H13683

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13683

LOCALITY

State(s):	Pennsylvania
General Locality:	Lake Erie
Sub-locality:	5 NM Northeast of Presque Isle

2022

CHIEF OF PARTY
Matthew J. Jaskoski, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13683**

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):	**Pennsylvania**
General Locality:	**Lake Erie**
Sub-Locality:	**5 NM Northeast of Presque Isle**
Scale:	**5000**
Dates of Survey:	**08/09/2022 to 08/14/2022**
Instructions Dated:	**08/02/2022**
Project Number:	**OPR-W386-TJ-22**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**Matthew J. Jaskoski, CDR/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Low Water Datum IGLD-1985**

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, LWD - IGLD 1985. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13683

Project: OPR-W386-TJ-22

Locality: Lake Erie

Sublocality: 5 NM Northeast of Presque Isle

Scale: 1:5000

August 2022 - August 2022

NOAA Ship *Thomas Jefferson*

Chief of Party: Matthew J. Jaskoski, CDR/NOAA

A. Area Surveyed

Survey H13683, located in Lake Erie within the sub locality of 5 NM Northeast of Presque Isle, PA, was conducted in accordance with coverage requirements set forth in the Project Instructions OPR-W386-TJ-22 (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
42° 17' 49.42" N 80° 12' 2.96" W	42° 12' 1.47" N 80° 3' 56.76" W

Table 1: Survey Limits

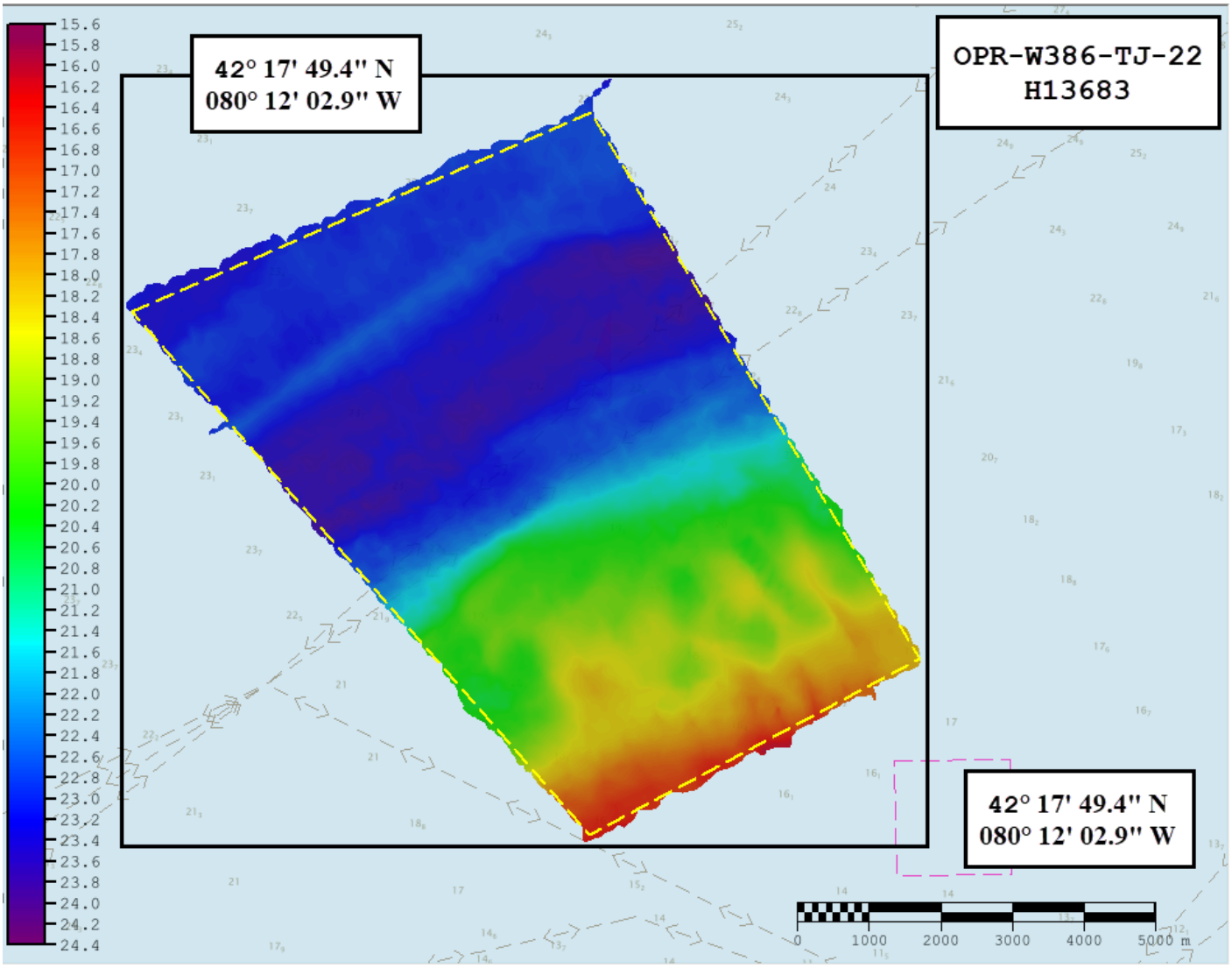


Figure 1: Survey layout for H13683, plotted over ENC US4PA21M. The black outline represent the geographical extents of the survey. The dashed yellow outline represents the survey limits set forth by the Project Instructions. MBES coverage shown in color.

Survey data were acquired in accordance with the requirements set forth by the Project Instructions (PI) and the 2022 Hydrographic Surveys Specifications and Deliverables (HSSD).

A.2 Survey Purpose

Erie is Pennsylvania's primary port for accessing Lake Erie and the St. Lawrence Seaway. Erie, PA is occasionally used by container ships, tankers, barges, and other large shipping vessels. It also boasts a robust sailing and fishing community, scenic beauty, biodiversity, and historical connections.

This area was identified as a statistically significant hotspot within the 2018 Hydrographic Health Model, a risk model that Coast Survey uses for evaluating priorities based upon navigational risk and the necessary quality of data to support modern traffic.

The modern bathymetric survey in this area will not only identify hazards and changes to the lake bed, but will update National Ocean Service (NOS) nautical charting products and support Erie County's Lake Erie Quadrangle nomination for National Marine Sanctuary designation.

https://www.sail-world.com/Australia/Erie-Pennsylvania-Small-place-big-boating/-127219?
https://en.wikipedia.org/wiki/Economy_of_Erie,_Pennsylvania

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13683 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the 2022 HSSD. This includes crosslines (see section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.5.2).

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 (Refer to HSSD Section 5.2.2.3)
All waters in survey area.	Acquire backscatter data during all multibeam data acquisition (Refer to the HSSD Section 6.2)

Table 2: Survey Coverage

Survey coverage is in accordance with requirements listed in section 5.2.2 of the 2022 HSSD. Coverage requirements were met with 100% complete coverage MBES.

One holiday exists outside of the sheet limits on the western edge of the sheet (Figure 2). An additional gap in coverage exists between the coverage achieved in H13683 and the assigned sheet limits, however it is not large enough to be classified as a holiday per specifications in the 2022 HSSD (Figure 3). Both of these gaps are fully covered by the adjacent contemporary survey H13670 and no features exist in those areas.

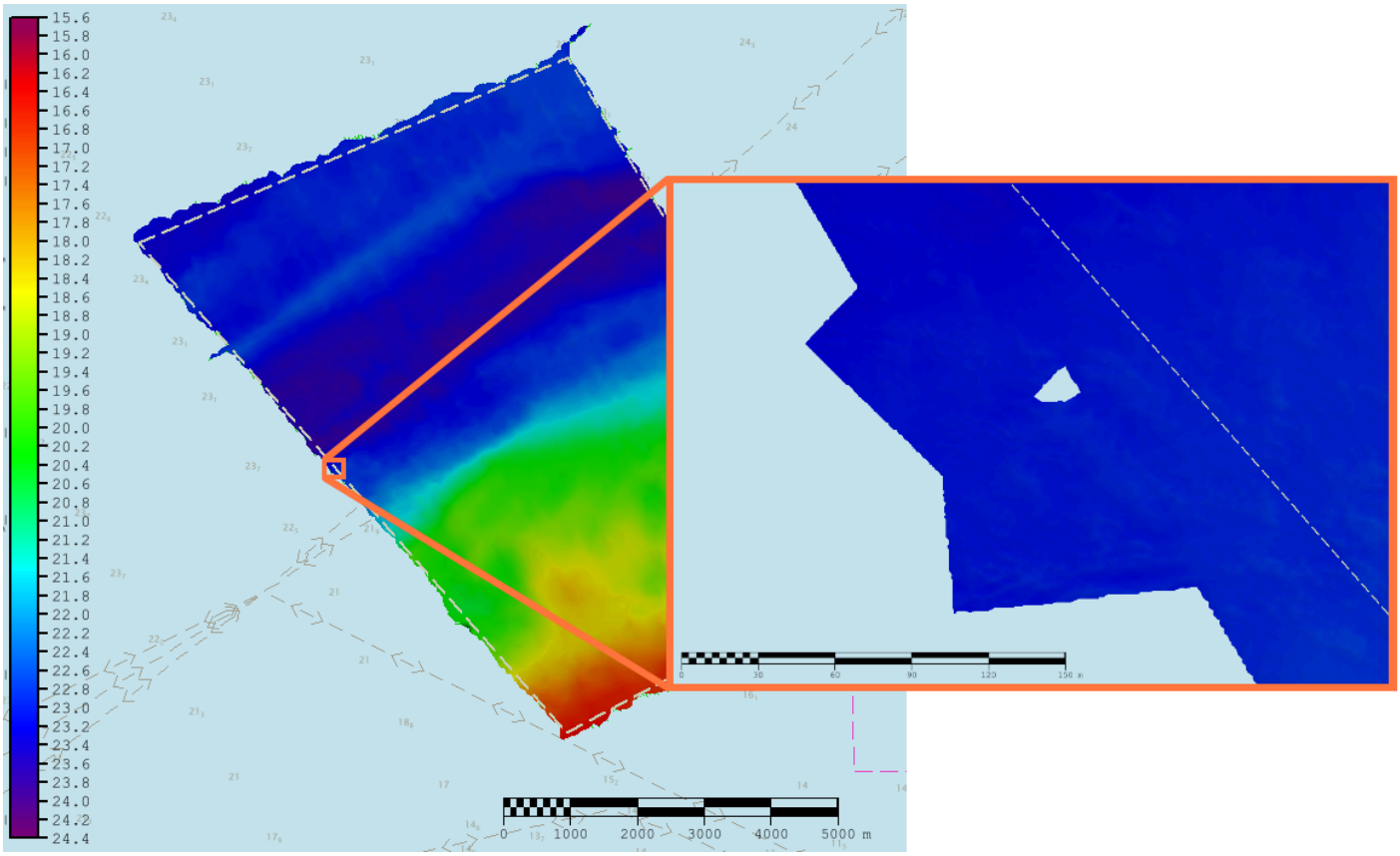


Figure 2: Holiday outside of sheet limits, outlined in pumpkin, is centered around 42° 14' 13.81" N 080° 09' 52.74" W.

