H13802

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13802

LOCALITY

State(s):	Alaska
General Locality:	Pribilof Islands, Alaska
Sub-locality:	Lukanin Bay

2023

CHIEF OF PARTY
CDR Meghan McGovern

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13802

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**Alaska**
General Locality:	**Pribilof Islands, Alaska**
Sub-Locality:	**Lukanin Bay**
Scale:	**20000**
Dates of Survey:	**07/20/2023 to 08/13/2023**
Instructions Dated:	**05/22/2022**
Project Number:	**OPR-R344-FA-23_Pribilof_Islands**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR Meghan McGovern**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 2N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13802

Project: OPR-R344-FA-23_Pribilof_Islands

Locality: Pribilof Islands, Alaska

Sublocality: Lukanin Bay

Scale: 1:20000

July 2023 - August 2023

NOAA Ship *Fairweather*

Chief of Party: CDR Meghan McGovern

A. Area Surveyed

The survey area is located in Lukanin Bay, Alaska.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
57° 14' 41.23" N 170° 16' 31.98" W	57° 2' 52.3" N 169° 59' 46.03" W

Table 1: Survey Limits

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) for H13802 as shown in the figure below.

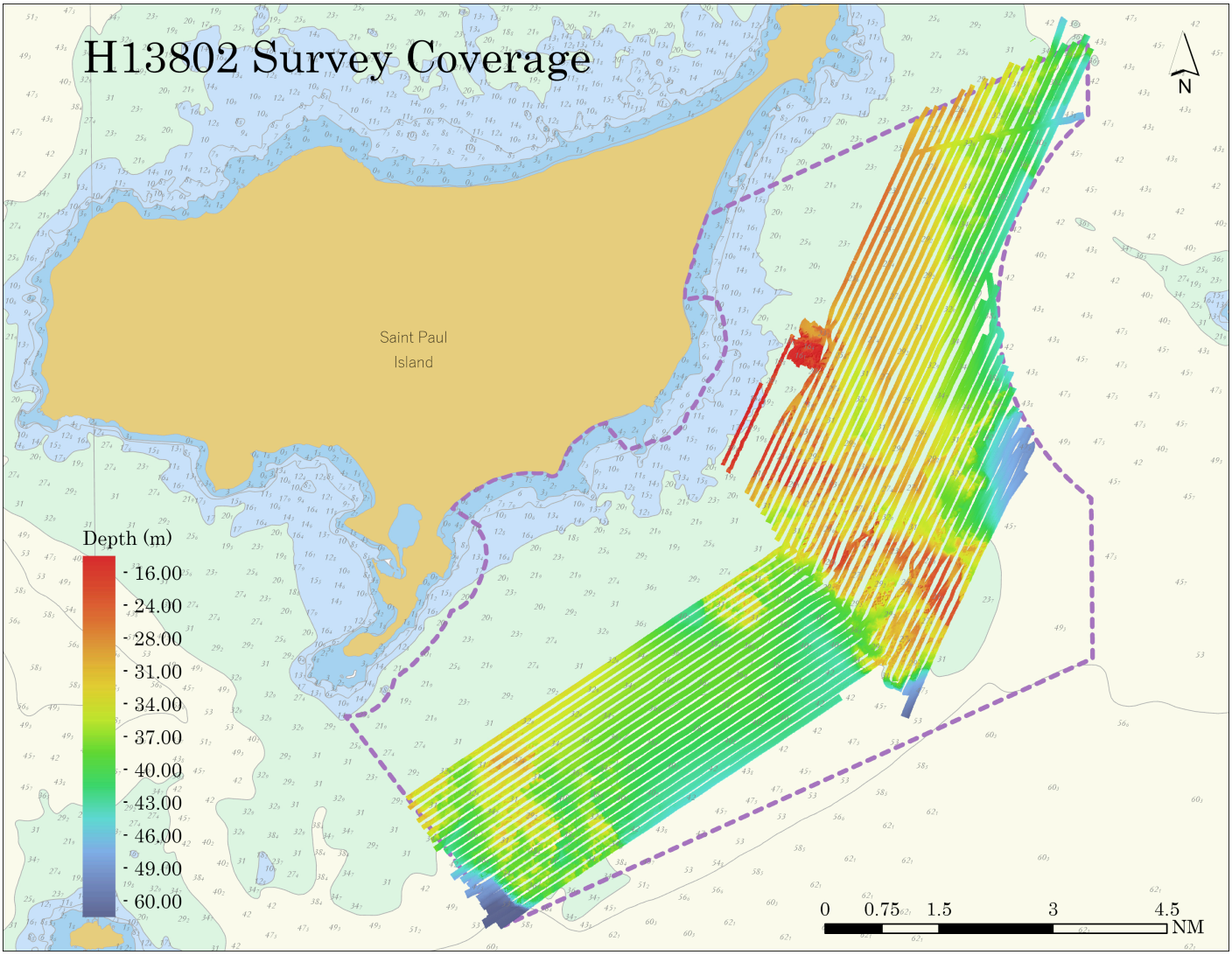


Figure 1: H13802 sheet limits (in purple) and survey coverage overlaid onto ENC US4AK3SB and ENC US4AK3SC.

A.2 Survey Purpose

The Pribilof Islands, a group of four volcanic islands in the Bering Sea, are located 400-km north of the Aleutian Chain. They provide habitat to large colonies of seabirds and marine mammals. The principal islands are Saint Paul and Saint George; they host resident Aleut communities and receive the bulk of shipped supplies and freight. The primary commerce of the Pribilof Islands began in the 1800s with fur seal harvesting, but was halted in the 1980s and has since transitioned to a fishery-based economy. Today's halibut and crab industries employ residents, and provide economic and social benefits for constituents of western Alaska. The income generated from local vessel landing ranged between approximately $1 million to $5.5 million between 2003 and 2015.2 During crab season, the St. Paul harbor serves over 230 transient vessels. The southwestern shore of St. George is frequently used by commercial fishing vessels for shelter in the Bering Sea during storms. Additionally, cruise ships transport birders that make up 70% of

the tourism industry on Pribilof Islands; other attractions include wildlife sightings (e.g., fur seals, Steller sea lions, walruses, whales). Accurate navigational charts are integral to safe transit and continual delivery of goods and services for the Pribilof Islands. Additionally, the islands are one of the few areas to provide a potential lee for vessels transiting in the Bering Sea in inclement weather. The majority of the area was last surveyed in the 1950s; this project will provide modern bathymetric data for updating NOS charting products, improving maritime safety, as well as support the Seabed 2030 global mapping initiative.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13802 meets MBES coverage requirements for Set Line Spacing, as required by the HSSD. Only 0.73% of crosslines were acquired, but NOAA allowable uncertainty (see Section B.2.10), and density statistics (see Section B.2.11) meet HSSD requirements.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Set Line Spacing MBES at 200m perpendicular to contours when safe to do so (Refer to HSSD Section 5.2.2.4)

Table 2: Survey Coverage

The H13802 survey coverage was not met to the extents of the H13802 sheet limits due to poor weather conditions and time constraints. Data was acquired in accordance with the MBES Set Line Spacing coverage standard, meeting the requirements listed above and in the HSSD. See the figure below for an overview of the coverage.

