F00811

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

DESCRIPTIVE REPORT

Type of Survey:	Basic Hydrographic Survey
Registry Number:	F00811

LOCALITY

State(s):	Alaska
General Locality:	Southeast Alaska
Sub-locality:	Dawes Glacier and Endicott Arm

2020

CHIEF OF PARTY
Samuel F. Greenaway, CDR /NOAA

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

F00811

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:	**Southeast Alaska**
Sub-Locality:	**Dawes Glacier and Endicott Arm**
Scale:	**10000**
Dates of Survey:	**09/14/2020 to 10/10/2020**
Instructions Dated:	**08/24/2020**
Project Number:	**OPR-O392-RA-20**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Samuel F. Greenaway, CDR /NOAA**
Soundings by:	**Kongsberg Maritime EM2040 MBES**
Imagery by:	
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 8N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey F00811

Project: OPR-O392-RA-20

Locality: Southeast Alaska

Sublocality: Dawes Glacier and Endicott Arm

Scale: 1:10000

September 2020 - October 2020

NOAA Ship *Rainier*

Chief of Party: Samuel F. Greenaway, CDR /NOAA

A. Area Surveyed

The survey area is referred to as F00811, "Endicott Arm and Dawes Glacier" (sheet 1) in the project instructions. The survey area is approximately 5.57 square nautical miles and located south of Tracy Arm, AK.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
57° 46' 0" N 133° 35' 38.09" W	57° 42' 46.09" N 133° 33' 37.75" W

Table 1: Survey Limits

Data were acquired within the assigned survey limits as required in the Project Instructions and HSSD unless otherwise denoted.

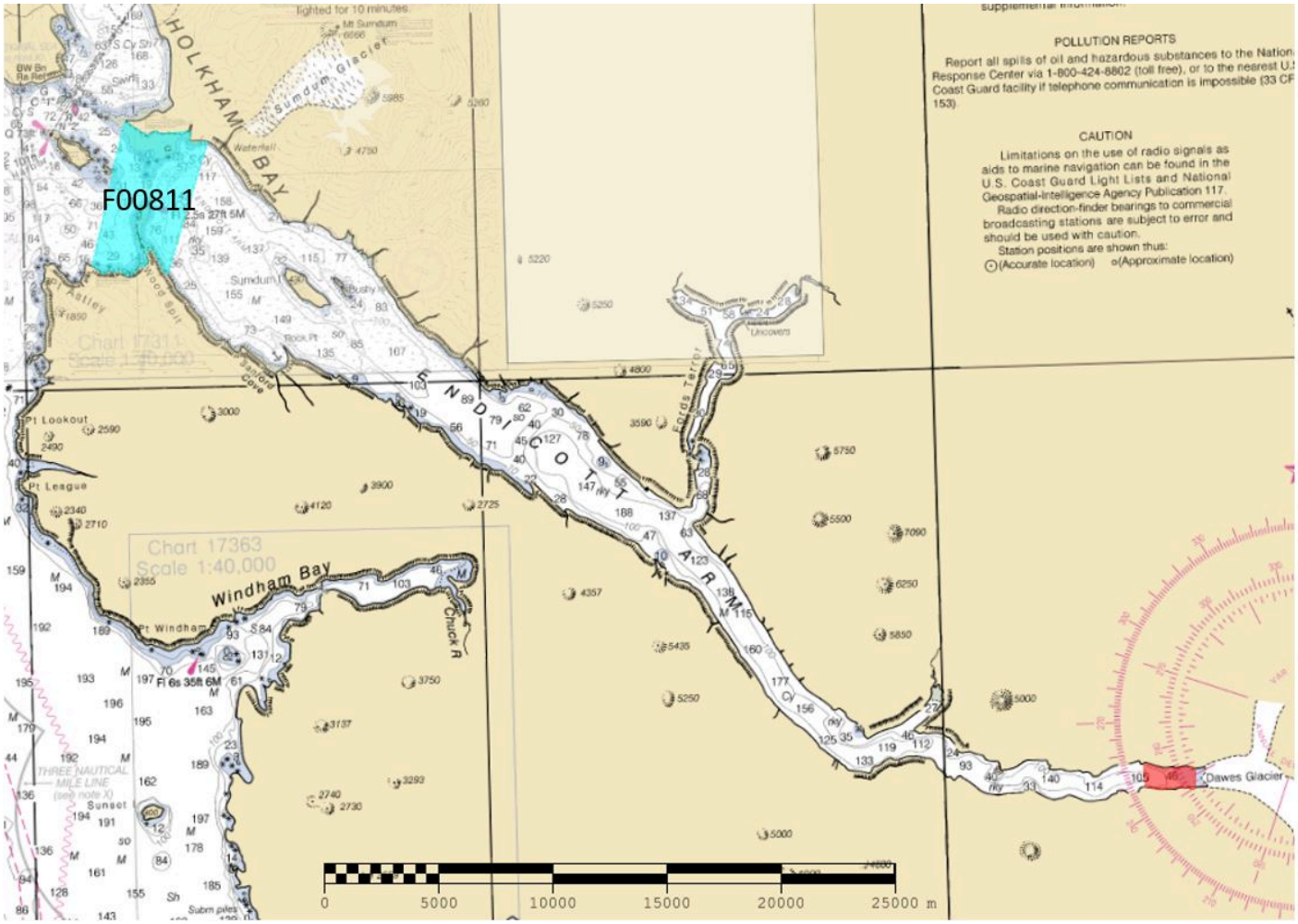


Figure 1: F00811 assigned survey area (Charts 17311 & 17360)

A.2 Survey Purpose

Endicott Arm is located south of Tracy Arm and is a popular destination for cruise ships to see Dawes Glacier. Dawes Glacier is an actively calving and retreating glacier, leaving the area at the face of the glacier uncharted. Dawes Glacier is also depositing sediment into the fjord leaving the potential for shoaling near the entrance to Endicott Arm.

A.3 Survey Quality

The entire survey is adequate to supersede previous 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 survey area	Complete Coverage (Refer to HSSD Section 5.2.2.3)

Table 2: Survey Coverage

Complete multibeam echosounder coverage was acquired to 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-the face meter depth contour, the line defined by the distance seaward from the observed MHW line which is equivalent to 0.8 millimeters at chart scale (the assigned sheet limits closely reflect this) or the inshore limit of safe navigation. Areas where F00811 survey coverage reached neither 3.5 meters water depth, or the assigned sheet limits, were due to the presence of thick kelp and lack of a shoreline window to further develop the NALL.

Coverage was not acquired near the face of Dawes Glacier due to ice conditions on the two days we attempted to reach this area. The ice field extended over the survey area and prevented acquisition due to safety concerns. This can be seen in Figure 4 and survey junction H11759.

We used Pydro Explorer QC Tool Holiday Finder to detect gaps in data (holidays) on the finalized Variable Resolution (VR) surfaces for submission. Holiday finder yielded no holidays.

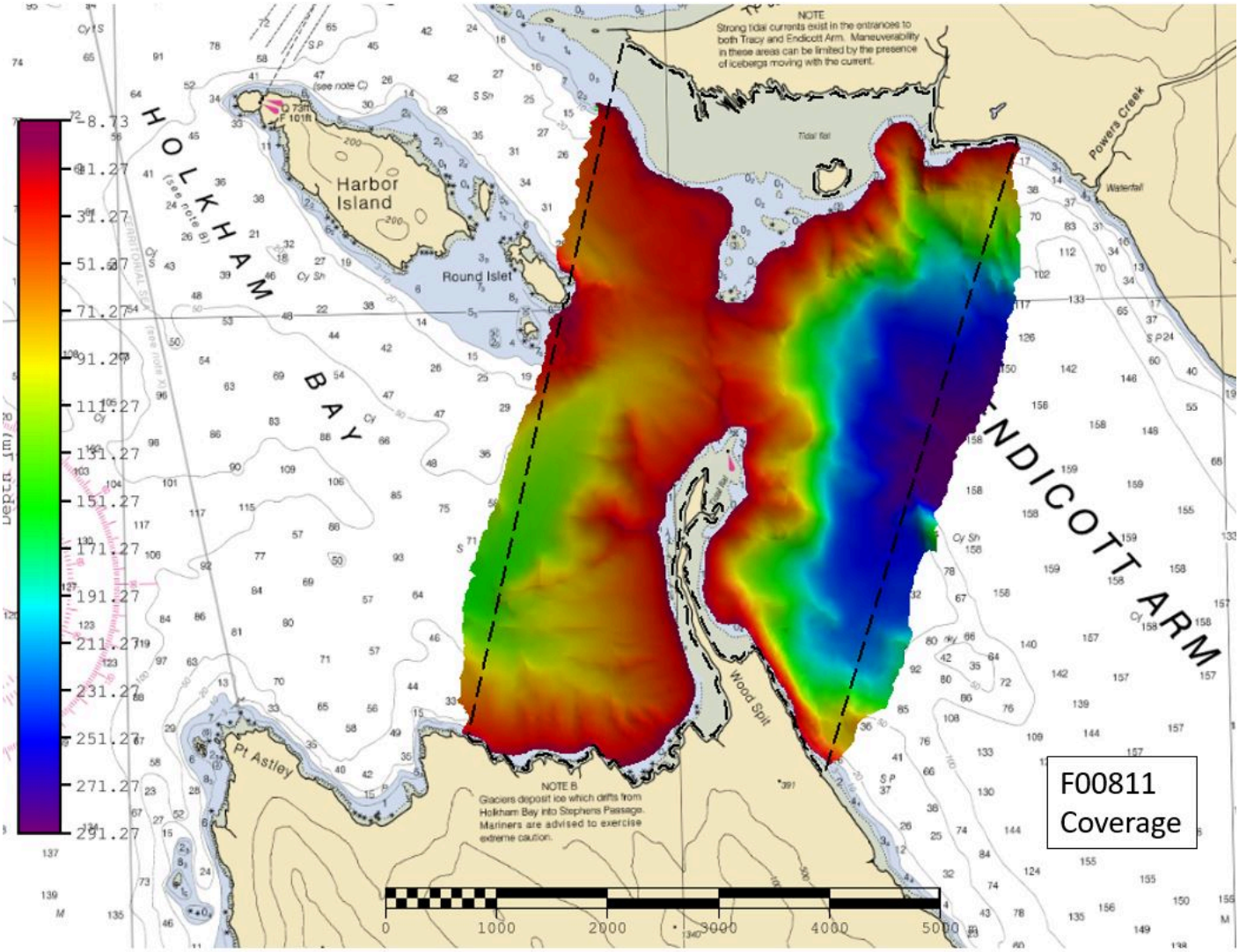


Figure 2: F00811 MBES coverage and assigned survey limits (Chart 17311)

