H12840

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12840

LOCALITY

State(s):	North Carolina
General Locality:	Approaches to Chesapeake Bay
Sub-locality:	30 Miles East of Currituck Beach

2015

CHIEF OF PARTY
CDR Marc S. Moser, NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H12840**

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):	**North Carolina**
General Locality:	**Approaches to Chesapeake Bay**
Sub-Locality:	**30 Miles East of Currituck Beach**
Scale:	**40000**
Dates of Survey:	**08/22/2015 to 10/17/2015**
Instructions Dated:	**07/24/2015**
Project Number:	**OPR-D304-FH-15**
Field Unit:	**NOAA Ship *Ferdinand R. Hassler***
Chief of Party:	**CDR Marc S. Moser, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic 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 https://www.ncei.noaa.gov/.

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Descriptive Report to Accompany Survey H12840

Project: OPR-D304-FH-15

Locality: Approaches to Chesapeake Bay

Sublocality: 30 Miles East of Currituck Beach

Scale: 1:40000

August 2015 - October 2015

NOAA Ship *Ferdinand R. Hassler*

Chief of Party: CDR Marc S. Moser, NOAA

A. Area Surveyed

Survey H12840 was conducted near the approaches to Chesapeake Bay, with a sublocality of 30 miles East of Currituck Beach as shown in Figure 1.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
36° 29' 59.14" N 75° 24' 0.39" W	36° 11' 57.82" N 75° 18' 22.18" W

Table 1: Survey Limits

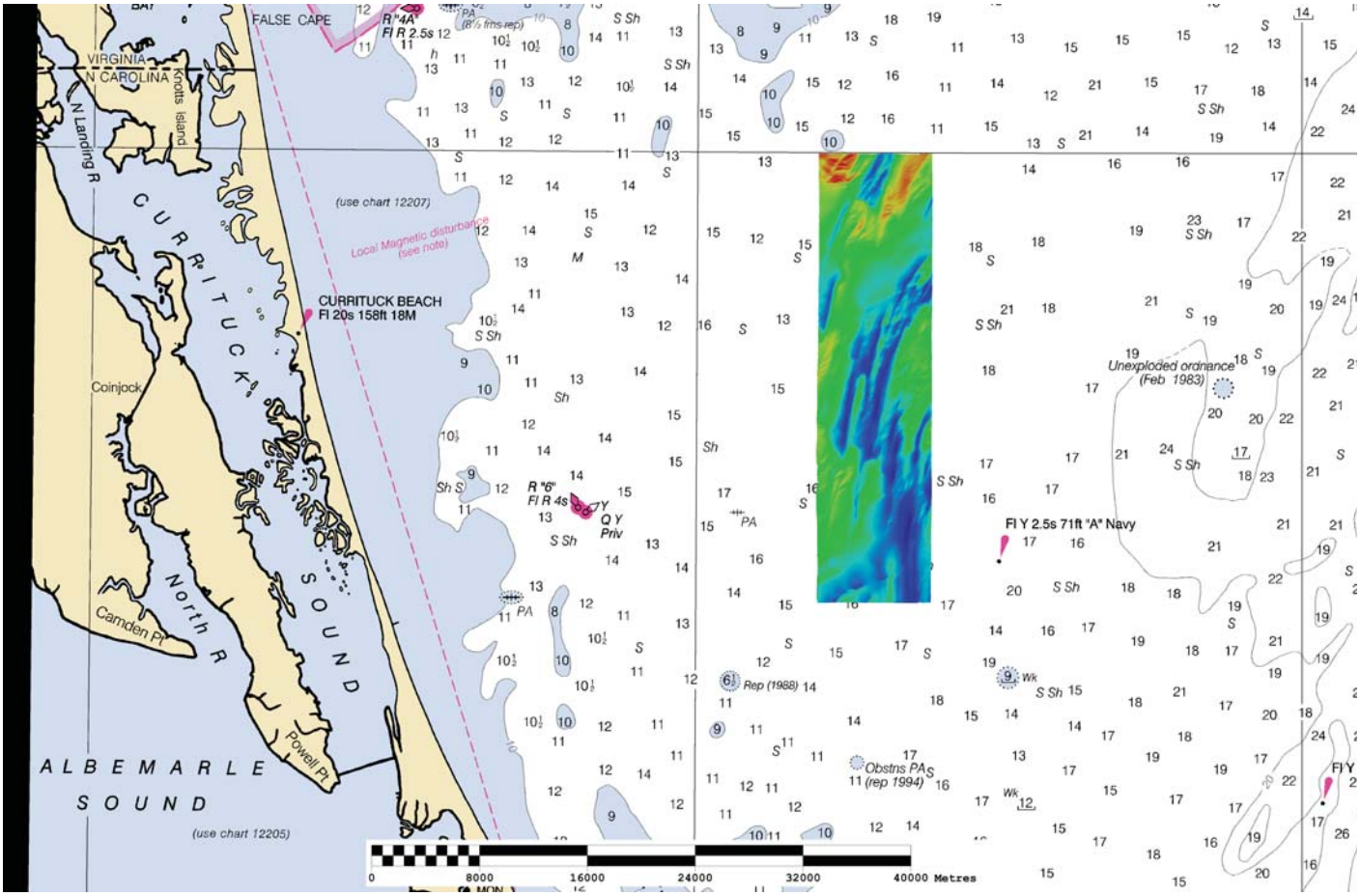


Figure 1: H12840 survey limits

Survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The purpose of this project is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products. In addition, this project will improve the chart for traffic navigating the Atlantic Ocean Channel and will support BOEM research in the area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

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 MBES with backscatter.

Survey coverage was in accordance with the requirements listed above and in the HSSD.

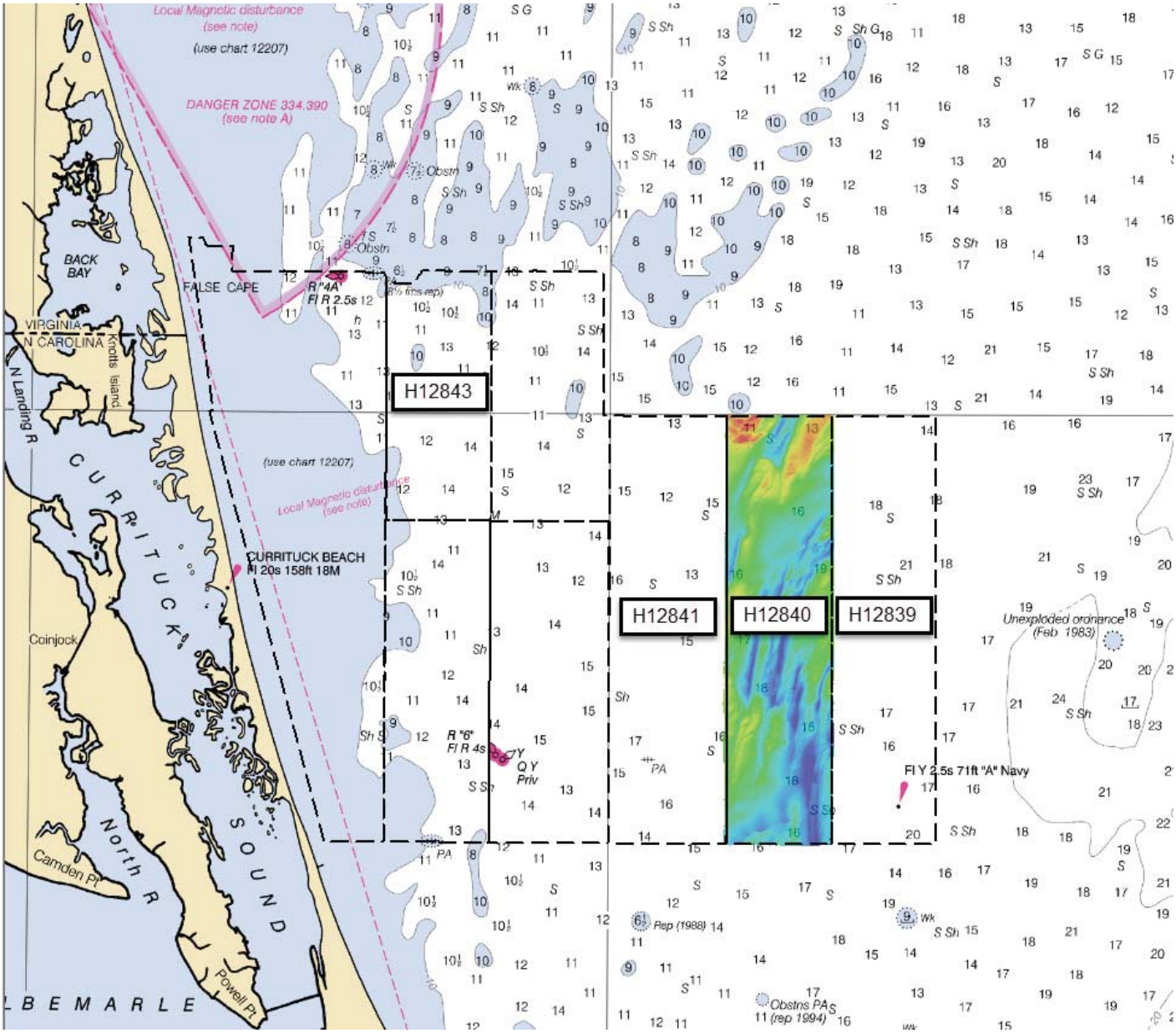


Figure 2: Survey layout for OPR-D304-FH-15 over raster chart 12200

A.5 Survey Statistics

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

	HULL ID	*S250*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	1395.94	1395.94
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	72.91	72.91
	Lidar Crosslines	0	0
Number of Bottom Samples			9
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			82.26

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/22/2015	234
08/23/2015	235
08/24/2015	236
08/25/2015	237
08/26/2015	238
08/27/2015	239
09/03/2015	246
09/04/2015	247
09/05/2015	248
09/06/2015	249
09/07/2015	250
09/10/2015	253
09/18/2015	261
09/19/2015	262
10/17/2015	290

Table 3: Dates of Hydrography

Mainscheme survey lines were run with a dual-head multibeam echosounder. Linear nautical miles were calculated using statistics from the port head.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***S250***
LOA	37.7 meters
Draft	3.77 meters

Table 4: Vessels Used

Figure 3: NOAA Ship FERDINAND R. HASSLER

NOAA Ship FERDINAND R. HASSLER (S250), shown in Figure 3, acquired all surveyed soundings during operation for H12840

B.1.2 Equipment

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

Manufacturer	Model	Type
RESON	7125	MBES
Applanix	POS M/V 320 V5	Positioning and Attitude System
Hemisphere	MBX-4	Sound Speed System
AML	MicroCTD	Sound Speed System
Brooke Ocean	MVP-200	Sound Speed System
RESON	SVP-70	Sound Speed System
Sea Bird	SBE 19+	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 5.22% of mainscheme acquisition.

