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June 8, 2016  
File No. 21236

City of Beverly Hills  
345 Foothill Road  
Beverly Hills, California 90210

Attention: Julio Guerrero

Subject: Geotechnical Engineering Investigation  
Proposed Restroom Facility  
Beverly Gardens Park  
North Santa Monica Boulevard and North Canon Drive, Beverly Hills, California

Dear Mr. Guerrero:

This letter transmits the Geotechnical Engineering Investigation for the subject property prepared by Geotechnologies, Inc. This report provides geotechnical recommendations for the development of the site, including earthwork, seismic design, retaining walls, excavations, and foundation design. Engineering for the proposed project should not begin until approval of the geotechnical investigation is granted by the local building official. Significant changes in the geotechnical recommendations may result due to the building department review process.

The validity of the recommendations presented herein is dependent upon review of the geotechnical aspects of the project during construction by this firm. The subsurface conditions described herein have been projected from limited subsurface exploration and laboratory testing. The exploration and testing presented in this report should in no way be construed to reflect any variations which may occur between the exploration locations or which may result from changes in subsurface conditions.

Should you have any questions please contact this office.

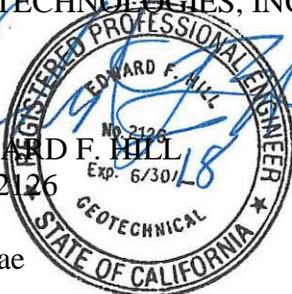
Respectfully submitted,  
GEOTECHNOLOGIES, INC.

EDWARD F. HILL  
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EFH:ae

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**GEOTECHNICAL ENGINEERING INVESTIGATION  
PROPOSED RESTROOM FACILITY  
BEVERLY GARDENS PARK  
NORTH SANTA MONICA BOULEVARD AND NORTH CANON DRIVE  
BEVERLY HILLS, CALIFORNIA**

**INTRODUCTION**

This report presents the results of the geotechnical engineering investigation performed on the subject property. The purpose of this investigation was to identify the distribution and engineering properties of the earth materials underlying the site, and to provide geotechnical recommendations for the design of the proposed development.

This investigation included two exploratory borings, collection of representative samples, laboratory testing, engineering analysis, review of published geologic data, review of available geotechnical engineering information and the preparation of this report. The site location is shown on the enclosed Vicinity Map, and the exploration locations are shown on the enclosed Plot Plan. The results of the exploration and the laboratory testing are presented in the Appendix of this report.

**PROPOSED DEVELOPMENT**

Information concerning the proposed development was furnished by client. The proposed project consists of a restroom facility. The structure is proposed to be one story built at existing site grades. Wall loads are estimated to be between 1 and 3 kips per lineal foot. Grading will consist of removal and recompaction of existing unsuitable soils.



Any changes in the design of the project or location of any structure, as outlined in this report, should be reviewed by this office. The recommendations contained in this report should not be considered valid until reviewed and modified or reaffirmed, in writing, subsequent to such review.

### **SITE CONDITIONS**

The subject site is located near North Canon Drive between North Santa Monica Boulevard and Park Way. At the time of exploration, the site was occupied by a single story restroom structure. The subject site is bounded to the north by residential structures, to the south by North Santa Monica Boulevard, and to the east and west by Beverly Gardens Park.

Vegetation on the site includes many trees, shrubs and grasses. The site is roughly level with no pronounced topographic highs or lows. Drainage on the site appears to occur by sheetflow along existing contours towards the improved streets. The surrounding developments predominantly consist of single family residences, larger commercial structures at a distance.

### **GEOTECHNICAL EXPLORATION**

#### **FIELD EXPLORATION**

The site was explored on May 24, 2016 by conducting two exploratory borings. The exploratory borings varied between 20 and 50 feet in depth and were drilled with the aid of a truck-mounted drilling machine using 8-inch diameter hollowstem augers. Samples were collected in the borings and transported to our office for laboratory testing. The exploration locations are shown on the Plot Plan and the geologic materials encountered are logged on Plates A-1 and A-2.

The location of exploratory excavations was determined by information furnished by the client. Elevations of the exploratory excavations were determined by hand level or interpolation from



data provided. The location and elevation of the exploratory excavations should be considered accurate only to the degree implied by the method used.

### **Geologic Materials**

The explorations encountered existing fill and natural alluvium. Fill materials underlying the site consist of sandy silts and silty sands. The fill soils are generally dark brown in color. They are moist, medium dense to stiff, and predominantly fine grained. The maximum fill thickness was measured to be three feet below ground surface.

The underlying natural alluvium consists of silty sands, sandy silts and sands. The alluvium is generally dark yellowish brown, moist, medium dense to dense, fine to coarse grained and were observed to contain gravel locally.

The geologic materials are typical to this area of Los Angeles County. More detailed descriptions of the earth materials encountered may be obtained from the individual boring.

### **Groundwater**

Groundwater was not encountered during exploration. According to the Seismic Hazard Zone Report of the Beverly Hills 7½-Minute Quadrangle (CDMG, 1998, Revised 2005), the historic high groundwater level for the subject site was on the order of 40 feet below the ground surface.

Fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time of the measurements reported herein. Fluctuations also may occur across the site. High groundwater levels can result in changed conditions.



## **Caving**

Caving could not be directly observed during exploration due to the type of excavation equipment utilized. Based on the experience of this firm, large diameter excavations, excavations that encounter granular, cohesionless soils and excavations below the groundwater table will most likely experience caving.

## **SEISMIC EVALUATION**

### **REGIONAL GEOLOGIC SETTING**

The subject property is located in the northern portion of the Peninsular Ranges Geomorphic Province. The Peninsular Ranges are characterized by northwest-trending blocks of mountain ridges and sediment-floored valleys. The dominant geologic structural features are northwest trending fault zones that either die out to the northwest or terminate at east-trending reverse faults that form the southern margin of the Transverse Ranges (Yerkes 1965).

### **REGIONAL FAULTING**

Based on criteria established by the California Division of Mines and Geology (CDMG) now called California Geologic Survey (CGS), faults may be categorized as active, potentially active, or inactive. Active faults are those which show evidence of surface displacement within the last 11,000 years (Holocene-age). Potentially-active faults are those that show evidence of most recent surface displacement within the last 1.6 million years (Quaternary-age). Faults showing no evidence of surface displacement within the last 1.6 million years are considered inactive for most purposes, with the exception of design of some critical structures.

Buried thrust faults are faults without a surface expression but are a significant source of seismic activity. They are typically broadly defined based on the analysis of seismic wave recordings of hundreds of small and large earthquakes in the southern California area. Due to the buried nature



of these thrust faults, their existence is usually not known until they produce an earthquake. The risk for surface rupture potential of these buried thrust faults is inferred to be low (Leighton, 1990). However, the seismic risk of these buried structures in terms of recurrence and maximum potential magnitude is not well established. Therefore, the potential for surface rupture on these surface-verging splays at magnitudes higher than 6.0 cannot be precluded.

Two major buried thrust fault structures in the Los Angeles area are the Elysian Park fold and thrust belt and the Torrance-Wilmington fold and thrust belt. It is postulated that the Elysian Park structure was responsible for the magnitude 5.9, October 1, 1987 Whittier Narrows earthquake, and that the Torrance-Wilmington structure was responsible for the magnitude 5.0, January 19, 1989 Malibu earthquake. The magnitude 6.7, January 17, 1994 Northridge earthquake was caused by a buried thrust fault located beneath the San Fernando Valley.

## **SEISMIC HAZARDS AND DESIGN CONSIDERATIONS**

The primary geologic hazard at the site is moderate to strong ground motion (acceleration) caused by an earthquake on any of the local or regional faults. The potential for other earthquake-induced hazards was also evaluated including surface rupture, liquefaction, dynamic settlement, inundation and landsliding.

### **Surface Rupture**

In 1972, the Alquist-Priolo Special Studies Zones Act (now known as the Alquist-Priolo Earthquake Fault Zoning Act) was passed into law. The Act defines “active” and “potentially active” faults utilizing the same aging criteria as that used by California Geological Survey (CGS). However, established state policy has been to zone only those faults which have direct evidence of movement within the last 11,000 years. It is this recency of fault movement that the CGS considers as a characteristic for faults that have a relatively high potential for ground rupture in the future.



CGS policy is to delineate a boundary from 200 to 500 feet wide on each side of the known fault trace based on the location precision, the complexity, or the regional significance of the fault. If a site lies within an Earthquake Fault Zone, a geologic fault rupture investigation must be performed that demonstrates that the proposed building site is not threatened by surface displacement from the fault before development permits may be issued.

Ground rupture is defined as surface displacement which occurs along the surface trace of the causative fault during an earthquake. Based on research of available literature and results of site reconnaissance, no known active or potentially active faults underlie the subject site. In addition, the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Based on these considerations, the potential for surface ground rupture at the subject site is considered low.

### **Liquefaction**

Liquefaction is a phenomenon in which saturated silty to cohesionless soils below the groundwater table are subject to a temporary loss of strength due to the buildup of excess pore pressure during cyclic loading conditions such as those induced by an earthquake. Liquefaction-related effects include loss of bearing strength, amplified ground oscillations, lateral spreading, and flow failures.

Liquefaction typically occurs in areas where groundwater is less than 50 feet from the surface, and where the soils are composed of poorly consolidated, fine to medium-grained sand. In addition to the necessary soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to initiate liquefaction.

The Seismic Hazards Zone Map of the Beverly Hills Quadrangle by the State of California (CDMG, 1999), indicates that the subject site is not located within an area designated as “Liquefiable.” This determination is based on groundwater depth records, soil type and distance to a fault capable of producing a substantial earthquake. A copy of this map is provided in the Appendix.



### **Dynamic Dry Settlement**

Seismically-induced settlement or compaction of dry or moist, cohesionless soils can be an effect related to earthquake ground motion. Such settlements are typically most damaging when the settlements are differential in nature across the length of structures.

Some seismically-induced settlement of the proposed structures should be expected as a result of strong ground-shaking, however, due to the uniform nature of the underlying geologic materials, excessive differential settlements are not expected to occur.

