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Geotechnical Engineering
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LETTER OF TRANSMITTAL

W.O. 17-6132

January 3, 2018

TO: Mr. Jeff Furuta
GSF, Inc.
1288 Ala Moana Boulevard, Suite 35A
Honolulu, HI 96814

SUBJECT: Kahului Lani
Phases 1 & 2
Kahului, Maui, Hawaii

WE ARE TRANSMITTING THE FOLLOWING:

Copies	DATE	DESCRIPTION
5	1/03/18	Geotechnical Investigation report

__X__ For your information and use
_____ As requested
_____ For review
_____ Other

COMMENTS:

Con C. Truong, P.E.

GEOTECHNICAL INVESTIGATION
KAHULUI LANI
PHASES 1 AND 2
KAHULUI, MAUI, HAWAII
TMK: (2) 3-7-05: 11

for

GSF, INC.

HIRATA & ASSOCIATES, INC.
W.O. 17-6132
January 3, 2018

Hirata & Associates
Geotechnical Engineering
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99-1433 Koaha Pl
Aiea, HI 96701
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January 3, 2018
W.O. 17-6132

Mr. Jeff Furuta
GSF, Inc.
1288 Ala Moana Boulevard, Suite 35A
Honolulu, Hawaii 96814

Dear Mr. Furuta:

Our report, "Geotechnical Investigation, Kahului Lani, Phases 1 and 2, Kahului, Maui, Hawaii, TMK: (2) 3-7-05: 11," dated January 3, 2018, our Work Order 17-6132 is enclosed. This investigation was conducted in general conformance with the scope of services presented in our proposal dated February 2, 2017.

The surface soils encountered in our borings consisted of layers of sand and silty fine sand with occasional clayey silt pockets. The sand and silty fine sand were in a loose to medium dense conditions in the upper 8 to 10 feet and transitioned to a medium dense condition at deeper depths. Basalt was encountered below the sand and silty fine sand at depths ranging from about 21 to 33 feet. The basalt was hard and extended down to the maximum depths drilled. Several borings also encountered a layer of medium dense silty gravel between the sand and basalt strata. Groundwater was encountered at depths ranging from about 6.5 to 8.8 feet.

Conventional spread footings may be used to support the proposed multi-purpose building. Due to the loose condition of the near surface sand and silty sand and the higher building loads, mat foundations are recommended for support of the two six-story apartment buildings. To provide a working base over the sand subgrade, all footings, mat foundations, and building slabs-on-grade should be underlain by at least 8 inches of imported, non-expansive granular structural fill. The following is a summary of our geotechnical recommendations. This summary is not intended to be a substitute for our report which includes more detailed explanation of our recommendations, as well as additional requirements.

- Allowable bearing value = 2,500 psf
- Coefficient of friction = 0.4
- Passive earth pressure = 300 pcf

We appreciate this opportunity to be of service. Should you have any questions concerning this report, please feel free to call on us.

Very truly yours,

HIRATA & ASSOCIATES, INC.

Rick I.K. Yoshida

Rick I.K. Yoshida Vice President

RIKY:CCT

TABLE OF CONTENTS

APPENDICES

APPENDIX A

APPENDIX B

APPENDIX C

GEOTECHNICAL INVESTIGATION
KAHULUI LANI
PHASES 1 AND 2
KAHULUI, MAUI, HAWAII
TMK: (2) 3-7-05: 11

INTRODUCTION

This report presents the results of our geotechnical investigation performed for the proposed Kahului Lani, an affordable senior housing project at Kane Street in Kahului, Maui. Our scope of services for this study included the following:

- A visual reconnaissance of the site and its vicinity to observe existing conditions which may affect the project. The general location of the project site is shown on the enclosed Location Map, Plate A2.1.

- A review of available in-house soils information pertinent to the site and the proposed project.

- Drilling and sampling 18 exploratory borings to depths ranging from about 5.5 to 105.5 feet. A description of our field investigation is summarized on Plates A1.1 through A1.3. The approximate exploratory boring locations are shown on the enclosed Boring Location Plan, Plate A2.2, and the soils encountered in the borings are described on the Boring Logs, Plates A4.1 through A4.30.

- Performing percolation tests in 4 test holes drilled to depths of about 5 feet. Falling head percolation test results are presented on the Department of Health Site Evaluation/Percolation Test Forms, Plate A5.1 through A5.4.

- Developing one of the drilled borings into a test hole and performing a downhole shear wave geophysical survey in the test hole. Results of the survey are presented on Plates C1.1 through C1.4.

- Laboratory testing of selected soil samples. Testing procedures are presented in the Description of Laboratory Testing, Plates B1.1 and B1.2.

Test results are presented on the Boring Logs (Plates A4.1 through A4.30), Consolidation Test reports (Plates B2.1 through B2.6), Direct Shear Test reports (Plates B3.1 through B3.4), Sieve Analysis Test reports (Plates B4.1 through B4.3), Modified Proctor Test reports (Plates B5.1 and B5.2), and CBR Test reports (Plates B6.1 and B6.2).

- Engineering analyses of the field and laboratory data.

- Preparation of this report presenting geotechnical recommendations for the design of foundations, including seismic considerations, resistance to lateral pressures, concrete slabs-on-grade, flexible pavement, and site grading.

PROJECT CONSIDERATIONS

Information regarding the proposed project was provided by your office and Mitsunaga & Associates, Inc., Civil Engineer.

The project consists of the construction of two 6-story residential buildings with 164 one-bedroom units, a two-story multi-purpose building, on-grade parking, and park/landscaped areas. The 6-story residential buildings will have plan dimensions of approximately 145 by 54 feet each and the multi-purpose building will have plan dimensions of approximately 52 by 70 feet. The project will be constructed in two phases. Phase 1 will include the multi-purpose building and one 6-story residential building located in the northeastern portion of the site. Phase 2 will consist of the second 6-story residential building located in the southeastern portion of the site.

Structural loads of the buildings were not available at the time of this report. Grading information for the project was also not available. However, based on the relatively level existing topography, site grading is expected to consist of minor cuts and fills.

The project also includes improvements to Vevau Street that borders the site on the north. The improvements will consist of pavement reconstruction.

SITE CONDITIONS

The project site encompasses approximately 3.81 acres of land located on the southeast corner of the intersection of Kane and Vevau Streets in Kahului, Maui. The site is bordered by Vevau Street to the north, School Street to the east, and Kane Street to the west. One and two story structures border the site to the south.

The site is presently vacant of structures and is covered by light vegetation and trees. The northwest portion of the site was formerly used as a recreational go-kart facility and AC pavement for parking and the go-kart track still remains. The area is relatively level with ground elevations ranging from about +9 to +14. Drainage over the site generally flows in a northerly direction.

SOIL CONDITIONS

The surface soils encountered in our borings consisted of layers of sand and silty fine sand with occasional clayey silt pockets. The sand and silty fine sand were in loose to medium dense conditions in the upper 8 to 10 feet and transitioned to a medium dense condition at deeper depths. Our past experience also indicates that the sand and silty fine sand is difficult to compact and is easily disturbed.

Basalt was encountered below the sand and silty fine sand at depths ranging from about 21 to 33 feet. The basalt was hard and extended down to the maximum depths drilled. Several borings also encountered a layer of medium dense silty gravel between the sand and basalt strata.

Groundwater was encountered at depths ranging from about 6.5 to 8.8 feet, or at elevations ranging from about +2.5 to +4.2.

CONCLUSIONS AND RECOMMENDATIONS

Based on our exploratory fieldwork and laboratory testing, we believe that from a geotechnical viewpoint, the site can generally be developed as planned.

Based on our borings, the near surface soils at the site consist of sand and silty fine sand in a loose to medium dense conditions. As a result, although conventional spread footings may be used to support the proposed two-story multi-purpose building, mat foundations are recommended for support of the 2 six-story residential buildings which are expected to have moderately heavy building loads. The mat foundation subgrade should be proofrolled using heavy construction equipment. Loose soil pockets indicated by pumping conditions should be removed and replaced with either approved onsite material or imported granular structural fill.

Furthermore, the sand and silty fine sand have very little fines, making them susceptible to disturbance when allowed to dry. To reduce the potential for disturbance and to provide a working base during construction, we recommend that the sand and silty fine sand exposed at the bottom of footing excavations and at building slab subgrade be capped with an 8-inch layer of compacted granular structural fill.

Our test borings encountered groundwater at depths ranging from about 6 to 9 feet or at approximate elevations of +2.5 to +4.2 at the time of our field exploration. To facilitate construction, we recommend that the mat foundations for the proposed residential buildings be located as high above the groundwater as possible.

Foundations

Conventional spread footings are recommended for support of the multi-purpose building and mat foundations are recommended for support of the residential

buildings. The sand and silty fine sand exposed at the bottom of footing and mat foundation excavations should be scarified to a depth of 6 inches and recompacted to a minimum 90 percent compaction as determined by ASTM D 1557. Furthermore, in order to reduce the potential for disturbance and to provide a working base during construction, the sand and silty fine sand at the bottom of footing and mat foundation excavations should be capped with an 8-inch layer of imported, non-expansive granular structural fill compacted to a minimum 95 percent compaction.

The footings and mat foundations may be designed for an allowable bearing value of 2,500 pounds per square foot. The allowable bearing value is for the total of dead and frequently applied live loads and may be increased by one-third for short duration loading which includes the effects of wind and seismic forces.

The mat foundations should be embedded at least 24 inches below finish adjacent grade. Spread footings should be a minimum 16 inches in width and embedded at least 18 inches below finish adjacent grade. Footings located on or near the top of slopes should be embedded such that a minimum horizontal distance of 5 feet is maintained between the bottom edge of footing and slope face.

The bottom of footing excavations should be thoroughly compacted and cleaned of loose material prior to placement of reinforcing steel and concrete.

Seismic Design

As part of our field work, a downhole shear wave geophysical survey was performed at the project site to calculate the shear wave velocities of the subsurface soils. The results of the geophysical survey are presented in Appendix C. Based on the shear wave geophysical survey, the subsurface soils can be characterized as at the borderline between a very dense soil profile and rock profile based on the 2006 International Building Code. However, due to the loose

to medium dense condition of the sand and silty sand at near surface, Site Class C (very dense soil profile) is recommended for this site.

Lateral Design

Resistance to lateral loading may be provided by friction acting at the base of foundations, and by passive earth pressure acting on the buried portions of foundations.

A coefficient of friction of 0.4 may be used with the dead load forces. Passive earth pressure may be computed as an equivalent fluid having a density of 300 pounds per cubic foot with a maximum earth pressure of 3,000 pounds per square foot. Unless covered by pavement or concrete slabs, the upper 12 inches of soil should not be considered in computing lateral resistance.

For active earth pressure considerations, equivalent fluid pressures of 40 and 55 pounds per cubic foot may be used for freestanding and restrained or at-rest conditions, respectively. To prevent buildup of hydrostatic pressures, weepholes or subdrains should be included in the design of all retaining structures.

Foundation Settlement

Structural loads were not available at the time of this report. Due to the granular nature of the sand and silty fine sand, much of the settlement is expected to occur during construction, upon the initial application of loads.

Slabs-on-Grade

To facilitate construction, the sand and silty fine sand exposed at the buildings slab subgrade should be capped by at least 8 inches of imported, non-expansive granular structural fill. To provide uniform support, all building slabs-on-grade should also be underlain by a 4-inch cushion of clean gravel, such as #3 Fine (ASTM C33, Size No. 67).

The sand subgrade should be compacted to a minimum 90 percent compaction as determined by ASTM D 1557. The granular structural fill should be compacted to a minimum 95 percent compaction. The cushion of clean gravel should be compacted to a level surface using vibratory equipment. All building slabs should also be protected by a vapor barrier.

Slabs-on-grade which will receive floor covering, especially "hard" floor covering such as slate or marble, should include control joints saw-cut into the concrete slab. The purpose of this is to help reduce the potential for reflective cracking of the floor covering due to shrinkage cracks in the concrete slab. Proper curing of the concrete slab will help reduce shrinkage cracking.

Concrete walkways and sidewalks should be underlain by a minimum 6 inches of granular base material, such as select borrow or base course. The select borrow and base course should be compacted to a minimum 95 percent compaction as determined by ASTM D 1557.

Pavement Design

Based on our test borings and CBR test results, the following flexible pavement section is recommended. The recommendations assumed that the pavement will be subjected to light vehicle loadings such as passenger cars and light pickup trucks.

2.0"	Asphalt Concrete
6.0"	Base Course (CBR = 85 minimum)
8.0"	Total Thickness

Flexible pavement subjected to heavy trucks should include an additional 6-inch layer of aggregate subbase, with minimum CBR value of 25, below the base course layer.

Flexible pavement reconstruction of Vevau Street may consist of the following pavement section.

2.0"	Asphalt Concrete
6.0"	Base Course (CBR = 85 minimum)
6.0"	Subbase (CBR = 25 minimum)
14.0"	Total Thickness

The base course and subbase should be compacted to a minimum 95 percent compaction as determined by ASTM D1557. The sand subgrade should be compacted to a minimum 90 percent compaction.

Site Grading

Site Preparation - The project sites should be cleared of all vegetation, large tree roots, AC pavement, and other deleterious material. Prior to placement of fill, the exposed subgrade should be scarified to a minimum depth of 6 inches, moisture conditioned, and compacted to a minimum 90 percent compaction as determined by ASTM D 1557. Soft or loose soils indicated by pumping conditions should be removed and replaced with either approved onsite material or imported granular structural fill.

Structural Excavations - Based on our exploratory borings, we believe that excavations into the sand and silty fine sand can generally be accomplished using conventional excavating equipment. Due to the cohesionless nature of the sand and silty fine sand, temporary shoring may be required for footing and trench excavations. Alternatively, the excavation sidewalls may be sloped back. Temporary cuts exposing the sand and silty fine sand should be stable at gradients of 1.5H:1V or flatter. Excavations extending below groundwater will require shoring. The contractor should be responsible for conforming to OSHA safety standards for all excavations.

Onsite Fill Material - The onsite sand and silty sand may be reused in compacted fill and backfills. All rock fragments larger than 3 inches in maximum dimension should be removed from the soil prior to compaction.

Imported Fill Material - Imported structural fill should be well-graded, non-expansive granular material. Specifications for imported granular structural fill should indicate a maximum particle size of 3 inches, and state that between 8 and 20 percent of soil by weight shall pass the #200 sieve. In addition, the plasticity index (P.I.) of that portion of the soil passing the #40 sieve shall not be greater than 10. Imported structural fill should have a CBR expansion value no greater than 1.0 percent and a minimum CBR value of 15 percent, when tested in accordance with ASTM D 1883.

Compaction - In general, fill and backfill consisting of the onsite sand and silty fine sand should be placed in horizontal lifts restricted to 8 inches in loose thickness, and compacted to a minimum 90 percent compaction as determined by ASTM D 1557. Imported granular structural fill should also be placed in 8-inch loose lifts, but compacted to at least 95 percent compaction as determined by ASTM D 1557.

Fill placed in areas which slope steeper than 5H:1V should be continually benched as the fill is brought up in lifts.

ADDITIONAL SERVICES

We recommend that we perform a general review of the final design plans and specifications. This will allow us to verify that the foundation design and earthwork recommendations have been properly interpreted and implemented in the design plans and construction specifications.

For continuity, we recommend that we be retained during construction to (1) observe footing excavations prior to placement of granular structural fill, reinforcing steel and concrete, (2) review and/or perform laboratory testing on import borrow to determine its acceptability for use in compacted fills, (3) observe structural fill placement and perform compaction testing, and (4) provide geotechnical consultation as required.

Our services during construction will allow us to verify that our recommendations are properly interpreted and included in construction, and if necessary, to make modifications to those recommendations, thereby reducing construction delays in the event subsurface conditions differ from those anticipated.

LIMITATIONS

The boring logs indicate the approximate subsurface soil conditions encountered only at those times and locations where our borings were made, and may not represent conditions at other times and locations.

This report was prepared specifically for GSF, Inc. and their consultants for design of the proposed affordable senior housing project in Kahului, Maui, Hawaii. The boring logs, laboratory test results, and recommendations presented in this report are for design purposes only, and are not intended for use in developing cost estimates by the contractor.

During construction, should subsurface conditions differ from those encountered in our borings, we should be advised immediately in order to re-evaluate our recommendations, and to revise or verify them in writing before proceeding with construction.

