PAIWA STREET EXTENSION - PRELIMINARY SOIL REPORT

WAIPAHU, OAHU, HAWAII
TAX MAP KEY: 9-4-02: POR. 3 & 4

FOR REFERENCE
not to be taken from this room

To:
COMMUNITY PLANNING, INCORPORATED

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

APRIL 13, 1972

MUNICIPAL REFERENCE RECORDS CENTER
City & County of Honolulu
City Hall Annex, 555 S. King Street
Honolulu, Hawaii 96813
MR. GEORGE HOUGHTAILING  
Community Planning, Inc.  
700 Bishop Street, Suite 608  
Honolulu, Hawaii 96813

Dear Mr. Houghtailing:

Subject: Paiwa Street Extension  
Preliminary Soil Report  
(for pavement design purposes)  
Waipahu, Oahu, Hawaii  
Tax Map Key: 9-4-02: Por. 3 & 4

Transmitted herewith is our soil exploration report for pavement design purposes for the proposed Paiwa Street Extension at Waipahu, Oahu, Hawaii.

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

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike  
Professional Engineer  
Hawaii No. 1450

April 13, 1972
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Paiwa Street Extension - Preliminary Soil Exploration

Waipahu, Oahu, Hawaii
Tax Map Key: 9-4-02: Por. 3 & 4

Scope of Exploration

The purpose of this exploration was to determine general soil conditions for the proposed Paiwa Street Extension in Waipahu.

This report includes field explorations, laboratory tests and general pavement design recommendations.

Field Exploration

Four exploratory borings and one sounding were made at the site. The approximate locations of these borings and sounding are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on Boring Logs Nos. 1 thru 5. Also attached are logs of borings previously made for Waipahu Estates Unit 3-2, Proposed Haul Cane Road in Waipahu and Proposed Overpass Structure Over Haul Cane Road in Waipahu.

Borings were made with 4-in. diameter augers using a carbide drag bit. Soil samples were obtained with 2 and 3-in. thin-wall tube samplers and a 2-in. standard split spoon sampler driven with a 140-lb hammer falling 30 inches.
LABORATORY TESTS

Laboratory tests included: natural water content, Atterberg limit, unconfined compression, grain-size analysis, expansion and CBR. A summary of the laboratory test results is given in Tables IA and IB.

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 northern section of the proposed road alignment is partly along an existing sugar cane field and cane haul road. The central portion crosses an old gully or drainageway, and the southern section crosses an area occupied by existing plantation homes.

The natural drainageway slopes downward in a southeasterly direction at about a 2% gradient with side slopes varying from about 8 to 15%.

An existing silting basin was noted about 50 ft east of the proposed roadway near the central section of the new road alignment.
INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils may be generally described as follows:

Stiff clayey silts and silty clays ("MH" soils) to about 15 ft, the depth drilled.

Rocky material was encountered in the borings in the northern and central sections.

Clay pockets ("CH" soils) were encountered in Boring No. 4 from about 3 to 12-ft depths.

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

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

DISCUSSION AND RECOMMENDATIONS

The proposed plan is to construct a new road (2,900+ ft) from the south side of the Interstate H-1 freeway extending in a southerly direction to Waipahu Street.

Preliminary plans indicate cuts of about 5 to 10 ft in the northern section, fills of about 2 to 12 ft in the central section, and shallow cuts and fills in the southern section.
**Boring Log**

**PROJECT:** PROPOSED HAUL CANE ROAD IN WAIPAHU  
**LOCATION:** From Interstate H-1 to Aulii St.  
Waiele, Ewa, Oahu, Hawaii

- **HAMMER:** 140#  
- **Drop:** 30"  
- **SAMPLER:** 2" STANDARD SPLIT SPON

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>DESCRIPTION</th>
<th>PENETRATION DATA</th>
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<tbody>
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<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
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<td>20</td>
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**HOURLY LOG:**

