

H13790

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area
Habitat Mapping

Registry Number: H13790

LOCALITY

State(s): Florida

General Locality: Florida Keys

Sub-locality: Turtle Reef to Brewster Reef

2023

CHIEF OF PARTY
James Kirkpatrick

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

H13790

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): **Florida**

General Locality: **Florida Keys**

Sub-Locality: **Turtle Reef to Brewster Reef**

Scale: **20000**

Dates of Survey: **04/19/2023 to 08/03/2023**

Instructions Dated: **09/15/2023**

Project Number: **S-H902-NRTFB-23**

Field Unit: **NOAA Navigation Response Team - Fernandina**

Chief of Party: **James Kirkpatrick**

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 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.

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Descriptive Report to Accompany Survey H13790

Project: S-H902-NRTFB-23

Locality: Florida Keys

Sublocality: Turtle Reef to Brewster Reef

Scale: 1:20000

April 2023 - August 2023

NOAA Navigation Response Team - Fernandina

Chief of Party: James Kirkpatrick

A. Area Surveyed

H13790, encompassing an area from Turtle Reef in the south to just north of Port Everglades, was surveyed from the reef break eastward to the 60 meter isobath.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
26° 8' 50.34" N 80° 4' 40.7" W	25° 17' 27.36" N 80° 9' 23.16" W

Table 1: Survey Limits

Survey Limits were acquired in accordance with the requirements in the Project Instructions and the HSSD. The northernmost area was assigned while on project when NRTFB had completed the original limits. Unfinished areas will be completed in 2024. Project Instructions were updated to make H13790 all inclusive rather than split sheets.

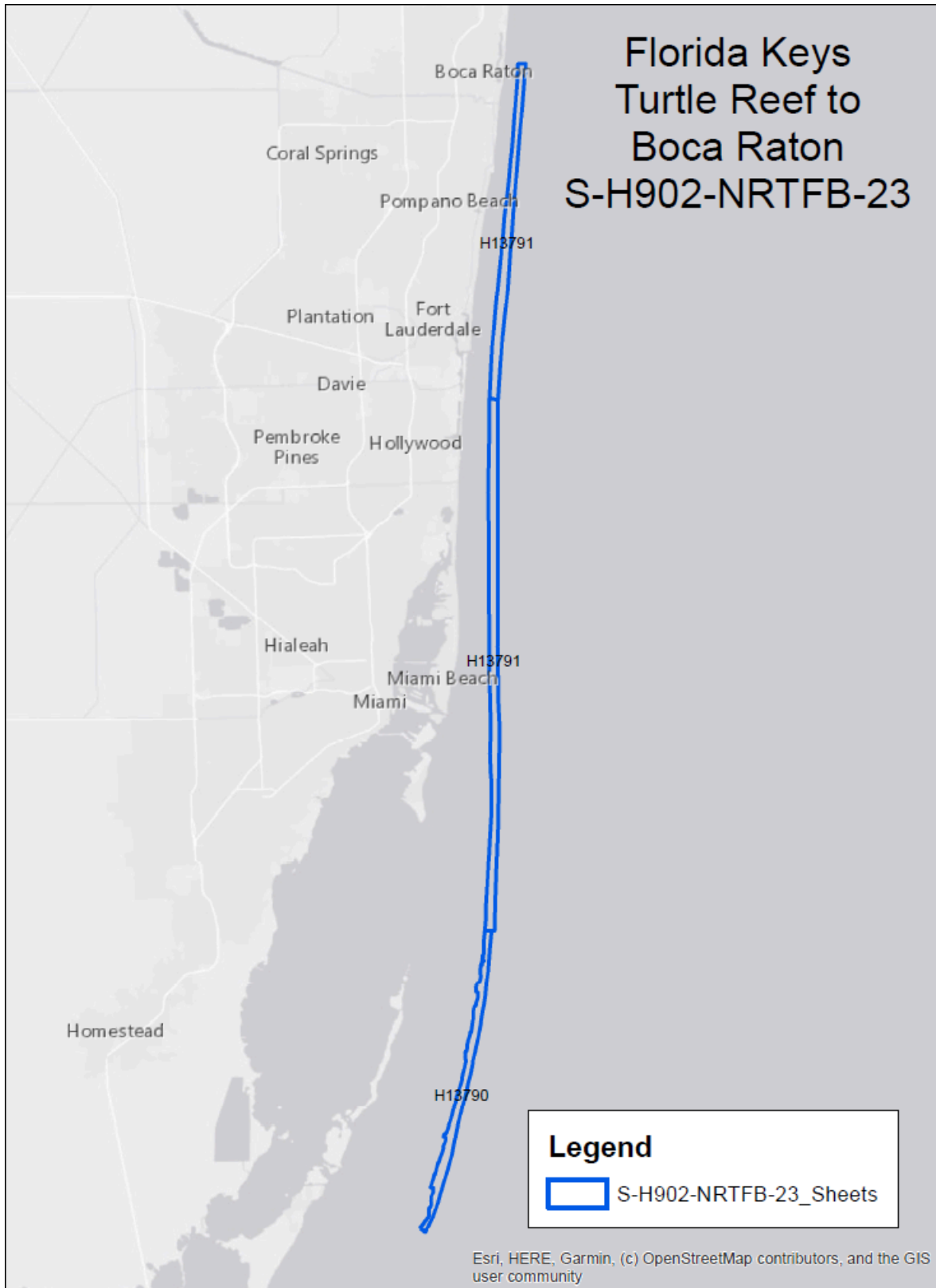


Figure 1: H13790 survey limits.

