H13432

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area Habitat Mapping
Registry Number:	H13432

LOCALITY

State(s):	Florida
General Locality:	Key West
Sub-locality:	South of Marquesas

2021

CHIEF OF PARTY
David J. Bernstein, CH, PLS, GISP

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13432**

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:	**Key West**
Sub-Locality:	**South of Marquesas**
Scale:	**5000**
Dates of Survey:	**05/26/2021 to 06/23/2021**
Instructions Dated:	**02/17/2021**
Project Number:	**OPR-H355-KR-21**
Field Unit:	**Geodynamics LLC**
Chief of Party:	**David J. Bernstein, CH, PLS, GISP**
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 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 H13432

Project: OPR-H355-KR-21

Locality: Key West

Sublocality: South of Marquesas

Scale: 1:5000

May 2021 - June 2021

Geodynamics LLC

Chief of Party: David J. Bernstein, CH, PLS, GISP

A. Area Surveyed

Geodynamics LLC conducted a hydrographic survey in the assigned area of H13432 located south of Marquesas, Florida. Within H13432, all survey operations were conducted in accordance with the provided Statement of Work (SOW), Hydrographic Survey Project Instructions (PI), and the April 2021 National Ocean Service (NOS) Hydrographic Survey Specifications and Deliverables (HSSD). Any deviations from the aforementioned guidelines have been approved by the National Oceanographic and Atmospheric Administration (NOAA) Hydrographic Survey Division (HSD) Operations (OPS) branch and are documented in the survey correspondences.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
24° 32' 15.09" N 82° 17' 4.46" W	24° 28' 45.4" N 82° 0' 58.92" W

Table 1: Survey Limits

Data were acquired to the survey limits in accordance with the requirements listed in the PI and the HSSD.

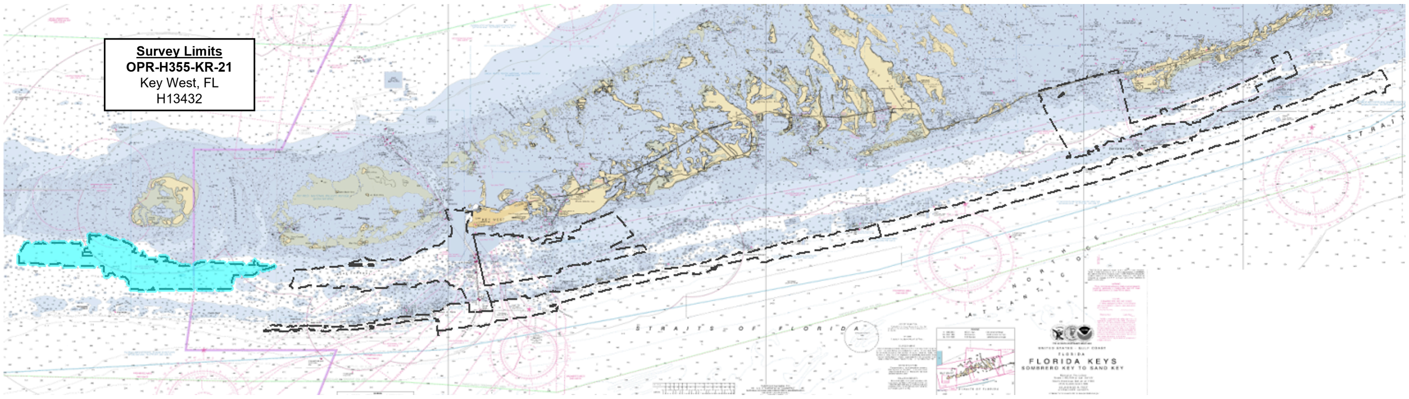


Figure 1: Overview of project survey limits (H13432 shown in blue), overlaid onto Charts 11439, 11442, and 11452

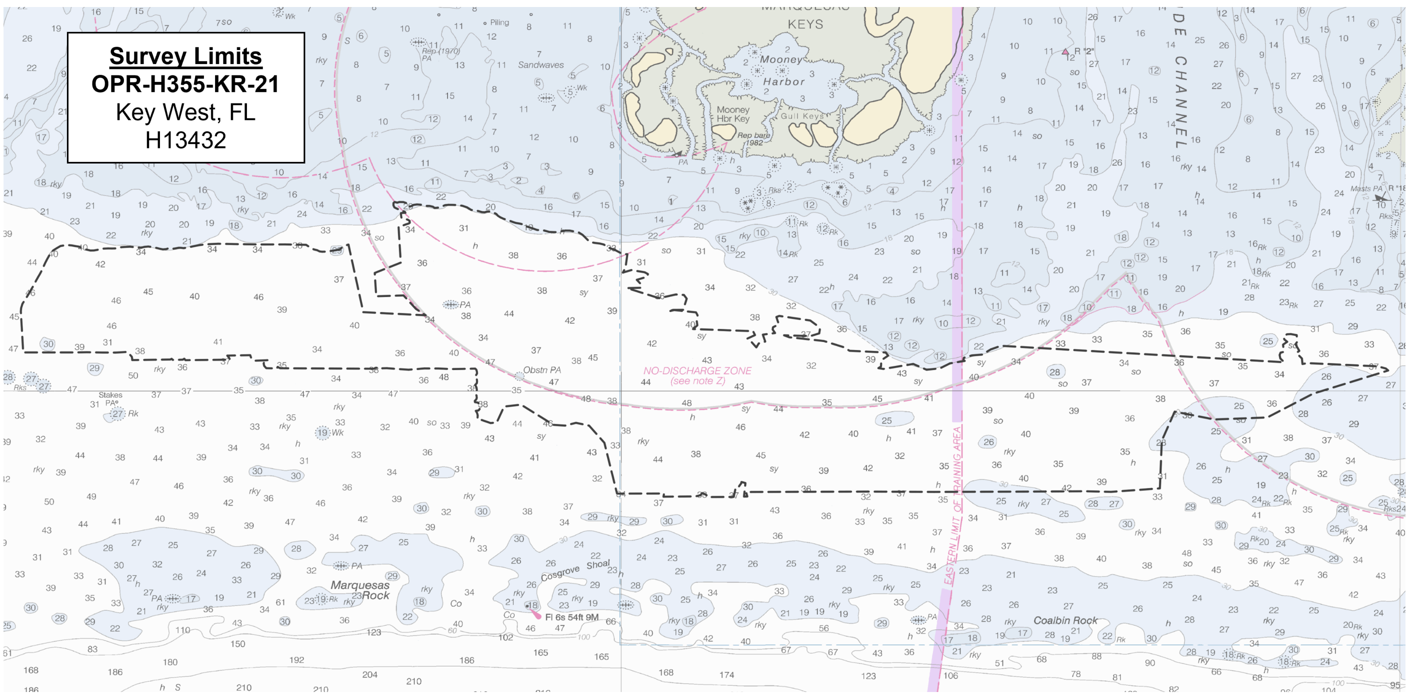


Figure 2: H13432 survey limits overlaid onto Chart 11439

A.2 Survey Purpose

This project is located within the Florida Keys National Marine Sanctuary, with survey areas focused along the outer reef shelf as well as Hawk Channel, which is located in between the Keys and the barrier reef. Much of the 149 SNM survey area has not been surveyed since the 1950s, and many commercial and recreational boaters utilize Hawk Channel and the waters surrounding the coral reef for fishing, recreation, and other uses.

Conducting a modern bathymetric survey with concurrent backscatter data in this area will provide critical data for the updating of NOS nautical charting products and services to increase maritime safety near the waters of the Florida Keys, and help classify the habitat of the reefs. 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.

Survey quality in H13432 meets or exceeds requirements set forth in the HSSD. Survey quality was assessed through visual inspection, the analysis of crosslines, and utilizing QC Tools to assess uncertainty and density. Additionally, a junction analysis was conducted between H13432 and 2019 NOAA National Geodetic Survey (NGS) lidar data. For more information on methods and results of the survey data quality assessments for this survey, refer to section B.2 of this report.

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

The entirety of H13432 was acquired with complete coverage in accordance with section 5.2.2.3 of the HSSD. See Figure 3 for an overview of coverage.

