FOUNDATION INVESTIGATION

PROPOSED MALA EKENA PROJECT
HONOLULU, HAWAII

TMK: 1-7-19: 21
1-7-20: 16 & 50

for

AMFAC FINANCIAL CORP.

W. O. 287
January 24, 1975

ERNEST K. HIRATA & ASSOCIATES, INC.
Amfac Financial Corp.
700 Bishop Street - 16th Floor
Honolulu, Hawaii 96813

Attention: Mr. Kenneth Matsuura

Gentlemen:

Our report, "Foundation Investigation, Proposed Mala Ekena Project, Honolulu, Hawaii, TMK: 1-7-19: 21 and 1-7-20: 16 & 50", dated January 24, 1975, our Work Order 287 is enclosed. This is the report requested by you and planned in cooperation with personnel of Wong, Wong & Peng, Inc., Architects, and T. Y. Lin, Hawaii, Inc., Structural Engineers.

In general, the surface soil consists of a grayish brown silty clay underlain by basalt. Between the two areas delineated as rock outcrop, the underlying soil consisted of silty gravels with numerous cobbles and boulders.

Since subsurface conditions vary, design of foundations should include alternate designs for areas where basalt is not encountered. We recommend conventional spread footings founded on basalt. In areas along the stream bed, mat or strip type footings are recommended. Recommendations are presented in this report for the design of both foundation types.

We appreciate this opportunity to be of service. Should you have any questions concerning this report, please feel free to call on us.

Very truly yours,


Ernest K. Hirata  President

EKH:yk
INTRODUCTION

This report presents the results of our foundation investigation performed on the subject property. The purpose of this investigation was to determine the nature of the soils underlying the site, to ascertain their engineering properties, and to provide recommendations for foundation design, floor slabs, lateral pressures, and site preparation.

This investigation included drilling ten exploratory test borings, obtaining representative soil samples, laboratory testing and analysis, and the preparation of this report. The exploratory boring locations are shown on the enclosed Grading Plan. Also attached is an Appendix which describes the laboratory testing procedures.

STRUCTURAL CONSIDERATIONS

Information concerning the proposed development was furnished by the personnel of Wong, Wong & Peng, Inc., Architects, and T. Y. Lin, Hawaii, Inc., Structural Engineers.
The proposed development will consist of six buildings located along Puehuehu Stream. The buildings will be five to six stories in height of reinforced concrete construction. Structural loads will be transmitted to the foundations primarily by columns. Maximum column loads were not available at the time of this investigation. Excavations of 6 to 8 feet along with some embankment fills are anticipated.

SITE DESCRIPTION

The property is bordered by Stillman Lane on the Ewa end and by a portion of the City & County of Honolulu Park on the Diamond Head end. The site is located at the end of Huna Street, and Puehuehu Stream flows through the site in a southerly direction. Total relief over the site is approximately 36 feet.

At the time of our investigation, the Ishii Gardens Teahouse occupied a portion of the Diamond Head half of the site. Numerous abandoned wood frame cottages were also observed adjacent to the teahouse. Vegetation growth was moderate to heavy along the stream banks. Rock outcrops and boulders were also observed along the banks of the stream.

FIELD EXPLORATION

The site was explored from December 20th, 1974 to January 15th, 1975 by drilling ten exploratory test borings with both a truck mounted and portable drilling machines. The borings
varied in depth from 10 to 21 feet. The soils were continuously logged by our field engineer and classified by visual examination in accordance with the Unified Soil Classification System. The boring locations are shown on the Grading Plan and the soils encountered are logged on Plates A1 through A10.

Undisturbed, bag, and core samples were recovered from the borings for laboratory testing. Undisturbed samples were obtained by driving a 3 inch O.D. thin-walled steel sampler with a 140 pound hammer from a height of 30 inches. Core samples were obtained by drilling with a NX core barrel. The required blow count for each six inches of penetration and recovery percentages for each core run are shown on the enclosed Boring Logs.

SOIL CONDITIONS

The soil conditions for the project site can be divided into two areas. Area I is situated on the Diamond Head side of Puehuehu Stream while Area II is on the Ewa side of the stream. The delineation of rock outcrops for both areas is plotted on the Grading Plan.