Multibeam crosslines were acquired using dual head RESON 7125s on DN253. A geographic plot of crosslines is shown in Figure 4. Crosslines were filtered to remove soundings greater than 45 degrees from nadir. To evaluate crossline agreement, two 2-meter surfaces were created: one from crossline bathymetry, the other from mainscheme bathymetry. These two surfaces were differenced using CARIS HIPS and SIPS. The statistical analysis of the differences between the mainscheme and crossline surfaces is shown in Figure 5. The average difference between the surfaces is 0.03 meters with a standard deviation of 0.09 meters. Ninety-five percent of nodes are within +/- 0.13 meters of the mean.

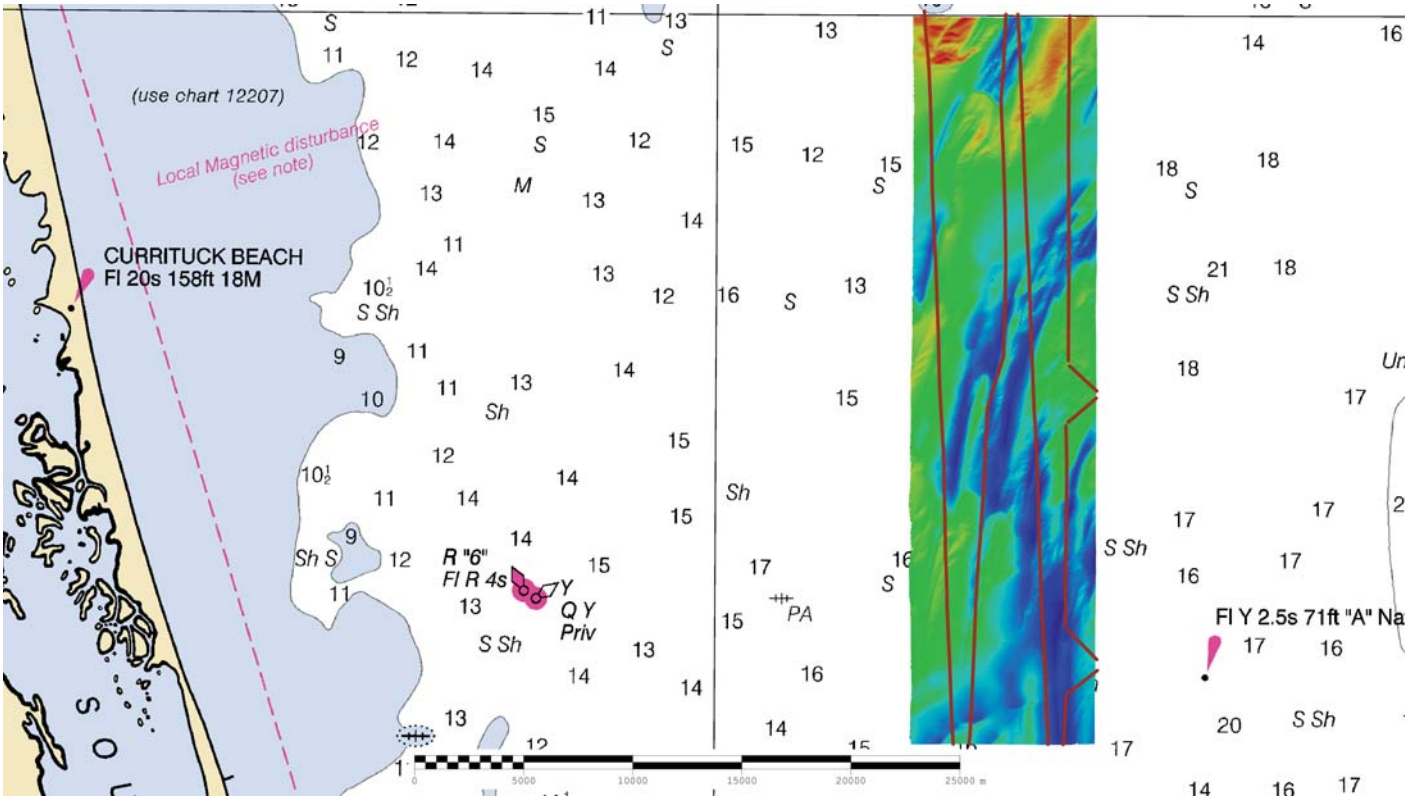
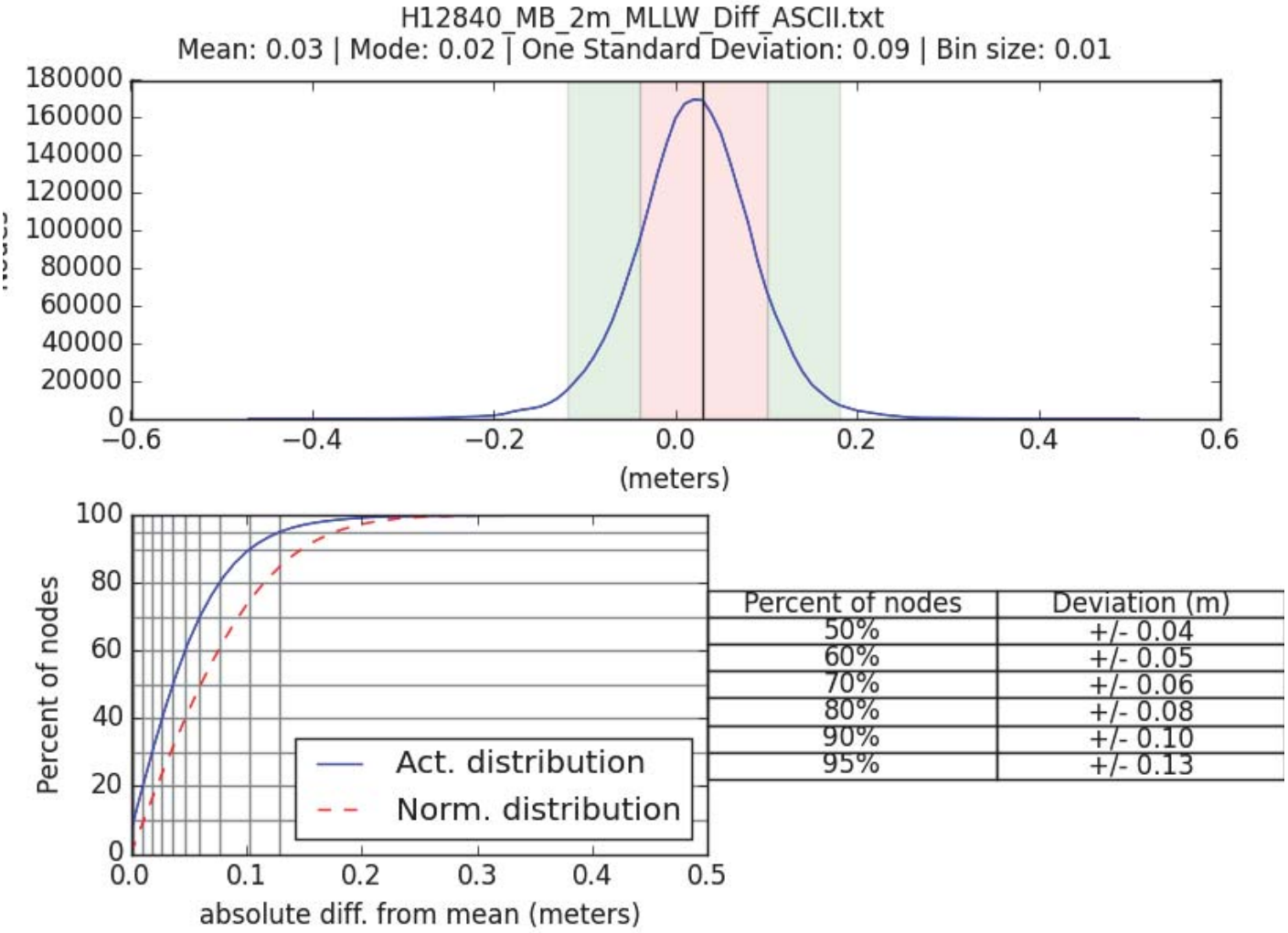


Figure 4: Location of crosslines for H12840.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.08
90%	+/- 0.10
95%	+/- 0.13

Figure 5: Statistics of the difference surface between the mainscheme and crosslines.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning	Method
0.01 meters	0.102 meters	VDATUM

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
S250	1.0 meters/second	1.0 meters/second	0.5 meters/second

Table 7: Survey Specific Sound Speed TPU Values

Two tidal models were available for water level corrections associated with survey H12840. A discrete tide zone file, produced by CO-OPS for project OPR-B304-FH-15, was provided to the field unit. Additionally, a vertical datum transformation (VDatum) model was delivered to the field unit in the project instructions. All data for survey H12840 were reduced to MLLW via VDatum. This model functioned as a gridded separation model for GPS tide computations with a 0.081 meter uncertainty. Final TPU calculations are derived from the following sources: VDatum separation model, sound velocity (MVP and surface sound velocimeter), HVF uncertainties, and SBET post processed uncertainty.

