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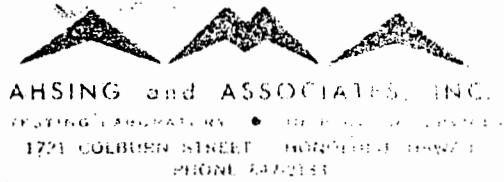
SOIL INVESTIGATION
KAILUA HEIGHTS
UNIT 6 A1 SUBDIVISION
BY

AHSING & ASSOCIATES, INC.

64Ks1

MUNICIPAL REFERENCE & RECORDS CENTER
City & County of Honolulu
City Hall Annex, 505 S. King Street
Honolulu, Hawaii 96813

WITHDRAWN



July 19, 1976

Y. Arakaki - Consulting Engineer
914 Ala Moana Blvd. Suite 202
Honolulu, HI 96814

Subject: Kailua Heights - Unit 6 A1 Subdivision

Sir,

Transmitted herewith is our soils investigation report for the subject project.

In general we find the soil conditions to be quite favorable and no undue construction difficulties are expected. Included in the report is a "Guide Specifications for Engineered Fill" and also recommendations for the proper reworking of the fill at the end of Kuuna Place that was not placed properly. During construction, should soil conditions vary from what is indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of construction, or if conditions change due to natural causes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Thank you for this opportunity to be of service to you. Should you have any questions concerning this report, please don't hesitate to contact us.

Respectfully Submitted,

Simeon A. Callejo
Professional Engineer #3384



Madan Dhakhwa - Vice President
AHSING & ASSOCIATES, INC.

Soils Investigation for the proposed
Kailua Heights - Unit 6A1 Subdivision
Kailua, Koolaupoko, Oahu, Hawaii
TMK: 4-2-02:41

Introduction

This report presents the results of our soils investigation performed on the subject project. The purpose of our investigation was to determine the nature of the subsurface soils and its relativity in the design and construction of the proposed project.

The investigation included the excavation of the five (5) test pits, drilling of two (2) exploratory test borings, logging and obtaining representative soil samples and laboratory analysis and testing; all of which is summarized in this report. The location of the test pits and exploratory borings are shown on the attached site plan. Also attached are the boring logs and laboratory test data and analysis.

The project site is located in Kailua Heights in the vicinity of Kina, Kuuna, and Apokula streets. It is bordered on the West by existing improved and built up lots fronting Kuuna Street and the other three (3) sides by existing hillsides. The entire area is overgrown with a relatively dense conglomeration of Haole Koa brush and weeds. Careful investigation of the site shows that occasional dumping of asphaltic concrete chunks, concrete rubble and miscellaneous rock are scattered throught out the site.

Field Exploration

The field investigations was accomplished with two pieces of equipment at different times. The test pits were excavated on June 7, 1976 with a case 580 backhoe/loader

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and the exploratory borings were drilled with a Failing 250 truck mounted rotary drill rig using a 4" Auger on June 14th and 15th. The soils were continuously logged by our field engineer and classified by visual examination in accordance with the Unified Soil Classification System. Undisturbed and bag samples were recovered from the borings and test pits for laboratory analysis and testing. Undisturbed samples were taken by driving a 3" OD thin walled split tube sampler with a 140 pound hammer through a drop of 30 inches. The required blow count and applicable penetration is shown on the attached boring logs.

Soil Conditions

Both the test pits and the borings indicate the subsurface conditions are generally consistent in the areas tested. Generally there exists a 2.5 to 3.0 layer of sandy silt which is relatively loose at the surface and gets progressively denser till it becomes dense at 3.0. The sandy silt has an abundance of weathered rock in various sizes and stages of weathering. Underlying this layer is a hard to very hard rock with only a slight amount of weathering down to a depth of 20 feet. No ground water was encountered.

Conclusions and Recommendations

Based on the field investigation and the laboratory test results, the site appears to be very feasible for the intended subdivision with the fills shown on the preliminary plans by Y. Arakaki.

We recommend that prior to the placement of any fill material that the entire area be grubbed of all the vegetation and miscellaneous dumpings.* In the area

* As spelled out in the "Guide Specifications for Engineered Fill"

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Where approximately 2' of fill was placed at the end of Kuuna Place we feel that the material can be used for the fill but it would have to be removed and that area under it grubbed and reworked prior to replacement of fill in lifts.

