EWA ACRES SUBDIVISION - PRELIMINARY SOIL REPORT
(for residential, apartment and institutional type development)

PUULOA, EWA, OAHU, HAWAII

TAX MAP KEY: 9-10-01: Parcel 7

To:
EWA ACRES, INCORPORATED

By:
WALTER LUM ASSOCIATES, INCORPORATED
CIVIL ENGINEERS
February 27, 1967
February 27, 1967

MR. JAMES WONG
Ewa Acres, Inc.
1575 S. Beretania Street
Honolulu, Hawaii 96814

Dear Mr. Wong:

Subject: Ewa Acres Subdivision - Preliminary Soil Report
(for residential, apartment and institutional type developments)
Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended

In accordance with your request, a preliminary soil exploration was made at the proposed residential, apartment and institutional type development site for Ewa Acres Subdivision at Puuloa, Ewa, Oahu, Hawaii, Tax Map Key: 9-10-01: Parcel 7.

From the field explorations and laboratory test results, it is our opinion that the site may be used for the planned subdivision. Residential and other light, short-span structures up to 3 stories can be supported either directly on medium dense or harder coral or on properly compacted fills constructed from suitable on-site soils. Material imported for the construction of fills should be tested and approved by the soil engineer and the test data submitted to the F.H.A.

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

All earthwork should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended and the recommendations contained herein.

For structures of more than 3 stories, an additional soil investigation should be made.
MR. JAMES WONG, February 27, 1967

The report includes a boring location plan, boring logs, laboratory tests and recommendations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike
Professional Engineer
Hawaii No. 1450
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EWA ACRES SUBDIVISION - PRELIMINARY SOIL REPORT
(for residential, apartment and institutional type development)

PUULOA, EWA, OAHU, HAWAII

TAX MAP KEY: 9-10-01: Parcel 7

SCOPE OF EXPLORATION
The purpose of this exploration was to determine soil conditions of the proposed site, Ewa Acres Subdivision at Puuloa, Ewa, Oahu, Hawaii, for residential, apartment and institutional type building development.

This report includes field exploration, laboratory tests and recommendations regarding the soils at the site.

FIELD EXPLORATION
Thirty-two borings were made at the site. The locations of these borings are shown on the Boring Location Plan. Descriptions of the underlying soils are shown on the Boring Logs Nos. 1 thru 32.

Disturbed, exploratory thin-wall-tube, and standard split spoon samples were taken during the boring operation. Soil samples were visually identified and tentatively classified in the field. In the laboratory, they were subjected to appropriate tests. The field identifications and classifications were then reviewed and modified to conform with the results of the laboratory tests in accordance with the "Unified Soil Classification System."
LABORATORY TESTS

Laboratory tests included: moisture content, gradation, expansion and CBR.

A list of the standard field and laboratory test methods used for this project is attached.

A summary of the laboratory test results is given in Table I.

SITE AND SOIL CONDITIONS

The project site is situated on a triangular portion of land adjacent to the junction of North Road and Fort Weaver Road.

The surface is generally flat and covered with thick vegetation.

The soils at the site may be described as a coral formation overlain by thin surface layers (1 to 2 ft) of brown clayey silts in various areas. The borings generally indicated medium dense coral with hard, coral streaks and pockets of coral fragments and sand.

Water was generally encountered near mean sea level.

At some locations, light auger drilling (using the "Mobile" mining bit) was insufficient to penetrate the coral, particularly near the surface. Large cavities up to 4 ft in diameter and 6 ft deep were observed at various locations at the surface. Smaller cavities or crevices not more than a few inches in size were encountered in the drill holes.
DISCUSSION AND RECOMMENDATIONS

**Fills**

In general, the on-site soils are suitable for the construction of the proposed fills. The construction of the proposed low fills at the project site should be done as required by the F.H.A. Data Sheet 79-G; Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. All vegetation and organic matter should be removed.

2. Loose topsoil should be scarified and recompacted before the placement of fills.

3. All surface cavities should be filled with well-graded crushed coral (6 in. to dust sizes) in 6-in. compacted layers.

4. Fills should be constructed in about 6-in. compacted layers. Each layer should be compacted to at least 90% of AASHO T-180-57 density.

5. Borrow materials should be tested and approved by the soil engineer. Test data should be submitted to the F.H.A.

**Slopes**

For slope construction, the following are recommended:

1. Cut and fill slope ratios of about 2 horizontal to 1 vertical or flatter should be used.
2. For protection against erosion, runoff water from rainstorms should be controlled by berms or other approved methods.

3. Cut and fill slopes should be planted to minimize erosion.

   For additional information, see the attached "Proposed Specification for Planting."

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

**Foundations**

If earthwork is carried out in the specified manner, the natural ground and properly constructed fill should develop adequate bearing values to support the proposed light, short-span residential structures.

Recommendations for these structures are:

1. For light residential structures, conventional types of house foundations such as slab-on ground construction or post-and-beam construction may be used.

2. Bearing values for a given soil usually vary with the size and depth of the footings. For light residential structures, bearing values of 2000 p.s.f. on compacted fills and 3000 p.s.f. on medium dense or harder coral may be used.

