ATTACHMENT F

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

LIMITED GEOTECHNICAL INVESTIGATION

PROPOSED CAMP GLENN ROCKEY SECURITY UPGRADES PROJECT
1628 & 1900 N. SYCAMORE ROAD
SAN DIMAS, CALIFORNIA

PREPARED FOR
LOS ANGELES COUNTY PUBLIC WORKS
ALHAMBRA, CALIFORNIA

PROJECT NO. W1500-06-08

NOVEMBER 14, 2023

GEOCON
WEST, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. W1500-06-08
November 14, 2023

Los Angeles County Public Works
900 South Fremont Avenue, 5th Floor
Alhambra, California 91803

Attention: Cham Wadu

Subject: LIMITED GEOTECHNICAL INVESTIGATION
PROPOSED CAMP GLENN ROCKEY SECURITY UPGRADES PROJECT
1628 & 1900 NORTH SYCAMORE CANYON ROAD, SAN DIMAS, CALIFORNIA

Dear Ms. Wadu:

In accordance with your authorization of our proposal dated September 26, 2023, we have prepared this limited geotechnical investigation report for the proposed Camp Glenn Rockey Security Upgrades Project located at 1628 and 1900 North Sycamore Canyon Road in the City of San Dimas, California. The accompanying report presents the findings of our study and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as proposed, provided the recommendations provided in this report are followed and implemented during design and construction.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.

REGISTERED PROFESSIONAL ENGINEER H. HARRY DERKALOUSDIAN C 79694 CIVIL STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST SUSAN FRANZEN KIRKGARD No. 1754 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed Camp Glenn Rockey Security Upgrades Project located at 1628 and 1900 North Sycamore Canyon Road in the City of San Dimas, California (see Vicinity Map, Figure 1). The purpose of the investigation was to evaluate the subsurface soil and geologic conditions underlying the areas of proposed improvements and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of design and construction.

The scope of this investigation included site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored on October 12, 2023, by excavating two 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine to depths of approximately 15½ feet below the ground surface. and one 6-inch diameter boring using hand auger equipment to a depth of approximately 3½ feet below the ground surface. The approximate locations of the exploratory borings are depicted on the Site Plan (see Figure 2). A detailed discussion of the field investigation, including logs of the borings, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located at 1628 and 1900 North Sycamore Canyon Road in the City of San Dimas, California. The 1628 North Sycamore Canyon Road site is occupied by a single story at-grade structure (San Dimas Canyon Nature Center), asphalt paved paving lot, water storage tank, a pump house and storge building. The natural terrain is sloping to the southwest, and the parking lot is gently sloping to the east and south. Surface water drainage at the site appears to be by sheet flow along the existing ground contours to the city streets and natural drainage areas. Vegetation consists of mature trees and groundcover, consisting of grasses and shrubs. The 1900 North Sycamore Canyon Road site is occupied by several one to two-story at-grade structures, asphalt paved driveways and parking areas and grass covered landscaped areas. The site is relatively level and surface drainage at the site appears to be by sheet flow along the existing ground contours to the city streets and natural drainage areas. Vegetation consists of grass and trees.

It is our understanding that the proposed project will consist of constructing a new, approximately 48 square foot, guard booth in the location of the existing water fountain at the 1900 North Sycamore Canyon Road site. The proposed security booth will be a prefabricated structure that is approximately 8½ feet in height and constructed at or near existing grade. A new concrete equipment pad will be constructed at the 1628 North Sycamore Canyon Road site. The new equipment pad will support the new standby generator for the pump house located at the site. The water that supplies Camp Glenn Rocky (1900 North Sycamore Canyon Rd. site) is pumped from the water tank located at the 1628 North Sycamore Canyon Road site. The standby generator will provide emergency power to the pump house, if needed. The existing and proposed site conditions are provided on the site plans (see Figure 2).

Based on the preliminary nature of the design at this time, wall and column loads were not available. It is anticipated that column loads for the proposed improvements will be up to 50 kips, and wall loads will be up to 1 kips per linear foot.

Once the design phase proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Any changes in the design, location or elevation of any structure, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps of the area, the site is underlain by artificial fill and Pleistocene age alluvium consisting of silt, sand, and gravel (California Geological Survey [CGS], 2010). Detailed stratigraphic profiles of the materials encountered at the site are provided on the boring logs in Appendix A.

3.1 Artificial Fill

Artificial fill was encountered in the exploratory borings to a depth of 3½ feet below existing ground surface. The artificial fill generally consists of light grayish brown or brown to dark brown silty gravel or sandy silt with varying amounts of fine to coarse-gravel and a few cobbles. The fill is characterized as dry to moist and medium dense or stiff to hard. The fill is likely the result of past grading or construction activities at the site. Deeper fill may exist between excavations and in other portions of the site that were not directly explored.

3.2 Alluvium

Pleistocene age alluvium was encountered beneath the artificial fill and consists of light gray, light reddish gray to light reddish brown, or brown sandy silt, silty sand and silty gravel with varying amounts of fine to coarse-gravel and cobbles. The alluvium can be characterized as dry to moist, hard or medium dense to very dense.

4. GROUNDWATER

Review of the Seismic Hazard Zone Report for the Glendora Quadrangle (California Division of Mines and Geology [CDMG], 1998) indicates the historically highest groundwater level in the area is greater than 150 feet beneath the ground surface. Groundwater information presented in this document is generated from data collected in the early 1900's to the late 1990s. Based on current groundwater basin management practices, it is unlikely that groundwater levels will ever exceed the historic high levels.

Groundwater was not encountered in our field explorations excavated to a maximum depth of 15½ feet below the ground surface. Based on the reported historic high groundwater levels in the site vicinity (CDMG, 1998), the lack of groundwater in our borings, and the depth of proposed construction, static groundwater is neither expected to be encountered during construction, nor have a detrimental effect on the project. However, it is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed, especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the immediate site vicinity. Proper surface drainage of irrigation and precipitation will be critical for the future performance of the project. Recommendations for drainage are provided in the S*urface Drainage* section of this report (see Section 6.11).

5 SEISMIC DESIGN CRITERIA

The following table summarizes the site-specific design criteria obtained from the 2022 California Building Code (CBC; Based on the 2021 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the online application *U.S. Seismic Design Maps*, provided by the Structural Engineers Association of California (SEAOC). The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2022 CBC and Table 20.3-1 of ASCE 7-16. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2022 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2022 CBC Reference
Site Class	D	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.713g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.651g	Figure 1613.2.1(2)
Site Coefficient, F_A	1	Table 1613.2.3(1)
Site Coefficient, F_V	1.7	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.713g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	1.106g*	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.142g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.737g*	Section 1613.2.4 (Eqn 16-39)

*Per Supplement 3 of ASCE 7-16, a ground motion hazard analysis (GMHA) shall be performed for projects on Site Class “D” sites with 1-second spectral acceleration (S_1) greater than or equal to 0.2g, which is true for this site. However, Supplement 3 of ASCE 7-16 provides an exception stating that that the GMHA may be waived provided that the parameter S_{M1} is increased by 50% for all applications of S_{M1}. The values for parameters S_{M1} and S_{D1} presented above have **not** been increased in accordance with Supplement 3 of ASCE 7-16.

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.731g	Figure 22-9
Site Coefficient, F_{PGA}	1.1	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.804g	Section 11.8.3 (Eqn 11.8-1)

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude the construction of the proposed improvements provided the recommendations presented herein are followed and implemented during design and construction.

6.1.2 Up to 3½ feet of existing artificial fill was encountered during the site investigation in boring B2. The existing fill encountered is believed to be the result of past grading and construction activities at the site. However, up to one foot of artificial fill was encountered in the proposed locations of the security booth of the generator equipment pad. Deeper fill may exist in other areas of the site that were not directly explored. The existing fill is not considered suitable for direct support of new slabs. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the *Grading* section of this report are followed (see Section 6.4).

6.1.3 The proposed project improvements (security booth foundation and generator equipment pad) may be supported on a reinforced mat foundation system deriving support in the undisturbed, competent alluvial soils found at and below a depth of 1 foot below the existing ground surface. Foundations should be deepened as necessary to penetrate through any unsuitable soils or existing fill and derive support in the competent alluvial soils. All foundation excavations must be observed and approved in writing by the Geotechnical Engineer prior to placement of steel or concrete. Recommendations for the design of a conventional foundation system are provided in the *Mat Foundation Design* section of this report (see Section 6.5).

6.1.4 Compaction of the foundation excavation bottom will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

6.1.5 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

6.1.6 Based on our observations onsite and our knowledge of the geologic setting, cobbles should be anticipated during earthwork at the subject site. Boulders are also common in this geologic environment and should be expected in the existing fill or alluvial soils. Due to the granular nature of the soils, moderate to excessive caving is anticipated during excavation activities. The contractor should be aware that formwork may be required to prevent caving of shallow spread foundation excavations. In addition, the contractor should be prepared to screen cobble and boulders from the soils during earthwork operations. Generation and disposal of oversized material (greater than 6 inches) should be anticipated.

6.1.7 It is anticipated that stable excavations for construction of the proposed improvements can be achieved with sloping measures. However, if excavations in close proximity to an adjacent property line, existing slope, and/or structure are required, special excavation measures may be necessary in order to maintain lateral support of offsite improvements. Excavation recommendations are provided in the *Temporary Excavations* section of this report (Section 6.9).

6.1.8 Where new paving or hardscape is to be placed, it is recommended that all existing fill and soft alluvial soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing fill and soft alluvial soils in the area of new paving is not required; however, paving constructed over existing uncertified fill or unsuitable alluvial soil may experience increased settlement and/or cracking and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of subgrade soil should be scarified and properly compacted for paving support. Paving recommendations are provided in *Preliminary Pavement Recommendations* sections of this report (see Section 6.8).

