

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(22)	2003	8	72

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B17 (STA 196+00) DRIVING WT. 140 lb. DATE OF DRILLING 5/29/96
SURFACE ELEV. 592.5± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, moist, medium dense.
5			6/6" 10/6"	93	27	Silty CLAY (CL-ML) - Reddish brown, moist, medium stiff, with cobbles, gravel, and sand. Boulder at 4 to 5 feet. Begin NX coring at 5 feet. 58% recovery from 5 to 9 feet. Cobbles from 5 to 6 feet. Cobbles from 7.5 to 8.5 feet. End NX coring at 9 feet. Cobbles from 9 to 11 feet.
10						Silty CLAY (CL-ML) - Brown, moist, medium stiff.
15			19	80	31	End boring at 14.5 feet.

Plate B17

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B18 (STA 205+50) DRIVING WT. 140 lb. DATE OF DRILLING 5/29/96
SURFACE ELEV. 641± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Reddish brown, slightly moist, stiff, with cobbles, gravel, and sand. Boulder at 0.5 to 2 feet.
5			70/10"	105	11	Cobbles from 3 to 4.5 feet.
10						SLIGHTLY WEATHERED BASALT (WS) - Gray, hard. Begin NX coring at 5 feet. 94% Recovery from 5 to 10 feet. RQD = 80%
						End boring at 10 feet.

Plate B18

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B19 (STA 239+75) DRIVING WT. 140 lb. DATE OF DRILLING 5/23/96
SURFACE ELEV. 815± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0			4/6" 15/No	Tip Recovery		Silty CLAY (CL-ML) - Brown, moist, medium stiff, with cobbles. Cobbles from 2 to 3 feet.
5			16	95	30	
			15	86	37	
10			17	82	22	COMPLETELY WEATHERED BASALT (WC) - Mottled brown, moist, medium dense.
15			15/No	Penetration		SLIGHTLY WEATHERED BASALT (WS) - Gray, hard, vesicular. Begin NX coring at 13 feet. 100% Recovery from 13 to 18 feet. RQD = 80%
20						End boring at 18 feet.

Plate B19

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B20 (STA 240+25) DRIVING WT. 140 lb. DATE OF DRILLING 5/22/99
SURFACE ELEV. 811± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Dark brown, moist, medium stiff.
5			19	99	27	Cobble at 2 feet. Firm at 3 feet.
10			7	90	30	
			13	95	31	
15			10/No	Penetration		SLIGHTLY WEATHERED BASALT (WS) - Gray, hard, fractured. Begin NX coring at 10 feet. 100% Recovery from 10 to 15 feet. RQD = 50% Vesicular from 11.5 feet.
20						100% Recovery from 15 to 20 feet. RQD = 84%
						End boring at 20 feet.

Plate B20

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B21 (STA 255+20) DRIVING WT. 140 lb. DATE OF DRILLING 5/29/99
SURFACE ELEV. 870± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Brown, moist, medium stiff, with gravel. Covered by 3 inches of asphaltic concrete.
5			13	84	28	
			21	97	24	COMPLETELY TO HIGHLY WEATHERED BASALT (WC-WH) - Mottled grayish brown, moist, dense.
10			28	88	38	
15			63	93	25	End boring at 14 feet.

Plate B21

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B22 (STA 270+00) DRIVING WT. 140 lb. DATE OF DRILLING 5/28/96
SURFACE ELEV. 951± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						COMPLETELY WEATHERED BASALT (WC) - Mottled brown, moist, medium dense. Covered by 2.5 inches of asphaltic concrete.
5			13	75	39	
			20	76	42	
10			50/6"	86	20	HIGHLY WEATHERED BASALT (WH) - Grayish brown, moist, dense.
15			82/7"	Tip Recovery		MODERATELY WEATHERED BASALT (WM) - Mottled gray, dense to medium hard.
						End boring at 15 feet.

Plate B22

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B23 (STA 284+10) DRIVING WT. 140 lb. DATE OF DRILLING 5/28/96
SURFACE ELEV. 1022± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Grayish brown, moist, medium stiff, with gravel. Brown color from 1 foot.
5			12	89	31	
			20	80	30	
10			21	73	46	COMPLETELY TO HIGHLY WEATHERED BASALT (WC-WH) - Mottled yellowish brown, moist, medium dense.
15			50/2"	No Recovery		MODERATELY WEATHERED BASALT (WM) - Gray, medium hard.
						End boring at 14 feet.

