H13445

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13445

LOCALITY

State(s):	Alaska
General Locality:	Unimak Island, AK
Sub-locality:	Paso Point to Cape Aspid

2021

CHIEF OF PARTY
Allison Stone

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13445

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:	**Paso Point to Cape Aspid**
Scale:	**5000**
Dates of Survey:	**06/14/2021 to 07/14/2021**
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:

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 3N, MLLW. 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 H13445

Project: OPR-Q350-KR-21

Locality: Unimak Island, AK

Sublocality: Paso Point to Cape Aspid

Scale: 1:5000

June 2021 - July 2021

Fugro USA Marine, Inc.

Chief of Party: Allison Stone

A. Area Surveyed

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 H13445 (Figure 1 and Table 1) is composed of the shoreline areas to the East and West of the entrance 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 on 15, 18, and 19 June 2021. The Skiff acquired set line spaced and complete coverage MBES and MBAB within the assigned survey limits 14 and 15 June 2021 and 13 and 14 July 2021 (Tables 2-4).

The western shoreline from No Name Bight to West Point is characterized by several coves that could potentially serve as areas of refuge in all but North seas. In general, good water can be found seaward of the 10 fathom contour in these coves. If possible, refuge should be sought in the innermost portions of Chernofski Harbor (Survey H13444).

The eastern shoreline from Chernofski Point to Cape Aspid is characterized by shallow coves and bights and has a more gradual shoreward bathymetric gradient than the western area. To the East of Ram Point the field party found surveyed depths on a charted rock to be dangerously inaccurate, and a Danger to Navigation (DtoN) Report was submitted accordingly.

Areas of thick kelp all along all shoreline of the assigned survey limits of H13455 could pose rock-strike or fouling threats and should be avoided.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
53° 23' 19.47" N 167° 43' 2.37" W	53° 26' 45.7" N 167° 28' 6.55" W

Table 1: Survey Limits

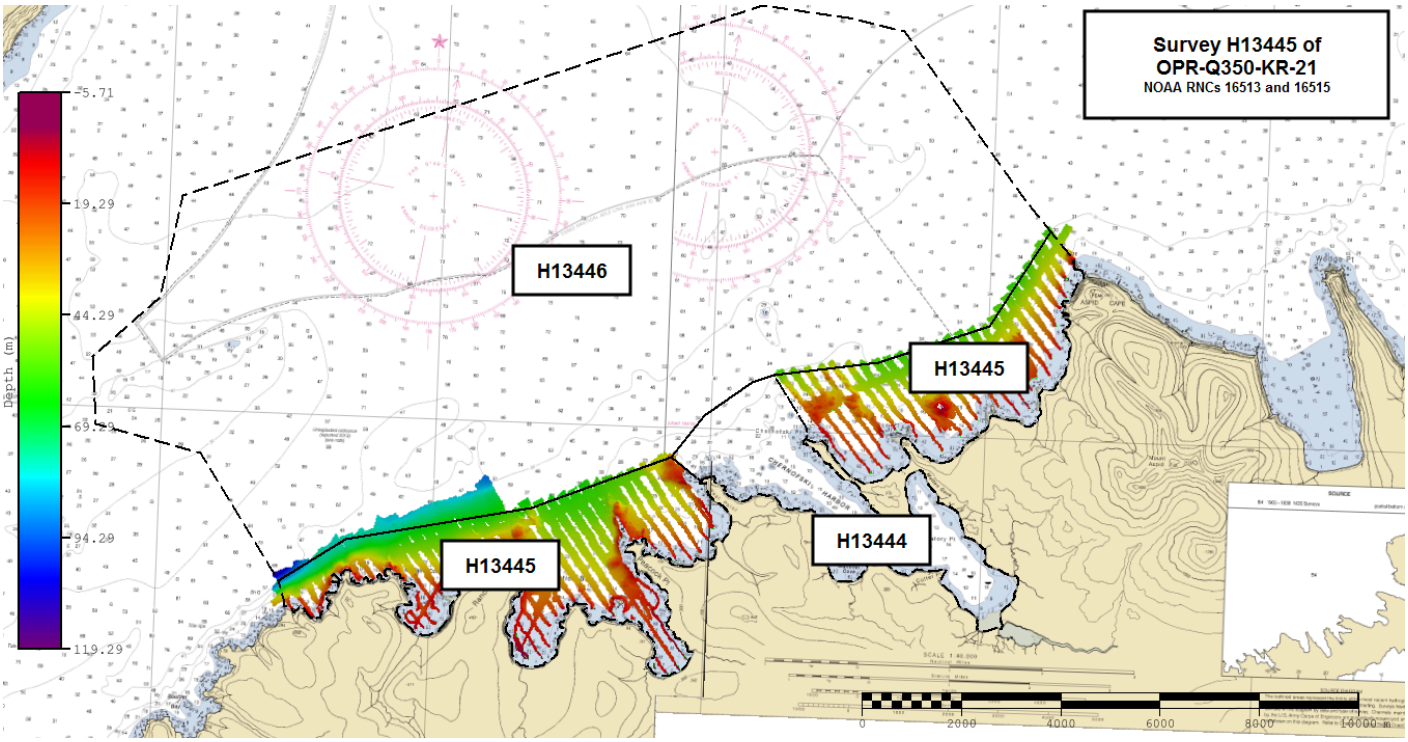

Figure 1: Survey H13445 relative to overall sheet limits of OPR-Q350-KR-21

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

A.2 Survey Purpose

This project will provide contemporary data to update NOS nautical charting products; increasing maritime safety and commerce in the region. The waters around the the North side of Unimak Island are an important fishing ground for the Bering Sea Pacific Cod and other Bering Sea fisheries. This area is part of the main route transited by vessels between Bristol Bay and Dutch Harbor, AK.

The North shore of Unimak Island commonly serves as a refuge from weather and waves coming off of the open waters from the North Pacific.

The area has been identified by the Western Alaska Tanker Lightering Best Practices Committee as a primary location for lightering operations to occur.

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.

240m set line MBES and complete coverage MBES of any significant shoals less than 20m was achieved within the survey limits of H13445 (Figures 2-5). Along the majority of the coastline, the 3.5m contour was not fully ensonified due to high concentrations of kelp and due to the general morphology of the coastline with steeply rising, rocky shoreline. Following the same reasoning; the shoreline areas were not ensonified to complete coverage in the majority of cases as this would have posed undue risk for the Skiff acquiring the data.

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 2	240m 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 coverge 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.

