NEWTOWN-MAKAI AREA AND KAABUMANU STREET EXTENSION
PRELIMINARY SOIL REPORT

WAIMALU, EWA, OAHU, HAWAII
TAX MAP KEY: 9-8-20: 1 &
9-8-08: 3, 4 & 8

FOR REFERENCE

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
JUNE 7, 1972

TO:
COMMUNITY PLANNING, INCORPORATED

MUNICIPAL REFERENCE & RECORDS CENTER
City & County of Honolulu
City Hall Annex, 202 S. King Street
Honolulu, Hawaii 96813
June 7, 1972

MR. GEORGE HOUGHTAILING
Community Planning, Inc.
700 Bishop Street, Suite 608
Honolulu, Hawaii 96813

Dear Mr. Houghtailing:

Subject: Newtown-Makai Area and Kaahumanu Street Extension
Preliminary Soil Report
(for site grading purposes)
Waimalu, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-20: 1 &
  9-8-08: 3, 4 & 8

Transmitted herewith is our preliminary soil exploration report for general
site grading and pavement design purposes for the proposed Newtown-Makai
Area and Kaahumanu Street Extension at Waimalu, Ewa, Oahu, Hawaii.

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

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

[Signature]
Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf
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B. SUMMARY OF LABORATORY TEST RESULTS - Tables IA thru IG
C. PLASTICITY CHART
D. MOISTURE-DENSITY CURVES
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F. LOGS OF BORINGS FROM "WAIMALU ESTATES"
G. BORING LOCATION PLAN
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NEWTOWN-MAKAI AREA AND KAAHUMANU STREET EXTENSION
PRELIMINARY SOIL REPORT

WAIMALU, EWA, OAHU, HAWAII
TAX MAP KEY:  9-8-20: 1 &
               9-8-08: 3, 4 & 8

SCOPE
The purpose of this exploration was to determine general soil conditions for design purposes for the proposed Newtown-Makai Area and Kaahumanu Street Extension, Waimalu, Ewa, Oahu, Hawaii.

This report includes field explorations, laboratory test results and general recommendations for site grading and roadway pavement design purposes.

FIELD EXPLORATION
Seventeen exploratory borings were made at the site. The locations of these borings are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on Boring Logs Nos. 1 thru 17. Also attached are the logs of borings previously made for "Waimalu Estates."

Borings were made with 3 and 4-in. diameter augers using a carbide drag bit. Soil samples were recovered with a 2-in. thin-wall tube and 2-in. standard split spoon samplers driven with a 140-lb hammer falling 30 inches.
For those borings that were made along the bank of Waimalu Stream, the consistency or penetration resistance of the material below the depth of the boring was estimated by probing with a 2-in. diameter point driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content, density, unconfined compression and laboratory vane shear, Atterberg limit, AASHO T-180-57 density, expansion and CBR.

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

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 site is a strip of land situated along the west side of Waimalu Stream between Kamehameha Highway and Moanalua Road with ground elevations varying from +6 to +45 ft. The site can be generally separated into two sections: a flat lying portion along Waimalu Stream, and a sloping portion about
200 to 300 ft west of Waimalu Stream that rises at about 10 to 20% gradients in a northwesterly direction.

Stockpiles of soil and boulders were noted at the north corner of the site. Much of the site is covered with haole koa, sugar cane and keawe trees. Existing homes and paved roads were also noted on the site.

During the weekend of February 5, 1972, a portion of the northwest bank of Waimalu Stream that was under construction slumped into the stream. The slump is located about midway along the stream frontage of this site and measures about 300 ft in length with a subsidence varying from 0 to 5 ft in height. Construction work involving lining of the stream bank for this section has presently stopped.

**INTERPRETATION OF SOIL CONDITIONS**

The soils encountered in the borings can be generalized as follows:

**Flat Lying Ground**

A surface crust of about 3 to 13 ft of soft to medium silty clays ("MH") underlain by soft organic silts ("OIl") to about 20 to 30 ft, the depths drilled. Firm material may be encountered at about 35 to 60 ft, as far as can be determined by probing.

Water was noted in the borings at about 3 to 10-ft depths.
**Sloping Ground**

A surface crust of about 3 to 8 ft of medium to stiff, silty clays and clayey silts ("MH") underlain by stiffer clayey silts and silty clays with decomposed rock to about 20 ft, the depth drilled.

Some clay ("CH") pockets were found in several borings from the surface to about 8-ft depths.

Water was noted in the borings at about 9 to 18-ft depths.

For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.

**DISCUSSION AND RECOMMENDATIONS**

The proposed plan is to grade the Newtown-Makai site for future developments, including Kaahumanu Street Extension which will cross the central portion of the site in the north-south direction.

Cuts from 0 to 18 ft and fills from 0 to 12 ft are contemplated.

The site should be cleared and grubbed before the start of fill construction. The site should be drained, proofrolled and localized soft spots removed.

Except for minor fills and grading to drain the site, fills should be avoided within a 70 to 100-ft wide strip west of the top of bank along Waimalu Stream.
The site should be graded with sufficient slopes, particularly for the low flat-lying areas, so that there will be some surface drainage after settlements of the ground surface take place after development.

The construction of fills, particularly in the flat-lying areas, should be done as soon as practicable to allow as much settlement to occur prior to the start of building construction. However, the construction of fills should be done slowly to allow the ground to consolidate and gain in strength as the fill loads are placed.

For fills of about 5 to 10 ft, settlements of about half to one foot or more may occur. Much of the primary settlements would probably occur during the placing of fills and for several months afterwards.

Settlement gages should be installed to monitor performance of fills over the flat-lying areas.

Cesspools may be encountered near the existing homes. They should be located on the grading plan prior to grading operations, if practicable. Sludge should be removed and the cesspool backfilled with granular material.

Site Grading

Grading work should be done in accordance with the requirements of the Revised Ordinances of Honolulu, 1961 As Amended and as recommended below:
1. The area should be cleared and grubbed. Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.

2. Topsoil and stockpiled soils should be stripped to stiff natural ground before the placement of fills. Loose surface soils at grade should be scarified and recompressed.

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

4. Hard surfaces of existing roads should be scarified down to stiff soils and recompressed to match the density of the surrounding soil.

5. The bottom and sides of drainage ditches should be stripped down to stiff natural ground before the placement of fills.

6. Where fills are proposed on sidehill areas, gullies and in drainage and irrigation ditches, loose material at the bottom and sides should
be stripped down to stiff natural ground before the placement of fills. New fills should be keyed into the stiff natural ground.

7. Where fills are proposed in natural drainageways or gullies, trenches should be cut in a herringbone pattern along the bottom and sides before the placement of fills. Subdrains should be placed in the trenches. The locations of subdrains should be determined in the field after clearing and grubbing.

8. 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.

9. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.
10. If boulders are proposed to be used in the construction of fills, they should be generally placed along the toe section of fill slopes and outside of probable building sites. A sketch showing the placement of boulders is attached, See Figure 1.

Slopes
Cut and fill slopes of 2 horizontal to 1 vertical or flatter may be used in the areas away from the stream.

Slope adjustments or other precautions may be necessary if seepage zones, soft spots or expansive soils are encountered in localized areas.

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

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

The surface of fill slopes should be compacted by cat-tracking or with a sheepfoot 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 soft spots are encountered in localized areas.

Roadway

In general, a rough estimate of the roadway pavement thickness for the light automobile traffic anticipated is as follows:

2. Base course - 6-in. base course.
3. Subbase course - 6-in. subbase course over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding subbase requirements in the field in accordance with the design standards of the City and County of Honolulu. In fill areas, the use of select soils within the top 2 to 3 ft of the subgrade may reduce the thickness or eliminate the need for the select borrow course.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels thru the walls of the catch basins which are placed in these low areas.
Utilities
Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints, particularly where lines are connected to structures.

Existing Cesspools
Cesspools possibly may be encountered during the site preparation work where the homes are located. When encountered, they should be flagged and located on the plans. Sludge should be removed from the bottom and the cesspool backfilled with fairly well-graded granular materials. The materials should be compacted with vibratory equipment or rammed into place. The top 5 ft of fill should be constructed in 6-in. compacted layers.

Building foundations should be designed to bridge over the cesspool.

Foundations for Future Structures
Other than light residential structures, supplementary borings should be made for building foundation design at the locations of the proposed structures.
Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water or expansive soil pockets may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

Site Regrading

After mass grading work is done and cuts and fills are made according to the grading plans, regrading at some future date should be avoided unless done under the guidance of a Soils Engineer.
PROPOSED SPECIFICATION FOR EARTHWORK
NEWTOWN-MAKAI AREA AND KAUMUMANU STREET EXTENSION

General Description

This item shall consist of clearing and grubbing, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work necessary for grading the site.

Clearing, Grubbing and Preparing Areas to be Filled

Vegetation, rubbish and miscellaneous material shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Loose surface and stockpiled soils shall be stripped to stiff natural ground before the placement of fills. Loose surface soils encountered at finish grade shall be scarified and recompacted.

Hard surfaces along existing access roads shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

Sidehill areas and the bottom and sides of gullies or natural drainageways shall be stripped down to stiff natural ground before the placement of fills. New fills shall be keyed into stiff natural ground.
Trenches shall be cut in a herringbone pattern and subdrains placed in the trenches to provide drainage paths along the bottom of natural drainageways. The locations of subdrains should be determined in the field after clearing and grubbing.

Where fills are made on sloping areas steeper than 5 horizontal to 1 vertical, the ground at the toe of the slope shall be benched to a generally level condition. As the fill is brought up, it shall be continually keyed into the stiff natural ground by the cutting of steps into the hillside and compacting the fill into these steps.

Materials

Fill material shall consist of selected on-site soils or approved borrow soils. The soils shall contain no more than a trace of organic and deleterious matter.

Borrow soils shall be select soils generally less than 3-in. maximum size, with more than 30% fines and a plasticity index generally less than 20.

Fill material placed in the top 2 ft of fills shall contain less than 30% gravel.

Placing, Spreading and Compacting Fill Material

The construction of fills in the flat-lying areas near Waimalu Stream should be done slowly to allow the ground to consolidate and gain in strength as the fill loads are placed.
The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and thoroughly blade-mixed during the spreading to insure uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest and voids between rocks shall be carefully filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content assures a thorough bonding during the compacting process.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.

After each layer has been placed, mixed and spread evenly, it shall be compacted to 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified water content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to obtain the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepfoot rollers are used, the soil
may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

**Boulder Fills**

If boulders are used for the construction of fills, they shall be generally placed along the toe section of slopes. The subgrade shall be stripped to stiff natural ground, shaped to drain and a layer of filter material shall be placed on it. Nesting of boulders shall be avoided. Voids shall be filled with smaller granular soils. A blanket of filter material shall be placed against the boulder fill before construction of fills against it.

**Excavation**

Suitable material from excavation shall be used in the fill and unsuitable material from excavation shall be disposed of.
Unforeseen Conditions

If unforeseen or undetected critical soil conditions such as soft spots, seepage water or expansive soil pockets are encountered, corrective measures shall be made in the field as they are detected.

Rainy Weather

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.
BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.
### Boring Log

**KAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA**

**LOCATION**: Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key**: 9-8-20: 1 & 9-8-08: 3, 4 & 8

**HAMMER**: Weight 140#, Drop 30"

**SAMPLER**: 2" STANDARD SPLIT SPOON

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#### PENETRATION DATA

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**DESCRIPTION**

- **ELEV. = 40' + 7"**
  - MEDIUM, REDDISH BROWN SILTY CLAY w/ TRACES OF GRAVEL & SAND
  - LIGHT TAN & GRAY DECOMPOSED ROCK, SAND & GRAVEL (SOME CRUSHED TO SILTY SAND)
  - MOTTLED GRAY & BROWN SILTY SAND w/ GRAVEL & DECOMPOSED ROCK
  - ROCK OR BOULDER
  - END OF BORING: 6' 12.5'

**DRILL RATE**: 11.5' / 12.5' / 30 MIN.

---

*ELEVATION ESTIMATED FROM TOPO MAP DATED 7-31-72*
### Boring Log

**PROJECT**
KAAHUMANU STREET EXTENSION AND NEWTON-MAKAI AREA

**LOCATION**
Waimalua, Ewa, Oahu, Hawaii

**Tax Map Key:**
- 9-8-20: 1 & 9-8-08: 3, 4 & 8

**HAMMER:**
- Weight: 140#  
- Drop: 30"

**SAMPLER:**
- 2" S - 2" O.D. THIN WALL TUBE  
- 2" 5S: 2" STANDARD SPLIT SPOON

**BoRErING NO.:** 2  
**Sheet NO.:** of

**Boring No.:** 2
**Location:** Waimalua, Ewa, Oahu, Hawaii
**Date:** Jan. 31, 1972

**Driller:** W. LUM ASSOCIATES
**Field Party:** SUZUKI, RADOVICH, COLLURA
**Type of Boring:** AUGER (MOBILE)

**Elev:** 98' 7"  
**Datum:**

**Drill Bit:** T.C. DRAG

**Water Level:** NOT NOTED

**Time:**
**Date:** 1-31-72

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**Elevation Estimated From Topo Map:**
**Dated:** 1-31-70

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*Note: The section 131-72 seems to be a date or task number, possibly indicating the page number or version of the data sheet.*
Boring Log

