PRELIMINARY GEOTECHNICAL INVESTIGATION
For
PROPOSED TOWNHOME DEVELOPMENT

900 High Street
APN 001-022-40
Santa Cruz, California

Prepared
For
ENVISION 1, LLC
Santa Cruz, California

Prepared By
DEES & ASSOCIATES, INC.
Geotechnical Engineers
Project No. SCR-1221
MARCH 2023

Dees & Associates, Inc.
Geotechnical Engineers
501 Mission Street, Suite 8A Santa Cruz, CA 95060 Phone (831) 427-1770

March 10, 2023 Project No. SCR-1221

ENVISION 1, LLC
% Sibley Simon
189 Walnut Avenue
Santa Cruz, California 95060

Subject: Preliminary Geotechnical Investigation

Reference: Proposed Townhome Development
900 High Street
APN 001-022-40
Santa Cruz, California

Dear Mr. Simon:

As requested, we have completed a preliminary geotechnical investigation for the new townhome development proposed at the referenced site. The purpose of our preliminary investigation was to evaluate the soil conditions in the vicinity of the proposed improvements and develop preliminary geotechnical recommendations for the proposed development. We have worked closely with the project geologist, Erik Zinn, during our investigation.

This report presents the preliminary results, conclusions and recommendations of our investigation.

Very truly yours,

DEES & ASSOCIATES, INC.

Rebecca L Dees

REBECCA LYNN DEES
GE-2623
EXPIRES: 12/23

Rebecca L. Dees
Geotechnical Engineer
G.E. 2623

Copies: 1 to Addressee
1 to Erik Zinn; Pacific Crest Engineering

TABLE OF CONTENTS

PRELIMINARY GEOTECHNICAL INVESTIGATION

Introduction

This report presents the results of our preliminary geotechnical investigation for the new townhome development proposed at 900 High Street in Santa Cruz, California. The proposed townhome development will consist of a three to five story structure that steps up the slope at the back of the existing parking lot for the Peace United Church.

Purpose and Scope

The purpose of our preliminary investigation was to explore the soil and marble conditions beneath the proposed development in conjunction with the project geologist, determine potential geotechnical hazards that may exist at the proposed development site, and discuss potential mitigation methods to address geologic and geotechnical hazards for the proposed improvements.

The specific scope of our services was as follows:

1. Site reconnaissance and review of available data in our files pertinent to the site and vicinity. Including review of our stability analysis letter, dated 1 April 2022.

2. Discussions with the project geologist and review of the Preliminary Geologic Investigation, dated 2 July 2018, prepared by Zinn Geology and the geological feasibility letter, dated 9 March 2023 by Pacific Crest Engineering, Inc. Note that Erik Zinn was the author/geologist for both referenced reports.

3. Exploration of subsurface conditions consisting of logging and sampling of thirteen (13) exploratory borings, terminated 6 to 40 feet below grade.

4. Engineering analysis and evaluation of the resulting data.

5. Preparation of this report presenting the results of our preliminary investigation.

Project Location and Description

The project site is located at 900 High Street in Santa Cruz, California, Figure 1. The site is developed with the Peace United Church which consists of several buildings and parking areas. The proposed townhome building will be located on the rear slope at the existing upper parking lot of the church. See Figure 2. The project is still in the preliminary feasibility stages and the exact layout of the proposed building has not been determined yet. However, preliminary plans indicate the new townhome building will be three to five stories high and it will step up the slope with the lower portion of the building at the base of the slope in the existing parking lot area and the upper portion of the building on the terrace at the top of the slope.

The 5.9-acre property is located on a moderate slope above High Street. The site was graded to accommodate the existing improvements and a portion of the proposed building will be located in the area of an existing parking lot. The nearly level parking lot was graded by cutting into the slope above and placing fill on the downslope side. Grading on the adjacent parcel to the east created a steep, near vertical cut slope adjacent to the proposed building envelope. The cut slope is about 50 to 70 feet high, adjacent to the proposed development, and the slope begins a few feet from the eastern property line of the subject site. See Figure 2. The building will be setback 60 feet from the top of the adjacent slope to the east.

Field Investigation

The site is underlain by marble bedrock that is overlain by marine terrace deposits and soil. The marble formation in the region is characterized by sinkholes, caves and underground drainages. The marble formation at the proposed building site is relatively level and is capped with about 10 to 30 feet of marine terrace soils. Voids have developed in the marble creating dolines with doline fill consisting of broken marble rocks and soil that have collapsed into the voids. The composition of doline fill is typically mixed soil and angular fragments of bedrock.

Determining the depth to intact marble is constrained by the mechanical limitations of the drilling equipment used for the field exploration. "Intact" marble for this project is mostly defined by refusal for the auger. It is possible that the auger may have encountered refusal in some borings on a large piece of marble rubble instead of the assumed intact marble. Nevertheless, the results obtained from the equipment used for this project, combined with consistent assumptions, allow for reasonable conclusions to be drawn about the relative geometry of the "intact" marble surface. Obtaining the absolute geometry of the marble surface, however, may prove economically prohibitive.

We initially drilled a grid of ten borings along the lower pad of the proposed building area with the borings being about 40 to 50 feet apart to broadly characterize the overall geometry of the intact marble bedrock surface and risk related to future sinkhole collapses. As the design of the project evolved to development on the steep slope that lies above the relatively flat parking lot, we drilled three borings at the top of the slope to characterize the earth materials that underlie the steep slope and to determine the stability of the slope. The marble in areas between the borings can vary greatly so the information from the borings is only reliable at the actual boring locations.

The subsurface conditions in the parking area at the base of the slope were explored on May 9, 2018 with ten (10) exploratory borings drilled with 6-inch diameter continuous flight augers advanced with truck mounted drilling equipment and subsurface conditions at the top of the slope were explored on February 11, 2022 with three (3) exploratory borings drilled 33 and 40 feet below grade with 6-inch diameter tractor mounted drilling equipment. The approximate locations of the exploratory borings are indicated on Figure 3. Each boring was drilled to refusal in marble. Refusal was based on the drilling resistance; when the drilling rate became slower than 5 minutes for six (6) inches of penetration the boring was terminated.

The soils observed in the test borings were logged in the field and described in accordance with the Unified Soil Classification System (D2487 and D2488), Figure 4. The Test Boring Logs, Figures

5 to 17, denote subsurface conditions at the locations and times observed, and they are not warranted they are representative of subsurface conditions at other locations or times.

Representative soil samples were obtained from the exploratory borings at selected depths, or at major strata changes. These samples were recovered using the 3.0-inch O.D. Modified California Sampler (L) or the Standard Terzaghi Sampler (T). The penetration resistance blow counts for the (L) and (T) noted on the boring logs were obtained as the sampler was dynamically driven into the in-situ soil. The process was performed by dropping a 140-pound hammer a 30-inch free fall distance and driving the sampler 6 to 18 inches and recording the number of blows for each 6-inch penetration interval. The blows recorded on the boring logs present the accumulated number of blows that were required to drive the last 12 inches. The blow counts for the large samples indicated on the logs have been converted to equivalent standard penetration test (SPT) values.

Subsurface Soil Conditions

Our borings suggest the surface of the marble bedrock is generally located 6 to 12 feet below existing grade in the parking area at the base of the slope and about 30 to 35 feet below the building area at top of the slope. Some of the borings penetrated infilled dolines and encountered intact marble at deeper depths.

The project geologist prepared a contour map based on our borings showing the surface of the marble below the parking area. The depth of the marble surface is fairly uniform between our borings (6 to 10 feet deep) with the exception of the Boring 2, where the marble was 24 feet deep. Rubble and slough were encountered on top of the marble surface suggesting there is a doline in the vicinity of Boring 2. A doline, also known as a sinkhole, can fill with slough and rubble spalling/eroding off the side walls of the depression. Although the marble surface appears uniform in our borings, the marble in areas between the borings can vary greatly so the information from the borings is only reliable at the actual boring locations. Therefore, we recommend drilling additional borings in a smaller grid pattern prior to developing plans and specifications for the project.

The marble encountered in our widely dispersed borings drilled at the top of the slope was mostly rubble and the geometry of the intact marble bedrock was not determined. Further drilling, will be necessary to adequately characterize the intact marble and sinkhole hazards north of the parking area.

The soil overlying the marble primarily consists of fine silty sand with some areas of fine sandy silt at the base of the building site and clayey sand over sand on the slope and upper terrace areas. The soils were generally medium dense to dense except for the soils encountered in the infilled dolines.

At Boring 2, drilled at the base of the slope, the doline was infilled with about 12 feet of loose to medium dense soil over marble rubble down to 24 feet. We were unable to sample the soils/rubble below 12 feet but we were able to advance the drill auger to 24 feet where refusal was met. Loose soil and marble rubble was encountered in our borings drilled at the top of the slope. The loose soil and marble rubble was encountered from 31.5 to 38 feet in Boring 1A and 25 to 40 feet in Boring 2A.

Groundwater

Groundwater was not encountered in our borings and the soils were damp to moist throughout the explored profile. The boring logs denote groundwater conditions at the locations and times observed, and they are not warranted they are representative of groundwater conditions at other locations and times.

Seismicity

The following is a general discussion of seismicity in the project area. A detailed discussion of seismicity is beyond the scope of our services.

The closest faults to the site are the Monterey Bay-Tularcitos Fault, the offshore San Gregorio Fault, the Zayante-Vergeles Fault, and San Andreas Fault. The San Andreas Fault is the largest and most active of the faults in the site vicinity. However, each fault is considered capable of generating moderate to severe ground shaking. It is reasonable to assume that the proposed development will be subject to at least one moderate to severe earthquake from one of the faults during the next fifty years.

Monterey Bay Fault Zone	San Gregorio Fault Zone	Zayante Fault Zone	San Andreas Fault Zone
5.8 miles Southwest	8.6 miles Southwest	8.8 miles Northeast	11.6 miles Northeast

Liquefaction

Liquefaction occurs when saturated fine grained sands, silts and sensitive clays are subject to shaking during an earthquake and the water pressure within the pores builds up leading to loss of strength. Due to the lack of groundwater, there is a very low potential for liquefaction to affect the proposed improvements.

Landsliding

The proposed building site is located on a moderately steep, 25 to feet high south facing slope. Perpendicular to the south facing slope is a near vertical, 50 to 70 feet high, east facing cut slope remaining from an abandoned quarry located just east of the project site.

We performed a stability analysis of the south facing slope that lies between the parking lot and the upper terrace where the building will be situated. Our analysis indicated the south facing slope is stable under both static and seismic conditions. See our report, dated 1 April 2022. The geologist indicated there has not been any historic landslides on the natural south facing slope and no surficial landslides were observed in the cut at the base of the slope during our investigation. However, the cut at the base of the slope beneath the proposed building has experienced erosion over the years so the cut at the base of the slope should be flattened or retained as part of the proposed improvements.

The July 2018 Zinn Preliminary Geologic Investigation indicated there is a potential for rock falls within the steep east facing quarry face adjacent to the proposed building site. They have recommended assuming five (5) feet of marble could be lost from portions of the rock face over the life of the structure. A stability analysis of the soil overlying the marble comprising the east slope was performed using a modified version of the geologic cross section provided in the preliminary geologic report. The overall height of the cross section was increased with a thicker terrace deposit that match the thickness of the terrace deposits encountered in our borings drilled at the top of the slope. Our analysis indicates the soil overlying the marble is stable under both static and seismic conditions. However, there is a potential for erosion to occur within the terrace deposits. Based on existing eroded areas, the terrace deposits tend to flatten to about 35 degrees.

DISCUSSIONS AND CONCLUSIONS

Based on the results of our preliminary investigation, the proposed townhouse development is feasible from a geotechnical standpoint. Primary geotechnical concerns include performing additional subsurface exploration to further explore the marble formation beneath the building, mitigating potential future sink hole formation beneath structures, providing firm uniform support for the building foundation, setting improvements back from the top of the quarry slope, retaining or flattening the cut slope at the base of the slope beneath the proposed building, controlling site drainage and designing for strong seismic shaking.

Our initial borings indicate the marble formation below the lowest section of the building is shallow (about 10 feet) and relatively uniform with the exception of an infilled sinkhole (doline) located in the vicinity of Boring 2. The soils that infilled the doline are looser than the natural soils elsewhere so there is a potential for differential settlement between areas supported over the doline and areas not supported over the doline. Marble rubble was encountered at about the same elevation as the marble encountered at the base of the slope in all three borings drilled at the top of the slope. But it is not known at this time if the rubble is part of a doline. Further investigation is necessary to determine the relative geometry of the intact marble bedrock surface and if there are additional sinkholes/dolines beneath the proposed building that might pose a risk to the proposed structures if they reactivate.

There are several mitigation options available for preventing sinkhole development beneath the building. In the lower portion of the building where the existing parking lot is located, the marble is only located about 10 feet below the ground surface. The soil above the existing dolines can be excavated to expose the dolines and lean concrete can be used to plug and cap the dolines which will prevent soil from eroding into the dolines and causing future sinkholes. The marble is over 30 feet below the ground surface at the top of the slope so excavating the soil down to the marble is not practical. If dolines are found to exist in the higher areas of the building site, we recommend a cap grout, several feet thick, be installed by injection grouting along the marble bedrock surface. The cap grout can be used in isolated areas or the entire area can be grouted depending on the number and spacing of potential dolines. Cap grout can also be used in the lower portion of the building envelope, if desired.

The surface soils in the building envelope vary and the soils at the top of the slope do not have the same bearing capacities or engineering properties as the soils at the base of the slope. This could result in differential settlement between the different levels of the building foundation. To mitigate differential settlement across the building, we recommend compacting the foundation zone soils to create uniform bearing support beneath foundations.

South Slope: The cut at the base of the slope beneath the proposed building has experienced erosion over the years so the cut slope should be flattened or retained as part of the proposed improvements.

East Slope: Using a 5 feet thick marble retreat and a 35 degree angle within the terrace deposits, the retreat line becomes about 15 feet at the lower portion of the building envelope and about 40 feet on the upper terrace at the upper end of the building envelope. We recommend setting the structure back from the top of the slope at least 25 feet at the elevation of the parking lot at the base of the proposed building envelope and at least 50 feet from the top edge of the slope at the upper end of the proposed building envelope. There is an existing erosional scar that is near the back of the proposed building. The setback to the existing erosion scar can be reduced since the soil has already eroded there. The top of slope adjacent to the existing scar may be used to measure the setback in that area.

Dolines frequently reactivate and renewed collapse of the soil/rubble matrix frequently occurs when extra water is added to an existing doline. This is because the soils become weaker and heavier as they become unnaturally saturated causing soil collapses under its own weight and from erosion of the soils through a process called soil piping, where soil is carried away with the water flowing the karst formations. Due to the risk related to doline reactivation at the site, we recommend that surface runoff from the proposed improvements and coming off the slope above the improvements should be captured and discharged off-site. Bioswales and retention systems may be used to store and filter runoff, but these systems will need to be sealed so no water is infiltrated into the soil. Irrigated landscape areas located within 20 feet of structures should also be sealed to prevent irrigation water from seeping into the subsoils. Buried utilities that carry water (water, sewer, fire etc.) that are located within 50 feet of structures should be regularly tested for leaks as sink holes can develop quickly.

The site is located in a highly seismic region near several major fault zones. The proposed improvements will most likely experience strong seismic shaking during the design lifetime. Structures should be designed to resist seismic shaking in accordance with current building code requirements.

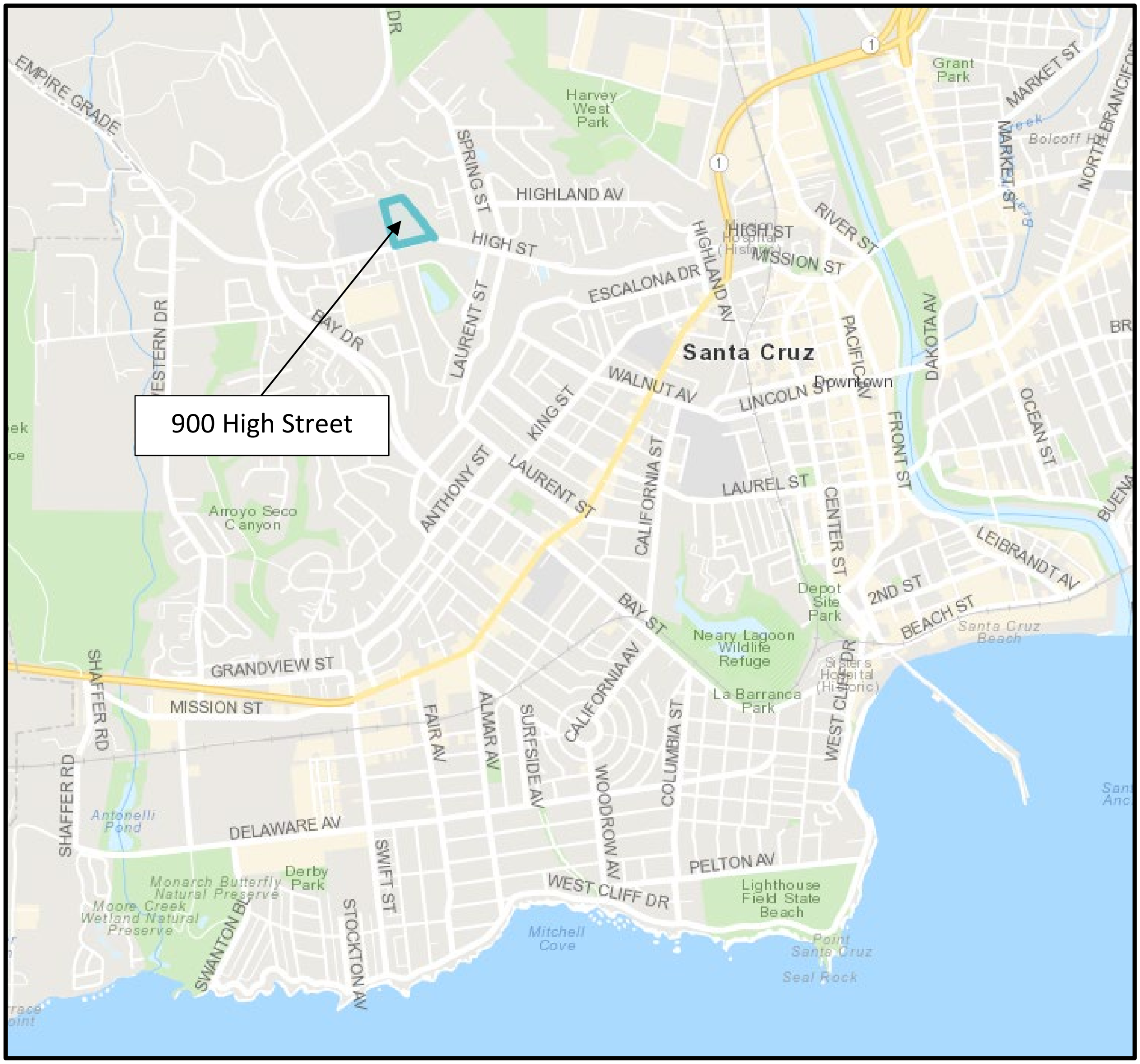
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the time, our firm should be notified so that supplemental recommendations can be given.

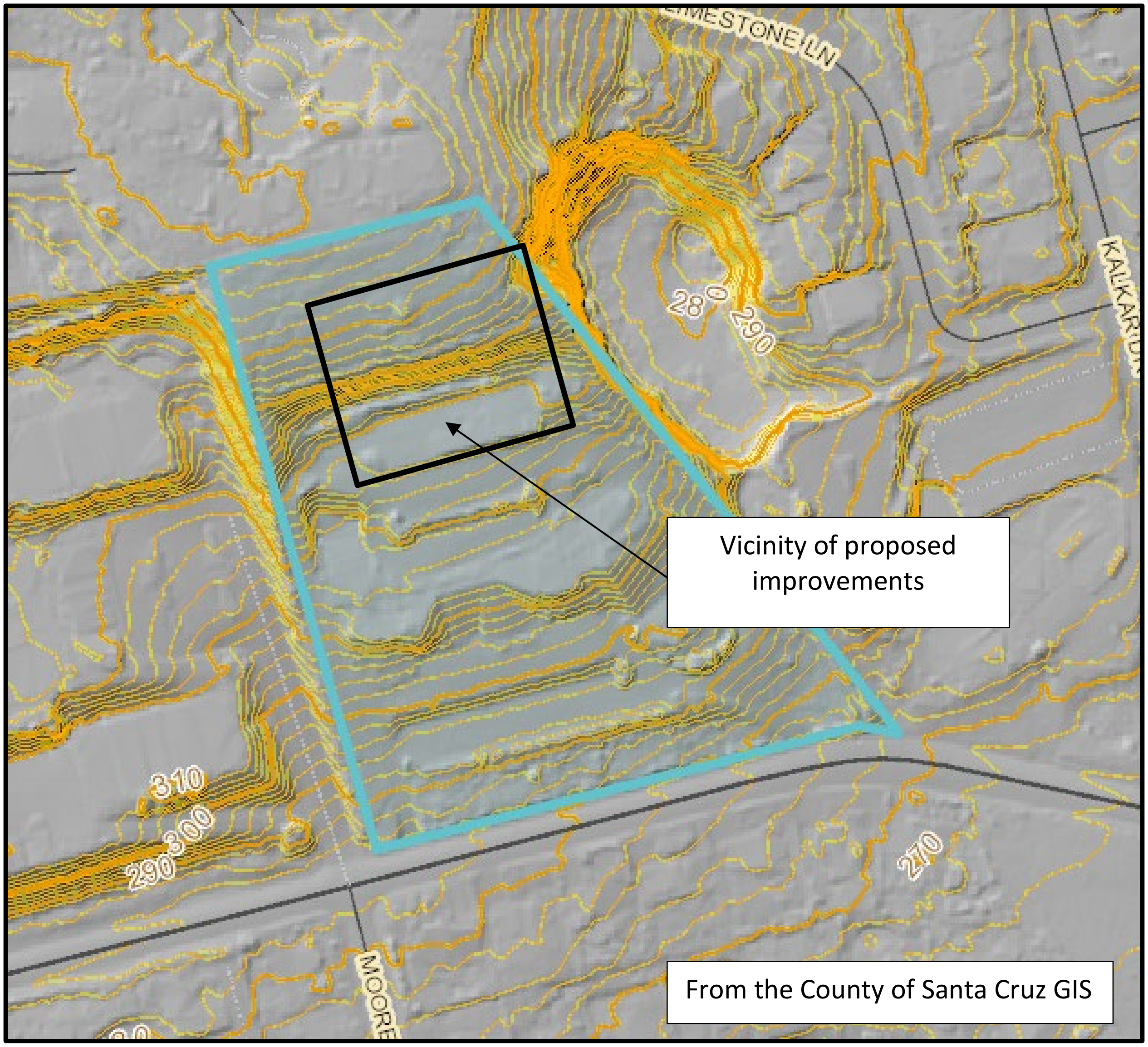
2. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are called to the attention of the Architects and Engineers for the project and incorporated into the plans, and that the necessary steps are taken to ensure that the Contractors and Subcontractors carry out such recommendations in the field. The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice. No other warranty expressed or implied is made.

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or partially, by changes outside our control. Therefore, this report should not be relied upon after a period of three years without being reviewed by a soil engineer.

APPENDIX A



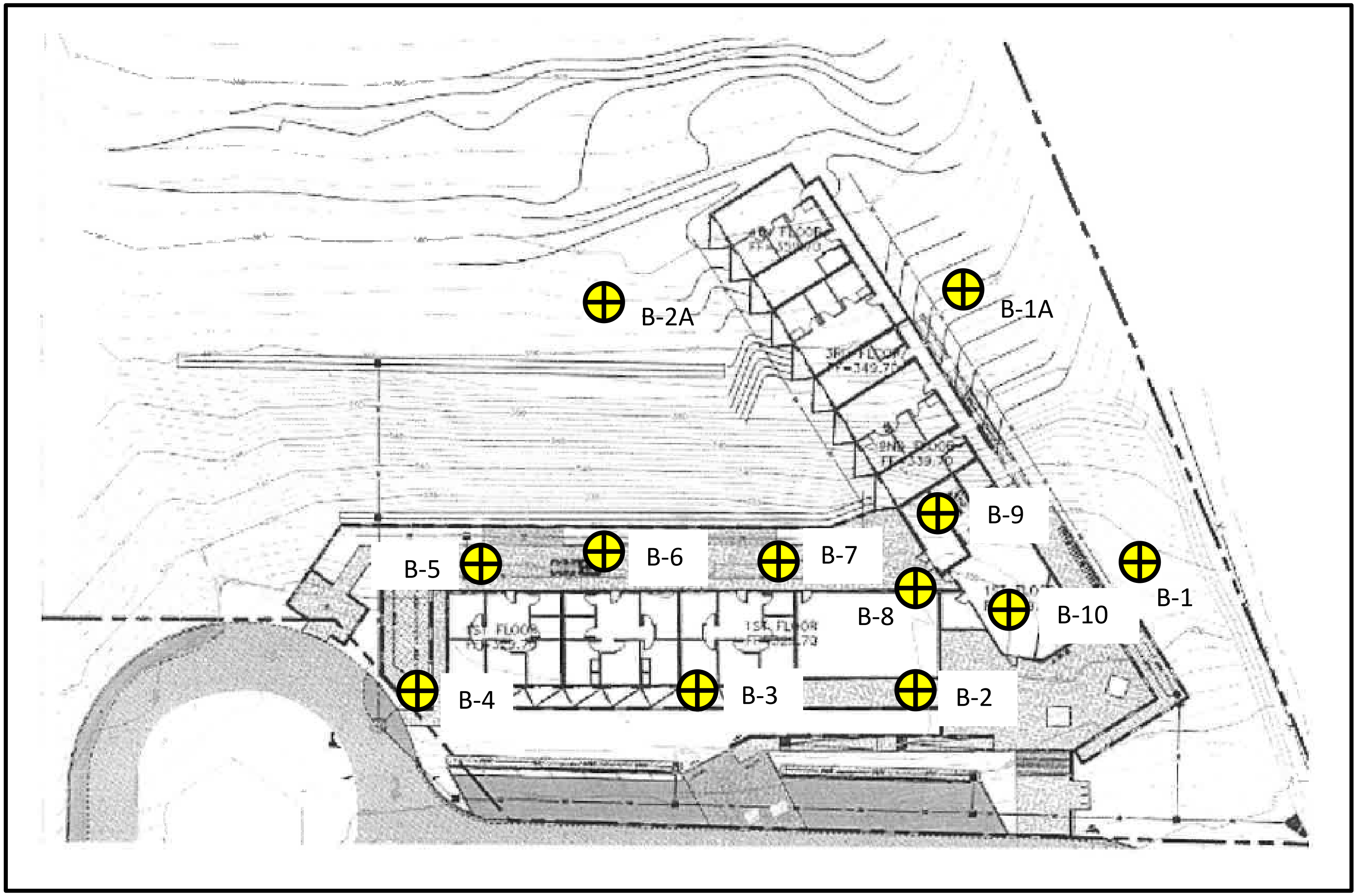
SITE VICINITY
Figure 1



Vicinity of proposed improvements

From the County of Santa Cruz GIS

REGIONAL TOPOGRAPHY
Figure 2



BORING SITE PLAN
Figure 3

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS** MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE (THE NO. 200 SIEVE SIZE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE)	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS (< 5% FINES)	**GW**	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Predominantly one size or a range of sizes with some intermediate sizes missing Not meeting all gradation requirements for GW	
		GRAVELS WITH FINES (>12% FINES)	**GM**	Silty gravels, gravel-sand-silt mixtures	Non plastic fines or fines with low plasticity Atterberg limits below “A” line or PI < 4	Above “A” line with 4 < PI < 7 are borderline cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Plastic fines Atterberg limits above “A” line with PI > 7	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS (<5% FINES)	**SW**	Well-graded sands, gravelly sands, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate sizes missing	
			SP	Poorly graded sands, gravelly sands, little or no fines	Predominantly one size or a range of sizes with some intermediate sizes missing Not meeting all gradation requirements for SW	
		SANDS WITH FINES (>12% FINES)	**SM**	Silty sands, sand-silt mixtures	Non plastic fines or fines with low plasticity Atterberg limits below “A” line or PI < 4	Limits plotting in hatched zone with 4 < PI < 7 are borderline cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Plastic fines Atterberg limits above “A” line with PI > 7	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE (THE NO. 200 SIEVE SIZE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE)	SILTS AND CLAYS (LIQUID LIMIT < 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 silts and organic silty clays of low plasticity		
	SILTS AND CLAYS (LIQUID LIMIT > 50)		**MH**	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of medium to high plasticity, organic silts		
			OH	Organic clays of medium to high plasticity, organic silts		

Figure 4

**Gravels and sands with 5% to 12 % fines are borderline cases requiring use of dual symbols.

RELATIVE DENSITY OF SANDS AND GRAVELS

DESCRIPTION	BLOW / FT*
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	30 – 50
VERY DENSE	OVER 50

CONSISTENCY OF SILTS AND CLAYS

DESCRIPTION	BLOWS / FT*
VERY SOFT	0 – 2
SOFT	2 – 4
FIRM	4 – 8
STIFF	8 – 16
VERY STIFF	16 – 32
HARD	OVER 32

*Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. 12 vertical inches.

TEST BORING LOG

SCR-1221
900 High Street

LOGGED BY: BD | **DATE DRILLED: 5/7/18** | **BORING TYPE: 6" SOLID STEM** | **BORING NO: 1**

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1		▨			8								
-	1-1	▨	Mottled yellow brown fine Silty SAND, damp, medium dense	SM	13								
2	T	▨			13	26							
-													
3													
-													
4													
-													
5		▨											
-	1-2	▨	Yellow brown mottled gray and orange fine Silty SAND/Sandy	SM/	10								
6	T	▨	SILT, damp, medium dense	ML	9								
-					12	21							
7													
-													
8													
-													
9													
-													
10	1-3												
-	T	▨	MARBLE – Refusal at 11 feet		25/5"	25/30"							
11													
-			Boring Terminated at 11 Feet										
12			No Groundwater Encountered										
-													
13													
-													
14													
-													
15													
-													
16													
-													
17													
-													
18													
-													
19													
-													
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-													
21													
-													
22													
-													
23													
-													
24													
-													

DEES & ASSOCIATES, INC.
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Figure 5

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221
900 High Street

LOGGED BY: BD
DATE DRILLED: 5/7/18
BORING TYPE: 6" SOLID STEM
BORING NO: 2

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-			FILL										
1		▨	Mottled yellow brown fine Silty SAND, damp, medium dense	SM	17								
-	2-1-1	▨			20								
2	L	▨	NATIVE		23	22							
-			Yellow brown very fine Silty SAND, damp, medium dense	SM									
3	2-2	▨			7								
-	T	▨			4								
4		▨			5	9							
-													
5													
-	2-3	▨	Yellow brown very fine Silty SAND, damp, medium dense		4								
6	T	▨	1-inch clay seam at 6 feet		5								
-		▨			7	12							
7													
-													
8													
-													
9													
-													
10		▨			3								
-	2-4	▨	Yellow brown with orange mottling Schist fragments	GP	3								
11	T	▨			2	5							
-			Dark yellow brown Clayey SAND with dark gray brown CLAY,	CL									
12			damp-moist, loose-soft										
-			MARBLE RUBBLE with Soil infill at 11.5 feet										
13													
-				GP									
14													
-													
15													
-													
16													
-													
17													
-													
18													
-													
19													
-													
20													
-													
21													
-													
22													
-													
23													
-			Refusal on MARBLE at 24 feet										
24			Boring Terminated at 24 Feet										
-			No Groundwater Encountered										

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Figure 6

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221
900 High Street

LOGGED BY: BD	DATE DRILLED: 5/7/18	BORING TYPE: 6" SOLID STEM	BORING NO: 3

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-			FILL										
1		▨	Yellow brown mottled with dark gray brown and orange CLAY,	CL	7								
-	3-1-1	▨	damp-moist, very stiff		15								
2	L	▨			25	20							
-		▨	NATIVE		12								
3	3-2	▨	Yellow brown mottled orange fine Silty SAND, damp, dense	SM	17								
-	T	▨			28	45							
4													
-													
5					15								
-	3-3	▨	Dark yellow brown fine Silty SAND with heavy mica, damp-		18								
6	T	▨	moist, dense (weathered Schist)	SM	28	46							
-		▨											
7													
-													
8													
-			MARBLE – Refusal at 9 feet	m									
9													
-													
10			Boring Terminated at 9 Feet										
-			No Groundwater Encountered										
11													
-													
12													
-													
13													
-													
14													
-													
15													
-													
16													
-													
17													
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23													
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24													
-													

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Figure 7

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221
900 High Street

LOGGED BY: BD/SC	DATE DRILLED: 5/7/18	BORING TYPE: 6" SOLID STEM	BORING NO: 4

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1		▨			12								
-	4-1-1	▨	Light grayish brown fine Silty SAND, damp, medium dense to	SM	18								
2	L	▨	dense, mica		32	25							
-		▨			15								
3	4-2	▨			27								
-	T	▨			50	57							
4													
-													
5					9								
-	4-3	▨	Yellowish brown fine Silty SAND, damp, medium dense	SM	10								
6	T	▨	(weathered schist)		10	20							
-													
7													
-													
8													
-													
9			MARBLE - Refusal at 9 feet	m									
-													
10			Boring Terminated at 9 Feet										
-			No Groundwater Encountered										
11													
-													
12													
-													
13													
-													
14													
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Figure 8