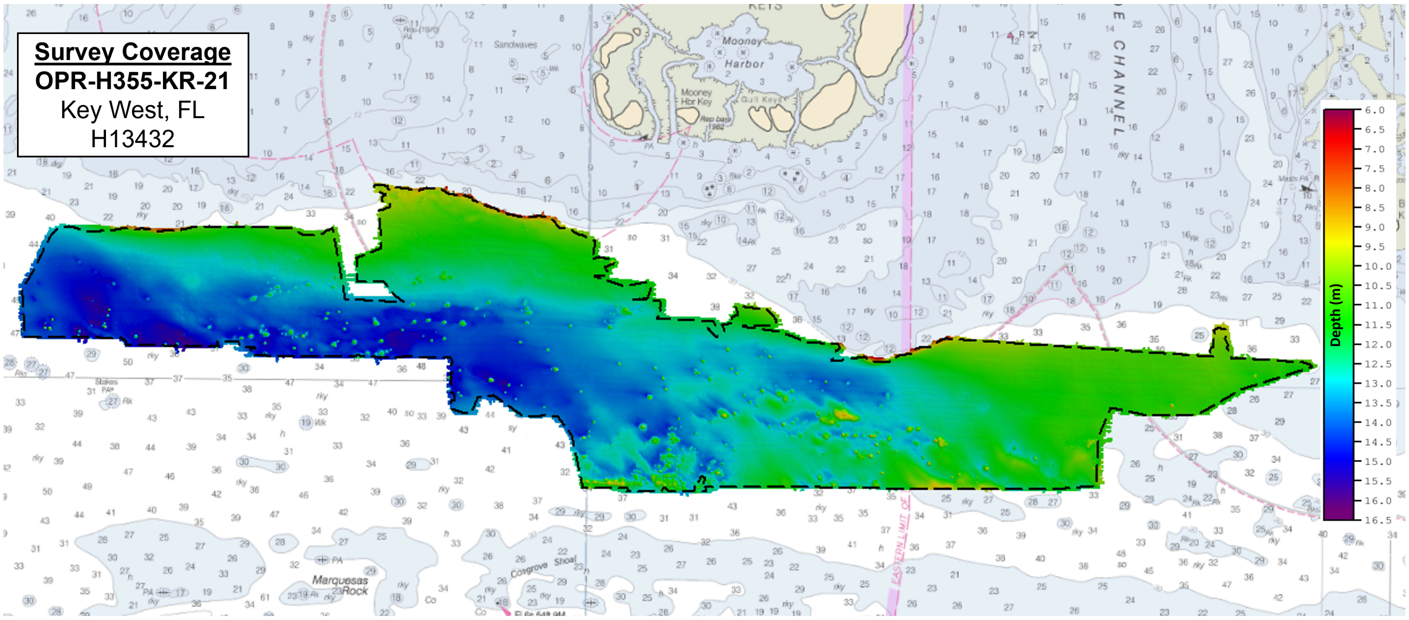


Figure 3: H13432 survey coverage overlaid onto Chart 11439

A.6 Survey Statistics

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

	HULL ID	*R/V Chinook*	*R/V Substantial*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0
	MBES Mainscheme	1.08	850.1	851.18
	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	0.0	45.95	45.95
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				0
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				22.92

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/26/2021	146

Survey Dates	Day of the Year
05/27/2021	147
05/28/2021	148
05/29/2021	149
05/30/2021	150
05/31/2021	151
06/01/2021	152
06/12/2021	163
06/13/2021	164
06/23/2021	174

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-H355-KR-21 Data Acquisition and Processing Report (DAPR) for a complete description of survey equipment and configurations, data acquisition procedures, data processing methods, quality control measures, and survey reporting methods. Additional information to supplement 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	***R/V Chinook***	***R/V Substantial***
LOA	9.44 meters	16.15 meters
Draft	0.61 meters	1.89 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 2040C	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MicroX SV	Sound Speed System
AML Oceanographic	BaseX2	Sound Speed System
AML Oceanographic	MVP30-350	Sound Speed System
AML Oceanographic	MinosX	Sound Speed System

Table 6: Major Systems Used

R/V Chinook and the R/V Substantial utilized a dual-head Kongsberg EM 2040C multibeam system, a POS M/V 320 v5 positioning and attitude system, and an AML MicroX surface sound speed system. The R/V Chinook utilized an AML BaseX2 sound speed profiling system. The R/V Substantial utilized both an AML MVP30-350 and AML MinosX sound speed profiling system.

B.2 Quality Control

B.2.1 Crosslines

Multibeam crosslines acquired for H13432 totaled 5.40% of mainscheme acquisition.

H13432 crosslines were collected and analyzed in accordance with section 5.2.4.2 of the HSSD. Crosslines were evaluated in CARIS HIPS with a detailed visual inspection followed by a thorough statistical analysis. To conduct the statistical analysis, a 1 m CUBE surface was generated with strictly mainscheme data and another, separate 1 m CUBE surface was generated with only crossline data. The mainscheme and crossline surfaces were analyzed using the Compare Grids tool in Pydro Explorer, which generated a difference surface and associated statistics. In addition to the direct statistics from the surface differencing, the tool assessed the difference surface statistics and computed the proportion of NOS total allowable vertical uncertainty (TVU) consumed by the mainscheme to crossline differences per surface node.

The statistical results of the difference comparison show 95% of nodes falling within +/- 0.10 m, with a mean difference of 0.01 m (Figure 4). Additionally, 99.5+% of the difference surface nodes met or exceeded TVU specifications, as described in section 5.1.3 of the HSSD.

