

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1001
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: AHULOA
 STATE: HAWAII YEAR: 1914 THIRD ORDER

SOURCE: G-Spice
 NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE	19 05 20.69	ELEVATION	METERS
GEODETIC LONGITUDE	155 54 36.46		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	S OR Δ φ ANGLE*
HI 1	101	358,400.41	53,035.15	- 0 08 03

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

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

QQ 284

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 151553 STATION 1002
 HAWAII
 LATITUDE 15° 00' TO 15° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1, HAWAII

Akihi (Hawaii Island, Hawaiian Government Survey, 1890).—In southern part of Hawaii, in southern Ka-u, on a lofty peak, Mount Akihi, in the Kahuku forest, east of the lava flow of 1868, and about 13 miles north of Ka lae, the most southern point of Hawaii. Station is on southeasterly rim of deep crater. Marked by cross cut in rock set deep in ground, and by stone cairn 9 feet in diameter. Reference marks are crosses in three stones, distant 1.5 meters.

RECOVERY NOTE, TRIANGULATION STATION.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 529.

NAME OF STATION: Akihi STATE: Hawaii COUNTY: Hawaii
 ESTABLISHED BY: H.G.S. YEAR: 1890 LOCALITY: Kau, Hawaii
 RECOVERED BY: Chas. L. Murray YEAR: 1938

Detailed statement as to the fitness of the original description: In the southern part of Hawaii in southern Kau on the south crater rim of Akihi Hill which is located about 5 miles west-northwest of Waiohinu village and about 2 1/2 miles above the government road. The hill slopes are thickly wooded but the hill is visible from the government road. It lies above the conspicuous grassy hill called Olokuana.

Old station mark found: Drill-hole in a cut in rock firmly set in ground and covered by a stone pile.

New station marks: H.T.S. Type D monument (Triangular concrete monument 7 1/2 feet on each side with 2 1/2" pipe 2 feet long set on steel legs over the old mark which is left exposed to view). A metal target is set over the 2 1/2" pipe.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 529

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: AKIHI STATE: HAWAII
 ESTABLISHED BY: Hawaiian Govt. YEAR: 1890 COUNTY: HAWAII
 RECOVERED BY: L. C. Wilder YEAR: 1949

Detailed statement as to the fitness of the original description: At the time of this survey a 2 1/2 inch pipe projected from the top of a triangular concrete platform was recovered. A new description follows—

The station is located on the southern rim of an extinct volcanic cone which lies about 4 miles northwest of Waiohinu, about 3 miles north northeast of the Kahuku Ranch Headquarters, about 1.5 miles north of a saw mill and about 0.4 mile northeast of a graded cinder road.

To reach from the school house and church in the village of Waiohinu; go west and north, on the road which leads toward Captain Cook, for 5.0 miles; turn right, onto a graded, cinder, road and go north for 0.45 miles to a large sawmill and lumber yard; pass to the northerly side of the mill and follow the good cinder road northerly for 1.75 miles to the end of truck travel at a cinder pit. From this point, pack northeasterly through the ferns and scrub trees for about 0.4 mile to the highest ground and the station.

The station is the center of a 2 1/2 inch iron pipe which projects about 2 feet from the top of a triangular slab of concrete which is about 6 feet on each side and about flush with the surrounding rock.

Object	Direction	Distance
HAAO	00 00 00	
KIPANPAE (metal target)	23 11 07.8	
MAHANA (metal target)	73 32 37.1	

The Hawaii Territory Survey reports that they monumented this station in 1938, with concrete instrument platform, metal pole and target and 2 1/2 inch pipe mentioned in this description, centered over the old mark found. The old mark found was a drill hole in a cross cut on a buried stone. This agrees with the marking of the original station.

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: AKIHI

STATE: HAWAII

YEAR: 1890

SECOND

ORDER

SOURCE: G- 5279

GEODETIC LATITUDE:	<u>15° 05' 39.577</u>	ELEVATION:	<u>912.0</u> METERS
GEODETIC LONGITUDE:	<u>155° 40' 52.154</u>		<u>2992</u> FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ HI ANGLE
HI 1	5101	427,457.61	94,806.50	- 0 03 33

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
HAAO	275 23 36.7	275 27 10	5101

QE 088

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

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553 STATION 1002

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

AKIHI (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: AKIHI
ESTABLISHED BY: HGS YEAR: 1890 STATE: Hawaii BENCH MARK(S) ALSO
RECOVERED BY: D.R. Whipp YEAR: 1967 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 was recovered in good condition. All lines are now blocked by Ohia trees. It is now possible to drive within 75 yards of the station. A complete description follows:

Station is located about 6-1/2 miles west-northwest of Maalehu and 2 miles north of State Highway 11, on the timber-covered south rim, and highest point, of an old volcanic crater, at about 2992 feet elevation, along a timbered ridge, on Kahuku Ranch property.

To reach station from the post office in Maalehu, go west on State Highway 11 for 6.7 miles to red cinder side road right, at sign "KAHUKU RANCH". Turn right and go 0.55 mile; take left fork and go 0.3 mile to landing strip; continue ahead for 1.1 miles to side road right, 50 yards before corrals. Go right, up steep grade, for 0.55 mile to crossroad. Turn left and follow track road along ridge line for 0.35 mile to bladed side road left. Go left 0.1 mile to end of truck travel. Pack northerly up through ferns and brush about 75 yards to high point and station.

Station is marked by a 2-1/2-inch, iron pipe 2 feet long, mounted vertically over a 4-inch hole in the center of a triangular, concrete platform 7 feet on each side and flush with the ground. A metal target, set into the 2-foot pipe, extends 8 feet above the platform.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 Old Hawaiian Datum

QUAD 191553 STATION 1004
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NOAA FORM 76-39
 12-701
 FORMERLY CGS FORM 828

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

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **AUAU** STATE: **Hawaii** COUNTY: **Hawaii**
 NEAREST TOWN: **Kealia** QUADRANGLE NO.: **191553**
 CHIEF OF PARTY: **GEH** YEAR: **1972** DESCRIBED BY: **RDB**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK	METERS.†	HEIGHT OF LIGHT ABOVE STATION MARK	METERS.	
	SURFACE-STATION MARK, UNDERGROUND-STATION MARK	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	
	R.M. No. 1	NNW	20.84'	6.346	

Station is located on the northern rim of an old volcano vent, approximately 12 miles south of Kealakekua Bay and 7 miles south of the town of Kealia, on the western coast of Hawaii island.

To reach station from State Highway 11, turn towards sea on Pebble Beach Estates road, about 1.1 miles south of Alae School and about 0.6 mile south of Pahoehee 2 lava flow of 1950. Road is paved and may have a gate across it. Follow road to beach, thence pack southward along shoreline about 1 mile to northern rim of an old volcano vent. Station is located at highest point of the northern rim, set in red-brown rock. It is stamped "AUAU 1972".

Reference mark number 1 is a 1½ inch galvanized pipe protruding about 12 inches from a circular mound of concrete about 18 inches in diameter. "REF POINT OCT '70 AEM" is inscribed on the concrete.

This station was located by intersection from stations HOOKENA, PUIWA, and WAIKAKUU 4.

Detailed description:

ADJUSTED HORIZONTAL CONTROL DATA

ADJUSTMENT BY NGS

NAME OF STATION: **AUAU** OBS BY NGS
 STATE: **HAWAII** YEAR: **1972** **SECOND** ORDER

SOURCE: **G-14950**

GEODEIC LATITUDE:	19° 18' 13.79135	ELEVATION:	1	METERS:
GEODEIC LONGITUDE:	155 53 30.22422	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE*
HI 1	5101	364,928.14	171,006.30	= 0 07' 46"

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

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

THESE DATA OBTAINED FROM ADJUSTMENT OF SEP 1979

RL 186

*Refers to notes in manuals of triangulation and state publications of triangulation. †Direction-angle measured clockwise, referred to initial station
 ‡To nearest meter only, when no trigonometric leveling is being done.
 * U.S. GOVERNMENT PRINTING OFFICE: 1971-780-051

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151553 STATION 1006
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1,5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 525
 Rev. Aug. 1948

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: BISHOP STATE: HAWAII COUNTY: SOUTH KONA DISTRICT HAWAII

CHIEF OF PARTY: L. C. WILDER YEAR: 1948 Described by: G. J. HOEPEL

NOTE: HEIGHT OF TELESCOPE ABOVE STATION MARK 3.4 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

1a	Surface-station mark Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION			
		OBJECT	BEARING	DISTANCE	
			feet	meters	
	KALAPA				00 00 00
120	R. M. 2	SW	11.810	3.600	34 12 18
120	R. M. 1	ENE	20.862	6.359	268 32 35
	KEEI SOUTH BASE				50 53 56.4

The station is located on the edge of a cultivated lot about 3 miles south southeast of Kealakekua, about 2 miles east of Napoopoo, about 100 feet west of a small shack, about 100 feet east of a road intersection, 57 feet northeast of telephone pole number 893, 32 feet north of the center of a graded road and about 10 feet higher than the road.

To reach from the post office at Captain Cook; go southerly, on the road which leads toward Keokea, for 2.9 miles to telephone pole number 893; turn left, onto a graded road, and go easterly for about 100 feet to the station on the bank to the left hand side of the road.

The station is a standard disk, stamped BISHOP 1948, set in the top of a square concrete post which projects about 5 inches, and in a 1 inch pipe which is the Bishop Estate survey station "BISHOP".

Reference mark number 1 is a standard disk, stamped BISHOP NO 1 1948, set into a drill hole in a boulder which projects about 4 inches. It is located 39 feet north of the center of a graded road and is about 2 feet higher than the station.

Reference mark number 2 is a standard disk, stamped BISHOP NO 2 1948, set into a drill hole in a boulder which projects about 5 inches. It is located 22 feet north of the center of a graded road and about 2 feet lower than the station.

The distance between reference mark number 1 and reference mark number 2 is 8.950 m or 29.361 feet.

* Refer to notes in manuals of triangulation and state publications of triangulation. | Direction-angle measured clockwise, referred to initial station.
 † To nearest meter only, when no trigonometric leveling is being done. 10-56850-1 U. S. GOVERNMENT PRINTING OFFICE

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: BISHOP
 STATE: HAWAII YEAR: 1948 SECOND ORDER

SOURCE G- 9279

GEODETIC LATITUDE	19 28 08.715	ELEVATION	410.6 METERS
GEODETIC LONGITUDE	155 53 15.290		1547 FEET

STATE COORDINATES (feet)				
STATE & ZONE	CODE	X	Y	PL OR Δ RI ANGLE
HI 1	5101	366,492.75	231,016.53	- 0 07 45

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\theta = \theta_P \Delta \theta$ FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (from south)	PLANE AZIMUTH (from south)	CODE
KALAPA	351 01 49.6	351 09 35	5101

QE 064

(continued on next page)

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

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553

STATION 1006

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

BISHOP (continued)

FORM 526a
(8-16-65)

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: BISHOP
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 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	
LAE O KANONI (HGS) 1884----1948	DISTANCE	and DIRECTION---		-00° 00' 00.0
KEEI SOUTH BASE				00 39 11.0
R.M. No. 1	ENE	20.862	6.359	218 17 50
R.M. No. 2	SW	11.810	3.600	343 57 33
LAE O KANONI (HGS) 1884----1968	DISTANCE	and DIRECTION---		-00 00 00.0
KEEI SOUTH BASE 1948				00 39 09.0
R.M. No. 2	SW	11.799	3.596	343 58 19

Station was recovered and all marks found in good condition. A house has been built nearby. The distance and angle to RM No. 1 was not checked as the line is blocked by a large tree fern. A complete description follows:

Station is located about 2-1/2 miles southeast of Captain Cook and 2 miles north of Honaunau, along the northeast side of State Highway 11, in front of a small home in a coffee grove, about 35 feet higher than the highway, on small, flat area just above driveway.

To reach station from the post office at Captain Cook go southeast on State Highway 11 for 2.75 miles to driveway on left, near telephone pole No. 893. Fork left and go upgrade on driveway for 100 yards to house on left on flat above drive, and station.

Station mark is a standard disk stamped "BISHOP 1948", set in the top of a 10-inch-square, concrete monument that projects 3 inches above ground. It is 19.5 feet southwest of edge of house, 56 feet east of telephone pole No. 893, 12.3 feet east of power pole No. 1, 10 feet northwest of the northwest 1 of 2 coconut palms, and 10 feet northwest of line extended from southeast end of house.

Reference mark number one is a standard disk stamped "BISHOP NO 1 1948" cemented in a drill hole in a boulder that projects about 4 inches above ground. It is 9.5 feet south of southwest corner of the house and 1 foot southeast of a large tree fern which blocks the line to station mark.

Reference mark number two is a standard disk stamped "BISHOP NO 2 1948" cemented in a drill hole in a small bedrock outcrop that projects 6 inches above ground, and is 2 feet lower than station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: BISHOP
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii BENCH MARK(S) ALSO
RECOVERED BY: GEH YEAR: 1972 COUNTY: Hawaii

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

Station mark and Reference marks 1 and 2 were recovered as described by R.C. Munson (1968) in good condition.

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1007
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

SEE STATION KEEI NORTH BASE

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: Boundary Monument 9
 ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: R.C. Munson YEAR: 1968 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 was recovered in good condition, although a power pole has been set directly on line with station KEEI NORTH BASE.

Located about 3 miles northwest of Honaunau and 1/2-mile south of Napoopoo Bay, along east side of macadam road, on top of stone wall, 51.5 feet southeast of power pole No. 2 and 138.76 feet from station KEEI NORTH BASE, in azimuth 132° 46' 44".

The mark is a 1-inch iron pipe projecting 1 foot from the center of a 12-inch concrete mound with "9" inscribed in it.

FORM C&S-526 (11-65)
 USCOMM-DC 12501-P65

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: BOUNDARY MONUMENT 9
 STATE: HAWAII YEAR: 1948 SECOND ORDER

SOURCE: G- 9275
 NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	19° 26' 05.437	ELEVATION	12	METERS
GEODETIC LONGITUDE:	155 55 18.323	SCALED		FEET

STATE COORDINATES (feet)				
STATE & ZONE	CODE	X	Y	β OR Δ OR ANGLE *
HI 1	5101	354,720.08	250,715.57	- 0 06 26

* 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

POSITION DETERMINED BY TRAVERSE FROM STATION KEEI NORTH BASE

QE 260

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1008
 HAWAII
 LATITUDE 15° 00' TO 15° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO ORIGINAL TEXT

ADJUSTED HORIZONTAL CONTROL DATA

RECOVERY NOTE, TRIANGULATION STATION INTERSECTION

R

NAME OF STATION: **Cairn**
 ESTABLISHED BY: **L.C. Wilder** YEAR: **1948** STATE: **Hawaii** BENCH MARK(S) ALSO
 RECOVERED BY: **R.C. Munson** YEAR: **1968** COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island: Hawaii**

NAME OF STATION: **CAIRN**
 STATE: **HAWAII** YEAR: **1948** THIRD ORDER
 SOURCE: **G- 9279**

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

Station was visited and found to be nearly gone, with only a few of the base rocks left, so was rebuilt. Angles were checked to it from stations OHEPUUPUU, NIUOU and HANAKEAUMOE and found to differ somewhat from the 1948 angles.

Station is a 3-foot cairn, located about 4-1/2 miles south of Milolii, 1/2-mile south of station NIUOU 1948, 1600 feet east-southeast of Kanewaa Point and 3500 feet west-northwest of a bombing target, on a high point in rough, jagged lava area.

GEODETIC LATITUDE:	19 07 11.927	ELEVATION	METERS
GEODETIC LONGITUDE	155 55 01.328		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE °
HI 1	5101	356,042.15	104,261.60	- 0° 08' 12"

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

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 Old Hawaiian Datum

QUAD 191553 STATION 1010
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

ADJUSTED HORIZONTAL CONTROL DATA ADJUSTMENT BY NGS

IOAA FORM 76-39
 (2-70)
 (FORMERLY C&G FORM 529)

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

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: CAROL STATE: HAWAII COUNTY: HAWAII
 NEAREST TOWN: Kealia QUADRANGLE NO.: 191553
 CHIEF OF PARTY: GEH YEAR: 1972 DESCRIBED BY: RDB

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK		METERS,†		HEIGHT OF LIGHT ABOVE STATION MARK		METERS.	
	SURFACE-STATION MARK, UNDERGROUND-STATION MARK	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	BEARING	DISTANCE	DIRECTION‡	FEET	METERS	FEET
		LAE O KANONI 1884	NW	23.69		77.220	00 00 00.0	
		R.M. No. 2				30 15 29.6		
		R.M. No. 1	SW	73.94		22.550	280 30 25.8	
		LAE MAMO 1972				320 12 53.75		

Detailed description:

Station is located in a crushed lava rock pit, about 2½ miles south-southeast of Honaunau, about 2 miles northeast of Hookena, about ½ mile east of State Highway 11 on the west coast of the Island of Hawaii.

To reach station from post office at Honaunau, go south on Highway 11 for 3.2 miles to the store in Kealia village. Continue on highway for .25 mile and turn left onto a gravel road. Go easterly ungrade for .3 mile to chain gate, then another .2 mile to a leveled crushed lava rock pit. A rusty corrugated metal water tank about 15 feet high and 15 feet in diameter is located on left side of the gravel road .44 mile uphill from the rock pit and station. The rock pit is bordered on the southwest side by an unlevelled lava mound. Station is located about 60 feet north of the gravel road and about 40 feet west of a stand of Guava trees. It is cemented into a drill hole in a rock imbedded in the crushed lava and soil. Station is a standard bronze disk stamped "CAROL 1972".

Reference mark number 1 is located about 4 feet higher than station on the unlevelled lava rock and soil mound about 70 feet southwest of station. It is cemented in a drill hole in a 2½ foot by 4 foot rock, 2 feet higher than surrounding ground, 10 feet northeast of the track road. It is a standard bronze disk stamped "CAROL NO. 1 1972".

Reference mark number 2 is located about 40 feet south of the north border of the rock pit, about 2 feet lower than the station in a rock imbedded in crushed lava and soil. It is a standard bronze disk stamped "CAROL NO. 2 1972".