B.2.3 Junctions

There were two surveys that junctioned with sheet H12840

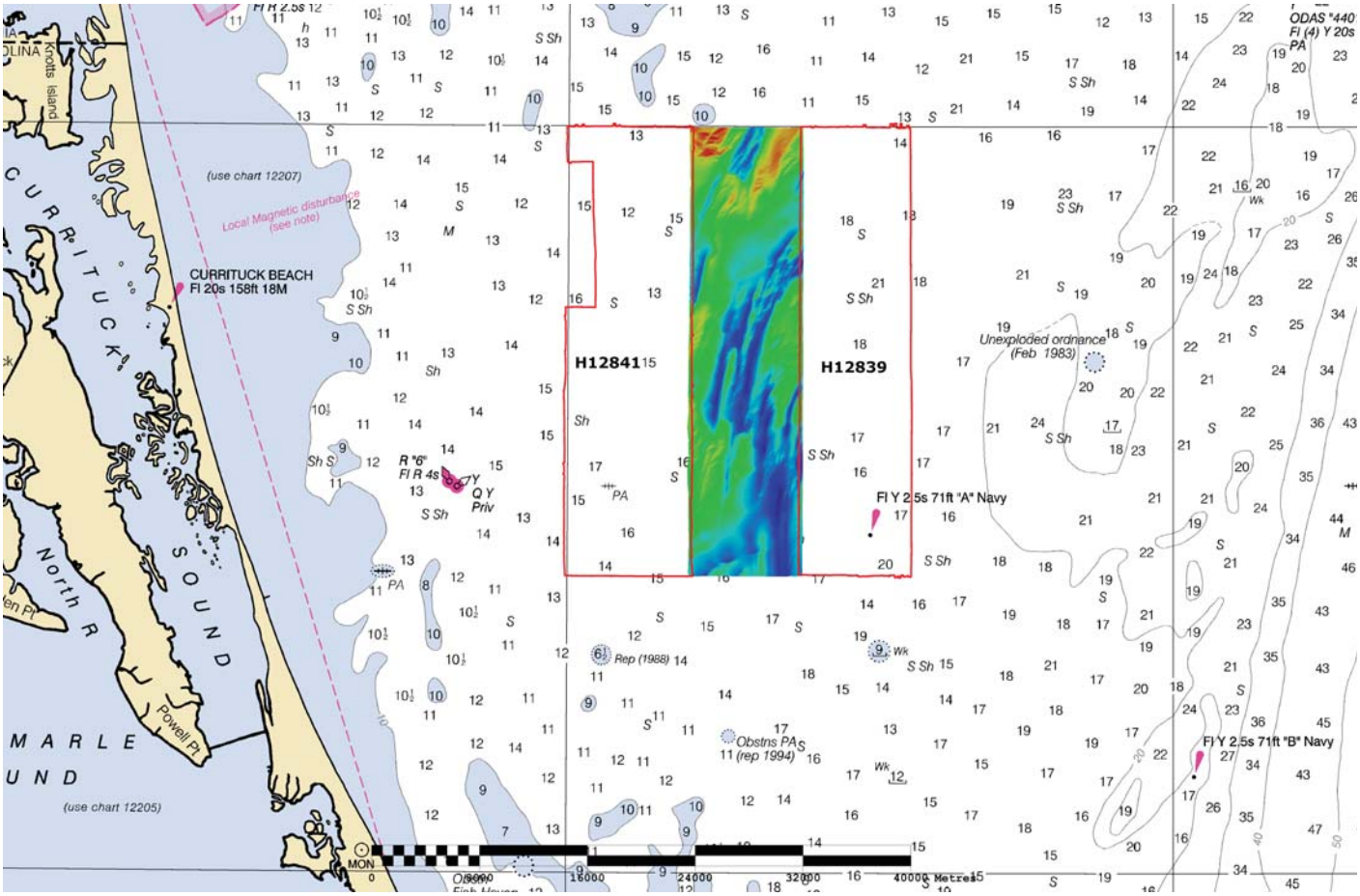


Figure 6: H12840 Junction Surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12839	1:40000	2015	NOAA Ship FERDINAND R. HASSLER	E
H12841	1:40000	2015	NOAA Ship FERDINAND R. HASSLER	W

Table 8: Junctioning Surveys

H12839

To evaluate junction survey agreement, the 2-meter surfaces were differenced using CARIS HIPS and SIPS. The statistical analysis of the differences between the H12840 and H12839 surfaces is shown in Figure 8. The average difference between the surfaces is -0.14 meters with a standard deviation of 0.09. Ninety-five percent of nodes fall within +/- 0.17 meters from the mean.

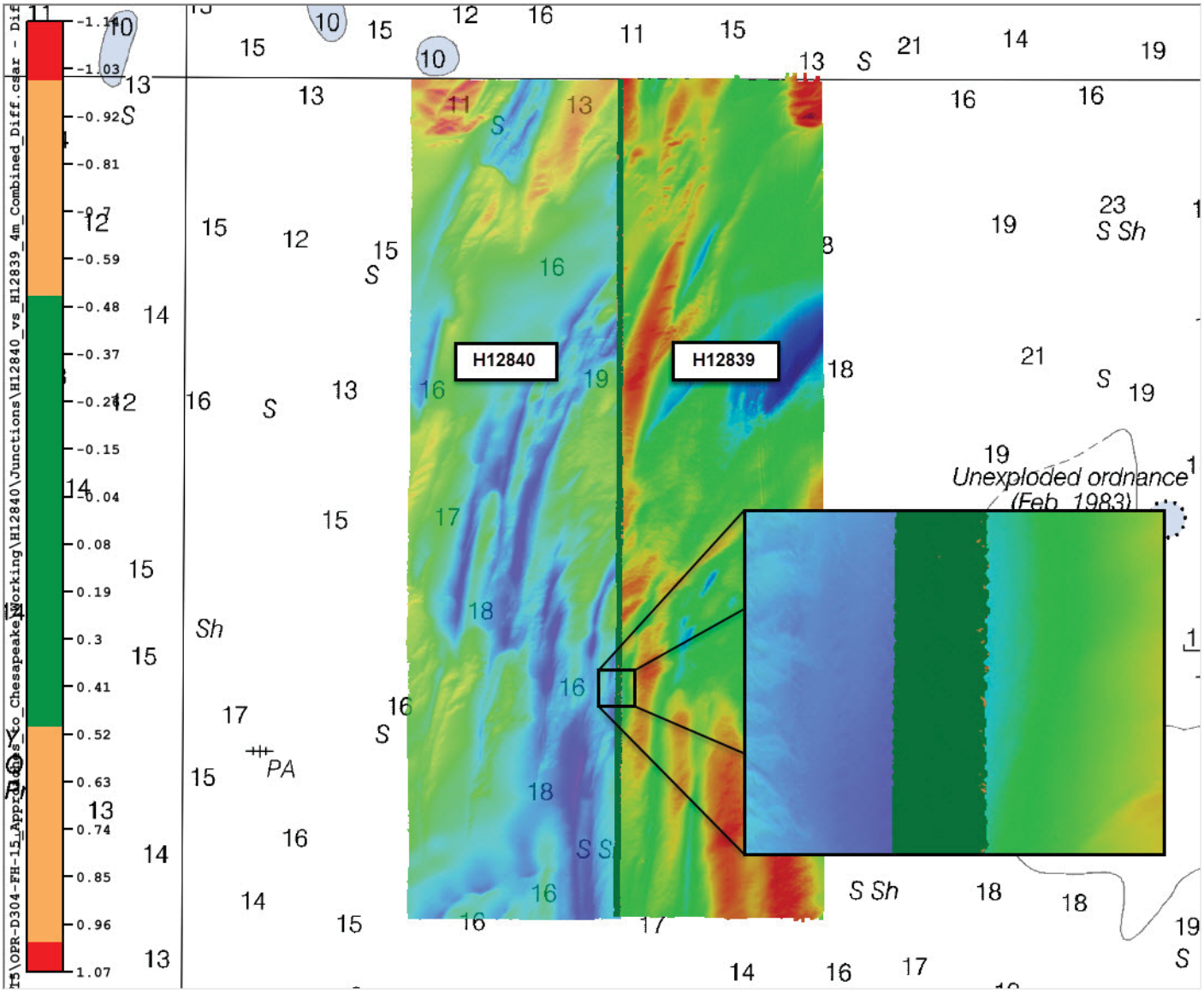
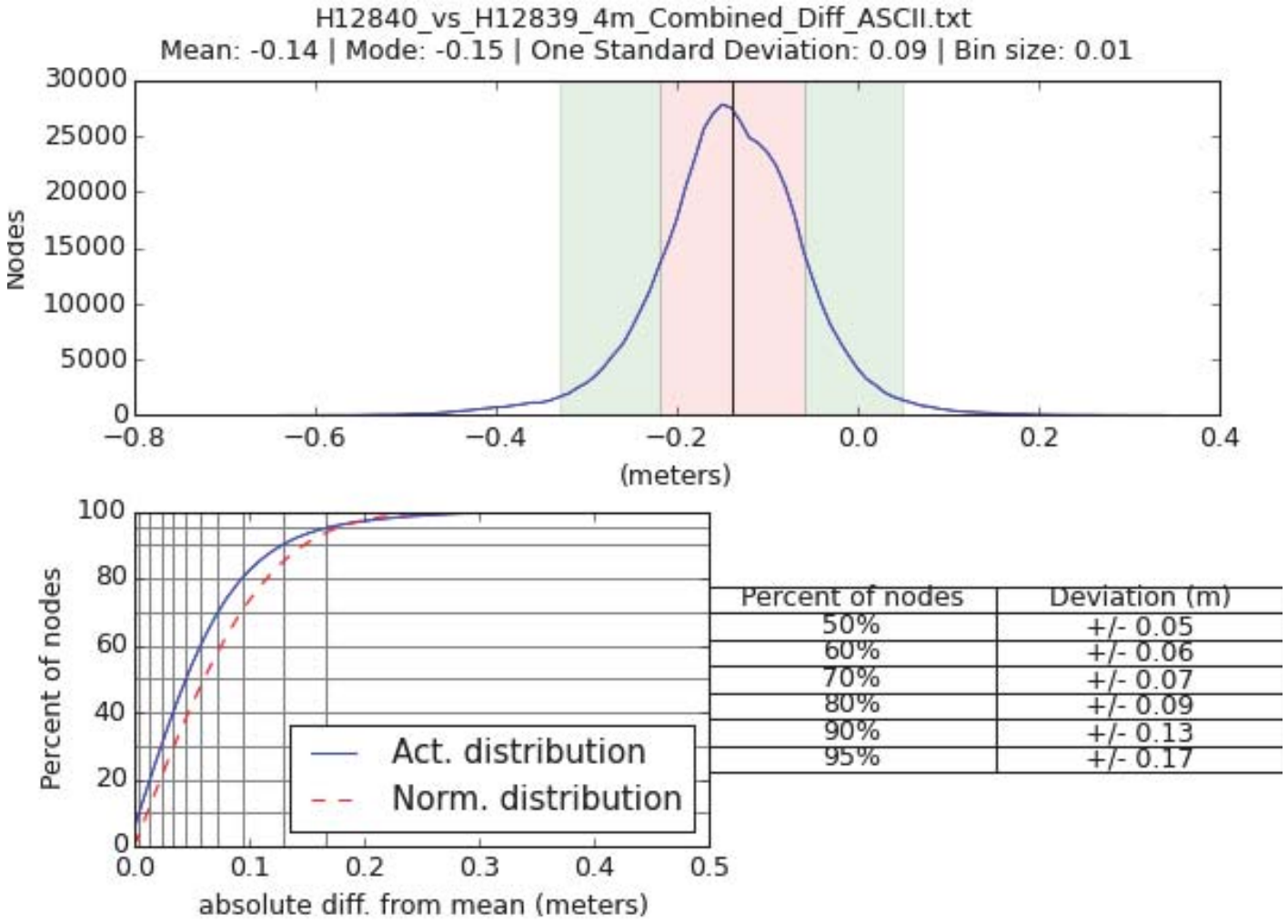


