H13398

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13398

LOCALITY

State(s):	Alaska
General Locality:	Glacier Bay, AK
Sub-locality:	Northwest Glacier Bay

2021

CHIEF OF PARTY
CDR John Lomnicky

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13398**

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:	**Glacier Bay, AK**
Sub-Locality:	**Northwest Glacier Bay**
Scale:	**10000**
Dates of Survey:	**09/30/2020 to 10/04/2020**
Instructions Dated:	**08/19/2020**
Project Number:	**OPR-O351-FA-20**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR John Lomnicky**
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 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.

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Descriptive Report to Accompany Survey H13398

Project: OPR-O351-FA-20

Locality: Glacier Bay, AK

Sublocality: Northwest Glacier Bay

Scale: 1:10000

September 2020 - October 2020

NOAA Ship *Fairweather*

Chief of Party: CDR John Lomnicky

A. Area Surveyed

The survey area is located in Northwest Glacier Bay, Alaska.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
59° 3' 31.45" N 137° 8' 54.87" W	58° 44' 10.16" N 136° 28' 22.25" W

Table 1: Survey Limits

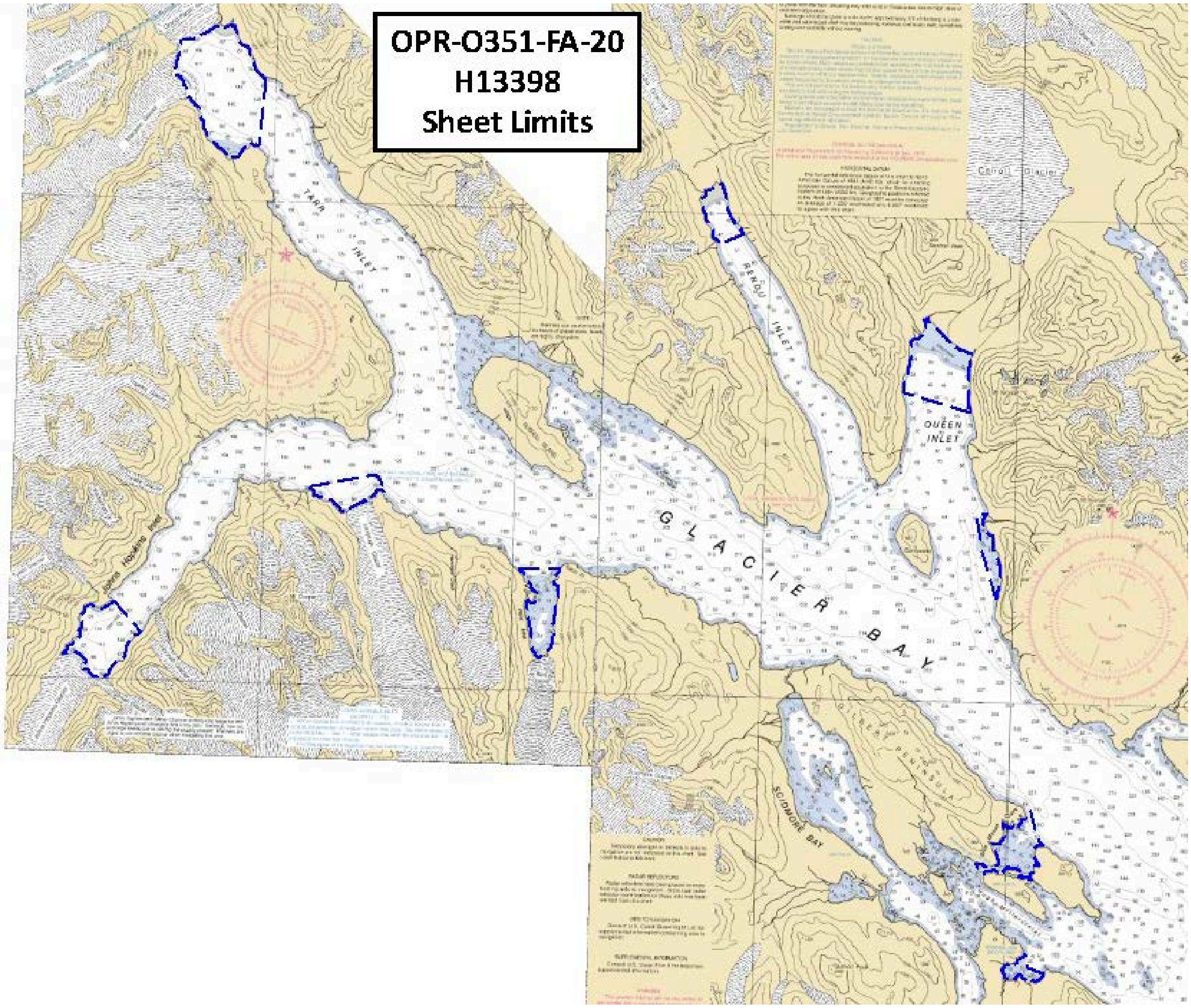


Figure 1: H13398 sheet limits (in blue) overlaid onto Chart 17318.

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the 2020 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). Coverage acquired in H13398 is shown in Figure 1. In all areas where the 3.5 meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to kelp, ice, and the risks of maneuvering the survey vessel in close proximity to the steep and rocky shoreline. Examples of these areas are shown in Figure 2.

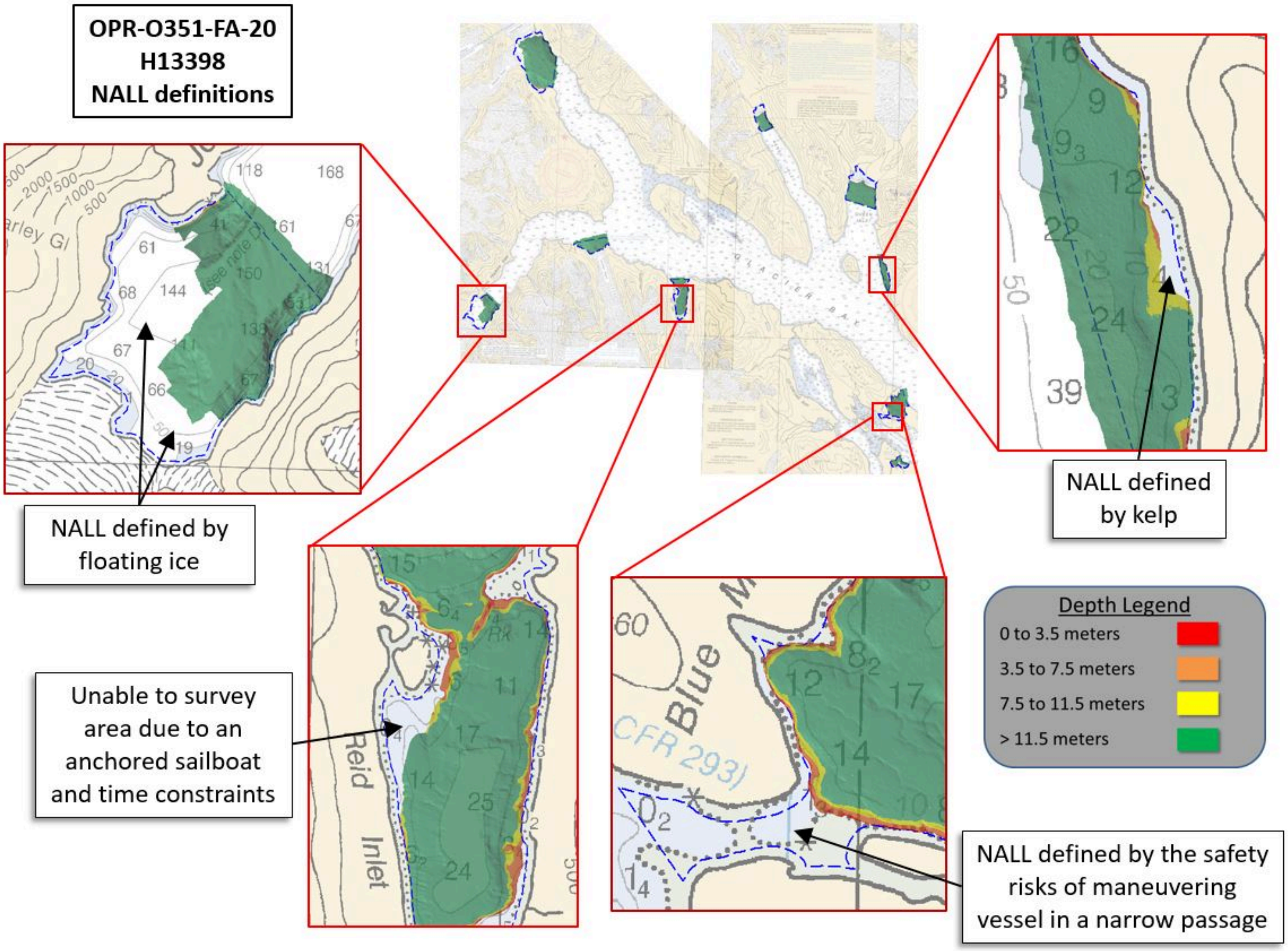


Figure 2: Areas where the NALL was defined by the presence of ice, kelp, or the risks of maneuvering near steep and rocky shoreline.

A.2 Survey Purpose

Glacier Bay in Southeast Alaska was covered by a single ice sheet as recently as the late 1700s. The tidewater glaciers that visitors see today are remnants of the calving and retreat of this glacial ice. In 2019, Glacier Bay National Park received approximately 675,000 visitors traveling by cruise ships, tour boats, charter boats, and private vessels. Most of the glaciers within the bay are thinning and receding due to rapidly warming atmospheric temperatures and ocean water, exposing uncharted areas at the glacier faces. In addition, glacial till has altered the bathymetry in the fjords near the glaciers. Most of Glacier Bay was last surveyed in 2009. This project focuses on a number of glacier faces, as well as several coves within Glacier Bay. Conducting a modern bathymetric survey in this area will provide critical data for the updating of National Ocean Service (NOS) nautical charting products and services to increase maritime safety in Glacier Bay. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13398 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11).

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 MBES

Table 2: Survey Coverage

The entirety of H13398 was acquired with Complete Coverage, meeting the requirements listed above and in the HSSD. See Figure 3 for an overview of coverage.

