SOILS INVESTIGATION
ASPHALT PAVEMENT COVER
FORMER EAST KAPOLEI PESTICIDE MIXING AND LOADING FACILITY
KAPOLEI, OAHU, HAWAII

for

THE LIMTIACO CONSULTING GROUP

HIRATA & ASSOCIATES, INC.
W.O. 09-4856
June 15, 2010

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June 15, 2010
W.O. 09-4856

Mr. Jason H. Lau
The Limtiaco Consulting Group
650 Iwilei Road, Suite 208
Honolulu, Hawaii 96817

Dear Mr. Lau:

Our report, "Soils Investigation, Asphalt Pavement Cover, Former East Kapolei Pesticide Mixing and Loading Facility, Kapolei, Oahu, Hawaii," dated June 15, 2010, our Work Order 09-4856 is enclosed. This investigation was conducted in general conformance with the scope of services presented in our proposal dated April 1, 2009.

Surface fill consisting of grayish brown silty sand mixed with coralline and basalt gravel, and brown to light brown gravel mixed with sand, coral and AC fragments, was encountered in borings B3 through B6, drilled in the southeastern portion of the site. The granular fills were in a medium dense to dense condition and extended to depths of about 2 to 4 feet. The surface soil encountered in borings B1 and B2, drilled along the northeastern edge of the property, and underlying the surface fill in borings B3 through B6, was classified as brown silty clay. The silty clay was in a stiff condition and extended to the maximum depths drilled. Neither groundwater nor seepage water was encountered in our borings.

Recommendations for the design of flexible permeable pavement and site grading are included in this report. 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.

Paul S. Morimoto

Paul S. Morimoto President

PSM:NKT

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SOILS INVESTIGATION
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KAPOLEI, OAHU, HAWAII

INTRODUCTION

This report presents the results of our soils investigation performed for design of the asphalt pavement cover of the former East Kapolei Pesticide Mixing and Loading Facility in Kapolei, Oahu, Hawaii. Our scope of services for this study included the following:

- A visual reconnaissance of the site 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 six exploratory borings to depths ranging from approximately 5.5 to 10.5 feet. A description of our field investigation is summarized on Plates A1.1 and A1.2. 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 A4.6.

- Drilling and testing two percolation test holes to depths of approximately 5 feet. The approximate test hole locations are shown on Plate A2.2. Falling head percolation tests were performed in both test holes and results are presented on Department of Health Site Evaluation/ Percolation Test forms, Plates A5.1 and A5.2.

- Due to possible soil contamination, laboratory testing of selected soil samples were performed by Advanced Terra Testing, Inc. in Lakewood, Colorado. Testing procedures are presented in the Description of Laboratory Testing, Plates B1.1 and B1.2. Test results are presented on the Unified Soil

Classification System Chart (Plate A3.2), Boring Logs (Plates A4.1 through A4.6), Standard Proctor Test reports (Plates B2.1 through B2.3), and CBR Test reports (Plates B3.1 through B3.3).

- Engineering analyses of the field and laboratory data.
- Preparation of this report presenting geotechnical recommendations for flexible pavement and site grading.

PROJECT CONSIDERATIONS

Information regarding the proposed project was provided by personnel from your office, and EnviroServices & Training Center LLC.

The project site is located on approximately 3.0 acres of land on a former sugar mill site that has been contaminated as a result of pesticide mixing and handling. The general area is planned for a 404-acre residential housing project. As a result, the proposed project is part of a Remedial Alternative Analysis of the site to address environmental impacts of the contamination.

The Remedial Alternative Analysis will include up to five remedial alternative strategies for the site, including ground cover consisting of permeable pavement with a subsurface infiltration system for surface runoff. As a result, the scope of this study is limited to the permeable pavement design.

Finish grades were not available at the time of this report, however, we understand that the ground cover remedial alternative may include placement of several feet of fill throughout the site.

SITE CONDITIONS

The former sugar mill site is located on the west side of Palehua Road, approximately one mile southeast of its intersection with Farrington Highway in Kapolei, Oahu,

Hawaii. The site is bordered on the north and west by agricultural land, on the east by Palehua Road, and on the south by an unpaved road.

A chainlink fence extends along the perimeter of the former sugar mill site, with an additional inner fence parallel to the northern and western outer chainlink fences. Access was not available to this enclosed area in the northern and western portions of the former sugar mill site. This area was generally covered with light to moderate vegetation consisting of grass and trees.

We understand that the remainder of the site was previously occupied by two wooden buildings and four elevated storage tanks. The structures had been demolished prior to the start of our work, and the site was vacant at the time of our fieldwork. At the time of our field investigation, mounds of soil partially covered by plastic sheeting were observed in the central portion of the site.

Drainage over the site generally flows away from the central portion of the site. Total relief over the project site is approximately 4 feet, with ground elevations ranging from about +103 to +107.

SOIL CONDITIONS

In borings B3 through B6, the surface soil was classified as fill consisting of grayish brown silty sand mixed with coralline and basalt gravel and brown to light brown gravel mixed with sand, coral and AC fragments. The granular fills were in a medium dense to dense condition to depths ranging from about 2 to 4 feet.

Underlying the surface fill in borings B3 through B6, and at ground surface in borings B1 and B2, was brown silty clay in a stiff condition extending to the maximum depths drilled. Completely weathered rock fragments were generally encountered within the silty clay stratum at deeper depths. Although laboratory

testing on the silty clay indicated a low expansion potential when recompacted at near its optimum moisture content, the Soil Survey, prepared by the US Soil Conservation Service, describes the soil in the project area as having a high expansion potential. In addition, Atterberg Limit tests on the silty clay resulted in a Unified Soil Classification System classification of CH, fat clay, which is typically characterized by a moderate to high expansion potential.

Neither groundwater nor seepage water was encountered in our exploratory borings.

CONCLUSIONS AND RECOMMENDATIONS

Pavement Design

We assume that permeable pavement sections based on hydrological design will be determined by the Civil Engineer and that our analyses will be limited to structural design based on the anticipated traffic loads. The final pavement section should consist of the thicker section of the two design methods.

We understand that the ground cover remedial alternative may result in the contaminated site being developed into a shopping area. We assume that the pavement areas will generally be limited to passenger vehicles and light trucks, with occasional delivery, garbage, and fire trucks.

Although finish grades were not available at the time of this report, site grading may include placement of several feet of fill throughout the site. If site grading includes placement of more than 2 feet of fill, pavement subgrade is expected to expose new compacted granular fill. The recommended pavement section assumes that the new fill will have a minimum CBR value of 15 and a CBR swell of less than 1 percent when tested in accordance with ASTM D 1883.