Figure 7: Junctioning area of survey H12840 and H12839



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.13
95%	+/- 0.17

Figure 8: Difference surface statistics of H12840 minus H12839

H12841

To evaluate junction survey agreement, the 2-meter surfaces were differenced using CARIS HIPS and SIPS. The statistical analysis of the differences between the H12840 and H12841 surfaces is shown in Figure 10. The average difference between the surfaces is -0.01 meters with a standard deviation of 0.09. Ninety-five percent of nodes fall within +/- 0.17 meters from the mean.

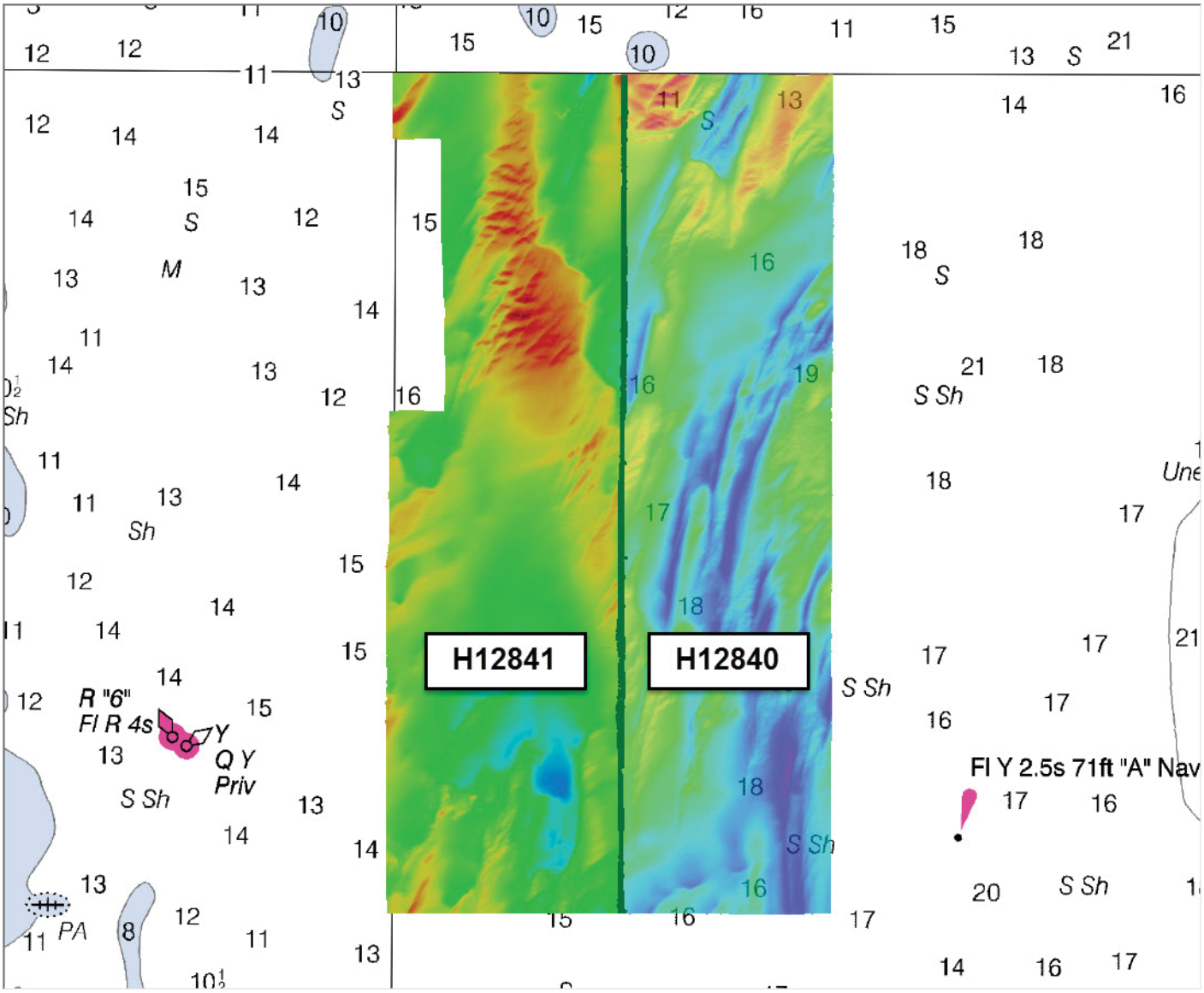
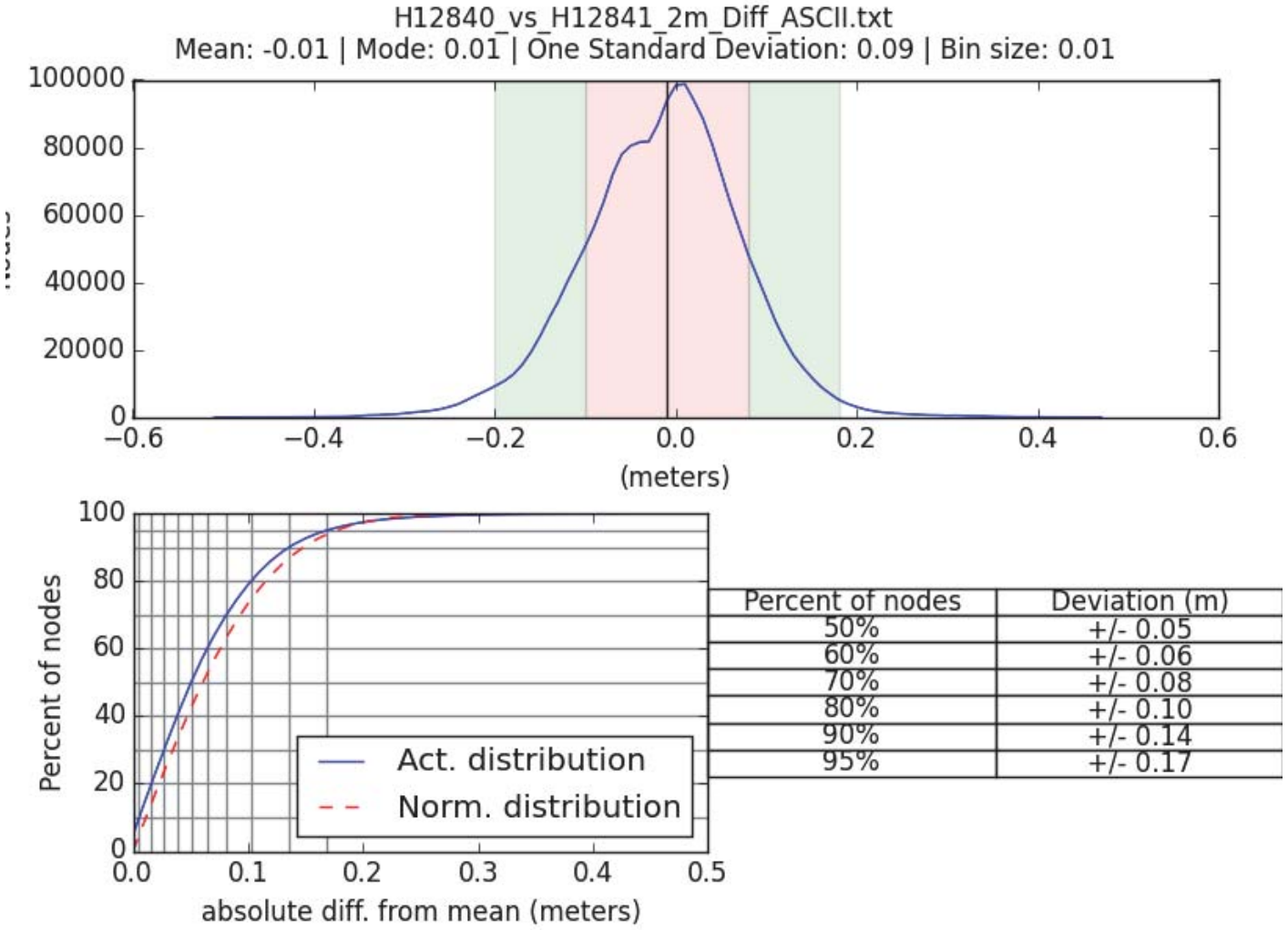


Figure 9: Junctioning area of survey H12840 and H12841



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.08
80%	+/- 0.10
90%	+/- 0.14
95%	+/- 0.17

Figure 10: Difference surface statistics of H12840 minus H12841

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

Static Two-Way Travel Time Offset

For reasons unknown, the port Reson 7125 developed a static two-way travel time offset equating to a depth error of 0.47m. The problem disappeared after rebooting the system but data collected on the port system beginning with line 000_1048 from DN 247 up until line 000_1439 on DN 249 were affected with this offset. The Ferdinand Hassler chose to re-acquire the data instead of applying a static offset to correct for the two-way travel time error. The new data was collected on DN 261 and 262.

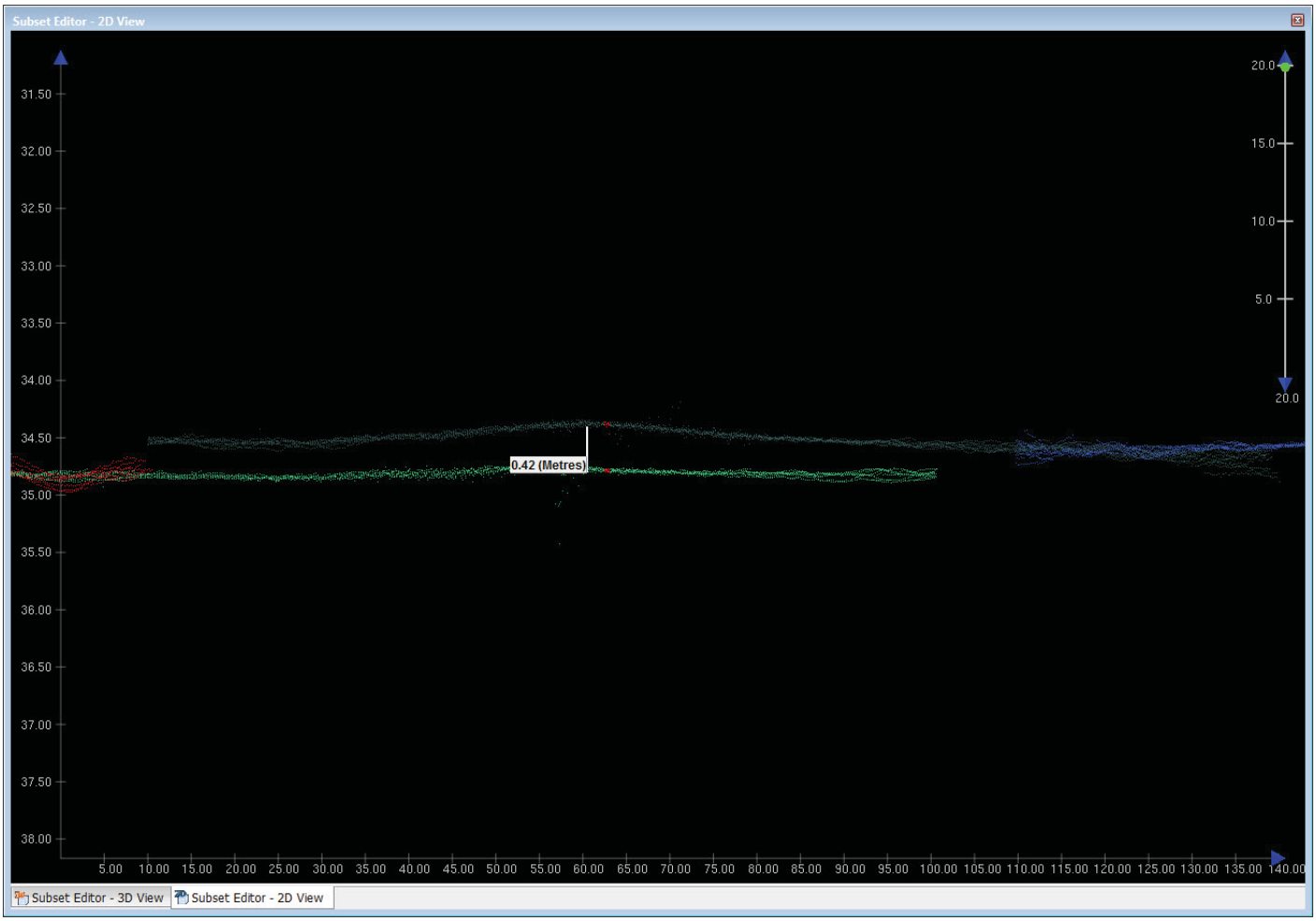


Figure 11: Image displaying 0.47m offset between port and starboard systems.

B.2.6 Factors Affecting Soundings

Acquisition Without Survey Watchstander

The Ferdinand Hassler was sailing without a visiting Physical Scientist on DN 261 and 262. The Hassler requires a visiting PS onboard to stand a 12 hour sonar acquisition watch. Due to time constraints, the ship was forced to acquire data without a survey watchstander at the acquisition machine. During this time, sound speed casts were not taken and the system continued to log through turns. In post processing, data during turns were rejected and the outer beam data were filtered according to cross track distance on the port and starboard side in order to balance achieving full coverage and minimizing effects of sound speed changes. The filter rejected data that appeared greater than 20m to port and greater than 30m to starboard of the trackline.

The reviewer found that this description of events is not entirely accurate. Contrary to the statement in DR Section B.2.6 that casts were not taken, the SVP folder includes one cast on DN261 (MVP_2015-09-18_001841) and one cast on DN262 (MVP_2015-09-19_001319). Contrary to the statements in DR Section B.2.7 that casts were applied using Nearest in Distance (within 1 or 2 hours), cast MVP_2015-09-18_001841 was applied to 9 hours of data on DN261 (10 lines) and cast MVP_2015-09-19_001319 was applied to 5 hours of data on DN262 (6 lines) using the Nearest in Time method.

Despite these issues, the 2015 HSSD does not require a specific cast frequency. As described in 2015 HSSD Section 5.2.3.3, sound speed observations must be taken with sufficient frequency, density, and accuracy to meet the vertical uncertainty requirements in Section 5.1.3, one cast must be taken at the beginning of the acquisition period, and additional casts must be conducted if the surface sound speed sensor value differs from the commensurate cast data by 2 m/s or more. The reviewer has confirmed that the data meet all of these specifications on DN261 and DN262.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Typically sound speed casts were taken every 10-20 minutes due to the strong artifacts seen seen in earlier project data. DN 234 and 235, casts were applied nearest in distance within 1 hour. Subsequent days were processed as nearest in distance within 2 hours. On August 24, 2015, the Ferdinand Hassler lost an MVP during survey operations. During the time between when the MVP was lost and when a new one was installed on August 31, 2015, sound speed casts were taken with the SeaBird CTDs approximately every 1-2 hours.

Some sound speed casts were taken more than the 250m outside the edge of the surveyed area. This occurred due to a mine warfare training field establishment that contained moored training mines that reached up to 30 feet off of the seafloor. To limit the risk of snagging equipment, casts were not performed in the area outlined in Figure 12. Due to sound speed issues that occurred over the course of the project, the hydrographer deemed that occasional casts on the west end of the mine training field were warranted even though they were outside the 250 meter limit stated in the HSSD.

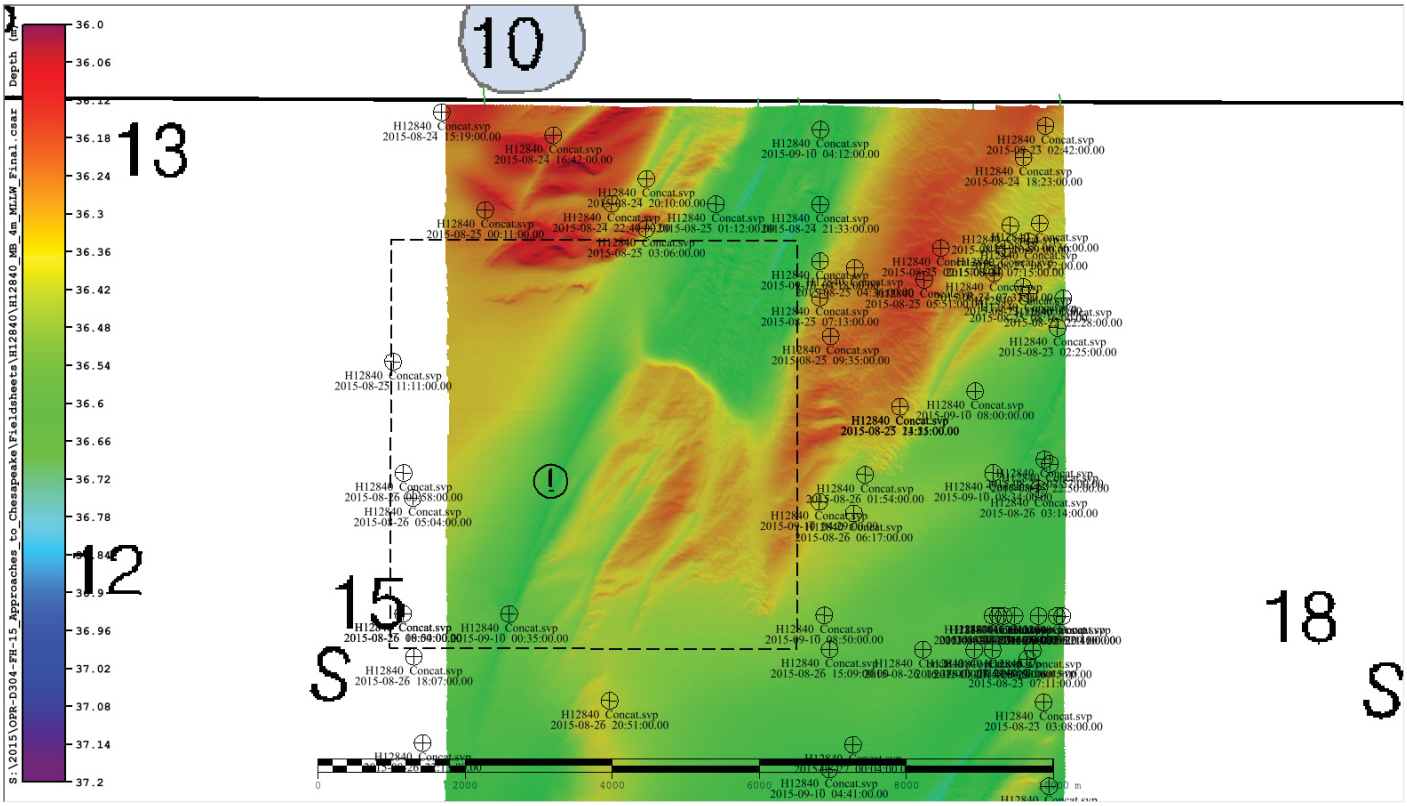


Figure 12: An image of the sound speed casts taken around the mine warfare training field.

B.2.8 Coverage Equipment and Methods

See section "Factors Affecting Soundings" that refers to data acquired without a survey acquisition watchstander.

B.2.9 Data Density Analysis

A density analysis was run to calculate the number of soundings per surface node. The results determined that over 99% of all nodes in both the 1-meter and 2-meter finalized surfaces contain five or more soundings. The density analysis was executed on nodes which are populated by at least one sounding and did not account for holidays located within the surface.

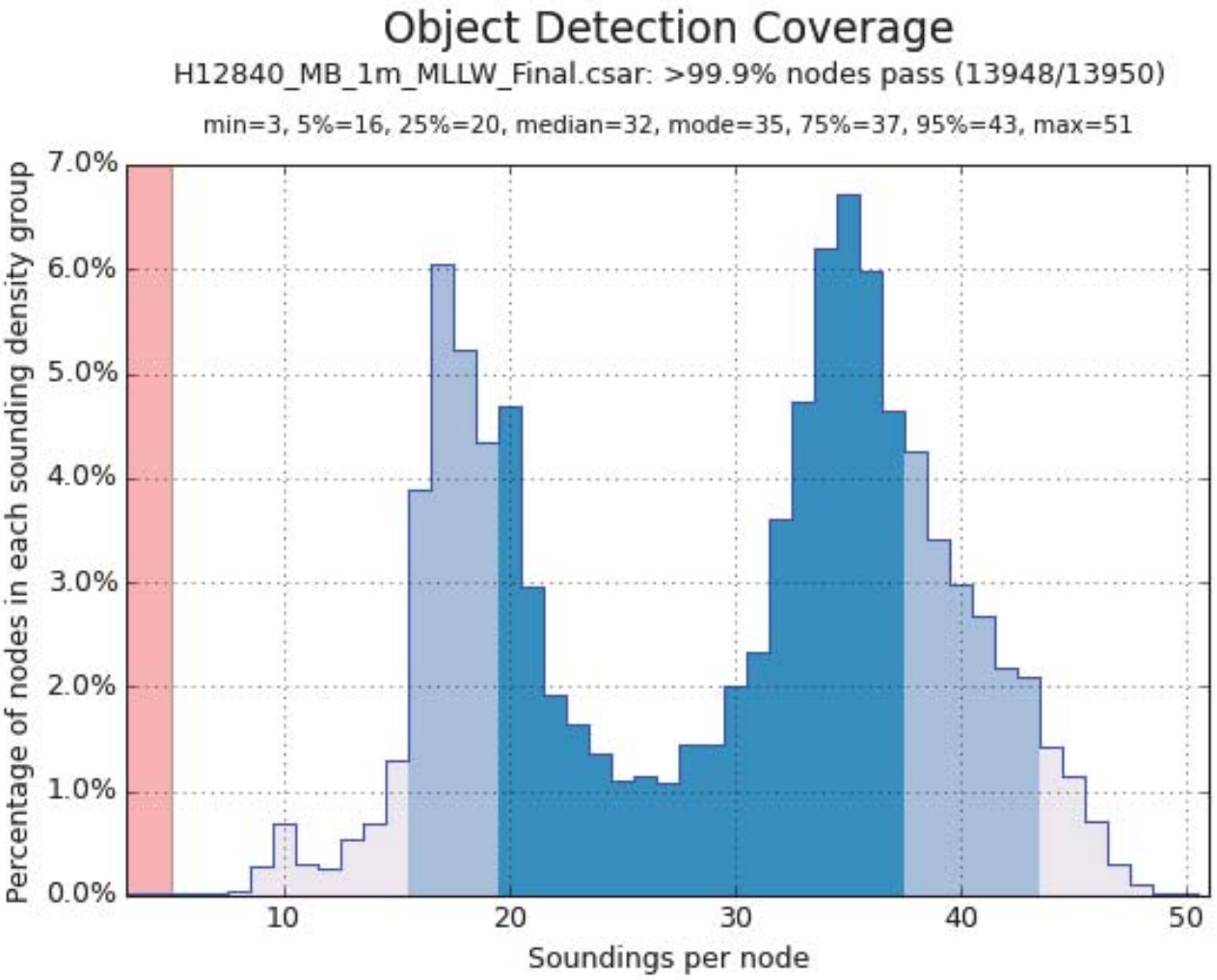


Figure 13: Data density analysis for the 1-meter finalized surface.

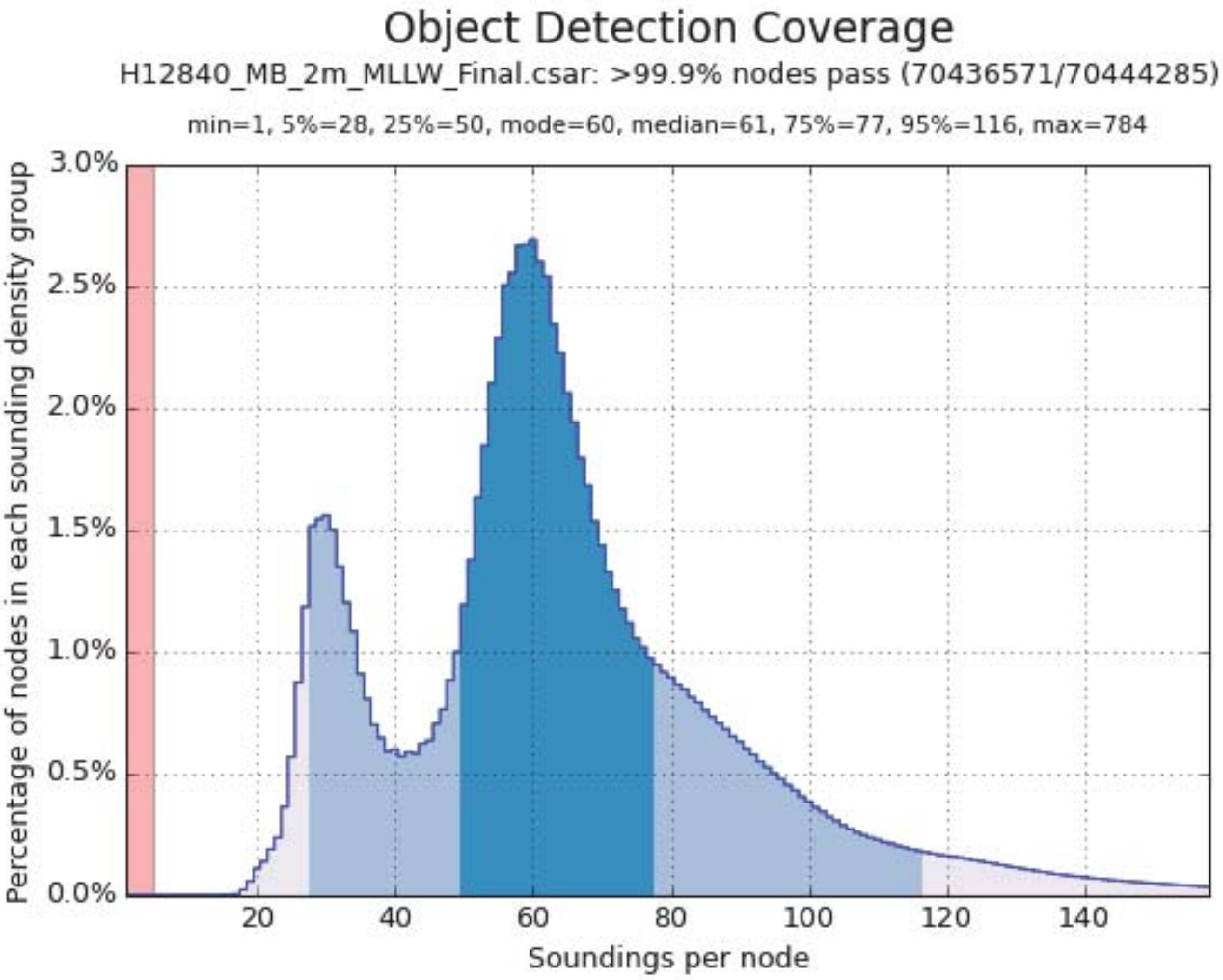


Figure 14: Data density analysis for the 2-meter finalized surface.

B.2.10 Total Vertical Uncertainty Analysis

Pydro's Finalized CSAR QA tool was used to calculate the percentage of nodes which meet total vertical uncertainty (TVU) specifications. The resulting statistical analysis show 100% of nodes in both the 1-meter and 2-meter finalized surfaces meet TVU specifications. In addition, a custom layer was created for the finalized surfaces submitted in correlation with H12840. The layer was derived from the difference between the calculated uncertainties of individual nodes and the allowable uncertainty at the coupled node.

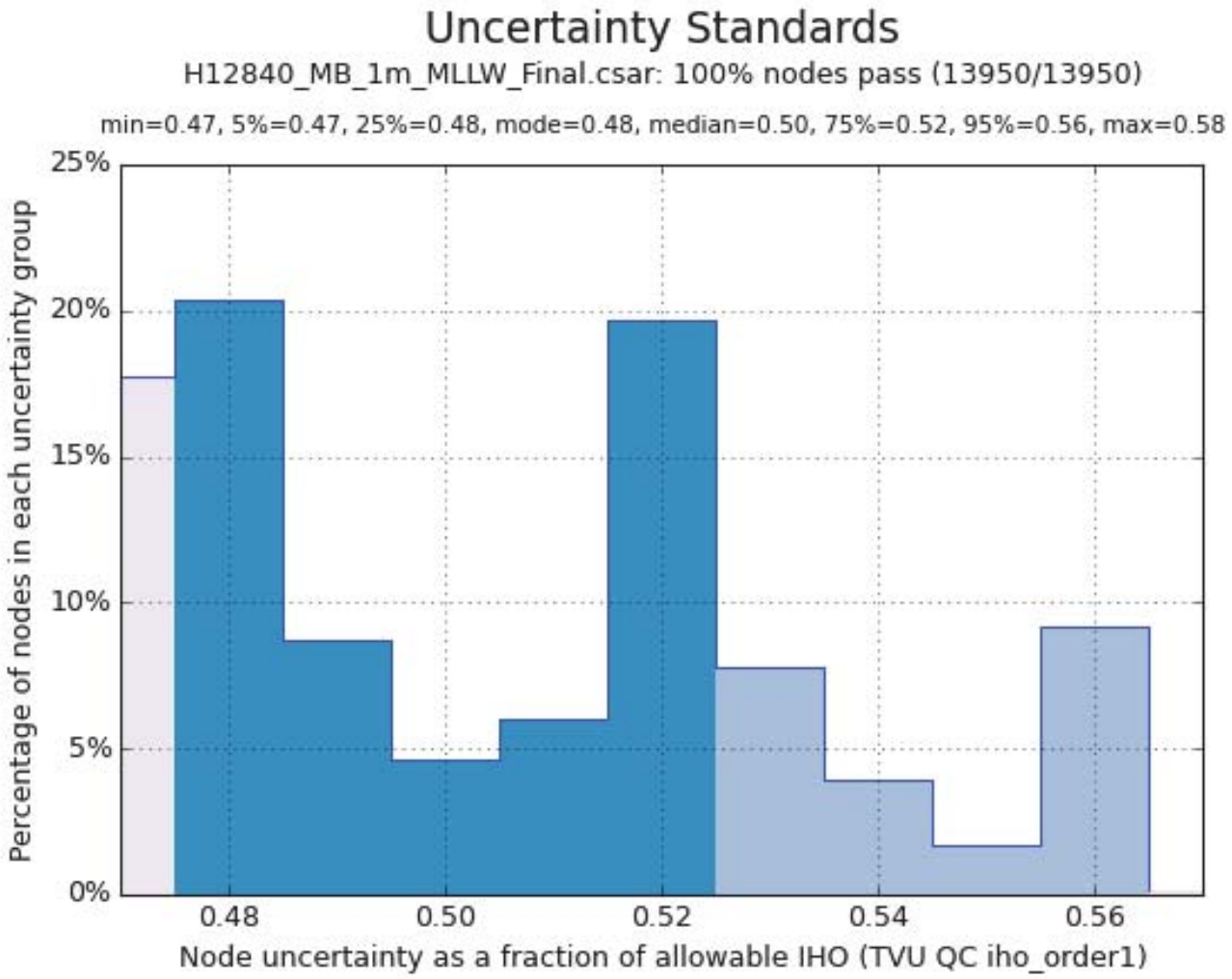


Figure 15: Total vertical uncertainty analysis for the 1-meter finalized surface.

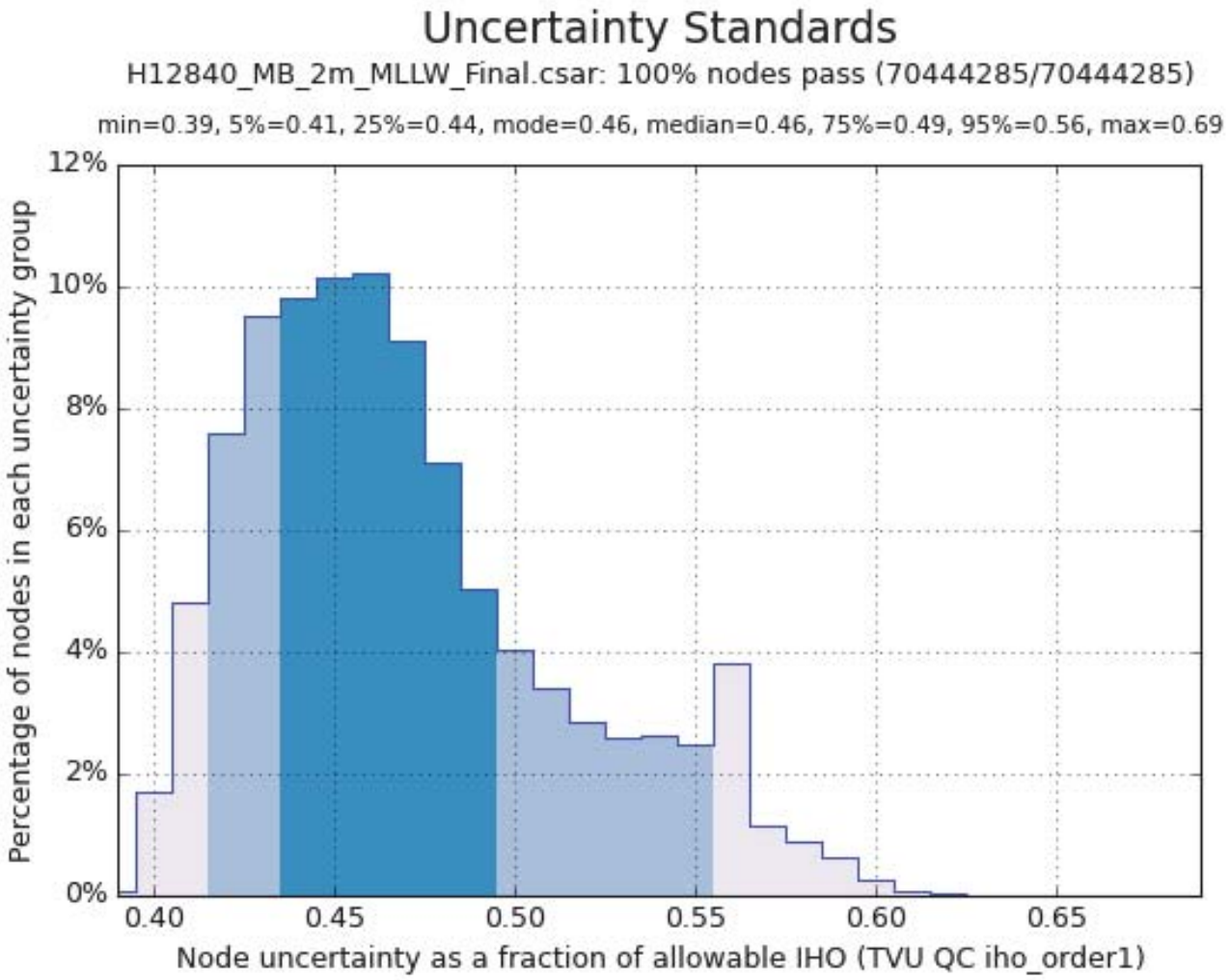


Figure 16: Total vertical uncertainty analysis for the 2-meter finalized surface.

B.2.11 Data Holidays

Nine data gaps exist in the 2-meter surface for H12840. They were undetected at the time of field acquisition and later found using the Pydro QC Tool "Holiday Finder". The holidays can be found in positions:

Latitude	Longitude
036-16-27.21N	75-22-52.42W
036-16-29.54N	75-23-33.16W
036-16-29.58N	75-22-21.65W
036-16-49.70N	75-22-21.51W
036-17-55.43N	75-21-47.18W
036-17-55.67N	75-21-51.75W
036-18-05.99N	75-22-57.32W
036-22-32.72N	75-19-10.82W
036-28-57.98N	75-18-36.87W

The data was inspected in Subset Editor for signs of missed features and there was no evidence of any significant features.

