H13007

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13007

LOCALITY

State(s):	Alaska
General Locality:	Southeast Alaska
Sub-locality:	Tracy Arm South

2018

CHIEF OF PARTY
CDR Mark Van Waes, NOAA

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13007

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:	**Tracy Arm South**
Scale:	**20000**
Dates of Survey:	**05/07/2018 to 05/12/2018**
Instructions Dated:	**03/14/2018**
Project Number:	**OPR-O360-FA-18**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR Mark Van Waes, 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 H13007

Project: OPR-O360-FA-18

Locality: Southeast Alaska

Sublocality: Tracy Arm South

Scale: 1:20000

May 2018 - May 2018

NOAA Ship *Fairweather*

Chief of Party: CDR Mark Van Waes, NOAA

A. Area Surveyed

The survey area is located in Southeast Alaska within the sub-locality of Tracy Arm South.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
57° 55' 27.99" N 133° 41' 48.83" W	57° 42' 31.97" N 133° 33' 17.34" W

Table 1: Survey Limits

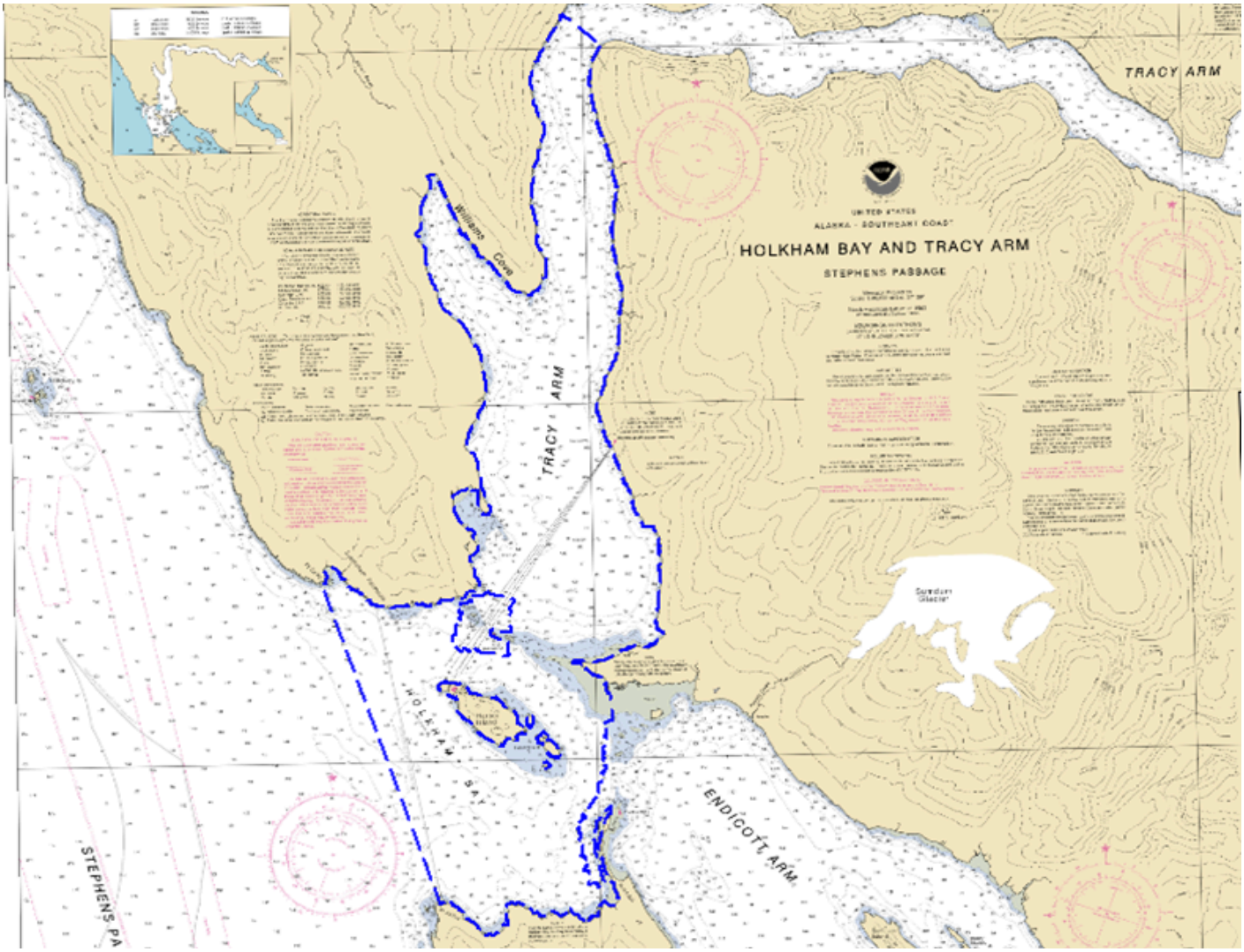


Figure 1: H13007 sheet limits (in blue) overlaid onto Chart 17311

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the April 2018 NOS Hydrographic Surveys Specifications and Deliverables (HSSD), as 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 risks of maneuvering the vessel. An example of such an area is shown in Figure 2.

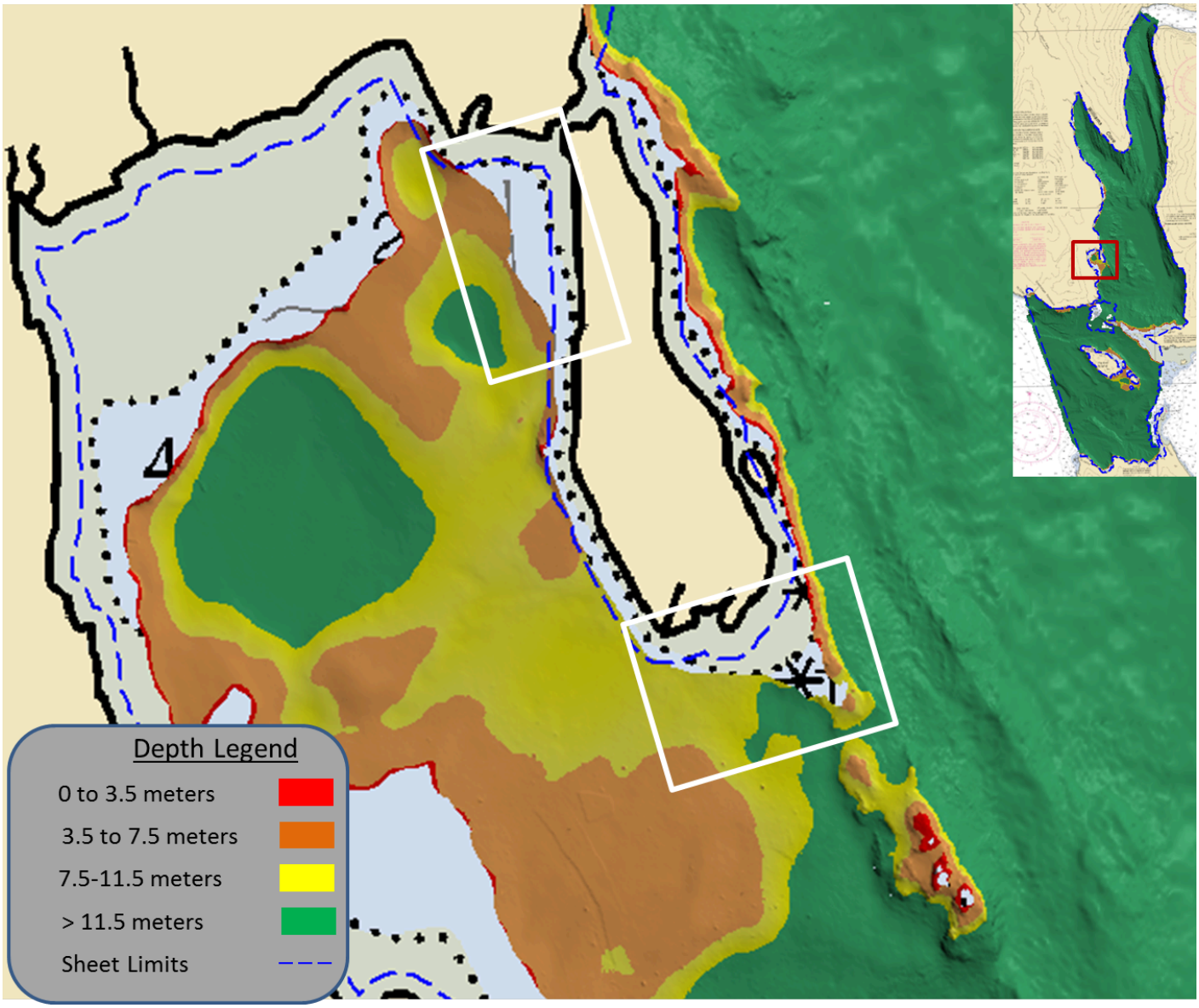


Figure 2: NALL defined by safety and rocks.

A.2 Survey Purpose

Tracy Arm Fjord, located in the Tongass National Forest, is a popular recreation destination and a highlight for the thousands of tourists who visit to see Sawyer Glacier. As confirmed by AIS data, it is regularly transited by cruise ships and sightseeing vessels. Existing surveys in the region are from 1974 and were completed using only partial-bottom coverage techniques. Modern complete-coverage surveys will increase maritime safety, as well as provide valuable data for glaciologists. This project will address these needs and the requests of the maritime pilot community. Data from this survey will update National Ocean Service (NOS) nautical charting products.

Nearshore feature investigations were conducted later in 2018 by the NOAA Ship RAINIER with survey F00728.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13007 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). Additional compliance statistics can be found in the Standards and Compliance Review located in Appendix II of this report.

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 with complete MBES backscatter

Table 2: Survey Coverage

The entirety of H13007 was acquired with complete coverage, meeting the requirements listed above and in the HSSD. See Figure 3 for an overview of coverage.

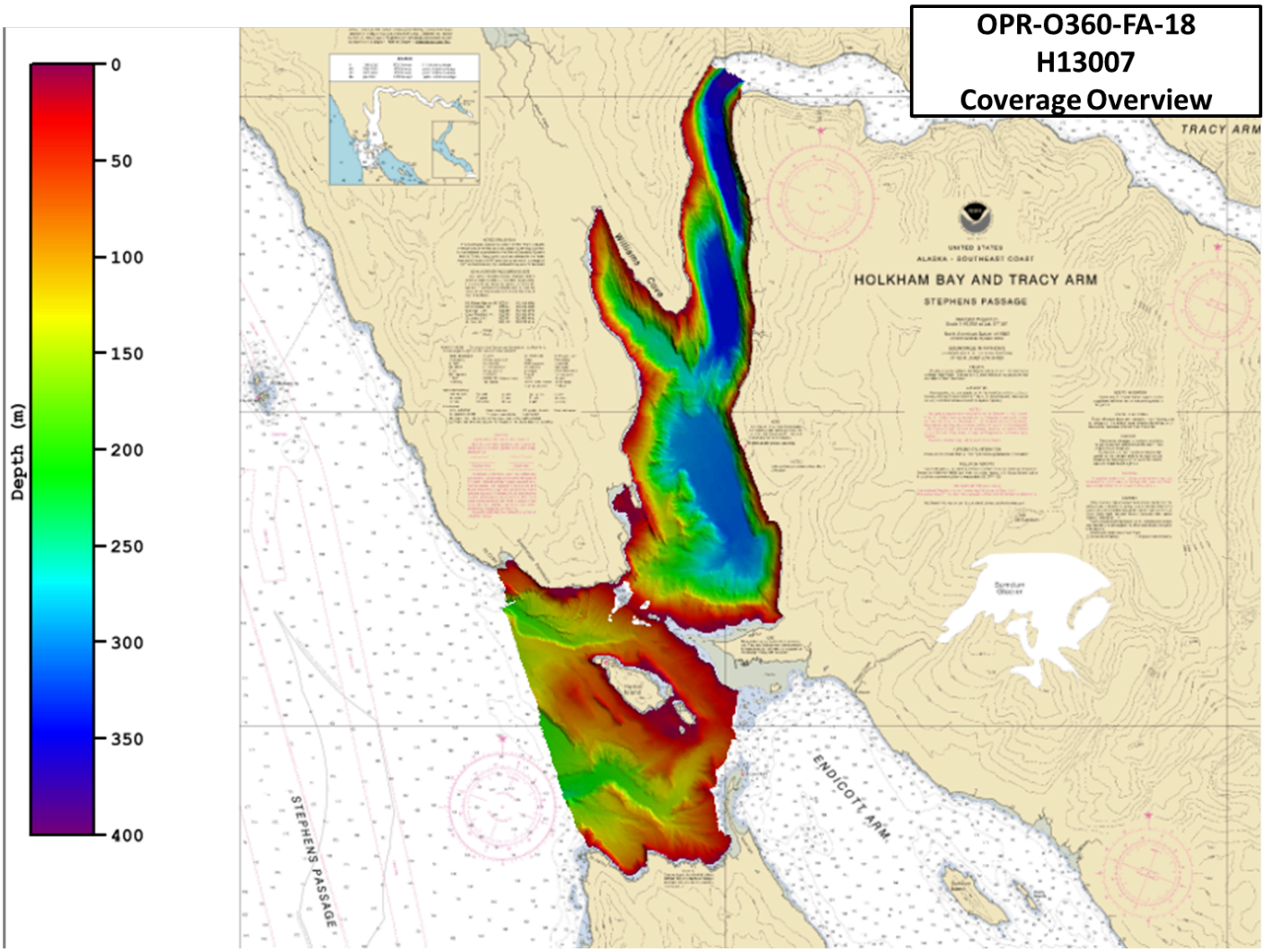


Figure 3: H13007 survey coverage overlaid onto Chart 17311

The data from H13007 combined with F00728 is compliant the the HSSD.

A.6 Survey Statistics

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

	HULL ID	*2805*	*2806*	*2807*	*2808*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0
	MBES Mainscheme	161.37	133.25	16.10	70.89	381.71000000000004
	Lidar Mainscheme	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0
	SBES/MBES Crosslines	0.85	14.30	0	0	15.15
	Lidar Crosslines	0	0	0	0	0
Number of Bottom Samples						9
Number Maritime Boundary Points Investigated						0
Number of DPs						0
Number of Items Investigated by Dive Ops						0
Total SNM						25.96

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/07/2018	127
05/08/2018	128

Survey Dates	Day of the Year
05/09/2018	129
05/10/2018	130
05/11/2018	131
05/12/2018	132

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-360-FA-18 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	***2805***	***2806***	***2807***	***2808***
LOA	8.6 meters	8.6 meters	8.6 meters	8.6 meters
Draft	1.1 meters	1.1 meters	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 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was installed on the survey platforms as follows: all MBES survey vessels are equipped with POS MV v5 systems for positioning and attitude. All launches utilize Kongsberg EM 2040 MBES, Teledyne RESON SVP 71 surface sound speed sensors, and Sea-Bird Scientific 19plus CTD casts.