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</tr>
<tr>
<td>5</td>
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<td>16-32</td>
<td>52</td>
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<tr>
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<td>2-C</td>
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<td></td>
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</tr>
<tr>
<td>15</td>
<td>2-D</td>
<td>30</td>
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</table>

*ELEVATION ESTIMATED FROM PROFILE DATED AUG. 10, 1971*
**Boring Log**

**PROJECT**  PROPOSED HAUL CANE ROAD IN WAIPAHU

**LOCATION** From Interstate H-1 to Auali'i St.

**Waikelo, Ewa, Oahu, Hawaii**

**HAMMER:**

- **Weight:** 40 lbs
- **Drop:** 2' 6" 2" O.D. THIN WALL TUBE
- **2" 44" 2" STANDARD SPLINT 5' POON**

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

**Date:** Oct. 15, 1971

**Field Party:** SUEKII SAKAI MIKHEI, KAKU

**Type of Boring**
- AUGER (AGREÉ 3/8) 2" Diam.

**Elev.** B2' 2" Date 10/15/71

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

Water Level NOT NOTED

**Time:** --

**Data** RECORDED

**Penetration Test**

- Standard Penetration Test
- 3.00 O.D. THIN WALL TUBE SAMPLER

**N (Blows per foot):**

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<tr>
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<th>20</th>
<th>30</th>
<th>40</th>
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<td></td>
</tr>
</tbody>
</table>

**Penetration Data**

- Boring Log
- Description
- ELEV. B2' 2"
- Depth (ft)
- Sampler
- Sample No.
- Plastic Limit
- Water Cont.
- Liquid Limit
- Undist Comp.
- V.H.D.
- PENETRATION TEST
- 3.00 O.D. TUBE SAMPLER

**Boring Log Details**

- **(MH) STIFF, REDDISH BROWN CLAYEY SILT**
- **(MH) MEDIUM, REDDISH BROWN CLAYEY SILT**
- **(MH) ROCK OR BOULDER**
- **(MH) MEDIUM, REDDISH BROWN CLAYEY SILT**
- **(MH) STIFF, LIGHT BROWN CLAYEY SILT**
- **(MH) STIFF, HOTTED REDDISH BROWN, SILTY CLAY**
- **(MH) STIFF, BROWN CLAYEY SILT (TRACE OF DECOMPOSED ROCK)**
- **(MH) STIFF REDDISH BROWN (BROWN CLAYEY SILT) DECOMPOSED ROCK**
- **BOULDER**

**Elevation Estimated From Profile Dated Aug. 10, 1971**
**Boring Log**

**PROPOSED OVERPASS STRUCTURE**

**PROJECT**  
OVER HAUL CANE ROAD IN WAIPAHU

**LOCATION**  
Waieke, Ewa, Oahu, Hawaii

**HAMMER:**
- **Weight:** 140#  
- **Drop:** 30°  
- **Type:** 2" S. 2" O.D. THIN WALL TUBE  
- **SAMPLER:**  
  - **2"-1/2" STANDARD SPLIT SPOON**

---

**BNOR NO.** 1  
**Sheet No.** 1 of 1  
**Driller:** W. LUM ASSOC. INC.  
**Date:** DEC. 18, 1971

**Field Party:**  
**Type of Boring:** AUGER (0.5")  
**Diam.:** 4"  
**Elev:**  
**Datum:**  
**Date:** 12-18-71

**Water Level**
- **ELEVATED**

### PENETRATION DATA

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<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Liquid Limit</th>
<th>Unified Comp.</th>
<th>Water Level</th>
<th>Penetration</th>
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</tbody>
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---

