GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
THE SHOPS AT JURUPA VALLEY
NEC PYRITE STREET AND MISSION BOULEVARD
JURUPA VALLEY, CALIFORNIA

-Prepared By-

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Project No. 644-19049
19-10-081

Panorama Development
2005 Winston Court
Upland, California 91784

Subject: Geotechnical Investigation

Project: Proposed Commercial Development
The Shops at Jurupa Valley
NEC Pyrite Street and Mission Boulevard
Jurupa Valley, California

Sladden Engineering is pleased to present the results of our geotechnical investigation performed for the commercial development proposed for the subject site located on the northeast corner Pyrite Street and Mission Boulevard in the City of Jurupa Valley, California. Our services were completed in accordance with our proposal for geotechnical engineering services dated August 14, 2019 and your authorization to proceed with the work. The purpose of our investigation was to explore the subsurface conditions at the site in order to provide recommendations for foundation design and site preparation. Evaluation of environmental issues and hazardous wastes was not included within the scope of services provided.

The opinions, recommendations and design criteria presented in this report are based on our field exploration program, laboratory testing and engineering analyses. Based on the results of our investigation, it is our professional opinion that the proposed project should be feasible from a geotechnical perspective provided that the recommendations presented in this report are implemented into design and carried out through construction.

We appreciate the opportunity to provide service to you on this project. If you have any questions regarding this report, please contact the undersigned.

Respectfully submitted,
SLADDEN ENGINEERING

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INTRODUCTION

This report presents the results of the geotechnical investigation performed by Sladden Engineering (Sladden) for the commercial development proposed for the subject site located on the northeast corner of Pyrite Street and Mission Boulevard in the City of Jurupa Valley, California. The site is located at approximately 34.0133 degrees North latitude and 117.4600 degrees West longitude. The approximate location of the site is indicated on the Site Location Map (Figure 1).

Our investigation was conducted in order to evaluate the engineering properties of the subsurface materials, to evaluate their *in-situ* characteristics, and to provide engineering recommendations and design criteria for site preparation, foundation design and the design of various site improvements. This study also includes a review of published and unpublished geotechnical and geological literature regarding seismicity at and near the subject site.

PROJECT DESCRIPTION

Based on the provided Site Plan (MM Architect, 2019), it is our understanding that the proposed project will consist of constructing a total of 13 new structures on the subject site. The proposed structures will consist of six (6) restaurant/drive through buildings ranging in size from 3,600 square feet (ft^2) to 4,600 ft^2, a gas station with convenience store occupying approximately 3,500 ft^2, new retail space occupying 66,000 ft^2, a car wash building occupying 4,801 ft^2, an auto repair facility occupying 6,009 ft^2, a new movie theater occupying 38,391 ft^2, a medical/office building occupying 28,500 ft^2 and a new two-story Hotel occupying approximately 28,800 ft^2. For our analyses, we expect that the proposed new commercial structures will consist of relatively lightweight wood-frame, steel-frame or reinforced masonry structures supported on conventional shallow spread footings and a concrete slab-on-grade floor system. We anticipate that proposed gas station will include a fuel canopy that will be supported on a cast-in-place concrete drilled pier foundation system.

Based on the relatively level nature of the site, Sladden expects that grading will be limited to minor cuts and fills in order to accomplish the required pad elevations and to provide adequate gradients for site drainage. This does not include the removal and re-compaction of the loose surface soil and primary foundation bearing soil within the proposed building areas. Upon completion of precise grading plans, Sladden should be retained in order to verify that the recommendations presented within in this report are properly incorporated into the design of the proposed project.

Structural foundation loads were not available at the time of this report. Based on our experience with relatively lightweight wood-frame, steel-frame and reinforced masonry structures, we expect that isolated column loads will be less than 50 kips and continuous wall loads will be less than 5.0 kips per linear foot. If these assumed loads vary significantly from the actual loads, we should be consulted to verify the applicability of the recommendations provided.

SCOPE OF SERVICES

The purpose of our investigation was to determine specific engineering characteristics of the surface and near surface soil in order to develop foundation design criteria and recommendations for site preparation. Exploration of the site was achieved by drilling seven (7) exploratory boreholes to depths between approximately 16 and 26 feet below the existing ground surface (bgs). Specifically, our site characterization consisted of the following tasks:

- Site reconnaissance to assess the existing surface conditions on and adjacent to the site.
- The excavation of seven (7) exploratory boreholes to depths varying from approximately 16 to 26 feet bgs in order to characterize the subsurface soil conditions. Representative samples of the soil were classified in the field and retained for laboratory testing and engineering analyses.
- The performance of laboratory testing on selected samples to evaluate their engineering characteristics.
- The review of geologic literature with respect to potential geologic hazards.
- The performance of engineering analyses to develop recommendations for foundation design and site preparation.
- The preparation of this report summarizing our work at the site.

SITE CONDITIONS

The site is located on the northeast corner of Pyrite Street and Mission Boulevard in the City of Jurupa Valley, California. The site consists of two parcels occupying a combined total area of approximately 31.5 acres. The subject property is formally identified by the County of Riverside as APNs 171-020-001 and 171-020-025. Pyrite Channel separates the two parcels in a north-south orientation. The subject property is undeveloped and covered in scattered low growth vegetation and trees and is transected by several dirt roads and trails. The site is bounded by Mission Boulevard to the south, Pyrite Street to the west, Highway 60 east bound onramp to the north and residential properties to the east.

The project site is relatively level with minimal surface gradients. According to the USGS 7.5′ Fontana West Quadrangle map (USGS, 2015), site elevations range from approximately 825 to 870 feet above mean sea level (MSL). Generally, surface gradients across the site descend to the southwest.

No ponding water or surface seeps were observed at or near the site during our investigation conducted on October 2, 2019. Site drainage is controlled by sheet flow, surface infiltration and within City and/or County maintained Pyrite Channel that transects the site.

GEOLOGIC SETTING

The project site is located in the northern portion of the Peninsular Ranges Physiographic Province of California. The Peninsular Ranges are mountainous areas that extend from the western edge of the continental borderland to the Salton Trough and from the Transverse Ranges Physiographic Province in the north to the tip of Baja California in the south. The province is characterized by elongated, northwest-southeast trending mountain ranges and valleys and is truncated at its northern margin by the east-west grain of the Transverse Ranges.

The site has been mapped by Morton (2003) to be immediately underlain by Pleistocene-age older alluvial fan deposits (Qof). The geologic setting for the site and site vicinity is presented on the Regional Geologic Map (Figure 2).

SUBSURFACE CONDITIONS

The subsurface conditions at the site were investigated by drilling seven (7) exploratory boreholes on the site. The approximate locations of the boreholes are illustrated on the Borehole Location Photograph (Figure 3). The boreholes were advanced using a truck-mounted Mobile B-61 drill-rig equipped with 8-inch outside diameter hollow stem augers. A representative of Sladden was on-site to log the materials encountered and retrieve samples for laboratory testing and engineering analyses.

During our field investigation, disturbed soil underlain by native alluvial materials were encountered. Disturbed soil was encountered near the surface within each of our bores and was generally less than two (2) feet in depth. The native older alluvium consists primarily of interbedded silty sand (SM), sand (SW/SP) and clayey sand (SC). Sampler penetration resistance as measured by field blow counts indicates that density generally increases with depth.

The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples. The final logs are included in Appendix A of this report. The stratification lines represent the approximate boundaries between soil types although the transitions may be gradual and/or variable across the site.

Groundwater was not encountered within our boreholes. Based upon our bores and our review of CDWR (2019), it is our opinion that groundwater is at a sufficient depth as not to be a factor during construction of the proposed project. The following table summarizes the groundwater depths in the site vicinity as available through the California Department of Water Resources (CDWR, 2019).

TABLE 1
DEPTH TO GROUNDWATER

WELL NO	DISTANCE/DIRECTION	DEPTH TO GW	DATE
339950N1174230W001	2.5 miles/SE	67.18	10/31/2011
340040N1175131W001	3.10 miles /SW	63.8	07/01/1922
340233N1175215W001	3.60 miles /NW	216.3	01/28/1997

SEISMICITY AND FAULTING

The southwestern United States is a tectonically active and structurally complex region, dominated by northwest trending dextral faults. The faults of the region are often part of complex fault systems, composed of numerous subparallel faults that splay or step from the main fault traces. Strong seismic shaking could be produced by any of these faults during the design life of the proposed project.

We consider the most significant geologic hazard to the project to be the potential for moderate to strong seismic shaking that is likely to occur during the design life of the project. The proposed project is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene epoch (about the last 11,000 years). A potentially active fault is defined by the State as a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago).

Table 2 lists the closest known active faults that were generated in part using the EQFAULT computer programs (Blake, 2000), as modified using the fault parameters from The Revised 2002 California Probabilistic Seismic Hazard Maps (Cao et al, 2003). This table does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any of the other faults in the region.

TABLE 2
CLOSEST KNOWN ACTIVE FAULTS

Fault Name	Distance (Km)	Maximum Event
San Jacinto – San Bernardino	14.4	6.7
Cucamonga	18.3	6.9
Chino – Central Ave. (Elsinore)	20.1	6.7
San Jacinto – San Jacinto Valley	20.6	6.9
San Jose	24.0	6.4
Whittier	24.1	6.8
Elsinore – Glen Ivy	24.1	6.8
San Andreas – Southern	25.6	7.2
San Andreas – San Bernardino	25.6	7.5

2016 CBC SEISMIC DESIGN PARAMETERS

Sladden has reviewed the 2016 California Building Code (CBC) and summarized the current seismic design parameters for the proposed structures. The seismic design category for a structure may be determined in accordance with Section 1613 of the 2016 CBC or ASCE7. According to the 2016 CBC, Site Class C may be used to estimate design seismic loading for the proposed structures. The 2016 CBC Seismic Design Parameters are summarized below (SEA, 2019). The project Design Map Reports are included within Appendix C.

Risk Category (Table 1.5-1)	II
Site Class (Table 1613.3.2)	C
Ss (Figure 1613.3.1)	1.500g
S1 (Figure 1613.3.1)	0.600g
Fa (Table 1613.3.3(1))	1.0
Fv (Table 1613.5.3(2))	1.3
Sms (Equation 16-37 {Fa X Ss})	1.500g
Sm1 (Equation 16-38 {Fv X S1})	0.780g
SDS (Equation 16-39 {2/3 X Sms})	1.000g
SD1 (Equation 16-40 {2/3 X Sm1})	0.520g
Seismic Design Category	D

GEOLOGIC HAZARDS

The subject site is located in an active seismic zone and will likely experience strong seismic shaking during the design life of the proposed project. In general, the intensity of ground shaking will depend on several factors including: the distance to the earthquake focus, the earthquake magnitude, the response characteristics of the underlying materials, and the quality and type of construction. Geologic hazards and their relationship to the site are discussed below.

I. Surface Rupture. Surface rupture is expected to occur along preexisting, known active fault traces. However, surface rupture could potentially splay or step from known active faults or rupture along unidentified traces. Based on review of Jennings (1994), CDOC (2019) and Morton (2003) faults are not mapped on the site. In addition, no signs of active surface faulting were observed during our review of non-stereo digitized photographs of the site and site vicinity (Google, 2019). Finally, no signs of active surface rupture or secondary seismic effects (lateral spreading, lurching etc.) were identified on-site during our field investigation. Therefore, it is our opinion that risks associated with primary surface ground rupture should be considered "low".

II. Ground Shaking. The site has been subjected to past ground shaking by faults that traverse through the region. Strong seismic shaking from nearby active faults is expected to produce strong seismic shaking during the design life of the proposed project. A probabilistic approach was employed to the estimate the peak ground acceleration (a_{max}) that could be experienced at the site. Based on the USGS Unified Hazard Tool (USGS, 2019) and shear wave velocity (Vs30) of 360 m/s, the site could be subjected to ground motions on the order of 0.49g. The peak ground acceleration at the site is judged to have a 475 year return period and a 10 percent chance of exceedance in 50 years.

III. Liquefaction/Seismic Settlement. Liquefaction is the process in which loose, saturated granular soil loses strength as a result of cyclic loading. The strength loss is a result of a decrease in granular sand volume and a positive increase in pore pressures. Generally, liquefaction can occur if all of the following conditions apply: liquefaction-susceptible soil, groundwater within a depth of 50 feet or less, and strong seismic shaking.

According to the County of Riverside, the site is situated within a "Moderate" liquefaction potential zone (RCPR, 2019). Based on the dense nature of the underlying alluvium and the depth to groundwater, risks associated with liquefaction are considered negligible.

IV. Tsunamis and Seiches. Because the site is situated at an elevated inland location and is not immediately adjacent to any impounded bodies of water, risk associated with tsunamis and seiches is considered negligible.

V. Slope Failure, Landsliding, Rock Falls. The site is situated on relatively level ground and is not immediately adjacent to any slopes or hillsides that could be potentially susceptible to slope instability. No signs of slope instability in the form of landslides, rock falls, earthflows or slumps were observed at or near the subject site during our investigation. As such, risks associated with slope instability should be considered "negligible".

VI. Expansive Soil. Expansion Index testing of select samples was performed in order to evaluate the expansive potential of the materials underlying the site. Based the results of our laboratory testing (EI=16), the materials present near the ground surface are considered to have a "very low" expansion potential. Accordingly, risk of structural damage caused by volumetric changes in the subgrade soil is considered "low". However, the surface soil should be tested subsequent to grading and final foundation and slab design should be based upon post-grading expansion test results.

VII. Static Settlement. Static settlement resulting from the anticipated foundation loads should be acceptable provided that the recommendations included in this report are considered in foundation design and construction. The estimated ultimate static settlement is calculated to be approximately 1 inch when using the recommended bearing pressures. As a practical matter, differential static settlement between footings can be assumed as one-half of the total settlement.

VIII. Flooding and Erosion. No signs of flooding or erosion were observed during our field investigation. Risks associated with flooding and erosion should be considered evaluated and mitigated by the project design Civil Engineer.

CONCLUSIONS

Based on the results of our investigation, it is our professional opinion that the project should be feasible from a geotechnical perspective provided that the recommendations provided in this report are incorporated into design and carried out through construction. The main geotechnical concern in the design and construction of the proposed project is the presence of disturbed and potentially compressible near surface soil.

Because of the presence of the somewhat soft and compressible condition of some of the near surface soil, and potential transition related settlements remedial grading including overexcavation and recompaction is recommended for the proposed building and foundation areas. We recommend that remedial grading within the proposed building areas include over-excavation and/or re-compaction of the artificial fill soil and the primary foundation bearing soil. Specific recommendations for site preparation are presented in the Earthwork and Grading section of this report.

Groundwater was not encountered within our bores to the maximum explored depth of 26 feet bgs. Therefore, it is our opinion that groundwater should not be a factor during the construction of the proposed project.

Caving did occur to varying degrees within each of our exploratory bores and the surface soil may be susceptible to caving within deeper excavations. All excavations should be constructed in accordance with the normal CalOSHA excavation criteria. On the basis of our observations of the materials encountered, we anticipate that the subsoil will conform to that described by CalOSHA as Type B or C. Soil conditions should be verified in the field by a "Competent person" employed by the Contractor.

