H13391

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13391

LOCALITY

State(s):	North Carolina
General Locality:	Offshore Chesapeake Bay
Sub-locality:	32 NM SE of Currituck Beach

2020

CHIEF OF PARTY
CDR Briana Hillstrom, NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13391**

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):	**North Carolina**
General Locality:	**Offshore Chesapeake Bay**
Sub-Locality:	**32 NM SE of Currituck Beach**
Scale:	**40000**
Dates of Survey:	**07/19/2020 to 08/22/2020**
Instructions Dated:	**08/05/2020**
Project Number:	**OPR-D304-TJ-20**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**CDR Briana Hillstrom, NOAA**
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 18N, 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 H13391

Project: OPR-D304-TJ-20

Locality: Offshore Chesapeake Bay

Sublocality: 32 NM SE of Currituck Beach

Scale: 1:40000

July 2020 - August 2020

NOAA Ship *Thomas Jefferson*

Chief of Party: CDR Briana Hillstrom, NOAA

A. Area Surveyed

Survey H13391 is located approximately 32 NM SE of Currituck Beach, North Carolina.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
36° 24' 29.94" N 75° 13' 7.43" W	36° 11' 48.41" N 75° 7' 21.06" W

Table 1: Survey Limits

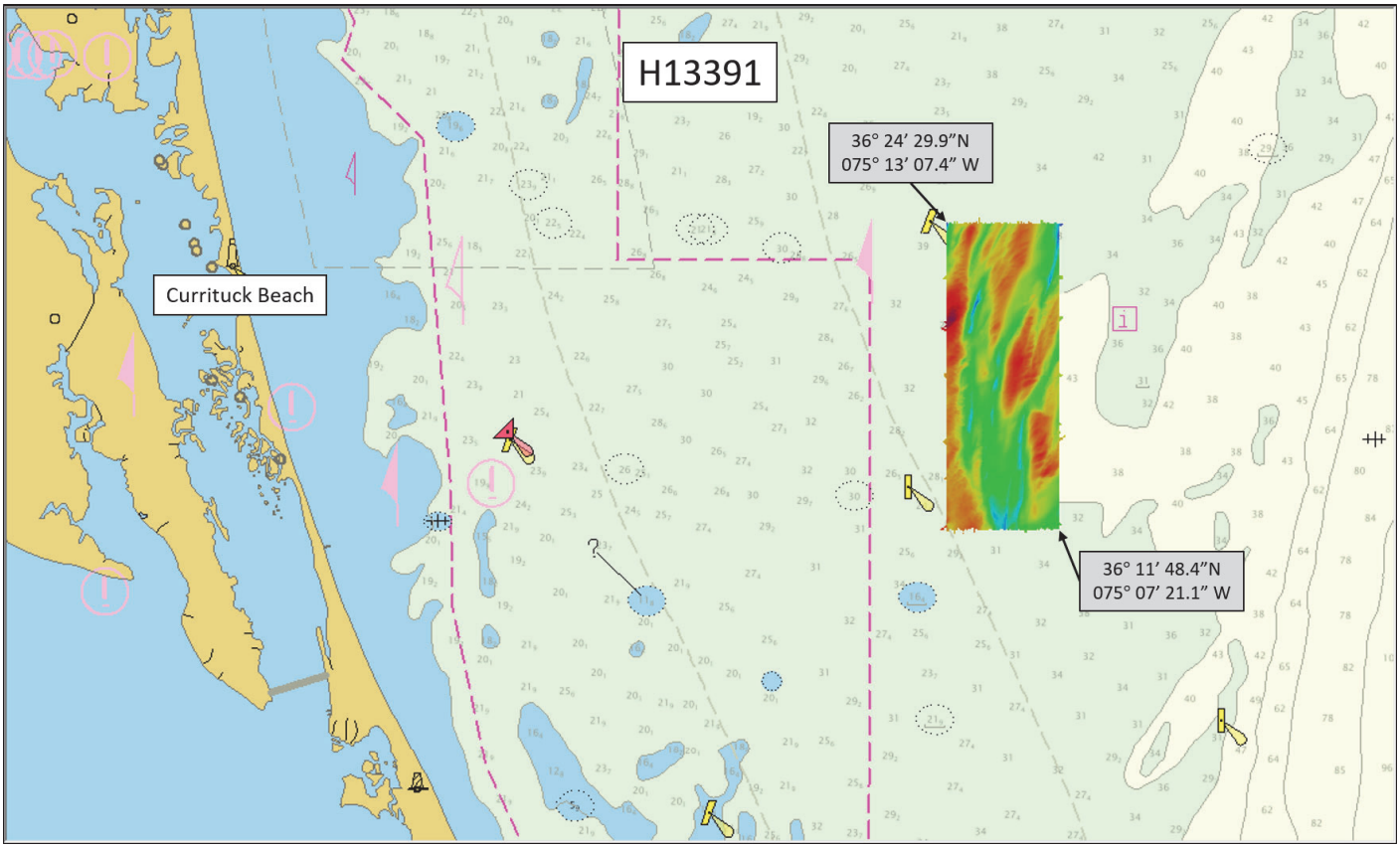


Figure 1: Area of collected coverage for H13391. MBES derived surface is overlain on NOAA ENC US3DE01M.

Survey data were acquired in accordance with the requirements set forth by the Project Instructions (PI) and the Hydrographic Survey Specifications and Deliverables (HSSD) dated May 2020.

A.2 Survey Purpose

This project covers 55.6 SNM approaching Chesapeake Bay, home for two top 20 container ports in the USA: Baltimore, MD and Port of Virginia. Together they net over 116 million tons of imports and exports per year. (1)

The Port of Virginia, with four 50 foot deep water marine terminals located in Norfolk Harbor, 18 nautical miles from the Atlantic Ocean, regularly hosts the larger New Panamax vessels over 1,000 feet in length and the Ultra Large Container Vessels (ULCVs) over 1,200 feet. In 2018, the Port of Virginia received Congressional authorization to dredge 55 feet (16.75 meters) deep and 1,400 feet (426.72 meters) wide channels in Norfolk Harbor and plan to start in 2020. (2)

Norfolk is the home a Naval Station in the Sewell's Point area and is a major base for the US Atlantic Command, US Atlantic Fleet and other fleet forces operating internationally. The Port of Baltimore, 145 nautical miles from the Atlantic Ocean, also receives New Panamax and ULCV vessels and is competitively located close to USA Midwestern metropolitan areas with only a day truck drive. (3)

The most recent surveys in this approaches project are partial bottom coverage from the 1880s to 1940s. Chart depths currently indicate 66 to 110 feet. Historic storms and hurricanes have likely made substantial changes to the seabed and therefore deprecated the nautical charts over the last century raising a concern for shoaling.

This important survey is a critical part of an ongoing, multi-year hydrographic survey covering the Approaches to Chesapeake Bay to support the safety of waterborne commerce to these vital ports and monitor the habitat and the environmental health of the region. Survey data from this project is intended to supersede all prior survey data in the common area.

1.U.S. Army Corps of Engineers, "Waterborne Commerce Statistics Center: Tonnage for selected U.S. ports in 2018." Institute for Water Resources. Submitted to USACE Digital Library 2019-12-12. https://usace.contentdm.oclc.org/. Accessed May 21, 2020.

2. The Port of Virginia, "Virginia Directories: Virginia Advantages." 600 World Trade Center, Norfolk, VA 23510. PORTOFVIRGINIA.COM. http://aapa.files.cms-plus.com/Awards Competition Materials/2019CommunicationsAward/DirectoriesHandbooks/Virginia_Directories_Virginia-Advantages.pdf. Accessed May 21, 2020.

3. Ronan, Dan, "Port of Baltimore Welcomes Its Largest Cargo Ship" Transport Topics, May 29, 2019. https://www.ttnews.com/articles/port-baltimore-welcomes-its-largest-cargo-ship. Accessed May 21, 2020.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13391 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD dated May 2020. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11).