**ORANGE (BROWN SILTY SAND (DEC. ROCK))**

**VOLATIZED BROWN DECOMPOSED ROCK**

**END OF BORING 241.3'**

---

**ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971.**
**Boring Log**

**PROPOSED OVERPASS STRUCTURE**

**PROJECT**

OVERRIDE CANE ROAD IN WAIPAHU

**LOCATION**

Waikiki, Ewa, Oahu, Hawaii

**HAMMER:**

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

**SAMPLER:**

- **2" S. 2" D.P. THIN WALL TUBE**
- **2" S. 2" STANDARD SPLIT SPOON**

---

**Unified Soil Classification**

<table>
<thead>
<tr>
<th>Unified Soil Classification</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1' A.G. BROWN, Silty CLAY with coral fragments</td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td></td>
</tr>
<tr>
<td>2' 5&quot; 2&quot; S. 2&quot; D.P. THIN WALL TUBE</td>
<td>2-A</td>
</tr>
<tr>
<td>3' 5&quot; 2&quot; S. 2&quot; S. STANDARD SPLIT SPOON</td>
<td>2-B</td>
</tr>
<tr>
<td>5' 2&quot; MEDIUM, REDDISH BROWN CLAYEY-SILT</td>
<td>2-C</td>
</tr>
<tr>
<td>10' 2&quot; MEDIUM, REDDISH BROWN CLAYEY-SILT</td>
<td>2-D</td>
</tr>
<tr>
<td>15' 2&quot; MEDIUM, REDDISH BROWN CLAYEY-SILT</td>
<td>2-E</td>
</tr>
<tr>
<td>20' 2&quot; MEDIUM, REDDISH BROWN CLAYEY-SILT</td>
<td>2-F</td>
</tr>
<tr>
<td>25' 2&quot; MEDIUM, REDDISH BROWN CLAYEY-SILT</td>
<td>2-G</td>
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<tr>
<td>30' 2&quot; MEDIUM, REDDISH BROWN CLAYEY-SILT</td>
<td>2-H</td>
</tr>
</tbody>
</table>

**Depth (ft.)**

- 0
- 10
- 20
- 30
- 40

**N (Blows per foot)**

- 0
- 10
- 20
- 30
- 40

**ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971**
COMPACTED FILL

FILL VOIDS BETWEEN BOULDERs WITH GRANULAR SOILs.
(BOULDERs 2' TO 3' MAXIMUM.)

SOIL COVER.

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

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

SECTION
NOT TO SCALE

FIGURE 1
PROPOSED BOULDER FILL
PAIWA STREET EXTENSION
WAIPAHU, OAHU, HAWAI'I
TAX MAP KEY: 9-4-02: 3 & 4

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.
Decomposed rocks were encountered in some borings. Because of the shallow depths to decomposed rocks, boulders will probably be found interspersed over the site. The closer an excavation approaches decomposed rocks, the greater will be the quantity of boulders. Boulders may be used to construct the toes of fill slopes, see Figure 1.

Before fills are constructed across the drainageway, loose surface soils should be stripped. Trenches should be cut in a herringbone pattern and subdrains placed in the trenches to provide drainage paths for the bottom of the drainageway.

Cesspools may be encountered near the existing plantation 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

Surface vegetation, ditch linings and miscellaneous debris should be cleared and removed prior to site filling. Localized soft pockets encountered during the site preparations should be excavated and backfilled with compacted select material. Provisions to drain the site should be included during and after the completion of filling operations.
In general, the on-site soils and approved borrow soils may be used for the construction of the proposed fills. Grading work should be done according to the Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. The area should be cleared and grubbed.

2. Topsoil and stockpiled soils should be either (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.

3. The bottom and sides of irrigation ditches should be stripped down to stiff natural ground or scarified and recompacted before the placement of fills.

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

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

6. Subdrains should be placed in a herringbone pattern along the bottom and sides 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 bench to a generally level condition. As the fill is brought up, it should be keyed continually into the stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.

8. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.
Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used. The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

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

To minimize erosion, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable. Slope planting is recommended on cut and fill slopes to minimize erosion.

Roadways

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

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

If localized clay pockets are encountered at subgrade level, these pockets should be excavated to a depth of 18 in. and replaced with select material, compacted in thin lifts.
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 level thru the walls of the catch basins which are placed in these low areas.