**PROJECT**
KAAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA

**LOCATION**
Waialu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 &

**9-8-08: 3, 4 & 8**

**HAMMER:**

- **Weight:** 140*
- **Drop:** 30"*

**SAMPLER:** 2" STANDARD SPLIT SPOON

---

**LOCATION**
Wainalu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 &

**9-8-08: 3, 4 & 8**

**HAMMER:**

- **Weight:** 140*
- **Drop:** 30"*

**SAMPLER:** 2" STANDARD SPLIT SPOON

---

**LOCATION**
Wainalu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 &

**9-8-08: 3, 4 & 8**

**HAMMER:**

- **Weight:** 140*
- **Drop:** 30"*

**SAMPLER:** 2" STANDARD SPLIT SPOON
**Boring Log**

**KAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA**

**PROJECT**

**LOCATION** Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 & 9-8-08: 3, 4 & 8

**HAMMER:**

- **Weight:** 140#
- **Drop:** 30'

**SAMPLER:** 2" STANDARD SLIT SPOON

---

**LOCATION**

- **T.C. DRAG**
- **DATE:** 2-10-72
- **TIME:**

**MATERIAL DATA**

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**END OF BORING C 21.5'**

---

**ELEVATION ESTIMATED FROM TDPO MAP**

**DATED 1-31-72**
### Boring Log

**KAAHUMANU STREET EXTENSION**

**PROJECT**
AND NEWTOWN-MAIKAI AREA

**LOCATION**
Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 &

**HAMMER:**

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**SAMPLER:** 2" STANDARD SPLIT SPOON

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- **ELEVATION ESTIMATED FROM TOPO. MAP, DATED 7-31-70**

---

**BORING NO.** 5  
**Sheets No.** 1 of 1  
**Driller** WALTER LUM ASSOCIATES, INC.  
**Date** FEB. 2, 1972  
**Field Party** MAESHIRO, RADOVICH  
**Type of Boring** AUGER (MOBILE)  
**Elev.** 23'  
**Datum**  
**Hammer**  
**Drill Btl Type** T.C. DRAC  
**Water Level** NOT NOTICED  
**Time**  
**Date** 2-2-72  

---

**Unified Soil Classification**

- **(CH)**
  - STIFF, BROWN CLAY WITH TRACES OF SAND AND ROOTS

- **(MH)**
  - STIFF BROWN CLAYEY SILT
  - STIFF MOTTLED BROWN CLAYEY SILT WITH TRACES OF SAND

---

**Notes:**

- Elevation estimated from topographic map dated 7-31-70
## ORANGE STREET EXTENSION
### PROJECT
AND NEWTOWN-MAKAI AREA

#### LOCATION
Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 & 9-8-08: 3, 4 & 8

### BORING NO.
1

#### HAMMER:
- **Weight:** 140#
- **Drop:** 30'

#### SAMPLER:
- 2" S. 2" O.D. THIN WALL TUBE
- 2" 96.2" STANDARD SPLIT SPOON

<table>
<thead>
<tr>
<th>Depth</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Penetration Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>G-A</td>
<td>34</td>
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<tr>
<td>10</td>
<td>G-B</td>
<td>26</td>
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<tr>
<td>15</td>
<td>G-C</td>
<td>35</td>
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<tr>
<td>20</td>
<td>G-D</td>
<td>19</td>
<td>8/5' 15'5'</td>
</tr>
<tr>
<td></td>
<td>G-E</td>
<td>17</td>
<td>9/5' 15'5'</td>
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### PENETRATION DATA

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Blows/0.5'</th>
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<tr>
<td>10</td>
<td>40</td>
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<tr>
<td>20</td>
<td>50</td>
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### NOTES
- **Elevation Estimated from Topo Map Dated:** 7-31-70

---

*WALTER LUM ASSOCIATES, INC.*

2000 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

MAESHIRO, ASATO

*Date: FEB. 1, 1972*

**Type of Boring:** AUGER (ACKER) Diam. 4"

**Elev.:** 42' + 0

**Datum:** WHT 140'

**Drop Water Level:** HOTIC

**Time:** —

**Date:** 2-1-72
**Boring Log**

**KAUHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA**

**LOCATION**

Waialua, Ewa, Oahu, Hawaii

Tax Map Key: 9-8-20: 1 & 9-8-08: 3, 4 & 8

**HAMMER:**

Weight 140#
Drop 30"

**SAMPER:** 2" STANDARD SPLIT SPOON

---

<table>
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<tr>
<th>Unified Soil Classification</th>
<th>DESCRIPTION</th>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Wet Density</th>
<th>Dry Density</th>
<th>Unconf. Comp.</th>
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<tr>
<td>(MH)</td>
<td>STIFF, BROWN &amp; GRAY CLAY &amp; SILT W/TRACE OF DECOMPOSED ROCK</td>
<td>10</td>
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<td>PL</td>
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<td>LL</td>
<td>PL</td>
<td>73</td>
<td>35/5'</td>
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**END OF BORING @ 21'**

* ELEVATION ESTIMATED FROM TOPO MAP DATED 7-31-70.
### Boring Log

**Location:** Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 & 9-8-08: 3, 4 & 8

**Driller:** W. LUM ASSOC, INC.  
**Date:** JAN. 28, 1972

**Log Details:**
- **Hammer:** Weight 140 lbs, Drop 30".
- **Sampler:** 2" x 2" standard split spoon.
- **Type of Boring:** Auger (mobile), Diam. 3".
- **Datum:** 33' ± 8

**Penetration Data:**

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<tr>
<th></th>
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<tr>
<td>0</td>
<td>2.5</td>
<td>9.4 111</td>
<td>32</td>
<td>84</td>
<td>8200</td>
<td>9/5 4/5</td>
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<tr>
<td>10</td>
<td>2.5</td>
<td>9.5 112</td>
<td>44</td>
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<td>3930</td>
<td>3/5 4/5</td>
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<tr>
<td>15</td>
<td>2.5</td>
<td>9.6 120</td>
<td>34</td>
<td>89</td>
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<td>10/5 20/5</td>
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<tr>
<td>20</td>
<td>2.5±</td>
<td>9.7 120</td>
<td>34</td>
<td>89</td>
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<td>24/5 40/5</td>
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<tr>
<td>20.9</td>
<td>2.5±</td>
<td>9.8 120</td>
<td>34</td>
<td>89</td>
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<td>40/4</td>
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**Notes:**
- Elevation estimated from topo map dated 7-31-70.