Plate B23

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG

W.O. 95-2687

BORING NO. B24 (STA 65+40) DRIVING WT. 140 lb. DATE OF DRILLING 5/30/96
SURFACE ELEV. 146± DROP 30 in. WATER LEVEL None

DEPTH	G R A P H	S A M P L E	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Reddish brown, slightly moist, medium stiff.
5			24	70	21	COMPLETELY WEATHERED BASALT (WC) - Grayish brown, moist, dense.
10						MODERATELY TO SLIGHTLY WEATHERED BASALT (WM-WS) - Gray, hard, vesicular. Begin NX coring at 5 feet. 98% Recovery from 5 to 10 feet. RQD = 82%
						End boring at 10 feet.

Plate B24

ORIGINAL PLAN	DATE
NOTE BOOK	
DESIGNED BY	
CHECKED BY	
NO.	

194-56 (B-18-3.dwg ESH-1 Plot: 11/21/2002 AMR



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.

LICENSE EXPIRATION DATE: 4/30/04

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

HALEAKALA HIGHWAY WIDENING, PHASE I
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(22)

SCALE: AS NOTED DATE: NOV., 2002

SHEET No. 3 OF 5 SHEETS

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(22)	2003	9	72

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG W.O. 95-2687
BORING NO. B25 (STA 78+00) DRIVING WT. 140 lb. DATE OF DRILLING 5/30/96
SURFACE ELEV. 170± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Reddish brown, moist, stiff.
5			51	87	18	
10			10/No Penetration			HIGHLY WEATHERED BASALT (WH) - Mottled grayish brown, moist, dense to medium hard.
15			15/4" 10/No Penetration	80	15	
20						MODERATELY WEATHERED BASALT (WM) - Gray, medium hard.
25						Dense to medium hard from 12 feet.
30						End boring at 15 feet.

Plate B25

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG W.O. 95-2687
BORING NO. B29 (STA 227+90) DRIVING WT. 140 lb. DATE OF DRILLING 5/29/96
SURFACE ELEV. 754± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Reddish brown, slightly moist, dense.
5			29/6" 35/1"	97	23	HIGHLY WEATHERED BASALT (WH) - Mottled grayish brown, moist, dense.
10			50/5"	Tip Recovery		MODERATELY WEATHERED BASALT (WM) - Mottled gray, dense to medium hard.
15			50/3"	No Recovery		End boring at 9 feet.

Plate B29

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG W.O. 95-2687
BORING NO. B26 (STA 118+60) DRIVING WT. 140 lb. DATE OF DRILLING 5/30/99
SURFACE ELEV. 302± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, slightly moist, dense.
5			40/4"	Tip Recovery		Silty CLAY (CL-ML) - Grayish brown, slightly moist, stiff, with cobbles and gravel. Cobble at 1 foot. Cobble at 3 feet.
10			50/5"	No Recovery		MODERATELY WEATHERED BASALT (WM) - Gray, medium hard, highly vesicular.
15			50/2"	Tip Recovery		
20			10/No Penetration			End boring at 15 feet.

Plate B26

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG W.O. 95-2687
BORING NO. B30 (STA 126+25) DRIVING WT. 140 lb. DATE OF DRILLING 8/25/99
SURFACE ELEV. 333± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Reddish brown, moist, stiff, with sand and gravel.
5			42	91	26	
10			45	90	28	
15			43	86	34	HIGHLY WEATHERED BASALT (WH) - Mottled grayish brown, moist, dense.
20			19/2" 10/No Penetration	No Recovery		MODERATELY WEATHERED BASALT (WM) - Gray, medium hard.
25			10/No Penetration			End boring at 13 feet.

Plate B30

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG W.O. 95-2687
BORING NO. B27 (STA 160+70) DRIVING WT. 140 lb. DATE OF DRILLING 5/29/96
SURFACE ELEV. 444± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty GRAVEL (GM) - Grayish brown, slightly moist, dense.
5			47	119	6	Brown color from 2 feet.
10			24	97	26	Silty CLAY (CL-ML) - Reddish brown, moist, stiff.
15			4/6" 12/6"	93	30	COMPLETELY TO HIGHLY WEATHERED BASALT (WC-WH) - Mottled grayish brown, moist, medium dense to dense.
20						End boring at 9.5 feet.