APPENDIX I

GUIDE SPECIFICATIONS FOR ENGINEERED FILL

General. The designation "Engineered Fill" is applied to a fill placed under the direct supervision of a Soils Engineer for the purpose of supporting building foundations or other loads. The Soils Engineer shall approve the material, the method of placing and compacting, and shall give written approval of the completed fill. No deviation from these specifications shall be made except upon the written approval of the Soils Engineer.

Clearing and Grubbing. All timber logs, trees brush, buried rubbish, or decayed matter, and other undesirable material within the areas affected by the grading operations, or if call for on plans, shall be removed in a satisfactory manner.

All vegetable matter such as roots, tree stumps, grass, etc., shall be removed from the surface upon which fill is to be placed. Such surfaces shall be uniformly scarified to a depth of at least six (6) inches and the operation shall be continued until all objectionable matter is disposed of and the soil is free of same as well as large clods. It shall then be brought to the proper moisture content, additional fill soil being added if necessary, and recompact until the density meets the requirements as hereafter specified.

When fills or embankments are to be made and compacted on hillsides, or when new fill is to be compacted against existing fill, or where fill is to be built part width at a time, the slopes of the original hillside, old or new fill, shall be cut into or benched as the work is brought up in layers, Material thus cut out shall be recompact along with the material brought up. No soil

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containing objectionable vegetable matter of the kind mentioned shall be used in fills supporting housing units, but shall be disposed of as directed by the Soils Engineer, in special waste areas.

Compaction Requirements. All fill areas and embankments shall be built up in uniform layers. The loose thickness of each layer shall be adjusted so that the required degree of compaction, as hereafter specified, can be readily attained, but shall not in any event exceed approximately six (6) inches compacted thickness. Each layer shall be thoroughly compacted before the next layer is laid thereon.

The compaction operations shall be carried out using approved compacting equipment, such as sheepsfoot tampers, flat-wheel rollers, pneumatic rollers, or combinations thereof as directed by the Soils Engineer.

In general, all fill compaction operations shall be carried out and the layers of soil compacted at a moisture content which is optimum for the soil, the optimum moisture content being determined by ASTM D1557. If the moisture content of the soil is below optimum, enough water shall be added to the soil to bring its moisture content up to optimum. If above, the soil shall be allowed to dry, aerating by blading, harrowing, etc., to speed up the drying, until the moisture content drops down to approximately optimum.

Compaction of each and every layer of fill shall be continued until the density, as determined by field tests reaches a value of at least 90% of the maximum indicated by ASTM D1557.

Fills on Hillsides and Slopes. Where fills are made on hillsides or slopes, the slope of the original ground upon which the fill is to be placed shall be

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plowed or scarified deeply or where the slope ratio of the original ground is steeper than 5 horizontal to 1 vertical, the bank shall be stepped or benched. Ground slopes which are flatter than 5:1 shall be benched when considered necessary by the Soils Engineer.

Rocky Material. When fill material includes rock, no large rocks will be allowed to nest and all voids must be carefully filled with small stones or earth and properly compacted. No large rocks will be permitted higher than twenty-four inches (24") below the finished grade.

Drainage. Care shall be exercised during the rough grading work so that areas involved will drain properly. Thus, as far as practicable, all ruts and depressions resulting from construction traffic shall be carefully smoothed out at the end of the day's work. All fill slopes shall be protected by temporary terms.

Field Tests. The Soils Engineer shall be notified in advance as to the date grading operations are scheduled to start, so that he may make the necessary preparations for carrying out field density tests to determine the actual relative compactions be obtained, and thus determine appropriate corrective measures, if needed.

Field density tests shall be made by the Soils Engineer of the compaction of each layer of fill. Density tests may be made at intervals not exceeding 2 feet of fill height provided all layers are tested. Where sheepsfoot rollers are used the soil may be disturbed to a depth of several inches. Density reading shall be taken in the compacted material below the disturbed surface, and as often as necessary, as determined by the Soils Engineer. When these readings

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indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion shall be reworked until the required density has been obtained.

Supervision. Supervision by the Soils Engineer shall be made during the fill and compacting operation so that he can certify that the fill was made in accordance with accepted specifications.

