GEOTECHNICAL INVESTIGATION
For
PROPOSED MEDICAL BUILDING AND PARKING STRUCTURE
5940 Soquel Avenue, Santa Cruz
Santa Cruz County, California

Prepared
For
PMB SANTA CRUZ LLC
San Diego, California

Prepared By
DEES & ASSOCIATES, INC.
Geotechnical Engineers
Project No. SCR-1231
SEPTEMBER 2018

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September 12, 2018 Project No. SCR-1231

PMB SANTA CRUZ LLC
3394 Carmel Mountain Road, Suite 200
San Diego, California 92121

Attention: Mark Toothacre

Subject: Geotechnical Investigation

Reference: Proposed Medical Building and Parking Structure
5940 Soquel Avenue, Santa Cruz
APN 029-021-47
Santa Cruz County, California

Dear Mr. Toothacre:

As requested, we have completed a Geotechnical Investigation for the new medical building and parking structure proposed at the referenced site. The purpose of our investigation was to explore surface and subsurface soil conditions in the vicinity of the proposed improvements and develop geotechnical recommendations and criteria for design and construction of the proposed project.

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
Geotechnical Engineer
G.E. 2623

REGISTERED PROFESSIONAL ENGINEER
REBECCA LYNN DEES
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Copies: 4 to Addressee

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GEOTECHNICAL INVESTIGATION

Introduction
This report presents the results of our Geotechnical Investigation for the new medical building and parking structure proposed at 5940 Soquel Avenue in Santa Cruz County, 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 proposed improvements and provide geotechnical recommendations for design and construction of 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.

2. Exploration of subsurface conditions consisting of logging and sampling of eight (8) exploratory borings terminated 16.5 to 46.5 feet below the ground surface.

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 general site grading, concrete slabs-on-grade, pavements, foundations, retaining walls and general site drainage.

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

Project Location and Description
The 5-acre project site is located at 5940 Soquel Avenue in the unincorporated area of Santa Cruz County, California, Figure 1. The site is currently used as a yard/storage facility and most of the site is partitioned into separate fenced yard areas. See Figure 2. The buildings at the site are temporary structures primarily consisting of trailers and shipping containers, and the driveways are gravel.

The project consists of removing the existing improvements and constructing a new medical building and parking structure at the site. The plans for the project are in the preliminary stages, but the plans provided to us indicate the four-story medical building will be centrally located along the east side of the parcel and will occupy roughly 46,000 square feet of area. The three to four-story parking garage will be located in the southwest portion of the parcel and will occupy roughly 43,000 square feet of area. See Figure 3.

The site is bordered by Soquel Avenue to the north, commercial office space to the west, residential housing to the south and commercial/industrial storage and work space to the east. The parcel and the surrounding area are level to gently sloping to the south and southeast with slope gradients on the order of 1 to 1.5 percent. Drainage from Soquel Avenue, above the site, is collected in a ditch that discharges into a culvert that passes through the northeast corner of the site. There are no existing drainage improvements for the site itself and we understand runoff temporarily ponds then percolates into the soil.

Field Investigation

Subsurface conditions at the site were explored on August 6, 2018 with eight (8) exploratory borings drilled with 6-inch diameter continuous flight augers advanced with truck mounted drilling equipment. The exploratory borings were drilled 16.5 to 46.5 feet below existing grades. The approximate locations of the exploratory borings are indicated on Figure 3. Our boring locations were limited to accessible areas and while they are expected to be representative of the soils in other areas the site, our test boring logs denote subsurface conditions at the locations and times observed are not warranted they are representative of subsurface conditions at other locations or times.

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. 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 indicated on the logs have been converted to equivalent standard penetration test (SPT) values.

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 densities were performed on representative soil samples to determine the consistency of the soil and the moisture variation throughout the explored soil profile. Atterberg Limits were performed to evaluate the soils relative shrink/swell potential. Direct shear testing was performed to evaluate the soil shear strength properties. Grain size analysis was performed to aid in soil classification. Corrosion testing was performed on select samples. The results of our field and laboratory testing appear on the "Test Boring Logs", next to the sample tested or in the appendix.

Subsurface Soil Conditions

The County of Santa Cruz Geologic Map indicates the site is underlain by Lowest Emergent Coastal Terrace Deposits (Pleistocene), which are described as, "Semiconsolidated, generally well-sorted sand with a few thin, relatively continuous layers of gravel. Deposited in nearshore high-energy marine environment. Thickness variable; maximum approximately 40 ft. 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 indicate the site is underlain by up to 40 feet of terrace deposits that overly Purisima Formation sandstone. The terrace deposits generally consisted of clayey sand and sandy clay down to about 20 feet where sandy gravels were encountered. There was up to 3 feet of loose fill (±) encountered at the ground surface in the borings drilled on the western side of the site. The deepest fill was in the southwest corner.

The upper 3 to 8 feet of native soil (below the fill), with the exception of Boring 7, consisted of clayey sand. Boring 7 encountered clay from the ground surface to a depth of 8 feet. The native soils were mostly medium dense with some loose areas with up to 3.5 feet of loose native soil below the fill. The deepest loose soil area was in Boring 2, where 6.5 feet of loose fill and native soils were encountered. The soils below the upper loose zones are medium dense to very dense.

Very dense sandstone was encountered around 40 feet in Boring 2 and around 26 feet in both Borings 3 and 7. Sandstone was not encountered in our other borings, which were drilled up to 26 feet in depth.

The foundation zone soils generally have a low to moderate expansion potential with Atterberg Limits between 18 and 24. There were 1 to 2 feet thick layers of expansive clay encountered in Borings 3 and 5 and a couple thin layers of expansive clay encountered in Boring 2.

Groundwater

Interesting that the environmental investigation did not encounter this

A fully developed groundwater table was encountered 18 feet below grade in Boring 1, 43.5 feet below grade in Boring 2, and 9 feet below grade in Boring 8. Perched groundwater was encountered 12 feet below grade in Boring 1; 5.5 to 6 feet and 18 to 19 feet below grade in Boring 2; and wet soils with no seepage were observed 24 to 27 feet below grade in Boring 3. Groundwater was not encountered in the other test borings.

Although not encountered in our test borings, there is a potential for perched groundwater to develop on top of the clayey soils during and following the rainy season. Clayey soils were encountered 3 to 7 feet below the ground surface.

Our 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 project site is located in a seismically active region and several active and potentially active faults are located in the vicinity of the site. The following is a general discussion of seismicity in the project area. A more detailed discussion of faulting and seismicity is beyond the scope of our services.

The faults closest to the site are the Zayante-Vergeles Fault, Monterey Bay Fault, San Andreas Fault and San Gregorio Fault. See Figure 13. 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.

Zayante-Vergeles Fault	Monterey Bay-Tularcitos Fault	San Andreas Fault	San Gregorio Fault
7.3 miles Northeast	9.1 miles Southwest	9.2 miles Northeast	12.3 miles Southwest

Structures designed according to the 2016 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 USGS Seismic Design Map and ASCE 7-10.

Design Parameter	ASCE 7-10
Site Class	D
Mapped Spectral Acceleration for Short Periods	S_S = 1.500 g
Mapped Spectral Acceleration for 1-second Period	S_1 = 0.600 g
MCE Spectral Response Acceleration for Short Period	S_{MS} = 1.500 g
MCE Spectral Response Acceleration for 1-Second Period	S_{M1} = 0.900 g
5% Damped Spectral Response Acceleration for Short Period	S_{DS} = 1.500 g
5% Damped Spectral Response Acceleration for 1-Second Period	S_{D1} = 0.600 g
Seismic Design Category	D
PGAm	0.500 g

Ground Rupture

There are no known fault traces located near the site and the potential for seismic ground rupture is very low.

