H13651

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

DESCRIPTIVE REPORT

Type of Survey:	Basic Hydrographic Survey
Registry Number:	H13651

LOCALITY

State(s):	Mississippi
General Locality:	Biloxi, MS
Sub-locality:	Biloxi Bay

2022

CHIEF OF PARTY
LTJG Robert Sobelsohn

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13651**

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):	**Mississippi**
General Locality:	**Biloxi, MS**
Sub-Locality:	**Biloxi Bay**
Scale:	**20000**
Dates of Survey:	**07/14/2022 to 03/23/2023**
Instructions Dated:	**05/25/2022**
Project Number:	**S-J901-NRTST-22**
Field Unit:	**NOAA Navigation Response Team - Stennis**
Chief of Party:	**LTJG Robert Sobelsohn**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Side Scan Sonar Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

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Descriptive Report to Accompany Survey H13651

Project: S-J901-NRTST-22

Locality: Biloxi, MS

Sublocality: Biloxi Bay

Scale: 1:20000

July 2022 - March 2023

NOAA Navigation Response Team - Stennis

Chief of Party: LTJG Robert Sobelsohn

A. Area Surveyed

The survey area is located in Biloxi, Mississippi, within the sub locality of Biloxi Bay.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
30° 25' 27.7" N 88° 54' 57.1" W	30° 17' 5.75" N 88° 45' 45.73" W

Table 1: Survey Limits

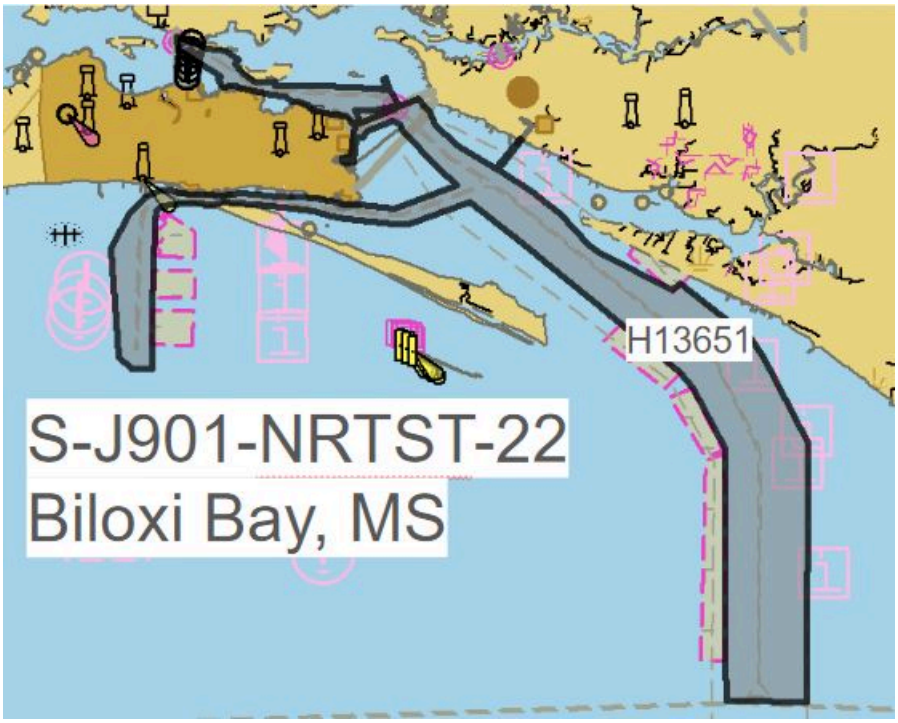


Figure 1: H13651 sheet limits (in gray) overlaid onto ENC US4MS12M.

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2022 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in the figure below. In all areas where the 2 meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to the risks of maneuvering the survey vessel in close proximity to rocky shorelines or shoreline constructions.

A.2 Survey Purpose

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.

Data acquired in H13651 meets multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD. 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.	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)

Table 2: Survey Coverage

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

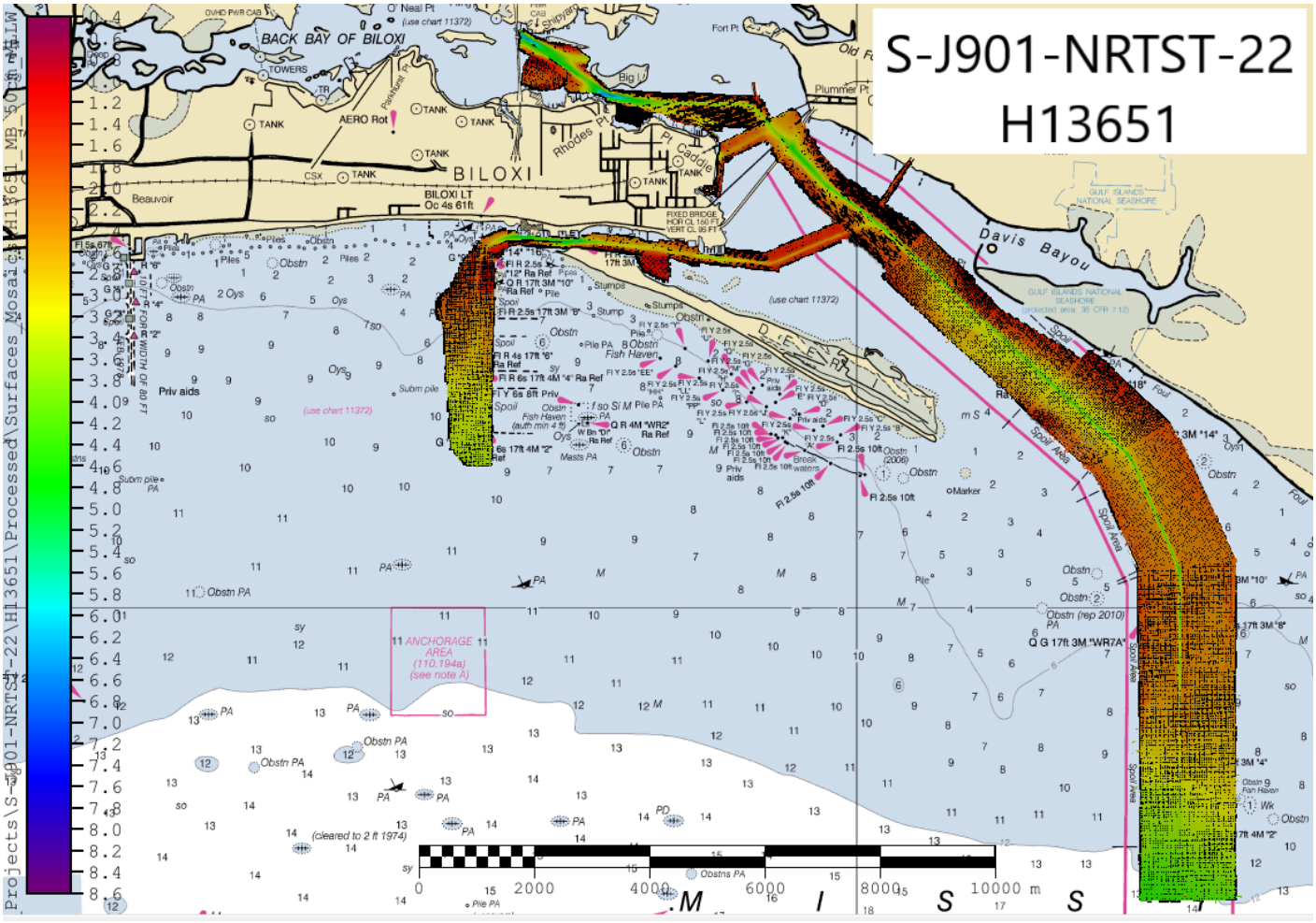


Figure 2: H13651 MBES coverage overlaid on SSS coverage extents.

A.6 Survey Statistics

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

	HULL ID	*S3005*	*S3008*	*EB240*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0	0.0
	MBES Mainscheme	0.0	0.0	0.0	0.0
	Lidar Mainscheme	0.0	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0	0.0
	MBES/SSS Mainscheme	213.53	256.08	17.01	486.62
	SBES/MBES Crosslines	6.06	19.64	4.22	29.92
	Lidar Crosslines	0.0	0.0	0.0	0.0
Number of Bottom Samples					0
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					8.54

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/14/2022	195
07/18/2022	199
07/24/2022	205
07/25/2022	206
07/26/2022	207
08/01/2022	213
08/02/2022	214
08/03/2022	215
08/14/2022	226
08/18/2022	230
08/21/2022	233
08/22/2022	234
08/23/2022	235
08/24/2022	236
08/25/2022	237
08/28/2022	240
08/29/2022	241
08/30/2022	242
08/31/2022	243
09/01/2022	244
09/05/2022	248
09/06/2022	249
09/08/2022	251
09/14/2022	257
09/18/2022	261
09/19/2022	262
09/20/2022	263
09/21/2022	264
09/22/2022	265
10/18/2022	291
10/19/2022	292
10/20/2022	293

Survey Dates	Day of the Year
10/26/2022	299
10/30/2022	303
10/31/2022	304
11/07/2022	311
11/08/2022	312
11/09/2022	313
11/10/2022	314
12/07/2022	341
12/27/2022	361
12/28/2022	362
03/21/2023	80
03/22/2023	81
03/23/2023	82

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	*S3005*	*S3008*	*EB240*
LOA	31.0 feet	31.0 feet	7.9 feet
Draft	1.2 feet	1.2 feet	0.21 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
Teledyne RESON	SeaBat T20-P	MBES
EdgeTech	4125	SSS
Tritech	Starfish 453	SSS
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MicroX SV	Sound Speed System
Applanix	POS MV SurfMaster	Positioning and Attitude System
Applanix	POS MV 320 v5	Positioning and Attitude System
Valeport	SWiFT SVP	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

29.92 LNM of crosslines were collected for H13651 resulting in a crossline percentage of 17.26%, which does meet the minimum percentage and distribution requirements as specified in the HSSD, Section 5.2.4.2. Uncertainty standards between a 50cm Mainscheme grid versus a 50cm Crossline grid showed 99.5+ % of nodes passed, which passes NOAA IHO TVU requirements.