The following recommendations present more detailed design criteria that have been developed on the basis of our field and laboratory investigation.

EARTHWORK AND GRADING

All earthwork including excavation, backfill and preparation of the surface soil, should be performed in accordance with the geotechnical recommendations presented in this report and portions of the local regulatory requirements, as applicable. All earth work should be performed under the observation and testing of a qualified soil engineer. The following geotechnical engineering recommendations for the proposed project are based on observations from the field investigation program, laboratory testing and geotechnical engineering analyses.

a. Stripping. Areas to be graded should be cleared of the scattered weeds and surface vegetation. All areas scheduled to receive fill should be cleared of surface improvements, artificial fill and any unsuitable matter. The unsuitable materials should be removed from the site. Existing artificial fill soil should be removed in its entirety and replaced as engineered fill. Voids left by obstructions should be properly backfilled in accordance with the compaction recommendations of this report.

b. Preparation of Building Areas. In order to achieve firm and uniform bearing conditions, we recommend over-excavation and re-compaction throughout the building areas. All native low density near surface soil and bedrock (if encountered) should be removed to at least 3 feet below existing grade or 3 feet below the bottom of the footings, whichever is deeper. If deeper removals are deemed necessary during site grading, the removals should be equivalent to approximately one-half of the maximum removals to minimize the potential for differential settlements related to variable fill depths. Remedial grading should extend laterally beyond the building perimeters a minimum distance equivalent to the fill depth where possible. The exposed surface soil should then be scarified, moisture conditioned to within two percent of optimum moisture content, and compacted to at least 90 percent relative compaction.

c. Compaction. Soil to be used as engineered fill should be free of organic material, debris, and other deleterious substances, and should not contain irreducible matter greater than three inches in maximum dimension. All fill materials should be placed in thin lifts, not exceeding six inches in a loose condition. If import fill is required, the material should be of a low to non-expansive nature and should meet the following criteria:

Plastic Index	Less than 12
Liquid Limit	Less than 35
Percent Soil Passing #200 Sieve	Between 15% and 35%
Maximum Aggregate Size	3 inches

The subgrade and all fills material should be compacted with acceptable compaction equipment, to at least 90 percent relative compaction. The bottom of the exposed subgrade should be observed by a representative of Sladden Engineering prior to fill placement. Compaction testing should be performed on all lifts in order to ensure proper placement of the fill materials. Table 3 provides a summary of the excavation and compaction recommendations.

TABLE 3
SUMMARY OF RECOMMENDATIONS

*Remedial Grading	Removal and recompaction of all fill soil and loose native soil to depths of at least 3 feet below existing grade or 3 feet below the bottom of footings, whichever is deeper. Removals should extend laterally a minimum of 5 feet beyond the footing limits.
Native / Import Engineered Fill	Place in thin lifts not exceeding 6 inches in the loose state, compact to a minimum of 90 percent relative compaction.
Asphalt Concrete Sections	Compact the top 12 inches to at least 95 percent compaction within 2 percent of optimum moisture content.

*Actual depth may vary and should be determined by a representative of Sladden Engineering in the field during construction.

d. Shrinkage and Subsidence. Volumetric shrinkage of the material that is excavated and replaced as controlled compacted fill should be anticipated. We estimate that this shrinkage could vary from 10 to 15 percent. Subsidence of the surfaces that are scarified and compacted should be between 1 and 2 tenths of a foot. This will vary depending upon the type of equipment used, the moisture content of the soil at the time of grading and the actual degree of compaction attained.

FOUNDATIONS: CONVENTIONAL SHALLOW SPREAD FOOTINGS

Exterior footings should extend at least 18 inches beneath lowest adjacent grade and interior footings should extend at least 12 inches below slab subgrade. Isolated square or rectangular footings at least 2 feet square and continuous footings at least 12 inches wide may be designed using allowable bearing pressures of 2200 and 2000 pounds per square foot, respectively. The allowable bearing pressure may be increased by approximately 250 psf for each additional 1 foot of width and 250 psf for each additional 6 inches of depth, if desired. The maximum allowable bearing pressure should be limited to 4000 psf unless confirmed by Sladden Engineering subsequent to performing specific settlement calculations. The allowable bearing pressures are for dead and frequently applied live loads and may be increased by 1/3 to resist wind, seismic or other transient loading.

The allowable bearing pressure may be increased by one-third when considering transient live loads, including seismic and wind forces. All footings should be reinforced in accordance with the project structural engineer's recommendations.

Based on the allowable bearing pressures recommended above, total settlement of the shallow footings are anticipated to be less than one inch, provided that foundation preparation conforms to the recommendations provided in this report. Differential settlement is anticipated to be approximately one-half the total settlement for similarly loaded footings spaced approximately 50 feet apart.

Resistance to lateral loads may be provided by a combination of friction acting at the base of the slabs or foundations and passive earth pressure along the sides of the foundations. A coefficient of friction of 0.45 between soil and concrete may be used for dead load forces only. A passive earth pressure of 275 pounds per square foot, per foot of depth, may be used for the sides of footings that are placed against properly compacted native soil. Passive earth pressure should be ignored within the upper 1 foot except where confined.

All footing excavations should be observed by a representative of the project geotechnical consultant to verify adequate embedment depths prior to placement of forms, steel reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, disturbed, sloughed or moisture-softened soils and/or any construction debris should be removed prior to concrete placement. Excavated soil generated from footing and/or utility trenches should not be stockpiled within the building envelope or in areas of exterior concrete flatwork.

DRILLED PIERS

We anticipate that the proposed gas station will include a fuel canopy that will be supported upon cast-in-place concrete, drilled pier foundations. We expect that drilled pier foundations approximately 18 to 36 inches in diameter will be used to support the fuel island canopy. The following structural values are provided to assist in drilled pier design. A minimum drilled pier depth of 8 feet is recommended.

Allowable end bearing soil pressure at 8 feet:
a. Static: DL+LL------------------------------------ 4.5 ksf
b. Seismic event: DL+LL+EQ --------------------- 6.0 ksf

Allowable passive pressure:
a. Surface to 1 foot ---------------------------------- Zero
b. Between 1 foot and 10 feet ---------------------- 250 psf/ft*
* may be doubled when using "flagpole" design

Allowance for skin friction -------------------------- 250 psf
(Ignore upper 1 foot)
Angle of internal friction, between 1 foot and 12 feet --------30 degrees

Effective unit weight of the site soil:
a. Surface to 5 feet --------------------------------------130 pcf

SLABS-ON-GRADE

In order to provide uniform and adequate support, concrete slabs-on-grade must be placed on properly compacted engineered fill soil as outlined in the previous sections of this report. The slab subgrade should remain near optimum moisture content and should not be permitted to dry prior to concrete placement. Slab subgrade should be firm and unyielding. Disturbed soil should be removed and replaced with engineered fill soil compacted to a minimum of 90 percent relative compaction.

Slab thickness and reinforcement should be determined by the Structural Engineer. Considering the expected uses, we recommend a minimum slab thickness of 5.0 inches with minimum slab reinforcement of #4 bars and 24 inches on-center in each direction. All slab reinforcement should be supported on concrete chairs to ensure that reinforcement is placed at slab mid-height. Final floor slab design and reinforcement should be determined by the Structural Engineer.

Slabs with moisture sensitive surfaces should be underlain with a moisture vapor retarder consisting of a polyvinyl chloride membrane such as 10-mil visqueen, or equivalent. All laps within the membrane should be sealed and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface can not be achieved by grading, consideration should be given to placing a 1-inch thick leveling course of sand across the pad surface prior to placement of the membrane.

PRELIMINARY PAVEMENT DESIGN

Asphalt concrete pavements should be designed in accordance with Topic 608 of the Caltrans Highway Design Manual based on R-Value and Traffic Index. The preliminary testing indicated an R-Value of 24 by exudation pressure and 32 by expansion pressure. Preliminary pavement design sections provided herein are based upon a design R-value of 30. The actual R-Value of subgrade soil should be reevaluated prior to the final pavement design.

RECOMMENDED ASPHALT PAVEMENT SECTION LAYER THICKNESS

Pavement Material	Recommended Thickness	
	TI=5.0	TI=6.5
Asphalt Concrete Surface Course	3.0 inches	4.0 inches
Class II Aggregate Base Course	6.0 inches	8.0 inches
Compacted Subgrade Soil	12 inches	12 inches

Asphalt concrete should conform to Section 39 of the latest edition of the CalTrans Standard Specifications. Class II aggregate base should conform to Section 26 Caltrans Standard Specifications, latest edition. The aggregate base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Method D 1557 or to the dry density revealed by the R-value test data, whichever is greater.

CONCRETE PAVEMENT

We expect that concrete pavement may be used for some on-site pavement areas. A concrete pavement section of 6.0 inches of Portland Cement Concrete (PCC) on 4.0 inches of compacted aggregate base material should be adequate for the on-site concrete pavement subject to light vehicle traffic and occasional heavy truck traffic. In areas where repeated and regular heavy truck traffic is expected, the concrete pavement section should be increased to 8.0 inches of PCC on 4.0 inches of compacted aggregate material.

Properly spaced and constructed control joints including expansion joints and contraction joints should be incorporated into concrete pavement design to accommodate temperature and shrinkage related cracking. Joint spacing and joint patterns should be established based upon Portland Cement Association (PCA) and American Concrete Institute (ACI) guidelines.

CORROSION SERIES

The soluble sulfate concentrations of the surface soil were determined to be 280 parts per million (ppm). The soil is considered to have a "moderate" corrosion potential with respect to concrete. The use of Type V cement and special sulfate resistant concrete mixes may be necessary. Soluble sulfate content of the surface soil should be reevaluated after grading and appropriate concrete mix designs should be established based upon post-grading test results.

The pH level of the surface soil was determined to be 9.1. Based on soluble chloride concentration testing (80 ppm), the soil is considered to have a "low" corrosion potential with respect to normal grade steel. The minimum resistivity of the surface soil was found to be 2800 ohm-cm that suggests the site soil is considered to have a "moderate" corrosion potential with respect to ferrous metal installations. Accordingly, a corrosion expert should be consulted regarding appropriate corrosion protection measures.

UTILITY TRENCH BACKFILL

All utility trench backfill should be compacted to a minimum relative compaction of 90 percent. Trench backfill materials should be placed in lifts no greater than six inches in a loose condition, moisture conditioned (or air-dried) as necessary to achieve near optimum moisture conditions, and mechanically compacted to a minimum relative compaction of 90 percent. A representative of the project geotechnical consultant should test the backfill material to verify adequate compaction.

EXTERIOR CONCRETE FLATWORK

To minimize cracking of concrete flatwork, the subgrade soil below concrete flatwork areas should first be compacted to a minimum relative compaction of 90 percent. A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soil.

DRAINAGE

All final grades should be provided with positive gradients away from foundations to provide rapid removal of surface water runoff to an adequate discharge point. No water should be allowed to be pond on or immediately adjacent to foundation elements. In order to reduce water infiltration into the subgrade soil, surface water should be directed away from building foundations to an adequate discharge point. Subgrade drainage should be evaluated upon completion of the precise grading plans and in the field during grading.

LIMITATIONS

The findings and recommendations presented in this report are based upon an interpolation of the soil conditions between the exploratory boring locations and extrapolation of these conditions throughout the proposed building areas. Should conditions encountered during grading appear different than those indicated in this report, this office should be notified.

The use of this report by other parties or for other projects is not authorized. The recommendations of this report are contingent upon monitoring of the grading operation by a representative of Sladden Engineering. All recommendations are considered to be tentative pending our review of the grading operation and additional testing, if indicated. If others are employed to perform any soil testing, this office should be notified prior to such testing in order to coordinate any required site visits by our representative and to assure indemnification of Sladden Engineering.

We recommend that a pre-job conference be held on the site prior to the initiation of site grading. The purpose of this meeting will be to assure a complete understanding of the recommendations presented in this report as they apply to the actual grading performed.

ADDITIONAL SERVICES

Once completed, final project plans and specifications should be reviewed by use prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. Following review of plans and specifications, observation should be performed by the Soil Engineer during construction to document that foundation elements are founded on/or penetrate into the recommended soil, and that suitable backfill soil is placed upon competent materials and properly compacted at the recommended moisture content.

Tests and observations should be performed during grading by the Soil Engineer or his representative in order to verify that the grading is being performed in accordance with the project specifications. Field density testing shall be performed in accordance with acceptable ASTM test methods. The minimum acceptable degree of compaction should be 90 percent for subgrade soils and 95 percent for Class II aggregate base as obtained by the ASTM D1557 test method. Where testing indicates insufficient density, additional compactive effort shall be applied until retesting indicates satisfactory compaction.

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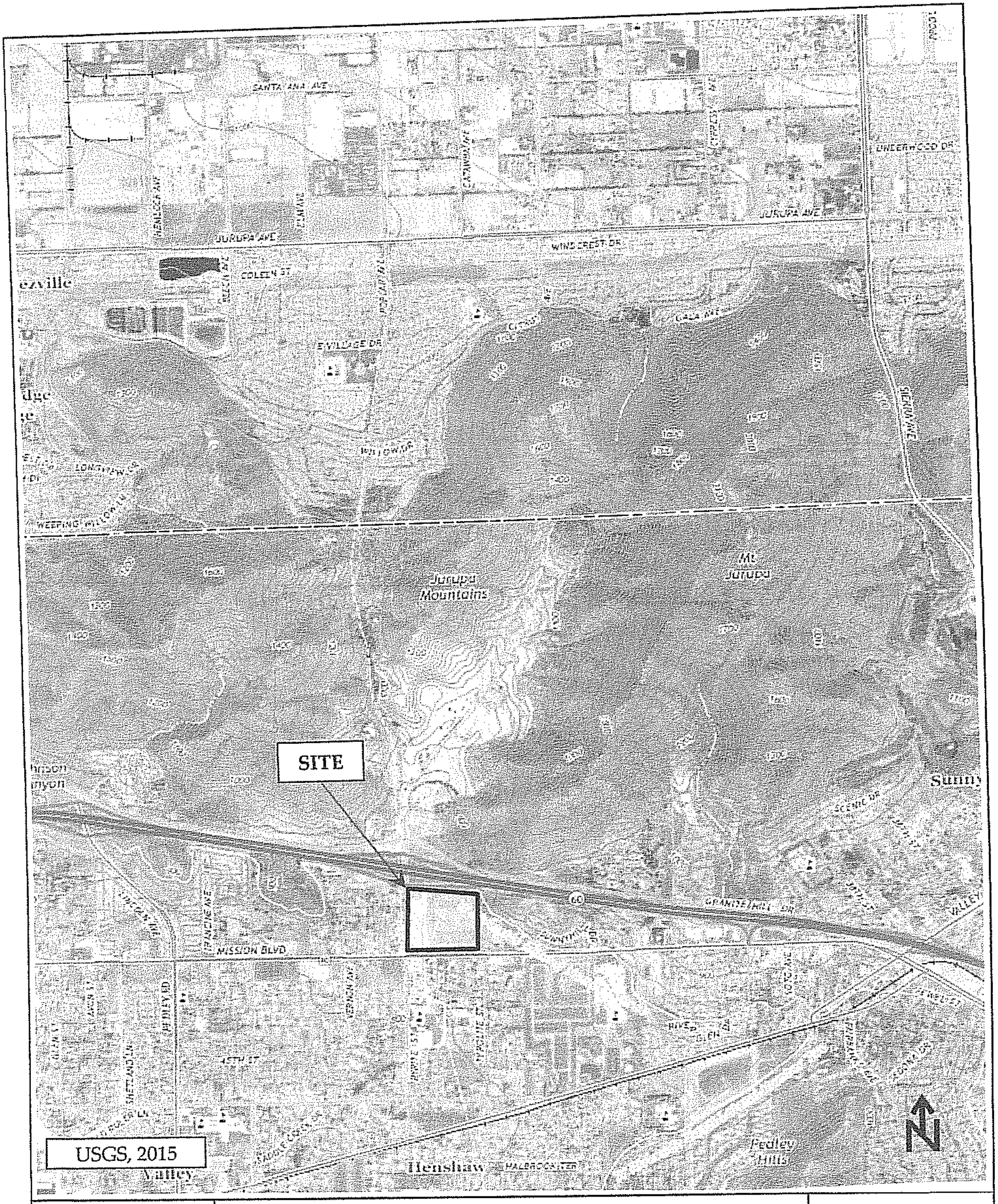
Structural Engineer Association (SEA), 2019, Seismic Design Maps; available at: https://seismicmaps.org/

United States Geological Survey (USGS), 2015, Fontana 7.5 Minute Quadrangle Map, 1:24000.

