H12897

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

# DESCRIPTIVE REPORT

| | |
|---|---|
| Type of Survey: | Navigable Area |
| Registry Number: | H12897 |

## LOCALITY

| | |
|---|---|
| State(s): | Alaska |
| General Locality: | South Coast of Kodiak Island |
| Sub-locality: | Geese Channel |

## 2016

CHIEF OF PARTY
CDR Mark Van Waes, NOAA

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Date:

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

REGISTRY NUMBER:

# HYDROGRAPHIC TITLE SHEET

**H12897**

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: | **Geese Channel** |
| Scale: | **40000** |
| Dates of Survey: | **06/25/2016 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: | **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 H12897**

Project: OPR-P335-FA-16

Locality: South Coast of Kodiak Island

Sublocality: Geese Channel

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 on the south coast of Kodiak Island, AK, within the sub locality of Geese Channel.

## A.1 Survey Limits

Data were acquired within the following survey limits:

| Northwest Limit | Southeast Limit |
|---|---|
| 56° 50' 16.49" N<br>153° 51' 45.48" W | 56° 43' 14.04" N<br>153° 42' 17.99" W |

*Table 1: Survey Limits*

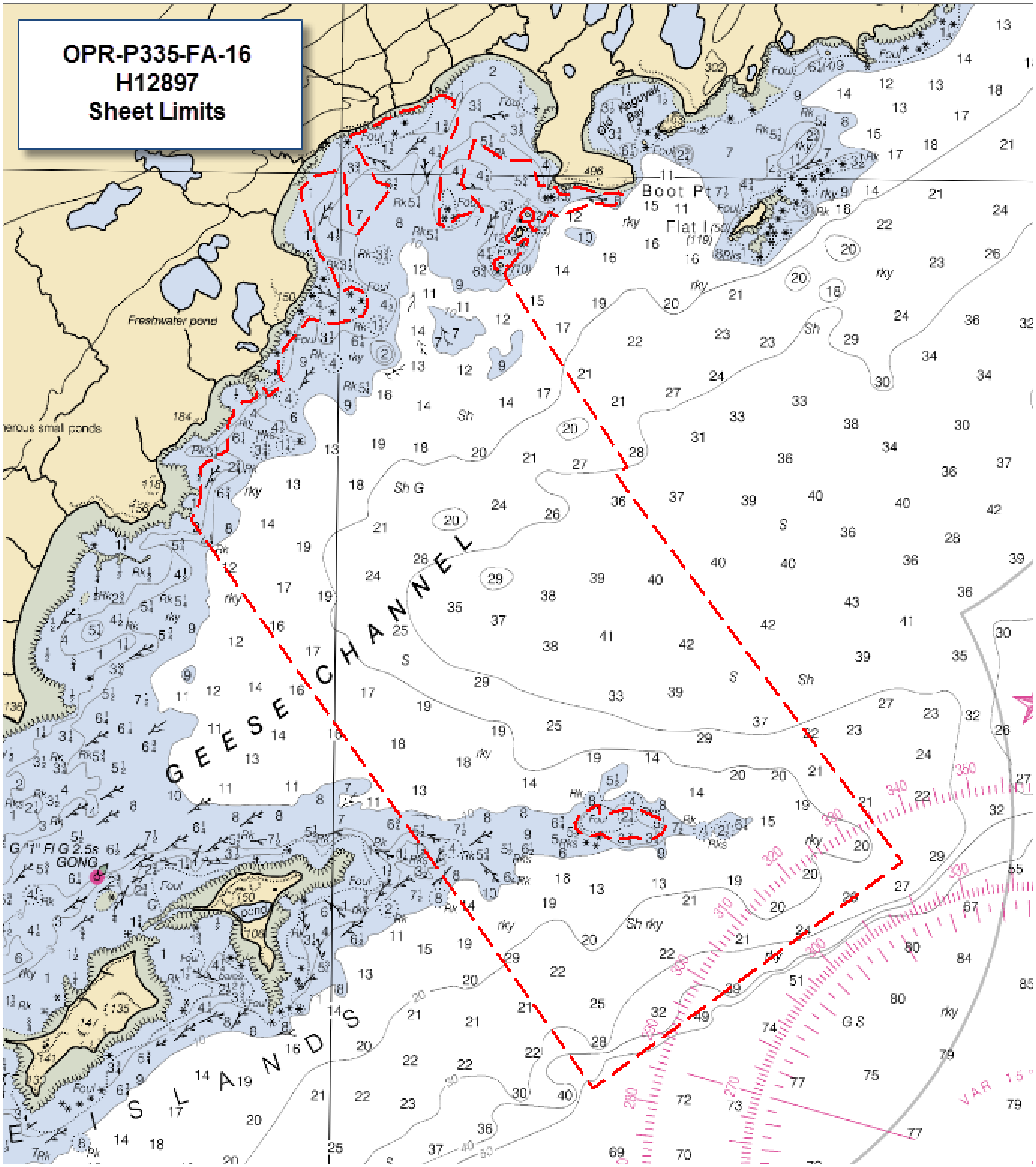



*Figure 1: H12897 Sheet limits overlaid onto Chart 16590.*

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 areas with excessively dense kelp. An example of such an area is shown in Figure 2.

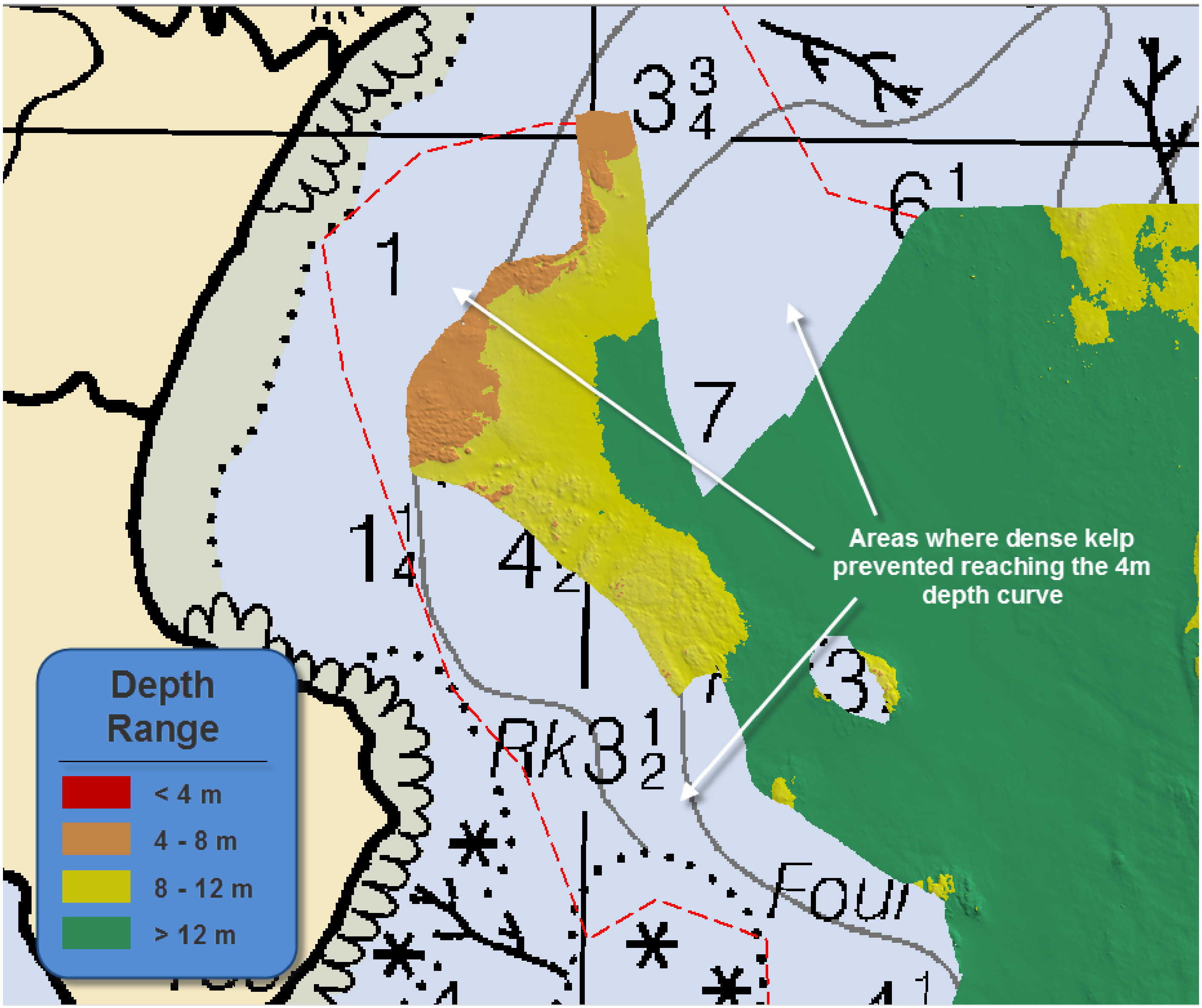



*Figure 2: H12897 Example of an area in the northwestern corner of the sheet not acquired to the 4 meter depth curve due to kelp defining the inshore limit of safe navigation.*

## A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. Survey areas will address 17 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 US 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 H12897 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 (HSSD Section 5.2.2.2). |

The entirety of H12897 was acquired with complete coverage MBES and backscatter data, meeting the requirements listed above and in the HSSD. See Figure 2 for an overview of coverage.

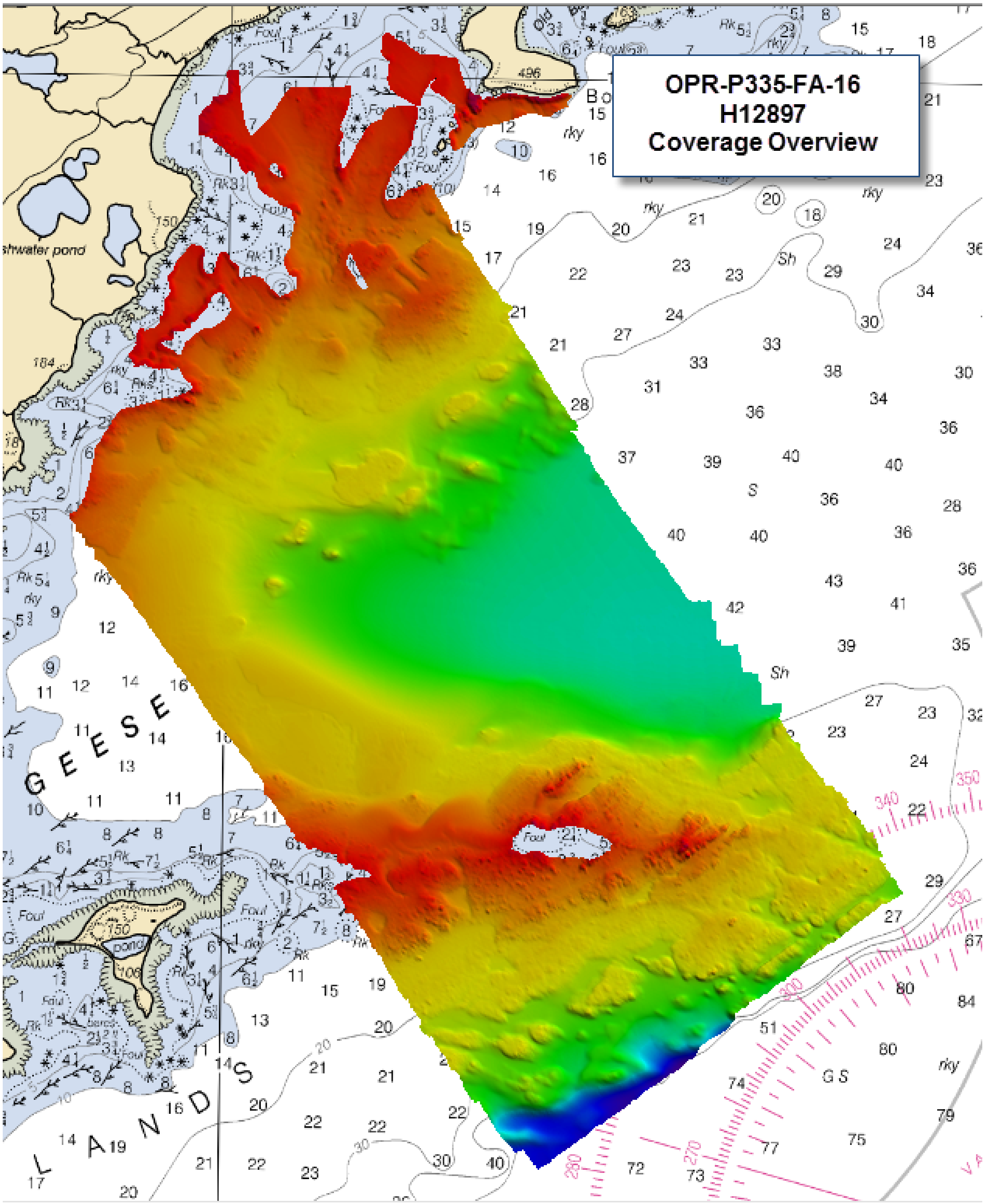



*Figure 3: H12897 survey coverage (8 meter surface) overlaid onto Chart 16590.*

## A.5 Survey Statistics

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

| | HULL ID | *2805* | *2806* | *2807* | *S220* | *Total* |
|---|---|---|---|---|---|---|
| LNM | SBES Mainscheme | 0 | 0 | 0 | 0 | 0 |
| | MBES Mainscheme | 92.27 | 126.68 | 121.36 | 41.12 | 381.43 |
| | 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 | 17.65 | 0 | 7.52 | 0 | 25.17 |
| | Lidar Crosslines | 0 | 0 | 0 | 0 | 0 |
| Number of Bottom Samples | | | | | | 2 |
| Number Maritime Boundary Points Investigated | | | | | | 0 |
| Number of DPs | | | | | | 0 |
| Number of Items Investigated by Dive Ops | | | | | | 0 |
| Total SNM | | | | | | 17.31 |

*Table 2: Hydrographic Survey Statistics*

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

| Survey Dates | Day of the Year |
|---|---|
| 06/25/2016 | 177 |
| 07/07/2016 | 189 |
| 07/08/2016 | 190 |
| 07/10/2016 | 192 |
| 07/11/2016 | 193 |
| 07/12/2016 | 194 |
| 07/17/2016 | 199 |
| 07/19/2016 | 201 |
| 07/20/2016 | 202 |
| 07/21/2016 | 203 |
| 07/28/2016 | 210 |
| 07/29/2016 | 211 |
| 07/31/2016 | 213 |

*Table 3: Dates of Hydrography*

# B. Data Acquisition and Processing

## B.1 Equipment and Vessels

Refer to the OPR-P335-FA-16 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*** | ***S220*** |
|---|---|---|---|---|
| **LOA** | 8.64 meters | 8.64 meters | 8.64 meters | 70.40 meters |
| **Draft** | 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 71 | Sound Speed System |
| Reson | SVP 70 | Sound Speed System |
| Applanix | POS/MV V4 | Positioning and Attitude System |

*Table 5: Major Systems Used*

## B.2 Quality Control

### B.2.1 Crosslines

Crosslines acquired for this survey totaled 6.60% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.3 of the HSSD. To evaluate crosslines, a 8 meter CUBE surface using strictly mainscheme lines and a 8 meter CUBE surface using strictly crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated at a 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 0.03 meters (with mainscheme being deeper) with 95% of nodes falling within +/- 0.26 meters (Figure 5). For the respective depths, the difference surface was compared to the allowable NOAA accuracy standards (Figure 6). In total, 99.68% of the depth differences between H12897 mainscheme and crossline data were within allowable NOAA uncertainties (Figure 7).

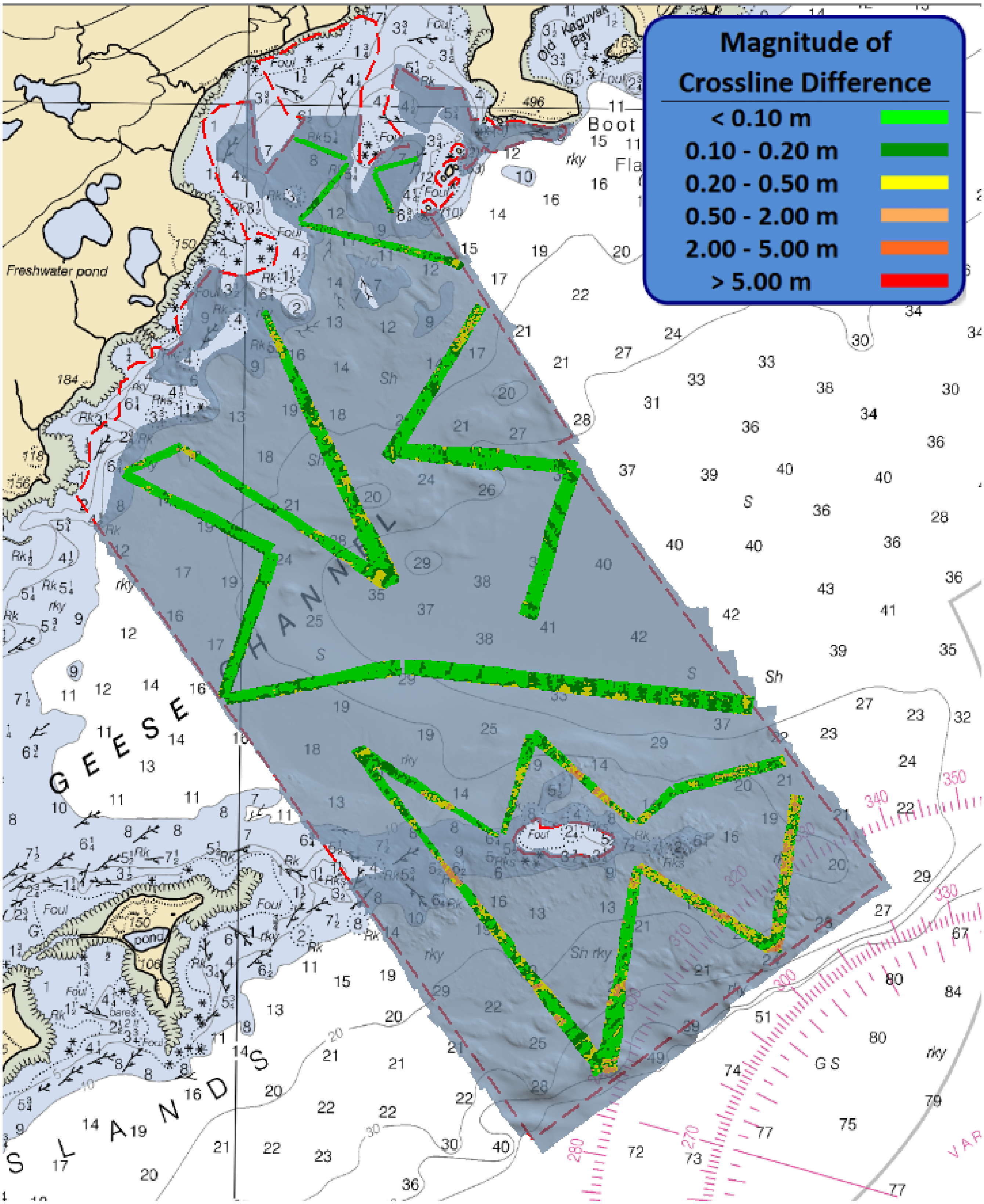
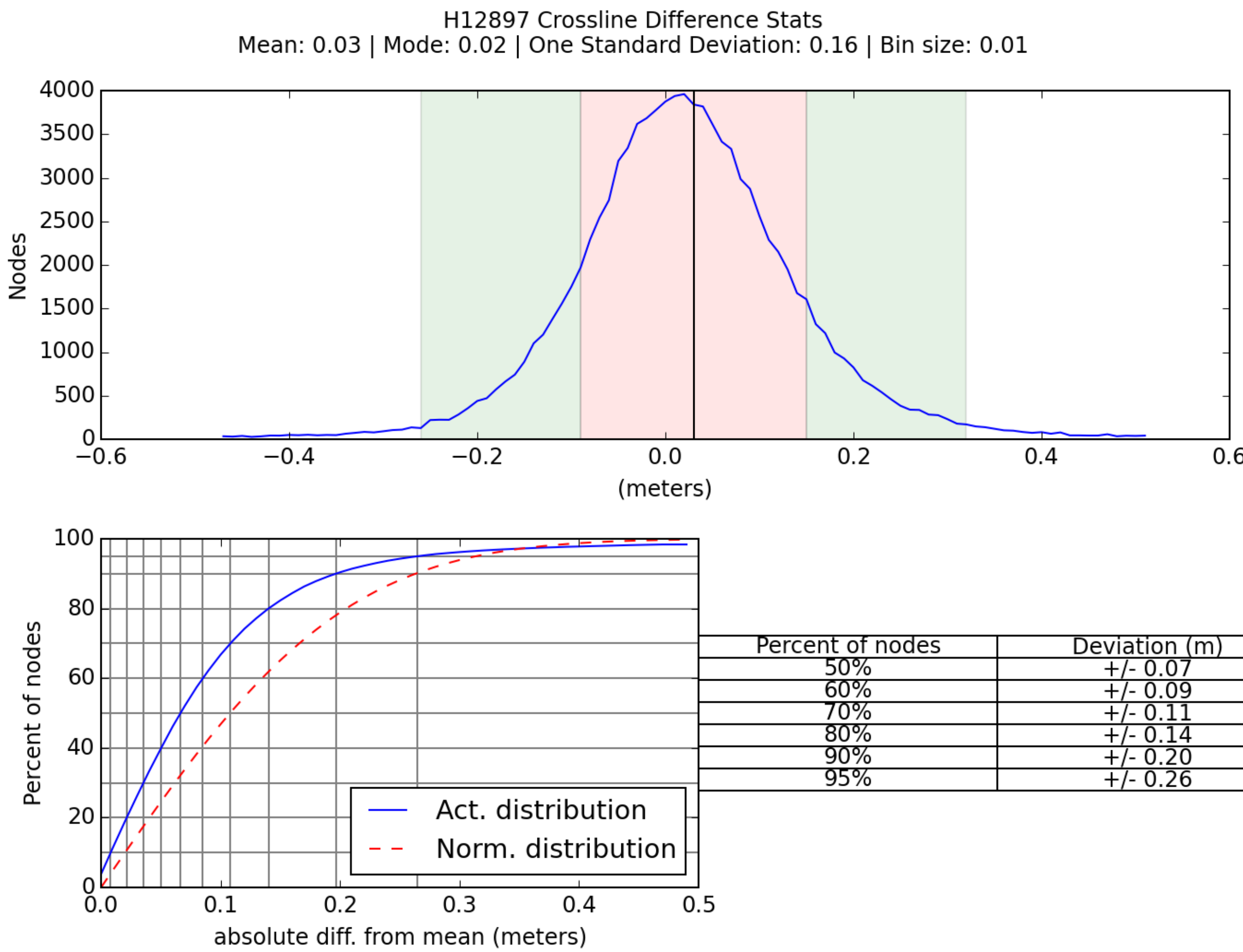



*Figure 4: Overview of H12897 crosslines.*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 0.07 |
| 60% | +/- 0.09 |
| 70% | +/- 0.11 |
| 80% | +/- 0.14 |
| 90% | +/- 0.20 |
| 95% | +/- 0.26 |