In the central portion of the site, pavement subgrade for site grading consisting of less than 2 feet of fill is expected to expose the onsite granular fill. Flexible pavement for pavement subgrades exposing the onsite granular fill or new compacted fill may be structurally designed based on the following section:

Granular Fill Subgrade

3.0"	Porous Asphaltic Concrete
2.0"	Aggregate Filter Course
14.0"	Permeable Base
19.0"	Total Thickness

For site grading consisting of placement of less than 2 feet of fill in the northern and western portions of the site, pavement subgrade is expected to expose the expansive silty clay. Based on the results of the laboratory testing, permeable pavement for pavement subgrades exposing silty clay material may be structurally designed based on the following section:

Silty Clay Subgrade

3.0"	Porous Asphaltic Concrete
2.0"	Aggregate Filter Course
28.0"	Permeable Base
33.0"	Total Thickness

The aggregate filter course is recommended to stabilize the permeable base surface. The aggregate filter course should consist of 0.5-inch diameter crushed aggregate, while the permeable base should consist of 1.5 to 3-inch diameter aggregate with No. 2 AASHTO gradation.

Prior to the placement of permeable base, the pavement subgrade should be scarified to a minimum depth of 6 inches, moisture conditioned to about 2 percent above optimum moisture content, and compacted to between 90 and 95 percent compaction as determined by ASTM D 1557. Overcompaction of the subgrade soils above 95 percent compaction should be avoided as increasing the density of the soil decreases the permeability.

Prior to placement of the permeable base, a non-woven geotextile filter fabric should be placed over the pavement subgrade. The subgrade slope should not exceed 5% for maximum infiltration. In addition, the pavement should have edge confinement, such as concrete curbs.

Site Grading

Site Preparation - The project site should be cleared of all vegetation, including large tree roots, and other deleterious material. Prior to placement of general fills, the exposed subgrade should be scarified to a minimum depth of 6 inches, moisture conditioned to about 2 percent above optimum moisture content, and compacted to between 90 and 95 percent compaction as determined by ASTM D 1557. Overcompaction of the exposed subgrade above 95 percent compaction should be avoided.

Rippability - Based on our exploratory borings, we believe that excavations into the onsite silty clay and granular fills can be accomplished using conventional earth moving equipment.

Slope Gradients - Permanent cut and fill slopes should be stable at gradients of 2H:1V or flatter. All slopes should be planted as soon as practical upon completion of grading to reduce the effects of erosion and weathering.

Onsite Fill Material - The onsite silty clay will be acceptable for reuse in compacted fills and backfills in fill areas deeper than 3 feet below finish grade. The onsite granular fills will be acceptable for reuse in compacted fills and backfills. All rock fragments larger than 3 inches in maximum dimension should be removed from the onsite soils prior to reuse.

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 - Compacted fills, including onsite and imported fill material, should be placed in horizontal lifts restricted to eight inches in loose thickness and compacted to between 90 and 95 percent compaction as determined by ASTM D 1557. Overcompaction of compacted fills above 95 percent compaction should be avoided.

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 pavement 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 mass grading operations and fill placement, and perform compaction testing, (2) review and/or perform laboratory testing on import borrow to determine its acceptability for use in compacted fills, and (3) 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 The Limtiaco Consulting Group and their sub-consultants for design of the asphalt pavement cover of the former East Kapolei Pesticide Mixing and Loading Facility in Kapolei, Oahu, 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 judgement. 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

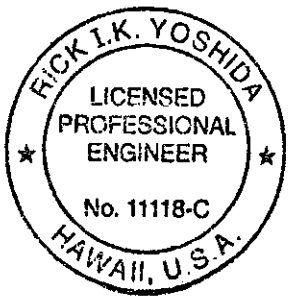
responsible for the interpretation by others of the information developed. No warranty is made regarding the services performed, either express or implied.

Respectfully submitted,

HIRATA & ASSOCIATES, INC.

Nathan K. Tanaka, Project Engineer

Rick Yoshida, Project Manager



This work was prepared by me or under my supervision
Expiration Date of License:
April 30, 2010

APPENDIX A

FIELD INVESTIGATION

DESCRIPTION OF FIELD INVESTIGATION

GENERAL

The site was explored on January 29, 2010, by performing a visual reconnaissance of the site and drilling six test borings to depths ranging from about 5.5 to 10.5 feet with a Mobile B40-L22 truck-mounted drill rig. In addition, two percolation test holes were drilled to a depth of about 5 feet and tested in accordance with Department of Health guidelines.

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 A4.6.

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 the Topographic Survey provided by EnviroServices & Training Center, LLC received on January 19, 2010. The accuracy of the boring locations shown on Plate A2.2 and the boring elevations shown on Plates A4.1 through A4.6 are therefore approximate, in accordance with the field methods used.

