Appendix F

Geotechnical Investigation prepared by
Southern California Geotechnical

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENCE

LDS Temple
Newport Beach, California
for
David Pierce Hohmann and Associates

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

October 21, 2008

David Pierce Hohmann and Associates
250 Baker Street East, Suite 200
Costa Mesa, California 92626

Attention: Mr. Chris Jacques

Project No.: **08G193-1**

Subject: **Geotechnical Investigation**
Proposed Residence
LDS Temple
Newport Beach, 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.

Daniel W. Nielsen
Staff Engineer

John A. Seminara, GE 2294
Principal Geologist

REGISTERED PROFESSIONAL ENGINEER
JOHN A. SEMINARA
No. 2294
Exp. 12/31/08
GEOTECHNICAL
STATE OF CALIFORNIA

Distribution: (5) Addressee

22885 East Savi Ranch Parkway ▾ Suite E ▾ Yorba Linda, CA 92887-4624
voice: (714) 685-1115 ▾ fax: (714) 685-1118 ▾ www.socalgeo.com

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 stripping of the existing vegetation and any other existing improvements in the vicinity of the proposed residential building. Resultant debris should be properly disposed of off-site.
- Fill soils extend to depths of 4½ to 7½± feet below existing site grades within the area of the proposed building. These fill soils generally consist of medium dense clayey fine sands with fine gravel and stiff fine sandy clays with occasional fine gravel.
- Based on these conditions, remedial grading is recommended to be performed within the proposed building pad area. The existing soils are recommended to be overexcavated to a depth of 3 feet below existing grade and to a depth of 3 feet below proposed pad grade, throughout the building area. Within the building area, the proposed foundation influence zones should be overexcavated to a depth of 2 feet below proposed foundation bearing grade.
- After overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify if any additional soils should be overexcavated. The resulting soils should be scarified and properly moisture conditioned to achieve a moisture content of 2 to 4 percent above optimum moisture, to a depth of at least 12 inches. The overexcavation subgrade soils should then be recompacted under the observation of the geotechnical engineer. The previously excavated soils may then be replaced as compacted structural fill.

Building Foundations

- Conventional shallow foundations, supported in newly placed compacted structural fill.
- 1,500 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-inch minimum thickness.
- Reinforcement of the floor slab should consist of No. 3 bars at 18-inches on center in both directions. Conventional welded wire mesh (6x6-W1.4xW1.4 WWF) may be used at the discretion of the structural engineer. The actual floor slab reinforcement should be determined by the structural engineer.

Driveways and Exterior Flatwork

- Conventional Slab-on-Grade, 4-inch minimum thickness.
- Reinforcement consisting of No. 3 bars at 18-inches on-center in both directions in areas which may be subjected to vehicular traffic. Additional reinforcement may be necessary for structural considerations.

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 08P243, dated June 12, 2008. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations and building floor slab 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 2300 Bonita Canyon Drive in Newport Beach, California. The subject site is located within the existing Church of Jesus Christ of Latter Day Saints (LDS) facility. The overall site is currently occupied by the Fellowship Hall and the Temple. The overall site is bordered to the south by Bonita Canyon Drive, to the east and north by open space, and to the west by Battersea Road. The subject site is located in the southeast corner of the overall site within the existing landscape planter area. The general location of the site is illustrated on the Site Location Map, included as Plate 1 in Appendix A of this report.

As previously stated, the subject site is located within the landscape planter area in the southeast corner of the LDS facility. Ground surface cover in the landscape planter area generally consists of ornamental groundcover plants with some shrubs and small trees throughout.

Preliminary topographic information was obtained from a plan provided to our office by David Pierce Hohmann and Associates. The plan indicates that site grades within the proposed area of development on the subject site range from elevation (El.) 178± feet mean sea level (msl) in the northwestern and southeastern areas of the site to El. 182± msl in the eastern area of the site. There is approximately 4± feet of elevation change across the area of proposed development on the subject site.

3.2 Proposed Development

A preliminary site plan for the proposed development was obtained from David Pierce Hohmann and Associates. Based on this plan, the proposed development will consist of a one-story residence and garage with a total footprint area of 2,385± ft^2, located in the southeast corner of the LDS facility. Maximum column and wall loads are estimated to be 20 kips and 2 kips per foot, respectively. We assume that the proposed development will not incorporate any below ground construction, such as basements or crawl spaces.

Detailed grading plans for the proposed development are not currently available. Based on a conversation with a representative of the client, the finished floor grade is expected to located at El. 181.5 feet msl. Therefore, we expect the pad elevation to be located at El. 181± feet msl. Based on these conditions, minor cuts and fills up to 3± feet may be required in order to achieve the new site grades. However, these estimates are exclusive of site preparation and overexcavation requirements. We should be notified if the proposed site grades are modified significantly from those stated above, since revision to the geotechnical recommendations may be appropriate.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of two (2) borings advanced to depths of 8 to 9½± feet below currently existing site grades. Both of the borings were logged during drilling by a member of our staff.

The borings were advanced using manually operated auger equipment. Representative 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. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory. Bulk samples were also collected from auger cuttings and placed into plastic bags to retain their in-situ moisture content.

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

Artificial Fill

Artificial fill soils were encountered at the ground surface at both of the boring locations. The fill soils consist of clayey fine to medium sands and fine sandy clays extending to depths of 4½ to 6½± feet below existing site grades. The fill soils possess variable strengths and a disturbed appearance, resulting in their classification as fill. Additionally, soils classified as possible fill were encountered at Boring No. B-2 at depths of 6½ to 7½± feet below the existing grade. These soils consisted of stiff, fine to medium sandy clay with traces of fine gravel. These soils were classified as possible fill soils because they possessed a somewhat disturbed appearance but lacked other obvious indicators of artificially placed fill soils.

Terrace Deposits

Terrace deposits were encountered underlying the artificial fill soils at both of the boring locations. The terrace deposits consist of medium dense to dense silty fine sands to fine sandy silts, clayey sands and stiff fine sandy clays extending to the maximum depth explored of 9½± feet.

Groundwater

Free water was not encountered at any of the boring locations. Based on the lack of any free water within the borings and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth greater than 9½± feet below existing site grades at the time of subsurface exploration.

4.3 Previous Grading

SCG monitored grading operations for the adjacent temple building and its associated improvements. Rough grading operations commenced on September 29, 2003 and were completed on November 17, 2003. These rough grading operations were documented in Rough Grade Compaction Report, Proposed LDS Temple, 2300 Bonita Canyon Road, Newport Beach, California for The Church of Jesus Christ of Later Day Saints, SCG Project No. 03M189-3, dated January 8, 2004. This report documents the site preparation, remedial grading in the building pad area and placement of compacted structural fill soils to achieve finished pad grades. The structural fill materials generally consisted of on-site sandy clays, clayey sands and sands silts. Depths of structural fill in the building pad area range from 4 to 12± feet below finished pad grade.

Site grading operations and post-grading earthwork activities for the overall temple site were documented in Final Compaction Report, Proposed LDS Temple, 2300 Bonita Canyon Road, Newport Beach, California for The Church of Jesus Christ of Later Day Saints, SCG Project No. 03M189-4, dated July 5, 2005. These activities included trench backfills for underground utilities, slope construction near an existing crib wall that had been lowered by 11± feet, backfills for several site retaining walls with compacted structural fill, pavement subgrades and aggregate base courses and asphaltic concrete pavements.

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. The field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown graphically 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-4 in Appendix C of this report.

Soluble Sulfates

A representative sample of the near-surface soil 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 results of the soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

Sample Identification	**Soluble Sulfates (%)**	**UBC Classification**
B-1 @ 0 to 5 feet	0.027	Negligible

Expansion Index

The expansion potential of the on-site soils was determined in general accordance with California Building Code (CBC) Standard 18-2. 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**	**Expansive Potential**
B-1 @ 0 to 5 feet	9	Very Low

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 must be designed in accordance with the requirements of the latest edition of the 2007 California Building Code (CBC), which is based on the 2006 International Building Code (IBC).

The IBC 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 2006 IBC Seismic Design Parameters have been generated using Earthquake Ground Motion Parameters, a 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 2006 IBC, 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:

2007 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.623
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.579
Site Class	---	D
Short-Period Site Coefficient at 0.2 sec Period	F_a	1.0
Long-Period Site Coefficient at 1.0 sec Period	F_v	1.5
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.623
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.868
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.082
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.579

Liquefaction

Liquefaction is the loss of 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.

Based on mapping performed by the California Geological Survey (CGS) the subject site is not located within a designated liquefaction hazard zone. In addition, the subsurface conditions encountered at the boring locations are not considered to be conducive to liquefaction. These conditions generally consist of medium dense to dense clayey sands and stiff sandy clays and clayey silts, extending to the maximum depth explored of 9½± feet. Based on the mapping performed by CGS and the 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 subject site is underlain by near surface fill soils consisting of medium dense clayey sands and stiff sandy clays extending to depths of 4½ to 7½± feet below existing site grades. As stated in a previous section of this report, the site was rough graded to its current configuration in 2003. Post-grading earthwork activities including placement of fill soils in the subject site were performed subsequent to rough grading. Based on these considerations, remedial grading is warranted within the proposed building area in order to remove and replace a portion of the near surface fill soils as compacted structural fill. Deeper fill soils will be evaluated to determine if they were placed as acceptable structural fill.

Settlement

Laboratory testing indicates that the upper portion of existing fill soils are subject to consolidation and collapse when exposed to moisture infiltration. The remedial grading recommendations contained within this report include removal and replacement of these potentially compressible and collapsible materials. Provided that the recommended remedial grading is completed, the post-construction static settlement of the proposed structure is expected to be within tolerable limits.

Expansion

Laboratory testing performed on a representative sample of the near surface soils indicates that these materials possess a very low expansion potential (EI = 9). The foundation and floor slab design recommendations contained within this report are made in consideration of the expansion index test results. It is recommended that additional expansion index testing be conducted at the completion of rough grading to verify the expansion potential of the as-graded building pad.

Soluble Sulfates

The results of the soluble sulfate testing, as discussed in Section 5.0 of this report, indicate a soluble sulfate concentration of 0.027 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 rough grading to verify the soluble sulfate concentrations of the soils which are present at pad grade within the building areas.

Grading and Foundation Plan Review

Detailed grading and foundation plans were not available at the time of this report. It is therefore recommended that we be provided with copies of the 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

Initial site preparation should include stripping of any vegetation on the site. Any such materials should be disposed of off-site, or in nonstructural areas of the property. The actual extent of stripping should be determined in the field by a representative of the geotechnical engineer, based on the organic content and the stability of the encountered materials.