---

**PROJECT AND NEWTOWN-MAKAI AREA LOCATION**

**Waimalu, Ewa, Oahu, Hawaii**

**Field Party:** Suzuki, Radovich, Collins

**Type of Boring:** Auger (mobile), Diam. 3".

**Datum:** 33' ± 8

---

**Hammer:** Weight 140 lbs, Drop 30".

**Sampler:** 2" x 2" standard split spoon.

---

**Penetration Test:**
- 9/5 4/5
- 3/5 4/5
- 10/5 20/5
- 24/5 40/5
- 40/4
## Boring Log

**KAAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA**

**LOCATION**
Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key:**
9-8-20: 1 & 9-8-08: 3, 4 & 8

### HAMMER:
- **Weight:** 140*
- **Drop:** 30"
- **Type of Boring:** 2" S. 2" O.D. THIN WALL TUBE
- **Sampler:** 2" SS 2" STANDARD SPLIT SPOON

### BORING NO. 10

**Driller:** W. LUM ASSOC., INC. Date: FEB 14, 1972
**Field Party:** SUZUKI, COLUKARADPOVICH, FUJI, MEYER
**Type of Boring:** AUGER (MOBILE) Diam. 3"
**Elev.:** 25' ± x
**Datum:** 10.5'
**Drill Bit:** T.C. DRAC

### Water Level:
- **Time:** 10:45 AM
- **Date:** 2-5-72

### PENETRATION DATA

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<th></th>
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<th></th>
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<tbody>
<tr>
<td>2.5'</td>
<td>10-A</td>
<td>36</td>
<td></td>
<td></td>
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<td>5</td>
<td>10-B</td>
<td>93</td>
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<td>10</td>
<td>4190</td>
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<td>4.5'.10.5'</td>
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<tr>
<td>10</td>
<td>10-C</td>
<td>104</td>
<td>43</td>
<td>44</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.5'.11.5'</td>
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<tr>
<td>15</td>
<td>10-D</td>
<td>110</td>
<td>46</td>
<td>15</td>
<td>4170</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.5'.10.5'</td>
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</tbody>
</table>

### ELEVATION ESTIMATED FROM TOPO MAP
DATED 7-31-70

---

*WA'LTER LUM ASSOCIATES, INC.
3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931*
Boring Log

**PROJECT:** FAAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA

**LOCATION:** Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-8-20: 1 & 6

**9-8-08:** 3, 4 & 8

**HAMMER:**

*Weight:* 140 lbs

*Drop:* 30"

**SAEMPLER:**

2.5" - 2" O.D. THIN WALL TUBE

2.5" - 2" STANDARD BORE SPOON

2" DIA. BLUNT POINT

---

**UNITED GEOCO: ON**

**DESCRIPTION:**

**ELEV.: 9.5' -**

- MEDIUM, REDDISH-BROWN SILTY CLAY

- MEDIUM GRAY-BROWN CLAY W/ TRACES OF DECOMPOSED ROCK (SLIGHTY ORGANIC)

- SOFT BROWN GRAY ORGANIC Silt w/ SAND & SHELL FRAGMENTS

**END OF BORING @ 26.5**

- END OF PENETRATION @ 37'

**PENETRATION DATA**

**BORE NO. 11**

**Sheet No. 1 of 1**

**DATER:** W. LUM ASSOC., INC.

**DATE:** FEB. 9, 1972

**FIELD PARTY:** MAEGIRIO, AGATO, RADOVICH

**ELEV. - 9.5'**

**SUMMARY:**

**Standard Penetration Test:**

- 2" O.D. THIN WALL TUBE SAMPLER

- N (Blows per foot) - 0 10 20 30 40 BLOWS/0.5'

- **Continuous Penetration Test:**

- 9" DIA. BLUNT POINT

- 100# Wt. Ter. 1.5 ft.

- 140# Wt. Ter. 3.5 ft.

**MAP:**

- NEWTOWN-MAKAI

- AND KAAHUMANU STREET EXTENSION

- W. J. DUGAN

- 30 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

---

**ELEVATION ESTIMATED FROM TOPO MAP**

**DATED:** 7-31-70
**Boring Log**

**KAHAHUMANU STREET EXTENSION**  
**AND NEWTOWN-MAKAI AREA**

**PROJECT**  
Waimalu, Ewa, Oahu, Hawaii

**LOCATION**  
Tax Map Key: 9-8-20: 1 & 9-8-08: 3, 4 & 8

**HAMMER:**  
Weight: 140*  
Drop: 20"

**SAMPLER:**  
2" S. 2" O.D. THIN WALL TUBE  
2" S6. 2" STANDARD SPLIT SPOON

<table>
<thead>
<tr>
<th>Ham Classification</th>
<th>Description</th>
<th>Depth (Ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Wet Density P.C.F.</th>
<th>Water Content</th>
<th>Dry Density P.C.F.</th>
<th>Uncert. Comp.</th>
<th>Test Shear P.S.F.</th>
<th>Penetration Data</th>
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<tbody>
<tr>
<td>(MH)</td>
<td>STIFF, BROWN Silty Clay w/ Traces of Sand &amp; Roots</td>
<td>2.5</td>
<td>12-A</td>
<td>107</td>
<td>34</td>
<td>80</td>
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<td>6/5. B/5'</td>
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<td>(MH)</td>
<td>STIFF, BROWN &amp; GRAY CLAYEY SILT w/ Traces of SAND</td>
<td>5</td>
<td>2.95</td>
<td>12-B</td>
<td>92</td>
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<tr>
<td>(MH)</td>
<td>STIFF, MOTTLED BROWN CLAYEY SILT w/ Traces of SAND</td>
<td>10</td>
<td>2.95</td>
<td>12-C</td>
<td>97</td>
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<td>(MH)</td>
<td>STIFF, MOTTLED BROWN CLAYEY SILT w/ SAND</td>
<td>15</td>
<td>2.95</td>
<td>12-D</td>
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<tr>
<td></td>
<td>END OF BORING &amp; 21.5'</td>
<td>20</td>
<td>2.36</td>
<td>12-E</td>
<td>37</td>
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*ELEVATION ESTIMATED FROM TOPO MAP DATED 7-31-70*
### Boring Log

**KAAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA**

**LOCATION**: Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key**: 9-8-20: 1 & 9-8-08: 3, 4 & 8

**PROJECT**: WALTER LUM ASSOCIATES, INC.

**ADDRESS**: 3030 WAIKIKI AVE, HONOLULU, HAWAII 96816 • PHONE 737-7931

---

**BOARING NO.**: 13  
**Date**: FEB. 5, 1972

**Driller**: W. LUM ASSOC., INC.  
**Field Party**: MEYER, FUJII, RADOVICH

**Type of Boring**: AUGER (MOBILE)  
**Elev.**: 8' 4"

**Diam.**: 3"  
**Datum**: 10' 0"

**Drill Bit**: T.C. DRAG

**Weight**: 140*  
**Drop**: 30"

**HAMMER**: 2" S. 2" O.D. THIN WALL TUBE  
**SAMPLER**: 2" 56. 2" STANDARD SPLIT SPOON

---

**HAMMER**: 140*  
**Weight**: 30"

**Drop**: 2" S. 2" O.D. THIN WALL TUBE  
**SAMPLER**: 2" 56. 2" STANDARD SPLIT SPOON

---

### PENETRATION DATA

<table>
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<tr>
<th>Layer Description</th>
<th>Elevation (ft)</th>
<th>Sample P.C.E.</th>
<th>% Water Cont.</th>
<th>Dry Density</th>
<th>Unconfined Comp.</th>
<th>Res. Shear Test</th>
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<tbody>
<tr>
<td>MEDIUM BROWN SILTY CLAY</td>
<td>8' 4&quot;</td>
<td>13-A</td>
<td>63</td>
<td>42</td>
<td>1500</td>
<td>500</td>
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<tr>
<td>SOFT DARK GRAY ORGANIC SILT W/ TRACES OF SAND</td>
<td>9' 0&quot;</td>
<td>13-B</td>
<td>107</td>
<td>83</td>
<td>58</td>
<td>1030</td>
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<tr>
<td>SOFT DARK GRAY ORGANIC SILT W/ SHELLS</td>
<td>10' 0&quot;</td>
<td>13-C</td>
<td>112</td>
<td>58</td>
<td>71</td>
<td>LL</td>
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<tr>
<td>LIGHT BROWN CLAYY SILT</td>
<td>11' 0&quot;</td>
<td>13-D</td>
<td>112</td>
<td>58</td>
<td>77</td>
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*ELEVATION ESTIMATED FROM TOPO MAP DATED 7-31-70*
<table>
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<tr>
<th>Sampled</th>
<th>Depth (ft)</th>
<th>Weight</th>
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<tr>
<td>#1</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>#2</td>
<td>13</td>
<td>40</td>
</tr>
<tr>
<td>#3</td>
<td>14</td>
<td>40</td>
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Weight: 40 lbs

No. of Samples: 3

Date: 9-8-08

Location: 500 E. Ali I. Ave.

Type: CPT

Method: Boring

Unit: ft

Depth: 12 to 14 ft

WALTER LUM ASSOCIATES, INC.

9-8-20
**Boring Log**

**Location:** Kauhuanu Street Extension and Kekaha Kai State Park Area, Wai'anae, Oahu, Hawaii

**Type of Boring:** AUGER

**Tax Map Key:** 9-8-20: 1 & 2

**Date:** 9-8-88: 1 & 4-8

**Weight:** 140 lbs

**Drop:** 20 ft

**Sampler:** 2 1/2" BORING TUBE RING, 2 1/2" STANDARD SPLIT SPOON

**Sample Point:**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
<th>Density</th>
<th>Water Content</th>
<th>Standard Penetration Test</th>
<th>2&quot; O.D. TUBE WALL TUBE SIZE</th>
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<td>0.00</td>
<td>MEDIUM, BROWN, SILTY CLAY WORMHOLES</td>
<td>2 lbs/ft³</td>
<td>30%</td>
<td>0 blow/10 ft</td>
<td>2 1/2&quot; TW TUBE</td>
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<td>0.05</td>
<td>MOTTLED GRAY-BROWN SILTY CLAY</td>
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<td>20%</td>
<td>0 blow/10 ft</td>
<td>2 1/2&quot; TW TUBE</td>
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<td>0.10</td>
<td>SOFT, PARCHED CLAY</td>
<td>2 lbs/ft³</td>
<td>20%</td>
<td>0 blow/10 ft</td>
<td>2 1/2&quot; TW TUBE</td>
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<tr>
<td>0.15</td>
<td>ORGANIC SILT WITH TRACES OF SAND &amp; SHELLS</td>
<td>2 lbs/ft³</td>
<td>20%</td>
<td>0 blow/10 ft</td>
<td>2 1/2&quot; TW TUBE</td>
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</table>

**End of Penetration @ 60'**

**Elevation Estimated from Tax Map Dated 1/91/70**

**End of Penetration 3/15/5**

**Continuous Penetration Test**

**Standard Penetration Test**

**2" O.D. tube wall tube size**
## Boring Log

**KAAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA**

**LOCATION:** Waimalu, Ewa, Oahu, Hawaii  
**Tax Map Key:** 9-8-20: 1 & 9-8-08: 3, 4 & 8

**BOURING NO.** 1G  
**Sheet No.** of ____________

**Driller:** W. LUM ASSOCIATES, INC.  
**Date:** FEB. 9, 1977

**Field Party:** MAEISHIRO, ASATO, RADOVICH

**Type of Boring:** AUGER  
**Sleeve:** 4"

**Elev.** 8 +/- 2  
**Datum:** T.C. DRAG

**Weight:** 140#  
**Drop:** 30"

**HAMMER:**  
**SAMPLER:** 2" STANDARD SPLIT SPOON

### PENETRATION DATA

<table>
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<th>Standard Penetration Test</th>
<th>N (Blows per foot)</th>
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</thead>
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<td>30</td>
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<tr>
<td></td>
<td>40</td>
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**END OF BORING @ 21.8'**

---

**ELEVATION ESTIMATED FROM TOPO MAP DATED 7.31.70**

---

**UNITED STATES DEPARTMENT OF THE INTERIOR**

---

**CLASSIFICATION**

- **ELEV. = 8' +/- 2**

---

**DESCRIPTION**

- **(CH)** SOFT, BROWN Silty Clay  
  **WATER**  
  **(CH)** SOFT, BROWN Organic Clay & Silt

---

**SAMPLER**

- **16-A**  
  **16-B**  
  **16-C**  
  **16-D**  
  **16-E**

---

**VANE TEST**

- **VANE TEST**
  **(MH)** STIFF, MOTTLED BROWN CLAYEY Silt  
  **WATER**  
  **(MH)** STIFF, MOTTLED BROWN CLAYEY Silt  
  **WATER**

---

**DIAGRAM**

- **Drill Bit:** T.C. DRAG  
  **Water Level:** 3.0'

---

**TIME:** 2:00PM  
**DATE:** 2-9-72
Boring Log

**Project:** KAAHUMANU STREET EXTENSION AND NEWTOWN-MAKAI AREA

**Location:** Waimalu, Ewa, Oahu, Hawaii

**Hammer:**
- **Weight:** 140#
- **Drop:** 30".

**Sampler:** 2" STANDARD SPLIT SPOON

**Boring No.** 17

**Driller:** W. LUM ASSOC., INC.

**Field Party:** MAESHIRO, ASATO, KADOVICH

**Type of Boring:** AUGER (MOBILE)

**Diam.:** 4".

**Test:** 9-8-80; 9-8-20: 1 & 9-8-08: 3, 4 & 8

**Elevation:** 15' ± 0.

**Drill Bit:** T.C. DRAG

**Water Level:** 12.0

**Time:** 3:30 P.M.

**Date:** 2-9-72

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### PENETRATION DATA

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<tr>
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<th>Description</th>
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<th>Sampler</th>
<th>Density</th>
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<tbody>
<tr>
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<td>ROCK FRAGMENTS W/SAND &amp; MOTTLED BROWN, CLAYEY Silt (FILL?)</td>
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<td>-</td>
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<tr>
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<td>MEDIUM, MOTTLED GRAY, BROWN SILTY CLAY</td>
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<td>-A</td>
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<tr>
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<td>(MH)</td>
<td>STIFF, GRAY- BROWN Silty Clay W/TRACES OF SAND</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>(SM)</td>
<td>MEDIUM DENSITY BROWN, SILTY SAND W/ GRAVEL</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