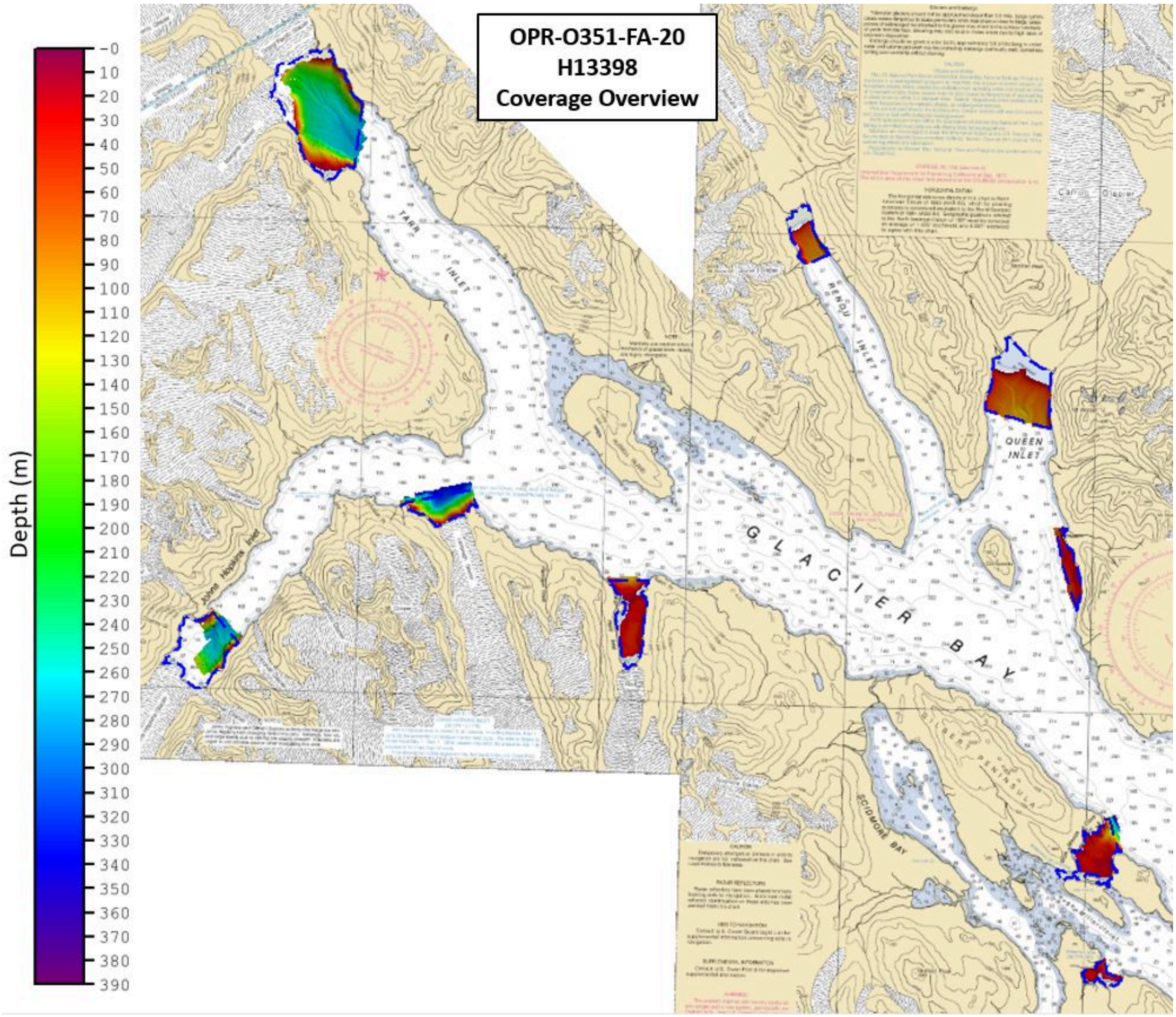


Figure 3: H13398 survy coverage overlaid onto Chart 17318

A.6 Survey Statistics

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

	HULL ID	*2808*	*2807*	*Total*
LNM	SBES Mainscheme	0	0	0
	MBES Mainscheme	92.0477	45.7870	137.8347
	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	1.3053	4.4494	5.7547
	Lidar Crosslines	0	0	0
Number of Bottom Samples				7
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Investigated by Dive Ops				0
Total SNM				8.95

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/30/2020	274
10/01/2020	275

Survey Dates	Day of the Year
10/02/2020	276
10/03/2020	277
10/04/2020	278

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	*2808*	*2807*
LOA	8.6 meters	8.6 meters
Draft	1.1 meters	1.1 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 71	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was installed on the survey platform as follows: All launches utilize the Kongsberg EM 2040 MBES, a POS M/V v5 system for positon and attitude, SVP 71 surface sound speed sensors, and Sea-Bird SBE 19plus v2 CTDs for conductivity, temperature, and depth casts.

B.2 Quality Control

B.2.1 Crosslines

Multibeam sonar crosslines acquired for this survey totaled 4.18% of mainscheme acquisition. Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD. To evaluate crosslines, a surface generated via data strictly from mainscheme lines and a surface generated via data strictly from crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated (Figure 4), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between depths derived from mainscheme data and crossline data was -0.11 meters (with mainscheme being shoaler/deeper) and 95% of nodes falling within +/- 0.88 meters (Figure 5). The -0.11 meter mean difference between crossline and mainscheme is likely due to the large depth range observed in this survey, extending to 390m. For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 99% of the depth differences between H13398 mainscheme and crossline data were within allowable NOAA uncertainties.

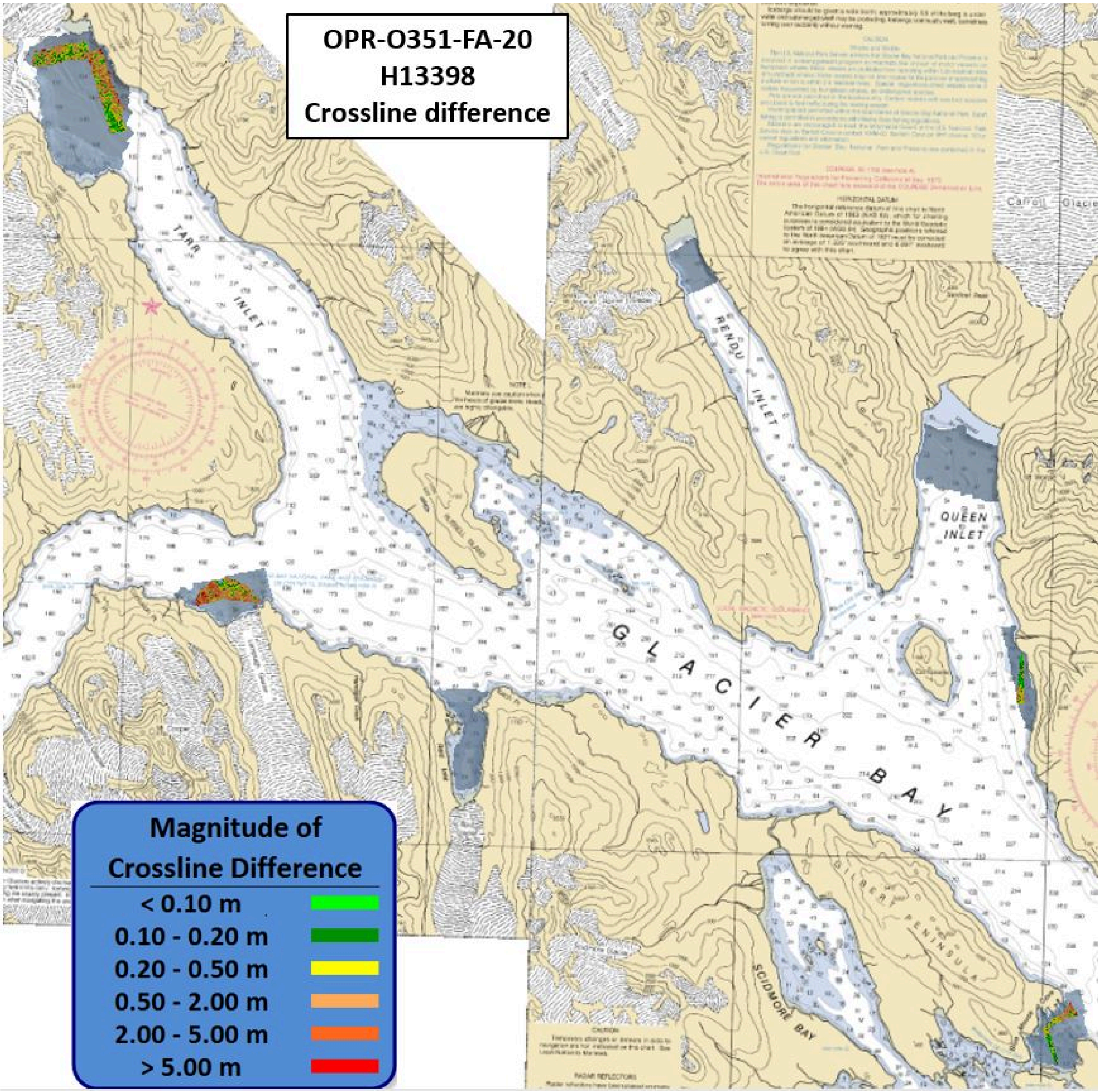


Figure 4: Overview of H13398 crosslines

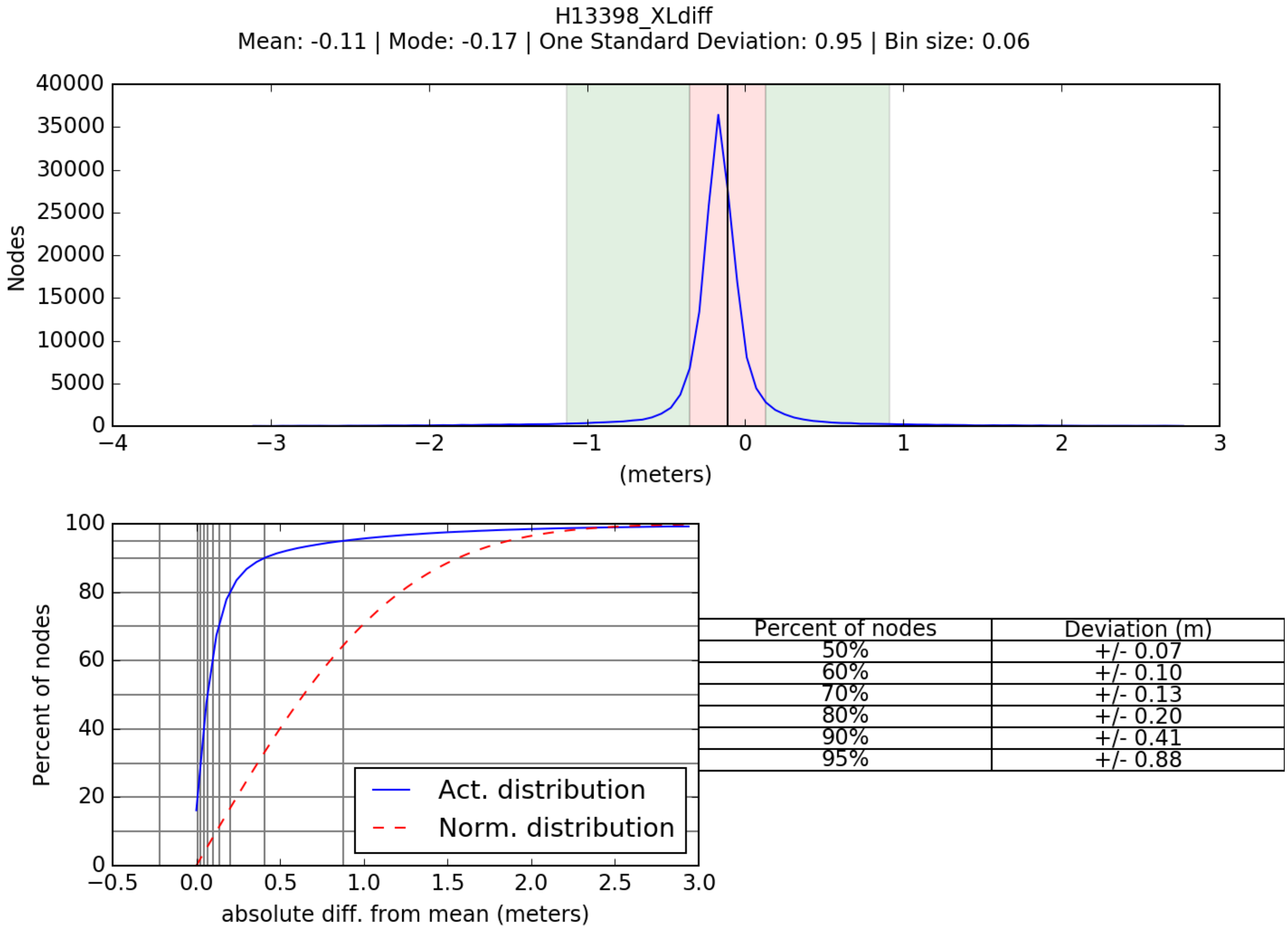


Figure 5: H13398 Crossline and mainscheme difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.13 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
2807, 2808	2 meters/second	NA meters/second	NA meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty via device models for vessel motion and VDATUM, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13398. Real-time uncertainties were provided via EM 2040 MBES data and Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

H13398 junctions with 3 adjacent surveys from prior projects, H12140, H12141 and H12142 as shown in Figure 6. Data overlap between H13398 and each adjacent survey was achieved. These areas of overlap between surveys were reviewed in CARIS HIPS and SIPS by surface differencing (at equal resolutions) to assess surface agreement. The multibeam data were also examined in CARIS Subset Editor for consistency and agreement. The junctions with H13398 generally exceed the NOAA allowable uncertainty in their areas of overlap. It is important to note that the purpose of H13398 was to update bathymetry in an area known for rapid sediment flux and seafloor change; therefore, major differences were expected in all junction comparisons. For all junctions with H13398, a negative difference indicates H13398 was shoaler and a positive difference indicates H13398 was deeper.

