MILILANI FILL SITE NO. 2
PRELIMINARY SOIL REPORT

WAIPIO, EWA, OAHU, HAWAII
TAX MAP KEY: 9-5-01: POR. 1

FOR REFERENCE
not to be taken from this room

To:
SAM O. HIROTA, INC.

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

NOVEMBER 7, 1973

MUNICIPAL REFERENCE & RECORDS CENTER
City & County of Honolulu
City Hall Annex, 548 S. King Street
Honolulu, Hawaii 96813
November 7, 1973

SAM O. HIROTA, INC.
Suite 707, Amfac Building
700 Bishop Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: Mililani Fill Site No. 2
Preliminary Soil Report
(for site grading purposes)
Waipio, Ewa, Oahu, Hawaii

Transmitted herewith is our preliminary soil report for site grading purposes for the proposed Mililani Fill Site No. 2 in Waipio, Ewa, Oahu, Hawaii.

The proposed plan is to fill a gully or drainageway up to about 25 ft.

The soils at the site may generally be described as stiff clayey silt (MH soils) to about 40 ft, the depths drilled.

Before filling the drainageway, trenches should be cut in a herringbone pattern and subdrains placed in the trenches to provide drainage paths.

The fill slope at the low end of the proposed fill site should be constructed at average overall slope ratios of about 3 horizontal to 1 vertical or flatter or constructed with granular material.

The earthwork should be done in accordance with the requirements of the Revised Ordinances of Honolulu, 1969 As Amended and the recommendations contained herein.

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

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By Ezra Koike

CM/EK:rmf
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PROPOSED SPECIFICATION FOR EARTHWORK

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B. SUMMARY OF LABORATORY TEST RESULTS - Table IA
C. PLASTICITY CHART
D. PROJECT LOCATION SKETCH
E. BORING LOCATION SKETCH
F. PROPOSED BOULDER FILL - Figure 1
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MILILANI FILL SITE NO. 2
PRELIMINARY SOIL REPORT

WAIPIO, EWA, OAHU, HAWAII
TAX MAP KEY: 9-5-02: POR. 1

SCOPE OF EXPLORATION

The purpose of this exploration was to evaluate general soil conditions for site grading purposes for the proposed Mililani Fill Site No. 2 in Waipio, Ewa, Oahu, Hawaii.

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

FIELD EXPLORATION

Three borings were made at the site. The approximate locations of these borings are shown on the Boring Location Sketch. Descriptions of the soils encountered are shown on the boring logs.

Borings were made with 4-in. diameter augers using finger-type bits. Soil samples were recovered with a 2-in. standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content and density, Atterberg limit and unconfined compression. A summary of the laboratory test results is given in Table IA.
GEOLOGIC AND SOIL DESCRIPTIONS BY OTHERS
Stearns, H. T. and U. S. Geologic Survey, "Geologic and Topographic Map of the Island of Oahu," 1938:
Jointed dense to very vesicular, holocryalline and micro-
crystalline, aphanitic and porphyritic permeable effusive basalts (TKb).

Helemano silty clay, 30 to 90 percent slopes (HLMG)
Unified Soil Classification - MH

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
Location
The proposed fill area is located behind Waipio Acres Subdivision about 5,000 ft northeast of the intersection of Kamehameha Highway and Kuahelani Avenue in Waipio, Ewa, Oahu, Hawaii.
Annual Rainfall
The average annual rainfall varies from about 40 to 50 inches.

Topography
The proposed fill site is a natural drainageway that slopes downward in a southwestern direction at about a 5% gradient. The depth of the gully varies from about 5 to 25 ft. The side slopes vary from about 20 to 50% and steeper in localized areas.

The site is covered with trees and brush.

The elevation varies from about 700 to 730 ft.

INTERPRETATION OF SOIL CONDITIONS
From the field exploration and laboratory test results, the soils encountered in the borings may be generally described as follows:

Stiff clayey silts (MH soils) to 21 to 41 ft, the depths drilled.

Water was not noticed in the borings at the time of the field explorations.

Variations to the above soil conditions are to be expected in localized areas. For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.
DISCUSSION AND RECOMMENDATIONS

In general, the present plan is to clear and fill the natural drainageway. The portion of the drainageway to be filled is approximately 710 ft long and 160 to 225 ft wide. Fills of about 5 to 25 ft are planned. The higher fills would generally occur at the lower (southwest) end of the site.

It is our understanding that the fill would be constructed and the site left idle. This would allow the fills and surrounding ground to adjust to the new fill loads.

If development of the site is contemplated in the future, soil explorations may be made at that time for the intended use.

Before fills are placed in the drainageway, trenches should be cut in a herringbone pattern along the bottom and sides and subdrains placed in the trenches to provide drainage paths.

For the fill slope at the lower end of the drainageway, average overall slope ratios of about 3 horizontal to 1 vertical or flatter are recommended.

**Site Grading**

Grading work should be done in accordance with the requirements of the Revised Ordinances of Honolulu, 1969 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. Loose surface soils should be stripped to stiff natural ground before the placement of fills.

3. Subdrains should be placed along the bottom of the natural drainageway with laterals in a herringbone pattern along the sides.

4. Localized soft pockets encountered during the site preparation should be excavated and replaced with compacted select material.