**Existing Cesspools**

Cesspools possibly may be encountered during the site preparation work. When encountered, they should be flagged and located on the plans. Sludge should be removed and replaced with fairly well-graded granular material. The material should be placed in thin layers and rammed into place or compacted with vibratory equipment.

**Utilities**

Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints.

**Unforeseen Conditions**

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

**PROJECT:** PAWA STREET EXTENSION  
**LOCATION:** Waipahu, Oahu, Hawaii  
**Tax Map Key:** 9-4-02, Por. 3 & 4

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<th>Hammer</th>
<th>Details</th>
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<td>Weight</td>
<td>140#</td>
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<td>Drop</td>
<td>20&quot;</td>
</tr>
<tr>
<td>Sampler</td>
<td>2&quot; SS + 2&quot; STANDARD SPLIT SPOON</td>
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**Hammer:**  
- **Weight:** 140#  
- **Drop:** 20"

**Sampler:**  
- **Type:** 2" SS + 2" STANDARD SPLIT SPOON

**Penetration Data**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>Description</th>
<th>Elevation</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Water Cont.</th>
<th>Liquid Limit</th>
<th>Upward Compress.</th>
<th>Penetration Test</th>
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<td>2'0&quot;</td>
<td>35</td>
<td>61</td>
<td>49</td>
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<td>MEDIUM DARK BROWN SILTY CLAY</td>
<td>1-B</td>
<td>3'5&quot;</td>
<td>80</td>
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<td>-</td>
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<tr>
<td>GRAY LAVA FORMATION W/ VESICLES</td>
<td>1-C</td>
<td>5'5&quot;</td>
<td>ROCK FRAGMENTS</td>
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<td>49%</td>
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<td>ROCK FRAGMENTS</td>
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*EOElevation Estimated from Prelim. Plan Dated Aug. 6, 1971*
**Boring Log**

**PROJECT** PAIWA STREET EXTENSION

**LOCATION** Waipahu, Oahu, Hawaii

**Tax Map Key**: 9-4-02; Por. 3 & 4

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

**Sampler:** 2" x 6" - 2" STANDARD SPLIT SPOON

**Date**: 1-10-71

---

<table>
<thead>
<tr>
<th>Unified Soil Classification</th>
<th>Description</th>
<th>ELEV.</th>
<th>Depth (Ft.)</th>
<th>Plastic Limit</th>
<th>Liquid Limit</th>
<th>Unconf. Compress. P.S.F.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELEV. = 108' + 0&quot;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MU)</td>
<td>BROWN, SILTY CLAY w/ SANDGRavel, REDDISH BROWN SILTY CLAY</td>
<td>2.5</td>
<td>2.5</td>
<td>27</td>
<td>10,000</td>
<td>4.5', 5.5'</td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>MEDIUM, REDDISH BROWN CLAYEY SILT w/ TRACES OF SAND</td>
<td>2.10</td>
<td>2.10</td>
<td>27</td>
<td>11,500</td>
<td>4.5', 5.5'</td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>MEDIUM, BROWN CLAYEY SILT</td>
<td>2.65</td>
<td>2.65</td>
<td>26</td>
<td>30</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>MEDIUM, REDDISH BROWN CLAYEY SILT</td>
<td>2.65</td>
<td>2.65</td>
<td>27</td>
<td>10</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>DENSE MOTTE BROWN &amp; GREY SILTY SAND</td>
<td>2.65</td>
<td>2.65</td>
<td>29</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>(MH)</td>
<td>DECOMPOSED ROCK</td>
<td>2.65</td>
<td>2.65</td>
<td>28</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td><strong>END OF BORING @ 15.3</strong></td>
<td></td>
<td></td>
<td></td>
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---