NAME OF STATION: CAROL OBS BY NGS
 STATE: HAWAII YEAR: 1972 SECOND ORDER

SOURCE: G-14950

GEODETIC LATITUDE	19° 23' 45.27561	ELEVATION	427.3 METERS
GEODETIC LONGITUDE	155° 52' 19.21509		1402 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	± DR Δ B ANGLE
HI 1	5101	371,801.44	204,429.90	- 0 07 25

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE ± DR Δ B FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
LAE O KANONI	130° 08' 15.5	130° 15' 40"	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF SEP 1979

RL 181

*Refers to notes in manuals of triangulation and state publications of triangulation. †Direction-angle measured clockwise, referred to initial station
 ‡To nearest meter only, when no trigonometric leveling is being done. § U.S. GOVERNMENT PRINTING OFFICE: 1971-740-031

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151553 STATION 1011
 HAWAII
 LATITUDE 19° 03' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 Form 525
 Rev. Aug. 1968

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **FOREST** STATE: **HAWAII** COUNTY: **SOUTH KONA HAWAII**
 CHIEF OF PARTY: **L. C. WILDER** YEAR: **1948** Described by: **G. L. MURRAY**

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS.1	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	
	Surface-station mark, Underground-station mark			feet	meters	
						00 00 00
12a				10.17	3.102	155 31
12a				13.15	4.007	304 19 30

Located in the South Kona Forest Reserve in the land of Kipahohoe, about two miles above the Government main road and one half mile south of the trail leading from the Government main road to the old Kapuna Ranch House. The station mark is a standard disk, cemented in drill hole in solid rock on the highest point of a prominent wooded volcanic hill. The station is on the NE rim of three deep lava channels that trisection the hill and is near the angle formed by the channels running north and east. To reach the station, take the Kapuna Ranch trail which commences at a wooden corral on the upper side of the Government road about 1/4 mile south of the Ohia Lodge (a roadside inn). Proceed easterly up a steep trail to a point about 2 miles distant. This trail follows on and near the north edge of a wooded lava flow and passes through open pasture in places. From this point proceed southerly through the forest of dense fern underbrush and scattered trees, for 1/2 mile. It is best located by using a barometer and following the 2600 foot contour as there are no trails through this area. R. M. No. 1 is NNE of the station and is a standard disk cemented in a drill hole in solid lava rock mound 1.5 feet high and 3 feet in diameter at its base. The RM is about the same elevation as the station mark. R. M. No. 2 is SSE of the station and is a standard disk cemented in a drill hole in solid flat lava rock which is about the same elevation as the station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **FOREST**
 ESTABLISHED BY: **L.C. Wilder** YEAR: **1948** 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:

Not recovered, although 2 days were spent in searching. The station is probably still in existence due to the isolated location, but is difficult to search for because of dense covering of uluhi fern up to 10 feet high in forest of large ohia trees.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **FOREST**
 STATE: **HAWAII** YEAR: **1948** SECJND ORDER
 SOURCE: **G- 9279**

GEODETIC LATITUDE: 19 15 03.688	ELEVATION: 850.0 METERS
GEODETIC LONGITUDE: 155 51 25.185	2769 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	9 10R Δ 11 ANGLE
HI 1	5101	376,864.74	151,803.87	- 0 07 34

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE 9 10R Δ 11 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (from south)	PLANE AZIMUTH (from south)	CODE
KAPUKAWAA	39 44 17.4	39 51 21	5101

QE 072

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151553 STATION 1012
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1,5 HAWAII

DESCRIPTION OF TRIANGULATION STATION

R

ADJUSTED HORIZONTAL CONTROL DATA

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 536

NAME OF STATION: **HAAO**
 ESTABLISHED BY: **L. C. Wilder** YEAR: **1949** STATE: **HAWAII**
 COUNTY: **HAWAII**

NAME OF STATION: **HAAO**
 STATE: **HAWAII** YEAR: **1949** SECOND ORDER

Detailed statement as to the fitness of the original description: **No information is available on the original station. At the time of this survey a 1 inch drill hole was recovered in good condition. One reference mark was established. A new description follows--**

The station is located in open pasture land about 3.0 miles north-west of Naalehu, about 1 mile north of Waiohinu, about 300 yards southeast of Haao Springs, about 100 yards east of a steel flume and about 90 yards east of a dirt road. Cultivated cane land lies about 250 yards to the south. A rock cairn has been built over the station.

To reach from the post office in Naalehu; go north, on the graveled road for 2.2 miles; turn left, cross over a cattle guard, and go northerly for 2.6 miles; take the left hand fork and follow the steel flume northerly for 1.2 miles; pass through a board gate and follow the steel flume northerly for 0.5 mile; turn right and go easterly, across country, for about 100 yards to the high ground and the station.

The station is the center of a 1 inch drill hole in a flat rock which is about 1 foot in diameter and projects about 3 inches.

Reference mark number 1 is a standard disk, stamped R M NO 1 1949, cemented in the top of a 2 1/2 inch iron pipe which projects about 4 inches and is about the same elevation as the station.

Object	Direction	Distance
--------	-----------	----------

AKIHI (metal target) W	00 00 00	
KIPAEPAE (metal target) SE	222 42 29.1	
R. M. No. 1 W	356 14 05	27.030 ft 8.238 m

An old Hawaii Government Survey description states that this mark was a cross on a stone with a square or round hole at the center, a cairn built over same.

There is little question but that the 1949 recovery, is the old station unless the stone had been moved. It was found solid in the ground and there was a cairn of rocks over same.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: **HAAO**
 ESTABLISHED BY: **L.C. Wilder** YEAR: **1949** 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:

Station mark was recovered in good condition. RM No. 1 has been destroyed. The area has been developed into cane land and the station is now in the middle of a sugar cane field. No new RMs were set for this reason.

Station is located about 2-3/4 miles northwest of Naalehu and 1-1/4 miles north-northwest of Waiohinu, at about 2336 feet elevation, on point of hill to north up above a sharp jog in an irrigation canal, in cane field.

To reach station from the post office in Naalehu, go east on State Highway 11 for 0.1 mile to crossroad. Turn left and go uphill for 2.1 miles to crossroad. Turn left and go west on main cane road for 2.5 miles to side road left; turn left and go southwest for 1.0 mile to side road left, where main road makes a sharp left curve. Turn right and go uphill for 0.2 mile to crossroad; turn left and go 0.15 mile to crest of ridge. Turn left and go down along hill through cane field about 600 feet to station.

Station is marked by a 1-inch drill hole in flat rock. There is a large, flat-topped stone pier built up around station mark.

SOURCE G- 9275

GEODETIC LATITUDE	19 05 19.922	ELEVATION:	712.0 METERS
GEODETIC LONGITUDE	155 37 13.592		2336 FEET

STATE COORDINATES (Fvri)				
STATE & ZONE	CODE	X	Y	B OR Δ 91 ANGLE
HI 1	510i	458,416.65	92,806.23	- 0 02 22

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE B OR Δ 91 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
AKIHI	95 24 48.2	95 27 10	5101

QE 085

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151533 STATION 1013
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HALEILI

STATE: HAWAII

YEAR: 1884

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	19 20 15.300	ELEVATION:	METERS
GEODETIC LONGITUDE:	155 51 54.966		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	$\rho \cos \Delta \phi$ ANGLE *
HI 1	5101	374,077.97	183,243.55	- 0 07 15 "

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

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

QO 278

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151553 STATION 1015
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1,5 HAWAII

NO ORIGINAL TEXT

Hanakeaumoe (Hawaii Island, Hawaiian Government Survey, 1890; E. R. Hand, 1914).—On southwest coast of Hawaii, in South Kona, land of Kapua, about 3½ miles south of Okoe Bay, between Kanewaa Point and Ahuloa (or Kamoi) Point, and 660 meters inside the cliffs. Station is on a sharp mound which rises abruptly some 15 meters above a level expanse of "aa" lava, and is noticeable for a long way up and down the coast. Marked by a cross cut in the rock. Over it a cairn was erected and painted white.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 536
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **HANAKEAUMOE**
 ESTABLISHED BY: **Hawaiian Govt.** YEAR: **1890** STATE: **HAWAII**
 RECOVERED BY: **L. C. Wilder** YEAR: **1948** COUNTY: **HAWAII**

Detailed statement as to the fitness of the original description: **The original station was recovered in good condition. A standard disk was set in the center of the coras which was carved in the rock and two reference disks were established. A new description follows--**

The station is located 6 miles south of Milolii, about 2 miles north of Lae O Kamoi, about 1.8 miles north of the southern boundary of the South Kona District, about 0.6 mile east of the sea and on the summit of a lava mound which rises about 40 feet above the level plane.

To reach from the schoolhouse in Waiohinu; go north, on the road which leads toward Captain Cook, for 19.7 miles to triangulation station Kahahawai; turn left, onto a very poor graded road, and go westerly, down grade, for 6.4 miles to Lae O Kamoi and the end of truck travel. From this point pack northerly for about 2 miles to the prominent lava mound and the station.

The station is a standard disk, stamped **HANAKEAUMOE 1948**, set into a drill hole in a boulder. A rock cairn was built over the station.

Reference mark number 1 is a standard disk, stamped **HANAKEAUMOE R M NO 1 1948**, set into a drill hole in a boulder which projects about 4 feet and is about the same elevation as the station.

Reference mark number 2 is a standard disk, stamped **HANAKEAUMOE R M NO 2 1948**, set into a drill hole in a boulder which projects about 5 feet and is about the same elevation as the station.

Object	Distance	Direction
NIUCU		00 00 00
R. M. 2 SSW	16.545 ft 5.044 m	234 55 10
R. M. 1 NW	20.715 ft 6.315 m	328 13 10
Cairn NW	1 mile	353 44 32.3
KAHAWAII (metal target)	(HTS)	89 50 33.6

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **HANAKEAUMOE**
 STATE: **HAWAII** YEAR: **1890** SECOND ORDER
 SOURCE: **G- 9279**

GEODETIC LATITUDE:	19 °06' 21.091	ELEVATION:	19.4 METERS
GEODETIC LONGITUDE:	155 54 34.393		129 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# COR Δ ANGLE *
HI 1	5101	358,612.90	99,127.51	- 0 08 03

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE Spherical Formula NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (from south)	PLANE AZIMUTH * (from south)	CODE
NA PUU A PELE	326 02 44.3	326 10 47	5101

QE 076

(continued on next page)

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1015

LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

HANAKEAUMOE (continued)

FORM 576a
 (8-18-69)

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

R

NAME OF STATION: HANAKEAUMOE
 ESTABLISHED BY: HGS YEAR: 1890 STATE: Hawaii
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.73 METERS, HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
NA PUU A PELE (HGS) 1891 ---1948	DISTANCE and DIRECTION---	00	00	00.0
R.M. No. 2	SSW	16.545	5.044	68 23 54
R.M. No. 1	NW	20.715	6.315	161 41 54
Cairn	NW			187 13 16.1
NA PUU A PELE (HGS) 1891 ---1968	DISTANCE and DIRECTION---	00	00	00.0
R.M. No. 2	SW	16.481	5.025	68 22 38
R.M. No. 1	NW	20.697	6.308	161 43 38
Cairn, 1948	NW			187 13 08.0

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

Station is located about 5-1/2 miles south of Milolii, 4-1/2 miles southwest of the Honomalino Agriculture Co. Office, 1-3/4 miles north of Kamoi Point, and 3800 feet south of a bomb target area, on a jagged, rocky hill of about 132 feet elevation, that rises about 50 feet above the surrounding smooth lava and grass flats.

To reach station from the post office at Honaunau, go south on State

Highway 11 for 19.7 miles to the Honomalino Agriculture Co. drive on the right; continue on the highway for 3.3 miles to gravel crossroad between power poles 301 and 302. Turn right, through gate, and go 0.6 mile to a Navy electronics building. Continue downgrade for 2.9 miles to fork at gate on left fork. Take right fork and go 1.8 miles to dim road left, 75 yards before reaching second observation hut. Turn left and follow rough road for 1.3 miles to end of truck travel at target area. Pack south a cross fairly smooth lava land about 3/4-mile to station.

Station mark is a standard disk stamped "HANAKEAUMOE", cemented in a drill hole in bedrock on top of a 10-foot-diameter, flat-topped, rock knob.

Reference mark number one is a standard disk stamped "HANAKEAUMOE RM NO 1 1948", cemented in a drill hole in a sharp rock outcrop that projects 4 feet above ground. It is at about same elevation as station.

Reference mark number two is a standard disk stamped "HANAKEAUMOE RM NO 2 1948", cemented in a drill hole in a large rock, 0.4 foot higher than station.

*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.

JUN 1578
 U. S. DEPARTMENT OF COMMERCE
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1016
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-15 HAWAII

SEE STATION HANAMALO 2

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION HANAMALO 1

STATE HAWAII

YEAR 1890

SECOND

ORDER

SOURCE G- 9279

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE	19° 05' 33.535	ELEVATION	12	METERS
GEODETIC LONGITUDE	155° 55' 04.858	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ρ OR Δ OR ANGLE*
HI 1	5101	355,737.85	118,546.89	- 0 08 14

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

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

POSITION DETERMINED BY TRAVERSE FROM STATION HANAMALO 2

QE 262

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 151553 STATION 1017
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO ORIGINAL TEXT

Hanamalo 2 (Hawaii Island, Hawaiian Government Survey, 1890; E. R. Hand, 1913).—On west coast of Hawaii, in South Kona, land of Okoe, 3 miles south of Hoopuloa, on Cape Hanamalo (or Point Hanamalo), close to the water. Marked by a triangle cut in the solid rock in the "aa" (lava); it is 8.78 meters (28.8 feet) southeast of the position of *Hanamalo 1*. The action of the waves made the change necessary. A large cairn was placed over the station and painted white.

RECOVERY NOTE, TRIANGULATION STATION

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

NAME OF STATION: **HANAMALO 2**
 ESTABLISHED BY: **Haw. Govt. Survey** YEAR: **1890** STATE: **HAWAII**
 RECOVERED BY: **L. C. Wilder** YEAR: **1948** COUNTY: **HAWAII**

Detailed statement as to the fitness of the original description:

The station was recovered as described. The original station Hanamalo 1 has been washed out by wave action. A standard station mark and reference mark were established. A new description follows—

The station is located on Hanamalo Point about 2 miles south of Milolii, about 0.5 mile north of Okoe Bay, about 75 feet east of the beach and about 50 feet west of a dim beach trail.

The station is best reached, by boat, from the village of Milolii. A landing can be made off the point in an average sea. If the sea is rough the station can be reached by beach trail from the village of Milolii.

The station is a standard disk, unstamped, set into a drill hole in a boulder which is flush with the surface of the ground.

Reference mark number 1 is a standard disk, unstamped, set into a mass of loose rock which projects about 4 inches. The disk is located in the center of the beach trail and is about 1 foot lower than the station.

Object	Distance	Direction
KAPUKAWAA (metal target)		00 00 00
R M 1 ENE	62.370 ft 19.011 m	57 22 38

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

NAME OF STATION: **HANAMALO 2**
 ESTABLISHED BY: **Haw. Govt. Sur.** YEAR: **1890** 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 recovered.

To reach from the school house at Hookena, proceed southerly along main road for 17.2 miles to the main ranch buildings at Honomolino Ranch; turn right going past houses for 0.1 mile; take left fork thru gate for 1.8 miles to wire corral, turn into corral and continue out gate on west side of corral and continue down hill for 2.3 miles to coastline; take right fork and go northerly across lava for 0.6 mile; turn left at road fork and continue for 0.1 mile to sand beach and end of truck travel, from here pack northerly along beach for 0.3 mile to station.

Form 526
 (11-8-55)

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

NAME OF STATION: **HANAMALO 2**
 ESTABLISHED BY: **H.G.S.** YEAR: **1890** STATE: **Hawaii**
 RECOVERED BY: **R.E.A.** YEAR: **1961** COUNTY: **Hawaii**

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

The station and reference mark was recovered in good condition as described.

The station is best reached by boat from the village of Milolii.

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **HANAMALO 2**

STATE: **HAWAII**

YEAR: **1890**

SECOND ORDER

SOURCE: **G- 9279**

GEODETIC LATITUDE: 19° 09' 33.253	ELEVATION: 12.1 METERS
GEODETIC LONGITUDE: 155° 55' 04.810	40 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ OR ANGLE
HI 1	5101	355,742.37	118,518.43	- 0 08 14

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From unit)	PLANE AZIMUTH (From unit)	CODE
KAPUKAWAA	193 36 35.6	193 44 50	5101

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1017

LATITUDE 0 ' TO 0 '
 LONGITUDE 0 ' TO 0 '
 DIAGRAM

HANAMALO 2 (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: HANAMALO 2
 ESTABLISHED BY: HGS YEAR: 1890 STATE: Hawaii
 RECOVERED BY: C.A. Burroughs YEAR: 1962 COUNTY: Hawaii

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

The station and reference mark were recovered in good condition and as described,

The station was visited by a lightkeeper only. It was reached by trail from Milolii because the sea was rough. It is a 1 1/2 hour pack by trail. The best way is by boat.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: HANAMALO 2
 ESTABLISHED BY: HGS YEAR: 1890 STATE: Hawaii
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.67 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	
KAPUKAWAA (HGS) 1884	-----1948	DISTANCE and DIRECTION-----		00 00 00.0
R.M. No. 1	ENE	62.370	19.011	57 22 38
KAPUKAWAA (HGS) 1884	-----1968	DISTANCE and DIRECTION-----		00 00 00.0
R.M. No. 1	NE	62.119	18.934	57 22 15
R.M. No. 2	S	43.661	13.309	166 55 46
Milolii Point Light	NNE	About 2 miles		358 57 59.4

Station mark and RM No. 1 were recovered in good condition. A new reference mark, No. 2, was established. It is now possible to drive to within 1/2-mile of station with a 4-wheel-drive vehicle. A complete description follows:

Station is located about 2 miles south-southwest of Milolii and 3-1/2 miles west of the Honomalino Agriculture Co. Headquarters, on Hanamalo Point, in bare lava area and about 2000 feet northwest of the kiawe grove at Okoe Bay.

To reach station from the Honomalino Agriculture Co. Office (which is

20 miles south on State Highway 11 from the post office at Honaunau) go south on narrow macadam road for 0.25 mile to start of macadamia orchards on both sides of road. Continue ahead for 100 yards, then go right, and follow track road west down through orchard and then pasture, for 1.25 miles to locked gate (obtain key at the above office). Pass through gate and go 0.35 miles to T-junction. Turn right and go 0.05 mile to corral. Turn left and follow track road westerly for 2.35 miles to fork near sea. Take right fork and go northerly for 0.7 mile to old stone trail opposite kiawe grove, and end of truck travel. Walk west along trail, then follow sea coast northwest to station; about a 1/2-mile pack.

Station mark is a standard disk, unstamped, cemented in a drill hole in rock flush with ground, on a low knoll, about 100 yards east of extreme rock point and 10 yards southeast of edge of sea bluff that curves in from the point. There is a large cairn, with a 3 x 3-inch target about 12 feet tall, centered over the mark.

Reference mark number one is a standard disk, unstamped, cemented in a drill hole in a lava rock outcrop projecting 10 inches from ground. It is across a small dip from station mark, on a low rise, and is 0.9 foot lower than station mark.

Reference mark number two is a standard disk, stamped "HANAMALO 2 HGS 1890 NO 2 1968", cemented in a drill hole in a 10-inch rock, flush with ground and 2.6 feet lower than station mark.

NOTE: discrepancy in distance to RM No. 1 was noted and checked; the 1968 distance is correct.

*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.

USCOMM-DC 57173-P59

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: HANAMALO 2
 ESTABLISHED BY: HGS YEAR: 1890 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: C. A. Burroughs YEAR: 1973 COUNTY: Hawaii

AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

The station and all marks were recovered in good condition.

