GEOTECHNICAL INVESTIGATION
For
PROPOSED SINGLE-FAMILY RESIDENCE
1410 Prospect Avenue
APN 034-046-19
Capitola, California

Prepared
For
ALEX AND AMY JOHNSON
Capitola, California

Prepared By
DEES & ASSOCIATES, INC.
Geotechnical Engineers
Project No. SCR-1655
JULY 2021

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July 27, 2021 Project No. SCR-1655

ALEX AND AMY JOHNSON
1410 Prospect Avenue
Santa Cruz, California 95010

Subject: Geotechnical Investigation

Reference: Proposed Single-Family Residence
1410 Prospect Avenue
APN 034-046-19
Capitola, California

Dear Mr. and Mrs. Johnson:

As requested, we have completed a geotechnical investigation for the new single-family residence proposed at the referenced site. The purpose of our investigation was to evaluate the soil conditions in the vicinity of the proposed residence and provide geotechnical recommendations for the development.

This report presents the results, conclusions, and recommendations of our investigation. If you have any questions regarding this report, please call our office.

Very truly yours,

DEES & ASSOCIATES, INC.

Rebecca L Dees

Rebecca L. Dees
Geotechnical Engineer
G.E. 2623

REGISTERED PROFESSIONAL ENGINEER
REBECCA LYNN DEES
GE-2623
EXPIRES: 12/21
GEOTECHNICAL
STATE OF CALIFORNIA

C. Scott Clark
C. Scott Clark (Jul 27, 2021 13:07 PDT)

C. Scott Clark
Staff Engineer
E.I.T. 162365

Copies: 1 to Addressee

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GEOTECHNICAL INVESTIGATION

Introduction

This report presents the results of our geotechnical investigation for the new single-family residence proposed at 1410 Prospect Avenue in Capitola, California.

Purpose and Scope

The purpose of our investigation was to explore and evaluate surface and near surface soil conditions in the vicinity of the new residence and provide geotechnical recommendations for design and construction of the development.

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.

2. Exploration of subsurface conditions consisting of logging and sampling of two (2) exploratory borings drilled to depths of 1.5 and 28.5 feet.

3. Laboratory testing to evaluate the engineering properties of the subsoils.

4. Engineering analysis and evaluation of the resulting field and laboratory test data. Based on our findings, we have developed geotechnical design criteria for foundations, retaining walls, general site grading, concrete slabs-on-grade and general site drainage.

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

Project Location and Description

The project site is located at 1410 Prospect Avenue in Capitola, California. The 0.05-acre parcel is located just south of the intersection with Jewell Street and approximately 0.1 miles southwest of Wharf Road and Cliff Drive near downtown Capitola. See Figure 1. The site is bordered to the north and south by similar residential properties and by Prospect Avenue to the northwest.

The 0.05-acre parcel is situated on a gently sloping terrace above a moderate to steep coastal bluff that has been terraced to accommodate a railroad track and roadway. The slope immediately below the parcel descends about 20 feet to the railroad tracks at a slope gradient of 45 and 50 degrees. The slope continues on the other side of the railroad tracks down to Cliff Drive then ultimately drops down to the beach about 200 feet away.

The site is developed with a single-family residence with an attached garage. The project consists of removing the existing improvements and constructing a new residence with a detached garage. The new residence will be two stories with a full basement. See Figure 2.

Field Investigation
Subsurface conditions at the site were explored on May 5, 2021, with two (2) exploratory borings drilled 1.5 and 28.5 feet below grade. Our borings were advanced with 6-inch diameter tractor mounted drilling equipment and 4-inch diameter hand drilling equipment. The approximate locations of our exploratory borings are indicated on our Boring Site Plan, Figure 2.

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), the Standard Terzaghi Sampler (T), or bulk samples collected from the auger cuttings (B). 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 with the tractor mounted drilling equipment 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 indicated on the logs have been converted to equivalent standard penetration test (SPT) values.

The soils observed in the test borings were logged in the field and described in accordance with the Unified Soil Classification System (ASTM D2487 and ASTM D2488), Figure 3. The Test Boring Logs denote subsurface conditions at the locations and times observed, and it is not warranted they are representative of subsurface conditions at other locations or times.