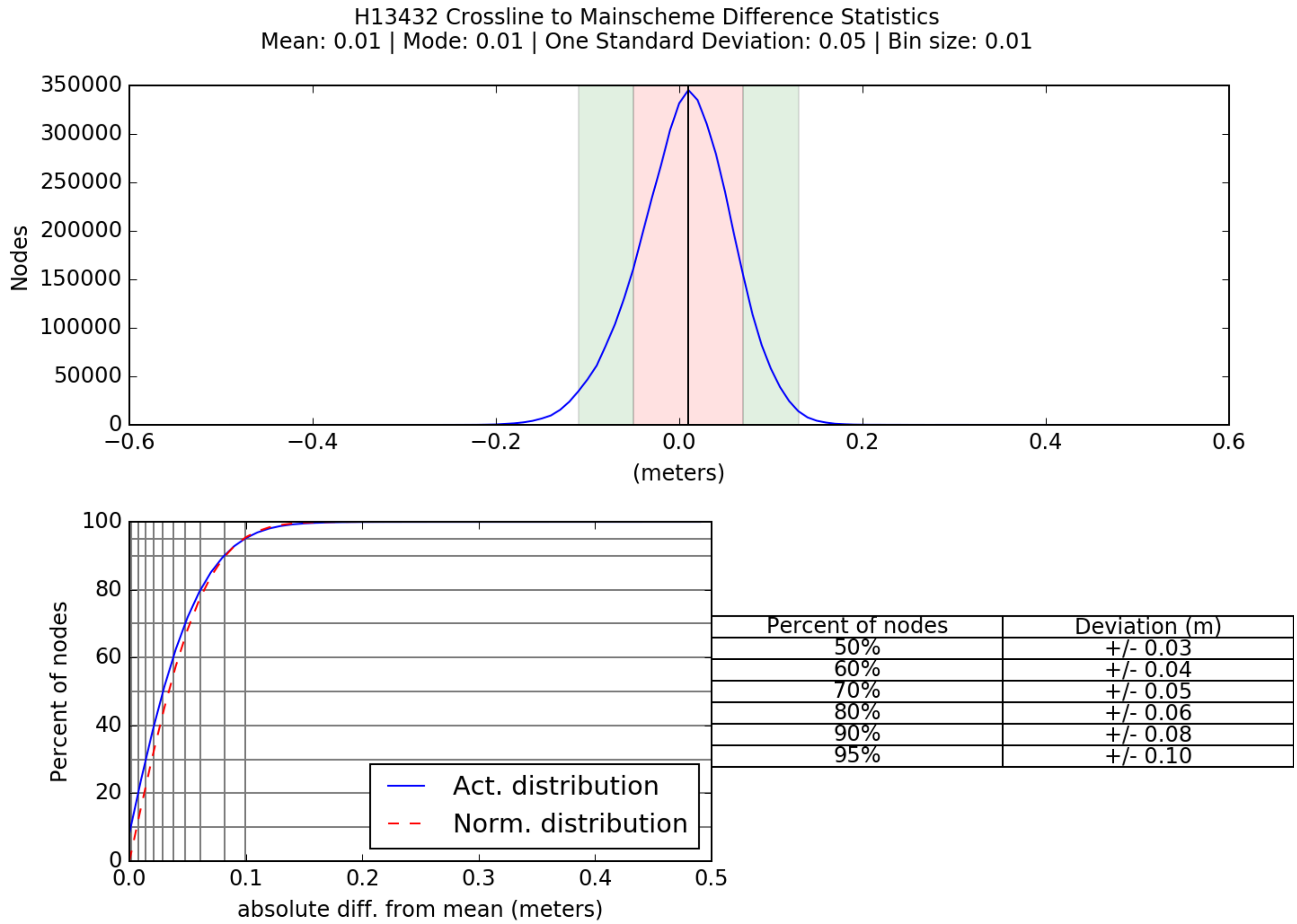


Figure 4: H13432 crossline to mainscheme difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.089 meters	0.0 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
R/V Chinook	2.00 meters/second	N/A	N/A	0.05 meters/second
R/V Substantial	N/A	2.00 meters/second	N/A	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The Tide Measured uncertainty was prescribed in the PI (0.089 m), and this was the value utilized in the TPU calculation (Table 7). It should be noted a small discrepancy was discovered between the uncertainty value listed in the PI (0.089 m) and the uncertainty value in the .log file accompanying the utilized separation model (0.094 m). Please refer to DR Appendix II Supplemental Records for additional information and related correspondence with the HSD Project Manager.

The finalized CUBE surface was analyzed using the HydrOffice QC Tools Grid QA tool to assure 99.5% of the surface nodes meet TVU specifications. The results of the Grid QA tool determined that the finalized CUBE surface met or exceeded the TVU specifications, as shown in Figure 5.

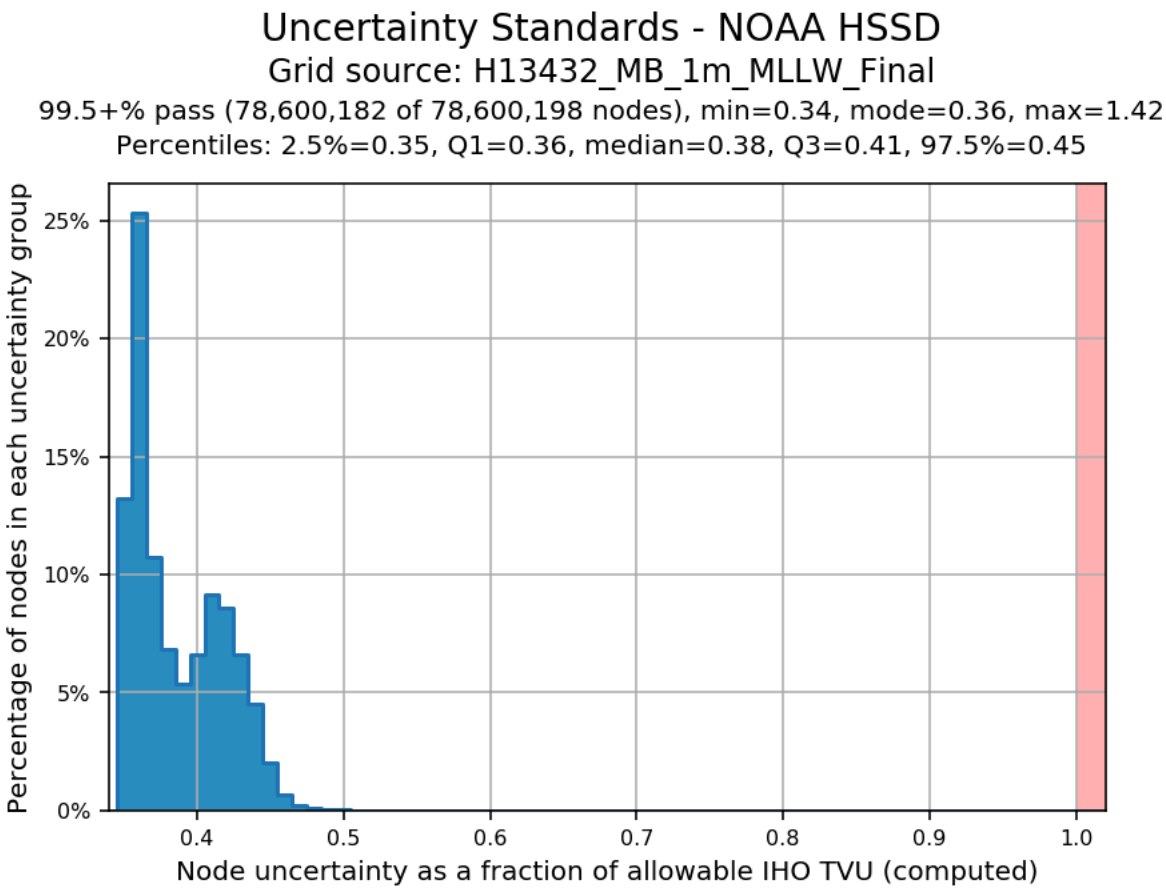


Figure 5: Finalized 1 m CUBE surface TVU statistics for H13432

Data was reprocessed at the Branch to incorporate the real-time uncertainties as well as the correct tide zoning uncertainty of 9.4cm.

B.2.3 Junctions

H13432 junctions with 2019 NOAA NGS lidar data, registry number FL-1806-TB-C (Figure 6). Data overlap between H13432 and the adjacent survey was attained. To conduct the junction analysis, similar to section B.2.1 of this report, the Pydro Compare Grids tool was utilized. The inputs for this tool were the surfaces for each individual survey at matching resolutions.

In addition to the statistical results of the junction analysis, the resultant difference surface was visually inspected and CARIS HIPS Subset Editor was used to examine overlapping data for consistency, agreement between surveys, and confirming data met TVU specifications.