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221
900 High Street

LOGGED BY: SC | **DATE DRILLED: 5/7/18** | **BORING TYPE: 6" SOLID STEM** | **BORING NO: 5**

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1		▨			17								
-	5-1-1	▨	Light yellowish brown Silty SAND, damp, dense	SM	38								
2	L	▨			50	44							
-		▨			17								
3	5-2	▨			23								
-	T	▨			36	59							
4			Yellowish brown Silty SAND, damp, dense (weathered schist)	SM									
-													
5		▨			18								
-	5-3	▨	Grayish Silty SAND, damp, very dense (weathered schist)		50/3"	50/3"							
6	T	▨	Refusal on MARBLE										
-													
7			Boring Terminated at 6 Feet										
-			No Groundwater Encountered										
8													
-													
9													
-													
10													
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12													
-													
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Figure 9

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221
900 High Street

LOGGED BY: SC	DATE DRILLED: 5/7/2018	BORING TYPE: 6" SOLID STEM	BORING NO: 6

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1	6-1-1	▨			16								
-	L	▨	Light yellowish brown Silty SAND damp, dense	SM	30								
2		▨			50	40							
-	6-2	▨			13								
3	T	▨			30								
-		▨	Yellowish brown Silty SAND, damp, very dense (weathered schist)	SM	38	68							
4													
-													
5	6-3	▨			12								
-	T		MARBLE – Refusal at 6 feet	m									
6													
-			Boring Terminated at 6 Feet										
7			No Groundwater Encountered										
-													
8													
-													
9													
-													
10													
-													
11													
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Figure 10

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SC-1221
900 High Street

LOGGED BY: SC/BD	DATE DRILLED: 5/7/2018	BORING TYPE: 6" SOLID STEM	BORING NO: 7

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-			Fill – Trench Backfill										
1		▨			5								
-	7-1-2	▨	Yellow brown fine Silty SAND, damp, medium dense	SM	8								
2	L	▨			20	19							
-		▨			3								
3	7-2	▨	Hit 4" pvc pipe at 3.3 feet		5								
-	T	▨			12	17							
4			NATIVE										
-			Dark yellow brown mottled gray fine Silty SAND, damp-moist, loose	SM									
5		▨			3								
-	7-3	▨			2								
6	T	▨	White highly weathered MARBLE, dry, loose		2	4							
-				m									
7			Refusal on MARBLE at 7.5 feet										
-													
8			Boring Terminated at 7.5 Feet										
-			No Groundwater Encountered										
9													
-													
10													
-													
11													
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12													
-													
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14													
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Figure 11

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SC-1221
900 High Street

LOGGED BY: BD | **DATE DRILLED: 5/7/2018** | **BORING TYPE: 6" SOLID STEM** | **BORING NO: 8**

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1		▨			14								
-	8-1-1	▨	Dash yellow brown (orange) fine Silty SAND, damp-moist,	SM	21								
2	L	▨	medium dense		19	20							
-		▨			9								
3	8-2	▨			8								
-	T	▨			10	18							
4													
-													
5					4								
-	8-3	▨			5								
6	T	▨			6	11							
-		▨											
7			Rocky drilling MARBLE RUBBLE										
-				GP									
8													
-													
9													
-													
10			Refusal on MARBLE at 10.5 feet										
-													
11													
-			Boring Terminated at 10.5 Feet										
12			No Groundwater Encountered										
-													
13													
-													
14													
-													
15													
-													
16													
-													
17													
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Figure 12

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SC-1221
900 High Street

LOGGED BY: BD | **DATE DRILLED:** 5/7/2018 | **BORING TYPE:** 6" SOLID STEM | **BORING NO:** 9

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1	9-1-1	▨			10								
-	L	▨	Yellow brown to dark yellow brown fine Silty SAND, damp,	SM	12								
2		▨	dense		18	30							
-	9-2				8								
3	T	▨	Yellow brown fine Silty SAND/Sandy SILT, damp-moist, medium	SM/	12								
-		▨	dense	ML	14	26							
4													
-													
5	9-3				10								
-	T	▨			24								
6		▨			19	43							
-		▨	MARBLE at 6.7 feet – Refusal at 7 feet	m									
7													
-			Boring Terminated at 7 Feet										
8			No Groundwater Encountered										
-													
9													
-													
10													
-													
11													
-													
12													
-													
13													
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Figure 13

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SC-1221
900 High Street

LOGGED BY: BD	DATE DRILLED: 5/7/2018	BORING TYPE: 6" SOLID STEM	BORING NO: 10

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1		▨	Light yellow brown fine Silty SAND/Sandy SILT, damp, medium dense	SM/	3								
-	10-1	▨		ML	10								
2	T	▨			10	20							
-													
3													
-													
4													
-													
5		▨			12								
-	10-2	▨			17								
6	T	▨			22	39							
-													
7													
-													
8													
-													
9													
-													
10		▨			3								
-	10-3	▨	Dark brown with dark orange brown mottling Sandy CLAY, moist, medium stiff	CL	3								
11	T	▨			5	8							
-			MARBLE at 11.5 feet – Refusal at 12 feet										
12													
- 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26 -			Boring Terminated at12 Feet No Groundwater Encountered										

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Figure 14

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221.1
900 High Street

LOGGED BY: SC	DATE DRILLED: 2/11/22	BORING TYPE: 6" SOLID STEM	BORING NO: 1A

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1					5								
-	1-1-1				7								
2	L		Dark brown with reddish mottling Sandy CLAY, moist, stiff	CL	12	10							
-					4								
3	1-2		Mottled reddish-brown Clayey SAND/gray Sandy CLAY, moist,	SC/	5								
-	T		medium dense	CL	6	11							
4													
-					6								
5					9								
-	1-3-1		Reddish-brown Clayey SAND with seams of gray Clay, moist,	SC/	12	11							
6	L		medium dense, some small Gravel	CL	4								
-					6								
7	1-4				8	14		22.3					
-	T		No gravels										
8													
-			Approximate contact										
9													
-													
10					12								
-	1-5		Mottled yellowish-brown/pale brown Clayey SAND, dry-damp,	SC	15								
11	T		dense, trace rootlets		20	35		10.7					
-													
12													
-			Approximate contact										
13													
-													
14													
-													
15					7								
-	1-6		White with yellowish-brown mottling fine SAND, dry, medium	SP	9								
16	T		dense		12	21							
-													
17													
-													
18													
-													
19													
-													
20													
-	1-7-1		Pale brown mottled strong brown fine SAND, dry- damp,		17								
21	L		medium dense		20								
-					22	21							
22	1-8				12								
-	T		White slightly mottled strong brown fine SAND, dry, dense		19								
23					30	49		8.5					
-													
24													

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Figure 15

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221.1
900 High Street

LOGGED BY: SC	DATE DRILLED: 2/11/22	BORING TYPE: 6" SOLID STEM	BORING NO: 1A cont.

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU	MOISTURE (%) SATURATED	COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
25		▨											
-	1-9	▨	White fine SAND, damp, very dense	SP	12								
26	T	▨			20								
-					32	52							
27													
-													
28													
-													
29													
-													
30		▨			15								
-	1-10	▨	Yellow fine SAND, damp, some small sub-round Gravels, very dense		24								
31	T	▨			34	58							
-													
32			MARBLE RUBBLE										
-													
33													
-													
34													
-													
35		▨			5								
-	1-11	▨	Brown and reddish-brown SAND and Clayey SAND, damp, very loose	SP/	2								
36	T	▨		SC	3	5		8.6					
-		▨			1								
37	1-12	▨	Brown and reddish-brown mixture of Granite Gravel, Schist, Sand and Clayey Sand		2								
-	T	▨			3	5							
38			Rocky drilling below 38 feet MARBLE RUBBLE										
-													
39													
-													
40			Boring Terminated at 40 Feet										
-			No Groundwater Encountered										
41													
-													
42													
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43													
-													
44													
-													
45													
-													
46													
-													
47													
-													
48													
-													

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Figure 15a

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221.1
900 High Street

LOGGED BY: SC | **DATE DRILLED: 2/11/22** | **BORING TYPE: 6" SOLID STEM** | **BORING NO: 2A**

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU		COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
1													
-													
2													
-													
3													
-													
4													
-													
5		▨			4								
-	2-1	▨	Yellowish-brown strong brown mottling Clayey SAND, damp,	SC	5								
6	T	▨	medium dense		8	13							
-													
7													
-													
8													
-													
9													
-													
10		▨			9								
-	2-2-1	▨	Yellowish-brown with gray mottling Clayey SAND, damp,		10								
11	L	▨	medium dense		12	11	96.9	17.3					
-													
12													
-			Gradational change with depth										
13													
-													
14													
-													
15		▨			7								
-	2-3-1	▨	Yellowish-brown Clayey SAND, damp, loose, trace roots and		7								
16	L	▨	some coarse SAND		9	8	107.4	14.0		1648.4	51.7		
-													
17													
-													
18													
-													
19													
-													
20		▨			4								
-	2-4	▨	Yellowish-brown Clayey SAND, damp, loose		3								
21	T	▨			4	7							
-			White mottled yellowish-brown fine SAND, damp, loose										
22													
-													
23													
-													
24													
-													

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Figure 16

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5

TEST BORING LOG

SCR-1221.1
900 High Street

LOGGED BY: SC | **DATE DRILLED: 2/11/22** | **BORING TYPE: 6" SOLID STEM** | **BORING NO: 2A cont.**

	SAMPLE NO.		SOIL DESCRIPTION	USCS SOIL TYPE	FIELD BLOW COUNT	SPT BLOW COUNT*	DRY DENSITY (PCF)	MOISTURE (%) IN-SITU		COHESION (PSF)	PHI ANGLE	% PASSING 200 SIEVE	PLASTICITY INDEX
-													
25					8								
-	2-5-1	▨	Doline Infill??		8								
26	L	▨	Mottled yellowish-brown/white Clayey fine SAND (fractured Marble) damp, loose		9	9	97.3	10.6		1522.6	40.6		
-		▨											
27													
-													
28													
-													
29													
-													
30		▨			7								
-	2-6-1	▨	Variegated yellowish-brown and pale brown Clayey very fine SAND, with schist and Granite Gravel, roots, damp, loose		13								
31	L	▨			11	12							
-		▨			7								
32	2-7	▨	Variegated white, yellowish-brown Clayey (granitic) SAND and Gravel, damp, loose, black manganese oxide mottling		5								
-	T	▨			3	8							
33													
-			MARBLE RUBBLE										
34													
-													
35													
-													
36													
-													
37													
-													
38													
-													
39													
-													
40													
-			Boring Terminated at 40 Feet No Groundwater Encountered										
41													
-													
42													
-													
43													
-													
44													
-													
45													
-													
46													
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47													
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48													
-													

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Figure 16a

* Blow count converted:
L = Field Blow Count / 2
M = Field Blow Count / 1.5