Landsliding

The site is nearly level and the nearest steep slope is located over 1000 feet away. There is a very low potential for landsliding to affect the proposed improvements.

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.

An analysis of the liquefaction potential was performed using a design earthquake of 0.5g. Groundwater was only encountered in Borings 1, 2 and 8, but there is a potential for groundwater to develop in the vicinity of Boring 3. The groundwater levels used in our analysis represent our best estimate of historic high groundwater levels.

The results of our liquefaction analysis indicate there is a potential for liquefaction to develop from 18 to 21 feet in Boring 1 and from 24 to 26 feet in Boring 3. There are no surface effects expected as a result of liquefaction due to the small thickness and depth of the liquefiable layers. There is a very low potential for lateral spreading to occur due to the discontinuity of the liquefiable soils.

DISCUSSIONS & CONCLUSIONS

Based on the results of our investigation, the proposed development is feasible from a geotechnical standpoint. Primary geotechnical concerns for the project include total and differential settlement in the loose and variable surface soils, soil expansion within the thin zones of highly expansive clay encountered near the ground surface, strong seismic shaking from nearby faults and controlling site drainage.

The near surface soils are variable in terms of composition, density and engineering characteristics. There was up to three feet of man-made fill encountered in our borings. The fill consisted of granular soils and ranged from loose to medium dense. Below the fill, the native soils varied between clayey sand, silty sand and sandy clay that were medium dense except in Boring 6 where the soils were loose in the upper 4.5 feet. The clayey soils vary from slightly expansive to highly expansive and the thickness and depth of the expansive soil varies across the site.

To create a uniform building pad and mitigate differential movement below the proposed structures, we recommend blending and densifying the top 6 feet of soil within 5 feet of buildings and blending and densifying the top 3 feet of soil within 3 feet of pavements. The site soils will shrink during compaction. We estimate shrinkage will be on the order of 15 percent. Structures may be supported on conventional foundations embedded into engineered fill. There should be at least 4 feet of engineered fill below the bases of the foundation elements.

The foundation zones soils are slightly to moderately expansive with thin zones of highly expansive clay. The thin zones of highly expansive clay should be removed from the site or used in landscape areas. To help mitigate soil expansion and provide a firm uniform base for slab floors, we recommend capping the native fill with 12 inches of select granular fill. Our calculations indicate properly moisture conditioned and blended soils with at least 12 inches of granular fill on top will have a low potential to swell under the proposed building loads.

The proposed structures will most likely experience strong seismic shaking during the design lifetime. The foundations and structures should be designed utilizing the most current seismic design standards.

The ground surface adjacent to buildings should be sloped away so water is not allowed to pond next to foundations. The site is fairly level so buildings may have to be raised to get the ground to slope away. Walkways and driveways should be sloped towards suitable collection areas. The majority of the soils at the site have low permeability and surface runoff may pond if adequate drainage is not provided. Our firm performed percolation testing in the upper eight feet of soil and the soils had infiltration rates between 0.02 and 0.4 incher per hour which is not well suited for on-site retention. Storm runoff should be collected and discharged off-site in a controlled manner.

RECOMMENDATIONS

The following recommendations may be used as guidelines for preparing project plans and specifications. At the time of this report, structures will be constructed at or above existing grades with no basements proposed. If basements are proposed in the future, additional geotechnical recommendations and criteria should be developed.

General Site Grading

1. 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 assumptions 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.

3. Areas to be graded should be cleared of all obstructions including existing fill and any other unsuitable material or debris. All organic materials shall be stripped from any areas to receive engineered fill, foundations, slabs or pavements. The exact depth of stripping should be determined in the field during grading. Organically contaminated soils may be stockpiled and used in landscape areas.

4. All voids created during site clearing should be backfilled with engineered fill.

5. The soil within 5 feet of building foundations should be excavated to 6 feet or at least 4 feet below the bases of the proposed foundation elements, whichever is deeper; be moisture conditioned to 2 percent over optimum moisture content; be blended to a uniform consistency; then be replaced as engineered fill. Expansive clays encountered during grading should be removed. The fill below structures should be capped with 12 inches of select granular fill or baserock. Select granular fill should consist of well graded granular soil with approximately 10 percent fines.

6. The soil within 3 feet of pavements should be excavated to a depth of 3 feet, be moisture conditioned to 2 percent over optimum moisture content, be blended to a uniform consistency, then be replaced as engineered fill.

7. Areas to receive engineered fill should be scarified and compacted to provide a firm base for fill placement.

8. The on-site soil may be used for engineered fill (as specified in this report) with the exception of the 1 to 2 feet thick layers of highly expansive clay encountered in some areas. The clay soils encountered in the upper 5 feet in the vicinity of Boring 7 meet the requirements for engineered fill, but the clayey soil may require substantial moisture conditioning and extra compaction effort to be used as engineered fill.

Imported 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. Imported soils to be used as engineered fill should be provided to our firm at least 4 days prior to importing the material to the site so the soil may be tested for conformance with our recommendations.

9. Engineered fill placed beneath buildings 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 95 percent relative compaction.

10. Engineered fill placed elsewhere on the site 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.

11. Where referenced in this report, Percent Relative Compaction and Optimum Moisture Content shall be based on ASTM Test Designation D1557.

12. 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 foot 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.

13. 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.

Concrete Slabs-on-Grade

14. All existing fill should be removed from areas to receive concrete slabs-on-grade.

15. The upper 8 inches of subgrade soil below non-load bearing concrete slabs-on-grade should be moisture conditioned to 1 to 2 percent over optimum moisture content and compacted to at least 90 percent relative compaction.

16. For driveway slabs the upper 3 feet of soil within 3 feet of the pavement should be moisture conditioned to 1 to 2 percent over optimum moisture content and compacted to at least 90 percent relative compaction. The upper 8 inches of subgrade and any aggregate base placed beneath the slab should be compacted to at least 95 percent relative compaction.

17. 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.

18. 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. In order to minimize vapor transmission, an impermeable membrane (15-mil or thicker) should be placed over the gravel.

Pavements

19. The top 8 inches of pavement subgrade should be scarified, moisture conditioned to 1 to 2 percent over optimum moisture content and compacted to at least 95 percent relative compaction.

20. For preliminary design purposes, an R-value of 15 was used to estimate the pavement sections for the proposed development. Once the site soils have been blended and placed per our grading recommendations, the actual R-value of the subgrade soil should be determined.

	Traffic Index	AC Thickness	Class 2 Aggregate Base
Driveways	5	3	5
Truck Areas	7	4.5	8

21. The aggregate base pavements should be moisture conditioned and compacted to at least 95 percent relative compaction prior to placing concrete or asphalt paving materials.

22. Only quality materials of the type and minimum thickness specified should be used. Baserock (R=78 minimum) should meet Caltrans Standard Specifications for Class II Untreated Aggregate Base.

Utility Trenches

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

24. 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.

25. 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.

Earthwork Construction Considerations

26. At the time of our study, moisture contents of the surface and near-surface soils ranged from about 9 percent to 20 percent. Based on these moisture contents, some moisture conditioning will likely be needed for the project. The soils moisture contents

may need to be dried by aeration or wetted to achieve the recommended moisture content range.

