
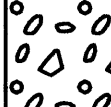

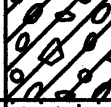







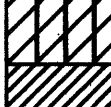
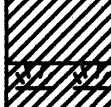


GEOLABS, INC.


Geotechnical Engineering


Soil Log Legend


UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)						
MAJOR DIVISIONS			USCS		TYPICAL DESCRIPTIONS	
COARSE-GRAINED SOILS	GRAVELS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		LESS THAN 5% FINES		GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
	SANDS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
		LESS THAN 5% FINES		SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
		SANDS WITH FINES		SM	SILTY SANDS, SAND-SILT MIXTURES	
FINE-GRAINED SOILS	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 50 OR MORE		MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
				CH	INORGANIC CLAYS OF HIGH PLASTICITY	
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS		


NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS


LEGEND


 (2-INCH) O.D. STANDARD PENETRATION TEST

 (3-INCH) O.D. MODIFIED CALIFORNIA SAMPLE

 SHELBY TUBE SAMPLE

 GRAB SAMPLE

 CORE SAMPLE

 WATER LEVEL OBSERVED IN BORING

LL LIQUID LIMIT (NP=NON-PLASTIC)

PI PLASTICITY INDEX (NP=NON-PLASTIC)


TV TORVANE SHEAR (tsf)

PEN POCKET PENETROMETER (tsf)

UC UNCONFINED COMPRESSION (psi)

UU UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (ksf)

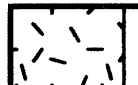


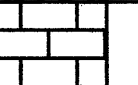


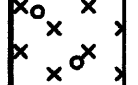


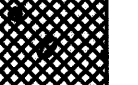

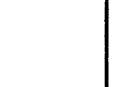
Plate A-0.1



GEOLABS, INC.

Geotechnical Engineering

Rock Log Legend

ROCK DESCRIPTIONS			
	BASALT		FINGER CORAL
	BOULDERS		LIMESTONE
	BRECCIA		SANDSTONE
	CLINKER		SILTSTONE
	COBBLES		TUFF
	CORAL		VOID/CAVITY

ROCK DESCRIPTION SYSTEM

ROCK FRACTURE CHARACTERISTICS

The following terms describe general fracture spacing of a rock:

Massive:

Greater than 24 inches apart

Slightly Fractured:

12 to 24 inches apart

Moderately Fractured:

6 to 12 inches apart

Closely Fractured:

3 to 6 inches apart

Severely Fractured:

Less than 3 inches apart

DEGREE OF WEATHERING

The following terms describe the chemical weathering of a rock:

Unweathered:

Rock shows no sign of discoloration or loss of strength.

Slightly Weathered:

Slight discoloration inwards from open fractures.

Moderately Weathered:

Discoloration throughout and noticeably weakened though not able to break by hand.

Highly Weathered:

Most minerals decomposed with some corestones present in residual soil mass. Can be broken by hand.

Extremely Weathered:

Saprolite. Mineral residue completely decomposed to soil but fabric and structure preserved.

HARDNESS

The following terms describe the resistance of a rock to indentation or scratching:

Very Hard:

Specimen breaks with difficulty after several "pinging" hammer blows.  
Example: Dense, fine grain volcanic rock

Hard:

Specimen breaks with some difficulty after several hammer blows.  
Example: Vesicular, vugular, coarse-grained rock

Medium Hard:

Specimen can be broked by one hammer blow. Cannot be scraped by knife. SPT may penetrate by ~25 blows per inch with bounce.  
Example: Porous rock such as clinker, cinder, and coral reef

Soft:

Can be indented by one hammer blow. Can be scraped or peeled by knife. SPT can penetrate by ~100 blows per foot.  
Example: Weathered rock, chalk-like coral reef

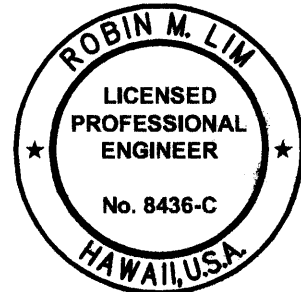
Very Soft:

Crumbles under hammer blow. Can be peeled and carved by knife. Can be indented by finger pressure.  
Example: Saprolite

