

SOILS AND FEASIBILITY INVESTIGATION

KAOPA SUBDIVISION UNIT 3B

KAILUA, OAHU, HAWAII

for

LONE STAR HAWAII, INC.

W.O. 176

January 23, 1973



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering



ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering

1157 South King Street • Honolulu, Hawaii 96814 • Phone 531-5733

January 23, 1973
W.O. 176

Lone Star Hawaii, Inc.
1020-E Keolu Drive
Kailua, Oahu, Hawaii 96734

Attention: Mr. William Rus

Gentlemen:

The following report titled "Soils and Feasibility Investigation, Kaopa Subdivision Unit 3B, Kailua, Oahu, Hawaii," dated January 23, 1973, our Work Order 176 is enclosed.

Based upon the results of our exploratory borings, we feel that the proposed three extensions of land into the lake will not be feasible. Much of the material was found to be soft, and problems due to settlement and slope failures may exist.

Portions of the lake adjacent to Keolu Drive Extension were found to be firm while other portions were found to be soft. A limited number of residential pads may be feasible. We recommend that settlement markers be placed during grading operations to determine the extent of the soft areas.

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,

Ernest K. Hirata & Associates, Inc.

Ernest K. Hirata

EKH:gk

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SOILS AND FEASIBILITY INVESTIGATION

KAOPA SUBDIVISION UNIT 3B

KAILUA, OAHU, HAWAII

INTRODUCTION

The following report presents the results of a soils and feasibility investigation conducted on the subject property. A preliminary grading plan showing the area covered by this investigation and the approximate location of the borings is enclosed in the Appendix. This investigation was authorized to determine the subsurface soil conditions within the lake and to determine the feasibility of constructing the proposed development.

SITE DESCRIPTION

The subject area is located along the western portion of Enchanted Lakes adjacent to the proposed extension of Keolu Drive.

The area designated as Kaopa Subdivision Unit 3B is bounded on the north by the planned unit development known as Unit 8-B2. The western boundary includes the proposed extension of Keolu Drive while the southern boundary is limited by the Kaopa Subdivision Unit 1. The eastern boundary borders Enchanted

Lakes and will extend into the lake for a distance of approximately 120 feet. Much of the area is presently under water within the lake itself and portions of the site lie within a designated conservation district.

PROPOSED GRADING

Preliminary plans indicate that along the proposed extension of Keolu Drive, rock fill will be placed extending into the lake for a distance of 120 feet. Three extensions of approximately 350 to 400 feet will be placed to create additional marina homes, as can be seen on the enclosed plan.

FIELD EXPLORATION

Field exploration was performed between December 19, 1972 and January 12, 1973 by drilling nine exploratory test borings within the lake. Drilling platforms were constructed and exploratory borings placed at designated locations. Two borings were placed within the cul-de-sac of the two extensions. The remaining seven exploratory borings were placed between 85 to 120 feet from the centerline of the proposed Keolu Drive Extension. The approximate location of the exploratory borings are shown on the preliminary grading plan enclosed in the Appendix.

The soils were continuously logged by our field engineer and classified by visual examination in accordance with the Unified Soil Classification System.

Undisturbed samples of soils encountered were obtained at frequent intervals. Samples were obtained by driving a 3 inch O.D. split tube sampler with a 140 pound hammer from a height of 30 inches. The required blow count for each 6 inches of penetration was recorded. The soils encountered are logged on the Boring Logs along with the penetration blow counts and can be found on Plates A1 through A11.

SOIL CONDITIONS

Boring 1 was the only boring where decomposed rock was encountered. The decomposed rock was encountered at a depth of 28 feet below the bottom of the lake. Boring 3, also placed at the ends of the cul-de-sac was drilled to a maximum depth of 50 feet at which point cobbles were encountered. Both borings encountered a surface stratum of soft clayey silt ranging in depth from 4.5 to 9 feet below the lake. Underlying the soft clayey silt was loose to soft silty sand with large amounts of loose coral fragments.

Seven additional exploratory borings were placed paralleling the Keolu Drive Extension. Results from the exploratory

borings indicate that the soils underlying the site vary from loose and soft clayey silts to firm and medium dense silty sands and sandy silts. Borings 5, 7, and 9 encountered the soft and loose material while borings 2,4,6, and 8 encountered firm to medium dense material. All borings encountered soft organic clayey silts within the upper two to nine feet of lake bottom.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of our exploratory borings, we feel that the proposed three extensions of land into the lake will not be feasible. Much of the material was found to be loose and soft, and problems due to settlement and slope failures may exist.

Portions of the lake adjacent to Keolu Drive Extension were found to be firm, while other portions were found to be soft. A limited number of residential pads may be feasible. However, since there are soft portions separating the feasible portions, we would recommend that settlement markers be placed during grading operation to determine the extent of the soft material. We have shown on the preliminary grading plan, those areas where construction may be feasible.

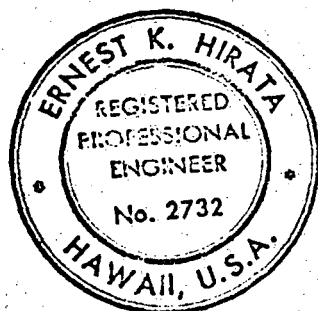
As a possible alternate solution, the entire area paralleling Keolu Drive Extension could be carefully filled, and settlement markers erected. Additional areas for construction may be feasible if sufficient time is allowed for the settlement of the soft underlying stratum. The time for total settlement to occur is difficult to determine and constant monitoring of the fill by use of settlement markers is recommended. If the settlement continues to occur, these areas which are not suitable could be converted into open areas and parks.

It should be noted that possibility of slope failures into the lake exist in those areas where soft clays were encountered.

Prior to filling operations along Keolu Drive Extension, we recommend that the upper two to eight feet of soft clayey silt be removed. This will help to eliminate possible slope failures and reduce total settlement of the fills. The extent of removal can be made during mucking operations.

Respectfully submitted,

Ernest K. Hirata & Associates, Inc.



Ernest K. Hirata
Ernest K. Hirata P.E. 2732

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B1

DRIVING WT. 140 lb.