Treatment of Existing Soils: Proposed Residence

Remedial grading should be performed within the area of the proposed building in order to remove a portion of the near surface soils. Based on conditions encountered at the boring locations, these fill materials and possible fill materials extend to depths of 4½ to 7½± feet below existing site grades. In order to provide a relatively uniform support condition for the new structure, it is recommended that the existing soils within the proposed building area be overexcavated to a depth of 3 feet below existing grade and to a depth of 3 feet below proposed building pad subgrade elevation. The depth of overexcavation should also be sufficient to provide at least 2 feet of newly placed compacted structural fill below the bearing grade of all foundations.

The overexcavation areas should extend at least 5 feet beyond the building perimeter, and to an extent equal to the depth of fill below the new foundations. If the proposed structure incorporates any exterior columns (such as for a canopy or overhang) the 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 probing and proofrolling to identify any soft, loose or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if dry, loose, porous, low density or otherwise unsuitable materials 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, moisture treated to 2 to 4 percent above optimum moisture content, and compacted. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Flatwork and Driveway Areas

Subgrade preparation in new flatwork 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.

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 recent IBC/CBC and the grading code of the City of Newport Beach.
- 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 non to 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 should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. As an alternative, a clean sand (minimum Sand Equivalent of 30) may be placed within trenches and compacted in place (jetting or flooding is not recommended). Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the City of Newport Beach. 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 encountered at the boring locations generally consist of clayey sands and sandy clays. These materials are generally not considered to be subject to caving within shallow excavations. However, if caving occurs within shallow excavations, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, temporary excavation slopes should be made 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

Most of the near surface soils possess occasional silt and clay content. If grading occurs during a period of relatively wet weather, an increase in subgrade instability should also be expected.

If the construction schedule dictates that site grading will occur during a period of wet weather, allowances should be made for costs and delays associated with drying the on-site soils or import of a less moisture sensitive fill material. Grading during wet or cool weather may also increase the depth of overexcavation in the pad area.

Groundwater

The static groundwater table at this site is considered to exist at a depth in excess of 9½± 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 residential building will be underlain by newly placed structural fill soils extending to a depth of at least 2 feet below foundation bearing grade. Based on this subsurface profile, the proposed structure may be supported on a shallow foundation system.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 1,500 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.

- Minimum longitudinal steel reinforcement within strip footings: Four (4) No. 5 rebars (2 top and 2 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 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. Within the new building area, 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. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill, 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 moisture content, 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, under static conditions. 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 slab 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 suitable compacted structural fill. The maximum allowable passive pressure is 2500 lbs/ft^2.

6.6 Floor Slab Design and Construction

Subgrades which will support the new floor slab 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 proposed 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 finished pad. Based on geotechnical considerations, the floor slab may be designed as follows:

- Minimum slab thickness: 5 inches.

- Minimum slab reinforcement: Reinforcement of the floor slab should consist of No. 3 bars at 18-inches on center in both directions. Conventional welded wire mesh (6x6-W1.4xW1.4 WWF) may be used at the discretion of the structural engineer. The actual floor slab reinforcement should be determined by the structural engineer.

- Slab underlayment: A moisture vapor barrier should be constructed below the entire slab area of the proposed building. 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. 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.

- 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.

- 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 Exterior Flatwork Design and Construction

Subgrades which will support new exterior slabs-on-grade for patios, flatwork and driveways should be prepared in accordance with the recommendations contained in the ***Grading Recommendations*** section of this report. Based on geotechnical considerations, exterior slabs-on-grade may be designed as follows:

- Minimum slab thickness: 4 inches
- Minimum slab reinforcement: Driveway slabs or other flatwork which may be subjected to vehicular traffic should include No. 3 bars at 18 inches on center, in both directions. Reinforcement in other exterior flatwork is not required, with respect to geotechnical conditions.
- Moisture condition the flatwork subgrade soils to a moisture content of 2 to 4 percent above optimum moisture content, to a depth of at least 12 inches.
- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.
- Control joints should be provided at a maximum spacing of 8 feet on center in two directions for slabs and at 4 feet on center for sidewalks. Control joints are intended to direct cracking. Minor cracking of exterior concrete slabs-on-grade should be expected.
- Expansion or felt joints should be used at the interface of exterior slabs-on-grade and any fixed structures to permit relative movement.

Thickened Edges

Where the outer edges of concrete flatwork are to be bordered by landscaping, consideration should be given to the use of thickened edges to prevent excessive infiltration and accumulation of water under the slabs. Thickened edges, if used, should be 6 to 8 inches wide, extend 12 inches below the tops of the finish slab surfaces, and be reinforced with a minimum of two No. 4 bars, one top and one bottom. Thickened edges are not mandatory; however, their inclusion in flatwork construction adjacent to landscaped areas will significantly reduce the potential for movement and subsequent cracking of the flatwork related to settlement.

6.8 Landscape Wall Construction

Foundations

Foundations for landscape walls should be founded at a minimum depth of 12 inches below the lowest adjacent final grade. The footings should also be reinforced with a minimum of two No. 4 bars, one top and one bottom.

Construction Joints

In order to minimize the potential for unsightly cracking related to the effects of differential settlement, construction joints should be provided in the walls at horizontal intervals of approximately 20± feet, and at each corner. The separations should be provided in the blocks and should not extend through the foundation. Foundations should be poured monolithically with continuous reinforcement along the entire length of the wall. A joint to provide positive separation between the wall face and adjacent flatwork is also recommended. A ½± inch thick felt joint may be used for this application.

6.9 Planters and Planter Walls

Area drains should be extended into all planters that are located within 5 feet of building walls, foundations, retaining walls and landscape walls to minimize infiltration of water into the adjacent foundation soils. The surface of the ground in these areas should also be sloped at a minimum gradient of 2 percent away from the walls and foundations. A drip irrigation system is also recommended to prevent over watering and subsequent saturation of the foundation walls.

Planter walls should be supported by continuous concrete footings designed and constructed in accordance with the recommendations presented for landscape walls.

6.10 Retaining Wall Design and Construction

Some small retaining walls may be required to facilitate the new site grades. 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 for two different types of wall backfill: on-site granular soils consisting of clayey sands and imported select granular material. The on-site near surface soils generally consist of clayey sands and sandy clays. The following parameters do not apply to the predominantly fine gained sandy clays, but are intended for the granular clayey sands. Based on their composition, the granular on-site soils have been assigned a friction angle of 28 degrees. Select fill materials must be placed within the entire active failure wedge in order to use the design parameters for imported select fill. This wedge is defined as extending from the heel of the retaining wall upwards at an angle of approximately 60°.

RETAINING WALL DESIGN PARAMETERS

Design Parameter		Soil Type	
		Imported Aggregate Base	On-Site Clayey Sands
Internal Friction Angle (ϕ)		38°	28°
Unit Weight		130 lbs/ft³	125 lbs/ft³
Equivalent Fluid Pressure:	Active Condition (level backfill)	30 lbs/ft³	45 lbs/ft³
	Active Condition (2h:1v backfill)	44 lbs/ft³	79 lbs/ft³
	At-Rest Condition (level backfill)	50 lbs/ft³	66 lbs/ft³

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/ft³. 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, such as the perimeter walls of any basement levels.

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.

Retaining Wall Foundation Design

The retaining wall foundations should be supported within existing near surface soils which will be evaluated at the time of excavation. 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

It is recommended that a minimum 1 foot thick layer of free-draining granular material (less than 5 percent passing the No. 200 sieve) be placed against the face of the retaining walls. This material should extend from the top of the retaining wall footing to within 1 foot of the ground surface on the back side of the retaining wall. This material should be approved by the geotechnical engineer. If the layer of free-draining 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 layer of free draining granular material 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 D1557-91). 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.

Waterproofing

The back side of all retaining walls should be waterproofed prior to placing subdrains or backfill. The design and selection of the waterproofing system is outside the scope of our report and is outside our purview.

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 2 cubic foot pocket of open graded gravel, surrounded by an approved 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 or sump-pump system.

7.0 GENERAL COMMENTS

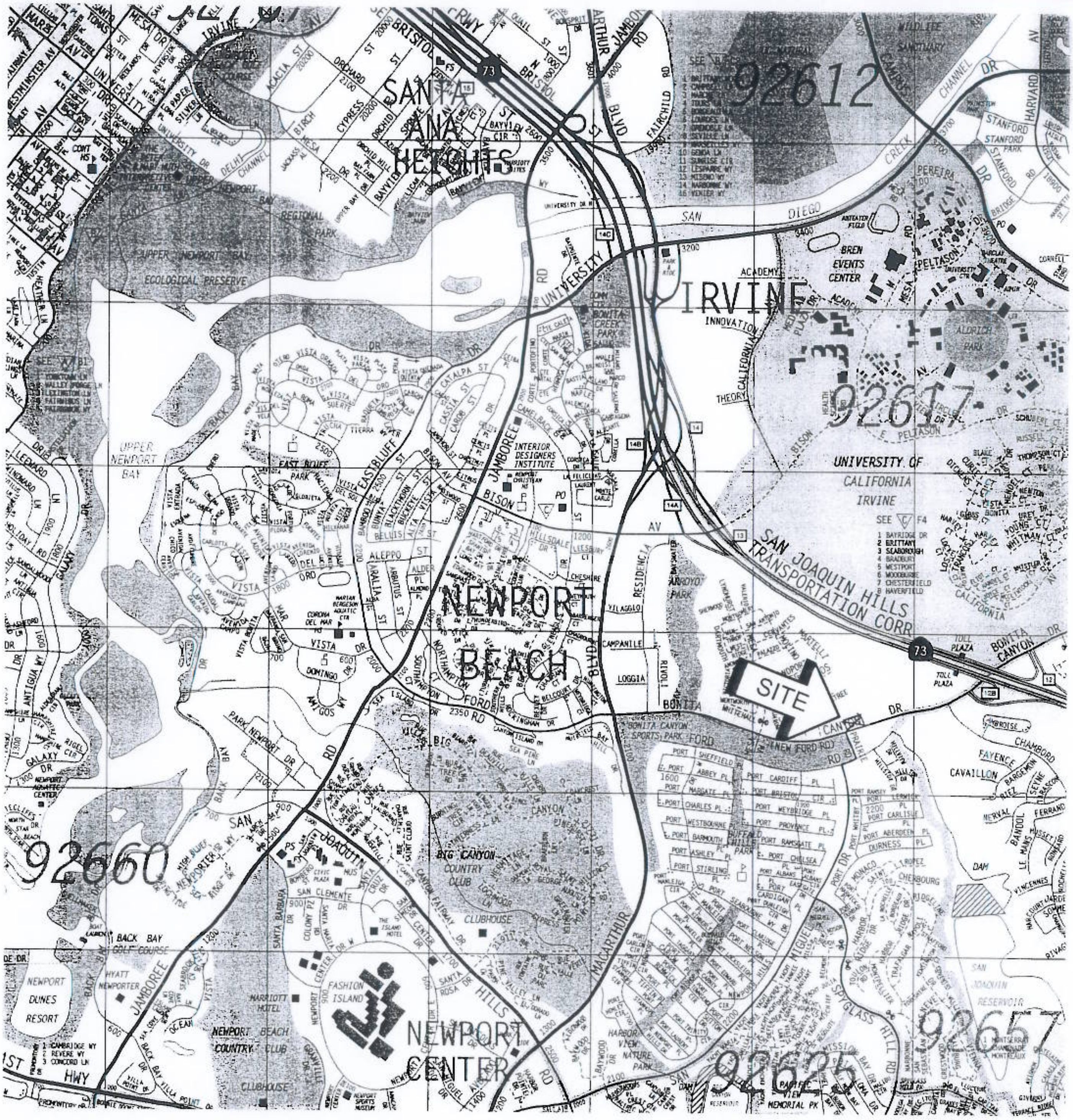
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other 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.

