H13994

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13994

LOCALITY

State(s):	Massachusetts
General Locality:	Northern Massachusetts Bay
Sub-locality:	Central Approaches to Boston Harbor

2025

CHIEF OF PARTY
John R. Bean

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13994**

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):	**Massachusetts**
General Locality:	**Northern Massachusetts Bay**
Sub-Locality:	**Central Approaches to Boston Harbor**
Scale:	**5000**
Dates of Survey:	**09/10/2024 to 03/15/2025**
Instructions Dated:	**08/01/2024**
Project Number:	**OPR-A325-KR-24**
Field Unit:	**Ocean Surveys**
Chief of Party:	**John R. Bean**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic 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 19N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13994

Project: OPR-A325-KR-24

Locality: Northern Massachusetts Bay

Sublocality: Central Approaches to Boston Harbor

Scale: 1:5000

September 2024 - March 2025

Ocean Surveys

Chief of Party: John R. Bean

A. Area Surveyed

This survey provides hydrographic data for waters in Northern Massachusetts Bay. The general locations of the survey limits are presented in Table 1.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
42° 23' 8.73" N 70° 56' 33.6" W	42° 16' 7.88" N 70° 50' 6.51" W

Table 1: Survey Limits

Survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The waters in and around the ports of Boston and Gloucester in Northern Massachusetts Bay are some of the most heavily used in the US by commercial and recreational boating traffic. The Port of Boston sees more than 16 million tons of cargo movement annually*, and thousands of vessels travel into, out of, and within Boston Harbor every year. Boston, Gloucester and Rockport are also major fishing ports, with average yearly landings of over 40 million pounds worth over $80 million**.

This project will also provide an analysis of the feasibility of using inshore bathymetric lidar data for identifying and updating features, in concert with new multibeam sonar data collection.

The prior survey data in much of the survey area is over 20 years old, and several areas have data that is from the 1940s. The survey area has an extensive coastline, and has been heavily trafficked by humans for almost 400 years; there have been extensive and poorly documented effects and changes to the seafloor by human activity***. This survey will address this by collecting modern high resolution bathymetry for updating NOAA nautical charting products improving the safety of maritime traffic and commerce as well as supporting the Seabed 2030 global mapping initiative. Survey data from this project is intended to supersede all prior survey data in the common area.

*Massachusetts Port Authority Statistics 2022
**2022 NMFS Landing Statistics https://www.fisheries.noaa.gov/national/sustainable-fisheries/commercial-fisheries-landings
***https://www.sec.state.ma.us/divisions/cis/historical/historical-sketch.htm
and https://stellwagen.noaa.gov/maritime/maritimehistory.html

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

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 within ACHARE feature in PRF	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

Survey coverage was in accordance with the requirements listed above and in the HSSD.

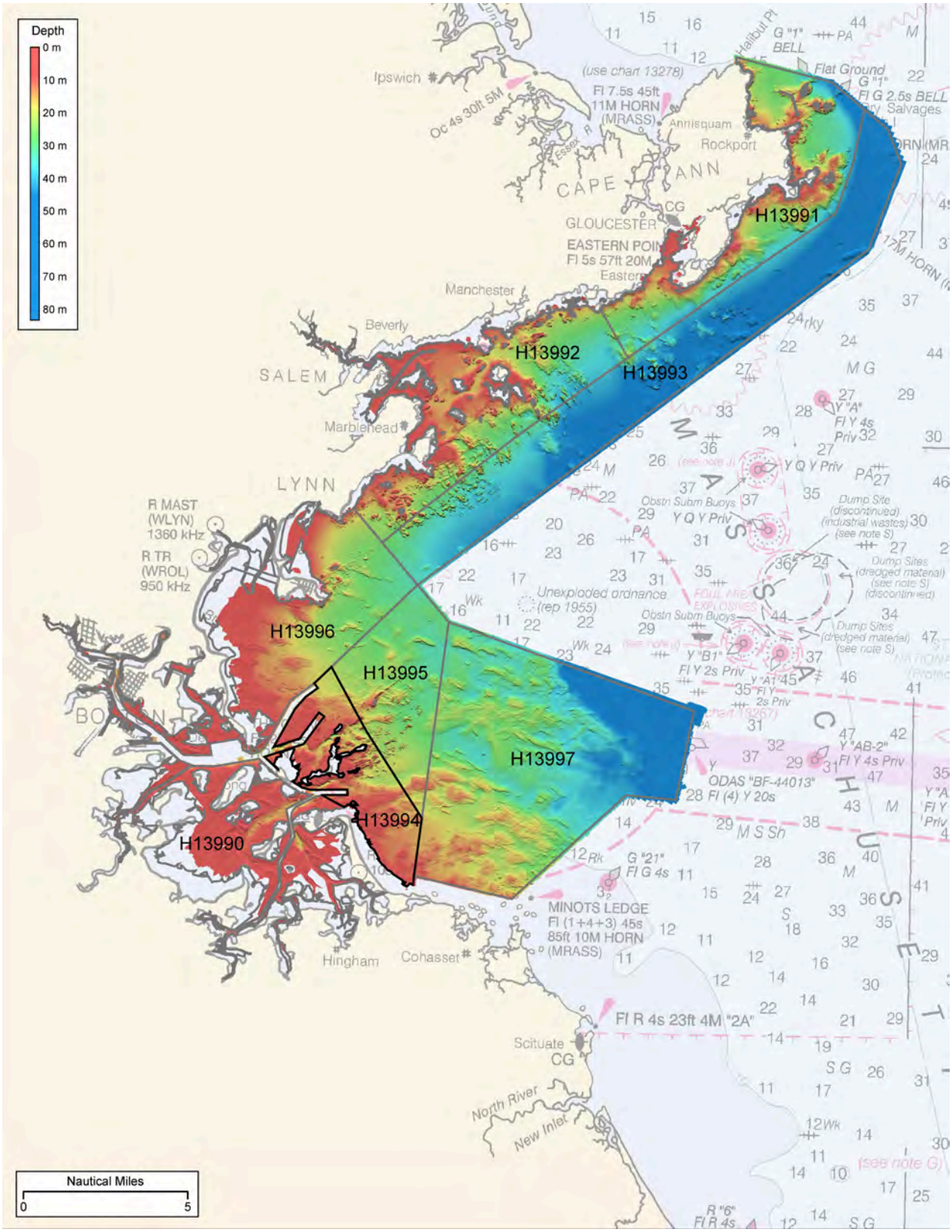


Figure 1: Project OPR-A325-KR-24 coverage with H13994 emphasized.

A.6 Survey Statistics

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

	HULL ID	*MV Northstar Challenger*	*RV North Cove*	*RV South Cove*	*RV West Cove II*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0	0.0	0.0
	MBES Mainscheme	285.5	118.9	425.2	112.4	942.0
	Lidar Mainscheme	0.0	0.0	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0	0.0	0.0	0.0
	SBES/MBES Crosslines	0.0	0.0	43.3	0.0	43.3
	Lidar Crosslines	0.0	0.0	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						12.6

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/10/2024	254
09/11/2024	255
09/12/2024	256
09/14/2024	258
09/15/2024	259
09/16/2024	260
09/17/2024	261
09/18/2024	262
09/27/2024	271
09/28/2024	272
09/29/2024	273
09/30/2024	274
10/01/2024	275
10/02/2024	276
10/03/2024	277
10/04/2024	278
10/05/2024	279
10/06/2024	280
10/09/2024	283
03/15/2025	74

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the 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	*MV Northstar Challenger*	*RV North Cove*	*RV South Cove*	*RV West Cove II*
LOA	28.0 meters	11.1 meters	9.4 meters	12.8 meters
Draft	2.6 meters	0.8 meters	0.8 meters	1.4 meters

Table 5: Vessels Used

Figure 2: MV Northstar Challenger configured for survey operations.

