

F00718

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: F00718

LOCALITY

State(s): Alaska

General Locality: Kodiak Island, AK

Sub-locality: West of Puffin Island

2019

CHIEF OF PARTY
Benjamin K. Evans CAPT/NOAA

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

F00718

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: **Kodiak Island, AK**

Sub-Locality: **West of Puffin Island**

Scale: **10000**

Dates of Survey: **05/16/2019 to 06/20/2019**

Instructions Dated: **04/16/2019**

Project Number: **OPR-P136-RA-19**

Field Unit: **NOAA Ship *Rainier***

Chief of Party: **Benjamin K. Evans CAPT/NOAA**

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:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via <http://www.ncei.noaa.gov/>.

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Descriptive Report to Accompany Survey F00718

Project: OPR-P136-RA-19

Locality: Kodiak Island, AK

Sublocality: West of Puffin Island

Scale: 1:10000

May 2019 - June 2019

NOAA Ship *Rainier*

Chief of Party: Benjamin K. Evans CAPT/NOAA

A. Area Surveyed

This survey is referred to as F00718, "West of Puffin Island" (Sheet 9). The assigned survey consists of two separate areas of approximately 0.37 square nautical miles in total within St. Paul Harbor just outside of the town of Kodiak, AK. In addition to the mainscheme coverage area, an attempt was made to address 13 underwater/awash rocks not fully addressed by 2017 surveys in nearby areas of Chiniak Bay. These rocks were not assigned in the project instructions but were provided in the composite source file from the project manager, and email traffic regarding these features can be found in Appendix II Supplemental Correspondance. Please refer to section D.2.1 of this report for more information.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
57° 46' 50.76" N 152° 27' 33.18" W	57° 44' 55.5" N 152° 25' 43.68" W

Table 1: Survey Limits

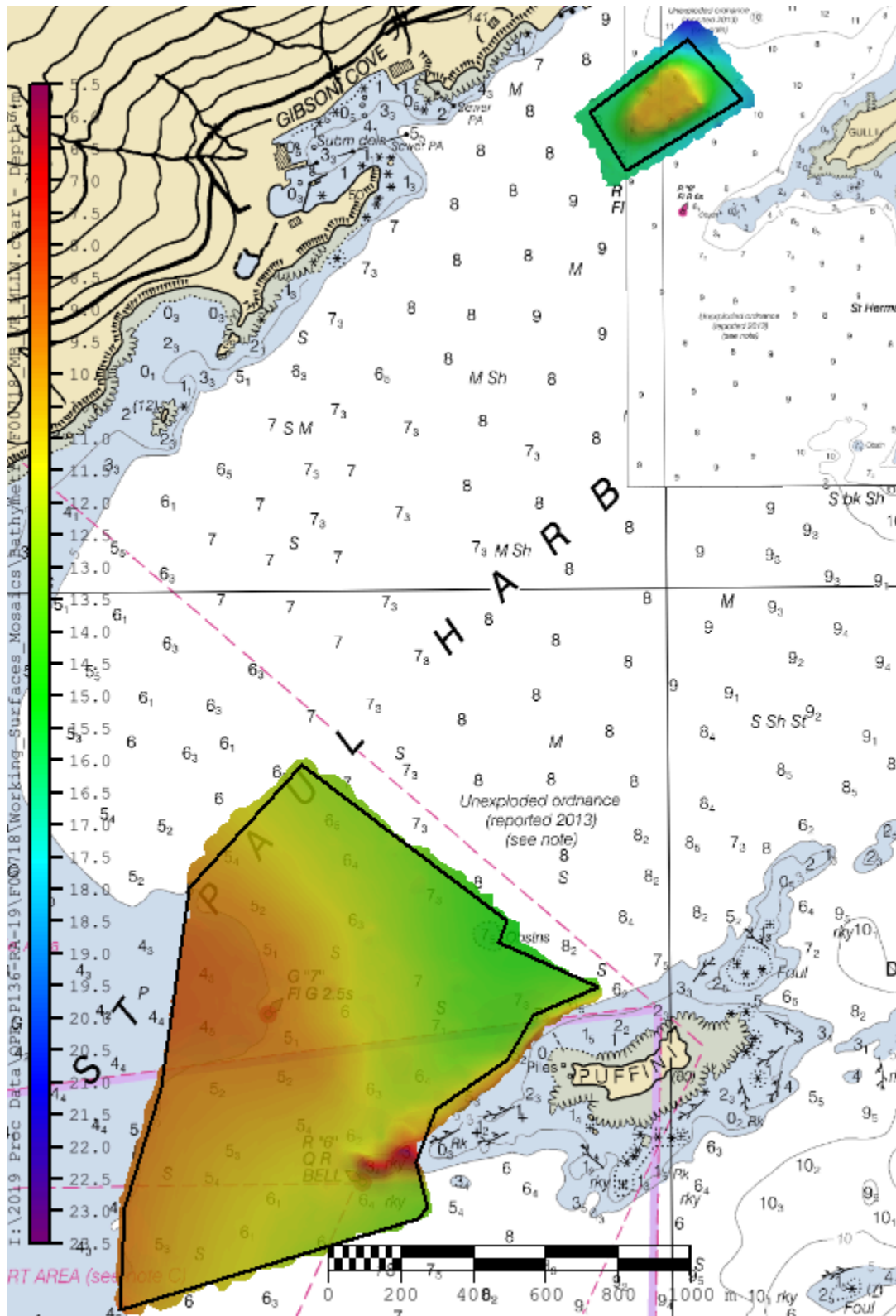


Figure 1: F00718 Survey Coverage and Assigned Coverage Area (depths in meters), with NOAA chart 16594.

