H13242

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13242

LOCALITY

State(s):	Alaska
General Locality:	Bristol Bay
Sub-locality:	5 NM E of Cape Newenham

2019

CHIEF OF PARTY
CDR Marc Moser

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13242

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:	**Bristol Bay**
Sub-Locality:	**5 NM E of Cape Newenham**
Scale:	**40000**
Dates of Survey:	**06/07/2019 to 07/17/2019**
Instructions Dated:	**05/01/2019**
Project Number:	**OPR-R320-FA-19**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CDR Marc Moser**
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/.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H13242

Project: OPR-R320-FA-19

Locality: Bristol Bay

Sublocality: 5 NM E of Cape Newenham

Scale: 1:40000

June 2019 - July 2019

NOAA Ship *Fairweather*

Chief of Party: CDR Marc Moser

A. Area Surveyed

The survey area is located 5 NM E of Cape Newenham, Alaska.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
58° 44' 34.49" N 162° 41' 11.69" W	58° 29' 28.14" N 162° 7' 21.15" W

Table 1: Survey Limits

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2019 NOS Hydrographic Surveys Specifications and Deliverables (HSSD) as shown in Figure 1.

Following the completion of survey operations on the assigned sheets within the project area, guidance was received from HSD to continue acquisition northward and southward with the remaining time, utilizing 400 meter set line spacing. A record of this correspondence is located in Appendix II of this report.

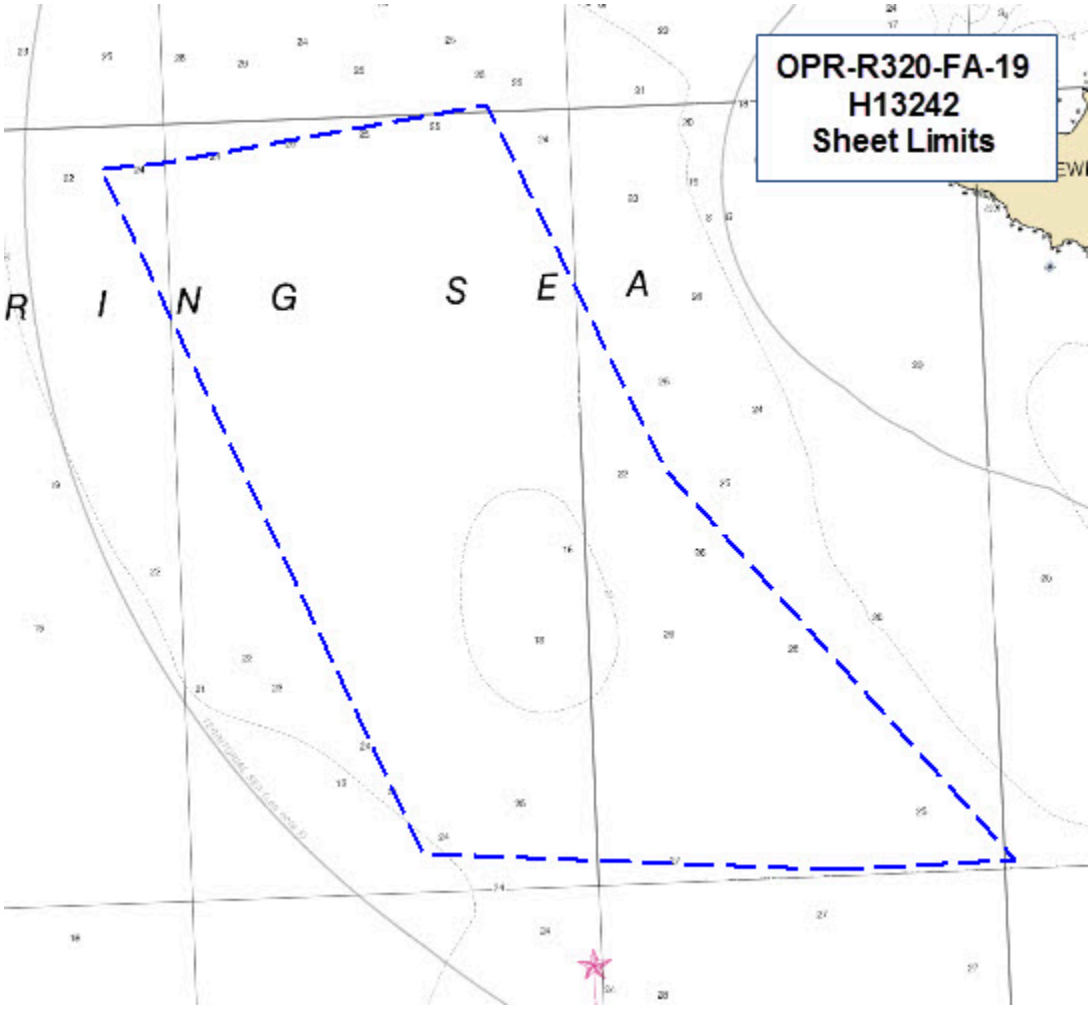


Figure 1: H13242 sheet limits (in blue) overlaid onto Chart 16305

The survey limits shown in figure 1 were the originally assigned limits and not the expanded limits discussed in section A.1

A.2 Survey Purpose

The purpose of this hydrographic survey is to update National Ocean Service nautical charting products and support commerce to the northern Bristol Bay region. Capes Newenham and Pierce, Alaska are the southwestern corner of the Togiak National Wildlife Refuge and provide habitat to numerous birds and sea mammals. Ship and barge traffic delivering industrial, consumer, and energy products to the communities of northern Bristol Bay, or continuing north to Etolin Strait must transit around these capes. Marine commerce is critical for the survival of these western Alaskan communities as they are detached from the rest of the state road system. Legacy hydrographic data in this survey area is extremely sparse and was acquired prior to the 1920s. Updating the nautical charts and accurately charting reported shoals by modern hydrographic means is critical for the future safety of regional commerce, local tanker lightering, emergency response, and

the protection of the local wildlife. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in H13242 meet multibeam echo sounder (MBES) coverage requirements for set line spacing, as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.9), and density requirements (see Section B.2.10).

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.	Set Line Spacing MBES at 400 m

Table 2: Survey Coverage

The entirety of H13242 was acquired with set line spacing MBES at 400m, meeting the requirements listed above and in the HSSD. See Figure 2 for an overview of coverage.

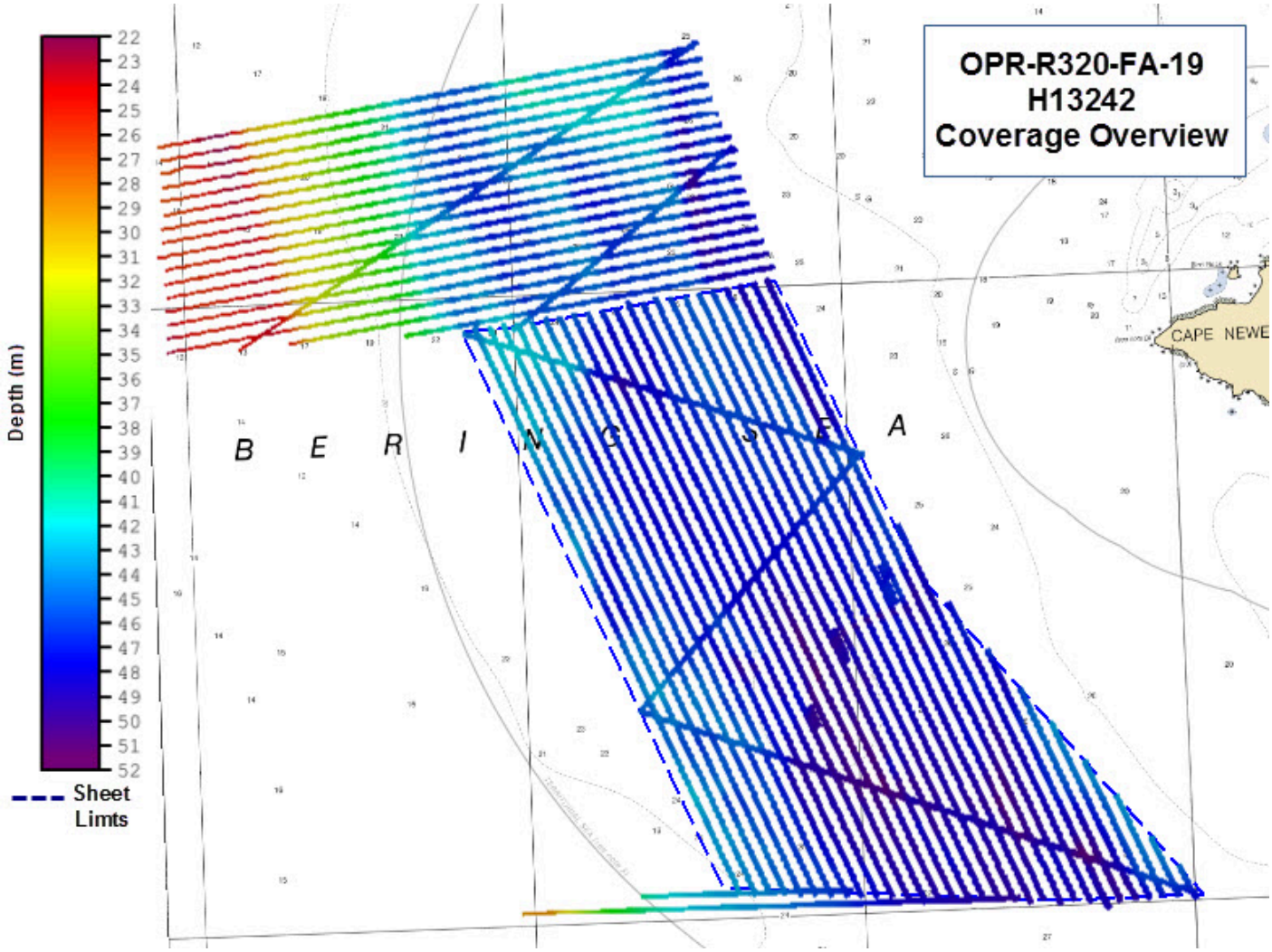


Figure 2: H13242 survey coverage overlaid onto Chart 16305

A.6 Survey Statistics

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

	HULL ID	*S220*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	430.2	430.2
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	34.47	34.47
	Lidar Crosslines	0	0
Number of Bottom Samples			6
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			93.94