---

**END OF BORING @ 21.5**

---

**Elevation Estimated from Topo Map Dated 7-21-70**
TABLE I.A - SUMMARY OF LABORATORY TEST RESULTS

| BORING NO. | C | 10'-11' | BROWN SILTY CLAY WITH TRACES OF SAND |
| SAMPLE NO. | C | SURFACE | MOSSLED REDDISH BROWN & GRAY SILTY CLAY |
| DEPTH BELOW SURFACE | 3 | 10'-11.5' | CLAYETY Silt WITH COMP. ROCK |

**DESCRIPTION**

**GRAIN-SIZE ANALYSIS**

(\% Passing)

<table>
<thead>
<tr>
<th>Sieve</th>
<th>1''</th>
<th>1/2''</th>
<th>#4</th>
<th>#10</th>
<th>#20</th>
<th>#40</th>
<th>#100</th>
<th>#200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ATTERBERG LIMITS**

- Air Dried or Natural
- Liquid Limit
- Plastic Limit
- Plasticity Index
- Dilatancy
- Toughness
- Dry Strength

**UNIFIED SOIL CLASSIFICATION**

- MH
- ML
- MH

**APPARENT SPECIFIC GRAVITY**

- 2.95

**EXPANSION AND CBR TESTS**

(Surcharge-51 P.S.F.)

- Molding Moisture, %
- Molding Dry Density, P.C.F.
- Swell upon saturation, %
- CBR at 0.1'' Penetration

<table>
<thead>
<tr>
<th></th>
<th>26.6</th>
<th>101.4</th>
<th>0.7</th>
<th>15.3</th>
</tr>
</thead>
</table>

**MOISTURE-DENSITY RELATIONS OF SOILS**

(AASHO T-180-57 Method)

- Dry to Wet or Wet to Dry
- Max. Dry Density (P.C.F.)
- Optimum Moisture (%)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>WET TO DRY</th>
<th>101.3</th>
<th>26.9</th>
</tr>
</thead>
</table>

**REMARKS:**

Date 3-9-72  By RT
## Table 1 — Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>SAMPLE NO.</th>
<th>DEPTH BELOW SURFACE</th>
<th>DESCRIPTION</th>
<th>GRAIN-SIZE ANALYSIS ( % Passing )</th>
<th>ATTERBERG LIMITS</th>
<th>UNIFIED SOIL CLASSIFICATION</th>
<th>APPARENT SPECIFIC GRAVITY</th>
<th>EXPANSION AND CBR TESTS</th>
<th>MOISTURE-DENSITY RELATIONS OF SOILS</th>
<th>REMARKS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4</td>
<td>6'-6.5'</td>
<td>BROWN BROWN</td>
<td>Silt Clay Clay</td>
<td>NATURAL 69</td>
<td>MH</td>
<td>2.92</td>
<td></td>
<td>A WET TO DRY: 100%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>SURFACE</td>
<td>DARK BROWN</td>
<td>CLAYY Silt</td>
<td>NATURAL 60</td>
<td>MH</td>
<td>2.08</td>
<td></td>
<td>A DRY TO WET: 89.7%</td>
<td></td>
</tr>
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</table>

**Remarks:**

Date 3-4-72  By WALTER LUM ASSOCIATES, INC.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
### TABLE I.C - SUMMARY OF LABORATORY TEST RESULTS

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>SAMPLE NO.</th>
<th>DEPTH BELOW SURFACE</th>
<th>DESCRIPTION</th>
<th>GRAIN-SIZE ANALYSIS (% Passing)</th>
<th>ATTERBERG LIMITS</th>
<th>UNIFIED SOIL CLASSIFICATION</th>
<th>APPARENT SPECIFIC GRAVITY</th>
<th>EXPANSION AND CBR TESTS</th>
<th>MOISTURE-DENSITY RELATIONS OF SOILS</th>
<th>REMARKS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.5'-2'</td>
<td>MOTTLED BROWN CLAY</td>
<td>Sieve</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10'-11.5'</td>
<td>BROWN SANDY CLAY</td>
<td>1&quot;</td>
<td>NATURAL</td>
<td></td>
<td>MH</td>
<td></td>
<td></td>
<td>3-9-72</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1'-1.5'</td>
<td>CLAYY Silt WITRACES OF</td>
<td>1/2&quot;</td>
<td>NATURAL</td>
<td></td>
<td>MH</td>
<td></td>
<td></td>
<td>WALTER LUM ASSOCIATES, INC. CIVIL, STRUCTURAL, SOILS ENGINEERS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30'-31.5'</td>
<td>ORGANIC Silt WITRACES OF</td>
<td>#4</td>
<td>NATURAL</td>
<td></td>
<td>OH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SHELL</td>
<td>10</td>
<td>NATURAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>1/4</td>
<td>SAND &amp; ROOTS</td>
<td>1/20</td>
<td>SLOW-MED.</td>
<td></td>
<td>SLIGHT-MED.</td>
<td></td>
<td></td>
<td></td>
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</table>

**Remarks:**

Date: 3-9-72  By: B.T.
TABLE I - SUMMARY OF LABORATORY TEST RESULTS

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<thead>
<tr>
<th>BORING NO.</th>
<th>8</th>
<th>9</th>
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</thead>
<tbody>
<tr>
<td>SAMPLE NO.</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>DEPTH BELOW SURFACE</td>
<td>6' - 6½'</td>
<td>0' - 1'</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>BROWN SILTY CLAY</td>
<td>BROWN CLAY W/ TRACES OF SAND</td>
</tr>
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</table>

**GRAIN-SIZE ANALYSIS** (% Passing)

<table>
<thead>
<tr>
<th>Sieve</th>
<th>1&quot;</th>
<th>1/2&quot;</th>
<th>1/4&quot;</th>
<th>#10</th>
<th>#20</th>
<th>#40</th>
<th>#100</th>
<th>#200</th>
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**ATTERBERG LIMITS**

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<tr>
<th>Air Dried or Natural</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Plasticity Index</th>
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<tr>
<td>NATURAL</td>
<td>71</td>
<td>95</td>
<td>33</td>
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<td>NATURAL</td>
<td>70</td>
<td>30</td>
<td>40</td>
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<table>
<thead>
<tr>
<th>Dilatancy</th>
<th>Toughness</th>
<th>Dry Strength</th>
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<tr>
<td>NONE</td>
<td>MED-HIGH</td>
<td>MED-HIGH</td>
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<tr>
<td>NONE</td>
<td>HIGH</td>
<td>HIGH</td>
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**UNIFIED SOIL CLASSIFICATION**

<table>
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<th>MH-CH</th>
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**APPARENT SPECIFIC GRAVITY**

<p>| |</p>
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<th></th>
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</thead>
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**EXPANSION AND CBR TESTS**

(Surcharge-51 P.S.F.)

