H13618

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13618

LOCALITY

State(s):	Michigan
General Locality:	Michigan
Sub-locality:	Fighting Island to Belle Isle

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	**H13618**

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):	**Michigan**
General Locality:	**Michigan**
Sub-Locality:	**Fighting Island to Belle Isle**
Scale:	**5000**
Dates of Survey:	**08/05/2022 to 08/15/2022**
Instructions Dated:	**04/19/2022**
Project Number:	**OPR-W387-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 Great Lakes 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, 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.

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Descriptive Report to Accompany Survey H13618

Project: OPR-W387-TJ-22

Locality: Michigan

Sublocality: Fighting Island to Belle Isle

Scale: 1:5000

August 2022 - August 2022

NOAA Ship *Thomas Jefferson*

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

A. Area Surveyed

The survey area is referred to as H13618, "Fighting Island to Belle Isle" (sheet 1) in the Project Instructions (PIs) for OPR-W387-TJ-22. The survey area is approximately 4.1 square nautical miles.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
42° 21' 23" N 83° 7' 57" W	42° 15' 13" N 82° 56' 39" W

Table 1: Survey Limits

Data were acquired within the assigned survey limits as required in the Project Instructions and in the 2022 Hydrographic Survey Specifications and Deliverables (HSSD) 2022 unless otherwise noted in this report. See figure below for overview of sheet limits.

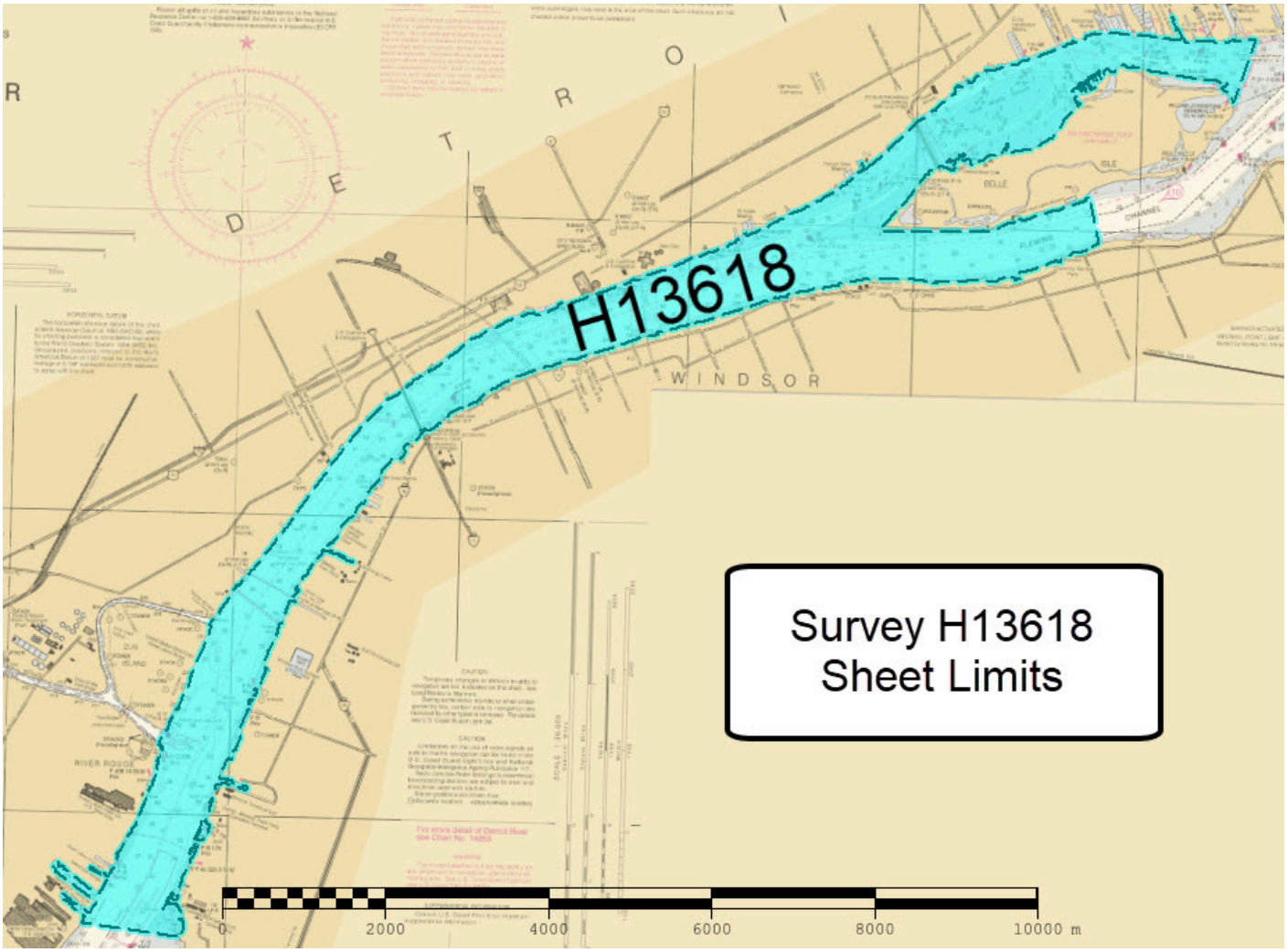


Figure 1: H13618 assigned survey area (Chart 14848).

A.2 Survey Purpose

The Detroit River divides the metropolitan areas of Detroit, Michigan and Windsor, Ontario and contains a portion of the border between the United States and Canada. Flowing 28 miles from Lake St. Clair into Lake Erie, the waterway serves as a critical transportation route connecting various ports along the Great Lakes handling approximately 1,500 passages or 80 million tons of cargo annually (1).

The Port of Detroit serves as a top 20 port for dry bulk products (2) and provides approximately 16,000 jobs to southeast Michigan (1). The river is crossed numerous times by bridges and tunnels and ferries of critical importance to regional and international trade and travel between Canada and the United States.

The Detroit River hosts islands, marshes, and structures dating back to the colonization of the area in the 1700's. There are numerous wrecks, ruins, and other potential hazards outside of the USACE maintained

channels. These areas outside of the USACE maintained channels have not been adequately surveyed with modern technology and present a critical surveying need.

This project represents a portion of the NOAA Ship Thomas Jefferson's planned FY22 work in the Great Lakes region. Survey data from this project is intended to supersede all prior survey data in the common area.

1: https://www.freightwaves.com/news/freightwaves-classics-port-of-detroit-is-an-economic-enginefor-the-region

2: https://www.bts.gov/ports

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13618 meet multibeam echo sounder (MBES) coverage requirements for object detection 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	Object detection (Refer to HSSD Section 5.2.2.2)
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 was acquired in accordance with the 2022 HSSD. Object detection coverage requirements were met with 100% multibeam (MBES) or full MBES coverage. See image below for more detail on the extents of survey coverage.

Coverage met the inshore limit of hydrography, the Navigable Area Limit Line (NALL). The NALL is defined as the most seaward of the following: the surveyed 3.5- meter depth contour, the line defined by the distance seaward from the observed mean high water (MHW) line which is equivalent to 0.8 millimeters at chart scale, or the inshore limit of safe navigation. Areas where H13618 survey coverage reached neither 3.5 meters water depth, nor the assigned sheet limits, was due to the presence of hazards such as a thick weeds, recreational boaters, swimmers or private docks and moorings. See image below for an example of NALL determination for this survey.

Pydro Explorer QC Tool Holiday Finder was used to detect gaps in data (holidays) on the finalized Single Resolution (SR) surfaces for submission. Holiday finder yielded 37 certain holidays, 18 of which were false positives. These false positives were data gaps around bridge pilings and building structures. The remaining 19 holidays were created as a result of cleaning of dense vegetation areas, or rejection of a data artifact.

