ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: AHUALOA
STATE: HAWAII
YEAR: 1877
THIRD ORDER

SOURCE: G-SP156

| GEODETIC LATITUDE | 20° 05' 16.320 |
| GEODETIC LONGITUDE | 155° 29' 11.892 |
| ELEVATION | METERS |

STATE COORDINATES (FT):

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (GRD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1</td>
<td>91L1</td>
<td>568,631.29</td>
<td>455,583.02</td>
<td>+ 0 30 13</td>
</tr>
</tbody>
</table>

*PLANE ADJTMNT HAS BEEN COMPUTED BY THE 2ND ORDER FORMULA NEGLECTING THE SECOND TERM.

TO STATION OR OBJECT | GEODETIC ADJTMNT (FEET) | PLANE ADJTMNT (FEET) | CODE
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>00 365</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Au (Hawaii Island, Hawaiian Government Survey, 1877; K. T. Adams, 1928).—On the north coast of Hawaii, near Honoka’a. Reached from Honoka’a by going west along the Honoka’a Sugar Co. railroad, and after crossing four bridges, continuing on the railroad for approximately 1,000 feet to the first ridge reached just before coming to a deep cut in the railroad embankment. Follow up this ridge to a sugar-cane flume just above which will be found the station. A cane field is on the east side of the ridge, and a ditch runs down the ridge 10 feet west of the station. A wooden flume runs along the face of the hill 100 feet below the station. There are no trees on this ridge, but a ridge with ironwood trees on it is ½ mile to the east, Honoka’a stock farm S. 80° E. Station marked by a 3-inch gas pipe projecting 2 feet above the center of a concrete base which is 3 feet square and stands 1 foot above the ground.

### ADJUSTED HORIZONTAL CONTROL DATA

<table>
<thead>
<tr>
<th>NAME OF STATION</th>
<th>AU</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE</td>
<td>HAWAII</td>
</tr>
<tr>
<td>YEAR</td>
<td>1877</td>
</tr>
<tr>
<td>THIRD</td>
<td>UNDER</td>
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**Source** G-SP150

<table>
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<tr>
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<tr>
<td>GEODETIC LONGITUDE</td>
<td>155° 25’ 34.915</td>
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<tr>
<td>ELEVATION</td>
<td>158 FEET</td>
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<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (H.O. at Base)</th>
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</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>502,390.75</td>
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</table>

*Plane Azimuth has been computed by the 2 H.O. at Base point using the second term.*

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEODETIC AZIMUTH (From Base)</th>
<th>PLANE AZIMUTH* (From Base)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 36 7</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION INTERSECTION STATION

Honokaa, Hawaiian

STATE: Hawaii
COUNTY: Hawaii
Island: Hawaii

CHIEF OF PARTY: D.M. Whipp

Description, including sketch of object:

Located in the northern part of the island, in the town of Honokaa, in the northwest angle of the intersection of Manana St. and Ilima St., at northwest side of a Hawaiian Telephone Co. building. Station is the center of a 3-legged, skeleton-steel tower 150 feet tall, painted alternate red and white, 20 feet on each side at the base and tapering to about 4 feet at the top. There is no obstruction light on the tower. Center of tower is 16 feet northwest of edge of building and 55 feet northeast of center line of Manana St.

HORIzONTAL CONTROL DATA

Adjusted Horizontal Control Data

NAME OF STATION: Honokaa Hawaiian Tel. Micro-Mast
STATE: Hawaii
YEAR: 1967
THIRD ORDER

Source: G-13405

Geodetic Latitude: 22° 04' 50.7922" N
Geodetic Longitude: 155° 28' 00.3146"
Elevation: 510.1 ft

State Coordinates (foot)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z or H. H. Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>511,408.18</td>
<td>453,905.24</td>
<td>+ 0 00' 41&quot;</td>
</tr>
</tbody>
</table>

* Plane azimuth has been computed by the xcord & ycord formula neglecting the second term.

To Station OR Sheet | Geodetic Azimuth | Plane Azimuth | Code
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

QF 446
DESCRIPTION OF TRIANGULATION STATION

HOROKAA SUGAR CO. MILL STACK, HAWAII
NAME OF STATION: HOROKAA SUGAR CO. MILL STACK
HAWAII COUNTY: HAWAII
DESCRIPTION: This station was located by intersection.

The station is the center of a black steel stack which is about 150 feet in height and 10 feet in diameter. It rests on a concrete base which is about 15 feet square and about 15 feet in height.

The station is located on the eastern side of the Horokaa Sugar Company Mill, about 1.0 mile north of Horokaa, about 0.5 mile southwest of Horokaa Landing and 23 feet west of a dirt road.

RECOVERY NOTE, TRIANGULATION STATION

RECOVERY NOTE, TRIANGULATION STATION

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HOROKAA SUGAR CO. MILL STACK
HAWAII COUNTY: HAWAII
YEAR: 1966
SOURCE: G-13903

THE PLAN/AZIMUTH HAS BEEN COMPUTED BY THE FORMULA RELATING THE SECOND TERM.

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z (\text{M}^A \text{O}^A \text{N}^A \text{G} \text{E} \text{N} \text{I} \text{C} \text{A} \text{L} \text{M} \text{A} \text{R} \text{T} \text{H})</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 1</td>
<td>5101</td>
<td>510,113.17</td>
<td>458,745.48</td>
<td>+ 00 00 37</td>
<td></td>
</tr>
</tbody>
</table>
NO ORIGINAL TEXT

HUMULJA (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Hand, 1913) — On northeast coast of Hawaii, in East Hanalei, land of Hanalei, on the northwest side of Kauai Guleh, about 1,350 meters above the government road, on a conspicuous round-topped, cone-covered hill called Puu Lani. It is an elevation point on the northwest side of gulch when viewed from the cliff edge or road. It is reached by following one of the trails leading from the government road up the hill on the northwest side of the gulch. Marked by a concrete post 1 foot in diameter with a concrete plate of the United States Geological Survey in the top.

DEPARTMENT OF COMMERCY
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HUMULJA
Established by: Hawaiian Gov't Year: 1877
Locality: Huma, North Hilo, Hawaii
Recovered by: C.L. Murray Year: 1969

Detailed statement as to the theme of the original description:

The mark found at this station was a U.S.G.S. Bronze tablet set concrete on the top of cylindrical concrete block set firmly in the ground and marked on the top with the letters U.S.G.S. This station has been renumbered with a Type B concrete monument by C.L. Murray of the Hawaii Territory Survey in Sept., 1950. Huma railway station is situated on the northeast coast of Hawaii, North Hilo, the northwest side of Kauai Guleh, about 1,400 feet above the main government road, on a conspicuous round-topped hill covered with grass and called Puu Lani. It appears to be the highest point on the northwest side of Kauai Guleh. The easiest approach to this station is along a plantation road about 1/2 mile east of Okalua Village. This road goes up along the west side of a small gulch about 1/3 mile crossing it and going along the south side another 1/3 mile and then turns to the left (east). Reaching a gulch at about 200 feet. Cross the gulch and follow up the west side of this gulch and along a plantation trail about 1/3 to a point opposite the high hill upon which the station is situated. Around the hill along one of the cane furrows.

DEPARTMENT OF COMMERCY
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: HUMULJA
Established by: H.O.S. Year: 1877
Locality: North Hilo
Recovered by: C.T. Hussey Year: 1949

Detailed statement as to the theme of the original description:

Located on the northeast coast of Hawaii, in North Hilo district, land of Humula, on the northwest side of Kauai Guleh, about 1,350 meters above the government road, on a conspicuous round topped, cone covered hill called Puu Lani. It appears to be the highest point on the northwest side of the gulch when viewed from the cliff edge or road.

The original station was marked by the Hawaiian Government Survey. In 1911 the station was recovered by W.H. Barringer and marked by a bronze Geological Survey tablet centered over old mark, on top of concrete post one foot in diameter. Old mark is a furrowed copper triangle. In 1950 the Hawaii Territory Survey placed a Type B monument over the station. A six foot concrete platform projecting one foot above the ground. A two inch pipe with a metal target is centered over the mark. The center of this pipe was used as the station.

From the post office at Hilo: go north on the coast highway for 25 miles to the Laupahoehoe post office. Continue ahead on main highway for 6 miles. Here turn left on paved main road and go southerly for 0.5 mile, take left fork and go 2.5 miles, turn right on road up hill and on left side of road and go 0.5 mile and bear left to ETT. Park east, toward ocean, along down. Top end site for about 500 feet to station.