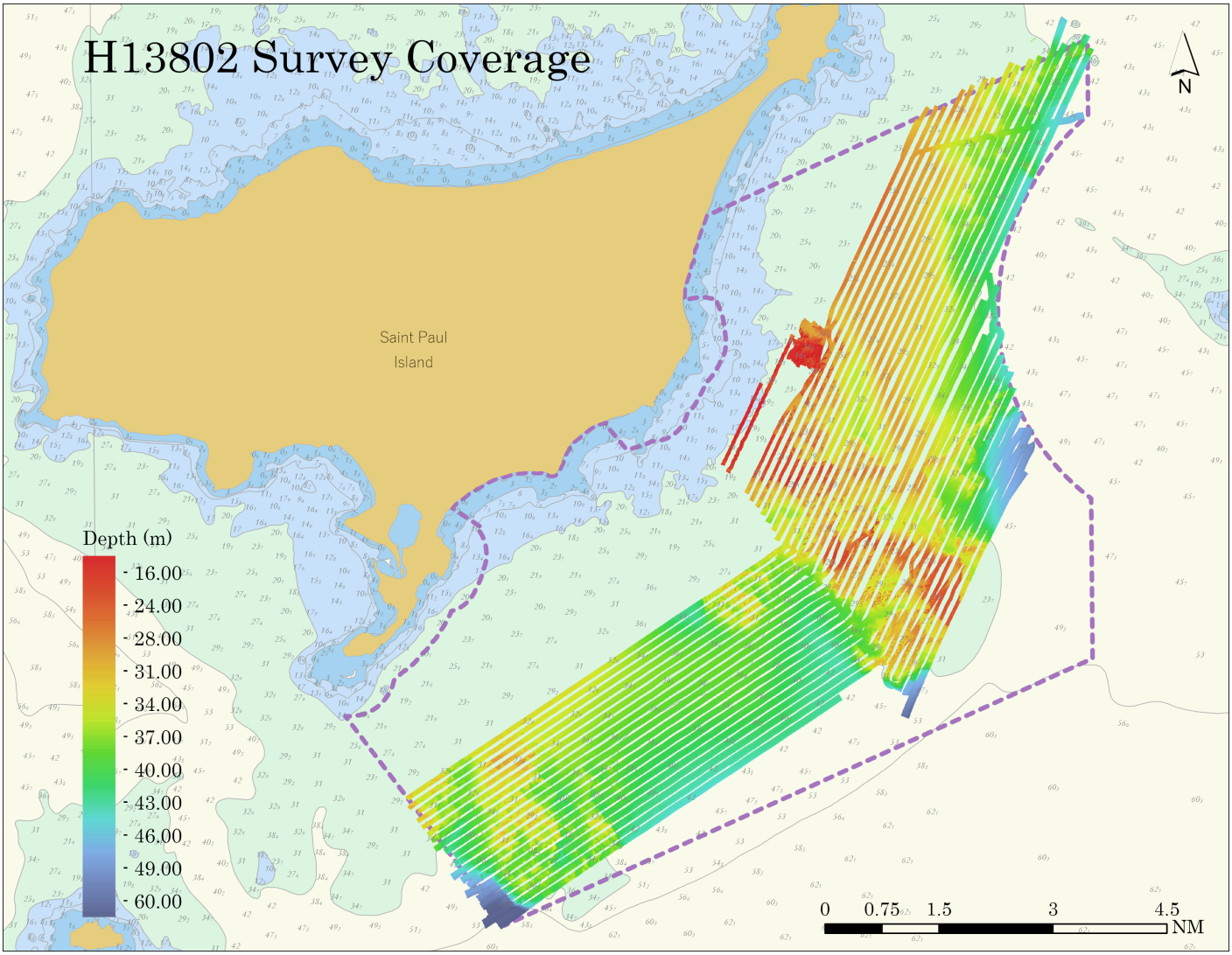


Figure 2: H13802 survey coverage.

A.6 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*FA_2806*	*FA_S220*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0
	MBES Mainscheme	9.0	313.1	324.5
	Lidar Mainscheme	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0	0.0
	SBES/MBES Crosslines	0.0	2.4	2.4
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				0
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				22.1

Table 3: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates	Day of the Year
07/20/2023	201
07/21/2023	202

Survey Dates	Day of the Year
08/11/2023	223
08/12/2023	224
08/13/2023	225

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-R344-FA-23_Pribilof_Islands Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR, are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*FA_S220*	*FA_2806*
LOA	70.4 meters	8.6 meters
Draft	4.8 meters	1.1 meters

Table 5: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 712	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Teledyne RESON	SVP 71	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was installed on the survey platform as follows: S220 utilizes the Kongsberg EM 712 MBES, a POS M/V v5 system for position and attitude, SVP 70 surface sound speed sensors, and AML Oceanographic MVP 200 for conductivity, temperature, and depth (CTD) casts. All launches utilize the Kongsberg EM 2040 MBES, a POS M/V v5 system for position and attitude, SVP 71 surface sound speed sensors, and Sea-Bird SBE 19plus v2 CTDs for conductivity, temperature, and depth casts.

B.2 Quality Control

B.2.1 Crosslines

A crossline was collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD. Due to poor weather conditions, only 0.73% of crossline to MBES data was acquired. To evaluate the crossline, a surface generated via data strictly from mainscheme lines and a surface generated via data strictly from crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated, see figure below. Statistics show the mean difference between the depths derived from mainscheme data and crossline data was -0.04 meters and 95% of nodes falling within 0.42 meters. For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 99.5% of the depth differences between H13802 mainscheme and crossline data were within allowable NOAA uncertainties.