Area I

The surface soil consists of a grayish brown silty clay in a firm condition varying in thickness from 0.5 to 5.5 feet. Borings B4 and B5 encountered fill consisting of silty clays with mixtures
of sand and coral fragments.

Underlying the surface soil was basalt of varying hardness. Borings B2, B3, B5, and B6 encountered gray hard basalt which will require blasting. The basalt encountered in borings B1 and B4 were fractured and could probably be excavated with heavy equipment.

Boring B7 was drilled within the stream bed, and the soils consisted of silty gravels with numerous cobbles and boulders down to the maximum depths drilled.

Groundwater was encountered in boring B3 at a depth of 11.5 feet below existing ground.

Area II

The surface soils in Area II, located on the Ewa side of Puehuehu Stream, consist of a grayish brown silty clay ranging in thickness from 4.5 to 6.5 feet. Borings B8 and B9 encountered silty gravels with numerous cobbles and boulders to depths of 12 to 13 feet below existing ground. Basalt was encountered in boring B10 underlying the silty clay.

Plates 1 and 2 present a cross section of the approximate subsurface soil conditions underlying the site.
CONCLUSIONS AND RECOMMENDATIONS

General

Since the proposed buildings will be situated over portions of the former stream bed, design of the foundations should include alternate designs for areas where basalt is not encountered.

AREA I

For Area I, where borings B1 through B6 were drilled, foundations may be designed using conventional spread footings founded on basalt. The delineation of the rock outcrop indicates areas where basalt will probably be encountered.

It should be noted that the location where boring B1 was drilled is at the top of bank, and any footings located below that point will probably be founded on silty gravels and cobbles.

Foundations for Building "B" located below the rock outcrop will require mat or strip type footings founded on the silty gravels and cobbles.

AREA II

For foundations located above the rock outcrop, conventional spread footings founded on basalt may be used. For foundations located below the rock outcrop, mat or strip type footings will
be required founded on the silty gravels and cobbles.

**Foundations**

Conventional spread footings may be used in areas where basalt will be encountered. Column footings may be designed for a bearing value of 5000 pounds per square foot founded on the hard basalt.

Mat or strip type footings should be designed for areas where basalt is not encountered. Foundations may be designed for a bearing value of 2000 pounds per square foot.

All foundations should be founded either on the basalt or silty gravel stratum, and in no case should any foundations rest on the surface layer of silty clays.

For foundations resting on the silty gravels, recompaction of the bottom of excavations may be necessary. In addition, up to 12 inches of granular material may be required if soft areas are encountered.

**Lateral Design**

The bearing values indicated above are for the total of dead and frequently applied live loads, and may be increased by one-third for short duration loading which includes the effect of wind or seismic forces. Resistance to lateral loading may
be provided by friction acting at the base of foundations and by passive earth pressure. An allowable coefficient of friction of 0.4 may be used with the dead load forces. Passive earth pressure may be computed as an equivalent fluid having a density of 300 pounds per cubic foot with a maximum earth pressure of 3000 pounds per square foot. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

For active earth pressure considerations, an equivalent fluid pressure of 50 pounds per cubic foot per foot of depth should be used.

**Foundation Settlement**

Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is not expected to exceed 1/4 inch.

**Retaining Walls**

For design of retaining walls, an active equivalent fluid pressure of 50 pounds per cubic foot per foot of depth should be used. In addition, hydrostatic pressure buildup may be possible with sudden drops of the stream level. We recommend that an additional equivalent fluid pressure of 63 pounds per cubic foot be used for design, beginning at a point one half
the height of the wall from the location of the weeper holes.

**Floor Slabs**

For any slabs on grade resting on basalt, we recommend a four inch cushion of crushed rock to be placed beneath the slab.

In areas where the slab on grade rests on the silty clay stratum, we recommend the removal of the upper 24 inches of expansive silty clays and replacement with compacted nonexpansive granular material.

**Site Preparation**

For areas where structural fill will be required, we recommend removal of all vegetation. The surface should then be scarified to a depth of six inches and recompacted to a minimum of 90 percent relative compaction. Any fills placed on slopes exceeding slope gradients of 5:1 (horizontal to vertical) shall be properly keyed and benched. Any imported material used for structural fill shall be approved by us prior to use in the compacted fills.

