

H13548

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: H13548

**LOCALITY**

State(s): Florida

General Locality: Florida Keys

Sub-locality: Brewster Reef to Tennessee Reef

**2021**

CHIEF OF PARTY  
James L. Kirkpatrick

**LIBRARY & ARCHIVES**

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION		REGISTRY NUMBER:
<b>HYDROGRAPHIC TITLE SHEET</b>		<b>H13548</b>
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):	<b>Florida</b>	
General Locality:	<b>Florida Keys</b>	
Sub-Locality:	<b>Brewster Reef to Tennessee Reef</b>	
Scale:	<b>20000</b>	
Dates of Survey:	<b>10/05/2021 to 10/17/2021</b>	
Instructions Dated:	<b>10/21/2021</b>	
Project Number:	<b>S-H902-NRTFB-21</b>	
Field Unit:	<b>NOAA Navigation Response Team - Fernandina</b>	
Chief of Party:	<b>James L. Kirkpatrick</b>	
Soundings by:	<b>Multibeam Echo Sounder</b>	
Imagery by:		
Verification by:	<b>Pacific Hydrographic Branch</b>	
Soundings Acquired in:	<b>meters at Mean Lower Low Water</b>	
Remarks: <i>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 <a href="https://www.ncei.noaa.gov/">https://www.ncei.noaa.gov/</a>. Products created during office processing were generated in NAD83 UTM 17N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.</i>		

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## Descriptive Report to Accompany Survey H13548

Project: S-H902-NRTFB-21

Locality: Florida Keys

Sublocality: Brewster Reef to Tennessee Reef

Scale: 1:20000

October 2021 - October 2021

**NOAA Navigation Response Team - Fernandina**

Chief of Party: James L. Kirkpatrick

### A. Area Surveyed

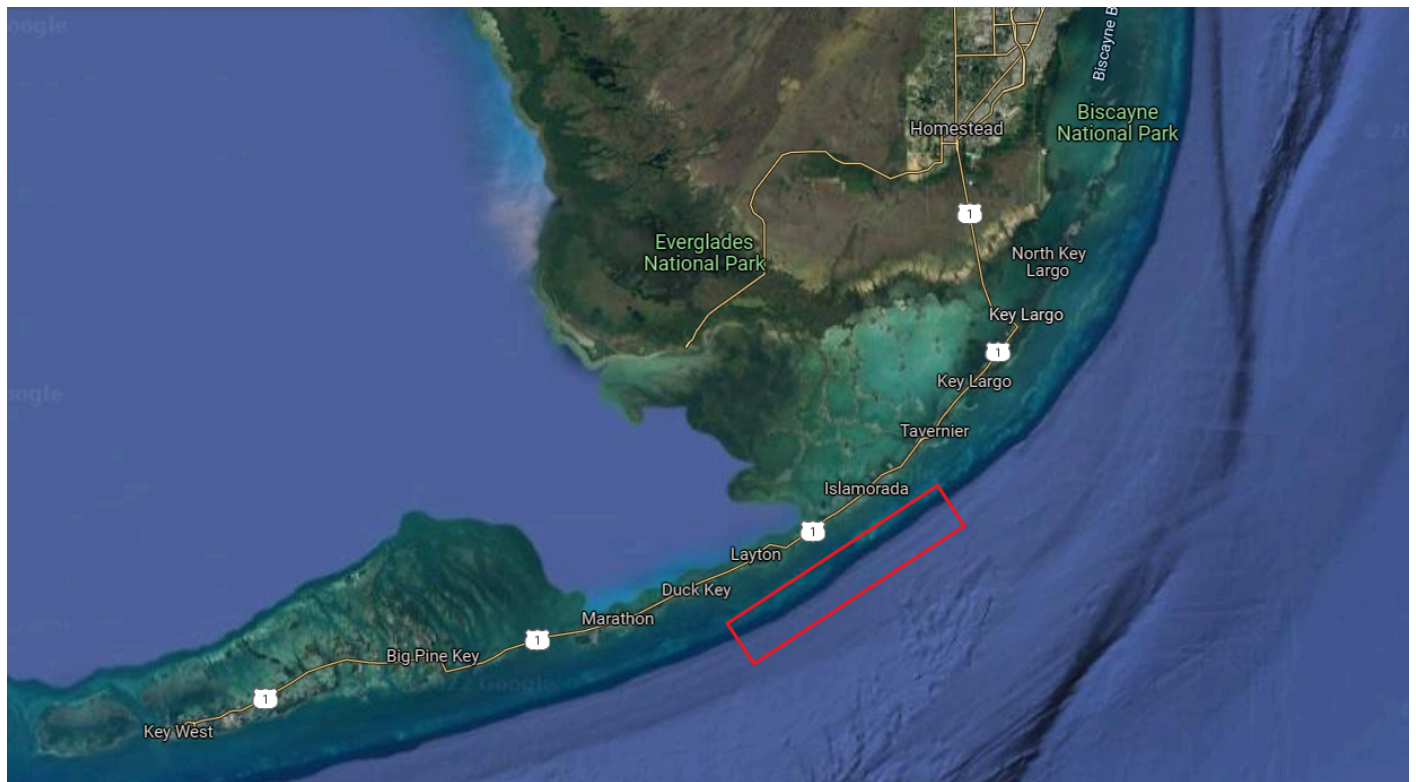
H13548 consists of an approximately one nautical mile wide area extending offshore from the Florida Keys barrier reef. The southwestern extent is near Duck Key and the northeastern extent is near Islamorada. The full assigned area was not completed due to time constraints and weather. Navigation Response Team-Fernandina Beach (NRTFB) and a Mobile Integrated Survey Team (MIST) were intended to split the area as evenly as possible. The southern area was split into 7 sections approximately 3.5 miles long and 1 mile wide with the intent of NRTFB completing sections 1,3,5 and 7, while the MIST would complete 2,4 and 6. Each section could be completed in 3 full survey days. NRTFB delivered the MIST equipment to the Southeast Fisheries Center in Miami on the way to Marathon Key. The MIST was installed onto a vessel of opportunity provided by Marine Sanctuaries. NRTFB arrived in Marathon on October 4th and began survey operations on October 5th. The MIST team intended to begin survey operations on October 7th but experienced some equipment integration issues that persisted until October 16th. This issue caused the assumed schedule and expected progress to diminish significantly. The MIST was unable to complete section 2 leaving a large gap and numerous holidays in coverage. NRTFB was able to complete Sections 1,3 and 5. NRTFB also collected one day of survey data in section 4 but due to a week long weather system that moved into the area we were unable to fill holidays from that day. The Navigation Response Branch and NCCOS are planning to return to the area in 2022 or 2023 to complete the area.