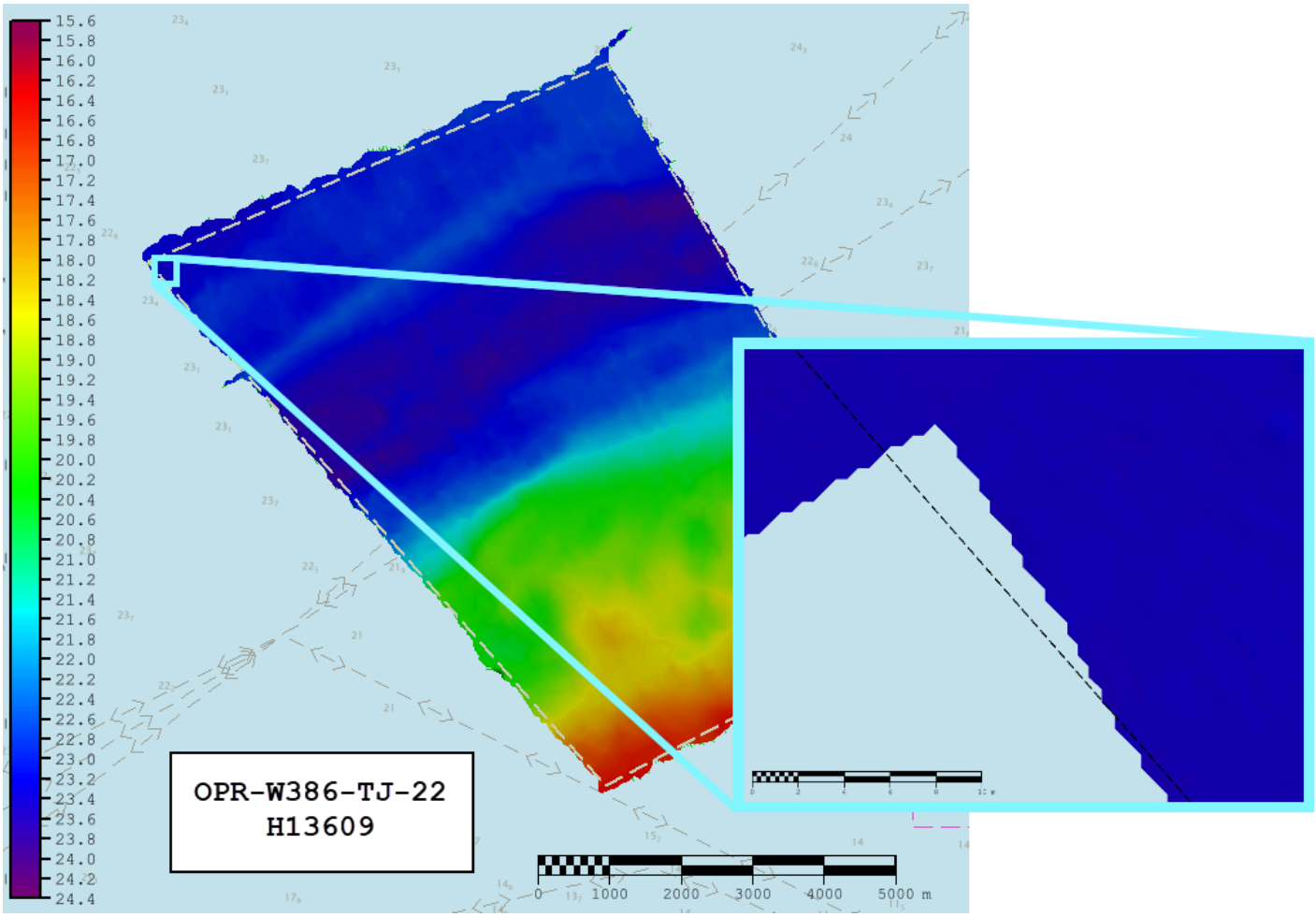


Figure 3: Gap in coverage, outlined in arctic blue, is centered around 42° 15' 56.14" N 080° 11' 48.82" W.

A.6 Survey Statistics

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

	HULL ID	*S222*	*2903*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0	0.0
	MBES Mainscheme	628.74	1.0	629.75
	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	29.29	0.0	29.29
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				3
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				16.91

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/09/2022	221
08/10/2022	222

Survey Dates	Day of the Year
08/11/2022	223
08/12/2022	224
08/13/2022	225
08/14/2022	226

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*S222*	*2903*
LOA	63.3 meters	8.5 meters
Draft	4.6 meters	1.2 meters

Table 5: Vessels Used

Figure 4: NOAA Ship Thomas Jefferson

Figure 5: Hydrographic Survey Launch 2903

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 2040	MBES Backscatter
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Valeport	Thru-Hull SVS	Sound Speed System

Table 6: Major Systems Used

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

B.2 Quality Control

B.2.1 Crosslines

S222 collected 29.29 linear nautical miles of MBES crosslines, or 4.65% of mainscheme MBES data. The crosslines acquired represent good spatial and depth diversity for this survey area (Figure 6). A variable resolution Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a variable resolution CUBE surface of crossline data were differenced - the resulting mean was 0.02 m with a standard deviation of 0.07 m (Figure 7). Over 99.5% of nodes are compliant with fraction of allowable error standards (Figure 8). Visual inspection of the difference surface indicated no systematic issues.