DATE OF DRILLING 12-19-72

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							ø	C	
5	x		1 4 4						Clayey SILT (OL) - Gray, very soft w/sand in upper 1.5 feet. Numerous coral fragments and sand below 1.5 feet, soft and loose.
10	x		5 5 2						Silty SAND (SM) - Blue Gray, firm to loose, w/finger coral fragments.
15	x		4 3 2 2						
20	x		5 2 2 3						
	x		2 3 3 3	75.4	42.8				
25	x		3 2 3						
30	x		34 29	110.3	24.6				Decomposed Rock - Greenish Brown, hard. Plate A1

BORING LOG

BORING NO. B1 (Cont.)

DRIVING WT. 140 lb.

DATE OF DRILLING 12-19-7

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							φ	c	
							30	x	
35	x		15 12 10	No Recovery					
40									End boring at 36.5 feet. Water level of lake at 3.2 feet above existing ground.

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B2

DRIVING WT. 140 lb.

DATE OF DRILLING 1-3-73

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							ø	c	
									Clayey SILT (OL) - Gray and Black, very soft.
	x		2 2 8		No Recovery				Sandy SILT (ML) - Gray, loose, w/finger coral fragments firm.
-5-									
	x		3 1 1		No Recovery				CORAL FRAGMENTS - Tan to Gray, w/sandy silt, firm. Pockets of soft silty sand.
	x		4 2 3		No Recovery				
-10-									
	x		5 2 2		No Recovery				
-15-			5 4 3		No Recovery				
-20-	x		2 1 1		No Recovery				Grading loose and soft from 20 feet.
	x		2 1 PUSH		No Recovery				
-25-									End boring at 25 feet. Water level of lake at 2.2 feet above existing ground.
-30-									

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B3

DRIVING WT. 140 lb.

DATE OF DRILLING 12-26-72

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							φ	c	
0									Clayey SILT (OL) - Brown to Gray, very soft w/sand and seashells, black organic material from 2 to 3 feet.
-5-	x		4 6 8	60.4	70.1				
	x		2 1 1	No Recovery					
-10-									
	x		3 2 3	No Recovery					
-15-									
	x		3 2 4 7	No Recovery					
-20-									
	x		3 2 1	No Recovery					
-25-									Silty CLAY (MH) - Blue Gray, very soft, w/fine sand and coral fragments.
-30-			PUSH	57.8	75.9				

Plate A4

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B3 (Cont.)

DRIVING WT. 140 lb.

DATE OF DRILLING 12-26-72

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							φ	c	
30	x		PUSH 1	57.8	75.9				
35	x		PUSH 1 2 2	52.8	81.2				
40	x		2	57.2	75.6				
			3 3 3						Clayey SILT (OL) - Black, soft, w/organic material
45	x		2 2 3 3	54.0	77.3				
	x		4 6 12	55.2	70.9				Silty CLAY (MH) - Blue Gray, soft. Dark brown cobbles at 50 feet.
50									End boring at 50 feet. Water level of lake at 0.8 feet above existing ground.

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B4

DRIVING WT. 140 lb.

DATE OF DRILLING 1-4-73

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							φ	c	
									Clayey SILT (OL) - Dark Gray, to Black, very soft.
	x		3 11 8	73.4	43.8				Sandy SILT (ML) - Mottled Orange Brown, dense w/coral fragments.
5									
	x		3 4 3	68.7	56.3				
									UNCONFINE 2324 PSF
10									
	x		5 7 6	83.5	48.1				
									End boring at 15 feet.
15									
	x		4 5 6	72.5	47.6				
									End boring at 15 feet.
20									
25									
30									

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B5

DRIVING WT. 140 lb.

DATE OF DRILLING 1-5-73

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							φ	c	
0									Clayey SILT (OL) - Dark Gray, soft w/loose sand and organic material.
	x		PUSH 1 1	39.2	155.1				
5									Sandy SILT (ML) - Greenish Gray soft and loose w/coral fragments.
	x		3 1 3	No Recovery					
10									Grading more clayey from 10 feet.
	x		PUSH	No Recovery					
15									Grading to firm from 23.5 feet.
	x		1 1 1 1	No Recovery					
20									Grading to firm from 23.5 feet.
	x		1 1 1	No Recovery					
25									Grading to firm from 23.5 feet.
	x		3 2 3 5	No Recovery					
30									End boring at 30 feet.
	x		3 3 3	No Recovery					

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B6

DRIVING WT. 140 lb.

DATE OF DRILLING 1-9-73

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR		CLASSIFICATION (% Sand, % Silt, % Clay)
							STRENGTH PARAMETERS		
							φ	c	
									Clayey SILT (MH) - Dark Gray, soft, w/coral fragments and loose sands.
	x		2	63.7	44.5				
			2						
			3						
-5-									
	x		2	71.6	46.1				Silty SAND (SM) - Greenish Gray, loose to medium dense w/coral fragments.
			1						
			PUSH						Soft pocket at 7 feet.
			3						
	x		7	No Recovery					
			5						
-10-			4						
	x		3	83.1	38.9				Clayey SILT (MH) - Blue Gray, firm to medium w/coral fragments.
			3						
-15-			4						Silty SAND (SM) - Yellowish Brown, medium to fine grained, medium dense to loose.
									End boring at 15 feet.
-20-									
-25-									
-30-									

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B7

DRIVING WT. 140 lb.

DATE OF DRILLING 1-10-73

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							Ø	C	
5	x		3 2 1	38.4	118.8				Clayey SILT (MH) - Gray, soft, w/coral fragments.
10	x		PUSH 2 1 1 1 1	69.5	56.8				Sandy SILT (MH) - Gray, loose and soft w/coral frag- ments. Grading clayey and loose from 10 feet.
15	x		5 2 1						End boring at 15 feet.
20									
25									
30									

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B8

DRIVING WT. 140 lb.

DATE OF DRILLING 1-11-73

SURFACE ELEV. _____

DROP 30 in.