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/07/2019	158
06/08/2019	159

Survey Dates	Day of the Year
06/19/2019	170
06/28/2019	179
07/16/2019	197
07/17/2019	198

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-R320-FA-19 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	***S220***
LOA	70.4 meters
Draft	4.8 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 710	MBES
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 8.01% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD. To evaluate crosslines, a surface generated via data strictly from mainscheme lines and a surface generated via data strictly from crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated (Figure 3), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between depths derived from mainscheme data and crossline data was 0.02 meters (with mainscheme being deeper) and 95% of nodes falling within +/- 0.11 meters (Figure 4). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 99.5% of the depth differences between H13242 mainscheme and crossline data were within allowable NOAA uncertainties.

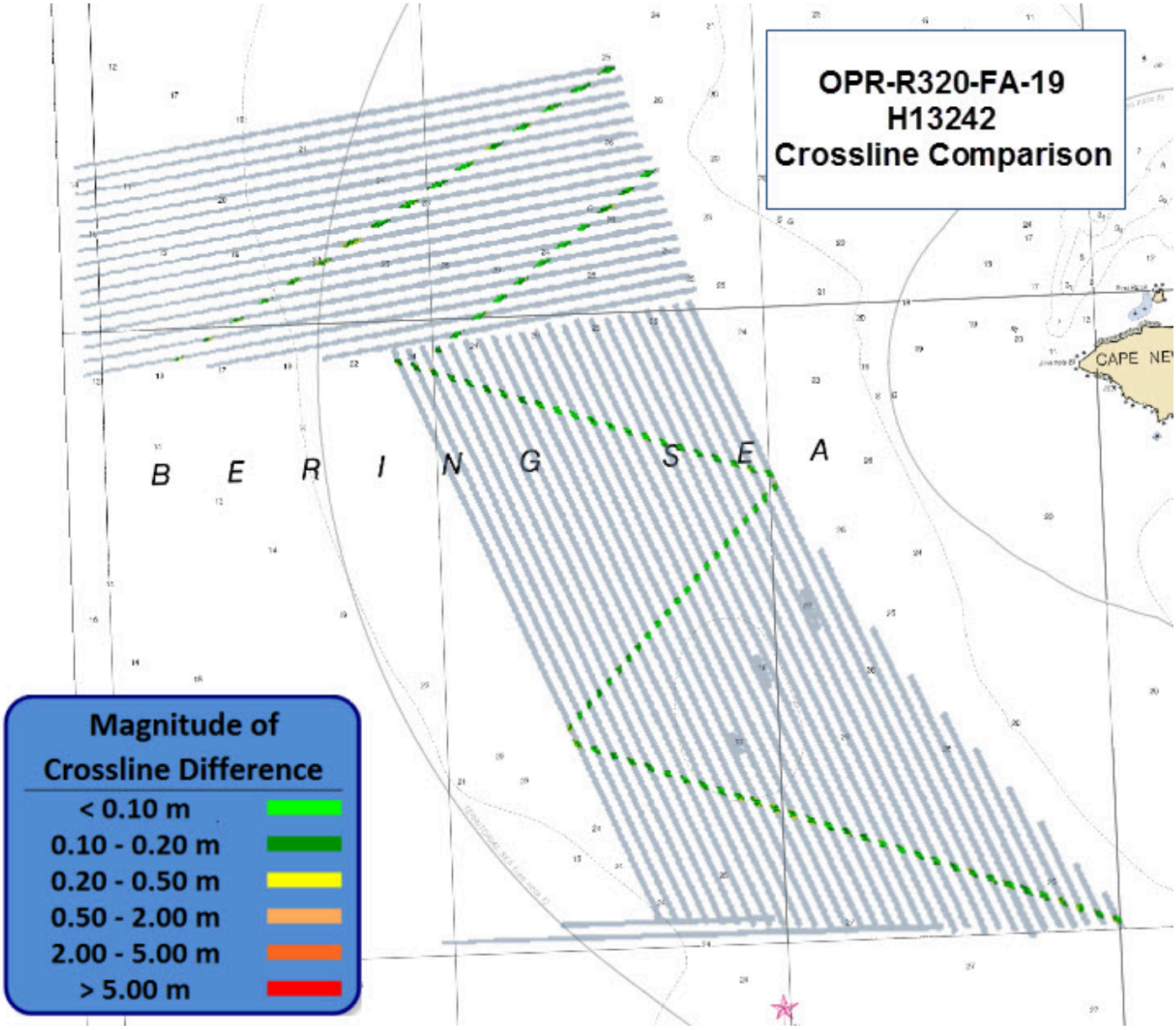
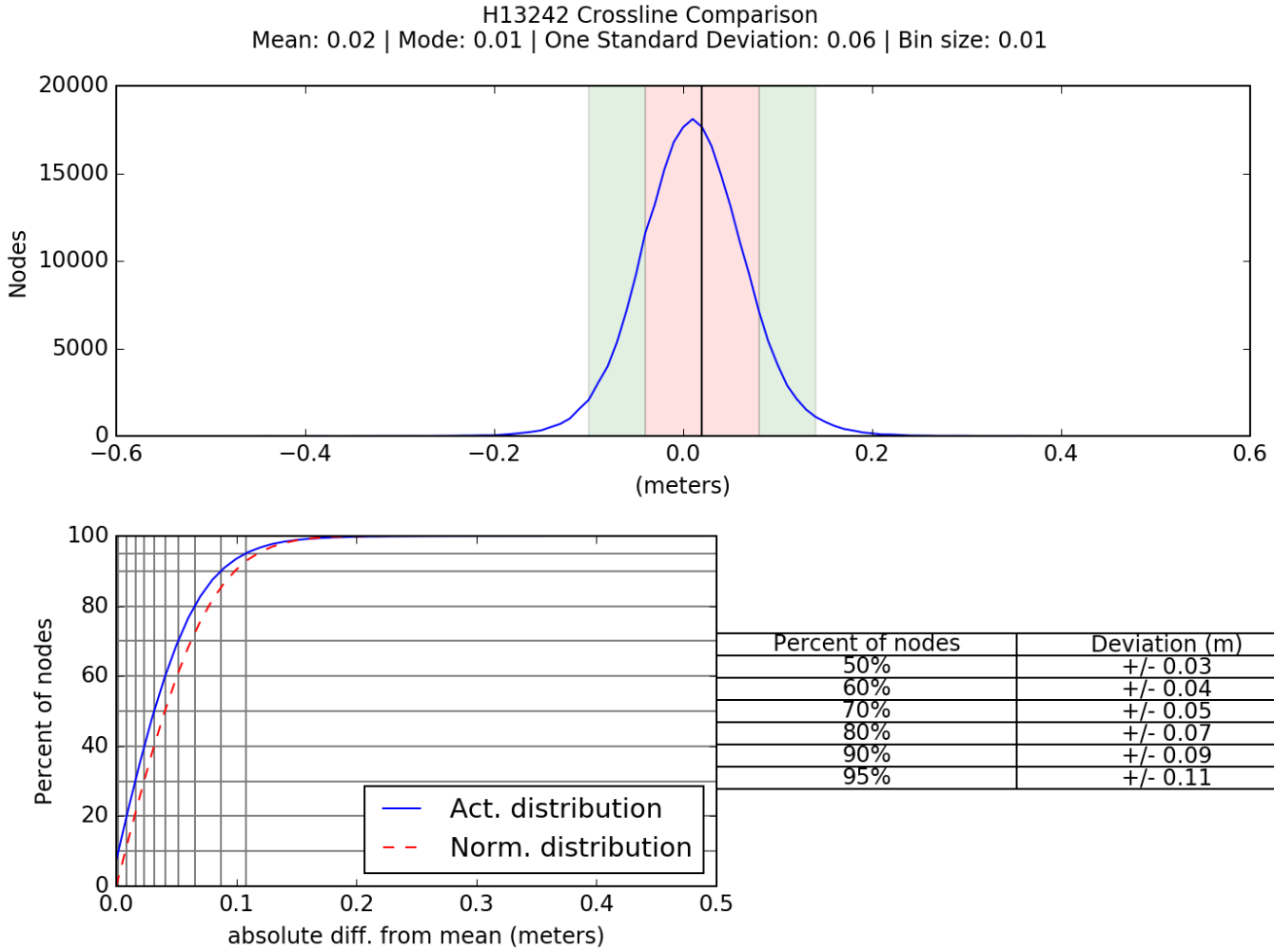


Figure 3: Overview of H13242 crosslines



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.09
95%	+/- 0.11

Figure 4: H13242 crossline and mainscheme difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via ERTDM	0.14 meters	0.00 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S220	N/A	1 meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty via device models for vessel motion and ERTDM, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13242. Real-time uncertainties were provided via EM 710 MBES data and Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

B.2.3 Junctions

H13242 junctions with four adjacent surveys from this project, H13243, H13238, H13241, H13244 as shown in Figure 5. In an effort to maximize efficiency during acquisition, data were collected on a single heading on the same day across the western junction with H13241. Since the data were collected continuously across the sheet limits by the same platform with the same SBET files and separation model applied to adjacent sheets, overlap was not achieved at this junction. A visual analysis was performed of the data across the respective sheet limits to ensure that no biases arose in processing the data. Data overlap was achieved, however, at the junctions with H13238, H13243, and H13244. These areas of overlap between surveys were reviewed in CARIS HIPS and SIPS by surface differencing (at equal resolutions) to assess surface agreement. The multibeam data were also examined CARIS Subset Editor for consistency and agreement. For the junctions with H13238, H13243, and H13244, a negative difference indicates H13242 was shoaler and a positive difference indicates H13242 was deeper.