Laboratory Testing
The laboratory testing program was directed toward a determination of the physical and engineering properties of the soils underlying the site. Moisture content and dry density tests were performed on representative undisturbed soil samples to determine the consistency of the soil and the moisture variation throughout the explored soil profile. A grain size analysis was performed to aid in classification of the soil. An Atterberg Limits test was performed to determine the shrink/swell characteristics of the soil and to aid in soil classification. An unconfined compression test and a direct shear test were performed to determine the strength characteristics of the soil.

The results of our field and laboratory testing appear on the "Test Boring Logs", opposite the sample tested, Figures 5 to 7.

Subsurface Soil Conditions
The site is mapped as being underlain by lowest emergent coastal terrace deposits, (Pleistocene), which are described as, “Semi-consolidated, generally well-sorted sand with a few thin, relatively continuous layers of gravel. Deposited in nearshore high-energy marine environment. Weathered zone ranges from 5 to 20 ft. thick. As mapped, locally includes many small areas of fluvial and colluvial silt, sand and gravel, especially at or near old wave-cut cliffs”

Our borings encountered approximately 25 feet of terrace deposits over Purisima Formation sandstone. The terrace deposits consisted of approximately 7 feet of hard, fine, sandy clay over dense to very dense clayey gravel. Purisima sandstone was encountered at 25 feet. The upper 7 feet (±) of soil is clayey has a moderate to high expansion potential. The soil was moist in the upper 10 to 12 feet and very moist to 25 feet. The bedrock was moist.

Groundwater

Perched groundwater was encountered at 24.5 feet. The boring logs denote groundwater conditions at the locations and times observed, and it is not warranted they are representative of groundwater conditions at other locations and times. Groundwater levels at the site may vary due to seasonal variations and other factors not evident during our investigation.

Seismicity

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

The closest faults to the site are the San Andreas Fault, Zayante-Vergeles Fault, San Gregorio Fault and Monterey Bay-Tularcitos Fault, Figure 8. 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.

Fault	San Andreas	Zayante-Vergeles	Monterey Bay-Tularcitos	San Gregorio
Distance (mi.)	9.3	5.8	9.1	13.1
Direction	NE	NE	SW	WSW

Structures designed according to the 2019 California Building Code may use the following parameters in their analysis. The following ground motion parameters may be used in seismic design and were determined using the OHSPD Seismic Design Calculator and ASCE 7-16.

Seismic Design Parameters	**ASCE 7-16 2019 CBC**
Site Class	C
Mapped Spectral Acceleration for Short Periods	Ss = 1.791 g
Mapped Spectral Acceleration for 1-second Period	S_1 = 0.686 g
5% Damped Spectral Response Acceleration for Short Period	S_{DS} = 2.149 g
5% Damped Spectral Response Acceleration for 1-Second Period	S_{D1} = 0.640
Seismic Design Category	D
PGAm	0.899 g

(Site Coordinates: 36.971157° N, 121.955055° W)

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 build up leading to loss of strength.

Due to the density of the soil below the groundwater table, the potential for liquefaction to affect the project is low.

Landsliding
The project is situated at the top of a coastal bluff that has been graded into two terraces. The slope directly below the site appears to have been cut into the hillside to create a 20 feet wide bench for the railroad tracks. The slope is about 20 feet high and sloped between 45 and 50 degrees. The slope continues on the other side of the railroad tracks down to Cliff Drive.

Our borings indicate the slope is comprised of dense sandy and gravelly soils overlying very dense sandstone bedrock. There is no evidence of deep-seated landslides on the slope and none have been reported to us. The slope is well vegetated and there are no concentrated drainages discharging onto the slope. There is some minor erosion that has created a small step at the top of the slope, but no slumps or shallow landslides were observed during our investigation.

The proposed residence should be setback behind a 1.5:1 (horizontal to vertical) line drawn upwards from the base of the slope. There is a low potential for landslides to affect the proposed residence as long as it is setback as recommended above.

DISCUSSIONS AND CONCLUSIONS

Based on the results of our investigation, the new residence is feasible provided the recommendations presented in this report are incorporated into the design and properly followed during construction of the development.