United States Geological Survey (USGS), 2019, Unified Hazard Tool; available at: https://geohazards.usgs.gov/hazards/interactive/

FIGURES

SITE LOCATION MAP
REGIONAL GEOLOGIC MAP
BOREHOLE LOCATION PHOTOGRAPH
SITE PLAN



SITE LOCATION MAP

Sladden Engineering

Project Number:	644-19049
Report Number:	19-10-081
Date:	October 28, 2019

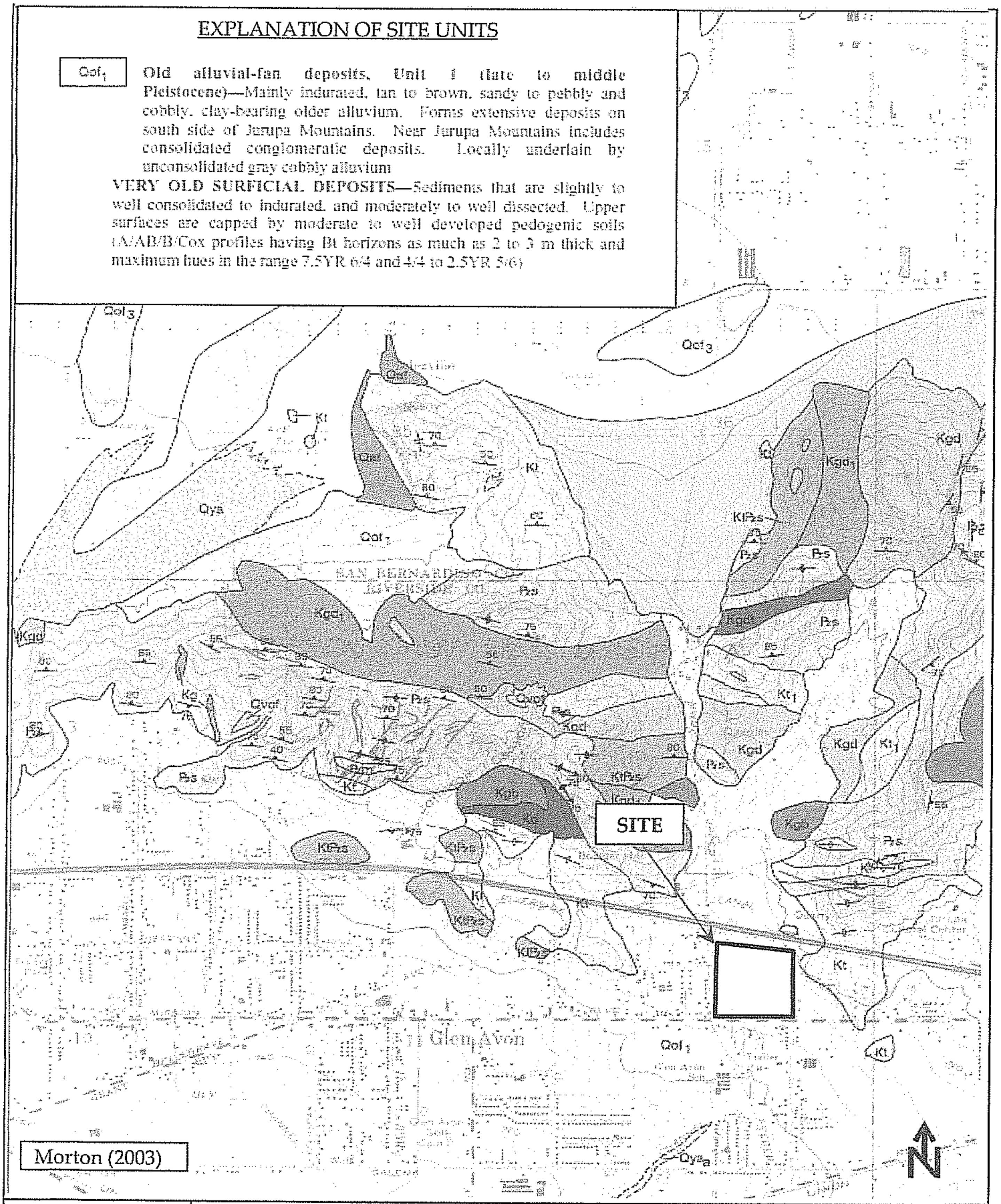
FIGURE

1

EXPLANATION OF SITE UNITS

Qof_1	Old alluvial-fan deposits, Unit 1 (late to middle Pleistocene)—Mainly indurated, tan to brown, sandy to pebbly and cobbly, clay-bearing older alluvium. Forms extensive deposits on south side of Jurupa Mountains. Near Jurupa Mountains includes consolidated conglomeratic deposits. Locally underlain by unconsolidated gray cobbly alluvium

VERY OLD SURFICIAL DEPOSITS—Sediments that are slightly to well consolidated to indurated, and moderately to well dissected. Upper surfaces are capped by moderate to well developed pedogenic soils (A/AB/B/Cox profiles having Bt horizons as much as 2 to 3 m thick and maximum hues in the range 7.5YR 6/4 and 4/4 to 2.5YR 5/6)



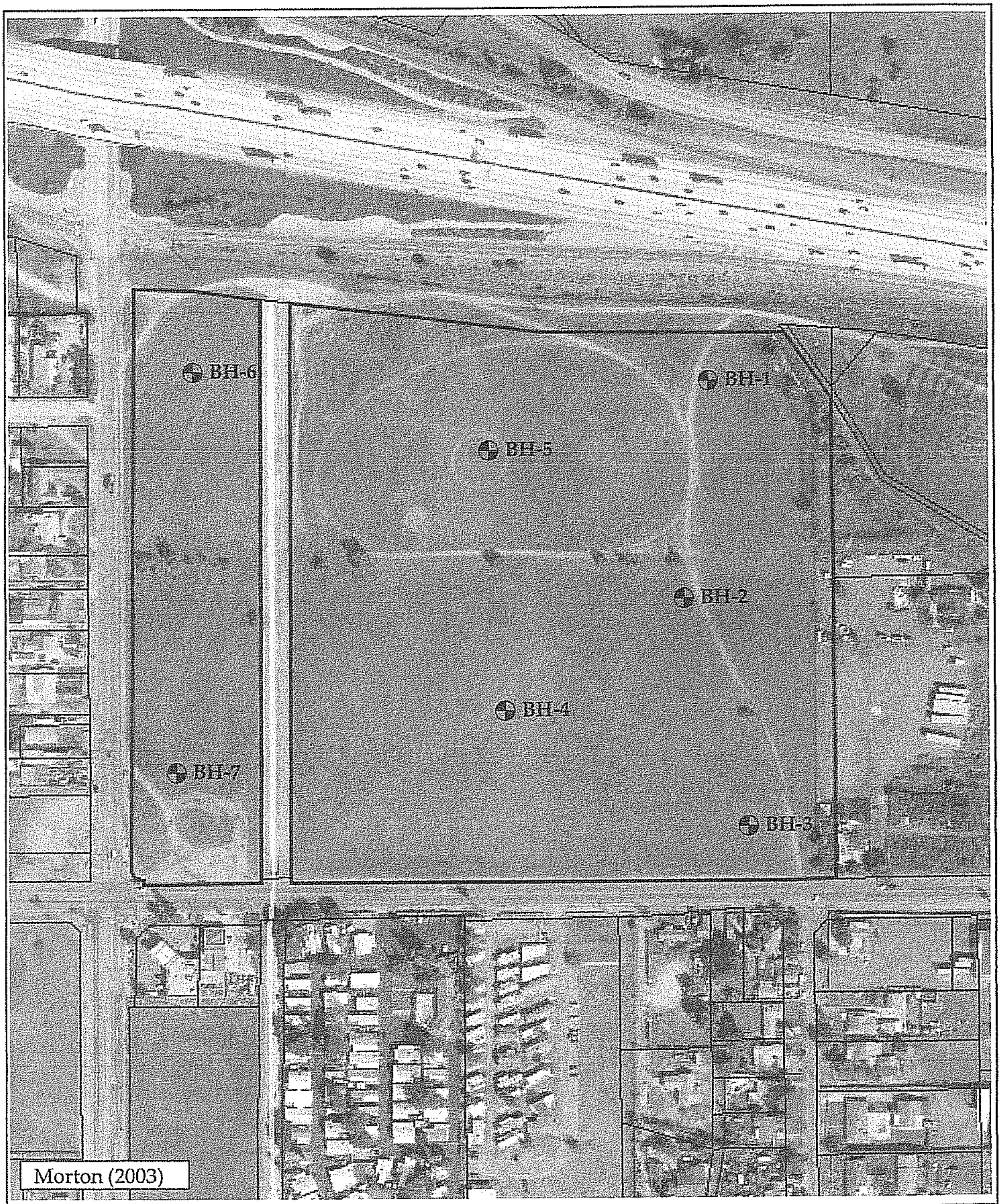
REGIONAL GEOLOGIC MAP

Project Number:	644-19049
Report Number:	19-10-081
Date:	October 28, 2019

Sladden Engineering

FIGURE

2



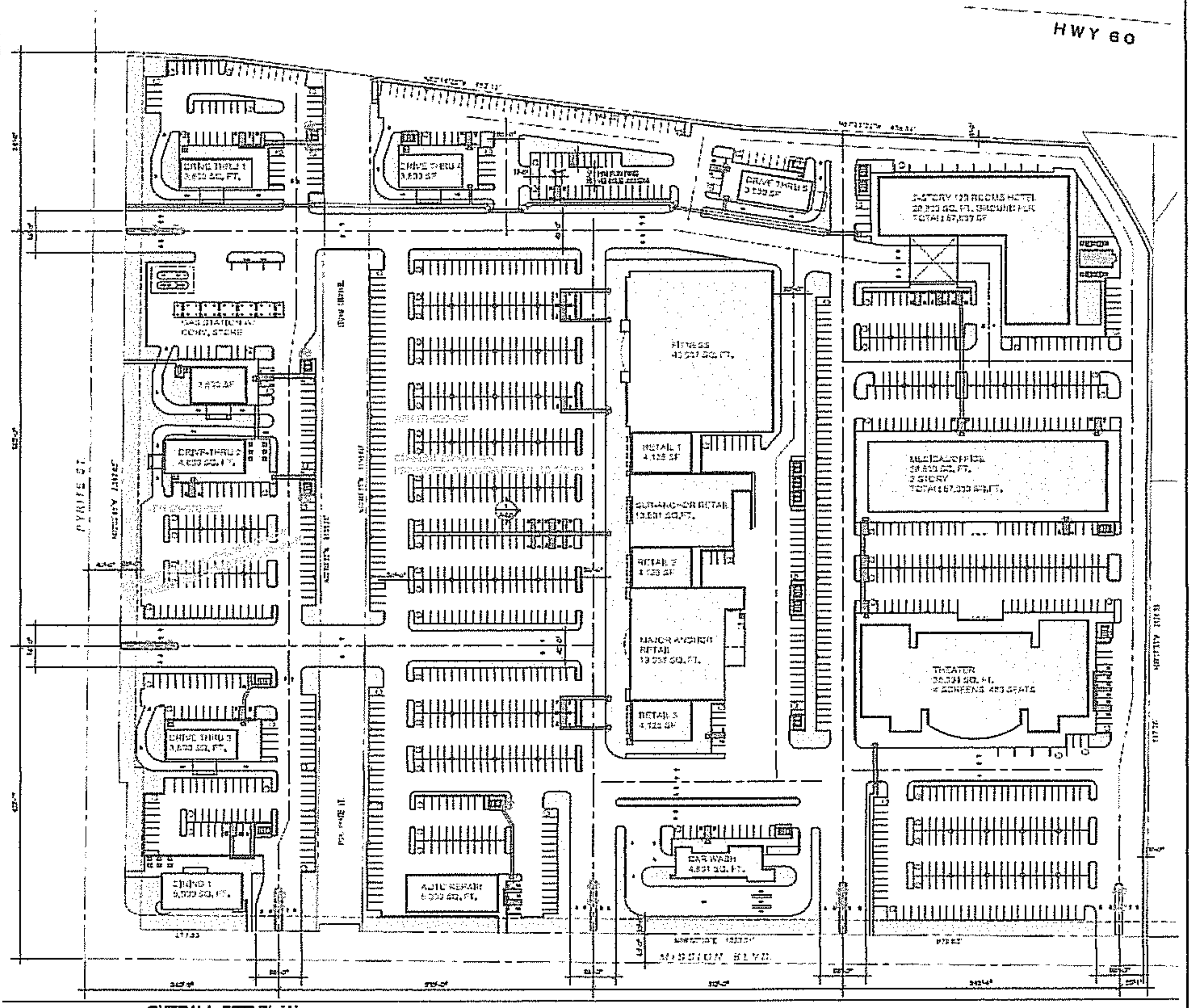
Sladden Engineering

BOREHOLE LOCATION PHOTOGRAPH

Project Number:	644-19049
Report Number:	19-10-081
Date:	October 28, 2019

FIGURE

3



OVERALL SITE PLAN

MM Architect (2019)

Sladden Engineering	SITE PLAN		FIGURE
	Project Number:	644-19049	4
	Report Number:	19-10-081	
	Date:	October 28, 2019	

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

For our field investigation seven (7) exploratory bores were excavated on October 2, 2019 utilizing a truck mounted hollow stem auger rig (Mobile B-61). Continuous logs of the materials encountered were made by a representative of Sladden Engineering. Materials encountered in the boreholes were classified in accordance with the Unified Soil Classification System which is presented in this appendix.