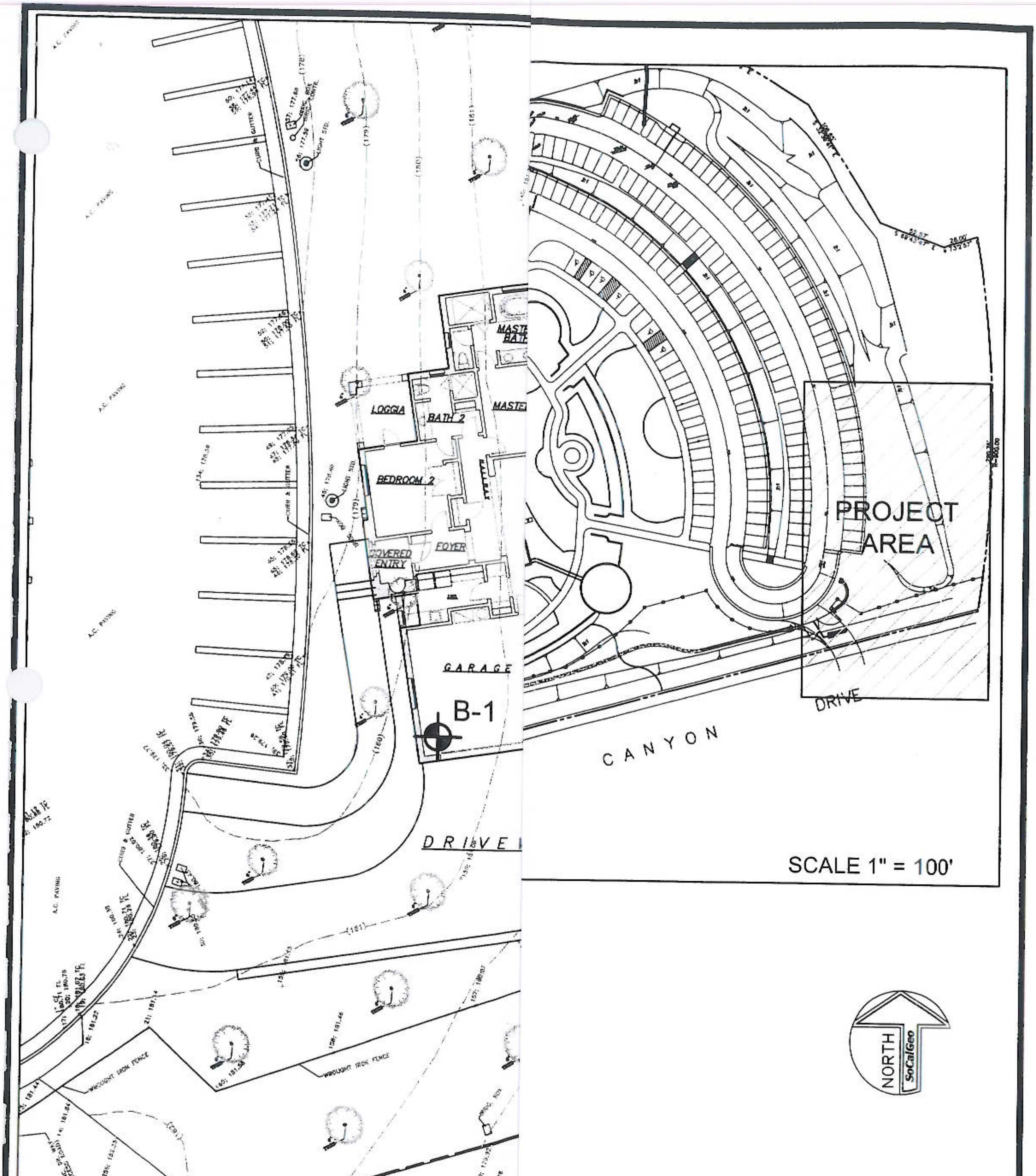
The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

APPENDIX A



SOURCE: ORANGE COUNTY
THOMAS GUIDE, 2008

SITE LOCATION MAP	
PROPOSEDSINGLE FAMILY RESIDENCE	
NEWPORT BEACH, CALIFORNIA	
1" = 2400'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: DRK CHKD: JAS	
SCG PROJECT 08G193-1	
PLATE 1	

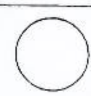
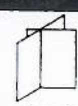


BORING LOCATION PLAN
PROPOSED SINGLE FAMILY RESIDENCE
NEWPORT BEACH, CALIFORNIA

SCALE AS SHOWN	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: DRK CHKD: JAS	
SCG PROJECT 08G193-1	
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 RECOVER: 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		SHEBLY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGH 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 blow 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.

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

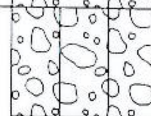
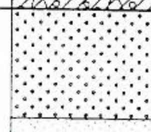
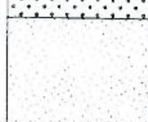
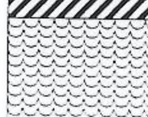
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

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

BORING NO. B-1

JOB NO.: 08G193
PROJECT: Proposed Single Family Residence
LOCATION: Newport Beach, California

DRILLING DATE: 9/29/08
DRILLING METHOD: Hand Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: 9.5 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 180.5 feet MSL

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	
	X				FILL: Brown Clayey fine to medium Sand, some fine to coarse Gravel, medium dense-damp	115	9					EI = 9
	X		4.5+		FILL: Dark Brown fine Sandy Clay to Clayey fine Sand, some Silt, trace fine root fibers, medium dense to stiff-damp to moist	112	10					
5	X				TERRACE DEPOSITS: Gray Brown to Brown Clayey fine Sand, trace medium Sand, little Silt, porous, medium dense-damp to moist	104	11					
	X					100	14					
	X		4.5+		TERRACE DEPOSITS: Gray Brown Clayey Silt, little fine Sand, calcareous veining and nodules, dense-moist	107	14					

Boring Terminated at 9½'

TBL 08G J SOCALGEO.GDT 10/20/08

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL

BORING NO. B-2

JOB NO.: 08G193
PROJECT: Proposed Single Family Residence
LOCATION: Newport Beach, California

DRILLING DATE: 9/29/08
DRILLING METHOD: Hand Auger
LOGGED BY: Daryl Kas

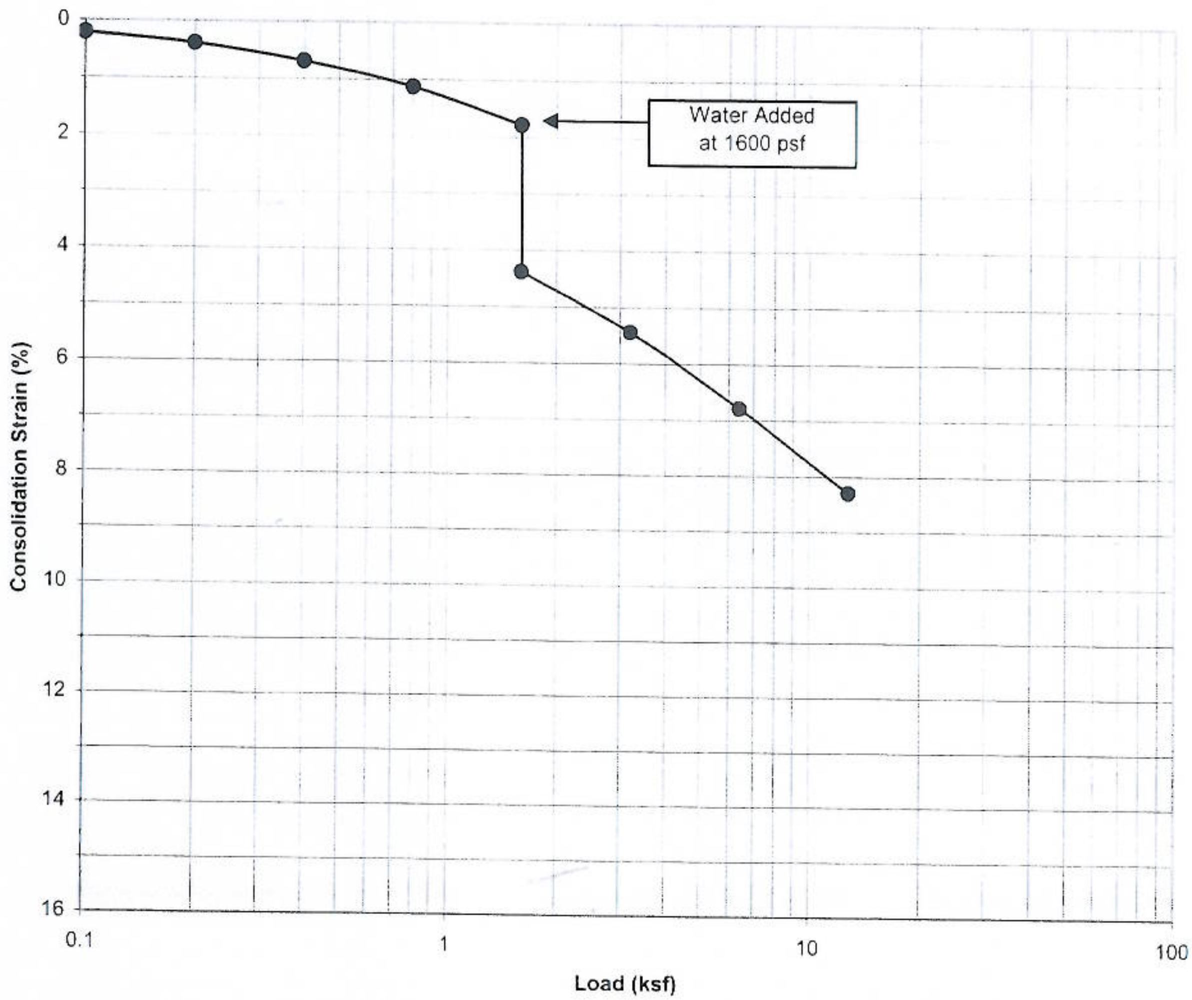
WATER DEPTH: Dry
CAVE DEPTH: 8 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 182 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	X				FILL: Brown Clayey fine Sand, little fine to coarse Gravel, trace medium Sand, medium dense-damp	101	5					
	X					106	7					
5	X					109	6					
					FILL: Gray Clayey fine Sand, little Silt, medium dense-damp							
	X		4.5+		POSSIBLE FILL: Dark Brown fine to medium Sandy Clay, trace fine Gravel, trace fine root fibers, stiff-damp	119	9					
					TERRACE DEPOSITS: Dark Gray Brown fine Sandy Clay, stiff-damp							
					Boring Terminated at 8'							