<table>
<thead>
<tr>
<th>Molding Moisture, %</th>
<th>Molding Dry Density, P.C.F.</th>
<th>Swell upon saturation, %</th>
<th>CBR at 0.1&quot; Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**MOISTURE-DENSITY RELATIONS OF SOILS**

(AASHO T-180-57 Method)

<table>
<thead>
<tr>
<th>Dry to Wet or Wet to Dry</th>
<th>Max. Dry Density (P.C.F.)</th>
<th>Optimum Moisture (%)</th>
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**REMARKS:**

Date 3-9-72 By B1
### Boring Log

**PROJECT:** WAIMALU ESTATES  
**LOCATION:** Waimalu, Ewa, Oahu, Hawaii  
**Tax Map Key:** 9-8-08: 8

<table>
<thead>
<tr>
<th>Hammer:</th>
<th>Weight: 140#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop:</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

**Sampler:** 2" 3/4" O.D. THIN WALL TUBE  
3" 1/2" STANDARD SPLIT SPOON

#### Soil Classification

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Wet Den. %</th>
<th>Water Cont. %</th>
<th>Dry Den. %</th>
<th>Unconf. Comp.</th>
<th>Penetration Test (Blows per foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(MH)</td>
<td>Stiff Mottled Brown Silty Clay &amp; Decomposed Rock</td>
<td>2.55</td>
<td>4-A</td>
<td>27</td>
<td>LL+68</td>
<td>PL+33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>Stiff Brown &amp; Gray Silty Clay &amp; Traces of Decomposed Rock</td>
<td>2.75</td>
<td>4-B</td>
<td>54</td>
<td>LL+86</td>
<td>PL+33</td>
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<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>Medium Mottled Brown &amp; Gray Silty Clay</td>
<td>2.75</td>
<td>4-C</td>
<td>65</td>
<td>PL+33</td>
<td>PL+33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(OH)</td>
<td>Soft Dark Gray Organic Clays &amp; Silts &amp; Traces of Shells</td>
<td>3.5</td>
<td>4-D</td>
<td>64</td>
<td>LL+51</td>
<td>PL+34</td>
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</tbody>
</table>

#### Datum

- **Location:** 3-26-71
- **Elevation:** 12'-7"

### Penetration Data

- **Standard Penetration Test:** 2" 3/4" O.D. THIN WALL TUBE
- **Blows per foot:** 0 10 20 30 40
- **N:**
  - **3 1/2" O.D. THIN WALL TUBE:**
    - 3/5 7/5
  - **HYDRAULIC:**
    - PUSH/1.2'
    - PUSH/1.0'
    - ONE MAN PUSH/1.5'
    - HYDRAULIC PUSH/2.0'

**Continuous Penetration Test:** 2" 3/4" BLUNT POINT

**Elevation Estimated from Topo Map**

**Location:** HONOLULU, HAWAII 96816  
**Date:** MAY 26, 1971
**Boring Log**

**PROJECT**  WAIMALU ESTATES

**LOCATION**  Waimalu, Ewa, Oahu, Hawaii

**Tax Map Key:**  9-8-08: 8

**HAMMER:**

- **Weight:** 140 lbs
- **Drop:** 30"

**SAMPLER:**

- **2" 5'- 2" O.D. THIN WALL TUBE**
- **2" SS. 2" STANDARD 'SPLIT SPOON**

**LOCATION**

- **Location:** Waimalu, Ewa, Oahu, Hawaii

**FIELD DATA**

- **Date:** May 26, 1971
- **Driller:** W. Lum Assoc., Inc.
- **Field Party:** Suzuki, Meyer
- **Type of Boring:** ALGER (ACKER) Diam. 4"
- **Datum:** 10 ±
- **Hammer:** FINGER TYPE
- **Drop:** 2' 5' - 2" R.D. THIN WALL TUBE
- **Sample:** 2" 5'. 2" STANDARD 'SPLIT SPOON
- **Water Level:** 2.0'

**PENETRATION DATA**

- **Standard Penetration Test:** 2" O.D. THIN WALL TUBE
- **N (Blows per foot):**
  - 0 10 20 30 40
  - **Blows/0.5'**

**UNITED STATES GEOL OGY**

- **GEOLOGIC CLASSIFICATION**
  - **MICH**
  - **CH**
  - **MH**

**DESCRIPTION**

1. **STIFF, BROWN**
   - **SILTY CLAY W/ TRACES OF DECOMPOSED ROCK**
2. **GRAY, CLAY W/ SOME DECOMPOSED ROCK**
3. **STIFF, BROWN**
   - **CLAYET, SILT W/ SAND**
   - **DECOMPOSED ROCK**
4. **STIFF, MOTTLED BROWN**
   - **CLAYET, SILT W/ GRAY**
   - **CLAY POCKETS & TRACES OF DECOMPOSED ROCK**
5. **END OF BORING @ 265'**

**ELEVATION ESTIMATED FROM TOPO. MAP**
**Boring Log**

**PROJECT:** WAIMALU ESTATES  
**LOCATION:** Waimalu, Ewa, Oahu, Hawaii  
**Tax Map Key:** 9-8-08: 8

<table>
<thead>
<tr>
<th>HAMMER:</th>
<th>Weight</th>
<th>Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>140#</td>
<td>30&quot;</td>
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<table>
<thead>
<tr>
<th>SAMPLER:</th>
<th>Description</th>
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<tbody>
<tr>
<td>2.5&quot; x 2.5&quot; STANDARBD SPLT SPOON</td>
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<table>
<thead>
<tr>
<th>ELEV.</th>
<th>DESCRIPTION</th>
<th>SAMPLE</th>
<th>SAMP. No.</th>
<th>WET DESC.</th>
<th>DRY DESC.</th>
<th>WATER CONTENT</th>
<th>UND. CONC.</th>
<th>PENETRATION DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STIFF, BROWN Silt-CLAY</td>
<td>2.43</td>
<td>G.A</td>
<td>31</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3/5 4/5</td>
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<tr>
<td></td>
<td>MEDIUM TO STIFF, MOTTLED BROWN Silt-CLAY</td>
<td>2.9</td>
<td>G.B</td>
<td>100</td>
<td>55.75</td>
<td>3750</td>
<td>-</td>
<td>HYDRAULIC PUSH/1.5&quot;</td>
</tr>
<tr>
<td></td>
<td>SOFT, DARK GRAY ORGANIC CLAYS &amp; Silt, W/SAND &amp; GRAVEL</td>
<td>3.5</td>
<td>G.C</td>
<td>101</td>
<td>LL=79 PL=30</td>
<td>62</td>
<td>0.5</td>
<td>HYDRAULIC PUSH/1.5&quot;</td>
</tr>
<tr>
<td></td>
<td>ENDP. OF BORING</td>
<td>2.9</td>
<td>G.D</td>
<td>91</td>
<td>23</td>
<td>42</td>
<td>-</td>
<td>HYDRAULIC PUSH/1.5&quot;</td>
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<tr>
<td></td>
<td>ENDP. OF PENETRATION</td>
<td>4.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