Part of the old road has been washed away; the new to reach description is: To reach station from the Post Office at Honaunau, go south on State Highway 11 for 19.7 miles to the Honomalino Agriculture Company Office on right. From the office continue south up hill and return to Hwy 11, at the highway turn right and proceed south for 0.2 miles to narrow asphalt road on right. Turn right and follow road for 0.3 miles to two Mango trees on the left and a narrow track road to the right leading through a Macadamia Orchard. Follow this track road 1.3 miles to a locked gate (key was obtained at the Honomalino Office). Pass through gate for 0.2 miles and take right fork in road and continue 0.6 miles to a wire corral. Go through corral and take the left exit which makes a sharp U-turn and parallels the road that entered the corral. Continue for 2.3 miles where a road joins from the right and continue straight ahead for 0.1 mile to a T-junction at beach. Turn right and follow beach road north for 0.3 miles to locked chain gate (key was obtained at the Honomalino Office). Continue ahead for 0.7 miles to old stone trail opposite Kiawa Grove and black sand beach. Walk west along trail, then follow sea coast northwest to station; about a 1/2 mile

pack over the lava.

U.S. DEPARTMENT OF COMMERCE
 ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191555 STATION 1019
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1,5 HAWAII

HILL-PUEHU

(Hawaii Island, E. R. Hand, 1914).—In southern Hawaii, on the hill northwest of Punaluu warehouse, 1,300 meters distant. Mark is a truncated pyramid of concrete, white.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 530

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: HILL (Puehu) STATE: Hawaii COUNTY: Hawaii
 ESTABLISHED BY: E. R. Hand YEAR: 1914 LOCALITY: Southeast Coast of Hawaii.
 RECOVERED BY: K. T. Adams YEAR: 1929.

Detailed statement as to the fitness of the original description:

On the top of a barren, reddish colored, rounded hill about 1300 meters N. W. of the warehouse at Punaluu, Hawaii; marked by a truncated pyramid of concrete 3 feet in height with the sides 3 feet in width at the base and 1 foot in width at the top. A 2 inch pipe projects about 8 inches above the top and center. The inscription, "PUEHU, 1904, E", is impressed in the seaward face.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 530

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: HILL (Puehu) STATE: Hawaii COUNTY: Hawaii
 ESTABLISHED BY: E. R. Hand YEAR: 1914 LOCALITY: Kau, Hawaii
 RECOVERED BY: Chas. L. Murray YEAR: 1938

Detailed statement as to the fitness of the original description:

Location of station: In the southern part of Hawaii on the top of lone reddish dirt hill about 3/4 mile above Punaluu Village, 1/2 mile below the Pahala-Honuapo Government main road and a few hundred feet southwest of the road leading down to Punaluu.

Old station mark found: 2" pipe in concrete marked "Puehu 1904".

New station mark: H.T.S. Type D-1 monument (Triangular concrete monument 7 1/2 feet on each side with 1 7/8 steel bar 2 feet long set on steel legs over the station which is left exposed to view. A standard metal target is set over the steel bar).

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 525 D

RECOVERY DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: HILL (PUEHU) YEAR: 1949 STATE: Hawaii COUNTY: Hawaii
 Established By: E. R. Hand, 1914
 CHIEF OF PARTY: L. C. Wilder

Description, including sketch of object: The station is the center of a steel target at triangulation station HILL (PUEHU) which was established by the Hawaiian Territory Survey.

The station is located on the summit of a red cinder hill which has been dug away on the south and west sides. It lies about 4.5 miles southwest of Pahala; about 4.5 miles northeast of Honuapo, about 0.7 mile northwest of Punaluu and about 100 yards east of the highway which runs between Naalehu and Hilo.

The top of the target is 9.6 feet higher than the concrete platform on which it is set.

Station may soon be destroyed due to heavy cinder excavation being made by the Hawaiian Agricultural Company.

Described by

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HILL-PUEHU

STATE: HAWAII

YEAR: 1914

SECOND

ORDER

SOURCE: G- 9279

GEODETIC LATITUDE: 19 °08' 43.967	ELEVATION 77.0 METERS
GEODETIC LONGITUDE: 155 30 58.842	253 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ ρ ANGLE *
HI 1	5101	454,358.72	113,374.44	- 0 00 15 "

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From length)	PLANE AZIMUTH (From angles)	CODE

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

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553 STATION 1019

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

HILL-PUEHU (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: HILL (PUEHU)
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

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

Station was recovered in good condition. A complete description follows:

Station is located about 3/4-mile northwest of Punaluu and 4-1/2 miles northeast of Honuapo, along southeast side of State Highway 11, on a cinder hill that has been quarried on the southeast side and has a sheer cliff.

To reach station from the post office in Pahala, go south on Pikake St. for 0.2 mile; turn right and go 0.85 mile; turn right and go southwest on State Highway 11 3.8 miles to the Punaluu road. Continue on the highway 0.4 mile to board gate on left, just beyond milepost No. 57. Walk south east across pasture about 125 yards to station.

Station mark is the center of a 2-1/4-inch iron pipe in the center of a triangular, concrete platform about 7 feet on each side and projecting 8 inches above ground. A 2-inch, steel shaft about 2 feet long, is centered over the pipe and supports a removable, red and white, metal target 8 feet high. Station is 10 feet northwest of edge of cliff and 30 feet northeast of southwest end of hilltop.

N CGS-526 (11-68)
ONM-DC 18808-P02

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

G 191553 STATION 1020
 HAWAII
 LATITUDE 15 °00' TO 15 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1.5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HOIKEANA CHURCH SPIRE

STATE: HAWAII

YEAR: 1884

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	15 18 57.003	ELEVATION:	METERS
GEODETIC LONGITUDE:	155 52 37.367		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	GEOD. Δ ^o ANGLE *
HI 1	5101	370,000.37	175,354.04	- 0 07 29

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE GEOD. Δ^o FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From length)	PLANE AZIMUTH (From length)	CODE

QO 281

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1021
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1,5 HAWAII

DESCRIPTION:
TRIANGULATION STATION

ADJUSTED HORIZONTAL CONTROL DATA
 ADJUSTMENT BY NGS

NAME OF STATION: HOKUKANO (HGS)
 ESTABLISHED BY: L.A. Critchlow YEAR: 1977 STATE: Hawaii BENCH MARK ALSO
 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 5 miles northeast of Haalehu:
 HEIGHT OF TELESCOPE ABOVE STATION MARK $\frac{1}{4}$ FEET. HEIGHT OF LIGHT ABOVE STATION MARK $\frac{1}{4}$ FEET.

NAME OF STATION: HOKUKANO HGS OBS BY NGS
 STATE: HAWAII YEAR: 1977 SECOND ORDER
 SOURCE: G-16241

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	
PUNALUU 1949'	NE	about 6	miles	°00 00 00.0
PAHALA MAU SUGAR CO STACK	SE	10.535	3.210	02 32 55.9
RM 1	SE	16.715	5.097	87 04 45
RM 2	SE	19.935	6.077	170 12 46
RM 1 to RM 2				

GEODETIC LATITUDE: 19 00 21.9085H	ELEVATION: 40.6 METERS
GEODETIC LONGITUDE: 155 32 32.2777I	133 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 2	5152	838,173.32	444,440.81	+ 0 22 05 "

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
PUNALUU	210 °03 '33.1	209 °41 '28 "	5102

THESE DATA OBTAINED FROM ADJUSTMENT OF JAN 1979

3M 047

* 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.

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1022
 HAWAII
 LATITUDE 19° 30' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1,5 HAWAII

U. S. DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 Form 585
 Rev. Aug. 1965

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **HONAUNAU SPIRE** STATE: **HAWAII** COUNTY: **HAWAII**

CHIEF OF PARTY: **L. G. WILDER** YEAR: **1948** Described by: **G. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK 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	DIRECTION‡
	Surface-station mark, Underground-station mark		BEARING	DISTANCE feet meters
This is an intersection station.				

The station is the top of the spire on the top of the small, ornamente, steeple of the Saint Benedict Catholic Church in the village of Honaunau. This church is known as the painted church and is regularly visited by tourists.

The church is constructed of wood, painted white; the roof is tin, painted white and a small, intricate, steeple is near the west end of the roof.

It is located about 150 feet east of the "Middle Road", about 100 feet north of an open shed and about 50 feet northwest of a white house.

The top of the steeple is about 35 feet above ground.

RECOVERY NOTE, TRIANGULATION STATION
 INTERSECTION

NAME OF STATION: **Honaunau, St. Benedict Catholic Church, spire**
 ESTABLISHED BY: **L.C. Wilder** YEAR: **1948** STATE: **Hawaii** BENCH MARKS) ALSO
 RECOVERED BY: **R.C. Munson** YEAR: **1968** 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 was recovered. Located about 3/4-mile southwest of the post office in Honaunau, along east side of old macadam road known as Middle Road.

Station is a white cross atop a prominent, sharp, white, conical spire on a square, white, intricately-designed base, on the west end of a rectangular church building which is painted white and has a bright green roof. This church is known as the Painted Church.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **HONAUNAU ST BENEDICT CATH CH**
 STATE: **HAWAII** YEAR: **1948** THIRD ORDER

SOURCE **G- 5279**

GEODETIC LATITUDE:	19 26 17.333	ELEVATION	METERS
GEODETIC LONGITUDE:	155 53 27.938		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ OR ANGLE*
HI 1	5101	365,257.48	219,753.16	- 0 07 49

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

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

QE 216

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1023
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 150° 00'
 DIAGRAM NE 5-1,5 HAWAII

Honuapo (Hawaii Island, E. R. Hand, 1914).—On southern coast of Hawaii, on the first point east of Honuapo Wharf, and across the entrance to the lagoon upon which the old landing and derrick (abandoned) are situated. The old derrick bears N. 70° W. 220 meters. The taller of two stacks on sugar mill (station *Stack, Honuapo*) of Hutchinson Sugar Plantation Co. bears N. 25° W. 660 meters. Marked by a standard bronze station disk set flush in the surface of the lava. Above it was built a cairn 9 feet high, whitewashed. There was an old cairn on this spot for a number of years previous which was used as a beacon. The new cairn will serve both as a triangulation mark and as a beacon; its elevation is 21 feet above mean high water.

RECOVERY NOTE, TRIANGULATION STATION

DEPARTMENT OF COMMERCE
 U. S. OCEANIC AND GEODETIC SURVEY
 FORM 538

NAME OF STATION: **HONUAPO** STATE: **Hawaii** COUNTY: **Hawaii**
 ESTABLISHED BY: **E. R. Hand** YEAR: **1914** LOCALITY: **Southeast Coast of Hawaii**
 RECOVERED BY: **K. T. Adams** YEAR: **1929**

Detailed statement as to the fitness of the original description:

A bronze disc set flush in the surface of the lava on the first prominent point, which bears N. 74 E. (true) from the end of the dock at Honuapo, on the east side of the bay at Honuapo. Above it is built a cairn of stone 9 feet high and whitewashed. This cairn shows prominently. The steeple of the Catholic Church, triangulation station **CHURCH**, Honuapo, is N. 63 1/2° W. (true) from the station, and the stack at the Honuapo sugar mill is N. 16 1/2° W. (true) from the station.

RECOVERY NOTE, TRIANGULATION STATION

DEPARTMENT OF COMMERCE
 U. S. OCEANIC AND GEODETIC SURVEY
 FORM 538

NAME OF STATION: **Honuapo** STATE: **Hawaii** COUNTY: **Hawaii**
 ESTABLISHED BY: **E. R. Hand** YEAR: **1914** LOCALITY: **Honuapo, Kau, Hawaii**
 RECOVERED BY: **Chas. L. Murphy** YEAR: **1938**

Detailed statement as to the fitness of the original description:

Location of station: On southern coast of Hawaii on the first point of land east of Honuapo Landing and across the entrance to a lagoon.

Old station mark found: U.S.G.S. bronze tablet set in concrete and covered by a large white-washed stone pile formerly used as a beacon.

New station mark: 6 foot 2 1/2" pipe set in concrete over the bronze tablet. The stone pile was rebuilt 10 feet in diameter and 5 feet high and plastered with mortar. The top of this stonepile is a concreted platform. A standard metal target is set in the 2 1/2" pipe.

* 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.

U. S. GOVERNMENT PRINTING OFFICE

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

11-7928

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **HONUAPO**

STATE: **HAWAII**

YEAR: **1914**

SECOND

ORDER

SOURCE: **G- 9279**

GEODETIC LATITUDE	19 05 16.647	ELEVATION	6.2 METERS
GEODETIC LONGITUDE	155 32 59.609		20 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR Δ HI ANGLE °
HI 1	5101	482,774.65	92,464.04	- 3 00 59

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
MAKANAO 2	176 33 43.2	176 34 42	5101

QE 165

(continued on next page)

HONUAPO (continued)

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1023

LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

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

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: HONUAPO
 ESTABLISHED BY: E. R. Hand YEAR: 1914 STATE: HAWAII
 RECOVERED BY: L. C. Wilder YEAR: 1949 COUNTY: HAWAII

Detailed statement as to the fitness of the original description: The original station, marked by a standard disk, was not recovered. In 1938 the Hawaiian Territory Survey reported recovering a U. S. Geological Survey bronze disk and no information is available as to when this disk was established. Also in 1938 the Territory Survey set a 2 1/2 inch pipe 6 feet long over the bronze disk and built a stone and concrete platform around this pipe. The top and center of this pipe was used as the station in the 1949 survey. One reference mark was established in 1949. A new description follows--

The station is located about 0.4 mile southeast of Honuapo, about 350 yards northeast of the Honuapo wharf, about 100 yards southeast of a stone and cinder causeway and about 50 feet north of the ocean.

To reach from the post office at Naalehu; go northeast, on the road which leads toward Hilo, for 3.5 miles; turn right and go southwest for 0.26 mile to the large warehouse; turn left and go southeasterly, crossing over a stone causeway, for 0.3 mile to the end of the road in a rough lava bed. From this point pack southerly for about 100 yards to the small point and the station.

The station is the center of a 2 1/2 inch pipe which projects about 2 feet from the top of a circular stone and concrete platform. This platform is about 5 feet high and about 10 feet in diameter.

Reference mark number 1 is a standard disk, stamped NO 1, set into a drill hole in bedrock which is flush with the surrounding rock. It is located about 7 feet lower than the top of the pipe which was used as the station.

FORM 526a
 (10-18-69)

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

R

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HONUAPO
 ESTABLISHED BY: E.R. Hand YEAR: 1914 STATE: Hawaii
 RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.33 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
MAKANAO 2 (HSC) 1949 RM NO. 2	NE	19.150	5.837	00 00 00.0 32 55 56
Fahala, Hawaiian Agriculture Co., stack 1967 RM NO. 1	NE NW			34 06 20.0 319 21 10

Station monument and reference mark number one were recovered in good condition. A new reference mark, number two, was established. A complete description follows:

Station is located in the southern part of the island, about 3 miles northeast of Naalehu, at northeast end of Honuapo Bay, about 2200 feet south-southeast of the Hutchinson Sugar Mill in Honuapo, 1200 feet east-northeast of Whittington Park and old wharf, and on the finger of land at east side of cove.

To reach station from the post office in Naalehu, go northeast on State Highway 11 for 3.5 miles to the sugar mill at Honuapo. Turn sharp right and go south on old road beneath bluff for 0.25 mile; take side road left and go east for 0.1 mile to end of truck travel at end of the grassy point. Walk east, across old stone causeway remains, and then southeast around edge of cove about 200 yards to end of point and station.

The station is the center of a 2-1/2-inch iron pipe projecting 10 inches from the center of a large, prominent, flat-topped, stone and concrete monument 10 feet in diameter and 5-1/2 feet high. It is 75 feet north of water line and about 700 feet southeast of south side of pond. Reference mark number one is a standard disk stamped "NO 1", cemented in a drill hole in flat lava area, 5 feet southeast of a large crack, 3 feet northwest of a 2-inch iron pipe set in cement in the bedrock, with "WILCOX" inscribed in the concrete, and 6.1 feet lower than top of station pipe.

Reference mark number two is a standard disk stamped "HONUAPO 1914 NO 2 1967", cemented in a drill hole in lava bedrock between two naupaka patches and 7.4 feet lower than top of station pipe.

*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.

USCOMM-DC 27173-P28

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

HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

0 191553 STATION 1024
HAWAII
LATITUDE 19° 00' TO 19° 30'
LONGITUDE 155° 30' TO 156° 00'
DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 553 D

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

Honuapo, Hutchinson
NAME OF STATION: Sugar Co. Mill, YEAR: 1967 STATE: Hawaii COUNTY: Hawaii
Stack Island: Hawaii
CHIEF OF PARTY: D.M. Whipp

Description, including sketch of object:

Located in the southern part of the island, about 3 miles north-east of Naalehu, at the Hutchinson Sugar Co. Mill at Honuapo. Station is the center of a short, silver-colored, steel stack, that extends about 30 feet from the southeast end of the mill roof. Top of stack is 99 feet above ground.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION HONUAP0 HUTCHINSON MILL STACK

STATE HAWAII

YEAR 1967

THIRD

ORDER

SOURCE G-13903

GEODETIC LATITUDE	19 05 37.2550	ELEVATION	METERS
GEODETIC LONGITUDE	155 33 05.3406		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 1	5101	482,225.55	94,542.55	- 0 J1 J1

* 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

U. S. GOVERNMENT PRINTING OFFICE 16-66301-1

Described by

QF 497

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 Old Hawaiian Datum

QUAD 191553 STATION 1025
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NOAA FORM 76-39
 (12-70)
 (FORMERLY CGS FORM 528)

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

TRAVERSE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL GEODETIC SURVEY

DESCRIPTION OF ~~TRANGULATION~~ STATION

NAME OF STATION: HOOKENA
 NEAREST TOWN: Hookena
 CHIEF OF PARTY: GEH

STATE: Hawaii
 COUNTY: Hawaii
 QUADRANGLE NO.: 191553
 YEAR: 1972
 DESCRIBED BY: JRF

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK		HEIGHT OF LIGHT ABOVE STATION MARK		METERS.		
	SURFACE-STATION MARK	UNDERGROUND-STATION MARK	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 ¹	
				FEET	METERS	"	"
	LAE MAMO	1972				00	00
	RM 1		N	63.61	19.389	27	18
	RM 2		SSE	28.58	8.710	143	58
						00	00
						50	0
						58	1

Station is located approximately 3 miles SSE of the City of Refuge near the small town of Hookena on the Kona Coast of Hawaii Island. Station is near the small point 800 feet south of Palianihi Point, near the northern edge of Kauhako Bay; approximately 5 feet above sea-level and 100 feet east of the high-water line.

To reach station from post office at Honanau, travel south on State Hwy 11 for 3.9 miles to Hookena School; continue on Highway 11 for 0.4 mile to fork and sign "Hookena"; take right fork and go 2.25 miles along paved road to gravel track crossroad, just before reaching Hookena Beach; turn right and travel through trees for 0.1 mile to where the road turns north along the beach. Pack southerly for approximately 400 feet to the station on the lava beach.