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 3.97% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.3 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 the depths derived from mainscheme data and crossline data was 0.42m, with 95% of nodes falling within +/- 3.20 meters (Figure 5). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 99% of the depth differences between H13007 mainscheme and crossline data were within allowable NOAA uncertainties.

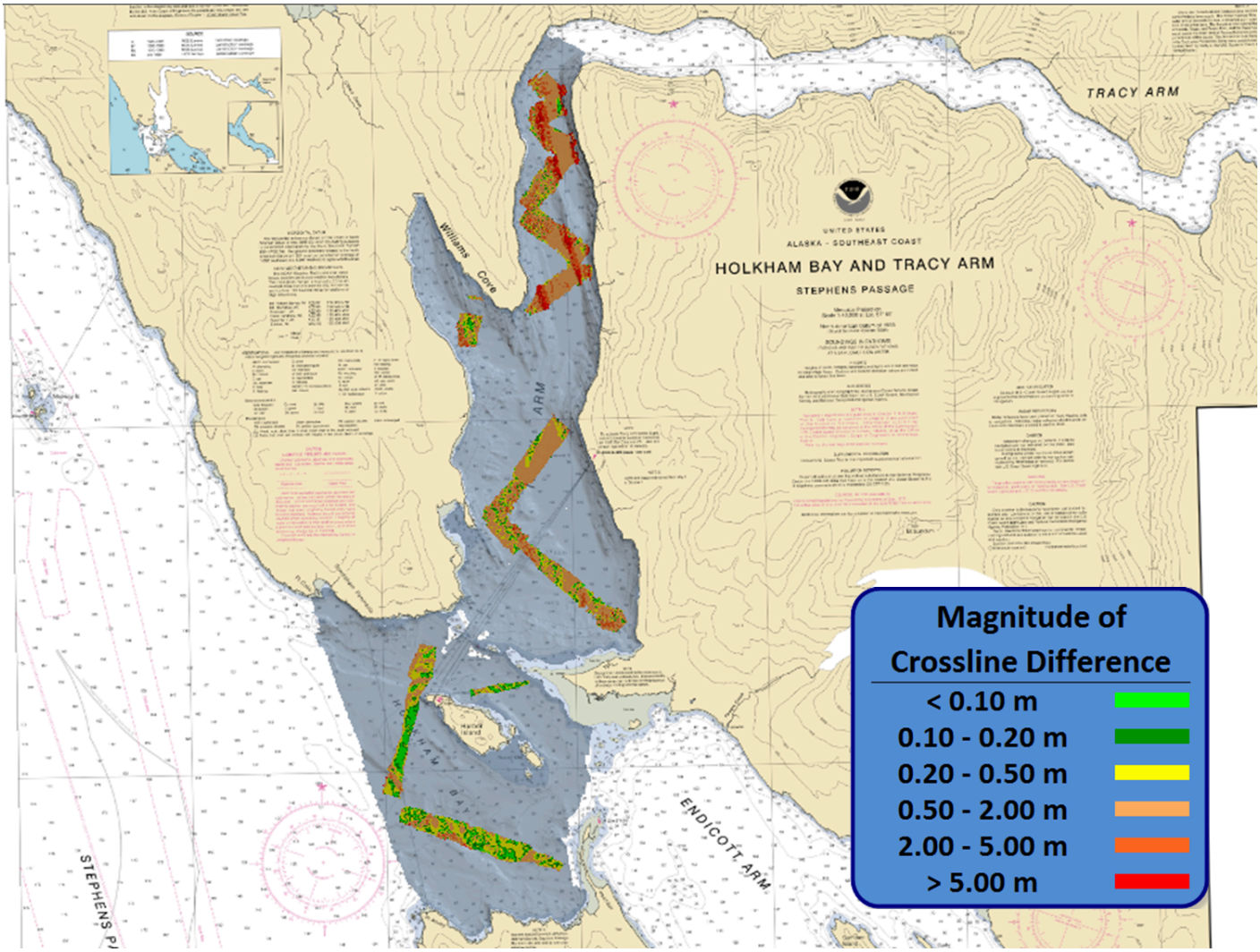
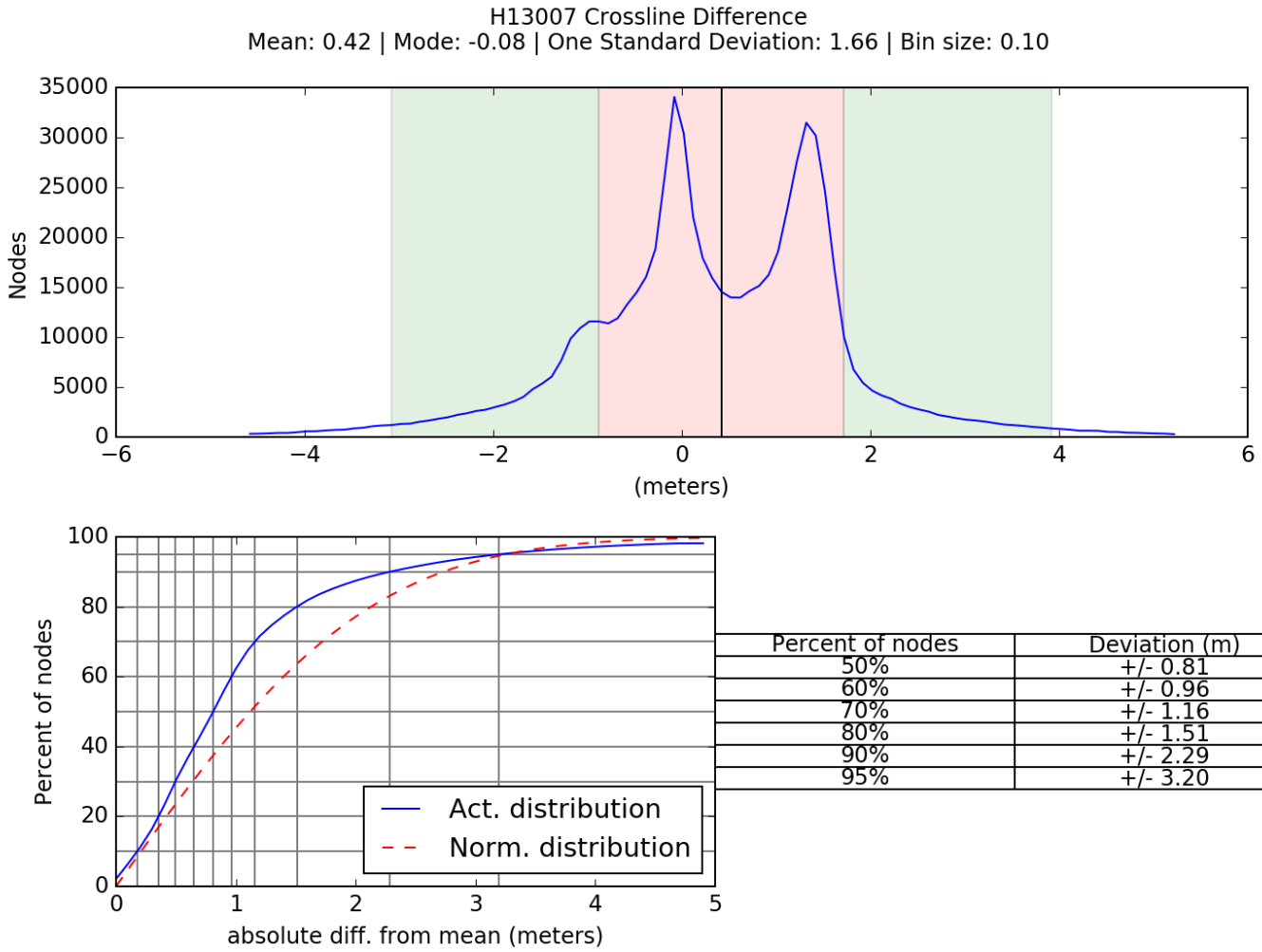


Figure 4: Overview of H13007 crosslines



Percent of nodes	Deviation (m)
50%	+/- 0.81
60%	+/- 0.96
70%	+/- 1.16
80%	+/- 1.51
90%	+/- 2.29
95%	+/- 3.20

Figure 5: H13007 crossline comparison statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Real time uncertainty values were calculated by TCARI grid

Method	Measured	Zoning
ERS via PMVD	0 meters	0.08 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
280x	2 meters/second	N/A meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion, ERZT, and Poor Man's VDatum (PMVD), real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13007. Real-time uncertainties were provided via EM2040 MBES data, Applanix Delayed Heave RMS, and TCARI tides. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel 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

H13007 junctions with two surveys from prior projects, H11998 and F00503 as shown in Figure 6. These areas of overlap between surveys were reviewed with CARIS HIPS and SIPS by surface differencing (at equal resolutions) to assess surface agreement. The junctions with H13007 are generally in agreement with each other, however did not pass the NOAA allowable uncertainty in their areas of overlap. For all junctions with H13007, a negative difference indicates H13007 was shoaler, and a positive difference indicates H13007 was deeper.

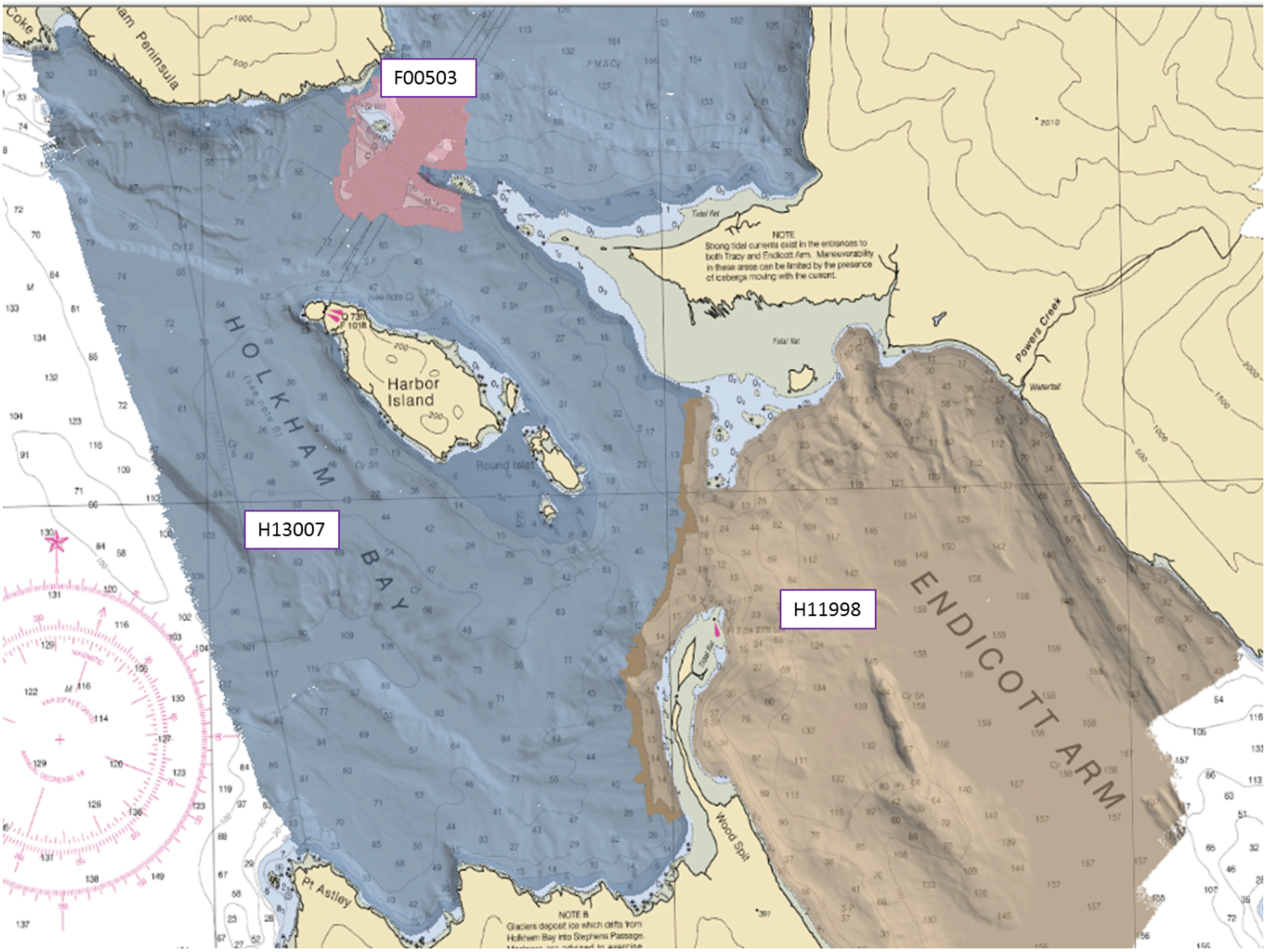


Figure 6: H13007 junction overview

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H11998	1:10000	2008	NOAA Ship FAIRWEATHER	SE
F00503	1:10000	2005	NOAA Ship FAIRWEATHER	S

Table 9: Junctioning Surveys

H11998

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface generated from H13007 data and the surface generated from H11998 data (Figure 7). The statistical analysis

of the difference surface shows a mean of -0.36 meters with 95% of all nodes having a maximum deviation of +/- 0.94 meters, as seen in Figure 8. It was found that 91% of nodes are within the NOAA allowable uncertainty. The largest differences exhibited are in areas where the geological structure of the sea floor is dynamic, such as steep slopes and rocks, as seen in Figure 9.

