

DATE: August 4, 1983

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

TIDE NOTE FOR HYDROGRAPHIC SHEET

Processing Division: Pacific Marine Center:

Hourly heights are approved for

Tide Station Used (NOAA Form 77-12): 161-2702 Laiemaloo, Hawaii

Period: October 26 - November 19, 1982

HYDROGRAPHIC SHEET: H - 10061

OPR: T 126

Locality: North Shore Island of Oahu, Hawaii

Plane of reference (mean lower low water): 9.95 ft.

Height of Mean High Water above Plane of Reference is 1.7 ft.

REMARKS: Recommended Zoning:
Zone: Direct

fr Donald Carrier
Chief, Tidal Datums Section, Tides & Water
Levels Branch

DATE: 8/14/84

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

TIDE NOTE FOR HYDROGRAPHIC SHEET

Marine Center: Pacific

OPR: T126

Hydrographic Sheet: H-10061

Locality: North Coast Oahu, HI

Time Period: October 26, 1982 - November 18, 1982 and
October 5, 1983 - November 29, 1983

Tide Station Used:

161-2668 Haleiwa, HI
161-2702 Laiemaloo, HI

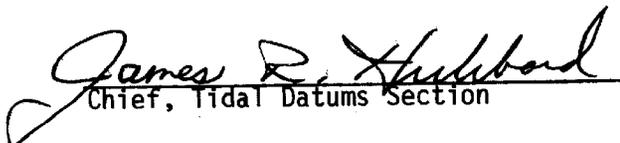
Plane of Reference (Mean Lower Low Water): 161-2668 = 2.68 ft.
(1982 work) 161-2702 = 9.95 ft.
(1983 work) 161-2702 = 9.88 ft.

Height of Mean High Water Above Plane of Reference: 161-2668 = 1.6 ft.
(1982 work) 161-2702 = 1.7 ft.
(1983 work) 161-2702 = ~~9.88 ft.~~ 1.8 FT. *

* FROM PHONE CONVERSATION WITH JOE MULLEN ON 9/6/84.

Remarks: Recommended Zoning:

- 1) For 1982 Work, Zone Direct on 161-2702
- 2) For 1983 Work
 - a) West of Longitude 157° 59.0' Zone Direct on 161-2668
 - b) East of Longitude 157° 59.0' Zone Direct on 161-2702


Chief, Tidal Datums Section

Field Tide Note

OPR-T126-FA-82✓

Island of Oahu, Hawaiian Islands

Field tide reduction of sounding was based on predicted tides from Honolulu, Oahu. Correctors were interpolated by the Hydroplot system using program AM 500. All times of both predicted and recorded tides were based on Universal Coordinated Time (UCT). Predicted tides were acceptable for hydrography with no discrepancies attributable to tide errors.

Honolulu Standard Gauge (161-2340)✓

The permanent tide station at Honolulu, Oahu (161-2340)✓ was the primary controlling gauge for project OPR-T126-FA-82✓, Island of Oahu. Levels were run by FAIRWEATHER personnel at the beginning and end of the project. Opening levels run on 7 October 1982 (JD 280) to four existing benchmarks were closed to 4.3 mm over the entire run of .49 km. Closing levels, run on 23 November 1982 (JD 327) to the same four benchmarks were closed to 5.0 mm over the entire run of .50 km. No changes in elevation were observed during hydrographic operations. Tide marigrams from station 161-2340 (Honolulu)✓ will be transmitted by the local tide observer in charge of this station.

Mokuoloe Island Subordinate Gauge (161-2480)✓

The permanent tide station located on Mokuoloe Island (161-2480)✓ was used for controlling the entire survey area along the northeast coast of Oahu. Opening and closing levels were run by FAIRWEATHER personnel to three existing benchmarks at the beginning and end of the project. Opening levels run on 8 October 1982 (JD 281) were closed to 2.1 mm over a run of .49 km. Closing levels, run on 24 November 1982 (JD 328) were closed to 2.0 mm over a run of .50 km. No changes in elevation were observed during hydrographic operations. Tide marigrams will be transmitted by the local tide observer in charge of this station.

Laiemaloo Subordinate Gauge (161-2702)✓

Tide station Laiemaloo (161-2702)✓ was used to control survey operations run between Kaoio Point and longitude 158°00.0'W along the northeast coast of Oahu. A 1-10 foot scale Metercraft bubbler tide gauge (#7601-7536-34)✓ was installed on 25 October 1982 (JD 298). Two gauge problems developed (see Tide Gauge Problems section) which were field corrected. The gauge then functioned properly until removal on 22 November 1982 (JD 326). Opening and closing levels were run by FAIRWEATHER personnel to five existing benchmarks. Opening levels, run on 26 October 1982 (JD 299) closed to 7 mm over a run of 3.0 km. Closing levels, run on 22 November 1982 (JD 326) closed to 4 mm over the 3.0 km run. An apparent shift in the tide gauge orifice of 4 mm downward was discovered after the running of the closing levels. The orifice movement is a result of the heavy surf conditions in this area. The apparent orifice movement of 4 mm downward is not significant enough that correctors be applied to tide data from this station.

Waimanalo Subordinate Gauge (161-2396)

Tide station Waimanalo (161-2396) was used to control survey operations from the southern limit of hydrography northward to Makapu Point on the northeast coast of Oahu. Investigation of the historical tide station site proved that all the historical benchmarks had been destroyed by recent construction and renovations. A new tide station site, and five new benchmarks were established on the University of Hawaii pier located approximately one mile south of the historical site. Five benchmarks stamped 2376A - 2376E consecutively, were set in the northern cement curb along the length of the pier, running shoreward from the tide gauge location. State survey mark U-11, located at the western limit of the pier, was included in the leveling runs, opening levels, run on 12 October 1982 (JD 285) to all six marks, closed to 1.3 mm over a run of .65 km. Closing levels, run on 24 November 1982 (JD 328) to the same marks, closed to 1.8 mm over a .65 km run. No changes in elevation were seen during hydrographic operations. A 1-10 foot scale Metercraft bubbler gauge (#7601-7536-31) was installed on 11 October 1982 (JD 284) and ran well until removed on 29 November 1982 (JD 333).

Gauge Problems

Laiemaloo Tide Gauge (161-2702)

On 27 October 1982 (JD 300) tide gauge #7601-7536-34 located at tide station Laiemaloo (161-2702) began to malfunction. An interrupted pen trace, caused by corroded pen pivots on the recording mechanism of the gauge, was randomly seen between Julian dates 300 to 312. All periods of lost tidal trace were recoverable by interpolation of the marigram and no hydrography was lost as a result of this malfunction.

Table 1, Periods of Interrupted Tidal Trace, is a listing by Julian dates of periods in which no tidal trace was recorded on the marigram.

On 06 November 1982 (JD 310), gauge #7601-7536-34 located at station Laiemaloo (161-2702) was found to be jammed. No tidal record was gathered between 0100, 4 November 1982 (JD 308) to 0200, 6 November 1982 (JD 310). No hydrography, controlled by this gauge, was run during this period.

Table 1
Times of Lost Tidal Record
Laiemaloo Tide Station (161-2702)

| <u>Julian Day</u> | <u>Times (+10)</u> |
|-------------------|--------------------|
| 300 | 1928-1936 |
| 300 | 1939-2155 |
| 301 | 0945-0950 |
| 301 | 1533-1600 |
| 301 | 1945-2250 |
| 301 | 2315-2340 |
| 302 | 0650-0725 |
| 302 | 0825-0905 |
| 302/303 | 2110-0135 |
| 303 | 0720-1345 |
| 303/304 | 2025-0120 |
| 304 | 0225-0305 |

Table 1 continued

| <u>Julian Day</u> | <u>Times (+10)</u> |
|-------------------|--------------------|
| 304 | 0631-0708 |
| 304 | 0840-0850 |
| 304 | 0930-1450 |
| 304/305 | 2345-0000 |
| 305 | 1017-1235 |
| 307 | 1058-1735 |
| 307 | 2117-2143 |
| 307 | 2215-2232 |
| 312 | 2020-2035 |

Miscellaneous

All tidal records were based on a +10 time meridian corresponding to Universal Coordinated Time (UCT).

On 23 November 1982 (JD 327) Hurricane Iwa struck the islands of Oahu, Kauai, and Niihau. A tidal surge of 3-5 feet was predicted for the area on and around these islands. Although the gauge located at station Laiemaloo (161-2702) was removed prior to the hurricane and station Wiamanalo (161-2376) showed no sign of tidal surge, a close inspection of data from both permanent gauge sites should be made on this date to see if either location experienced a tidal surge.

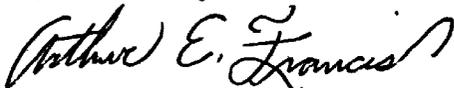
Because the tidal records from the permanent gauge sites will not be transmitted until a later date by the local tide observers, a comparison between adjacent tide gauges could not be made, and should be performed at a later date when all tidal records are available. A recommendation for zoning and time correctors could not be made for the same reasons.

For station Laiemaloo gauge, zero was equivalent to 0.880 feet (0.268 meters) on the adjacent staff. Gauge zero for station Wiamanalo was equivalent to 1.420 feet (-0.433 meters) on the adjacent tide staff. Gauge to staff comparisons for both permanent sites should be taken from historical data because records from both sites were unavailable for determination.

The gauge at station Laiemaloo (161-2702) was only under operation for a period of 28 days. Its removal was necessitated by the approach of Hurricane Iwa.

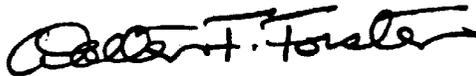
Times of hydrography abstracts are appended to this field note.

Submitted by:



Arthur E. Francis
Ensign, NOAA

Approved by:



Walter F. Forster
Commander, NOAA
Commanding Officer

Field Tide Note
OPR-T126-FA-83
Oahu Island, Hawaii

The primary tide gauge (161-2340) at Honolulu, Hawaii, served as reference station for the predicted tides used on the Oahu Island project as stated in the Project Instructions, OPR-T126-FA-83.

Predicted tide correctors for the field sheets were interpolated aboard the FAIRWEATHER using the program AM 500 dated 10 NOV 72. Zone correctors from Project Instructions were applied to the reference station for hydrography on the inshore sheet FA-20-3-83 (H-10061) only. Due to the surveyed depths (between 100 & 2000 fathoms) of the offshore sheet FA-80-1-82 (H-10068), tide correctors were not applied to this survey. Since Project Instructions did not specify zoning correctors for the Penguin Bank area, correctors for the closest subordinate tide station (Hanauma Bay) were used to obtain the predicted tidal data used on the final field sheet of the offshore survey FA-40-1-83 (H-10117).

All times of both predicted and recorded tides are expressed in Universal Coordinated Time (UTC or Z). All predicted tides were acceptable for hydrography with no discrepancies in data attributable to tide errors.

Four tide gauges were used to support hydrographic operations of the Hawaiian Islands project, OPR-T126-FA-83. These gauges consisted of the primary reference gauge at Honolulu (161-2340); the primary gauge at Mokuoloe Island in Kaneohe Bay (161-2480); and the two field gauges established by FAIRWEATHER personnel; Laiemaloo (161-2702) and Haleiwa (161-2668). Installed at Laiemaloo was a Metercraft analog tide gauge, S/N 7602-705-101. The Haleiwa gauge was also a Metercraft analog recorder, S/N 7601-7536-29.

Levels

Third order levels were performed at all four tide stations before the beginning of hydrographic operations and again before departing the working grounds in accordance with Project Instructions, OPR-T126-FA-83, dated 31 AUG 83.

Levels were performed at the primary reference gauge in Honolulu, Hawaii (161-2340) on 29 SEP 83 (JD 272) and again on 22 NOV 83 (JD 236) between the reference mark of the electric tape gauge and three bench marks. Comparison of opening and closing levels to historic data showed no indication of any vertical movement in the marks or the tape gauge reference mark. The maximum deviation between present and historic levels was 2 mm.

Levels were performed at the primary tide station on Mokuoloe Island, Kaneohe Bay, Hawaii, (161-2480) on 28 SEP 83 (JD 271) and again on 21 NOV 83 (JD 325) between the tide staff and three bench marks. Comparison of opening and closing levels showed no indication of any vertical movement in the marks or the staff. Present levels agreed to historic levels to within 1 mm.

Levels at the Laiemaloo field tide gauge were conducted on 3/4 OCT 83 (JD 276/277) and again on 22 NOV 83 (JD 326) to the five existing bench marks from the staff. Closing levels agreed within 4 mm to opening levels indicating no vertical movement in the marks or the staff. The maximum deviation between present and historic levels was 2 mm.

Levels for the Haleiwa tide gauge were conducted on five separate occasions during survey operations: 13 OCT (JD 286), 21 NOV (JD 325), 25 NOV (JD 329), 28 NOV (JD 332), and 1 DEC (JD 335), 1983. Opening levels were conducted on 13 OCT 83 to establish initial elevations for the five bench marks used.

The first set of closing levels were conducted on 21 NOV 83. Two problems were encountered during these levels. First, the onset of darkness precipitated the loss of the rod level bubble in the water near the staff thus preventing the closure of the level loop to the staff. The second problem was the discovery of a 0.802 meter discrepancy in the elevation of bench mark "2668 D 1983".

On 25 NOV 83, two level loops were run from bench mark "C&GS No. 5 1969" to "2668 D 1983" in an effort to resolve the 0.802 meter discrepancy. These levels confirmed that an error was made during the 13 OCT 83 opening levels.

On 28 NOV 83, one level loop was run from the staff stop to BM "2668 A 1983" in an effort to close out the levels begun on 21 NOV 83. These levels failed to confirm the opening elevation for BM A.

After piecemealing the levels to agree, the complete level run from the staff to all five bench marks were releveled on 1 DEC 83. These final closing levels agreed with the 13 OCT 83 opening levels for bench marks A, B, C, and No. 5 with a maximum variance of 3 mm. They also confirmed the run from C&GS No. 5 to BM D obtained from levels conducted on 21 and 25 NOV 83.

Operational Problems

The bubbler gauge at Laiemaloo only experienced two problems during the course of survey operations. The first problem detected was a minor inconsistency with the speed of the chart drive. This required only that the clock mechanism be reset several times during survey operations. The second problem occurred on 18 OCT 83 at 0135Z when high surf conditions tore the bubbler tubing apart at the surf zone. The bubbler tubing was replaced and the gauge was restarted at 0121Z on 26 OCT 83. No hydrographic data was lost due to this problem as ship survey operations were being conducted in water depths that ranged from approximately 100 to 2000 fathoms during the time of the gauge failure.

The Haleiwa bubbler gauge failed to collect tidal data on two occasions as a result of a dry pen. The first gap is from 0110Z on 9 OCT 83 to 2200Z on 13 OCT 83. The second gap is on 17 OCT 83 from 1130Z to 1902Z.

No hydrographic data was lost as a result of the 117 hour gap between 9 OCT and 13 OCT since only deep water ship hydrography was being conducted during this period of time. Interpolation can be used to provide tidal information for the 9.5 hour gap in tidal data on 17 OCT 83.

One additional problem was encountered with the Haleiwa tide record. The printed time on the chart paper was centered between time lines in such a way as to cause confusion for different observers as to the actual gauge time of observations. This problem was corrected during the final scan of the marigram.

No other problems were encountered with this or the other tide gauges.

For processing information the 0.24 foot mark of the staff at Haleiwa (161-2668) was found to be equal to the zero foot mark on the gauge. At Laiemaloo (161-2702), the 6.9 foot mark on the staff was equal to the zero foot mark on the gauge.