H10973

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No. RA-10-02-00

Registry No. H-10973

LOCALITY

State Alaska

General Locality Northern Shelikof Strait

Sublocality Kukak Bay

2000

CHIEF OF PARTY
Commander D.R. Herlihy, NOAA

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

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

REGISTER NO.

HYDROGRAPHIC TITLE SHEET

H-10973

INSTRUCTIONS - The hydrographic sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the office.

FIELD NO.
RA-10-02-00

State **Alaska**

General Locality **Northern Shelikof Strait**

Sublocality **Kukak Bay**

Scale **1:10,000** Date of Survey **5/24/2000-6/23/2000**

Instructions Dated **5/8/2000** Project No. **OPR-P164-RA**
Change #1 dated 6/12/2000

Vessel **RA-1(2121), RA-2(2122), RA-3(2123), RA-4(2124), RA-5(2125)**
RA-6(2126), and RA-7(2127)

Chief of Party **Commander D. R. Herlihy, NOAA**

Surveyed by **Ship personnel and physical scientists from Pacific Hydrographic Branch**

Soundings taken by echo sounder, hand lead, pole **Knudsen 320, RESON 8101 MB**

Graphic record scaled by **RAINIER Personnel**

Graphic record checked by **RAINIER Personnel**

Evaluation by **B. Olmstead, M. Bigelow** Automated plot by **HP DesignJet 1050C**

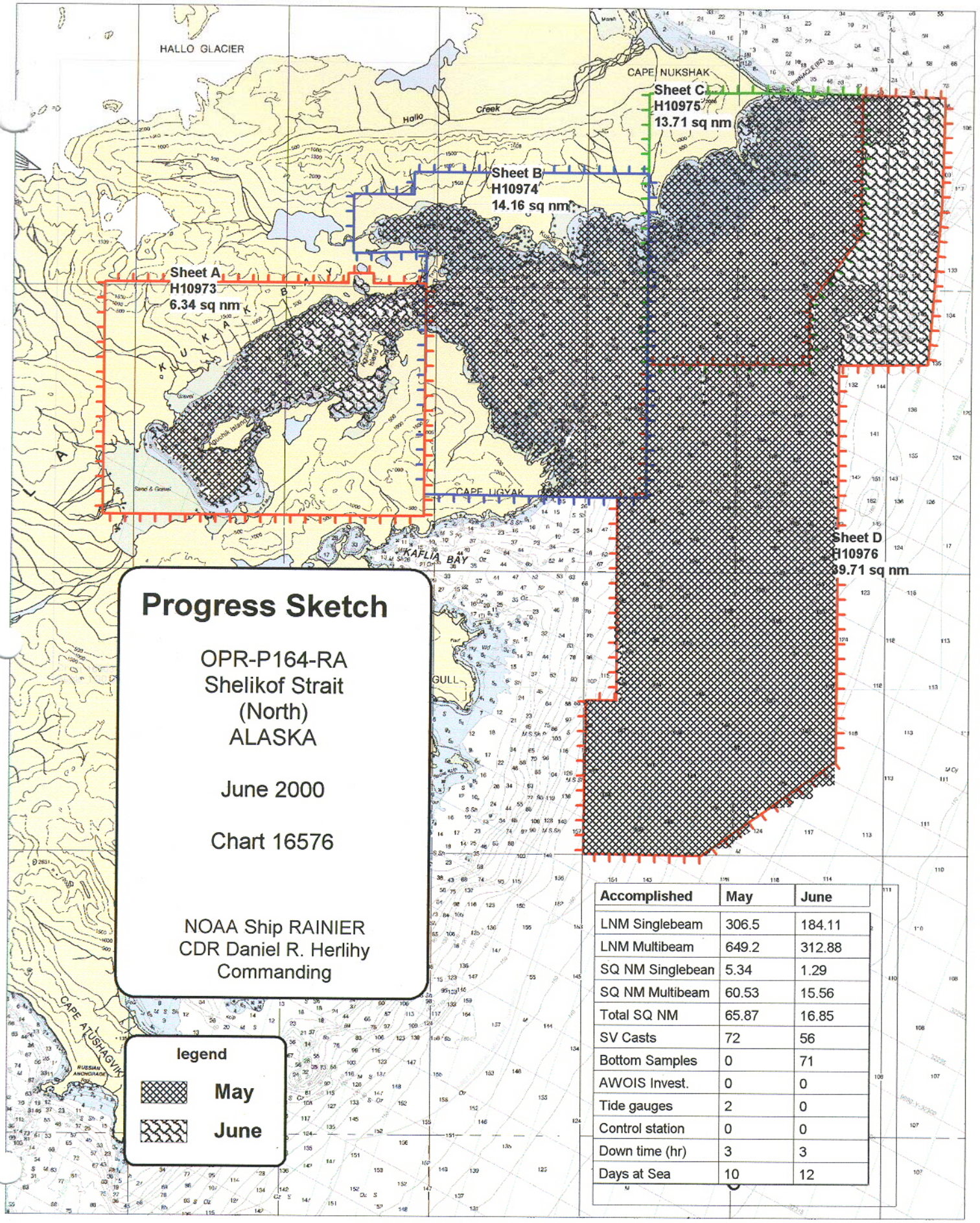
Verification by **M. Bibelow, R. Mayor, R. Davies, B. Olmstead**

Soundings in **Fathoms and tenths** at **MLLW**

REMARKS: **Time in UTC.**

Revisions and annotations appearing as endnotes were generated during office processing..

All depths listed in this report are referenced to mean lower low water unless otherwise noted.



Progress Sketch

OPR-P164-RA
Shelikof Strait
(North)
ALASKA

June 2000

Chart 16576

NOAA Ship RAINIER
CDR Daniel R. Herlihy
Commanding

Accomplished	May	June
LNM Singlebeam	306.5	184.11
LNM Multibeam	649.2	312.88
SQ NM Singlebean	5.34	1.29
SQ NM Multibeam	60.53	15.56
Total SQ NM	65.87	16.85
SV Casts	72	56
Bottom Samples	0	71
AWOIS Invest.	0	0
Tide gauges	2	0
Control station	0	0
Down time (hr)	3	3
Days at Sea	10	12

Descriptive Report to Accompany Hydrographic Survey H10793[1]

Project OPR-P164-RA-~~00~~[2] Shelikof Strait
Scale 1:10,000
May 25-June 24, 2000
NOAA Ship RAINIER
Chief of Party: Commander Daniel R. Herlihy, NOAA

A. AREA SURVEYED[3]

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions OPR-P164-RA-00, dated May 8, 2000, and the Draft Standing Project Instructions dated April 6, 1998. The survey area is located in Kukak Bay and its approaches. The survey's northern limit is latitude 58°20'3.3"N and the southern limit is latitude 58°15'57.3"N.[4] The survey's western limit is longitude 154°21'2.9"W and the eastern limit is longitude 154°10'22.1"W.[5] Data acquisition was conducted from May 24 to June 23, 2000 (DN 145 to 175).

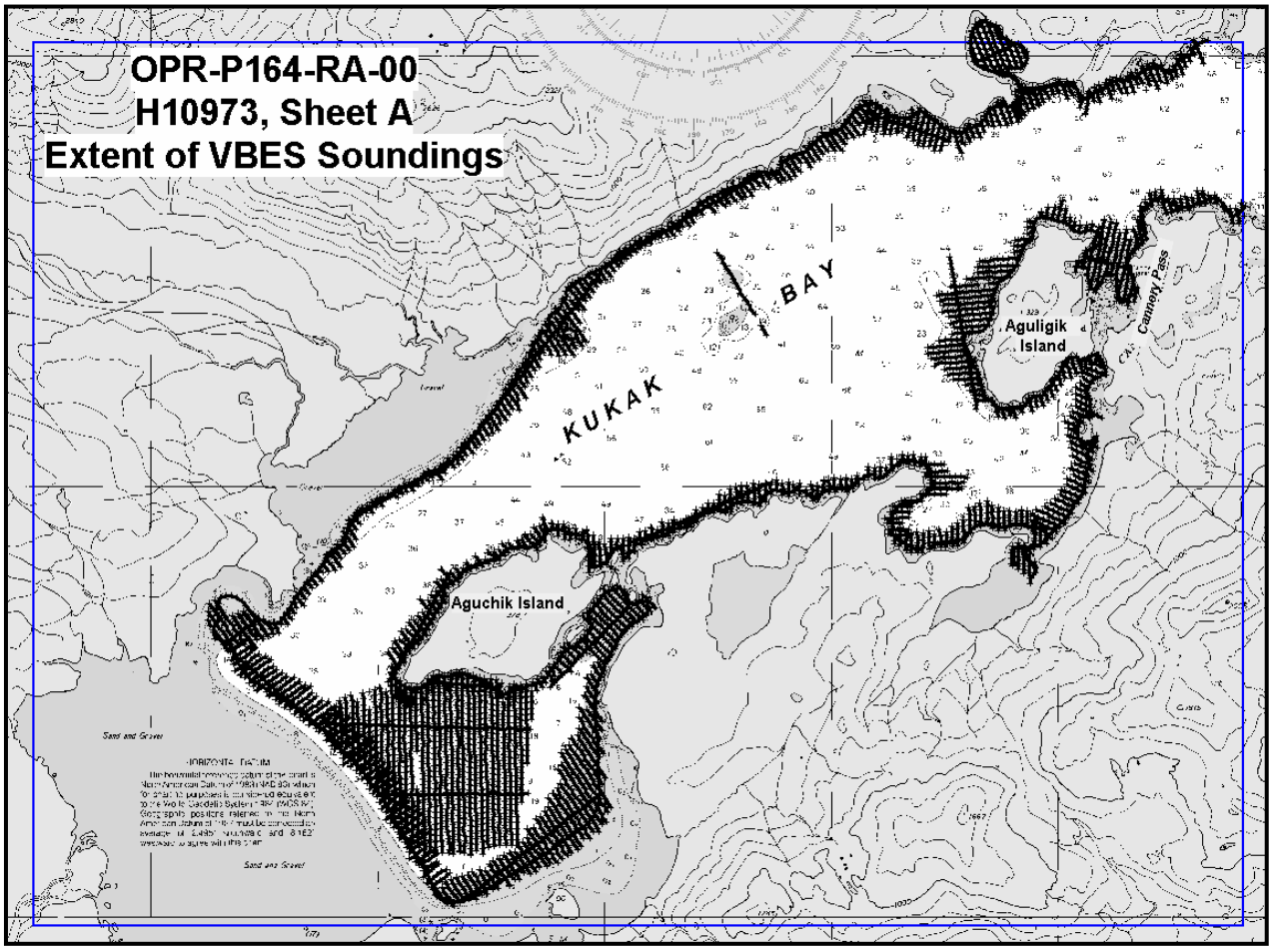


Figure 1: Extent of VBES hydrography for H10973

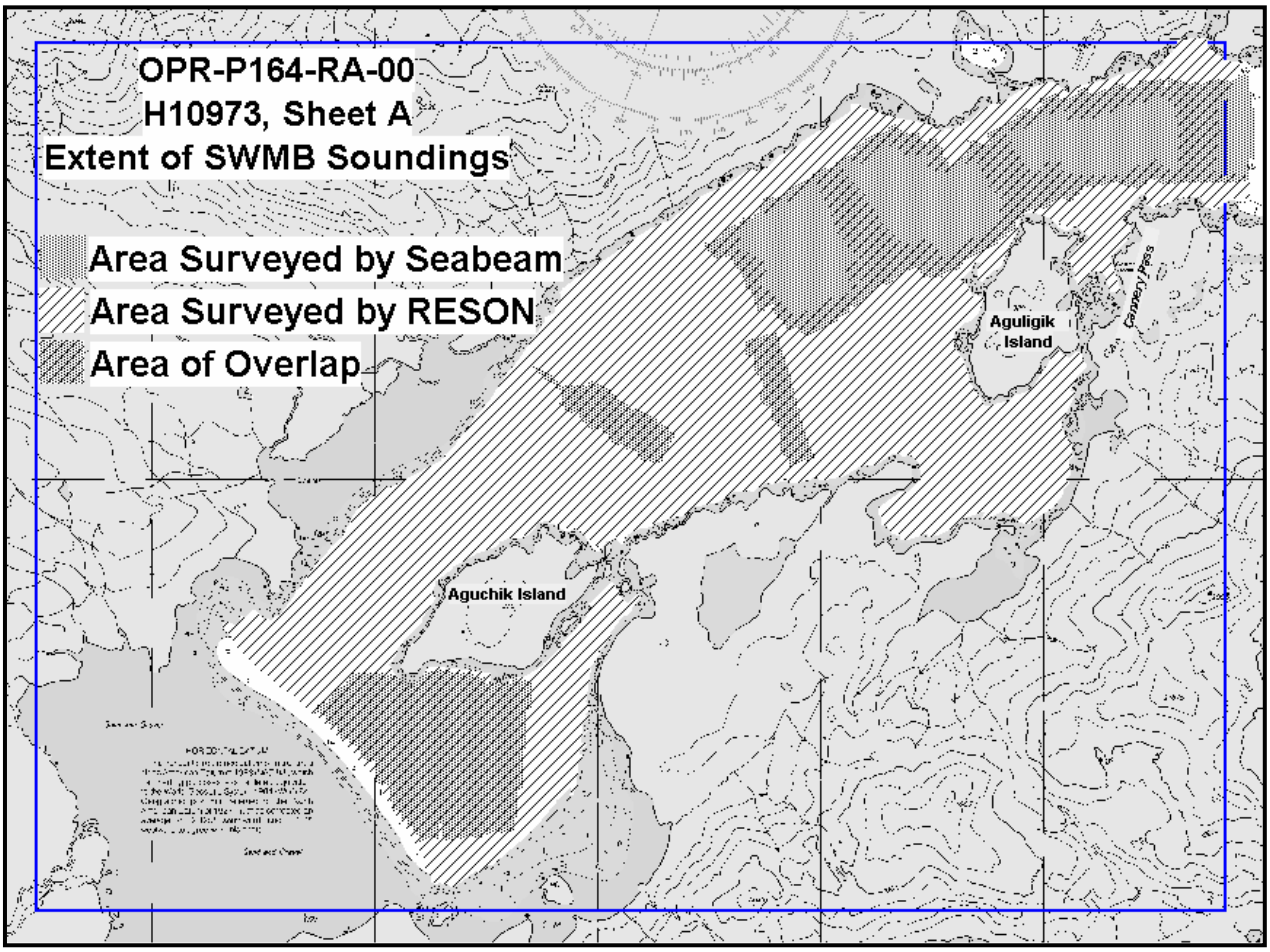


Figure 2: Extent of SWMB coverage for H10973

B. DATA ACQUISITION AND PROCESSING

A complete description of data acquisition and processing systems, survey vessels, quality control procedures, and data processing methods, can be found in the *OPR-P164-RA-00 Data Acquisition and Processing Report* submitted under separate cover. Items specific to this survey and any deviations from the aforementioned report are discussed in the following sections.

B1. Equipment and Vessels

Data were acquired by RAINIER's survey launches (vessel numbers 2121, 2122, 2124, 2125, 2126 and 2127). Vessels 2121, 2124, and 2126 were used to acquire shallow-water multibeam (SWMB) soundings and sound velocity profiles. Vessels 2122, 2124, and 2125 were used to acquire vertical-beam echo soundings (VBES). Vessels 2124 and 2125 were used to collect bottom samples. Vessels 2122, 2125, and 2127 were used to acquire detached positions on shoreline features. No unusual vessel configurations or problems were encountered during this survey.

B2. Quality Control

Crosslines

Vertical-beam echo sounder (VBES) crosslines totaled 10.25 nautical miles, comprising 12.1% of mainscheme hydrography. In flat areas of even bathymetry, crosslines agreed with mainscheme hydrography generally within 1 meter. However, VBES data were mainly collected inshore of the 10-meter curve, where the bathymetry is steep and irregular. Assuming a reasonably constant slope, and considering the slope and the positions of soundings relative to each other, the data in these steep and irregular areas generally agree within 1 to 2 meters.

Shallow-water multibeam (SWMB) crosslines totaled 12.63 nautical miles, comprising 7.8% of SWMB hydrography. Two separate CARIS HIPS Quality Control Reports (QCRs) were generated, one for data acquired with the Reson SeaBat 8101, and the other for data acquired with the SeaBeam/Elac 1180. The QCR for the Reson checkline file averaged 96.70%; the QCR for the Seabeam checkline file averaged 93.43%. See Appendix V[6] for the detailed reports. Each report had a depth tolerance factor of 0.013, which conforms to International Hydrographic Organization Order I specifications as detailed in Special Publication S-44, (Edition 4), and NOAA depth accuracy standards as set forth in the NOS Hydrographic Surveys Specification and Deliverables Manual (HSSDM).[7]

Junctions[8]

The following contemporary survey junctions with H10973:

Registry Fix Number	Scale	Date	Junction side
H10974	1:10,000	2000	East

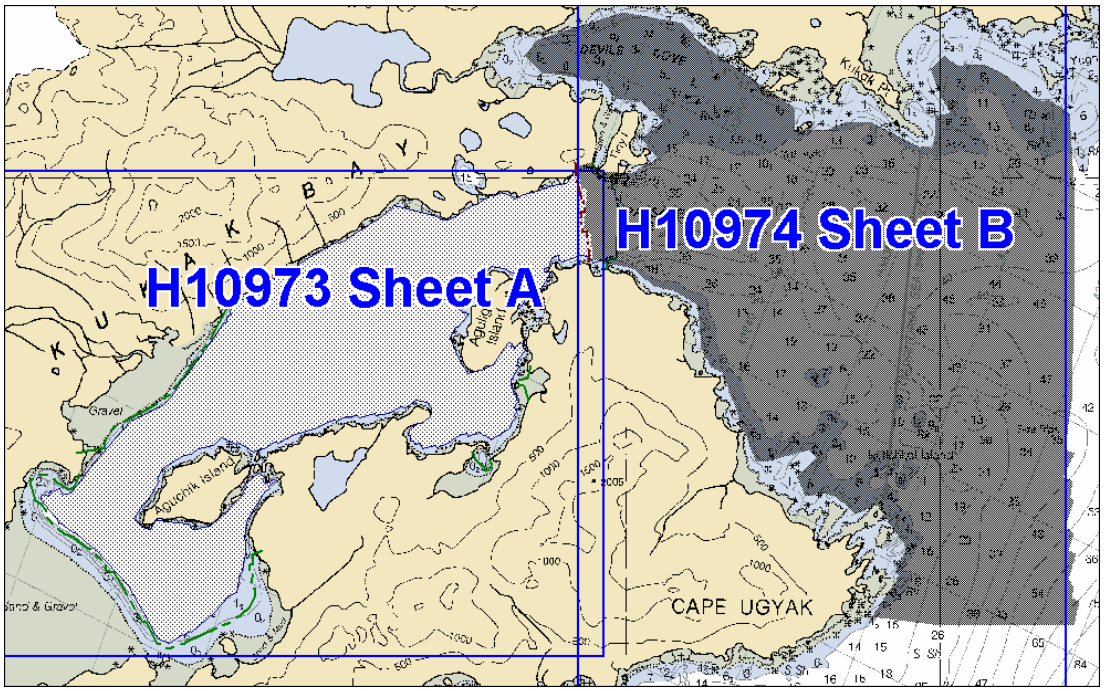


Figure 3: H10973 Survey Junction

There were no gaps in coverage between H10973 and H10974. Soundings from the two surveys agree within one fathom. Final comparisons will be made at the Pacific Hydrographic Branch (PHB) after the application of smooth tides.

Data Quality Factors

During shallow-water multibeam data acquisition using the Reson SeaBat 8101 system at the southwest end of Kukak Bay, south of Aguchik Island, the outer beams were observed curving downward on the real-time display windows in Isis, as well as in CARIS subset mode following full correction for attitude, sound velocity, tide, and draft. Suspended sediment in the water column was believed to be the cause. This area is located at the head of the bay were several streams deposit sediment. The SeaBeam/Elac system was then used to acquire full-bottom coverage data in the area, to determine if the difference in bottom-detection methods between the Reson and Elac/Seabeam systems would have an effect on the "frowning" due to the nature of the sediment. The outer beams were still observed curving downward in real-time monitoring, although the "frowning" was less obvious. In HDCS subset mode, the shallow-water multibeam data acquired on DN 145 by VN 2121, DN 172 by VN 2126, DN 173 by VN 2126, DN 174 by VN 2126, and DN 174 by VN 2124 were filtered to 45° off nadir, instead of the standard 60°, to compensate for the outer beams curving downward. (See Figure 4 for an example of the outer beams curving downward in HDCS subset mode.)

For the purpose of quality assurance, VBES data were also collected simultaneously with the shallow-water multibeam data by VN 2124 at the head of Kukak Bay. A noticeable double trace was observed in the VBES analog paper record, indicating sediment slurry at the bottom and confirming the Hydrographer's opinion that suspended sediment was likely to blame for the profile viewed in the SWMB data. (See Figure 5 for an example of the VBES analog trace from VN 2124 on DN174). The VBES

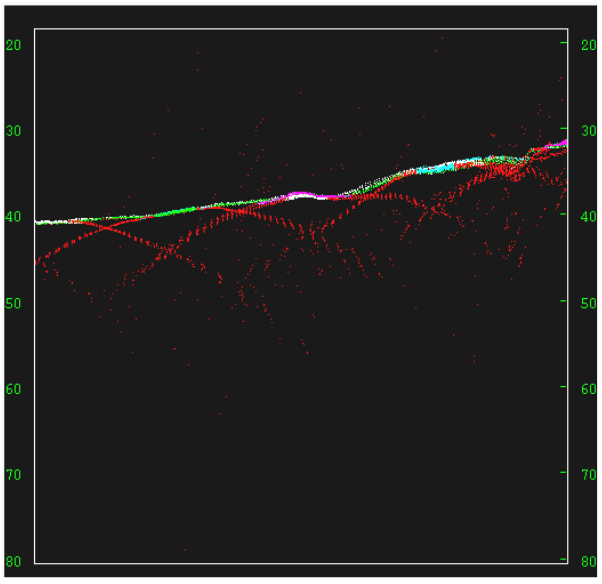


Figure 4: HDCS subset from SW Kukak Bay.

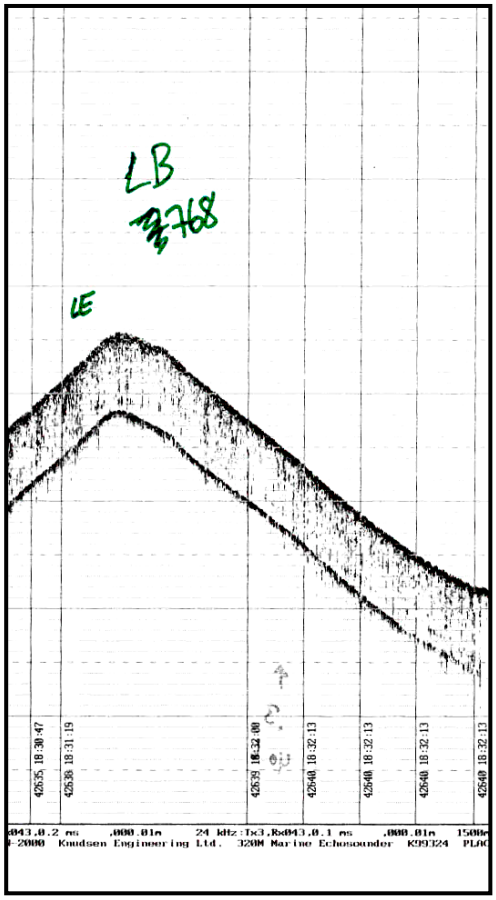


Figure 5: VBES analog trace from SW Kukak Bay.

soundings were digitized from the top of the double trace. VBES data compared within one meter of the final SWMB dataset.[9]

Three CARIS Quality Control Reports (QCRs) were generated to assess the effectiveness of the measures used to resolve the data problems seen in the southwest end of Kukak Bay (see Appendix V[10] for the detailed reports). The three workfiles created to generate these QCRs used data only from the problem area. The first QCR compared mainscheme data and crossline data collected only by VN 2124; this QCR averaged 97.30%. The second QCR compared mainscheme data and crossline data collected only by VN 2126; this QCR averaged 99.94%. The third QCR compared data collected by VN 2124 to data collected by VN 2126; data collected by VN 2124 were imported with a grid size of 5 meters; data collected by VN 2126 were imported as checklines, with no data thinning; the QCR comparing data from VN 2124 with data from VN 2126 in the southwest end of Kukak Bay averaged 96.59%. Each report had a depth tolerance factor of 0.013, which conforms to International Hydrographic Organization Order I specifications as detailed in Special Publication S-44, (Edition 4), and NOAA depth accuracy standards as set forth in the NOS Hydrographic Surveys Specification and Deliverables Manual (HSSDM). The data which were retained in the final data set (after all measures were taken to eliminate problems) met a minimum accuracy standard of 96.59%; this demonstrates that correction measures in this area were effective.[11]

No other unusual conditions were encountered during the survey which affected the expected accuracy and quality of survey data.

B3. Data Reduction

Data reduction procedures for survey H10973 conform to those detailed in the *OPR-P164-RA-00 Data Acquisition and Processing Report*, with the following exceptions:

Verified tides were applied to SWMB data in CARIS before exporting to HPS.

Verified tides were used when applying zoned tidal correctors to the final HPS data set before excessing.

The final HPS data set was excessed using a character size of 5.0 millimeters.

C. VERTICAL AND HORIZONTAL CONTROL

A complete description of vertical and horizontal control for survey H10973 can be found in the *OPR-P164-RA-00 Vertical and Horizontal Control Report* submitted under separate cover. A summary of horizontal and vertical control for this survey follows.

Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. The US Coast Guard Beacons at Kenai, AK and Kodiak, AK were the sources of differential correctors. Launch-to-launch DGPS performance checks were performed in accordance with Section 3.2 of the FPM. Copies of the performance checks are included in *OPR-P164-RA-00 Horizontal and Vertical Control Report* submitted under separate cover.

Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station at Kodiak, Alaska (945-7292) will serve as control for datum determination. RAINIER personnel installed Sutron 8200 "bubbler" tide gauges at the following subordinate stations in accordance with the Project Instructions:

Station Name	Station Number	Type of Gauge	Date of Installation	Date of Removal
Aguchik Island	945-6901	Sutron 8200	05/23/2000	06/24/2000
Nukshak Island	945-6717	Sutron 8200	05/24/2000	06/30/2000

Raw water level data from these gauges was forwarded to N/OPS1 throughout the project period, with the final package submitted on August 18, 2000 in accordance with HSG 50 and FPM 4.7. The Pacific Hydrographic Branch will apply final approved (smooth) tides to the survey data during final processing. A request for delivery of final approved (smooth) tides[12] for survey H10973 was forwarded to N/OPS1 on July 14, 2000 in accordance with FPM 4.8.

D. RESULTS AND RECOMMENDATIONS

D.1 Automated Wreck and Obstruction Information System (AWOIS) Investigations

No AWOIS items were located within the limits of H10973.