3. Good surface drainage away from the foundations of the proposed structures should be maintained.
For heavy structures or structures of 3 stories or more, a soil exploration should be made specifically for each structure.

Roadways

In general, if roadways are to be constructed in the existing coral or on good fill, the pavement design for the light residential traffic anticipated may be as follows:

1. Wearing course - 2 in. asphaltic concrete.
2. Base course - 6 in. base course over a prepared subgrade.

Local adjustments regarding subbase requirements can be made in the field in accordance with the design standards of the City and County of Honolulu as soil conditions are encountered in the field at subgrade levels.

It is recommended that the subgrades of roadways be compacted and shaped to drain. Outlets should be placed at low points of roadway profiles to avoid water pocketing by the running of bleeder pipes into catch basins at low points of the subgrade.
PROPOSED SPECIFICATION FOR EARTHWORK

EWA ACRES SUBDIVISION

General Description

This item shall consist of all clearing and grubbing, removing of existing structures, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and all subsidiary work necessary to complete the grading.

Clearing, Grubbing and Preparing Areas to be Filled

All vegetation and rubbish shall be removed and disposed of, leaving the disturbed areas with a neat, debris-free appearance.

All vegetable matter shall be removed from the surface upon which fill is to be placed. All topsoil and stockpiled soils shall be stripped to stiff natural ground or scarified and recompacted before the placement of fill. All topsoil encountered at finish grade shall be scarified and recompacted.

Where cavities are found, loose material and vegetation shall be removed and the cavity filled with crushed coral in 6-in. compacted layers.

Materials

Fill material shall consist of soils approved by the Soil Engineer, and identified in a soil report accepted by the F.H.A. Borrow materials shall be submitted to the Soil Engineer for testing and approval and data shall be submitted to the F.H.A. The soils shall contain no more than a trace of organic matter and no particles larger than 6 in.
diameter. Also, it shall contain no more than 40% gravel (\#4 sieve to 3 in. sieve sizes) and no more than 10% cobbles. Fill material placed in the top 2 ft of fills shall contain no more than 30% gravel or any material larger than gravel.

**Placing, Spreading and Compacting Fill Material**

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 uniformity of moisture content in each layer.

No rocks or cobbles shall be allowed to nest and all voids between rocks must be carefully filled and compacted with small stones or earth.

When the moisture content of the fill material is below that specified by the Soil Engineer, water shall be added until the moisture content is as specified and assures a thorough bonding during the compacting process.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to no less than 90% of maximum density in accordance with AASHO Test No. T-180-57 or other density tests which will obtain comparable results. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers. Rollers shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified moisture content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to insure that the desired density has been obtained.
Field density tests of the compaction of each layer of fill shall be made by the Soil Engineer. Where sheepsfoot rollers are used, soil may be disturbed to a depth of several inches. Density tests shall be made below the disturbed surface as determined by the Soil Engineer. When these tests indicate that the density of any layer of fill or portion thereof is below the required 90% density, the particular 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.

Excavation

Should any unforeseen critical soil formations be encountered at or near finish grades in cut areas, additional investigations shall be made by the Soil Engineer. Corrective measures shall be evaluated and field adjustments shall be made in these areas.

Suitable material from excavations shall be used in the fill and all unsuitable material from excavations shall be disposed of.

Soil Engineering Services

The Soil Engineer shall observe the filling and compacting operations and make necessary tests in accordance with the guide specifications.

Rainy Weather

No fill material shall be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until field tests by the Soil Engineer indicate that the moisture content and density are as previously specified.
PROPOSED SPECIFICATION FOR PLANTING

EWA ACRES SUBDIVISION

Planting materials shall be hunnan grass, buffalo grass, and manienie. In damp areas where manienie will not thrive, hunnan grass shall be planted and in shaded areas, buffalo grass shall be planted.

Planting materials shall be obtained by digging up luxuriu1ant growths from areas that are free of seeds, roots, plants, and grasses that are objectionable. Plant and water within 24 hours after digging from original growing position.

Grasses for planting shall be in approximately 4 in. runners. Planting shall be done in staggered rows 12 in. apart over topsoiled areas. After planting, cover with additional 1/2 in. topsoil. Flat areas shall be rolled with a lawn roller. Water soon after planting, continue daily until growth is sufficient that complete cover has been achieved. In any area where grasses do not become established, runners shall be replanted.

Apply 10-10-2 fertilizer after 2 to 3 months at the rate of 800 lb per acre. Initial maintenance shall be continued until stabilization has been reached.
PROPOSED SPECIFICATION FOR BASE COURSE

EWA ACRES SUBDIVISION

Materials

The base course for use under floor slabs shall consist of clean crushed rock, gravel, coral, cinders or other material as approved by the Soil Engineer. It shall be free from adobe, organic matter, and other such deleterious substances.