W.O. 176

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							φ	c	
									Clayey SILT (MH) - Orange Brown, soft.
	x		2	86.7	38.9				Sandy SILT (ML) - Gray, soft and loose, w/finger coral fragments. Grading brown at 5 feet.
			3						
			6						
-5-									
	x		4	59.8	65.7				Silty CLAY (ML) - Gray, firm to medium w/coral fragment.
			4						
			5						
			7						
	x		6	No Recovery					
			6						
-10-									
	x		4	62.8	63.0				
			7						
			4						
	x		2	67.4	58.4				Sandy SILT (ML) - Yellowish Brown, soft to firm w/coral fragments, firm.
			2						
-15-			3						End boring at 15 feet. ▽ Water level at 0.5 feet.
-20-									
-25-									
-30-									

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B9

DRIVING WT. 140 lb.

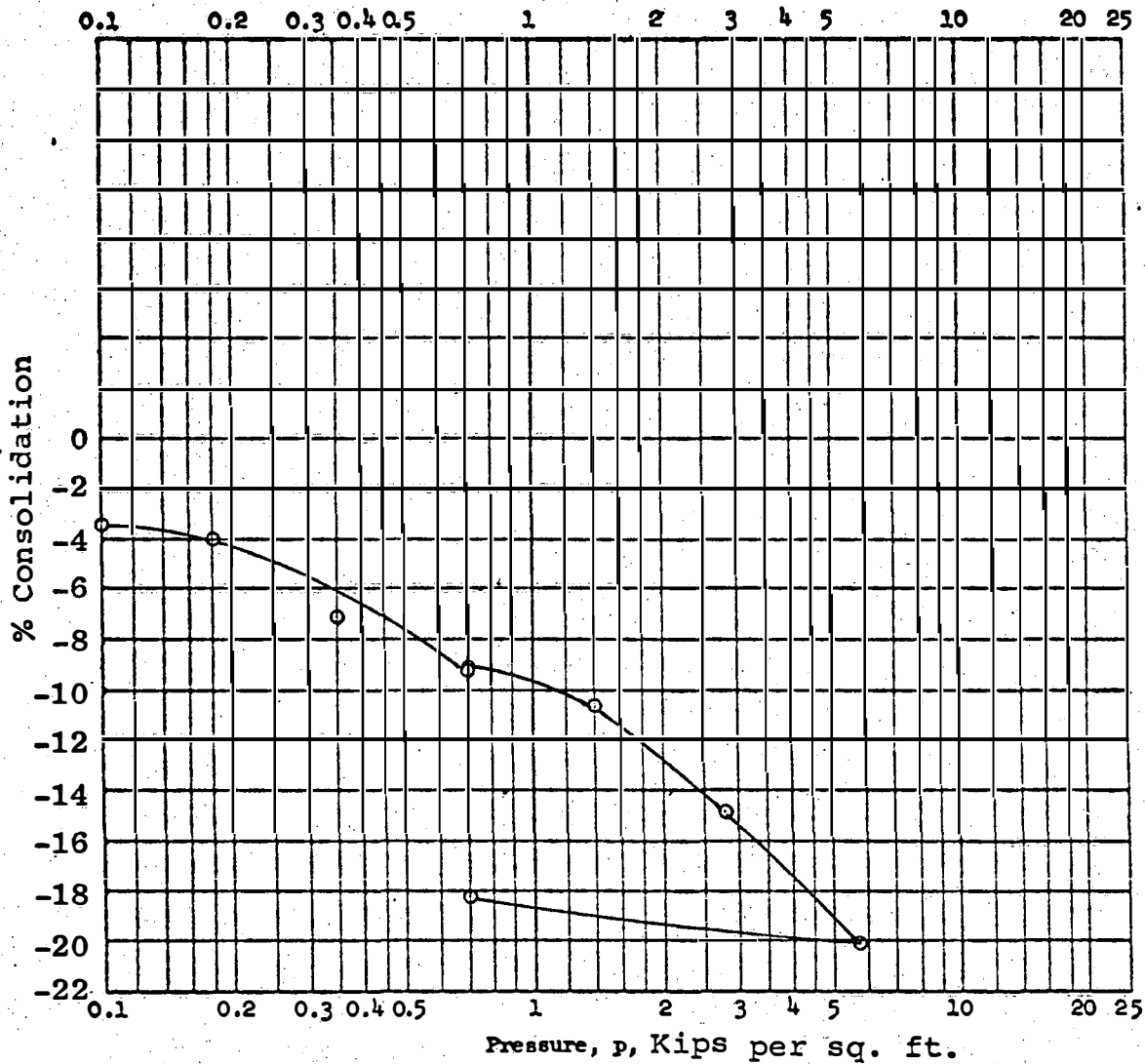