TBL 08G1... J SOCALGEO.GDT 10/20/08

APPENDIX C

Consolidation/Collapse Test Results

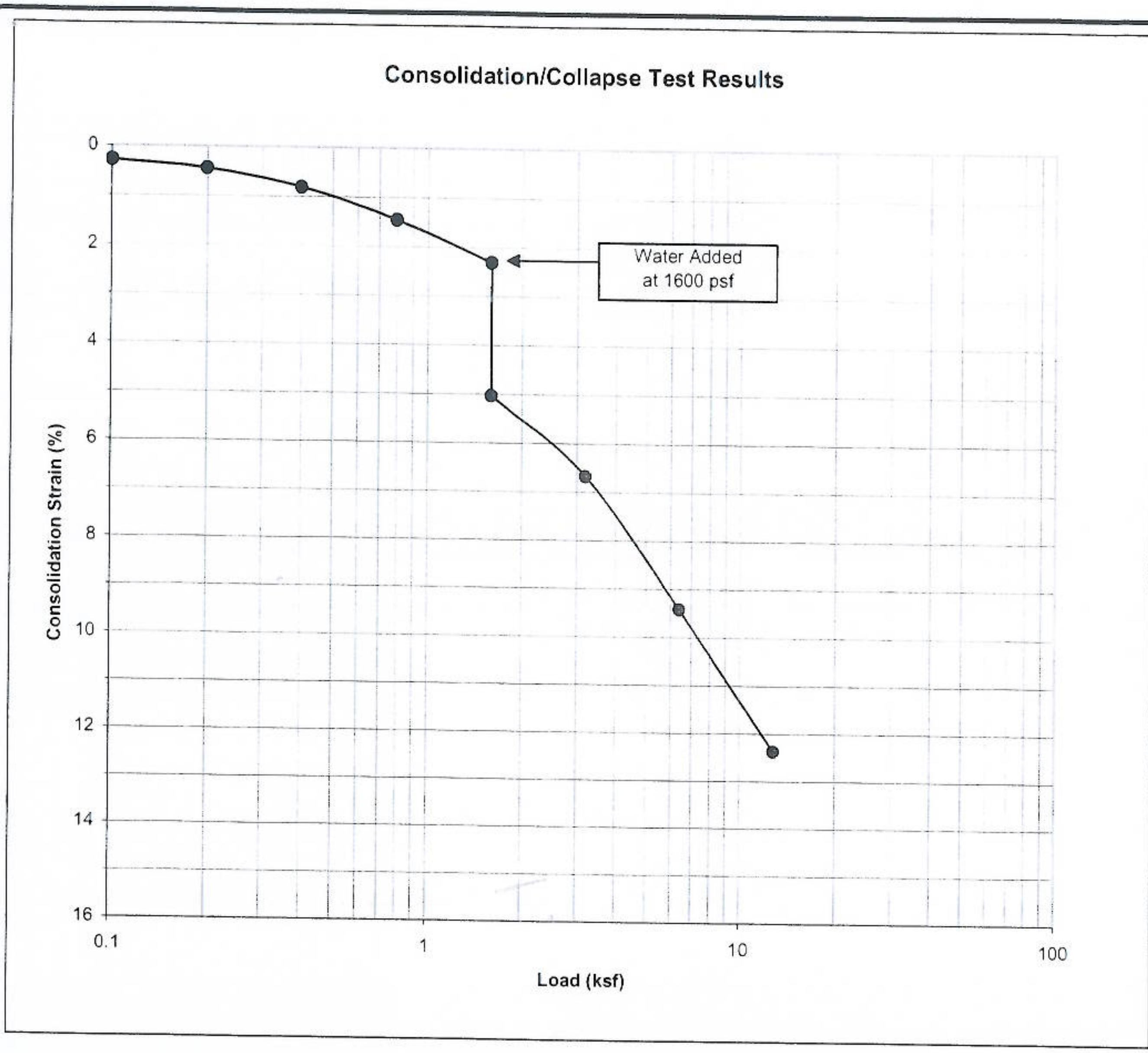


Classification: FILL: Brown Clayey fine to medium Sand, some fine to coarse Gravel

Boring Number:	B-1	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	1 to 2	Initial Dry Density (pcf)	115.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	128.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.60

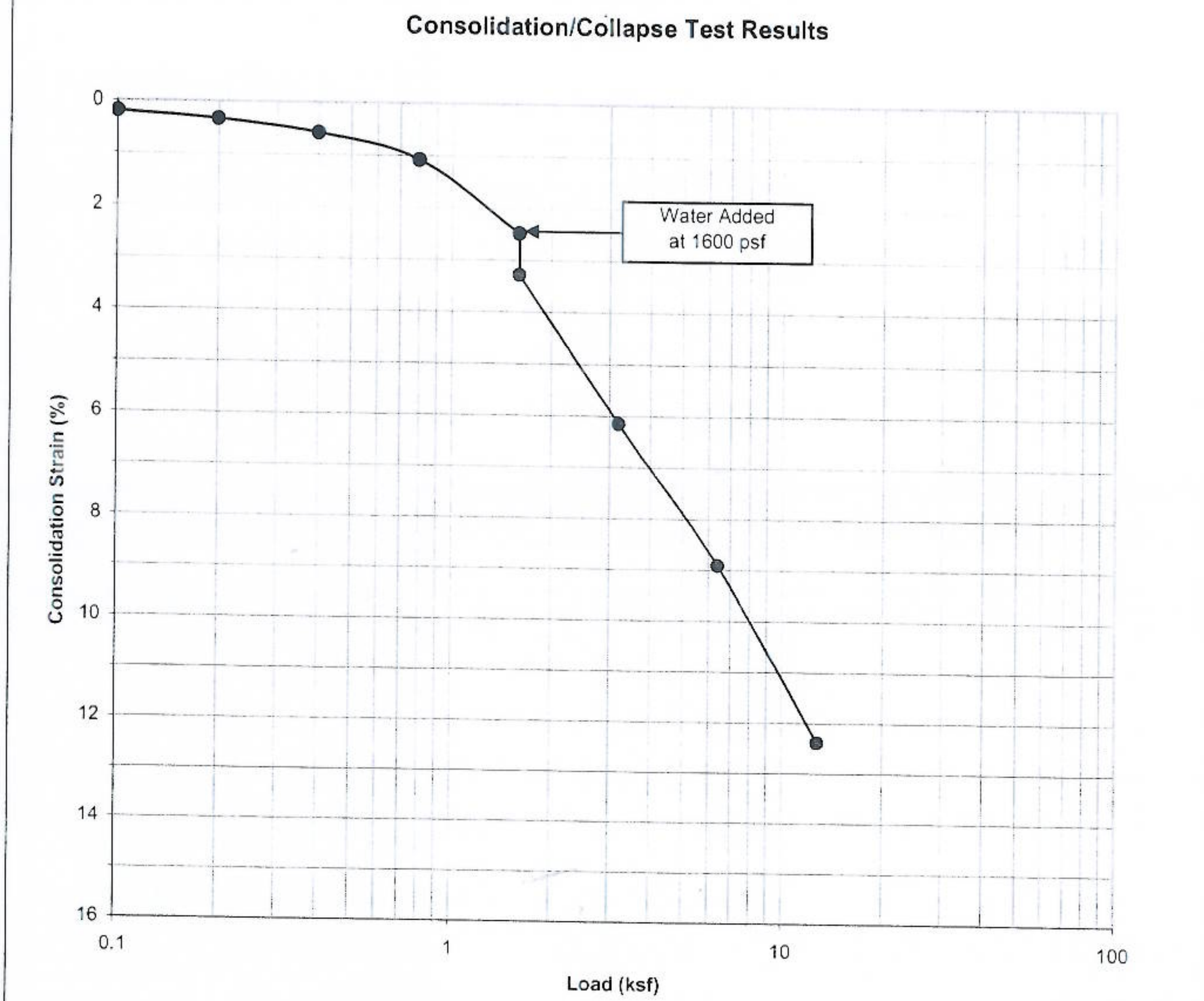
Proposed Single Family Residence
Newport Beach, California
Project No. 08G193
PLATE C- 1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Classification: FILL: Dark Brown fine Sandy Clay, some Silt, trace fine root fibers

Boring Number:	B-1	Initial Moisture Content (%)	10
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	3 to 4	Initial Dry Density (pcf)	110.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	125.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.72