- **BORE NO. C**  
- **Date:** MAY 19, 1971  
- **Driller:** W. LUM ASSOC, INC.  
- **Field Party:** SUZUKI, MEYER

---

**PENETRATION TEST IN THIN WALL TUBE**

- **N (Blows per foot):** 0 10 20 30 40
- **Blows/0.5'**
**Boring Log**

**PROJECT**: WAIMALU ESTATES  
**LOCATION**: Waimalu, Ewa, Oahu, Hawaii  
**Tax Map Key**: 9-8-08: 8

**HAMMER**:  
- **Model**: 140#  
- **Drop**: 30’

**SAMPLER**:  
- **Material**: 2” x 2” O.D. THIN WALL TUBE  
- **Material**: 3” x 3” O.D. THIN WALL TUBE  
- **Material**: 2” x 2” STANDARD SPLIT SPOON

---

**PENETRATION DATA**

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Sampler</th>
<th>Penetration Test</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td></td>
<td>Standard Penetration Test</td>
<td></td>
</tr>
<tr>
<td>10-20</td>
<td></td>
<td>HYDRAULIC PUSH/15’</td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td></td>
<td>CONTINUOUS PENETRATION TEST W/2” DIA BLUNT POINT</td>
<td></td>
</tr>
</tbody>
</table>

---

**UNITED SOIL CLASSIFICATION**

- **Top Soil**: STIFF, BROWN SILITY CLAY/GRANUL (Fill)  
- **Top Soil**: STIFF, DARK BROWN SILITY CLAY

---

**WATER BORE**

- **Water Bore**: 5’

---

**LOCATION**

- **Map**: ASSOCIATES, INC.

---

**END OF BORING @ 26.5’**

---

**END OF PENETRATION @ 40’**

---

*ELEVATION ESTIMATED FROM TOPO MAP*
**WALTER LUM ASSOCIATES, INC.**  
3268 WAIKACIE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

**Boring Log**

**PROJECT:** WAIALU ESTATES

**LOCATION:** Waialu, Oahu, Hawaii

**Tax Map Key:** 9-6-08: 8

**Type of Boring:** AUGER (4"")

---

**HAMMER:** 1-4-0

- **Weight:** 116.0
- **Drop:** 119.0
- **Drill:** 3/8"
- **Date:** 1-18-71

**LOCATION:** ____________

**FIELD PROPERTY INFORMATION:**

- **Boring No.:** 8
- **Sample No.:** 1-26-71

---

**DESCRIPTION:**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
<th>Penetration Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>BROWN, MUDY CLAY/GRANITE</td>
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</tr>
<tr>
<td>11-15</td>
<td>MEDIUM BROWN, BROWN CLAY/SILT</td>
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<tr>
<td>16-20</td>
<td>SOFT, DARK GRAY, ORGANIC CLAY</td>
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<tr>
<td>21-25</td>
<td>ORGANIC CLAY &amp; SILT GRANITE</td>
<td></td>
</tr>
<tr>
<td>26-30</td>
<td>LOOSE, BROWN, CLAY/GRANITE</td>
<td></td>
</tr>
<tr>
<td>31-35</td>
<td>SOFT, FAIRM CLAY, ORGANIC</td>
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</tr>
<tr>
<td>36-40</td>
<td>CLAY &amp; Silt</td>
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<td>41-45</td>
<td>END OF BORING 36.5</td>
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<tr>
<td></td>
<td>END OF PENETRATION 60</td>
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**ELEVATION:**

- **ELEVATION ESTIMATE:** FROM TOPS, MAP

---

**PENETRATION DATA:**

- Standard Penetration Test
- Thin Wall Tube

<table>
<thead>
<tr>
<th>Depth (ft)</th>
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<tbody>
<tr>
<td>0-10</td>
<td>0 BLOW/1.0</td>
</tr>
<tr>
<td>11-15</td>
<td>HYDRAULIC PULL/1.0</td>
</tr>
<tr>
<td>16-20</td>
<td>HYDRAULIC PULL/1.5</td>
</tr>
<tr>
<td>21-25</td>
<td>5 BLOW/1.0</td>
</tr>
<tr>
<td>26-30</td>
<td>5 BLOW/1.0</td>
</tr>
<tr>
<td>31-35</td>
<td>5 BLOW/1.0</td>
</tr>
<tr>
<td>36-40</td>
<td>5 BLOW/1.0</td>
</tr>
<tr>
<td>41-45</td>
<td>5 BLOW/1.0</td>
</tr>
</tbody>
</table>

---

**DRAINAGE PITS:**

- 3 BLOW/1.0
# Boring Log

**PROJECT**: WAIMALU ESTATES  
**LOCATION**: Waimalu, Ewa, Oahu, Hawaii  
**Tax Map Key**: 9-8-08: 8

**HAMMER:**  
- **Weight**: 140 lbs  
- **Drop**: 30"

**SAMPLER:**  
- **Description**: 2" 6 - 2" O.D. THIN WALL TUBE  
- **Type**: 2" 66 - 2" STANDARD SPLIT SPOON

**BORING NO.**:  
- **Driller**: W. LUM ASSOC., INC.  
- **Field Party**: SUZUKI MEYER  
- **Date**: MAY 27, 1971

**ELEVATION**: 20' 4"

### Penetration Data

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<th>P.S.F.</th>
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**Notes**:
- **Elevation Estimated From Topo Map**
COMPACTED FILL

SOIL COVER

FILL VOIDS BETWEEN BOULDERS WITH GRANULAR SOILS.
MAXIMUM SIZE OF BOULDER 2'

STRIP OFF LOOSE MATERIAL DOWN TO STIFF GROUND
AND SLOPE TO DRAIN.

18" FILTER MATERIAL
(WELL-GRAPED GRANULAR MATERIAL
3/4" MAXIMUM TO DUST SIZES,
LESS THAN 10%, PASSING NO. 200 SIEVE.)

SECTION
NOT TO SCALE

FIGURE 1
PROPOSED BOULDER FILL
NEWTOWN-MAKAI AREA AND
KAHUMANU STREET EXTENSION
WAIMALU, OAHU, HAWAII
TAX MAP KEY: 9-8-20: 1 & 9-8-08: 3, 4 & 8

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

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise 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 work at the site, or if conditions have changed due to natural causes, plan changes, 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.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.