DATE OF DRILLING 1-12-73

SURFACE ELEV. _____

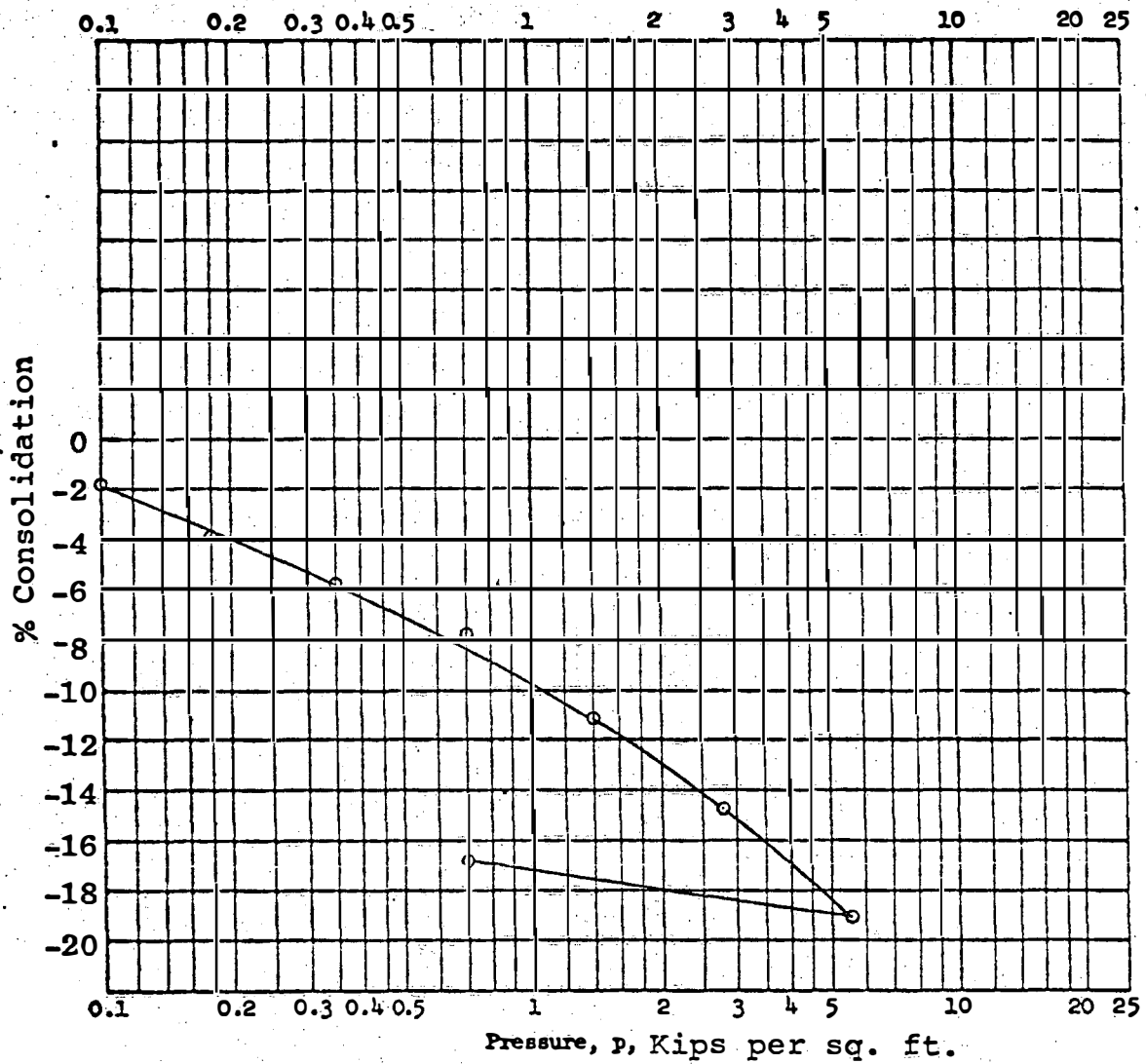
DROP 30 in.

W.O. 176

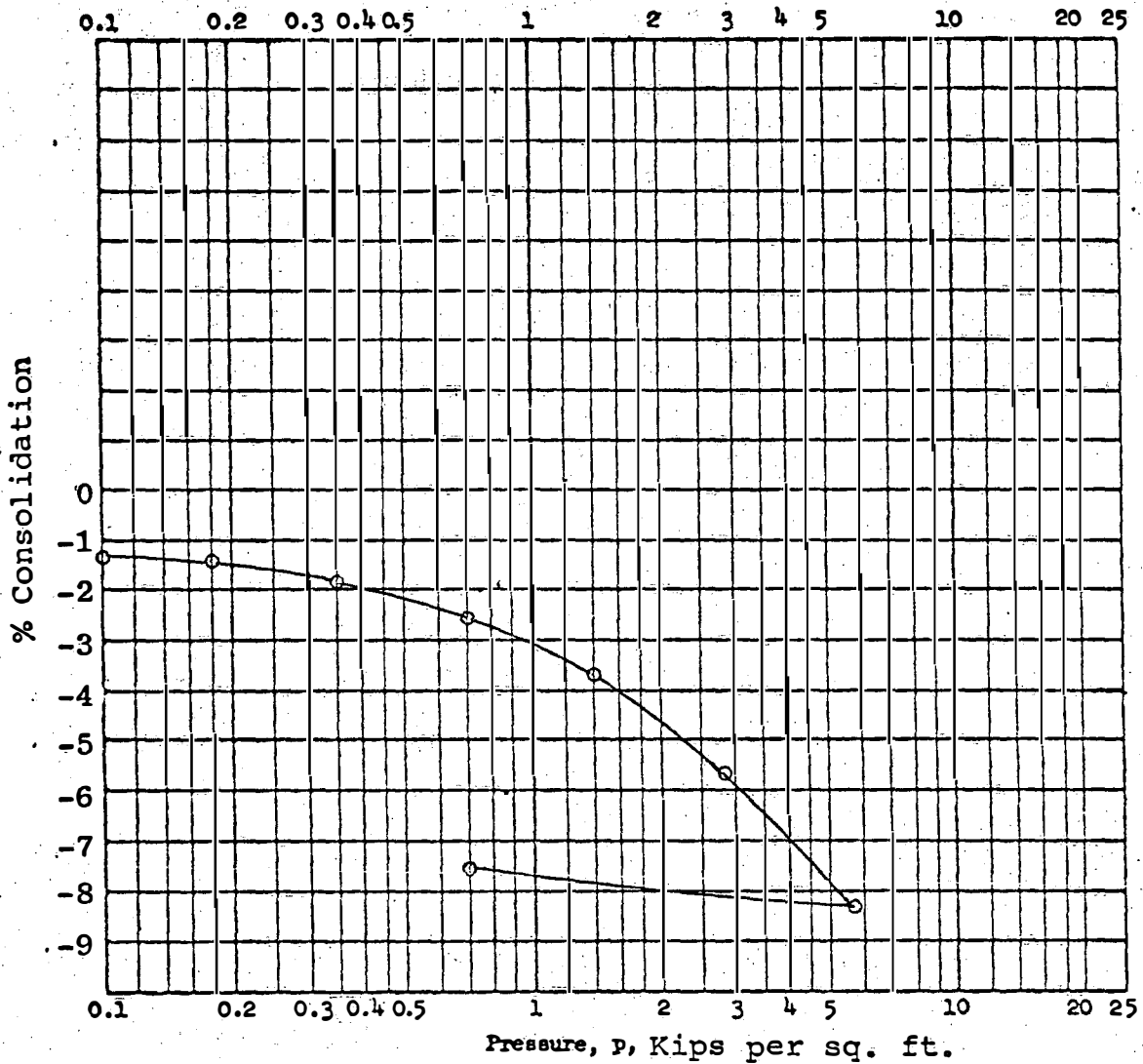
DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/6 in.	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS		CLASSIFICATION (% Sand, % Silt, % Clay)
							φ	c	
4									Silty CLAY (MH) - Dark Brown, soft.
	x		1	42.6	108.3				Silty CLAY (OH) - Black, very soft, organic.
			1						Silty SAND (ML) - Gray, loose to firm, w/coral fragment
5			1						
	x		2	No Recovery					
			2						Become very loose.
			2						
	x		2	No Recovery					
10			2						Sandy SILT (ML) - Gray, soft, w/coral fragments.
			2						
	x		1	No Recovery					
15			2						End boring at 15 feet. ▽Water level at 1.0 feet.
			1						
			1						
20									
30									