GUIDE SPECIFICATIONS FOR USE OF OVERSIZE MATERIAL

Oversize material. Occasional rock particles up to 12 inches in diameter (or largest dimensions) may be used in the fill layers provided they are spaced at least 3 diameters apart. Rock particles larger than 12 inches in diameter shall be scalped out and wasted in designated areas. Oversize material, when placed in fills, shall be surrounded by, and sufficient earth or other fine material shall be placed around the large particles as they are deposited so as to fill the interstices and produce a dense compact fill. No oversize material shall be placed higher than 2 feet below finish grade.

BORING LOG

Depth (Feet)	Log	Penetration Resistance (Blows/6")	Dry Density (PCF)	Moisture Content (%)	Classification	Remarks
14						
30						
33			51.99	6.86	Brown Sandy Silt (ML) with Weathered Mudrock, Dry, Loose	LL = 39.05; PI = 18.56
50/1"						
5		50/2"				
10		50/1 1/2"			Brown Weathered Rock	
15		50/3"				
20						

BOH @ 20.0

No Water Encountered.
 * Elevation Taken From
 "Preliminary Subdivision
 Map" by Y. Arakaki

BORING LOG

Depth (Feet)	Log	Penetration Resistance (Blows/6")	Dry Density (PCF)	Moisture Content (%)	Classification	Remarks
18 47	50/3"	113.09	11.05	92.24 13.70	Loose Brown Sandy Silt (ML) with Weathered Mudrock, Dry, Loose.	LL = 38.9; PI = 18.49
					Mottled Red/Gray Rock Slightly Weathered, Hard.	
5	50/1"				Greenish Gray Highly Weathered Mudrock	
					Mottled Orange/Gray Mudrock Slightly Weathered & Hard.	
-10						
-15	25/0'					
						BOH @ 13.0
						No Water Encountered.
						* Elevation Taken From "Preliminary Subdivision Map" by Y. Arakaki.
-20						


PROJECT KAILUA HEIGHTS - UNIT 6A1 SUBDIVISION

 BORING NO. Test Pit #1

 ELEVATION 88*

 DATE 6-7-76

BORING LOG

Depth (Feet)	Log	Penetration Resistance (Blows/6")	Dry Density (PCF)	Moisture Content (%)	Classification	Remarks
					Mottled Brown Silt with Weathered Mudrock	LL = 36.20; PI = 18.88 @ 3.0
		93.65	23.95		Very Hard Mudrock	LL = 38.21; PI = 19.69 (loose material from Excavation)
						Signs of AC & Concrete dumped at Site
-5						BOH @ 3.0
						* Elevation Taken From "Preliminary Subdivision Map" by Y. Arakaki
-10						
-15						
-20						

BORING LOG

Depth (Feet)	LOG	Penetration Resistance (Blows/6")	Dry Density (PCF)	Moisture Content (%)	Classification	Remarks
0	AS				Mottled Red, Brown Gravelly Silt, Loose, Dry	
3.5			120.28	10.07	Gray Weathered Mudrock, Very Hard	LL = 30.50; PI = 12.24 Sample @ 3.5
5						* Elevation Taken From "Preliminary Subdivision Map" by Y. Arakaki
10						
15						
20						

PROJECT KAILUA HEIGHTS - UNIT 6A1 SUBDIVISION
 BORING NO. Test Pit #3
 ELEVATION 100±*
 DATE 6-7-76

BORING LOG

Depth (Feet)	Log	Penetration Resistance (Blows/6")	Dry Density (PCF)	Moisture Content (%)	Classification	Remarks
					Mottled Brown/Gray Clayey Silt	
					Weathered Mudrock Mixed with Sandy Silt.	
5						
						* Elevation Taken From "Preliminary Subdivision Map" by Y. Arakaki
-10						
-15						
-20						

BORING LOG

Depth (Feet)	LOG	Penetration Resistance (Blows/6")	Dry Density (PCF)	Moisture Content (%)	Classification	Remarks
0					Mottled Red/Brown Sandy Silt	
0					Mudrock Chunks and Boulders with Silt, Very Hard	
-5						* Elevation Taken From "Preliminary Subdivision Map" by Y. Arakaki
-10						
-15						
-20						