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 bathymetry 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.

A.4 Survey Coverage

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

Water Depth	Coverage Required
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

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

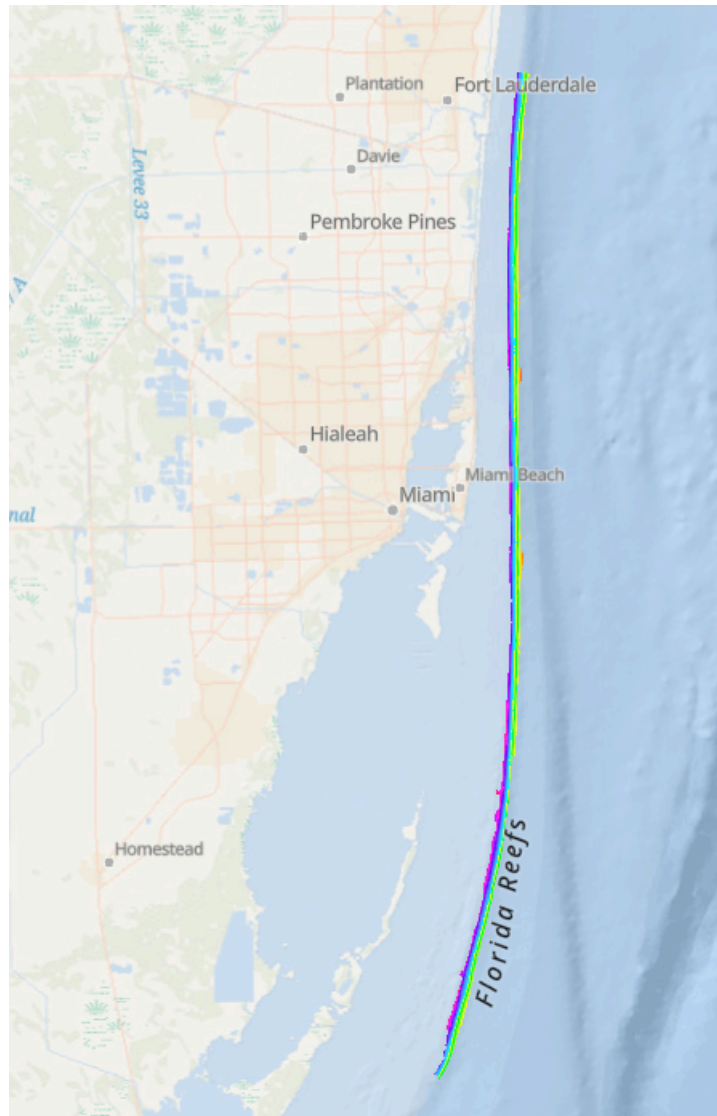


Figure 2: H13790 coverage graphic.

A.6 Survey Statistics

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

	HULL ID	<i>S3009</i>	<i>Total</i>
LNM	SBES Mainscheme	0.0	0.0
	MBES Mainscheme	638.0	638.0
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0
	SBES/MBES Crosslines	33.0	33.0
	Lidar Crosslines	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			27.8

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
04/19/2023	109
04/20/2023	110

Survey Dates	Day of the Year
04/21/2023	111
04/22/2023	112
04/23/2023	113
04/24/2023	114
04/25/2023	115
04/29/2023	119
05/01/2023	121
05/02/2023	122
07/11/2023	192
07/12/2023	193
07/13/2023	194
07/14/2023	195
07/17/2023	198
07/18/2023	199
07/20/2023	201
07/21/2023	202
07/24/2023	205
07/26/2023	207
08/01/2023	213
08/02/2023	214
08/03/2023	215

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	<i>S3009</i>
LOA	10.0 meters
Draft	0.5 meters

Table 5: Vessels Used



Figure 3: S3009.

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040C	MBES
Kongsberg Maritime	EM 2040C	MBES Backscatter
Applanix	POS MV 320 v5	Positioning and Attitude System
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MicroX SV	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines and mainscheme soundings are in good agreement throughout the survey area. Crosslines totaled 5.1% of mainscheme. Crosslines versus mainscheme comparison revealed a mean difference of 0.00m and a standard deviation of 0.16m.