Note: One of these markers should be used as primary marker. The other one on which actual station should be noted on the end of the recovery note. (continued on next page)
Station was recovered in good condition. There is now a tall microwave relay tower on the hill near the station. A complete description follows:

Station is located about 1-1/4 miles south-southeast of Oahula and 3/4-mile south-southwest of State Highway 19, on a rounded hill in cane fields on southeast side of Kaaahoa Gulch, at about 1080 feet elevation.

To reach station from the post office in Laupahoehoe, go northwest for 0.1 mile; turn left and continue northwest, on State Highway 19, for 4.2 miles to fork at Oahula; continue ahead on the highway for 0.55 mile to diagonal, paved crossroad at power pole No. 86. Turn left and go 0.3 mile to crossroad. Turn left, through long cut, and go 0.15 mile to landing strip; continue ahead, along landing strip, for 0.3 mile to side road right, 25 yards beyond end of the strip and on southeast side of gulch. Turn right and go up steep cane road along left side of gulch for 0.5 mile to diagonal crossroad. Turn left and go northeast, down slight grade, for 0.1 mile to microwave tower on right. Continue ahead on cane road for 135 feet to station on left in cane field.

Station mark is a U.S. Geological Survey disk, faintly stamped "1085", set in the top of a 12-inch-diameter, concrete monument about 1-1/2 feet above field level. A type S-1 signal is centered over the mark, with the 6-foot-square, concrete platform extending 2 feet above ground. The station mark is at the bottom of a rectangular depression 8 x 30 inches and about 8 inches deep. It is 18 feet northeast of center line of cane road, 135 feet north-northeast of the microwave tower, and 49 feet northeast of the north 1 of 2 60-foot-tall, wooden, antenna poles with a transformer pole between them and an 8-foot-square, green, metal shack by them.
HORIZONTAL CONTROL DATA

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

HORIZONTAL CONTROL DATA

NAME OF STATION: IKI
STATE: HAWAII
YEAR: 1932
THIRD ORDER

SOURCE: G- 1085

COORDINATES (FAGT)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>P X Y ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 1</td>
<td>5101</td>
<td>513,878.15</td>
<td>458,073.95</td>
<td>+ 0 00 50</td>
</tr>
</tbody>
</table>

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: IKI
ESTABLISHED BY: O.W. Swinson
YEAR: 1912
STATE: HAWAII
RECOVERED BY: D.M. Whipp
YEAR: 1966
COUNTY: HAWAII
EXPLANATION AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

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

Station was recovered in poor condition, partially destroyed. A 6-inch-diameter, concrete-filled, iron pipe was found, tilted slightly due to being bumped by machinery during cane-field cultivation. Nearby, the length of 3-inch iron pipe, originally marking the station, was found, and also 2 large chunks of concrete with the imprint of both pipes in them, indicating that the 6-inch pipe had been the anchor supporting the 3-inch pipe. After reconstructing the 6-inch pipe and setting the concrete chunks in place an angle check was made, indicating this to be the correct point.

Since it was located in the edge of a cane field a new station, IKI 2, was established nearby and the 6-inch pipe was removed from the field.

See description for IKI 2.
HORIZONTAL CONTROL DATA
by the National Ocean Survey
OLD HAWAIIAN DATUM

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: IKI 2
STATE: Hawaii
COUNTY: Hawaii

CHIEF OF PARTY: D.M. Whipp
YEAR: 1966
SUBSURFACE MARK.

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KUILEI (HGS) 1877</td>
<td>W</td>
<td>00</td>
<td>00 00 00.0</td>
</tr>
<tr>
<td>Honokaa, Honoiko Sugar Co.</td>
<td>20</td>
<td>33</td>
<td>50.6</td>
</tr>
<tr>
<td>Mill, stack, 1948</td>
<td>5.706</td>
<td>130</td>
<td>18 54</td>
</tr>
<tr>
<td>Pfau, Pahuau Sugar Co., stack, 1948</td>
<td>SSE</td>
<td>202</td>
<td>16 09.3</td>
</tr>
<tr>
<td>SSE</td>
<td>13.932</td>
<td>4.247</td>
<td>261</td>
</tr>
</tbody>
</table>

Station is located about 1-1/4 miles northeast of Honokaa and 3/4 mile east of the Honokaa Sugar Mill at Haines, at about 506 feet elevation, along the east edge of a low ridge that is planted in sugar cane, just above the old railroad grade (now a track road). There are scattered ironwood trees along the east slope of the ridge.

To reach station from the post office in Honokaa, go southeast on the main street for 0.6 mile; turn left on Ohelo Street and go downhill for 0.35 mile to fork where macadam road curves right. Continue ahead on field road downhill for 0.2 mile to paved crossroad. Continue downhill for 0.3 mile to second paved crossroad. Turn left and go 0.1 mile to paved, diagonal crossroad. Turn sharp right and go 0.05 mile; turn left on field road and go downgrade along east side of ridge for 0.15 mile; turn up steep, grassy track road and go 30 yards to top of ridge; turn right and go 0.25 mile to end of ridge and station on right.

Station mark is a standard disk stamped "IKI 2 1966", set in the top of a 12-inch-diameter, concrete monument that projects 6 inches. It is located in grassy area along east side of cane field; 15 feet east of edge of field road, 13 feet north-northwest of a 12-inch ironwood tree, 2-1/2 feet south of a white pine post, 8 feet west of where hill breaks sharply down to east, and 60 feet south from point where ridge ends and drops steeply down to north.

Reference mark number one is a standard disk stamped "IKI 2 NO 1 1966" cemented in a drill hole in a 10-inch-square bedrock ledge outcrop, projecting 2 feet on lower side. It is 12 feet east of small ironwood tree and 4 feet lower than station mark.

Reference mark number two is a standard disk stamped "IKI 2 NO 2 1966" set in the top of a concrete-filled, 4-inch, iron pipe that is set in concrete and projects 4 inches. It is 18 feet east of edge of road, 4 feet southwest of the 12-inch ironwood tree, and about 1 foot lower than station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: IKI 2
STATE: Hawaii
COUNTY: Hawaii

RECOVERED BY: P. Collom YEAR: 1969

Station recovered in good condition. 1966 description adequate.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: ISAAC
STATE: HAWAII
YEAR: 1877
THIRD ORDER

SOURCE: G-5P156

<table>
<thead>
<tr>
<th>GEOGRAPHIC LATTITUDE</th>
<th>GEOGRAPHIC LONGITUDE</th>
<th>ELEVATION</th>
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<tbody>
<tr>
<td>20° 05' 41.643</td>
<td>159° 27' 34.425</td>
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</table>

<table>
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<tr>
<th>STATE &amp; CODE</th>
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<th>Y (FTS)</th>
<th>Z (FTS)</th>
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<tr>
<td>MI 1</td>
<td>5101</td>
<td>513,874.80</td>
<td>458,139.82</td>
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*PLANE A THVALUE HAS BEEN COMPUTED BY THE FORMULA [NORTH] FORMULA NELECTING THE SECOND TERM.

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>GEOGRAPHIC AZIMUTH (FROM NORTH)</th>
<th>PLANE AZIMUTH (FROM NORTH)</th>
<th>CODE</th>
</tr>
</thead>
</table>

QC 368
ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAAO
STATE: HAWAII
YEAR: 1877
THIRD ORDER

SOURCE: G-SP156

DEGREES

DEGREES

ELEVATION

METERS

FEET

STATE & ZONE CODE X Y Z

HI 1 5101 511704.43 451895.24 + 0 00 42

* Plane azimuth has been computed by the formula neglecting the second term.

TO STATION OR OBJECT

DEGREES

PLANE

CHORD

CODE

00 364
HORIZONTAL CONTROL DATA

NAME OF STATION: KAOLO

STATE: HAWAII

YEAR: 1877

ADJUSTED HORIZONTAL CONTROL DATA

SOURCE: G-9275

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

NO ORIGINAL TEXT

Kaholo (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Hand, 1913.) On northeastern coast of Hawaii, in Hamakua District, on a flat, well defined hill close to the government road and on its upper side, between Okalua and Kukaiwa post offices, and ½ mile from the former in a direct line. It is a short distance east of the Keeha public school, a small and shabby building on the upper side of the road. To reach station, start at this school and proceed toward Okalua (or eastward) about 400 meters, where there is a private road going directly up the hill; turn along this private road for 190 meters, then turn at right angles to the left (or N. 66° E.) and go 76 meters through the cane to station. Marked by a copper plate of the United States Geological Survey set in concrete inside an iron pipe about 8 inches in diameter; pipe is of thin iron and has ragged edges projecting a few inches above ground. Station is surrounded by a great pile of bowlders.