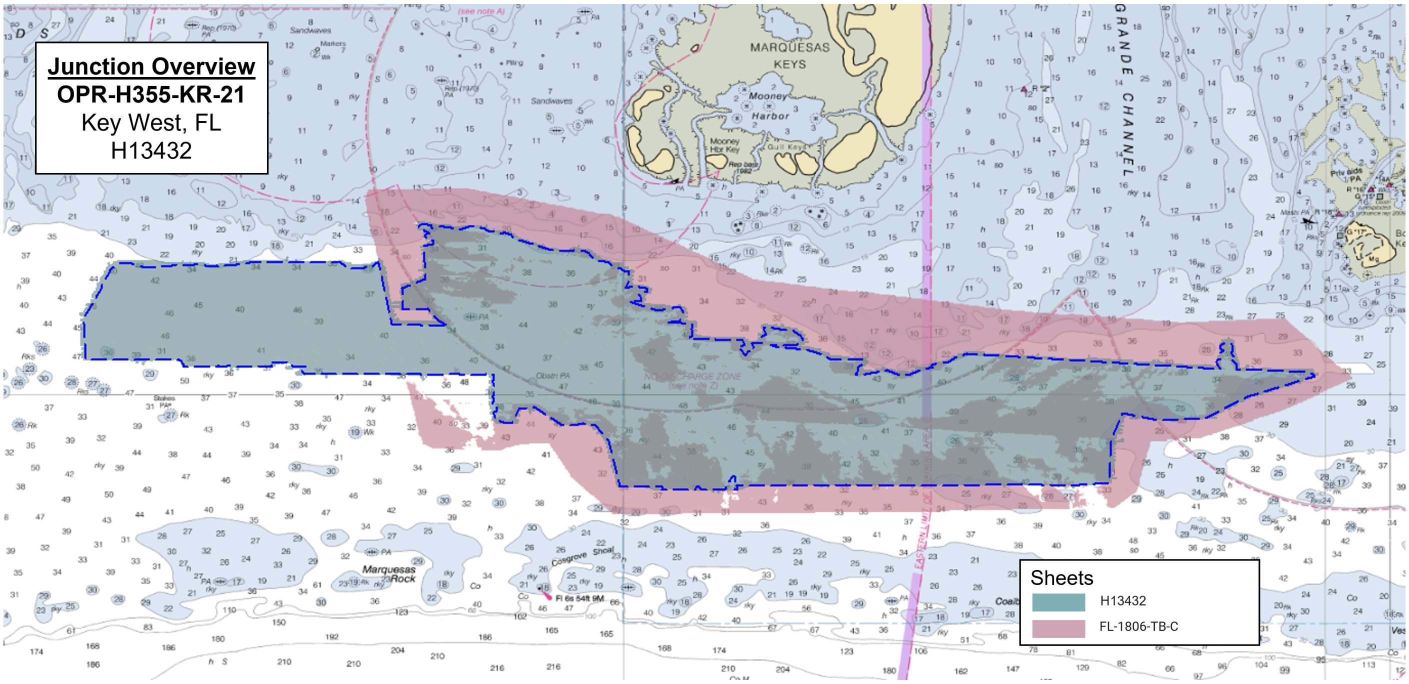


Figure 6: Overview of H13432 junction survey

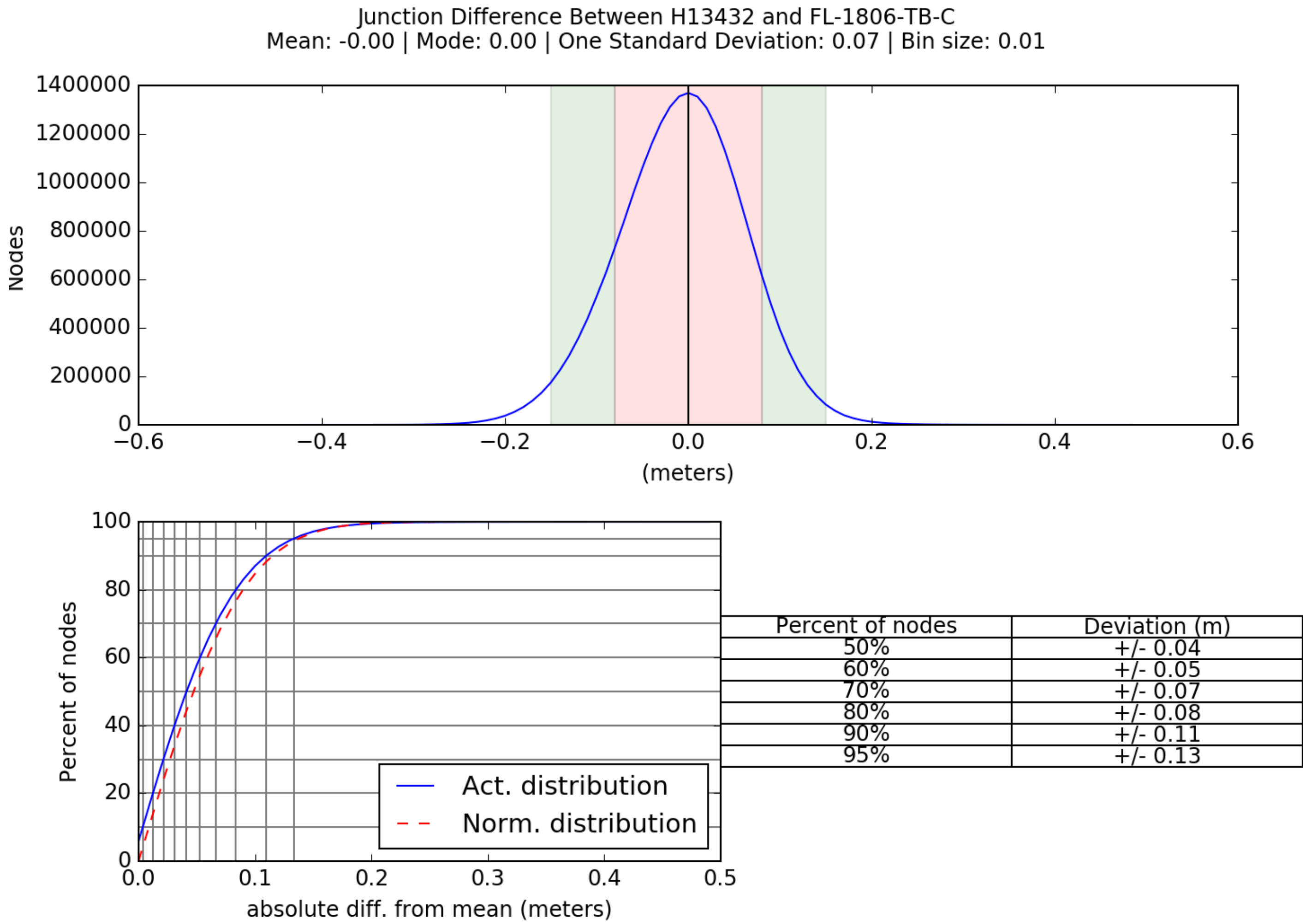
The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
FL-1806-TB-C	1:0	2019	NOAA NGS - Lidar	NW

Table 9: Junctioning Surveys

<u>FL-1806-TB-C</u>

The statistical results of the difference comparison show 95% of nodes falling within +/- 0.13 m, with a mean difference of 0.00 m (Figure 7). Additionally, 99.5+% of the difference surface nodes met or exceed TVU specifications, as described in section 5.1.3 of the HSSD.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.07
80%	+/- 0.08
90%	+/- 0.11
95%	+/- 0.13

Figure 7: Junction analysis between H13432 and FL-1806-TB-C

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

EM Datagrams

During acquisition onboard the R/V Substantial, a disruption in network communications between the Kongsberg PU and the acquisition PC resulted in reduced datagrams and led to missing pings for several lines, primarily on day number 149 (Figure 8). The disruption was mitigated therefore the missing pings are not widespread, and the submitted grids meet the complete coverage density requirements set forth in section 5.2.2.3 of the HSSD.