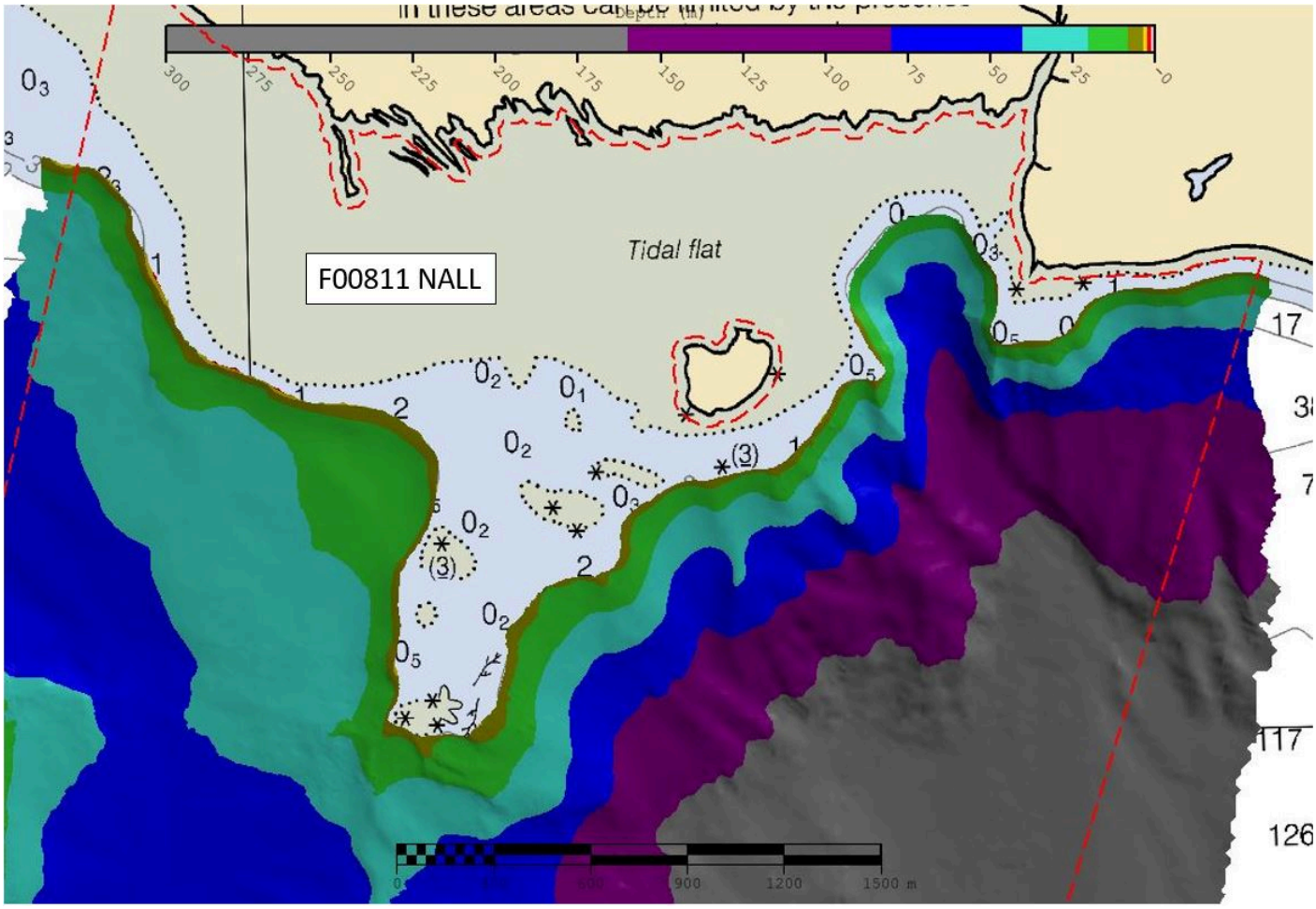


Figure 3: Example of Navigational Area Limit Line (NALL) determination; the dashed line indicates assigned sheet limits. Kelp and lack of a shoreline window prevented full coverage of the NALL. Yellow in the legend indicates depths less than 3.5 meters and the bathymetric limit of the NALL.

A.6 Survey Statistics

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

	HULL ID	*2801*	*2803*	*2804*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	22.57	45.00	9.61	77.18
	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	0	1.85	1.32	3.17
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					3
Number Maritime Boundary Points Investigated					0
Number of DPs					0
Number of Items Investigated by Dive Ops					0
Total SNM					5.57

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/14/2020	258
09/15/2020	259

Survey Dates	Day of the Year
10/10/2020	284

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	*2801*	*2803*	*2804*
LOA	8.8 meters	8.8 meters	8.8 meters
Draft	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

Figure 4: Example of NOAA ship RAINIER survey launch in front of ice field near the face of Dawes Glacier.

All data for survey F00811 was acquired by NOAA ship RAINIER launches 2801, 2803, 2804. The vessels acquired MBES bathymetry, backscatter, and sound velocity profiles.

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
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus V2	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

RAINIER launch 2803 acquired 1.85 lnm and launch 2804 acquired 1.32 lnm of crosslines across most depth ranges on one boat day. We performed analysis using Compare Grids function in Pydro Explorer on finalized VR surfaces of F00811 mainscheme only and crossline only data. Pydro found that 99.5% of nodes met allowable uncertainties. The difference in this comparison are likely due to steep relief in the bathymetry.. For additional results see plots below.

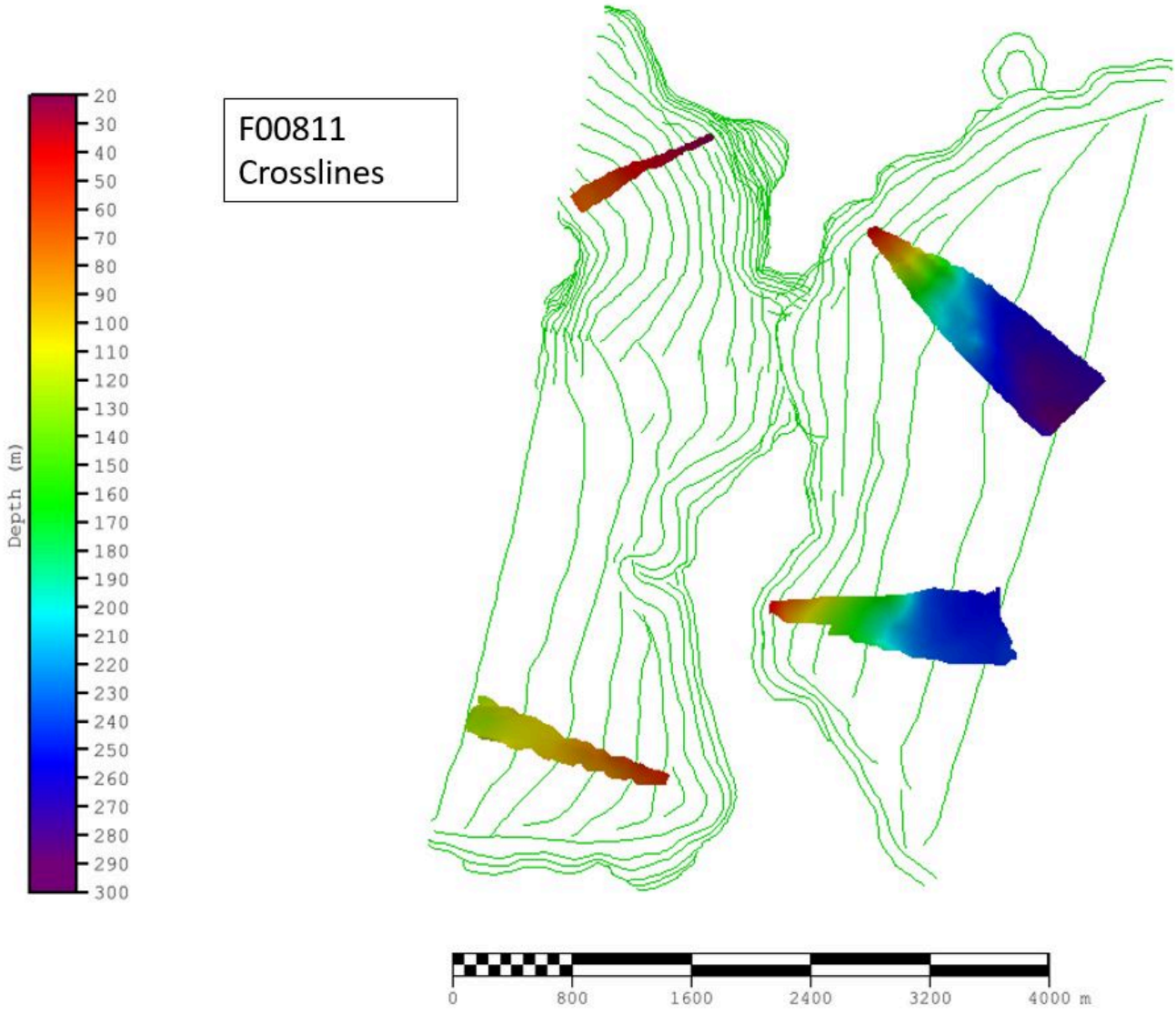
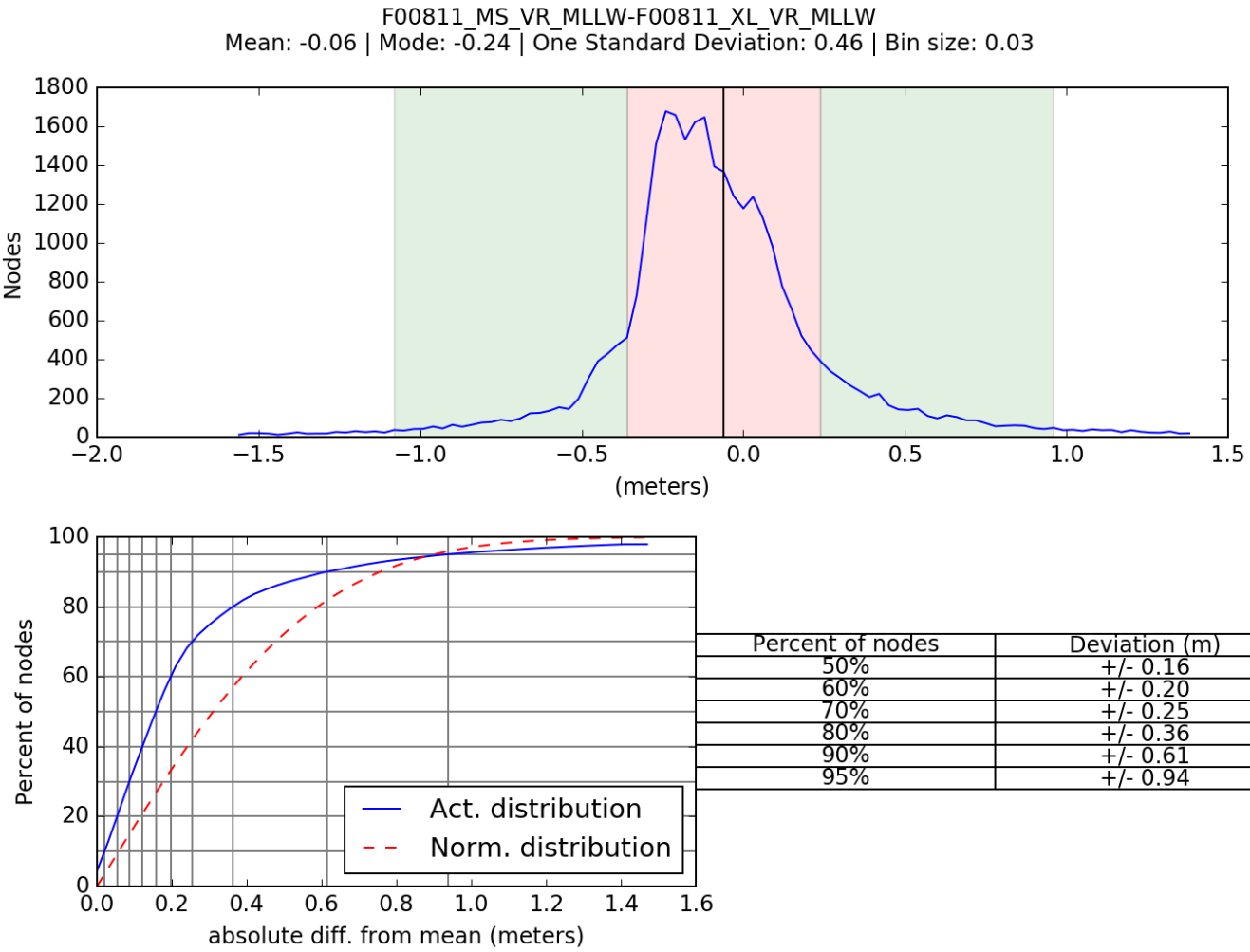


Figure 5: F00811 crossline surface overlaid on mainscheme tracklines.



Percent of nodes	Deviation (m)
50%	+/- 0.16
60%	+/- 0.20
70%	+/- 0.25
80%	+/- 0.36
90%	+/- 0.61
95%	+/- 0.94

Figure 6: Pydro derived plot showing percentage-pass value of F00811 mainscheme to crossline data.

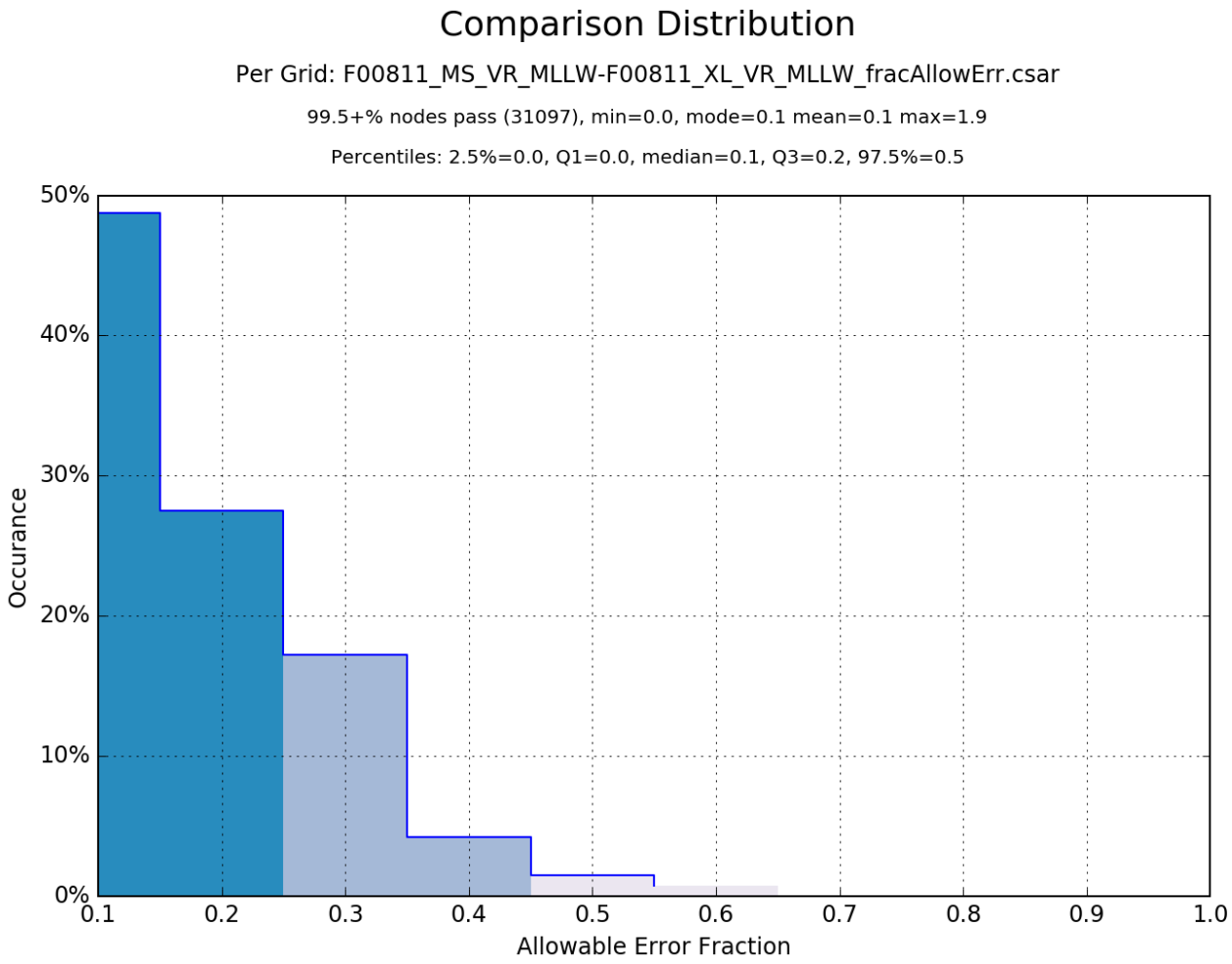


Figure 7: Pydro derived plot showing absolute difference statistics of F00811 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	12.9 centimeters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
All Vessels	3.0 meters/second	NA meters/second	NA meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey F00811 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 NOAA vertical datum transformation model used in this survey.

In addition to the usual a priori estimates of uncertainty, 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. We later applied POSPac SBET and RMS files in CARIS HIPS to supercede POS MV uncertainties associated with GPS height and position.

Uncertainty values of the submitted finalized grids were calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA v5 within Hydro QC Tools was used to analyze F00811 TVU compliance. F00811 met 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 F00811 multibeam echosounder (MBES) data density. The submitted F00811 variable-resolution (VR) surface met HSSD density requirements shown in the histograms below.

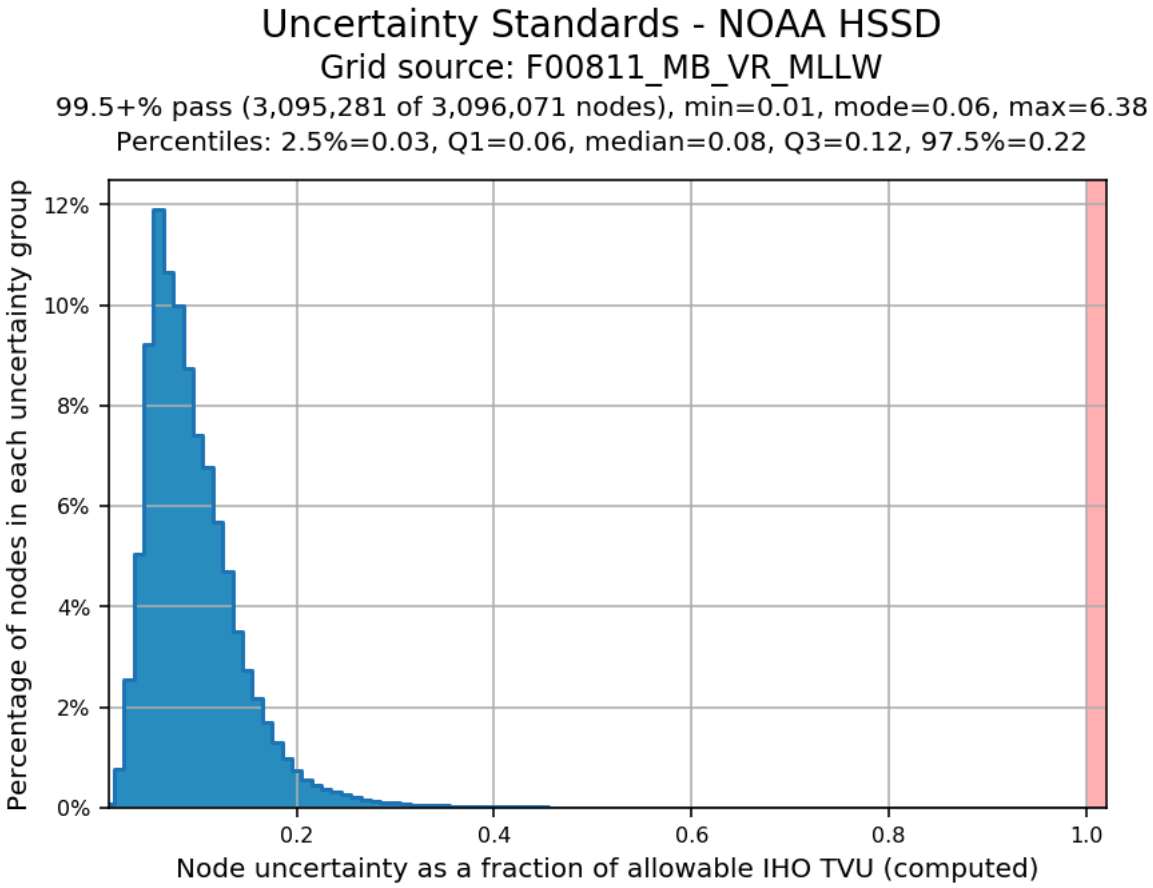


Figure 8: Pydro derived plot showing TVU compliance of F00811 finalized multi-resolution MBES data.

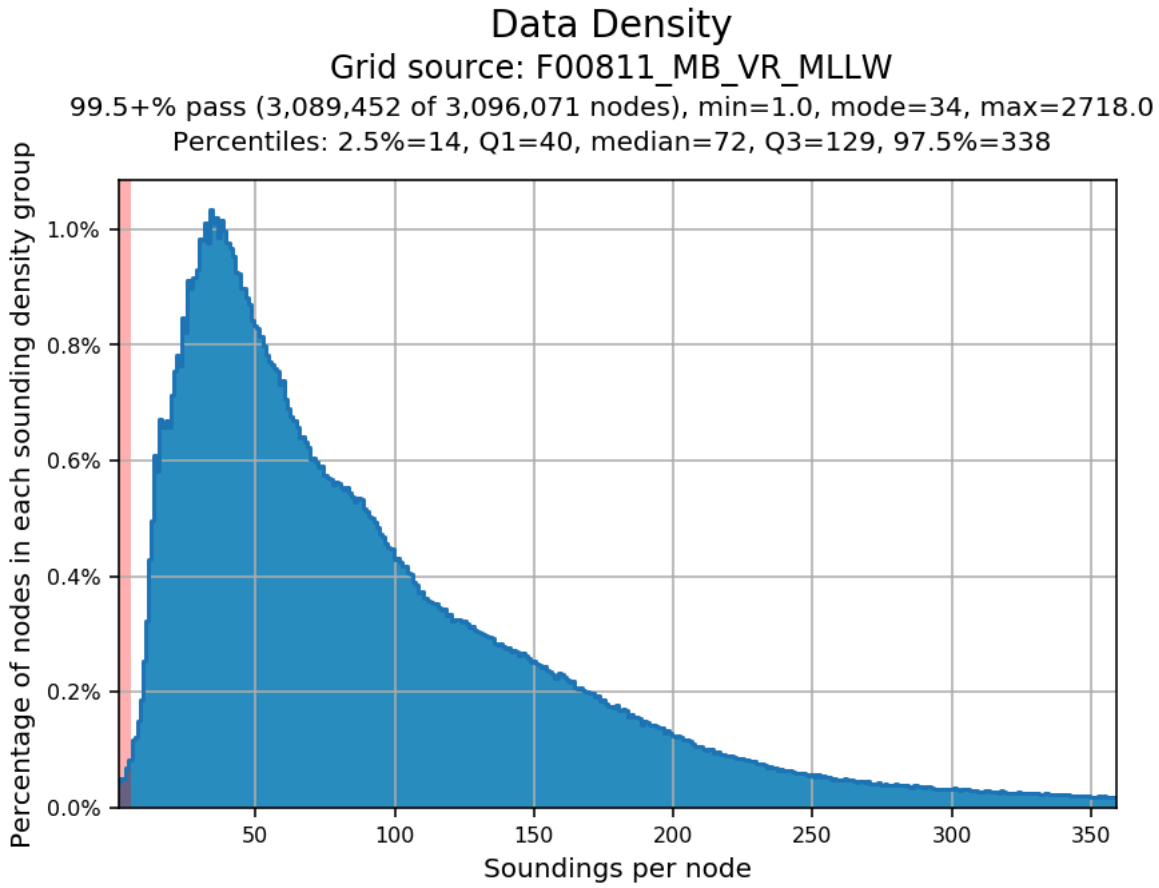


Figure 9: Pydro derived histogram plot showing HSSD density compliance of F00811 finalizd variable-resolution MBES data.

B.2.3 Junctions

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H11759	1:10000	2007	Fairweather	E
H11998	1:10000	2008	Fairweather	E
H13007	1:20000	2018	Fairweather	W

Table 9: Junctioning Surveys

H11759

Junction H11579 was not completed as assigned in project instructions due to ice conditions. Ice field coverage extended over the survey area preventing acquisition due to safety concerns.

Figure 10: Example of ice field blocking survey near the face of Dawes Glacier.

H11998

The junction with 2008 survey H11998 encompassed approximately 9.64 square nautical miles along the eastern boundary of F00811. An 8m single-resolution surface from F00811 was compared with the 8m resolution BAG surface from H11998. Pydro's Compare Grids results showed that 85% of nodes in the overlapping area met NOAA allowable error standards. Analysis of the difference surface indicated that there is a -0.23 average difference between these two junctioned surveys. There is a course grid resolution

issue between surveys F00811 and H11998. The average difference could be because of survey H11998 representing data as a 8m resolution surface or bathymetry changing due to sediment migration along the seafloor and scouring. For additional results see plots below.

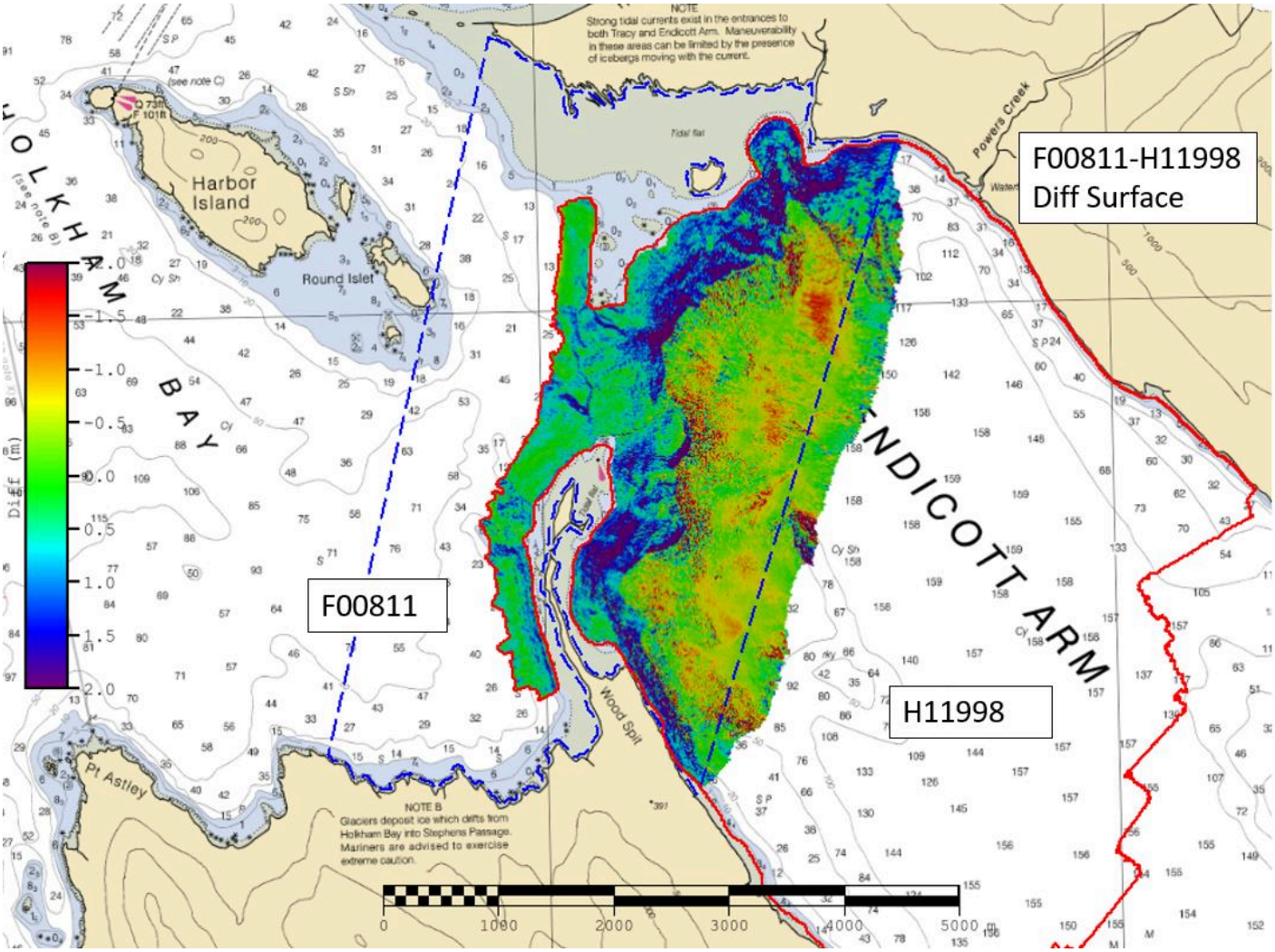
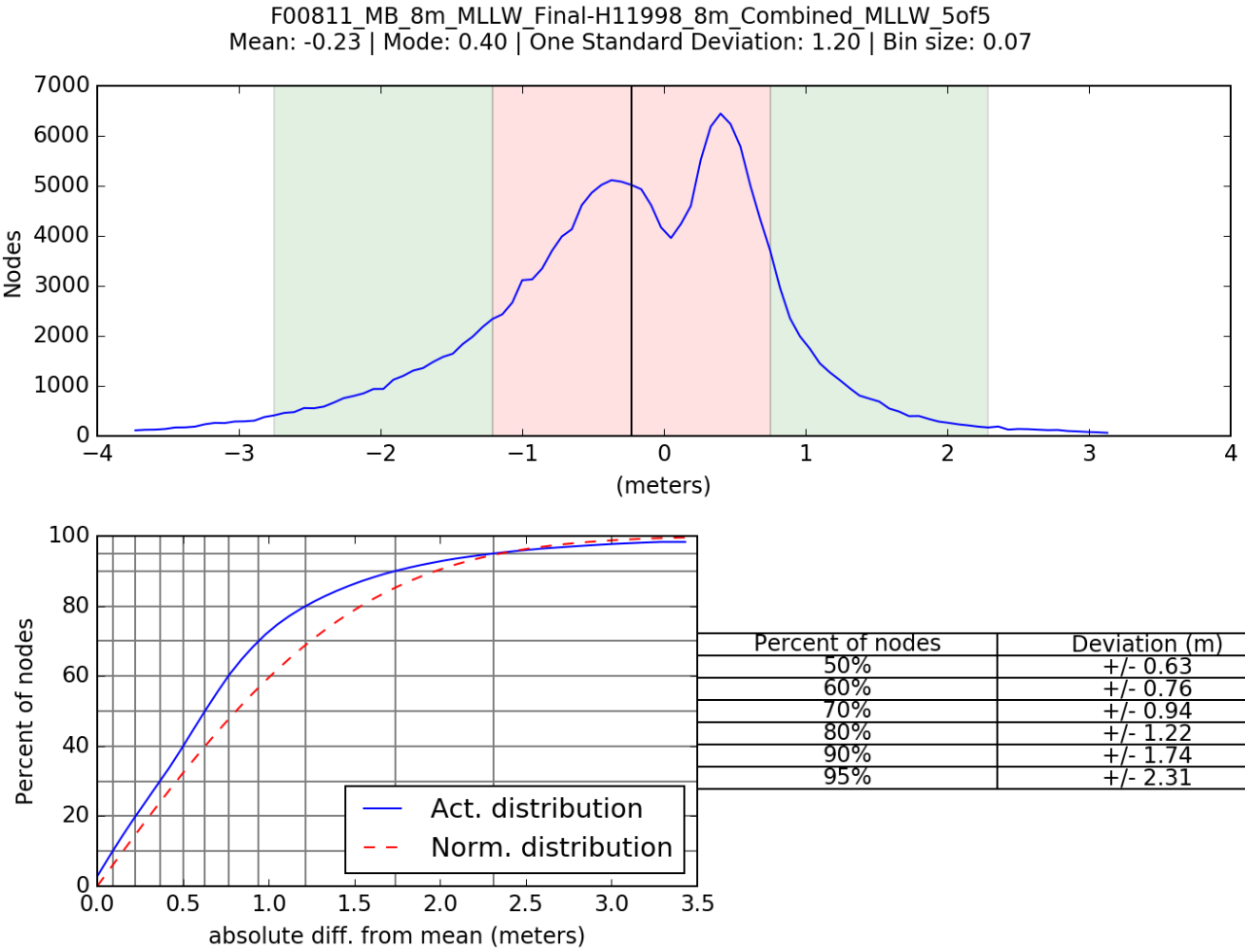


Figure 11: F00811/ H11998 Junction Comparison.



Percent of nodes	Deviation (m)
50%	+/- 0.63
60%	+/- 0.76
70%	+/- 0.94
80%	+/- 1.22
90%	+/- 1.74
95%	+/- 2.31

Figure 12: Pydro derived plot showing percentage-pass value of F00811 to H11998.

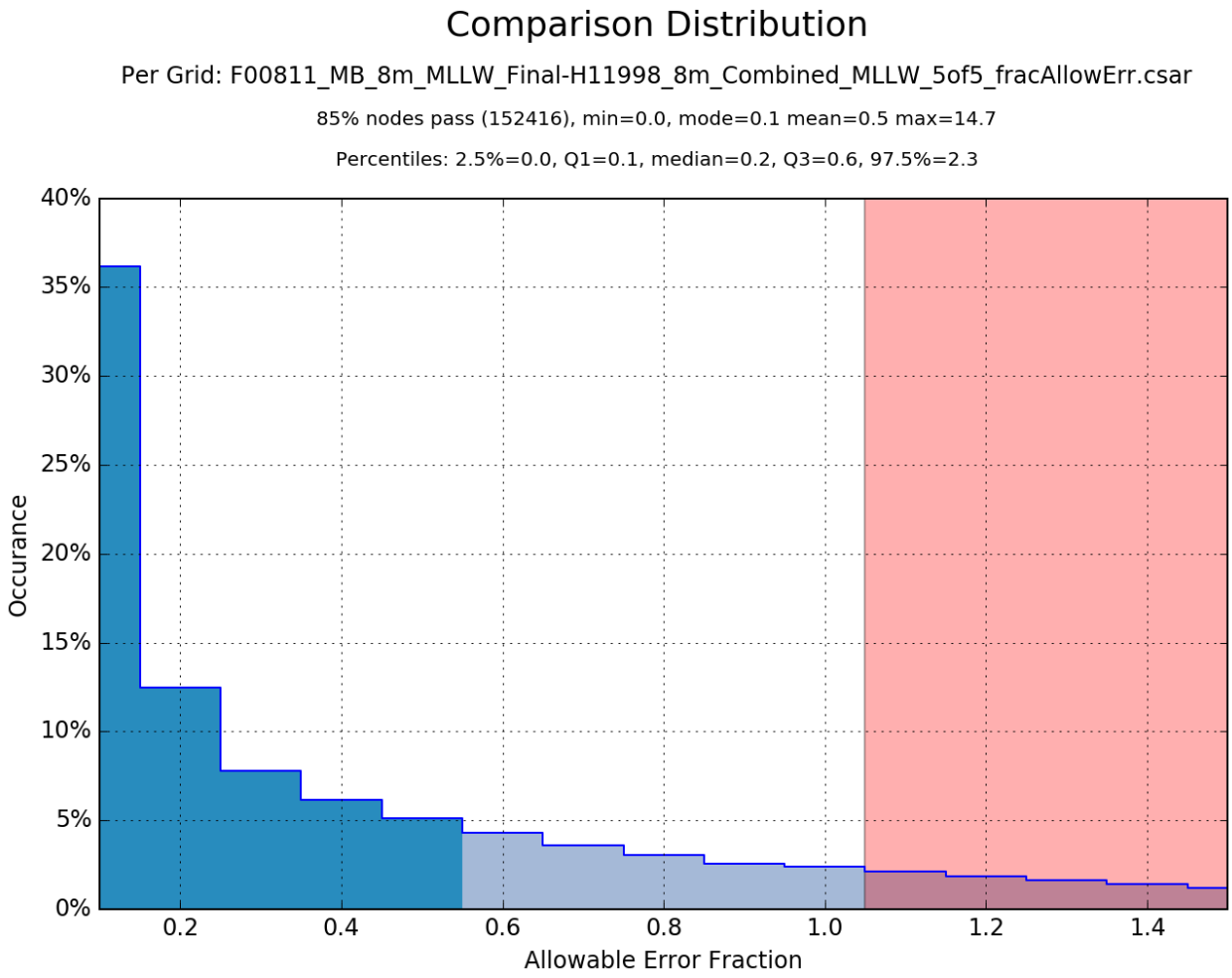


Figure 13: Pydro derived plot showing absolute difference statistics of F00811 to H11998.

H13007

The junction with 2018 survey H13007 encompassed approximately 26.45 square nautical miles along the western boundary of F00811. The finalized variable-resolution surface from F00811 as compared with the variable-resolution surface from H13007. Pydro's Compare Grids results showed that 99.5% of nodes in the overlapping area met NOAA allowable error standards. Analysis of the difference surface indicated that there is a 0.01 average difference between these two junctioned surveys. The variable-resolution holidays in the difference surface are caused by a small maximum grid size. For additional results see plots below.

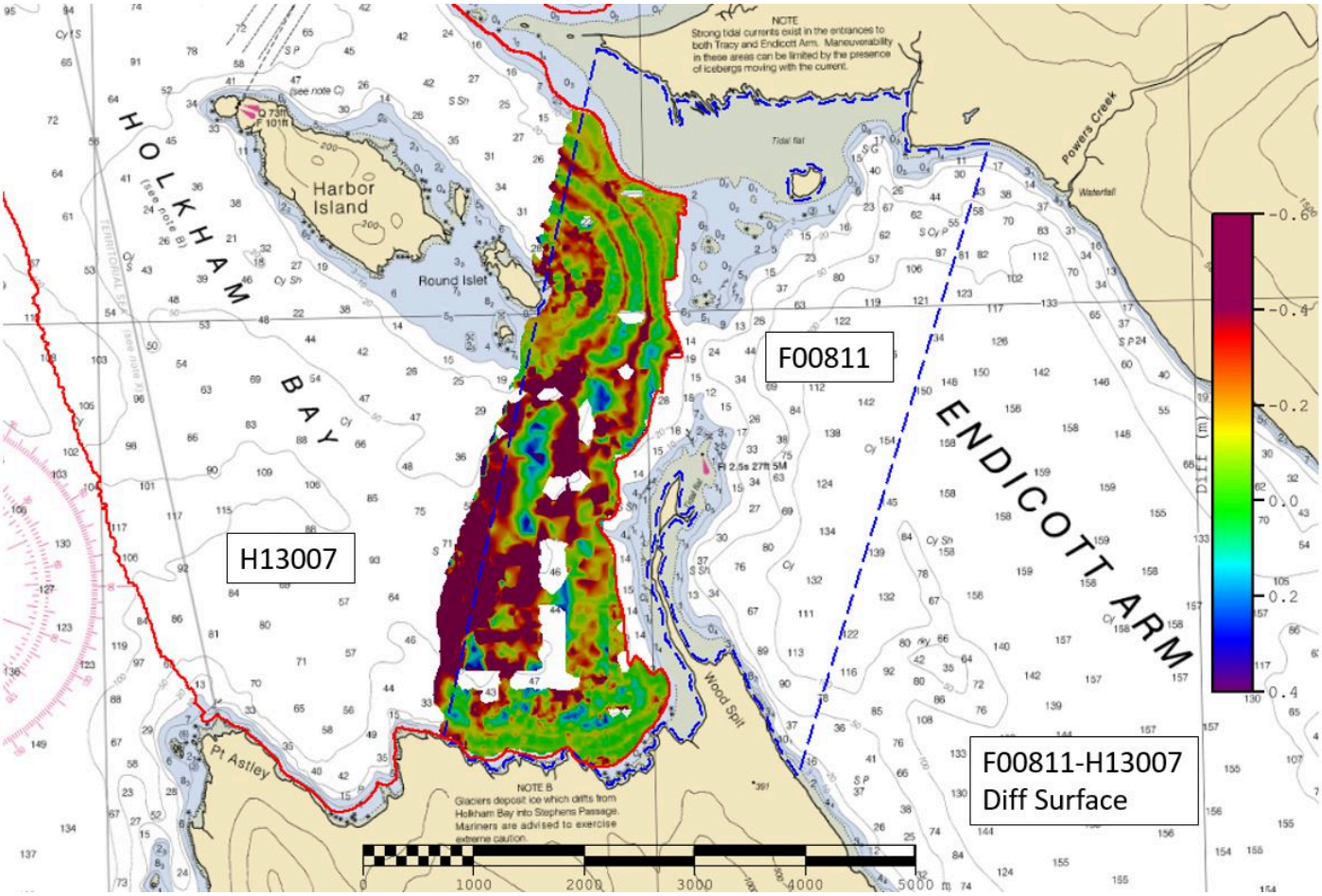
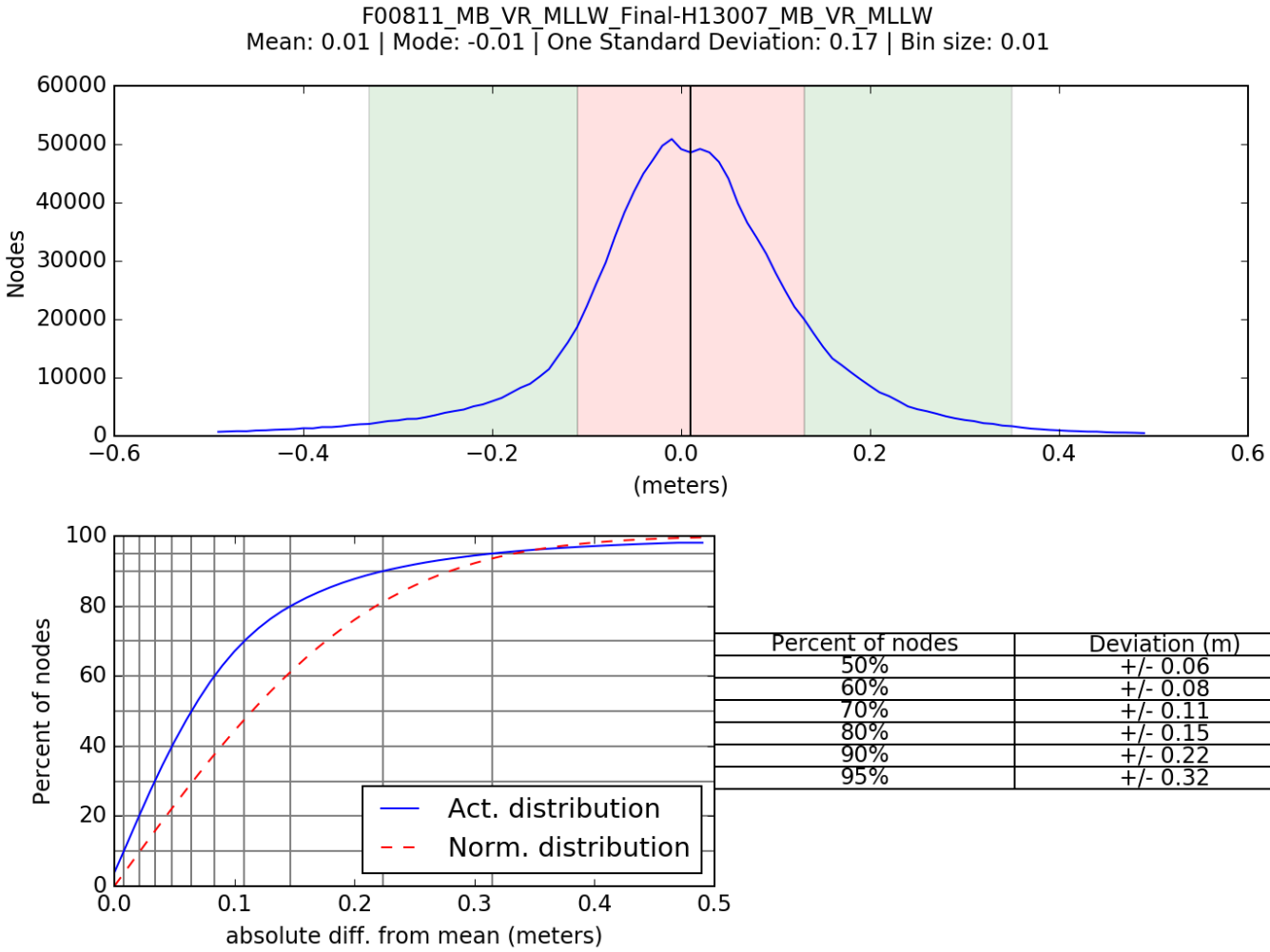


Figure 14: F00811/ H13007 Junction Comparison.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.11
80%	+/- 0.15
90%	+/- 0.22
95%	+/- 0.32

Figure 15: Pydro derived plot showing percentage-pass value of F00811 to H13007.

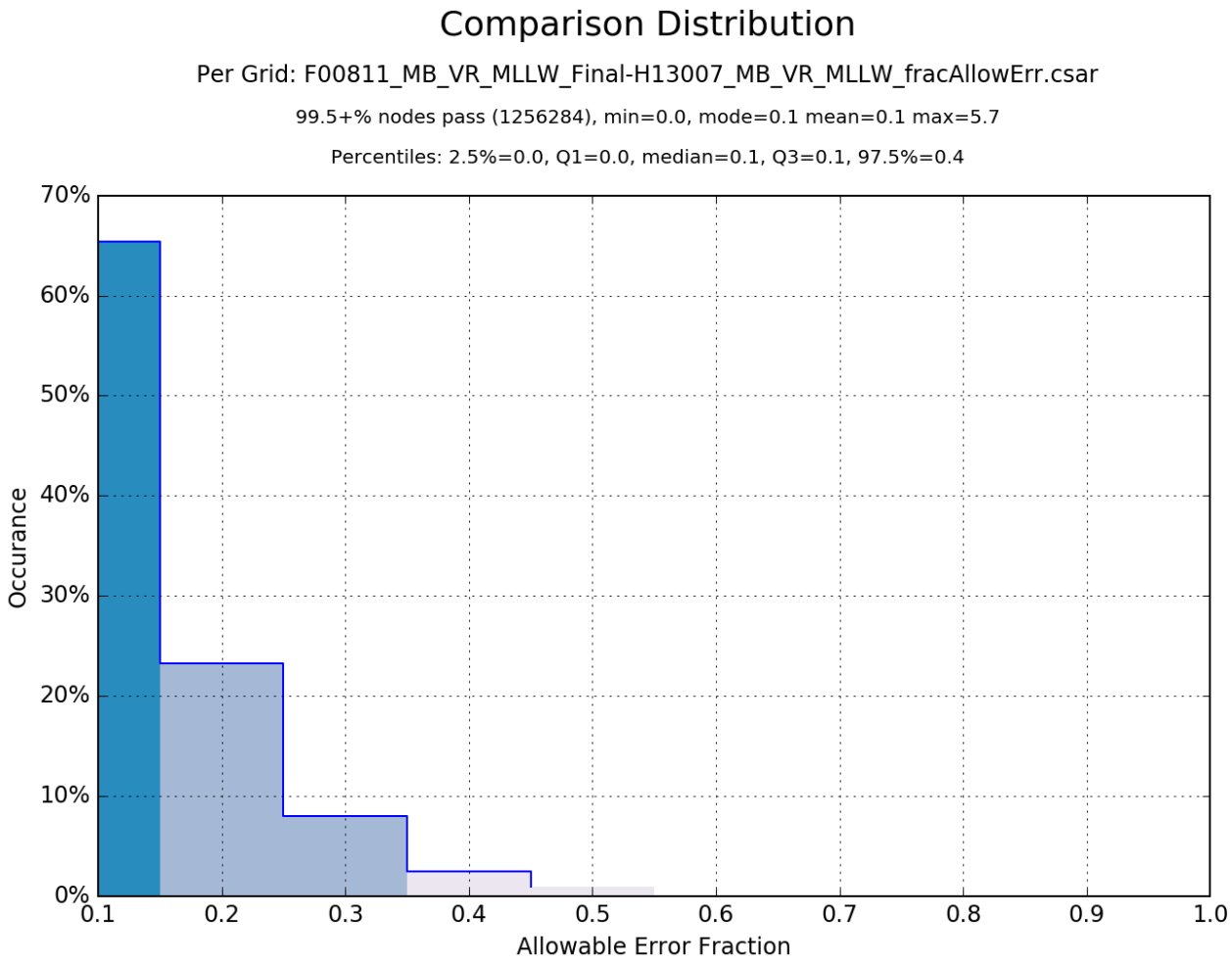


Figure 16: Pydro derived plot showing absolute difference statistics of F00811 to H13007.

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

Sound Speed

Despite the best efforts of the hydrographers did not conduct sufficient sound speed casts distributed spatially and temporally, in some areas, particularly in the northwestern portion of the survey in waters shallower than 20 meters. Sound speed correction was suboptimal. This was evidenced by the appearance of artifacts in the survey grid and the characteristic "smiles" or "frowns" of the data when viewed in subset editor. Even with these sound speed errors 99.5% of F00811 grid nodes passed uncertainty standards.

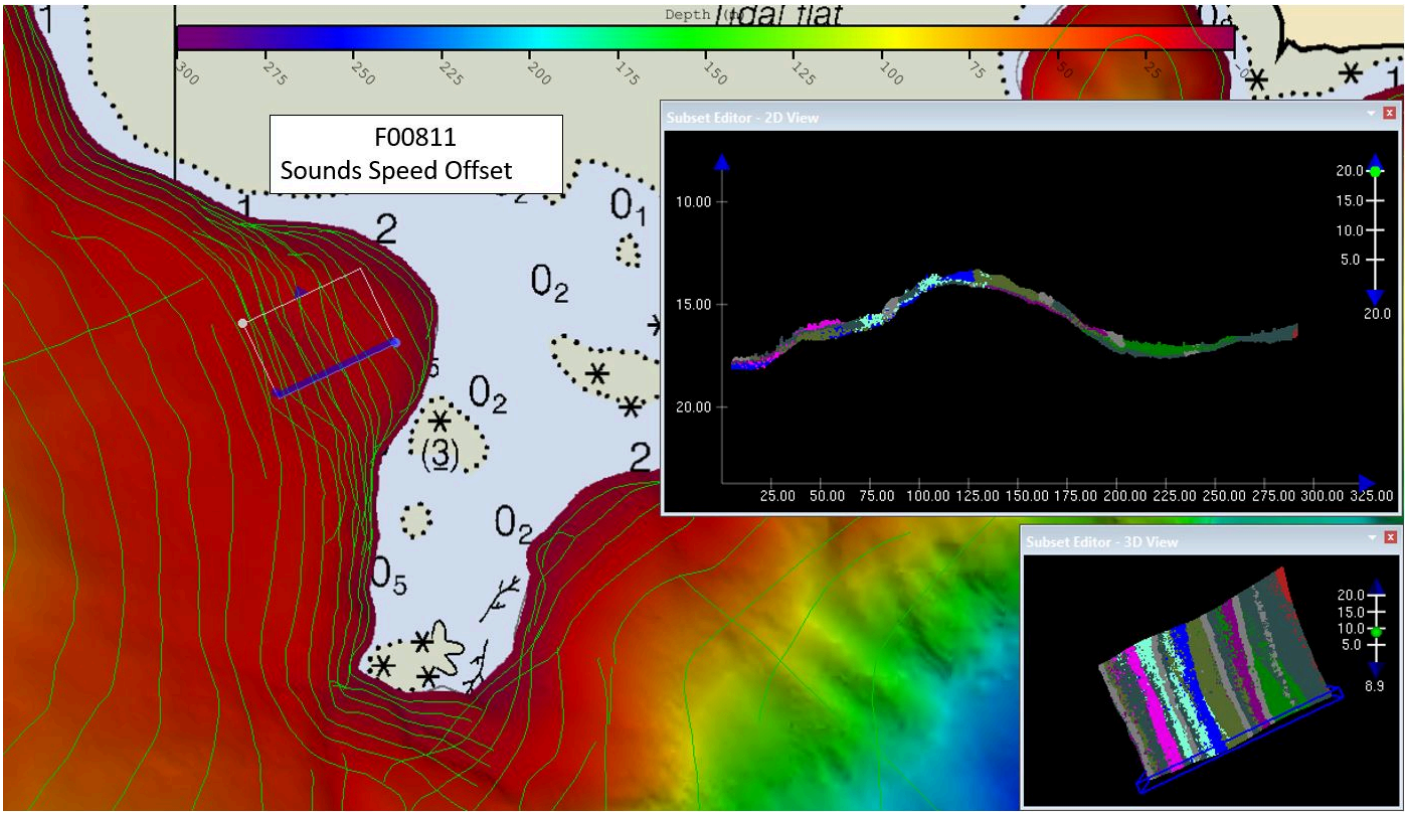


Figure 17: Example of area with suboptimal sound speed correction.

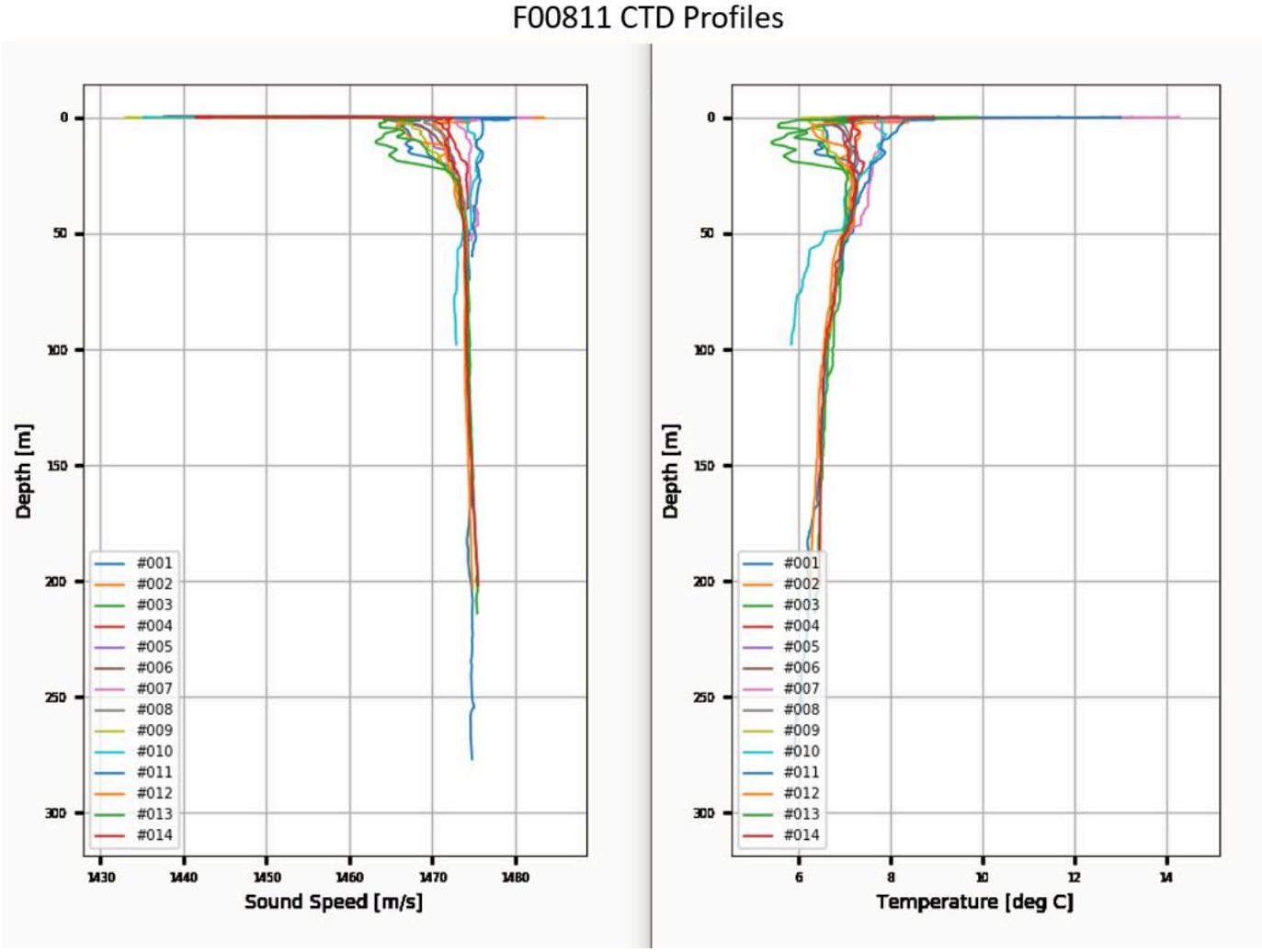


Figure 18: CTD casts taken during survey acquisition of F00811.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: At least once every 4 hours or as needed.

Fourteen 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 obtained using Sea-Bird 19plus SEACAT 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.

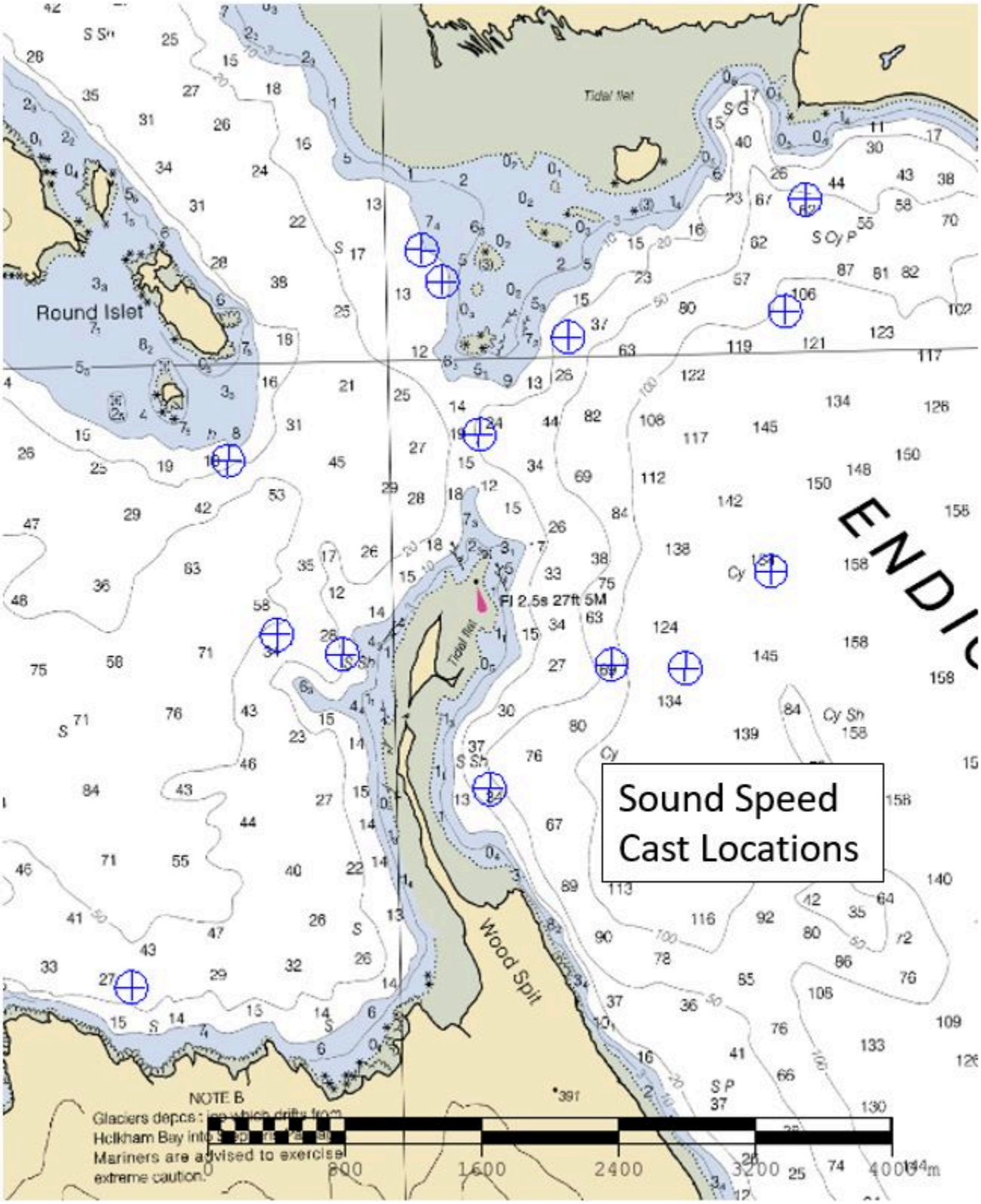


Figure 19: F00811 sound speed cast locations.

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.

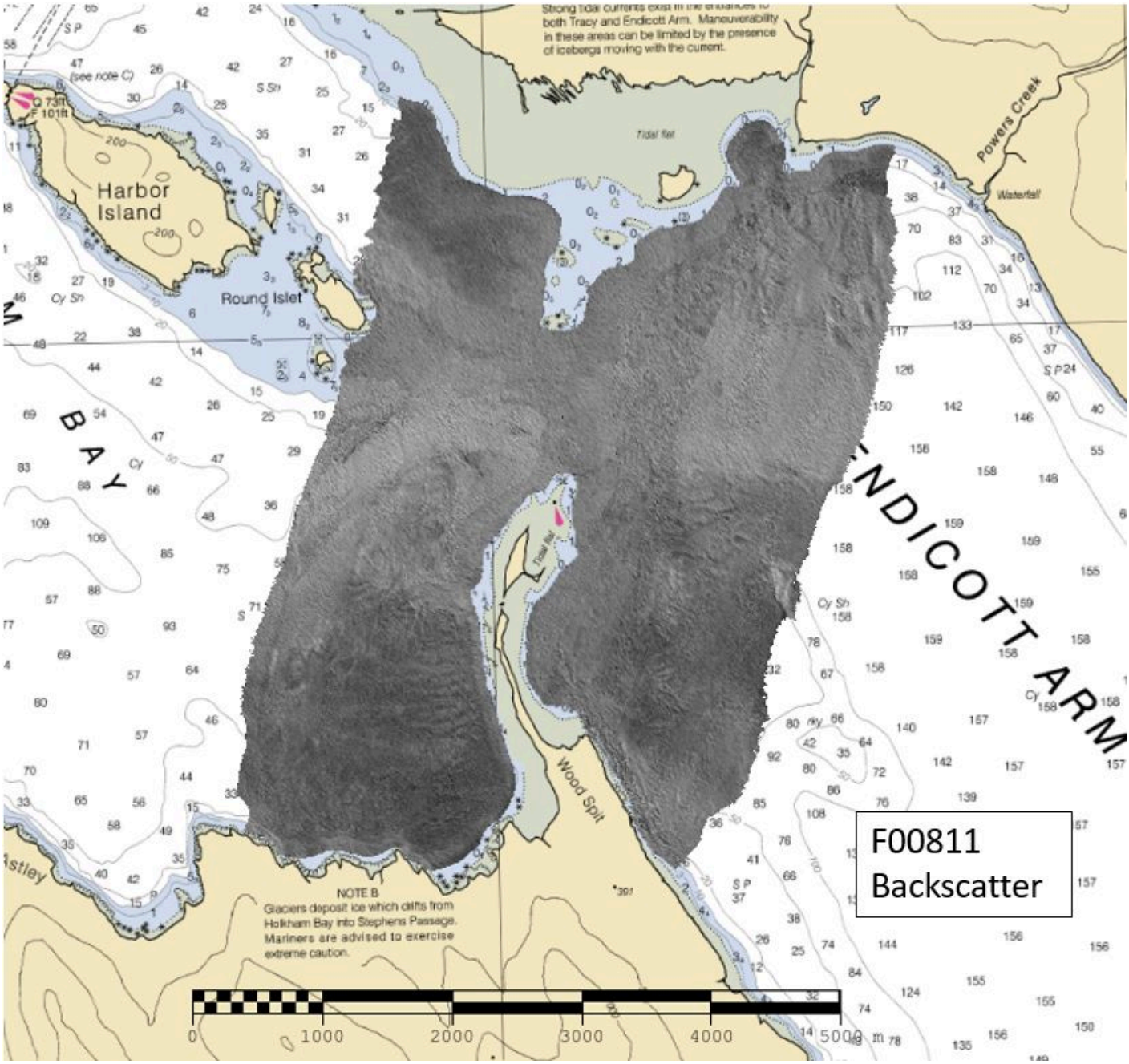


Figure 20: Overview of F00811 backscatter mosaics.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile Version 2020.