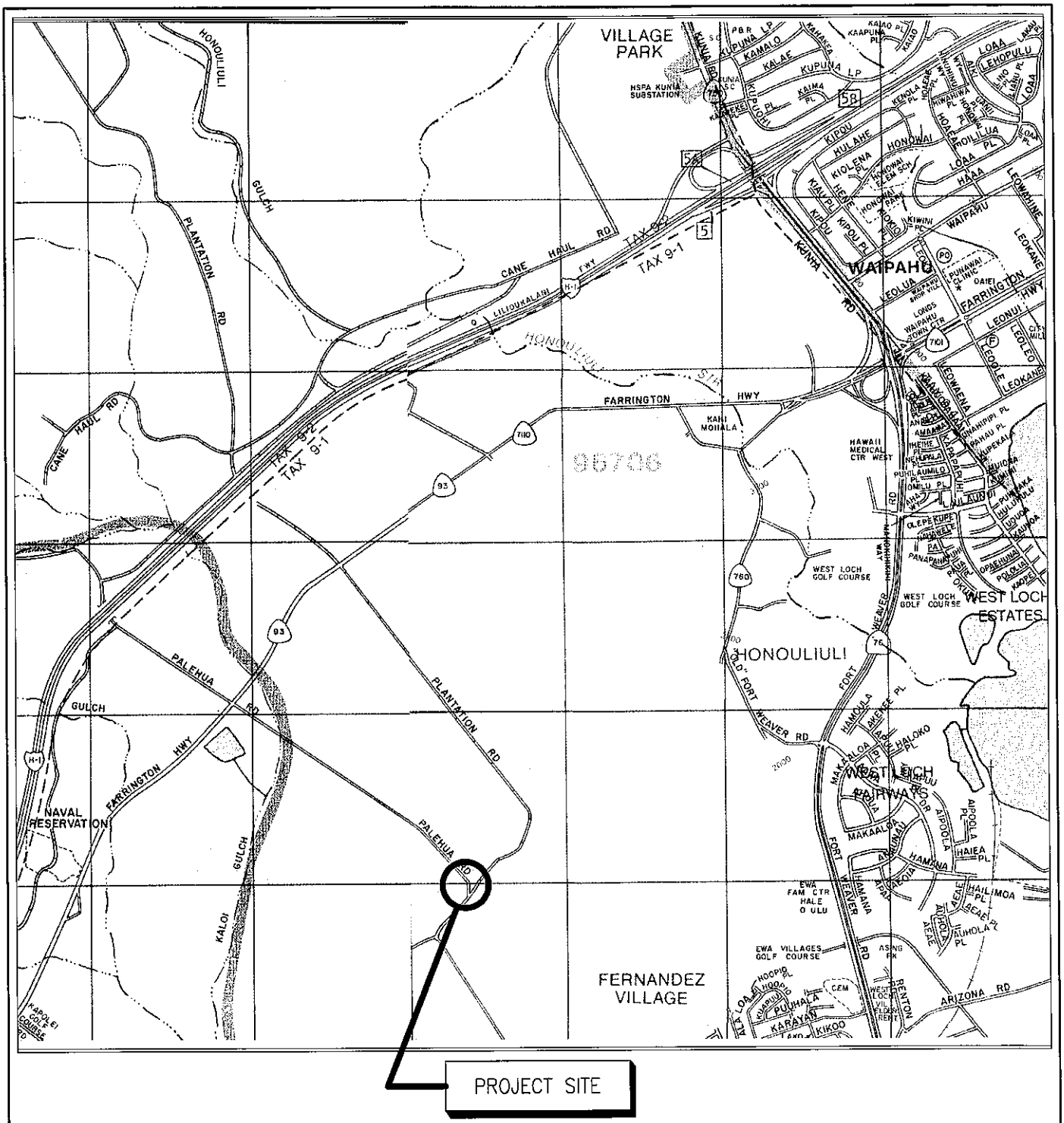
SOIL SAMPLING

Representative and bulk soil samples 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. The number of blows required to drive the sampler the final 12 inches are recorded at the appropriate depths on the boring logs, unless noted otherwise. Bulk soil samples were recovered from near borings B3 and B5, and bulk sample S1 between depths of about 1 and 2 feet below ground surface.

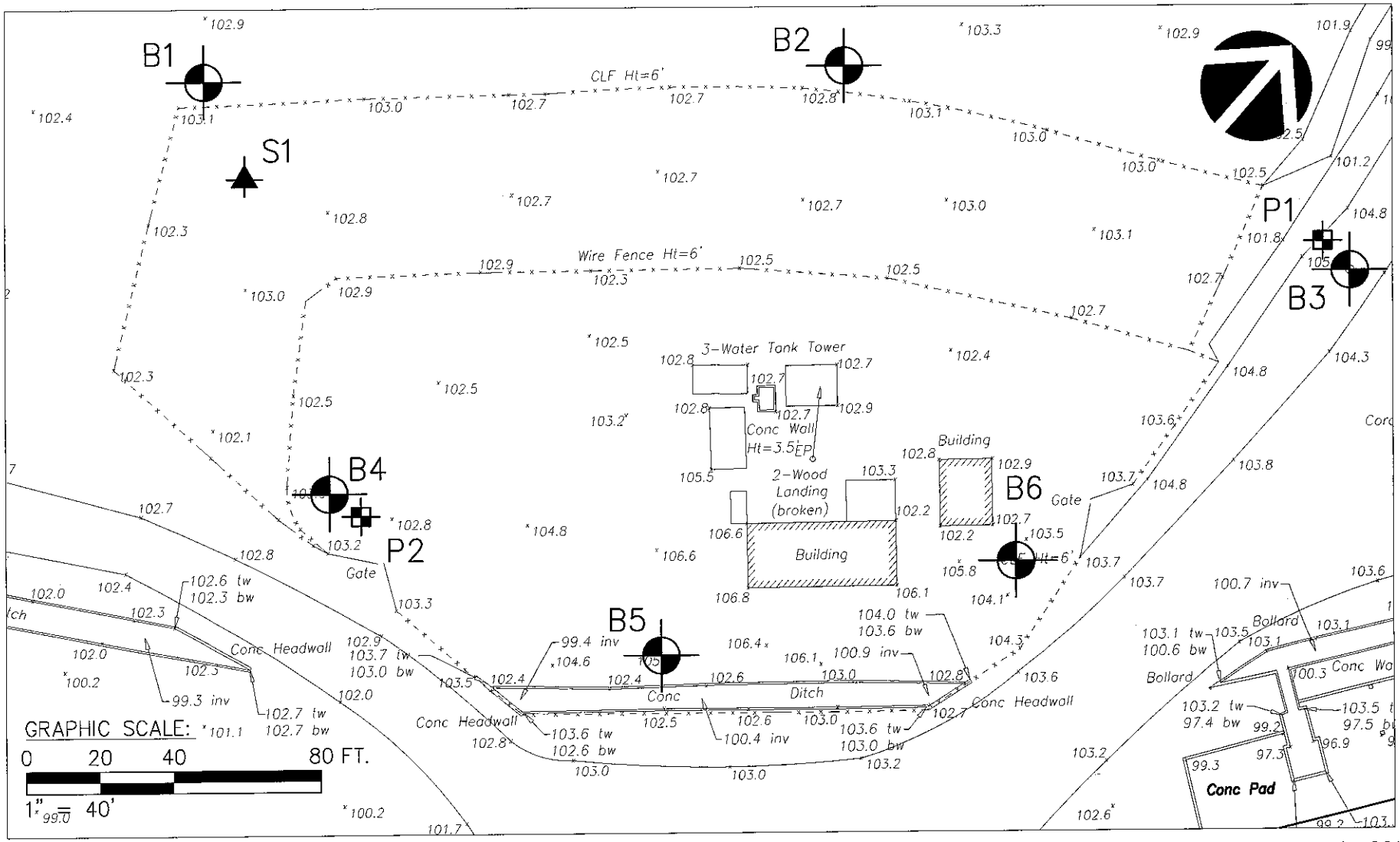
PERCOLATION TESTING

Two percolation test holes were drilled to depths of about 5 feet. Falling head percolation tests were performed in general accordance with Department of Health guidelines. The approximate test hole locations are shown on Plate A2.2, and test results are shown on Plates A5.1 and A5.2.



Reference: Bryan's Sectional Maps, 2008 Edition
(Copyright J.R. Clere, used with permission)

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	LOCATION MAP Plate A2.1

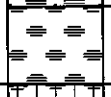
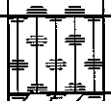
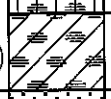
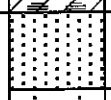
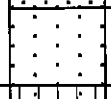
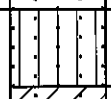
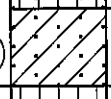
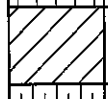
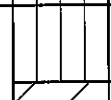
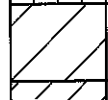
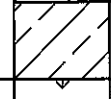
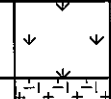
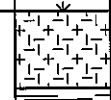
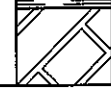


LEGEND:

- Approximate location of borings
- Approximate location of percolation tests
- Approximate location of bulk sample

Reference: Topographic Survey provided by EnviroServices & Training Center, LLC received on January 19, 2010.