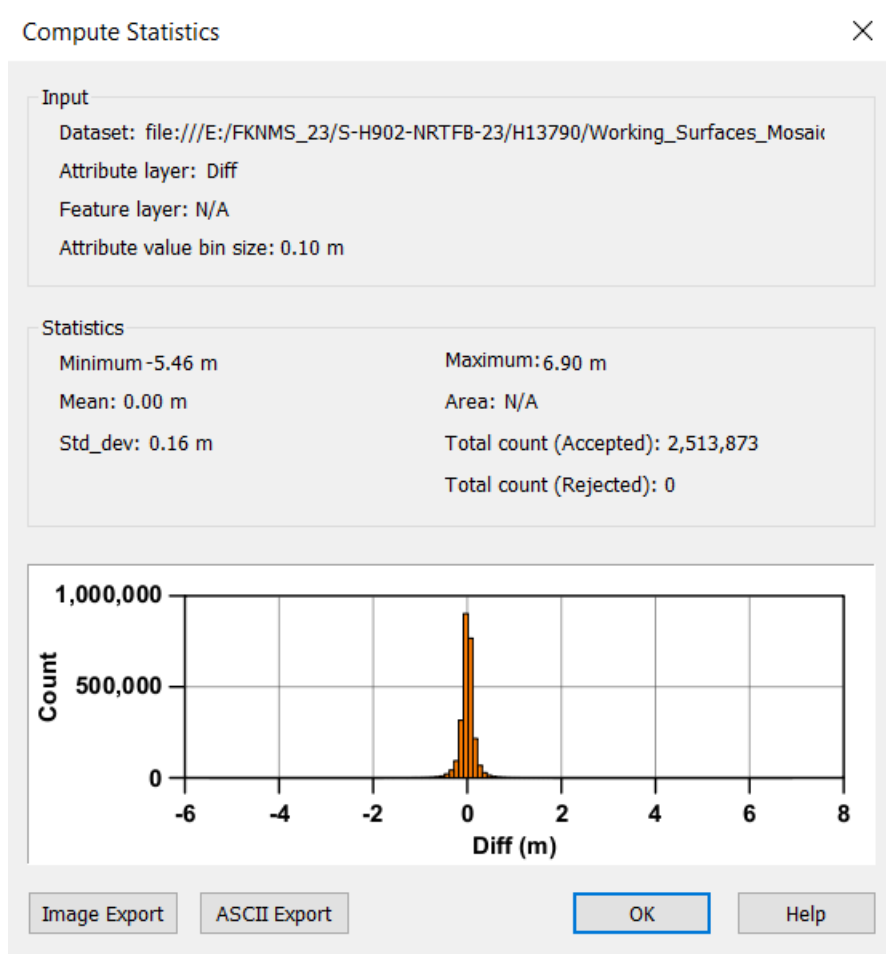


Figure 4: Crossline comparison.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	9.7 centimeters	0.0 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S3009	2.0 meters/second	N/A	N/A	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Uncertainty provided in Project Instructions and from sound speed instrument manufacturers.

B.2.3 Junctions

Survey data compared with H13656 was in good general agreement.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13656	1:10000	2022	NRTFB	SW

Table 9: Junctioning Surveys

H13656

Junction difference statistical analysis performed in Caris HIPS and SIPS shows a mean difference of 0.24 meters. This is most likely attributed to H13656 being tidally corrected using TCARI.

