Appendix E

Geotechnical Engineering Investigation

ESA

Geotechnical Engineering Investigation

Burbank Airport Industrial/Office/Hotel/Retail Development
SWC of Hollywood Way and San Fernando Road
Burbank, California

Overton Moore Properties
19300 Hamilton Avenue, Suite 200
Gardena, California 90248

Attn.: Mr. Michael Johnson

February 29, 2016
Project Number 18536-15

NorCal Engineering
Soils and Geotechnical Consultants
10641 Humbolt Street Los Alamitos, CA 90720
(562) 799-9469 Fax (562) 799-9459

February 29, 2016 Project Number 18536-15

Overton Moore Properties
19300 Hamilton Avenue, Suite 200
Gardena, California 90248

Attn.: Mr. Michael Johnson

RE: **Geotechnical Engineering Investigation** - Proposed Burbank Airport Industrial/Office/Hotel/Retail Development - Located at the Southwest Corner of Hollywood Way and San Fernando Road, in the City of Burbank, California

Dear Mr. Johnson:

Pursuant to your request, this firm has performed a Geotechnical Engineering Investigation in accordance with your authorization of signed proposal dated November 4, 2015 for the above referenced project. The purpose of this investigation is to evaluate the subsurface conditions of the subject site and to provide recommendations for the proposed multi-use development complex located adjacent to the Bob Hope Airport (Figure 1).

The scope of work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration and sampling; 3) laboratory testing; 4) engineering analysis of field and laboratory data; 5) and preparation of a geotechnical engineering report. It is the opinion of this firm that the proposed development is feasible from a geotechnical standpoint provided that the recommendations presented in this report are followed in the design and construction of the project.

1.0 Project Description

It is proposed to construct a multi-use complex consisting of industrial, office, hotel and retail on the 61.55-acre subject property as shown on the attached Site Plan (Figure 2) based from the conceptual site plan by HPA Architecture dated February 2016. The planned industrial portion of the project will consist of six (6) concrete tilt-up warehouse buildings totaling approximately 942,660 square feet located over a majority of the site to the south and west parcel areas. The office development will consist of ten (10), one to two story structures totaling 130,00 square feet and the retail will comprise of two buildings with a total footprint of 12,000 square feet and will be located towards the northeast corner of the property. An 110,000 square feet, seven-story hotel development will be planned also towards the northeast corner of the site.

The buildings will be supported by a conventional slab-on-grade foundation system with perimeter-spread footings and isolated interior footings. Other improvements will consist of interior streets, concrete and asphaltic parking, landscaping and hardscape. It is assumed that the proposed grading for the development will include minor cut and fill procedures. A project specific geotechnical report will be required for the seven-story hotel development once building plans are made available. Final building plans shall be reviewed by this firm prior to submittal for city approval to determine the need for any additional study and revised recommendations pertinent to the proposed development, if necessary.

2.0 Site Description

The subject project is located east of the Bob Hope Airport at the southwest corner of Hollywood Way and San Fernando Road, bordered by Winona Avenue to the south, in the City of Burbank. The generally rectangular-shaped parcel is elongated in a north to south direction with topography of the relatively level parcel descending gradually from the northwest (elevation 740 msl) to the southeast (elevation 700 msl). A greater part of the site was recently under demolition operations from the existence of a previous industrial facility and is currently undeveloped land covered with asphalt pavement. The northeast portion of the site is utilized as a parking area for trucks and is currently paved with asphalt.

3.0 Site Exploration

The investigation consisted of the placement of thirty (30) exploratory borings by a truck mounted hollow stem auger to depths ranging between 5 and 60 feet below current ground elevations. The explorations were visually classified and logged by a field engineer with locations of the subsurface explorations shown on the attached Site Plan. The exploratory borings revealed the existing earth materials to consist of a fill and natural soil. A detailed description of the subsurface conditions is listed on the excavation logs in Appendix A.

Fill: A fill and disturbed top soil classifying as a brown, fine to medium to a fine to coarse grained, silty SAND with gravel and some cobbles were encountered to a depth of 1 to 8 feet. These soils were noted to be loose to dense and damp to moist. The deeper fills were observed toward the northern portion of the site.

Exploratory Boring B-11 located toward at the southeast corner of the site encountered deep fills to a depth of 20 feet below ground surface and appears to have been a previous certified fill for the abandonment of a previous underground structure. These soils were observed to be dense with relative compaction levels greater than 90%.

Natural: An undisturbed alluvium soil classifying as a brown, fine to medium grained to fine to coarse grained, slightly silty SAND to a medium to coarse grained, gravelly SAND with cobbles were encountered directly beneath the fill and observed to be medium dense to dense and damp. Deeper soils consist predominately of silty sands and gravelly sands with cobbles which were noted to be dense and damp.

The overall engineering characteristics of the earth material were relatively uniform with each excavation. No groundwater was encountered to the depth of our borings and some caving occurred in the deeper cohesionless soils.

4.0 Laboratory Tests

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These relatively undisturbed ring samples were obtained by driving a thin-walled steel sampler lined with one inch long brass rings with an inside diameter of 2.42 inches into the undisturbed soils. Bulk bag samples were obtained in the upper soils for expansion index tests and maximum density tests. All test results are included in Appendix B, unless otherwise noted.

4.1 **Field moisture content** (ASTM: D 2216-10) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of explorations.

4.2 **Maximum density tests** (ASTM: D-1557-12) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

4.3 **Expansion index tests** (ASTM: D 4829-11) were performed on remolded samples of the upper soils. Results of these tests are provided on Table II.

4.4 **Corrosion tests** consisting of sulfate, pH, resistivity and chloride analysis to determine potential corrosive effects of soils on concrete and underground utilities. Test results are provided on Table III.

4.5 **R-Value test** per California Test Method 301 was performed on a representative sample, which may be anticipated to be near subgrade to determine pavement design. Result provided within pavement section design section of report and in Table IV.

4.6 **Direct shear tests** (ASTM: D-3080-11) were performed on undisturbed and disturbed samples of the subsurface soils. The test is performed under saturated conditions at loads of 1,000 lbs./sq.ft., 2,000 lbs./sq.ft., and 3,000 lbs./sq.ft. with results shown on Plates A to D.

4.7 **Consolidation tests** (ASTM: D-2435-11) were performed on undisturbed samples to determine the differential and total settlement which may be anticipated based upon the proposed loads. Water was added to the samples at a surcharge of one KSF and the settlement curves are plotted on Plates E to L.

5.0 Seismicity Evaluation

The proposed development lies outside of any Alquist Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered very remote. The site is located in an area of high regional seismicity and the Verdugo fault is located less than 2 kilometers from the site. Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults. Seismicity information for the subject site was obtained from the USGS Interactive Disaggregation web site: http://geohazards.usgs.gov/deaggint/2008/ and is provided in Appendix C.

The seismic design of the project has been updated to the latest 2010 ASCE 7-10 (with July 2013 errata) standards and the mapped seismic ground motions were provided by using the Java based program available from the United States Geological Survey (USGS) website: http://geohazards.usgs.gov/designmaps/us/application.php. The earthquake design parameters are in accordance with the 2013 California Building Code (CBC) and are listed on the following page.

Seismic Design Parameters

Site Location	Latitude	34.204°
	Longitude	-118.352°
Site Class		D
Maximum Spectral Response Acceleration	S_S	2.371g
	S_1	0.830g
Adjusted Maximum Acceleration	S_{MS}	2.371g
	S_{M1}	1.245g
Design Spectral Response Acceleration Parameters	S_{DS}	1.580g
	S_{D1}	0.830g

6.0 Liquefaction Evaluation

The site is expected to experience ground shaking and earthquake activity that is typical of Southern California area. It is during severe ground shaking that loose, granular soils below the groundwater table can liquefy. The site is not located in an area which is mapped by the State of California Seismic Hazards Mapping Act as potentially susceptible to liquefaction. Thus, no additional investigation regarding liquefaction was performed and the design of the proposed construction in conformance with the latest Building Code provisions for earthquake design and the following recommendations are expected to provide mitigation of ground shaking hazards that are typical to Southern California.

7.0 Conclusions and Recommendations

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures will be safe from excessive settlements under the anticipated design loadings and conditions. The proposed development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent structures. A project specific geotechnical report will be required for the seven-story hotel development once building plans are made available.

The following recommendations are based upon geotechnical conditions encountered in our field investigation and laboratory data. Therefore, these surface and subsurface conditions could vary across the site. Variations in these conditions may not become evident until the commencement of grading operations and any unusual conditions which may be encountered in the course of the project development may require the need for additional study and revised recommendations.

It is recommended that site inspections be performed by a representative of this firm during all grading and construction of the development to verify the findings and recommendations documented in this report. The following sections present a discussion of geotechnical related requirements for specific design recommendations of different aspects of the project.

7.1 Site Grading Recommendations

Any vegetation and or demolition debris shall be removed and hauled from proposed grading areas prior to the start of grading operations. Existing vegetation shall not be mixed or disced into the soils. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. Grading operations shall be performed in accordance with the attached "Specifications for Compacted Fill Operations".

7.1.1 Removal and Recompaction Recommendations

All disturbed soils and/or fill (about 1 to 8 feet) including areas outside of proposed building areas shall be removed to competent native material, the exposed surface scarified to a depth of 12 inches, brought to within 2% of optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557) prior to placement of any additional compacted fill soils, foundations, slabs-on-grade and pavement. Grading shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

The area of deep fill located toward the southeast corner of the site will need to be reassessed during grading operations to determine its approximate dimensions. Additional excavation and testing will need to be performed by this firm within this deep fill to evaluate its overall structural integrity in relation to the proposed development.

It is possible that isolated areas of undiscovered fill not described in this report are present on site. If found, these areas should be treated as discussed earlier. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed or properly abandoned prior to the proposed construction.

Any imported fill material should be preferably soil similar to the upper soils encountered at the subject site. All soils shall be approved by this firm prior to importing at the site and will be subjected to additional laboratory testing to assure concurrence with the recommendations stated in this report.

If placement of slabs-on-grade and pavement is not completed immediately upon completion of grading operations, additional testing and grading of the areas may be necessary prior to continuation of construction operations. Likewise, if adverse weather conditions occur which may damage the subgrade soils, additional assessment by the geotechnical engineer as to the suitability of the supporting soils may be needed.

7.1.2 Fill Blanket Recommendations

Due to the potential for differential settlement of foundations placed on compacted fill and the medium dense native materials, it is recommended that all foundations including floor slab areas be underlain by a uniform compacted fill blanket at least two feet in thickness. This fill blanket shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

7.2 Shrinkage and Subsidence

Results of our in-place density tests reveal that the soil shrinkage will be on the order of 5 to 15% due to excavation and recompaction, based upon the assumption that the fill is compacted to 92% of the maximum dry density per ASTM standards. Subsidence should be 0.2 feet due to earthwork operations. The volume change does not include any allowance for vegetation or organic stripping, removal of subsurface improvements or topographic approximations. Although these values are only approximate, they represent our best estimate of lost yardage which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing using the actual equipment and grading techniques should be conducted.

7.3 Temporary Excavations

Areas with shallow temporary unsurcharged excavations in the existing site materials up to 3 feet high may be made at a vertical gradient unless cohesionless soils are encountered. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring, slot-cutting, or flatter excavations may be required.

The temporary cut slope gradients given do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of CAL-OSHA and other public agencies having jurisdiction. Care should be taken to provide or maintain adequate lateral support such as shoring for all adjacent improvements and structures at all times throughout the construction phase. Additional recommendations regarding specific excavations may be calculated once typical detail sections are made available.

Deeper excavations will require temporary shoring design utilizing a lateral soil pressure value of 25 pcf for the granular on-site soils. Any surcharge due to adjacent traffic, equipment or structures should be added to these soil pressures. The passive fluid pressure value of 250 pcf may be doubled to 500 pcf for temporary design. The final shoring structural calculations and drawings should be reviewed by this firm prior to installation.

7.4 Foundation Design

All foundations for the industrial/office/retail development may be designed utilizing the following safe bearing capacities for an embedded depth of 18 inches into approved fill materials with the corresponding widths:

Allowable Safe Bearing Capacity (psf)

Width (ft)	Continuous Foundation	Isolated Foundation
1.5	2000	2500
2.0	2075	2575
4.0	2375	2875
6.0	2500	3000

The bearing value may be increased by 500 psf for each additional foot of depth in excess of the 18-inch minimum depth, up to a maximum of 4,000 psf. A one third increase may be used when considering short term loading and seismic forces. Any foundations located along the property lines or where lateral overexcavation is not possible may utilize a safe bearing capacity of 1,500 psf. A representative of this firm shall inspect all foundation excavations prior to pouring concrete.

7.5 Settlement Analysis

Resultant pressure curves for the consolidation tests are shown on Plates E to L. Computations utilizing these curves and the recommended safe bearing capacities reveal that the foundations will experience settlements on the order of 3/4 inch and differential settlements of less than 1/4 inch.

7.6 Lateral Resistance

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the Uniform Building Code should be adhered to when the coefficient of friction and passive pressures are combined.

Coefficient of Friction – 0.40
Equivalent Passive Fluid Pressure = 250 lbs./cu.ft.
Maximum Passive Pressure = 2,500 lbs./cu.ft.

The passive pressure recommendations are valid only for approved compacted fill soils.

7.7 Retaining Wall Design Parameters

Active earth pressures against retaining wall will be equal to the pressures developed by the following fluid densities. These values are for **granular backfill material** placed behind the walls at various ground slopes above the walls.

Surface Slope of Retained Materials (Horizontal to Vertical)	Equivalent Fluid Density (lb./cu.ft.)
Level	30
5 to 1	35
4 to 1	38
3 to 1	40
2 to 1	45

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. An equivalent fluid pressure of 45 pcf may be utilized for the restrained wall condition with a level grade behind the wall.

All walls shall be waterproofed as needed and protected from hydrostatic pressure by a reliable permanent subdrain system. The subsurface drainage system shall consist of 4-inch diameter perforated PVC pipe encased with gravel and wrapped with filter fabric. The granular backfill to be utilized immediately adjacent to the retaining/basement walls shall consist of an approved granular soils with a sand equivalency greater than 30. This backfill zone of free draining material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upward at an inclination of no less than 3/4 to 1 (horizontal to vertical).

The seismic-induced lateral soil pressure for walls greater than 6 feet shall be computed using a triangular pressure distribution with the maximum value at the top of the wall. The maximum lateral pressure of (20 pcf) H, where H is the height of the retained soils above the wall footing should be utilized in final design of retaining walls. Sliding resistance values and passive fluid pressures given in our referenced report may be increased by 1/3 during short-term wind and seismic loading conditions.

7.8 Slab Design

All concrete slabs-on-grade shall be at least four inches in office/retail floor slabs and hardscape areas, six inches in warehouse and placed on approved subgrade soils. Additional reinforcement requirements and an increase in thickness of the slabs-on-grade may be necessary based upon proposed loading conditions in the structures and should be evaluated further by the project engineers and/or architect.

A vapor retarder (10-mil minimum thickness) should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.* The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs.*

The moisture retarder may be placed directly upon approved subgrade soils, although one to two inches of sand beneath the membrane is desirable. The subgrade upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

7.9 Pavement Section Design

The table below provides a preliminary pavement design based upon an R-Value of 75 for the proposed pavement areas. Final pavement design may need to be based on R-Value testing of the subgrade soils near the conclusion of rough grading to assure that these soils are consistent with those assumed in this preliminary design.

Type of Traffic	Traffic Index	Asphaltic Concrete (in)	Base Material (in)
Automobile Parking Stalls and Circulation Drive Areas	4.0/5.0	3.0	3.0
Heavy Truck Access Areas (GVW < 90,000 lbs.; 5 axle)	7.0	4.0	6.0
Interior Street (Tulare Street)	8.0 (Estimated)	5.0	6.0

All concrete slabs to be utilized for pavement shall be a minimum of six inches in thickness and placed on approved subgrade soils. The above recommendations are based upon estimated traffic loads. Client should submit anticipated traffic loadings, when available, so that pavement sections may be reviewed to determine adequacy to support these loads. At this time, the street design is preliminary and will require an approved traffic index from the City Traffic Engineer to prepare finalized sections.

Any approved base material shall consist of a Class II aggregate or equivalent and should be compacted to a minimum of 95% relative compaction. All pavement materials shall conform to the requirements set forth by the City of Burbank. The base material and asphaltic concrete should be tested prior to delivery to the site and during placement to determine conformance with the project specifications. A pavement engineer shall designate the specific asphalt mix design to meet the required project specifications.

All pavement areas shall have positive drainage toward an approved outlet from the site. Drain lines behind curbs and/or adjacent to landscape areas should be considered by client and the appropriate design engineers to prevent water from infiltrating beneath pavement. If such infiltration occurs, damage to pavement, curbs and flow lines, especially on sites with expansive soils, may occur during the life of the project.

7.10 Utility Trench and Excavation Backfill

Trenches from installation of utility lines and other excavations may be backfilled with on-site soils or approved imported soils compacted to a minimum of 90% relative compaction. All utility lines shall be properly bedded with clean sand having a sand equivalency rating of 30 (SE > 30) or more. This bedding material shall be thoroughly water jetted around the pipe structure prior to placement of compacted backfill soils.

7.11 Corrosion Design Criteria

Representative samples of the surficial soils, typical of the subgrade soils expected to be encountered within foundation excavations and underground utilities were tested for corrosion potential. The minimum resistivity value obtained for the samples tested is representative of an environment that may be corrosive to metals. The soil pH value was considered mildly acidic and may have a significant effect on soil corrosivity. Consideration should be given to corrosion protection systems for buried metal such as protective coatings, wrappings or the use of PVC where permitted by local building codes.

According to Table 4.3.1, ACI 318 Building Code and Commentary, these contents revealed negligible levels of sulfate exposure. Therefore, a Type II cement according to latest CBC specifications may be utilized for building foundations at this time. Additional sulfate tests shall be performed at the completion of site grading to assure that these soils are consistent with the recommendations stated in this design. Sulfate test results may be found on the attached Table III.

7.12 Expansive Soil

If any expansive soils are encountered, special attention should be given to the project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers, architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

8.0 Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase.