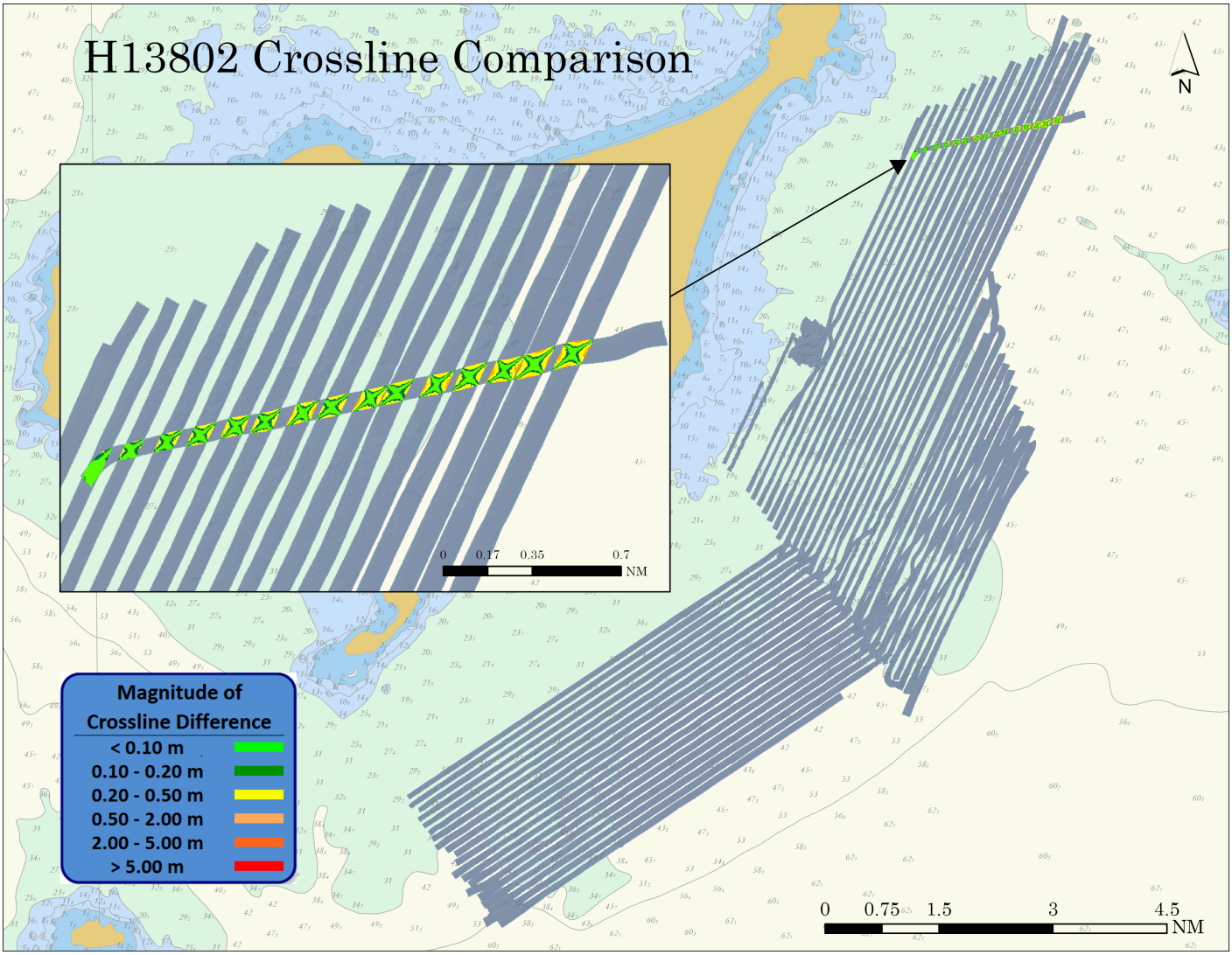
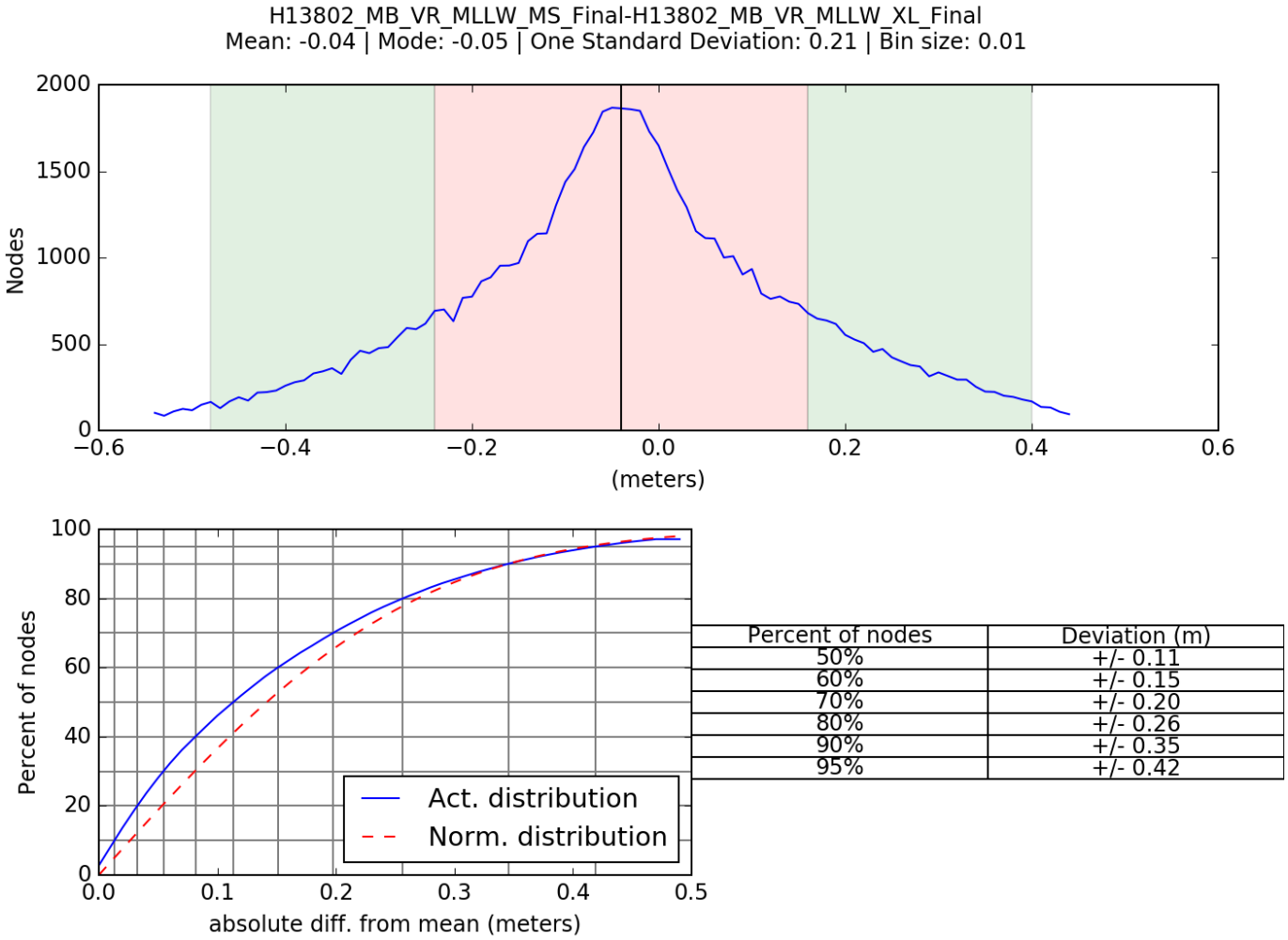


Figure 3: Overview of the H13802 crossline.



Percent of nodes	Deviation (m)
50%	+/- 0.11
60%	+/- 0.15
70%	+/- 0.20
80%	+/- 0.26
90%	+/- 0.35
95%	+/- 0.42

Figure 4: H13802 crossline and mainscheme difference statistics.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.1 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
2806	2 meters/second	N/A meters/second	N/A meters/second	0.5 meters/second
S220	N/A meters/second	1 meters/second	N/A meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the a priori estimates of uncertainty provided via device models for vessel motion, VDatum and real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13802. Real-time uncertainties were provided via EM2040 and EM712 MBES data and Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel gps height and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

No junctions exist for this survey.