#### A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
24° 52' 23.86" N 80° 34' 29.8" W	24° 41' 40.78" N 80° 50' 51.17" W

*Table 1: Survey Limits*



*Figure 1: Overview of survey area.*

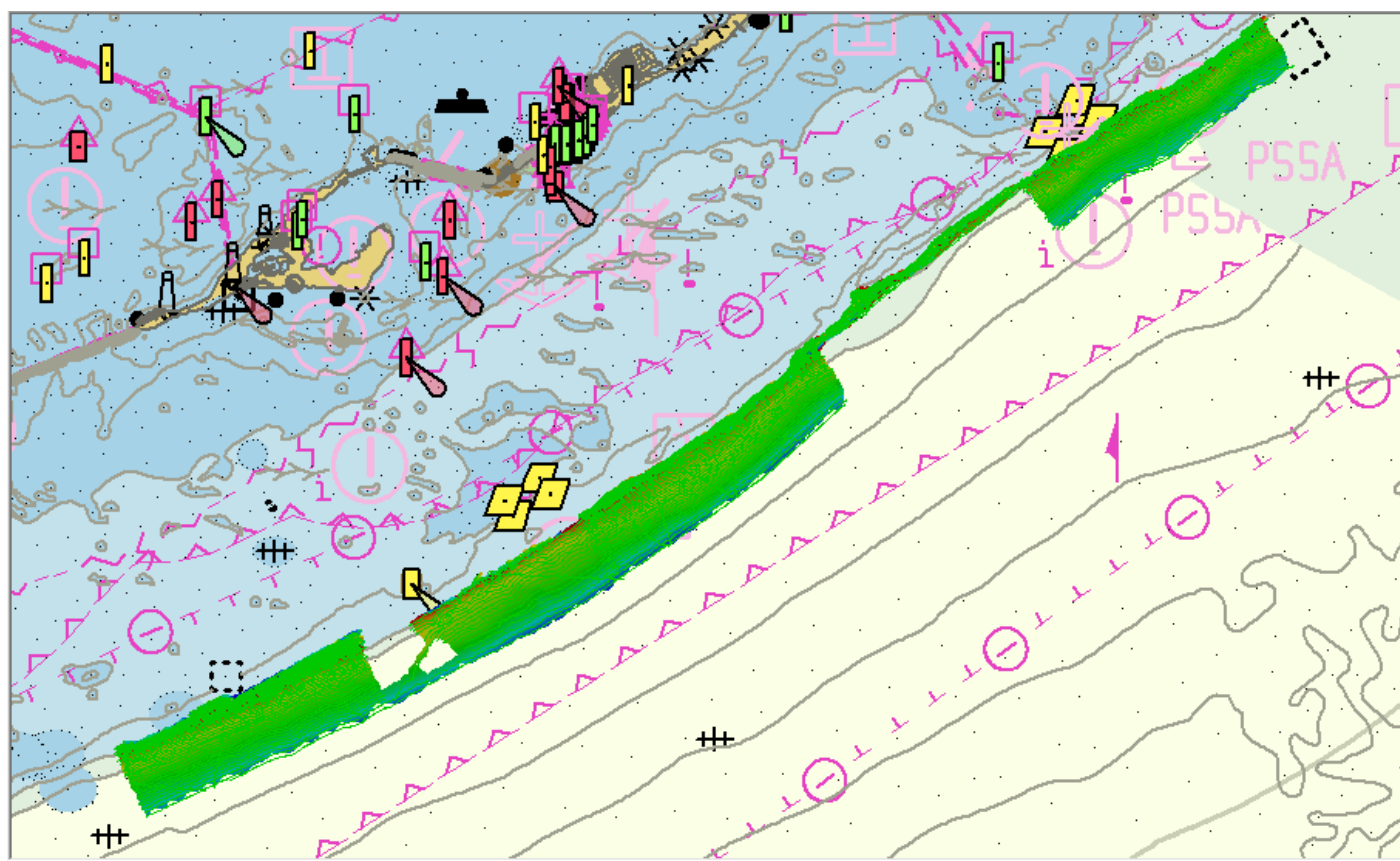
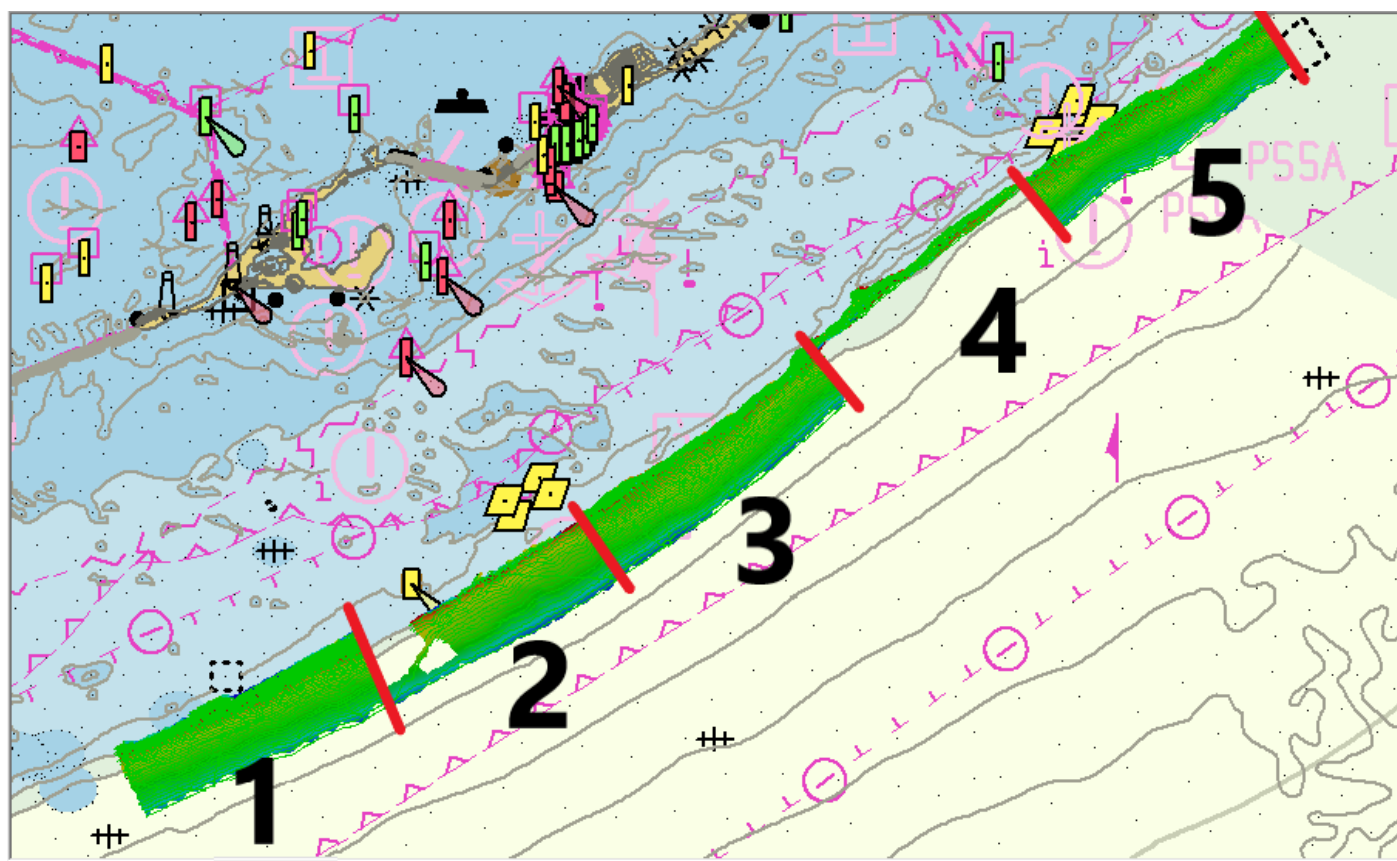