### **Tsunamis, Seiches and Flooding**

Tsunamis are large ocean waves generated by sudden water displacement caused by a submarine earthquake, landslide, or volcanic eruption. Review of the County of Los Angeles Flood and Inundation Hazards Map, Leighton (1990), indicates the site does not lie within the mapped tsunami inundation boundaries.

Seiches are oscillations generated in enclosed bodies of water which can be caused by ground shaking associated with an earthquake. Review of the County of Los Angeles Flood and Inundation Hazards Map, Leighton (1990), indicates the site lies within mapped inundation boundaries due to a seiche or a breached upgradient reservoir. A determination of whether a higher site elevation would remove the site from the potential inundation zones is beyond the scope of this investigation.

### **Landsliding**

The probability of seismically-induced landslides occurring on the site is considered to be low due to the general lack of elevation difference slope geometry across or adjacent to the site.



## **CONCLUSIONS AND RECOMMENDATIONS**

Based upon the exploration, laboratory testing, and research, it is the finding of Geotechnologies, Inc. that construction of the proposed restroom facility is considered feasible from a geotechnical engineering standpoint provided the advice and recommendations presented herein are followed and implemented during construction.

The existing fill materials are not suitable for support of the proposed foundations, floor slabs or additional fill. Existing fill materials should be completely removed within the building area and recompacted. In addition, earth materials should be removed to a minimum depth of three feet below proposed foundations and recompacted as controlled fill prior to foundation excavation. Conventional foundations bearing in newly placed controlled fill are recommended for foundation support.

Foundations for small outlying structures, such as property line walls, which will not be tied-in to the proposed classroom building may be supported on conventional foundations bearing in native geologic materials.

## **SEISMIC DESIGN CONSIDERATIONS**

### **2013 CBC Seismic Parameters**

Based on information derived from the subsurface investigation, the subject site is classified as Site Class D, which corresponds to a “Stiff Soil” Profile, according to Table 1613.5.2 of the California Building Code (CBC). This information and the site coordinates were input into the USGS U.S. Seismic Design Maps tool to calculate the seismic ground motion parameters for the site. Ground motion parameters for the 2013 CBC (ASCE 7-10) are presented below.



<b>2013 CALIFORNIA BUILDING CODE SEISMIC PARAMETERS</b>	
Site Class	D
Mapped Spectral Acceleration at Short Periods ( $S_s$ )	2.319g
Site Coefficient ( $F_a$ )	1.0
Maximum Considered Earthquake Spectral Response for Short Periods ( $S_{MS}$ )	2.319g
Five-Percent Damped Design Spectral Response Acceleration at Short Periods ( $S_{DS}$ )	1.546g
Mapped Spectral Acceleration at One-Second Period ( $S_1$ )	0.850g
Site Coefficient ( $F_v$ )	1.5
Maximum Considered Earthquake Spectral Response for One-Second Period ( $S_{M1}$ )	1.275g
Five-Percent Damped Design Spectral Response Acceleration for One-Second Period ( $S_{D1}$ )	0.850g

### **FILL SOILS**

The maximum depth of fill encountered on the site was three feet. This material and any fill generated during demolition should be removed and recompactd as controlled fill prior to foundation excavation.

### **EXPANSIVE SOILS**

The onsite geologic materials are in the very low to moderate expansion range. The Expansion Index was found to be between 17 and 50 for bulk samples remolded to 90 percent of the laboratory maximum density. Special considerations are recommended in the Foundation Design and Slabs on Grade sections of this report.



## **WATER-SOLUBLE SULFATES**

The Portland cement portion of concrete is subject to attack when exposed to water-soluble sulfates. Usually the two most common sources of exposure are from soil and marine environments.

The sources of natural sulfate minerals in soils include the sulfates of calcium, magnesium, sodium, and potassium. When these minerals interact and dissolve in subsurface water, a sulfate concentration is created, which will react with exposed concrete. Over time sulfate attack will destroy improperly proportioned concrete well before the end of its intended service life.

The water-soluble sulfate content of the onsite geologic materials was tested by California Test 417. The water-soluble sulfate content was determined to be less than 0.1% percentage by weight for the soils tested. Based on American Concrete Institute (ACI) Standard 318-08, the sulfate exposure is considered to be negligible for geologic materials with less than 0.1% and Type I cement may be utilized for concrete foundations in contact with the site soils.

## **GRADING GUIDELINES**

### **Site Preparation**

- A thorough search should be made for possible underground utilities and/or structures. Any existing or abandoned utilities or structures located within the footprint of the proposed grading should be removed or relocated as appropriate.
- All vegetation, existing fill, and soft or disturbed geologic materials should be removed from the areas to receive controlled fill. All existing fill materials and any disturbed geologic materials resulting from grading operations shall be completely removed and properly recompacted prior to foundation excavation.
- Any vegetation or associated root system located within the footprint of the proposed structures should be removed during grading.



- Subsequent to the indicated removals, the exposed grade shall be scarified to a depth of six inches, moistened to optimum moisture content, and recompactd in excess of the minimum required comparative density.
- The excavated areas shall be observed by the geotechnical engineer prior to placing compacted fill.

### **Recommended Overexcavation**

The proposed building area shall be excavated to a minimum depth of three feet below the bottom of all foundations. The excavation shall extend at least three feet beyond the edge of foundations or for a distance equal to the depth of fill below the foundations, whichever is greater. It is very important that the position of the proposed structure is accurately located so that the limits of the graded area are accurate and the grading operation proceeds efficiently.

### **Compaction**

Comparative compaction is defined, for purposes of these guidelines, as the ratio of the in-place density to the maximum density as determined by applicable ASTM testing.

All fill should be mechanically compacted in layers not more than 8 inches thick. The materials placed should be moisture conditions to within 3 percent of the optimum moisture content of the particular material placed. All fill shall be compacted to at least 90 percent of the maximum laboratory density for the materials used. The maximum density shall be determined by the laboratory operated by Geotechnologies, Inc. using the test method described in the most recent revision of ASTM D 1557.

Field observation and testing shall be performed by a representative of the geotechnical engineer during grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compactive effort



shall be made with adjustment of the moisture content, as necessary, until a minimum of 90 percent compaction is obtained.

### **Acceptable Materials**

The excavated onsite materials are considered satisfactory for reuse in the controlled fills as long as any debris and/or organic matter is removed.

Any imported materials shall be observed and tested by the representative of the geotechnical engineer prior to use in fill areas. Imported materials should contain sufficient fines so as to be relatively impermeable and result in a stable subgrade when compacted. Any required import materials should consist of geologic materials with an expansion index of less than 20. The water-soluble sulfate content of the import materials should be less than 0.1% percentage by weight.

Imported materials should be free from chemical or organic substances which could affect the proposed development. A competent professional should be retained in order to test imported materials and address environmental issues and organic substances which might affect the proposed development.

### **Utility Trench Backfill**

Utility trenches should be backfilled with controlled fill. The utility should be bedded with clean sands at least one foot over the crown. The remainder of the backfill may be onsite soil compacted to 90 percent of the laboratory maximum density. Utility trench backfill should be tested by representatives of this firm in accordance with the most recent revision of ASTM D-1557.



## **Wet Soils**

At the time of exploration the soils which will be exposed during grading were locally above optimum moisture content. It is anticipated that the excavated material to be placed as compacted fill, and the materials exposed at the bottom of excavated plane may require significant drying and aeration prior to recompaction.

Pumping (yielding or vertical deflection) of the high-moisture content soils at the bottom of the excavation may occur during operation of heavy equipment. Where pumping is encountered, angular minimum ¾-inch gravel should be placed and worked into the subgrade. The exact thickness of the gravel would be a trial and error procedure, and would be determined in the field. It would likely be on the order of 1 to 2 feet thick.

The gravel will help to densify the subgrade as well as function as a stabilization material upon which heavy equipment may operate. It is not recommended that rubber tire construction equipment attempt to operate directly on the pumping subgrade soils prior to placing the gravel. Direct operation of rubber tire equipment on the soft subgrade soils will likely result in excessive disturbance to the soils, which in turn will result in a delay to the construction schedule since those disturbed soils would then have to be removed and properly recompacted. Extreme care should be utilized to place gravel as the subgrade becomes exposed.

## **Shrinkage**

Shrinkage results when a volume of soil removed at one density is compacted to a higher density. A shrinkage factor between 5 and 15 percent should be anticipated when excavating and recompacting the existing fill and underlying native geologic materials on the site to an average comparative compaction of 92 percent.



### **Weather Related Grading Considerations**

When rain is forecast all fill that has been spread and awaits compaction shall be properly compacted prior to stopping work for the day or prior to stopping due to inclement weather. These fills, once compacted, shall have the surface sloped to drain to an area where water can be removed.

Temporary drainage devices should be installed to collect and transfer excess water to the street in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope.

Work may start again, after a period of rainfall, once the site has been reviewed by a representative of this office. Any soils saturated by the rain shall be removed and aerated so that the moisture content will fall within three percent of the optimum moisture content.

Surface materials previously compacted before the rain shall be scarified, brought to the proper moisture content and recompact prior to placing additional fill, if considered necessary by a representative of this firm.

### **Abandoned Seepage Pits**

No abandoned seepage pits were encountered during exploration and none are known to exist on the site. However, should such a structure be encountered during grading, options to permanently abandon seepage pits include complete removal and backfill of the excavation with compacted fill, or drilling out the loose materials and backfilling to within a few feet of grade with slurry, followed by a compacted fill cap.

If the subsurface structures are to be removed by grading, the entire structure should be demolished. The resulting void may be refilled with compacted soil. Concrete and brick generated



during the seepage pit removal may be reused in the fill as long as all fragments are less than 6 inches in longest dimension and the debris comprises less than 15 percent of the fill by volume. All grading should comply with the recommendations of this report.

Where the seepage pit structure is to be left in place, the seepage pits should be cleaned of all soil and debris. This may be accomplished by drilling. The pits should be filled with minimum 1-1/2 sack concrete slurry to within 5 feet of the bottom of the proposed foundations. In order to provide a more uniform foundation condition, the remainder of the void should be filled with controlled fill.

### **Geotechnical Observations and Testing During Grading**

Geotechnical observations and testing during grading are considered to be a continuation of the geotechnical investigation. It is critical that the geotechnical aspects of the project be reviewed by representatives of Geotechnologies, Inc. during the construction process. Compliance with the design concepts, specifications or recommendations during construction requires review by this firm during the course of construction. Any fill which is placed should be observed, tested, and verified if used for engineered purposes. Please advise this office at least twenty-four hours prior to any required site visit.