27. There is a potential for near surface perched groundwater to develop 3 to 6 feet below grade causing the near surface soils to become saturated. If grading is performed in the winter or spring, excavations may become flooded and have to be dewatered. The on-site soils may pump and unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Should unstable subgrade conditions develop stabilization measures may need to be developed.

28. Upon completion of grading, care should be taken to maintain the subgrade moisture content prior to construction of the floor slab. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and re-compacted prior to floor slab and pavement construction.

29. We recommend the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically October through May) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

Spread Footings Foundations

30. Structures may be supported on spread footing foundations embedded into compacted engineered fill. Spread footing foundations may be designed in accordance with the following:

Number of Stories	Minimum Depth (inches)	Minimum Width (inches)	Allowable Bearing Capacity (psf)
1	12	12	2,600
2	18	15	3,100
3 to 4	24	18	3,700

31. Total and differential settlements are anticipated to be less than 1 inch and 1/2 inch respectively for footings designed and constructed in accordance with the above.

32. Lateral load resistance for structures supported on footings may be developed in friction between the foundation bottom and the supporting subgrade. A friction coefficient of 0.5 is considered applicable. Where footings are poured neat against

engineered fill, a passive lateral earth pressure of 375 pcf may be used. The top 12 inches of soil should be neglected in passive design.

33. Footings located adjacent to other footings or utility trenches should have their bearing surfaces founded below an imaginary 1.5:1 plane projected upward from the bottom edge of the adjacent footings or utility trenches.

34. The foundation trenches must be kept moist until the concrete is placed to mitigate soil shrinkage. If the soils are allowed to dry out and shrinkage cracks develop, the soils will need to be moisture conditioned until the cracks close and the surrounding soil is moist.

35. Prior to placing concrete, foundation excavations should be observed by the soils engineer.

Retaining Wall Lateral Pressures

36. Retaining walls should be designed to resist both lateral earth pressures and any additional surcharge loads.

37. Unrestrained retaining walls may be designed to resist an active lateral earth pressure of 42 pcf equivalent fluid weight for level backfills, 48 pcf equivalent fluid weight for backslopes inclined up to 3:1 (horizontal to vertical) and 72 pcf equivalent fluid weight for backslopes inclined up to 2:1 (horizontal to vertical).

38. Restrained retaining walls may be designed to resist an at rest earth pressure of 63 pcf equivalent fluid weight for level backfills, 84 pcf equivalent fluid weight for backfills inclined up to 3:1 (horizontal to vertical) and 111 pcf equivalent fluid weight for backslopes inclined up to 2:1 (horizontal to vertical).

39. Retaining walls over 6 feet high should include a seismic surcharge load of 16 pcf, EFW, in addition to the above lateral earth pressures. The dynamic pressure should be applied as an inverted triangle with the resulted located at a point 0.6 H above the base of the wall.

40. 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 either Class 1 or Class 2 permeable material (Caltrans Specification 68). Place filter fabric between Class 1 permeable material and backfill. No filter fabric is required with Class 2 permeable material. The drains should extend from the base of the walls to within 12 inches of the top of the backfill. A perforated pipe should be placed (holes down) about 2 inches above the bottom of the wall and be tied to a suitable drain outlet. Wall backdrains should be plugged at the surface with clayey material to prevent infiltration of surface runoff into the backdrains.

Site Drainage

41. Surface drainage should include provisions for positive gradients so that surface runoff is not permitted to pond adjacent to improvements.

42. Where bare soil or pervious surfaces are located next to building foundations, the ground surface within 10 feet of the structure should be sloped at least 5 percent away from the foundation.

43. Where impervious surfaces are used within 10 feet of building foundations, the impervious surface within 10 feet of the structure should be sloped at least 2 percent away from the foundation.

45. Where the ground cannot be sloped the full 10 feet width, swales should be used to collect and remove surface runoff away from the structure. Swales should be sloped towards the discharge point.

46. Full roof gutters should be placed around the eves of structures and water from the downspouts should be conveyed away from the structure.

47. Sufficient driveway gradients should be provided for rapid removal of storm water and to prevent ponding water on or adjacent to pavements.

48. The subsoils at the site have low permeability and are not well suited for on-site retention of concentrated storm runoff. Concentrated storm water should be discharged off-site in conformance with local drainage requirements.

Plan Review, Construction Observation, and Testing

49. 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 encountered in the field during construction.