D.2 Chart Comparison[13]

Survey H10973 was compared with chart 16603 (7th Ed.; Jan 4, 1992, Scale 1:30,000) and chart 16576 (3rd Ed.; March 14, 1998, Scale 1:80,000). There were no Notices to Mariners which affected the survey area since the publication of the charts.[14]

Chart 16603

The following comparisons represent soundings not otherwise submitted as dangers to navigation (refer to Appendix I[15] for a copy of the Danger to Navigation Report). Depths from chart 16603 agreed well with survey depths, with most differences less than two fathoms. In ~~many~~[16] instances soundings from H10973 were three to four fathoms shoaler than charted soundings, a difference which is likley attributable to 100% SWMB coverage.[17] Differences that are more significant are addressed below.[18]

The mud flats along the west shore of Kukak Bay have migrated approximately 150 to 300 meters seaward. Each of the corresponding contours has migrated an equivalent distance from shore, and therefore survey depths were 10 to 15 fathoms shoaler, on average, than charted depths in this region. It was also apparent that the 0-fathom contour, although not specifically surveyed, has also migrated offshore, and therefore the Hydrographer recommends charting an approximate 0-fathom curve[19] as depicted on the Final Field Sheet. The Hydrographer also recommends including a notation on all charts of Kukak Bay that the mud and gravel bars are subject to migration and that mariners are advised to use caution when navigating this region.[20]

H10973 located several soundings shoaler than those charted in a small cove in the northwest corner of Kukak Bay:

- The present survey revealed a depth of 2.7 fathoms at 58°17’21.28”N, 154°19’25.53”W (Fix Number 50,869, Easting 422,388.7, Northing 6,461,676.2), in the vicinity of a charted 4-fathom 5-feet sounding (58°17’21.18”N, 154°19’24.32”W). The soundings for this area were acquired with VBES.

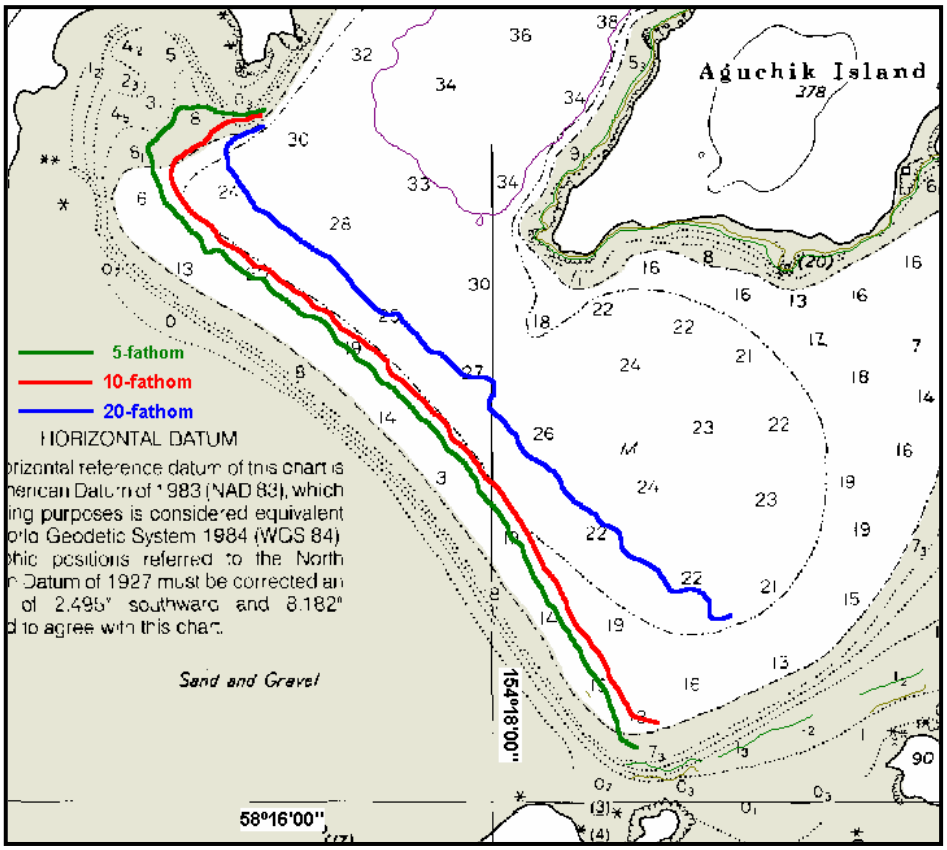


Figure 6: Migration of sand bar at the head of Kukak Bay

- The present survey revealed a depth of 4.5 fathoms at 58°17’17.30”N, 154°19’19.38”W (Fix Number 338,034, Easting 422,486.5, Northing 6,461,551.2), in the vicinity of a charted 6-fathom 1-foot sounding (58°17’16.9”N, 154°19’20.39”W). The soundings for this area were acquired with VBES.

In many instances, soundings from H10973 were deeper than those charted, particularly in near-shore regions with steep slopes. Unless otherwise stated, in all instances, these regions were covered with 100% SWMB. The differences are likely attributable to improved modern positioning methods. The more significant instances are discussed below:[21]

- The present survey revealed a depth of 25 fathoms at 58°19’57.60”N, 154°10’28.11”W (Fix Number 254,422, Easting 431,224.9, Northing 6,466,347.8), in the vicinity of a charted 11-fathom sounding (58°19’57.70”N, 154°10’27.29”W).

- The present survey revealed a depth of 60 fathoms at 58°19’31.20”N, 154°12’49.79”W (Fix Number 250,305, Easting 428,905.8, Northing 6,465,572.2), in the vicinity of a charted 50-fathom sounding (58°19’31.16”N, 154°12’52.02”W).

- The present survey revealed a depth of 54 fathoms at 58°19’47.56”N, 154°11’28.01”W (Fix Number 134,966, Easting 430,245.2, Northing 6,466,054.5), in the vicinity of a charted 36-fathom sounding (58°19’47.6”N, 154°11’28.85”W).

- Inshore of a charted 29-fathom sounding (58°19’47.62”N, 154°12’1.10”W), the present survey revealed a depth of 33 fathoms at 58°19’48.86”N, 154°~~0~~12’02.96”W[22] (Fix Number 21,637, Easting 429,677.4, Northing 6,466,104.9). Offshore of the charted 36-fathom sounding, the present survey revealed a depth of 44 fathoms at 58°19’46.84”N, 154°12’00.98”W (Fix Number 251,420, Easting 429,708.5, Northing 6,466,041.7).

- The present survey revealed a depth of 18.8 fathoms at 58°19’42.47”N, 154°12’27.82”W (Fix Number 250,961, Easting 429,269.4, Northing 6,465,914.5), in the vicinity of a charted 15-fathom sounding (58°19’42.47”N, 154°12’30.4”W).

- The present survey revealed a depth of 15.9 fathoms at 58°19’37.11”N, 154°12’55.40”W (Fix Number 259,675, Easting 428,817.8, Northing 6,465,756.7), in the vicinity of a charted 6-fathom 1-foot sounding (58°19’37.57”N, 154°12’53.85”W).

- The present survey revealed a depth of 22 fathoms at 58°19’36.17”N, 154°13’07.96”W (Fix Number 51,806, Easting 428,612.9, Northing 6,465,731.4), in the vicinity of a charted 16-fathom sounding (58°19’36.26”N, 154°13’08.98”W).

- The present survey revealed a depth of 15.9 fathoms at 58°19’41.25”N, 154°13’36.88”W (Fix Number 249,511, Easting 428,145.4, Northing 6,465,897.1), in the vicinity of a charted 6-fathom 5-feet sounding (58°19’41.69”N, 154°13’39.44”W).

- The present survey revealed a depth of 29 fathoms at 58°19’17.44”N, 154°15’3.27”W (Fix Number 264,181, Easting 426,726.3, Northing 6,465,186.6), inshore of a charted 26-fathom sounding (58°19’16.63”N, 154°15’02.06”W).

- The present survey revealed a depth of 22 fathoms at 58°19’9.40”N, 154°15’31.49”W (Fix Number 266,113, Easting 426,262.5, Northing 6,464,946.6), in the vicinity of a charted 11-fathom sounding (58°19’08.83”N, 154°15’31.13”W).

- The present survey revealed a depth of 36 fathoms at 58°19’5.90”N, 154°15’37.33”W (Fix Number 265,996, Easting 426,165.5, Northing 6,464,840.1), in the vicinity of a charted 28-fathom sounding (58°19’04.94”N, 154°15’37.98”W).

- The present survey revealed a depth of 17.9 fathoms at 58°19’3.88”N, 154°15’51.10”W (Fix Number 265,808, Easting 425,940.3, Northing 6,464,781.8), in the vicinity of a charted 14-fathom sounding (58°19’03.1”N, 154°15’51.0”W).

- The present survey revealed a depth of 34 fathoms at 58°17’49.39”N, 154°16’20.87”W (Fix Number 194,507, Easting 425,412.3, Northing 6,462,487.3), in the vicinity of a charted 29-fathom sounding (58°17’49.31”N, 154°16’18.46”W).

- The present survey revealed a depth of 35 fathoms at 58°17’46.20”N, 154°16’01.75”W (Fix Number 308,592, Easting 425,721.7, Northing 6,462,382.9), in the vicinity of a charted 31-fathom sounding (58°17’45.75”N, 154°16’01.87”W).

- The present survey revealed a depth of 1.4 fathoms at 58°17'55.43"N, 154°14'47.88"W (Fix Number 20,886, Easting 426,929.8, Northing 6,462,645.9), in the vicinity of a charted 6-fathom sounding (58°17'55.30"N, 154°14'46.58"W).

- The present survey revealed a depth of 48 fathoms at 58°17'59.51"N, 154°14'59.09"W (Fix Number 307,212, Easting 426,749.6, Northing 6,462,775.3), in the vicinity of a charted 41-fathom sounding (58°17'59.16"N, 154°14'58.62"W).