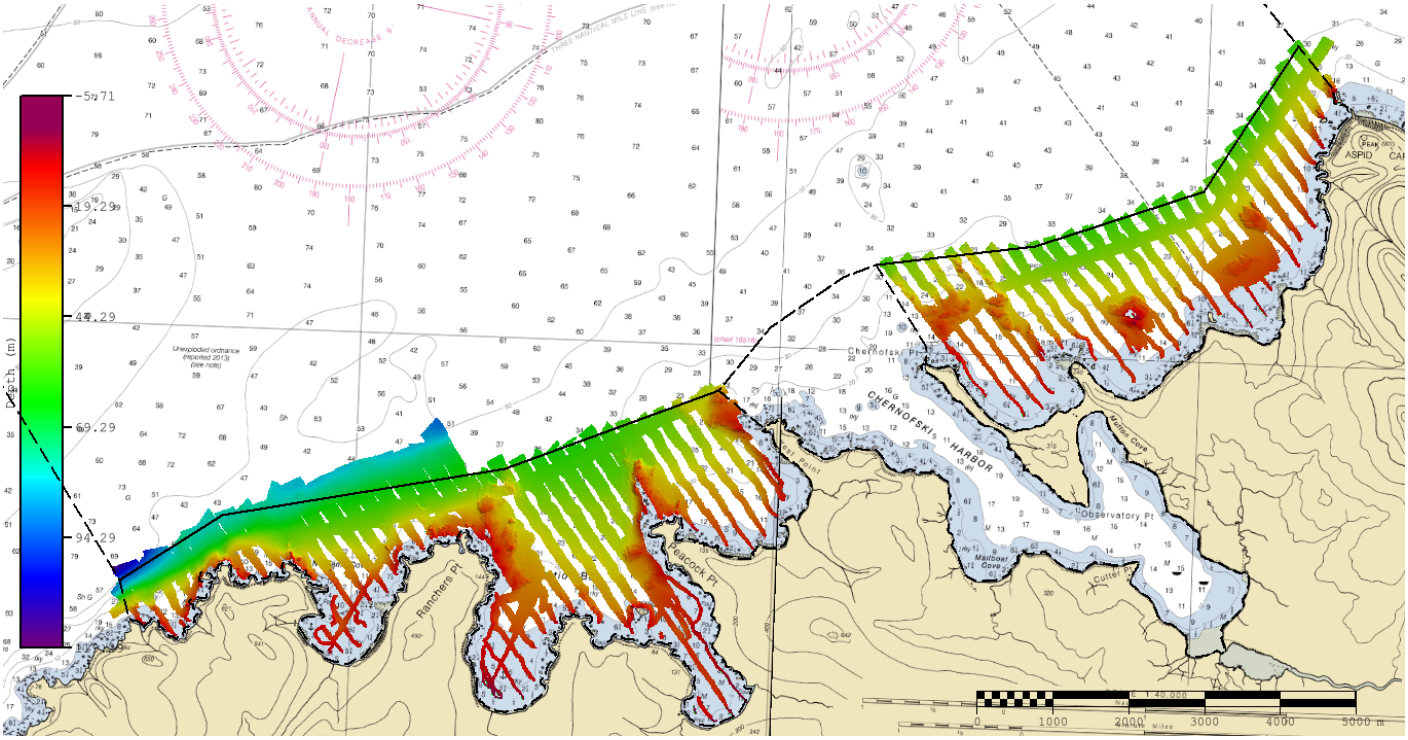

Figure 2: Survey H13445 MBES coverage

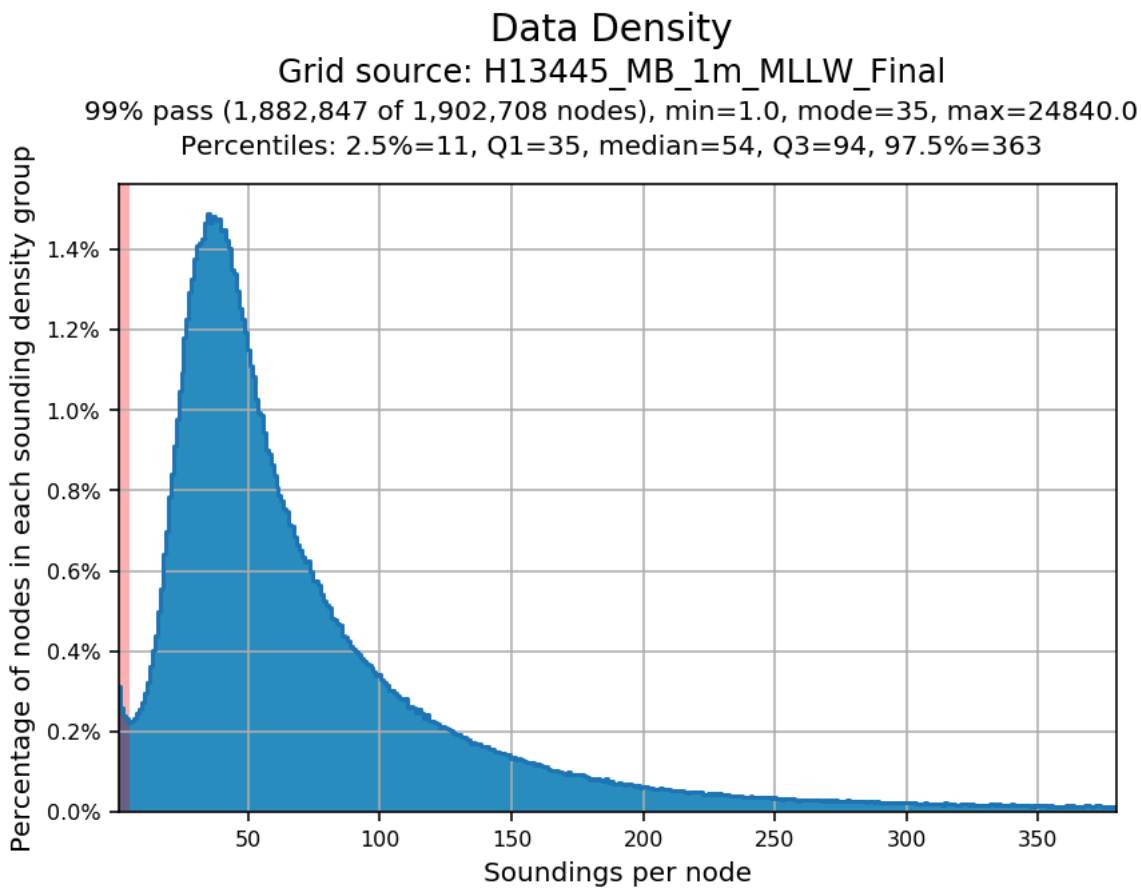

Figure 3: Survey H13445 1m complete coverage MBES density QC

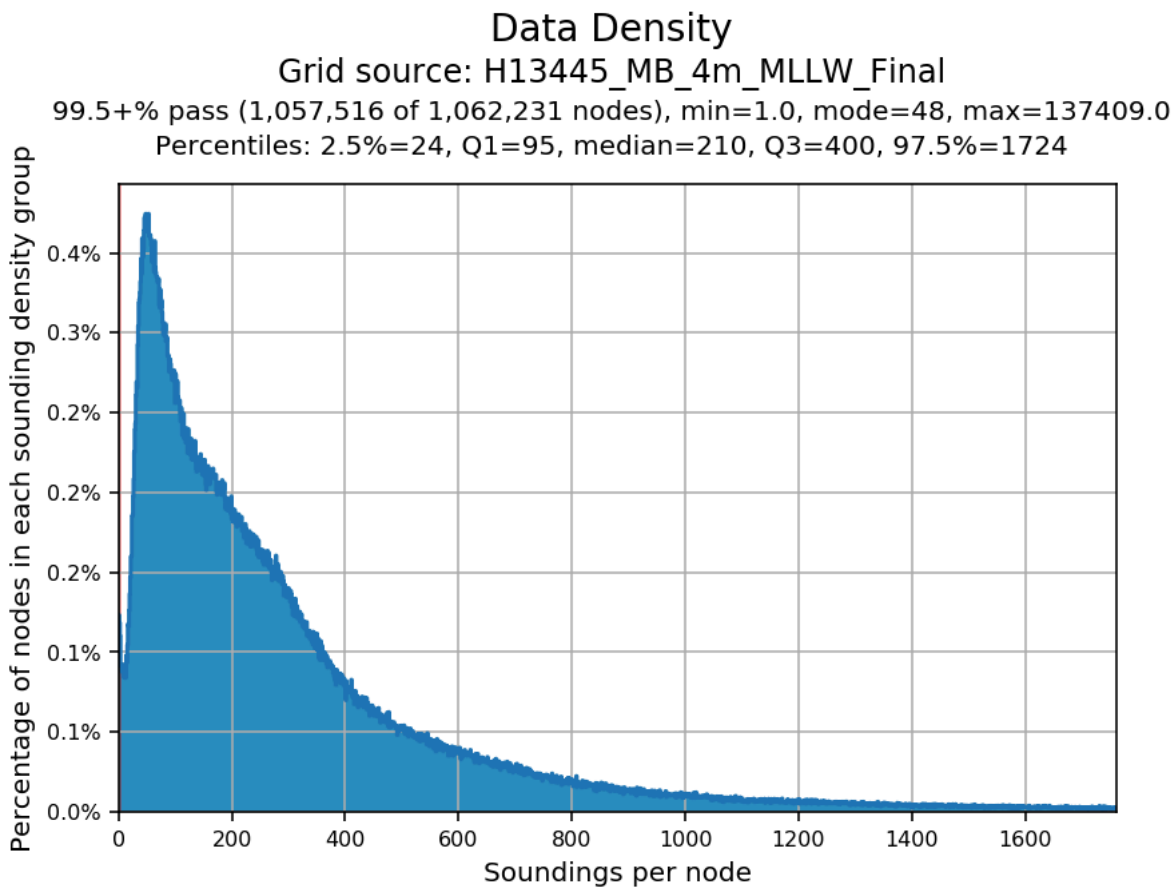

Figure 4: Survey H13445 4m set line MBES density QC

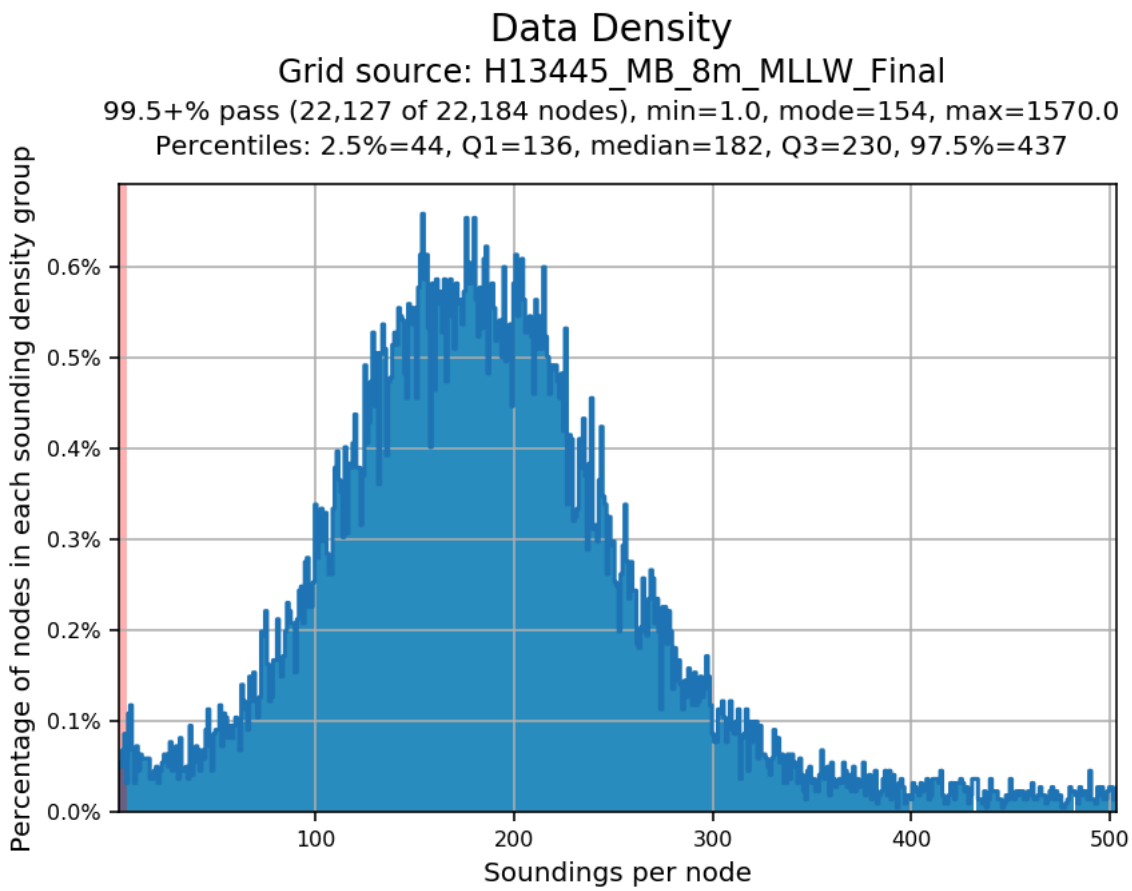

Figure 5: Survey H13445 8m set line MBES density QC

A.6 Survey Statistics

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

	HULL ID	*R/V Woldstad*	*Skiff*	*Total*
LNM	SBES Mainscheme	0	0	0
	MBES Mainscheme	11.22	92.58	103.8
	Lidar Mainscheme	0	0	0
	SSS Mainscheme	0	0	0
	SBES/SSS Mainscheme	0	0	0
	MBES/SSS Mainscheme	0	0	0
	SBES/MBES Crosslines	7.86	0.44	8.3
	Lidar Crosslines	0	0	0
Number of Bottom Samples				0
Number Maritime Boundary Points Investigated				2
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				9.47

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/14/2021	165

Survey Dates	Day of the Year
06/15/2021	166
06/18/2021	169
06/19/2021	170
07/13/2021	194
07/14/2021	195

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	***R/V Woldstad***	***Skiff***
LOA	121 feet	23 feet
Draft	12 feet	1 feet

Table 5: Vessels Used

Figure 6: R/V Woldstad

Figure 7: Skiff

R/V Woldstad (Table 5 and Figure 6) and the Skiff (Table 5 and Figure 7) acquired MBES, MBAB, surface sound velocity, sound velocity profiles, and attitude and positioning data within the survey limits of H13445 (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
AML Oceanographic	3-RT Velocity Probe	Conductivity, Temperature, and Depth Sensor
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 H13445 were acquired in accordance with section 5.2.4.2 of the HSSD 2020 (Figure 8). Mainscheme to crossline mileage percentage across H13445 is 8%. Of the 112,696 grid nodes compared between H13445 mainscheme MBES and MBES crosslines, 99% were within 1m difference. The mean difference is 0.0m, with a standard deviation of 0.2m (Figure 9).

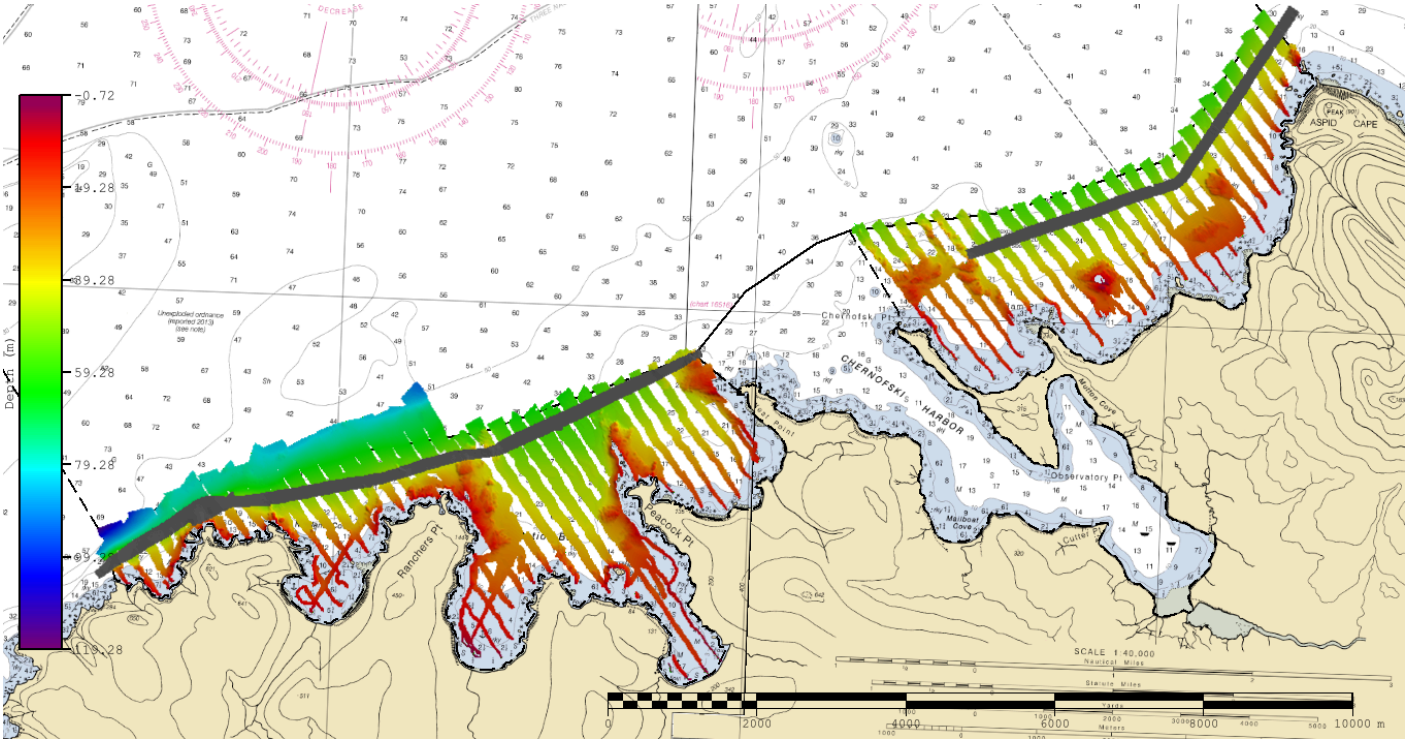

Figure 8: H13445 MBES mainscheme and MBES crossline distribution

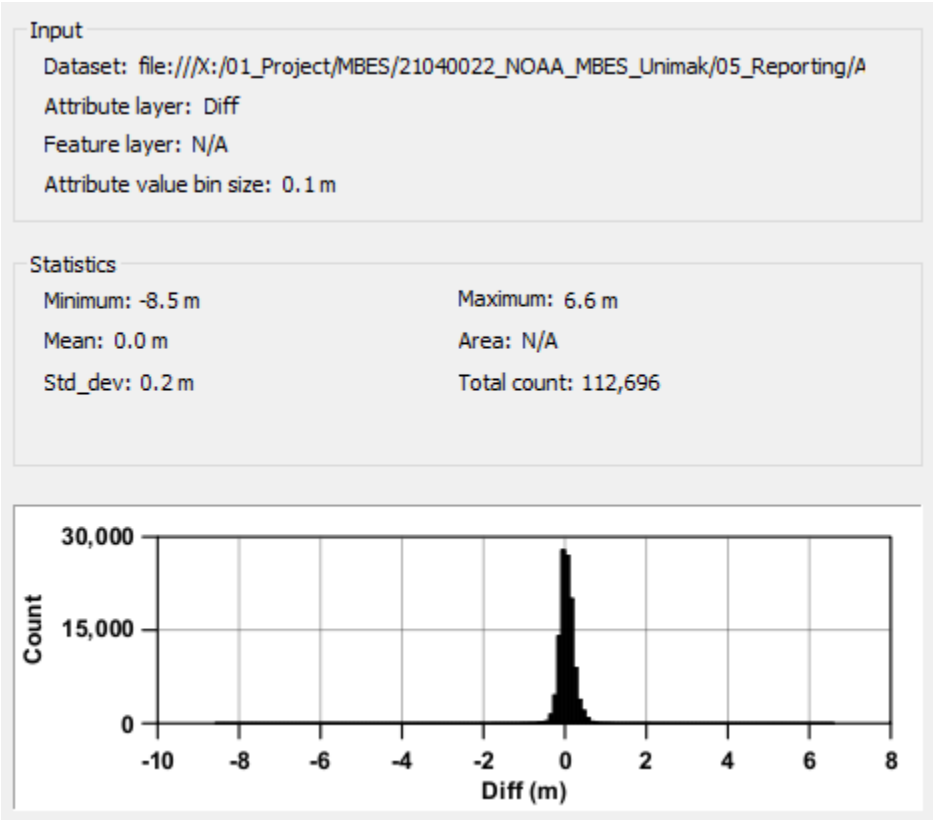

Figure 9: H13445 MBES mainscheme differenced from MBES crosslines statistical output

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	0.59 meters/second	N/A meters/second	N/A meters/second	0.25 meters/second
Skiff	2.25 meters/second	N/A meters/second	N/A meters/second	0.25 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Survey H13445 uncertainty values (Tables 7 and 8) were evaluated in both CARIS HIPS 10.4 and via Pydro QC Tools v3.4.7. The finalized 1m (Figure 10), 4m (Figure 11), and 8m (Figure 12) bathymetric grids meet uncertainty standards with a minimum of 99% of nodes passing.

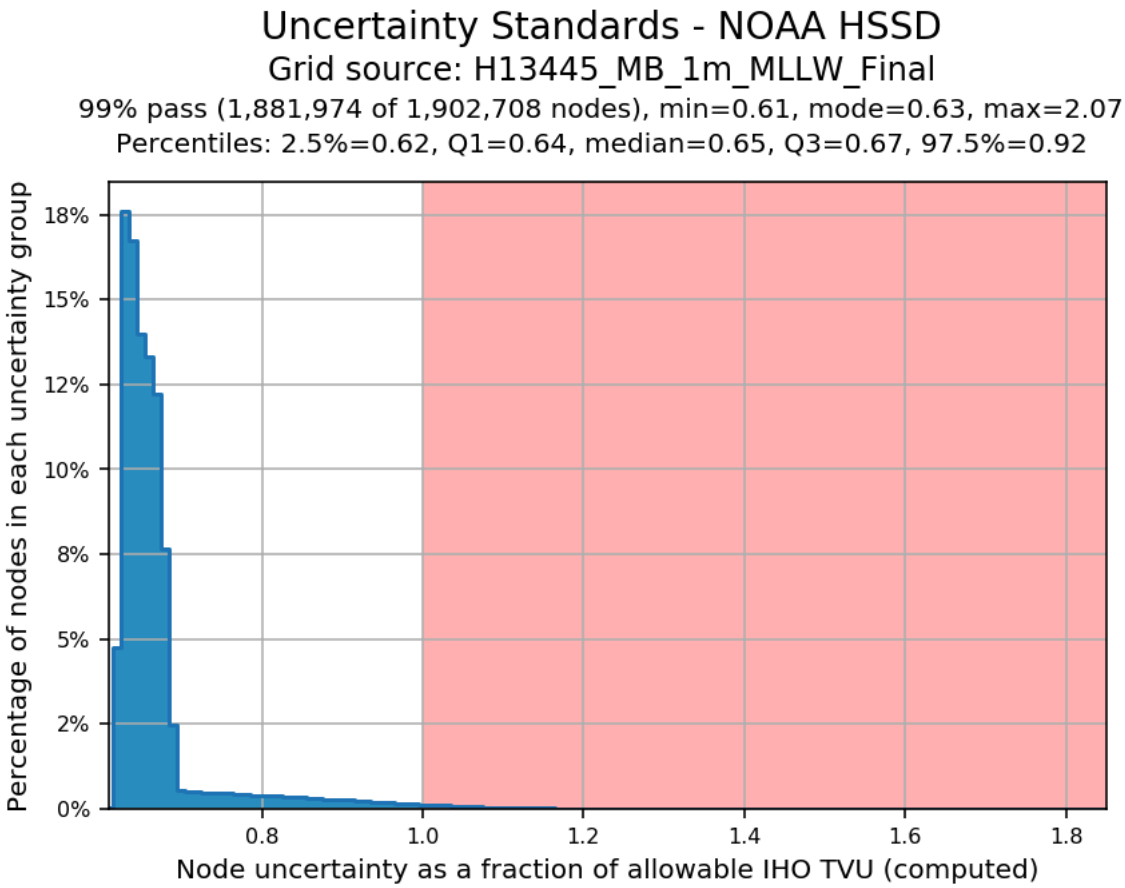

Figure 10: H13445 1m finalized grid TPU QC

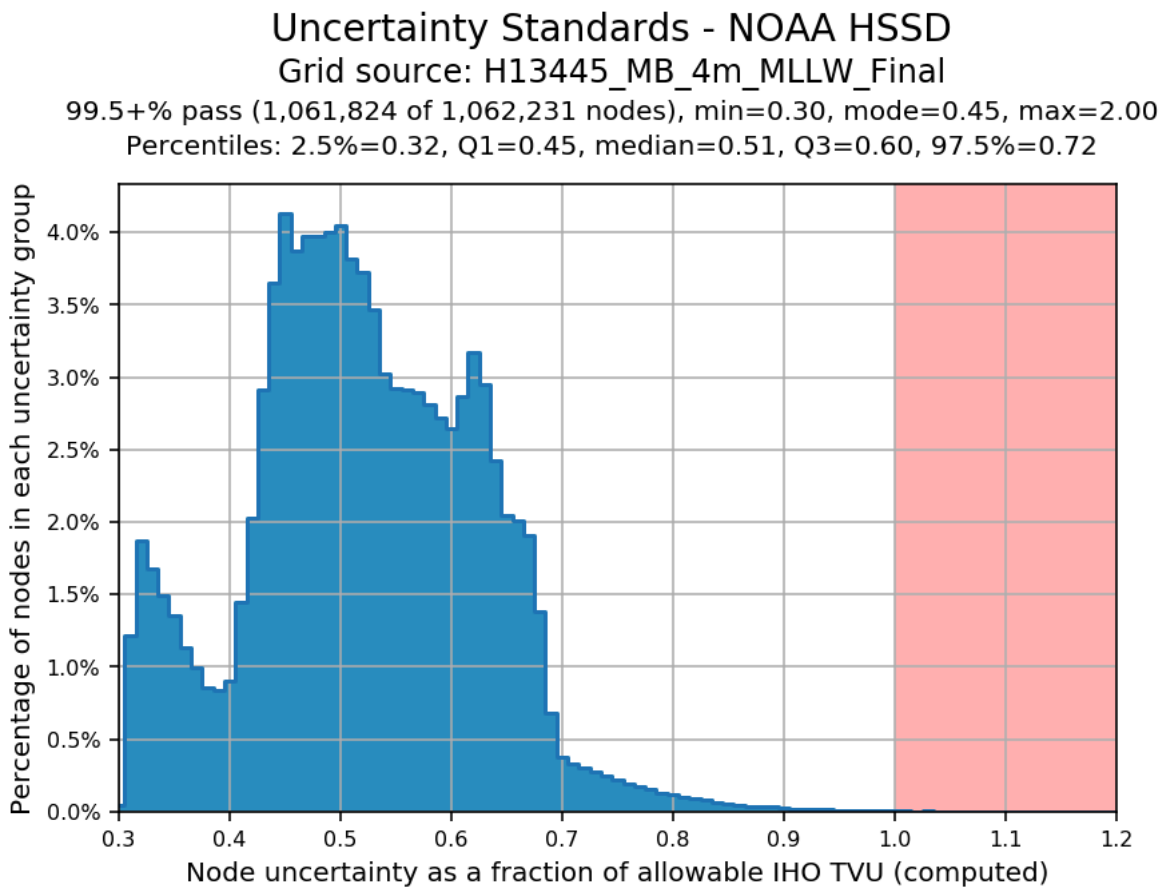

Figure 11: H13445 4m finalized grid TPU QC

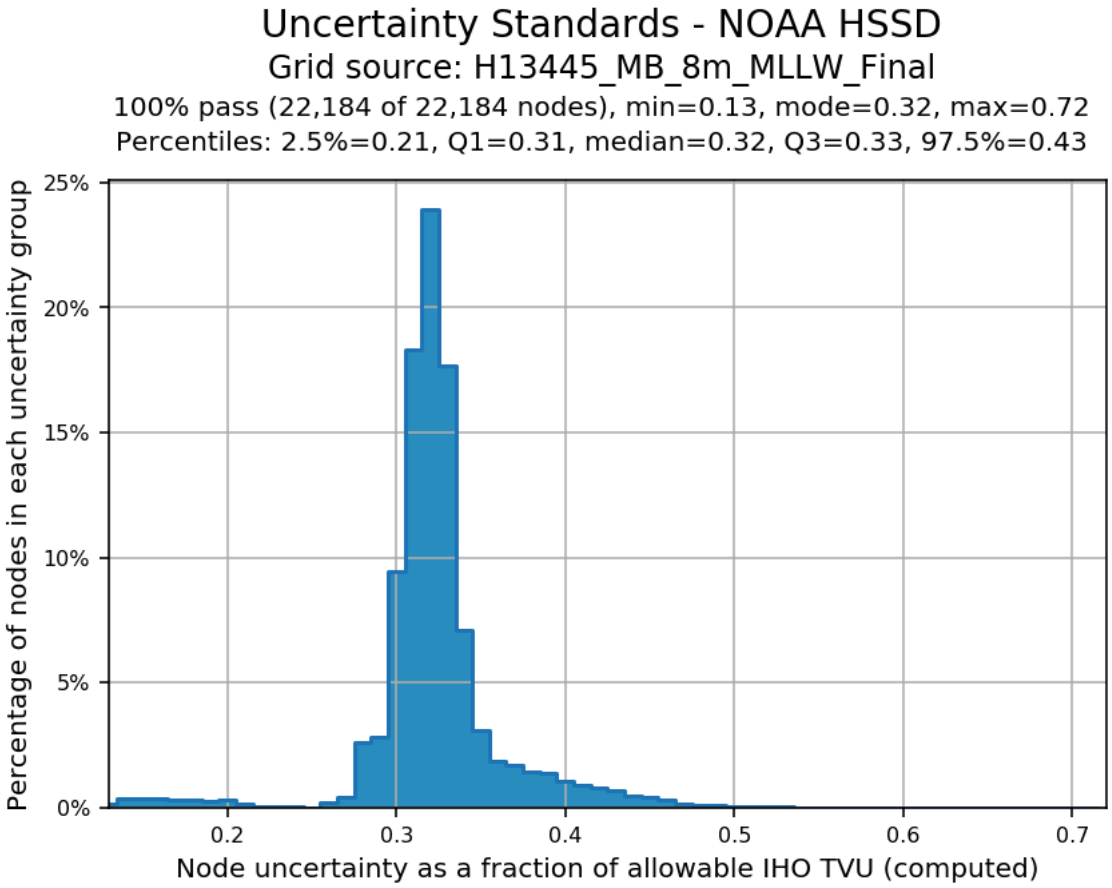

Figure 12: H13445 8m finalized grid TPU QC

B.2.3 Junctions

Two contemporary surveys are available for comparison to H13445: H13444 and H13446 (Table 9 and Figure 13).

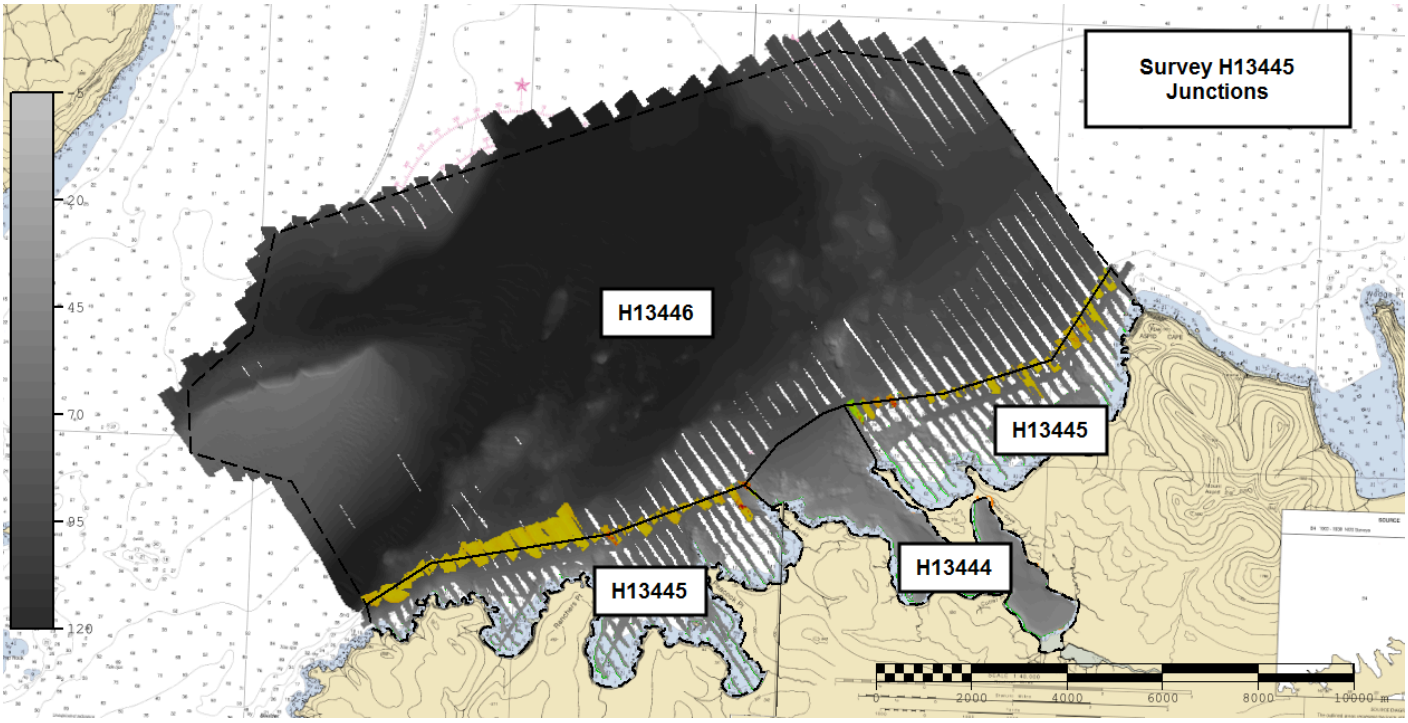

Figure 13: Junction surveys to H13445

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
H13446	1:5000	2021	Fugro USA Marine, Inc.	N

Table 9: Junctioning Surveys

<u>H13444</u>

Survey H13444 was acquired by Fugro USA Marine, Inc. in 2021 as a part of OPR-Q350-KR-21. Of the 6,382 grid nodes compared between H13445 and H13444 the mean difference is 0.1m; 99.9% agree within 1m (Figure 14).

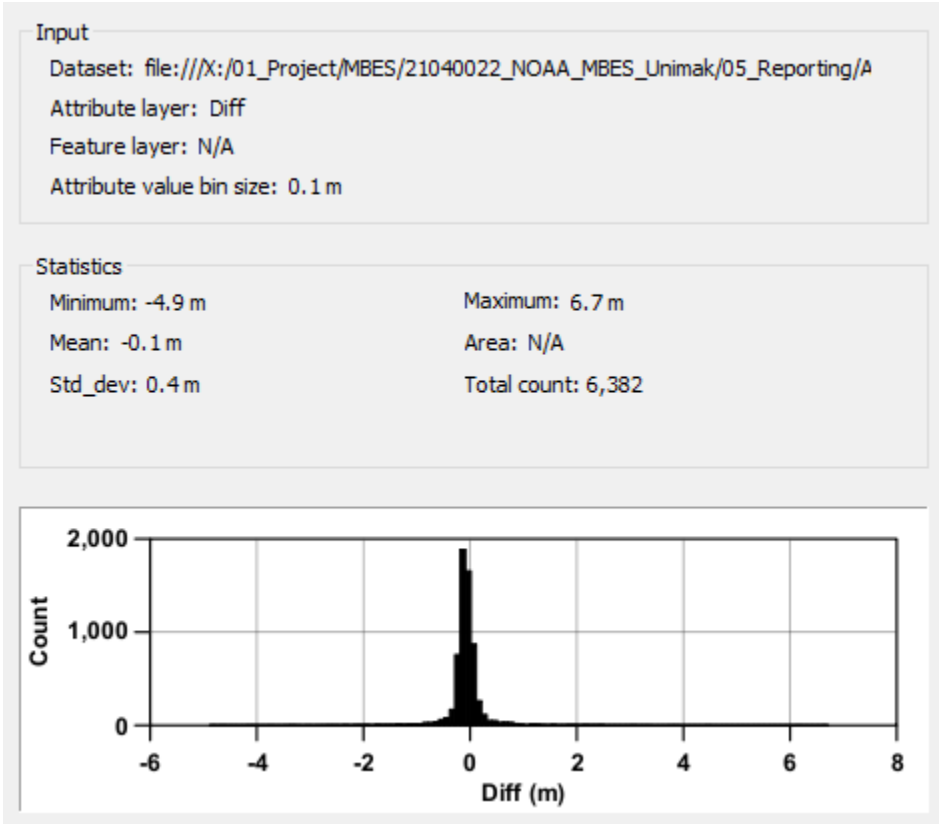

Figure 14: Survey H13445 junction with Survey H13444

H13446

Survey H13446 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 H13445 and H13446 the mean difference is 0.1m; 99.9% agree within 1m (Figure 15).

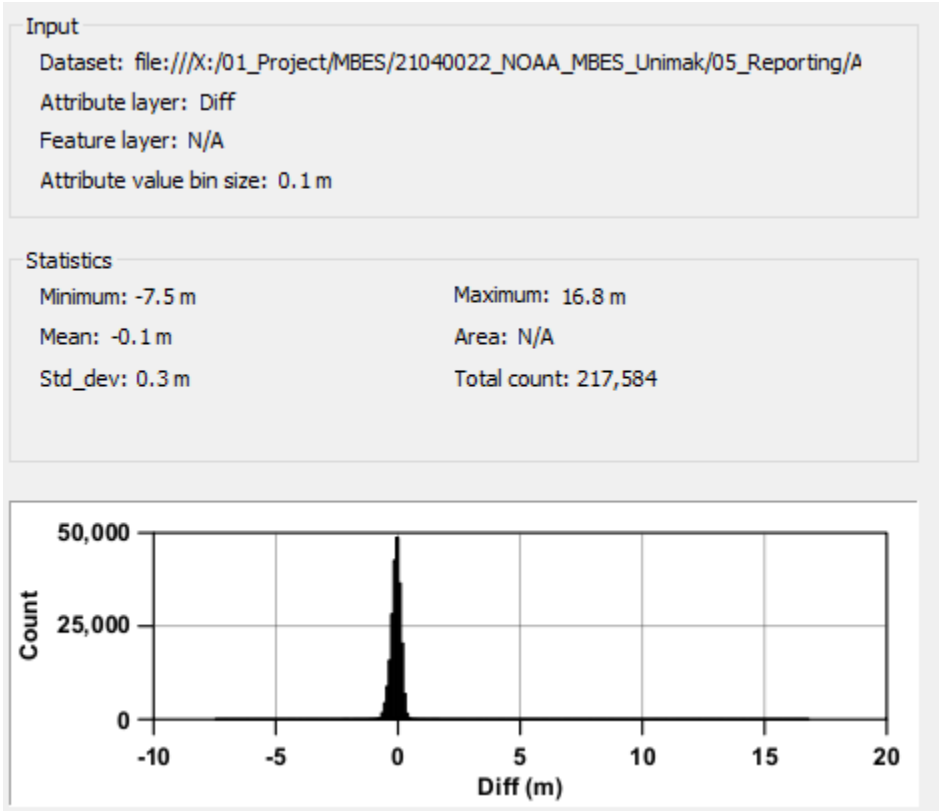

Figure 15: Survey H13445 junction with Survey H13446

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

High density of kelp in near-shore locations

Kelp posed a serious danger to the small boat while working in close proximity to kelp beds both near shore and along the shoreline. The Skiff engines had several temperature alarms while trying to push through kelp beds and the kelp would also frequently become entangled around the multibeam sonar pole, requiring the vessel to stop operations in order to free the boat from entanglement. Due to these issues, the 3.5m was rarely achieved within the limits of H13445. Refer to the Final Feature File (FFF) for recommendations by area.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound velocity profiles were acquired approximately every two hours from the R/V Woldstad and Skiff using a Teledyne Ocean Science Rapid Cast and AML RT-3 SVP, respectively.

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 H13445. 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.

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
H13445_MB_1m_MLLW	CARIS Raster Surface (CUBE)	1 meters	1.20 meters - 119.58 meters	NOAA_1m	Complete MBES
H13445_MB_1m_MLLW_Final	CARIS Raster Surface (CUBE)	1 meters	1.15 meters - 20 meters	NOAA_1m	Complete MBES
H13445_MB_4m_MLLW	CARIS Raster Surface (CUBE)	4 meters	1.45 meters - 119.27 meters	NOAA_4m	MBES Set Line Spacing
H13445_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	1.15 meters - 80 meters	NOAA_4m	MBES Set Line Spacing
H13445_MB_8m_MLLW	CARIS Raster Surface (CUBE)	8 meters	1.63 meters - 119.28 meters	NOAA_8m	MBES Set Line Spacing
H13445_MB_8m_MLLW_Final	CARIS Raster Surface (CUBE)	8 meters	72 meters - 119.28 meters	NOAA_8m	MBES Set Line Spacing

Table 10: Submitted Surfaces

Pacific Hydrographic Branch updated the depth range for 'H13445_MB_4m_MLLW_Final' to 18 - 80m for NBS purposes.

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 H13445 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 ENCs listed in the project instructions and an s57 file of surveyed soundings were compared with the following results (Figure 16).

Survey H13445 surveyed soundings exhibit 815 instances where surveyed soundings are shoal to charted soundings by greater than 1m: 522 surveyed soundings are 1-3m shoal to charted; 285 surveyed soundings are 3-9m shoal to charted; 10 surveyed soundings are 9-13m shoal to charted.

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 near-shore, and do not generally pose a threat to navigation; the charted extents of rocky, shoal, and kelp-heavy areas are generally well delineated on existing charts.

One Danger to Navigation (DtoN) was reported during the course of survey H13445 where a surveyed sounding of 1.15m was found in proximity of a charted sounding of 8.68m in the vicinity of 53-25-18N 167-30-45W (Figure17).

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.