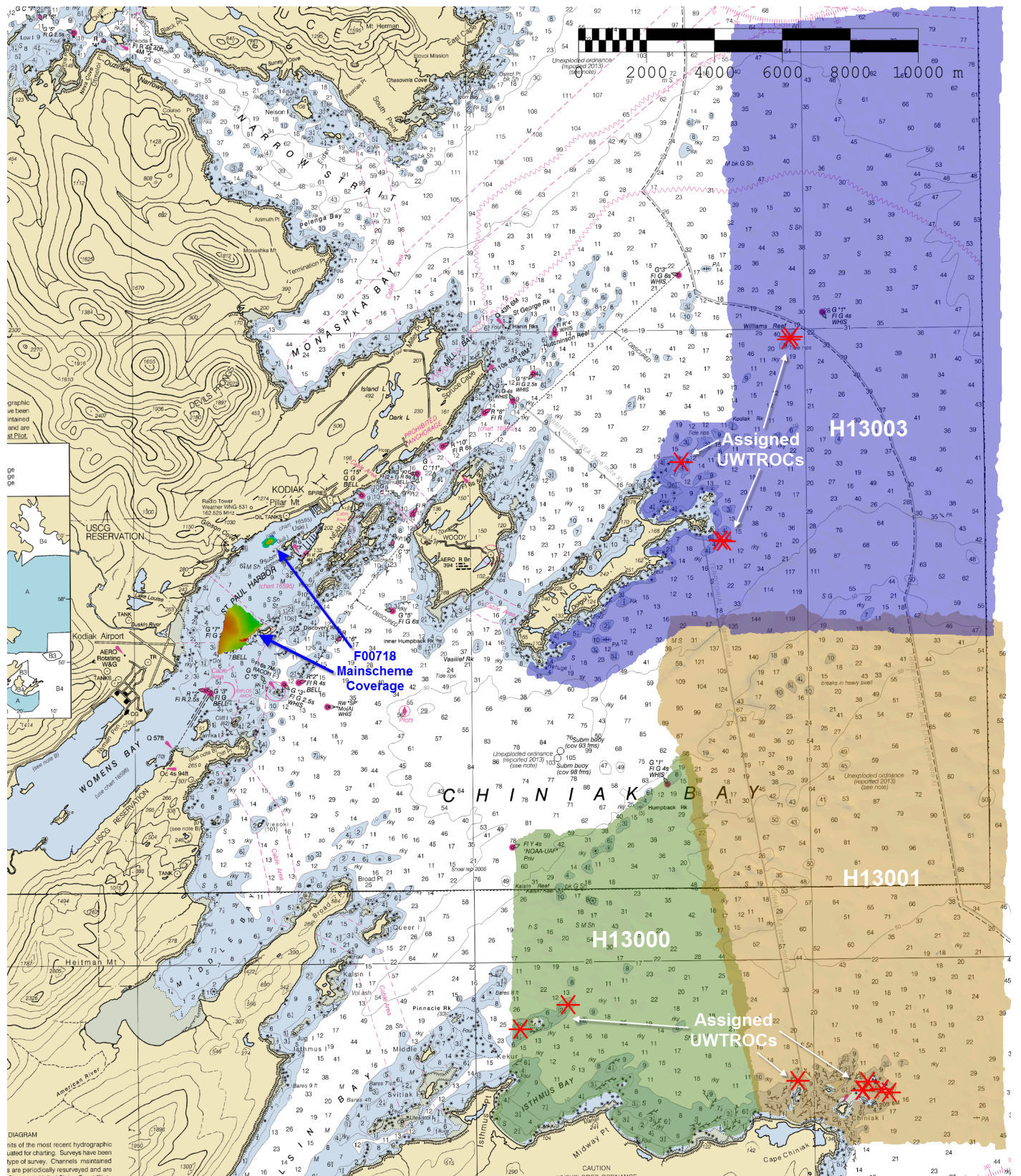


Figure 2: Locations of assigned UWTROCs with 2017 survey areas. F00718 mainscheme data, and NOAA charts 16593 and 16594 included for reference.

Data within the assigned survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD

A.2 Survey Purpose

The area of Chiniak Bay supports the third busiest and fourth richest fisheries port in the United States. Chiniak Bay is the gateway to Kodiak and has a survey vintage of 1933. In 2017, the Port of Kodiak was responsible for 530 million pounds of fish and \$152 million dollars of product.* This area has seen many groundings and near misses due to the number of dangers to navigation and pinnacles that exist in this area. The navigation of this area is further complicated by the number of vessels trying to enter and exit the Port of Kodiak via a choke point located at the channel entrance buoy. In recent years a number of groundings in and around the area have occurred, the most famous being a 174 foot Army Landing craft that was outbound to deliver goods to a remote village in western Alaska in 2012. This survey will serve to update the nautical charts with modern data to support the above need. *NOAA Fisheries of the United States 2017

In particular, this survey addresses two navigationally significant areas in St. Paul Harbor (Figure 1), the ultimate destination of the majority of traffic in the Chiniak Bay area. The two areas addressed with NOAA object detection standards are the area West of Puffin Island gated by the R "6" buoy and G"7" buoy, and an area of shoaling midchannel near the main cargo dock.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Pydro QC Tools 3 Grid QA was used to analyze F00718 multibeam echosounder (MBES) data density. The submitted F00718 finalized variable-resolution (VR) surface met HSSD density and object detection coverage requirements as shown in the histograms below.

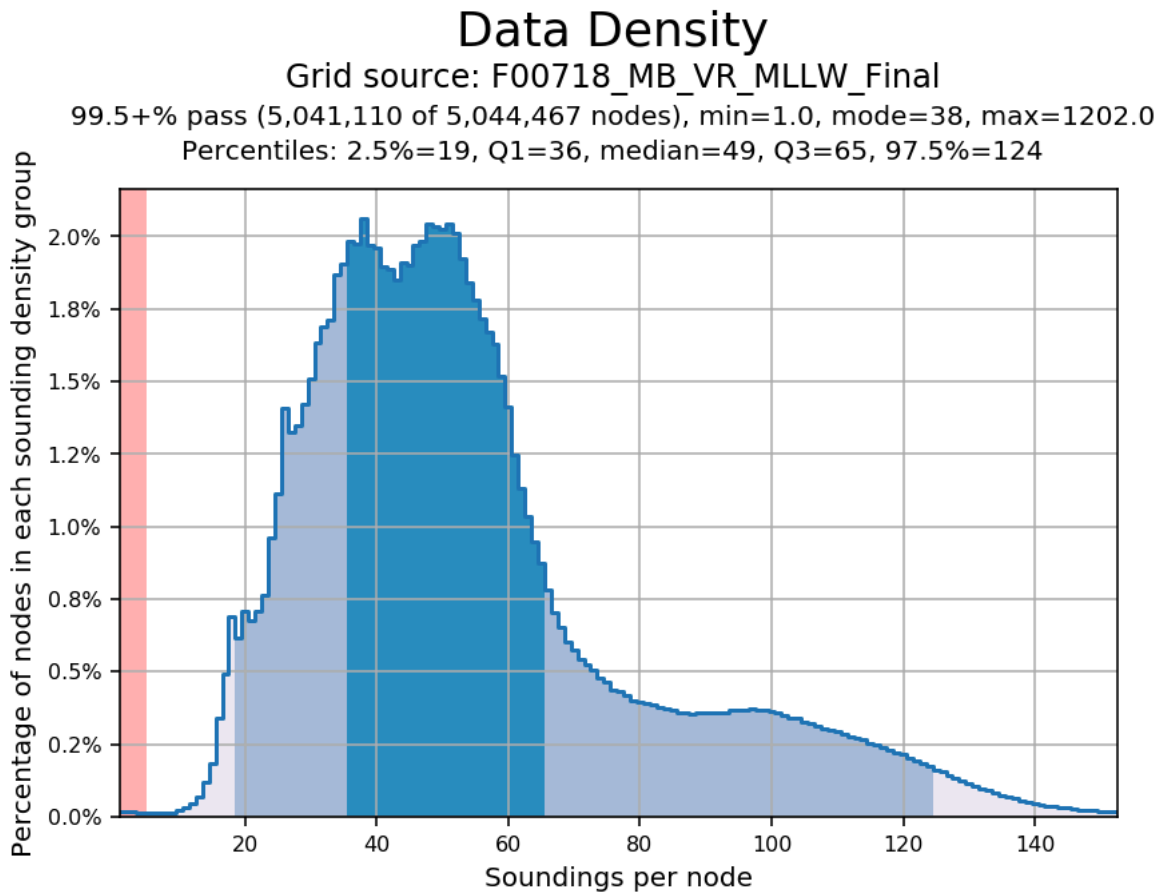


Figure 3: Pydro derived plot showing HSSD density compliance of F00718 finalized variable-resolution MBES data.