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

Site Image

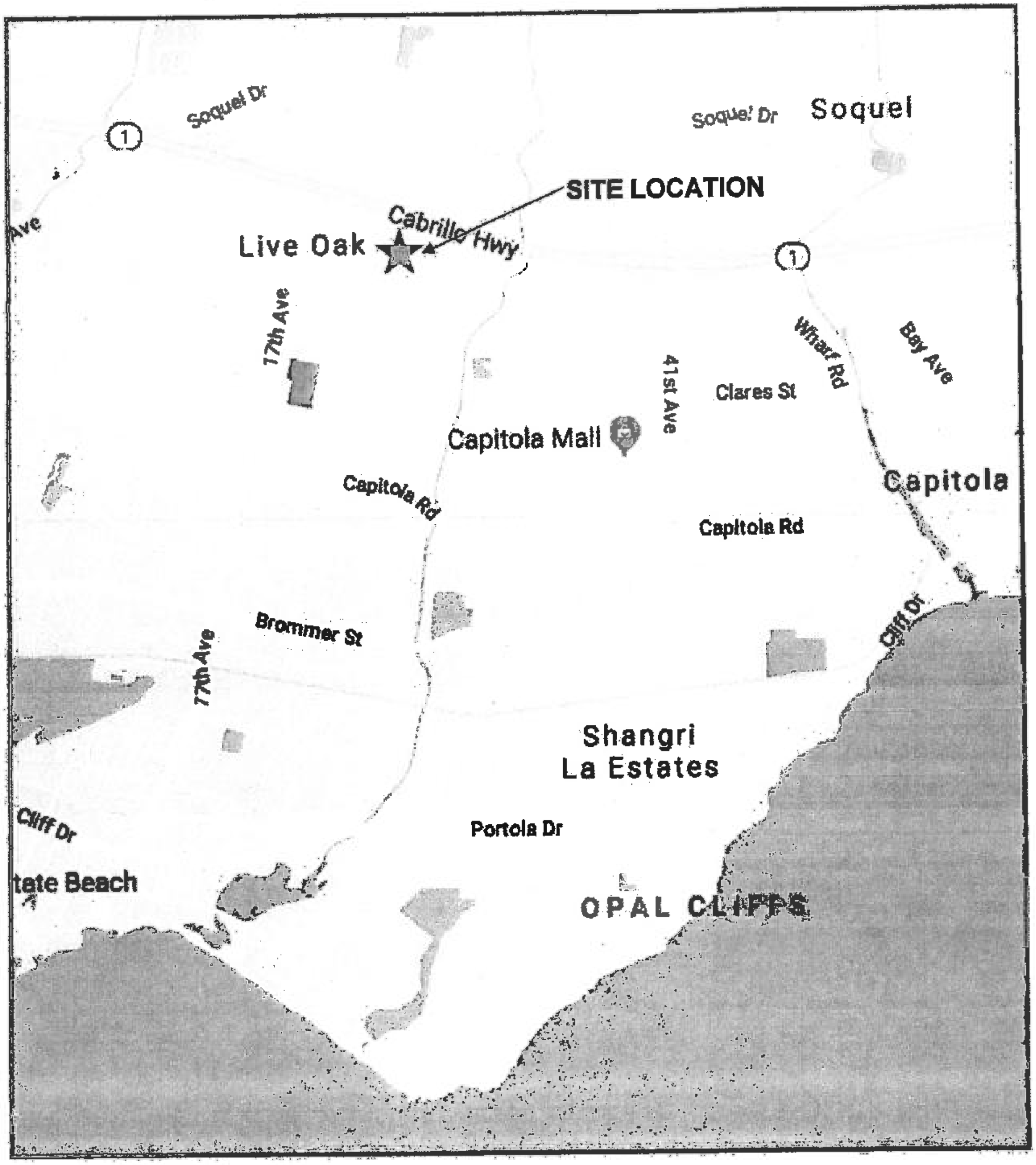
Boring Site Map

Unified Soil Classification System

Test Borings Logs

Fault Map

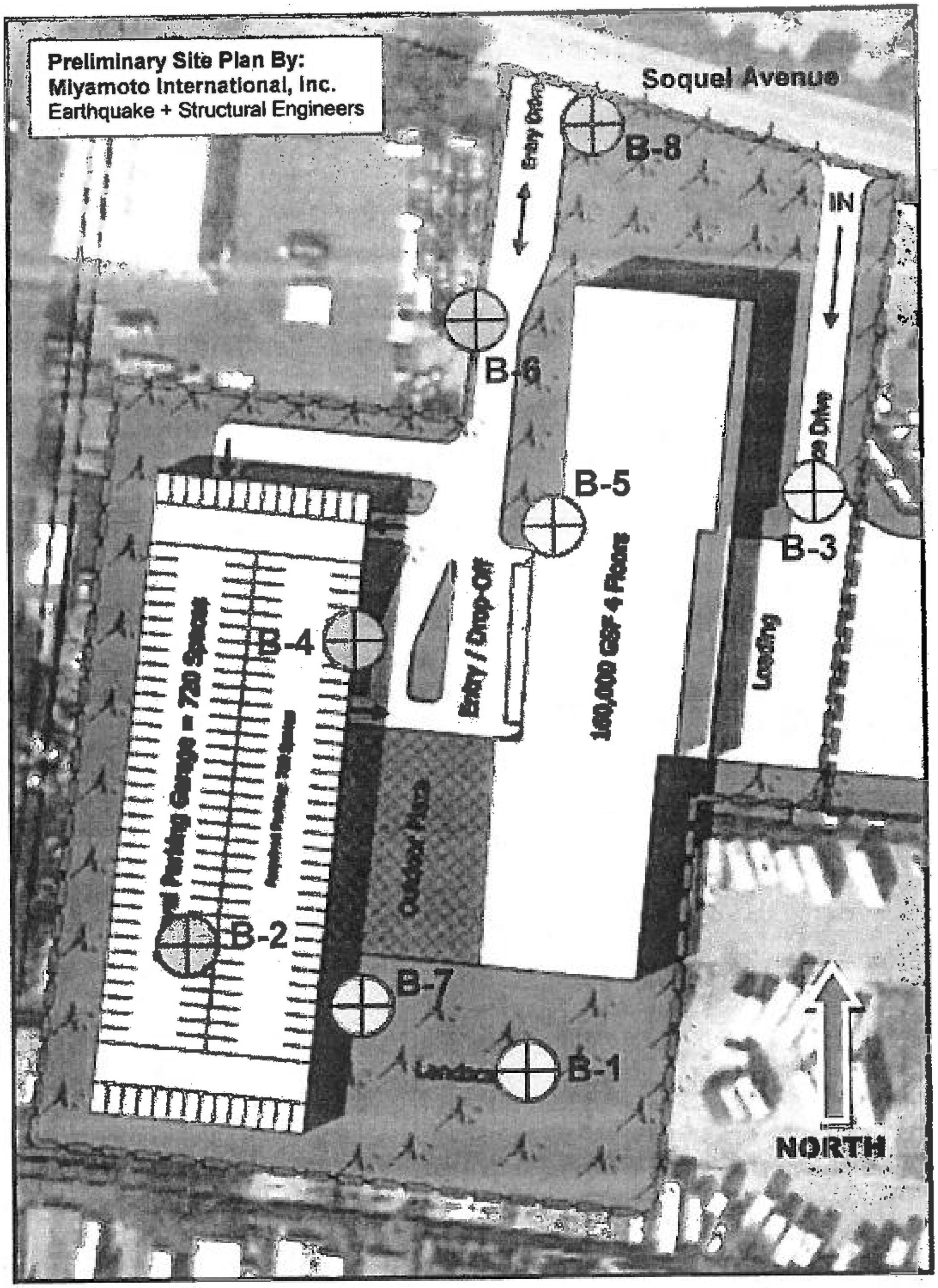
Laboratory Test Results



SITE VICINITY MAP
Figure 1

EXISTING SITE IMAGE

Figure 2



BORING SITE MAP

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 Atterburg 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 Atterburg 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 Atterburg 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-1231
Soquel Avenue

LOGGED BY: SC | DATE DRILLED: 8/6/2018 | 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
-		Fill?										
1	1-1-1			10								
-	L	Dark brown mottled Clayey SAND, damp, medium dense	SC	12								
2				28	20	86.7	14.1	33.7	799.0	27.0		
-	1-2-			7								PI=
3	T			14								23.6
-				12	26							LL=
4	1-3-1			15								38.5
-	L			24								
5		Dark yellowish brown Clayey SAND, damp, medium dense	SC	32	28	104.8	22.6	25.6	995.2	26.7		
-	1-4			8								
6	T			9								
-		Dark yellowish brown Sandy CLAY - Clayey SAND, moist,	CL/	10	19							
7		medium dense to stiff	SC									
-												
8	1-5			2								
-	T	Grayish brown Sandy CLAY, moist, firm	CL	2								
9				4	6		30.9					
-												
10												
-												
11												
-												
12	1-6	▼ water seepage at 12 feet										
-	T	Gray mottled Sandy CLAY, moist, firm		3								
13				3								
-				4	7							
14												
-												
15		Increase in sand and mottling										
-												
16	1-7			3								
-	T	Mottled gray Sandy CLAY, damp, medium stiff		3								
17				4	7							
-												
18		▼ Perched groundwater at 18 feet										
-												
19												
-			SM									
20		Brown Silty SAND, saturated, loose		4								
-	1-8			4								
21	T	Gray mottled Sandy CLAY, moist, stiff	CL	5	9		28.9				23.7	
-												
22		Boring Terminated at 21.5 Feet										
-		Groundwater Seep at 12 Feet										
23		Groundwater Encountered at 18 Feet										
-												
24												
-												
25												
-												
26												
-												