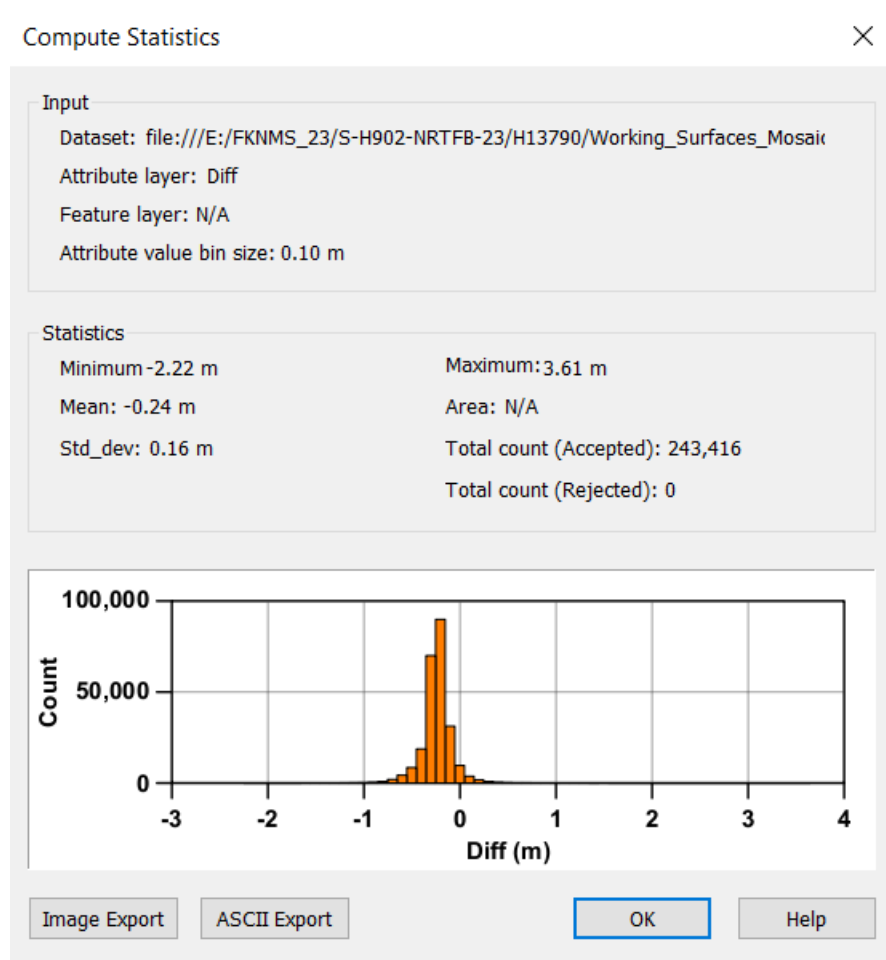


Figure 5: Junction difference statistics.

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

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: Sound velocity measurements were taken at least every two hours or when the surface sound speed differed significantly from the most recent cast.

B.2.8 Coverage Equipment and Methods

100% multibeam was acquired throughout the assigned survey area. Two areas within the survey limits contain coverage holidays caused by a steep slope. Several areas outside of the survey limits have object detection holidays over shallow reef.

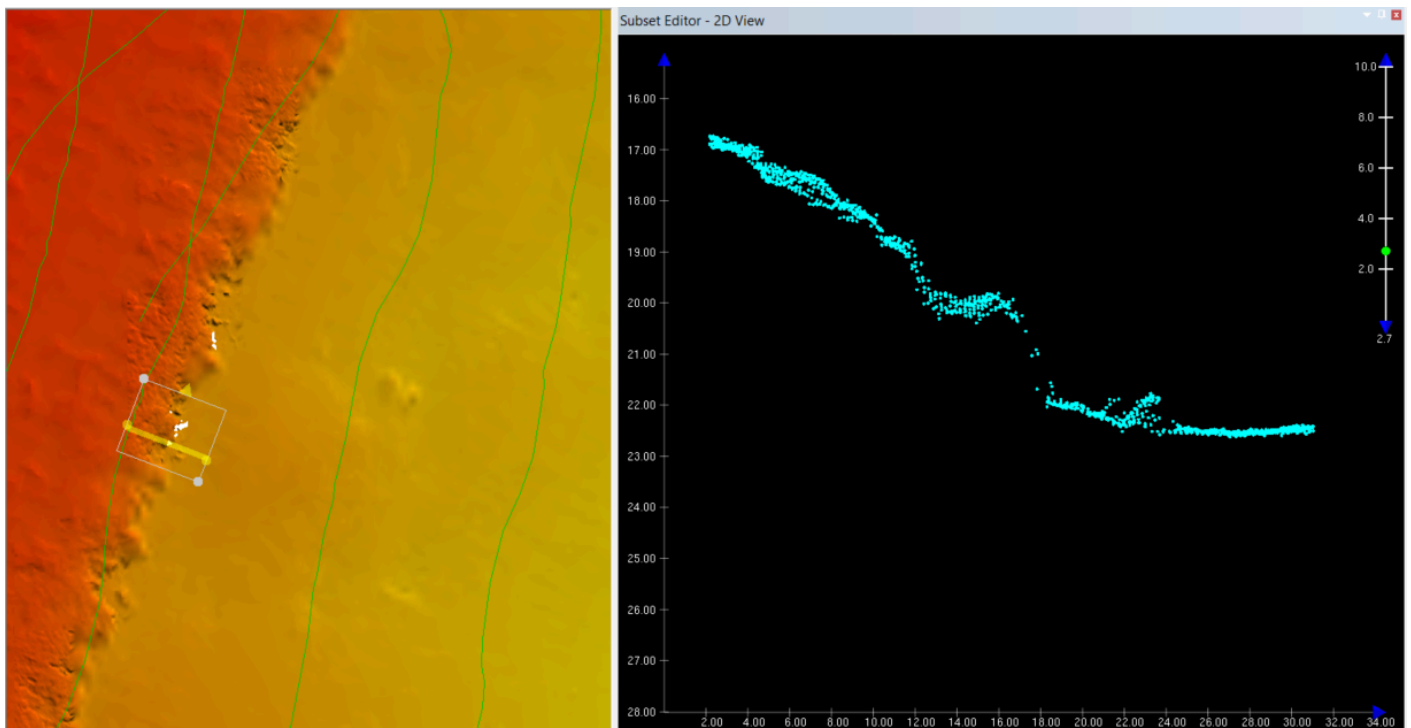


Figure 6: Holiday area caused by steep drop-off.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

A 12ms attitude delay between the POSMV and Kongsberg MBES was discovered about halfway through this project. The 12ms corrector was applied in SIS after discovery. To correct the data acquired before the discovery Roll, Pitch and Gyro were applied manually from the SBET and then the data was re-georeferenced.