It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project. This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D Tucker

Keith D. Tucker
Project Engineer
R.G.E. 841

KEITH D. TUCKER
No. 841
Exp. 12/31/16

Scott D. Spensiero
Project Manager

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Excavation

Any existing low density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Soils Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557).

In any area where a transition between fill and native soil or between bedrock and soil are encountered, additional excavation beneath foundations and slabs will be necessary in order to provide uniform support and avoid differential settlement of the structure.

Material For Fill

The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Soils Engineering firm a minimum of 24 hours prior to importation of site.

Placement of Compacted Fill Soils

The approved fill soils shall be placed in layers not excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 2% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Soils Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Soils Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24 hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.

Expansive Soil Guidelines

The following expansive soil guidelines are provided for your project. The intent of these guidelines is to inform you, the client, of the importance of proper design and maintenance of projects supported on expansive soils. ***You, as the owner or other interested party, should be warned that you have a duty to provide the information contained in the soil report including these guidelines to your design engineers, architects, landscapers and other design parties in order to enable them to provide a design that takes into consideration expansive soils.***

In addition, you should provide the soil report with these guidelines to any property manager, lessee, property purchaser or other interested party that will have or assume the responsibility of maintaining the development in the future.

Expansive soils are fine-grained silts and clays which are subject to swelling and contracting. The amount of this swelling and contracting is subject to the amount of fine-grained clay materials present in the soils and the amount of moisture either introduced or extracted from the soils. Expansive soils are divided into five categories ranging from "very low" to "very high". Expansion indices are assigned to each classification and are included in the laboratory testing section of this report. *If the expansion index of the soils on your site, as stated in this report, is 21 or higher, you have expansive soils.* The classifications of expansive soils are as follows:

Classification of Expansive Soil*

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

When expansive soils are compacted during site grading operations, care is taken to place the materials at or slightly above optimum moisture levels and perform proper compaction operations. Any subsequent excessive wetting and/or drying of expansive soils will cause the soil materials to expand and/or contract. These actions are likely to cause distress of foundations, structures, slabs-on-grade, sidewalks and pavement over the life of the structure. ***It is therefore imperative that even after construction of improvements, the moisture contents are maintained at relatively constant levels, allowing neither excessive wetting or drying of soils.***

Evidence of excessive wetting of expansive soils may be seen in concrete slabs, both interior and exterior. Slabs may lift at construction joints producing a trip hazard or may crack from the pressure of soil expansion. Wet clays in foundation areas may result in lifting of the structure causing difficulty in the opening and closing of doors and windows, as well as cracking in exterior and interior wall surfaces. In extreme wetting of soils to depth, settlement of the structure may eventually result. Excessive wetting of soils in landscape areas adjacent to concrete or asphaltic pavement areas may also result in expansion of soils beneath pavement and resultant distress to the pavement surface.

Excessive drying of expansive soils is initially evidenced by cracking in the surface of the soils due to contraction. Settlement of structures and on-grade slabs may also eventually result along with problems in the operation of doors and windows.

Projects located in areas of expansive clay soils will be subject to more movement and "hairline" cracking of walls and slabs than similar projects situated on non-expansive sandy soils. There are, however, measures that developers and property owners may take to reduce the amount of movement over the life the development. The following guidelines are provided to assist you in both design and maintenance of projects on expansive soils:

- Drainage away from structures and pavement is essential to prevent excessive wetting of expansive soils. Grades of at least 3% should be designed and maintained to allow flow of irrigation and rain water to approved drainage devices or to the street. Any “ponding” of water adjacent to buildings, slabs and pavement after rains is evidence of poor drainage; the installation of drainage devices or regrading of the area may be required to assure proper drainage. Installation of rain gutters is also recommended to control the introduction of moisture next to buildings. Gutters should discharge into a drainage device or onto pavement which drains to roadways.

- Irrigation should be strictly controlled around building foundations, slabs and pavement and may need to be adjusted depending upon season. This control is essential to maintain relatively uniform moisture content in the expansive soils and to prevent swelling and contracting. Over-watering adjacent to improvements may result in damage to those improvements. NorCal Engineering makes no specific recommendations regarding landscape irrigation schedules.

- Planting schemes for landscaping around structures and pavement should be analyzed carefully. Plants (including sod) requiring high amounts of water may result in excessive wetting of soils. Trees and large shrubs may actually extract moisture from the expansive soils, thus causing contraction of the fine-grained soils.

- Thickened edges on exterior slabs will assist in keeping excessive moisture from entering directly beneath the concrete. A six-inch thick or greater deepened edge on slabs may be considered. Underlying interior and exterior slabs with 6 to 12 inches or more of non-expansive soils and providing presaturation of the underlying clayey soils as recommended in the soil report will improve the overall performance of on-grade slabs.

- Increase the amount of steel reinforcing in concrete slabs, foundations and other structures to resist the forces of expansive soils. The precise amount of reinforcing should be determined by the appropriate design engineers and/or architects.

- Recommendations of the soil report should always be followed in the development of the project. Any recommendations regarding presaturation of the upper subgrade soils in slab areas should be performed in the field and verified by the Soil Engineer.

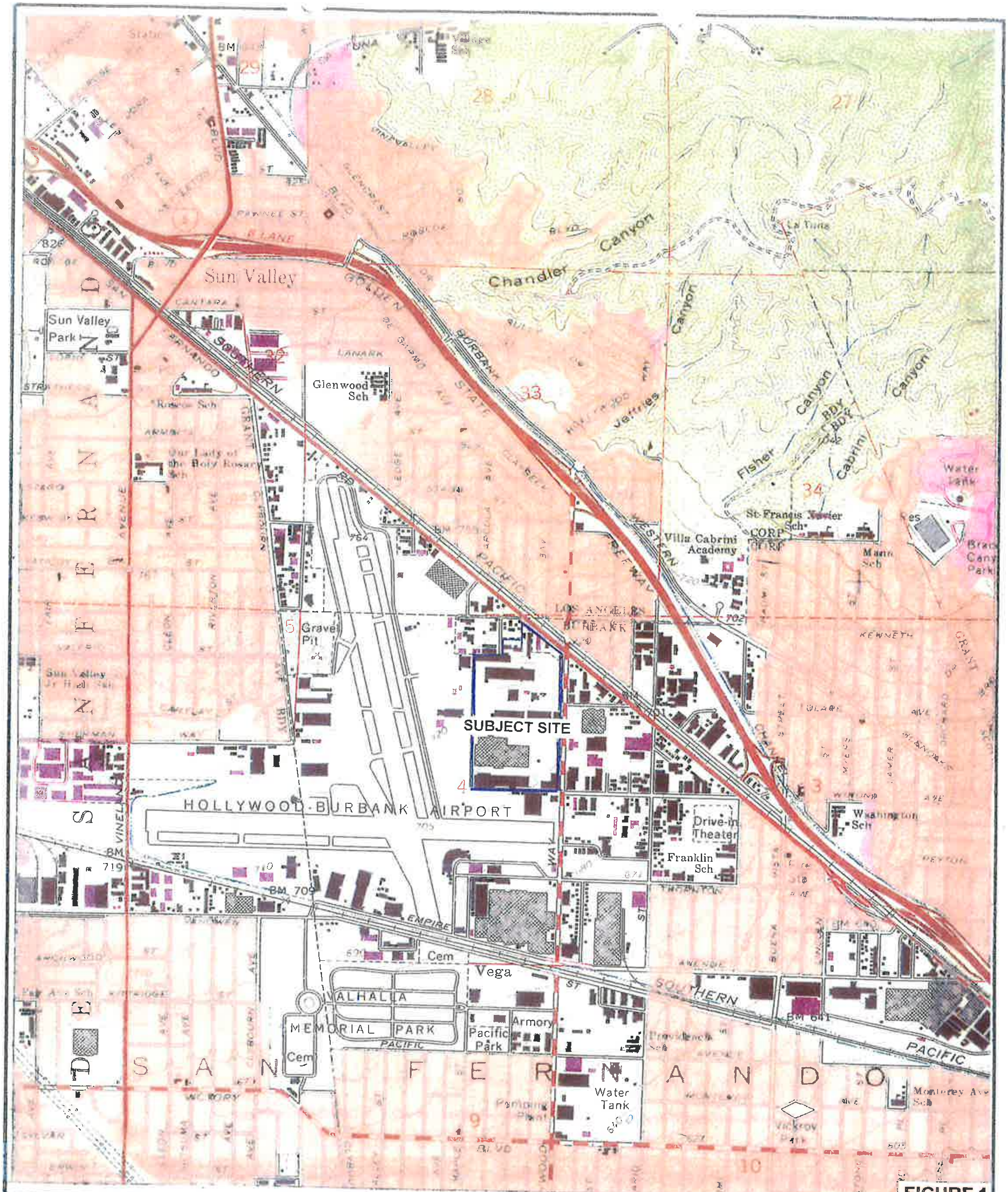


FIGURE 1

NorCal Engineering

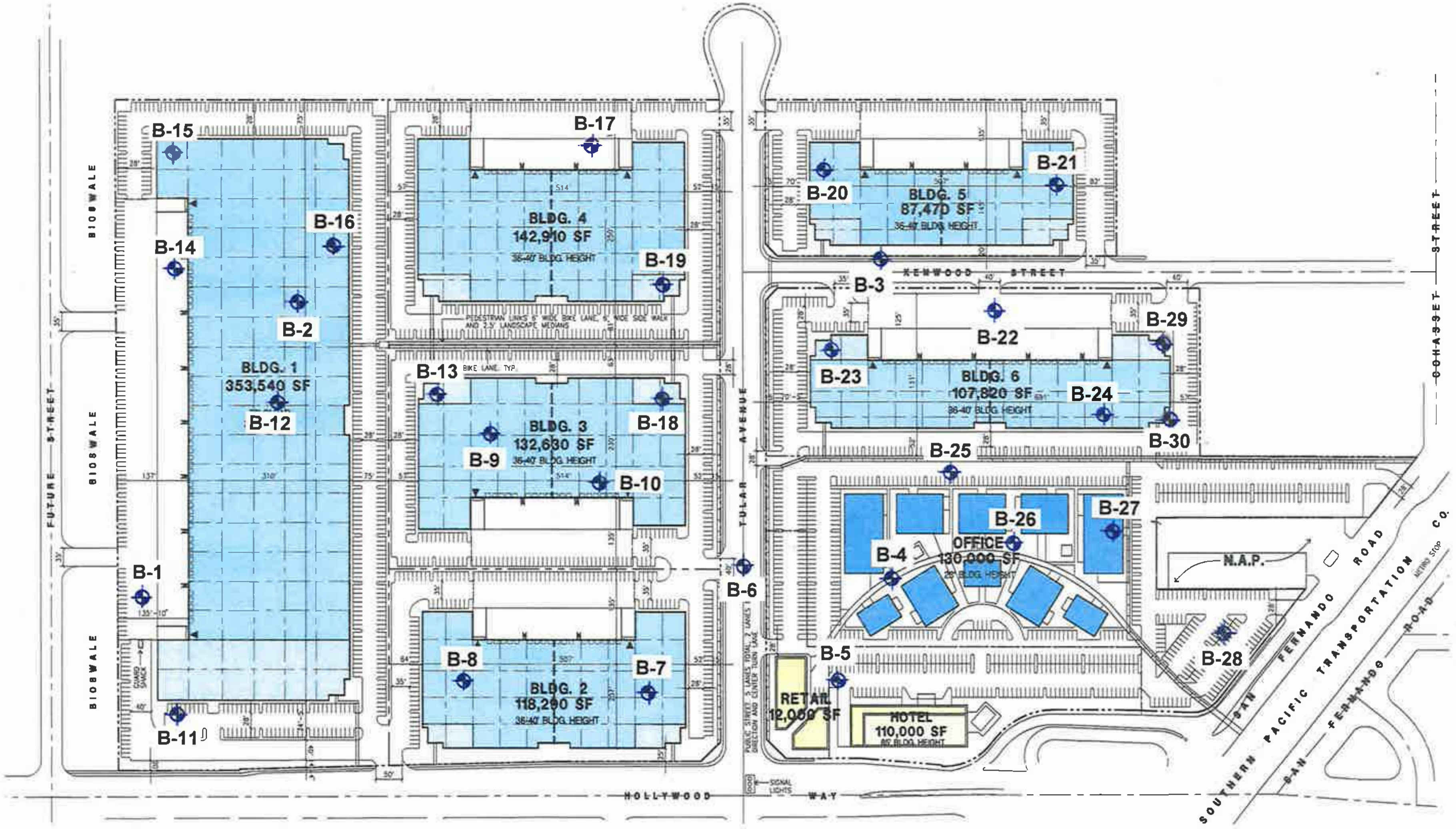
SOILS AND GEOTECHNICAL CONSULTANTS

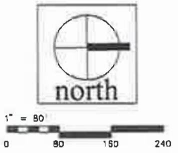
PROJECT 18536-15

DATE FEBRUARY 2016

VICINITY MAP

UNITED STATES GEOLOGICAL SURVEY MAP
BURBANK QUADRANGLE - PHOTOREVISED 1972





1 INCH = 150 FEET

FIGURE 2

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 18536-16

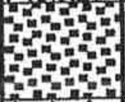
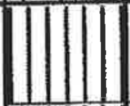
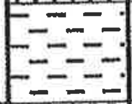
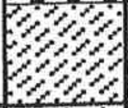
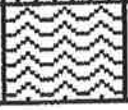
DATE FEBRUARY 2016

SITE PLAN

List of Appendices

(in order of appearance)

Appendix A

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL. SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 5O		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				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

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY:

■ Indicates 2.5-inch Inside Diameter. Ring Sample.

☒ Indicates 2-inch OD Split Spoon Sample (SPT).

⧄ Indicates Shelby Tube Sample.

◫ Indicates No Recovery.

◧ Indicates SPT with 140# Hammer 30 in. Drop.

🖂 Indicates Bulk Sample.

◩ Indicates Small Bag Sample.

◨ Indicates Non-Standard

⧗ Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

Overton Moore Properties
18536-15

Log of Boring B-1

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/14/15

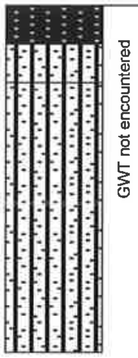
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Lith- ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0		Asphalt Pavement					
		FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist					
5		NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles					
10		Boring completed at depth of 9'					
15							
20							
25							
30							
35							

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-2

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/14/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith- ology		Material Description	Samples		Laboratory		
				Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
0		GWT not encountered	Pulverized Pavement					
			FILL Silty (fine to medium grained) SAND Brown, loose, damp					
5			NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles					
10			Boring completed at depth of 9'					
15								
20								
25								
30								
35								

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-3

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/14/15

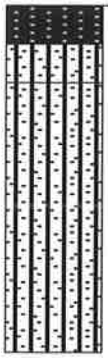
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology		Material Description	Samples		Laboratory		
				Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
0		GWT not encountered	Asphalt Pavement					
			FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist					
5			NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles					
10			Boring completed at depth of 9'					
15								
20								
25								
30								
35								

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

Overton Moore Properties
18536-15

Log of Boring B-4

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/14/15

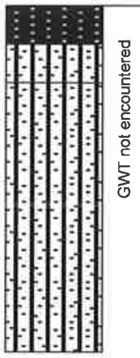
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Lith- ology	Material Description	Samples Type	Samples Blow Counts	Laboratory Moisture	Laboratory Dry Density	Laboratory % Passing 200 Sieve
0		Pulverized Asphalt/Asphalt					
		FILL Silty (fine to medium grained) SAND Brown, medium dense, damp					
5		NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles					
10		Boring completed at depth of 9'					
15							
20							
25							
30							
35							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-5

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology		Material Description	Samples		Laboratory		
				Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
0		GWT not encountered	Asphalt Pavement					
			FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist; with occasional gravel					
			NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense to dense, damp; slightly silty with gravel and some cobbles	☒				
5				■	3/5	5.0	112.1	
10				■	12/15	3.0	111.8	
15				■	14/18	2.9	112.2	
20				■	8/13	2.7	119.8	
			Silty (fine to medium grained) SAND Brown, dense, moist; with occasional gravel					
25				■	10/12	7.9	110.1	
			Silty (fine to coarse grained) SAND Light brown, dense, damp; slightly silty with gravel and cobbles					
30				■	9/19	3.6	115.5	
35								

Overton Moore Properties
18536-15

Log of Boring B-5

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith- ology	Material Description	Samples Type	Samples Blow Counts	Laboratory Moisture	Laboratory Dry Density	Laboratory % Passing 200 Sieve
35	▨	Silty (fine to coarse grained) SAND Light brown, dense, damp; slightly silty with gravel and cobbles	■	17/19	4.6	107.7	
40	▨		■	16/27	4.7	110.3	
45	▨		■	24/37	4.2	112.8	
50	▨		■	19/27	2.7	108.1	
55	▨		■	50-5"	2.4	115.0	
60	▨		■	21/31	5.4	111.7	
		Boring completed at depth of 61'					
65							
70							

Overton Moore Properties

18536-15

Log of Boring B-6

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

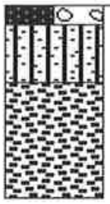
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith- ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0		Asphalt Pavement/Base Material					
		FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist	☒				
		NATURAL Silty (fine to coarse grained) SAND Light brown to brown, medium dense, damp; slightly silty with occasional gravel and some cobbles					
5		Boring completed at depth of 5'					
10							
15							
20							
25							
30							
35							

GWT not encountered

Overton Moore Properties

18536-15

Log of Boring B-7

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

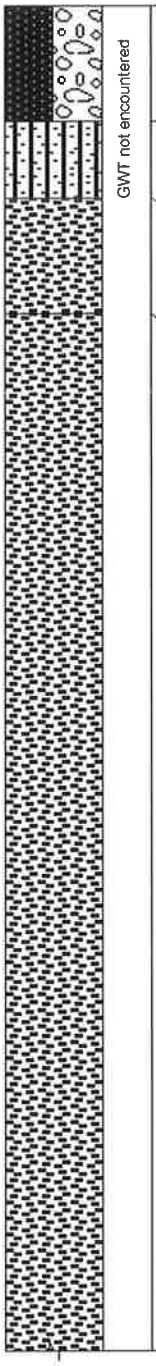
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



Material Description

Pulverized Asphalt with base material and concrete fragments

FILL
Silty (fine to medium grained) SAND
Brown, medium dense, moist

NATURAL
Silty (fine to coarse grained) SAND
Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles

Gravelly (medium to coarse grained) SAND
Light brown to brown, dense, damp to moist; slightly silty with cobbles

Depth (feet)	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0					
5	■	5/5	4.1	113.7	
10	■	16/24	1.9	122.2	
15	■	10/19	2.5	121.8	
20	■	40/50	8.6	116.7	
25	■	13/17	4.9	111.9	
30	■	12/12	5.7	111.7	
35					

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-7

Boring Location: Hollywood Wy & San Fernando	
Date of Drilling: 11/18/15	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith- ology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
35	▨	Gravelly (medium to coarse grained) SAND Light brown to brown, dense, damp to moist; slightly silty with cobbles	■	11/23	3.5	113.0	
40	▨		■	13/22	4.4	114.0	
45	▨		■	14/28	4.2	119.7	
50	▨		■	17/25	5.6	121.5	
		Boring completed at depth of 51'					
55							
60							
65							
70							

Overton Moore Properties
18536-15

Log of Boring B-8

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology		Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0		GWT not encountered	Asphalt Pavement					
			FILL Silty (fine to coarse grained) SAND Brown, loose, moist					
			NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense to dense, damp; slightly silty with occasional gravel and some cobbles	■	4/4	6.8	100.2	
5				■	6/11	2.6	112.2	
10				■	15/16	2.9	121.8	
15				■	13/28	2.7	118.3	
			Gravelly (medium to coarse grained) SAND Light brown to brown, dense, damp; slightly silty with cobbles					
20				■	15/27	2.5	122.9	
			Silty (fine to coarse grained) SAND Light brown to brown, dense, damp; with gravel and cobbles					
25				■	17/31	3.0	125.3	
30				■	14/21	1.9	118.5	
35								

NorCal Engineering

Overton Moore Properties 18536-15	Log of Boring B-8

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
35	▨	Silty (fine to coarse grained) SAND Light brown to brown, dense, damp; with gravel and cobbles	■	24/38	3.7	114.4	
40	▨		■	16/29	4.2	109.6	
45	▨		■	15/24	3.1	109.8	
50	▨		■	17/23	3.0	106.3	
55	▨		■	17/31	5.4	105.3	
60	▨		■	23/34	8.7	110.9	
		Boring completed at depth of 61'					
65							
70							

Overton Moore Properties
18536-15

Log of Boring B-9

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

Groundwater Depth: None Encountered

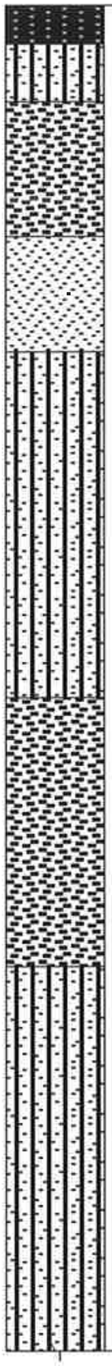
Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Lith-ology



GWT not encountered

Depth (feet)	Material Description	Samples		Laboratory		
		Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
0	Pulverized Asphalt/Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, damp					
5	NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles	■	7/12	2.5	111.6	
	SAND (medium to coarse grained) Light brown, medium dense, damp; with gravel and some cobble					
10	Silty (fine to coarse grained) SAND Light brown to brown, dense, damp; with gravel and cobbles	■	6/9	3.6	109.1	
15		■	11/13	5.1	109.7	
20	Gravelly (medium to coatse grained) SAND Light brown, dense, damp; slightly silty with cobbles	■	7/25	2.3	125.1	
25	Silty (fine to coarse grained) SAND Light brown to brown, dense, damp to moist; with gravel and cobbles	■	12/13	4.1	114.8	
30		■	20/25	4.1	120.8	
35						

NorCal Engineering

Overton Moore Properties

18536-15

Log of Boring B-9

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
35	Silty (fine to coarse grained) SAND Light brown to brown, dense, damp to moist; with gravel and cobbles	■	21/31	5.6	120.2	
40		■	25/28	2.9	118.8	
42	Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
45		■	17/29	2.7	117.4	
50		■	20/31	2.5	120.1	
55		■	24/32	2.6	121.3	
60		■	18/41	2.6	117.2	
61	Boring completed at depth of 61'					
65						
70						

Overton Moore Properties
18536-15

Log of Boring B-10

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/18/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist; with gravel					
	NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, moist to damp; slightly silty with occasional gravel and some cobbles					
5		■	3/4	8.4	100.9	
10	Boring completed at depth of 10'	■	6/9	3.0	108.0	
15						
20						
25						
30						
35						

Overton Moore Properties
18536-15

Log of Boring B-11

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

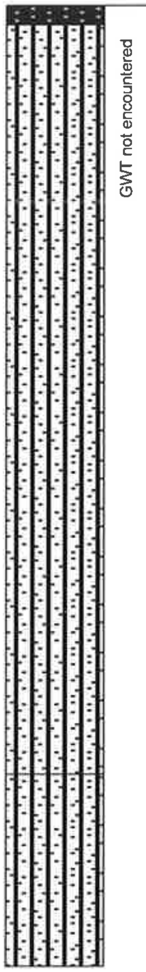
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Lith- ology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
0		Asphalt Pavement					
		ENGINEERED FILL Silty (fine to coarse grained) SAND Brown, dense, damp to moist; with gravel and some concrete fragments	☒				
5			■	20/34	2.7	121.7	
10			■	19/33	7.2	118.7	
15			■	20/25	7.2	125.1	
20		NATURAL Silty (fine to coarse grained) SAND Brown, dense, moist	■	17/18	6.3	115.4	
25		Boring completed at depth of 25'	■	14/17	6.6	117.7	
30							
35							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-12

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

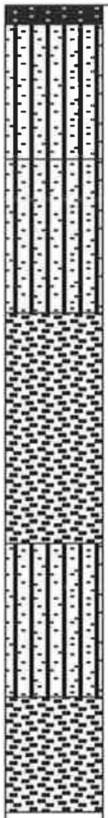
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



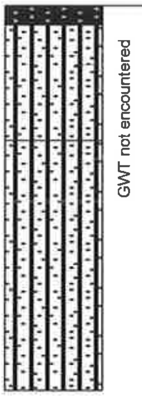
GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Pulverized Asphalt					
	FILL Silty (fine to coarse grained) SAND Brown, loose, moist; with gravel					
5	NATURAL Silty (fine to coarse grained) SAND Light brown to brown, medium dense, damp; slightly silty to silty with occasional gravel and some cobbles	■	7/14	2.2	114.6	
10	Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles	■	10/11	2.8	111.6	
15	Silty (fine grained) SAND Brown, medium dense, moist	■	6/8	10.9	107.7	
20	Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles	■	22/28	2.1	121.9	
	Boring completed at depth of 21'					
25						
30						
35						

Overton Moore Properties
18536-15

Log of Boring B-13

Boring Location: Hollywood Wy & San Fernando	
Date of Drilling: 11/20/15	**Groundwater Depth: None Encountered**
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	**Drop: 30"**
Surface Elevation: Not Measured	

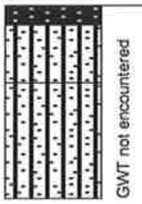


Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0		Pulverized Asphalt					
		FILL Silty (fine to medium grained) SAND Brown, medium dense, moist					
5		NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty to silty with occasional gravel and some cobbles	▮	10/11	5.9	114.0	
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

Overton Moore Properties
18536-15

Log of Boring B-14

Boring Location: Hollywood Wy & San Fernando	
Date of Drilling: 11/20/15	**Groundwater Depth:** None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	**Drop:** 30"
Surface Elevation: Not Measured	



Depth (feet)	Lith-ology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
0		Pulverized Asphalt					
		FILL Silty (fine to coarse grained) SAND Brown, loose, damp; with gravel	☒				
5		NATURAL Silty (fine to medium grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles					
		Boring completed at depth of 5'					
10							
15							
20							
25							
30							
35							

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-15

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/20/15

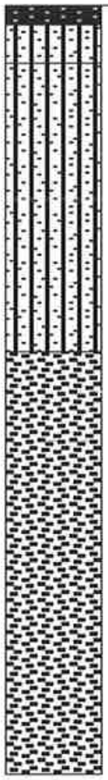
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Pulverized Asphalt					
	FILL Silty (fine to medium grained) SAND Brown, loose, moist; with gravel	☒				
	NATURAL Silty (fine to coarse grained) SAND Light brown to brown, medium dense, damp; slightly silty with occasional gravel and some cobbles					
5		■	4/4	2.1	105.6	
	Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
10		■	14/20	2.4	120.3	
15		■	9/17	3.3	114.8	
20	Boring completed at depth of 20'	■	9/20	3.1	114.7	
25						
30						
35						

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

Overton Moore Properties
18536-15

Log of Boring B-16

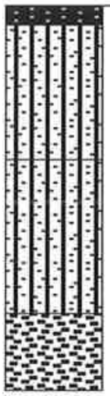
Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/20/15 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured



Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Pulverized Asphalt					
	FILL Silty (fine to coarse grained) SAND Brown, loose to medium dense, moist; with gravel					
5	NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense to dense, damp; slightly silty with occasional gravel and some cobbles	■	17/20	2.9	117.5	
	Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles	■	10/15	2.6	122.0	
10	Boring completed at depth of 10'					

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35

Overton Moore Properties
18536-15

Log of Boring B-17

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/20/15

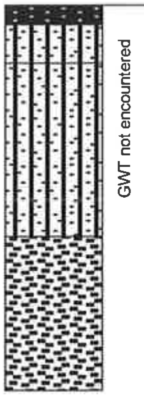
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to medium grained) SAND Brown, medium dense, damp	■	6/6	2.7	103.4	
5	NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles	■	4/4	5.0	102.2	
	Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles	■	11/17	2.5	116.3	
10	Boring completed at depth of 10'					
15						
20						
25						
30						
35						

Overton Moore Properties
18536-15

Log of Boring B-18

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

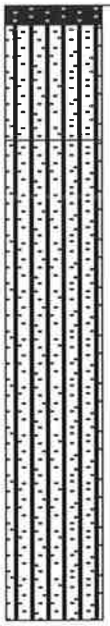
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist; with gravel					
	NATURAL Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
5		▮	9/17	1.9	124.2	
10		▮	10/16	2.4	121.2	
15		▮	10/12	3.1	118.0	
	Boring completed at depth of 16'					
20						
25						
30						
35						

Overton Moore Properties
18536-15

Log of Boring B-19

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs
Drop: 30"

Surface Elevation: Not Measured

GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, damp	☒				
	NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense to dense, damp to moist; slightly silty with occasional gravel and cobbles					
5		■	10/15	8.2	112.9	
10		■	10/15	4.9	117.0	
15		■	31/31	5.6	119.5	
20		■	19/23	5.3	117.1	
	Boring completed at depth of 21'					
25						
30						
35						

Overton Moore Properties
18536-15

Log of Boring B-20

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

Groundwater Depth: None Encountered

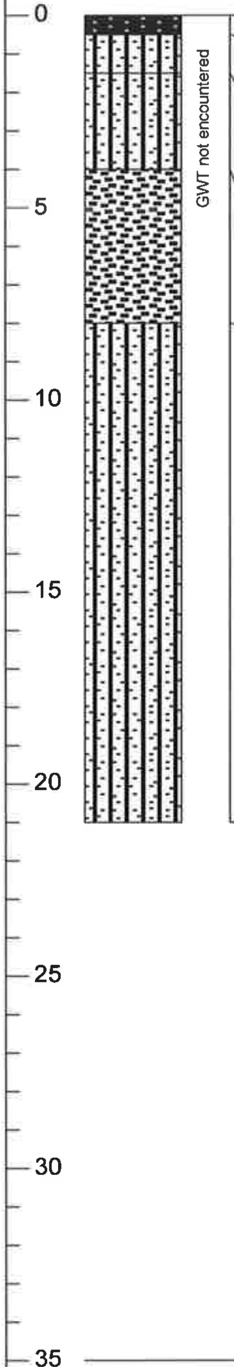
Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet) | **Lith-ology** | **Material Description**



Asphalt Pavement

FILL
Silty (fine to medium grained) SAND
Brown, medium dense, moist

NATURAL
Silty (fine to coarse grained) SAND
Light brown, medium dense, damp; slightly silty with occasional gravel and some cobbles

Gravelly (medium to coarse grained) SAND
Light brown, dense, damp; with cobbles

Silty (fine to coarse grained) SAND
Light brown to brown, dense, damp; slightly silty with gravel and cobbles

Boring completed at depth of 21'

Samples		Laboratory		
Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
■	5/11	2.4	112.3	
■	6/11	2.1	125.3	
■	7/11	2.3	115.9	
■	8/16	2.2	117.5	
■	16/18	3.0	120.7	

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-21

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	GWT not encountered	Asphalt Pavement					
		FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist	⊠				
5		NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense to dense, damp; slightly silty with occasional gravel and some cobbles	■	8/10	2.9	107.9	
			■	19/23	2.7	125.3	
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-22

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist					
	NATURAL Silty (fine to coarse grained) SAND Light brown to brown, medium dense to dense, damp; slightly silty with occasional gravel and some cobbles					
5		■	5/7	4.5	113.2	
10		■	9/15	1.5	120.5	
15		■	11/19	2.7	111.9	
20		■	15/33	3.1	115.0	
25		■	18/24	2.6	111.3	
30		■	28/33	2.6	110.6	
35						

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-22

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
35	▥	NATURAL Silty (fine to coarse grained) SAND Light brown to brown, medium dense to dense, damp; slightly silty with occasional gravel and some cobbles	■	17/27	2.3	113.1	
40	▥		■	14/20	1.9	113.3	
	▩	Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
45	▩		■	17/20	3.3	115.7	
50	▩		■	19/24	2.2	117.7	
		Boring completed at depth of 51'					
55							
60							
65							
70							

Overton Moore Properties
18536-15

Log of Boring B-23

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, dense, moist					
	NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense to dense, damp; slightly silty with occasional gravel and some cobbles					
5		■	9/10	2.6	115.1	
10	Boring completed at depth of 10'	■	10/17	5.3	115.9	
15						
20						
25						
30						
35						

Overton Moore Properties
18536-15

Log of Boring B-24

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

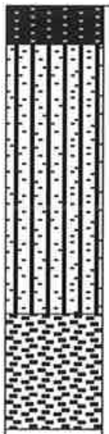
Surface Elevation: Not Measured

Depth (feet)	Lith- ology		Material Description	Samples		Laboratory		
				Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
0			Asphalt Pavement					
		GWT not encountered	FILL Silty (fine to coarse grained) SAND Brown, loose to medium dense, damp to moist; with gravel and some cobbles					
5				■	2/3	8.6	105.5	
			NATURAL Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
10				■	10/19	3.0	116.8	
15				■	14/22	1.8	117.9	
20				■	22/32	1.7	123.1	
			Boring completed at depth of 21'					
25								
30								
35								

Overton Moore Properties
18536-15

Log of Boring B-25

Boring Location: Hollywood Wy & San Fernando	
Date of Drilling: 11/19/15	**Groundwater Depth: None Encountered**
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	**Drop: 30"**
Surface Elevation: Not Measured	



Depth (feet)	Lith- ology		Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0		GWT not encountered	Asphalt Pavement					
			FILL Silty (fine to coarse grained) SAND Brown, loose to medium dense, damp to moist					
5				■	2/2	11.2	104.7	
			NATURAL Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
10				■	11/13	2.5	125.1	
			Boring completed at depth of 11'					
15								
20								
25								
30								
35								

Overton Moore Properties
18536-15

Log of Boring B-26

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

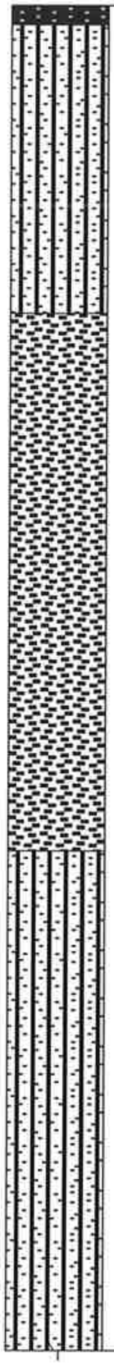
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, dense, damp to moist; with gravel and occasional cobbles					
5		▮	6/7	10.8	110.4	
	NATURAL Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
10		▮	11/13	1.1	119.6	
15		▮	8/13	2.3	116.6	
20		▮	11/20	1.9	116.9	
	Silty (fine to coarse grained) SAND Light brown to brown, dense, damp; slightly silty with gravel and cobbles					
25		▮	19/19	2.5	118.6	
30		▮	32/37	2.2	124.3	
35						

Overton Moore Properties
18536-15

Log of Boring B-26

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/19/15

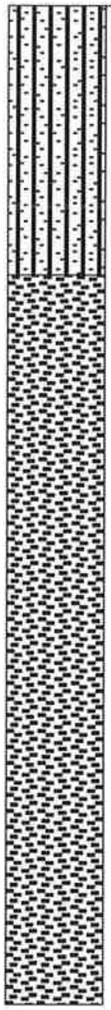
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples		Laboratory		
			Type	Blow Counts	Moisture	Dry Density	% Passing 200 Sieve
35		Silty (fine to coarse grained) SAND Light brown to brown, dense, damp; slightly silty with gravel and cobbles	■	16/30	2.4	118.2	
40			■	18/29	2.6	116.7	
		Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
45			■	23/31	2.5	120.3	
50			■	41/50	2.3	125.7	
55			■	19/42	2.5	123.2	
60			■	19/21	1.9	120.6	
		Boring completed at depth of 61'					
65							
70							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

Overton Moore Properties
18536-15

Log of Boring B-27

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/20/15

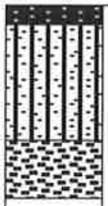
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Lith- ology		Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0		GWT not encountered	Asphalt Pavement					
			FILL Silty (fine to coarse grained) SAND Brown, loose, moist; with gravel					
			NATURAL Gravelly (medium to coarse grained) SAND Light brown, medium dense, damp; slightly silty					
5			Boring completed at depth of 5'					
10								
15								
20								
25								
30								
35								

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-28

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 11/20/15

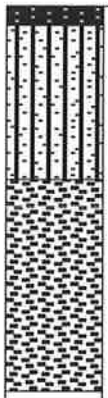
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist	■	4/4	11.4	103.5	
5	NATURAL Gravelly (medium to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles	■	11/13	1.7	112.1	
10	Boring completed at depth of 10'					
15						
20						
25						
30						
35						

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1853615-1.log Date: 2/29/2016

Overton Moore Properties
18536-15

Log of Boring B-29

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 2/27/16

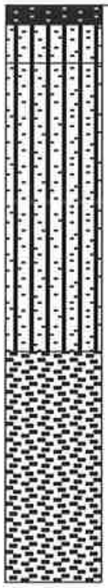
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist; with gravel					
	NATURAL Silty (fine to coarse grained) SAND	■	3/3	5.2	104.8	
5	Brown to light brown, medium dense, damp; slightly silty with gravel	■	5/8	3.3	109.7	
	Gravelly (medium to coarse grained) SAND					
10	Light brown, dense, damp; slightly silty with cobbles	■	9/13	3.3	118.2	
15	Boring completed at depth of 15'	■	15/17	1.9	122.1	
20						
25						
30						
35						

NorCal Engineering

Overton Moore Properties
18536-15

Log of Boring B-30

Boring Location: Hollywood Wy & San Fernando

Date of Drilling: 2/27/16

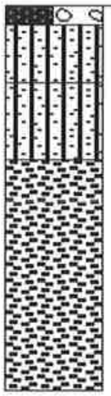
Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured



GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: % Passing 200 Sieve
0	Asphalt Pavement/Base Material					
	FILL Silty (fine to coarse grained) SAND Brown, medium dense, moist; with gravel					
	NATURAL Silty (fine to coarse grained) SAND Light brown, medium dense, damp; slightly silty with occasional gravel	■ ■	6/8 13/14	2.7 2.5	114.0 120.7	
5	Gravelly (fine to coarse grained) SAND Light brown, dense, damp; slightly silty with cobbles					
10	Boring completed at depth of 10'					

15

20

25

30

35

NorCal Engineering

Appendix B

TABLE I
MAXIMUM DENSITY TESTS

Sample	Classification	Optimum Moisture	Maximum Dry Density (lbs./cu.ft.)
B-5 @ 3'	Silty SAND	8.0	129.0
B-11 @ 2'	Silty SAND	9.0	127.0
B-15 @ 2'	Silty SAND	10.0	128.0
B-19 @ 2'	Gravelly SAND	8.0	132.0
B-21 @ 2'	Silty SAND	8.5	126.0

TABLE II
EXPANSION INDEX TESTS

Soil Type	Classification	Expansion Index
B-5 @ 3'	Silty SAND	0
B-15 @ 2'	Silty SAND	2
B-21 @ 2'	Silty SAND	0

TABLE III
CORROSION TESTS

Sample	pH	Electrical Resistivity (ohm-cm)	Sulfate (%)	Chloride (ppm)
B-5 @ 3'	7.1	33,763	0.001	139
B-15 @ 2'	6.9	39,141	0.001	175
B-21 @ 2'	7.0	7,349	0.002	154

ND denotes not detected
% by weight
ppm – mg/kg

TABLE IV
R VALUE TESTS

Soil Type	Classification	Expansion Index
B-4 @ 2'	Silty SAND	77
B-6 @ 2'	Silty SAND	79
B-14 @ 2'	Silty SAND	75

GMU
GEOTECHNICAL, INC.

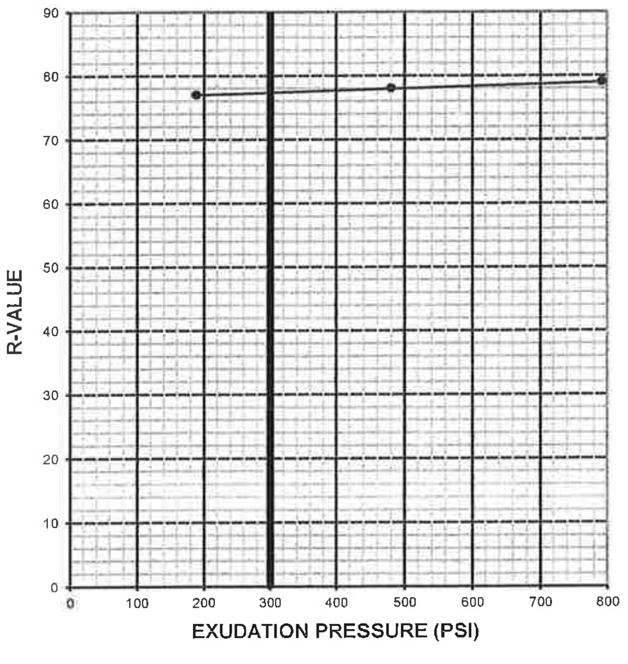
R-VALUE TEST RESULTS

PROJECT NAME: Norcal (Norton Moore Properties) 18536-15
SAMPLE LOCATION: SWC of Hollywood Way & San Fernando Blvd Burbank CA
SAMPLE DESCRIPTION: Poorly Graded Sand (SP)

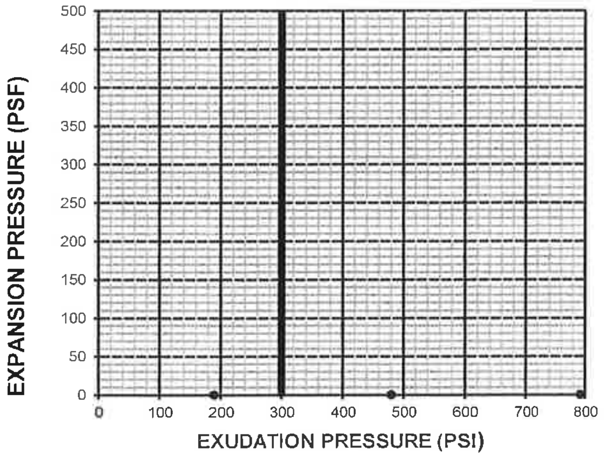
PROJECT NUMBER: L-151202
SAMPLE NUMBER: B-4 @ 2
TECHNICIAN: JV
DATE TESTED 12/2/2015

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	10.6	11.1	11.7
WEIGHT OF SAMPLE, grams	1076	1092	1102
HEIGHT OF SAMPLE, Inches	2.60	2.60	2.65
DRY DENSITY, pcf	113.4	114.5	112.9
COMPACTOR AIR PRESSURE, psi	250	250	250
EXUDATION PRESSURE, psi	792	480	189
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	22	20	23
TURNS DISPLACEMENT	4.51	5.33	4.87
R-VALUE UNCORRECTED	78	77	75
R-VALUE CORRECTED	79	78	77
EXPANSION PRESSURE (psf)	0.0	0.0	0.0

R-VALUE VS. EXUDATION PRESSURE



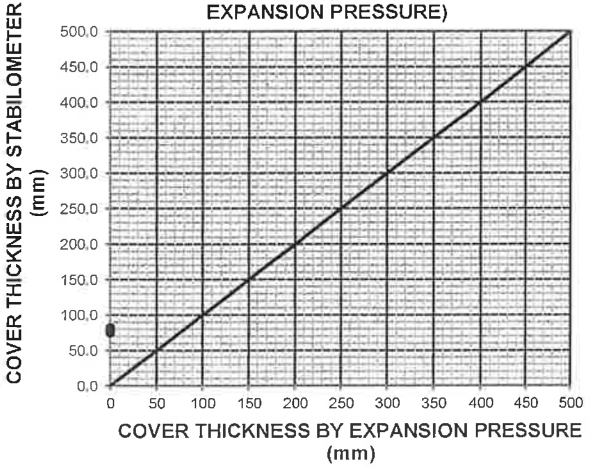
EXPANSION PRESSURE VS. EXUDATION PRESSURE



R-VALUE AT EQUILIBRIUM:	77

R-VALUE BY EXUDATION PRESSURE:	77
R-VALUE BY EXPANSION PRESSURE:	N.A.
EXPANSION PRESSURE AT 300 PSI EXUDATION:	0
TRAFFIC INDEX (Assumed):	5.5
GRAVEL FACTOR (Assumed):	1.5
UNIT MASS OF COVER MATERIAL, kg/m^3 (Assumed):	2100.0

COVER THICKNESS (STABILOMETER BY EXPANSION PRESSURE)



GMU
GEOTECHNICAL, INC.

R-VALUE TEST RESULTS

PROJECT NAME: Norcal (Norton Moore Properties) 18536-15

PROJECT NUMBER: L-151202

SAMPLE LOCATION: SWC of Hollywood Way & San Fernando Blvd Burbank CA

SAMPLE NUMBER: B-6 @ 1

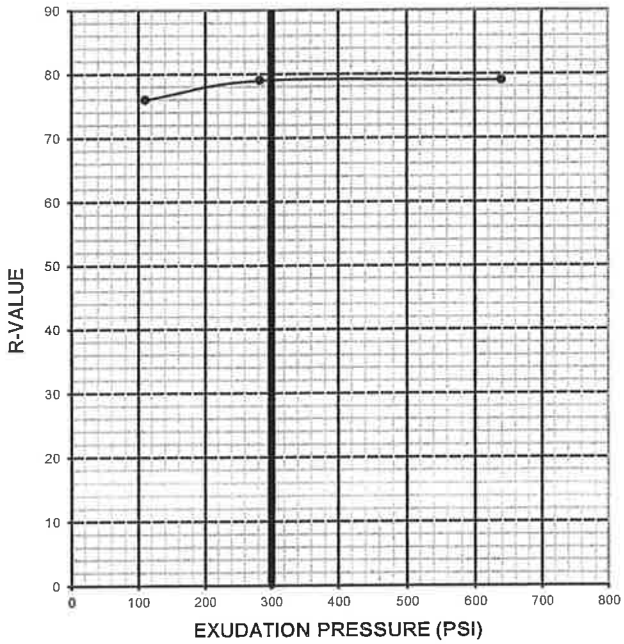
SAMPLE DESCRIPTION: Poorly Graded Sand (SP)

TECHNICIAN: JV

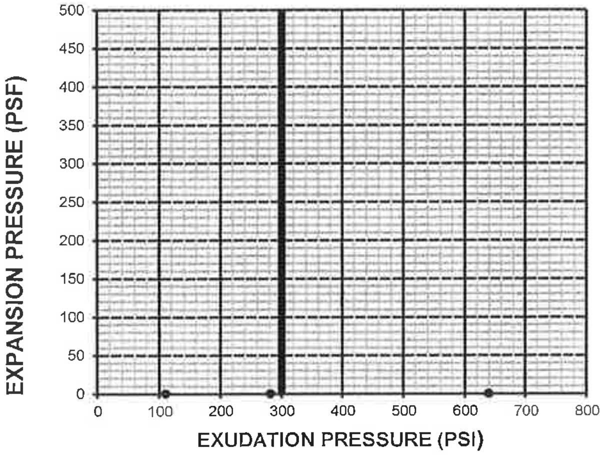
DATE TESTED 12/2/2015

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	9.6	10.2	10.5
WEIGHT OF SAMPLE, grams	1128	1121	1138
HEIGHT OF SAMPLE, Inches	2.58	2.57	2.61
DRY DENSITY, pcf	121.0	120.0	119.6
COMPACTOR AIR PRESSURE, psi	250	250	250
EXUDATION PRESSURE, psi	639	282	110
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	19	21	22
TURNS DISPLACEMENT	4.96	4.50	5.19
R-VALUE UNCORRECTED	79	79	75
R-VALUE CORRECTED	79	79	76
EXPANSION PRESSURE (psf)	0.0	0.0	0.0

R-VALUE VS. EXUDATION PRESSURE



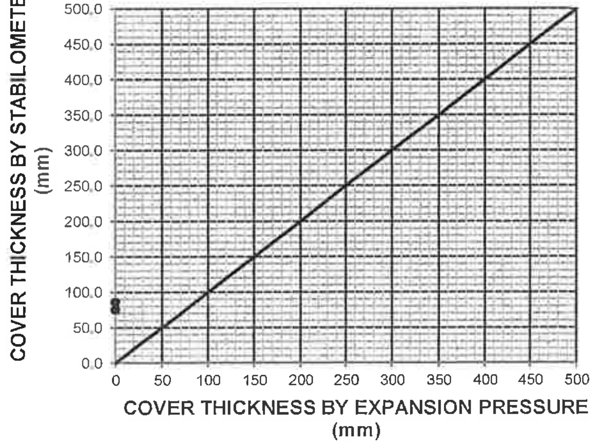
EXPANSION PRESSURE VS. EXUDATION PRESSURE



R-VALUE AT EQUILIBRIUM:	79

R-VALUE BY EXUDATION PRESSURE:	79
R-VALUE BY EXPANSION PRESSURE:	N.A.
EXPANSION PRESSURE AT 300 PSI EXUDATION:	0
TRAFFIC INDEX (Assumed):	5.5
GRAVEL FACTOR (Assumed):	1.5
UNIT MASS OF COVER MATERIAL, kg/m^3 (Assumed):	2100.0

COVER THICKNESS (STABILOMETER BY EXPANSION PRESSURE)

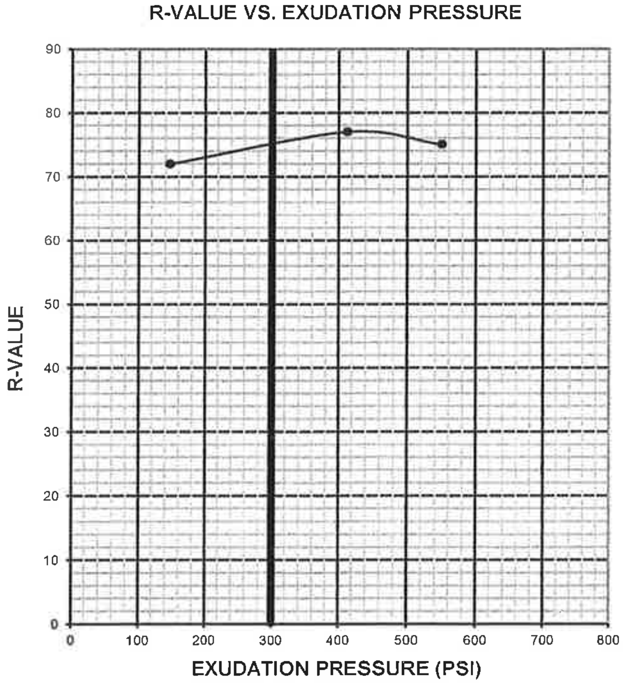


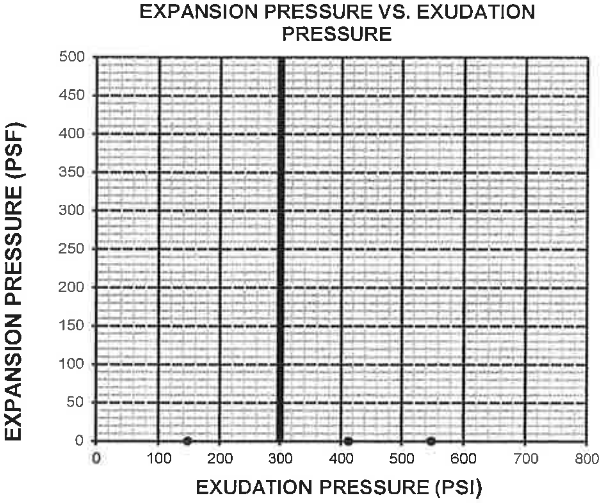
GMU
GEOTECHNICAL, INC.