Primary geotechnical concerns for the project include designing for expansive soil conditions in the upper 7 feet, embedding foundations into firm native soil, controlling site drainage and designing structures to resist strong seismic shaking.

The new residence is proposed to have a full basement. We expect the basement will be situated approximately 8 to 10 feet below grade and will penetrate the upper expansive clayey soils. The basement may be supported with spread footings embedded into the dense sand/gravel encountered below 7 feet. If the design changes and portions of the residence will not have a basement, the portion of the residence without a basement should be supported on piers that penetrate the upper clayey soils to keep the entire structure on similar materials.

If room allows, the upper 5 feet of expansive soil behind the proposed basement retaining walls should be removed to mitigate expansive soil pressures acting against the basement walls. The expansive soil that lies above a 1:1 line drawn upwards from a point located 5 feet below final grade should be removed. If the expansive soil cannot be removed, basement walls should be designed to withstand swell pressures from the expansive clay in addition to the standard lateral earth pressures.

The proposed detached garage will not have a basement so the foundation and floor slab will be situated in the expansive clays. Our calculations indicate, at the existing moisture levels, the weight of the footings in addition to a small building load will be enough load to resist soil expansion. In order to mitigate soil expansion below interior floor slabs, we recommend using at least 12 inches of baserock below the capillary break to add a surcharge load to the clay**. The soil in the footing excavations and beneath floor slabs must be kept moist to prevent the soil from drying out and developing shrinkage cracks. If the soil dries out, the soil should be moisture conditioned until the cracks close prior to placing concrete.**

Due to the clays at the ground surface and the presence of a steep slope behind the proposed residence, the site is not well suited for on-site retention of stormwater. On-site retention may be used, but a suitable overflow path will need to be provided to carry excess water to the street. In addition, retention structures should be located at least 50 feet from the top edge of the rear slope.

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.

RECOMMENDATIONS

The following recommendations should be used as guidelines for preparing project plans and specifications:

Foundations

- The residence basement should be excavated into the dense sandy soils located about 7 feet below existing grades. If portions of the residence are not underlain by a basement, the portion of the structure not supported on the basement foundation should be supported on drilled piers embedded into the dense sandy soils below about 7 feet.

- The proposed garage may be supported on shallow spread footings embedded into the upper sandy clays or on drilled piers embedded into the sandy soils below about 7 feet. **The soil in the footing excavations and beneath floor slabs must be kept moist to prevent the soil from drying out and developing shrinkage cracks. If the soil dries out, the soil should be moisture conditioned until the cracks close prior to placing concrete.**

Spread Footings - Residence

- Footings should be embedded into the sandy soils which are located about 7 feet below existing grades **and** be embedded at least 12 inches below the lowest adjacent grade for one story-structures and at least 18 inches below lowest adjacent grade for two-story structures.

- Spread footings should be a minimum of 12 inches wide for single-story structures, 15 inches wide for two-story structures and 18 inches wide for three-story structures.

- Conventional spread footings may be designed for an allowable soil bearing pressure of 3,000 psf for dead plus live. This value may be increased by one-third to include short-term seismic and wind loads.

- Footings located adjacent to other foundations should have their bearing surfaces founded below an imaginary 2:1 (H:V) plane projected upward from the bottom edge of the adjacent footings or utility trenches.

- Total and differential settlements from foundation loads are anticipated to be on the order of 1 inch and 1/2 inch respectively.

- Lateral load resistance may be developed in friction between the foundation base and the supporting subgrade. A friction factor of 0.35 is applicable. An allowable lateral bearing pressure of 200 pcf, equivalent fluid weight may be used where the foundation is poured neat against firm native soil. The top 12 inches of soil should be neglected in passive design.

Concrete Pier and Grade Beam Foundations

- Uncased concrete piers should be embedded at least 12 feet below the ground surface to resist the uplift pressures that may occur if the clayey soils swell. If the upper 5 feet of pier length is cased (with the casing left in place), the piers should be at least 7 feet deep, or at least 1 foot into the sandy soils below the clay, whichever is deeper. Piers used for temporary shoring support should be at least 5 feet deep.

- Piers should be at least 12 inches in diameter and spaced at least 3 pier diameters apart.

- Piers may be designed using an allowable end bearing of 9,000 psf. This value may be increased by one-third under wind or seismic loads.

- Total and differential settlements for foundations supported on deep foundations are anticipated to be less than 1 inch and 0.5 inch respectively.

- A passive soil resistance of 300 pcf, equivalent fluid weight, times 2.25 pier diameters, may be used for drilled piers. The top foot of soil should be neglected in passive design.

Spread Footings - Garage

- Footings should be embedded at least 12 inches below the lowest adjacent grade for one story-structures and at least 18 inches below lowest adjacent grade for two-story structures.

- Spread footings should be a minimum of 12 inches wide for single-story structures, 15 inches wide for two-story structures and 18 inches wide for three-story structures.

- Conventional spread footings may be designed for an allowable soil bearing pressure of 1,600 psf for dead plus live. This value may be increased by one-third to include short-term seismic and wind loads.

- Footings located adjacent to other foundations should have their bearing surfaces founded below an imaginary 2:1 (H:V) plane projected upward from the bottom edge of the adjacent footings or utility trenches.

- Total and differential settlements from foundation loads are anticipated to be on the order of 1 inch and 1/2 inch respectively.

- Lateral load resistance may be developed in friction between the foundation base and the supporting subgrade. An adhesion value of 200 psf is applicable. An allowable lateral bearing pressure of 300 pcf, equivalent fluid weight may be used where the foundation is poured neat against firm native soil. The top 12 inches of soil should be neglected in passive design.

Basement/Retaining Wall Lateral Earth Pressures

- Basement/retaining walls should be designed to resist both lateral earth pressures and any additional surcharge loads.

- If room allows, the upper 5 feet of expansive soil behind the proposed basement retaining walls should be removed to mitigate expansive soil pressures acting against the basement walls. The expansive soil that lies above a 1:1 line drawn upwards from a point located 5 feet below final grade should be removed. If the expansive soil cannot be removed, basement walls should be designed to withstand swell pressures from the expansive clay in addition to the standard lateral earth pressures.

- The following lateral earth pressures should be used for basement/retaining walls. Unrestrained walls may use the active pressure values while restrained retaining walls should be designed using at-rest pressures.

Slope	Active Pressure (pcf)	At-Rest Pressure (pcf)
Level	40	60

- If the clayey soils are not removed from the upper 5 feet, retaining walls should be designed to withstand swell pressures in the upper 5 feet. A swell pressure of 150 psf/ft should be used in addition to the above lateral earth pressure in the upper 5 feet of wall height.

- For retaining walls requiring seismic design, a dynamic surcharge load of 27 psf/ft, should be used in addition to the above active lateral earth pressures. The resultant force should be applied at a point located 0.6H above the base of the wall, where H is the height of the wall.

- The above lateral pressures assume that the walls are fully drained to prevent hydrostatic pressure behind the walls. Drainage materials behind the wall should consist of Class 2 permeable material (Caltrans Specification 68-1.025) or an approved equivalent. Filter fabric should not be used with Class 2 permeable material. The drainage material should be at least 12 inches thick. The drains should extend from the base of the walls to within 12 inches of the top of the backfill. A pipe should be used to collect drainage from behind the wall. **The pipe should be placed below the base of interior slab subgrade elevations (below the capillary break).** Collected water should be directed to a suitable discharge location.

Concrete Slabs-on-Grade

- Where basement slabs penetrate the expansive clay, (roughly the upper 7 feet), slabs may be supported on firm native soil.

- The garage slab floor should be underlain by at least 12 inches of baserock to surcharge to the underlying clays. The baserock should be compacted to at least 90 percent relative compaction.

- Driveway pavements should be underlain by at least 12 inches of baserock to surcharge to the underlying clays. The baserock should be compacted to at least 95 percent relative compaction.

- **The soil beneath floor slabs and pavements must be kept moist to prevent the soil from drying out and developing shrinkage cracks. If the soil dries out, the soil should be moisture conditioned until the cracks close prior to placing baserock.**

- All concrete slabs-on-grade can be expected to suffer some cracking and movement. However, thickened exterior edges, a well-prepared subgrade including pre-moistening prior to pouring concrete, adequately spaced expansion joints and good workmanship should reduce cracking and movement.