Grading

The base course material shall have the following gradation:

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<th>% Passing</th>
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<td>100%</td>
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<td>#4</td>
<td>0</td>
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</table>

Compacting

The base course material shall be thoroughly compacted with vibratory or other approved equipment.
Boring Log

PROJECT: EWA ACRES SUBDIVISION

LOCATION: PUALOA, EWA, OAHU, HAWAII

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

SAMPLER: STANDARD SPLIT SPOON

<table>
<thead>
<tr>
<th>ELEV.</th>
<th>DESCRIPTION</th>
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<td>8 ft</td>
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<tr>
<td>5 ft</td>
<td>MEDIUM, WHITE CORAL LIMESTONE w/ STREAKS OF HARD CORAL</td>
</tr>
<tr>
<td>10 ft</td>
<td>LOOSE TO MEDIUM WHITE CORAL FRAGMENTS</td>
</tr>
</tbody>
</table>

*ELEVATION ESTIMATED FROM CONTOUR MAP*
### Boring Log

**PROJECT**  
EWA ACRES SUBDIVISION

**LOCATION**  
PILULOA, EWA, OAHU, HAWAII

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**HAMMER:**
- Weight: 15# SLEDGE
- Drop: 

**SAMPLER:**  

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<thead>
<tr>
<th>DESCRIPTION</th>
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<tr>
<td>MEDIUM, BROWN CLAYEY SILT w/CORAL FRAGMENTS &amp; ORGANIC MATTER</td>
</tr>
<tr>
<td>MEDIUM TO HARD WHITE CORAL LIMESTONE</td>
</tr>
</tbody>
</table>

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**BORING NO.** 2  
**Sheet No.** 1 of 1

**Driller**  
WALTER LUM ASSOCIATES  
Date: JANUARY 6, 1967

**Field Party**  
MAKAULA, SUZUKI

**Type of Boring**  
AUGER "McCUOCH" Diam. 3"

**Elev.**  
Datum: 

**BIT TYPE:** "MOBILE" MINING BIT

**Water Level:**  
NOT ENCOUNTERED

**Time:**  
Date: 1-6-67

**PENETRATION RESISTANCE**

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<th>CONICAL POINT</th>
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<th>30</th>
<th>40</th>
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<td>CONT. PENETRATION USING 1 1/8&quot;</td>
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</tbody>
</table>

**Blows Per Foot**  
14 1/1
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUUOA, EWA, OAHU, HAWAII

HAMMER:
Weight: 10# SLEDGE
Drop:

SAMPLER:

BORING NO. 3  Sheet No. 1 of 1

Driller: WALTER LUM ASSOC. Date: JANUARY 6, 1967
Field Party: MAKAWA, SUZUKI
Type of Boring: AUGER "MACULOCK" Diam: 3"

BIT TYPE: "MOBILE" MINING BIT

Water Level: NOT ENCOUNTERED

ELEVATION: 56 ft

MEDIUM TO HARD WHITE CORAL LIMESTONE

ELEVATION ESTIMATED FROM CONTOUR MAP

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<td>MEDIUM TO HARD WHITE CORAL LIMESTONE</td>
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20/1
Boring Log

PROJECT  EWA ACRES SUBDIVISION
LOCATION  PUUOLA, EWA, OAHU, HAWAII

HAMMER:
Weight  10 lb. SLEDGE
Drop  —

SAMPLER:  —

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<th>DESCRIPTION</th>
<th>ELEV. = 8.0*</th>
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<tr>
<td>SOFT TO MEDIUM WHITE, CORAL LIMESTONE W/STREAKS OF HARD CORAL</td>
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ELEVATION ESTIMATED FROM CONTOUR MAP.

CONICAL POINT PENETRATION RESISTANCE
CONTINUOUS PENETRATION USING 1/8' CONICAL POINT

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<th>Blows Per Foot</th>
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Blows: 59

**Note:** This document appears to be a boring log for a construction or engineering project, detailing the borehole analysis, water level, and other relevant information. The description of the soil type and its characteristics is also provided, along with a note on elevation estimation from a contour map.
Boring Log

PROJECT EWA ACRES SUBDIVISION
LOCATION PUULOA, EWA, OAHU, HAWAII

HAMMER:
Weight
Drop

SAMPLER:

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| MEDIUM TO HARD
WHITE
CORAL LIMESTONE |

* ELEVATION, ESTIMATED FROM CONTOUR MAP

BORING NO. 4-A
Sheet No. 1 of 1
Driller WALTER LUM ASSOC. Date JANUARY 10, 1967
Field Party SAPP, SUZUKI
Type of Boring LOG OF CAVITY WALL Diam. 
Elev. Datum
Water Level NOT ENCOUNTERED
Time
Date 1-10-67
Boring Log

BOARING NO. 5        Sheet No. 1 of 1

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAII

HAMMER:
Weight
Drop

SAMPLER:

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<th>ELEV. = 5'</th>
<th>DESCRIPTION</th>
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<td>MEDIUM TO HARD WHITE CORAL LIMESTONE</td>
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* Elevation estimated from contour map

Blows Per Foot

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WALTER LUM ASSOCIATES
1019-A UNIVERSITY AVENUE * HONOLULU, HAWAII 96814 * PHONE: 990-471
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAII

HAMMER:
- Weight
- Drop

SAMPLER:

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<th>DESCRIPTION</th>
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<tr>
<td>MEDIUM TO HARD WHITE CORAL LIMESTONE w/ POCKETS OF MEDIUM LIGHT BROWN CLAYEY SILTS</td>
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*ELEVATION ESTIMATED FROM CONTOUR MAP*
**Boring Log**