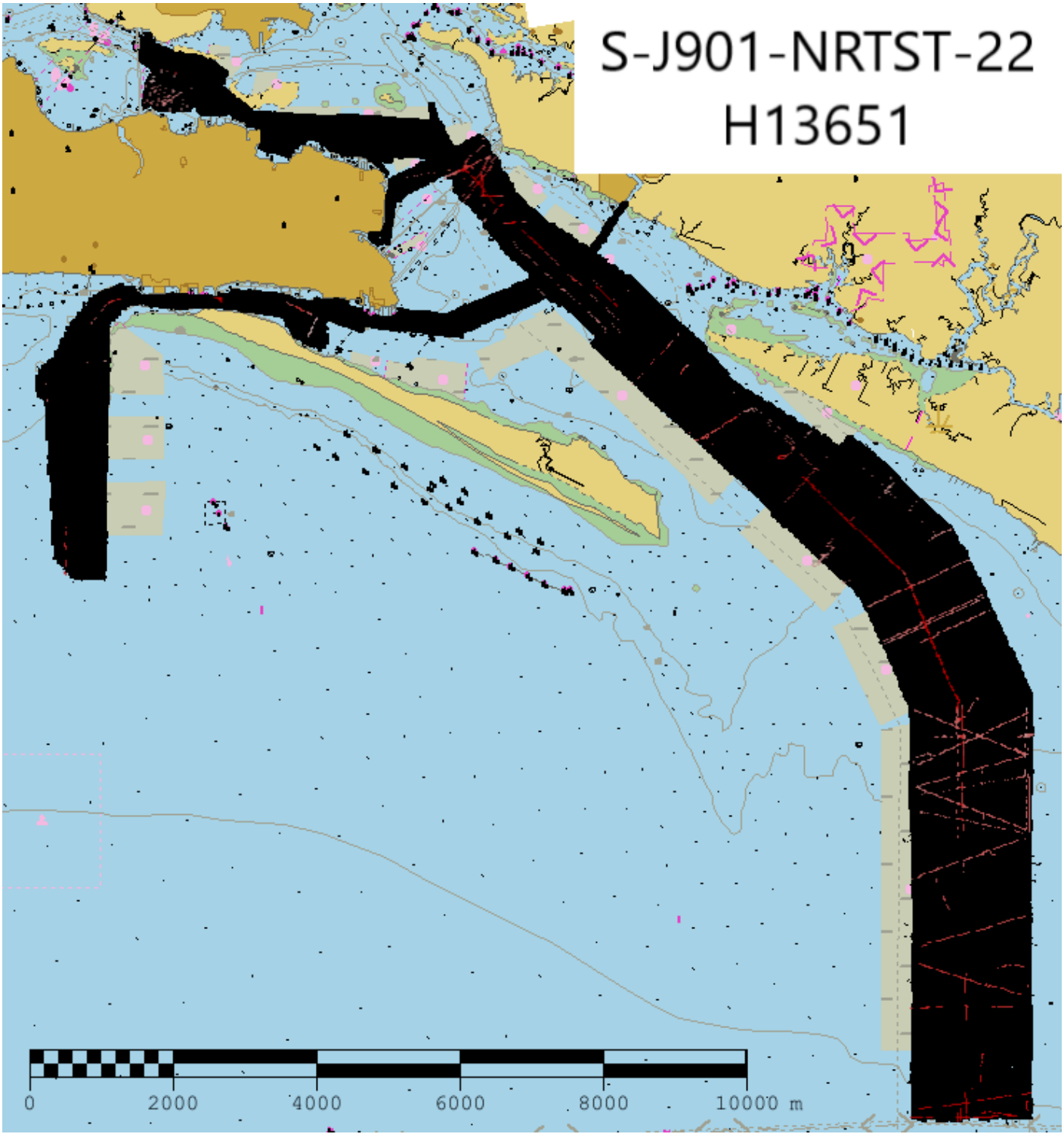
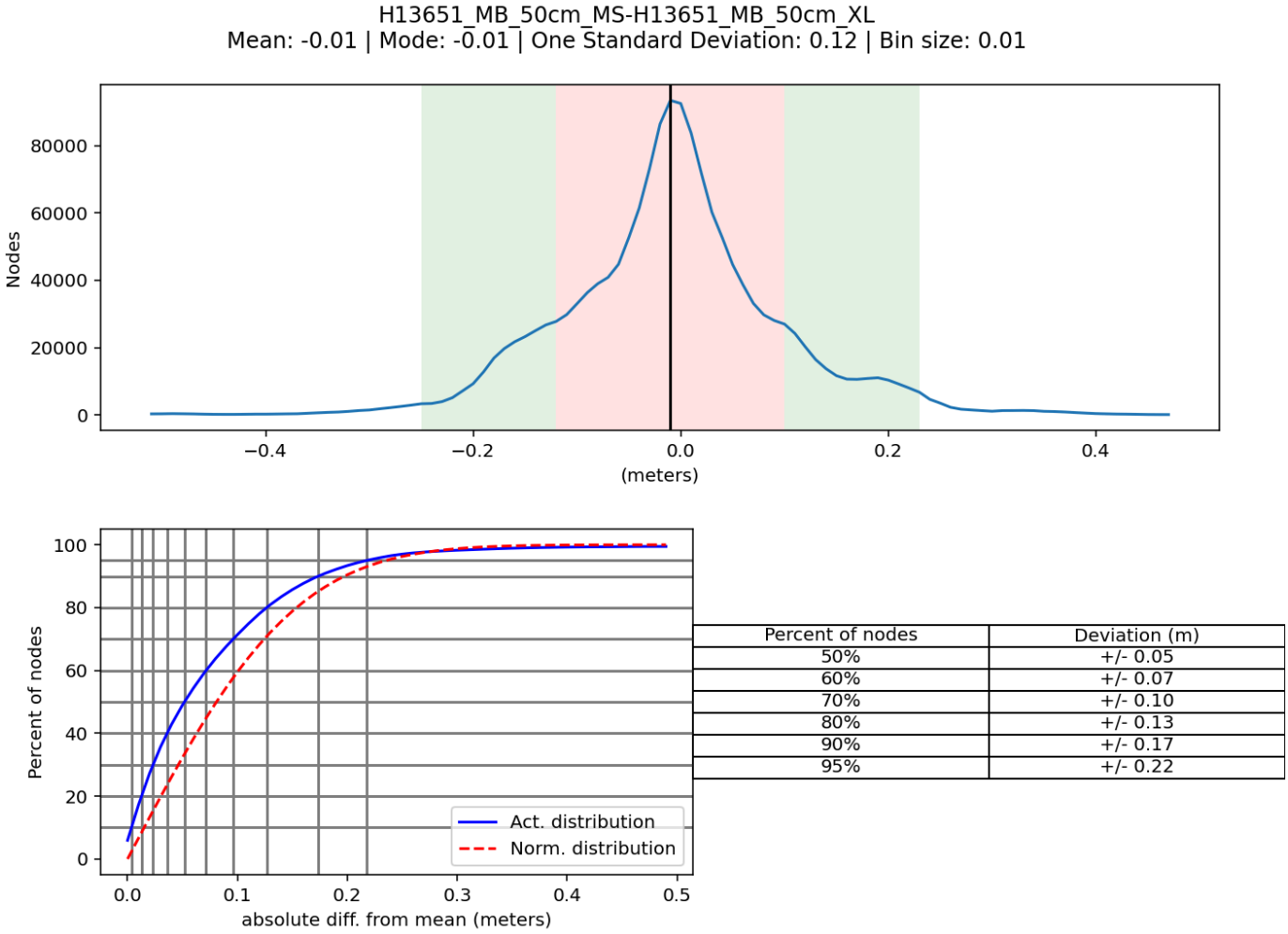


Figure 3: H13651 MBES crossline data, shown in pink, overlaid on mainscheme SSS data, shown in black.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.07
70%	+/- 0.10
80%	+/- 0.13
90%	+/- 0.17
95%	+/- 0.22

Figure 4: H13651 MBES crossline/mainscheme comparison.

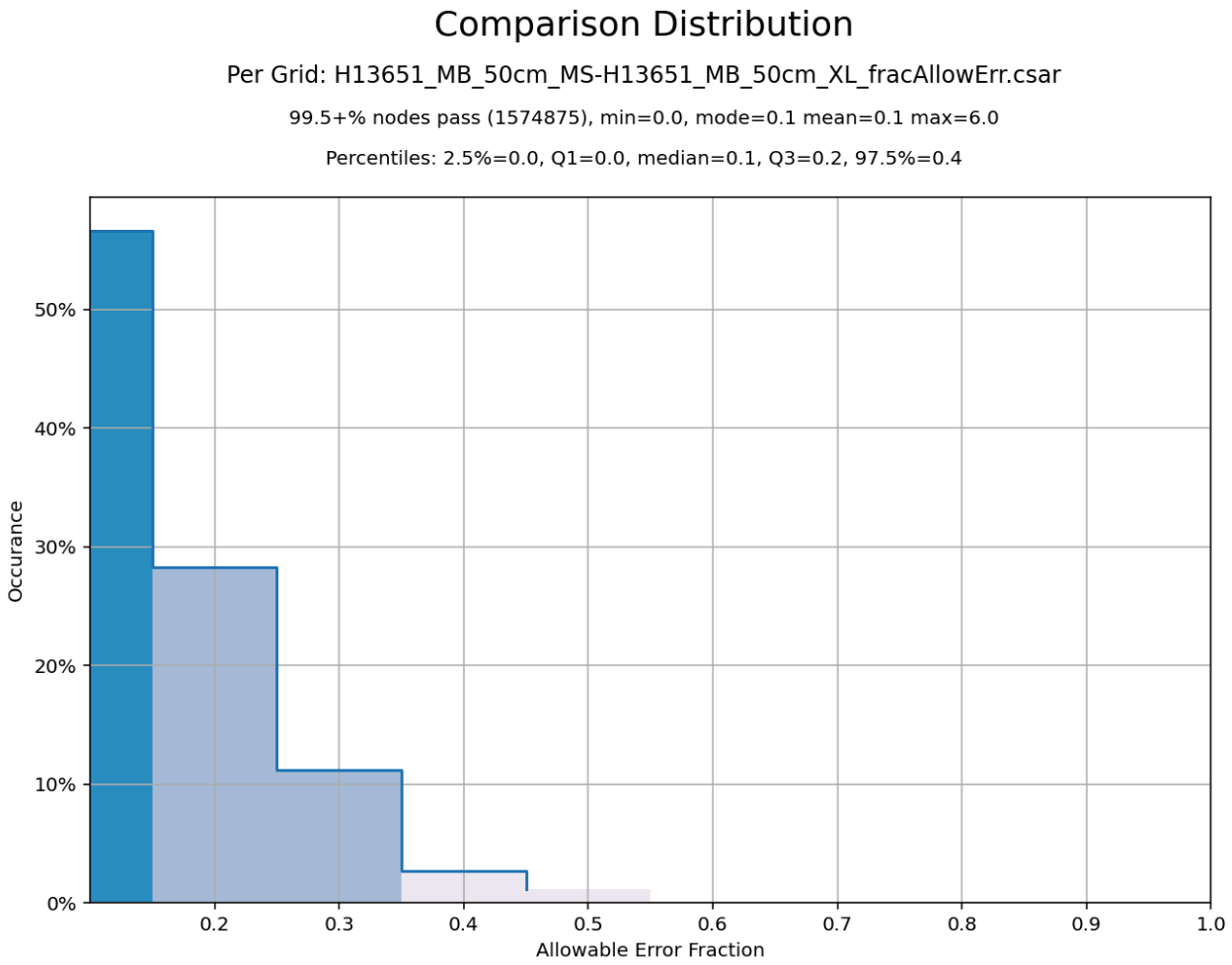


Figure 5: H13651 MBES Crossline vs. Mainscheme Distribution, 99.5+% of nodes pass.

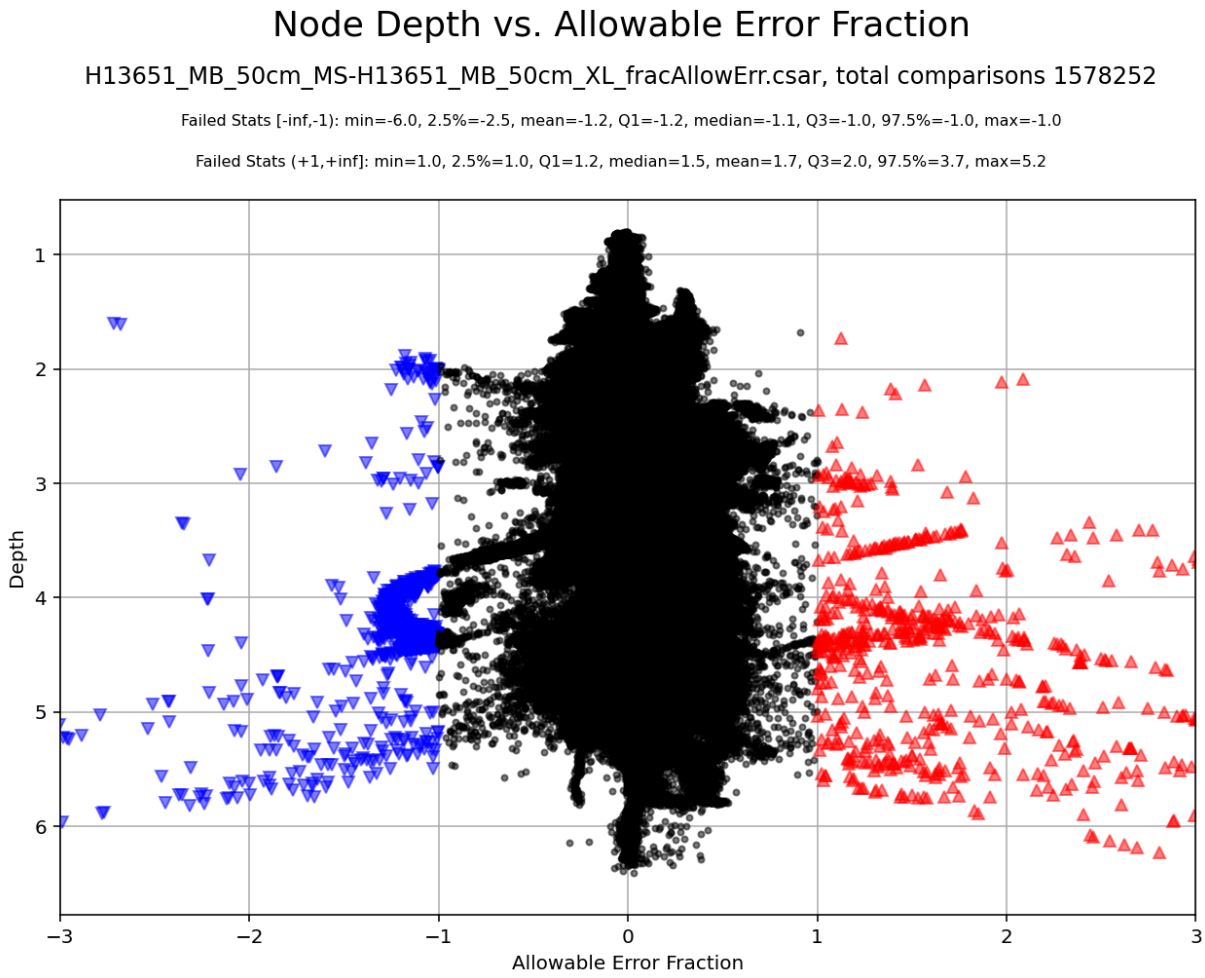


Figure 6: H13651 Nodes vs. Allowable Error Fraction

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.17 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S3005	2 meters/second	N/A meters/second	0 meters/second	0.5 meters/second
S3008	2 meters/second	N/A meters/second	0 meters/second	0.5 meters/second
EB240	2 meters/second	0 meters/second	0 meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with HSSD 2022 uncertainty standards. Over 99.5+ % of all nodes pass uncertainty standards as shown in the figure below.

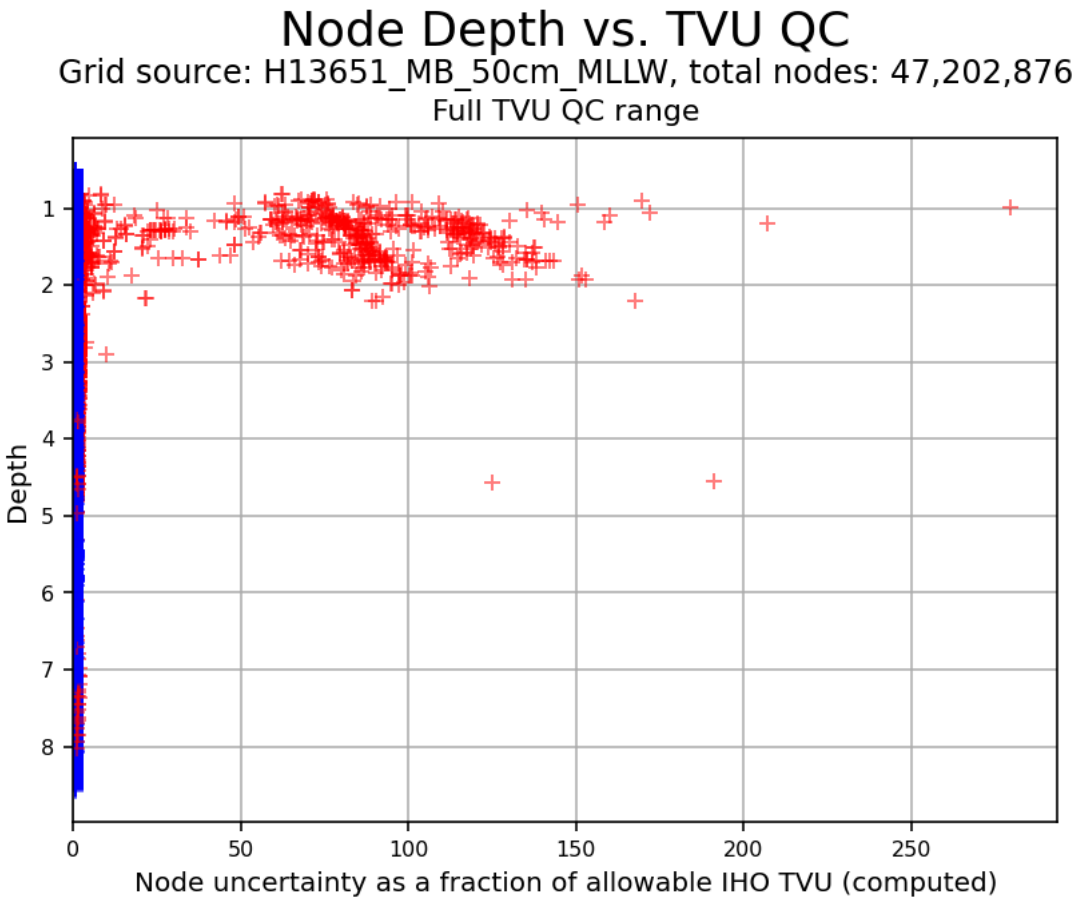


Figure 7: Node Depth vs. Total Vertical Uncertainty (TVU)

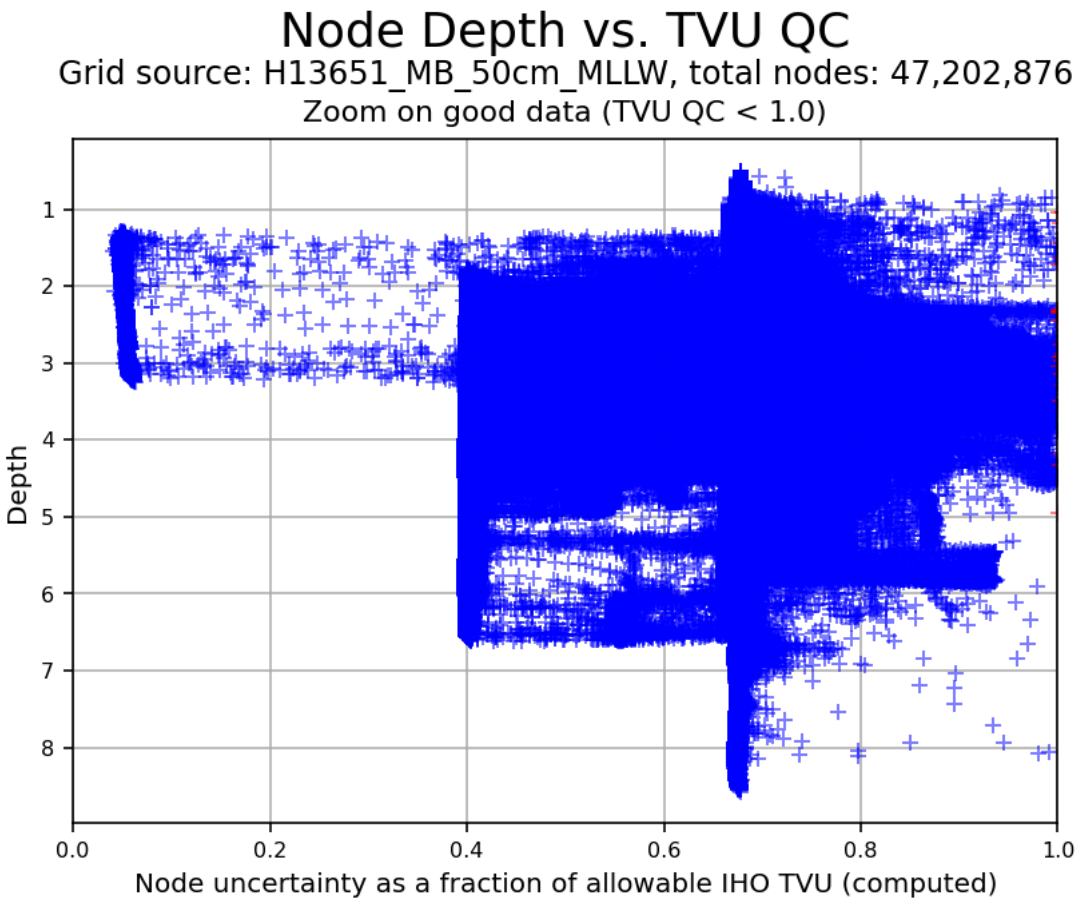


Figure 8: Node Depth vs. TVU, Zoom on good data (TVU QC < 1.0)

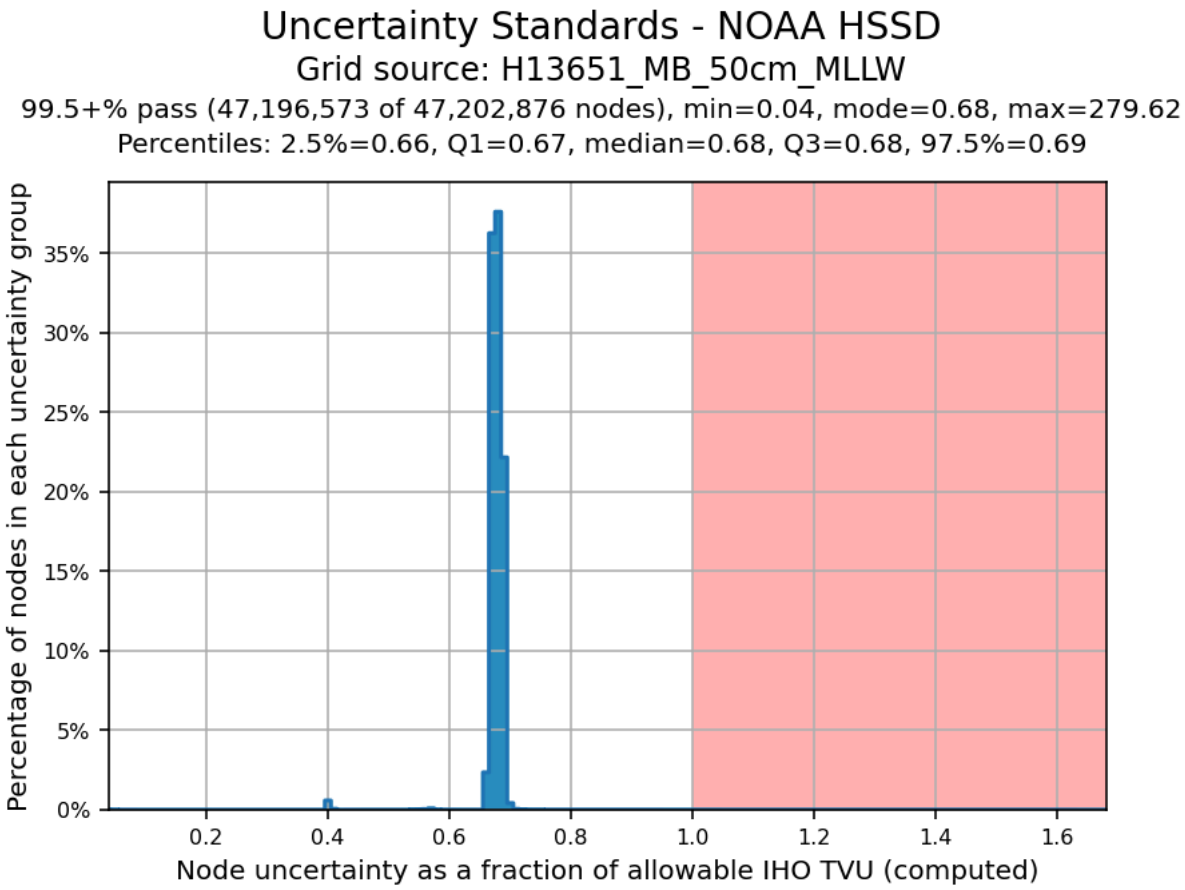
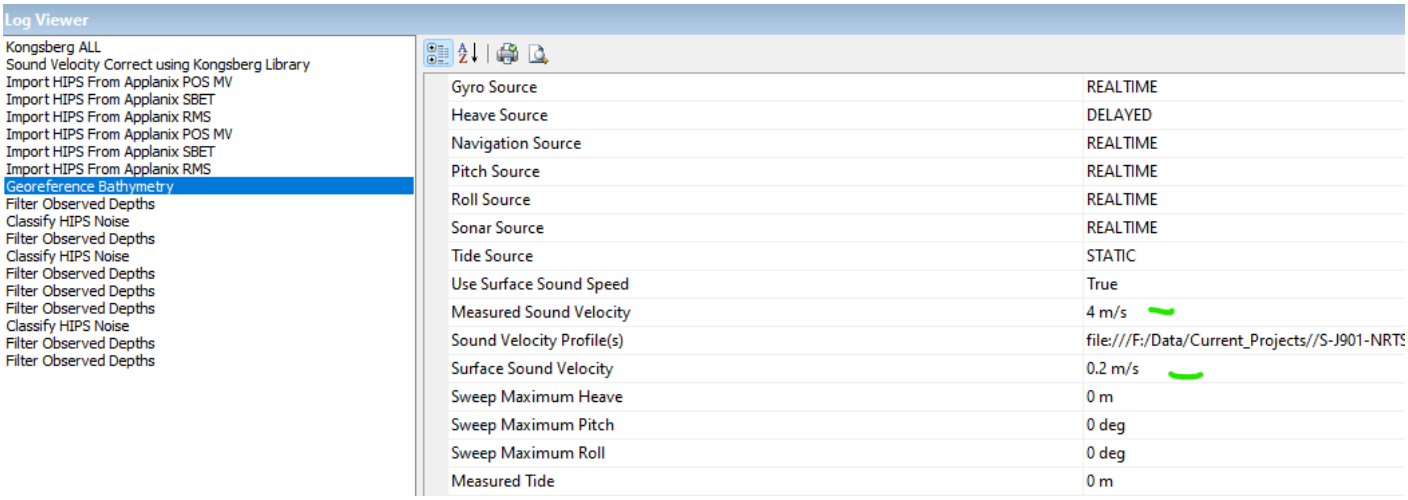


Figure 9: NOAA HSSD Uncertainty Standards

Concur with clarification that Georeference Bathymetry the "Measure Sound Velocity" in the HDCS data is at 4 m/s and the "Surface Sound Velocity" is at 0.2 m/s.



H13651 Sound speed uncertainties

B.2.3 Junctions

No Junctions were prescribed per Project Instructions. 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

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at the start of acquisition each day and at a minimum of one every four hours during launch acquisition.

Cast frequency met or exceeded 1 cast per every 4 hours of survey.

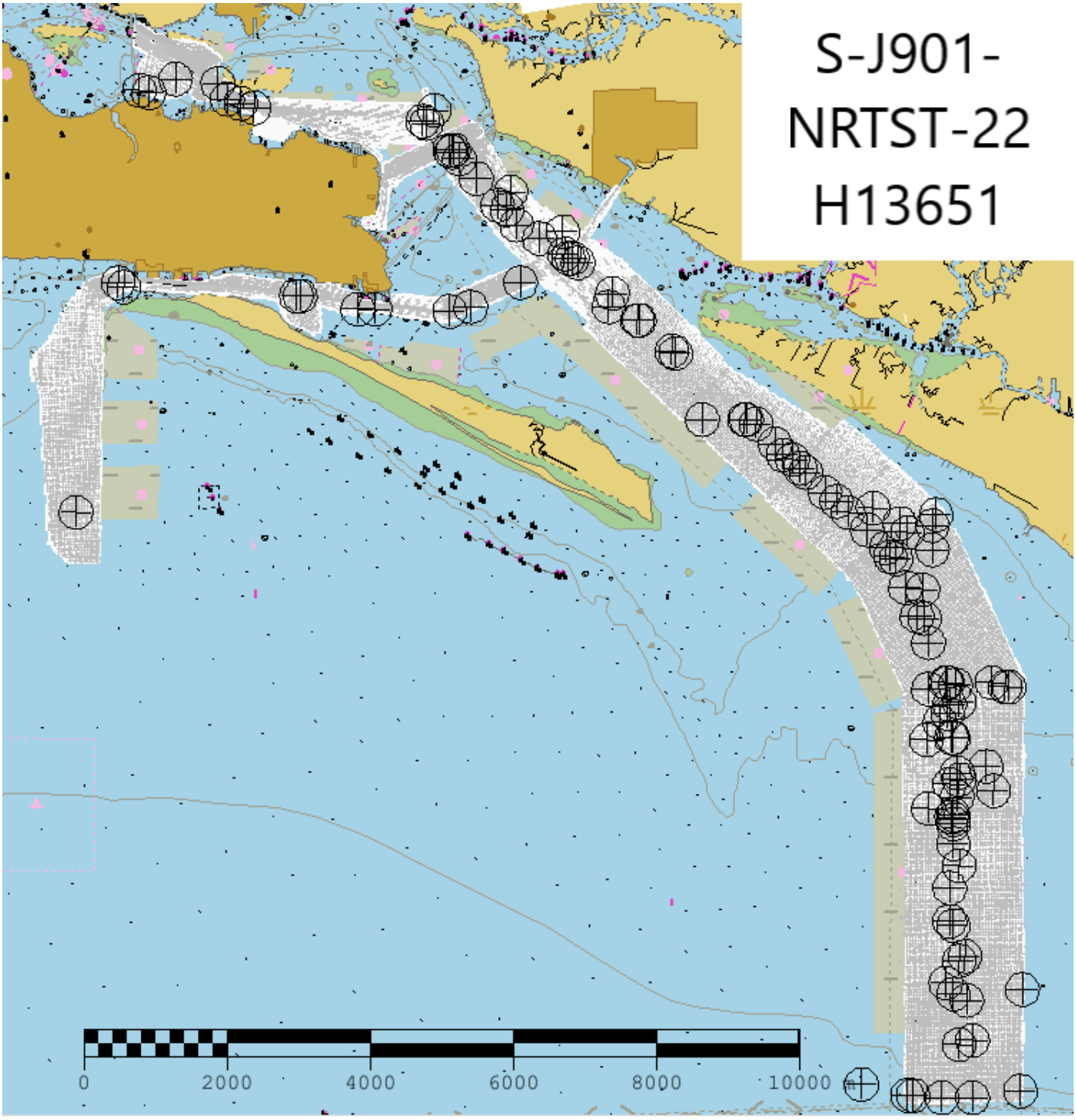


Figure 10: H13651 SVP cast locations overlaid on mainscheme SSS coverage.

B.2.8 Coverage Equipment and Methods

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

B.2.9 Density

The surface was analyzed using HydrOffice QC Tools Grid QA feature. Density requirements for H13651 were achieved with at least 99% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3. The few nodes that did not meet density requirements are due to sparse data in the outer beams.

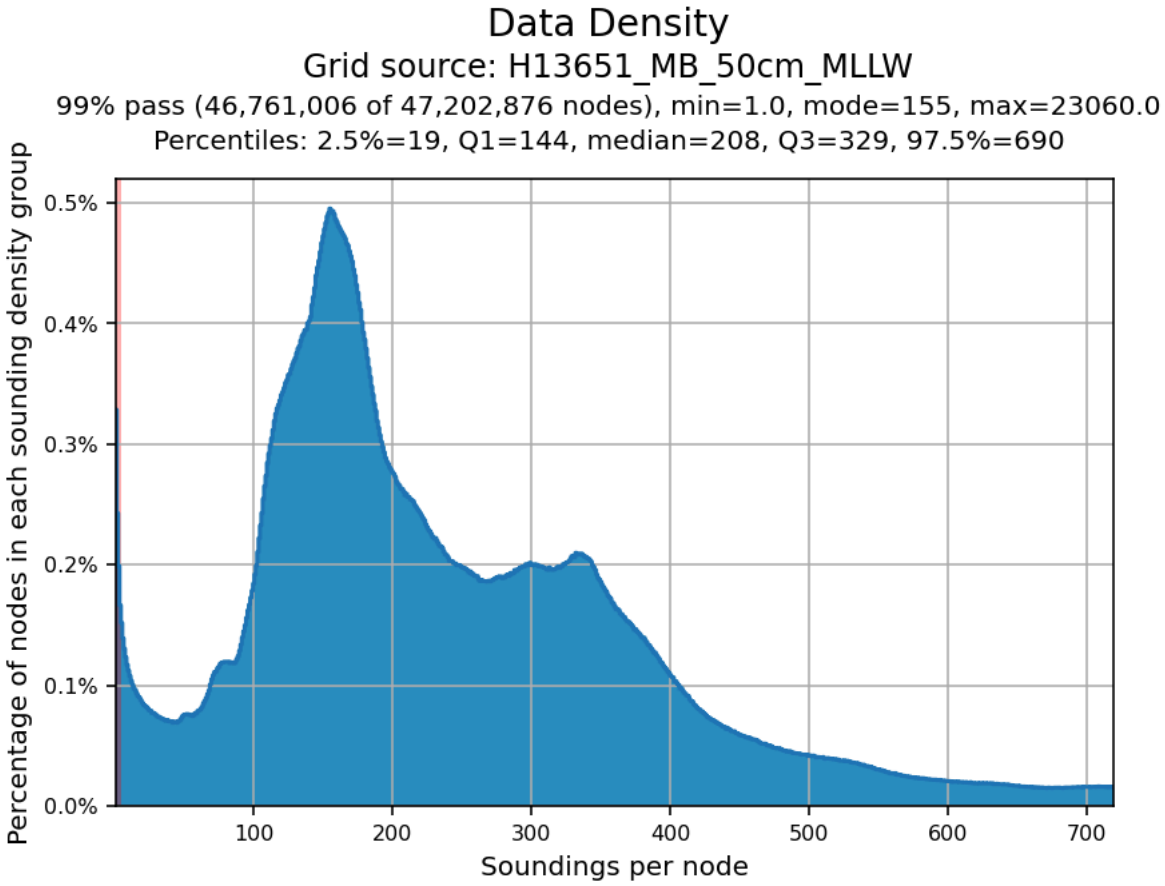


Figure 11: H13651 Data Density

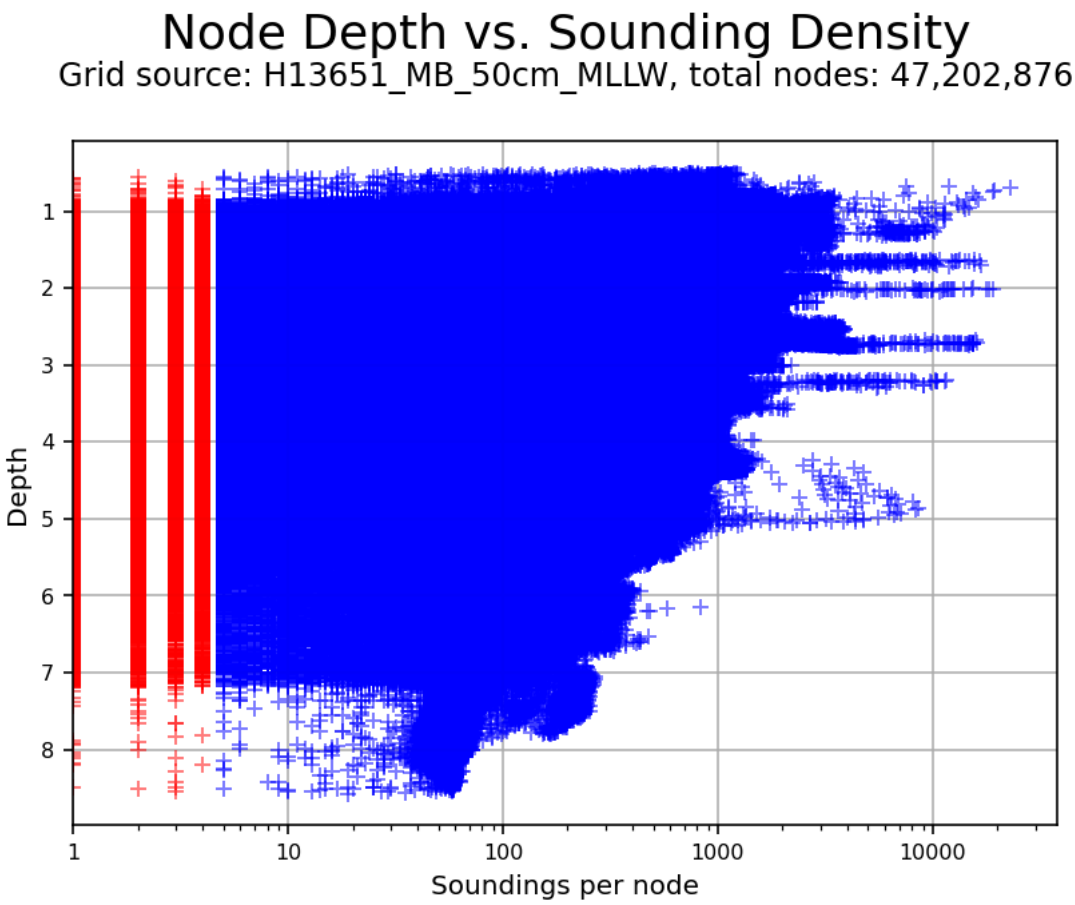


Figure 12: H13651 Node Depth vs. Sounding Density

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

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

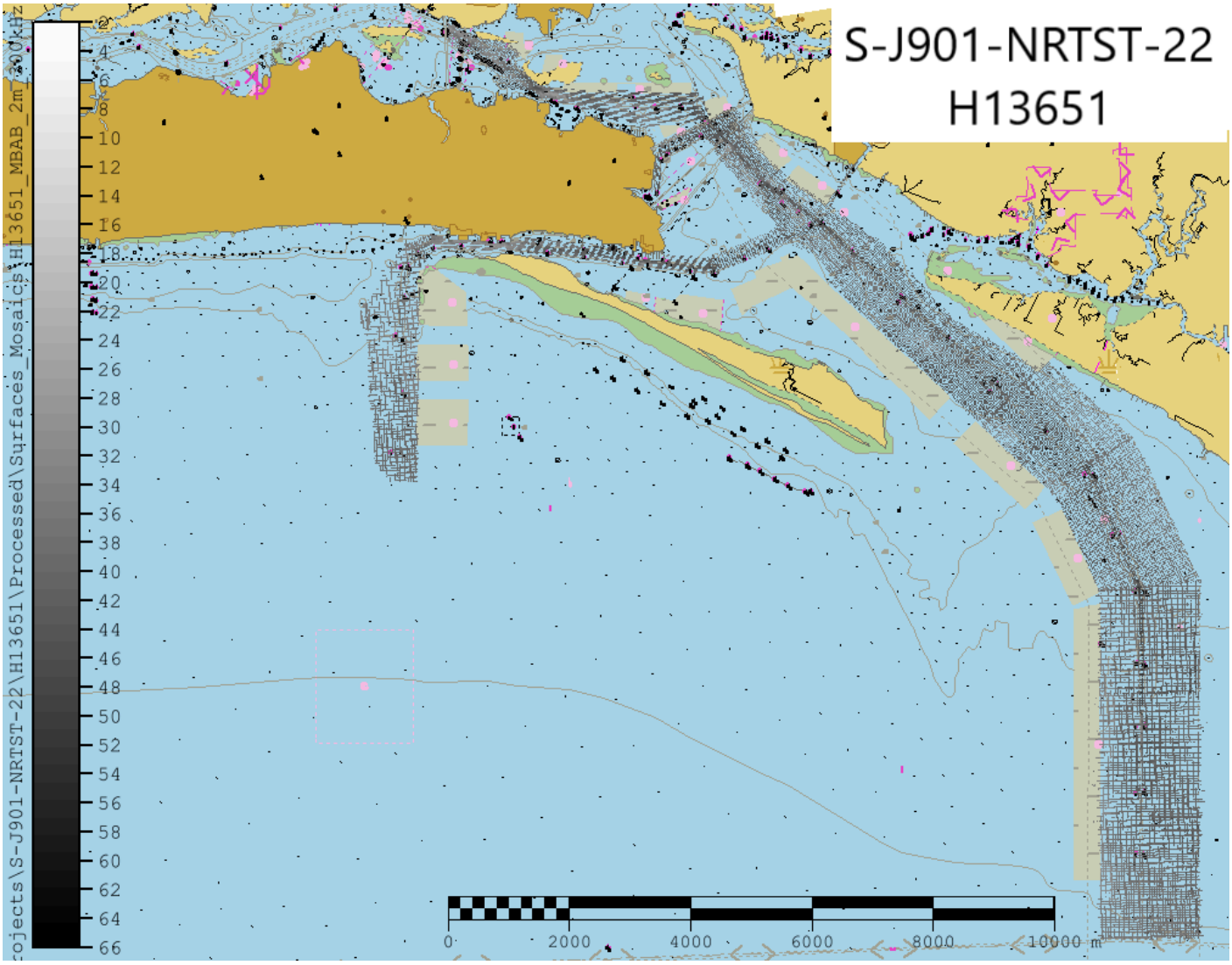


Figure 13: H13651 300 kHz MBAB coverage at 2m resolution.

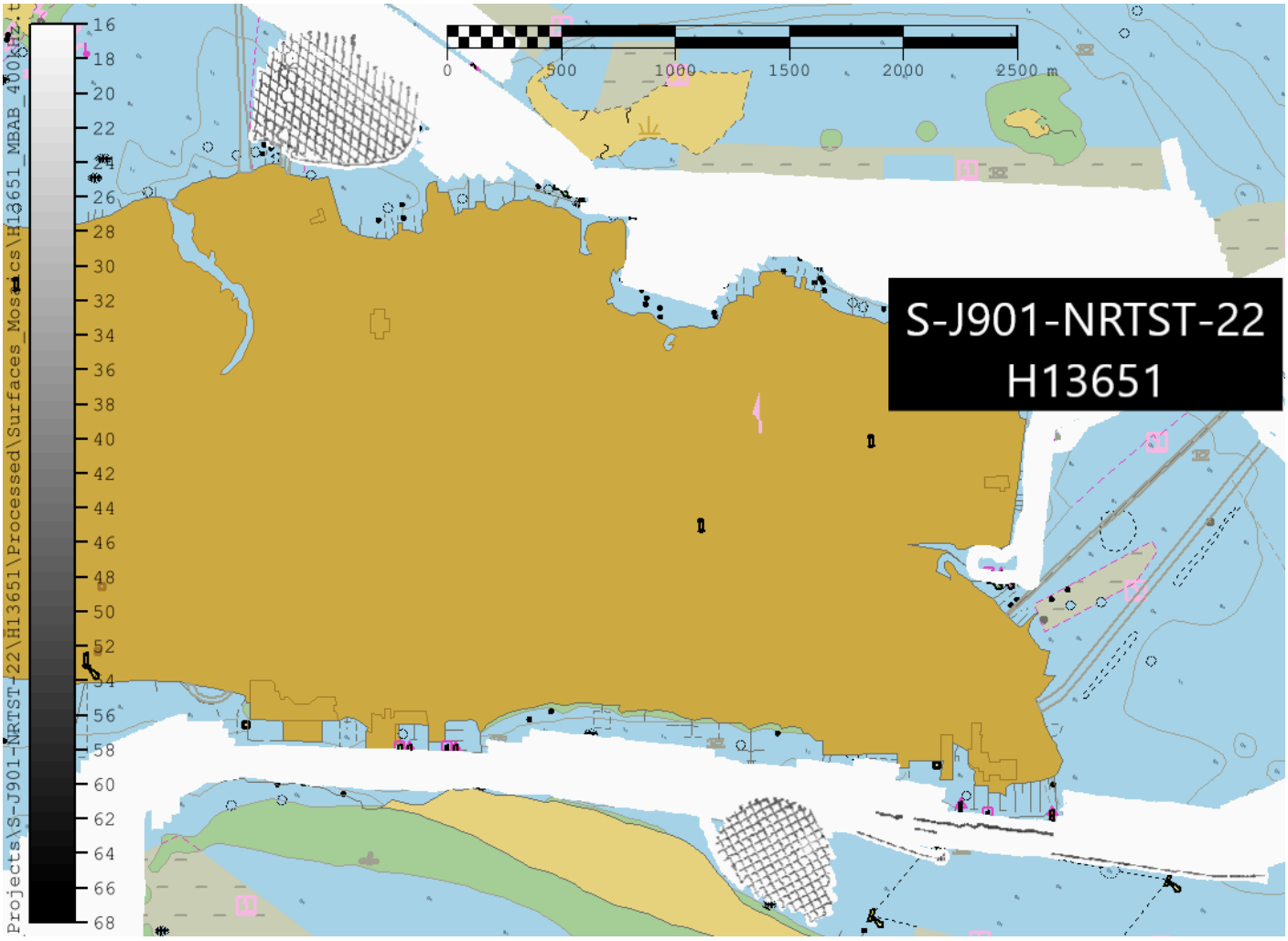


Figure 14: H13651 400 kHz MBAB coverage, overlaid on mainscheme SSS coverage, at 2m resolution.

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
Applanix	POSPac	8.9

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus	7.10.2

Table 10: Primary imagery 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
H13651_MBES_50cm_MLLW	CARIS Raster Surface (CUBE)	0.5 meters	0.5 meters - 8.6 meters	NOAA_0.5m	MBES Trackline
H13651_MBES_50cm_MLLW_Final	CARIS Raster Surface (CUBE)	0.5 meters	0.5 meters - 8.6 meters	NOAA_0.5m	MBES Trackline
H13651_SSSAB_1m_450kHz_1of2	SSS Mosaic	1 meters	-	N/A	100% SSS
H13651_SSSAB_1m_450kHz_2of2	SSS Mosaic	1 meters	-	N/A	200% SSS
H13651_MBAB_2m_300kHz	MB Backscatter Mosaic	2 meters	-	N/A	MBES Trackline
H13651_MBAB_2m_400kHz	MB Backscatter Mosaic	2 meters	-	N/A	MBES Trackline

Table 11: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13651. The surfaces have been reviewed where noisy data, or "fliers", are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed. Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was

run iteratively until all remaining flagged fliers were deemed to be valid aspects of the steep slopes and dynamic nature of the seafloor.

B.5.3 Data Processing Issues with Chucky

During the processing of H13651 many issues were encountered that have since made working with the data more difficult. Specific issues were encountered with Pydro 22's batch processor Chucky leading to multiple iterations of the processed data corrupting. As a result of these corruptions there was some data loss and additional issues with the data while reprocessing. This has lead to gaps in the survey areas as well as multiple lines refusing to process. Many attempts have been made to remedy this situation both by the remaining field team and by HSTB with mixed results. All issues that have not/were not able to be fixed are shown in the images below.

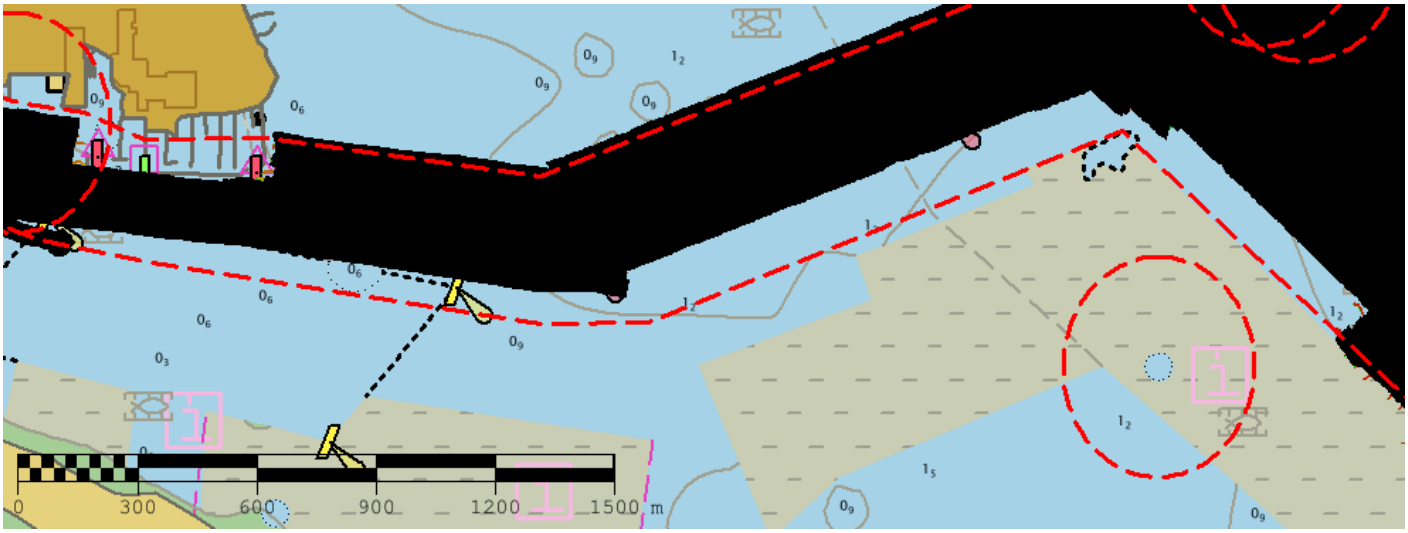


Figure 15: Large SSS Data Gap, Project Outline in Red

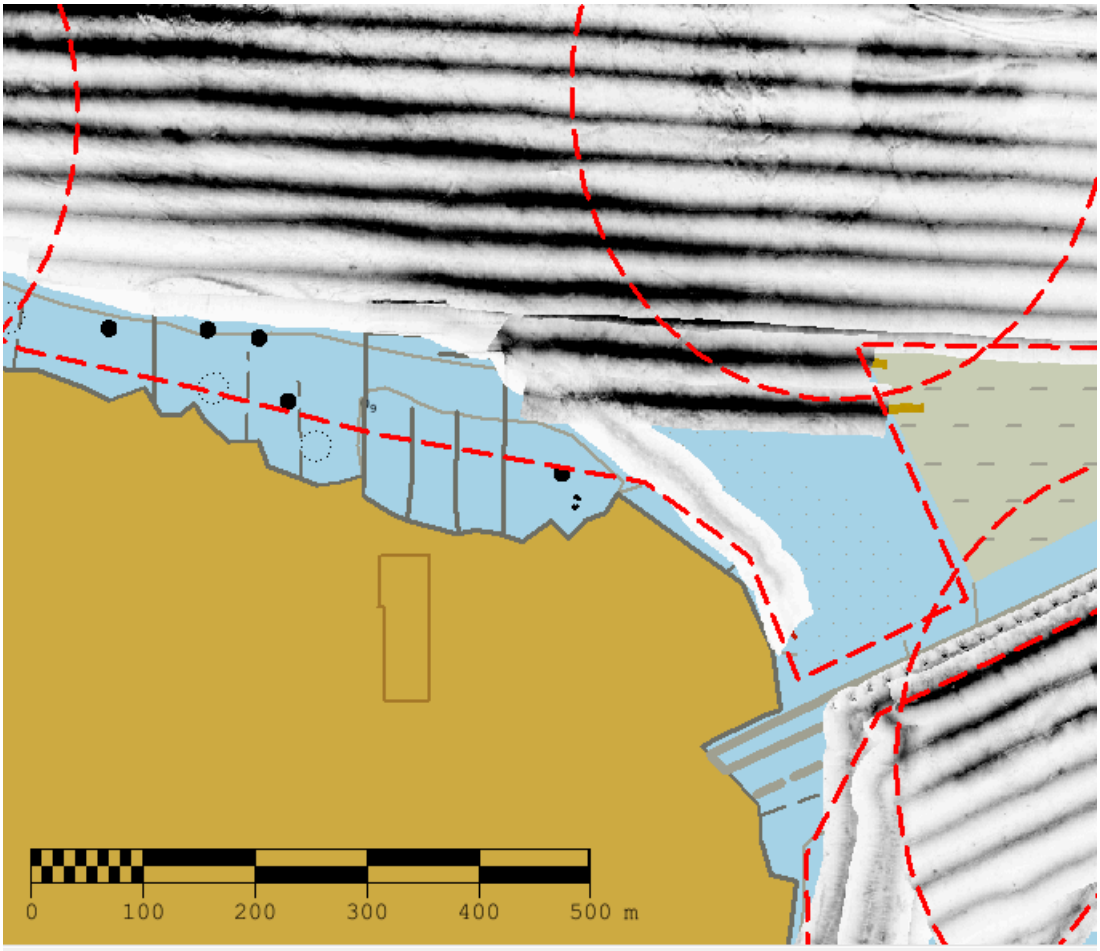


Figure 16: Medium SSS Data Gap, Project Outline in Red

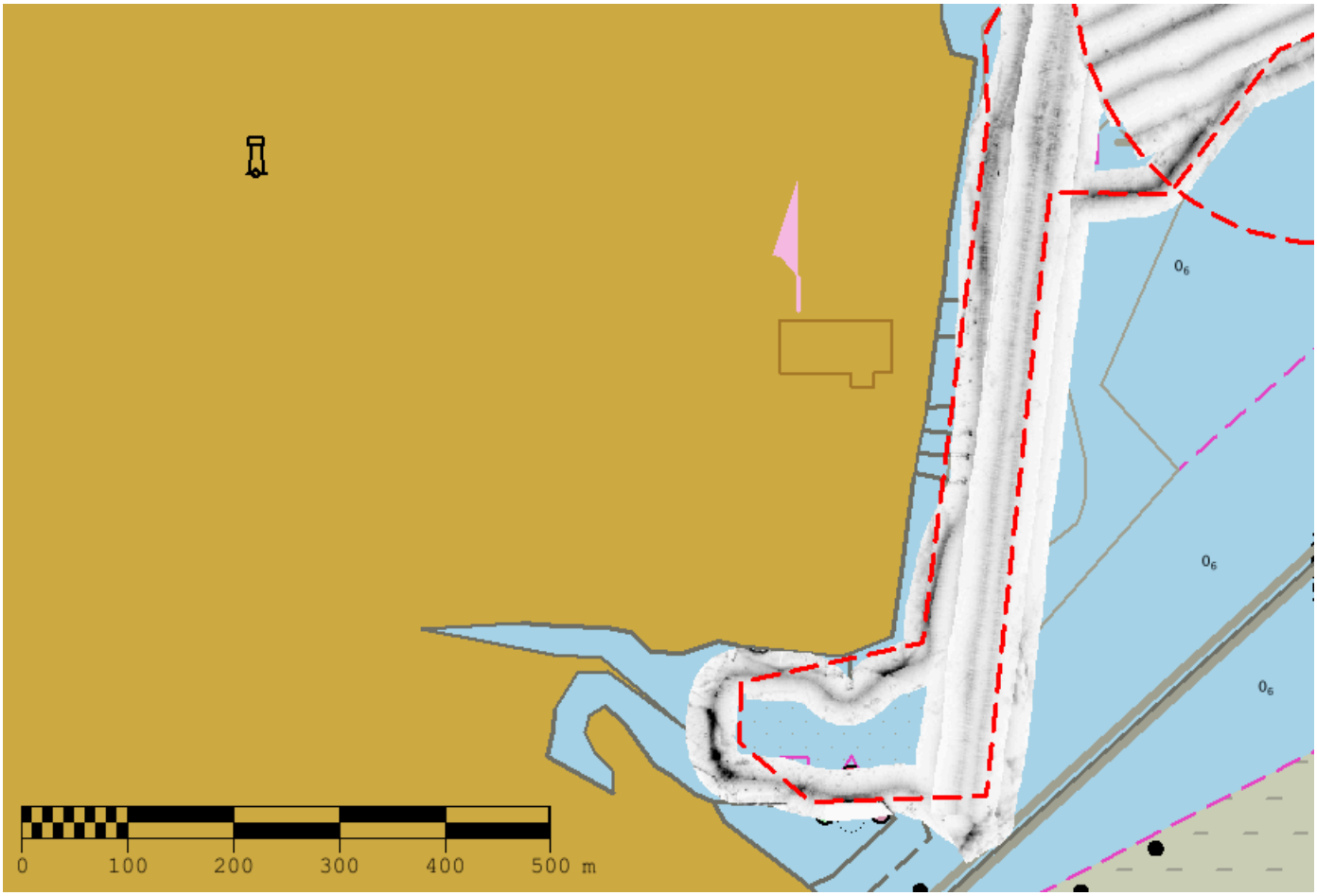


Figure 17: Small SSS Data Gap, Project Outline in Red

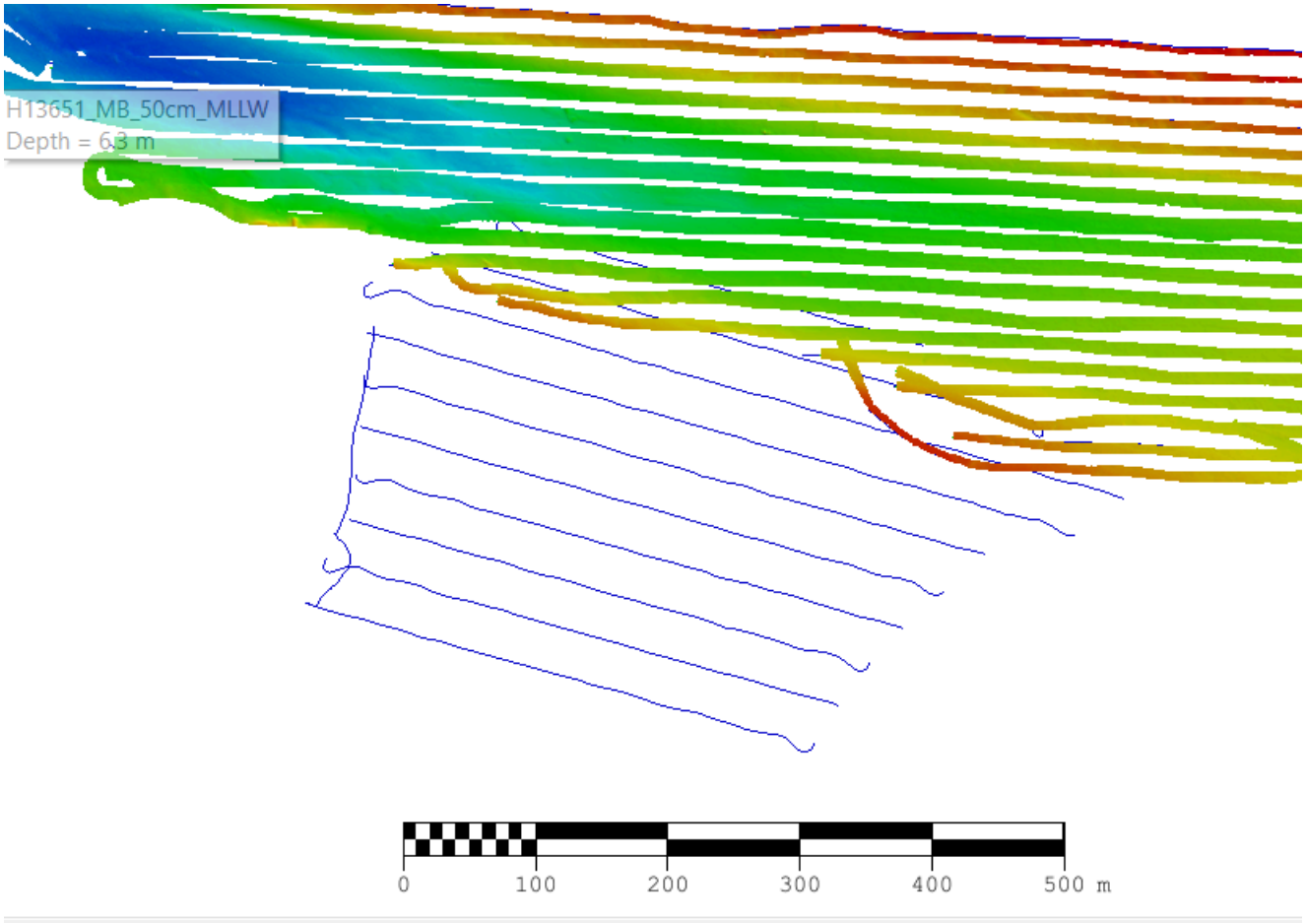


Figure 18: Missing MBES Data from EB240

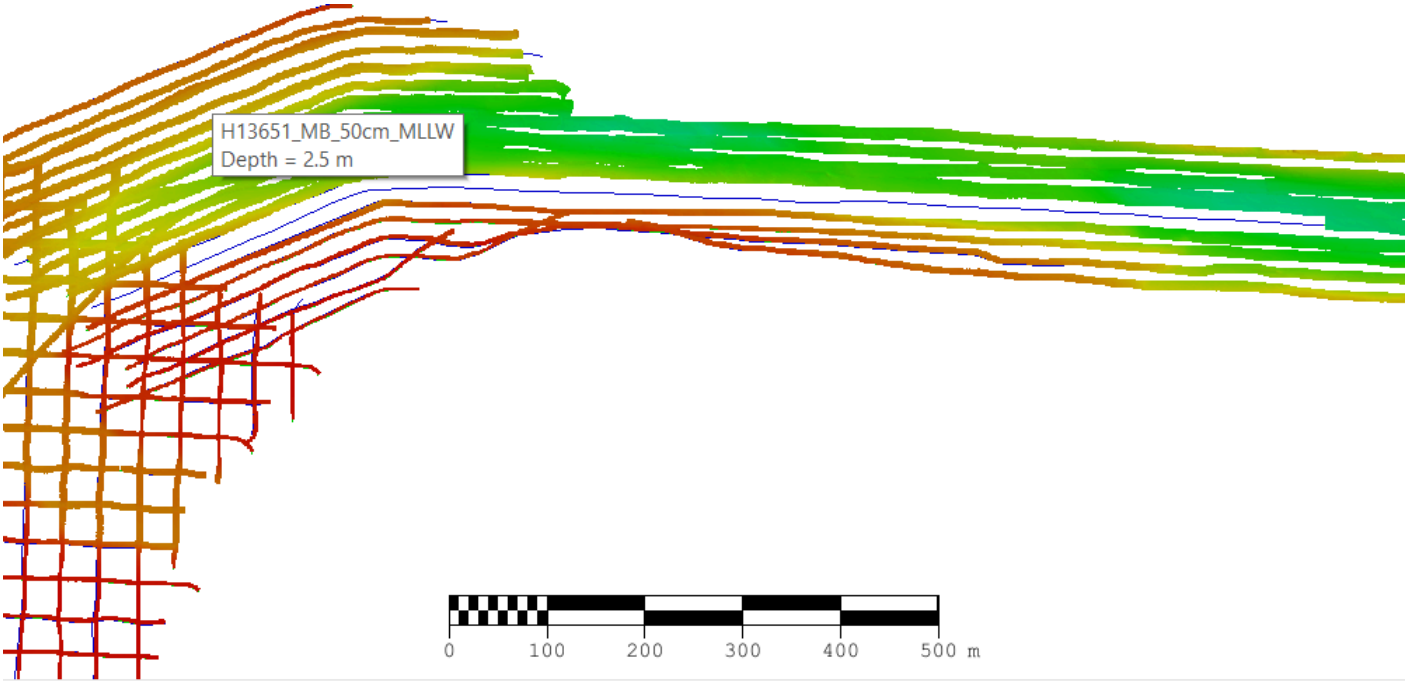


Figure 19: Missing MBES Data from S3005

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-J901-NRTST-22_VDatum_100m_NAD83-MLLW_geoid12b.csar

Table 12: ERS method and SEP file

All soundings submitted for H13651 are reduced to MLLW using VDatum techniques as outlined in the DAPR. Field installed tide and GPS stations were not utilized for this survey. There is no HVCR report included with the submission of H13651.

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 16.

The following PPK methods were used for horizontal control:

- RTX

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 16. Horizontal and vertical positioning were achieved in accordance with practices outlined in the DAPR. Processing and products for Survey H13651 were conducted and completed in NAD 83 per HSSD specification. Refer to the DAPR for a complete description of horizontal control procedures. RTX Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS software to produce Smoothed Best Estimate of Trajectory (SBET) files and their associated uncertainty for post-processing horizontal correction.

PPP

Trimble CenterPoint RTX is the preferred method for the positioning for the Gulf of Mexico where horizontal accuracies of 2cm or less may be achieved without the use of reference stations. CenterPoint RTX service was accessed via an internet connection within one hour after field operations had concluded. Applanix POSPac MMS 8.8 software was used to access Trimble RTX servers to produce a Smoothed Best Estimate of Trajectory (SBET) file implementing the Applanix proprietary "SmartBase" algorithm. The SBET file consisted of GPS position and attitude data corrected and integrated with inertial measurements and correctors which were then exported to the reference ellipsoid. These SBET navigation and attitude files were applied to all lines in CARIS and supersede initial positioning and attitude data.