*Figure 5: H12897 Mainscheme and Crossline Difference Statistics.*

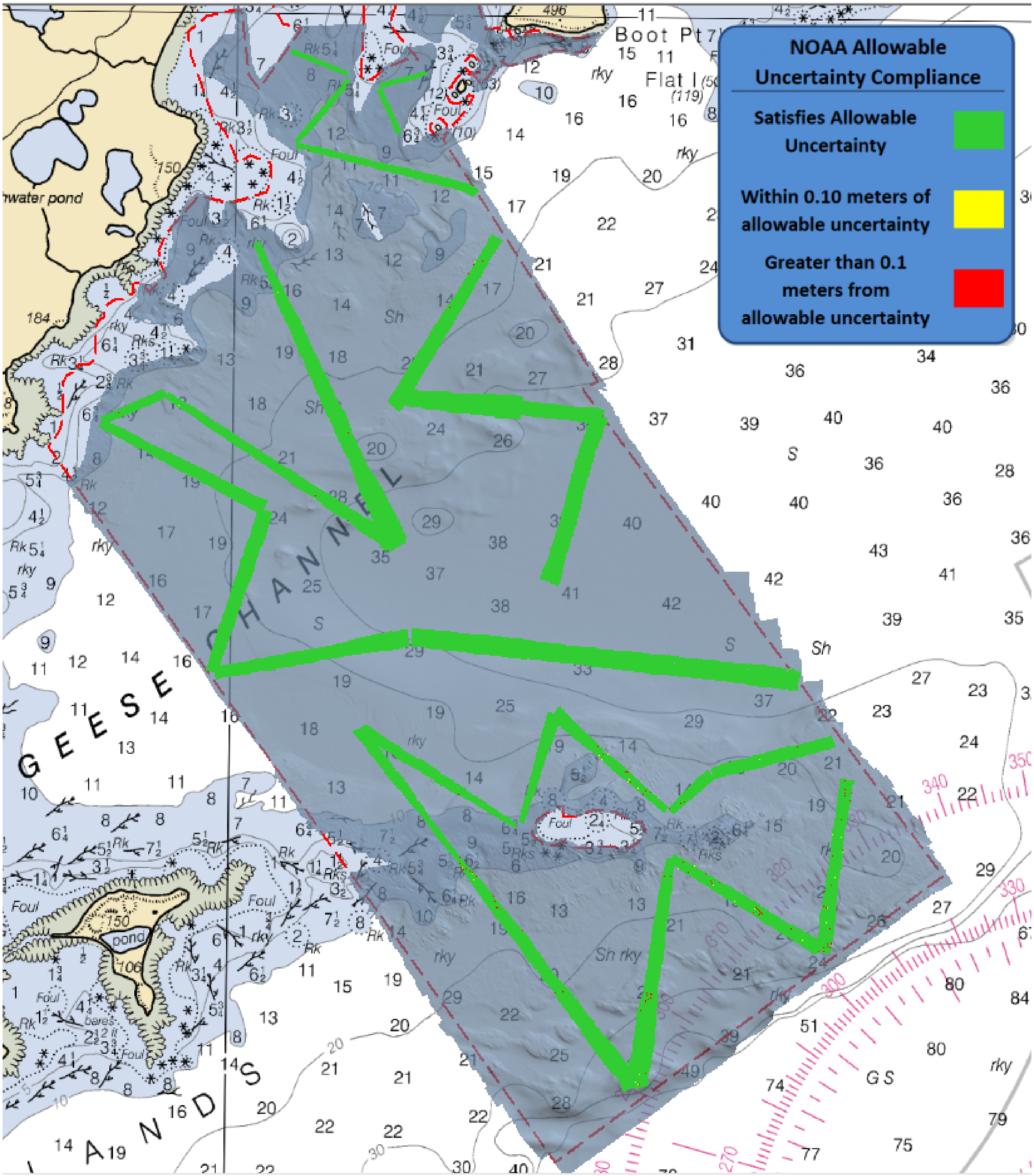



*Figure 6: Depth differences between H12897 mainscheme and crossline data as compared to NOAA allowable uncertainty standards for the associated depths.*

**H12897 Crossline Differencing NOAA Allowable Uncertainty**

| Total Nodes | Passed Nodes | Failed Nodes |
|---|---|---|
| 101,132 | 100,812 | 320 |
| | | |
| Percentage Nodes Passed | | 99.68% |
| Percentage Nodes Failed | | 0.32% |

*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 |
|---|---|---|
| 0.02 meters | 0 meters | ERS via PMVD |
| 0 meters | 0 meters | TCARI |

*Table 6: Survey Specific Tide TPU Values.*

| Hull ID | Measured - CTD | Measured - MVP | Surface |
|---|---|---|---|
| 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 |
| S220 | N/A meters/second | 1 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, ERZT, and PMVD, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H12897. Real-time uncertainties were provided via EM710 and Reson 7125 MBES data, Applanix Delayed Heave RMS, and TCARI tides. 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

H12897 junctions with two adjacent surveys from this project, H12896 and H12898, and four surveys from prior projects, H12686, H11665, H11666, and H11667, as shown in Figure 8. Data overlap between H12897 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 H12897 are generally within the NOAA allowable uncertainty in their areas of overlap, with the exception of one of the LIDAR surveys, H11666. Considering the good agreement seen with all other junctions, the disagreements with this LIDAR survey is believed to be due to the early vintage (2007) of this product in combination with the relatively deep and rocky nature of the seabed in the area of the junction, as well as the presence of kelp. For all junctions with H12897, a negative difference indicates H12897 was shoaler, and a positive difference indicates H12897 was deeper.

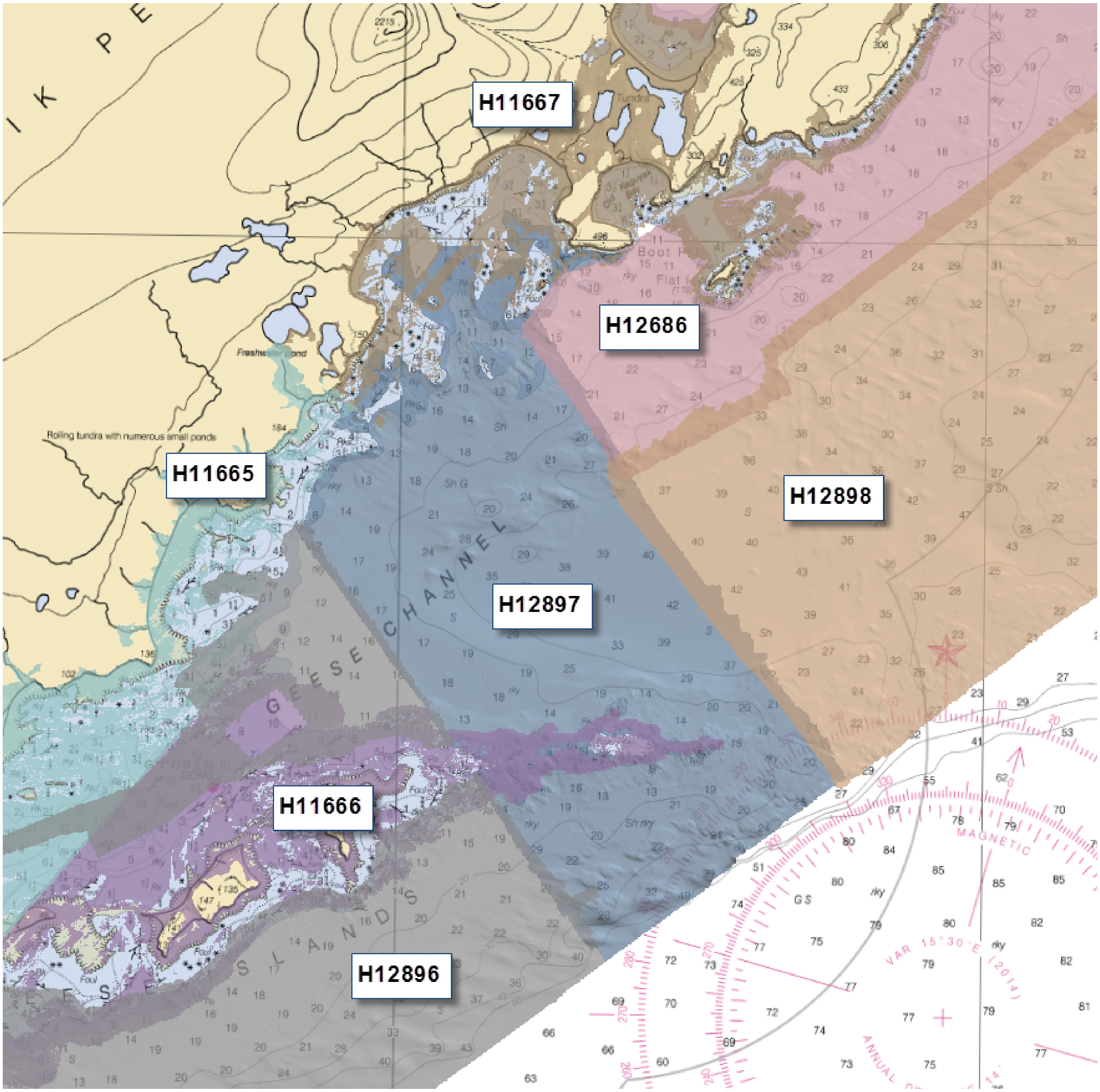



*Figure 8: Overview of H12897 junction surveys.*

The following junctions were made with this survey:

| Registry Number | Scale | Year | Field Unit | Relative Location |
|---|---|---|---|---|
| H11665 | 1:10000 | 2007 | Tenix Lads | NW |
| H11666 | 1:10000 | 2007 | Tenix Lads | W |
| H11667 | 1:10000 | 2007 | Tenix Lads | N |
| H12686 | 1:40000 | 2014 | NOAA Ship FAIRWEATHER | NE |
| H12896 | 1:40000 | 2016 | NOAA Ship FAIRWEATHER | W |
| H12898 | 1:40000 | 2016 | NOAA Ship FAIRWEATHER | E |

*Table 8: Junctioning Surveys*

H11665

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between H12897 and H11665. For comparison purposes, a 3 meter surface was generated for H12897 to match the resolution of the LIDAR surface from H11665. For gridding at the 3 meter node size, the CUBE parameters were the same as the defined NOAA resolutions, with "Capture_Distance_Min" adjusted to be (1/sqrt(2)) * 3 m = 2.12 m, since this is the only parameter which changes among the standard resolutions. The statistical analysis of the difference surface shows a mean of 0.14 meters with 95% of all nodes having a maximum deviation of +/- 0.61 meters, as seen in Figure 10. A detailed graphical overview can be seen in Figure 9, where the two highlighted areas show the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (Figure 11). It was found that 97.75% of nodes are within NOAA allowable uncertainty (Figure 12). The largest differences are located on the southern and eastern sides of the junction, as seen in Figure 9.

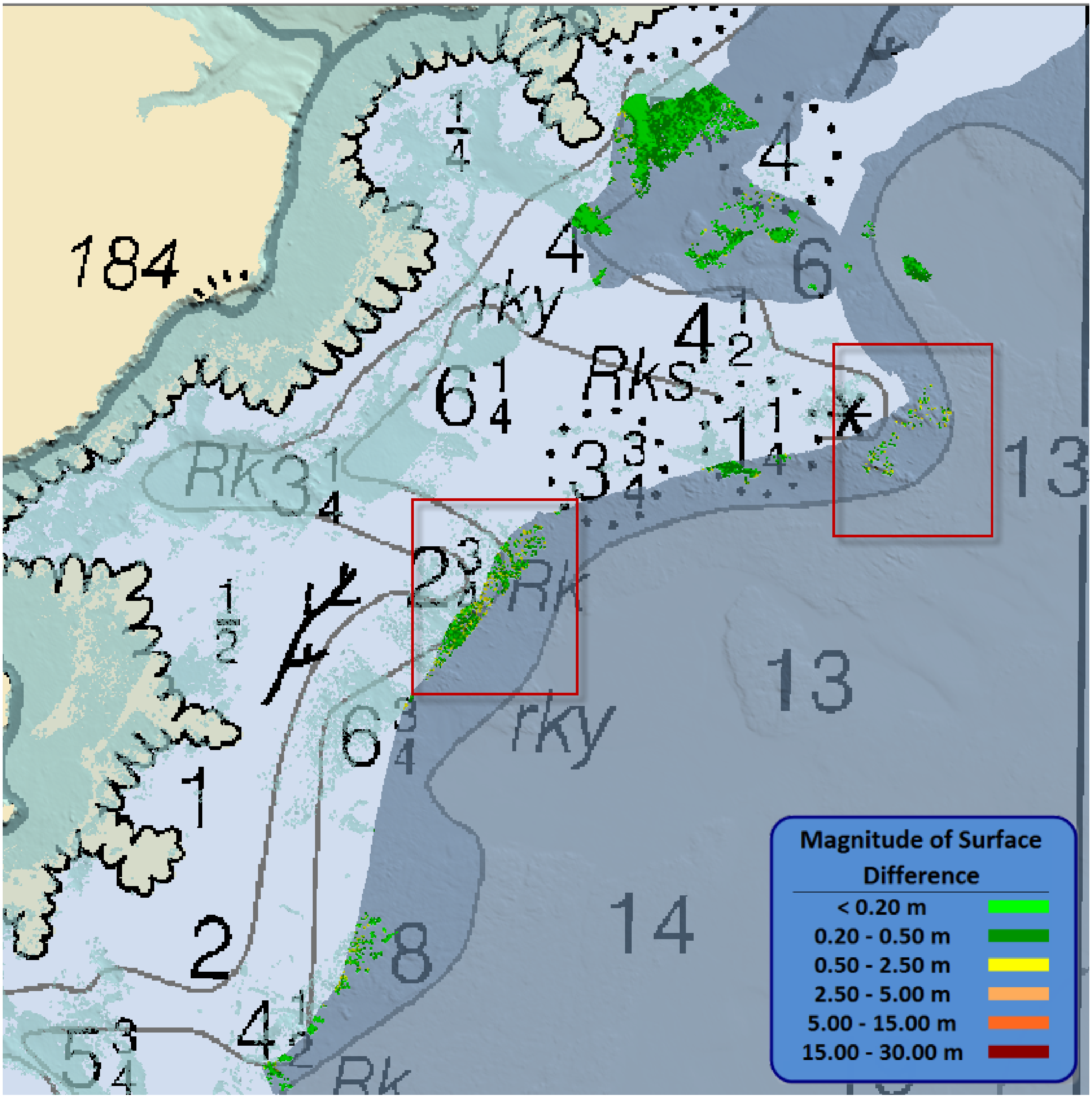
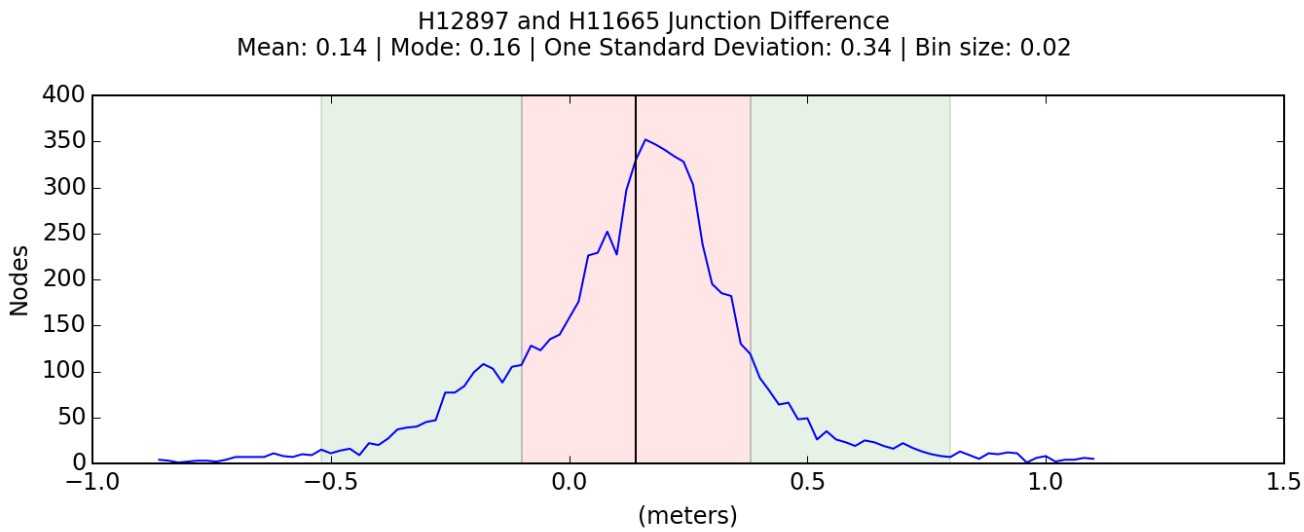
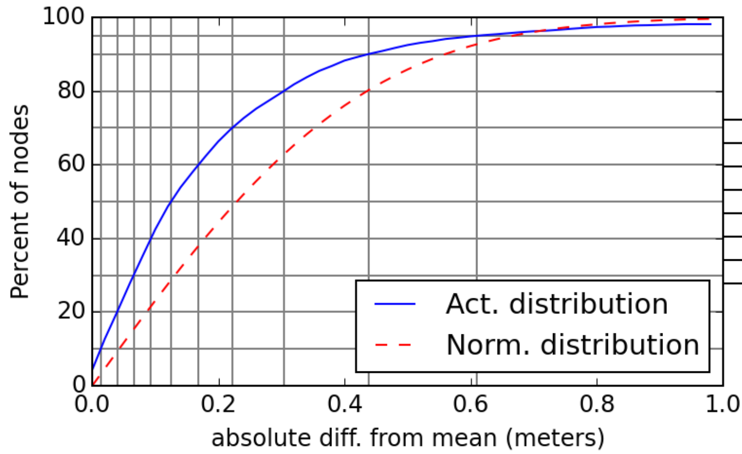



*Figure 9: Difference surface between H12897 (blue) and junctioning survey H11665 (turquoise).*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 0.13 |
| 60% | +/- 0.17 |
| 70% | +/- 0.22 |
| 80% | +/- 0.30 |
| 90% | +/- 0.44 |
| 95% | +/- 0.61 |

*Figure 10: Difference surface statistics between H12897 (3 meter surface) and H11665 (3 meter surface).*

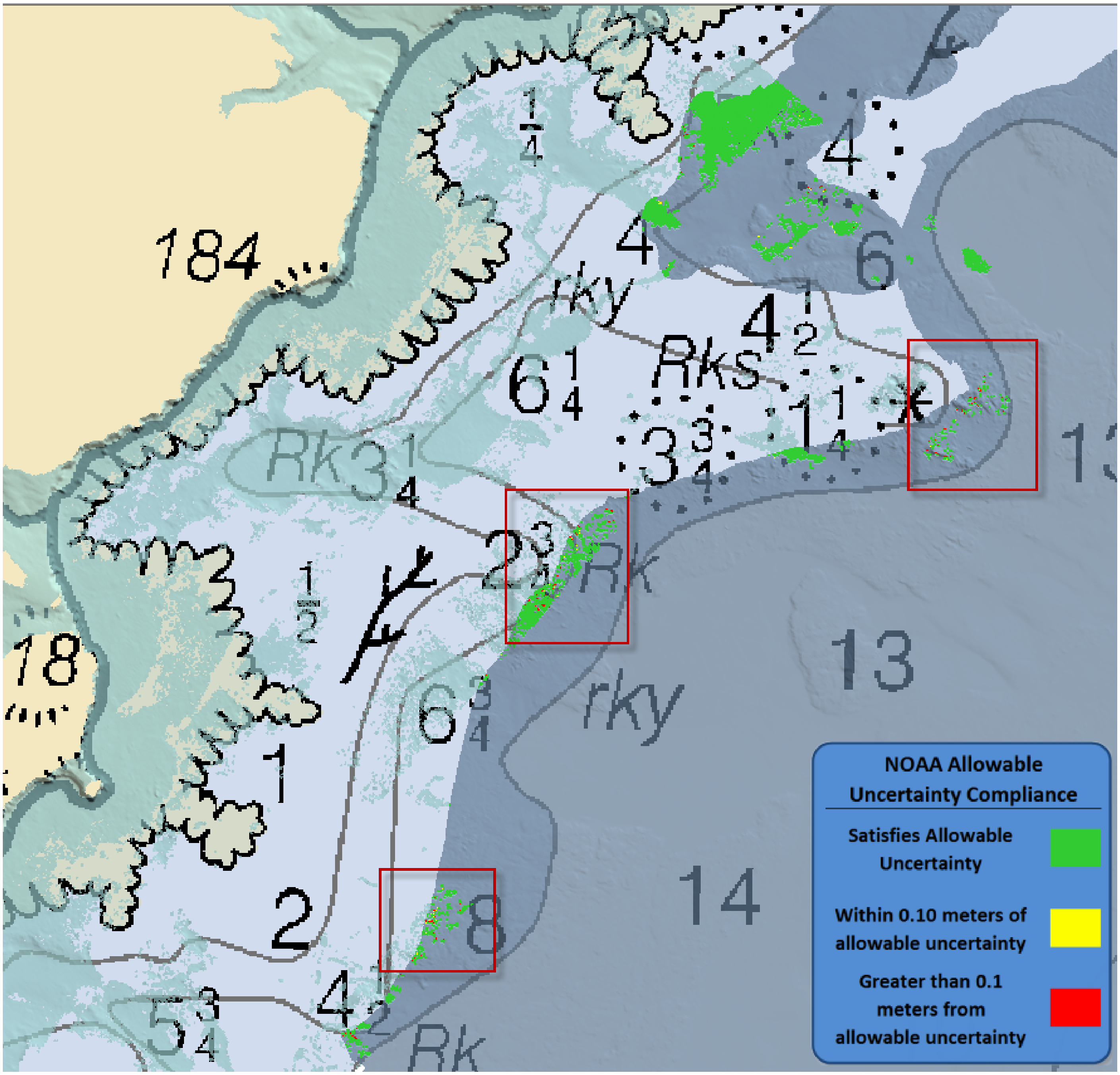



*Figure 11: Difference surface compliance with regard to NOAA allowable uncertainty between H12897 (blue) and junctioning survey H11665 (turquoise).*

| H12897 Junction Differencing with H11665 NOAA Allowable Uncertainty | | |
|---|---|---|
| Total Nodes | Passed Nodes | Failed Nodes |
| 7,684 | 7,511 | 173 |
| | | |
| Percentage Nodes Passed | | 97.75% |
| Percentage Nodes Failed | | 2.25% |

*Figure 12: Difference surface statistics between H12897 and H11665 showing percentage of nodes meeting NOAA allowable uncertainty.*

<u>H11666</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between H12897 and H11666. For comparison purposes, a 3 meter surface was generated for H12897 to match the resolution of the LIDAR surface from H11666. For gridding at the 3 meter node size, the CUBE parameters were the same as the defined NOAA resolutions, with "Capture_Distance_Min" adjusted to be (1/sqrt(2)) * 3 m = 2.12 m, since this is the only parameter which changes among the standard resolutions. The statistical analysis of the difference surface shows a mean of 0.00 meters with 95% of all nodes having a maximum deviation of +/- 0.81 meters, as seen in Figure 14. A detailed graphical overview can be seen in Figure 13, where the three highlighted areas show the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (Figure 15). It was found that 94.58% of nodes are within NOAA allowable uncertainty (Figure 16). This low number is likely due to the older vintage of LIDAR technology (2007) used in H11666, which was more susceptible to spurious returns in rocky areas with significant kelp presence, as was encountered in this area of H12897. The largest differences are located on the southern and eastern sides of the junction, as seen in Figure 13.