Representative undisturbed samples were obtained within our bores by driving a thin-walled steel penetration sampler (California split spoon sampler) or a Standard Penetration Test (SPT) sampler with a 140 pound automatic-trip hammer dropping approximately 30 inches (ASTM D1586). The number of blows required to drive the samplers 18 inches was recorded in 6-inch increments and blowcounts are indicated on the boring logs.

The California samplers are 3.0 inches in diameter, carrying brass sample rings having inner diameters of 2.5 inches. The standard penetration samplers are 2.0 inches in diameter with an inner diameter of 1.5 inches. Undisturbed samples were removed from the sampler and placed in moisture sealed containers in order to preserve the natural soil moisture content. Bulk samples were obtained from the excavation spoils and samples were then transported to our laboratory for further observations and testing.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			TYPICAL NAMES	
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN No.200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No.4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY-GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN No.4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN No.200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS & 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, CLEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS: LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

EXPLANATION OF BORE LOG SYMBOLS

▨ California Split-spoon Sample

☒ Unrecovered Sample

▯▨▯ Standard Penetration Test Sample

▼ Groundwater depth

Note: The stratification lines on the borelogs represent the approximate boundaries between the soil types; the transitions may be gradual.

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/2/2019
Elevation:	858 Feet (MSL)	Boring No:	BH-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
■	36/50-5"	1	16	34.0	7.2	126.5	2	▒	Clayey Sand (SC); yellowish brown, slightly moist, very dense, fine- to coarse-grained (Qof).
							4	▒	
■	25/50-5"			34.1	6.1	140.3	6	▒	Clayey Sand (SC); yellowish brown to olive brown, slightly moist, very dense, fine- to coarse-grained (Qof).
							8	▒	
▣	12/14/14			29.8	6.1		10	▒	Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained (Qof).
							12	▒	
							14	▒	
■	11/13/23			20.6	4.4	119.9	16	▒	Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained (Qof).
							18	▒	
▣	9/10/15			22.5	6.5		20	▒	Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained (Qof).
							22	▒	
							24	▒	
☒	50-3"						26	▒	No Recovery.
							28		Terminated at ~26.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED MIXED-USE DEVELOPMENT
NEC PYRITE STREET & MISSION BOULEVARD, JURUPA VALLEY
Project No: 644-19049
Report No: 19-10-081

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/2/2019
Elevation:	840 Feet (MSL)	Boring No:	BH-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2	▨	Clayey Sand (SC); yellowish brown, slightly moist, fine- to coarse-grained (Qof).
◨	11/12/15			40.4	9.5		4 6 8	▨	Clayey Sand (SC); yellowish brown, moist, medium dense, fine- to coarse-grained (Qof).
■	20/32/50-6"			31.0	7.1	131.6	10 12 14	▨	Clayey Sand (SC); yellowish brown, moist, medium dense, fine- to coarse-grained (Qof).
◨	12/22/26			19.3	4.7		16 18	▨	Clayey Sand (SC); yellowish brown, slightly moist, dense, fine- to coarse-grained (Qof).
■	21/50-4"			17.4	8.7	109.0	20	▨	Silty Sand (SM); yellowish brown, moist, very dense, fine- to coarse-grained (Qof).
							22 24 26 28 30 32 34 36 38 40 42 44 46 48 50		Terminated at ~21.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED MIXED-USE DEVELOPMENT
NEC PYRITE STREET & MISSION BOULEVARD, JURUPA VALLEY
Project No: 644-19049
Report No: 19-10-081

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/2/2019
Elevation:	830 Feet (MSL)	Boring No:	BH-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2 4	▒	Clayey Sand (SC); yellowish brown, slightly moist, fine- to coarse-grained (Qof).
■	9/15/15			17.4	5.5	122.2	6 8	▒	Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained (Qof).
□■□	9/11/13			4.2	2.0		10 12 14	░	Gravelly Sand (SP); yellowish brown, dry, medium dense, fine- to coarse-grained (Qof).
■	15/26/41			3.2	1.7	110.2	16 18	░	Gravelly Sand (SP); yellowish brown, dry, dense, fine- to coarse-grained (Qof).
□■□	16/24/32			30.4	6.5		20 22 24	▒	Clayey Sand (SC); yellowish brown to olive brown, slightly moist to moist, very dense, fine- to coarse-grained (Qof).
■	50-6"			14.2	7.7	109.3	26	▒	Clayey Sand (SC); yellowish brown, moist, medium dense, fine- to coarse-grained (Qof).
							28 30 32 34 36 38 40 42 44 46 48 50		Terminated at ~25.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED MIXED-USE DEVELOPMENT
NEC PYRITE STREET & MISSION BOULEVARD, JURUPA VALLEY

Project No: 644-19049
Report No: 19-10-081

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/2/2019
Elevation:	830 Feet (MSL)	Boring No:	BH-4

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2 4		Silty Sand (SM); grayish brown, dry, fine- to coarse-grained with gravel (Qof).
▣	3/4/6			38.6	8.6		6 8		Clayey Sand (SC); dark yellowish brown, moist, loose, fine- to coarse-grained with gravel (Qof).
■	8/16/38			25.6	11.9	117.7	10 12 14		Clayey Sand (SC); yellowish brown, moist, dense, fine- to coarse-grained with gravel (Qof).
▣	15/35/41			11.1	4.1		16 18		Sand (SP); olive brown, slightly moist, very dense, fine- to coarse-grained (Qof).
■	50-5"			23.2	5.6	93.1	20		Clayey Sand (SC); yellowish brown, moist, dense, fine- to coarse-grained with gravel (Qof).
							22 24 26 28 30 32 34 36 38 40 42 44 46 48 50		Terminated at ~20.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED MIXED-USE DEVELOPMENT
NEC PYRITE STREET & MISSION BOULEVARD, JURUPA VALLEY
Project No: 644-19049
Report No: 19-10-081

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/2/2019
Elevation:	845 Feet (MSL)	Boring No:	BH-5

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2 4	▨	Silty Sand (SM); grayish brown, dry, fine- to coarse-grained with gravel (Qof).
■	3/11/21			25.5	7.4	121.2	6 8	▨	Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained with gravel (Qof).
▪	8/10/14			21.6	6.0		10 12 14	▨	Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained with gravel (Qof).
■	9/14/20			12.8	3.5	119.1	16 18	▨	Clayey Sand (SC); yellowish brown, dry, medium dense, fine- to coarse-grained with gravel (Qof).
▪	11/14/15			41.3	7.5		20 22 24	▨	Clayey Sand (SC); yellowish brown, moist, medium dense, fine- to coarse-grained with gravel (Qof).
■	19/39/50-5"			28.6	8.4	130.3	26	▨	Clayey Sand (SC); yellowish brown to olive brown, moist, very dense, fine- to coarse-grained with gravel (Qof).
							28 30 32 34 36 38 40 42 44 46 48 50		Terminated at ~26.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED MIXED-USE DEVELOPMENT
NEC PYRITE STREET & MISSION BOULEVARD, JURUPA VALLEY

Project No: 644-19049
Report No: 19-10-081

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobil B-61	Date Drilled:	10/2/2019
Elevation:	845 Feet (MSL)	Boring No:	BH-6

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Clayey Sand (SC); yellowish brown, dry, fine- to coarse-grained with gravel (Qof).
							4		
■	8/9/9			36.4	4.7		6		Clayey Sand (SC); yellowish brown, dry to slightly moist, medium dense, fine- to coarse-grained with gravel (Qof).
							8		
■	8/12/19			12.1	2.6	118.3	10		Silty Sand (SM); yellowish brown, dry, medium dense, fine- to coarse-grained (Qof).
							12		
							14		Gravelly Sand (SP); yellowish brown, dry, dense, fine- to coarse-grained with cobbles (Qof).
■	14/17/22			7.7	2.1		16		
							18		Practical Auger Refusal at ~16.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED MIXED-USE DEVELOPMENT
NEC PYRITE STREET & MISSION BOULEVARD, JURUPA VALLEY

Project No: 644-19049
Report No: 19-10-081

Page 6

SLADDEN ENGINEERING

BORE LOG

Drill Rig: Mobil B-61
Date Drilled: 10/2/2019
Elevation: 825 Feet (MSL)
Boring No: BH-7

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2	▒	Clayey Sand (SC); yellowish brown, dry, fine- to coarse-grained with gravel (Qof).
							4	▒	
■	7/8/9			17.0	5.1	114.3	6	▒	Clayey Sand (SC): yellowish brown, dry to slightly moist, medium dense, fine- to coarse-grained (Qof).
							8	▒	
▪	9/11/13			18.2	4.5		10	▒	Clayey Sand (SC): yellowish brown, dry to slightly moist, medium dense, fine- to coarse-grained (Qof).
							12	▒	
							14	▒	
■	15/29/50-50-5"			41.5	7.8	130.3	16	▒	Clayey Sand (SC): yellowish brown, moist, very dense, fine- to coarse-grained (Qof).
							18	▒	
▪	22/50-6"			29.1	9.1		20	▒	Clayey Sand (SC): yellowish brown, moist, very dense, fine- to coarse-grained (Qof).
							22	▒	
							24	▒	
■	19/31/50-6"			21.8	6.3	114.4	26	▒	Clayey Sand (SC): yellowish brown, slightly moist, very dense, fine- to coarse-grained (Qof).
							28		Terminated at ~26.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED MIXED-USE DEVELOPMENT
NEC PYRITE STREET & MISSION BOULEVARD, JURUPA VALLEY
Project No: 644-19049
Report No: 19-10-081

APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

Representative bulk and relatively undisturbed soil samples were obtained in the field and returned to our laboratory for additional observations and testing. Laboratory testing was generally performed in two phases. The first phase consisted of testing in order to determine the compaction of the existing natural soil and the general engineering classifications of the soils underlying the site. This testing was performed in order to estimate the engineering characteristics of the soil and to serve as a basis for selecting samples for the second phase of testing. The second phase consisted of soil mechanics testing. This testing including consolidation, shear strength and expansion testing was performed in order to provide a means of developing specific design recommendations based on the mechanical properties of the soil.

CLASSIFICATION AND COMPACTION TESTING

Unit Weight and Moisture Content Determinations: Each undisturbed sample was weighed and measured in order to determine its unit weight. A small portion of each sample was then subjected to testing in order to determine its moisture content. This was used in order to determine the dry density of the soil in its natural condition. The results of this testing are shown on the Bore Logs.

Maximum Density-Optimum Moisture Determinations: Representative soil types were selected for maximum density determinations. This testing was performed in accordance with the ASTM Standard D1557-91, Test Method A. The results of testing are presented graphically in this appendix. The maximum densities are compared to the field densities of the soil in order to determine the existing relative compaction to the soil.

Classification Testing: Soil samples were selected for classification testing. This testing consists of mechanical grain size analyses. This provides information for developing classifications for the soil in accordance with the Unified Soil Classification System which is presented in the preceding appendix. This classification system categorizes the soil into groups having similar engineering characteristics. The results of this testing is very useful in detecting variations in the soils and in selecting samples for further testing.

SOIL MECHANIC'S TESTING

Expansion Testing: One (1) bulk sample was selected for Expansion testing. Expansion testing was performed in accordance with the UBC Standard 18-2. This testing consists of remolding 4-inch diameter by 1-inch thick test specimens to a moisture content and dry density corresponding to approximately 50 percent saturation. The samples are subjected to a surcharge of 144 pounds per square foot and allowed to reach equilibrium. At that point the specimens are inundated with distilled water. The linear expansion is then measured until complete (ASTM D4829).

Direct Shear Testing: One (1) bulk sample was selected for Direct Shear testing. This test measures the shear strength of the soil under various normal pressures and is used to develop parameters for foundation design and lateral design. Tests were performed using a recompacted test specimen that was saturated prior to tests. Tests were performed using a strain controlled test apparatus with normal pressures ranging from 800 to 2300 pounds per square foot (ASTM D3080-04).

Consolidation Testing: Two (2) relatively undisturbed samples were selected for consolidation testing. For this test, a one-inch thick test specimen was subjected to vertical loads varying from 575 psf to 11520 psf applied progressively. The consolidation at each load increment was recorded prior to placement of each subsequent load. The specimens were saturated at 575 psf or 720 psf load increment (ASTM D2435 & D5333).

Corrosion Series Testing: The soluble sulfate concentrations of the surface soil was determined in accordance with California Test Method Number (CA) 417. The pH and Minimum Resistivity were determined in accordance with CA 643. The soluble chloride concentrations were determined in accordance with CA 422.

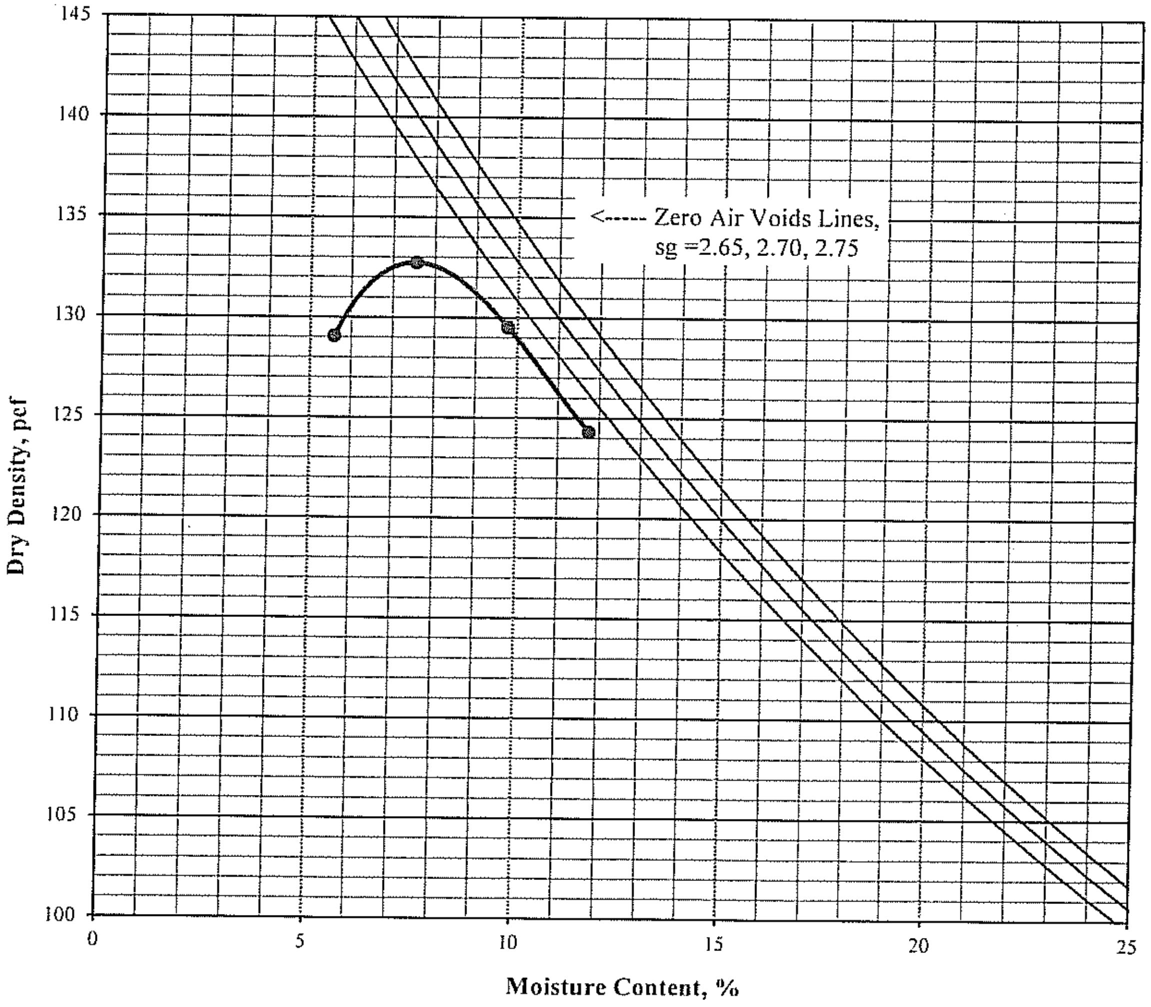
Maximum Density/Optimum Moisture

ASTM D698/D1557

Project Number:	644-19049	October 17, 2019
Project Name:	NEC Pyrite Street & Mission Boulevard	
Lab ID Number:	LN6-19522	ASTM D-1557 A
Sample Location:	BH-1 Bulk 1 @ 0-5'	Rammer Type: Machine
Description:	Red Brown Clayey Sand (SC)	

Maximum Density: **133 pcf**
Optimum Moisture: **8%**

Sieve Size	% Retained
3/4"	
3/8"	
#4	0.6



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450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Expansion Index

ASTM D 4829

Job Number:	644-19049	October 17, 2019
Job Name:	NEC Pyrite Street & Mission Boulevard	
Lab ID Number:	LN6-19522	
Sample ID:	BH-1 Bulk 1 @ 0-5'	
Soil Description:	Red Brown Clayey Sand (SC)	

Wt of Soil + Ring:	595.0
Weight of Ring:	191.1
Wt of Wet Soil:	403.9
Percent Moisture:	7.7%
Sample Height, in	0.95
Wet Density, pcf:	128.8
Dry Denstiy, pcf:	119.6

% Saturation:	50.9

Expansion **Rack # 3**

Date/Time	10/16/2019	3:00 PM
Initial Reading	0.0000	
Final Reading	0.0155	

Expansion Index **16**

(Final - Initial) x 1000

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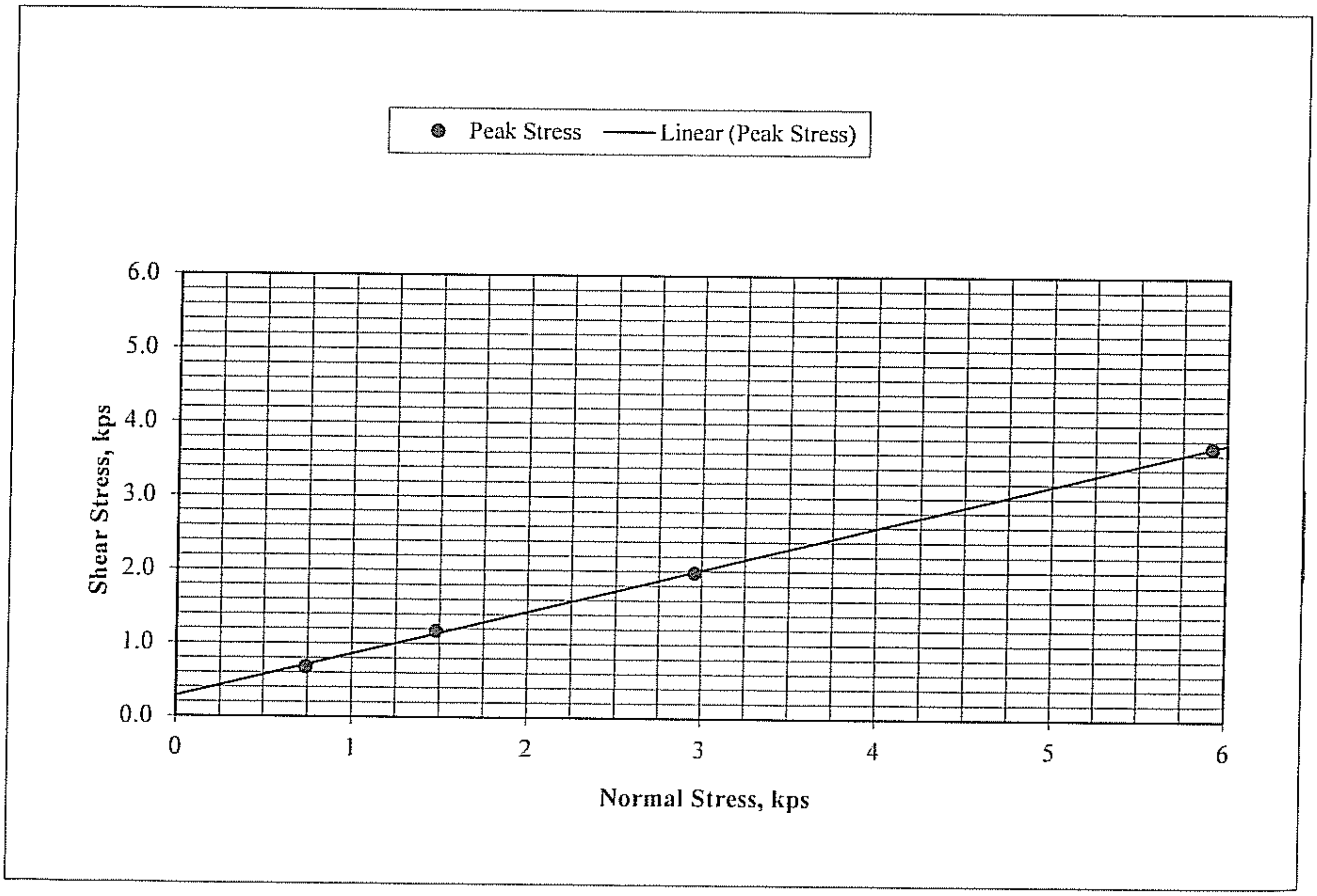
Direct Shear ASTM D 3080-04
(modified for unconsolidated condition)

Job Number: 644-19049
Job Name NEC Pyrite Street & Mission Boulevard
Lab ID No. LN6-19522
Sample ID BH-1 Bulk 1 @ 0-5'
Classification Red Brown Clayey Sand (SC)
Sample Type Remolded @ 90% of Maximum Density

October 17, 2019
Initial Dry Density: 119.6 pcf
Initial Mosture Content: 8.2 %
Peak Friction Angle (Ø): 30°
Cohesion (c): 280 psf

Test Results	1	2	3	4	Average
Moisture Content, %	14.5	14.5	14.5	14.5	14.5
Saturation, %	95.5	95.5	95.5	95.5	95.5
Normal Stress, kps	0.739	1.479	2.958	5.916	
Peak Stress, kps	0.674	1.175	1.979	3.698	



Job Number: 644-19049
Job Name: NEC Pyrite Street & Mission Boulevard
Date: 10/17/2019

Moisture Adjustment

Wt of Soil: 1,000
Moist As Is: 5.5
Moist Wanted: 8.0

ml of Water to Add: 23.7

Remolded Shear Weight

Max Dry Density: 133.0
Optimum Moisture: 8.0

Wt Soil per Ring, g: 155.5

UBC

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Gradation

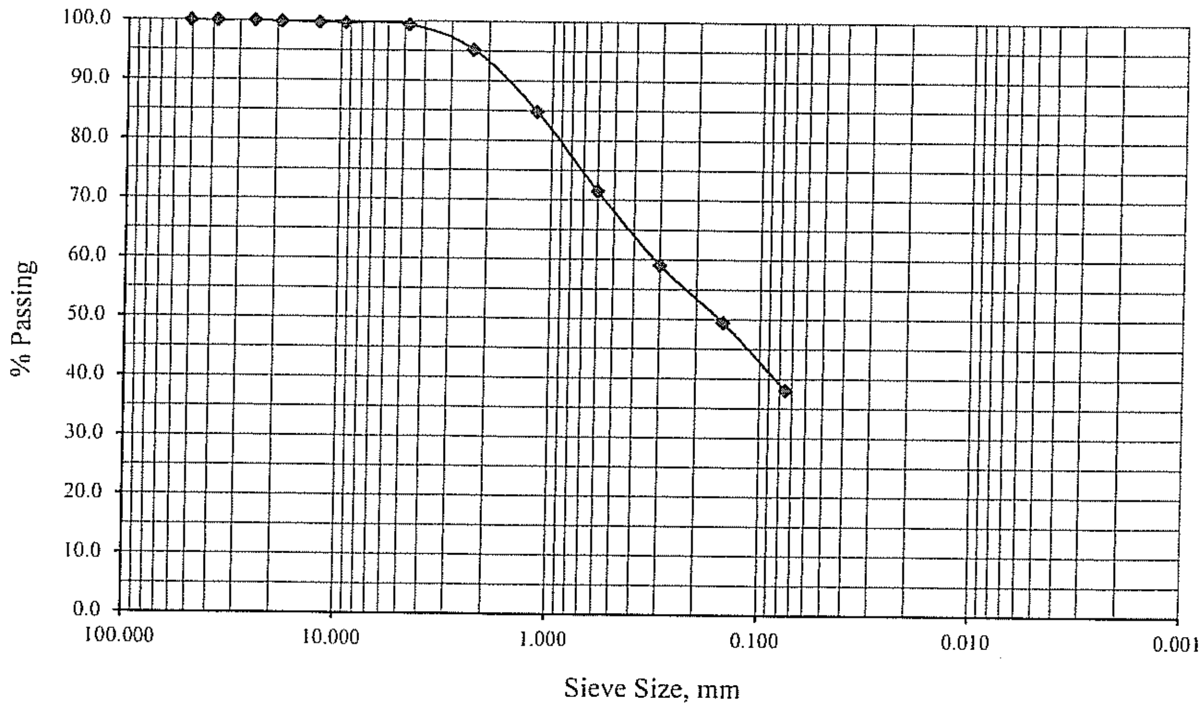
ASTM C117 & C136

October 17, 2019

Project Number: 644-19049
Project Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-1 Bulk 1 @ 0-5'

Soil Classification: SC

Sieve Size, in	Sieve Size, mm	Percent Passing
2"	50.8	100.0
1 1/2"	38.1	100.0
1"	25.4	100.0
3/4"	19.1	99.8
1/2"	12.7	99.7
3/8"	9.53	99.7
#4	4.75	99.4
#8	2.36	95.3
#16	1.18	84.8
#30	0.60	71.5
#50	0.30	59.1
#100	0.15	49.5
#200	0.075	38.1



Sladden Engineering
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Gradation

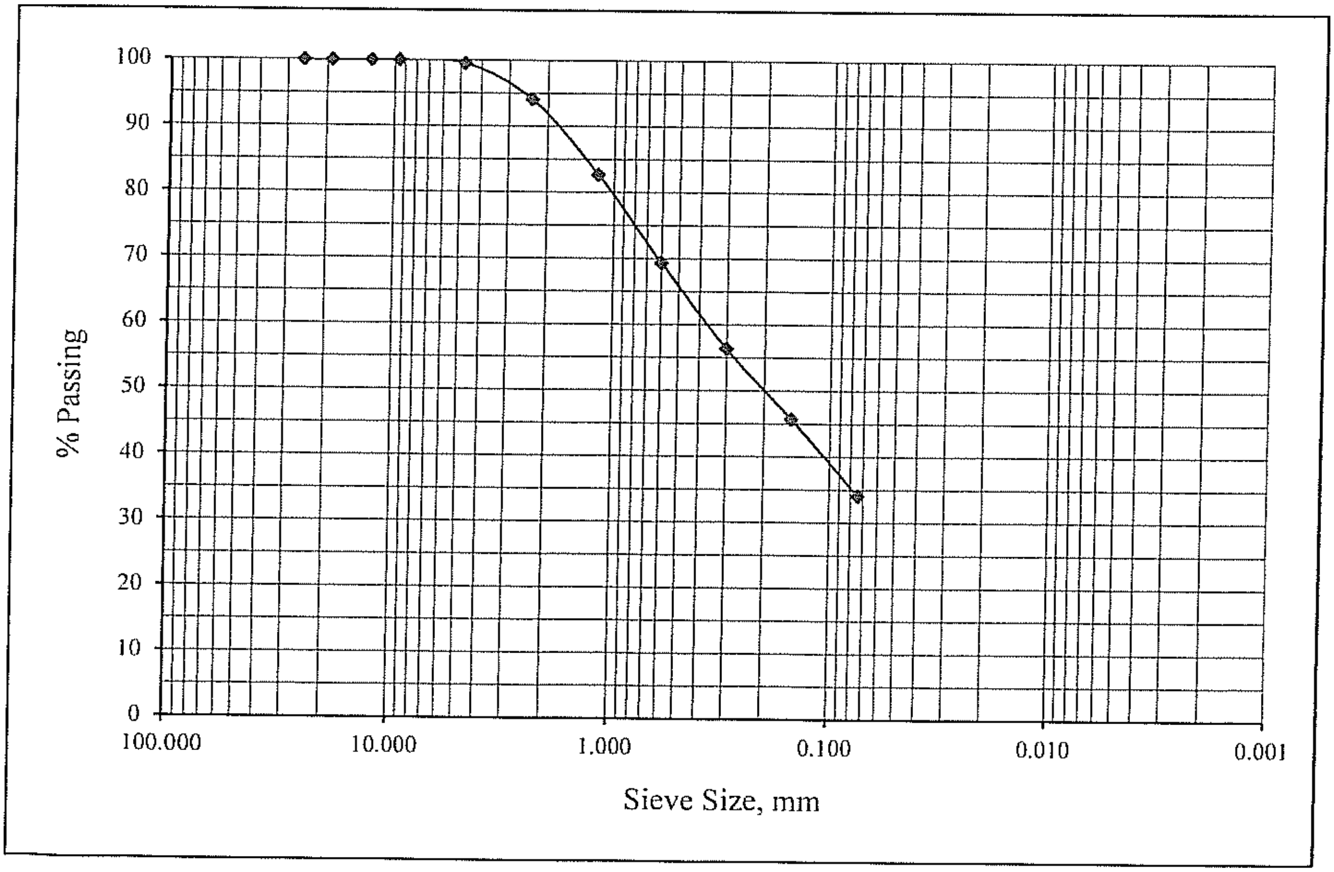
ASTM C117 & C136

Project Number: 644-19049
Project Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-1 R-2 @ 5'

October 17, 2019

Soil Classification: SC

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.5
#8	2.36	94.1
#16	1.18	82.7
#30	0.60	69.3
#50	0.30	56.4
#100	0.15	45.7
#200	0.074	34.1