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 chart comparison was conducted between survey H13651 soundings and previously charted ENC soundings using procedures outlined in the DAPR.

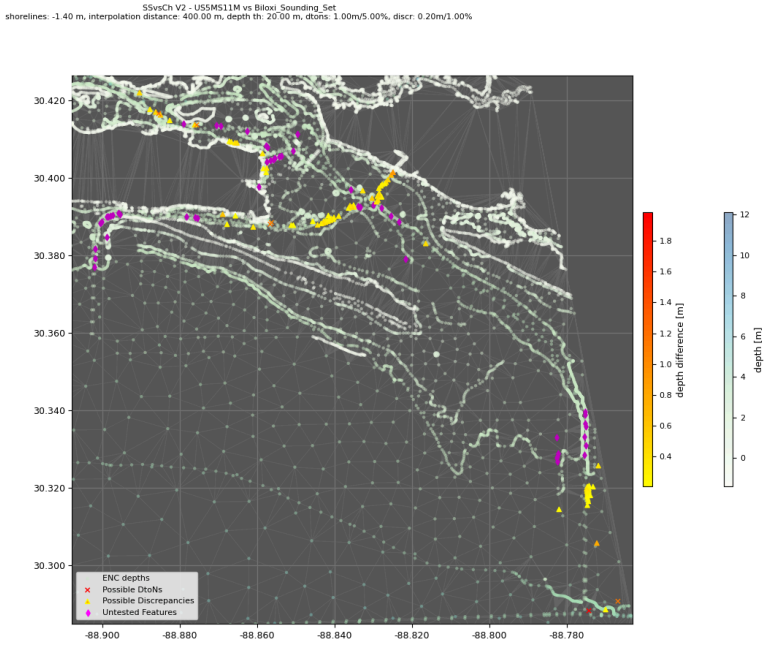


Figure 20: H13651 vs. US5MS11M Chart Sounding Comparison

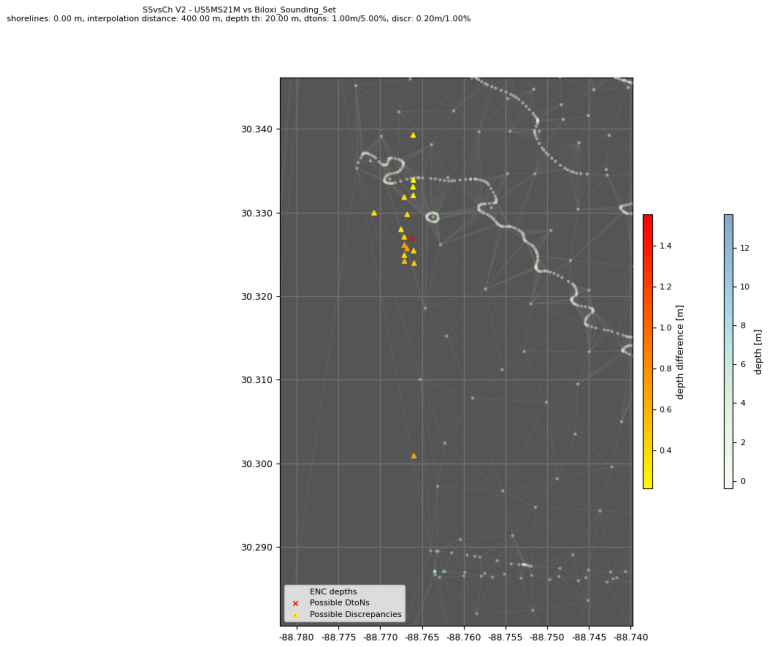


Figure 21: H13651 vs. US5MS21M Chart Sounding Comparison

D.1.1 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US5MS11M	1:40000	62	02/08/2022	04/08/2022
US5MS21M	1:40000	48	01/05/2022	04/11/2022

Table 13: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Refer to the H13651 Final Feature File.

D.1.3 Charted Features

Refer to the H13651 Final Feature File.

D.1.4 Uncharted Features

Survey H13651 has 7 new features that are addressed in the H13651 Final Feature File. Of these features, there are 7 new Obstructions, 0 new Seabed Areas, 0 new Underwater Rocks of which 0 are submitted as DTONs.

D.1.5 Channels

There were no discrepancies found between the ENC charted contours and the surveyed contours of the channel for survey H13651. There were no differences found between the survey depths and the recorded controlling depths, tabulated depths, and reported depths of all maintained channels within survey H13651.

D.2 Additional Results

D.2.1 Aids to Navigation

Refer to the H13651 Final Feature File.

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

Refer to the H13651 Final Feature File.

D.2.5 Submarine Features

During processing of H13651, three features were found in side scan coverage that were not covered with multibeam during preliminary investigations. Therefore, the least depths for these two features have been reported as unknown in the final feature file. An additional contact was found to only have partial multibeam coverage over it. The shoalest known point was used for the "Value of Sounding" but this should be refined with more accurate data. The hydrographic field party has intentions of investigating these features in the future to update the least measurements. Please refer to the H13651 Final Feature File for more information.

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 prior to my arrival with the team. 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
Robert Sobelsohn	Chief of Party	03/05/2025	SOBELSOHN.ROBERT.WILLIAM.1607479476 Digitally signed by SOBELSOHN.ROBERT.WILLIAM.1607479476 Date: 2025.03.05 12:13:22 -06'00'

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