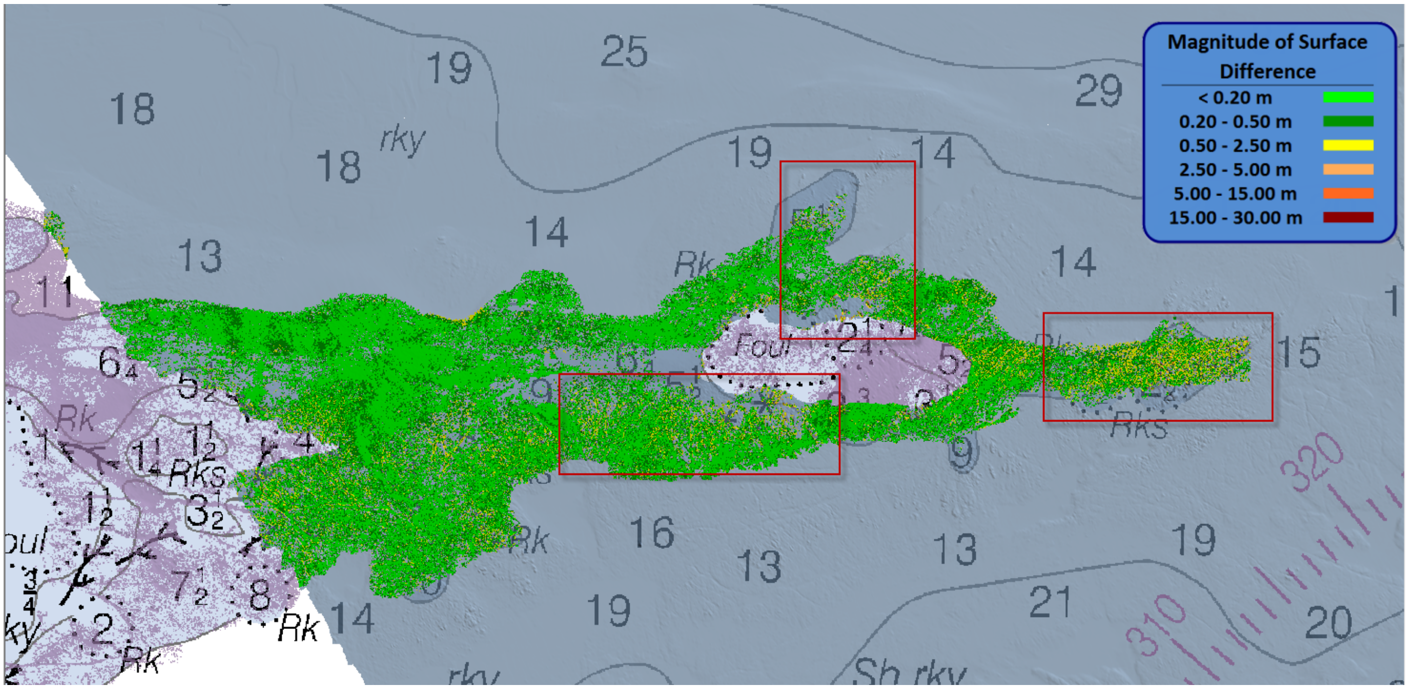
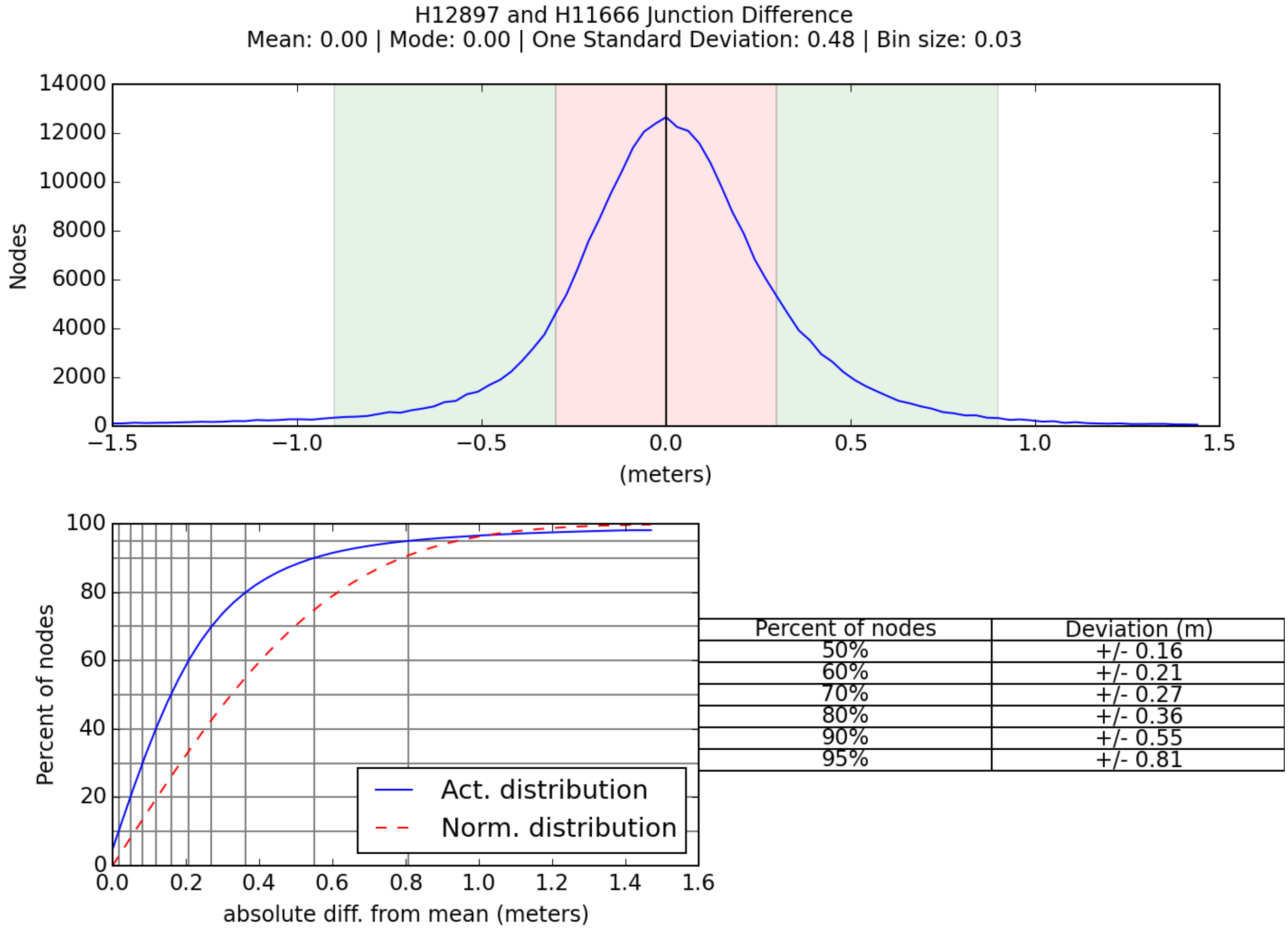



*Figure 13: Difference surface between H12897 (blue) and junctioning survey H11666 (purple).*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 0.16 |
| 60% | +/- 0.21 |
| 70% | +/- 0.27 |
| 80% | +/- 0.36 |
| 90% | +/- 0.55 |
| 95% | +/- 0.81 |

*Figure 14: Difference surface statistics between H12897 (3 meter surface) and H11666 (3 meter surface).*

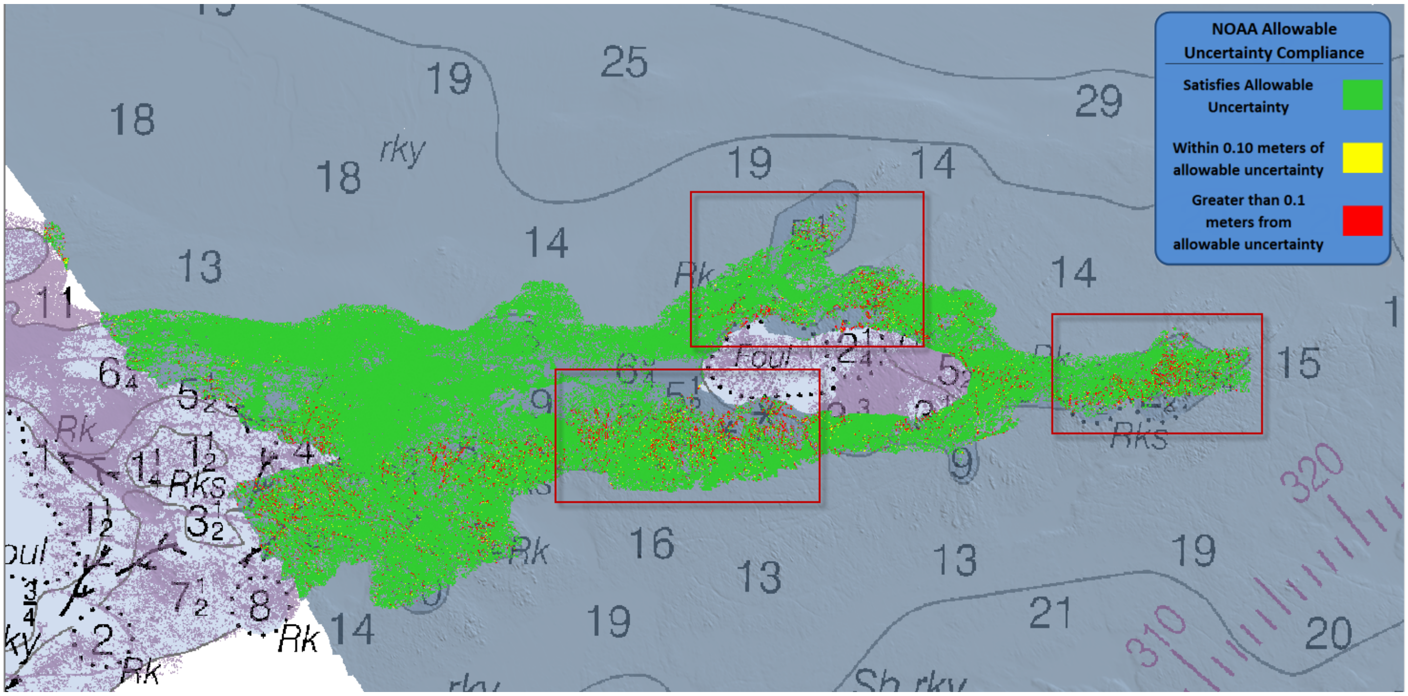



*Figure 15: Difference surface compliance with regard to NOAA allowable uncertainty between H12897 (blue) and junctioning survey H11666 (purple).*

**H12897 Junction Differencing with H11666 NOAA Allowable Uncertainty**

| Total Nodes | Passed Nodes | Failed Nodes |
|---|---|---|
| 260,658 | 246,524 | 14,134 |
| | | |
| Percentage Nodes Passed | | 94.58% |
| Percentage Nodes Failed | | 5.42% |

*Figure 16: Difference surface statistics between H12897 and H11666 showing percentage of nodes meeting NOAA allowable uncertainty.*

<u>H11667</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between H12897 and H11667. For comparison purposes, a 3 meter surface was generated for H12897 to match the resolution of the LIDAR surface from H11667. For gridding at the 3 meter node size, the CUBE parameters were the same as the defined NOAA resolutions, with "Capture_Distance_Min" adjusted to be (1/sqrt(2)) * 3 m = 2.12 m, since this is the only parameter which changes among the standard resolutions. The statistical analysis of the difference surface shows a mean of 0.06 meters with 95% of all nodes having a maximum deviation of +/- 0.43 meters, as seen in Figure 18. A detailed graphical overview can be seen in Figure 17, where the three highlighted areas show the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (Figure 19). It was found that 99.52% of nodes are within NOAA allowable uncertainty (Figure 20).

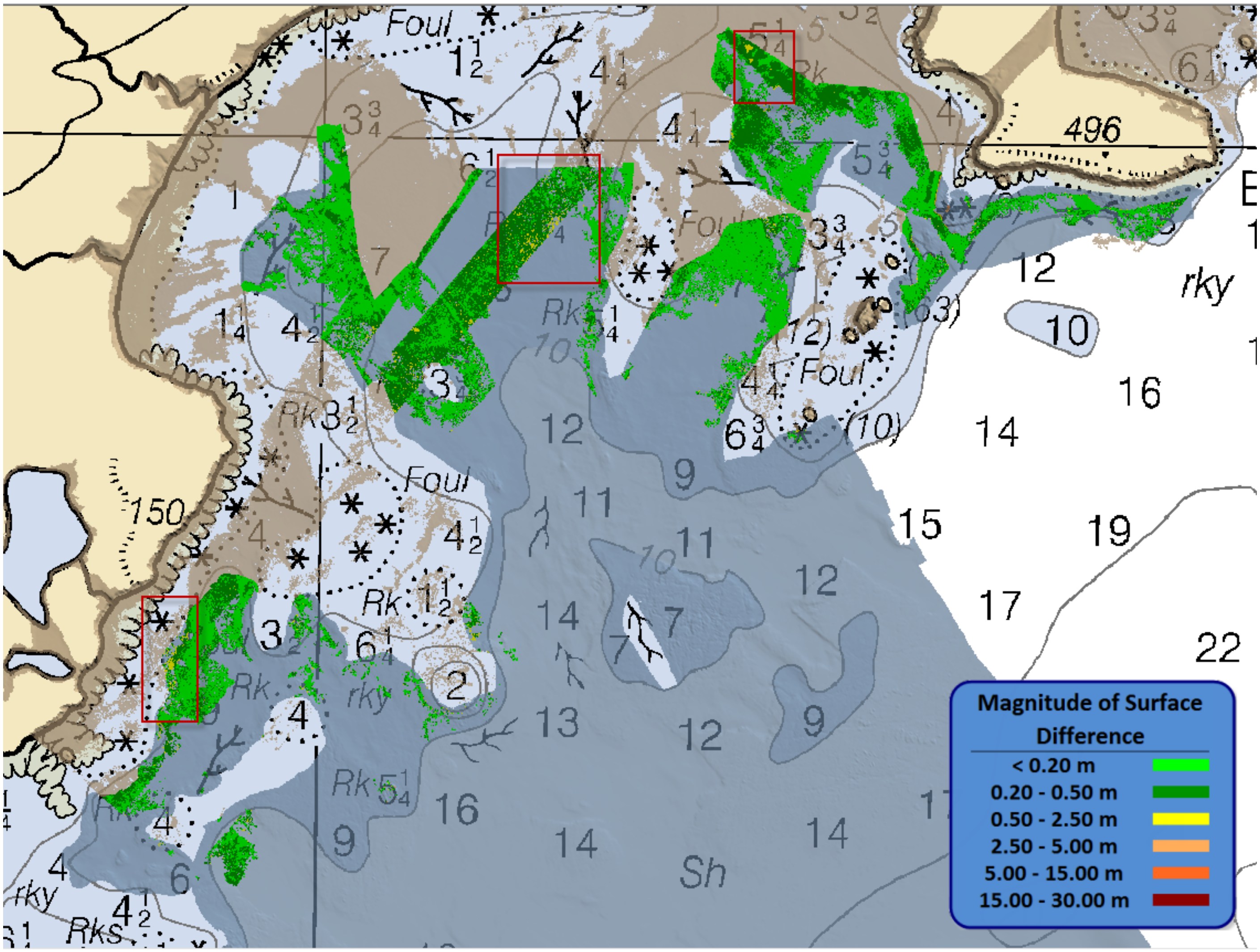
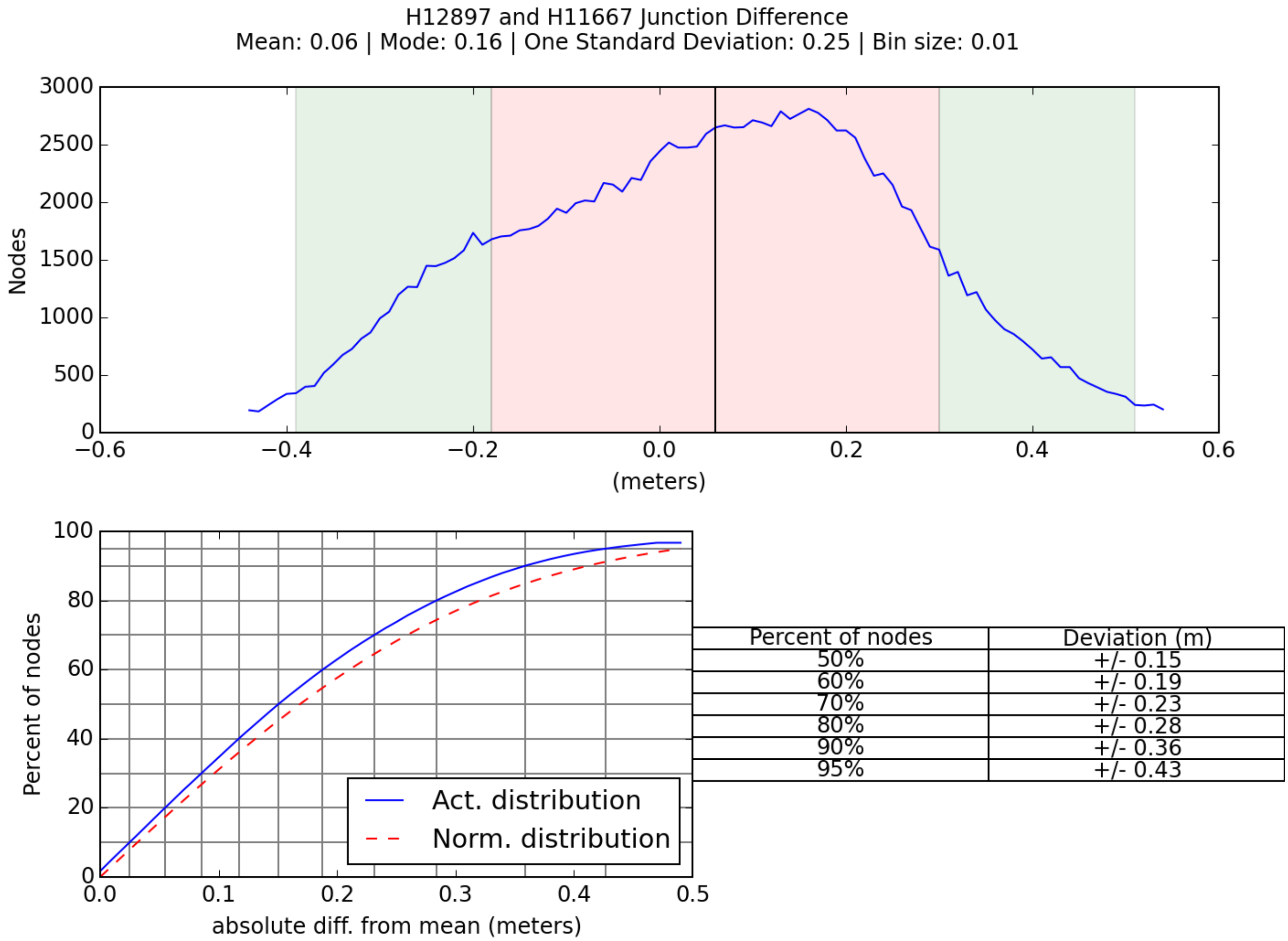



*Figure 17: Difference surface between H12897 (blue) and junctioning survey H11667 (brown).*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 0.15 |
| 60% | +/- 0.19 |
| 70% | +/- 0.23 |
| 80% | +/- 0.28 |
| 90% | +/- 0.36 |
| 95% | +/- 0.43 |

*Figure 18: Difference surface statistics between H12897 (3 meter surface) and H11667 (3 meter surface).*

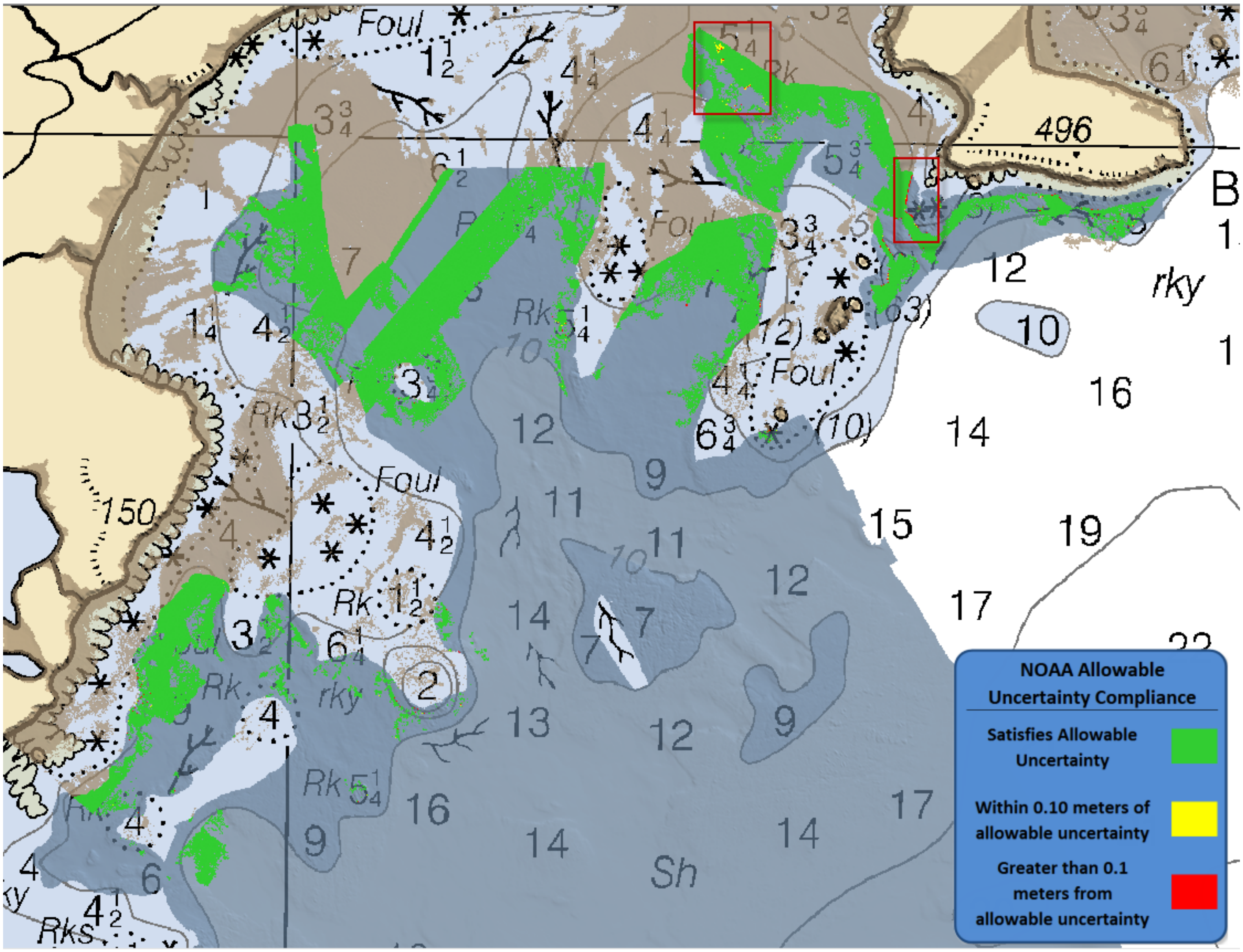



*Figure 19: Difference surface compliance with regard to NOAA allowable uncertainty between H12897 (blue) and junctioning survey H11667 (brown).*

**H12897 Junction Differencing with H11667 NOAA Allowable Uncertainty**

| Total Nodes | Passed Nodes | Failed Nodes |
|---|---|---|
| 154,817 | 154,069 | 748 |
| | | |
| Percentage Nodes Passed | | 99.52% |
| Percentage Nodes Failed | | 0.48% |

*Figure 20: Difference surface statistics between H12897 and H11667 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 H12897 and the 8 meter combined surface from H12686. The statistical analysis of the difference surface shows a mean of -0.09 meters with 95% of all nodes having a maximum deviation of +/- 0.33 meters, as seen in Figure 22. A detailed graphical overview can be seen in Figure 21, where the two highlighted areas show the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (Figure 23). It was found that 99.56% of nodes are within NOAA allowable uncertainty (Figure 24).

