

H13446

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: H13446

LOCALITY

State(s): Alaska

General Locality: Unimak Island, AK

Sub-locality: Offshore Chernofski Harbor

2021

CHIEF OF PARTY
Allison Stone

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION		REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		H13446
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):	Alaska	
General Locality:	Unimak Island, AK	
Sub-Locality:	Offshore Chernofski Harbor	
Scale:	5000	
Dates of Survey:	06/13/2021 to 06/19/2021	
Instructions Dated:	04/02/2021	
Project Number:	OPR-Q350-KR-21	
Field Unit:	Fugro USA Marine, Inc.	
Chief of Party:	Allison Stone	
Soundings by:	Multibeam Echo Sounder	
Imagery by:	Multibeam Echo Sounder Backscatter	
Verification by:	Pacific Hydrographic Branch	
Soundings Acquired in:	meters at Mean Lower Low Water	
Remarks: <i>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 03N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.</i>		

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Descriptive Report to Accompany Survey H13446

Project: OPR-Q350-KR-21

Locality: Unimak Island, AK

Sublocality: Offshore Chernofski Harbor

Scale: 1:5000

June 2021 - June 2021

Fugro USA Marine, Inc.

Chief of Party: Allison Stone

A. Area Surveyed

The offshore approach to Chernofski Harbor, on the western peninsula of Unalaska Island has been identified by local mariners as a potential port of refuge. The area was last surveyed in the 1930s and 1940s and is identified as an area of inadequate coverage by a risk-based model utilized by the National Ocean Service (NOS). Survey H13446 (Figure 1 and Table 1) is the northern approach to Chernofski Harbor.

The R/V Woldstad acquired set line spaced Multibeam Echosounder (MBES) and Multibeam Echosounder Acoustic Backscatter (MBAB) within the assigned survey limits from 13 to 19 June 2021 (Tables 2-4).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
53° 27' 21.62" N 167° 45' 2.53" W	53° 27' 5.04" N 167° 28' 42.04" W

Table 1: Survey Limits

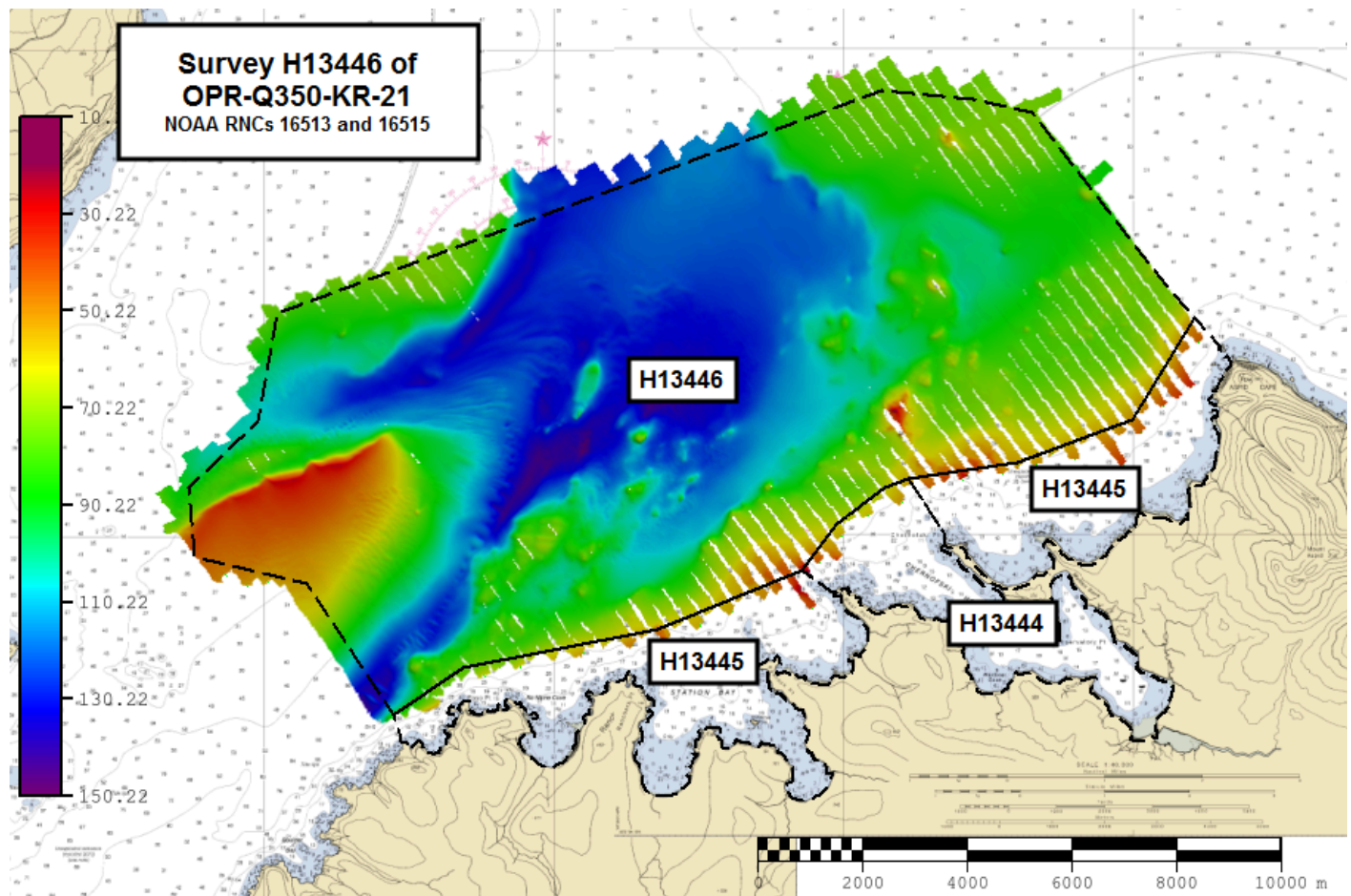


Figure 1: Survey H13446 relative to overall sheet limits of OPR-Q350-KR-21

Survey limits were acquired in accordance with the requirements set forth in the Project Instructions and the HSSD 2020.

A.2 Survey Purpose

OPR-Q350-KR-21 will provide contemporary data to update NOS nautical charting products; increasing maritime safety and commerce in the region.

The project area has also been identified as an area of inadequate coverage by a risk-based model with respect to the desired coverage needed to support modern navigational needs.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

320m set line MBES was achieved within the survey limits of H13446 (Figures 2-4).

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 Sheet 3	320m Set Line Spacing (Reference HSSD Section 5.2.2.4 Option A). Note: All significant shoals or features found in waters less than 20m deep shall be developed to complete coverage standards. Note: The requirement to verify or disprove all charted depths falling between sounding lines and shallower than adjacent surveyed soundings is waived.