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Gradation

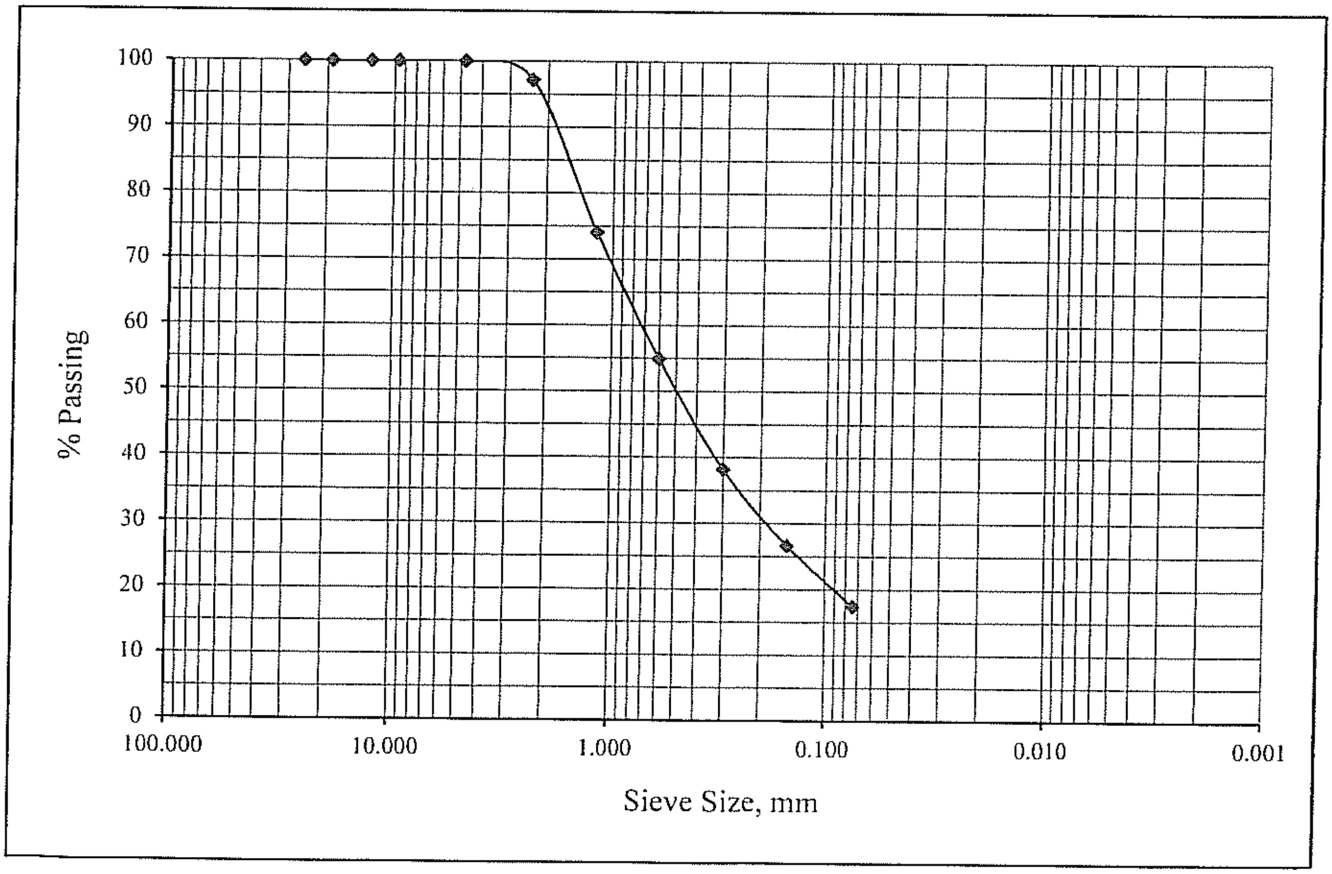
ASTM C117 & C136

Project Number: 644-19049
Project Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-2 R-4 @ 20'

October 17, 2019

Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	100.0
#8	2.36	97.2
#16	1.18	74.1
#30	0.60	54.9
#50	0.30	38.2
#100	0.15	26.6
#200	0.074	17.4



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Gradation

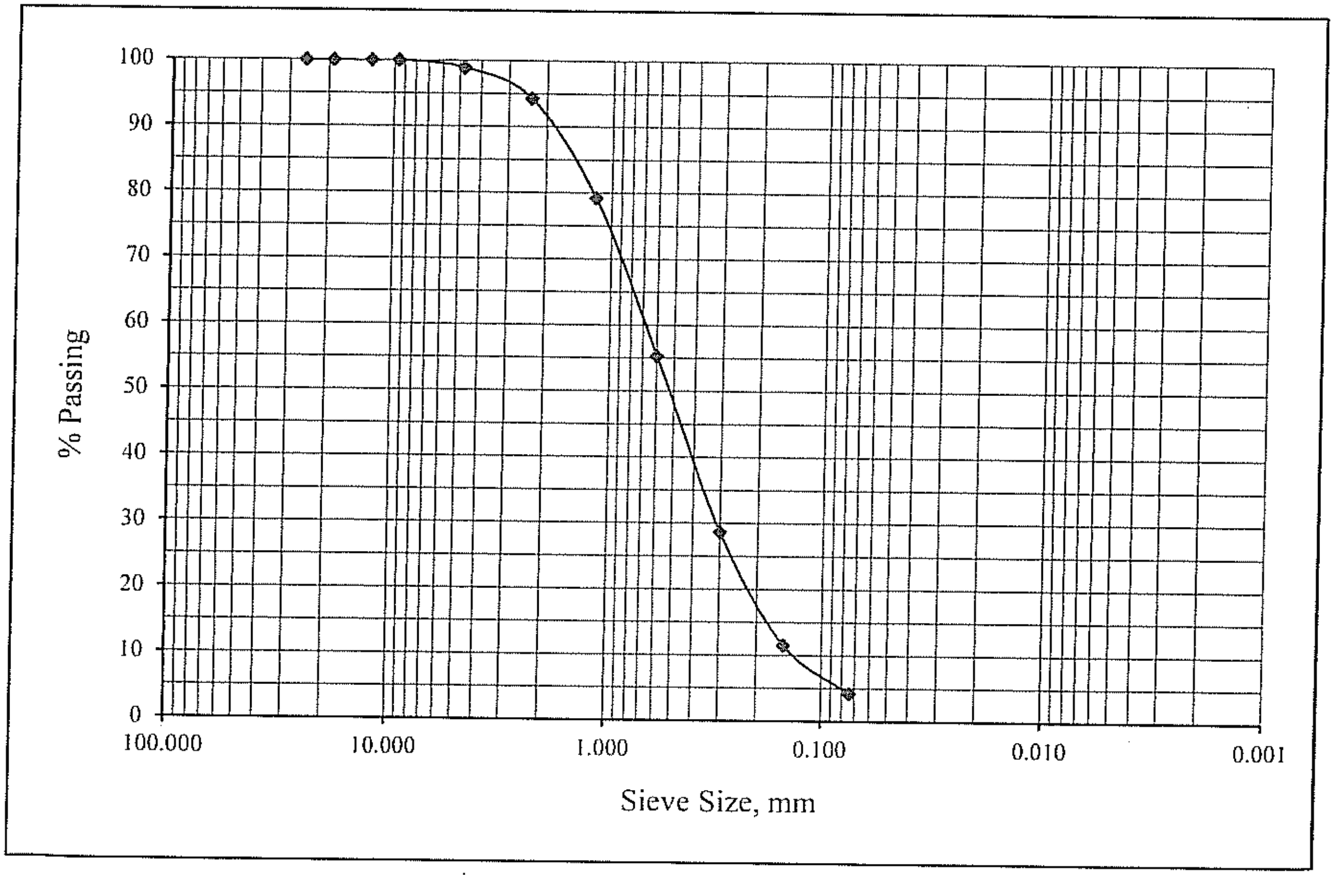
ASTM C117 & C136

Project Number: 644-19049
Project Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-3 S-2 @ 10'

October 17, 2019

Soil Classification: SP

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	98.9
#8	2.36	94.3
#16	1.18	79.2
#30	0.60	55.3
#50	0.30	28.7
#100	0.15	11.5
#200	0.074	4.2



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Gradation

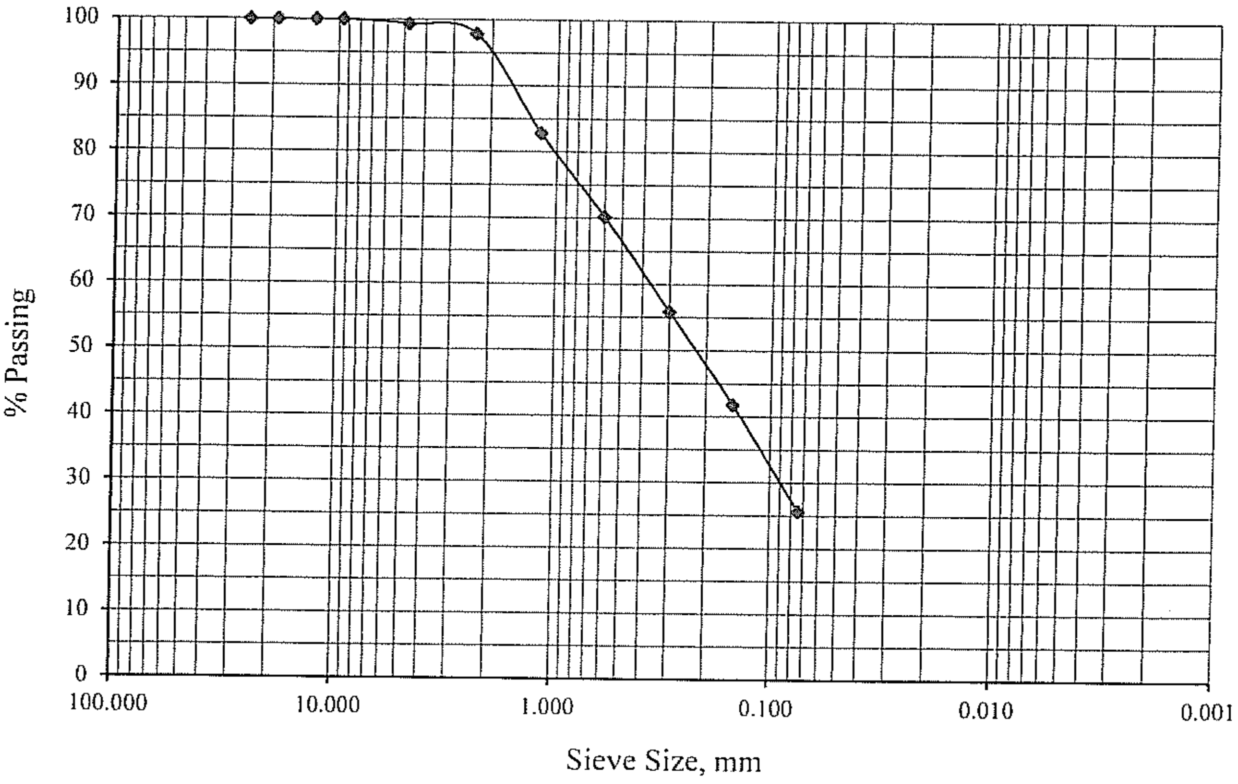
ASTM C117 & C136

Project Number: 644-19049
Project Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-4 R-2 @ 10'

October 17, 2019

Soil Classification: SC

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.3
#8	2.36	97.9
#16	1.18	82.8
#30	0.60	70.2
#50	0.30	55.8
#100	0.15	41.8
#200	0.074	25.6



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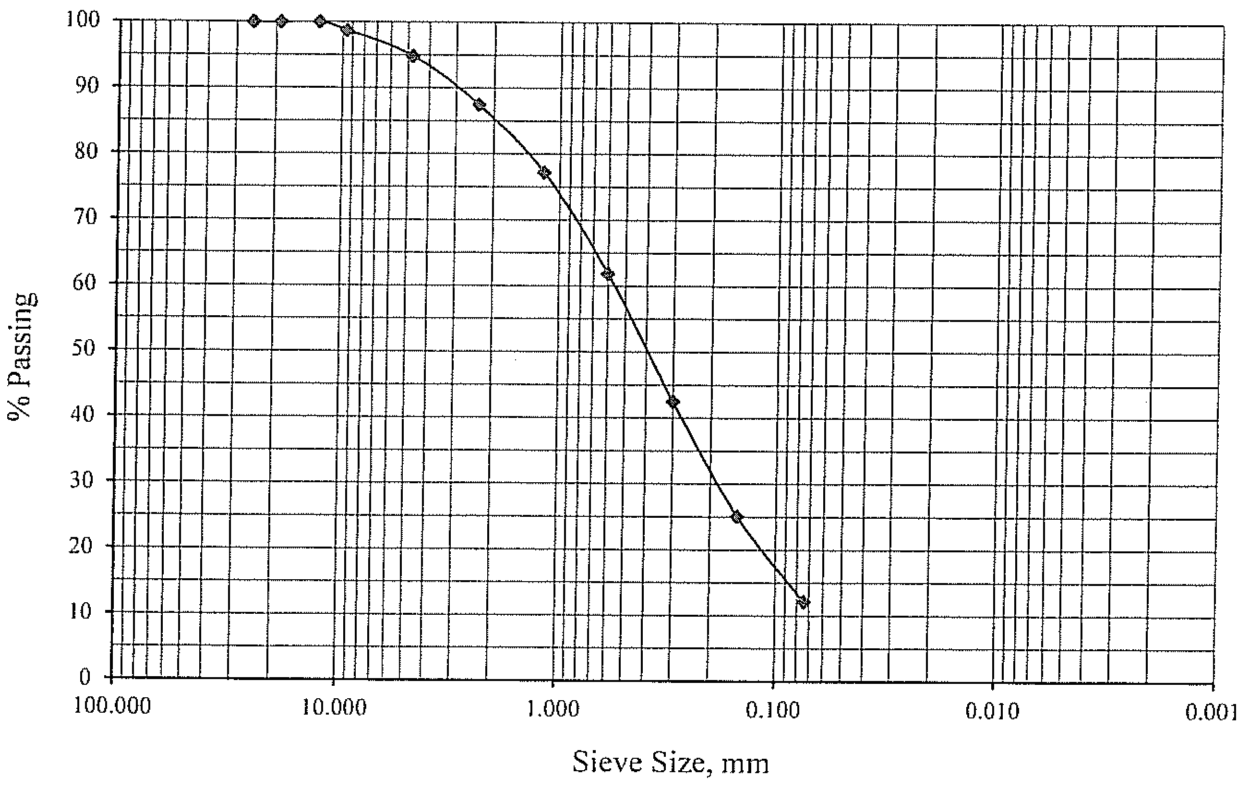
Gradation

ASTM C117 & C136

Project Number: 644-19049
October 17, 2019
Project Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-6 R-2 @ 10'
Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	98.7
#4	4.75	94.8
#8	2.36	87.5
#16	1.18	77.2
#30	0.60	61.9
#50	0.30	42.5
#100	0.15	25.1
#200	0.074	12.1