Resolution Requirements - Object Detection

Grid source: F00718_MB_VR_MLLW_Final

99.5+% pass (5,044,262 of 5,044,467 nodes), min=0.50, mode=1.0, max=2.00

Percentiles: 2.5%=1.0, Q1=1.0, median=1.0, Q3=1.0, 97.5%=1.0

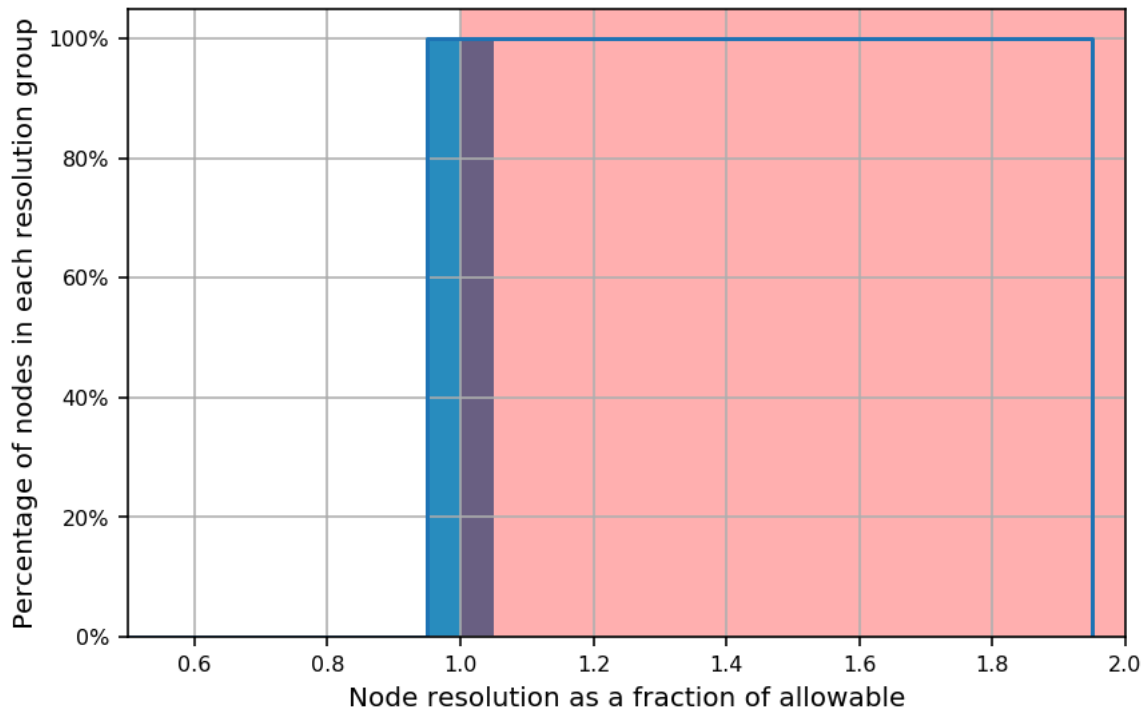


Figure 4: Pydro derived plot showing F00718 finalized variable-resolution MBES data complies with HSSD required resolution standards for object detection coverage.

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 (Refer to HSSD section 6.2)

Table 2: Survey Coverage

Coverage area assigned by project manager differed slightly from initial area assigned by the Alaska Navigation Manager for this survey, partially because of the requirement for a junction analysis with survey F00646 in the project instructions. To compensate for any potential discrepancy resulting in inadequate coverage, coverage was obtained over an area encompassing both boundaries. This was approved verbally by

the project manager in the field, and because of the small nature of the discrepancies in the assigned areas, it did not result in any significant acquisition time wasted.

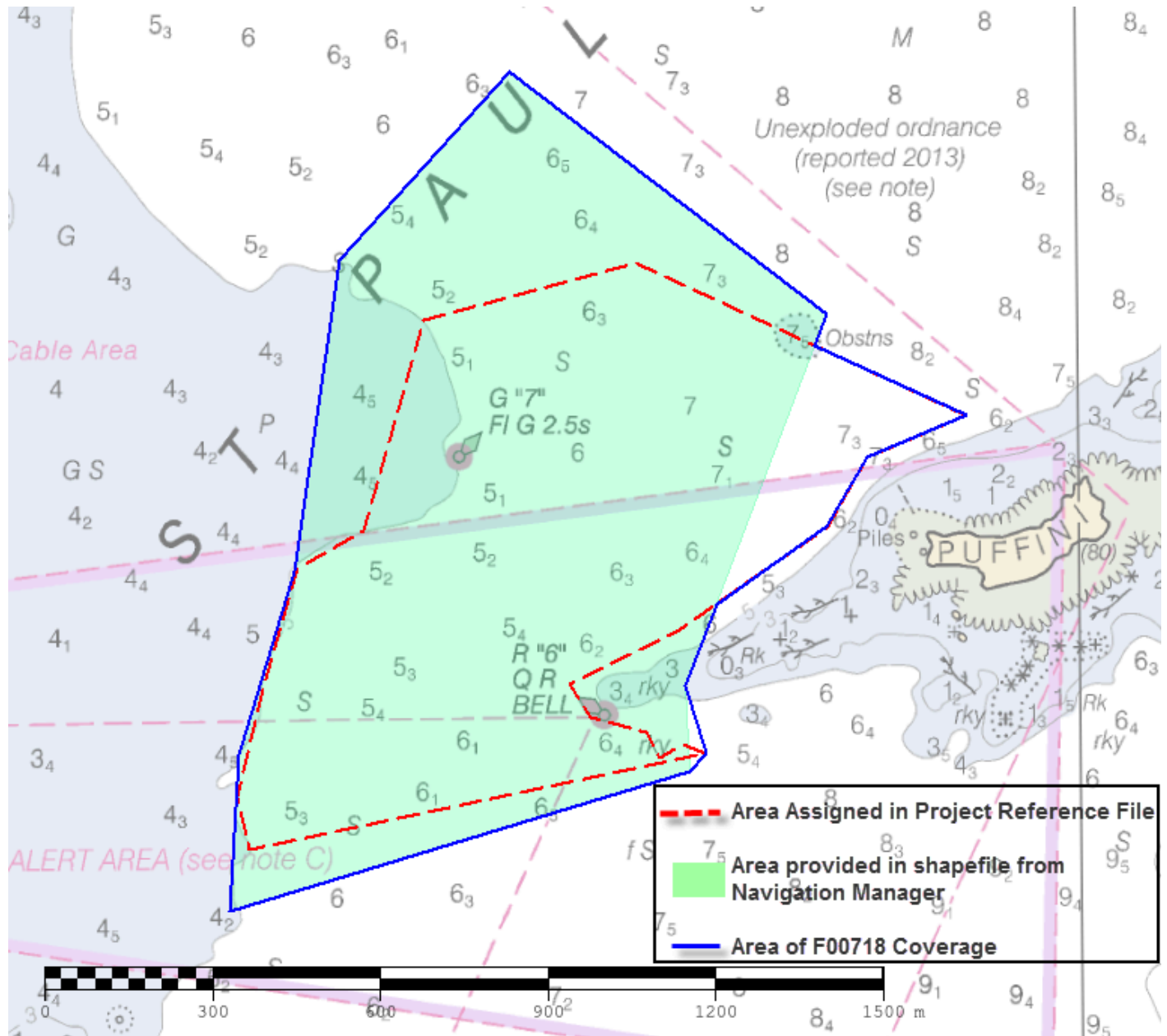


Figure 5: Two different coverage areas provided with F00718 southern acquisition area. Blue line represents area where data was acquired.

A.6 Survey Statistics

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

	HULL ID	<i>2801</i>	<i>Total</i>
LNM	SBES Mainscheme	0	0
	MBES Mainscheme	20.08	20.08
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	1.15	1.15
	Lidar Crosslines	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			0.37

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/16/2019	136
06/20/2019	171

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>2801</i>	<i>2701</i>
LOA	8.8 meters	7.6 meters
Draft	1.1 meters	0.47 meters

Table 5: Vessels Used



Figure 6: RAINIER Launch 2801, with Launch 2701 in the background

All MBES data for F00718 were acquired by NOAA Ship RAINIER survey launch 2801, which acquired depth soundings, backscatter imagery, and sound speed profiles. RAINIER survey launch 2701 acquired SBES data which which was unable to fully address assigned features due to equipment misconfiguration. Refer to section D.2.1 of this report for more information.

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040	MBES
Applanix	POS MV 320 v5	Positioning and Attitude System
Sea-Bird Scientific	SBE 19plus	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Teledyne Odom Hydrographic	Echotrac CV200	SBES

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

RAINIER launch 2801 collected 1.15 nm of crosslines across varying depth ranges and over both areas encompassed by the survey. The crosslines were collected on a separate day from mainscheme coverage. The hydrographer deems them adequate for verifying and evaluating the internal consistency of F00718 mainscheme survey data. Crossline analysis was performed using the Compare Grids function in Pydro Explorer on variable-resolution surfaces of F00718 mainscheme only and crossline only data. 99.5+% of nodes met allowable uncertainties as shown in Pydro generated histograms below.