**Notes:** ELEVATION ESTIMATED FROM PRELIM. PLAN DATED AUG. 6, 1971
# Boring Log

**PROJECT:** PAIWA STREET EXTENSION  
**LOCATION:** Waipahu, Oahu, Hawaii  
**Tax Map Key:** 9-4-02: Por. 3 & 4

### HAMMER:
- **Weight:** 10 lb SLEDGE HAMMER  
- **Drop:**  

### SAMPLER:
- **2" DIA. BLUNT POINT**

### PENETRATION DATA

<table>
<thead>
<tr>
<th>Unified Soil Classification</th>
<th>Description</th>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Water Content</th>
<th>Liquid Limit</th>
<th>Undisturbed Compress. Modulus</th>
<th>P.S.E.</th>
<th>Vane Shear P.S.E.</th>
<th>Vane Shear Depth (ft)</th>
<th>Penetration Test</th>
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<tbody>
<tr>
<td></td>
<td>ELEV. = 69 (\frac{3}{2}) ft</td>
<td></td>
<td>A</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
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</table>

**ELEVATION ESTIMATED FROM PRELIM. PLAN DATED AUG. 6, 1971**
# Boring Log

**PROJECT:** PAIWA STREET EXTENSION  
**LOCATION:** Waipahu, Oahu, Hawaii  
**Tax Map Key:** 9-4-02- Por. 3 & 4

**HAMMER:**
- **Weight:** 140 lbs
- **Drop:** 20"  
**DUG:**
- **Type of Boring:** ACKER AUS  
- **Diam.:** 4"  
- **Elev.:** 66' z-x  
- **Datum:**  

**DUG BY:** T.G. DRAG  
**Date:** 1-11-72

---

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>Depth (Ft)</th>
<th>Plastic Limit</th>
<th>Water Content</th>
<th>Liquid Limit</th>
<th>Unconf. Cons.</th>
<th>Penetration Test</th>
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<tbody>
<tr>
<td>ML</td>
<td>2.5</td>
<td>97</td>
<td>49</td>
<td>-</td>
<td>-</td>
<td>9/5, 3/5</td>
</tr>
<tr>
<td>CH</td>
<td>2.65</td>
<td>27</td>
<td>6.7</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CH</td>
<td>2.55</td>
<td>26</td>
<td>29</td>
<td>5B 695</td>
<td>-</td>
<td>6/5, 10/5</td>
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<tr>
<td><em>(MH)</em></td>
<td>2.55</td>
<td>-</td>
<td>34</td>
<td>-</td>
<td>-</td>
<td>4-7</td>
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</table>

*ELEVATION ESTIMATED FROM PRELIM. PLAN DATED AUG. 6, 1971*
## Boring Log

**PROJECT**  
Paiwa Street Extension

**LOCATION**  
Waipahu, Oahu, Hawaii

**Tax Map Key:** 9-4-02; Por. 3 & 4

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

**Sampler:** 2" Standard Split Spoon

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Soil Classification</th>
<th>Description</th>
<th>Plastic Limit</th>
<th>Water Cont.</th>
<th>Liquid Limit</th>
<th>Unconfined Comp.</th>
<th>Penetration Test</th>
<th>Standard Penetration Test</th>
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<tr>
<td>0</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>0.5</td>
<td>(MH)</td>
<td>0.5' COPPLES, SAND</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>(MH)</td>
<td>STIFF RED - BROWN CLAY</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>(MH)</td>
<td>CLAYET SILT W. TRACES OF SAND</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>9</td>
<td>(MH)</td>
<td>STIFF, MOTTLED BROWN SILTY CLAY</td>
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<td></td>
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<tr>
<td>10</td>
<td>(MH)</td>
<td>MEDIUM, MOTTLED BROWN CLAY</td>
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<tr>
<td>15</td>
<td>(MH)</td>
<td>SOFT TO MEDIUM MOTTLED BROWN SILTY CLAY</td>
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<tr>
<td>20</td>
<td>(MH)</td>
<td>MEDIUM MOTTLED GRAY BROWN SILTY CLAY</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.5</td>
<td>MH</td>
<td>END OF BORING &amp; 21.5'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO.:** 5  
**Sheet No.:** 1  

