

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

QUAD 191544 STATION 1003
 HAWAII
 LATITUDE 19 °30' TO 20 °00'
 LONGITUDE 154 °30' TO 155 °00'
 DIAGRAMME 5-1.5 HAWAII

DESCRIPTION
 NOTE, TRIANGULATION STATION

NAME OF STATION: HALONA USGS
 ESTABLISHED BY: L.A. Critchlow YEAR: 1978 STATE: Hawaii COUNTY: Hawaii BENCH MARK ALSO
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 4 miles north of Pahoa
 HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
		FROM THE GROUND AT THE STATION		
HEIHEIARULU 1014				00 00 00.0
RM 2	N	20.38	6.212	60 55 28
RM 1	S	20.10	6.127	336 17 13
RM 1 to RM 2		27.26	8.309	

The station is located on a small, fern covered hill, about 7 miles southeast of Meau, 4 miles north of Pahoa and 4 miles west of Honolulu Landing and 2700 feet southwest of an old railroad grade.

To reach the station from the junction of State Highways 11 & 13, go south along highway 13 for 6.7 miles to road intersection left. Turn left and go east on Makuu Drive 1.85 miles to a fork. Take right fork, Pa'aahi Road, and go southeast 0.55 mile to a point where the road narrows, and runs along the top of old railroad grade, continue 1.1 miles southeast to a dim road on the right. Turn right (a four wheel drive is needed from this point) and follow dim road southwest for 0.7 mile to a small hill and the station site.

The station mark is a USGS aluminum disk, stamped "HALONA 1958", cemented in a drill hole in solid pahoehoe lava and is 13 feet west of 4 inch ohia tree, on a small hill.

Reference mark 1 is a USGS reference mark disk, stamped "NO. 1 1954", cemented in a drill hole in solid pahoehoe lava, 10 feet north of 4 inch ohia tree and is about the same elevation as the station mark.

Reference mark 2 is a USGS reference mark disk, stamped "NO. 2 1954", cemented in a drill hole in solid pahoehoe lava and is about the same elevation as the station mark.

* Name of chief of party should be inserted here. The person who actually visited the station should sign his name at the end of the recovery note.

NOAA FORM 76-96 SUPERSEDES CGS FORM 828A WHICH MAY BE USED
 1-72

NOAA
 U.S. GPO: 1976-645-641/1220 Aegton 6

ADJUSTED HORIZONTAL CONTROL DATA
 ADJUSTMENT BY NGS

NAME OF STATION: HALONA USGS OBS BY NGS
 STATE: HAWAII YEAR: 1978 FIRST ORDER

SOURCE: G-10241

GEODETIC LATITUDE: 19 33 30.03494	ELEVATION: 99.6 METERS
GEODETIC LONGITUDE: 154 36 38.13219	327 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ FOR Δ θ ANGLE *
HI 1	5101	691,437.41	263,590.33	+ 0°11'10"

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ FOR Δ θ FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
HEIHEIARULU	19 31 39.2	19 20 29 "	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

SM 034

HORIZONTAL CONTROL DATA

JUN 1978
 U.S. DEPARTMENT OF COMMERCE
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191544 STATION 1004
 HAWAII
 LATITUDE 19° 30' TO 20° 00'
 LONGITUDE 154° 30' TO 155° 00'
 DIAGRAMME 5-1.5 HAWAII

NO ORIGINAL TEXT

Kaloli (Hawaii Island, Hawaiian Government Survey, 1896; E. R. Hand, 1914).—On eastern coast of Hawaii, Puna District, between Hilo and Cape Kumukahi, on the outermost point of Kaloli Point, a low flat rounded point. Originally marked by an iron bolt let into the rock; this was replaced with a survey tablet, and an irregular shaped cairn placed over station.

RECOVERY NOTE, TRIANGULATION STATION

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 526

NAME OF STATION: **KALOLI**
 ESTABLISHED BY: **H.G.S.** YEAR: 1896 STATE: **Hawaii**
 RECOVERED BY: **C.T. Husemeyer** YEAR: 1949 COUNTY: **Hawaii**

Detailed statement as to the fitness of the original description:
 Station was recovered as described and found in poor condition. It is in danger of being washed away by the waves and is too near the cliff edge to be occupied at this time. Station KALOLI 2 was established to replace this station. It is 20.454 meters, 63° 07' in azimuth.
 Old description follows: "On eastern coast of Hawaii, Puna District, between Hilo and Cape Kumukahi, on the outermost point of Kaloli Point, a flat rounded point. Originally marked by an iron bolt let into the rock; this was replaced with a survey tablet, and an irregular shaped cairn placed over the station."

