H13613

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13613

LOCALITY

State(s):	Ohio
General Locality:	Lake Erie
Sub-locality:	Vicinity of Kelleys Island

2022

CHIEF OF PARTY
Matthew J. Jaskoski, CDR/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13613**

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):	**Ohio**
General Locality:	**Lake Erie**
Sub-Locality:	**Vicinity of Kelleys Island**
Scale:	**5000**
Dates of Survey:	**06/11/2022 to 06/15/2022**
Instructions Dated:	**04/19/2022**
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 Side Scan Sonar**
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, Low Water Datum 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.

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Descriptive Report to Accompany Survey H13613

Project: OPR-W386-TJ-22

Locality: Lake Erie

Sublocality: Vicinity of Kelleys Island

Scale: 1:5000

June 2022 - June 2022

NOAA Ship *Thomas Jefferson*

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

A. Area Surveyed

Survey H13613, located in Lake Erie, OH in the vicinity of Kelleys Island, was conducted in accordance with coverage requirements set forth in the Project Instructions (PI) OPR-W386-TJ-22.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
41° 40' 4.81" N 82° 46' 59.93" W	41° 32' 7.9" N 82° 39' 20.67" W

Table 1: Survey Limits

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) (Figure 1).

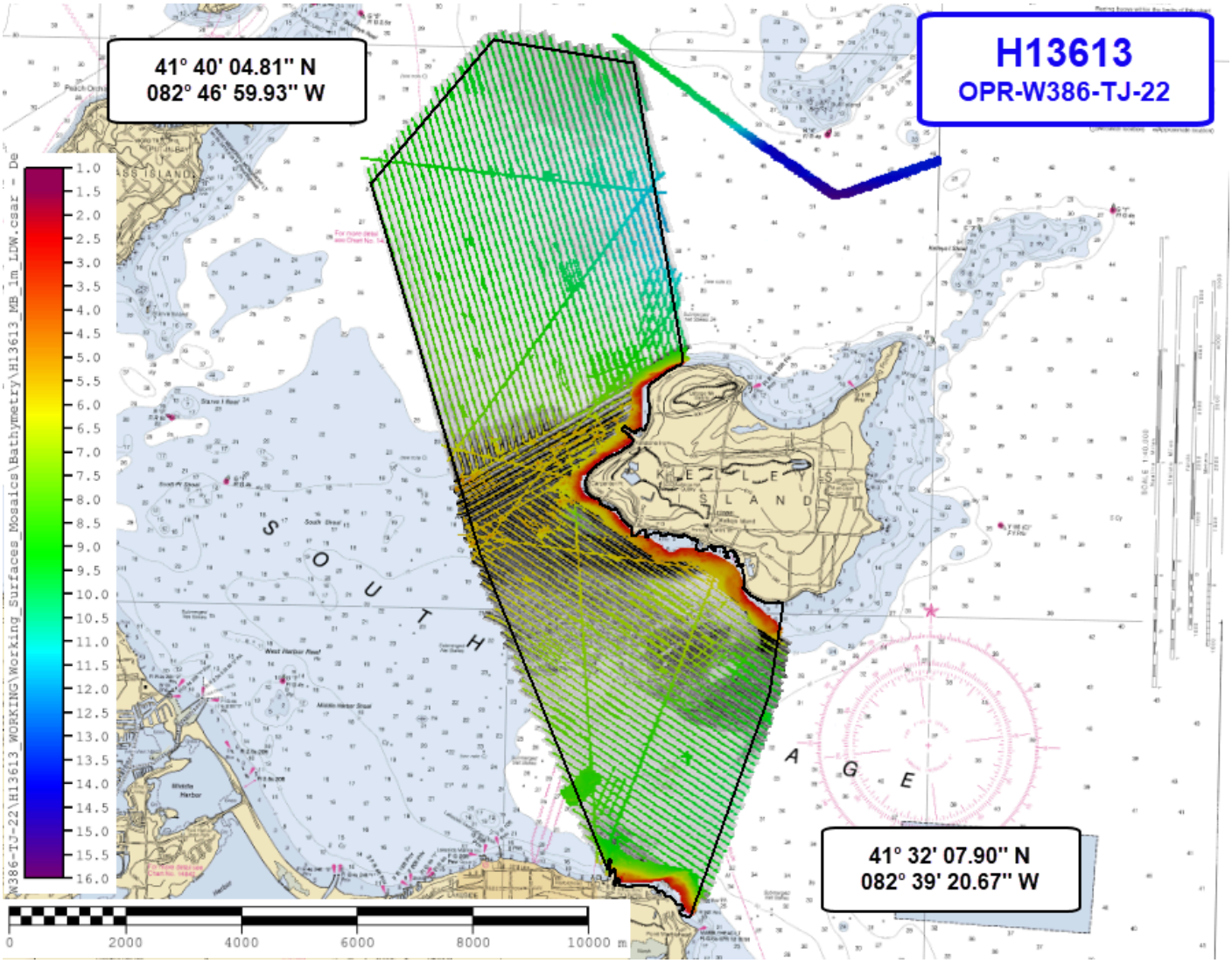


Figure 1: Survey layout for H13613, plotted over RNC 14844. Black outline represents the survey limits set forth by the Project Instructions, MBES coverage in color, and SSS coverage in greyscale.

A.2 Survey Purpose

The Port of Cleveland is one of the largest ports in the Great Lakes and ranks within the top 50 ports in the United States. Roughly 13 million tons of cargo are transported through Cleveland Harbor each year supporting over 20,000 jobs and $3.5 billion in annual economic activity [1]. This project will provide modern bathymetric data for the Cleveland area as well as the vicinity of South Bass Island and Presque Isle. The project area was identified as a statistically significant hot spot within the 2018 Hydrographic Health Model, a risk model that Coast Survey uses for evaluating priorities based upon navigational risks and the necessary quality of data to support modern traffic. Most of this area has not been surveyed since the 1940s, and experiences significant professional and recreational vessel traffic largely supporting a significant tourist industry.

A modern bathymetric survey in this area will identify hazards and changes to the seafloor, provide critical data for updating National Ocean Service (NOS) nautical charting products and improve maritime safety. Survey data from this project is intended to supersede all prior survey data in the common area.

1. https://www.portofcleveland.com/

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Complete coverage requirements were met utilizing a combination of 100% multibeam echo sounder (MBES) coverage and 100% side scan sonar (SSS) with concurrent MBES coverage as specified by the 2022 HSSD. Data acquired in H13613 meet survey quality standards specified in the 2022 HSSD, including crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.2), 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 Table 2 and in the 2022 HSSD. These requirements were met with a combination of 100% complete coverage MBES and 100% SSS with concurrent MBES coverage. Assigned features requiring a disproval radius were addressed with 200% SSS with concurrent MBES (see Section B.2.8 for more information).

Coverage was acquired to the inshore limit of hydrography, the Navigable Area Limit Line (NALL). Areas where survey coverage did not reach the 3.5-meter depth contour, nor the assigned sheet limits, were due to the survey vessel reaching the extent of safe navigation (Figure 2). These areas are characterized as being near shore, subject to dangerous wave action or other hazards.

Two holidays exist in the combined coverage achieved for H13613. A small gap between neighboring SSS swaths was partially covered by an MBES crossline, resulting in two small holidays (Figure 3). Due to time constraints, these two holidays were not able to be collected. After inspection of surrounding areas, these holidays do not appear to be navigationally significant.

Following completion of mainscheme acquisition, surveyed soundings were assessed against charted soundings to determine whether bathymetric splits were necessary. Splits were acquired where charted soundings were found to be shallower than neighboring surveyed soundings by more than the maximum allowable TVU at that depth (generally 0.5m or greater). One bathymetric split identified by this method was not acquired (Figure 4). After inspection of SSS imagery and surrounding lake bed bathymetry, the hydrographer does not believe confirmation of the charted sounding to be critical for safe navigation.

Additional MBES coverage was acquired outside of the assigned limits as reconnaissance over an area in which the ship would transit (Figure 5). These additional data are included in the submitted surfaces and in the final delivery package.

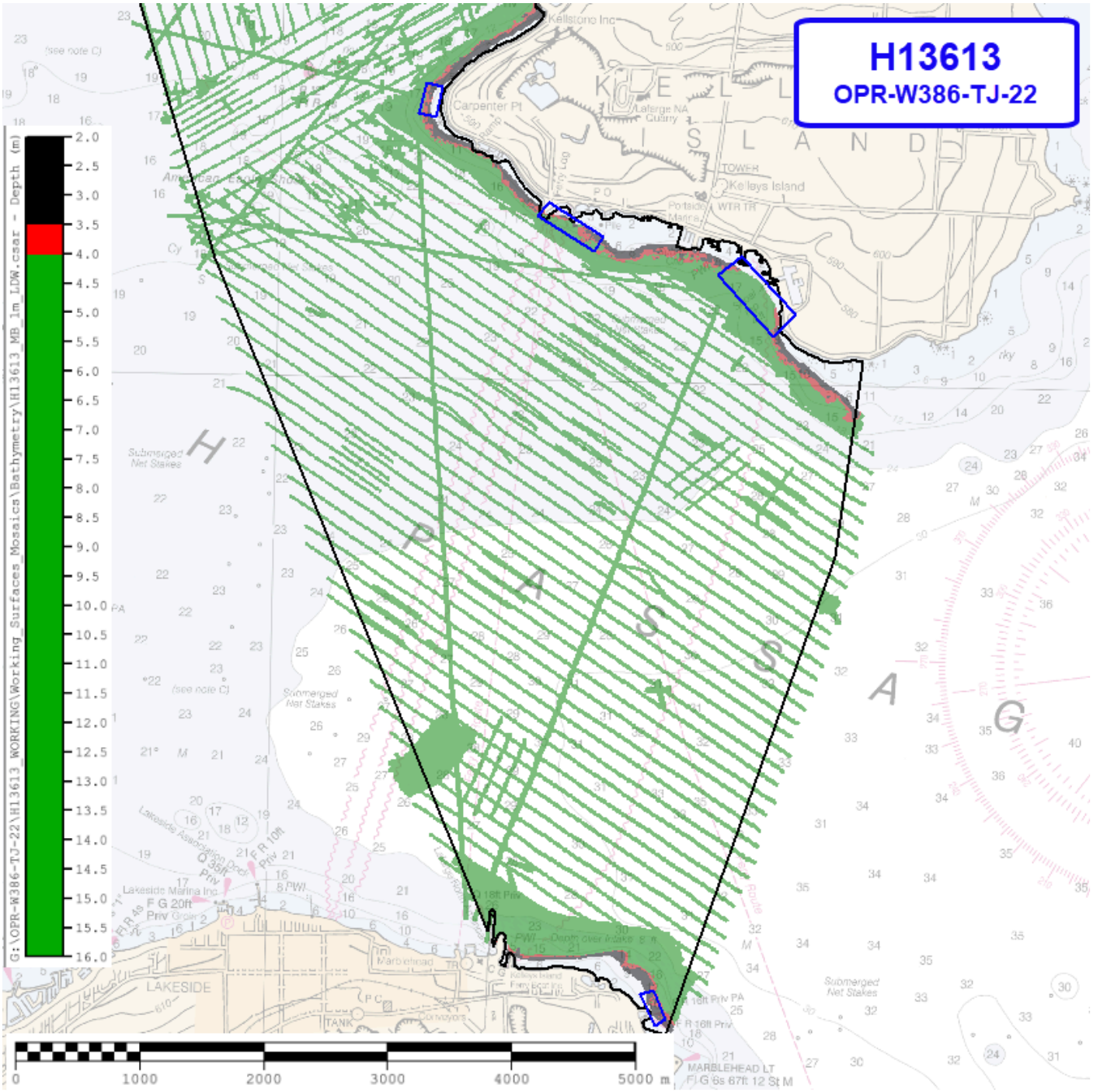


Figure 2: Areas where coverage did not meet the 3.5m depth contour or the assigned sheet limits outlined in blue.