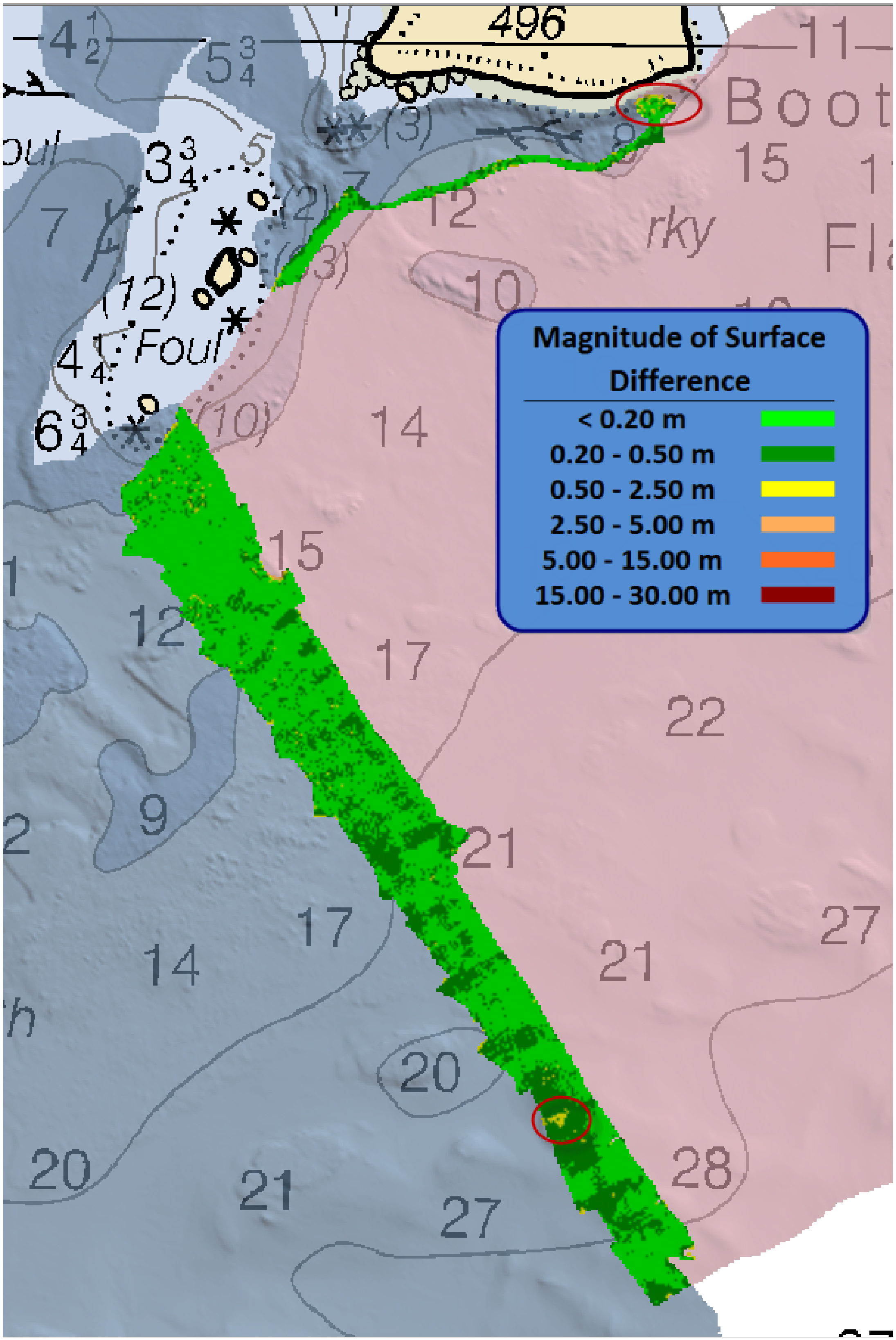
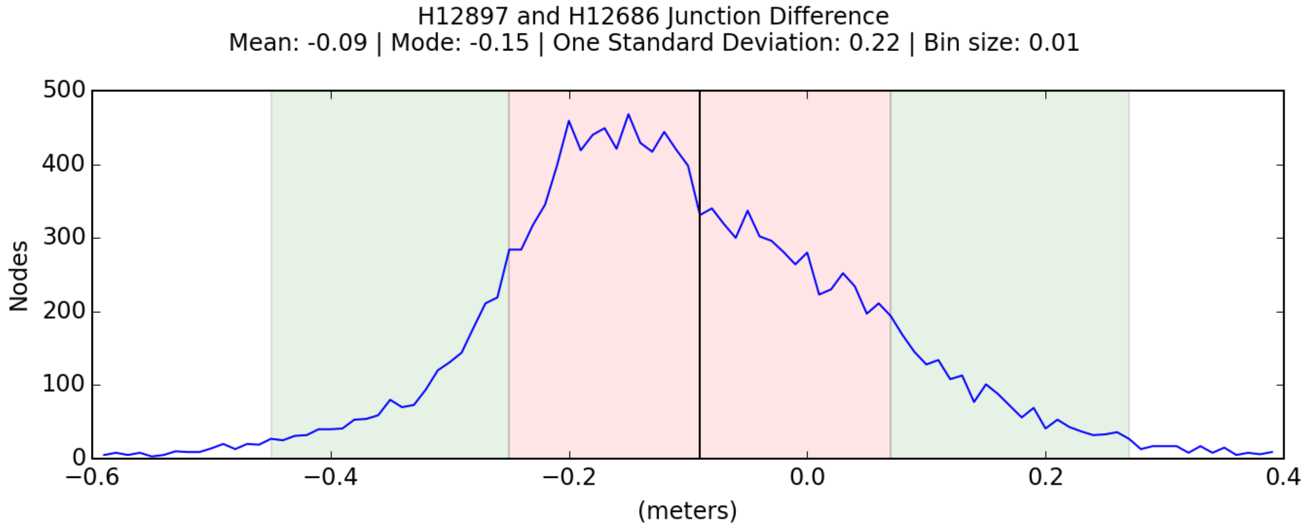
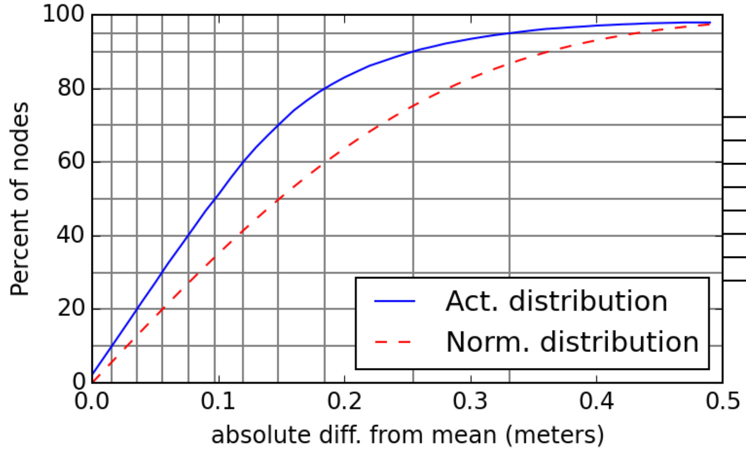



*Figure 21: Difference surface between H12897 (blue) and junctioning survey H12686 (pink).*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 0.10 |
| 60% | +/- 0.12 |
| 70% | +/- 0.15 |
| 80% | +/- 0.18 |
| 90% | +/- 0.25 |
| 95% | +/- 0.33 |

*Figure 22: Difference surface statistics between H12897 (8 meter surface) and H12686 (8 meter surface).*

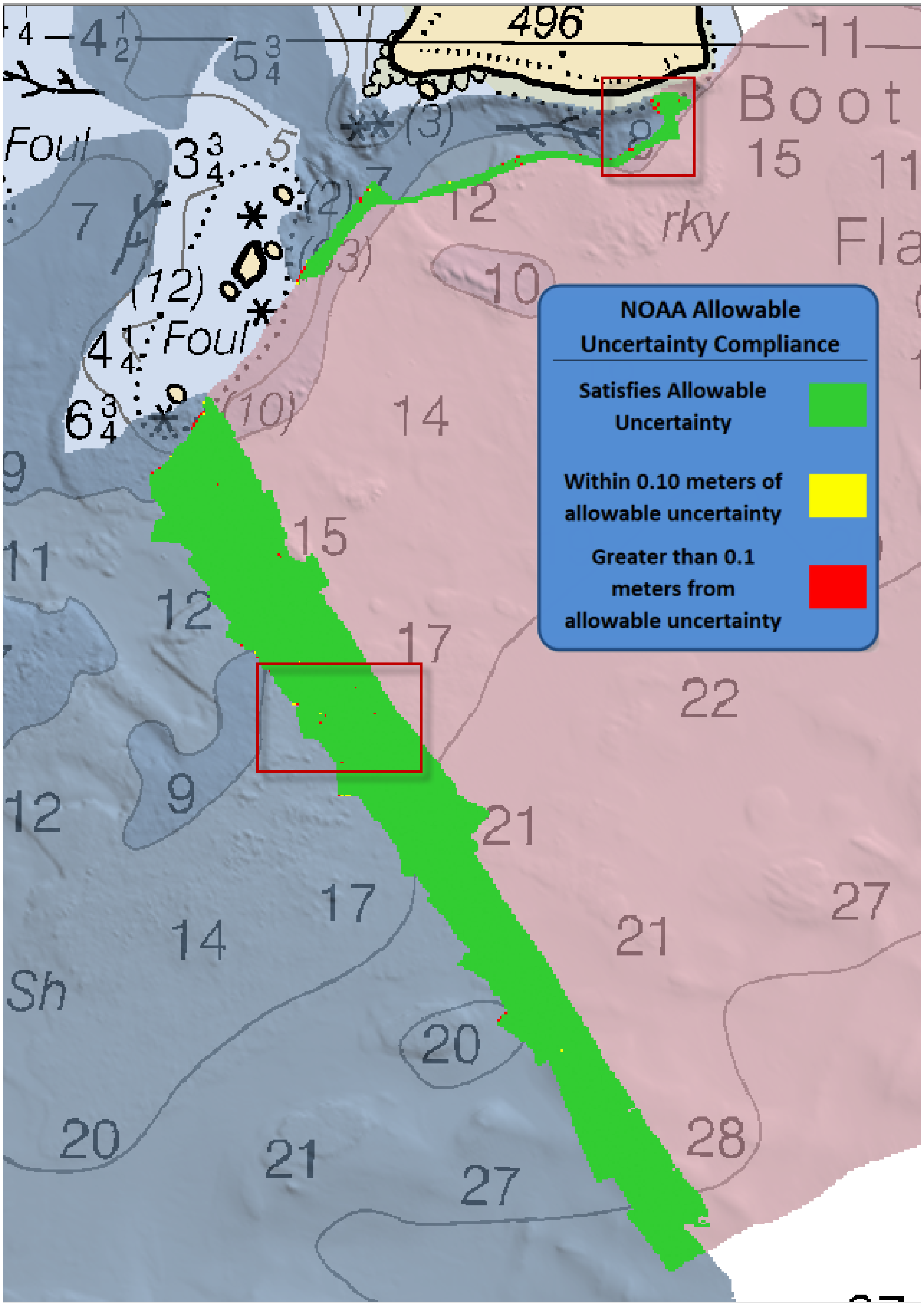



*Figure 23: Difference surface compliance with regard to NOAA allowable uncertainty between H12897 (blue) and junctioning survey H12686 (pink).*

| H12897 Junction Differencing with H12686 NOAA Allowable Uncertainty | | |
|---|---|---|
| Total Nodes | Passed Nodes | Failed Nodes |
| 14,836 | 14,770 | 66 |
| | | |
| Percentage Nodes Passed | | 99.56% |
| Percentage Nodes Failed | | 0.44% |

*Figure 24: Difference surface statistics between H12897 and H12686 showing percentage of nodes meeting NOAA allowable uncertainty.*

<u>H12896</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 8 meter combined surface from H12897 and the 8 meter combined surface from H12896. The statistical analysis of the difference surface shows a mean of -0.03 meters with 95% of all nodes having a maximum deviation of +/- 0.30 meters, as seen in Figure 26. A detailed graphical overview can be seen in Figure 25, where the two highlighted areas show the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (Figure 27). It was found that 99.62% of nodes are within NOAA allowable uncertainty (Figure 28).

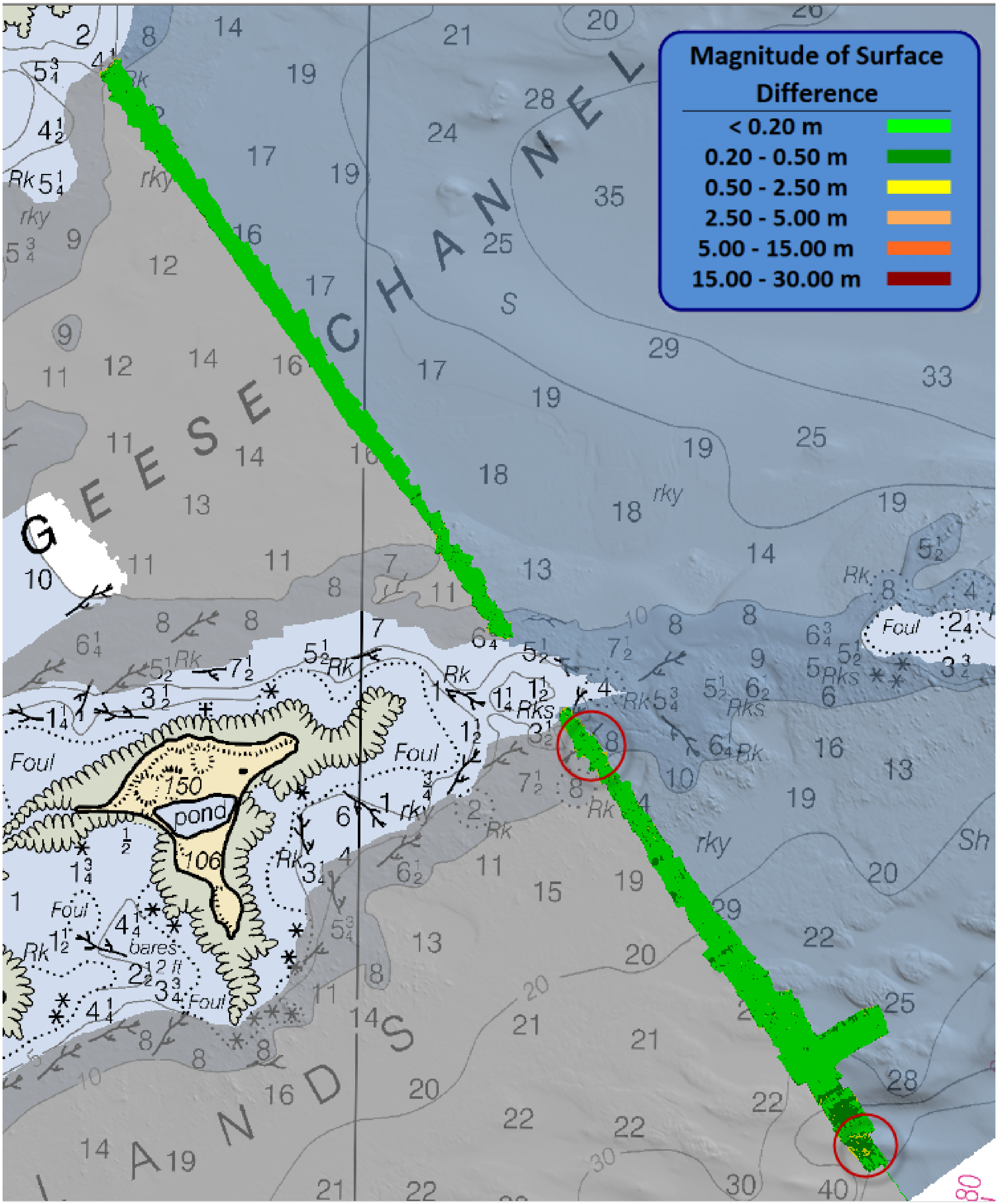
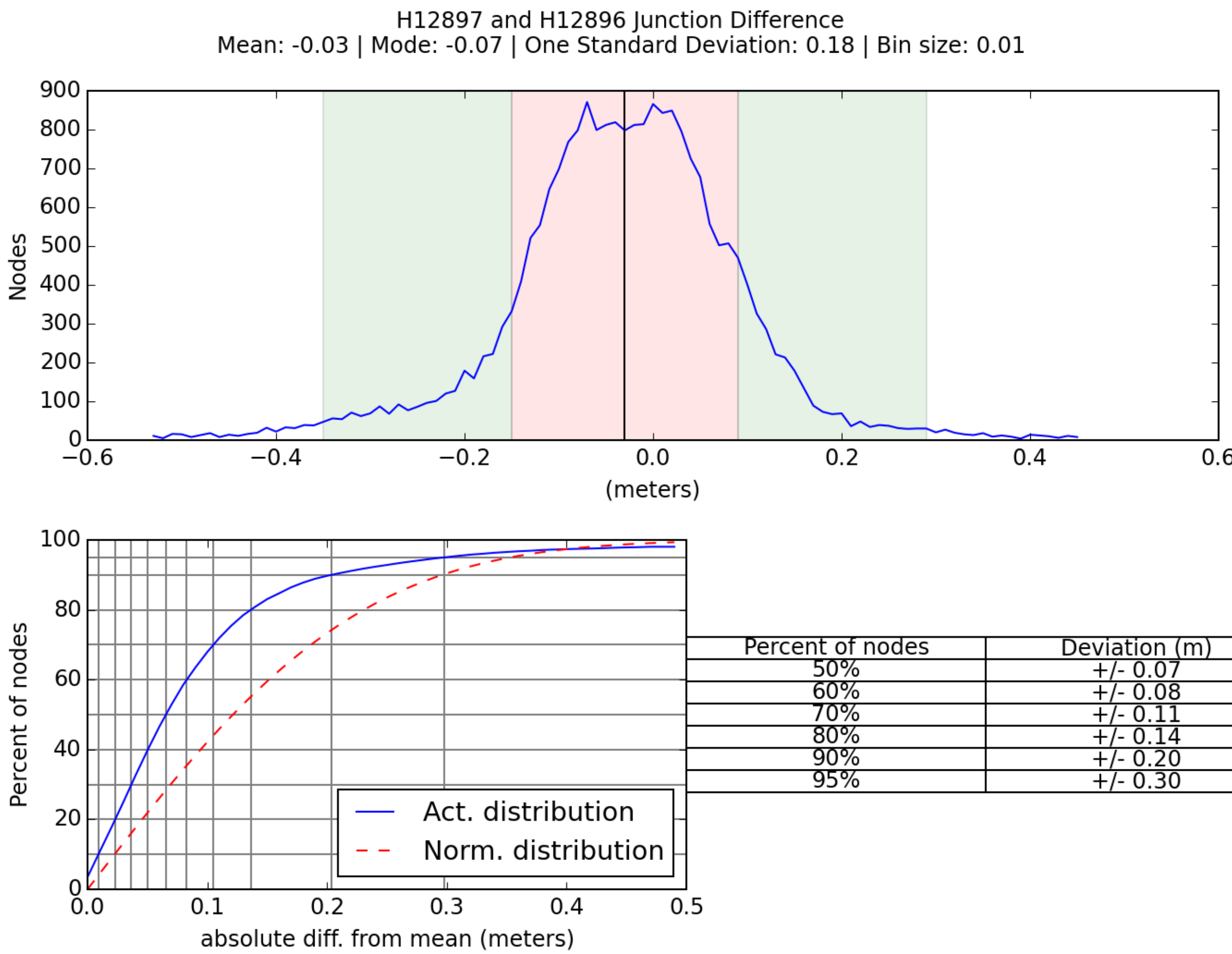



*Figure 25: Difference surface between H12897 (blue) and junctioning survey H12986 (gray).*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 0.07 |
| 60% | +/- 0.08 |
| 70% | +/- 0.11 |
| 80% | +/- 0.14 |
| 90% | +/- 0.20 |
| 95% | +/- 0.30 |

*Figure 26: Difference surface statistics between H12897 (8 meter surface) and H12896 (8 meter surface).*

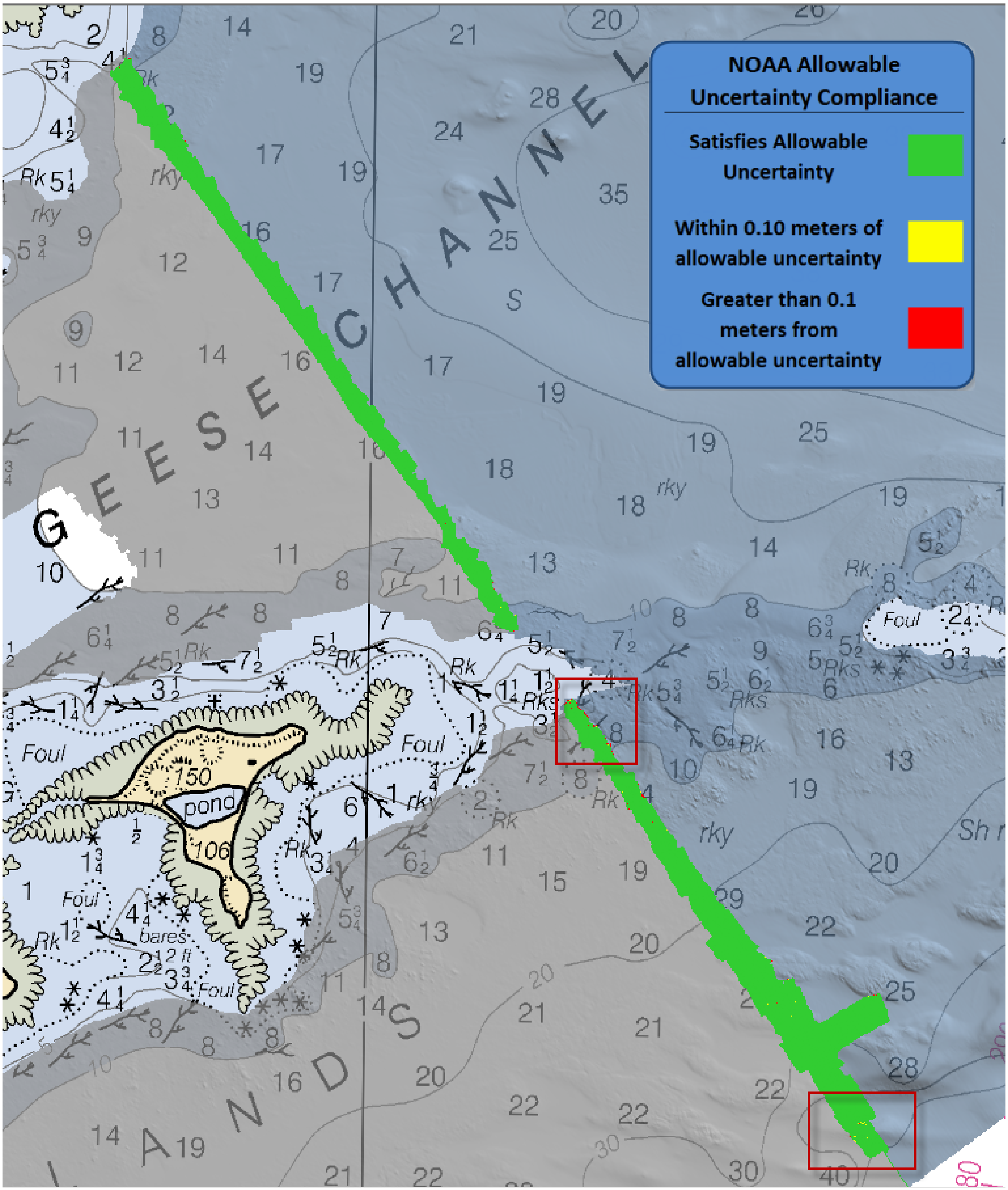



*Figure 27: Difference surface compliance with regard to NOAA allowable uncertainty between H12897 (blue) and junctioning survey H12896 (gray).*

**H12897 Junction Differencing with H12896 NOAA Allowable Uncertainty**

| Total Nodes | Passed Nodes | Failed Nodes |
|---|---|---|
| 22,859 | 22,771 | 88 |
| | | |
| Percentage Nodes Passed | | 99.62% |
| Percentage Nodes Failed | | 0.38% |

*Figure 28: Difference surface statistics between H12897 and H12896 showing percentage of nodes meeting NOAA allowable uncertainty.*

<u>H12898</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the 8 meter combined surface from H12897 and the 8 meter combined surface from H12898. The statistical analysis of the difference surface shows a mean of 0.03 meters with 95% of all nodes having a maximum deviation of +/- 0.25 meters, as seen in Figure 30. A detailed graphical overview can be seen in Figure 29, where the two highlighted areas show the greatest differences. In addition, a comparison surface was created between the difference surface and the NOAA allowable uncertainty (Figure 21). It was found that 99.79% of nodes are within NOAA allowable uncertainty (Figure 32).

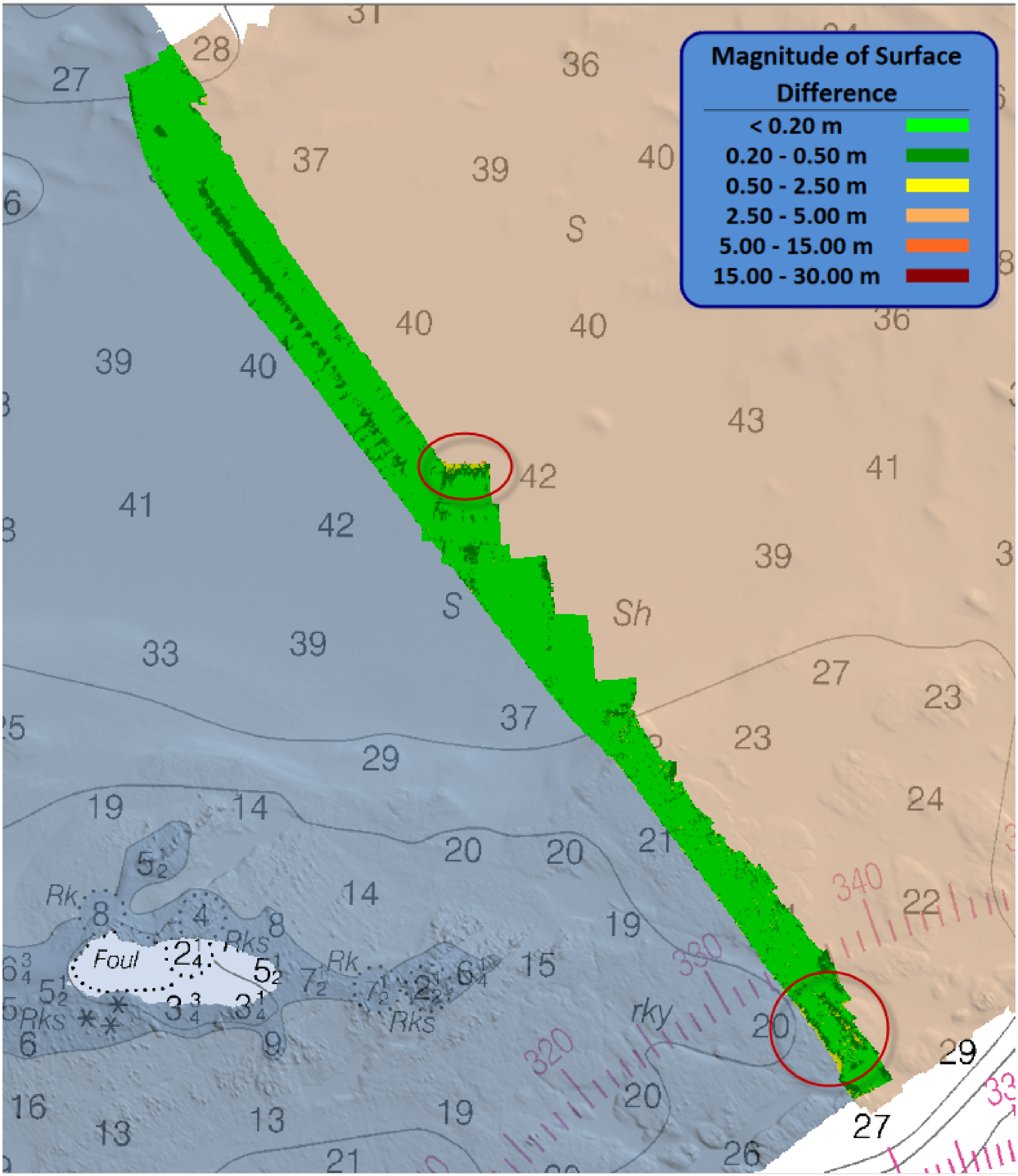
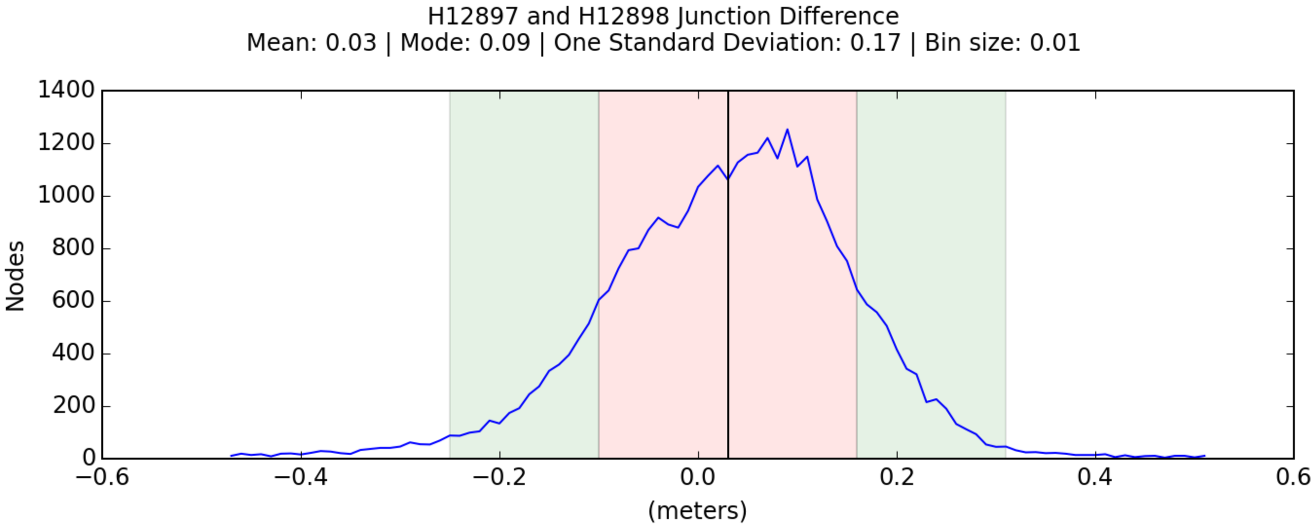
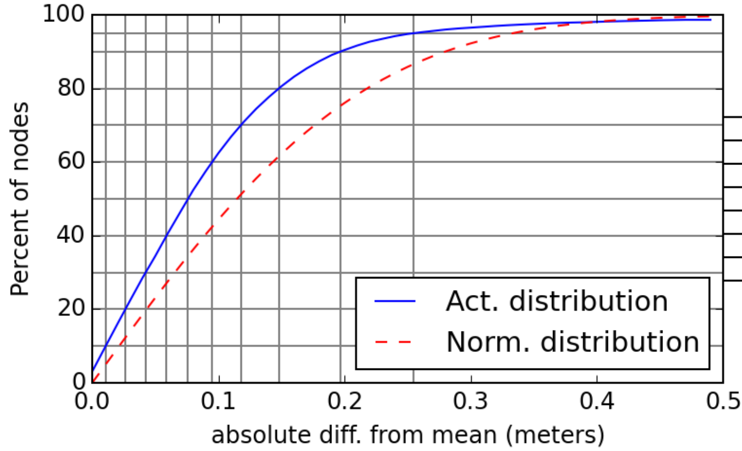



*Figure 29: Difference surface between H12897 (blue) and junctioning survey H12988 (tan).*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 0.08 |
| 60% | +/- 0.10 |
| 70% | +/- 0.12 |
| 80% | +/- 0.15 |
| 90% | +/- 0.20 |
| 95% | +/- 0.25 |

*Figure 30: Difference surface statistics between H12897 (8 meter surface) and H12898 (8 meter surface).*

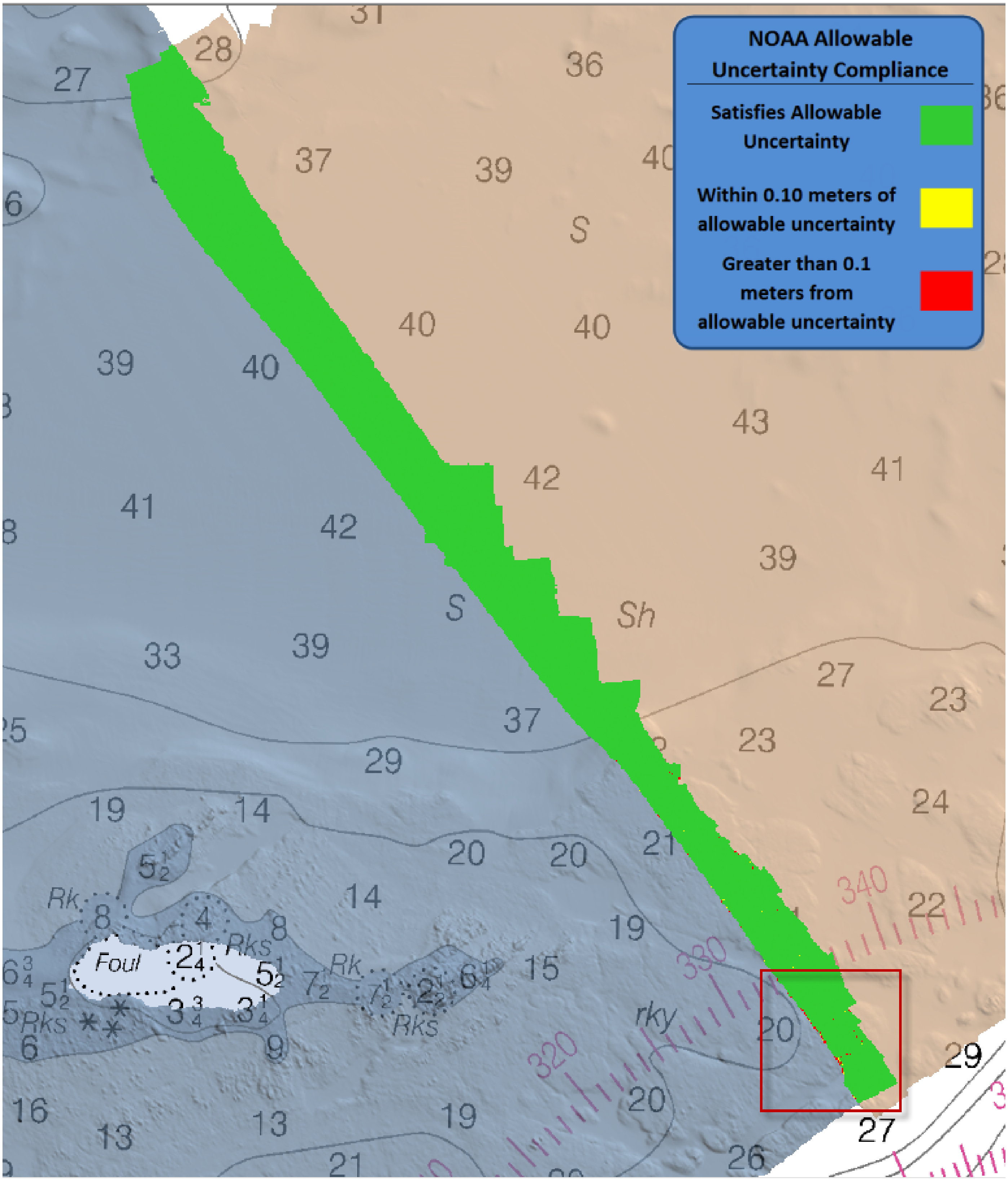



*Figure 31: Difference surface compliance with regard to NOAA allowable uncertainty between H12897 (blue) and junctioning survey H12898(tan).*

| H12897 Junction Differencing with H12898 NOAA Allowable Uncertainty | | |
|---|---|---|
| Total Nodes | Passed Nodes | Failed Nodes |
| 34,585 | 34,514 | 71 |
| | | |
| Percentage Nodes Passed | | 99.79% |
| Percentage Nodes Failed | | 0.21% |

*Figure 32: Difference surface statistics between H12897 and H12898 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 33). In areas where they were 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, as discussed in Section A.1. Documentation can be found in the vessel boat sheets, which are located in the Separates I Digital Data folder.

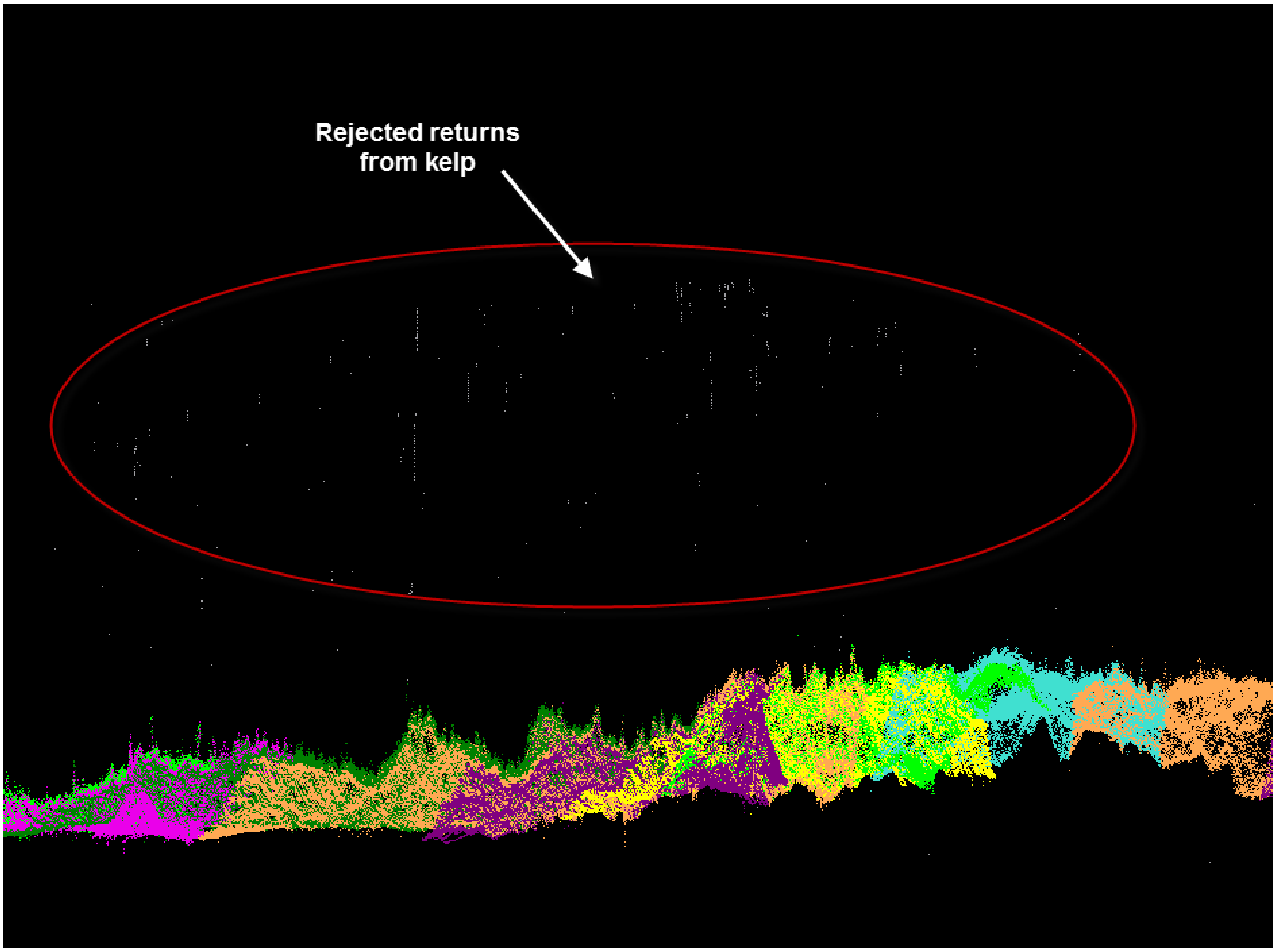



*Figure 33: H12897 Example of kelp in the soundings (5x vertical exaggeration).*

Sound Speed Issues

In certain areas, particularly the shallow bay that composed the northern portion of the survey area, sound speed issues were apparent, visible primarily as "frowns" (see Figure 34). Given the location of the issues, the most probable cause is freshwater intrusion from numerous lakes and rivers flowing into the bay and creating thermoclines and haloclines. Surfaces were not significantly impacted, and the data still meet NOAA allowable uncertainty parameters from HSSD Section 5.1.3, and as such, the data remain sufficient to supersede previous data.

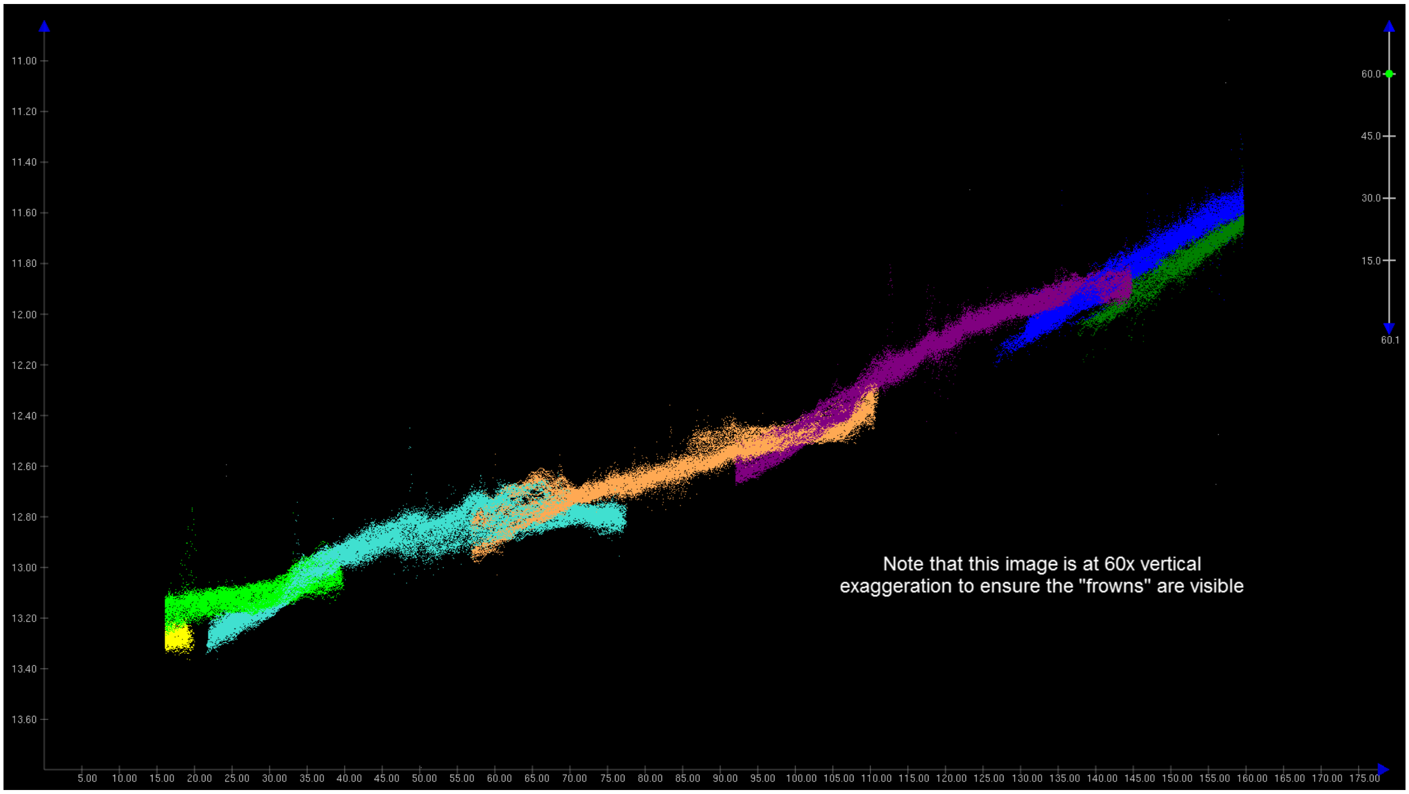



*Figure 34: H12897 Example of "frowns" in data caused by sound speed issues (60x vertical exaggeration).*

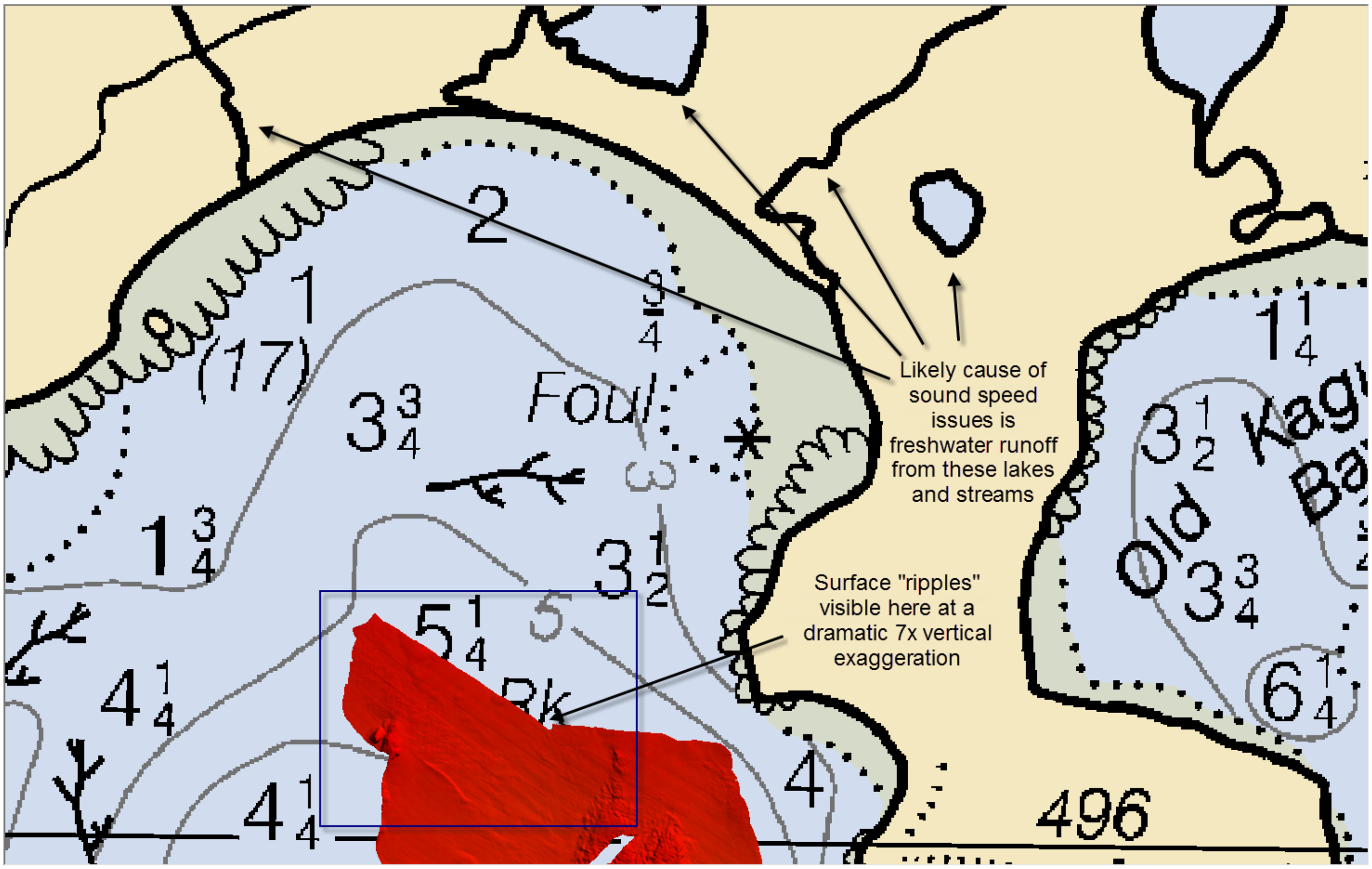



*Figure 35: H12897 The subset data in Figure 34 above was taken from within the blue rectangle in this image. The banding in the 1 meter surface is visible at 7x vertical exaggeration. To the north, note the charted freshwater lakes and rivers that are the likely cause.*

**B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: Casts were conducted at a minimum of at least one per every four hours during launch acquisition. Casts were conducted more often 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.

On DN211, the MVP towfish was lost while towing at the docked position due to a sudden material failure of the MVP cable. A replacement MVP towfish was installed by the time data were collected on H12897 on DN212, but was working only intermittently, so only one cast was successfully collected for that day. The maximum time between casts was one hour for this period, which is in accordance with HSSD Section 5.2.3.

### B.2.8 Coverage Equipment and Methods

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

### B.2.9 Holiday Assessment

H12897 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. No holidays which meet the three by three 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 all but two determined to be from areas where an adjoining finalized surface covered the gap (e.g. a holiday in the 2 meter finalized surface was covered by the 1m finalized surface due to the area being shoaler than the depth range for the 2 meter surface).

The other two apparent holidays identified in H12897 are due to acoustic shadowing in steep, rocky areas as seen in Figures 37 and 39. These shadows are formed due to lack of coverage on the “back” side of a feature, usually due to rapid drops in the seafloor in conjunction with poor geometry from the sonar head. In both cases, the shadows were caused by rocks past the inshore limit of safe navigation, and kelp and nearshore topography made it too dangerous to acquire additional bathymetry. Because these gaps are inshore of the NALL, they are not holidays. Both areas with acoustic shadows were investigated in CARIS subset editor to verify that least depths were found.

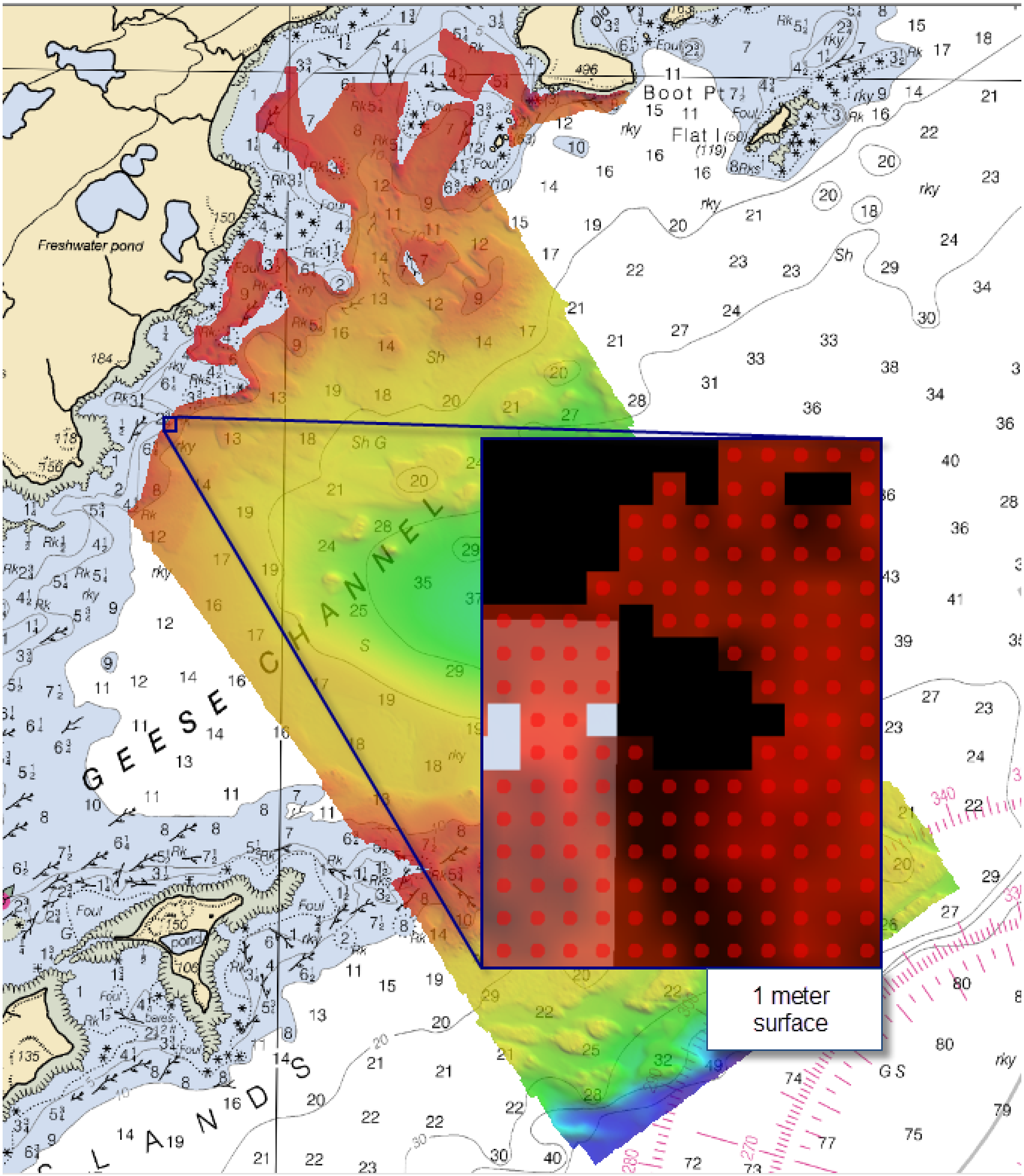



*Figure 36: The further west gap in coverage examined as a potential holiday in H12897.*

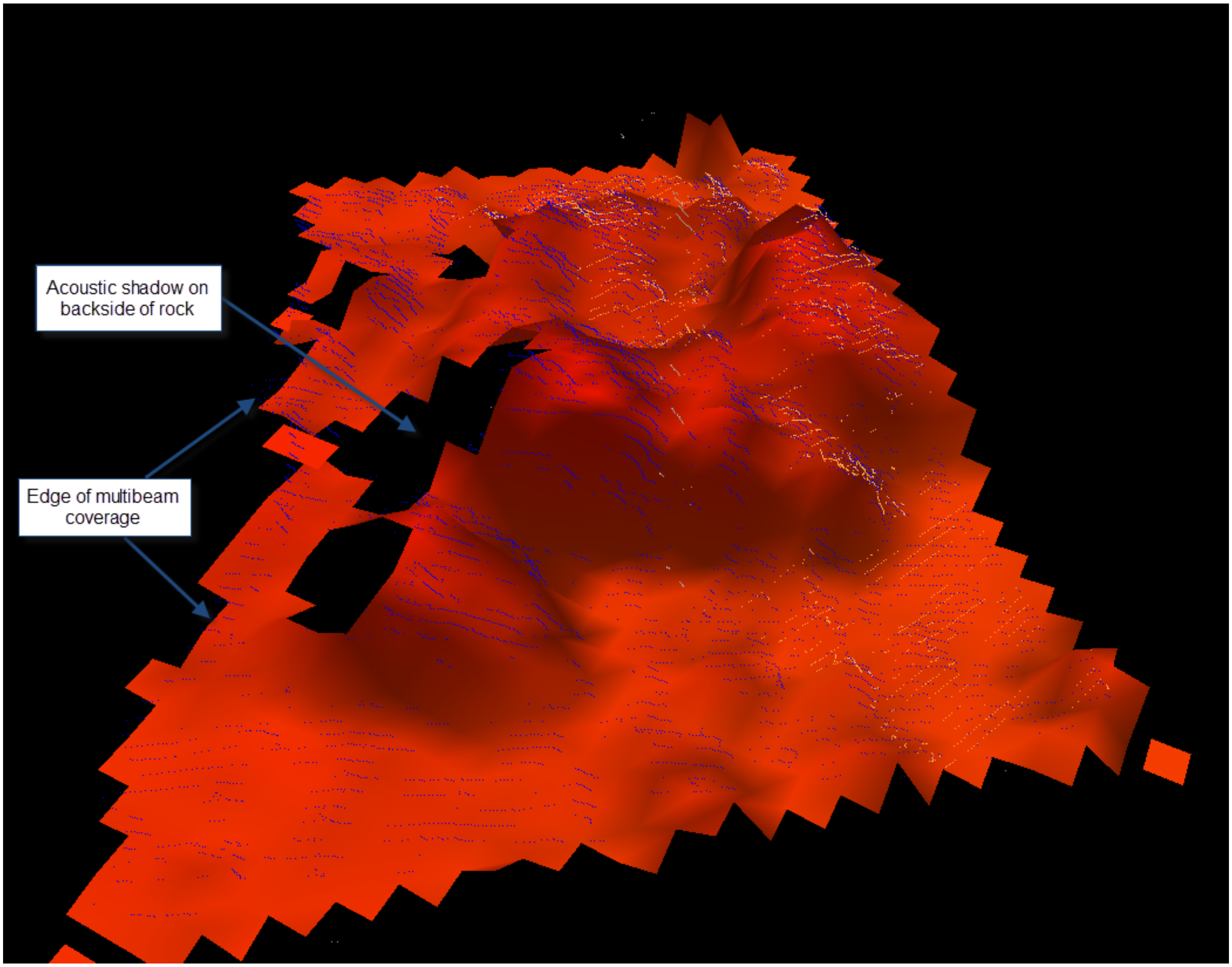



*Figure 37: The gap in coverage from Figure 36, as viewed in CARIS subset editor. Note the proximity to the edge of coverage. This image is not vertically exaggerated.*

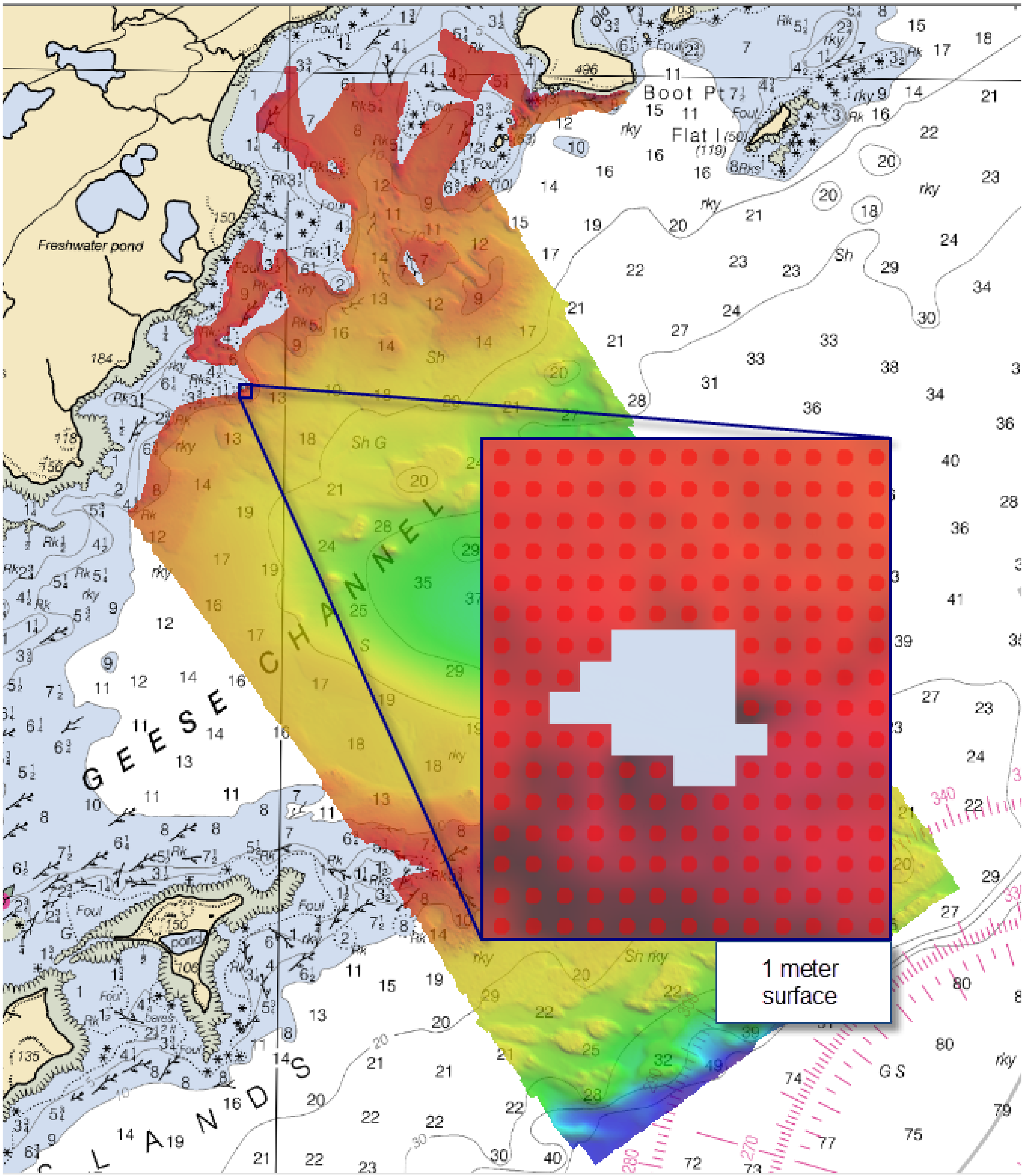



*Figure 38: The further east gap in coverage examined as a potential holiday in H12897.*

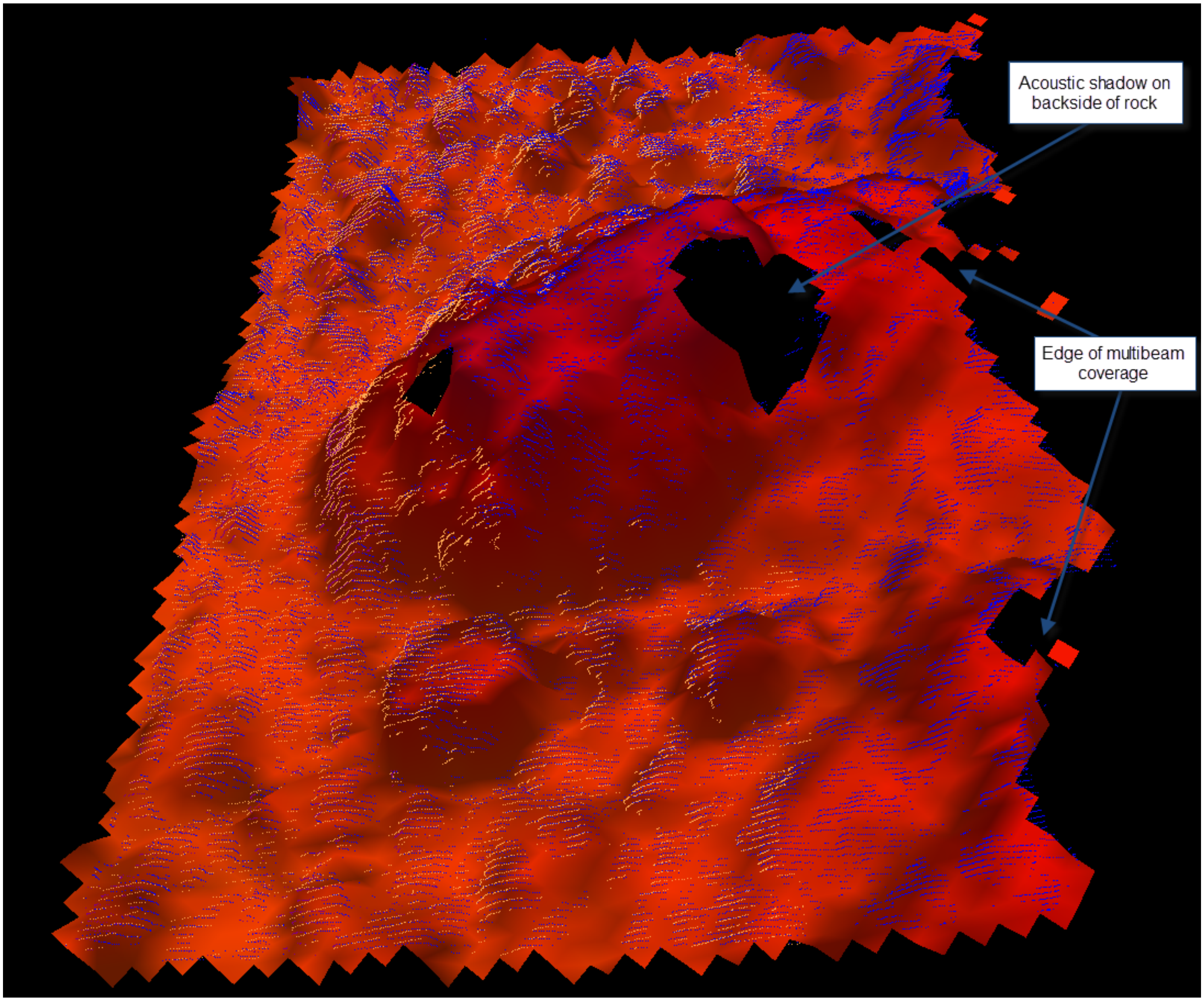



*Figure 39: The gap in coverage from Figure 38, as viewed in CARIS subset editor. Note the proximity to the edge of coverage. This image is not vertically exaggerated.*

### 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 (72-100 meter) and "NOAA_Allowable_2" for the 8 meter (100-160 meter) 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 40 shows an overview of the NOAA Allowable Uncertainty layers for all surfaces. Figure 41 shows the corresponding statistics for each individual surface. Overall, 99.95% of nodes with all surfaces meet or exceed NOAA Allowable Uncertainty specifications for H12897. For individual graphs per surface of NOAA Allowable Uncertainty requirements, see the Standards and Compliance Review located in Appendix II.

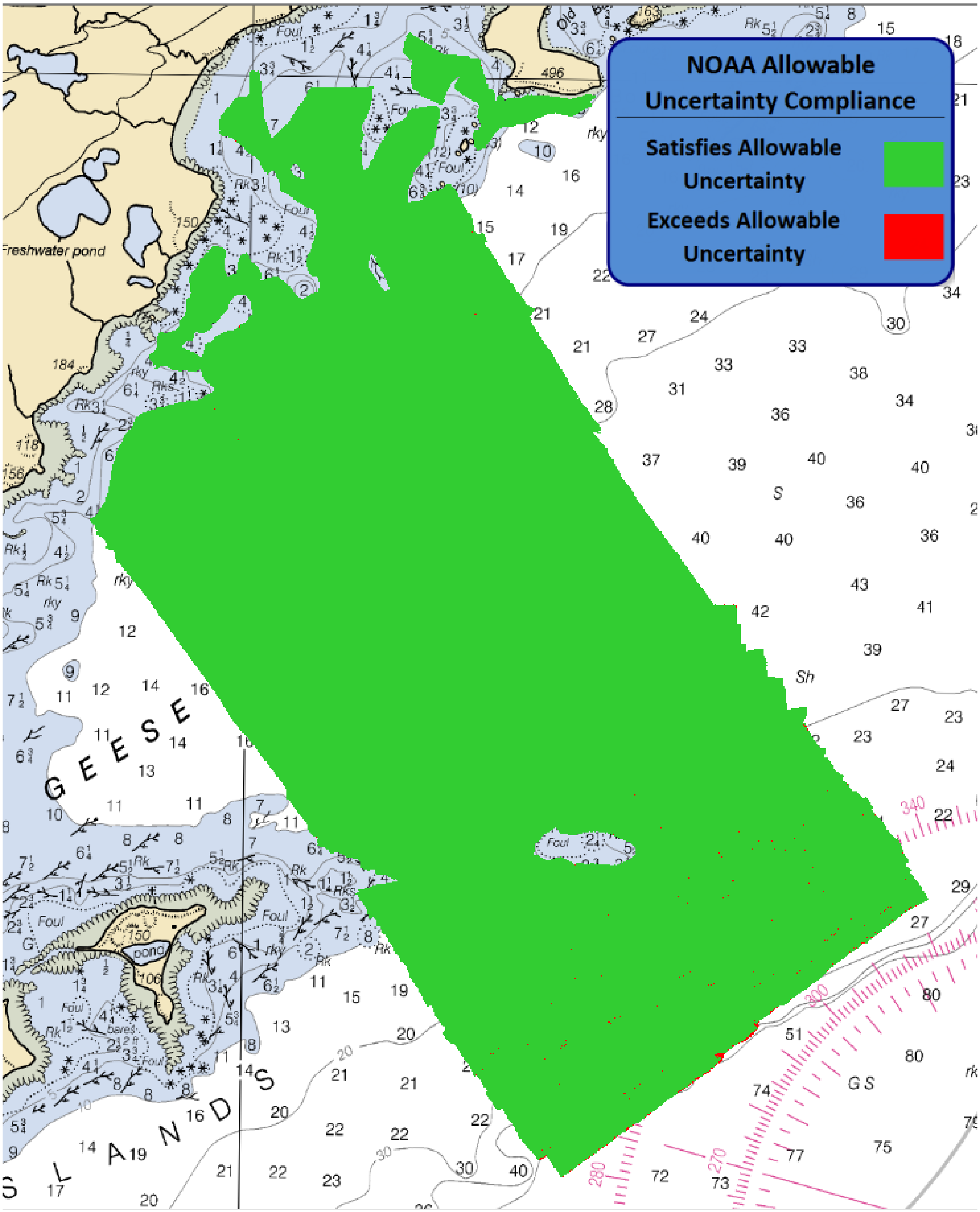



*Figure 40: H12897 NOAA Allowable Uncertainty overview.*

| H12897 NOAA Allowable Uncertainty | Total Nodes | Passed Nodes | Percent Pass |
|---|---|---|---|
| 1m | 6,988,239 | 6,985,713 | 99.96% |
| 2m | 6,315,923 | 6,312,521 | 99.95% |
| 4m | 2,081,769 | 2,080,044 | 99.92% |
| 8m | 105,904 | 105,470 | 99.59% |
| | Total Nodes | | 15,491,835 |
| | Total Nodes Pass | | 15,483,748 |
| | Total Percent Pass | | 99.95% |

*Figure 41: H12897 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 42 below. Density requirements for H12897 were achieved with at least 99.92% of finalized surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3. For individual graphs (per surface) of density requirements, see the Standards and Compliance Review located in Appendix II.

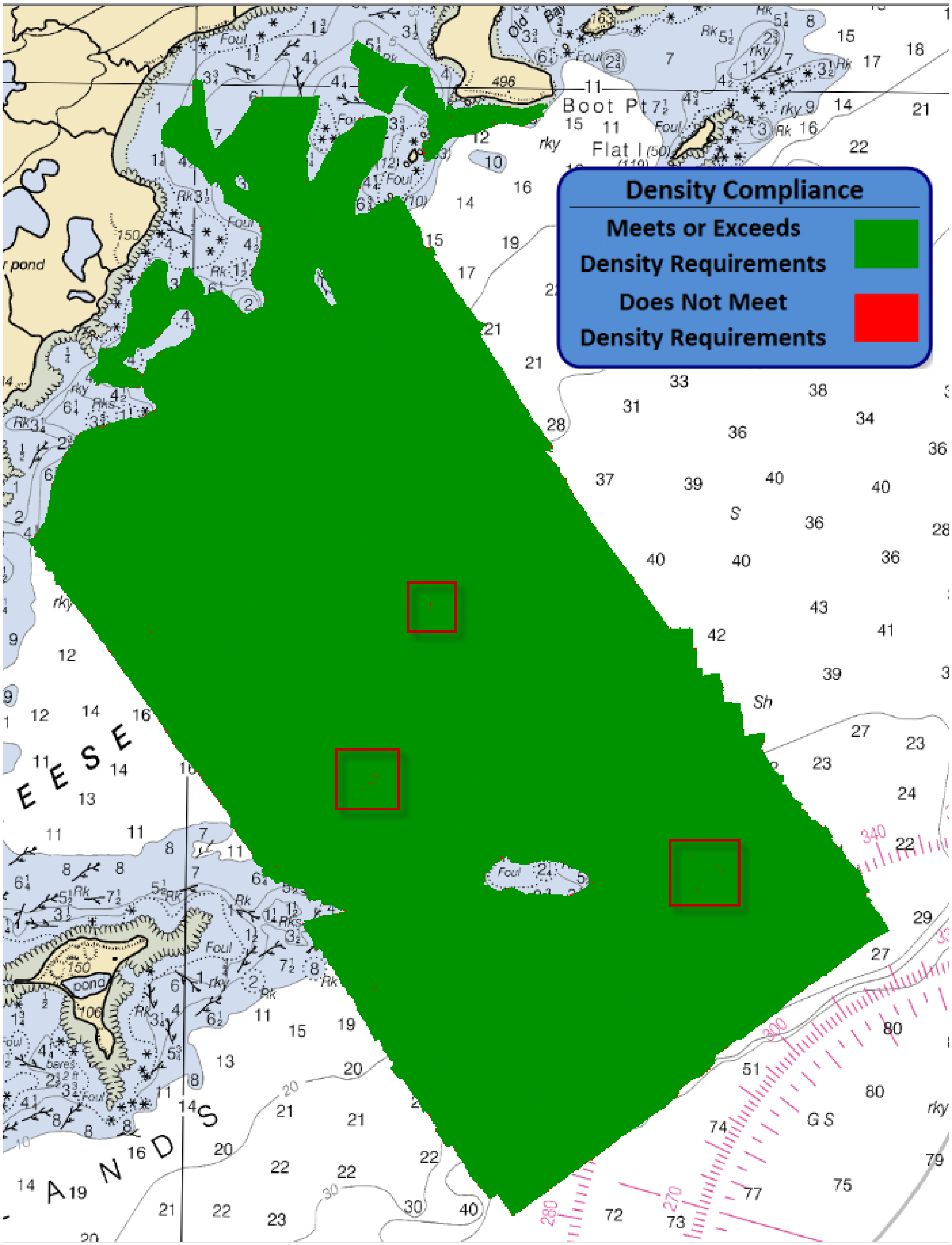



*Figure 42: H12897 density overview.*

| H12897 Density Statistics | | | |
|---|---|---|---|
| | Total Nodes | Passed Nodes | Percent Pass |
| 1m | 6,988,239 | 6,978,191 | 99.86% |
| 2m | 6,315,923 | 6,314,381 | 99.98% |
| 4m | 2,081,769 | 2,080,616 | 99.94% |
| 8m | 105,904 | 105,786 | 99.89% |
| | Total Nodes | | 15,491,835 |
| | Total Nodes Pass | | 15,478,974 |
| | Total Percent Pass | | 99.92% |

*Figure 43: H12897 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 |
|---|---|---|---|---|---|
| H12897_MB_1m_MLLW | CUBE | 1 meters | - | NOAA_1m | Complete MBES |
| H12897_MB_2m_MLLW | CUBE | 2 meters | - | NOAA_2m | Complete MBES |
| H12897_MB_4m_MLLW | CUBE | 4 meters | - | NOAA_4m | Complete MBES |
| H12897_MB_8m_MLLW | CUBE | 8 meters | - | NOAA_8m | Complete MBES |
| H12897_MB_1m_MLLW_Final | CUBE | 1 meters | 0 meters - 20 meters | NOAA_1m | Complete MBES |
| H12897_MB_2m_MLLW_Final | CUBE | 2 meters | 18 meters - 40 meters | NOAA_2m | Complete MBES |
| H12897_MB_4m_MLLW_Final | CUBE | 4 meters | 36 meters - 80 meters | NOAA_4m | Complete MBES |

| Surface Name | Surface Type | Resolution | Depth Range | Surface Parameter | Purpose |
|---|---|---|---|---|---|
| H12897_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 H12897. 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 hundreds of 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 velocity application are noted in the H12897 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

### B.5.4 Designated Soundings

H12897 contains three designated soundings in accordance with HSSD Section 5.2.1.2.3. All three designated soundings were selected to accurately represent the seafloor. These designated soundings are in rocky areas where the CUBE surface did not accurately depict the true seafloor. Figure 44 shows an overview of the survey area and the location of designated soundings.

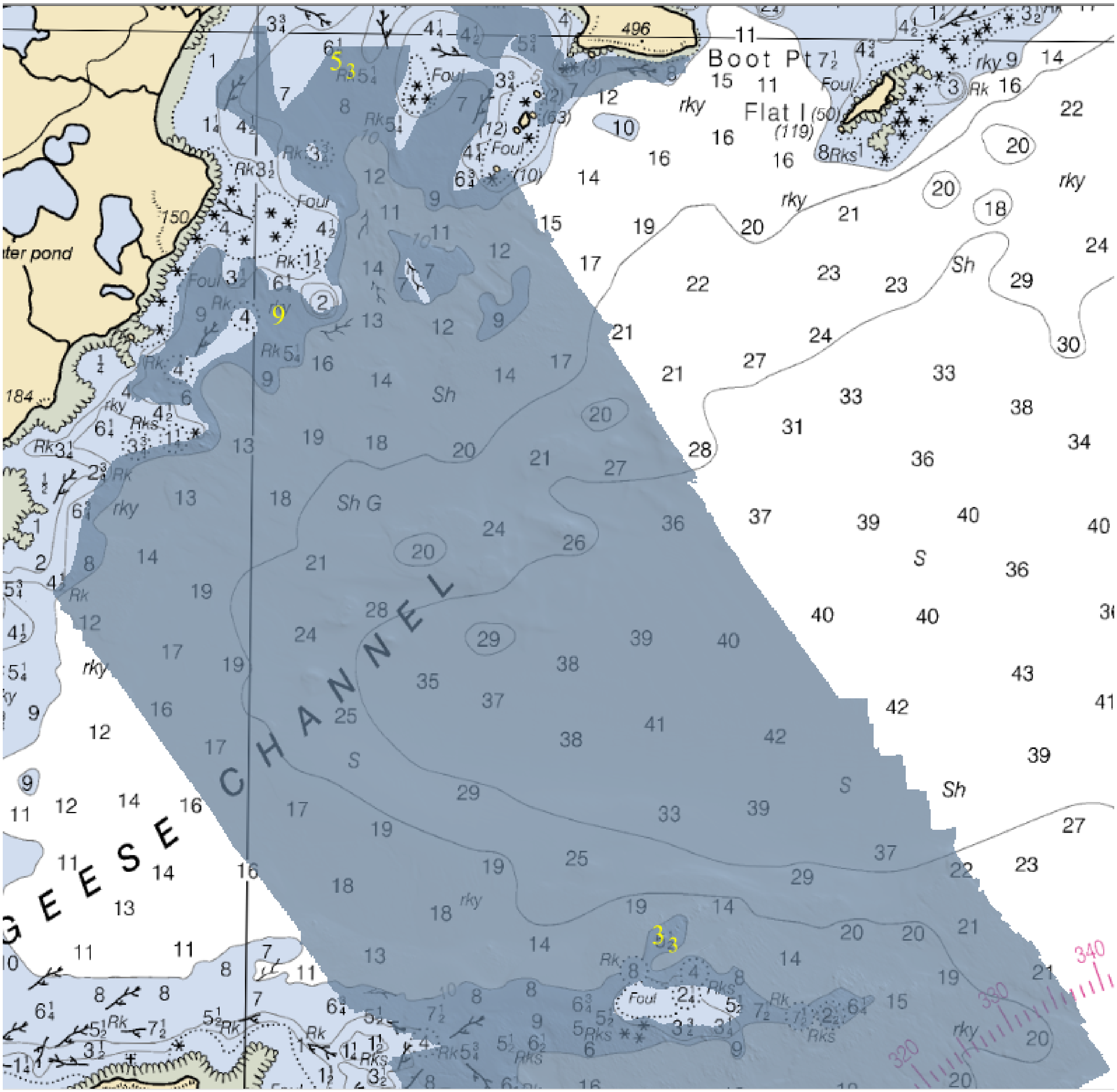



*Figure 44: Overview of designated soundings (yellow) in H12897.*

# C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying Horizontal and Vertical Control Report (HVCR).

## 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 |
|---|---|
| Kodiak Island | 9457292 |
| Alitak | 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 H12897. As processing was completed prior to receiving final tides, a waiver was obtained from HSD-OPS for the submission of H12897 without final tides applied. This correspondence has been included in Appendix II, accompanying this submission.

<u>ERS Methods Used:</u>

ERS via Poor Mans VDATUM

<u>Ellipsoid to Chart Datum Separation File:</u>

P335FA2016_PMVD_UTM-NAD83-5N_WGS84-MLLW_Composite.csar

ERS methods were used as the final means of reducing H12897 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 H12897 to MLLW. For further information see the ERS Capability Memo, submitted under a 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.

<u>The following PPK methods were used for horizontal control:</u>

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.

For further details regarding the processing and quality control checks performed, see the H12897 POSPAC Processing Logs spreadsheet located in the Separates folder. See also the OPR-P335-FA-16 Horizontal and Vertical Control report, 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 |
| --- | --- |
| AC45 | Sitkinak Island |

*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 during real time 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 (313 kHz) |

*Table 18: USCG DGPS Stations*

# D. Results and Recommendations

## D.1 Chart Comparison

A comparison was performed between survey H12897 and Chart 16590 as well as ENC US4AK5LM 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 a 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 H12897.

All data from H12897 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 | 09/10/2016 | 09/13/2016 |

*Table 19: Largest Scale Raster Charts*

<u>16590</u>

The charted soundings and contours of Chart 16590 are identical to those found on ENC US4AK5LM. As such, all discussions regarding comparisons between surveyed soundings and charted depths are covered under the ENC US4AK5LM 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? |
|---|---|---|---|---|---|
| US4AK5LM | 1:81529 | 9 | 10/27/2015 | 10/27/2015 | NO |

*Table 20: Largest Scale ENCs*

US4AK5LM

Soundings from H12897 are in a general agreement with charted depths on ENC US4AK5LM, with most depths agreeing to one to two fathoms as shown in Figure 46. The largest differences are seen in offshore rocky areas where differences range to eight fathoms as seen in Figure 48.

To more accurately visualize trends within these differences, an 8 meter TIN surface was interpolated from the ENC sounding layer. This surface was then differenced with a corresponding 8 meter surface from H12897 and visualized in Figure 45. In this difference surface red colors indicate H12897 was shoaler than the ENC US4AK5LM, green colors indicate agreement, and blue colors indicate H12897 was deeper than ENC US4AK5LM. Most of the differences indicate that H12897 is deeper than US4AK5LM, particularly in the deeper areas of the survey where the ENC soundings are spaced more widely and linear interpolation between soundings will be a less accurate approximation.

Contours from H12897 are in a general agreement with charted contours on ENC US4AK5LM as shown in Figure 49. The largest differences are seen in the southeast where surveyed and charted contours differ by over 300 meters (Figure 50), in the north central region of the sheet, where two charted contours were not supported by survey data (Figure 51), and in the eastern side of the central channel, where a 40 fathom contour was found in survey data but not charted.

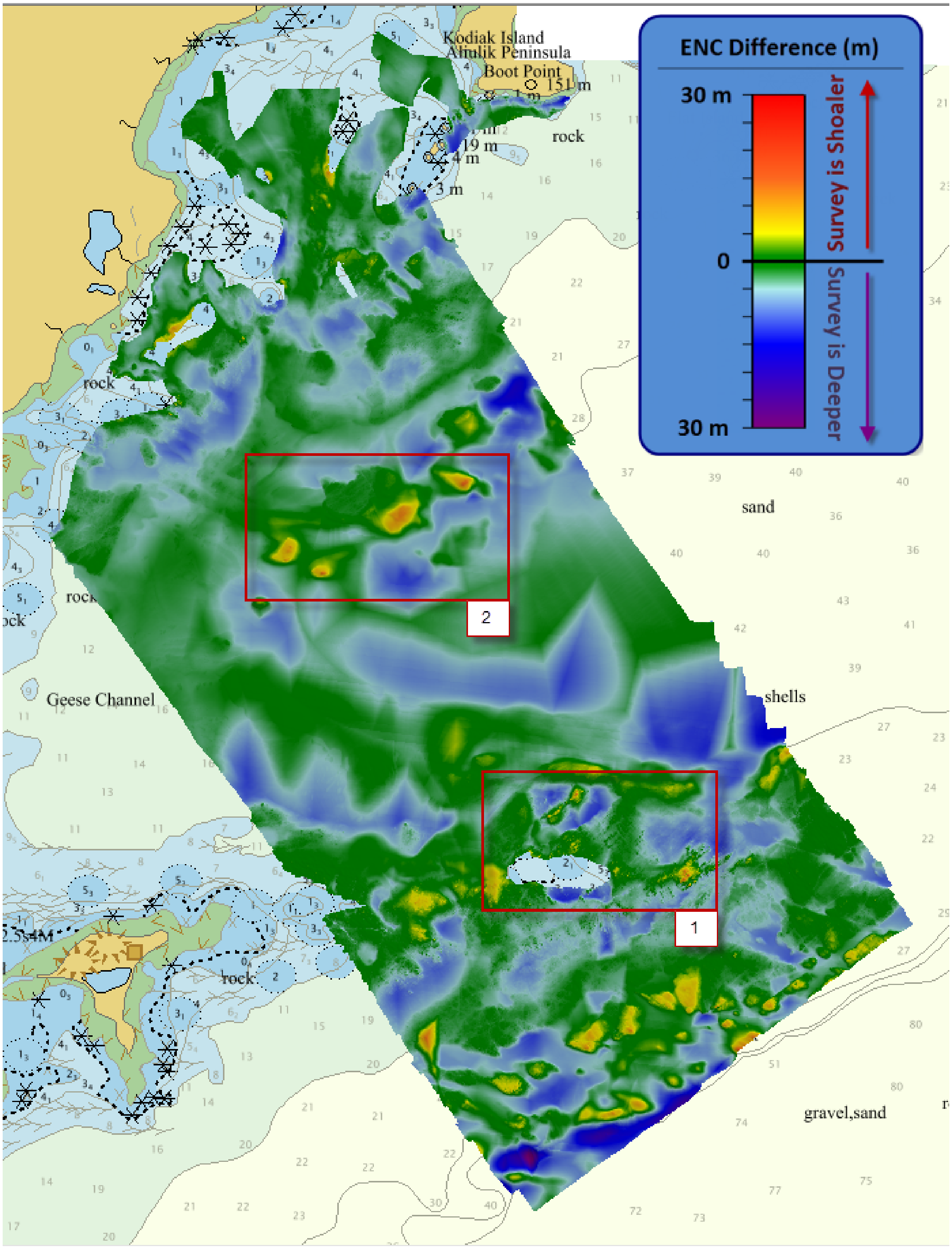
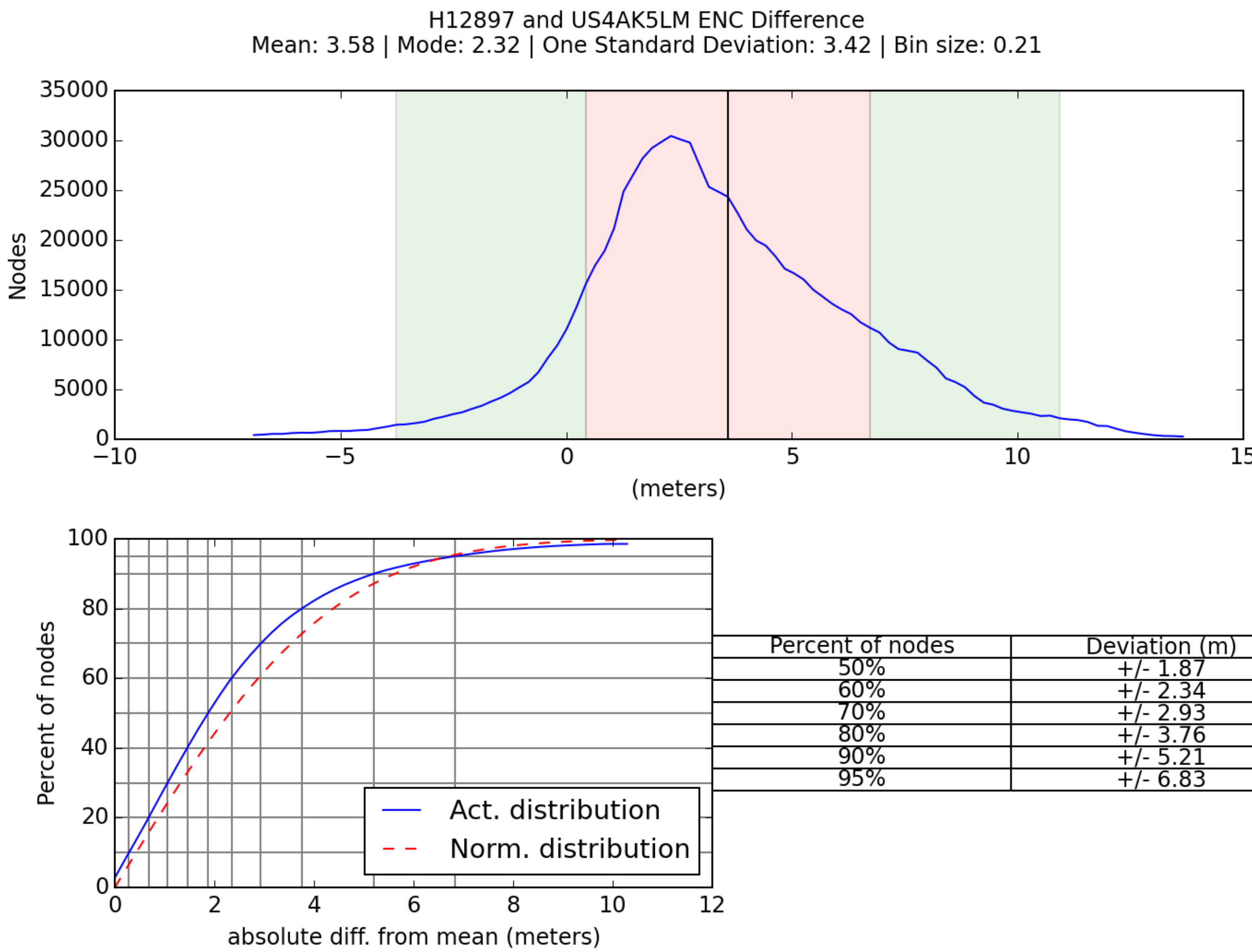



*Figure 45: Difference surface between H12897 and interpolated TIN surface from US4AK5LM.*




| Percent of nodes | Deviation (m) |
|---|---|
| 50% | +/- 1.87 |
| 60% | +/- 2.34 |
| 70% | +/- 2.93 |
| 80% | +/- 3.76 |
| 90% | +/- 5.21 |
| 95% | +/- 6.83 |

*Figure 46: Difference surface statistics between H12897 and interpolated TIN surface from US4AK5LM.*

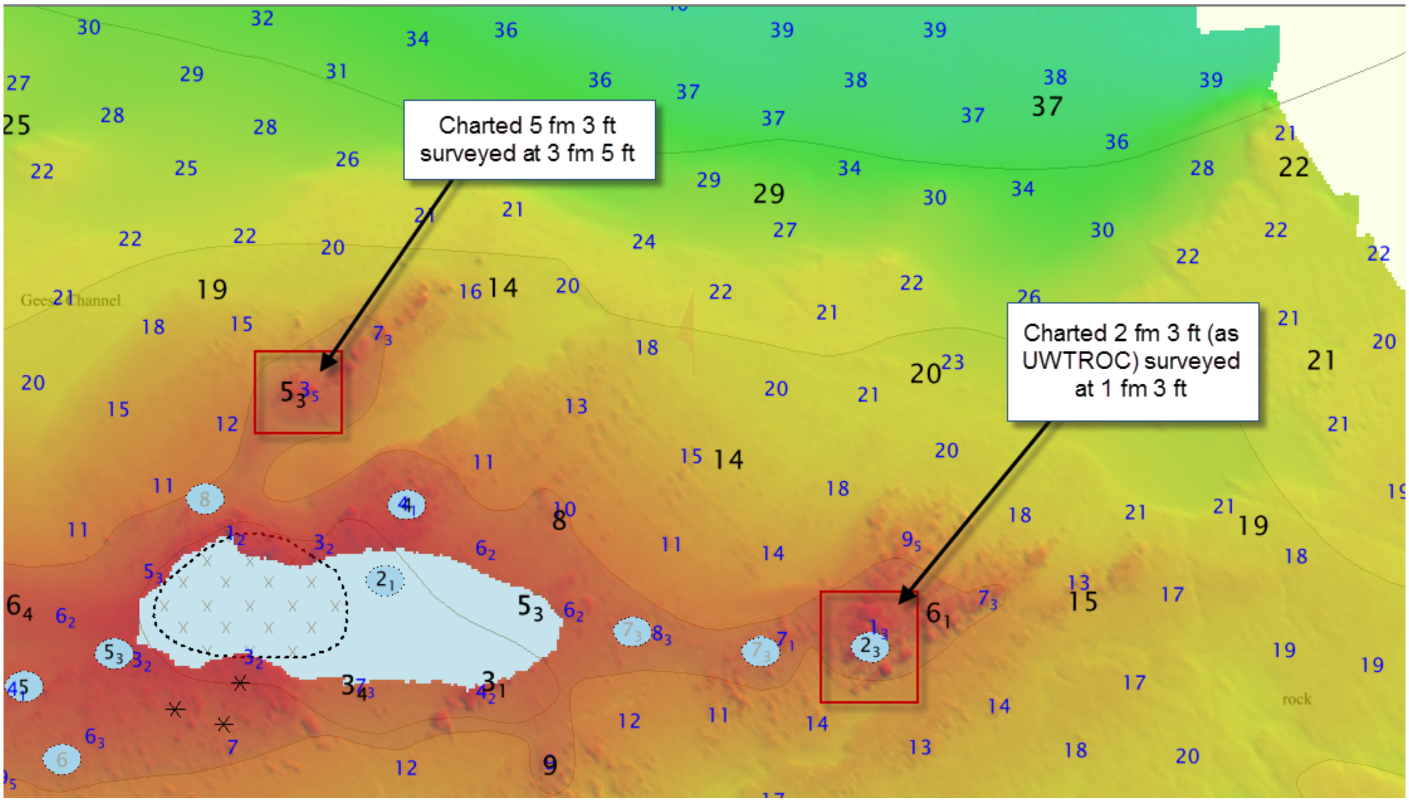



*Figure 47: Close up of offshore reef (detail area 1 from Figure 45) where significant differences exist between H12897 soundings (in blue) and ENC US4AK5LM depths (in black).*

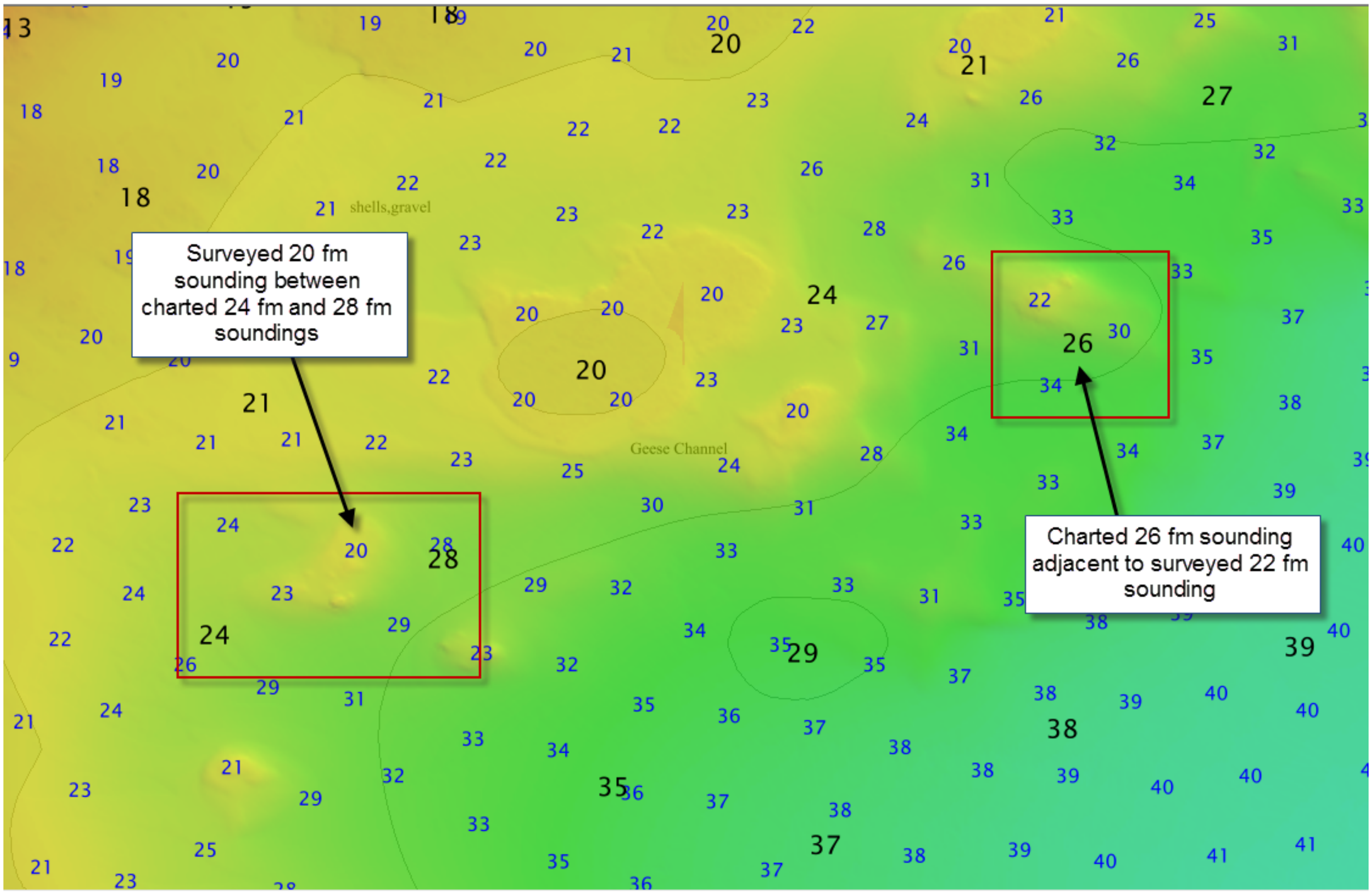



*Figure 48: Close up of Geese Channel rocky areas (detail area 2 from Figure 45) where significant differences exist between H12897 soundings (in blue) and ENC US4AK5LM depths (in black).*

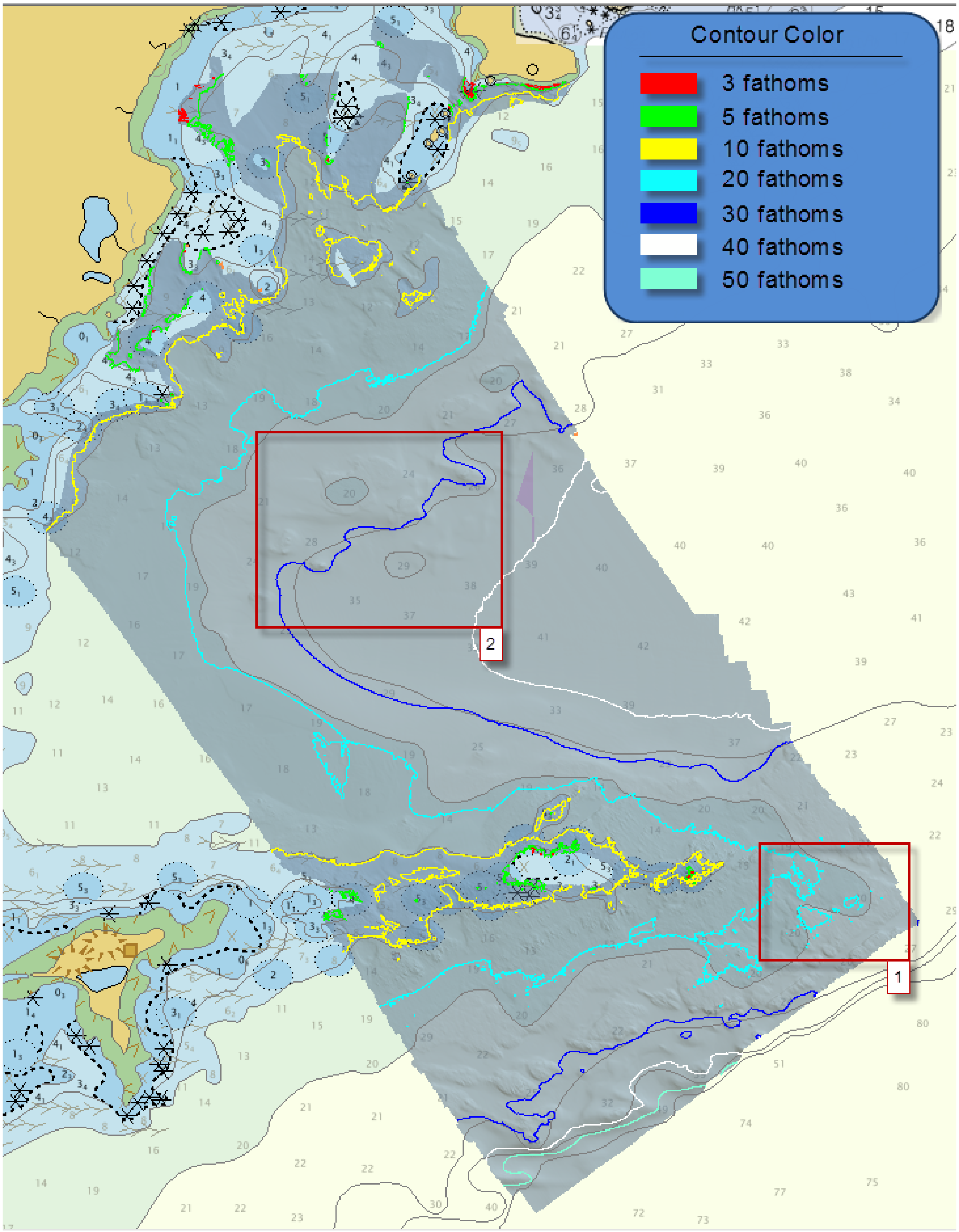



*Figure 49: Overview of H12897 contours overlaid onto ENC US4AK5LM.*

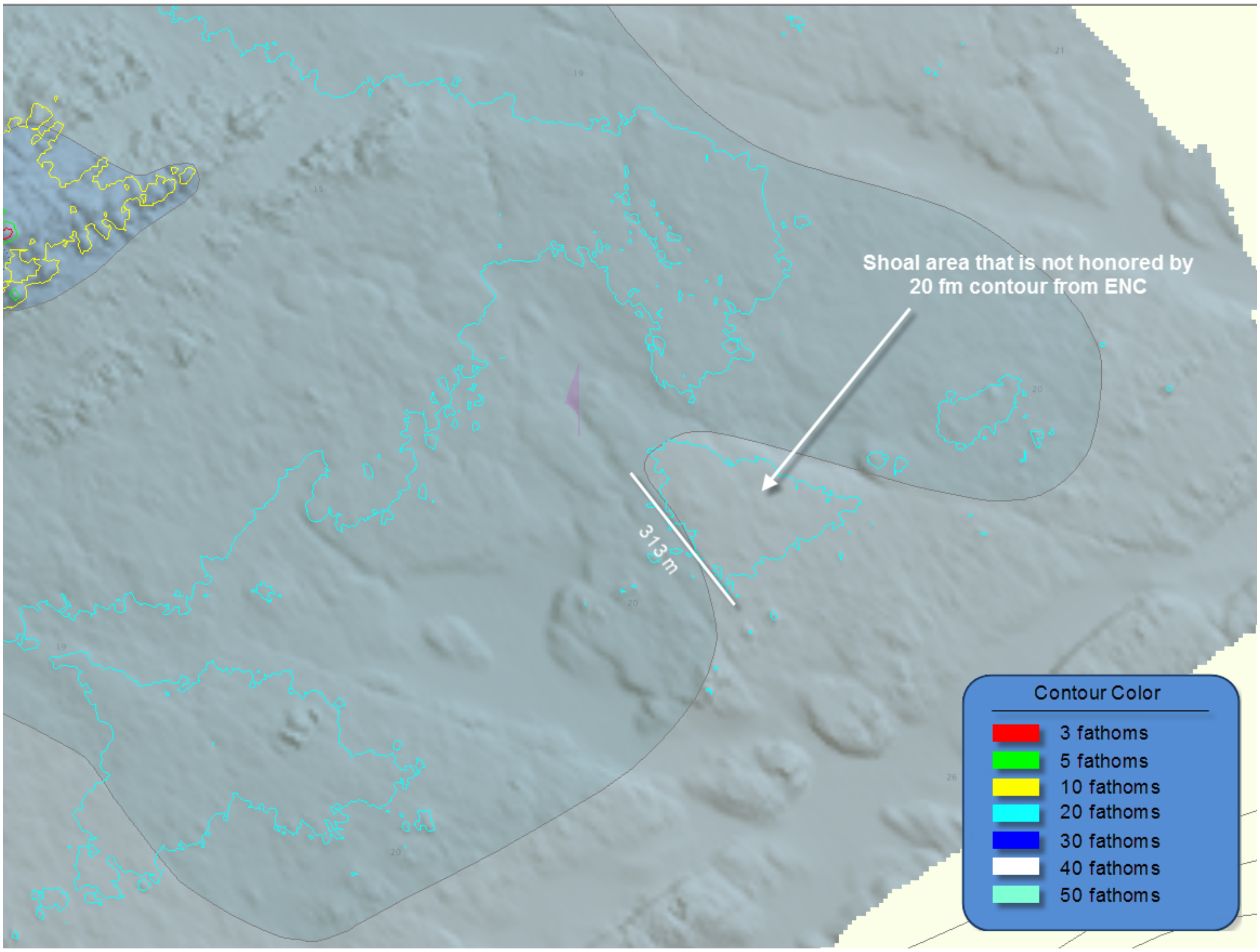



*Figure 50: Close up of southeast corner of the sheet (detail area 1 from Figure 49) where significant differences exist between H12897 contours and ENC US4AK5LM contours.*