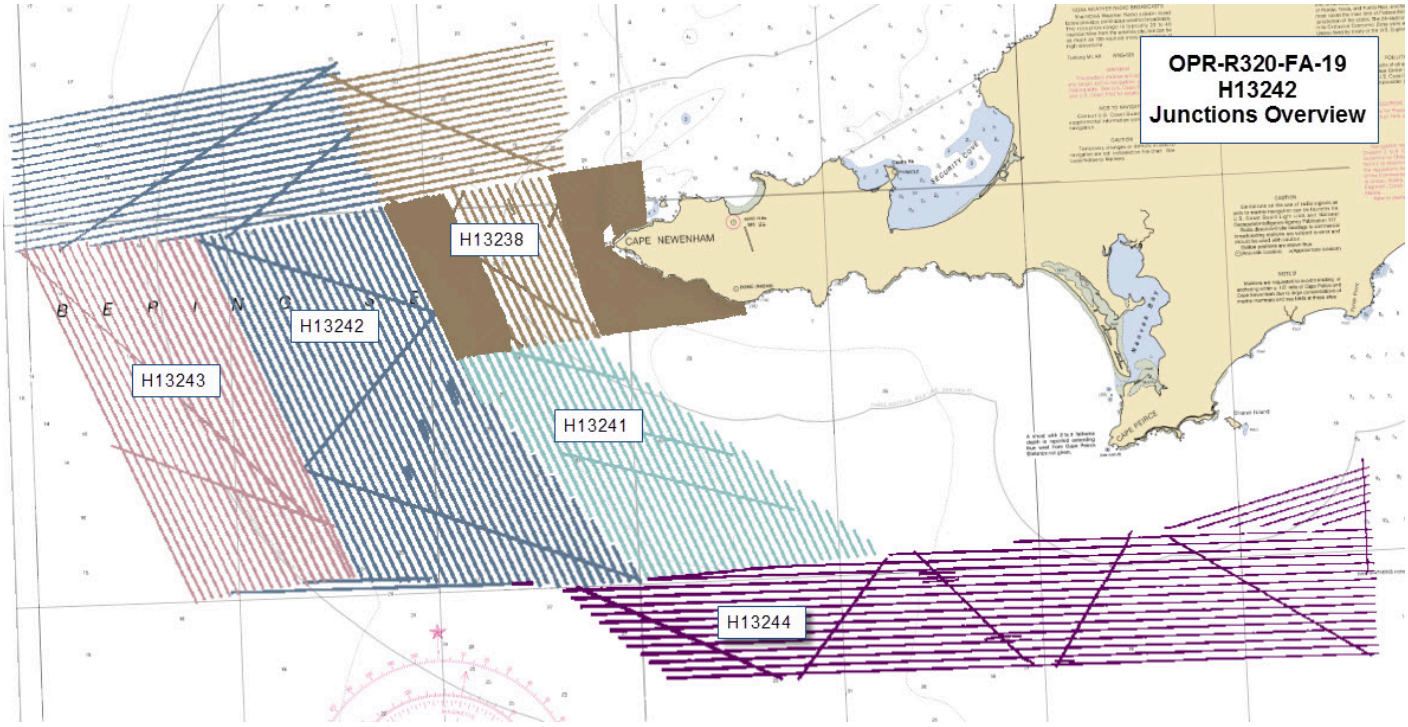


Figure 5: Overview of H13242 junction surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13238	1:40000	2019	NOAA Ship FAIRWEATHER	NE
H13243	1:40000	2019	NOAA Ship FAIRWEATHER	W
H13244	1:40000	2019	NOAA Ship FAIRWEATHER	S

Table 9: Junctioning Surveys

H13238

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13242 and the surface from H13238 (Figure 6). The statistical analysis of the difference surface shows a mean of 0.00 meters with 95% of the nodes having a maximum deviation of +/- 0.09 meters, as seen in Figure 7. It was found that 100% of nodes are within NOAA allowable uncertainty.

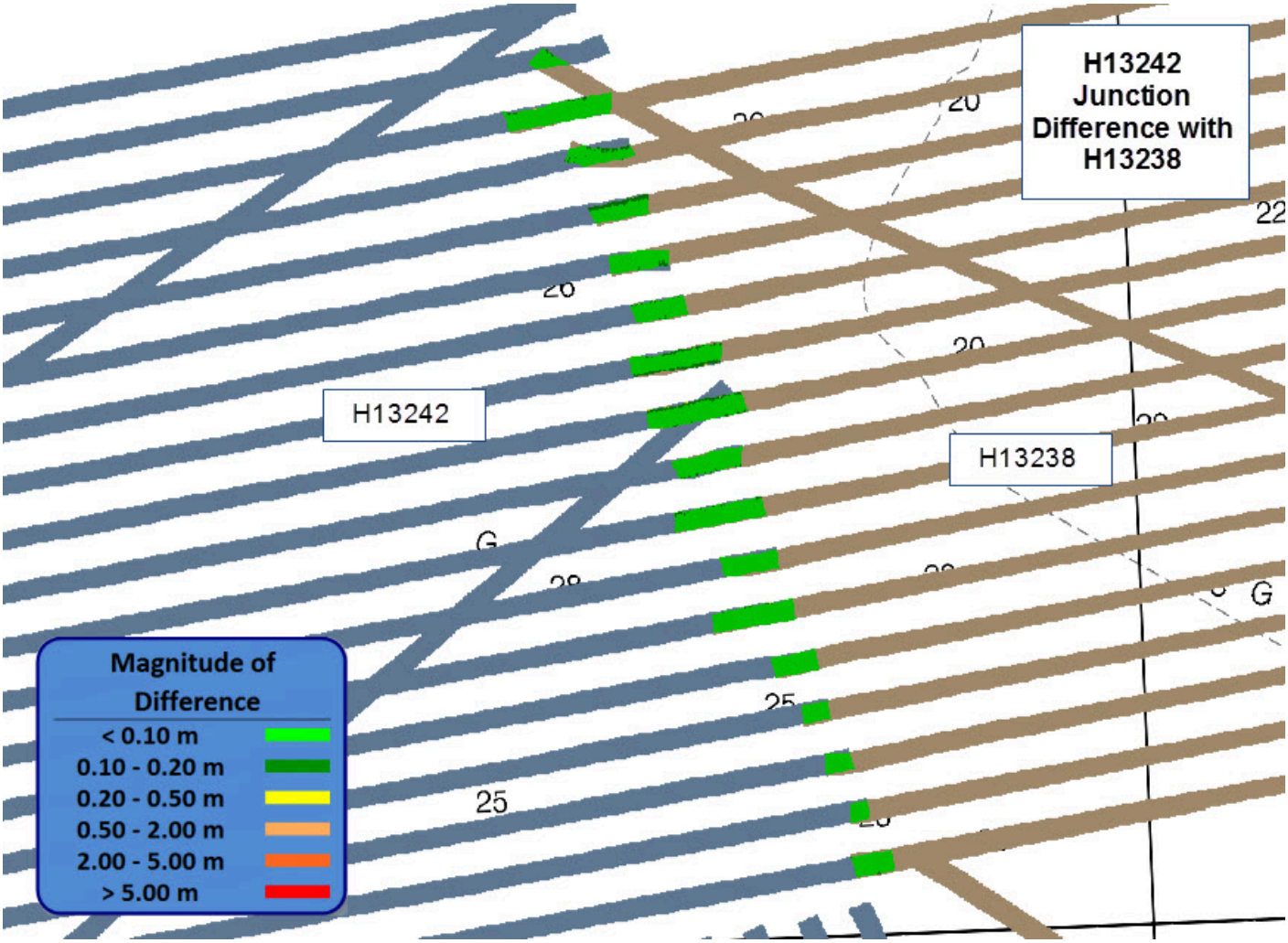
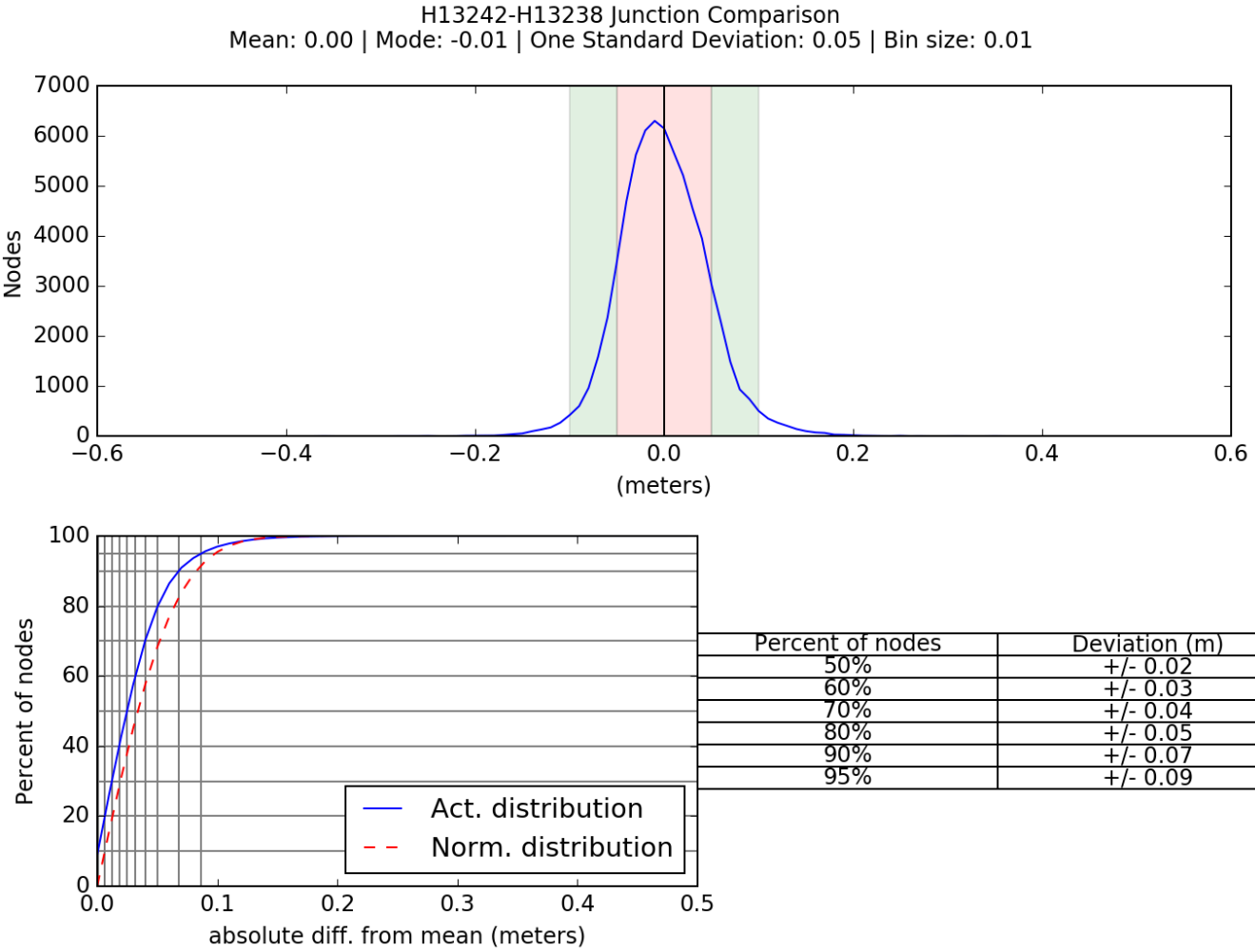