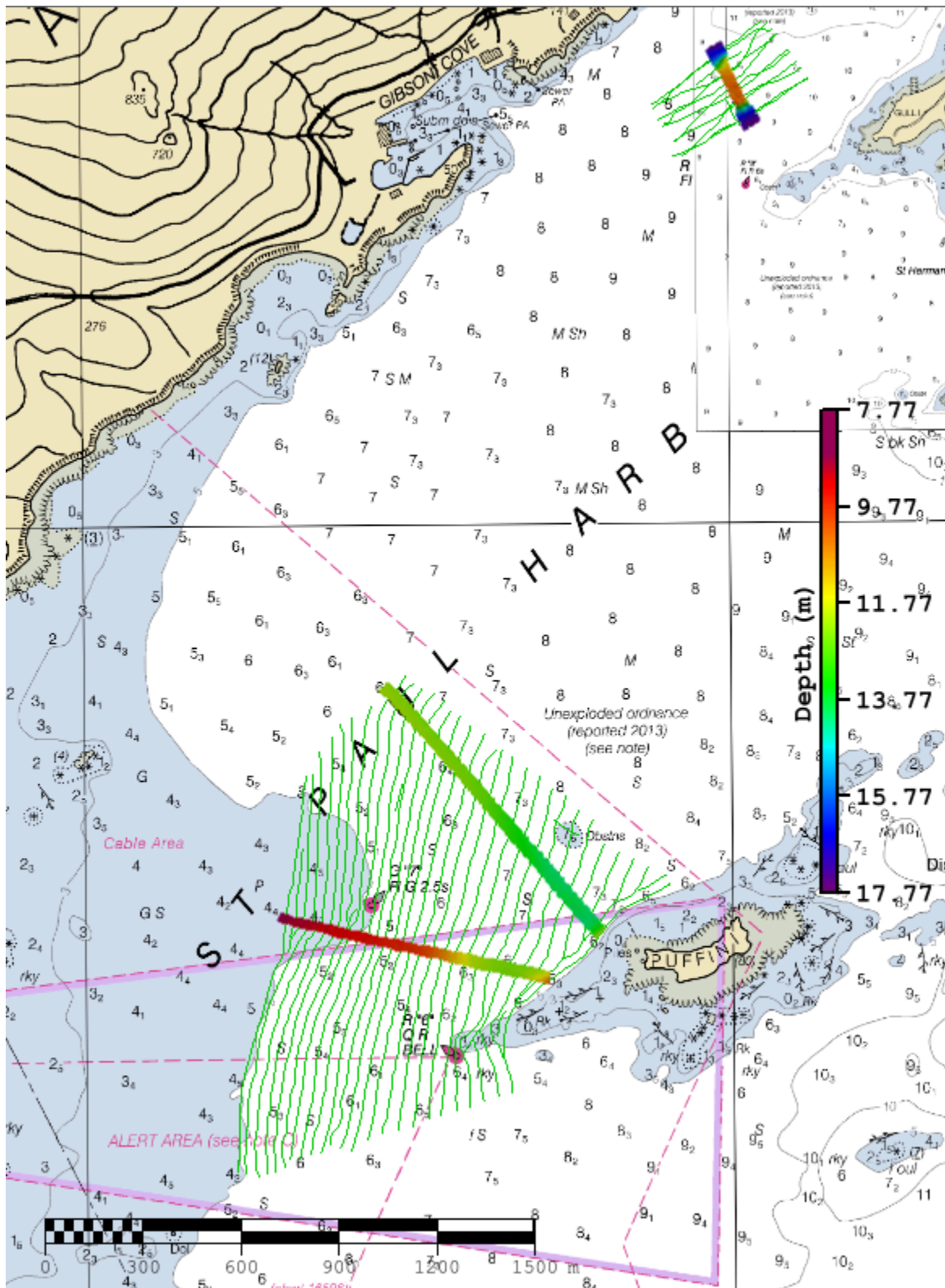


Figure 7: F00718 Crosslines Overlaid on Mainscheme Tracklines. Depths in meters

Comparison Distribution

Per Grid: F00718_MSOnly_VR_MLLW-F00718_XL_VR_MLLW_Final_fracAllowErr.csar

100% nodes pass (320763), min=0.00, mode=0.01 mean=0.04 max=0.50

Percentiles: 2.5%=0.00, Q1=0.02, median=0.03, Q3=0.05, 97.5%=0.10

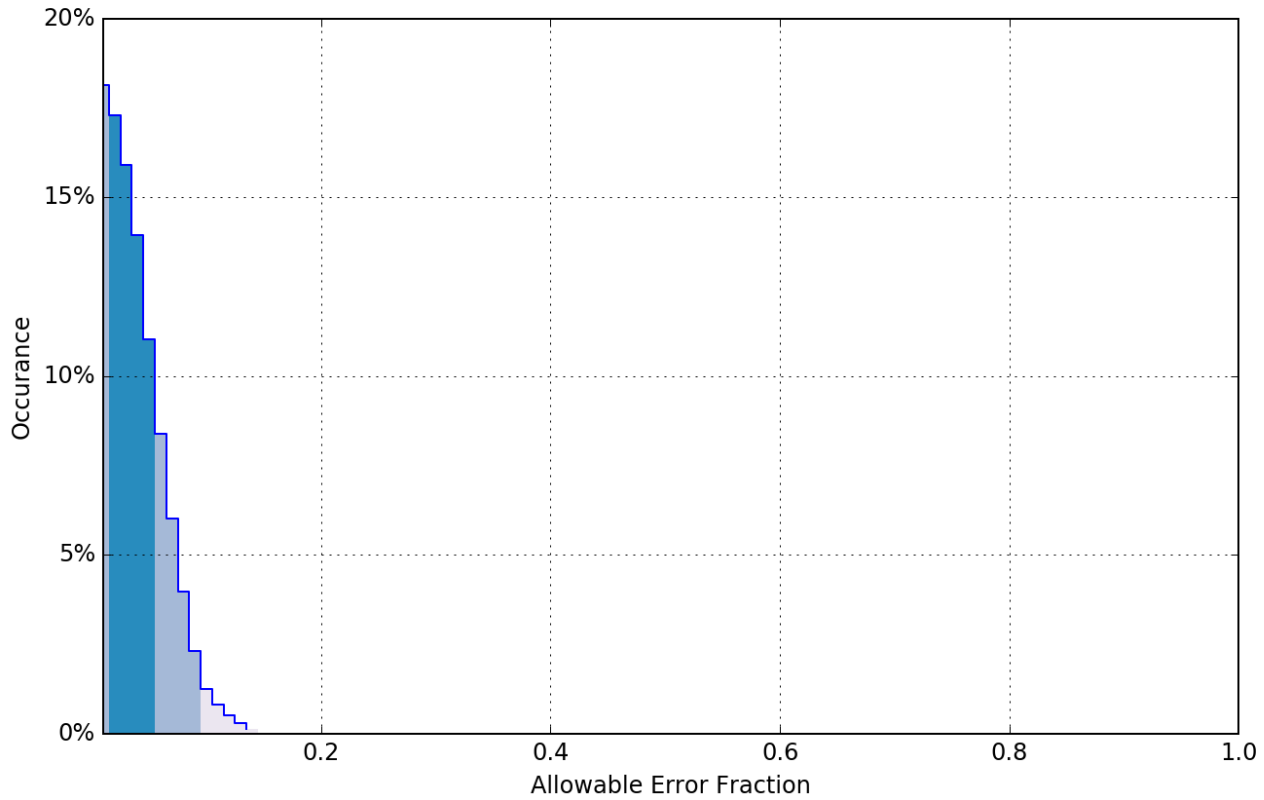


Figure 8: Pydro derived plot showing node percentage-pass value of F00718 mainscheme to crossline data.