RECOVERY NOTE: TRIANGULATION STATION

STATE OF HAWAII COUNTY: HAMAKUA DISTRICT

RECOVERED BY: C.T. HUSSEY

Established by: B.O.S.

RECOVERY YEAR: 1949

NAME OF STATION: KAOLO

STATE: HAWAII

YEAR: 1877

Description of the station is as follows: Station mark, a concrete block 8 or 10 inches in diameter and 3 ½ feet long encased in a corrugated iron tube, the top marked with a triangle and three considerable stones are dug in the ground around the station. 180 feet above the government road and 1000 feet along road, west of Kuaokalani Gulch on a rise from which an extensive view can be had. Nov. 1, 1895 station was restored by J.S. Emerson. Present station mark is a concrete cylinder 9 inches in diameter set in banked stone, sand and cement above which it projects 2 1/2 feet.

In 1914 E. R. Hand described the station as follows: on the northeastern coast of Hawaii, in Hamakua District on a flat, well defined hill close to the government road and on its upper side, between Okalua and Kukaiwa post offices, and ½ mile from the former in a direct line. Marked by a copper plate of the U.S. Geological Survey set in concrete inside an iron pipe about 8 inches in diameter.

In 1899 the Hawaii Territory Survey reported the station mark recovered as a drill hole in a triangle in concrete cylinder. At this time a six foot square concrete platform mounted on four foot high masonry work supports was placed over the station. A three inch iron pipe in the center admits plumbing to the station.

In 1949 the station was recovered as a Hawaii Territory Survey disk set in a concrete cylinder 9 inches in diameter and projecting about two feet above ground, the cylinder is surrounded by a mass of concrete and lava boulders. No record can be found of this mark being set. It appears to be the same concrete cylinder as recovered and monumented in 1899.

To reach from the Post Office at Hilo: go north on the coast highway for 31.9 miles to the Okalua Post Office; continue ahead on highway for 0.9 miles, turn left on paved plantation road and go 0.6 miles. From here park southeasterly through same field for about 150 yards to station.

(continued on next page)
RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAHOLO
ESTABLISHED BY: IHO
YEAR: 1877
STATE: Hawaii
RECOVERED BY: J.M. Whipp
YEAR: 1966
COUNTY: Hawaii
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: Island: Hawaii

Detailed statement as to the nature of the original description, including marks found, surroundings, changes noted, and other pertinent facts:
Station mark was recovered in good condition. A complete description follows: Station is located about 1-1/2 miles west of O'olua and 700 feet south of State Highway 18, at about 955 feet elevation, on a flat rise in cane field, 250 feet east of the main cane-field road that runs upgrade between Kehia and Kaho'olua Gulches, and 350 feet north-northeast of a crossroad. To reach station from the post office at Kauhalehe, go northwest 0.1 mile; turn left and continue north, on State Highway 19, for 6.7 miles to macadam side road left, on curve of highway. Turn left and go southerly upgrade for 0.15 mile to end of truck travel about 75 yards before crossroad. Walk east 250 feet to high point and station.
Station mark is an unstamped Hawaii Territory Survey disk, set in the top of an 8-inch-diameter, concrete monument that projects 3 inches from the top of a stone and concrete pillar about 2-1/2 feet high and 4 feet across at the base. A Type A signal is centered over the mark, with the 6-foot-square, concrete platform 4 feet above ground. A red and white metal target extends about 8 feet above the platform.
No reference marks established as cane is planted up to edge of the signal.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KAHOLO
ESTABLISHED BY: IHO
YEAR: 1977
STATE: Hawaii
RECOVERED BY: J.W. Collom
YEAR: 1986
COUNTY: Hawaii

Detailed statement as to the nature of the original description, including marks found, surroundings, changes noted, and other pertinent facts:
Station recovered in good condition. 1966 description adequate.
**HORIZONTAL CONTROL DATA**

**DESCRIPTION OF TRIANGULATION STATION**

**NAME OF STATION**: KAU
**STATE**: Hawaii  
**COUNTY**: Hawaii

**CHIEF OF PARTY**: D.M. Whipp  
**YEAR**: 1967

**NOTE:**
- **Height of telescope above station mark**: 1.57 meters
- **Height of light above station mark**: 0.00 meters
- **Distance and direction to adjacent marks, reference marks and prominent objects which can be seen from the ground at the station**: 0.00 meters

---

**UNIT**: Feet

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEANING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOHOLALELE</td>
<td>HS</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RM No. 2</td>
<td>M</td>
<td>412.0</td>
<td>0.00</td>
</tr>
<tr>
<td>RM No. 1</td>
<td>M</td>
<td>412.0</td>
<td>0.00</td>
</tr>
<tr>
<td>Paiauilo, Stack, 1948</td>
<td>ESE</td>
<td>392.0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Station is located in the northern part of the island, about 2 miles northeast of Paiauilo, 3/4-mile northeast of State Highway 19 and 1/4-mile southwest of the sea, at about 400 feet elevation, between Kauai and Koamano Gulches, on a small grassy and rocky knoll on the southeast and higher end of a brushy rim overlooking next cane field to northwest, which is about 40 feet lower.

To reach station from the post office at Paiauilo, go north on State Highway 19 for 1.6 miles to crossroad. Turn right and go 0.25 mile to T-junction; turn right and go 0.5 mile to T-junction. Turn left and go 0.25 mile to side road right. After crossing concrete bridge, turn right and follow cane road 0.1 mile, then go left 0.05 mile on cane road to end of road and station.

Station mark is a standard disk stamped "KAU 1967", set in the top of a 2-foot-diameter mass of concrete flush with surrounding rocks. It is on southeast slope of the knoll, on small flat area among rocks, 20 feet northeast of, and about 5 feet lower, than highest point of knoll, and is 3 feet southwest of a white witness post.

Reference mark number one is a standard disk stamped "KAU 1967", cemented in a drill hole in a 3-foot boulder that projects 1.5 feet above ground. It is 0.4 foot higher than station mark.

Reference mark number two is a standard disk stamped "KAU 1967", cemented in a drill hole in the northeast tip of a large rock that projects about 4 feet higher than station mark. It is about 15 feet northeast of high point of knoll.

**NOTE:** Underground station mark is a standard disk stamped "KAU 1967", set in concrete about 3 feet beneath ground level.

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION**: KAU  
**STATE**: Hawaii  
**YEAR**: 1967

**NOTE:**
- **Height of telescope above station mark**: 1.57 meters
- **Height of light above station mark**: 0.00 meters
- **Distance and direction to adjacent marks, reference marks and prominent objects which can be seen from the ground at the station**: 0.00 meters

---

**UNIT**: Feet

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEANING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOHOLALELE</td>
<td>HS</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RM No. 2</td>
<td>M</td>
<td>412.0</td>
<td>0.00</td>
</tr>
<tr>
<td>RM No. 1</td>
<td>M</td>
<td>412.0</td>
<td>0.00</td>
</tr>
<tr>
<td>Paiauilo, Stack, 1948</td>
<td>ESE</td>
<td>392.0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Station is located in the northern part of the island, about 2 miles northeast of Paiauilo, 3/4-mile northeast of State Highway 19 and 1/4-mile southwest of the sea, at about 400 feet elevation, between Kauai and Koamano Gulches, on a small grassy and rocky knoll on the southeast and higher end of a brushy rim overlooking next cane field to northwest, which is about 40 feet lower.

To reach station from the post office at Paiauilo, go north on State Highway 19 for 1.6 miles to crossroad. Turn right and go 0.25 mile to T-junction; turn left and go 0.05 mile; turn right, opposite a cemetery, and go downgrade 0.7 mile to T-junction. Turn left and go 0.35 mile to side road right, just after crossing concrete bridge. Turn right and follow cane road 0.1 mile, then go left 0.05 mile on cane road to end of road and station.

Station mark is a standard disk stamped "KAU 1967", set in the top of a 2-foot-diameter mass of concrete flush with surrounding rocks. It is on southeast slope of the knoll, on small flat area among rocks, 20 feet northeast of, and about 5 feet lower, than highest point of knoll, and is 3 feet southwest of a white witness post.

Reference mark number one is a standard disk stamped "KAU 1967", cemented in a drill hole in a 3-foot boulder that projects 1.5 feet above ground. It is 0.4 foot higher than station mark.

Reference mark number two is a standard disk stamped "KAU 1967", cemented in a drill hole in the northeast tip of a large rock that projects about 4 feet higher than station mark. It is about 15 feet northeast of high point of knoll.

**NOTE:** Underground station mark is a standard disk stamped "KAU 1967", set in concrete about 3 feet beneath ground level.