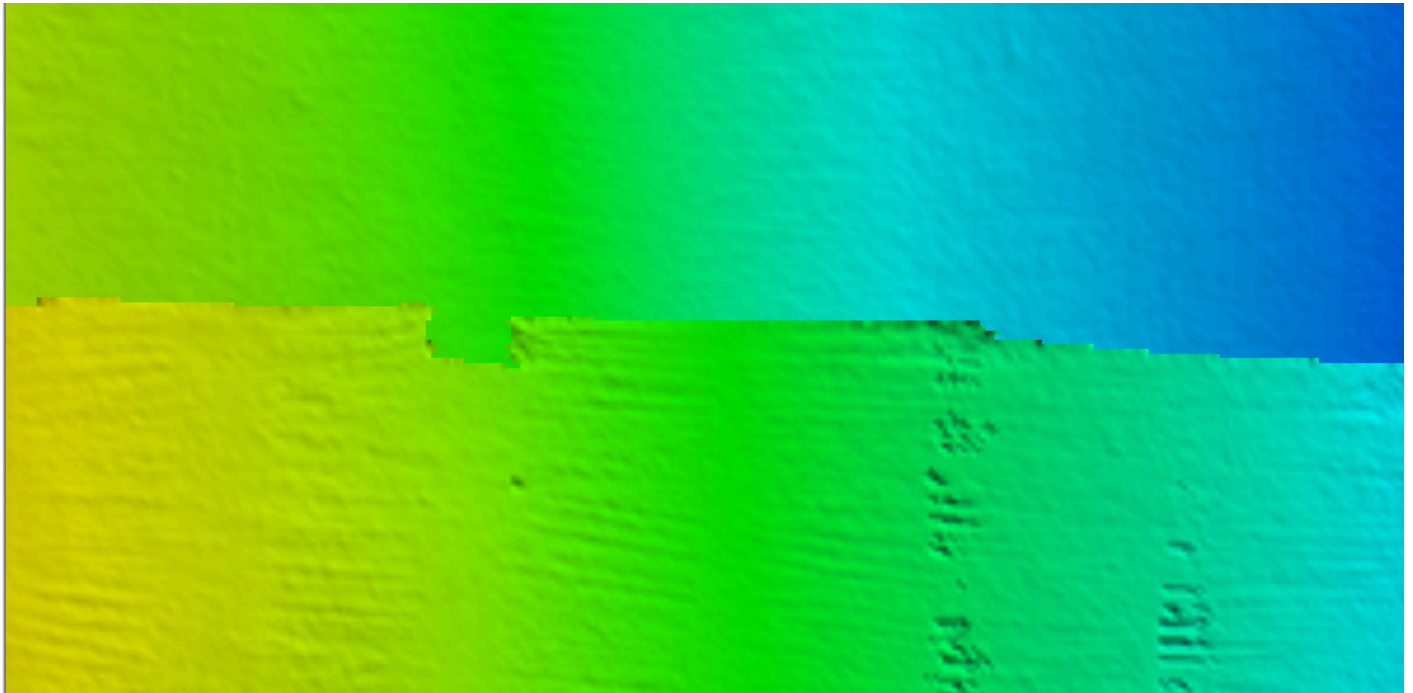


Figure 7: Latency correction.

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.

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	11.4.26

Table 10: Primary bathymetric data processing software

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

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.4.26
QPS	Fledermaus	7.10.2

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2022v2.

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
H13790_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	5.58 meters - 77.05 meters	NOAA_VR	Complete MBES
H13790_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	5.58 meters - 77.05 meters	NOAA_VR	Complete MBES
H13790_MBAB_2m_S3009_300kHz_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES

Table 12: Submitted Surfaces

The CUBE VR surface was created using a custom range resolution vs. depth file created by NRTFB. Depths of 20m and less are gridded according to Object Detection standards while depths greater than 20m are gridded to Complete Coverage standards per HSSD. A 50cm single resolution surface was also created for depths 20m and shoaler in order to perform Object Detection QA/QC. Specifications were met easily.