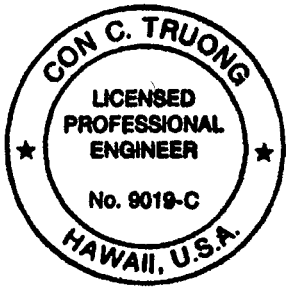
Our recommendations and conclusions are based upon the site materials observed,

the preliminary design information made available, the data obtained from our site exploration, our engineering analyses, and our experience and engineering judgment. The conclusions and recommendations in this report are professional opinions which we have strived to develop in a manner consistent with that level of care, skill, and competence ordinarily exercised by members of the profession in good standing, currently practicing under similar conditions in the same locality. We will be responsible for those recommendations and conclusions, but will not be responsible for the interpretation by others of the information developed. No warranty is made regarding the services performed, either expressed or implied.

Respectfully submitted,

HIRATA & ASSOCIATES, INC.

Con Truong, Project Engineer



This work was prepared by
me or under my supervision.
Expiration Date of License:
April 30, 2018

APPENDIX A

FIELD INVESTIGATION

DESCRIPTION OF FIELD INVESTIGATION

GENERAL

The site was explored between October 16 and November 2, 2017, by performing a visual reconnaissance of the site and drilling 18 test borings to depths ranging from about 5.5 to 105.5 feet with a truck-mounted Mobile B53 drill rig. In addition, percolation tests were performed in four test holes and a downhole shear wave (S-wave) geophysical survey was performed in one of the borings on October 25, 2017.

During drilling operations, the soils were continuously logged by our field engineer and classified by visual examination in accordance with the Unified Soil Classification System. The boring logs indicate the depths at which the soils or their characteristics change, although the change could actually be gradual. If the change occurred between sample locations, the depth was interpreted based on field observations. Classifications and sampling intervals are shown on the boring logs. A Boring Log Legend is presented on Plate A3.1. The Unified Soil Classification and Rock Weathering Classification Systems are shown on Plates A3.2 and A3.3, respectively. The soils encountered are logged on Plates A4.1 through A4.30.

Borings were located in the field by measuring/taping offsets from existing site features shown on the plans. Surface elevations at boring locations were estimated based on a site layout plan provided by Mitsunaga & Associates, Inc. on October 4, 2017. The accuracy of the boring locations shown on Plate A2.2 and the boring elevations shown on Plates A4.1 through A4.30 are therefore approximate, in accordance with the field methods used.

SOIL SAMPLING

Representative and disturbed samples, as well as a bulk soil sample, were recovered from the borings for selected laboratory testing and analyses. Representative samples were recovered by driving a 3-inch O.D. split tube

sampler a total of 18 inches with a 140-pound hammer dropped from a height of 30 inches. Disturbed samples were obtained by driving a 2-inch O.D. standard split spoon sampler a total of 18 inches with a 140-pound hammer dropped from a height of 30 inches. The number of blows required to drive the samplers the final 12 inches are recorded at the appropriate depths on the boring logs, unless noted otherwise.

ROCK SAMPLING

Core samples of rock were obtained with PQ and NX core barrels having inside diameters of 3.3 and 2.1 inches, respectively. Recovery percentages for each core run are shown on the enclosed Boring Logs.

The rock quality designation (RQD) for the core runs are also shown on the boring logs. This is a modified core recovery percentage which takes into account the number of fractures observed in the core samples. Only pieces of core 4 inches in length or longer, as measured along the centerline, were included in the determination of this modified core recovery percentage. Fractures caused by drilling or handling were ignored.

The following is a general correlation between RQD percentages and rock quality.

RQD (%)	Description of Rock Quality
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

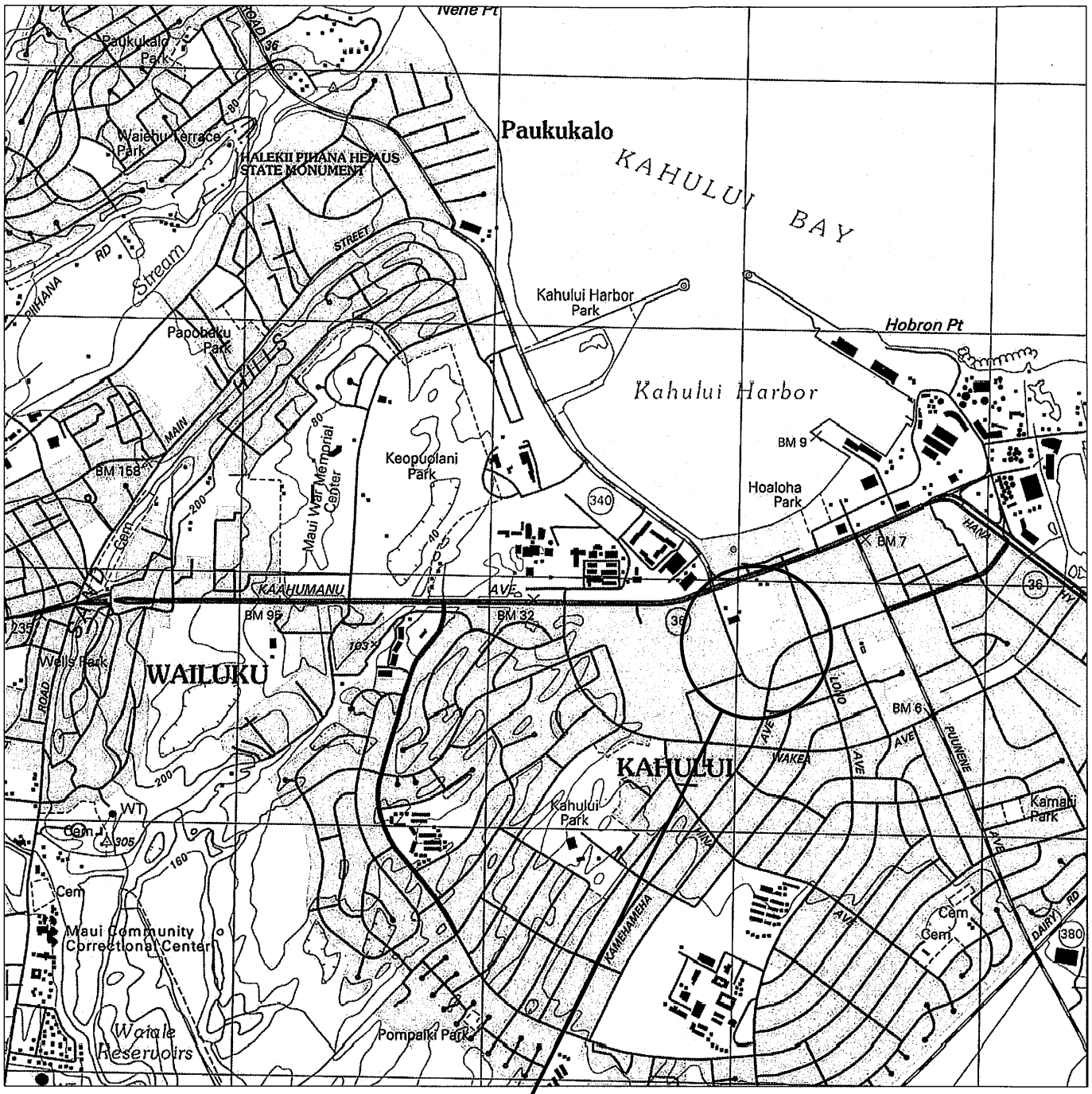
Reference: Tunnel Engineering Handbook, Second Edition, edited by J.O. Bickel, T.R. Kuesel, and E.H. King, 1996.

PERCOLATION TESTS

Percolation tests were performed in 4 test holes drilled to depths of about 5 feet. Falling head percolation tests were performed in general accordance with Department of Health guidelines. Test results are presented on Plates A5.1 through A5.4.

DOWNHOEL SHEAR-WAVE GEOPHYSICAL SURVEY

A downhole shear-wave (S-wave) geophysical survey was performed in boring B3 to determine the shear-wave velocities of the subsurface soils. The test was performed by Global Geophysics of Redmond, Washington. Results of the geophysical survey are presented on Plates C1.1 through C1.4.



2000 1000 0 2000 FT.

GRAPHIC SCALE

Reference: Topographic quadrangle map prepared by the United States Department of the Interior Geologic Survey Wailuku Quadrangle, Maui County, Hawaii. 1997

Kahului Lani, Kahului, Maui

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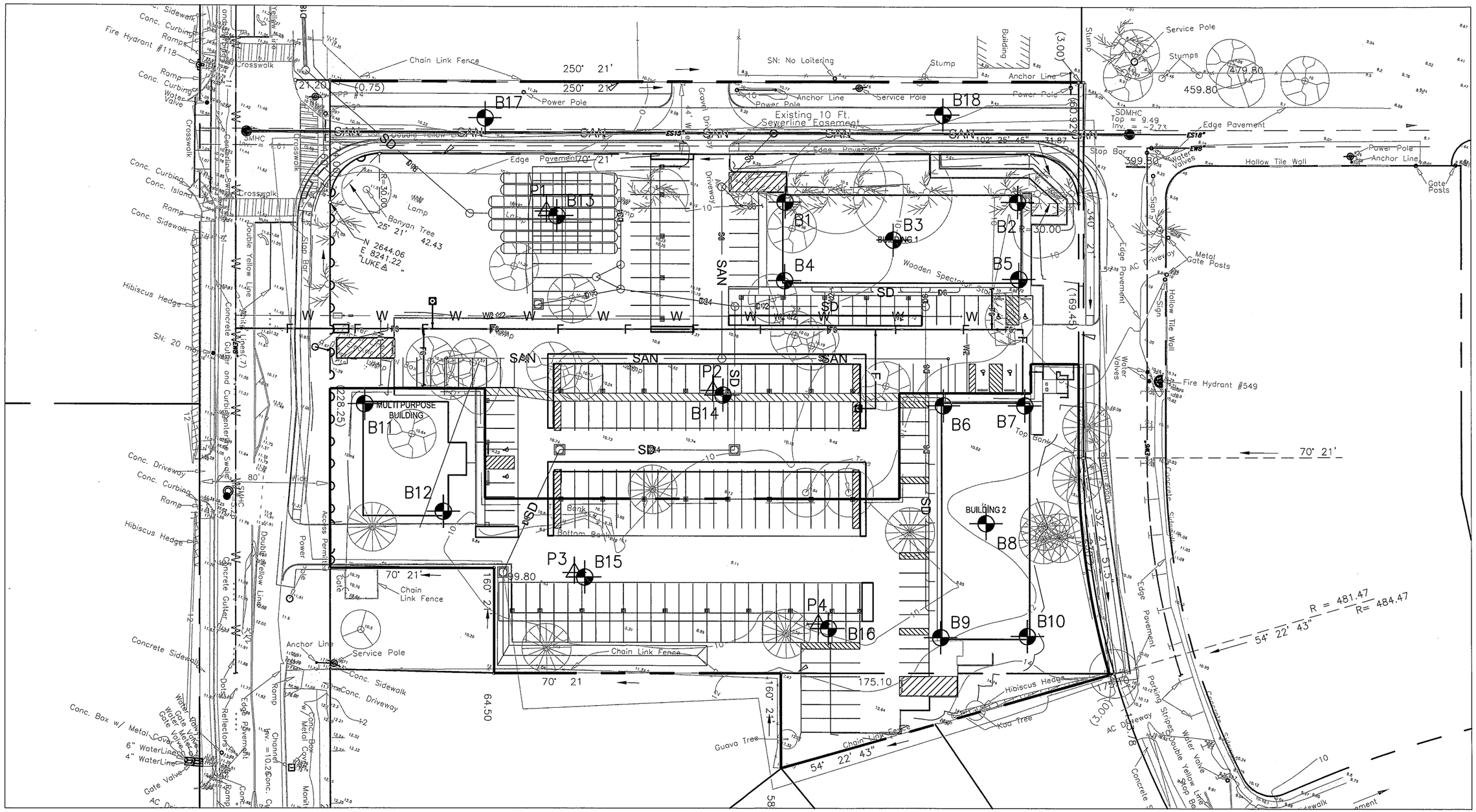
Geotechnical Engineering

W.O. 17-6132

LOCATION MAP

Plate A2.1



LEGEND:

- Approximate location of borings
- Approximate location of percolation test holes

GRAPHIC SCALE:

0 30 60 120FT.

1" = 60'

Reference: Site Layout Plan provided by Mitsunaga & Associates, Inc., on 10/4/17.

Kahului Lani, Kahului, Maui

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W.O. 17-6132

BORING LOCATION PLAN

Plate A2.2

MAJOR DIVISIONS			GROUP DIVISIONS		TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of the material is LARGER than No. 200 sieve size.)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines.)		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
				GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines.)		GM	Silty gravels, gravel-sand-silt mixtures.
				GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size.)	CLEAN SANDS (Little or no fines.)		SW	Well graded sands, gravelly sands, little or no fines.
				SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines.)		SM	Silty sands, sand-silt mixtures.
				SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of the material is SMALLER than No. 200 sieve size.)	SILTS AND CLAYS (Liquid limit LESS than 50.)			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
				CL	Inorganic clays of high plasticity, lean clays.
				OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50.)			MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic clays of high plasticity, fat clays.
				OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic silts.
FORMATIONS					FRESH TO MODERATELY WEATHERED BASALT
					VOLCANIC TUFF / HIGHLY TO COMPLETELY WEATHERED BASALT
					CORAL

SAMPLE DEFINITION

2" O.D. Standard Split Spoon Sampler	Shelby Tube	RQD: Rock Quality Designation
3" O.D. Split Tube Sampler	Core Sample	Water Table

Kahului Lani, Kahului, Maui

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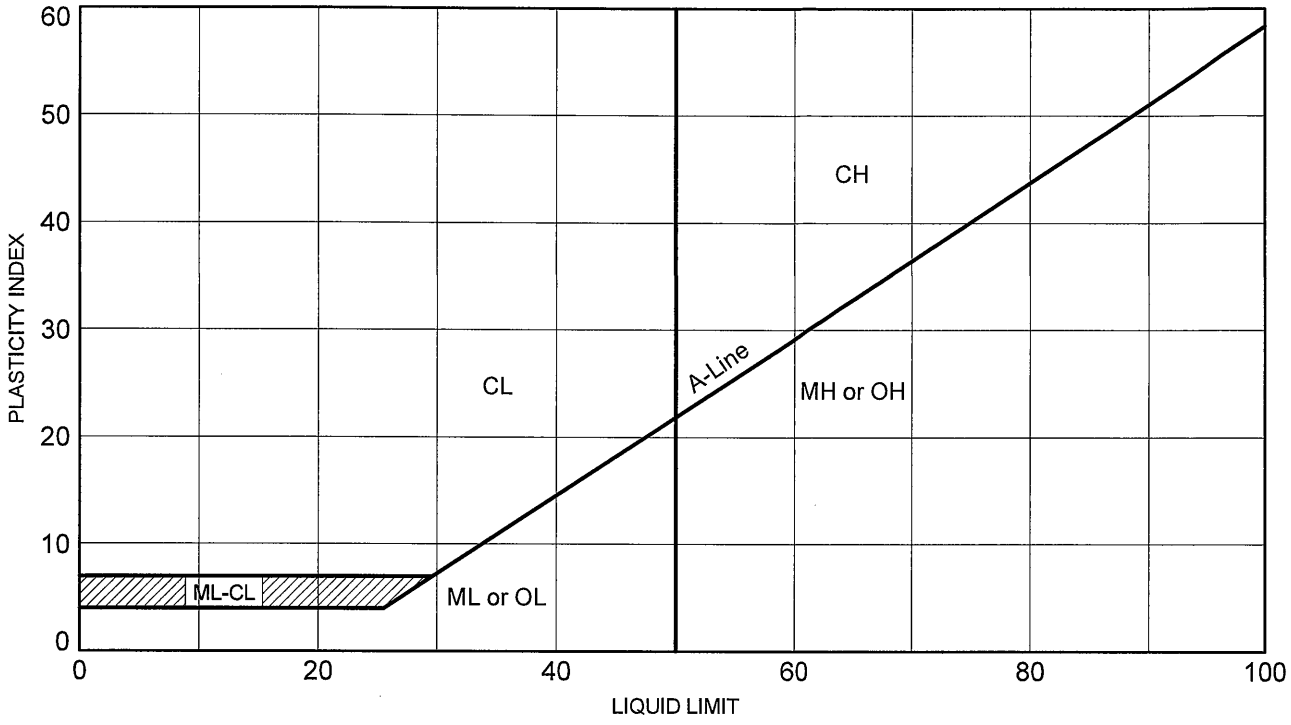
BORING LOG LEGEND

Plate A3.1

PLASTICITY CHART



GRADATION CHART

COMPONENT DEFINITIONS BY GRADATION	
COMPONENT	SIZE RANGE
Boulders	Above 12 in.
Cobbles	3 in. to 12 in.
Gravel	3 in. to No. 4 (4.76 mm)
Coarse	3 in. to 3/4 in.
Fine Gravel	3/4 in. to No. 4 (4.76 mm)
Sand	No. 4 (4.76 mm) to No. 200 (0.074mm)
Coarse Sand	No. 4 (4.76 mm) to No. 10 (2.0 mm)
Medium Sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine Sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

Kahului Lani, Kahului, Maui

HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

W.O. 17-6132

UNIFIED SOIL CLASSIFICATION SYSTEM

Plate A3.2

Grade	Symbol	Description
Fresh	F	No visible signs of decomposition or discoloration. Rings under hammer impact.
Slightly Weathered	WS	Slight discoloration inwards from open fractures, otherwise similar to F.
Moderately Weathered	WM	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped by knife. Texture preserved.
Highly Weathered	WH	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.
Completely Weathered	WC	Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.
Residual Soil	RS	Advance state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

Reference: Soil Mechanics, NAVFAC DM-7.1, Department of the Navy, Naval Facilities Engineering Command, September, 1986.