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION**: KAU  
**STATE**: Hawaii  
**YEAR**: 1967

**NOTE:**
- **Height of telescope above station mark**: 1.57 meters
- **Height of light above station mark**: 0.00 meters
- **Distance and direction to adjacent marks, reference marks and prominent objects which can be seen from the ground at the station**: 0.00 meters

---

**UNIT**: Feet

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEANING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
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<td>M</td>
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<td>0.00</td>
</tr>
<tr>
<td>RM No. 1</td>
<td>M</td>
<td>412.0</td>
<td>0.00</td>
</tr>
<tr>
<td>Paiauilo, Stack, 1948</td>
<td>ESE</td>
<td>392.0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Station is located in the northern part of the island, about 2 miles northeast of Paiauilo, 3/4-mile northeast of State Highway 19 and 1/4-mile southwest of the sea, at about 400 feet elevation, between Kauai and Koamano Gulches, on a small grassy and rocky knoll on the southeast and higher end of a brushy rim overlooking next cane field to northwest, which is about 40 feet lower.

To reach station from the post office at Paiauilo, go north on State Highway 19 for 1.6 miles to crossroad. Turn right and go 0.25 mile to T-junction; turn left and go 0.05 mile; turn right, opposite a cemetery, and go downgrade 0.7 mile to T-junction. Turn left and go 0.35 mile to side road right, just after crossing concrete bridge. Turn right and follow cane road 0.1 mile, then go left 0.05 mile on cane road to end of road and station.

Station mark is a standard disk stamped "KAU 1967", set in the top of a 2-foot-diameter mass of concrete flush with surrounding rocks. It is on southeast slope of the knoll, on small flat area among rocks, 20 feet northeast of, and about 5 feet lower, than highest point of knoll, and is 3 feet southwest of a white witness post.

Reference mark number one is a standard disk stamped "KAU 1967", cemented in a drill hole in a 3-foot boulder that projects 1.5 feet above ground. It is 0.4 foot higher than station mark.

Reference mark number two is a standard disk stamped "KAU 1967", cemented in a drill hole in the northeast tip of a large rock that projects about 4 feet higher than station mark. It is about 15 feet northeast of high point of knoll.

**NOTE:** Underground station mark is a standard disk stamped "KAU 1967", set in concrete about 3 feet beneath ground level.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: KAUMOALI 2
STATE: HAWAII
YEAR: 1949
SECOND

SOURCE 6-9276

GEODETIC LATITUDE: 20° 03' 55.95"
GEODETIC LONGITUDE: 159° 23' 46.749"
ELEVATION: 193.3 METERS

STATE COORDINATES (FUR):

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>535,676.64</td>
<td>447,487.13</td>
</tr>
</tbody>
</table>

PLAN AITMHT HAS BEEN COMputed BY THE 2" X 2" FORMULA NEGLECTING THE SECOND TERM

TO STATION OR OBJECT

<table>
<thead>
<tr>
<th>NAME</th>
<th>GEODETIC AZIMUTH (True north)</th>
<th>PLANE AZIMUTH (Clin. north)</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAHAKUOLO 2</td>
<td>125° 19' 51.4</td>
<td>125° 17' 43&quot;</td>
<td>5101</td>
</tr>
</tbody>
</table>

(continued on next page)
Station is destroyed. The ridge has been cleared off and planted in sugar cane. Station monument was found pushed nearly out of ground by machinery; a search was made for an underground mark but none was found. The station had apparently been built up over an old survey point because a 2-1/2-inch iron pipe was found extending from the bottom of the concrete monument.

Reference mark number one was recovered in good condition. A search was made for reference mark number two by distance and angle but it was not found and is believed destroyed by machinery.

Reference mark number one is a standard disk stamped "1 1948", cemented in a drill hole in a 12-inch boulder flush with ground. It is 21 feet east of center line of field road and 6 feet west of edge of ridge, where road begins to drop downgrade to north.

To reach from the post office in Kualapuu, go northwest 0.1 mile; turn left and go northwest on State Highway 19 for 11.2 miles to fork in Puuolu village; continue ahead on the highway for 1.6 miles to paved side road right. Turn right and go 0.15 mile to T-Junction. Turn left and go 0.05 mile to side road right, by cemetery. Turn right and go down long hill for 0.7 mile to T-Junction. Turn left and go 0.35 mile to side road right, just after crossing bridge across Kaumolu Stream. Turn right and go north 200 feet along west side of gulch to crest of hill.
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

NO ORIGINAL TEXT

Kohalaale (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Hand, 1913).—Near northeastern coast of Hawaii, in the central part of Hamakua district, on the eastern summit of Puu Pele, a conspicuous hogback hill trending north and south, which is seen ¾ mile above the government road, between the post offices of Kukialua and Paaulo. The lower or seaward end of this hill is covered with bushes. To reach the station start at the large schoolhouse, red, trimmed with white, and go along the government road toward Kukialua, passing the road down to Paaulo mill; a few yards farther on take the trail which leads up the hill. When on top the hill will be seen to consist of two parallel hogbacks; the station is on the highest point of the east hogback. The hill is on range with the Paaulo sugar mill and the red and white schoolhouse. Station marked by a concrete cylinder about 8 inches in diameter projecting some 4 inches above surface of ground with copper plate of the United States Geological Survey in top. It is surrounded by a pile of small bowders. Reference mark is station Water, an octagonal water tank on the lower end of the west hogback. It is about 50 meters from station bearing N. 20° W.

RECOVERY NOTE. TRIANGULATION STATION

NAME OF STATION: KOHALALE
EMPIRE: Hawaiian Govt.
YEAR: 1877
STATE: HAWAII
RECOVERED BY: E. L. Church
YEAR: 1946
COUNTY: HAWAII

Detailed statement as to the losses of the original description: The original station was not recovered. It is not known how the 1877 station was marked. In 1913 E. R. Hand reported recovering a U. S. Geological Survey disk set in the top of an 8 inch concrete cylinder. About 1929 the Territory Survey Department reported recovering a 4 inch iron pipe which was set in concrete. Also in 1929 the Territory Survey constructed a concrete platform, 6 feet square and 4 feet high, over the station. The present survey has recovered a 4 inch iron pipe which projects 4 inches from a concrete base which is 1 1/2 inches high. No disk was found in the pipe. A new description follows:

The station is located on the crest of a low north-south ridge; about 8 miles west of Ookala, about 2.5 miles southeast of Paaulo, 2.5 miles west southwest of Popoloa Point, about 200 yards south of three old water tanks and about 100 yards north of a heavy growth of timber. The station is the center of a 2 1/2 inch iron pipe which projects 10 inches from the top of a concrete base. The top of this pipe is 48 inches higher than the top of the pipe which marks the old station.

To reach the station from the post office at Paaulo; go south and east, on the road which leads toward Hilo, for 2.5 miles. Turn right, go west for about 100 feet, turn left and go south and west, on a paved road, for 1.8 miles; turn right onto a dirt road, and go westerly for 0.6 mile; pass through a board gate and follow a field road northwesterly for 0.5 mile; pass under a power line and continue northwesterly, up a steep grade, for 0.1 mile to the crest of the ridge and the station.

Object

PAUAULU (metal target) NW 00 00 00
KOOLOE S 107 30 25.1
KHUA (metal target) S 206 50 55.7

An early recovery note reports: Original station recovered by E. L. Church in March 1911. Marked by bronze tablet set over old mark in top of concrete post. Elevation stamped 1060.

(continued on next page)
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM

KOHOLALELE (continued)

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION:
KOHOLALELE

ESTABLISHED BY:
N.O.S.
YEAR: 1887
STATE: Hawaii
COUNTY: Hawaii
Island: Hawaii

RECOVERED BY:
D.M. Whipp
YEAR: 1966

HEIGHT OF TELESCOPE ABOVE STATION MARK:
2.52 METERS
HEIGHT OF LIGHT ABOVE STATION MARK:

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

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE FEET</th>
<th>DISTANCE METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPHIHALA (HGS) 1969</td>
<td></td>
<td>00 00 00.0</td>
<td></td>
</tr>
<tr>
<td>BM No. 1</td>
<td>S</td>
<td>10,598</td>
<td>3,219</td>
</tr>
<tr>
<td>BM No. 2</td>
<td></td>
<td>13,177</td>
<td>3,961</td>
</tr>
</tbody>
</table>

Station mark was recovered in good condition. Two reference marks were established. A complete description follows:

Station is located about 1/2 miles southeast of Paauilo and 1 mile southwest of State Highway 19, at about 1541 feet elevation, on a low, narrow, north-south ridge covered with ironwood trees, between cane fields.

