H12910

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12910

LOCALITY

State(s):	Alaska
General Locality:	South Coast of Kodiak Island
Sub-locality:	South of Black Point

2016

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

H12910

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:	**South Coast of Kodiak Island**
Sub-Locality:	**South of Black Point**
Scale:	**40000**
Dates of Survey:	**06/24/2016 to 07/31/2016**
Instructions Dated:	**06/13/2016**
Project Number:	**OPR-P335-FA-16**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR Mark Van Waes, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Side Scan Sonar**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at 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 H12910

Project: OPR-P335-FA-16

Locality: South Coast of Kodiak Island

Sublocality: South of Black Point

Scale: 1:40000

June 2016 - July 2016

NOAA Ship *Fairweather*

Chief of Party: CDR Mark Van Waes, NOAA

A. Area Surveyed

The survey area is located along the South Coast of Kodiak Island within the sub locality of South of Black Point.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
56° 59' 23.11" N 153° 30' 17.37" W	56° 51' 23.3" N 153° 13' 54.14" W

Table 1: Survey Limits

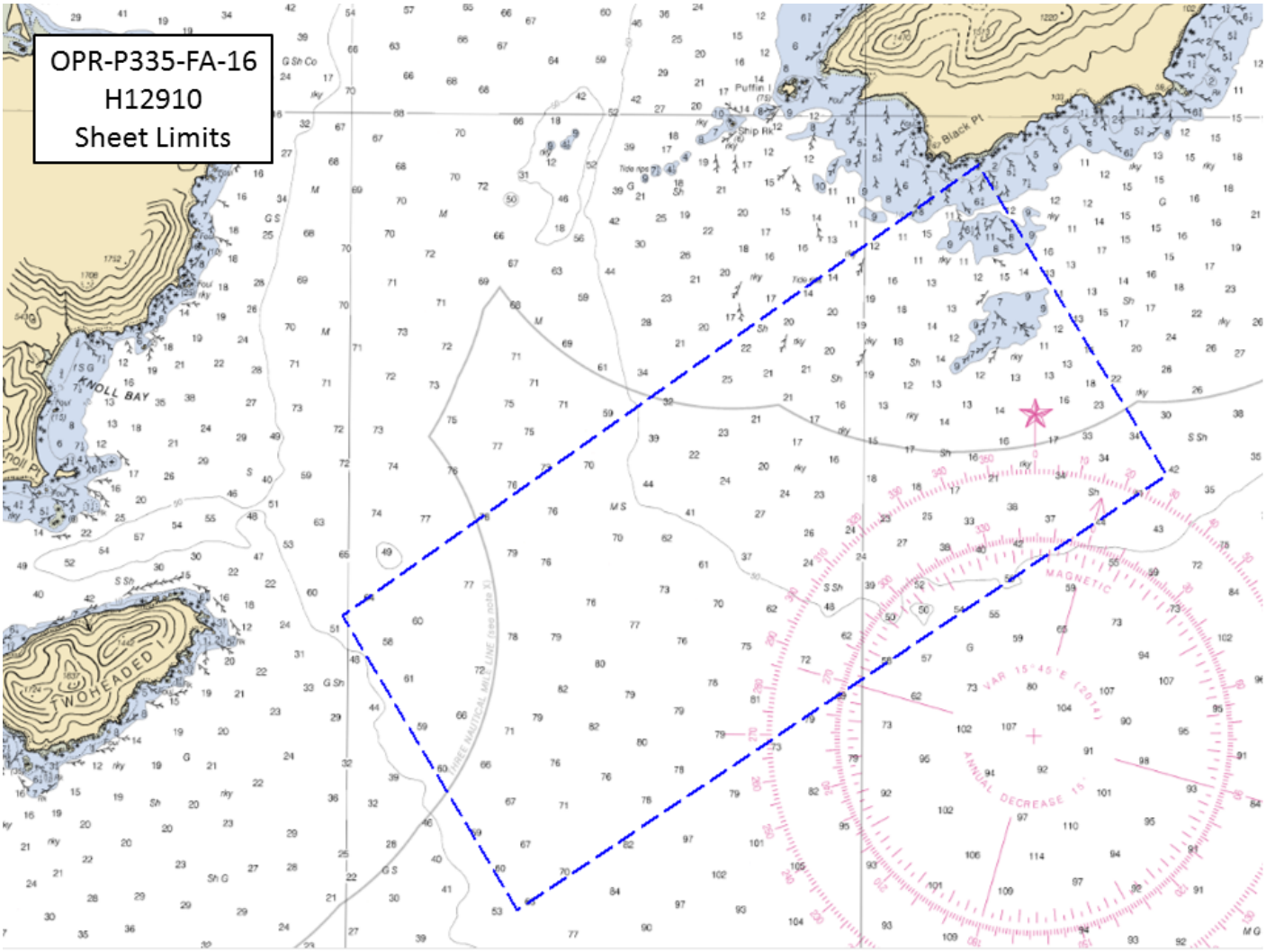


Figure 1: H12910 sheet limits (in blue) overlaid onto Chart 16592.

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2016 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in Figure 1. In all areas where the 4-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 the risks of maneuvering the survey vessel in close proximity to kelp and breaking waves. An example of such an area is shown in Figure 2.

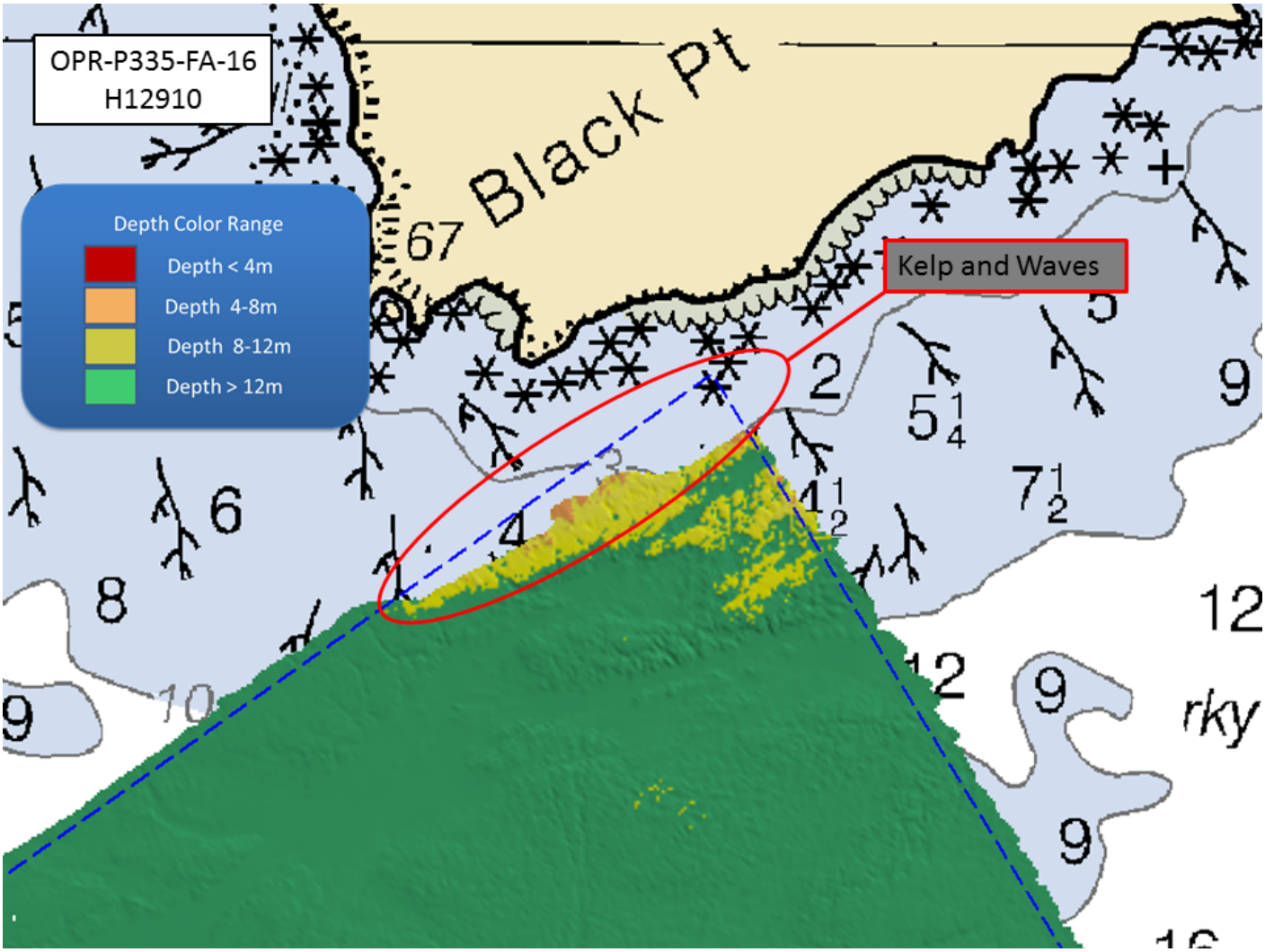


Figure 2: H12910 Near shore coverage limited by kelp growth and breaking waves.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. Survey area will address 33 SNM of navigationally significant waters in accordance with the National Hydrographic Survey Priorities Edition 2012. This survey will also support seismic research for tsunami risk analysis by the United States Geological Survey (USGS) and the Alaska Department of Fish and Game (ADF&G).

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H12910 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 accomplished using either: A) Complete coverage MBES depth and backscatter data, or B) 100% SSS coverage with concurrent set line spacing MBES depth and backscatter data. Refer to HSSD Section 5.2.2.2

The entirety of H12910 was acquired with complete coverage MBES depth and backscatter data, meeting the requirements listed above and in the HSSD.

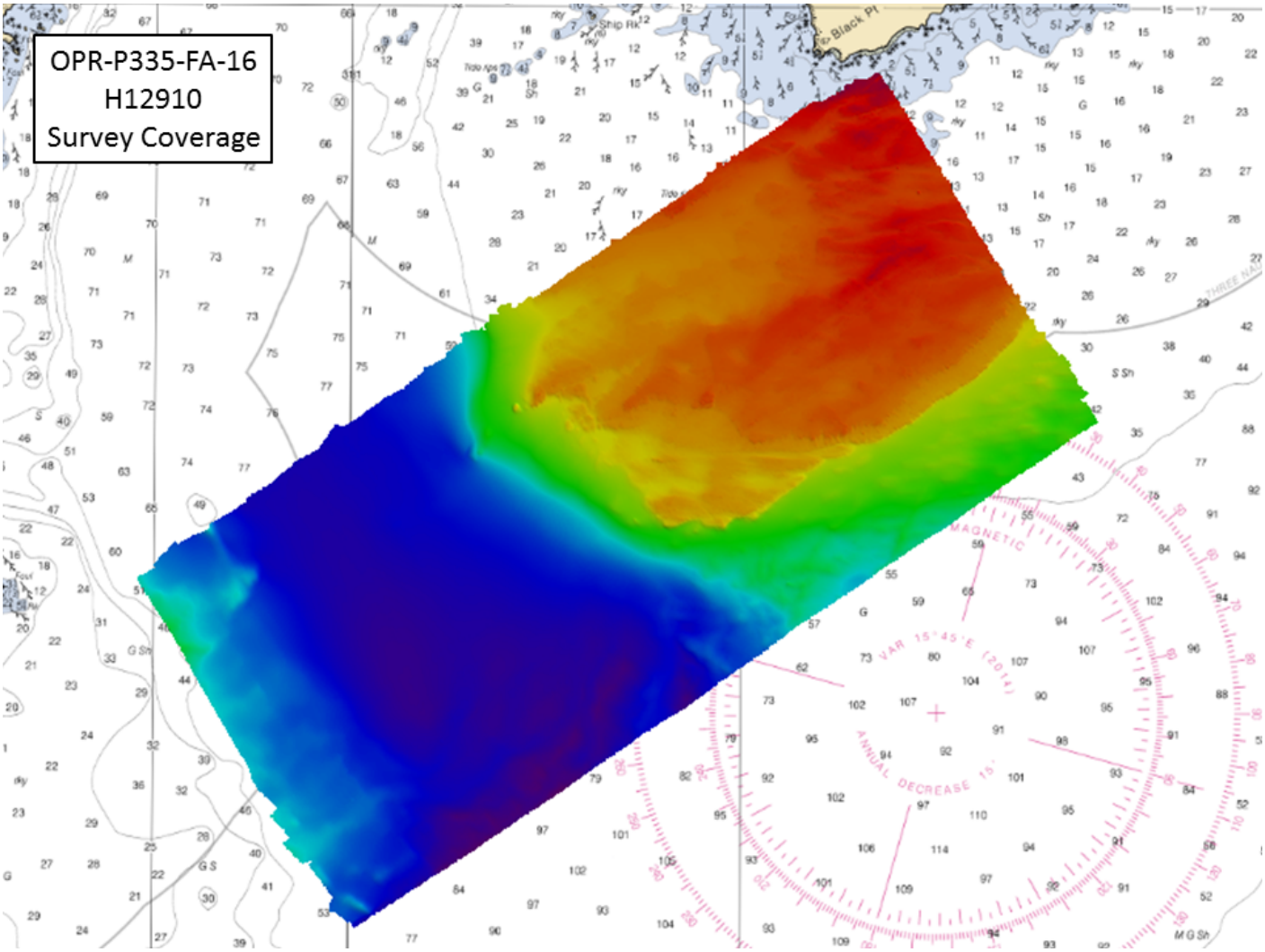


Figure 3: H12910 survey coverage (8m combined surface) overlaid onto Chart 16592.

A.5 Survey Statistics

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

	HULL ID	*FA_2805*	*FA_2806*	*FA_2807*	*FA_2808*	*S220*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0	0	0
	MBES Mainscheme	66.51	59.06	55.11	32.48	160.53	373.69
	Lidar Mainscheme	0	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0	0
	SBES/MBES Crosslines	8.12	0	4.84	4.48	15.58	33.02
	Lidar Crosslines	0	0	0	0	0	0
Number of Bottom Samples							5
Number Maritime Boundary Points Investigated							0
Number of DPs							0
Number of Items Investigated by Dive Ops							0
Total SNM							33.48

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/24/2016	176
06/25/2016	177

Survey Dates	Day of the Year
06/26/2016	178
06/29/2016	181
06/30/2016	182
07/15/2016	197
07/16/2016	198
07/27/2016	209
07/28/2016	210
07/31/2016	213

Table 3: 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	*2805*	*2806*	*2807*	*2808*	*S220*
LOA	8.64 meters	8.64 meters	8.64 meters	8.64 meters	70.40 meters
Draft	1.12 meters	1.12 meters	1.12 meters	1.12 meters	4.88 meters

Table 4: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Reson	7125 SV1	MBES
Kongsberg	EM710	MBES
SeaBird	19plus	Conductivity, Temperature, and Depth Sensor
Rolls Royce	MVP 200	Conductivity, Temperature, and Depth Sensor
Reson	SVP 70	Sound Speed System
Reson	SVP 71	Sound Speed System
Applanix	POS/MV V4	Positioning and Attitude System

Table 5: Major Systems Used

The equipment was installed on the survey platforms as follows: S220 utilizes the Kongsberg EM710 MBES, SVP 70 surface sound speed sensors, Applanix POS/MV V4, and Rolls Royce MVP for conductivity, temperature, and depth (CTD) casts. All launches utilize Reson 7125 SV1 MBES, SVP71 surface sound speed sensors, Applanix POS/MV V4, and Sea-Bird Electronics 19plus CTD casts.

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 8.84% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.3 of the HSSD. To evaluate crosslines, an 8-meter CUBE surface using strictly mainscheme lines, and an 8-meter CUBE surface using strictly crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated at an 8-meter resolution (Figure 4), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between the depths derived from mainscheme and crosslines was 0.01 meters (with mainscheme being deeper) and 95% of nodes falling within 0.32 meters (Figure 5). For the respective depths, the difference surface was compared to the allowable NOAA accuracy standards (Figure 6). In total, 99.80% of the depth differences between H12910 mainscheme and crossline data were within NOAA allowable uncertainties (Figure 7).