**PROJECT**: EWA ACRES SUBDIVISION  
**LOCATION**: PUULOA, EWA, OAHU, HAWAII

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**NOTE:**  
"MOBILE" DRILL USING SAME BIT UNABLE TO PENETRATE THIS MATERIAL

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**ELEVATION ESTIMATED FROM CONTOUR MAP**
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAII

HAMMER:
- Weight: 140 lbs
- Drop: 30" into soil

SAMPLER: STANDARD SPLIT SPOON

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<td>LOOSE, BROWN</td>
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<td>MEDIUM TO HARD</td>
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<td>CORAL FRAGMENTS</td>
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ELEVATION ESTIMATED FROM CONTOUR MAP.
# Boring Log

**PROJECT:** EWA ACRES SUBDIVISION  
**LOCATION:** PUULOA, EWA, OAHU, HAWAII

**HAMMER:**  
- **Weight:** 10 lbs  
- **Drop:**

**SAMPLER:**

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<td>BROWN, SILTY CLAY w/CORAL FRAGMENTS</td>
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<td>MEDIUM, WHITE CORAL, LIMESTONE w/Streaks of HARD CORAL</td>
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**ELEVATION:** ESTIMATED FROM CONTOUR MAP.

**BORING NO.:**  
**Date:** JANUARY 6, 1967  
**Driller:** WALTER LUM ASSOC.  
**Field Party:** MEYER, MAESHiro

**Type of Boring:** AKEP"MCULLOCH"  
**Diam.:** 3"

**Elev.:**  
**Datum:**

**Water Level:** NOT ENCOUNTERED

**Time:**  
**Date:** 1-6-67
Boring Log

**PROJECT**: EWA ACRES SUBDIVISION

**LOCATION**: PULILOA, EWA, OAHU, HAWAII

**HAMMER**:
- Weight: 10° SLEDGE
- Drop: 

**SAMPLER**:

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<td>LOOSE, BROWN SILTY CLAY w/CORAL FRAGMENTS</td>
<td>8</td>
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<tr>
<td>SOFT TO MEDIUM WHITE CORAL LIMESTONE w/STREAKS OF HARD CORAL</td>
<td>5</td>
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</tbody>
</table>

* ELEVATION ESTIMATED FROM CONTOUR MAP

**BORING NO.**: 10
**Sheet No.**: 1 of 1

**Driller**: WALTER LUM ASSOC. Date: JANUARY 6, 1967
**Field Party**: MEYER, MAESHIRO
**Type of Boring**: AUGER McCULLOCH Diam. 3" **Elev.** **Datum**

**Water Level**: NOT ENCOUNTERED
**Time**
**Date**: 1-6-67

**CONICAL POINT**

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
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<tbody>
<tr>
<td>0</td>
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</tbody>
</table>

**PEIETRATION RESISTANCE**
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUUOLA, EWA, OAHU, HAWAII

HAMMER:
- Weight: 10 lb.
- Type: SLEDGE

SAMPLER:

---

DESCRIPTION

MEDIUM, WHITE CORAL LIMESTONE W/STREAKS OF HARD CORAL

---

ELEVATION ESTIMATED FROM CONTOUR MAP
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAII

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

SAMPLER: STANDARD SPLIT SPOON

ELEVATION = 5 ft

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<tbody>
<tr>
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<td>12-A</td>
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<td>5</td>
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<td>5</td>
<td>5</td>
<td></td>
<td>5</td>
<td>30</td>
</tr>
</tbody>
</table>

* ELEVATION ESTIMATED FROM CONTOUR MAP
Boring Log

PROJECT: FWA ACRES SUBDIVISION
LOCATION: PUUOLOA, ENA, OAHU, HAWAII

HAMMER:
Weight: 10 lb. SLEDGE
Drop: 

BIT TYPE: "MOBILE" MINING BIT

SAMPLER: STANDARD SPLIT SPOON

ELEVATION ESTIMATED FROM CONTOUR MAP.
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUUOLOA, EWA, OAHU, HAWAII

BORING NO. 14
Driller: WALTER LUM ASSOC. Date: JANUARY 9, 1967
Field Party: SAPP, SUZUKI, CANTORIA, GLORY
Type of Boring: AUGER "McCULLOCH" Diam.: 3" "MOBILE"

HAMMER:
Weight: 10 lb SLEDGE
Drop: __

SAMPLER: __

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<tr>
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</tbody>
</table>

* ELEVATION ESTIMATED FROM CONTOUR MAP.

BIT TYPE: "MOBILE" MINING BIT
Water Level: 3.2'
Time: __
Date: 1-13-67

CONICAL POINT
MOBILE UNABLE TO PENETRATE

MOBILE DRILL 1-10-67

PENETRATION RESISTANCE
CONT. PENETRATION USING 15" P C.O.R. 8-14-GT
MOBILE DRILL 1-9-67
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUU LOA, EWA, OAHU, HAWAII

HAMMER:
Weight 140 lb
Drop 30'

SAMPLER: STANDARD SPLIT SPOON

ELEVATION = 10 ±

Coral, cobble, and boulders
Medium, brown sandy silt with coral fragments

Medium, white coral limestone with streaks of hard coral

Medium to dense light tan silty sand with coral fragments

ELEVATION ESTIMATED FROM CONTOUR MAP
Boring Log

**PROJECT:** EWA ACRES SUBDIVISION  
**LOCATION:** PUULOA, EWA, OAHU, HAWAII

**HAMMER:**
- **Weight:** 10 lb.
- **Drop:**

**SAMPLER:** STANDARD SPLIT SPOON

<table>
<thead>
<tr>
<th>PENETRATION RESISTANCE</th>
<th>STANDARD SPLIT SPOON</th>
<th>SAMPLER</th>
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</thead>
<tbody>
<tr>
<td><strong>Blows Per Foot</strong></td>
<td></td>
<td></td>
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<tr>
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<td></td>
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**AVG. DRILLING RATE**

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<tbody>
<tr>
<td>MEDIUM, BROWN CLAYEY SILT</td>
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<td>0</td>
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<tr>
<td>HARD, WHITE CORAL LIMESTONE</td>
<td>30</td>
<td>0</td>
<td>30</td>
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</tbody>
</table>

**ELEVATION ESTIMATED FROM CONTOUR MAP**
### Boring Log

**Project:** Ewa Acres Subdivision  
**Location:** Puuloa, Ewa, Oahu, Hawaii

**Hammer:**
- **Weight:** 10 lb. Sledge  
- **Drop:** __________

**Sampler:** __________

**Boring No.** 17  
**Sheet No.** 1 of 1  
**Driller:** Walter Lum Associates  
**Date:** January 12, 1967  
**Field Party:** Oshiro Meyer, Maeshiro  
**Type of Boring:** Anchor McCulloch, Diam. 3"  
**Bit Type:** "Mobile" Mining Bit  
**Water Level:** Not Encountered  
**Date:** 1-12-67

### Penetration Resistance

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
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</thead>
<tbody>
<tr>
<td><strong>Penetration</strong></td>
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</tr>
<tr>
<td><strong>Consolidation</strong></td>
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<td><strong>Unit Weight</strong></td>
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<tr>
<td><strong>Shear Strength</strong></td>
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</tbody>
</table>

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**Description**

- **ELEV = 7 ft.**

- Loose, brown silty clay w/ coral fragments

- Medium to hard white coral limestone

---

**Elevation Estimated From Contour Map.**
## Boring Log

**PROJECT**  EWA ACRES SUBDIVISION  
**LOCATION**  PUULOA, EWA, OAHU, HAWAII  
**HAMMER:**  Weight 10 lb. SLEDGE  
**SAMPLER:**  

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>ELEV. = 5 ft.</th>
<th>0</th>
<th>10</th>
<th>20</th>
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<tbody>
<tr>
<td>LOOSE, BROWN</td>
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<tr>
<td>SILTY CLAY</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>w/CORAL FRAGMENTS</td>
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<tr>
<td>MEDIUM TO HARD</td>
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<tr>
<td>WHITE</td>
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<tr>
<td>CORAL LIMESTONE</td>
<td></td>
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</tbody>
</table>

**ELEVATION ESTIMATED FROM CONTOUR MAP**

---

**BORING NO.** 18  
**Driller** WALTER LUM ASSOC.  
**Field Party** OSHIRO, MEYER, MAESHIRO  
**Type of Boring** AUGER "NICKLOCH"  
**Diam.** 2"  
**Elev.**  
**Bit Type:** "MOBILE" MINING BIT  
**Water Level:** 5.1'  
**Time:**  
**Date:** 1-13-67  
**Weight:** 10 lb. SLEDGE  
**Drop:**  

---

**Penetration Resistance**

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetration</td>
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</tbody>
</table>
| Using 1 1/2"  
| CONICAL POINT |   |    |    |    |    |
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAII

Driller: WALTER LUM ASSOC.
Date: JANUARY 6, 1967
Field Party: MAKALI'A MEYER, SUZUKI
Type of Boring: AUGER"MCULLEN" Diam. 3"

Elev. Datum

BIT TYPE: "MOBILE" MINING BIT
Water Level: NOT ENCOUNTERED
Time

Date: 1-6-67

HAMMER:
Weight: 10 lb. SLEDGE
Drop:

SAMPLER:

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>ELEV. = 10 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARD, WHITE CORAL LIMESTONE</td>
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</tbody>
</table>

15 MIN. FT.

ELEVATION ESTIMATED FROM CONTOUR MAP
Boring Log

PROJECT  EWA ACRES SUBDIVISION
LOCATION  PUULOA, EWA, OAHU, HAWAII

HAMMER:
Weight  10 lb SLEDGE
Drop

SAMPLER:  STANDARD SPLIT SPOON

---

ELEVATION ESTIMATED FROM CONTOUR MAP.

---

**Boring Log**

**PROJECT**  EWA ACRES SUBDIVISION

**LOCATION**  PUULOA, EWA, OAHU, HAWAII

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

**SAMPLER:**  STANDARD SPLIT SPOON

---

**ELEVATION ESTIMATED FROM CONTOUR MAP.**

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<tbody>
<tr>
<td>LOOSE, CORAL COBBLES</td>
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<tr>
<td>HARD, WHITE CORAL LIMESTONE W/STREAKS OF HARD CORAL</td>
<td>5</td>
<td>20-A</td>
<td>10</td>
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<td>10</td>
<td>20-B</td>
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**ELEVATION ESTIMATED FROM CONTOUR MAP.**

---

**Boring Log**

**PROJECT**  EWA ACRES SUBDIVISION

**LOCATION**  PUULOA, EWA, OAHU, HAWAII

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

**SAMPLER:**  STANDARD SPLIT SPOON

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**ELEVATION ESTIMATED FROM CONTOUR MAP.**

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<tbody>
<tr>
<td>LOOSE, CORAL COBBLES</td>
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<tr>
<td>HARD, WHITE CORAL LIMESTONE W/STREAKS OF HARD CORAL</td>
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<td>20-A</td>
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**ELEVATION ESTIMATED FROM CONTOUR MAP.**
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUU OLA, EWA, OAHU, HAWAII

Driller: WALTER LUM ASSOC., Date: JANUARY 12, 1967
Field Party: OSHIRO, MEYER, MAESHIRO
Type of Boring: AUGER- McCULLOCH, Diam.: 3"

HAMMER:
- Weight: 10 lb. SLEDGE
- Drop: 

SAMPLER:

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<tbody>
<tr>
<td>LOOSE BROWN SILTY CLAY w/ CORAL FRAGMENTS</td>
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<tr>
<td>HARD, WHITE CORAL LIMESTONE</td>
<td>5</td>
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</table>

*ELEVATIONS ESTIMATED FROM CONTOUR MAP.

Boring No. 21

Penetration Resistance

CONC. PENETRATION
USING 1 1/4" 
CONICAL POINT

Blows Per Foot
0 10 20 30 40
Boring Log

**PROJECT**  EWA ACRES SUBDIVISION

**LOCATION**  PUUOLA, EWA, OAHU, HAWAII

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

**SAMPLER:**

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<tbody>
<tr>
<td><strong>ELEV. = 5 ft</strong></td>
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<td>LOOSE, BROWN Silty Clay</td>
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<tr>
<td>w/ CORAL FRAGMENTS</td>
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<tr>
<td>MEDIUM TO HARD WHITE C. A. CORAL LIMESTONE</td>
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</table>

**ELEVATIONS ESTIMATED FROM CONTOUR MAP**

**BORING NO.** 22  **Sheet No.** 1 of 1

Driller: WALTER LUM ASSOC.  **Date:** JANUARY 12, 1967

Field Party: OSHIRO, MEYER, MAESHIRO

Type of Boring: AUGER "MACULLOCH"  **Diam.** 3"

**Penetration Resistance**

<table>
<thead>
<tr>
<th>Cont. Penetration</th>
<th><strong>Using 1% of Conical Point</strong></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Blows Per Foot</td>
</tr>
<tr>
<td>0</td>
<td>10</td>
</tr>
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<td></td>
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</table>
# Boring Log

**PROJECT:** EWA ACRES SUBDIVISION  
**LOCATION:** PUULOA, EWA, OAHU, HAWAII  
**Driller:** WALTER LUM ASSOC.  
**Date:** JANUARY 9, 1967  
**Field Party:** CANTORNA, GLORY  
**Type of Boring:** AUGER MOBILE  
**Diam.:** 3"  
**Datum:**  
**Date:**  
**Bit Type:** "MOBILE" MINING BIT & DRAG BIT  
**Water Level:** 2.6'  
**Time:**  
**Date:** 2-14-67

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

## Sampler
- **Standard Split Spoon**

## Penetration Resistance

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
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<tbody>
<tr>
<td>Depth (ft.)</td>
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<tr>
<td>Sample No.</td>
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<tr>
<td>Wet Density</td>
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<tr>
<td>P.C.F.</td>
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<tr>
<td>Moist. Cont.</td>
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<tr>
<td>Dry Density</td>
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<tr>
<td>P.C.F.</td>
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<tr>
<td>Unconf. P.C.F.</td>
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<tr>
<td>Vane Shear</td>
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<tr>
<td>P.S.</td>
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</table>
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAII

HAMMER:
- Weight: 10 oz SLEDGE
- Drop: [Blank]

SAMPLER: [Blank]

ELEV. = 62'*

1.2 MIN. FT.

SOFT, WHITE CORAL LIMESTONE
W/STREAKS OF HARD CORAL

20 MIN. FT.

TAN & WHITE CORAL LIMESTONE

0.4 MIN. FT.

SOFT TO MEDIUM TAN & WHITE CORAL LIMESTONE
W/STREAKS OF HARD CORAL

2.5 MIN. FT.

ELEVATION ESTIMATED FROM CONTOUR MAP
# Boring Log

**PROJECT:** EWA ACRES SUBDIVISION  
**LOCATION:** PUKUOA, EWA, OAHU, HAWAII

**HAMMER:**  
- Weight: 10 lb  
- Drop: __________

**SAMPLER:** __________

**BIT TYPE:** "MOBILE" MINING BIT
- Water Level: 2.8'
- Time: 2:00 PM  
- Date: 1-18-67

**DESCRIPTION**

<table>
<thead>
<tr>
<th>ELEV. = 6 ±</th>
<th>1 MIN.</th>
<th>5 MIN.</th>
<th>10 MIN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFT TO MEDIUM</td>
<td>TAN &amp; WHITE CORAL LIMESTONE</td>
<td>W/STREAKS OF HARD CORAL</td>
<td></td>
</tr>
</tbody>
</table>

**PENETRATION RESISTANCE**

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONT. PENETRATION USING 15/8&quot; Ø CONICAL POINT</td>
<td>25</td>
<td>5'</td>
<td>41</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAI'I

Driller: WALTER LUM ASSOC., Date: JANUARY 18, 1967
Field Party: OSHIRO, SUZUKI

Type of Boring: AUGER "McCulloch" Diam: 3"  

BIT TYPE: "MOBILE" MINING BIT

TIPS: 'MOBILE' MINING BIT

DRILLING DATE: 1-18-67

ELEVATION ESTIMATED FROM CONTOUR MAP

<table>
<thead>
<tr>
<th>AVERAGE DRILLING DATE</th>
<th>DESCRIPTION</th>
<th>ELEV. = 5 ±*</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 MIN.</td>
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</table>

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<tr>
<td>5</td>
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<tr>
<td>10</td>
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</tbody>
</table>
Boring Log

**PROJECT**  EWA ACRES SUBDIVISION

**LOCATION**  PUULOA, EWA, OAHU, HAWAII

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

**SAMPLER:**

**ELEVATION ESTIMATED FROM CONTOUR MAP**

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HARD, WHITE CORAL LIMESTONE</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**ELEVATION**  Estimated from Contour Map

**BORING NO.**  27  **Sheet No.**  1 of 1

**Driller**  WALTER LUM ASSOC.  **Date**  JANUARY 13, 1967

**Field Party**  SAPP, SUZUKI

**Type of Boring**  AUGER "McCULLOCH" Diam.  3"

**Elev.**  

**Datum**  

**BIT TYPE:**  "MOBILE" MINING BIT

**Water Level**  NOT ENCOUNTERED

**Time**  

**Date**  1-13-67

**PENETRATION RESISTANCE**

**CONE, PENETRATION USING 1½"内の CONICAL POINT**

**Blows Per Foot**  0 10 20 30 40

**25½'**
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUALOA, EWA, OAHU, HAWAII

HAMMER:
- Weight: 10# SLEDGE
- Drop: [Blank]

SAMPLER: [Blank]

BORING NO. 28
DRILLER: WALTER LUM ASSOC.
DATE: JANUARY 17, 1967

FIELD PARTY: OSHIRO, SAITO, SUZUKI

TYPE OF BORING: AUGER "MCCULLOUGH" Diam.: 3"

ELEV. [Blank]

BIT TYPE: "MOBILE" MINING BIT

WATER LEVEL: 6.1'

TIME: 5:55 PM
DATE: 1-17-67

PENETRATION RESISTANCE
CONT. PENETRATION USING 19/64" CONICAL POINT
BLOWS PER FOOT
0 10 20 30 40

LEVEL BORING RATE

ELEV. = 62'

7.5 MIN. FT.

MEDIUM, BROWN CLAYEY SILT
W/ LOOSE, CORAL ROCK

MEDIUM, WHITE CORAL LIMESTONE
W/ STREAKS OF HARD CORAL

12'/1'

* ELEVATION ESTIMATED FROM CONTOUR MAP.

WALTER LUM ASSOCIATES
1019-A UNIVERSITY AVENUE • HONOLULU, HAWAII 96814 • PHONE: 990-471
Boring Log

PROJECT: EWA ACRES SUBDIVISION
LOCATION: PUULOA, EWA, OAHU, HAWAII

HAMMER:
Weight: 140 lbs
Drop: 30'

SAMPLER: STANDARD SPLIT SPOON

ELEVATION: 3 ± ft

SOFT TAN & WHITE CORAL LIMESTONE W/STREAKS OF HARD CORAL & POCKETS OF FINGER CORAL

VERY LOOSE TAN & WHITE CORAL FRAGMENTS

ELEVATION ESTIMATED FROM CONTOUR MAP.
Boring Log

PROJECT: EWA ACRES SUBDIVISION  
LOCATION: WAILOA, EWA, OAHU, HAWAII

HAMMER:
Weight: 10" § TEUDE
Drop: 

SAMPLER: 

BORING NO. 30  
Driller: WALTER LUM ASSOC.  
Date: JANUARY 17, 1967
Field Party: OSHIRO, SAPP, SUZUKI
Type of Boring: AUGER-MCCULLOH  
Diam.: 3"

BIT TYPE: "MOBILE" MINING BIT
Water Level: 3.7'
Time: 2:00pm
Date: 1-17-67

Description:

ELEVATION ESTIMATED FROM CONTOUR MAP
### Boring Log

**PROJECT**: EWA ACRES SUBDIVISION  
**LOCATION**: PUULOA, EWA, OAHU, HAWAII  
**Driller**: WALTER LUM ASSOC.  
**Date**: JANUARY 16, 1967  
**Field Party**: OSHIRO, SAPP, SUZUKI  
**Type of Boring**: AUGER "McCulloch"  
**Diam.**: 3"  
**Bit Type**: "MOBILE" MILLING BIT

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

#### SAMPLER:
- **STANDARD SPLIT SPOON**

#### PENETRATION RESISTANCE

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>33-A</td>
<td>27.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### DESCRIPTION

- ELEV. = 6' ±
- **SOFT, WHITE CORAL LIMESTONE W/STREAKS OF HARD CORAL**

---

* ELEVATION ESTIMATED FROM CONTOUR MAP

---

**BOERING NO.**: 31  
**Sheet No.**: 1 of 1
# Boring Log

**Project:** EWA ACRES SUBDIVISION  
**Location:** PUALOA, EWA, OAHU, HAWAII

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

**Sampler:** STANDARD SPLIT SPOON

---

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>Elev = 4 ft</td>
</tr>
</tbody>
</table>
| 4 - 9      | MEDIUM, BROWN CLAYEY SILT W/CORAL FRAGMENTS  
| 9 - 15     | SOFT, WHITE CORAL LIMESTONE W/STREAKS OF HARD CORAL |

---

**Penetration Resistance**

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>Penetration Resistance</td>
</tr>
</tbody>
</table>

---

**Elevation Estimated From Contour Map"
TABLE I - SUMMARY OF LABORATORY TEST RESULTS

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>1</th>
<th>6</th>
<th>8</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE NO.</td>
<td>C</td>
<td>A</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>DEPTH BELOW SURFACE</td>
<td>10-115</td>
<td>0-1</td>
<td>10-115</td>
<td>6-6.3</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>WHITE CORAL FRAGMENTS</td>
<td>WHITE CORAL LIMESTONE (COBBLES CRUSHED FOR TEST)</td>
<td>WHITE CORAL FRAGMENTS</td>
<td>WHITE CORAL FRAGMENTS</td>
</tr>
</tbody>
</table>

**GRADING ANALYSIS** (% Passing)

<table>
<thead>
<tr>
<th>Sieve</th>
<th>1&quot;</th>
<th>1/2&quot;</th>
<th>#4</th>
<th>#10</th>
<th>#20</th>
<th>#40</th>
<th>#100</th>
<th>#200</th>
</tr>
</thead>
<tbody>
<tr>
<td>92.7</td>
<td>52.0</td>
<td>39.4</td>
<td>28.9</td>
<td>23.0</td>
<td>19.7</td>
<td>15.6</td>
<td>12.6</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**

**SPECIFIC GRAVITY**

**EXPANSION AND CBR TESTS**

(Surcharge-51 P.S.F.)
- Molding Moisture Content, %
- Molding Dry Density, P.C.F.
- Swell upon saturation, %
- CBR at 0.1" Penetration (%)

**COMPACTION TEST**

(AASHO T-180-57 Method)
- Dry to Wet or Wet to Dry
- Max. Dry Density (P.C.F.)
- Optimum Moisture (%)
U.S. STANDARD SIEVE SIZE

GRAIN SIZE IN MILLIMETERS

PERCENT FINER BY WEIGHT

COBBLES

GRANULARITY CURVE

GRAVEL

SAND

GRAIN SIZE IN MILLIMETERS

COARSE

FINE

COARSE

MEDIUM

FINE

GRADEATION CURVE

EWA ACRES

PUULOA, EWA, OAHU, HAWAII

WALTER LUM ASSOCIATES, INC.

CIVIL STRUCTURAL SOILS ENGINEERS
GENERAL TESTING METHODS

EXPLORATORY BORINGS AND SAMPLING

Method for soil investigation and sampling by auger borings (Tentative)  
ASTM Designation: D 1452-63T

Method for thin wall tube sampling of soils (Tentative)  
ASTM Designation: D 1587-63T

Method for penetration test and split barrel sampling of soils (Tentative)  
ASTM Designation: D 1586-64T

LABORATORY TESTING

Grading Analysis

Sieve analysis of fine and coarse aggregates  
AASHTO Designation: T 27-60

Amount of material finer than No. 200 sieve in aggregate  
AASHTO Designation: T 11-60

Atterberg Limits

Determining the liquid limit of soils AASHTO Designation: T 89-60
Modified as follows: Substitute Casagrande grooving tool. Tests conducted from natural moisture content unless noted otherwise.

Determining the plastic limit of soils  
AASHTO Designation: T 90-56

Calculating the plasticity index of soils  
AASHTO Designation: T 91-54

Specific Gravity

Specific gravity of soils AASHTO Designation: T 100-60
Modified as follows: 500 ML Pycnometer

Expansion and CBR Tests

Expansion test and California Bearing Ratio (CBR)  
Section VIII - TM 5-530
"Materials Testing" by Headquarters, Dept. of the Army

Compaction Test

Moisture-Density relations of soils using a 10# rammer and an 18" drop  
AASHTO Designation: T 180-57

Unified Soil Classification

Designation E-3 from "Earth Manual" by the United States Department of the Interior Bureau of Reclamation