R-VALUE TEST RESULTS

PROJECT NAME:	Norcal (Overton Moore Properties) 18536-15	PROJECT NUMBER:	L-151202
SAMPLE LOCATION:	SWC of Hollywood Way & San Fernando Blvd Burbank CA	SAMPLE NUMBER:	B-14 @ 1
SAMPLE DESCRIPTION:	Silty Sand (SM)	TECHNICIAN:	JV
		DATE TESTED	12/3/2015

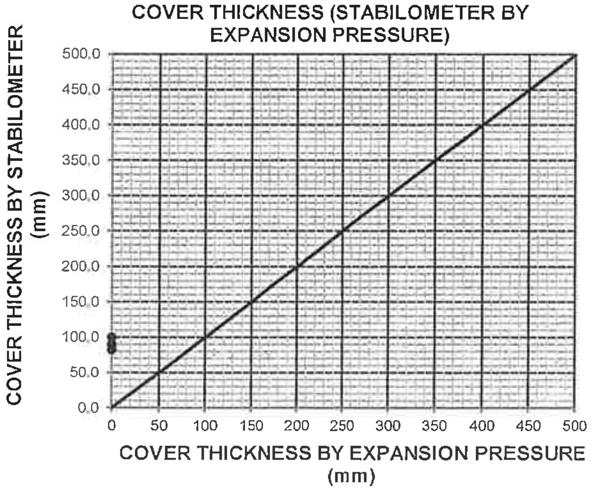
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	10.1	10.6	11.0
WEIGHT OF SAMPLE, grams	1098	1102	1123
HEIGHT OF SAMPLE, Inches	2.58	2.60	2.65
DRY DENSITY, pcf	117.1	116.2	115.7
COMPACTOR AIR PRESSURE, psi	250	250	250
EXUDATION PRESSURE, psi	549	413	147
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	29	26	33
TURNS DISPLACEMENT	3.80	4.17	4.09
R-VALUE UNCORRECTED	75	76	70
R-VALUE CORRECTED	75	77	72
EXPANSION PRESSURE (psf)	0.0	0.0	0.0





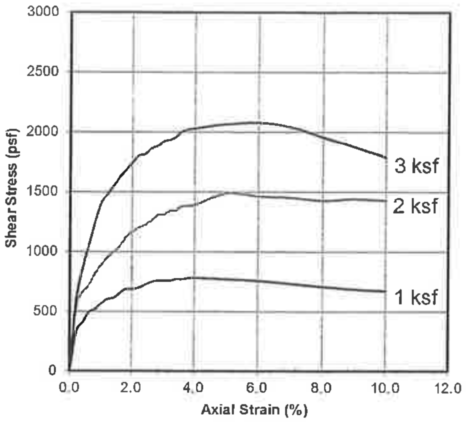
R-VALUE AT EQUILIBRIUM:	75

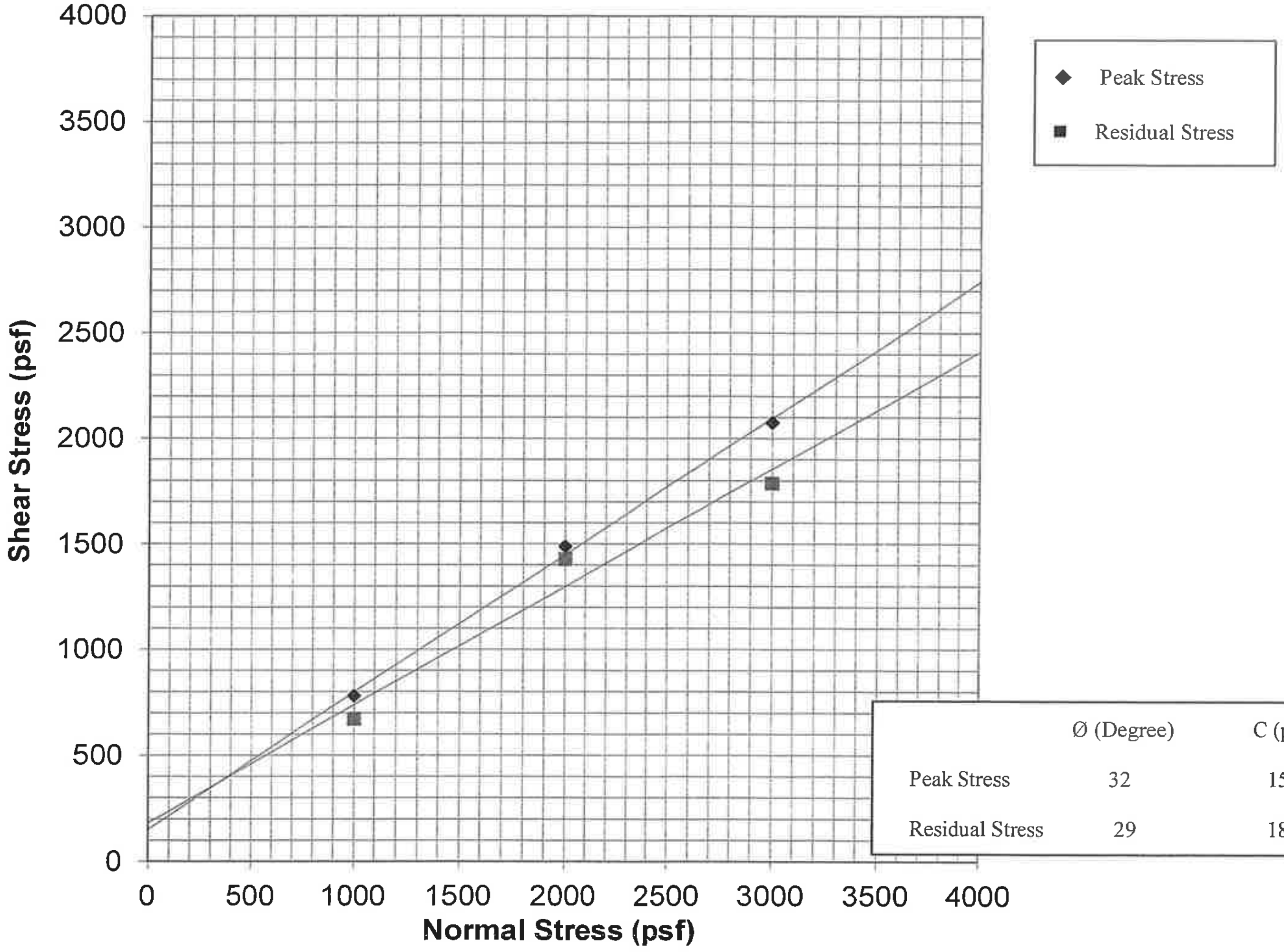
R-VALUE BY EXUDATION PRESSURE:	75
R-VALUE BY EXPANSION PRESSURE:	N.A.
EXPANSION PRESSURE AT 300 PSI EXUDATION:	0
TRAFFIC INDEX (Assumed):	5.5
GRAVEL FACTOR (Assumed):	1.5
UNIT MASS OF COVER MATERIAL, kg/m^3 (Assumed):	2100.0



Sample No. B5@5'
Sample Type: Undisturbed/Saturated
Soil Description: Fine-Coarse Grained Sand w/ Some Small Gravel & Trace Silt

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	780	1488	2076
Displacement	(in)	0.100	0.125	0.150
Residual Stress	(psf)	672	1428	1788
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	112.1	112.1	112.1
In Situ Water Content	(%)	5.0	5.0	5.0
Saturated Water Content	(%)	18.6	18.6	18.6
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	32	150
Residual Stress	29	180

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15 DATE: 12/4/2015

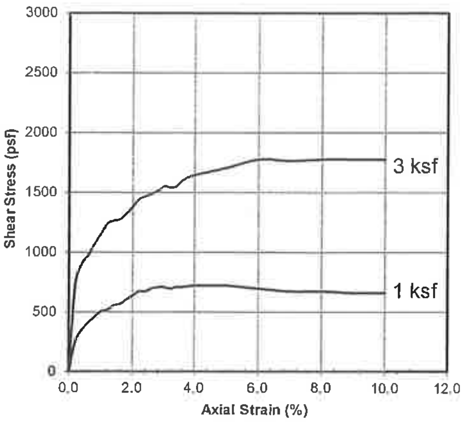
DIRECT SHEAR TEST

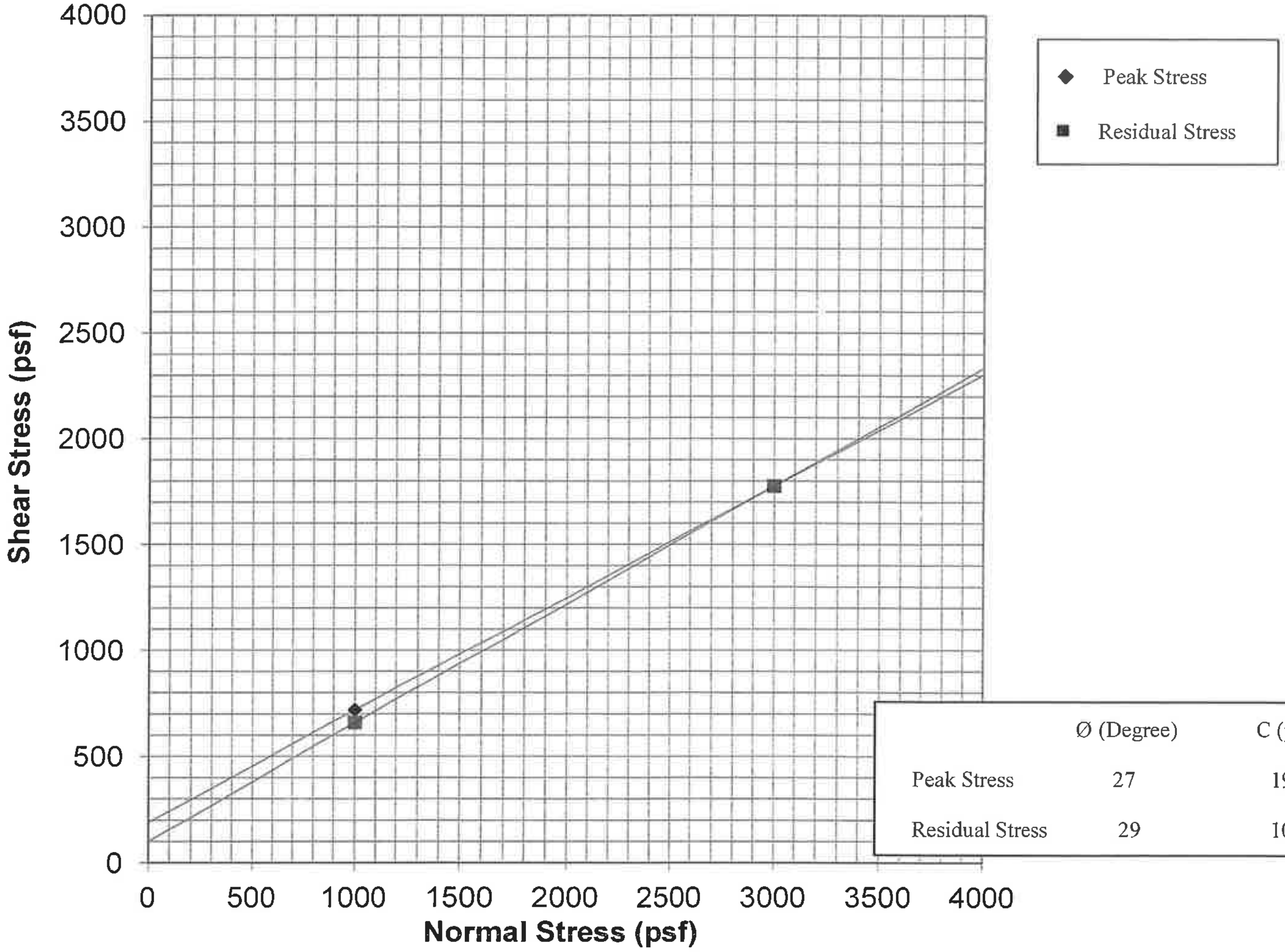
ASTM D3080

Plate A

Sample No. B8@2'
Sample Type: Undisturbed/Saturated
Soil Description: Fine-Coarse Grained Sand w/ Some Silt & Small Gravel

		1	3
Normal Stress	(psf)	1000	3000
Peak Stress	(psf)	720	1776
Displacement	(in)	0.100	0.150
Residual Stress	(psf)	660	1776
Displacement	(in.)	0.250	0.250
In Situ Dry Density	(pcf)	100.2	100.2
In Situ Water Content	(%)	6.8	6.8
Saturated Water Content	(%)	25.2	25.2
Strain Rate	(in/min)	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	27	190
Residual Stress	29	100

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15 DATE: 12/4/2015

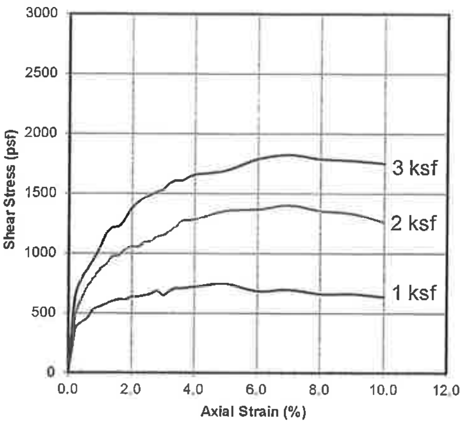
DIRECT SHEAR TEST

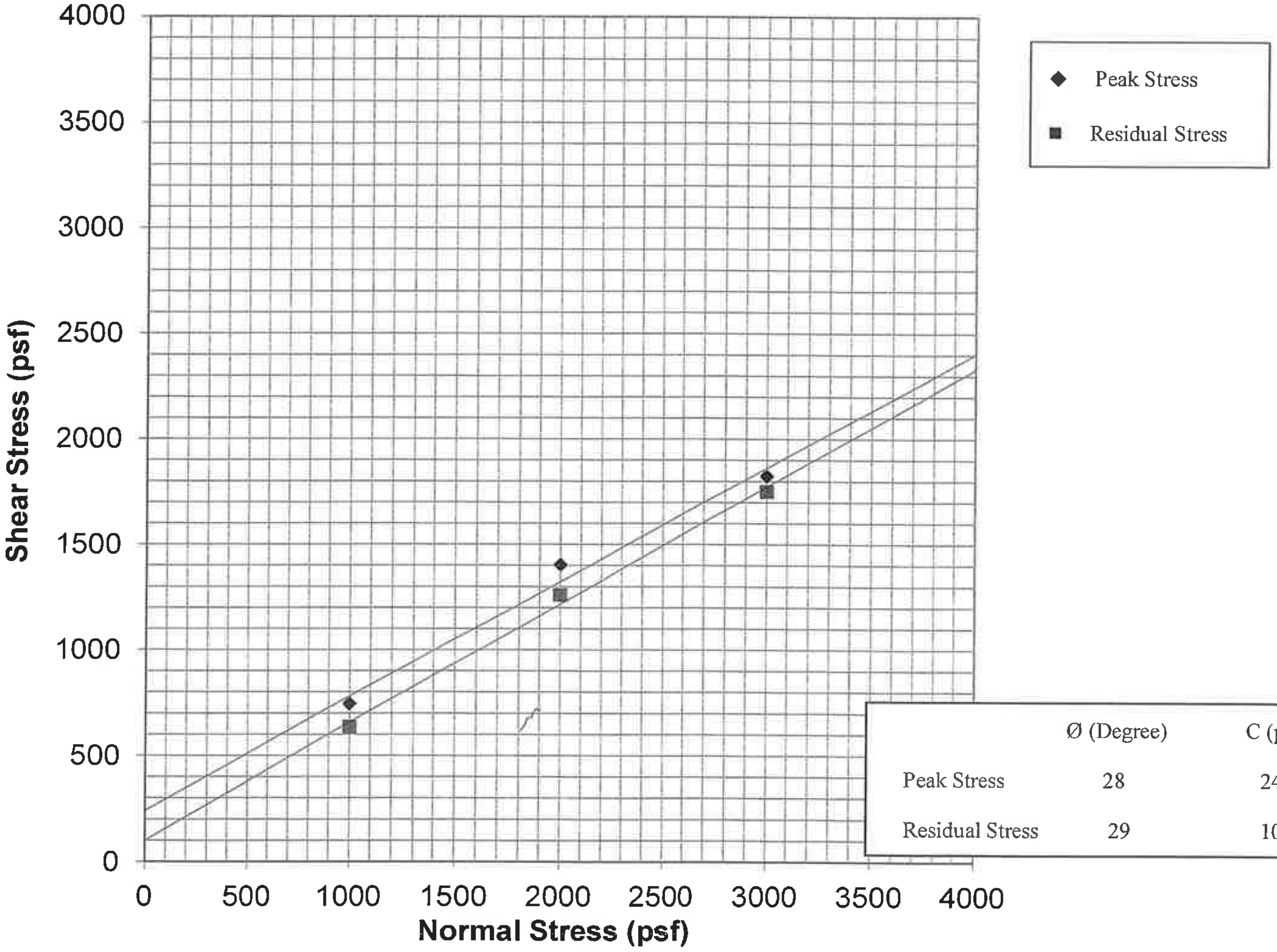
ASTM D3080

Plate B

Sample No. B15@5'
Sample Type: Undisturbed/Saturated
Soil Description: Fine-Very Coarse Grained Sand w/ Some Small Gravel & Trace Silt

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	744	1404	1824
Displacement	(in)	0.125	0.175	0.175
Residual Stress	(psf)	636	1260	1752
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	105.6	105.6	105.6
In Situ Water Content	(%)	2.1	2.1	2.1
Saturated Water Content	(%)	22.1	22.1	22.1
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	28	240
Residual Stress	29	100

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15 DATE: 12/4/2015

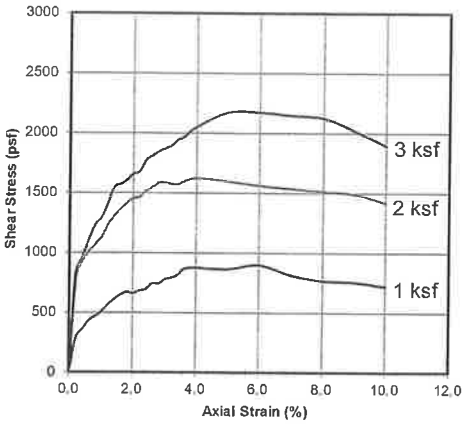
DIRECT SHEAR TEST

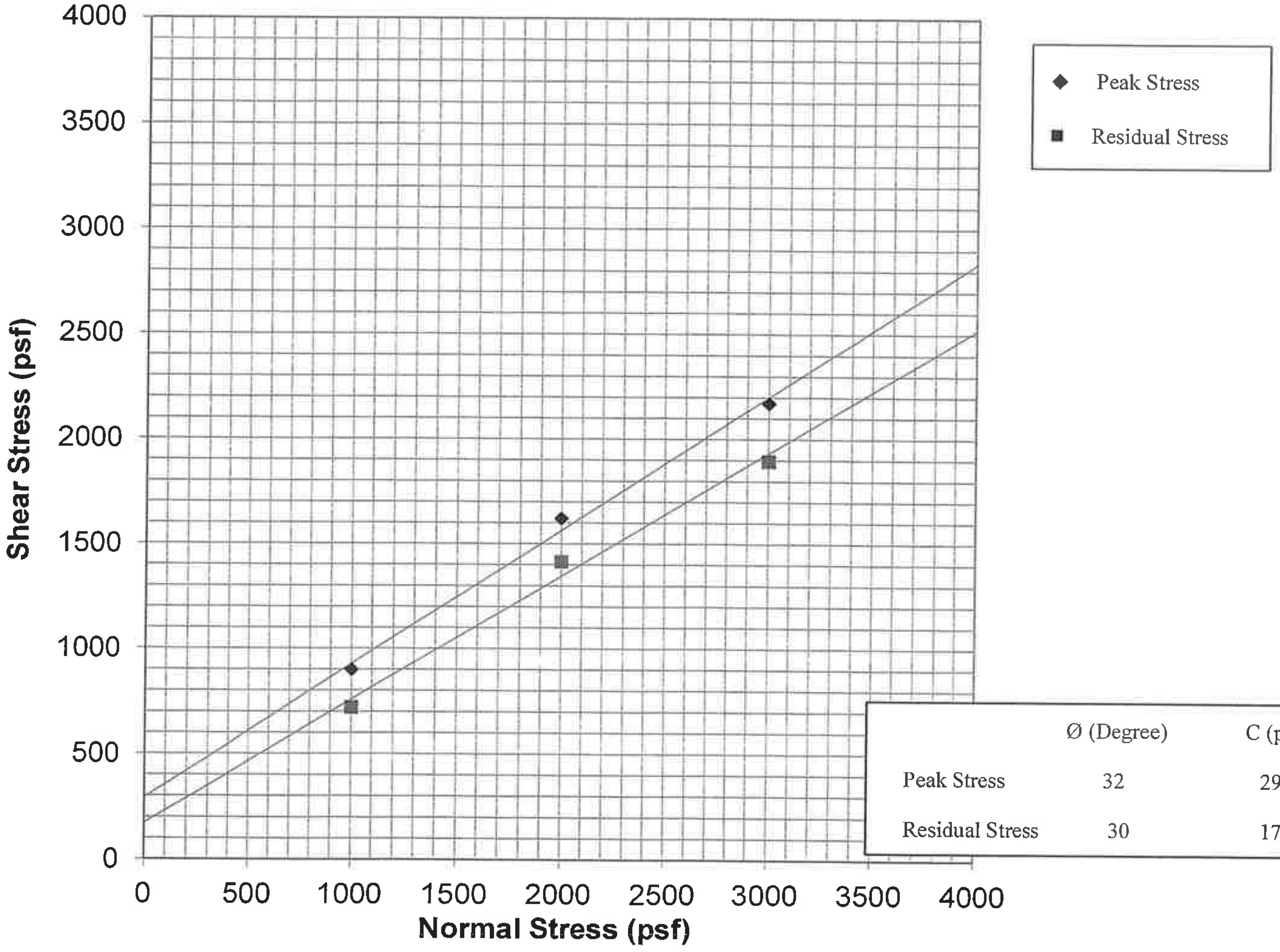
ASTM D3080

Plate C

Sample No. B21@4'
Sample Type: Undisturbed/Saturated
Soil Description: Fine-Very Coarse Grained Sand w/ Some Small Gravel & Trace Silt