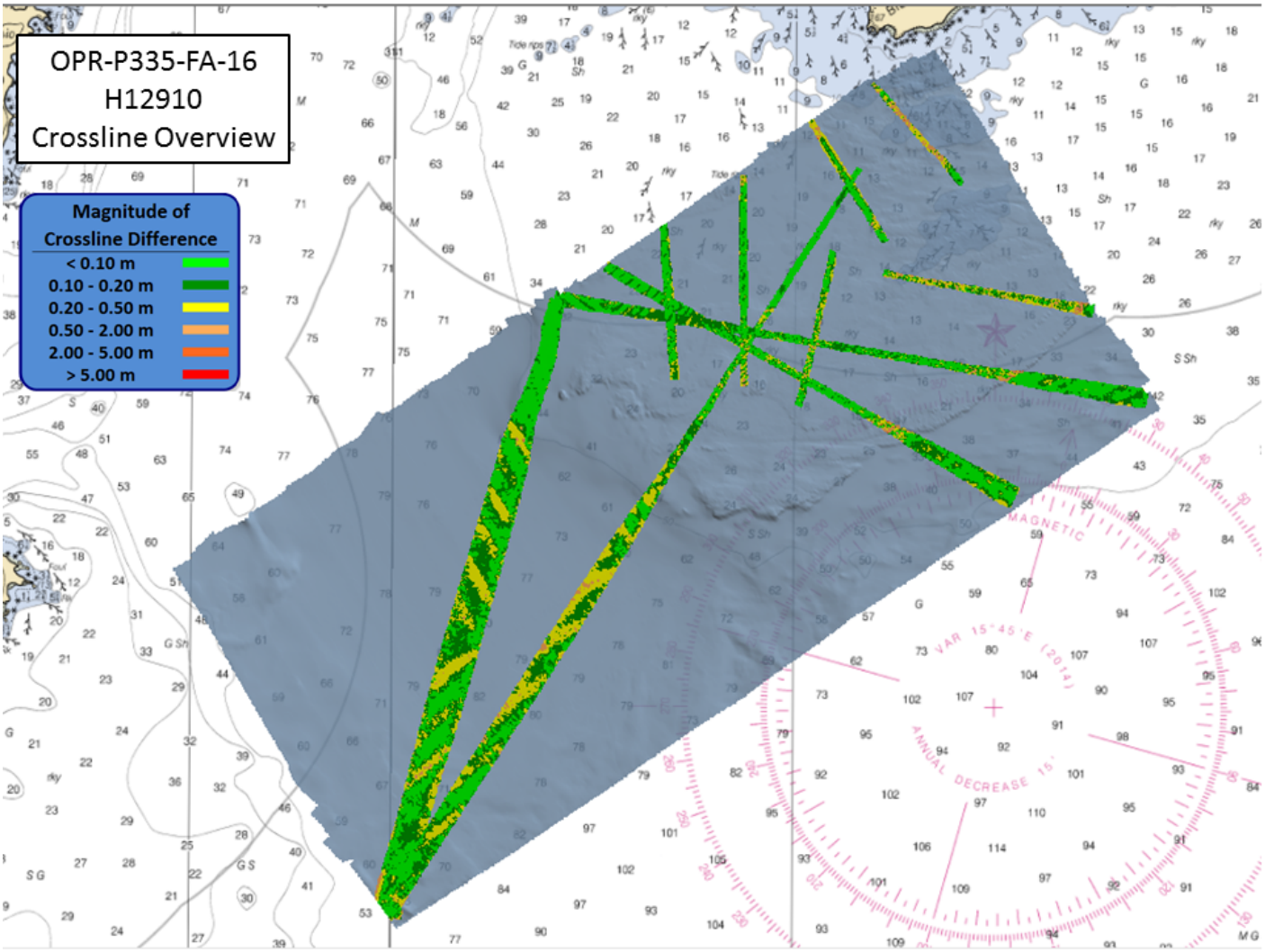
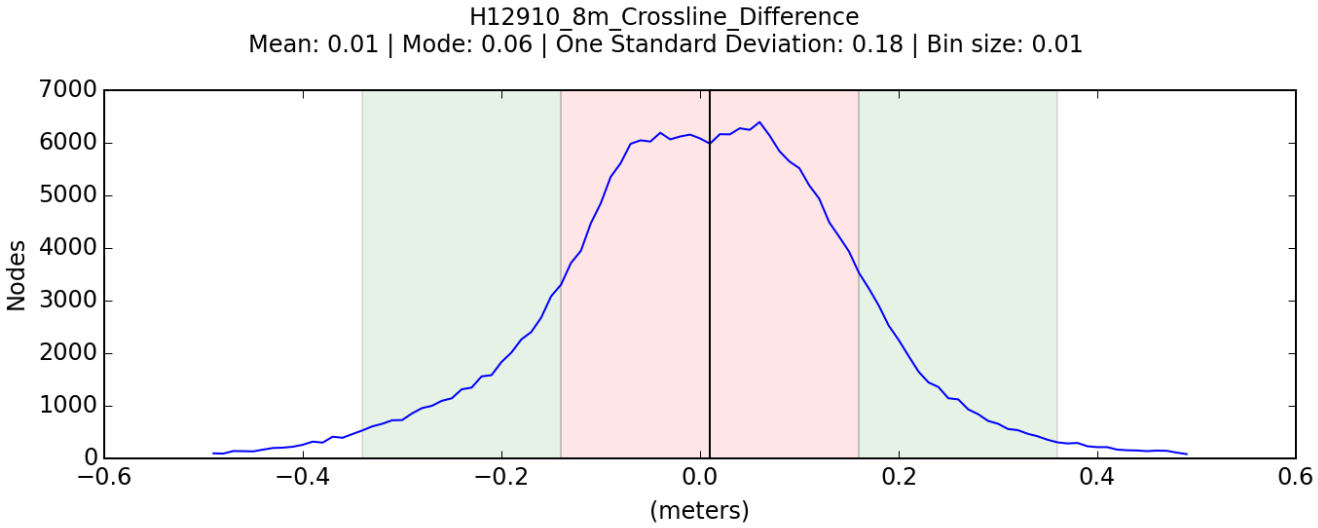
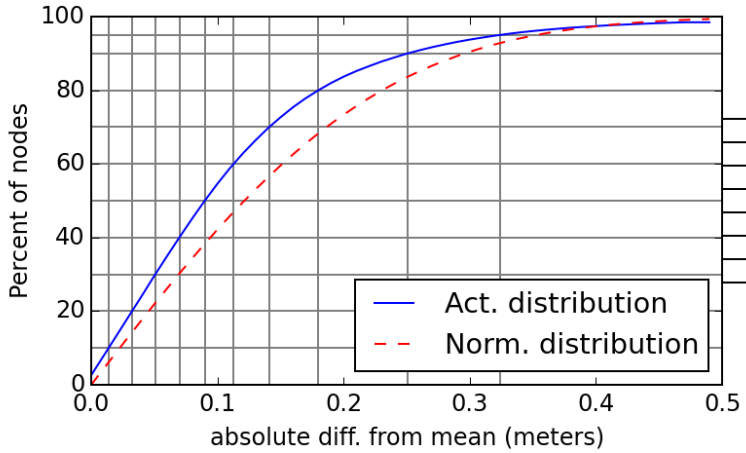


Figure 4: Overview of H12910 crosslines.





Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.11
70%	+/- 0.14
80%	+/- 0.18
90%	+/- 0.25
95%	+/- 0.32

Figure 5: H12910 crossline and mainscheme difference statistics.

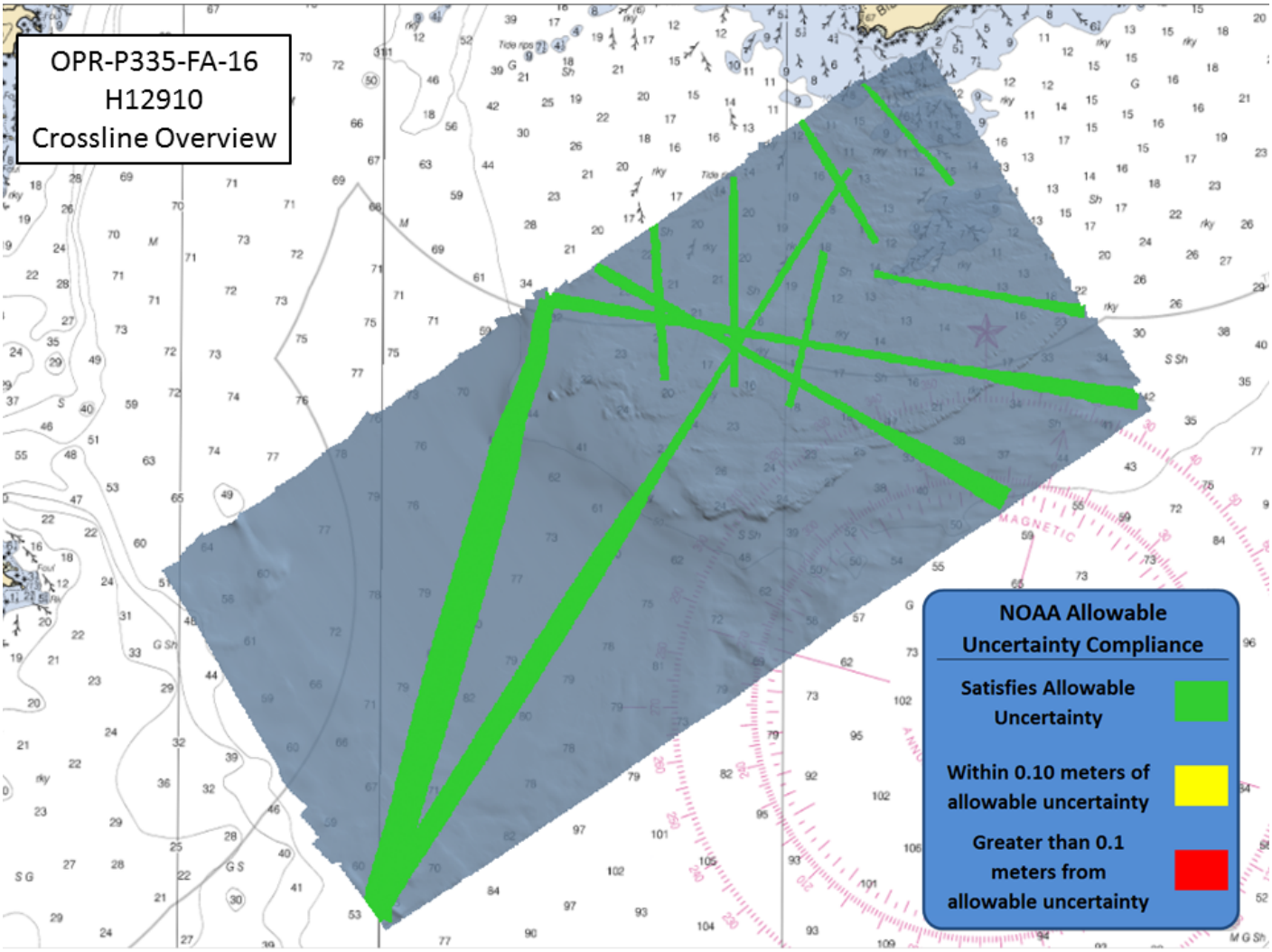


Figure 6: Depth diferences between H12910 mainscheme and crossline data as compared to NOAA allowable uncertainty standards for the associated depths.

H12910 Crossline Differencing NOAA Allowable Uncertainty

Total Nodes	Passed Nodes	Failed Nodes
229286	228,834	452
Percentage Nodes Passed		99.80%
Percentage Nodes Failed		0.20%

Figure 7: Crossline surface statistics showing percentage of nodes meeting NOAA allowable uncertainty.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning	Method
0 meters	0 meters	TCARI
0 meters	0.02 meters	ERS via PMVD

Table 6: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S220	N/A meters/second	1 meters/second	0.5 meters/second
2805	2 meters/second	N/A meters/second	0.5 meters/second
2806	2 meters/second	N/A meters/second	0.5 meters/second
2807	2 meters/second	N/A meters/second	0.5 meters/second
2808	2 meters/second	N/A meters/second	0.5 meters/second

Table 7: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion, Poor Man's VDatum (PMVD), real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H12910. Real-time uncertainties were provided via EM710 and Reson 7125 MBES data, Applanix Delayed Heave RMS, and Tidal Constituent and Residual Interpolation (TCARI). Following post-processing of vessel motion, real-time 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

H12910 junctions with 3 adjacent surveys from this project, H12898, H12911 and one survey from prior projects, H12686, as shown in Figure 8. Data overlap between H12910 and each adjacent survey was achieved. These areas of overlap between surveys were reviewed with 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 H12910 are within the NOAA allowable uncertainty in their areas of overlap. For all junctions with H12910, a negative difference indicates H12910 was shoaler, and a positive difference indicates H12910 was deeper.

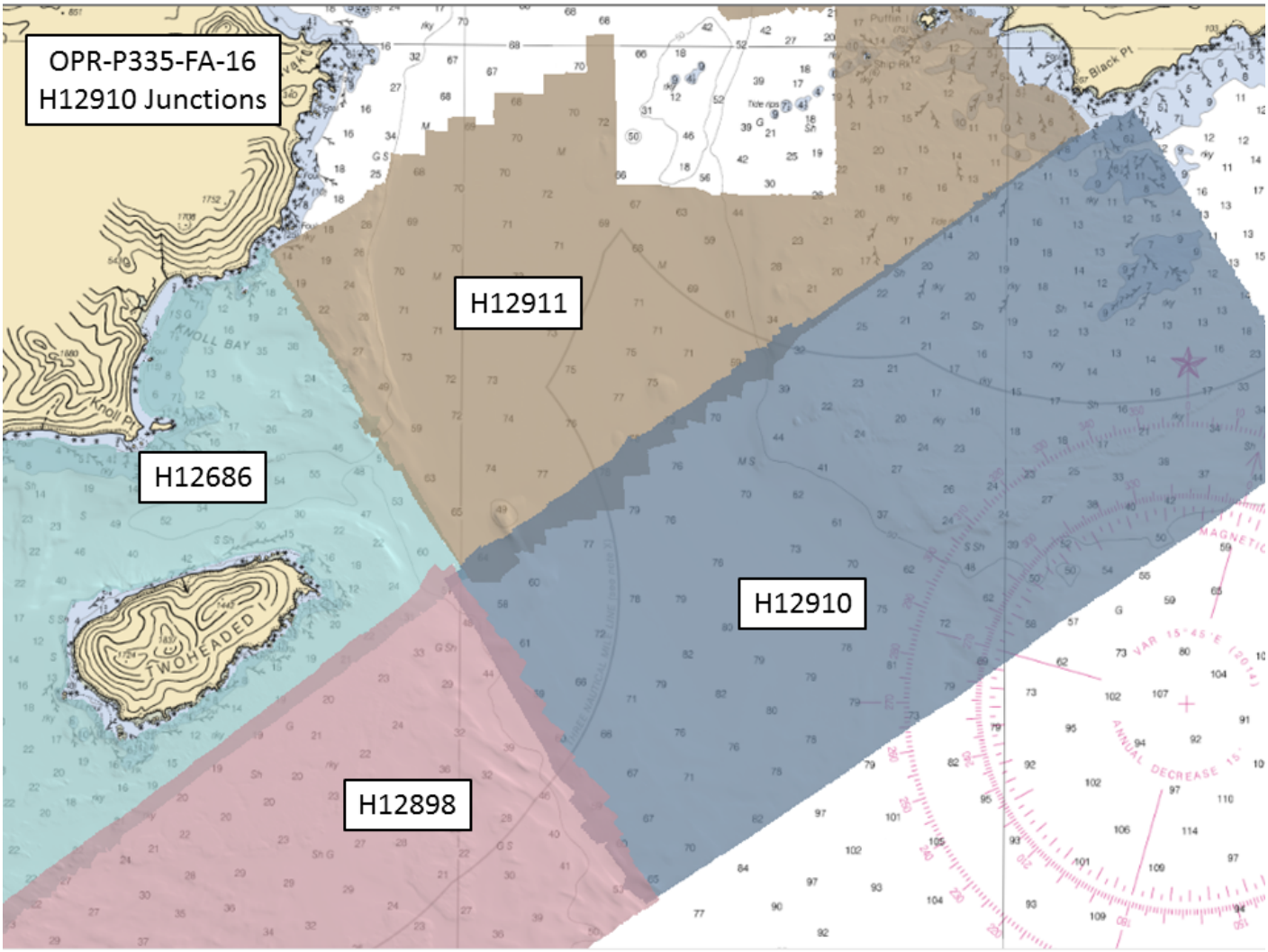


Figure 8: Overview of H12910 junction surveys.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12898	1:40000	2016	NOAA Ship FAIRWEATHER	W
H12911	1:40000	2016	NOAA Ship FAIRWEATHER	N
H12686	1:40000	2014	NOAA Ship FAIRWEATHER	NW

Table 8: Junctioning Surveys

H12898

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 8 meter combined surface from H12910 and the 8 meter combined surface from H12898. The statistical analysis of the difference surface shows a mean of -0.11 meters with 95% of all nodes having a maximum deviation of +/- 0.34 meters, as seen in Figure 10. A detailed graphical overview can be seen in Figure 9, the highlighted area shows the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (See Figure 11). It was found that 99.97% of nodes are within NOAA allowable uncertainty (Figure 12).

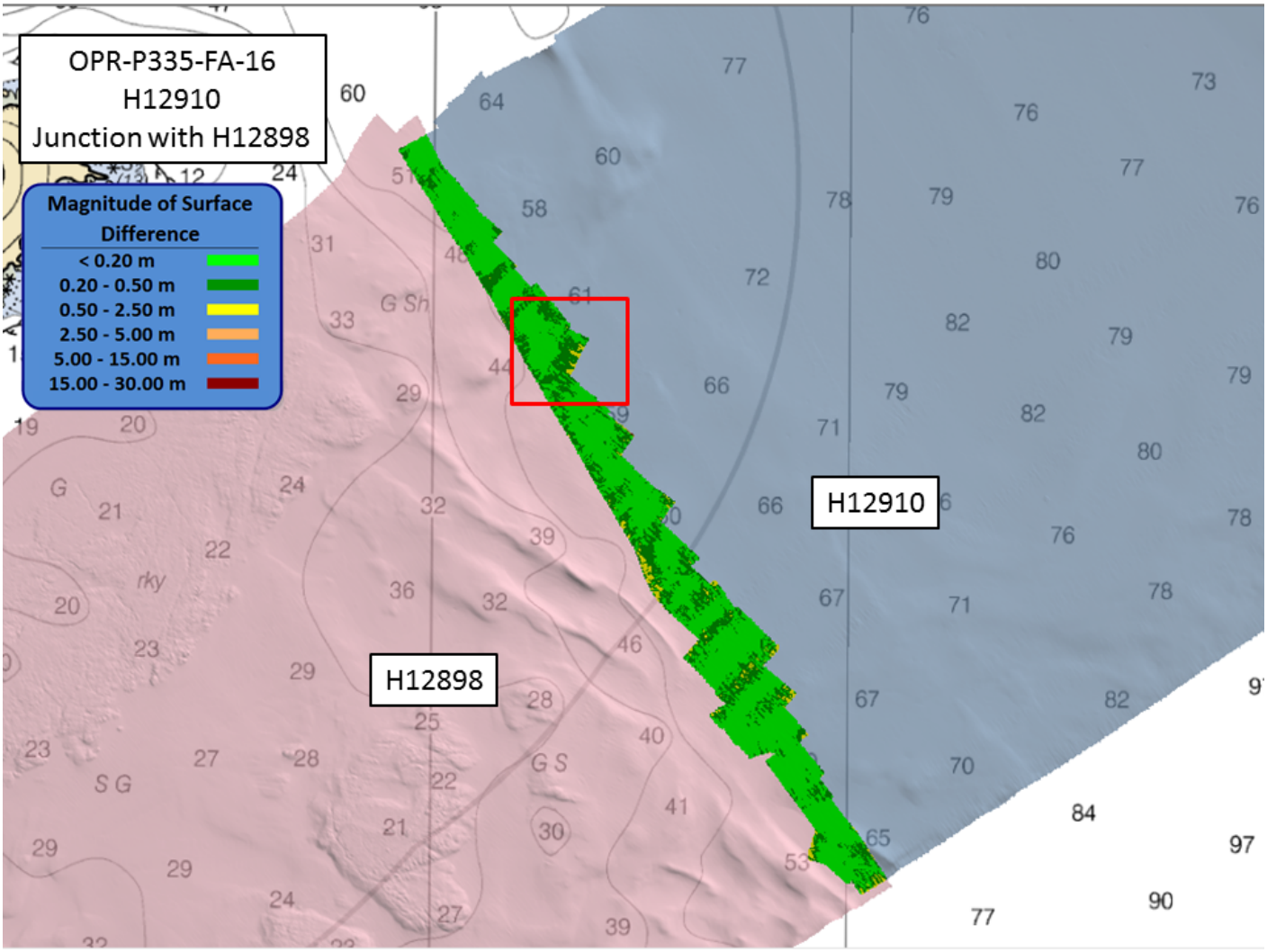
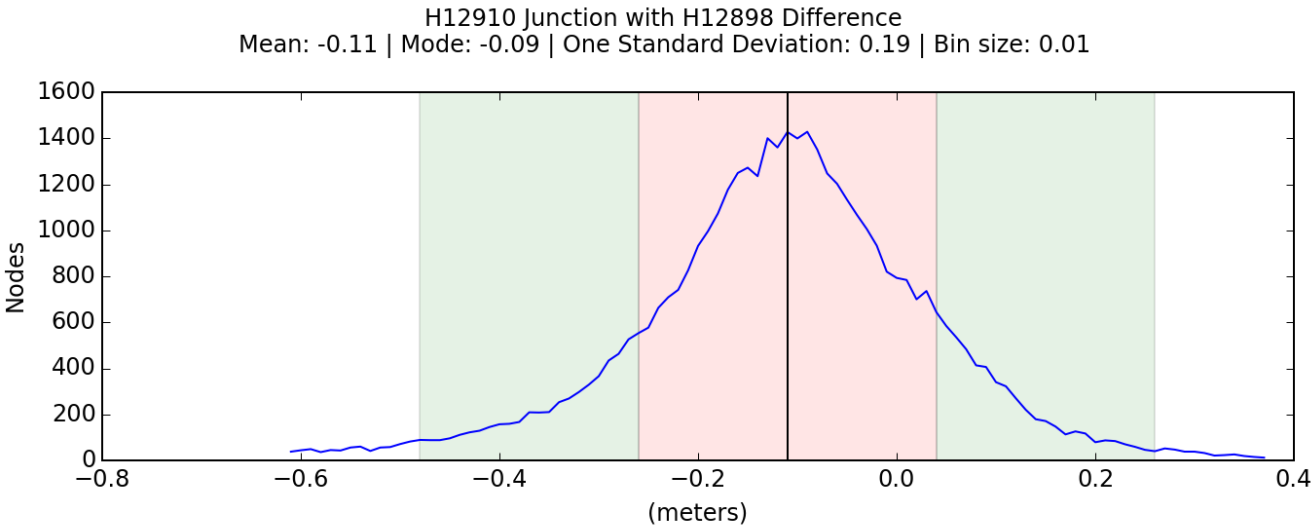
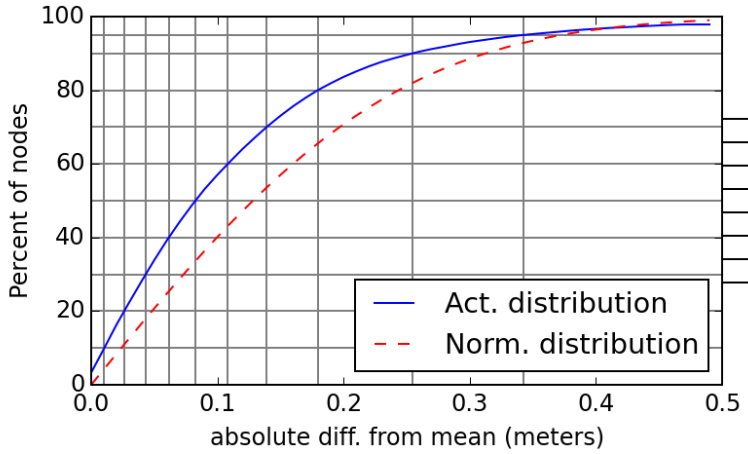


Figure 9: Difference surface between H12910 (grey) and junctioning survey H12898 (pink).





Percent of nodes	Deviation (m)
50%	+/- 0.08
60%	+/- 0.11
70%	+/- 0.14
80%	+/- 0.18
90%	+/- 0.25
95%	+/- 0.34

Figure 10: Difference surface statistics between H12910 and H12898 (8 meter surface).

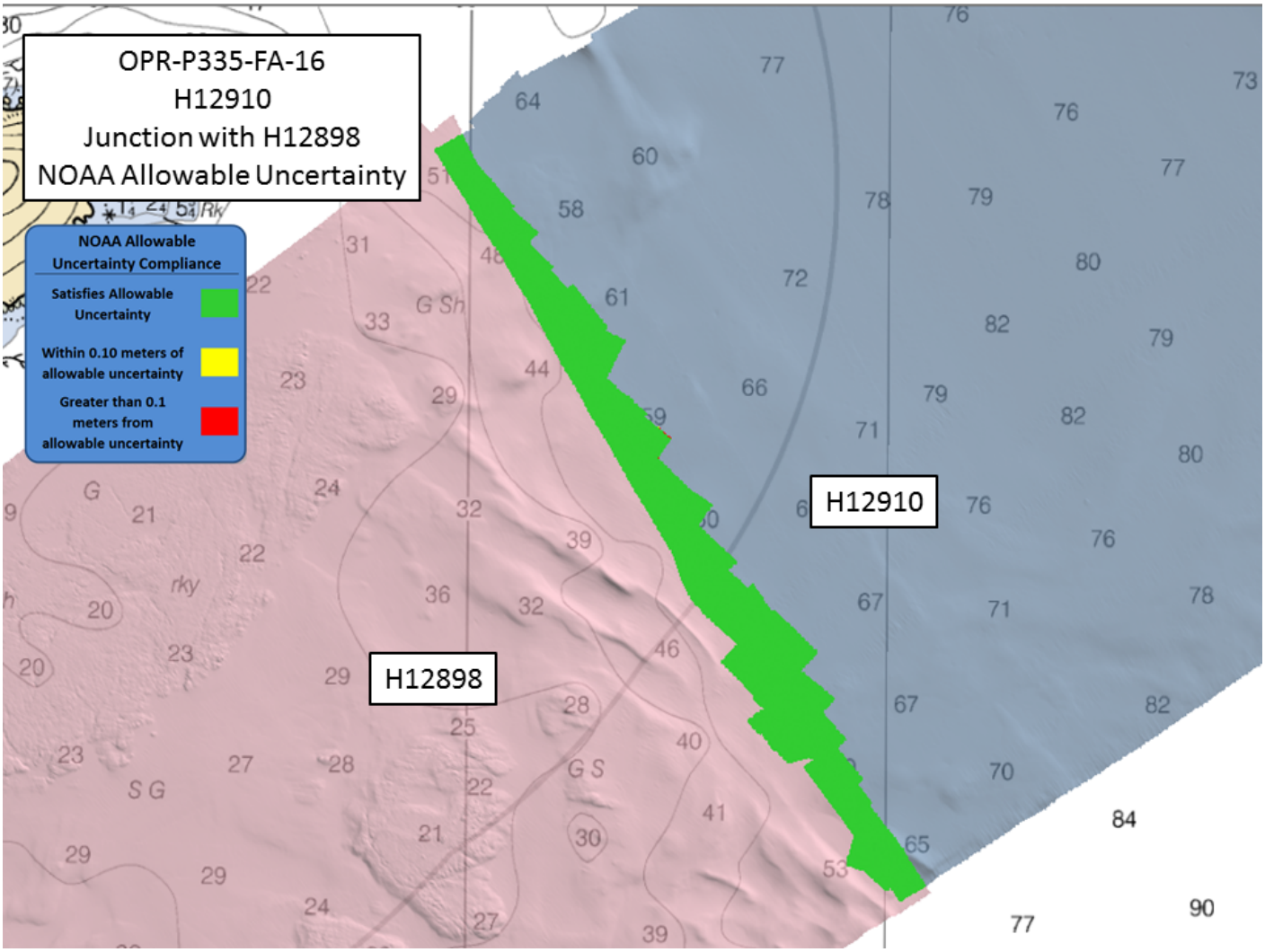


Figure 11: Difference surface compliance with regard to NOAA allowable uncertainty between H12910 (grey) and junctioning survey H12898 (pink).

H12910 Junction Differencing with H12898 NOAA Allowable Uncertainty

Total Nodes	Passed Nodes	Failed Nodes
43,014	42,999	15
Percentage Nodes Passed		99.97%
Percentage Nodes Failed		0.03%

Figure 12: Difference surface statistics between H12910 and H12898 showing percentage of nodes meeting NOAA allowable uncertainty.

H12911

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 8 meter combined surface from H12910 and the 8 meter combined surface from H12911. The statistical analysis of the difference surface shows a mean of 0.09 meters with 95% of all nodes having a maximum deviation of +/- 0.36 meters, as seen in Figure 14. A detailed graphical overview can be seen in Figure 13, the highlighted area shows the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (See Figure 15). It was found that 99.89% of nodes are within NOAA allowable uncertainty (Figure 16).

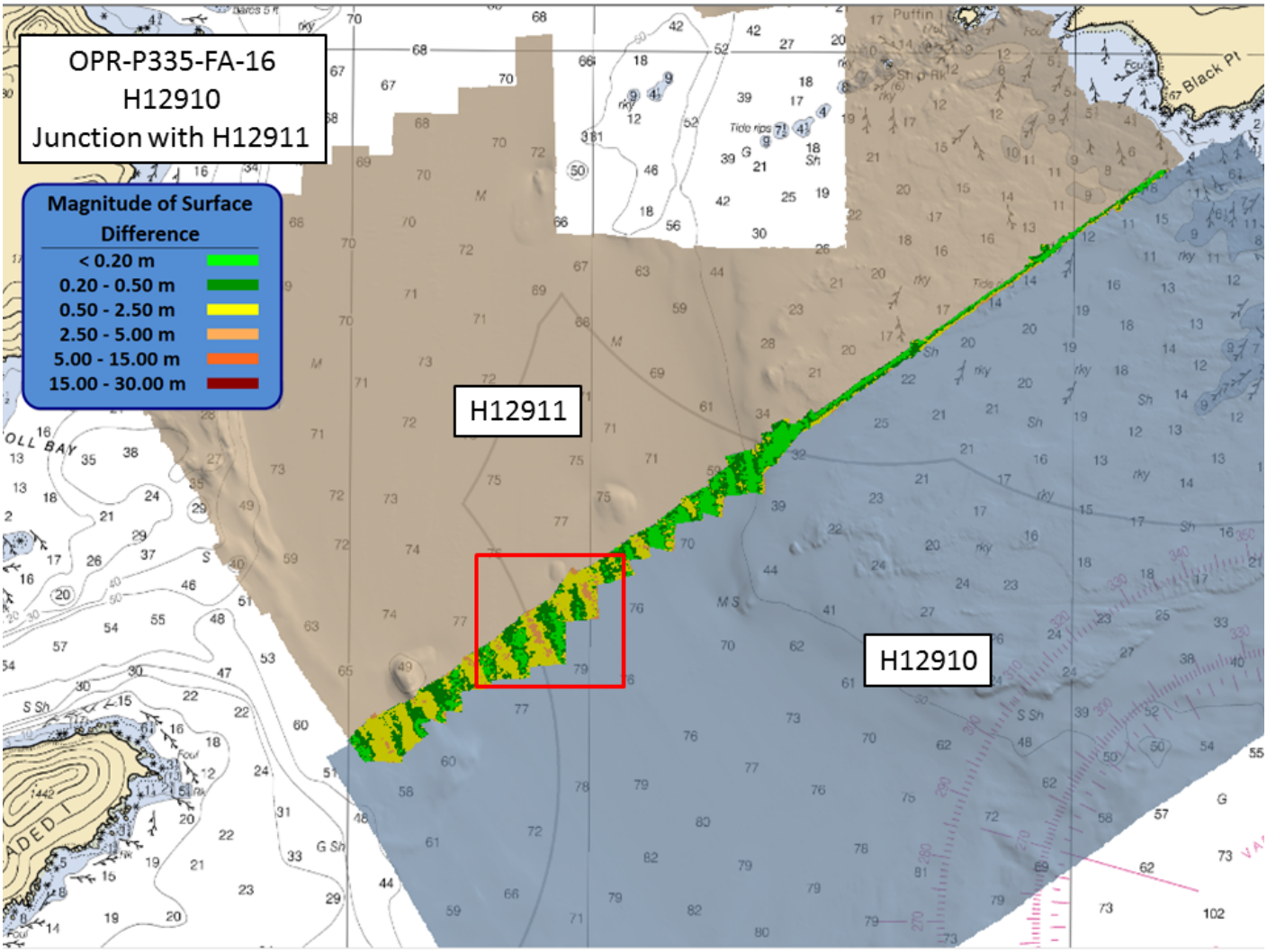
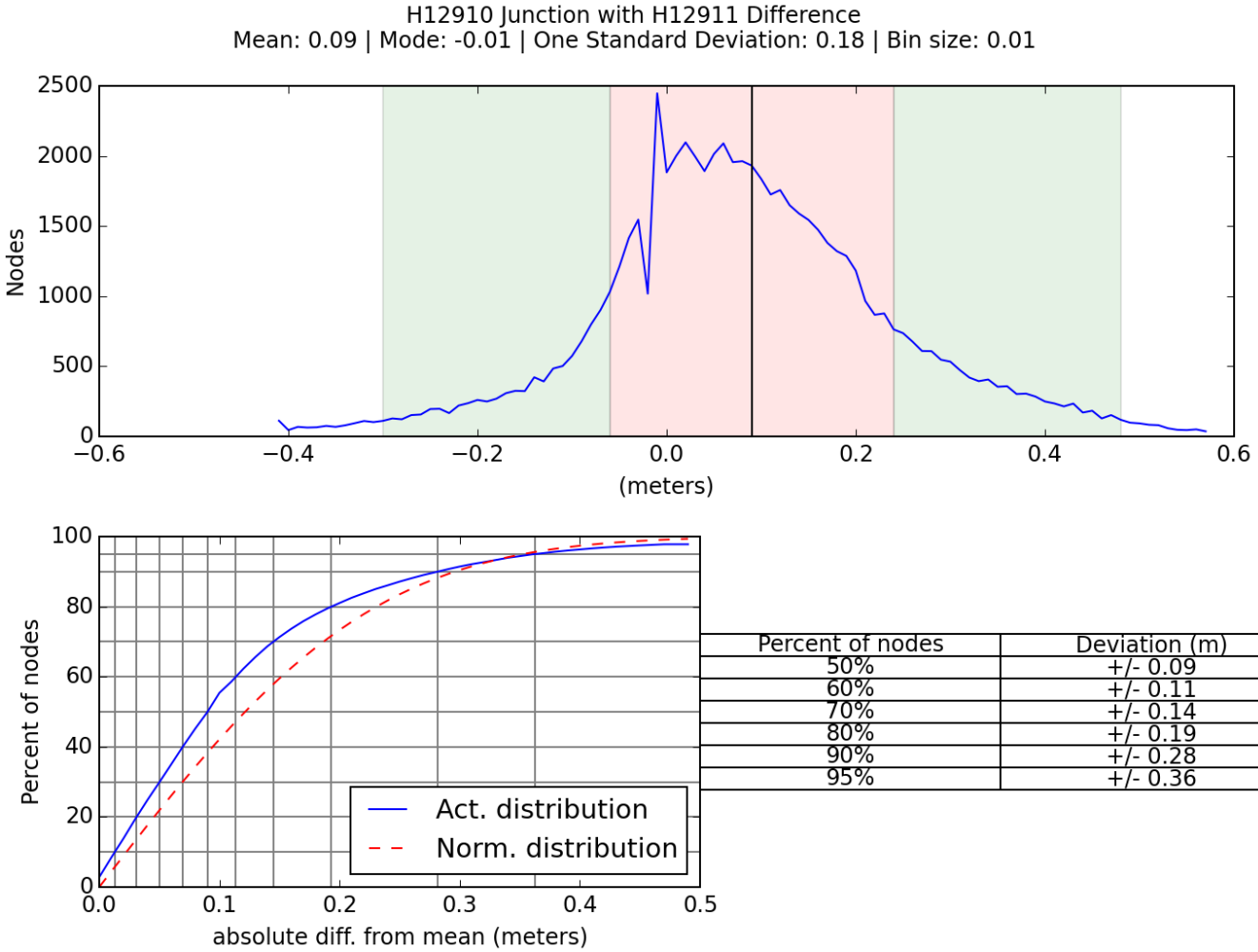


Figure 13: Difference surface between H12910 (grey) and junctioning survey H12911 (brown).



Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.11
70%	+/- 0.14
80%	+/- 0.19
90%	+/- 0.28
95%	+/- 0.36

Figure 14: Difference surface statistics between H12910 and H12911 (8 meter surface).

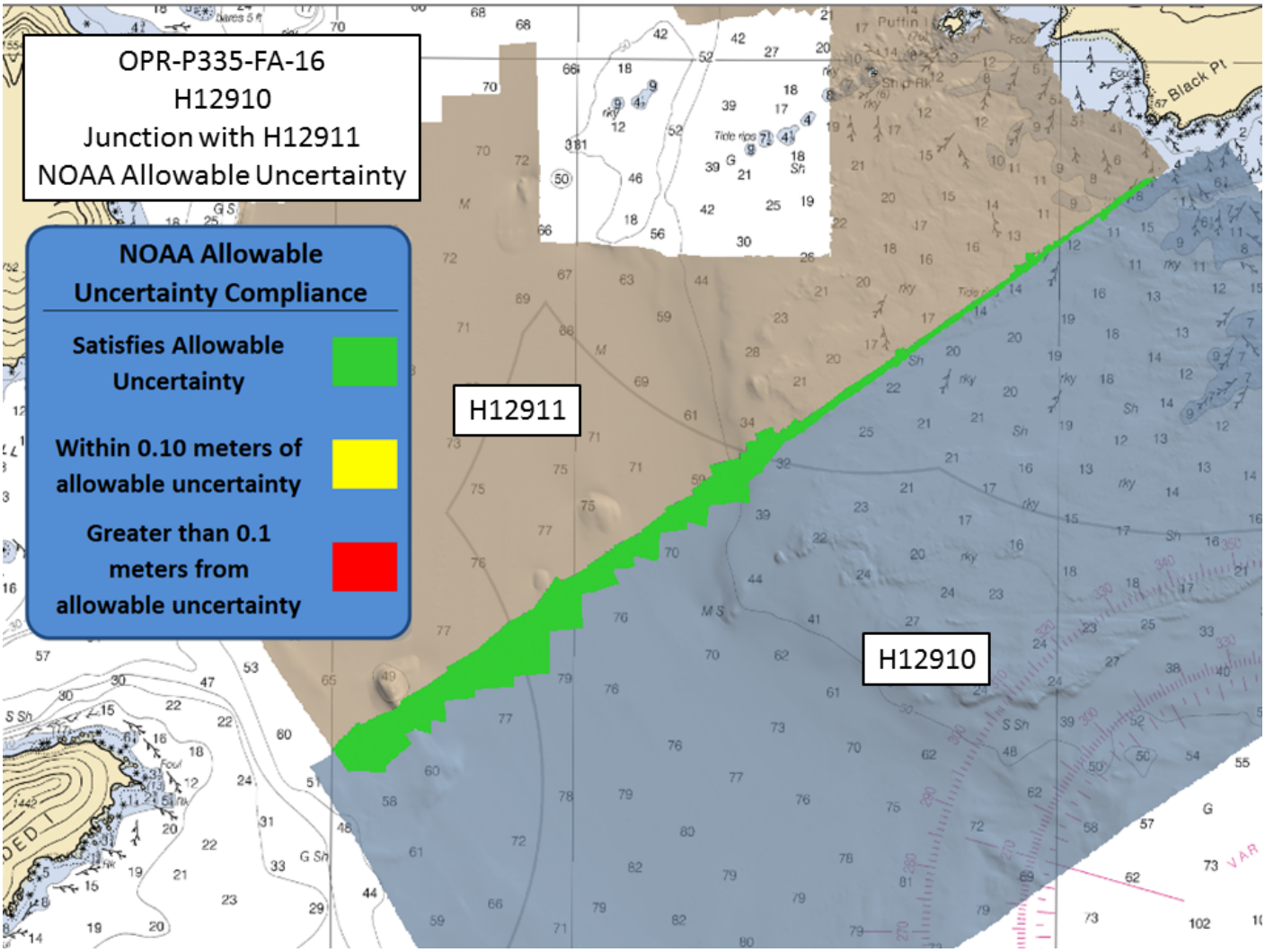


Figure 15: Difference surface compliance with regard to NOAA allowable uncertainty between H12910 (grey) and junctioning survey H12911 (brown).

H12910 Junction Differencing with H12911 NOAA Allowable Uncertainty

Total Nodes	Passed Nodes	Failed Nodes
68,285	68,213	72

Percentage Nodes Passed	99.89%
Percentage Nodes Failed	0.11%

Figure 16: Difference surface statistics between H12910 and H12911 showing percentage of nodes meeting NOAA allowable uncertainty.

H12686

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 8 meter combined surface from H12910 and the 8 meter combined surface from H12686. The statistical analysis of the difference surface shows a mean of -0.37 meters with 95% of all nodes having a maximum deviation of +/- 0.34 meters, as seen in Figure 18. A detailed graphical overview can be seen in Figure 17. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (See Figure 19). It was found that 99.94% of nodes are within NOAA allowable uncertainty (Figure 20).

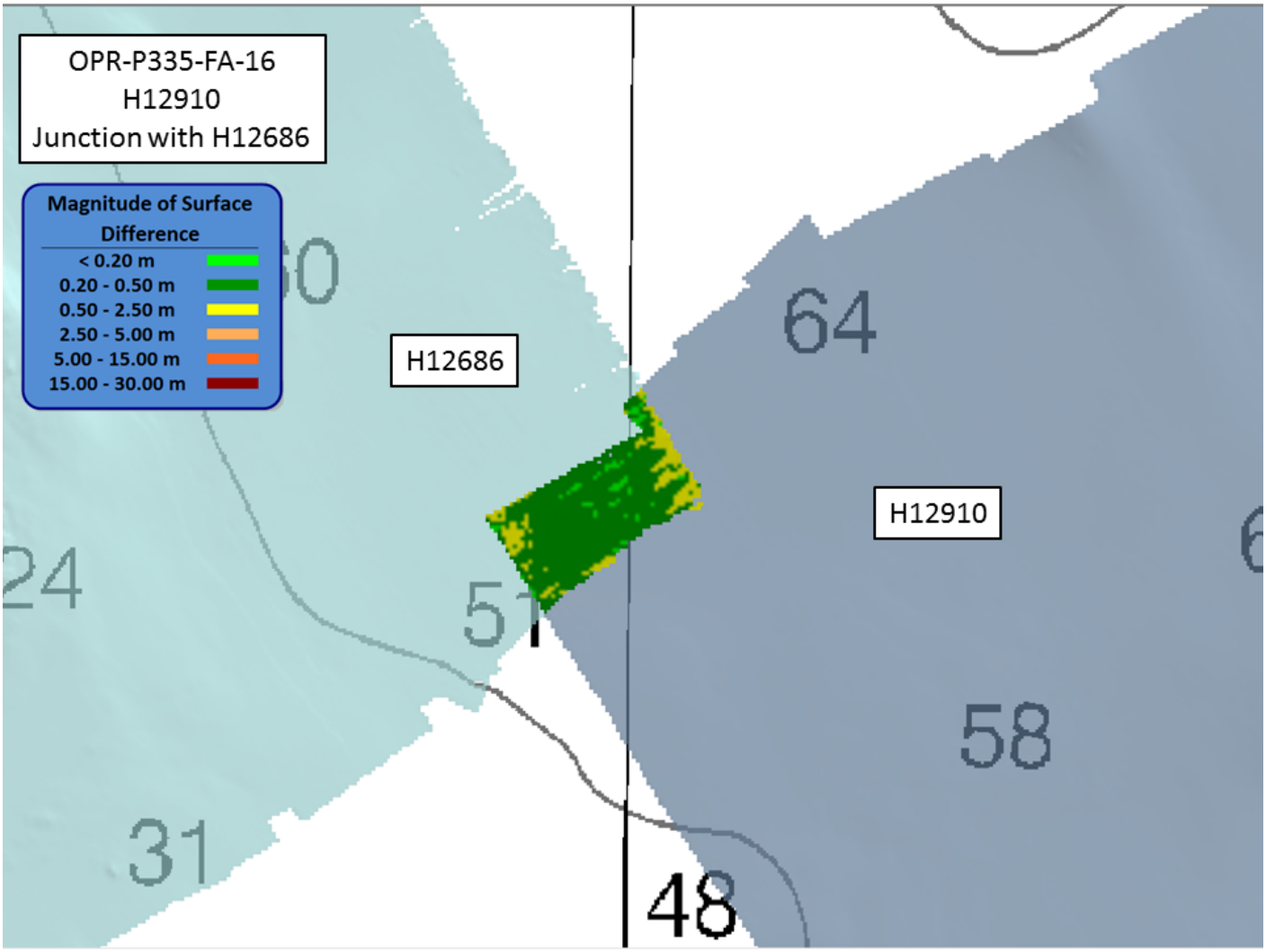
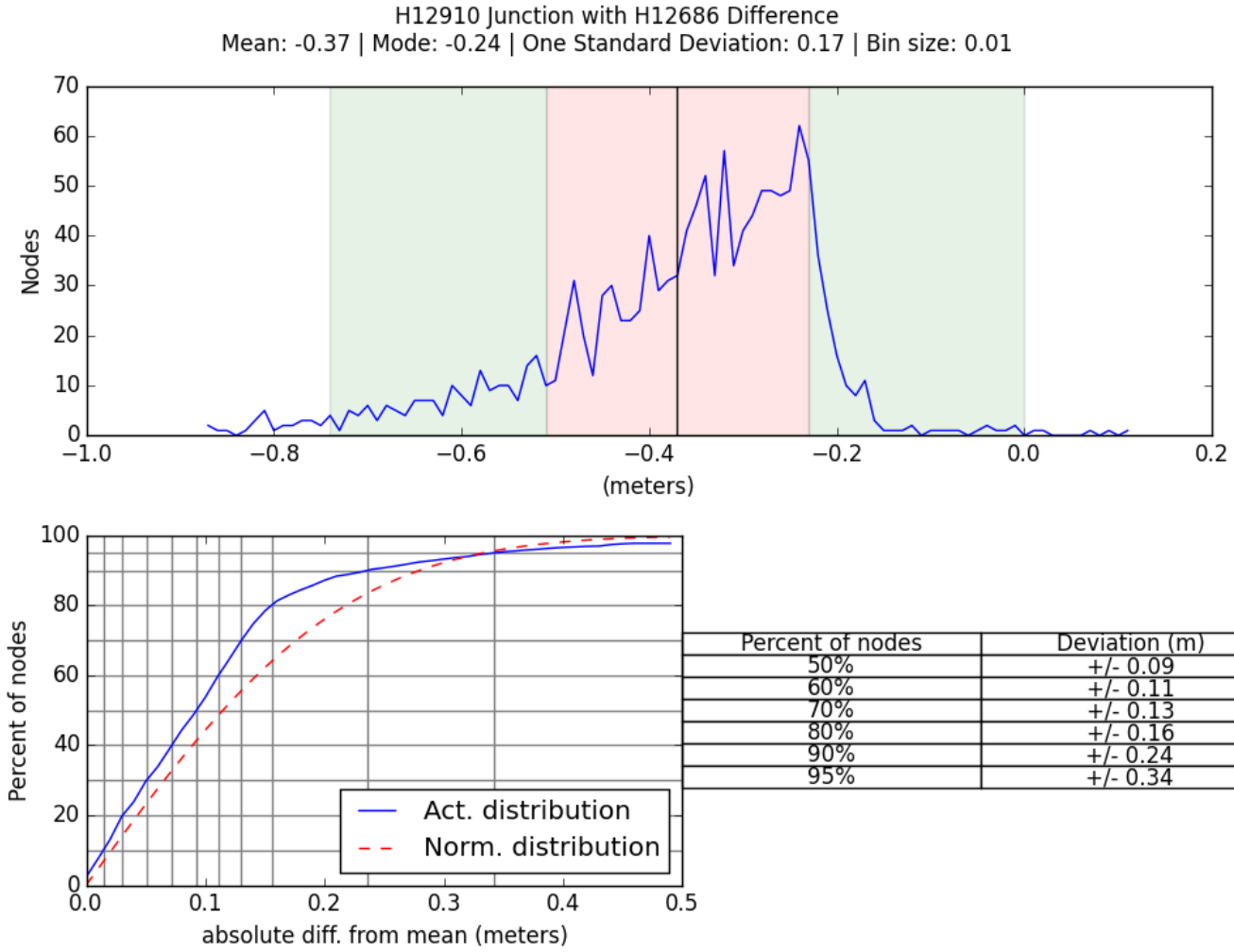


Figure 17: Difference surface between H12910 (dark blue) and junctioning survey H12686 (light blue).



Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.11
70%	+/- 0.13
80%	+/- 0.16
90%	+/- 0.24
95%	+/- 0.34

Figure 18: Difference surface statistics between H12910 and H12686 (8 meter surface).

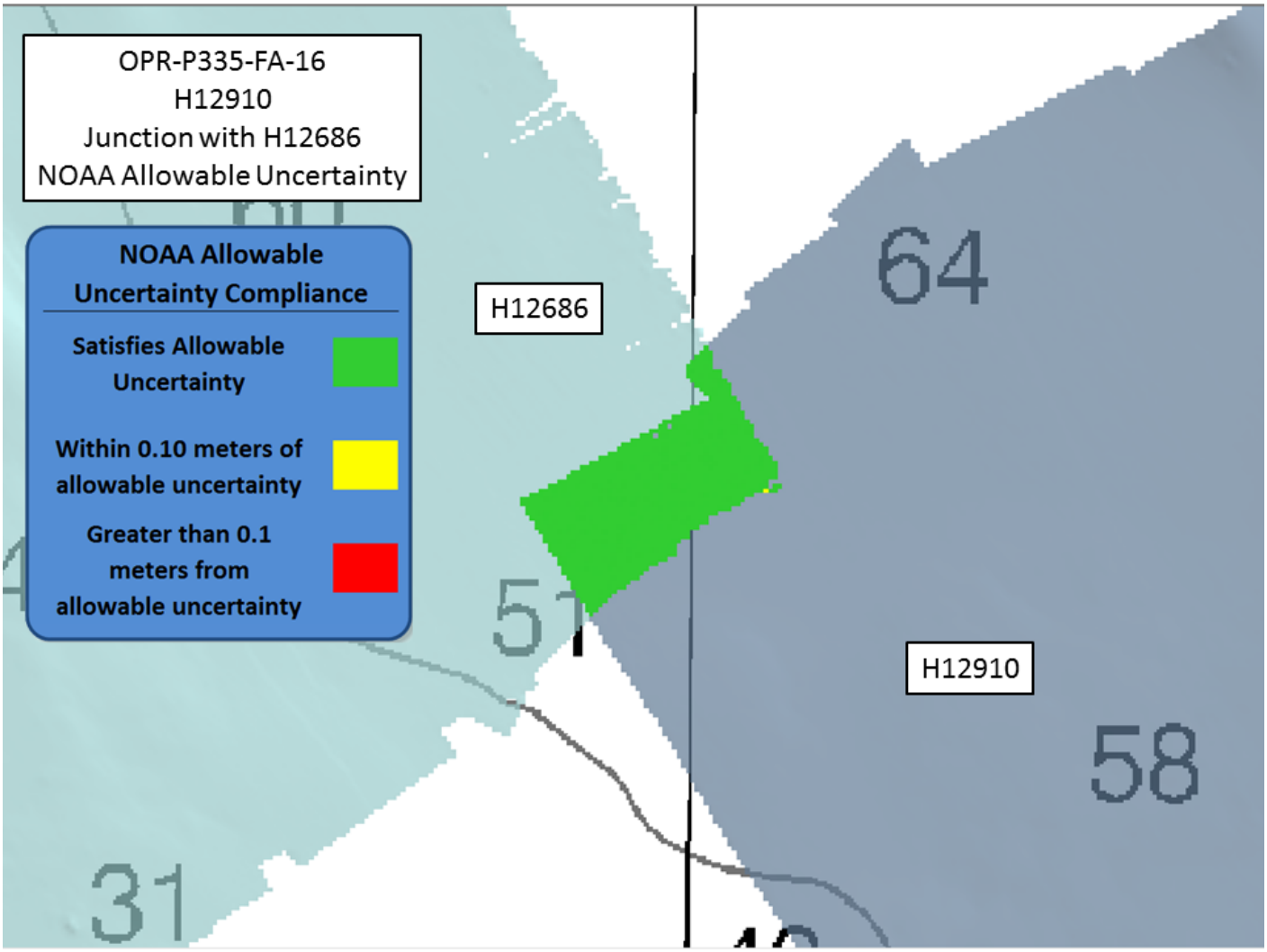


Figure 19: Difference surface compliance with regard to NOAA allowable uncertainty between H12910 (dark blue) and junctioning survey H12686 (light blue).

H12910 Junction Differencing with H12686 NOAA Allowable Uncertainty

Total Nodes	Passed Nodes	Failed Nodes
1,373	1,372	1
Percentage Nodes Passed: 99.94%		
Percentage Nodes Failed: 00.06%		

Figure 20: Difference surface statistics between H12910 and H12686 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

Kelp

Kelp was present throughout the survey area and at times, indistinguishable from the seafloor (Figure 21). In areas where it was distinguishable, the soundings on the vegetation were rejected to enable more accurate representation of the true seafloor. Where vegetation was indistinguishable, all soundings were retained. Furthermore, in some areas, patches of dense kelp prohibited safe navigation of the survey vessels. The limits of these areas were then used to define the NALL (Figure 2). Documentation can be found in the vessel boat sheets, which are located in the Separates I Digital Data folder.

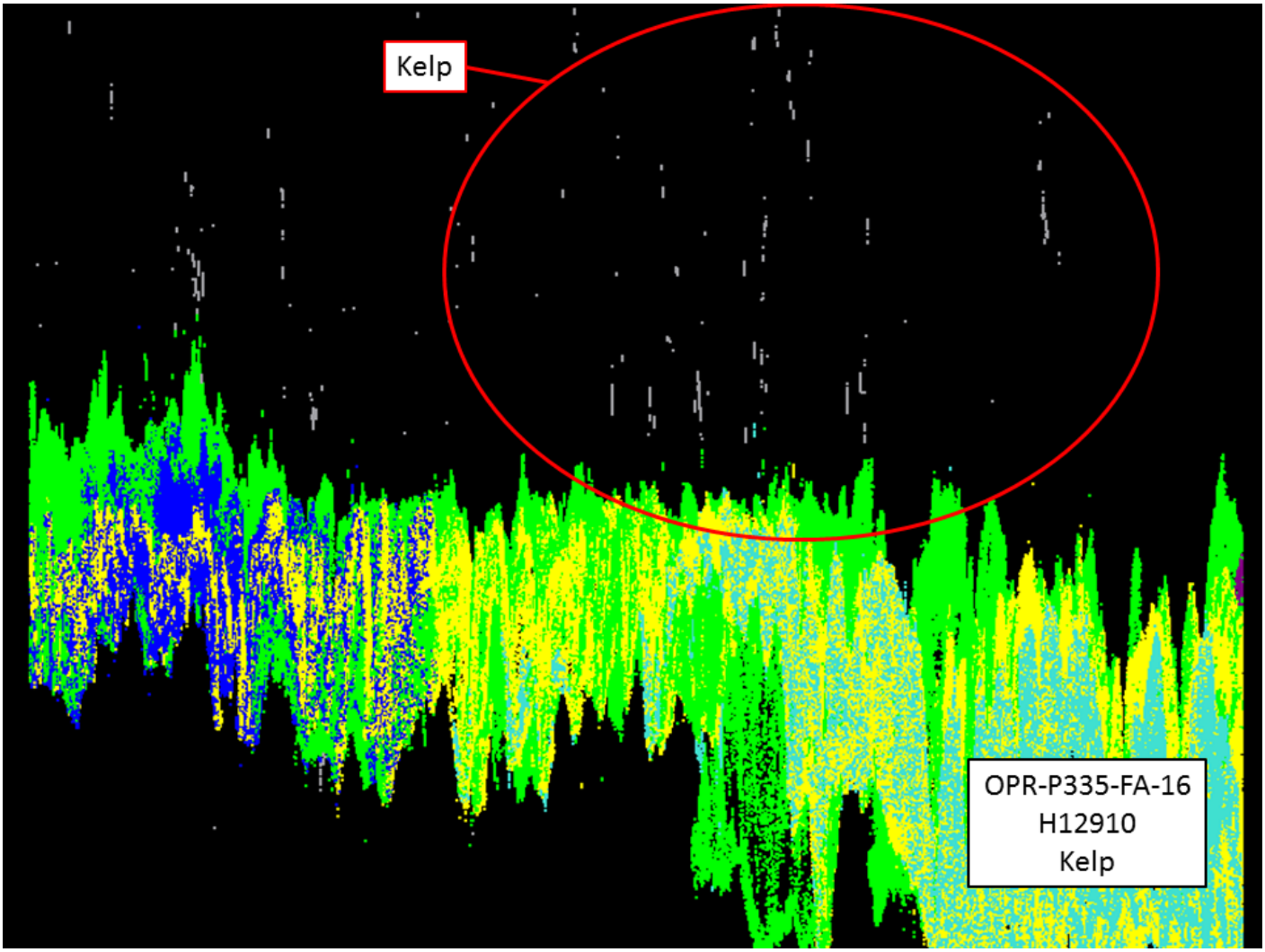


Figure 21: Rejected soundings from kelp in H12910.

Sound Speed

The most significant sound speed artifact within the survey was found in the eastern portion of the survey area near along the 20fm contour. Upon investigation it was determined that the sound speed cast applied to the line was not representative for the full extents of the line, causing some limited “frowning” at the eastern extents of the line. No other temporally adjacent casts were available to apply to the data and the Hydrographer flagged all erroneous data below the true seafloor as “rejected” (Figure 21). The resulting surfaces are within NOAA allowable uncertainties and remain adequate to supersede previous data.

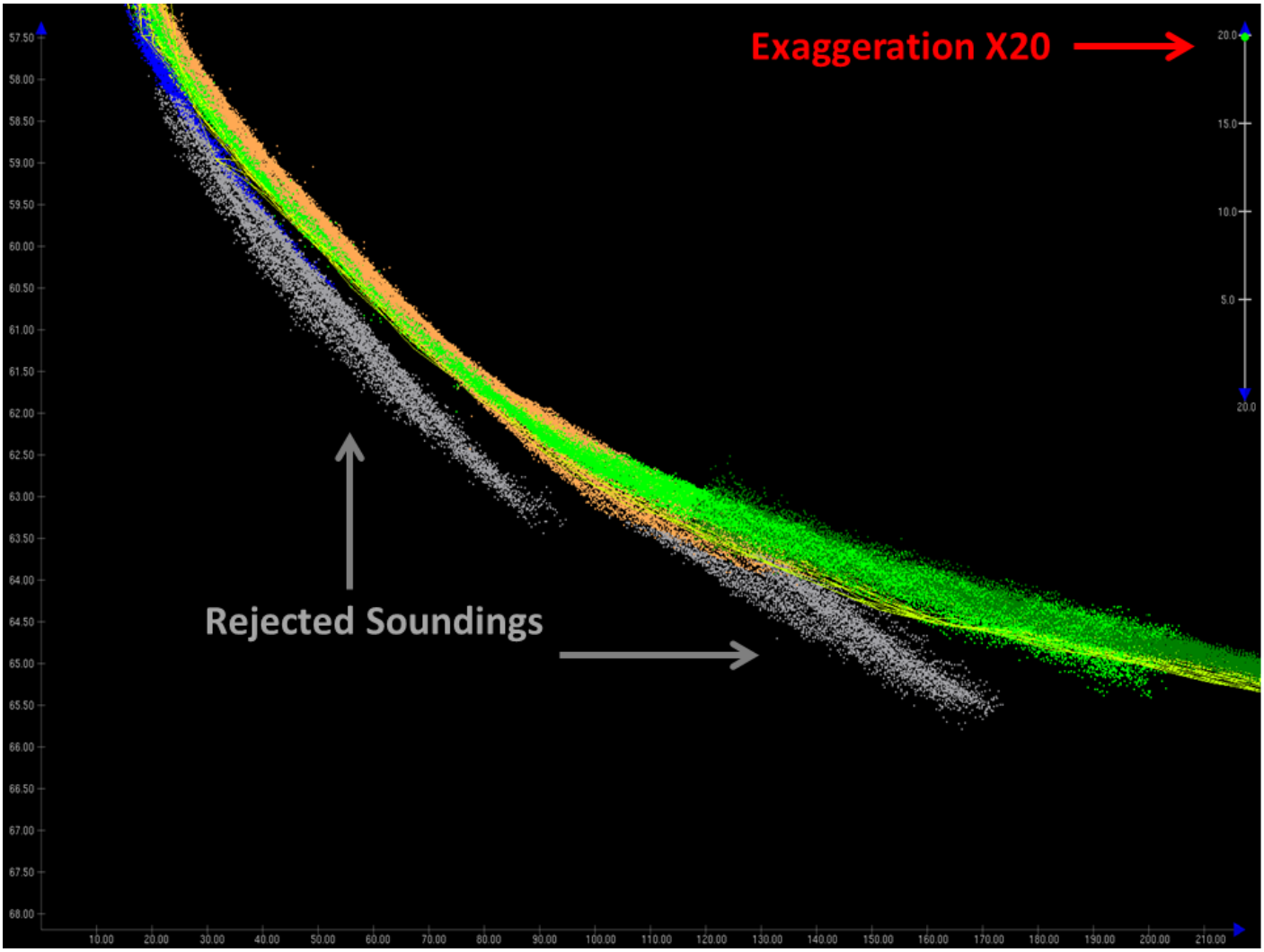


Figure 22: Subset of H12910 showing "frowns" in data caused by sound speed issues (20x vertical exaggeration).

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Casts were conducted at a minimum of one every 4 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. MVP casts on S220 were conducted at an average interval of 10 minutes as recommended by Pydro's CastTime software, which determines optimum cast frequency based on the observed sound speed variations from previous casts. 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

H12910 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. No true holidays which meet the 3 by 3 node definition were identified via Pydro QC Tools Holiday Finder tool. This tool automatically scans finalized surfaces for holidays as defined in the HSSD and was run in conjunction with a visual inspection of all surfaces by the Hydrographer. Although numerous apparent holidays were flagged by Holiday Finder, all were examined and determined to be from areas where an adjoining finalized surfaces covered the gap (e.g., a holiday in the 4m finalized surface was covered by the 2m finalized surface due to the area being shoaler than the depth range for the 4m surface) as shown in Figure 23.

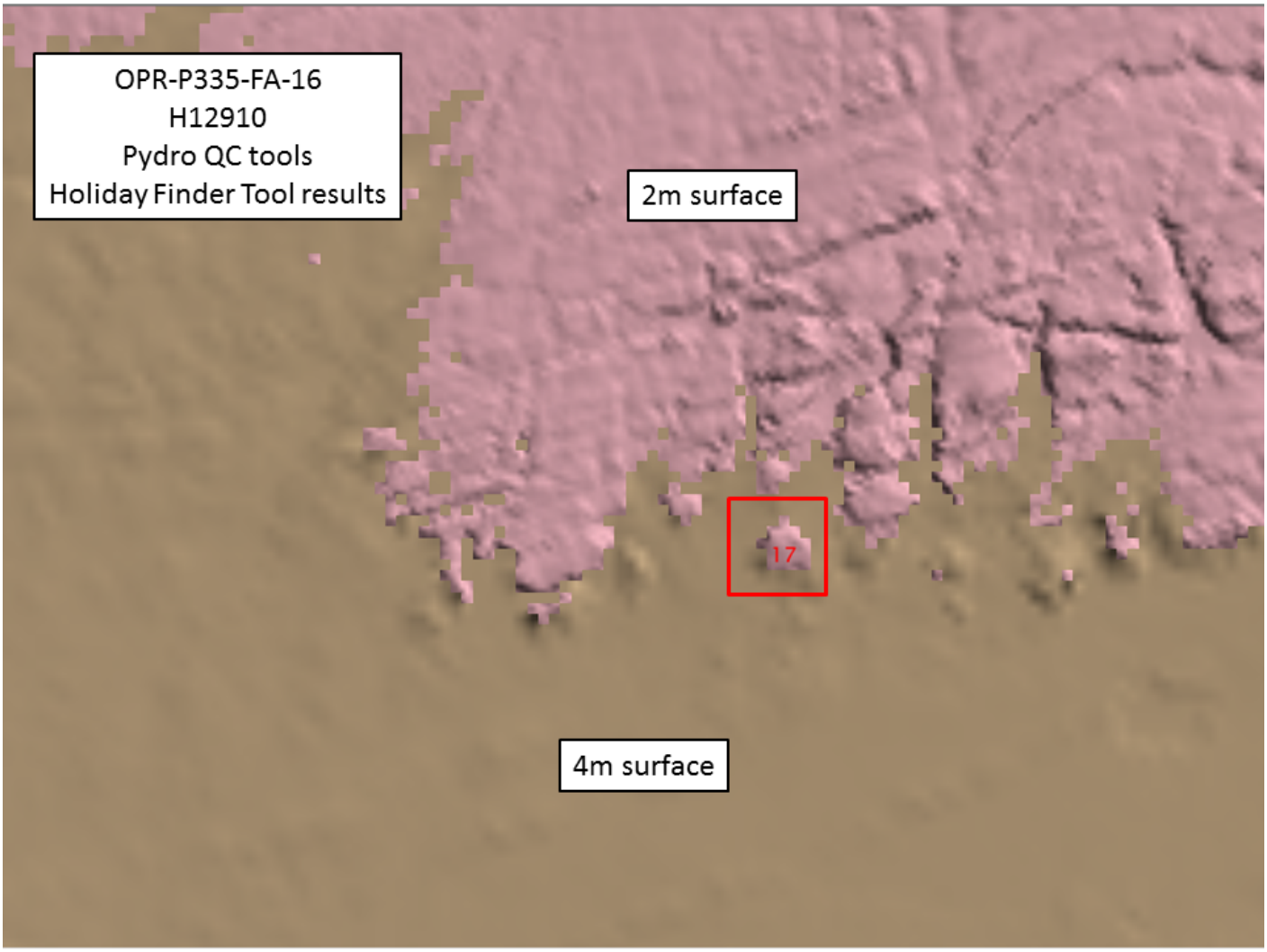


Figure 23: H12910 Holiday in 4m surface covered by 2m surface.

B.2.10 NOAA Allowable Uncertainty

To verify that all data meets the accuracy specifications as stated in HSSD Section 5.1.3, a child layer titled "NOAA_Allowable_1" was created for each of the 1-meter, 2-meter, 4-meter, and 8-meter (72-100m) and "NOAA_Allowable_2" for the 8-meter (100-160m) finalized surfaces using the equations stated in Section C. 2.1 of the DAPR. These surfaces were then analyzed using the Pydro QC Tools Grid QA feature to determine what percentage of each surface meets specifications. Figure 24 shows an overview of the NOAA Allowable Uncertainty layers for all surfaces. Figure 25 shows the corresponding statistics for each individual surface. Overall, 99.90% of nodes with all surfaces meet or exceed NOAA Allowable Uncertainty specifications for H12910. For individual graphs per surface of density requirements, see the Standards and Compliance Review located in Appendix II.

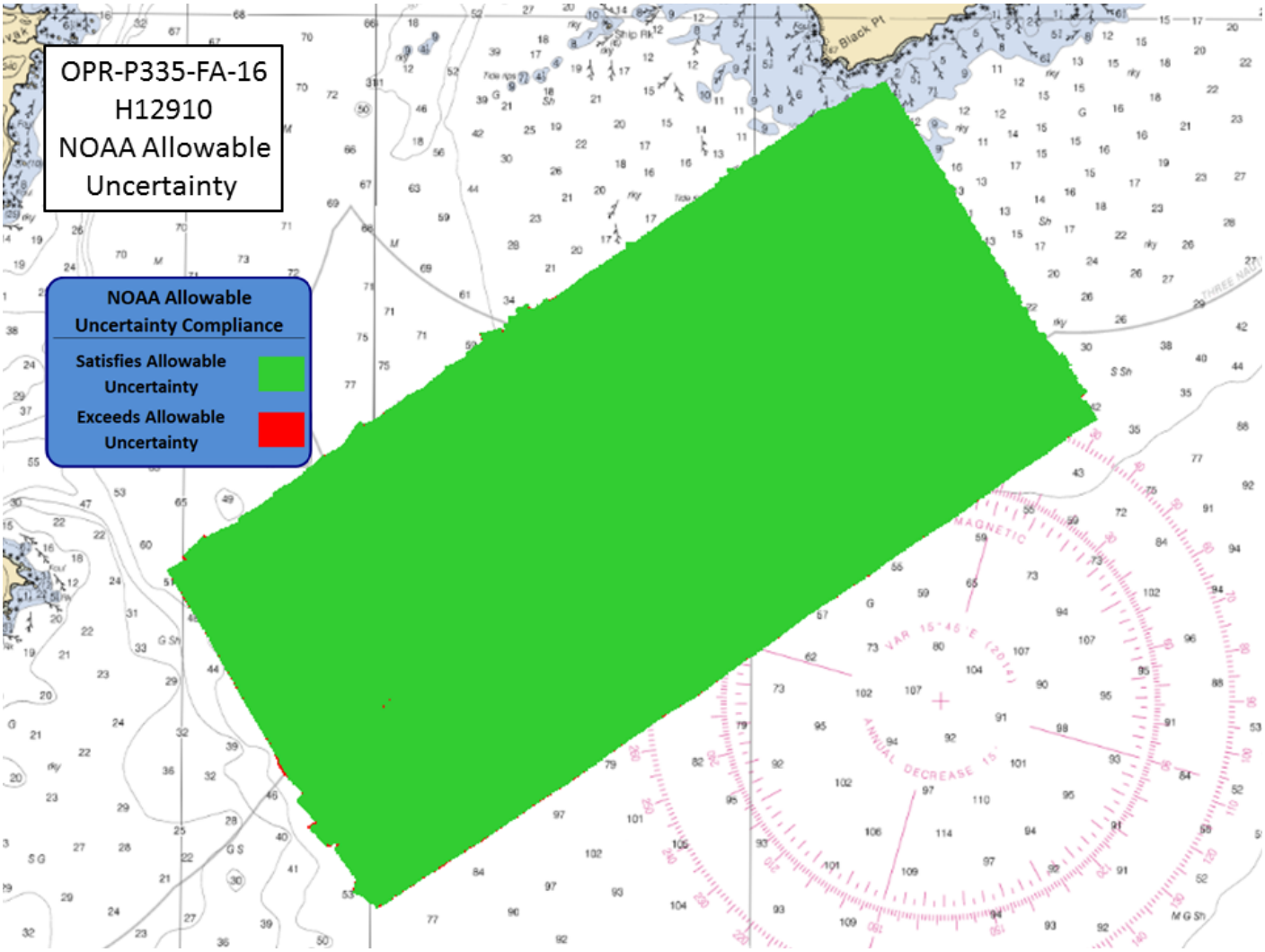


Figure 24: H12910 NOAA Allowable Uncertainty overview.

H12910 NOAA Allowable Uncertainty

	Total Nodes	Passed Nodes	Percent Pass
1m	2,965,852	2,960,506	99.82%
2m	6,286,536	6,283,015	99.94%
4m	1,739,041	1,737,106	99.89%
8m	1,048,122	1,046,394	99.84%

Total Nodes	12,039,551
Total Nodes Pass	12,027,021
Total Percent Pass	99.90%

Figure 25: H12910 NOAA Allowable Uncertainty statistics.

B.2.11 Density

Finalized surfaces were analyzed using the Pydro QC Tools Grid QA feature and the results are shown in Figure 26 below. Density requirements for H12910 were achieved with at least 99.95% of finalized surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3.

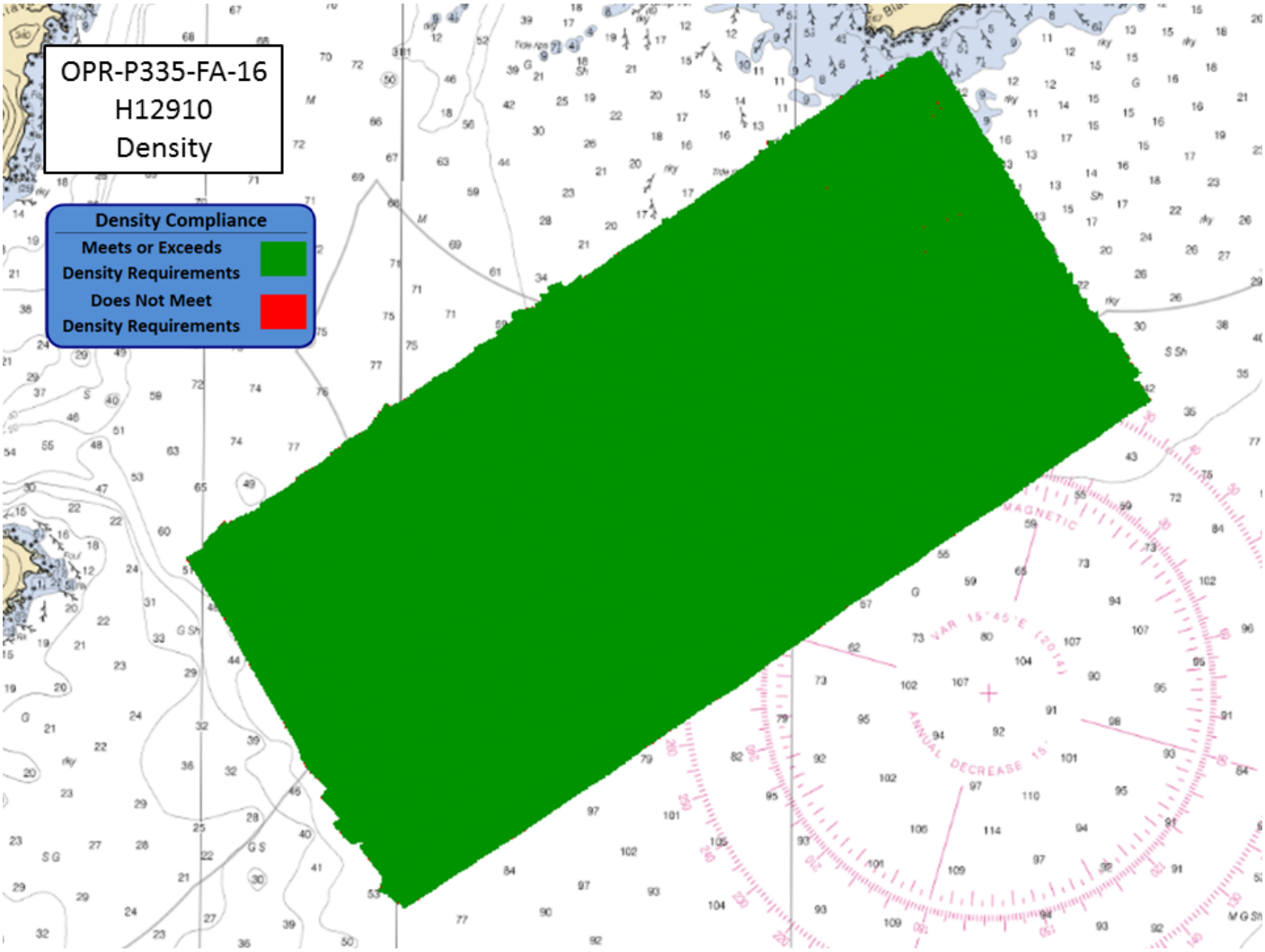
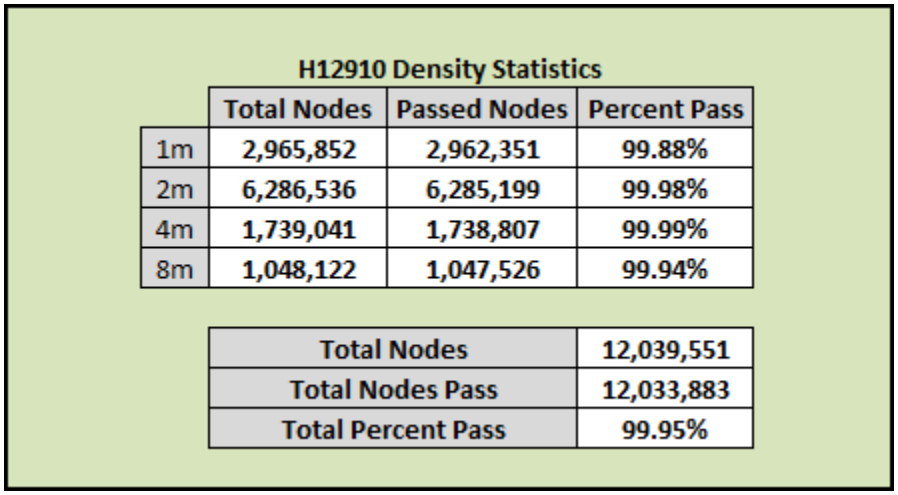


Figure 26: H12910 density overview.



H12910 Density Statistics

	Total Nodes	Passed Nodes	Percent Pass
1m	2,965,852	2,962,351	99.88%
2m	6,286,536	6,285,199	99.98%
4m	1,739,041	1,738,807	99.99%
8m	1,048,122	1,047,526	99.94%

Total Nodes	12,039,551
Total Nodes Pass	12,033,883
Total Percent Pass	99.95%

Figure 27: H12910 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 logged as .7k files for Reson 7125 data. Kongsberg EM710 stores the backscatter data in the .all file. The data have been sent to the Pacific Hydrographic Branch for processing. One line per vessel per day of acquisition was processed by the field unit for quality control.

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	9.1

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus FMGT	7.5.3

Table 10: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Extended attribute Files version 5.4.

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
H12910_MB_1m_MLLW	CUBE	1 meters	-	NOAA_1m	Complete MBES
H12910_MB_1m_MLLW_final	CUBE	1 meters	0 meters - 20 meters	NOAA_1m	Complete MBES
H12910_MB_2m_MLLW	CUBE	2 meters	-	NOAA_2m	Complete MBES
H12910_MB_2m_MLLW_final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12910_MB_4m_MLLW	CUBE	4 meters	-	NOAA_4m	Complete MBES
H12910_MB_4m_MLLW_final	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H12910_MB_8m_MLLW	CUBE	8 meters	-	NOAA_8m	Complete MBES
H12910_MB_8m_MLLW_final	CUBE	8 meters	72 meters - 160 meters	NOAA_8m	Complete MBES

Table 11: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces in Survey H12910. 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 be shoaler or deeper than 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 v3, part of the QC Tools package within Pydro, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run multiple times for each surface, reducing the flier height value for each consecutive run. This allowed Flier Finder to accurately and quickly identify gross fliers, but as the flier height was reduced the effectiveness of the tool diminished. With smaller heights, Flier Finder began to incorrectly flag dynamic aspects of the seafloor such as steep drop offs and rocky areas as fliers resulting in false positives. At this point, the hydrographer ceased using the tool and returned to manual cleaning for these dynamic regions of seafloor.

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 H12910 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

C. Vertical and Horizontal Control

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

C.1 Vertical Control

The vertical datum for this project is 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
Kodiak Island, AK	9457292
Alitak, AK	9457804

Table 12: NWLON Tide Stations

The following subordinate water level stations were established for this survey:

Station Name	Station ID
Offshore Sitkalidak Island GPS Buoy	945AAAA
Offshore Geese Islands GPS Buoy	945BBBB

Table 13: Subordinate Tide Stations

File Name	Status
9457292.tid	Verified Observed
9457804.tid	Verified Observed

Table 14: Water Level Files (.tid)

File Name	Status
P335FA2016_Verified.tc	Preliminary

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

A request for final approved tides was sent to N/OPS1 on 07/31/2016. The final tide note was received on 12/02/2016.

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.

As ERS methods were successful for the reduction to MLLW, final tides were not necessary for H12910. As processing was completed prior to receiving final tides, a waiver was obtained from HSD-OPS for the submission of H12910 without final tides applied. This correspondence has been included in Appendix II, accompanying this submission.

ERS Methods Used:

ERS via Poor Mans VDATUM

Ellipsoid to Chart Datum Separation File:

P335FA2016_PMVD_UTM-NAD83-5N_WGS84-MLLW_Composite

ERS methods were used as the final means of reducing H12910 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. In areas where the PMVD model did not have sufficient coverage such as near shore areas, the ERZT separation model was appended to the PMVD model creating the composite ERZT/PMVD separation model listed above and used to reduce H12910 to MLLW. For further information see the ERS Capability Memo, submitted under separate cover.

C.2 Horizontal Control

The horizontal datum for this project is World Geodetic System 1984 (WGS84).

The projection used for this project is UTM Zone 5 North.

The following PPK methods were used for horizontal control:

Single Base

Vessel kinematic data were post-processed using Applanix POSPac processing software and Single Base 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. The WGS84 horizontal datum was used for the entirety of H12910, based on the most recent guidance at the start of the survey.

For further details regarding the processing and quality control checks performed, see the H12910 POSPAC Processing Logs spreadsheet located in the Separates folder. See also the OPR-P335-FA-16 Horizontal and Vertical Control Report (HVCR), submitted under separate cover.

Hydrographic Technical Directive (HTD) 2016-3, which revises the horizontal datum requirement to NAD83, was released after acquisition had commenced for OPR-P335-FA-16. The field unit conferred with HSD-OPS and determined no waiver was required to maintain WGS84 as the datum for submission. This correspondence has been included in Appendix II.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
AC34	Old Harbor

Table 16: CORS Base Stations

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
9677	PZ 2014

Table 17: User Installed Base Stations

Differential correctors from the US Coast Guard beacon at Kodiak, AK (313kHz) were used in real-time during acquisition when not otherwise noted in the acquisition logs, and were the sole method of positioning of bottom samples.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Kodiak, AK (313kHz)

Table 18: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H12910 and charts 16590 and 16592, as well as ENC US4AK5NM using CARIS HIPS and SIPS sounding and contour layers derived from the 8 meter combined surface. The contours and soundings were overlaid on the charts to assess differences between the surveyed soundings and charted depths. ENCs were compared to the 8 meter combined grid by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the combined surface from H12910.

All data from H12910 should supersede charted data. In general, surveyed soundings agree with the majority of charted depths. A full discussion of the disagreements follows below.

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
16590	1:81529	12	09/2014	10/11/2016	09/10/2016
16592	1:80728	11	07/2014	11/12/2016	11/12/2016

Table 19: Largest Scale Raster Charts

16590

The charted soundings and contours of Chart 16590 are identical to those found on ENC US4AK5NM. As such, all discussions regarding comparisons between surveyed soundings and charted depths are covered under the ENC US4AK5NM discussion below.

16592

The charted soundings and contours of Chart 16592 are identical to those found on ENC US4AK5NM. As such, all discussions regarding comparisons between surveyed soundings and charted depths are covered under the ENC US4AK5NM discussion below.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US4AK5NM	1:80728	12	08/19/2016	08/19/2016	NO

Table 20: Largest Scale ENCs

US4AK5NM

Soundings from H12910 are in general agreement with charted depths on ENC US4AK5NM, with most depths agreeing to 2 fathoms as shown in Figure 29. The largest differences are seen in the deep western portion of the survey where differences range to 4 fathoms.

To more accurately visualize trends within these differences, a 8 meter TIN surface was interpolated from the ENC sounding layer. This surface was then differenced with a corresponding 8 meter surface from H12910 and visualized in Figure 30. In this difference surface red colors indicate H12910 was shoaler than the ENC US4AK5NM, green colors indicate agreement, and blue colors indicate H12910 was deeper than ENC US4AK5NM. While the difference surface showed areas of significant difference, closer inspection suggests those differences are a result of limitations of the TIN algorithm used on the ENC sounding layer, and not from actual differences between H12910 and ENC US4AK5NM as shown in Figure 30.

Contours from H12910 are in general agreement with charted contours on ENC US4AK5NM as shown in Figure 31. The Hydrographer recommends that a 20fm and 30fm contour be added to the charted contours to provide necessary detail to the mariner where the deeper parts of the basin within H12910 begin to shoal, as seen in Figure 32.

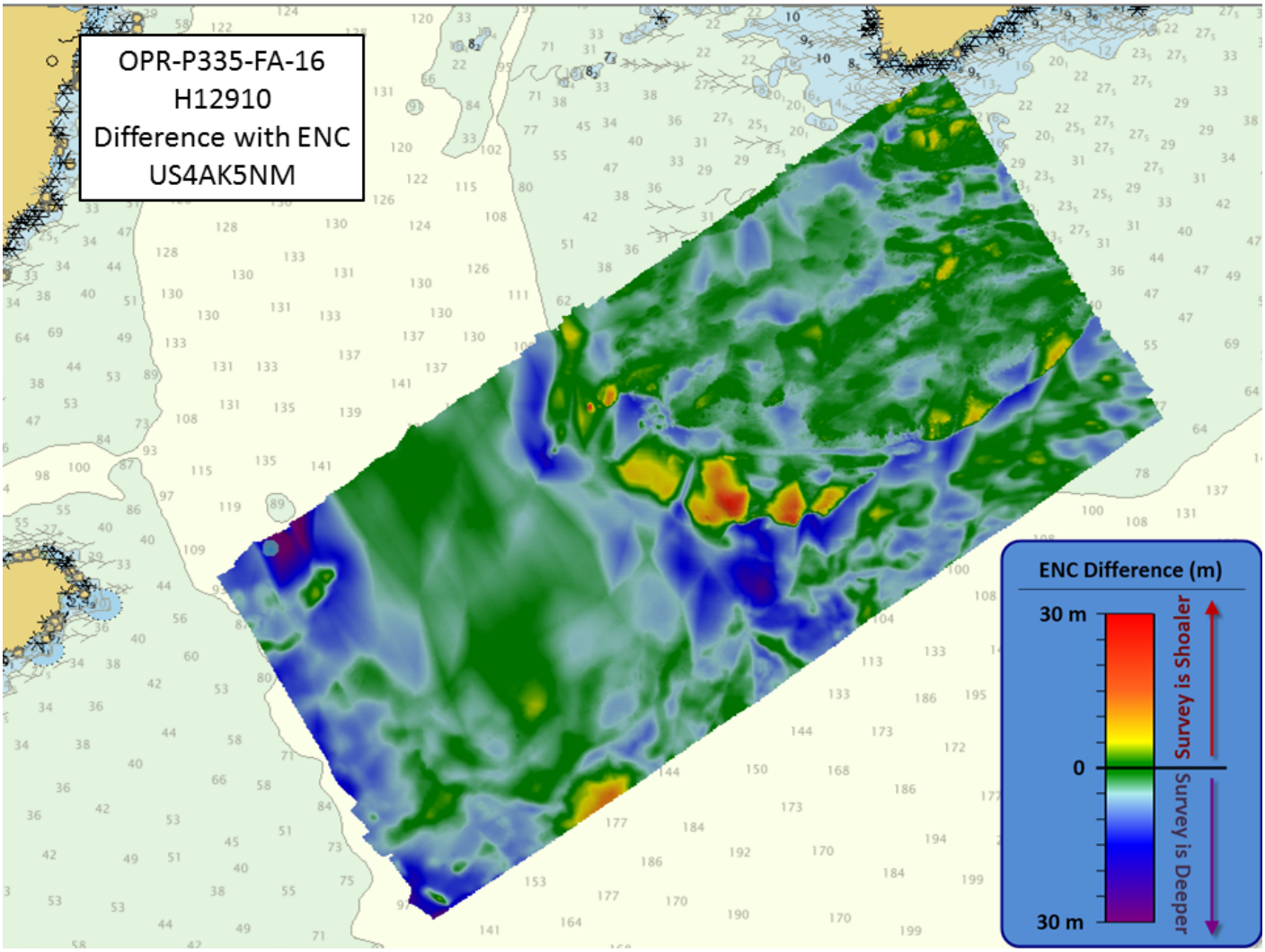
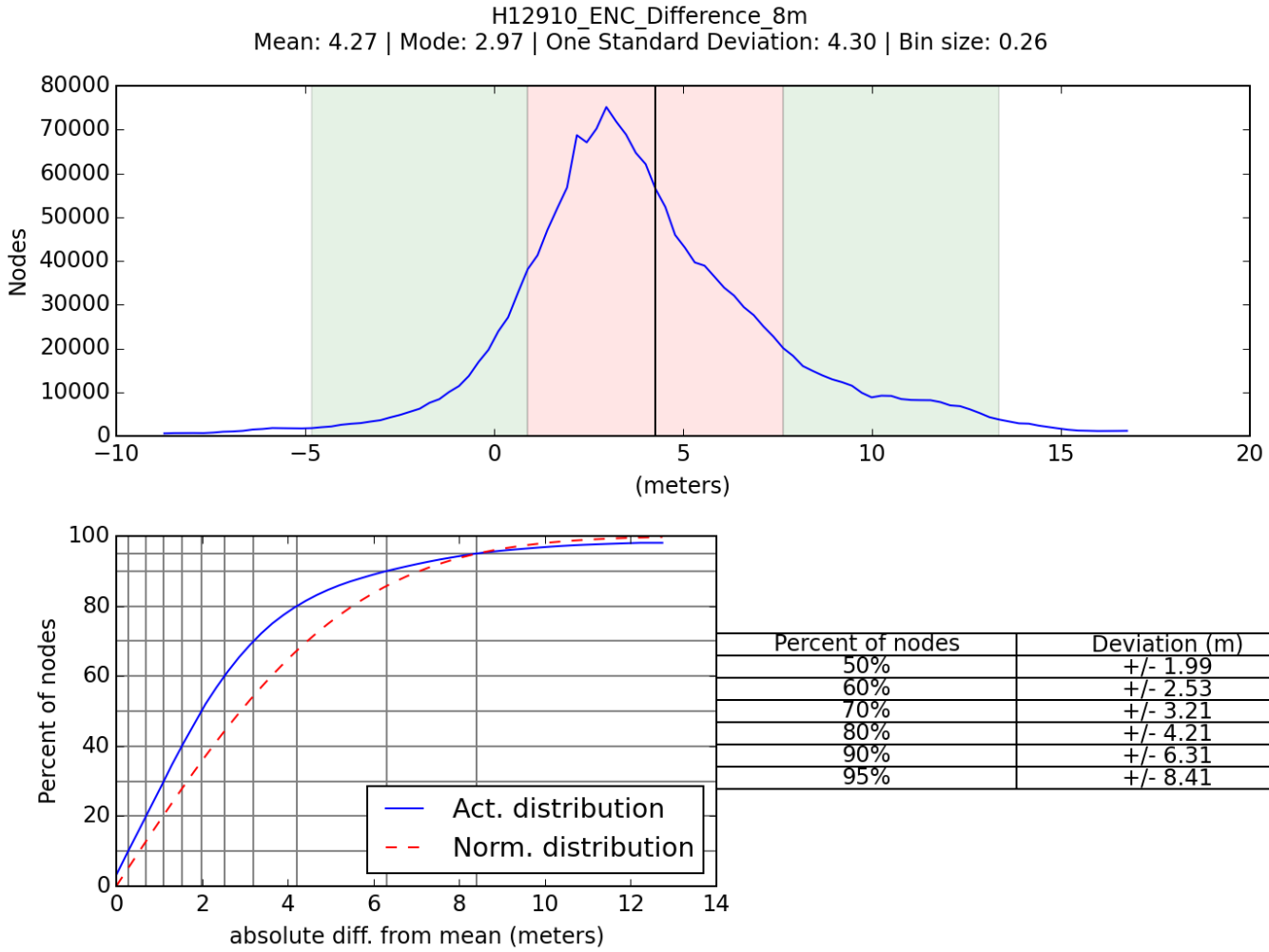


Figure 28: Difference surface between H12910 and interpolated TIN surface from US4AK5NM.



Percent of nodes	Deviation (m)
50%	+/- 1.99
60%	+/- 2.53
70%	+/- 3.21
80%	+/- 4.21
90%	+/- 6.31
95%	+/- 8.41

Figure 29: Difference surface statistics between H12910 and interpolated TIN surface from US4AK5NM.

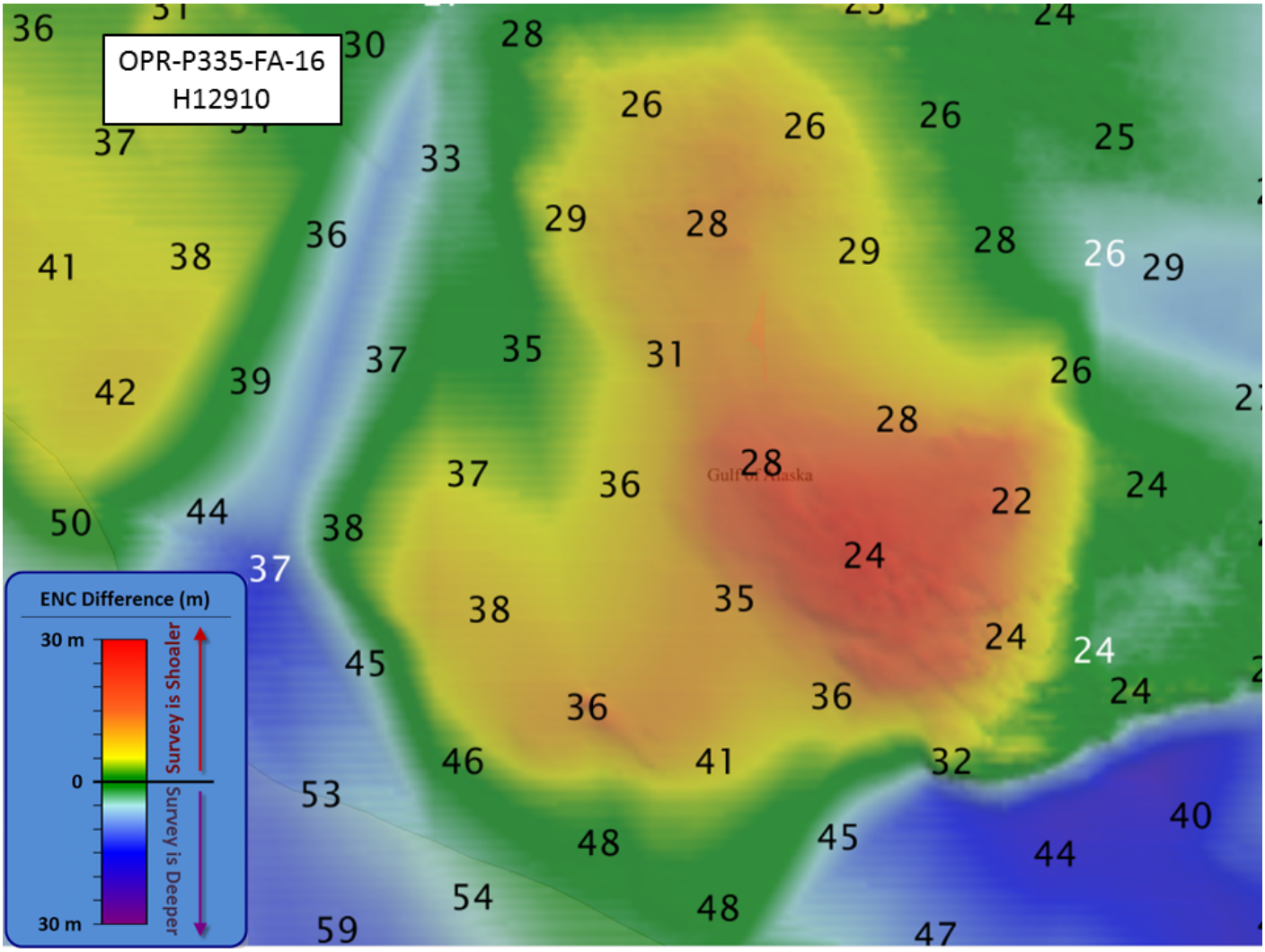


Figure 30: US4AK5NM TIN surface differenced from H12910 8m combined surface, with a sounding selection from the H12910 (black) and USAK5NM (white).

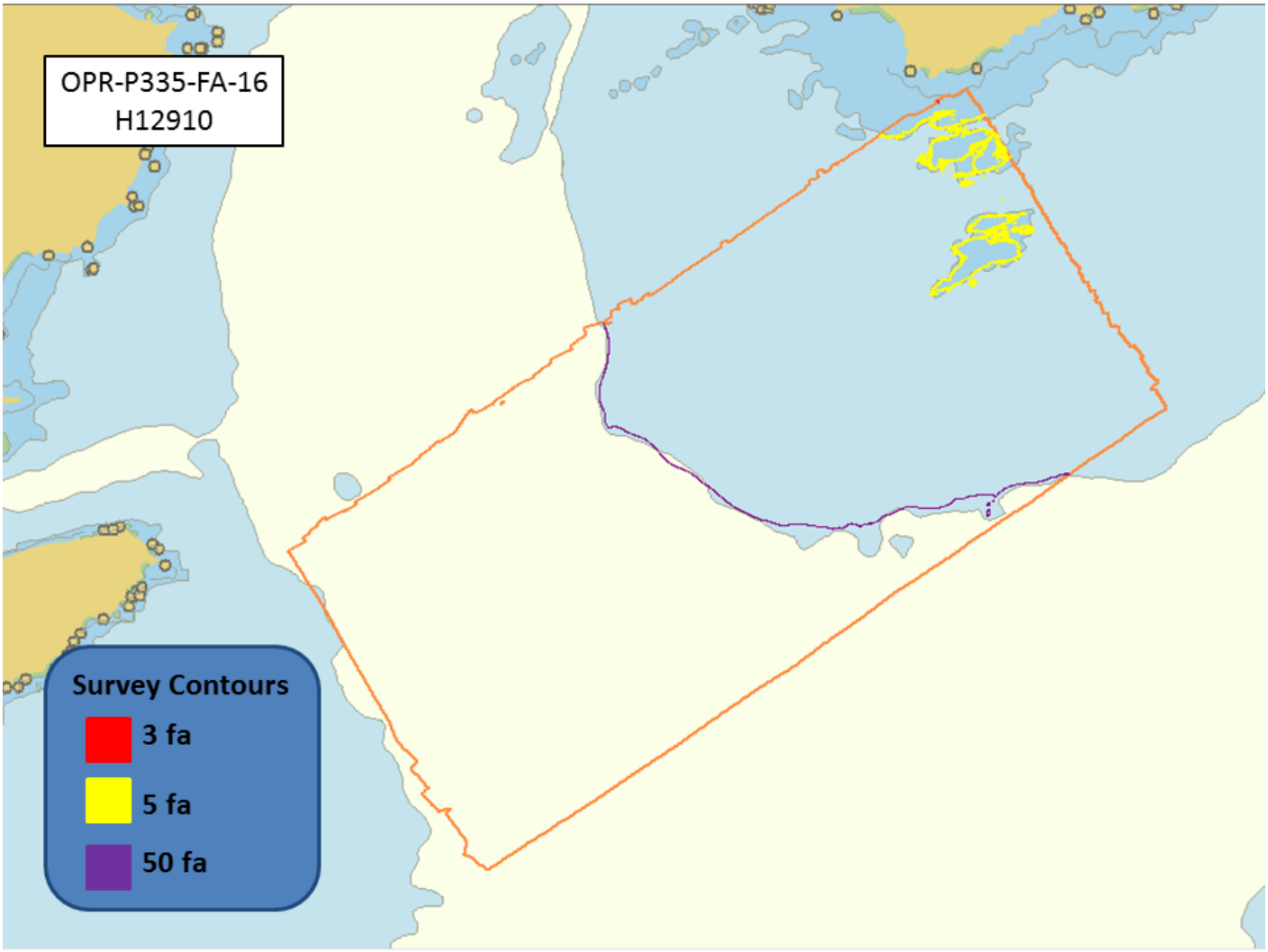


Figure 31: Overview of H12910 contours overlaid onto ENC US4AK.

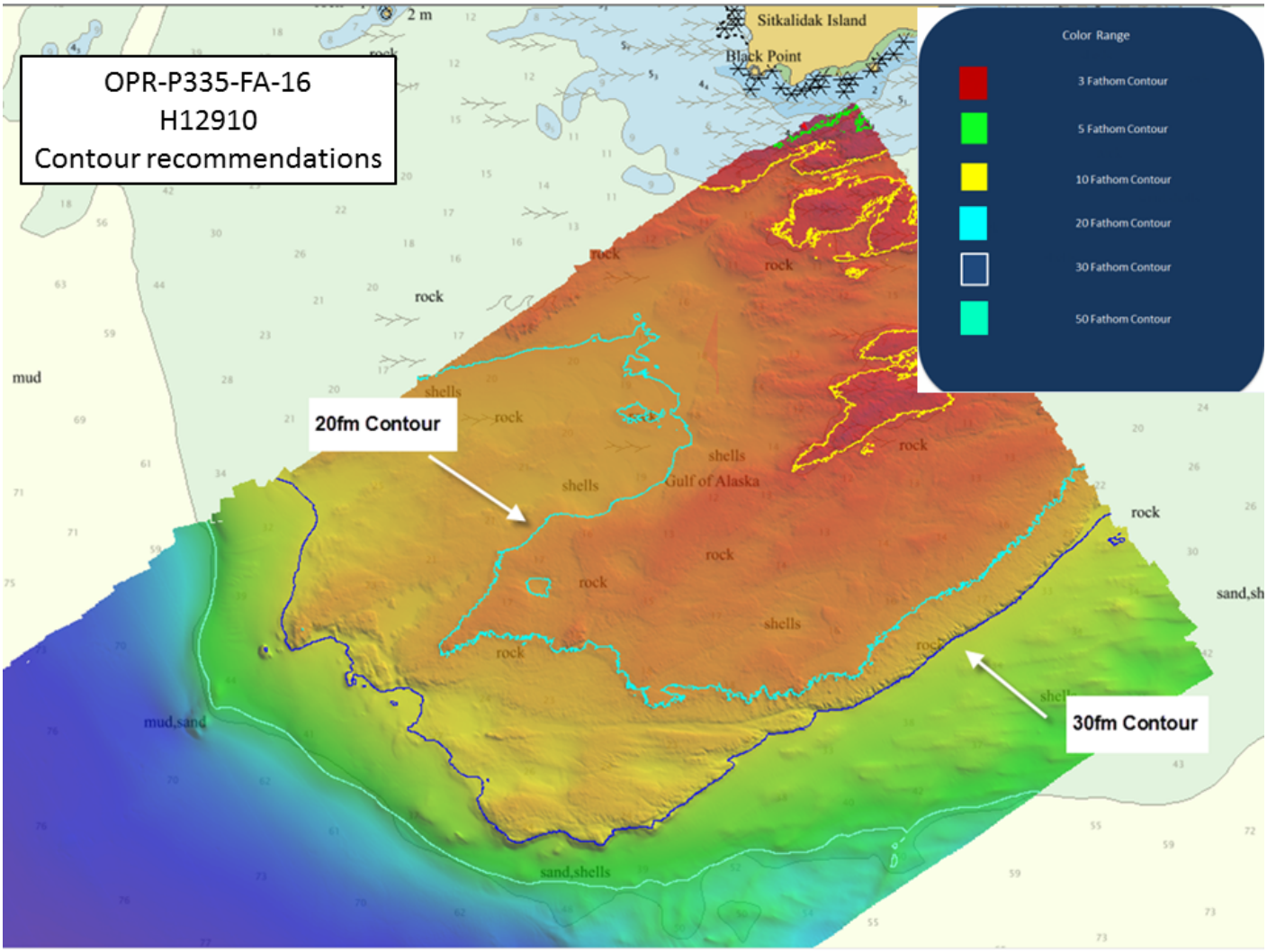


Figure 32: The 20fm and 30fm contours in H12910.

During cartographic compilation it was deemed that adding the 20fm and 30fm contours would not improve the chart as a whole, therefore it was not added during the compilation of H12910.

D.1.3 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.4 Charted Features

All assigned features within the NALL were addressed and are included in the H12910 Final Feature File. Assigned features inshore of the NALL were given the description of “Not Addressed” with remarks “Retain as charted, not investigated due to being inshore of NALL” in accordance with HSSD 7.3.1.

No charted features or soundings that contain the label PA, ED, PD, or Rep exist within the sheet limits of H12910.

D.1.5 Uncharted Features

Survey H12910 has three new features that are addressed in the H12910 Final Feature File. These features consist of three new Seabed Areas.

The three new features are bottom sample points. No other uncharted features exist.

D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.7 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.8 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.1.9 Bottom Samples

Five bottom samples were attempted in accordance with the Project Instructions for survey H12910, of which 3 successfully retrieved samples All bottom samples were entered in the H12910 Final Feature File. See Figure 33 for a graphical overview of sample locations.

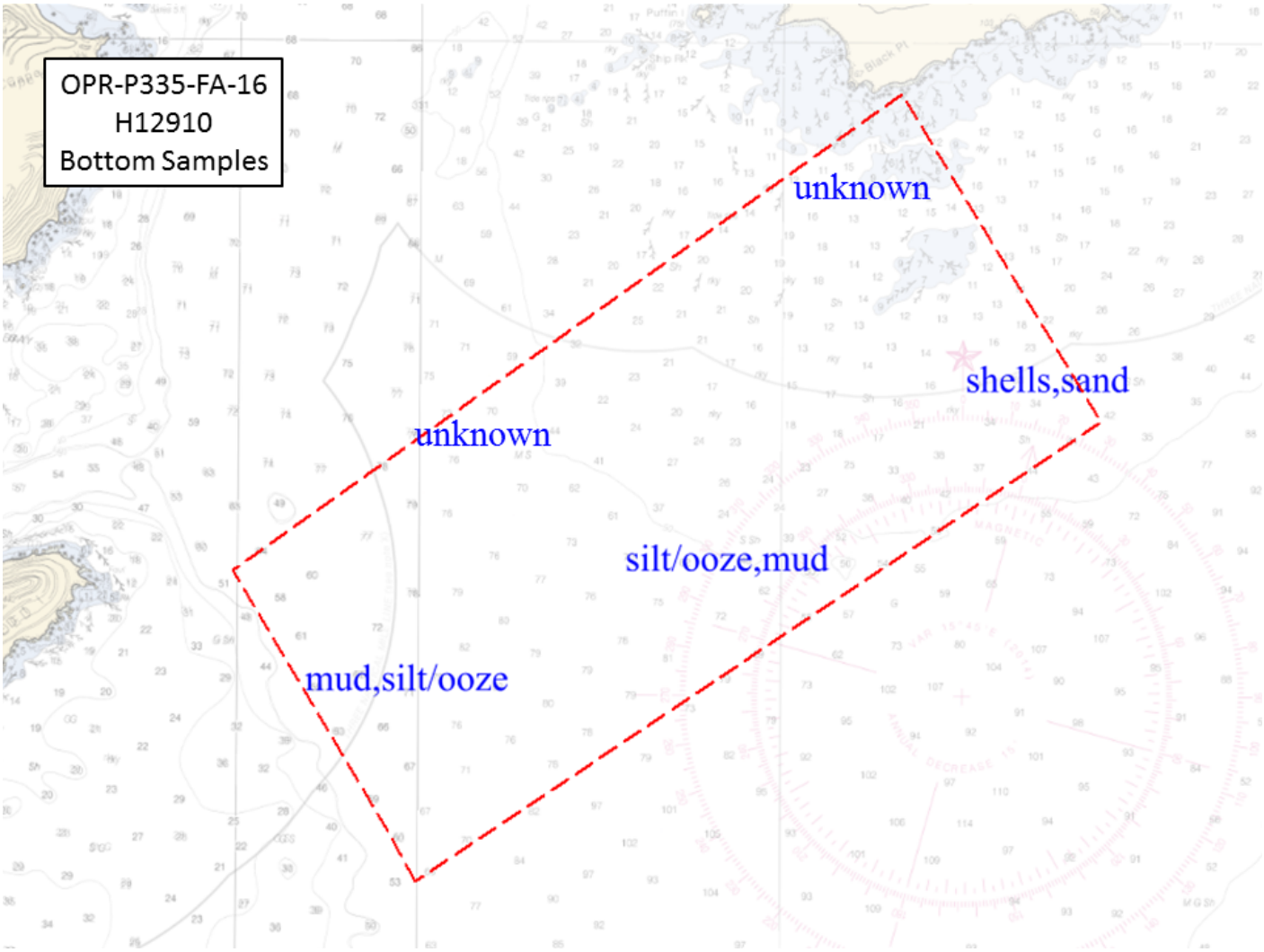


Figure 33: H12910 bottom sample locations.

D.2 Additional Results

D.2.1 Shoreline

H12910 survey limits extended to the NALL (see Section A.1) and all features within these limits were addressed and attributed in the H12910 Final Feature File. All features inshore of the NALL were included in the Final Feature File with the description of “Not Addressed” and remarks of “Retain as charted, not investigated due to being inshore of NALL” as per HSSD Section 7.3.1. Annotations, information, and diagrams collected on DP forms and boat sheets during field operations are scanned and included in the Separates I Detached Positions folder.

D.2.2 Prior Surveys

No prior survey comparisons were assigned for this survey.

D.2.3 Aids to Navigation

No Aids to navigation (ATONs) exist 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 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

No Significant Features 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 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, except as noted in this Descriptive Report. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required unless otherwise noted herein.

Report Name	Report Date Sent
Data Acquisition and Processing Report	2016-11-08
Horizontal and Vertical Control Report	2016-11-14
Coast Pilot Report	2016-11-10

Approver Name	Approver Title	Approval Date	Signature
CDR Mark Van Waes, NOAA	Commanding Officer	11/28/2016	VAN WAES.MARK.1240076329 2016.11.28 08:58:31 -08'00'
LT Bart Buesseler, NOAA	Field Operations Officer	11/23/2016	Digitally signed by BUESSELER.BART.OWEN.1396600559 Date: 2016.11.23 12:07:29 -08'00'
HCST Douglas Bravo	Chief Survey Technician	11/23/2016	Douglas Bravo 2016.11.23 19:02:54 -08'00'
ENS Jeffrey Douglas, NOAA	Sheet Manager	11/23/2016	Digitally signed by DOUGLAS.JEFFREY.JAMES.1365482353 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=DOUGLAS.JEFFREY.JAMES.1365482353 Date: 2016.11.23 09:32:37 -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	Local Notice to Mariners
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

Acronym	Definition
PRF	Project Reference File
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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : December 2, 2016

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P335-FA-16
HYDROGRAPHIC SHEET: H12910

LOCALITY: South of Black Point, South Coast of Kodiak Island
TIME PERIOD: June 24 to July 31, 2016

TIDE STATION USED: Kodiak Island, AK 9457292
Lat. 57° 43.8′ N Long. 152° 30.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.400 meters

TIDE STATION USED: Alitak, AK 9457804
Lat. 56° 53.8' N Long. 154° 14.9' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.311 meters

Tide STATION USED: Sitkalidak Island GPS Tide Buoy, AK 9457512
Lat. 56° 57.9′ N Long. 153° 15.1' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.307 meters

Tide STATION USED: Geese Island GPS Tide Buoy, AK 9457726
Lat. 56° 35.7′ N Long. 153° 59.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.483 meters

REMARKS: RECOMMENDED GRID
Please use the TCARI grid "P335FA2016Final.tc" as the final grid for project OPR-P335-FA-16, during the time period between June 24 to July 31, 2016.

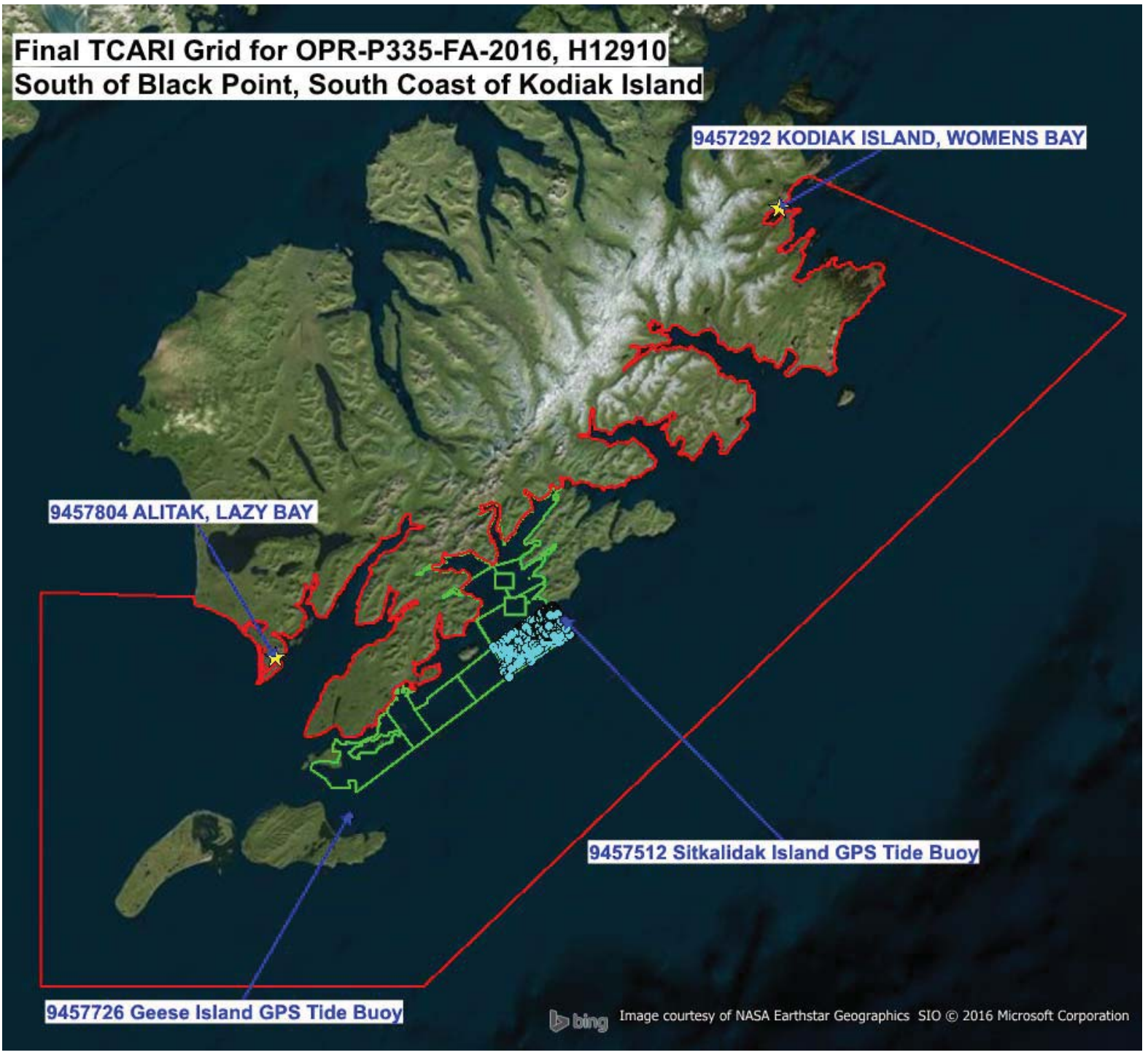
Refer to attachments for grid information.

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).

BURKE.PATRICK.B.1365830335

Digitally signed by BURKE.PATRICK.B.1365830335
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=BURKE.PATRICK.B.1365830335
Date: 2016.12.02 14:43:10 -05'00'

CHIEF, OCEANOGRAPHIC DIVISION


Final TCARI Grid for OPR-P335-FA-2016, H12910
South of Black Point, South Coast of Kodiak Island
9457292 KODIAK ISLAND, WOMENS BAY
9457804 ALITAK, LAZY BAY
9457512 Sitkalidak Island GPS Tide Buoy
9457726 Geese Island GPS Tide Buoy
bing
Image courtesy of NASA Earthstar Geographics SIO © 2016 Microsoft Corporation

APPROVAL PAGE

H12910

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 NGDC for archive

- H12910_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12910_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101
Date: 2017.05.31 14:46:53 -07'00'

Approved:_____

Pete Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Digitally signed by EVANS.BENJAMIN.K.1237217094
Date: 2017.05.30 15:11:22 -07'00'

Approved:_____

CDR Ben Evans, NOAA
Chief, Pacifica Hydrographic Branch