Table 2: Survey Coverage

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

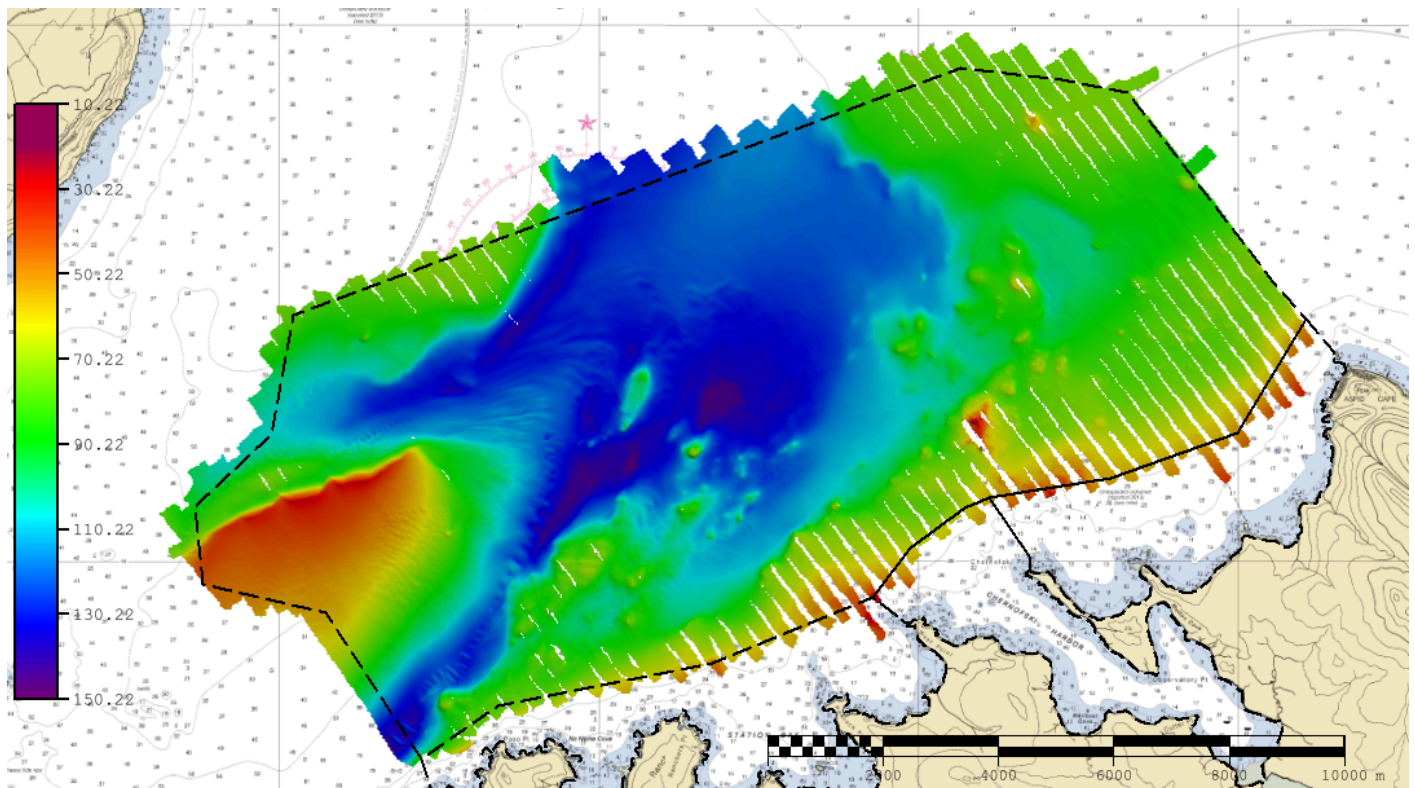


Figure 2: Survey H13446 MBES coverage

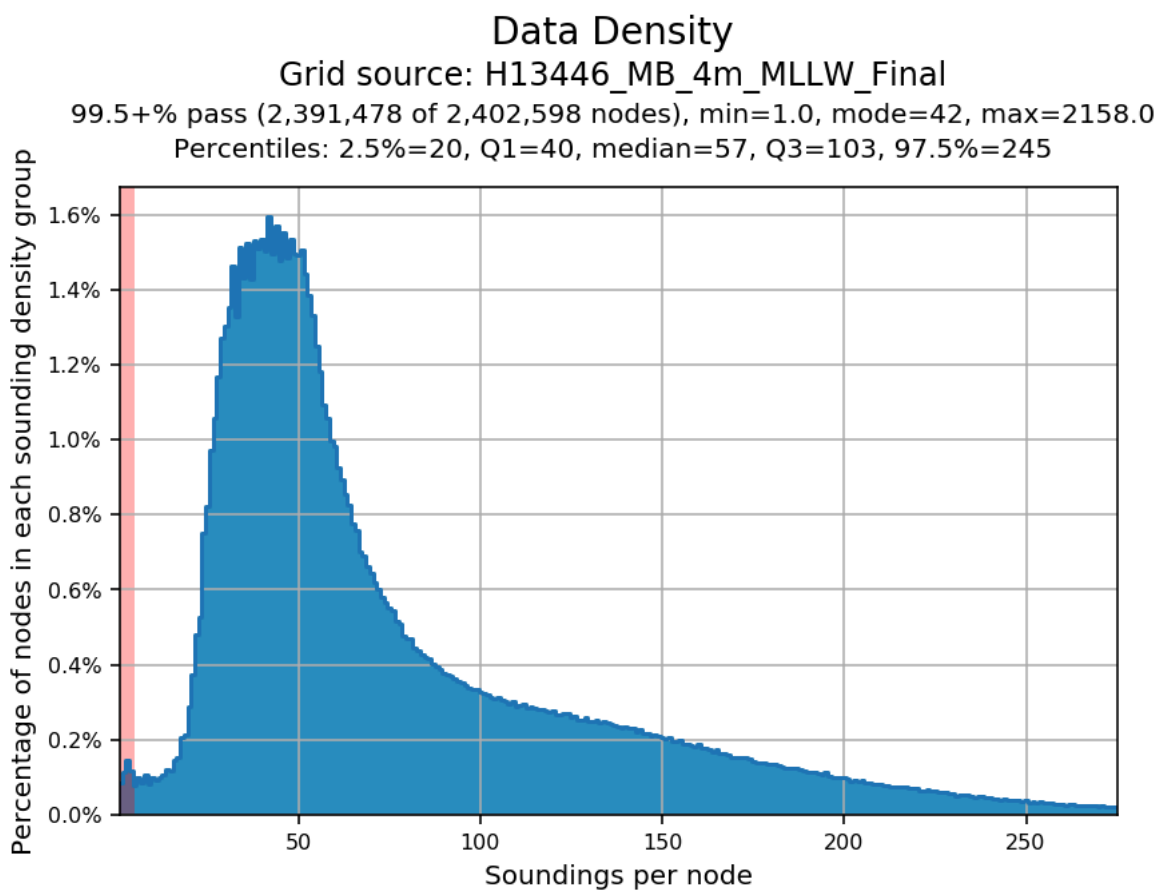


Figure 3: Survey H13446 4m set line MBES density QC

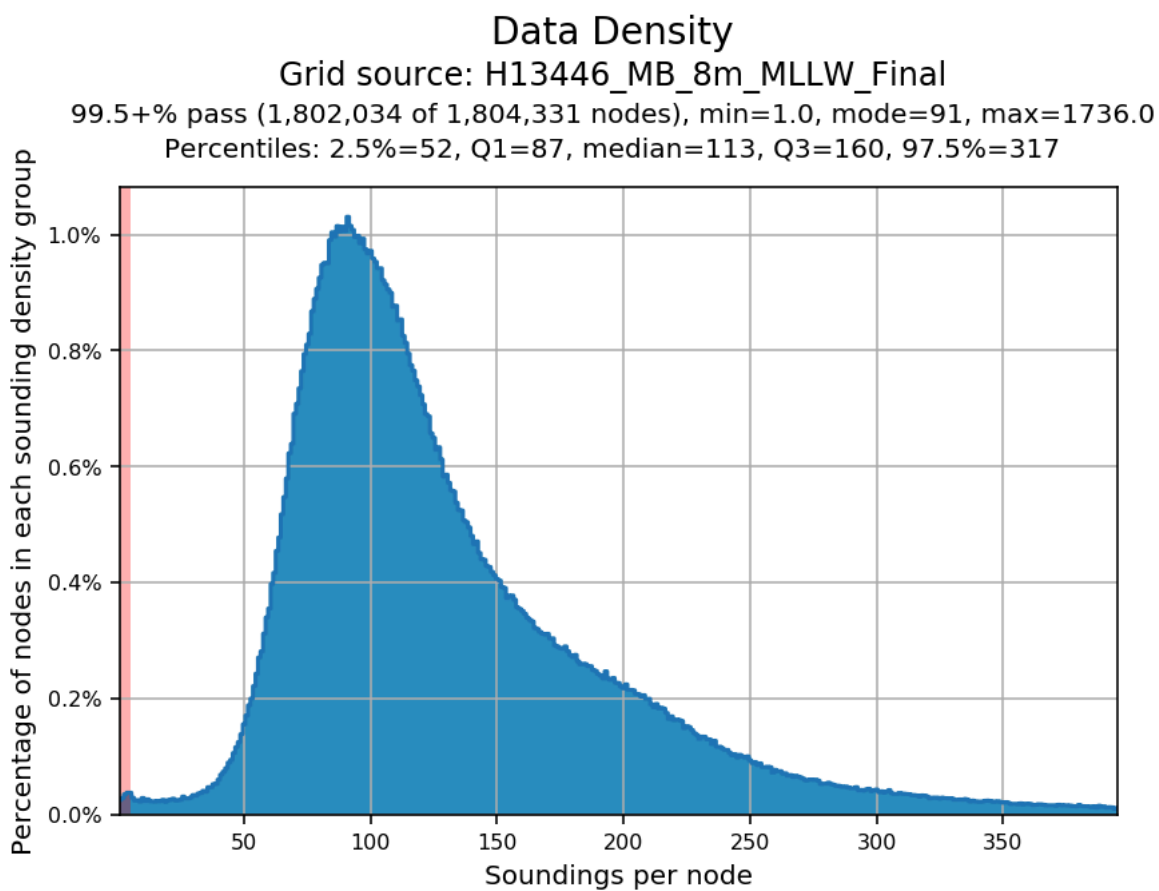


Figure 4: Survey H13446 8m set line MBES density QC

A.6 Survey Statistics

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

	HULL ID	<i>R/V Woldstad</i>	<i>Total</i>
LNM	SBES Mainscheme	0.0	0.0
	MBES Mainscheme	287.8	287.8
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0
	SBES/MBES Crosslines	25.86	25.86
	Lidar Crosslines	0.0	0.0
Number of Bottom Samples			0
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			41.18

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/13/2021	164

Survey Dates	Day of the Year
06/14/2021	165
06/15/2021	166
06/16/2021	167
06/19/2021	170

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	<i>R/V Woldstad</i>
LOA	121.0 feet
Draft	12.0 feet

Table 5: Vessels Used



Figure 5: R/V Woldstad

R/V Woldstad (Table 5 and Figure 5) acquired MBES, MBAB, surface sound velocity, sound velocity profiles, and attitude and positioning data within the survey limits of H13446 (Table 6). For a detailed listing of equipment used to acquire survey data, refer to the DAPR submitted with this report under Project Reports.

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat 7125 SV2	MBES
Teledyne RESON	SVP 70	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System
Teledyne Oceanscience	rapidCAST	Conductivity, Temperature, and Depth Sensor

Table 6: Major Systems Used

For a detailed listing of equipment, refer to the DAPR submitted with this report.

B.2 Quality Control

B.2.1 Crosslines

Crosslines for survey H13446 were acquired in accordance with section 5.2.4.2 of the HSSD 2020 (Figure 6). Mainscheme to crossline mileage percentage across H13446 is 8.98%. Of the 796,426 grid nodes compared between H13446 mainscheme MBES and MBES crosslines, 99% were within 1m difference. The mean difference is 0.02m, with a standard deviation of 0.29m (Figure 7).