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B1

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/30/17
SURFACE ELEV. 10.5 ±* DROP 30 in. END DATE 10/31/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			20	92	10				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			10	91	15	5			Loose to medium dense at 4 feet.
			16	102	17	▼			SAND (SP) - Tan and gray, medium dense, poorly graded. Groundwater encountered at 7 feet on 10/31/17 at 10:00 am.
			21	107	22	10			
			32	91	31	15			
			31	83	38	20			
			8	93	36	25			Silty SAND (SM) - Brown, medium dense, with gravel. Loose at 23 feet.
			36	67	46	30			Gravelly at 28 feet.

Plate A4.1

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B1
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/30/17
SURFACE ELEV. 10.5 ±* DROP 30 in. END DATE 10/31/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
									Silty SAND (SM) - Brown, medium dense, with gravel. (continued)
Begin NX coring at 33.5 feet.	89	57	50/5"			35			BASALT (WS-WM) - Gray, hard, slightly to moderately weathered.
	100	65				40			
						45			End boring at 43.0 feet.
						50			* Elevations based on a site layout plan provided by Mitsunaga and Associates, Inc. on 10/4/2017.
						55			
						60			

Plate A4.2

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B2

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/31/17
SURFACE ELEV. 10.5 ± DROP 30 in. END DATE 10/31/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			16	92	15				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			17	97	6				SAND (SP) - Tan and gray, slightly moist, medium dense, poorly graded.
			15	102	22	5 ▼			Silty SAND (SM) - Brown, moist, medium dense, fine-grained. Groundwater encountered at 6.5 feet on 10/31/17 at 3:00 pm.
			20	113	18				SAND (SP) - Tan and gray, medium dense, poorly graded.
			50	111	18	10			Dense at 9 feet.
			38	118	9	15			
			11	67	58	20			Loose at 19 feet.
									Silty GRAVEL (GM) - Brown, loose to medium dense, with sand.
Begin NX coring at 24 feet.	92	92	10/No Penetration			25			BASALT (WS-WM) - Gray, hard, slightly to moderately weathered.
						30			

Plate A4.3

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B2
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/31/17
SURFACE ELEV. 10.5 ± DROP 30 in. END DATE 10/31/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
	100	90							BASALT (WS-WM) - Gray, hard, slightly to moderately weathered. (continued)
						35			End boring at 34.0 feet.
						40			
						45			
						50			
						55			
						60			

Plate A4.4

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B3

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/16/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/24/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			44	95	8				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel. Covered by a thin layer of gravel.
			11	102	6				Loose to medium dense at 3 feet.
			9	74	54	5			SAND (SP) - Tan, moist, medium dense, poorly graded. Loose at 5.5 feet, with clayey silt pocket.
						▼			Groundwater encountered at 7.6 feet on 10/16/17 at 1:01 pm.
			21	101	25	10			
			52	124	8	15			Gravelly at 14 feet.
			14	79	42	20			
			31	120	15	25			Silty GRAVEL (GM) - Dark brown, medium dense.
Begin PQ coring from 29 feet.			10/No Penetration			30			BASALT (WS) - Gray, hard, slightly weathered. Plate A4.5

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B3
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/16/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/24/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
Begin PQ coring from 29 feet.	100	90				35			BASALT (WS) - Gray, hard, slightly weathered. (continued)
	100	50							Highly to completely weathered at 37.5 feet.
	100	45				40			Highly to completely weathered at 40.5 feet.
	100	40				45			
	100	92				50			
	100	53				55			Clinker from 54 to 56 feet.
						60			

Plate A4.6

(Continued Next Page)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/16/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/24/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
End PQ coring at 64 feet	92	67	10/No Penetration			65			
			10/No Penetration			70			
			10/No Penetration			75			
Resume PQ coring at 80 feet.	0	0				80			Purplish red clinker from 80 to 90.5 feet, medium dense to dense.
	0	0				85			
						90			

Plate A4.7

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B3
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/16/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/24/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			36/6" 10/No Penetration	100	6				
	100	96				95			
	93	83				100			
	100	96				105			
									End boring at 105.5 feet.
						110			
						115			
						120			

Plate A4.8

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B4

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/30/17
SURFACE ELEV. 10.5 ± DROP 30 in. END DATE 10/30/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			42	99	17				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			24	105	6				SAND (SP) - Tan and gray, slightly moist, medium dense, poorly graded.
			9	86	14	5			Silty SAND (SM) - Brown, slightly moist, loose to medium dense, fine-grained.
			17	93	29	▼			SAND (SP) - Tan and gray, moist, medium dense, poorly graded. Groundwater encountered at 8 feet on 10/30/17 at 11:00 am.
			32	107	24	10			
			43	119	14	15			
			21	89	30	20			
			18	112	18	25			Silty SAND (SM) - Dark brown, medium dense.
Begin NX coring at 27 feet.	53	42				30			BASALT (WS) - Gray, hard, slightly weathered. Highly to completely weathered from 29 to 31 feet.

Plate A4.9

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B4
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/30/17
SURFACE ELEV. 10.5 ± DROP 30 in. END DATE 10/30/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
	100	58				35			
						40			End boring at 37.0 feet.
						45			
						50			
						55			
						60			

Plate A4.10

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B5

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/31/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/31/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			21	88	12				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			7	82	28	5			Loose at 4 feet.
			14	99	23	▼			Groundwater encountered at 6.6 feet on 10/31/17 at 4:30 pm.
			14	105	18	10			SAND (SP) - Tan and gray, medium dense, poorly graded.
			42	115	19	15			Silty GRAVEL (GM) - Gray, medium dense, with sand.
			9	79	29				Loose to medium dense at 18 feet.
						20			Dark brown color, increase in sand content from 19 feet.
Begin NX coring at 22 feet.	40	15							Cobbles and boulders from 22 feet.
	95	53				25			BASALT (WS) - Gray, hard, slightly weathered.
						30			

Plate A4.11

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B5
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/31/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/31/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
	92	77				35			BASALT (WS) - Gray, hard, slightly weathered. (continued)
						40			End boring at 37.0 feet.
						45			
						50			
						55			
						60			

Plate A4.12

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B6

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/2/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 11/2/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			28	98	8				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			14	86	14	5			
			17	92	30	▼			SAND (SP) - Tan and gray, medium dense, poorly graded. Groundwater encountered at 7.5 feet on 11/2/17 at 4:40 pm.
			22	103	26	10			
			36	94	29	15			
			15	87	36	20			Silty SAND (SM) - Gray, medium dense.
			38	93	26	25			Silty GRAVEL (GM) - Dark brown, medium dense, with sand.
Begin NX coring at 26.5 feet.	72	58				30			BASALT (WS-WM) - Gray, hard, slightly to moderately weathered. Highly to completely weathered at 26.5 to 27.5 feet.

Plate A4.13

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B6
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/2/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 11/2/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
	100	100				35			
						40			End boring at 36.5 feet.
						45			
						50			
						55			
						60			

Plate A4.14

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B7

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/2/17
SURFACE ELEV. 11 ± DROP 30 in. END DATE 11/2/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			13	93	8				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			13	93	13				
			4	70	48	5			Loose at 5 feet. Brown clayey silt pocket at 5.5 feet.
No Recovery at 14 feet.			17	100	27	▼			SAND (SP) - Tan and gray, medium dense, poorly graded. Groundwater encountered at 7.8 feet on 11/2/17 at 2:30 pm.
			55	114	10	10			
			25			15			
			4	89	41	20			Silty SAND (SM) - Dark brown, medium dense, with gravel. Loose at 19 feet.
			32	79	44	25			Gravelly at 24 feet.
			18	81	41	30			

Plate A4.15

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B7
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/2/17
SURFACE ELEV. 11 ± DROP 30 in. END DATE 11/2/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
Begin NX coring at 33 feet.	98	98				35			BASALT (WS-WM) - Gray, hard, slightly to moderately weathered.
	100	100				40			
						45			End boring at 43.0 feet.
						50			
						55			
						60			

Plate A4.16

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B8

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/25/17
SURFACE ELEV. 12 ± DROP 30 in. END DATE 10/25/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			25	88	7				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained.
			11	87	8				Loose to medium dense from 3 feet.
			8	92	14	5			Clayey silt pocket at 5 feet.
			14	100	25	▼			Groundwater encountered at 7.8 feet on 10/25/17 at 2:46 pm.
			30	115	18	10			SAND (SP-SM) - Tan and gray, medium dense, poorly graded with silt.
			22	96	30	15			
			4	71	54	20			
									Silty GRAVEL (GM) - Dark brown, loose.
Begin PQ coring at 21.5 feet	100	61				25			BASALT (WS) - Gray, hard, slightly weathered.
	50	13							Purplish red and gray clinker from 26.5 to 30 feet, medium dense to dense.
						30			

Plate A4.17

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B8
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/25/17
SURFACE ELEV. 12 ± DROP 30 in. END DATE 10/25/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
	100	100				35			End boring at 35.5 feet.
						40			
						45			
						50			
						55			
						60			

Plate A4.18

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B9

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/1/17
SURFACE ELEV. 12 ± DROP 30 in. END DATE 11/1/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			13	91	15				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			15	81	8	5			Silty SAND (SM) - Tan and gray, slightly moist, medium dense.
			12	86	7				Loose to medium dense at 5 feet.
			14	98	25				
			15	109	22	▼ 10			SAND (SP) - Tan and gray, medium dense, poorly graded. Groundwater encountered at 8.5 feet on 11/1/17 at 2:50 pm.
			40	99	26	15			
			11	100	19	20			Silty SAND (SM) - Dark brown, loose to medium dense, with gravel.
Begin NX coring at 25 feet.	90	57	36/6" 54/6"			25			BASALT (WS-WM) - Gray, hard, slightly to moderately weathered. Highly to completely weathered at 29 feet.
						30			

Plate A4.19

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B9
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/1/17
SURFACE ELEV. 12 ± DROP 30 in. END DATE 11/1/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
	100	92				35			
	100	92				40			
	87	72				45			
	100	65				50			
									End boring at 50.0 feet.
						55			
						60			

Plate A4.20

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B10

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/1/17
SURFACE ELEV. 13 ± DROP 30 in. END DATE 11/1/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			10	99	3				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
									Loose to medium dense at 2 feet.
			14	97	3	5			
			17	91	6				Clayey silt pocket at 7 feet.
			7	70	51	▼			SAND (SP) - Tan and gray, medium dense, poorly graded.
						10			Loose at 8 feet.
									Groundwater encountered at 8.8 feet on 11/1/17 at 4:00 pm.
			65	109	22	15			
			19	105	19	20			
			31	94	30				Silty SAND (SM) - Dark brown, medium dense, with gravel.
Begin NX coring at 25 feet.	72	48				25			BASALT (WS-WM) - Gray, hard, slightly to moderately weathered.
									Highly to completely weathered at 28 feet.
						30			

Plate A4.21

(Continued Next Page)

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B10
(continued)

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/1/17
SURFACE ELEV. 13 ± DROP 30 in. END DATE 11/1/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
	90	70				35			End boring at 35.0 feet.
						40			
						45			
						50			
						55			
						60			

Plate A4.22

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B11

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/26/17
SURFACE ELEV. 10.5 ± DROP 30 in. END DATE 10/26/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			26	85	19				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained.
			19	98	8				With gravel at 3 feet.
			7	71	14	5			Loose to medium dense at 5 feet.
			19	94	31	▼			SAND (SP) - Tan and gray, medium dense, poorly graded. Groundwater encountered at 7.6 feet on 10/26/17 at 8:31 am.
			23	103	22	10			
			38	109	15	15			
									End boring at 15.5 feet.
						20			
						25			
						30			

Plate A4.23

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B12

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/26/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/26/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
									Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained.
			13	91	13				SAND (SP) - Brown, slightly moist, medium dense to loose, poorly graded.
			22	99	23	5			Silty SAND (SM) - Brown, moist, medium dense, fine-grained.
			19	103	25				SAND (SP) - Tan and gray, medium dense, poorly graded.
			34	102	22				Groundwater encountered at 6.6 feet on 10/26/17 at 10:01 am.
			65	101	26	10			
						15			End boring at 14.5 feet.
						20			
						25			
						30			

Plate A4.24

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B13

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/2/17
SURFACE ELEV. 11 ± DROP 30 in. END DATE 11/2/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			22	96	7				SAND (SP-SM) - Brown, slightly moist, medium dense, fine-grained, poorly graded, with silt and gravel. Covered by 2 inches of AC over 5 inches of base material.
			16	91	7				
			18	87	12	5			
									End boring at 6.5 feet.
									Neither groundwater nor seepage water encountered.
						10			
						15			
						20			
						25			
						30			

Plate A4.25

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B14

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/26/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 10/26/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			26	85	8				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained. Covered by 2 inches of broken asphaltic concrete.
			21	85	13	5			
									End boring at 5.5 feet.
									Neither groundwater nor seepage water encountered.
						10			
						15			
						20			
						25			
						30			

Plate A4.26

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B15

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 10/26/17
SURFACE ELEV. 9.5 ± DROP 30 in. END DATE 10/26/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			9	100	12				SAND (SP-SM) - Brown, slightly moist, medium dense, fine-grained, poorly graded, with silt.
			6	92	10				Loose at 3 feet.
			9	86	33	5			SAND (SP) - Tan and gray, moist to wet, loose to medium dense, poorly graded.
									End boring at 6.5 feet.
									Neither groundwater nor seepage water encountered.
						10			
						15			
						20			
						25			
						30			

Plate A4.27

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B16

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/1/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 11/1/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			12	86	12				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained.
			7	87	18	5			Loose at 4 feet.
									End boring at 5.5 feet.
									Neither groundwater nor seepage water encountered.
						10			
						15			
						20			
						25			
						30			

Plate A4.28

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No. B17

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/2/17
SURFACE ELEV. 10 ± DROP 30 in. END DATE 11/2/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			28	100	5				SAND (SP-SM) - Brown, slightly moist, medium dense, fine-grained, poorly graded with silt.
			7	92	7	5			Loose at 4 feet, with brown clayey silt at 4.5 feet.
									End boring at 5.5 feet.
									Neither groundwater nor seepage water encountered.
						10			
						15			
						20			
						25			
						30			

Plate A4.29

Hirata & Associates, Inc.
GEOTECHNICAL ENGINEERING

Boring No.
B18

BORING LOG

PROJECT NAME Kahului Lani, Kahului, Maui
WORK ORDER NO. 17-6132 DRIVING WT. 140 lb. START DATE 11/2/17
SURFACE ELEV. 9.5 ± DROP 30 in. END DATE 11/2/17

REMARKS/ SAMPLE NO.	CORE RECOVERY (%)	RQD (%)	BLOWS PER FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	DEPTH (ft)	GRAPHIC LOG	SAMPLE	MATERIAL DESCRIPTION
			21	93	12				Silty SAND (SM) - Brown, slightly moist, medium dense, fine-grained, with gravel.
			12	85	8				
			16	98	27	5			SAND (SP) - Tan and gray, moist, medium dense, poorly graded.
									End boring at 6.5 feet. Neither groundwater nor seepage water encountered.
						10			
						15			
						20			
						25			
						30			

Plate A4.30

SITE EVALUATION/PERCOLATION TEST

Date/Time: November 2, 2017 / 10:50 am
Test performed by: Hirata & Associates, Inc.
Owner:
Tax Map Key: (2) 3-7-05: 11
Test Number: P1

Elevation: 11± ft.
Depth to Groundwater Table: 7.2 ft. below grade (based on adjacent probe hole)
Depth to Bedrock (if observed): 33 ft. below grade (based on nearby boring B1)
Diameter of Hole: 4 in.
Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	**Soil Profile** (Color, texture, other)
0-60	Brown sand

PERCOLATION READINGS

Time 12 inches of water to seep away: _____ min.
Time 12 inches of water to seep away: _____ min.