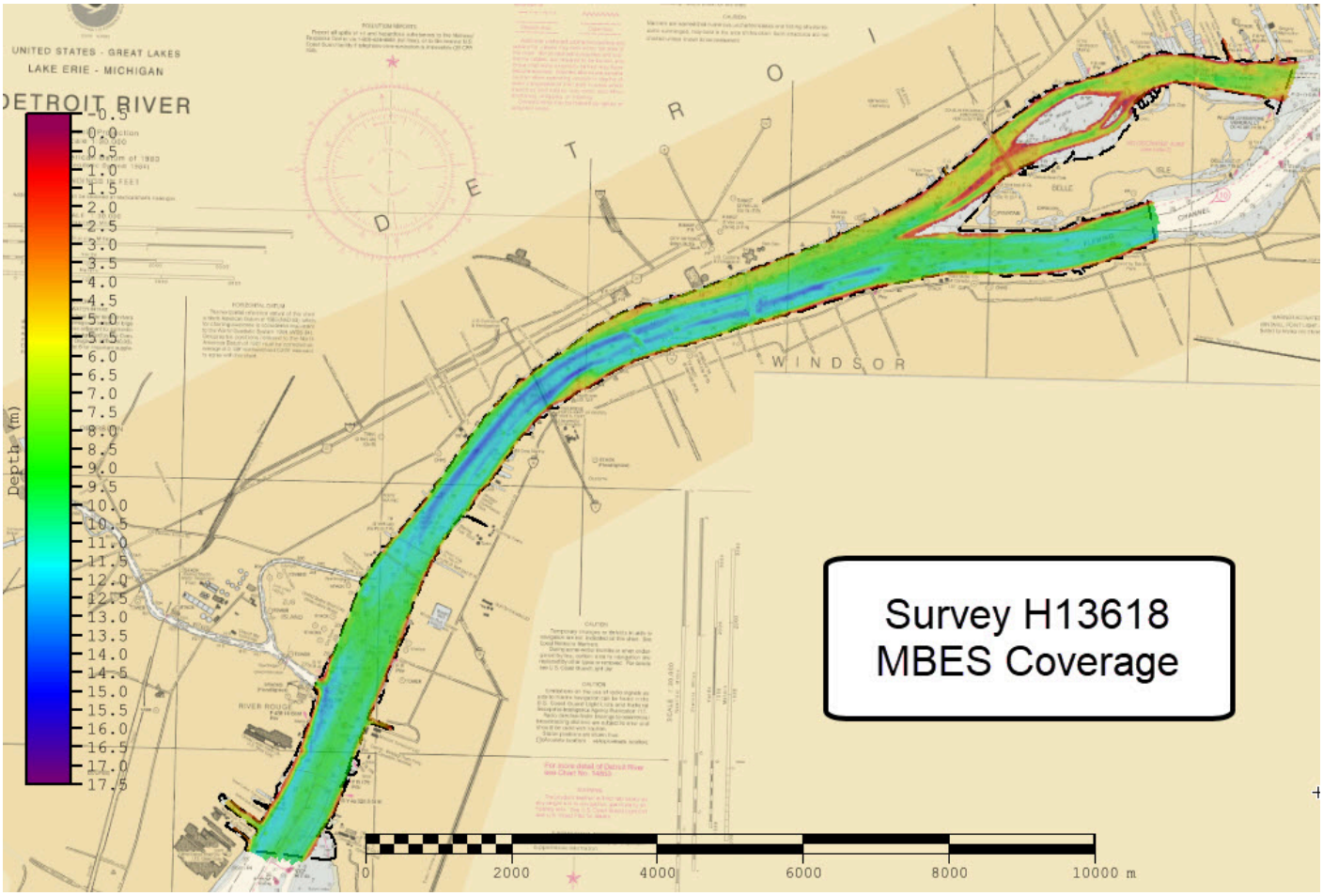


Figure 2: H13618 MBES coverage and assigned survey limits.

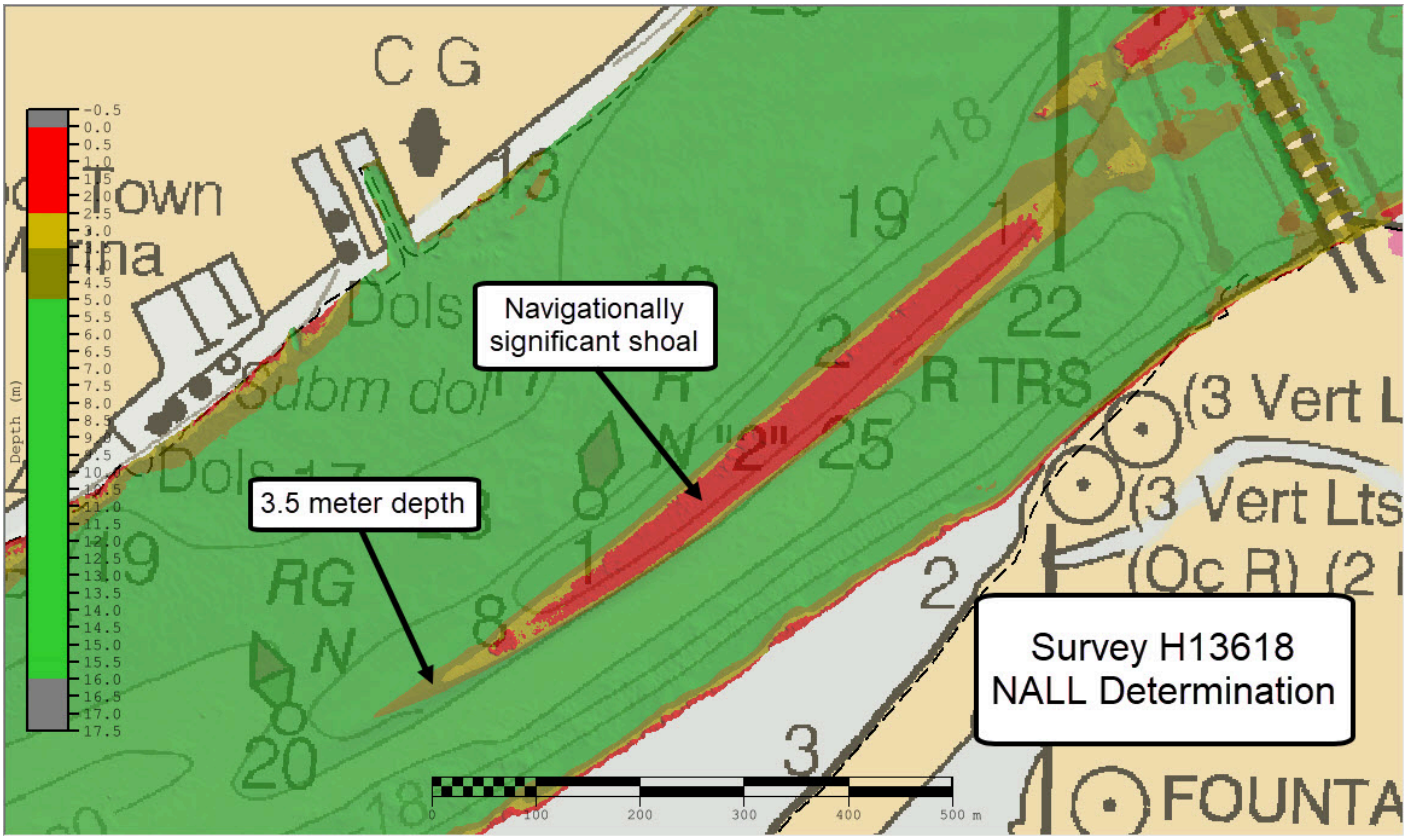


Figure 3: Examples of H13618 NALL determination; the black dashed line indicates assigned sheet limits and the yellow indicates where the 3.5-meter contour was reached.