Figure 6: Difference surface between H13243 (blue) and H13238 (brown)



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.05
90%	+/- 0.07
95%	+/- 0.09

Figure 7: Difference surface statistics between H13242 and H13238

H13243

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13242 and the surface from H13243 (Figure 8). The statistical analysis of the difference surface shows a mean of -0.03 meters with 95% of the nodes having a maximum deviation of +/- 0.11 meters, as seen in Figure 9. It was found that 100% of nodes are within NOAA allowable uncertainty.

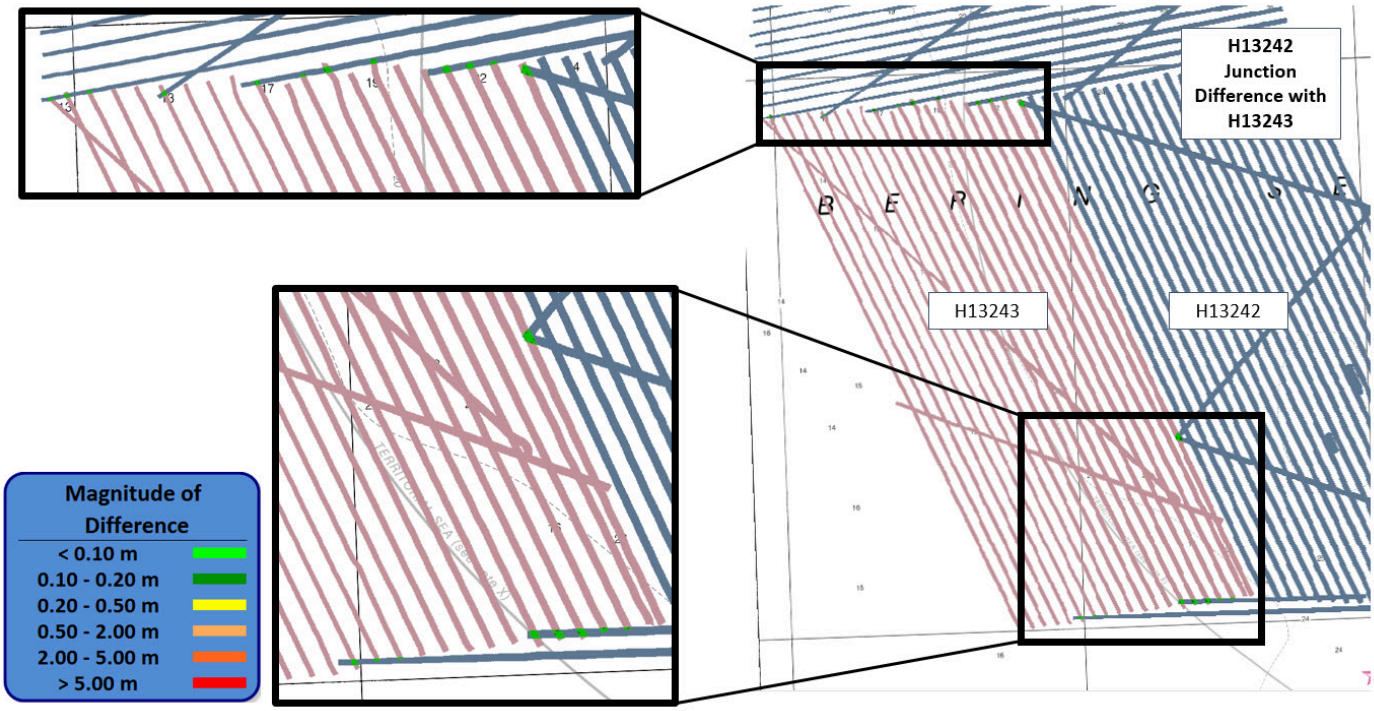
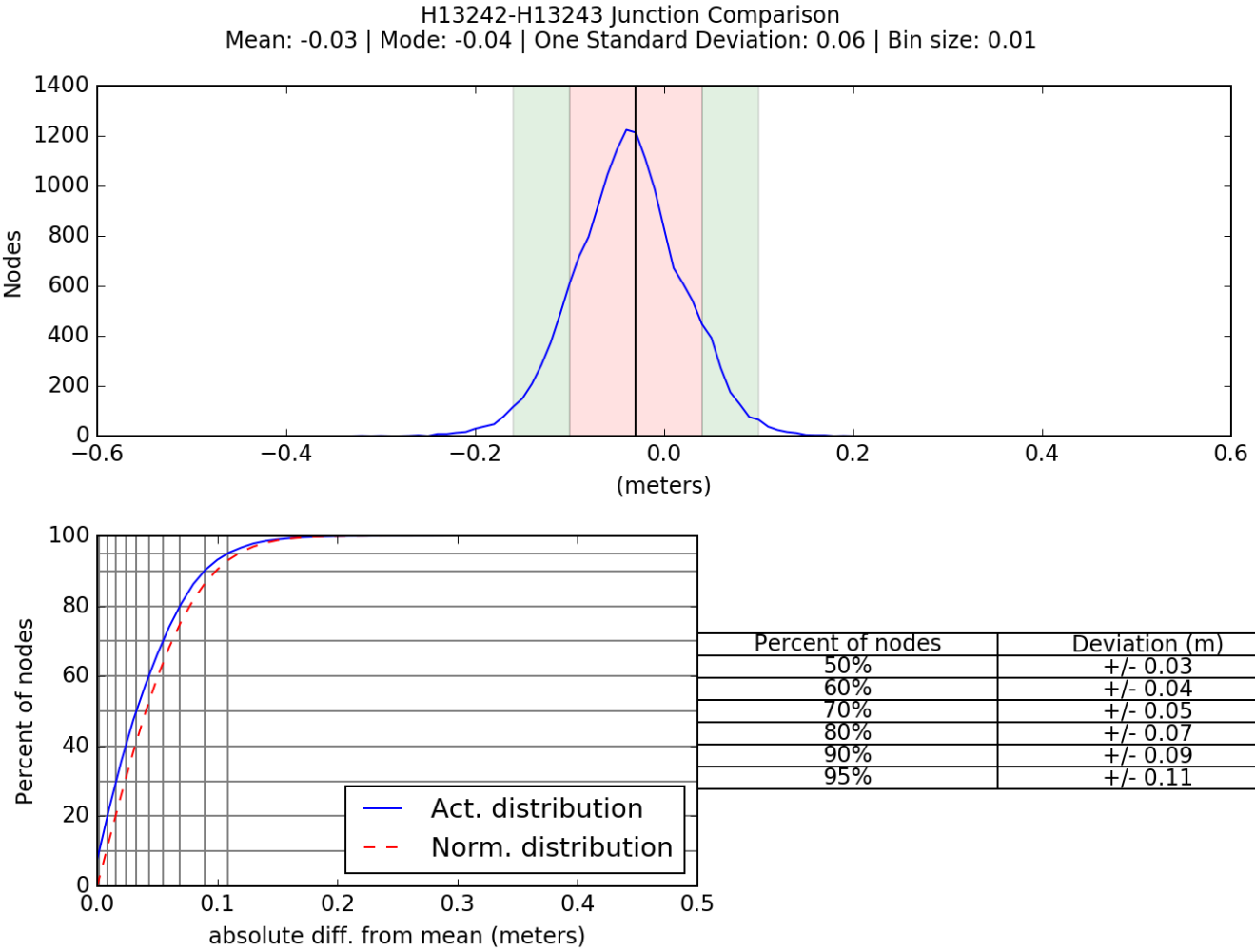