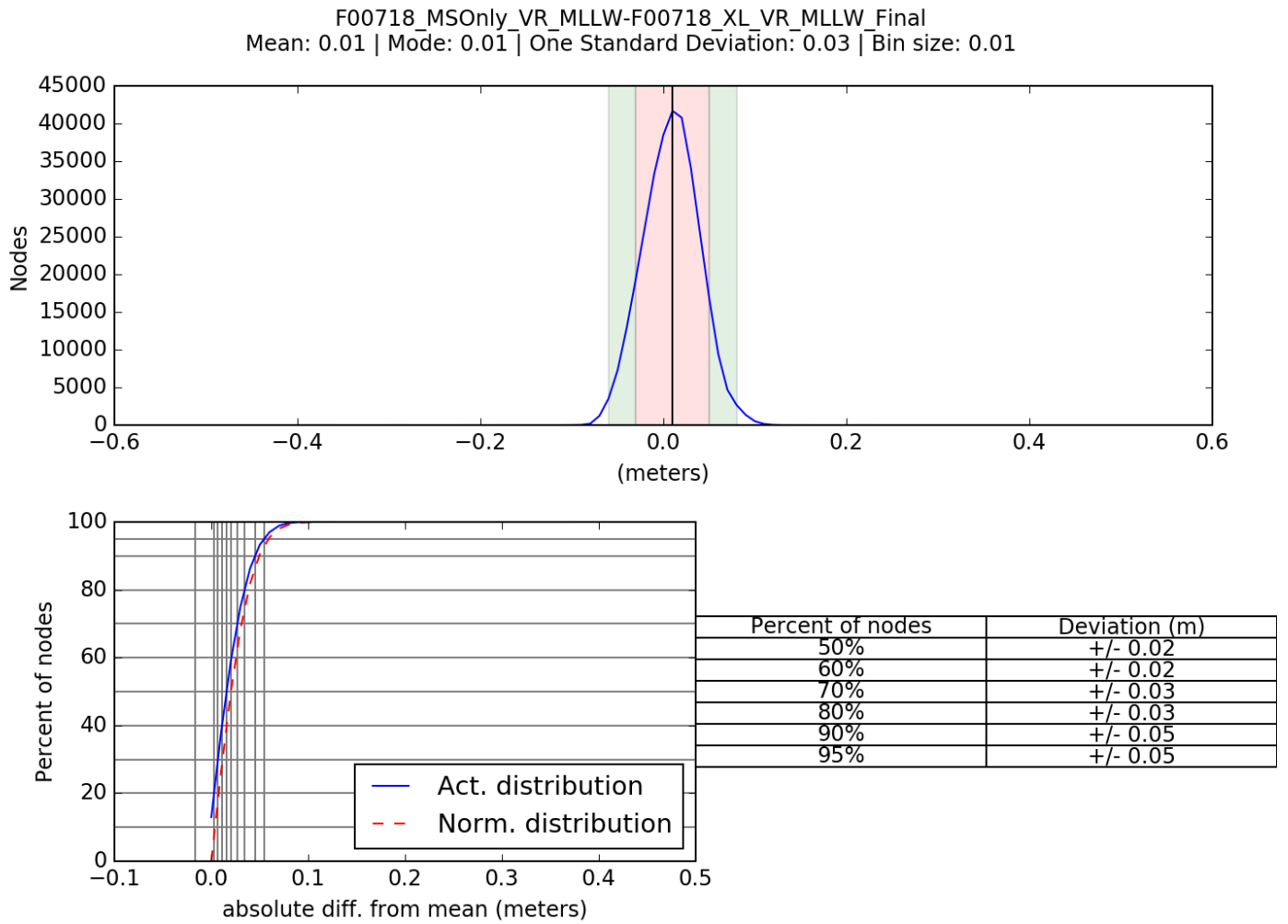


Figure 9: Pydro derived plot showing absolute difference statistics of F00718 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0 meters	0.15 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
2801	3 meters/second	N/A meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey F00718 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. The uncertainty for the Ellipsoidally Referenced Tidal Datum Model (ERTDM) used to reduce data to the ellipse was determined to be 0.15 m based on a conservative modeling of uncertainty for the separation model. Please see Appendix II Supplemental Correspondence for more details.

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 from Kongsberg MBES sonars were recorded and applied in post-processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were also applied during post-processing. Finally, the postprocessed uncertainties associated with vessel position and attitude were applied in Caris HIPS using SBET and RMS files generated using POSpac MMS software.

Uncertainty values of the submitted finalized grid was calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA within Pydro QC Tools 3 was used to analyze F00718 Total Vertical Uncertainty (TVU) compliance, a histogram plot of the results is shown below.

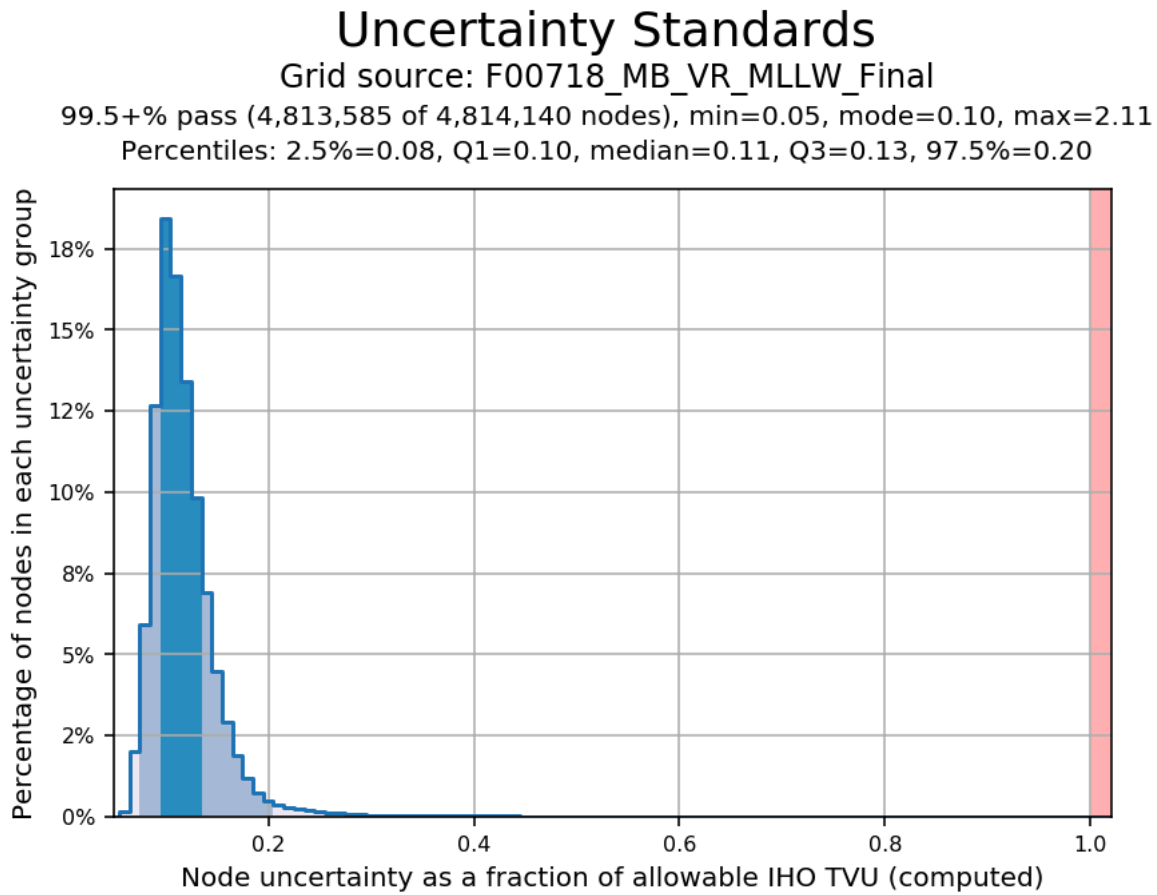


Figure 10: Pydro derived plot showing TVU compliance of F00718 finalized multi-resolution MBES data

B.2.3 Junctions

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
F00646	1:10000	2014	NOAA Ship RAINIER	E

Table 9: Junctioning Surveys

F00646

The junction with 2014 survey F00646 encompassed approximately 0.02 square nautical miles along the southeastern boundary of the southern section of F00718 (Figure 11). The finalized VR surface from F00718 was compared with the 50 cm resolution surface from F00646. Pydro's Compare Grids results showed that 99.5+% of nodes in the common area met NOAA allowable error standards (Figure 12).

