GEOTECHNICAL ENGINEERING INVESTIGATION
OAK HILLS 800 MHz TOWER PROJECT
CAJON PASS, SAN BERNARDINO COUNTY, CALIFORNIA

BSK PROJECT G21-216-11B

PREPARED FOR:
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SEPTEMBER 9, 2021

GEOTECHNICAL ENGINEERING INVESTIGATION
OAK HILLS 800 MHz TOWER PROJECT
CAJON PASS, SAN BERNARDINO COUNTY, CALIFORNIA

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Bakersfield Project: G21-216-11B

September 9, 2021

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1. INTRODUCTION

This report presents the results of a Geotechnical Engineering Investigation conducted by BSK Associates (BSK), for the proposed improvements at the Oak Hills Tower site, approximately 9.8-miles southwest of Hesperia, CA, between northbound and southbound Interstate 15 near the Cajon Summit (site), as shown on the Site Vicinity Map, Figure A-1. The geotechnical engineering investigation was conducted in accordance with BSK Proposal GB20-20430 dated June 29, 2020.

This report provides a description of the geotechnical conditions at the Site and provides specific recommendations for earthwork and foundation design with respect to the planned site improvements. In the event that changes occur in the design of the project, this report's conclusions and recommendations will not be considered valid unless the changes are reviewed with BSK and the conclusions and recommendations are modified or verified in writing. Examples of such changes would include location, size of structures, foundation loads, etc.

1.1. Planned Construction

Based on the information provided, BSK understands that the intent of the improvements is to install a new 50-ft 800 MHz monopole tower, along with a San Bernardino County equipment shelter and equipment generator. BSK anticipates that the generator will be supported on a mat foundation and the antenna tower will be supported on a pedestal footing.

In the event that significant changes occur in the design of the proposed improvements, this report's conclusions and recommendations will not be considered valid unless the changes are reviewed with BSK and the conclusions and recommendations are modified or verified in writing.

1.2. Purpose and Scope of Services

The objective of this geotechnical investigation was to characterize the subsurface conditions in the areas of the proposed structures and provide geotechnical engineering recommendations for the preparation of plans and specifications and bearing and lateral earth pressure conditions. The scope of the investigation included a field exploration, laboratory testing, engineering analyses, and preparation of this report.

2. FIELD INVESTIGATION AND LABORATORY TESTING

2.1. Field Exploration

The field exploration for this investigation was conducted under the oversight of a BSK Project Geologist. Three (3) test pits were excavated at the site on August 3, 2021 using a Deere 310 SJ backhoe provided by Golden Excavation to a maximum depth of 5-feet beneath the existing ground surface (bgs).

The soil materials encountered in the test pits were visually classified in the field, and the logs were recorded during the sampling operations. Visual classifications of the materials encountered in the test pits were made in general accordance with the Unified Soil Classification System (ASTM D-2488). A soil classification chart is presented in Appendix A. Stratification lines were approximated by the field staff based on observations made at the time of exploration, while the actual boundaries between soil types may be gradual and soil conditions may vary at other locations.

2.2 Laboratory Testing

Laboratory tests were performed on selected soil samples to evaluate corrosion characteristics. A description of the laboratory test methods and results are presented in Appendix B.

3. SITE AND GEOLOGY/SEISMICITY CONDITIONS

The following sections address the Site descriptions and surface conditions, regional geology and seismic hazards, subsurface conditions, and groundwater conditions at the site. This information is based on BSK's field exploration and published maps and reports.

3.1 Site Description and Surface Conditions

The site is located at the existing Cal Trans Cajon Summit Tower Site. The surface material consists of native vegetation, a mix of cobbles and gravels, and silty sand. The site is located in Section 18, Township 3 North, and Range 5 West of the San Bernardino Meridian. The NAD 83 GPS coordinates for the center of the Site are 34.348583 degrees North latitude and 117.446217 degrees West longitude.

3.2 Regional Geology and Seismic Hazards Assessment

Our Scope of services included a review of published maps and reports to assess the regional geology and potential for seismic hazards.

3.2.1 Regional Geology

The site is located in the Mojave Desert Geomorphic Province, near the border of the Transverse Ranges. The Mojave Desert Geomorphic Province is a broad interior region of isolated mountain ranges separated by expanses of desert plains. It has an interior enclosed drainage and many playas. There are two important fault trends that control topography a prominent NW-SE trend and a secondary east-west trend (apparent alignment with Transverse Ranges is significant). The Mojave province is wedged in a sharp angle between the Garlock Fault (southern boundary Sierra Nevada) and the San Andreas Fault, where it bends east from its northwest trend. The northern boundary of the Mojave is separated from the prominent Basin and Range by the eastern extension of the Garlock Fault.

3.2.2 Seismic Hazards Assessment

The types of geologic and seismic hazards assessed include surface ground fault rupture, liquefaction, seismically induced settlement, slope failure, flood hazards and inundation hazards.

The purpose of the Alquist-Priolo Geologic Hazards Zones Act, as summarized in CDMG Special Publication 42 (SP 42), is to "prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." As indicated by SP 42, "the State Geologist is required to delineate "earthquake fault zones" (EFZs) along known active faults in California. Cities and counties affected by the zones must regulate certain development 'projects' within the zones. They must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting.

The site is not located in an Earthquake Fault Zone. The closest Earthquake Fault Zone is associated with the Southern Branch of the San Andreas Fault Zone, located approximately 4.9-miles south/southwest of the Site.

Zones of Required Investigation referred to as "Seismic Hazard Zones" in CCR Article 10, Section 3722, are areas shown on Seismic Hazard Zone Maps where site investigations are required to determine the need for mitigation of potential liquefaction and/or earthquake-induced landslide ground displacements. There are no mapped areas that have Seismic Hazard Zones in the project area.

3.3 Subsurface Conditions

The subsurface material generally consisted of silty sands, with sparse surface cobbles and gravels near the hillsides. Test pits were terminated at 5-feet bgs and refusal from encountering dense cobbles and gravels. The test pit logs in Appendix A provide a more detailed description of the materials encountered, including the applicable Unified Soil Classification System symbols.

3.4 Groundwater Conditions

Groundwater was not encountered at the time of excavating on August 3, 2021. Depth to groundwater at this site is generally believed to be greater than 50-feet bgs.

Please note that the groundwater level may fluctuate both seasonally and from year to year due to variations in rainfall, temperature, pumping from wells and possibly as the result of other factors such as irrigation, that were not evident at the time of our investigation.

4. CONCLUSIONS AND RECOMMENDATIONS

Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site conditions would not preclude the construction of the proposed improvements. However, due to shallow dense gravels and cobbles, difficult ripping, trenching and/or excavation should be anticipated.

The proposed improvements may be supported on mat foundations if the recommendations presented herein are incorporated into the design and construction of the project.

4.1 Seismic Design Criteria

Based on Section 1613.3.2 of the 2019 California Building Code (CBC), the Site shall be classified as Site Class A, B, C, D, E or F based on the Site soil properties and in accordance with Chapter 20 of ASCE 7-16. Based on the observation from our test pits and geologic composition of the site, as per Table 20.3-1 of ASCE 7-16, the Site is Class D (Stiff Soil).

The 2019 CBC utilizes ground motion based on the Risk-Targeted Maximum Considered Earthquake (MCER) that is defined in the 2019 CBC as the most severe earthquake effects considered by this code, determined for the orientation that results in the largest maximum response to horizontal ground motions and with adjustment for targeted risk. Ground motion parameters in the 2019 CBC are based on ASCE 7-16, Chapter 11.

The Structural Engineers Associates of California (SEAOC) has prepared maps presenting the Risk-Targeted MCE spectral acceleration (5-percent damping) for periods of 0.2 seconds (S_S) and 1.0 seconds (S_1). The values of S_S and S_1 can be obtained from the Occupational Safety Health Planning and Development (OSHPD) Seismic Design Maps Tool at: https://seismicmaps.org/.

The OSHPD Seismic Design Maps Tool and Chapter 16 of the 2019 CBC based on ASCE 7-16 produced the spectral acceleration parameters risk targeted maximum considered earthquake values in Table 1 based on Site Class D conditions.

As per Section 1803.5.12 of the 2019 CBC, peak ground acceleration (PGA) utilized for dynamic lateral earth pressures and liquefaction, shall be based on a site-specific study (ASCE 7-16, Section 21.5) or ASCE 7-16, Section 11.8.3. The OSHPD Seismic Design Maps Tool and based on ASCE 7-16, Section 11.8.3 produced the Geometric Mean PGA value in Table 1 based on Site Class D conditions.

Table 1: Seismic Design Parameters

Seismic Design Parameter	2019 CBC Value		Reference
MCE Mapped Spectral Acceleration (g)	S_S = 1.694	S_1 = 0.700	USGS Mapped Value
Amplification Factors (Site Class D)	F_a = 1.000	F_v = null[1](1.700)[2]	ASCE Table 11.4
Site Adjusted MCE Spectral Acceleration (g)	S_{MS} = 1.694	S_{M1} = null[1](1.190)[2]	ASCE Equations 11.4.1-2
Design Spectral Acceleration (g)	S_{DS} = 1.129	S_{D1} = null[1](0.793)[2]	ASCE Equations 11.4.1-4
Geometric Mean PGA (g)	PGA_M = 0.812		Section 11.8.3, ASCE 7-16
Site Short Period – T_s (seconds)	T_s = 0.703		$T_s = S_{D1}/ S_{DS}$
Site Long Period – T_L (seconds)	T_L = 8		USGS Mapped Value

4.2 Soil Corrosivity

A surface soil sample obtained from the site was tested to provide a preliminary screening of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts. The test results are presented in Appendix B.

The corrosivity evaluation was performed by BSK on a soil sample obtained at the time of excavation. The soil was evaluated for minimum resistivity (ASTM G-57), pH (ASTM D-4972), and soluble sulfate and chlorides (ASTM D-4327). Using a combination of representative samples from each test pit, the minimum resistivity was 670 ohm-cm, pH was 5.78, sulfate was not detected, and chloride was also not detected.

The water-soluble sulfate content severity class is considered negligible to concrete (Exposure Category S0 per Table 19.3.1.1 of ACI 318-14). A representative sample of the site soil in the vicinity has a minimum resistivity of 670 ohm-cm which is considered very extremely corrosive to buried metal conduit. Therefore, buried metal conduits, ferrous metal pipes, and exposed steel should have a protective coating in accordance with the manufacturer's specification.

4.3 Site Preparation Recommendations

The following procedures must be implemented during Site preparation for the proposed Site improvements. References to maximum dry density, optimum moisture content, and relative compaction are based on ASTM D-1557 (latest test revision) laboratory test procedures.

1. The areas of proposed improvements must be cleared of surface vegetation and debris. Materials resulting from the clearing and stripping operations must be removed and properly disposed of off-site. In addition, all undocumented fills should be removed where encountered and where fills or structural improvements will be placed. BSK recommends at the proposed structures, the exposed ground surface should be overexcavated to 2-feet below the existing grade or to the bottom of the footing elevation, whichever is greater. Due to shallow dense gravels and cobbles, difficult ripping, trenching and/or excavation should be anticipated. Overexcavation should extend laterally 3-feet beyond the edge of foundations for shallow footings. Yielding areas should be observed by the geotechnical consultant and removed and recompacted if necessary.
2. After overexcavation, the bottom of the exposed soil should be scarified 8-inches, moisturized to optimum moisture content, and compacted to 90-percent of ASTM D-1557.
3. Following the required stripping and overexcavation, the exposed ground surface must be inspected by the Geotechnical Engineer to evaluate if loose or soft zones are present that will require over excavation.
4. Imported soil or native excavated soils, free of organic materials or deleterious substances, may be placed as compacted engineered fill. The material must be free of oversized fragments greater than 3-inches in greatest dimension. Engineered fill underneath and extending 5-feet beyond the building foundation and must be placed in uniform layers not exceeding 8-inches in loose thickness, moisture conditioned to within 2- to 4-percent above optimum moisture content and compacted to at least 90-percent relative compaction. Engineered fill placed on fill slopes 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 relative compaction.
5. BSK must be called to the site to verify the import material properties through laboratory testing.
6. If possible, earthwork operations should be scheduled during a dry, warm period of the year. Should these operations be performed during or shortly following periods of inclement weather,

unstable soil conditions may result in the soils exhibiting a "pumping" condition. This condition is caused by excess moisture in combination with moving construction equipment, resulting in saturation and zero air voids in the soils. If this condition occurs, the adverse soils will need to 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 should be subject to review and approval by BSK prior to implementation.

7. Import fill materials must be free from organic materials or deleterious substances. The project specifications must require the contractor to contact BSK to review the proposed import fill materials for conformance with these recommendations at least one week prior to importing to the Site, whether from on-site or off-site borrow areas. Imported fill soils must be non-hazardous and derived from a single, consistent soil type source conforming to the following criteria:

Plasticity Index:	< 12
Expansion Index:	< 20 (Very Low Expansion Potential)
Maximum Particle Size:	3-inches
Percent Passing #4 Sieve:	65 - 100
Percent Passing #200 Sieve:	20 - 45
Low Corrosion Potential:	Soluble Sulfates < 1,500 ppm
	Soluble Chlorides < 150 ppm
	Minimum Resistivity > 3,000 ohm-cm

4.4 Foundations

Provided the recommendations contained in this report are implemented during design and construction, it is our opinion that the structures may be supported on mat foundations.

4.4.1 Mat Foundations

We understand that the structure may be supported on a concrete mat foundation. The mat foundation may be designed to impose a maximum allowable pressure of 3,000 psf due to dead plus live loads. This value may be increased by one-third for transient loads such as seismic or wind. The concrete mat foundation should be embedded at least 8-inches below the lowest adjacent grade.

Settlements: Based on the results of our laboratory tests and analyses, total static settlements of the mat foundation under the allowable bearing pressure are expected to be approximately 1-inch, and maximum differential settlements are expected to be about 1/2-inch.

4.5 Excavation Stability

Soils encountered within the depth explored are generally classified as Type C soils in accordance with OSHA (Occupational Safety and Health Administration). The slopes surrounding or along temporary excavations may be vertical for excavations that are less than 5-feet deep and exhibit no indication of potential caving, but should be no steeper than 1.5H:1V for excavations that are deeper than 5-feet, up to a maximum depth of 15-feet. Certified trench shields or boxes may also be used to protect workers during construction in excavations that have vertical sidewalls and are greater than 5-feet deep.

Temporary excavations for the project construction should be left open for as short a time as possible and should be protected from water runoff. In addition, equipment and/or soil stockpiles must be maintained at least 10-feet away from the top of the excavations. Because of variability in soils, BSK must be afforded the opportunity to observe and document sloping and shoring conditions at the time of construction. 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).

4.6 Trench Backfill and Compaction

Processed on-site soils, which are free of organic material, are suitable for use as general trench backfill above the pipe envelope. Native soil with particles less than 3-inches in the greatest dimension may be incorporated into the backfill and compacted as specified above, provided they are properly mixed into a matrix of friable soils. The backfill must be placed in thin layers not exceeding 12-inches in loose thickness, be well-blended and consistent texture, moisture conditioned to at least optimum moisture content, and compacted to at least 90-percent of the maximum dry density as determined by the ASTM D-1557. The uppermost 12-inches of trench backfill below pavement sections must be compacted to at least 95-percent of the maximum dry density as determined by ASTM D-1557. Moisture content within 2-percent of optimum must be maintained while compacting this upper 12-inch trench backfill zone.

We recommend that trench backfill be tested for compliance with the recommended Relative Compaction and moisture conditions. Field density testing should conform to ASTM Test Methods D-1556 or D-6938. We recommend that field density tests be performed in the utility trench bedding, envelope and backfill for every vertical lift, at an approximate longitudinal spacing of not greater than 150-feet. Backfill that does not conform to the criteria specified in this section should be removed or reworked, as applicable over the trench length represented by the failing test so as to conform to BSK recommendations.

4.7 Drainage Considerations

The control surface drainage in the project areas is an important design consideration. BSK recommends that final grading around shallow foundations must provide for positive and enduring drainage away from the structures, and ponding of water must not be allowed around, or near the shallow foundations. Ground surface profiles next to the shallow foundations must have at least a 2-percent gradient away from the structures.

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 and earthwork, prior to their 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, then 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 pits performed at the locations shown on the Test Pit Location Map, Figure A-2. The report does not reflect variations which may occur between or beyond the test pits. The nature and extent of such variations may not become evident until 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 San Bernardino County at the time the report was written. No other warranties either expressed or implied are made as to the professional advice provided under the terms of BSK's agreement with Client and included in this report.

8. REFERENCES

Lee, Norman. California Geomorphic Provinces (2012): n. pag. California Department of Conservation. California Geological Survey. <http://www.conservation.ca.gov/cgs/information/publications/cgs_notes/note_36/Documents/note_36.pdf>. August 2021.

USGS/OSHPD, U.S. Seismic Design Maps, https://seismicmaps.org/. August 2021

APPENDIX A

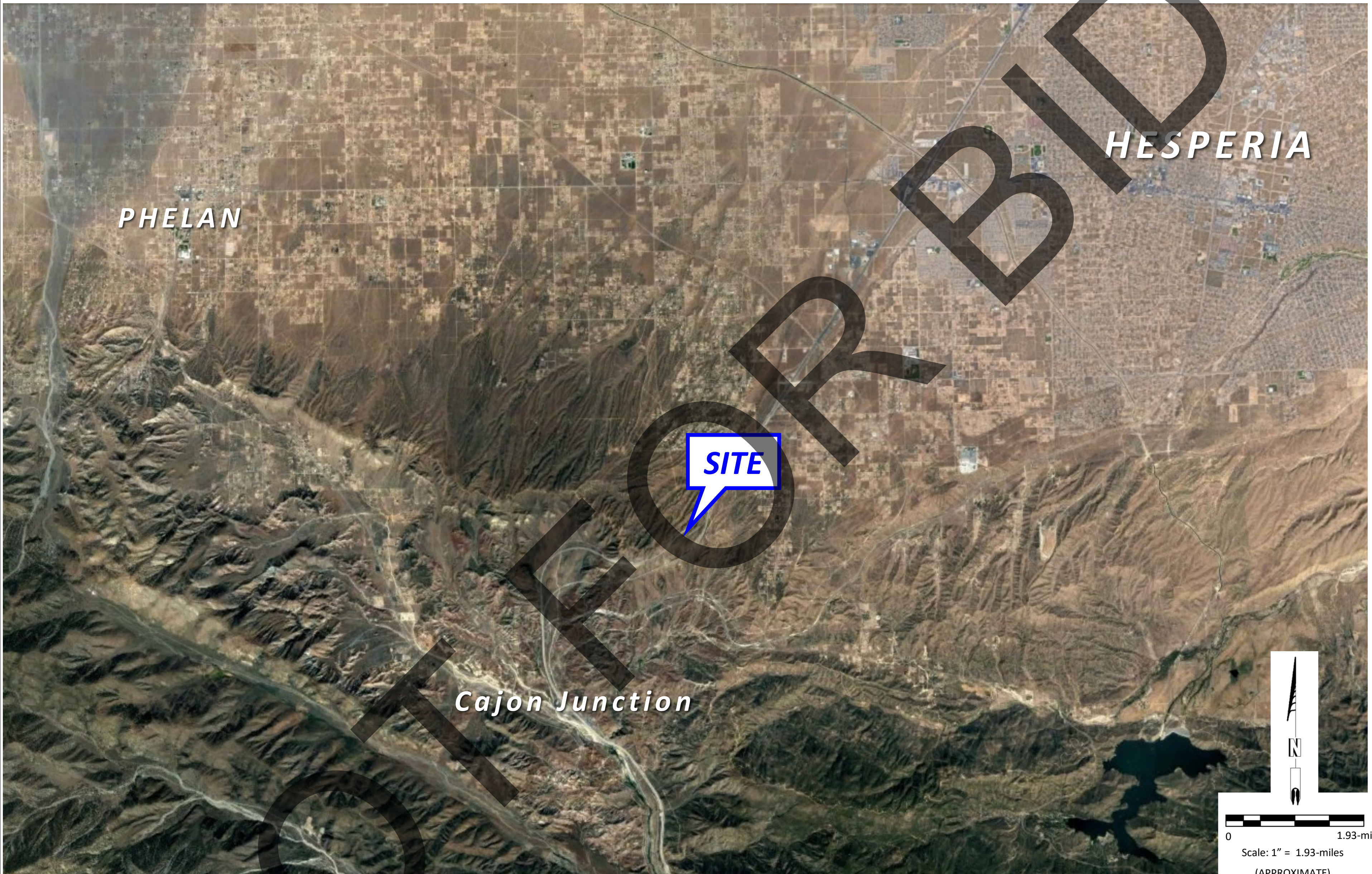
FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

The field exploration for this investigation was conducted under the oversight of a BSK Project Geologist. Three (3) test pits were excavated at the site on August 3, 2021 using a Deere 310 SJ backhoe provided by Golden Excavation to a maximum depth of 5-feet beneath the existing ground surface (bgs).

The soil materials encountered in the test pits were visually classified in the field, and the logs were recorded during the excavating and sampling operations. Visual classification of the materials encountered in the test pits was made in general accordance with the Unified Soil Classification System (ASTM D-2488). A soil classification chart is presented herein. Test pit logs are presented herein and should be consulted for more details concerning subsurface conditions. Stratification lines were approximated by the field staff based on observations made at the time of excavation, while the actual boundaries between soil types may be gradual and soil conditions may vary at other locations.



REFERENCE IMAGE: Google Earth 2021

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SITE VICINITY MAP

Salas O'Brien
Oak Hills 800 MHz Tower Project
Cajon Pass, San Bernardino County, California

FIGURE A-1

JOB NO. G21-216-11B
DATE August 2021

DR. BY LP
CH. BY AXT
SCALE AS SHOWN

SHEET NO. 1
OF 1 SHEETS

REFERENCE IMAGE: Google Earth 2021

LEGEND:

APPROXIMATE BORING LOCATION B-1

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BORING LOCATION MAP

Salas O'Brien
Oak Hills 800 MHz Tower Project
Cajon Pass, San Bernardino County, California

FIGURE A-2

JOB NO.	G21-216-11B
DATE	August 2021
DR. BY	LP
CH. BY	OML
SCALE AS SHOWN	
SHEET NO.	1
OF	1 SHEETS

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half >#200	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, POORLY 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

Note: Dual symbols are used to indicate borderline soil classifications.

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

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA
Unified Soil Classification System

BSK ASSOCIATES

PLATE: Figure A-3

LOG OF TEST PIT NO. TP-1

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Telephone: (661) 327-0671

Project Name: **Oak Hills 800 MHz Tower Project**
Project Number: **G21-216-11B**
Project Location: **Cajon Pass, CA**
Logged by: **L. Prosser**
Checked by: **A. Terronez**

Surface El.:
Location:

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Sample Number	Penetration Blows / Foot	Pocket Penetro-meter, TSF	% Passing No. 200 Sieve	In-Situ Dry Weight (pcf)	In-Situ Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
0–5		**SM: SILTY SAND:** Dark Yellowish Brown; fine to coarse grained; moist; poorly graded; subangular; trace roots from adjacent vegetation; trace fine to coarsed grained gravels.					23		3			
5		End of test pit.										

Completion Depth: 5.0
Date Started: 8/3/21
Date Completed: 8/3/21
California Sampler: -
SPT Sampler: -

Drilling Equipment: Deere 310SJ Backhoe
Drilling Method: -
Drive Weight: -
Hole Diameter: -
Drop: -
Remarks: Test pits backfilled with native soil

LOG OF TEST PIT NO. TP-2

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Project Name: **Oak Hills 800 MHz Tower Project**
Project Number: **G21-216-11B**
Project Location: **Cajon Pass, CA**
Logged by: **L. Prosser**
Checked by: **A. Terronez**

Surface El.:
Location:

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Sample Number	Penetration Blows / Foot	Pocket Penetro-meter, TSF	% Passing No. 200 Sieve	In-Situ Dry Weight (pcf)	In-Situ Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
		SM: SILTY SAND: Dark Yellowish Brown; fine to coarse grained; moist; poorly graded; subangular; trace roots from adjacent vegetation; trace fine to coarsed grained gravels.	(hand sample)				25		3			
5		End of test pit.										

Completion Depth:	5.0	**Drilling Equipment:**	Deere 310SJ Backhoe
Date Started:	8/3/21	**Drilling Method:**	-
Date Completed:	8/3/21	**Drive Weight:**	-
California Sampler:	-	**Hole Diameter:**	-
SPT Sampler:	-	**Drop:**	-
		Remarks:	Test pits backfilled with native soil

LOG OF TEST PIT NO. TP-3

BSK Associates
700 22nd Street
Bakersfield, CA 93301
Telephone: (661) 327-0671

Project Name:	**Oak Hills 800 MHz Tower Project**
Project Number:	**G21-216-11B**
Project Location:	**Cajon Pass, CA**
Logged by:	**L. Prosser**
Checked by:	**A. Terronez**

Surface El.:
Location:

Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Sample Number	Penetration Blows / Foot	Pocket Penetro-meter, TSF	% Passing No. 200 Sieve	In-Situ Dry Weight (pcf)	In-Situ Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
		GP: SANDY GRAVEL: Gravels Metamorphic Dark Yellowish Brown; fine to coarse grained; moist; poorly graded; subangular; trace roots from adjacent vegetation; trace fine to coarsed grained gravels.	(hand)				19		4			
		End of test pit - refusal (dense gravels and cobbles)										
5												

Completion Depth:	3.5	**Drilling Equipment:**	Deere 310SJ Backhoe
Date Started:	8/3/21	**Drilling Method:**	-
Date Completed:	8/3/21	**Drive Weight:**	-
California Sampler:	-	**Hole Diameter:**	-
SPT Sampler:	-	**Drop:**	-
		Remarks:	Test pits backfilled with native soil

APPENDIX B

LABORATORY TESTING RESULTS

APPENDIX B
LABORATORY TESTING

Direct Shear Test

One (1) Direct Shear Test was performed on a remolded soil sample from materials obtained at the time of excavating in the area of planned construction. The test was conducted to determine the soil strength characteristics. The standard test method is ASTM D-3080, Direct Shear Test for Soil under Consolidated Drained Conditions. The direct shear test result is presented graphically on Figure B-1.

Collapse Potential Test

One (1) Collapse Potential Test was performed on a relatively undisturbed soil sample to evaluate collapse potential characteristics. The test was performed in general accordance with ASTM D-5333. The sample was initially loaded under as-received moisture conditions to a selected stress level, loaded to a maximum load of 1,300 psf and then saturated. The test results are presented on Figure B-2.

Expansion Index Test

One (1) Expansion Index Test was performed on a combined representative sample from materials obtained at the time of excavating in the area of planned construction. The test was performed in general accordance with UBC Standard 18-2. The test results are presented on Figure B-3.

Moisture-Density Relationship Test

One (1) Moisture-Density Relationship Test was performed on a combined representative sample from materials obtained at the time of excavating in the area of planned construction. The bulk sample was tested for optimum moisture content and maximum dry density per Test Method ASTM D-1557. The test results are presented on Figure B-4.

Soil Corrosivity

One (1) Corrosivity Evaluation was performed on a bulk soil sample obtained at the time of excavating in the area of planned construction. The soil was evaluated for minimum resistivity (ASTM G-57), sulfate ion concentration (CT 417), chloride ion concentration (CT 422), and pH of soil (ASTM D-4972). The test results are presented in Table B-1.

Minus #200 Wash Test

Three (3) #200 Wash Test was performed on samples from materials obtained at the time of excavating in the area of planned construction. The tests were performed to determine the amount of fine material present in the subsurface material. The tests were performed in general accordance with ASTM Test Method D-1140. The test results are presented in Table B-2 and the boring logs in Appendix A.

Table B-1: Summary of Corrosion Test Results				
Sample Location	pH	Sulfate, ppm	Chloride, ppm	Minimum Resistivity, ohm-cm
TP-1	5.78	ND	ND	670

Table B-2: Summary of Minus #200 Wash Test Results	
Test Location	Percent Fines
TP-1	23
TP-2	25
TP-3	19

Direct Shear Test

ASTM D 3080

700 22nd St
Bakersfield, CA
Ph: (661) 327-0671
Fax: (661) 324-4218

Project Name:	Oak Hill 800 MHz Tower Projet	**Sample Date:**	8/3/2021
Project Number:	G21-216-11B	**Test Date:**	8/18/2021
Lab Tracking ID:	B21-115	**Report Date:**	8/19/2021
Sample Location:	B-1 @ 0.0-5.0 Feet bgs Remolded to 90%	**Sampled By:**	L. Prosser
Sample Description:	SM: SILTY SAND: Brown; Fine to Coarse; Traces of Clay.	**Tested By:**	I. Pacheco

SHEAR STRENGTH DIAGRAM

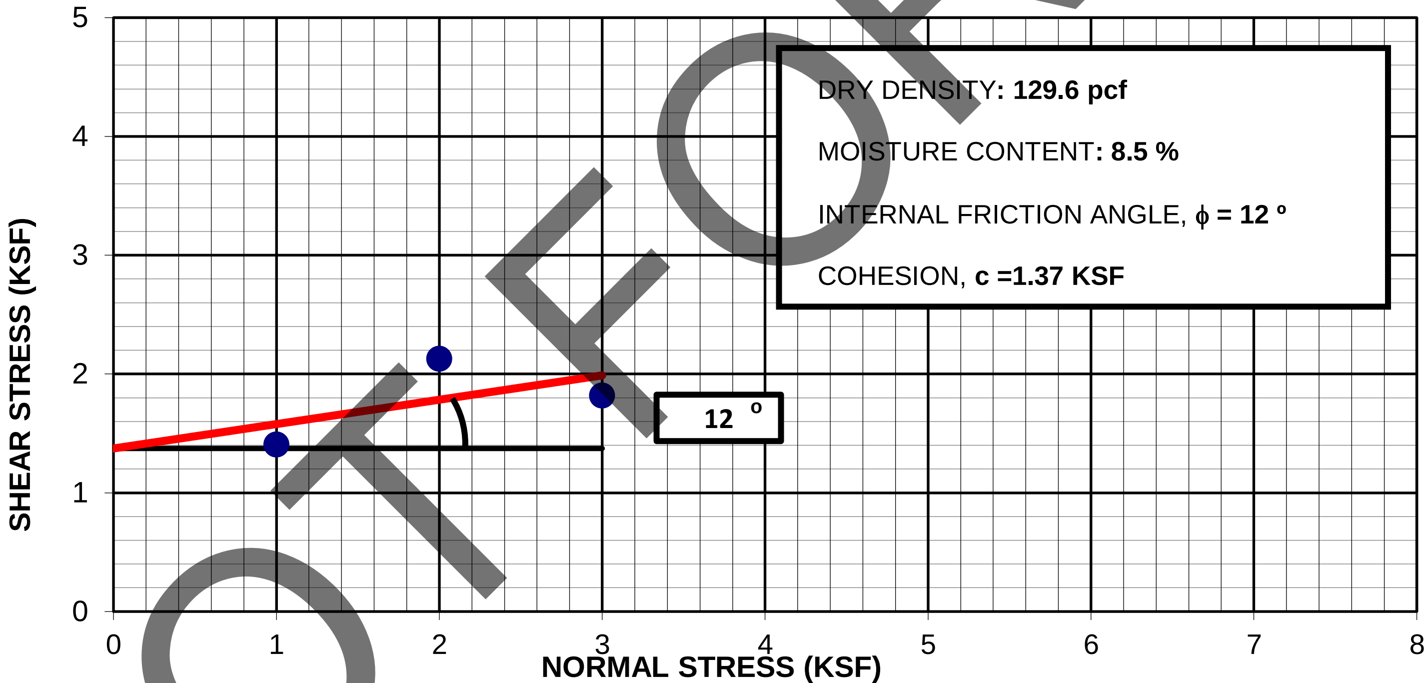


Figure B-1

Reviewed By: *Ian Remotique*

BSK ASSOCIATES

700 22nd St
Bakersfield, CA
Ph: (661) 327-0671
Fax: (661) 324-4218

Collapse Potential Test

ASTM D 5333, One-Dimensional Analysis

Project Name:	Oak Hill 800 MHz Tower Project	**Sample Date:**	8/3/2021
Project Number:	G21-216-61B	**Test Date:**	8/18/2021
Sample Location:	B-1 @ 0.0-5.0 Feet bgs remolded to 90%	**Sampled By:**	L. Prosser
Sample Description:	SM: SILTY SAND: Brown : Fine to Coarse; Traces of Clay	**Tested By:**	I. Pacheco
Collapse Potential:	0.09 percent collapse at 1300 psf	**Dry Density (pcf):**	129.6
Peak Load (psf):	1300	**Initial Moisture Content (%):**	8.5

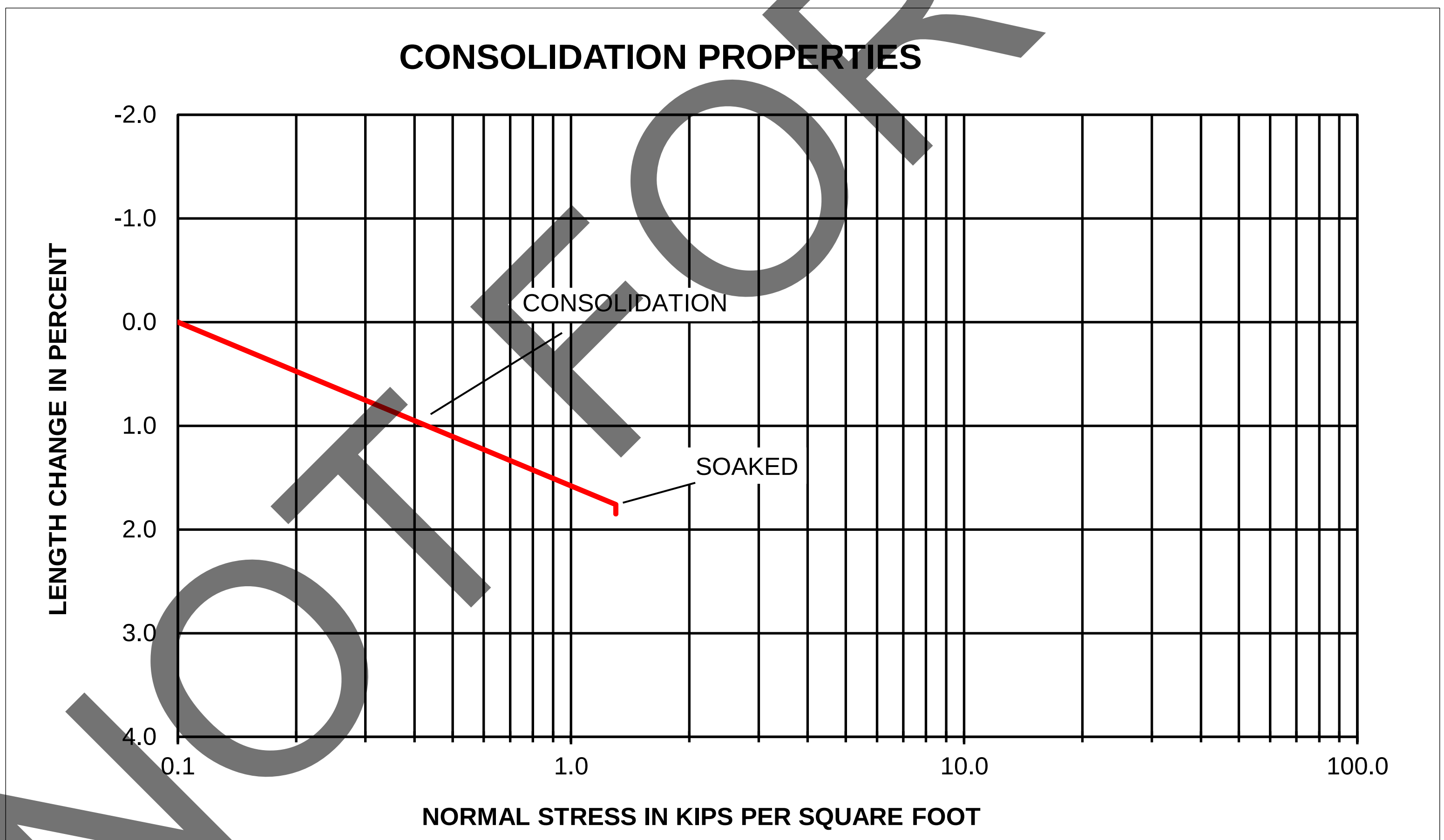


Figure B-2

700 22nd Street
Bakersfield, CA 93301
Ph: (661) 327-0671
Fax: (661) 324-4218

EXPANSION INDEX OF SOILS

ASTM D 4829

Project Name: Oak Hills 800 MHz Tower Project
Project Number: G21-216-11B
Sample Location: B1 @ 0-5'
Source: **Native**
Lab ID No. **B21-115**
Sample Description: SM: Silty Sand,brown, moist, fine to coarse grained

Sample Date: 8/3/2021
Sampled By: L.Prosser
Test Date: 8/19/2021
Tested By: F.Velez

TEST DATA

INITIAL SET-UP DATA		**FINAL TAKE-DOWN DATA**	
Sample + Tare Weight (g)	792.8	Sample + Tare Weight (g)	856.0
Tare Weight (g)	367.8	Tare Weight (g)	367.8
Moisture Content Data		**Moisture Content Data**	
Wet Weight + Tare	155.9	Wet Weight + Tare	856.0
Dry Weight + Tare	145.2	Dry Weight + Tare	788.4
Tare Weight (g)	0	Tare Weight (g)	367.8
Moisture Content (%)	7.4%	Moisture Content (%)	16.1%
Initial Volume (ft^3)	0.007272	Final Volume (ft^3)	0.007418
Remolded Wet Density (pcf)	128.8	Final Wet Density (pcf)	145.1
Remolded Dry Density (pcf)	120.0	Final Dry Density (pcf)	125.0
Degree of Saturation	**49.2**	**Degree of Saturation**	**125**

EXPANSION READINGS

Initial Gauge Reading (in)	0.254
Final Gauge Reading (in)	0.274
Expansion (in)	0.02

Uncorrected Expansion Index	**20**

Classification of Expansive Soil

EI	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

Remarks: Very Low expansion potential.

Reviewed By: I. Remontigue

ASSOCIATES

MOISTURE DENSITY RELATIONSHIP
ASTM D1557

700 22nd Street
Bakersfield, CA 93301
Ph: (661) 327-0671
Fax: (661) 324-4218

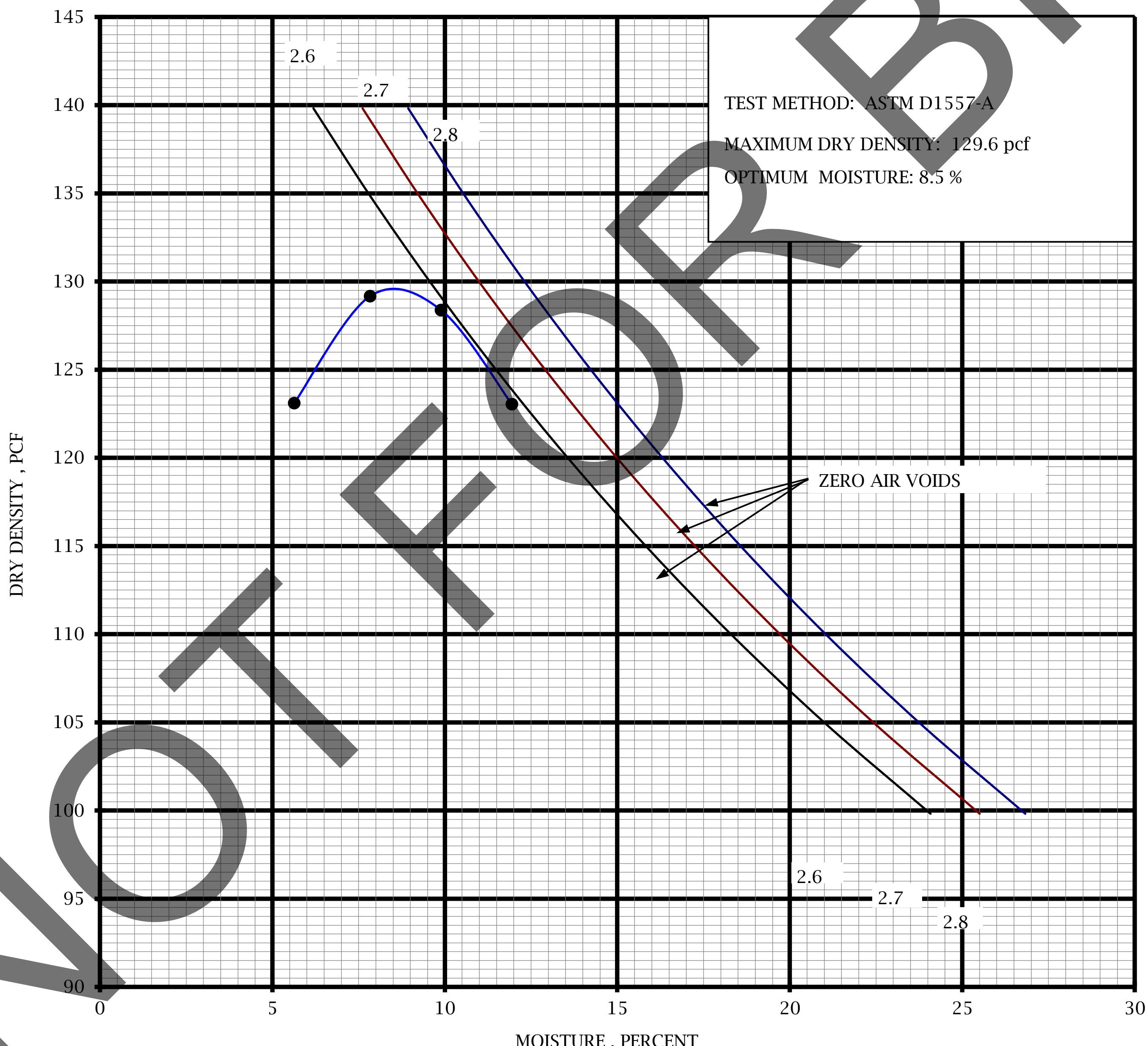
Project Name: Oaks Hills 800 MHz Tower Project **Project Number:** G21-216-11B

Project Manager: A. Terronez **Lab Number:** B21-112

Sample Location: B-3 @ 0.0-5.0 feet bgs **Sample Date:** 8/3/2021

Sample Description: SM: SILTY SAND; Brown; Fine to Coarse; trace of Clay.

Tested By: J. Buenrostro **Tested Date:** 8/17/2021 **Sample By:** L. Prosser



Reviewed by: Ian Remotigue