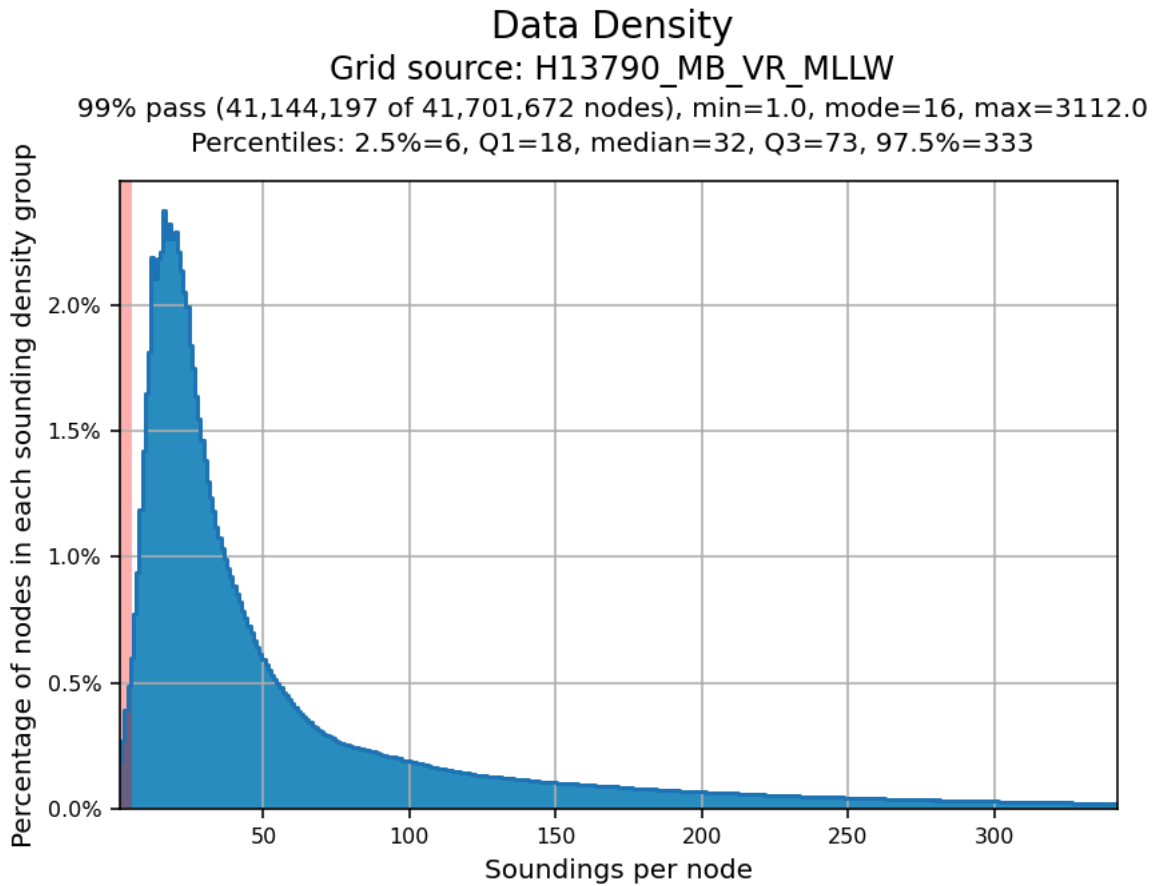


Figure 8: Complete Coverage Density.

Uncertainty Standards - NOAA HSSD

Grid source: H13790_MB_VR_MLLW

99.5+% pass (41,698,847 of 41,701,672 nodes), min=0.00, mode=0.03, max=7.47

Percentiles: 2.5%=0.01, Q1=0.03, median=0.04, Q3=0.06, 97.5%=0.14

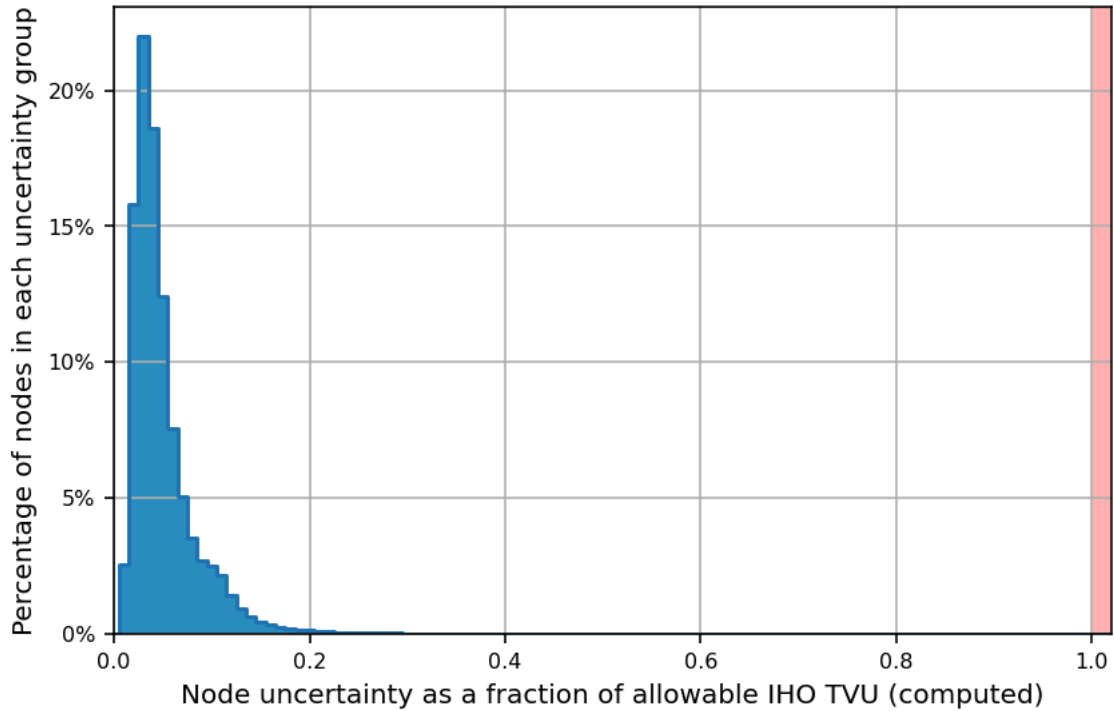


Figure 9: Complete Coverage Uncertainty.

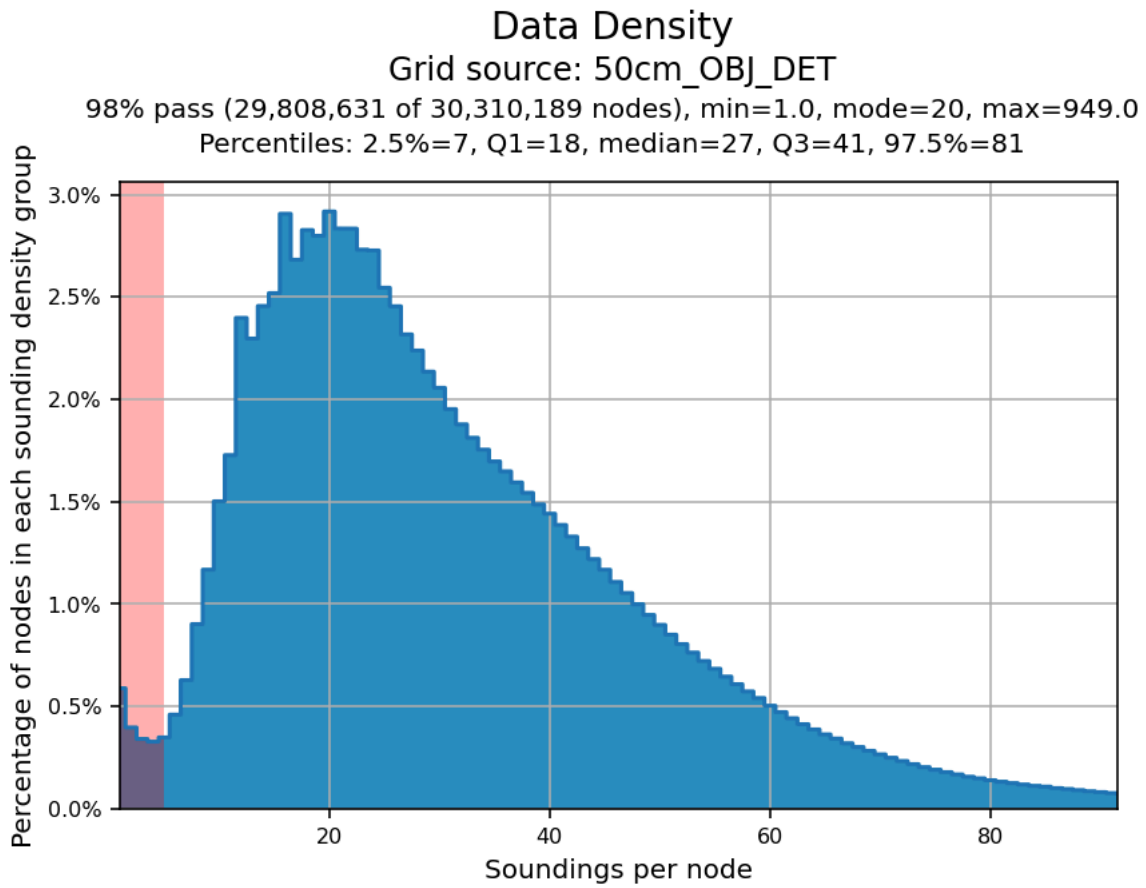


Figure 10: Object Detection Density.