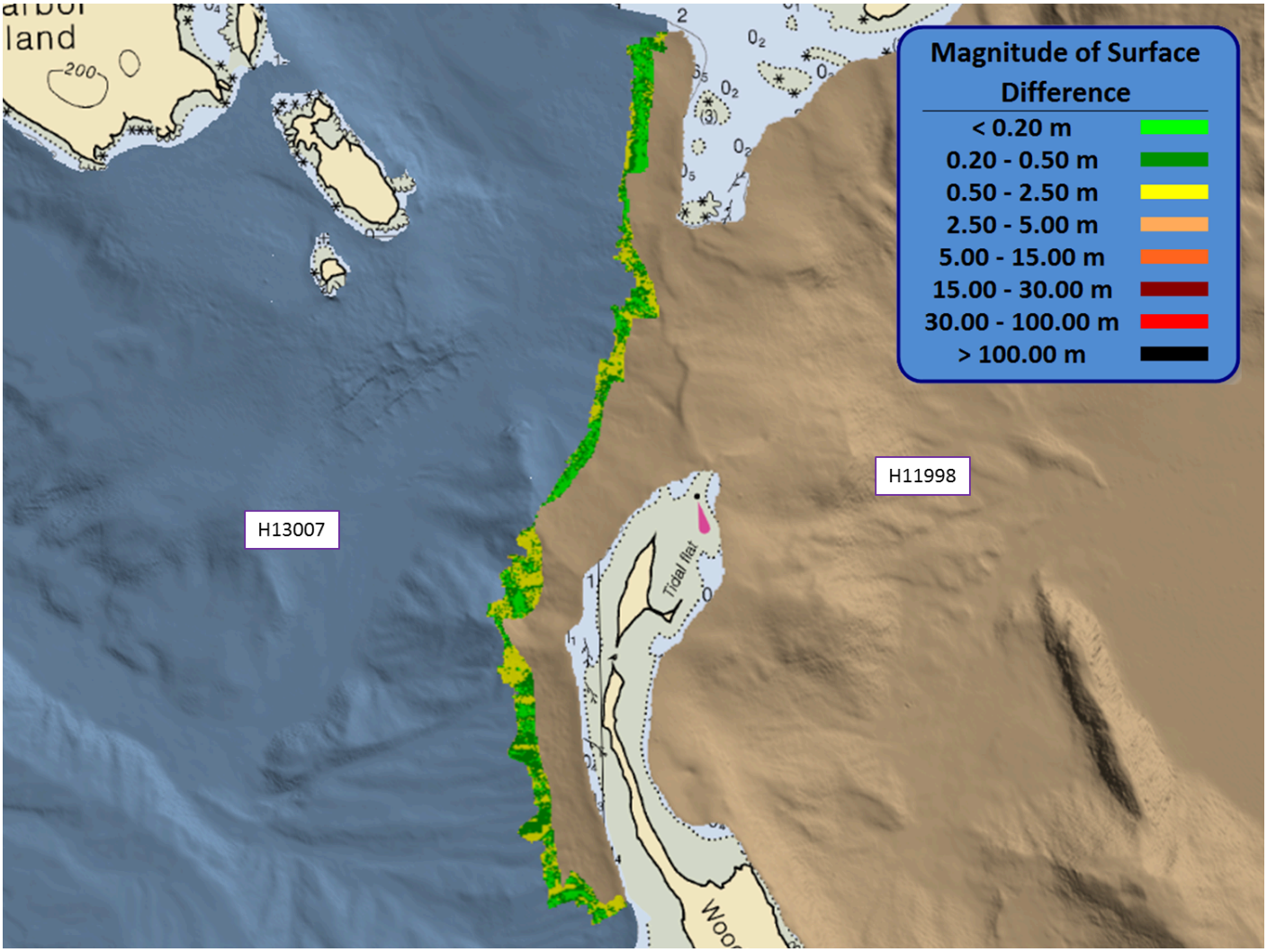
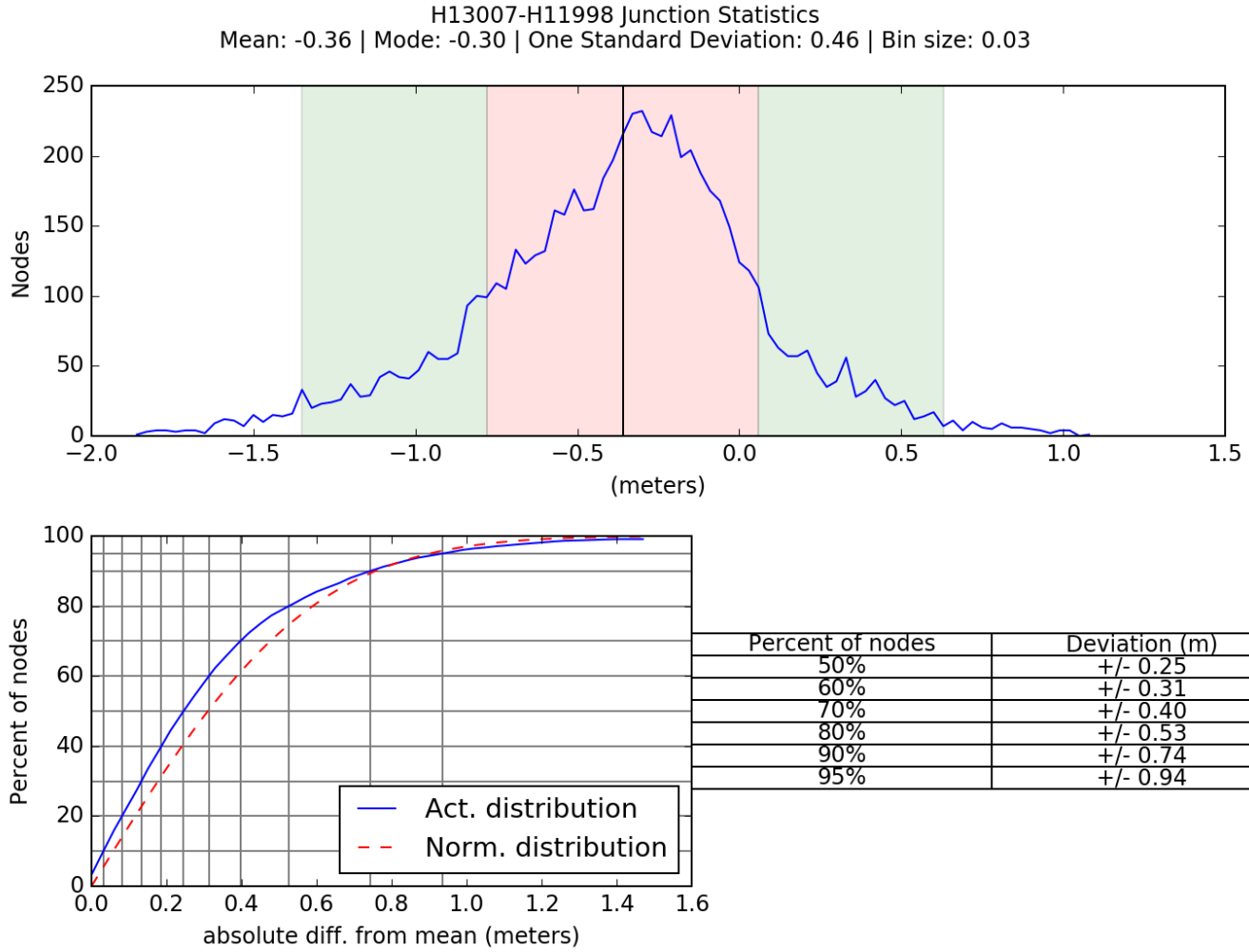


Figure 7: Difference surface between H13007 (blue) and junctioning survey H11998 (brown)



Percent of nodes	Deviation (m)
50%	+/- 0.25
60%	+/- 0.31
70%	+/- 0.40
80%	+/- 0.53
90%	+/- 0.74
95%	+/- 0.94

Figure 8: Difference surface statistics between H13007 and H11998

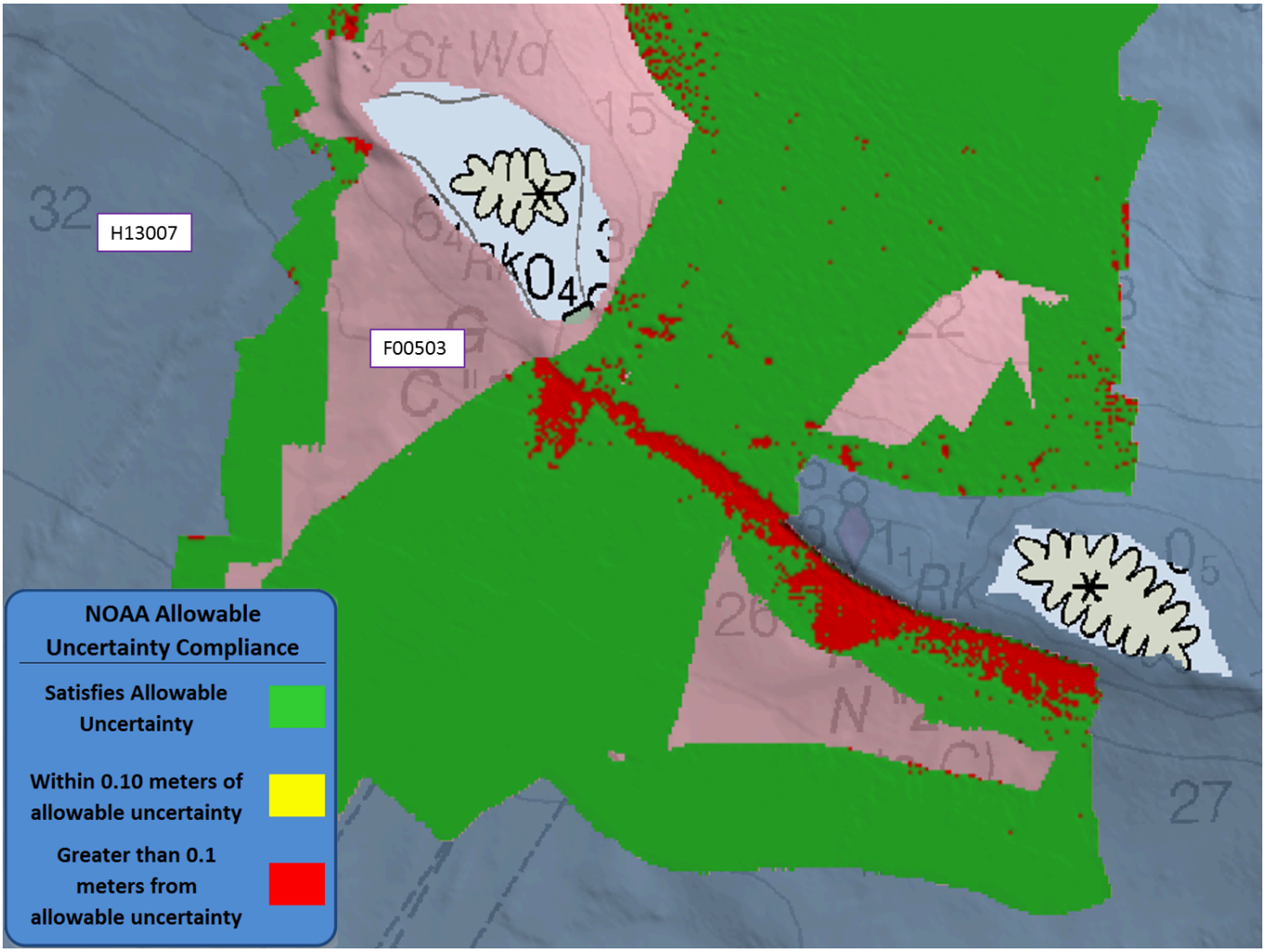


Figure 9: Difference surface compliance with regard to NOAA allowable uncertainty between H13007 (blue) and junctioning survey H11998 (brown).

F00503

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface generated from H13007 data and the surface generated from F00503 data (Figure 10). The statistical analysis of the difference surface shows a mean of -0.23 meters with 95% of all nodes having a maximum deviation of +/- 1.12 meters, as seen in Figure 11. It was found that 94% of nodes are within the NOAA allowable uncertainty. The largest differences are located where there is a glacial moraine on the seafloor, as seen in Figure 12.

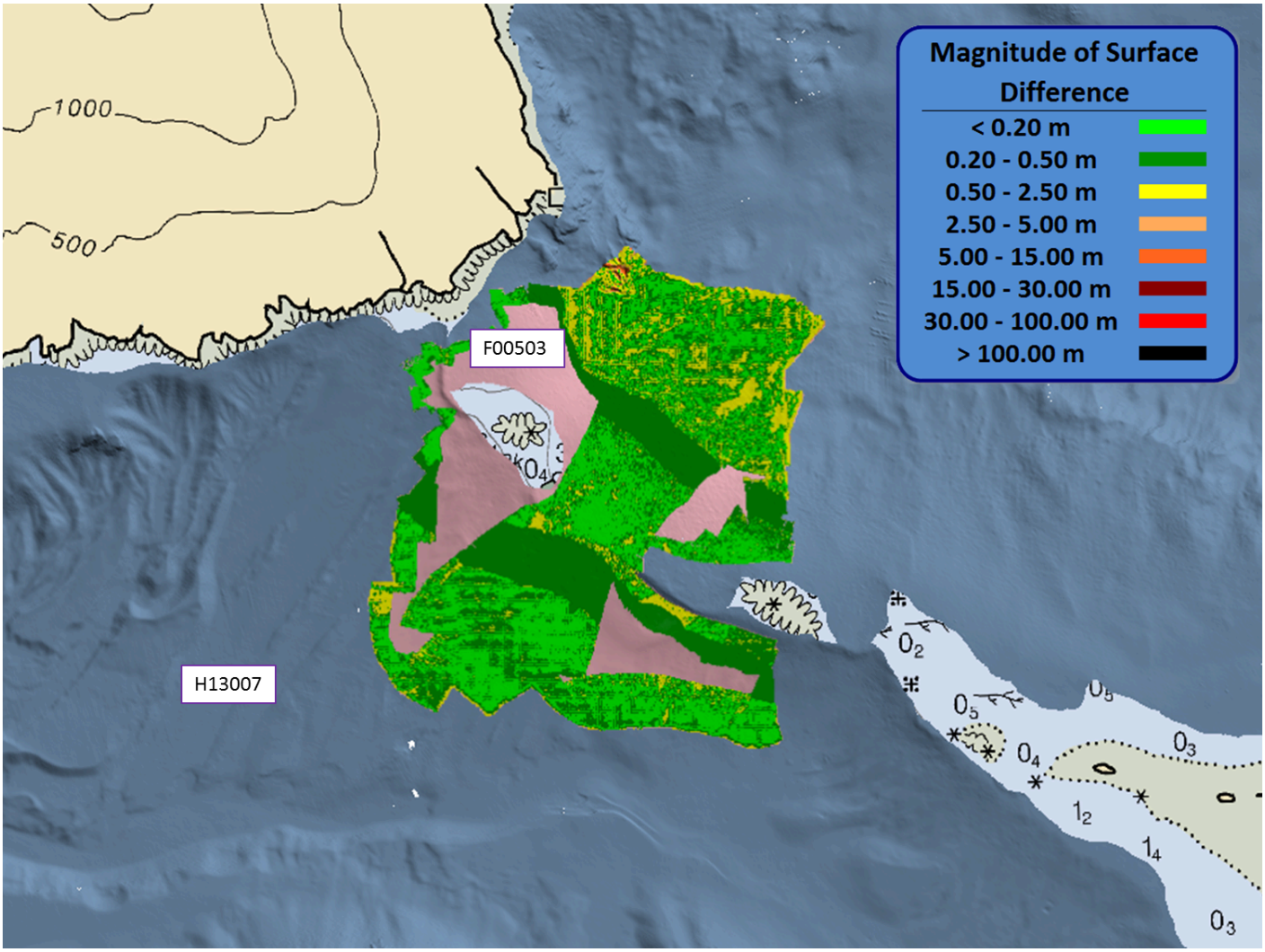
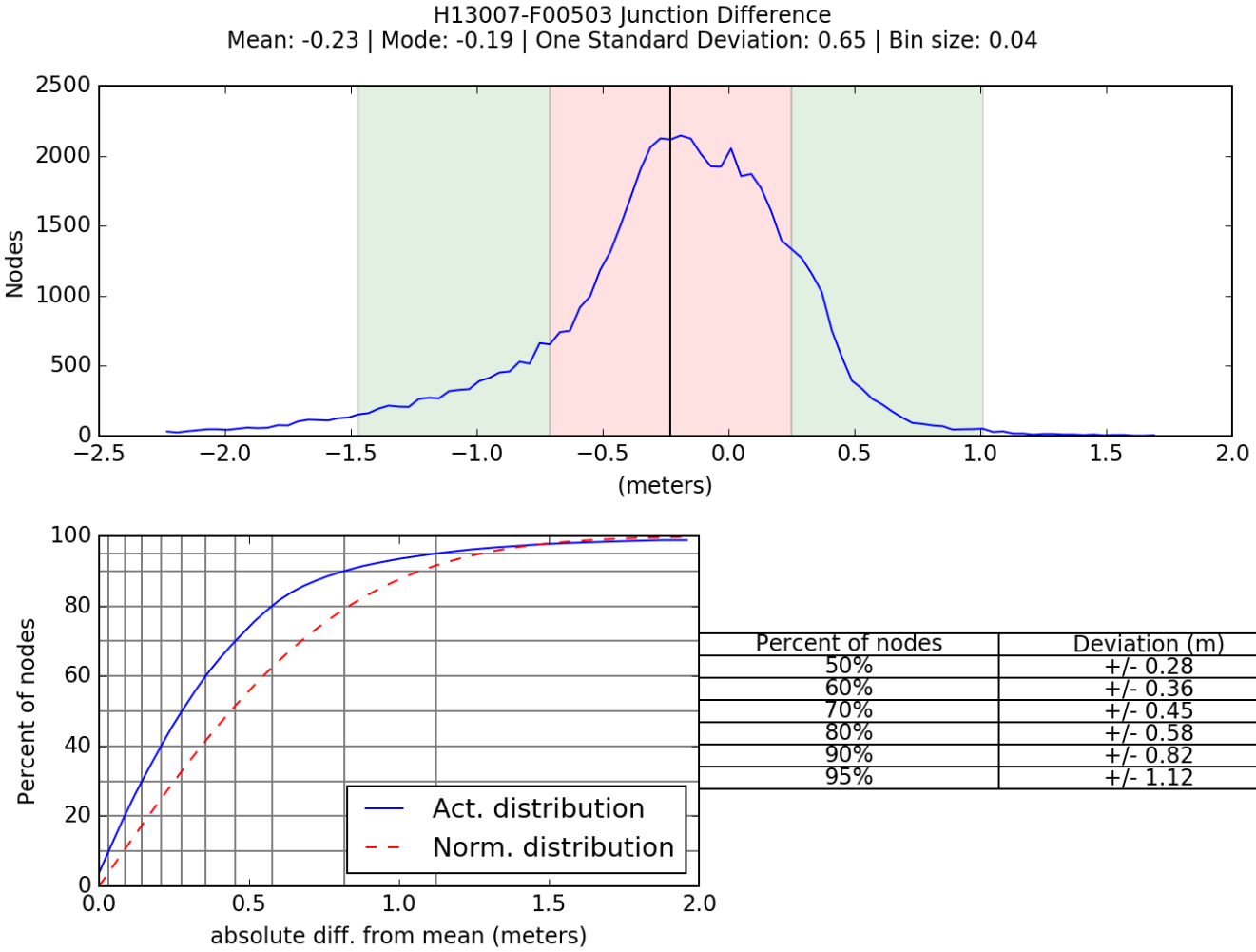