Plate A-0.2

GEOTECHNICAL NOTES

- A geotechnical engineering report entitled "Geotechnical Engineering Exploration, Seismic Retrofit Of Interstate Route H-1, Pali Interchange and Nuuanu Grade Separation, Honolulu, Oahu, Hawaii" dated October 20, 2009 has been prepared by Geolabs, Inc. A copy of the report is on file at the office of the Engineer for review by the Contractor.
- For boring locations, see Sheet S6.
- The information presented in the logs of borings depict the subsurface conditions encountered at that specified location and at the time of the field exploration only. Variations of subsoil conditions from those depicted in the logs of borings may occur between and beyond the borings.
- The penetration resistance shown on the logs of borings indicate the number of blows required for the specific sampler type used. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.
- The data given is for general information only. Bidders shall examine the site and the boring data and draw their own conclusions therefrom as to the character of materials to be encountered. The Engineer will not assume responsibility for variations of subsoil quality or conditions other than at the boring locations shown and at the time the borings were taken.




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*Robin M. Lim*  
4/20/2012

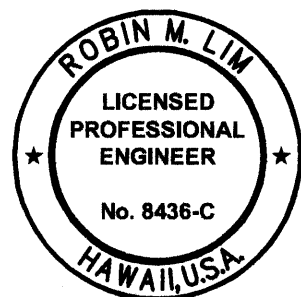
GEOLABS, INC. EXP. DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**BORING LOG NOTES & LEGEND**  
**INTERSTATE ROUTE H-1**  
**Seismic Retrofit- Pali Interchange**  
**and Nuuanu Separation**  
**Federal Aid Project No. BR-H1-1(249)**  
Scale: As Noted Date: February 2010  
SHEET No. G-1 OF 4 SHEETS

 <b>GEOLABS, INC.</b> Geotechnical Engineering		SEISMIC RETROFIT OF INTERSTATE ROUTE H-1 PALI INTERCHANGE AND NUUANU GRADE SEPARATION HONOLULU, OAHU, HAWAII								Log of Boring <b>1</b>
Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample Graphic	USCS	Approximate Ground Surface Elevation (feet) : 26 *
Direct Shear	11	103	67		62				GW	4.5-inch ASPHALTIC CONCRETE
	25		67		14				SM	6.5-inch CONCRETE
	25	77	67		6		5			Dark reddish gray with gray mottling SANDY GRAVEL (BASALTIC) with silt, very dense, damp (base course)
Sieve	41		83		27		10		SM	Orangish brown with multi-color mottling SILTY SAND with some clay, medium dense, damp (alluvium)
			100		5/0" Ref.		15			grades to loose at 5.5 feet
			100				20			Yellowish tan with multi-color mottling SILTY SAND with gravel, medium dense, wet (alluvium)
LL=98 PI=61			67				25			Gray with tan mottling COBBLES AND BOULDERS (BASALTIC) with clayey sand, very dense (alluvium)
			87				30		CH	Orangish brown with multi-color mottling SILTY CLAY with sand, stiff to very stiff (alluvium)
	81		83		14	3.5	35			grades with cobbles and gravel (basaltic)
			100		5/0" Ref.		40			Gray with multi-color mottling COBBLES (BASALTIC) with gravel and some sand, dense (alluvium)
			83				45		CH	Orangish brown with multi-color mottling SILTY SAND with gravel, very stiff (alluvium)
			75				50			
UC=181 psi	63		67		11	3.5	55			
	60		83		8	3.5	60			
			100		50		65			Gray with tan mottling vesicular BASALT, severely to closely fractured, moderately to highly weathered, hard
			90		37		70			
										Boring terminated at 71 feet * Elevations estimated from Topo Map transmitted by Mitsunaga & Associates, Inc. on 4/3/09.
Date Started: May 4, 2009										Water Level: 12.1 ft. 05/04/2009 1015 HRS
Date Completed: May 5, 2009										
Logged By: Y. Chiba										Drill Rig: CME-75
Total Depth: 71 feet										Drilling Method: 4" Auger & PQ Coring
Work Order: 5648-10										Driving Energy: 140 lb. wt., 30 in. drop

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	

ORIGINAL PLAN	NOTE BOOK
No.	




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OR UNDER MY SUPERVISION.