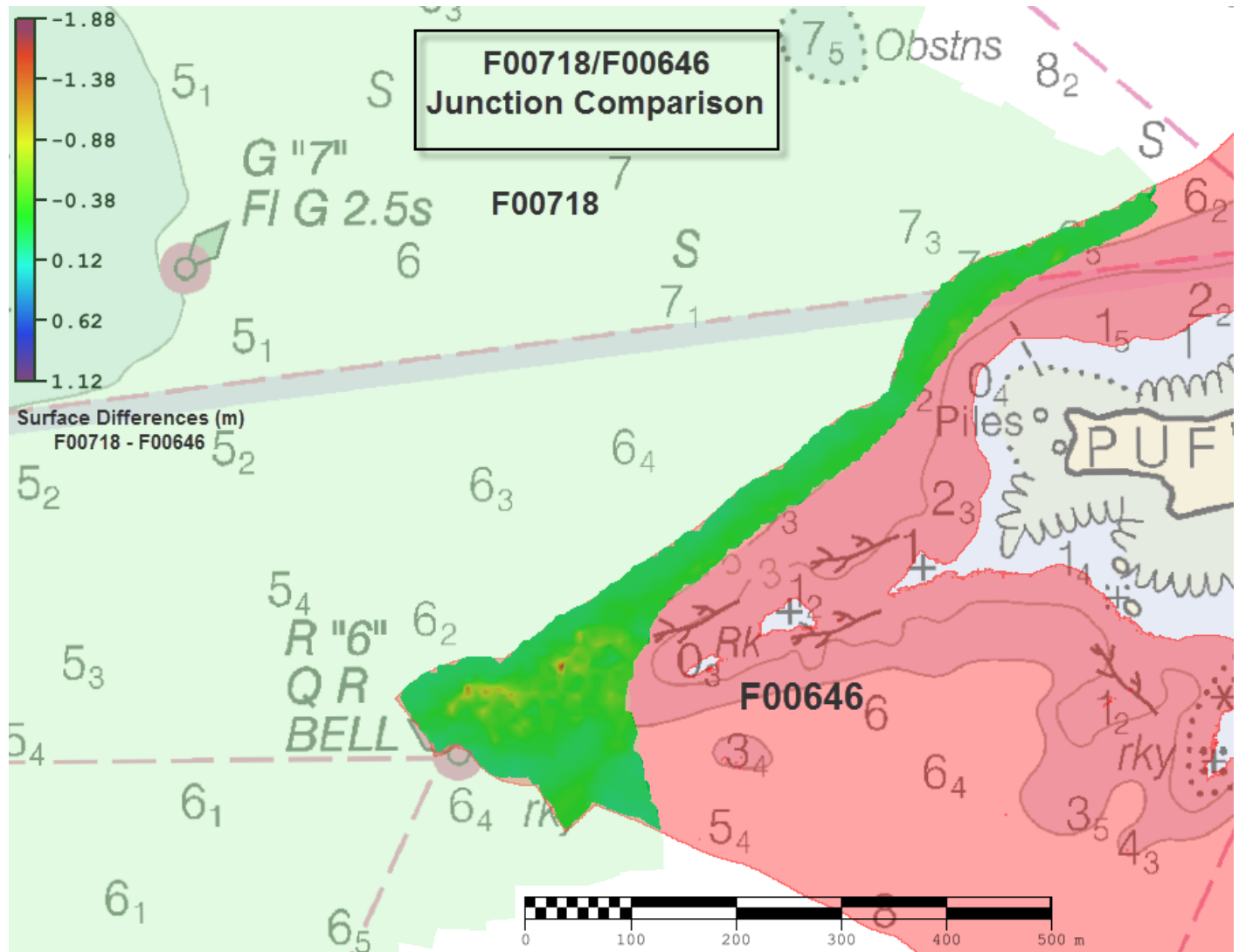


Figure 11: F00718/F00646 Junction Comparison

Comparison Distribution

Per Grid: F00718_MB_VR_MLLW_Final-F00646_MB_50cm_MLLW_1of3_fracAllowErr.csar

99.5+% nodes pass (213293), min=0.0, mode=0.2 mean=0.2 max=1.6

Percentiles: 2.5%=0.0, Q1=0.1, median=0.2, Q3=0.2, 97.5%=0.4

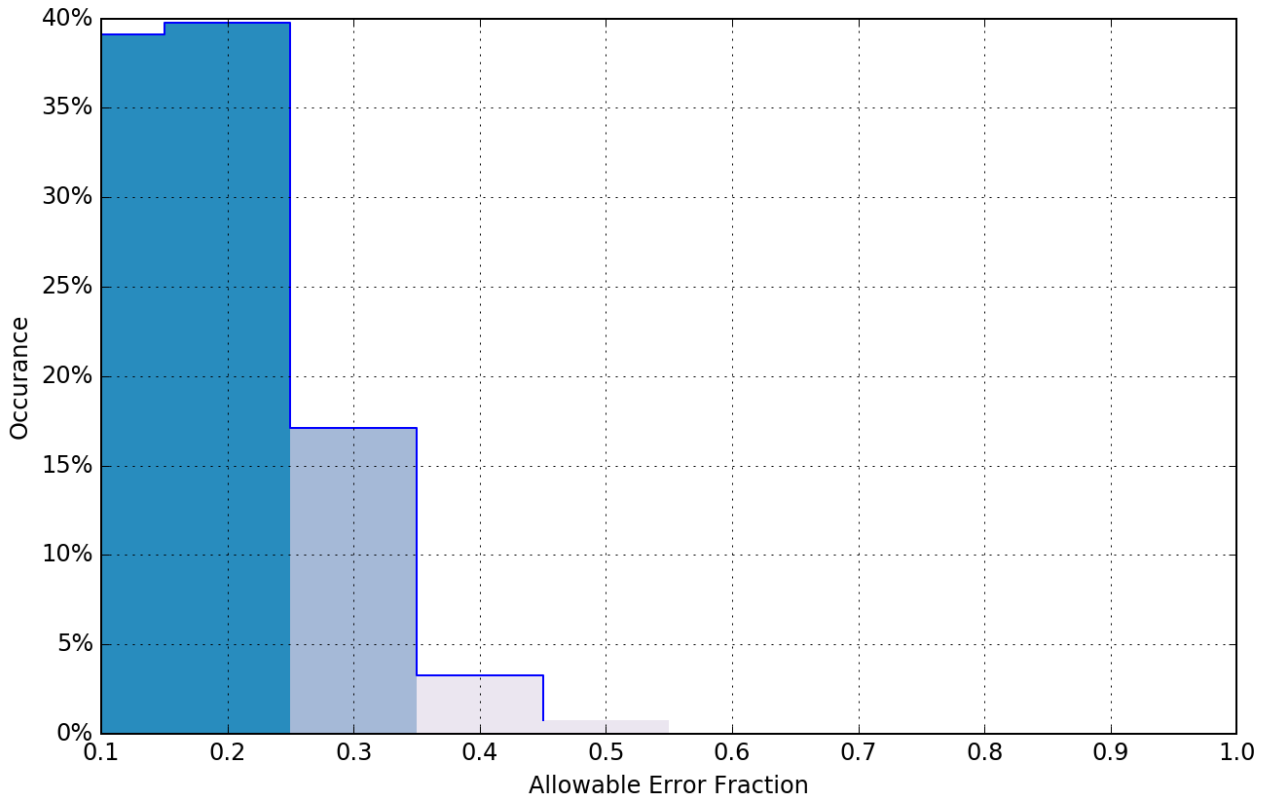


Figure 12: Fraction of allowable error for F00718/F00646 junction

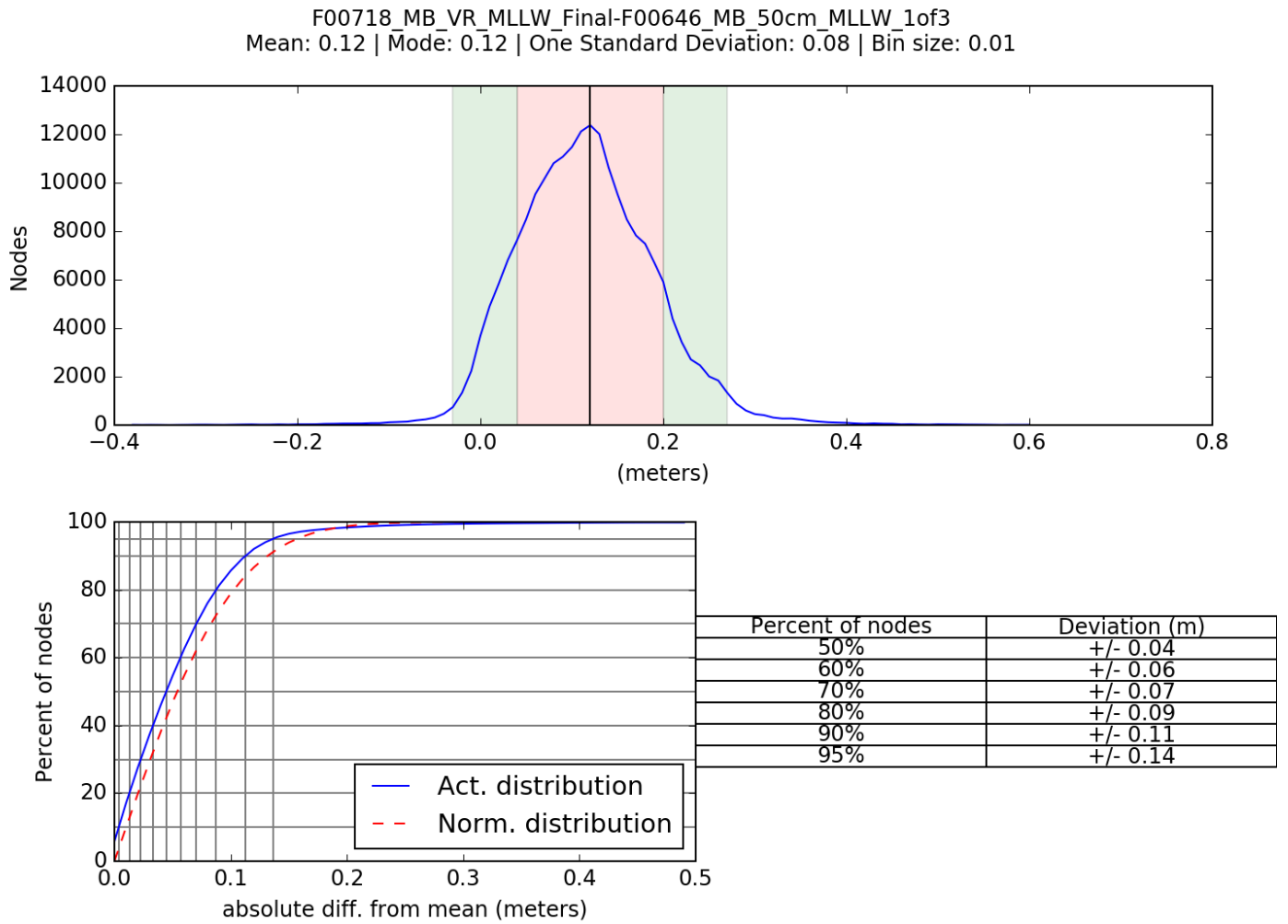


Figure 13: Pydro derived plot showing F00718/F00646 VR surface comparison statistics

B.2.4 Sonar QC Checks