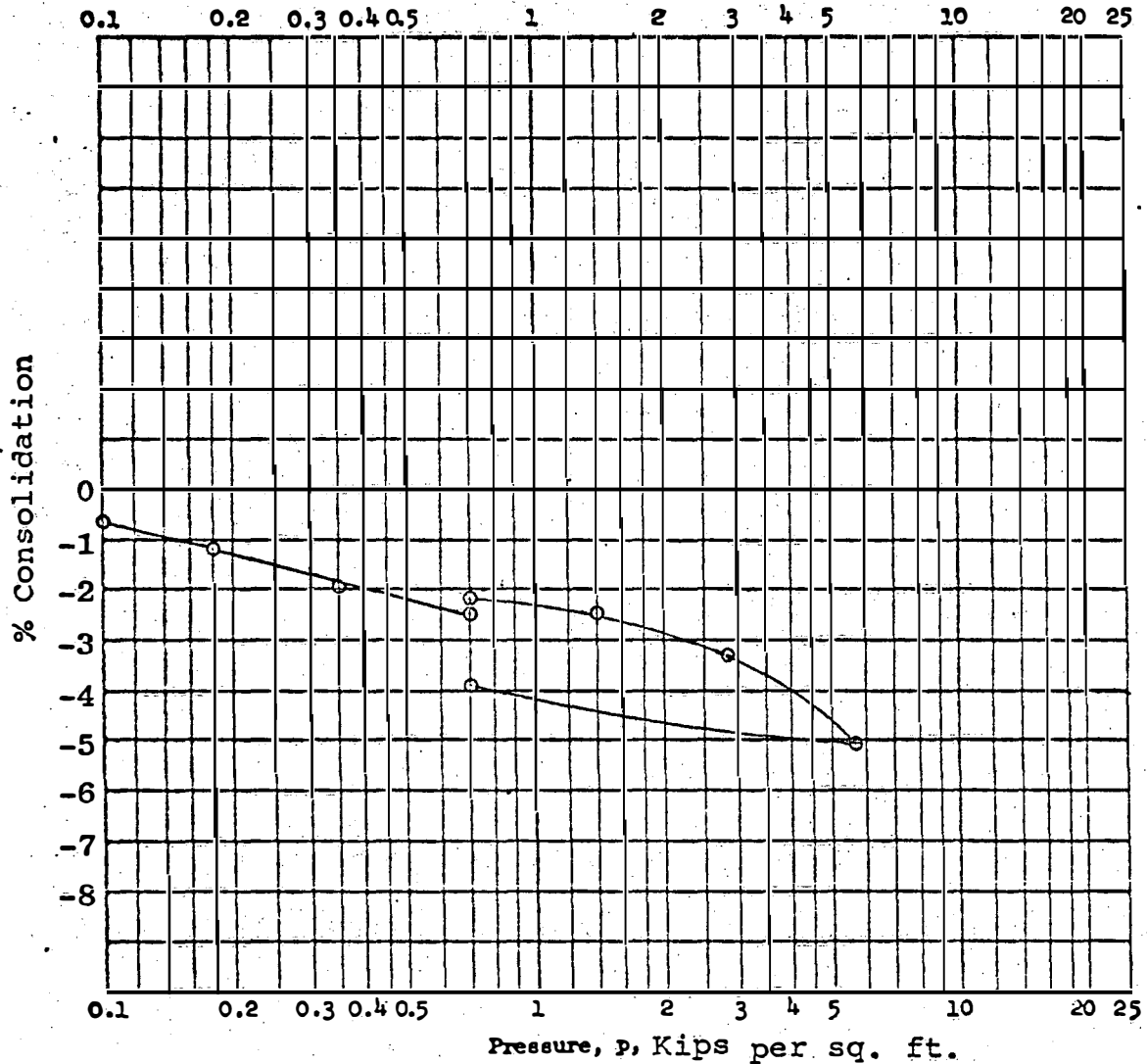
Type of Specimen		Undisturbed		Before Test		After Test	
Diam	2.40 in.	Ht	1.0 in.	Water Content, v_o	75.9 %	v_f	50.2 %
Overburden Pressure, p_o	T/sq ft			Void Ratio, e_o		e_f	
Preconsol. Pressure, p_c	T/sq ft			Saturation, S_o	%	S_f	%
Compression Index, C_c				Dry Density, γ_d	57.8 lb/ft ³		
Classification	ML			k_{20} at $e_o =$	$\times 10^{-7}$ cm/sec		
LL	G_s	Project Kaopa Unit 3B					
PL	D_{10}	Lone Star Hawaii					
Remarks	Water added at 700			Area	W.O. 176		
	PSF			Boring No.	B3	Sample No.	
				Depth	30'	Date	1-11-73
				CONSOLIDATION TEST REPORT			