Station mark is a standard triangulation disk stamped HOOKENA 1972, set in a drill hole in the lava field, approximately 50 feet from the edge of the vegetation.

Reference mark 1 is a standard disk set in the lava field at the same elevation as the station. Disk is stamped "NO. 1 1972".

Reference mark 2 is a standard disk set in the lava field at the same elevation as the station. Disk is stamped "NO. 2 1972".

*Refers to notes in manuals of triangulation and state publications of triangulation. ¹Direction-angle measured clockwise, referred to initial station
²To nearest meter only, when no trigonometric leveling is being done.
 U.S. GOVERNMENT PRINTING OFFICE: 1971-780-081

ADJUSTED HORIZONTAL CONTROL DATA

ADJUSTMENT BY NGS

NAME OF STATION: HOOKENA
 STATE: HAWAII
 YEAR: 1972

OBS BY NGS
 SECOND
 ORDER

SOURCE: G-14950

GEODETIC LATITUDE:	19° 23' 00.67644	ELEVATION:	1.5 METERS
GEODETIC LONGITUDE:	155 54 10.34147		5 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ or ANGLE*
HI 1	5101	361,153.05	199,954.80	- 0 08' 01"

* 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
LAE MAMO	147° 19' 32.6"	147° 27' 34"	5101

THESE DATA OBTAINED FROM ADJUSTMENT OF SEP 1979

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151553 STATION 1026
 HAWAII
 LATITUDE 19 ° 00' TO 19 ° 30'
 LONGITUDE 155 ° 30' TO 156 ° 00'
 DIAGRAM NE 5-1,5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: IHUANU
 STATE: HAWAII YEAR: 1914 THIRD ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	19 05 56.705	ELEVATION:	METERS
GEODETIC LONGITUDE:	155 44 08.102		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ or ANGLE *
HI 1	5101	418,700.83	120,766.24	- 0 04 38

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From <i>same</i>)	PLANE AZIMUTH * (From <i>same</i>)	CODE

QQ 290

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 151553 STATION 1027
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1.5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION **KAAPUNA**
 STATE **HAWAII** YEAR **1890** **THIRD** -ORDER

SOURCE **G-SP156**

GEODETIC LATITUDE:	19 °15' 12.476	ELEVATION:	METERS
GEODETIC LONGITUDE:	155 48 41.056		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ OR ANGLE *
HI 1	5101	392,592.21	152,660.10	- 0 °06' 10 "

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

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

QQ 216

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

191553 STATION 1028
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO ORIGINAL TEXT

ADJUSTED HORIZONTAL CONTROL DATA

DEPARTMENT OF COMMERCE RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KAHAHA**
 ESTABLISHED BY: **Haw. Govt. Survey** YEAR: 1897 STATE: **HAWAII**
 RECOVERED BY: **L. O. Wilder** YEAR: 1949 COUNTY: **HAWAII**

R

NAME OF STATION: **KAHAHA**
 STATE: **HAWAII** YEAR: 1897 SECOND ORDER

Detailed statement as to the fitness of the original description:

The station mark was recovered. However the stone "ahu" was not recovered. At the time of this survey a pile of fern logs about 16 feet in diameter and 5 foot high was found over the station mark. This station was not occupied during the 1949 survey but was located by distance and direction from triangulation station KAHANA 2. A new description follows—

The station is located on the crest of a low ridge, heavily grown over with ferns and scrub trees, which lies about 5 miles north of Pahala, about 3 miles west southwest of the Kapapala Ranch, about 0.2 mile north of the west mouth of a water tunnel and about 100 yards east of a well marked trail. It is 20.821 feet northwest of triangulation station KAHANA 2.

For a detailed description on how to reach this station from the village of Pahala, see the description on triangulation station KAHANA 2 which was established in 1949.

SOURCE **G- 9279**
 NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	19 16 08.000	ELEVATION	1119.0 METERS
GEODETIC LONGITUDE:	155 30 02.759		3671 FEET

STATE COORDINATES (feet)				
STATE & ZONE	CODE	X	Y	θ ON Δ ± ANGLE *
HI 1	5101	499,735.68	158,104.71	- 0 00 01

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ 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 KAHANA 2

* 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.

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1029
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 535
 Rev. Aug. 1963

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAHAHA 2** STATE: **HAWAII** COUNTY: **HAWAII**

CHIEF OF PARTY: **L. O. WILDER** YEAR: **1949** Described by: **O. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK 5.67 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 feet meters	DIRECTION: 0 90 180
	Surface-station mark				
	Underground-station mark				
		PUU ULAULA 1914			00 00 00
		KAHAHA (HGS)	NW	20.621 6.348	190 01 52
Pipe		R. M. No. 2	N	45.480 13.862	221 39 39
Pipe		R. M. No. 1	SE	26.289 8.014	352 36 55

The station is located on the crest of a low ridge about 5 1/2 miles north of Pahala, about 1 mile north of a low wooded knoll, about 0.7 mile north northeast of a cultivated field, about 0.2 mile north of the westerly end of a tunnel and flume and about 100 yards east of a good trail. Higher ground is to the north.

To reach from the post office at Pahala; go easterly for one block; turn left and follow the paved road northeasterly for 3.4 miles to power pole number 102; turn left, onto a graded road, and go westerly for 0.8 mile; turn right and go northeasterly for 0.3 mile; cross over a rocky wash and continue on the main traveled road for 0.2 mile to a wooden water flume and the end of truck travel. From this point pack northwesterly, through the cultivated field, for about 0.4 mile to the edge of the brush and the timber. From this point cut your way, through the dense tangle of ferns and brush for about 0.6 mile to a wooden flume; turn right and pack easterly, following the lower flume, for about 0.3 mile to the mouth of a tunnel; turn left and follow a good trail, up grade, northwesterly for about 0.1 mile; turn right and out your way through the ferns for about 100 yards to the crest of a low ridge and the station.

The station is a standard disk, stamped KAHANA 2 1949, set in the top of a 3 inch pipe which projects about 4 inches.

Reference mark number 1 is a standard disk, stamped KAHANA 2 NO 1 1949, set in the top of a 3 inch pipe which projects about 4 inches and is located about 5 feet lower than the station.

Reference mark number 2 is a standard disk, stamped KAHANA 2 NO 2 1949, set in the top of a 3 inch pipe which projects about 3 inches and is located about 2 feet higher than the station.

KAHANA is a 1 inch drill hole, surrounded by a carved triangle, in a flat rock which seem flush with the surface of the ground. The mark is surrounded by a pile of fern logs about 16 feet in diameter and about 5 feet high. It is about 1 foot higher than the station.

* Refer to notes in manuals of triangulation and state publications of triangulation. † Direction-angle measured clockwise, referred to initial station.
 ‡ To nearest meter only, when no trigonometric leveling is being done.

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAHAHA 2** OBS BY **CGS**
 STATE: **HAWAII** YEAR: **1949** FIRST ORDER

SOURCE: **5- 9279**

GEODETIC LATITUDE: 19 16 07.83300	ELEVATION: 1119.8 METERS
GEODETIC LONGITUDE: 155 30 02.63200	3674 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR Δ #1 ANGLE *
HI 1	5101	499,747.85	158,147.86	- 0° 00' 01"

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE B OR Δ #1 FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
KAMEHAME NEW HTS	345° 54' 45.4	345° 54' 46"	5101

THESE DATA ARE OBTAINED FROM ADJUSTMENT OF 1951

5M 064

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553

STATION 1029

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

KAHAHA 2 (continued)

FORM 526a
(9-18-68)

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAHAHA 2
ESTABLISHED BY: L.C. Wilder YEAR: 1949 STATE: Hawaii
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.6 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
PUU ULAULA 1914 -----1949 DISTANCE and DIRECTION				00 00 00.0
KAHAHA (HGS)	NW	20.821	6.348	190 01 52
RM No. 2	N	45.480	13.862	221 39 39
RM No. 1	SE	26.289	8.014	352 36 55
PUU ULAULA 1914 -----1967 DISTANCE and DIRECTION				00 00 00.0
KAHAHA (HGS) 1897	NW	20.729	6.318	190 01 47
RM No. 2	N	45.456	13.855	221 39 30
RM No. 1	SE	26.210	7.990	352 37 33

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

Station is located about 5 miles north-northwest of Pahala, 1 mile west-northwest of the wooded knob at lower end of the ridge at Wood Valley, 1200 feet northwest of a flume and the mouth of a tunnel, and at about 3669 feet elevation, on a small point, heavily covered with ferns, along a timbered ridge, about 100 yards northeast of a dim trail.

To reach station from the post office in Pahala, go north on Pikake St. and State Highway 151 for 2.4 miles to side road left, at power pole 87. Turn left and go 0.65 mile; take left fork and go 0.65 mile; take right fork and go 0.25 mile; take left fork and go 0.5 mile; take left fork and go 0.05 mile; take right fork and go 0.35 mile along edge of cane field to point 20 yards below metal flume on left, and end of truck travel. Walk northeast along flume about 3/4-mile to 3rd flume fork, keeping along the lower, right, fork each time. Continue on right fork about 300 yards to mouth of tunnel. Take trail to left about 50 yards to trail fork. Take dim left fork and go northwest about 275 yards, then leave trail and go right, northeast, about 100 yards to fern-covered point and station.

Station mark is a standard disk stamped "KAHAHA 2 1949", set in the top of a 2-inch, iron pipe flush with ground. NOTE: Station soon becomes hidden by dense ferns; the remains of a 20-foot, wooden tower are laying at station.

Reference mark number one is a standard disk stamped "KAHAHA 2 NO 1 1949", set in the top of a 6-inch dome of cement and small stones projecting 4 inches from ground. It is 6.3 feet lower than station mark and hidden in ferns.

Reference mark number two is a standard disk stamped "KAHAHA 2 NO 2 1949", set in the top of a 2-inch, iron pipe projecting 2 inches. It is 3 feet south of a 5-inch lehua tree and 3.3 feet higher than station mark.

KAHAHA (HGS) 1897 is a 3/4-inch drill hole in center of a chiseled triangle in the top of a stone, at the bottom of a 12-inch-diameter hole, about 3 feet below present ground level, and 4.5 feet higher than station.

*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.

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

USCOM-DC 57173-P28

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAHAHA 2
ESTABLISHED BY: L.C.W. YEAR: 1949 STATE: Hawaii BENCH MARK ALSO
RECOVERED BY: I.A. Critchlow YEAR: 1977 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 5 miles north-northwest of Pahala.
HEIGHT OF TELESCOPE ABOVE STATION MARK 1.6 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KANTHAME NEW MTS 1949				00 00 00.0
RM 2		45.46	13.057	189 53 16
RM 1	SE	26.71	8.053	320 52 31
PAHALA KAU SUGAR CO STACK	SSW	about 5 miles		357 20 12.9

The station mark and reference marks 1 and 2 were recovered in good condition. KAHAHA HGS 1897 was not searched for at this time. The distance to reference mark 1 was found longer by 0.063 meter and the direction was found larger by 56 seconds. The distance to reference mark 2 was found longer by 0.002 meter and the direction was found smaller by 16 seconds.

The station was reached at this time by helicopter. It can be walked to by following the 1967 recovery note.

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

U.S. DEPARTMENT OF COMMERCE

NOAA
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HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1030
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 Form 813
 Rev. Aug 1964

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAHAWAII (HTS)** STATE: **HAWAII** COUNTY: **HAWAII**

CHIEF OF PARTY: **L. G. WILDER** YEAR: **1948** Described by: **L. G. WILDER**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS.1	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	O	I	#
Surface-station mark, Underground-station mark						
KAMOI KAUNA POINT LIGHT (lantern)	SW SSW			00 00 00 331 11 56.4		

Detailed description:

This is an old Hawaii Territory Survey station, but no record is available regarding the original station. In 1938 a concrete platform, metal pole and target were installed at which time a recovery note states that a drill hole in a rock and a large pile of stones were recovered. The present metal pole and target were centered over the drill hole.

Station is close to the main highway, on lower side of same and plainly visible, at the South Kona - Kau boundary, about 3.7 miles westward of the 1907 lava flow. On the opposite side of the road is a concrete post marked S. Kona - Kau, designating the boundary.

The steel bar which supports the pipe pole and target was used as the station. From this station a rough road over lava, leads to Lae O Kamoi.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KAHAWAII (HTS)**
 ESTABLISHED BY: **L.C. Wilder** YEAR: **1948** 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 was recovered in good condition. A complete description follows:

Station is located about 17 miles west-northwest of Naalehu and 21 miles south of Honaunau, at the South Kona-Kau boundary, on a low lava bluff on northeast side of State Highway 11 and at the southwest edge of the old highway, across this old road from the State Highway Base Yard.

To reach station from the post office in Naalehu, go west on State Highway 11 for 19.1 miles to track crossroad just after passing a Boundary sign up on bank on right. Turn right and go 100 yards to T-junction. Go right about 60 yards on old highway to station on right.

Station is the center of a 2-inch-diameter, steel shaft 2 feet long, mounted vertically on 3 iron legs at the center of a triangular, concrete platform 7 feet on each side. It is 32 feet southwest of center line of old road, about 280 feet northeast of State Highway 11, 14.6 feet south of telephone pole 370, and 40 feet north of a large eucalyptus tree. A red and white metal target 8 feet high is supported by the steel shaft.

(C.A.Burroughs,1973)--Station was recovered as described in 1967.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAHAWAII HTS**

STATE: **HAWAII**

YEAR: **1948**

SECOND

ORDER

SOURCE **G- 9279**

GEODETIC LATITUDE	19 07 49.409	ELEVATION	551.6 METERS
GEODETIC LONGITUDE	155 50 27.499		1744 FEET

STATE COORDINATES (Feet)

STATE & ZONE	CODE	X	Y	BIG Δ 0' ANGLE
HI 1	5101	382,306.44	107,985.61	- 0 06 42

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE β 10R Δ 0' FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KAMOI	51 17 27.8	51 24 10	5101

QE 156

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 Old Hawaiian Datum

QUAD 191553 STATION 1031
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NOAA FORM 76-39
 12-79
 FORMERLY CGS FORM 5283

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

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KAHOE
 NEAREST TOWN: Kealia
 CHIEF OF PARTY: GEH
 STATE: Hawaii
 COUNTY: Hawaii
 QUADRANGLE NO.: 191553
 YEAR: 1972
 DESCRIBED BY: JRP

SURFACE-STATION MARK, UNDERGROUND-STATION MARK	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	DISTANCE		DIRECTION ¹
		BEARING	FEET	
RM NO. 1		ENE	49.07'	14.955'
RM NO. 2		S	23.71'	7.230'

Station is located on a small lava knoll on the western coast of Hawaii Island, approximately 0.75 mile southeast of Kaula Point and about 5.6 miles south-southwest of Kealia. To reach station from Kealia, travel south on State Hwy. 11 to the Alae School, continue south for about 1.1 miles to the Pebble Beach Estates road on the right. Turn right and travel down the paved side road toward the beach for 0.9 mile to the station on the right. The station is on a small brush covered lava knoll, immediately below and across the road from a large level graded lookout area rising approximately 30 feet above the station.

Station is a standard triangulation disk stamped "KAHOE 1972" cemented in a drill hole atop a small lava knoll about six feet above road level. It is located approximately 40 feet north of the centerline of the road in a small clear area, near the highest point on the knoll.

Reference mark No. 1 is a standard disk cemented in a drill hole in a rock ledge about seven feet lower than the station. It is about 40 feet north of the centerline of the road and five feet lower than the level of the road at this point.

Reference mark No. 2 is a standard disk cemented in a drill hole in lava bedrock about five feet lower than the station. It is about 20 feet north of the centerline of the road and one foot above the level of the road at this point.

Reference mark No. 1 is stamped "NO. 1 1972"

Reference mark No. 2 is stamped "NO. 2 1972"

This station was located by intersection from HOOKENA, PUIWA, and WAIKAKOU 4.

Detailed description:

ADJUSTED HORIZONTAL CONTROL DATA

ADJUSTMENT BY NGS

NAME OF STATION: KAHOE
 STATE: HAWAII
 YEAR: 1972
 OBS BY NGS
 SECOND ORDER

SOURCE: G-14950

GEODETIC LATITUDE: 19° 19' 02.50506	ELEVATION: 1 METERS
GEODETIC LONGITUDE: 155 53 12.47149	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ (OR Δ) ANGLE ²
HI 1	5101	366,639.49	175,916.47	- 0° 07' 41"

² PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ (OR Δ) FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH ² (From south)	CODE
THESE DATA OBTAINED FROM ADJUSTMENT OF SEP 1979			

RL 184

¹ Refers to notes in manuals of triangulation and state publications of triangulation. ² Direction-angle measured clockwise, referred to initial station
³ To nearest meter only, when no trigonometric leveling is being done.
 * U. S. GOVERNMENT PRINTING OFFICE: 1971-780-03

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 151553 STATION 1032
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1,5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAHOLO FLAG

STATE: HAWAII

YEAR 1884

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	19° 20' 24.243	ELEVATION	METERS
GEODETIC LONGITUDE:	155 53 09.003		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ OR ANGLE*
HI 1	5101	366,990.06	184,161.07	- 0° 07' 40"

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

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

QO 279

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191555 STATION 1033
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 535
 REV. AUG. 1965

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAHUKU N. W. BASE** STATE: **HAWAII** COUNTY: **HAWAII** **KAU DISTRICT**

CHIEF OF PARTY: **L. C. WILDER** YEAR: **1949** Described by: **G. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE 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	HEIGHT OF LIGHT ABOVE STATION MARK METERS.
10	Surface-station mark, Underground-station mark		
		OBJECT	DIRECTION:
		BEARING	DISTANCE
			feet meters
			0 00 00
12c		KAHUKU S E BASE	
		R M 2	57.490 17.523 65 39 05
12c		R M 1	58.669 17.883 155 08 54
12c		Azimuth mark	0.2 mile 183 45 54.1

The station is located about 7 miles east northeast of Kauna Point, about 7 miles northwest of the Kahuku Ranch headquarters, about 0.7 mile southeast of the 1907 lava flow, 39 feet south of the centerline of a paved road, 57.8 feet northwest of telephone pole number 253, 11 feet southwest of a rock wall and about 5 feet higher than the paved road.

To reach from the schoolhouse and church in the village of Waiohinu; go west and north on the road which leads toward Captain Cook for 12.3 miles to the station on the left hand side of the road.

The station is a standard disk, stamped KAHUKU N W BASE 1948, set in the top of an irregular mass of concrete which is about flush with the surface of the ground.

Reference mark number 1 is a standard disk, stamped, R. M. 1 1948, set into a drill hole in a boulder which projects about 3 feet and is located 62 feet southwest of the highway and about 5 feet higher than the station.

Reference mark number 2 is a standard disk, stamped, R. M. 2 1948, set into a drill hole in a boulder which projects about 3 feet and is about the same elevation as the station. A large tree lies on line between the disk and the station.

A rock cairn with black and white pole plumbed over the mark has been built over this station 4/7/49.