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Gradation

ASTM C117 & C136

Project Number: 644-19049

October 17, 2019

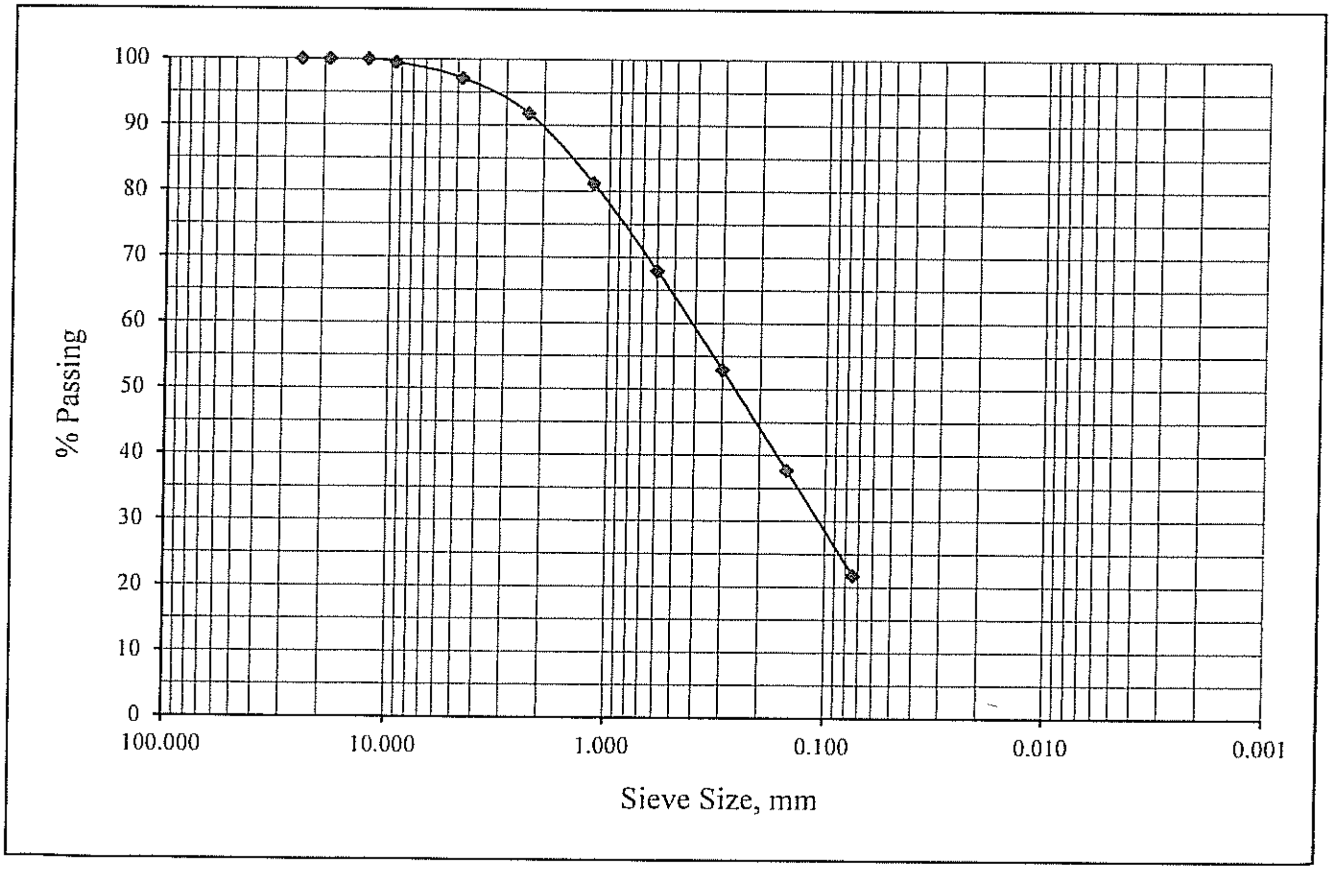
Project Name: NEC Pyrite Street & Mission Boulevard

Lab ID Number: LN6-19522

Sample ID: BH-7 R-5 @ 25'

Soil Classification: SC

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	99.5
#4	4.75	97.1
#8	2.36	91.8
#16	1.18	81.2
#30	0.60	67.9
#50	0.30	53.0
#100	0.15	37.7
#200	0.074	21.8



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One Dimensional Consolidation

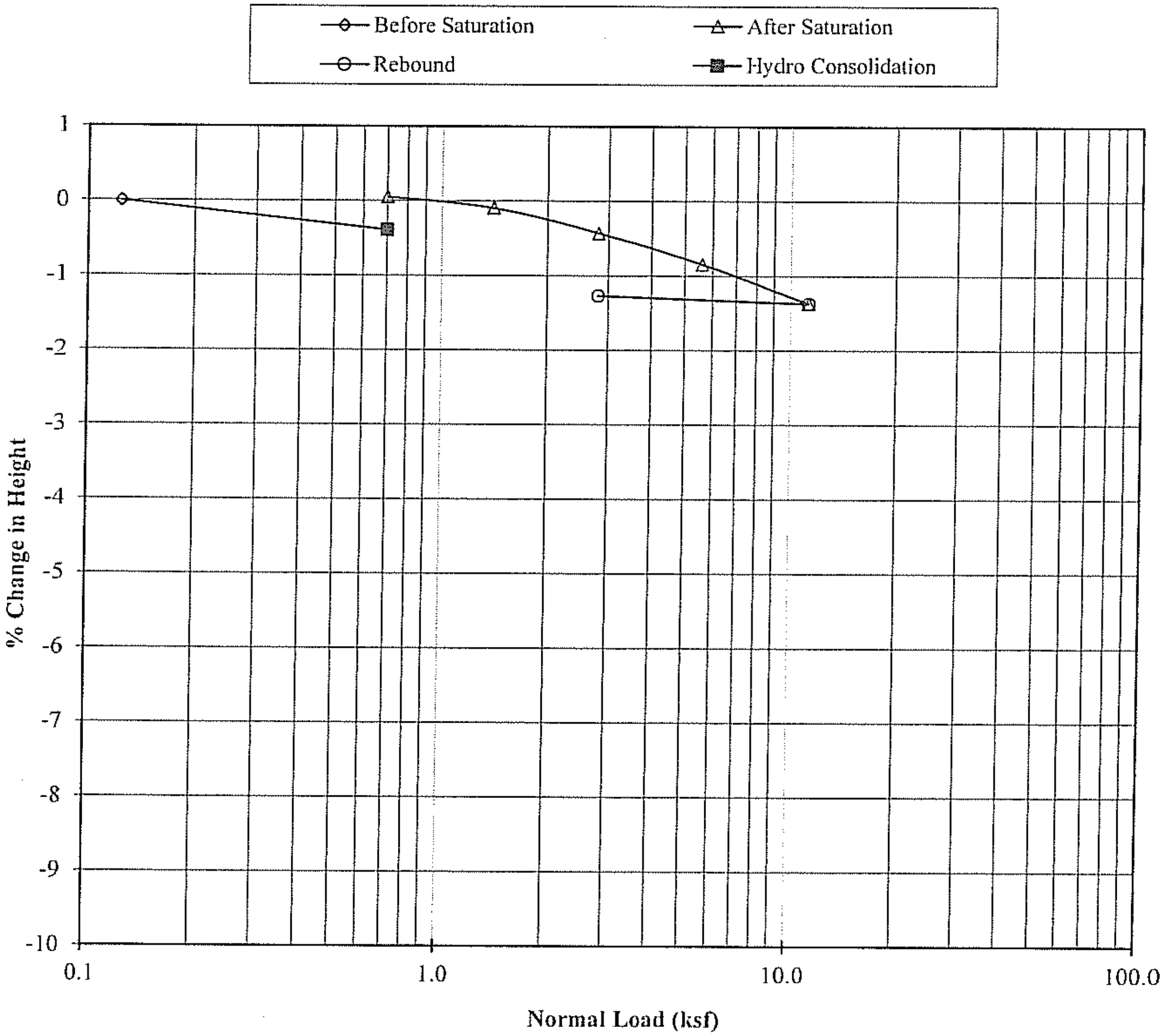
ASTM D2435 & D5333

Job Number: 644-19049
Job Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-1 R-2 @ 5'
Soil Description: Red Brown Clayey Sand (SC)

October 17, 2019

Initial Dry Density, pcf: 136.7
Initial Moisture, %: 6.1
Initial Void Ratio: 0.219
Specific Gravity: 2.67

% Change in Height vs Normal Presssure Diagram



One Dimensional Consolidation

ASTM D2435 & D5333

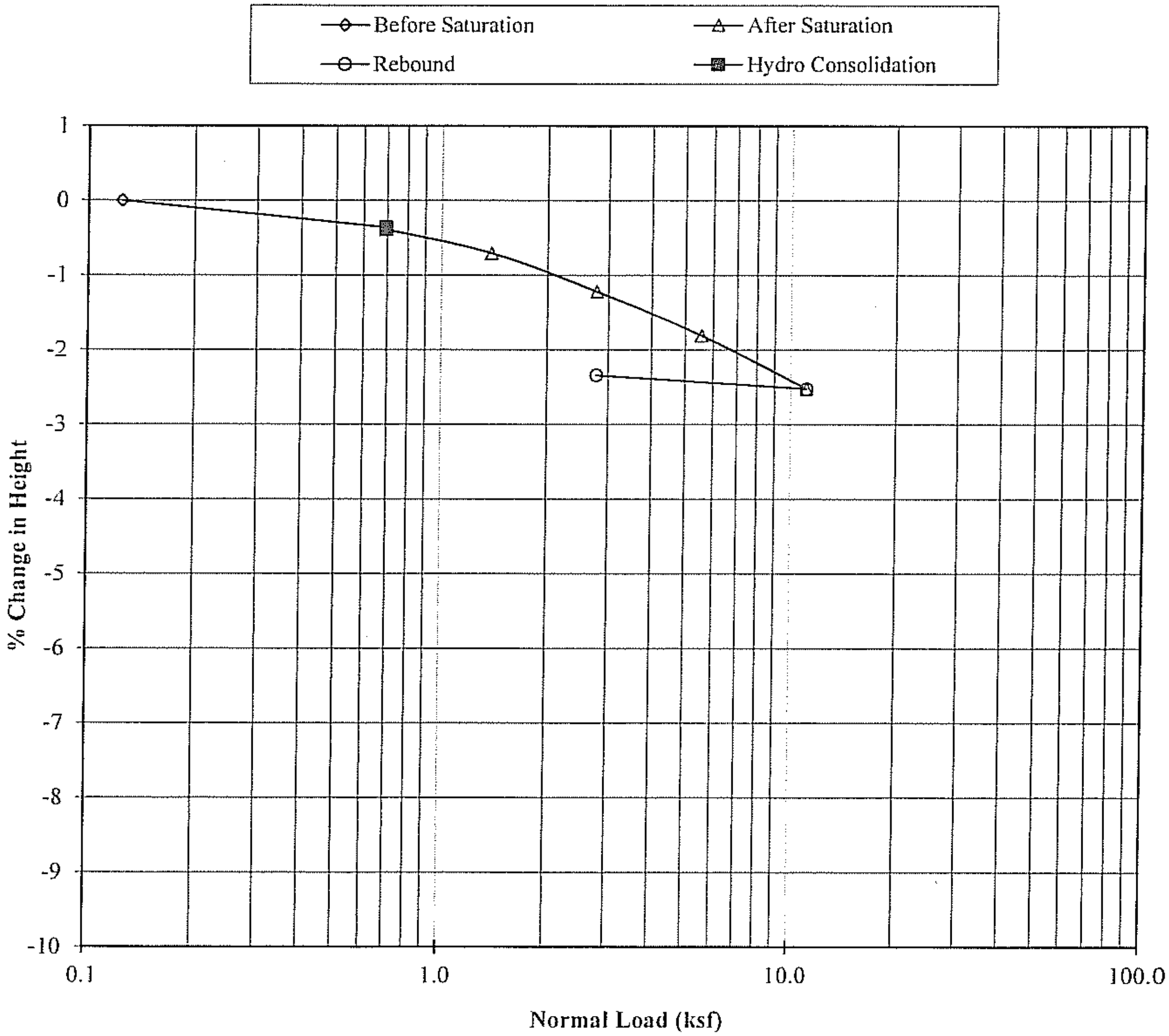
Job Number: 644-19049
Job Name: NEC Pyrite Street & Mission Boulevard

October 17, 2019

Lab ID Number: LN6-19522
Sample ID: BH-4 R-2 @ 10'
Soil Description: Red Brown Clayey Sand (SC)

Initial Dry Density, pcf: 113.0
Initial Moisture, %: 11.9
Initial Void Ratio: 0.476
Specific Gravity: 2.67

% Change in Height vs Normal Presssure Diagram



RESISTANCE '*R*' VALUE AND EXPANSION PRESSURE

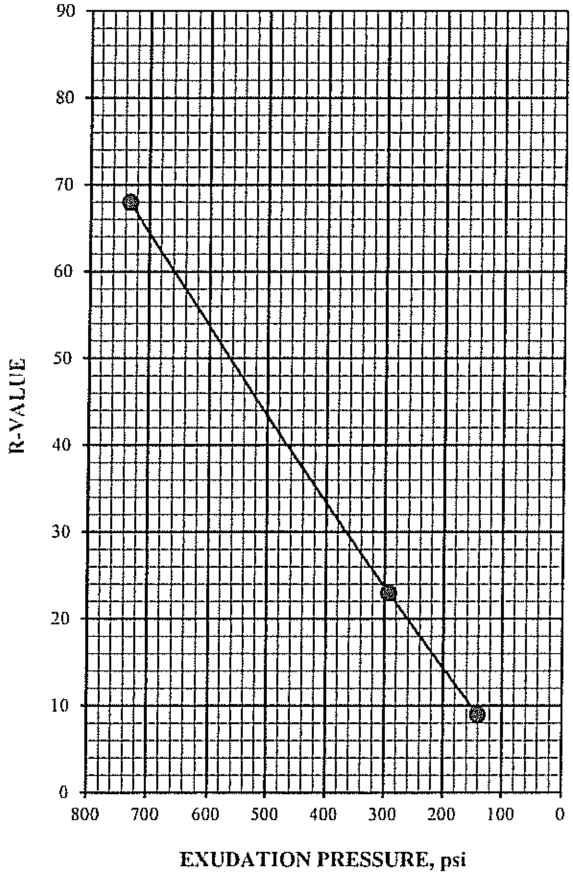
CTM 301

October 17, 2019

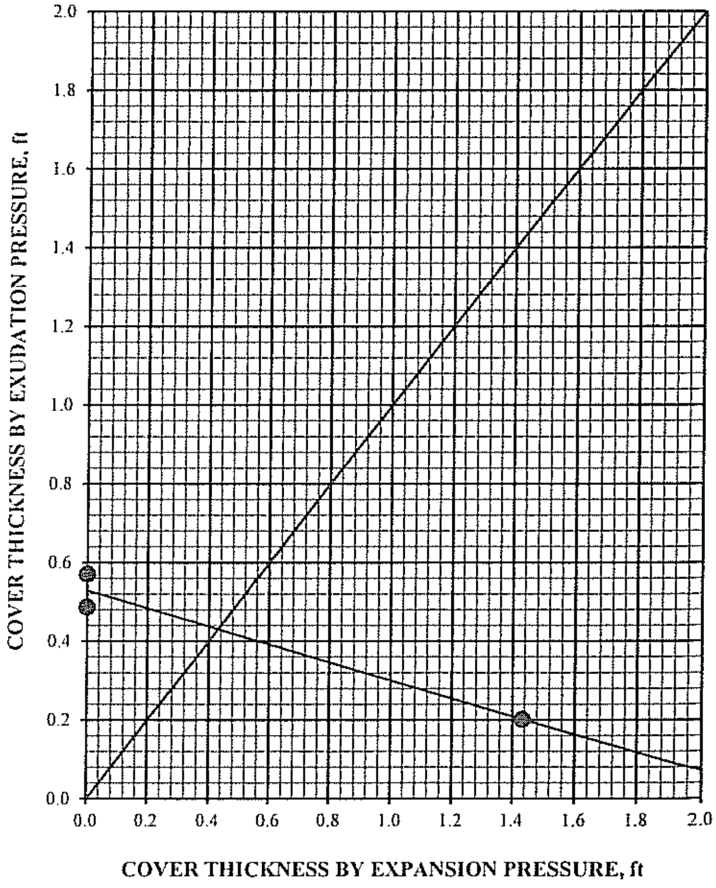
Project Number: 644-19049
Project Name: NEC Pyrite Street & Mission Boulevard
Lab ID Number: LN6-19522
Sample ID: BH-1 Bulk 1 @ 0-5'
Sample Description: Red Brown Clayey Sand (SC)
Specified Traffic Index: 5.0