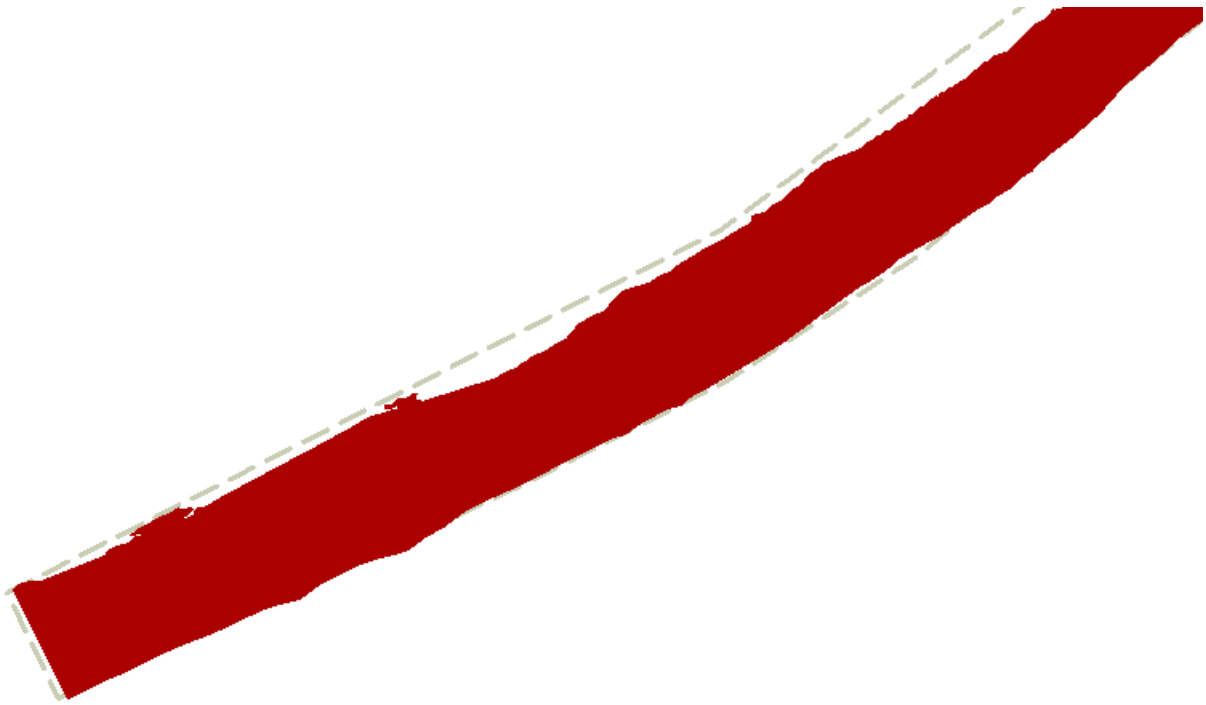
Figure 2: H13548 survey area.



*Figure 3: Breakdown of H13548 sections.*

The GIS files for H13548 were not received until survey operations were already underway. NRTFB used a shapefile provided by NMFS to cover the exact areas that they required. When we did receive the project GIS files the prf survey limits were not as precise as the NMFS shapefile, hence there are some areas where the prf limits are not surveyed.





*Figure 4: PRF and NMFS Shapefile difference.*

## **A.2 Survey Purpose**

The NCCOS and NMFS Southeast Fisheries Science Center request support by NRB to assist with hydrographic surveys (bathymetry and backscatter acquisition) to fill critical gaps in bathymetric survey coverage to support expansion of habitat maps and dive surveys of fishery resources. Additional stakeholders for this request include the Florida Keys National Marine Sanctuary and Florida Fish and Wildlife Commission. Survey data from this project is intended to supersede all prior survey data in the common area.

## **A.3 Survey Quality**

The entire survey is adequate to supersede previous data.

With the exception of small areas with holidays noted in this report.