* Refer to notes in manuals of triangulation and state publications of triangulation.
 † To nearest meter only, when no trigonometric leveling is being done.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAHUKU NORTHWEST BASE**
 STATE: **HAWAII** YEAR: **1948** **SECOND** ORDER

SOURCE: **G- 5279**

GEODETIC LATITUDE	19 05 14.479	ELEVATION	005.1 METERS
GEODETIC LONGITUDE	155 40 39.985		1985 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ or ANGLE*
HI 1	5101	404,095.62	52,518.92	- 0 05 27

* 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
AZIMUTH MARK 1948	113 36 07.9	113 41 35	5101
AZIMUTH MARK 1948	110 10 29.1	110 15 50	5101

QE 084

(continued on next page)

HORIZONTAL CONTROL DATA

QUAD 191553 STATION 1033

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KAHUKU N.W. BASE (continued)

FORM 52
 (2-15-65)

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

R

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAHUKU N.W. BASE
 ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.9 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	
NA PUU A PELE -----1948	DISTANCE and DIRECTION			00 00 00.0
R.M. No. 1	W	58.669	17.883	32 36 08
R.M. No. 2	S	57.490	17.523	303 06 19
NA PUU A PELE (HGS) 1891 -----1968	DISTANCE and DIRECTION			00 00 00.0
R.M. No. 1	W	58.617	17.867	32 35 28
Azimuth Mark	WNW	0.25 mile		57 47 29.4
R.M. No. 2	S	57.441	17.509	303 06 31

Station mark and both reference marks were recovered in good condition. A thorough search was made for the azimuth mark but it could not be found, and is believed destroyed. A new azimuth mark was established. A complete description follows:

Station is located about 9 miles west of Waiohinu and 8 miles southeast of the Honomalino Agriculture Co. Office, along southwest side of State Highway 11, across highway from power pole No. 380, on a rocky knoll with a stone fence along the northeast edge, and diagonally across the highway

from the Keaka Parkway entrance to the Hawaiian Ocean View Estates subdivision.

To reach station from the post office at Honaunau, go southerly on State Highway 11 for 24.6 miles to Manuka State Park; continue on the highway for 3.45 miles to junction with Hawaii Blvd. on left; continue on the highway for 0.1 mile to azimuth mark on right; continue on highway for 0.25 mile to station on right.

Station mark is a standard disk stamped "KAHUKU N W BASE 1948", set in a concrete mass 1 foot below general rock level; 37 feet southwest of centerline of highway, 59 feet west of telephone pole No. 253, 11 feet southwest of the stone fence, 3-1/2 feet northeast of a large ohia tree which is on line to RM No. 2, and 193 feet west-southwest of the intersection of State Highway 11 with Keaka Parkway.

Reference mark number one is a standard disk stamped "RM 1 1948", cemented in a drill hole in the top of a large, rough lava mound that projects 5 feet above ground. It is 33 feet southwest of the stone fence.

Reference mark number two is a standard disk stamped "RM 2 1948", cemented in a drill hole in a boulder that projects 2 feet above ground.

Azimuth mark is a standard disk stamped "KAHUKU NW BASE 1948 1968", cemented in a drill hole in a bedrock outcrop in the middle of a stone fence up on a cutbank, across highway from power pole No. 376, 23 feet southwest of center line of highway, 90 feet southeast of telephone pole No. 259, 15 feet northeast of a large, 3-foot ohia tree, and about 8 feet higher than highway. NOTE: The large ohia tree is the first large tree northwest along highway from station.

*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.

USCOMMA-DC 27173-P89

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1034
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1,5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 535
 Rev. Aug. 1968

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAHUKU S. E. BASE** STATE: **HAWAII** COUNTY: **HAWAII**

KAU DISTRICT
HAWAII

CHIEF OF PARTY: **L. C. WILDER** YEAR: **1949**

Described by: **G. J. HOEPEL**

NOTE: HEIGHT OF TELESCOPE ABOVE STATION MARK **5.2** METERS.1 HEIGHT OF LIGHT ABOVE STATION MARK METERS.

10	Surface-station mark, Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	BEARING	DISTANCE		DIRECTION:		
				feet	meters	0	1	2
		AKIHI (metal target)	S	32.189	9.812	00	00	00
120	R M 1					110	28	41
120	R M 2		N	23.029	7.020	296	56	44
		PUU O KAMAQA (metal target)				225	52	50.5

The station is located on a lava bed about 8 miles west of the village of Waiohinu, about 6 miles northeast of the sea, about 3.5 miles west northwest of the Kahuku Ranch, about 150 feet woutheast of a rock crusher, about 80 feet north of the road which runs between Captain Cook and Waiohinu, 29.6 feet northwest of telephone pole number 187, 24 feet southeast of a 1 inch pipe set in concrete and 5 feet east of a pipe line.

To reach from the old school house and church in the village of Waiohinu; go west and north, on the road which leads toward Captain Cook, for 8.8 miles to the station on the right hand side of the road.

The station is a standard disk, stamped KAHUKU S E BASE 1948, set in the top of an irregular mass of concrete which is flush with the surrounding rock.

Reference mark number 1 is a standard disk, stamped KAHUKU S E BASE NO 1 1948, set into a drill hole in a boulder which projects about 2 feet and is about the same elevation as the station.

Reference mark number 2 is a standard disk, stamped KAHUKU S E BASE NO 2 1948, set into a drill hole in a boulder which projects about 3 feet and is about 3 feet higher than the station. It is located 1 foot south of a 1 inch pipe which projects 1 foot from the top of a mound of cement.

A rock cairn with black and white pole plumbed over the station has been built over the station 4/7/49.

* Refer to notes in manuals of triangulation and state publications of triangulation. 1 Direction-angle measured clockwise, referred to initial station.
 1 To nearest meter only, when the trigonometric leveling is being done. 10-6020-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAHUKU SOUTHEAST BASE**

STATE: **HAWAII**

YEAR: **1948**

SECOND ORDER

SOURCE: **G- 5275**

GEODETIC LATITUDE: 19 04 16.724	ELEVATION: 606.3 METERS
GEODETIC LONGITUDE: 155 43 51.684	1989 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ HOR Δ ANGLE*
HI 1	5101	420,229.38	86,465.66	- 0 04 32

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
UMIS AHU	338 24 34.2	338 29 06	5101

POSITION DETERMINED BY TRAVERSE FROM STATION KAHUKU NW BASE
 AND CHECKED BY ADDITIONAL OBSERVATIONS

QE 085

JUN 1978

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

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553

STATION 1034

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

KAHUKU SOUTHEAST BASE (continued)

FORM 526a
(2-14-63)U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

R

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAHUKU S.E. BASE
ESTABLISHED BY: L.C. Wilder YEAR: 1949 STATE: Hawaii
RECOVERED BY: D.M. Whipp YEAR: 1967 COUNTY: Hawaii
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.54 METERS, HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
UMIS AHU (HGS) 1887----		DISTANCE and DIRECTION ----		00 00 00.0
RM 1	S	32.189	9.812	16 10 10
PUU O KAMAOKA				131 34 19.3
RM 2	N	23.029	7.020	202 38 13
UMIS AHU (HGS) 1887----		DISTANCE and DIRECTION ----		00 00 00.0
RM No. 1	S	32.245	9.828	16 05 20
PUU O KAMAOKA (HTS) 1948	WNW			131 34 22.2
RM No. 2	N	23.000	7.011	202 37 53

Station was recovered and all marks found in good condition, however slight discrepancies in distance and angle to R.M. No. 1 were noted. A complete description follows:

Station is located about 9 miles west of Naalehu, along the northeast side of State Highway 11, at about 1989 feet elevation, on a lava hill that sets in a jog in the highway, where it rounds the left side of the hill. To reach station from the Post Office in Naalehu, go west on State

Highway 11 for 5.7 miles to junction with South Point Road. Continue on the highway for 4.7 miles to station on right.

Station mark is a standard disk stamped "KAHUKU S E BASE 1948", set in the top of a 10-inch-diameter, concrete monument that projects 2 inches above ground. It is 55.7 feet southwest of power pole 431, 29.5 feet north of telephone pole 187, and 4.3 feet south of a 1-inch iron pipe projecting 4 inches from a 16-inch-diameter, concrete mass in which the letters "P.O.T." are inscribed.

Reference mark number one is a standard disk stamped "KAHUKU S E BASE 1948", cemented in a drill hole in a triangular-shaped, 3-foot bedrock outcrop projecting 18 inches above ground. It is 4 feet southeast of telephone pole 187 and 0.6 foot lower than station mark.

Reference mark number two is a standard disk stamped "KAHUKU SE BASE NO 2 1948", cemented in a drill hole in a bedrock ledge. It is 1 foot south of a 1-inch iron pipe cemented in the ledge, and is 3.8 feet higher than 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.

USCOM&DC 2717a-P88

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1035
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-15 HAWAII

NO ORIGINAL TEXT

Kaiholena (Hawaii Island, Hawaiian Government Survey, 1897; E. R. Hand, 1914).—In the southern part of Hawaii, in central Ka-u, on the summit of Kaiholena Mountain, a steep, sharp-ridged, wooded hogback, behind Puu Enuhe and Makanau Hill. Marked by a triangle cut in a large stone, and three logs planted vertically in the ground as an instrument support, and covered with a pile of hapuu logs, 18 feet in diameter. Not searched for in 1914, when part of above description was written.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM NO. 508
 (Rev. Feb. 1963)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAIHOLENA
 ESTABLISHED BY: H.G.S. YEAR: 1897 STATE: Hawaii
 RECOVERED BY: L.C. Wilder YEAR: 1949 COUNTY: Hawaii

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

After the position of the new station KAIHOLENA 2 was calculated, a tie was figured to the old station which was found by roughly tapping thru the heavy underbrush. The old mark is a Δ triangle and drill hole cut in stone set in ground.

Due to the difficulty of reaching the station and clearing the heavy underbrush between the stations, the old station was not tied in by traverse to the new station KAIHOLENA 2.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAIHOLENA

STATE: HAWAII

YEAR: 1897

THIRD

—ORDER

SOURCE: G-SP15c

GEODETIC LATITUDE:	19 10 42.605	ELEVATION:	1161	METERS
GEODETIC LONGITUDE:	155 35 00.182	SCALED		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ρ OR Δ OR ANGLE*
HI 1	5101	471,226.78	125,548.26	- 0 01 35

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

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

* 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.
 U. S. GOVERNMENT PRINTING OFFICE NOTE.—One of these forms must be used for every station recovered.

HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

191553 STATION 1036
HAWAII
LATITUDE 19° 00' TO 19° 30'
LONGITUDE 155° 50' TO 156° 00'
DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 832
Rev. Aug. 1965

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAIHOLENA 2** STATE: **HAWAII** COUNTY: **KAU DISTRICT HAWAII**

CHIEF OF PARTY: **L. C. WILDER** YEAR: **1949** Described by: **G. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK 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	DIRECTION‡
4	1.8				
pipe					
pipe					

The station is located near the summit of a prominent, wooded knoll which lies about 8 miles north of Naalehu, about 7 miles west of Pahala, about 6.5 miles north northwest of Honuapo and about 0.7 mile east of the Hilea Gulch. The highest ground on the knoll lies about 200 yards to the northwest of the station.

To reach from the post office at Naalehu; go north and east, on the good cinder road for 6.7 miles to a point where the road crosses over the Hilea Gulch Creek and the end of truck travel. From this point pack northwesterly, up the creek bed, for about 3.0 miles to a point where the creek runs near a long north-south spur ridge; leave the creek bed and out your way through the dense jungle growth, northerly, for about 0.1 mile to the foot of the spur ridge; thence up the ridge for about 1.0 mile to the summit of the hill. From this point pack southerly, down the long hog back, for about 300 yards to the station. Considerable clearing was done at this station and may aid in future recovery. Water may be obtained from a spring which is located about 100 feet west of the highest ground. This is about a 5 hour pack with a clear trail and about 10 hours if clearing is necessary. The ground at the station site is soft and muddy and floor boards will be necessary for observing.

The station is a standard disk, stamped KAIHOLENA 2 1949, set into a drill hole in a buried boulder which is about 1 inch below the surface of the ground.

Reference mark number 1 is a standard disk, stamped KAIHOLENA 2 R M NO 1 1949, set in the top of a 2 inch pipe which projects about 6 inches and is about 1 foot lower than the station.

Reference mark number 2 is a standard disk, stamped KAIHOLENA 1 R M NO 2 1949, set in the top of a 2 inch pipe which projects about 6 inches and is about 2 feet higher than the station.

* Reference notes in manual of triangulation and state pub'ications of triangulation.
† Telescopic level only, when no trigonometric leveling - using dunn.

‡ Direction-angle measured clockwise, referred to initial meridian.
16-50392-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

ADJUSTMENT BY NGS

NAME OF STATION: **KAIHOLENA 2** OBS BY CGS
STATE: **HAWAII** YEAR: **1949** SECOND ORDER
SOURCE: **S- 9279**

GEODETIC LATITUDE: 19 30 32.9860U	ELEVATION: 1136.1 METERS
GEODETIC LONGITUDE: 155 34 56.7570J	3727 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ or ANGLE*
HI 1	5101	471,554.62	124,377.82	- 0° 01' 38"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
PUU ULAULA HTS	257° 38' 12.9"	257° 39' 50"	5101

THESE DATA ARE OBTAINED FROM ADJUSTMENT OF 1951

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1036
 LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KAIHOLENA 2 (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAIHOLENA 2
 ESTABLISHED BY: L.C. Wilder YEAR: 1949 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:

Station was recovered and all marks found in good condition, although the station mark was under an 8-inch cover of dirt, moss, and hapuu. The distance to reference marks was checked and found correct. A complete description follows:

Station is located about 8 miles north of Naalehu and 6-1/2 miles north-northwest of the sugar mill at Honuapo on a prominent, wooded, steep-sided hill of about 4000 feet elevation, known as Kaiholena. The hill has a large, diamond-shaped, rather flat top, with the highest point being near the northwest end; the station is at about 3725 feet elevation, on the southeast point, about 1000 feet southeast from the highest point, and where this southeast point becomes very narrow, just before steep drop down to southeast.

To reach station from the post office in Naalehu, go northeast on State Highway 11 for 3.4 miles to fork at Honuapo bridge, 0.1 mile before reaching sugar mill. Take left fork and go uphill for 3.1 miles. Take right fork and go 0.55 mile; take left fork and go northwest 1.9 miles; take left fork, leaving main road, and go 0.3 mile on cane-field road; take side road left, following cane road around base of station hill, for 0.7 mile to side road right, at end of cane-field. Turn right and go 0.75 mile to end of truck travel at old T-junction. Pack northerly on old road about 3/4-mile to saddle, then go right, southeast, up narrow ridge to top of hill and continue southeast about 1000 feet to station. About a 3-hour pack.

Station mark is a standard disk stamped "KAIHOLENA 2 1949", cemented in a drill hole in a 7-inch boulder flush with ground. It is 40 feet southwest of a large ohia tree that was chopped off in 1949, and 20 feet southeast of a 16-inch ohia tree.

Reference mark number one is a standard disk stamped "KAIHOLENA 2 RM NO 1 1949", set in the top of a 2-inch pipe that projects 1 foot from ground, and is 1 foot lower than station mark. It is 3.860 m (12.662 ft.) from station, in azimuth 12° 09' 26".

Reference mark number two is a standard disk stamped "KAIHOLENA 2 RM NO 2 1949", set in the top of a 2-inch pipe that projects 1 foot from ground, and is about 2 feet higher than station mark. It is 4.108 m (13.479 ft.) from station, in azimuth 141° 21' 32".

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAIHOLENA 2
 ESTABLISHED BY: L.C.W. YEAR: 1949 STATE: Hawaii BENCH MARK ALSO
 RECOVERED BY: L.A. Critchlow YEAR: 1977 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 7 West of Pahala.
 HEIGHT OF TELESCOPE ABOVE STATION MARK 4 FEET. HEIGHT OF LIGHT ABOVE STATION MARK 4 FEET.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
PUD ULAULA HTS 1914				00 00 00.0
RM 1	SSW	12.785	3.897	114 16 08
RM 2	WNW	13.385	4.081	243 14 09
PAHALA KAU SUGAR CO STACK	E	about 7	miles	358 27 27.6
RM 1 to RM 2		23.61	7.196	

The station mark and reference marks 1 and 2 were recovered. The reference marks are a little loose in the ground. The distance to reference mark 1 was found longer by 0.037 meter and the direction was found smaller by 15 minutes and 05 seconds. The distance to reference mark 2 was found shorter by 0.027 meter and the direction was found smaller by 29 minutes and 10 seconds.

The station was reached at this time by helicopter. It can be walked to by following the 1968 recovery note.

* 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.

JUN 1976
 U. S. DEPARTMENT OF COMMERCE
 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
 NATIONAL OCEAN SURVEY, NATIONAL GEODETIC SURVEY

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1037
 HAWAII
 LATITUDE 19° 03' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALAMA UMI

STATE: HAWAII

YEAR: 1913

THIRD

ORDER

SOURCE: G-SP156

GEODETIC LATITUDE:	19° 29' 25.776	ELEVATION:	METERS
GEODETIC LONGITUDE:	155° 53' 52.157		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ρ OR Δ ANGLE*
HI 1	5101	362,983.70	238,798.27	- 0° 07' 58"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From ρ or Δ)	PLANE AZIMUTH* (From ρ or Δ)	CODE

QQ 265

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1038
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO ORIGINAL TEXT

Kalapa (Hawaii Island, Hawaiian Government Survey, 1884: E. R. Hand, 1928).—In Kona, on highest part of prominent hill in Keokea called Kalapa, about 1,200 feet "mauka" (inland) from the government road, and immediately north of the big buildings of the Kona Tobacco Co. The sea gable of packing house bears S. 15° W., distant about 300 meters; the boarding house bears S. 3° E., about 300 meters; the nearer of two "mauka" (inland) drying barns bears S. 80° E., about 320 meters. In 1928 station was recovered. Reported difficult because top of hill heavily overgrown with guava and other bushes. The Kona Tobacco Co. is no longer operating, and the whole place has a run-down appearance. Station marked by 1½-inch iron pipe set upright in a truncated pyramid of concrete, with the legend "Kalapa, 1921, JBM, Primary" scratched thereon. In 1913 two of the four original reference marks were recovered; they were crosses cut in stones, 3.25 feet to the north, and 3.47 feet to the south of the station.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 539

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KALAPA**
 ESTABLISHED BY: **Hawaiian Govt.** YEAR: **1884** STATE: **HAWAII**
 RECOVERED BY: **L. C. Wilder** YEAR: **1948** COUNTY: **HAWAII**

R

Detailed statement as to the fitness of the original description: **The station was recovered, in good condition, as described in the 1928 description. A new description follows—**

The station is located on the summit of a brush covered knoll, named Puu Kalapa, which lies about 5 miles southeast of Napoopoo, about 2 miles east of Honaunau Bay, about 1200 feet east of the highway which runs between Captain Cook and Waiohinu, about 100 yards north of a coffee plantation and about 200 feet south of a gravel pit.