Dry Density @ 300 psi Exudation Pressure: 124.2-pcf
%Moisture @ 300 psi Exudation Pressure: 11.3%
R-Value - Exudation Pressure: 24
R-Value - Expansion Pressure: 32
R-Value @ Equilibrium: 24

EXUDATION PRESSURE CHART



EXPANSION PRESSURE CHART



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45090 Golf Center Pkwy, Suite F, Indio CA 92201 (760) 863-0713 Fax (760) 863-0847
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Date: October 17, 2019

Account No.: 644-19049

Customer: Panorama Development

Location: APN 171-020-001 & 025, NEC Pyrite Street & Mission Boulevard, Jurupa Valley

Analytical Report

Corrosion Series

	pH per CA 643	Soluble Sulfates per CA 417 ppm	Soluble Chloride per CA 422 ppm	Min. Resistivity per CA 643 ohm-cm
BH-1 @ 0-5’	9.1	280	80	2800

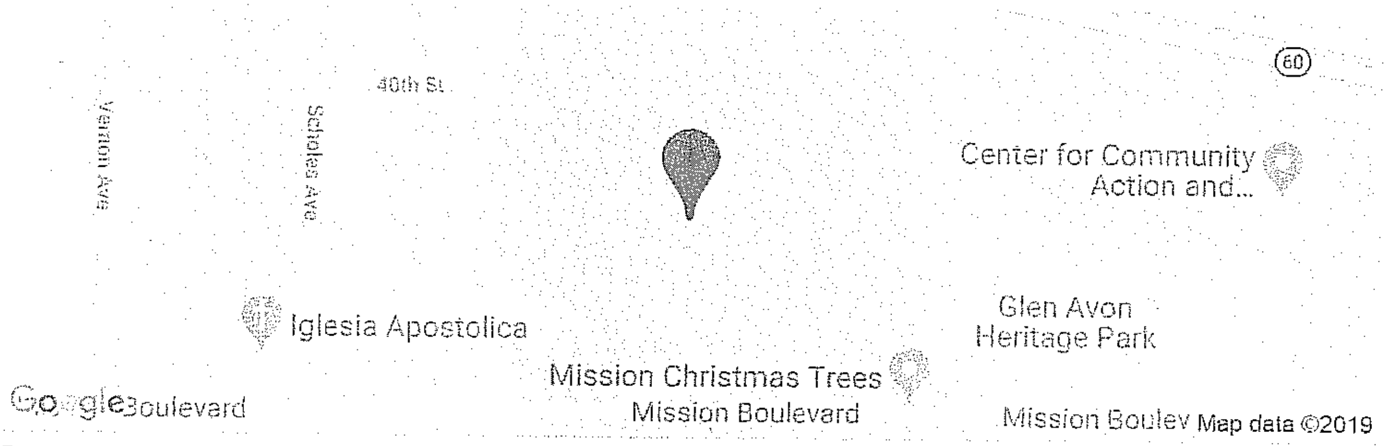
APPENDIX C

SEISMIC DESIGN MAP AND REPORT
DEAGGREGATION OUTPUT

OSHPD

Pyrite Street and Mission Boulevard

Latitude, Longitude: 34.013399, -117.460092

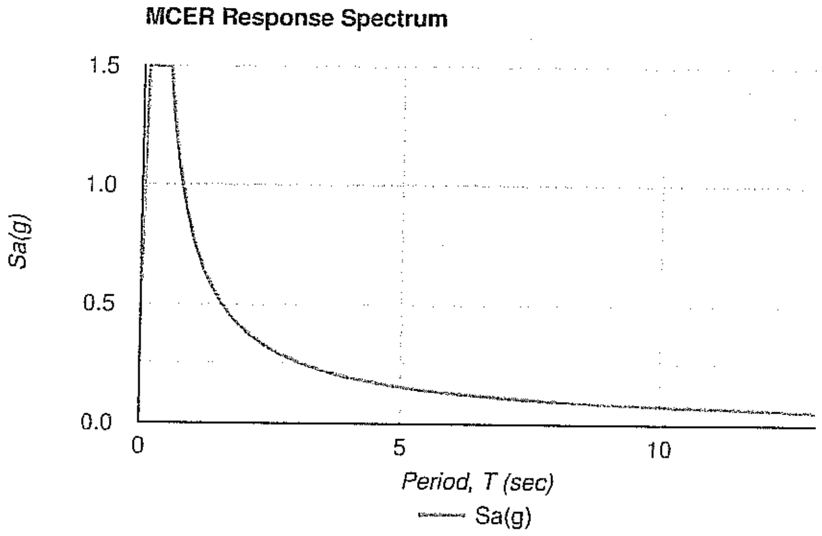


Date	10/7/2019, 12:52:34 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

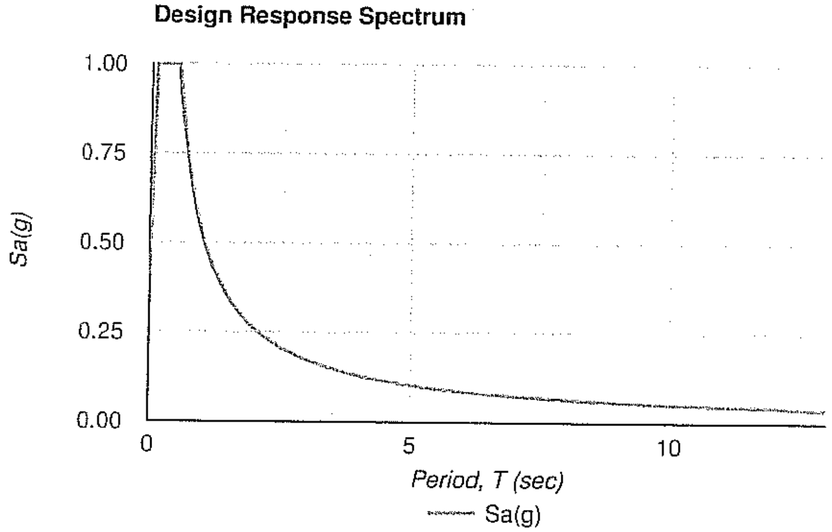
Type	Value	Description
S_S	1.5	MCE$_R$ ground motion. (for 0.2 second period)
S_1	0.6	MCE$_R$ ground motion. (for 1.0s period)
S_{MS}	1.5	Site-modified spectral acceleration value
S_{M1}	0.78	Site-modified spectral acceleration value
S_{DS}	1	Numeric seismic design value at 0.2 second SA
S_{D1}	0.52	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.3	Site amplification factor at 1.0 second
PGA	0.5	MCE$_G$ peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.5	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	1.931	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.727	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.74	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.686	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	1.118	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	1.079	Mapped value of the risk coefficient at a period of 1 s



MCER Response Spectrum



Design Response Spectrum

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

^ Input

Edition

Dynamic: Conterminous U.S. 2014 ...

Latitude

Decimal degrees

34.013399

Longitude

Decimal degrees, negative values for western longitudes

-117.460092

Site Class

360 m/s (C/D boundary)

Spectral Period

Peak Ground Acceleration

Time Horizon

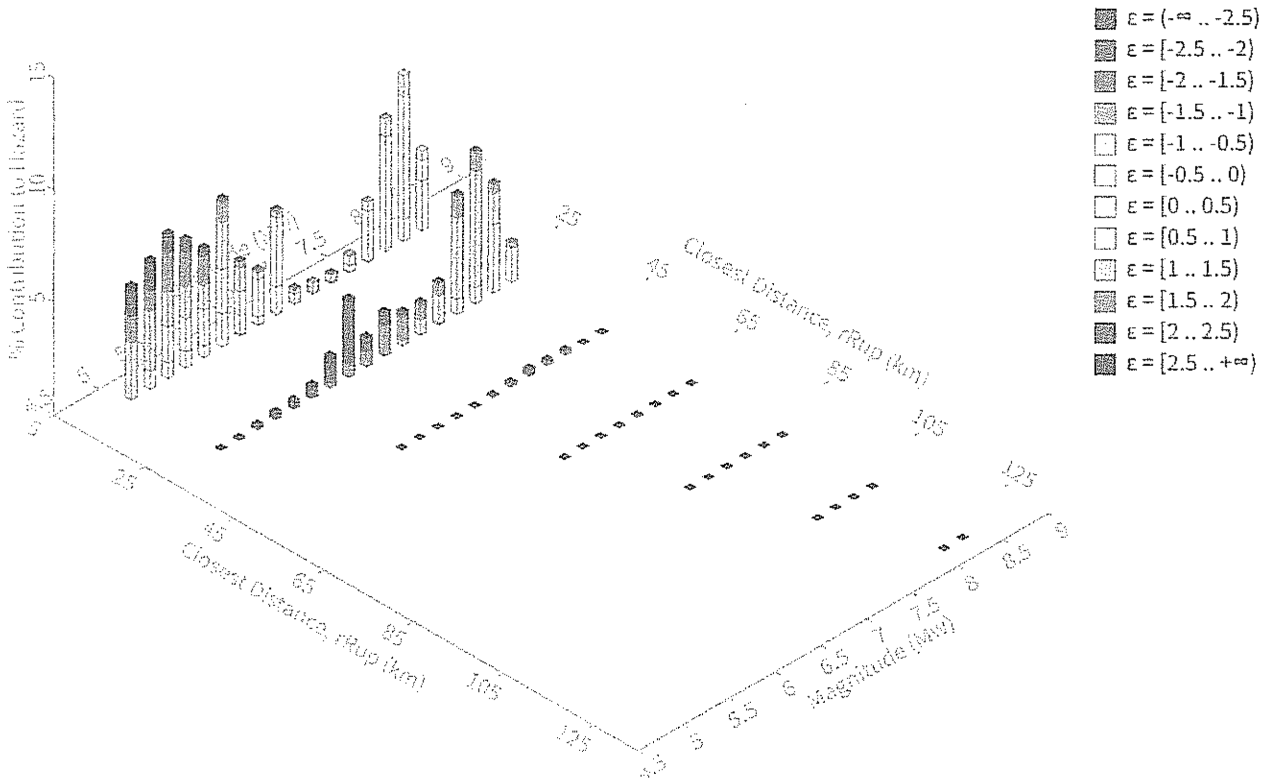
Return period in years

475

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 475 yrs
Exceedance rate: 0.0021052632 yr^{-1}
PGA ground motion: 0.48951827 g

Recovered targets

Return period: 515.33559 yrs
Exceedance rate: 0.0019404831 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.13 %

Mean (over all sources)

m: 6.82
r: 16.31 km
ε_0: 1.18 σ

Mode (largest m-r bin)

m: 8.1
r: 15.81 km
ε_0: 0.65 σ
Contribution: 7.39 %

Mode (largest m-r-ε_0 bin)

m: 8.1
r: 15.82 km
ε_0: 0.59 σ
Contribution: 5.5 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31	System							29.20
San Andreas (San Bernardino N) [4]		24.16	7.83	1.20	117.323°W	34.199°N	31.36	7.73
San Jacinto (San Bernardino) [3]		15.87	8.03	0.69	117.322°W	34.099°N	53.16	7.44
Fontana (Seismicity) [1]		6.91	6.59	0.57	117.514°W	34.054°N	312.53	2.61
San Jacinto (Lytle Creek connector) [2]		15.53	8.00	0.67	117.357°W	34.123°N	37.76	1.93
Whittier alt 1 [0]		22.35	7.51	1.21	117.588°W	33.833°N	210.46	1.48
Elsinore (Glen Ivy) rev [0]		23.69	6.55	2.10	117.563°W	33.819°N	203.64	1.48
UC33brAvg_FM32	System							28.64
San Andreas (San Bernardino N) [4]		24.16	7.84	1.20	117.323°W	34.199°N	31.36	7.82
San Jacinto (San Bernardino) [3]		15.87	8.03	0.69	117.322°W	34.099°N	53.16	7.38
Fontana (Seismicity) [1]		6.91	6.59	0.57	117.514°W	34.054°N	312.53	2.16
San Jacinto (Lytle Creek connector) [2]		15.53	7.99	0.68	117.357°W	34.123°N	37.76	1.94
Whittier alt 2 [0]		22.96	7.59	1.19	117.588°W	33.832°N	210.44	1.50
Elsinore (Glen Ivy) rev [0]		23.69	6.54	2.11	117.563°W	33.819°N	203.64	1.50
UC33brAvg_FM31 (opt)	Grid							21.14
PointSourceFinite: -117.460, 34.063		7.36	5.69	0.95	117.460°W	34.063°N	0.00	2.89
PointSourceFinite: -117.460, 34.063		7.36	5.69	0.95	117.460°W	34.063°N	0.00	2.89
PointSourceFinite: -117.460, 34.045		6.26	5.59	0.82	117.460°W	34.045°N	0.00	2.57
PointSourceFinite: -117.460, 34.045		6.26	5.59	0.82	117.460°W	34.045°N	0.00	2.57
PointSourceFinite: -117.460, 34.117		12.03	5.72	1.58	117.460°W	34.117°N	0.00	1.02
PointSourceFinite: -117.460, 34.117		12.03	5.72	1.58	117.460°W	34.117°N	0.00	1.02
UC33brAvg_FM32 (opt)	Grid							21.02
PointSourceFinite: -117.460, 34.063		7.36	5.69	0.95	117.460°W	34.063°N	0.00	2.89
PointSourceFinite: -117.460, 34.063		7.36	5.69	0.95	117.460°W	34.063°N	0.00	2.89
PointSourceFinite: -117.460, 34.045		6.26	5.59	0.82	117.460°W	34.045°N	0.00	2.57
PointSourceFinite: -117.460, 34.045		6.26	5.59	0.82	117.460°W	34.045°N	0.00	2.57
PointSourceFinite: -117.460, 34.117		12.03	5.72	1.58	117.460°W	34.117°N	0.00	1.02
PointSourceFinite: -117.460, 34.117		12.03	5.72	1.58	117.460°W	34.117°N	0.00	1.02