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	Complete Coverage

Table 2: Survey Coverage

Survey coverage is in accordance with requirements listed in Table 2 and in the 2020 Hydrographic Survey Specifications and Deliverables (HSSD). Coverage requirements were met with Complete Coverage multibeam echosounder (MBES) coverage (Figure 1).

A.6 Survey Statistics

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

	HULL ID	*S222*	*2903*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0
	MBES Mainscheme	1471.96	18.22	1490.18
	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	66.45	0.0	66.45
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				5
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				58.85

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/19/2020	201
07/20/2020	202

Survey Dates	Day of the Year
07/21/2020	203
07/22/2020	204
07/23/2020	205
07/24/2020	206
07/25/2020	207
07/26/2020	208
07/27/2020	209
08/06/2020	219
08/07/2020	220
08/08/2020	221
08/22/2020	235

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	*S222*	*2903*
LOA	63.4 meters	8.5 meters
Draft	4.6 meters	1.2 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 710	MBES
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP-X	Sound Speed System
AML Oceanographic	MVP100	Sound Speed System
Valeport	Thru-Hull SVS	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System
Teledyne RESON	SVP 71	Sound Speed System

Table 6: Major Systems Used

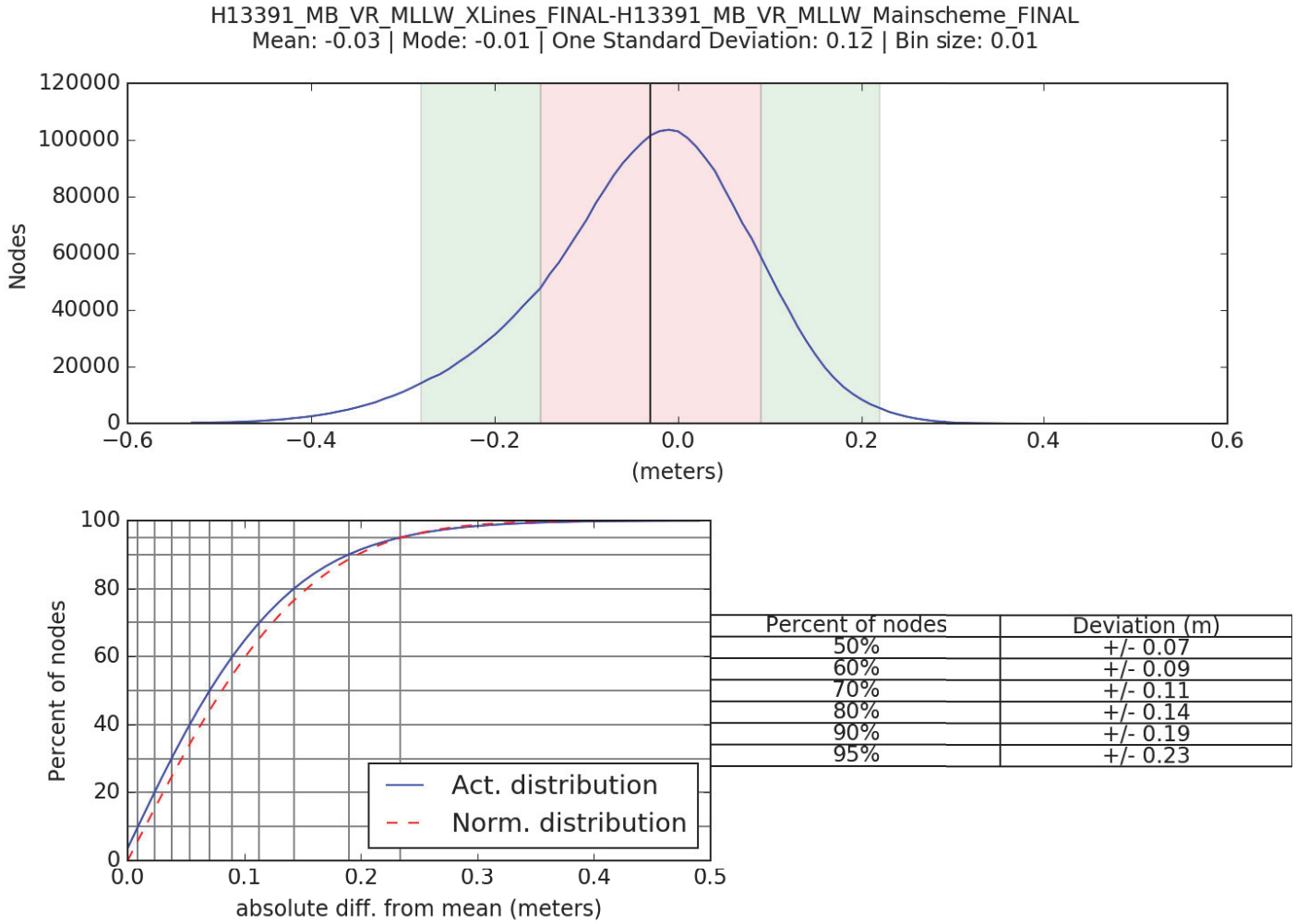
Vessel configurations, equipment operations, data acquisition, and processing were consistent with specifications described in the DAPR.

B.2 Quality Control

B.2.1 Crosslines

S222 collected 66.45 linear nautical miles of MBES crosslines or 4.46% of mainscheme MBES data (Figure 2). A variable resolution (VR) Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a VR CUBE surface of crossline data were differenced - the resulting mean was -0.03 m with a standard deviation of 0.12 m (Figure 3). Visual inspection of the difference surface indicated no systematic issues.

Figure 2: H13391 MBES difference surface of crossline and mainscheme data, shown in color, overlaid on mainscheme data, shown in grayscale.



Percent of nodes	Deviation (m)
50%	+/- 0.07
60%	+/- 0.09
70%	+/- 0.11
80%	+/- 0.14
90%	+/- 0.19
95%	+/- 0.23

Figure 3: H13391 crossline/mainscheme comparison.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	N/A	0.094 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S222	N/A	4 meters/second	0.2 meters/second
2903	4 meters/second	N/A	0.2 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with HSSD 2020 uncertainty standards. Over 99.5% of all nodes pass uncertainty standards (Figure 4).