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
F00811_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	0.24 meters - 291.67 meters	NOAA_VR	Complete MBES
F00811_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	0.24 meters - 291.67 meters	NOAA_VR	Complete MBES

Table 10: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based (Ranges) Caris variable resolution bathymetric grids specified in the 2020 HSSD.

Pydro QC Tools Detect Fliers was used with default settings to find fliers in a finalized VR surfaces. Obvious noise was rejected by the hydrographer in Caris Subset Editor. After data cleaning, Detect Fliers was run again and found 1 potential flier in the Complete Coverage surface. It was investigated and found to be false. These were investigated and found to be false. The results of the Detect Fliers tool are included as .000 files in the Separates section of this report.

B.5.3 SBET Processing Method

Post Processed-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.4 SP2 software to produce SBETs for post-processing horizontal correction.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying DAPR

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-O392-FA-20_VDATUM_100m_NAD83_2011-MLLW.csar

Table 11: ERS method and SEP file

We used ellipsoid referenced GNSS derived heights and applied a separation model to reduce soundings to chart datum.

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 8.

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
US3AK3UM	1:217828	9	08/09/2018	02/21/2020
US5AK35M	1:40000	5	10/30/2018	04/20/2016

Table 12: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.3 Charted Features

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

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

Aids to navigation (ATONs) exist for this survey, but were not investigated.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Three bottom sample locations were assigned for F00811 after their positions were revised at the request of the hydrographer due to depth and the possibility of potentially new anchorage locations. There are no images to accompany bottom samples. The results of the bottom samples acquired are included in the F00811 Final Feature File submitted with this report.

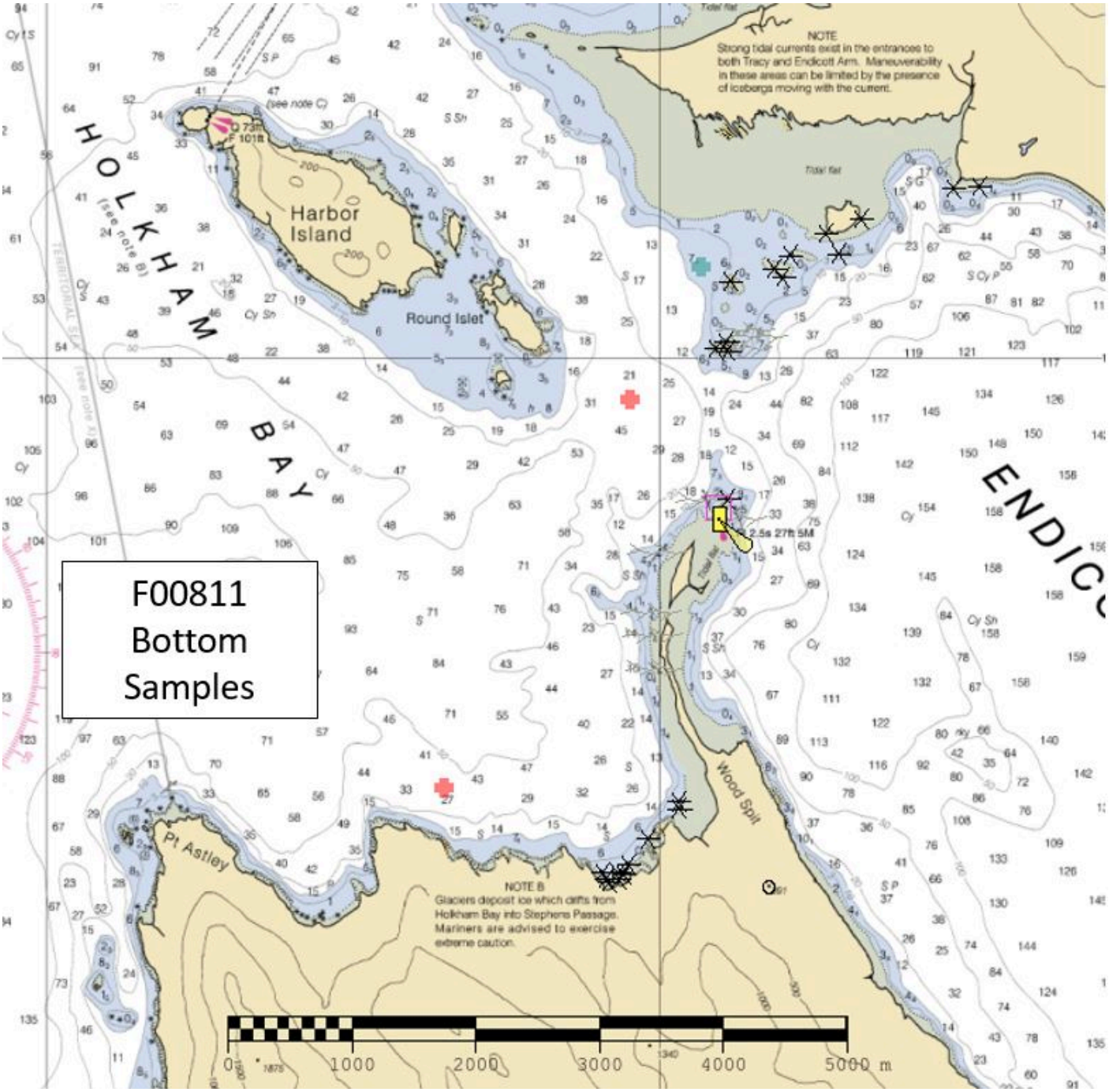


Figure 21: F00811 Bottom Samples.

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

Several icebergs carrying carrying large boulders or ice rafted debris were observed in the area of the survey grounds. It was also observed that several icebergs were stranded in shallow water in the survey area. This means that icebergs could be depositing large boulders in shallow water.

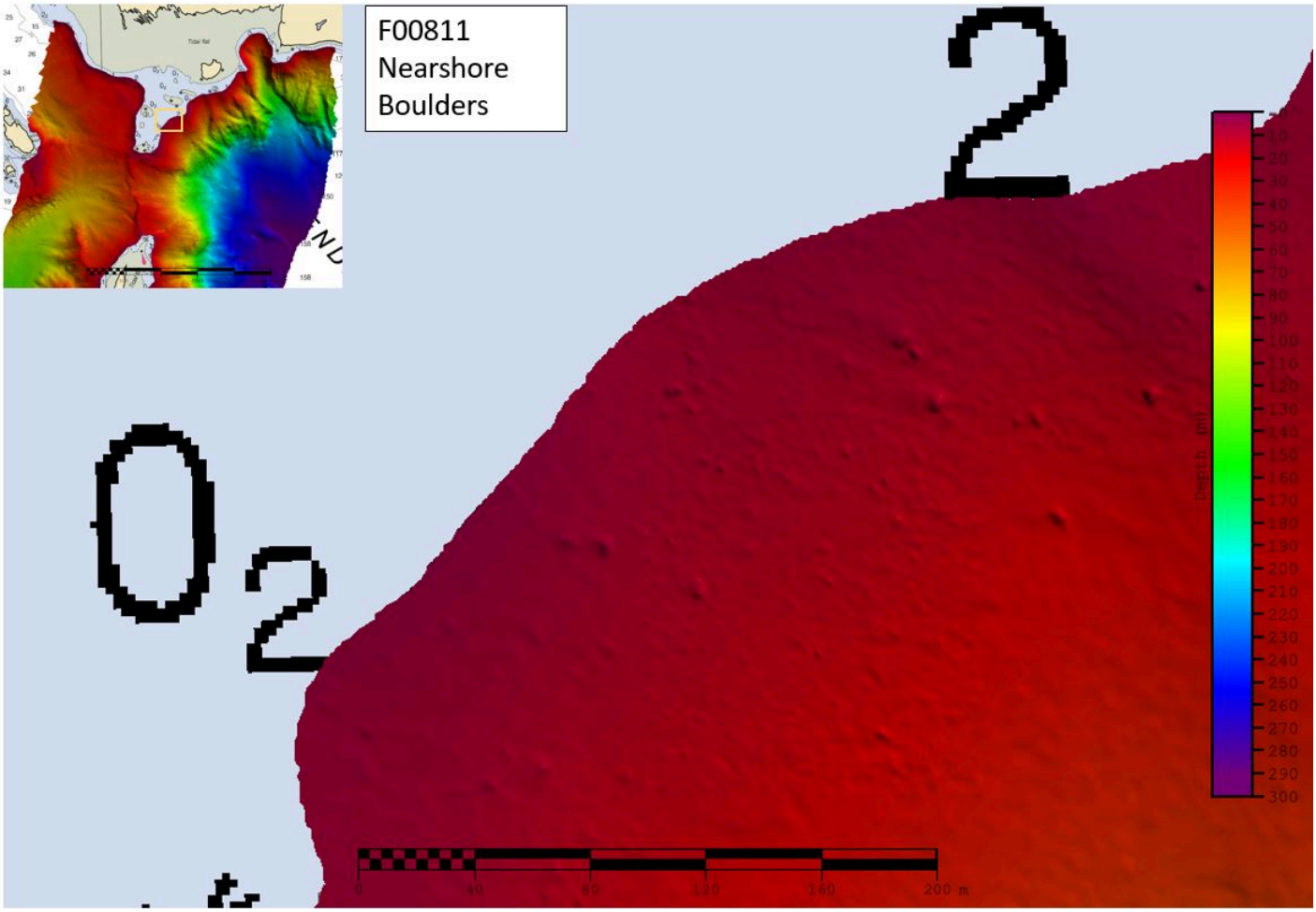


Figure 22: Example of F00811 surface, nearshore area with boulders.

Figure 23: Image of iceberg carrying sediment taken on transit to survey grounds.

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

No new ENC scales are recommended for this area.

E. Approval Sheet

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

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

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

Approver Name	Approver Title	Approval Date	Signature
Samuel F. Greenaway, CDR/ NOAA	Chief of Party	10/29/2020	Digitally signed by GREENAWAY.SAMUEL.F.1275635347 Date: 2020.10.30 10:57:04 -07'00'
Matthew B. Sharr, LT/ NOAA	Operations Officer	10/29/2020	SHARR.MATTHEW.BRANDON.1503637126 2020.10.29 13:56:22 -07'00'
James B. Jacobson	Chief Survey Technician	10/29/2020	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2020.10.29 13:59:20 -07'00'
Christina L. Brooks	Survey Technichian	10/29/2020	BROOKS.CHRISTINA.LORRAINE.1553513177 Digitally signed by BROOKS.CHRISTINA.LORRAINE.1553513177 Date: 2020.10.29 13:52:39 -07'00'

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

APPROVAL PAGE

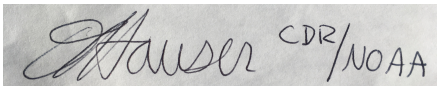
F00811

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- Bottom samples
- GeoPDF of survey products

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.



Digitally signed by HAUSER.OLIVIA.A.1275636009
Date: 2021.03.11 16:55:54 -08'00'

Approved:_____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch