

H10882

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-20-04-99
Registry No. H-10882

LOCALITY

State Alaska
General Locality Lynn Canal
Sublocality Northern Approach to
Chatham Strait

1999

CHIEF OF PARTY
CAPT Alan D. Anderson, NOAA

LIBRARY & ARCHIVES

DATE MAR. 23. 2001

HYDROGRAPHIC TITLE SHEET

H-10882

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-20-04-99

State Alaska

General locality Lynn Canal

Locality Northern Approach to Chatham Strait

Scale 1:20,000 Date of survey 5/6/99 - 6/8/99

Instructions dated March 5, 1998 Project No. OPR-0340-RA

Vessel RAINIER(2120), RA-1(2121), RA-2(2122), RA-3(2123), RA-4(2124)
RA-5 (2125), RA-6 (2126)

Chief of party CAPT Alan D. Anderson, NOAA

Surveyed by RAINIER Personnel

Soundings taken by echo sounder, ~~hand lead, pole~~ DSF-6000N, Knudsen 320M, RESON 8101MB, Seabeam 1050D
MK II (Low Frequency)

Graphic record scaled by RAINIER Personnel

Graphic record checked by RAINIER Personnel

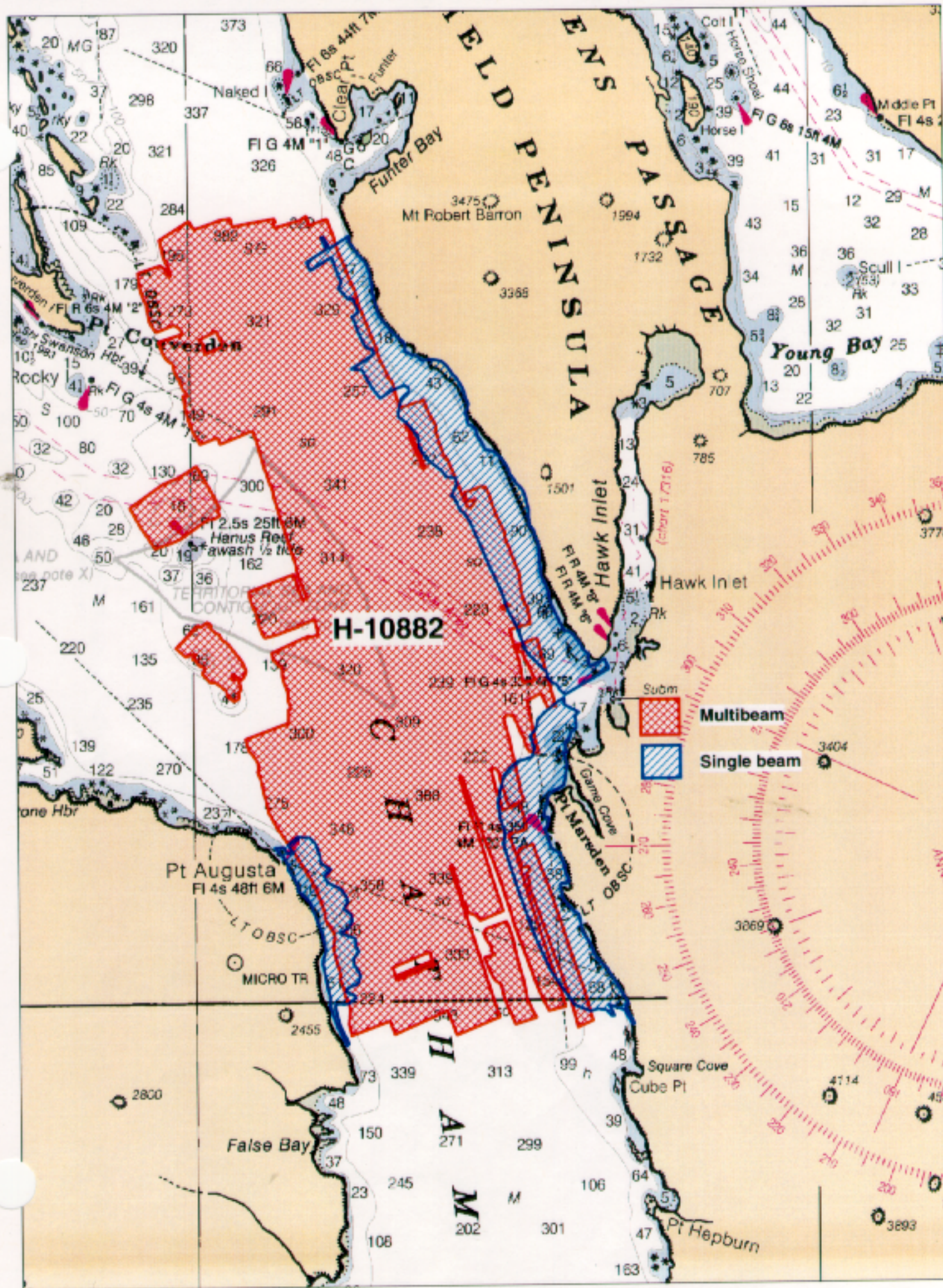
~~Processed by~~ M. Bigelow Automated plot by HP-750C

Verification by M. Bigelow, L. Deodato, D. Doles, R. Mayor, R. Shipley



Soundings in fathoms ~~feet~~ XXXXX at ~~MLLW~~ MLLW

REMARKS: All times are UTC, revisions and marginal notes in black were
generated during office processing. All separates are filed
with the hydrographic data, as a result page numbering may be
interrupted or non-sequential.
All depths listed in this report are referenced to mean lower
low water unless otherwise noted.

4WOIS/SURF 2/7/01 MGR



H-10882

-  Multibeam
-  Single beam

PROGRESS SKETCH

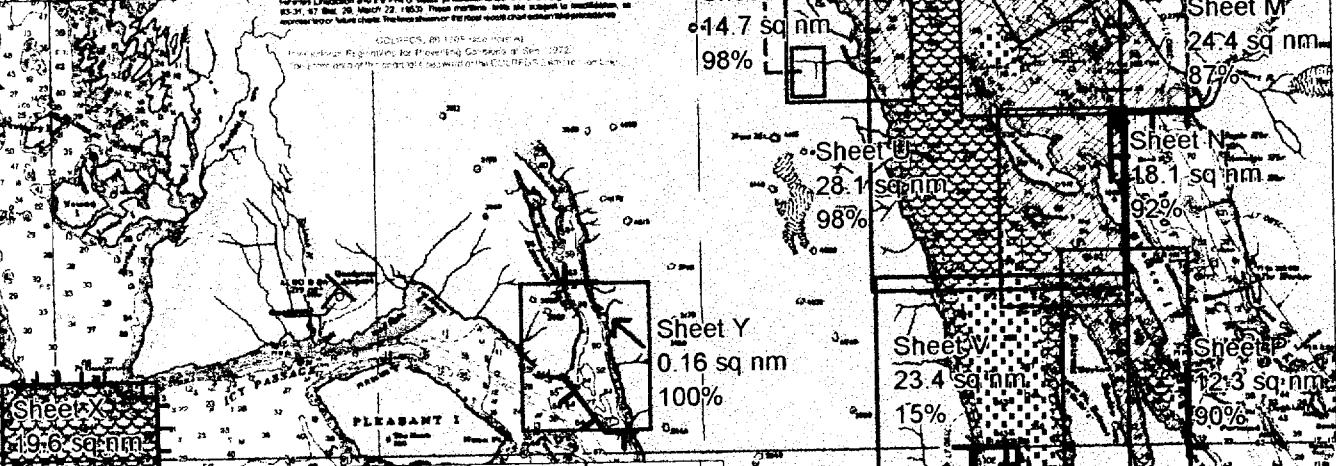
May, 1999
 OPR-0340-RA-99
 Lynn Canal, Alaska
 Capt. A. D. Anderson
 COMMANDING
 Chart 17300

APRIL
 MAY
 JUNE

Downtime Type	April	May	June
Weather - Hr	0	0	0
Mechanical -Hr	2	0	0
Electronic -Hr	2	2	0

DEFERRED BY PROTECTIVE PROTECTION ORDER
 OF THE U.S. COAST GUARD...
 DURING THE MONTHS...
 85-31, 47 Stat. 26, March 22, 1853...
 APPROVED BY...
 REGULATIONS FOR PREVENTING COLLISIONS AT SEA, 1972

CAUTION
 Sheeting according to as much as 6 feet has
 been done...
 the Alaska Commission of July 19, 1960...
 Sheeting...
 Sheeting...
 Sheeting...



Accomplished	April	May	June
LNM Hydro	2910	679	41.8
LNM SSS	0	0	0
SQ NM	43.89	144.17	102.3
AWOIS Invest.	0	9	5
Other Invest.	0	4	2
LNM Multibeam	174.4	1053.64	290.5
Days at Sea	28	26	11

Sheet	Reg No	Started	Percent	Completed	Submitted	SQNM
J	H-10860	4/6	100	5/24		11.5
K	H-10861	4/6	100	5/22		9.5
L	H-10862	4/8	100	5/25		17.0
M	H-10866	4/14	100	6/3		24.4
N	H-10865	4/14	100	6/7		18.1
P	H-10870	4/20	100	6/7		12.3
Q	H-10879	5/1	100	6/5		10.9
R	H-10869	4/18	100	6/2		14.7
T	H-10864	4/13	100	5/25		47.8
U	H-10880	5/3	100	6/2		28.1
V	H-10881	5/2	100	6/5		23.4
W	H-10882	5/6	100	6/8		52.9
Y	F00451	5/20	100	5/20		0.16
X	H-10883	5/10	100	5/20		19.6

Descriptive Report to Accompany Hydrographic Survey H10882

Field Number RA-20-04-99

Scale 1:20,000

May-June 1999

NOAA Ship RAINIER

Chief of Party: Captain Alan D. Anderson, NOAA

A. PROJECT ✓

This hydrographic survey was completed as specified by Project Instructions OPR-O340-RA dated March 5, 1998, Change number 1, dated March 30, 1998, Change number 2, dated April 12, 1999 and Change number 3, dated May 6, 1999. Survey H10882 corresponds to Sheet W (Sheet 12 in HPS) as defined in the sheet layout. This survey will provide contemporary hydrographic survey data as part of a continuing program to improve chart coverage of the Inside Passage in southeast Alaska. Requests for hydrographic surveys and updated charts in this area have been received from the Southeastern Alaska Pilot's Association (SEAPA) and the commercial fishing industry.

B. AREA SURVEYED SEE EVAL REPORT, SECTION B

The survey area is located in Lynn Canal, Alaska, Northern Approach to Chatham Strait. Figure 1 depicts the survey limits in blue. The survey's northern limit is latitude $58^{\circ}12'51''N$ and the southern limit is latitude $57^{\circ}59'41''N$. The survey's western limit is longitude $135^{\circ}01'34''W$ and the eastern limit the shoreline of the Mansfield Peninsula of Admiralty Island. Included in the survey, outside of the survey limits, are two AWOIS items surveyed with shallow water multibeam. One lies just north of Hanus Reef and the other is 3 km south of the reef. Data acquisition was conducted from May 6 to June 8, 1999 (DN 126 to 159).

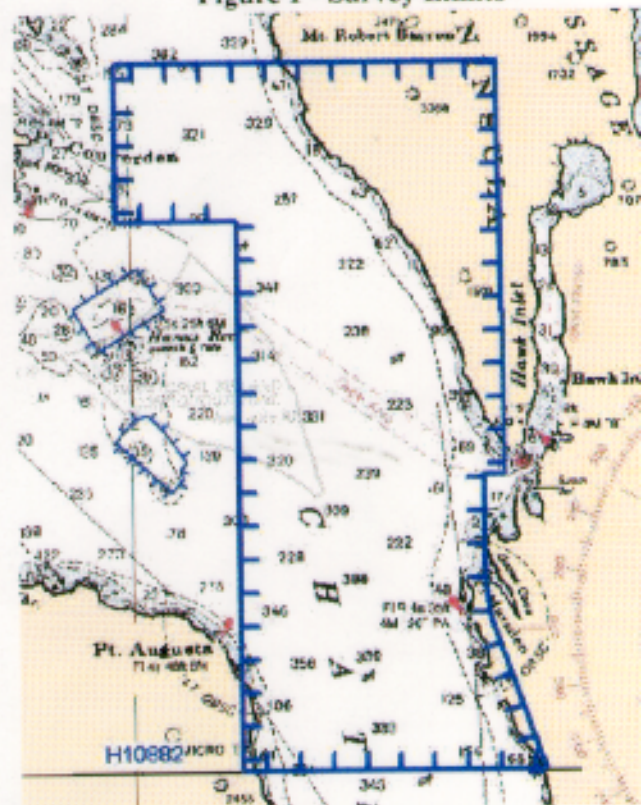
C. SURVEY VESSELS ✓

Data were acquired by RAINIER and her survey launches (vessel numbers 2120, 2121, 2122, 2123, 2124, 2125 and 2126) as noted in the Survey Information Summary included with this report. See Project Related Data for OPR-O340-RA for vessel descriptions. No unusual vessel configurations or problems were encountered during this survey.

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

All vertical beam echo sounder (VBES) data were acquired using HYPACK version 8.9 and preliminary processing was accomplished with HPS version 9.3 and MapInfo version 5.0. Final detached positions, features, and soundings based on observed tides were saved in MapInfo format. Raster image and shoreline data in MapInfo facilitated chart and prior survey comparisons.

Figure 1 - Survey Limits



Shallow water multibeam (SWMB) echosounder data were acquired using the Reson SeaBat 8101 with Triton Elics ISIS version 4.32 and processed using CARIS software version 4.3.

Multibeam data collected by RAINIER were acquired using the SeaBeam 1050D MKII and HydroStar ONLINE version 2.8.5b with Triton Elics ISIS version 4.32 and processed using CARIS software version 4.3.

Reson 8101 and SeaBeam 1050D MKII depth data were reviewed with CARIS-HIPS data cleaning programs. Depth flyers were identified and manually flagged as "rejected". Vessel positioning and attitude data from each system were similarly displayed and manually cleaned. Additionally, instantaneous speed as computed from the positioning data was checked for speed jumps exceeding 2 knots.

After review and cleaning, Reson 8101 depth, position and attitude data were merged with sound velocity, preliminary tide and dynamic draft correctors to compute the true depth and position of each sonar footprint. These processed data were excessed in a CARIS Workfile by selecting shoal soundings at a density of 5 meters x 5 meters. These excessed soundings were then suppressed at 2.5 mm at survey scale, and exported into HPS through HP Tools. For this survey, the outer ten beams of the Reson 8101 on each side of the swath (beam numbers 1-10 and 92-101) were not used, reducing the effective swath width to 120°.

After review and cleaning, SeaBeam 1050D MKII depth, position and attitude data were merged with sound velocity, preliminary tide and dynamic draft correctors to compute the true depth and position of each sonar footprint. Prior to the final application of correctors in CARIS, the heave, pitch and roll data were manually deleted from the HDCS data to prevent these data from being applied twice. The heave, pitch and roll values have been archived in TAR format and left with the HDCS data in the event they are needed at a future date. These data were then extracted to a CARIS Workfile with a grid size of 5 meters x 5 meters. These soundings were further excessed by suppressing soundings with a shoal bias to produce one sounding every 2.5 mm at survey scale. Processed soundings were then exported into HPS through HP Tools.

All final plots were created in MapInfo using UTM Zone 8 projection.

A complete listing of software is included in Appendix VI. *

E. SONAR EQUIPMENT ✓

Side Scan Sonar (SSS) equipment was not used on this survey. However, it should be noted that the Reson 8101 provides a low-resolution digital SSS record of the SWMB swath. This SSS imagery is primarily used to aid in final processing of the SWMB depth data but can also be used to provide imagery of features such as wrecks, rocks, and obstructions.

F. SOUNDING EQUIPMENT ✓

Three different categories of echosounder systems were used and are described below. The individual system(s) chosen for use in a given area were decided at the discretion of the Hydrographer using the guidance stated in the Project Instructions and depended upon the limitations of each system, bottom topography, water-depth, and the ability of the platform vessel to safely navigate the area.

1. Launch Vertical Beam Echo Sounder (VN 2121, 2122, 2123, 2124, 2125, 2126)

Vertical beam echosounders (VBES) utilized for this survey were the Raytheon DSF-6000N and Knudsen 320M, which are dual frequency (100 kHz, 24 kHz) digital recording echosounders with analog paper traces. Soundings were acquired in meters using the High + Low, high frequency digitized setting. In depths over 250 meters, and when the echosounder lost its high frequency trace, the low frequency was scanned in place of the high frequency. VBES launches were used to collect mainscheme hydrography in areas that were considered too hazardous or too shallow for shipboard SeaBeam 1050 MKII coverage, generally areas less

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than 150 meters of depth. In addition, singlebeam launches were used to perform all shoreline verification. VBES serial numbers are included in Appendix VI.

2. Launch Shallow Water Multibeam (VN 2121, 2123, 2126)

The shallow water multibeam (SWMB) system utilized for this survey was the Reson SeaBat 8101, which is a 240 kHz multibeam system that measures relative water depths across a wide path perpendicular to the vessel's path. The Reson 8101 ensonifies the seafloor with a 150° swath, consisting of 101 individual 1.5° x 1.5° beams. A TSS POS/MV Position and Orientation Sensor was used to correct for the effects of vessel motion during survey operations. Serial numbers for the Reson 8101 and POS/MV are included in Appendix VI.

Although the Reson 8101 was designed to survey to depths in excess of 300 meters, RAINIER has discovered that maximum attainable depths are approximately 80-150 meters, depending on sea conditions and bottom topography. However, the installation this winter of an extended range projector on VN 2126 has extended the maximum depth range by 30-40%. SWMB launches were used to collect full-bottom coverage of select areas identified during singlebeam hydrography, generally all areas determined to be less than 100 meters deep that could safely be investigated without the risk of damaging the SWMB transducer. SWMB launches were not used for shoreline verification due to the extremely high risk of damaging the SWMB transducers on submerged rocks.

3. SeaBeam 1050D MKII

The SeaBeam 1050D MKII is a hull-mounted, dual frequency (180 kHz, 50 kHz), high resolution multibeam echosounder system for shallow and medium water depths. A TSS 335B attitude sensor was used to correct for the effects of vessel motion during survey operations, and a Sperry MK227 gyro was used for heading. The SeaBeam 1050D MKII ensonifies the seafloor utilizing two narrow beam width transducer arrays pinging into 14 sectors. The receiving beamformer generates 3 narrow beams each sector with a beam width of 1.5° and a spacing of 1.25°. Three subfans are one total fan. Hence, there are 14 sectors x 3 beams x 3 subfans resulting in 126 total beams. Serial numbers for the SeaBeam 1050D MKII, TSS335B and Sperry MK227 are included in Appendix VI.

The high frequency array (180 kHz) is used to acquire soundings ranging from 10 to 300 meters, while the low frequency array (50 kHz) is used to acquire soundings ranging from 100 to 3100 meters. Low frequency was used exclusively on survey H10882 with an acquisition swath width of 128°. During processing, all soundings beyond a maximum angle of 50° off nadir were rejected to further reduce noise in the outer beams.

G. CORRECTIONS TO ECHO SOUNDINGS ✓

Seven sound velocity casts were used for this survey: Two for the Reson 8101 SWMB, three for SeaBeam 1050D MKII, and two for VBES (both of which were also used for the SeaBeam). Information on the casts is included in the Survey Information Summary report and in Separate IV--Sounding Equipment Calibrations and Corrections.

The sound velocity casts were acquired with SBE SEACAT Profilers (S/N 219, 2543 and 2477), calibrated November 13, 1998. Calibration reports are included with the project data for OPR-O340-RA-99. Velocity correctors were computed using the PC program VELOCITY, version 4.0, 1998. New for the 1999 field season is the program VELOCWIN version 4 beta 2, a GUI interface for the DOS program VELOCITY with the additional ability to directly generate and export sound velocity correction tables for both CARIS and HPS.

For VBES launches, sound velocity correctors were applied to the raw sounding data in HPS during post processing. For Reson 8101 and SeaBeam 1050D MKII data, sound velocity correctors were applied in CARIS during post processing.

The following table shows when the vessel offset correctors used for this survey were determined:

Vessel No.	Date of Static Draft and Transducer Offset Measurements	Method of Settlement and Squat Measurement	Date of Settlement and Squat Measurement	Location of Settlement and Squat Measurement
2120	March 1999	OTF	March 1999	Port Angeles, WA
2121	March 1999	OTF	March 1999	Port Angeles, WA
2122	March 1999	Rod leveling	March 1999	Port Angeles, WA
2123	March 1999	OTF	March 1999	Port Angeles, WA
2124	March 1999	Rod leveling	March 1999	Port Angeles, WA
2125	March 1999	Rod leveling	March 1999	Port Angeles, WA
2126	March 1999	OTF	March 1999	Port Angeles, WA

OTF = ON THE FLY

Settlement and squat correctors, static draft measurements and vessel offsets are included with the project data for OPR-O340-RA-99. Offset tables # 1-6 correspond to the last digit of the vessel number, with RAINIER being designated as #7 for HPS processing. For VBES launches, offset tables were applied to the raw sounding data in HPS during post processing. ✖

SWMB launches (VN2121, 2123 and 2126) utilize a TSS POS/MV Model 320 Position and Orientation System (POS), which provides accurate navigation and attitude data (heave, pitch, roll and heading) to correct for the effects of vessel motion during survey operations. The POS generates attitude data in three axes (roll, pitch and heading) to an accuracy of 0.05° or better. Heave measurements supplied by the POS maintain an accuracy of 5% of the measured vertical displacement for movements that have a period of up to 10 seconds. The POS delivers heading measurements by two distinct methods. First, the Dynamic Heading Alignment determines the vessels heading by using the data supplied by the Internal Measurement Unit (IMU) and GPS receivers to achieve heading that is, at best, accurate to within 0.35°. This method suffers from drift but is relatively unaffected by noise. Second, the GPS Azimuth Measurement System (GAMS) determines the geographic vector between two GPS antennas fixed to the vessel by comparing the phase of satellite signals they receive. The error from this method is largely due to noise, but exhibits no drift. The POS uses the advantages of each method to compensate for the disadvantages of the other to arrive at an optimal accuracy of 0.05°. Serial numbers are located in Appendix VI.

RAINIER utilizes a TSS 335B attitude sensor, which provides attitude data (heave, pitch and roll) to correct for the effects of vessel motion during survey operations. Heave resolution is 1cm, with an accuracy of 5cm or 5% of the range, whichever is the greater. The roll and pitch resolution is 0.01° with an accuracy of 0.05° - 0.1°. During acquisition, SeaBeam depth data are corrected for roll in HYDROSTAR to account for beam steering at the transducer face. A Sperry MK227 digital gyro was utilized for vessel heading, which has a resolution of 0.1° and an accuracy of better than 1°. Serial numbers are located in Appendix VI.

SWMB launches and RAINIER Vessel Configuration Files (VCF) were created within the CARIS program VCFEDIT, and applied to the sounding data during processing. VCF files define the physical relationship between the various components that comprise the systems. The VCF files contain offsets, dynamic draft, timing errors, and heave, roll and pitch biases. System biases for the SWMB launches were determined during a "patch test" conducted at Port Angeles, WA on March 26-28, 1999. System biases for RAINIER were determined during a "patch test" conducted in Lynn Canal, southeast Alaska on May 21, 1999. A copy of each vessel's VCF are included in the Project Related Data for OPR-O340-RA.

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Tidal Correctors

For the 1999 field season, the Oceanographic Products and Services Division (OPSD), User Services Branch (N/CS41), supplied no predicted tides for OPR-O340-RA-99. Predicted tide tables were generated for both HPS and CARIS using Tides & Currents v2.5. Tide correctors for H10882 were based on the location William Henry Bay, Lynn Canal (945-1705) which uses Juneau (945-2210) as a reference station. Tide table HPS #99 was used only for preliminary inspection of the VBES soundings. CARIS tide table whbay_new.tid was also based on Tides & Currents and was used throughout the entire CARIS processing pipeline.

Once data acquisition was complete and all sounding data consolidated in HPS, OPSD preliminary observed tides for Juneau (945-2210) were downloaded from the Internet and used to create HPS table #1. The MapInfo tidal zoning table supplied by OPSD was then imported into HPS using the MapBasic application HPT_UTIL.MBX and HP Tools v.3.4.1. Tide zone correctors were then computed and applied to all soundings in HPS (SeaBeam, SWMB, & VBES) to produce a final sounding plot.

Listings of HPS tide tables used for H10882 are included in the Separates of this report. Tidal correctors as provided in the Project Instructions for H10882 are provided in the Survey Information Summary included with this report.

Juneau, Alaska (945-2210), Sitka, Alaska (945-1600), and Skagway, Alaska (945-2400) are the primary control stations for datum determination. RAINIER personnel installed a Sutron 8200 tide gage at Cove Point (945-2346) on April 4, 1999, at Barlow Cove (945-2318) on April 4, 1999 and at Hawk Inlet (945-2294) on April 29, 1999. The Cove Point gage was removed on June 2, 1999, the Barlow Cove gage was removed June 7, 1999 and the Hawk Inlet gage was removed June 9, 1999. Refer to the Field Tide Notes and supporting data in Appendix V for individual gage performance and level closure information. This information has been forwarded to N/CS41 in accordance with HSG 50 and FPM 4.8. A request for approved tides was forwarded to N/CS41 in accordance with FPM 4.8.

APPROVED TIDE NOTE DATED OCTOBER 6, 1999 IS ATTACHED TO THIS REPORT

H. HYDROGRAPHIC POSITION CONTROL

SEE EVAL REPORT, SECTION I

The horizontal datum for this project is NAD 83. See the OPR-O340-RA-99 Horizontal Control Report for more information.

All hydrographic features were positioned using differential GPS (DGPS). For survey H10882, differential corrections from the U.S. Coast Guard Beacon at Gustavus were used as the primary corrector source. In addition, a VHF reference station was set up at station CURTIS which was used as a backup differential correctors source. DGPS reference station information is located in Appendix III of this report. Serial numbers for positioning equipment are included in the Appendix VI.

Launch to launch DGPS performance checks were performed weekly in accordance with Section 3.2 of the FPM. Differential corrections from two reference stations were received by the independent launch positioning systems as they were rafted together with their GPS antennae 2-3 meters apart. RAINIER performance checks were conducted weekly by comparing DGPS positions acquired by RAINIER's positioning system and the launches positioning systems, while at rest in the davits. Copies of DGPS performance checks are included in the Separates.

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I. SHORELINE *SEE EVAL REPORT, SECTION J.*

No official registered shoreline was supplied by N/CS341 for any of the eastern shoreline for the entire Lynn Canal project. Prior surveys and digitized versions of chart 17316 and 17300 also proved to be of poor quality for the area covered by H10882. This problem was resolved by registering NASA aerial photos acquired from the U.S. Forest Service. The photos were scanned and registered using prominent landmarks along the shoreline. To differentiate between areas of gently sloping beaches and ledges, the registered photos were digitized in MapInfo using a combination of the shoreline on the photograph, chart, and notes taken during VBES mainscheme. The resultant shoreline was then exported in .DXF format for use with Hypack during data acquisition. While conducting shoreline verification, numerous detached positions were obtained on ledges and rocks to field check the NASA photo's registration. Adjustments to the registration of the digitized shoreline were then made based upon the detached positions. This method proved to be remarkably reliable and accurately depicted the shoreline when checked against the detached positions, soundings, and survey tracklines.

Two photographs were registered (0031_Small and 0033_Bright) in order to help delineate shoreline (see tables below). These photographs do not cover all of the shoreline encompassing the survey limits of H10882. The following addresses the source of additional shoreline:

Shoreline from chart 17312 (1:10,000; 1st Ed.; Aug 2, 1997) was digitized between latitudes 58°08'54"N and 58°07'45.9"N to depict the western edge of Admiralty Island, and is shown in brown on the final DP and BS plot and final sounding plot. Charted shoreline in this area was shifted to match survey tracklines.

Shoreline from contemporary survey H10746 (a 1:5,000 scale survey from 1997) was digitized from latitude 58°07'45.9"N south to Hawk Point, and is shown in black on the final DP and BS plot and final sounding plot.

Shoreline from chart 17300 (1:209,978; 27th Ed.; Aug 14, 1993) was digitized from latitude 58°00'16"N to the southern survey limit, and is shown in brown on the final DP and BS plot and final sounding plot. Charted shoreline in this area was shifted to match survey tracklines.

The following tables list reference points used to register NASA satellite photograph number 0031_Small and 0033_Bright into MapInfo.

NASA Photograph 0031_Small

Location Name	Point Number	Geographic Position		Photo Pixel Position	
		Latitude	Longitude	Image Y	Image X
Unnamed Reef on Mansfield Peninsula	1	58/10/59 N	134/53/00 W	772	368
Unnamed Reef on Mansfield Peninsula	2	58/10/50 N	134/52/32 W	798	421
Unnamed Point on Mansfield Peninsula	3	58/09/49 N	134/51/07 W	1,032	585
Unnamed Connected Islet on Mansfield Penn.	4	58/12/05 N	134/54/08 W	529	237

NASA Photograph 0033_Bright

Location Name	Point Number	Geographic Position		Photo Pixel Position	
		Latitude	Longitude	Image Y	Image X
Rock North of Pt. Augusta	1	58/02/36 N	134/57/18 W	1,191	498
Rock North of Hawk Inlet	2	58/06/15 N	134/48/09 W	403	1,590
Point South of Pt. Marsden	3	58/01/46 N	134/48/14 W	1,394	1,557
Rock North of Game Cove	4	58/04/15 N	134/48/19 W	847	1,555
Rock Northeast of Game Cove	5	58/04/23 N	134/48/34 W	821	1,640
Northern Shore of cove South of Pt. Augusta	6	58/00/45 N	134/55/48 W	1,598	665
Southern Shore of cove South of Pt. Augusta	7	58/00/41 N	134/55/55 W	1,616	655

During shoreline verification the digitized NASA photos and prior survey shoreline were treated as official digital manuscript (DM) shoreline for the purpose of distinguishing new shoreline features.

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 is 5-30 meters offshore of apparent low tide. Water depths along this limit of safe navigation are generally 2-5 meters at Mean Lower Low Water (MLLW). Features shown inshore of the Navigable Area Limit Line (NALL) are the hydrographer's representation of the shoreline while slowly transiting along the shore, and are intended to aid chart compilation.

Detached positions taken during shoreline verification were recorded within HYPACK and on DP forms. These indicate significant features and features not found on the DM or chart.

A detailed "DP and BS plot" is provided showing all detached positions and bottom samples with notes relating to each feature. Updated shoreline and features were then transferred to the final sounding plot.

Changes and New Features

Several changes and new features were found and are depicted on the DP and BS plot and final sounding plot. DM rocks and islets were often identified as high points of new ledges or reefs.

Recommendations

The Hydrographer recommends that the shoreline as depicted on the DP and BS plot (MapInfo digital files "shoreline" and shoreline_update") and final sounding plot be used to supercede shoreline information compiled on the digitized NASA photos. *DO NOT CONCUR. SEE EVAL REPORT, SECTION J.*

Charted Features

Charted rocks were often identified as DM rocks, high points or extensions of DM ledges or reefs, except as noted below.

Upon comparison of chart 17312 and chart 17316 (1:80,000; 18th Ed.; Jul 18, 1998) north of Hawk Point, the Hydrographer noted significant differences in the location of charted features. It appears that during compilation of chart 17316, rocks were moved 150-300 meters offshore to better represent the nearshore detail at 1:80,000. While conducting shoreline verification, numerous rocks islets from these charts were not verified or disproved, and are discussed in general below. *CONCUR*

Ten charted rocks and six islets depicted on chart 17312 from the survey limits at Hawk Point north to latitude 58°08'00"N were not verified during shoreline verification. Several charted rocks appear to be high points or extensions of charted ledges, and charted islets are most likely high points of charted ledges. Nearshore line spacing of 100m does not warrant verification or disproval of additional rocks located offshore of charted ledges. The Hydrographer recommends that these rocks and islets be retained in their charted positions. *CONCUR*

Ten charted rocks and one islet depicted on chart 17316 from 58°06'4.3"N north to 58°08'05"N were not verified during shoreline verification. Several of the charted rocks appear to be high points or extensions of charted ledges. The charted islet is detached from the shoreline, however this was not verified. Nearshore line spacing of 100m does not warrant verification or disproval of these features. The Hydrographer recommends that these rocks and islet be retained in their charted positions. *CONCUR*

Two charted rocks at 58°04'03.39N, 134°48'15.23W and 57°59'52.27N, 134°46'25.98W depicted on chart 17300 were not verified during shoreline verification. The Hydrographer recommends that these rocks be retained in their charted positions. *CONCUR*

Recommendations

Except as noted above, the charted shoreline should be revised using the manuscript shoreline and fieldwork notes as recorded in the MapInfo digital files named "shoreline" and "shoreline_update".

J. CROSSLINES

VBES crosslines totaled 18 nautical miles, or 15.7 % of mainscheme hydrography. VBES crosslines agreed to within 1 meter with mainscheme VBES hydrography in regions of relatively flat bathymetry. SWMB crosslines generally agreed to within 0.1 meters with mainscheme SWMB hydrography in regions of low vertical gradients.

Comparisons between the VBES and the ship's low frequency multibeam are within 1-2 meters in regions of low vertical gradients. The primary difference between depths between the two systems deals with the size of the sounding footprint. On the ship's low frequency multibeam the footprint is 1.5°, while the VBES has a footprint of 7°. This translates into a radius of approximately 4m and 18m, respectively, for each footprint at 300 m of depth.

Large vertical gradients were noted in the vicinity of Point Augusta. Average depths 0.5 nm offshore were 500-600 m (slope of 30° or more). This exacerbated system differences between the DSF 6000N and the Knudsen 320M resulting in shallower soundings for the DSF 6000N than the Knudsen 320M in similar areas. In regions with small vertical gradients (South of Hawk Inlet) differences between the DSF 6000 and Knudsen were negligible.

A Quality Control Report (CARIS HIPS) was not generated for sheet H10882. Due to a core dump caused by a corrupt header file in the raw SeaBeam data, only one ship multibeam crossline converted in CARIS. One ship multibeam crossline would not provide enough data for a thorough statistical analysis.

K. JUNCTIONS *SEE EVAL REPORT, SECTION L.*

The following contemporary surveys junction with H10882, and are shown in Figure 2.

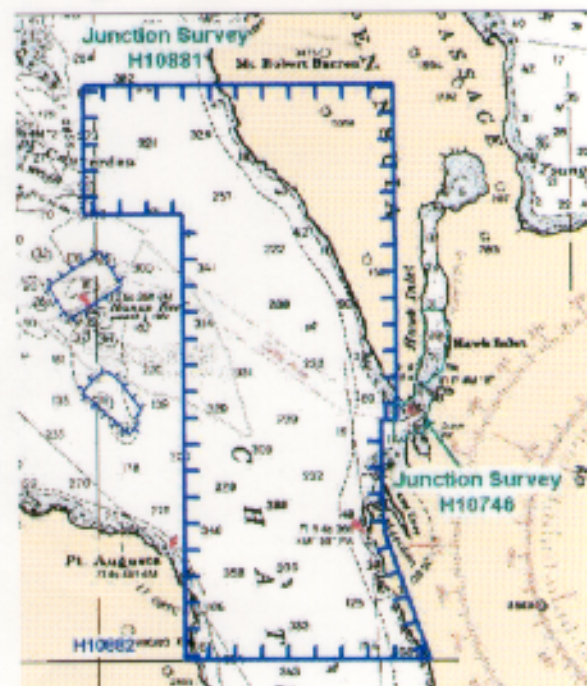
Registry #	Scale	Date	Junction side
H10746	1:5,000	1997	East ✓
H10881	1:20,000	1999	North ✓
H10879	1:10,000	1999	NORTH

Soundings from survey H10746 (at the entrance to Hawk Inlet) were in excellent agreement with depths from survey H10882. Differences of less than 0.5 fathom were noted.

Soundings from survey H10881 were found to be in good agreement. In depths from 200-350 fathoms (the typical depths at the junction), the difference between soundings was between one and five fathoms. Most of the differences were within 2 fathoms but no patterns were observed.

Final comparisons will be made at the Pacific Hydrographic Branch (PHB) after application of smooth tides.

Figure 2 – Junction Surveys



L. COMPARISON WITH PRIOR SURVEYS

Seven prior surveys were compared to H10882 and are shown in Figure 3 below.

Registry	Scale	Date	Region
H10060 ✓	1:10,000	1982	Center of Survey
H10087 ✓	1:10,000	1983	East Side of Survey
H10227 ✓	1:20,000	1986	West Side of Survey
H1602A ✓	1:40,000	1884	Northern Survey Limit
H2055 ✓	1:40,000	1890	Encompasses Survey
H4227WD ✓	1:40,000	1922	Center of Survey
H4228 ✓	1:40,000	1922	Northern Side of Survey

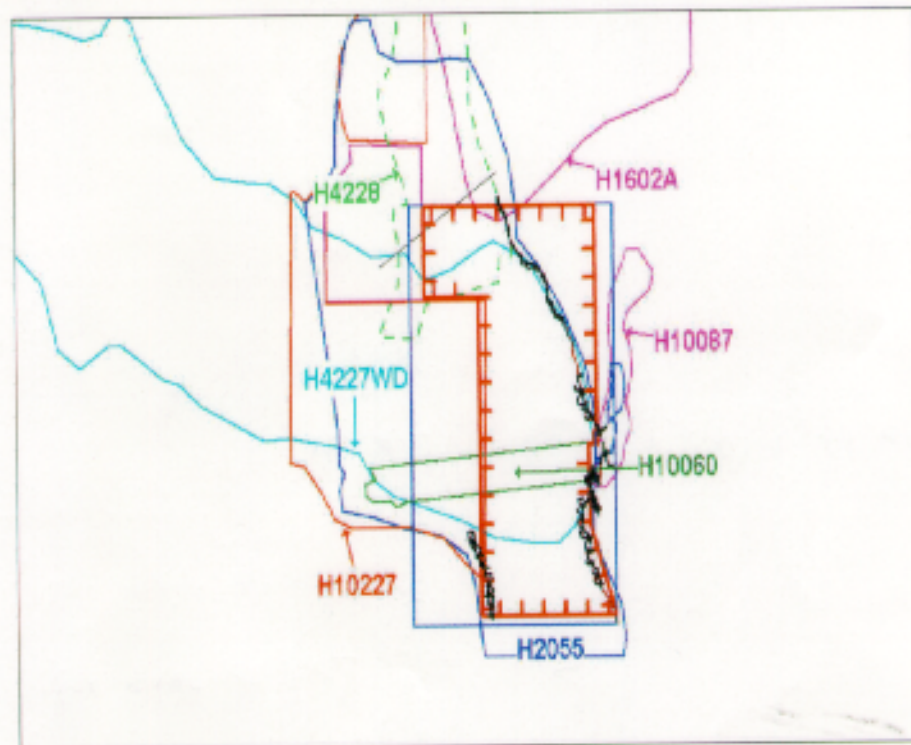


Figure 3 - Prior Surveys

Survey H1602A, conducted in 1884, is a rough sketch of the landforms in the region with relative positioning to one another. Shoreline matches poorly, and no soundings fall within the H10882 common area.

Shoreline and soundings from H2055 generally match survey H10882. The table below is a list of 22 soundings from survey H2055 which were shoaler than that of H10882. Depths from H2055 listed in the table below were compared to present survey soundings, up to a distance of 500m, without finding soundings of similar depth.

CONCUR, EXCEPT FOR THE LISTING OF 22 SOUNDINGS ON PAGE 10. SEE EVAL REPORT, SECTION M.

H2055 Depth (fm)	H10882 Depth (fm)	H10882 Fix #	Geographic Position	
			Latitude	Longitude
265 <i>285</i>	280.1 ✓	145,626	58-09-53.81 N	134-58-27.72 W
238 <i>286</i>	281.9 EX	145,779	58-09-44.16 N	134-58-27.63 W
188 <i>NR</i>	252.3 ✓	112,115	58-10-13.75 N	134-54-32.38 W
210 <i>NR</i>	264.2	83,078	58-09-58.94 N	134-54-10.23 W
312 <i>NR</i>	344.5 ✓	119,522	58-08-26.61 N	134-54-56.93 W
238	251.2 EX	85,023	58-07-54.51 N	134-52-29.25 W
314	325.5 ✓	136,485	58-07-26.74 N	134-55-33.44 W
312	328 EX	136,594	58-07-25.50 N	134-56-25.20 W
227	267.9 EX	108,458	58-07-01.28 N	134-52-56.16 W
248	346.6 ✓	121,856	58-06-00.32 N	134-53-45.79 W
290	346.2	134,876	58-05-51.56 N	134-54-48.59 W
334	369.8 EX	133,509	58-04-55.75 N	134-54-17.52 W
272	356.4 EX	153,532	58-04-24.14 N	134-55-41.43 W
285	312.3	154,445	58-03-53.56 N	134-55-18.69 W
228	304.1	168,197	58-03-51.55 N	134-54-49.61 W
234	304.5 EX	167,709	58-03-24.27 N	134-56-12.22 W
234	298.3	155,103	58-03-21.87 N	134-55-12.01 W
247	300.6 ✓	155,142	58-03-27.20 N	134-54-42.05 W
298	321.1 EX	129,421	58-00-04.80 N	134-51-57.07 W
298	344.0	128,866	57-59-37.88 N	134-50-52.52 W
237	330.3 EX	128,908	57-59-47.25 N	134-50-22.21 W

NR = NOT READABLE
EX = EXCEEDED

The hydrographer recommends that soundings from survey H10882 supercede all prior soundings from H2055. All depths listed in the above table from H10882 are from ship's multibeam with 100% coverage in the vicinity of the H2055 soundings.

A comparison of the current survey with surveys H4227WD and H4228 was not conducted. The scans were of very poor quality; no least depths were discernible and annotations on the priors were illegible.

Soundings from survey H10227 were found to be in good agreement. Depths compared ranged from 200-350 fathoms. Differences of one and five fathoms were noted. Most differences were within 2 fathoms, but no patterns were observed.

Soundings from survey H10087 were found to be in very good agreement. Differences of less than 1 fathom were noted.

Differences between the current survey and prior surveys can be attributed to scale and improved modern positioning and sounding equipment. Final comparisons will be conducted at PHB after application of smooth tides.

M. ITEM INVESTIGATION REPORTS

There were two AWOIS items investigated during survey H10882.

AWOIS 51068**1. Area of Investigation**

AWOIS Number: 51068

State and Locality: Lynn Canal, AlaskaReported Position: Latitude: 58/05/53.28NLongitude: 134/59/46.52W Datum: NAD83Type of Feature: Pinnacle rockReported Depth: 35 fathoms**2. Description and Source of Item****History**

CL410/48 – USCGS; Pinnacle rock with 47 fm over it was located 1.75 mile 180 degree true from Hanus Reef Light in Lat 58/06/06N; Long 134/59/42W; charted as 47 fm sounding, danger curve and label rk. (entered MSM 7/86)

H10227/86 – OPR-O186-MI-86; 50 m line development revealed a rock or reef, extending NW-SE, approximately 1000m long and 450 m wide at its widest point; west side is extremely steep (35-126 fathoms in less than 200m); least depth of 35 fms located 356m south of charted position of 47 fm sounding; least depth position provided in Lat 58/05/54.51N, Long 134/59/40.07W (NAD27). Hydrographer and verifier recommend deleting 47 fm sounding and charting 35 fm sounding and delineating the rock/reef formation. (Updated MSM 4/88) (Revised 11/98 RWD)

3. Survey Requirements

Although AWOIS 51068 was unassigned, RAINIER acquired SWMB data over this feature.

4. Method of Investigation

On DN 157, 159, vessels 2121 and 2123 acquired SWMB data over AWOIS 51068.

5. Results of Investigation

Least depth over the feature was determined to be 37 fathoms at 58°05'55.02"N, 134°59'53.04W (Pos. #73267).

6. Comparison with Prior Surveys

Prior survey H10227 revealed a least depth of 35 fathoms (vertical beam echosounder).

7. Comparison with the Chart and Charting Recommendation

Chart 17300 (27th Ed.; Aug 14, 1993, 1:109,978) shows a shoal in the area with a least depth of 35 fathoms at the location of the 37 fathom sounding determined by survey H10882. The Hydrographer recommends that present survey results be used to supercede the chart in their common areas.

CONCUR

AWOIS 51990

1. Area of Investigation

AWOIS Number: 51990

State and Locality: Lynn Canal, Alaska

Reported Position: Latitude: 58/08/25.66N

Longitude: 135/00/25.03W Datum: NAD83

Type of Feature: Shoal

Reported Depth: 15 fathoms

2. Description and Source of Item

History

H2055/1890 – 15 fm sounding located in Lat 58/08/16N, Long 135/00/06W.

H10227/86 – OPR-O186-MI-86; Depths of 57-76 fms were obtained in the vicinity of the charted 15 fm sounding; 16.6 fms was found in Lat 58/08/26N, Long 135/00/18.57W; 15 fm sounding is not considered disproved; Evaluator recommends moving the 15 fm sounding to the survey position of the 16.6 fm sounding least depth until a full investigation of depths around this area is accomplished (Entered MSM 4/88).

3. Survey Requirements

Although AWOIS 51990 was unassigned, RAINIER acquired SWMB data over the feature.

4. Method of Investigation

On DN 157, 159, vessel 2121 acquired SWMB data over this feature.

5. Results of Investigation

Least depth over the feature was determined to be 16 fathoms at 58°08'26.5"N, 135°00'26.18W (Pos. # 71133).

6. Comparison with Prior Surveys

Prior survey H10227 revealed a least depth of 16.6 fathoms (vertical beam echosounder).

7. Comparison with the Chart and Charting Recommendation

Chart 17316 (18th Ed.; Jul 18, 1998, 1:80,000) shows a shoal with a least depth of 16 fathoms at the location of the 16 fathom sounding determined by survey H10882. The Hydrographer recommends that present survey results be used to supercede the chart in their common areas. *CONCUR*

N. COMPARISON WITH THE CHART *SEE EVAL REPORT, SECTION O*

The following charts were compared to survey H10882:

Chart	Scale	Edition Number	Date	Datum
17316	1:80,000	18 th	July 18, 1998	NAD 83
17312	1:10,000	1 st	August 2, 1997	NAD 83
17300	1:209,978	27 th	August 14, 1993	NAD 83

17300, 28th Ed. SEPTEMBER 12, 1998 WAS USED DURING OFFICE PROCESSING.

Comparisons to the above charts were generally in good agreement, within one to two fathoms, except as noted below.

The Hydrographer noted that offshore soundings (far western edge of chart 17312) and northern soundings (originating from survey H2055) do not agree with depths from survey H10882 (prior survey H2055 forms the basis for soundings on chart 17316 and 17300 in the region of H10882 - see Section L, Comparison with Prior Surveys). The table below lists charted depths, which are shoaler than present survey depths (within an approximate 125 m radius of the charted sounding).

EX = EXCESSED

Chart Affected	Chart Depth (fm)	H10882 Depth (fm)	H10882 Fix #	Geographic Position		Comments
				Latitude	Longitude	
17312	126	143 142.9	10,185	58-08-09.14 N	134-49-56.0 W	Charted depth is probably mis-positioned, but not disproved.
17312	199	220.7	96,085	58-07-39.76 N	134-50-36.35 W	Shoalest sounding in area determined by ship multibeam.
17312	132	144.9 EX	96,206	58-07-41.39 N	134-49-49.68 W	Charted depth is probably mis-positioned, but not disproved.
17312	218	235.7 EX	91,958	58-07-07.55 N	134-50-59.41 W	Shoalest sounding in area determined by ship multibeam.
17312	83	202.4 EX	96,660	58-07-11.95 N	134-49-50.11 W	Shoalest sounding in area determined by 100% SWMB coverage.
17312	36	85.8 ✓	40,855	58-06-48.96 N	134-49-17.26 W	Charted depth is probably mis-positioned, but not disproved.
17312	201	213.6 EX	91,450	58-06-42.12 N	134-50-05.96 W	Shoalest sounding in area determined by ship multibeam.
17312	84	110.8 EX	40,824	58-06-36.21 N	134-49-09.01 W	Charted depth is probably mis-positioned, but not disproved.
17312	51	80.6 ✓	40,766	58-06-12.38 N	134-48-50.14 W	Charted depth is probably mis-positioned, but not disproved.
17312	220	231.1 ✓	87,258	58-05-38.97 N	134-50-44.44 W	Shoalest sounding in area determined by ship multibeam.
17312	220	229.2 EX	87,389	58-05-29.94 N	134-50-44.91 W	Shoalest sounding in area determined by ship multibeam.
17312	207	222.6 EX	87,603	58-05-18.44 N	134-50-35.6 W	Shoalest sounding in area determined by ship multibeam.
17316	210	264.1 ✓	111,710	58-09-53.11 N	134-54-07.59 W	Shoalest sounding in area determined by ship multibeam.
17316	312	335.3 EX	119,537	58-08-23.77 N	134-55-06.45 W	Shoalest sounding in area determined by ship multibeam.
17316	312	328.5 EX	136,550	58-07-22.97 N	134-56-20.89 W	Shoalest sounding in area determined by ship multibeam.
17316 17300	314	327.5 EX	136,554	58-07-30.76 N	134-55-37.11 W	Shoalest sounding in area determined by ship multibeam.
17316 17300	238	250.3 ✓	85,025	58-07-58.35 N	134-52-14.58 W	Shoalest sounding in area determined by ship multibeam.
17316	227	261.1 ✓	108,399	58-06-59.39 N	134-52-48.49 W	Shoalest sounding in area determined by ship multibeam.
17300	228	302.2 EX	168,147	58-03-48.35 N	134-54-59.31 W	Shoalest sounding in area determined by ship multibeam.
17300	320	332.8 EX	134,750	58-05-31.77 N	134-55-07.2 W	Shoalest sounding in area determined by ship multibeam.
17300	224	273.4 EX	161,488	57-59-54.11 N	134-54-16.08 W	Shoalest sounding in area determined by ship multibeam.

Depths from chart 17312 at the entrance to Hawk Inlet (based on prior survey H10087) match very closely with present survey soundings, generally within 0.5 fathom. *CONCUR*

A charted underwater cable crossing lies within the H10882 survey area. The cable crossing was not investigated and is shown in brown on the final DP and BS plot. The Hydrographer recommends retaining the cable crossing as charted. *CONCUR*

The Hydrographer recommends that soundings from the current survey be used to update the chart in their common areas. Non sounding features are addressed in Section I, Shoreline. Final comparisons will be made at PHB after application of smooth tides. *CONCUR*

Dangers to Navigation

No dangers to navigation were discovered during survey H10882.

O. ADEQUACY OF SURVEY ✓ SEE EVAL REPORT, SECTION P.

Except for the charted features noted in Section I and the holidays addressed in Section R, survey H10882 is complete and adequate to supersede charted soundings and features in their common areas.

P. AIDS TO NAVIGATION

Two aids to navigation were located on survey H10882.

A new daybeacon (R"2") at the south entrance to Hawk Inlet, just east of the survey limits at 58°04'38.98"N, 134°47'55.83"W (Pos. #40056) was positioned by DGPS on DN 129. This aid to navigation was not depicted on chart 17312 and 17300. However, the daybeacon was included in Notice to Mariners No. 6, dated 6 Feb 1999 at 58°04'39.0"N, 134°47'55.8"W.

The charted light R "20" at 58°02'40.89N, 134°48'35.75W (Pos. #40060) was verified by DGPS on DN 129.

See Appendix II ^{*} for additional information on these fixed aids to navigation.

Q. STATISTICS ✓

Statistics are listed in the Survey Information Summary included with this report.

R. MISCELLANEOUS ✓

Bottom samples were collected and sent to the Smithsonian in accordance with Project Instructions.

Temporary anchorage with protection against southerly winds, may be obtained in the bight at the mouth of Hawk Inlet.

Marine traffic in the region includes Alaskan State Ferries, cruise ships, both large and small commercial fishing vessels and small recreational boats.

Small holidays exist on survey H10882. These holidays are a result of rejected SeaBeam data, or inadequate SeaBeam coverage at the steep nearshore areas where VBES lines did not extend offshore far enough to overlap with the SeaBeam data. These holidays exist in depths greater than 90m, with one exception noted below.

A 300m (E-W) by 600m (N-S) holiday was noted at the entrance to Hawk Inlet, in the vicinity of 58°05'08.6"N, 134°48'12.5"W. This holiday is a result of mainscheme VBES lines not being extended far enough offshore and insufficient swath coverage with the ship multibeam.

S. RECOMMENDATIONS

Because no photogrammetric shoreline was provided for the entire survey area, the Hydrographer recommends that shoreline depicted on survey H10882 be used to update the chart in their common areas. Precise, low-water shoreline information is imperative when conducting basic hydrographic surveys along the complex Alaska coast. When shoreline manuscripts are not provided, significant effort is required to adequately delineate the shoreline and its features.

DO NOT CONCUR. SEE
EVAL REPORT, SECTION J.

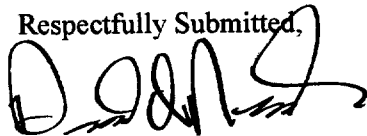
* FILED WITH
THE SURVEY
RECORDS

T. REFERRAL TO REPORTS

The following supplemental reports contain additional information relevant to this survey:

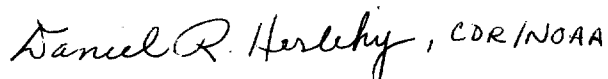
<u>Title</u>	<u>Date Sent</u>	<u>Office</u>
OPR-O340-RA Horizontal Control Report	July 1999	N/CS34
Project related data for OPR-O340-RA	July 1999	N/CS34
OPR-O340-RA Coast Pilot Report	July 1999	N/CS26

Respectfully Submitted,



for
 Mark A. Wetzler
 Lieutenant, NOAA
 Navigation Officer

Approved and Forwarded,



Alan D. Anderson
 Captain, NOAA
 Commanding Officer

for

List of Horizontal Control Stations

NAME	STATE	TYPE	LATITUDE	LONGITUDE	SITE ID	source of position
CURTIS	AK	DGPS Flyaway	58 27.2687N	134 58.7415W	n/a	NOAA Ship RAINIER
GUSTAVUS	AK	USCG Beacon	58 25.1000N	135 41.8000W	892	USCG

Survey Information Summary

Project: OPR-0340-99 **Project Name:** LYNN CANAL
Instructions Dated: 3/5/98 **Project Change Info:**

Change #	Dated
1	3/30/98
2	4/12/99
3	5/6/99

Sheet Letter: W **Registry Number:** H-10882
Sheet Number: RA-20-04-99

Survey Title: Northern Approach to Chatham Strait
Data Acquisition Dates: From: 06-May-99 126 To: 08-Jun-99 159

Vessel Usage Summary

VESNO	MS	SPLITS	DEV	XL	S/L	DP	BS	DIVE
2120								
2121				1				
2122	1				1	1		
2123		1						
2124	4				1	2		
2125	3				1	2	2	
2126		3		1				

Sound Velocity Cast Information

Launch Table #	Ship Table #	Cast DN	Max Depth	Position	Applicable DN
10		139	585	58/14/25	
				134/57/05	
14		157	619	57/58/05	
				134/48/55	

Tide Zone Information

Zone #	Time Corr.	Height Corr.
SEA57	00 hr 00 min	X0.93
SEA55	00 hr 00 min	X0.92

Tide Gage Information

Tide Gage #	Gage Name	Installed	Removed
945-2294	HAWK INLET	4/29/99	6/9/99

Statistics Summary

Type	Total:	Percent XL:
BS	9	15.7%
DP	46	SQNM: 52.9
MBMS	38.55	
MBXL	7.53	
MS	114.37	
S/L	14.67	
SPLIT	69.18	
SWMB	28.44	
XL	18	



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of NOAA Corps Operations
Pacific Marine Center
1801 Fairview Avenue East
Seattle, Washington 98102-3767

NOAA Ship RAINIER
July 21, 1999

MEMORANDUM FOR: CDR James Gardner
Chief, Pacific Hydrographic Branch

THROUGH: RADM Nicholas A. Prah
Director, Pacific Marine Center

FROM: *Daniel R. Herlihy*
CDR Daniel R Herlihy
Commanding Officer

SUBJECT: Survey Data Transmittal Delay

There will be a delay in the transmission of survey data for projects OPR-O340-RA-99 and OPR-O351-RA-99. The transmission of data will exceed four weeks from completion of field work.

The surveys affected are H-10866 (RA-10-4-99), H-10865 (RA-10-5-99), H-10869 (RA-10-6-99), H-10870 (RA-10-7-99), H-10879 (RA-10-8-99), H-10880 (RA-20-3-99), H-10882 (RA-20-4-99), H-10883 (RA-10-9-99), F-00451 (RA-10-10-99), and H-10902 (RA-10-11-99). There are numerous reasons for this delay including, but not limited to, use of untested software for the acquisition of data, lack of experienced personnel, and the need to efficiently use the vessels as acquisition platforms while processing data already collected. In addition, the Commanding Officer and Field Operations Officer rotated during the summer inport; there was a ramp up period on the above projects to allow for adequate review.

The four week submittal of survey data recommendation noted in the Field Procedures Manual (FPM) does not reflect knowledge of current data acquisition and processing timelines. As you know, the shallow water multibeam (SWMB) systems allow for extremely large data sets to be collected in a very short amount of time. The processing of these data sets takes a much longer amount of time than does the processing of single beam data. In fact, the ratio of time processing SWMB data to time collecting SWMB data is 4:1. In comparison, the ratio of processing single beam data to the collection of single beam data is 1:3. The FPM should be updated to recognize the larger amount of time needed to process SWMB data by the field units. It is recommended that the FPM be changed to allow eight weeks for the submittal of survey data from the date of field work completion.

The anticipated transmittal date for the above mentioned surveys is the beginning of August 1999.



APPROVAL SHEET

for

H10882

RA-20-04-99

Standard field surveying and processing procedures were followed in producing this survey in accordance with the NOS Hydrographic Surveys Specifications and Deliverables; the Hydrographic Survey Guidelines; and the Field Procedures Manual, as updated for 1998.

The field sheet and accompanying records have been examined 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.

Approved and Forwarded,

Daniel R. Herbby, CDR/NOAA

Alan D. Anderson
Captain, NOAA
Commanding Officer
NOAA Ship RAINIER

for



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: October 6, 1999

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-0340-RA
HYDROGRAPHIC SHEET: H-10882

LOCALITY: Northern Approach to Chatham Strait, AK
TIME PERIOD: May 6 - June 8, 1999

TIDE STATION USED: 945-2294 Hawk Inlet Entrance, AK
Lat. 58° 05.2'N Lon. 134° 46.6'W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.393 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: SEA61, SEA62 & SEA200.

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.

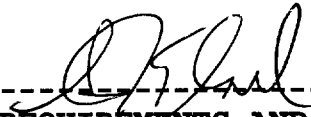
Note 2: Juneau, AK and Skagway, AK were used as datum control for subordinate tide stations and for tidal zoning in this hydrographic survey. Accepted datums for these two stations have been updated recently and have changed significantly from previous values.

The current National Tidal Datum Epoch (NTDE) used to compute tidal datums at tide stations is the 1960-78 NTDE. Traditionally, NTDEs have been adjusted when significant changes in mean sea level (MSL) trends are found through analyses among the stations of the National Water Level Observation Network (NWLON). Epochs are updated to ensure that tidal datums are the most accurate and practical for navigation, surveying and engineering applications and reflect the existing local sea level conditions. For instance, analyses of sea level trends show that a new NTDE is necessary and efforts are underway to update the 1960-78 NTDE to a more recent 19-year time period.



TIDE NOTE FOR HYDROGRAPHIC SURVEY SHEET H-10882 cont.

However, analyses also show that there are several geographic areas which are strongly anomalous from the average sea level trends found across the NWLON and must be treated differently. One of these areas is in southeast Alaska covering the Lynn Canal, Icy Strait, and Glacier Bay region. Juneau and Skagway show relative sea level trends of -0.038 ft/yr and -0.052 ft/yr, respectively due to land emergence from the retreat of glaciers over recent geological time. NOS has adopted a procedure of computing accepted tidal datums for these anomalous regions by using a MSL value calculated from the last several years of data rather than the 19-year NTDE. The accepted range of tide is still based on the 19-year NTDE and, when applied to the updated MSL, will result in updated values for Mean High Water (MHW) and Mean Lower Low Water (MLLW) derived through standard datum calculation procedures. For both Juneau and Skagway, the MSL values were computed from the period of 1994-1998. This resulted in a lowering of the MLLW datums relative to land by -0.40 ft at Juneau and -0.53 ft at Skagway compared to the previous MLLW elevations used in last year's surveys. Subordinate tide stations in the area used for hydrographic surveys and controlled by Juneau or Skagway will be affected similarly. Accepted datums have been computed and may be accessed on the Internet through the URL specification <http://www.co-ops.nos.noaa.gov>.

For 

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

Final tide zone node point locations for OPR-O340-RA-99,
Sheet H-10882.

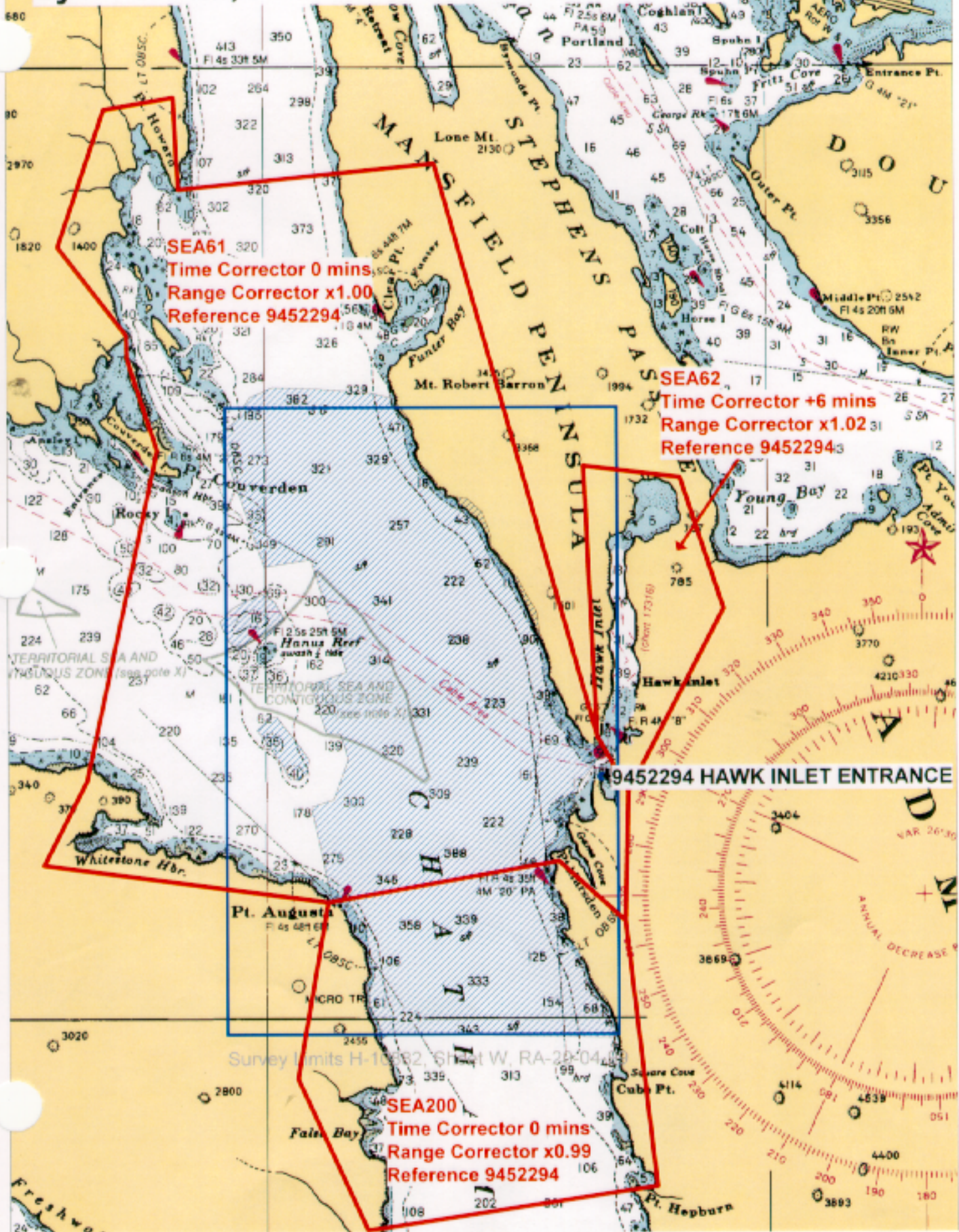
Format: Longitude in decimal degrees (negative value denotes
Longitude West),
Latitude in decimal degrees
Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction

	Tide Station Order	AVG Time Correction	Range Correction
Zone SEA61			
-134.959218 58.041117	9452294	0	1.00
-135.14771 58.054253			
-135.118932 58.083961			
-135.071513 58.199522			
-135.091253 58.231806			
-135.091462 58.239746			
-135.136994 58.270642			
-135.106151 58.318618			
-135.059847 58.322891			
-135.056682 58.290764			
-134.886639 58.299621			
-134.779935 58.099384			
-134.759117 58.079735			
-134.761492 58.034383			
-134.805447 58.055403			
-134.959218 58.041117			
Zone SEA62			
-134.779935 58.099384	9452294	+6	1.02
-134.788178 58.19375			
-134.724488 58.189642			
-134.69598 58.143854			
-134.759117 58.079735			
-134.779935 58.099384			
Zone SEA200			
-134.740992 57.94085	9452294	0	0.99
-134.761492 58.034383			
-134.805447 58.055403			
-134.959218 58.041117			
-134.979853 57.978872			

-134.933739 57.925429

-134.740992 57.94085

Final Tidal Zoning for OPR-O340-RA-99 Lynn Canal, AK - Sheet H-10882



SEA61
Time Corrector 0 mins
Range Corrector x1.00
Reference 9452294

SEA62
Time Corrector +6 mins
Range Corrector x1.02
Reference 9452294

9452294 HAWK INLET ENTRANCE

SEA200
Time Corrector 0 mins
Range Corrector x0.99
Reference 9452294

Survey limits H-10882, Sheet W, RA-29-04

GEOGRAPHIC NAMES

H-10882

Name on Survey	A ON CHART NO. 17300, 17312, 17316 B ON PREVIOUS SURVEY NO. C ON U.S. QUADRANGLE MAPS D FROM LOCAL INFORMATION E ON LOCAL MAPS F P.O. GUIDE OR MAP G RAND MCNALLY ATLAS H U.S. LIGHT LIST K											
	ALASKA (title)	X		X								
ADMIRALTY ISLAND	X		X									2
AUGUSTA, POINT	X		X									3
CHATHAM STRAIT	X		X									4
CHICHAGOF ISLAND	X		X									5
GAME COVE	X		X									6
HANUS REEF	X		X									7
HAWK INLET	X		X									8
HAWK POINT	X		X									9
ICY STRAIT	X		X									10
LYNN CANAL	X		X									11
MANSFIELD PENINSULA	X		X									12
MARSDEN, POINT	X		X									13
												14
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												16
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												23
												24
												25

~~Figure~~

Dennis R. ...
 Chief ...

FEB 23 2000

HYDROGRAPHIC SURVEY STATISTICS

H-10882

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

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION		AMOUNT
SMOOTH SHEET			SMOOTH OVERLAYS: POS., ARC, EXCESS		
DESCRIPTIVE REPORT			FIELD SHEETS AND OTHER OVERLAYS		
DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDION FILES					
ENVELOPES					
VOLUMES					
CAHIERS					
BOXES					

SHORELINE DATA					
SHORELINE MAPS (List): GC10426, GC10427, TP-01527, TP-01528					
PHOTOBATHYMETRIC MAPS (List): N/A					
NOTES TO THE HYDROGRAPHER (List): N/A					
SPECIAL REPORTS (List): N/A					
NAUTICAL CHARTS (List): 17300 18th Ed., Sept. 12, 1998, 17312 1st Ed., Aug. 2, 1997					
OFFICE PROCESSING ACTIVITIES 17316 18th Ed., July 18, 1998 <i>The following statistics will be submitted with the cartographer's report on the survey</i>					

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

	TIME-HOURS		
	VERIFICATION	EVALUATION	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	172.0		172.0
COMPARISON WITH PRIOR SURVEYS AND CHARTS		40.0	40.0
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		20.0	20.0
GEOGRAPHIC NAMES			
OTHER (Chart Compilation)		26.0	26.0
USE OTHER SIDE OF FORM FOR REMARKS			
TOTALS	172.0	153.0	217.50

Pre-processing Examination by	Pacific Hydrographic Branch	Beginning Date 12/28/99	Ending Date 01/04/00
Verification of Field Data by	M Bigelow, L Deodato, R. Mayor, D Doles, D Hill,	R Shipley	172.0
Verification Check by	D. Hill	Time (Hours) 4	Ending Date 5-17-00
Evaluation and Analysis by	M. Bigelow	Time (Hours) 92.00	Ending Date 05/17/00
Inspection by	D. Hill	Time (Hours) 6	Ending Date 5-31-00

**EVALUATION REPORT
H-10882**

A. PROJECT

The project is adequately discussed in the hydrographer's report.

B. AREA SURVEYED

The survey area is adequately described in the hydrographer's report except as follows.

The hydrographer has determined the inshore limits of safe navigation by defining a Navigable Area Limit Line (NALL) throughout the survey area. Prior survey and charted features and soundings inshore of this limit line may not have been specifically addressed during survey operations and should be retained as charted. Page-size plots of the charted area depicting the specific limits of supersession accompanies this report as Attachment 1.

The bottom is typically comprised of sand, pebbles and mud. Depths range from 0 to 384 fathoms.

C. SURVEY VESSELS

Survey vessels are adequately discussed in the hydrographer's report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

The acquisition and processing of data in the field has been adequately addressed in the hydrographer's report, section D.

Office processing of survey data was conducted using the same Computer Aided Resource Information System (CARIS) and Hydrographic Processing System (HPS) used by the hydrographer. MicroStation 95 was used during office processing to compile the smooth sheet.

Processed digital data for this survey exists in the standard HPS format, a database format using the .dbf extension. In addition, the smooth sheet drawing is filed in the MicroStation format, i.e., .dgn extension. Copies of these files have been forwarded to the Hydrographic Surveys Division and a backup copy retained at PHB. Database records forwarded are in the Internal Data Format (IDF) and are in compliance with specifications in existence at the time of survey processing.

The drawing files necessarily contain information that is not part of the HPS data set such as geographic names text, line-type data, and minor symbolization. In addition, those soundings deleted from the drawing for clarity purposes remain unrevised in the HPS digital files to preserve the integrity of the original hydrographic data set. Cartographic codes used to describe the digital data are those authorized by Hydrographic Survey Guideline No. 35 and No. 75.

The data are plotted using a Universal Transverse Mercator, Zone 8 projection and are depicted on a single sheet.

E. SONAR EQUIPMENT

Side scan sonar was not used during the field work.

F. SOUNDING EQUIPMENT

Sounding equipment has been adequately addressed in the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

Soundings and elevations below Mean High Water (MHW) have been reduced to Mean Lower Low Water

(MLLW). The reducers include corrections for an actual tide; dynamic draft; sound velocity; and heave, pitch and roll. Additional reducers for multibeam survey data include heave, pitch and roll. These reducers have been reviewed and are consistent with NOS specifications.

Reduction of sounding data for sound velocity is based on nine separate casts which do not bracket the period of single beam data collection. Single beam data collection began on DN 126. The first velocity cast was taken on DN 139. Velocity casts however do bracket the time of multibeam data collection. Although the period of data collection for single beam hydrography is in excess of 14 days (there are three files DN 126, DN128 and DN129) before the time of the earliest cast there is no indication that the sounding data quality has been compromised.

Unverified real tides were downloaded from the Internet from the tide gauge Juneau (945-2210) and were used for the reduction of soundings during field processing. During office processing, tide reductions were derived from approved hourly heights zoned direct from the following tide gauge: gauge 945-2294 , Hawk Inlet Entrance, AK.

H. CONTROL STATIONS

Control stations are adequately discussed in the hydrographer's report.

The positions of horizontal control stations used during hydrographic operations are published values based on NAD 83. The smooth sheet is annotated with an NAD 27 adjustment tick based on values determined with the NGS program NADCON. Geographic positions based on NAD 27 may be plotted on the smooth sheet utilizing the NAD 83 projection by applying the following corrections:

Latitude: -1.214 seconds (-37.574 meters)
Longitude: 6.446 seconds (105.561 meters)

Additional information concerning calibrations and system checks can be found in the hydrographer's report and in the separates related to horizontal position control and corrections to position data

I. HYDROGRAPHIC POSITION CONTROL

Hydrographic position control is adequately discussed in the hydrographer's report. See the OPR-O340-RA Horizontal Control Report for more information.

Differential GPS (DGPS) was used to control this survey. A horizontal dilution of precision (HDOP) not to exceed 3.75 for a 1:10,000 scale survey was computed for survey operations. The maximum (HDOP) allowable limit has not been exceeded during this survey and the quality of data obtained is good.

J. SHORELINE

With the exception of the following shoreline is adequately discussed in the hydrographer's report.

The hydrographer used an unconventional source for shoreline, registered NASA aerial photos acquired from the U.S. Forest Service. This source was not authorized via the Letter Instructions. The hydrographer should have used photogrammetric digital map GC10426 and GC10427 and analog maps TP01527 and TP01528. Nautical chart 17316, 18th edition, July 18th 1998, chart 17312, 1st edition, August 2, 1997 and chart 17300, 28th edition, September 12, 1998 should have been used in areas not common to the photogrammetric maps. The authorized source documents were utilized during office processing to compile the smooth sheet.

K. CROSSLINES

The hydrographer noted a difference in depths collected between the DSF 6000N and the Knudsen 320M fathometers. These differences occurred while collecting data over the steep slopes off Point Augusta. These

differences only occurred in areas with large vertical gradients. Data collected in this area by both fathometer systems was processed and excessed in HPS to display the shoal depths on the smooth sheet. Contour lines off Point Augusta are consistent and show no anomalies in this area. All other crosslines are adequately discussed in the hydrographer's report.

L. JUNCTIONS

Survey H-10849 junctions with the following surveys:

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H10746	1997	1:5,000	East
H10879	1999	1:10,000	North
H10881	1999	1:20,000	North

The junctions with surveys H10746 and H10881 are complete. Survey H10879 was not listed in section L of the hydrographer's report. Junctions were not addressed between H-10882 and H-10879. The required junction was accomplished during office processing and a "Joins" note has been added to the smooth sheet where applicable to indicate completed junctions.

There are many holidays within the limits of survey H10882. The hydrographer reports that these holidays are the result of several factors but primarily rejected SeaBeam data or inadequate SeaBeam coverage at the steep near-shore areas. VBES lines did not extend offshore far enough to overlap with the SeaBeam data. The holidays are at Latitude 58°11'30" N between Longitude 134°59'00" W and Longitude 135°01'00" W. At Latitude 58°06'10" N between Longitude 134°56'00" W and Longitude 134°58'00" W. At Latitude 58°06'00" N between Longitude 134°48'00" W and Longitude 134°50'00" W. At Latitude 58°03'50" N and Longitude 134°50'00" W. At Latitude 58°00'00" N and Latitude 58°03'00" N between Longitude 134°50'00" W and Longitude 134°51'00" W. At Latitude 58°00'40" N between Longitude 134°52'30" W and Longitude 134°53'30" W. Holidays also exist inside the 40-fathom depth curve at Latitude 58°05'10" N and Longitude 134°48'10" W, just west of the mouth of Hawk Inlet between survey H10882 and survey H10746. Based on the current survey depths in the holidays the depths are between 37 and 340 fathoms. The rest of the depth curves between junction survey H10881, junction survey H10746 and junction survey H10879 were brought into agreement. Depths are in good agreement within the common area.

M. COMPARISON WITH PRIOR SURVEYS

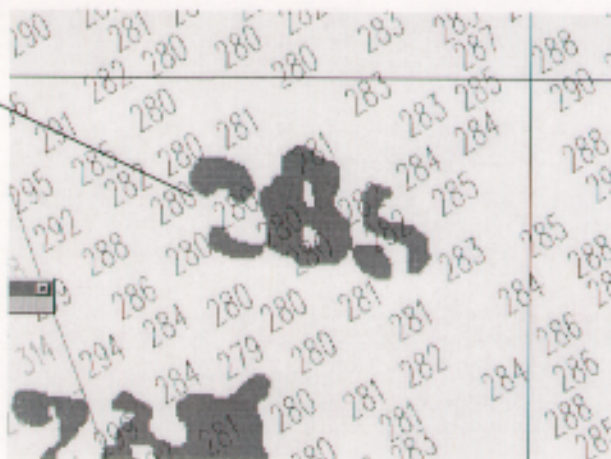
The present survey was compared to the following prior surveys:

<u>Survey</u>	<u>Year</u>	<u>Scale</u>
H1602A	1884	1:40,000
H2055	1890	1:40,000
H4227WD	1922	1:40,000
H4228	1922	1:40,000
H10060	1982	1:10,000
H10087	1983	1:10,000
H10227	1986	1:20,000

The digital raster image of prior survey H1602A is of poor quality with no depths or grid, therefore difficult to register to the present survey. Comparison could only be made with surveys H2056 and H2055. The bathymetry from survey H2056 along the west side of Lynn Canal in depths less than 20 fathoms matches within 1 to 2 fathoms. In depths more than 20 fathoms and in depths between 240 and 300 fathoms along the flat bottom soundings are within 1 fathom. Soundings along the west side of Lincoln Island in depths less than 20 fathoms do not compare well due to a random shifting in the location of historical depths when compared to the present survey. Depths between 20 and 50 fathoms are shoaler on the prior survey. In depths more than 50

fathoms the soundings compare within 1 to 2 fathoms. It is difficult to compare the prior shoreline features to the newer digital shoreline due to locational differences and the lack of detail on the prior. The same goes for the shoreline on the east side of Lynn Canal. There are places along the shoreline where the newer digital shoreline does not match the shoreline from the 1890's and in other places the shorelines match well. The descriptive report, Section L. Comparison With Prior Surveys, compares soundings from prior survey H2055 to survey H10882 and provides a table of soundings that do not match. A spot check of the comparisons made in the field show that the depths from prior survey H2055 were sometimes misread. This problem is likely due to the poor quality of the raster imagery.

This depth was misread as 265.



In areas where a comparison could be made differences between prior survey depths and the present survey may be attributed to greater sounding coverage; improved positioning and sounding methods; and relative accuracy of the present data acquisition techniques.

Because the many of the raster images of the prior surveys are illegible, a comparison was made between the present survey and chart 17300, chart 17312 and chart 17316. Assuming that all critical depths and clearances would have been previously transferred from the prior surveys to the chart the chart functioned as a proxy for the surveys for the purpose of supersession analysis. Since the present survey data is consistently high quality and sufficiently dense to eliminate the possibility of any hazards to navigation remaining undetected the prior surveys H10060, H10087, H10227, H1602A, H2055, H4227WD and H4228 are considered to be superseded.

N. ITEM INVESTIGATION REPORTS

AWOIS items 51068 and 51990 fall within the limits of survey H10882 are adequately discussed in the hydrographer's report.

O. COMPARISON WITH THE CHART

Survey H10882 was compared with the following charts:

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>
17300	18 th	September 12, 1998	1:209,978
17312	1 st	August 2, 1997	1:10,000
17316	18 th	July 18, 1998	1:80,000

Nautical chart 17312, 1st edition, August 2, 1997 has a mislabeled contour line at the mouth of Hawk Inlet at Latitude 58°05'40" N and Longitude 134°46'48" W. The 10-fathom curve is incorrectly labeled as a 20 fathom

curve.

a. Hydrography

Charted hydrography originates with the previously discussed prior surveys. However, as charted on chart 17316 the three-fathom curve and the fifty-fathom curve on both sides of Lynn Canal, is actually closer to shore than charted. The shoreline on chart 17316 along the west side of Admiralty Island does not compare well to the present shoreline as depicted on the smoothsheet between Latitude 58°11'15" N and Latitude 58°08'00" N.

Numerous rocks are presently charted near the shore within the survey area. The hydrographer failed to specifically discuss or otherwise provide definitive disposition of these features. A close examination of the prior surveys, the chart and the present hydrography has led the evaluator to the conclusion these rocks are likely representations of ledges observed during earlier survey work. Accordingly, the charted depiction is recommended for supersession by the present survey which provides good detail in some near-shore areas.

The hydrographer failed to verify the charted depiction of the high water line which is symbolized to represent a steep bluff (Chart No. 1, C3). The revision of the charted high water line from the aforementioned (section J) remote sensing data should be supplemented with this symbolization.

The application of this survey to charts of a scale less than 1:40,000 may require the generalization of features such as ledges, and reefs. The recommended charting disposition of specific ledges or reefs is their depiction as isolated rocks. The application of this survey to charts of a scale greater than 1:40,000 may be accomplished without generalization of features.

Survey H10882 is adequate to supersede charted hydrography within the charted area.

b. Dangers to Navigation

There were no dangers to navigation reported during the survey or during office processing.

P. ADEQUACY OF SURVEY

With the following exception survey H10882[✓] is adequate to:

- a. Delineate the bottom configuration, determine least depths, and draw the required depth curves;
- b. Reveal there are no significant discrepancies or anomalies requiring further investigation; and
- c. Show the survey was properly controlled and soundings are correctly plotted.

The hydrographic records and reports received for processing are adequate and conform to the requirements of the Hydrographic Manual, 4th Edition, revised through Change No. 3, the Hydrographic Survey Guidelines, and the Field Procedures Manual (FPM), April 1998 Edition, and the NOS Hydrographic Surveys Specifications and deliverables, dated April 23, 1999 with the following exceptions:

Many holidays exist between H10882 and the junction surveys. An unapproved source of shoreline was used during field operations. In the DR, Appendix II. Nonfloating Aids to Navigation, Coast Guard Light List numbers were incorrectly used. The hydrographer failed to specifically discuss or otherwise provide definitive disposition of numerous charted rocks and islets.

Q. AIDS TO NAVIGATION

Two aids to navigation were located during survey H10882. Hawk Inlet Daybeacon "2" (Light List number 24107) is not charted on chart 17300, 18th Edition September 12, 1998. This day beacon was included in the Notice to Mariners No. 6, dated 6 February 1999. The Local Notice to Mariners and Light List position of this day beacon are the same as positioned during survey H10882. Chatham Strait Light "20" (Light List number 24100) is also charted on chart 17300. Appendix II. Non floating Aids to Navigation, states that Hawk Inlet Daybeacon "2" has no Light List number and that Chatham Strait Light "20" is Light List number 40060. The number 40060 is the DP position number of this light, not the LL number. Both lights were located by DGPS. The static geodetic position for Hawk Inlet Daybeacon "2" is Latitude 58°04'38.94362" N and Longitude 134°47'55.75713" W. and Chatham Strait Light "20" is Latitude 58°02'41.48397" N and Longitude

134°48'33.19961" W. Hawk Inlet Daybeacon 3 Light List number 24109 and Hawk Inlet Light 5, Light List number 24111 on chart 17312 were not addressed. There are no features of landmark value located within the area of this survey.

R. STATISTICS

Statistics are adequately itemized in the hydrographer's report.

S. MISCELLANEOUS

Miscellaneous information is discussed in the hydrographer's report. No additional miscellaneous items were noted during office processing.