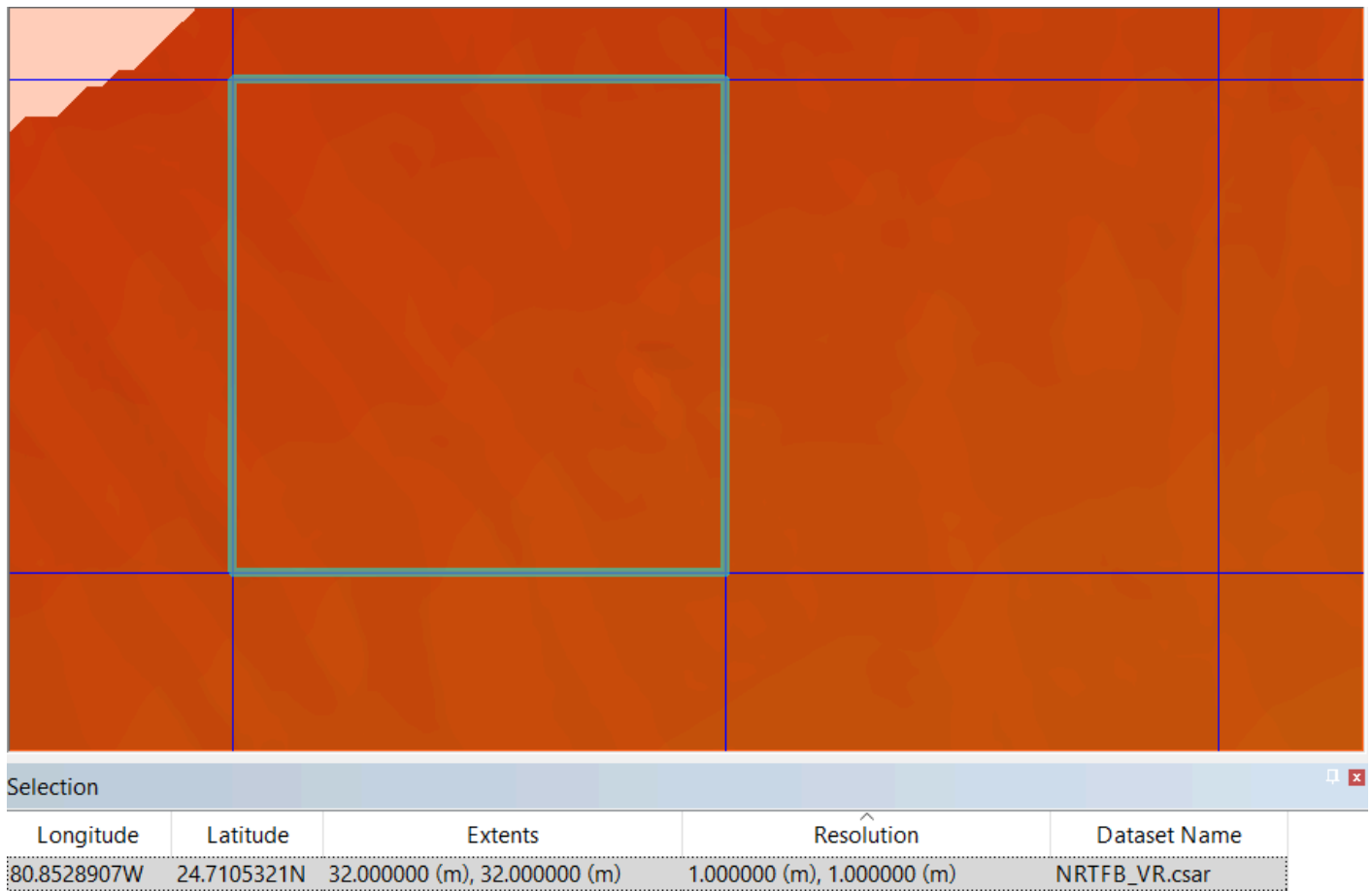
## **A.4 Survey Coverage**

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

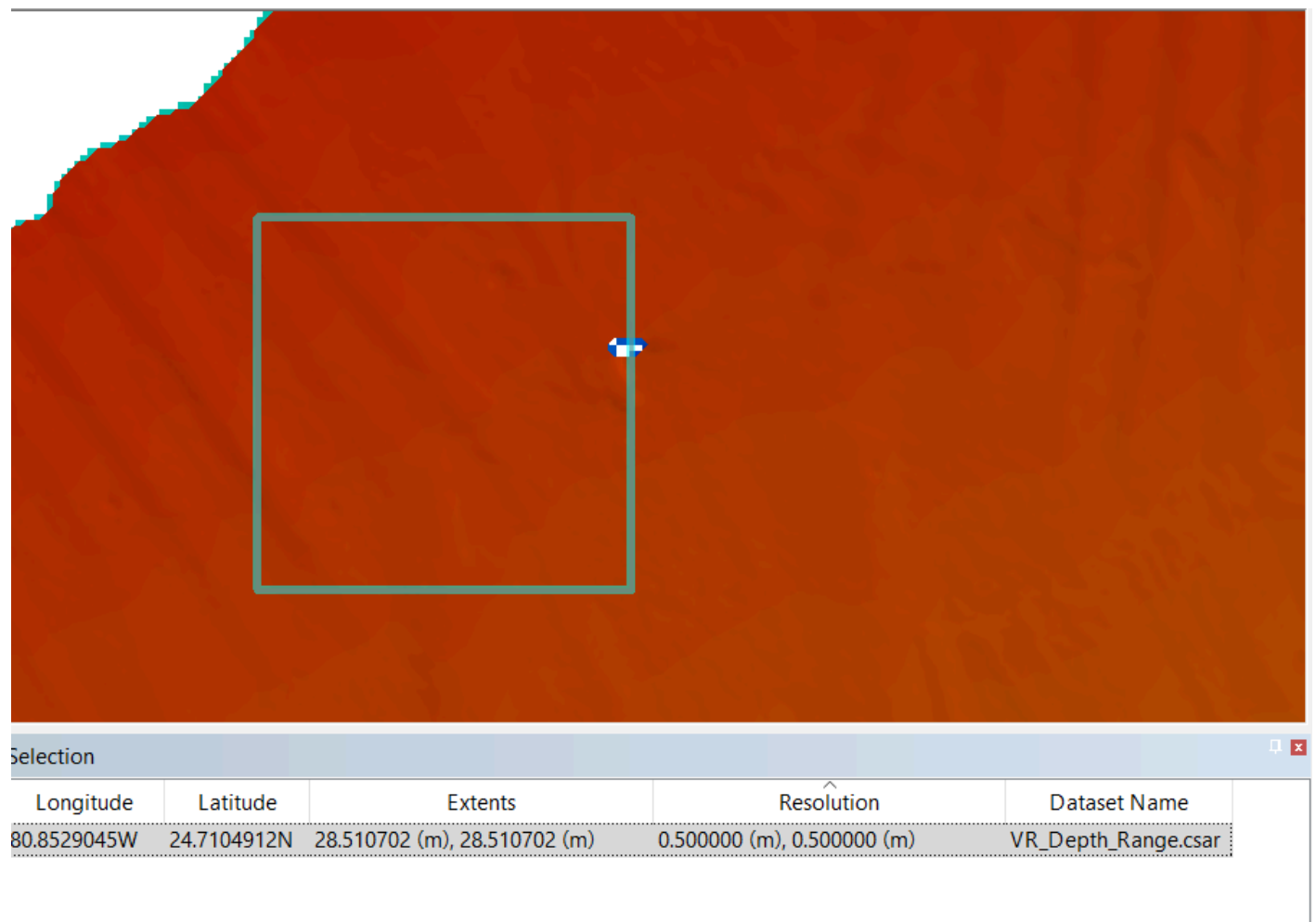
<b>Water Depth</b>	<b>Coverage Required</b>
Inshore limit to 20 meters water depth	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)
Greater than 20 meters water depth	Complete Coverage (Refer to HSSD Section 5.2.2.3)
All waters in survey area	Acquire backscatter data during all multibeam data acquisition (Refer to HSSD Section 6.2)