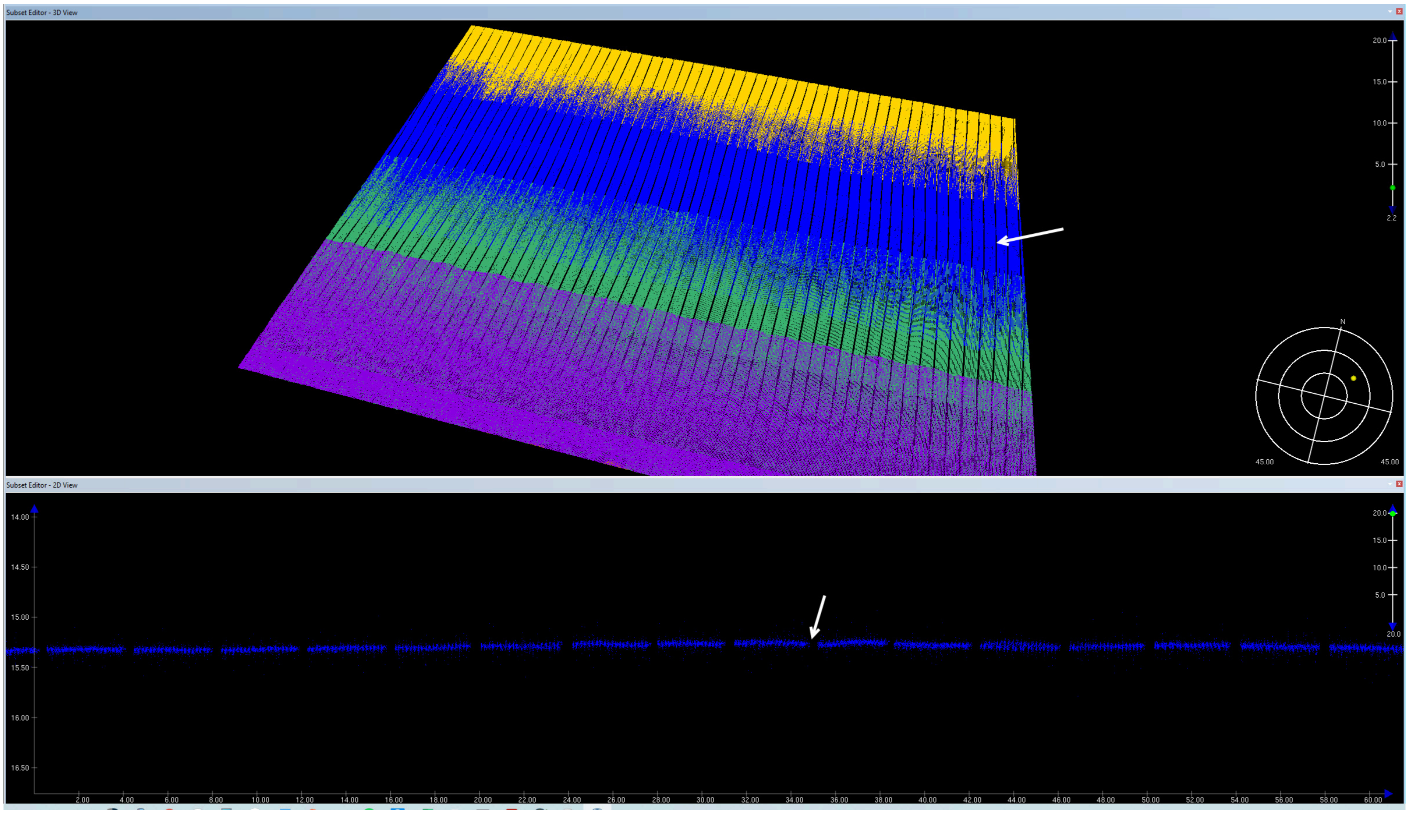


Figure 8: Example of missing pings, viewed in CARIS HIPS Subset Editor

B.2.6 Factors Affecting Soundings

<u>Trimble RTX</u>

Trimble RTX post-processing methods produced SBET solutions that improved the real-time positioning and attitude data, as described in section C.1. However, variability in the ellipsoid (altitude) solution can result in artifacts that resemble static offset data or line-to-line offset data. To help identify and assess this variability, the SMRMSG error data associated with the SBET along with surface Depth and Standard Deviation layers were inspected. Navigation Editor in CARIS HIPS was used to clip segments of lines where the data quality was impacted, and these clipped line segments were later recovered in the field. Although portions of the surface did display some slight vertical variations, the post-processed positioning and attitude data were well within the allowable error budget as outlined in section 5.2.3.5 of the HSSD. An example of a deviation in the quality of the GNSS corrections can be seen below in Figure 9.

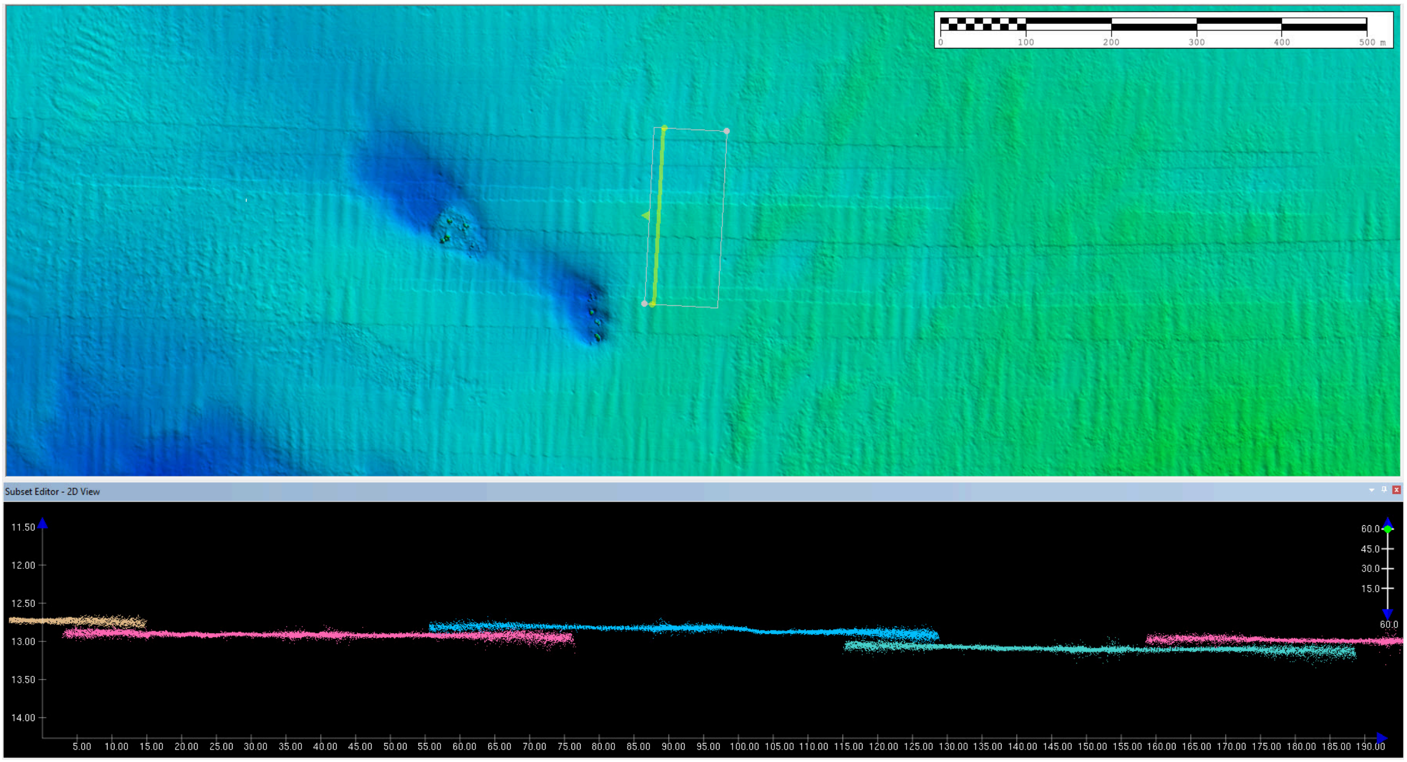


Figure 9: An example of a deviation in the quality of the GNSS corrections in H13432

Sound Speed

The spatio-temporal variability in temperature of the water column created complex sound speed conditions throughout the survey. These complexities often created challenges for the field team and resulted in occasional refraction artifacts in the survey data and resultant surfaces. The convex or concave trend in the across-track sonar data, as a result of refraction, is most prevalent on the outer beams and is noticeable in the surface as a striped line-to-line artifact, as shown in Figure 10.

The hydrographer made considerable efforts to reduce the impact of sound speed issues during acquisition. These efforts included increasing the frequency of casts, closely monitoring real-time swath "smiling" or "frowning", utilizing alerts for surface-to-profile sound speed deviations, observing the real-time standard deviation map display, and utilizing Sound Speed Manager to track spatial changes in surface sound speed along with profile location. Additional efforts in post-processing to minimize refraction artifacts included manual outer beam editing when necessary.