U.S. DEPARTMENT OF COMMERCE - COAST AND GEODETIC SURVEY RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KALOLI**
 ESTABLISHED BY: **H.G.S.** YEAR: 1896 STATE: **Hawaii**
 RECOVERED BY: **U.S.G.S.** YEAR: 1958 COUNTY: **Hawaii**

Detailed statement as to the fitness of the original description, including marks found, stampings, changes made, and other pertinent facts:
 Station was not recovered. The C&GS survey in 1949 stated that this station was likely to fall into the sea and at that time a new station Kaloli 2 was established. We turned azimuth and taped distance and found all rocks in that area to have fallen into the sea. A thorough search was made for this monument and no evidence was found except some anchor spikes that may have been used for tie downs for signals.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KALOLI**
 ESTABLISHED BY: **HGS** YEAR: 1896 STATE: **Hawaii** BENCH MARK(S) ALSO
 RECOVERED BY: **D.M. Whipp** YEAR: 1966 COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

Detailed statement as to the fitness of the original description, including marks found, stampings, changes made, and other pertinent facts:
 Station has been destroyed by the wearing away of the soft lava rock.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KALOLI**
 STATE: **HAWAII** YEAR: 1896 SECOND ORDER

SOURCE **G- 9275**
 NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE	19 37 29.775	ELEVATION	8	METERS
GEODETIC LONGITUDE	154 56 55.853	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ANGLE
HI 1	5101	689,669.75	287,769.85	+ 0° 11' 06"

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE ϕ OR Δ FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
POSITION DETERMINED BY TRAVERSE FROM STATION KALOLI 2			
QE 277			

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191544 STATION 1005
 LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KALOLI 2 (continued)

FORM 526a
 (9-18-58)

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KALOLI 2**
 ESTABLISHED BY: **C.T. Husemeyer** YEAR: **1949** STATE: **Hawaii**
 RECOVERED BY: **D.M. Whipp** YEAR: **1966** COUNTY: **Hawaii**
 Island: **Hawaii**

HEIGHT OF TELESCOPE ABOVE STATION MARK **1.65** METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.
 DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
Cape Kumukahi Lighthouse ----1949				00 00 00.0
RM No. 2	W	31.485	9.597	139 19 13
RM No. 1	N	32.385	9.872	233 53 43
Cape Kumukahi Lighthouse 1949 ---1966				00 00 00.0
RM No. 2	W	31.477	9.595	139 20 47
Olaa, Olaa Sugar Co., stack, 1949	WNW			147 09 53.5
Olaa, Olaa Sugar Co., water tank	WNW			147 13 59.7
RM No. 1	N	32.383	9.871	233 53 51

Station was recovered and all marks found in good condition. It is now possible to drive to station. A complete description follows:
 Station is located about 12 miles southeast of Hilo and 7 miles east of Olaa, on Kaloli Point, on the smooth, black lava area near sea, about 330 feet northwest of 2 conspicuous ironwood trees in the otherwise open area.

To reach station from the post office in Olaa, go northeast on the main street for 0.1 mile to crossroad. Turn right and go southeast on State Highway 13 for 5.7 miles; turn left and go northeast on Paradise Ave. for 4.4 miles to crossroad. Continue ahead (the road soon bears left and follows coast) for 1.0 mile to green cabin on left. Continue ahead for 0.1 mile; take T-road left and go 0.1 mile to crossroad. Continue ahead for 0.1 mile to crossroad. Turn right and go 0.1 mile to end of bladed cinder road. Pick way northeast across grassy lava area for 0.2 mile to station.

Station mark is a standard disk stamped "KALOLI 2 1949", cemented in a drill hole in lava bedrock 70 feet southwest of water's edge and 70 feet west-southwest of a prominent, small lava ridge, or rise, about 6 feet high, at water's edge, which is the only high point in the vicinity. Reference mark number one is a standard disk stamped "KALOLI 2 NO 1 1949", cemented in a drill hole in smooth flat lava bedrock area, 40 feet southwest of water edge and at same elevation mark. Reference mark number two is a standard disk stamped "KALOLI 2 NO 2 1949", cemented in a drill hole in a smooth lava outcrop at edge of jumbled rock area and at about same elevation as station mark.

*Name of chief of party should be inserted here. The officer who actually visited the station should sign his name at the end of the recovery note.

NOTE - One of these forms must be used for every station recovered.

USCGMA-DC 27178-P59

NAME OF STATION: **KALOLI 2**
 ESTABLISHED BY: **C.T. Husemeyer** YEAR: **1949** STATE: **Hawaii** BENCH MARK ALSO
 RECOVERED BY: **L.A. Critchlow** YEAR: **1977** COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **7 miles east of Keaau**
 HEIGHT OF TELESCOPE ABOVE STATION MARK **4** FEET. HEIGHT OF LIGHT ABOVE STATION MARK **4** FEET.

DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KAPOHO HGS 1896				00 00 00.0
RM 2	W	31.48	9.597	127 58 20
RM 1	N	32.39	9.872	222 30 44
Cape Kumukahi Lighthouse 1949	SE	about 12 miles		348 37 07.96
RM 1 to RM 2		46.91	14.299	

The station mark and reference marks 1 and 2 were recovered in good condition. The directions and distances to the reference marks measured on this date compared favorably with the 1949 and 1966 measurements. The 1966 recovery note is adequate except the town of Olaa in the to reach description is now Keaau.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KALOLI 2**
 ESTABLISHED BY: **C. T. HUSEMEYER** YEAR: **1949** STATE: **HAWAII** BENCH MARK(S) ALSO
 RECOVERED BY: **R. B. MELBY** YEAR: **1978** COUNTY: **HAWAII**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **7 MILES NORTHEAST OF OLA A**

Detailed statement as to the fitness of the original description, including marks found, stampings, changes made, and other pertinent facts:
 THE STATION AND REFERENCE MARKS WERE RECOVERED IN GOOD CONDITION. A JEEP WAS DRIVEN TO THE STATION SITE.

NOAA FORM 76-165
 (12-72)
 (OLD C&GS 526) U. S. GOVERNMENT PRINTING OFFICE: 1976-065861/1130 RECIPIENT NO. 6

U. S. DEPARTMENT OF COMMERCE
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SURVEY

*Name of chief of party should be inserted here. The person who actually visited the station should sign his name at the end of the recovery note.

NOAA FORM 76-96 SUPERSEDES C&GS FORM 526A WHICH MAY BE USED
 (1-72)

U. S. DEPARTMENT OF COMMERCE
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 U.S. GPO: 1976-665-661/1270 Region 6

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191544 STATION 1006
 HAWAII
 LATITUDE 19° 30' TO 20° 00'
 LONGITUDE 154° 30' TO 155° 00'
 DIAGRAM NE 5-1,5 HAWAII

NO ORIGINAL TEXT

KAPOHO (HGS)

(Hawaii Island, Hawaiian Government Survey, 1896; E. R. Hand, 1914).—On eastern point of Hawaii, not far from Cape Kumukahi, on the most southerly and highest part of the semicircular crater of Kapoho, which is close to the village of Kapoho, Puna District. Marked by a cross cut in a solid beach-worn stone set in cement, and covered with a cairn.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 536
 (Rev. Feb. 1965)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KAPOHO (HGS)**
 ESTABLISHED BY: Hawaiian Govt. YEAR: 1896 STATE: Hawaii
 RECOVERED BY: C. T. Husemeyer YEAR: 1949 COUNTY: Hawaii

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:

The station was recovered in good condition. In 1929 the Hawaii Territory Survey surrounded this station with a 6 foot square slab of concrete which projects about 4 inches above the surrounding soil. A new description follows--

The station is located on the most southerly and highest part of the semicircular crater of Kapoho which lies about 2.5 miles southwest of Cape Kumukahi, about 1.7 miles west of Kapoho Point and about 0.6 mile south of the village of Kapoho.

To reach from the post office at Pahoa; go southerly, on the paved road, for 0.4 mile; continue straight ahead, as per the sign reading KAPOHO, and follow the main traveled road south and east for 7.6 miles; pass through the village of Kapoho and continue easterly for 0.7 mile; turn right and go south for 0.15 mile; pass the Kapoho Grade School and continue south for 0.35 mile; turn right and follow a track road west for 0.15 mile; take the right hand fork and continue westerly for 0.15 mile; pass through a board gate and go west and south for 0.3 mile to the end of truck travel at the foot of the station hill. From this point pack south up the steep, brushed in, slope for about 0.1 mile to the high ground and the station.

The station is a small cross carved in a flat rock which is about flush with the surface of the ground.

Reference mark number 1 is a standard disk, stamped KAPOHO NO 1 1949, set into a drill hole in a flat boulder which is flush with the surface of the ground. It is located about 1 foot lower than the station.

Reference mark number 2 is a standard disk, stamped KAPOHO NO 2 1949, set into a drill hole in a large boulder which is flush with the surface of the ground. It is located about 1 foot lower than the station.

NOTE	OBJECT	BEARING	FEET	METERS	DIRECTION
	KALIU (HGS)				00 00 00
	Kumukahi Lighthouse	E	2 miles		175 29 37.7
12c	R. M. No. 2	E	12.148	3.703	201 15 41
12c	R. M. No. 1	SSE	15.264	4.652	269 13 04

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAPOHO HGS

OBS BY CGS

STATE: HAWAII

YEAR: 1895

FIRST

ORDER

U-16-41

GEODETIC LATITUDE:	19 30 01.44095	ELEVATION:	136.0
GEODETIC LONGITUDE:	154 50 31.04762		446 METERS FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ OR ANGLE
HI 1	5101	726,629.36	242,671.73	+ 0 13 11

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE β OR Δ OR FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KALIU HGS	59 19 55.3	59 06 44	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

THESE DATA SHOULD BE USED FOR ALL SURVEYS AFTER DEC 1975

34 079

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191544 STATION 1006
 LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KAPOHO (HGS) (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAPOHO (HGS)
 ESTABLISHED BY: HGS YEAR: 1896 STATE: Hawaii
 RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 Island: Hawaii

R

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.83 METERS, HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KALIU (HGS)-----1949 DISTANCE	and DIRECTION-----	-----	-----	00 00 00.0
Kumukahi Lighthouse	E	175	29	37.7
RM No. 2	E	12.148	3.703	201 15 41
RM No. 1	SSE	15.264	4.652	269 13 04
KALIU (HGS) 1949----1967 DISTANCE	and DIRECTION-----	-----	-----	00 00 00.0
Olaa, Olaa Sugar Co., stack, 1949	NW	67	01	05.0
Cape Kumukahi Lighthouse 1949	NE	175	28	36.9
RM No. 2	ENE	12.122	3.695	201 22 37.5
RM No. 1	SE	15.274	4.655	269 15 01

Station was recovered and all marks found in good condition. A complete description follows:

Station is located about 7 miles east of Pahoa and 2-1/4 miles southwest of Cape Kumukahi Lighthouse, at west side of old site of Kapoho Village (now covered with lava), on the south rim of Kapoho Crater, a heavily brush and tree covered, circular ridge.

To reach station from the post office in Pahoa, go east 0.4 mile; take left fork and go easterly on State Highway 132 for 2.8 miles to fork just after passing Lava Tree State Park. Take left fork and go 5.2 miles to crossroad; turn right and go south on State Highway 137 for 0.4 mile to crossroad. Turn right, take center fork of 3 and go west on track road 0.3 mile; take right fork just before cinder quarry and follow track road upgrade inside crater, along left side, for 0.5 mile to end of truck travel at steep, shallow ravine on left, with large trees in it, and quite free of underbrush. Pack up steep slope about 100 yards to crest, then go left about 200 yards to highest point and station.

Station mark is a 2-inch cross chiseled into the top of an 8-inch stone. A Type B-1 signal is centered over the mark, which is visible in the bottom of a 7 x 30-inch depression in the center of the 6-foot-square, concrete platform of the signal. A concrete pedestal 30 inches high is at center of platform and supports a red and white metal target.

Reference mark number one is a standard disk stamped "KAPOHO NO 1 1949", cemented in a drill hole in a bedrock outcrop along southwest edge of hill-top. It projects 2 inches and is about 8 inches lower than station mark.

Reference mark number two is a standard disk stamped "KAPOHO NO 2 1949", cemented in a drill hole in a flat boulder 2 inches beneath ground surface. It is along flat top of hill and about 8 inches lower than station mark.

NOTE: All lines are usually blocked by trees and high brush; all were cleared at this time.

*Name of chief of party should be inserted here. The officer who actually visited the station should sign his name at the end of the recovery note.

NOTE - One of these forms must be used for every station recovered.

USCGM-DC 3717B-P&B

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAPOHO (HGS)
 ESTABLISHED BY: HGS YEAR: 1896 STATE: Hawaii BENCH MARK ALSO
 RECOVERED BY: L.A. Critchlow YEAR: 1977 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: About 7-1/2 miles east of Pahoa
 HEIGHT OF TELESCOPE ABOVE STATION MARK 5 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 5 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KALIU HGS 1891				00 00 00.0
BM YY 153 USGS Geodetic Distance	SW	10384.00	3165.050	16 57 21.67
CAPE KUKUKAHI LIGHTHOUSE 1949	NE	About 2 miles		175 28 42.86
RM 2	ENE	12.11	3.692	201 20 02
RM 1	SE	15.28	4.657	269 17 28
RM 1 to RM 2		15.52	4.731	

The station and reference marks 1 and 2 were recovered in good condition. The distance and direction to reference marks 1 and 2 compared favorable to the 1967 date, the difference to reference mark 1 being 0.002 meters longer and 02 minutes, 27 seconds. The difference to reference mark 2 being 0.003 meters shorter and 02 minutes, 35.5 seconds. A measurement was made between reference marks 1 and 2 at this time and due to changes a new description follows.

The station is located about 7-1/2 miles east of Pahoa, on the south rim of Kapoho Crater and on property of Mr. Arthur Lyman, Phone Number 965-8328 who lives near the station site.

To reach the station from the junction of State Highways 13 and 132 at Pahoa, go east on highway 132 for 2.6 miles to a fork; take the left fork and continue east on highway 132 for 2.1 miles to Bench Mark YY 153 on the left. Continue east on highway 132 for 2.85 miles to the junction with State Highway 137. Turn right on highway 137 and go south for 0.35 mile to a crossroad. Turn right and go west about 150 feet on a graded road to a locked gate. Continue westerly through the gate for 0.35 mile to a fork; take the left fork and go southwest and west on track road for 0.3 mile to a reverse fork. Turn sharp left on the track road and go southerly up hill for 0.4 mile to the top of the hill and the station on a steep bluff on the right.

The station mark is a 2-inch cross chiseled into the top of an 8-inch stone, with a tapering concrete post centered over the mark, with a 2-1/2 inch pipe cemented in the center for mounting a metal signal post and is surrounded by a 6 foot square concrete platform. It is southeast of the north edge of the bluff.

Reference mark 1 is a C&GS disk stamped KAPOHO NO 1 1949, cemented in a drill hole in bedrock and is flush with the ground surface. It is 20 feet northeast of the north edge of the bluff and 3 feet north of the south edge of the bluff.

Reference mark 2 is a C&GS disk stamped KAPOHO NO 2 1949, cemented in a drill hole in a flat boulder and is flush with the ground surface. It is 3 feet south of the north edge of the bluff.

YY 153 is a USGS bench mark disk stamped 383 YY 153, cemented in the top of an 8-inch square concrete post that projects about 8 inches above the ground surface. It is 145 feet northeast of a power line pole and 27 feet northwest of the center of State Highway 132.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191544 STATION 1007
 HAWAII
 LATITUDE 19° 30' TO 20° 00'
 LONGITUDE 154° 30' TO 155° 00'
 DIAGRAM NE 5-1.5 HAWAII

Kumukahi (Hawaii Island, E. R. Hand, 1914).—On Cape Kumukahi, the most easterly point of Hawaii, and near the site of a proposed lighthouse. Several symmetrical cairns (Kings' Pillars), probably built by old-time natives, are on the shore 400 meters N. 85° E. from the station. A deep pit or well, built in connection with the proposed light bears S. 30° E., 23 meters. Reference mark is a crow's-foot and drill hole surrounded by a patch of cement; mark is on exact line to station *Kapoho*, being 6.38 meters, (20.9 feet) from center, bearing S. 43° W. Mark is a copper survey tablet set in the center of a small area of smooth lava; it was surrounded by a rim of cement 2 feet in diameter.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KUMUKAHI**
 ESTABLISHED BY: **E.R. Hand** YEAR: **1914** STATE: **Hawaii** BENCH MARK(S) ALSO
 RECOVERED BY: **D.M. Whipp** YEAR: **1967** COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

R

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:

Station is destroyed. This area was covered with a deep layer of lava during the 1960 eruption at *Kapoho*.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KUMUKAHI**
 STATE: **HAWAII** YEAR: **1914** ORDER: **THIRD**

SOURCE **G-92184**

GEODETIC LATITUDE:	19 31 10.374	ELEVATION:	12.0 METERS
GEODETIC LONGITUDE:	154 48 49.348		39 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	Bearing Angle*
HI 1	5101	736,331.17	245,663.87	+ 0 13 46

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\theta \cos \Delta \phi$ FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151544 STATION 1008
 HAWAII
 LATITUDE 19 ° 30' TO 20 ° 00'
 LONGITUDE 154 ° 30' TO 155 ° 00'
 DIAGRAM NE 5-1,5 HAWAII

NO ORIGINAL TEXT

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: SAND HILL
 ESTABLISHED BY: F.W. Perkins YEAR: 1901 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the fitness of the original description, including marks found, stampings, changes made, and other pertinent facts:

A cinder hill was found at the location plotted on the topo map, and on the highest point there was a metal fence post, however it is not known who set it. Ironwood trees block the view to all stations except KALOLI 2, so the position of the post could not be checked. It is doubtful that this the original point.

FORM CGS-526 (1-65)
 USCOMM-OC 18509-Pes

U. S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: SAND HILL
 STATE: HAWAII YEAR: 1901 THIRD ORDER

SOURCE: G-92184

GEODETIC LATITUDE	19 33 23.84	ELEVATION	METERS
GEODETIC LONGITUDE	154 52 34.04		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ OR ANGLE
HI 1	5101	714,788.44	263,045.87	+ 0 12 32

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE ϕ OR Δ OR ϕ FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE

QF 065

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

QUAD 191544 STATION 1010
 HAWAII
 LATITUDE 19 030' TO 20 000'
 LONGITUDE 154 030' TO 155 000'
 DIAGRAM NE 5-1.5 HAWAII

DESCRIPTION ~~RECORD~~ NOTE, TRIANGULATION STATION

NAME OF STATION: **WAIKAHEKAHE USGS**
 ESTABLISHED BY: **L.A. Critchlow** YEAR: **1978** STATE: **Hawaii** BENCH MARK ALSO
 COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **3 1/2 miles NW of Pahoa**
 HEIGHT OF TELESCOPE ABOVE STATION MARK **4** FEET. HEIGHT OF LIGHT ABOVE STATION MARK **4** FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FROM THE GROUND AT THE STATION		
		FEET	METERS	
HALONA USGS				00 00 00"
RM 1	S	15.93	4.856	70 13 58
RM 2	E	7.74	2.358	343 41 06
RM 1 to RM 2		17.29	5.272	

The station is located about 14 miles southeast of Hilo, 7 miles southeast of Keauhou and 3 1/2 miles northwest of Pahoa, on private property.

To reach the station from the junction of State Highways 11 and 13, go south on Highway 13 for 6.7 miles to road intersection left. Turn left and go east on Makuu Drive .1 mile to road right. Turn right and go 0.3 mile southeast on gravel road to house and station site on the right.

The station mark is a USGS tablet, stamped WAIKAHEKAHE 1957, cemented in a concrete triangular block projecting about 0.5 foot, 97 feet southwest of the street centerline, 41 feet southeast of the southeast corner of a house and 14 feet northwest of the property line.

Reference mark 1, stamped NO 1 1957, is a USGS tablet cemented in a drill hole in lava rock, 57 feet southeast of the southeast corner of the house and 2 feet east of the property line.

Reference mark 2, stamped NO 2 1957, is a USGS tablet cemented in lava rock, 45 feet east of the southeast corner of the house and 12 feet northwest of property line.

ADJUSTED HORIZONTAL CONTROL DATA ADJUSTMENT BY NGS

NAME OF STATION: **WAIKAHLKAHL USGS** OBS BY NGS
 STATE: **HAWAII** YEAR: **1978** FIRST ORDER

SOURCE: **G-16-41**

GEODETIC LATITUDE:	19 32 51.52092	ELEVATION:	149.8 METERS
GEODETIC LONGITUDE:	154 58 33.17164		491 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 1	5101	679,974.48	259,669.20	+ 0° 10' 30"

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ OR Δ OR FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
HALONA USGS	251° 17' 26.4"	251° 06' 57"	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

34 164

* Name of chief of party should be inserted here. The person who actually visited the station should sign his name at the end of the recovery note.