✓ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

___ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
5 min.	1	5 min.	1
5 min.	1-1/4	5 min.	1/2
5 min.	1	5 min.	3/4
5 min.	3/4	5 min.	1/2
5 min.	1	5 min.	1/2
5 min.	3/4	5 min.	1/2

Percolation Rate (time/final water level drop): 10 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.

CON C. TRUONG
LICENSED PROFESSIONAL ENGINEER
No. 9019-C
HAWAII, U.S.A.

Engineer's Signature/Stamp

Plate A5.1

SITE EVALUATION/PERCOLATION TEST

Date/Time: October 30, 2017 / 12:20 pm
Test performed by: Hirata & Associates, Inc.
Owner:
Tax Map Key: (2) 3-7-05: 11
Test Number: P2

Elevation: 10± ft.
Depth to Groundwater Table: 7.6 ft. below grade (based on adjacent probe hole)
Depth to Bedrock (if observed): 27 ft. below grade (based on nearby boring B4)
Diameter of Hole: 4 in.
Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	**Soil Profile** (Color, texture, other)
0-60	Brown silty sand

PERCOLATION READINGS

Time 12 inches of water to seep away: _____ min.
Time 12 inches of water to seep away: _____ min.

✓ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

___ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
5 min.	3-1/2	5 min.	2
5 min.	3	5 min.	1-3/4
5 min.	2-1/2	5 min.	1-1/2
5 min.	1-3/4	5 min.	1-1/2
5 min.	1-1/2		
5 min.	2-1/2		

Percolation Rate (time/final water level drop): 3.3 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.

CON C. TRUONG
LICENSED PROFESSIONAL ENGINEER
No. 9019-C
HAWAII, U.S.A.

Con Chi Truong
Engineer's Signature/Stamp

Plate A5.2

SITE EVALUATION/PERCOLATION TEST

Date/Time: October 30, 2017 / 2:20 pm
Test performed by: Hirata & Associates, Inc.
Owner:
Tax Map Key: (2) 3-7-05: 11
Test Number: P3

Elevation: 9.5± ft.
Depth to Groundwater Table: 7 ft. below grade (based on adjacent probe hole)
Depth to Bedrock (if observed): 24 ft. below grade (based on nearby boring B9)
Diameter of Hole: 4 in.
Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	**Soil Profile** (Color, texture, other)
0-60	Brown sand

PERCOLATION READINGS

Time 12 inches of water to seep away: _____ min.
Time 12 inches of water to seep away: _____ min.

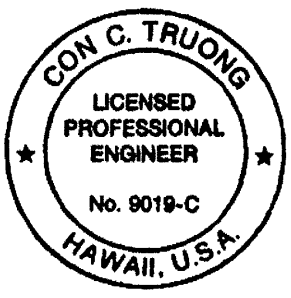
✓ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

____ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
5 min.	3	5 min.	1-3/4
5 min.	2-1/4	5 min.	1-1/2
5 min.	2	5 min.	1-3/4
5 min.	2	5 min.	1-3/4
5 min.	1-3/4	5 min.	1-3/4
5 min.	1-1/2		

Percolation Rate (time/final water level drop): 2.8 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.



Engineer's Signature/Stamp

Plate A5.3

SITE EVALUATION/PERCOLATION TEST

Date/Time: November 1, 2017 / 9:55 am
Test performed by: Hirata & Associates, Inc.
Owner:
Tax Map Key: (2) 3-7-05: 11
Test Number: P4

Elevation: 10± ft.
Depth to Groundwater Table: 7.6 ft. below grade (based on adjacent probe hole)
Depth to Bedrock (if observed): 24 ft. below grade (based on nearby boring B9)
Diameter of Hole: 4 in.
Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	**Soil Profile** (Color, texture, other)
0-60	Brown silty sand

PERCOLATION READINGS

Time 12 inches of water to seep away: _____ min.
Time 12 inches of water to seep away: _____ min.

✓ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

____ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval	Drop in inches	Time interval	Drop in inches
5 min.	1-1/2	5 min.	3/4
5 min.	1-1/2	5 min.	1/2
5 min.	1	5 min.	3/4
5 min.	1-1/4	5 min.	1/2
5 min.	1	5 min.	1/2
5 min.	1	5 min.	1/2

Percolation Rate (time/final water level drop): 10 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.

CON C. TRUONG
LICENSED PROFESSIONAL ENGINEER
No. 9019-C
HAWAII, U.S.A.

Engineer's Signature/Stamp

Plate A5.4

APPENDIX B

LABORATORY TESTING

DESCRIPTION OF LABORATORY TESTING

CLASSIFICATION

Field classification was verified in the laboratory in accordance with the Unified Soil Classification System. Laboratory classification was determined by visual examination and sieve analyses. The final classifications are shown at the appropriate locations on the Boring Logs, Plates A4.1 through A4.30.

MOISTURE-DENSITY

Representative samples were tested for field moisture content and dry unit weight. The dry unit weight was determined in pounds per cubic foot while the moisture content was determined as a percentage of dry weight. Samples were obtained using a 3-inch O.D. split tube sampler. Test results are shown at the appropriate depths on the Boring Logs, Plates A4.1 through A4.30.

CONSOLIDATION

Representative samples were tested for their consolidation characteristics. The test samples were 2.42 inches in diameter and 1 inch high. Porous stones were placed in contact with the top and bottom of the test samples to permit addition and release of pore fluid. Loads were then applied in several increments in a geometric progression, and the resulting deformations recorded at selected time intervals. Test results are plotted on the Consolidation Test Reports, Plates B2.1 through B2.6.

SHEAR TESTS

Shear tests were performed in the Direct Shear Machine which is of the strain control type. Each sample was sheared under varying confining loads in order to determine the Coulomb shear strength parameters, cohesion and angle of internal friction. Test results are presented on Plates B3.1through B3.4.

SIEVE ANALYSES

Sieve analyses tests were conducted in general accordance with ASTM D 422. The tests are used to determine the grain size distribution. Test results are presented on Plates B4.1 through B4.3.

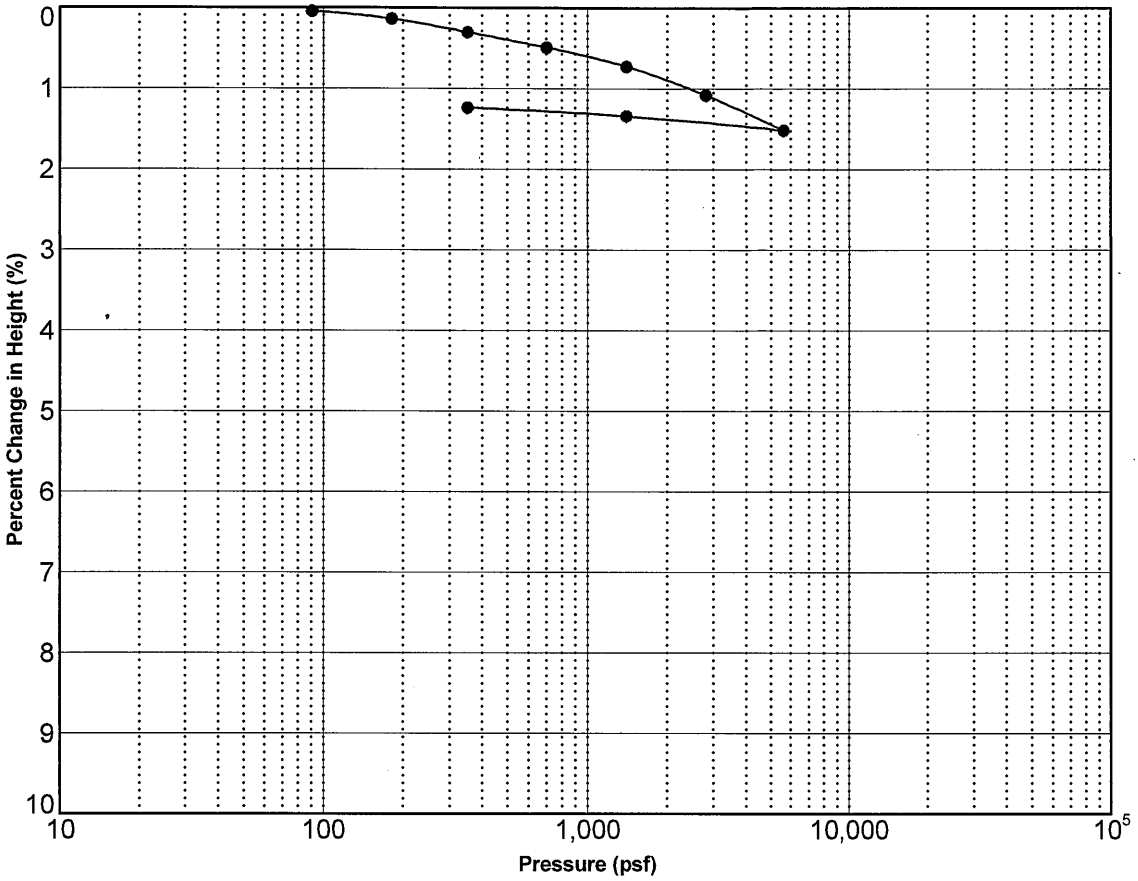
PROCTOR TESTS

Modified Proctor tests were performed in general accordance with ASTM D 1557 on bulk samples of near surface soils obtained from borings B13 and B16. The test is used to determine the optimum moisture content at which the soil compacts to 100 percent density. Results are shown on Plates B5.1 and B5.2.

CALIFORNIA BEARING RATIO TESTS

CBR tests were performed in general accordance with ASTM D 1883 on bulk sample of near surface soil obtained from borings B13 and B16. The test is used to evaluate the relative quality of subgrade soils to be used in the design of flexible pavements. Results are shown on Plates B6.1 and B6.2.

Consolidation Test Results



Sample Description

Boring No.: B1 Depth (ft): 8

Soil Description: Tan and gray sand

	Moisture Content (%)	Dry Density (pcf)
Initial	22.4	107.0
Final	18.1	108.3

Kahului Lani, Kahului, Maui

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Geotechnical Engineering

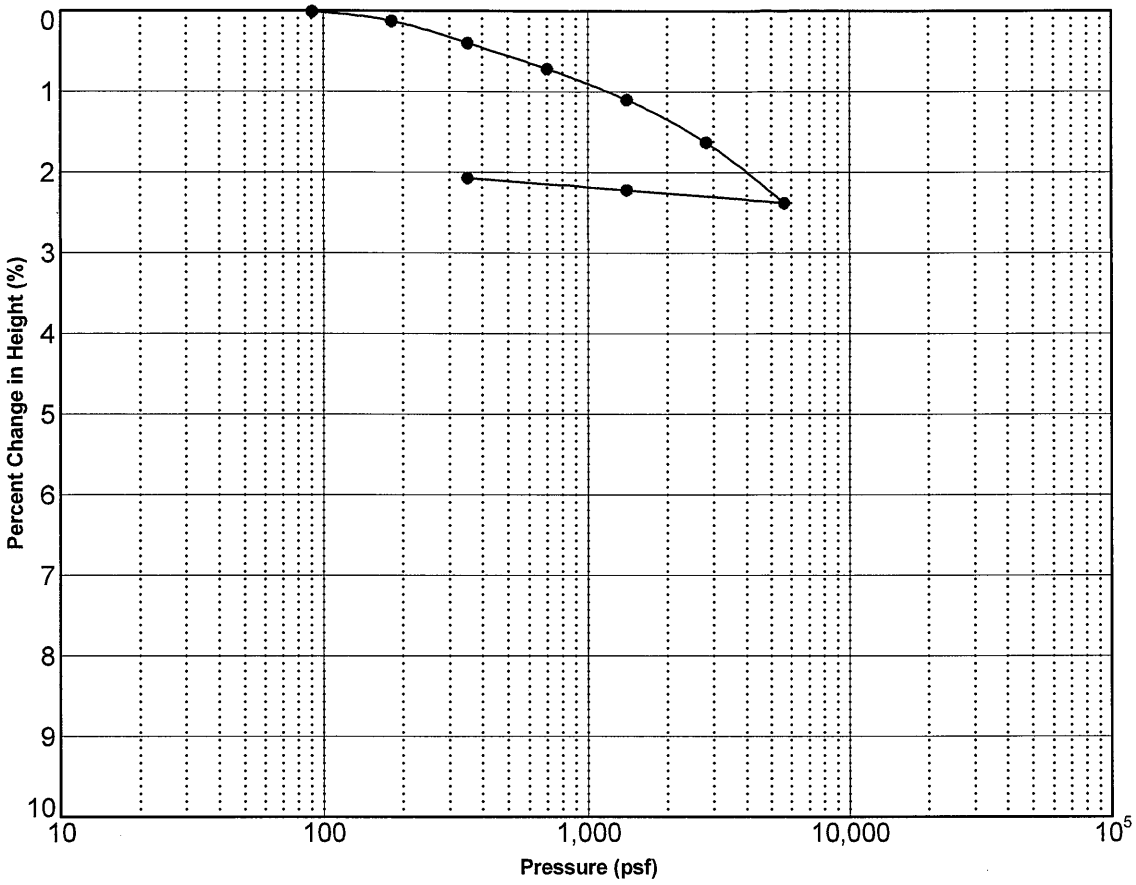
W.O. 17-6132

CONSOLIDATION TEST

ASTM D2435 / D2435M - 11

Plate B2.1

Consolidation Test Results



Sample Description

Boring No.: B1 Depth (ft): 18

Soil Description: Tan and gray sand

	Moisture Content (%)	Dry Density (pcf)
Initial	38.4	83.5
Final	36.9	85.2

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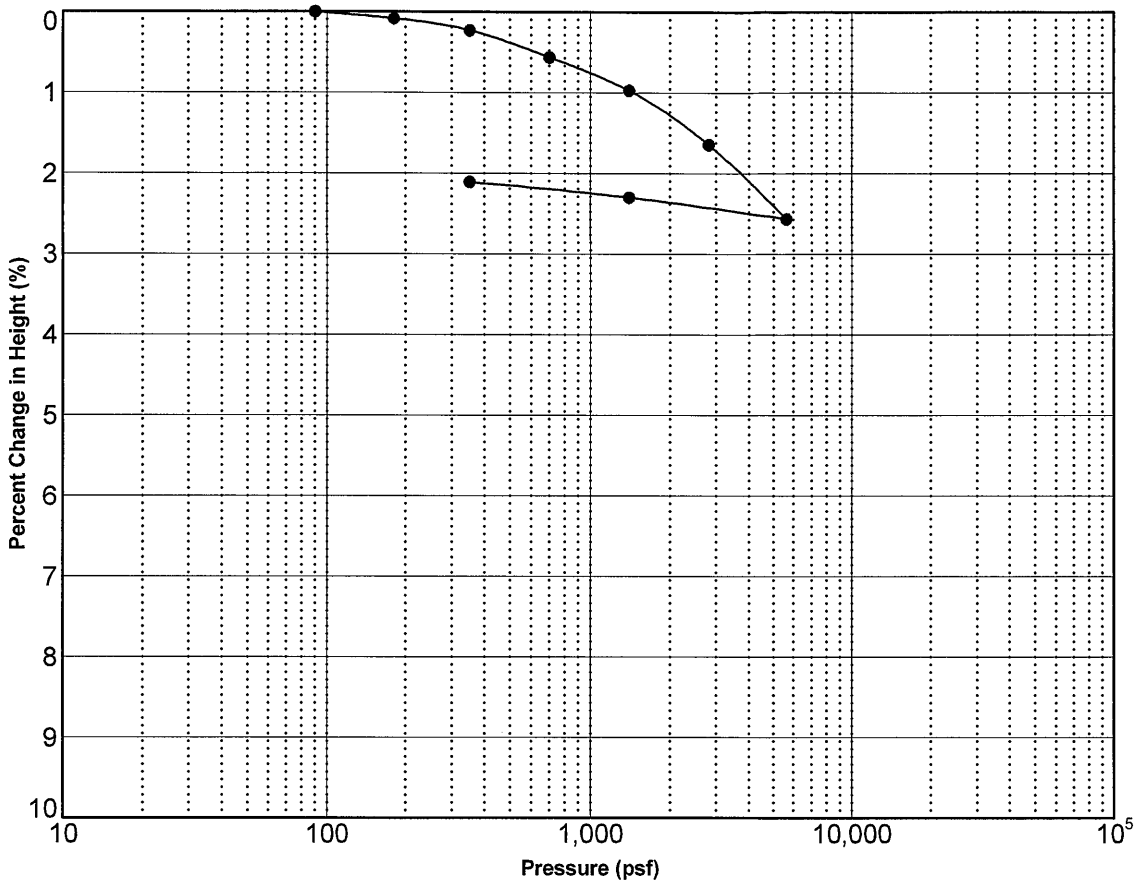
W.O. 17-6132