### **LEED Considerations**

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System encourages adoption of sustainable green building and development practices. Credit for LEED Certification can be assigned for reuse of construction waste and diversion of materials from landfills in new construction.

In an effort to provide the design team with a viable option in this regard, demolition debris could be crushed onsite in order to use it in the ongoing grading operations. The environmental ramifications of this option, if any, should be considered by the team.



The demolition debris should be limited to concrete, asphalt and other non-deleterious materials. All deleterious materials should be removed including, but not limited to, paper, garbage, ceramic materials and wood.

For structural fill applications, the materials should be crushed to 2 inches in maximum dimension or smaller. The crushed materials should be thoroughly blended and mixed with onsite soils prior to placement as compacted fill. The amount of crushed material should not exceed 20 percent. The blended and mixed materials should be tested by this office prior to placement to insure it is suitable for compaction purposes. The blended and mixed materials should be tested by Geotechnologies, Inc. during placement to insure that it has been compacted in a suitable manner.

## **FOUNDATION DESIGN**

### **Conventional**

Conventional foundations may bear in newly placed controlled fill. All conventional foundations for a structure should bear in the same material.

Continuous foundations may be designed for a bearing capacity of 2,000 pounds per square foot, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 18 inches into the recommended bearing material.

Column foundations may be designed for a bearing capacity of 2,500 pounds per square foot, and should be a minimum of 24 inches in width, 18 inches in depth below the lowest adjacent grade and 18 inches into the recommended bearing material.

The bearing capacity increase for each additional foot of width is 35 pounds per square foot. The bearing capacity increase for each additional foot of depth is 225 pounds per square foot. The maximum recommended bearing capacity is 4,000 pounds per square foot.



The bearing capacities indicated above are for the total of dead and frequently applied live loads, and may be increased by one third for short duration loading, which includes the effects of wind or seismic forces.

### **Miscellaneous Foundations**

Conventional foundations for structures such as privacy walls or trash enclosures which will not be rigidly connected to the proposed classroom building may bear in native soils. Continuous footings may be designed for a bearing capacity of 2,000 pounds per square foot, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 18 inches into the recommended bearing material. No bearing capacity increases are recommended.

Since the recommended bearing capacity is a net value, the weight of concrete in the foundations may be taken as 50 pounds per cubic foot and the weight of the soil backfill may be neglected when determining the downward load on the foundations.

### **Foundation Reinforcement**

All continuous foundations should be reinforced with a minimum of four #4 steel bars. Two should be placed near the top of the foundation, and two should be placed near the bottom.

### **Lateral Design**

Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure. An allowable coefficient of friction of 0.23 may be used with the dead load forces.



Passive geologic pressure for the sides of foundations poured against undisturbed or recompacted soil may be computed as an equivalent fluid having a density of 300 pounds per cubic foot with a maximum earth pressure of 3,000 pounds per square foot.

The passive and friction components may be combined for lateral resistance without reduction. A one-third increase in the passive value may be used for short duration loading such as wind or seismic forces.

### **Foundation Settlement**

Settlement of the foundation system is expected to occur on initial application of loading. The maximum settlement is expected to be 1/2 inch and occur below the heaviest loaded columns. Differential settlement is not expected to exceed 1/4 inch.

### **Foundation Observations**

It is critical that all foundation excavations are observed by a representative of this firm to verify penetration into the recommended bearing materials. The observation should be performed prior to the placement of reinforcement. Foundations should be deepened to extend into satisfactory geologic materials, if necessary.

Foundation excavations should be cleaned of all loose soils prior to placing steel and concrete. Any required foundation backfill should be mechanically compacted, flooding is not permitted.

### **TEMPORARY EXCAVATIONS**

Excavations on the order of 3 to 5 feet in vertical height will be required for the recommended recompaction. The excavations are expected to expose fill and dense native soils, which are



suitable for vertical excavations up to 5 feet where not surcharged by adjacent traffic or structures. Excavations which will be surcharged by adjacent traffic or structures should be shored.

Where sufficient space is available, temporary unsurcharged embankments could be cut at a uniform 1:1 slope gradient. A uniform sloped excavation is sloped from bottom to top and does not have a vertical component.

Where sloped embankments are utilized, the tops of the slopes should be barricaded to prevent vehicles and storage loads near the top of slope within a horizontal distance equal to the depth of the excavation. If the temporary construction embankments are to be maintained during the rainy season, berms are strongly recommended along the tops of the slopes to prevent runoff water from entering the excavation and eroding the slope faces. Water should not be allowed to pond on top of the excavation nor to flow towards it.

### **Excavation Observations**

It is critical that the soils exposed in the cut slopes are observed by a representative of Geotechnologies, Inc. during excavation so that modifications of the slopes can be made if variations in the geologic material conditions occur. Many building officials require that temporary excavations should be made during the continuous observations of the geotechnical engineer. All excavations should be stabilized within 30 days of initial excavation.

### **SLABS ON GRADE**

Concrete floor slabs should be a minimum of 4 inches in thickness. Slabs-on-grade should be cast over undisturbed natural geologic materials or properly controlled fill materials. Any geologic materials loosened or over-excavated should be wasted from the site or properly compacted to 90 percent of the maximum dry density.



Outdoor concrete flatwork should be a minimum of 4 inches in thickness. Outdoor concrete flatwork should be cast over undisturbed natural geologic materials or properly controlled fill materials. Any geologic materials loosened or over-excavated should be wasted from the site or properly compacted to 90 percent of the maximum dry density.

### **Design of Slabs That Receive Moisture-Sensitive Floor Coverings**

Geotechnologies, Inc. does not practice in the field of moisture vapor transmission evaluation and mitigation. Therefore it is recommended that a qualified consultant be engaged to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. The qualified consultant should provide recommendations for mitigation of potential adverse impacts of moisture vapor transmission on various components of the structure.

Where dampness would be objectionable, it is recommended that the floor slabs should be waterproofed. A qualified waterproofing consultant should be retained in order to recommend a product or method which would provide protection for concrete slabs-on-grade.

All concrete slabs-on-grade should be supported on vapor retarder. The design of the slab and the installation of the vapor retarder should comply with the most recent revisions of ASTM E 1643 and ASTM E 1745. The vapor retarder should comply with ASTM E 1745 Class A requirements.

Where a vapor retarder is used, a low-slump concrete should be used to minimize possible curling of the slabs. The barrier can be covered with a layer of trimable, compactible, granular fill, where it is thought to be beneficial. See ACI 302.2R-32, Chapter 7 for information on the placement of vapor retarders and the use of a fill layer.

Groundwater was not encountered on the subject site to a depth of 50 feet. Proposed concrete slabs-on-grade do not need to be supported on a layer of compacted aggregate to provide a capillary break.



## **Concrete Crack Control**

The recommendations presented in this report are intended to reduce the potential for cracking of concrete slabs-on-grade due to settlement. However even where these recommendations have been implemented, foundations, stucco walls and concrete slabs-on-grade may display some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete cracking may be reduced and/or controlled by limiting the slump of the concrete used, proper concrete placement and curing, and by placement of crack control joints at reasonable intervals, in particular, where re-entrant slab corners occur.

For standard control of concrete cracking, a maximum crack control joint spacing of 12 feet should not be exceeded. Lesser spacings would provide greater crack control. Joints at curves and angle points are recommended. The crack control joints should be installed as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. Construction joints should be designed by a structural engineer.

Complete removal of the existing fill soils beneath outdoor flatwork such as walkways or patio areas, is not required, however, due to the rigid nature of concrete, some cracking, a shorter design life and increased maintenance costs should be anticipated. In order to provide uniform support beneath the flatwork it is recommended that a minimum of 12 inches of the exposed subgrade beneath the flatwork be scarified and recompact to 90 percent relative compaction.

## **Slab Reinforcing**

Concrete slabs-on-grade should be reinforced with a minimum of #3 steel bars on 18-inch centers each way.

Outdoor flatwork should be reinforced with a minimum of #3 steel bars on 18-inch centers each way.



## **PAVEMENTS**

Prior to placing paving, the existing grade should be scarified to a depth of 12 inches, moistened as required to obtain optimum moisture content, and recompacted to 90 percent of the maximum density as determined by the most recent revision of ASTM D 1557. The client should be aware that removal of all existing fill in the area of new paving is not required, however, pavement constructed in this manner will most likely have a shorter design life and increased maintenance costs. The following pavement sections are recommended:

<b>Service</b>	<b>Asphalt Pavement Thickness Inches</b>	<b>Base Course Inches</b>
Passenger Cars	3	4
Moderate Truck	4	6

Aggregate base should be compacted to a minimum of 95 percent of the most recent revision of ASTM D 1557 laboratory maximum dry density. Base materials should conform with Sections 200-2.2 or 200-2.4 of the most recent edition of “Standard Specifications for Public Works Construction”, (Green Book).

The performance of pavement is highly dependent upon providing positive surface drainage away from the edges. Ponding of water on or adjacent to pavement can result in saturation of the subgrade materials and subsequent pavement distress. If planter islands are planned, the perimeter curb should extend a minimum of 12 inches below the bottom of the aggregate base.

The management of pavement wear primarily is focused on the distress caused by vertical loads. The reduction of vertical loading from large vehicles is assisted by increasing the number of axles. Multi-axle groups reduce the peak vertical loading and, when closely spaced, reduce the magnitude of the strain cycles to which the pavement is subjected. However, where tight low-speed turns are



executed, non-steering axle groups lead to transverse shear forces (scuffing) at the pavement-tire interface.

With asphaltic concrete pavements, tensile shear stresses from tires can cause surface cracking and raveling, thus, the increased use of non-steering axle groups results in increased pavement wear in the vicinity of intersections and turnarounds where tight low speed turns are executed.

When designing intersections and turnarounds the turn radius should be as large as possible. This will lead to reduced “scuffing” forces. Where tight radius turns are unavoidable, the pavement surface design should take into account the high level of “scuffing” forces that will occur and thickened pavement and subgrade and base course keyways should be considered to assist in the reduction of lateral deflection.