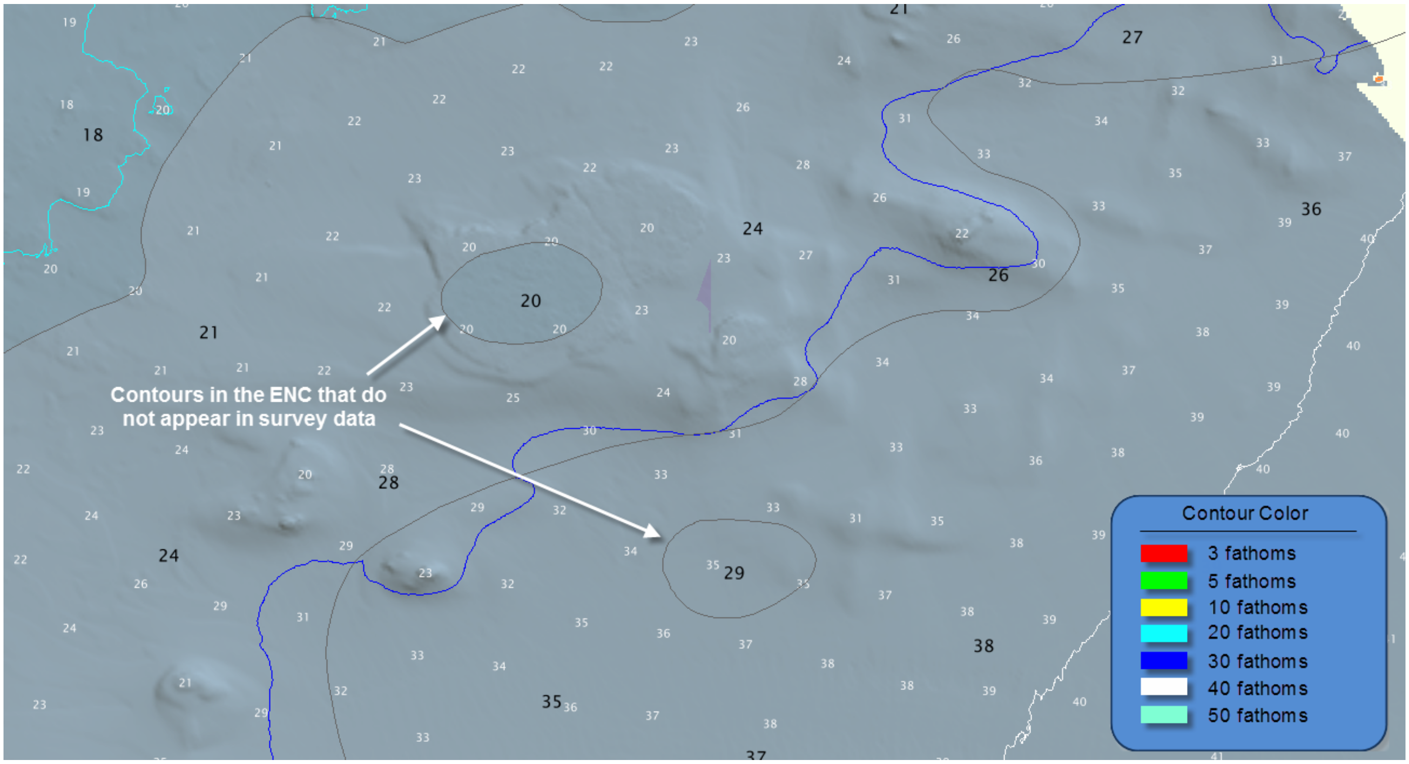



*Figure 51: Close up of northern central area of the sheet (detail area 2 from Figure 49) where two contours from ENC US4AK5LM do not appear in the H12897 contours. US4AK5LM soundings are black, while H12897 soundings are white.*

### 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 included in the H12897 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 the NALL" in accordance with HSSD 7.3.1.

### D.1.5 Uncharted Features

Survey H12897 has six new features that are addressed in the H12897 Final Feature File. Of these features, there are two new Seabed Areas and four new Kelp features.

### D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

### D.1.7 Shoal and Hazardous Features

Near the eastern side of the offshore reef in the southern portion of the sheet, significant differences were noted between the charted depths and observed soundings for two shoal underwater rocks. The discrepancies are discussed in Section D 1.2, and can be seen in Figure 47. Subset views of the rocky areas are shown below in Figures 52 and 53. These were not submitted as DTONs due to their proximity to the already charted dangerous reef and very limited traffic in the area, but special care should be taken in ensuring that this area is represented fully on the chart.

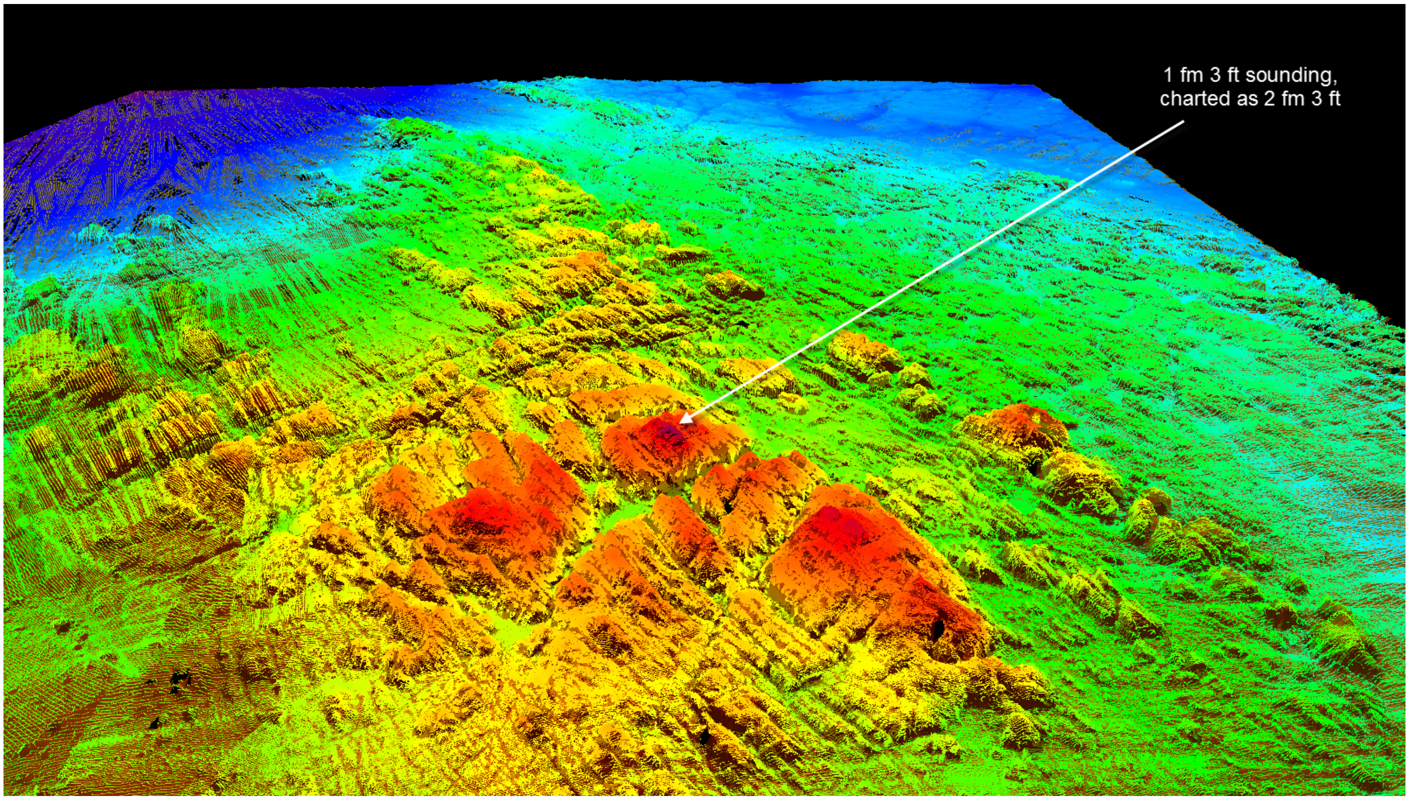



*Figure 52: The rocky shoal area in H12897 due east of the offshore reef, viewed in CARIS subset editor.*

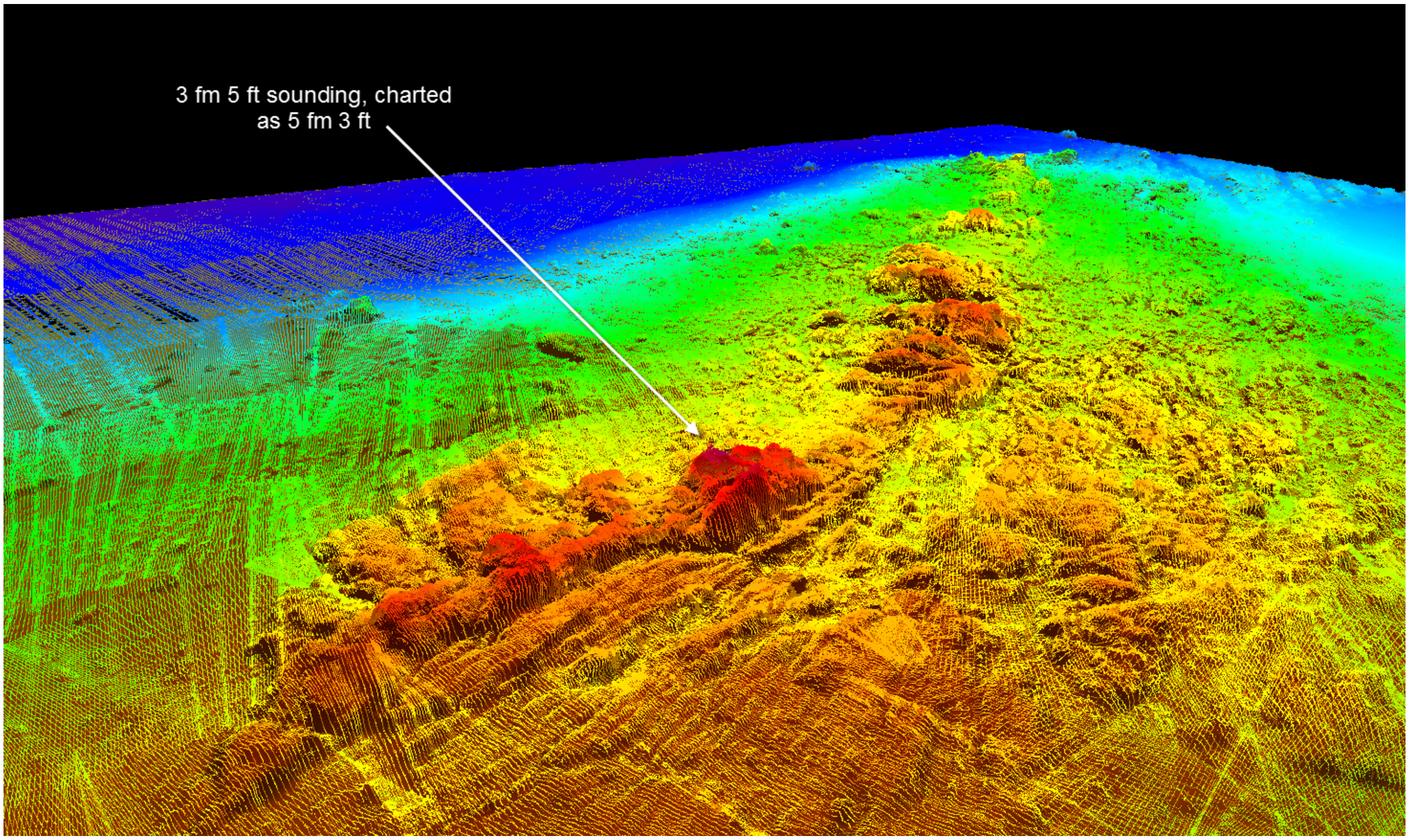



*Figure 53: The rocky shoal area in H12897 due north of the offshore reef, viewed in CARIS subset editor.*

### 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

Two bottom samples were acquired in accordance with the Project Instructions for survey H12897. All bottom samples were entered in the H12897 Final Feature File. See Figure 54 for Bottom Sample locations.

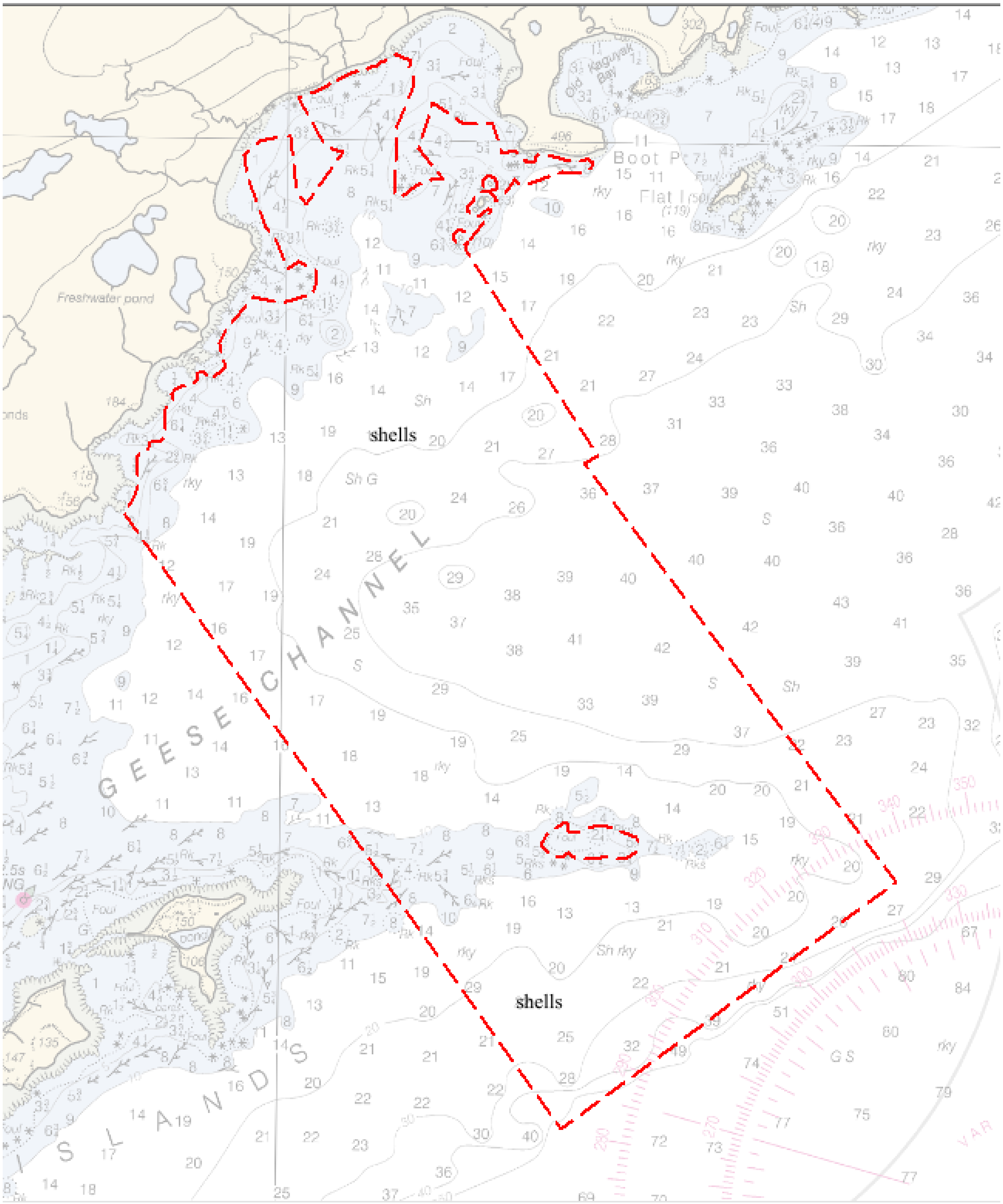



*Figure 54: H12897 Bottom Sample Location Overview with Descriptions*

## D.2 Additional Results

### D.2.1 Shoreline

H12897 survey limits extended to the NALL (see Section A.1) and all features within these limits were addressed and attributed in the H12897 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 exist 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 | Chief of Party | 11/18/2016 | VAN WAES.MARK.1240076329 2016.11.18 11:17:08 -08'00' |
| LT Bart Buesseler, NOAA | Field Operations Officer | 11/18/2016 | Digitally signed by BUESSELER.BART.OWEN.1396600559 Date: 2016.11.18 11:08:26 -08'00' |
| HCST Douglas Bravo | Chief Survey Technician | 11/18/2016 | Douglas Bravo 2016.11.18 10:06:35 -09'00' |
| ENS Lander Ver Hoef, NOAA | Sheet Manager | 11/18/2016 | ENS/NOAA VER HOEF.LANDER.A.1512612705 2016.11.18 10:59:46 -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:** H12897

**LOCALITY:** Geese Channel, South Coast of Kodiak Island
**TIME PERIOD:** June 25 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 25 to July 31, 2016.

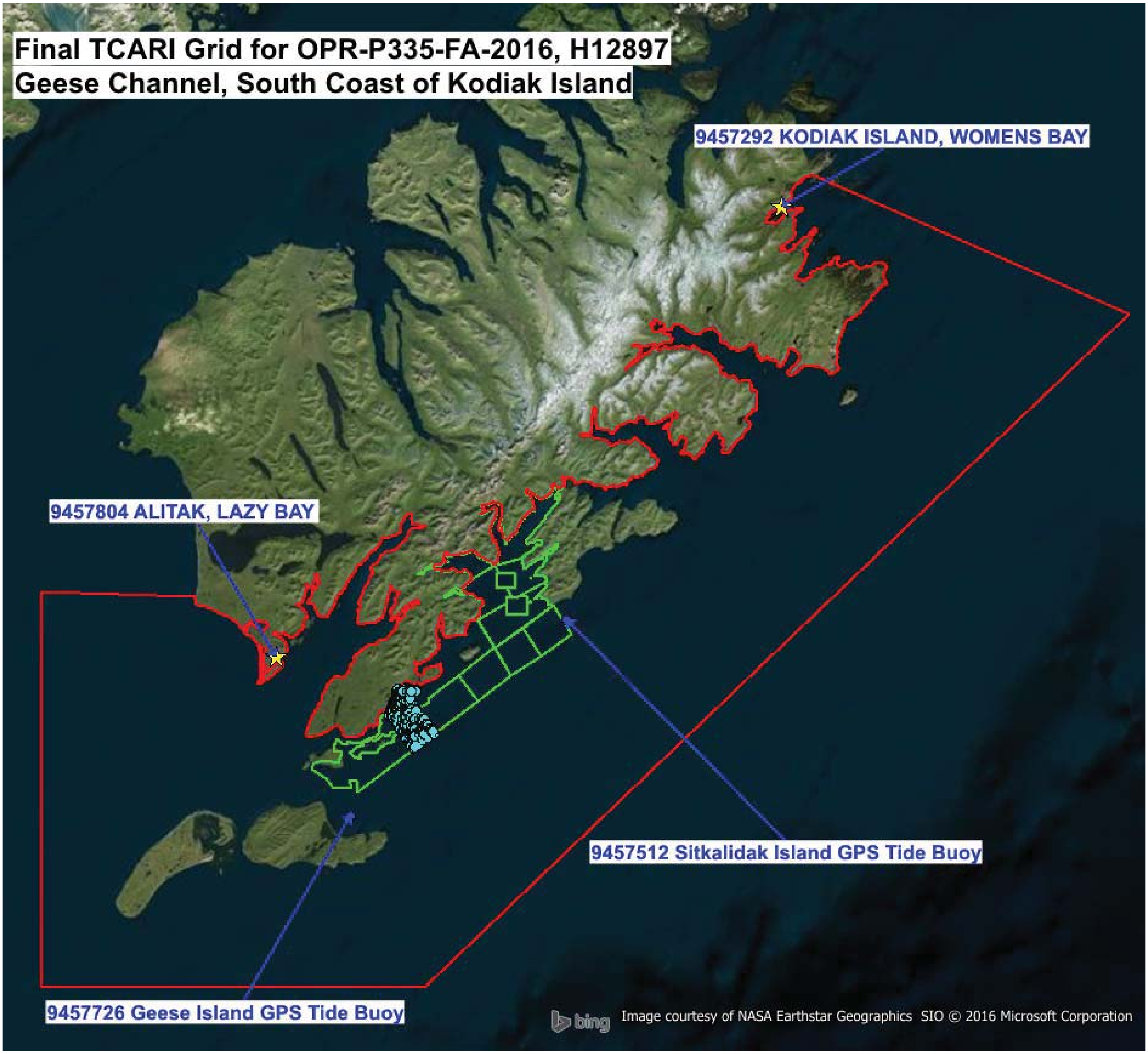
**Refer to attachments for grid information.**

**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 14:41:43 -05'00'

CHIEF, OCEANOGRAPHIC DIVISION


Final TCARI Grid for OPR-P335-FA-2016, H12897
Geese Channel, 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

**H12897**

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

- H12897_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12897_GeoImage.pdf

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

Digitally signed by Peter Holmberg
DN: cn=Peter Holmberg, o, ou=signing for Kurt Brown, email=kurt.brown@noaa.gov, c=US
Date: 2017.07.20 12:09:24 -07'00'

Approved:________________________________________

**Kurt Brown**
**Physical Scientist, Pacific Hydrographic Branch**

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

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: 2017.07.20 12:08:58 -07'00'

Approved:________________________________________

**Peter Holmberg**
**Cartographic Team Lead, Pacific Hydrographic Branch**