Figure 3: RV North Cove configured for survey operations.

Figure 4: RV South Cove configured for survey operations.

Figure 5: RV West Cove II configured for survey operations.

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
Trimble	NetR9	Positioning System
AML Oceanographic	Micro SV-Xchange	Sound Speed System
AML Oceanographic	MVP30-350	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	AML-3 LGR	Conductivity, Temperature, and Depth Sensor
Velodyne LiDAR	VLP-16	Lidar System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crossline mileage in H13994 totaled 4.6% of the mainscheme survey miles. Agreement between crosslines and mainscheme bathymetry was very good, with a mean difference of 0.0m in the 50cm resolution surface.

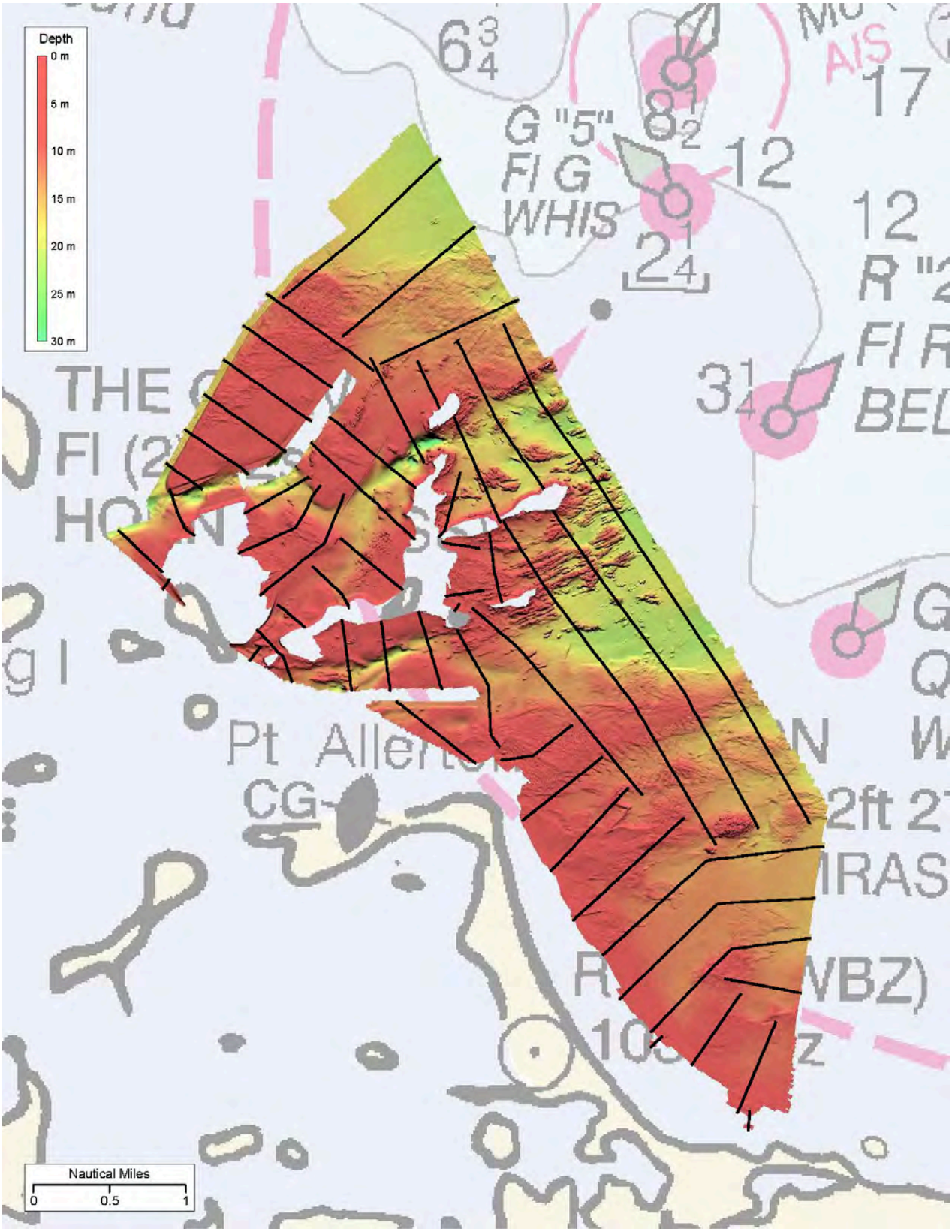
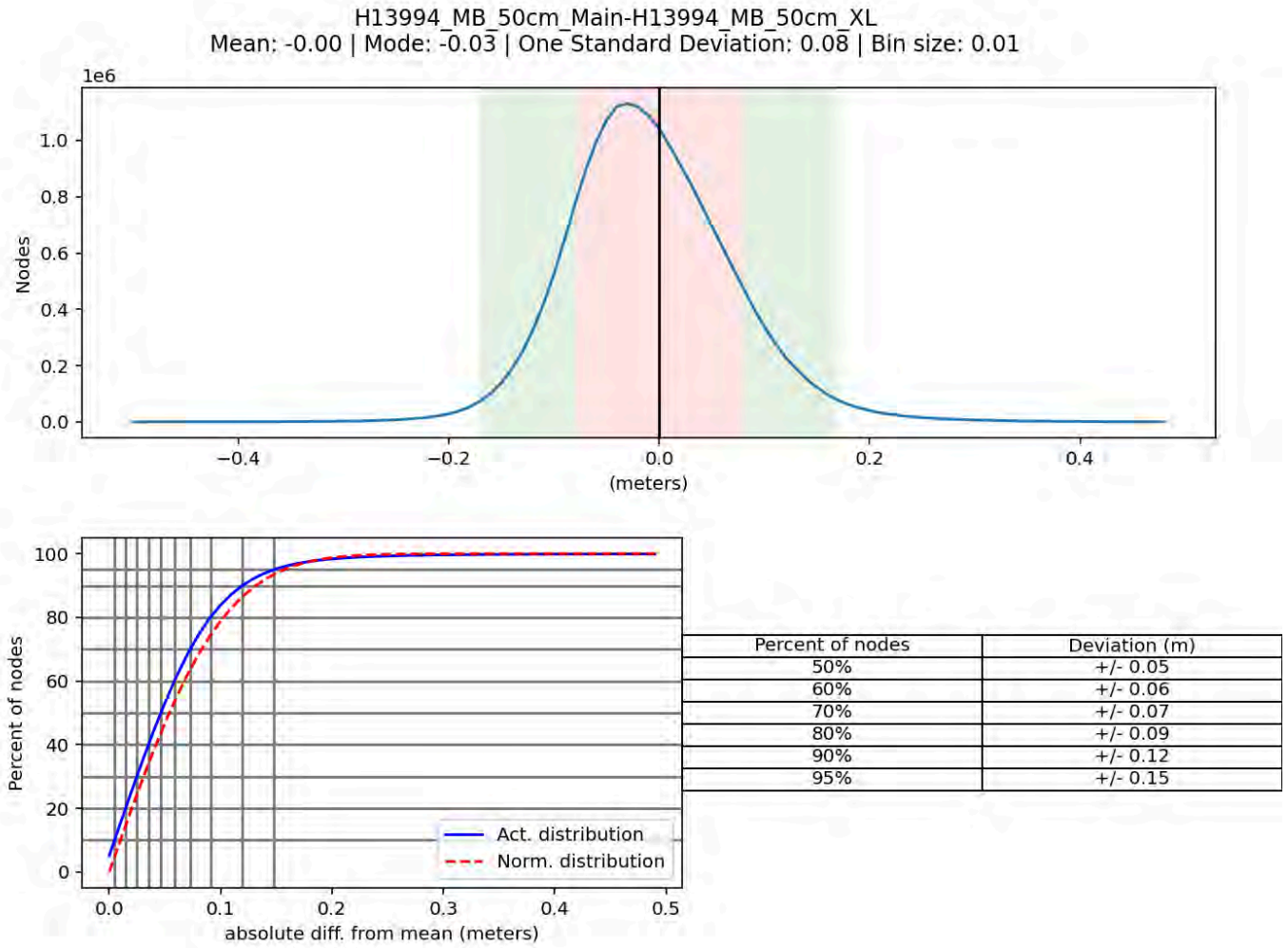