**Inspection**

It is recommended that all footing excavations be inspected by a qualified foundation engineer prior to placing concrete or steel. Any structural fill which is placed should be inspected and tested.
Limitations

The boring logs indicate the approximate subsurface soil conditions encountered only at those locations where the borings were made, and may not represent conditions at other locations.

During construction, should subsurface conditions differ from those encountered in the borings, we should be advised immediately in order to review and to revise our recommendations.

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.

Respectfully submitted,


Ernest K. Hirata
P.E. 2732

Enc: Appendix of Laboratory Testing
Boring Logs Plates A1 through A10
Consolidation Tests Plate B
Cross Sections Plates 1 and 2
Grading Plan
APPENDIX OF LABORATORY TESTING

Classification
The field classification is verified in the laboratory, also in accordance with the Unified Soil Classification System. Laboratory classification is determined by both visual examination and Atterburg Limit Tests according to ASTM D423 and D424. The final classification is shown on the Boring Logs.

Moisture-Density
The field moisture content and dry unit weight are determined for each of the undisturbed soil samples. The information is useful in providing a gross picture of the soil consistency between borings and any local variations. The dry unit weight is determined in pounds per cubic foot while the moisture content is determined as a percentage of the dry unit weight. These samples are obtained from a 3" O.D. split tube sampler.

Consolidation
Settlement predictions of the soil's behavior under load are made on the basis of the consolidation tests. Loads are applied in several increments in a geometric progression, and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen having an inside diameter of 2.40 inches and a height of 1 inch to permit addition and
release of pore fluid. Results of undisturbed and remolded samples are plotted on the Consolidation Test Report.

Compaction Tests
Compaction tests were performed on bag samples to determine the optimum moisture content at which each type of proposed fill material compacts to 100% density. The tests were performed according to ASTM D-1557-70.

Swell Tests
Swell tests were performed to determine the expansiveness of the onsite surface soils. The tests were performed on undisturbed ring and remolded samples taking a one inch high specimen under different surcharge loads.

Shear Tests
Shear tests are performed in the Direct Shear Machine which is of the strain control type. The rate of deformation is approximately 0.03 inches per minute. Each sample is sheared under varying confining loads in order to determine the Coulomb shear strength parameters, cohesion and angle of internal friction. Eighty percent of the ultimate value is taken to determine the shear strength parameters.
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<th>DEPTH FEET</th>
<th>CORE</th>
<th>BAG</th>
<th>PENETRATION RESIST BLOWS/6 inches</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT</th>
<th>RELATIVE COMPACTION</th>
<th>DIRECT SHEAR STRENGTH PARAMETERS</th>
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**SURFACE ELEV:** 30.5+

**DRIVING WT:** 140 lb.

**DROP:** 30 in.

**DATE OF DRILLING:** 12-30-74

**W.O.:** 287

**BORING NO.:** B1

**Boring Log:**

- **Silty CLAY (CH)-Grayish brown, moist, firm, with roots, cobbles.**
- **BASALT-Gray, hard.**
  - Begin NX coring from 1 foot.
  - 80% Recovery from 1 to 2.5 feet.
  - Hard basalt.
  - 100% Recovery from 2.5 to 6.5 feet.
  - Hard basalt.
- **DECOMPOSED ROCK-Orange-brown, hard.**
  - 7% Recovery from 6.5 to 10.5 feet.
  - Decomposed rock and basalt fragments with silt.
  - 85% Recovery from 10.5 to 14.5 feet.
  - Hard decomposed rock.

End boring at 14.5 feet.

Plate A1
<table>
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<tr>
<th>DEPTH FEET</th>
<th>SURFACE ELEV.</th>
<th>PENETRATION RESIST. BLOWS/6 inches</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT %</th>
<th>RELATIVE COMPACT %</th>
<th>DIRECT SHEAR STRENGTH PARAMETERS</th>
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<td>92% Recovery from 1 to 2 feet.</td>
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<td>Basalt.</td>
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<td>100% Recovery from 10 to 15 feet.</td>
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</table>

**Classification**

- **Silty Clay (CH):** Grayish brown, moist, firm, with roots, cobbles and boulders.
  - Percent Recovery: 92%
  - Depth: 5 to 10 feet.

- **Basalt:** Gray, hard.
  - Percent Recovery: 100%
  - Depth: 15 to 20 feet.

**Notes:**
- End boring at 15 feet.
- Drop 30 in.
- Date of Drilling: 12-27-74
- Driving WT.: 140 lb.
- Drop: 30 in.
- W.O.: 287

**Plate A2**
# Boring Log

**Boring No.: B3**

**Surface Elev.: 49 ft.**

**Driving Wt.: 140 lb.**

**Drop: 30 in.**

**Date of Drilling: 12-20-74**

**W.O.: 287**

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<tr>
<th>Depth Feet</th>
<th>Core</th>
<th>Bag</th>
<th>Penetration Resists./6 inches</th>
<th>Dry Density</th>
<th>Moisture Content</th>
<th>Relative Compaction</th>
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**Direct Shear Strength Parameters:**

- **D:**
- **C:**

**Classification:**

- **Silty CLAY (CH)-Grayish brown, moist, firm, with roots and cobbles. Covered by 2" asphaltic concrete and 4" base course.**

- **BASALT-Gray, hard, fractured. Begin NX coring from 3 feet.**
  - 80% Recovery from 3 to 4 feet.
  - Highly fractured vesicular basalt.
  - 50% Recovery from 4 to 8 feet.
  - Fractured basalt with silt.
  - 100% Recovery from 9 to 10.5 feet.
  - Fractured basalt.
  - 100% Recovery from 10.5 to 12.5 feet.
  - Hard basalt.
  - 33% Recovery from 12.5 to 15.5 feet.
  - Decomposed rock with basalt fragments and silt from 13.5 feet.
  - 0% Recovery from 15.5 to 16.5 feet.
  - 100% Recovery from 17 to 21 feet.
  - Hard basalt.

End boring at 21 feet.

- **△ Water level at 11.5 feet.**

Plate A3
### BORING LOG

**BORING NO.:** B4  
**DRIVING WT.:** 140 lb.  
**DATE OF DRILLING:** 12-23-74

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<th>DEPTH FEET</th>
<th>PENETRATION RESISTANCE BLOWS/6 inches</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT</th>
<th>RELATIVE COMPACATION</th>
<th>DIRECT SHEAR STRENGTH PARAMETERS</th>
<th>CLASSIFICATION</th>
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<td>4</td>
<td>67.4</td>
<td>43.5</td>
<td>34° 1.0 KSF</td>
<td>FILL—Silty Clay, brown, moist, firm with roots, sand, gravels, and coral fragments.</td>
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<td>10</td>
<td>18/5.5&quot;</td>
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<td>BASALT—Gray, hard, fractured. Begin NX coring from 4 feet. 20% Recovery from 4 to 8.5 feet. Highly fractured basalt with decomposed rock from 4.2 to 8.5 feet. 40% Recovery from 8.5 to 10.5 feet. Highly fractured basalt. 85% Recovery from 10.5 to 14.5 feet. Hard basalt. Decomposed rock from 14 feet. 100% Recovery from 14.5 to 19.5 feet. Hard basalt from 15.5 feet.</td>
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End boring at 19.5 feet.

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Plate A4
### BORING LOG

**BORING NO. B5**

**SURFACE ELEV.** 50.5±

**DEPTH FEET**

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<th>CORE</th>
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<th>DRY DENSITY</th>
<th>MOISTURE CONTENT</th>
<th>RELATIVE COMPACTION %</th>
<th>DIRECT SHEAR STRENGTH PARAMETERS</th>
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<td>FILL—Silty Clay, brown, moist, firm, with sand, coral fragments and cobbles. Covered by 2&quot; asphaltic concrete and 4&quot; base course.</td>
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<td>30°</td>
<td>0.2 KSF</td>
<td>BASALT—Gray, hard, slightly fractured. Begin NX coring from 5.5 feet. 88% Recovery from 5.5 to 10.5 feet. Slightly fractured basalt with silt from 6 to 7 feet. Hard basalt from 7 feet. 100% Recovery from 10.5 to 14.5 feet. Hard basalt. 100% Recovery from 14.5 to 16.5 feet. Hard basalt. End boring at 16.5 feet.</td>
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**DROP** 30 in.

**DATE OF DRILLING** 12-23-74

**W.O.** 287
### BORING LOG

**BORING NO.** B6  \[ SURFACE ELEV. \( 44^\pm \) \[ DRIVING WT. 140 lb. \[ DROP 30 in. \[ DATE OF DRILLING 12-3-74 \[ W.O. __287__

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<td>95</td>
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<td>100</td>
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</tr>
</tbody>
</table>

- **SHEAR STRENGTH PARAMETERS**
  - \( \phi \)
  - \( c \)

**CLASSIFICATION**

- **Silty CLAY (CH)** - Grayish brown, moist, firm.
- **BASALT** - Gray, hard, slightly fractured.
  - Begin NX coring from 1.3 feet.
  - 90% Recovery from 1.3 to 3.3 feet.
  - Hard basalt, slightly fractured.
  - 96% Recovery from 3.3 to 6 feet.
  - Hard basalt, slightly fractured.
  - 100% Recovery from 6 to 10 feet.
  - Hard basalt, slightly fractured.

End boring at 10 feet.

---

Plate A6
## BORING LOG

**BORING NO.**: B7  
**SURFACE ELEV.**: 30.5 ft  
**DRIVING WT.**: 140 lb  
**DROP**: 30 in  
**DATE OF DRILLING**: 1-8-75  
**W.O.**: 287

### CLASSIFICATION

<table>
<thead>
<tr>
<th>% Sand</th>
<th>% Silt</th>
<th>% Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty GRAVELS (GM)-Brown, loose, river-washed, with cobbles and boulders. Covered by 4&quot; concrete slab and 4&quot; gravel cushion. Begin NX coring from 2.4 feet.</td>
<td>94% Recovery from 2.4 to 4 feet. Boulder from 2.4 to 4.5 feet.</td>
<td>20% Recovery from 4 to 9 feet. 12% Recovery from 9 to 14 feet.</td>
</tr>
<tr>
<td>50% Recovery from 14 to 15 feet. 24% Recovery from 15 to 20 feet.</td>
<td>End boring at 20 feet.</td>
<td></td>
</tr>
</tbody>
</table>

### DIRECT SHEAR STRENGTH PARAMETERS

<table>
<thead>
<tr>
<th>PHIL DEPT</th>
<th>BAG</th>
<th>PENETRATION RESIST. BLOWS/6 inches</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT</th>
<th>RELATIVE COMPACTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
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<tr>
<td>5</td>
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<td>15</td>
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<td>20</td>
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<tr>
<td>30</td>
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</tr>
</tbody>
</table>
**BORING LOG**

**SURFACE ELEV. 31.5\(\pm\)**

<table>
<thead>
<tr>
<th>DEPTH FEET</th>
<th>PENETRATION RESIST BLOWS/6 inches</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT</th>
<th>RELATIVE COMPACTION %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>x</td>
<td>5</td>
<td>37.0</td>
<td>56.4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
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<td>25</td>
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<tr>
<td>30</td>
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</tr>
</tbody>
</table>

**DIRECT SHEAR STRENGTH PARAMETERS**

\[ 36^\circ \quad 0.6 \]

\[ \text{KSF} \]

**CLASSIFICATION**

(\% Sand, \% Silt, \% Clay)

- **Silty CLAY (CH)**—Grayish brown, moist, firm, with cobbles.
  Grading to mottled reddish orange color from 2 feet.

- **Silty GRAVELS (GM)**—Brown, loose, river-washed, with cobbles and boulders.
  Begin NX coring from 5 feet.
  47\% Recovery from 5 to 6.5 feet.
  100\% Recovery from 6.5 to 7 feet.
  79\% Recovery from 8 to 10 feet.
  Boulder from 9 to 10 feet.
  64\% Recovery from 10 to 15 feet.
  Clay pocket from 12 to 13 feet.

**CEMENTED CINDERS AND SILT—Orange-brown, hard.**

End boring at 15 feet.

**DATE OF DRILLING** 1-10-75

**DRIVING WT.** 140 lb.

**W.O.** 287

---

Plate A8
**BORING LOG**

**BORING NO. B9**

<table>
<thead>
<tr>
<th>DEPTH FEET</th>
<th>CORE</th>
<th>BAG</th>
<th>PENETRATION RESIST. 6 inches</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT %</th>
<th>RELATIVE COMPACTION %</th>
<th>DIRECT SHEAR STRENGTH PARAMETERS</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>x</td>
<td>4</td>
<td>69.0</td>
<td>54.3</td>
<td></td>
<td></td>
<td>2353 PSF</td>
<td>Silty CLAY (CH) - Grayish brown, moist, firm with cobbles and boulders. Cobble at 2 feet.</td>
</tr>
<tr>
<td>0 - 5</td>
<td>x</td>
<td>6</td>
<td>73.7</td>
<td>47.8</td>
<td></td>
<td></td>
<td>UNCONFINE</td>
<td>Silty GRAVELS (GM) - Brown, loose, with cobbles and boulders. 1 foot boulder at 5 feet. Begin NX coring from 6 feet. 20% Recovery from 6 to 10 feet. 34% Recovery from 10 to 15 feet. Reddish brown sandy silt pocket from 10 to 12 feet.</td>
</tr>
<tr>
<td>5 - 10</td>
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<td></td>
<td>CEMENTED CINDERS AND SILT - Orange-brown, medium hard. 44% Recovery from 15 to 19.5 feet.</td>
</tr>
<tr>
<td>10 - 15</td>
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<td></td>
<td></td>
<td></td>
<td>Silty GRAVELS (GM) - Orange-brown, loose, with cobbles.</td>
</tr>
<tr>
<td>15 - 20</td>
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<td></td>
<td></td>
<td>End boring at 19.5 feet.</td>
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<tr>
<td>20 - 30</td>
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<td></td>
<td>Plate A9</td>
</tr>
</tbody>
</table>

**SURFACE ELEV. 32.0**

**DRIVING WT. 140 lb.**

**DROP 30 in.**

**DATE OF DRILLING 1-10-75**

**W.O. 287**
## BORING LOG

**BORING NO.** B10

**SURFACE ELEV.** 30.5±

<table>
<thead>
<tr>
<th>DEPTH FEET</th>
<th>CORE</th>
<th>PENETRATION RESIST BLOWS/6 inches</th>
<th>DRY DENSITY</th>
<th>MOISTURE CONTENT</th>
<th>RELATIVE COMPACTION %</th>
<th>DIRECT SHEAR STRENGTH PARAMETERS</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>x</td>
<td>12</td>
<td>75.0</td>
<td>53.3</td>
<td></td>
<td></td>
<td>Silty CLAY (CH)-Dark brown, moist, firm with cobbles. Grading grayish brown color from 3 feet. Cobbles and boulders from 3.5 feet.</td>
</tr>
<tr>
<td>3</td>
<td>x</td>
<td>12</td>
<td>75.0</td>
<td>53.3</td>
<td></td>
<td></td>
<td>Basalt-Gray, hard, fractured. Begin NX coring from 7 feet. 77% Recovery from 7 to 10 feet. Hard basalt, slightly fractured. Clay pocket from 8.9 to 9.2 feet. 46% Recovery from 10 to 13.5 feet. Hard basalt, fractured. Clay pocket from 12.5 to 13.0 feet. End boring at 13.5 feet.</td>
</tr>
</tbody>
</table>

**DROP** 30 in.

**DATE OF DRILLING** 1-15-75

**DRIVING WT.** 140 lb.

**W.O.** 287

**ERNEST K. HIRATA & ASSOCIATES, INC.**

Soils and Foundation Engineering

1236 South King Street • Honolulu, Hawaii 96814 • Phone 531-5733

Plate A10
**CONSOLIDATION TEST REPORT**

Type of Specimen | Undisturbed |
--- | --- |
Diam | 2.40 in. |
Ht | 1.0 in. |

Before Test | After Test
--- | ---
Water Content, \( w_0 \) | 56.4 % | \( w'_f \) 61.4 %
Void Ratio, \( e_0 \) | \( e'_f \) |
Saturation, \( s_0 \) | \( s'_f \) |
Dry Density, \( \gamma_d \) | 67.0 lb/ft³ |

Classification | CH |

Project | Mala Ekena Project |
Area | W. O. 287 |

Remarks | Water added at 350 PSF |

Boring No. | B8 |
Sample No. | |
Depth | 2' |
Date | 1-16-75 |

ERNEST K. HIRATA & ASSOCIATES, INC.
CROSS-SECTION B-B

Scale: Vert. 1" = 10'
    Horiz. 1" = 20'

W. O. 287

Plate 2