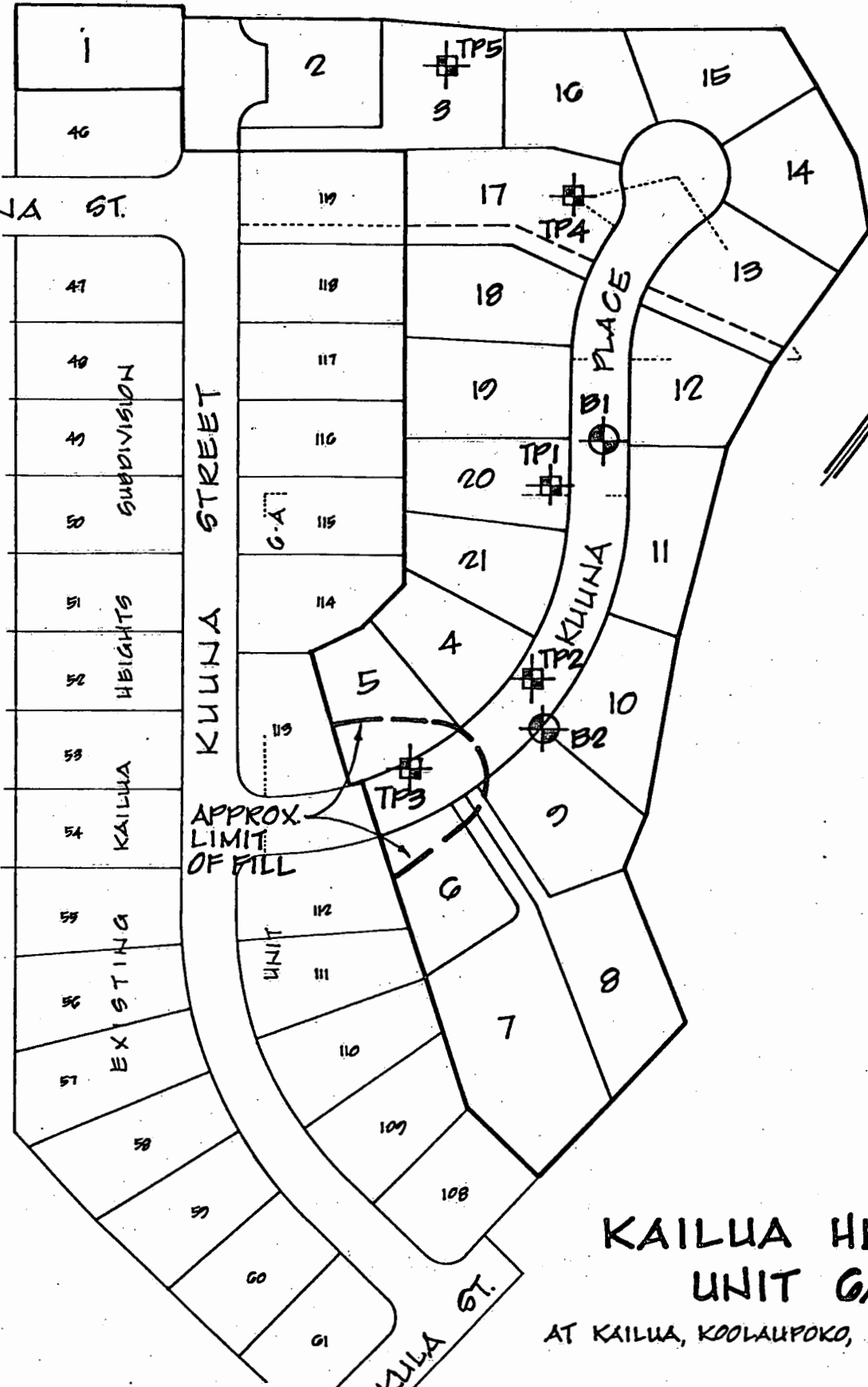
BORING LOG

Depth (Feet)	LOG	Penetration Resistance (Blows/6")	Dry Density (PCF)	Moisture Content (%)	Classification	Remarks
0					Very Hard Mudrock	Could not Excavate. (Broke Tooth on BackHoe) * Elevation Taken From "Preliminary Subdivision Map" by Y. Arakaki
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

KINA ST.

KUUNA STREET

APOKULA ST.



**KAILUA HEIGHTS
UNIT GA-1**

AT KAILUA, KOOLAUPOKO, OAHU, HAWAII