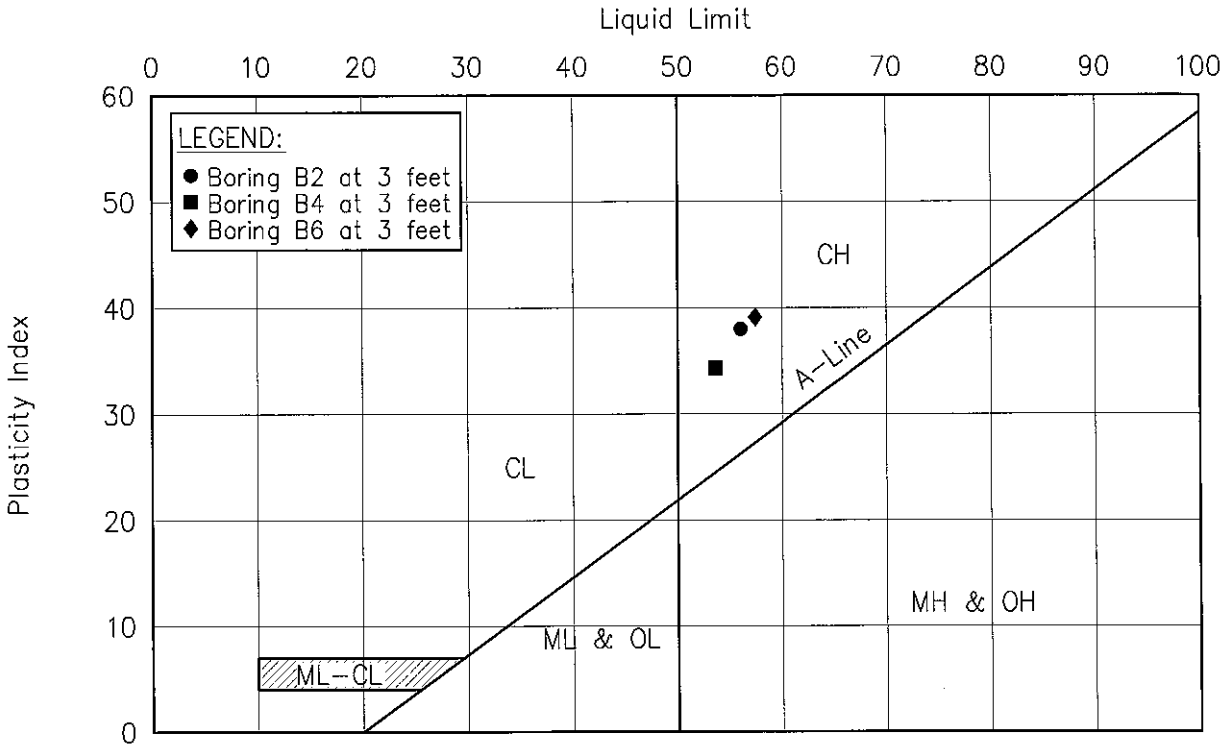
W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	BORING LOCATION PLAN Plate A2.2

MAJOR DIVISIONS			GROUP SYMBOLS		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 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 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 soils.
					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	NX / 4" Coring	Water Level

W.O. 09–4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	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 Coarse gravel Fine gravel	3 in. to No. 4 (4.76 mm) 3 in. to 3/4 in. 3/4 in. to No. 4 (4.76 mm)
Sand Coarse sand Medium sand Fine sand	No. 4 (4.76 mm) to No. 200 (0.074 mm) No. 4 (4.76 mm) to No. 10 (2.0 mm) No. 10 (2.0 mm) to No. 40 (0.42 mm) No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and clay	Smaller than No. 200 (0.074 mm)

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	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	Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

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

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	ROCK WEATHERING CLASSIFICATION SYSTEM Plate A3.3

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4856

BORING NO. B1 DRIVING WT. 140 lb. START DATE 1/29/10

SURFACE ELEV. 103±* DROP 30 in. END DATE 1/29/10

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CH) – Brown, moist, stiff.
			45	96	20	
5			41	107	24	
						End boring at 5.5 feet.
10						
15						
20						Neither groundwater nor seepage water encountered.
25						* Elevations based on Topographic Survey provided by EnviroServices & Training Center, LLC received on January 19, 2010.
30						

Plate A4.1

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4856

BORING NO. B2 DRIVING WT. 140 lb. START DATE 1/29/10

SURFACE ELEV. 103± DROP 30 in. END DATE 1/29/10

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CH) – Brown, moist, stiff.
			57	94	19	
			38	104	22	
5			31	98	28	With completely weathered rock fragments at 5 feet.
						End boring at 6.5 feet.
10						
15						
20						
						Neither groundwater nor seepage water encountered.
25						
30						

Plate A4.2

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4856

BORING NO. B3 DRIVING WT. 140 lb. START DATE 1/29/10

SURFACE ELEV. 105± DROP 30 in. END DATE 1/29/10

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			20/6"	Not Available	6	Silty SAND (SM) – Grayish brown, dry, dense, with coralline and basalt gravel. (Fill)
			25/6"	89	23	Silty CLAY (CH) – Brown, moist, stiff.
5			57	95	19	
			91/10"	108	20	With completely weathered rock fragments at 8 feet.
10						End boring at 9.5 feet.
15						
20						Neither groundwater nor seepage water encountered.
25						
30						

Plate A4.3

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4856

BORING NO. B4 DRIVING WT. 140 lb. START DATE 1/29/10

SURFACE ELEV. 103± DROP 30 in. END DATE 1/29/10

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						GRAVEL (GP) – Brown, dry, dense, with sand and coral fragments. (Fill)
			18/6"	Not Available	3	
			17/6"	94	22	Silty CLAY (CH) – Brown, moist, stiff.
			67	109	19	With completely weathered rock fragments from 3 feet.
5			70	107	19	
			93	101	20	
10						End boring at 10.5 feet.
15						
20						Neither groundwater nor seepage water encountered.
25						
30						

Plate A4.4

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4856

BORING NO. B5 DRIVING WT. 140 lb. START DATE 1/29/10

SURFACE ELEV. 105± DROP 30 in. END DATE 1/29/10

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			25	Not Available	2	GRAVEL (GP) – Brown, dry, medium dense, with sand, coral and AC fragments. (Fill)
5			47	94	21	Silty CLAY (CH) – Brown, moist, stiff, with completely weathered rock fragments.
						End boring at 5.5 feet.
						Neither groundwater nor seepage water encountered.

Plate A4.5

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 09-4856

BORING NO. B6 DRIVING WT. 140 lb. START DATE 1/29/10
SURFACE ELEV. 104± DROP 30 in. END DATE 1/29/10

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			35	Not Available	4	GRAVEL (GP) – Light brown, dry, dense, with sand and coral fragments. (Fill)
			70	108	22	Silty CLAY (CH) – Brown, moist, stiff.
5			88	112	20	With completely weathered rock fragments from 5 feet.
10			97/10"	110	20	
						End boring at 10.5 feet.
15						
20						Neither groundwater nor seepage water encountered.
25						
30						

Plate A4.6

SITE EVALUATION/PERCOLATION TEST

Date/Time: January 29, 2010 / 3:15 p.m.
Test performed by: Hirata & Associates, Inc.
Owner: State of Hawaii (Leased by Aloun Farms)
Tax Map Key: 9-1-017: 93 (formerly 9-1-017: 88)
Test Number: P1

Elevation: 105± ft.
Depth to Groundwater Table: >9.5 ft. below grade (Based on nearby boring B3)
Depth to Bedrock (if observed): >9.5 ft. below grade (Based on nearby boring B3)
Diameter of Hole: 4 in.
Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 36	Grayish brown silty sand with gravel (Fill)
36 - 60	Brown silty clay

PERCOLATION READINGS

Time 12 inches of water to seep away: >30 min.
Time 12 inches of water to seep away: >30 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
30 min.	2-1/4		
30 min.	2-5/16		
30 min.	1-15/16		
30 min.	1-7/8		

Percolation Rate (time/final water level drop): 16 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.