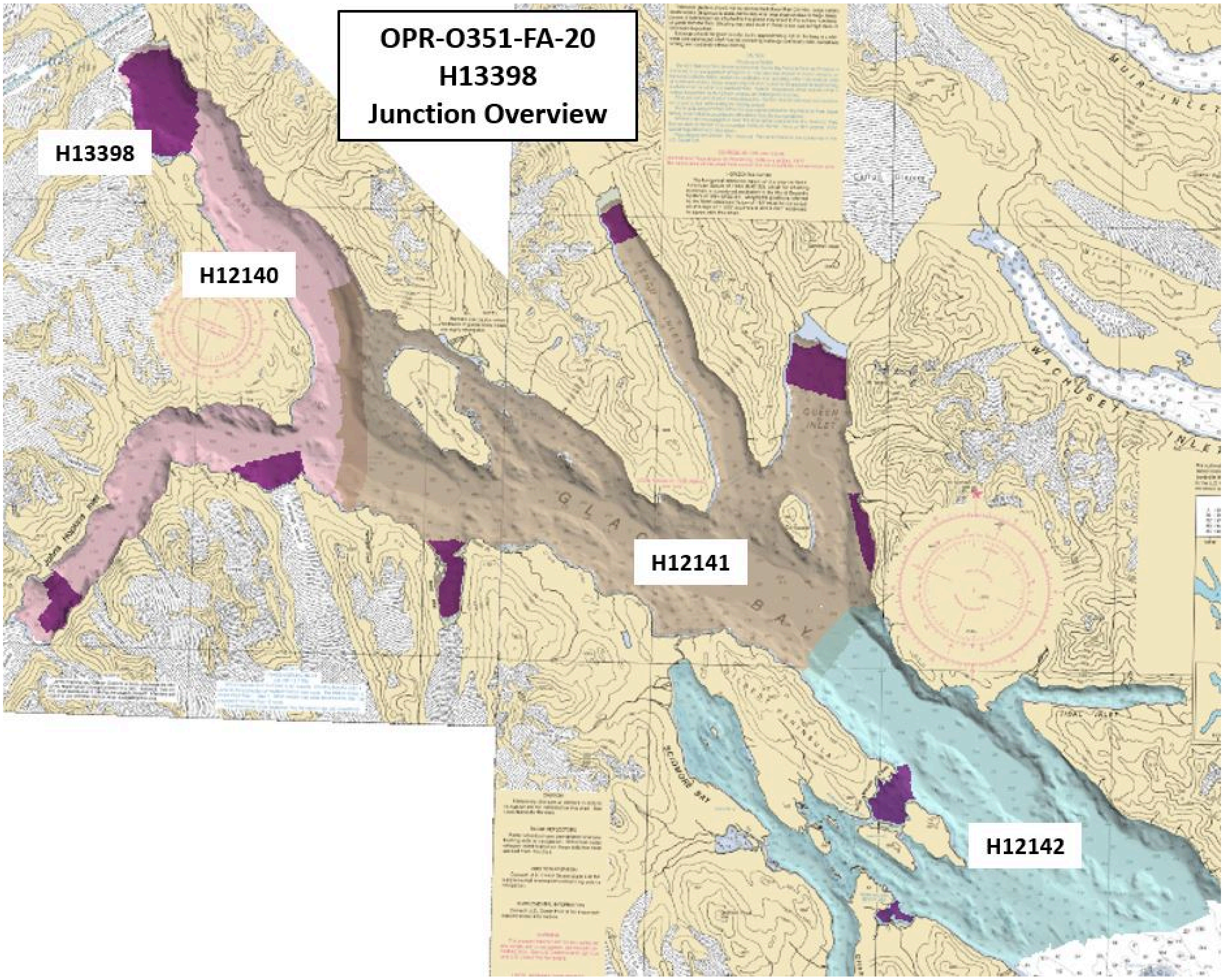


Figure 6: Overview of H13398 junction surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12140	1:40000	2009	FA	NW
H12141	1:40000	2009	FA	NW
H12142	1:40000	2009	FA	NW

Table 9: Junctioning Surveys

H12140

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13398 and the surface from H12140 (Figure 7). The statistical analysis of the difference surface shows a mean of 3.69 meters with 95% of the nodes having a maximum deviation of +/- 16.52 meters, as seen in Figure 8. It was found that 64.02% of nodes are within NOAA allowable uncertainty (Figures 9 and 10).

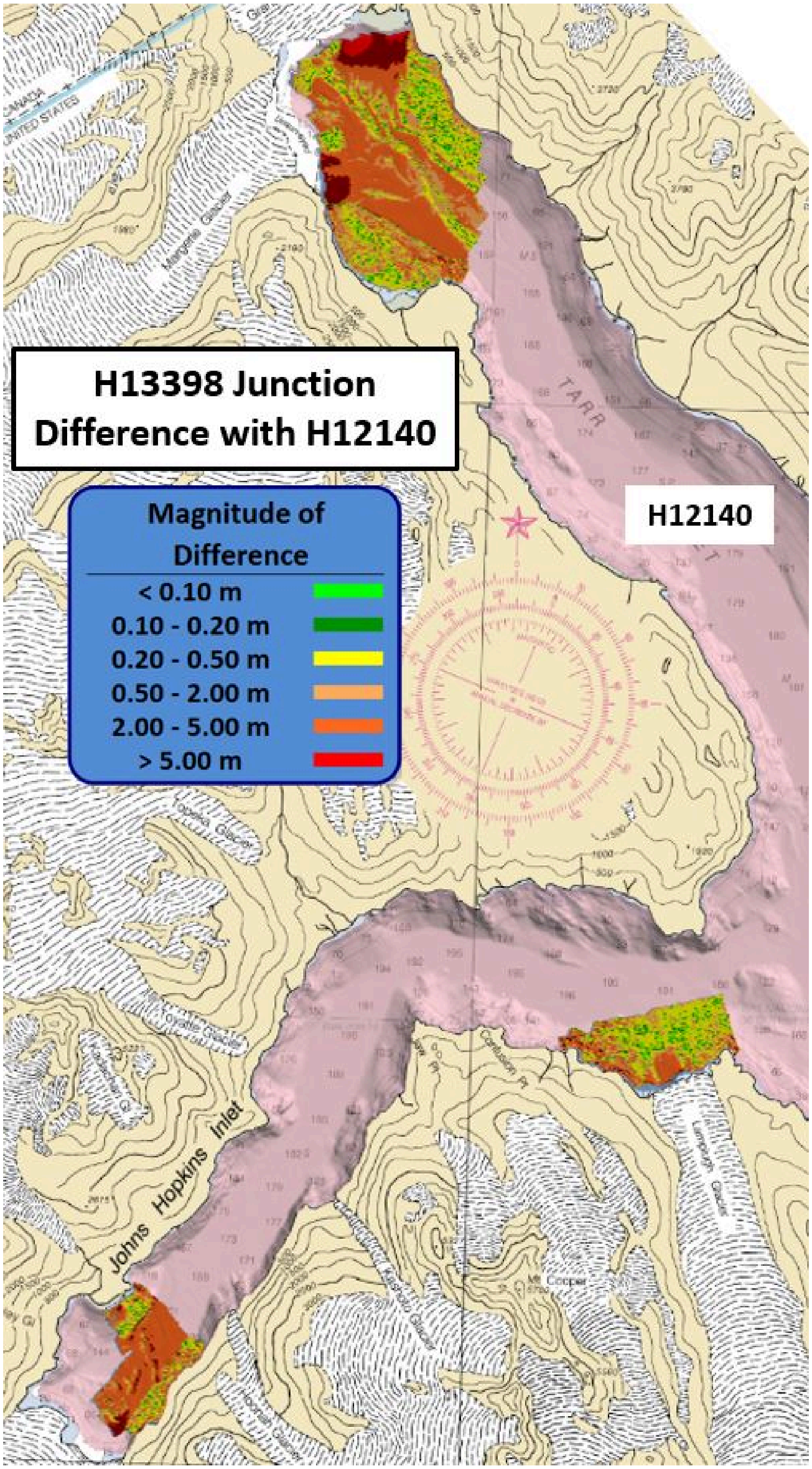
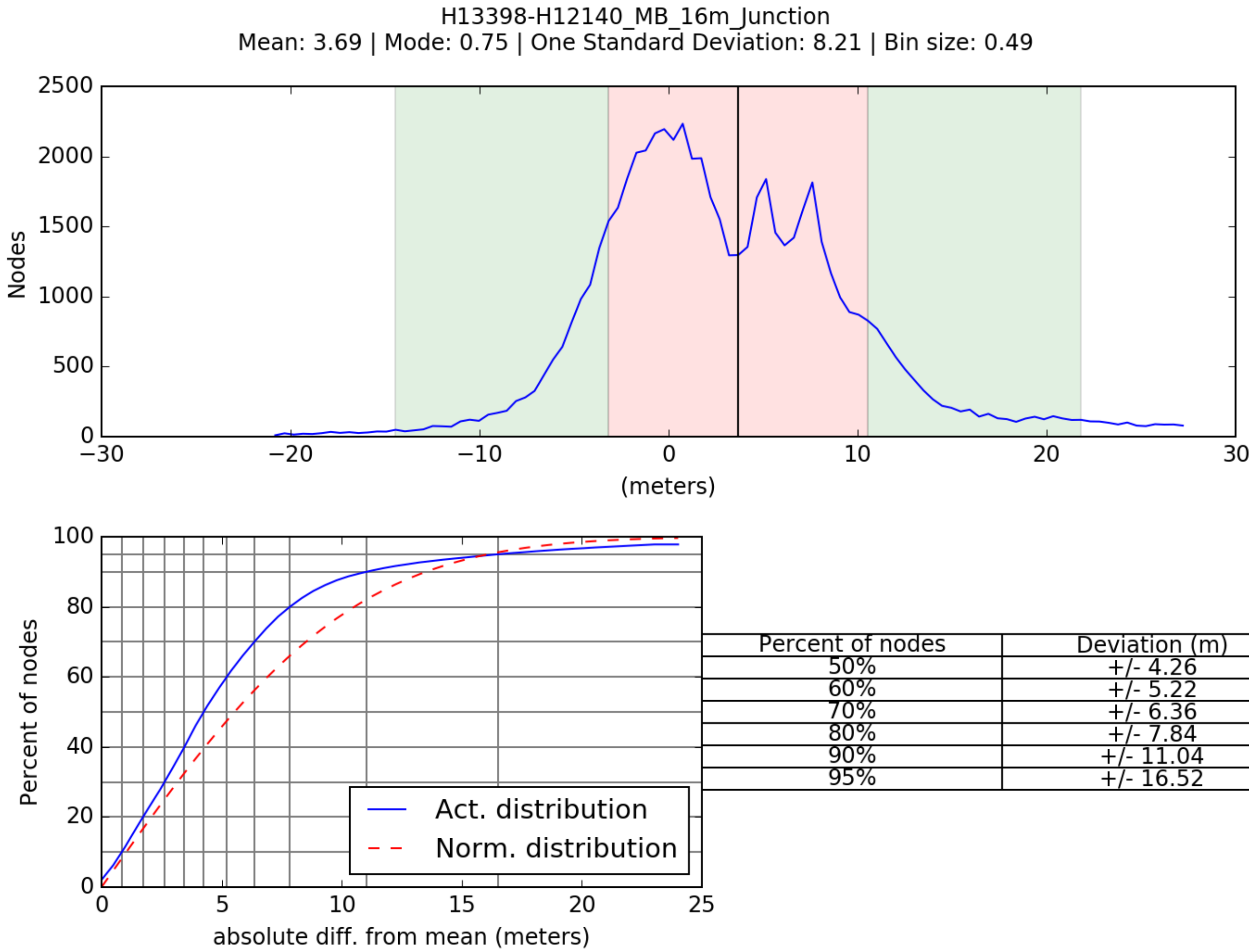