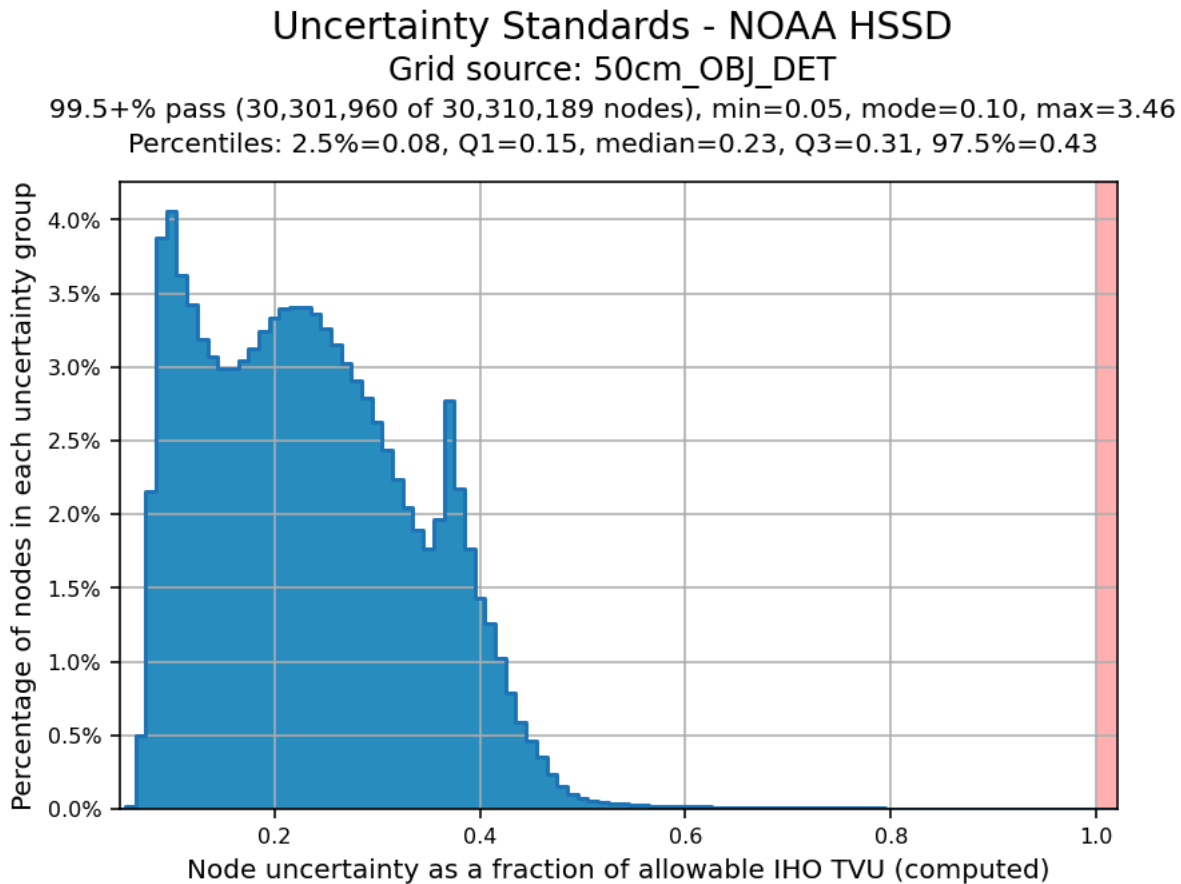


Figure 11: Object Detection Uncertainty.

C. Vertical and Horizontal Control

Horizontal and vertical control stations were not established during the project. Per FPM section 5.2.3.2.3 a HVCR report was not filed as horizontal and vertical control stations were not established by the field party for this survey. POSPAC data was logged to create a statistical best estimate of trajectory file (SBET) to help improve horizontal positioning. Vertical control was established with ERS via VDATUM.

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	S-H902-NRTFB-23_VDatum_100m_NAD83_2011- MLLW_geoid18

Table 13: ERS method and SEP file

Sounding elevations relative to the ellipsoid were collected through Ellipsoidal Referenced Survey (ERS) with post-processing of the daily logged POSpac data to create a statistical best estimate of trajectory (SBET) file, as detailed in the DAPR. All of H13790 meets HSSD vertical accuracy requirements.

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

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
US4FL20M	1:80000	18	04/07/2023	08/17/2023
US5FL21M	1:40000	33	08/30/2022	08/30/2022
US5FL22M	1:12000	55	04/27/2023	04/27/2023
US5FL24M	1:40000	32	04/07/2023	04/07/2023
US5FL33M	1:10000	60	06/06/2023	06/06/2023
US4FL31M	1:80000	55	07/11/2023	07/11/2023

Table 14: Largest Scale ENC's

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey. No DTON reports were submitted for H13790.

D.1.3 Charted Features

Several of the charted Fish Havens need to be evaluated and possibly updated to include wrecks that exist outside of their boundaries.

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. Mooring buoys in the Florida Keys National Marine Sanctuary and Biscayne National Park in or near the survey area were added in the Final Feature File. It would be prudent to contact these entities for any updated mooring buoy information. On station ATONs are not included in the FFF per 2022 HSSD.

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

Several cable areas and sewer outfalls are included in the FFF.

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

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
James L. Kirkpatrick	Chief of Party	10/06/2023	KIRKPATRICK.JA MES.LEROY.IV.1 400487398  Digitally signed by KIRKPATRICK.JAMES.LEROY .IV.1400487398 Date: 2023.10.06 11:15:44 -04'00'

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