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Figure 5

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | 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
		FILL?										
1–2	2-1-1 L	Mottled very dark gray brown Silty and Clayey SAND with pockets of CLAY, moist, medium dense	SC	12 12 12	12		12.2					
2–4	2-2 T	NATIVE? Gray brown mottled Clayey SAND, moist, medium dense	SC	4 4 4	8							
5–7	2-3 T	Grades to black Sandy CLAY, very moist Thin Sand lens at 5.5 feet, saturated Dark gray CLAY with SAND, very moist, very stiff	CL	2 7 8	15							
10–13	2-4 T	Gray brown Sandy SILT/CLAY, moist to very moist, very stiff Contact is approximate	ML/CL	8 12 12	24		17.4					
15–16	2-5 T	Grades to a pale gray brown SILT, moist to very moist, hard	ML	10 18 25	43							
20–21	2-6 T	Pale gray brown fine Sandy SILT, very moist, medium stiff	ML	4 5 6	11		28.5					
25–26	2-7 T	Gray Sandy SILT, very moist, medium stiff Gray to dark yellow brown Silty SAND lens Gray Sandy SILT/Silty SAND, very moist, medium dense	ML/SM	8 8 7	15							

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Figure 6

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | 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
27												
28	2-8 T	Gray Silty SAND to SAND with SILT, moist, dense	SM	7 10 20	30							
29												
30												
31												
32												
33												
34												
35	2-9 T	Gray brown SILT with Sand, very moist, very stiff	ML	4 8 15	23		26.7					
36												
37												
38												
39												
40	2-10 T	Gray brown well graded SAND with few gravels up to 1", moist, very dense (Purisima Formation)	SW	12 21 28	49							
41												
42												
43												
44												
45	2-11 T	Gray fine Silty SAND, wet, very dense	SM	20 20 35	55							
46												
47												
48		Boring Terminated at 46.5 Feet Perched Water Encountered at 5.5-6 Feet Perched Water Encountered at 18-19 Feet Groundwater Encountered at 43.5 Feet										
49												
50												
51												
52												

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Figure 6

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 3

DEPTH (feet)	SAMPLE NO.	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	3-1-1 L	Gray brown fine Silty SAND, dry-damp, medium dense	SM	10 15 17	16	83.4	17.4	38.2	485.5	31.8		
2–3	3-2 T			5 7 10	17							PI= 61.2 LL= 72.7
4		Gray Fat CLAY, moist, stiff	CH									
5–6	3-3-1 L			12 12 30/3"	30/3"							
6–9		Gray Silty SAND, damp, very dense	SM									
10–11	3-4 T	Thin seam coarse SAND and GRAVEL		5 5 5	10		23.1					
11–14		Gray fine Sandy SILT, very moist, medium stiff	ML									
14		Approximate Contact										
15–16	3-5-1 L	Gray Clayey GRAVEL, wet, dense	GP	10 20 50/6"	50/6"							
17		Approximate Contact										
19–21	3-6 T	Gray brown Clayey SAND with lenses of Silty SAND, damp to moist, medium dense	SC	10 10 15	25		16.2					
24		Approximate Contact										
24–25		▼ Perched groundwater										
25–26	3-7 T	Gray fine Silty SAND, saturated, very loose (sample sucked out)	SM	1 1 2	3							

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Figure 7

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 3

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
27													
28													
29													
30	3-8				17								
31	T		Dark yellow brown Gravelly SAND, damp to moist, dense (subangular gravels up to ¼ inch)	SP	20 24	44		9.4					
32													
33													
34													
35	3-9				12 19								
36	T		Yellow brown fine Silty SAND, damp, very dense (Purisima Formation)	SM	50/6"	50/6"							
37			Boring Terminated at 36.5 Feet										
38			Perched Water Encountered at 24 Feet										
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													

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Figure 7

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 4

DEPTH (feet)	SAMPLE NO.	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	4-1-1 L	FILL Dark brown Gravelly Silty SAND, damp, medium dense	SM	10 15 16	31							
2–3	4-2 T	NATIVE Dark brown clayey SAND grading to Sandy CLAY, moist, medium dense - stiff	SC/ CL	4 6 7	13		20.1					
4		Grades to gray brown Clayey SAND, moist to very moist, medium dense	SC									
5–6	4-3-1 L			4 9 9	9		23.3					
7–8		Contact Unknown										
10–11	4-4 T	Gray brown fine Sandy SILT/CLAY, very moist, medium stiff	ML/ CL	3 3 7	10							
13–14		Contact Unknown										
15–16	4-5 T	Gray brown fine Clayey SAND, moist, medium dense	SC	9 11 15	26		19.8					
20–21	4-6 T	Brown Sandy GRAVEL-Gravelly SAND, moist dense	GP/ SP	17 17 26	43							
25–26	4-7 T	Brown Gravelly SAND, moist, dense	SP	38 24 36	60		9.7					
		Boring Terminated @ 26.5 Feet No Groundwater Encountered										

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Figure 8

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: SC	DATE DRILLED: 8/6/2018	BORING TYPE: 6" Solid Stem	BORING NO: 5

DEPTH (feet)	SAMPLE NO.	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	5-1-1 L	Dark brown Silty/Clayey SAND with Gravel, damp, loose	SC	11 4 3	7	116.0	16.1	16.7	480.7	33.0		
2–3	5-2 T	Dark mottled yellowish brown Sandy CLAY, moist, stiff	CL	2 4 7	11							PI= 27.7 LL= 39.7
4–5	5-3-1 L			3 4 8	12							
7		Approximate Contact										
8–9	5-4 T	Dark mottled yellowish brown Clayey SAND, trace angular ½" gravels, moist, medium dense	SC	4 5 5	10		25.4					
12–13	5-5 T	Gray mottled Sandy CLAY, moist, stiff	CL	3 4 5	9							
15		Approximate Contact										
16–17	5-6 T	Dark yellow to grayish brown fine to medium grained Clayey SAND, damp, medium dense	SC	5 11 14	25		20.1					
20–21	5-7 T	Yellowish brown Clayey angular GRAVEL with SAND, moist, very dense	GP	12 25 25	50							
21.5		Boring Terminated @ 21.5 Feet No Groundwater Encountered										

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Figure 9

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: SC | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 6

DEPTH (feet)	SAMPLE NO.		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			Yellowish brown Silty SAND with Gravel up to 2", moist, loose	SM									
2	6-1-1				4								
-	L				5								
3			Dark yellowish brown Silty SAND, moist, loose	SM	5	5	94.4	18.4	29.4	382.3	35.1		
-	6-2				2								
4	T		Dark brown Silty to Clayey SAND, wet, loose	SC	2								
-					3	5		20.5					
5			Black Sandy CLAY with trace rounded Gravel, moist, firm										
-				CL									
6													
-			Approximate Contact										
7													
-													
8	6-3		Pale yellow to grayish brown mottled Sandy SILT-Silty	ML/	5								
-	T		SAND, trace angular Gravel, damp, medium dense	SM	10								
9					10	20		19.5					
-													
10													
-													
11													
-													
12	6-4				8								
-	T		Gravels at 12 feet		10								
13			Dark yellowish brown Clayey SAND with angular Gravel, moist, medium dense	SC	10	20							
-													
14													
-			Approximate Contact										
15													
-													
16	6-5				11								
-	T		Dark brown Sandy GRAVEL, moist, medium dense	GP	15								
17					15	30		11.5					
-													
18													
-			Approximate Contact										
19													
-													
20	6-6		Yellowish brown medium to coarse grained well graded	SW	15								
-	T		SAND with rounded Gravel up to 3/4", damp, dense		16								
21					18	34							
-													
22			Boring Terminated @ 21.5 Feet										
-			No Groundwater Encountered										
23													
-													
24													
-													
25													
-													
26													
-													