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

B.2.5 Equipment Effectiveness

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

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Once every four hours, which equated to one cast in both geographical areas, and one cast in between the areas during crossline acquisition.

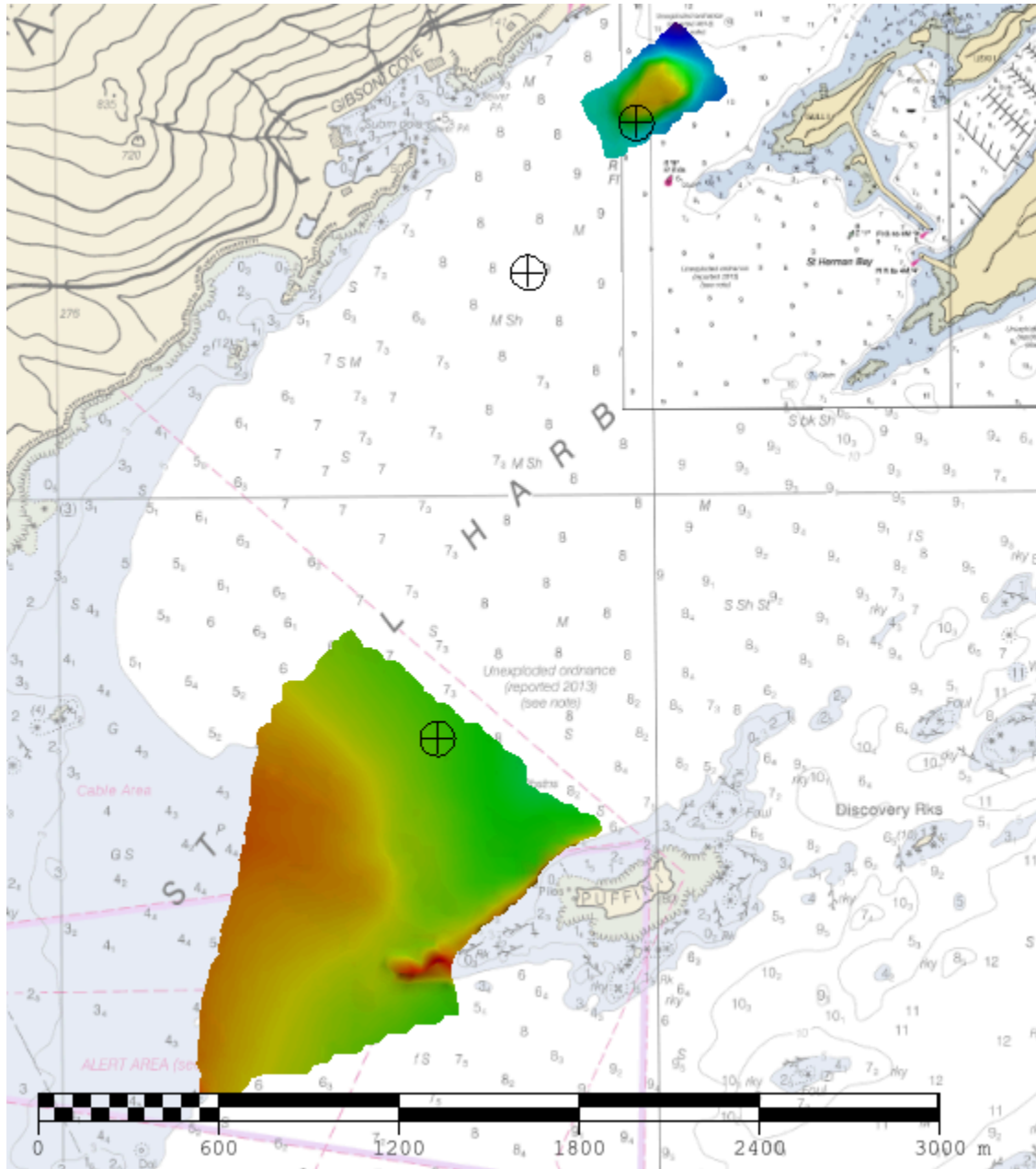


Figure 14: F00718 Cast Locations: One cast taken in each area of mainscheme collection. Cast in between the two areas was used for crossline and holiday acquisition to maximize efficiency.