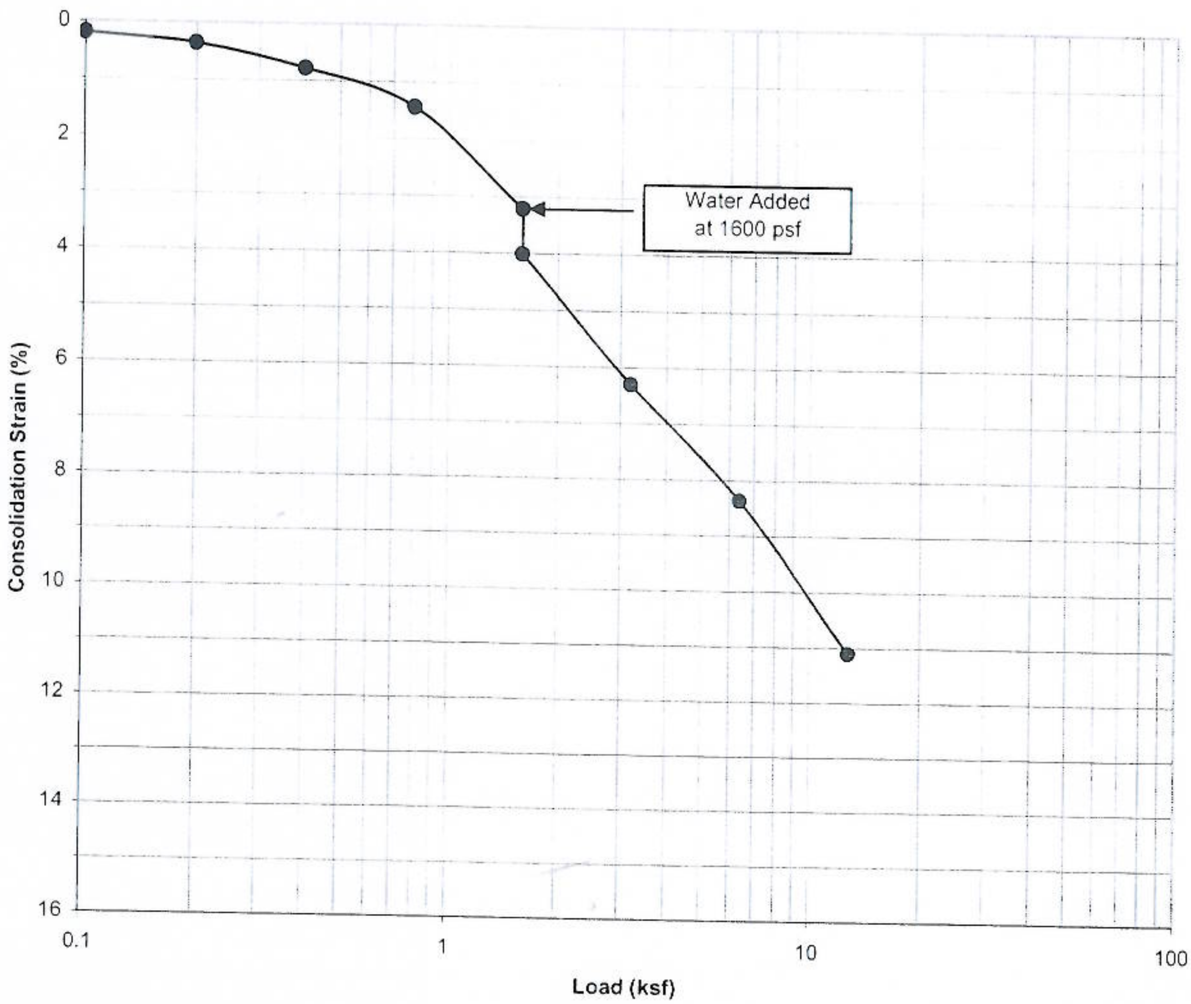
Classification: Gray Brown to Brown Clayey fine Sand, trace medium Sand

Boring Number:	B-1	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	5 to 6	Initial Dry Density (pcf)	102.3
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	116.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.80

Proposed Single Family Residence
Newport Beach, California
Project No. 08G193
PLATE C- 3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



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

Boring Number:	B-1	Initial Moisture Content (%)	13
Sample Number:	---	Final Moisture Content (%)	24
Depth (ft)	7 to 8	Initial Dry Density (pcf)	99.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	110.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.80

Proposed Single Family Residence
Newport Beach, California
Project No. 08G193
PLATE C- 4

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.

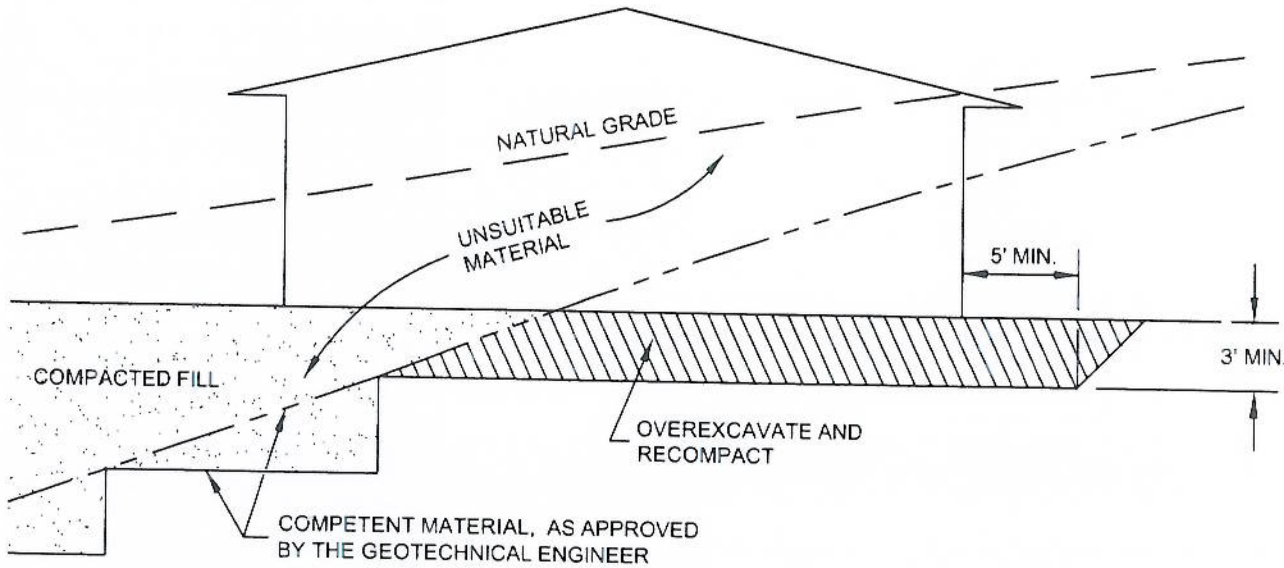
- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