Figure 8: Difference surface between H13242 (blue) and H13243 (pink)



Percent of nodes	Deviation (m)
50%	+/- 0.03
60%	+/- 0.04
70%	+/- 0.05
80%	+/- 0.07
90%	+/- 0.09
95%	+/- 0.11

Figure 9: Difference surface statistics between H13242 and H13243

H13244

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the surface from H13242 and the surface from H13244 (Figure 10). The statistical analysis of the difference surface shows a mean of 0.02 meters with 95% of the nodes having a maximum deviation of +/- 0.13 meters, as seen in Figure 11. It was found that 100% of nodes are within NOAA allowable uncertainty.

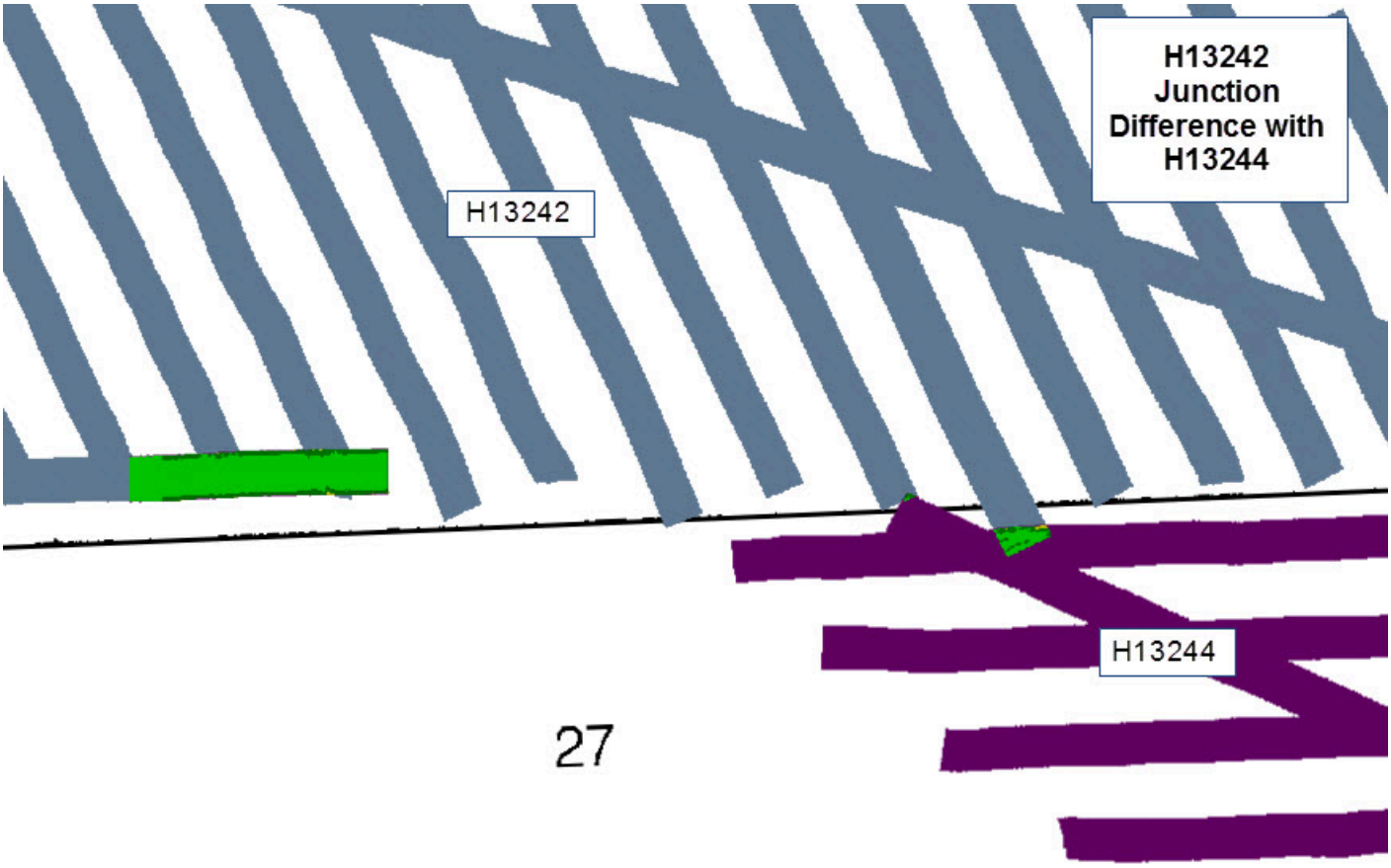
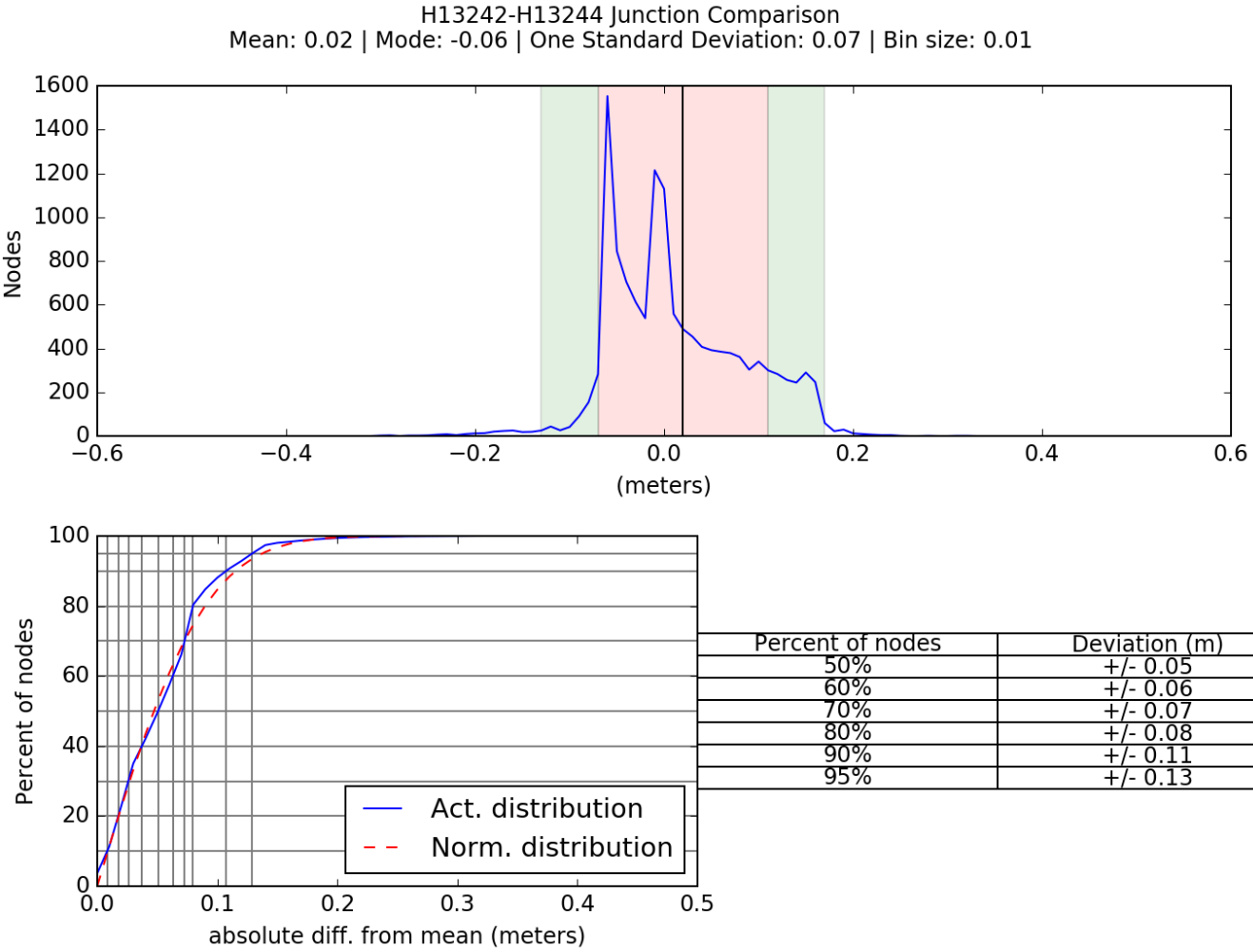


Figure 10: Difference surface between H13242 (blue) and H13244 (purple)



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.08
90%	+/- 0.11
95%	+/- 0.13

Figure 11: Difference surface statistics between H13242 and H13244

B.2.4 Sonar QC Checks

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

B.2.5 Equipment Effectiveness

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

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: MVP casts on S220 were conducted at an average interval of 65 minutes guided by observation of the surface sound speed. 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 NOAA Allowable Uncertainty

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, greater than 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13242, as seen in Figure 12 below.