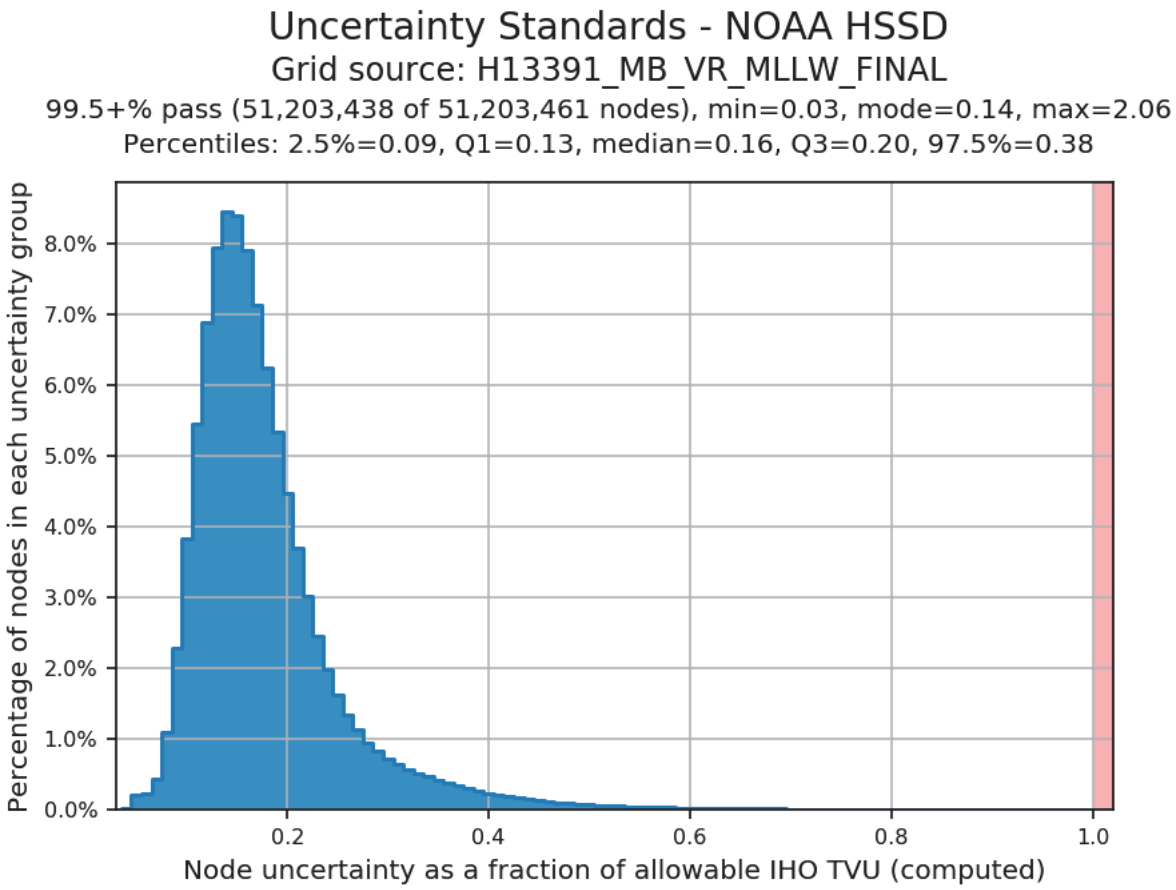


Figure 4: H13391 uncertainty standards.

B.2.3 Junctions

There is one contemporary and one historic survey that junction with survey H13391 (Figure 5).

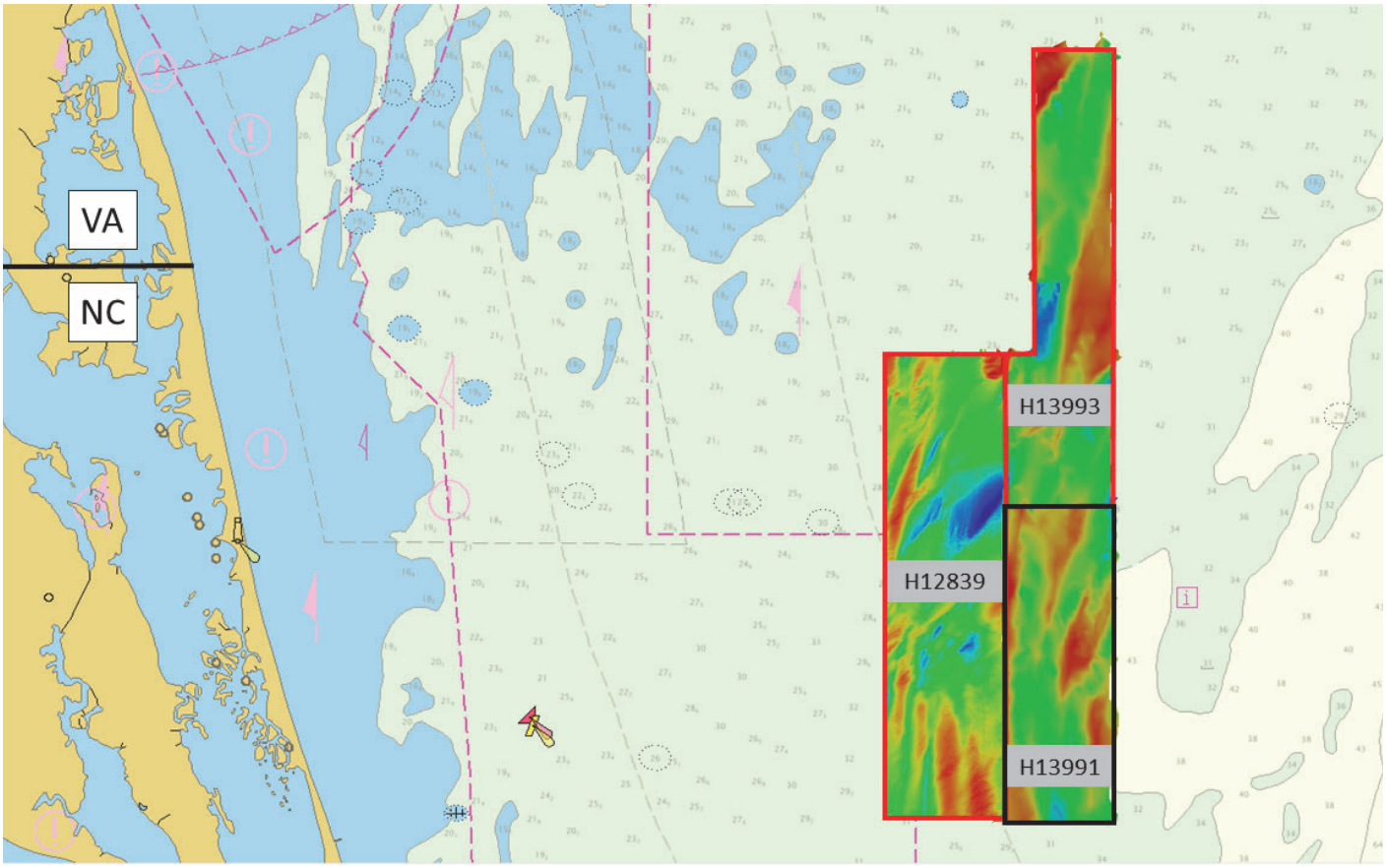


Figure 5: H13391 junctions with one contemporary survey, H13393 to the north, and one historic survey, H12839 to the west.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13393	1:40000	2020	Thomas Jefferson	N
H12839	1:40000	2015	Ferdinand Hassler	W

Table 9: Junctioning Surveys

H13393

The west side of Survey H13391 junctioned with Survey H13393 (Figure 7). A Variable Resolution (VR) Combined Uncertainty Bathymetry Estimator (CUBE) surface of H13391 data and a VR CUBE surface of H13393 data were differenced. The mean difference between bathymetric surface nodes was -0.03m with a

standard deviation of 0.09m. Statistics and visual inspection indicate that surveys H13391 and H13393 are in general agreement (Figure 8, Figure 9).

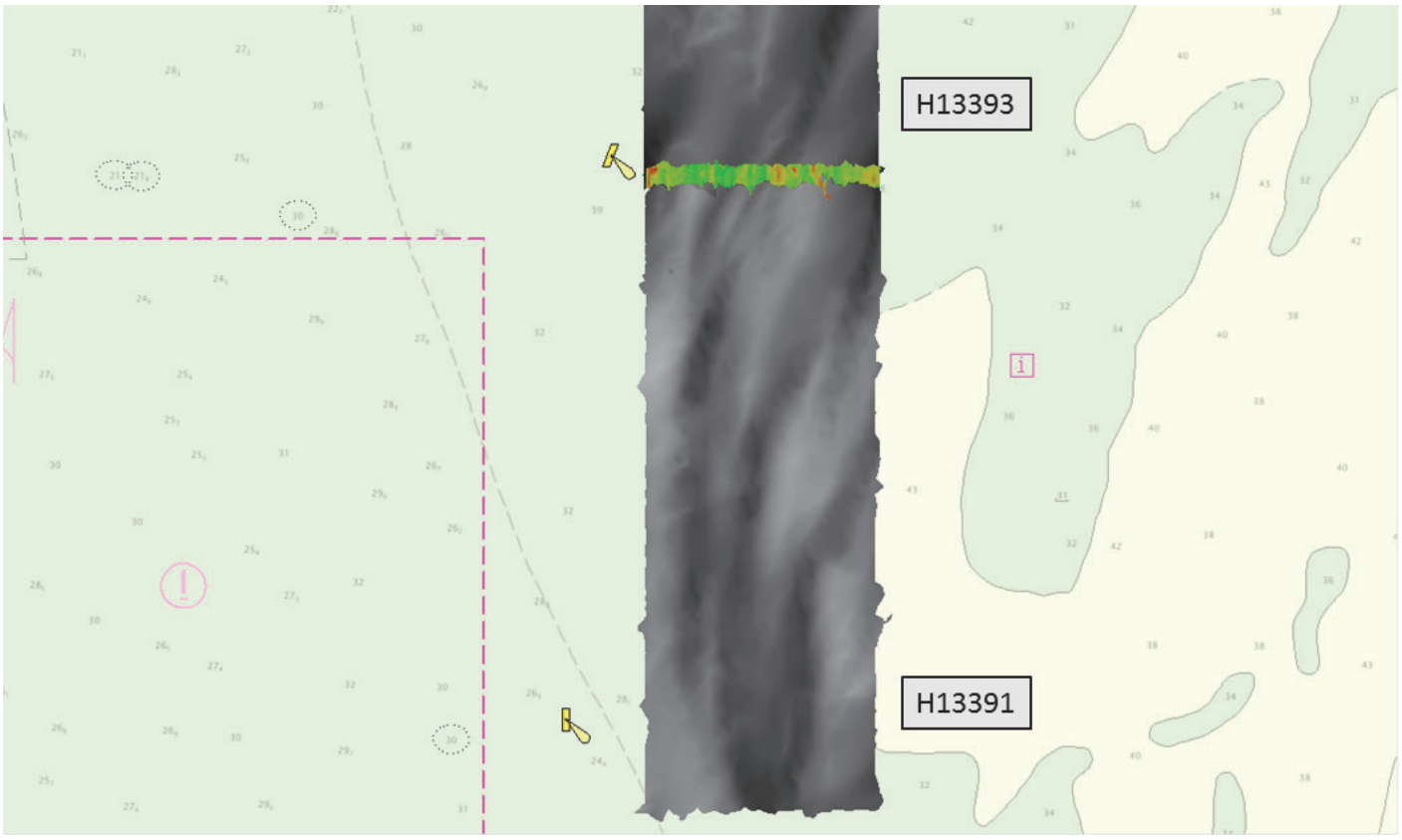
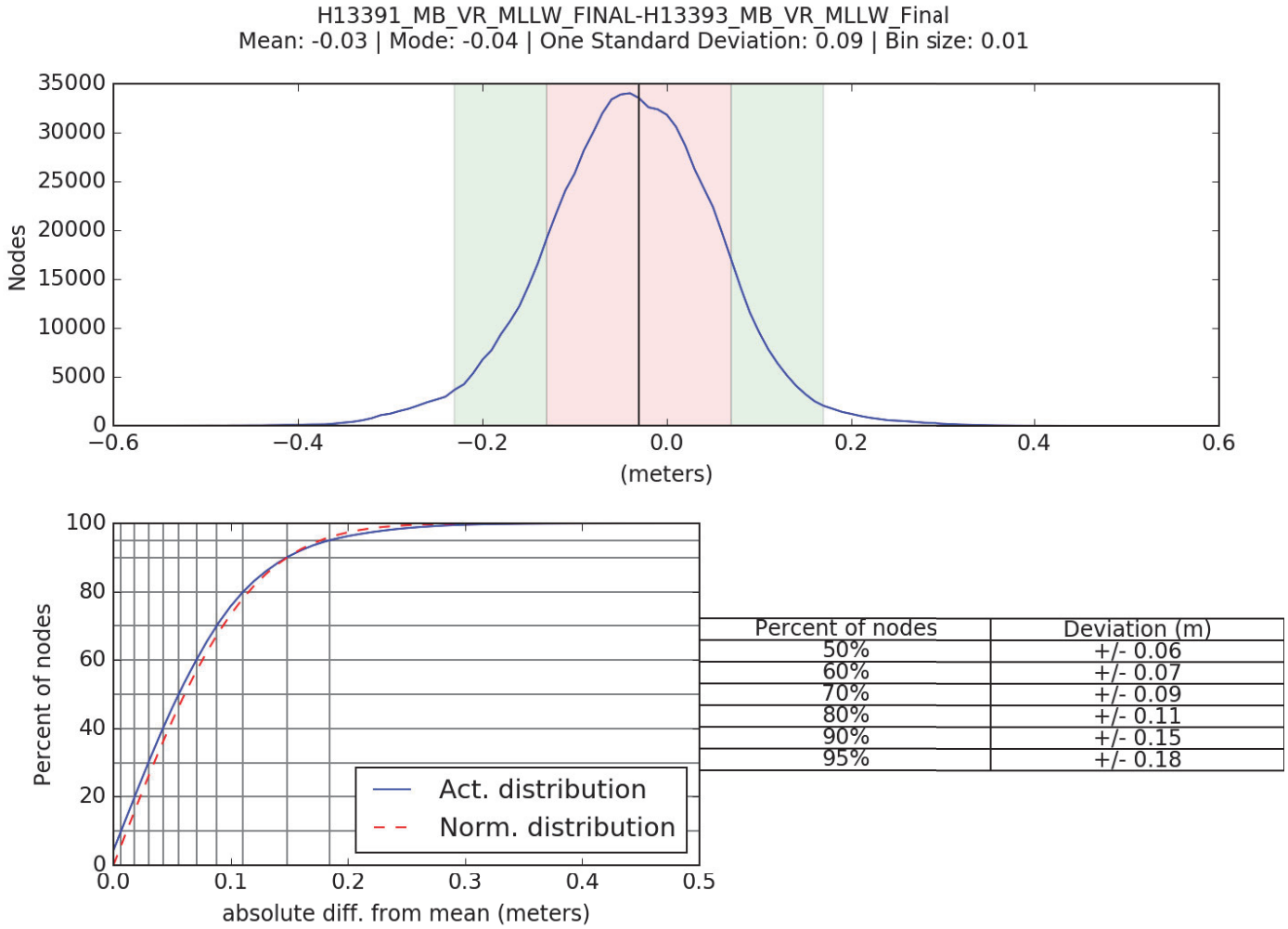


Figure 6: H13393 junctions with the northern edge of H13391.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.07
70%	+/- 0.09
80%	+/- 0.11
90%	+/- 0.15
95%	+/- 0.18

Figure 7: H13393 and H13391 difference surface comarison statistics.

H12839

The west side of Survey H13391 junctioned with Survey H12839 (Figure 5). A Variable Resolution (VR) Combined Uncertainty Bathymetry Estimator (CUBE) surface of H13391 data and a combined resolution Bathymetric Attributed Grid (BAG) surface of H12839 data at the 2m and 4m resoultion were differenced. The mean difference between bathymetric surface nodes was -0.02m with a standard deviation of 0.21m. Statistics and visual inspection indicate that surveys H13391 and H12839 are in general agreement (Figure 6).

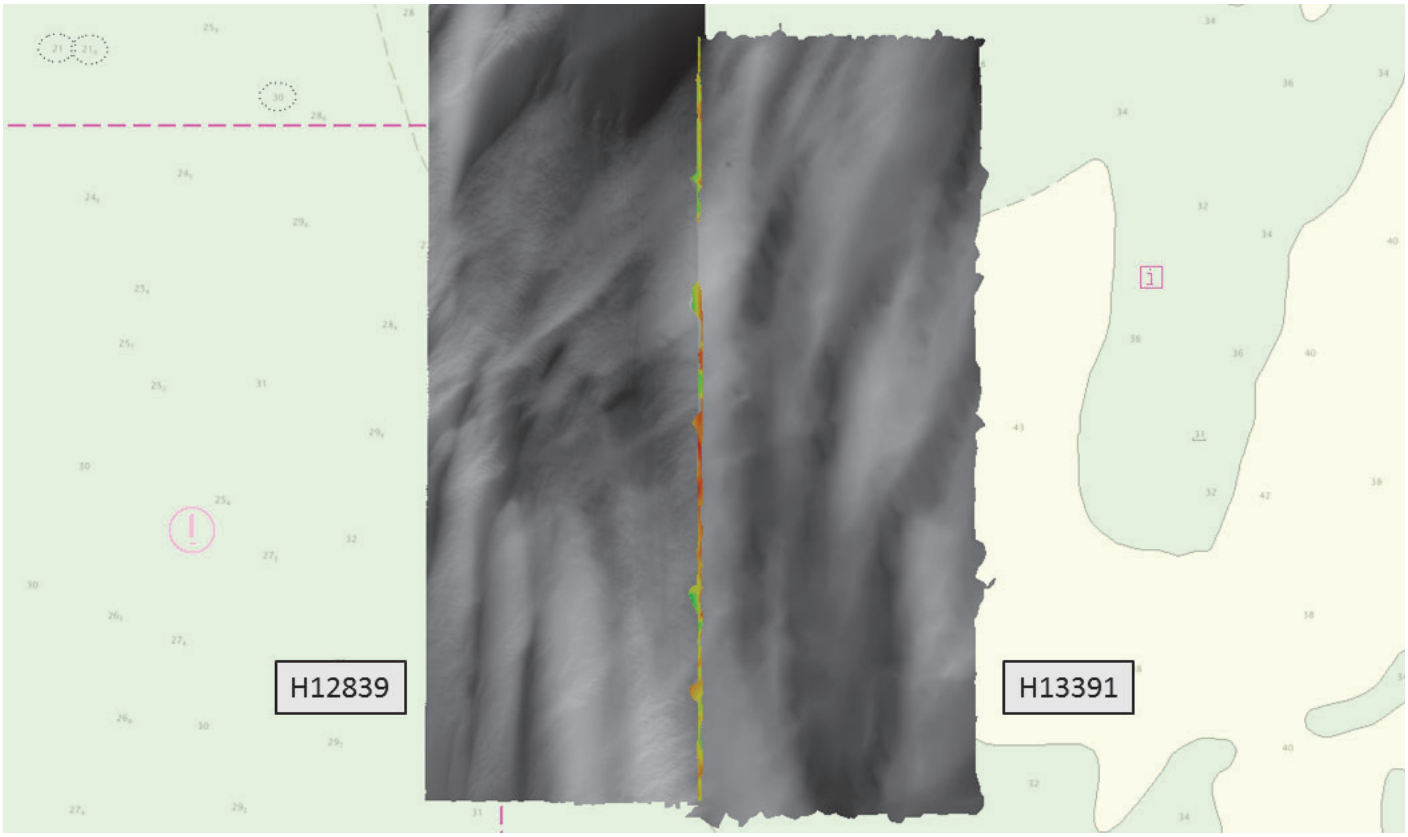
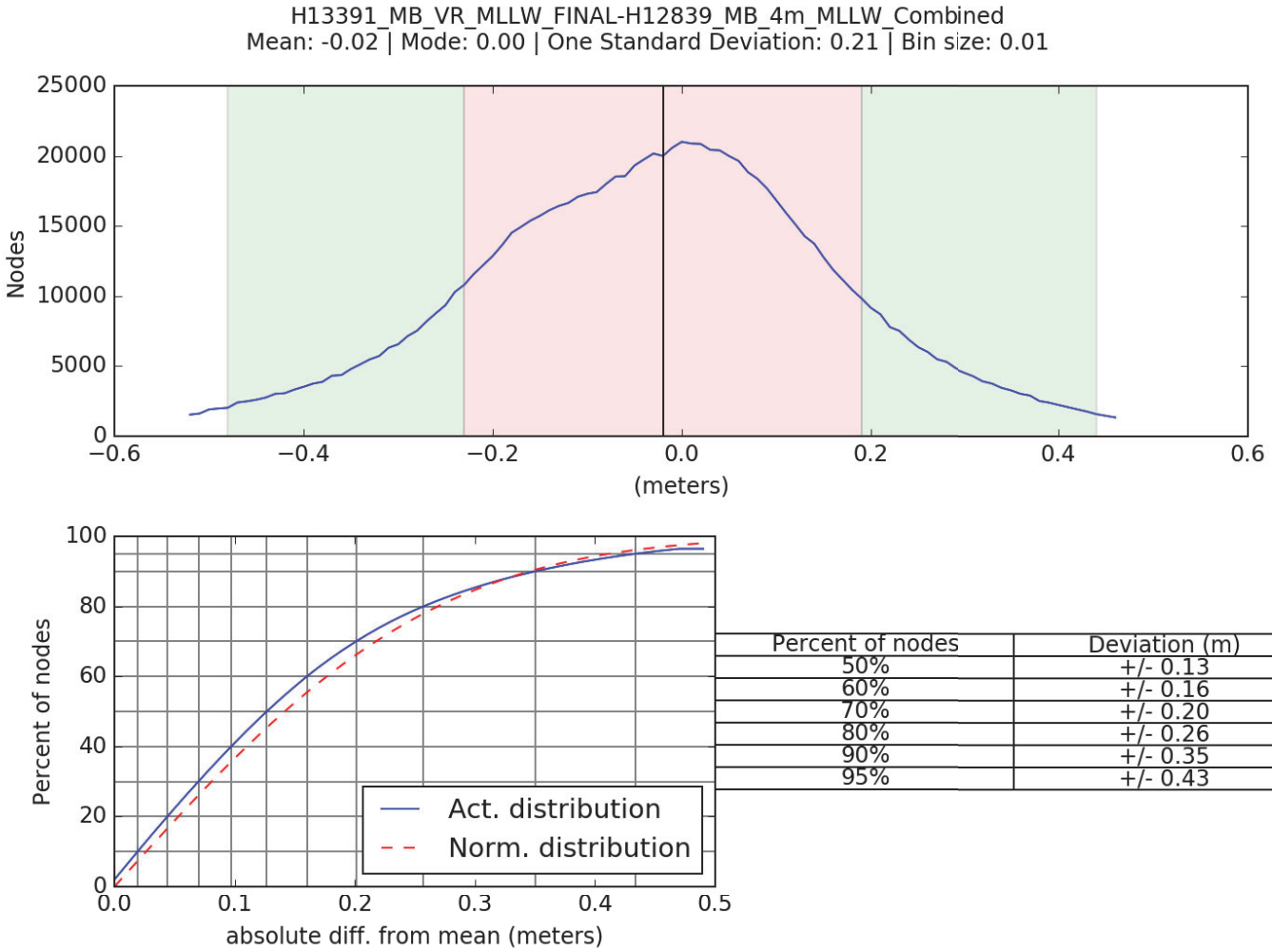


Figure 8: H12839 junctions with the western edge of H13391.



Percent of nodes	Deviation (m)
50%	+/- 0.13
60%	+/- 0.16
70%	+/- 0.20
80%	+/- 0.26
90%	+/- 0.35
95%	+/- 0.43

Figure 9: H12839 and H13391 difference surface comarison statistics.

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

Use of Kongsberg EM710

There were no conditions or deficiencies that affected equipment operational effectiveness throughout acquisition. Refer to the DAPR section A.2.1.1 Kongsberg EM2040 for an explanation of the use of the ship's Kongsberg EM710 rather than the Kongsberg EM2040.

B.2.6 Factors Affecting Soundings

Thermal Stratification

Thermal stratification was present throughout the survey duration. This stratification was identified in the MVP sound speed profiles (Figure 10). Refer to section B.2.7 for measures that were taken to mitigate these sound speed issues. Surfaces were not significantly impacted, and the data meet NOAA allowable uncertainty parameters from the HSSD. As such, the data remain sufficient to supersede previous data.

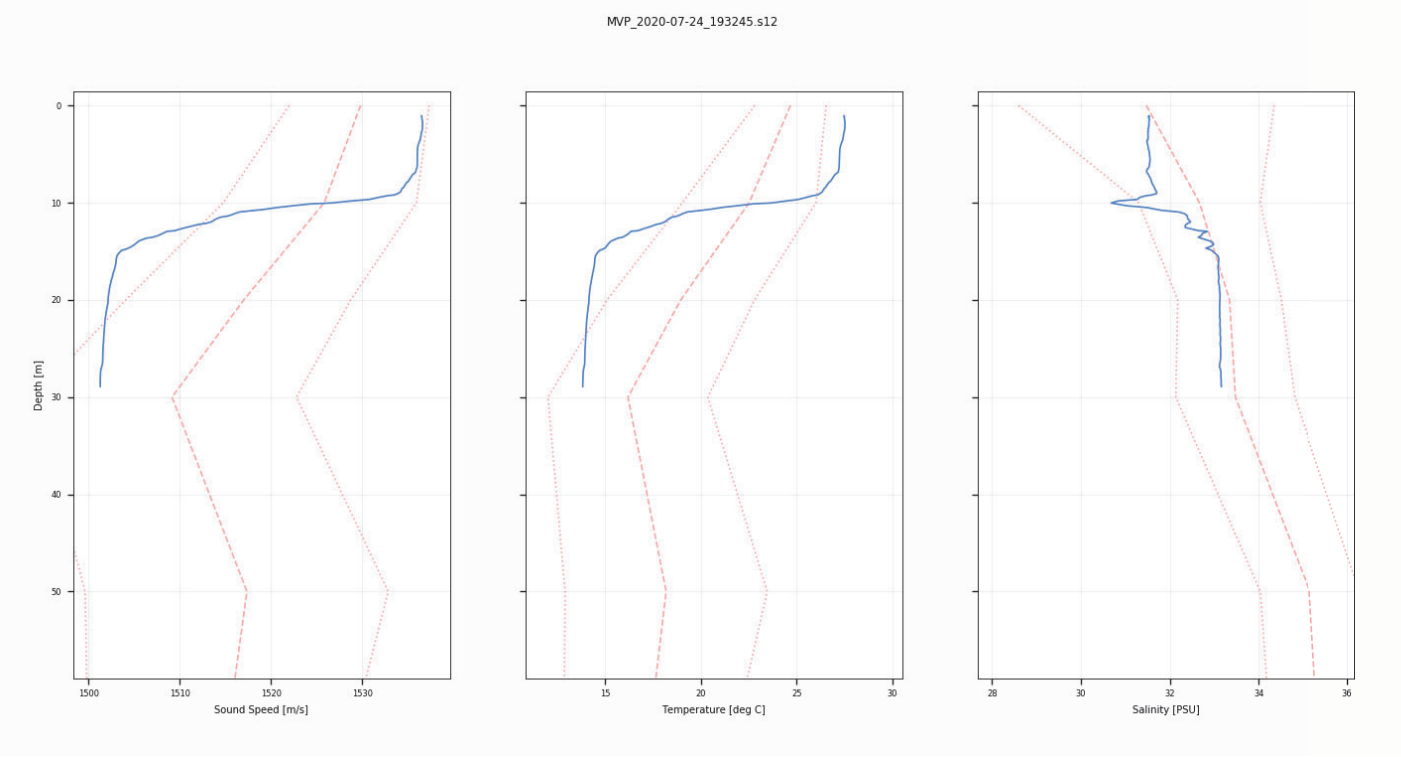


Figure 10: MVP cast profile that is representative of the sounds speed profiles in the survey area. The strong thermocline in this cast similarly appears in most of the casts taken for this sheet.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: MVP casts on S222 were conducted at an average interval of 10 minutes as recommended by CastTime analysis in Sound Speed Manager, which determines optimum cast frequency based on the observed sound speed variations from previous casts. A high cast frequency was also used to combat the persistent thermocline throughout the survey area. CTD casts on 2903 were conducted at the start of acquisition, which was completed within four hours. When processing data acquired by 2903, the master .svp file for the sheet was used to apply the closest spatial and temporal profiles. All sound speed methods were used as detailed in the DAPR.

B.2.8 Coverage Equipment and Methods

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

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. Raw MBES backscatter was logged as part of the .all file of the Kongsberg EM710 and EM2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox (FMGT) software, and the exported geotiffs are included in the final processed data package (Figures 11-13).

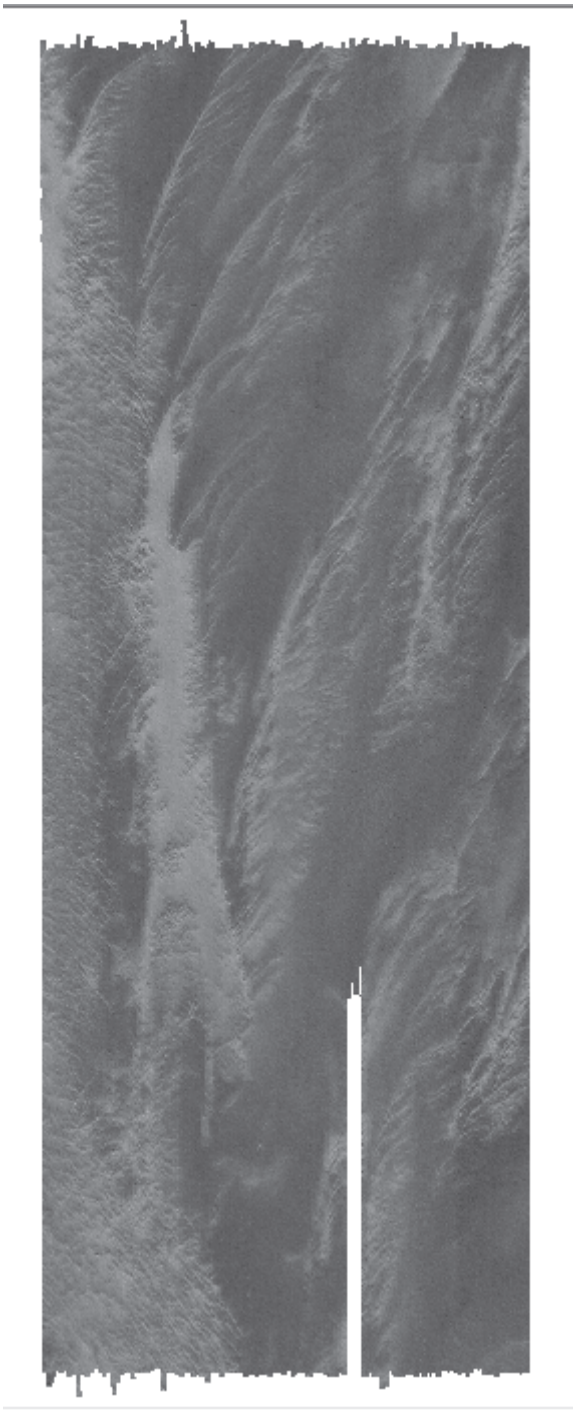


Figure 11: S222's 100kHz multibeam acoustic backscatter at 6m resolution. Gap in coverage in lower right of image is area acquired by 2903, seen in Figure 12.

Figure 12: 2903's 300kHz multibeam acoustic backscatter at 2m resolution.

Figure 13: Combined image of all backscatter acquired on H13391.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2020.

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
H13391_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	26.6 meters - 43.8 meters	NOAA_VR	Complete MBES
H13391_MB_VR_MLLW_FINAL	CARIS VR Surface (CUBE)	Variable Resolution	26.6 meters - 43.7 meters	NOAA_VR	Complete MBES
H13391_MBAB_6m_S222_100kHz_1of2	MB Backscatter Mosaic	6 meters	-	N/A	Complete MBES
H13391_MBAB_2m_2903_300kHz_2of2	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES

Table 10: Submitted Surfaces

Complete coverage requirements were met by 100% complete coverage MBES as specified under section 5.2.2.3 of the HSSD 2020. All bathymetric grids for H13391 meet density requirements per the HSSD 2020 (Figure 14).

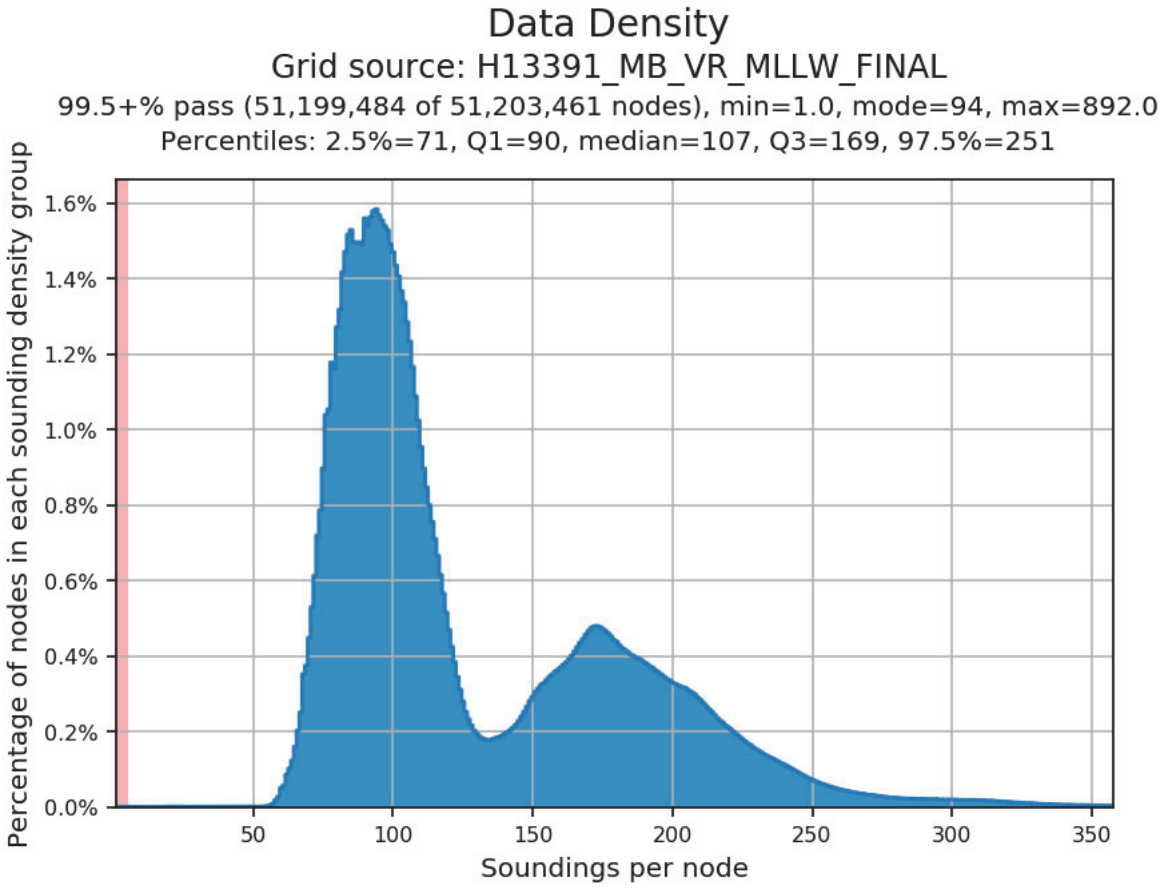


Figure 14: H13391 data density statistics.

C. Vertical and Horizontal Control

No Horizonal and Vertical Control Report (HVCR) is required for this survey.

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	vdatum_July_cb_100m_NAD83-MLLW_geoid12b

Table 11: ERS method and SEP file

All soundings submitted for H13391 are reduced to MLLW using VDatum techniques as outlined in the DAPR.

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 18.

PPP

Trimble-RTX service was used with an Applanix POS MVv5 GNSS_INS system to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications for H13301 MBES data from vessels HSL 2903 and S222.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition on vessels S222 and HSL 2903

D. Results and Recommendations

D.1 Chart Comparison

A chart comparison was conducted between survey H13391 soundings and previously charted ENC soundings using procedures outlined in the DAPR (Figure 15). Soundings are in general agreement with charted depths. See Section D.1.2 for identified shoal soundings.

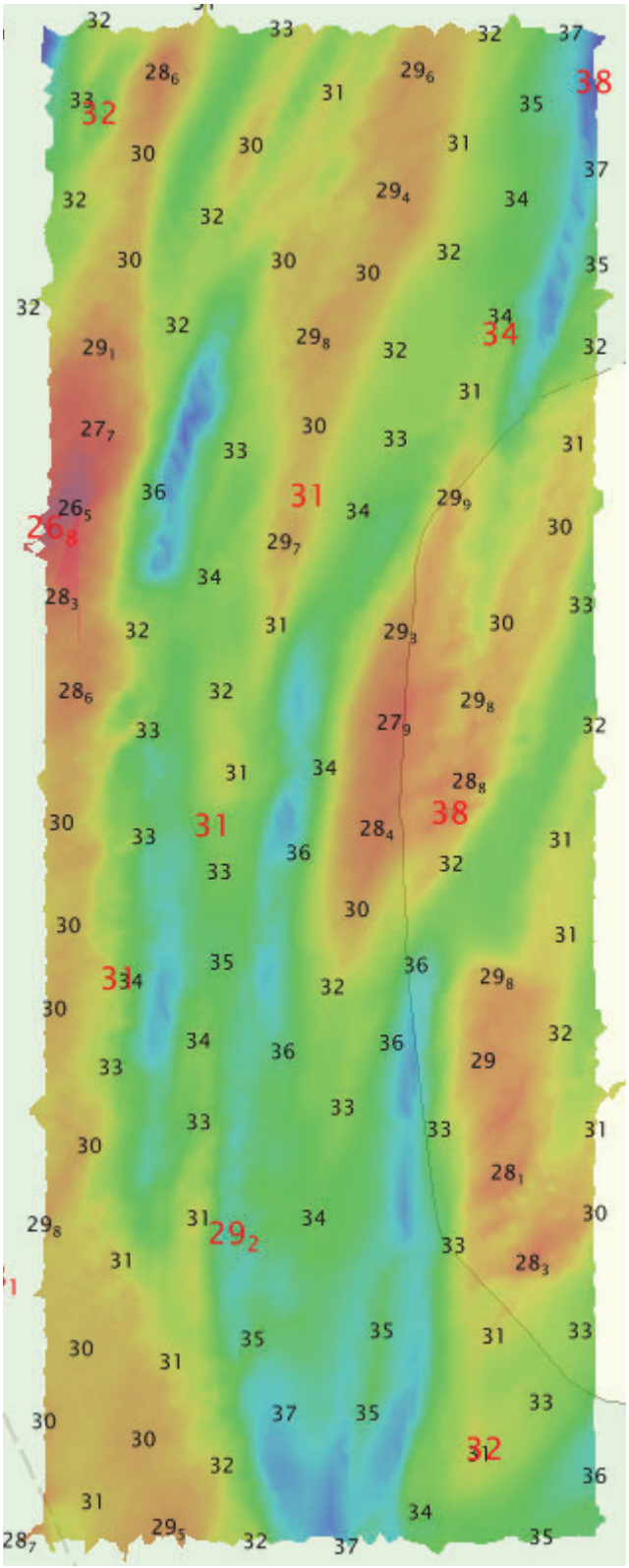


Figure 15: H13391 VR surface overlaid on ENC US3DE01M. Red soundings indicate charted depths on ENC US3DE01M, black soundings indicate sounding set generated from H13391 collected data.

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
US3DE01M	1:149706	22	06/20/2018	08/12/2020

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

There were a total of three soundings determined by the hydrographer to be considered significantly shoaler than charted soundings (Figure 16). No DTONS were identified.

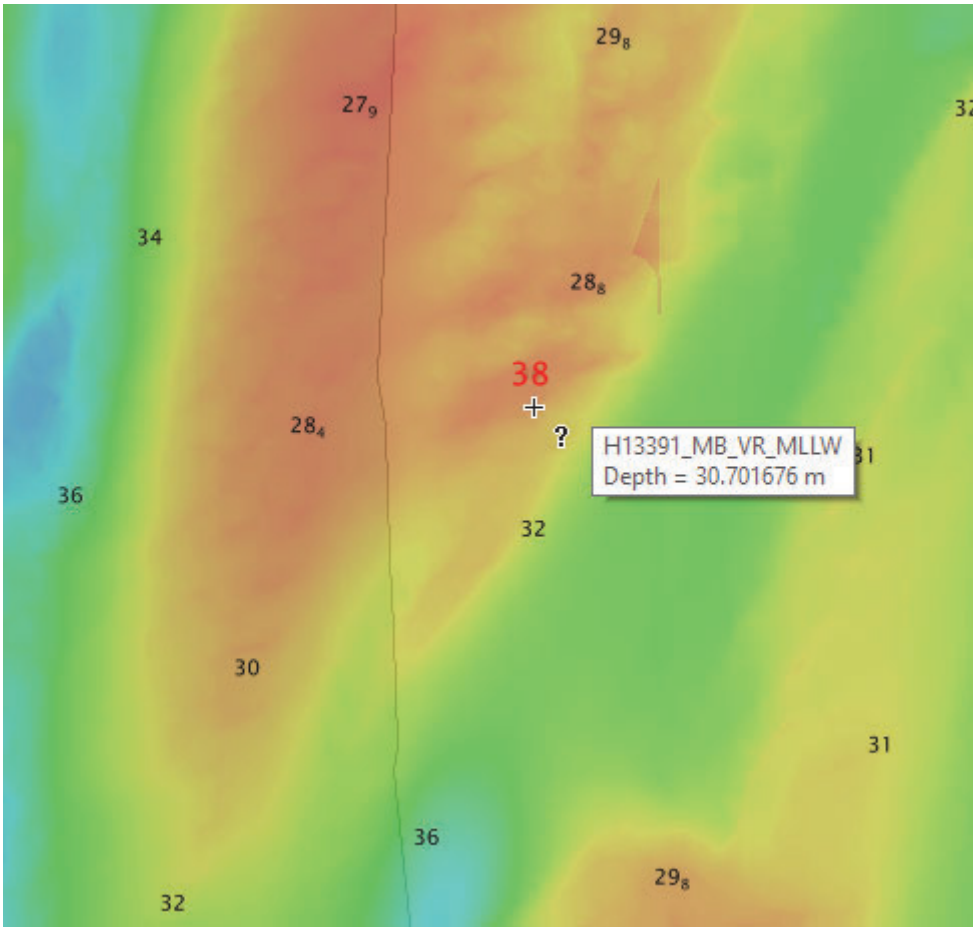


Figure 16: Subset view of H13391 VR surface overlaid on ENC US3DE01M. Red sounding indicates charted depths on US3DE01M, black soundings indicate sounding set generated from H13391 collected data. Textbox indicates the VR surface depth at the location of the black crosshairs.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines 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

Bottom samples were assigned, investigated, and are included in the Final Feature File. New sample locations were selected based on collected backscatter imagery in an effort to characterize varying bottom types. See Figure 17 for a generalized view of H13391 bottom sample locations.

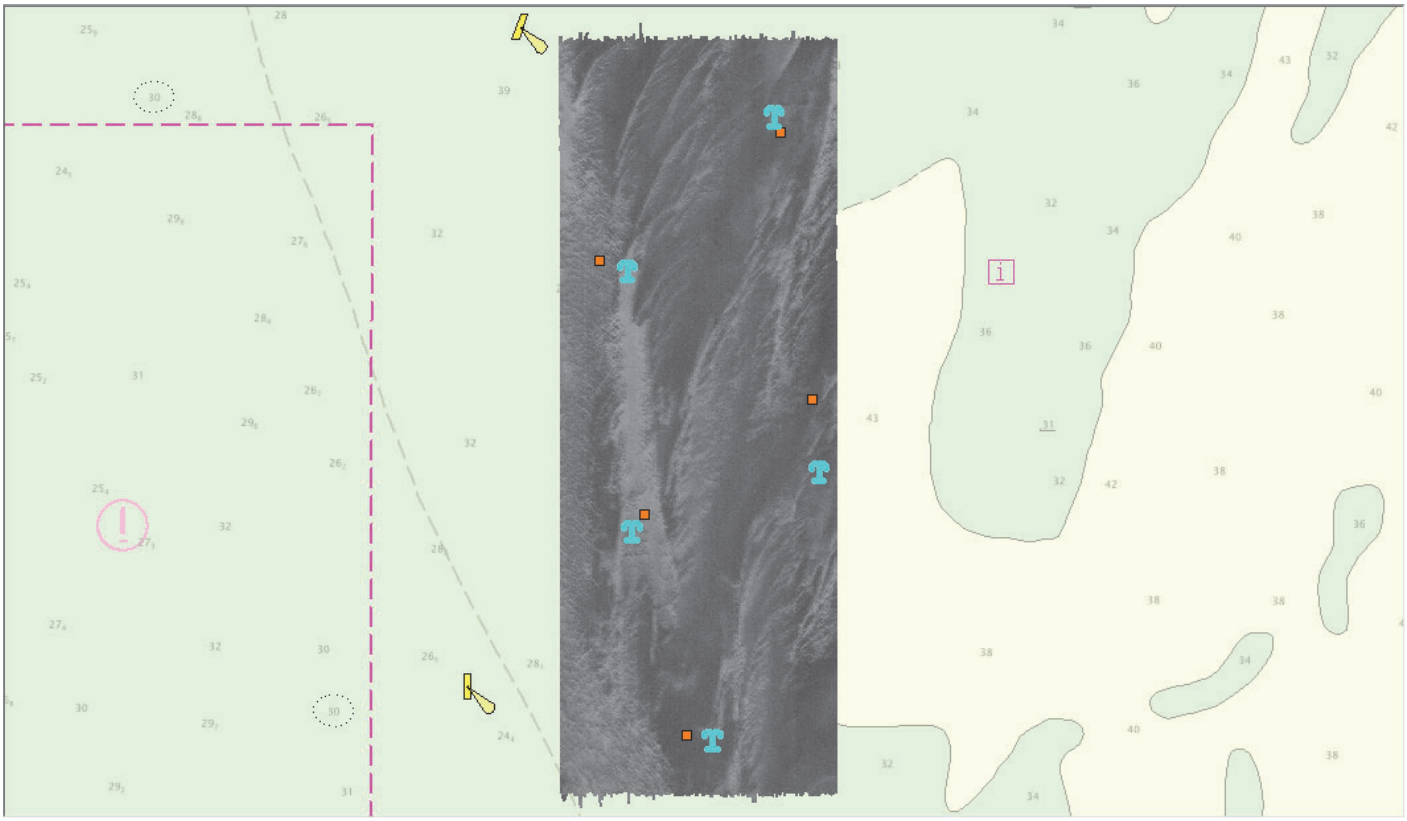


Figure 17: H13391 bottom sample locations overlaid on backscatter imagery. Original suggested locations as blue SPRING symbols. Location of collected bottom samples as orange squares.

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

Sound speed measurements throughout the survey were highly variable. Refer to Section B.2.7 for measures that were taken to mitigate against these issues.

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
CDR Briana Hillstrom, NOAA	Commanding Officer/ Chief of Party	11/12/2020	Briana Welton Hillstrom Digitally signed by HILLSTROM.BRIANA.WELTON.1267667531 Date: 2020.11.12 11:13:15 -05'00'
LT Calandria DeCastro, NOAA	Field Operations Officer	11/12/2020	Calandria DeCastro Digitally signed by DECASTRO.CALANDRIA.MALVINA.1468902156 Date: 2020.11.12 11:19:16 -05'00'
Joshua Hiteshew	Chief Survey Technician	11/12/2020	HITESHEW.JOSHUA.TAYLOR.1537939652 Digitally signed by HITESHEW.JOSHUA.TAYLOR.1537939652 Date: 2020.11.18 16:55:21 Z
ENS Patrick Faha, NOAA	Sheet Manager	11/12/2020	FAHA.PATRICK.T.1549418305 Digitally signed by FAHA.PATRICK.T.1549418305 Date: 2020.11.19 09:45:58 -05'00'

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