- The present survey revealed a depth of 16.8 fathoms at 58°17'59.37"N, 154°12'54.98"W (Fix Number 21,072, Easting 428,770.1, Northing 6,462,734.1), in the vicinity of a charted 12-fathom sounding (58°17'59.81"N, 154°12'55.79"W).

In a few instances H10973 located soundings significantly shoaler than those charted:

- The present survey revealed a depth of 1.6 fathoms at 58°18'03.17"N, 154°13'38.40"W (Fix Number 20,235, Easting 428,065.4, Northing 6,462,864.4), in the vicinity of a charted 7-fathom sounding (58°18'03.01"N, 154°13'38.59"W). This area is close to shore, and soundings were acquired with VBES

- The present survey revealed a depth of 15.4 fathoms at 58°18'43.80"N, 154°16'11.57"W (Fix Number 246,463, Easting 425,595.5, Northing 6,464,167.1), in the vicinity of a charted 18-fathom sounding (58°18'43.80"N, 154°16'11.57"W). This area was covered by 100% SWMB.

- The present survey revealed a depth of 28 fathoms at 58°17'28.16"N, 154°18'31.62"W (Fix Number 182,589, Easting 423,270.8, Northing 6,461,871.7), in the vicinity of a charted 32-fathom sounding (58°17'28.47"N, 154°18'29.59"W). This area was covered by 100% SWMB.

A 5-fathom, 5-foot sounding charted at 58°18'59.47"N, 154°14'48.04"W was not located on H10973. The shoalest sounding over this feature from H10973 is 6.7 fathoms[23] at 58°18'58.10"N, 154°14'53.76"W (Fix Number 304,078, Easting 426,870.0, Northing 6,464,585.8). This area was covered by 100% SWMB.[24]

Chart 16576

Depths from H10973 generally agree with chart 16576 within 1 fathom. The following comparison represents soundings not otherwise submitted as dangers to navigation (refer to ~~Appendix I~~[25] for a copy of the Danger to Navigation Report):

- The present survey revealed a depth of 63 fathoms at 58°18'54.44"N, 154°13'52.58"W (Fix Number 138,495, Easting 427,863.5, Northing 6,464,454.1), in the vicinity of a charted 66-fathom sounding (58°18'55.38"N, 154°13'51.70"W). This area was covered by 100% SWMB.[26]

D.3 Shoreline

N/NGS3 supplied photogrammetric shoreline data in raster format for T-13161, T-13162, T-13164 and T-13165 for use as source shoreline. The T-sheet raster images were registered and digitized in MapInfo by RAINIER personnel and the resultant vector data were used in Hypack for field verification. In addition, features shown on the current editions of charts 16603 and 16576 were digitized in MapInfo by RAINIER personnel and displayed in Hypack for field verification.

Method of Shoreline Verification

Shoreline verification was conducted near predicted low water in accordance with the Project Instructions and FPM 6.1 and 6.2. For this survey, the general limit of safe navigation of a survey launch was 10 to 30 meters offshore of apparent low tide. Water depths along this limit of safe navigation were approximately 3 to 6 fathoms at Mean Lower-Low Water (MLLW). Features unreachable by survey launch are depicted on the Detached Position Plot[27] as the Hydrographer's approximate representation of the shoreline.

Detached positions (DP's) taken during shoreline verification were recorded in Hypack and on DP forms,[28] and processed in HPS. These indicate revisions to features, and features not found on the T-sheet or chart. In addition, hard copies of T-sheets and compiled digitized data (boat sheets) were taken into the field and annotated by hand to reflect verification of source features and updates to both the chart and T-sheet. DP forms are included in Section I of the *Separates to be Included With the Survey Data*.

A detailed Detached Position and Bottom Sample Plot (DP and BS plot),[29] in both paper copy and MapInfo format, is provided showing all detached positions and bottom samples with notes relating to each feature. The updated shoreline and features are also depicted on the final sounding plot.[30]

Several photographs were taken to complement the Hydrographer's description of shoreline features. These photographs are submitted with the digital data.

Source Shoreline Changes and New Features[31]

Several changes and new features were found that are depicted on the final DP and BS plot. T-sheet rocks were often found to be high points of new, T-sheet, or charted ledges and reefs.[32] Along the northeast shoreline, several reefs were depicted very close to the high water line on the T-sheet; field investigation found that these reefs are more accurately depicted as ledges.

- A DP (Fix Number 50041) taken at the seawardmost extent of a new ~~ledge~~[33] located at 58º 19'44.96"N, 154º13'17.00"W (Easting 428,466.8, Northing 6,466,006.0) was not included on the DP and BS Plot and was rejected in HPS. The range of this DP was estimated at 30 meters; this long and approximate distance, in conjunction with the approximate methods used to determine the azimuth, resulted in a position with questionable accuracy. When plotted with T-sheet features, the position of the DP (the seawardmost extent of the new ~~ledge~~)[34] relative to the positions of nearby T-sheet rocks and a T-sheet reef, contradicted the sketch on the DP form. The sketch made by the field investigator was chosen more reliable than the position of the DP; thus, the extent of this new ~~ledge~~[35] is depicted on the BS and DP Plot according to the field sketch, not the DP.[36]

- A small TS islet, denoted as a pinnacle rock on the T-sheet, located along the south shore of Aguchik Island at 58º17'02.70"N, 154º16'54.05"W (Fix Number 70118, Easting 424,844.6, Northing 6,461,053.9) should be depicted as a reef. The feature did not appear to extend above Mean High Water; no vegetation or soil was seen on the top of the reef. (See Figure 7 for a photograph of the TS reef.)[37]

Figure 7: TS islet is TS reef.

- The TS ledge located at 58º17'26.93"N, 154º18'51.87"W (Easting 422,940.3, Northing 646,184.0) was not specifically addressed during shoreline verification. The position of the ledge was inaccessible because it is in a mud flat which has migrated seaward. The Hydrographer recommends retaining the ledge as charted.[38]

- The TS ledge (58º16'01.52''N, 154º16'29.50''W, Easting 425,208.7, Northing 6,459,154.4) and the TS rock (58º15'53.51"N, 154º17'20.01"W, Easting 424,380.9, Northing 6,458,922.3) located in the mud flat along the southern shore of Kukak Bay were not observed during shoreline acquisition. The distance of observation to visually verify these features exceeded 200 meters due to shoal water. The Hydrographer recommends retaining these features as charted.[39]

- The TS reef and charted (16603) rock located along the shore of an island in southern Kukak Bay at 58º16'09.37"N, 154º16'22.59"W (Easting 425325.8, Northing 6,459,395.0) were visually observed as a small rock outcrop located on shore. This observation was made from a distance of approximately 200 meters. The Hydrographer recommends this feature should be depicted as a rock.[40]

- The TS ledge located on the east side of the inlet, along the east side of Aguchik Island, at 58º17'06.54"N, 154º16'00.15"W (Easting 425,724.7, Northing 6,461,156.0) was not specifically addressed during shoreline acquisition. The Hydrographer recommends this ledge should be retained as charted.[41]

- The TS rock located on the western shore of Aguligik Island at 58º18'41.62"N, 154º12'42.66"W (Easting 428,994.1, Northing 6464037.1) was not specifically addressed during shoreline acquisition. The Hydrographer recommends retaining this rock as charted.[42]

Charted Features

Charted rocks were often identified as T-sheet rocks, reefs, islands, islets, high points, or extensions of T-sheet ledges, or disproved:

- The charted (16603) islet located at 58º17'57.22"N, 154º14'36.54"W (Fix Number 20,298, Easting 427,115.5, Northing 6,462,698.0) was disproved using a 10-minute visual and echo sounder search with a 50-meter search radius in water with 3-meters visibility. The average depth found in the

vicinity of the islet was 15 fathoms. The Hydrographer recommends removing this islet from the chart.[43]

- The charted (16603) rock located at 58º19'25.63"N, 154º14'48.79"W (Easting 426966.6, Northing 6465435.5) was not specifically addressed during shoreline verification. This charted rock was inshore of the 4-meter curve. The Hydographer recommends retaining this rock as charted. [44]

- The charted (16603) rock located in the mud flat along the northwest shore at 58º17'15.84"N, 154º19'40.87"W (Easting 422,135.6, Northing 6,461,512.8) was not specifically addressed during shoreline verification. This rock was not verified due to its location in the mud flat. Two charted rocks nearby were verified visually; however the position of ~~this~~ [45]rock was obscured visually by the adjacent rock. The Hydrographer recommends retaining the rock [46]as charted.