To reach from the post office at Honaunau; go south on the road which leads toward Waiohinu for 1.65 miles; turn left, onto a graded road, and go easterly for 0.5 mile to a T road intersection; continue straight ahead, northerly, for 0.2 mile to a small gravel pit and the end of truck travel. From this point pack southwest for about 200 feet to the high ground and the station.

The station is the center of a 2 1/2 inch iron pipe (plumbed over the old mark) which projects about 3 feet from the top of a square concrete platform which is about 6 feet on each side and projects about 18 inches.

Reference mark number 1 (established in 1948) is a standard disk stamped KALAPA NO 1 1948, set into a drill hole in a boulder which projects about 2 feet on its north side and is flush on the south.

Reference mark number 2 (established in 1948) is a standard disk, stamped KALAPA NO 2 1948, set into a drill hole in a boulder which is about 2 feet in diameter and projects about 2 feet. It is located about 2 feet lower than the station.

Objects	Distance	Direction
LAE LOA		
R. M. No. 1 N	6.549 ft	00 00 00
R. M. No. 2 ESE	9.078 ft	156 41 *
		234 00 41

* Too close to focus

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KALAPA**
 STATE: **HAWAII** YEAR: **1884** SECOND ORDER
 SOURCE: **G- 9279**

GEODETTIC LATITUDE:	19 25 18.035	ELEVATION:	367.2 METERS
GEODETTIC LONGITUDE:	155 52 46.902		1270 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	# OR Δ @ ANGLE *
HI 1	5101	369,171.64	213,792.87	- 0 07 35

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

TO STATION OR OBJECT	GEODETTIC AZIMUTH (From south)	PLANE AZIMUTH * (From south)	CODE
LAE LOA	56 56 02.4	57 03 37	5101

QE 067

(continued on next page)

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553 STATION 1038

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

KALAPA (continued)

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KALAPA
ESTABLISHED BY: HGS YEAR: 1884 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:

Station mark was recovered in good condition. Both reference marks have been destroyed by clearing of the land for cultivation, and for this reason no new ones were set. A complete description follows:

Station is located about 1-1/2 miles south of the post office at Honaunau and 1400 feet northeast of the junction of State Highways 11 and 16, at about 1270 feet elevation, on an open, grassy hill at west end of a ridge and macadamia orchard. There is a wide, flat, bulldozed area about 50 yards west from station and about 30 feet lower.

To reach station from the post office at Honaunau, go south on State Highway 11 for 1.4 miles to board gate on left, by power pole No. 313. Go through gate and follow track road upgrade for 0.2 mile to fork; take right fork and go 0.1 mile to fence and end of truck travel. Pack south-erly along old road about 250 yards to station.

Station is marked by a 1-inch iron pipe set in concrete, down inside a 6 x 30-inch recess in the center of a 6-foot-square, concrete platform. A concrete pier, 2 feet high, with a 2-1/2-inch pipe through the middle, is centered over the mark, and supports a red and white metal target.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KALAPA
ESTABLISHED BY: HGS YEAR: 1884 STATE: Hawaii BENCH MARK(S) ALSO
RECOVERED BY: GEH YEAR: 1972 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 1.5 miles south-southeast of Honaunau

Detailed statement as to the fitness of the original description; including marks found, stampings, changes made, and other pertinent facts:
Station found as described in 1968 recovery note in good condition.

A much easier route to the station is the following:

To reach station from the post office at Honaunau, go south on State Route 11 for 1.6 miles and turn left on stone road opposite power pole No. 317. There is a stone wall on each side of the road. Go up the stone road for 0.2 mile and take the left fork. Continue up the left fork for 0.3 mile and the station is clearly visible on the grassy hill to the right.

Also, from the junction of State Route 11 and State Route 16 go north on S.R. 11 for 0.2 mile and turn right on the above mentioned stone road opposite power pole No. 317.

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1039
 HAWAII
 LATITUDE 19° 00' TO 15° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO TEXT

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALIHI

STATE: HAWAII

YEAR: 1914

THIRD

ORDER

SOURCE: G-SP156

NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	19° 08' 18.81	ELEVATION:	METERS
GEODETIC LONGITUDE:	155° 50' 44.41		FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE*
HI 1	5101	360,650.85	110,554.55	- 0 06 48

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

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

QD 283

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 151553 STATION 1040
 HAWAII
 LATITUDE 15° 00' TO 15° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO ORIGINAL TEXT

Kalua o Lapauwila (Hawaii Island, Hawaiian Government Survey, 1884; E. R. Hand, 1913).—On western coast of Hawaii, Kona District, on the rim of the crater which is directly on the coast 5½ miles south of Hookena. No other formation along the coast similar to this except at Puu Ohau, many miles to the north. It shows up as a crescent, steep-sided, and open toward the sea. The original station mark, an iron bolt, was not found in 1913, apparently having been destroyed by a slide. There was recovered a stone marked with drill hole and triangle set in the cinders very close to a recent slide. The position of this stone checked out with that of the triangulation station as closely as plane table tests would permit, showing it to be of sufficient accuracy for topographic and hydrographic work, but not for triangulation.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KALUA O LAPAUWILA
 STATE: HAWAII YEAR: 1884 THIRD ORDER
 SOURCE: G-SP156

GEODETIC LATITUDE	15 18 14.740	ELEVATION:	27 METERS
GEODETIC LONGITUDE	155 53 29.783	SCALED	FEET

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KALUA O LAPAUWILA
 ESTABLISHED BY: H.G.S. YEAR: 1884 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:

Station was recovered, however no check was made on it's position. Located about 8 miles north of Milolii and 5-1/2 miles south of Hookena, near sea, at Auau Point, on the northwest rim of an old crater, and about 1 mile south of a macadam road coming down from the highway.

To reach station from the post office at Honaunau, go south on State Highway 11 for 8.6 miles to the middle lava flow of 1950; continue on the highway for 0.5 mile to a macadam side road right, at power pole No. 93. Turn right and go down steep road for 1.2 miles to end of road at sea. Pack south along coast for about 1 mile to station on northwest rim of the crater.

Station is marked by a 1-inch-square hole in the center of a 6-inch chiseled triangle in the center of a smooth, oval-shaped, 1 x 2-foot stone projecting 2 inches from ground.

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ IOR Δ θ ANGLE*
HI 1	5101	364,970.62	171,101.50	- 0 07 46

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ IOR Δ θ 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 151553 STATION 1041
 HAWAII
 LATITUDE 16° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 535
 Rev. Aug. 1968

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAMOI** STATE: **HAWAII** COUNTY: **HAWAII** **KAU DISTRICT**

CHIEF OF PARTY: **L. C. WILDER** YEAR: **1948** Described by: **G. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK Surface-station mark, Underground-station mark	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION	HEIGHT OF LIGHT ABOVE STATION MARK		METERS.		
			feet	meters	0	1	2
		OBJECT	BEARING				
12a		HANAKEAUMOE			00	00	00
		R M 2	NE	45.078	13.740	67	18 52
12c		R M 1	NW	42.225	12.871	345	59 24
		KAHAWAI (metal target)				64	59 12.0

The station is located about 8 miles south of Milolii, about 0.2 mile south of the Kau and South Kona Districts, about 250 yards east of the beach, about 200 yards east of a small shack and about 200 yards south of a graded road.

To reach from the school house and church, in the village of Waiohinu; to northerly, on the road which leads toward Captain Cook, for 19.7 miles to triangulation station KAHAWAI: turn left, onto a very poor graded road, and go westerly, down grade, for 6.4 miles to the end of the road at a small cove and two old fishing shacks. From this point pack easterly for about 200 yards to a low lava mound and the station.

The station is a standard disk, stamped KAMOI 1948, set into a drill hole in a flat rock which is cemented to small rocks which form a low mound on the lava bed.

Reference mark number 1 is a standard disk, stamped NO 1, set into a drill hole in the vertical face of a boulder which is about 10 feet in diameter and projects about 5 feet. The arrow on the disk points straight down, into the ground. It is located about 6 feet lower than the station.

Reference mark number 2 is a standard disk, stamped NO 2, set into a crevice in a boulder which is about 3 feet in diameter and projects about 4 feet. It is located about 5 feet lower than the station.

A 8½ x 8½ black and white pole has been plumbed over this station and a cairn of rocks built around the pole.

* Refer to notes in manuals of triangulation and state publications of triangulation. † Direction-angle measured clockwise, referred to initial station.
 ‡ To nearest meter only, when no trigonometric leveling is being done. 16-60802-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAMOI**
 STATE: **HAWAII** YEAR: **1948** SECOND ORDER

SOURCE: **G- 9275**

GEODETIC LATITUDE: 19° 04' 57.581	ELEVATION: 15.7 METERS
GEODETIC LONGITUDE: 155 54 12.952	52 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ or ANGLE °
HI 1	5101	360,649.60	90,698.85	- 0 07 55

* 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
HANAKEAUMOE	166 17 01.6	166 24 57	5101

QE 080

HORIZONTAL CONTROL DATA

QUAD 191553 STATION 1041

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KAMOI (continued)

FORM 574-
 10-18-61

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

R

NAME OF STATION: KAMOI
 ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.62 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
HANAKEAUMOE -----1948		DISTANCE and DIRECTION---		00 00 00.0
R.M. 2	NE	45.078	13.740	67 18 52
R.M. 1	NNW	42.225	12.871	345 59 24
HANAKEAUMOE (HGS) 1890 ----1968		DISTANCE and DIRECTION---		00 00 00.0
R.M. No. 2	NE	42.255	12.880	67 22 52
R.M. No. 1	NW	44.956	13.703	345 59 54

Station was recovered and all marks found in good condition, however the distances to the reference marks were transposed and listed under the wrong mark in the 1948 description; the listing in the 1968 part of the above data is correct. A complete description follows:

Station is located about 7-1/2 miles south of Milolii, at Kamoi Point, about 500 feet northeast of the north tip of Manuka Bay, in rough lava area, on a 10-foot-diameter rock mound that projects about 8 feet above the general lava level, and is at about 52 feet elevation.

To reach station from the post office at Honaunau, go southerly on

State Highway 11 for 23.1 miles to gravel crossroad between power poles 301 and 302, and a locked gate on right. (Key was obtained from Mr. Goro Inaba at Holiualoa). Pass through gate and go southwest 0.6 mile to a Navy building; continue on the rough track road for 2.8 miles to fork with locked gate on left fork, (use same key). Pass through gate and go 2.1 miles to a fork about 1/2-mile from sea. Take left fork and go 0.65 mile to old shack at Manuka Bay, and end of truck travel. Walk northeast about 500 feet to station on high point.

Station mark is a standard disk stamped "KAMOI 1948", cemented in a drill hole in bedrock. There is a large, wooden, hydro-signal setting 12 feet east from station.

Reference mark number one is a standard disk stamped "NO 1", cemented in a drill hole, nearly vertically, on the south face of a rounded, lava formation, about 3 feet above ground level and 6.9 feet lower than station mark.

Reference mark number two is a standard disk stamped "NO 2", cemented in a drill hole in the top of a 3-foot-square rock outcrop that projects 3 feet above ground, and is about 4 feet lower than station mark.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAMOI
 ESTABLISHED BY: L. C. WILDER YEAR: 1948 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: C. A. Burroughs YEAR: 1973 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

Triangulation station and reference marks were recovered as described and all marks were found in good condition.

To reach station from seaward, proceed into northeast corner of Manuka Bay and head toward junction of dark rough lava flow and light colored coral and sand beach. The station mark is approximately 600 feet northeast of this junction.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151553 STATION 1042
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-15 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 535
 Rev. Aug. 1965

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAPUA** STATE: **HAWAII** COUNTY: **HAWAII** DISTRICT: **SOUTH KONA**

CHIEF OF PARTY: **L. G. WILDER** YEAR: **1948** Described by: **G. J. HOEPEL**
 NOTE: HEIGHT OF TELESCOPE ABOVE STATION MARK **6.4** METERS.1 HEIGHT OF LIGHT ABOVE STATION MARK METERS.

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION			
		OBJECT	BEARING	DISTANCE	
			feet	meters	° ' "
1c	Surface-station mark, Underground-station mark				
12c		NA PUU A PELE			00 00 00
12c		R M 1	45.230	13.786	125 25
12c		R M 2	35.283	10.755	179 26
		KAUNA PT. LIGHT			12 51 02.4

The station is located about 5 miles southeast of Milolii, about 4 miles east of Okee Bay, about 0.2 mile west of the highway which runs between Captain Cook and Naalehu and on a steep side hill which is covered with a dense growth of trees and brush. Higher elevation to the eastward.

To reach from the schoolhouse in Waiohina; go west and north on the road which leads toward Captain Cook for 4 miles; continue straight ahead, west and north, toward Captain Cook for 15.1 mile to a covered water tank and the end of truck travel. From this point pack westerly for about 0.2 mile to the station.

The station is a standard disk, stamped, KAPUA 1948, set into an irregular mass of concrete which projects about 3 inches.

Reference mark number 1 is a standard disk, stamped KAPUA NO 1 1948, set into a drill hole in a boulder which is about 1 foot in diameter and is lying on the top of the ground. It is located about 6 feet lower than the station.

Reference mark number 2 is a standard disk, stamped KAPUA NO 2 1948, set into a drill hole in a large boulder which projects about 5 feet and is located about 5 feet higher than the station.

Na Puu a Pele and Kauna Pt. Light can be seen from the ground with a little clearing of small trees.

A 2½ x 2½ black and white pole has been plumbed over this station and a cairn of rocks built around the pole.

* Refer to notes in manuals of triangulation and state publications of triangulation. † Direction-angle measured clockwise, referred to initial station.
 (To nearest meter only, when no trigonometric leveling is being done.)

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAPUA**

STATE: **HAWAII**

YEAR: **1948**

ORDER: **SECOND**

SOURCE: **G- 9275**

GEODETIC LATITUDE: 19 08 39.341	ELEVATION: 457.7 METERS
GEODETIC LONGITUDE: 155 51 10.222	1633 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ ϕ ANGLE*
HI 1	5101	378,220.25	113,030.52	- U 06 57

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
AZIMUTH MARK 1968	300 22 32.9	300 25 25	5101

QE 076

JUN 1978

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

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553

STATION 1042

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

KAPUA (continued)

FORM 526a
(9-12-66)

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAPUA
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
Island: Hawaii

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
NA PUU A PELE -----1948 R.M. No. 2	N	35.283	10.755	00 00 00.0 179 26
NA PUU A PELE (HGS) 1891----1968 R.M. No. 3	SW	10.033	3.059	00 00 00.0 44 01 57
R.M. No. 2	N	35.264	10.749	179 26 24
Azimuth Mark	ESE	About 0.3 mile		298 54 43.1

Station mark and RM No. 2 were recovered in good condition. RM No. 1 has been destroyed. A new reference mark and an azimuth mark were established and a witness post was set. A complete description follows:

Station is located about 5 miles southeast of Milolii, 2 miles southeast of the Honomalino Agriculture Co. Office, 800 feet southwest of State Highway 11 and power pole No. 285, and 550 feet southwest of old macadam road, at the southeast edge of a large, rectangular, ohia grove, at the northwest side of a large cleared field on a low rocky rise about 6 feet higher than the field.

To reach station from the post office at Honaunau, go southerly on State Highway 11 for 19.7 miles to right fork leading to the Honomalino Agriculture Co. Office; continue ahead on the highway for 1.9 miles to right fork at power pole 281. Take right fork and go parallel to the highway for 0.25 mile to southeast edge of the ohia grove, opposite power pole 285. Turn right and go across field for about 550 feet to station.

Station mark is a standard disk stamped "KAPUA 1948", set in the top of a 14-inch-diameter, concrete monument flush with ground, with a cairn built up over it, and is 2-1/2 feet east of a white witness post. Reference mark number two is a standard disk stamped "KAPUA NO 2 1948", cemented in a drill hole in the top of a 3-foot-square rock projecting 2 feet above ground, and is 5.2 feet higher than station mark.

Reference mark number three is a standard disk stamped "KAPUA 1948 NO 3 1968", cemented in a drill hole in a bedrock knob on the south edge of the station rise, and is 1.7 feet higher than station mark.

Azimuth mark is a standard disk stamped "KAPUA 1948 1968", cemented in a drill hole in a 12-inch, bedrock knob on a rock hump, located above a bedrock ledge cutbank along northeast side of the old macadam road, 49.5 feet north of telephone pole 392, 24.5 feet northeast of center line of road, 8 feet higher than road, 8 feet back from edge of cutbank, 12 feet south of a triangular blaze on a 10-inch ohia tree, about 35 yards southeast of a curve in the road, and 2 feet west of a cairn. NOTE: A 2-foot area around the mark has been capped with concrete and it looks like a concrete dome.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAPUA
ESTABLISHED BY: L. C. Wilder YEAR: 1948 STATE: Hawaii BENCH MARK(S) ALSO
RECOVERED BY: C. A. Burroughs YEAR: 1973 COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

Station mark and Reference marks 2 and 3 were recovered as described in 1968

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1043
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-15 HAWAII

NO ORIGINAL TEXT

Kapukawaa (Hawaii Island, Hawaiian Government Survey, 1884; E. R. Hand, 1913).—On west coast of Hawaii, South Kona District, 1,030 meters south of Hoopuloa Wharf, about 10 meters from the water, and just inshore from the "Kapukawaa Rock" out in the sea, and 152 meters west of the trail between Hoopalua and Milolii. Marked by three galvanized-iron bolts with circular heads set in drill holes in rock on "aa" (lava), and by four crosses cut in the rock, the lines connecting them diagonally intersecting at the station. A large cairn was erected over the station and painted white.

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 202

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KAPUKAWAA** STATE: **Hawaii** COUNTY: **Hawaii**
 ESTABLISHED BY: **H.G.S.** YEAR: **1884** LOCALITY: **Milolii, S. Kona Hawaii**
 RECOVERED BY: **Chas.L.Murray** YEAR: **1939**

Detailed statement as to the fitness of the original description:

Location of station: On seacoast about 700 feet north of Milolii wharf.

Old station mark found: 3 iron bolts in a rock over which was a pile of rocks. The bolts are practically rusted away.

New station mark: H.T.S. Type D-1 Monument (Triangular monument 7 1/2 feet on each side with 1 7/8 steel bar 2 feet long set on steel legs over the station mark which is left exposed to view. A standard metal target is set over the steel bar).

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 202

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KAPUKAWAA** STATE: **HAWAII** COUNTY: **HAWAII**
 ESTABLISHED BY: **Hawaiian Govt.** YEAR: **1884**
 RECOVERED BY: **L. C. Wilder** YEAR: **1948**

Detailed statement as to the fitness of the original description: The original station, three spikes, was recovered by the Hawaii Territory Survey in 1939. At the time of this survey, the station consists of a 1 1/2 inch iron bar which projects about 2 feet from the top of a triangular slab of concrete. Two reference marks were established. A new description follows--

The station is located about 0.2 mile north of the concrete wharf in the village of Milolii; about 150 yards west of the graded road, which leads to the wharf, about 50 yards southwest of the edge of the lava flow and about 30 feet east of the sea cliffs.

