WAIANAE RESIDENCE LOTS - UNIT I
HAWAIIAN HOME LANDS
PRELIMINARY SOIL REPORT

WAIANAE VALLEY, WAIANAE, OAHU, HAWAII
TAX MAP KEY: 8-5-04: 53

To:
MR. GEORGE KURIO

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

JULY 5, 1974

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
EZRA KOIKE
WALLACE WAKAHIRO
3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

July 5, 1974

MR. GEORGE KURIO
1300 Pali Highway, Room 208
Honolulu, Hawaii 96813

Dear Mr. Kurio:

Subject: Waianae Residence Lots - Unit I
Hawaiian Home Lands
Preliminary Soil Report
(for grading and foundation design purposes)
Waianae Valley, Waianae, Oahu, Hawaii
Tax Map Key: 8-5-04: 53

Transmitted herewith is our preliminary soil report for residential development for Waianae Residence Lots - Unit I at Waianae Valley, Waianae, Oahu, Hawaii.

This report includes a Boring Location Sketch, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By Ezra Koike
Ezra Koike

SHL/EK:ms

C O N T E N T S

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SCOPE OF EXPLORATION

The purpose of this exploration was to evaluate general soil conditions for site grading design considerations for residential development for the proposed Waianae Residence Lots - Unit I at Waianae Valley, Waianae, Oahu, Hawaii.

This report includes field explorations, laboratory tests, general recommendations for site grading and foundation design considerations and limitations.

FIELD EXPLORATION

Fourteen exploratory borings were made at various locations at the subdivision site. Two borings were made at the approximate locations of a proposed bridge over Kaupuni Stream. The approximate locations of the borings are shown on the Boring Location Sketch.

Borings were made with 4-in. diameter augers using T.C. drag type bits. Soil samples were recovered with a 2-in. diameter thin-wall tube and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content, Atterberg limit, grain-size analysis, specific gravity, AASHO T-180-73I density and CBR.

A summary of the laboratory test results is given in Tables IA thru ID.

GEOLOGIC AND SOIL CLASSIFICATION BY OTHERS

From a review of geologic literature and the U. S. Soil Conservation Service maps of the area, the surface soils are generally described by others as follows:

Stearns, H. T. and U. S. Geological Survey, "Geologic and Topographic Map, Island of Oahu," USGS 1938:

Qa - Consolidated noncalcareous deposits.
Older alluvium.

U. S. Soil Conservation Service, "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii," August 1972:

EwB - Ewa silty clay loam (ML, CL soils), 2 to 6% slopes.

PvC - Pulehu very stony clay loam, (ML, CL and SM soils), 0 to 12% slopes.

LPE - Lualualei extremely stony clay (CH soils), 3 to 35% slopes.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE CONDITIONS

The proposed site is located in Waianae Valley about 1-1/2 miles east of Farrington Highway. The site is on the southeast side of the Waianae Valley Road near Piliuka Place. Kaupuni Stream crosses the western portion of the site.

Most of the site on the eastern side of Kaupuni Stream is gently sloping at about 3 to 10% down towards the southwest. Kaupuni Stream and tributary drainageways are generally located along the western boundary of the site. A drainageway was also noted near the southeastern corner of the site. The slopes of the sides of the drainageways vary from about 20 to 50%.

The stream and drainageways were dry during the field exploration.

The eastern portion of the site is covered with grass, weeds, some shrubs and trees. Several rock walls were noted in this portion of the site. Cobbles and boulders were noted on the surface. This area was being used as a cattle grazing ground. Paheehee Ridge is about 500 ft or more from the eastern boundary.

The western portion of the site is covered with koa haole and kiawe trees, grasses and weeds. Boulders were noted along the stream bed and the stream banks.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soil conditions encountered in the borings may be generally approximated as follows:

Eastern Portion

Stiff brown clay with cobbles and boulders to 2 to 3-ft depth underlain by brown and gray-brown sandy silts, clayey silts, decomposed rocks, cobbles and boulders to 15 ft, the depth drilled.

Western Portion

Brown silty sands, sandy silts and clayey silt interspersed with boulders, cobbles and decomposed rocks to 41 ft, the maximum depth drilled.

Water was not noted in the borings during the field explorations.

Variations to the above soil conditions are to be expected between borings and in localized areas. For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

The present plan is to clear and grade the site for single family residential development.

The preliminary plan indicates minor cuts and fills in the eastern portion of the site. Cuts of about 20 ft and fills of about 20 to 30 ft are contemplated near Kaupuni Stream and near the tributary drainageways.

A bridge, 60 ft in width and 40 ft in length, is proposed across Kaupuni Stream. Abutments of about 15 ft in height are contemplated on both sides of the bridge. The invert of the stream is at about elevation 132 ft. The bridge is planned at about elevation 146 ft.

The preliminary plans indicate a constriction of the natural stream channel where the proposed bridge will be constructed. This constriction will probably encourage the erosion of the stream bank and scouring of the stream bed, particularly at the bridge site. To minimize erosion and scouring, the bottom of the stream channel should be lined and protected with boulders. The toes of slopes up to the flood flow level should also be protected with a lining or preferably a boulder buttress fill.

Since cobbles, boulders and decomposed rock were noted in various portions of the site, and were encountered near the surface in most borings, a considerable quantity of cobbles and boulders may be anticipated in most cuts. The deeper the cut, the greater quantity of boulders might be expected. If large quantities of cobbles and boulders are encountered during the grading work, a disposal site for the boulders and a source of off-site borrow may have to be considered.

In general, use of the boulders to construct boulder buttress fill slopes along Kaupuni Stream would be the ideal way to dispose of the boulders. Boulders may also be used to construct fill slopes away from building locations. Filter blankets of granular material should be placed between the boulder fill and natural or compacted earth fills. See Figure 1.

Because of surface clay soils, the overall site grading design should consider the use of low and fairly gentle slopes. In sloping areas, grading design may consider excavating upper areas to remove driving forces and filling lower areas for resistance to downhill movement.

Along the stream bank where fills up to 20 or more feet are contemplated, some settlements may be anticipated. To minimize the damaging effects of differential settlements, slab-on-ground construction should be avoided or delayed several months to a year or more until settlement gages indicate negligible rates of settlements.

Site Grading

Surface vegetation and miscellaneous debris and rubbish should be cleared and removed prior to site filling. Localized soft pockets encountered during site preparations should be excavated and replaced with select soils compacted in thin lifts.

Provisions to drain the site should be included during and after the grading operations.

Grading work should be done in accordance with the Revised Ordinances of Honolulu, 1969 As Amended and as recommended below:

1. The area should be cleared and grubbed.

2. Topsoil should be stripped to stiff natural ground before the placement of fills.

3. Localized soft pockets and pockets of unsuitable material encountered during site preparation should be excavated and replaced with select material compacted in thin lifts.

4. Use of clay soils in fills on sloping areas should be avoided. On-site clay soils should generally be placed in the deeper portions of fills in flatter

areas and away from the faces of slopes. Selected on-site soils or borrow soils should be placed in the upper 2 to 3 ft of fills for roadways, parking areas, building pads and in the outer portions of slopes, if practicable.

5. Where fills are proposed on sidehill areas, gullies and in drainageways, loose material at the bottoms and sides should be stripped down to stiff natural ground before the placement of fills.

6. Trenches should be cut and subdrains installed along the bottoms of natural drainageways or dips before the placement of fills. The locations of subdrains should be determined in the field after clearing and grubbing.

7. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should continually be keyed into the stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.

8. If boulders are proposed to be used in the construction of fills, they should be generally placed along the toe sections of fill slopes and outside of probable building sites. Before placing the boulders, the subgrade should be stripped to stiff natural ground and shaped to drain. A transition layer of select granular material (6-in. to dust sizes) should be placed on the subgrade and the boulders placed on the select material. A transition layer of select granular material should also be placed against boulders before earth fills are placed against the boulders. Earth fills may be used in the void spaces between boulders. See attached sketch, Figure 1.

9. Thin sidehill fills (sliver fills) on sloping areas should be avoided.

10. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-73I test method. In roadway areas, the top 2 ft of fill should be compacted to 95% of the maximum density.

Slopes

In silty or granular soils, cut and fill slopes of 2 horizontal to 1 vertical or flatter may be used.

Along the stream banks, 3 to 1 or flatter slopes should be used unless the toes of slopes up to the flood level are constructed of boulders and a free draining condition is provided. If a boulder toe is constructed as sketched in Figure 1, the slope may be constructed at a 2 horizontal to 1 vertical slope ratio as a general case. Slope adjustments may be needed where clay pockets or soft pockets are encountered.

If slope heights (top to toe) greater than 15 ft are considered, 8-ft-wide benches should be placed at height intervals of about 15 ft.

In clay (CH) soils, cut and fill slopes of 3 horizontal to 1 vertical or flatter should be used for slopes less than 6 to 8 ft in height. For slopes higher than 6 to 8 ft, removal of clay soils and reconstruction of the slope with selected soils may be considered.

To minimize erosion, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Slope adjustments or other precautions may be necessary if seepage zones or expansive clay pockets are encountered in localized areas.

Foundations for Residential Structures

Light, single family residences are contemplated.

In general, slab-on-ground type foundations may be considered on fairly level lots where the structures are located away from the tops of slopes.

For sloping lots or houselots located near the tops of slopes, post-and-beam type foundations are generally recommended. Post-and-beam type foundations are also recommended on lots next to the stream and on fill lots constructed over old natural drainageways.

Buildings should be avoided on lots with slopes about 3 horizontal to 1 vertical and steeper. Where buildings are contemplated on lots about 7 horizontal to 1 vertical and steeper or where buildings are close to tops of slopes, foundations should be evaluated on an individual basis.