*Table 2: Survey Coverage*

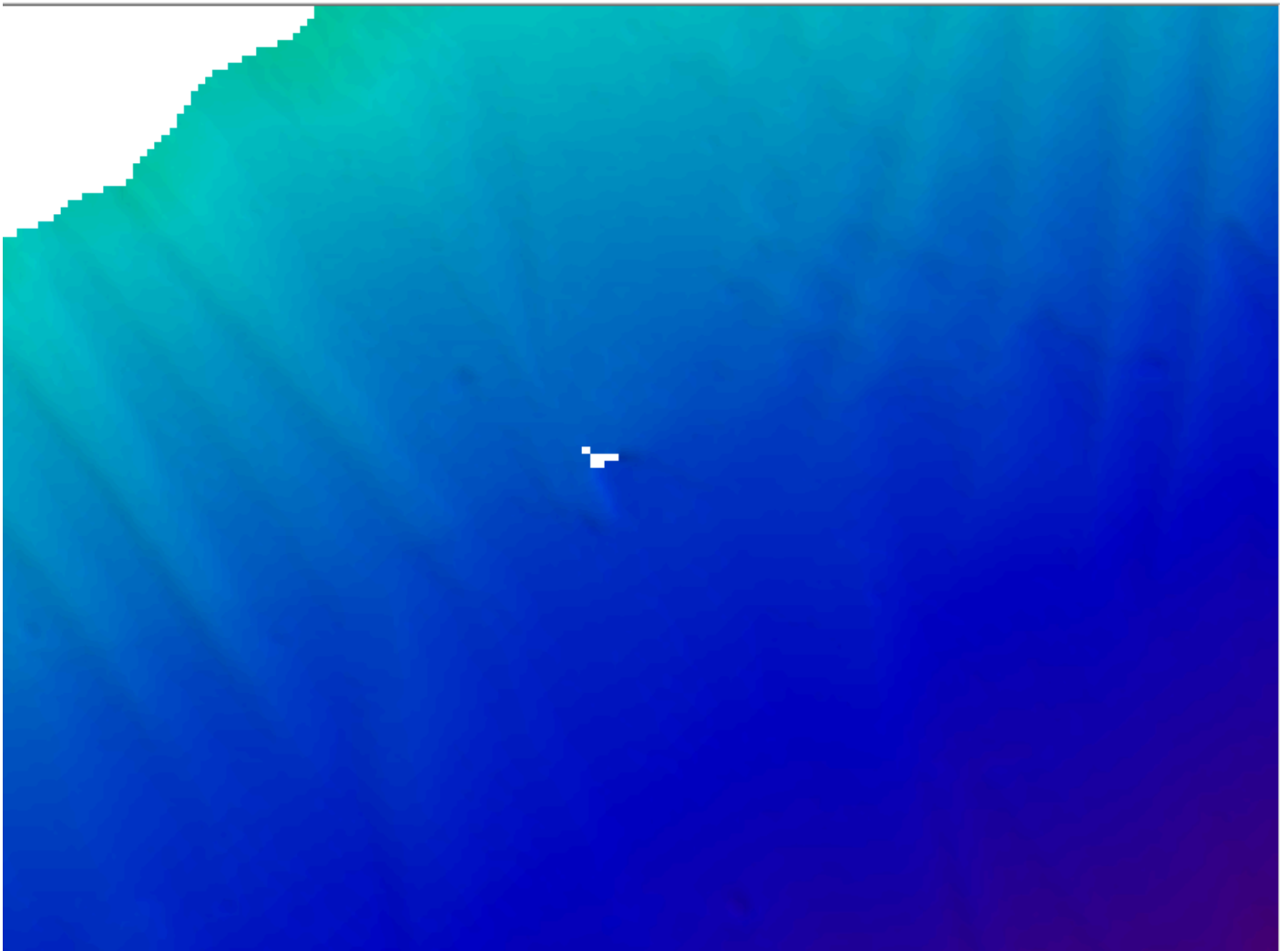
Holidays are present in the 50cm object detection surface. As a part of our nightly processing NRTFB created a Calder-Rice VR surface with a minimum resolution of 50cm to find holidays that were picked up on the next survey day. It was assumed that this surface truly was achieving 50cm resolution but was not verified in the field. After leaving the survey area it was realized that, although data density seemed sufficient, for an unknown reason the Calder-Rice surface did not achieve 50cm in depths less than 20m. This issue led to several holidays not being developed. Additionally, Area 2 and Area 4 have holidays due to time and weather constraints. NRTFB had one day to collect as much as possible of the inshore section of Area 4. Every attempt was made to limit holidays in real time but a few persisted. MIST also did not have an extra day to address holidays in Area 2 with bad weather moving in. Complete coverage was achieved in depths greater than 20m with no issues.



*Figure 5: No holiday in Calder-Rice VR surface.*



*Figure 6: Holiday in Depth Range VR surface.*



*Figure 7: Holiday in 50cm SR surface.*

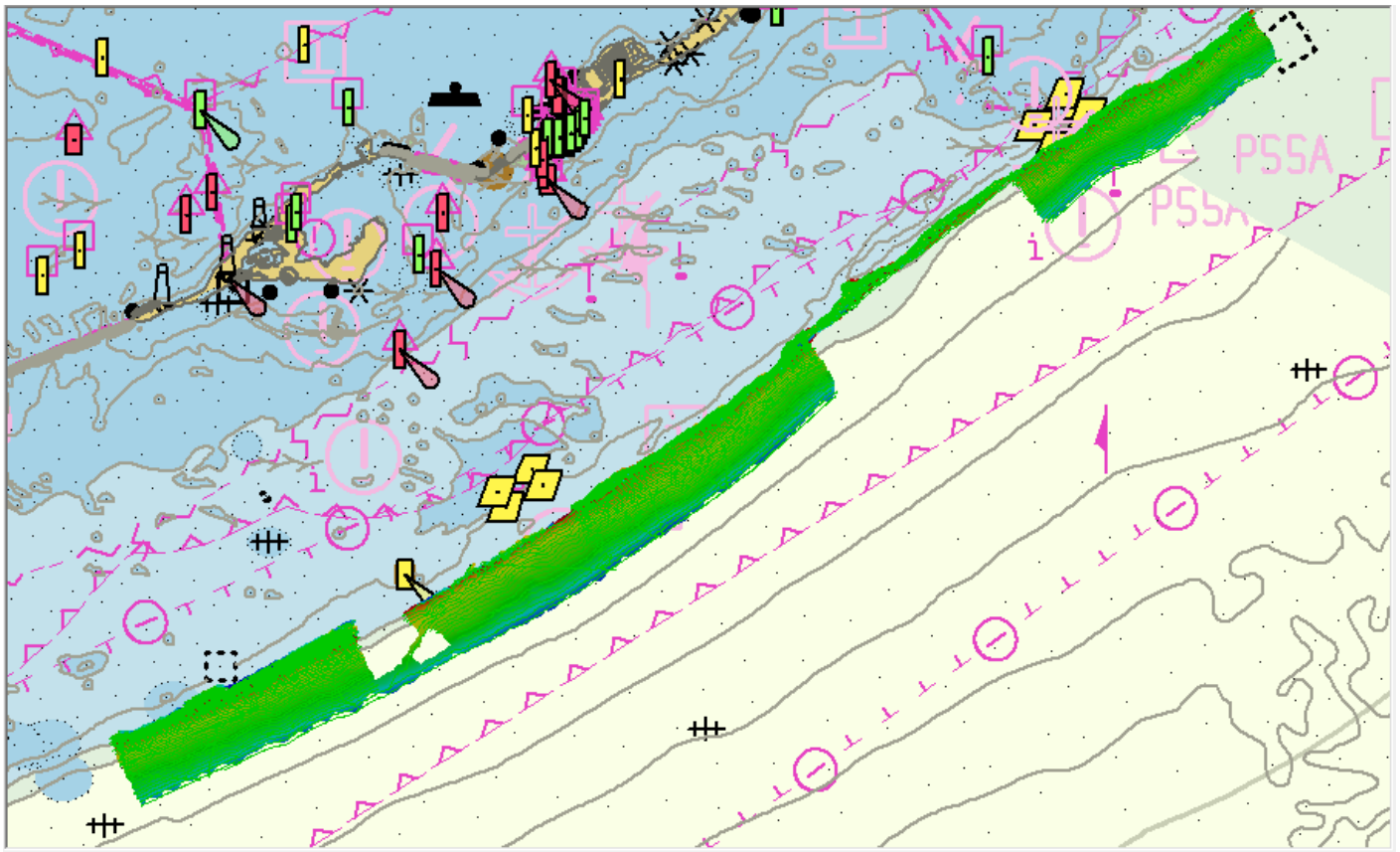


Figure 8: H13548 Coverage Graphic.

## A.6 Survey Statistics

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

	<b>HULL ID</b>	<i>S3009</i>	<i>MIST</i>	<i>Total</i>
<b>LNM</b>	<b>SBES Mainscheme</b>	0.0	0.0	0.0
	<b>MBES Mainscheme</b>	388.928	50.307	439.236
	<b>Lidar Mainscheme</b>	0.0	0.0	0.0
	<b>SSS Mainscheme</b>	0.0	0.0	0.0
	<b>SBES/SSS Mainscheme</b>	0.0	0.0	0.0
	<b>MBES/SSS Mainscheme</b>	0.0	0.0	0.0
	<b>SBES/MBES Crosslines</b>	15.107	3.905	19.091
	<b>Lidar Crosslines</b>	0.0	0.0	0.0
<b>Number of Bottom Samples</b>				0
<b>Number Maritime Boundary Points Investigated</b>				0
<b>Number of DPs</b>				0
<b>Number of Items Investigated by Dive Ops</b>				0
<b>Total SNM</b>				14.149

*Table 3: Hydrographic Survey Statistics*

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

<b>Survey Dates</b>	<b>Day of the Year</b>
10/05/2021	278
10/06/2021	279

<b>Survey Dates</b>	<b>Day of the Year</b>
10/07/2021	280
10/08/2021	281
10/11/2021	284
10/12/2021	285
10/13/2021	286
10/14/2021	287
10/15/2021	288
10/16/2021	289
10/17/2021	290

*Table 4: Dates of Hydrography*

NRTFB surveyed October 5th through October 16th and MIST surveyed on October 16th and 17th.

## **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:

<b>Hull ID</b>	<b><i>S3009</i></b>	<b><i>MIST</i></b>
<b>LOA</b>	10.0 meters	9.0 meters
<b>Draft</b>	0.5 meters	0.5 meters

*Table 5: Vessels Used*





*Figure 9: S3009*





*Figure 10: MIST*

### B.1.2 Equipment

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

<b>Manufacturer</b>	<b>Model</b>	<b>Type</b>
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MicroX SV	Sound Speed System
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Kongsberg Maritime	EM 2040C	MBES
Teledyne RESON	SeaBat T20-P	MBES

*Table 6: Major Systems Used*

## B.2 Quality Control

### B.2.1 Crosslines

Crosslines totaled 4.35% of the mainscheme acquisition. 556,476 comparison points yielded a mean difference of 0.02 meters and standard deviation of 0.16 meters.

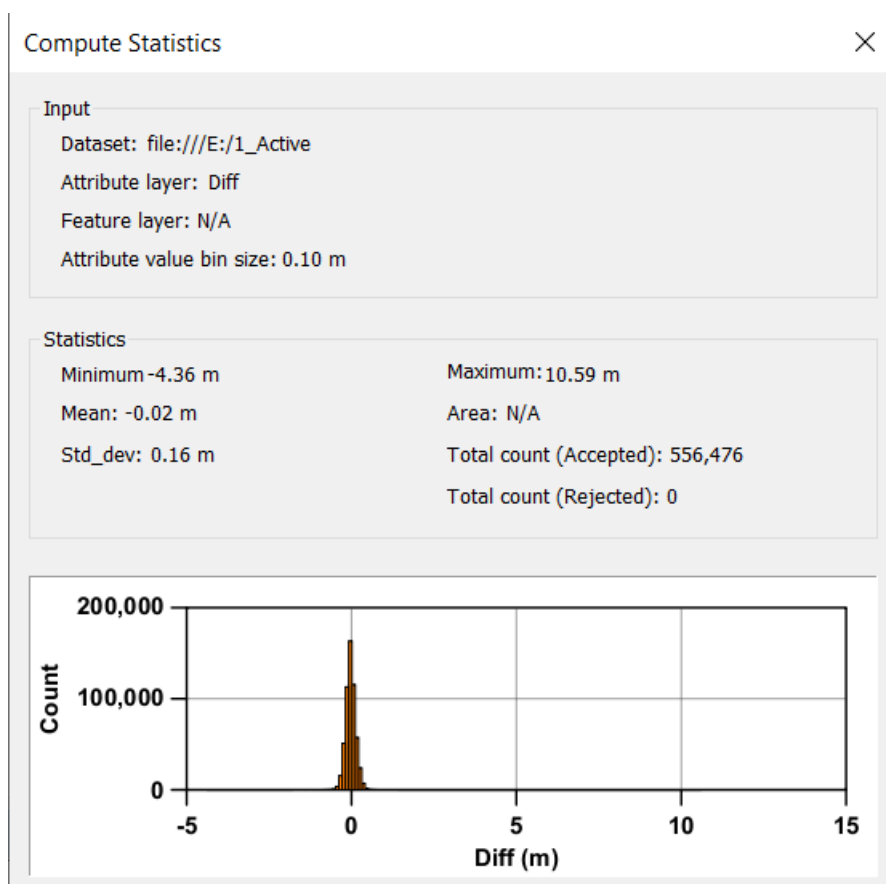


Figure 11: H13548 Crossline statistics.

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	9.4 centimeters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S3009	2 meters/second	0 meters/second	0 meters/second	0.5 meters/second
MIST	2 meters/second	0 meters/second	0 meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Sound speed uncertainty from manufacturers specs and cast frequency.

### **B.2.3 Junctions**

No junctions were assigned.

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**

#### Sea State

Sea state throughout the survey was challenging with larger than ideal waves and steep chop.





*Figure 12: NRTFB sea state.*



*Figure 13: NRTFB sea state.*

### **B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: Efforts were made to take a cast every 2 hours.

A total of 47 casts were taken by NRTFB. MIST took a total of 5 casts. Sound speed was generally consistent across the survey area.

### **B.2.8 Coverage Equipment and Methods**

100% MBES was used meet the requirements for Object Detection and Complete Coverage with the exceptions of the holidays discussed above.

## **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**

Backscatter was collected and delivered to NMFS for processing.

*During office review, GSF files and a mosaic were created for the backscatter data acquired by S3009. The backscatter data acquired by MIST was submitted in a format that was not able to be processed during office review.*

## **B.5 Data Processing**

### **B.5.1 Primary Data Processing Software**

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



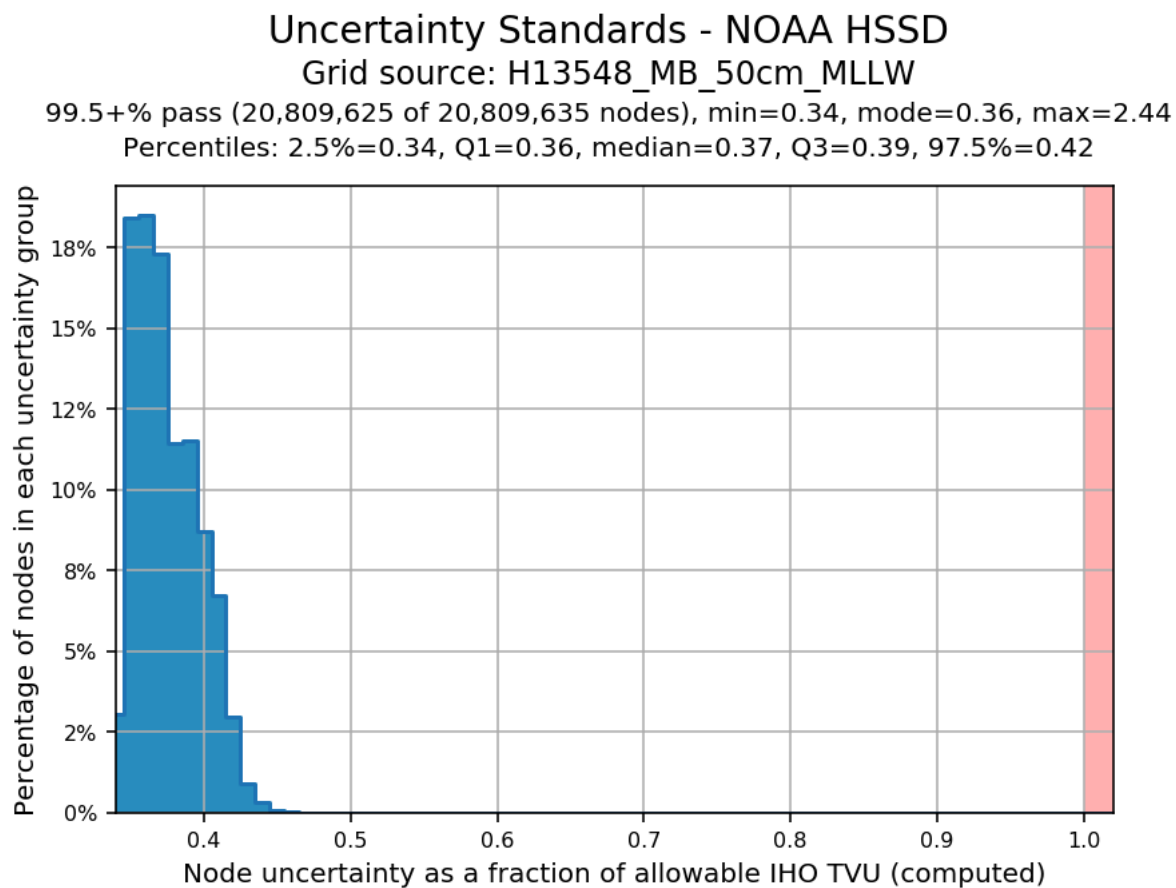
### B.5.2 Surfaces

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

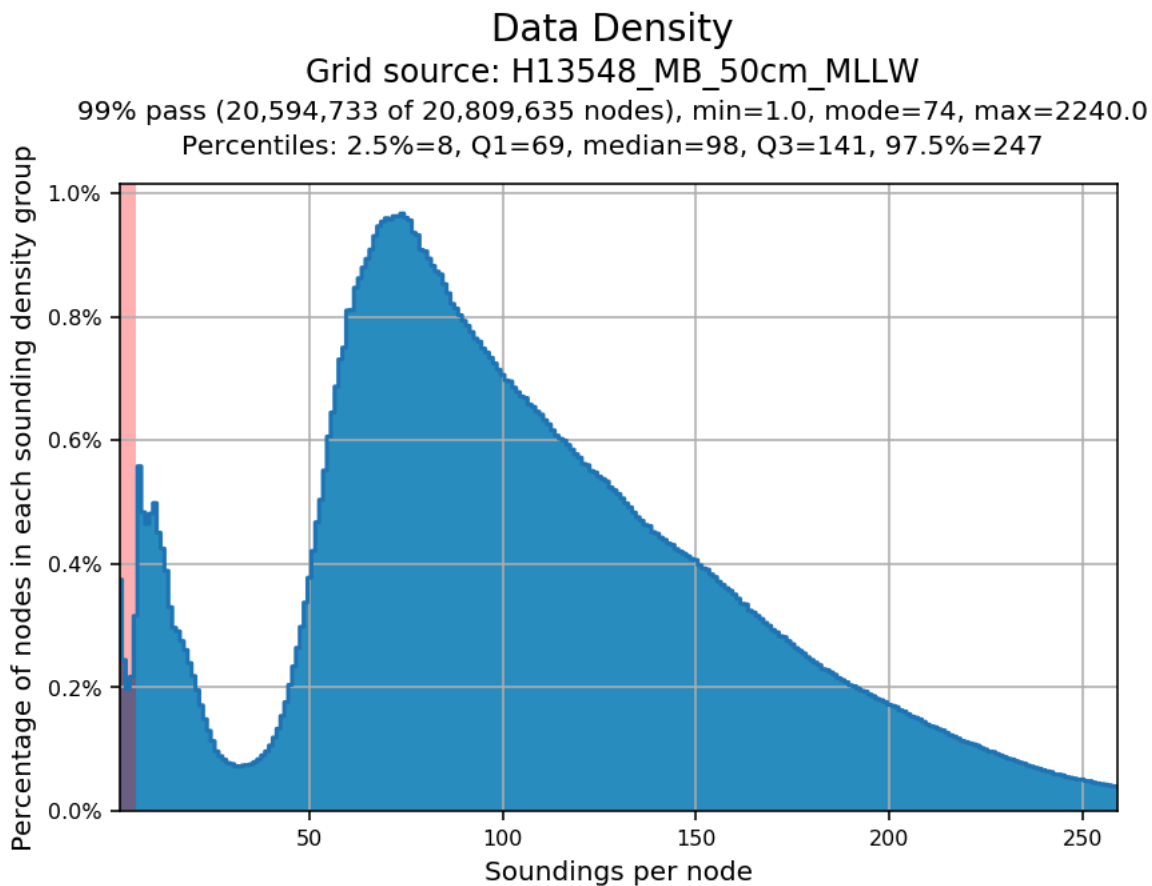
Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13548_MB_50cm_MLLW	CARIS Raster Surface (CUBE)	0.5 meters	10.56 meters - 20.0 meters	NOAA_0.5m	Object Detection
H13548_MB_50cm_MLLW_Final	CARIS Raster Surface (CUBE)	0.5 meters	10.56 meters - 20.0 meters	NOAA_0.5m	Object Detection
H13548_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	19.0 meters - 55.12 meters	NOAA_VR	Complete MBES
H13548_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	19.0 meters - 55.12 meters	NOAA_VR	Complete MBES