**Driller:** W. Lum Assc., Inc.  
**Date:** Feb. 15, 1972  
**Field Party:** Masahiro, Radovich, Collura  
**Type of Boring:** Auger/Ackerman  
**Diam.:** 4"
# Table I.A - 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>1</td>
<td>Surface</td>
<td>REDISH BROWN CLAYEY SILT</td>
<td>Natural 45</td>
<td>ML</td>
<td></td>
<td></td>
<td>Dry to Wet or Wet to Dry Max. Dry Density (P.C.F.) Optimum Moisture (%)</td>
<td>Date 3.23.72 By BT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1'-2'</td>
<td></td>
<td>Natural 49</td>
<td>ML</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>Surface</td>
<td>REDISH BROWN CLAYEY SILT</td>
<td>Natural 45</td>
<td>ML</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>1'-2'</td>
<td>SANDY SILT W/ CORAL CLAYEY SILT</td>
<td>Natural 49</td>
<td>ML</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td></td>
<td></td>
<td>Natural 49</td>
<td>ML</td>
<td></td>
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<td></td>
<td></td>
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</table>

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

**Unified Soil Classification**
- ML

**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

**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 (%)

**Remarks:**
### TABLE I.B - SUMMARY OF LABORATORY TEST RESULTS

<table>
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<th>BORING NO.</th>
<th>4</th>
<th>4</th>
<th>5</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>SAMPLE NO.</td>
<td>D</td>
<td>B</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>DEPTH BELOW SURFACE</td>
<td>5'-6.5'</td>
<td>10'-11'</td>
<td>5'-6.5'</td>
<td>15'-16.5'</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>DARK GRAY &amp; BROWN CLAY</td>
<td>BROWN CLAY</td>
<td>MOTTLED BROWN CLAYEY SILT</td>
<td>MOTTLED GRAY-BROWN SILTY CLAY</td>
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</table>

### GRAIN-SIZE ANALYSIS

<table>
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<tr>
<th>Sieve Size</th>
<th>% Passing</th>
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<td>1&quot;</td>
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<tr>
<td>1/2&quot;</td>
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</tr>
<tr>
<td>#4</td>
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### ATTERBERG LIMITS

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<th>Property</th>
<th>Natural</th>
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<th>Natural</th>
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<td>Air Dried or Natural</td>
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<tr>
<td>Liquid Limit</td>
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<td>58</td>
<td>48</td>
<td>79</td>
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<td>Plastic Limit</td>
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<td>28</td>
<td>30</td>
<td>37</td>
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<tr>
<td>Plasticity Index</td>
<td>41</td>
<td>20</td>
<td>18</td>
<td>42</td>
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</tbody>
</table>

### DILATANCY

- NONE
- NONE
- MEDIUM
- QUICK

### TOUGHNESS

- MED-HIGH
- MED-HIGH
- MED-HIGH
- MED-HIGH

### DRY STRENGTH

- HIGH
- HIGH
- SLIGHT-MED
- MED-HIGH

### UNIFIED SOIL CLASSIFICATION

<table>
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<tr>
<th></th>
<th>CH</th>
<th>CH</th>
<th>ML</th>
<th>MH</th>
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### APPARENT SPECIFIC GRAVITY

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### EXPANSION AND CBR TESTS

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>(Surcharge-51 P.S.F.)</td>
<td></td>
</tr>
<tr>
<td>Molding Moisture, %</td>
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</tr>
<tr>
<td>Molding Dry Density, P.C.F.</td>
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</tr>
<tr>
<td>Swell upon saturation, %</td>
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<tr>
<td>CBR at 0.1&quot; Penetration</td>
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### MOISTURE-DENSITY RELATIONS OF SOILS