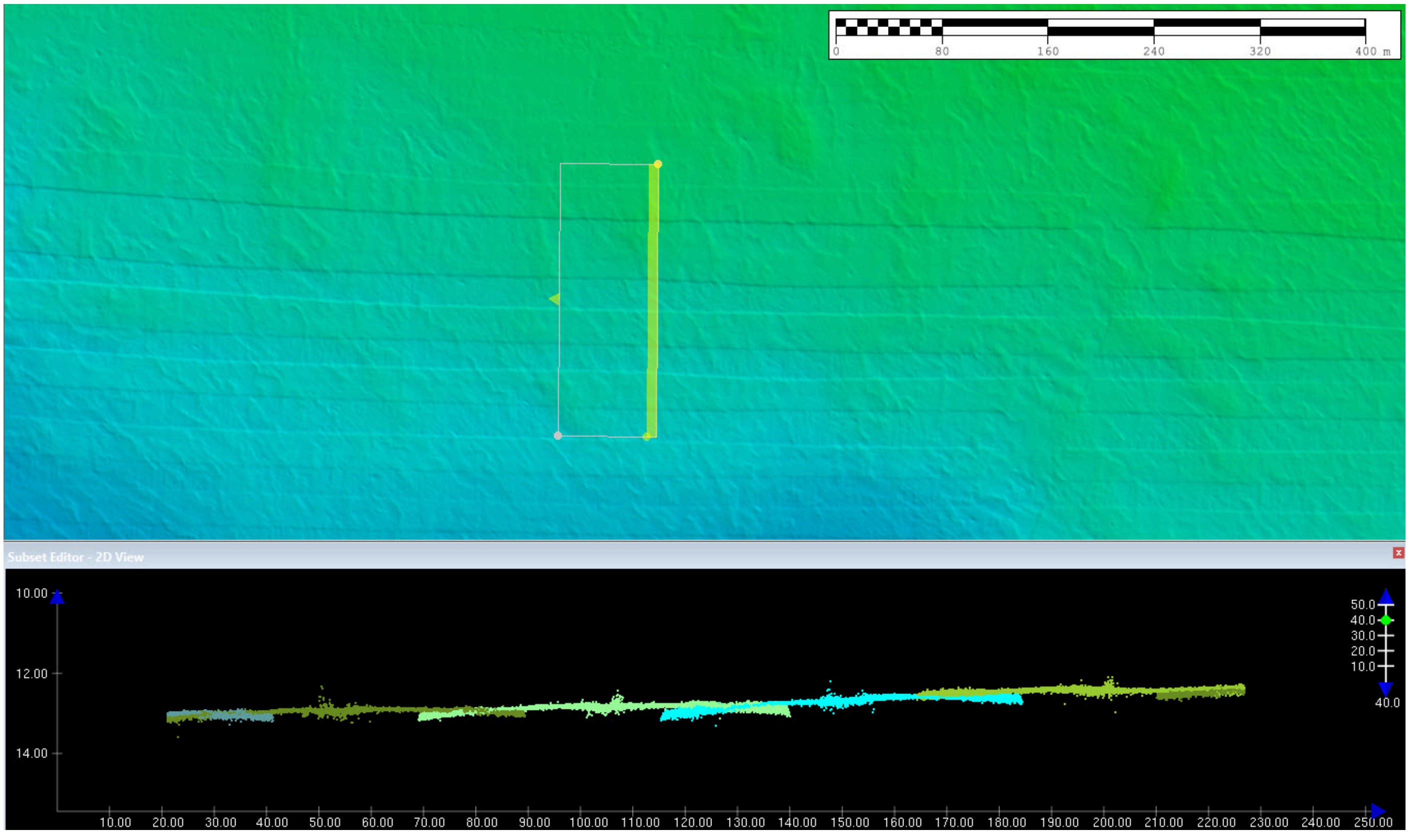


Figure 10: H13432 surface artifacts as a result of refraction in the sounding data

Residual Motion Artifacts

Small pitch induced heave artifacts are present in portions of H13432 and are the direct result of increased wave heights endured during survey acquisition, as the survey area was located further offshore. These artifacts are slight and well within the allowable error budget as outlined in section 5.2.3.5 of the HSSD. Figure 11 below is an example of where these artifacts are noticeable in the surface.

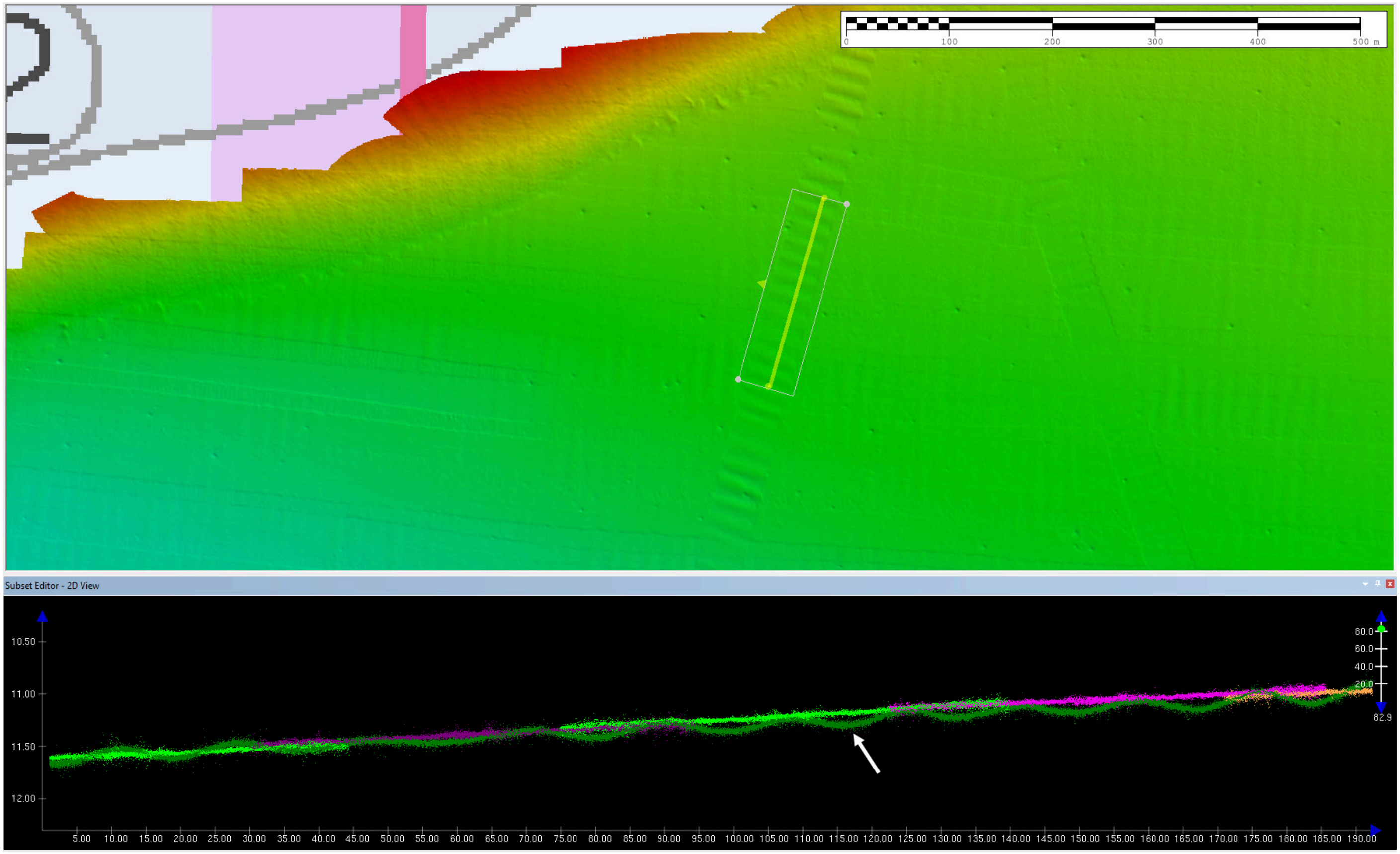


Figure 11: H13432 motion artifacts visible in the surface and viewed in CARIS HIPS Subset Editor

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed casts were acquired at least once every four hours. Casts were often conducted more frequently (~every two hours) than this time interval because of the dynamic water properties in the survey area. Additionally, the R/V Substantial utilized an MVP onboard allowing for a higher frequency of casts. However, the MVP onboard R/V Substantial experienced damage to the data cable while underway and the AML MinosX was used as a secondary sound speed profiler until the MVP was repaired. Sound speed profiles with the MinosX were obtained less frequently than with the functional MVP, however a cast was conducted every 2-4 hours.

Surface sound speed was compared in real-time to the sound speed profile. When the comparison differed by more than 2 m/s, a new sound speed profile was acquired. Additionally, QPS Qinsy and Kongsberg SIS provided a real-time visual assessment of data quality (standard deviation grids, bathymetric grids, swath views) aiding the hydrographer in determining when a new cast was required.