CONSOLIDATION TEST

ASTM D2435 / D2435M - 11

Plate B2.2

Consolidation Test Results



Sample Description

Boring No.: B4 Depth (ft): 5

Soil Description: Brown silty sand

	Moisture Content (%)	Dry Density (pcf)
Initial	13.6	86.2
Final	12.1	88.1

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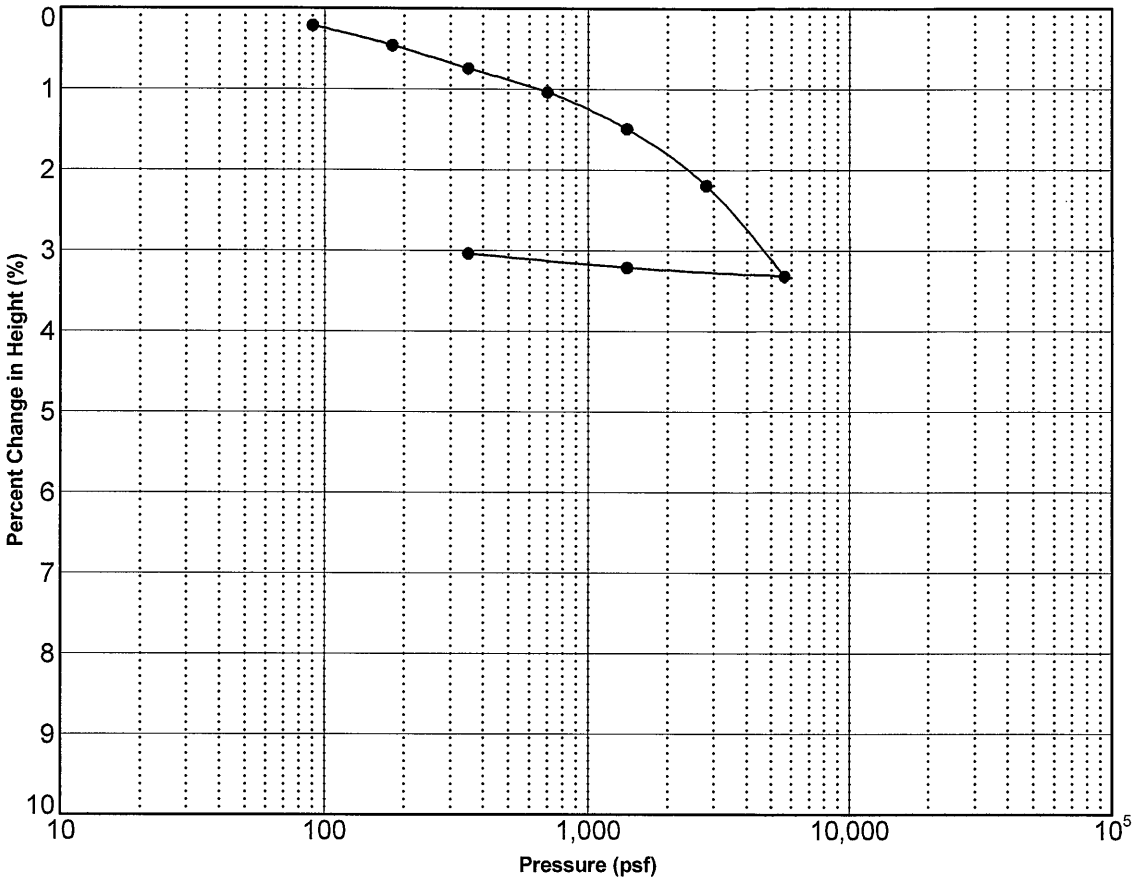
CONSOLIDATION TEST

ASTM D2435 / D2435M - 11

Plate B2.3

Consolidation Test Results



Sample Description

Boring No.: B8 Depth (ft): 5

Soil Description: Brown silty sand

	Moisture Content (%)	Dry Density (pcf)
Initial	13.8	92.3
Final	12.1	95.2

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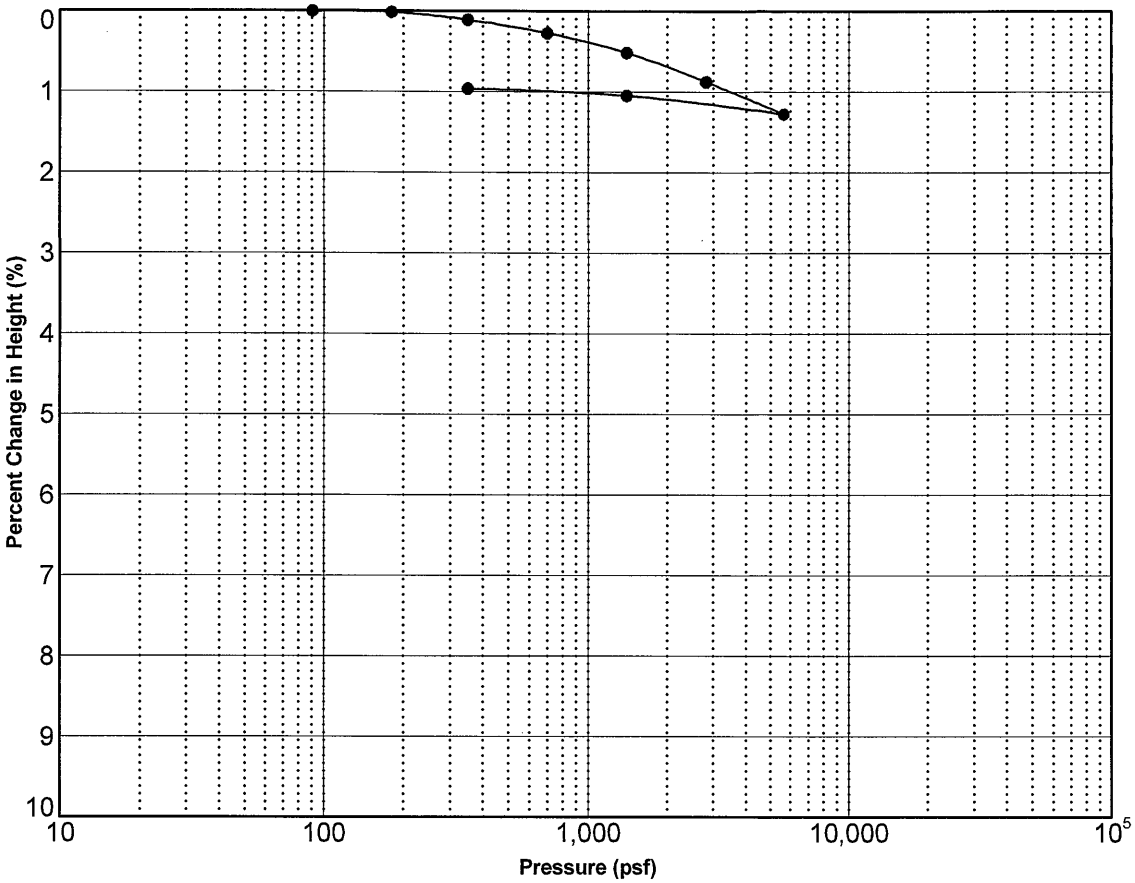
CONSOLIDATION TEST

ASTM D2435 / D2435M - 11

Plate B2.4

Consolidation Test Results



Sample Description

Boring No.: B9 Depth (ft): 9

Soil Description: Tan and gray sand

	Moisture Content (%)	Dry Density (pcf)
Initial	21.6	109.3
Final	19.9	110.3

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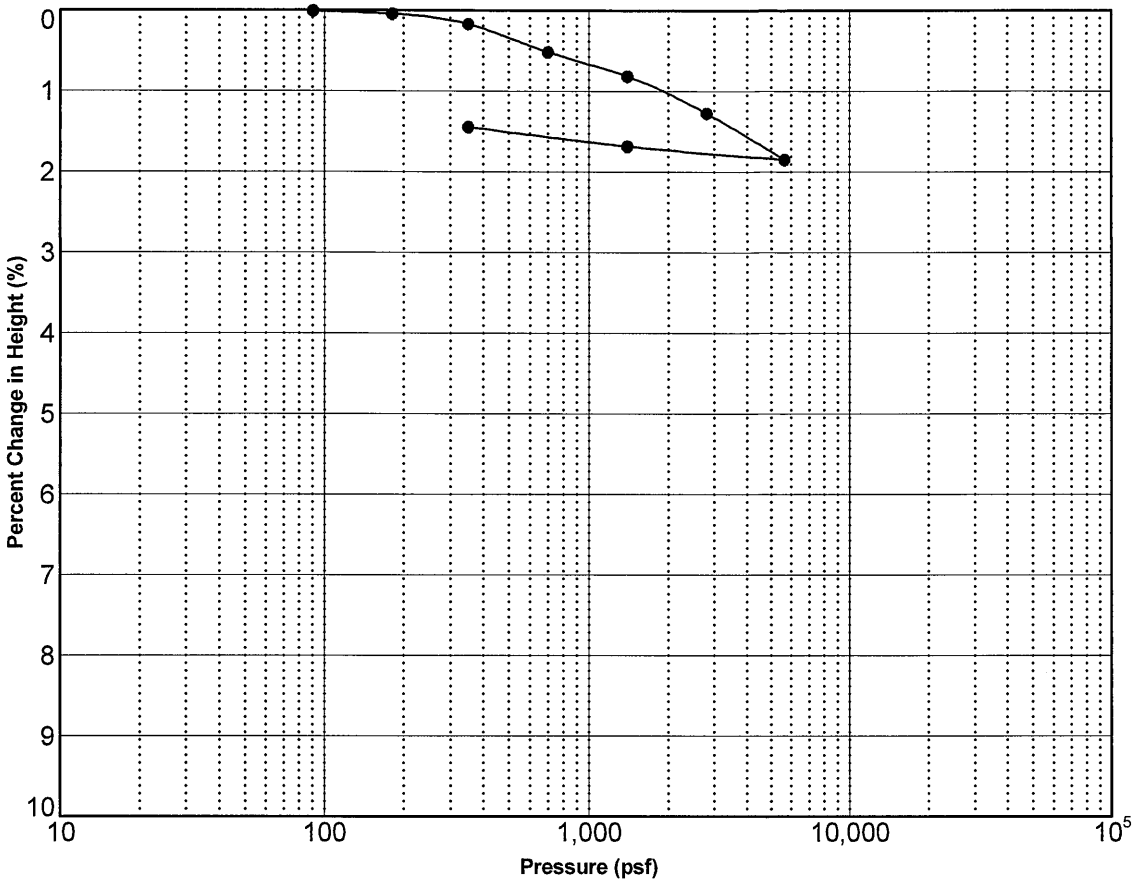
CONSOLIDATION TEST

ASTM D2435 / D2435M - 11

Plate B2.5

Consolidation Test Results



Sample Description

Boring No.: B12 Depth (ft): 4

Soil Description: Brown silty sand

	Moisture Content (%)	Dry Density (pcf)
Initial	23.5	99.5
Final	22.5	101.0

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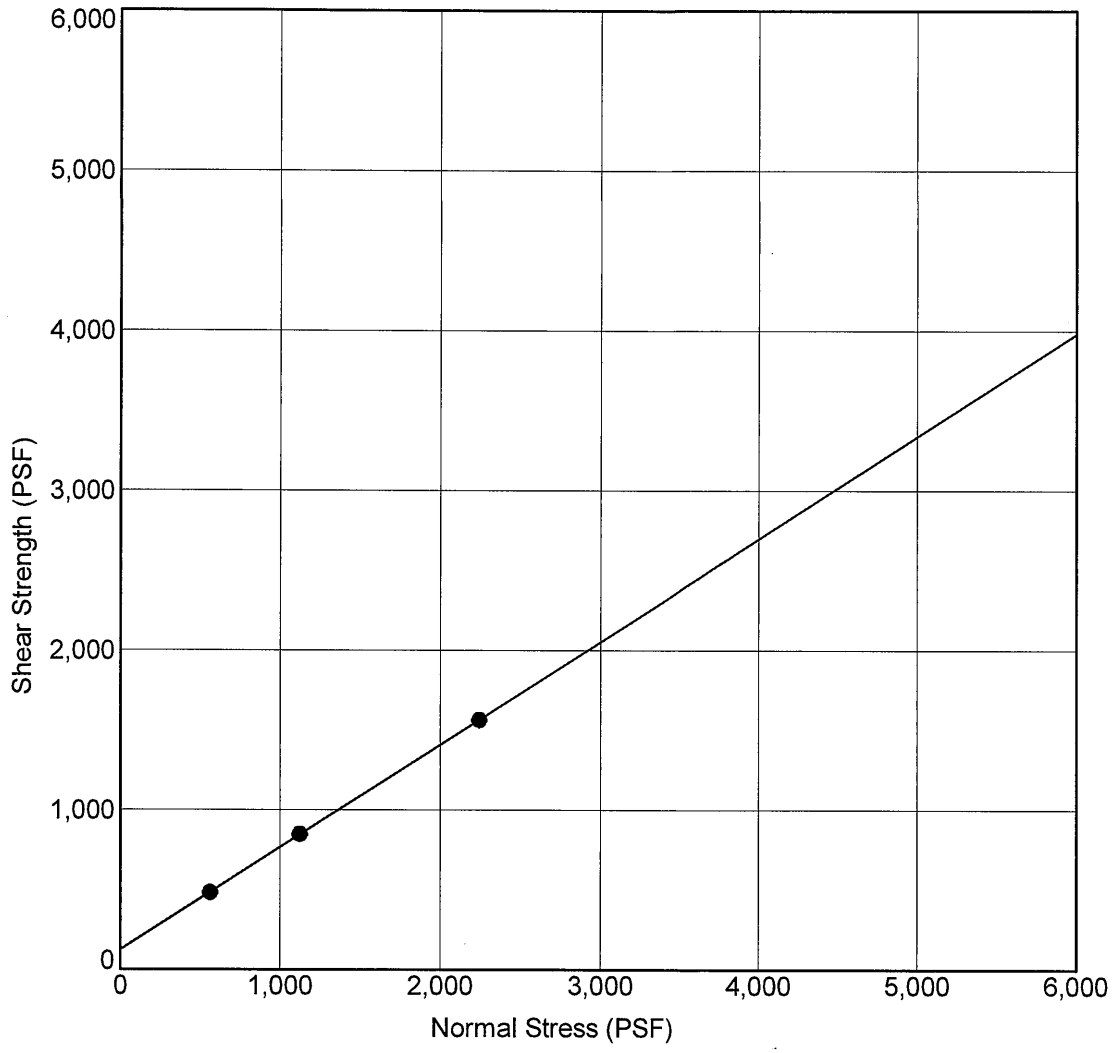
CONSOLIDATION TEST

ASTM D2435 / D2435M - 11

Plate B2.6

Direct Shear Test Results



Soil Data

Boring No.: B1 Depth (ft): 4
Soil Description: Brown silty sand

Test Results

Strength Intercept (c): 126.1 PSF (Peak Strength)
Friction Angle (phi): 32.7 DEG (Peak Strength)

