KAMLOIKI ELEMENTARY SCHOOL
TWO-STORY CLASSROOM BUILDING
MAUNALUA, OAHU, HAWAII
W.O. 207 - JUNE 29, 1970 Permit #4299

GEOLABS-HAWAII, INC.
1553 COLBURN STREET, SUITE 203
HONOLULU, HAWAII 96817

MUNICIPAL REFERENCE & RECORDS CENTER
City & County of Honolulu
City Hall Annex, 558 S. King Street
Honolulu, Hawaii 96813
TABLE OF CONTENTS

Page

I. INTRODUCTION .............................................. 1
II. SUMMARY OF SOIL CONDITIONS ......................... 1
III. SITE DESCRIPTION ........................................ 3
IV. FIELD EXPLORATION ....................................... 4
V. LABORATORY TESTS .......................................... 4
VI. RECOMMENDATIONS ........................................ 5

APPENDICES

A. DRILL LOGS
B. CONSOLIDATION TEST
C. LABORATORY MAXIMUM DENSITY TEST
D. HYDROMETER ANALYSIS SUMMARY
E. EARTHWORK SPECIFICATIONS

SITE PLAN - FIGURE #1

GEOLABS-HAWAII, Inc.
June 29, 1970
W. O. 207

State of Hawaii
Department of Accounting
& General Services
Division of Public Works
P. O. Box 119
Honolulu, Hawaii 96810

Attention: Mr. Herbert Chang

Subject: Kamiloiki Two-Story Elementary Classroom Building
Maunalua, Oahu, Hawaii

Gentlemen:

Presented in this report are the results and recommendations of a soils investigation completed at the site of the two-
story classroom building for the Kamiloiki Elementary School in the Hawaii-Kai area Oahu, Hawaii. A site plan showing the
field test locations is enclosed as Figure #1. The test boring
location plan was taken from the site plan as prepared by

SUMMARY OF SOIL CONDITIONS

1. The general soil profile in the four (4) holes drilled in
the building area consists of approximately 12 inches of loose,
brown Sandy SILT overlying layers of stiff to very stiff Silty CLAY with some rock fragments.

2. Water was not encountered to the depths drilled in this investigation.

3. The drill holes were stopped at depths shown on the logs due to the occurrence of very dense soil material or rock material that was not possible to penetrate.

4. The results of field and laboratory tests indicate that the on-site soil material is in a very stiff or dense condition and will be ideally suited either as a foundation soil material for the classroom footings or as a base upon which to place controlled, compacted fill material.

5. It is understood from the structural engineer, Mr. Reuben Tyau, that considerable fill material will be placed in the building area. If the soil material is processed and compacted in accordance with the enclosed earthwork specifications and under the supervision of a soils engineer, the foundation soil material will be capable of supporting a total loading (DL+LL) of 2,500 PSF. Differential settlement will be negligible.

6. It is further recommended that the top of the footings for the two-story classroom building be placed at a minimum depth
of -12 inches from finished rough grade.

SITE DESCRIPTION

The area covered by this investigation has been partially cleared due to the construction of temporary buildings in the near vicinity. The easterly or mauka one-third of the building area contains a boulder and rubbish pile that extends up to a height of approximately 10 feet from existing grade. It will be necessary that this area be cleared and the material removed from the site prior to placement of any fill. The remainder of the area was at one time used for agricultural purposes and to the east of the building area is a growth of keawe trees.

In the vicinity of drill hole #5 where the retaining wall is planned, the area is thickly vegetated with trees and grasses and contains boulders and in-place rock material throughout the length of the area investigated. The entire site area slopes gently in a northerly direction with the classroom area being somewhat level.

It is understood that considerable fill material will be placed in the building area to obtain the proper grade for drainage purposes. Providing the earthwork specifications as included in this report are followed, the on-site fill material or borrow...
material as approved by the soils engineer will be capable of
withstanding the anticipated foundation loadings.

FIELD EXPLORATION

Four (4) exploratory holes were drilled in the classroom
building area and one (1) drill hole placed at the site of
the proposed retaining wall. The drill holes were advanced
using a Mobile Minuteman auger drilling rig with 3-inch diameter
flight augers. Undisturbed samples were obtained at representa-
tive depths using a 1.4 inch I.D. standard sample spoon driven
with a 140-lb hammer freely falling 30 inches. In addition to
the samples, as noted above, drive tube samples were also taken
using a 2.8 inch I.D. sample spoon. Also representative bag
samples were obtained during the field exploration for laboratory
testing. The soil material encountered in the drill holes does
not necessarily represent subsurface conditions at other points;
however, sampling procedures are believed to be representative.
The soil material was classified visually in the field and
representative undisturbed and disturbed samples were returned
to the laboratory for a more detailed analyses.

LABORATORY TESTS

Representative samples were analyzed in the laboratory to
determine classification of the material in accordance with the Unified Soil Classification System. Consolidation tests, unit weight, moisture content, hydrometer analysis and laboratory maximum density tests were performed on the soil material derived from the site. One consolidation test was performed on the stiff, brown Silty CLAY material derived from drill hole #4 at a depth of -2 to -2.5 feet. Test results indicate that the soil material at the foregoing depth is slightly expansive when subjected to water in its natural condition. The consolidation test curve indicates that the material is not critical with respect to consolidation and no particular problems are anticipated with this material as a foundation base.

The remainder of the laboratory test results are shown in the appropriate spaces on the drill logs and in the appendices to this report.

RECOMMENDATIONS

1. It is understood that considerable fill material (up to approximately 10 feet) will be placed throughout the classroom building area. Since the on-site soil material is in a stiff to very stiff condition, no problems are anticipated with regard to stability of on-site soil material.
2. Prior to placement of fill in the area, all existing boulders and trash shall be removed from the site.

3. The upper 12 inches of soil material is in a loose condition and shall be watered and compacted in accordance with the enclosed earthwork specifications.

4. Fill material placed in the building area may consist of on-site soils or borrow material approved by the soils engineer. Also, fill material in the building area should be placed in accordance with the enclosed earthwork specifications and under the supervision of a soils engineer.

5. If the foregoing recommendations are followed, the bottom of the footings may be placed at any convenient depth as determined by the structural engineer in the engineered fill material. The foundation soil material will be capable of supporting a total loading (DL+LL) of 2,500 PSF without significant differential settlement due to shrinkage.

6. It is further recommended that the top of the footings be placed at a minimum depth of -12 inches from finished rough grade.

7. The fill material should encompass a sufficient area such that the footings for the classroom buildings are not closer than 10 feet from any fill slope line.
8. Since the on-site material is slightly expansive when compacted, confined and subjected to water, it is recommended that the upper 12 inches of soil material beneath all concrete slabs-on-grade consist of a clean, manufactured gravel. The gravel should also be compacted per the earthwork specifications.

9. The foundation material for the retaining wall proposed along a portion of the eastern boundary of the site will consist of in-place volcanic tuff, basalt and/or basalt boulders. No problems are anticipated with the foundation for the retaining wall providing the bottom of the footing is placed at the depth of the rock material which appears to be approximately 3 feet from existing grade. Refusal was encountered in drill hole #5 and off-set holes were placed to check the refusal depth. Refusal was encountered at a depth of approximately -3 feet from existing grade.

10. It is not known at this time what type of soil material will be backfilled around the retaining wall; however, the following equivalent fluid weights will apply:

Soil Material = Compacted on-site silty clay
Active case = 59 PCF
Passive case = 245 PCF
Imported Gravel Material

Active case = 24 PCF
Passive case = 820 PCF

Should other soil material be proposed for the backfill at the retaining wall location, this office will supply additional equivalent fluid weights upon request.

11. It is further recommended that prior to the placement of concrete in the footings for the classroom building and in the footing for the retaining wall that the soil material be inspected by a soils engineer to verify the assumptions as stated in this report.

This opportunity to be of service is appreciated.

Very truly yours,

GEOLABS-HAWAII, INC.

Stanley N. Mitchell, P. E.

Ronald A. Pickering
Vice President

GEOLABS-HAWAII, Inc.
APPENDIX A

UNIFIED SOIL CLASSIFICATION SYSTEM

1. DRILL LOGS
# Unified Soil Classification System

## Major Divisions

<table>
<thead>
<tr>
<th>Group Symbols</th>
<th>Typical Names</th>
<th>Material Description</th>
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<tbody>
<tr>
<td>SV</td>
<td>Clean Gravels (Little or no fines)</td>
<td>Well graded gravels, gravel-sand mixtures, little or no fines</td>
</tr>
<tr>
<td>GP</td>
<td>Gravels with Fines (Approximate or fine)</td>
<td>Poorly graded gravels, gravel-sand mixtures, little or no fines</td>
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<tr>
<td>GM</td>
<td>Silty Gravels, gravel-sand-silt mixtures</td>
<td>Clayey gravels, gravel-sand-clay mixtures</td>
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<td>SC</td>
<td>Clean Sands (Little or no fines)</td>
<td>Well graded sands, gravelly sands, little or no fines</td>
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<td>SP</td>
<td>Sands with Fines (Approachable or fine)</td>
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<tr>
<td>SM</td>
<td>Silty Sands, sand-silt mixtures</td>
<td>Clayey sands, sand-clay mixtures</td>
</tr>
<tr>
<td>ML</td>
<td>Inorganic silts &amp; very fine sands, near liquid limit</td>
<td>Silty or clayey fine sands, clayey silts with slight plasticity</td>
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<tr>
<td>CL</td>
<td>Inorganic clays of low to medium plasticity</td>
<td>Gravelly clays, silt clays, lean clays</td>
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<td>OL</td>
<td>Organic silts &amp; organic silt clays of low plasticity</td>
<td>Silty clays, lean clays</td>
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<td>MH</td>
<td>Inorganic silts, mesoicous and diatomicous fine sands, silt soils</td>
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<td>CH</td>
<td>Inorganic clay of high plasticity, very fine clays</td>
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<td>P1</td>
<td>Peat and other highly organic soils</td>
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## Particle Size Limits

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<th>Sand</th>
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## U.S. Standard Sieve Size

**Geolabs-Hawaii, Inc.**

1553 Colburn St., Honolulu, H.I. Tel. 815-064
# Subsurface Exploration & Penetration Log

**Work Order No:** 207  
**Ground Elevation:** E.G.*  
**Hole Number:** 1  
**Project:** Kamiloiki Elementary  
**Location:** See Figure No. 1  
**Total Depth of Hole:** 15  
**Elevation of Water table:** N/E  
**Date:** 5-26-70  
**Weight of Hammer:** 140-lb  
**Height of Drop:** 30"  
**Hole Logged By:** L. Larson  
**Foreman:**  
**Date Begun:** 6-26-70  
**Date Finished:** 6-26-70

<table>
<thead>
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<th>Notes</th>
<th>Depth (Ft.)</th>
<th>No Blows</th>
<th>% Moisture</th>
<th>Samples</th>
<th>Depth (Ft.)</th>
<th>Description</th>
<th>Unified Soil Classification</th>
<th>Log</th>
<th>Unit Wt. Lbs/ft³ (Meq)</th>
<th>Phi Value</th>
<th>Liquid Limit</th>
<th>Plastic Index</th>
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<td></td>
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<td>Loose, dry, brown Clayey</td>
<td>SILT. (ML)</td>
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<td>Very stiff, brown Silty CLAY</td>
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*E.G. = Existing Grade  
**N/E = Not Encountered*
## Subsurface Exploration & Penetration Log

**Work Order No.:** 207  
**Ground Elevation E.G.:**  
**Hole Number:** 2  
**Project:** Kamiloiki Elementary  
**Location:** See Figure No. 1  
**Total Depth of Hole:** 8'  
**Elevation of Water Table:** N/E  
**Weight of Hammer:**  
**Height of Drop:**  
**W L. Gaged:**  
**Date Begun:** 6-23-70  
**Date Finished:** 6-23-70

### Notes

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<th>Depth (Ft.)</th>
<th>No Blows</th>
<th>% Moisture</th>
<th>Samples</th>
<th>Description</th>
<th>Unified Soil Classification</th>
<th>Depth (Ft.)</th>
<th>Log</th>
<th>Unit Wt/Lbs/ft³ (Wet)</th>
<th>Phi O Value</th>
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<td>Very stiff, brown Silty CLAY. (CL-ML)</td>
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<td>Very stiff to hard Silty CLAY with decomposed rock fragments. (CL)</td>
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<td>Stiff, light brown Clayey SILT. (ML)</td>
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<td>Dense, black Silty SAND (SM)</td>
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**E.G. = Existing Grade**  
**N/E = Not Encountered**
**GEOLABS, INC.**

**SUBSURFACE EXPLORATION & PENETRATION LOG**

- **Project:** kamiloiki Elementary
- **Location:** See Figure No. 1
- **Total Depth of Hole:** 15'
- **Weight of Hammer:**
- **Height of Drop:**
- **Date Begun:** 6-23-70
- **Date Finished:** 6-23-70
- **Hole Logged By:** S. Mitchell

<table>
<thead>
<tr>
<th>Notes</th>
<th>Depth (Ft)</th>
<th>No Blows</th>
<th>% Moisture</th>
<th>Samples</th>
<th>Description</th>
<th>Unified Soil Classification</th>
<th>Depth (Ft)</th>
<th>Log</th>
<th>Unit Wt.</th>
<th>Lbs./Ft.</th>
<th>Phi</th>
<th>Value</th>
<th>Liquid Limit</th>
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<td>Some fine gravel</td>
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<td>Dense, black Silty SAND</td>
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<td>Bottom of hole 15.0 feet</td>
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**Notes:**
- *E.G.* = Existing Grade
- **N/E** = Not Encountered
**GEOLABS, INC.**

**SUBL/SURFACE EXPLORATION & PENETRATION LOG**

Work Order No. 207  Ground Elevation E.G.*  Hole Number 4
Project Kamiloiki Elementary  Location See Figure No. 1
Total Depth of Hole 17'  Elevation of Watertable N/E**  Date W.L. Gaged
Weight of Hammer  Height of Drop Date Begun 6-17-70
Hole Logged By L. Larson Foreman Date Finished 6-17-70

<table>
<thead>
<tr>
<th>Notes</th>
<th>Depth (Ft.)</th>
<th>No. Blows</th>
<th>% Moisture Samples</th>
<th>Description Unified Soil Classification</th>
<th>Depth (Ft.)</th>
<th>Log</th>
<th>Unit Wt Lbs./Ft.3 (Wet)</th>
<th>Phi O</th>
<th>Liquid Limit</th>
<th>Plastic Index</th>
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<tr>
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<td>4-1</td>
<td>Loose, brown Sandy SILT (ML)</td>
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<td>Stiff, brown Silty CLAY. (CL-ML)</td>
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<td>Very stiff Silty CLAY. (CL-ML)</td>
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<td>Hard, red-brown Silty CLAY. (CL)</td>
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<td>Alternating layers of stiff Clayey SILT and medium dense Silty SAND. (ML-SM)</td>
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<td>Dense, black Silty SAND. (SM)</td>
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<td>12 19 4-4</td>
<td>10</td>
<td>Bottom of hole 17.0 feet</td>
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* E.G. = Existing Grade
** N/E = Not Encountered

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**GEO-24**
# Subsurface Exploration & Penetration Log

**Work Order No.** 207  
**Project** Yamiloiki Elementary  
**Location** See Figure No. 1  
**Ground Elevation** E.G.*  
**Hole Number** 5  
**Elevation of Water Table** N/E  
**Date W.L. Gaged** Date Begun 6-26-70  
**Height of Drop** Date Finished 6-26-70

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<th>Depth (Ft.)</th>
<th>No Blows</th>
<th>% Moisture</th>
<th>Samples</th>
<th>Description</th>
<th>Unified Soil Classification</th>
<th>Depth (Ft.)</th>
<th>Log</th>
<th>Unit Wt. Lbs/Ft.3 (v/e)</th>
<th>Phi Value</th>
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<td>Loose Clayey SILT (ML)</td>
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<td>Medium dense Clayey SILT with boulders. (ML)</td>
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<td>BASALT ROCK offset hole 10' in each direction. No penetration</td>
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*E.G. = Existing Grade  
**N/E = Not Encountered
APPENDIX B

CONSOLIDATION TEST
CONSOLIDATION TEST

JOB No. 207
DIH/TP No. A
SAMPLE DEPTH 218'
SOIL TYPE CL-ML
CONDITION UNDISTURBED
DRY UNIT WT 86.9 PCF
MOISTURE
BEFORE TEST 21.8%
AFTER TEST 42.2%

LIQUID LIMIT
PLASTIC LIMIT
PLASTIC INDEX

NORMAL PRESSURE - P.S.F.

GEOLABS - HAWAII, INC.
APPENDIX C
LABORATORY MAXIMUM DENSITY TEST
Maximum Density Curve

MAX. DRY. UNIT WEIGHT = 93.0 PCF

W_c = 28.5%

UNIT WEIGHT (PCF)

MOISTURE CONTENT (%) AASHO-T-180-57

SAMPLE LOCATION: DH #4
SAMPLE DEPTH: 1.5'
SOIL CLASS: CL

W.O. NO. 207
CLIENT: STATE OF HAWAII
DATE: 6-30-70
APPENDIX D

HYDROMETER ANALYSIS SUMMARY
HYDROMETER ANALYSIS SUMMARY

DRILL HOLE NO. 4
DEPTH -2.5 feet
% SAND 24
% SILT 25
% CLAY 51
SOIL CLASSIFICATION CL-ML
APPENDIX E

EARTHWORK SPECIFICATIONS
The work under this section includes:

1. Clearing and grubbing of site
2. Preparation of natural ground
3. Preparation of fill areas
4. Placement and control of fill operations
5. Compaction equipment
6. Removal and backfill of underground structures
7. Supervision of earthwork
8. Seasonal requirements

1. Clearing

All areas within contract limit lines shall be cleared of trash, debris and organic matter, and such material shall be burned and removed from the site.

2. Preparation of Natural Ground

In areas where the bottom of footings are designed on or below existing natural ground, the soils shall be scarified to a depth as determined by the soils engineer until the material is free of all uneven features and shall be precompacted as outlined in the following Section #4b.
3. Preparation of Fill Areas

All areas upon which fill is to be placed after clearing, as outlined in Section #1 of these specifications, shall be scarified until free of uneven features to a depth as determined by the soils engineer, and watered and compacted according to Section #4 of these specifications.

4. Placement of Fill

a. Material for fill shall consist of on-site soils. Fill material shall be free of all organic matter and other deleterious material, and shall not contain rocks or lumps in excess of four inches (4") in diameter.

b. Compaction of Fill

After the base for the fill has been prepared as described above, it shall be brought to the proper moisture content and compacted to not less than 90% of maximum density in accordance with the modified AASHO T-180-57.

c. Depth of Fill

Fill shall be placed in horizontal layers which,
when compacted, will not exceed six inches (6").

5. Compaction Equipment

The soils engineer shall determine the type of compacting equipment which will attain the specified results in the most efficient manner. Sheepfoot, vibratory, or pneumatic tire rollers may be used in the test section and the equipment which produces the specified results in the most expedient manner as determined by the soils engineer shall be employed by the contractor. The equipment used in rolling shall be in good working condition, fully ballasted, and self cleaning. Fill material placed in an unsatisfactory condition and not within the enclosed specifications shall be rejected by the soils engineer and the contractor shall rework the fill placed such that the specifications are followed.

6. Removal and Backfill of Underground Structures

Any underground structures such as cesspools, cisterns, septic tanks, wells, pipe lines, etc. shall be removed under the direction of the soils engineer. Backfill of the excavation shall be in accordance with these specifications.
7. Supervision of Earthwork

Field density tests shall be made by the soils engineer during the earthwork operation such that he may certify that the fill was placed according to accepted specifications. In the event that field density tests of a layer or any portion thereof is less than the required density, the particular layer or portion shall be reworked until the required density is obtained.

8. Seasonal Requirements

No fill shall be placed during unfavorable weather conditions as determined by the soils engineer. After interruption of work due to heavy rain, the soils engineer shall approve previously placed fill before resumption of earth-moving operations.
SITE PLAN

FIGURE #1

GEOLABS·HAWAII, Inc.