Figure 6: Crossline tracks overlaid on a coverage surface.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.15

Figure 7: Depth differences between mainscheme and crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	N/A	0.13 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
MV Northstar Challenger	N/A	4 meters/second	N/A	2 meters/second
RV North Cove	4 meters/second	N/A	N/A	2 meters/second
RV South Cove	4 meters/second	N/A	N/A	2 meters/second
RV West Cove II	4 meters/second	N/A	N/A	2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The NOAA Pydro QC Tools application was used to calculate TVU QC, determined by a ratio of uncertainty to the allowable error per NOAA and IHO specification. A set of surfaces was finalized in CARIS HIPS using the "uncertainty" option to select the combination of a priori and realtime uncertainty estimates as the surface TVU source. The surfaces represented different resolutions as appropriate for the water depths. Both surfaces passed the uncertainty check, with 99.5+% of nodes meeting the uncertainty standards.

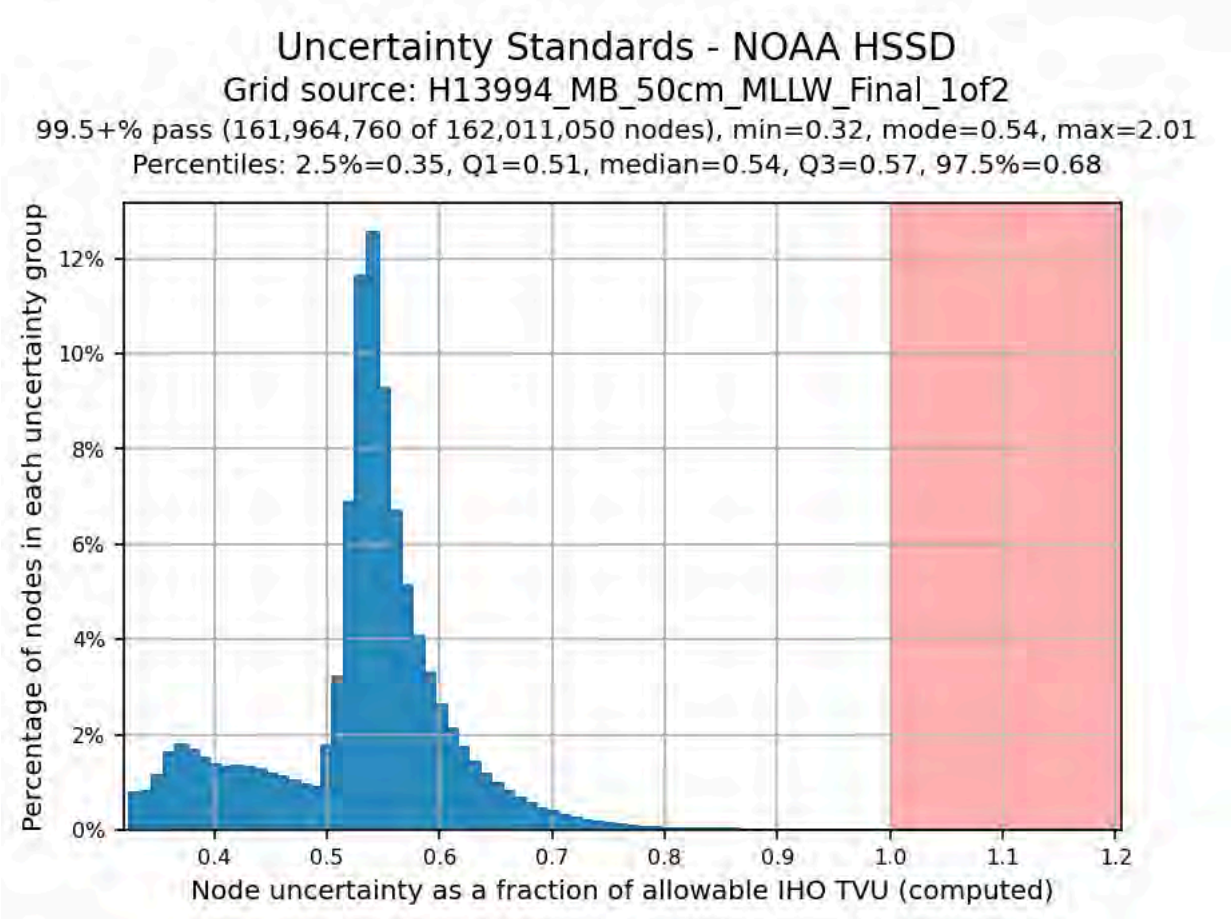


Figure 8: Uncertainty standards, 50cm resolution surface.

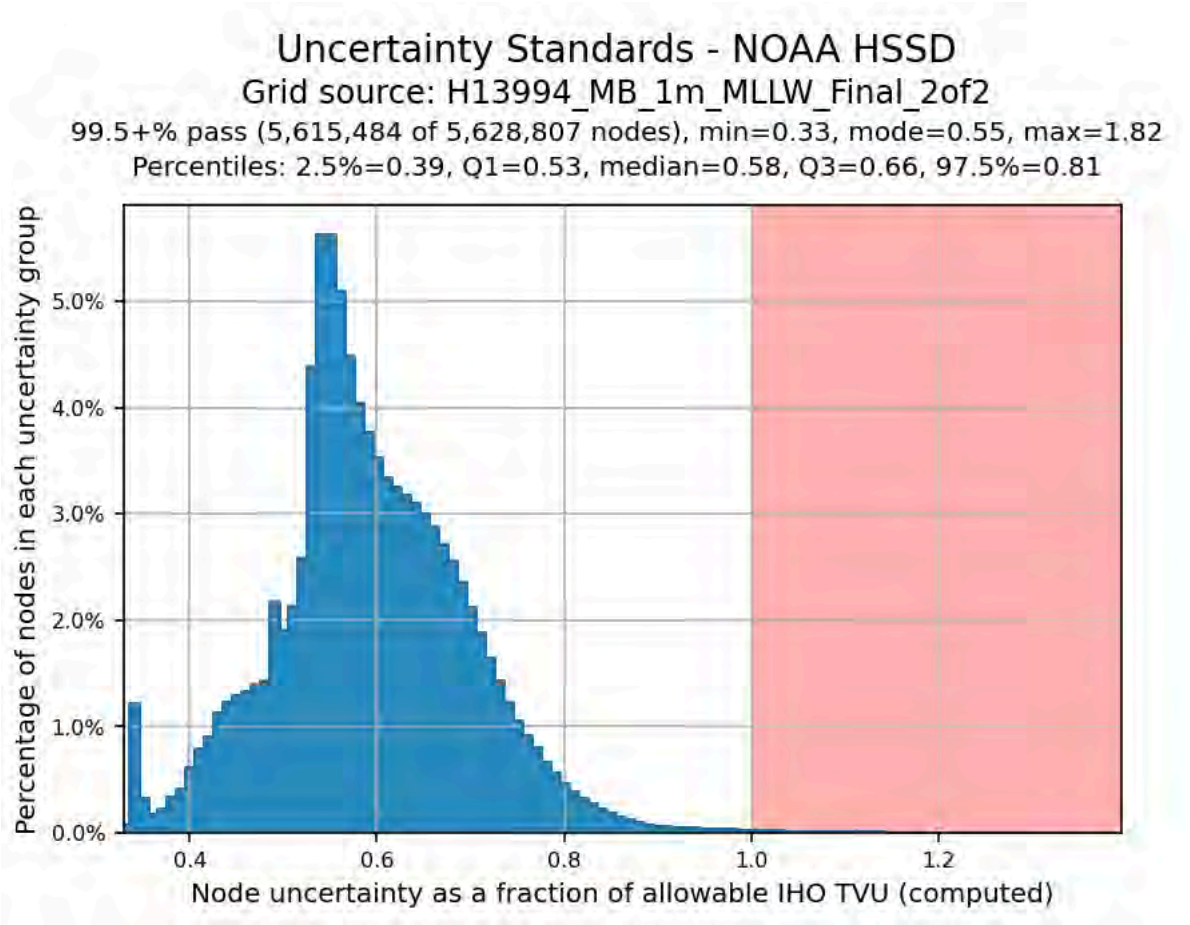


Figure 9: Uncertainty standards, 1m resolution surface.