Figure 10: Difference surface between H13007 (blue) and junctioning survey F00503 (pink)



Percent of nodes	Deviation (m)
50%	+/- 0.28
60%	+/- 0.36
70%	+/- 0.45
80%	+/- 0.58
90%	+/- 0.82
95%	+/- 1.12

Figure 11: Difference surface statistics between H13007 and F00503

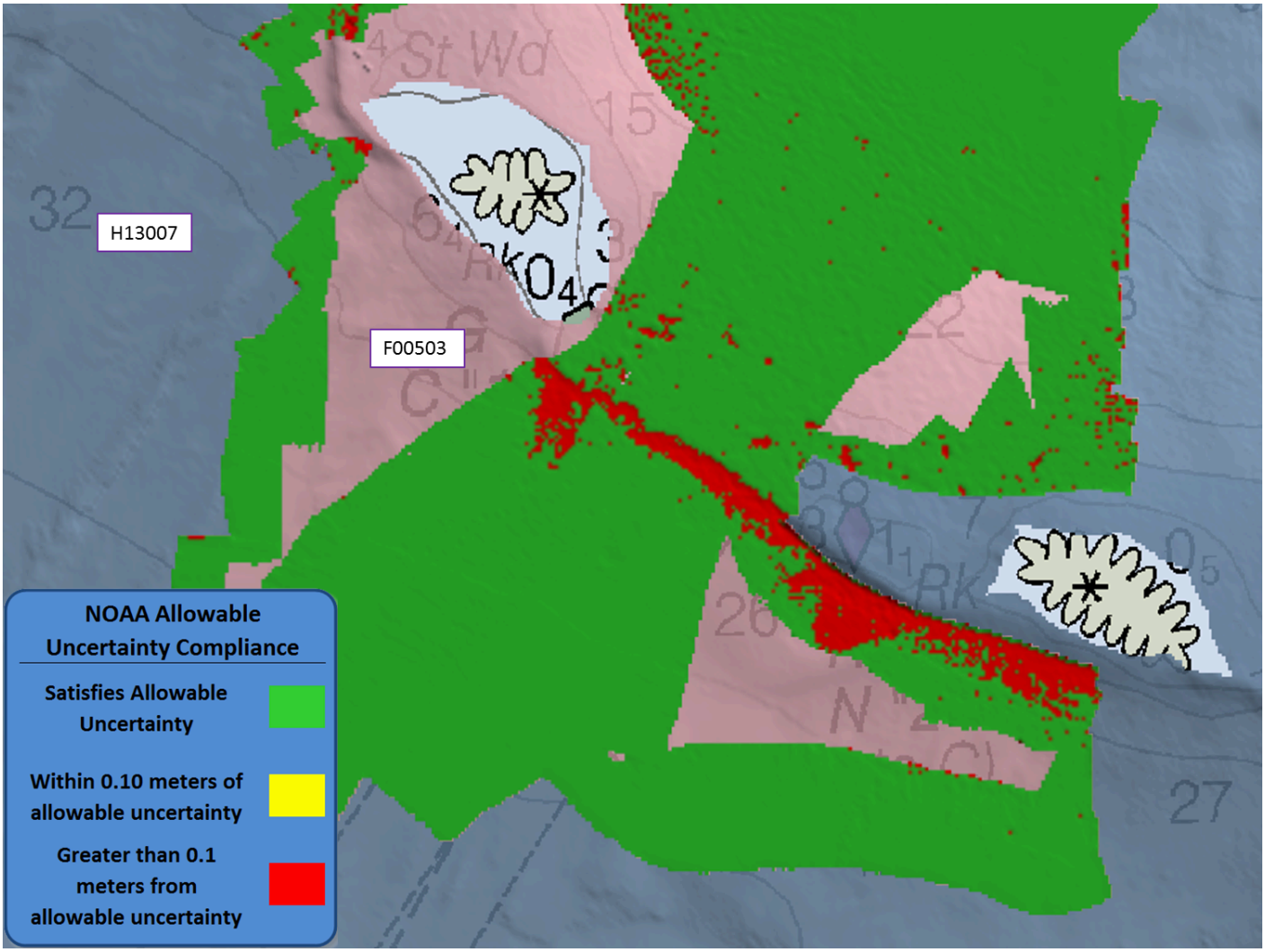


Figure 12: Difference surface compliance with regard to NOAA allowable uncertainty between H13007 (blue) and junctioning survey F00503 (pink).

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: 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, or in areas where 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

H13007 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Five holidays which meet the definition described in the HSSD for complete coverage were identified via the Pydro QC Tools Holiday Finder tool. 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.

Reasonable attempts were made to cover all gaps in the bathymetry that resulted from lack of coverage over the tops of features and underwater rocks when it was safe and prudent to do so. Holidays 1-4 as seen in Figure 13 are a result of underwater rocks, over which it was unsafe to acquire bathymetry. Due to time constraints on project, these features were unable to be addressed via alternate methods, and therefore were assigned to be addressed by NOAA Ship Rainier within F00728. The holiday labeled as "5" is located outside of the H13007 sheet limits.

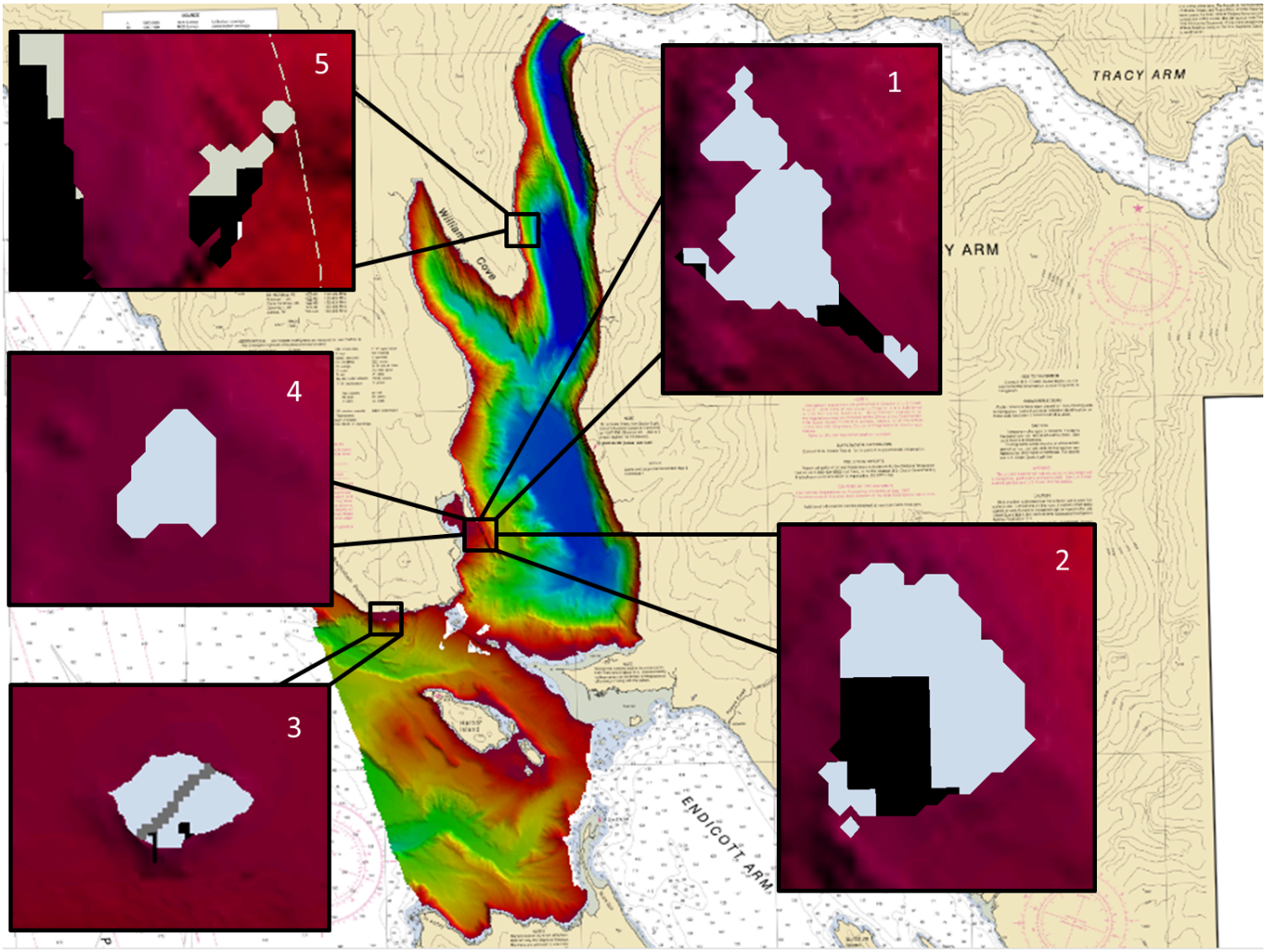


Figure 13: H13007 complete coverage holiday overview

B.2.10 NOAA Allowable Uncertainty

The surface was analyzed using the Pydro QC Tools Grid QA feature to determine compliance with specifications. Overall, 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13007. For a graphical representation of uncertainty requirements, see the Standards and Compliance Review located in Appendix II.

B.2.11 Density

The surface was analyzed using the Pydro QC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13007 were achieved with at least 96% of surface nodes

containing five or more soundings as required by HSSD Section 5.2.2.3. For a graphical representation of density requirements, see the Standards and Compliance Review located in Appendix II.

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 were stored in the .all file for Kongsberg systems. All backscatter have been processed by the field unit via Fledermaus FMGT 7.8.1. All processed mosaics and .gsf files have been submitted to the Pacific Hydrographic Branch. See Figure 14 for a complete mosaic.

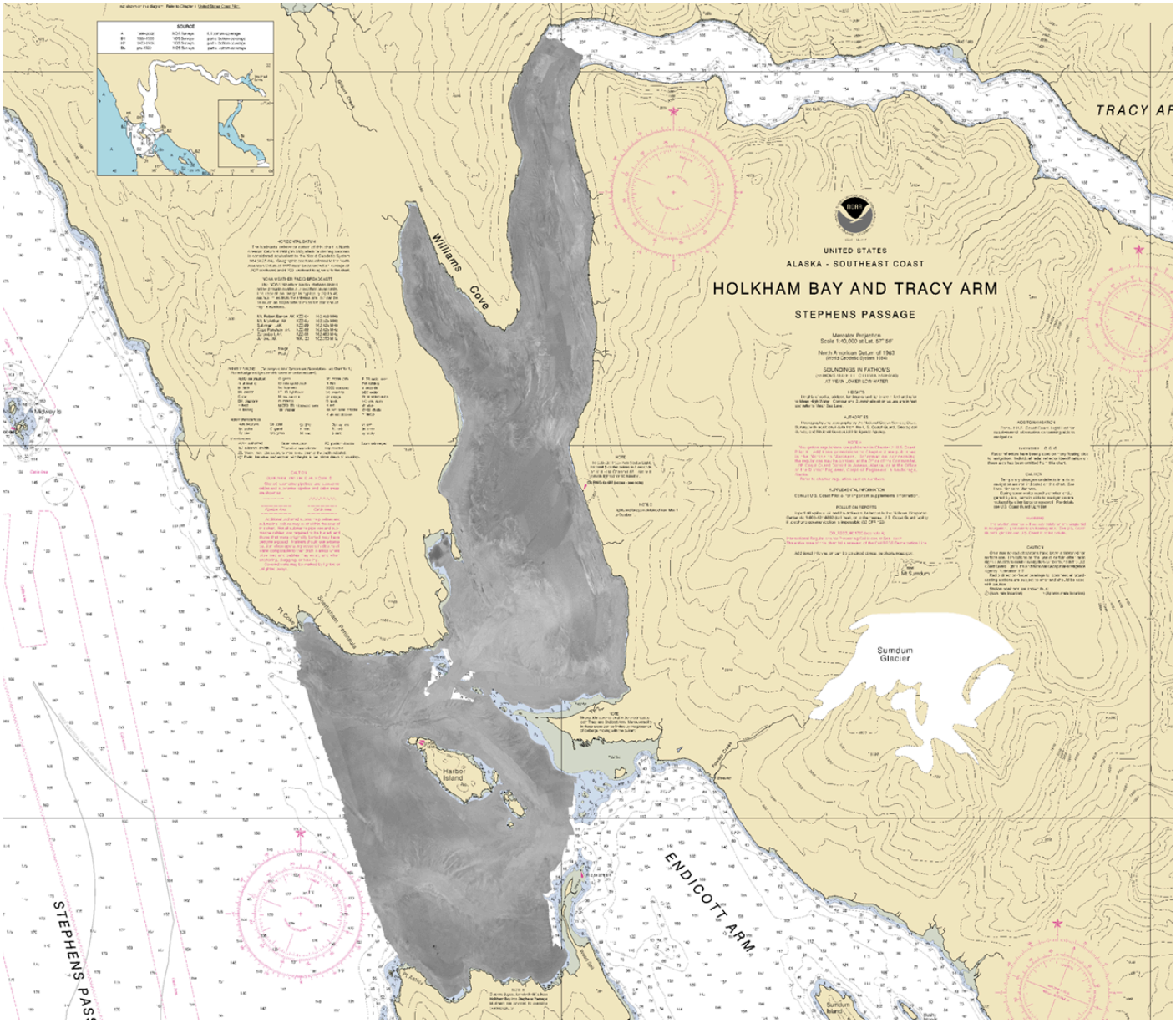


Figure 14: Overview of H13007 backscatter

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
Teledyne CARIS	HIPS and SIPS	10.4.3

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 FMGT	7.8.1

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Extended Attribute Files version 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
H13007_MB_VR_MLLW	CARIS VR Surface (CUBE)	1-32 meters	-1.2 meters - 380.6 meters	NOAA_VR	Complete MBES
H13007_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	1-32 meters	-1.2 meters - 380.8 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 H13007. 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 v6, part of QC Tools within Pydro, 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 steep slopes and dynamic nature of the seafloor.

A number of isolated node fliers were found by Pydro QC Tools Flier Finder in the northeast section of H13007 due to a gridding algorithm issue. Due to the steep slope in conjunction with the large supergrid size utilized during computation of the variable resolution surface, this area was gridded at a much finer resolution than required. Depths in excess of 150 meters were gridded at a one meter resolution, leading to gaps in the resultant surface (Figure 15). These fliers were ignored, as they appear to be valid data.

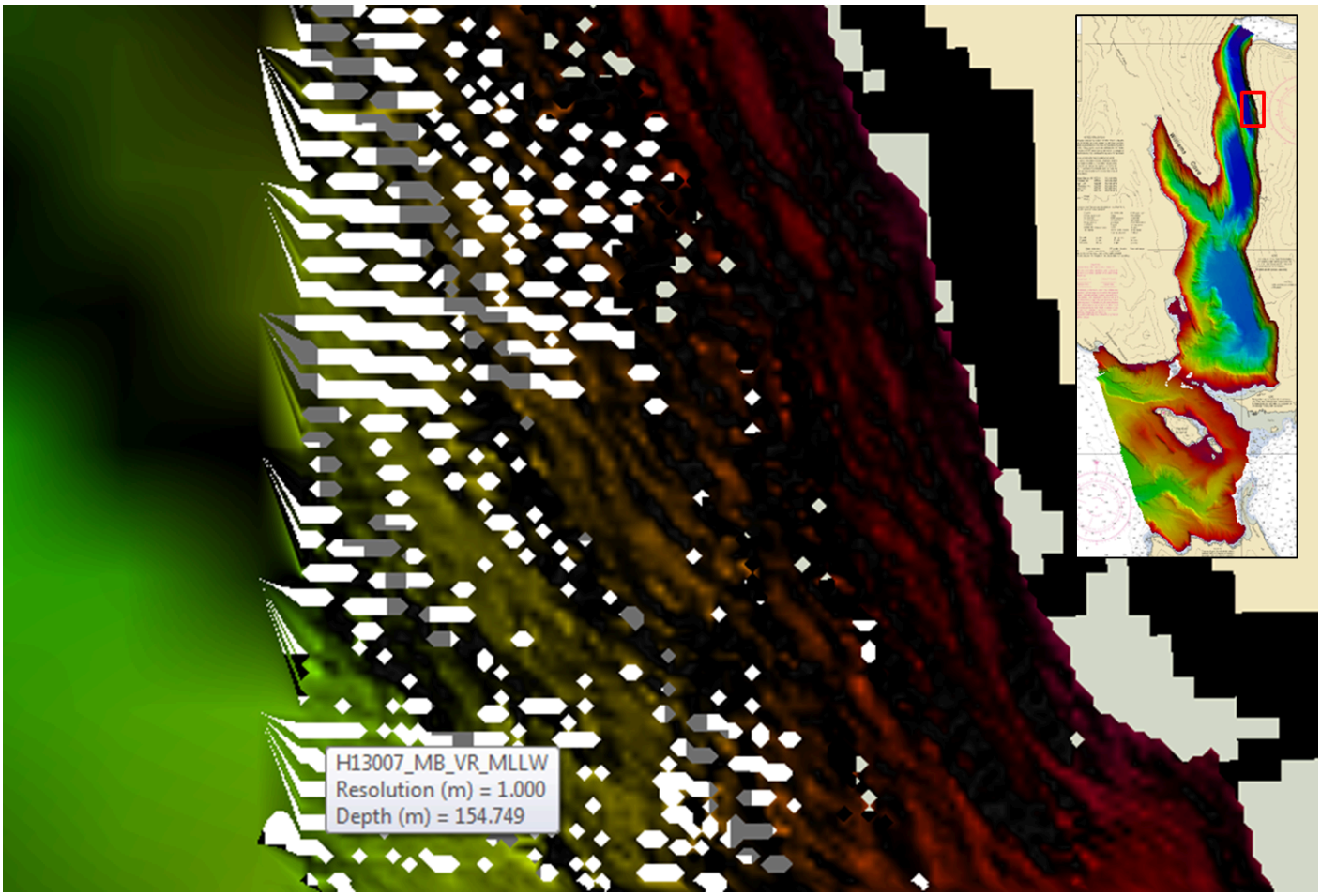


Figure 15: H13007 surface gridding issue

During office review the parameters for surface creation needed to be altered due to new holidays being created in deeper sections of this survey. It was determined that these artificial holidays were being created by the processing software. The coarsest resolution was changed from 64 to 128 for the archival surface. This did not, however, improve the gridding artifacts described above.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final tide and sound speed application are noted in the H13007 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

B.5.4 Designated Soundings

H13007 contains 1 designated sounding in accordance with HSSD Section 5.2.1.2.3. This designated sounding represents a DTON (see Section D.1.6).

C. Vertical and Horizontal Control

Per Section 5.1.2.3 of the 2014 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13007.

C.1 Vertical Control

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

Traditional Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Juneau	9452210
Ketchikan	9450460
Port Alexander	9451054
Sitka	9451600
Skagway	9452400
Elfin Cove	9452634

Table 13: NWLON Tide Stations

File Name	Status
O190_O360_O375_O392_FA2018.tc	Final Approved

Table 14: Water Level Files (.tid)

File Name	Status
O190_O360_O375_O392_FA2018.tc	Final

Table 15: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 06/15/2018. The final tide note was received on 06/27/2018.

Initial reduction of acquired data to MLLW was accomplished via traditional tidal means using the Tidal Constituent And Residual Interpolation (TCARI) grid provided by HSD-OPS. Following the successful application of SBETs and computation of an Ellipsoidally Referenced Zone Tide (ERZT) separation model, ERS methods were used for reducing data to MLLW.

ERS Methods Used:

ERS via Poor Mans VDATUM

Ellipsoid to Chart Datum Separation File:

OPR-O360-FARA-18-TracyArm_NSPMVD_NAD83-MLLW_debiased.csar

ERS methods were used as the final means of reducing H13007 to MLLW for submission. Data were initially reduced via traditional tidal means until an ERZT separation model could be calculated. This empirically derived model was then checked for consistency and compared to the Poor Man's VDatum (PMVD) separation model provided with the Project Instructions. The PMVD separation model was then vertically shifted such that the average difference between these two separation models is zero. This vertical shift de-biases the PMVD separation model, correcting for local offsets that cannot be effectively modeled by the PMVD. This vertical shift de-biases the PMVD separation model, correcting for local offsets that cannot be effectively modeled by the PMVD. The de-biased PMVD was used to reduce H13007 to MLLW.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The projection used for this project is UTM Zone 8 North.

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX 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.

For further details regarding the processing and quality control checks performed, see the H13070 POSPac Processing Logs spreadsheet located in the Separates I folder.

Differential correctors from the US Coast Guard beacon at Gustavus, Alaska (280 kHz) were used in real-time for acquisition when not otherwise noted in the acquisition logs.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Gustavus, AK

Table 16: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H13007 and ENC US5AK35M using CARIS HIPS and SIPS sounding and contour layers derived from the surface generated from H13007 data. The contours and soundings were overlaid on the charts to assess differences between the surveyed soundings and charted depths. A 15 meter grid was generated from the ENC by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface generated from H13007 data. All H13007 data should supersede charted data. In general, surveyed soundings agree with the majority of charted depths. A full discussion of the comparisons follows below.

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	Preliminary?
US5AK35M	1:40000	4	07/24/2017	07/24/2017	NO

Table 17: Largest Scale ENCs

US5AK35M

Soundings from H13007 are in general agreement with charted depths on ENC US5AK35M, with most depths agreeing to 1-3 fathoms. The largest difference is seen in the entrance to Holkham Bay, where the charted soundings differ so greatly that they were submitted as a DTON (see section D.1.5 and Appendix II of this report for more detailed discussions.)

To more accurately visualize trends within these differences, a TIN surface was interpolated from the ENC sounding layer. This surface was then differenced with a corresponding surface from H13007 and visualized in Figure 16. In this difference surface red colors indicated H13007 was shoaler than the ENC US5AK35M, green colors indicate agreement, and blue colors indicate H13007 was deeper than ENC US5AK35M. Statistics show the mean difference between the surfaces derived from mainscheme data and the interpolated TIN data was 5.54 and 95% of nodes falling within +/- 19.87m (Figure 17).

Contours from H13007 are in general agreement with charted contours on ENC US5AK35M. Contours generated from H13007 data generally trend inshore of charted contours (Figure 18). Furthermore, the hydrographer recommends superseding all charted contours with surveyed data.