<table>
<thead>
<tr>
<th>Method</th>
<th>Value</th>
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<tbody>
<tr>
<td>(AASHO T-180-57 Method)</td>
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</tr>
<tr>
<td>Dry to Wet or Wet to Dry</td>
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</tr>
<tr>
<td>Max. Dry Density (P.C.F.)</td>
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<tr>
<td>Optimum Moisture (%)</td>
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</table>

### REMARKS:

Date: 3.23-72  By: DT
PLASTICITY CHART

PROJECT: PAIWA STREET EXTENSION
LOCATION: WAI'ALI, OAHU, HAWAII

PLASTICITY INDEX

"A" LINE

CL

CH

MH & OH

CL-ML

ML

LIQUID LIMIT

DATE 3-23-72

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

PROJECT: PAIWA STREET EXTENSION

LOCATION: WAIKIKI, OAHU, HAWAII

SAMPLE NO: 1 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT

TEST RESULTS:

MOLDING MOISTURE, %: 20.8
MOLDING DRY DENSITY, P.C.F.: 100.2
CBR @ 0.1" PENETRATION: 275
DAYS SOAKED: 4

DATE: 1-21-72 BY MO
DATE: 1-24-72 BY SK

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

PROJECT: PAIWA STREET EXTENSION

LOCATION: WAIKIKI, OAHU, HAWAII

SAMPLE NO: 4 SURFACE

SAMPLE DESCRIPTION: BROWN SANDY SILT W/CORAL & GRAVEL

TEST RESULTS:

MOLDING MOISTURE, %: 24.1
MOLDING DRY DENSITY, P.C.F. 102.4
CBR @ 0.1" PENETRATION: 12.0
DAYS SOAKED: 4

DATE 1/21/72 BY RL
DATE 1/26/72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
LOGS OF BORINGS

FROM

WAIPAHU ESTATES UNIT 3-2
(DATED OCTOBER 11, 1971)

PROPOSED HAUL CANE ROAD IN WAIPAHU
FROM INTERSTATE H-1 TO AUALII STREET
(DATED DECEMBER 29, 1971)

PROPOSED OVERPASS STRUCTURE
OVERRIDE HAUL CANE ROAD IN WAIPAHU
(DATED MARCH 2, 1972)
# Boring Log

**PROJECT**  
WAIPAHU ESTATES UNIT 3-2

**LOCATION**  
Waipio, Ewa, Oahu, Hawaii

**Tax Map Key:** 9-4-02: Por. 7

---

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

**SAMPLER:**
- 2" 5'-2" O.D. Thin Wall Tubbing
- 2" 55'-2" Standard Split Spoon

---

## PENETRATION DATA

**Standard Penetration Test**

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<tr>
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<tbody>
<tr>
<td>2.5</td>
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<td>1-A</td>
<td>120</td>
<td>28</td>
<td>28</td>
<td>1</td>
<td>100</td>
<td>1920</td>
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<td>B</td>
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<td>117</td>
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<td>1</td>
<td>1000</td>
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<td>6.5</td>
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<td>1-C</td>
<td>100</td>
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<td>1</td>
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<td>10.5</td>
<td>E</td>
<td>1-E</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

---

**ELEVATION ESTIMATED FROM CONTOUR PLAN**
Boring Log

**PROJECT:** WAIPAHU ESTATES UNIT 3-2
**LOCATION:** Waipio, Ewa, Oahu, Hawaii
**LOCATION:** Tax Map Key: 9-4-02: Por. 7

**HAMMER:**
- Weight: 140 lbs
- Drop: 30 inches
- Type of Boring: AUGER (MOBILE DRUMMERMAN)
- Diam.: 3 inches
- Elev.: 126 + 0
- Datum: __