B.2.3 Junctions

H13995 junctions with contemporary surveys on its western, northern, northeastern, and eastern edges. The northern and western boundaries are buffered by unassigned channels between the surveys, so the area of data overlap is reduced. Junction analyses were also assigned for LiDAR surveys that were under review at the time of the PI.

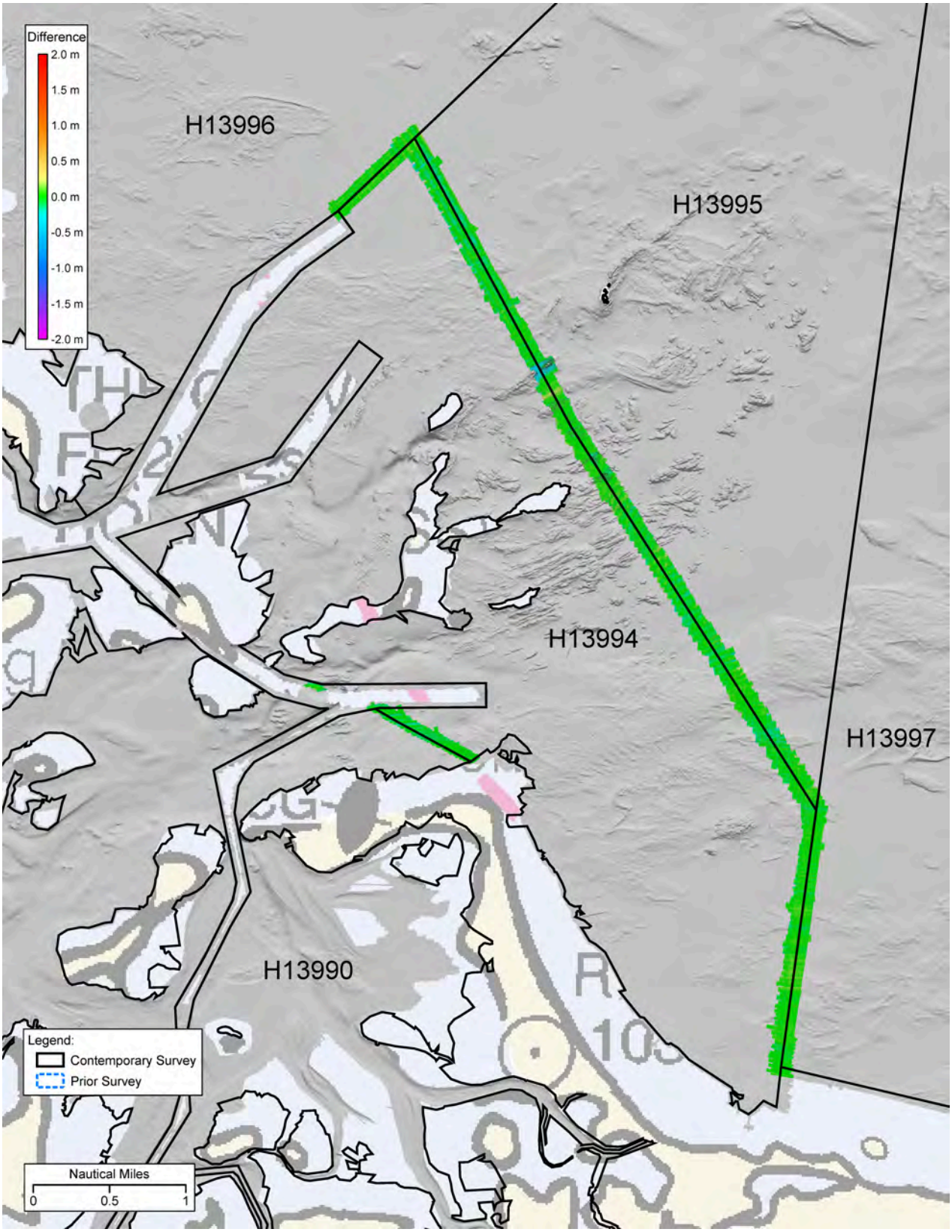


Figure 10: H13994 junction map with junction area depth differences.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13990	1:5000	2025	OSI	W
H13995	1:5000	2025	OSI	NE
H13996	1:5000	2025	OSI	N
H13997	1:5000	2025	OSI	E