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	900	1620	2172
Displacement	(in)	0.150	0.100	0.125
Residual Stress	(psf)	720	1416	1896
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	107.9	107.9	107.9
In Situ Water Content	(%)	2.9	2.9	2.9
Saturated Water Content	(%)	20.8	20.8	20.8
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	32	290
Residual Stress	30	170

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15 DATE: 12/4/2015

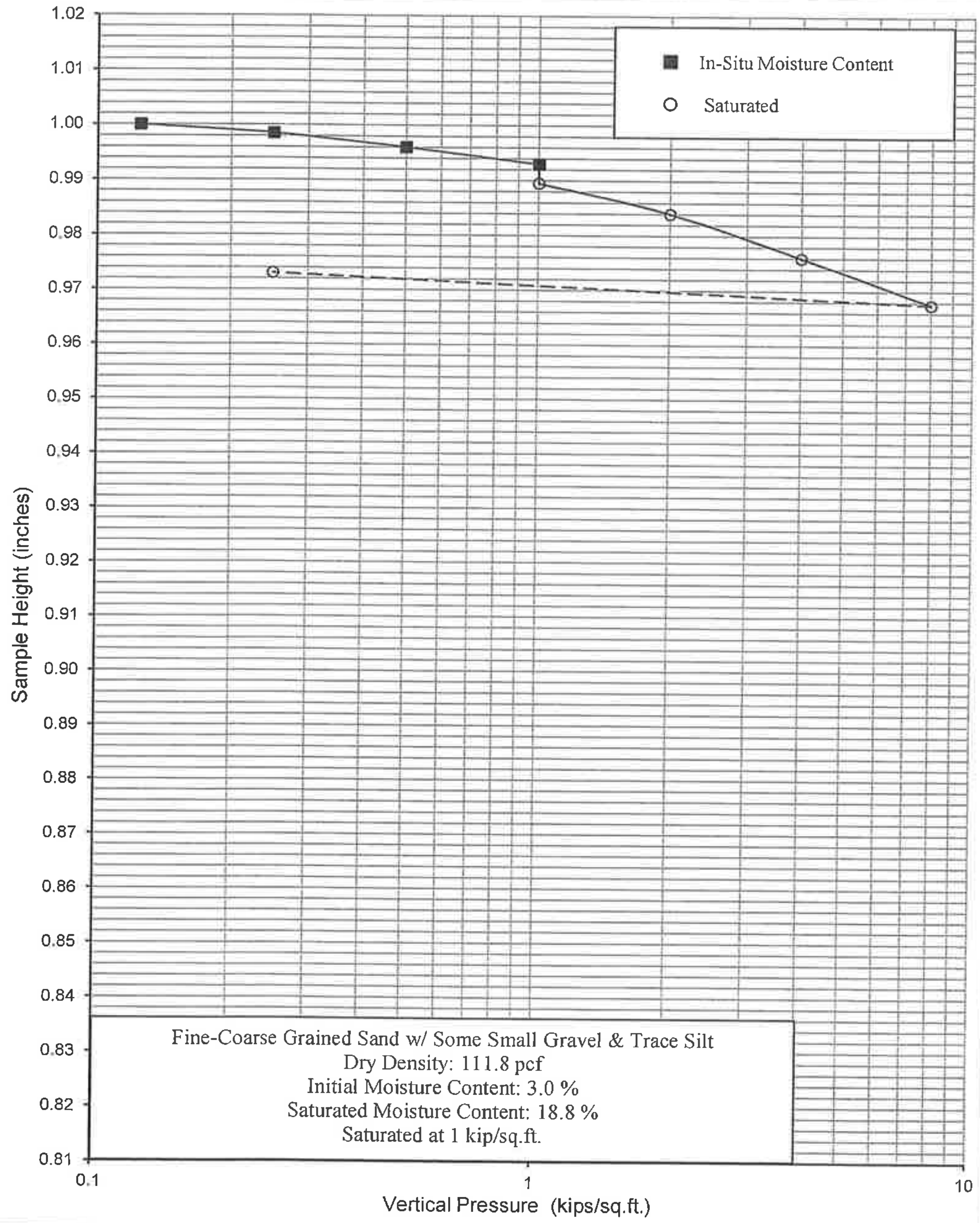
DIRECT SHEAR TEST
ASTM D3080
Plate D

Sample No. B5 Depth 10' Date 12/4/2015

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.125	**1.0000**	**0.0**
0.25	**0.9985**	**0.2**
0.5	**0.9960**	**0.4**
1	**0.9930**	**0.7**
1	**0.9895**	**1.1**
2	**0.9840**	**1.6**
4	**0.9760**	**2.4**
8	**0.9675**	**3.3**
0.25	**0.9730**	**2.7**

Saturated

Date Tested: 11/30/2015
Sample: B5
Depth: 10'



Fine-Coarse Grained Sand w/ Some Small Gravel & Trace Silt
Dry Density: 111.8 pcf
Initial Moisture Content: 3.0 %
Saturated Moisture Content: 18.8 %
Saturated at 1 kip/sq.ft.

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15 DATE: 12/4/2015

CONSOLIDATION TEST

ASTM D2435

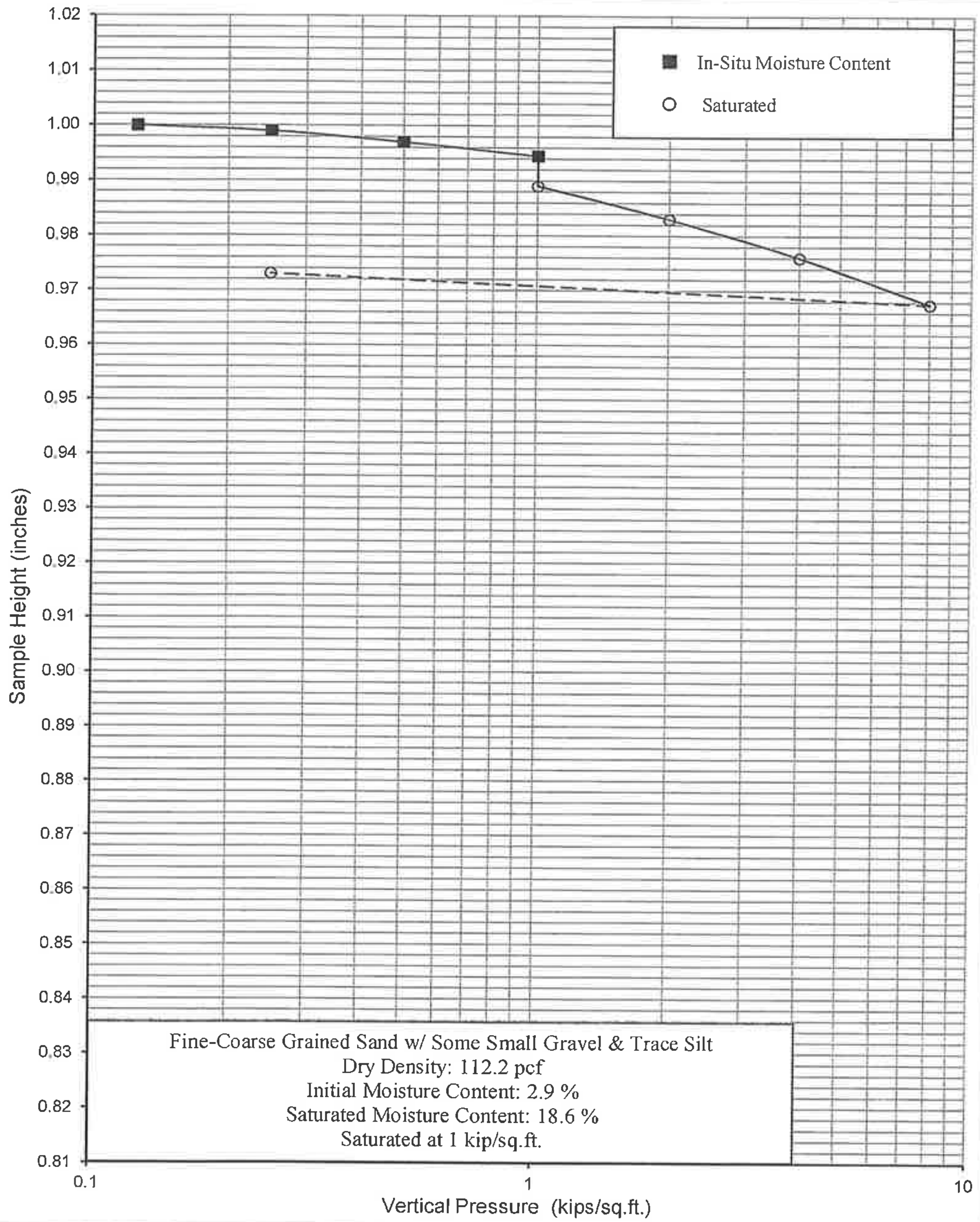
Plate E

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	Sample No.	B5	Depth	15'	Date	12/4/2015

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.125	1.0000	0.0
0.25	0.9990	0.1
0.5	0.9970	0.3
1	0.9945	0.6
1	0.9890	1.1
2	0.9830	1.7
4	0.9760	2.4
8	0.9675	3.3
0.25	0.9730	2.7

Saturated

Date Tested: 11/30/2015
Sample: B5
Depth: 15'



Fine-Coarse Grained Sand w/ Some Small Gravel & Trace Silt
Dry Density: 112.2 pcf
Initial Moisture Content: 2.9 %
Saturated Moisture Content: 18.6 %
Saturated at 1 kip/sq.ft.

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15 DATE: 12/4/2015

CONSOLIDATION TEST

ASTM D2435

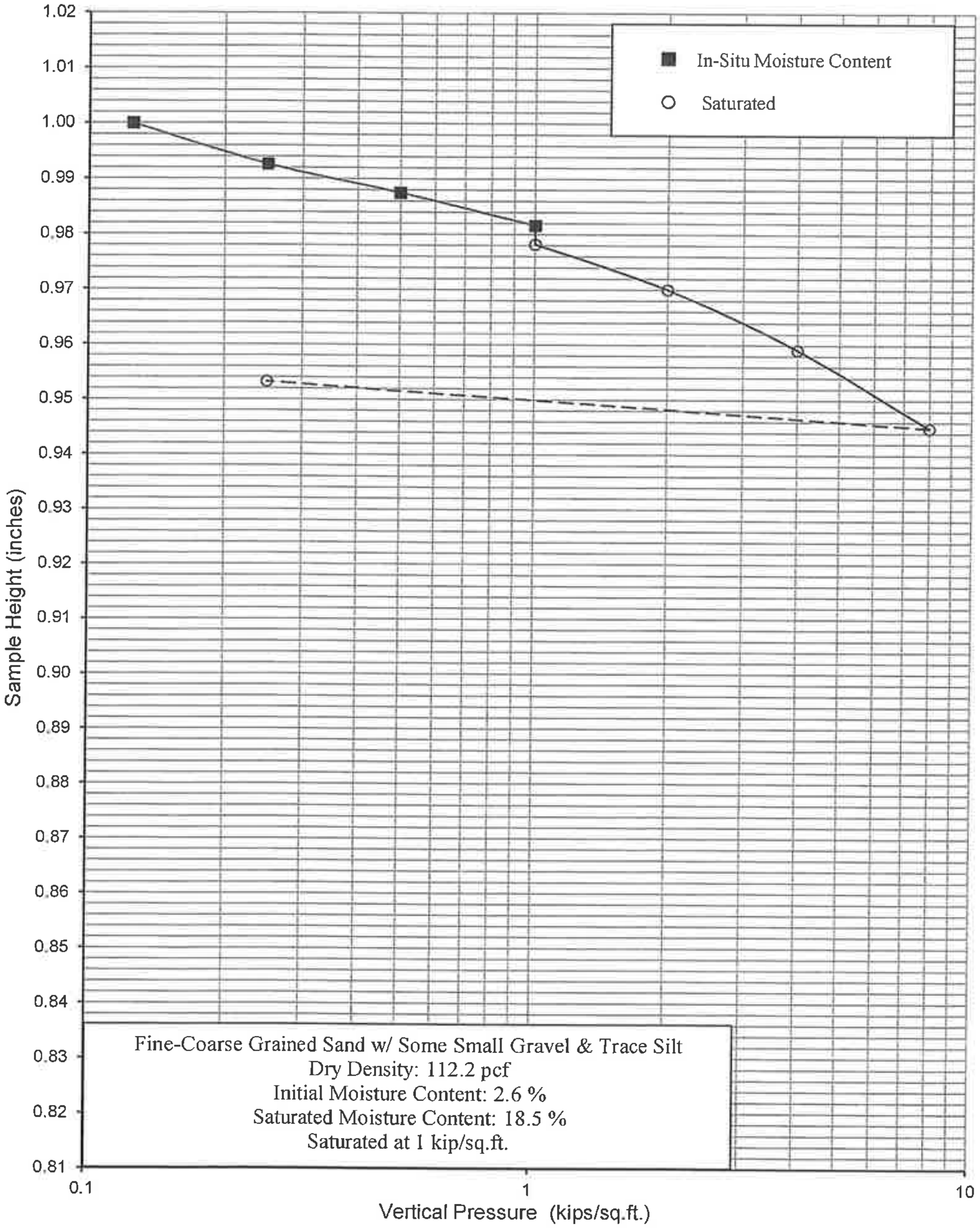
Plate F

Sample No. B8 Depth 5' Date 12/4/2015

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.125	**1.0000**	**0.0**
0.25	**0.9926**	**0.7**
0.5	**0.9875**	**1.3**
1	**0.9816**	**1.8**
1	**0.9782**	**2.2**
2	**0.9700**	**3.0**
4	**0.9591**	**4.1**
8	**0.9449**	**5.5**
0.25	**0.9532**	**4.7**

Saturated

Date Tested: 11/30/2015
Sample: B8
Depth: 5'



Fine-Coarse Grained Sand w/ Some Small Gravel & Trace Silt
Dry Density: 112.2 pcf
Initial Moisture Content: 2.6 %
Saturated Moisture Content: 18.5 %
Saturated at 1 kip/sq.ft.

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS
Overton-Moore Properties
PROJECT NUMBER: 18536-15 DATE: 12/4/2015

CONSOLIDATION TEST
ASTM D2435
Plate G

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.125	1.0000	0.0
0.25	0.9970	0.3
0.5	0.9950	0.5
1	0.9915	0.8
1	0.9895	1.1
2	0.9850	1.5
4	0.9800	2.0
8	0.9730	2.7
0.25	0.9820	1.8

Saturated

Sample No. B8

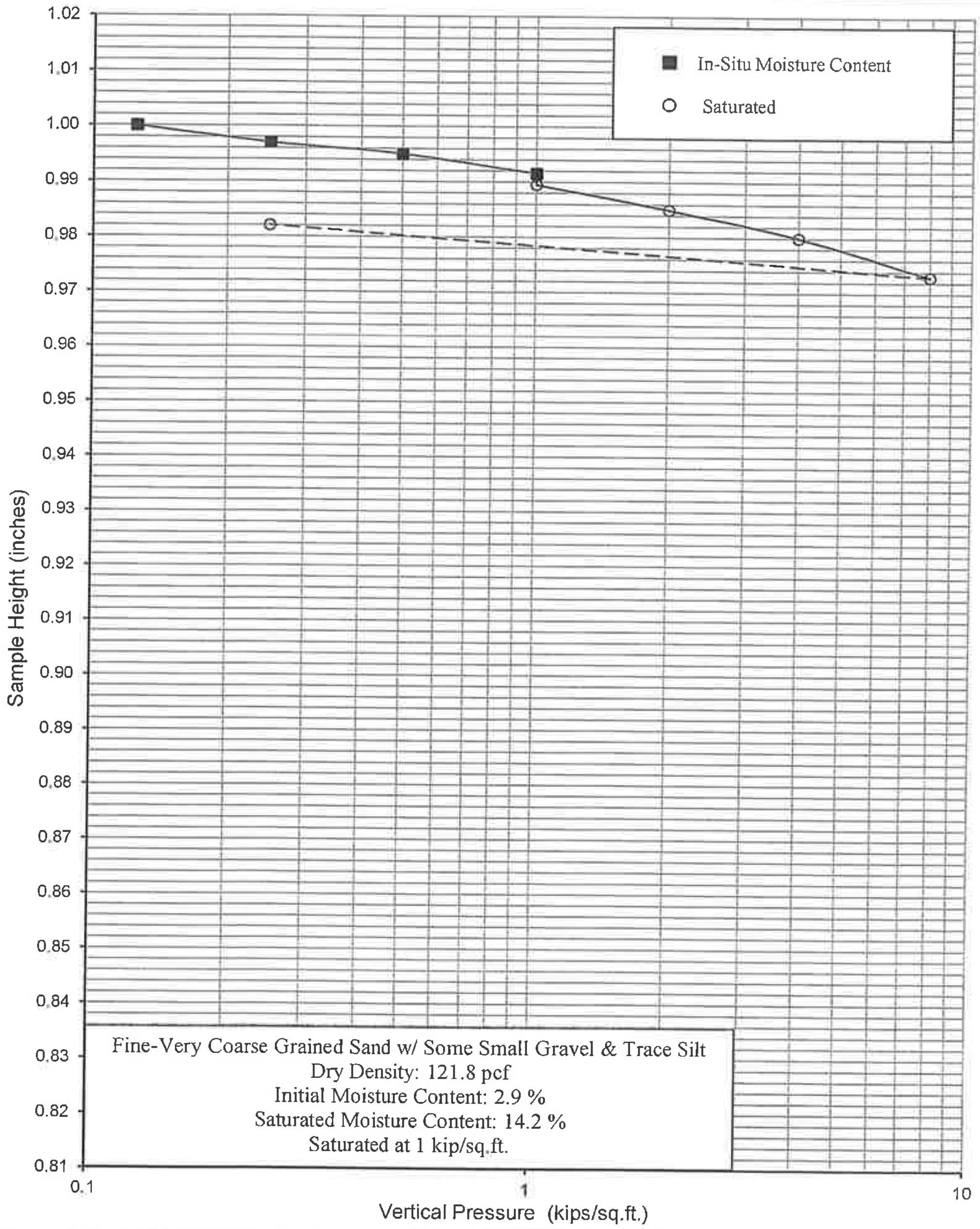
Depth 10'

Date 12/4/2015

Date Tested: 12/1/2015

Sample: B8

Depth: 10'



Fine-Very Coarse Grained Sand w/ Some Small Gravel & Trace Silt
Dry Density: 121.8 pcf
Initial Moisture Content: 2.9 %
Saturated Moisture Content: 14.2 %
Saturated at 1 kip/sq.ft.

