GEOTECHNICAL ENGINEERING INVESTIGATION REPORT

PROPOSED NEW LIGHT POLES
OLIVE BOWL PARK
18 N. OLIVE AVENUE
LINDSAY, CALIFORNIA

BSK PROJECT G21-320-11F

PREPARED FOR:

CITY OF LINDSAY
150 N. MIRAGE AVENUE
LINDSAY, CALIFORNIA

OCTOBER 25, 2021

GEOTECHNICAL ENGINEERING INVESTIGATION REPORT
PROPOSED NEW LIGHT POLES
OLIVE BOWL PARK
18 N. OLIVE AVENUE
LINDSAY, CALIFORNIA

Prepared for:

Ms. Neyba Amezcua
City of Lindsay
150 N. Mirage Avenue
Lindsay, California

BSK Project: G21-320-11F

October 25, 2021

Prepared by:

Tolleman Gorham
Staff Engineer

Neva M. Popenoe, PE, GE 2644
Geotechnical Group Manager Engineer

REGISTERED PROFESSIONAL ENGINEER
NEVA M. POPENOE
GE 3024
EXP. 6-30-2023
GEOTECHNICAL
STATE OF CALIFORNIA

On Man Lau

On Man Lau, PE, GE 3024
South Valley Regional Manager

REGISTERED PROFESSIONAL ENGINEER
ON MAN LAU
GE2644
EXP. 12-31-2021
GEOTECHNICAL
STATE OF CALIFORNIA

BSK Associates
550 West Locust Avenue
Fresno, California 93650
(559) 497-2880
www.bskassociates.com

Table of Contents

Tables

Figures

Appendices

1 INTRODUCTION

1.1 General

This report presents the results of our geotechnical engineering investigation for the proposed new light poles at Olive Bowl Park in Lindsay, California. The project site is shown on the Site Vicinity Map, Figure 1. The geotechnical engineering investigation was conducted in general accordance with the scope of services outlined in BSK Proposal GF21-22815, dated October 1, 2021. The proposed improvements and exploratory borings are shown on Figure 2, Boring Location Map.

In the event that significant changes occur in the design or location of the proposed structures, the conclusions and recommendations presented in the report will not be considered valid unless the changes are reviewed by BSK, and the conclusions and recommendations are modified or verified in writing as necessary.

1.2 Project Description

We understand that this project consists of the design and construction of new light poles within the Olive Bowl Park. Based on review of the Lighting Photometric Site Plan (dated August 10, 2021), we understand the project will include light poles being installed around the softball and baseball fields and in the parking lot at the park. We anticipate the structures will be supported on pole-type foundations, such as cast-in-drilled-hole piers. Other improvements are anticipated to include underground utilities, landscaping, and hardscaping.

1.3 Purpose and Scope of Services

The purpose of the geotechnical investigation is to assess soil conditions at the project site and provide geotechnical engineering recommendations for use by the project designers during preparation of the project plans and specifications. The scope of the investigation included a field exploration, laboratory testing, engineering analysis, and report preparation.

2 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 General

The field exploration, conducted on October 8, 2021, consisted of a site reconnaissance and drilling four (4) test borings. The test borings were drilled to depths of approximately 21.5 feet below ground surface (bgs). The test borings were drilled with a truck-mounted drill rig equipped with hollow stem augers. The approximate boring locations are presented on Figure 2. Details of the field exploration and the boring logs are provided in Appendix A.

2.2 Laboratory Testing

Laboratory testing of selected soil samples were performed to evaluate certain physical and engineering characteristics and properties. The testing program included: in-situ moisture and density, shear strength, collapse potential, and corrosion potential. The in-situ moisture and dry density test results are presented on the boring logs in Appendix A. Descriptions of the laboratory test methods and test results are provided in Appendix B.

3 SITE CONDITIONS

3.1 Site Description

The project site is anticipated to be situated at the 18 N. Olive Avenue, Lindsay, California. The site is triangular and is bound to the northeast by N. Olive Avenue, to the west by residences, and to the south by W. Apia Street. The site was bounded on all sides by fences. At the time of the field investigation the project site consisted of a baseball field with a grass area and several areas with bare soil. B-1 was in an existing dirt parking lot at the north end of the site, and B-2, B-3, and B-4 were all in the grass field.

3.2 Subsurface Conditions

The near surface soil consisted of silty sands and sandy silts, with some laterally discontinuous layers of silty sand with gravel to the maximum depth of exploration (21.5 feet bgs). The boring logs in Appendix A provide a more detailed description of the soils encountered in each boring, including the applicable Unified Soil Classification System symbols. The approximate locations of the soil borings are shown on the Boring Location Map (Figure 2).

3.3 Groundwater

Groundwater was not encountered within the test borings. The California Department of Water Resources indicates the depth to regional historic groundwater is greater than 30 feet bgs. However, fluctuations in the groundwater level or the presence of perched groundwater may occur due to variations in rainfall, irrigation, seasonal factors, pumping from wells and other factors that were not evident at the time of our investigation.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 General

Based upon the data collected during this investigation and from a geotechnical engineering standpoint, it is our opinion that there are no soil conditions that would preclude the construction of the proposed park development provided that the recommendations presented in this report are incorporated into the project design and construction. The planned improvements may be supported on cast-in-drilled hole pier foundations.