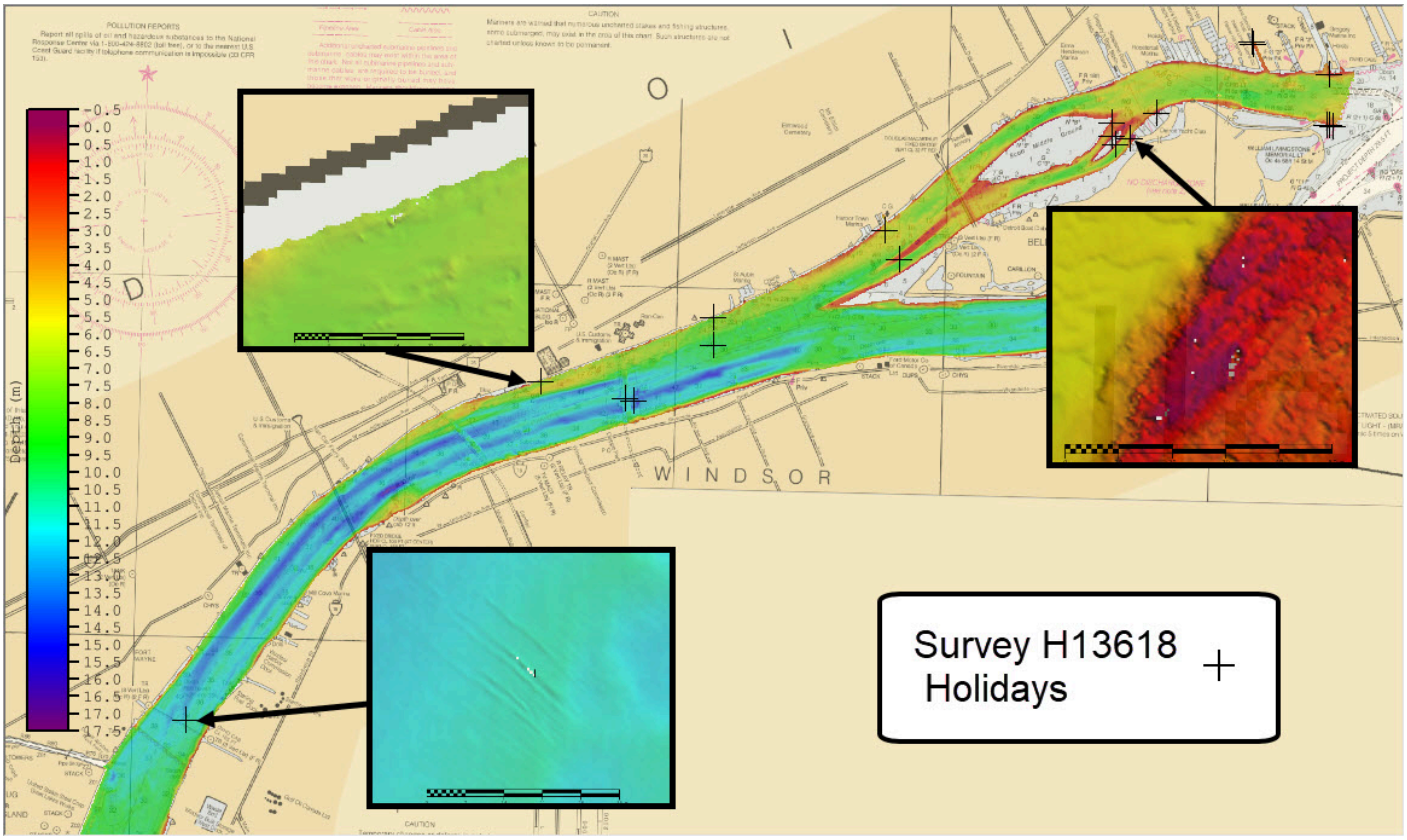


Figure 4: Overview of H13618 overlaid with the 19 real Holidays.

A.6 Survey Statistics

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

	HULL ID	*2904*	*S3007*	*Total*
LNM	SBES Mainscheme	0.0	0.0	0.0
	MBES Mainscheme	81.9	153.7	235.7
	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	10.1	0.0	10.1
	Lidar Crosslines	0.0	0.0	0.0
Number of Bottom Samples				5
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				4.1

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/05/2022	217
08/06/2022	218

Survey Dates	Day of the Year
08/08/2022	220
08/09/2022	221
08/10/2022	222
08/15/2022	227

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	*2904*	*S3007*
LOA	8.5 meters	10.4 meters
Draft	1.2 meters	0.6 meters

Table 5: Vessels Used

Figure 5: Thomas Jefferson Launch 2904.

Figure 6: NRT-5 vessel S3007

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	Micro SV-Xchange	Sound Speed System
Kongsberg Maritime	EM 2040	MBES
Kongsberg Maritime	EM 2040C	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
SonTek	CastAway-CTD	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Thomas Jefferson launch 2904 acquired 10.1 nautical miles of multibeam crosslines or 4.3% of mainscheme lines across most depth ranges and multiple boat days. H13618 crossline data is adequate for verifying and evaluating the internal consistency of survey data. The Compare Grids function in Pydro Explorer analyzed finalized single resolution (SR) surfaces of H13618 crossline-only data and mainscheme-only data. In the difference surface, the resulting mean was 0.02 m with a standard deviation of 0.05 m; 99.5% of nodes met IHO allowable Total Vertical Uncertainty (TVU) standards. See figures below for specific details on crossline analysis.