T. RECOMMENDATIONS

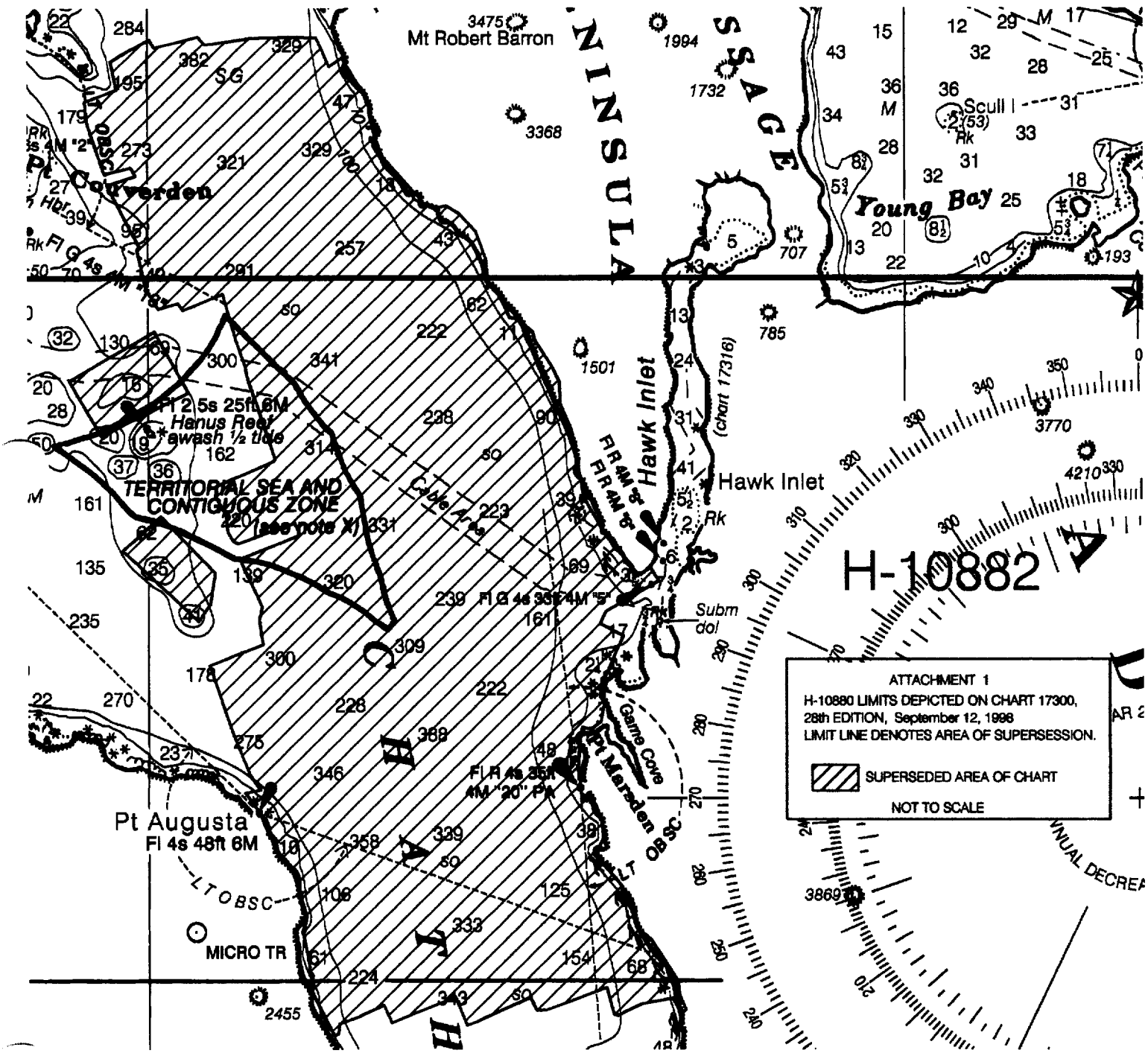
This is an adequate hydrographic survey. Re-survey all holidays within the sheet limits of H-10882 as described in this report, section L. Junctions.

U. REFERRAL TO REPORTS

Referral to reports is adequately discussed in the hydrographer's report.

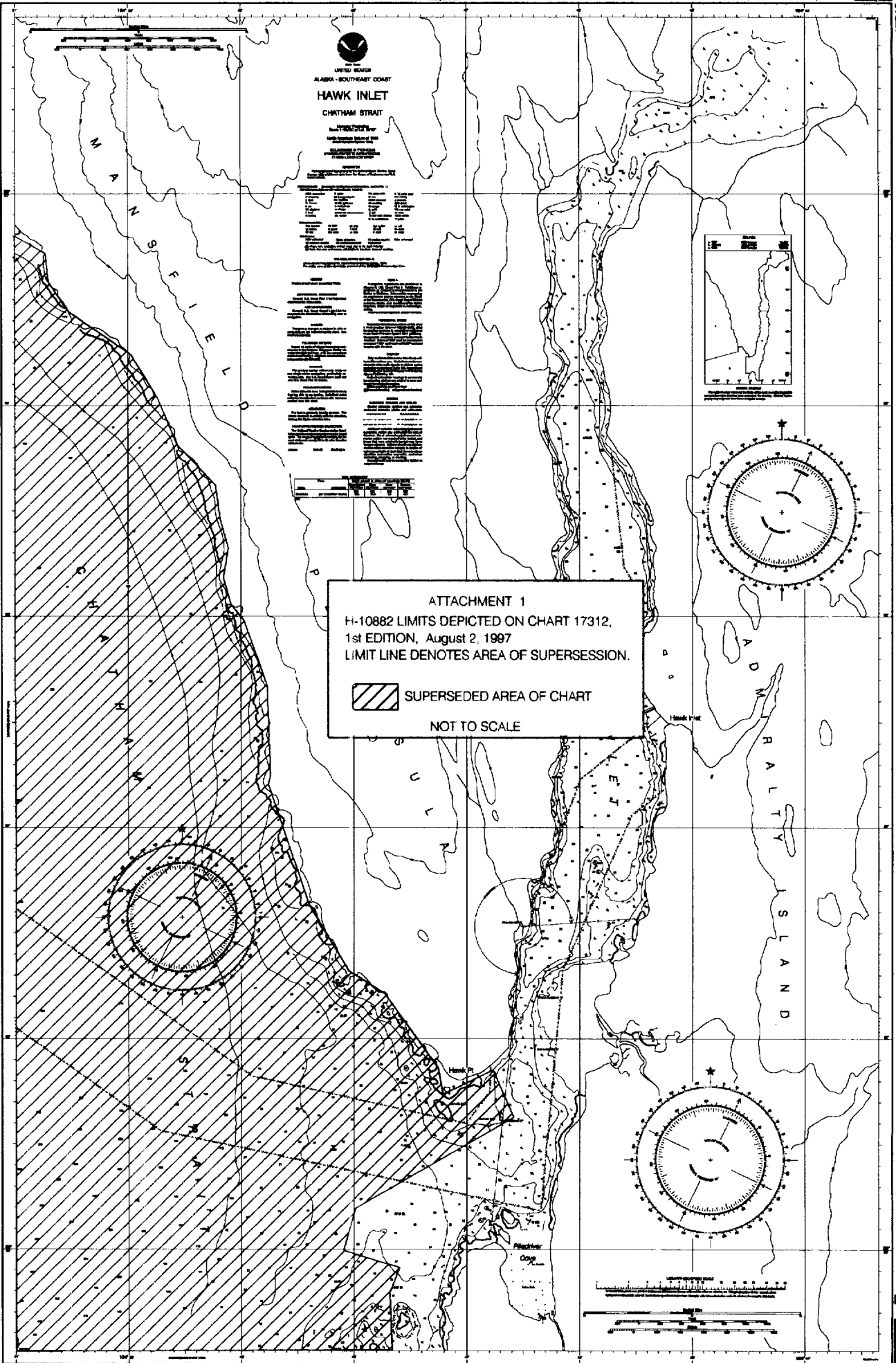


Michael E. Bigelow
Cartographer



17312

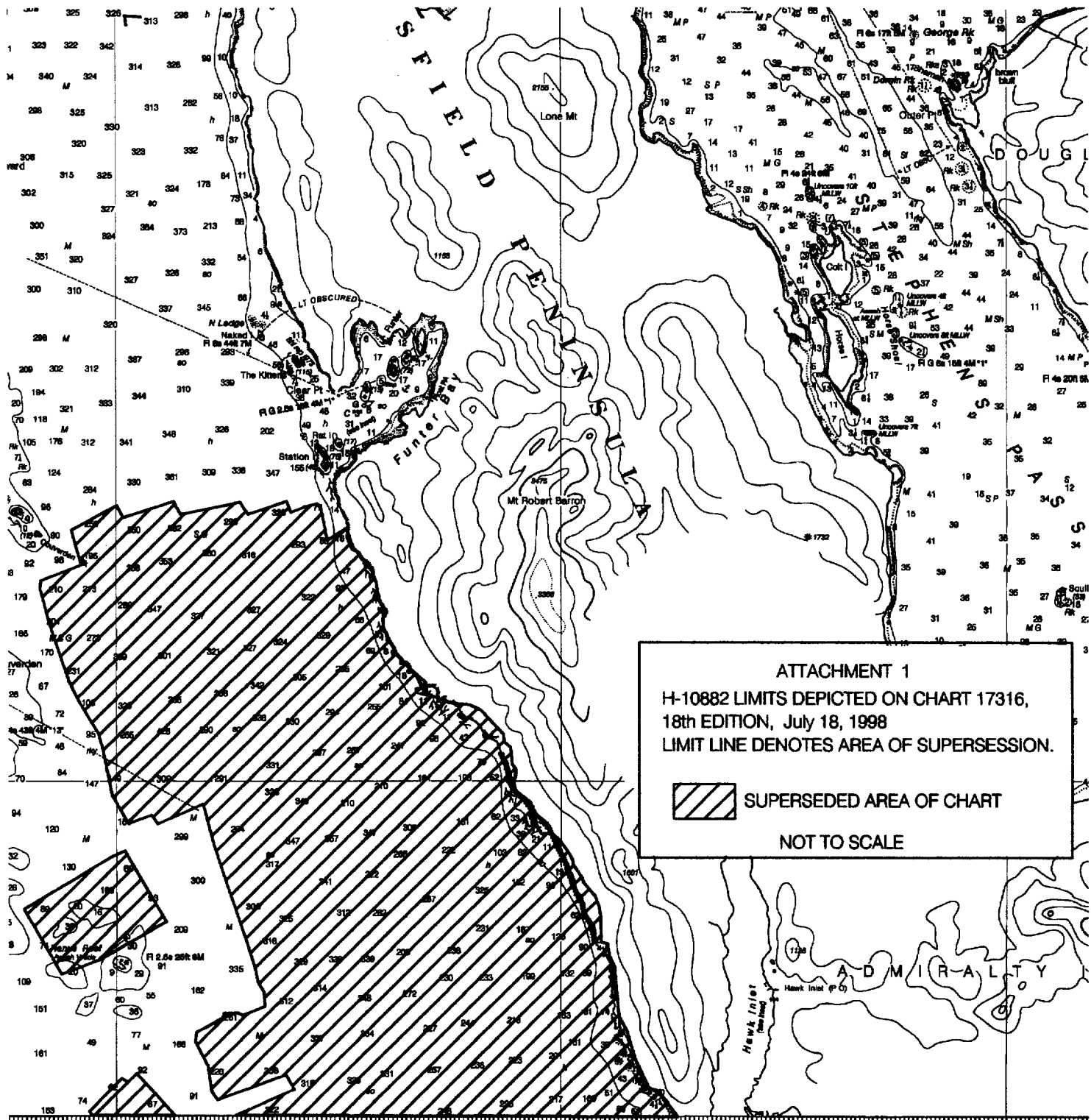
17312




ATTACHMENT 1
 H-10882 LIMITS DEPICTED ON CHART 17312,
 1st EDITION, August 2, 1997
 LIMIT LINE DENOTES AREA OF SUPERSESION.

SUPERSEDED AREA OF CHART

NOT TO SCALE



ATTACHMENT 1
 H-10882 LIMITS DEPICTED ON CHART 17316,
 18th EDITION, July 18, 1998
 LIMIT LINE DENOTES AREA OF SUPERSESSION.


 SUPERSEDED AREA OF CHART

NOT TO SCALE

APPROVAL SHEET
H-10882

Initial Approvals:


The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproof of charted data. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.



Dennis Hill
Chief, Cartographic Team
Pacific Hydrographic Branch

Date: 5-31-00

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 Evaluation Report.

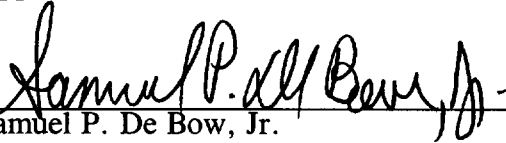


James C. Gardner
Commander, NOAA
Chief, Pacific Hydrographic Branch

Date: 5-31-00

Final Approval

Approved:



Samuel P. De Bow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

Date: March 23, 2001

MARINE CHART BRANCH
RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10882

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
17300	2-17-00	MICHAEL E BIGELOW	Full Part Before After Marine Center Approval Signed Via Drawing No. FULLY APPLIED SOUNDING AND FEATURES FROM SMOOTH SHEET and thru Charts 17312 and 17316
			Full Part Before After Marine Center Approval Signed Via
17312	2-17-00	MICHAEL E BIGELOW	Drawing No. FULLY APPLIED SOUNDINGS AND FEATURES FROM SMOOTH SHEET.
			Full Part Before After Marine Center Approval Signed Via
17316	2-17-00	MICHAEL E. BIGELOW	Drawing No. FULLY APPLIED SOUNDINGS AND FEATURES FROM SMOOTH SHEET AND THROUGH CHART 17312
			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
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