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Figure 10

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 7

DEPTH (feet)	SAMPLE NO.	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	7-1-1 L	Black fine Sandy CLAY – Clayey SAND, moist, medium dense/stiff	CL/ SC	10 7 12	10	85.1	20.6	35.1	325.8	31.5		
2–4	7-2 T	Black fine Sandy CLAY, moist, firm	CL	2 2 4	6							PI= 17.8
5–6	7-3-1 L	Brown Sandy CLAY, very moist, stiff	CL	5 9 12	21							
8		Contact unknown										
10–11	7-4 T	Gray brown Clayey SAND, damp-moist, medium dense	SC	6 6 10	16		19.5					
12		Contact Unknown										
15–16	7-5 T	Gray brown Sandy CLAY, moist, very stiff	CL	8 8 8	16							
17		Contact Unknown										
20–21	7-6 T	Gray brown SILT, wet, stiff	ML	6 6 10	16		37.1					
25–26	7-7 T	Yellow brown Sandy GRAVEL, moist, dense Yellow brown fine to medium SAND, moist, very dense (Purisima Formation)		12 30 50'6"	50/6"							

Boring Terminated @ 26.5 Feet
No Groundwater Encountered

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Figure 11

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

TEST BORING LOG

SCR-1231
Soquel Avenue

LOGGED BY: BD | DATE DRILLED: 8/6/2018 | BORING TYPE: 6" Solid Stem | BORING NO: 8

DEPTH (feet)	SAMPLE NO.		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	8-1 T		FILL Yellow brown Gravelly SAND, dry, dense to 18" then medium dense	SP	15 12 10	22		8.8					
3–4			NATIVE Black fine Clayey SAND, damp-moist, medium dense	SC									
5–6	8-2 T		Seep on top of Clay Black CLAY, moist, stiff	CL	5 8 7	15							
9			▼ Perched groundwater at 9 feet										
10	8-3 T		Mottled gray and yellow brown Sandy CLAY		8 12 12	24		17.4				32.9	
11–13			Mottled dark gray brown Clayey SAND, very moist, medium dense Contact Unknown	SC									
15	8-4 T		Yellow brown SAND with Gravel, moist, dense	SP	12 20 28	48		12.2				12.6	

Boring Terminated @ 16.5 Feet
Perched Groundwater Encountered at 9 Feet

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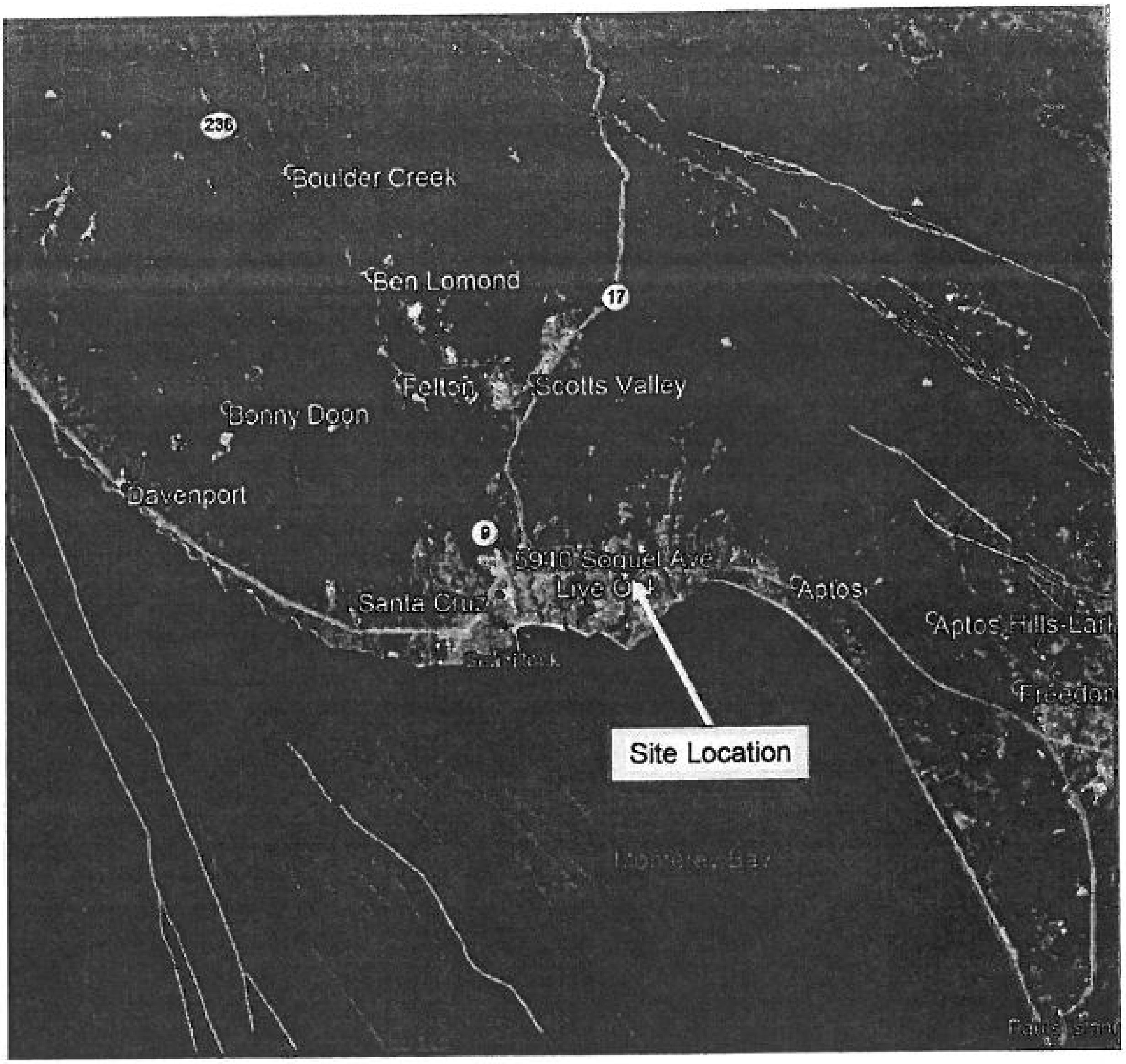
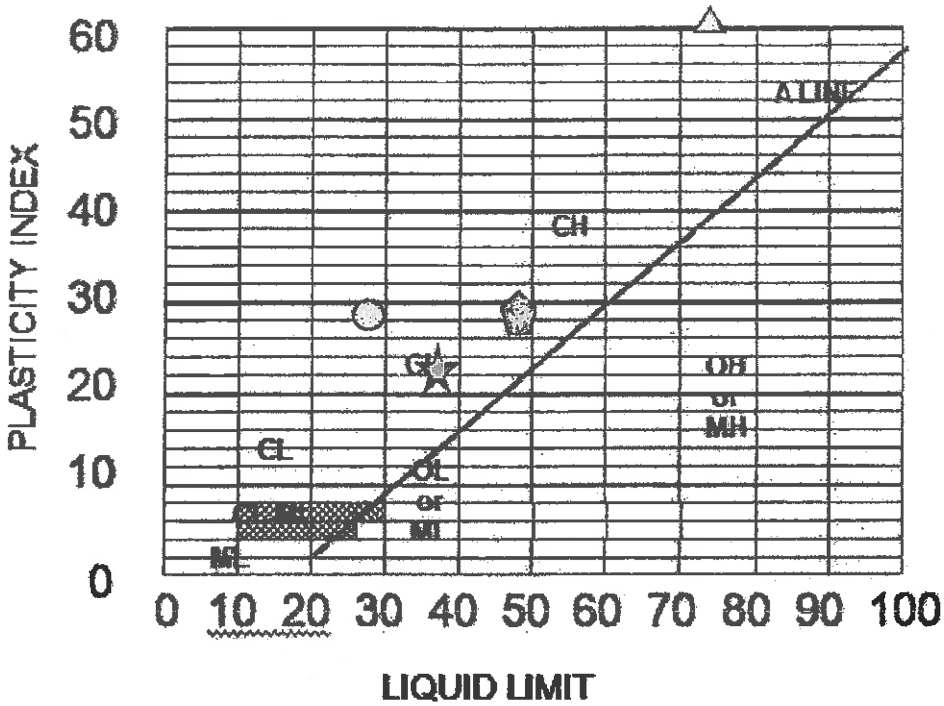
Figure 12