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of one every four hours during launch acquisition. Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column and when there was a change in surface sound speed greater than two meters per second. MVP casts on survey H13802 were conducted at an average interval of 120 minutes, guided by observation of the surface sound speed and targeted to deeper areas. All sound speed methods were used as detailed in the DAPR.

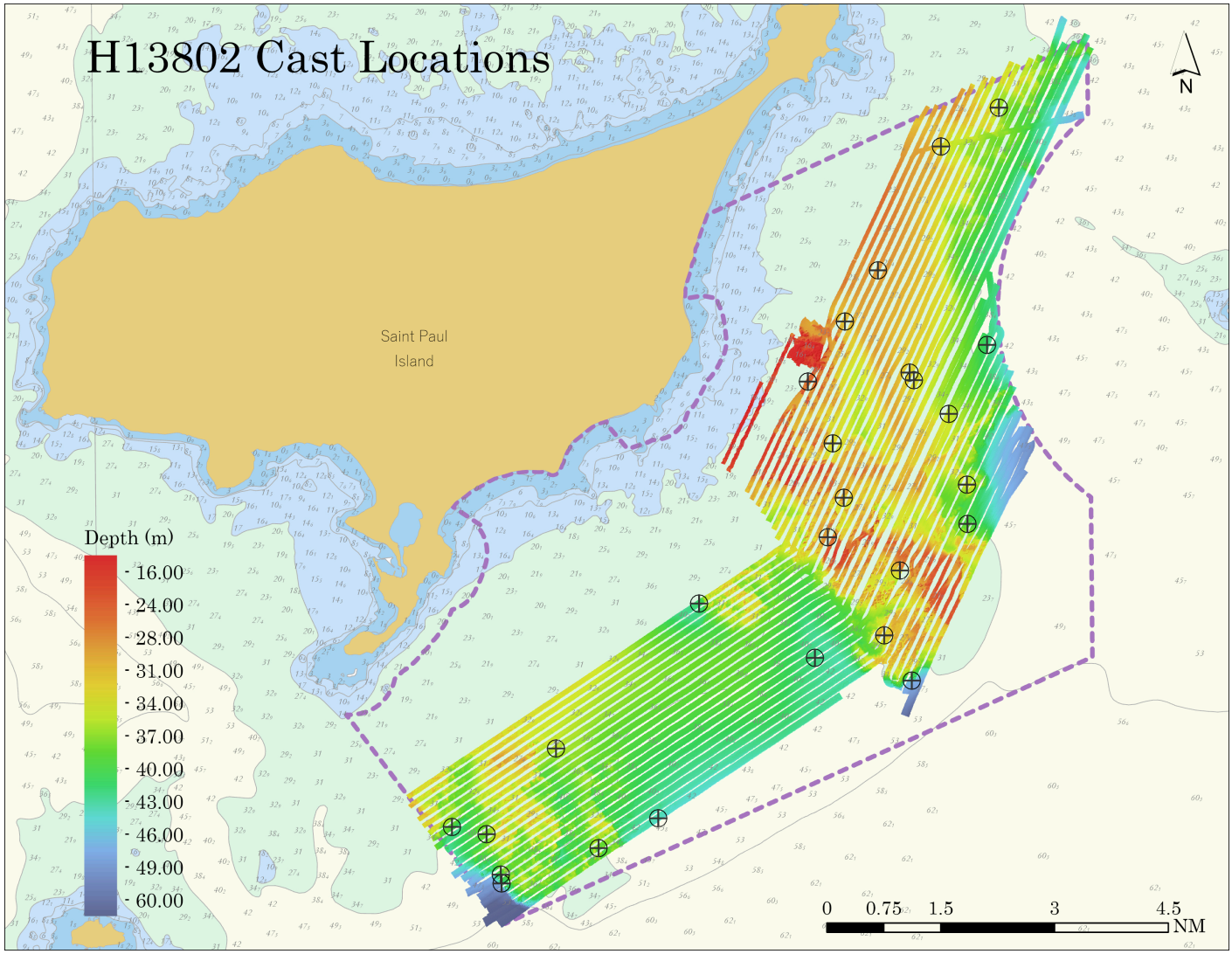


Figure 5: Cast locations for H13802.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 Holidays

H13802 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Seventeen holidays which meet the definition described in the HSSD for complete coverage were identified via HydrOffice QC Tools Holiday Finder tool. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer. All areas flagged as holidays were investigated in CARIS subset editor and are verified to be caused by acoustic shadowing and intentional gaps due to set line spacing requirements.