**Driller:** W. LUM, ASSOCIATES, INC.
**Date:** AUG. 26, 1971

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

**Drill Bit:** T.C. DRAG
**Field Party:** MEYER, KAKU, TSUKAZAKI

**Sampler:** 2" S. - 2" O.D. THIN WALL TUBE
2" S. - 2" SPLIT SPOON

---

**Penetration Data**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Water Cont. %</th>
<th>Dry Density</th>
<th>Unconf. Comp.</th>
<th>Vers. Shear</th>
<th>Penetration Test (Blows per foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>120</td>
<td>550</td>
<td>800</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>3</td>
<td>180</td>
<td>550</td>
<td>800</td>
<td>1/5 - 2/5</td>
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<tr>
<td>15</td>
<td>0</td>
<td>18</td>
<td>2080</td>
<td>400</td>
<td>45/5</td>
<td></td>
</tr>
</tbody>
</table>

---

**Unified Soils Classification**

- (MLC) **SOFT, REDDISH BROWN Silty Clay w/ Roots**
- (MH) **STIFF, BROWN Silty Clay W/ TRACES OF DECOMPOSED ROCK**
- (MH) **SOFT, MOTTLED BROWN CLAYEY Silt w/ DECOMPOSED ROCK**
- (MH) **GRAY, LAVA (TUKA PLUKA) ROCK W/ TRACES OF DECOMPOSED ROCK**

---

**Elevation Estimated from Contour Plan**

---

*ELEVATION ESTIMATED FROM CONTOUR PLAN*
### Project

**PROPOSED HAUL CANE ROAD IN WAIPAHU**

**Location**
From Interstate H-1 to Aualii St.
Waikiki, Ewa, Oahu, Hawaii

---

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

**Sampler:**
2" Standard Split Spoon

---

### Boring Log

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ELEV. = 119'2&quot;</td>
</tr>
<tr>
<td>5</td>
<td>STIFF, REDDISH BROWN CLAYEY SILT</td>
</tr>
<tr>
<td>10</td>
<td>GRAY BROWN DECOMPOSED ROCK</td>
</tr>
<tr>
<td>15</td>
<td>END OF BORING @ 80.5'</td>
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</tbody>
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**Penetration Data**

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<th>Sample No.</th>
<th>Penetr. (Blows per ft)</th>
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</tr>
<tr>
<td>1B</td>
<td></td>
</tr>
<tr>
<td>1C</td>
<td></td>
</tr>
<tr>
<td>1D</td>
<td></td>
</tr>
<tr>
<td>1E</td>
<td></td>
</tr>
<tr>
<td>1F</td>
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**Standard Penetration Test**

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<tr>
<td>20</td>
</tr>
<tr>
<td>30</td>
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<tr>
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**Notes:**


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**Report:**

- Driller: W. Lum Associates, Inc.
- Date: Oct. 15, 1971
- Project: PROPOSED HAUL CANE ROAD IN WAIPAHU
- Location: From Interstate H-1 to Aualii St.
- Waikiki, Ewa, Oahu, Hawaii
Boring Log:

PROJECT: PROPOSED HAUL CANE ROAD IN WAIPAHU

LOCATION: From Interstate H-1 to Aualii St., Waikiki, Ewa, Oahu, Hawaii

HAMMER: 140# Weight

Drop 30" Drop

SAMPLER: 2" STANDARD SPLIT SPOON Sampler

ELEV. = 60' + 4" Elevation

UNIFIED SOIL CLASSIFICATION

ML
BROWN, SILTY CLAY w/GRANUL 1 CORAL (FILL)

ML
MEDIUM, BROWN CLAYY SILT w/ TRACES OF ASH

ML
STIFF, BROWN CLAYE SILT w/ TRACES OF DEC. ROCK

MH-CH
STIFF, BROWN w/ GRAY SILT CLAYy SILT w/ TRACES OF DEC. ROCK

GRAY BROWN DECOMPOSED ROCK

END OF BORING @ 30.4'

* ELEVATION ESTIMATED FROM PROFILE DATED AUG. 10, 1971

PENETRATION DATA

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</table>

N (Blows per foot)

0 10 20 30 40

30/1' 30/2' 35/3' 61/4'

WALTER LUM ASSOCIATES, INC.

3030 WAIKLAU AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-1951