6.1.9 Once the design and foundation loading configuration for the proposed structures proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Based on the final foundation loading configurations, the potential for settlement should be reevaluated by this office.

6.1.10 Any changes in the design, location or elevation, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

6.2 Soil and Excavation Characteristics

6.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Due to the granular nature of the soils, moderate to excessive caving is anticipated in unshored excavations. The contractor should also be aware that formwork may be required to prevent caving of foundation excavations. In addition, the contractor should be prepared to screen cobbles and boulders.

6.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of existing adjacent improvements.

6.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping or shoring.

6.2.4 The upper 5 feet of existing site soils encountered during this investigation are considered to have a “very low” to “low” expansive potential (EI = 16 and 23, respectively) and are classified as “non-expansive” and “expansive”, respectively based on the 2022 California Building Code (CBC) Section 1803.5.3. Recommendations presented herein assume that proposed foundations will derive support in these materials.

6.3 Minimum Resistivity, pH and Water-Soluble Sulfate Content

6.3.1 Potential of Hydrogen (pH) and resistivity testing as well as chloride content testing were performed on representative samples of soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered “moderately corrosive” to “corrosive” with respect to corrosion of buried ferrous metals on site. Due to the corrosive potential of the soils, it is recommended that PVC, ABS or other approved plastic piping be utilized in lieu of cast-iron when in direct contact with the site soils. The results are presented in Appendix B (Figure B12) and should be considered for design of underground structures.

6.3.2 Laboratory tests were performed on representative samples of the on-site soil to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B12) and indicate that the on-site materials possess a sulfate exposure class of “S0” to concrete structures as defined by 2022 CBC Section 1904 and ACI 318-19 Chapter 19.

6.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

6.4 Grading

6.4.1 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer, geotechnical engineer, and building official in attendance. Special soil handling requirements can be discussed at that time.

6.4.2 Based on our observations onsite and our knowledge of the geologic setting, cobbles should be anticipated during earthwork at the subject site. Additionally, some of the site soils have little to no cohesion and are prone to excessive caving. The contractor should be prepared for difficult excavation conditions.

6.4.3 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill and alluvial soil encountered during exploration is suitable for re-use as engineered fill, provided any encountered oversize material (greater than 6 inches) and any encountered deleterious debris are removed. The contractor should be prepared to screen cobble and, possibly, boulders from the soils during earthwork operations. Generation and disposal of oversized material (greater than 6 inches) should be anticipated.

6.4.4 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structures should be exported from the site and should not be mixed with the fill soils. Concrete should not be mixed with the fill soils unless approved by the Geotechnical Engineer. All existing underground improvements planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein.

6.4.5 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

6.4.6 Compaction of the foundation excavation bottom will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

6.4.7 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to near optimum moisture content, and compacted to at least 90 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

6.4.8 It is anticipated that stable excavations can be achieved with sloping measures. However, for excavations in close proximity to an adjacent property line and/or existing structure, special excavation measures will be necessary in order to maintain lateral support of offsite improvements. Excavation recommendations are provided in the *Temporary Excavations* section of this report (Section 6.9).

6.4.9. Where new paving or hardscape is to be placed, it is recommended that all existing fill and soft alluvium be excavated and properly compacted for paving support. As a minimum, the upper 12 inches of soil should be excavated, moisture conditioned to near optimum moisture content, and compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 6.8).

6.4.10 Utility trenches should be properly backfilled in accordance with the following requirements. The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry as backfill is also acceptable. Prior to placing any bedding materials or pipes, the excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

6.4.11 Although not anticipated for this project, all imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. If necessary, import soils used as structural fill should have an expansion index less than 20 and corrosivity properties that are equally or less detrimental to that of the existing onsite soils. Import soils placed in the building area should be placed uniformly across the building pad or in a manner that is approved by the Geotechnical Engineer (a representative of Geocon).

6.4.12 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding materials, fill, steel, gravel, or concrete.

6.5 Mat Foundation Design

6.5.1 It is recommended that a reinforced concrete mat foundation system be utilized for support of the proposed project improvements (security booth foundation and generator equipment pad). The foundations may derive support in competent alluvium found at and below a depth of 1 foot below the ground surface. Foundations should be deepened as necessary to penetrate through any unsuitable soils or existing fill and derive support in the competent alluvial soils. Compaction of the foundation excavation bottom will be required prior to placing steel or concrete. Compaction of the excavation bottom is typically accomplished with a compaction wheel or mechanical whacker after wetting the soils. All foundation excavations must be observed and approved by the Geotechnical Engineer (a representative of Geocon), prior to placing steel or concrete.

6.5.2 Due to the granular nature of soils and potential for caving, the contractor should be prepared to form foundation excavations, if necessary.

6.5.3 The recommended maximum allowable bearing value for the design of a reinforced concrete mat foundation is 2,000 pounds per square foot (psf). The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

6.5.4 It is recommended that a modulus of subgrade reaction of 150 pounds per cubic inch (pci) be utilized for the design of the mat foundation on the existing fill soils exposed at the excavation bottom.

$$K_R = K\left[\frac{B+1}{2B}\right]^2$$

where: K_R = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

6.5.5 The thickness of and reinforcement for the mat foundation should be designed by the project structural engineer.

6.5.6 For seismic design purposes, a coefficient of friction of 0.43 may be utilized between concrete slab and alluvium without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

6.5.7 The maximum expected static settlement for an equipment pad mat foundation system deriving support in the recommended bearing material is estimated to be less than ¾ inch and occur below the heaviest loaded structural element. A majority of the settlement of the foundation system is expected to occur on initial application of loading; however, minor additional settlements are expected within the first 12 months. Differential settlement is expected to be less than ½ inch between the center of the mat and the corner of the mat.

6.5.8 No special subgrade presaturation is required prior to placement of concrete. However, the foundation subgrade should be sprinkled as necessary to maintain a moist condition at the time of concrete placement.

6.5.9 Slabs-on-grade at the ground surface that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder selection and design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) as well as ASTM E1745 and should be installed in general conformance with ASTM E 1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning is recommended. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4-inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

6.5.10 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

6.5.11 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

6.6 Lateral Design

6.6.1 Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. An allowable coefficient of friction of 0.43 may be used with the dead load forces in the existing fill soils.

6.6.2 Passive earth pressure for the sides of foundations and slabs poured against existing fill may be computed as an equivalent fluid having a density of 270 pounds per cubic foot (pcf) with a maximum earth pressure of 2,700 psf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

6.7 Exterior Concrete Slabs-on-Grade

6.7.1 Exterior concrete slabs-on-grade subject to vehicle loading should be designed in accordance with the recommendations in the *Preliminary Pavement Recommendations* section of this report (Section 6.8).

6.7.2 Exterior slabs for walkways or flatwork, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moistened to near optimum moisture content and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. The project structural engineer should design construction joints as necessary.

6.7.3 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

6.8 Preliminary Pavement Recommendations

6.8.1 Where new paving is to be placed, it is recommended that all existing fill and soft or unsuitable alluvial materials be excavated and properly recompacted for paving support. The client should be aware that excavation and compaction of all existing artificial fill and soft alluvium in the area of new paving is not required; however, paving constructed over existing unsuitable material may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of paving subgrade should be scarified, moisture conditioned to near optimum moisture content, and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

6.8.2 The following pavement sections are based on a laboratory R-Value of 30. If import soils are utilized and once site grading activities are complete, additional R-value testing can be conducted to confirm the properties of the soils serving as paving subgrade prior to placing pavement.

6.8.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Parking And Driveways	4	3	4
Trash Truck & Fire Lanes	7	4	10

6.8.4 Asphalt concrete should conform to Section 203-6 of the "*Standard Specifications for Public Works Construction*" (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the "*Standard Specifications of the State of California, Department of Transportation*" (Caltrans). The use of Crushed Miscellaneous Base in lieu of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the "*Standard Specifications for Public Works Construction*" (Green Book).

6.8.5 Unless specifically designed and evaluated by the project structural engineer, where concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 5 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The subgrade and base material should be compacted to 95 percent relative compaction as determined by ASTM Test Method D 1557 (latest edition).

6.8.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

6.9 Temporary Excavations

6.9.1 Excavations on the order of 3 feet in height may be required during construction activities. The excavations are expected to expose artificial fill materials and alluvial soils, which are suitable for vertical excavations up to 5 feet in height where loose soils or caving sands are not present, and where not surcharged by adjacent traffic or structures.

6.9.2 Vertical excavations greater than 5 feet or where surcharged by existing foundations will require sloping or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments could be sloped back at a uniform 1½:1 (H:V) slope gradient or flatter up to maximum height of 6 feet. A uniform slope does not have a vertical portion. Where space is limited, special excavation measures will be required.

6.9.3 If excavations in close proximity to an adjacent property line and/or structure are required, special excavation measures may be necessary in order to maintain lateral support of offsite improvements. If special excavation measures are required, the recommendations will be provided under separate cover.

6.9.4 Where temporary construction slopes are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction slopes are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

6.10 Surface Drainage

6.10.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.

6.10.2 All site drainage should be collected and controlled 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. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2022 CBC 1804.4 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within five feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within five feet of the building perimeter footings except when enclosed in protected planters.

6.10.3 Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. Pavement areas should be fine graded such that water is not allowed to pond.

6.10.4 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

6.11 Plan Review

6.11.1 Grading, foundation, and, if applicable, shoring plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

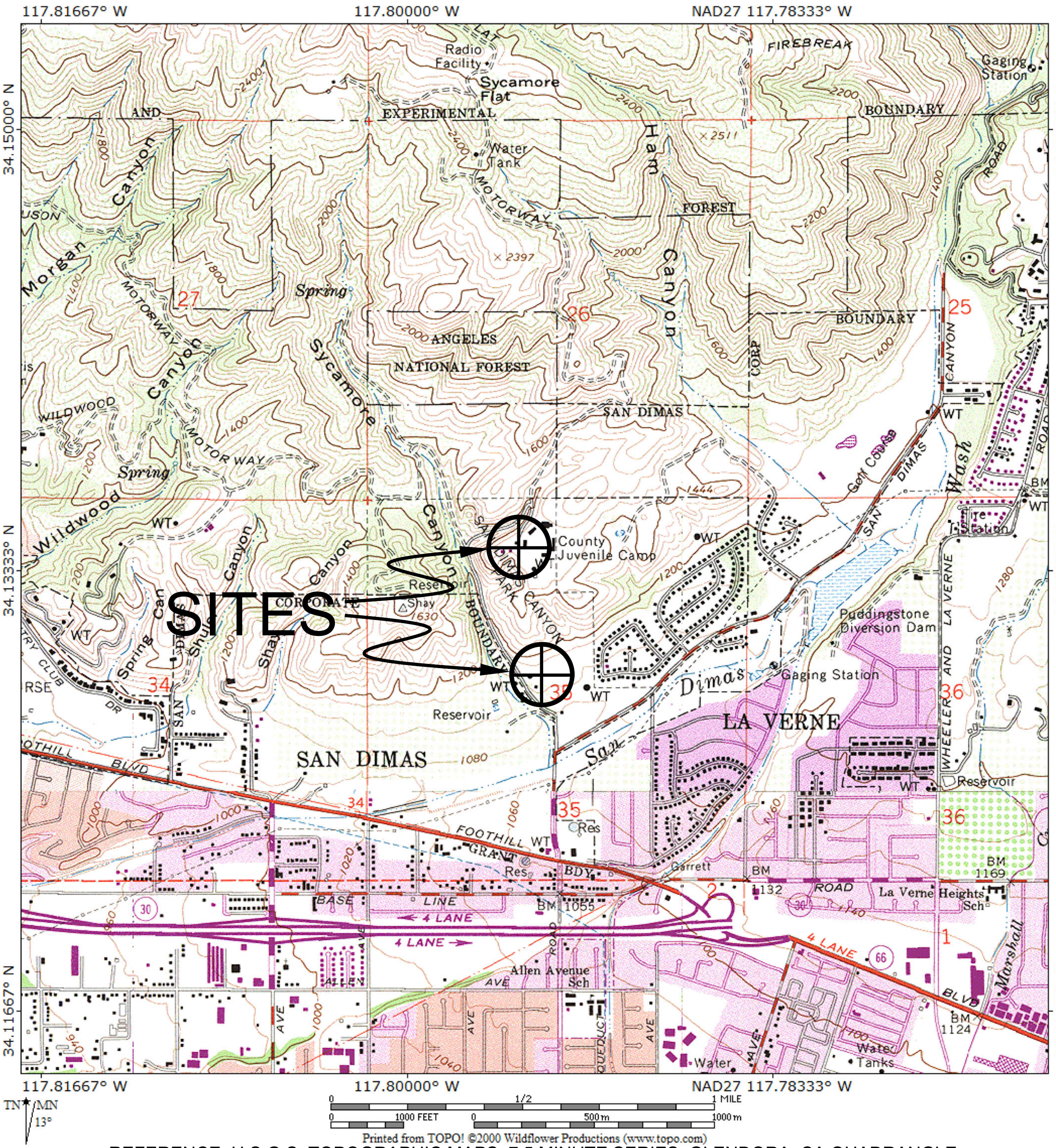
LIST OF REFERENCES

California Division of Mines and Geology, 1999; *State of California Seismic Hazard Zones, Glendora Quadrangle,* Official Map, Released: March 25, 1999.

California Division of Mines and Geology, 1998, *Seismic Hazard Zone Report for the Glendora 7.5-Minute Quadrangle, Los Angeles County, California,* Open-File Report 98-116.

California Geological Survey, 2010, *Geologic Compilation of Quaternary Surficial Deposits in Southern California, San Bernardino 30' X 60' Quadrangle*, A Project for the Department of Water Resources by the California Geological Survey, Compiled from existing sources by Trinda L. Bedrossian, CEG, Cheryl A. Hayhurst, PG, and Peter D. Roffers, CGS Special Report 217, Plate 13, Scale 1:100,000.

OSHPD Seismic Design Maps Web Application, https://seismicmaps.org/, accessed October 2023.



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

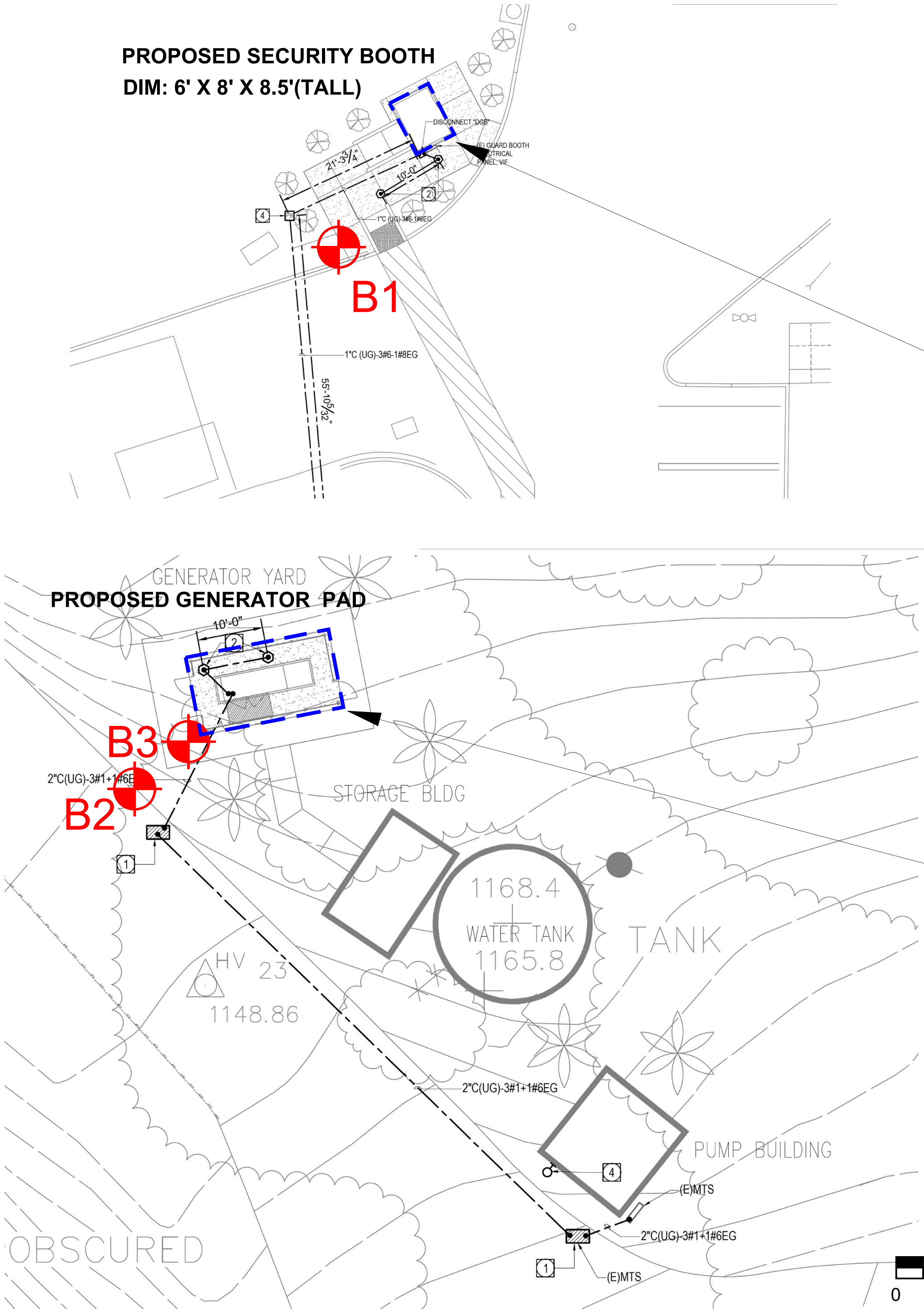
GEOCON WEST, INC.