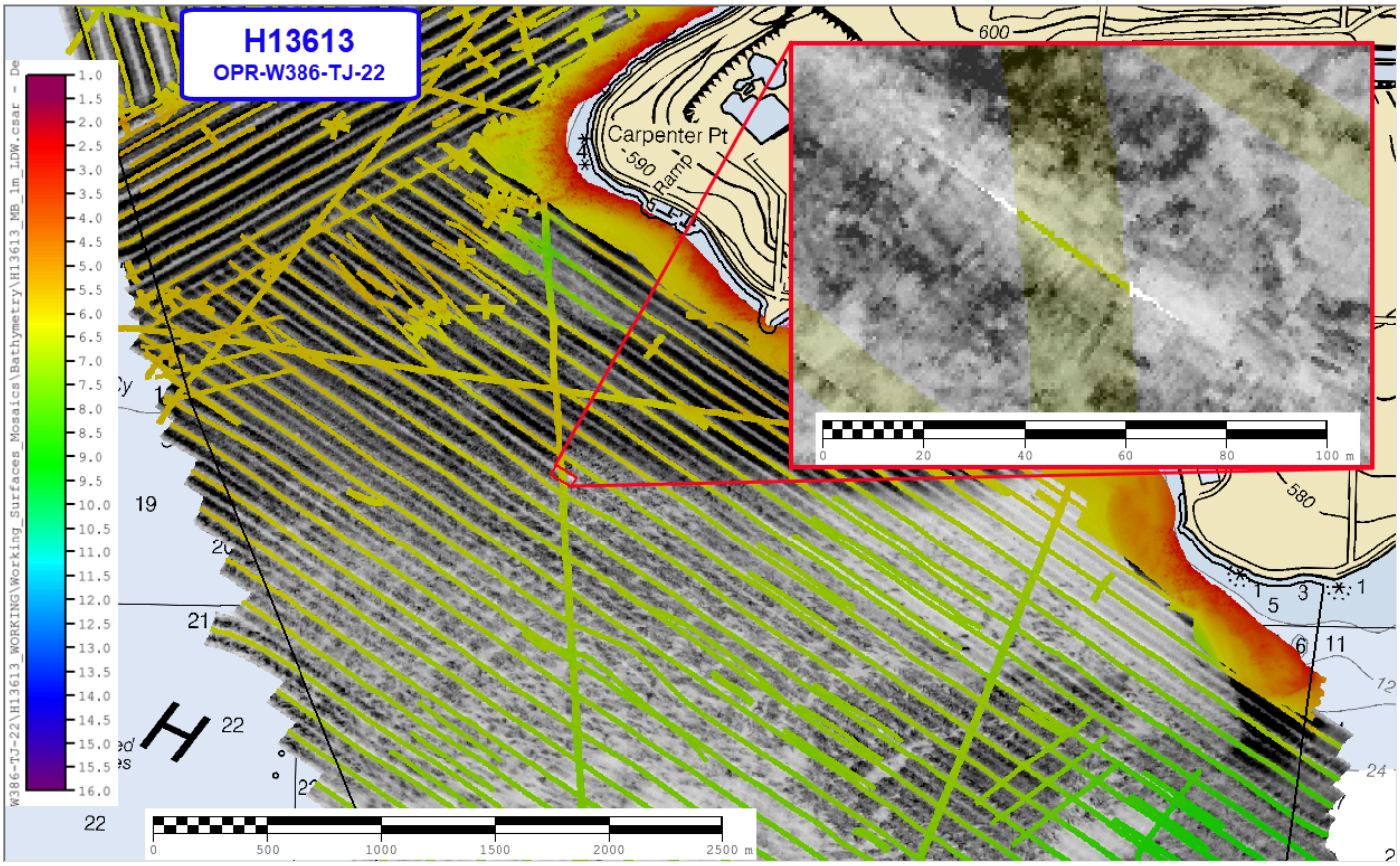


Figure 3: Holiday in SSS coverage centered around 41° 35' 19.6692"N 082° 44' 10.4892"W and partially covered by MBES crossline.

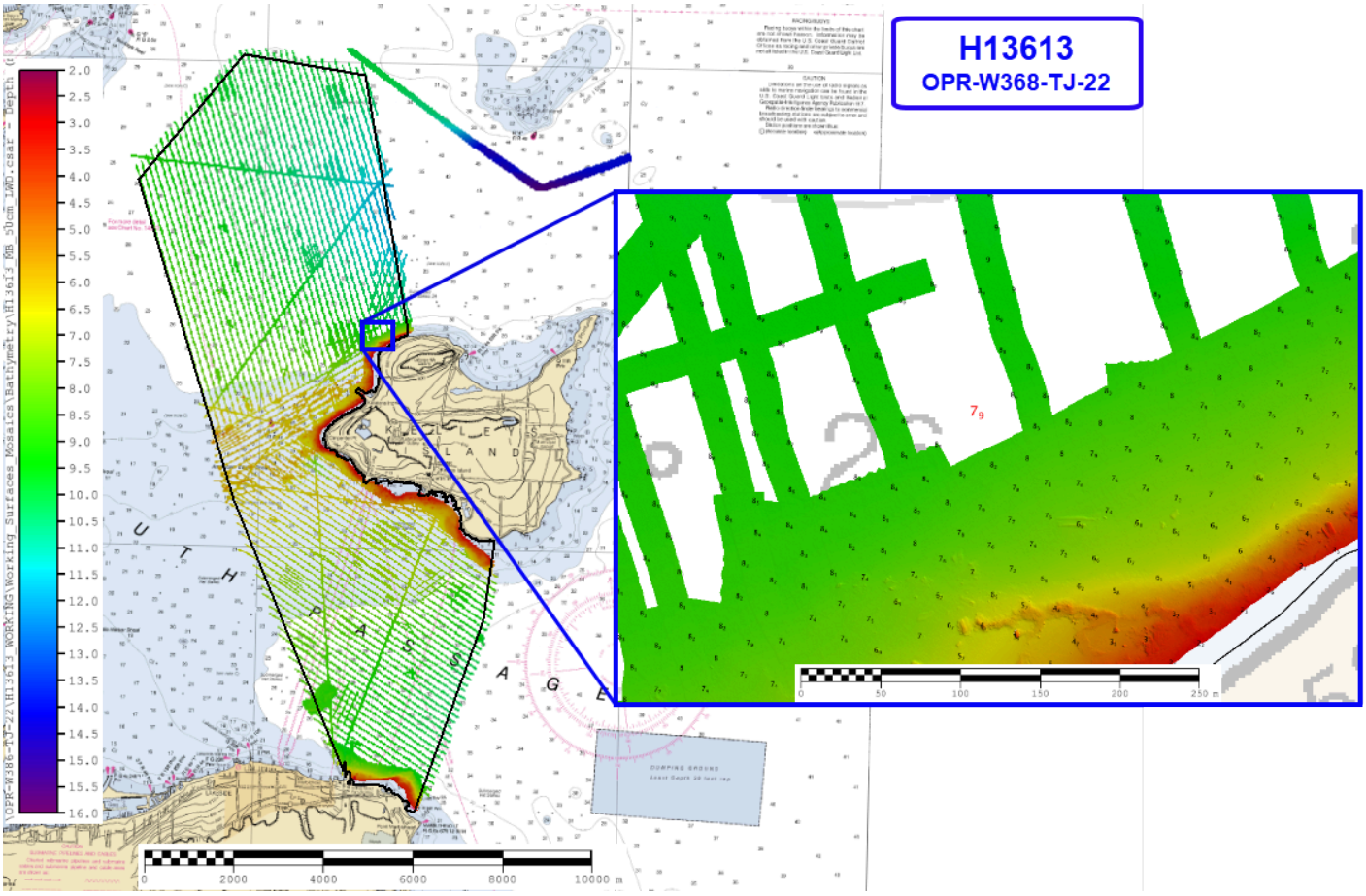


Figure 4: Charted sounding (in red) requiring a bathymetric split located at 41° 37' 12.2113"N 082° 43' 23.5045"W.

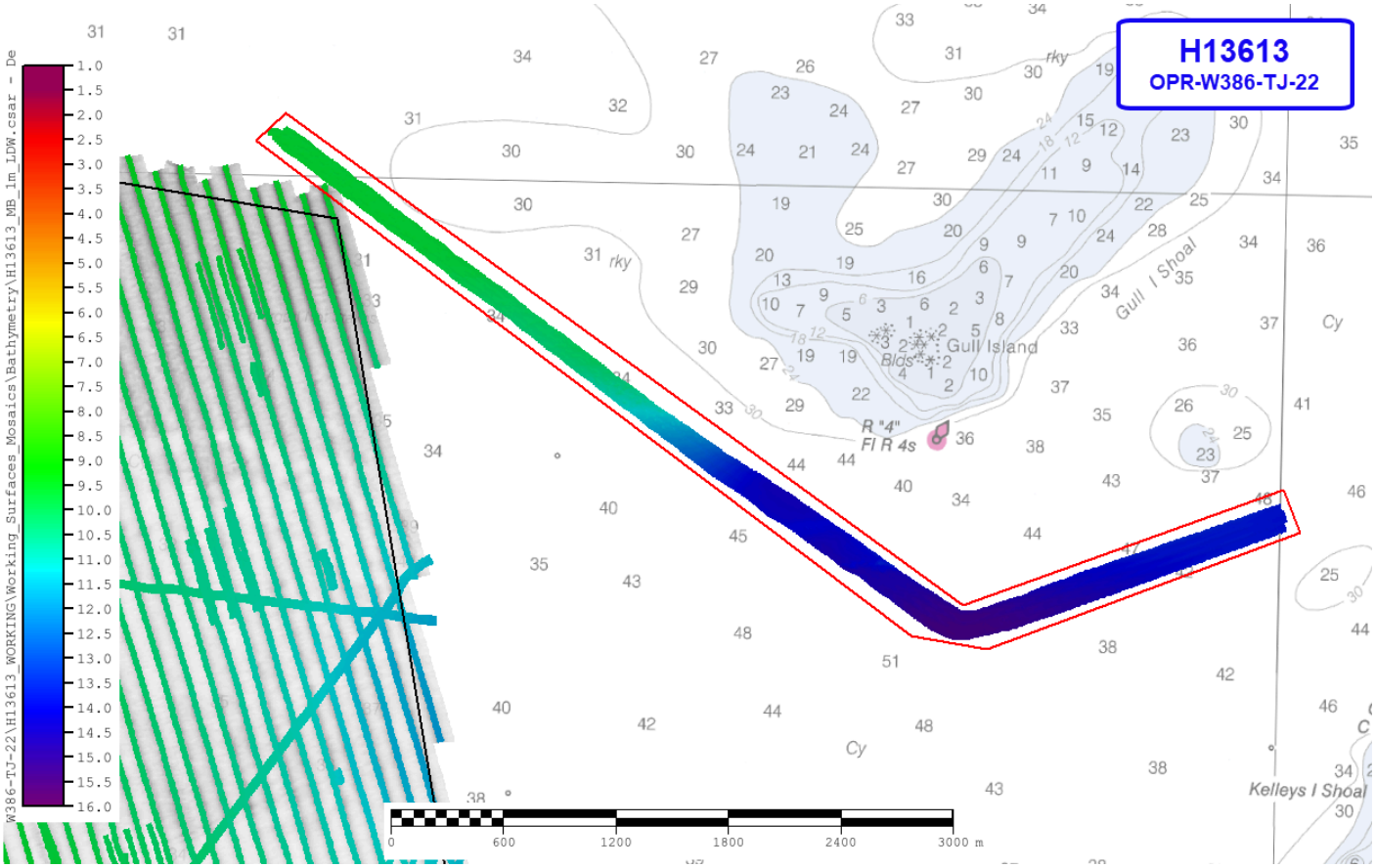


Figure 5: Area outside of assigned sheet limits surveyed as reconnaissance prior to ship transit outlined in red.

A.6 Survey Statistics

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

	HULL ID	*2903*	*2904*	*Total*
LNM	SBES Mainscheme	0.0	0.0	0.0
	MBES Mainscheme	5.73	107.09	112.82
	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	251.55	0.0	251.55
	SBES/MBES Crosslines	0.83	20.16	20.99
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				4
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				15.32

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/11/2022	162
06/12/2022	163

Survey Dates	Day of the Year
06/13/2022	164
06/14/2022	165
06/15/2022	166

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	*2903*	*2904*
LOA	8.5 meters	8.5 meters
Draft	1.2 meters	1.2 meters

Table 5: Vessels Used

Figure 6: Thomas Jefferson Launch 2903

Figure 7: Thomas Jefferson Launch 2904

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 2040	MBES Backscatter
EdgeTech	4200	SSS
Applanix	POS MV 320 v5	Positioning and Attitude System
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	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

Hydrographic Survey Launches 2903 and 2904 collected 20.99 linear nautical miles of MBES crosslines or 5.53% of mainscheme MBES data. The crosslines acquired represent good spatial and depth diversity for this survey area (Figure 8). A 1m single resolution (SR) Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a 1m SR CUBE surface of crossline data were differenced - the resulting mean was 0.00m with a standard deviation of 0.03m (Figure 9). Over 99.5% of nodes are compliant with fraction of allowable error standards (Figure 10). Visual inspection of the difference surface indicated no systematic issues.

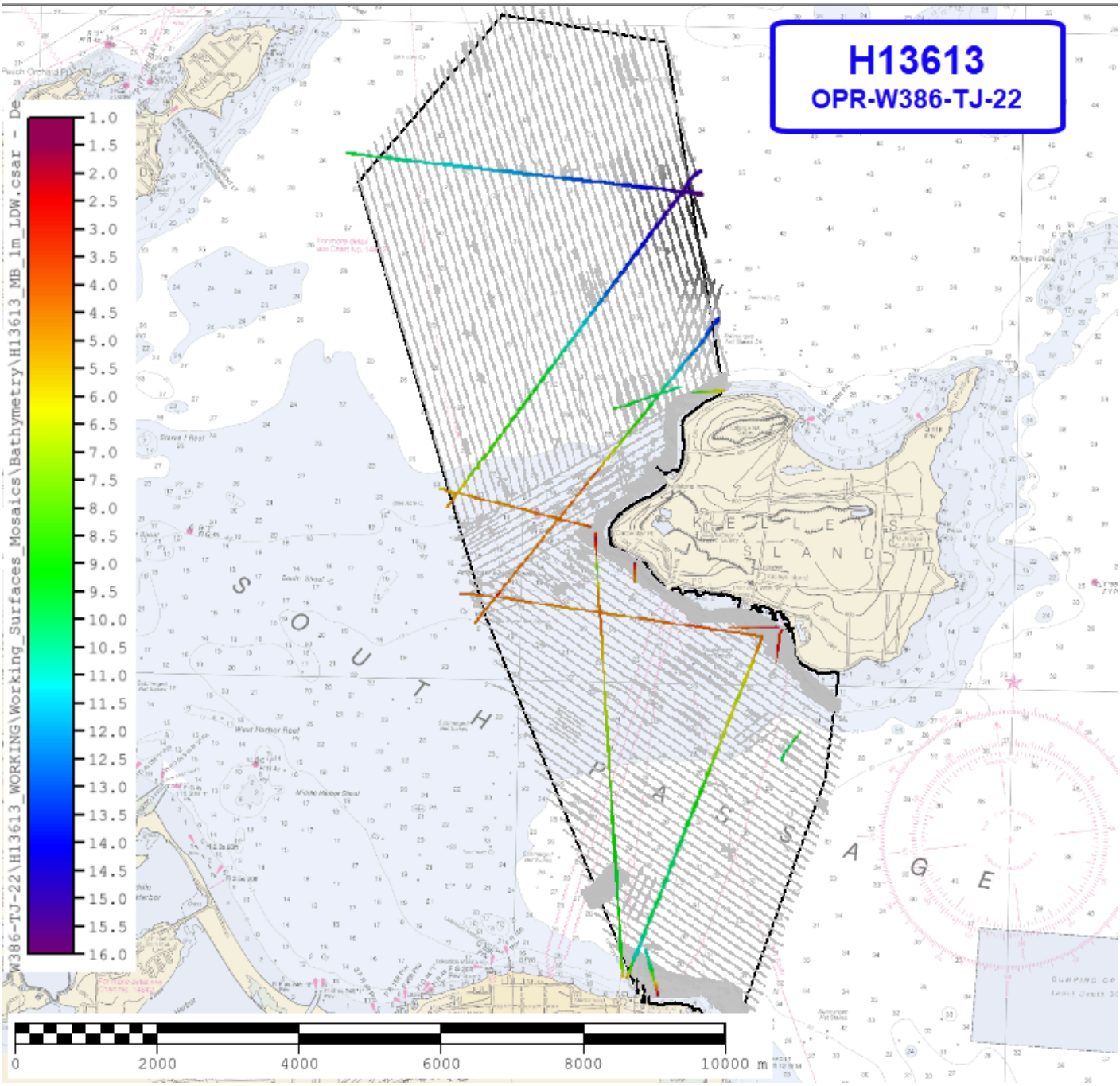
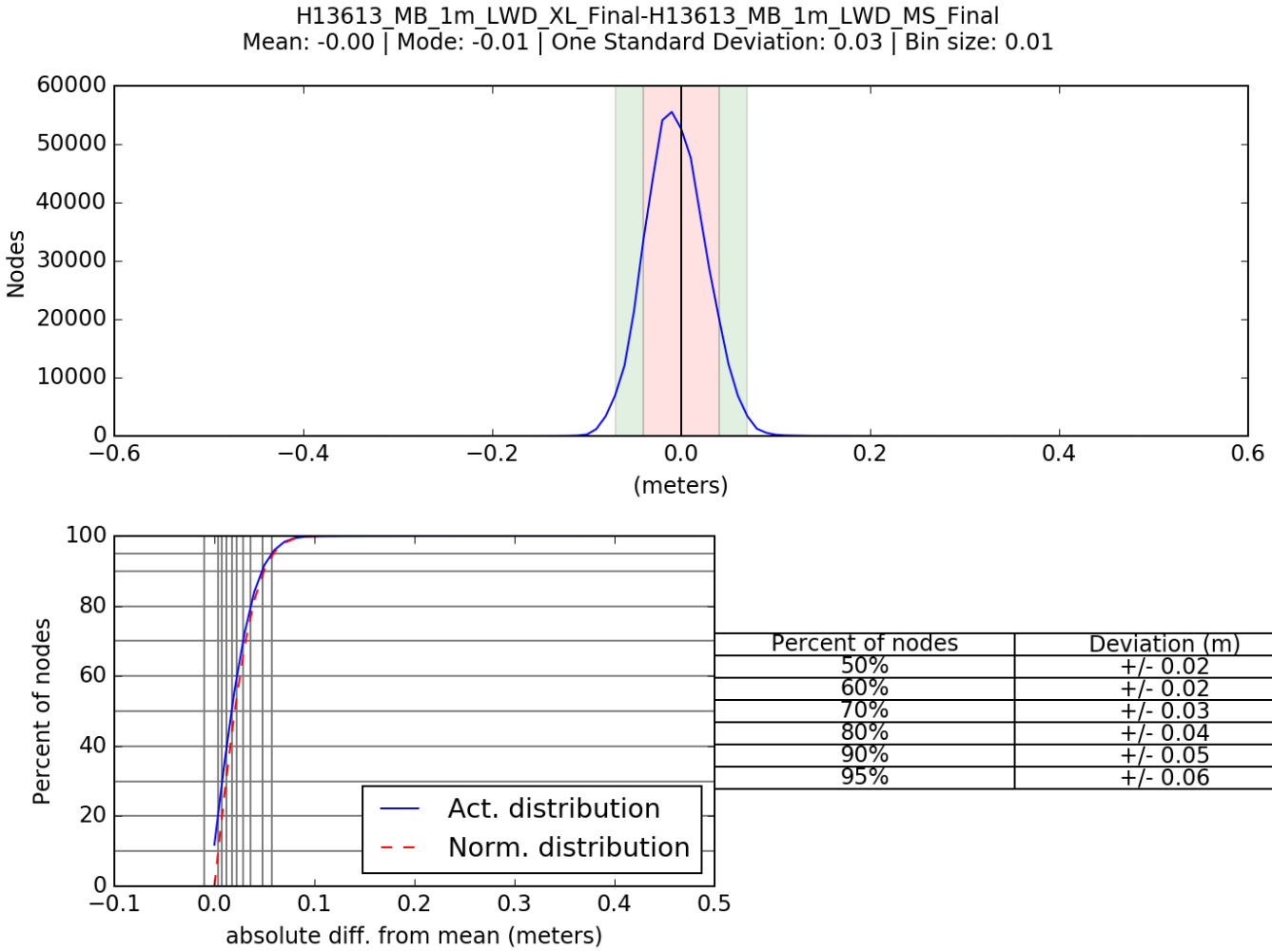


Figure 8: Overview of H13613 crossline distribution by geography and depth, shown in color, overlaid on mainscheme data shown in greyscale.



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.02
70%	+/- 0.03
80%	+/- 0.04
90%	+/- 0.05
95%	+/- 0.06

Figure 9: H13613 crossline/mainscheme comparison statistics.

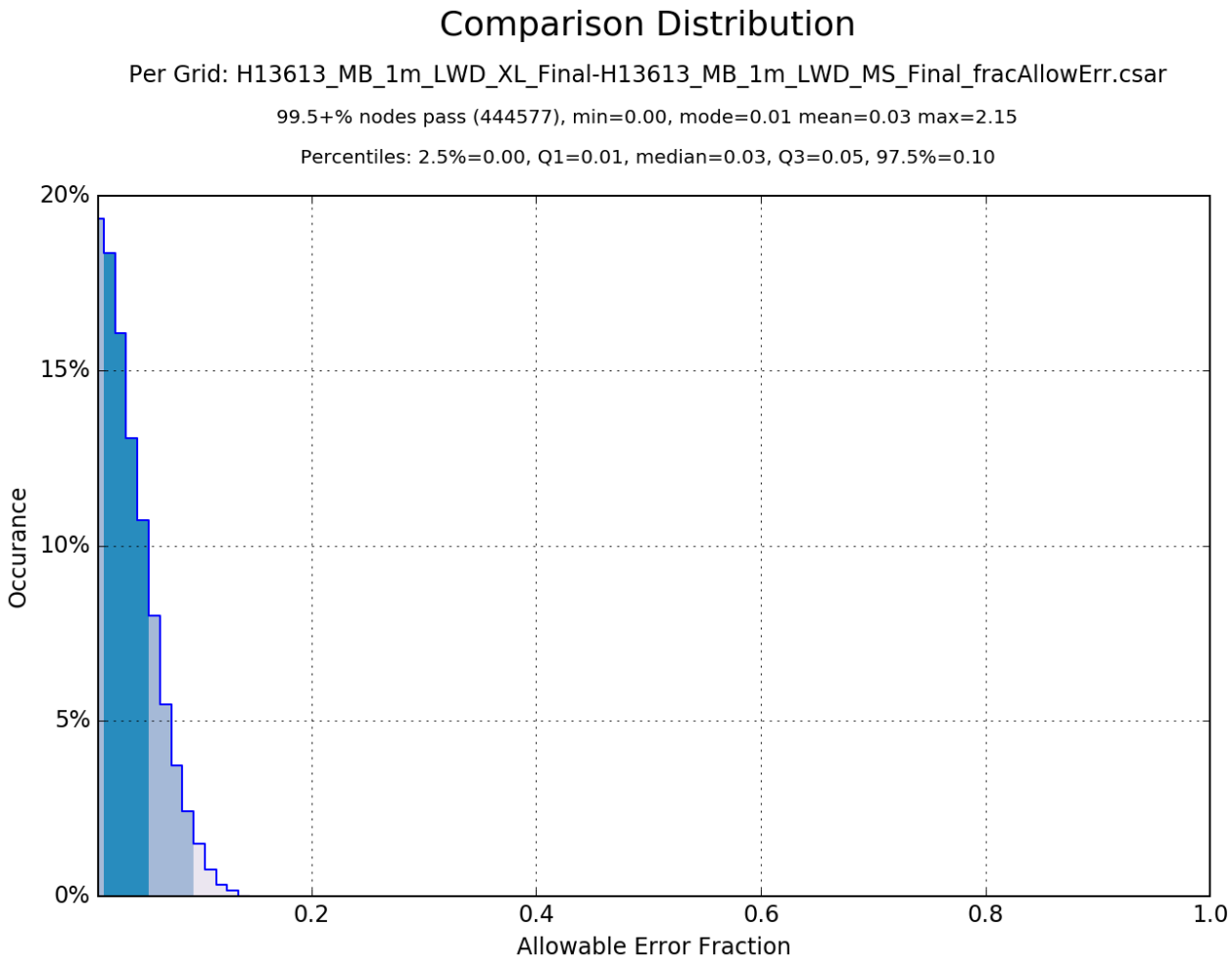


Figure 10: H13613 crossline fraction of allowable error statistics.

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
2903	4 meters/second	N/A meters/second	N/A meters/second	0.2 meters/second
2904	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 11).

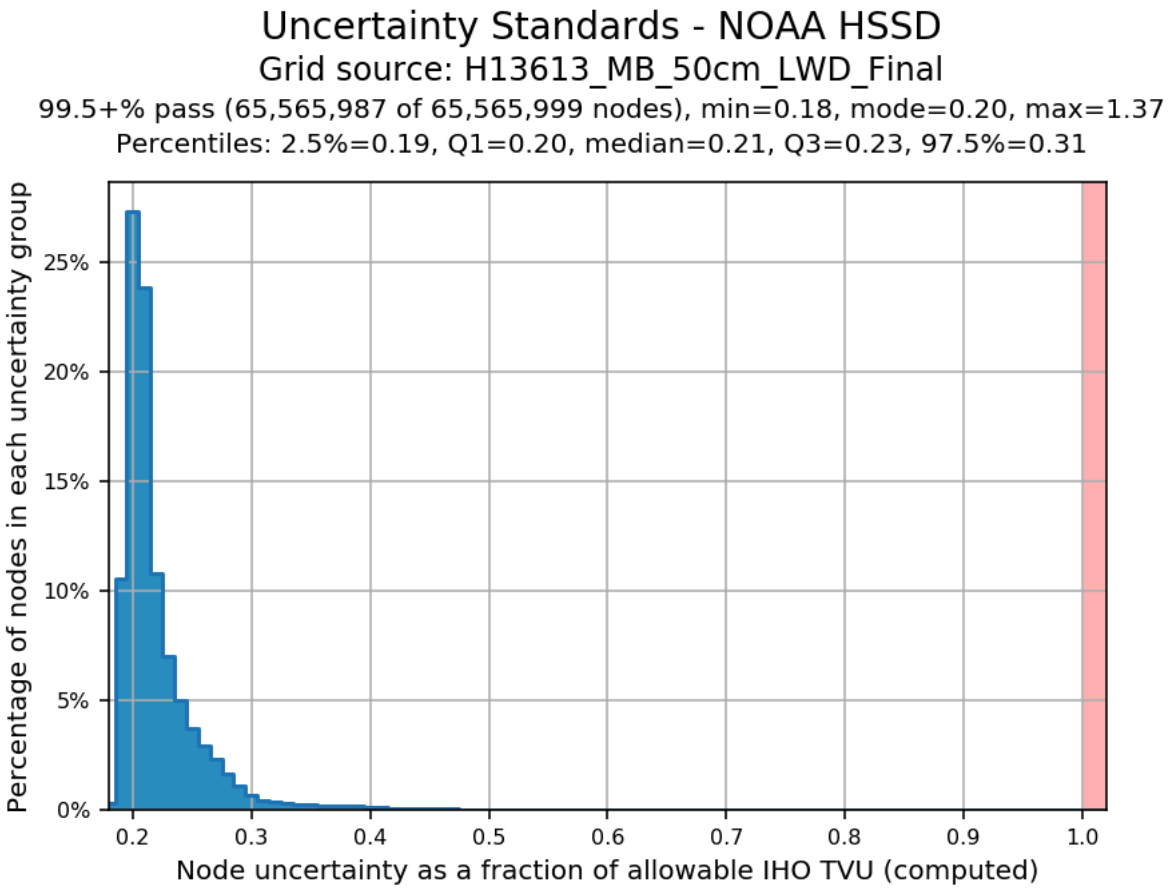


Figure 11: H13613 uncertainty standards.

B.2.3 Junctions

Survey H13613 junctions with H13612 within the OPR-W386-TJ-22 project.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13612	1:5000	2022	THOMAS JEFFERSON	W

Table 9: Junctioning Surveys

H13612

The northwestern edge of sheet H13613 junctions with sheet H13612. A 1m SR CUBE surface of H13613 data and a 1m SR CUBE surface of H13612 data were differenced (Figure 12). The mean difference between bathymetric surface nodes was 0.02m with a standard deviation of 0.04m (Figure 13). Statistics and visual inspection indicate that surveys H13163 and H13612 are in general agreement.

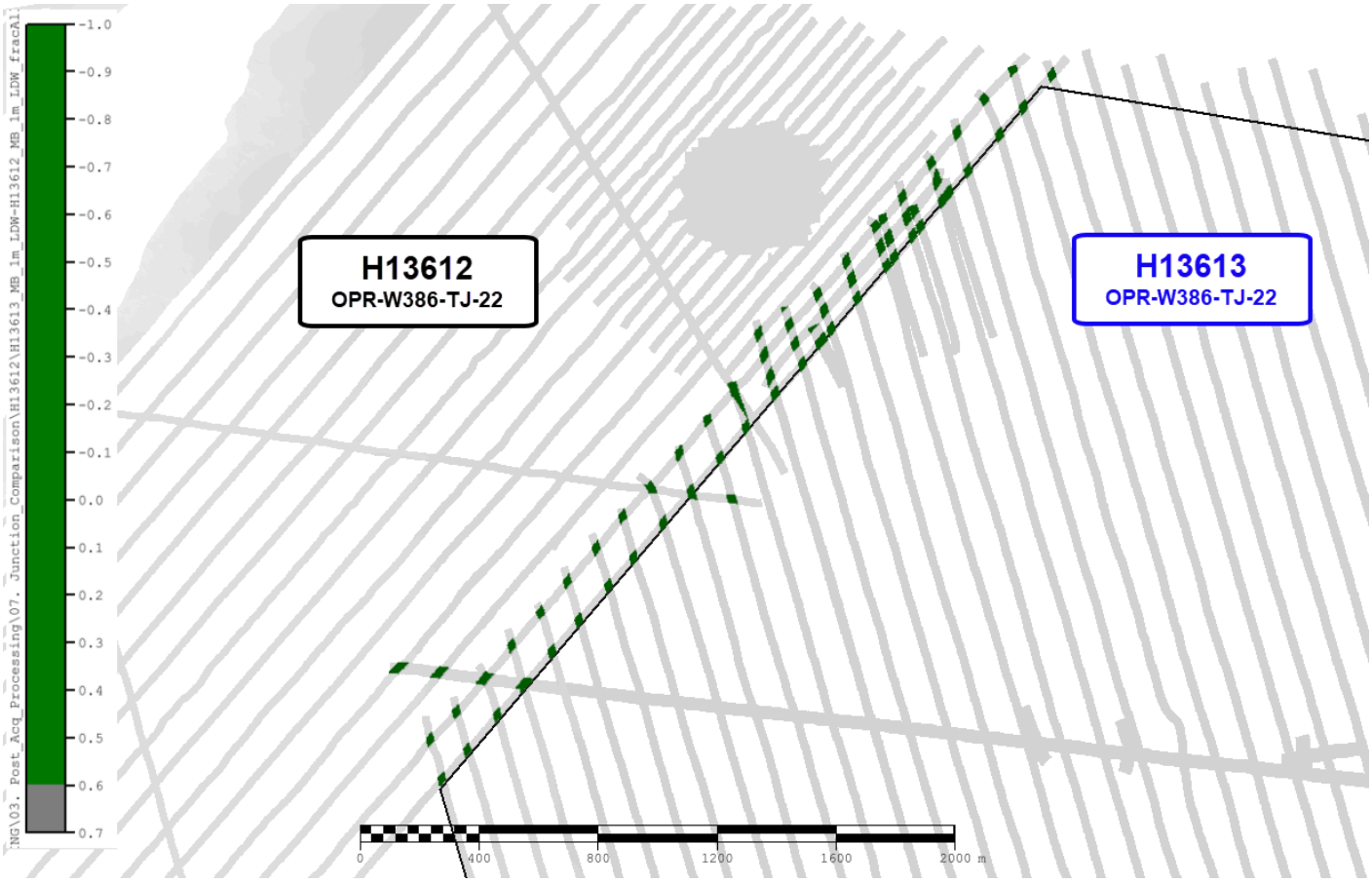
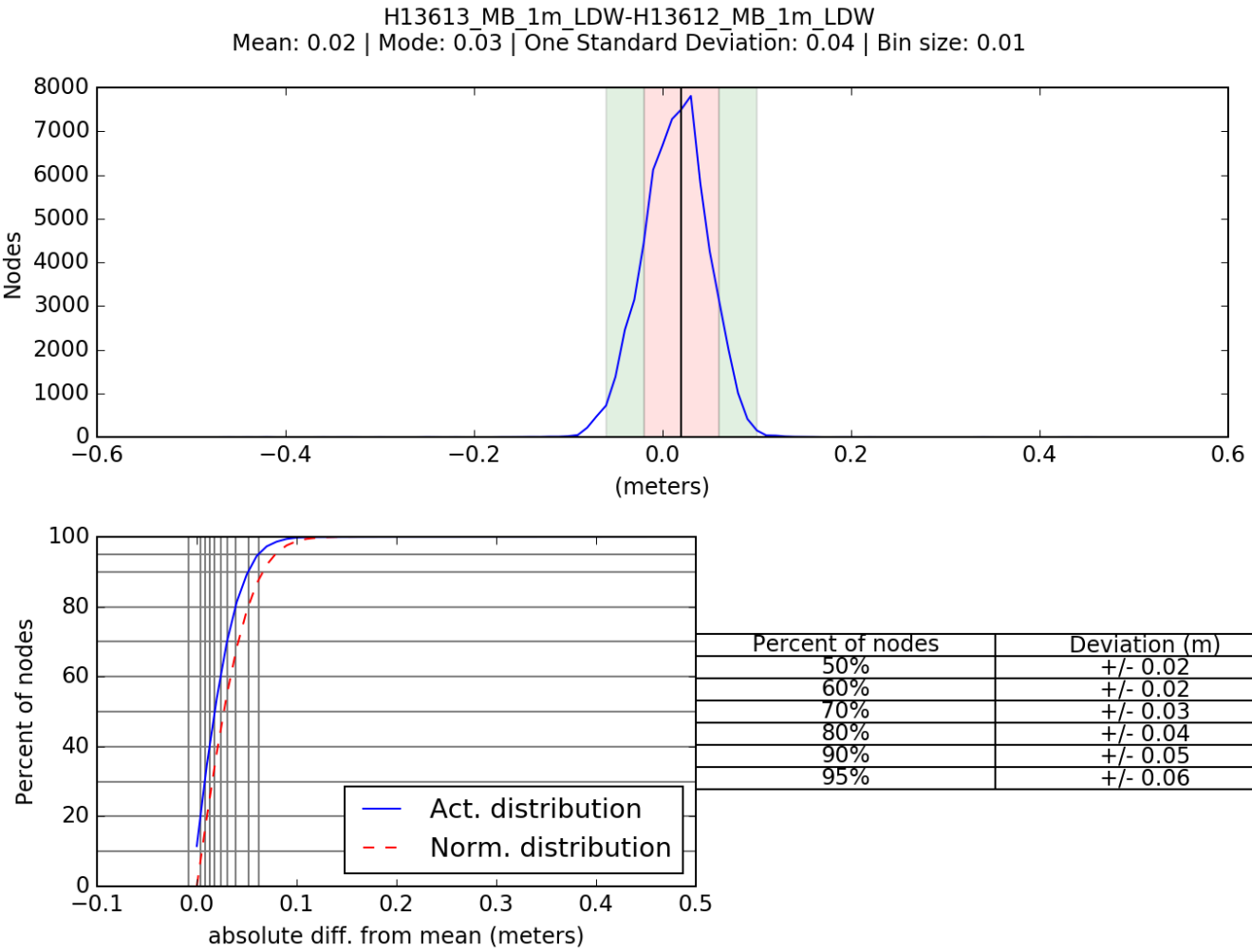


Figure 12: Fraction of allowable error surface difference comparison in color between H13613 and H13612.



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.02
70%	+/- 0.03
80%	+/- 0.04
90%	+/- 0.05
95%	+/- 0.06

Figure 13: H13613 and H13612 surface difference comparison 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

Refraction in SSS data

H13613 is located in an area that exhibits intense thermal stratification. This layering greatly affects sound speed (Figure 14) and results in refraction that can be observed in the SSS imagery (Figure 15). The side scan towfish are hull-mounted on the launches and cannot be lowered below the thermocline. Varying degrees of refraction were observed in SSS data collected by HSL 2903, however the hydrographer determined that all data are of acceptable quality to be able to discern contacts on the lake bed.

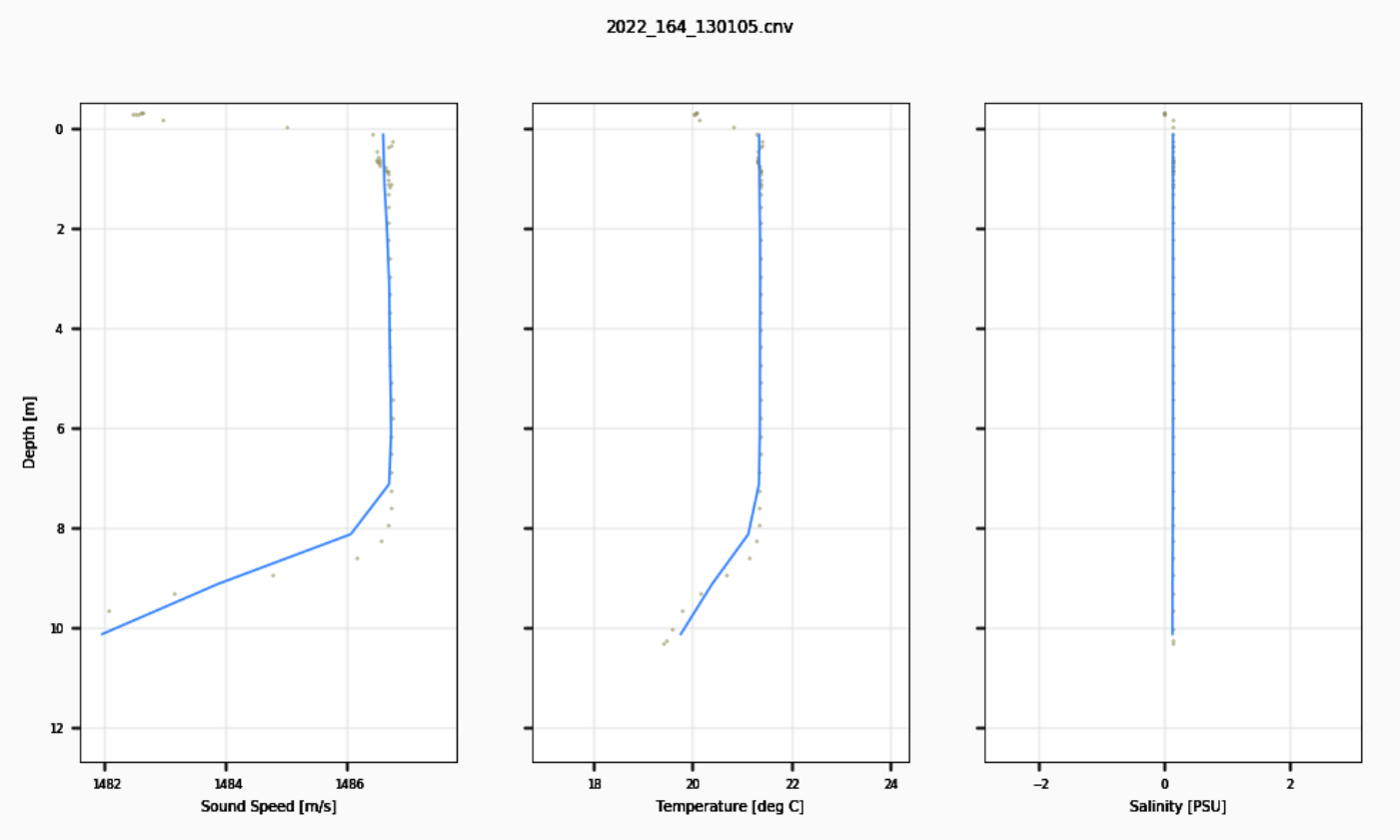


Figure 14: Example of conductivity, temperature, and sound speed profiles collected on H13613 showing the effect of temperature on sound speed.

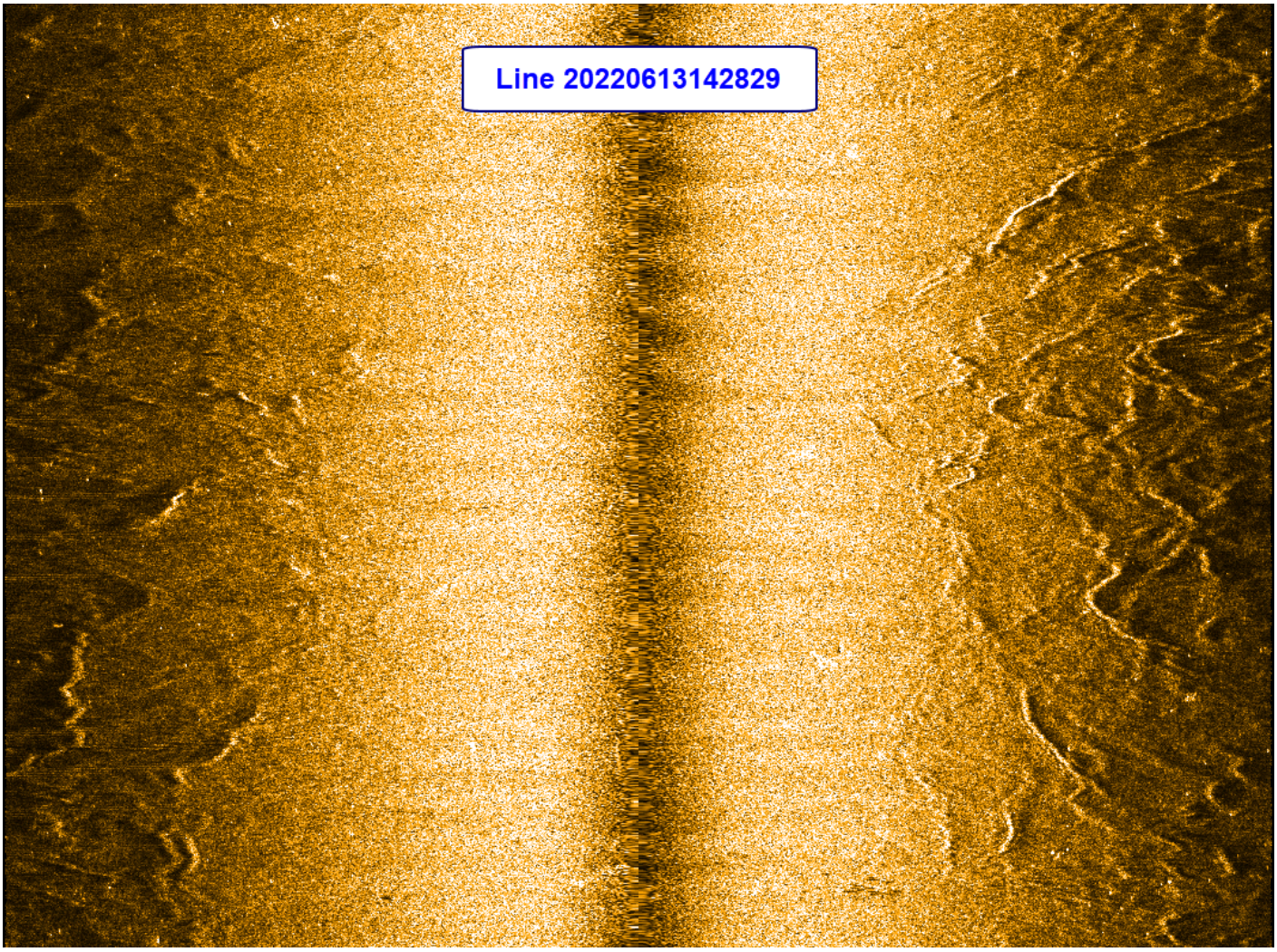


Figure 15: An example of refraction that was observed in SSS imagery collected on H13613.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Static conductivity, temperature, and depth (CTD) casts were conducted at the start of acquisition each day and at a minimum of one every four hours during launch acquisition using a Sea-Bird Seacat 19+ V2 CTD. Static cast frequency was increased in areas where a change in surface sound speed greater than two meters per second existed. All sound speed methods were used as detailed in the DAPR.

A total of 33 sound speed profiles were collected as part of acquisition of H13613 and display good spatial diversity (Figure 16). Ten of these casts were located outside of the sheet limits, not more than 250m away, and display profiles representative of the area. 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.

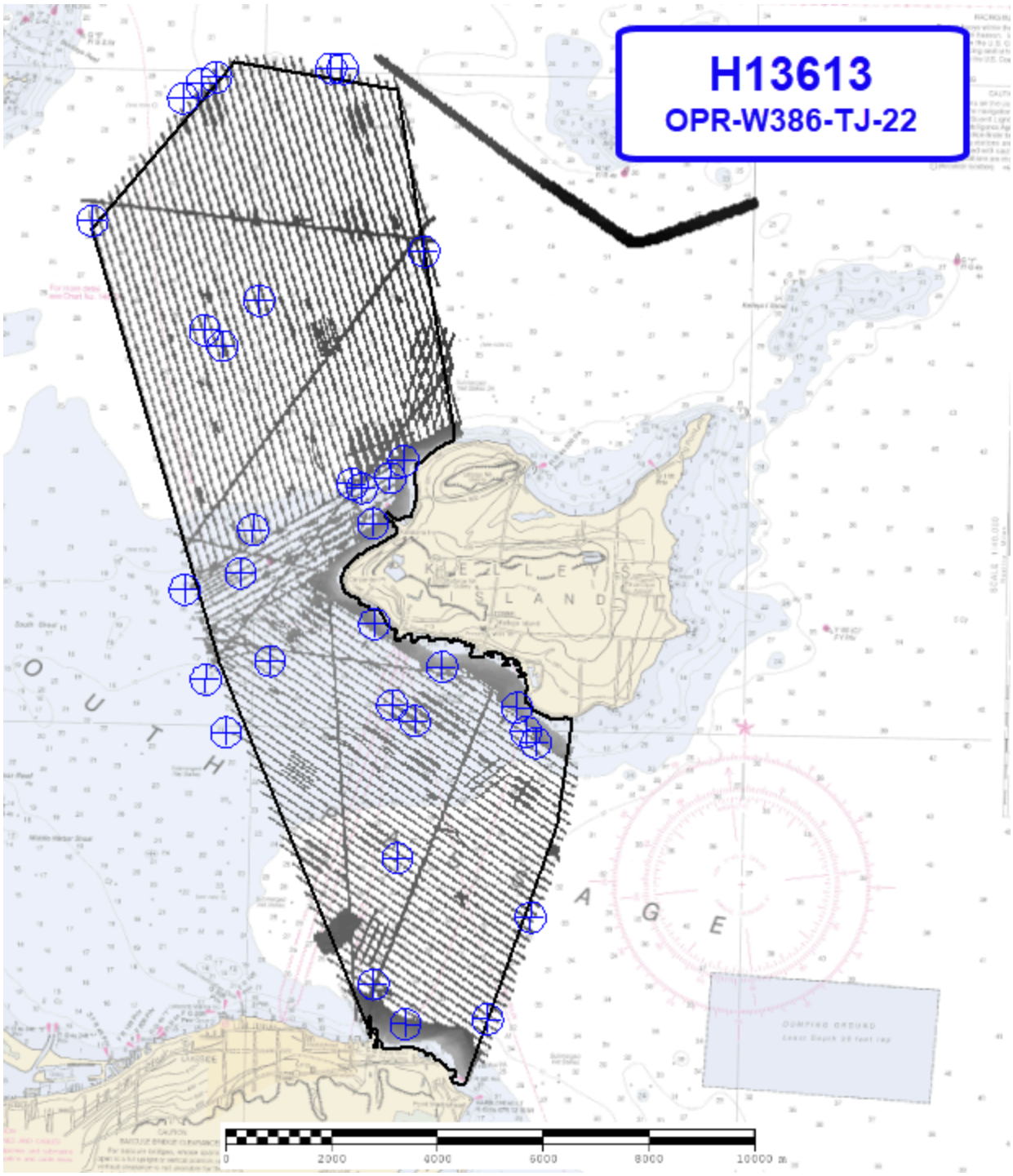


Figure 16: Overview of all CTD casts collected on H13613. Cast locations shown as blue targets overlaid on greyscale MBES data.

B.2.8 Coverage Equipment and Methods

Complete coverage requirements were met by 100% SSS coverage with concurrent MBES and 100% complete coverage MBES as specified under section 5.2.2.2 of the 2022 HSSD (Figure 17). Launch 2903 was outfitted with a Kongsberg EM2040 MBES system, an Edgetech 4200 SSS system, and was primarily used to acquire 100% SSS coverage with concurrent MBES and 200% SSS coverage to address assigned features. Launch 2904 was outfitted with a Kongsberg EM2040 MBES system and was primarily used to acquire 100% complete coverage MBES, crosslines, developments, bathymetric splits, and holidays.

Additional MBES coverage was acquired outside of the assigned limits as reconnaissance over an area in which the ship would transit (Figure 17). These additional data meet complete coverage specifications and are included in the submitted surfaces and in the final delivery package. Reference the DR Appendices for a record of communications regarding the inclusion of additional data.

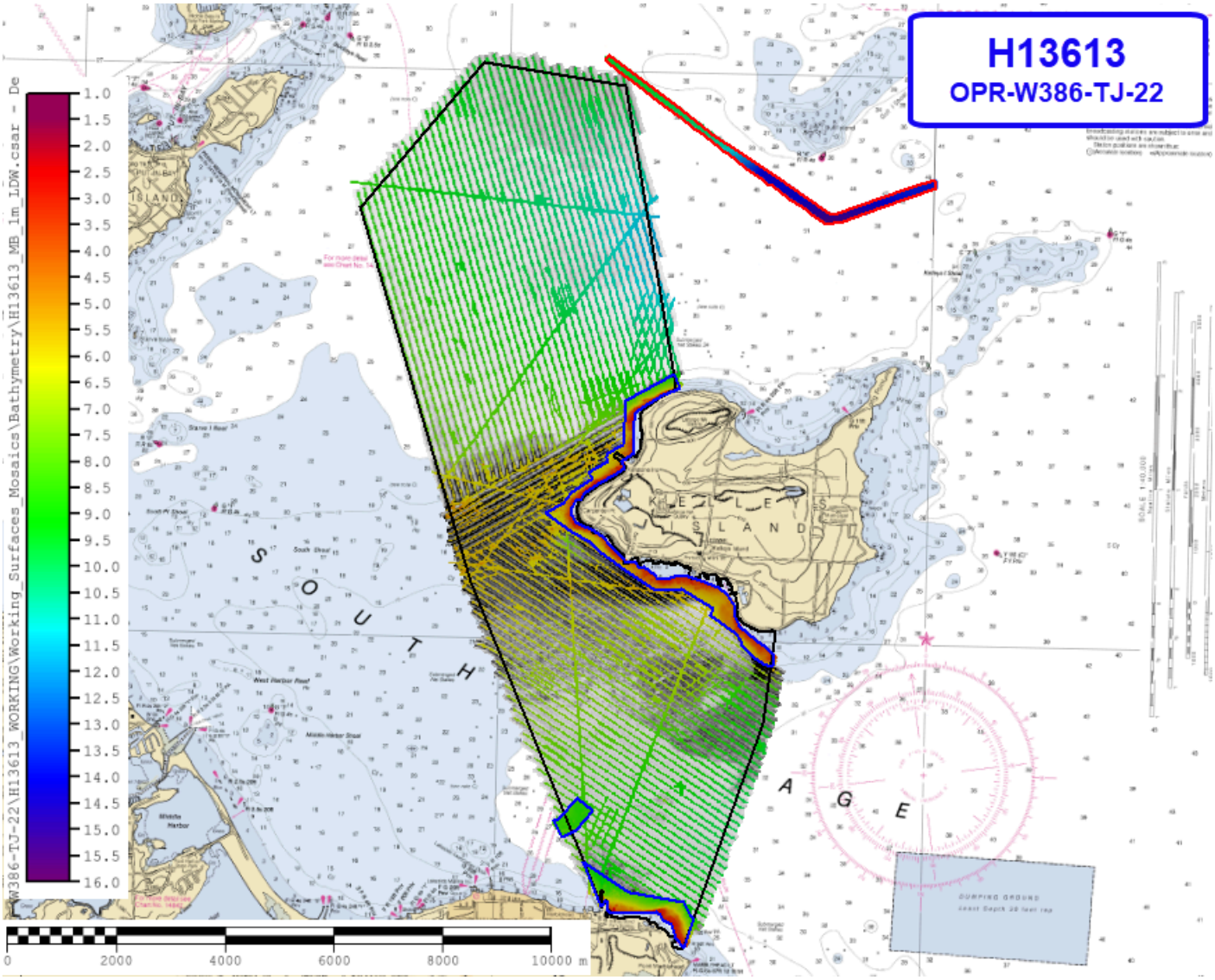


Figure 17: Coverage types used to meet complete coverage specifications. Areas of complete coverage MBES are outlined in blue and areas of complete coverage SSS with concurrent MBES are outlined in black. Reconnaissance area for ship's transit outlined in red.

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. Raw MBES backscatter was flagged as part of the .all file from the Kongsberg EM2040 systems. Backscatter was processed in QPS Fledermaus GeoCoder Toolbox (FMGT) software, and the exported geotiffs are included in the final processed data submission package (Figures 18 and 19).

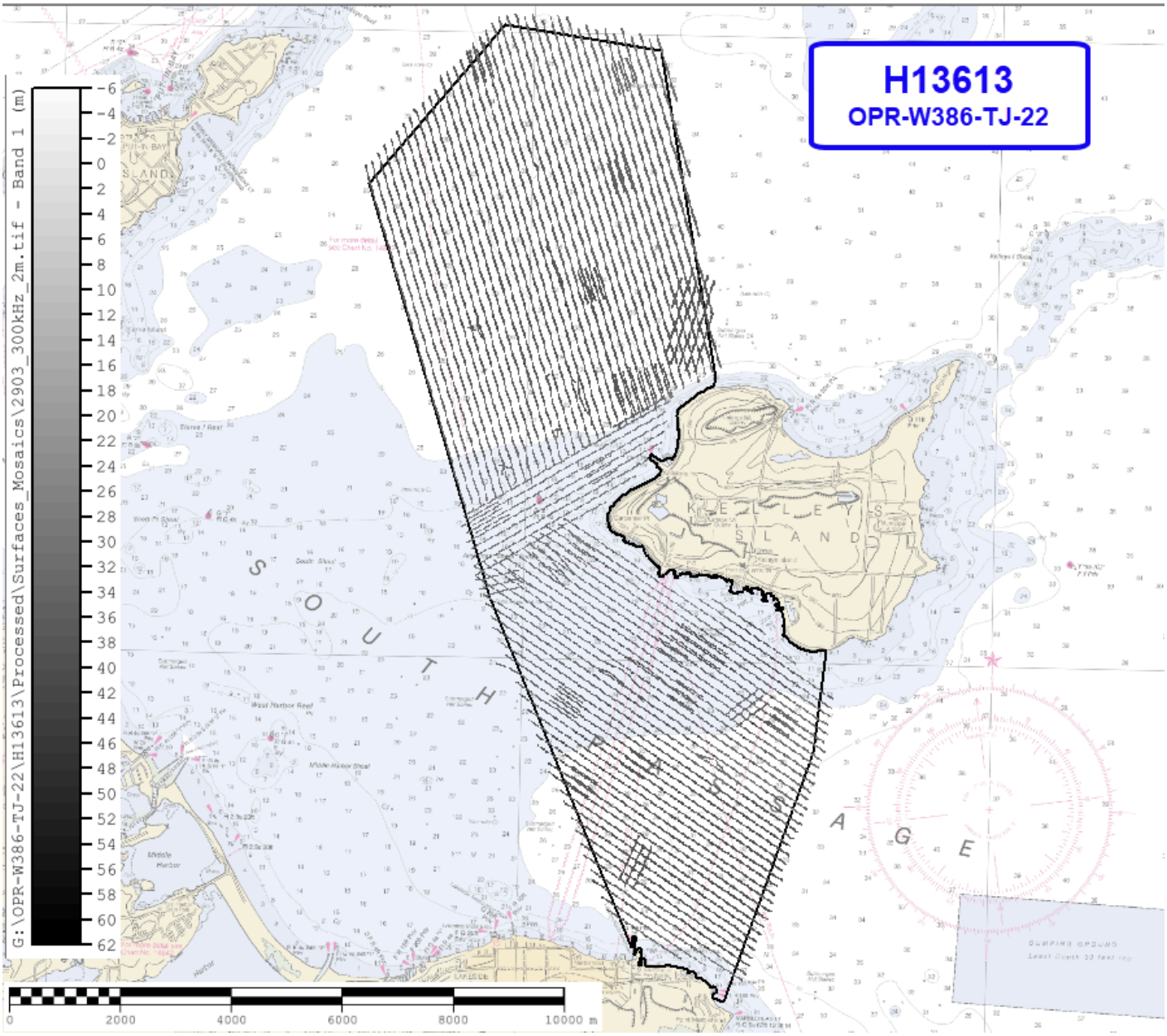


Figure 18: 300kHz backscatter mosaic from data acquired by 2903.

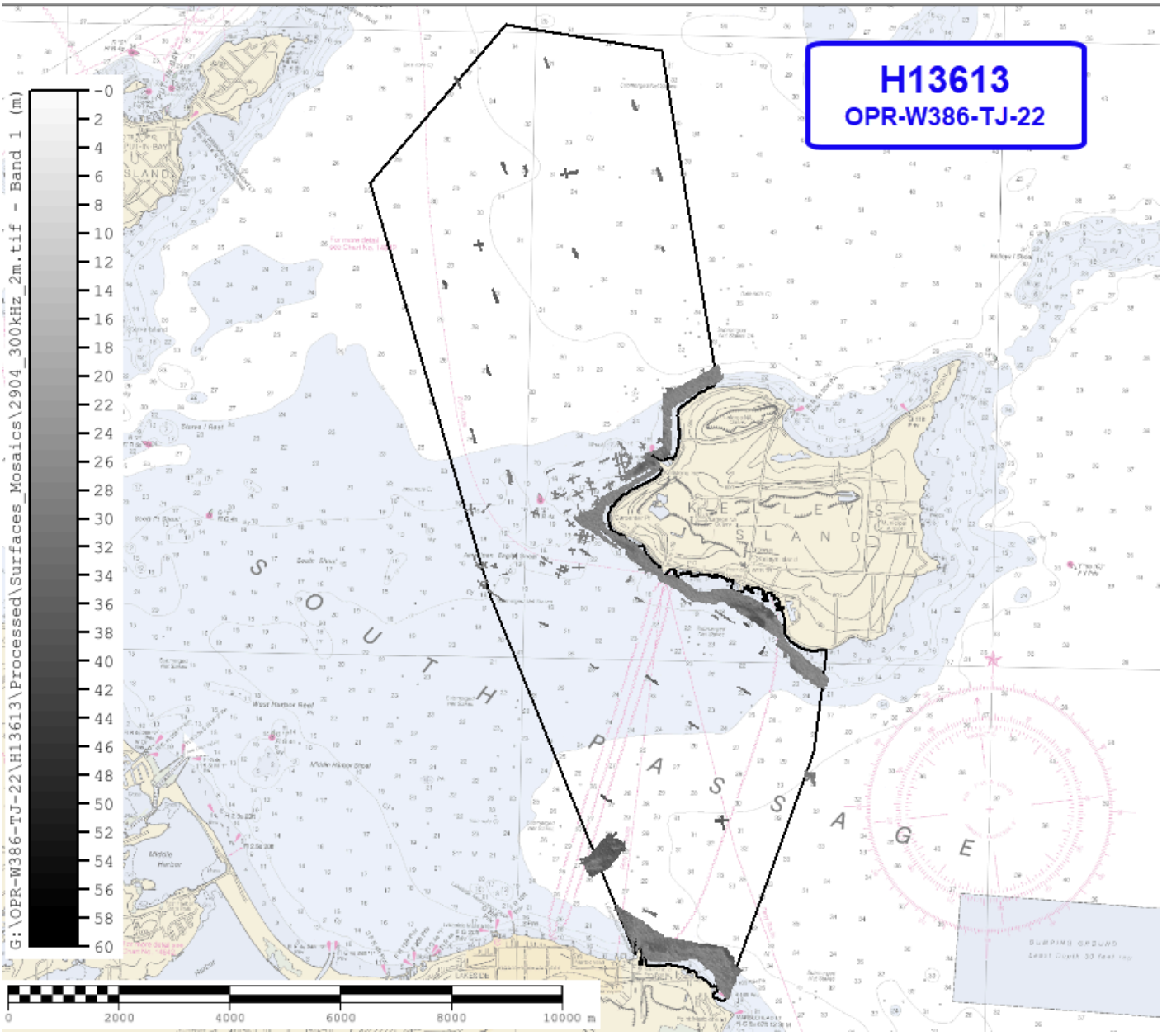


Figure 19: 300kHz backscatter mosaic from data acquired by 2904.

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
H13613_MB_50cm_LWD	CARIS Raster Surface (CUBE)	0.5 meters	1.4 meters - 15.8 meters	NOAA_0.5m	Complete MBES
H13613_MB_50cm_LWD_Final	CARIS Raster Surface (CUBE)	0.5 meters	1.4 meters - 15.8 meters	NOAA_0.5m	Complete MBES
H13613_MBAB_2m_300kHz_1of2	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES
H13613_MBAB_2m_300kHz_2of2	MB Backscatter Mosaic	2 meters	-	N/A	Complete MBES
H13613_SSSAB_1m_600kHz_1of2	SSS Mosaic	1 meters	-	N/A	100% SSS
H13613_SSSAB_1m_600kHz_2of2	SSS Mosaic	1 meters	-	N/A	200% SSS

Table 10: Submitted Surfaces

Complete coverage requirements were met by 100% SSS coverage with concurrent MBES and 100% complete coverage MBES as specified under section 5.2.2.2 of the 2022 HSSD. During the initial phases of surface review and QC, the hydrographer observed that a 1m surface resolution did not adequately represent significant rocks and other features observed in the sounding data. A surface with a 50cm resolution was created and found to be a more accurate representation of observed bathymetry. The 50cm grid was assessed for compliance with specifications outlined in the 2022 HSSD and was found to meet uncertainty (Section B.2.2) and density standards (Figure 20). While there are visible gaps in the bathymetric surface in areas of 100% complete MBES coverage, they are not large enough to meet the definition of a holiday for complete coverage requirements. There are two holidays present in the combined coverage achieved on H13613 as discussed in Section A.4.

After multiple rounds of surface cleaning, a total of 19 fliers remain as detected by NOAA's QC Tool Flier Finder available in the Pydro XL-19 suite. The hydrographer reviewed the flagged grid nodes, considers them to be accurate representations of the lake bed, and has retained them in the final delivered surfaces.

Unverified Charted Features (UCFs) were addressed with 200% SSS with concurrent MBES coverage. See section D.1.3 for details. The 200% SSS mosaic is included in the final deliverables package (Figure 21).

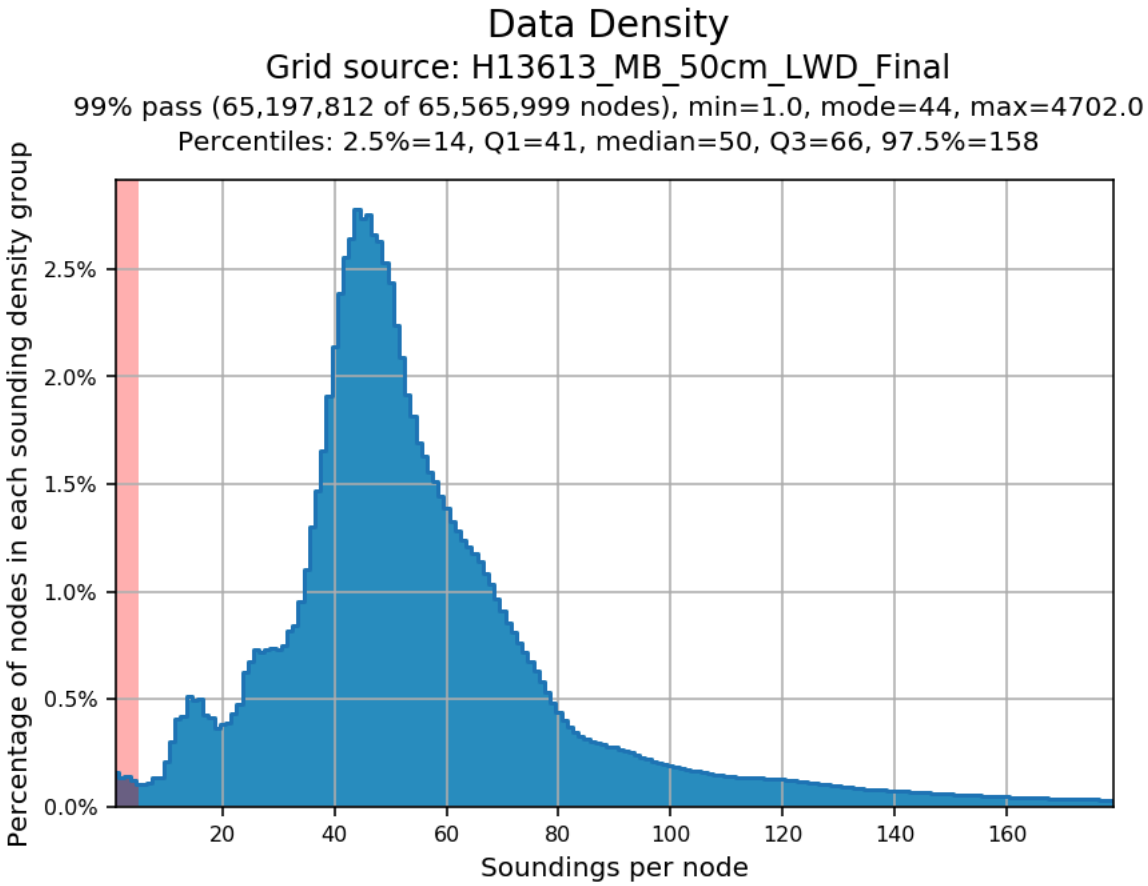


Figure 20: H13613 data density standards

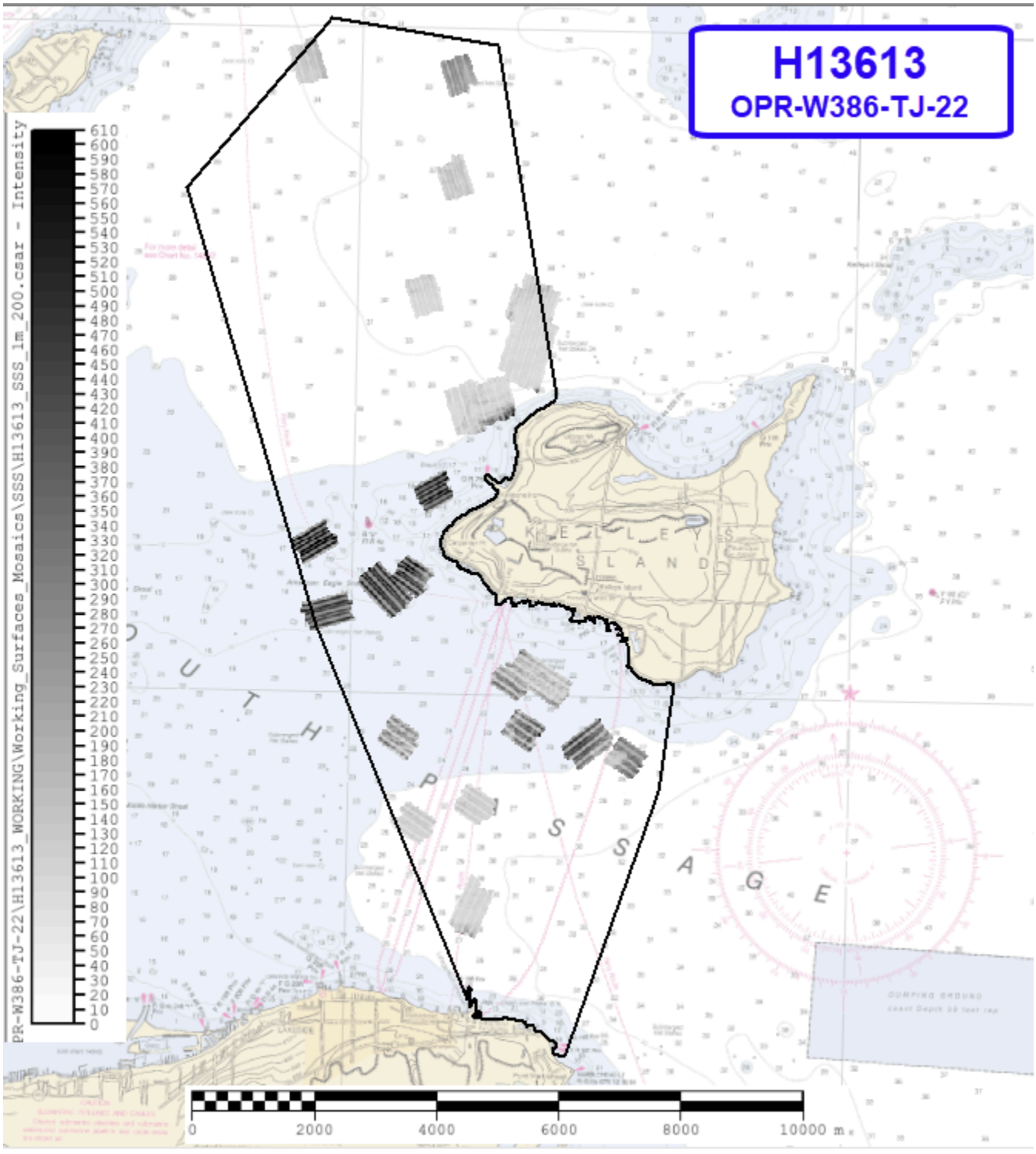


Figure 21: H13613 200% SSS mosaic for feature disproval areas

C. Vertical and Horizontal Control

Field installed tide and GPS stations were not utilized for this survey. There is no HVCR report included with the submission of H13613.

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

All soundings submitted for H13613 are reduced to LWD IGLD-85 using VDatum techniques as outlined in the DAPR.

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

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 H13613 MBES data from vessels 2903 and 2904.

WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition on HSLs 2903 and 2904.

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
US4OH08M	1:80000	2	06/15/2021	06/15/2021
US5OH08M	1:40000	5	05/05/2022	05/05/2022
US6OH1AM	1:5000	1	08/30/2017	08/30/2017

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Surveyed soundings and contours were compared against previously charted data. While depth values were found to be in general agreement, some contours near shore appear to have shifted. The hydrographer believes these shifts do not pose a hazard to navigation.

Newly discovered features are included in the Final Feature File (FFF), two of which were considered to be Dangers to Navigation (DTONs). A DTON report was submitted following guidance of the 2022 HSSD and a record of correspondence can be found in the DR Appendices. Reference the FFF for additional information.

D.1.3 Charted Features

A total of 125 charted features were assigned for investigation. 19 were not addressed due to being inshore of the NALL. 42 fishing stakes were designated as Unverified Charted Features (UCFs). Following a consultation with the project manager, a 150m search radius was created around each feature and 200% SSS with concurrent MBES was used to conduct a feature search (see DR Appendix II). Upon reviewing the SSS and MBES data, the hydrographer observed some stakes being present but their appearance is very slender in nature and difficult to detect (Figure 22). The hydrographer's opinion is that complete coverage MBES with watercolumn data should be used to conduct formal feature disprovals for the stakes, but limited operational time did not allow the field unit to conduct further investigation. Assigned features where stakes were observed in SSS and/or MBES coverage within the search radii are recommended to be 'retained as charted', while the rest are designated as 'un-addressed' since a more thorough search is recommended for full disproval. Reference the FFF for more information.

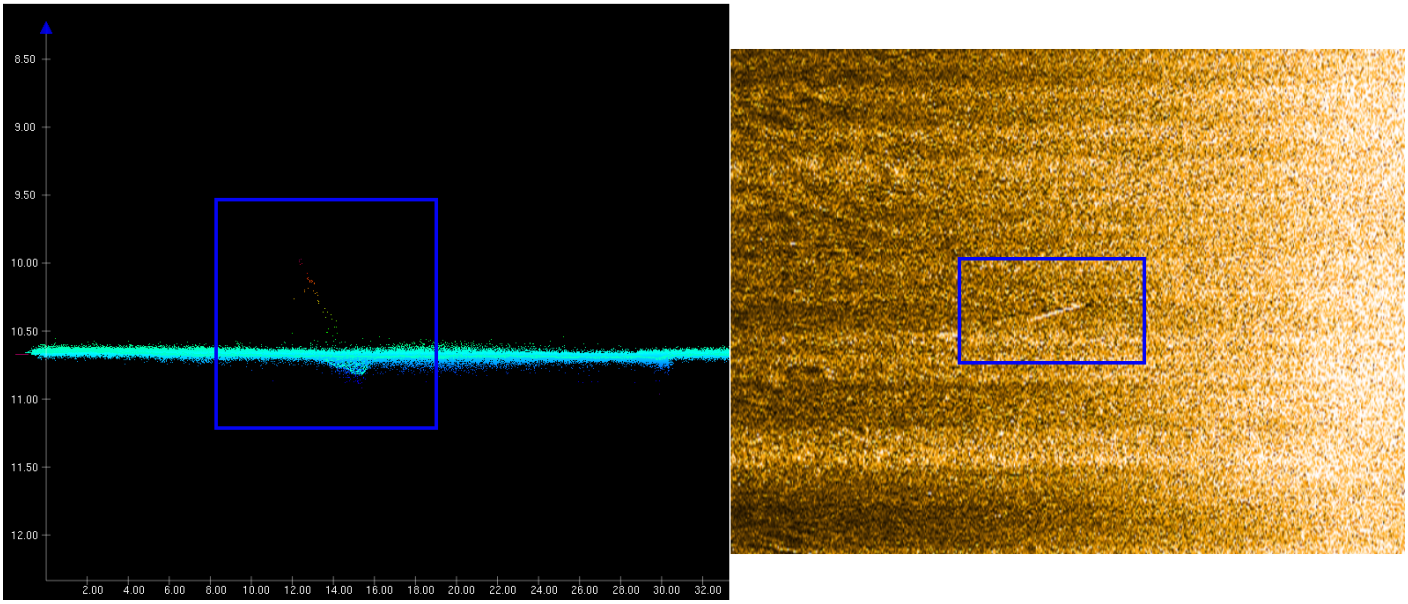


Figure 22: Example of a fishing stake seen in MBES data (right pane) and SSS imagery (left pane).

D.1.4 Uncharted Features

Six uncharted features were investigated as part of acquisition on H13613 and are recommended for charting. Two of these features were considered Dangers to Navigation (DTONs) and were reported following guidance in the 2022 HSSD. Reference the FFF for more information as well as the DR Appendices for a record of communications.

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

One charted aid to navigation (ATON) was investigated and was confirmed to be on station. No ATON reports were filed with the U.S. Coast Guard.

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. However the hydrographer chose to collect samples in alternate locations guided by differences observed in the SSS acoustic backscatter imagery (Figure 23).

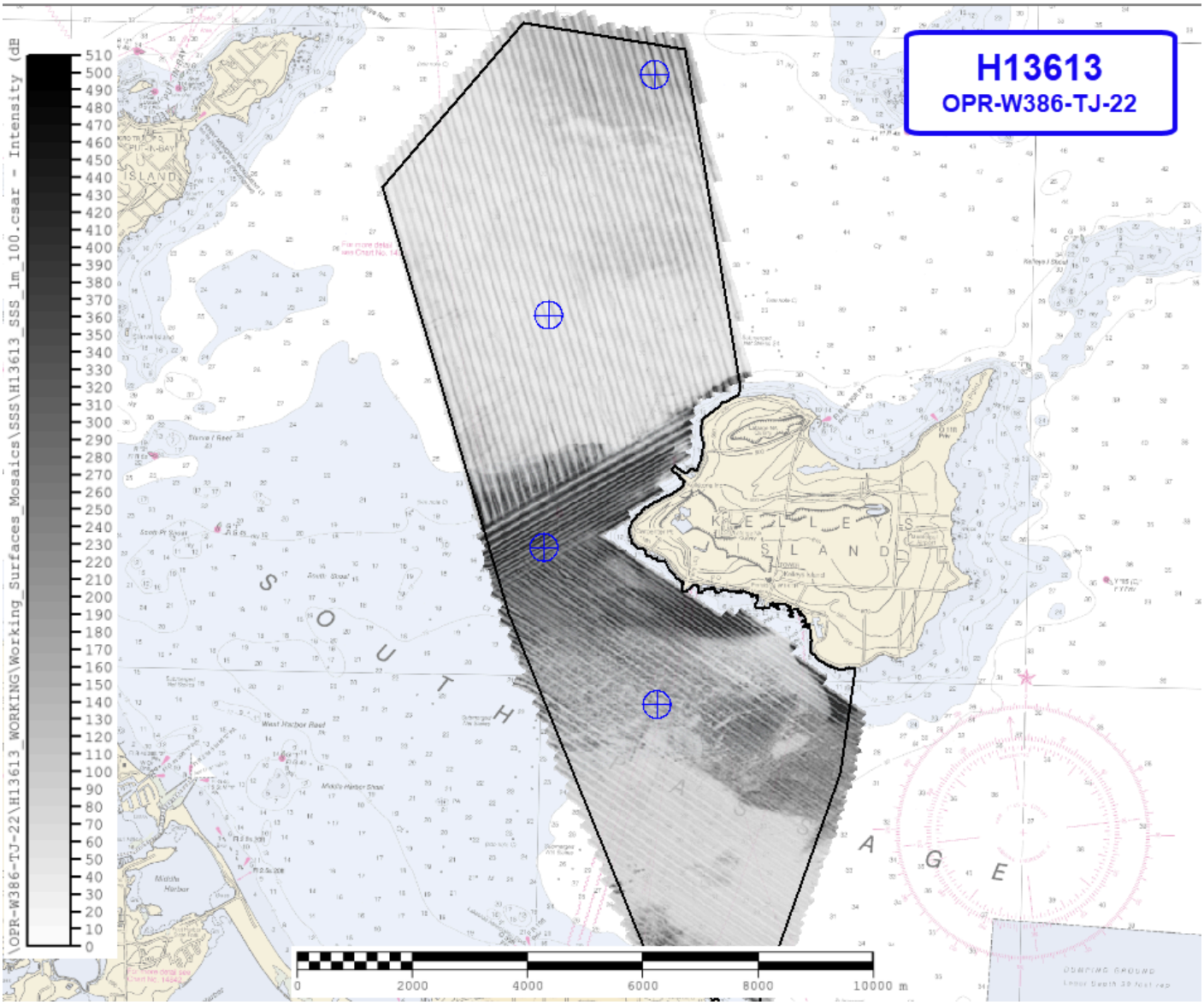


Figure 23: Overview of locations of bottom samples collected on H13613 shown as blue targets overlaid on SSS acoustic backscatter mosaic.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

Four submarine cables were assigned for investigation within H13613. Only one was observed in MBES and SSS data approximately 250m east of its charted location. Discrepancies were also observed for two pipelines which were found in locations slightly different than charted. Portions of these

pipelines were found to be unburied and were reported following guidance in the 2022 HSSD. Reference H13613_Discrepancies.000 in the S-57 folder of the submission drive for more information as well as the DR appendices for a record of communications.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

Three ferry routes were assigned for investigation within H13613. During field observations and historical AIS investigation, the hydrographer noted that the locations of the ferry terminals are different from what were previously charted (Figure 24). The hydrographer recommends further investigation of AIS traffic as well as consultation with source authorities to update the terminal locations and routes of ferry traffic in the area. Reference H13613_Discrepancies.000 in the S-57 folder of the submission drive for approximate terminal locations and ferry routes.

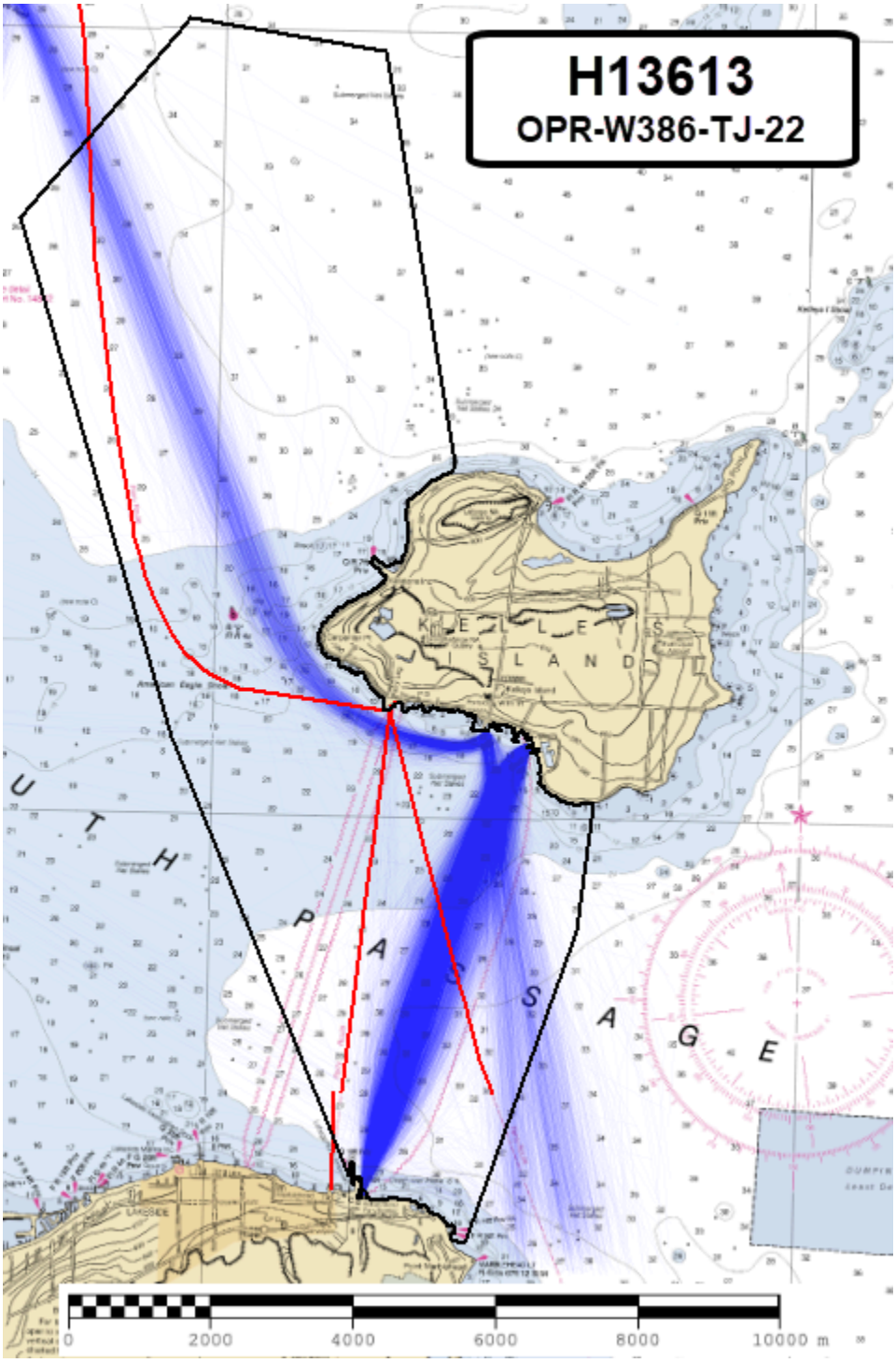


Figure 24: Overview of ferry routes within H13613. Solid red lines indicate charted ferry routes. Passenger vessel AIS tracks from Jan 2021-June 2022 shown in blue.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

During shoreline investigation activities, the field unit noted active construction to extend a previously charted pier in the vicinity of Portside Marina on Kelleys Island, OH. The extents of the construction were observed visually and in MBES coverage and are included in the FFF.

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	07/21/2022	JASKOSKI.MATTHEW.JACOB.1275636262 2022.07.21 11:09:02 -04'00'
Michelle M. Levano, LT/NOAA	Field Operations Officer	07/21/2022	Digitally signed by LEVANO.MICHELLE.MARIE.1516645888 Date: 2022.07.21 19:13:53 -04'00'
Erin K. Cziraki	Chief Survey Technician	07/21/2022	CZIRAKI.ERIN.KAYE.1550015338 Digitally signed by CZIRAKI.ERIN.KAYE.1550015338 Date: 2022.07.21 08:11:40 -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