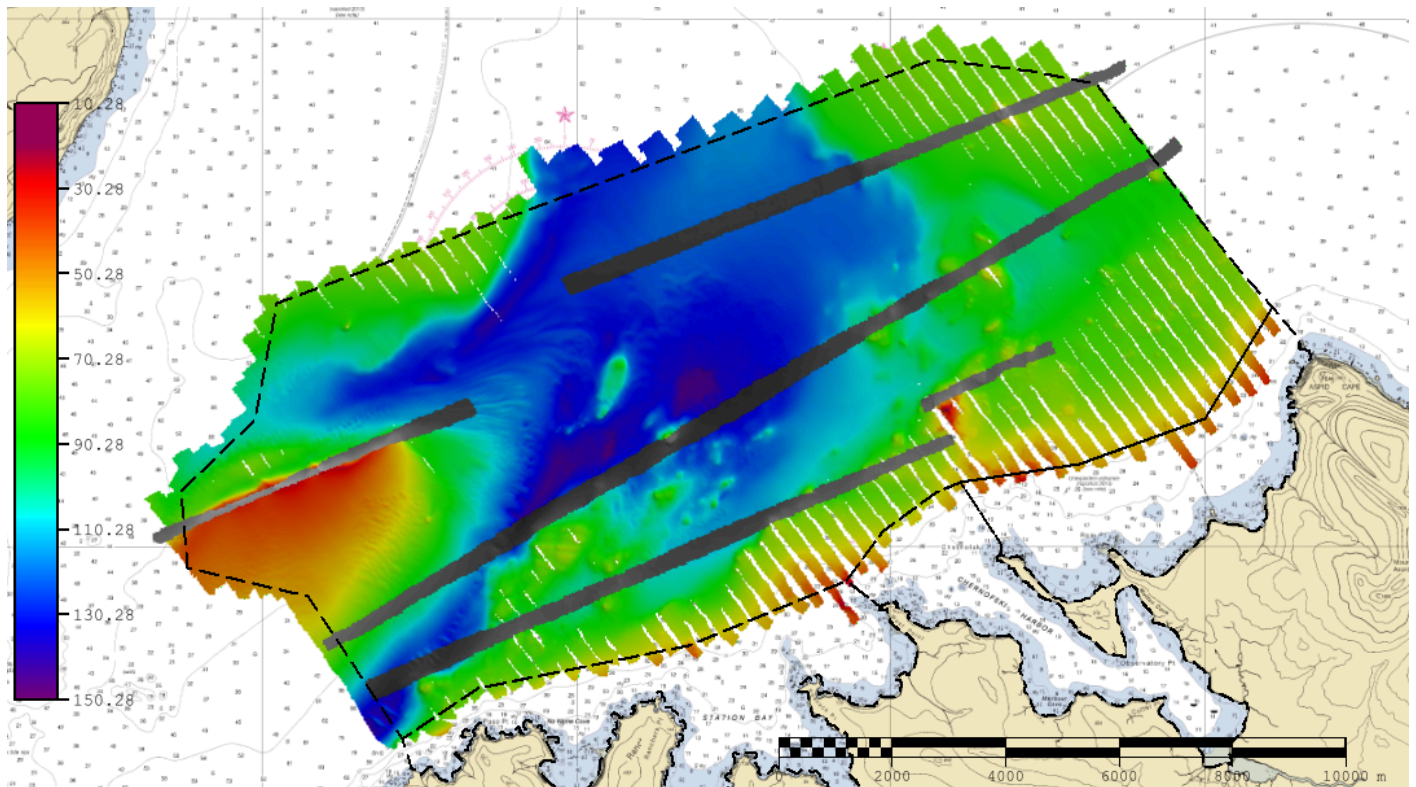


Figure 6: H13446 MBES mainscheme and MBES crossline distribution

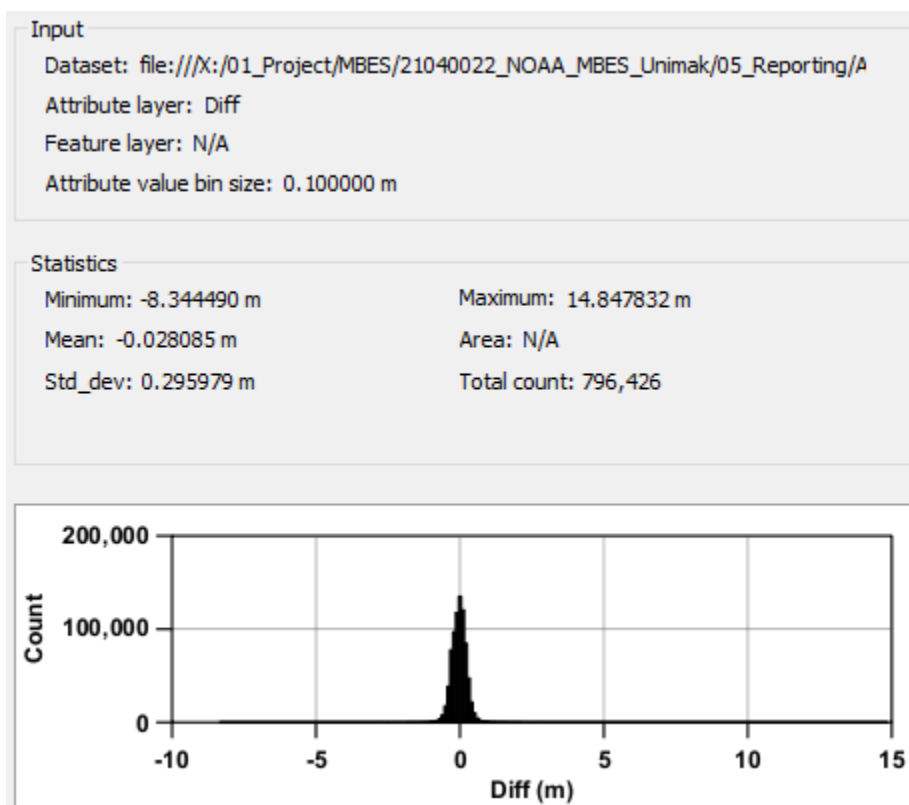


Figure 7: H13446 MBES mainscheme differenced from MBES crosslines statistical output

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.13 meters	0.101 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
R/V Woldstad	1.38 meters/second	N/A meters/second	N/A meters/second	0.25 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Survey H13446 uncertainty values (Tables 7 and 8) were evaluated in both CARIS HIPS 10.4 and via Pydro QC Tools v3.4.7. The finalized 4m (Figure 8), and 8m (Figure 9) bathymetric grids meet uncertainty standards with a minimum of 99.5% of nodes passing.

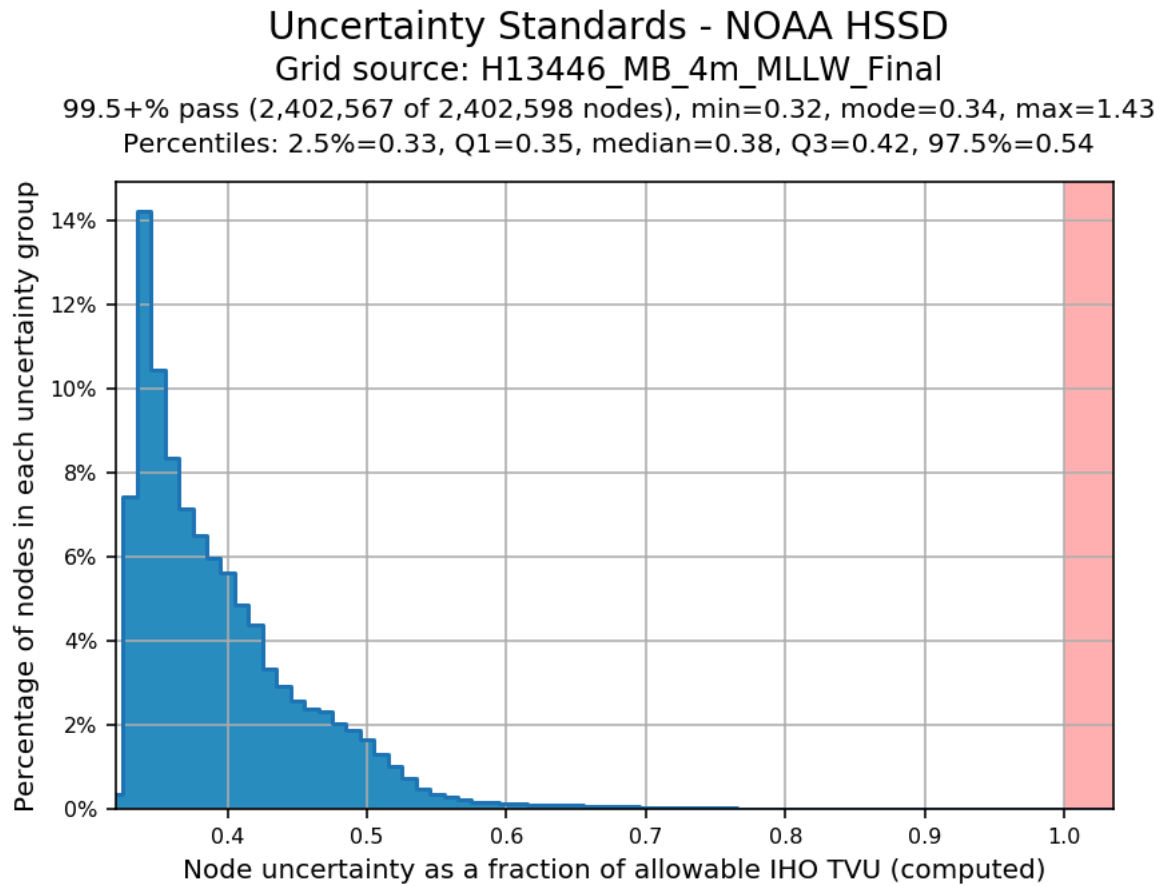


Figure 8: H13446 4m finalized grid TPU QC

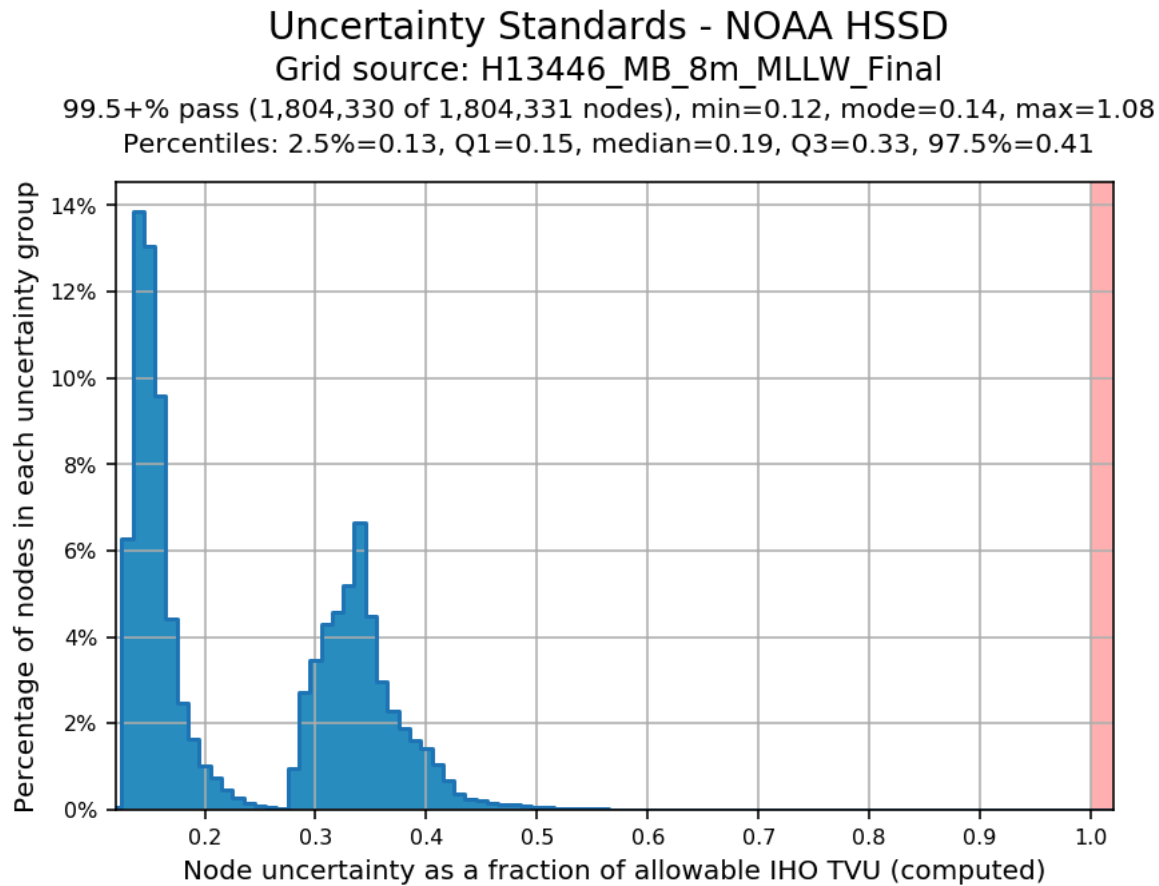


Figure 9: H13446 8m finalized grid TPU QC

The DAPR states that the Tide Measured value was calculated to be 0.100m and the Tide Zoning value provided in the Project Instructions was 0.101m. The zoning value provided in the Project Instructions was 0.13m. In this case, the zoning value of 0.13m provided in the Project Instructions was applied as the Tide Measured value and the zoning value of 0.101m stated in the DAPR was applied as the Tide Zoning value. The reviewer believes the magnitude of this discrepancy is insignificant in terms of the overall uncertainty calculation and does not warrant taking extra time to recompute TPU.

B.2.3 Junctions

Two contemporary surveys are available for comparison to H13446: H13444 and H13445 (Table 9 and Figure 10).

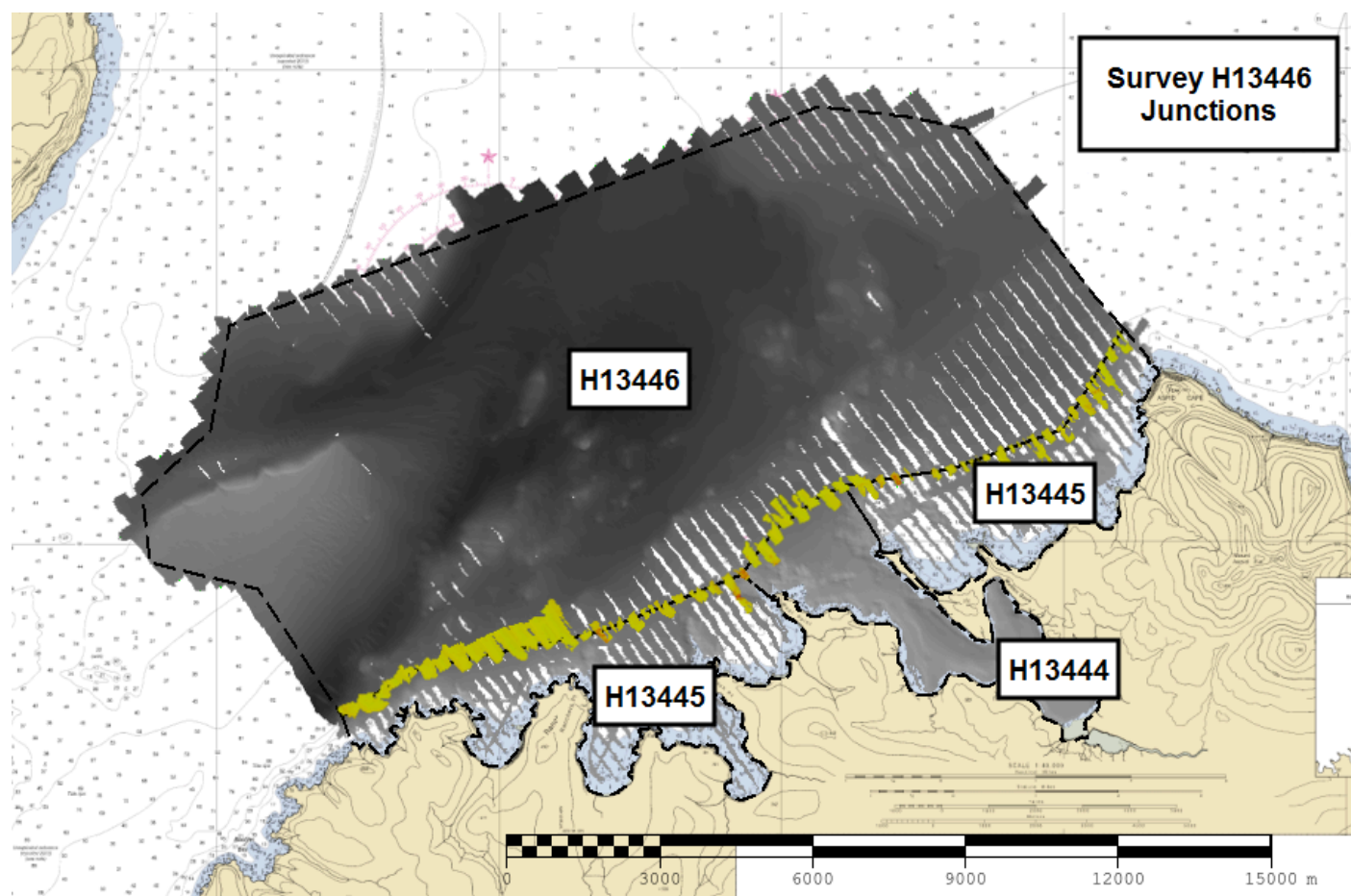


Figure 10: Junction surveys to H13446

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13444	1:5000	2021	Fugro USA Marine, Inc.	S
H13445	1:5000	2021	Fugro USA Marine, Inc.	S

Table 9: Junctioning Surveys

H13444

Survey H13444 was acquired by Fugro USA Marine, Inc. in 2021 as a part of OPR-Q350-KR-21. Of the 55,818 grid nodes compared between H13446 and H13444 the mean difference is 0.03m; 99.9% agree within 1m (Figure 11).

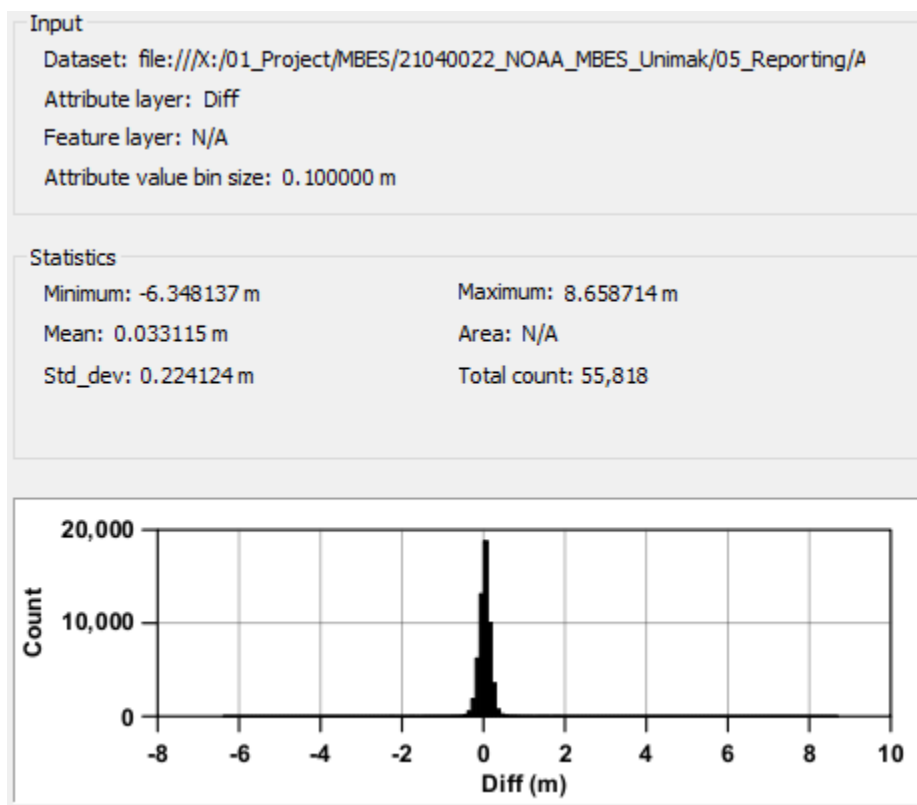


Figure 11: Survey H13446 junction with Survey H13444

H13445

Survey H13445 was acquired by Fugro USA Marine, Inc. in 2021 as a part of OPR-Q350-KR-21. Of the 217,584 grid nodes compared between H13446 and H13445 the mean difference is 0.08m; 99.9% agree within 1m (Figure 12).

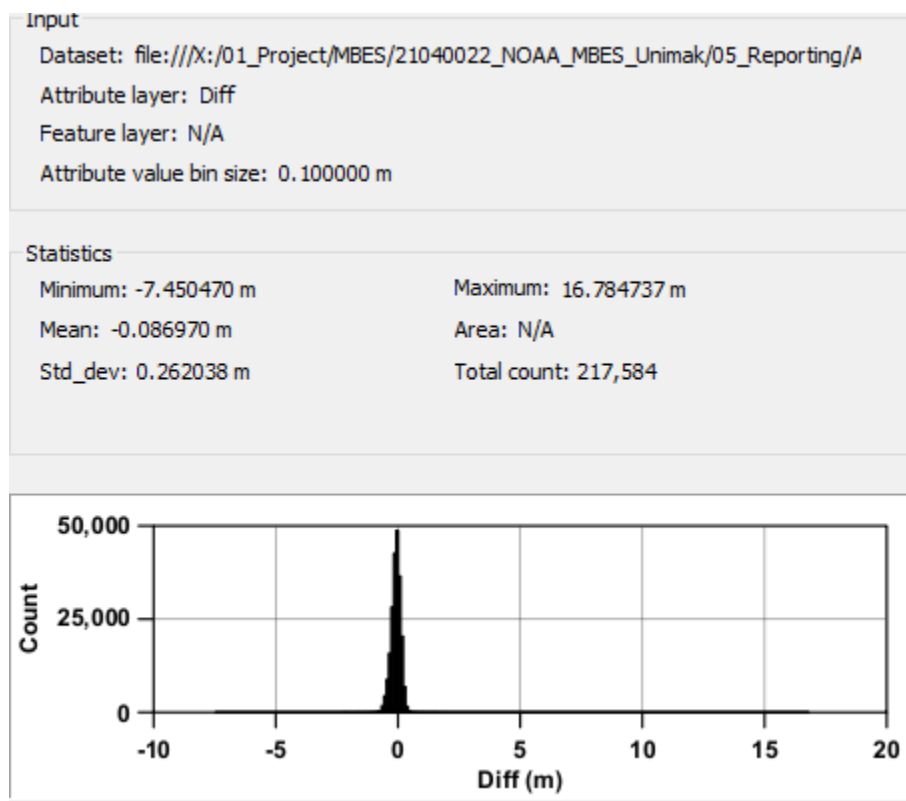


Figure 12: Survey H13446 junction with Survey H13445

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound velocity profiles were acquired approximately every two hours from the R/V Woldstad a Teledyne Ocean Science Rapid Cast.

Refer to the DAPR for additional information.

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

No backscatter deliverables are submitted with survey H13446. One line of data per vessel, per day was processed to ensure quality control. All equipment and survey methods utilized in the acquisition and processing of backscatter are detailed in the DAPR.

Backscatter GSF files and mosaics were created during office review.

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13446_MB_4m_MLLW	CARIS Raster Surface (CUBE)	4 meters	19.48 meters - 150.28 meters	NOAA_4m	MBES Set Line Spacing
H13446_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	19.48 meters - 80.0 meters	NOAA_4m	MBES Set Line Spacing
H13446_MB_8m_MLLW	CARIS Raster Surface (CUBE)	8 meters	19.51 meters - 150.21 meters	NOAA_8m	MBES Set Line Spacing
H13446_MB_8m_MLLW_Final	CARIS Raster Surface (CUBE)	8 meters	72.0 meters - 150.21 meters	NOAA_8m	MBES Set Line Spacing

Table 10: Submitted Surfaces

After re-accepting some filtered data during office review, the depth ranges of the grids are as follows: H13446_MB_4m_MLLW is 19.498 - 150.28 meters, H13446_MB_4m_MLLW_Final is 19.498 - 80 meters, H13446_MB_8m_MLLW is 19.716 - 150.217 meters and H13446_MB_8m_MLLW_Final is 72 - 150.217 meters

B.5.3 Additional Data Processing

In addition to the swath and TPU filters utilized, as stated in the DAPR, QC Tools was also utilized to inspect H13446 data. Using QC Tools Flier Finder with default settings. Any flags were investigated in Caris subset editor.

C. Vertical and Horizontal Control

No vertical or horizontal control reports were generated for this survey. All data were reduced to MLLW via VDatum model.

C.1 Vertical Control

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

ERS Datum Transformation

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

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR_Q350_KR_21_CapeAspidToPasoPt_ERTDM21-1_NAD83- MLLW

Table 11: ERS method and SEP file

All positioning and attitude data associated with OPR-Q350-KR-21 was post-processed in POSPac MMS using PP-RTX methods. For further discussion, reference the DAPR submitted with this report.

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 3.

PPP

All positioning and attitude data associated with OPR-Q350-KR-21 was post-processed in POSPac MMS using PP-RTX methods.

D. Results and Recommendations

D.1 Chart Comparison

A chart comparison was conducted using the Triangle Rule script within the Chart Review Tool of Pydro QC Tools. A combined s57 file of charted soundings extracted from ENC's listed in the project instructions and an s57 file of surveyed soundings were compared with the following results (Figures 13 and 14).

Survey H13446 surveyed soundings exhibit 3,094 instances where surveyed soundings are shoal to charted soundings by greater than 1m: 2219 surveyed soundings are 1-3m shoal to charted; 666 surveyed soundings are 3-9m shoal to charted; 209 surveyed soundings are 9-50.2m shoal to charted (Figure 15).

Given this is the first modern multibeam survey of the area, the differences found to exist between surveyed and charted soundings are not surprising but significant. In general, the largest differences are located on protruding bathymetric rock features missed by wire drag, which do not generally pose a threat to navigation.

Note: ENC US5AK65M was listed in the project instructions, but its extents were not relevant to the survey extents. The soundings from this ENC were not included in the charted soundings layer extracted for survey comparison.

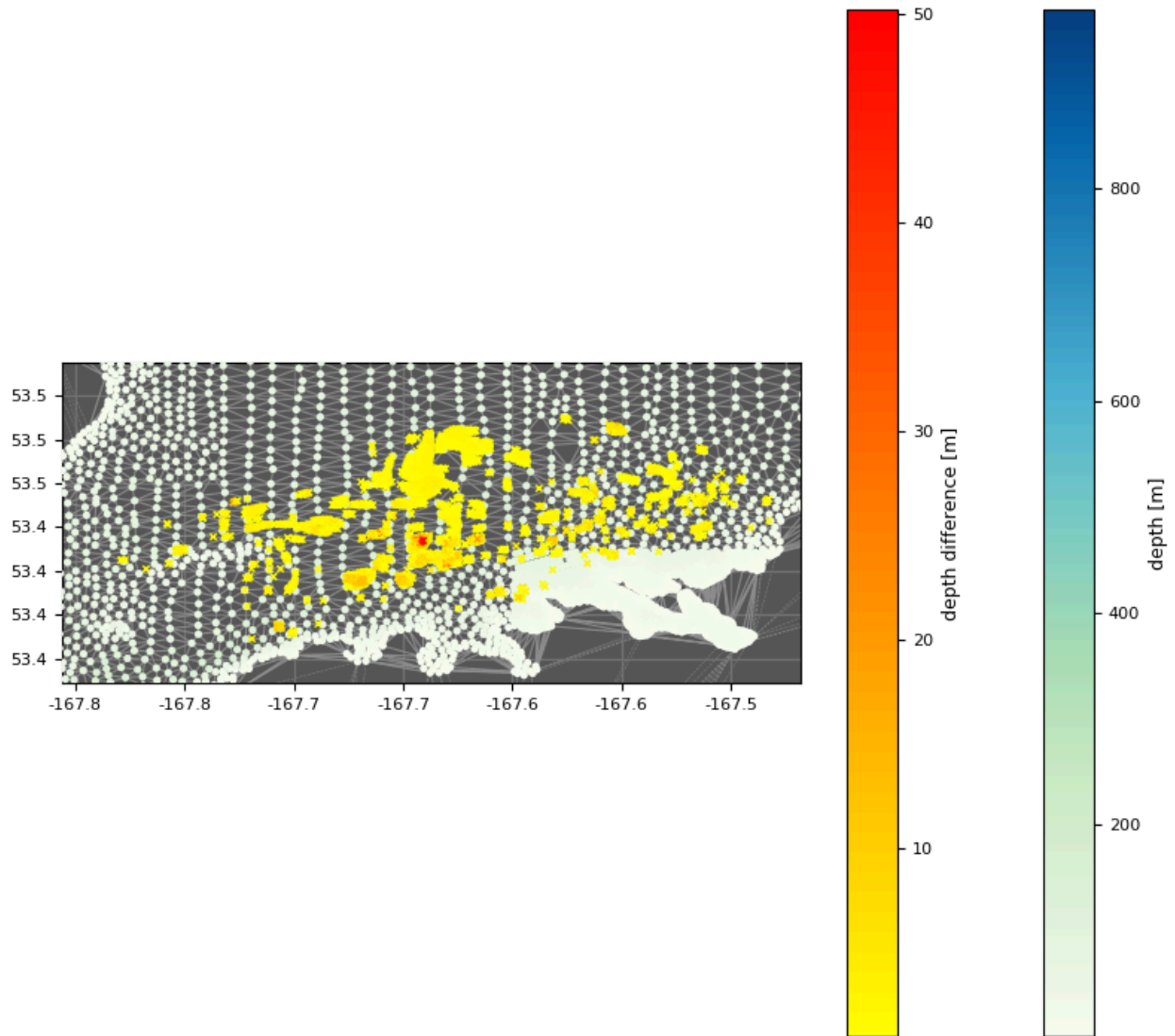


Figure 13: Pydro QC Tools chart review output of surveyed soundings shoal to charted soundings

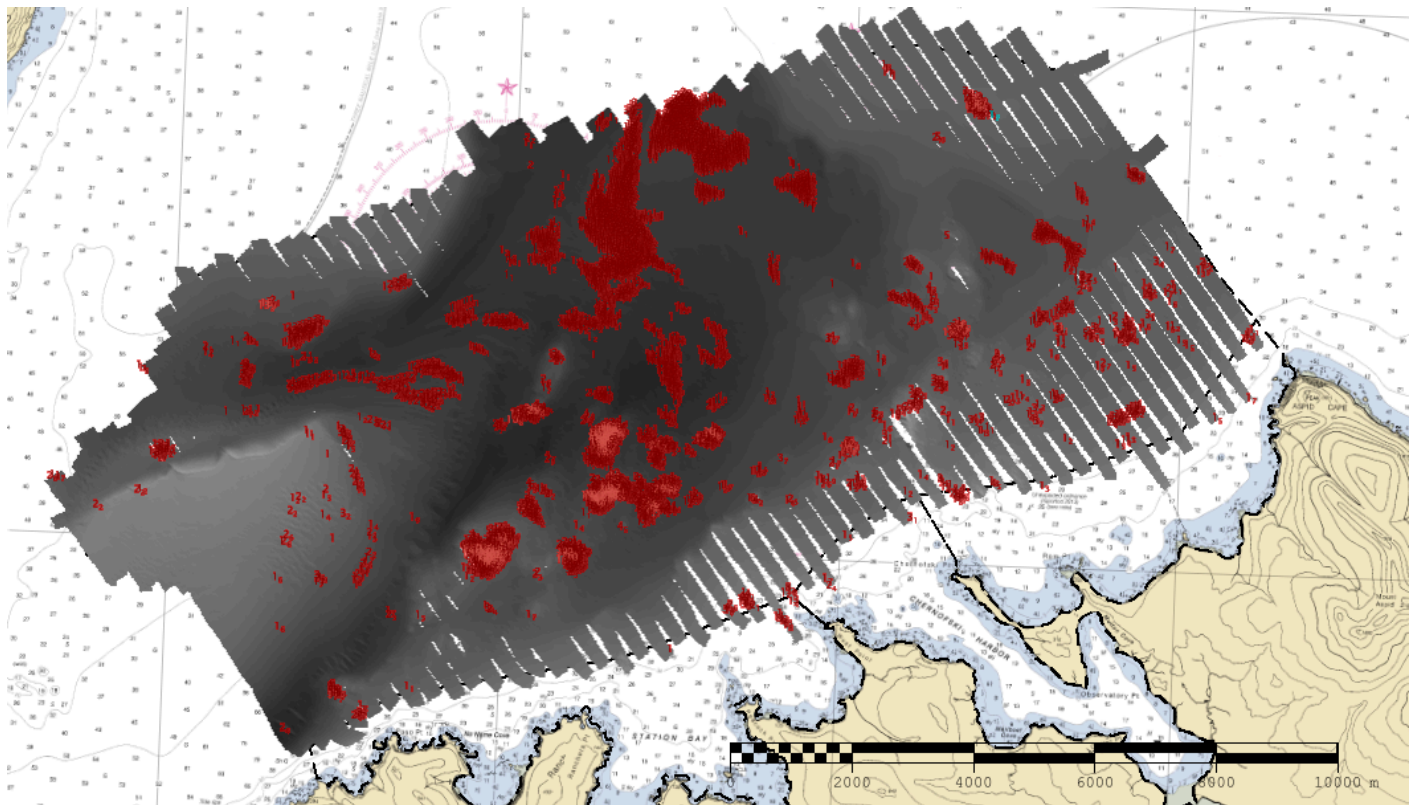


Figure 14: Pydro QC Tools chart review output of surveyed soundings shoal to charted soundings in context of survey H13446

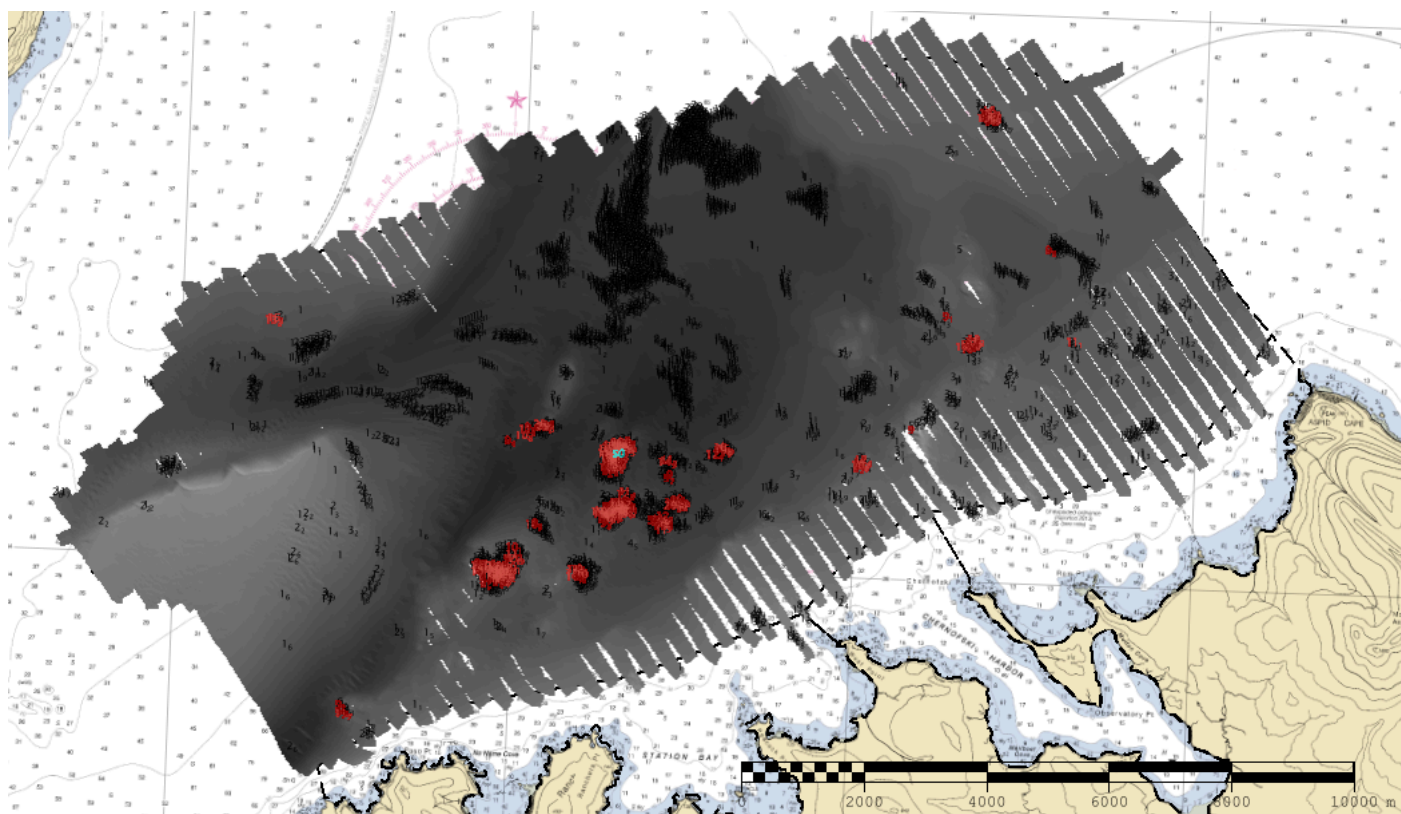


Figure 15: Pydro QC Tools chart review output of surveyed soundings shoal to charted soundings in context of survey H13446 greater than 9m

D.1.1 Electronic Navigational Charts

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date
US5AK64M	1:40000	8	03/29/2017	03/29/2017
US5AK66M	1:40000	8	04/12/2017	07/17/2019
US5AK67M	1:10000	6	06/01/2017	06/01/2017

Table 12: Largest Scale ENC's

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

An area prone to turbulent waters was noted during acquisition of H13446 in the vicinity of an assigned charted symbol for same. Refer to the Final Feature File (FFF) for further detail.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.2 Additional Results**D.2.1 Aids to Navigation**

No Aids to Navigation (ATONs) exist for this survey.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

No bottom samples were required for this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

D.2.10 New Survey Recommendations

No new surveys or further investigations are recommended for this area.

D.2.11 ENC Scale Recommendations

No new ENC scales are recommended for this area.


E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2021-10-24
Coast Pilot Report	2021-07-26

Approver Name	Approver Title	Approval Date	Signature
Allison C Stone	Chief of Party	10/24/2021	Allison C Stone  Digitally signed by Allison C Stone Date: 2021.10.24 18:47:43 -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