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15

DATE: 12/4/2015

CONSOLIDATION TEST

ASTM D2435

Plate H

Sample No. B12

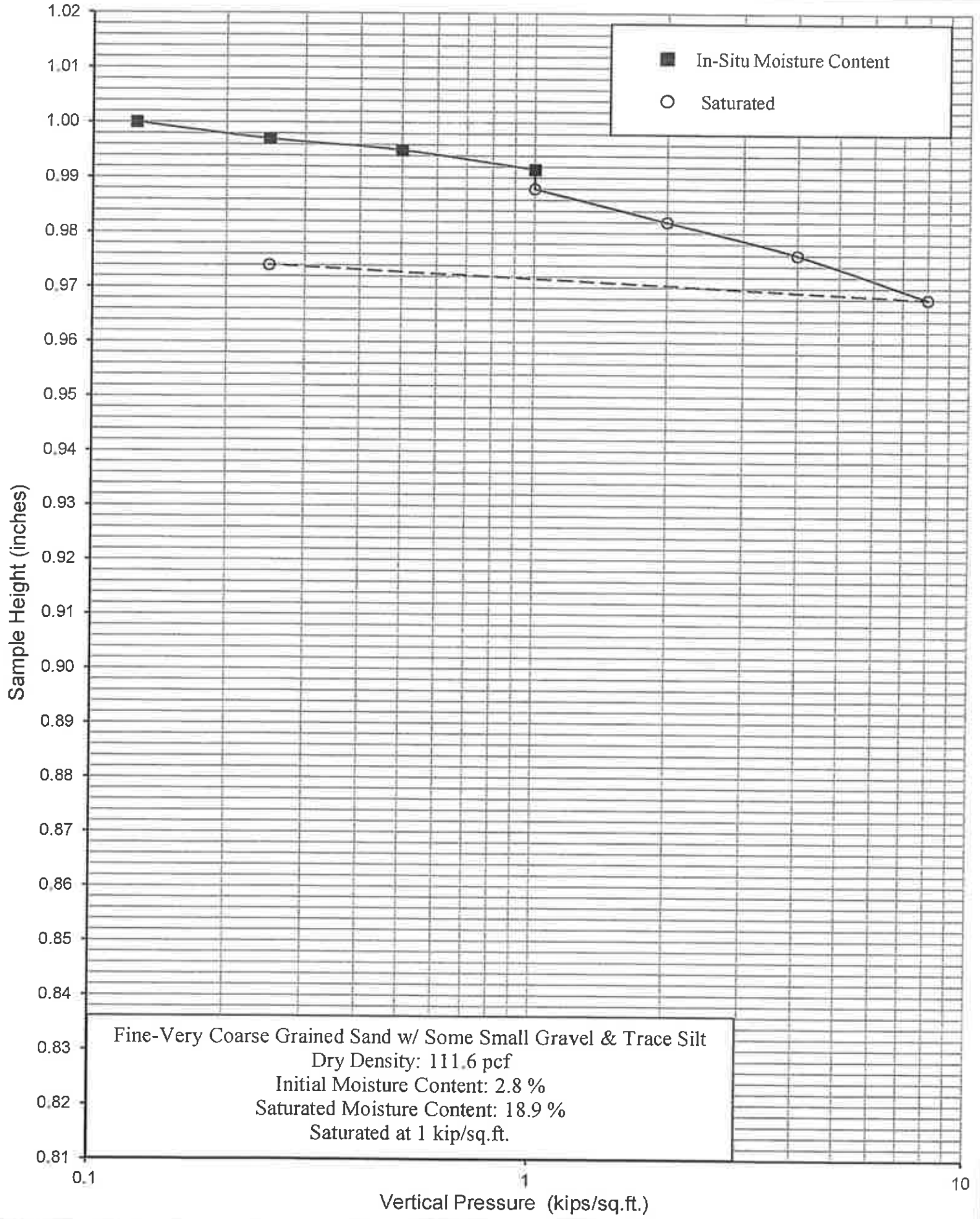
Depth 10'

Date 12/4/2015

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.125	1.0000	0.0
0.25	0.9970	0.3
0.5	0.9950	0.5
1	0.9915	0.8
1	0.9880	1.2
2	0.9820	1.8
4	0.9760	2.4
8	0.9680	3.2
0.25	0.9740	2.6

Saturated

Date Tested: 12/1/2015
Sample: B12
Depth: 10'



Fine-Very Coarse Grained Sand w/ Some Small Gravel & Trace Silt
Dry Density: 111.6 pcf
Initial Moisture Content: 2.8 %
Saturated Moisture Content: 18.9 %
Saturated at 1 kip/sq.ft.

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15   DATE: 12/4/2015

CONSOLIDATION TEST

ASTM D2435

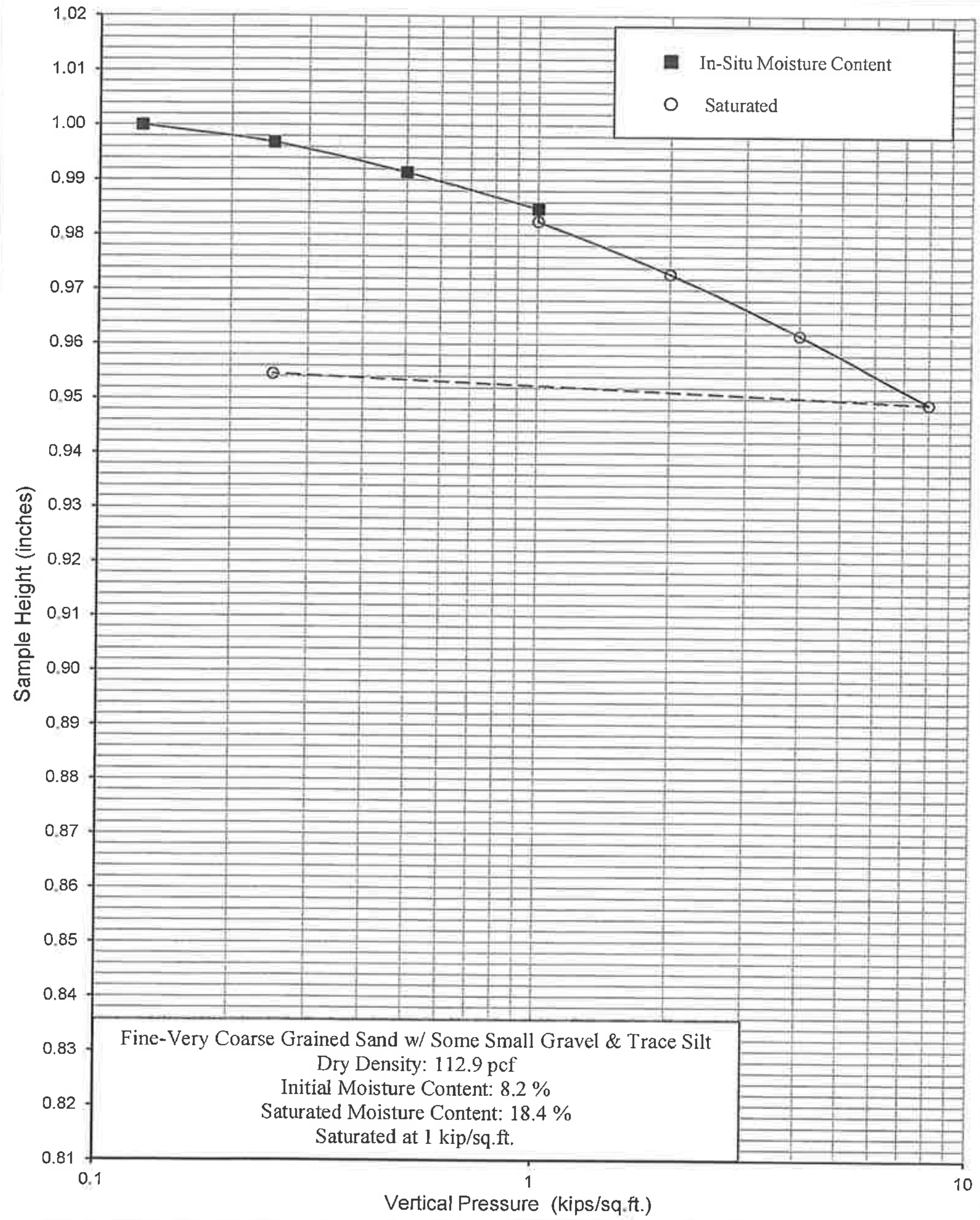
Plate I

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	Sample No.	B19	Depth 5'	Date 12/4/2015

0.125	1.0000	0.0
0.25	0.9968	0.3
0.5	0.9914	0.9
1	0.9848	1.5
1	0.9825	1.8
2	0.9729	2.7
4	0.9617	3.8
8	0.9491	5.1
0.25	0.9545	4.6

Saturated

Date Tested: 12/1/2015
Sample: B19
Depth: 5'



Fine-Very Coarse Grained Sand w/ Some Small Gravel & Trace Silt
Dry Density: 112.9 pcf
Initial Moisture Content: 8.2 %
Saturated Moisture Content: 18.4 %
Saturated at 1 kip/sq.ft.

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15 DATE: 12/4/2015

CONSOLIDATION TEST

ASTM D2435

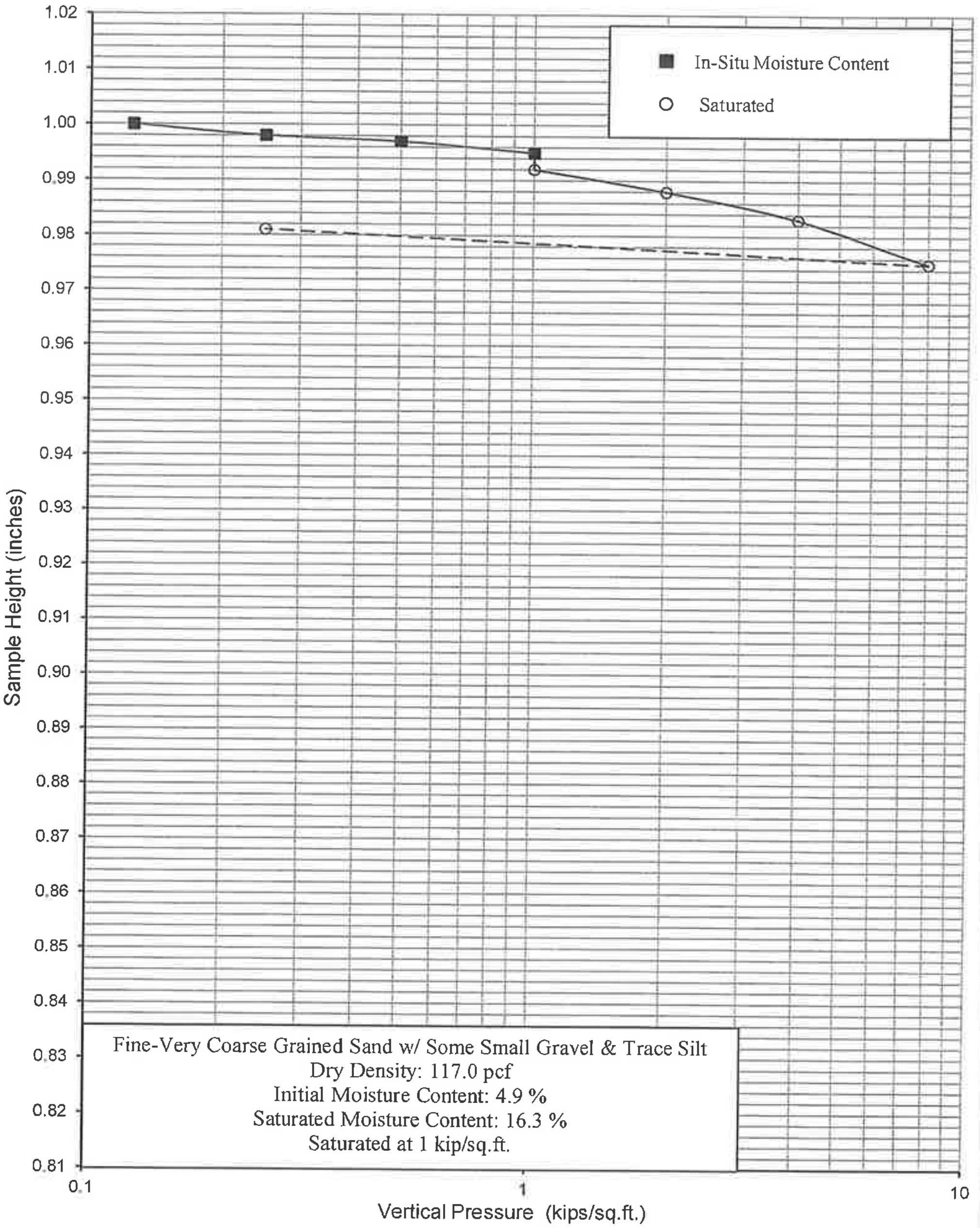
Plate J

Sample No. B19 | Depth 10' | Date 12/4/2015

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.125	**1.0000**	**0.0**
0.25	**0.9980**	**0.2**
0.5	**0.9970**	**0.3**
1	**0.9950**	**0.5**
1	**0.9920**	**0.8**
2	**0.9880**	**1.2**
4	**0.9830**	**1.7**
8	**0.9750**	**2.5**
0.25	**0.9810**	**1.9**

Saturated

Date Tested: 12/2/2015
Sample: B19
Depth: 10'



Fine-Very Coarse Grained Sand w/ Some Small Gravel & Trace Silt
Dry Density: 117.0 pcf
Initial Moisture Content: 4.9 %
Saturated Moisture Content: 16.3 %
Saturated at 1 kip/sq.ft.

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

PROJECT NUMBER: 18536-15   DATE: 12/4/2015

CONSOLIDATION TEST

ASTM D2435

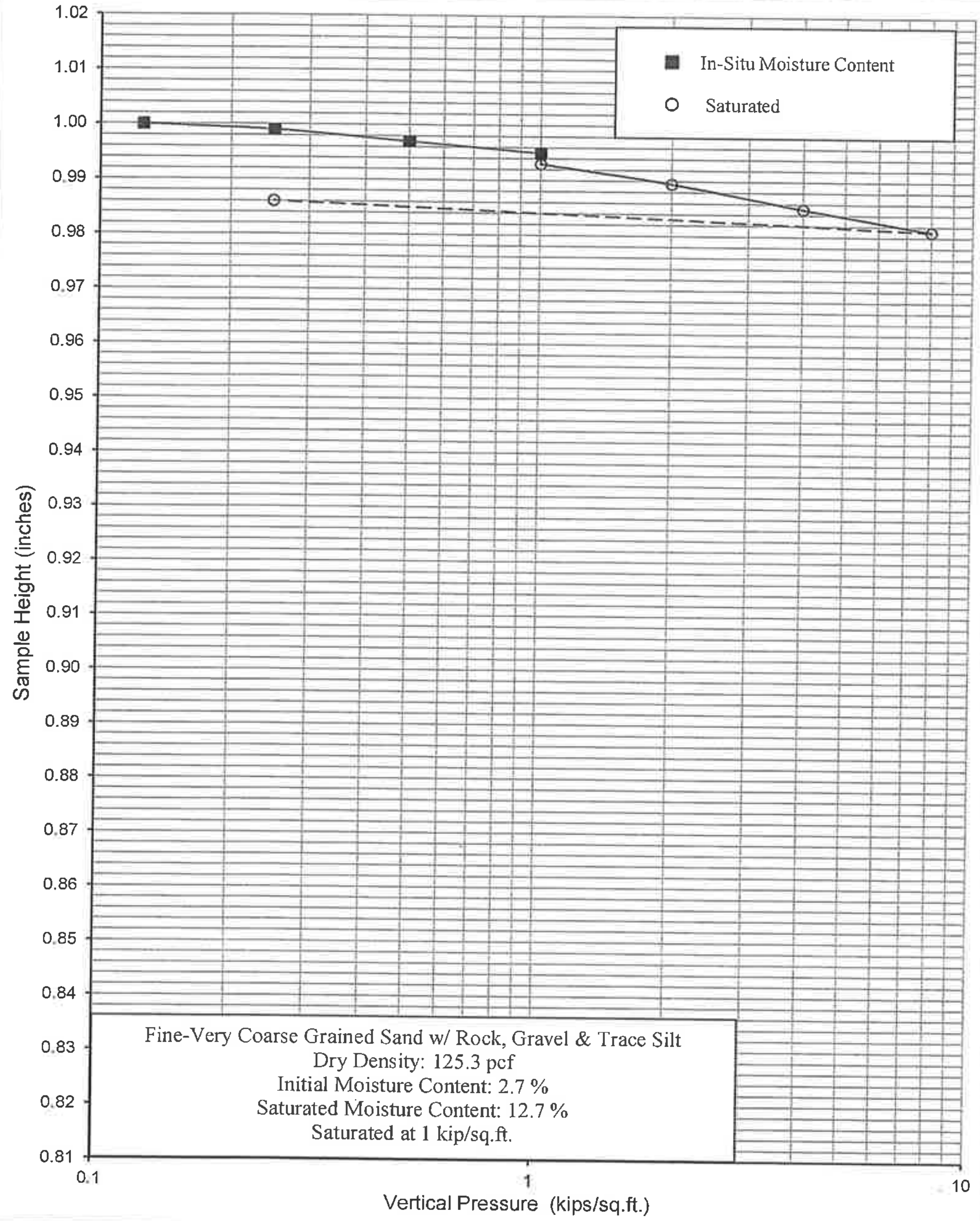
Plate K

Sample No.	B21	Depth	8'	Date	12/4/2015

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.125	1.0000	0.0
0.25	0.9990	0.1
0.5	0.9970	0.3
1	0.9950	0.5
1	0.9930	0.7
2	0.9895	1.1
4	0.9850	1.5
8	0.9810	1.9
0.25	0.9860	1.4

Saturated

Date Tested:	12/2/2015
Sample:	B21
Depth:	8'



Fine-Very Coarse Grained Sand w/ Rock, Gravel & Trace Silt
Dry Density: 125.3 pcf
Initial Moisture Content: 2.7 %
Saturated Moisture Content: 12.7 %
Saturated at 1 kip/sq.ft.