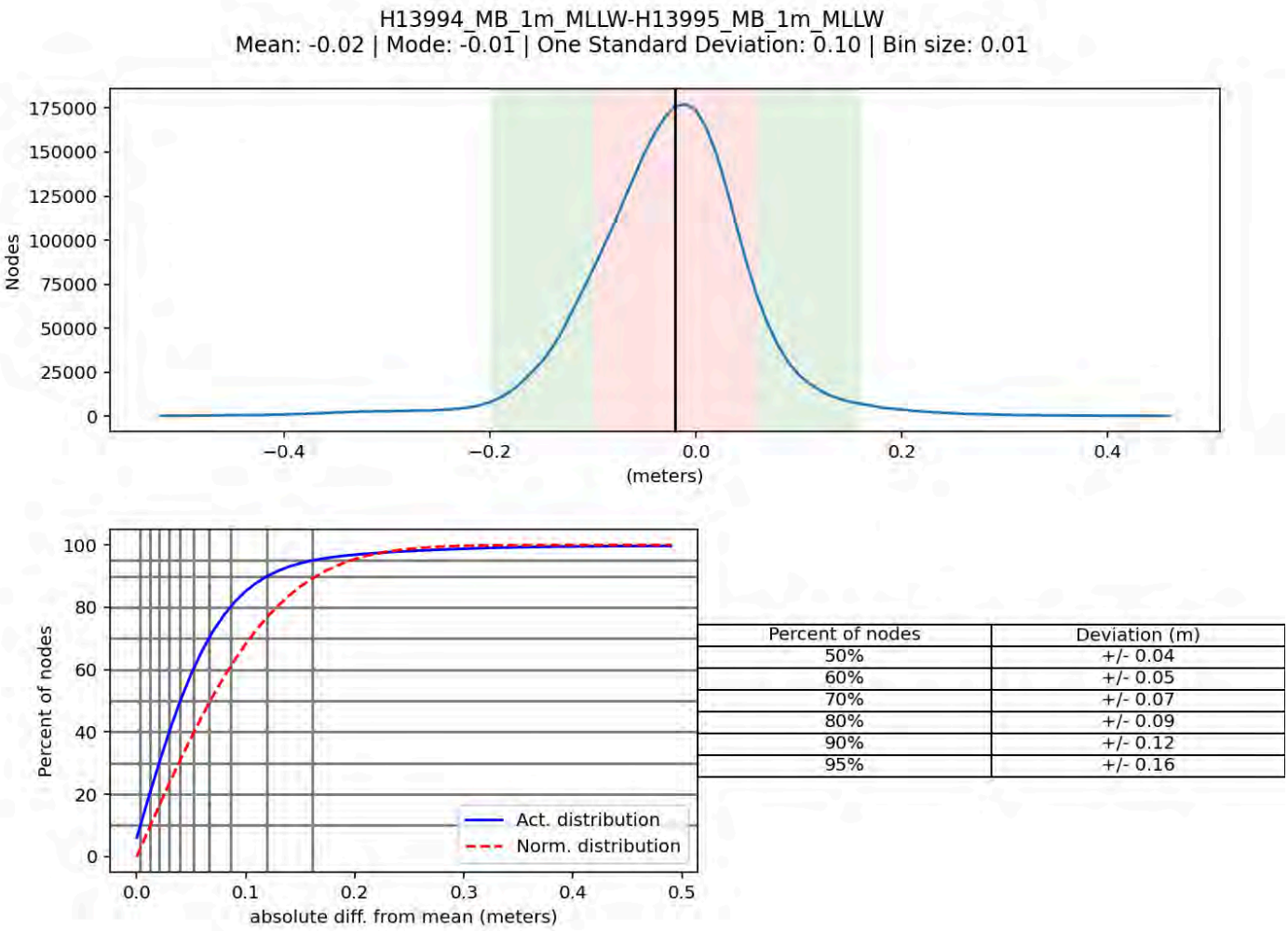
Table 9: Junctioning Surveys

H13990

This junction is addressed in the H13990 DR.

H13995

Survey H13995 junctions with the northwest border of H13994, with a shared border of approximately 10.2km in length. Agreement between the two surveys is very good, with a mean depth difference of 0.02m. Variation was greatest in the rockier areas between the two surveys, particularly in the northern third of the junction area where the bathymetry is characterized by large rock outcroppings.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.16

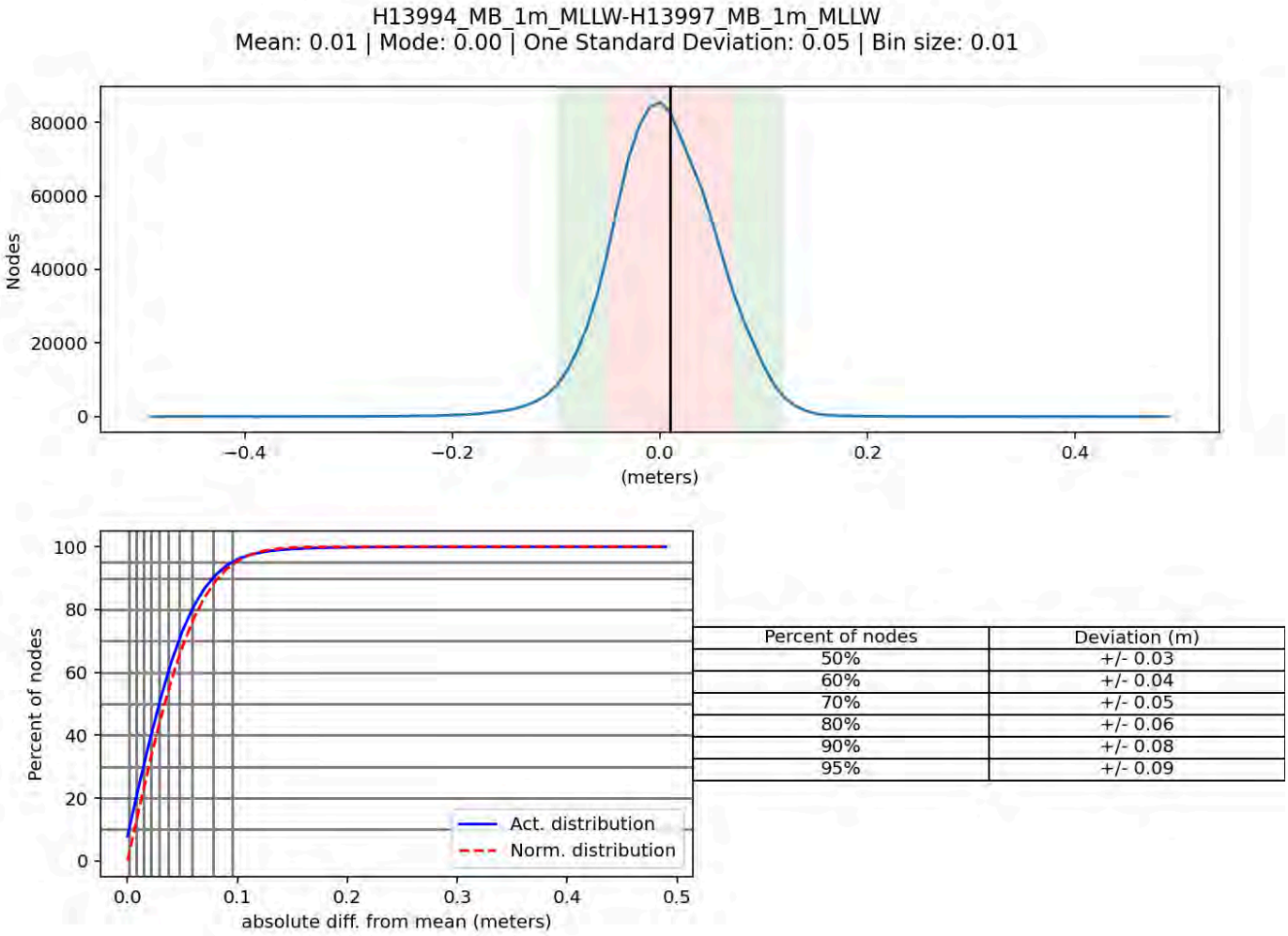
Figure 11: Depth differences between surveys H13994 and H13995, 1m resolution surface.

H13996

This junction is addressed in the H13996 DR.

H13997

Survey H13997 junctions with the eastern border of H13994, with a shared border of approximately 3.7km in length. Agreement between the two surveys is very good, with a mean depth difference of 0.01m.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.06
90%	+/- 0.08
95%	+/- 0.09

Figure 12: Depth differences between surveys H13994 and H13997, 1m resolution surface.

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

Sound Speed Variation

Sound speed variations were observed throughout the survey area, correlating to factors including the tide, weather, water depth, and bathymetric features, such as slopes or sand waves. In data processing, sound speed profiles that did not adequately reflect the surrounding water mass were identified and removed, edited, or replaced. Sound speed casts were primarily applied using the CARIS HIPS "Nearest in Distance within Time" method, therefore, removing a profile collected on a steep slope would allow deeper and shoaler casts on either side to be applied instead. Casts that were empirically found to represent a large water zone were added at additional locations within that zone to ensure proper corrections given the cast selection options available in the CARIS sound speed tools. Bathymetry, uncertainty, and standard deviation surfaces were used to direct editing and determine the accuracy of sound speed cast selection.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: MV Northstar Challenger acquired MVP casts at intervals of approximately 20 minutes. An AML-3 LGR was also onboard the MV Northstar Challenger and used when the presence of fixed fishing gear precluded the use of the MVP. AML casts were acquired at approximately 2-hour intervals. RV North Cove, RV South Cove, and RV West Cove II all acquired AML3 casts at intervals of approximately 60 minutes.

Hydrographers acquired more frequent sound speed profiles if high variability was noted in the surface sound speed from the AML Micro-X installed on the head of the transducer, or when the surface sound speed comparison threshold was exceeded (>2m/s change) between the profile reading at the draft of the transducer and the Micro-X.

OSI submitted a data package titled "SOUND VELOCITY collected from MV Northstar Challenger, RV North Cove, RV South Cove, RV Twister, and RV West Cove II in North Atlantic Ocean, Northern Massachusetts Bay from 2024-08-03 to 2025-03-28" in NetCDF format to the National Centers for Environmental Information (NCEI) on May 5, 2025.