- The charted (16603) rock located in the mud flat along the southern shore 58º15'56.65'' N, 154º17'39.53'' W (Easting 424,064.6, Northing 6,459,025.5) was not visually observed during shoreline acquisition. The distance of observation to visually verify this rock was approximately 320 meters due to the shoal depths in the area. The Hydrographer recommends retaining this rock as charted due to the excessive observation distance.[47]

- The charted (16603) rock located along the shore of an island in southern Kukak Bay at 58º16'08.26'' N, 154º16'29.56''W (Easting 425,211.6, Northing 6,459,362.8) was not specifically addressed during shoreline verification. It is adjacent two rocks that were verified. The Hydrographer recommends retaining this rock as charted.[48]

- The charted (16603) islet located at 58º17'40.96"N, 154º12'13.51"W (Easting 429,435.0, Northing 6,462,152.7) was visually disproved during shoreline verification. A gravel spit was found connecting a charted rock, immediately offshore of the position of the charted islet, to the shore. The Hydrographer recommends removing this islet from the chart.[49]

- The charted (16576) rock located on the west side of Cannery Pass at 58º18'51.65"N, 154º11'41.53"W (Easting 429,994.5, Northing 6,464,329.5) was not observed in an area observed to be a mud flat. However, due to the shoal depths, the closest observation distance obtainable was approximately 100 meters. The Hydrographer recommends retaining this rock as charted due to the excessive observation distance.[50]

- The charted (16576) rock located at 58º19'29.59"N, 154º14'25.93"W (Easting 427,340.8, Northing 6,465,551.1) was not specifically addressed during shoreline verification. However, 100% SWMB coverage was acquired over a seward portion of the position of the rock, and VBES data were acquired at 50-meter line spacing inshore of the position. The data did not support the existence of a rock. A TS islet, not found on chart 16576, was located in close proximity to the charted rock. The Hydrographer believes that the charted rock and TS islet are the same feature.[51]

Recommendations

The Hydrographer recommends that the shoreline,[52] as depicted on the DP and BS plot and final sounding plot, supersede and complement [53]shoreline information compiled on the T-sheets as noted. These revisions are recorded in the MapInfo digital files named "H10973_Shoreline" and "H10973_Shoreline_Updates". Field notes made by the Hydrographer, including verification of source features and descriptions of shoreline items, are submitted in the digital MapInfo file

"H10973_Shoreline_Notes." In addition, charted features which did not correlate with T-sheet features and which were not verified or disproved in the field, are submitted in the digital MapInfo file "H10973_Shoreline_Charted".

D.4 Dangers to Navigation

Nineteen [54]dangers to navigation were found and reported to the Pacific Hydrographic Branch (PHB) N/CS34 for verification and submission to the Seventeenth Coast Guard District on January 4, 2001. A copy of the preliminary Danger to Navigation Report is included in Appendix I.[55] A copy of the final report will be inserted by PHB following verification and submission to the U.S. Coast Guard.

D.5 Aids to Navigation

No aids to navigation were located within the limits of H10973.[56]

E. APPROVAL

As Chief of Party, I have ensured that standard field surveying and processing procedures were followed in producing this examination in accordance with the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; the Field Procedures Manual, and the NOS Hydrographic Surveys Specifications and Deliverables, as updated for 2000.

The digital data and supporting records have been reviewed by me, are considered complete and adequate for charting purposes, and are approved. All records are forwarded for final review and processing to N/CS34, Pacific Hydrographic Branch

Survey H10973 is complete and adequate to supersede charted soundings and features in their common areas. There is no additional work required on this survey.[57]

Listed below are supplemental reports submitted separately which contain additional information relevant to this survey:

Title	Date Sent	Office
Data Acquisition and Processing Report for OPR-P164-RA-00	September 29, 2000	N/CS34
Horizontal and Vertical Control Report for OPR-P164-RA-00	November 7, 2000	N/CS34
Tides and Water Levels Package for OPR-P164-RA-00	August 17, 2000	N/OPS1
Coast Pilot Report for OPR-P164-RA-00	November 11, 2000	N/CS26

Approved and Forwarded:

Daniel R. Herlihy
Commander, NOAA
Commanding Officer

In addition, the following individuals were also responsible for overseeing data acquisition and processing of this survey:

Survey Sheet Manager:

Angelika G. Messer
Ensign, NOAA

Field Operations Officer:

Edward J. Van Den Ameele
Lieutenant, NOAA

Revisions Compiled During Office Processing and Certification

[1] PHB Revision-Registry number is H-10973
[2] PHB Revision- Strikethrough ~~00~~
[3] PHB Revision-The survey area is characterized by deep water along the central portions of Kukak Bay with numerous ledges and isolated rocks fringing the shoreline. At the head of Kukak Bay, extensive mudflats are located approximately one-half mile northwest and southwest of Aguchik Island. Surveyed depths generally range from one fathom along the shoreline and in areas of shoal developments to over sixty fathoms along the central portions of Kukak Bay. However, in transiting the central portion of Kukak Bay, the mariner should be aware of a 1.3 fathom rock at latitude 58/18/45N, longitude 154/14/57W. The 1.3 fathom depth marks a prominent shoal area containing several depths less than ten fathoms.
[4] PHB Revision- Survey limits are latitude 58/16/06N to latitude 58/20/06N.
[5] PHB Revision-Survey limits are longitude 154/10/10W to longitude 154/19/30W.
[6] PHB Revision-Appendix V is filed with the hydrographic data.
[7] PHB Revision-Concur
[8] PHB Revision-The junction with H-10974 is complete. Soundings and depth curves are in good agreement. A few soundings and features have been transferred within the common area to better delineate the bottom configuration. A "JOINS" note has been added to the smooth sheet.
[9] PHB Revision-Based on the comparison of SWMB systems between vessels 2124 and 2126, the VBES data was not part of the final data set in the areas of overlapping coverage.
[10] PHB Revision-Appendix V is filed with the hydrographic data.
[11] PHB Revision- Concur
[12] PHB Revision-Approved Tide Note dated November 17, 2000 is attached.
[13] PHB Revision-Charted hydrography originates with prior survey H-7822 (1949) and contemporary shoreline information. Significant shoaling at the head of Kukak Bay has taken place since the prior work conducted in 1949. The area is located one-half nautical mile southwest of Aguchik Islan and falls within an area bounded by latitude 58/16/03N, longitude 154/19/31W. Within this area, present survey depths reflect significant shoaling from 5-15 fathoms and the standard depth curves have migrated north and northeast between 150 and 300 meters. Additional information regarding these specific changes is found in the hydrographer's report, section D.2 and the attached danger to navigation letter dated December 29, 2000. Several prior survey soundings, features and heights on rocks and islets have been carried forward from the prior survey to the smooth sheet. These items fall in areas that reflect good agreement with the prior survey and not covered by the present survey. Minor depth differences are largely attributed to improved positioning and sounding methods employed during the present survey. However, the most significant changes in depth and shoaling at the head of Kukak Bay are mostly attributed to the migration of the sand and gravel bars. This migration is caused by large quantities of silt being deposited by the several streams dumping into the head of the bay. With inclusion of the items mentioned above, survey H-10973 is adequate to supersede prior survey H-7822 within the area of common coverage.
[14] PHB Revision- Concur with clarification. See Dangers to Navigation Letter attached to this report.
[15] PHB Revision-Dangers to navigation are attached to this report.
[16] PHB Revision- Strikethrough ~~many.~~ Replace with some.
[17] PHB Revision-Differences are also attributed to those factors discussed in the paragraph below and in endnote 11.
[18] PHB Revision- Chart the areas discussed below (pages 6-9), based on the present survey information.
[19] PHB Revision- An approximate MLLW depth curve has been shown on the smooth sheet based on the field sheet and final plotted soundings.
[20] PHB Revision-Concur
[21] PHB Revision- Concur with statements below except as noted.
[22] PHB Revision-Delete ~~0~~ from longitude minute value.
[23] PHB Revision-Revise to 6.0 fathoms.
[24] PHB Revision- Concur, chart 6 FM depth.
[25] PHB Revision-Strikethrough ~~Appendix I~~. Replace with this report.
[26] PHB Revision- Concur- Chart this area based on the present survey information.

[27] PHB Revision- Plot is filed with the hydrographic data.
[28] PHB Revision- DP forms are filed with the hydrographic data.
[29] PHB Revision-Plots are filed with the hydrographic data.
[30] PHB Revision- Sounding plot is filed with the hydrographic data.
[31] PHB Revision- There were no mean high water revisions to the shoreline manuscripts.
[32] PHB Revision- Concur
[33] PHB Revision-Strikthrough ~~ledge~~. Replace with reef.
[34] PHB Revision-Strikethrough ~~ledge~~. Replace with reef.
[35] PHB Revision-Strikethrough ~~ledge~~. Replace with reef.
[36] PHB Revision- Concur- Chart as part of reef.
[37] PHB Revision-A reef, uncovering ten feet at MLLW has been shown on the smooth sheet as depicted by the hydrographer. Chart reef uncovering 10 feet.
[38] PHB Revision- Concur
[39] PHB Revision- Concur
[40] PHB Revision- Do not concur. Chart this area as a reef, uncovering 7 feet.
[41] PHB Revision- Concur
[42] PHB Revision- Concur
[43] PHB Revision-Concur
[44] PHB revision-Concur -The charted rock originates from prior survey H-7822 (1949) and has been transferred to the smooth sheet.
[45] PHB revision-Strikethrough ~~this~~ . Replace with one.
[46] PHB revision-Concur with clarification. Strikethrough ~~rock~~. Add these rocks.
[47] PHB revision-Concur-These charted rocks originate from H-7822 (1949) and have been transferred to the smooth sheet.
[48] PHB revision-Do not concur. Chart this area based on the present survey information.
[49] PHB revision-Concur
[50] PHB revision-Concur- Rock has been transferred to the smooth sheet from prior survey H-7822 (1949).
[51] PHB revision- Concur-Chart this area based on the present survey information.
[52] PHB revision-Add maps with revisions.
[53] PHB revision-Strikethrough ~~supersede and complement~~. Replace with supplement.
[54] PHB revision-Strikethrough ~~nineteen~~. Replace with eighteen.
[55] PHB revision-Strikethrough ~~Appendix I~~. Replace with this report.
[56] PHB Revision- Concur
[57] PHB Revision-Although no additional work is recommended, the evaluator feels that shoaling will continue to occur at the head of Kukak Bay, southwest of Aguchik Island. This shoaling may eventually close off the navigable waters south of Aguchik Island. The Hydro Surveys Division may want to consider these factors for fututre hydrographic operations.

REPORT OF DANGERS TO NAVIGATION

Hydrographic Survey Registry Number: H10973

ADVANCE INFORMATION

Survey Title: State: Alaska
Locality: Shelikof Strait
Sub-locality: Kukak Bay

Project Number: OPR-P164-RA-00

Survey Dates: May-June 2000

Depths are reduced to Mean Lower Low Water using predicted tides.
Positions are based on the NAD83 horizontal datum.

CHARTS AFFECTED:

CHART	EDITION	DATE	SCALE
16603	7th	1/4/1992	1:30,000
16576	3rd	3/14/1998	1:80,000

DANGERS:

FEATURE	DEPTH (FATHOMS)	LATITUDE(N)	LONGITUDE(W)
Sounding	0 1/2	58° 18' 51.196" N	154° 11' 23.701"
Sounding	0 3/4	58° 17' 24.008"	154° 19' 21.735"
Sounding	1.0	58° 17' 52.409"	154° 14' 56.579"
Sounding	1 1/2	58° 17' 42.859"	154° 12' 15.128"
Sounding	3.0	58° 17' 28.055"	154° 19' 12.545"
Sounding	3 1/2	58° 18' 50.339"	154° 12' 56.995"
Sounding	3 3/4	58° 19' 20.988"	154° 11' 05.586"
Sounding	4.0	58° 17' 16.526"	154° 17' 39.941"
Sounding	4 3/4	58° 16' 29.307"	154° 16' 23.571"
Sounding	4 3/4	58° 16' 39.356"	154° 16' 14.939"
Sounding	4 3/4	58° 18' 31.660"	154° 12' 50.259"
Sounding	5 3/4	58° 19' 19.638"	154° 10' 51.085"
Sounding	5 3/4	58° 17' 21.524"	154° 19' 04.626"
Sounding	6 1/2	58° 18' 44.823"	154° 12' 47.029"
Sounding	6 3/4	58° 17' 57.022"	154° 14' 42.473"
Sounding	8.0	58° 19' 03.868"	154° 12' 28.366"
Sounding	9 3/4	58° 18' 01.086"	154° 12' 54.556"

COMMENTS:

In addition, the sand and gravel flats along the southwest and northwest shores of Kukak Bay have migrated approximately 150 to 300 meters seaward. An approximate revision to the zero fathom contour in the west end of Kukak Bay has been included on the attached chartlet. Mariners are advised to use extreme caution when navigating this area as depths are significantly shoaler than those depicted on the chart.

REPORT OF DANGERS TO NAVIGATION

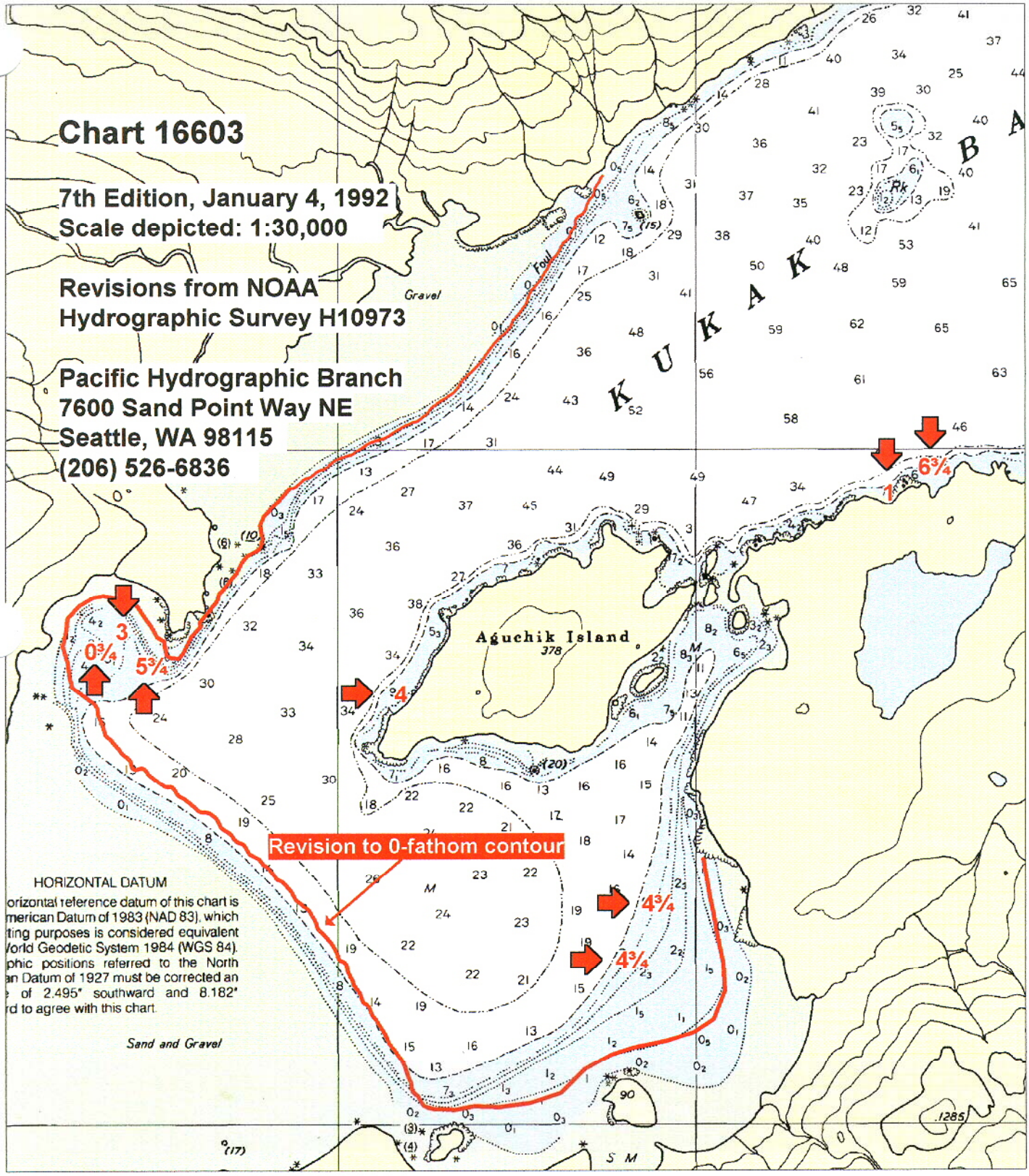
ADVANCE INFORMATION

To view chartlet No. 1 click here

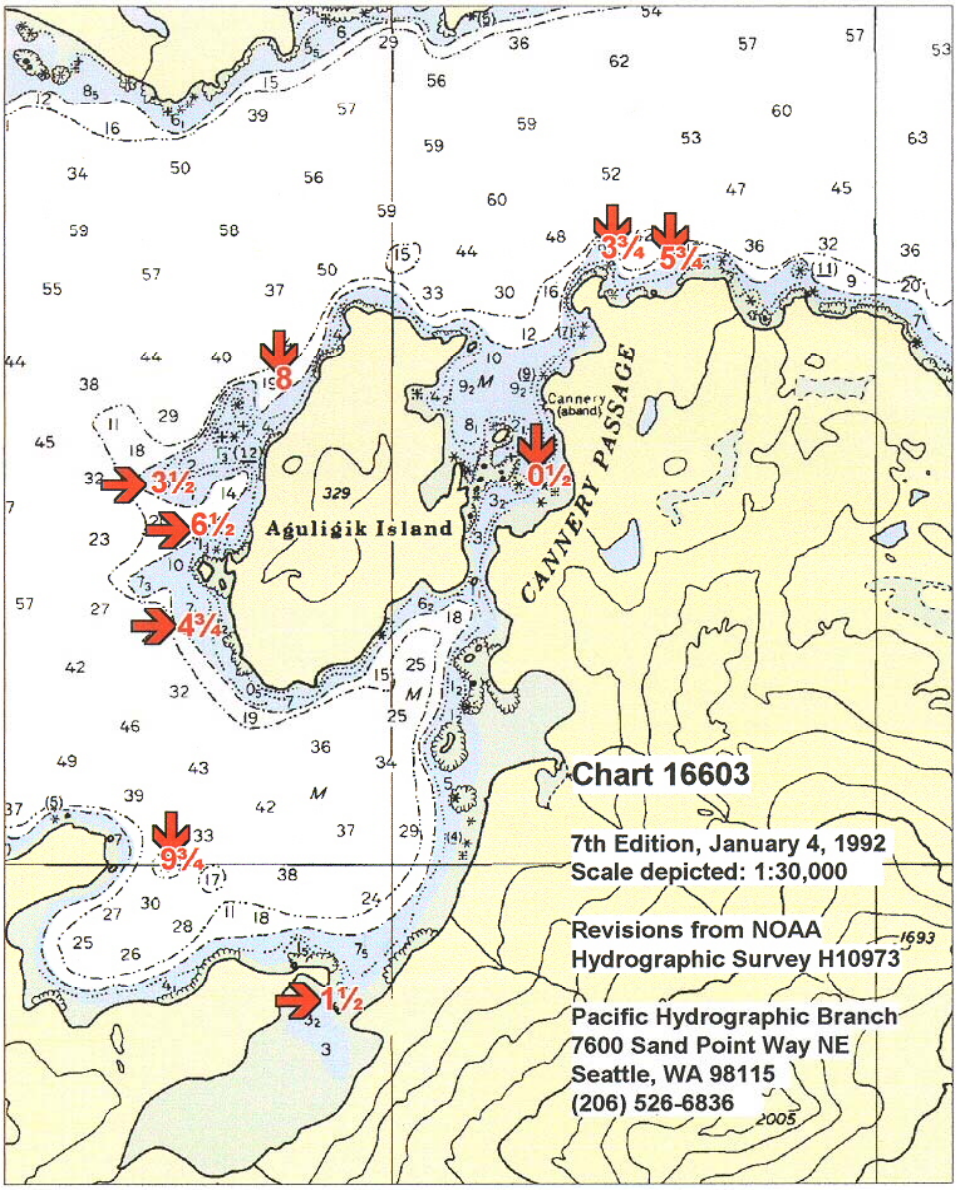
To view chartlet No. 2 click here

Questions concerning this report should be directed to the Pacific Hydrographic Branch (N/CS34) at (206) 526-6836.

ADVANCE
INFORMATION



ADVANCE
INFORMATION



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: November 17, 2000

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P164-RA-2000
HYDROGRAPHIC SHEET: H-10973

LOCALITY: Northern Shelikof Strait, AK
TIME PERIOD: May 24 - June 23, 2000

TIDE STATION USED: 945-6901 Aguchick Island, AK
Lat. 58° 17.4'N Lon. 154° 16.2'W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.984 meters

TIDE STATION USED: 945-6717 Nukshak Island, AK
Lat. 58° 23.5'N Lon. 153° 57.6'W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.957 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: SS25 & SS26.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time.

Note 2: Use tide data from the appropriate station with applicable zoning correctors for each zone according to the order in which they are listed in the Tide zone corrector files. For example, tide station one (TS1) would be the first choice for an applicable zone followed by TS2, etc. when data are not available.

Thomas A. Mero 11/17/00

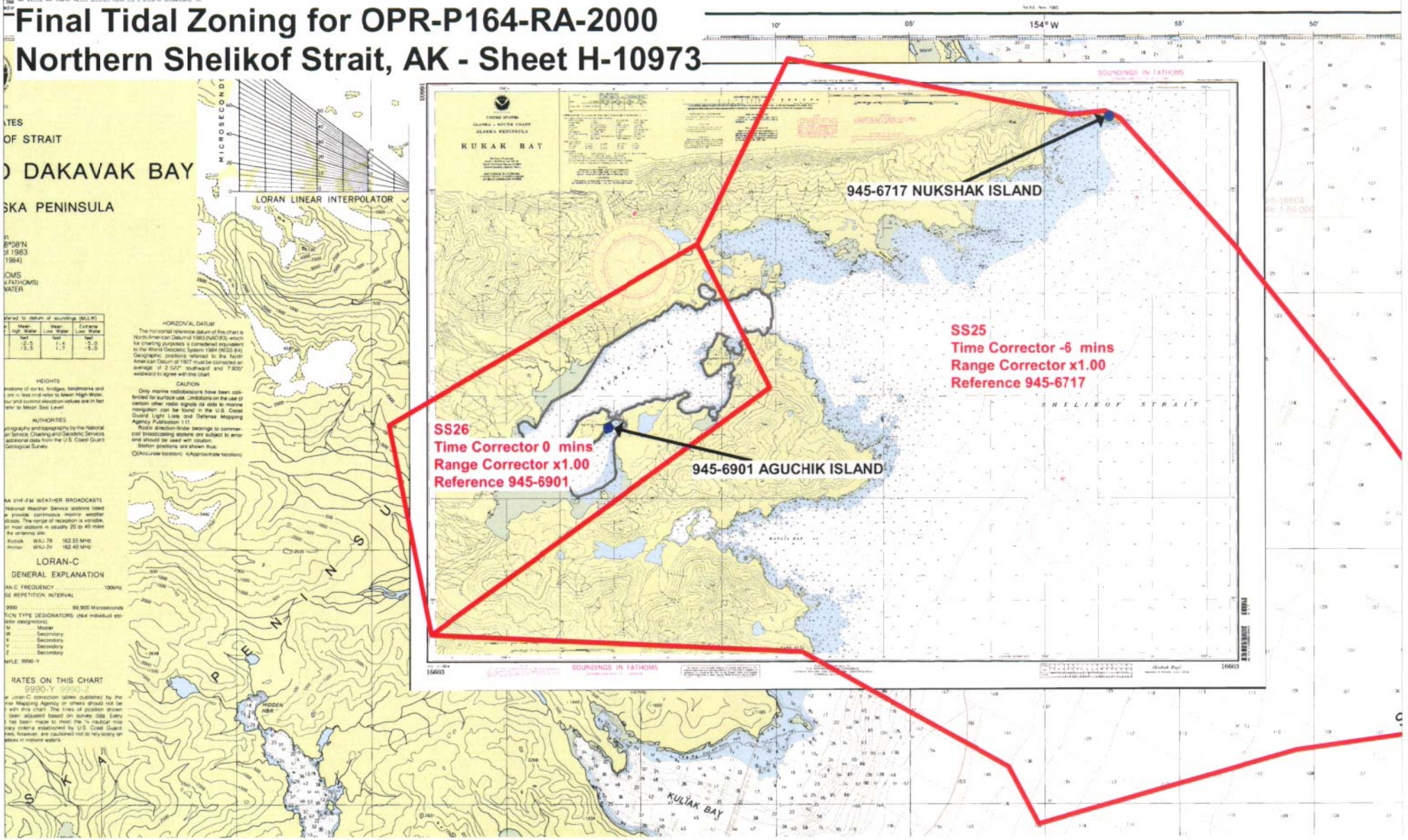
CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

Final tide zone node point locations for OPR-P164-RA-2000,
Sheet H-10973.

Format: Longitude in decimal degrees (negative value denotes Longitude West),
Latitude in decimal degrees
Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction

	Tide Station Order	AVG Time Correction	Range Correction
Zone SS25	945-6717	-6	1.00
-153.670059 58.197491	945-6901	0	0.99
-153.84431 58.18428			
-154.003896 58.160123			
-154.022405 58.178906			
-154.150451 58.216542			
-154.379911 58.2221			
-154.170534 58.302669			
-154.215019 58.349469			
-154.159216 58.409726			
-153.982972 58.391473			
-153.961876 58.392684			
-153.952909 58.390352			
-153.881433 58.348206			
-153.793241 58.289993			
-153.695792 58.219459			
-153.670059 58.197491			
Zone SS26	945-6901	0	1.00
-154.215019 58.349469			
-154.406019 58.290557			
-154.379911 58.2221			
-154.170534 58.302669			
-154.215019 58.349469			

Final Tidal Zoning for OPR-P164-RA-2000
Northern Shelikof Strait, AK - Sheet H-10973



NOAA FORM 77-27(H)
(9-83)

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER
H10973

RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	SMOOTH OVERLAYS: POS., ARC, EXCESS	NA
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	NA

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES	1					
ENVELOPES						
VOLUMES						
CAHIERS						
BOXES						

SHORELINE DATA

SHORELINE MAPS (List): T-13161-62, and T-13164-65

PHOTOBATHYMETRIC MAPS (List): NA

NOTES TO THE HYDROGRAPHER (List): NA

SPECIAL REPORTS (List): NA

NAUTICAL CHARTS (List):

OFFICE PROCESSING ACTIVITIES

The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS VERIFICATION	AMOUNTS EVALUATION	AMOUNTS TOTALS
POSITIONS ON SHEET			
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			

	TIME-HOURS VERIFICATION	TIME-HOURS EVALUATION	TIME-HOURS TOTALS
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS			
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET			231
COMPARISON WITH PRIOR SURVEYS AND CHARTS			
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT			80
GEOGRAPHIC NAMES			
OTHER (Chart Compilation)			
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS			311

Pre-processing Examination by	*Beginning Date* 03/19/2001	*Ending Date*
Verification of Field Data by R. Davies, M. Bigelow, E. Domingo, B. Olmstead	*Time (Hours)* 231	*Ending Date*
Verification Check by	*Time (Hours)*	*Ending Date*
Evaluation and Analysis by M. Bigelow, B. Olmstead	*Time (Hours)* 80	*Ending Date* 04/17/2002
Inspection by D. Hill, B. Olmstead	*Time (Hours)* 6	*Ending Date* 04/06/2003

U.S. GOVT. PRINTING OFFICE 1983: 764-008/6061

APPROVAL SHEET
H10973

Initial Approvals:

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

Bruce A. Ommanney for Date: 4/9/2003
Dennis Hill
Chief, Cartographic Team
Pacific Hydrographic Branch

I have reviewed the smooth sheet, accompanying data, and reports. This survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Descriptive Report.

John E. Lowell Jr. Date: 6/16/03
John E. Lowell, Jr.
Commander, NOAA
Chief, Pacific Hydrographic Branch

4WOIS and Surf
7/14/03 mcR

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10973

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.
1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
16603	3/22/02	B. Olmsted	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings and features from smooth sheet.
16603	8/14/03	J Storey	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings, currents, and features from BP 18 12419
16576	8/15/03	J. Storey	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings, currents, and features from 16603
16580	8/18/03	J Storey	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings, currents, and features through 16576.
16603	8/20/03	J. Storey	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings, currents, and features through 16580
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.