*Table 9: Submitted Surfaces*

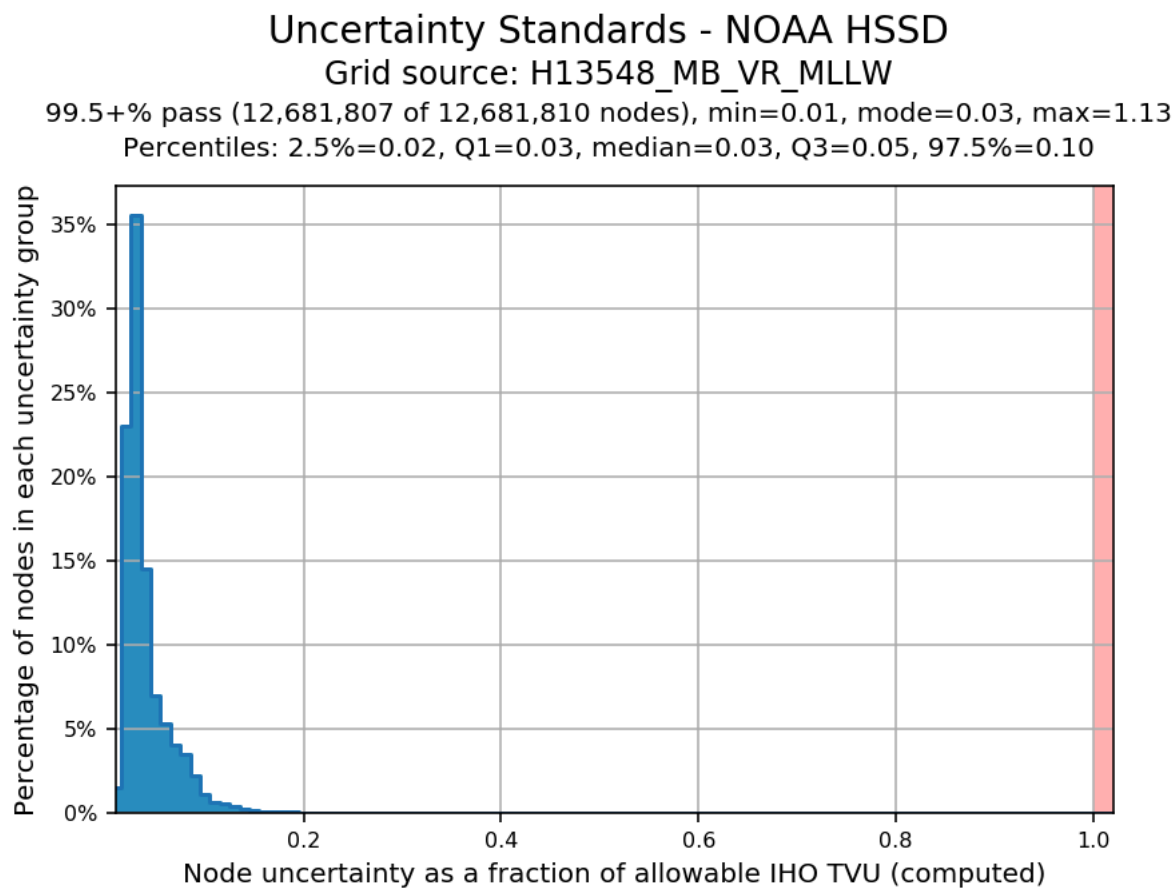
Two Caris CUBE surfaces were created to represent the bathymetry collected for Object Detection standards in depths less than 20 meters and Complete Coverage in depths greater than 20 meters. The Complete Coverage surface was created to include depths 19 meters and deeper to ensure sufficient overlap. Both surfaces were analyzed using QCTools and met TVU and Density specs.



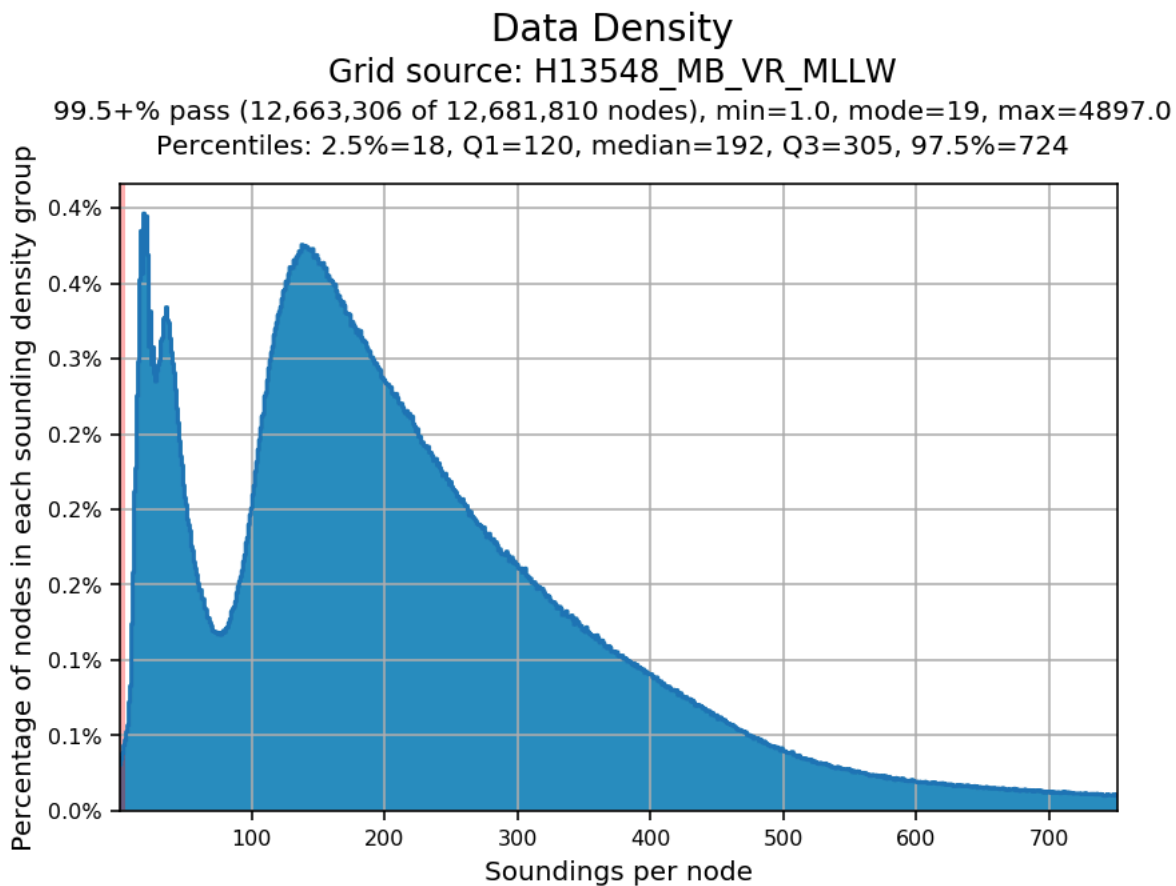
*Figure 14: MBES Object Detection uncertainty standards.*



*Figure 15: MBES Object Detection data density.*



*Figure 16: MBES Complete Coverage uncertainty standards.*



*Figure 17: MBES Complete Coverage data density.*

*During office review, a single variable resolution surface was generated and finalized using object detection parameters and has a final depth range of 10.527 m to 55.145 m. The final grid is fully compliant with uncertainty and data density requirements.*

## C. Vertical and Horizontal Control

Horizontal and vertical control stations were not established during the project.

## 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 ERTDM	OCS_NRT2_FY21_UpperKeys_100m_NAD83- MLLW_geoid12b.csar

*Table 10: ERS method and SEP file*

## 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 17.

The following PPK methods were used for horizontal control:

- RTX

### WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition.

## D. Results and Recommendations

### D.1 Chart Comparison

A sounding layer was created and compared to chart data. H13548 soundings are in good agreement with charted depths.

### D.1.1 Electronic Navigational Charts

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US4FL26M	1:80000	13	12/14/2021	12/14/2021
US5FL25M	1:40000	15	12/12/2018	04/20/2021
US5FL29M	1:40000	20	12/14/2021	12/14/2021

*Table 11: Largest Scale ENC's*

### D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

### D.1.3 Charted Features

No charted features exist for this survey.

*Two charted features exist for this survey. Neither feature was formally addressed by the survey and have been recommended to be retained.*

### 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.

*One ATON exists within the limits of survey coverage but was not formally addressed by the survey. It has been recommended to be retained.*

**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**

Additional surveys are planned to complete the original project extents.



**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
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KIRKPATRICK.JAMES.L  
EROY.IV.1400487398

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KIRKPATRICK.JAMES.LEROY.IV.1400  
487398  
Date: 2022.02.08 16:00:47 -05'00'

## F. Table of Acronyms

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

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

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