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

Raw backscatter data was acquired as .all files logged during MBES operations and subsequently processed by personnel aboard RAINIER. Two backscatter mosaics were created, one for each of the two sections of the survey. The .GSF files created during processing and one backscatter mosaic per vessel per frequency has been delivered with this report. Backscatter processing procedures are described in the DAPR.

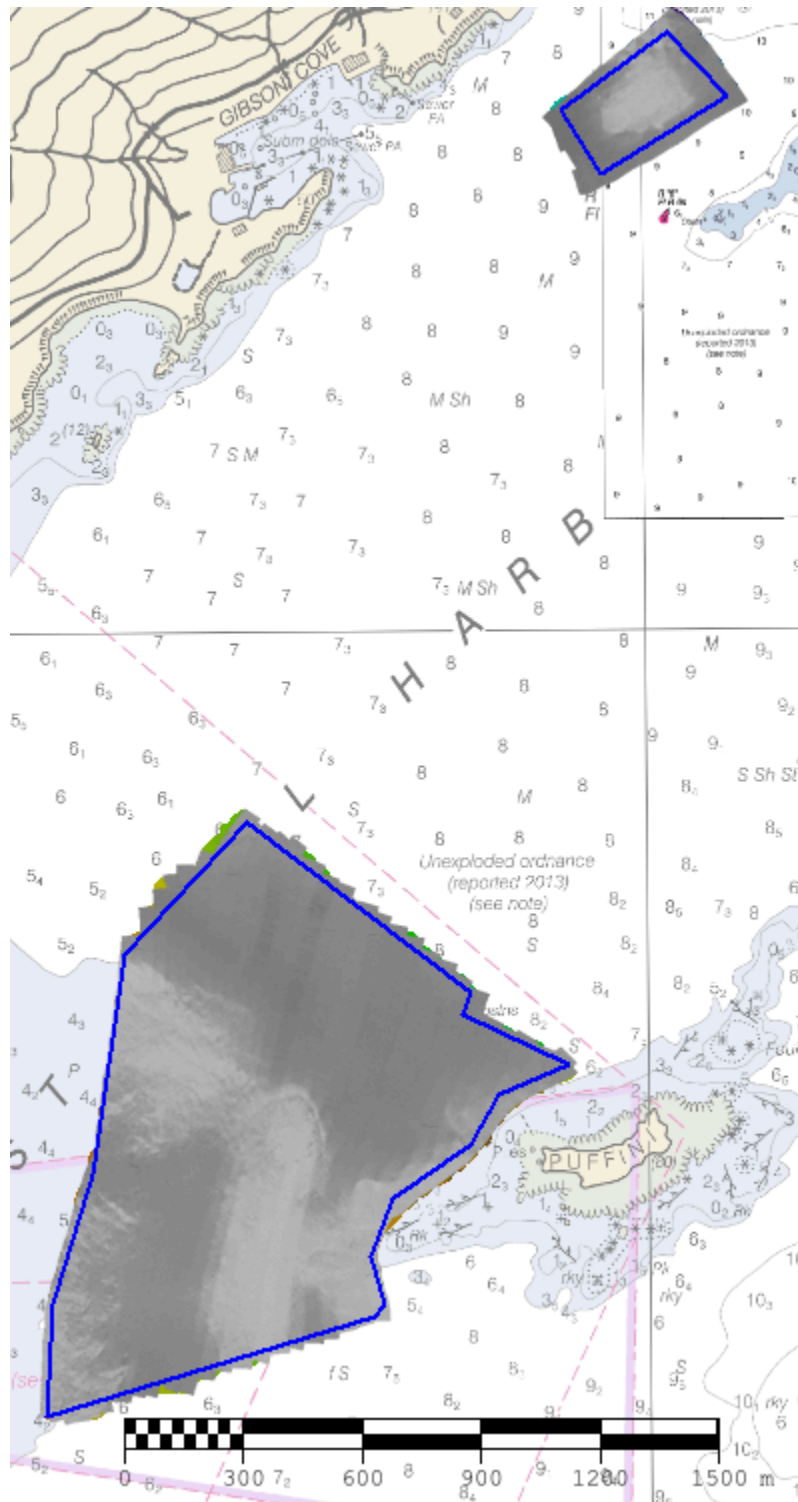


Figure 15: Overview of F00718 backscatter mosaics

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
CARIS	HIPS/SIPS	11.1

Table 10: Primary bathymetric data processing software

The following software program was the primary program used for imagery data processing:

Manufacturer	Name	Version
QPS	Fledermaus Geocoder Tool Box (FMGT)	7.8.1

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile V_5_7.

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
F00718_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	5.6 meters - 21.8 meters	NOAA_VR	Object Detection
F00718_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	5.6 meters - 21.8 meters	NOAA_VR	Object Detection

Table 12: Submitted Surfaces

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 ERTDM	P136RA2019_ERTDM_NAD83-MLLW.csar

Table 13: 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 5.

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.

C.3 Additional Horizontal or Vertical Control Issues

C.3.1 SBET Processing Method

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.3 software to produce SBETs for post-processing horizontal correction.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between F00718 survey data and Electronic Navigational Charts (ENC) US5AK5EM and US5AK5DM using CUBE surfaces, selected soundings and contours created in Caris.

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
US5AK5EM	1:120000	15	12/04/2017	07/17/2019
US5AK5DM	1:10000	13	12/04/2017	07/10/2018

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

The northern portion of MBES coverage addresses a charted shoal area, and found no significant deviation from charted soundings. No further shoals or uncharted hazards were discovered.

D.1.3 Charted Features

One underwater obstruction was investigated and verified. The ENC US5AK5DM shows a charted least depth for this obstruction of 14.3 meters. The shoalest soundings from F00718 survey data were found to be 14.2-14.3 m, in the same location as the charted obstruction.

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

Charted buoys R6 and G7 marking the entrance to St. Paul Harbor west of Puffin Island were included in the survey area. Both buoys appeared to be on station and serving their intended purpose.



Figure 16: Buoy G7 on station. Buoy R6 was also observed on station.

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 and/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 insets 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
Benjamin K. Evans CAPT/NOAA	Chief of Party	10/03/2019	 Digitally signed by EVANS.BENJAMIN.K.1237217094 Date: 2019.10.03 16:06:41 -07'00'
HCST James Jacobson	Chief Survey Technician	10/03/2019	 JACOBSON.JAMES.BRYAN.126 9664017 I have reviewed this document 2019.10.03 13:56:29 -07'00'
Hadley Owen LT/NOAA	Field Operations Officer	10/03/2019	 Digitally signed by OWEN.HADLEY.ANNE.141 0967070 Date: 2019.10.03 13:02:46 -07'00'
Nicholas Azzopardi LTJG/NOAA	Sheet Manager	10/03/2019	 Digitally signed by AZZOPARDI.NICHOLAS.JA MES.1539165093 Date: 2019.10.03 12:59:41 -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

F00718

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
- 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.

Approved: _____

James Miller, NOAA

Chief (acting), Pacific Hydrographic Branch