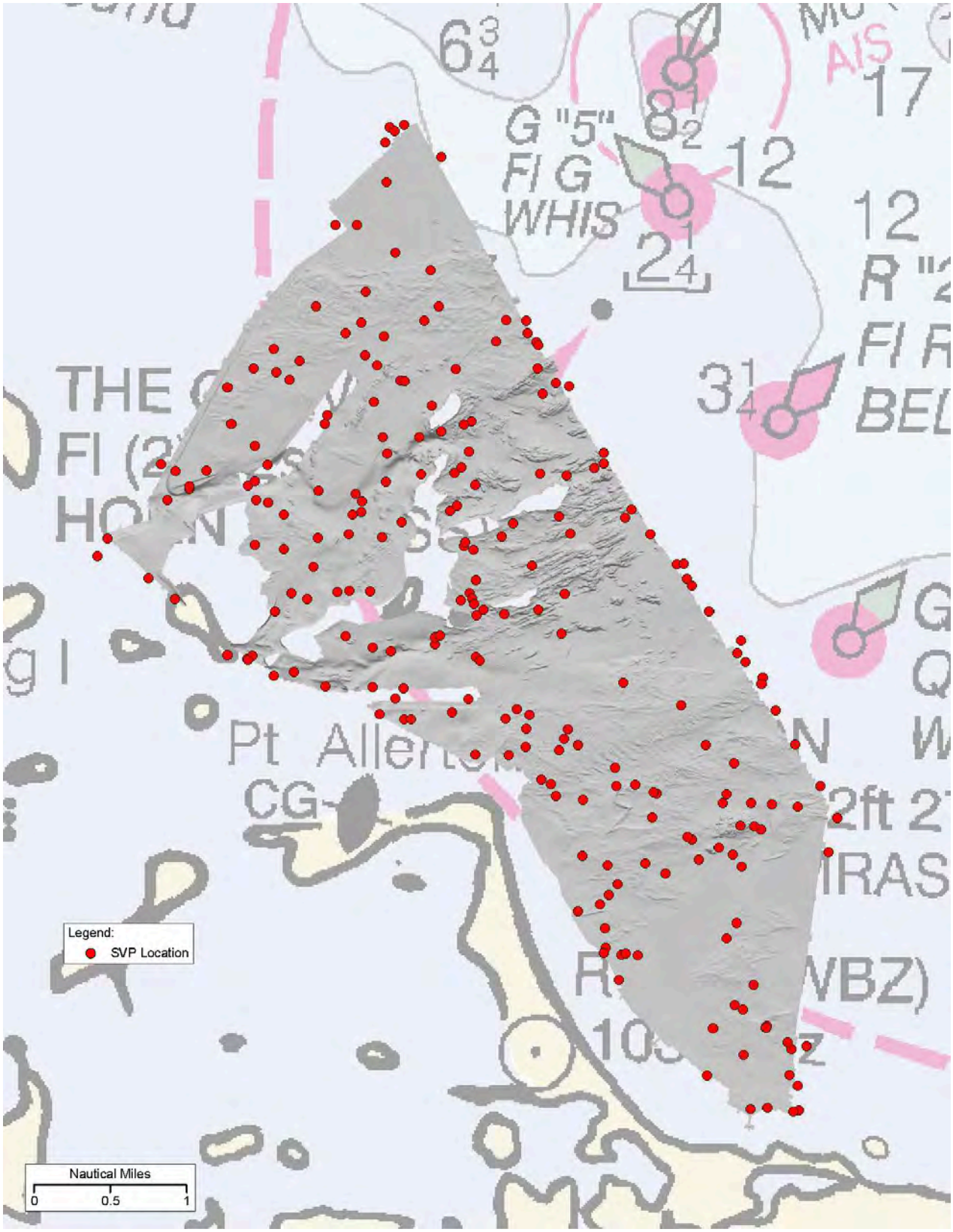


Figure 13: H13994 Sound speed cast locations.

B.2.8 Coverage Equipment and Methods

This survey was conducted to achieve Object Detection Coverage with multibeam, as specified in HSSD 5.2.2.2, Option A. The survey methods used to meet coverage requirements did not deviate from those described in the DAPR.

The NOAA Pydro QC Tools application was used to verify that the multibeam data met the density coverage requirements for each of the finalized grids submitted for the survey. Both surfaces passed the density check, which requires 95% of nodes to be populated with at least 5 soundings.

Coverage holidays are present in the 50cm resolution surface, primarily in crevices of rocky areas or on the sides of individual rocks. No holidays are present over the tops of features or other areas of potential significance.

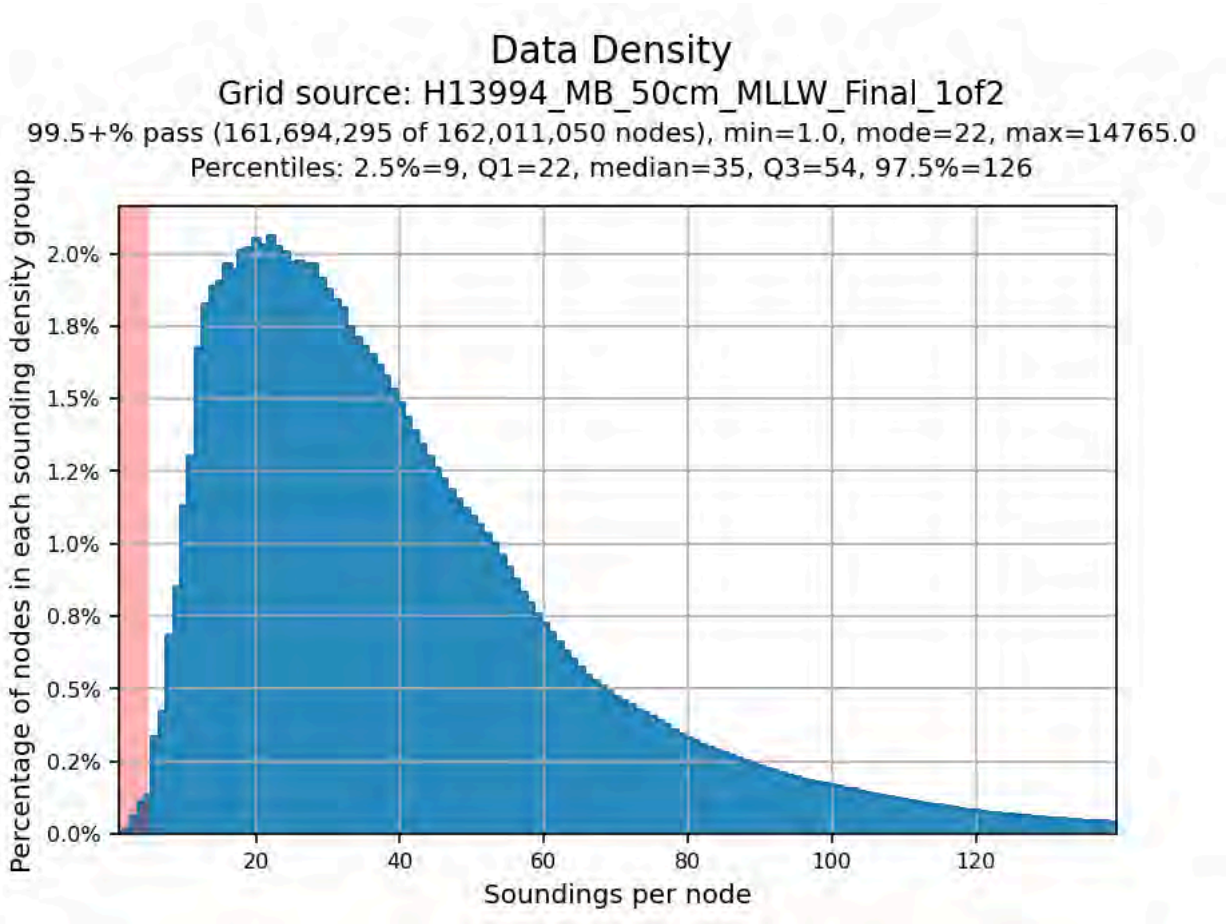


Figure 14: Data density, 50cm resolution surface.

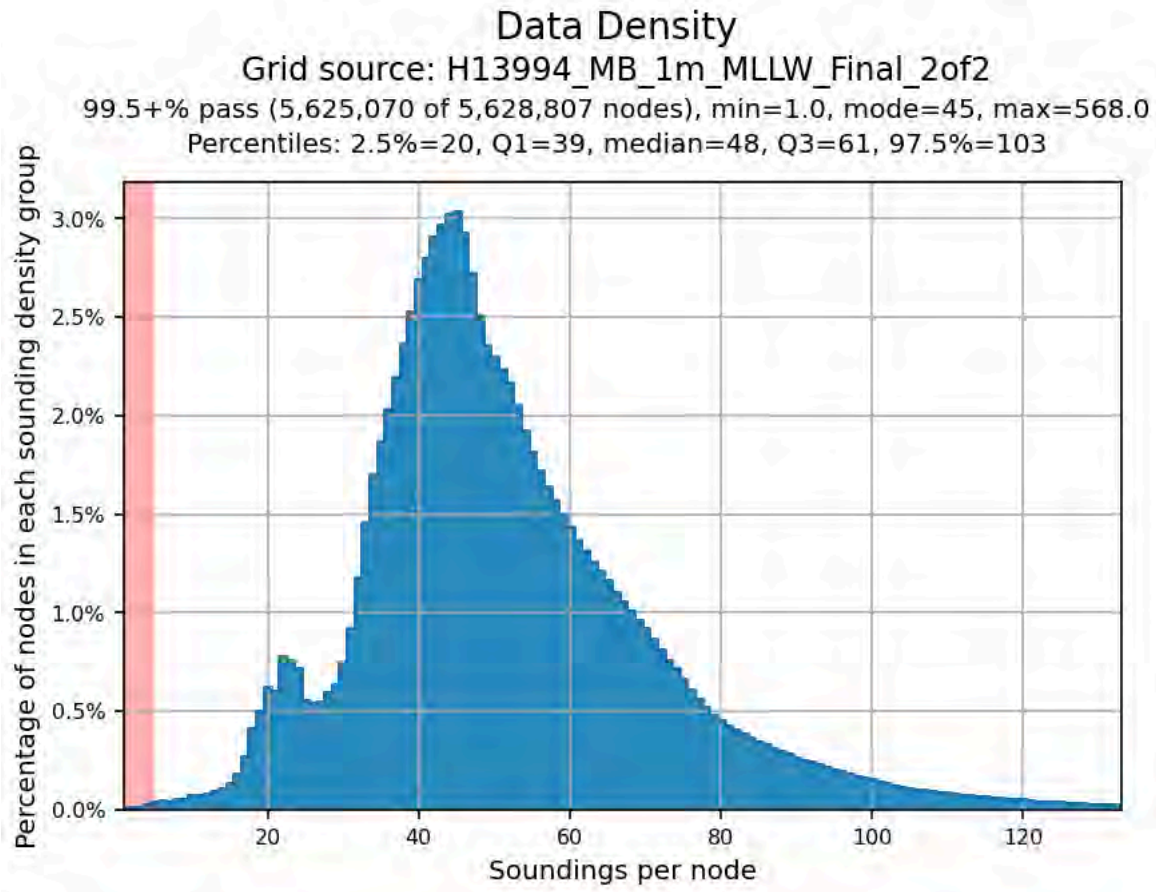


Figure 15: Data density, 1m resolution surface.

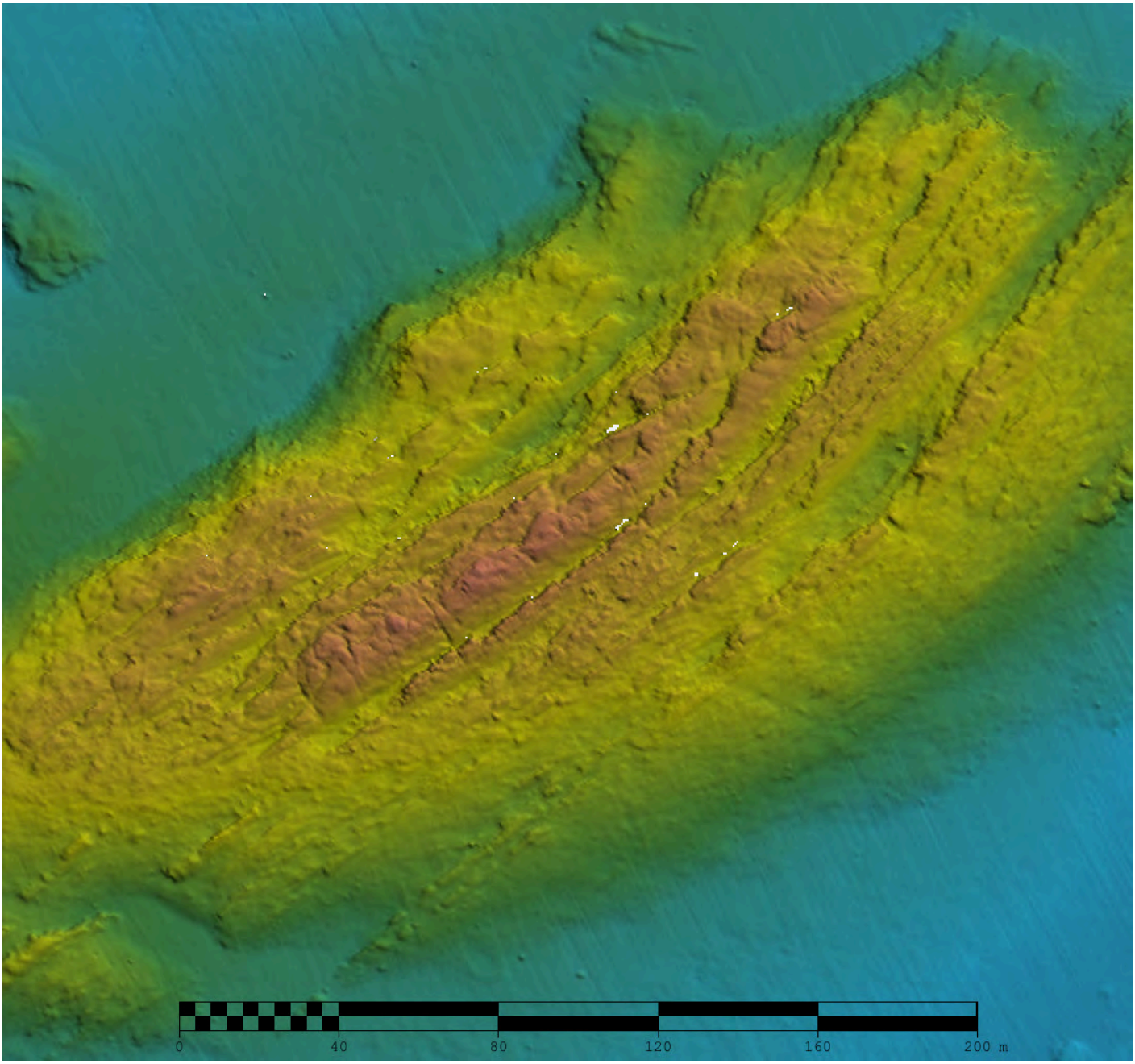


Figure 16: Holidays in 50cm resolution object detection surface.