Rick Yoshida
Engineer's Signature/Stamp

RICK I.K. YOSHIDA
LICENSED PROFESSIONAL ENGINEER
No. 11118-C
HAWAII, U.S.A.

Plate A5.1

SITE EVALUATION/PERCOLATION TEST

Date/Time: January 29, 2010 / 3:20 p.m.
Test performed by: Hirata & Associates, Inc.
Owner: State of Hawaii (Leased by Aloun Farms)
Tax Map Key: 9-1-017: 93 (formerly 9-1-017: 88)
Test Number: P2

Elevation: 103± ft.
Depth to Groundwater Table: >10.5 ft. below grade (Based on nearby boring B4)
Depth to Bedrock (if observed): >10.5 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 - 24	Brown gravel with sand and coral fragments (Fill)
24 - 60	Brown silty clay with completely weathered rock fragments

PERCOLATION READINGS

Time 12 inches of water to seep away: >30 min.
Time 12 inches of water to seep away: >30 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
30 min.	5/8		
30 min.	3/16		
30 min.	3/16		
30 min.	3/16		

Percolation Rate (time/final water level drop): 160 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.

RICK I.K. YOSHIDA
LICENSED PROFESSIONAL ENGINEER
No. 11118-C
HAWAII, U.S.A.

Rick Yoshida
Engineer's Signature/Stamp

Plate A5.2

APPENDIX B

LABORATORY TESTING

DESCRIPTION OF LABORATORY TESTING

LABORATORY TESTING AGENCY

Due to possible soil contamination, all laboratory testing was performed by Advanced Terra Testing, Inc. in Lakewood, Colorado.

CLASSIFICATION

Field classification was verified in the laboratory in accordance with the Unified Soil Classification System. Laboratory classification was determined by both visual examination and Atterberg Limit tests performed in general accordance with ASTM D 4318. Atterberg test results are shown on the Unified Soil Classification System Sheet, Plate A3.2. The final classifications are shown at the appropriate locations on the Boring Logs, Plates A4.1 through A4.6.

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 A4.6.

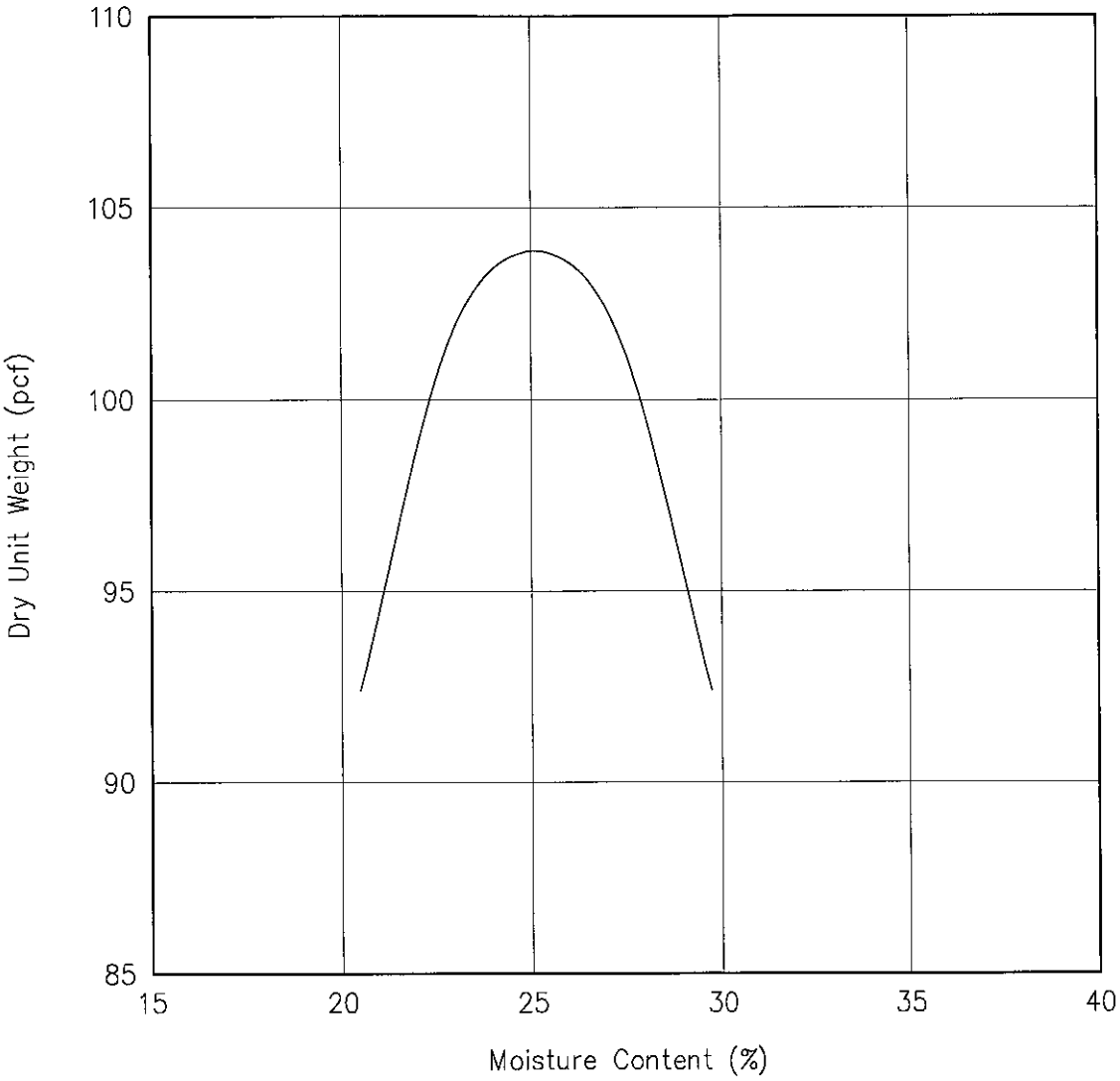
PROCTOR TESTS

Standard Proctor tests were performed in general accordance with ASTM D 698 on bulk samples obtained from near borings B3 and B5, and bulk sample S1, between depths of about 1 and 2 feet below grade. The test is used to determine the optimum moisture content at which the soil compacts to 100 percent density. Results are shown on Plates B2.1 through B2.3.

CALIFORNIA BEARING RATIO TESTS

CBR tests were performed in general accordance with ASTM D 1883 on bulk samples obtained from near borings B3 and B5, and bulk sample S1 between depths

of about 1 and 2 feet below grade. Bulk samples from near boring B5 and bulk sample S1 were compacted to approximately 95 percent compaction, while the bulk sample near boring B3 was compacted to approximately 100 percent compaction. 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 B3.1 through B3.3.