Figure 7: Difference surface between H13398 and junction survey H12140 (pink)



Percent of nodes	Deviation (m)
50%	+/- 4.26
60%	+/- 5.22
70%	+/- 6.36
80%	+/- 7.84
90%	+/- 11.04
95%	+/- 16.52

Figure 8: Difference surface statistics between H13398 and H12140 (16m surface)

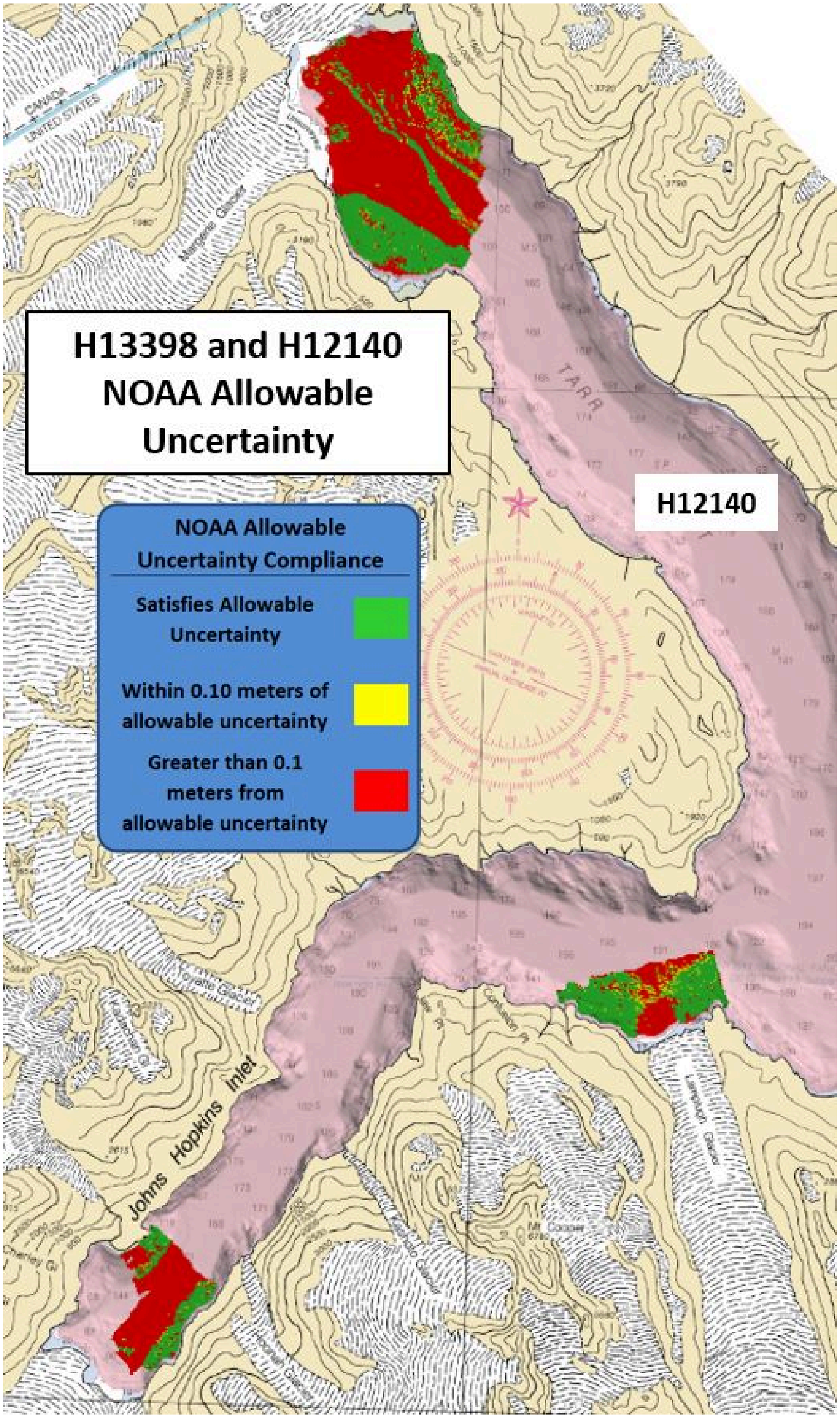


Figure 9: Difference surface compliance with NOAA allowable uncertainty between H13398 and junction survey H12140 (pink)

H13398/H12140 NOAA Allowable Uncertainty	
16m Resolution Surface	
Total Nodes	62,747
Total Nodes Pass	40,170
Total Percent Pass	64.02%

Figure 10: Difference surface statistics between H13398 and H12140 showing percentage of nodes meeting NOAA allowable uncertainty

H12141

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13398 and the surface from H12141 (Figure 11). The statistical analysis of the difference surface shows a mean of 2.62 meters with 95% of the nodes having a maximum deviation of +/- 9.58 meters, as seen in Figure 12. The greatest diferences were observed nearest the glacier's face, where significant discrepancies were expected due to variabilities in glacial sediment flux. It was found that 34.85% of nodes are within NOAA allowable uncertainty (Figures 13 and 14).

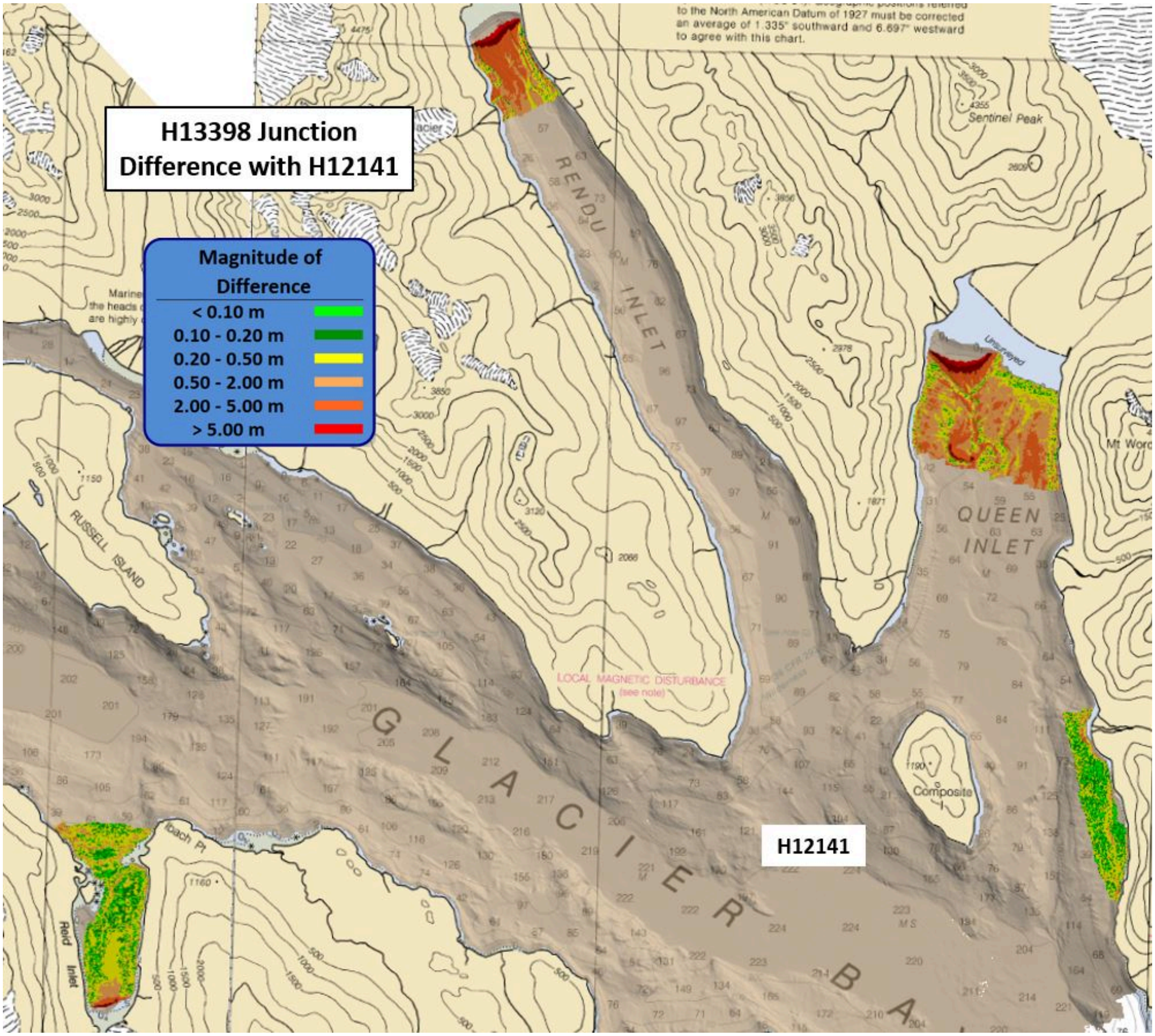
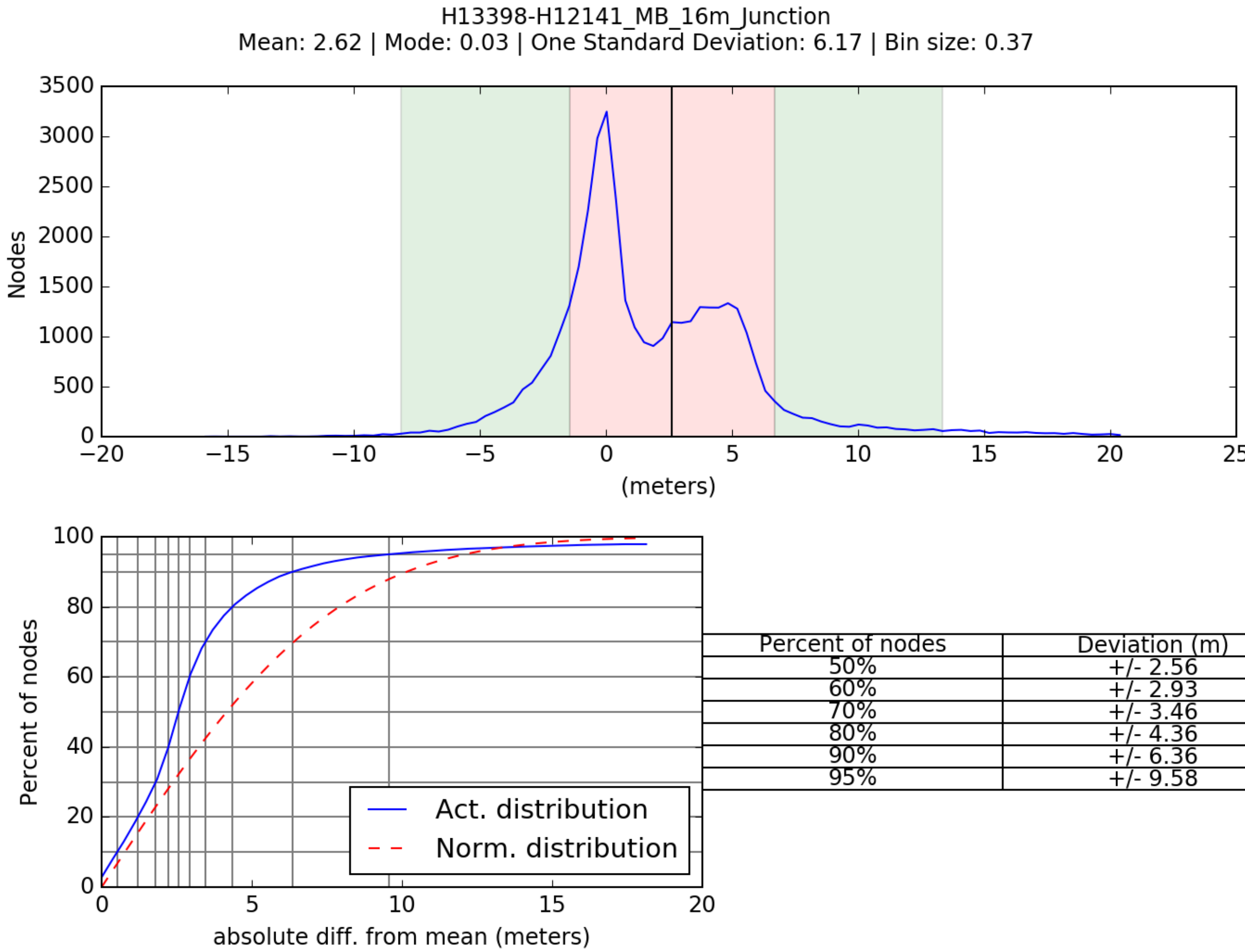


Figure 11: Difference surface between H13398 and junction survey H12141 (brown)



Percent of nodes	Deviation (m)
50%	+/- 2.56
60%	+/- 2.93
70%	+/- 3.46
80%	+/- 4.36
90%	+/- 6.36
95%	+/- 9.58

Figure 12: Difference surface statistics between H13398 and H12141 (16m surface)

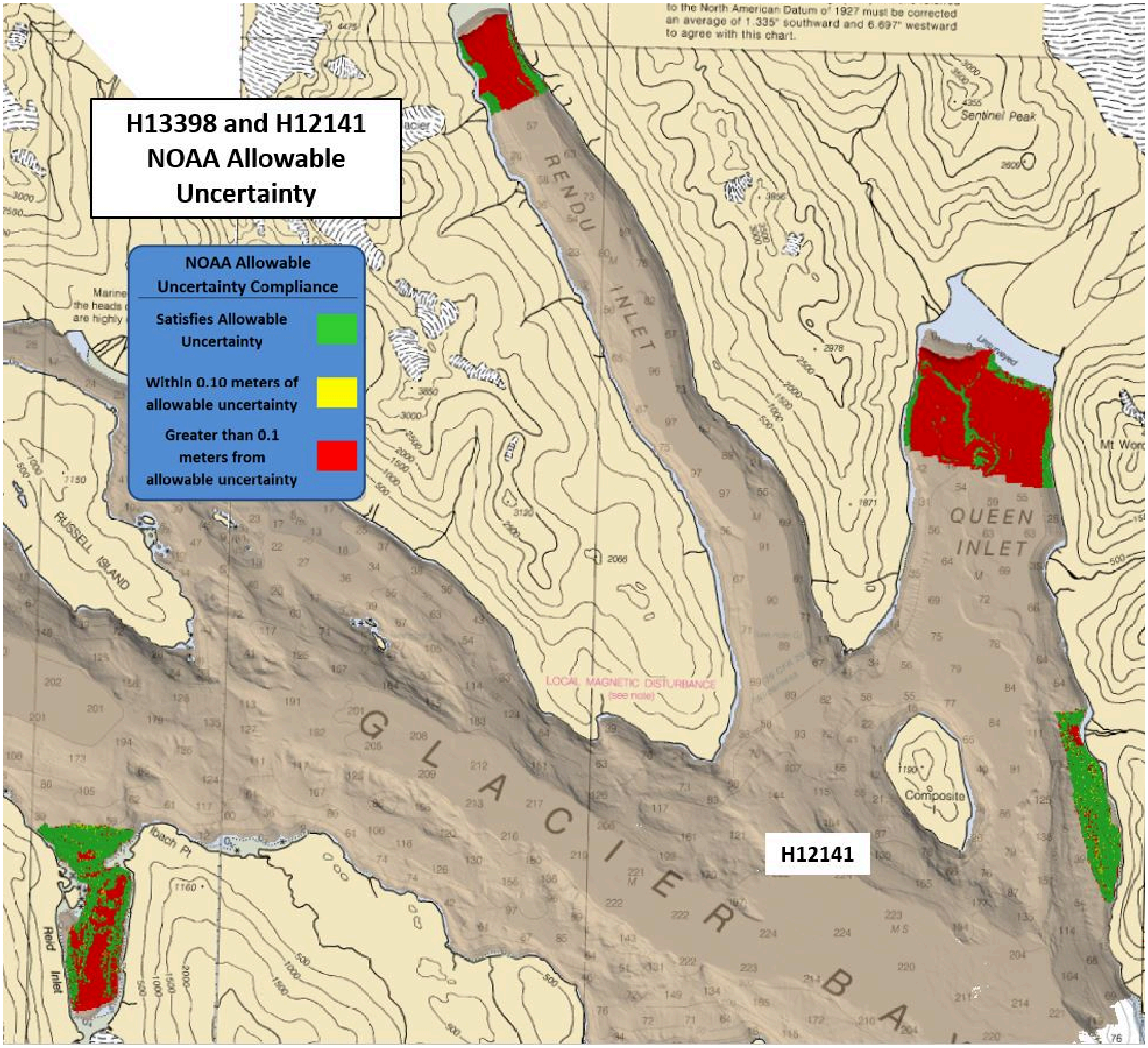


Figure 13: Difference surface compliance with NOAA allowable uncertainty between H13398 and junction survey H12141 (brown)

H13398/H12141 NOAA Allowable Uncertainty

16m Resolution Surface	
Total Nodes	40,833
Total Nodes Pass	14,232
Total Percent Pass	34.85%

Figure 14: Difference surface statistics between H13398 and H12141 showing percentage of nodes meeting NOAA allowable uncertainty

<u>H12142</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13398 and the surface from H12142 (Figure 15). The statistical analysis of the difference surface shows a mean of -0.99 meters with 95% of the nodes having a maximum deviation of +/- 5.17 meters, as seen in Figure 16. It was found that 60.82% of nodes are within NOAA allowable uncertainty (Figures 17 and 18).

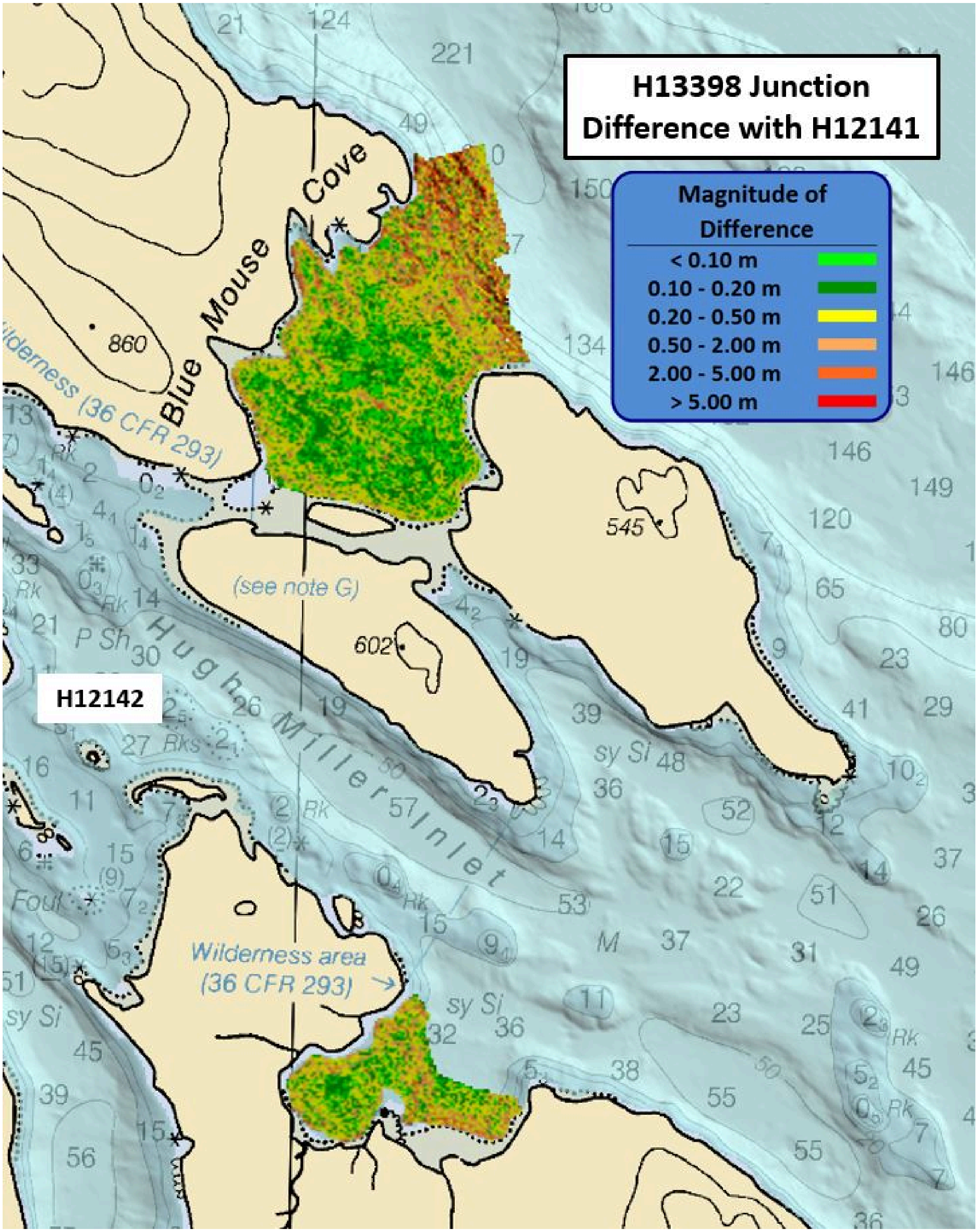
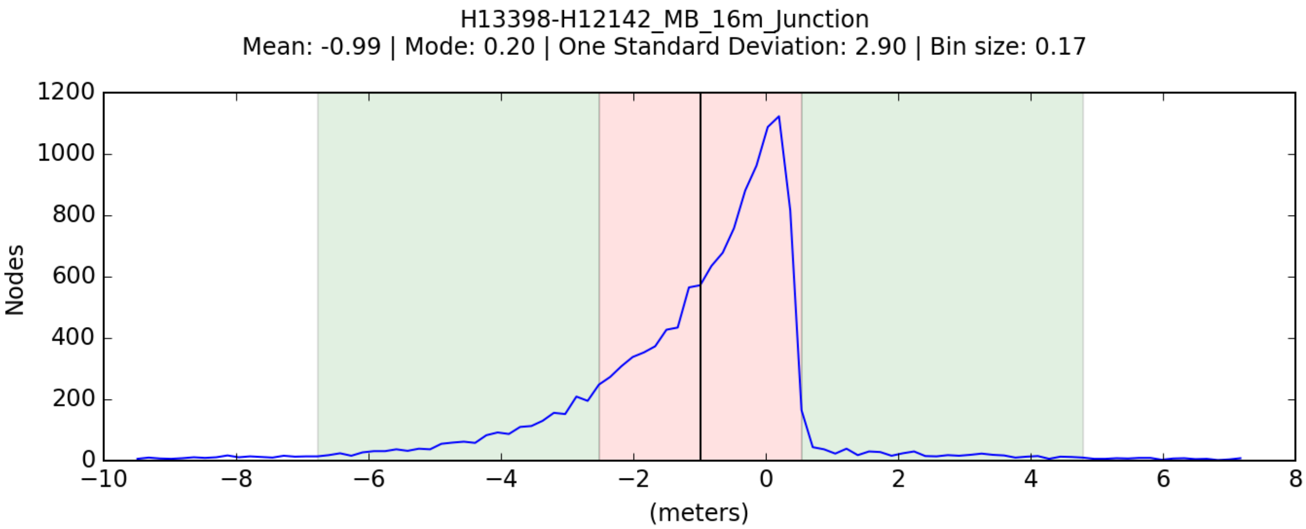
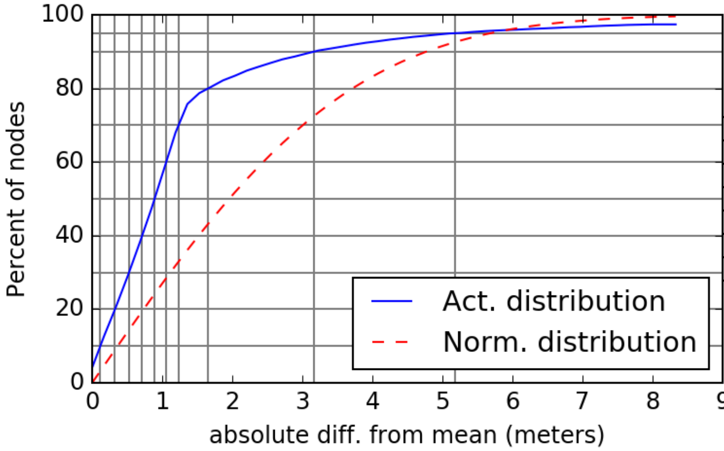


Figure 15: Difference surface between H13398 and junction survey H12142 (blue)





Percent of nodes	Deviation (m)
50%	+/- 0.89
60%	+/- 1.06
70%	+/- 1.23
80%	+/- 1.66
90%	+/- 3.17
95%	+/- 5.17

Figure 16: Difference surface statistics between H13398 and H12142 (16m surface)

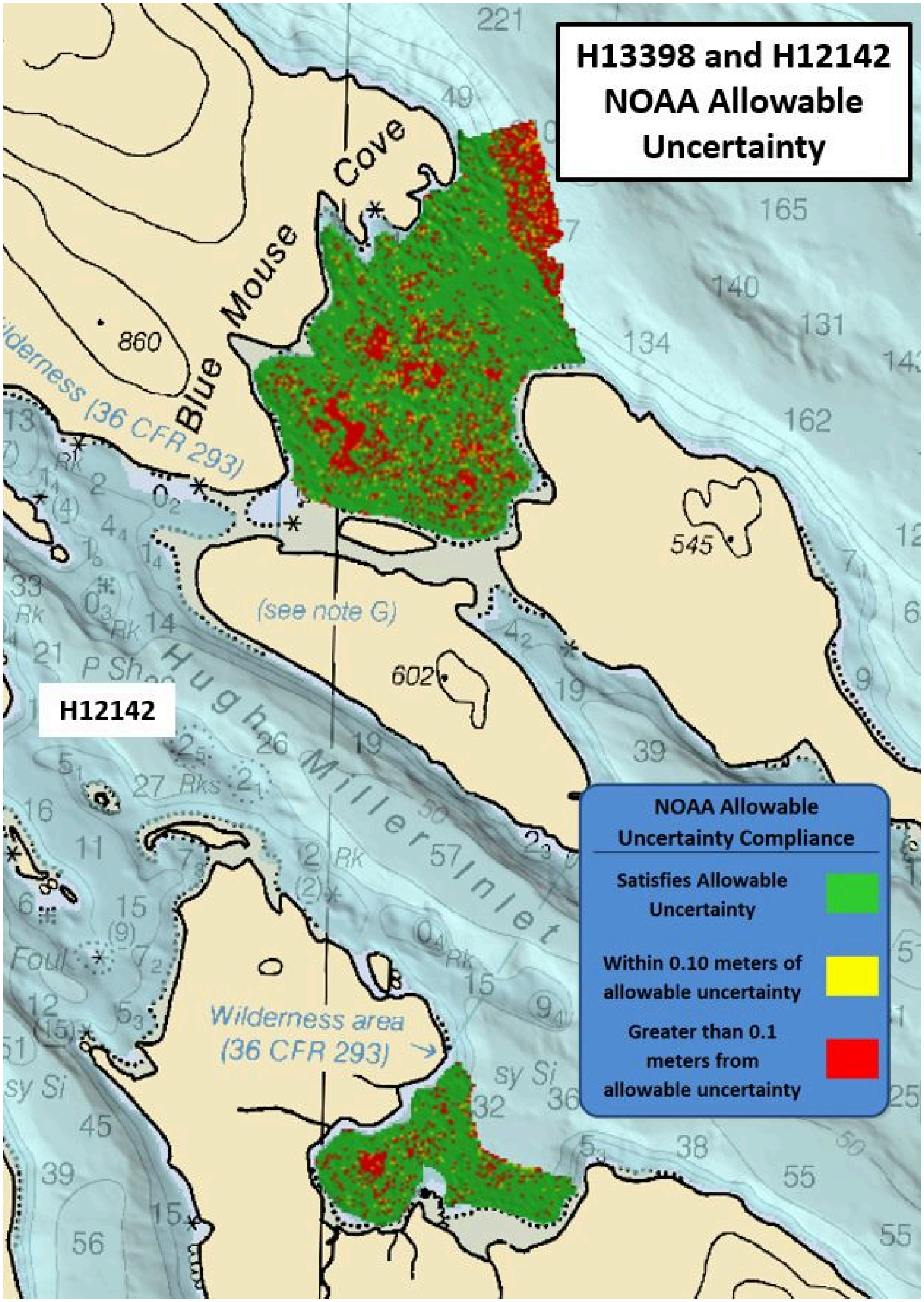


Figure 17: Difference surface compliance with NOAA allowable uncertainty between H13398 and junction survey H12142 (blue)

H13398/H12142 NOAA Allowable Uncertainty	
16m Resolution Surface	
Total Nodes	13,968
Total Nodes Pass	8,420
Total Percent Pass	60.28%

Figure 18: Difference surface statistics between H13398 and H12142 showing percentage of nodes meeting NOAA allowable uncertainty

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 issues

In the Reid Inlet portion of the survey area, sound speed issues were apparent, visible primarily as 0.5 to 1.5 m surface offsets (see Figure 19 for two examples). Given the location of the offsets, the most probable cause is freshwater intrusion from glacial streams flowing into the inlet approaching low tide and pulling the freshwater through a narrow channel creating thermoclines and haloclines. Surfaces were not significantly impacted, however some of the data in this area does not meet NOAA allowable uncertainty parameters from HSSD Section 5.1.3. In depths of 26 meters, the acceptable total vertical uncertainty is +/-0.604 meter. Most of the data in this area still remain sufficient to supersede previous data.

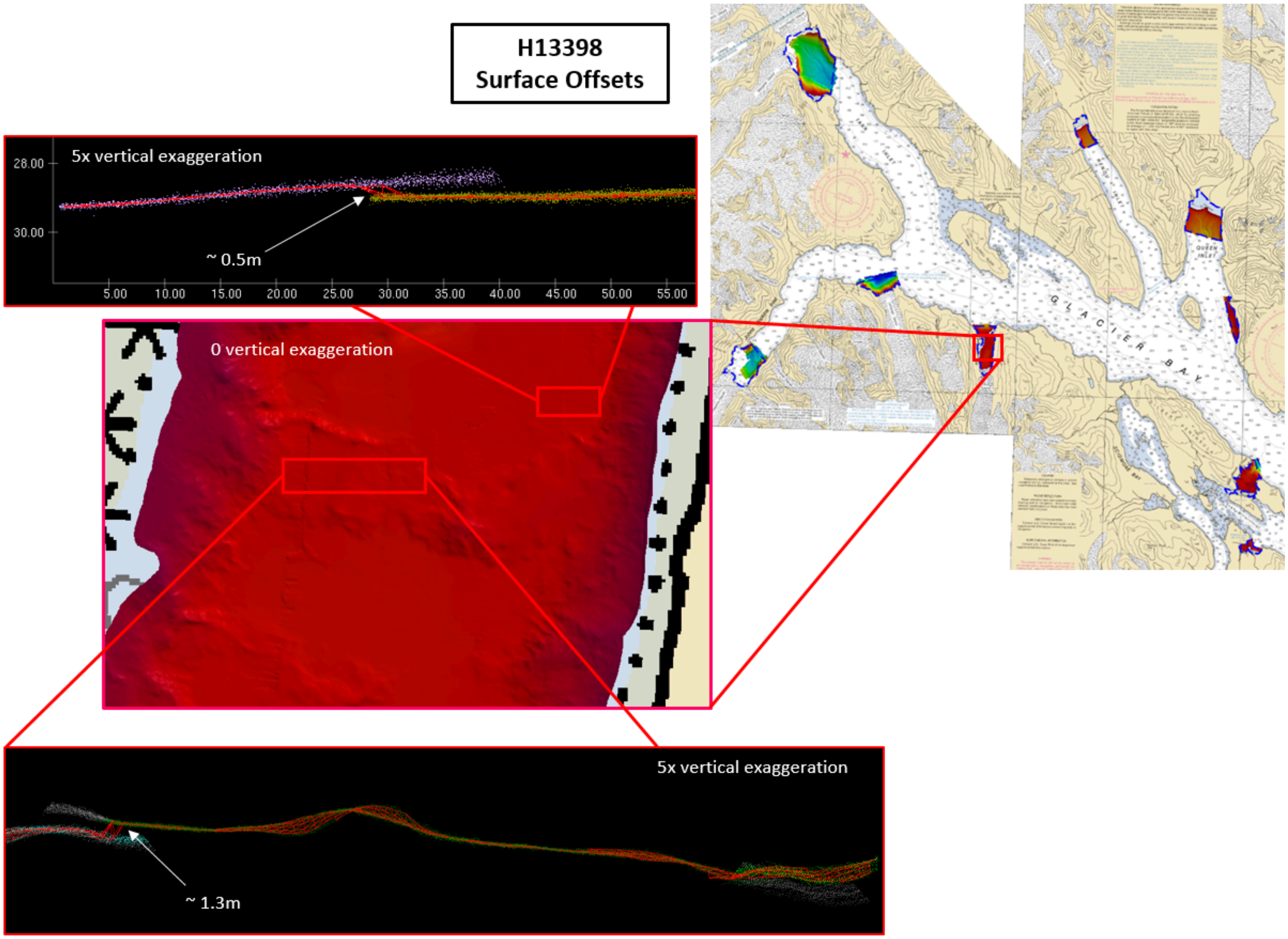


Figure 19: Sound speed surface offsets in Sheet H13398

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of one every four hours during launch acquisition. Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column and when there was a change in surface sound speed greater than two meters per second. All sound speed methods were used as detailed in the DAPR.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 Holidays

H13398 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. One holiday which meets the definition described in the HSSD for complete coverage was identified via HydrOffice QC Tools Holiday Finder tool, however that holiday lies outside of sheet limits. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer. The surrounding area of the one holiday was visually inspected and topography does not suggest any dangers to navigation exist in the vicinity of this holiday.

B.2.10 NOAA Allowable Uncertainty

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, 99.5+% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13398 (Figure 20).

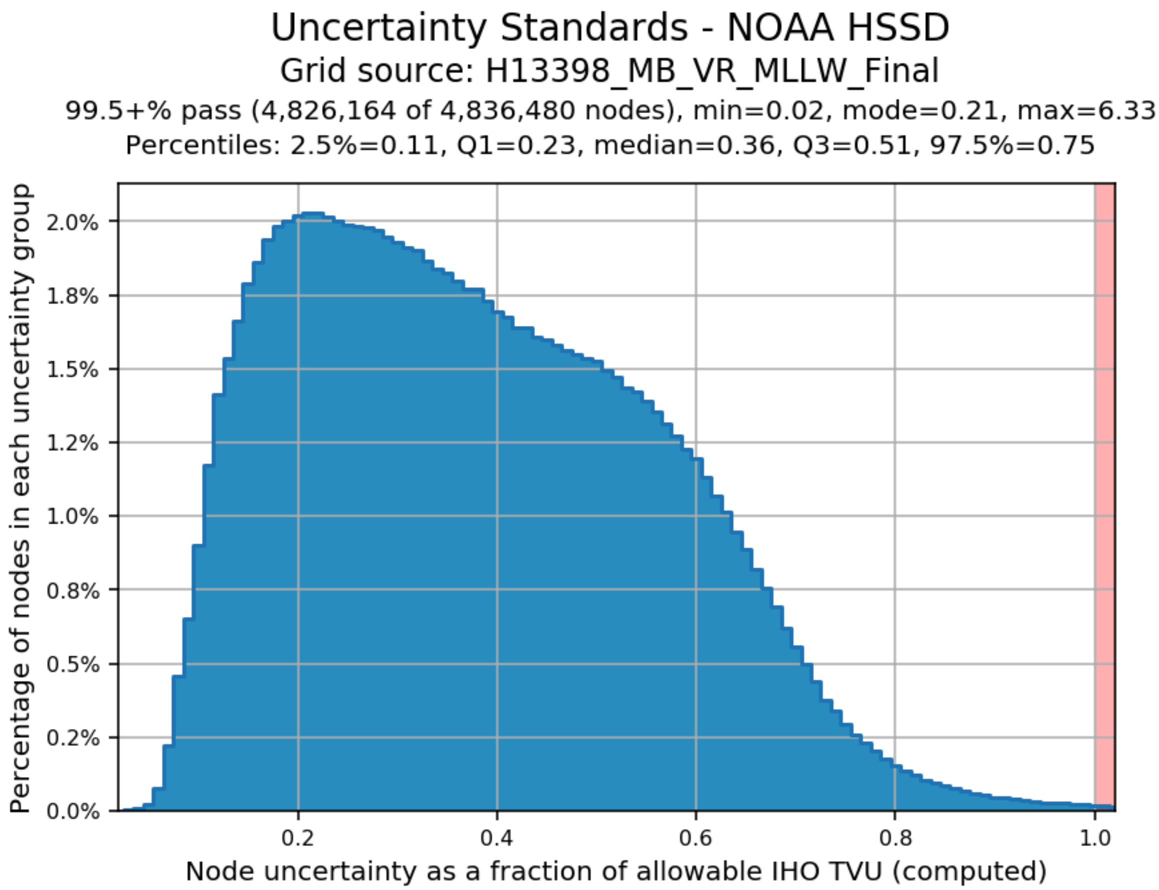


Figure 20: H13398 Allowable uncertainty statistics

B.2.11 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13398 were achieved with at least 99.5+% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3 (Figure 21).

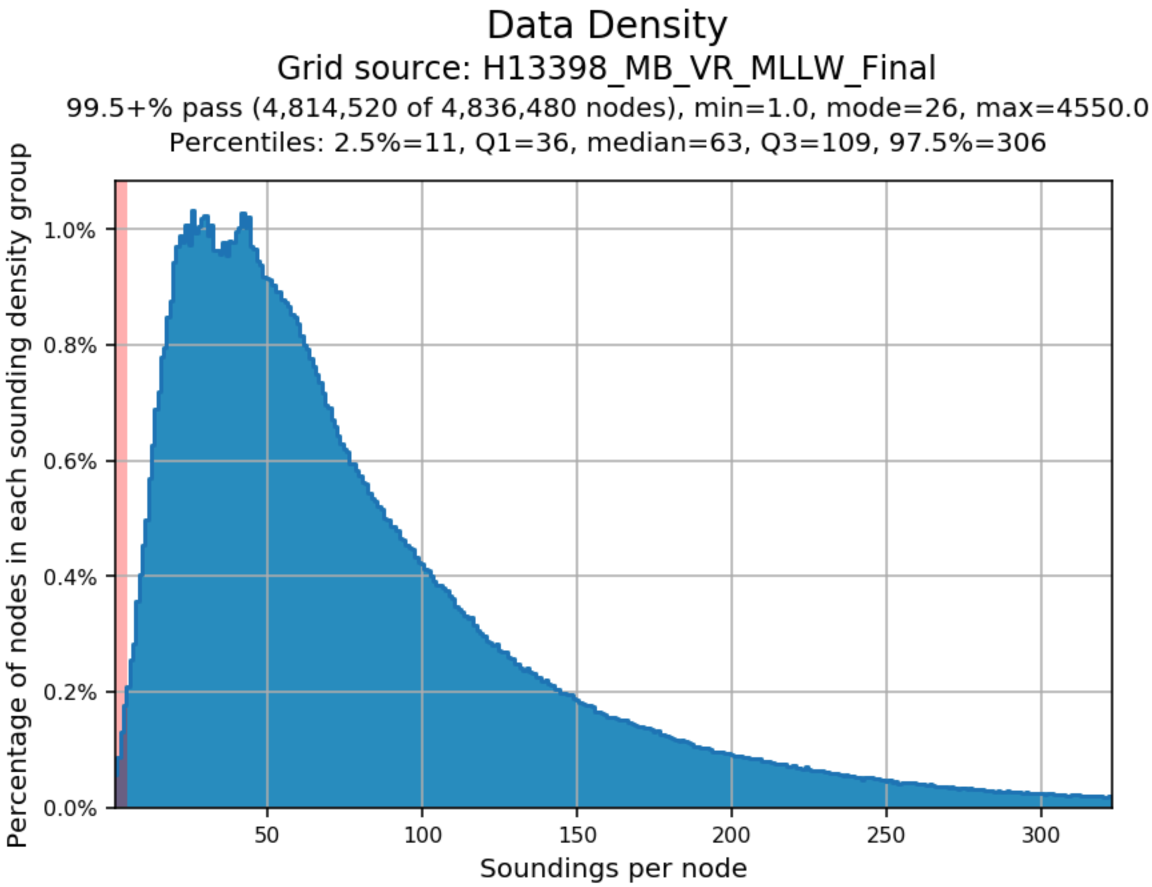


Figure 21: H13398 Data density statistics

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 were stored in the .all file for Kongsberg systems. All backscatter were processed to GSF files and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.9.0 . See Figure 22 for a greyscale representation of the complete mosaic. A relative backscatter calibration was performed by HSTB via a patch test in order to bring the survey systems on each of the launches into alignment. See Figure 23 for a table of the calibration values entered into the Processing Settings within FMGT. Approximate inter-calibration corrections for offsets between sonar systems were applied to the mosaic.

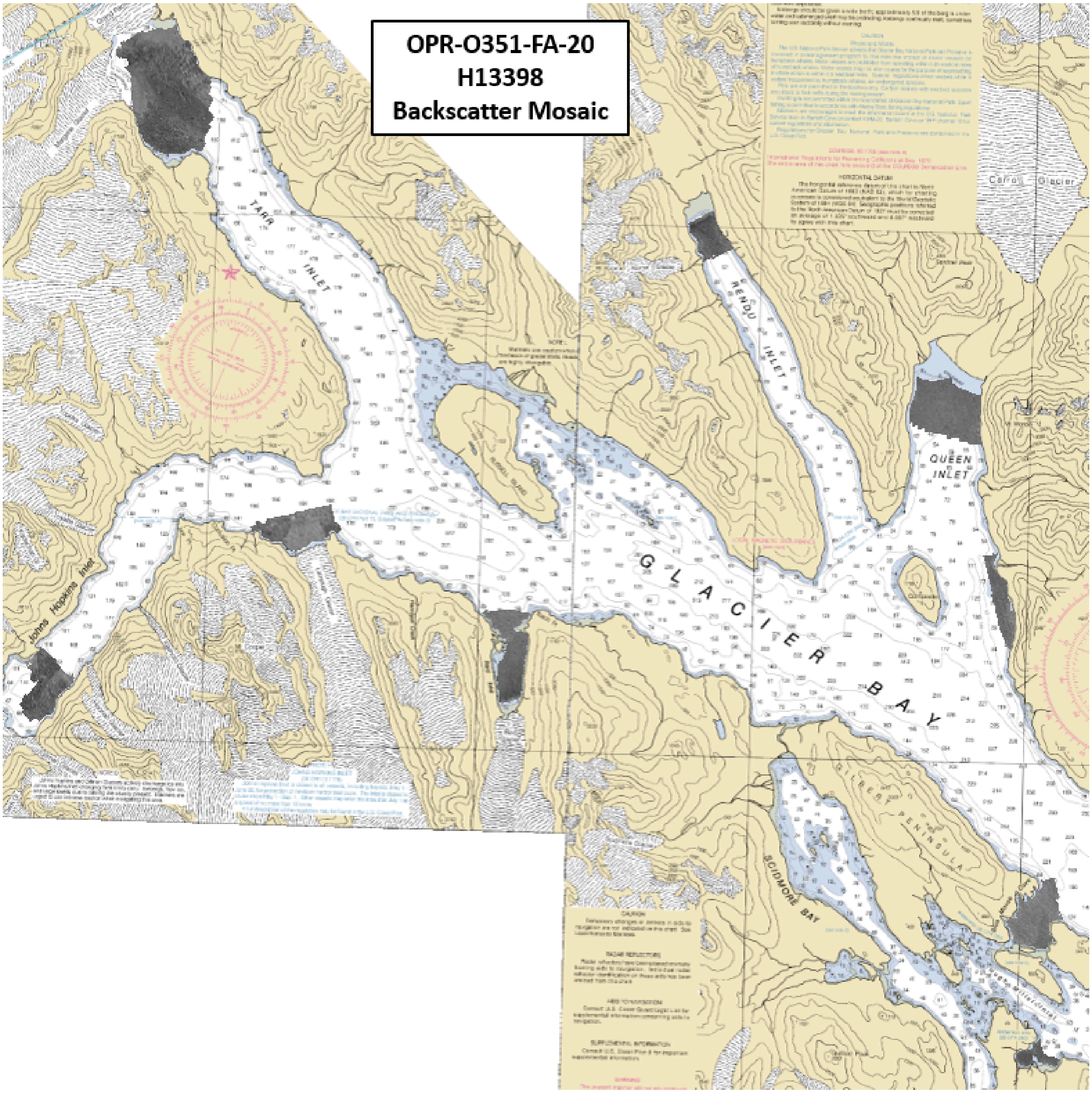


Figure 22: Backscatter mosiac for H13398

	200 kHz			300 kHz			400 kHz		
	Short CW	Long CW	FM (Both)	Short CW	Long CW	FM (Both)	Short CW	Long CW	FM (Both)
2807	-1.4	0.1	-0.1	-1.6	-0.1	-0.3	0.2	1.7	1.5
2808	-0.5	1	0.8	-1.8	-0.3	-0.5	-0.4	1.1	0.9

Figure 23: Backscatter calibration values

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 and SIPS	11.3.8

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	7.9.0

Table 11: Primary imagery 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
H13398_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	-0.7 meters - 389.7 meters	NOAA_VR	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13398_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	-0.7 meters - 389.7 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13398. The surfaces have been reviewed where noisy data, or "fliers" are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to vary from the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

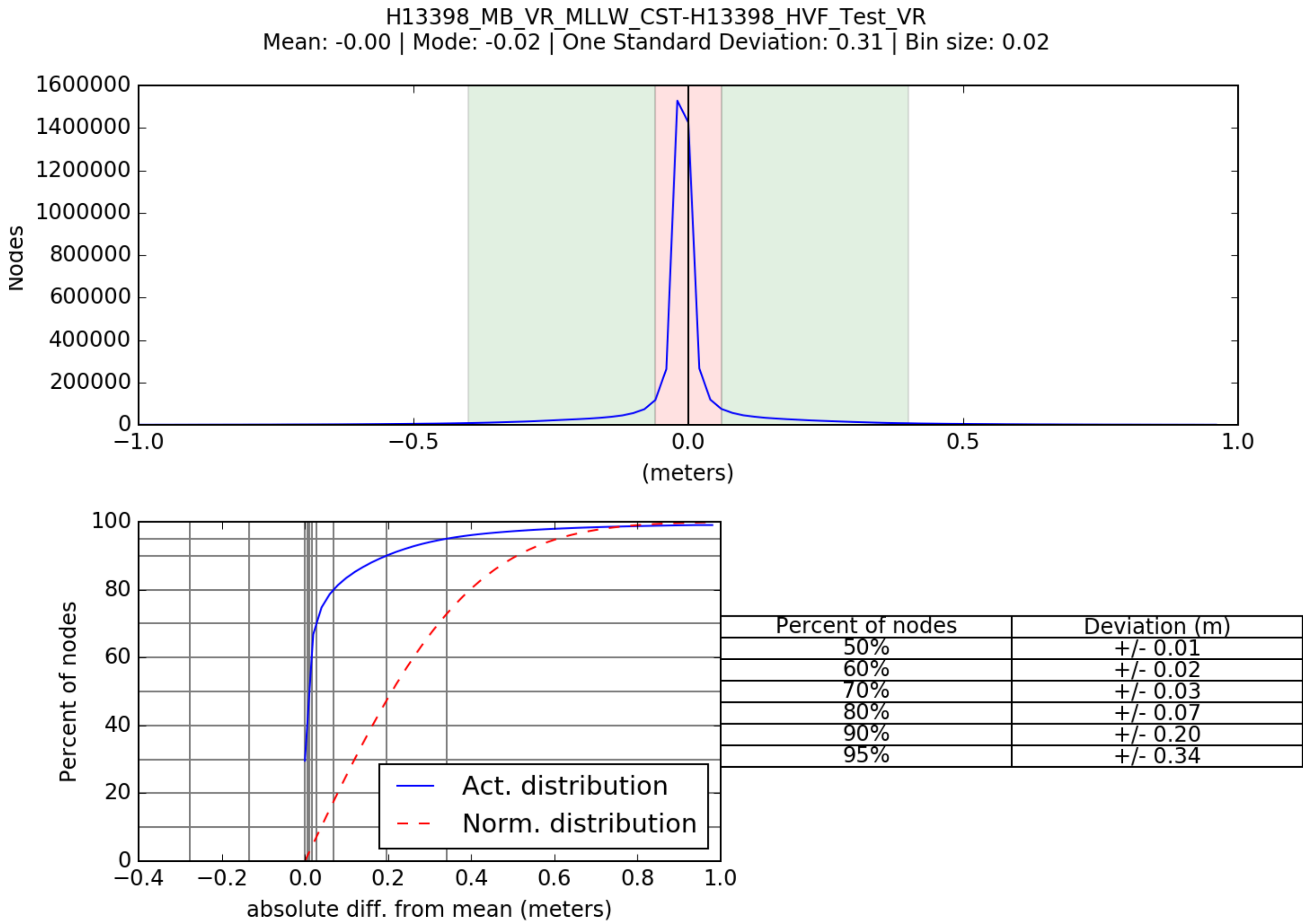
Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until all remaining flagged fliers were deemed to be valid aspects of the surface.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final separation model reduction and sound speed application are noted in the H13398 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

B.5.4 HVF errors

The DAPR includes the correct offsets in terms of what information is input into our systems. This information, unfortunately, did not make its way into the HVF. The offset inputs in the HVF are not applied directly to the data and are only used to determine uncertainty. These small differences do not seem to impact the uncertainty values. To assess this we created a test project and processed a small section of the data with the updated HVF and created a surface. We then compared the resulting uncertainty with the old HVF and new HVF which mirrors the DAPR and the POS offsets. The Reid Inlet area was specifically chosen as it does have a line that is outside specs. We strongly suspect the TPU bust for this line was due to SVP issues, not HVF uncertainty. We then utilized compare grids to assess the differences between "Correct HVF Surface" and the "Incorrect HVF Surface". The mean difference was 0.0m. Output graphs are attached.



Percent of nodes	Deviation (m)
50%	+/- 0.01
60%	+/- 0.02
70%	+/- 0.03
80%	+/- 0.07
90%	+/- 0.20
95%	+/- 0.34

Figure 24: Surface Comparison between Incorrect HVF and Correct HVF data

C. Vertical and Horizontal Control

Per Section 5.2.2.1.3 of the 2020 Field Procedures Manual no Horizontal and Vertical Control Report has been generated for H13398.

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-O351-FA-20_VDatum_100m_NAD83(2011)-MLLW_XGEOID16B.csar

Table 13: ERS method and SEP file

ERS methods were used as the final means of reducing H13398 to MLLW for submission.

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

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX positioning methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

WAAS

During real-time acquisition, all platforms received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole methods of positioning for H13398 as no DGPS stations were available for real-time horizontal control.

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
US4AK3DM	1:80000	7	09/20/2018	09/20/2018

Table 14: 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

No charted features exist for this survey.

D.1.4 Uncharted Features

Survey H13398 has 12 new features that are addressed in the H13398 Final Feature File. Of these features, there is 1 new Land Elevation, 7 new Seabed Areas, and 4 new Kelp features.

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

Seven out of nine bottom samples were acquired in accordance with the Project Instructions for survey H13398. All bottom samples were entered in the H13398 Final Feature File. See Figure 24 for a graphical overview of sample locations.

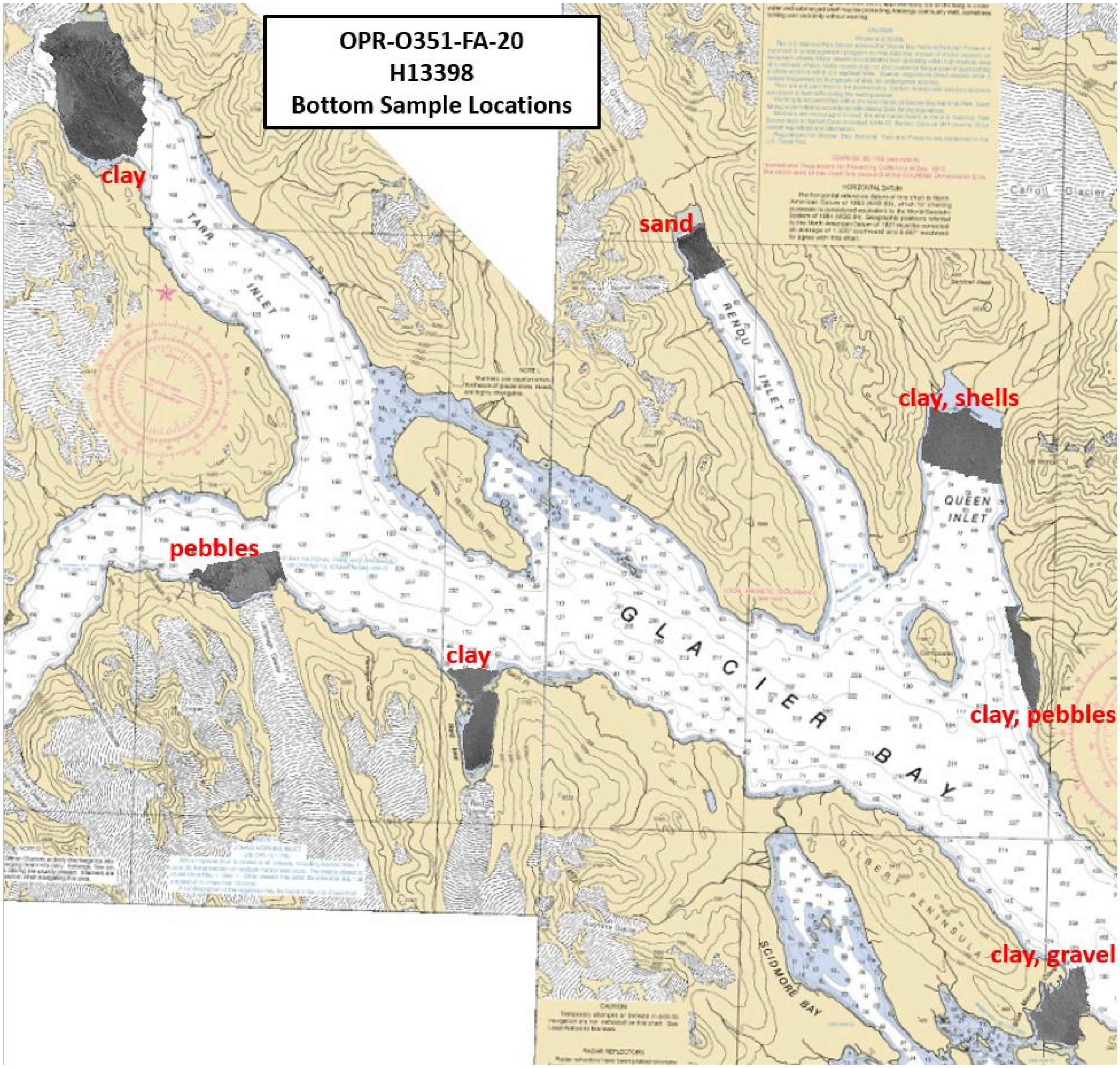


Figure 25: H13398 Bottom sample locations

Seven Bottoms samples were included in the FFF.

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.

Approver Name	Approver Title	Approval Date	Signature
CDR. John Lomnicky	Chief of Party	06/13/2021	Digitally signed by LOMNICKY.JOHN.JOSEPH.1257920239 Reason: I attest to the accuracy and integrity of this document Location: CO, NOAA Ship Fairweather Date: 2021.06.25 09:31:02 -08'00'
LT Marybeth Head	Operations Officer	06/13/2021	HEAD.MARYBETH.1474026490 Digitally signed by HEAD.MARYBETH.1474026490 Date: 2021.06.25 09:14:01 -08'00'
CHST Alissa Johnson	Chief Survey Technician	06/13/2021	JOHNSON.ALISSA.JEAN.1537531165 Digitally signed by JOHNSON.ALISSA.JEAN.1537531165 Date: 2021.06.18 14:34:28 -08'00'
HST Kevin Lally	Sheet Manager	06/13/2021	LALLY.KEVIN.FRANCIS.1570734411 Digitally signed by LALLY.KEVIN.FRANCIS.1570734411 Date: 2021.06.20 20:44:33 -08'00'

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