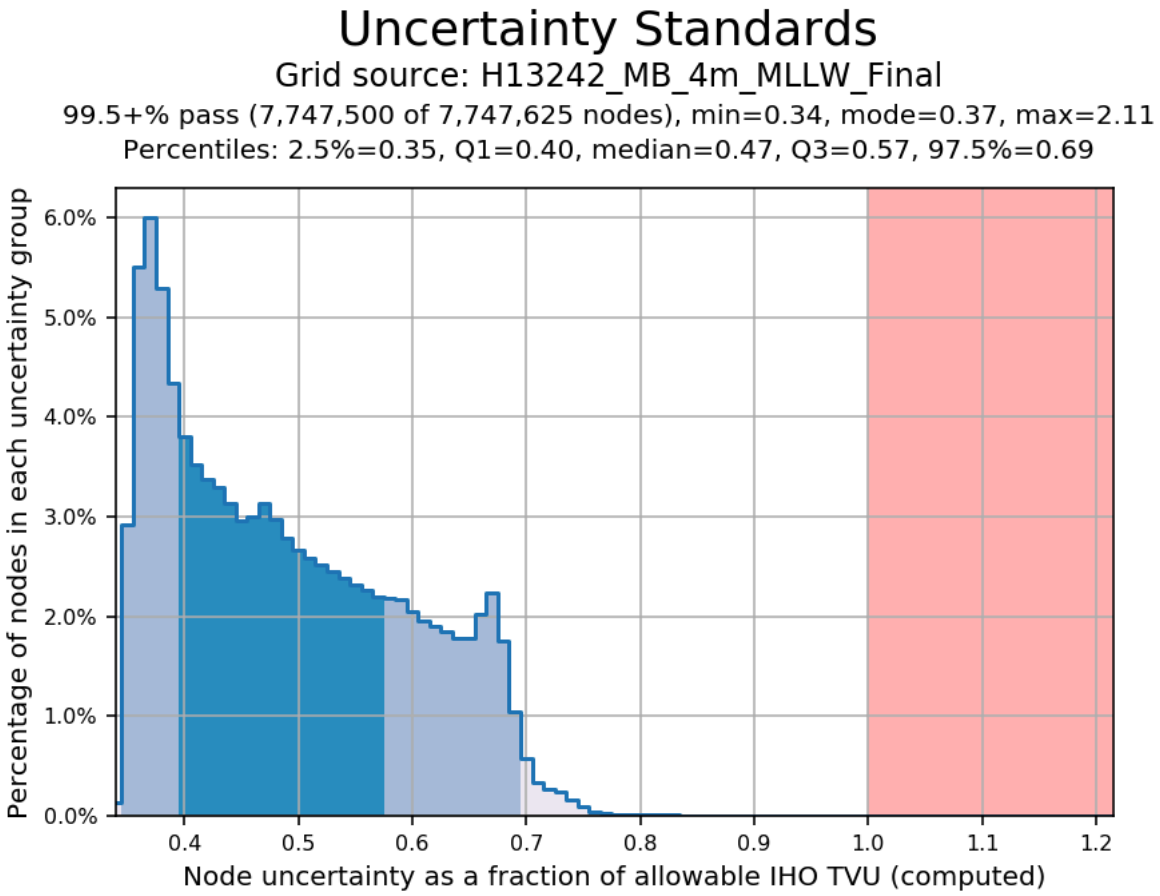


Figure 12: H13242 uncertainty compliance

B.2.10 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13242 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.4, as seen in Figure 13 below.

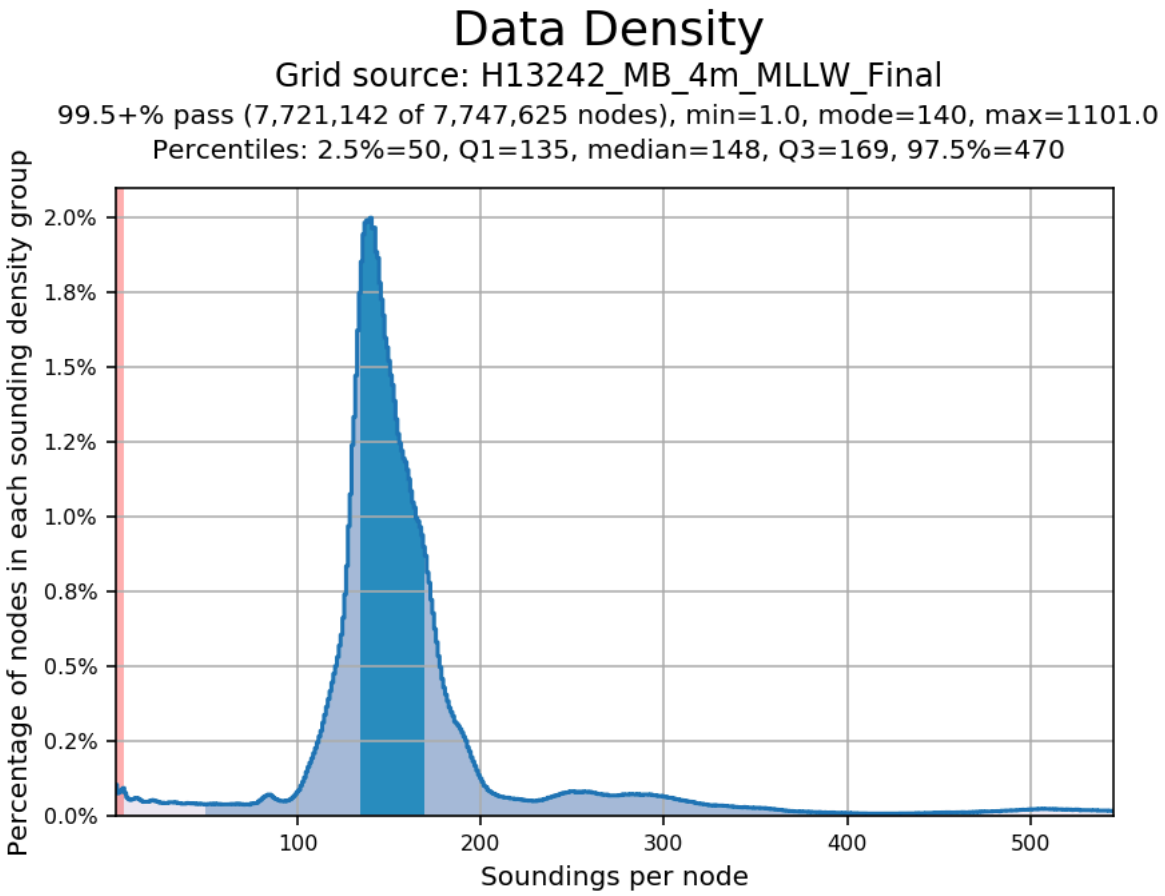


Figure 13: H13242 density compliance

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data were stored in the .all file for Kongsberg systems. All backscatter were processed to GSF files and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.8.10. See Figure 14 for a greyscale representation of the complete mosaic.