*[Signature]*  
4/30/2012

GEOLABS, INC. EXP. DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**BORING LOGS - 1**  
**INTERSTATE ROUTE H-1**  
**Seismic Retrofit- Pali Interchange**  
**and Nuuanu Separation**  
**Federal Aid Project No. BR-H1-1(249)**  
Scale: As Noted Date: February 2010

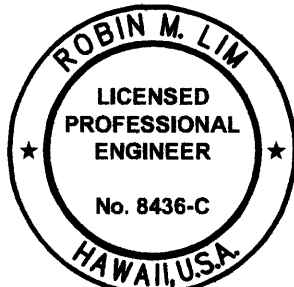


		GEOLABS, INC.					SEISMIC RETROFIT OF INTERSTATE ROUTE H-1 PALI INTERCHANGE AND NUUANU GRADE SEPARATION HONOLULU, OAHU, HAWAII										Log of Boring 2	
Geotechnical Engineering																		
Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample Graphic	USCS	Approximate Ground Surface Elevation (feet ): 50 *								
										Description								
	20	79	39		13	2.5			CL	Brown with multi-color mottling SANDY CLAY with gravel, medium stiff, dry								
	16		11		15		5											
	20	71	39		7	3.0												
							10		ML/MH/SW	Light gray with multi-color mottling CLAYEY SILT with some gravel, medium stiff, dry to damp								
	28	62			11					Brown with multi-color mottling GRAVELLY SAND (BASALTIC), medium dense, dry (cinder)								
	15	87	78		49		15											
							20		SM	Grayish brown with multi color mottling SAND (BASALTIC) with some silt, medium dense, dry (cinder)								
	Sieve	13	83		19		25		CH	Orangish brown with multi-color mottling SILTY CLAY with some gravel (basaltic), very stiff, damp (alluvium)								
LL=63 PI=33	28	79	78		54	3.0			CH	Brown with multi-color mottling SILTY CLAY with some sand, medium stiff, damp (alluvium) grades with some gravel								
	46	83		28	2.5		30											
							35		SC	Brown with multi-color mottling CLAYEY SAND (BASALTIC) with some gravel and cobbles, medium dense (alluvium)								
	Direct Shear	56	68	78	28		40			Gray with multi-color mottling BOULDERS AND COBBLES (BASALTIC) with clayey sand, dense (alluvium)								
			0		50/0" Ref.		45											
			100				50		SC	Brown with multi-color mottling CLAYEY SAND (BASALTIC) with some gravel, medium dense (alluvium)								
							55											
	48	71	0		47		60			grades to dense								
	25		48		41		65		GP/CL	Dark gray with multi-color mottling COBBLES AND GRAVEL (BASALTIC) with silty clay, dense (alluvium)								
			100				70			Orangish brown with multi-color mottling SANDY CLAY with silt, medium stiff (alluvium)								
	48	72	100		28	3.5			CH	Grayish brown with multi-color mottling SILTY CLAY with some fine sand, very stiff (alluvium)								
			100				75											
Date Started: April 29, 2009										Water Level: ± 33.0 ft. 04/29/2009 1214 HRS								
Date Completed: May 1, 2009										Drill Rig: CME-75								
Logged By: Y. Chiba										Drilling Method: 4" Auger & PQ Coring								
Total Depth: 111 feet										Driving Energy: 140 lb. wt., 30 in. drop								
Work Order: 5648-10																		

		GEOLABS, INC. Geotechnical Engineering					SEISMIC RETROFIT OF INTERSTATE ROUTE H-1 PALI INTERCHANGE AND NUUANU GRADE SEPARATION HONOLULU, OAHU, HAWAII					Log of Boring 2
Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample Graphic	USCS	(Continued from previous plate) Description		
UC= 8012 psi	81	53	78 29		28	3.0	0		CH			
			0 74		10/3" Ref.		80		GP	Tannish brown with multi-color mottling SANDY GRAVEL (BASALTIC) in a silty clay matrix, dense (alluvium)		
							85		CL	Brownish tan with multi-color mottling SANDY CLAY with some silt and little gravel, medium stiff (old alluvium)		
	114		67 100		17		90					
	102		67 24		12		95		GP	Gray with multi-color mottling GRAVEL (BASALTIC) with sand and some clay, medium dense (old alluvium)		
			77	47	3/0" Ref.		100			Gray with multi-color mottling vesicular BASALT, severely to closely fractured, highly weathered, hard grades to moderately fractured, moderately weathered, very hard		
			93	70			105					
			83	77			110					
							115					
							120					
						125						
						130						
						135						
						140						
						145						
						150						
Date Started: April 29, 2009									Water Level: ± 33.0 ft. 04/29/2009 1214 HRS			
Date Completed: May 1, 2009												
Logged By: Y. Chiba									Drill Rig: CME-75			
Total Depth: 111 feet									Drilling Method: 4" Auger & PQ Coring			
Work Order: 5648-10									Driving Energy: 140 lb. wt., 30 in. drop			