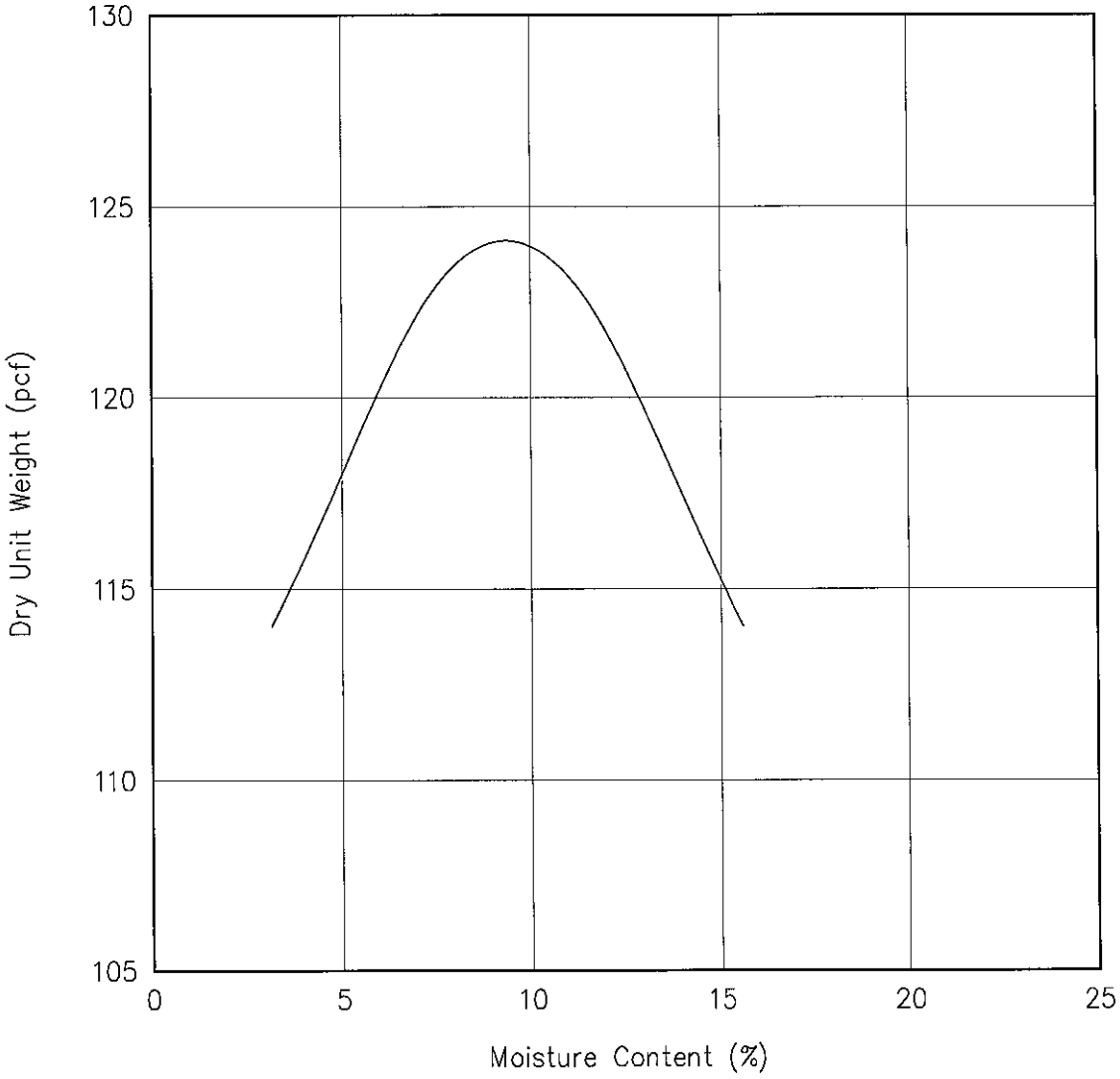
Soil Data

Location: Bulk sample S1 from 1 to 2 feet
Description: Brown silty clay

Test Results

Maximum Dry Density: 104 pcf
Optimum Moisture Content: 25%

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	STANDARD PROCTOR CURVE Plate B2.1



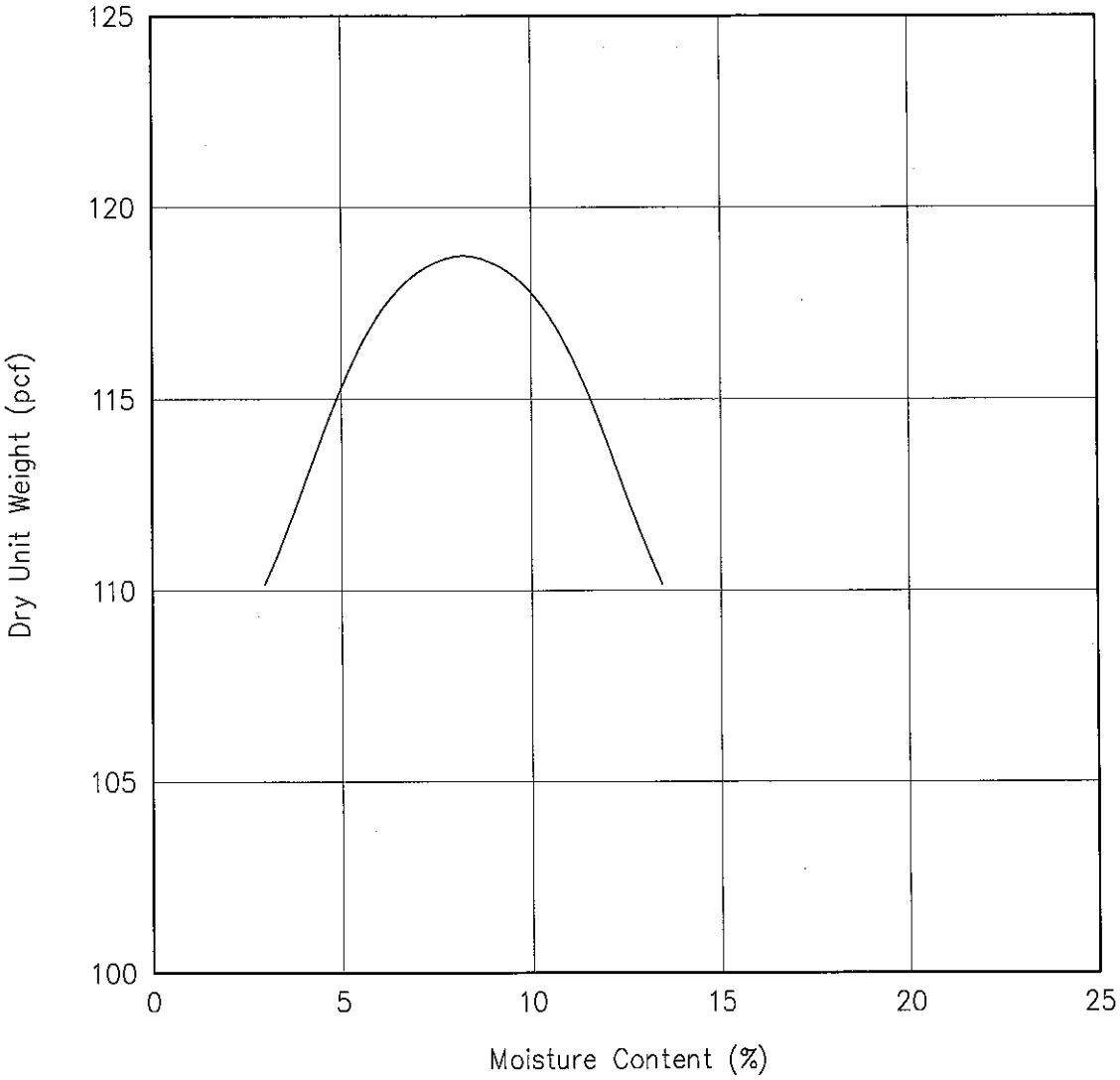
Soil Data

Location: Near boring B3 from 1 to 2 feet
Description: Grayish brown silty sand

Test Results

Maximum Dry Density: 124 pcf
Optimum Moisture Content: 9%

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	STANDARD PROCTOR CURVE Plate B2.2



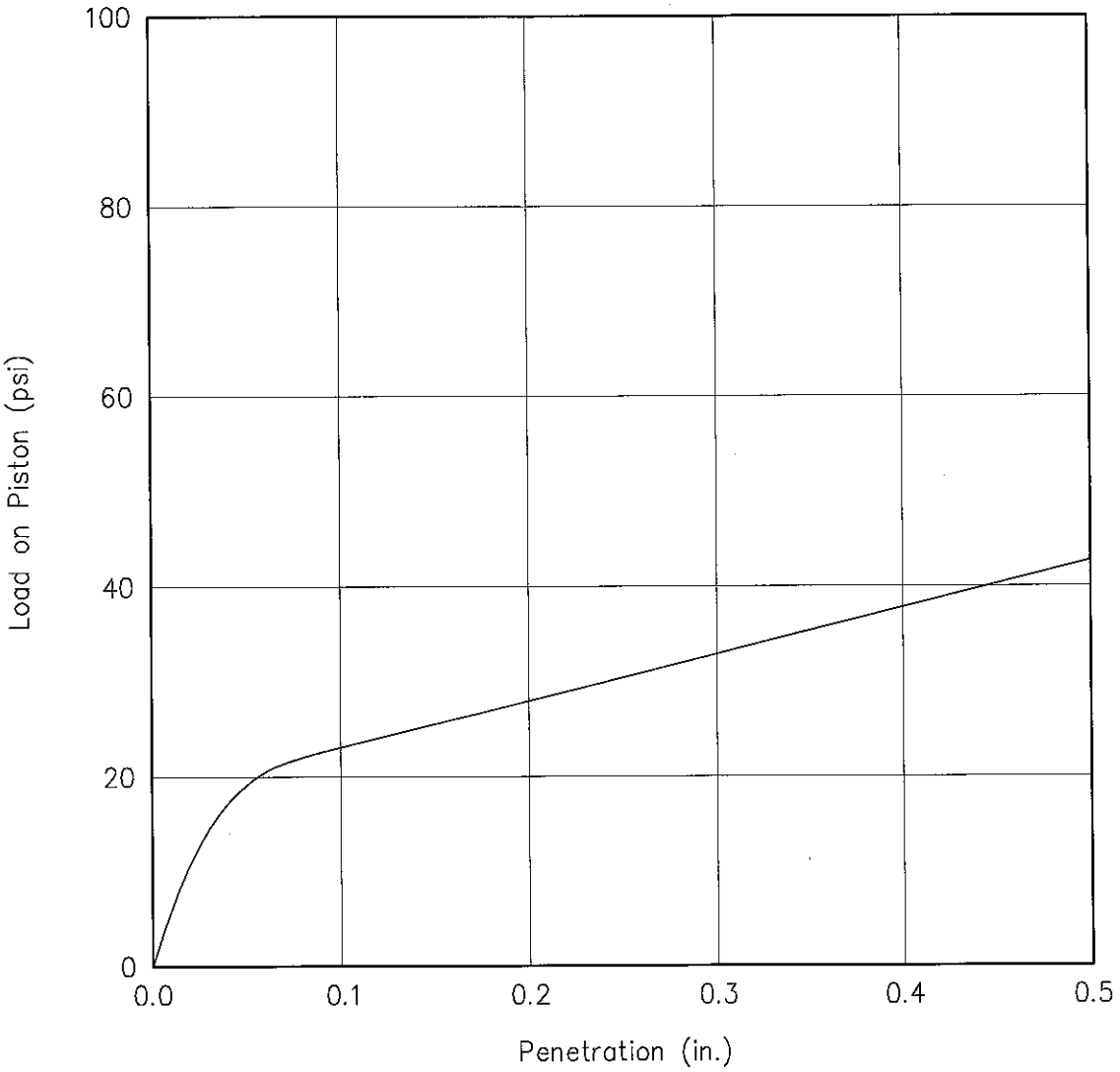
Soil Data

Location: Near boring B5 from 1 to 2 feet
Description: Brown gravel

Test Results

Maximum Dry Density: 119 pcf
Optimum Moisture Content: 8%

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	STANDARD PROCTOR CURVE Plate B2.3



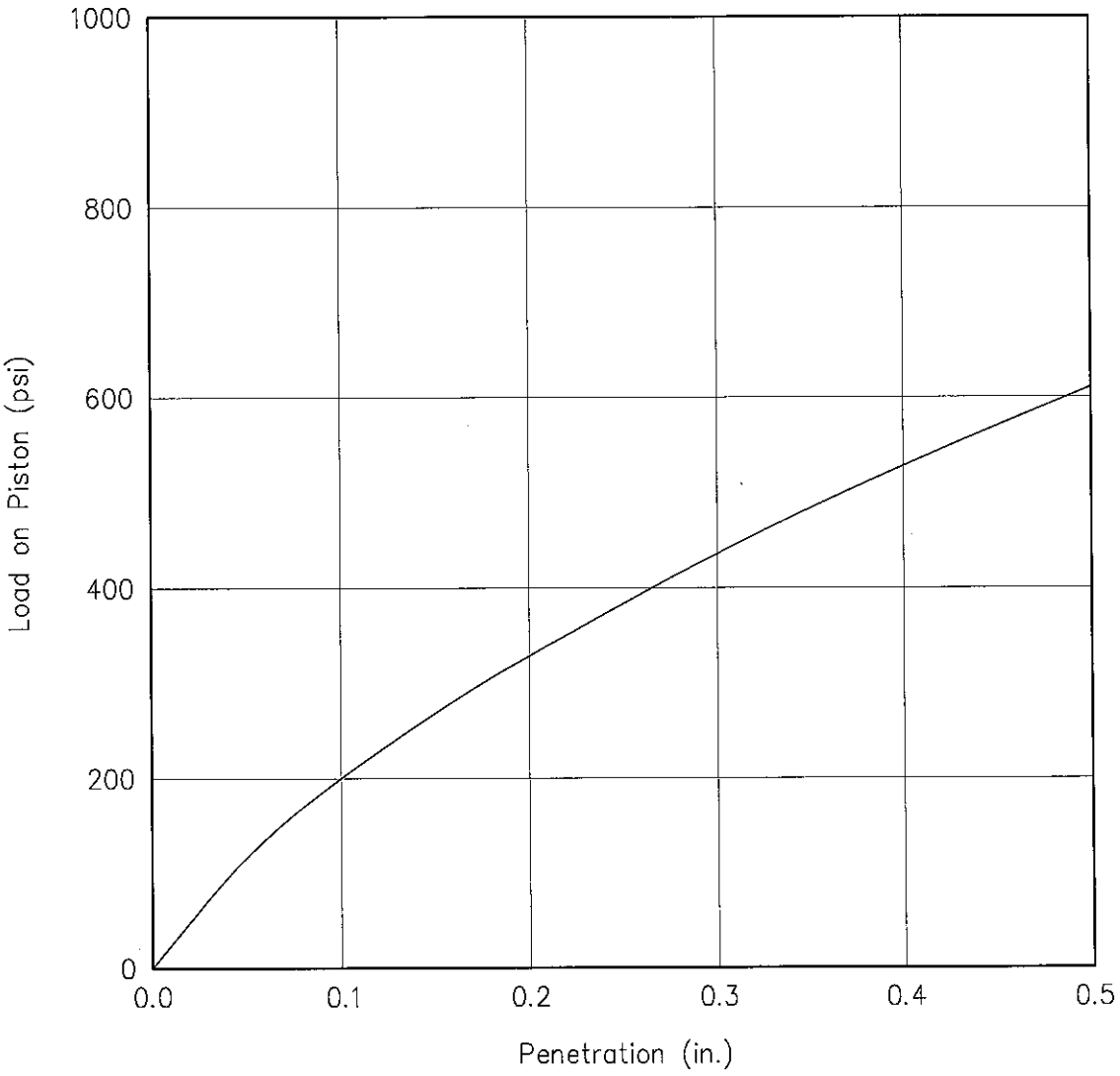
Soil Data

Location:	Bulk sample S1 from 1 to 2 feet
Description:	Brown silty clay
Sample Dry Density:	99 pcf
Sample Moisture Content:	25%

Test Results

CBR Value:	2%
Expansion:	1.0%

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	CBR STRESS PENETRATION CURVE Plate B3.1



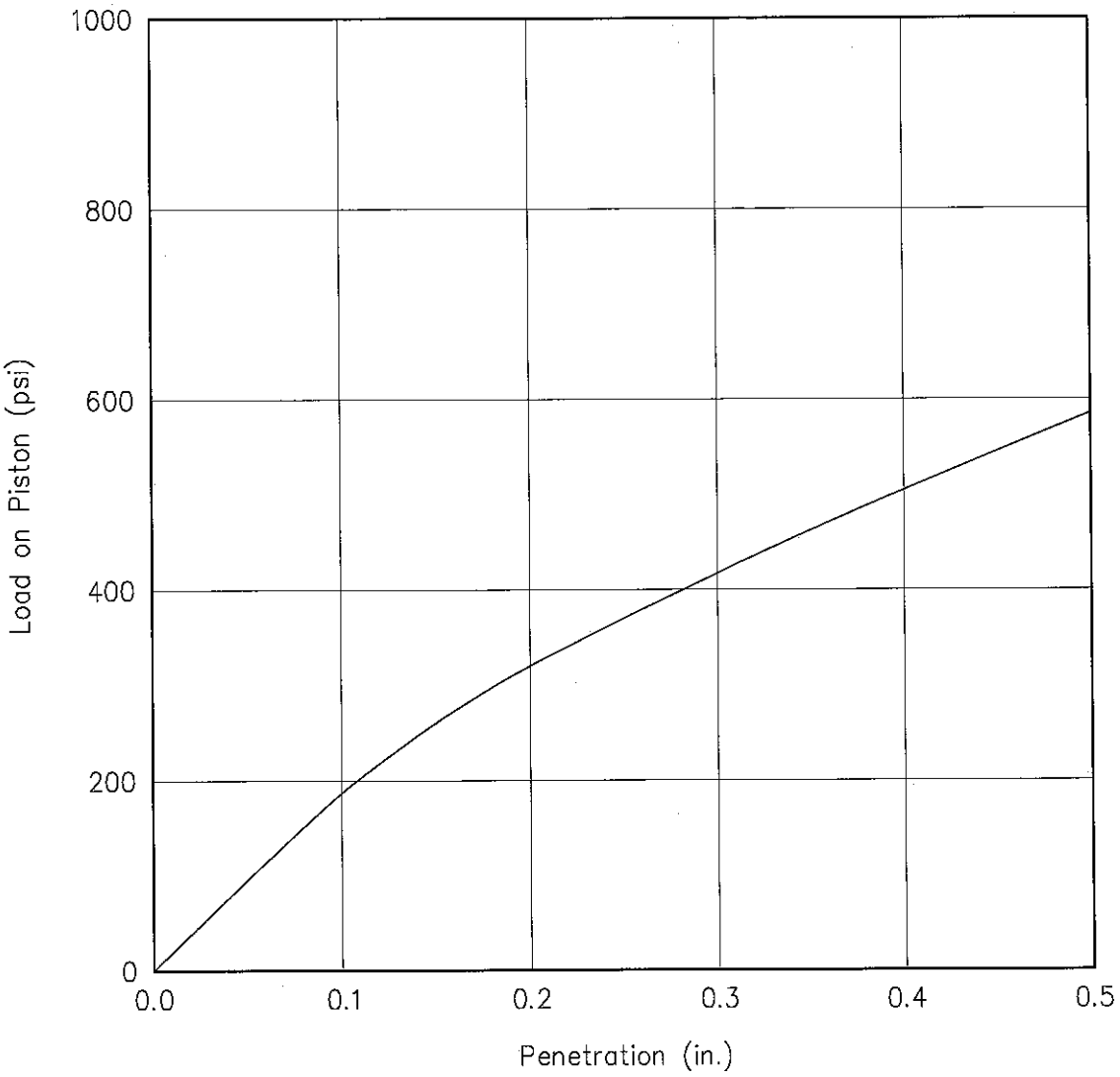
Soil Data

Location:	Near boring B3 from 1 to 2 feet
Description:	Grayish brown silty sand
Sample Dry Density:	124 pcf
Sample Moisture Content:	8%

Test Results

CBR Value:	20%
Expansion:	0.1%

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	CBR STRESS PENETRATION CURVE Plate B3.2



Soil Data

Location:	Near boring B5 from 1 to 2 feet
Description:	Brown gravel
Sample Dry Density:	114 pcf
Sample Moisture Content:	9%

Test Results

CBR Value:	19%
Expansion:	0.1%

W.O. 09-4856	Asphalt Pavement Cover, Former East Kapolei Pesticide Facility
Hirata & Associates, Inc.	CBR STRESS PENETRATION CURVE Plate B3.3