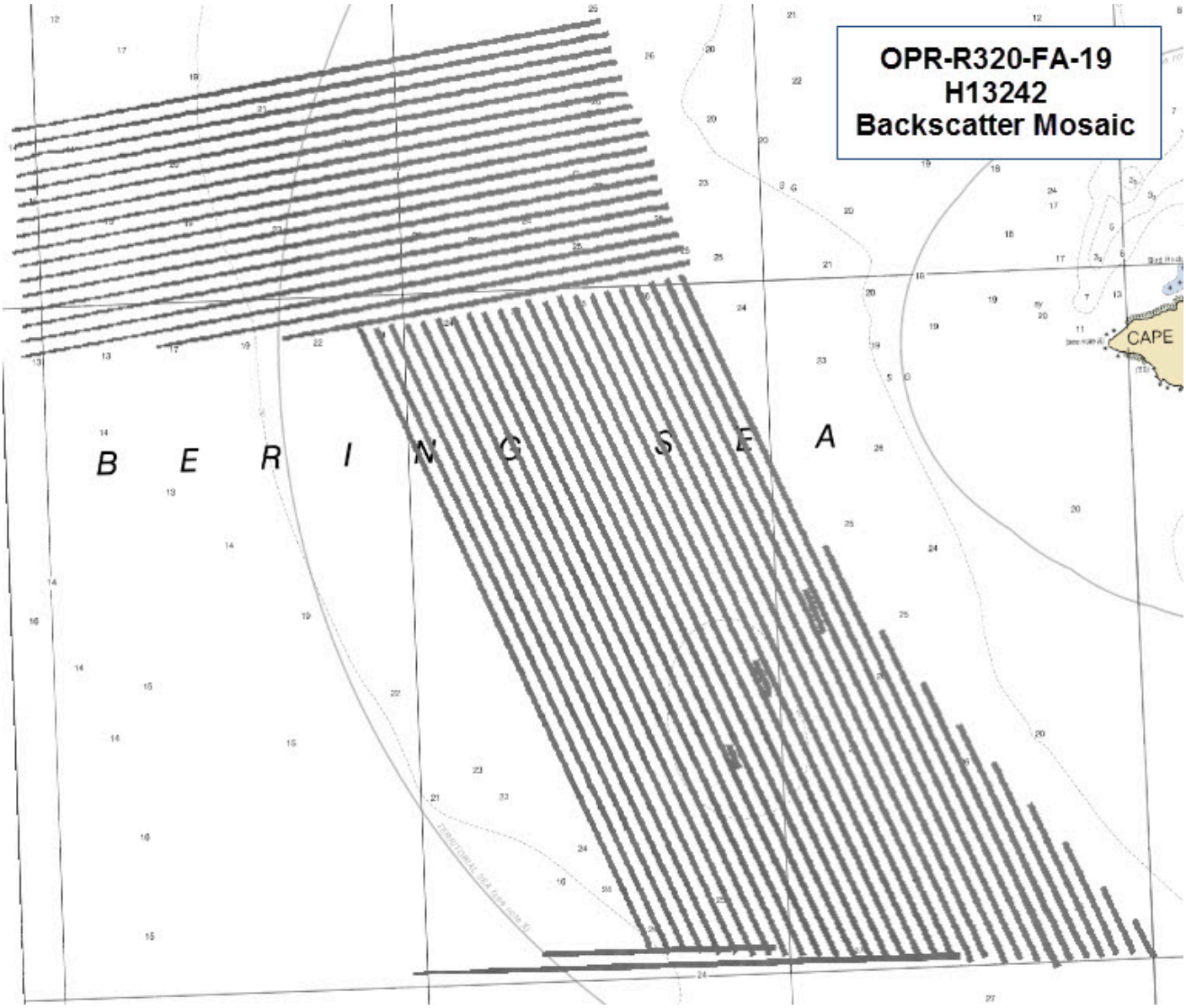


Figure 14: H13242 backscatter mosaic

B.5 Data Processing

B.5.1 Primary Data Processing Software

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

Manufacturer	Name	Version
CARIS	HIPS and SIPS	11.1.3

Table 10: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus	7.8.10

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2019.

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
H13242_MB_4m_MLLW	CARIS Raster Surface (CUBE)	4 meters	22.1 meters - 51.6 meters	NOAA_4m	MBES Set Line Spacing
H13242_MB_4m_MLLW_Final	CARIS Raster Surface (CUBE)	4 meters	22.1 meters - 51.6 meters	NOAA_4m	MBES Set Line Spacing

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13242. 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 seafloor. Where these spurious soundings cause the gridded surface to vary from the reliably measured seabed by greater than the maximum allowable

Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

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

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final separation model reduction and sound speed application are noted in the H13242 Data Log Spreadsheet. All data logs are submitted digitally in the Separates I Folder.

C. Vertical and Horizontal Control

Per Section 5.1.2.3 of the Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13242.

C.1 Vertical Control

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

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via ERTDM	R320FA2019_ERTDM_NAD83-MLLW.csar

Table 13: ERS method and SEP file

ERS methods were used as the final means of reducing H13242 to MLLW for submission.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 3.

The following PPK methods were used for horizontal control:

- RTX

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

WAAS

During real-time acquisition, S220 received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole method of positioning for H13242 as no DGPS stations were available for realtime horizontal control.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between H13242 and ENC US4AK86M using CARIS HIPS and SIPS. Sounding and contour layers were overlaid onto the ENC to assess differences between the surveyed soundings and charted depths. The ENC was compared to the surface by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface from H13242.

All data from H13242 should supersede charted data. In general, surveyed soundings agree with the charted depths. A full discussion follows below.

D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US4AK86M	1:100000	5	12/27/2017	12/27/2017	NO

Table 14: Largest Scale ENCs

US4AK86M

Soundings from H13242 are in general agreement with charted depths on ENC US4AK86M, with most depths agreeing to 3 meters as shown in Figure 15. The largest differences are seen in the southern part of the survey area where there are few charted soundings. Splits were run in conjunction with HSSD Section 5.2.2.1 where the charted soundings were shoaler than the adjacent survey soundings. The shoal soundings were disproved by the splits and the surveyed soundings were deeper than what was charted.

Contours from H13242 are in general disagreement with charted contours on ENC US4AK86M as shown in Figure 16. The charted 20 fathom contour in the southern area of H13242 does not exist.

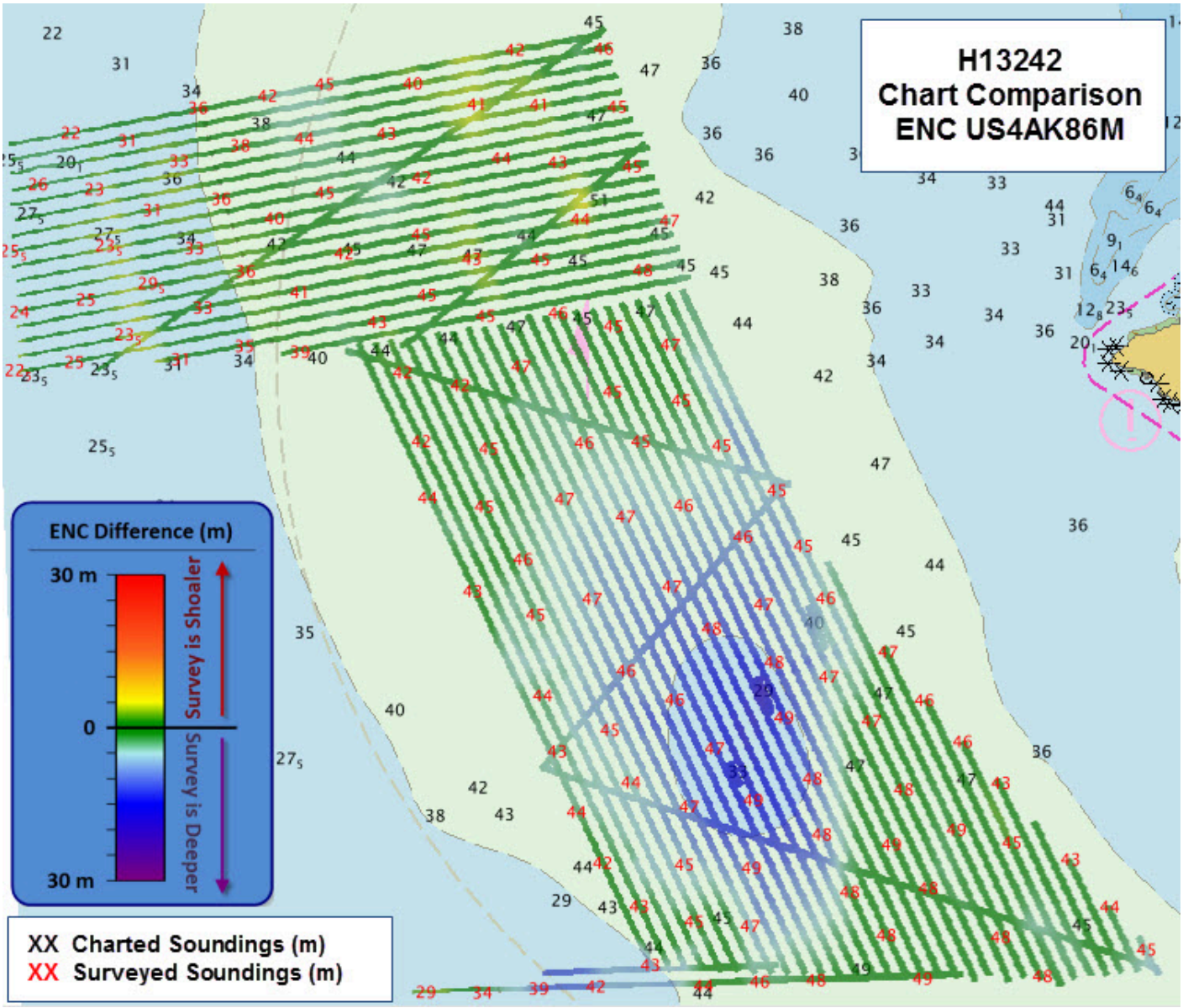
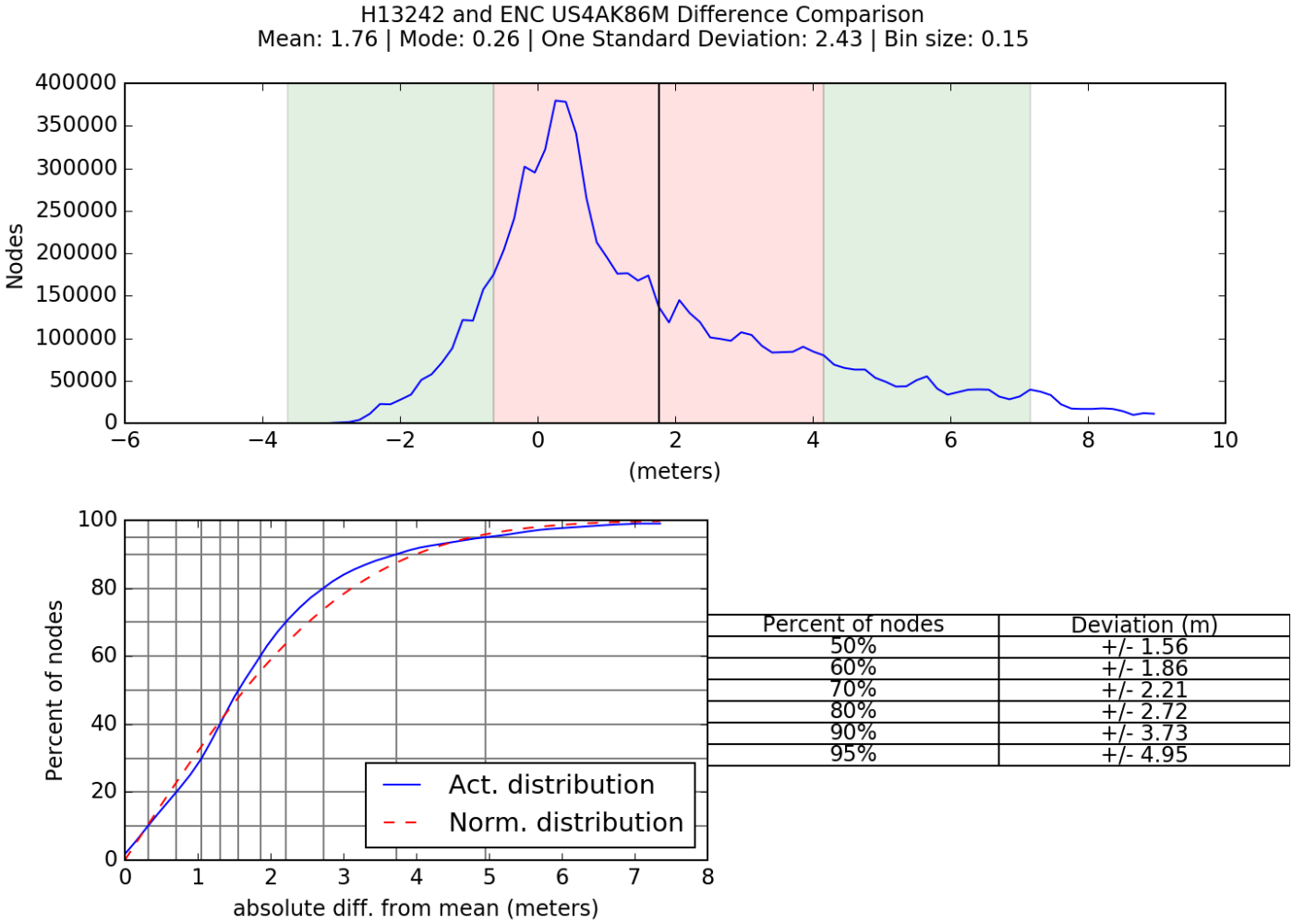


Figure 15: Difference surface between H13242 and interpolated TIN surface from ENC US4AK86M



Percent of nodes	Deviation (m)
50%	+/- 1.56
60%	+/- 1.86
70%	+/- 2.21
80%	+/- 2.72
90%	+/- 3.73
95%	+/- 4.95

Figure 16: Difference surface statistics between H13242 and interpolated TIN surface from ENC US4AK86M

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.6 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.1.7 Bottom Samples

Six bottom samples were acquired for survey H13242. All bottom samples were entered in the H13242 Final Feature File. See Figure 17 for a graphical overview of sample locations.

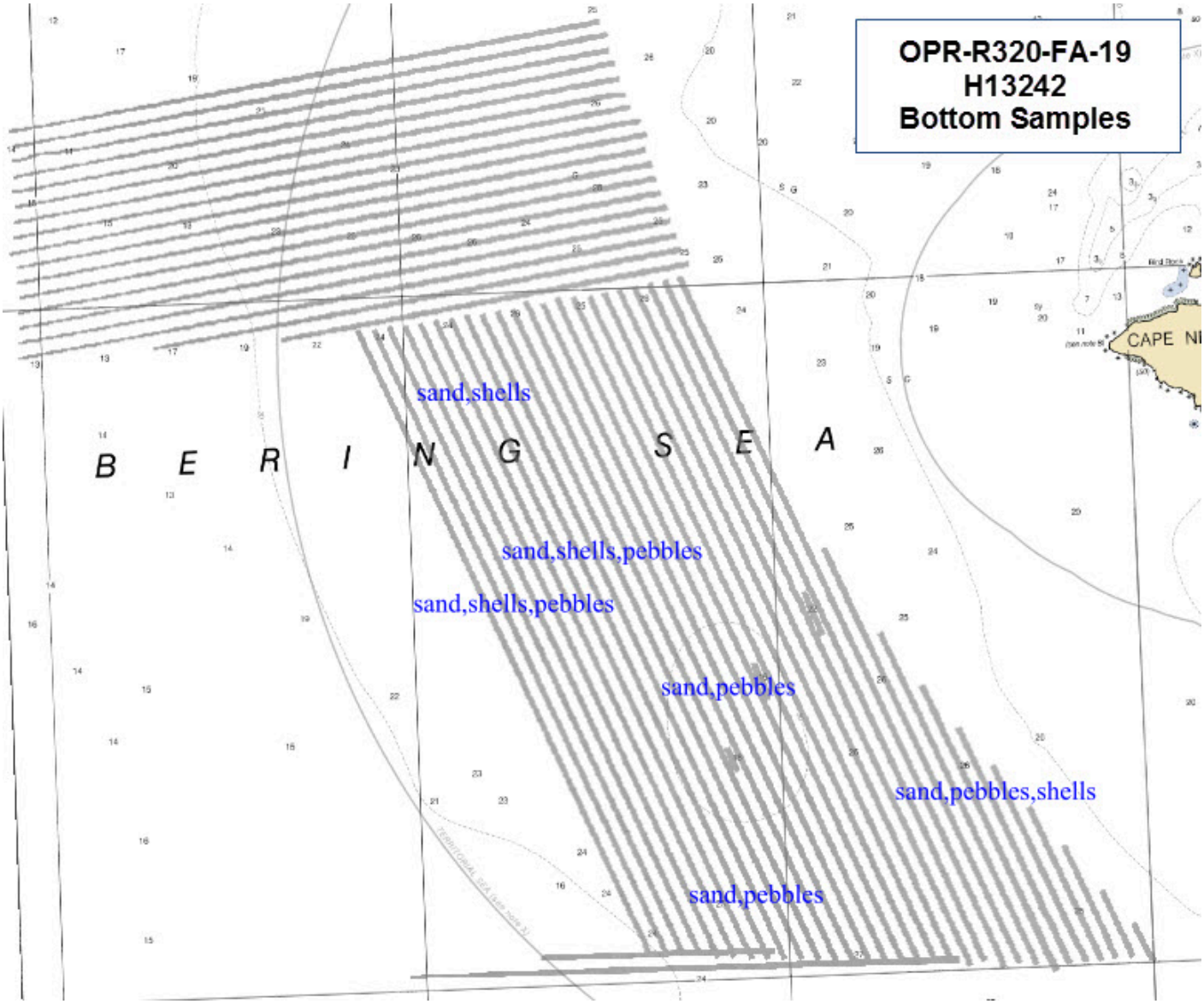


Figure 17: H13242 bottom sample locations overlaid onto the backscatter mosaic

D.2 Additional Results

D.2.1 Shoreline

Shoreline was assigned in the Hydrographic Survey Project Instructions, however no assigned features exist for this survey.

D.2.2 Aids to Navigation

No Aids to navigation (ATONs) exist for this survey.

D.2.3 Overhead Features

No overhead features exist for this survey.

D.2.4 Submarine Features

No submarine features exist for this survey.

D.2.5 Platforms

No platforms exist for this survey.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Abnormal Seafloor and/or Environmental Conditions

No abnormal seafloor and/or environmental conditions exist for this survey.

D.2.8 Construction and Dredging

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

D.2.9 New Survey Recommendation

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

D.2.10 Inset Recommendation

No new insets are recommended for this area.

E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
CAPT Marc Moser	Chief of Party	10/01/2019	MOSER.MARC.STANTON.1163193902 Digitally signed by MOSER.MARC.STANTON.1163193902 Date: 2019.10.01 14:21:51 -07'00'
LT Steve Moulton	Field Operations Officer	10/01/2019	MOULTON.STEPHEN.F.1282116835 Digitally signed by MOULTON.STEPHEN.F.1282116835 Date: 2019.10.01 13:12:43 -07'00'
CHST Samuel Candio	Chief Survey Technician	10/01/2019	
HSST Rebekah Gossett	Sheet Manager	10/01/2019	GOSSETT.REBEKAH.ROSE.1379960096 Digitally signed by GOSSETT.REBEKAH.ROSE.1379960096 Date: 2019.10.01 12:40:11 -07'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continuously Operating Reference Station
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERTDM	Ellipsoidally Referenced Tidal Datum Model
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division

Acronym	Definition
HSSD	Hydrographic Survey Specifications and Deliverables
HSTB	Hydrographic Systems Technology Branch
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NALL	Navigable Area Limit Line
NTM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

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

APPROVAL PAGE

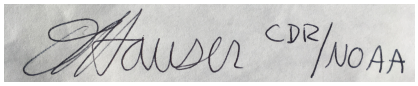
H13242

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- Bottom samples
- GeoPDF of survey products

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.



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Approved:_____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch