COMPACTION REPORT

KALAMA VALLEY SUBDIVISION

PHASE I - LOTS 43 TO 52

HAWAII KAI, OAHU, HAWAII

W.O. 423-20 JUNE 24, 1981

FOR

KALAMA ASSOCIATES, INC.

GEOLABS-HAWAII
2006 KALIHI STREET
HONOLULU, HAWAII 96819

CW ASSOCIATES, INC. dba
GEOLABS-HAWAII
Geology Soils and Foundation Engineering
2006 Kalihi Street • Honolulu, Hawaii 96819 • (808) 841-5064

June 24, 1981
W.O. 423-20

Gray, Hong & Associates, Inc.
116 South King Street
Suite 508
Honolulu, Hawaii 96813

Attention: Mr. Roy Aoki

Subject: Compaction Report
Kalama Valley Subdivision
Phase I - Lots 43 to 52
Hawaii Kai, Oahu, Hawaii

Reference: "Additional Soil Investigation - Lots 43 to 52
Kalama Valley Subdivision - Phase I
Hawaii Kai, Oahu, Hawaii" by
Geolabs-Hawaii, dated October 1980

Gentlemen:

From November 11, 1980 to January 30, 1981, the earthwork and grading operations at the above referenced project were observed by our firm. This report summarizes our field observations and compaction test results.

The mauka (eastern) cut slope along the rear of these lots were originally designed at a very steep slope ratio of ¼:1 (H:V). This very steep slope ratio is only suitable for cuts in hard, unweathered basalt formation. During construction, the exposed soil materials on these cut slopes were substantially less competent than the anticipated rock formation.

The initial upper part of the slope cut was made at ¼:1 to ½:1 (H:V) slope ratios. The cut slope was stopped after about 6 feet, when it was evident that the unweathered basalt rock formation would not be encountered close to the existing ground surface. The material exposed was a tuffaceous boulder material, moderately cemented. Therefore, a 5-foot bench was constructed and the remainder of the slope was cut at 1¼:1 slope ratio. Subsequent inspection of the slope face disclosed that drying of the exposed slope face had caused weakening of the soil and surface sloughing. It was also noted that the cementation of the deposit decreased substantially at the lower portion of the cut.

Subsequently, additional test pits excavated into the cut slope face encountered 'Adobe' clay layers with slickensided zones in some portions of the slope, which indicate the potential for substantial slope movement.

Our additional field exploration disclosed that the thick 'Adobe' clay was concentrated in Lots 48, 49 and 50. The 'Adobe' clay over the other lots, was very thin. Therefore, the recommended stabilization of these lots consisted of the following procedure:

1. Removal of the 'Adobe' clay up to the interceptor ditch.
2. Installation of a chimney drain in the rear portion of the 'Adobe' clay excavation; connected to a subdrain

system to intercept subsurface seepage.

3. Reconstruction of the fill at a 2:1 (H:V) slope ratio.

During the subsequent site stabilization work, the 'Adobe' clay was removed from the lots and stockpiled near the Phase II area. The 'Adobe' overexcavation at Lots 48, 49 and 50 extended about 8 to 10 feet into the existing cut slope and, it appeared that the removal of the surface 'Adobe' extended down to the stiff boulder colluvium encountered below.

The chimney gravel drain was installed in Lots 48, 49 and 50 and subdrains were placed at about 20-foot intervals along Lots 45 to 52. On-site excavated weathered rock material and select imported material from Kamehame Ridge Unit I Subdivision, were used to reconstruct the 2:1 (H:V) fill slope. Due to the limited space for equipment near the top of the slope, along Lots 45 through 47, the top 5 to 8 feet of the 2:1 (H:V) fill was eliminated. A bench was created at this level to catch loose material and divert water away from the slope face.

During the fill placement operations, periodic field density tests were done in accordance with the American Society for Testing and Materials (ASTM) Test Designation D-1556 (Sand

Cone Method). The compaction test results for the in-place fills are presented in the attached, "Summary of Density Tests - Control of Compacted Fill".

During the grading period, on-site and borrow soils were tested prior to being used in the field. The maximum dry densities and optimum moisture contents were established in our laboratory in accordance with ASTM Test Designation D-1557 (modified Proctor) and the test results are as follows:

Soil Type	Maximum Dry Density (p.c.f.)	Optimum Moisture Content (%)
Brown Gravelly Silt and Cobbles (excavated rock)	108.0	20.0
Gray Brown Sandy Silt with Gravel (borrow from Kamehame Ridge)	110.0	16.0

Boulder Protection

These hillside lots may be subject to boulders rolling down the hillside. This is an inherent risk for all hillside lots in any development.

The following recommendations have been presented previously to minimize the danger from boulders rolling down the hillsides:

1. Boulder sweeps along the upper boundaries of the site could be performed. However, the extent of the boulder sweep will be limited due to the steep terrain and difficult access into the areas beyond the project site.

2. The natural trees and vegetation along the upper portions of the site should be retained to act as a natural barrier against the boulders and to reduce erosion.

3. A boulder catchment area, about 10 to 15 feet wide, with a fence or wall could be utilized near the property boundary to catch rolling boulders. The concrete interceptor ditch along the upper boundaries of the site could be used in this capacity.

4. Where practicable, the houses should be set-back away from the toe of the hillside slope to create an additional boulder catchment area.

Due to the extensive hillside area beyond the project limits, the practicality of Item No. 1 was very limited and, therefore, not utilized. Item No. 4, also, was not practicable. Items 2 and 3 were utilized instead.

Limitations

It must be pointed out that an inherent risk of falling boulders could still exist for these hillside lots.

The state of the art of soil engineering practice has not advanced to a point that a solution is available for this area. It is our opinion that, no matter what one does, there is always the risk of boulders rolling down the hill, if not from areas near the house, it will come from areas high up on the slope. Whatever measure is chosen, it only reduces the risk. It should be pointed out that no guarantee against future falling boulders can be made due to changes in soil and rock conditions with time, weathering, erosion, earthquake and construction vibration and, improvements and construction activities at and around the site.

The owners of these hillside lots should be made aware of these limitations and cautioned against future improvements in the upper areas of the lots which may disturb the stability of the existing boulders.

RECOMMENDATIONS

House Foundations

In the level areas, the house footings should be embedded a minimum of 12 inches below the outside finish grade. Retaining wall footing embeddment, should be a minimum of 24 inches below finish grade. On sloping areas, the pier footings should be deepened an additional amount to provide a minimum 6-foot horizontal set-back distance between the outer edge

of the footing and the slope face, or a minimum of 3-foot embeddment.

Surface water should be diverted away from the house foundations. A concrete drainage swale and cut-off wall is recommended behind the house units to intercept run-off from the slope face and divert it into suitable drainage outlets around the perimeter of the units.

Site Grading

Subsequent to completion of lot grading, utility trenches within the lot pad should be properly backfilled and compacted under the observations of a soils technician.

This office assumes no responsibility for any alterations made to slopes or pads on the subject lots subsequent to the issuance of this report without our knowledge and written approval.

Should you have any questions concerning the above contents, please feel free to contact us.

Respectfully submitted,

C.W. ASSOCIATES, INC.
dba GEOLABS-HAWAII

By Bob Y.K. Wong
Bob Y.K. Wong, P.E.
President

BYKW:CSM:jp (3 copies submitted to Addressee)
(1 copy submitted to Kalama Assoc., Inc.)
Enclosure: Summary of Density Tests - Control of Compacted Fill

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL			W.O. NO. 423-20 PAGE 1 OF 2			OWNER KALAMA ASSOCIATES, INC. JOB KALAMA VALLEY SUBD. PHASE I			
TEST NO.	DATE	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
1	11-24-80	LOT 50	130.0	90.0	108.0	25.0	104.5	96.7	PASS
2	12-4-80	" 47	135.0	"	"	25.0	103.8	96.1	"
3	12-4-80	" 51	137.0	"	"	28.0	105.9	98.0	"
3A	12-12-80	" 46	130.0	"	110.0	14.0	105.1	95.5	"
3B	12-17-80	" 49	132.0	"	"	10.4	104.9	95.4	"
3C	12-17-80	" 51	133.5	"	"	12.2	107.8	98.0	"
4	12-19-80	" 50	145.0±	"	"	14.2	105.4	95.8	"
5	12-19-80	" 47	150.0±	"	"	15.1	107.2	97.5	"
6	1-7-81	" 46	136.0	"	"	17.8	108.1	98.2	"
7	1-7-81	" 50	147.0	"	"	19.7	101.4	92.2	"
8	1-15-81	" 52	149.0	"	"	19.3	104.0	94.5	"
9	1-15-81	" 49	149.0	"	"	20.4	105.7	96.1	"
10	1-16-81	" 51	148.0	"	"	16.2	102.5	93.2	"
11	1-16-81	" 49	147.0	"	"	15.4	104.1	94.6	"
12	1-16-81	" 47	152.0	"	"	14.2	107.4	97.6	"
13	1-19-81	" 51	155.0	"	"	17.2	104.2	94.7	"
14	1-19-81	" 49	151.0	"	"	14.5	106.9	97.2	"
15	1-20-81	" 46	150.0	"	"	13.4	105.4	95.8	"
16	1-20-81	" 48	155.0	"	"	16.6	103.2	93.8	"
17	1-20-81	" 52	152.0	"	"	15.8	107.6	97.8	"
18	1-21-81	" 50	152.0	"	"	10.1	103.5	94.1	"
19	1-21-81	" 51	150.0	"	"	9.4	104.6	95.1	"
20	1-21-81	" 45	153.0	"	"	11.3	104.1	94.6	"

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL	W.O. NO. 423-20	OWNER KALAMA ASSOCIATES, INC.
	PAGE 2 OF 2	JOB KALAMA VALLEY SUBD. PHASE I

TEST NO.	DATE	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
21	1-22-81	LOT 45	156.0	90.0	110.0	7.8	103.4	94.0	PASS
22	1-27-81	" 47	156.0	"	"	9.7	108.3	98.5	"
23	1-27-81	" 52	155.0	"	"	9.2	109.9	93.2	"
24	1-27-81	" 46	156.0	"	"	7.6	102.7	93.4	"
25	1-21-81	" 51	156.0	"	"	7.8	107.5	97.7	"
26	1-21-81	" 45	156.0	"	"	9.2	106.2	96.5	"
27	1-29-81	" 50	155.0	"	"	10.2	107.2	97.5	"
28	1-29-81	" 48	155.0	"	"	9.4	109.4	99.4	"
29	1-29-81	" 45	159.0	"	"	10.9	108.9	99.0	"
30	1-30-81	" 49	156.0	"	"	10.2	108.2	98.4	"
31	1-30-81	" 47	157.0	"	"	12.4	106.9	97.2	"
32	1-30-81	" 45	158.0	"	"	11.9	101.8	92.5	"

PW-DE-40
REV. 4/77

CITY AND COUNTY OF HONOLULU
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING

DATE APR 18 1983 19____

FROM: [signature]

TO:

Date		Date	
____	☐ Chief	4-20	☑ 2 Chief Construction Engineer
4/20	☑ 1 Assistant Chief	____	☐ 3 District Constr. Engr. – East
____	☐ Chief Administrative Engr.	____	☐ District Constr. Engr. – West
____	☐ Chief Control Engineer	____	☐ Service Engineer
____	☐ Chief Drainage Engineer	____	☐ Field Survey
____	☐ Chief Highway Engineer	____	☐ Testing Lab
____	☐ Chief Structural Engineer	____	☑ 4 Secretary
____	☐ _____	____	☐ _____

FOR:

☐ Appropriate Attention and Action	☐ Arrange Meeting
☐ Draft Reply	☐ Signature
☐ Comments & Recommendations	☐ Information
☐ See Me	☑ 4 File
☐ Work Order	☐ _____

LOG. NO. _____ SUSPENSE _____

[signature]

3-9-10-30

LETTER OF TRANSMITTAL

GRAY, HONG & ASSOCIATES, INC.

CONSULTING ENGINEERS
CIVIL / STRUCTURAL / SANITARY
116 SOUTH KING ST., RM. 508
HONOLULU, HAWAII 96813
TELEPHONE: 521-0306

GP

95 35

TO Division of Engineering
C & C of Honolulu
Municipal Building

DATE April 19, 1983

ATTENTION Construction Branch

SUBJECT: Kalama Valley Subd. Unit 6B-1
Grading Permit

Gentlemen:

We are sending you ☑ attached ☐ under separate cover the following items:

No. Copies	Date	Sheet No.	Description
1			Final compaction report for subject project
1 set			Surveyor's certification for lot pad grades

Action requested:

☐ For review and comment ☐ As requested

☐ For approval ☑ For your use

Remarks Soil compaction report and surveyor's certification sent to you to close out the grading permit.

Very truly yours,

Signed Roy Aoki

Job No. 466-5

Received:

TELEPHONE (808) 538-3857

TOWILL, SHIGEOKA & ASSOCIATES, INC.

LAND SURVEYORS
850 RICHARDS STREET, SUITE 302
HONOLULU, HAWAII 96813

April 4, 1983

Date Received APR 4 1983
File: 466-5
To: RA
Action: cc: Kalama Associates ✓

Mr. Roy Aoki
Gray, Hong & Associates, Inc.
119 Merchant Street, Suite 607
Honolulu, Hawaii 96813

Dear Mr. Aoki:

Subject: Grading Certification
Kalama Valley Subdivision, Unit 6B-1

We have completed final grade checks for Lots 1 to 28 and 52 to 57, all inclusive (File Plan 1772) and concur that all of the said Lots complies substantially with the contour Grading Plan Sheets 1 and 2 and as shown on our plans dated October 27, 1982 and November 29, 1982.

Sincerely yours,

TOWILL, SHIGEOKA & ASSOCIATES, INC.

Lester T. Shimabukuro

Lester T. Shimabukuro
Vice President

1017

TELEPHONE (808) 538-3857

TOWILL, SHIGEOKA & ASSOCIATES, INC.

LAND SURVEYORS
850 RICHARDS STREET, SUITE 302
HONOLULU, HAWAII 96813

Date Received JAN 31 1983 JAN 3

File: 466-5

To: cc: Kalama Assoc. Ltd. ✓

Action:

January 31, 1983

Mr. Roy Aoki
Gray, Hong & Associates, Inc.
116 South King Street, Room 508
Honolulu, Hawaii 96813

Dear Mr. Aoki:

Subject: Grading Certification
Kalama Valley Subdivision, Portion Unit 6B-1

We have completed grade checks for Lots 29 to 51 inclusive (former Lot Number 156 to 178) and we concur that the grading substantially complies with the Grading Plan 1 and 2 as shown on our plan dated October 27 and November 29, 1982.

We are also returning the original tracing, Grading Plan 1 and 2.

Sincerely yours,

TOWILL, SHIGEOKA& ASSOCIATES,INC.

Haruo Shigeoka

Haruo Shigeoka
President

Encl.
1017