4.2 Soil Corrosivity

Based on test results, on-site, near-surface soils have sulfate and chloride contents of 110 ppm and 170 ppm respectively. The minimum resistivity was 1550 ohm-cm, and the soil was alkaline with a pH of 7.4. Thus, on-site soils are considered to have a low corrosion potential with respect to buried concrete and a moderately corrosive corrosion potential to unprotected metal conduits.

Based on experience of soils in the area, BSK recommends that Type I/Type II cement be used in the formulation of concrete and that buried reinforcing steel protection be provided with a minimum concrete cover required by the American Concrete Institute (ACI) Building Code for Structural Concrete, ACI 318, Chapter 20. Buried metal conduits must have protective coatings in accordance with the manufacturer's specifications. If detailed recommendations for corrosion protection are desired, a corrosion specialist should be consulted.

4.3 Seismic Design Criteria

There are no known active fault zones within the vicinity of the project site. In accordance with Section 1613.2.2 of the 2019 California Building Code (CBC) and Table 20.3-1 of ASCE 7-16, the Site can be classified as Site Class D (stiff soil profile).

Use of the 2019 California Building Code (CBC) seismic design criteria is considered appropriate and the following parameters are considered applicable for the structural design of foundations.

Table 1: 2019 California Building Code (CDC) Seismic Design Parameters			
Seismic Design Parameter	**2019 CBC Value**		**Reference**
MCE Mapped Spectral Acceleration (g)	$S_S = 0.535$	$S_1 = 0.214$	USGS Mapped Value
Amplification Factors (Site Class D)	$F_a = 1.372$	F_v = null[1](2.172)[2]	ASCE Table 11.4
Site Adjusted MCE Spectral Acceleration (g)	$S_{MS} = 0.734$	S_{M1} = null[1](0.465)[2]	ASCE Equations 11.4.1-2
Design Spectral Acceleration (g)	$S_{DS} = 0.489$	S_{D1} = null[1] (0.310)[2]	ASCE Equations 11.4.1-4
Geometric Mean PGA (g)	$PGA_M = 0.317$		Section 11.8.3, ASCE 7-16
Site Short Period – T_S (seconds)	$T_S = 0.634$		$T_S = S_{D1}/ S_{DS}$
Site Long Period – T_L (seconds)	$T_L = 12$		USGS Mapped Value

Notes: [1] Requires site-specific ground motion procedure or exception as per ASCE 7-16 Section 11.4.8.

[2] Values from ASCE 7-16 supplement shall only be used to calculate T_S. Values provided based on use of exception, as provided in Section 11.4.8.2 to Site-Specific Ground Motion Procedures and assumes the value of the seismic response coefficient C_s is determined by Eq. 12.8-2 for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. 12.8-3 for $T_L \geq T > 1.5T_s$ or Eq. 12.8-4 for $T > T_L$.

As shown above, the short period design spectral response acceleration coefficient, S_{DS}, is less than 0.5. The long period design spectral response acceleration coefficient, S_{D1}, is greater than 0.2, therefore the Site lies in Seismic Design Category D as specified in Section 1613.2.5 of the 2019 CBC. In accordance with the 2019 CBC, each structure shall be assigned to the more severe seismic design category in accordance with Table 1613.2.5(1) or 1613.2.5(2), irrespective of the fundamental period of vibration of the structure.

4.4 Site Preparation and Earthwork Construction

The following procedures must be implemented during site preparation for the proposed improvements. It should be noted that references to maximum dry density, optimum moisture content, and relative compaction are based on ASTM: D1557 (latest test revision) laboratory test procedures.

1. Within the area of the planned improvements, remove existing pavement, concrete curbs and gutter, existing underground utilities, vegetation, and debris to expose a clean soil surface free of deleterious material, such as organic matter. Near surface soils containing vegetation, roots, organics, or other objectionable material must be stripped to a depth of at least 3-inches to expose a clean soil surface. Surface strippings must not be incorporated into engineered fill unless the organic content is less than 3 percent by weight (ASTM: D2974).

Existing utilities or irrigation pipes must be removed to a point at least 5-feet horizontally outside the proposed building area. Resultant cavities must be backfilled with engineered fill. Abandoned pipelines to remain in place that are less than 2 inches in diameter must be capped at the cutoff point, while pipelines greater than 2 inches in diameter must be filled with a 1-sack sand-cement slurry.

2. Soil disturbed as a result of demolition, undocumented fill deemed to possess inadequate compaction or uniformity, debris, abandoned underground structures must be excavated to expose undisturbed native soil or suitable fill.

3. Following the required demolition, stripping, and/or removal of underground structures, the exposed soil surface in proposed improvement areas or areas to receive fill must be over-excavated uniformly to a minimum depth of 24 inches below existing site grade or below bottom of footing elevation, whichever is greater. Proposed building pads must be underlain by a minimum of two feet of non-expansive material. Exterior concrete flatwork must be underlain by a minimum of one foot of non expansive material.

   The over-excavation must extend at least 5 feet laterally beyond the outside edge of the proposed shallow foundations or areas to receive fill, whichever distance is greater. The exposed subgrade must be proof-rolled under the observation of a BSK field representative to detect soft or pliant areas. Soft or pliant areas must be over-excavated to firm native soil. The exposed surface must be scarified at minimum of 8 inches, uniformly moisture conditioned to 4 percent above optimum moisture, and compacted to 90 but no more than 92 percent relative compaction.