### **SITE DRAINAGE**

Proper surface drainage is critical to the future performance of the project. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Proper site drainage should be maintained at all times.

All site drainage, with the exception of any required to be disposed of onsite by stormwater regulations, should be collected and transferred to the street in non-erosive drainage devices. The proposed structure should be provided with roof drainage. Discharge from downspouts, roof drains and scuppers should not be permitted on unprotected soils within five feet of the building perimeter. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope. Planters which are located within a distance equal to the depth of a retaining wall should be sealed to prevent moisture adversely affecting the wall. Planters which are located within five feet of a foundation should be sealed to prevent moisture affecting the earth materials supporting the foundation.



## **DESIGN REVIEW**

Engineering of the proposed project should not begin until approval of the geotechnical report by the Building Official is obtained in writing. Significant changes in the geotechnical recommendations may result during the building department review process.

It is recommended that the geotechnical aspects of the project be reviewed by this firm during the design process. This review provides assistance to the design team by providing specific recommendations for particular cases, as well as review of the proposed construction to evaluate whether the intent of the recommendations presented herein are satisfied.

## **CONSTRUCTION MONITORING**

Geotechnical observations and testing during construction are considered to be a continuation of the geotechnical investigation. It is critical that this firm review the geotechnical aspects of the project during the construction process. Compliance with the design concepts, specifications or recommendations during construction requires review by this firm during the course of construction. All foundations should be observed by a representative of this firm prior to placing concrete or steel. Any fill which is placed should be observed, tested, and verified if used for engineered purposes. Please advise Geotechnologies, Inc. at least twenty-four hours prior to any required site visit.

If conditions encountered during construction appear to differ from those disclosed herein, notify Geotechnologies, Inc. immediately so the need for modifications may be considered in a timely manner.

It is the responsibility of the contractor to ensure that all excavations and trenches are properly sloped or shored. All temporary excavations should be cut and maintained in accordance with applicable OSHA rules and regulations.



## **EXCAVATION CHARACTERISTICS**

The exploration performed for this investigation is limited to the geotechnical excavations described. Direct exploration of the entire site would not be economically feasible. The owner, design team and contractor must understand that differing excavation and drilling conditions may be encountered based on boulders, gravel, oversize materials, groundwater and many other conditions. Fill materials, especially when they were placed without benefit of modern grading codes, regularly contain materials which could impede efficient grading and drilling. Southern California sedimentary bedrock is known to contain variable layers which reflect differences in depositional environment. Such layers may include abundant gravel, cobbles and boulders. Similarly bedrock can contain concretions. Concretions are typically lenticular and follow the bedding. They are formed by mineral deposits. Concretions can be very hard. Excavation and drilling in these areas may require full size equipment and coring capability. The contractor should be familiar with the site and the geologic materials in the vicinity.

## **CLOSURE AND LIMITATIONS**

The purpose of this report is to aid in the design and completion of the described project. Implementation of the advice presented in this report is intended to reduce certain risks associated with construction projects. The professional opinions and geotechnical advice contained in this report are sought because of special skill in engineering and geology and were prepared in accordance with generally accepted geotechnical engineering practice. Geotechnologies, Inc. has a duty to exercise the ordinary skill and competence of members of the engineering profession. Those who hire Geotechnologies, Inc. are not justified in expecting infallibility, but can expect reasonable professional care and competence.

The scope of the geotechnical services provided did not include any environmental site assessment for the presence or absence of organic substances, hazardous/toxic materials in the soil, surface water, groundwater, or atmosphere, or the presence of wetlands.



Proper compaction is necessary to reduce settlement of overlying improvements. Some settlement of compacted fill should be anticipated. Any utilities supported therein should be designed to accept differential settlement. Differential settlement should also be considered at the points of entry to the structure.

## **GEOTECHNICAL TESTING**

### **Classification and Sampling**

The soil is continuously logged by a representative of this firm and classified by visual examination in accordance with the Unified Soil Classification system. The field classification is verified in the laboratory, also in accordance with the Unified Soil Classification System. Laboratory classification may include visual examination, Atterberg Limit Tests and grain size distribution. The final classification is shown on the excavation logs.

Samples of the geologic materials encountered in the exploratory excavations were collected and transported to the laboratory. Undisturbed samples of soil are obtained at frequent intervals. Unless noted on the excavation logs as an SPT sample, samples acquired while utilizing a hollow-stem auger drill rig are obtained by driving a thin-walled, California Modified Sampler with successive 30-inch drops of a 140-pound hammer. Samples from bucket-auger drilling are obtained utilizing a California Modified Sampler with successive 12-inch drops of a Kelly bar, whose weight is noted on the excavation logs. The soil is retained in brass rings of 2.50 inches outside diameter and 1.00 inch in height. The central portion of the samples are stored in close fitting, waterproof containers for transportation to the laboratory. Samples noted on the excavation logs as SPT samples are obtained in accordance with the most recent revision of ASTM D 1586. Samples are retained for 30 days after the date of the geotechnical report.



### **Grain Size Distribution**

These tests cover the quantitative determination of the distribution of particle sizes in soils. Sieve analysis is used to determine the grain size distribution of the soil larger than the Number 200 sieve.

The most recent revision of ASTM D 422 is used to determine particle sizes smaller than the Number 200 sieve. A hydrometer is used to determine the distribution of particle sizes by a sedimentation process.

The grain size distributions are plotted on the E-Plates presented in the Appendix of this report.

### **Moisture and Density Relationships**

The field moisture content and dry unit weight are determined for each of the undisturbed soil samples, and the moisture content is determined for SPT samples by the most recent revision of ASTM D 4959 or ASTM D 4643. This information is useful in providing a gross picture of the soil consistency between exploration locations and any local variations. The dry unit weight is determined in pounds per cubic foot and shown on the "Excavation Logs", A-Plates. The field moisture content is determined as a percentage of the dry unit weight.

### **Direct Shear Testing**

Shear tests are performed by the most recent revision of ASTM D 3080 with a strain controlled, direct shear machine manufactured by Soil Test, Inc. or a Direct Shear Apparatus manufactured by GeoMatic, Inc. The rate of deformation is approximately 0.025 inches per minute. Each sample is sheared under varying confining pressures in order to determine the Mohr-Coulomb shear strength parameters of the cohesion intercept and the angle of internal friction. Samples are generally tested in an artificially saturated condition. Depending upon the sample location and



future site conditions, samples may be tested at field moisture content. The results are plotted on the "Shear Test Diagram," B-Plates.

The most recent revision of ASTM 3080 limits the particle size to 10 percent of the diameter of the direct shear test specimen. The sheared sample is inspected by the laboratory technician running the test. The inspection is performed by splitting the sample along the sheared plane and observing the soils exposed on both sides. Where oversize particles are observed in the shear plane, the results are discarded and the test run again with a fresh sample.

### **Consolidation Testing**

Settlement predictions of the soil's behavior under load are made on the basis of the consolidation tests using the most recent revision of ASTM D 2435. The consolidation apparatus is designed to receive a single one-inch high ring. Loads are applied in several increments in a geometric progression, and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. Samples are generally tested at increased moisture content to determine the effects of water on the bearing soil. The normal pressure at which the water is added is noted on the drawing. Results are plotted on the "Consolidation Test," C-Plates.

### **Expansion Index Testing**

The expansion tests performed on the remolded samples are in accordance with the Expansion Index testing procedures, as described in the most recent revision of ASTM D4829. The soil sample is compacted into a metal ring at a saturation degree of 50 percent. The ring sample is then placed in a consolidometer, under a vertical confining pressure of 1 lbf/square inch and inundated with distilled water. The deformation of the specimen is recorded for a period of 24 hour or until the rate of deformation becomes less than 0.0002 inches/hour, whichever occurs first. The



expansion index, EI, is determined by dividing the difference between final and initial height of the ring sample by the initial height, and multiplied by 1,000.

### **Laboratory Compaction Characteristics**

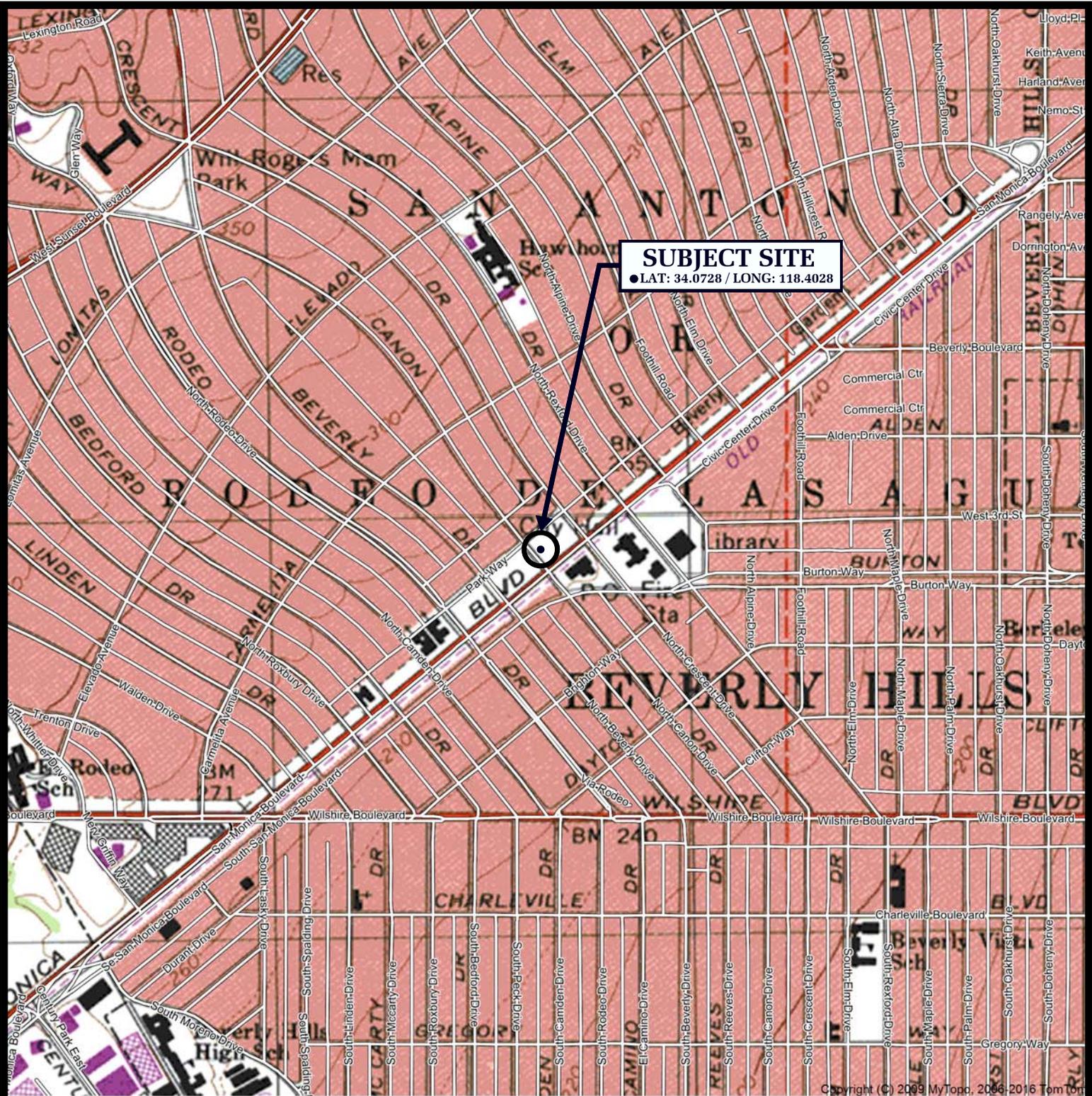
The maximum dry unit weight and optimum moisture content of a soil are determined by use of the most recent revision of ASTM D 1557. A soil at a selected moisture content is placed in five layers into a mold of given dimensions, with each layer compacted by 25 blows of a 10 pound hammer dropped from a distance of 18 inches subjecting the soil to a total compactive effort of about 56,000 pounds per cubic foot. The resulting dry unit weight is determined. The procedure is repeated for a sufficient number of moisture contents to establish a relationship between the dry unit weight and the water content of the soil. The data when plotted represent a curvilinear relationship known as the compaction curve. The values of optimum moisture content and modified maximum dry unit weight are determined from the compaction curve.