5. 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 stiff natural ground by cutting steps into these slopes and compacting the fill into these steps.
6. In general, fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

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

8. If boulders are proposed to be used in the construction of fills, they should be generally placed along the toe sections of fill slopes. Before placing any boulders, the subgrade should be stripped to stiff natural ground and shaped to drain. A layer of select material or low grade concrete should be placed on the subgrade and the boulders placed on the select material or low grade concrete. The void spaces between boulders should be filled with smaller granular material. A blanket of filter material should be placed against the boulders before any earth fills are placed against the boulders. See attached sketch, Figure 1.
Slopes

The fill slope at the lower end of the drainageway should be constructed at average overall slope ratios of 3 horizontal to 1 vertical or flatter or constructed with granular material.

For localized low slopes constructed with silty or sandy soils, cut and fill slopes of 2 horizontal to 1 vertical or flatter may be considered.

Where clay "CH" soils are encountered, flatter slopes should be considered, otherwise removal of clay pockets and replacement with select soils be considered.

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

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

Slope planting is recommended on fill slopes to minimize erosion.

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

Unforeseen Conditions

Because of the variability of soil deposits, site improvements, designs and construction techniques, conditions may be encountered that cannot be foreseen with even the most exhaustive studies of site and project conditions. These unforeseen conditions should be recognized when encountered and then evaluated so that the designs or the construction methods may be modified accordingly, if necessary.

Unforeseen or undetected conditions such as soft spots, existing utility trenches, structure foundations, voids or cavities, boulders, expansive soil pockets or seepage water, etc., may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.
PROPOSED SPECIFICATION FOR EARTHWORK

MILILANI FILL SITE NO. 2

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 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.

Topsoil 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.

The bottom and sides of natural drainageways shall be stripped down to stiff natural ground before the placement of fills.

Subdrains shall be placed along the bottom and sides of natural drainageways before the placement of fills.

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 6-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 selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and blade-mixed during the spreading to attain uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest and voids between rocks shall be 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 is near the optimum.

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 sheepsfoot 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 the 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 sheepsfoot 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 a layer of fill or portion thereof is below the required 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 select material or low grade concrete shall be placed on it. 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 conditions such as soft spots, existing utility trenches, structure foundations, voids or cavities, boulders, expansive soil pockets or seepage water, etc., 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**

**PROJECT**  
MILILANI FILL SITE NO. 2

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

**Tax Map Key:**  9-5-01: For. 1

**HAMMER:**  
- **Weight:** 140 lb  
- **Drop:** 80"  
- **Type of Boring:** AUGER (VERS)  
- **Diam.:** 4"  
- **Elev:** 100'±  
- **Date:** Oct. 25 & 26, 1973  
- **Driller:** W. LUM ASSOC., INC.  
- **Field Party:** ASATO, CHOW, OMORI  
- **Drill Bit:** T.C. DRAG

**SAMPLER:**  
- **2" 5. 2" O.D. THIN WALL TUBE**

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**STIFF, BROWN CLAYEY SILT**

**STIFF MITTED GRAY BROWN CLAYEY SILT**

**STIFF RED BROWN GRAY CLAYEY SILT**

**FLOWAGE:**

- **END OF BORING:** 41.5'  
- **10-26-73**

**ELEVATION ESTIMATED:** FROM TOPO MAP

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**NOTES:**

- LL = Liquid Limit
- PL = Plastic Limit
# Boring Log

**PROJECT** | MILILANI FILL SITE NO. 2  
**LOCATION** | Waipio, Ewa, Oahu, Hawaii  
**Tax Map Key:** | 9-5-01; Por. 1  
**HAMMER:** |  
**Weight:** | 140 #  
**Drop:** | 30"  
**SAMPLER:** | 2" STANDARD SPLIT SPOON  

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**END OF BORING 2 31.5' 10-25-73**

*ELEVATION ESTIMATED FROM TOPO MAP*
**WALTER LUM ASSOCIATES, INC.**

**Boring Log**

**PROJECT**  
MILILANI FILL SITE NO. 2

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

**Tax Map Key:** 9-5-01: Por. 1

---

**HAMMER:**

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

**SAMPLER:** 2" STANDARD SPLIT SPOON

---

**ELEV. = 719 ± 7 ft**

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**END OF BORING @ 21.5', 10.24.73**

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**PENETRATION DATA**

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**NOTE:**

- LL = LIQUID LIMIT
- PL = PLASTIC LIMIT

---

**ELEVATION ESTIMATED FROM TOPO MAP**
## TABLE I.A - SUMMARY OF LABORATORY TEST RESULTS

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<td>Dry to Wet or Wet to Dry</td>
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<td>Max. Dry Density (P.C.F.)</td>
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<td>Optimum Moisture (%)</td>
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**Remarks:**

Date 11-6-73  By C.M.
PLASTICITY CHART

PROJECT: MILILANI FILL SITE NO. 2
LOCATION: WAIPIO EWA, OAHU, HAWAII

DATE 11-6-72    BY CM

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
PROJECT LOCATION SKETCH
MILILANI FILL SITE NO. 2
WAIPIO, EWALO, OAHU, HAWAII
TAX MAP KEY: 9-5-01: POR. 1

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

NOVEMBER, 1973
Figure 1
Proposed Boulder Fill
Mililani Fill Site No. 2
Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-5-02: PDR 1
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, changed conditions, and changes in the state of the art of soil engineering.

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.