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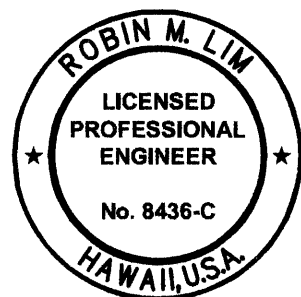
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4/30/2012  
GEOLABS, INC. EXP. DATE

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	BR-H1-1(249)	2010	29	61

 <b>GEOLABS, INC.</b> Geotechnical Engineering		SEISMIC RETROFIT OF INTERSTATE ROUTE H-1 PALI INTERCHANGE AND NUUANU GRADE SEPARATION HONOLULU, OAHU, HAWAII										Log of Boring  3
Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample Graphic	USCS	Approximate Ground Surface Elevation (feet ): 51.7 *		
Description												
LL=51 PI=27	24	84	78		14	2.0			CL	Dark brown SANDY CLAY with gravel (basaltic) and some silt, stiff, damp grades with multi-color mottling and sand (coralline)		
	26		50		14	2.0						
	31	79	61		14	1.5	5					
Direct Shear	21		50		4	1.5	10		SP	Dark brownish black SAND (BASALTIC), medium dense, dry to damp (cinder)		
	22	72	44		40		15					
	30		50		12	2.5	20					
TXUU	34	85	78		42	2.5	25		CH	Light yellowish gray with multi-color mottling SILTY CLAY with gravel and cobbles (basaltic), very stiff, damp (alluvium)		
	56		83		19	3.0	30					
							35					
Sieve							40		SC	Brown with multi-color mottling COBBLES in a sandy clay matrix, dense, saturated (alluvium) grades with boulders		
							45					
							50					
TXUU	82		83		12		55		SC	Tannish brown with multi-color mottling CLAYEY SAND with some gravel, medium dense (alluvium)		
	87	53	78		16		60					
	70		83		15		65					
							70		CL			
							75					
Date Started: April 27, 2009								Water Level: ± 34.6 ft. 04/27/2009 1034 HRS				
Date Completed: April 28, 2009												
Logged By: Y. Chiba								Drill Rig: CME-75				
Total Depth: 90.5 feet								Drilling Method: 4" Auger & PQ Coring				
Work Order: 5648-10								Driving Energy: 140 lb. wt., 30 in. drop				

 <b>GEOLABS, INC.</b> Geotechnical Engineering		SEISMIC RETROFIT OF INTERSTATE ROUTE H-1 PALI INTERCHANGE AND NUUANU GRADE SEPARATION HONOLULU, OAHU, HAWAII							Log of Boring <b>3</b>	
Other Tests	Moisture Content (%)	Dry Unit Weight (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample Graphic	USCS	(Continued from previous plate)
UC= 15233 psi	79		83		12	2.5			CL	Description
			48							Tan with black mottling SANDY CLAY with silt, medium stiff (alluvium)
			93	83						Gray with tan mottling vesicular BASALT, closely to severely fractured, highly weathered, medium hard grades to slightly fractured, slightly weathered, very hard grades to massive
			100	100			80			
							85			
							90			Boring terminated at 90.5 feet
							95			
							100			
							105			
							110			
							115			
							120			
							125			
							130			
							135			
							140			
							145			
							150			
Date Started: April 27, 2009							Water Level: ± 34.6 ft. 04/27/2009 1034 HRS			
Date Completed: April 28, 2009										
Logged By: Y. Chiba							Drill Rig: CME-75			
Total Depth: 90.5 feet							Drilling Method: 4" Auger & PQ Coring			
Work Order: 5648-10							Driving Energy: 140 lb. wt., 30 in. drop			

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STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**BORING LOGS - 3**  
**INTERSTATE ROUTE H-1**  
**Seismic Retrofit- Pali Interchange**  
**and Nuuanu Separation**  
**Federal Aid Project No. BR-H1-1(249)**  
Scale: As Noted Date: February 2010  
SHEET No. G-4 OF 4 SHEETS