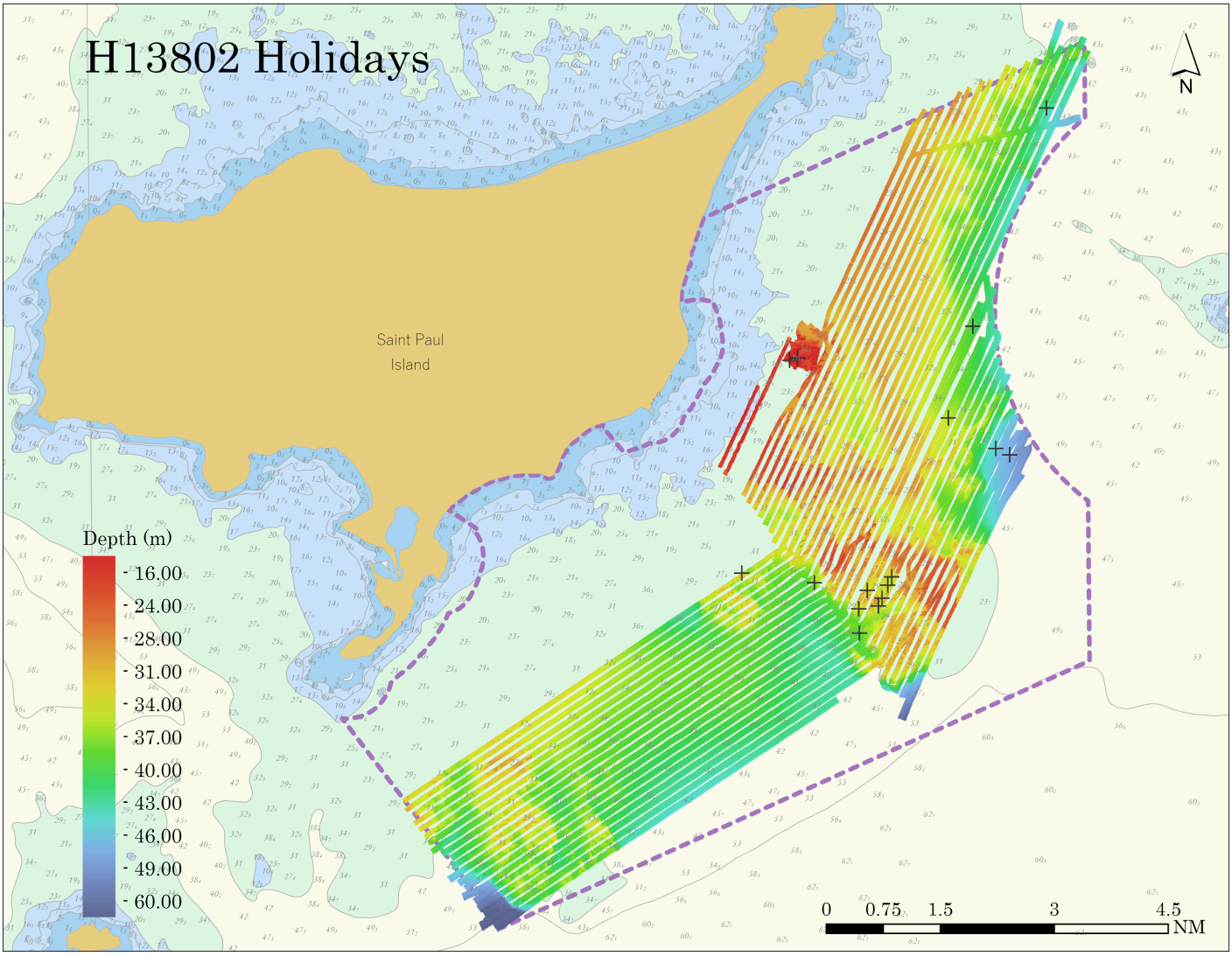


Figure 6: H13802 holidays.

B.2.10 NOAA Allowable Uncertainty

The surface was analyzed using the Hydrofluoric QC Tools Grid QA feature to determine compliance with specifications. Overall, 95.5+% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13802, as seen in the figure below.

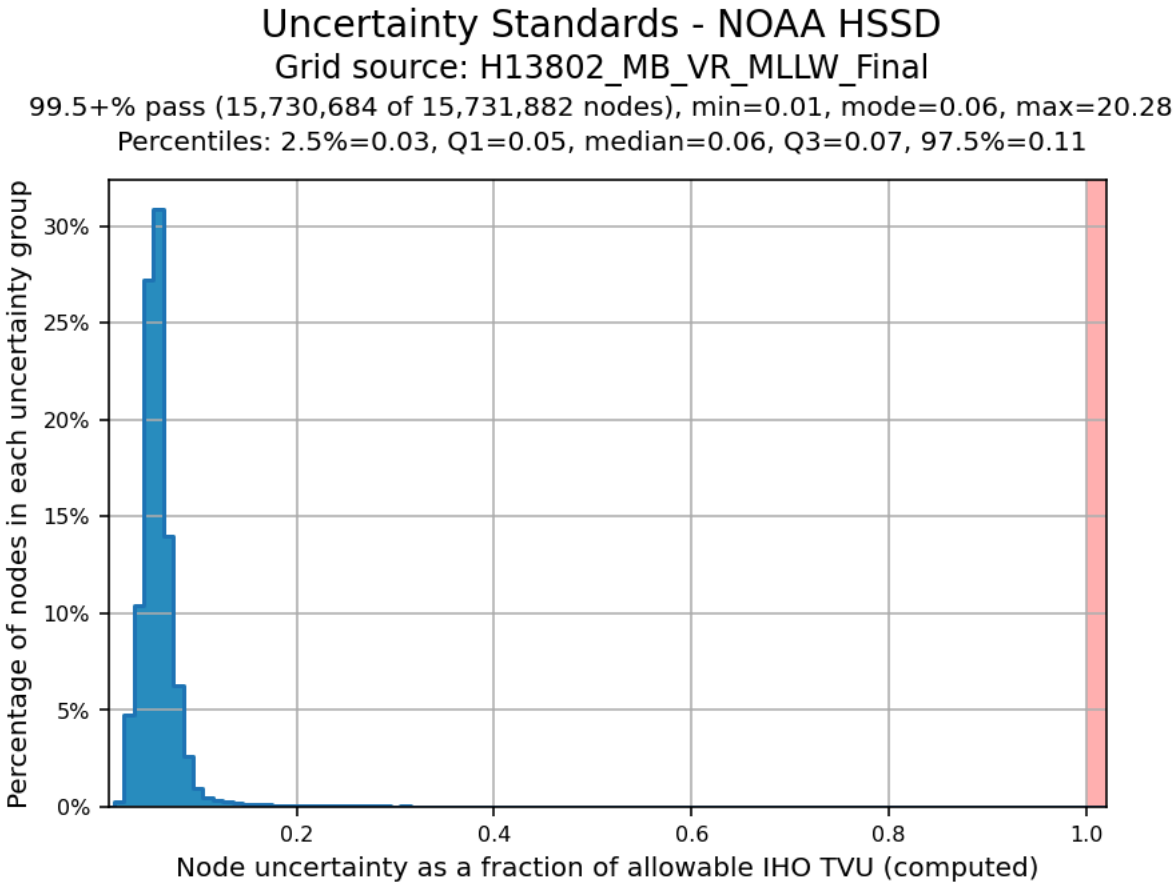


Figure 7: H13802 allowable uncertainty statistics.

B.2.11 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature and the results are shown in the figure below. Density requirements for H13802 were achieved with at least 99.0% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3. The few nodes that did not meet density requirements are due to sparse data in the outer beams, especially near steep slopes and rocky areas where acoustic shadowing occurred, and at the edges of the survey limits.