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

Overton-Moore Properties

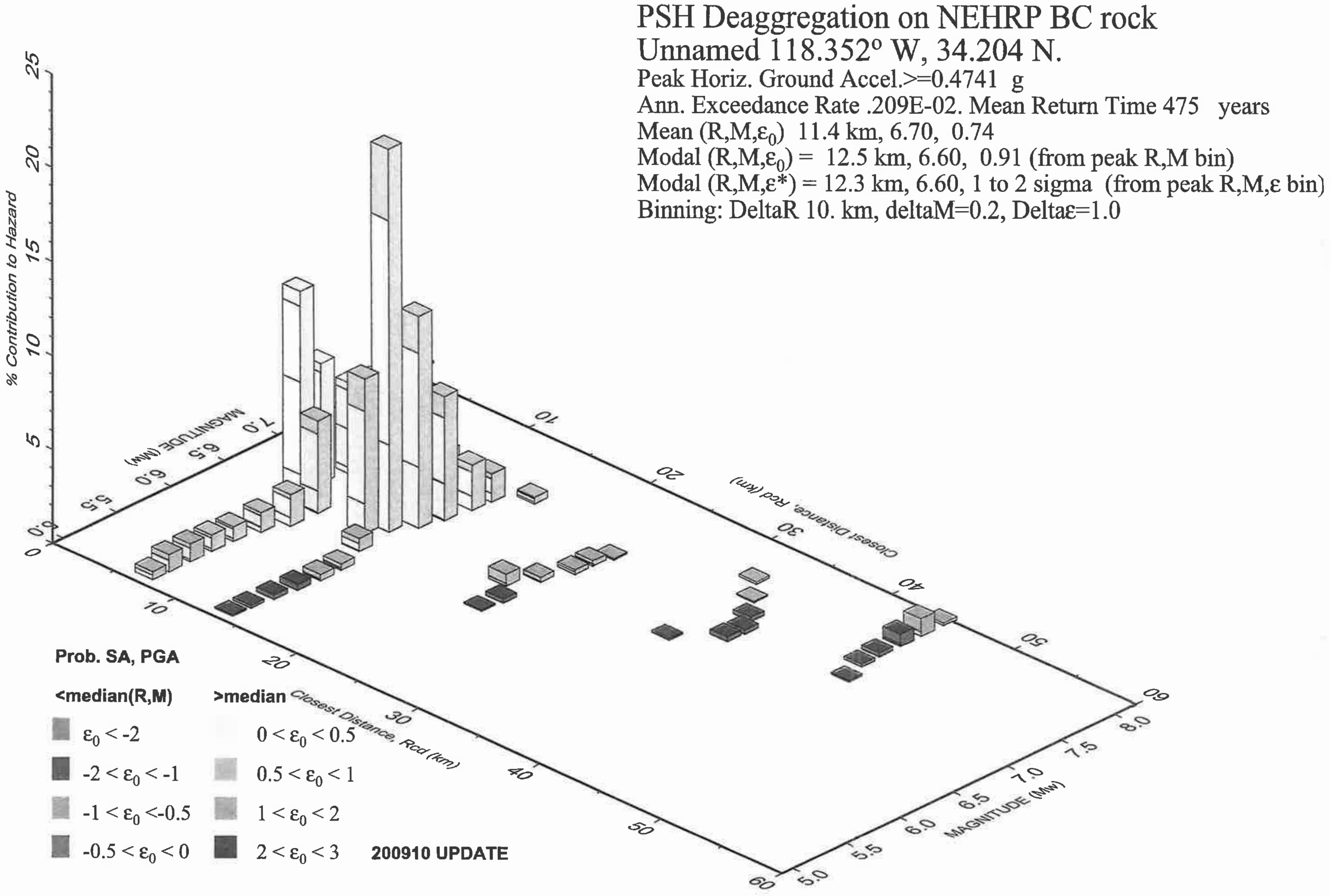
PROJECT NUMBER: 18536-15 DATE: 12/4/2015

CONSOLIDATION TEST

ASTM D2435

Plate L

Appendix C



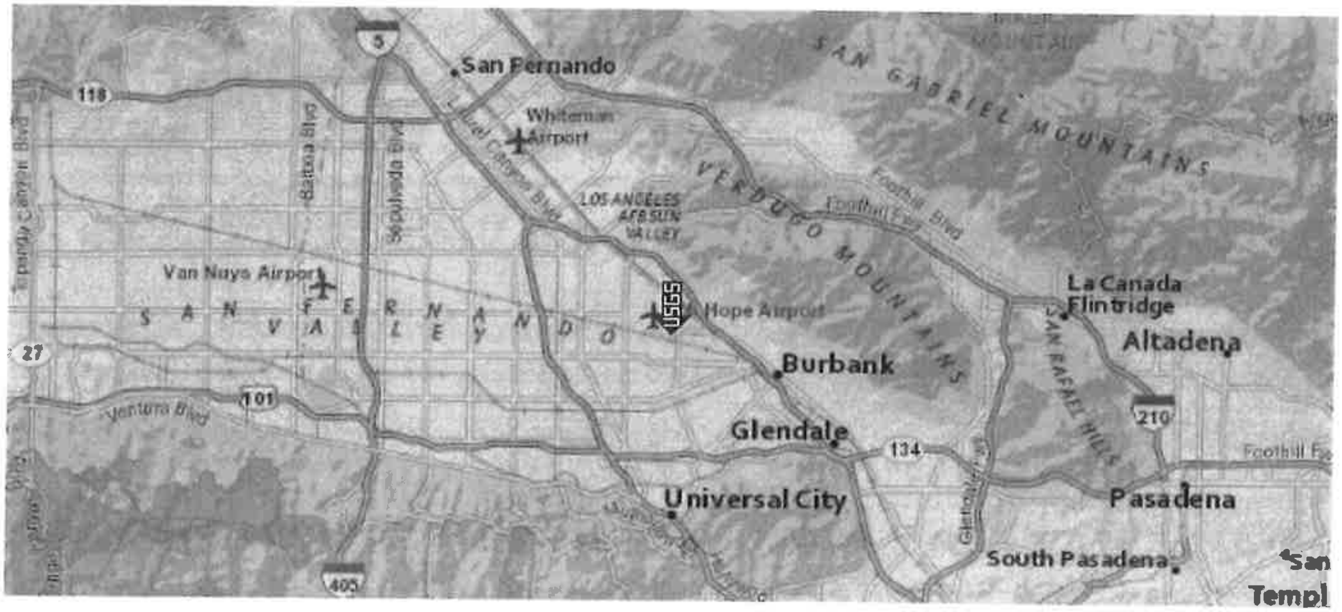
PSH Deaggregation on NEHRP BC rock
Unnamed 118.352° W, 34.204 N.
Peak Horiz. Ground Accel.>=0.4741 g
Ann. Exceedance Rate .209E-02. Mean Return Time 475 years
Mean (R,M,ε_0) 11.4 km, 6.70, 0.74
Modal (R,M,ε_0) = 12.5 km, 6.60, 0.91 (from peak R,M bin)
Modal (R,M,ε^*) = 12.3 km, 6.60, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0

GMT 2015 Dec 7 20:58:33 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

USGS Design Maps Summary Report

User–Specified Input

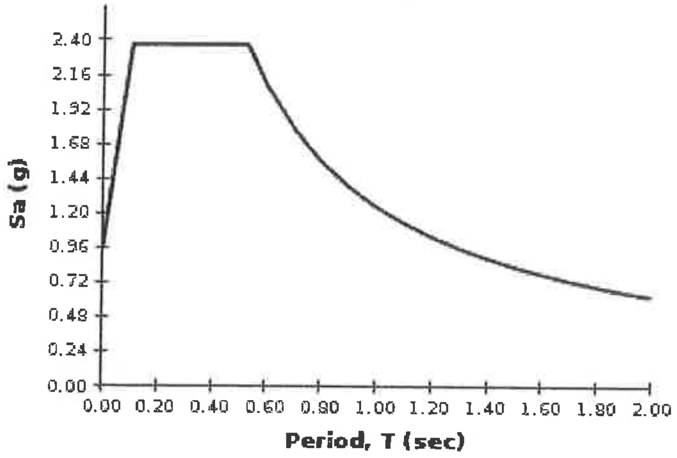
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	34.204°N, 118.352°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

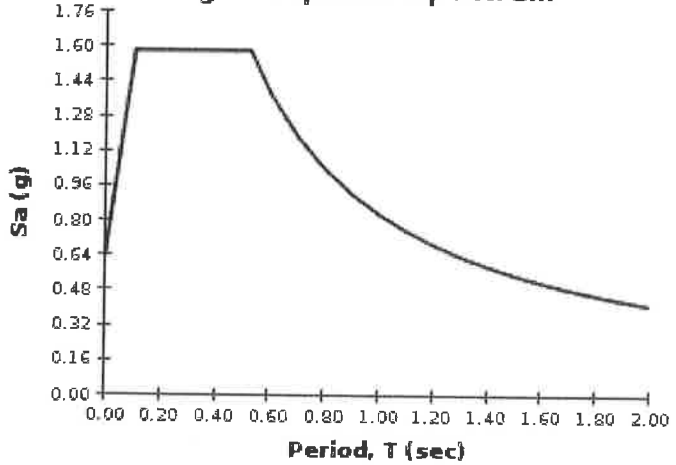


USGS–Provided Output

$S_S =$	2.371 g	$S_{MS} =$	2.371 g	$S_{DS} =$	1.580 g
$S_1 =$	0.830 g	$S_{M1} =$	1.245 g	$S_{D1} =$	0.830 g

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


MCE_R Response Spectrum


Design Response Spectrum

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

USGS Design Maps Detailed Report

ASCE 7-10 Standard (34.204°N, 118.352°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

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

From Figure 22-1 [1] $S_S = 2.371$ g

From Figure 22-2 [2] $S_1 = 0.830$ g

Section 11.4.2 — Site Class

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

Table 20.3–1 Site Classification

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

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

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

Table 11.4–1: Site Coefficient F_a

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

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

For Site Class = D and S_s = 2.371 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

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

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

For Site Class = D and S_1 = 0.830 g, F_v = 1.500

Equation (11.4-1): $S_{MS} = F_a S_S = 1.000 \times 2.371 = 2.371$ g

---

Equation (11.4-2): $S_{M1} = F_v S_1 = 1.500 \times 0.830 = 1.245$ g

---

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-3): $S_{DS} = ⅔\ S_{MS} = ⅔ \times 2.371 = 1.580$ g

---

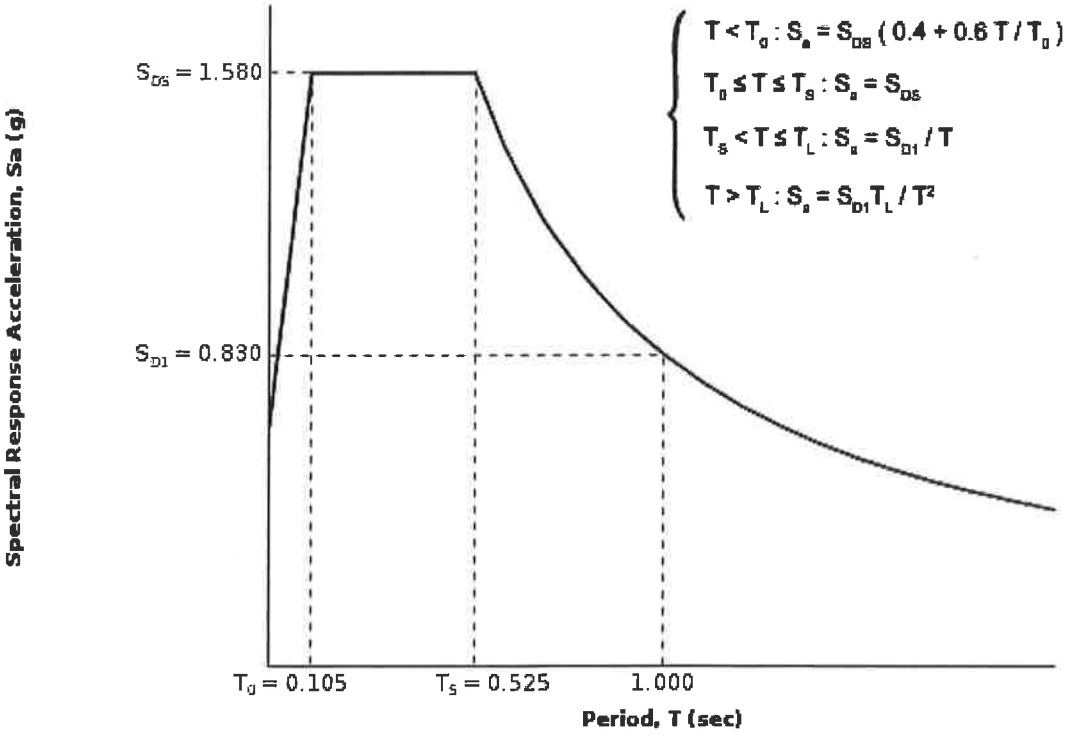
Equation (11.4-4): $S_{D1} = ⅔\ S_{M1} = ⅔ \times 1.245 = 0.830$ g

---

Section 11.4.5 — Design Response Spectrum

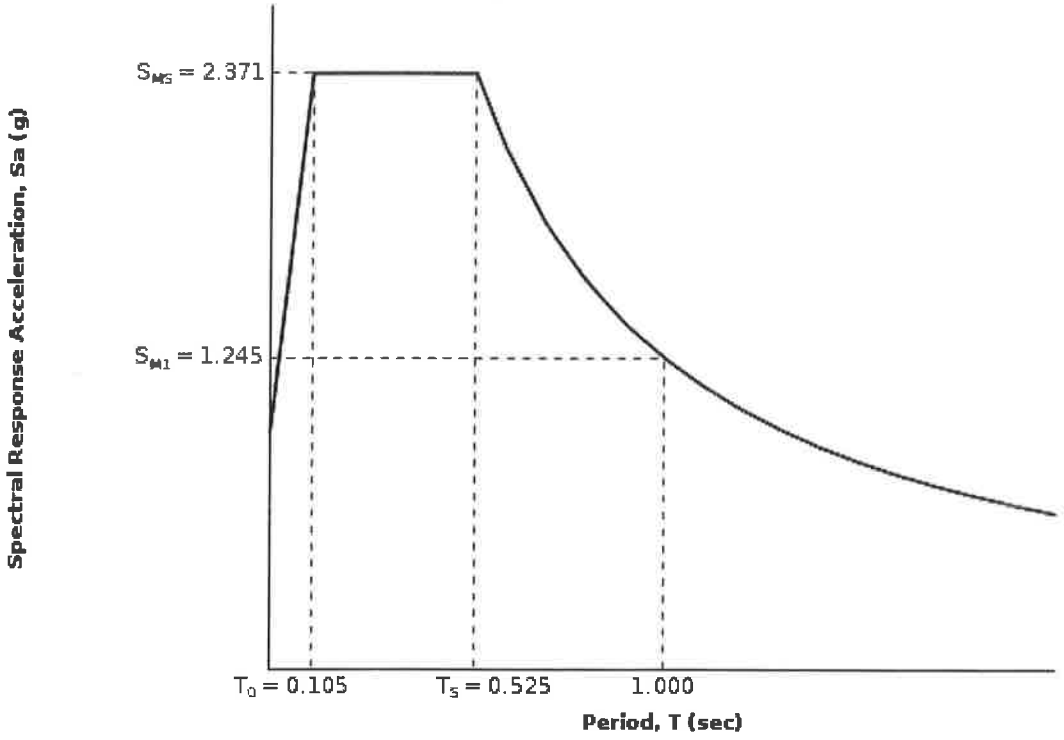
From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



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

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



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

From Figure 22-7 [4] PGA = 0.830

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.830 = 0.83$ g

Table 11.8–1: Site Coefficient F_{PGA}

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

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

For Site Class = D and PGA = 0.830 g, F_{PGA} = 1.000

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

From Figure 22-17 [5] C_{RS} = 0.993

From Figure 22-18 [6] C_{R1} = 1.008

Section 11.6 — Seismic Design Category

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

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

For Risk Category = I and S_{DS} = 1.580 g, Seismic Design Category = D

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

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

For Risk Category = I and S_{D1} = 0.830 g, Seismic Design Category = D

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

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

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

References

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