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



FAULT MAP

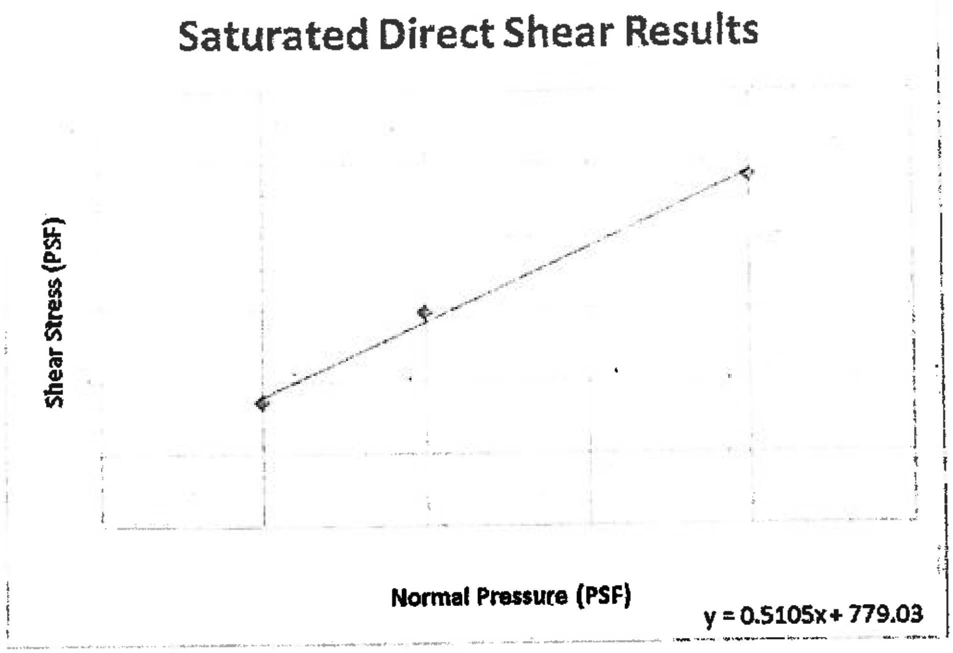
Figure 13



MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
CH	Inorganic clays of medium to high plasticity, organic silts, fat clays	CL	Inorganic clays of low to medium plasticity, gravelly clay sandy clays, silty clays, lean clays
OH	Organic clays of medium to high plasticity, organic silts	OL	Organic silts and organic silty clays of low plasticity
Pt	Peat and other highly organic soils		

PLASTICITY DATA

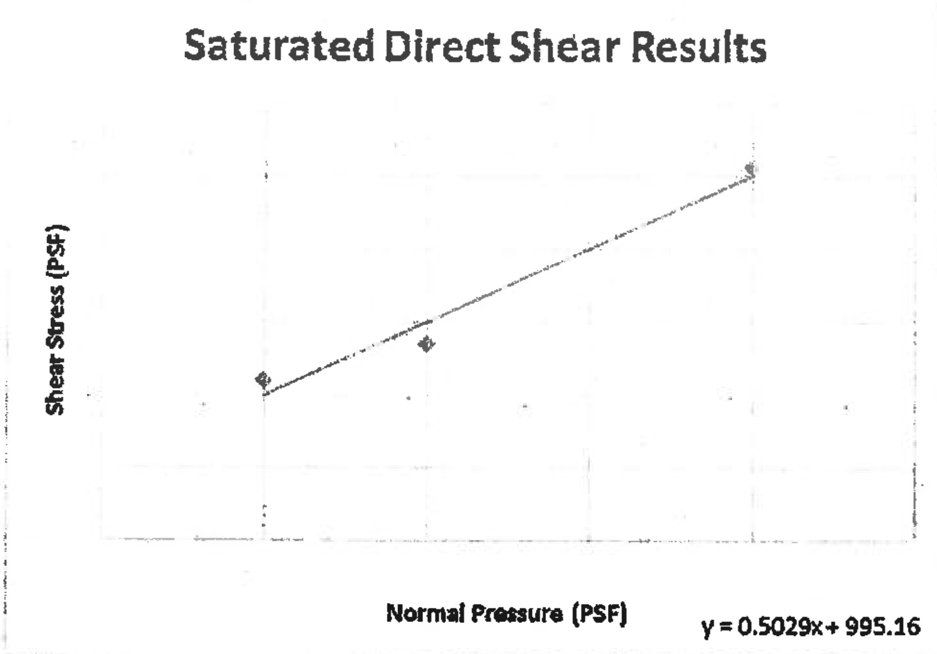
SYMBOL	SAMPLE NO.	DEPTH (FEET)	IN-SITU MOISTURE CONTENT (%)	LIQUID LIMIT (%	PLASTIC LIMIT (%	PLASTICITY INDEX (%)	LIQUIDITY INDEX (W-PL)/(LL-PL)	UNIFIED SOIL CLASSIFICATION SYMBOL
★	1-2	3.5	14.1	38.5	14.9	23.6	-	CL
▲	3-2	3.5	17.4	74.0	12.7	61.2	0.08	CH
⬟	5-2	3.5	16.1	39.7	12.0	27.7	0.15	CL
●	7-2	3.5	20.6	28.4	10.6	28.4	0.35	CL