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

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

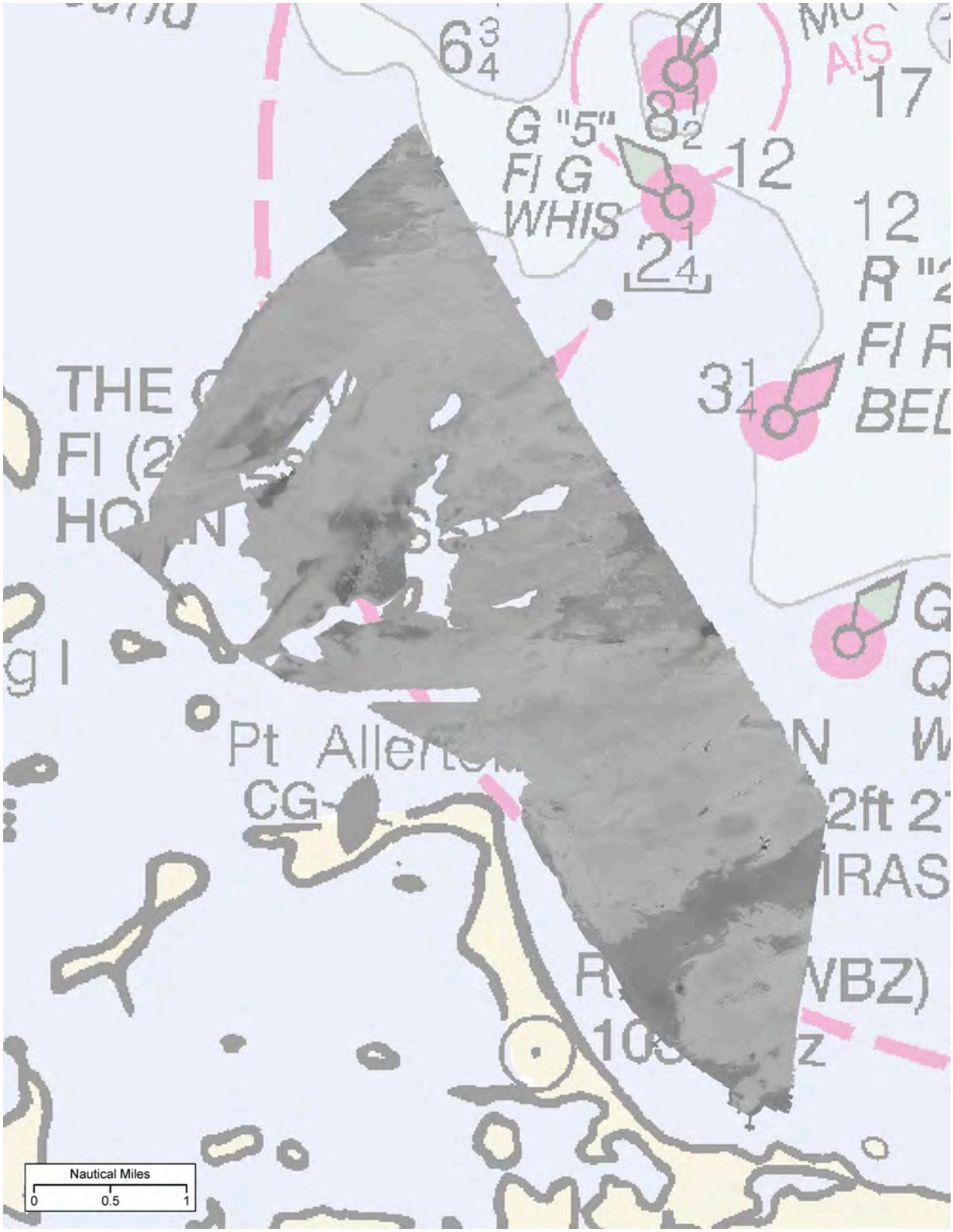


Figure 17: H13994 multibeam backscatter mosaic.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2024.

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
H13994_MB_50cm_MLLW_Final_1of2	CARIS Raster Surface (CUBE)	0.5 meters	-1.2 meters - 20.0 meters	NOAA_0.5m	Object Detection
H13994_MB_1m_MLLW_Final_2of2	CARIS Raster Surface (CUBE)	1 meters	18.0 meters - 29.9 meters	NOAA_1m	Object Detection
H13994_MB_50cm_MLLW_1of2	CARIS Raster Surface (CUBE)	0.5 meters	-1.2 meters - 29.9 meters	NOAA_0.5m	Source
H13994_MB_1m_MLLW_2of2	CARIS Raster Surface (CUBE)	1 meters	-1.2 meters - 29.9 meters	NOAA_1m	Source
H13994_MBAB_2m_400kHz_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Processed Backscatter

Table 10: Submitted Surfaces

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-A325-KR-24_NAD83(2011)-MHW.csar OPR-A325-KR-24_NAD83(2011)-MLLW.csar

Table 11: ERS method and SEP file

C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983 (2011).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 19.

The following PPK methods were used for horizontal control:

- Smart Base
- Single Base

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
Milton	MAMI
Plymouth	MAPL
Salisbury	MASA
Tewksbury	MATB
Truro	MATU
Wrenthm	MAWR
Machias	MEMA
U New Hampshire	NHUN
U of RI Coop	URIL
Westford	WES2
Boston WAAS 1	ZBW1

Table 12: CORS Base Stations

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
Ocean Surveys Gloucester	OSGL

Table 13: User Installed Base Stations

D. Results and Recommendations

D.1 Chart Comparison

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
US5BOSBF	1:22000	3	02/19/2025	02/19/2025
US5BOSCE	1:22000	4	02/19/2025	02/19/2025
US5BOSCF	1:22000	4	02/19/2025	02/19/2025
US5BOSDE	1:22000	3	02/25/2025	02/25/2025

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

This survey had 10 DTONS submitted representing groups of shoal rocks or areas of rock outcrops that were not adequately charted. In several cases the previous RNC charts had soundings for these DTONS, but they had been removed from the ENC and the ENC contours did not adequately reflect surveyed bathymetry.

D.1.3 Charted Features

A majority of the charted features assigned in H13994 were rocks, most of which were present and adequately represented in the bathymetry grid. Halftide Rock and Tewksbury Rock were the only named rocks within the survey, and a new feature was included in the FFF representing the surveyed shoal point of Halftide Rock. The surveyed shoal point of Tewksbury Rock is within the junction of this survey and adjacent survey H13995, and it is included only in the H13995 FFF.
All 9 charted wrecks were found to be present and larger than 1mm at survey scale, and so included in the FFF as new area features. A charted obstruction located in the Boston Harbor Main Ship Channel was similarly large and is included as a new obstruction area feature. Of the other charted obstructions, 2 were found to be rocks/rocky areas and 1 already charted as an area was found to be slightly larger than charted. See the FFF for details.

D.1.4 Uncharted Features

Most of the uncharted features in H13994 were wrecks or obstructions found near wrecks. A charted mooring buoy was not present but there were 3 mounds on the seafloor near its position, the tallest of these is included as a new obstruction feature. New features are also included for the potentially hazardous rocks that were surveyed. See the FFF for details.

D.1.5 Channels

No channels exist within the survey limits.

D.2 Additional Results

D.2.1 Aids to Navigation

There were 27 ATONS observed in or near survey H13994, all of which were at or near their charted positions. No uncharted aids were observed, and no reports were made to the U.S. Coast Guard.

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

An outfall pipe crosses the northern end of H13994, and was not elevated or exposed within this survey. A major gas pipeline also crosses H13994, and while its path is visible in the multibeam data no actual pipeline was exposed.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

Seasonal ferries from Boston to Salem or Provincetown may cross through this survey, but the routes are not on the chart.

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

No new surveys or further investigations are recommended for this area.

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
John R. Bean	Chief of Party	06/05/2025	Digitally signed by John R. Bean
David T. Somers	Data Processing Manager	06/05/2025	Digitally signed by David T. Somers

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