For more detailed information on sound speed methods, please refer to the DAPR.

B.2.8 Coverage Equipment and Methods

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

B.2.9 Holidays

The finalized 1 m CUBE surface was analyzed using HydrOffice QC Tools Holiday Finder to determine if the surface contained holidays, as described in section 5.2.2.3 of the HSSD. The tool scanned the CUBE surface, identifying any holidays, and generated an S-57 file to illustrate the locations of holidays. The tool determined no holidays were present within the sheet limits.

Another method of holiday evaluation was to visually pan the CUBE surface to identify holidays. The hydrographer would often alter the surface display (color ranges, symbology, shading) to help aid the hydrographer in identifying coverage gaps. The results reflected the same outcome as the tool, no holidays were identified within the sheet limits.

B.2.10 Density

The finalized 1 m CUBE surface was analyzed using HydrOffice QC Tools Grid QA tool to assure data met the required density specifications. Density requirements were achieved for the finalized surface in H13432 with 99.5% of the 1 m surface nodes (Figure 12) containing at least five or more soundings, exceeding the specifications required by section 5.2.2.3 of the HSSD.

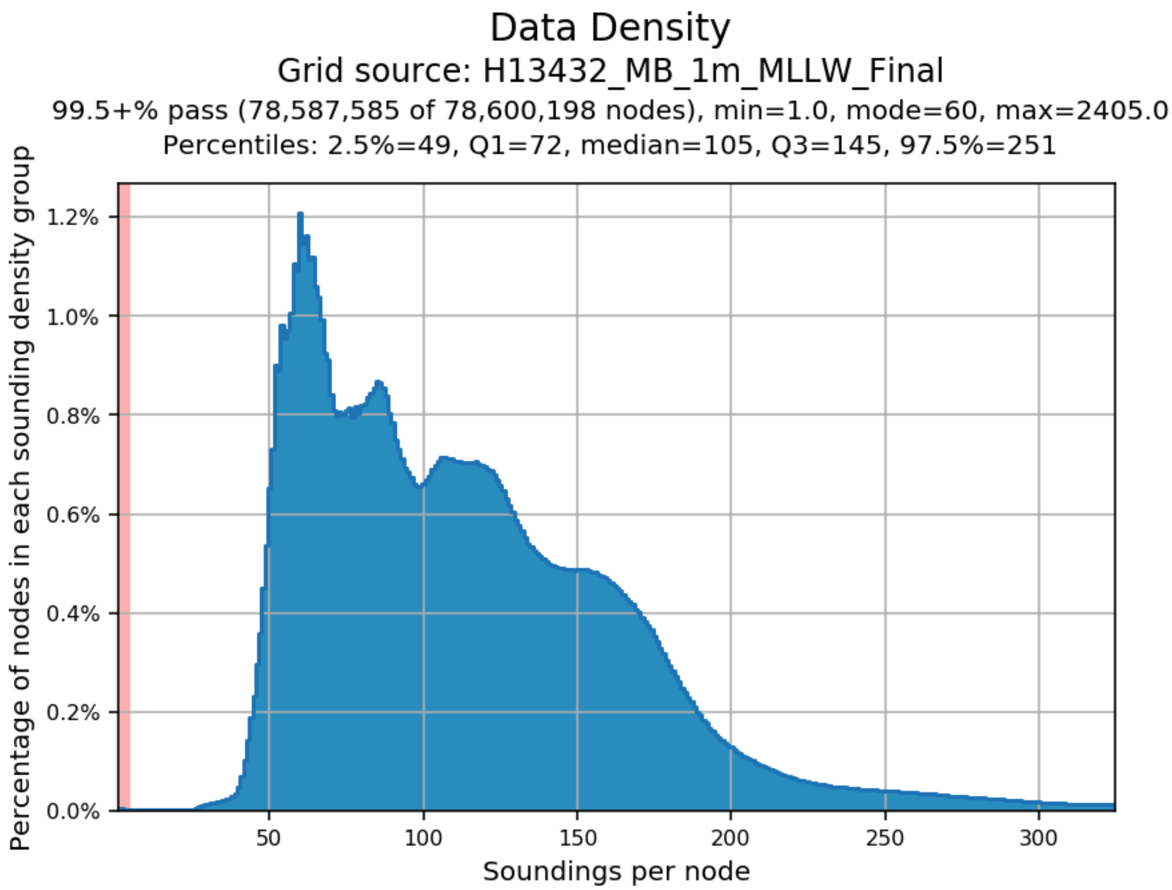


Figure 12: Finalized 1 m CUBE surface density statistics for H13432

B.2.11 Flier Finder

In addition to a visual inspection, the finalized 1 m CUBE surface was analyzed using HydrOffice QC Tools Flier Finder tool to assure data does not contain fliers (anomalous data as defined by QC Tools flier finding algorithms #2-5). While the Flier Finder tool flags surface fliers meeting a set criteria, it will also flag real surface features that meet the same criteria. Spurious soundings flagged by Flier Finder were cleaned until only the remaining flagged fliers were deemed valid aspects of the 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

Raw backscatter data were collected and stored within the .ALL files. Backscatter data were processed for quality assurance purposes in QPS FMGT. Additionally, mosaics were created to assure the coverage and quality of the backscatter (Figure 13). Hydrographers in the field monitored backscatter intensities in real-time and made efforts to collect quality backscatter without hindering bathymetric data quality. Refer to the DAPR for more information on backscatter data acquisition and processing procedures.

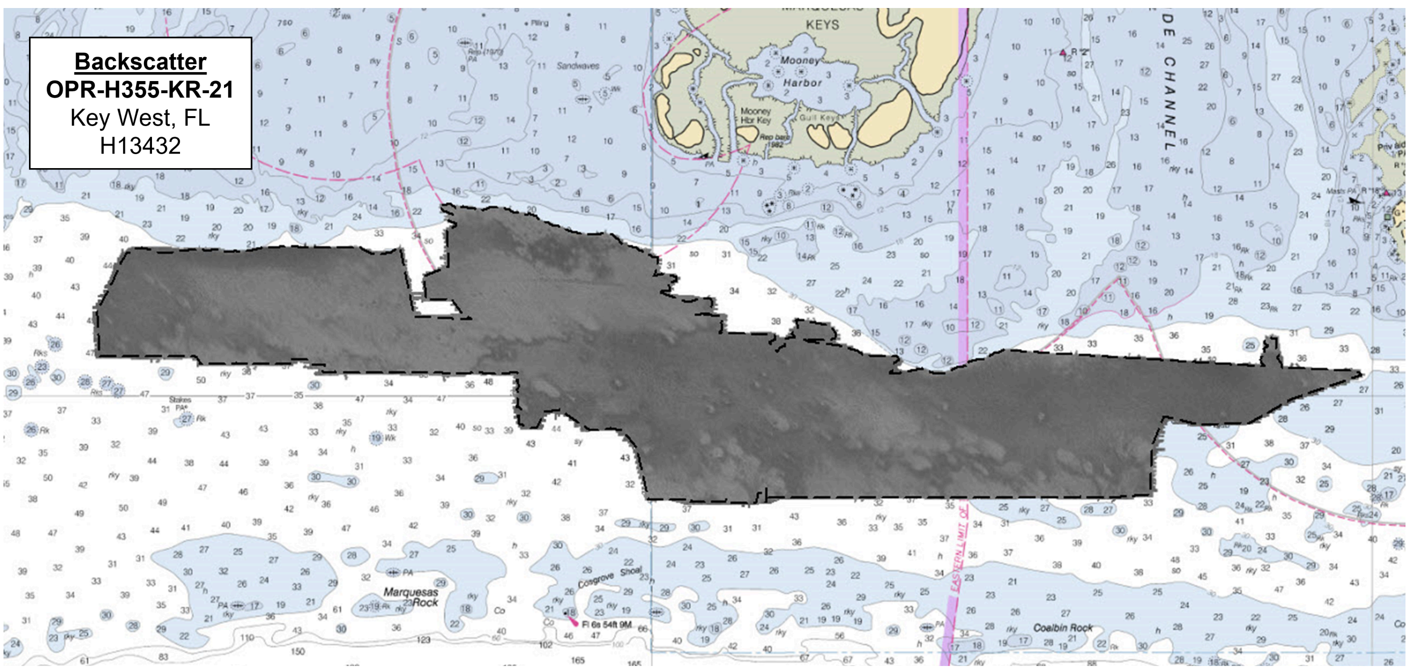


Figure 13: H13432 backscatter

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	11.3.14

Table 10: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	FMGT	7.9.3

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2021.

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
H13432_MB_1m_MLLW_Final	CARIS Raster Surface (CUBE)	1 meters	6.28 meters - 16.29 meters	NOAA_1m	Complete MBES
H13432_MB_1m_MLLW	CARIS Raster Surface (CUBE)	1 meters	6.28 meters - 16.29 meters	NOAA_1m	Complete MBES

Table 12: Submitted Surfaces

All surfaces submitted are in compliance with the complete coverage MBES requirements per section 5.2.2.3 of the HSSD.

B.5.3 Designated Soundings

H13432 contains seven designated soundings in accordance with sections 5.2.1.2.3 and 7.4 of the HSSD. These designated soundings were created to facilitate feature management and best represent the least depths over features in the Final Feature File (FFF). In the finalized CUBE surface, the CARIS HIPS Apply Designated Soundings function ensured designated sounding depths are retained in the finalized surfaces.

C. Vertical and Horizontal Control

Additional information discussing the vertical and 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-H355-KR-21_NAD83_VDatum_MLLW.csar

Table 13: ERS method and SEP file

Real-time positional data were corrected with G2+ Global Navigation Satellite System (GNSS) satellite corrections provided by the Fugro Marinestar Satellite-Based Augmentation System (SBAS). To improve the accuracy of the real-time data, real-time position and attitude data were post-processed using Applanix POSPac Mobile Mapping Solution (MMS) software. Trimble CenterPoint RTX correction methods were used to create Smoothed Best Estimate of Trajectory (SBET) files, which were applied to the survey data in CARIS HIPS. The provided separation model was then utilized to bring the data from ellipsoid heights to chart datum.

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.

RTK

Real-time positional data were corrected with G2+ GNSS satellite corrections provided by the Fugro Marinestar SBAS.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed in CARIS HIPS between H13432 and the ENC listed in Table 14 of section D.1.1. Sounding layers were generated from the CUBE surface and overlaid onto the ENC to visually assess differences between the surveyed and charted depths.

In addition to a detailed visual inspection in CARIS HIPS, all soundings from the chart were downloaded as a shapefile from NOAA's ENC Direct to GIS application and differenced with the nearest surveyed depth from H13432 in ESRI ArcPro. A statistical analysis of the difference comparison is shown in Figure 14. The surveyed depths from H13432 generally agree with the charted soundings from the largest scale ENC within the survey area, with a mean difference of 1.18 m.

Contour layers were generated from the CUBE surface and overlaid onto the ENC to visually assess differences between the surveyed and charted contours. In H13432, the surveyed contours are in general agreement with the charted contours. Areas with larger discrepancies between the surveyed and charted contours are the result of the dynamic and irregular coral mounds rising from the seafloor.

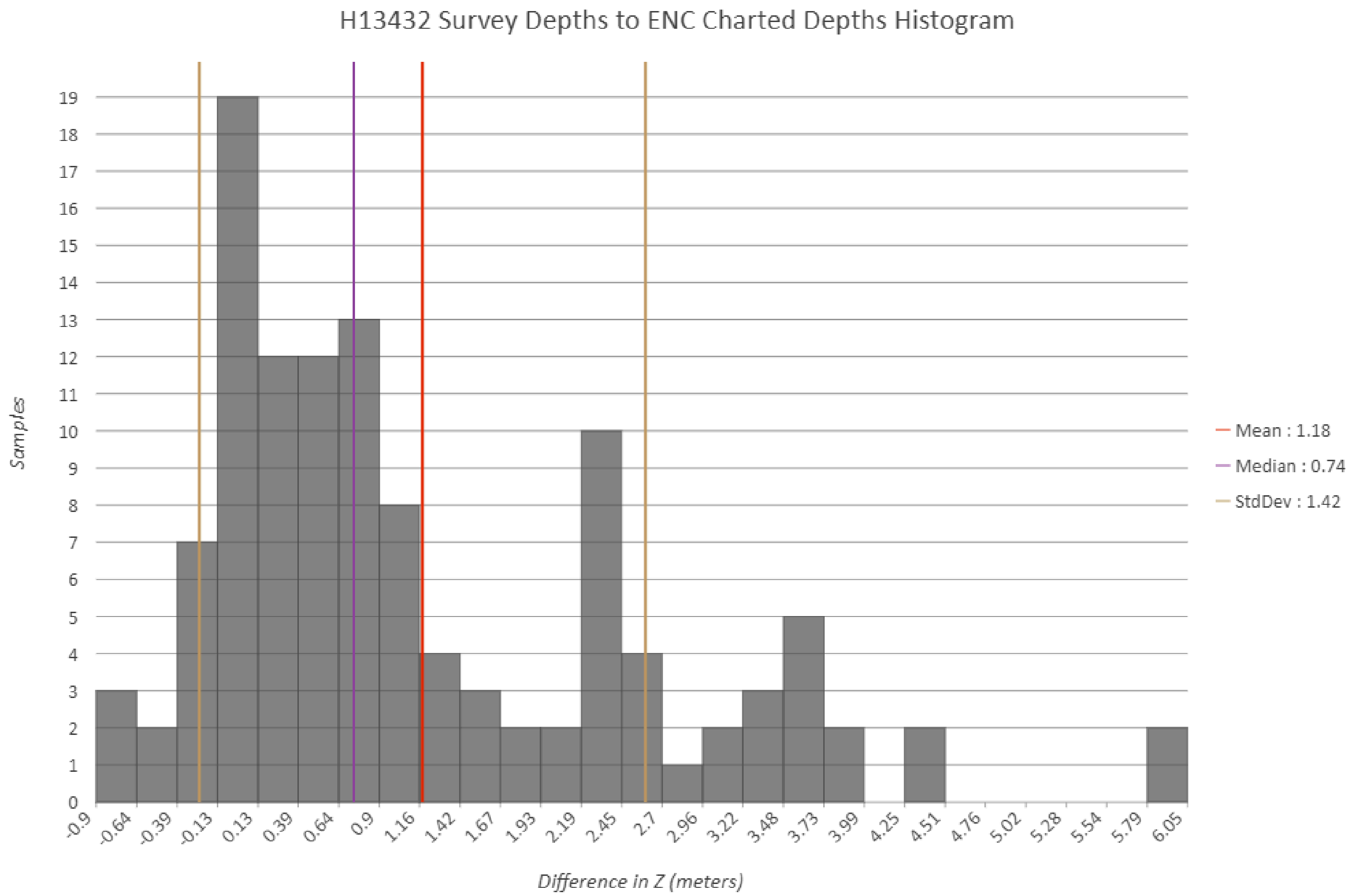


Figure 14: H13432 statistical analysis of surveyed depths to charted depths

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
US4FL92M	1:80000	20	09/17/2021	09/17/2021

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

There were two assigned charted features within H13432 and are detailed in the FFF in accordance with section 7.3 of the HSSD. Both of the assigned features were attributed with Special Feature Type as 'Unverified Charted Feature' and were investigated during survey operations and disproved, all of which are detailed as such in the FFF.

D.1.4 Uncharted Features

There were seven new features found within H13432 and are detailed in the FFF in accordance with section 7.3 of the HSSD. New area obstruction features representing navigationally significant coral mounds are detailed in the FFF with both the NATSUR and NATQUA attributes populated, as guided by the HSD Project Manager. See DR Appendix II Supplemental Records for related correspondence with the HSD Project Manager.

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

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

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.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2021-09-30
Horizontal and Vertical Control Report	2021-09-30
Coast Pilot Report	2021-09-10

Approver Name	Approver Title	Approval Date	Signature
David J. Bernstein	Chief of Party	11/08/2021	David J. Bernstein Digitally signed by David J. Bernstein Date: 2021.11.08 09:39:46 -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