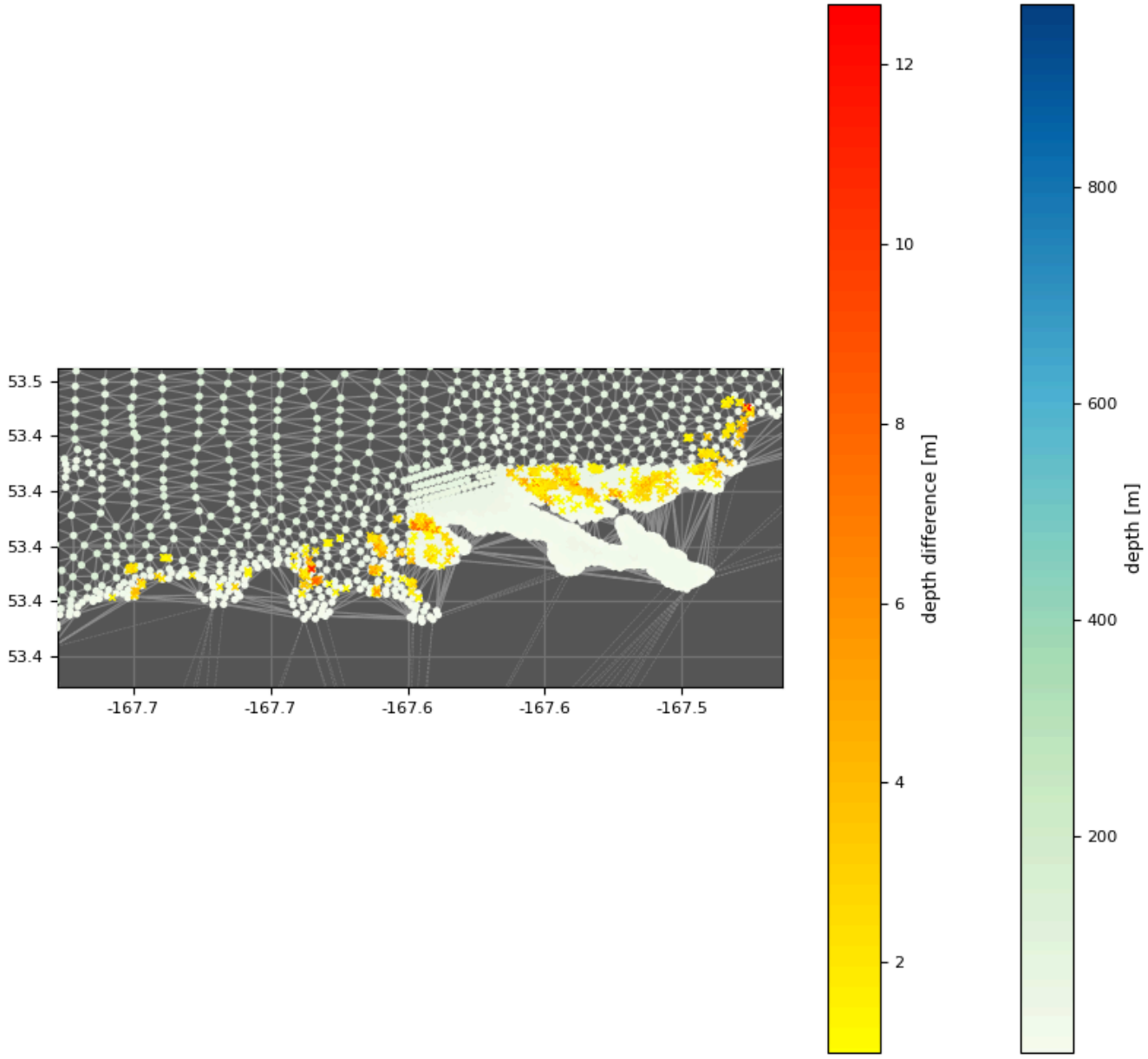

Figure 16: Pydro QC Tools chart review output of surveyed soundings shoal to charted soundings

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
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 ENCs

D.1.2 Shoal and Hazardous Features

To the extent safely possible, all significant shoals or features found in waters less than 20m deep were developed to complete coverage standards. Of the areas of interest, one located 53-25-18N 167-30-45W was determined by the Chief of Party to be a DtoN. The extents of this rock are charted properly (Figure 17), but the charted depth is 8.686m; survey H13445 found a least depth of 1.156m. This rock was unable to be fully ensonified due to dense kelp growth. During the course of the survey the area was observed at different times within the tidal range, and no rock awash was observed at this location. Refer to the Final Feature File (FFF) for further detail.

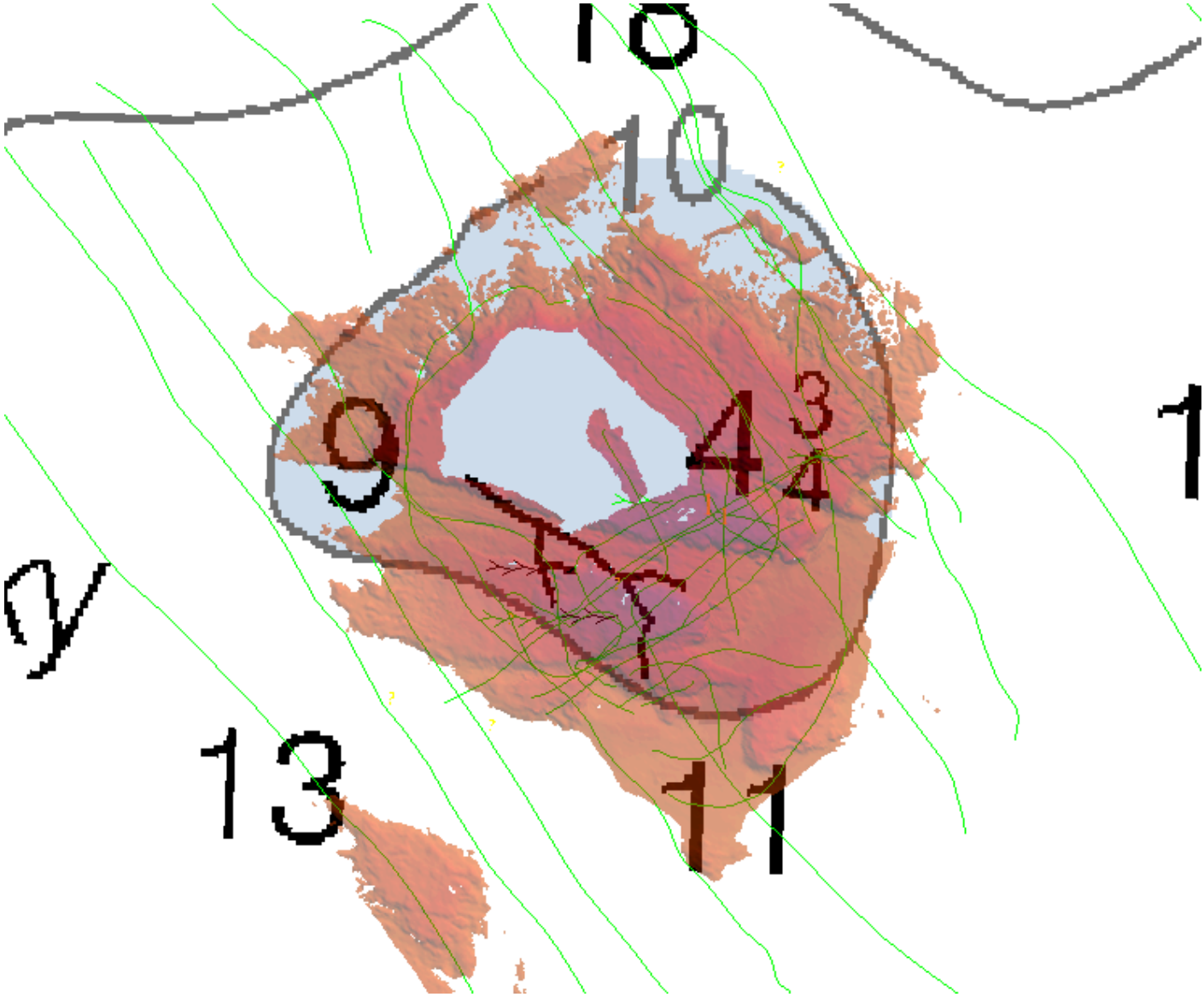

Figure 17: Location of Danger to Navigation

After consultation with the Hydrographic Team Lead, the Pacific Hydrographic Branch has determined the least depth found is most likely an acoustic artifact on kelp and will not be submitted as a DTON. Cartographic discretion will be left up to MCD (Marine Charting Division) for the rocky area in question.

D.1.3 Charted Features

468 assigned features are located within the survey limits of H13445. An additional 253 assigned features were assigned to be visually verified, of which the gross majority were located inshore of the NALL. If full verification is desired, Chief of Party recommends the use of aerial or satellite technologies. 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

Two maritime boundaries were assigned within the survey limits of H13445. The first assigned position for investigation was found to be only 25m southwest of the HSD-provided location, located 53-23-59.4N 167-36-38.4W. This land area (rock) is visible with an approximate elevation of 1m above MHW. The second maritime boundary point is charted within 15m of the nearest exposed land elevation, located 53-23-21.0N 167-40-44.7W.

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 18:38:26 -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