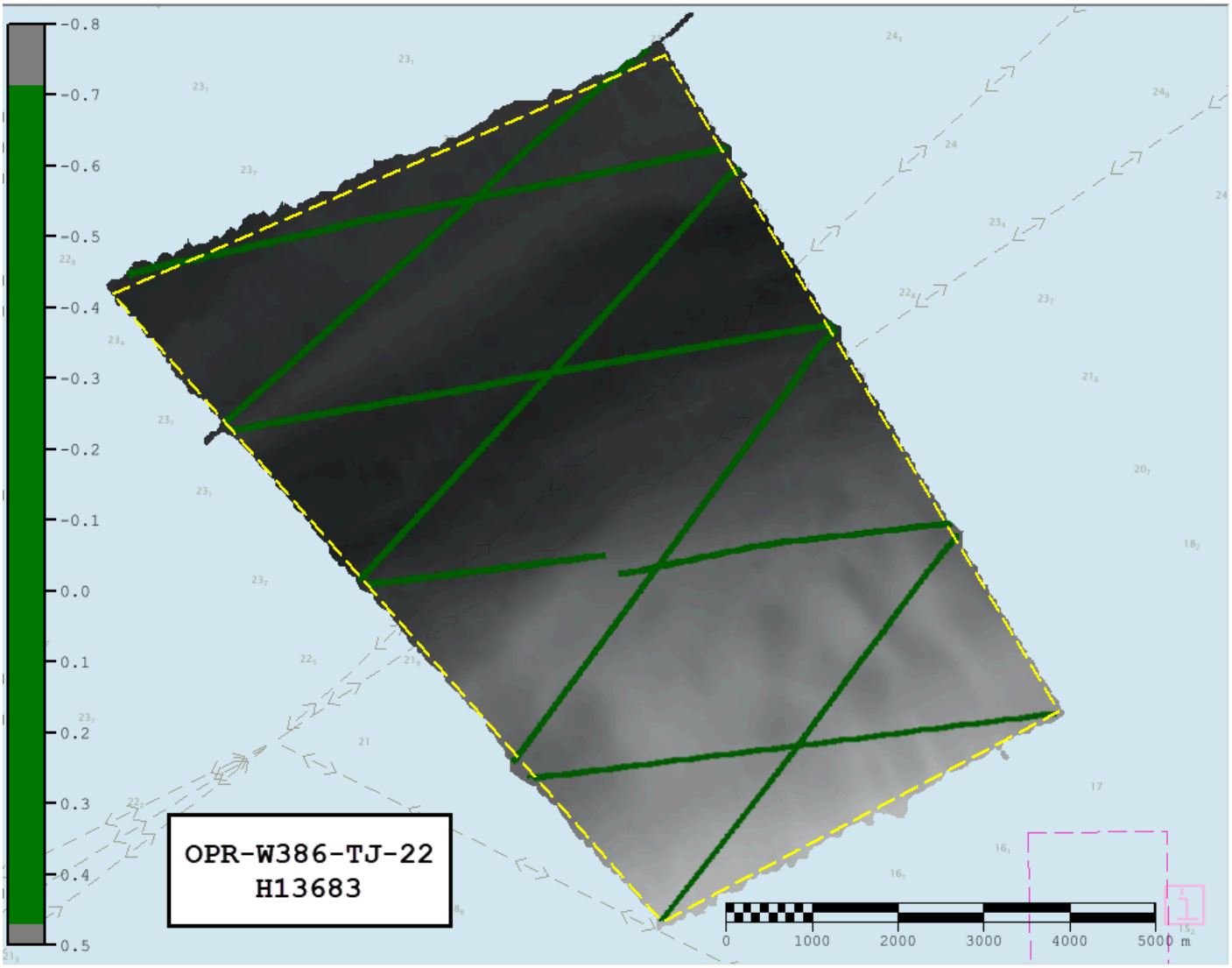
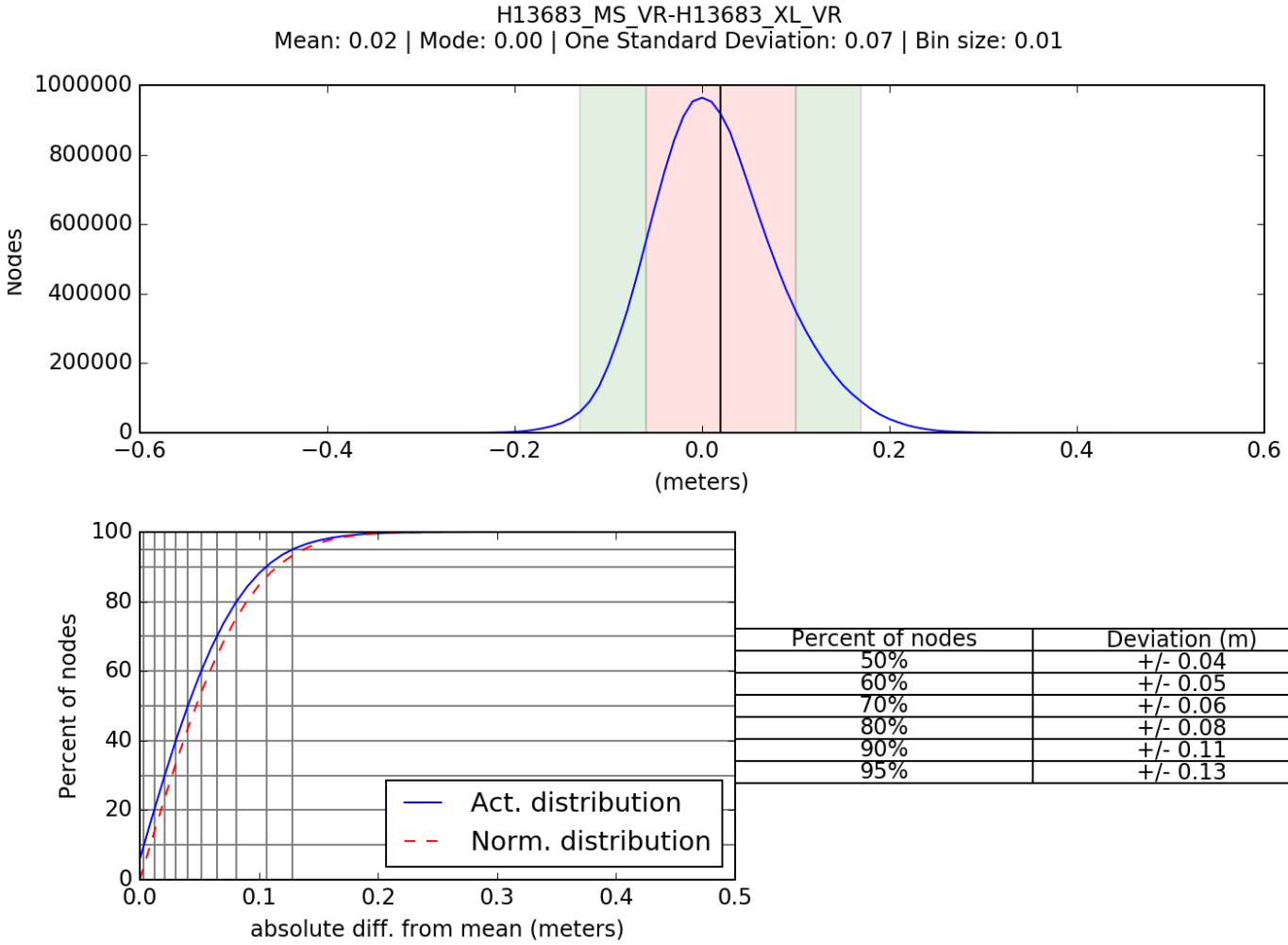


Figure 6: H13683 crossline fractional allowable error shown in color, overlaid onto survey data shown in greyscale.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.08
90%	+/- 0.11
95%	+/- 0.13

Figure 7: H13683 crossline and mainscheme comparison.

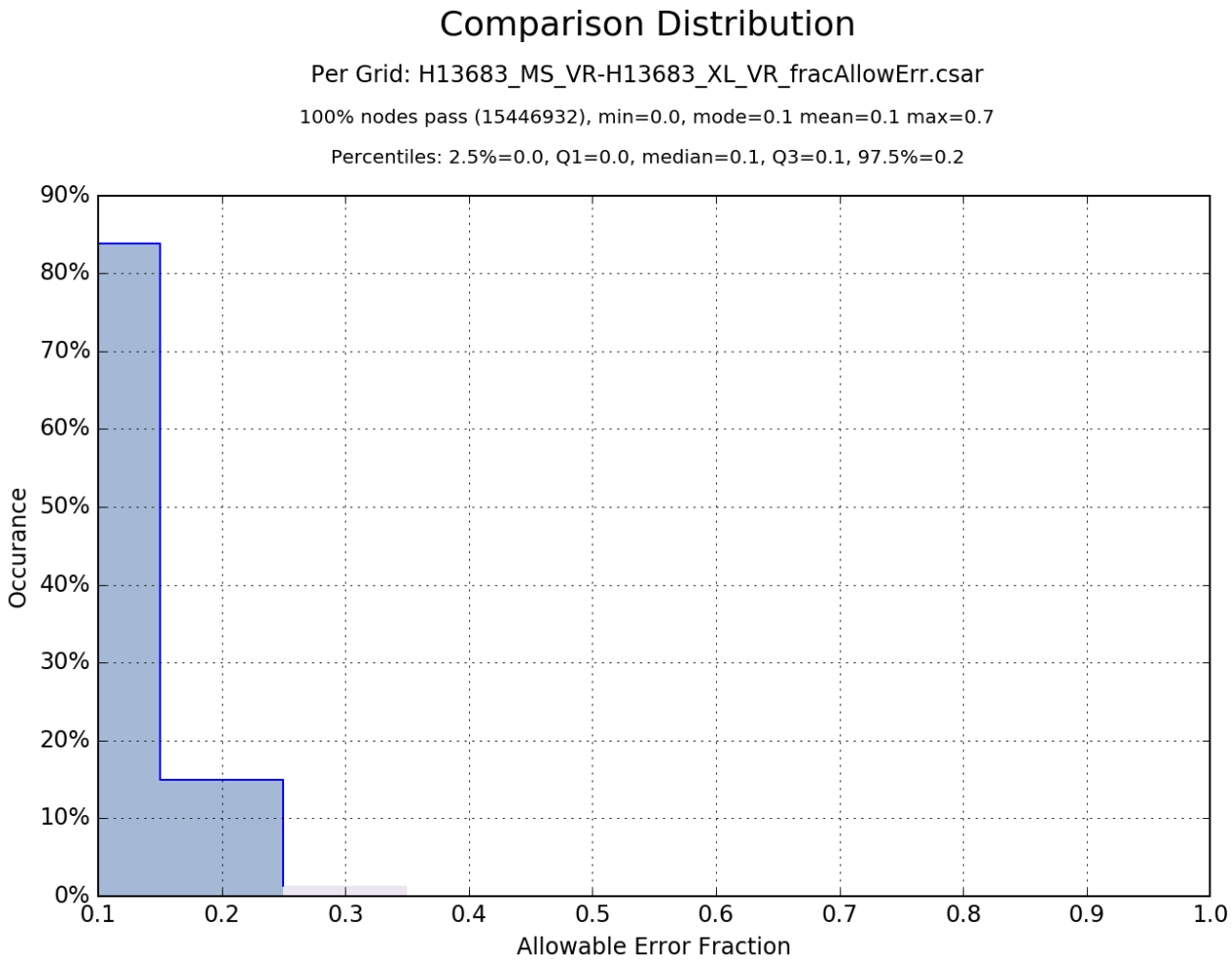


Figure 8: H13683 fractional allowable error node distribution.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.045 meters

Table 7: Survey Specific Tide TPU Values.

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

Table 8: Survey Specific Sound Speed TPU Values.

The bathymetric surface's uncertainty layer is compliant with 2022 HSSD uncertainty standards. Over 99.5% of all nodes pass uncertainty standards (Figure 9).

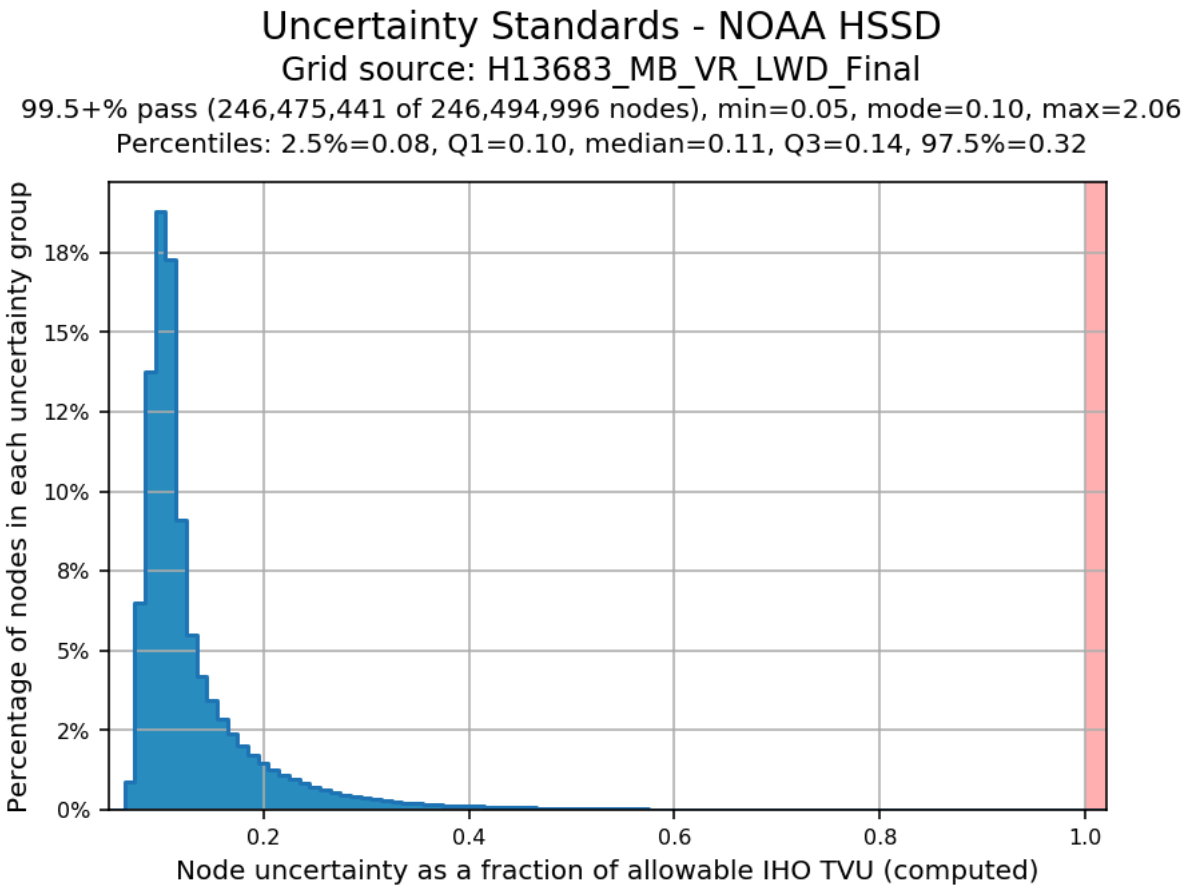


Figure 9: H13683 uncertainty standards.

B.2.3 Junctions

Survey H13683 junctions with H13611 and H13670 within the OPR-W386-TJ-22 project (Figure 10).

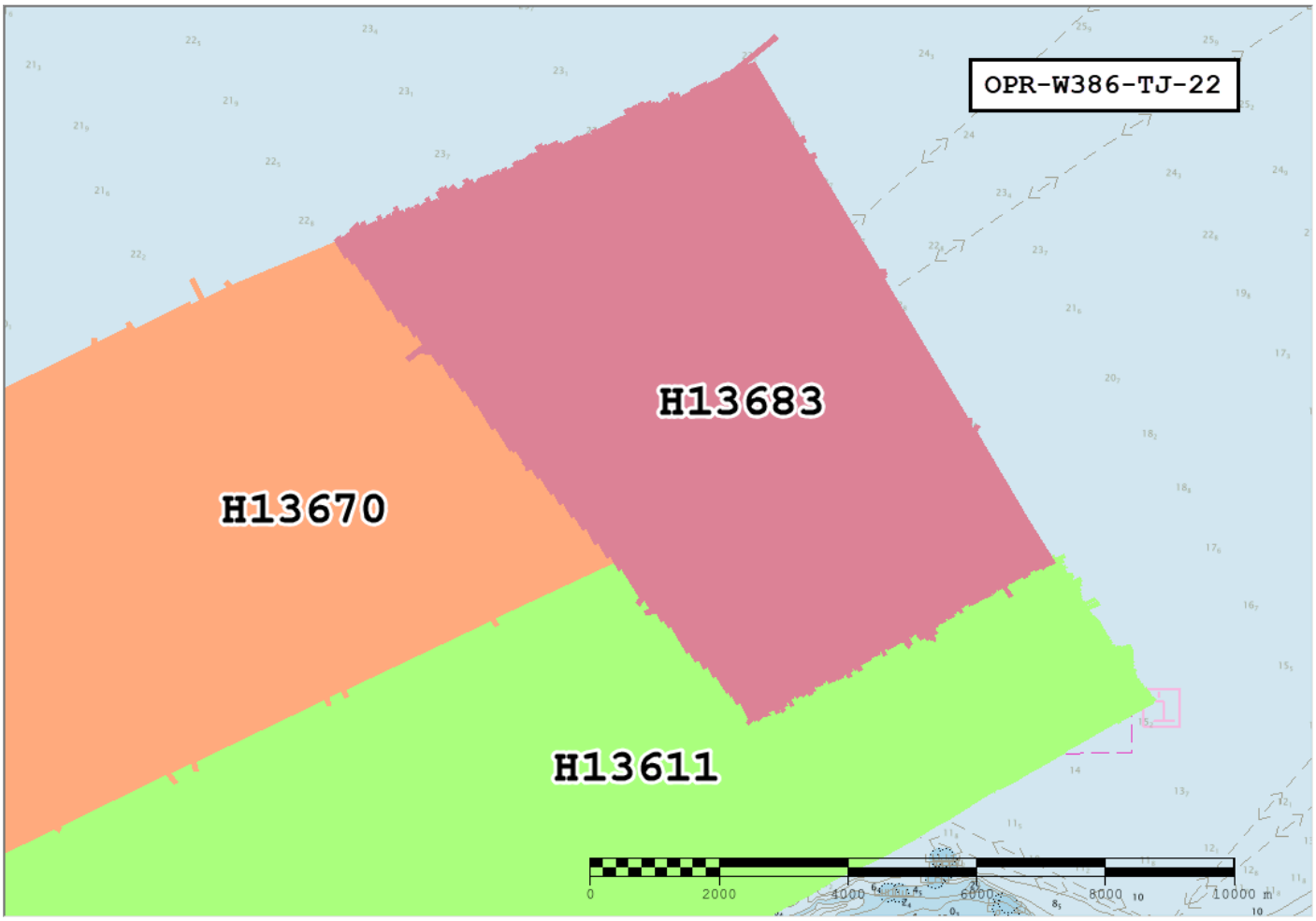


Figure 10: H13683, in raspberry, along with junctioning sheets H13611, in lime, and H13670, in sherbet orange.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13611	1:5000	2022	NOAA Ship Thomas Jefferson	S
H13670	1:40000	2022	NOAA Ship Thomas Jefferson	W

Table 9: Junctioning Surveys

H13611

Refer to survey H13611 Descriptive Report for junction analysis.

H13670

The eastern edge of H13683 junctions with sheet H13670. A variable resolution (VR) CUBE surface of H13683 data and a VR CUBE surface of H13570 data were differenced (Figure 11). The mean difference between bathymetric surface nodes was 0.00 m with a standard deviation of 0.06 m (Figure 12). Statistics and visual inspection indicate that surveys H13683 and H13670 are in general agreement.

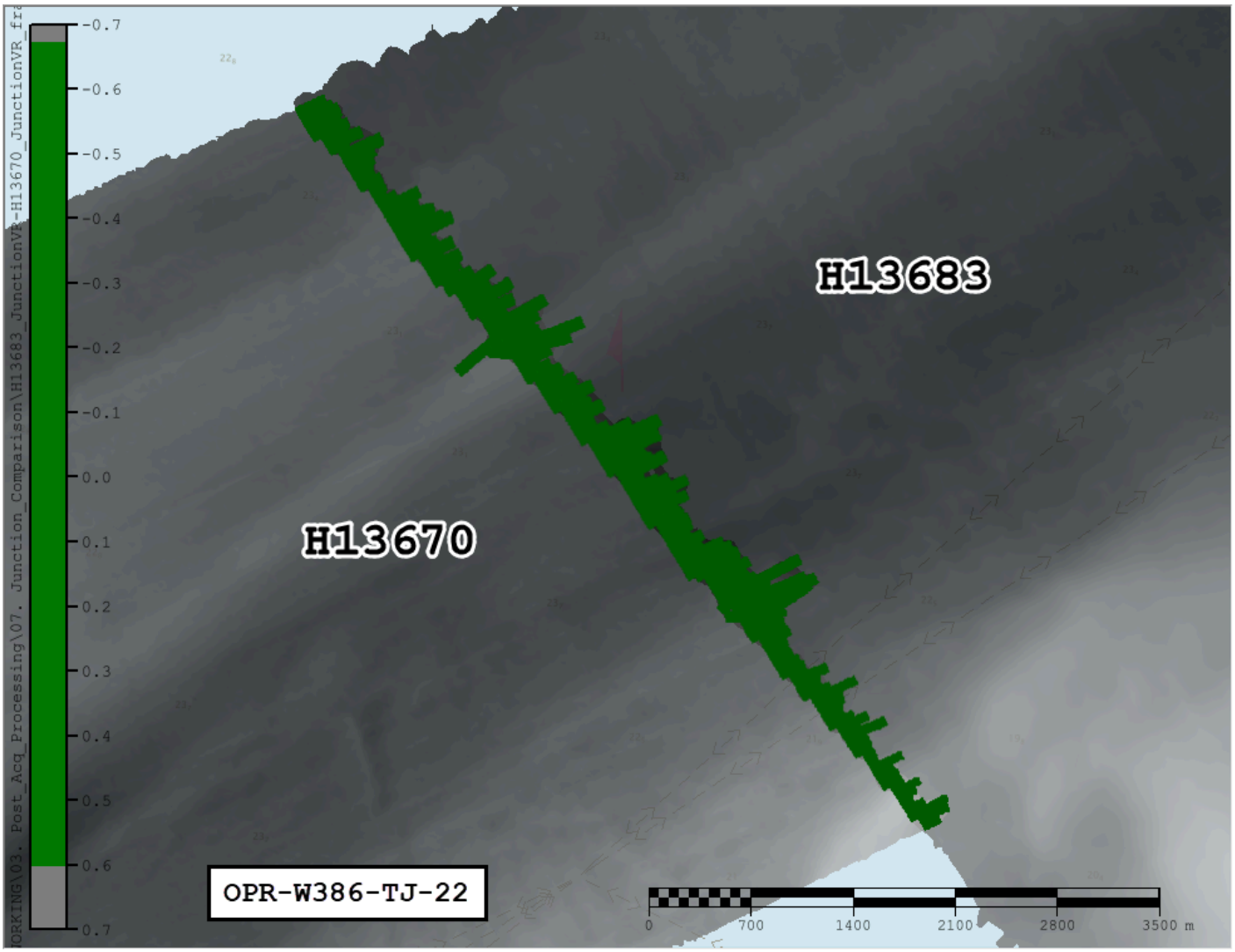
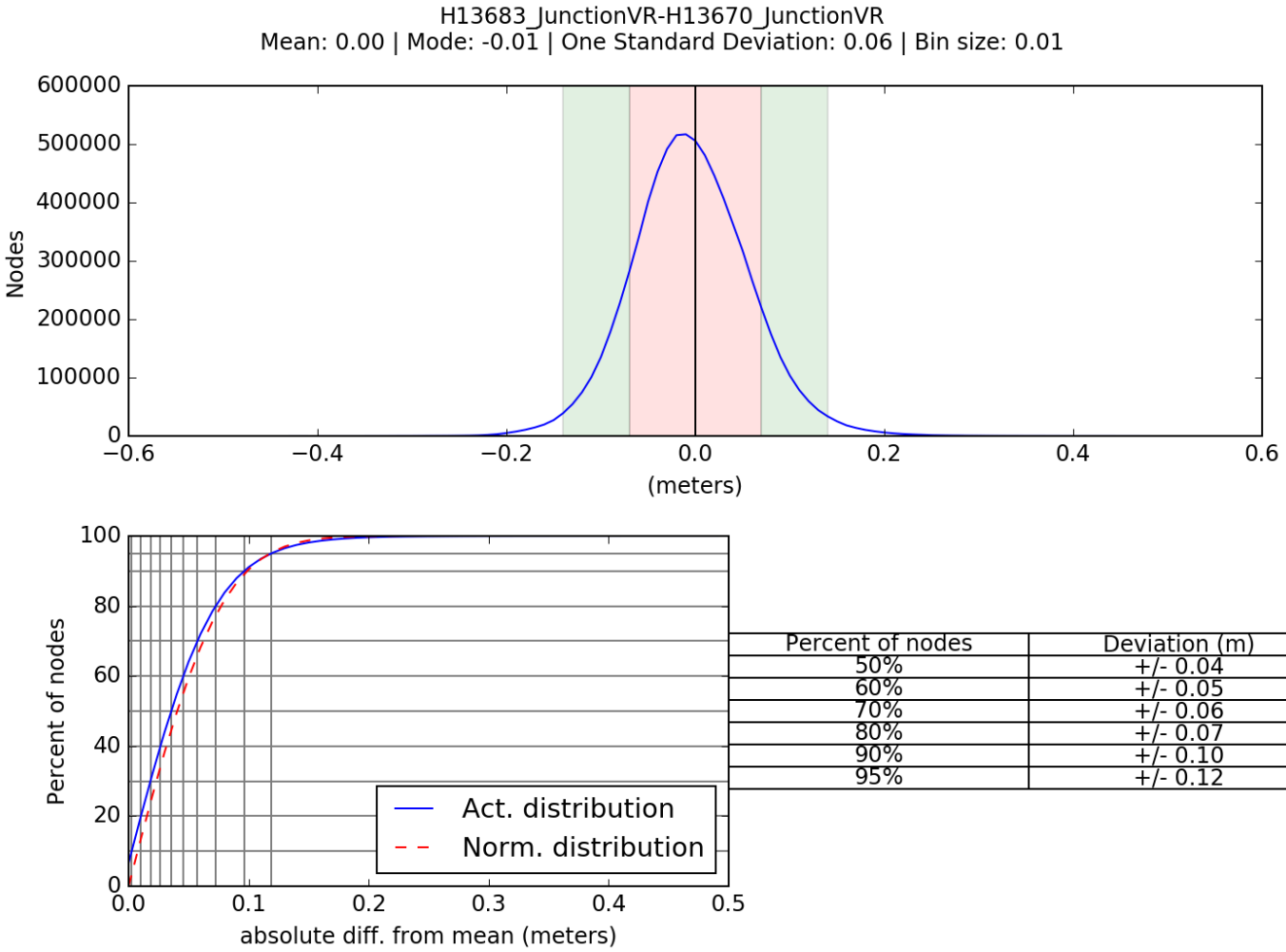


Figure 11: Fraction of allowable error surface difference comparison in color between H13683 and H13670.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.07
90%	+/- 0.10
95%	+/- 0.12

Figure 12: H13683 and H13670 surface difference comparison statistics.

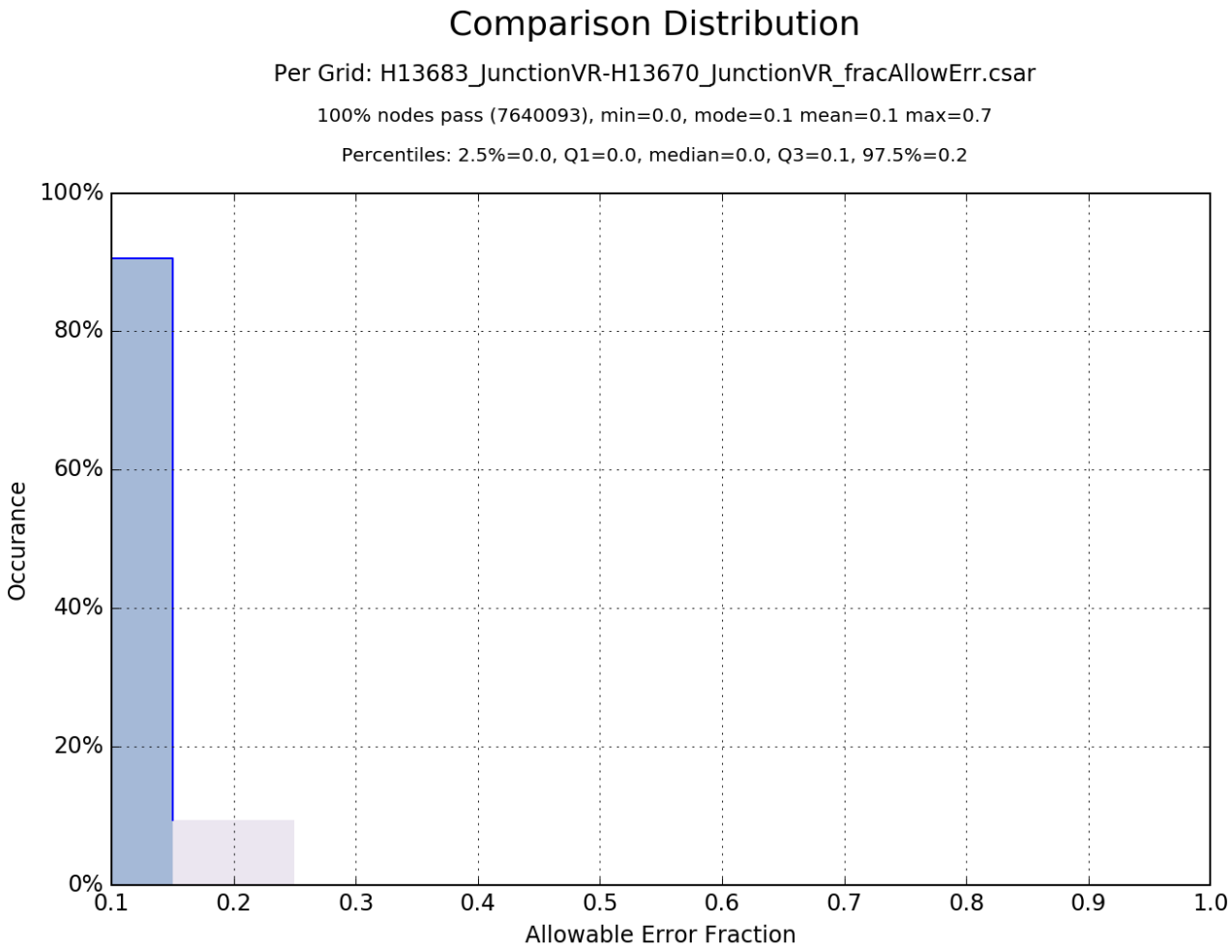


Figure 13: H13583 and H13670 fractional allowable error node distribution comparison stats.

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

Thermal Stratification

Thermal stratification is a persistent environmental condition encountered in the project area and was present for the duration for the survey. This stratification was identified in the MVP sound speed profiles (Figure 14) and resulted in varying degrees of refraction of the outer MBES swath. In locations where soundings were offset by a distance greater than the maximum allowable total vertical uncertainty (TVU), the data were rejected from being included in the bathymetric surface (Figure 15). The final delivered surfaces meet NOAA allowable vertical uncertainty parameters from the 2022 HSSD (Figure 9 - reference B.2.2 uncertainty figure). As such, the data remain sufficient to supersede previous data.

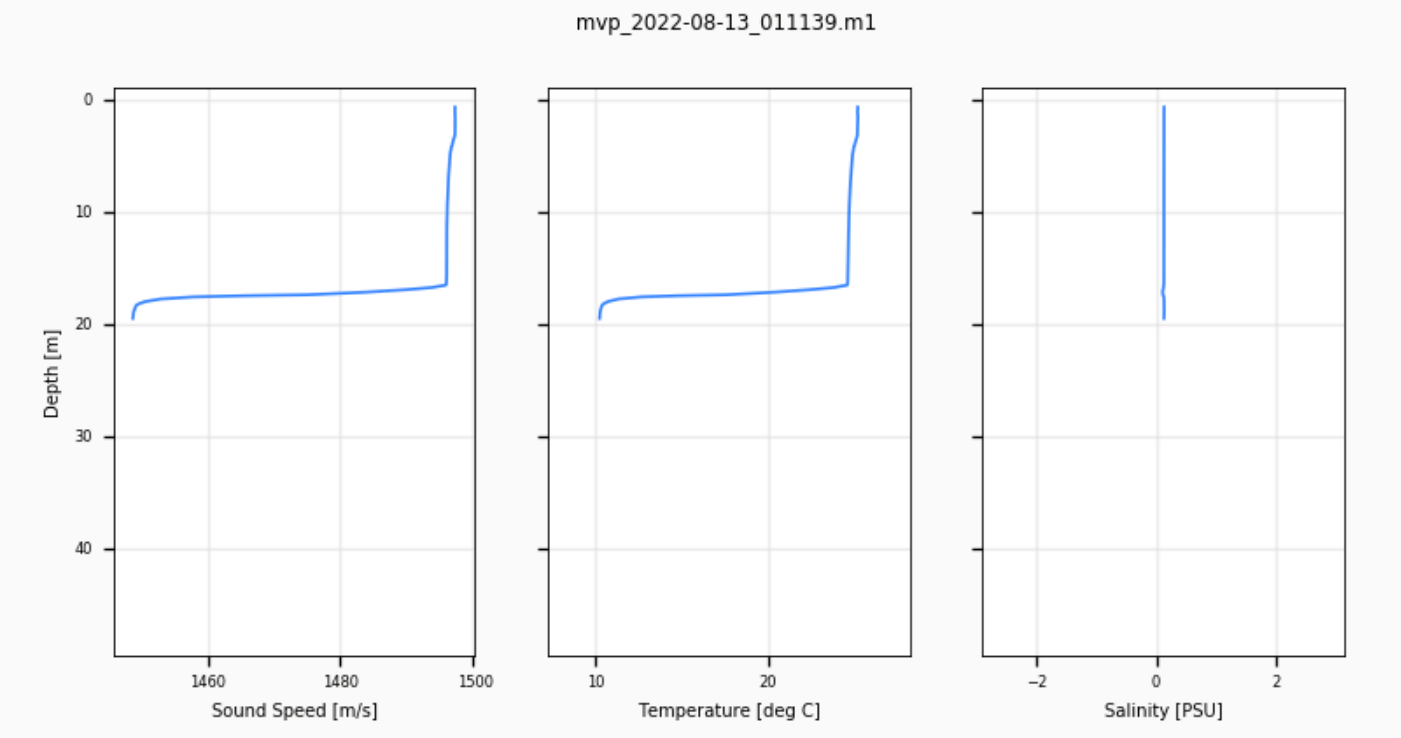


Figure 14: Profiles from an MVP cast that represent typical conditions in the survey area. The strong thermocline in this cast similarly appears in most of the casts taken for this sheet.

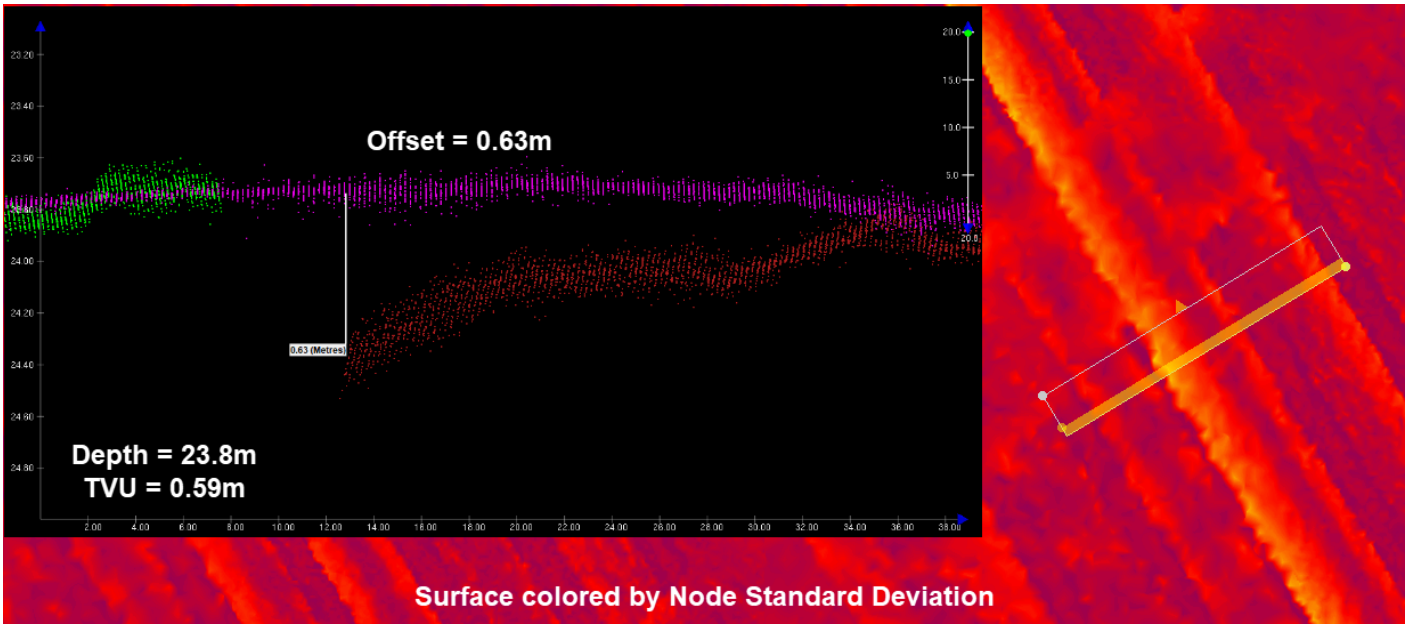


Figure 15: 2D view of survey data showing downturn in the outer swath likely caused by sound speed issues.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: MVP casts on S222 were conducted at an average interval of two hours, guided by observation of the surface sound speed and targeted to deeper areas. Cast frequency was increased in areas of greater depth where the thermocline could be fully measured. One static conductivity, temperature, and depth (CTD) cast was conducted prior to collecting holidays on Julian Day 226 using a Sea-Bird Seacat 19+ V2 CTD. All sound speed methods were used as detailed in the DAPR.

A total of 60 sound speed profiles were collected as part of acquisition of H13683 and display good spatial diversity (Figure 16). Several casts taken in the southern end of the sheet were rejected for not reaching past the thermal stratification, resulting in refraction (Refer to section B.2.6 Factors Affecting Soundings). All sound speed profile data were concatenated into a master file for the sheet. MBES data were corrected by applying profiles nearest in distance in time (4 hours) using this master file.

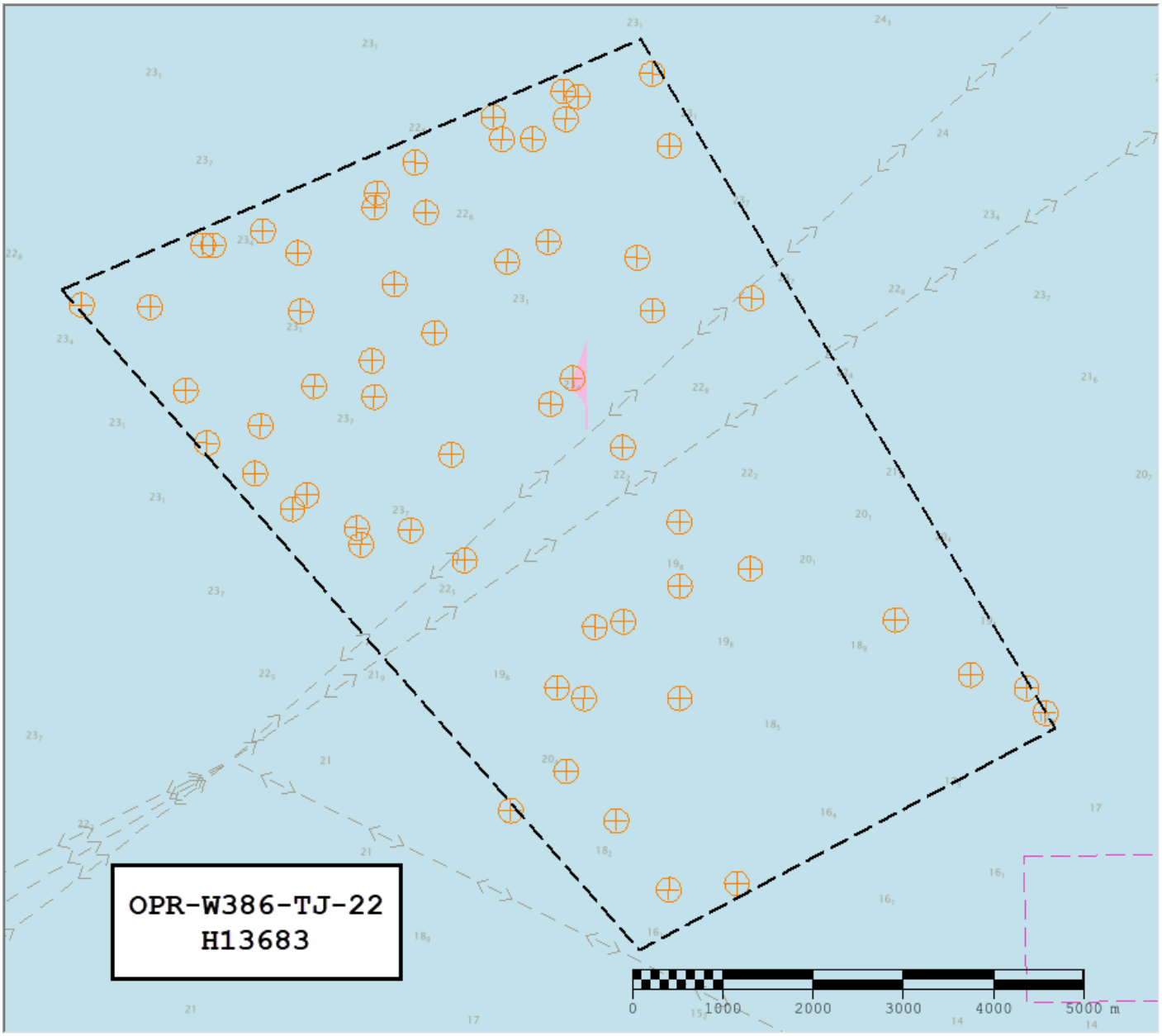


Figure 16: Overview of H13683 sound speed profile locations, plotted in carrot.

B.2.8 Coverage Equipment and Methods

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

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

All equipment and survey methods were used as detailed in the DAPR. While HSL 2903 was used to acquire MBES data on H13683, only five lines were acquired to address holidays on the southern sheet edge. The 2m backscatter mosaic created from S222 data contains one holiday, so a mosaic was not created for the sparse 2903 data (Figures 17 and 18). However, the processed GSF files are included in the final deliverables package.

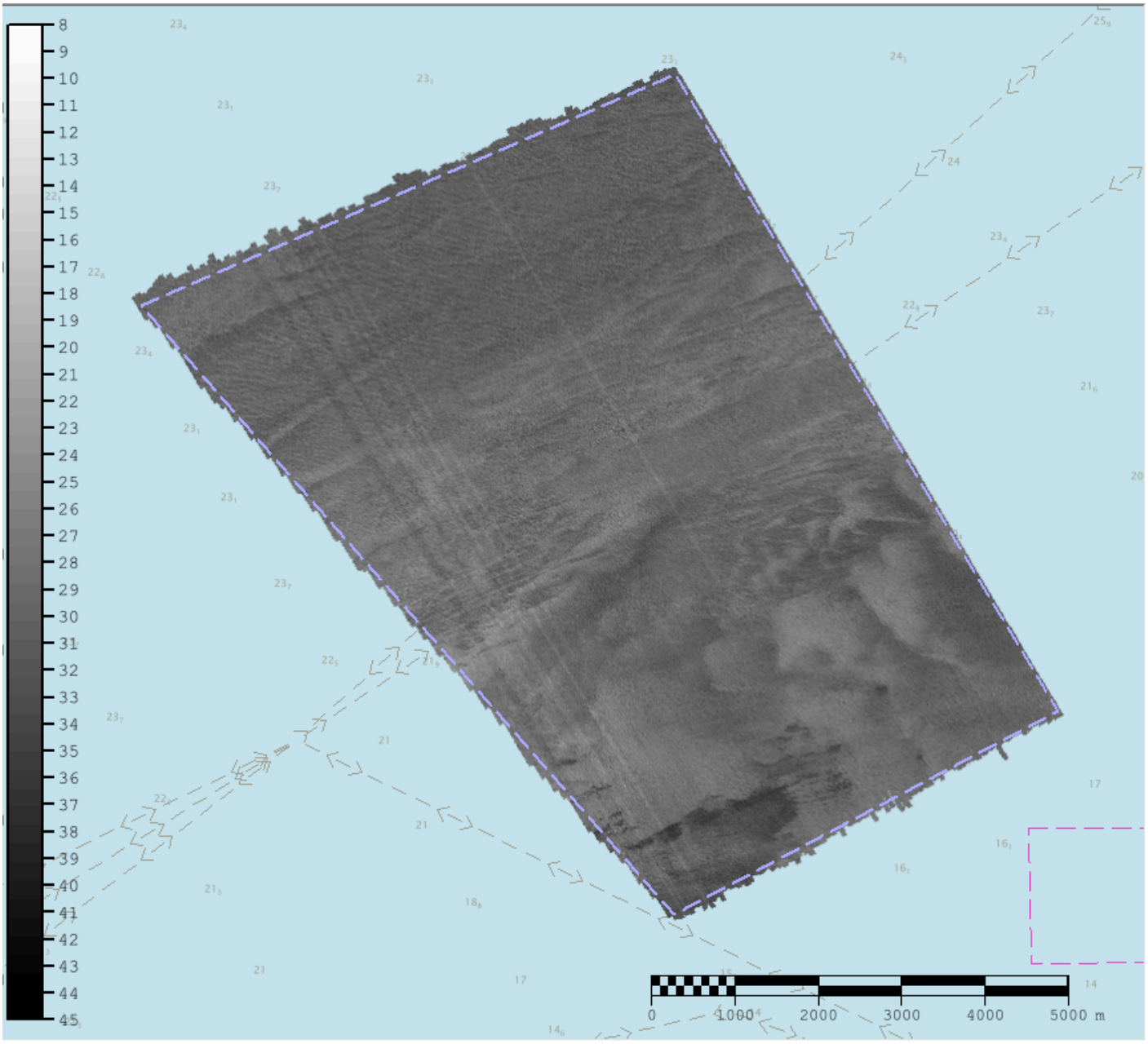


Figure 17: 300 kHz backscatter mosaic from data acquired by S222

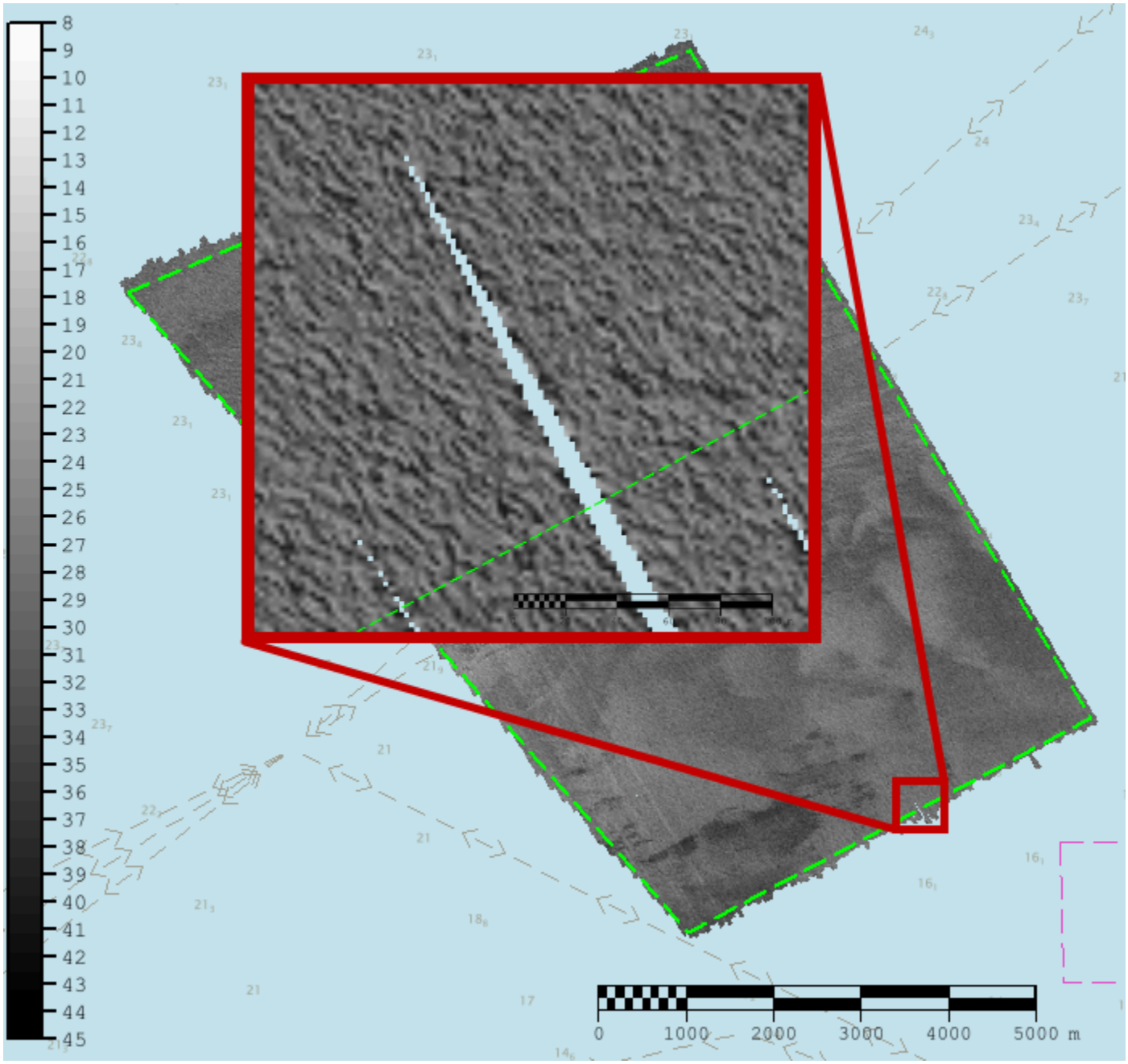


Figure 18: Holiday, outlined in cherry, within the backscatter mosaic from data acquired by S222.

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
H13683_MB_VR_LWD	CARIS VR Surface (CUBE)	Variable Resolution	15.7 meters - 24.4 meters	NOAA_VR	Complete MBES
H13683_MB_VR_LWD_Final	CARIS VR Surface (CUBE)	Variable Resolution	15.7 meters - 24.4 meters	NOAA_VR	Complete MBES
H13683_MBAB_2m_S222_300kHz_1of1	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES

Table 10: Submitted Surfaces

Complete coverage requirements were met by 100% complete coverage MBES as specified under section 5.2.2.2 of the 2022 HSSD. All bathymetric grids for H13683 meet density requirements per the HSSD 2022 (Figure 19). There is one holiday and another data gap not large enough to meet the definition of a holiday for complete coverage requirements as discussed in Section A.4.

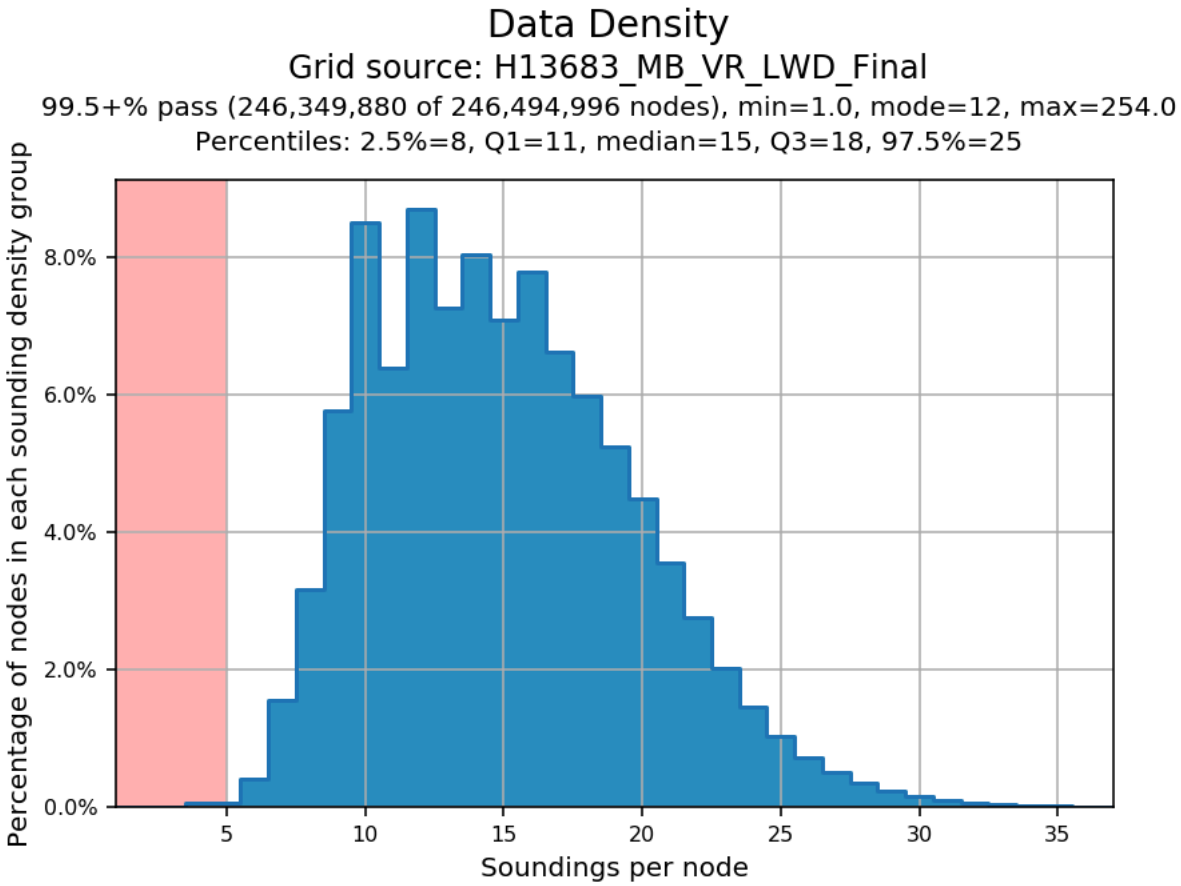


Figure 19: H13683 data density standards.

C. Vertical and Horizontal Control

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

C.1 Vertical Control

The vertical datum for this project is Low Water Datum IGLD-1985.

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-W386-TJ-22_NAD83_2011_VDatum_LWD_IGLD85

Table 11: 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.

RTK

Trimble-RTX service was used with an Applanix POS MVv5 GNSS_INS system to obtain highly accurate ellipsoidally referenced position data to meet ERS specifications for H13683 MBES data from vessels HSL 2903 and S222.

WAAS

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

D. Results and Recommendations

D.1 Chart 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
US4PA21M	1:80000	14	10/15/2021	10/15/2021

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Surveyed soundings and contours were compared against previously charted data on ENC US4PA21M. Depth values were found to be in general agreement with previously charted soundings. The hydrographer believes the surveyed soundings do not pose a hazard to navigation. Three newly discovered features are included in the Final Feature File (FFF) and none were considered to be navigational hazards. No danger to navigation reports were submitted for this survey and all data acquired on H13683 are recommended to supersede prior data.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

One uncharted feature was identified, investigated, and are recommended for charting. It is not considered dangerous to navigation (DTON) and no DTON reports were submitted for this survey. Reference the Final Feature File for further information.

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

Four bottom sample locations were assigned for investigation (Figure 20). However, the hydrographer was only able to obtain samples from three locations. Details regarding bottom sample attribution can be found in the Final Feature File.

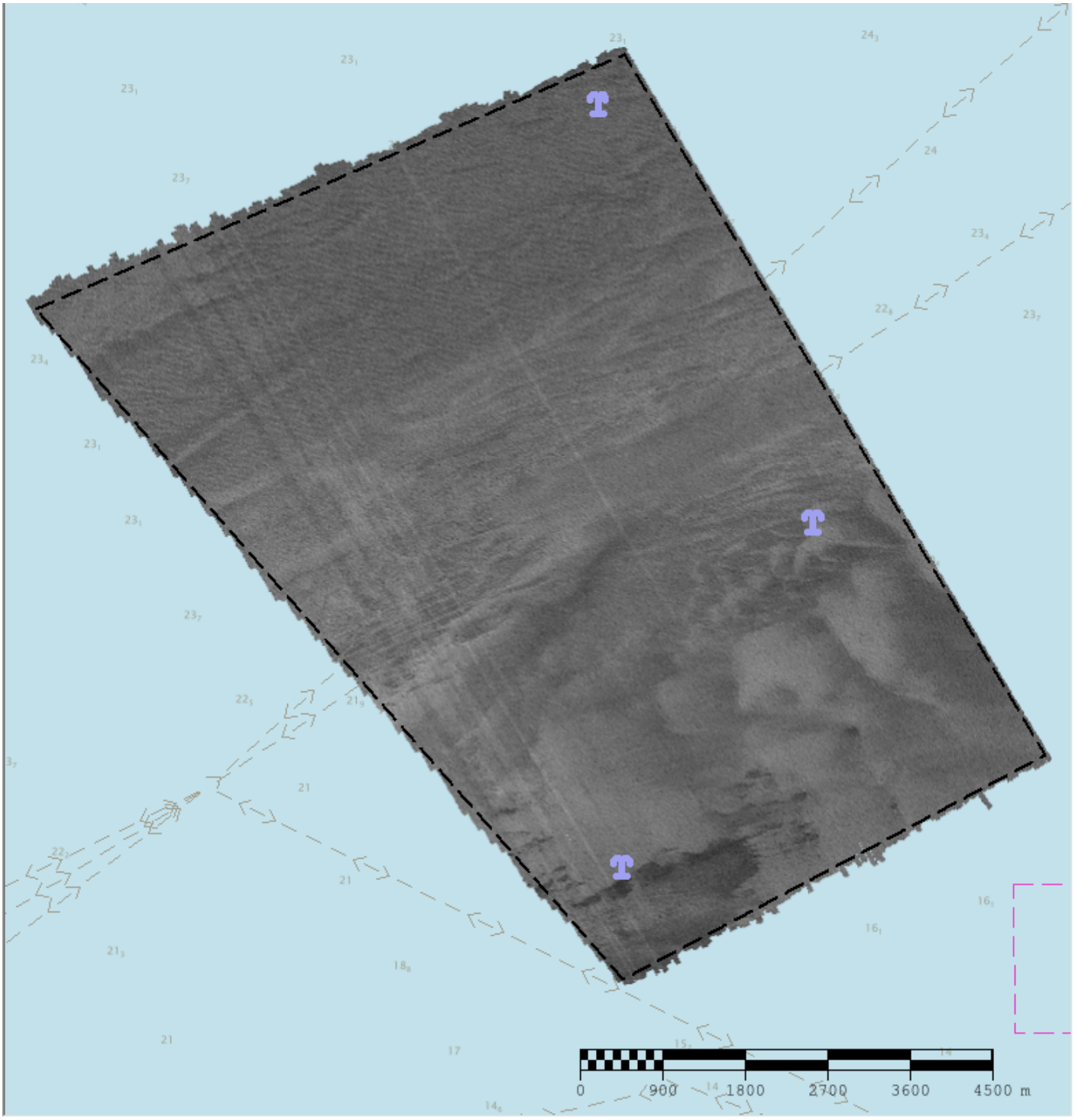


Figure 20: H13683 bottom sample locations in lavender plotted over the 2m resolution backscatter mosaic.

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.

Approver Name	Approver Title	Approval Date	Signature
Matthew J. Jaskoski, CDR/NOAA	Chief of Party	09/23/2022	JASKOSKI.MATTHEW.JACOB.1275636262 2022.10.19 17:27:15 -04'00'
Michelle M. Levano, LT/NOAA	Field Operations Officer	09/23/2022	Digitally signed by LEVANO.MICHELLE.MARIE.1516645888 Date: 2022.10.19 20:01:31 -04'00'
Erin K. Cziraki	Chief Survey Technician	09/23/2022	ARBOLEDA.CHLOE ELIZABETH.B.1550062760 Digitally signed by ARBOLEDA.CHLOE ELIZABETH.B.1550062760 Date: 2022.10.20 14:40:20 -04'00'
Sarah G. Thompson	Sheet Manager	09/23/2022	THOMPSON.SARAH.GRACE.1083063544 Digitally signed by THOMPSON.SARAH.GRACE.1083063544 Date: 2022.10.19 11:13:29 -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