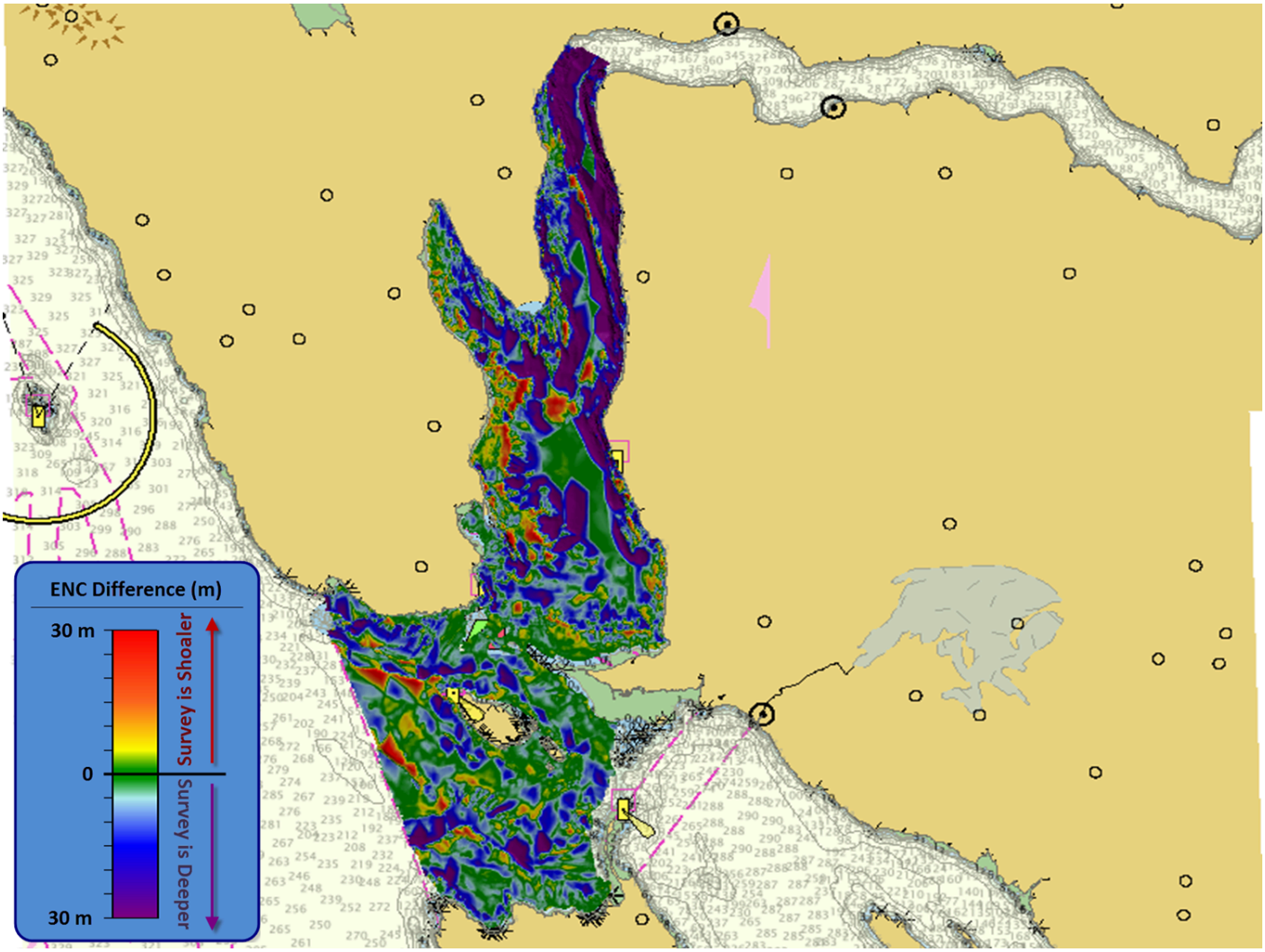
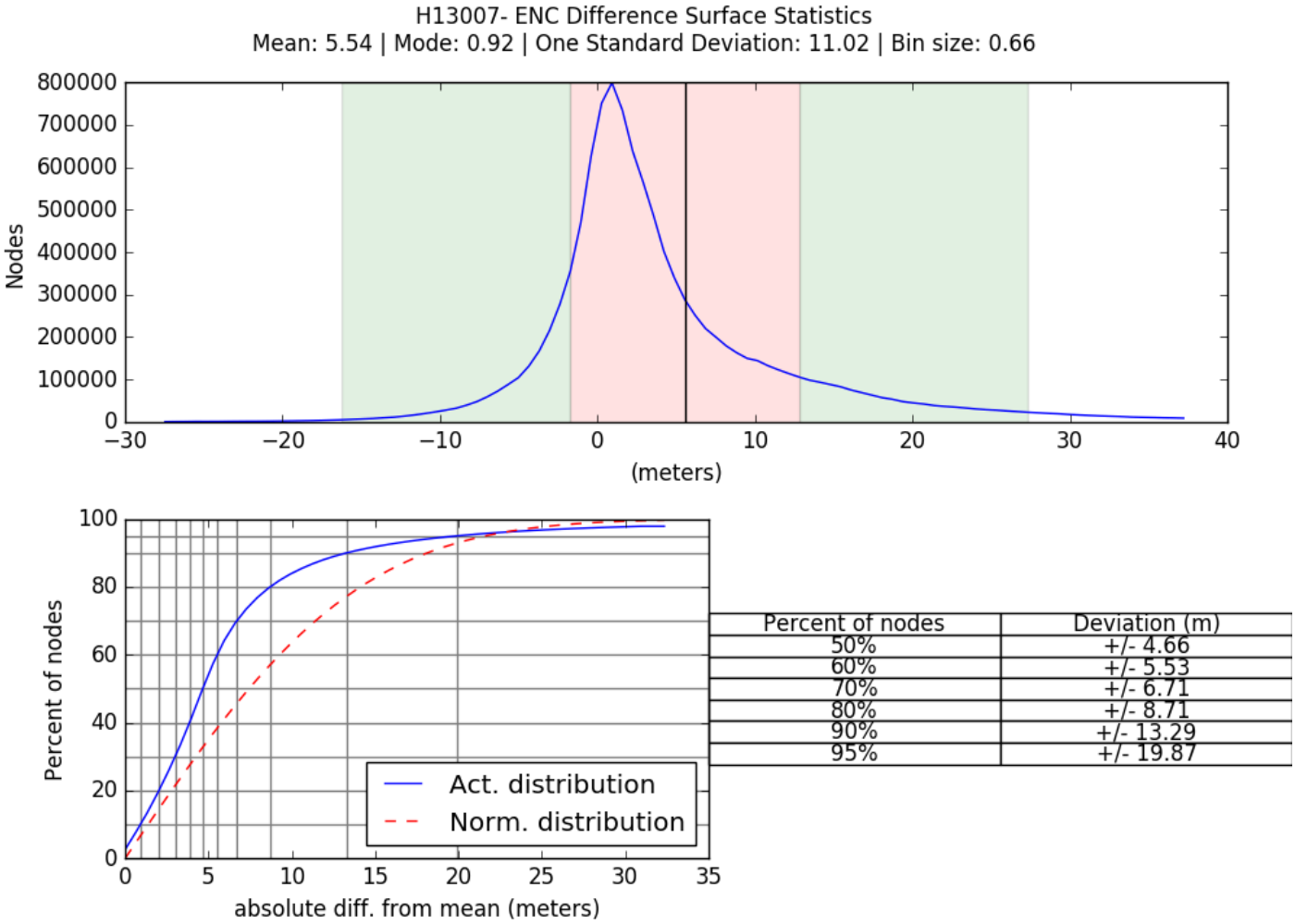


Figure 16: Difference surface between H13007 and interpolated TIN surface from US5AK35M



Percent of nodes	Deviation (m)
50%	+/- 4.66
60%	+/- 5.53
70%	+/- 6.71
80%	+/- 8.71
90%	+/- 13.29
95%	+/- 19.87

Figure 17: Difference surface statistics between H13007 and interpolated TIN surface from US5AK35M

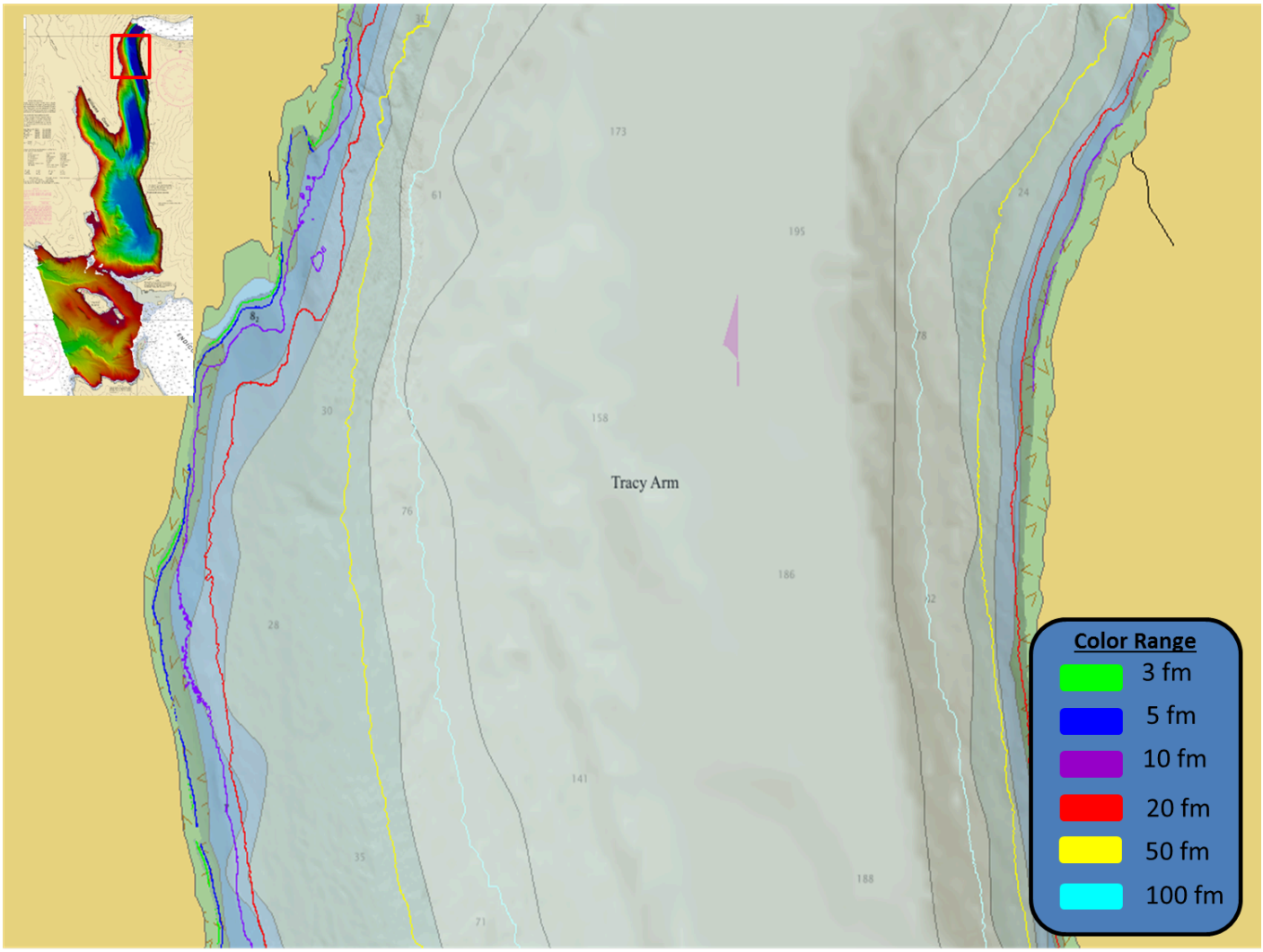


Figure 18: Charted contours further offshore than surveyed contours

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned 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 Shoal and Hazardous Features

A significant discrepancy between the charted contours and surveyed depths was observed during acquisition, prompting one Danger to Navigation Report to be submitted on May 25, 2018 (Figure 19). Surveyed data revealed a two foot sounding offshore of the three fathom contour. The Danger to Navigation Report is included in Appendix II of this report.

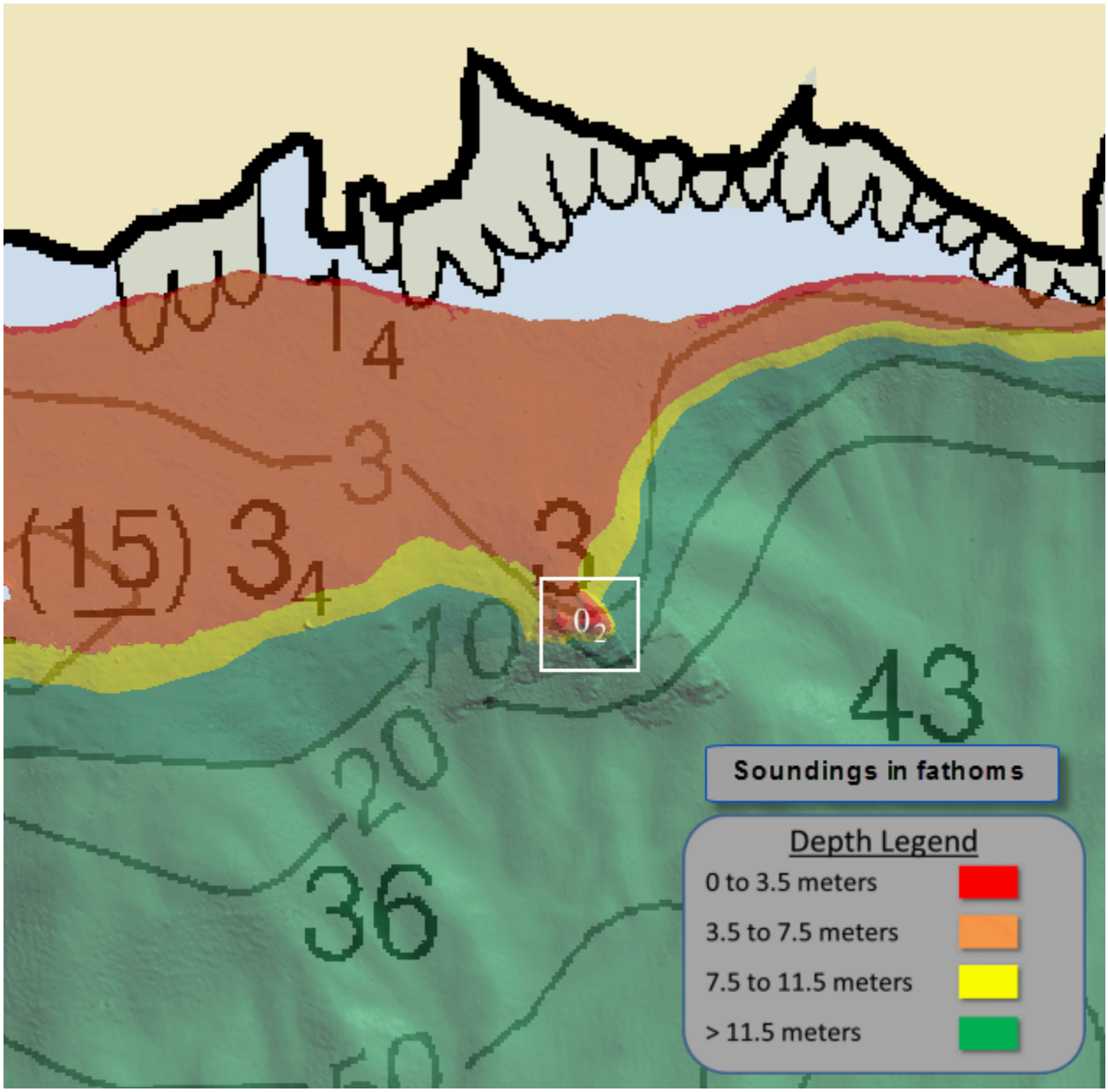


Figure 19: Overview of DTON found offshore of Snettisham Peninsula in Holkham Bay, AK

D.1.6 Channels

There are no precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or range lines within the survey limits. A designated anchorage for small boats in 5 fathoms is located in the small bight on the west side of the arm, about 2 miles above the entrance and 4 miles below Williams Cove. A navigable channel 0.3 miles wide and 6.5 fathoms deep is located at the entrance of Tracy Arm.

D.1.7 Bottom Samples

25 bottom sample locations were designated in the project reference file, however, 16 of these assigned locations were in areas in excess of 80m of water, which is outside the operational limits of bottom sampling as stated in the HSSD section 7.2.3. 9 bottom samples were acquired in accordance with the Project Instructions for survey H13007. All bottom samples were entered in the H13007 Final Feature File in the S-57 Files folder. See Figure 20 for a graphical overview of sample locations.