- Dees & Associates, Inc. are not experts in the field of moisture proofing and vapor barriers. In areas where floor wetness would be undesirable, an expert, experienced with moisture transmission and vapor barriers should be consulted. At a minimum, a blanket of 4 inches of free-draining gravel should be placed beneath the floor slab to act as a capillary break. To minimize vapor transmission, an impermeable membrane (10-mil. minimum) should be placed over the gravel.

Utility Trenches

- Utility trenches placed parallel to structures should not extend within an imaginary 2:1 (horizontal to vertical) plane projected downward from the bottom edge of the adjacent footing.

- Trenches may be backfilled with compacted engineered fill placed in accordance with the grading section of this report. The backfill material should not be jetted in place.

- The portion of utility trenches that extend beneath foundations should be sealed with 2-sack sand slurry (or equivalent) to prevent subsurface seepage from flowing under buildings.

General Site Grading

- Areas to receive engineered fill, foundations, slabs or pavements should be cleared of obstructions, organic material and debris. The exact depth of stripping should be determined in the field during grading. Organically contaminated soils may be stockpiled and used in landscape areas.

- Voids created during site clearing should be backfilled with engineered fill.

- The subgrade beneath areas to receive fill should be scarified and compacted to provide a firm base for fill placement.

- The upper 7 feet of clayey on-site soils are not suitable for use as engineered fill. The granular soils below 7 feet are suitable for use as engineered fill. Soils used for engineered fill should be granular, have a Plasticity Index less than 15, be free of organic material, and contain no rocks or clods greater than 6 inches in diameter, with no more than 15 percent larger than 4 inches. We estimate the existing loose soils will have about 15 to 20 percent shrinkage when compacted.

- Engineered fill should be moisture conditioned to about 2 percent over optimum moisture content, placed in thin lifts less than 8-inches in loose thickness and compacted to at least 90 percent relative compaction. Where referenced in this report, Percent Relative Compaction and Optimum Moisture Content shall be based on ASTM Test Designation D1557.

- Temporary cutslopes in the upper 7 feet of clay should be sloped no steeper than 0.75:1 (horizontal to vertical) and temporary cutslopes in the sandy soils below 7 feet should be sloped no steeper than 1:1 (horizontal to vertical). If groundwater exists in the cuts at the time of construction the above temporary cutslope angles should be re-evaluated to reflect the current groundwater conditions at the time of construction.

General Site Drainage

- Controlling surface and subsurface runoff is important to the performance of the project.

- Surface drainage should include provisions for positive gradients so that surface runoff is not permitted to pond adjacent to foundations or other improvements. Where bare soil or pervious surfaces are located next to the foundation, the ground surface within 10 feet of the structure should be sloped at least 5 percent away from the foundation. Where impervious surfaces are used within 10 feet of the foundation, the impervious surface within 10 feet of the structure should be sloped at least 2 percent away from the foundation. Swales should be used to collect and remove surface runoff where the ground cannot be sloped the full 10-foot width away from the structure. Swales should be sloped at least 2 percent towards the discharge point.

- Full roof gutters should be placed around the eves of the structures. Discharge from the roof gutters should be conveyed away from the downspouts in a controlled manner.

- Due to the clays at the ground surface and the presence of a steep slope behind the proposed residence, the site is not well suited for on-site retention of stormwater.

- On-site retention may be used, but a suitable overflow path will need to be provided to carry excess water to the street.

- Runoff from improvements should not be allowed to flow over the steep slope at the back of the site. Retention structures should be located at least 50 feet from the top edge of the rear slope.

- The locations of drainage outlets and retention facilities should be reviewed and approved in the field prior to installation.

Plan Review, Construction Observation, and Testing

- Dees & Associates, Inc. should be provided the opportunity for a general review of the final project plans prior to construction to evaluate if our geotechnical recommendations have been properly interpreted and implemented. If our firm is not accorded the opportunity of making the recommended review, we can assume no responsibility for misinterpretation of our recommendations. We recommend that our office review the project plans prior to submittal to public agencies, to expedite project review.