Kahului Lani, Kahului, Maui

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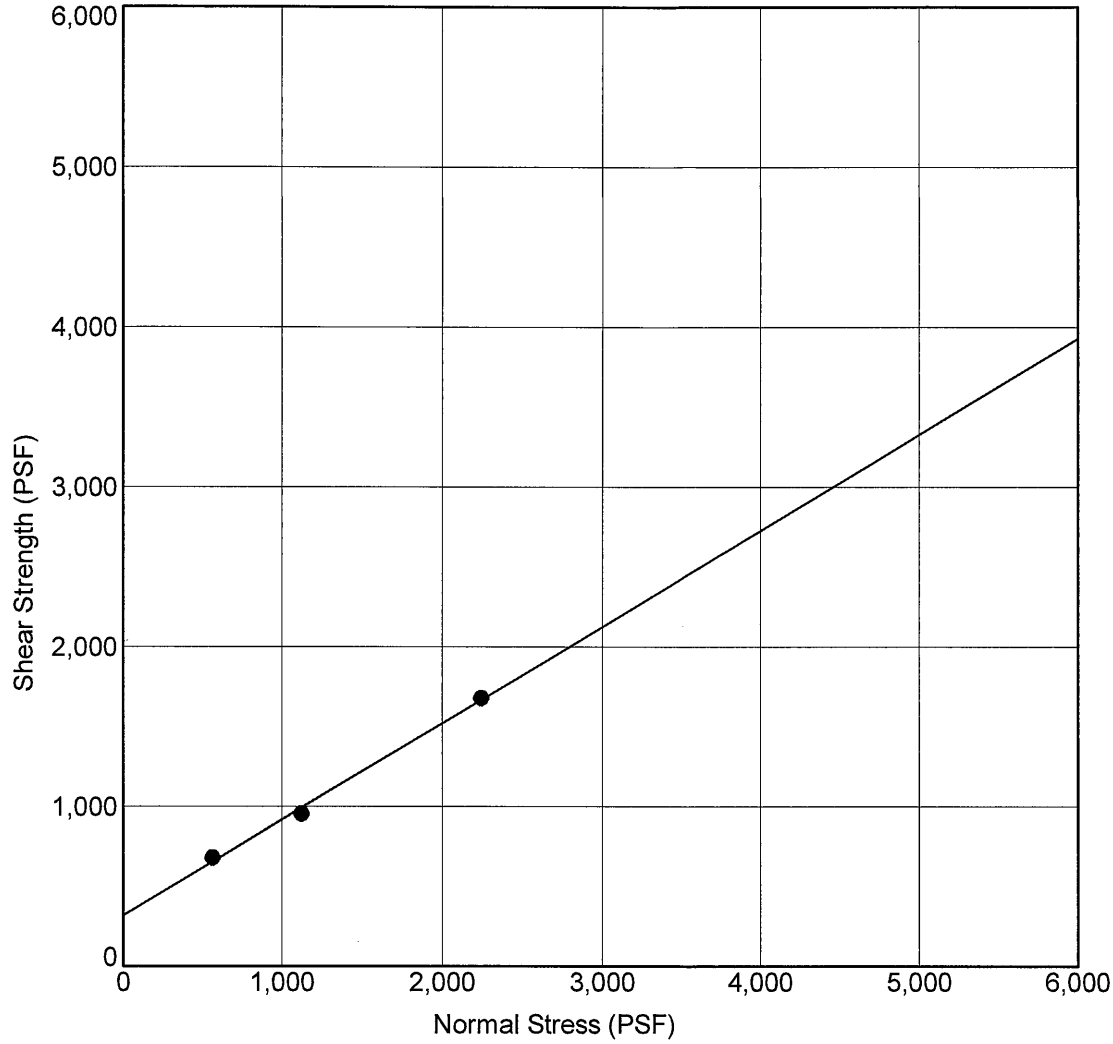
DIRECT SHEAR TEST

ASTM D3080

Plate B3.1

Direct Shear Test Results



Soil Data

Boring No.: B5 Depth (ft): 4
Soil Description: Brown silty sand

Test Results

Strength Intercept (c): 319.5 PSF (Peak Strength)
Friction Angle (phi): 31.1 DEG (Peak Strength)

Kahului Lani, Kahului, Maui

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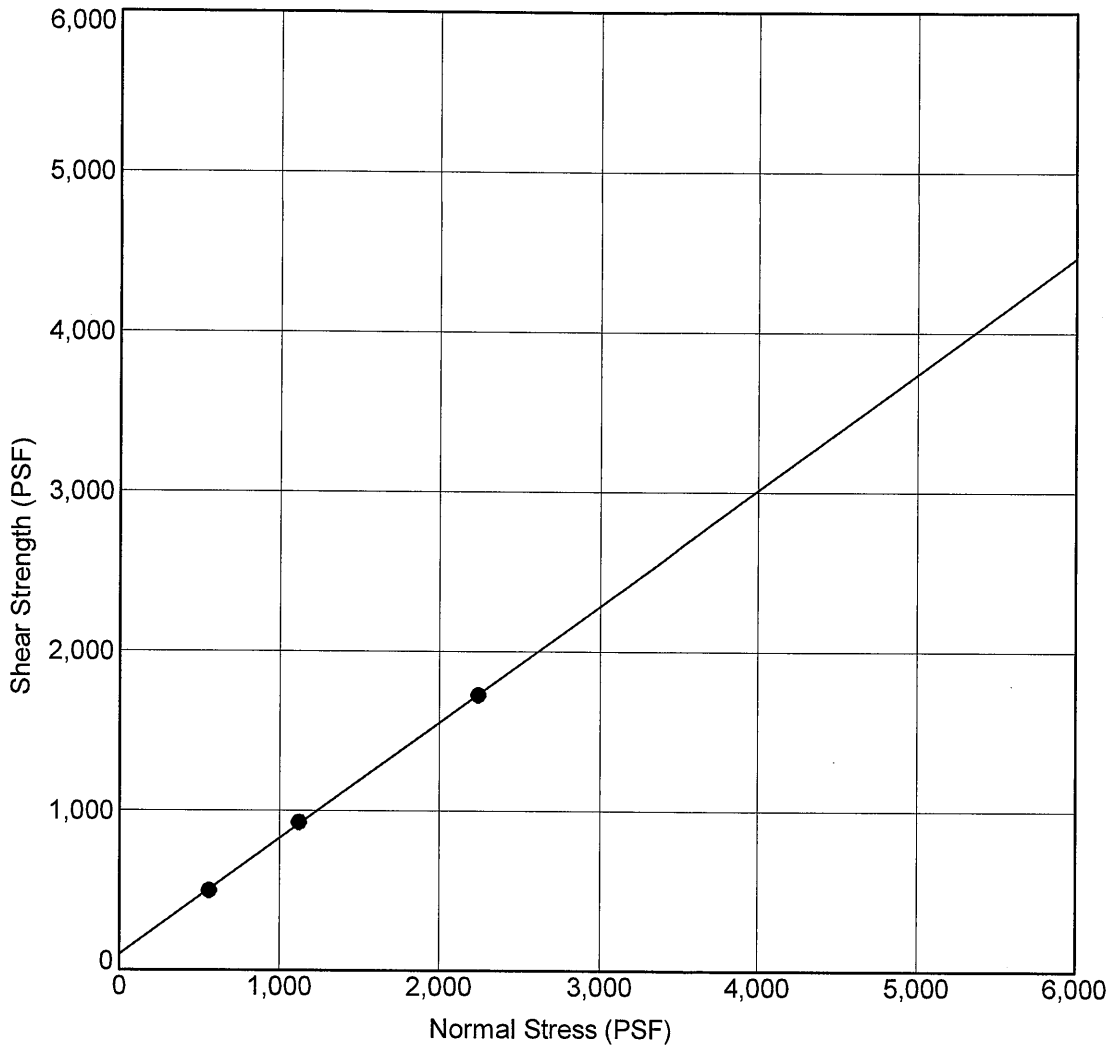
DIRECT SHEAR TEST

ASTM D3080

Plate
B3.2

Direct Shear Test Results



Soil Data

Boring No.: B6 Depth (ft): 4
Soil Description: Brown silty sand

Test Results

Strength Intercept (c): 100.6 PSF (Peak Strength)
Friction Angle (phi): 36.1 DEG (Peak Strength)

Kahului Lani, Kahului, Maui

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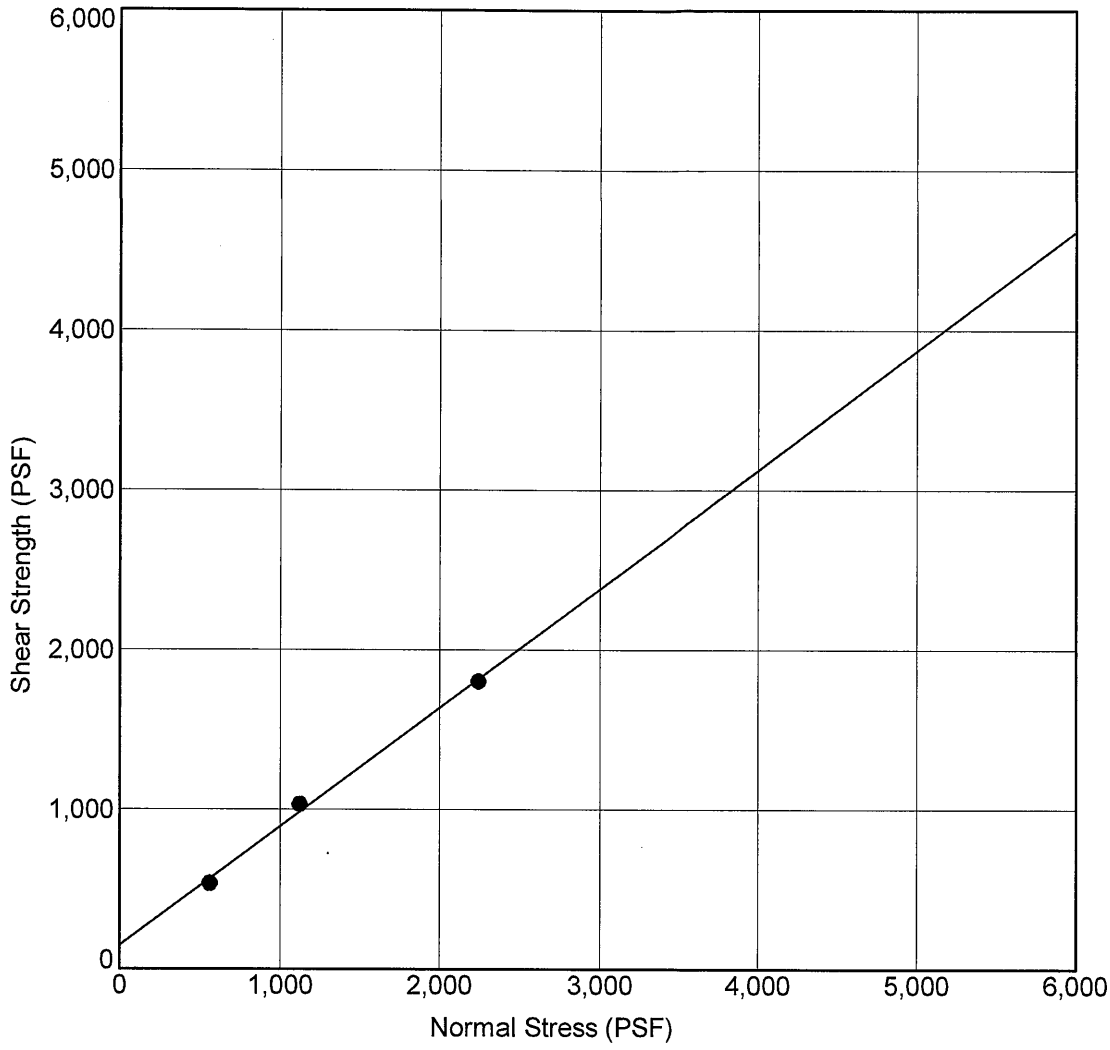
DIRECT SHEAR TEST

ASTM D3080

Plate B3.3

Direct Shear Test Results



Soil Data

Boring No.: B11 Depth (ft): 3
Soil Description: Brown silty sand

Test Results

Strength Intercept (c): 152.9 PSF (Peak Strength)
Friction Angle (phi): 36.7 DEG (Peak Strength)

Kahului Lani, Kahului, Maui

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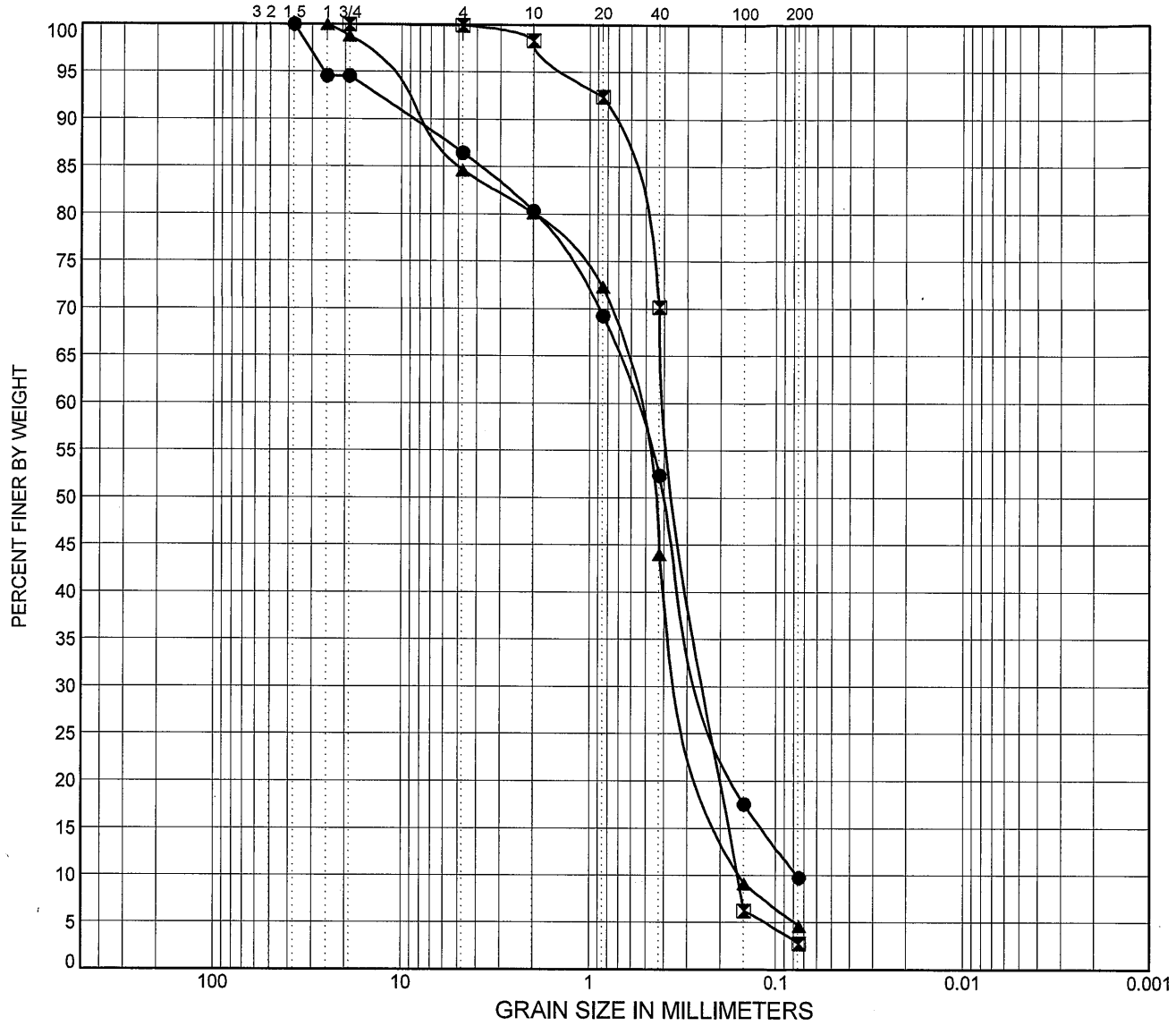
DIRECT SHEAR TEST

ASTM D3080

Plate B3.4

U.S. SIEVE OPENING IN INCHES | U.S. SIEVE NUMBERS | HYDROMETER



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Location	Classification	%Gravel	%Sand	%Fines
● Boring B1 at 2 ft	Brown silty sand	13.5	76.7	9.8
⊠ Boring B3 at 9 ft	Tan sand	0.1	97.2	2.8
▲ Boring B4 at 3 ft	Tan and gray sand	15.4	80.0	4.7

Sample Location	D100	D60	D30	D10	Cc	Cu
● Boring B1 at 2 ft	37.5	0.6	0.2	0.1	1.06	7.58
⊠ Boring B3 at 9 ft	19	0.4	0.2	0.2	0.85	2.26
▲ Boring B4 at 3 ft	25	0.6	0.3	0.2	0.81	4.08

Kahului Lani, Kahului, Maui

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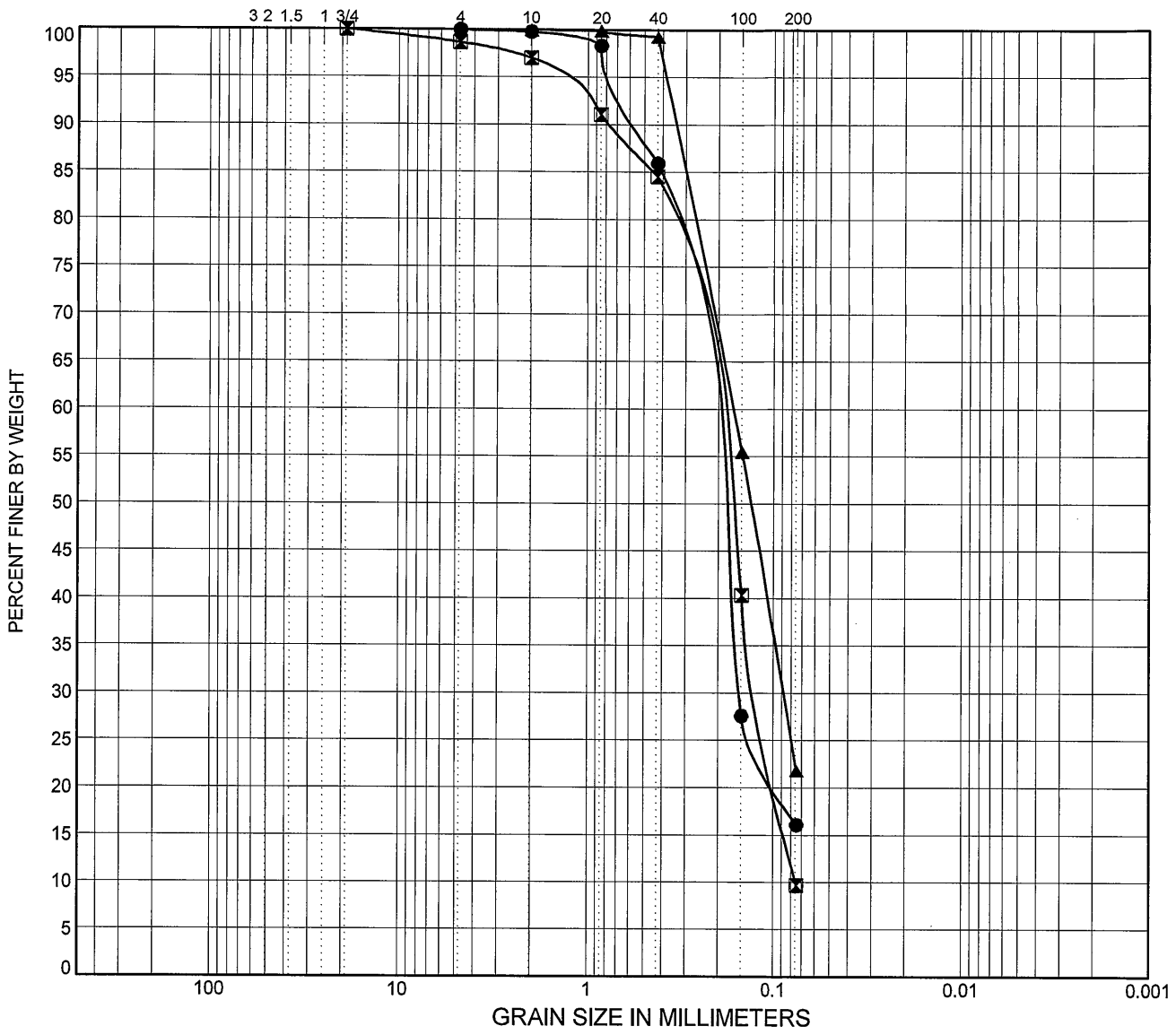
W.O. 17-6132

SIEVE ANALYSIS TEST

ASTM D422

Plate B4.1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Location	Classification	%Gravel	%Sand	%Fines
● Boring B8 at 3 ft	Brown silty sand	0.0	83.9	16.1
⊠ Boring B8 at 14 ft	Tan and gray sand	1.3	89.0	9.7
▲ Boring B9 at 3 ft	Tan and gray silty sand	0.0	78.2	21.8

Sample Location	D100	D60	D30	D10	Cc	Cu
● Boring B8 at 3 ft	4.75	0.3	0.2	*	*	*
⊠ Boring B8 at 14 ft	19	0.2	0.1	0.1	0.78	3.16
▲ Boring B9 at 3 ft	4.75	0.2	0.1	*	*	*

Kahului Lani, Kahului, Maui

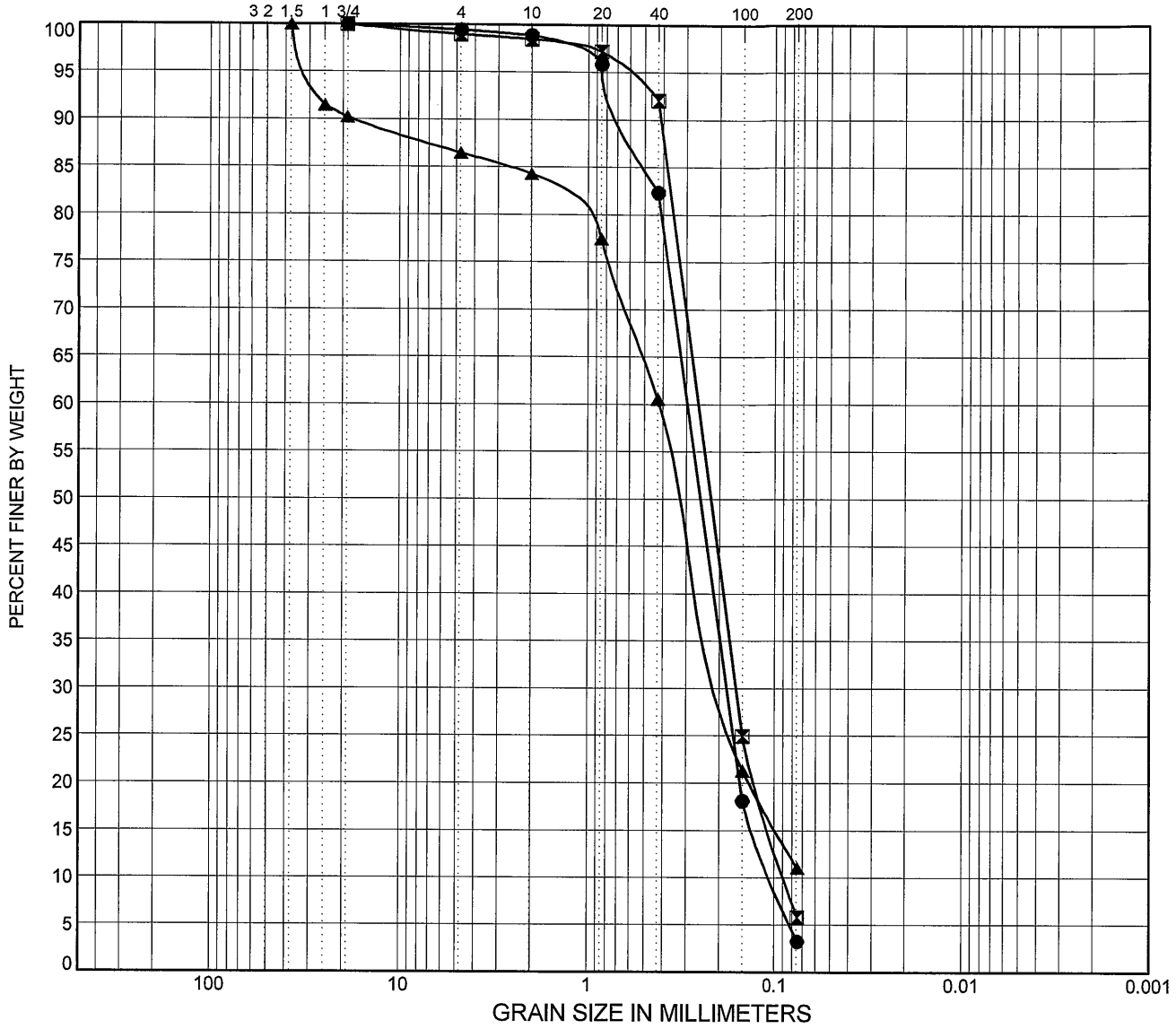
HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

W.O. 17-6132

SIEVE ANALYSIS TEST

ASTM D422

Plate B4.2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample Location	Classification	%Gravel	%Sand	%Fines
● Boring B12 at 2 ft	Brown sand	0.6	96.2	3.3
⊠ Boring B13 at 3 ft	Brown sand	1.0	93.1	5.8
▲ Boring B15 at 1 ft	Brown sand	13.5	75.4	11.1

Sample Location	D100	D60	D30	D10	Cc	Cu
● Boring B12 at 2 ft	19	0.3	0.2	0.1	1.09	2.88
⊠ Boring B13 at 3 ft	19	0.3	0.2	0.1	1.17	2.96
▲ Boring B15 at 1 ft	37.5	0.4	0.2	*	1.22	6.00

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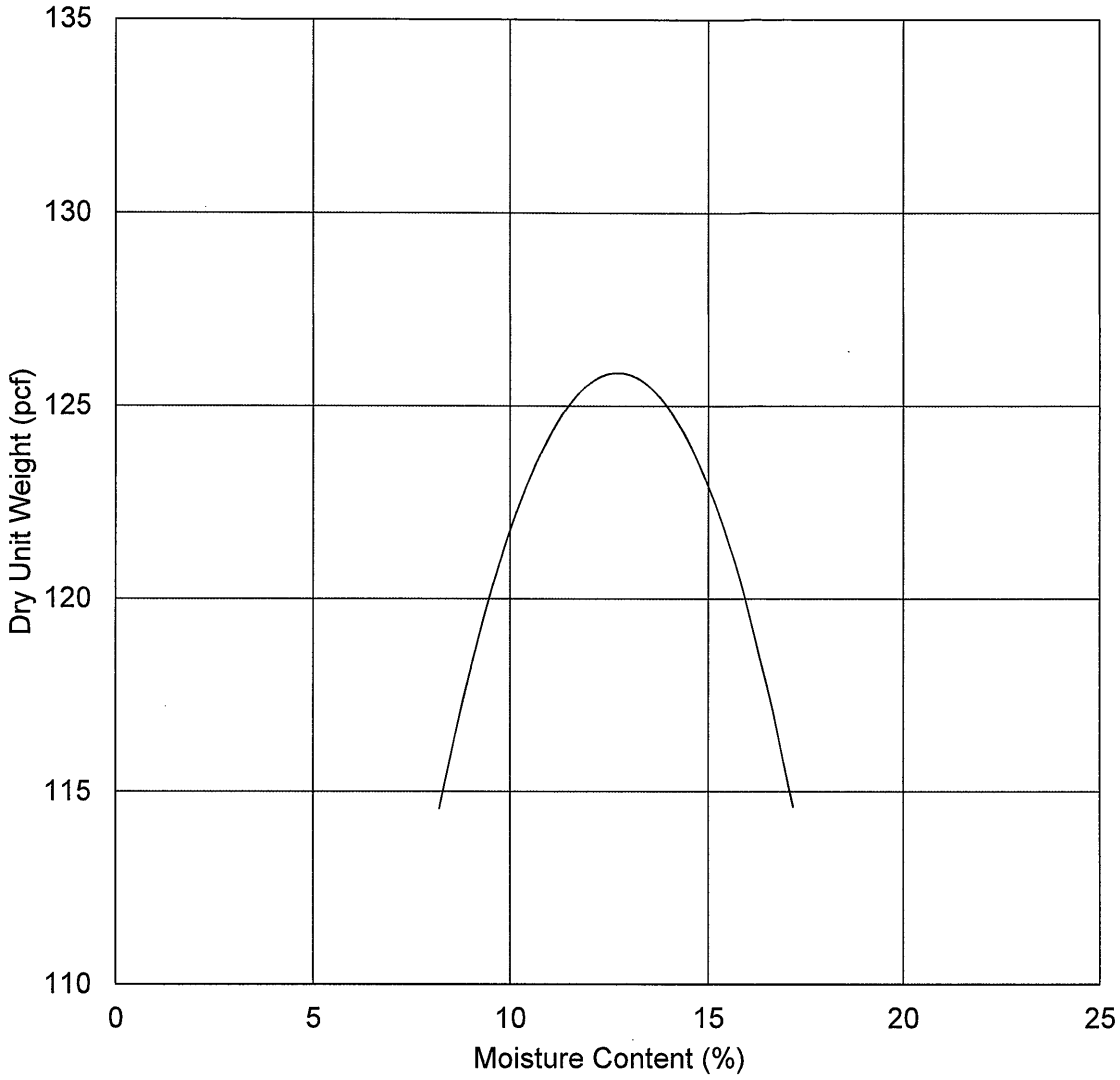
SIEVE ANALYSIS TEST

ASTM D422

Plate B4.3



Soil Data

Location: Boring B13 at near surface

Description: Brown sand with silt

Test Results

Maximum Dry Density: 125.9 pcf

Optimum Moisture Content: 12.7%

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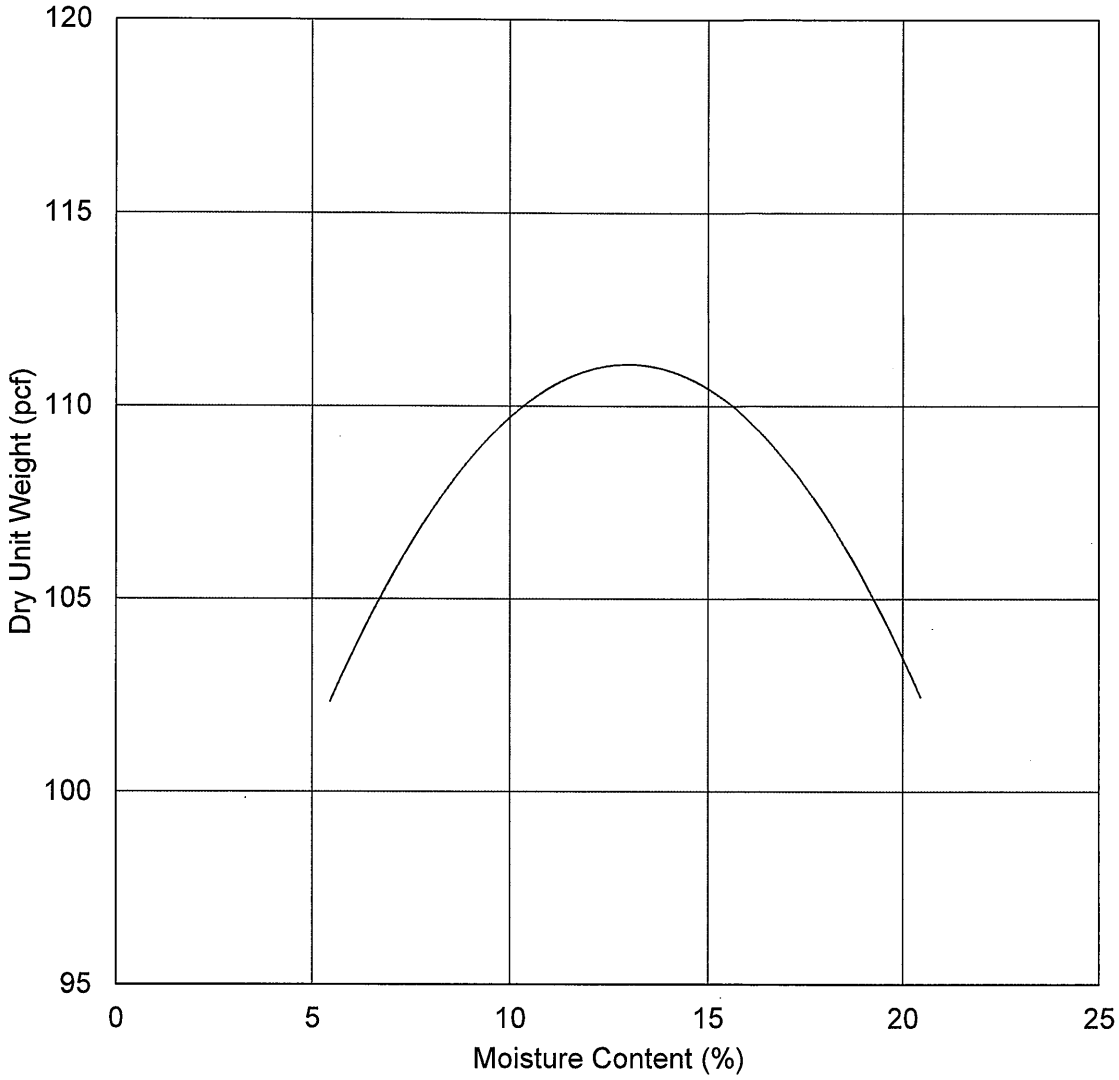
MODIFIED PROCTOR CURVE

ASTM D1557

Plate B5.1



Soil Data

Location:	Boring B16 at near surface
Description:	Brown silty sand

Test Results

Maximum Dry Density:	111.1 pcf
Optimum Moisture Content:	13.0%

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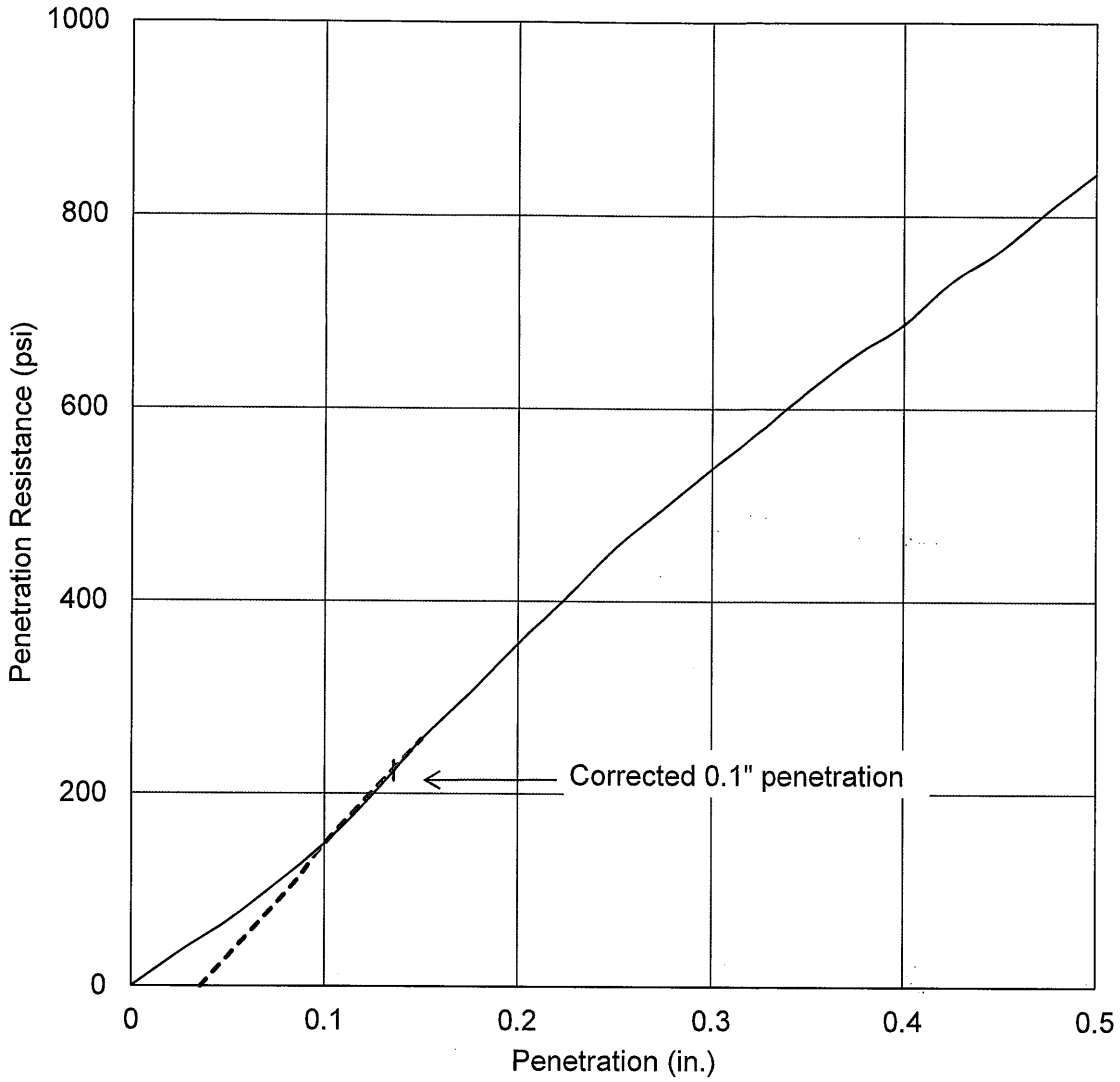
MODIFIED PROCTOR CURVE

ASTM D1557

Plate B5.2



Soil Data

Location:	Boring B13 at near surface
Description:	Brown sand with silt
Sample Dry Density:	122 pcf
Sample Moisture Content:	13.7%

Test Results

CBR Value:	22%
Expansion:	0%

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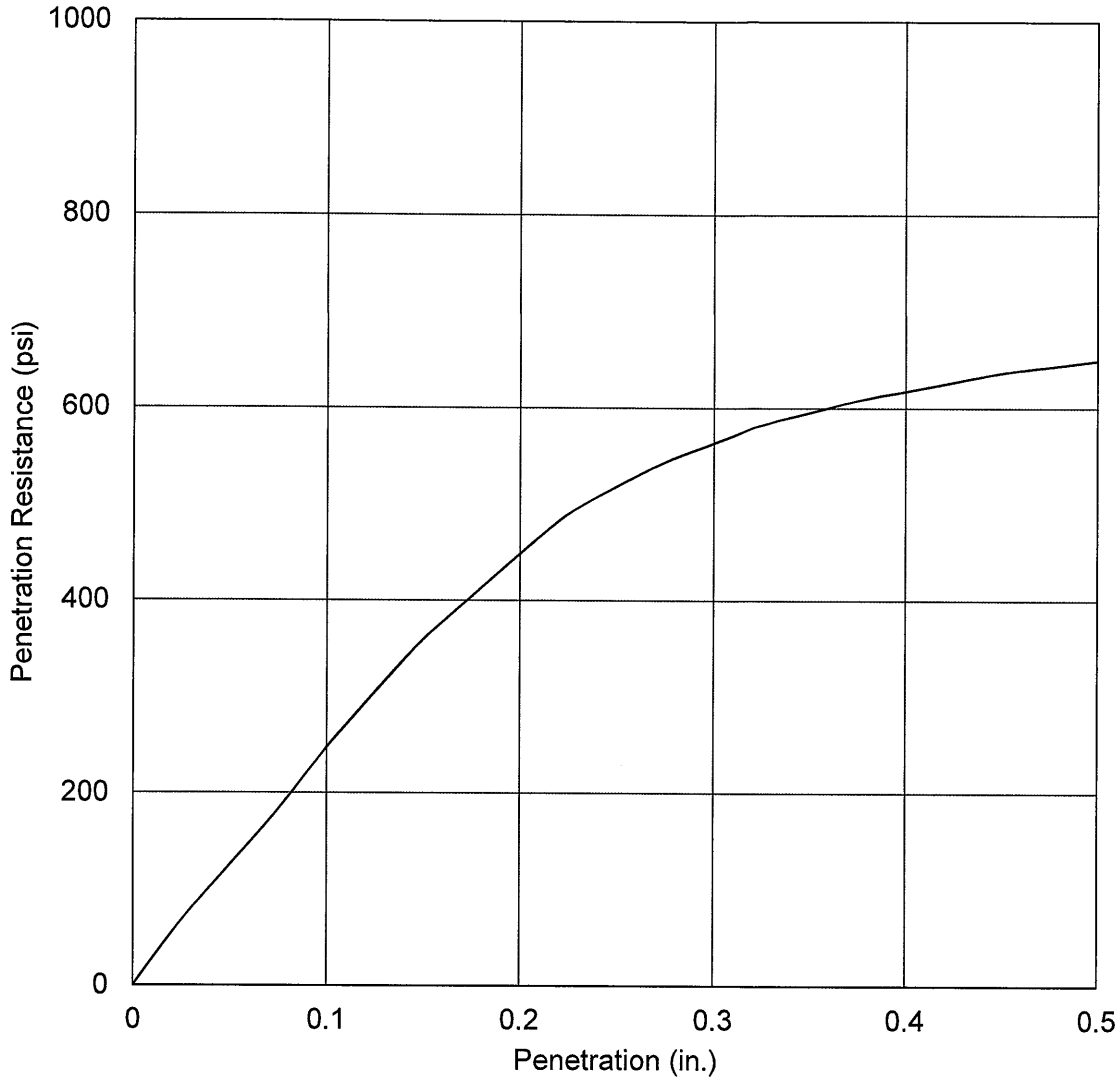
CBR STRESS PENETRATION CURVE

ASTM D1883

Plate B6.1



Soil Data

Location:	Boring B16 at near surface
Description:	Brown silty sand
Sample Dry Density:	109.7 pcf
Sample Moisture Content:	13.4%

Test Results

CBR Value:	25%
Expansion:	-0.1%

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CBR STRESS PENETRATION CURVE
ASTM D1883

Plate B6.2

APPENDIX C

DOWNHOLE SHEAR-WAVE GEOPHYSICAL SURVEY

Global Geophysics

P. O. Box 2229
Redmond, WA 98073-2229

Tel: 425-890-4321
Fax: 360-805-0259

November 8, 2017

Our ref: 107-1011.000

Hirata and Associates, Inc.
99-1433 Koaha Place
Aiea, HI 96701

ATTENTION: Mr. Rick Yoshida

RE: REPORT FOR THE DOWNHOLE SHEARWAVE SURVEY AT KANE STREET SENIOR RENTAL, MAUI, HAWAII

This letter report presents the results of the geophysical survey performed by Global Geophysics. The survey was carried out on October 25, 2017 at Kane Street Senior Rental, Maui, Hawaii. The objective of the survey was to calculate shear wave velocities in borehole B3.

INSTRUMENTATION AND FIELD PROCEDURES

The downhole seismic survey was carried out using a Geometrics Geode, 24-channel seismograph. The downhole receiver was a GeoSpace downhole geophone with one vertical geophone for recording compressional waves and two horizontal geophones for recording shear waves. The geophone package was held against the borehole wall by two steel springs. The shear wave energy source consisted of a wooden beam, secured under the wheels of the survey vehicle that was impacted with a 20 lb sledgehammer. The wooden beam was placed approximately 5 feet away from the borehole.

The field procedure consisted of lowering the geophone package to the measuring point in the hole and then mechanically coupling the geophones to the borehole wall. Data were collected at three-foot intervals over the entire 96-foot depth of the borehole. The beam was struck horizontally from both ends in order to produce shear waves of opposite polarity. This procedure optimized the identification of horizontally polarized shear waves. After identification of the seismic arrivals the data were stored digitally and the geophone package lowered to the next depth point where the procedure was repeated.

ANALYSIS AND RESULTS

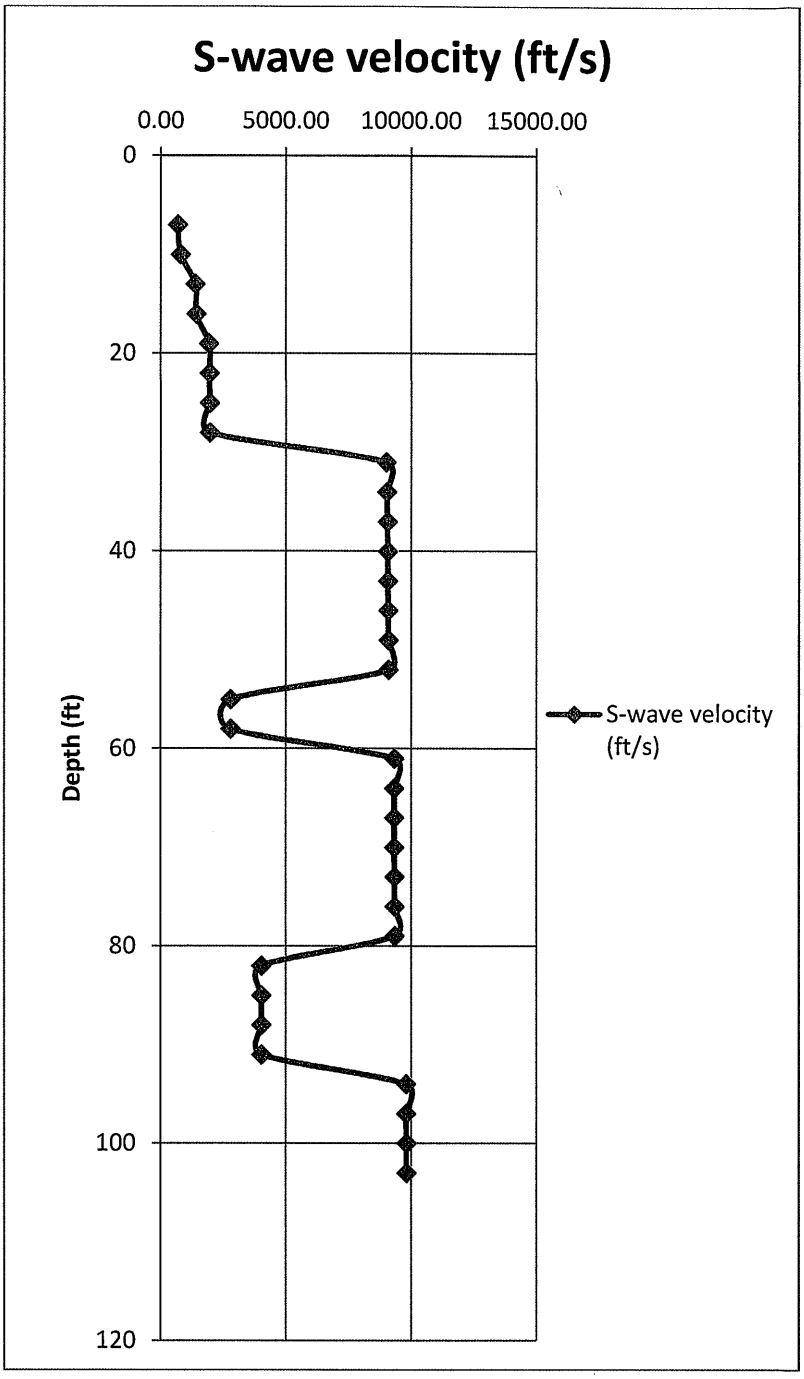
The first arrivals together with calculated velocities are listed in Table 1. The shear wave velocity is an interval velocity calculated by dividing the distance between two adjacent measurement points by the difference in travel times.

Table 1 Calculated shear wave velocity at B-3

Depth (ft)	Arrival (ms)	Velocity (ft/s)
4	9.44	
7	12.72	670.49
10	16.00	785.98
13	18.00	1374.02
16	20.00	1417.33
19	21.50	1922.55
22	23.00	1942.76
25	24.50	1956.05
28	26.00	1965.22
31	26.33	9031.18
34	26.66	9053.57
37	26.98	9070.62
40	27.31	9083.91
43	27.64	9094.45
46	27.97	9102.96
49	28.29	9109.92
52	28.62	9115.70
55	29.69	2791.56
58	30.76	2792.82
61	31.08	9342.05
64	31.40	9345.13
67	31.72	9347.79
70	32.04	9350.11
73	32.36	9352.15
76	32.68	9353.95
79	33.00	9355.54
82	33.75	4019.10
85	34.49	4019.64
88	35.24	4020.13
91	35.98	4020.57
94	36.29	9821.72
97	36.59	9822.61
100	36.90	9823.41
103	37.20	9824.15

S-wave source to borehole distance = 5

The velocity in the table is the calculated interval velocity, i.e. velocity at 31 ft is the interval velocity between 28 ft and 31 ft.


S-wave velocity (ft/s)
0.00
5000.00
10000.00
15000.00
0
20
40
60
80
100
120
Depth (ft)
S-wave velocity (ft/s)

CLOSURE

Global Geophysics's services are conducted in a manner consistent with the level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions subject to the time limits and financial and physical constraints applicable to the services. Individual values may, in some instances, be erroneous due to background noise occurring simultaneously with the measurements. Given the consistency of the data, however, the survey results are considered to be a reasonably accurate representation based on the measured geophysical parameters at the site. In general, the errors in the calculated velocities related to the resolution of the techniques are about ±10 % of the true velocities. The calculated shear wave velocities at this borehole may not represent the soil conditions of the whole development site.

We appreciate the opportunity to work with you on this project, and we hope that you find the results of the geophysical survey useful to your investigation. If you have any questions regarding this report, please call the undersigned at 425-890-4321. We look forward to providing you with additional geophysical services in the future.

Sincerely,

Global Geophysics.

John Liu, Ph.D., R.G.
Principal Geophysicist