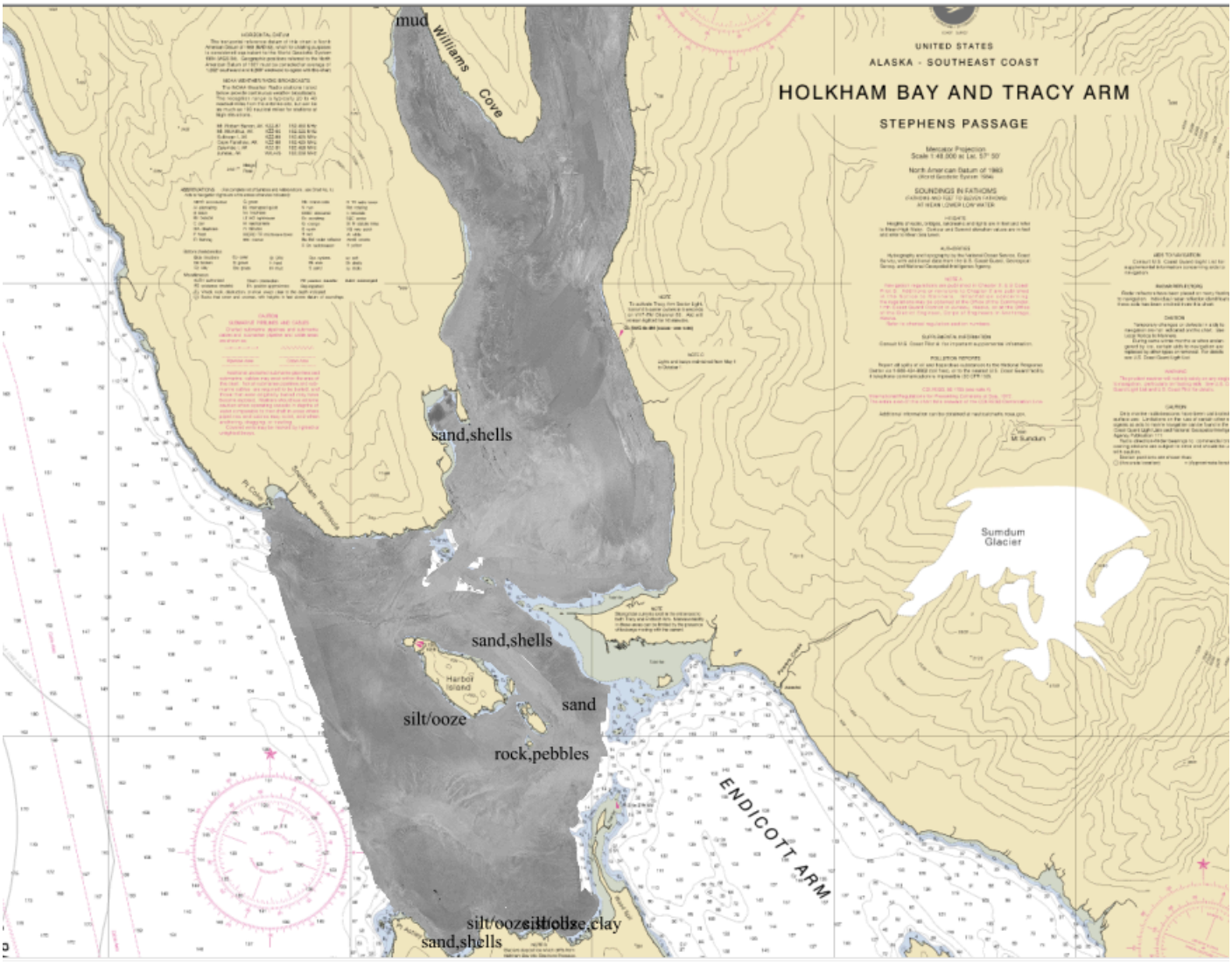


Figure 20: H13007 overview of bottom sample locations

D.2 Additional Results

D.2.1 Shoreline

Shoreline was assigned in the Hydrographic Survey Project Instructions or Statement of Work, but was not investigated. NOAA Ship Rainier completed H13007 features via an F00728 survey. It is recommended that the processing branch review these two surveys concurrently.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

Wood Spit Light stands within H13007 and was observed to be on station and serving it's intended purpose. Two unlighted buoys were observed on station marking the navigable channel at the entrance to Tracy arm.

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 and/or Environmental Conditions

A long, narrow bathymetric trough in the sea floor was investigated in the northeast region of H13007, running perpendicular to the shoreline. This depression has dimensions of roughly 40m deep, 280m long, and 20m wide.

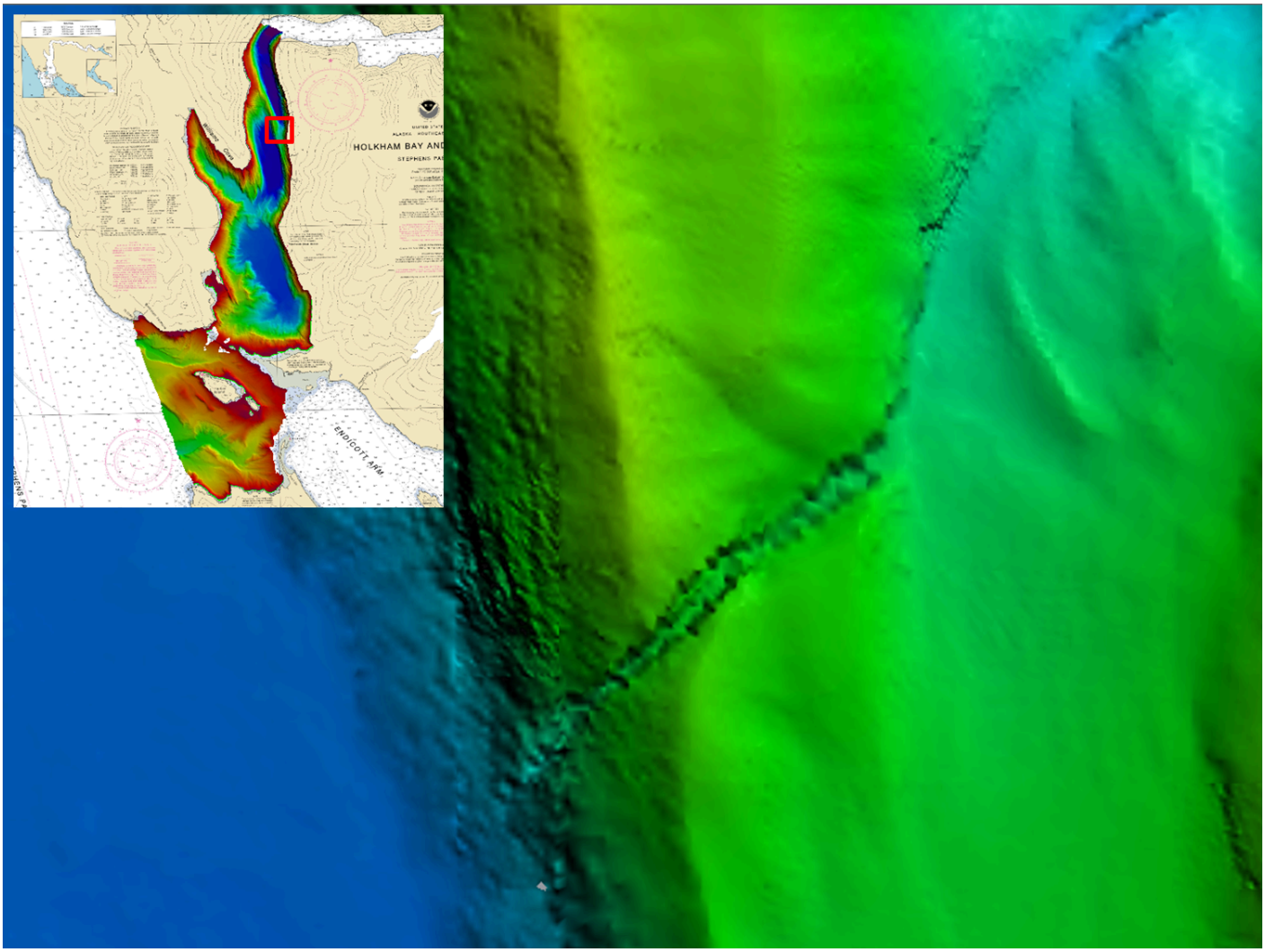


Figure 21: Surface in northeast region of H13007

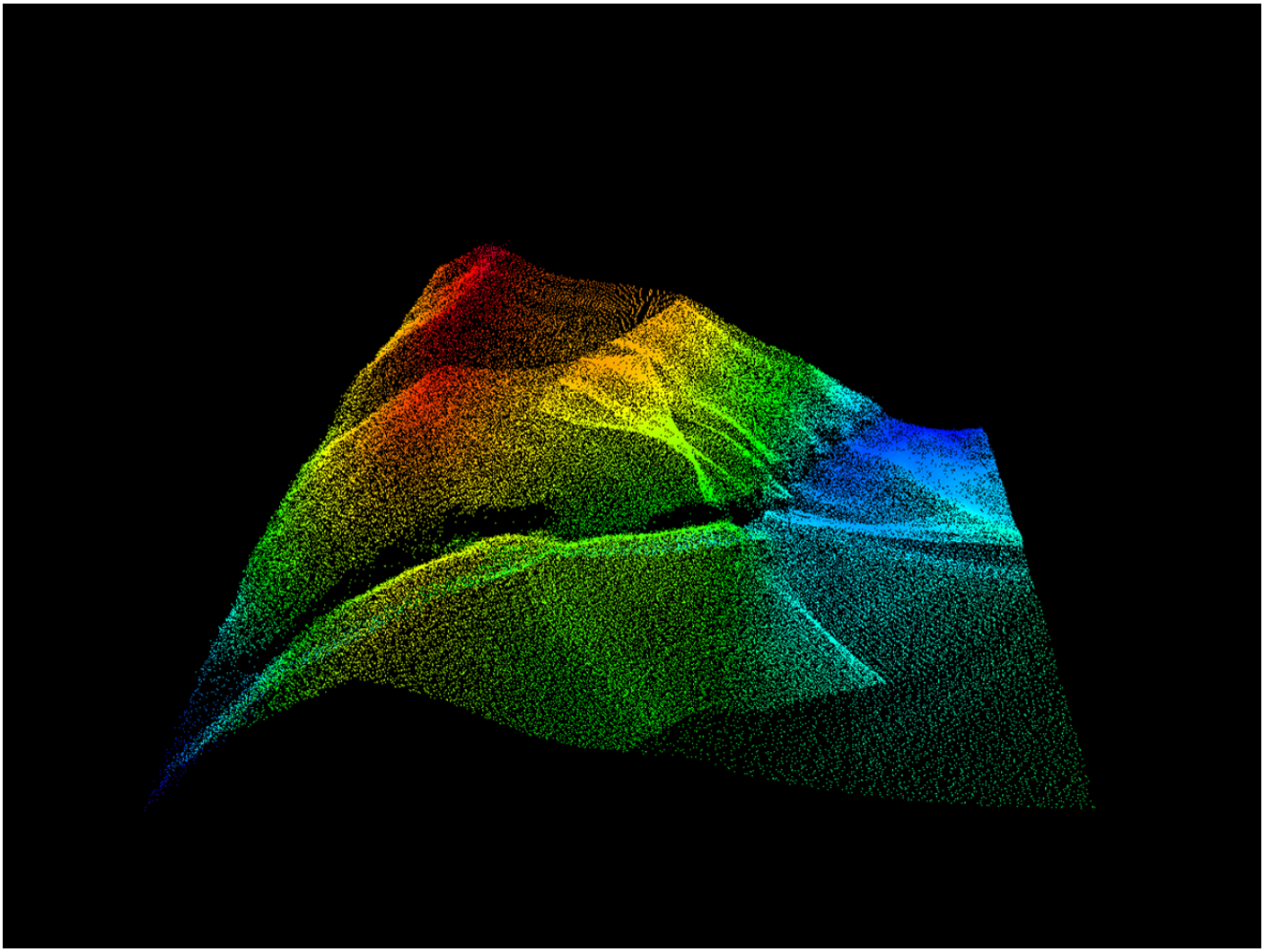


Figure 22: 3D image as seen from the south of H13007

D.2.9 Construction and Dredging

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

D.2.10 New Survey Recommendation

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

D.2.11 Inset Recommendation

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
CDR Mark Van Waes, NOAA	Chief of Party	08/03/2018	VAN WAES.MARK.1240076329 2018.08.04 09:27:15 -08'00'
LT Damian Manda, NOAA	Field Operations Officer	08/03/2018	MANDA.DAMIAN.CURTIS.1396610660 2018.08.19 13:00:03 -08'00'
HCST Sam Candio	Chief Survey Technician	08/03/2018	Digitally signed by CANDIO.SAMUEL.LOUIS.1515897743 Date: 2018.08.03 11:54:14 -08'00'
HAST Megan Shapiro	Sheet Manager	08/03/2018	SHAPIRO.MEGAN.MARIE.1543884185 Digitally signed by SHAPIRO.MEGAN.MARIE.1543884185 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=SHAPIRO.MEGAN.MARIE.1543884185 Date: 2018.08.03 11:59:01 -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	Continually Operating Reference Staiton
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
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
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
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
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	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
PRF	Project Reference File

Acronym	Definition
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPE	Total Propagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : June 25, 2018

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-O360-FA-2018
HYDROGRAPHIC SHEET: H13007

LOCALITY: Tracy Arm South, Southeast Alaska

TIME PERIOD: May 7-12, 2018

TIDE STATION USED: Ketchikan, AK 9450460
Lat.55° 19.9' N Long. 131° 37.6' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.433 meters

TIDE STATION USED: Port Alexander, AK 9451054
Lat. 56° 14.8' N Long. 134° 38.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.070 meters

TIDE STATION USED: Sitka, AK 9451600
Lat.57° 3.1' N Long. 135° 20.5' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.791 meters

TIDE STATION USED: Juneau, AK 9452210
Lat. 58° 17.9' N Long. 134° 24.7' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.676 meters

TIDE STATION USED: Skagway, AK 9452400
Lat. 59° 27.0' N Long. 135° 19.6' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.795 meters

TIDE STATION USED: Elfin Cove, AK 9452634
Lat. 58° 11.7' N Long. 136° 20.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.088 meters

REMARKS: RECOMMENDED Grid

Please use the TCARI grid "O190_O360_O375_O392_FA2018.tc" as the final grid for project OPR-O360-FA-2018, H13007, during the time period between May 7 and 12, 2018.

Refer to attachments for grid information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: Annual leveling for Juneau, AK (9452210), Skagway, AK (9452400) and Elfin Cove (9452634) was not completed in FY18. A review of the verified leveling records from 2008 to 2017 shows the tide station benchmark networks to be stable within an allowable 0.009 m tolerance. This Tide Note may be used as final stability verification for survey OPR-O360-FA-2018, H13007. CO-OPS will immediately provide a revised Tide Note should subsequent leveling records indicate any benchmark network stability movement beyond the allowable 0.009 m tolerance.

Note 3: Due to inaccurate shoreline around Tracy Arm South, Southeast Alaska, survey track lines fall outside of the TCARI grid boundaries in some areas. TCARI will extrapolate the tide corrector to cover these soundings.

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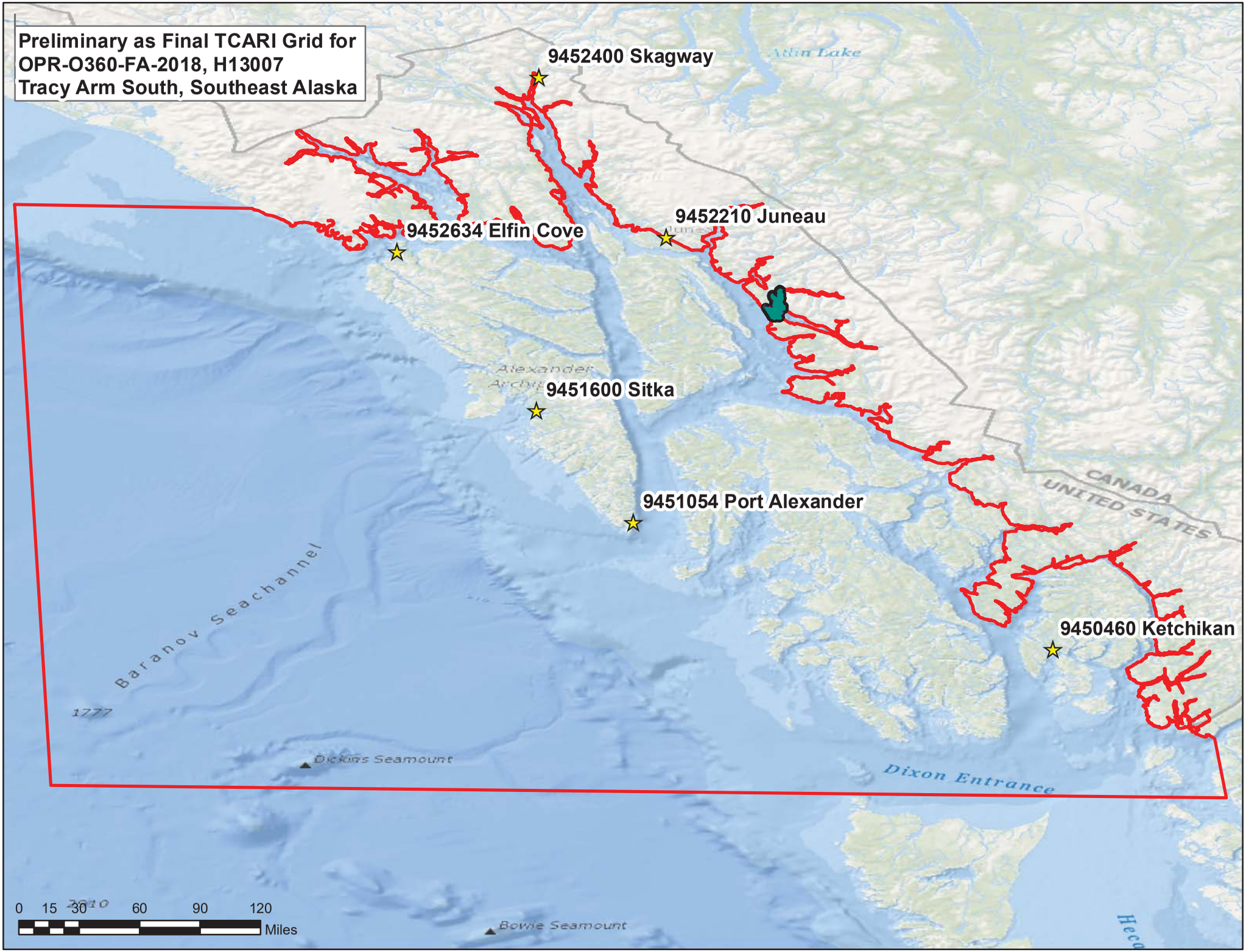
CHIEF, PRODUCTS AND SERVICES BRANCH

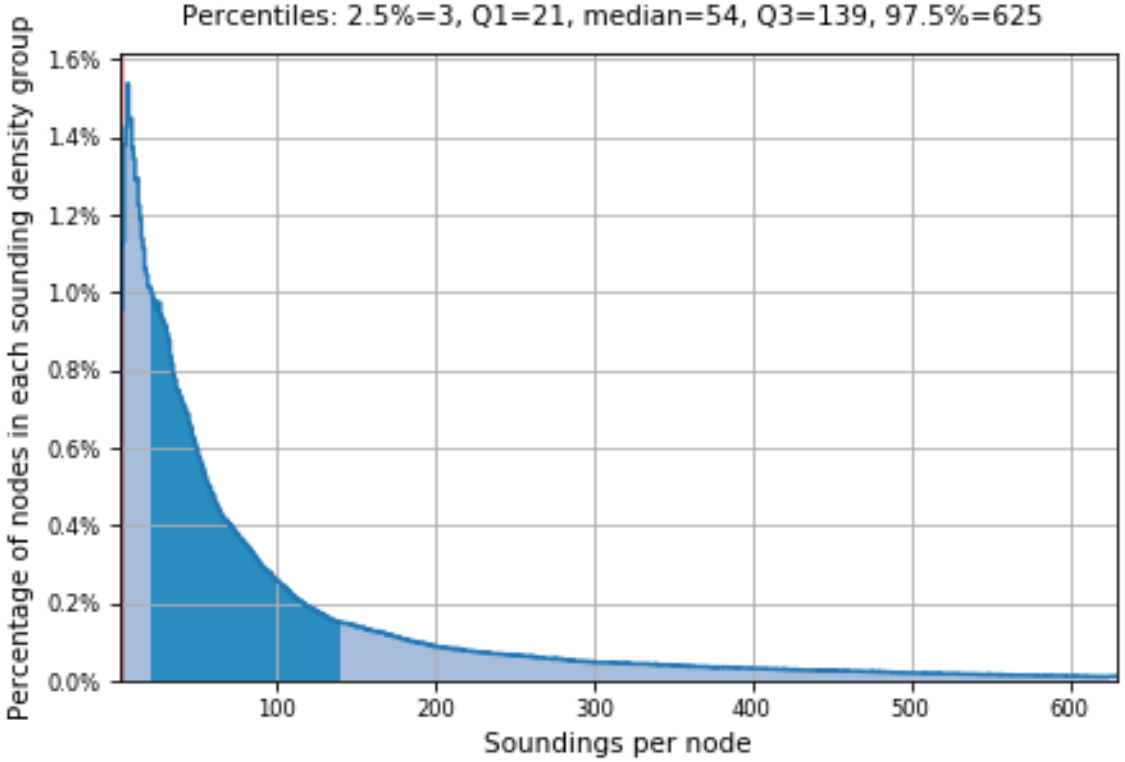

Preliminary as Final TCARI Grid for
OPR-O360-FA-2018, H13007
Tracy Arm South, Southeast Alaska
9452400 Skagway
Atlin Lake
9452634 Elfin Cove
9452210 Juneau
Alexander Archipelago
9451600 Sitka
9451054 Port Alexander
CANADA
UNITED STATES
9450460 Ketchikan
Baranov Seachannel
1777
Dickins Seamount
Dixon Entrance
Bowie Seamount
0 15 30 60 90 120
Miles

Data Density

Grid source: H13007_MB_VR_MLLW

96% pass (10,763,883 of 11,222,407 nodes), min=1.0, mode=6, max=13400.0

Percentiles: 2.5%=3, Q1=21, median=54, Q3=139, 97.5%=625

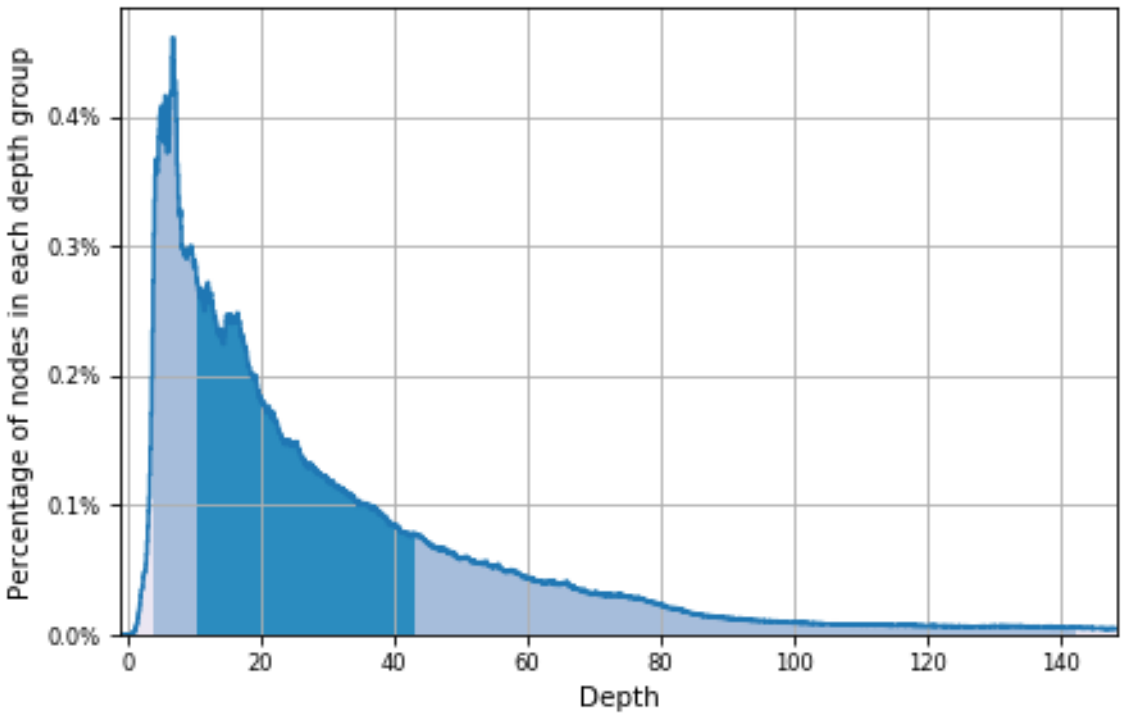


Depth Distribution

Grid source: H13007_MB_VR_MLLW

Total nodes: 11,222,407, min=-1.17, mode=6.7, max=380.58

Percentiles: 2.5%=4.0, Q1=10.3, median=21.3, Q3=43.0, 97.5%=142.4

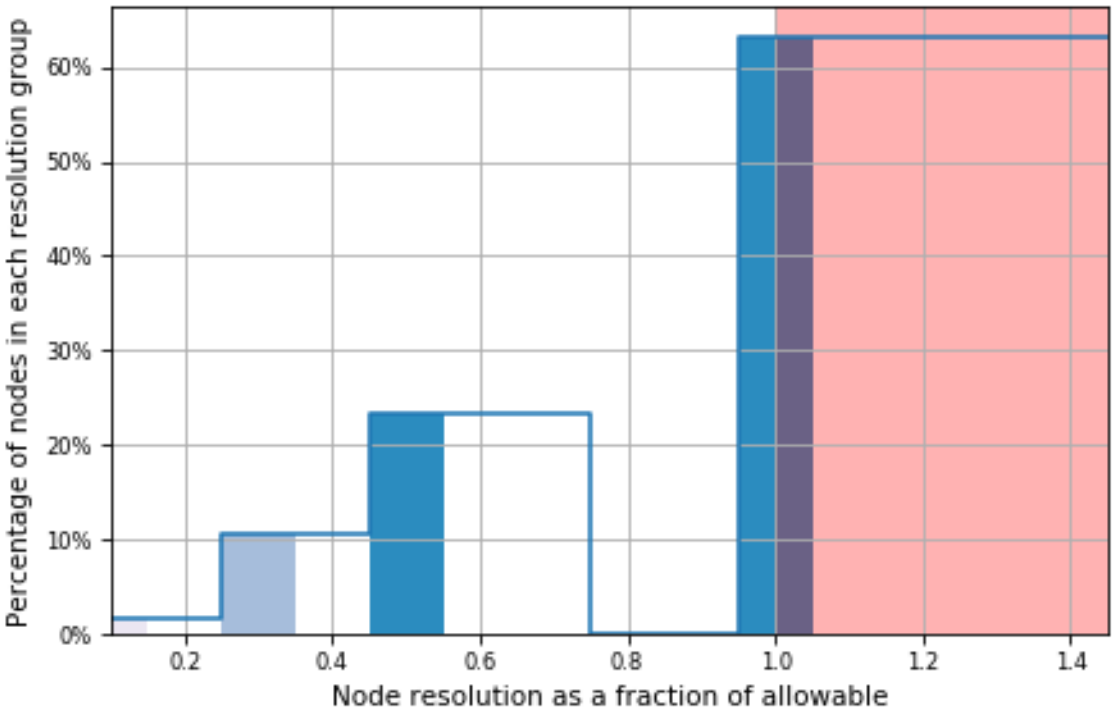


Full Coverage

Grid source: H13007_MB_VR_MLLW

99% pass (11,064,942 of 11,222,407 nodes), min=0.10, mode=1.0, max=8.00

Percentiles: 2.5%=0.3, Q1=0.5, median=1.0, Q3=1.0, 97.5%=1.0

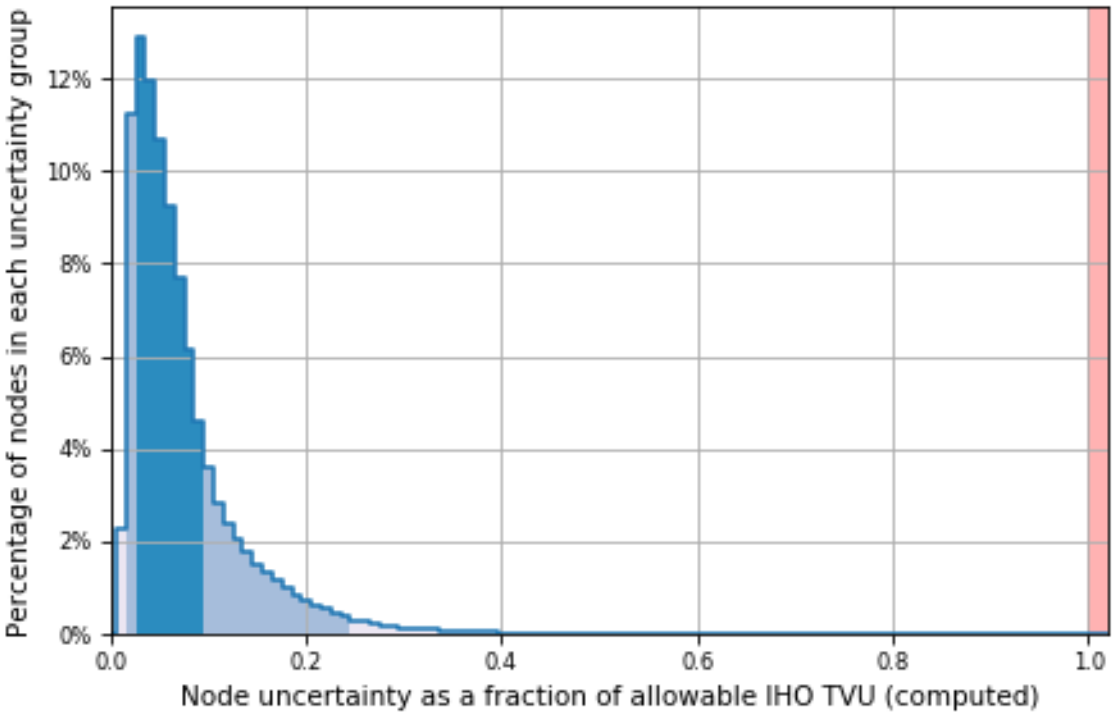


Uncertainty Standards

Grid source: H13007_MB_VR_MLLW

99.5+% pass (11,221,887 of 11,222,407 nodes), min=0.00, mode=0.03, max=5.96

Percentiles: 2.5%=0.02, Q1=0.03, median=0.06, Q3=0.09, 97.5%=0.24



APPROVAL PAGE

H13007

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.

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Date: 2020.01.13 10:47:30 -08'00'

Approved:_____

Peter Holmberg
Acting Chief, Pacific Hydrographic Branch