## REFERENCES

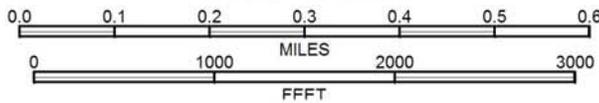
- California Division of Mines and Geology, 1998, Seismic Hazard Evaluation Report for the Hollywood 7.5-Minute Quadrangle, Los Angeles County, California, Seismic Hazard Zone Report 026.
- California Division of Mines and Geology, 1997, Seismic Hazard Zone Map, map scale 1:24,000.
- City of Los Angeles, Department of Public Works, 2003, Methane and Methane Buffer Zones Map, Map Number A-20960.
- Dibblee, T.W., 1991, Geologic Map of the Hollywood and Burbank (South ½) 7.5-Minute Quadrangles, Map No DF-30, map scale 1: 24,000.
- Division of Oil Gas and Geothermal Resources (DOGGR), 2001, Regional Wildcat Map, Northern Los Angeles Basin, map W1-5, map scale 1:48,000.
- Dolan, J.F., Sieh, K., Rockwell, T.K., Guptill, P., and Miller, G., 1997, Active Tectonics, Paleoseismology, and Seismic Hazards of the Hollywood Fault, Northern Los Angeles Basin, California, GSA Bulletin, v. 109: no 12, p1595-1616.
- Hart, E.W. and Bryant, W.A., 1999 (updated 2005), Fault Rupture Zones in California, Division of Mines and Geology, Special Publication 42, 25pp.
- Leighton and Associates, Inc. (1990), Technical Appendix to the Safety Element of the Los Angeles County General Plan: Hazard Reduction in Los Angeles County.
- National Flood Insurance Rate Program, 2008, Los Angeles County and Incorporated Areas, Map #06037C1605F.
- United States Geological Survey, 2011, U.S.G.S. Ground Motion Parameter Calculator (Version 5.0.9a). <http://earthquake.usgs.gov/hazards/designmaps/>.





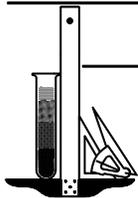
**SUBJECT SITE**  
 ● LAT: 34.0728 / LONG: 118.4028

SCALE 1:12000



REFERENCE: U.S.G.S. TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES,  
 BEVERLY HILLS, CA QUADRANGLE

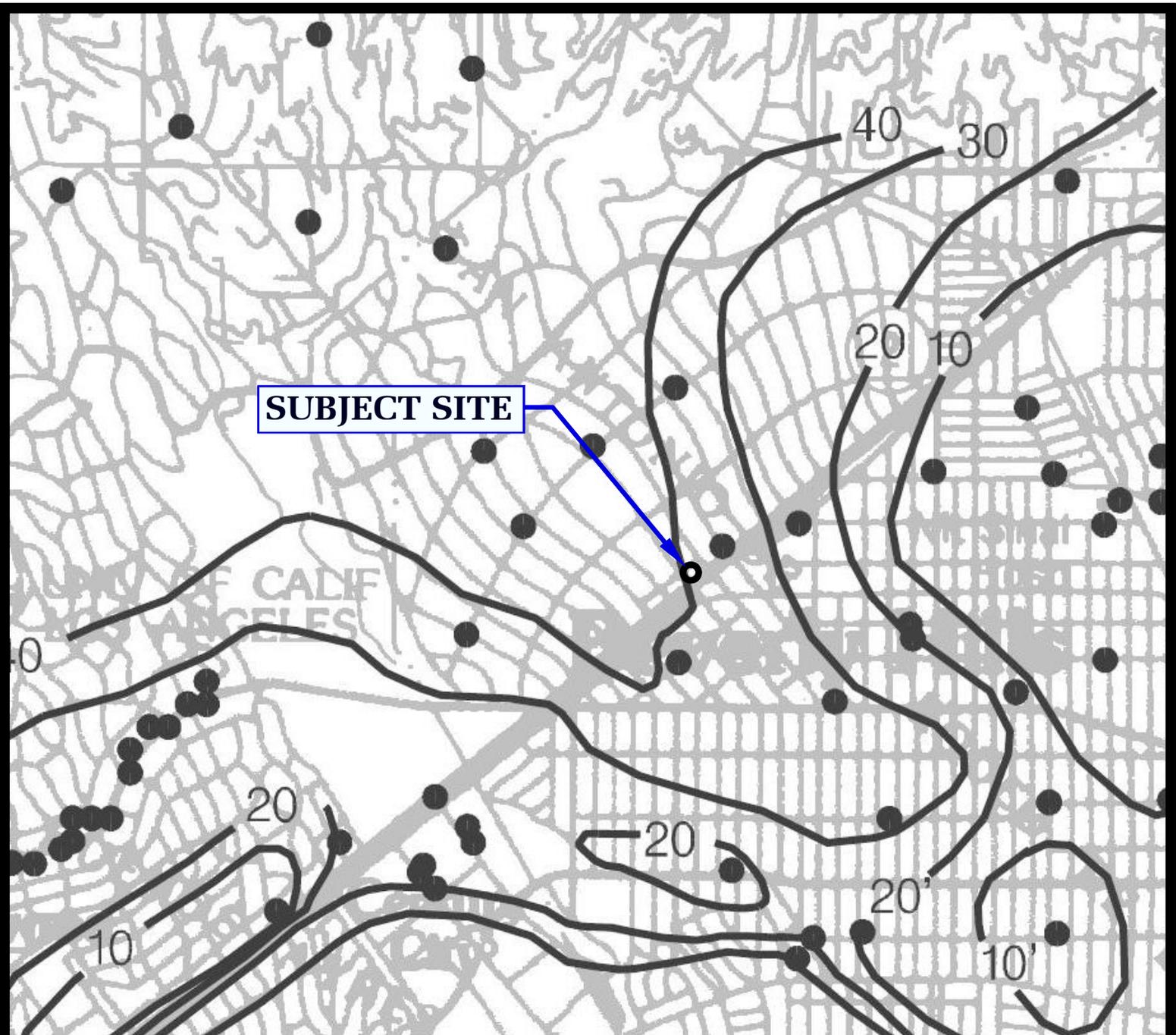
## VICINITY MAP



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**CITY OF BEVERLY HILLS**

**FILE NO. 21236**



**SUBJECT SITE**

ONE MILE

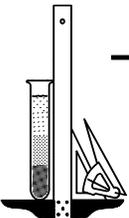
SCALE

— 20 — Depth to groundwater in feet



REFERENCE: CDMG, SEISMIC HAZARD ZONE REPORT, 023  
 BEVERLY HILLS 7.5 - MINUTE QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA (1998, REVISED 2005)

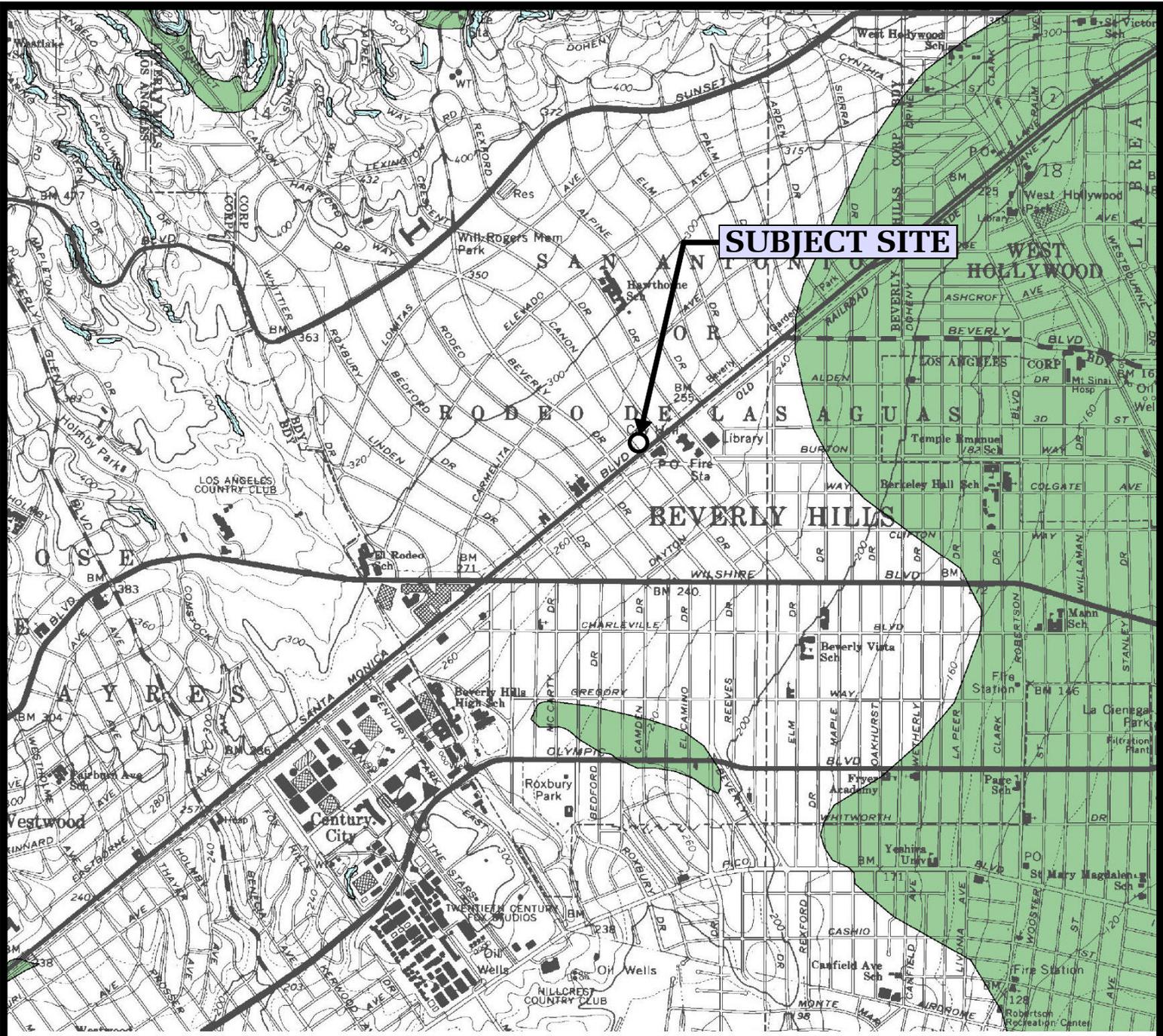
## HISTORICALLY HIGHEST GROUNDWATER LEVELS



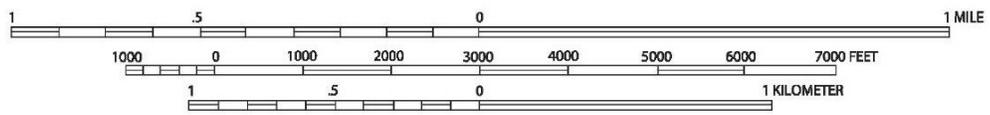
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SCALE 1:24,000



**LIQUEFACTION AREA**

**REFERENCE:** SEISMIC HAZARD ZONES, BEVERLY HILLS QUADRANGLE OFFICIAL MAP (CDMG, 1999)

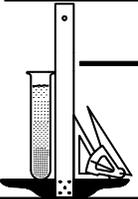


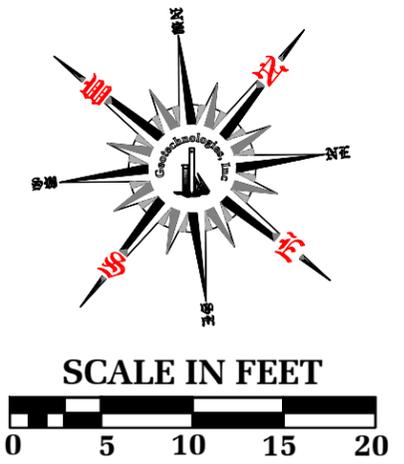
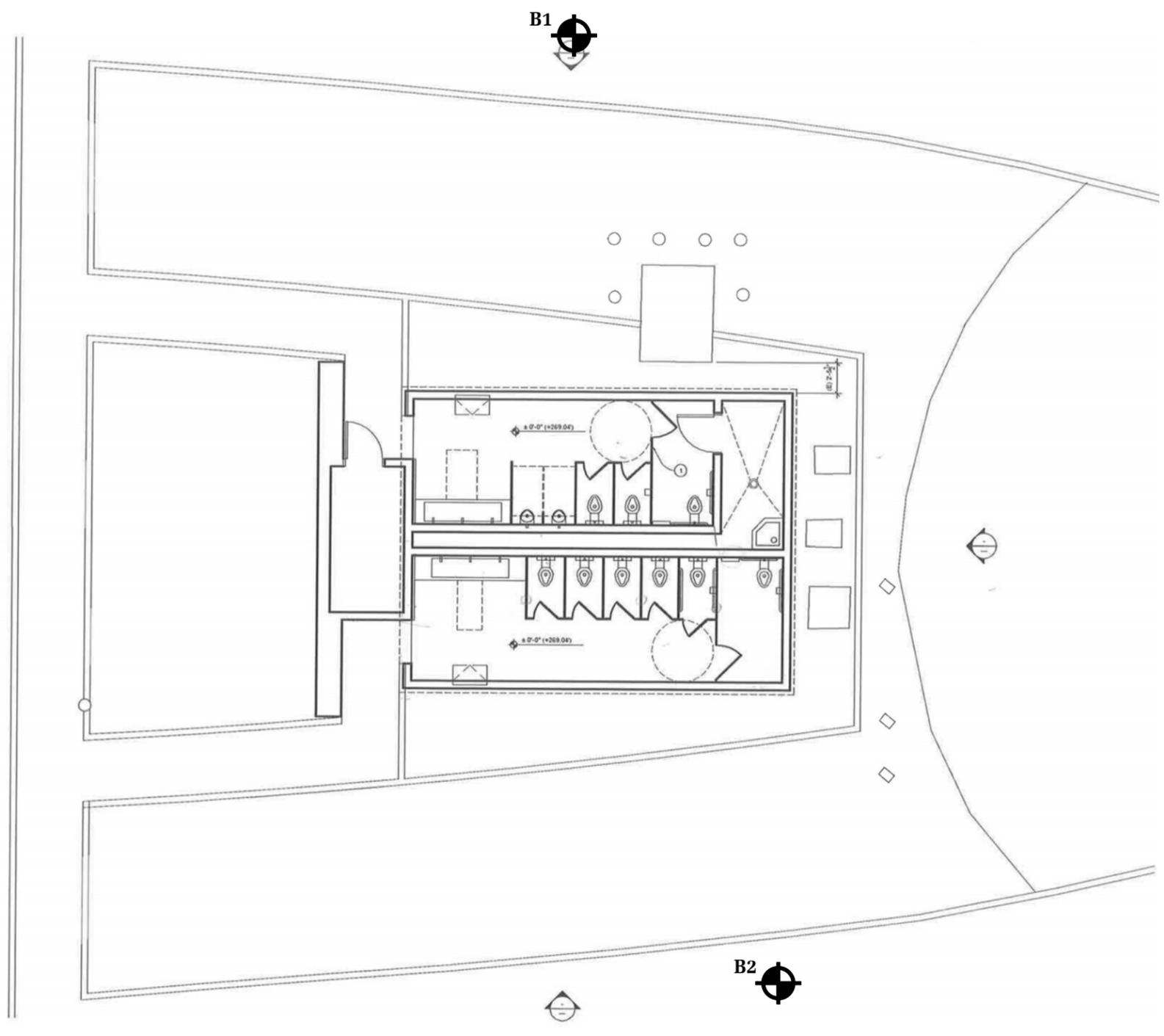
# SEISMIC HAZARD ZONE MAP

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FILE NO. 21236

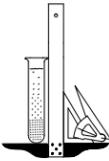




**LEGEND**

**B2**  LOCATION & NUMBER OF BORING

REFERENCE: PARTIAL SITE AND FLOOR PLAN BY RTK ARCHITECTS, INC.  
DATED MARCH 23, 2016

<b>PLOT PLAN</b>		
 <p><b>Geotechnologies, Inc.</b> <i>Consulting Geotechnical Engineers</i></p>	<b>CITY OF BEVERLY HILLS</b>	
	FILE No. 21236	DRAWN BY: TC
	DATE: May '16	

# BORING LOG NUMBER 1

City of Beverly Hills

Date: 05/24/16

File No. 21236

Method: 8-inch Diameter Hollow Stem Auger

ae

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		Surface Conditions: Bare Ground
2.5	9	9.4	100.2	-		FILL: Sandy Silt to Silty Sand, dark brown, moist, medium dense, fine grained, stiff
				1 --		
				2 --		
5	20	6.3	113.2	3 --	SM/ML	ALLUVIUM: Silty Sand to Sandy Silt, dark brown, moist, medium dense, fine grained, stiff, minor slate fragments
				4 --		
				5 --		
7.5	20	9.8	100.4	6 --	SM	Silty Sand, dark brown, moist, medium dense, fine grained, minor slate fragments
				7 --		
				8 --		
10	22	9.1	112.5	9 --		
				10 --		
				11 --		
15	31	5.3	115.5	12 --		
				13 --		
				14 --		
20	23	17.7	109.7	15 --	SM/SP	Silty Sand to Sand, dark yellowish brown, moist, medium dense, fine grained, minor gravel
				16 --		
				17 --		
				18 --	ML	Sandy Silt, dark brown, moist, stiff
			19 --			
			20 --			
				21 --		Total Depth 20 feet No Water Fill to 3 feet
				22 --		
				23 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				24 --		
				25 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				-		

## BORING LOG NUMBER 2

City of Beverly Hills

Date: 05/24/16

File No. 21236

Method: 8-inch Diameter Hollow Stem Auger

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		FILL: Sandy Silt to Silty Sand, dark brown, moist, stiff, medium dense, fine grained
				-		
				1 --		
				-		
2.5	11	7.1	97.1	2 --		
				-		
				3 --		
				-	SM/SP	ALLUVIUM: Silty Sand to Sand, dark to medium brown, moist, medium dense, fine grained
				4 --		
5	10	5.3	SPT	5 --		
				-		
				6 --		
				-		
7.5	14	5.8	116.7	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	12	3.3	SPT	10 --		
				-	SP/SW	Sand, dark to medium brown, moist, medium, dense, fine to coarse grained, some gravel
				11 --		
				-		
12.5	29	3.2	120.1	12 --		
				-	SP/SM	Sand to Silty Sand, dark grayish brown, moist, medium dense, fine to medium grained
				13 --		
				-		
				14 --		
				-		
15	11	12.6	SPT	15 --		
				-	SM	Silty Sand, dark brown, moist, medium dense, fine grained
				16 --		
				-		
				17 --		
17.5	33	15.4	102.1	18 --	SM/ML	Silty Sand and Clayey Silt, dark brown, moist, dense, fine grained, stiff
				-		
				19 --		
				-		
20	13	20.4	SPT	20 --		
				-	ML	Sandy to Clayey Silt, dark brown, moist, stiff
				21 --		
				-		
				22 --		
22.5	44	20.1	98.9	23 --	ML	Sandy to Clayey Silt, dark brown, moist, stiff
				-		
				24 --		
				-		
25	17	13.1	SPT	25 --		
				-	SM/ML	Silty Sand to Sandy Silt, dark brown, moist, medium dense, fine grained, stiff, minor slate fragments

# BORING LOG NUMBER 2

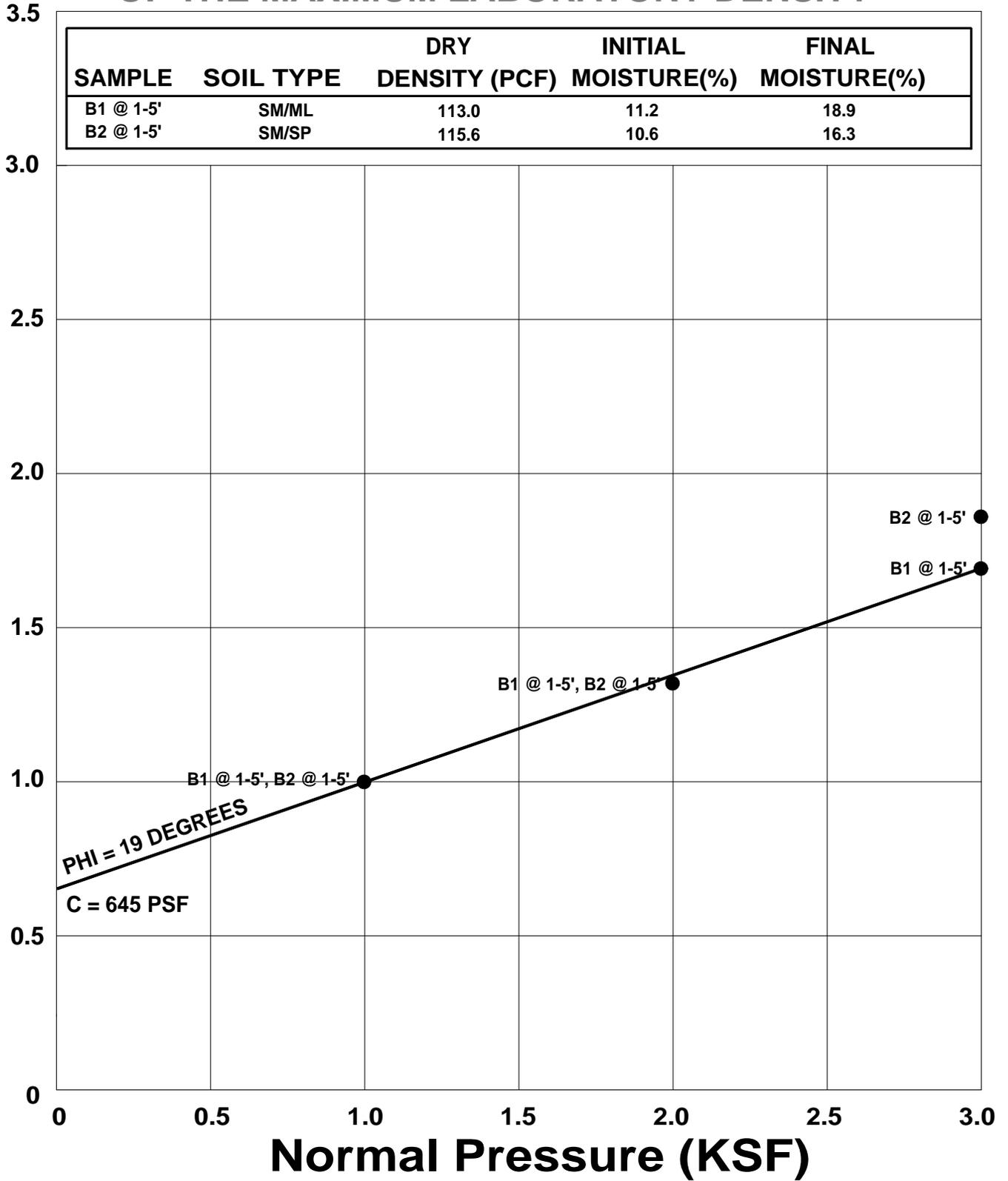
City of Beverly Hills

File No. 21236

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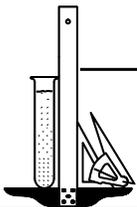
Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
27.5	68	11.4	124.3	28 --		
				-		
				29 --		
				-		
30	19	13.3	SPT	30 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				-		
				31 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				32 --		Modified California Sampler used unless otherwise noted
				-		
32.5	25	16.5	108.6	33 --		SPT=Standard Penetration Test
				-		
				34 --		
				-		
35	17	15.9	SPT	35 --		
				-	SM/SP	Silty Sand to Sand, dark brown, moist, dense, fine to medium grained
				36 --		
				-		
				37 --		
37.5	47	5.5	116.9	-		
				38 --	SP/SW	Sand, dark brown, moist, medium dense, fine to coarse grained, some gravel
				-		
				39 --		
				-		
40	16	14.1	SPT	40 --		
				-	SM/SP	Silty Sand to Sand, dark brown, moist, medium dense, fine grained
				41 --		
				-		
				42 --		
42.5	78	21.2	111.1	-		
				43 --	SM/SW	Silty Sand, dark to medium brown, moist, very dense, fine to coarse grained, some gravel
				-		
				44 --		
				-		
45	34	11.3	SPT	45 --		
				-		
				46 --		
				-		
				47 --		
47.5	50/5"	5.5	125.8	-		
				48 --	SP/SW	Sand, dark brown, moist, very dense, fine to coarse grained, some gravel
				-		
				49 --		
				-		
50	57	6.0	SPT	50 --		
				-		Total Depth 50 feet
						No Water
						Fill to 3 feet

**BULK SAMPLE REMOLDED TO 90 PERCENT OF THE MAXIMUM LABORATORY DENSITY**



● Direct Shear, Saturated

**SHEAR TEST DIAGRAM**

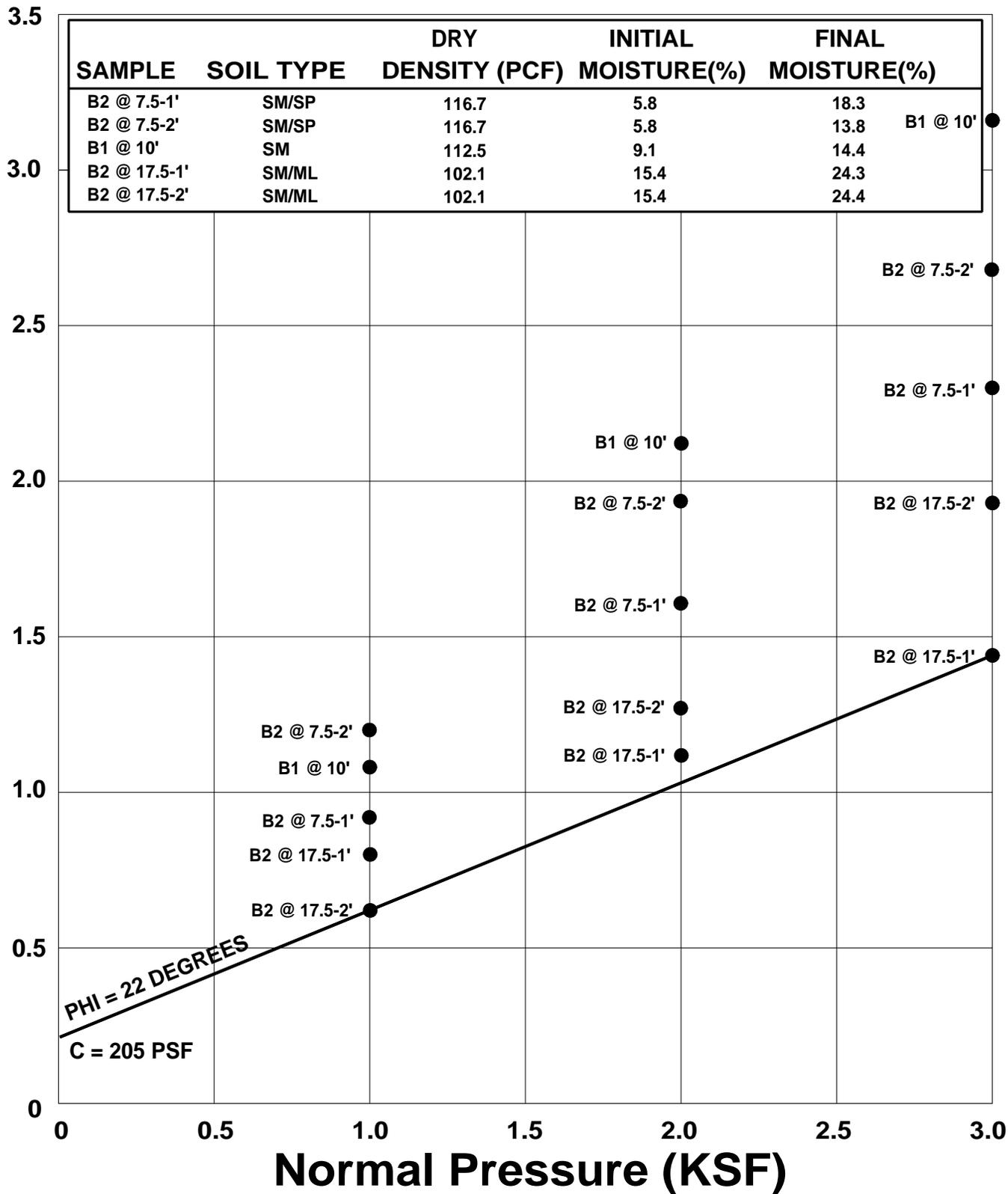


**Geotechnologies, Inc.**  
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**CITY OF BEVERLY HILLS**

FILE NO. 21236

PLATE: B-1

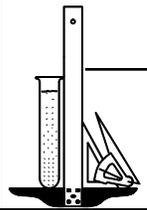


**Shear Strength (KSF)**

**Normal Pressure (KSF)**

● Direct Shear, Saturated

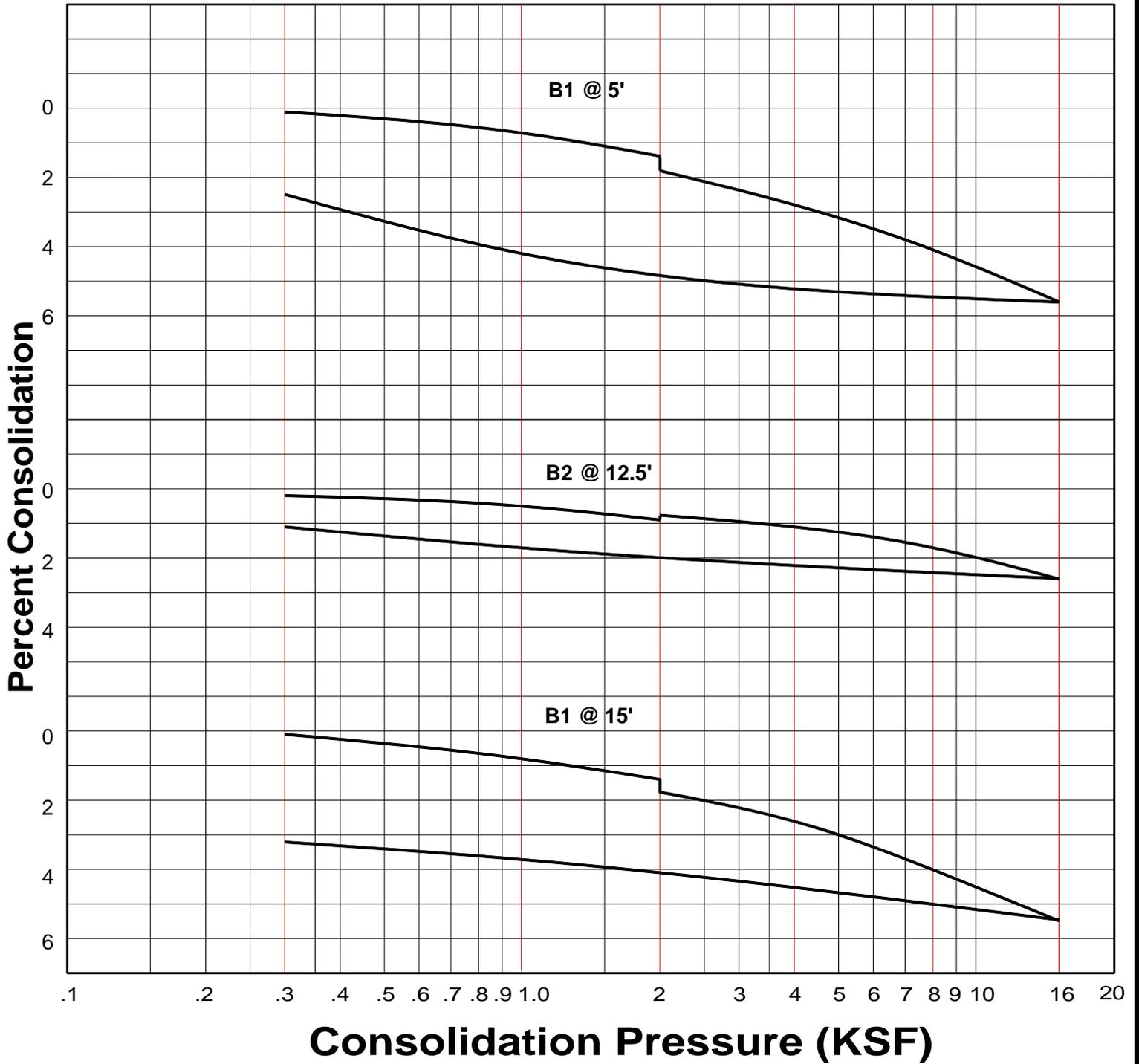
**SHEAR TEST DIAGRAM**



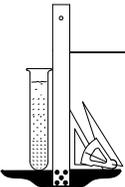
**Geotechnologies, Inc.**  
Consulting Geotechnical Engineers

CITY OF BEVERLY HILLS  
FILE NO. 21236      PLATE: B-2

WATER ADDED AT 2 KSF



## CONSOLIDATION TEST



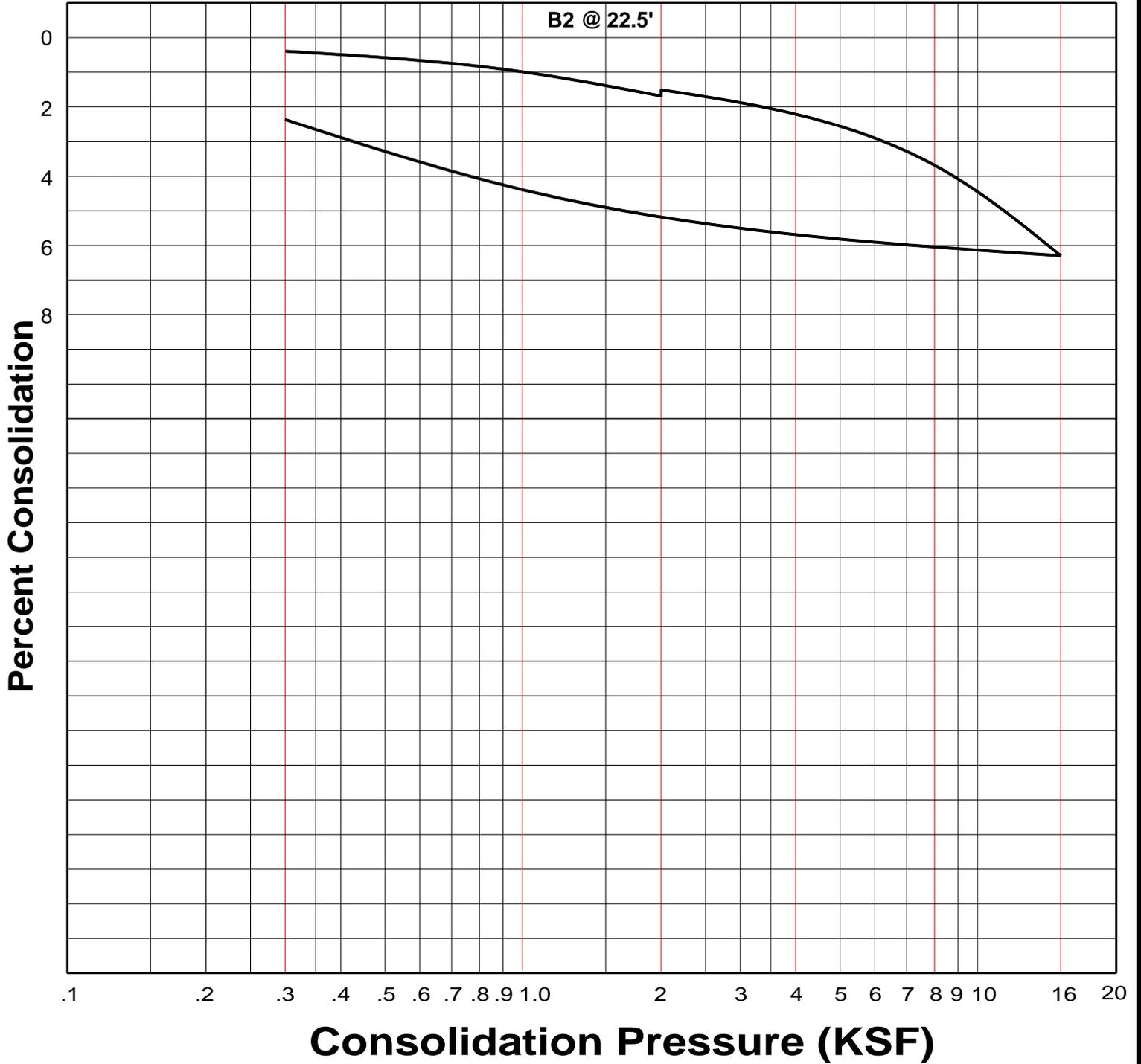
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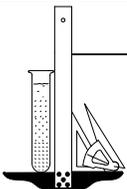
FILE NO. 21236

PLATE: C-1

WATER ADDED AT 2 KSF



### CONSOLIDATION TEST



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PLATE: C-2

### ASTM D-1557

SAMPLE	B1 @ 1-5'	B2 @ 1-5'
SOIL TYPE:	SM/ML	SM/SP
MAXIMUM DENSITY pcf.	125.5	128.4
OPTIMUM MOISTURE %	11.2	10.6

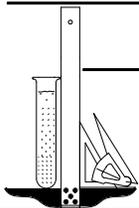
### ASTM D 4829

SAMPLE	B1 @ 1-5'	B2 @ 1-5'
SOIL TYPE:	SM/ML	SM/SP
EXPANSION INDEX UBC STANDARD 18-2	50	17
EXPANSION CHARACTER	<u>MODERATE</u>	<u>VERY LOW</u>

### SULFATE CONTENT

SAMPLE	B1 @ 1-5'	B2 @ 1-5'
SULFATE CONTENT: (percentage by weight)	< 0.10%	< 0.10%

## COMPACTION/EXPANSION/SULFATE DATA SHEET



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PLATE: D