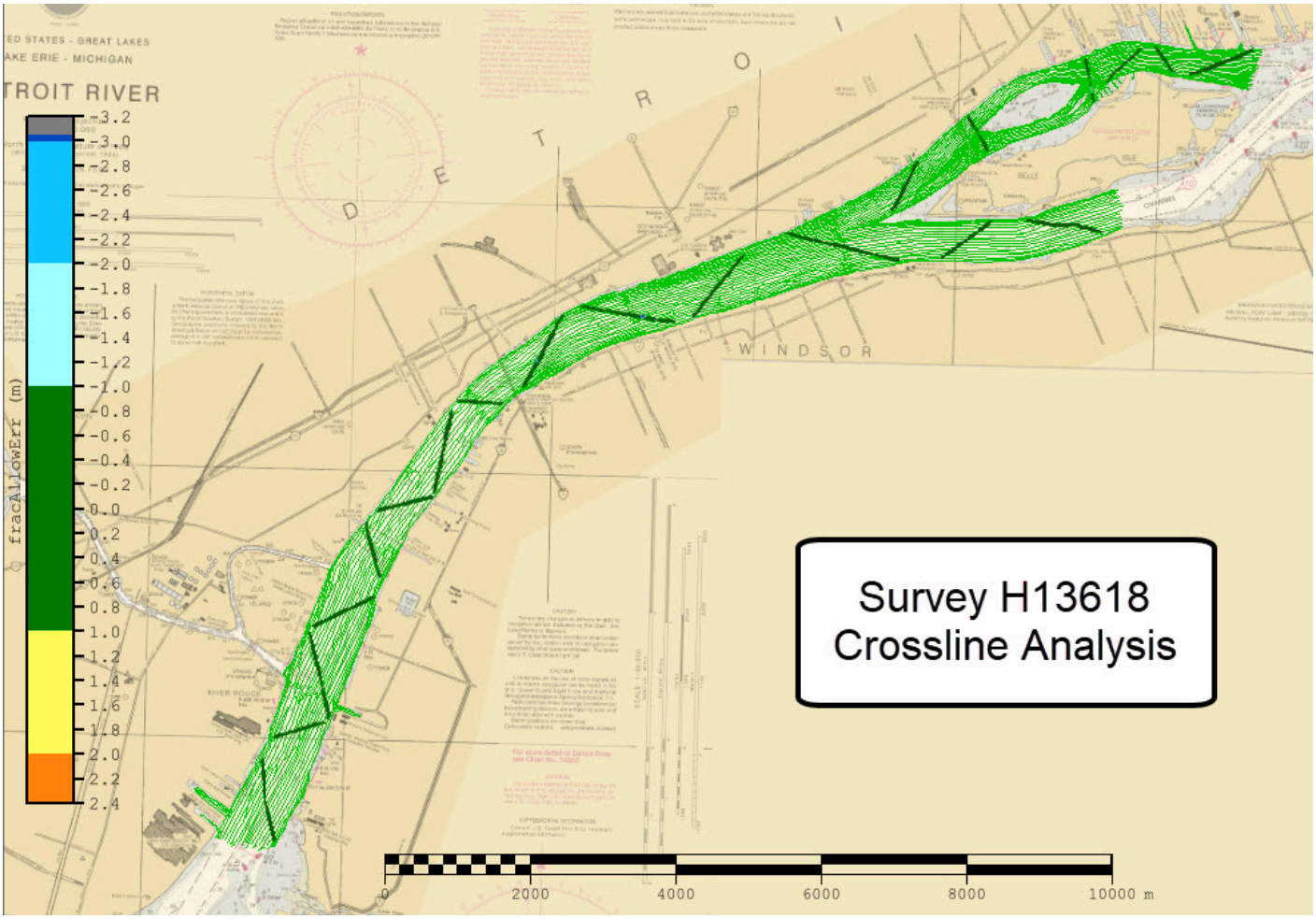
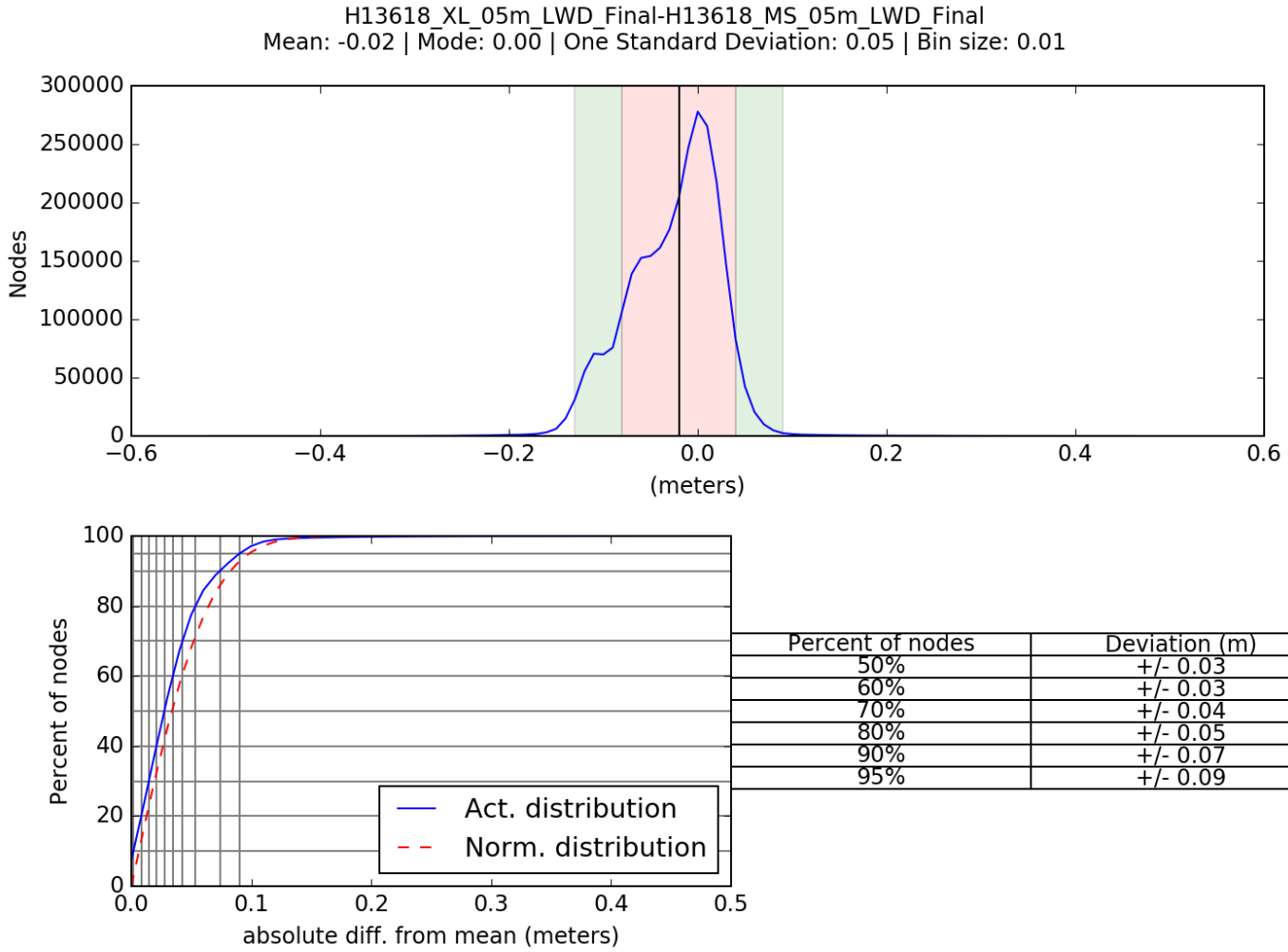


Figure 7: H13618 crossline surface overlaid on mainscheme tracklines.



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.05
90%	+/- 0.07
95%	+/- 0.09

Figure 8: Pydro derived plot showing absolute difference.