The station is a punch mark in the center of a 1 1/2 inch iron bar which projects about 2 feet from the top of a triangular slab of concrete which is about 6 feet on each side and projects about 1 foot above the "AA" lava bed.

Reference mark number 1 is a standard disk, stamped KAPUKAWAA 1 1948, set into a drill hole in a boulder which is about 8 feet in diameter and projects about 6 feet. It is located about 1 foot lower than the station.

Reference mark number 2 is a standard disk, stamped KAPUKAWAA 2 1948, set into a drill hole in a boulder which is flush with the ground and is about 6 feet lower than the station.

Object	Distance	Direction
KEEI S BASE		
R. M. 1 E	14.116 m	46.310 ft
R. M. 2 SSW	14.872 m	48.789 ft

A recovery note of the Hawaii Territory Survey, in 1939, states that the original three spikes were recovered and the 1 1/2 inch iron pipe installed over same.

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAPUKAWAA**
 STATE: **HAWAII** YEAR: **1884** SECOND ORDER
 SOURCE: **G- 9275**

GEODETIC LATITUDE:	19 11 25.269	ELEVATION:	13.5 METERS
GEODETIC LONGITUDE:	155 54 36.268		44 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	B OR Δ OR ANGLE*
HI 1	5101	358,505.13	125,811.42	- 0 08 05

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
LAE LOA	179 12 42.3	179 20 47	5101

QE 069

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1043

LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KAPUKAWAA (continued)

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

R

FORM 526
 (11-8-55)

NAME OF STATION: KAPUKAWAA
 ESTABLISHED BY: H.G.S. YEAR: 1884 STATE: Hawaii
 RECOVERED BY: R.E.A. YEAR: 1961 COUNTY: Hawaii

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 excellent condition. First-Order astronomic observations were performed at this station in advance of future Hiran measurements. The station is a rough 150 yard walk over lava from the road.
 The 1948 station description is adequate.

FORM 526a
 (6-18-59)

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

R

NAME OF STATION: KAPUKAWAA
 ESTABLISHED BY: HGS YEAR: 1884 STATE: Hawaii
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION				
LAE LOA (HGS) 1884 -----1948		DISTANCE and DIRECTION-----		00 00 00.0
R.M. No. 1	E	46.310	14.116	84 44 52
R.M. No. 2	SSW	48.789	14.872	206 19 45
LAE LOA (HGS) 1884 -----1968		DISTANCE and DIRECTION-----		00 00 00.0
R.M. No. 1	ENE	46.183	14.077	84 42 09
MILOLII 1913				93 30 08.7
R.M. No. 2	S	48.785	14.867	206 19 59
Milolii Point, light	SW	277.420	(84.558)	242 26 51.7

Station was recovered and the concrete platform found becoming undermined due to wind erosion; a cribbing of stones and concrete was built around base of platform to prevent further erosion. Both reference marks were found in good condition, however a discrepancy was noted in the distance to RM No.1, and the 1948 distance was found to be slope distance. There is now a navigation light, established in 1965, out on the point southwest from station. A complete description follows:
 Station is located along southwest coast of the island, at Milolii

village, at Kapukawaiki Point.

To reach station from the post office at Honaunau, go south on State Highway 11 for 16.8 miles to side road right and sign "MILOLII". Turn right and go downgrade 4.8 miles to side road right, at power pole No. 66, between two houses at Milolii. Go right, toward sea, for 100 yards to station on rise to right.

Station mark is a punch mark in the center of a 1-3/4-inch iron shaft 2 feet long, mounted vertically on 3 iron legs over a 3-inch hole in the center of a triangular, concrete platform 7 feet on each side. It is just above east point of small cove, at 44 feet elevation, 15 yards north of bulldozed road, 125 yards west of row of houses. A red and white metal target is mounted on the iron shaft. NOTE: The original station mark could not be inspected due to small size of hole in platform and the iron legs obstructing it.

Reference mark number one is a standard disk stamped "KAPUKAWAA 1 1948", cemented in a drill hole in a large round lava knob 10 feet in diameter and projecting 5 feet above ground. It is 3 feet lower than top of station pipe.

Reference mark number two is a standard disk stamped "KAPUKAWAA 2 1948", cemented in a drill hole in bedrock outcrop near edge of bluff and about 6 feet lower than top of station pipe.

Milolii Point light consists of a white, 7-inch-diameter, iron pipe 16 feet tall, with a 4 x 4-foot steel platform on top. A white light, mounted on a 4-inch iron pipe 4-1/2 feet above the platform, is offset from center of platform, on seaward edge of platform. A small white booth sets at north side of light base.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAPUKAWAA
 ESTABLISHED BY: Hawaiian Gov't. YEAR: 1884 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: R. H. Houlder YEAR: 1971 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: In the village of Milolii.

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 but were not occupied. A complete new description follows.

The station is located about 0.2 miles north of the concrete wharf in the village of Milolii on the west coast of the island of Hawaii; about 150 yards west of the graded road which is the main street through Milolii and which leads to the wharf; about fifty yards east of a twenty-foot high, white, unmanned lighthouse; and about fifty feet north of a graded road leading west to the sea cliff.

The station is a punch mark in the top of a 1 1/2 inch diameter iron bar which projects about two feet from a flat, triangular concrete slab. The iron bar has been bent so that the top of the bar is about one inch farther east than the bottom. The bottom of the bar appeared undisturbed. The slab is about four feet on a side and is raised above the "AA" lava surface about eight inches. At the time of this recovery the station was marked by a six-foot high, red and white metal Hawaiian Territorial Survey banner which was slipped over the upright iron bar.

Reference mark number one is a standard reference disk, stamped KAPUKAWAA 1 1948, set in a drill hole in a boulder which is about eight feet in diameter and projects about six feet. It is about one foot lower than the station and about 46 feet east of the station.

Reference mark number two is a standard reference disk stamped KAPUKAWAA 2 1948, set in a drill hole in a boulder which is flush with the ground. It is about six feet lower and 49 feet west-southwest of the station.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: KAPUKAWAA
 ESTABLISHED BY: H.G.S. YEAR: 1884 STATE: Hawaii BENCH MARK(S) ALSO
 RECOVERED BY: C. A. Burroughs YEAR: 1973 COUNTY: Hawaii
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN:

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

The station was recovered as described except for the following: the 1 1/2 inch iron bar the punch mark for the station is now leaning three inches to the east. All reference marks were in good condition.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 151553 STATION 1044
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NO ORIGINAL TEXT

Kapuna 2 (Hawaii Island, Hawaiian Government Survey, 1898; E. R. Hand, 1914).—In southern part of Hawaii, in southern Ka-u, near the top of the rounded grass-topped hill known as Puu Hoomaha, and shown on chart as Kapuna Mountain, just northeast of Waiohinu village. There is a grove of eucalyptus trees whose center is approximately 120 meters from the station, and whose left tangent is on range with this station and station *Kipaepae*, the bearing from *Kipaepae* being N. 42° W. Marked by a 5-inch iron pipe set deep into the ground, and surrounded by stones set in cement, a stone cairn being placed above it.

RECOVERY NOTE, TRIANGULATION STATION

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 530

NAME OF STATION: **KAPUNA 2**
 ESTABLISHED BY: **Hawaiian Govt.** YEAR: **1898** STATE: **HAWAII**
 RECOVERED BY: **L. O. Wilder** YEAR: **1949** COUNTY: **HAWAII**

Detailed statement as to the fitness of the original description: The station was recovered as described. Two reference marks were established. A new description follows—
 The station is located on a rounded hill, planted in sugar cane, which lies about ½ miles northwest of Naalehu, about 1.5 miles northeast of Waiohinu, about 0.4 mile west of a line of eucalyptus trees, about 100 yards east of a reservoir and about 200 feet south of a graded road. Higher ground is to the westward.

To reach from the post office in Naalehu; go north, on the good cinder road, for ½.2 miles; turn left, cross over a cattle guard, and go northerly for 1.9 miles; turn left and go westerly for 0.4 mile to a large reservoir; turn left, just east of the reservoir, and go southerly for about 150 feet; turn left and go easterly, through the cane field for about 200 feet to the station. A rock cairn has been built over the station.

The station is the center of a 5 inch iron pipe which is set in the ground and is surrounded by stones and bottles set in cement. The pipe projects about 10 inches above the soil.

Reference mark number 1 is a standard disk, stamped NO 1 1949, set in the top of a ½ 1/2 inch iron pipe which projects about 6 inches and is about 1 foot lower than the station.

Reference mark number 2 is a standard disk, stamped NO 2 1949, set in the top of a ½ 1/2 inch iron pipe which projects about 6 inches and is about 1 foot lower than the station.

Both reference marks are subject to loss or movement when the cane crop is harvested.

Object	Distance	Direction
KIPAEPAE (metal target)		00 00 00
R. M. 1 S	29.020 ft 8.846 m	26 16 34
R. M. 2 E	53.220 ft 16.222 m	263 30 04

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAPUNA 2**
 STATE: **HAWAII** YEAR: **1898** SECOND ORDER
 SOURCE: **G- 9279**

GEODETIC LATITUDE: 19 05 04.281	ELEVATION: 644.6 METERS
GEODETIC LONGITUDE: 155 36 12.121	2115 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ϕ OR Δ OR ANGLE
HI 1	5101	464,311.06	91,224.75	- 0° 02' 02"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KIPAEPAE	327 44 26.8	327 46 29	5101

QE 055

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

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553 STATION 1044

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

KAPUNA 2 (continued)

RECOVERY NOTE, TRIANGULATION STATION

<
R

NAME OF STATION: **KAPUNA 2**
ESTABLISHED BY: **HGS** YEAR: **1898** 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:

Station pipe has been pushed over by sugar cane machinery, and leans to one side. Both reference marks have been destroyed. At time of recovery it was not possible to re-mark and re-survey the station because of high cane.

Located 1-3/4 mile northwest of Naalehu and 1-1/4 miles northeast of Waiohinu, at about 2108 feet elevation, on Puu Hoomaha, a flat hill planted in sugar cane field.

To reach station from the post office in Naalehu, go east on State Highway 11 for 0.1 mile to crossroad. Turn left and go uphill for 2.1 miles to crossroad. Turn left and follow main cane road west for 1.9 miles to side road left. Turn left and go 0.4 mile to top of hill and side road left. Go left 200 feet, then turn left and go 200 feet into cane field to station.

Station is marked by a 5-inch iron pipe projecting about 1 foot from ground, and surrounded by a cairn.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 Old Hawaiian Datum

QUAD 191553 STATION 1045
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

NOAA FORM 76-39
 (12-70)
 FORMERLY CGS FORM 526

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

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KAULUOA STATE: HAWAII COUNTY: HAWAII
 NEAREST TOWN: Captain Cook QUADRANGLE NO.: 191553
 CHIEF OF PARTY: GEH YEAR: 1972 DESCRIBED BY: RGH

NOTE	HEIGHT OF TELESCOPE ABOVE STATION MARK METERS.1		HEIGHT OF LIGHT ABOVE STATION MARK METERS.		
	SURFACE-STATION MARK	UNDERGROUND-STATION MARK	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION		
	OBJECT	BEARING	DISTANCE		DIRECTION1
			FEET	METERS	

Detailed description:

The station is a standard traverse disk cemented into a small rise of lava approximately 25 feet long, 10 feet wide, and 5 feet high. There is a reference mark, RM 1 which is also on the same rise. The station disk is stamped "KAULUQA 1972" while the reference mark is stamped "RM 1 1972".

To reach the station proceed south from Captain Cook on State Route 11. From the Hookena Elementary School the following will be passed enroute (distances in statute miles): 0.45 mile -Turn off to the right (stay on S.R. 11); 0.95 mile cemetery to the left; 3.45 miles-middle of Honokua lava flow of 1950; 4.08 miles-Magoon Ranch house to the left, a wooden gate to the right which leads down to the station. Contact Mr. Solomon Thompson for access to the property.

Proceed through the wooden gate, turn right and go through another wooden gate. Continue down trail for 0.3 mile and turn left at a T. Cross the lava flow twice ending on the north side of the flow. Continue past the edge of the flow for 0.1 mile and turn left. Continue for 0.1 mile and turn left. Go 0.1 mile to a clearing to the left and a sharp drop off to the beach to the right. Park at the clearing and the station is located on the small rise on the east side of the clearing.

RM 2 is located on a smaller rise about 100 feet toward the lava flow from the rise that the station is located on. It is stamped "RM 2 1972".

¹Refers to notes in manuals of triangulation and state publications of triangulation. ²Direction-angle measured clockwise, referred to initial station.
³To nearest meter only, when no trigonometric leveling is being done.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAULUOA OBS BY NGS
 STATE: HAWAII YEAR: 1972 SECOND ORDER

SOURCE: G-14950

GEODETIC LATITUDE:	19° 19' 31.60421	ELEVATION:	1 METERS
GEODETIC LONGITUDE:	155 53 29.65854	SCALED	FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	P OR Δ HI ANGLE °
HI 1	5101	365,000.06	178,855.56	- 0° 07' 47"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH ² (From south)	CODE

THESE DATA OBTAINED FROM ADJUSTMENT OF SEP 1979

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1046
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-15 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 533
 Rev. Aug 1963

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KAUNA POINT LIGHT** STATE: **HAWAII** COUNTY: **KAU DISTRICT HAWAII**

CHIEF OF PARTY: **L. C. WILDER** YEAR: **1949** Described by: **G. J. HOEPEL**
 HEIGHT OF TELESCOPE ABOVE STATION MARK **4** METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK	DISTANCES AND DIRECTIONS TO AZIMUTH MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION		
		OBJECT	BEARING	DIRECTION!
	Surface-station mark, Underground-station mark		Foot meters	
No reference marks were set at this station.				

The station is located on Kauna Point, about 75 feet east of the water.

Detailed description
 The station is the center of the lighthouse which is 31.16 feet in height and rests on a square concrete base which projects 3 feet above the rook. The lighthouse is a wooden structure with a ladder on its south side. The light is located at the top and in the center of the tower. It is a fixed, flashing, light and is run by gas, there being no lightkeeper at this station.

The station is best reached, by boat, from the village of Milolii. Landing can be made in a small cove which lies about 200 yards north of the station.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: **KAUNA POINT LIGHT**
 ESTABLISHED BY: **L. C. Wilder** YEAR: **1949** STATE: **Hawaii** BENCH MARK(S) ALSO
 RECOVERED BY: **R. C. Munson** YEAR: **1968** 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 gone. The light tower has been removed and a new light established by the U.S. Coast Guard at Milolii. The old concrete foundation of the light remains and could probably be used for aerial photography control, as it is a 12-foot-square, white foundation that projects about 3 feet above ground.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KAUNA POINT LIGHT**
 STATE: **HAWAII** YEAR: **1949** SECOND ORDER

SOURCE: **G- 9279**

GEODETIC LATITUDE: 19 02 13.337	ELEVATION: 16.9 METERS
GEODETIC LONGITUDE: 155 52 53.784	55 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ (OR Δ) ANGLE
HI 1	5101	368,206.54	74,114.18	- 0° 07' 28"

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

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

QE 082

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

MAR 1981

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1047
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

NAME OF STATION: KEAWE

CHIEF OF PARTY: L.C.W. YEAR: 1948 STATE: Hawaii COUNTY: Hawaii Island

Description, including sketch of object:

The station, a boundary monument, is a 1 inch iron pipe which projects about 1 foot from the top of a square concrete post. The concrete post is stamped J B M KEAWE 1920. It is located on the south side of a rock wall, 27.4 feet west of the centerline of the highway and is about 2 feet lower than station KEEI SOUTH BASE. This mark is believed to be a boundary marker for the Bishop Estate.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEAWE
 ESTABLISHED BY: L.C. Wilder YEAR: 1948 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:

Station was recovered in good condition, although the distance published from station KEEI SOUTH BASE was found to be in error about 10 meters.

Located about 2-1/2 miles west-southwest of Honaunau, 2-3/4 miles south of Napoopoo Bay and 1 mile north of the City of Refuge National Park, along west side of macadam road.

Station is marked by a 1-inch iron pipe, projecting 14 inches from the top of a 10 x 10-inch concrete block with "KEAWE.S JEM 1920" inscribed in it. It is 16 inches south of a stone wall, 9 feet north of a metal gate, 27 feet west of center line of road.

The correct distance from station KEEI SOUTH BASE to the mark is 23.332 meters, (76.547 ft.)

FORM CGCS-526 (11-68)
 USCOMM-DC 18500-P89

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KEAWE

STATE: HAWAII YEAR: 1948 SECOND ORDER

SOURCE G-12664
 NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE: 19 26 15.401	ELEVATION: 42.0 METERS
GEODETIC LONGITUDE: 155 55 03.635	138 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ ANGLE*
HI 1	5101	356,098.57	219,610.04	- 0 08 20"

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE θ 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 KEEI SOUTH BASE			

QF 629

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

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1047
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

SEE STATION KEEI SOUTH BASE

ADJUSTED HORIZONTAL CONTROL DATA

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION **KEAWE**
 ESTABLISHED BY: **L.C. Wilder** YEAR: **1948** STATE: **Hawaii** BENCH MARK(S) ALSO
 RECOVERED BY: **R.C. Munson** YEAR: **1968** COUNTY: **Hawaii**
 AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: **Island:Hawaii**

R

NAME OF STATION **KEAWE**
 STATE: **HAWAII** YEAR: **1948** SECOND ORDER

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

Station was recovered in good condition, although the distance published from station KEEI SOUTH BASE was found to be in error about 10 meters.

Located about 2-1/2 miles west-southwest of Honaunau, 2-3/4 miles south of Napoopoo Bay and 1 mile north of the City of Refuge National Park, along west side of macadam road.

Station is marked by a 1-inch iron pipe, projecting 14 inches from the top of a 10 x 10-inch concrete block with "KEAWE.S JEM 1920" inscribed in it. It is 16 inches south of a stone wall, 9 feet north of a metal gate, 27 feet west of center line of road.

The correct distance from station KEEI SOUTH BASE to the mark is 23.332 meters, (76.547 ft.)

SOURCE: **G-12664**
 NO OBSERVATION CHECK ON THIS POSITION

GEODETIC LATITUDE:	19° 26' 50.401	ELEVATION:	42.0 METERS
GEODETIC LONGITUDE:	155 55 03.635		138 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	ρ OR Δ OR ANGLE*
HI 1	510i	356,107.13	223,140.73	- 0° 08' 21"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From 1920)	PLANE AZIMUTH* (From 1920)	CODE

POSITION DETERMINED BY TRAVERSE FROM STATION KEEI SOUTH BASE

FORM C&GS-526 (1-68)
 USCGMM-DC 18509-P65

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

QF 029

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

0 191553 STATION 1048
 HAWAII
 LATITUDE 19 °00' TO 19 °30'
 LONGITUDE 155 °30' TO 156 °00'
 DIAGRAM NE 5-1,5 HAWAII

NO ORIGINAL TEXT

Keawekaheka (Hawaii Island, Hawaiian Government Survey, 1891: E. R. Hand, 1928).—On the west coast of Hawaii, in South Kona District, on Keawekaheka Point, 50 meters from the water to the south, and 40 meters from the water to the west. It is about 1,340 meters from Napoopoo Light, which is seen just a few feet north of a line to Napoopoo Church. Marked by a drill hole and triangle cut in rock, and also 4 crosses cut in the rock equidistant from it. An iron bolt mentioned in original description as being 1 meter southwest of station was not found in 1913. A cairn was built over the station in 1913 and painted white. In 1928 the cairn was found, built substantially as it was in 1913. It had, however, been taken down and rebuilt since that year, as shown by the painting on the stones not being continuous. The cairn was not disturbed in 1928, and mark not seen.

RECOVERY NOTE. TRIANGULATION STATION

R

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 FORM 536

NAME OF STATION: **KEAWEKAHEKA**
 ESTABLISHED BY: **Hawaiian Govt** YEAR: **1891** STATE: **HAWAII**
 RECOVERED BY: **L. C. Wilder** YEAR: **1948** COUNTY: **HAWAII**

Detailed statement as to the fitness of the original description: The original station was recovered. The present station is a standard disk, set into a drill hole in bedrock, surrounded by a triangle chiseled in the stone. Seven crosses were found carved into the stone within a radius of 4 feet of the station. The iron bolt mentioned in the original description was not recovered. A new description follows--

The station is located on the crest of a small mound of lava about 3 miles south southwest of Keikiwaha Point, about 2 miles west northwest of Napoopoo, about 0.7 mile west of the Napoopoo Lighthouse and on the south end of Keawekaheka Point about 300 feet east of the sea cliff.

The station is best reached by boat from Napoopoo. Landing can be made at the Captain Cook Monument thence by foot along the beach, in a westerly direction to the end of Keawekaheka Point and the station. This is about 1 1/2 mile pack with last water at the house near the Captain Cook Monument.

The station is a standard disk, stamped KEAWEKAHEKA 1948, set into a drill hole in bedrock.

Reference mark number 1 is a standard disk, stamped KEAWEKAHEKA 1 1948, set into a drill hole in bedrock. It is located about 3 feet lower than the station.

Reference mark number 2 is a standard disk, stamped KEAWEKAHEKA 2 1948, set into a drill hole in flat lava bedrock which is about 3 feet lower than the station.

No azimuth mark was set for this station.

Object	Distance	Direction
PUU OHAU (metal target)		00 00 00
R. M. No. 1 NNE	19.512 ft 5.948 m	37 02 45
Napoopoo Lighthouse ESE	0.7 mile	124 28 59.1
R. M. No. 2 SSE	17.652 ft 5.381 m	159 46 00
KEOPIKA NNW	0.2 mile	344 44 47.30

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KEAWEKAHEKA**

STATE: **HAWAII**

YEAR: **1891**

SECOND

ORDER

SOURCE: **G- 9275**

GEODETIC LATITUDE:	19 29 14.602	ELEVATION:	10.2 METERS
GEODETIC LONGITUDE:	155 57 03.772		33 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	PLANE AZIMUTH ANGLE
HI 1	5101	344,648.41	237,716.38	- 0 09 02

* PLANE AZIMUTH HAS BEEN COMPUTED BY THE $\theta = \arctan \frac{y}{x}$ FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH* (From south)	CODE
PUU OHAU	170 36 46.8	170 45 49	5101

QE 058

(continued on next page)

HORIZONTAL CONTROL DATA

by the
 NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

QUAD 191553 STATION 1048

LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KEAWEKAHEKA (continued)

FORM 526a
 (6-16-66)

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEAWEKAHEKA
 ESTABLISHED BY: HGS YEAR: 1891 STATE: Hawaii
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 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		
PUU OHAU -----1948	DISTANCE	and DIRECTION----		00	00 00.0
R.M. No. 1	NNE	19.512	5.948	37	02 45
R.M. No. 2	SSE	17.652	5.381	159	46 00
KEOPUKA	NNW			344	44 47.3
PUU OHAU (HGS) 1883 -----1968	DISTANCE	and DIRECTION----		00	00 00.0
R.M. No. 1	NE	19.407	5.916	37	03 31
Kealakekua, Radio KONA, mast	NE			53	10 46.8
R.M. No. 2	SE	17.665	5.385	159	44 57
KEOPUKA 1948				344	44 50.2

Station was recovered and all marks found in good condition, however a discrepancy of .032 m was noted in the distance to RM No. 1. A complete description follows:

Station is located about 2-3/4 miles southwest of Kealakekua, 1 mile west-northwest of the Captain Cook Monument, and 1237 feet southeast of station KEOPUKA 1948, on a low lava mound about 200 feet east from sea

bluff and 33 feet above sea level.

To reach station from the post office in Kealakekua, go south on State Highway 11 for 0.75 mile to power pole 135. Turn sharp right and go downgrade on macadam track road for 0.3 mile to board gate on left. Pass through gate and go 0.15 mile to locked gate; pass through gate and continue on field road for 0.65 mile to gate. Pass through gate, take left fork, and go 0.25 mile to fork. Take left fork for 30 yards to gate; pass through gate and go 0.55 mile to gate. Pass through gate and go 0.3 mile to gate in stone wall. Pass through gate and continue ahead on old track road downgrade for 0.3 mile to T-junction. Go left, south, for 0.25 mile to board gate. Pass through gate and go 0.2 mile to track road right. Go right, along edge of lava flow, for 0.2 mile to end of truck travel at trees. Pack southerly about 1/2-mile to KEOPUKA, then continue, southeast for 1237 feet to station.

Station mark is a standard disk stamped "KEAWEKAHEKA 1948" cemented in a drill hole in lava bedrock. There is a large, 4-foot-high cairn, with old 4-foot stand, and a tall, 3 x 3-inch, target pole, in the center, over the mark.

Reference mark number one is a standard disk stamped "KEAWEKAHEKA 1 1948", cemented in a drill hole in flat bedrock, about 1-1/2 feet lower than station mark.

Reference mark number two is a standard disk stamped "KEAWEKAHEKA 2 1948", cemented in a drill hole in flat lava bedrock, about 3 feet lower than station mark.

party should be inserted here. The officer who actually visited the station should sign his name.
 Recovery note.

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

USCOMM-DC 27178-P28

U.S. DEPARTMENT OF THE INTERIOR
 GEOLOGICAL SURVEY
 Form 9-1165
 (Rev. 12-74)

REPORT ON PERMANENT SURVEY MARK

AREA OFFICE

STATE Hawaii COUNTY Hawaii QUADRANGLE 31
 QUOTE PRIMARY REFERENCE 3 mi S. SW. of Keikiwaha Point
 (Direction and distance)

DESIGNATION { LISTED KEAWEKAHEKA
 STAMPED _____ TYPE OF MARK: BM _____ TT _____ TRIANG. X _____

Lat. <u>19</u> ° <u>29</u> ' <u>14.602</u> "	CONDITION	ESTABLISHED BY
Long. <u>155</u> ° <u>57</u> ' <u>03.772</u> "	Disturbed <input type="checkbox"/>	USGS <input type="checkbox"/> USBR <input type="checkbox"/>
Elev. <u>33</u> feet	Destroyed <input type="checkbox"/>	USC&GS <input checked="" type="checkbox"/> State GS <input type="checkbox"/>
	Not Found <input type="checkbox"/>	USNPS <input type="checkbox"/> USNFS <input type="checkbox"/>
		USGLO <input type="checkbox"/> (Other) <input type="checkbox"/>
		USBLM <input type="checkbox"/>

REMARKS OR REVISED DESCRIPTION:

Station mark and RM's were recovered in good condition.

SUBMITTED BY Yukio Yamamoto
 TITLE Cartographer DATE 1/26/78
 AGENCY USGS

Marks found in good condition need not be reported.

FILL IN ALL AVAILABLE INFORMATION

500 10-54553-6

Please prepare in triplicate.

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 151553 STATION 1049
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1,5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 Form 532
 Rev. Aug 1965

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KEEI** STATE: **HAWAII** COUNTY: **SOUTH KONA DISTRICT HAWAII**

CHIEF OF PARTY: **L. G. WILDER** YEAR: **1948** Described by: **G. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE 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	DISTANCE		DIRECTION‡
			feet	meters	
2	Surface-station mark, Underground-station mark				
12a	R M 1	NE	35.368	10.780	00 00 00
12a	R M 2	ESE	40.058	12.211	281 29 04

The station is located on the crest of a brush and tree covered ridge about 2.2 miles southeast of Napoopoo, about 2 miles northeast of Honaunau Bay, about 1.5 miles east of the beach, about 0.75 mile east of the road which runs between Napoopoo and Honaunau Bay and about 100 yards southwest of a low knoll. Higher ground is to the east and northeast.

To reach from the post office at Napoopoo; go south, on the road which leads toward Honaunau Bay, for 1.9 miles to the end of truck travel. From this point cross over a rock wall and pack easterly for about 0.75 mile to the crest of the ridge and the station.

The station is a standard disk, unstamped, set into a drill hole in bedrock which projects about 8 feet above the surrounding lava.

Reference mark number 1 is a standard disk, unstamped, set into a drill hole in bedrock which projects about 2 feet and is about 4 feet lower than the station.

Reference mark number 2 is a standard disk, unstamped, set into a drill hole in bedrock which projects about 5 feet on its south side and is about 4 feet lower than the station.

A rock cairn with black and white pole plumbed over the mark has been built over this station.

* Refers to notes in manuals of triangulation and state publications of triangulation. † Direction-angle measured clockwise, referred to initial station. ‡ To nearest meter only, when no trigonometric leveling is being done. 10-58852-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KEEI** STATE: **HAWAII** YEAR: **1948** ORDER: **SECOND**

SOURCE: **G- 9275**

GEODETIC LATITUDE: 19 27 02.351	ELEVATION: 56.5 METERS
GEODETIC LONGITUDE: 155 54 32.888	317 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	β OR Δ OR ANGLE*
HI 1	5101	359,052.42	224,339.14	- 0° 08' 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
KEEI SOUTH BASE	31 05 42.1	31 13 53	5101

QE 061

HORIZONTAL CONTROL DATA

by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

QUAD 191553 STATION 1049

LATITUDE ° ' TO ° '
LONGITUDE ° ' TO ° '
DIAGRAM

KEEI (continued)

FORM 526a
(6-18-69)

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

R

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEEI
ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii
RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.97 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KEEI SOUTH BASE 1948				00 00 00.0
Napoopoo Light, 1928	NW			106 39 44.4
R.M. No. 3	N	34.162	10.414	158 35 50
R.M. No. 2	ESE	40.013	12.197	254 44 35

Station mark and RM No. 2 were recovered in good condition. RM No. 1 has been destroyed. a new reference mark, number 3, was established. A complete description follows:

Station is located about 2 miles north-northeast of the City of Refuge, 2 miles southeast of Napoopoo and about 3500 feet east of the road running between Napoopoo and the City of Refuge, at about 317 feet elevation, the very brushy and rough country sloping up to east from the road. The area the station is in has the appearance of a low ridge when seen from the road.

To reach station from the post office in Honaunau, go south on State

Highway 11 for 1.8 miles to junction with State Highway 16. Turn sharp right and go downhill on State Highway 16 for 3.5 miles to road junction at the City of Refuge. Continue ahead on the road to Napoopoo for 0.75 mile to station KEEI SOUTH BASE 1948 on right; continue on the road for 1.3 miles to locked board gate on right. (Key may be obtained from Mr. K. Yokoyama at Holualoa). Pass through gate and follow track road for 0.5 mile to corral and water trough, and end of truck travel. Go through gates, getting on east side of fence line, and walk south along fence for 150 yards to pasture corner. Cross fence and go left, up through trees along cattle trail, for about 300 yards to cairn. Here leave trail and pick way southeast across brushy lava country, gradually gaining elevation, for about 500 yards to station.

Station mark is a standard disk stamped "KEEI 1948", cemented in a drill hole in bedrock on a small mound that is about 8 feet higher than surrounding area. There is a 10-foot-diameter, stone pier, about 4 feet high, built over the mark, with a tall, 3 x 3-inch signal pole in the center.

Reference mark number two is a standard disk stamped "KEEI 1948", cemented in a drill hole in the top of a sloping, bedrock ledge 4 feet high on the west side, and is 2 feet lower than station mark.

Reference mark number three is a standard disk stamped "KEEI 1948 NO 3 1968", cemented in a drill hole in smooth bedrock area, 3.5 feet lower than station mark.

NOTE: Station is difficult to locate due to big trees and brush, and an altimeter is of help in recovery. Most lines are blocked by trees.

*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.

USCOM-DC 27179-P68

HORIZONTAL CONTROL DATA

by the
 National Ocean Survey
 OLD HAWAIIAN DATUM

Q 191553 STATION 1050
 HAWAII
 LATITUDE 19° 00' TO 19° 30'
 LONGITUDE 155° 30' TO 156° 00'
 DIAGRAM NE 5-1.5 HAWAII

DEPARTMENT OF COMMERCE
 U. S. COAST AND GEODETIC SURVEY
 Form 555
 Rev. Aug. 1948

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: **KEEI NORTH BASE** STATE:

HAWAII COUNTY: **SOUTH KONA DISTRICT HAWAII**

CHIEF OF PARTY: **L. G. WILDER** YEAR: **1948**

Described by: **G. J. HOEPEL**

NOTE*	HEIGHT OF TELESCOPE ABOVE STATION MARK 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	
	Surface-station mark.			feet	meters	
	Underground-station mark					
11a	BISHOP R M 2 Boundary Monument 9 Bishop Estate	12.6	ESE	104.376	31.814	00 00 00 10 26 43
11c	R M 1		ESE SE	138.762 90.978	42.295 27.730	43 55 32.8 70 10 19

The station is located on a rough lava bed about 0.7 mile north-east of Palemano Point, about 0.6 mile south of Napoopoo, about 100 yards south of a T road intersection, 98.7 feet north northwest of a cattle guard, 86.7 feet north of a rock wall and 45.8 feet west of the centerline of the highway which runs between Napoopoo and Honaunau.

To reach from the post office, at the T road intersection, in Napoopoo; go south on the road which leads toward Honaunau for 0.5 mile; continue straight ahead for 0.1 mile to the station on the west or right hand side of the road.

The station is a standard disk, stamped KEEI NO BASE 1948, set in the top of an irregular mass of concrete which is about 6 inches below the surface of the surrounding rock.

Reference mark number 1 is a standard disk, stamped KEEI NO BASE NO 1 1948, set into a drill hole in the most westerly of two concrete abutments of a cattle guard. It is located 10 feet west of the centerline of a road and 4.8 feet north of the center of a rock wall.

Reference mark number 2 is a standard disk, stamped KEEI NO BASE NO 2 1948, set in the top of a square concrete post which projects about 6 inches. It is located 58.3 feet east of the centerline of a road and about 2 feet higher than the station.

A rock cairn with black and white pole plumbed over the mark has been built over this station.

* Refer to notes in manuals of triangulation and state publications of triangulation. † Direction-angle measured clockwise, referred to initial station.
 ‡ To nearest meter only, when no trigonometric leveling is being done. 16-50000-1 U. S. GOVERNMENT PRINTING OFFICE

(continued on next page)

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: **KEEI NORTH BASE**

STATE: **HAWAII**

YEAR: **1948**

SECOND ORDER

SOURCE: **G- 9279**

GEODETIC LATITUDE: 19 28 06.371	ELEVATION: 11.5 METERS
GEODETIC LONGITUDE: 155 55 19.387	38 FEET

STATE COORDINATES (Feet)				
STATE & ZONE	CODE	X	Y	θ OR Δ OR ANGLE
HI 1	5101	354,618.50	230,808.04	- 0° 08' 26"

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

TO STATION OR OBJECT	GEODETIC AZIMUTH (From south)	PLANE AZIMUTH (From south)	CODE
KALAPA	319 19 08.2	319 27 34	5101

QE 063

HORIZONTAL CONTROL DATA

QUAD 191553 STATION 1050

by the

NATIONAL GEODETIC SURVEY
 OLD HAWAIIAN DATUM

LATITUDE ° ' TO ° '
 LONGITUDE ° ' TO ° '
 DIAGRAM

KEEI NORTH BASE (continued)

FORM 526a
 (5-18-59)

U.S. DEPARTMENT OF COMMERCE
 COAST AND GEODETIC SURVEY

R

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KEEI NORTH BASE
 ESTABLISHED BY: L.C. Wilder YEAR: 1948 STATE: Hawaii
 RECOVERED BY: R.C. Munson YEAR: 1968 COUNTY: Hawaii
 Island: Hawaii

HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METERS. HEIGHT OF LIGHT ABOVE STATION MARK METERS.

OBJECT	BEARING	DISTANCE		DIRECTION
		FEET	METERS	
KALAPA -----1948	DISTANCE	and DIRECTION-----		00 00 00.0
R.M. No. 1	SE	90.978	27.730	19 42 22
R.M. No. 2	ESE	104.376	31.814	319 58 46
KALAPA (HGS) 1884 -----1968	DISTANCE	and DIRECTION-----		00 00 00.0
R.M. No. 1	SSE	90.879	27.700	19 44 22
Napoopoo Light, 1928	NW			170 41 01.4
R.M. No. 2	E	104.562	(31.871)	319 59 37

Station was recovered. RM No. 2 was found slightly loose, so was re-enforced with concrete. There is now a power pole on line with Boundary Monument No. 9. A complete description follows:

Station is located about 3 miles northwest of Honaunau and 1/2-mile south of Napoopoo Bay, along west side of macadam road, 375 feet south of road fork leading southwest to Palemano Point.

To reach station from the post office in Honaunau, go south on State Highway 11 for 1.7 miles; turn sharp right on State Highway 16 and go 3.5 miles to road junction at the City of Refuge. Continue ahead, north, on macadam road for 3.0 miles to stone wall, cattleguard, and station, on left, just beyond stone wall.

Station mark is a standard disk stamped "KEEI NO BASE 1948", cemented in a drill hole in rock about flush with surrounding area. It is 4.5 feet west of center line of road, 107 feet northwest of center of cattleguard, 87 feet northwest of power pole No. 2 and about 135 feet northwest of the entrance to the Keel rubbish dump. There is a 9-foot-diameter stone pier, with a tall target pole in center, built over the mark.

Reference mark number one is a standard disk stamped "KEEI NO BASE NO 1 1948", cemented in a drill hole in the north end of the west concrete abutment of the cattleguard, about 3-1/2 feet higher than station mark.

Reference mark number two is a standard disk stamped "KEEI NO BASE NO 2 1948", set in the top of a 12-inch-square, concrete monument projecting 2 inches. It is 58 feet east of center line of road and about 3-1/2 feet higher than station mark.

Boundary Monument No. 9 (Bishop Estate) is a 1-inch iron pipe projecting 1 foot from the center of a 12-inch, concrete mound, with "9" inscribed in it. It is on the stone wall, about 3-1/2 feet above ground and 51.5 feet southeast of power pole No. 2.

*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.

USCOMH-DC 57175-P59