Sample 1-1-1

Phi = 27.0 Degrees

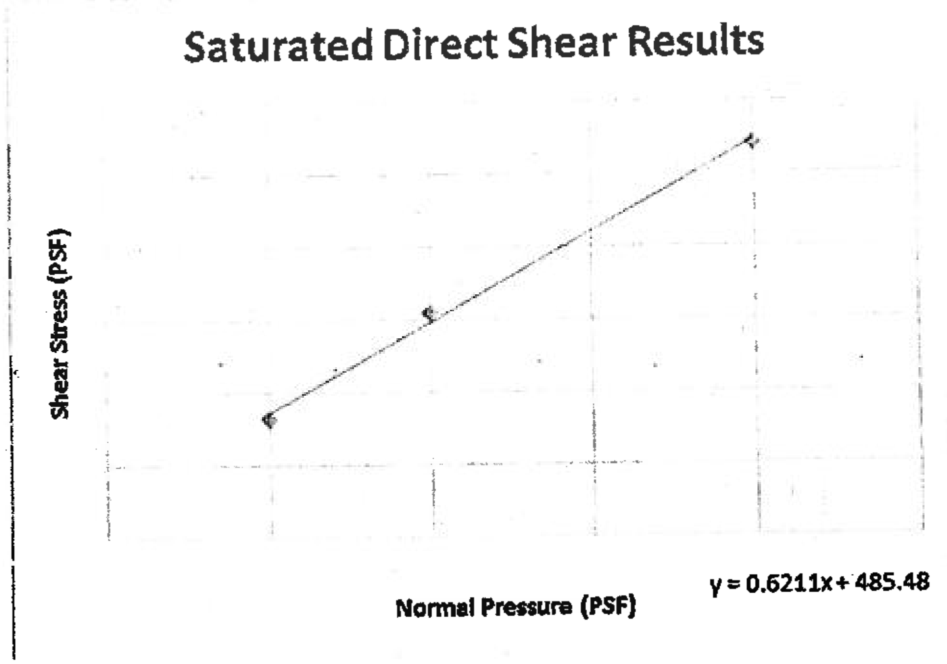
Cohesion = 779.0 psf



Sample 1-3-1

Phi = 26.7 Degrees

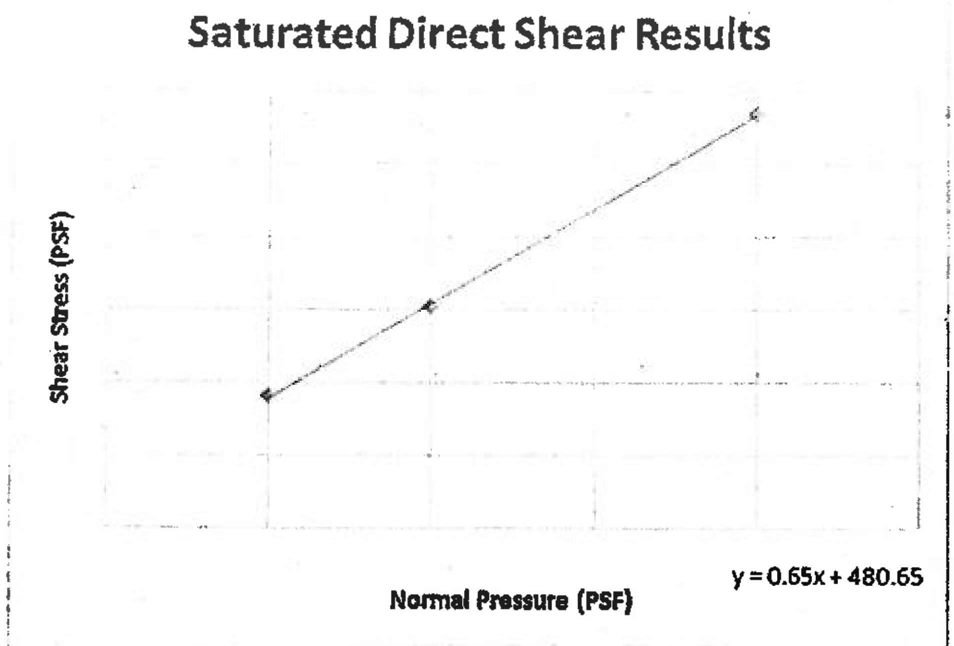
Cohesion = 995.2 psf



Sample 3-1-1

Phi = 31.8 Degrees

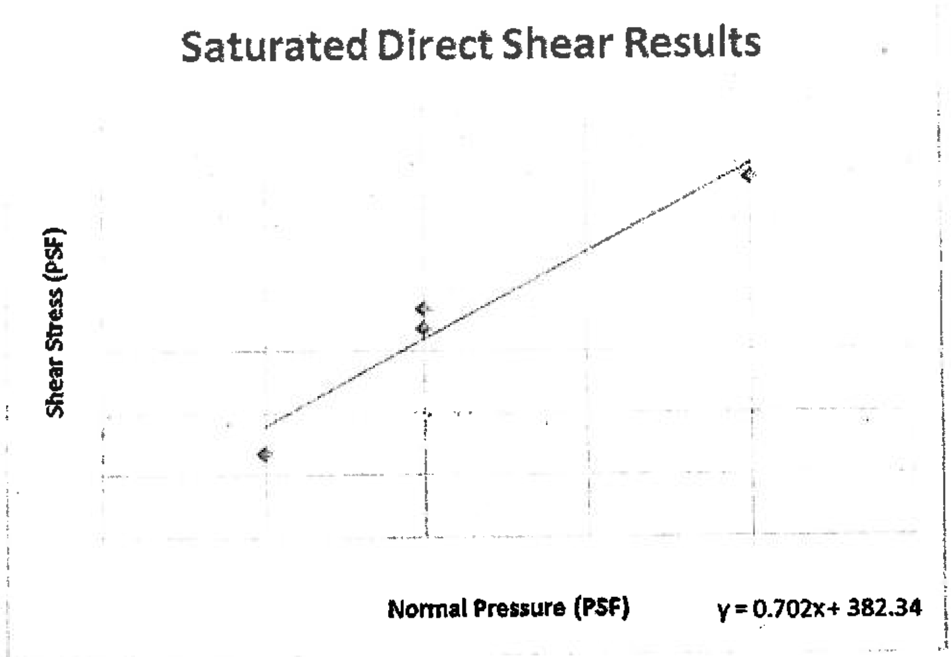
Cohesion = 485.5 psf



Sample 5-1-1

Phi = 33.0 Degrees

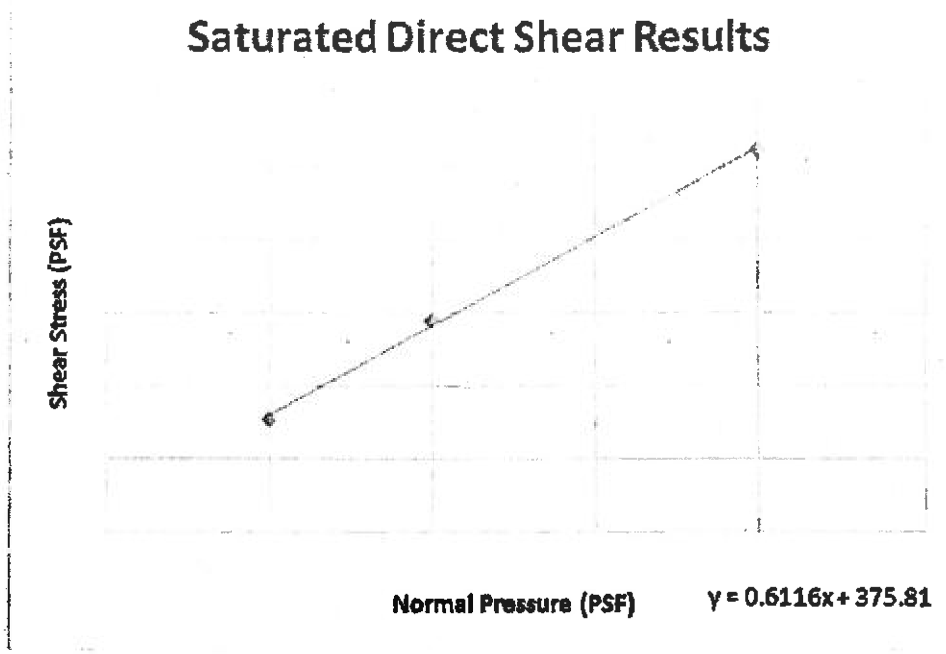
Cohesion = 480.7 psf



Sample 6-1-1

Phi = 35.1 Degrees

Cohesion = 382.3 psf



Sample 7-1-1

Phi = 31.5 Degrees

Cohesion = 375.8 psf