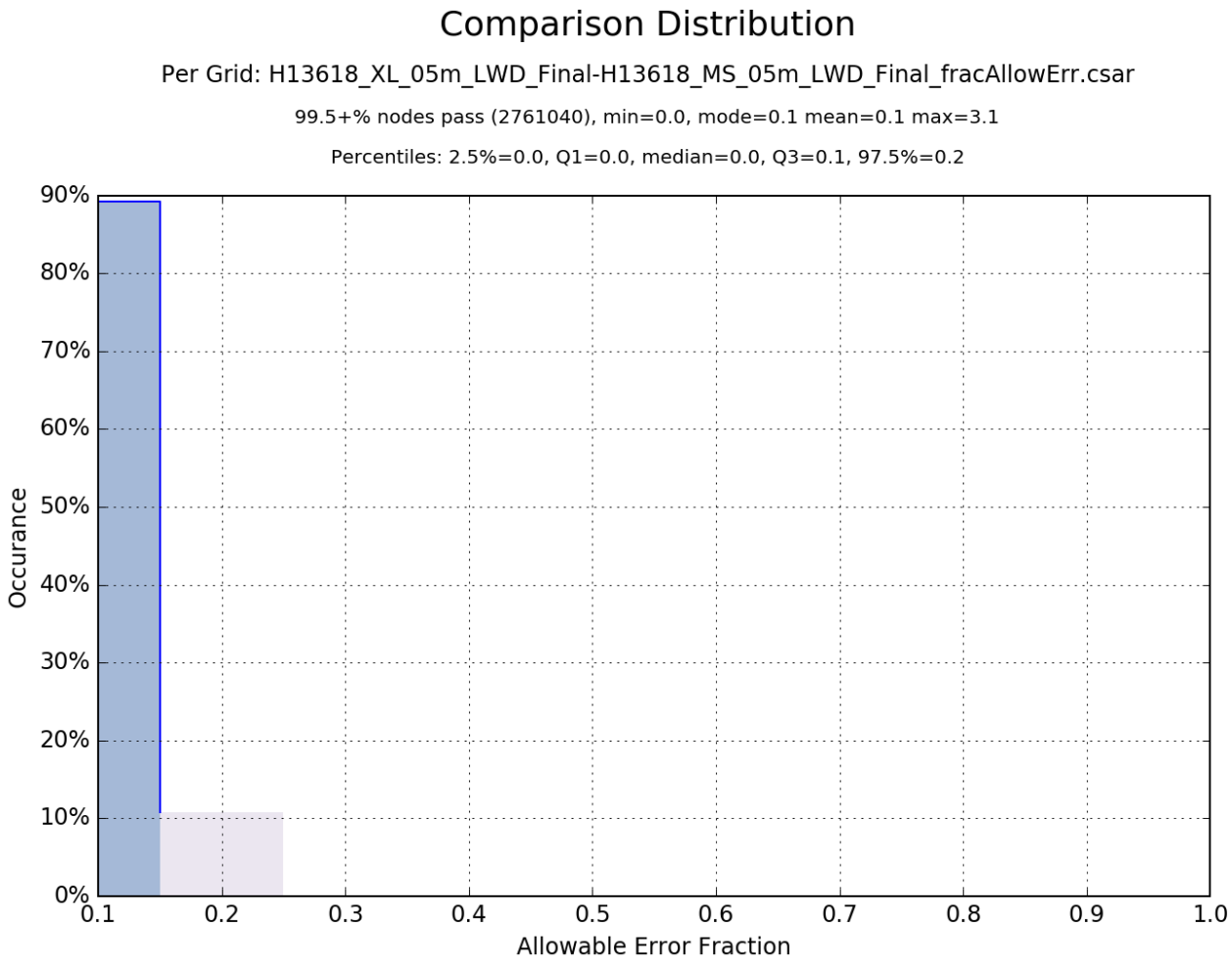


Figure 9: Pydro derived plot showing percentage-pass value of H13618 mainscheme to crossline data.

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
2904	4.0 meters/second	N/A	N/A	0.2 meters/second
S3007	2.0 meters/second	N/A	N/A	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13618 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. Tidal uncertainty was provided in the project instructions for the NOAA vertical datum transformation model used for this survey.

In addition to the usual a priori estimates of uncertainty, some real-time and post-processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties for position, navigation, attitude, and vessel motion data from Applanix POS MV were applied during acquisition and initially in post-processing. However, the SBET and RMS files, which were generated using POSPac MMS software and applied in CARIS HIPS to supersede POS MV data, have post-processed uncertainties associated with the GPS height and position.

Uncertainty values of the submitted finalized grids were calculated in Caris using "Uncertainty" of uncertainty and standard deviation (scaled to 95%). Grid QA v5 within Pydro QC Tools was used to analyze H13618 TVU compliance. H13618 met the 2022 HSSD requirements in over 99.5 percent of grid nodes, which is shown in the histogram plot below. Pydro QC Tools 2 Grid QA was used to analyze H13618 multibeam echosounder (MBES) data density. The submitted H13618 single-resolution surface met the 2022 HSSD density requirements as shown in the histograms below.

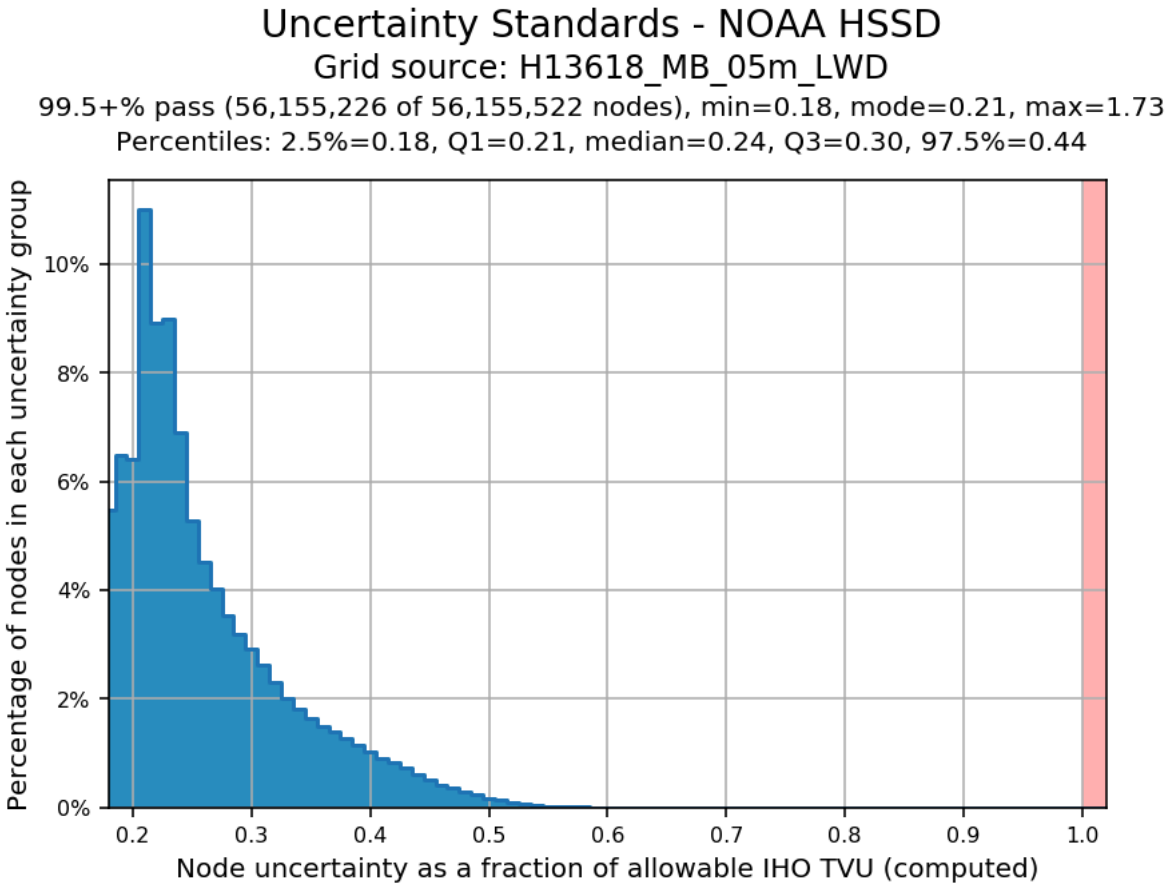


Figure 10: Pydro derived plot showing TVU compliance of H13618 finalized single-resolution MBES data.

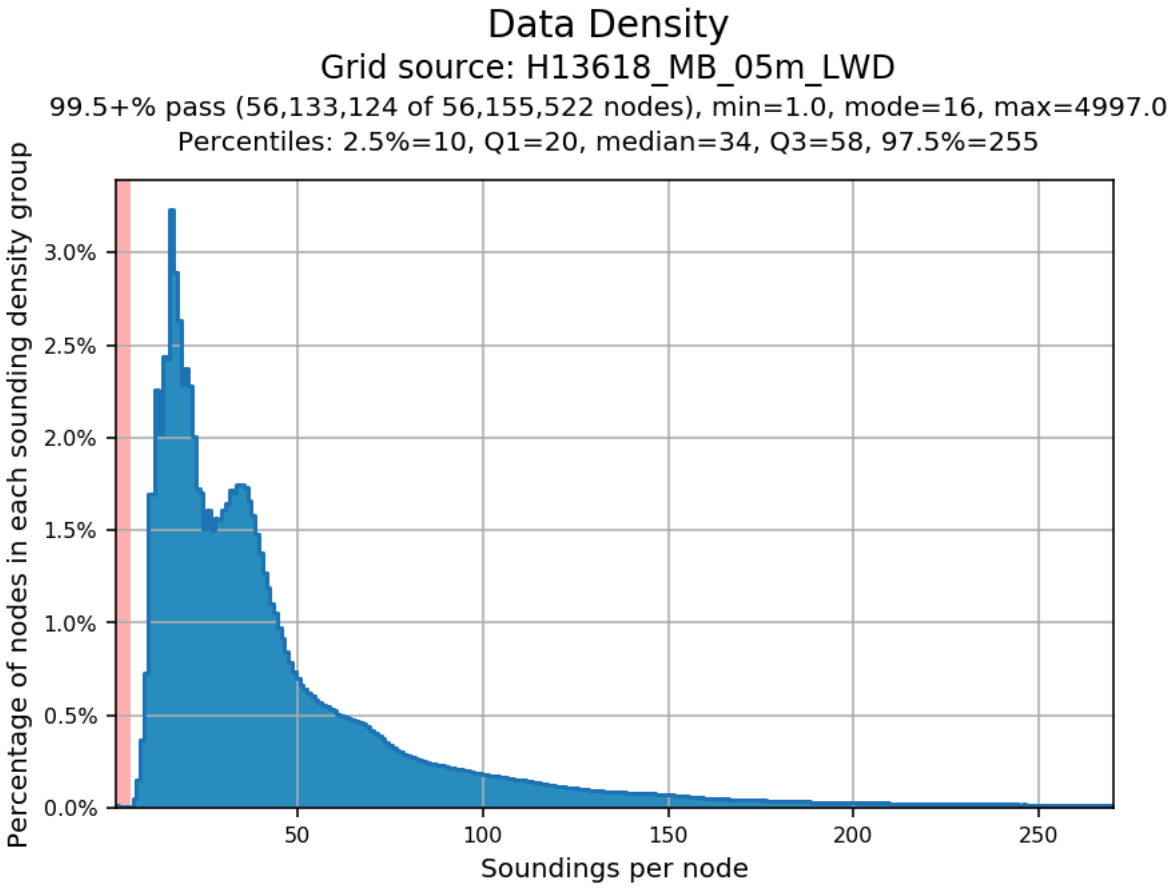


Figure 11: Pydro derived histogram plot showing HSSD density compliance of H13618 finalized single-resolution MBES data.

B.2.3 Junctions

Survey H13618 junctions with two contemporary surveys conducted by NOAA Ship Thomas Jefferson and NRT 5.

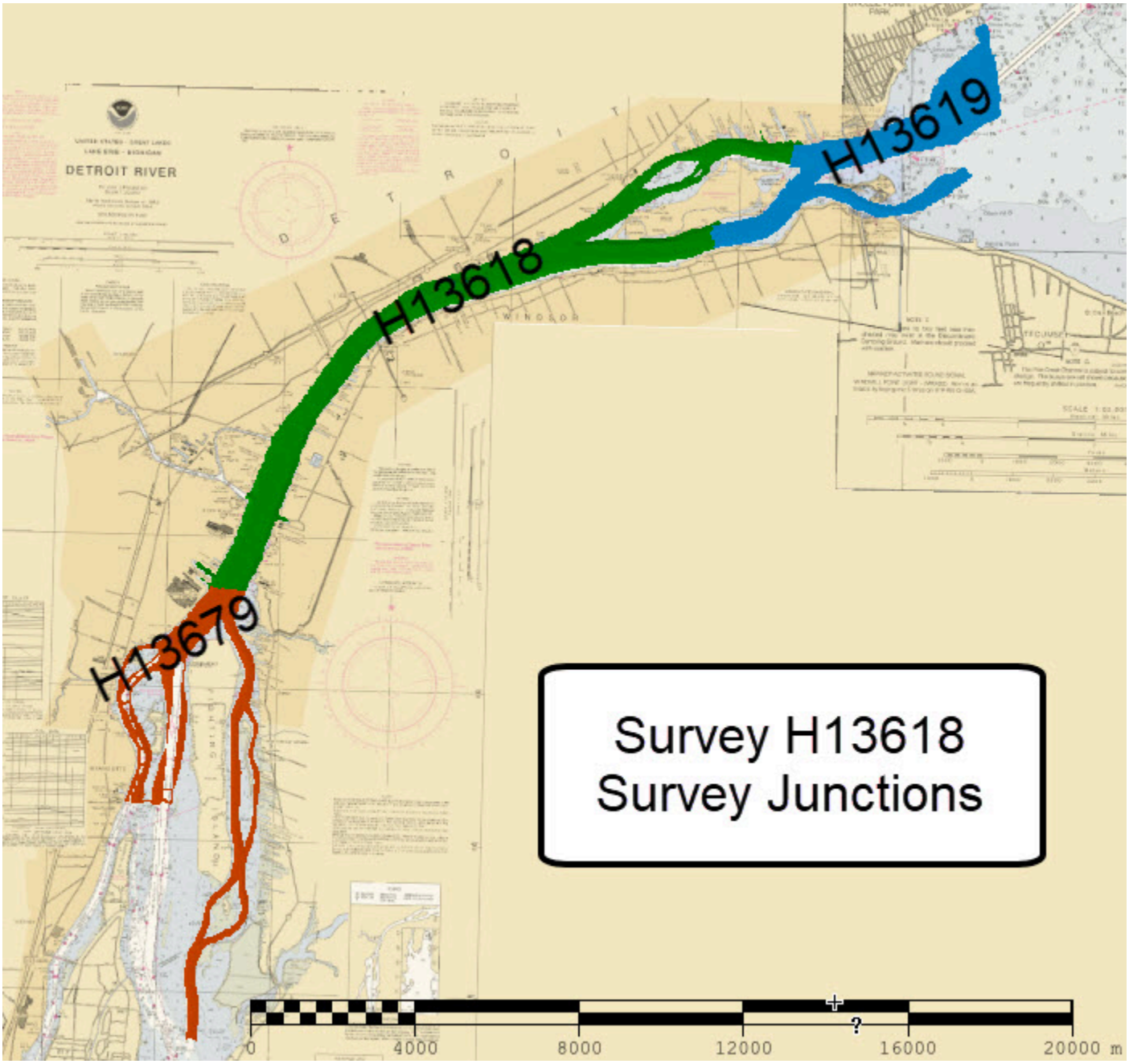


Figure 12: Overview of H13618 junctions.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13619	1:5000	2022	Thomas Jefferson	E
H13679	1:5000	2022	Thomas Jefferson	S

Table 9: Junctioning Surveys

H13619

Please refer to survey H13619 Descriptive Report for junction analysis.

H13679

Please refer to survey H13679 Descriptive Report for junction analysis.

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

Dense Vegetation

While conducting survey operations, field personnel reported dense patches of vegetation throughout all of sheet H13618. The majority of the vegetation was on the edges of the river and in shallower portions of the sheet, generally 3.5m or less. After consulting with personnel at the Atlantic Hydrographic Branch, conservative cleaning efforts were made to reject the vegetation from being included in the delivered surfaces.

Rather than attempting to discern the location of the bottom, the hydrographer took the more conservative approach and completely rejected sounding data from these areas. These areas include the vicinity around Scotts Middle Ground, the north east Shore of Belle Island and the various slips and inlets included within the sheet limits. Rejected data can be generally characterized as being less than 3.5m and abutting a charted shoal or shoreline. The original trackline data have been retained in the final submission package and WEDKLP area features were added to the Final Feature File (FFF).

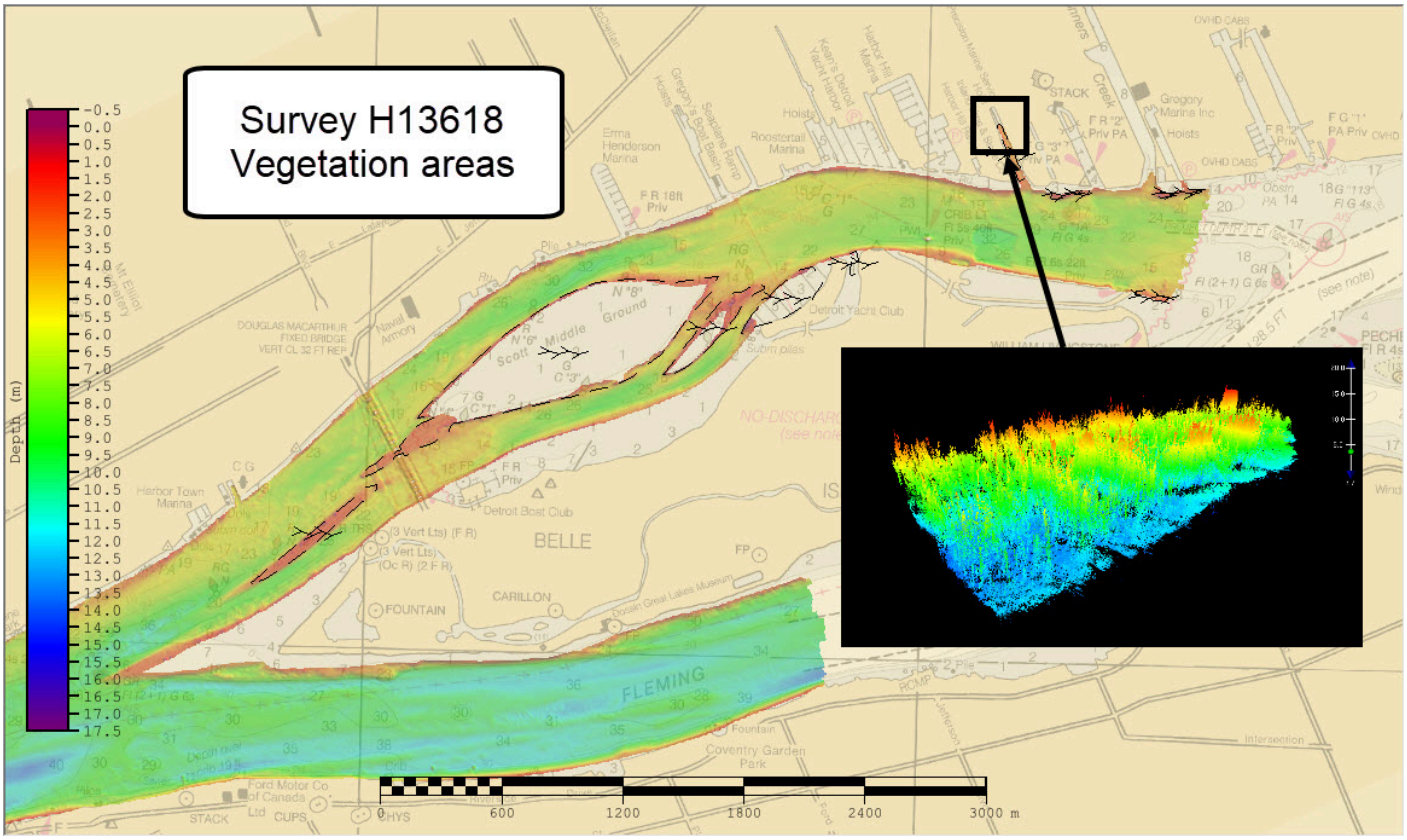


Figure 13: Dense patches of vegetation in the Detroit river shown in black outline.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: 37 sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, when significant changes in surface sound speed were observed, or when operating in a new area. Sound speed profiles were acquired using Sea-Bird 19plus SEACAT and SonTek CastAway-CTD profilers. All casts were concatenated into a master file and applied to MBES data using the "Nearest distance within time" (4 hours) profile selection method.

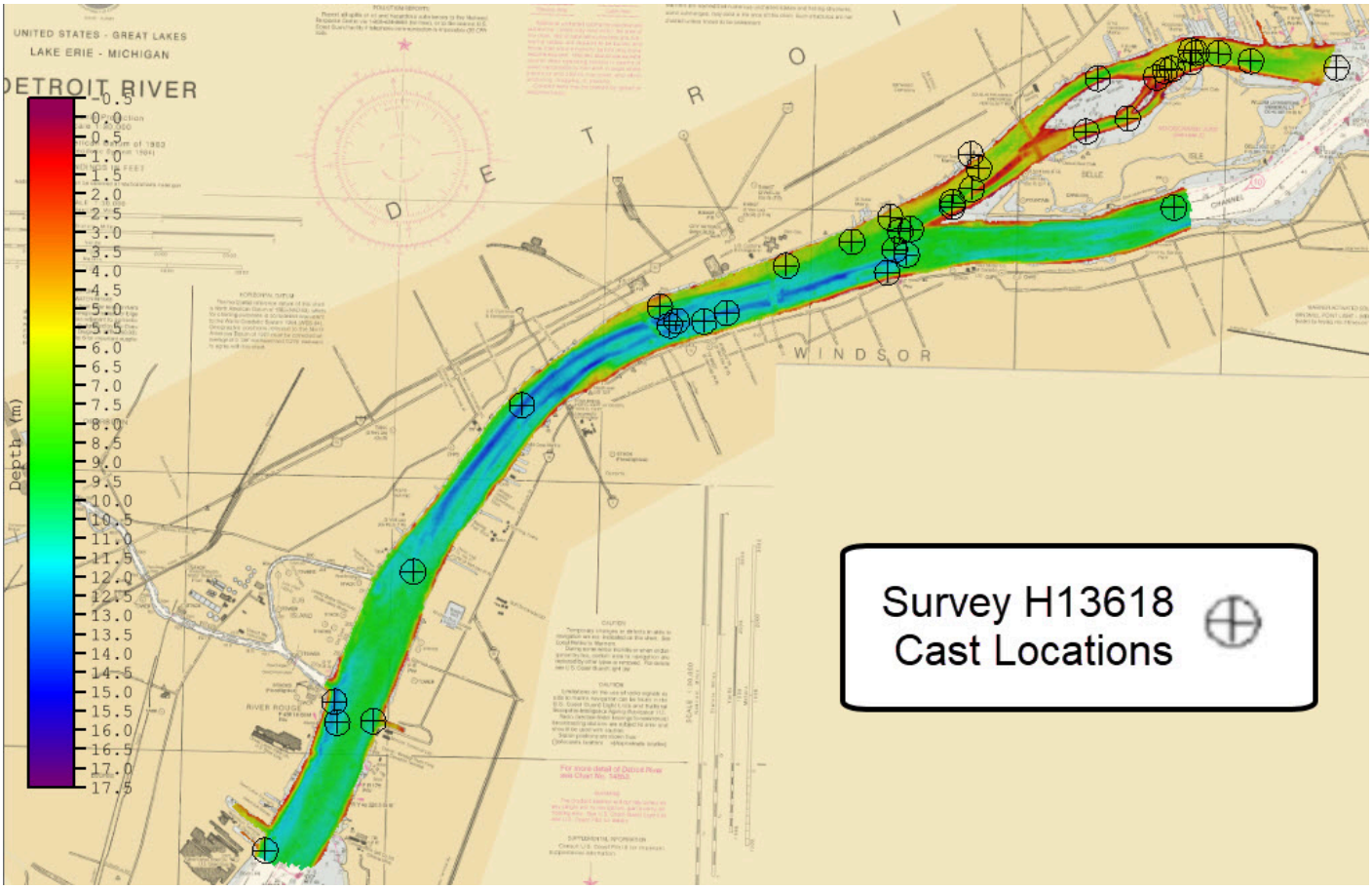


Figure 14: H13618 sound speed cast locations.

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

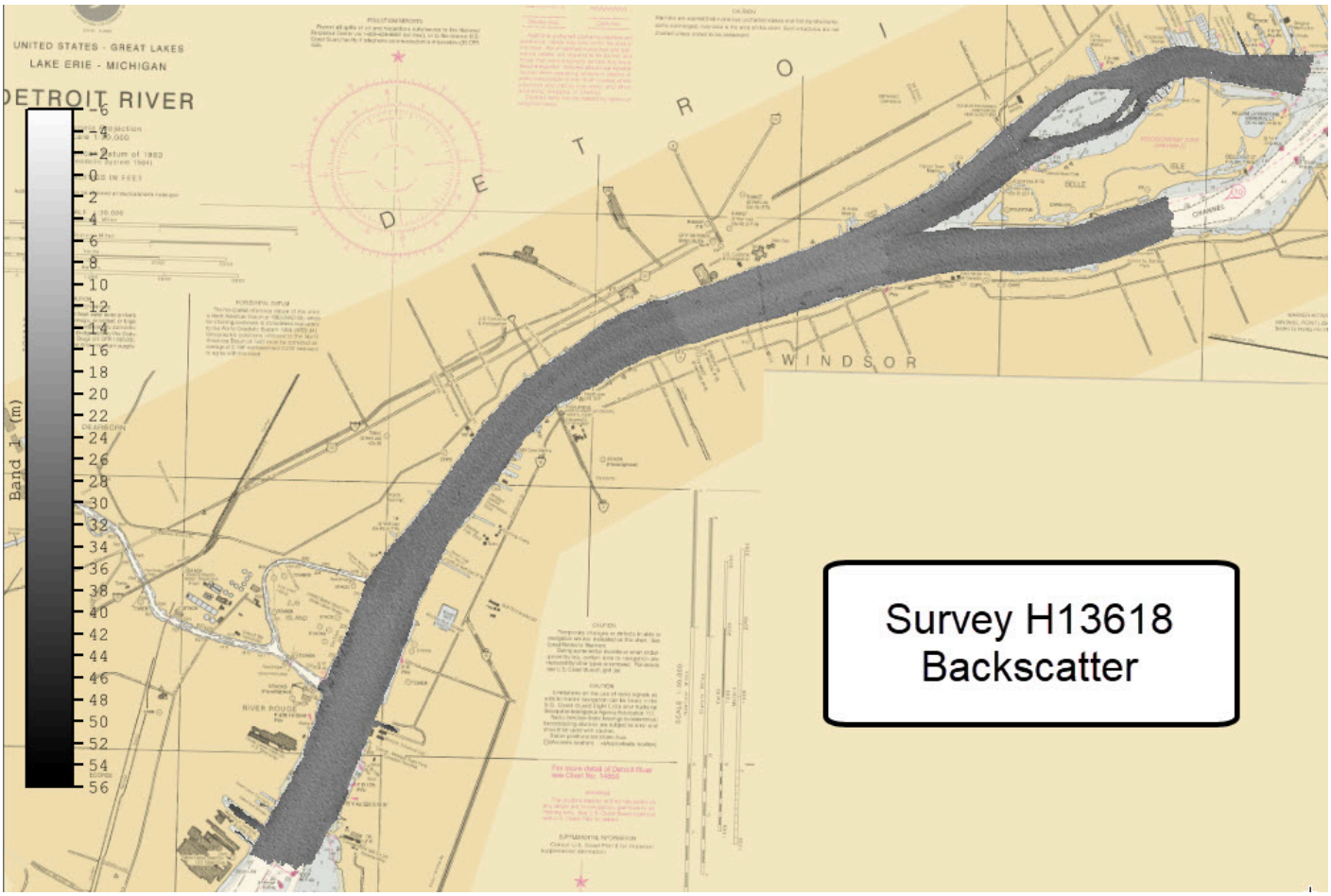


Figure 15: Overview of H13618 backscatter mosaics.

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
H13618_MB_50cm_LWD	CARIS Raster Surface (CUBE)	0.5 meters	-0.1 meters - 17.4 meters	NOAA_0.5m	Object Detection
H13618_MB_50cm_LWD_Final	CARIS Raster Surface (CUBE)	0.5 meters	-0.1 meters - 17.4 meters	NOAA_0.5m	Object Detection
H13618_MBAB_2m_2904_300kHz_1of2	MB Backscatter Mosaic	2 meters	-	N/A	Object Detection
H13618_MBAB_2m_S3007_300kHz_2of2	MB Backscatter Mosaic	2 meters	-	N/A	Object Detection

Table 10: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based (Ranges) Caris single-resolution bathymetric grids as specified in the 2022 HSSD. Pydro QC Tools Detect Fliers was used with the experimental option 7 "Noisy Margins" selected to find fliers in a finalized 0.5 meter single resolution surfaces. Obvious noise was rejected by the Hydrographer in Caris Subset Editor. After data cleaning, Detect Fliers was run again and found 1097 potential fliers. Upon further inspection, these flagged grid's nodes are considered to be accurate representations of the lake bed and have been retained in the submitted surfaces.

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 H13618.

C.1 Vertical Control

The vertical datum for this project is Great Lakes 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-W387-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.

The following PPK methods were used for horizontal control:

- RTX

WAAS

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

D. Results and Recommendations

D.1 Chart Comparison

D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date
US5MI28M	1:5000	5	09/21/2021	09/21/2021
US5MI22M	1:5000	24	06/16/2021	06/16/2021

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

A large shoal south of the Belle Isle bridge was found to have depths shoaler that 3.5 meters. Due to its navigational significance this area was fully surveyed. Additionally A large charted shoal referred to as Scott Middle Ground exists within the survey sheet limits. This area was not investigated as its depths were shoaler than could be safety navigated with vessels with 2904 or NRT-5. No Danger to Navigation Report were submitted with this survey.

D.1.3 Charted Features

Limited shoreline verification was conducted in accordance with applicable sections of NOAA 2022 HSSD and FPM using the Project Reference File (PRF) and Composite Source File (CSF) provided with the Project Instructions. In the field, all assigned features that were safe to approach were addressed as required with S-57 attribution and recorded in the H13618 FFF to best represent the features at survey scale. This file also includes new features found in the field as well as recommendations to update, retain or delete assigned features.

D.1.4 Uncharted Features

A total of 69 uncharted features were identified within the 100% object detection MBES coverage. None of these features are considered dangerous to navigation. Reference the FFF included with the submission of this project for further information.

D.1.5 Channels

Channels, designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, and/or channel and range lines exist within the survey limits, but were not investigated.

D.2 Additional Results

D.2.1 Aids to Navigation

All charted AtoNs wwithin sheetlimits were investigated and 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

Six bottom samples were assigned within the H13618 sheet limits, however during acquisition one sample did not yield a return. The results of the remaining five bottom samples acquired are included in the H13618 Final Feature File submitted with this report. See image below for an example of a typical bottom sample for this survey.

Figure 16: Example of typical H13618 bottom sample.

D.2.4 Overhead Features

Overhead features exist for this survey, but were not investigated.

D.2.5 Submarine Features

Fourteen pipelines were assigned within H13618. Reference the FFF included with the submission of this project for further information.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

Active use of charted ferry routes was observed, no new ferry routes need to be added at this time.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

The Gordie Howe International Bridge will be a new cable-stayed bridge across the Detroit River. This project is currently under construction and expected to be completed in 2024. This new bridge has a planned vertical clearance of 42m between the water and bridge deck and total length 2.5 km. The field party observed active construction of the shoreline and recommends areas in the vicinity the bridge be resurveyed upon its completion.

Figure 17: Active construction of the Gordie Howe International Bridge observed during survey operations in August 2022.

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	Commanding Officer	12/12/2022	JASKOSKI.MATTHEW.JACOB.1275636262 2022.12.13 09:19:06 -05'00'
Sydney M. Catoire, LT/NOAA	Operations Officer	12/12/2022	CATOIRE.SYDNEY.MARIE.1120060623 Digitally signed by CATOIRE.SYDNEY.MARIE.1120060623 Date: 2022.12.13 09:08:48 -05'00'
Erin K. Cziraki	Chief Survey Technician	12/12/2022	CZIRAKI.ERIN.KAYE.1550015338 Digitally signed by CZIRAKI.ERIN.KAYE.1550015338 Date: 2022.12.13 09:52:20 -05'00'
Audrey E. Jerauld	Senior Survey Technician	12/12/2022	JERAULD.AUDREY.ELIZABETH.1170496260 2022.12.13 11:55:48 -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