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

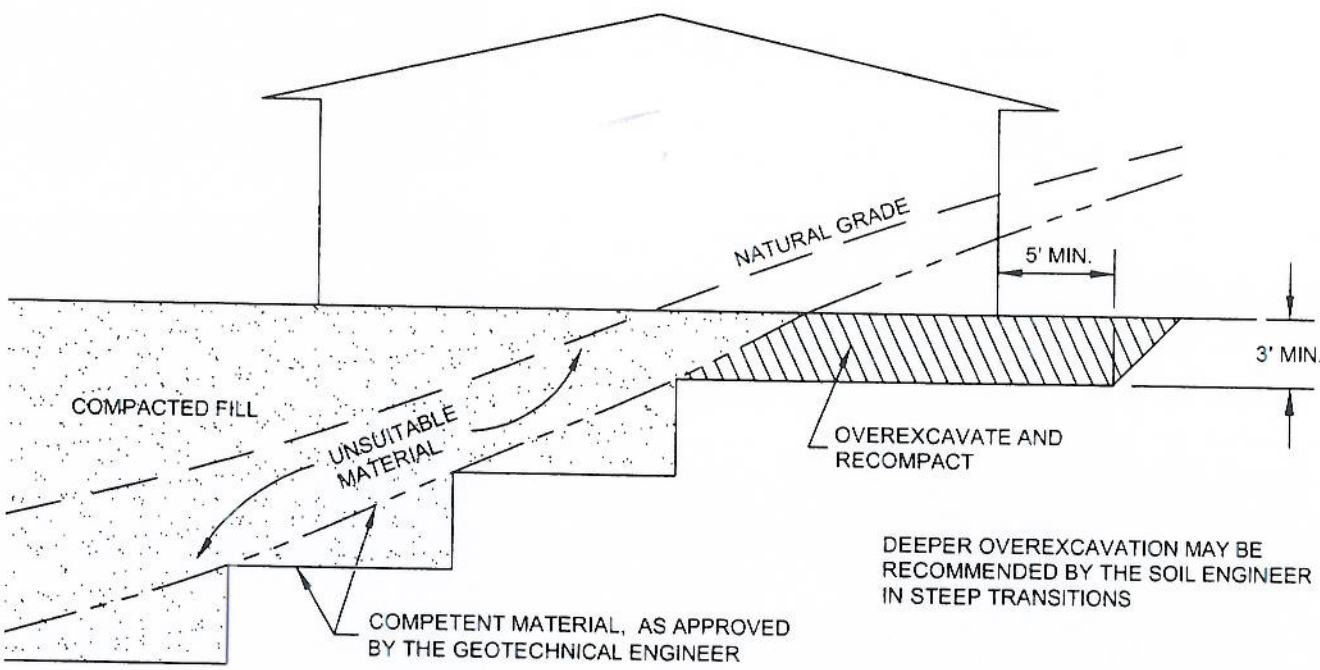
Subdrains

- 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

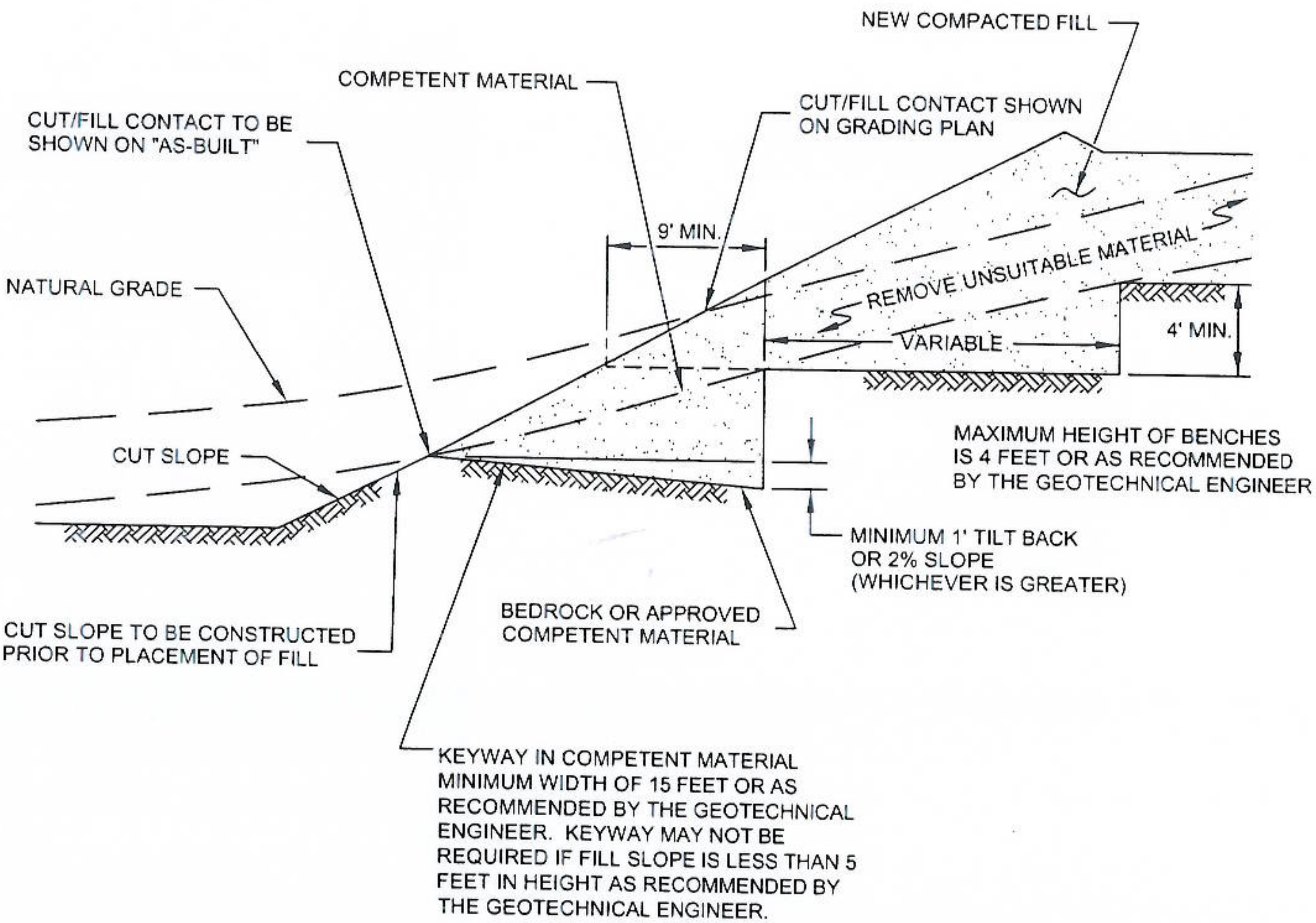


CUT/FILL LOT (TRANSITION)

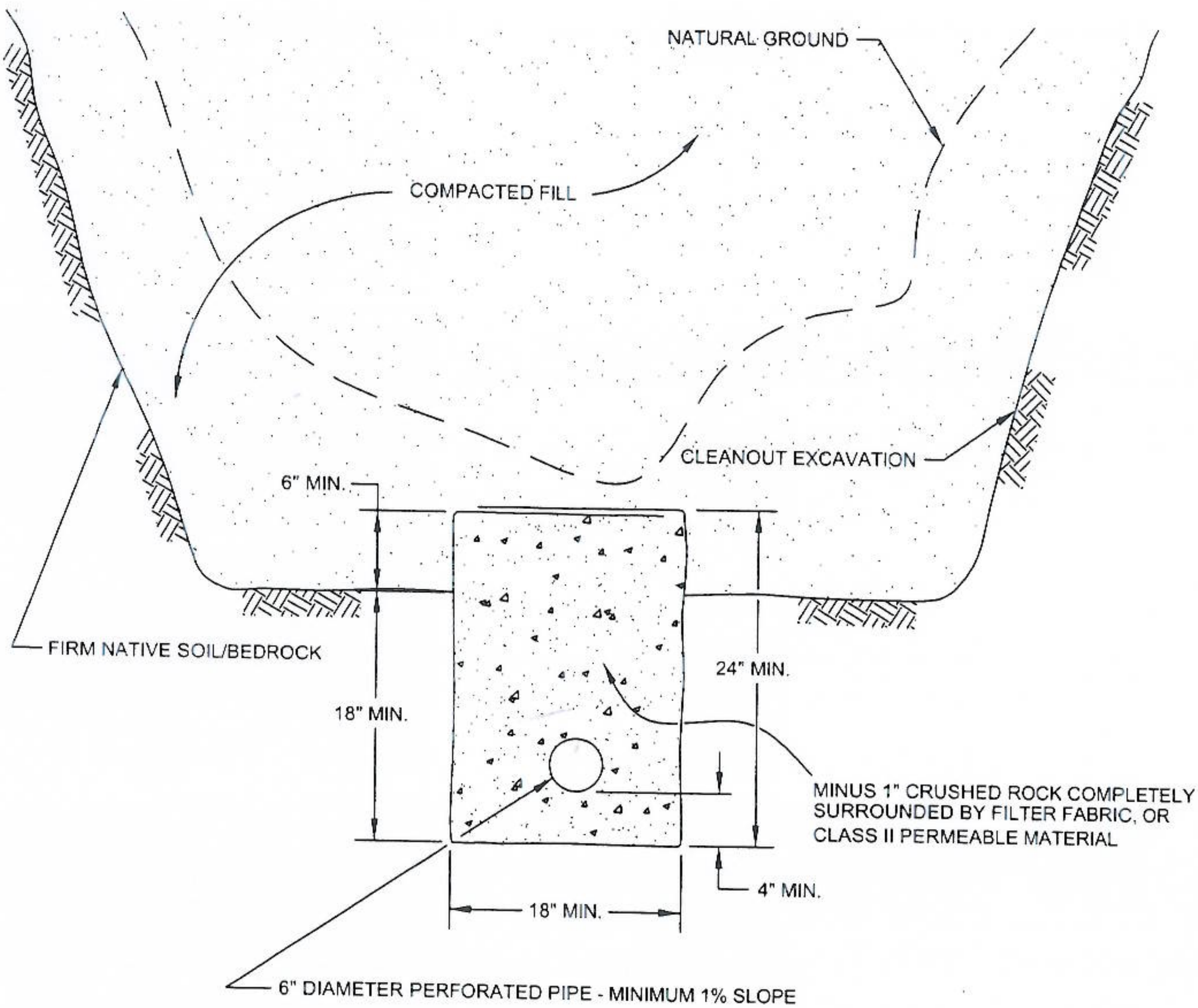


DEEPER OVEREXCAVATION MAY BE RECOMMENDED BY THE SOIL ENGINEER IN STEEP TRANSITIONS

TRANSITION LOT DETAIL	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JAS CHKD: GKM	
PLATE D-1	



FILL ABOVE CUT SLOPE DETAIL	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JAS CHKD: GKM	
PLATE D-2	



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

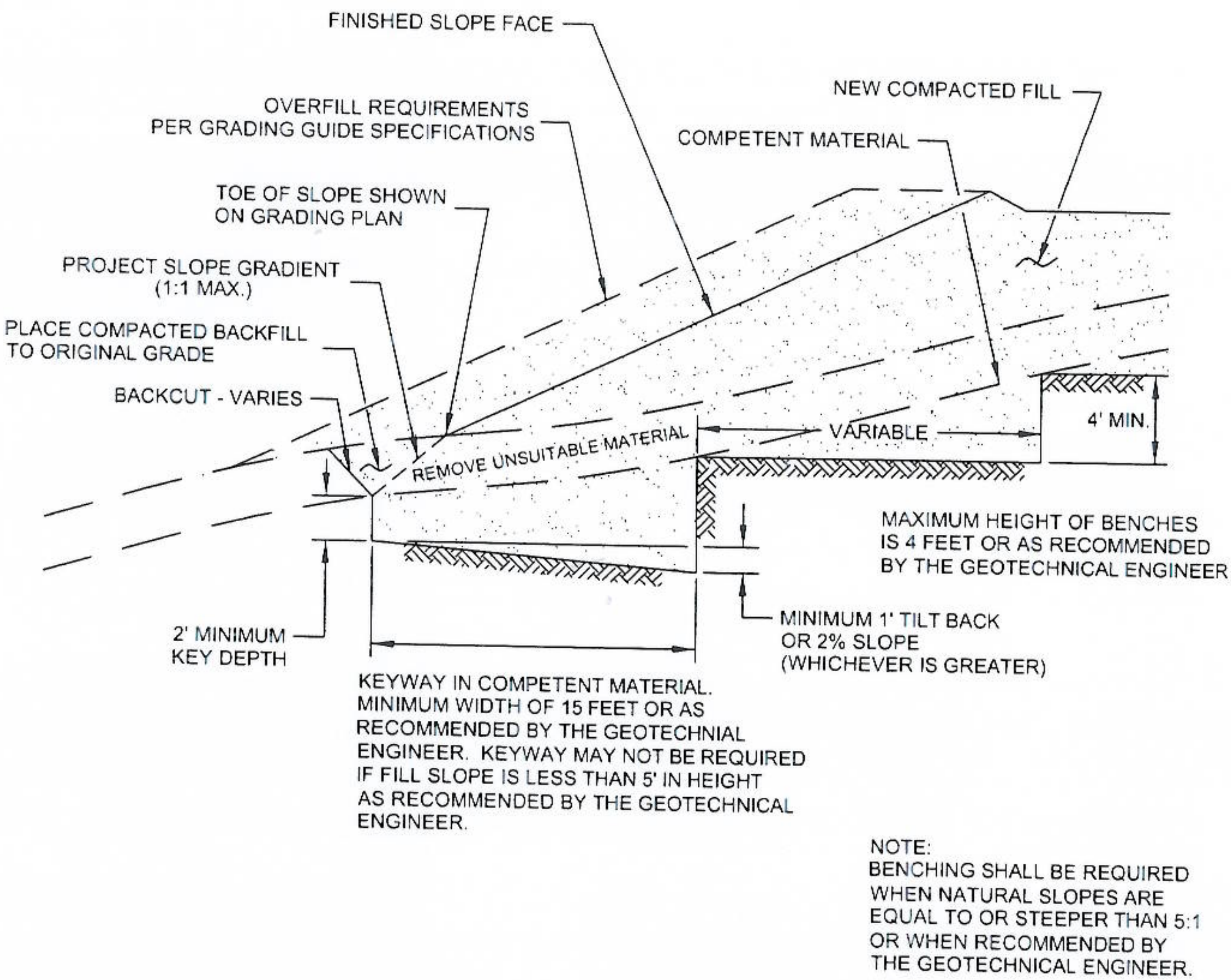
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo

SOUTHERN
CALIFORNIA
GEOTECHNICAL



FILL ABOVE NATURAL SLOPE DETAIL

GRADING GUIDE SPECIFICATIONS

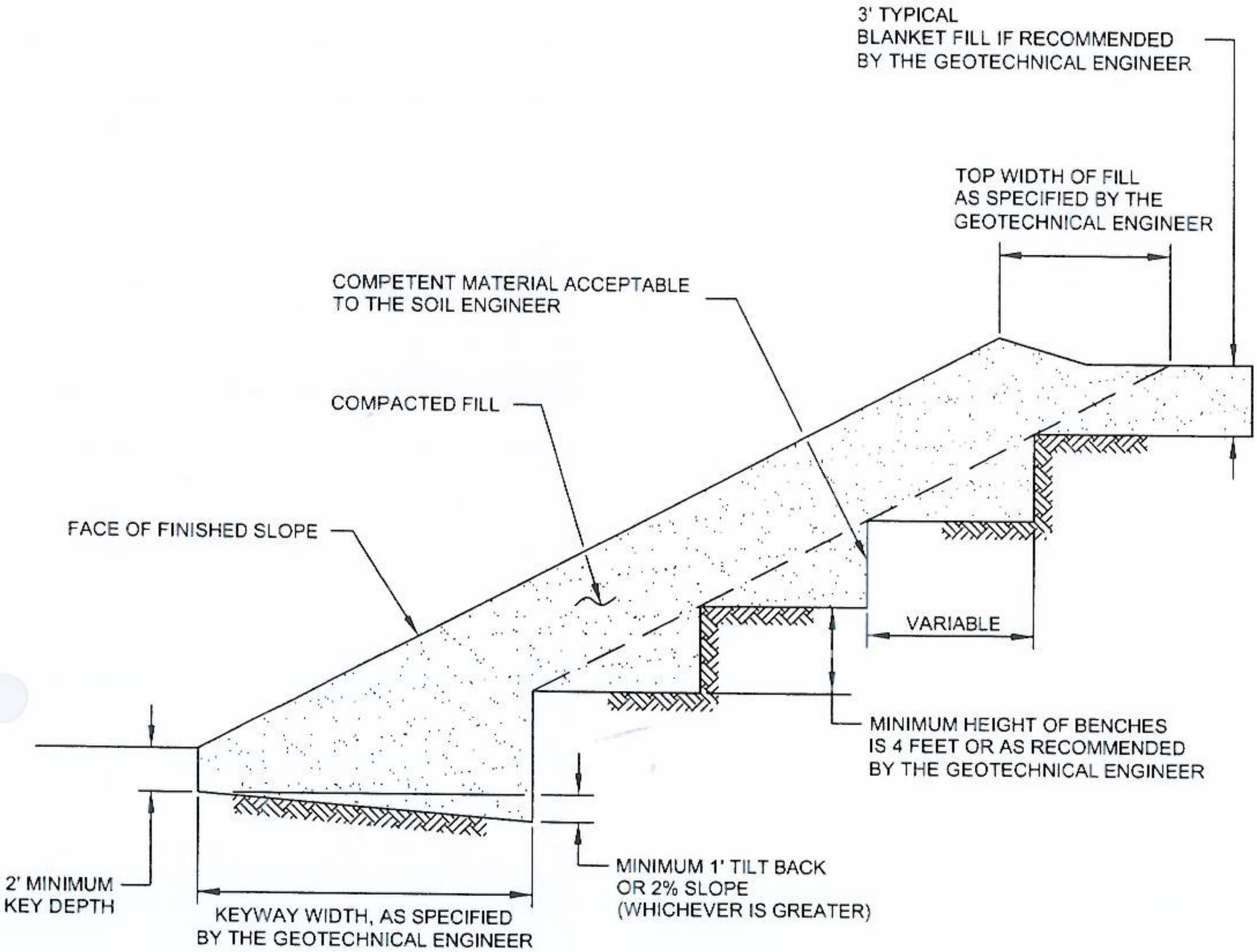
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

GRADING GUIDE SPECIFICATIONS

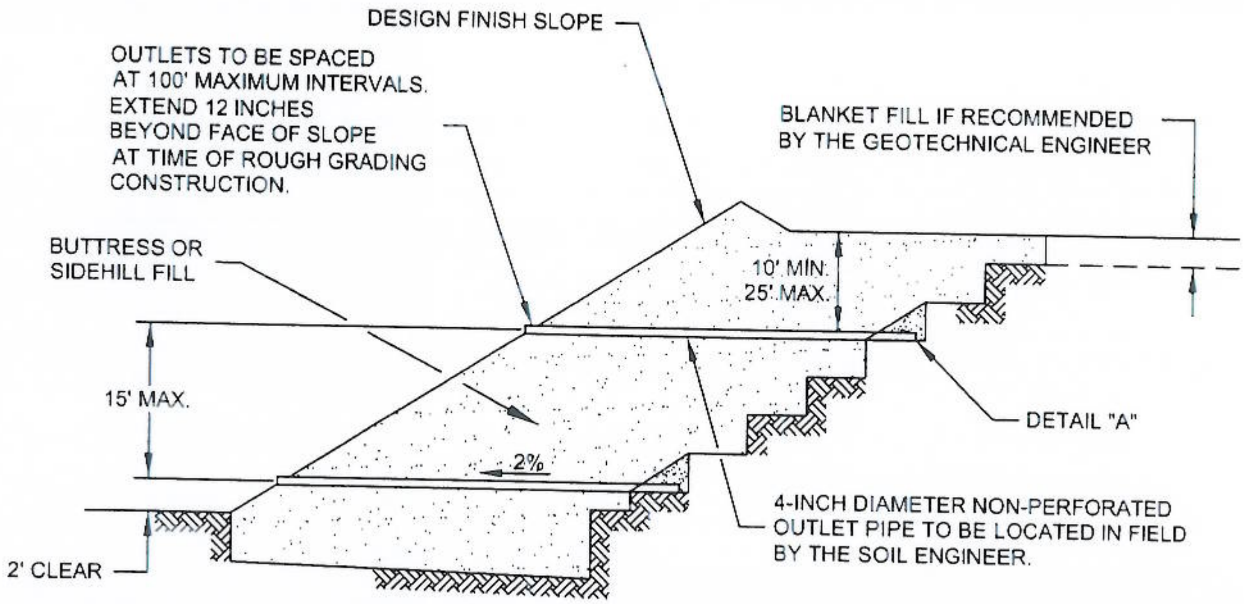
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



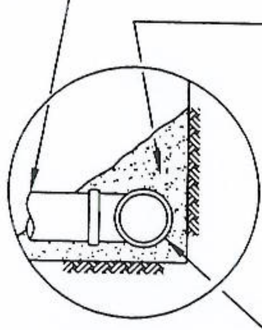
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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



DETAIL "A"