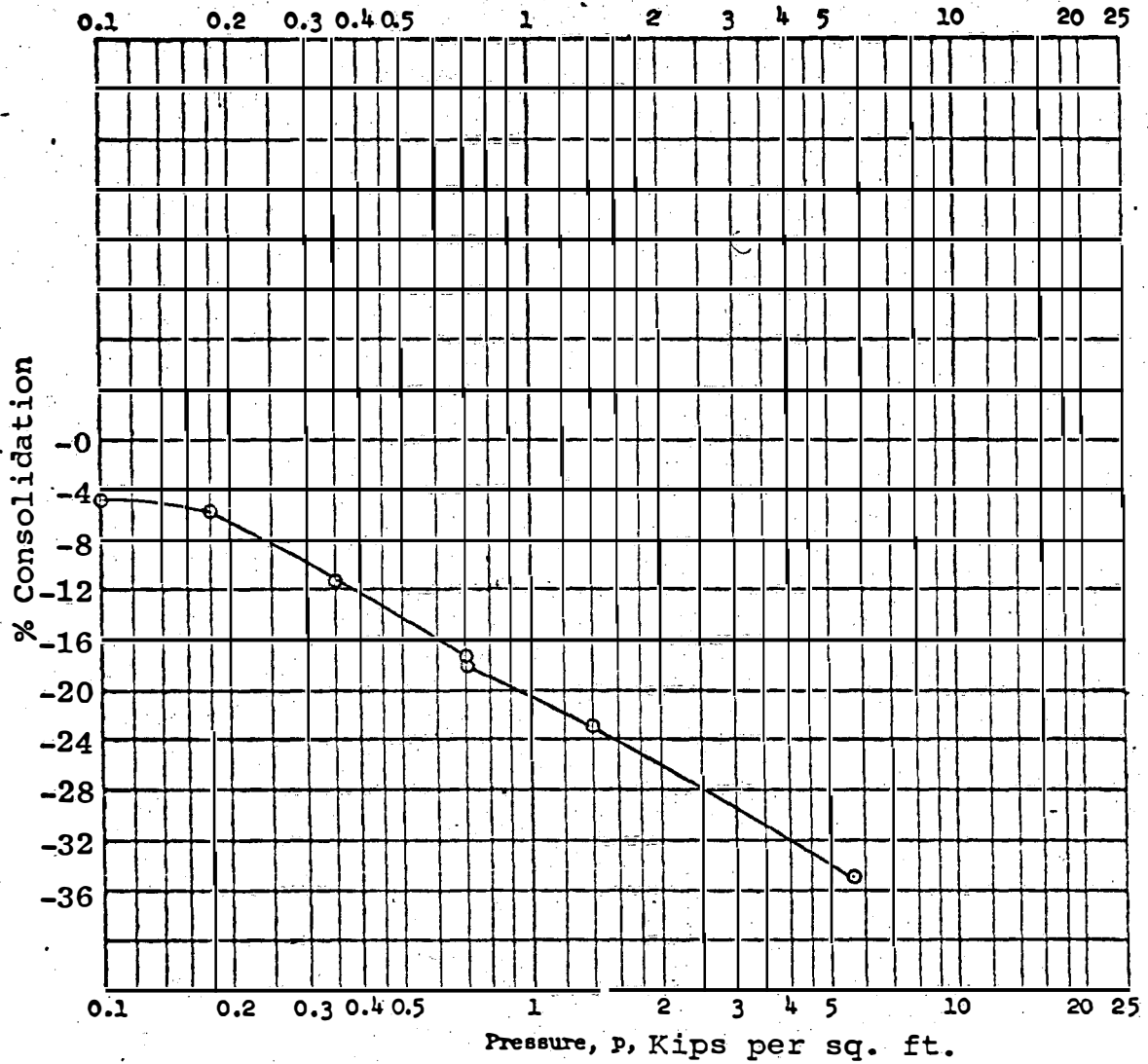
Type of Specimen		Undisturbed		Before Test		After Test	
Diam	2.40 in.	Ht	1.0 in.	Water Content, w_o	75.6 %	w_f	57.5 %
Overburden Pressure, P_o		T/sq ft		Void Ratio, e_o		e_f	
Preconsol. Pressure, P_c		T/sq ft		Saturation, S_o		% S_f	
Compression Index, C_c				Dry Density, γ_d		57.2 lb/ft ³	
Classification OL				k_{20} at $e_o =$ x 10 ⁻⁷ cm/sec			
LL	G_a			Project Kaopa Unit 3B			
PL	D_{10}			Lone Star Hawaii			
Remarks Water added at 700				Area W.O. 176			
PSF				Boring No. B3		Sample No.	
				Depth El 40'		Date 1-16-73	
CONSOLIDATION TEST REPORT							