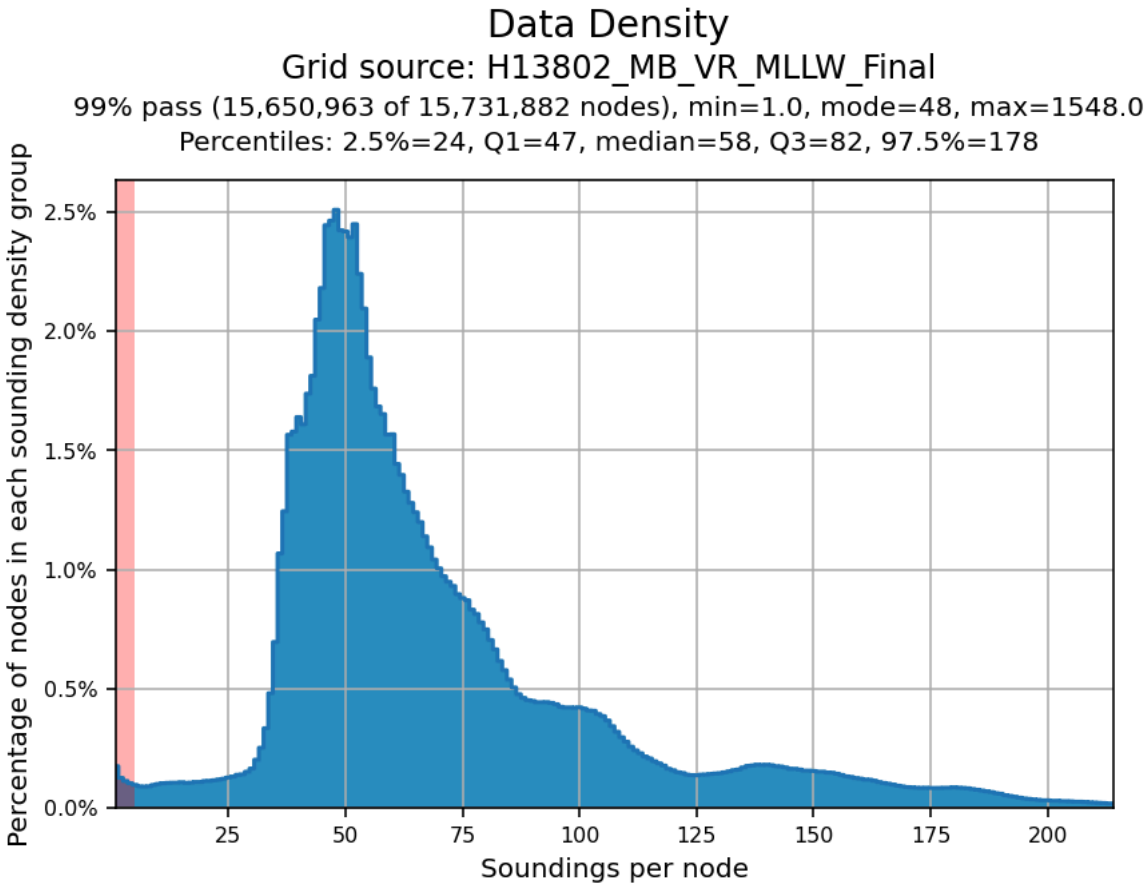


Figure 8: H13802 data density statistics.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data were stored in the .kmall and .all files for Kongsberg systems. All backscatter were processed to GSF files and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.10.2. See the figure below for a greyscale representation of the complete mosaic. Two backscatter mosaics were created at 2m resolution based on the specifications for a 70-100 kHz system and a 300 kHz system. All equipment and survey methods were used as detailed in the DAPR.

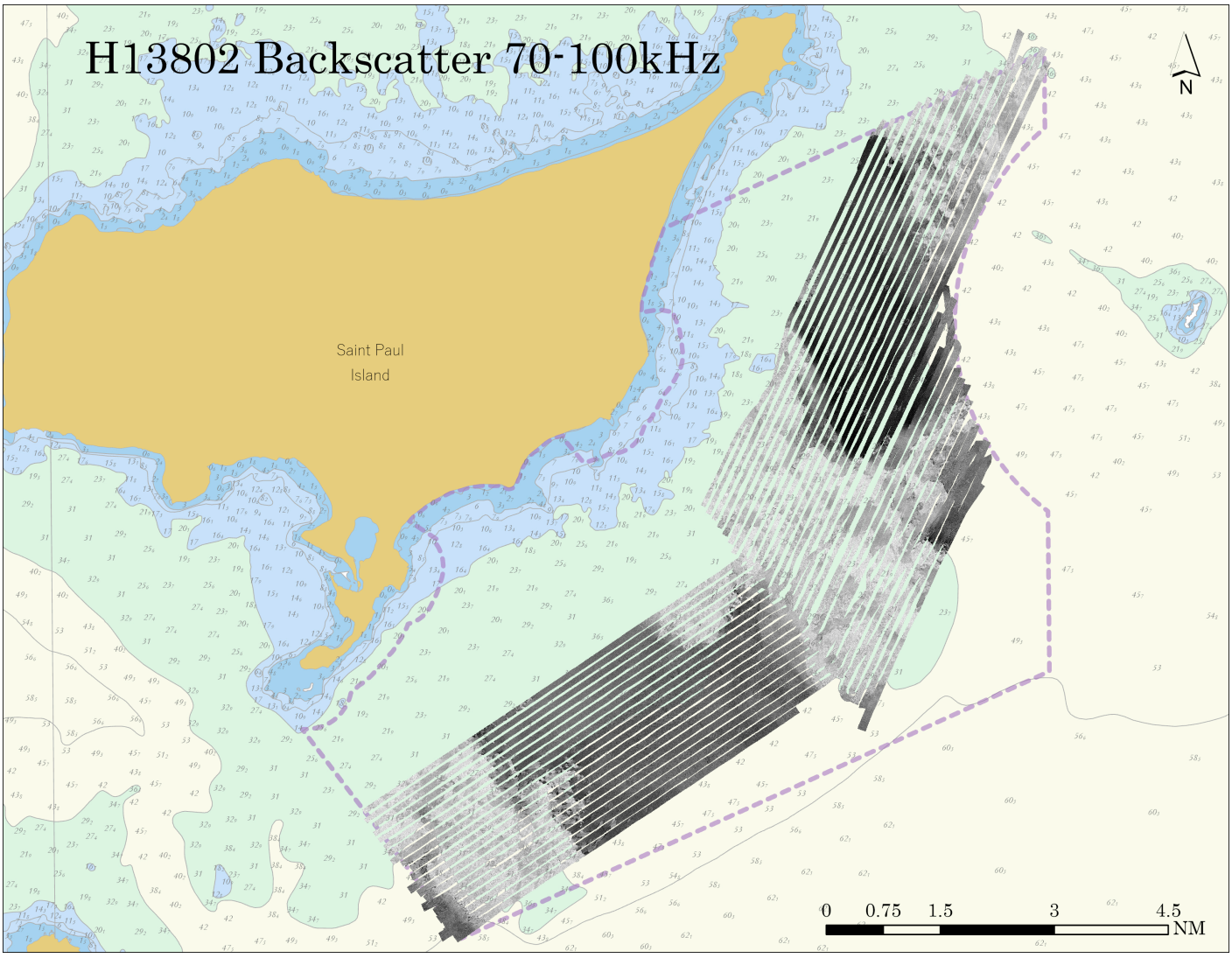


Figure 9: Backscatter mosaic for H13802 at 70-100kHz.

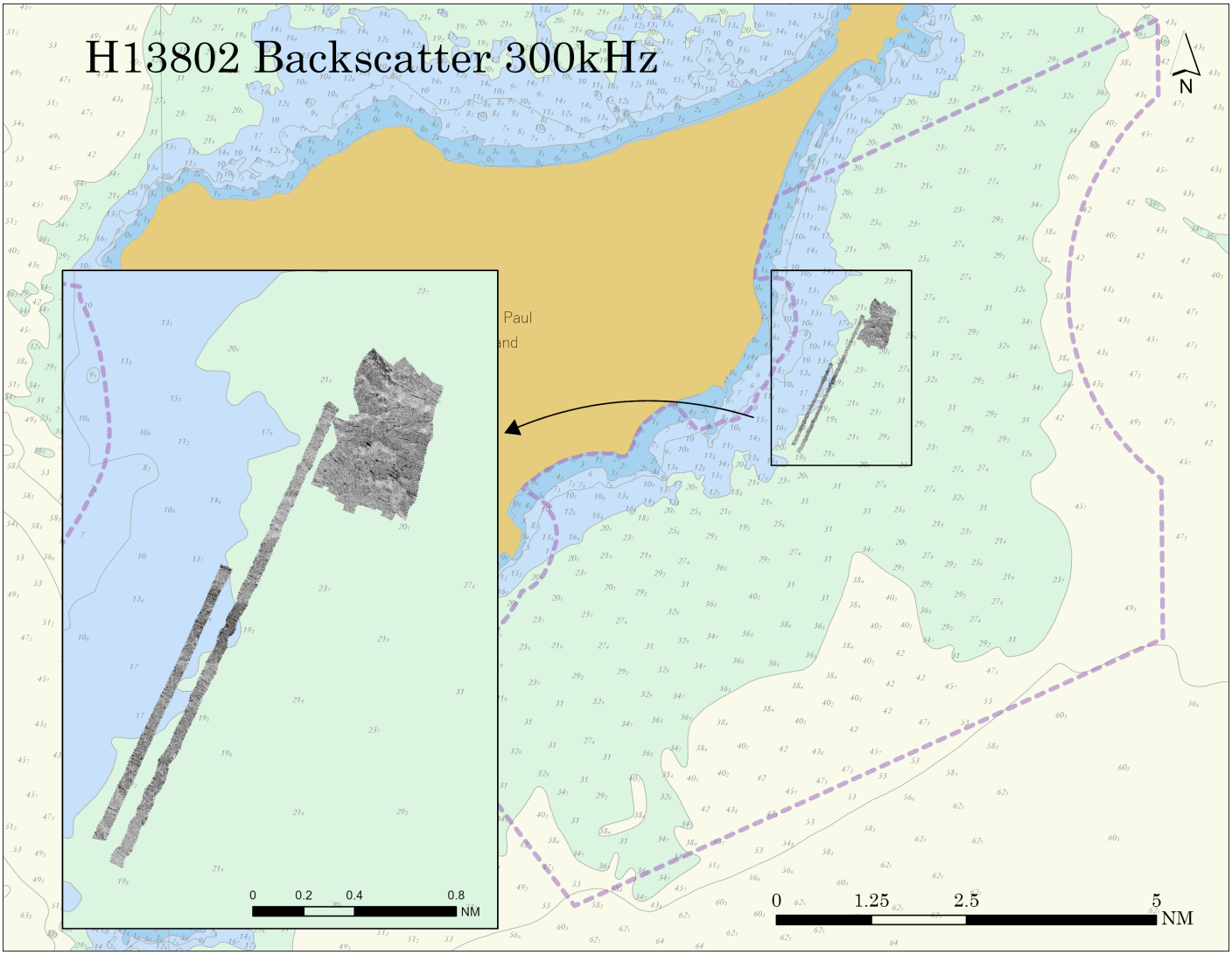


Figure 10: Backscatter mosaic for H13802 at 300kHz.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.4
QPS	Fledermaus	7.10.2

Table 9: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2022.

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13802_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	15.8 meters - 59.5 meters	NOAA_VR	MBES Set Line Spacing
H13802_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	15.8 meters - 59.5 meters	NOAA_VR	MBES Set Line Spacing

Table 10: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13802. The surfaces have been reviewed where noisy data, or "fliers", are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed. Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until all remaining 2,386 flagged areas were deemed to be valid aspects of the steep slopes and dynamic nature of the seafloor.

Figure 11: Remaining 2,386 flagged areas deemed valid aspects of the surface.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-R344-FA-23_AK_ERTDM_2023_NAD83-MLLW

Table 11: ERS method and SEP file

ERS methods were used as the final means of reducing H13802 to MLLW for submission.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 2.

The following PPK methods were used for horizontal control:

- RTX

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX positioning methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

WAAS

During real-time acquisition, all platforms received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies. WAAS and SBETs were the sole methods of positioning for H13802.

D. Results and Recommendations

D.1 Chart Comparison

Chart comparison between ENC and soundings from collected data. The soundings from H13802 are generally in agreement of ENC US4AK3SB and ENC US4AK3SC. A survey launch was specifically deployed to develop a shoal area. In this area a 16 meter sounding was discovered.

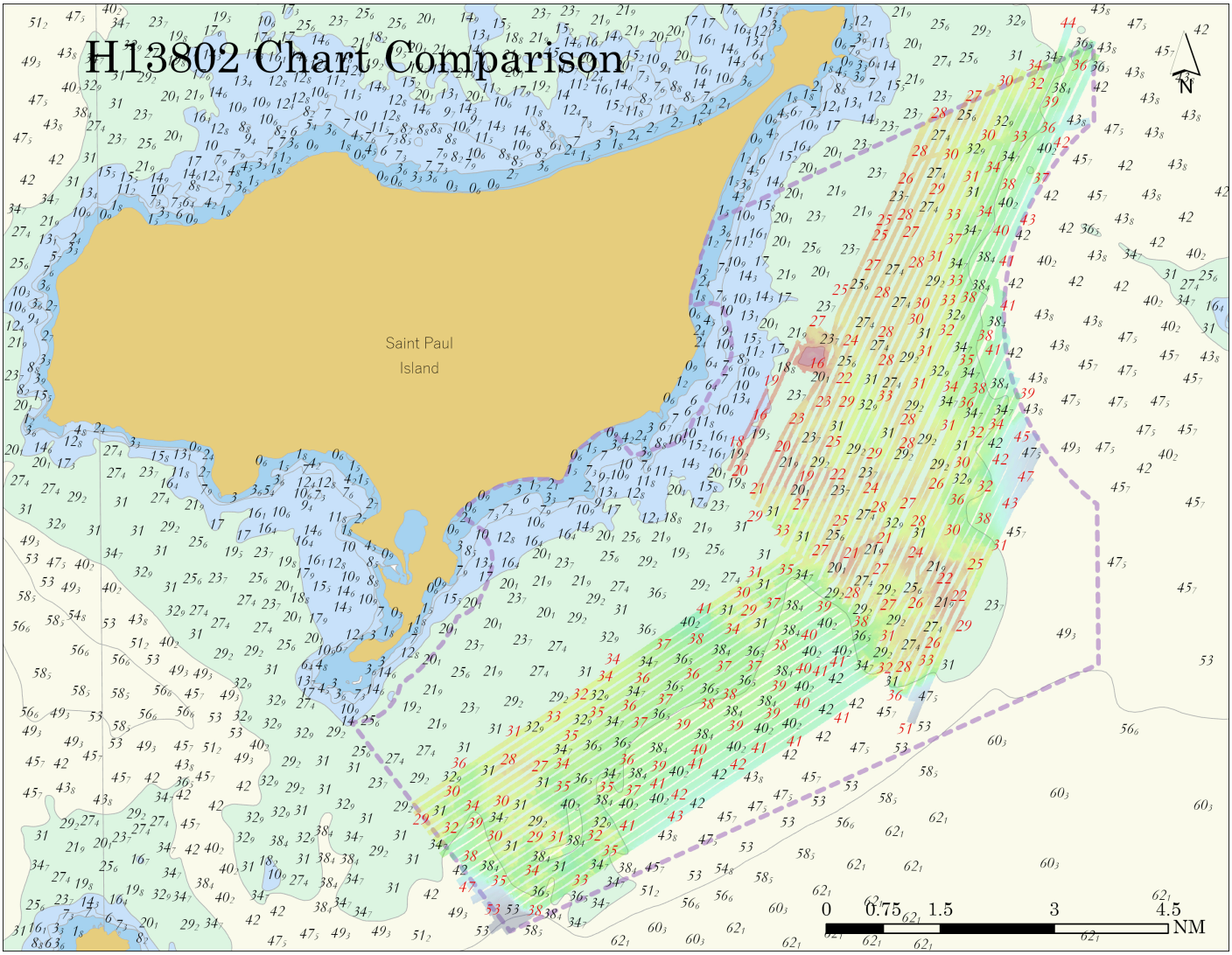


Figure 12: H13802 chart comparison (survey soundings in red).

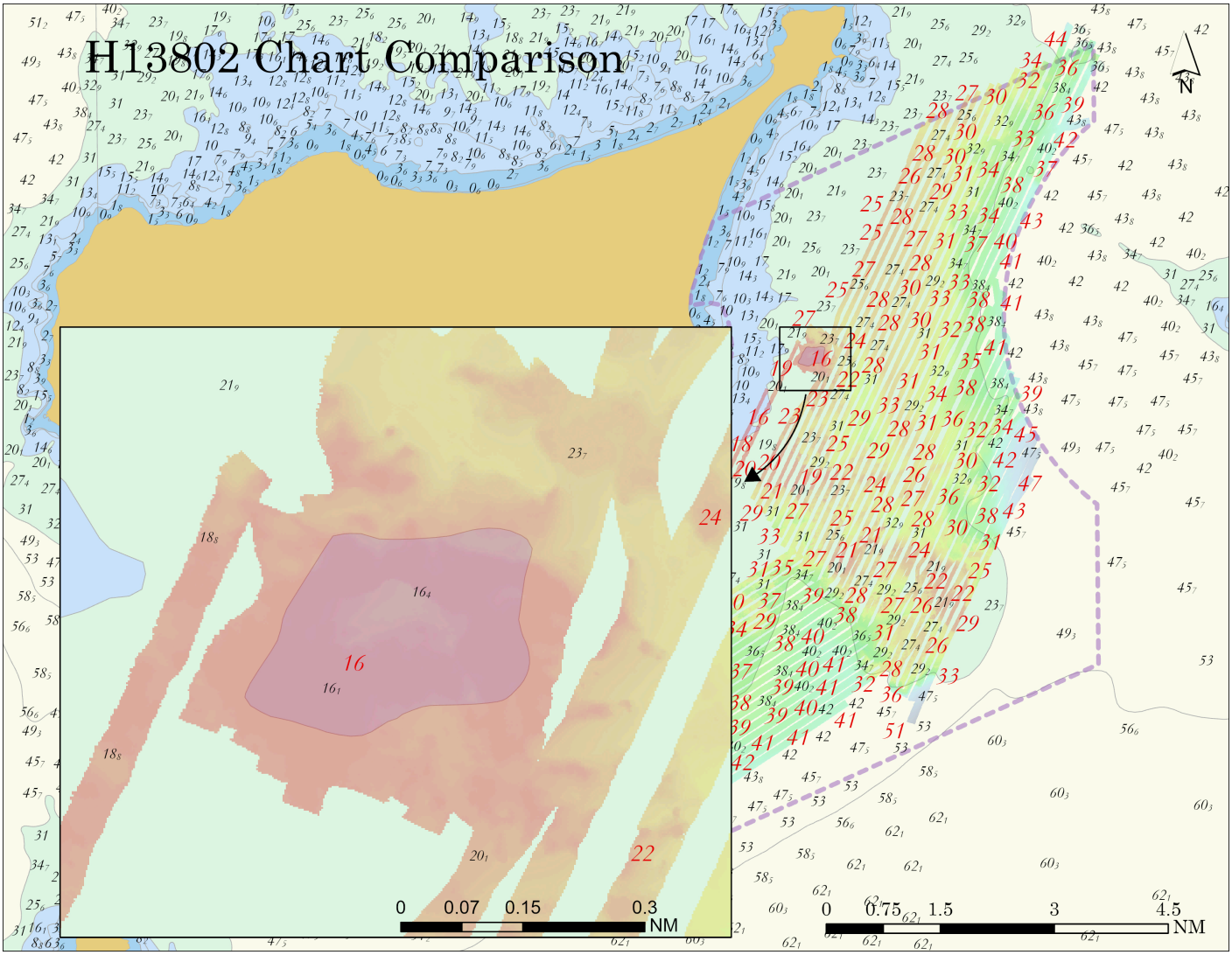


Figure 13: H13802 developed shoal area with a 16 meter sounding.

D.1.1 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US4AK3SB	1:40000	1	06/30/2020	03/23/2021
US4AK3SC	1:40000	1	06/30/2020	03/23/2021

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Shoals or potentially hazardous features exist for this survey, but were not investigated.

D.1.3 Charted Features

Charted features exist for this survey, but were not investigated.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

No channels exist within the survey limits.

D.2 Additional Results

D.2.1 Aids to Navigation

No Aids to navigation (ATONs) exist for this survey.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

No bottom samples were required for this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

D.2.10 New Survey Recommendations

It is recommended to return to H13802 to complete the unsurveyed portion of the sheet that was not acquired due to weather, sea state conditions, and seal populations.

D.2.11 ENC Scale Recommendations

No new ENC scales are recommended for this area.

E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
CDR Meghan McGovern	Commanding Officer	10/24/2023	MCGOVERN.MEGHAN.ELIZABETH.1284020495 Digitally signed by MCGOVERN.MEGHAN.ELIZABETH.1284020495 Date: 2023.10.24 09:34:57 -08'00'
LT Michael Card	Operations Officer	10/24/2023	CARD.MICHAEL.DOUGLAS.1011746507 Digitally signed by CARD.MICHAEL.DOUGLAS.1011746507 Date: 2023.10.24 10:29:42 -08'00'
ENS Lucas Doran	Sheet Manager	10/24/2023	DORAN.LUCAS.M.1612473621 Digitally signed by DORAN.LUCAS.M.1612473621 Date: 2023.10.24 12:13:37 -08'00'
Benjamin Bryan	Sheet Manager	10/24/2023	BRYAN.BENJAMIN.MASON.1619908402 Digitally signed by BRYAN.BENJAMIN.MASON.1619908402 Date: 2023.10.24 08:57:45 -08'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continuously Operating Reference Station
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERTDM	Ellipsoidally Referenced Tidal Datum Model
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NALL	Navigable Area Limit Line
NTM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File