- Dees & Associates, Inc. also requests the opportunity to observe and test grading operations and foundation excavations at the site. Observation of grading and foundation excavations allows anticipated soil conditions to be correlated to those actually encountered in the field during construction.

- The geotechnical engineer should be notified **at least four days** prior to any grading or foundation excavating so the work in the field can be coordinated with the grading contractor and arrangements for testing and observation can be made. The recommendations of this report are based on the assumption that the geotechnical engineer will perform the required testing and observation during grading and construction. It is the owner's responsibility to make the necessary arrangements for these required services.

- Engineered fill should be observed and tested by our firm. At a minimum, in-place density tests should be performed as follows: one test for every two feet of fill, one test for every 1,000 sq. ft. of material for relatively thin fill sections and one test whenever there is a definite suspicion of a change in the quality of moisture control or effectiveness in compaction.

- Prior to placing concrete, spread foundation excavations should be thoroughly cleaned and observed by the soils engineer.

- Our firm should be called to observe and test the baserock below interior and exterior concrete slabs-on-grade and pavements prior to placing vapor barriers or steel reinforcement.

- Our firm should be called to observe the gravel bed, perforated pipe and slope of pipe for retaining wall backdrains prior to backfilling. The perforated pipe should be placed below the base of interior slab elevations where retaining walls are behind living space.

- Drainage and erosion control preparations (swales, ground slopes, retention and detention structures and discharge areas) should be observed by the soils engineer. Discharge areas and retention areas should be reviewed and approved in the field prior to installation.

- After the earthwork operations have been completed and the geotechnical engineer has finished their observation of the work, no further earthwork operations shall be performed except with the approval of and under the observation of the geotechnical engineer.

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 Map

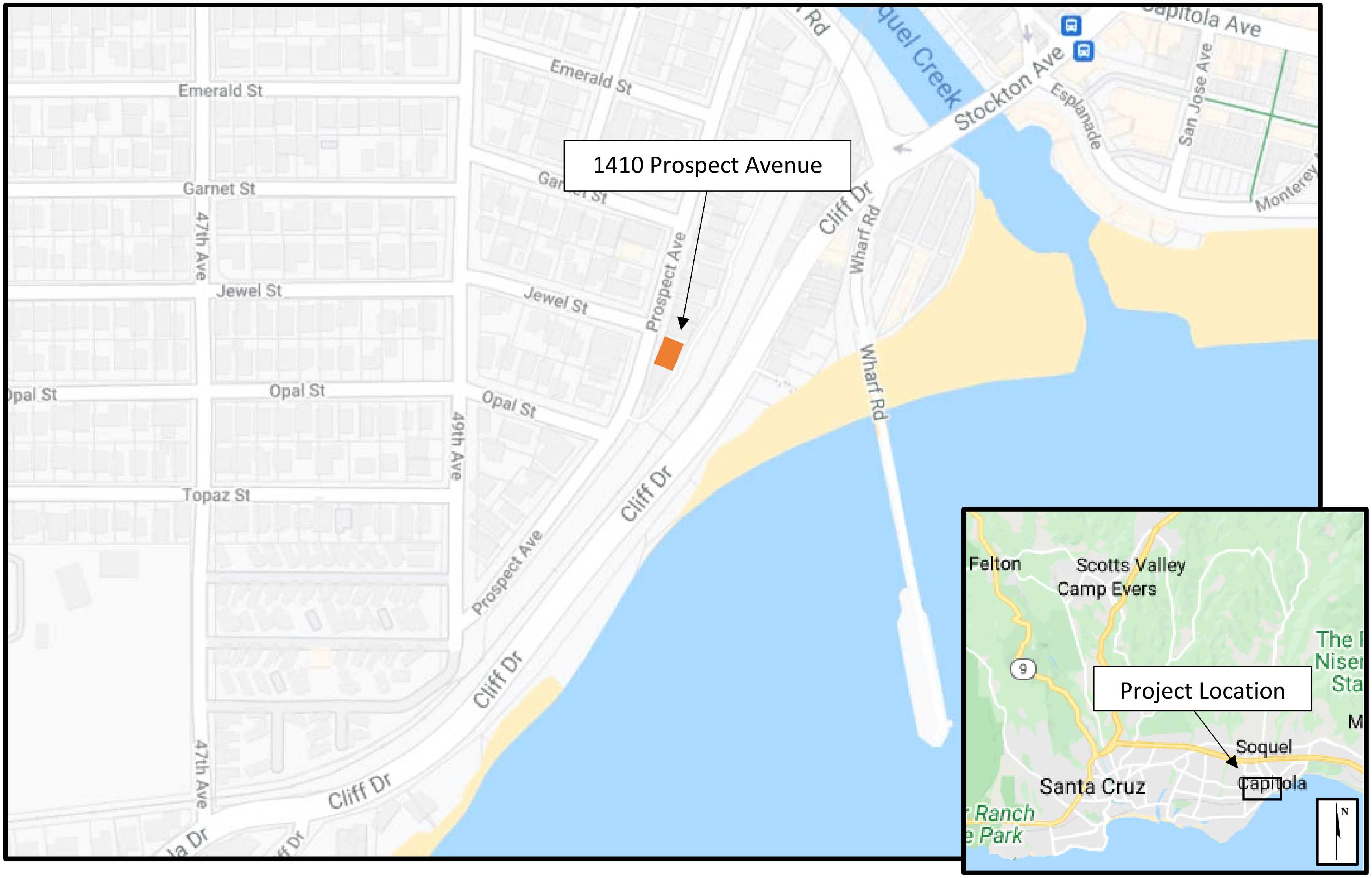
Santa Cruz County Lidar Map

Boring Site Plan

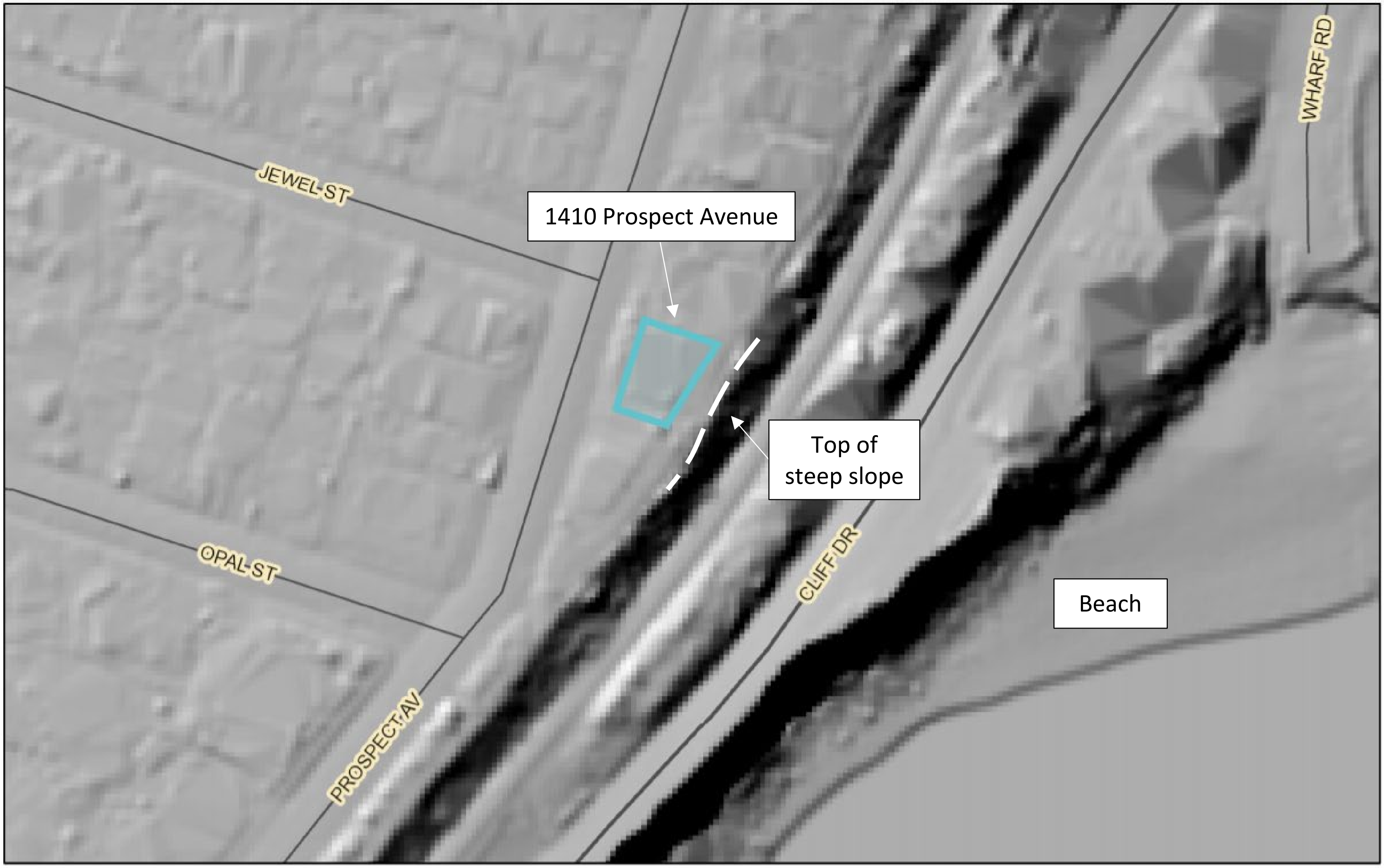
Unified Soil Classification System

Test Boring Log

Fault Map



SITE VICINITY MAP
Figure 1



July 6, 2021

1:960
0 40 80 160 ft

SANTA CRUZ COUNTY LIDAR MAP
Figure 2

BORING SITE PLAN
Figure 3

THE UNIFIED SOIL CLASSIFICATION SYSTEM

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		

*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.

Figure 4

TEST BORING LOG

SCR-1655
1410 Prospect Avenue

LOGGED BY: SC	DATE DRILLED: 5/5/2021	BORING TYPE: 6" SOLID STEM	BORING NO: 1

DEPTH (feet)	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 - 2	1-1-1 L	Strong brown fine Sandy CLAY, damp, hard		10 17 35	26	112.0	14.1		Qu = 1958 psf			
2 - 3 - 4	1-2 T	Strong brown fine Sandy CLAY, moist, hard		7 18 25	43		20.2					30.1
4 - 5	1-3-1 L	Strong brown fine Sandy CLAY, moist, very stiff	CL	7 10 25	18	97.5	22.8	28.8	580.6	30.0		
6 - 7												
8 - 9	1-4 T	Brown Gravelly SAND with Clay, very moist, dense (almost a Sandy Gravel)	SC	10 25 34	59		12.6				16.9	
10 - 11		Contact approximated (gradual transition)										
12 - 13	1-5 T	Dark yellowish-brown Clayey coarse SAND with Gravel, very moist, dense		6 10 19	29		14.1					
14 - 15			SC									
16 - 17	1-6 T	Dark yellowish-brown Clayey coarse SAND with more Gravel, very moist, dense		7 12 35	47		13.2					
18 - 19												
20 - 21	1-7 T	Dark yellowish-brown Clayey coarse SAND with Gravel, very moist to wet, dense		10 23 50/6"	73							
22 - 23 - 24 - 25 -												

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Figure 5

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

TEST BORING LOG

SCR-1655
1410 Prospect Avenue

LOGGED BY: SC	DATE DRILLED: 5/5/2021	BORING TYPE: 6" SOLID STEM	BORING NO: 1

DEPTH (feet)	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
26													
27				SM	10								
28	1-8 T		Bluish-gray Purisima SANDSTONE, moist, very dense		50/1"	50/1"							
29			Boring terminated at 28.5 Feet Groundwater Encountered at 24.5 Feet										
30													
31													
32													
33													
34													
35													
36													
37													
38													
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50													

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Figure 6

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

TEST BORING LOG

TEST BORING LOG			SCR-1655 1410 Prospect Avenue
LOGGED BY: SC	DATE DRILLED: 5/5/2021	BORING TYPE: 3.25" Hand Auger	BORING NO: 2

DEPTH (feet)	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	2-1 B		Strong brown fine Sandy CLAY, damp, stiff	CL									
2			Boring Terminated at 1.5 feet No Groundwater Encountered										
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													

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FAULT MAP
Figure 8