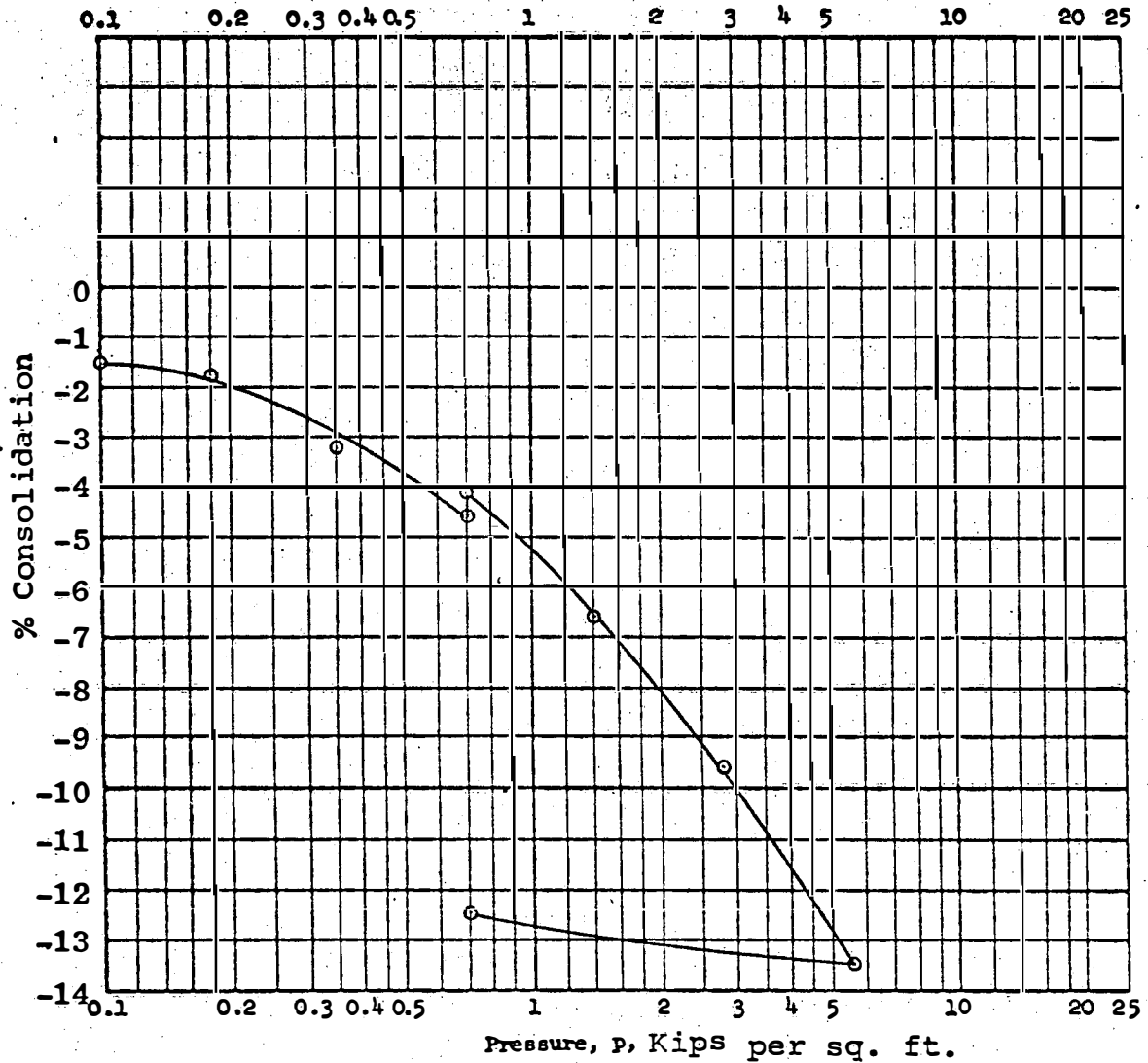
Type of Specimen		Undisturbed		Before Test		After Test	
Diam	2.40 in.	Ht	1.0 in.	Water Content, v_o	56.3 %	v_f	66.1 %
Overburden Pressure, p_o			T/sq ft	Void Ratio, e_o		e_f	
Preconsol. Pressure, p_c			T/sq ft	Saturation, S_o		% S_f	
Compression Index, C_c				Dry Density, γ_d	68.7 lb/ft ³		
Classification		ML		k_{20} at $e_o =$ $\times 10^{-7}$ cm/sec			
LL	G_s			Project Kaopa Unit 3B			
PL	D_{10}						
Remarks Water added at 700				Lone Star Hawaii			
PSF				Area W.O. 176			
Boring No.		B4		Sample No.			
Depth		6'		Date 1-9-73			
El							
CONSOLIDATION TEST REPORT							



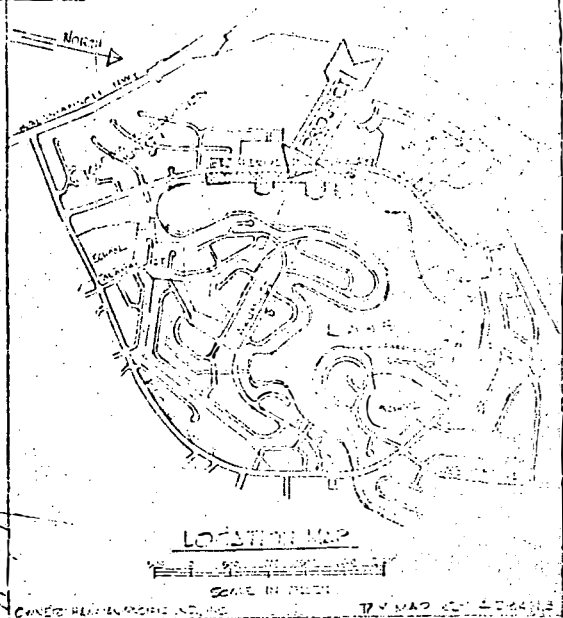
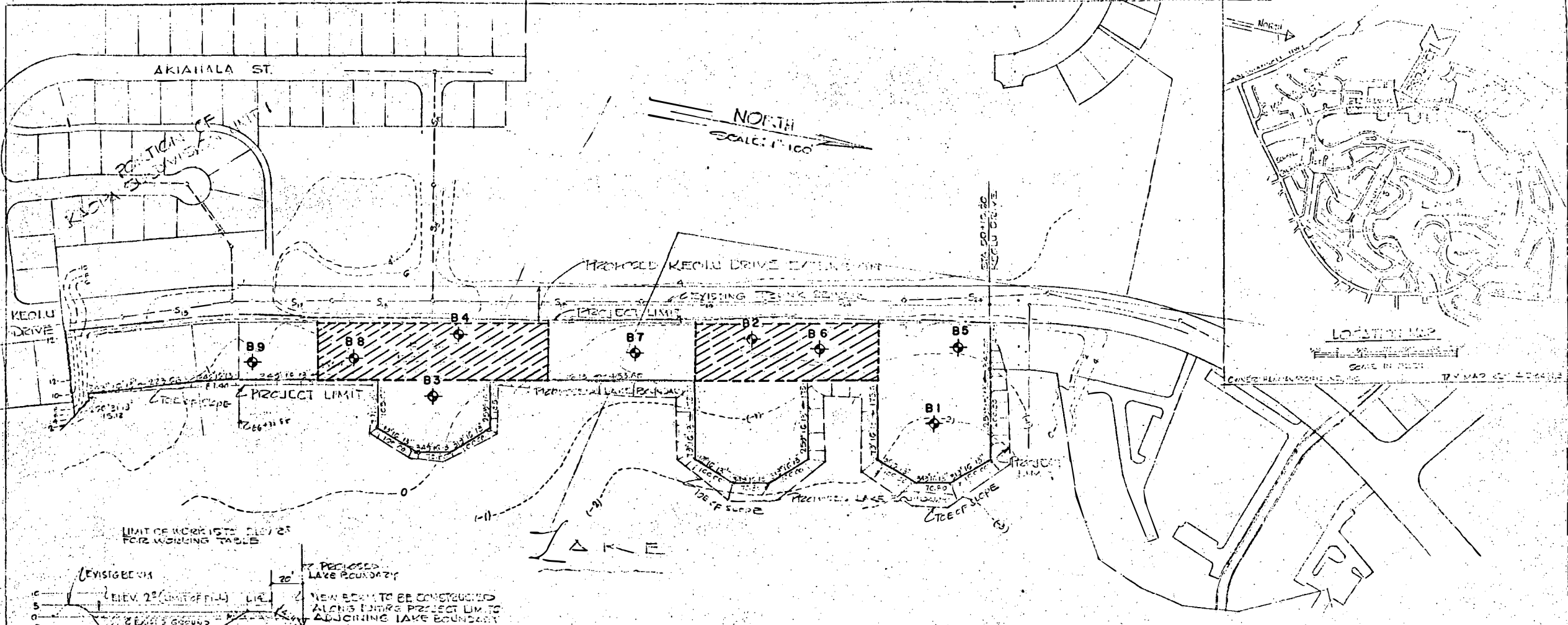
Type of Specimen		Undisturbed		Before Test		After Test	
Diam	2.40 in.	Ht	1.0 in.	Water Content, v_o	48.1 %	v_f	49.4 %
Overburden Pressure, p_o	T/sq ft	Void Ratio, e_o		e_f			
Preconsol. Pressure, p_c	T/sq ft	Saturation, S_o		S_f			
Compression Index, C_c		Dry Density, γ_d	83.5 lb/ft ³				
Classification	ML	k_{20} at $e_o =$	$\times 10^{-7}$ cm/sec				
LL	G_s	Project Kaopa Unit 3B					
PL	D_{10}	Lone Star Hawaii					
Remarks	Water added at 700			Area W.O. 176			
	PSF			Boring No.	B4	Sample No.	
				Depth	9'	Date	1-8-73
CONSOLIDATION TEST REPORT							