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

SLOPE FILL SUBDRAINS

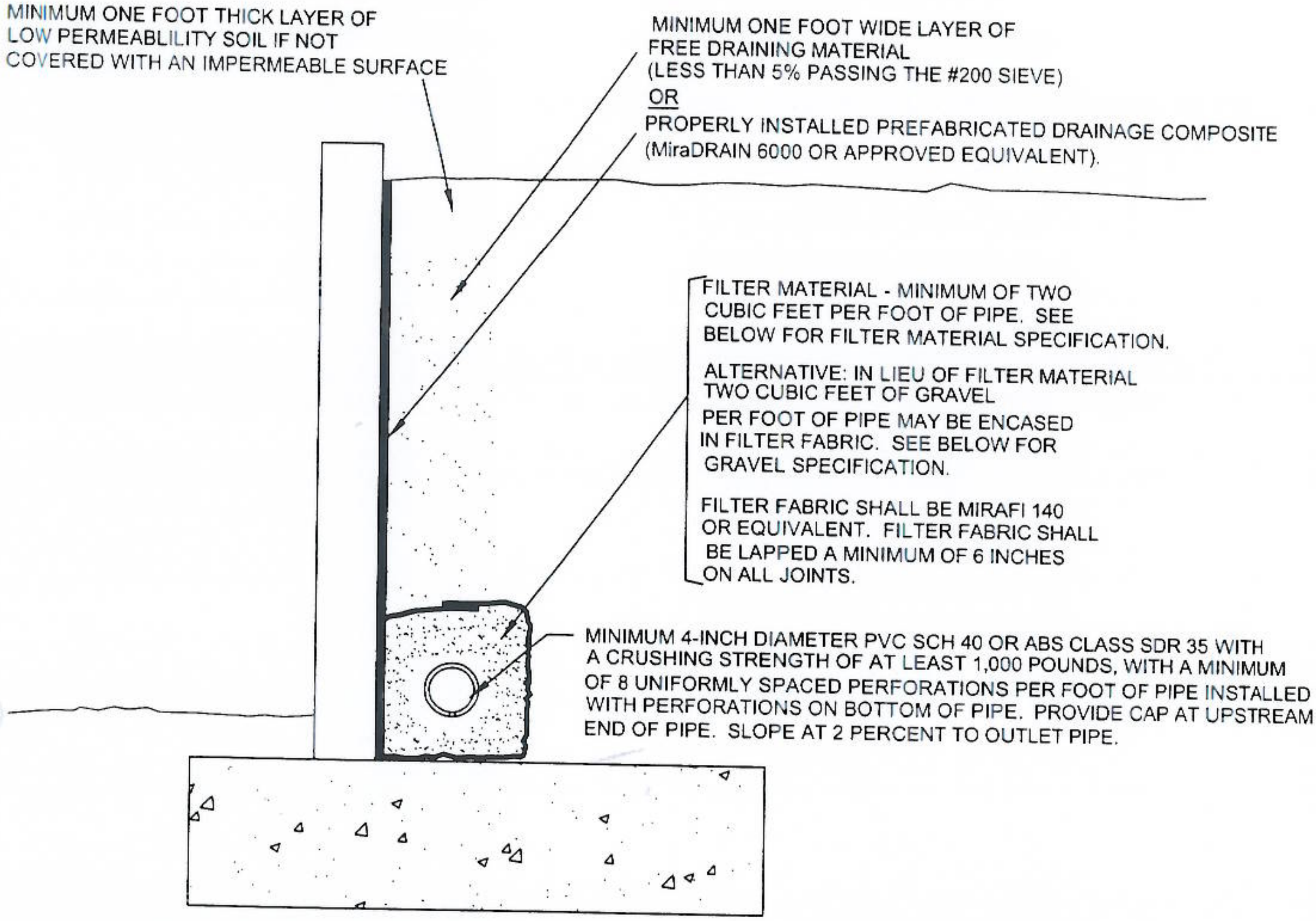
GRADING GUIDE SPECIFICATIONS

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

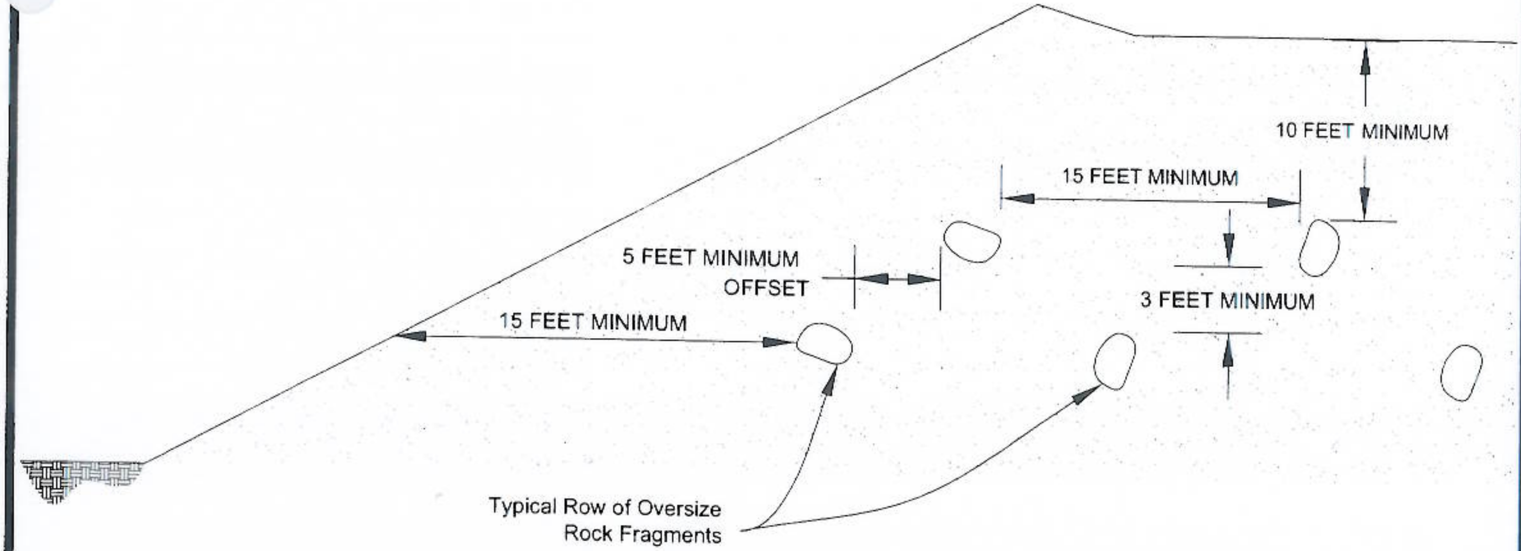
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

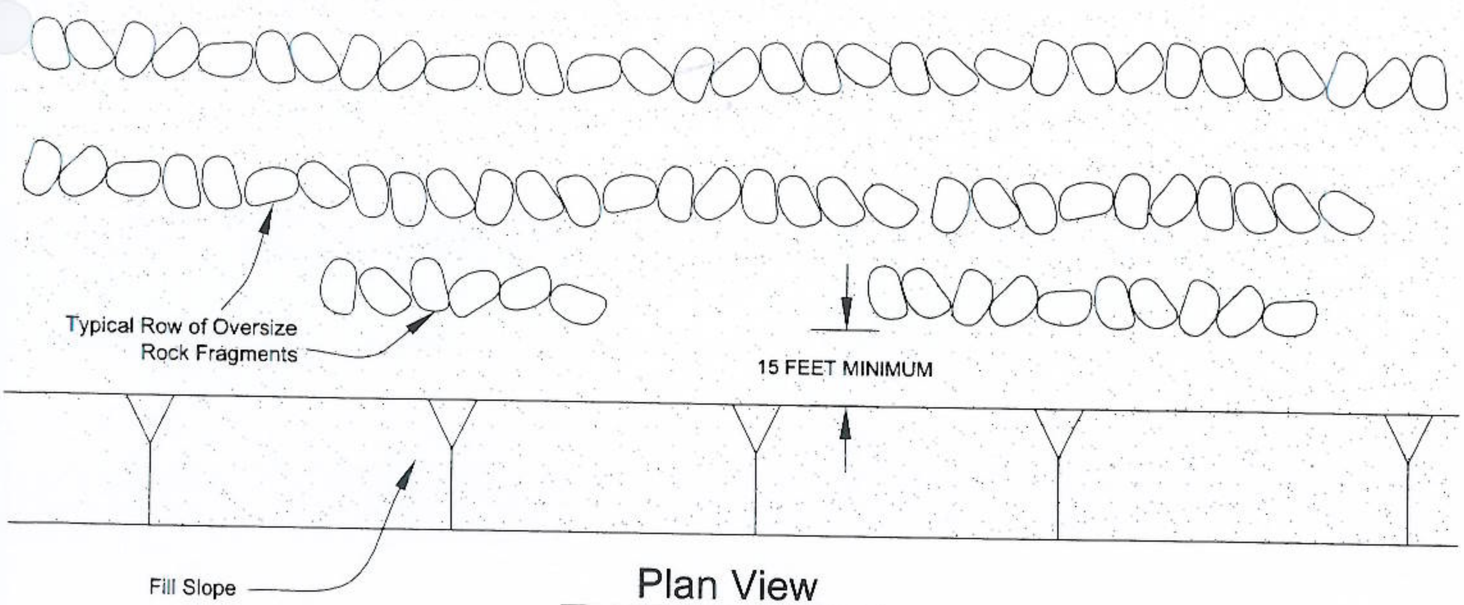
PLATE D-7

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

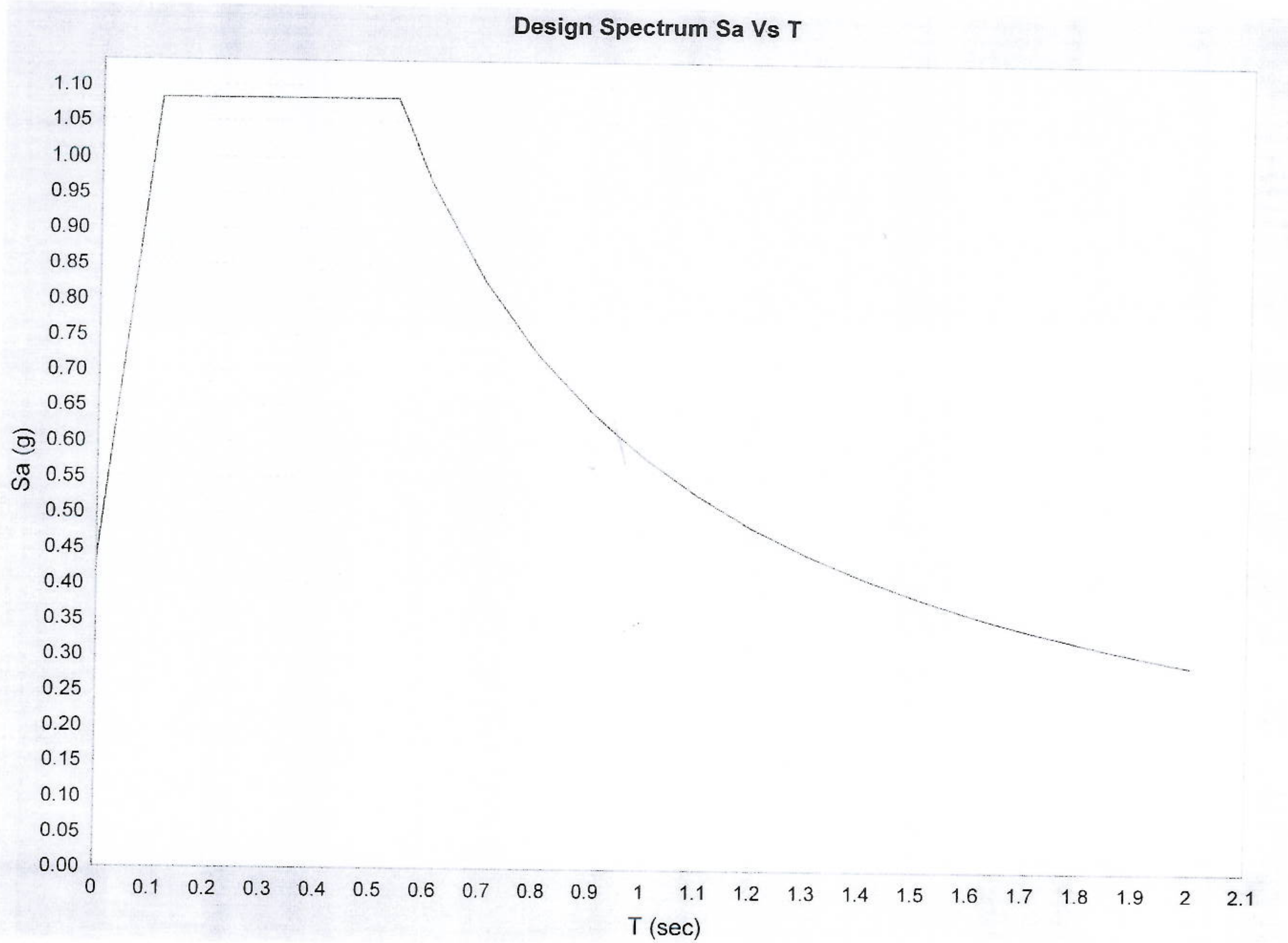
NOT TO SCALE

DRAWN: PM
CHKD: GKM

PLATE D-8

SOUTHERN
CALIFORNIA
GEOTECHNICAL

APPENDIX



Design Spectrum Sa Vs T
Sa (g)
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1
T (sec)

Conterminous 48 States
2006 International Building Code
Latitude = 33.629441
Longitude = -117.847599
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	1.623 (Ss, Site Class B)
1.0	0.579 (S1, Site Class B)

Conterminous 48 States
2006 International Building Code
Latitude = 33.629441
Longitude = -117.847599
Spectral Response Accelerations SMs and SM1
SMs = FaSs and SM1 = FvS1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	1.623 (SMs, Site Class D)
1.0	0.868 (SM1, Site Class D)

Conterminous 48 States
2006 International Building Code
Latitude = 33.629441
Longitude = -117.847599
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	1.082 (SDs, Site Class D)
1.0	0.579 (SD1, Site Class D)

Conterminous 48 States
2006 International Building Code
Latitude = 33.629441
Longitude = -117.847599
MCE Response Spectra for Site Class B