   Over-excavation is not required below cast-in-drilled hole foundations, however, care must be exercised to clean the bottom of drilled holes, and any loose or caved materials removed. The excavated hole and bottom must be observed by a representative of the geotechnical engineer of record.

4. Non-expansive (Expansion Index less than 20 or Plasticity Index less than 12) excavated soils, free of deleterious substances (organic matter, demolition debris, tree roots, etc.) and with less than 3 percent organic content by weight, may be returned to the excavations as engineered fill. Engineered fill must be placed in uniform layers not exceeding 8-inches in loose thickness, moisture-conditioned to within 2 percent of optimum moisture content and compacted to at least 90 percent of the maximum dry density. The upper 12 inches of engineered fill placed as backfill under pavement sections must be compacted to at least 95 percent of the maximum dry density. Acceptance of engineered fill placement must be based on both moisture content at time of compaction and relative compaction.

5. Imported fill materials must be free of deleterious substances and have less than 3 percent organic content by weight. The project specifications must require the contractor to contact BSK for review of the proposed import fill materials for conformance with these recommendations at least two weeks prior to importing to the site, whether from on-site or off-site borrow areas. Imported fill soils must be non-hazardous and be derived from a single, consistent soil type source conforming to the following criteria:

   Maximum Particle Size: 3-inches

Percent Passing #4 Sieve:	65 – 100
Percent Passing #200 Sieve:	20 – 45
Plasticity Index:	less than 12
Expansion Index:	< 20

Low Corrosion Potential:	
Soluble Sulfates:	< 1,500 mg/kg
Soluble Chlorides:	< 300 mg/kg
Soil Resistivity:	> 5,000 ohm-cm

Grading operations should be scheduled as to avoid working during periods of inclement weather. Should these operations be performed during or shortly following periods of inclement weather or following irrigation, unstable soil conditions may result in the soils exhibiting a "pumping" condition. This condition is caused by excess moisture, in combination with compaction, resulting in saturation and near zero air voids in the soils. If this condition occurs, the affected soils must be over-excavated to the depth at which stable soils are encountered and replaced with suitable soils compacted as engineered fill. Alternatively, the Contractor may proceed with grading operations after utilizing a method to stabilize the soil subgrade, which must be subject to review by BSK prior to implementation.

4.5 Pole-Type Foundations

Provided the recommendations contained in this report are implemented during design and construction, it is our opinion that the proposed structures can be supported on pole-type foundations. A structural engineer must evaluate reinforcement and embedment depth based on the requirements for the structural loadings.

4.5.1 Pole Type Foundations

The light posts may be supported on pole type foundations. This type of foundation must be designed in accordance with Section 1807.3 of the 2019 CBC. However, it is recommended that an allowable lateral soil bearing pressure of 300 psf per foot of embedment be used to develop parameters S1 and S3 rather than one of the values given in Table 1806A.2. This value includes a factor of safety of 2 and may be increased as indicated by 1806.3 and the footnotes to Table 1806.2. Unless the area surrounding the pole foundation is paved or covered with concrete flatwork, the upper 24 inches of soil should be ignored when calculating the minimum depth of embedment.

The following table provides expressions for the allowable and ultimate axial capacity using friction to resist axial loads. The skin friction within the upper two feet of embedded length must be ignored in unpaved areas. The total settlement of pier foundations designed in accordance with these recommendations should not exceed one-half inch.

Table 2: Friction Resistance for Vertical Loads	
Allowable (lbs)	**Ultimate (lbs)**
53 DL^2	132 DL^2

Note (1) – D is pile diameter (feet), and L is the total embedment length (feet).

Prior to placing concrete, loose or disturbed soils must be removed from the bottom of the drilled pier excavations using a flat bottom clean-out bucket or other pre-approved method. A representative of BSK must observe the drilling and clean-out associated with the construction of pier foundations in order to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

Pier deflection may govern the design lateral resistance. If provided with pier geometry, lateral load, and loading eccentricity, the estimated pier head deflection can be provided.

4.6 Lateral Earth Pressures and Frictional Resistance

Lateral loads applied against foundations may be resisted by a combination of passive resistance against the vertical faces of the foundations and friction between the foundation bottom and the supporting subgrade. An unfactored coefficient of friction of 0.53 may be used between soil subgrade and the foundation bottom. The unfactored passive pressure is presented in Table 3. The coefficient of friction and passive earth pressure values given above represent ultimate soil strength values. BSK recommends that a safety factor consistent with the design conditions be included in their usage. For resistance against lateral sliding that is countered solely by the passive earth pressure against footings or friction along the bottom of footings, a minimum safety factor of 1.5 is recommended. For stability against lateral sliding that is resisted by combined passive pressure and frictional resistance, a minimum safety factor of 2.0 is recommended. For lateral resistance against seismic loading conditions, a minimum safety factor of 1.2 is recommended. We based these lateral resistance values on the assumption that the concrete for the foundations is either placed directly against undisturbed soils or that the voids created from the use of forms are backfilled with engineered fill or other approved materials, such as lean concrete. Passive resistance in the upper foot of soil cover below finished grades should be neglected unless the ground surface is confined by concrete slabs, pavements, or other such positive protection. The following earth pressure parameters may be used for designing earth retaining structures and foundations using native material or select non-expansive fill.

Table 3: Lateral Earth Pressures	
Lateral Pressure Conditions	**Equivalent Fluid Pressure (pcf)**
Active Pressure	25
At-Rest Pressure	41
Passive Pressure	450
Dynamic Increment	6.1H

Notes: 1. H is wall height in feet

Parameters are shown in the above table for drained conditions of select engineered fill or prepared native soil. In addition, the drained condition assumes that positive drainage will be provided away from the structure improvements and that water does not accumulate around the structure and cause a build-up of hydrostatic pressure.

4.7 Excavation Stability

Soils encountered within the upper 10-feet are generally Type C soil in accordance with OSHA (Occupational Safety and Health Administration). The slopes surrounding or along temporary excavations may be no steeper than 1.5H:1V for excavations to a maximum depth of 10-feet. Temporary excavations for the project construction must be left open for as short a time as possible and must be protected from water runoff. Slope height, slope inclination, and excavation depths (including utility trench excavations) must in no case exceed those specified in local, state, or federal safety regulations (e.g., OSHA Health and Safety Standards for Excavations 29 CFR Part 1926, or successor regulations). These excavation recommendations are based on soil characteristics derived from the borings. Variations in soil conditions will likely be encountered during excavation. At the time of construction, BSK must be afforded the opportunity to observe and document sloping and shoring conditions, and the opportunity to provide review of actual field conditions to account for condition variations not otherwise anticipated in the preparation of these recommendations.

4.8 Utility Trench Excavation and Backfill

Pipes and conduits must be bedded and shaded in accordance with the requirements of the pipe manufacturer. Where no specific requirements exist, we recommend a minimum of 6-inches of sand bedding material for pipe installations 12 to 24-inches in diameter. For pipe diameters, smaller than 12-inches, the bedding thickness may be reduced to 4-inches. The bedding material and envelope (up to 6-inches above the pipe) must consist of sand (Sand Equivalent greater than 30), be placed in loose lifts not exceeding 8-inches in thickness, compacted to at least 90 percent of the maximum dry density, and moisture conditioned to within 2 percent of optimum moisture content. Water jetting to attain compaction must not be allowed.

Adequate excavation width must be provided to permit uniform compaction on both sides of utility lines installed within the trench. The trench backfill material may consist of engineered fill. Trench backfill outside the building footprint must be placed in loose lifts not to exceed 8-inches in loose thickness, compacted to at least 90 percent of the maximum dry density, and moisture conditioned to within 2 percent of optimum moisture content. The upper 12-inches of trench backfill below pavement sections must be compacted to at least 95 percent of the maximum dry density. Conduits extending through or below footings must be “sleeved” as determined by the Project Structural Engineer. Utility trench backfill beneath the building areas must be backfilled in accordance with Section 4.4 (Site Preparation and Earthwork Construction).

4.9 Surface Drainage Control

Final grading around site improvements must provide for positive and enduring drainage. Ponding of water must not be allowed on or near the building or paved surfaces. Saturation of the soils immediately adjacent to or below the building area must not be allowed. Irrigation water must be applied in amounts not exceeding those required to offset evaporation, sustain plant life, and maintain a relatively uniform moisture profile around and below, site improvements.

5 PLANS AND SPECIFICATIONS REVIEW

BSK recommends that it be retained to review the draft plans and specifications for the project, with regard to foundations, pavements, and earthwork, prior to there being finalized and issued for construction bidding.

6 CONSTRUCTION TESTING AND OBSERVATIONS

Geotechnical testing and observation during construction is a vital extension of this geotechnical investigation. BSK recommends that it be retained for those services. Field review during site preparation and grading allows for evaluation of the exposed soil conditions and confirmation or revision of the assumptions and extrapolations made in formulating the design parameters and recommendations. BSK's observations must be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. BSK must also be called to the site to observe foundation excavations, prior to placement of reinforcing steel or concrete, in order to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report. BSK must also be called to the site to observe placement of foundation and slab concrete.

If a firm other than BSK is retained for these services during construction, that firm must notify the owner, project designers, governmental building officials, and BSK that the firm has assumed the responsibility for all phases (i.e., both design and construction) of the project within the purview of the geotechnical engineer. Notification must indicate that the firm has reviewed this report and any subsequent addenda, and that it either agrees with BSK's conclusions and recommendations, or that it will provide independent recommendations.

7 LIMITATIONS

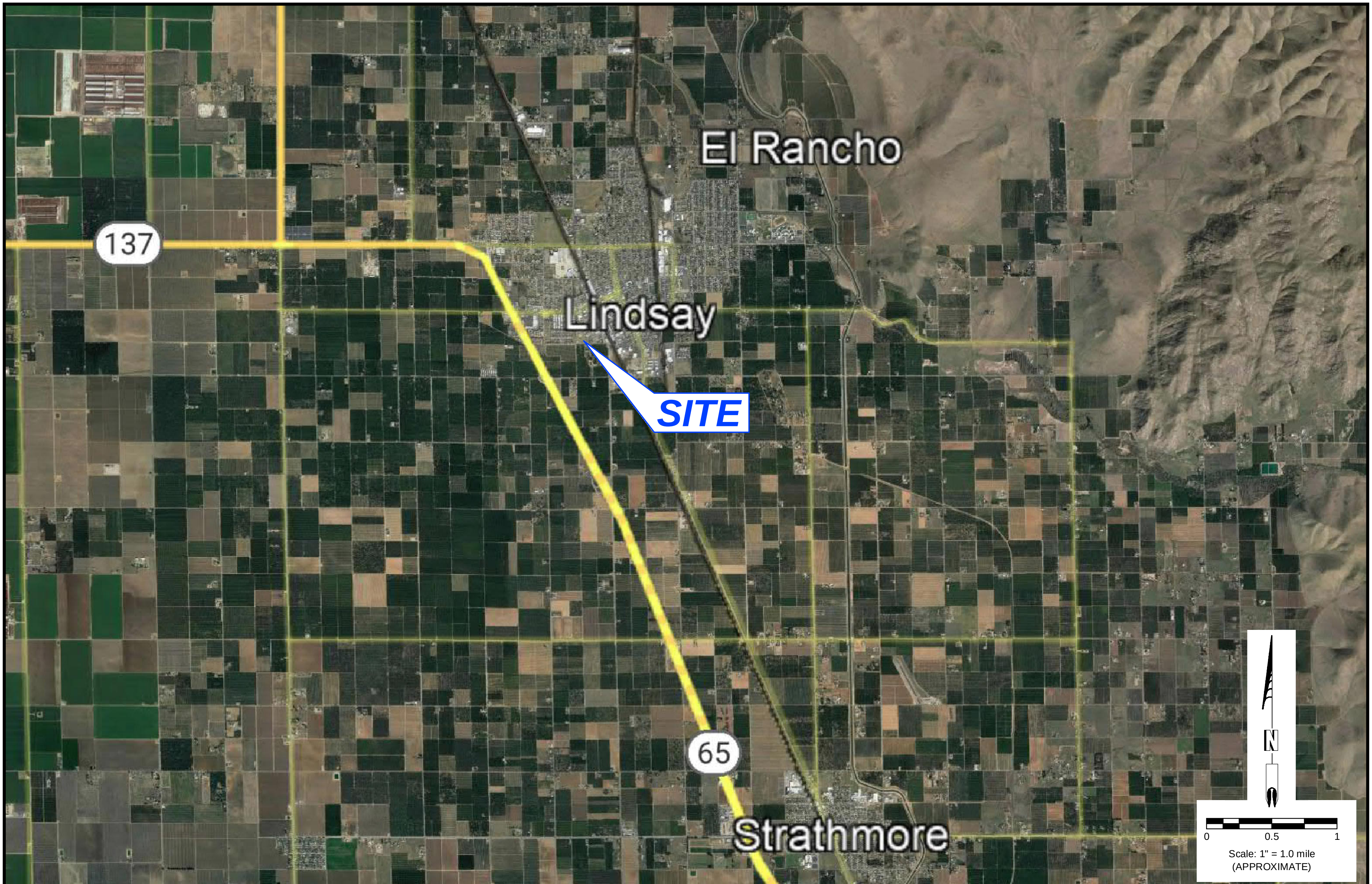
The analyses and recommendations submitted in this report are based upon the data obtained from the test borings performed at the locations shown on Figure 2. The report does not reflect variations, which may occur between or beyond the borings. The nature and extent of such variations may not become evident until additional exploration and testing is performed or construction is initiated. If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-site observations during the excavation period and noting the characteristics of the variations.

The validity of the recommendations contained in this report is also dependent upon an adequate testing and observation program during the construction phase. BSK assumes no responsibility for construction compliance with the design concepts or recommendations unless it has been retained to perform the testing and observation services during construction as described above.

The findings of this report are valid as of the present. However, changes in the conditions of the site can occur with the passage of time, whether caused by natural processes or the work of man, on this property or adjacent property. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation, governmental policy or the broadening of knowledge.

BSK has prepared this report for the exclusive use of the Client and members of the project design team. The report has been prepared in accordance with generally accepted geotechnical engineering practices, which existed in Tulare County at the time the report was written. No other warranties either express or implied are made as to the professional advice provided under the terms of BSK's agreement with Client and included in this report.

FIGURES



REFERENCE IMAGE: Google Earth

ASSOCIATES
550 West Locust Avenue
Fresno, California 93650
Tel. (559) 497-2880

SITE VICINITY MAP

New Light Poles
Olive Bowl Park
18 N Olive Avenue
Lindsay, California

FIGURE 1

JOB NO.	G21-320-11F
DATE	October 21, 2021
DR. BY	TG
CH. BY	OML
SCALE AS SHOWN	
SHEET NO.	1
OF	1 SHEETS

C:\Users\tgonzalez\BSK Associates\BSK Documents - FRS Projects Active\GEO\G2132011F - New Light Poles-Olive Bowl Park\Graphics\G21-320-11F_New Light Poles.dwg User:tgonzalez Plotted:Oct 21, 2021 - 10:40am

LEGEND:

APPROXIMATE BORING LOCATIONS
B-4

REFERENCE IMAGE: Google Earth

BSK ASSOCIATES
550 West Locust Avenue
Fresno, California 93650
Tel. (559) 497-2880

BORING LOCATION MAP

New Light Poles
Olive Bowl Park
18 N Olive Avenue
Lindsay, California

FIGURE 2

JOB NO.	G21-320-11F
DATE	October 21, 2021
DR. BY	TG
CH. BY	OML
SCALE AS SHOWN	
SHEET NO.	1
OF	1 SHEETS

C:\Users\tgonzalez\BSK Associates\BSK Documents - FRS Projects Active\GEO\G2132011F - New Light Poles-Olive Bowl Park\Graphics\G21-320-11F_New Light Poles.dwg User:tgonzalez Plotted:Oct 21, 2021 - 10:41am

APPENDIX A

FIELD EXPLORATION

APPENDIX A
Field Exploration

The field exploration was conducted on October 8, 2021, under the oversight of a BSK Engineer. The test borings were drilled to depths of approximately 21.5 feet below ground surface (bgs). The approximate locations of the test borings are illustrated on Figure 2, Boring Location Map.

The soil materials encountered in the test borings were visually classified in the field and logs were recorded during the drilling and sampling operations. Visual classification of the materials encountered in the test borings were made in general accordance with the Unified Soil Classification System (ASTM: D2487). A soil classification chart is presented herein. Boring logs are presented herein and should be consulted for more details concerning subsurface conditions. Stratification lines were approximated by the field staff on the basis of observations made at the time of drilling while the actual boundaries between different soil types may be gradual and soil conditions may vary at other locations.

Subsurface samples were obtained at the successive depths shown on the boring logs by driving samplers, which consisted of a 2.5-inch inside diameter (I.D.) California Sampler or a 1.4-inch I.D. Standard Penetration Test (SPT) Sampler. The samplers were driven 18 inches using a 140-pound, automatic hammer dropping 30 inches. The number of blows required to drive the last 12 inches was recorded as the blow count (blows/foot) on the log of borings. The relatively undisturbed soil core samples were capped at both ends to preserve the samples at their natural moisture content. Disturbed soil samples were obtained using the Split-Spoon Sampler (marked X in logs) and were placed and sealed in polyethylene bags. At the completion of the field exploration, the test borings were backfilled with the soil cuttings, as set forth in BSK's proposal.

It should be noted that the use of terms such as "loose", "medium dense", "dense" or "very dense" to describe the consistency of a soil is based on sampler blow count and is not necessarily reflective of the in-place density or unit weight of the soils being sampled. The relationship between sampler blow count and consistency is provided in the following Tables A-1 and A-2 for coarse grained (sandy and gravelly) soils and fine grained (silty and clayey) soils, respectively.

Table A-1: Density of Coarse-Grained Soil versus Sampler Blow Count		
Consistency	SPT Blow Count Blows / Foot)	2.5” I.D. Cal. Sampler (Blows / Foot)
Very Loose	<4	<6
Loose	4 – 10	6 – 15
Medium Dense	10 – 30	15 – 45
Dense	30 – 50	45 – 80
Very Dense	>50	>80

Table A-2: Consistency of Fine-Grained Soil versus Sampler Blow Count		
Consistency	SPT Blow Count (Blows / Foot)	2.5” I.D. Cal. Sampler (Blows / Foot)
Very Soft	<2	<3
Soft	2 – 4	3 – 6
Medium Stiff	4 – 8	6 – 12
Stiff	8 – 15	12 – 24
Very Stiff	15 – 30	24 – 45
Hard	>30	>45

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half > #200 sieve	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 15% 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	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 15% FINES	SM	SILTY SANDS, POOORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half < #200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC 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

	Modified California	RV	R-Value
	Standard Penetration Test (SPT)	SA	Sieve Analysis
	Split Spoon	SW	Swell Test
	Pushed Shelby Tube	TC	Cyclic Triaxial
	Auger Cuttings	TX	Unconsolidated Undrained Triaxial
	Grab Sample	TV	Torvane Shear
	Sample Attempt with No Recovery	UC	Unconfined Compression
CA	Chemical Analysis	(1.2)	(Shear Strength, ksf)
CN	Consolidation	WA	Wash Analysis
CP	Compaction	(20)	(with % Passing No. 200 Sieve)
DS	Direct Shear	▽	Water Level at Time of Drilling
PM	Permeability	▼	Water Level after Drilling(with date measured)
PP	Pocket Penetrometer		

SOIL CLASSIFICATION CHART AND LOG KEY

BSK ASSOCIATES

BSK ASSOCIATES
BSK Associates
550 W Locust Ave
Fresno, CA 93650
Telephone: (559) 497-2880
Fax: (559) 497-2886

Project: Olive Bowl

Location: Lindsay, CA

Project No.: G21-320-11F

Logged By: T. Gorham

Checked By: N. Popenoe

Boring: **B-01**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
0								SM	**Silty SAND with Gravel** - yellowish brown, moist, fine to medium grained sand, fine grained subangular gravel	
2–3.5	■		5	107.2	6.7					
5								ML	**Sandy SILT** - yellowish brown, moist, fine to medium grained sand	
5–6.5	■		7	98.5	9.2					Figure B-2: Collapse Potential = 1.58% @ 2000 ksf
10–11.5	■		12							
15–16.5	⧗		28							
19								SM	**Silty SAND with Gravel** - yellowish brown, moist, fine to coarse grained sand, fine grained angular gravel	
20–21.5	■		54							
21.5									Boring terminated at approximately 21.5 feet bgs. No groundwater encountered. Boring backfilled with soil cuttings.	

Drilling Contractor: Baja Exploration
Drilling Method: Mobile B-61
Drilling Equipment: Hollow Stem Auger
Date Started: 10/8/21
Date Completed: 10/8/21

Surface Elevation:
Sample Method: 2.5" I.D. Cal Mod & 1.5" I.D. SPT Split Spoon
Groundwater Depth: Not Encountered
Completion Depth: 21.5 Feet
Borehole Diameter: 8"

* See key sheet for symbols and abstractions used above.

GEO_BORING LOGS.GPJ BSK.GDT 10/25/21

BSK Associates
550 W Locust Ave
Fresno, CA 93650
Telephone: (559) 497-2880
Fax: (559) 497-2886

Project: Olive Bowl
Location: Lindsay, CA
Project No.: G21-320-11F
Logged By: T. Gorham
Checked By: N. Popenoe

Boring: **B-02**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
0								ML	**Sandy SILT** - yellowish brown, moist, fine grained sand	
2–3.5	Sample	Bulk 2–5	11							Fig B-1: Direct Shear Test: phi = 38°, c = 0.0 psf
5–6.5	Sample		13	106.0	5.3					
10–11.5	Sample		5	113.6	11.9			SM	**Silty SAND** - yellowish brown, moist, fine to medium grained sand	
15–16.5	SPT		25						... fine to coarse grained sand, layer of gravel	
19									... with gravel	
20–21	Sample		8							
21.5									Boring terminated at approximately 21.5 feet bgs. No groundwater encountered. Boring backfilled with soil cuttings.	

Drilling Contractor: Baja Exploration
Drilling Method: Mobile B-61
Drilling Equipment: Hollow Stem Auger
Date Started: 10/8/21
Date Completed: 10/8/21

Surface Elevation:
Sample Method: 2.5" I.D. Cal Mod & 1.5" I.D. SPT Split Spoon
Groundwater Depth: Not Encountered
Completion Depth: 21.5 Feet
Borehole Diameter: 8"

* See key sheet for symbols and abstractions used above.

BSK Associates
550 W Locust Ave
Fresno, CA 93650
Telephone: (559) 497-2880
Fax: (559) 497-2886

Project: Olive Bowl
Location: Lindsay, CA
Project No.: G21-320-11F
Logged By: T. Gorham
Checked By: N. Popenoe

Boring: **B-03**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
0								ML	**Sandy SILT** - yellowish brown, moist, fine to medium grained sand	
3			16							
6			16							
11			12	113.3	13.9				... brown	
16			16						... trace clay	
19									... fine to coarse grained sand, increased clay	
21			21							
21.5									Boring terminated at approximately 21.5 feet bgs. No groundwater encountered. Boring backfilled with soil cuttings.	

Drilling Contractor: Baja Exploration
Drilling Method: Mobile B-61
Drilling Equipment: Hollow Stem Auger
Date Started: 10/8/21
Date Completed: 10/8/21

Surface Elevation:
Sample Method: 2.5" I.D. Cal Mod & 1.5" I.D. SPT Split Spoon
Groundwater Depth: Not Encountered
Completion Depth: 21.5 Feet
Borehole Diameter: 8"

* See key sheet for symbols and abbreviations used above.

BSK ASSOCIATES
BSK Associates
550 W Locust Ave
Fresno, CA 93650
Telephone: (559) 497-2880
Fax: (559) 497-2886

Project: Olive Bowl
Location: Lindsay, CA
Project No.: G21-320-11F
Logged By: T. Gorham
Checked By: N. Popenoe

Boring: **B-04**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
0–21.5								ML	**Sandy SILT** - yellowish brown, moist, fine to medium grained sand	
3			10	109.6	3.8					
6			8							
11			6						... yellowish red	
16			12						... increased sand content	
21.5									Boring terminated at approximately 21.5 feet bgs. No groundwater encountered. Boring backfilled with soil cuttings.	

Drilling Contractor: Baja Exploration
Drilling Method: Mobile B-61
Drilling Equipment: Hollow Stem Auger
Date Started: 10/8/21
Date Completed: 10/8/21

Surface Elevation:
Sample Method: 2.5" I.D. Cal Mod & 1.5" I.D. SPT Split Spoon
Groundwater Depth: Not Encountered
Completion Depth: 16.5 Feet
Borehole Diameter: 8"

* See key sheet for symbols and abbreviations used above.

APPENDIX B

LABORATORY TESTING

APPENDIX B
Laboratory Testing

The results of laboratory testing performed in conjunction with this project are contained in this Appendix. The following laboratory tests were performed on soil samples in general conformance with applicable standards.

In-Situ Moisture and Density

The field moisture content and in-place dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The field moisture content, as a percentage of dry weight of the soils, was determined by weighing the samples before and after oven drying in accordance with ASTM: D2216 test procedures. Dry densities, in pounds per cubic foot, were also determined for undisturbed core samples in accordance with ASTM: D2937 test procedures. Test results are presented on the boring logs in Appendix A.

Direct Shear Test

One (1) direct shear test was performed on a test specimen trimmed from a selected soil sample. The three-point shear test was performed in general accordance with ASTM Test Method D3080, Direct Shear Test for Soil under Consolidated Drained Conditions. The test specimens, each 2.42 inches in diameter and 1 inch in height, were subjected to shear along a plane at mid-height after allowing for pore pressure dissipation. The results of this test are presented on Figure B-1.

Collapse Potential Test

One (1) Collapse Potential Test was performed on relatively undisturbed soil samples to evaluate collapse potential characteristics. The tests were performed in general accordance with ASTM D5333. The sample was initially loaded under as-received moisture content to a selected stress level, loaded to a load of 2000 psf, saturated, and lastly loaded to a maximum load of 4000 psf. The test results are presented on Figure B-2.

Soil Corrosivity

The results of chemical analyses performed on a bulk soil sample using California Test Method 643 (for minimum resistivity and pH) and CT-417 (for soluble sulfate), and CT-422 (for chlorides) are presented below.

SUMMARY OF CHEMICAL TEST RESULTS

Sample Location	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Minimum Resistivity (ohms-cm)
B-1 at 0 - 1’	7.4	110	170	1,550

ASSOCIATES

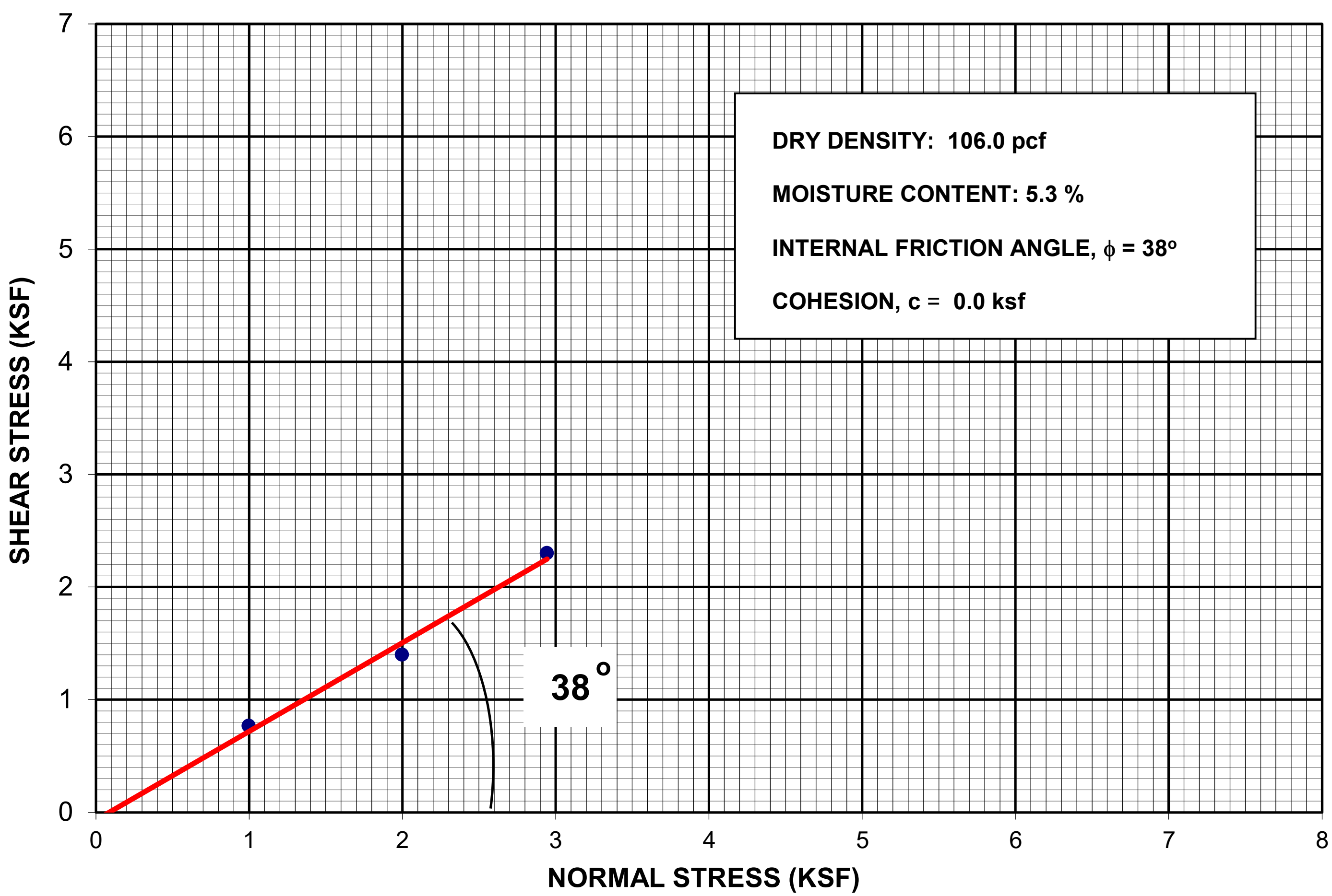
FIGURE B-1
550 W. Locust
Fresno, CA 93650
Ph: (559) 497-2880
Fax: (559) 497-2886

Direct Shear Test

ASTM D-3080

Project Name:	Olive Bowl Park	**Sampled By:**	T. Gorham	**Sample Date:**	10/8/2021
		Tested By:	D. Messfin	**Test Date:**	10/8/2021
Project Number:	G21-320-11F	**Lab Tracking ID:**	N/A	**Report Date:**	10/22/2021
Sample Location:	B-2 @ 6'	**Sample Description:**	Sandy SILT (ML), yellowish brown, moist, fine grained sand		

SHEAR STRENGTH DIAGRAM



ASSOCIATES

FIGURE B-2

550 W. Locust Ave.
Fresno, CA 93650
Ph: (559) 497-2880
Fax: (559) 497-2886

COLLAPSE POTENTIAL
ASTM D-5333

Project Name:	Olive Bowl Park	**Sampled By:**	T. Gorham	**Sample Date:**	10/8/21
		Tested By:	D.Messfin	**Test Date:**	10/18/21
Project Number:	G21-320-11F	**Lab Tracking ID:**	N/A	**Report Date:**	10/22/21
Sample Location:	B-1 @ 6'	**Sample Description:**	Sandy SILT (ML), yellowish brown, moist, fine to medium grained sand