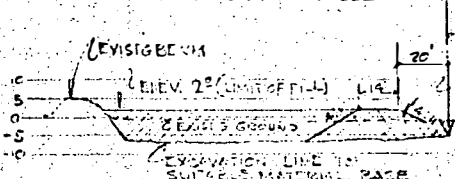
Type of Specimen		Undisturbed		Before Test		After Test	
Diam	2.40 in.	Ht	1.0 in.	Water Content, w_o	155.1 %	v_r	91.1 %
Overburden Pressure, p_o	T/sq ft			Void Ratio, e_o		e_r	
Preconsol. Pressure, p_c	T/sq ft			Saturation, s_o	%	s_r	%
Compression Index, C_c		Dry Density, γ_d	39.2 lb/ft ³				
Classification	OL	k_{20} at $e_o =$	$\times 10^{-}$ cm/sec				
LL	G_s	Project Kaopa Unit 3B					
PL	D_{10}	Lone Star Hawaii					
Remarks	Water added at 700			Area	W.O. 176		
	Boring No.	B5	Sample No.				
	Depth	3'	Date	1-15-73			
CONSOLIDATION TEST REPORT							



Type of Specimen		Undisturbed		Before Test		After Test	
Diam	2.40 in.	Ht	1.0 in.	Water Content, w_o	63.0 %	v_r	53.6 %
Overburden Pressure, P_o	T/sq ft			Void Ratio, e_o		e_r	
Preconsol. Pressure, p_c	T/sq ft			Saturation, S_o	%	S_r	%
Compression Index, C_c				Dry Density, γ_d	62.8 lb/ft ³		
Classification	ML			k_{20} at $e_o =$	$\times 10^{-7}$ cm/sec		
LL	G_s	Project Kaopa Unit 3B					
PL	D_{10}	Lone Star Hawaii					
Remarks	Water added at 700			Area	W.O. 176		
	PSF			Boring No.	B8	Sample No.	
				Depth	10.5'	Date	1-19-73
				CONSOLIDATION TEST REPORT			



LIMIT OF WORK SITE, ELEV 2' FOR WORKING TABLE



NEW BORINGS TO BE CONSTRUCTED ALONG FUTURE PROJECT LIMITS ADJOINING LAKE BOUNDARY

TYPICAL SECTION
NO SCALE

- NOTE:**
1. All debris such as gutters, trees, shrubbery, tree stumps, etc. shall be removed and disposed of.
 2. Removed material suitable for sandstone fill may be used under the supervision of the Soils Engineer.
 3. All material shall be obtained from the Project's Stone/Water Storage Basin in the vicinity of Kaopa Subdivision Unit 1.
 4. New Earth Boreings shall be constructed which together with the existing boreings will enclose the area of earthwork operations, and thus prevent lake pollution.
 5. Mucked material shall be used in Sandstone fill for embankment work, for Kaopa Subdivision Unit 2 in the project area, and for the construction of the dike and the embankment and properly compacted, bank to prevent

GRADING NOTES:

1. All grading work shall be done in accordance with Chapter 22, Revised Ordinances, 1961 as amended.
2. The Contractor shall be responsible for the clearing and removal of all silt and debris generated by the grading work and deposited and accumulated within the adjacent waterways, ditches and drain pipes and on public roads. The Contractor shall reimburse the City and County of Honolulu for all costs incurred with the removal of this above work if required for public health and safety or if such work is not performed by the Developer and Contractor.
3. The Contractor at his expense shall keep the Project and surrounding areas free from dust nuisance. The City may require supplementary measures as necessary.
4. Grading work shall conform to Chapter 27 and 37A of Public Health Regulations, State of Hawaii.
5. Approval of this plan by the Planning Director is for planning only and does not indicate approval for building, building permits or other purposes.

SCOPE OF WORK:

1. Grading work shall be confined to clearing, grubbing, mucking and embankment work within the Project Limits.
2. Grading operations shall be in accordance with the recommendations set forth in the Preliminary Soils Investigation Report for Project 11-140-11, SUBDIVISION UNIT 2, prepared by ERNEST K. HIRATA & ASSOCIATES, INC. dated Oct. 27, 1971.
3. Final grade for embankment shall not be higher than Elevation +2, MSL.

▨ Feasible areas for development

⊕ Approximate location of borings

PROJECT MARK, ELEV 374

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
1157 South King Street Honolulu, Hawaii

Date Jan. 24 1973 W.O. 176

<p>APPROVED ERNEST K. HIRATA Soils and Foundation Engineering 1157 South King Street Honolulu, Hawaii</p>	<p>KAOPA SUBDIVISION PARTIAL GRADING FOR PORTION OF PROJECTS UNITS 2 AND 3 NOV 1971</p>
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DATE: NOV 1971