Plate B27

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

BORING LOG W.O. 95-2687
BORING NO. B31 (STA 128+00) DRIVING WT. 140 lb. DATE OF DRILLING 8/25/99
SURFACE ELEV. 337± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Brown, moist, stiff, with sand and gravel.
5			50	99	26	
10			38	90	29	
15			16	81	34	HIGHLY WEATHERED BASALT (WH) - Grayish brown, moist, dense.
20			53/6" 10/No Penetration	68	18	
25			10/No Penetration			MODERATELY WEATHERED BASALT (WM) - Gray, medium hard.
30						End boring at 15 feet.

Plate B31

ERNEST K. HIRATA & ASSOCIATES, INC.
Geotechnical Engineering

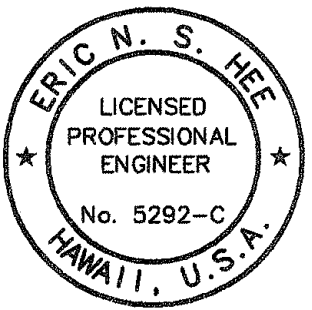
BORING LOG W.O. 95-2687
BORING NO. B28 (STA 216+60) DRIVING WT. 140 lb. DATE OF DRILLING 5/29/96
SURFACE ELEV. 697± DROP 30 in. WATER LEVEL None

DEPTH FOOT	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty CLAY (CL-ML) - Brown, moist, stiff, with gravel.
5			35	88	29	HIGHLY WEATHERED BASALT (WH) - Mottled grayish brown, moist, dense.
10			65	105	18	Mottled yellowish brown color at 4 feet.
15			50/5"	Tip Recovery		SLIGHTLY WEATHERED BASALT (WS) - Gray, hard.
20						End boring at 12.5 feet.

Plate B28

SURVEY PLOTTED BY	DATE
DRAWN BY	
TRACED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	

104-456 1B-4.dwg ESH-1 Plot 1-1 1/21/2002 AWR



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

Eric N. S. Hee
ENGINEERS SURVEYORS HAWAII, INC.

LICENSE EXPIRATION DATE: 4/30/04

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

HALEAKALA HIGHWAY WIDENING, PHASE I
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(22)

SCALE: AS NOTED DATE: NOV., 2002

SHEET No. 4 OF 5 SHEETS

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(22)	2003	10	72

SITE EVALUATION/PERCOLATION TEST

Date/Time: May 3, 2001
Test performed by: Ernest K. Hirata & Associates, Inc.
Owner: State of Hawaii - Department of Transportation - Highways Division
Station No. along Haleakala Highway: Near Sta. 1+10 (Existing Sta. 38+80)
Test Hole Number: P1

Elevation: 88.0± ft.
Depth to Groundwater Table: >20 ft. below grade
Depth to Bedrock (if observed): 3.5 ft. below grade
Diameter of Hole: 4 in.
Depth to Hole Bottom: 20 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 42	Clayey SILT (ML) - Reddish to grayish brown, slightly moist, stiff with sand.
42 - 84	MODERATELY WEATHERED BASALT (WM) - Mottled grayish brown, medium hard.
84 - 240	SLIGHTLY WEATHERED BASALT (WS) - Gray, hard.

PERCOLATION READINGS

Time 12 inches of water to seep away: NA minutes
Time 12 inches of water to seep away: NA minutes

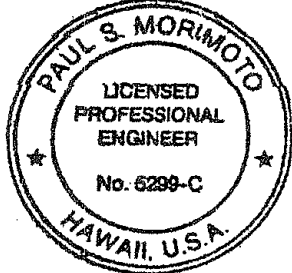
- For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.
- For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval*	Drop in inches	Time interval	Drop in inches

* Water pumped into hole at rate of 25 gallons per minute for a period of 30 minutes. Unable to fill hole.

Approximate Percolation Rate (time/final water level drop): _____ min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.



Paul S. Morimoto
Engineer's Signature/Stamp

Plate A1

SITE EVALUATION/PERCOLATION TEST

Date/Time: May 1, 2001
Test performed by: Ernest K. Hirata & Associates, Inc.
Owner: State of Hawaii - Department of Transportation - Highways Division
Station No. along Haleakala Highway: Sta. 8+60 (Existing Sta. 48+30)
Test Hole Number: P2

Elevation: 96.6± ft.
Depth to Groundwater Table: >20 ft. below grade
Depth to Bedrock (if observed): 11 ft. below grade
Diameter of Hole: 4 in.
Depth to Hole Bottom: 19.5 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 132	Clayey SILT (ML) - Grayish brown, slightly moist, medium stiff, with sand and gravel.
132 - 180	MODERATELY WEATHERED BASALT (WM) - Mottled grayish brown, medium hard.
180 - 234	SLIGHTLY WEATHERED BASALT (WS) - Gray, hard.

PERCOLATION READINGS

Time 12 inches of water to seep away: NA minutes
Time 12 inches of water to seep away: NA minutes

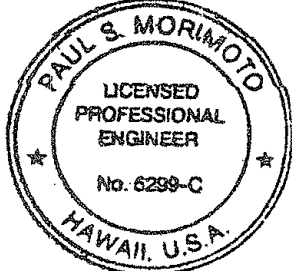
- For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.
- For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval*	Drop in inches	Time interval	Drop in inches

* Water pumped into hole at rate of 25 gallons per minute to fill hole. After hole was filled, water pumped in at a rate of 0.88 gallons per minute to maintain water level for a period of 30 minutes.

Approximate Percolation Rate (time/final water level drop): _____ min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.



Paul S. Morimoto
Engineer's Signature/Stamp

Plate A2

SITE EVALUATION/PERCOLATION TEST

Date/Time: May 2, 2001
Test performed by: Ernest K. Hirata & Associates, Inc.
Owner: State of Hawaii - Department of Transportation - Highways Division
Station No. along Haleakala Highway: Sta. 24+30 (Existing Sta. 62+00)
Test Hole Number: P3

Elevation: 106.5± ft.
Depth to Groundwater Table: >20 ft. below grade
Depth to Bedrock (if observed): 10.5 ft. below grade
Diameter of Hole: 4 in.
Depth to Hole Bottom: 20 ft. below grade

Depth (inches)	Soil Profile (Color, texture, other)
0 - 126	Clayey SILT (ML) - Reddish brown, slightly moist, medium stiff to stiff.
126 - 138	MODERATELY WEATHERED BASALT (WM) - Mottled grayish brown, medium hard.
138 - 240	SLIGHTLY WEATHERED BASALT (WS) - Gray, hard.

PERCOLATION READINGS

Time 12 inches of water to seep away: NA minutes
Time 12 inches of water to seep away: NA minutes

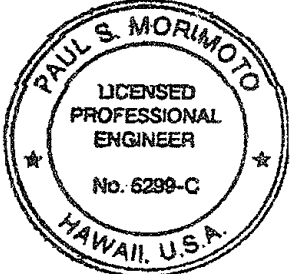
- For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.
- For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

Time interval*	Drop in inches	Time interval	Drop in inches

* Water pumped into hole at rate of 25 gallons per minute to fill hole. After hole was filled, water pumped at a rate of 1.07 gallons per minute for a period of 30 minutes.

Approximate Percolation Rate (time/final water level drop): _____ min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.

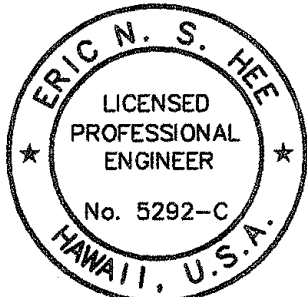


Paul S. Morimoto
Engineer's Signature/Stamp

Plate A3

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
No.	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
	CHECKED BY	

134-56-18-1B-5.dwg ESH-1 11/21/2002 AMR



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION.

Eric N. S. Hee
ENGINEER'S SURVEYORS HAWAII, INC.

LICENSE EXPIRATION DATE: 4/30/04

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BORING LOGS

HALEAKALA HIGHWAY WIDENING, PHASE I
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(22)
SCALE: AS NOTED DATE: NOV., 2002

SHEET No. 5 OF 5 SHEETS