To reach station from the post office at Laupahoehoe, go northwest 0.1 mile; turn left, and continue northwest, on State Highway 19, for 9.4 miles to Kohala Village; continue on the highway for 0.4 mile to crossroad at power pole #175. Turn left, past curved stone wall, and go upgrade 1.1 mile to crossroad. Turn right and go 0.15 mile, crossing a dip and passing under power line, to crest of ridge and end of truck travel. Walk north along ridge for about 75 yards to station.

Station mark is a U.S. Geological Survey disk stamped "1906", set in concrete 12 inches down inside of a 4-inch iron pipe which projects about 2 inches from the top of a 16-inch-diameter concrete monument that extends 10 inches above ground. NOTE: The pipe is usually filled with water and debris and mark cannot be seen. Station is 48 feet north of a triangle blaze on a 12-inch ironwood. A Type A signal built by the Hawaii Territorial Survey is centered over the mark, with the 6-foot-square concrete platform 2 feet above ground. A red and white metal target extends about 8 feet above the platform.

Reference mark number one is a standard disk stamped "KOHOLALELE HGS 1877 NO 1 1966", braced to the top of a 2-inch iron pipe that is set in concrete and projects 6 inches above ground. It is 6 feet west-northwest of a 5-inch ironwood tree and 1.1/2 feet lower than station mark.

Reference mark number two is a standard disk stamped "KOHOLALELE HGS 1877 NO 2 1966", braced to the top of a 2-inch iron pipe that is set in concrete and projects 6 inches above ground. It is 4 feet northwest of the 12-inch tree with triangle blaze and 1.1/2 feet higher than station mark.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION:
KOHOLALELE

ESTABLISHED BY:
N.O.S.
YEAR: 1877
STATE: Hawaii
COUNTY: Hawaii

RECOVERED BY:
D.M. Whipp
YEAR: 1967

AERIAL DISTANCE AND DIRECTION FROM NEAREST TOWN:

Detailed description of the location of the original descriptor, including marks found, animal tracks, features and other pertinent data:

Station was recovered as described in 1966 and all marks found in good condition.
HORIZONTAL CONTROL DATA
by the
National Ocean Survey
OLD HAWAIIAN DATUM

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

DEPARTMENT OF COMMERCE
U.S. GEOLOGICAL SURVEY

NAME OF STATION: KUKUI
STATE: Hawaii
COUNTY: Hawaii
Island: Hawaii
Described by: R.P. Hanson
CHIEF OF PARTY: D.W. Whipp
YEAR: 1967
Note: LEGEND OF TELESCOPE ABOVE STATION MARK 1.5 Meters
LEGEND OF MARK ABOVE STATION MARK 1 METER

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

OBJECT
PAUHAU (HGS) 1877
RM No. 2
Pauulo, Stack 1948
RM No. 1
MEASURING DIRECTION DISTANCE
Feet Meters
NW 13.245 4038
ESE 9.687 2,953

Station is located in the northern part of the island, about 2-1/4 miles west-northwest of Pauulo, along the southwest side of State Highway 19, above a very high cutbank on a prominent hill planted in sugar cane, between Kukilamalamahe and Waikakulu Gulches. The cutbank is about 90 feet high and has a fringe of small ironwoods along the edge.

To reach station from the post office at Pauulo, go northwesterly on State Highway 19 for 3.25 miles to crossroad at power pole 64. Turn left and go up grade on main cane field road for 0.13 mile; take left fork and follow winding field road for 0.2 mile to top of hill and station on left.

Station mark is a standard disk stamped "KUKUI 1967", set in the top of a 10-inch square, concrete monument that projects 5 inches. It is at north end of cane field, in line with the ironwood trees, tall grass, 7 feet southwest of edge of cutbank and 3 feet east of white witness post.

Underground mark is a standard disk stamped "KUKUI 1967", set in concrete about 3 feet below ground level.

Reference mark number one is a standard disk stamped "KUKUI NO 1 1967", set in cement in the top of a 3-inch, iron pipe that is set in concrete and projects 1 inches above ground. It is among the small ironwoods, 5 feet southwest of edge of cutbank and about 1 foot lower than station mark.

Reference mark number two is a standard disk stamped "KUKUI NO 2 1967", set in cement in the top of a 2-inch, iron pipe that is set in concrete and projects 1 inches above ground. It is in grassy area, 5 feet southwest of edge of cutbank and at same elevation as station mark.

NOTE: This station was established to replace destroyed station KUKILAMALAMAHEE 1948, which was located on high point of the hill, about 300 feet to southwest.

ADJUSTED HORIZONTAL CONTROL DATA

STATE HAWAII

YEAR 1967
SECOND ORDER

STATE COORDINATES (OFT):

STATE & ZONE CODE IN CHAIN
HI 5101 553,168.03 445,765.42 + 3.31 49

TO STATION OF OBJECT

GEODETIC LATITUDE: 20 03 38.5182
GEODETIC LONGITUDE: 155 24 42.4993
ELEVATION SLATED 28.5 FEET

QF 492

NOAA FORM 16-31
(3/62)
HORIZONTAL CONTROL DATA

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: KUUKULAMALAMHEE
STATE: HAWAII
CHIEF OF PARTY: L.C. WILDER
YEAR: 1948
NOTE: DISTANCE AND DIRECTION OF MAIN MARKS, GROUND MARKS, AND REFERENCE MARKS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION.

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASUREMENT</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KUUKULAMALAMHEE</td>
<td>100.15 30.829</td>
<td>0 00 00</td>
</tr>
<tr>
<td>R. No. 1 E</td>
<td>128.34 38.905</td>
<td>134 04 50.6</td>
</tr>
</tbody>
</table>

An old H.T.S. station located in the Hamakua District in the northern part of the Island of Hawaii 2.5 miles west of Pauulo Village and 1.5 miles inland from the sea. Situated on a prominent hill just above the government main road, 100 feet west of a line of eucalyptus trees and is surrounded by rocks.

The old station mark, a circular concrete post firmly imbedded in the ground was found. A standard disk was cemented in a drill-hole in the middle of the concrete post. The disk is stamped "KUUKULAMALAMHEE 1948". A small cairn of stones covers the station mark.

Two reference marks composed of the tops of 2-inch pipes three feet long and driven solidly in the ground are located near a fence line running north and south along the line of eucalyptus trees.

To reach the station from Pauulo Village drive westerly along the main government road to Honokaa a distance of about 2.5 miles and turn left up a plantation road that goes up the easterly side of the hill to the same field surrounding the station. The hill is the only prominent hill in the vicinity and can be identified by the line of eucalyptus trees on the east slope.

RECOVERY NOTE, TRIANGULATION STATION

NAME OF STATION: KUUKULAMALAMHEE
ESTABLISHED BY: L.C. WILDER
YEAR: 1948
STATE: HAWAII
RECOVERED BY: D.J. WHIPP
YEAR: 1967
COUNTY: HAWAII
AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN: 100 feet west of a line of eucalyptus trees.

Detailed statement as to the causes of the station's destruction, including notes from company, changes made, and other pertinent facts:

Station was searched for by angle, but was not found, and is believed to have been destroyed by cultivation. The row of trees mentioned in original description was recently removed and the reference marks are also gone.

A new station, KUUKULAMALAMHEE, was established nearby in April, 1967; see description for that station.
Landing (Hawaii Island, E. R. Hand, 1913).—On northeast coast of Hawaii, at Koholaale Shooting, which is between Puaulu and Rukahu sugar mills, the coast end, at gable, of large freight house. The building stands on the west side of the inclined railway which runs down to derrick and small-boat landing. The north, west, and south sides are white; the east end, or station end, is black. This east end, which is directly at track, is supported on nine 6 by 8 inch uprights, each resting on a stone set in the ground. The central stone, being directly under the station, serves as a mark. There is talk of removing all the buildings at this landing because of the new railroad. These foundation stones should permit the recovery of the station, which is well situated for an offshore hydrographic signal. Landing is easily made at concrete pier.

RECOVERY NOTE, TRIANGULATION STATION
INTERSECTION

NAME OF STATION Landing
STATE Hawaii
YEAR 1913
BENCH MARKS: Also

Recoveried By: B.M. Whipp
YEAR: 1966
COUNTY: Hawaii
Island: Hawaii

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

Station is destroyed. All buildings have been removed from old landing site and it is now overgrown with large ironwood trees.
## Horizontal Control Data

### Description of Triangulation Station

**Name of Station:** Makanuku 2  
**State:** Hawaii  
**County:** Hawaii  
**Chief of Party:** L. C. Wilder  
**Year:** 1946  
**Description:** By C. L. Knapp  

<table>
<thead>
<tr>
<th>Object</th>
<th>Bearing</th>
<th>Distance</th>
<th>Meters</th>
<th>Degrees</th>
<th>Minutes</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kukulilamahe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. M. No. 2 NW</td>
<td>15.60</td>
<td>6.009</td>
<td>188</td>
<td>36</td>
<td>06</td>
<td>20</td>
</tr>
<tr>
<td>R. M. No. 1 SW</td>
<td>61.60</td>
<td>18.087</td>
<td>334</td>
<td>28</td>
<td>30</td>
<td>19.50</td>
</tr>
</tbody>
</table>

Established by U.S. & O.S., in 1946 and is located in the Makanuku District on the north eastern part of the Island of Hawaii one mile east of Pauhihi Hill and 0.15 mile inland from the coast.

The station is located on a fairly prominent rise of land in a small rocky waste area surrounded by cane and is in the same vicinity of the old H.T.S. station "Makanuku" which is lost. Makanuku 2 is marked with a standard disk cemented in drill-hole in solid rock and stumped "Makanuku 2 1946".

Reference Mark No. 1 is cemented in drill-hole on top of a square concrete box from which a concrete ditch runs in a southern direction.

Reference Mark No. 2 is cemented in a drill-hole in solid rock about three feet lower than the station.

To reach the station from Hanalei Village proceed easterly along the main road to Hilo a distance of about 1.5 miles to the road which turns down to Pauhihi Hill. This road follows the east bank of a deep gulch for about a mile then turns right about one half mile more to Pauhihi Hill. Just before reaching the hill turn right into a deep gulch and continue along a plantation road running parallel to the sea for about 0.7 mile to a 2-foot concrete ditch running down towards the sea. Walk down the ditch about 700 feet along a gradual slope to a sharp drop in the terrain. After this point turn west 60 feet into the cane field to the station.

### Recovery Note, Triangulation Station

**Name of Station:** Makanuku 2  
**Established by:** L. C. Wilder  
**Year:** 1946  
**Recovered by:** D. M. Whipp  
**Year:** 1967  
**County:** Hawaii  
**Bench Mark:** L.

Airlane Distance and Direction from Nearest Town:

Detailed statements as to the history of the original description, including marks found, erroneous errors, and other pertinent facts:

Station was destroyed and replaced by Makanuku 3 1967 which is about 50 feet northwest.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
OLD HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

STATE: HAWAII
YEAR: 1967

NAME OF STATION: MAHAKUOLO 3

DEVELOPMENT OF TRIGONOMETRIC STATION

NOTE: 1. HEIGHT OF TELESCOPE ABOVE STATION MARK 1.5 METER.
2. HEIGHT OF TARGET ABOVE STATION MARK METER.
3. DISTANCES AND DIRECTIONS TO HORIZONTAL MARK, REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND AT THE STATION.

OBJECT MEARING DISTANCE DIRECTION
KAU SB 00 00 00.0
KUKUI SW 28 23 51.45
PAAHUAU (HGS) 1877 SW 101 52 38.43
Paauilo, Stock, 1948 SSE 156 08 34.4

Station is located in the northern part of the island, about 1 mile east of Paauilo Village and 700 feet inland from seaward, on a slightly rounded high point in a cane field, just below hill breaks quite steeply down to northeast.

To reach station from the post office in Paauilo, go northeast on State Highway 19 for 4.9 miles to paved road at highway sign "ELEV 1000 FEET". Turn right and go downhill for 1.3 miles to T-junction. Turn left and go 0.25 mile to side road left (this is the 5th cane road going left). Turn sharp left and go 0.15 mile to end of truck travel 30 feet before break in cane road where it begins very steep drop down to northeast. Walk left, northwest, across cane field for 62 feet to station.

Station mark is a standard disk stamped "MAHAKUOLO 3 1967", set in the top of a 12-inch-diameter, concrete monument that projects 1 inch above ground. It is 62.0 feet west-southwest of center line of cane road, 400 feet south-southwest, upgrade, from ironwood trees along edge of field, and 15 inches northeast of a 2-inch, iron pipe that is 15 feet high and has a red metal flag with yellow diamond in center mounted on top. The pipe is set in a mass of concrete about 2 feet square. An old section of concrete slab 3 feet long extends on an angle from the ground 2 feet northwest of station mark.

Underground mark is a standard disk stamped "MAHAKUOLO 3 1967", set in concrete about 3 feet below ground level. No reference marks were established as sugar cane is planted up to station all around.

NOTE: This station was established to replace destroyed station MAHAKUOLO 2 1948 which was about 50 feet northwest.

STATE COORDINATES (FT.)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>( \Delta \lambda )</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>525.59269</td>
<td>454,650.63</td>
<td>+ 0° 01' 32&quot;</td>
</tr>
</tbody>
</table>

* Plane azimuth with an adjusted the 100X formula neglecting the second term.

TO STATION OBJECT TABLE

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>DEGREES FROM CENTER</th>
<th>HORIZONTAL</th>
<th>PLANE AZIMUTH</th>
<th>CURVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAU</td>
<td>303 NO 24.6</td>
<td>303 38 53</td>
<td>5101</td>
<td></td>
</tr>
</tbody>
</table>
DESCRIPTION OF TRIANGULATION STATION

Station mark is a standard disk embedded in a mass of concrete projecting about 6" above the ground. It is located about 200 metres inland from the shore line and about 5.6 miles east of Honolulu. It is about 600 metres north of station III and is reached by following along the irrigation ditch and line of trees, running from III northwest to the shore. There is a small break in the trees where the station is located.

RECOVERY NOTE, TRIANGULATION STATION

Station has been destroyed by machinery. The concrete monument, with disk in top, was found laying on top of the ground. Disk was removed from monument at this time.
HORIZONTAL CONTROL DATA

by the
National Ocean Survey
O.H. HAWAIIAN DATUM

ADJUSTED HORIZONTAL CONTROL DATA

SOURCE: G-52184

STATE: HAWAI'I
YEAR: 1913
THIRD ORDER

DEGREES LATITUDE: 20° 01' 11.972
DEGREES LONGITUDE: 155° 17' 10.505
ELEVATION: 430,757.1 FEET

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>X</th>
<th>Y</th>
<th>Z COORDINATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI</td>
<td>5101</td>
<td>573,265.85</td>
<td>430,579.61</td>
<td>+ 0.04 23</td>
</tr>
</tbody>
</table>

* Plane azimuth has been computed by the T H O M A S FORMULA, neglecting the second term.

<table>
<thead>
<tr>
<th>STATION OR OBJECT</th>
<th>DEGREES AZIMUTH FROM SOUTH</th>
<th>PLANE AZIMUTH* FROM SOUTH</th>
<th>CODE</th>
</tr>
</thead>
</table>

QF 104
**HORIZONTAL CONTROL DATA**
by the National Ocean Survey, National Geodetic Survey

**NO ORIGINAL TEXT**

**RECOVERY NOTE, TRIANGULATION STATION**

**NAME OF STATION:** Opilihala
**STATE:** Hawaii
**COUNTY:** Hamakua
**ESTABLISHED BY:** H.O.S.
**YEAR:** 1881
**LOCALITY:** Paunilo, Hamakua, Hawaii
**RECOVERED BY:** H.O.S.
**YEAR:** 1998

Detailed statement of the change in the name of the original description:

Location of Station: On the upper bank of the Government main road thru Paunilo village. The station is located near the top of the long concrete stairway leading to the Japanese school lot.

Old Station Mark Found: 10" cylindrical concrete monument marked with C and drill hole in center of same.

New station mark: H.O.S. Type D monument (Triangular concrete monument 7 1/2 ft 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 standard metal target is set in the 2 1/2" pipe.

**DEPARTMENT OF COMMERCE**

**NAME OF STATION:** Opilihala
**STATE:** HAWAII
**COUNTY:** Hamakua
**ESTABLISHED BY:** H.O.S.
**YEAR:** 1881
**CHIEF OF PARTY:** C.L. WILBER
**YEAR:** 1968

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MEASUREMENT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. M. No. 1</td>
<td>48.05</td>
<td>14.655</td>
<td>E52°25'32&quot;</td>
</tr>
</tbody>
</table>

This station is an old Hawaiian Government station established in 1881. It is located in Paunilo village, Hamakua, Hawaii on the high road out directly above the middle of the business part of the village and about 100 feet east of the post office. At the top of a long concrete stairway up the roadside southwest and 95 feet distant from the station. The station is marked by a concrete monument 10 inches in diameter, the top of which is marked with a triangle cut, with a drill hole in the center. Surrounding the mark is a triangular slab of concrete 6 feet on each side, with a 2" inch pipe 2 feet long set on steel legs, cemented in place over the old mark which is exposed to view.

(continued on next page)
**HORIZONTAL CONTROL DATA**

by the

NATIONAL GEODETIC SURVEY

OLD HAWAIIAN DATUM

**OPHILALA (continued)**

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>BEARING</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>KONOLALEE (HGS) 1877--------1948</td>
<td>0° 00' 00&quot;</td>
<td>0° 00' 00&quot;</td>
<td>0° 00' 00&quot;</td>
</tr>
<tr>
<td>R.W. No. 1</td>
<td>SW</td>
<td>48.08 ft</td>
<td>14.655</td>
</tr>
<tr>
<td>KONOLALEE (HGS) 1877--------1966</td>
<td>0° 00' 00&quot;</td>
<td>0° 00' 00&quot;</td>
<td>0° 00' 00&quot;</td>
</tr>
<tr>
<td>NM No. 2</td>
<td>SE</td>
<td>75.570 ft</td>
<td>23° 03' 05&quot;</td>
</tr>
<tr>
<td>NM No. 1</td>
<td>NSW</td>
<td>48.065 ft</td>
<td>14.650</td>
</tr>
</tbody>
</table>

Station and NM No. 1 were recovered in good condition. An additional reference mark was established. A complete description follows:

Station is located in Puauloa village, in the northwest corner of the lawn at the east end of the cemetery at the Honokaa Buddhist Church, on top of the high curb above the business section of town, and 45 feet east of the path into the lawn, which is lined with concrete curbing on the street side.

To reach from the post office in Waipio village, go north 0.1 mile; turn left onto State Highway 19 and continue northwest for 11.2 miles to fork in Puauloa village. Turn left off highway and go north on the main street for 0.5 mile to narrow macadam driveway on left, just west of the school driveway. Turn left and follow driveway upgrade for 0.05 mile to macadam parking area. Continue ahead across north edge of lawn for 100 feet to station.

Station is marked by a 2-inch drill hole in the center of a 9-inch diameter concrete monument that projects 2 inches above the center of a triangular concrete platform that is 7 feet on each side and flush with ground. A 2-1/2-inch iron pipe, supported by 3 iron legs embedded in the concrete platform, is mounted vertically over the mark and supports a stainless steel target. Station is 68 feet north of an iron cemetery fence, 230 feet northwest of the concrete platform, 7-1/2 feet west of a line extended from the southeast side of the Iwahiku Gift Shop, and about 200 feet north-northwest of the cemetery gate.

Reference mark number one is a standard disk stamped "1948", cemented in the drill hole in the west end of the concrete platform at head of the long concrete platform, 6 inches in from edge of concrete and partly covered by a 2-inch water pipe. The mark is 1.56 feet higher than station.

Reference mark number two is a standard disk stamped "OPHILALA HGS 1948 NO 2 1966", cemented in the drill hole in the top of a 10-inch-square concrete block flush with ground. It is 21.5 feet east of the southeast corner of the iron cemetery fence, 33 feet west-northwest of edge of macadam parking area, 6 inches lower than station mark, and at the base of the bank above which the cemetery is located.

---

*Note: All property should be insured. The officer who actually placed the station should sign his name at the end of the recovery note.*

**RECOVERY NOTE, TRIANGULATION STATION**

<table>
<thead>
<tr>
<th>NAME OF STATION</th>
<th>OPHILALA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESTABLISHED BY</td>
<td>H.G.S.</td>
</tr>
<tr>
<td>YEAR</td>
<td>1861</td>
</tr>
<tr>
<td>STATE</td>
<td>Hawaii</td>
</tr>
<tr>
<td>COUNTY</td>
<td>Hawaii</td>
</tr>
<tr>
<td>AIRLINE DISTANCE AND DIRECTION FROM NEAREST TURN</td>
<td>AT PUAULOA</td>
</tr>
</tbody>
</table>
NO ORIGINAL TEXT

Pauhaun (Hawaii Island, Hawaiian Government Survey, 1877; E. R. Hand, 1913)—On northern coast of Hawaii, in Hamakua District, in land of Pauhaun, 150 meters northwest of the Weha-Pauhaun Gulch, on poorly defined flat-topped hill which rises gently to the southeast of the plantation camp called "Pauhaun Mauka" which is about 0.5 mile from the station. "Pauhaun Mauka" is about 3 miles above the main government road, about 1.5 miles inshore from the Pauhaun mill, and between Honokaa and Pauhaun post offices. To reach station, proceed along the government road from either Honokaa or Pauhaun post office until the road is reached which turns down to Pauhaun post office and mill; 150 meters from this road intersection toward Pauhaun post office (or to the northeast) is a road leading up the mountain; 400 meters up this road is the camp "Pauhaun Mauka." Continue along, crossing the plantation railroad, and about 140 meters beyond the tracks is a road turning left to a yellow house, occupied in 1913 by Dr. S. R. Brown, Pauhaun plantation. Follow this road until it turns into a yard, proceed a long outside of fence in front of house and along trail into cane in same direction as cane; in all go about 430 meters from the road intersection, then turn to left at right angles and proceed 80 meters to station. From the station "Pauhaun Mauka" bears N. 35° W., distant about 0.5 mile; Doctor Brown's house bears N. 15° E. distant about 250 meters. Original mark was a granite post set in concrete. Now marked by concrete cylinder, 6 inches in diameter, its top flush with ground, and centered with a copper plate, United States Geodetic Survey. A cairn was built over the station.

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION: PAUAHAU
ESTABLISHED BY HAWAIIAN GOVERNMENT SURVEY 1877
RECEIVED BY O. W. MILLER 1948 COUNTY HAWAII

Detailed statement as to the sources of the original description:
The original station, a granite post set in concrete, was not recovered. In 1913 Mr. E. R. Hand of the U.S. & S. reported recovering a bronze disk of the U.S. Geodetic Survey, in 1929 the Hawaiian Government Survey reported recovering a survey bronze disk.

Also in 1929 the Hawaiian Government Survey surrounded the station disk by a 6 foot square slab of concrete which projects about 1 foot above the soil. A 1/2 inch iron pipe projects about 18 inches from the top of this platform and was used as the station on this 1948 survey. A new description follows—
The station is located in a cane field about 0.5 miles southeast of Honokaa, about 2 miles south of Honokaa, about 0.5 mile west of the road which runs between Hilo and Honokaa, about 500 feet northwest of the west Pauhaun Gulch and about 300 feet southeast of a field road.

To reach from the post office in Honokaa; go southeasterly, on the road which leads toward Hilo, for 0.4 mile; continue straight ahead, southeasterly, for 0.5 mile; take the left hand fork and go southeasterly, toward Hilo, for 0.7 mile to a concrete overpass; cross over the overpass, turn right, onto a dirt road, and go southerly for 0.2 mile to a road intersection; turn left, southeasterly, and go 0.1 mile; turn right, southeasterly, and go 0.3 mile to the end of truck travel. From this point, proceed southeasterly, through a cane field, about 500 feet to the station.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: PAUAHAU
STATE: HAWAII
YEAR: 1877
SECOND: 1948

SOURCE: G-9276

| DEGREES LATTITUDE | 20 04 00.487 |
| DEGREES LONGITUDE | 155 26 49.883 |
| ELEVATION | 447.936.22 |
| METER | 153 |

STATE COORDINATE (EAST)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
</tr>
</tbody>
</table>

TO STATION OR OBJECT

| DEGREES LONGITUDE (Northward) | 11.0 38 44.6 |
| PLANE ALPHABET (Northward)    | 110 97 39 |
| CODE                         | 5101 |

*Plane azimuth has been computed by the cube of the formula neglecting the second term.

(continued on next page)
HORIZONTAL CONTROL DATA
by the
NATIONAL GEODETIC SURVEY
OLD HAWAIIAN DATUM
QUAD 201552 STATION 1023
LATITUDE ° 10 00 00
LONGITUDE ° 10 00 00

PAAUHAIU (continued)
The station is the center of a 2 1/2 inch iron pipe which
projects about 18 inches from the top of a 6 foot square concrete platform.
The platform projects about 1 foot above the soil.
No reference marks were set at this station.

<table>
<thead>
<tr>
<th>Object</th>
<th>Distance</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>KULAI (metal target)</td>
<td>00 00 00</td>
<td>GG 51 30</td>
</tr>
<tr>
<td>Pahuau Stool (Pahuau Sugar Co.)</td>
<td>2 miles NNE</td>
<td>08 12 08.3</td>
</tr>
<tr>
<td>KULAI (metal target)</td>
<td>170 80 10.3</td>
<td>155 12 01</td>
</tr>
<tr>
<td>KUHULAI (metal target)</td>
<td>187 31 13.2</td>
<td>187 31 13.2</td>
</tr>
</tbody>
</table>

An early recovery note reports; Original station recovered by H. H. H. P. in 1911. Remarked by bronze tablet centered in top of original granite post. Elevation stamped 1968.

RECOVERY NOTE, TRIANGULATION STATION

<table>
<thead>
<tr>
<th>NAME OF STATION</th>
<th>RECOVERY DATE</th>
<th>YEAR</th>
<th>STATE</th>
<th>COUNTY</th>
<th>ISLAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAAUHAIU</td>
<td>RECOVERED BY</td>
<td>D.M. Whipp</td>
<td>1967</td>
<td>Hawaii</td>
<td>Hawaii</td>
</tr>
<tr>
<td></td>
<td>YEAR</td>
<td>1877</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>COUNTRY</td>
<td>Hawaii</td>
<td></td>
<td>Hawaii</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RECOVERED BY</td>
<td>D.M. Whipp</td>
<td>1966</td>
<td>Hawaii</td>
<td>Hawaii</td>
</tr>
<tr>
<td></td>
<td>YEAR</td>
<td>1877</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>COUNTRY</td>
<td>Hawaii</td>
<td></td>
<td>Hawaii</td>
<td></td>
</tr>
</tbody>
</table>

Detailed statements as to the nature of the original description, including marks found, appearance, changes made, and other pertinent facts:

Station was recovered in poor condition. The Type B-1 signal was found to have been pushed about 30 feet north by cane-field machinery, and the station mark, a USGS disk, could be seen in a 7-inch, oval-shaped rock laying in the depression in the center of the concrete platform. Further investigation proved the rock to be the top part of the original granite post, snapped off at its 5-inch-diameter neck. The granite post was found very solidly embedded in a large mass of concrete and not shifted. A new station mark was set in the top of the granite post. No reference marks were set because sugar cane is planted up to the station on all sides. A complete description follows:

Station is located in cane field, about 2 miles southeast of Honokaa and 1/2 mile southeast of the junction of State Highways 19 and 24, at about 1354 feet elevation, along the west side of Kahawaiiloiiii Gulch, 1/4 mile southwest of a church and cemetery.

To reach station from Paauilo, go west on State Highway 19 for 5.3 miles to crossroad at milepost "Hilo 39 Mi". Turn left, go 25 yards and turn left again; go west 0.25 mile to fork by gas station. Take right fork and go 0.1 mile to old church. Pass along right side of church and cemetery and follow field road up along west side of gulch for 0.3 mile to end of truck travel. Walk westerly across cane field about 250 yards to station.

Station mark is a standard disk stamped "PAAUHAIU HGS 1877 1966", cemented in a drill hole in the center of the 5-inch-diameter neck on top of an 8-inch-square granite post that is set in a large mass of concrete about 1 foot in diameter and flush with ground. The mark projects about 1 inch above concrete.

NOTE: Officials of the Pahuau Sugar Co. plan to re-establish the 6-foot-square concrete platform of the Type B-1 signal over the station mark after the present sugar cane crop is harvested about March, 1968.

[Diagram showing the station mark, including an old USGS disk with the top part broken off, and a new station disk]
**RECOVERY NOTE, TRIANGULATION STATION**

**PAUAHU SUGAR CO STACK**

**HAWAII COUNTY, HAWAII**

**Established by:** E. R. Hand, 1913

**Owner:** Hawaii Sugar Company

**Year:** 1913

**State:** Hawaii

**Name of Station:** Pauahau Sugar Co. Stack

**Description:**

Station recovered and found in good condition. Station is a grey metal stack owned by Pauahau Sugar Company located on northern coast of Island of Hawaii, about 1/2 mile inland.

**RECOVERY NOTE, INTERSECTION**

**PAUAHU SUGAR CO. STACK**

**HAWAII COUNTY, HAWAII**

**Established by:** E. R. Hand, 1913

**Owner:** Hawaii Sugar Company

**Year:** 1913

**State:** Hawaii

**Name of Station:** Pauahau Sugar Co. Stack

**Description:**

Station was recovered. It is the tall silver stack with black top section, located on the Pauahau Sugar Mill at Pauahau village.

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** Pauahau Sugar Co. Stack

**YEAR:** 1913

**ELEVATION:** 20.35 24.516

**LATITUDE:** 155.26 16.037

**LONGITUDE:** 20.90 20.39

**DIAGRAM:** NE 51.5 HAWAII
**HORIZONTAL CONTROL DATA**

by the
National Ocean Survey
OLD HAWAIIAN DATUM

**ADJUSTED HORIZONTAL CONTROL DATA**

**NAME OF STATION:** PAUAULU STACK  
**STATE:** HAWAII  
**YEAR:** 1949  
**SOURCE:** G- 9279

<table>
<thead>
<tr>
<th>DEGREE U. S. A. SET</th>
<th>23°05' 15.155</th>
<th>ELEVATION:</th>
<th>METERS</th>
<th>0.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEGREE U. S. A. REFLI</td>
<td>195°21' 47.630</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STATE COORDINATES (1949):**

| STATE & ZONE | CODE | X | Y | Z 
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>546,940.05</td>
<td>443,375.36</td>
<td>0 02 45</td>
</tr>
</tbody>
</table>

*PLANE AZIMUTH HAS BEEN COMPUTED BY THE 5-5 FORMULA NEGLECTING THE SECOND TERM.*

<table>
<thead>
<tr>
<th>TO STATION OR OBJECT</th>
<th>DEGREE U. S. A. SET (Prinsecords)</th>
<th>PLANE AZIMUTH* (From Survey)</th>
<th>CURVE</th>
</tr>
</thead>
</table>

**QE 238**
HORIZONTAL CONTROL DATA

Pohakuaku (Hawaii Island, E. R. Haun, 1913)—On northeast coast of Hawaii, about 1½ miles west-northwest from Paauilo sugar mill, on a pronounced rise crowned with a great quantity of jagged rock and outcroppings, and about 25 meters back from the edge of the cliff; this is the highest point of the cliffs in this vicinity. This is a rounded point, and to the west-northwest the shore line curves inward, forming a cove across which the stack of Paauilo sugar mill is seen, bearing N. 75° W. Station marked by cross cut deeply into the rock outcrop. It is about 3 feet above the grassy slope, and is surrounded by a whitewashed cairn of stones built up to a height of 5 feet. A triangle cut in the outcrop is 0.7 meter from the station, bearing N. 65° E.

RECOVERY NOTE. TRIANGULATION STATION INTERSECTED

NAME OF STATION: Pohakuaku
ESTABLISHED BY: E. R. Haun
RECEIVED BY: D. W. Whipp
YEAR: 1913
COUNTY: Hawaii
STATE: Hawaii

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: Pohakuaku
STATE: Hawaii
YEAR: 1913

STATION 1026
HAWAII LATTITUDE: 20° 00' TO 20° 30'
LONGITUDE: 155° 00' TO 155° 30'
DIAGRAM: NE 5.15 HAWAII

SOURCE: G-92184

STATE COORDINATES (Ft)

<table>
<thead>
<tr>
<th>STATE &amp; ZONE</th>
<th>CODE</th>
<th>x (Ft)</th>
<th>y (Ft)</th>
<th>z (Ft)</th>
<th>f (Ft)</th>
<th>ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>5101</td>
<td>595,566.31</td>
<td>447,783.86</td>
<td>0.02 22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Plane Azimuth has been computed by the $ \phi = \Delta \phi' \Delta \Delta' $ formula neglecting the second term.
### Adjusted Horizontal Control Data

**Name of Station:** Puu Liolio  
**State:** Hawaii  
**Year:** 1877  
**Station Number:** 1029  
**Adjustment:** Third

**Source:** G–SP150

<table>
<thead>
<tr>
<th>Geographic Latitude</th>
<th>Geographic Longitude</th>
<th>Elevation (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20° 03' 15.723</td>
<td>155° 27' 00.824</td>
<td></td>
</tr>
</tbody>
</table>

**State Coordinates (feet):**

<table>
<thead>
<tr>
<th>State Zone</th>
<th>Code</th>
<th>X</th>
<th>Y</th>
<th>E (± 0.01')</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 1</td>
<td>9101</td>
<td>517,081.71</td>
<td>448,420.00</td>
<td>+ 0.01 01</td>
</tr>
</tbody>
</table>

*Plane Azimuth has been computed by the G–SP75 R. formula neglecting the second term.*

**To Station or Object**

<table>
<thead>
<tr>
<th>Geographic Azimuth (From Origin)</th>
<th>Plane Azimuth* (From Origin)</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QD 369**
NO TEXT.