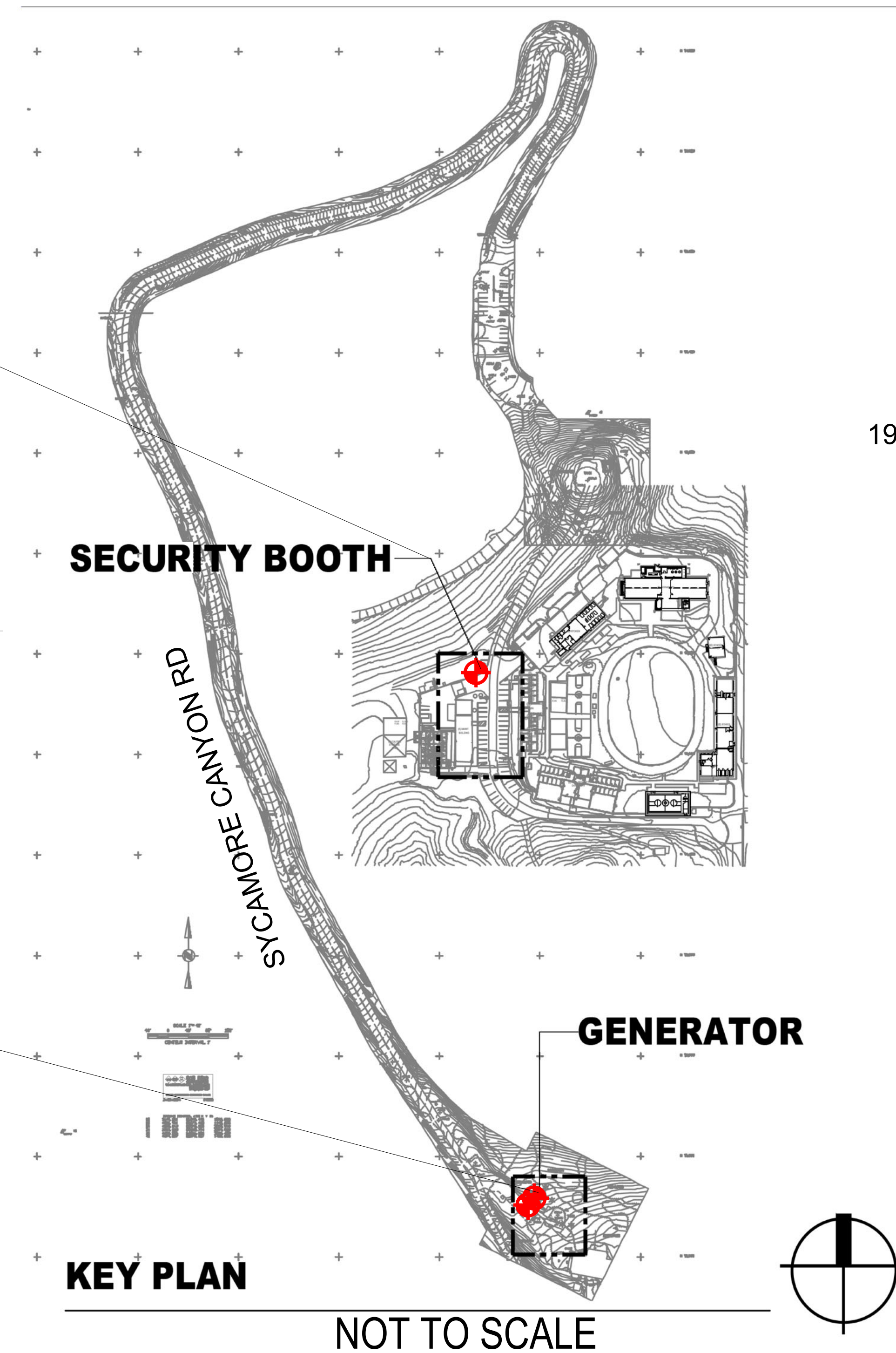
ENVIRONMENTAL GEOTECHNICAL MATERIALS
500 NORTH VICTORY BOULEVARD BURBANK, CA 91502
PHONE (818) 841-8388 - FAX (818) 841-1704

VICINITY MAP

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

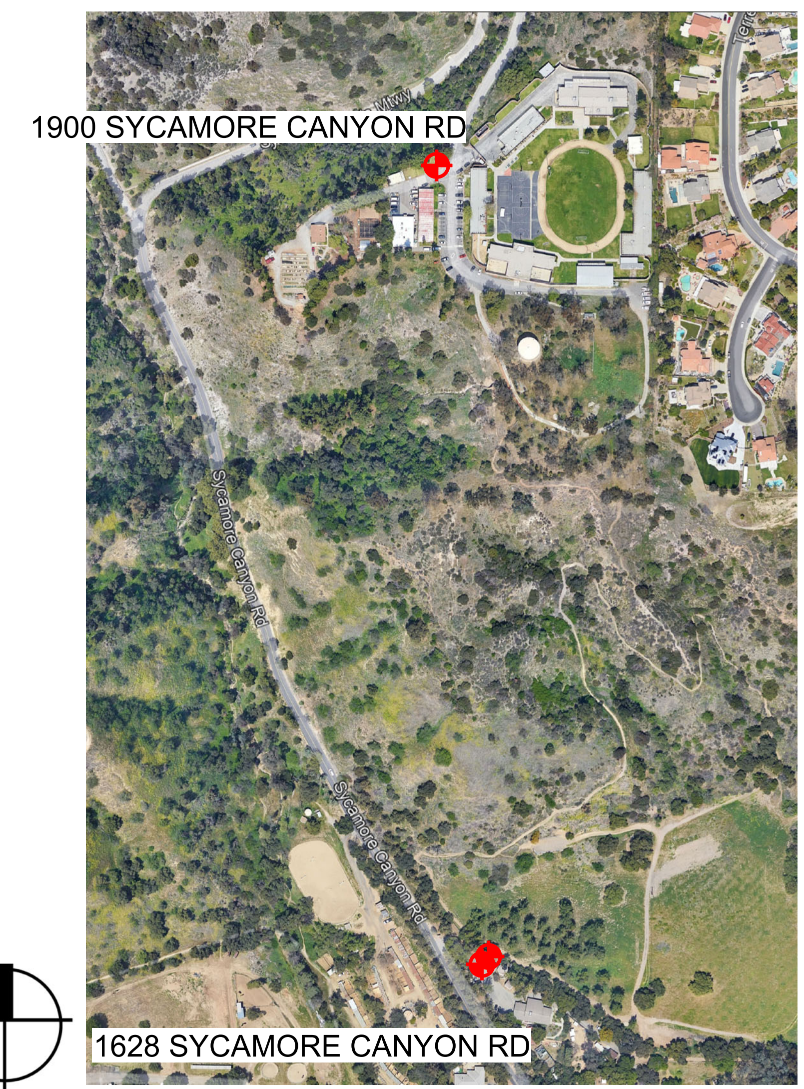
DRAFTED BY: RA	CHECKED BY: SFK	NOV. 2023	PROJECT NO. W1500-06-08	FIG. 1





Legend

- B3 Boring Locations
- Limit of Proposed Improvements



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DRAFTED BY: JJK	CHECKED BY: HHD

SITE PLAN

1628 SYCAMORE CANYON ROAD AND 1900 SYCAMORE CANYON ROAD SAN DIMAS, CALIFORNIA

NOV. 2023	PROJECT NO: W1500-06-08	FIG. 2

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The site was explored on October 12, 2023, by excavating two 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine to depths of approximately 15½ feet below the ground surface and one 6-inch diameter boring using hand auger equipment to a depth of approximately 3½ feet below the ground surface. Representative and relatively undisturbed samples were obtained by driving a 3-inch, O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a 140-pound auto-hammer falling 30 inches. The California Modified Sampler was equipped with 1-inch by 2³/₈-inch diameter brass sampler rings to facilitate soil removal and testing. Bulk samples were obtained.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figures A1 through A3. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the logs were revised based on subsequent laboratory testing. The approximate locations of the borings are indicated on Figure 2.

PROJECT NO. W1500-06-08

BORING 1

ELEV. (MSL.) - - DATE COMPLETED 10/12/2023

EQUIPMENT HOLLOW STEM AUGER BY: JJK

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'				**ARTIFICIAL FILL** Sandy Silt, stiff to hard, dry, light grayish brown, some fine to coarse gravel, trace cobbles.			
2	B1@2.5'			ML	**ALLUVIUM** Sandy Silt, hard, dry, light reddish gray, fine-grained.	50 (3")	102.4	9.8
4				SM	Silty Sand, very dense, dry, light reddish gray and light gray, fine-grained.			
6	B1@5.5'					50 (6")	105.5	10.8
8	B1@7.5'			GM	Silty Gravel, dense, dry to slightly moist, brown and light reddish brown, fine gravel, trace cobbles (to 4"). - no recovery	50 (6")		
10	B1@10'					62	91.1	8
12								
14	B1@15'					50 (3")	104.8	7.5

Total depth of boring: 15.5 feet
Fill to 1 foot.
No groundwater encountered.
Backfilled with soil cuttings and tamped.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.
NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

W1500-06-08 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. W1500-06-08

BORING 2

ELEV. (MSL.) - - DATE COMPLETED 10/12/2023

EQUIPMENT HOLLOW STEM AUGER BY: JJK

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ASPHALT: 4" BASE: 4 1/2"** **ARTIFICIAL FILL** Silty Gravel, medium dense, moist, brown to dark brown, fine angular gravel.			
2	B2@2.5'					37	84.4	6.8
4					**ALLUVIUM** Silty Gravel, very dense, moist, brown, predominately fine-grained, some coarse-grained sand and coarse gravel.			
6	B2@5'				- no recovery	50 (4")		
8	B2@7.5'			GM		50 (4")	112.1	5
10	B2@10'				- fine gravel, trace coarse gravel	56	112.4	3.9
12								
14	B2@15'				- very dense	50 (4")	112.9	5.8

Total depth of boring: 15.5 feet
Fill to 3.5 feet.
No groundwater encountered.
Backfilled with soil cuttings and tamped.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.
NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

Figure A2,
Log of Boring 2, Page 1 of 1

W1500-06-08 BORING LOGS.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 3 ELEV. (MSL.) - - DATE COMPLETED 10/12/2023 EQUIPMENT HAND AUGER BY: JJK	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0 2	BULK 0-3.5'			SM	**ALLUVIUM** Silty Sand, medium dense, moist, dark brown, fine-grained with fine to coarse gravel, some cobbles.			
					Refusal at 3.5 feet. No fill. No groundwater encountered. Backfilled with soil cuttings and tamped. NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.			

Figure A3,
Log of Boring 3, Page 1 of 1

W1500-06-08 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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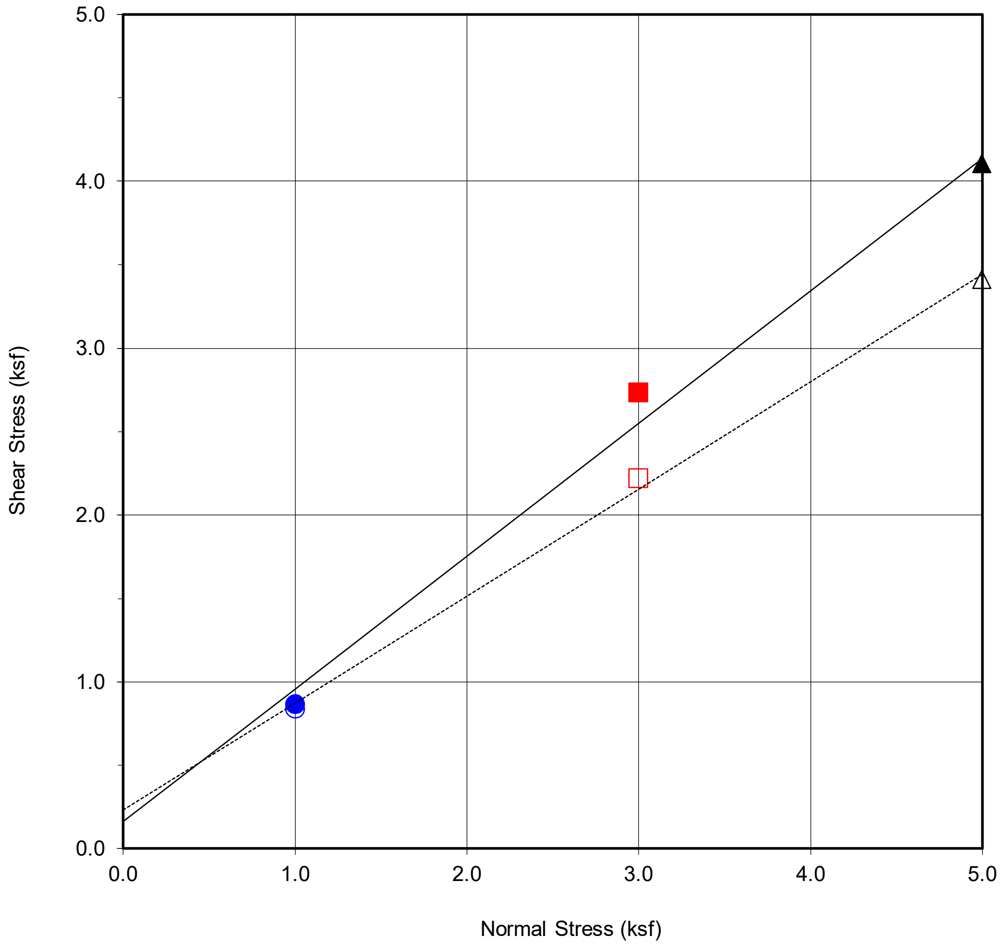
APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with “American Society for Testing and Materials (ASTM)”, or other suggested procedures selected samples were tested for direct shear strength, consolidation and expansion characteristics, maximum dry density, optimum moisture content, corrosivity and in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B12. The in-place dry density and moisture content of the samples tested are presented on the boring logs, Appendix A.



Boring No.	B1
Sample No.	B1@2.5'
Depth (ft)	2.5'
Sample Type:	Ring

Soil Identification:		
Sandy Silt (ML)		
Strength Parameters		
	C (psf)	ϕ (^{o})
Peak	163	38
Ultimate	230	33

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.86	■ 2.74	▲ 4.10
Shear Stress @ End of Test (ksf)	○ 0.84	□ 2.22	△ 3.41
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	11.4	11.2	14.8
Initial Dry Density (pcf)	88.9	103.1	106.2
Initial Degree of Saturation (%)	34.5	47.6	68.2
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	27.6	21.8	23.7

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

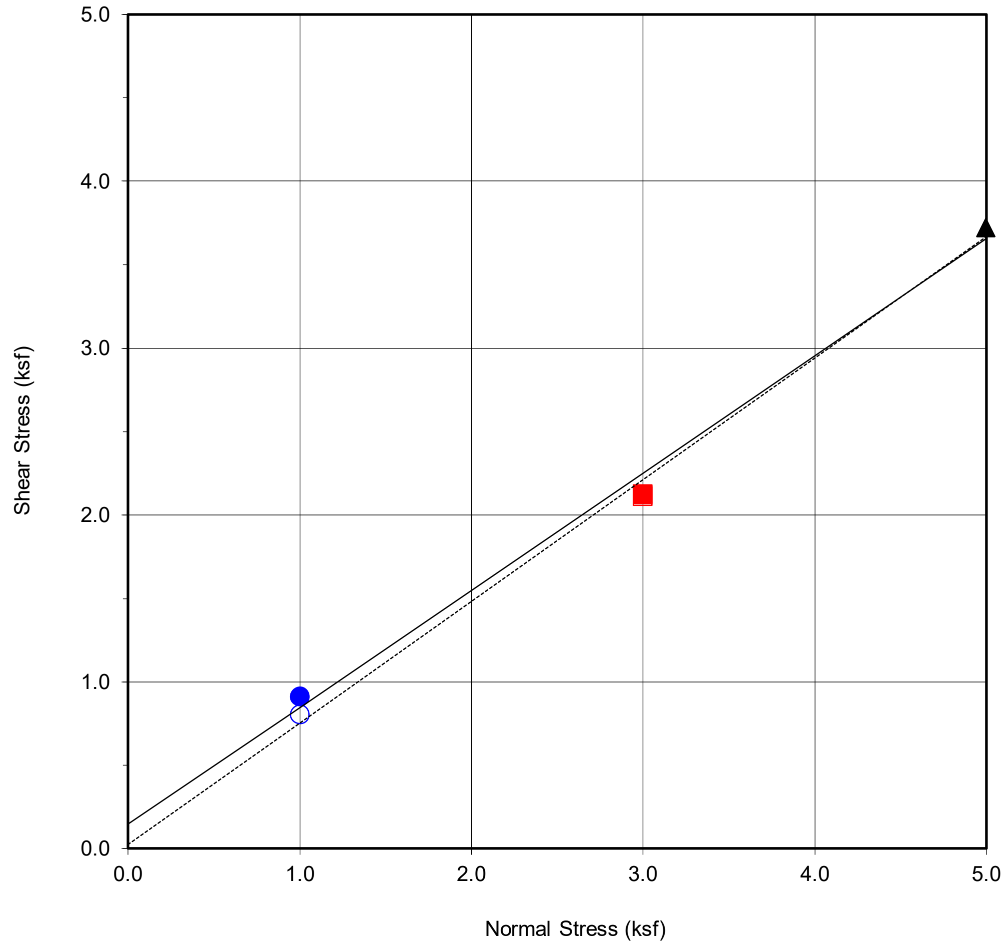
Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

NOV. 2023

Figure B1



Boring No.	**B1**
Sample No.	**B1@0-5'**
Depth (ft)	**0-5'**
Sample Type:	Bulk

Soil Identification:		
Silty Sand (SM)		
Strength Parameters		
	C (psf)	ϕ (°)
Peak	146	35
Ultimate	25	36

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.91	■ 2.12	▲ 3.72
Shear Stress @ End of Test (ksf)	○ 0.80	□ 2.11	△ 3.72
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	13.9	13.6	13.7
Initial Dry Density (pcf)	103.3	103.6	103.5
Initial Degree of Saturation (%)	59.6	58.6	58.8
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	22.4	21.5	20.7

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

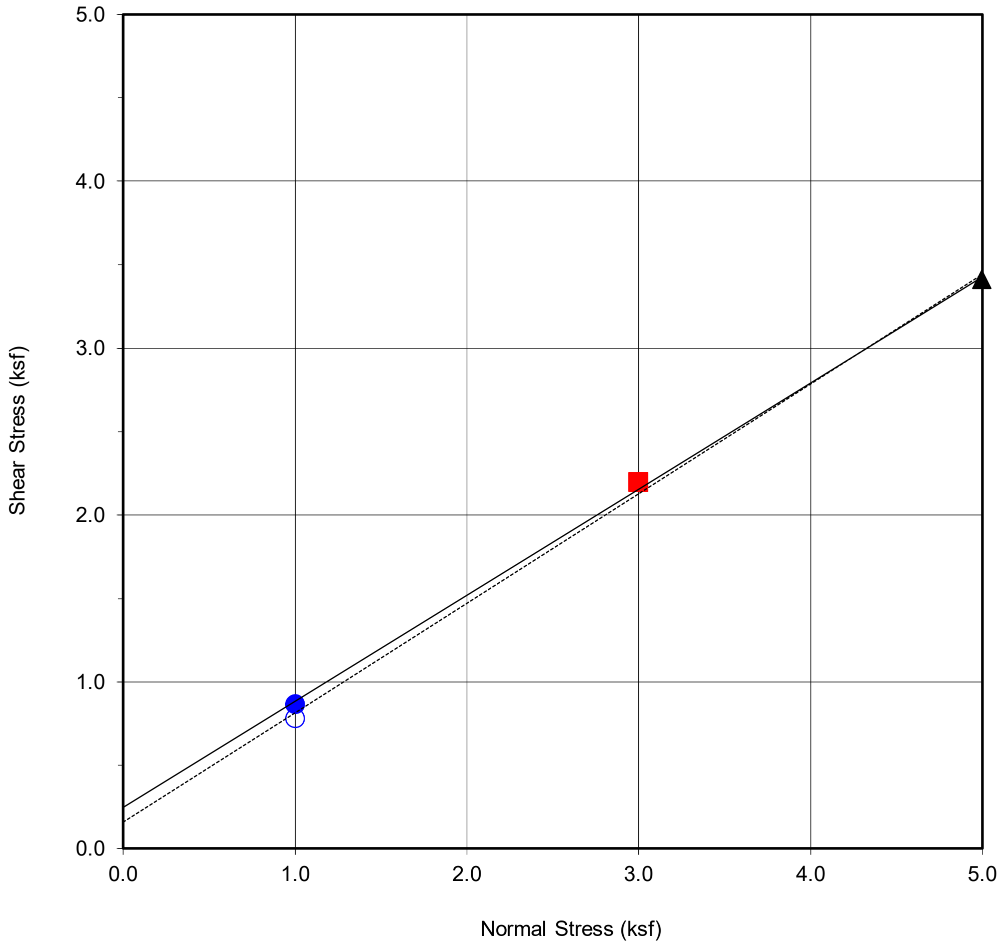
Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

NOV. 2023

Figure B2



Boring No.	**B3**
Sample No.	**B3@0-3.5'**
Depth (ft)	**0-3.5'**
Sample Type:	Bulk

Soil Identification:		
Silty Gravel (GM)		
Strength Parameters		
	C (psf)	ϕ (°)
Peak	248	32
Ultimate	157	33

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.86	■ 2.20	▲ 3.41
Shear Stress @ End of Test (ksf)	○ 0.78	□ 2.20	△ 3.41
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	13.2	13.1	13.0
Initial Dry Density (pcf)	102.2	102.0	102.4
Initial Degree of Saturation (%)	54.7	54.0	54.2
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	22.7	21.6	20.5

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

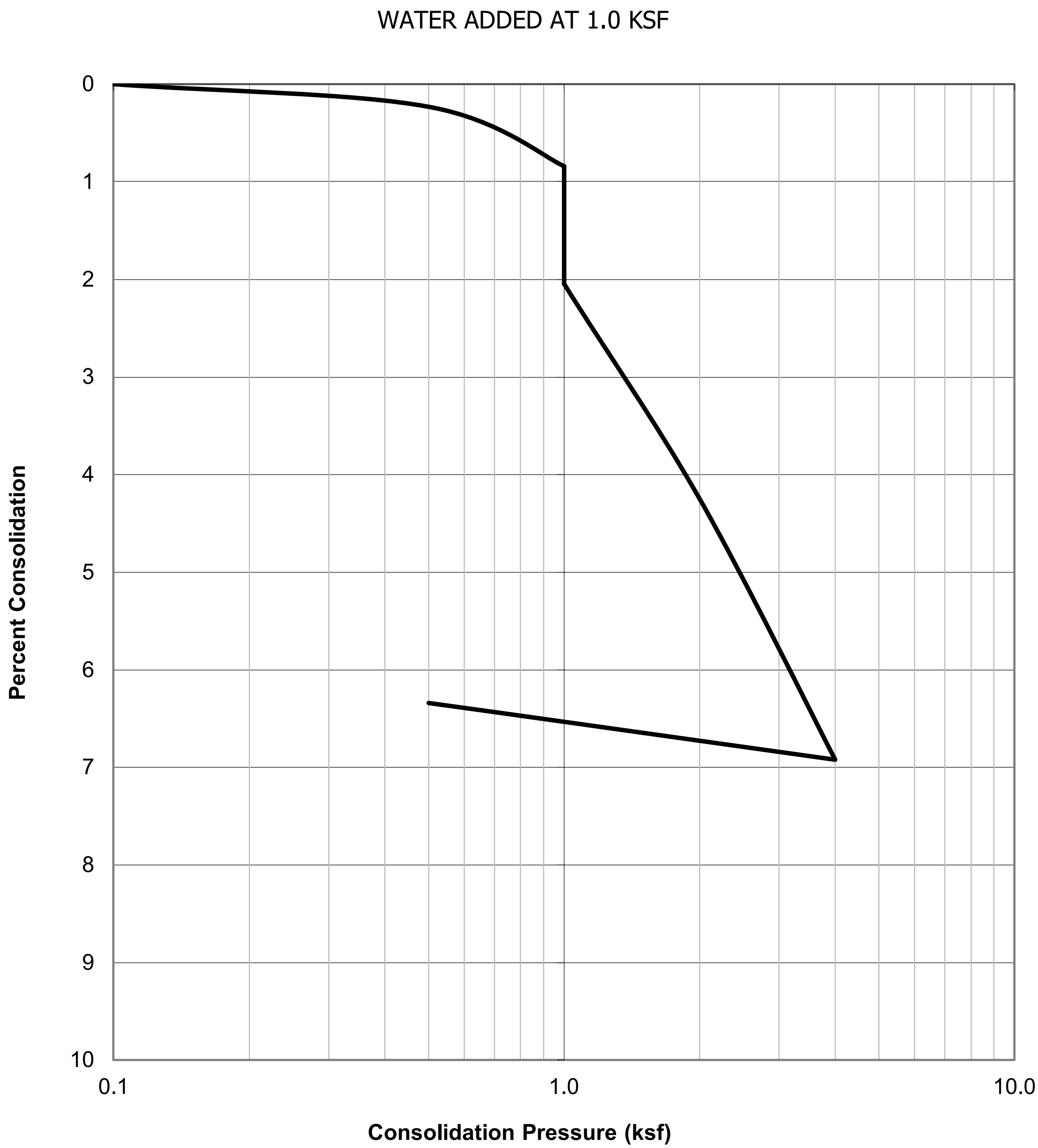
Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

NOV. 2023

Figure B3



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@2.5	Sandy Silt (ML)	88.6	9.9	23.9

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CONSOLIDATION TEST RESULTS

ASTM D-2435

Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

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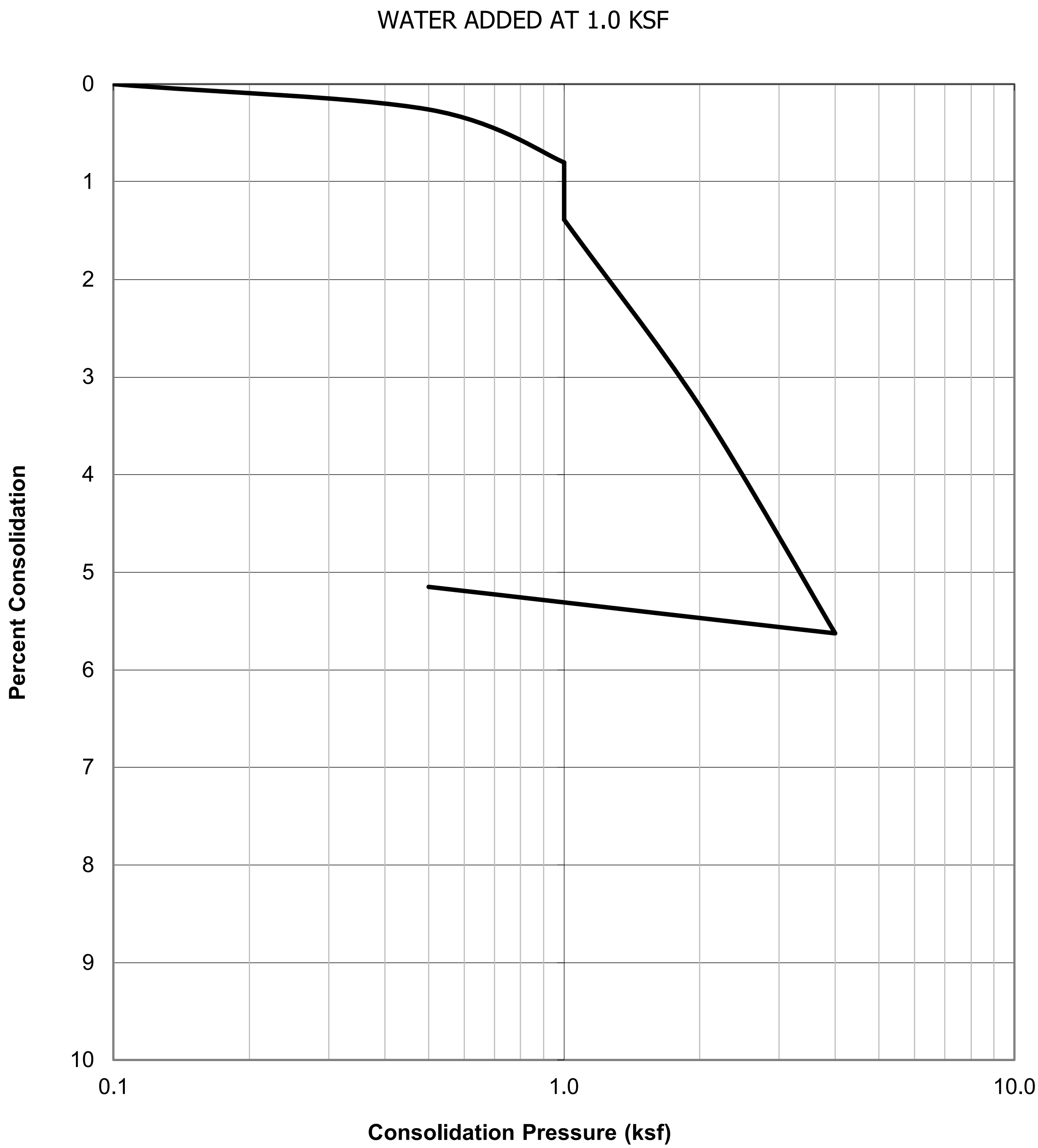
Figure B4



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@5.5	Silty Sand (SM)	95.7	10.8	21.0

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

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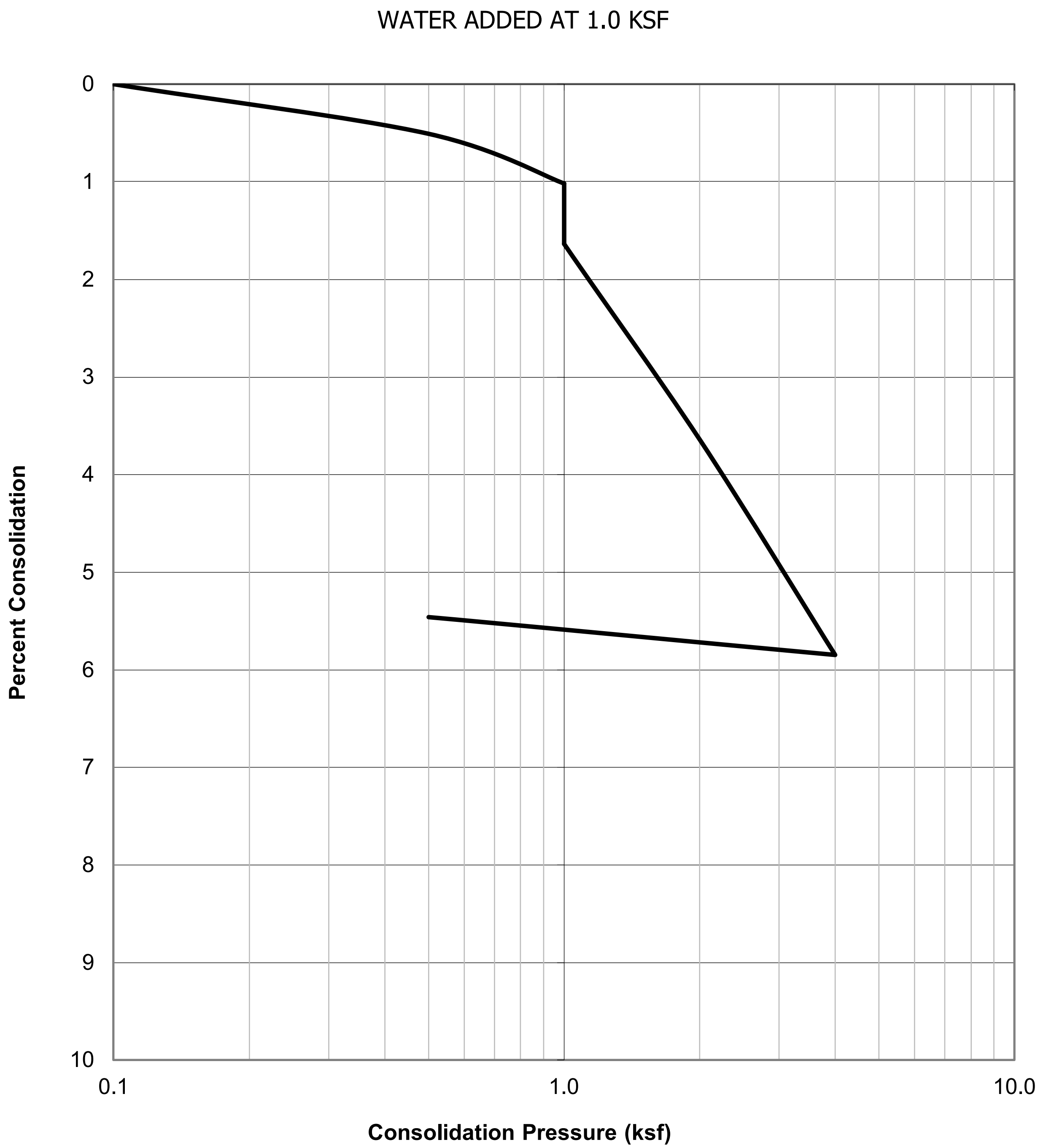
Figure B5



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@10	Silty Gravel (GM)	99.6	8.1	18.9

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CONSOLIDATION TEST RESULTS

ASTM D-2435

Checked by: JJK

Project No.: W1500-06-08

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1900 SYCAMORE CANYON ROAD
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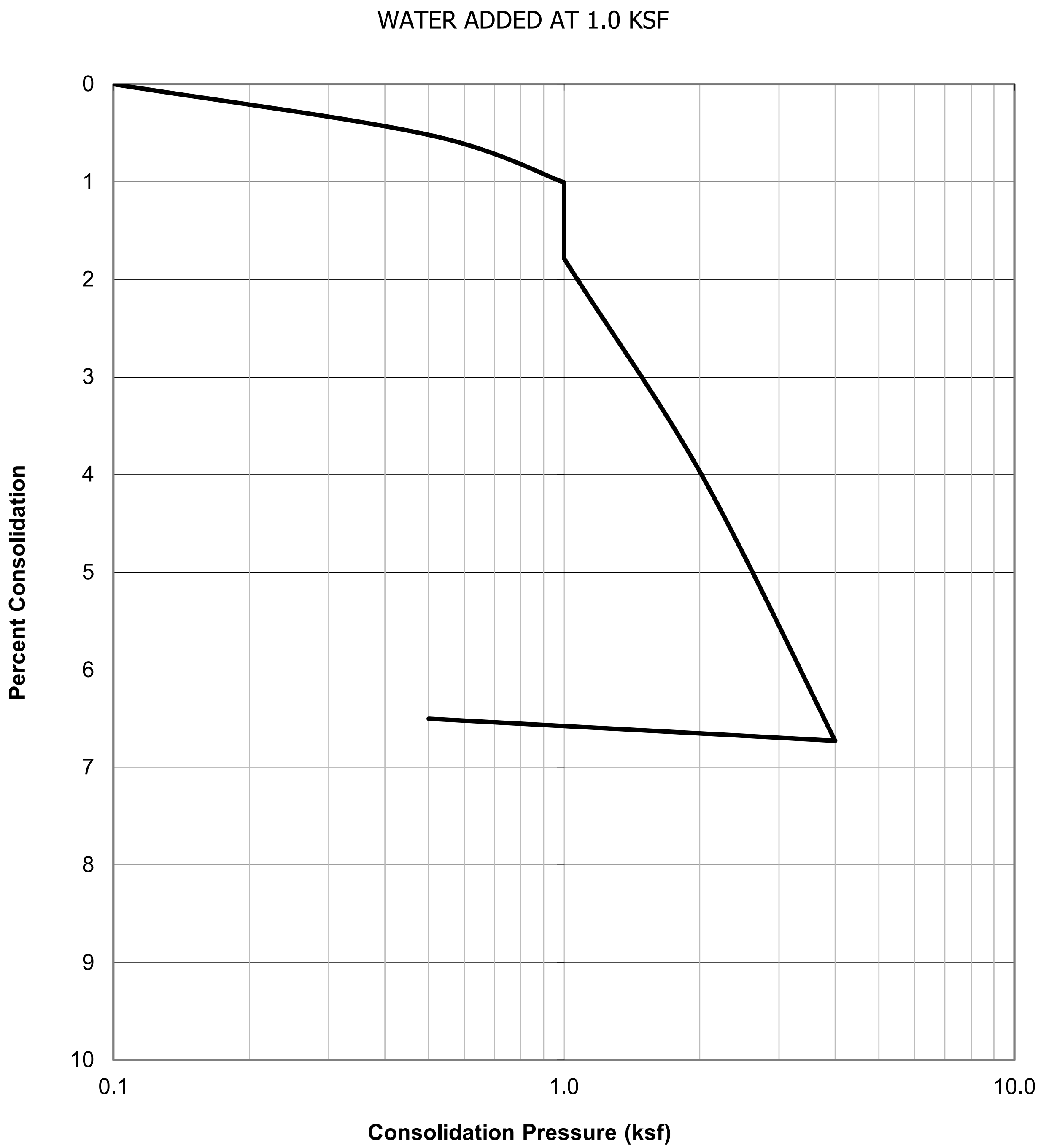
NOV. 2023

Figure B6



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2@2.5	Silty Gravel (GM)	96.9	6.9	17.8

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CONSOLIDATION TEST RESULTS

ASTM D-2435

Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

NOV. 2023

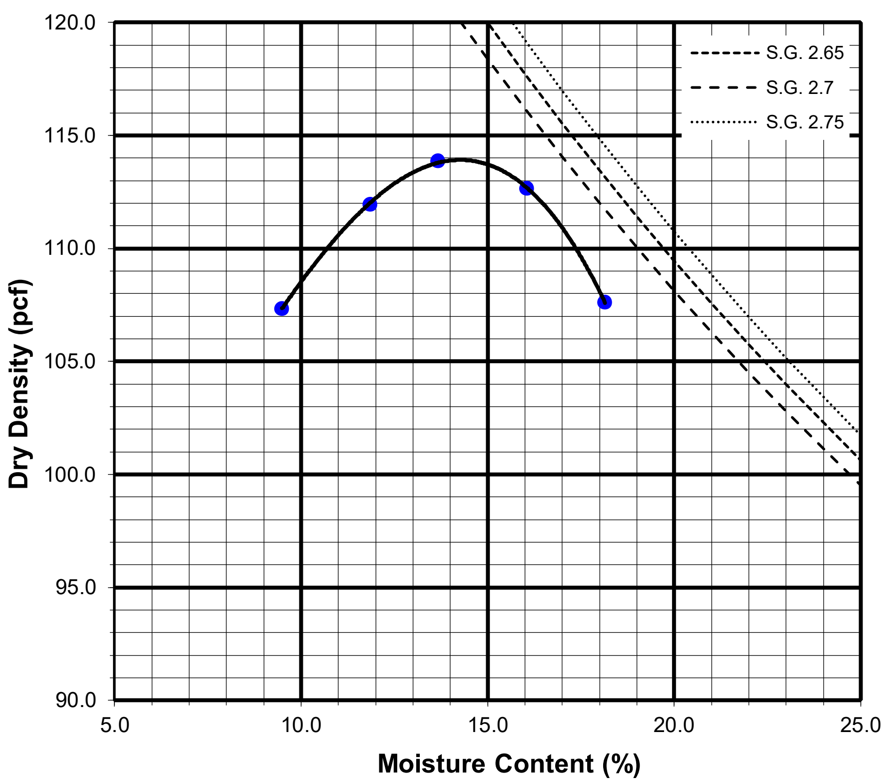
Sample No:

B1@0-5'	Silty Sand (SM)

TEST NO.		1	2	3	4	5	6
Wt. Compacted Soil + Mold	(g)	5856	5971	6035	6054	6000	
Weight of Mold	(g)	4086	4086	4086	4086	4086	
Net Weight of Soil	(g)	1770	1886	1949	1969	1915	
Wet Weight of Soil + Cont.	(g)	629.1	615.4	713.0	711.8	641.7	
Dry Weight of Soil + Cont.	(g)	585.5	563.7	645.0	633.8	562.6	
Weight of Container	(g)	126.0	127.1	147.7	147.6	126.7	
Moisture Content	(%)	9.5	11.8	13.7	16.0	18.1	
Wet Density	(pcf)	117.5	125.2	129.4	130.7	127.1	
Dry Density	(pcf)	107.3	112.0	113.9	112.6	107.6	

Maximum Dry Density (pcf)	**114.5**
Bulk Specific Gravity (dry)	**2.32**
Corrected Maximum Dry Density (pcf)	**116.5**

Optimum Moisture Content (%)	**14.5**
Oversized Fraction (%)	**9.0**
Corrected Moisture Content (%)	**13.0**



Preparation Method: A

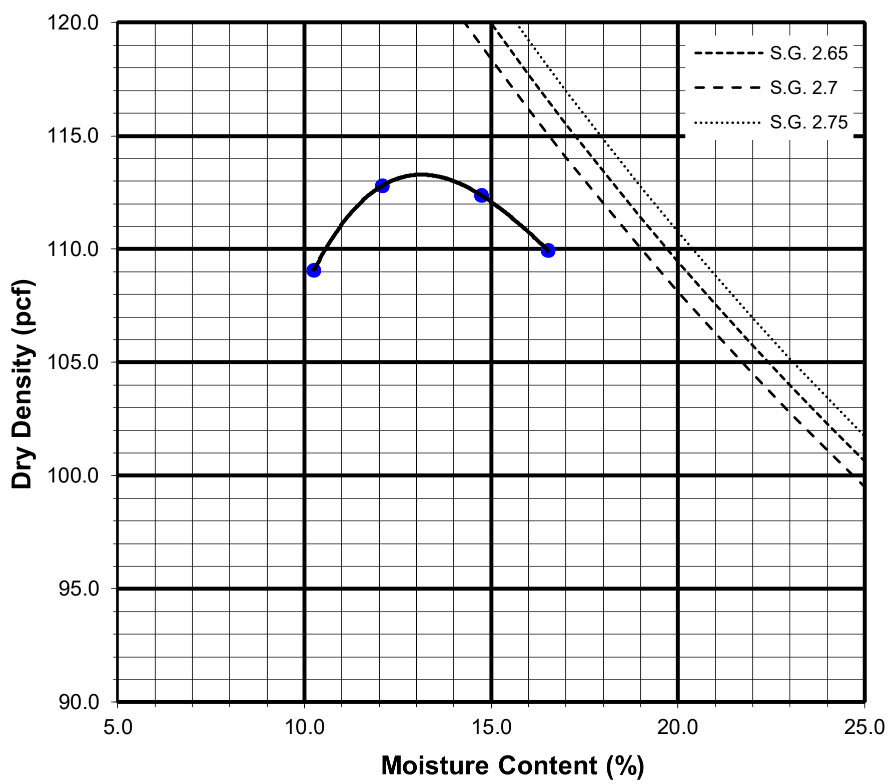
GEOCON	**COMPACTION CHARACTERISTICS USING MODIFIED EFFORT TEST RESULTS**	Project No.: W1500-06-08
	ASTM D-1557	1628 SYCAMORE CANYON ROAD 1900 SYCAMORE CANYON ROAD SAN DIMAS, CALIFORNIA
	Checked by: JJK	NOV. 2023 Figure B8

Sample No:

B3@0-3.5	Silty Gravel (GM)

TEST NO.		1	2	3	4	5	6
Wt. Compacted Soil + Mold	(g)	5897	5990	6027	6015		
Weight of Mold	(g)	4086	4086	4086	4086		
Net Weight of Soil	(g)	1811	1904	1942	1929		
Wet Weight of Soil + Cont.	(g)	696.3	679.4	672.0	717.1		
Dry Weight of Soil + Cont.	(g)	644.0	621.9	604.4	636.3		
Weight of Container	(g)	133.8	145.9	146.1	147.4		
Moisture Content	(%)	10.3	12.1	14.8	16.5		
Wet Density	(pcf)	120.2	126.4	128.9	128.1		
Dry Density	(pcf)	109.1	112.8	112.4	109.9		

Maximum Dry Density (pcf)	**113.5**	**Optimum Moisture Content (%)**	**13.5**
Bulk Specific Gravity (dry)	**2.41**	**Oversized Fraction (%)**	**24.0**
Corrected Maximum Dry Density (pcf)	**120.5**	**Corrected Moisture Content (%)**	**10.5**



Preparation Method: A

GEOCON

COMPACTION CHARACTERISTICS USING MODIFIED EFFORT TEST RESULTS

ASTM D-1557

Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

NOV. 2023

Figure B9

B1@0-5'

MOLDED SPECIMEN		BEFORE TEST	AFTER TEST
Specimen Diameter	(in.)	4.0	4.0
Specimen Height	(in.)	1.0	1.0
Wt. Comp. Soil + Mold	(gm)	747.3	787.2
Wt. of Mold	(gm)	367.8	367.8
Specific Gravity	(Assumed)	2.7	2.7
Wet Wt. of Soil + Cont.	(gm)	487.4	787.2
Dry Wt. of Soil + Cont.	(gm)	454.1	337.3
Wt. of Container	(gm)	187.4	367.8
Moisture Content	(%)	12.5	24.3
Wet Density	(pcf)	114.5	126.3
Dry Density	(pcf)	101.8	101.6
Void Ratio		0.7	0.7
Total Porosity		0.4	0.4
Pore Volume	(cc)	82.1	85.3
Degree of Saturation	(%) [S_{meas}]	51.8	96.2

Date	Time	Pressure (psi)	Elapsed Time (min)	Dial Readings (in.)
10/16/2023	10:00	1.0	0	0.3535
10/16/2023	10:10	1.0	10	0.353
Add Distilled Water to the Specimen				
10/17/2023	10:00	1.0	1430	0.3685
10/17/2023	11:00	1.0	1490	0.3685

Expansion Index (EI meas) =	15.5
Expansion Index (Report) =	**16**

Expansion Index, EI_{50}	CBC CLASSIFICATION *	UBC CLASSIFICATION **
0-20	Non-Expansive	Very Low
21-50	Expansive	Low
51-90	Expansive	Medium
91-130	Expansive	High
>130	Expansive	Very High

* Reference: 2022 California Building Code, Section 1803.5.3
** Reference: 1997 Uniform Building Code, Table 18-I-B.

GEOCON

EXPANSION INDEX TEST RESULTS

ASTM D-4829

Checked by: JJK

Project No.: W1500-06-08

1628 SYCAMORE CANYON ROAD
1900 SYCAMORE CANYON ROAD
SAN DIMAS, CALIFORNIA

NOV. 2023

Figure B10

B3@0-5'

MOLDED SPECIMEN		BEFORE TEST	AFTER TEST
Specimen Diameter	(in.)	4.0	4.0
Specimen Height	(in.)	1.0	1.0
Wt. Comp. Soil + Mold	(gm)	738.6	782.6
Wt. of Mold	(gm)	367.5	367.5
Specific Gravity	(Assumed)	2.7	2.7
Wet Wt. of Soil + Cont.	(gm)	498.4	782.6
Dry Wt. of Soil + Cont.	(gm)	465.8	330.7
Wt. of Container	(gm)	198.4	367.5
Moisture Content	(%)	12.2	25.5
Wet Density	(pcf)	111.9	125.0
Dry Density	(pcf)	99.8	99.6
Void Ratio		0.7	0.7
Total Porosity		0.4	0.4
Pore Volume	(cc)	84.5	89.2
Degree of Saturation	(%) [S_{meas}]	48.2	94.6

Date	Time	Pressure (psi)	Elapsed Time (min)	Dial Readings (in.)
10/16/2023	10:00	1.0	0	0.3305
10/16/2023	10:10	1.0	10	0.3295
Add Distilled Water to the Specimen				
10/17/2023	10:00	1.0	1430	0.352
10/17/2023	11:00	1.0	1490	0.352

Expansion Index (EI meas) =	22.5
Expansion Index (Report) =	**23**

Expansion Index, EI_{50}	CBC CLASSIFICATION *	UBC CLASSIFICATION **
0-20	Non-Expansive	Very Low
21-50	Expansive	Low
51-90	Expansive	Medium
91-130	Expansive	High
>130	Expansive	Very High

* Reference: 2022 California Building Code, Section 1803.5.3
** Reference: 1997 Uniform Building Code, Table 18-I-B.

GEOCON

EXPANSION INDEX TEST RESULTS

ASTM D-4829

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Figure B11

SUMMARY OF LABORATORY
POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS
AASHTO T289 ASTM D4972 and AASHTO T288 ASTM G187

Sample No.	pH	Resistivity (ohm centimeters)
B1@0-5'	8.0	2100 (Moderately Corrosive)
B3@0-3.5'	5.2	1100 (Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS
AASHTO T291 ASTM C1218

Sample No.	Chloride Ion Content (%)
B1@0-5'	0.005
B3@0-3.5'	0.027

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS
AASHTO T290 ASTM C1580

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure
B1@0-5'	0.002	S0
B3@0-3.5'	0.000	S0

GEOCON

CORROSIVITY TEST RESULTS

Checked by: JJK

Project No.: W1500-06-08

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Figure B12