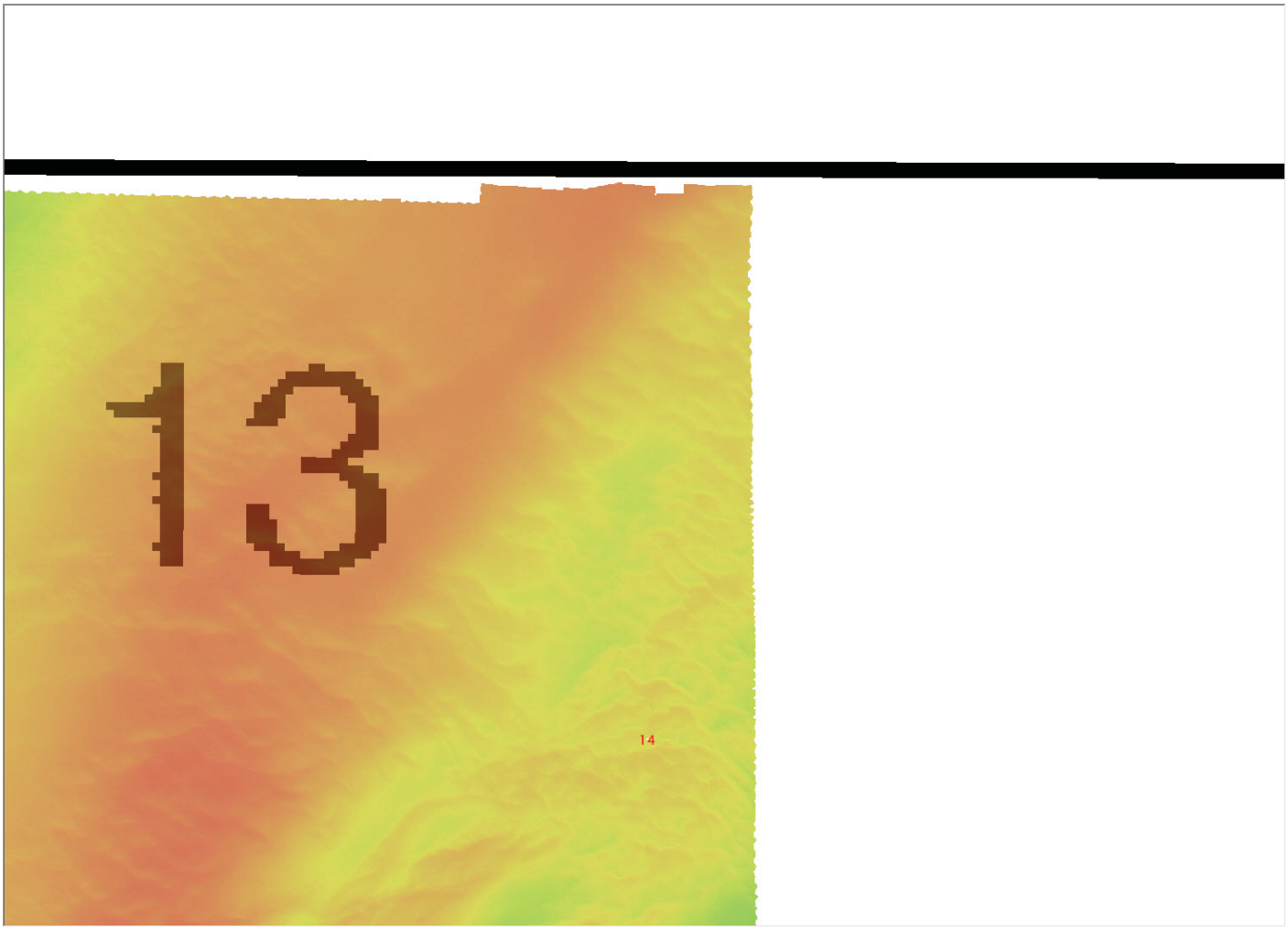


Figure 17: The location of a data gap in the northeast portion of the survey. The number (in red) indicates how many nodes are missing in the surface.

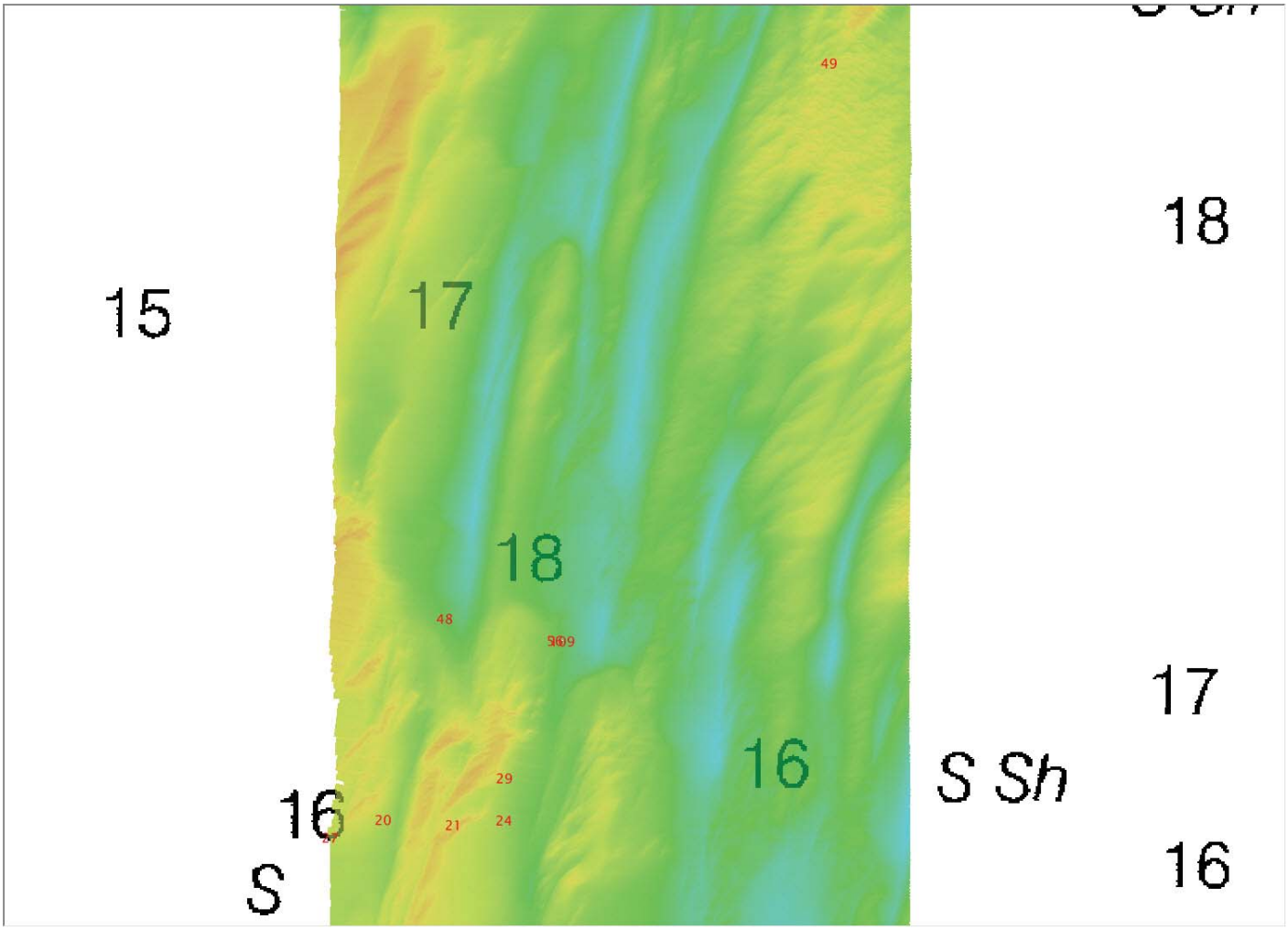


Figure 18: The location of a data gap in the central portion of the survey. The number (in red) indicates how many nodes are missing in the surface.

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

Backscatter was logged in Reson datagram 7008 snippets record in the raw .s7k files. The .s7k files also hold the navigation record and bottom detections for all lines of survey H12840. The files were paired with the CARIS HDCS data, imported and processed using Fledermaus Geocoder Toolbox.

The GSF files containing the extracted backscatter are submitted with the data in this survey. The processed mosaic is saved as a Geo-Tiff and also submitted.

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	9.0.19

Table 9: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Profile V_5_0

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
H12840_MB_1m_MLLW	CUBE	1.0 meters	19.25 meters - 37.45 meters	NOAA_1m	Complete MBES
H12840_1m_MLLW_Final	CUBE	1.0 meters	19.25 meters - 20 meters	NOAA_1m	Complete MBES
H12840_MB_2m_MLLW	CUBE	2.0 meters	19.26 meters - 37.20 meters	NOAA_2m	Complete MBES
H12840_MB_2m_MLLW_Final	CUBE	2.0 meters	19.26 meters -	NOAA_2m	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
			37.20 meters		

Table 10: Submitted Surfaces

The 2-meter finalized surface encompassed the full survey area of H12840. Due to the very small area covered by the 4-meter surface, approval was sought and granted from HSD Operations Branch and the Atlantic Hydrographic Branch to submit only the 1 and 2-meter surfaces. The 4-meter surface was inspected to ensure the difference between 2-meter and 4-meter surface are within allowable TVU and density specifications. The 2-meter surface was found to be adequate in these areas. Correspondence regarding the approval to only submit the 1 and 2-meter surface can be found in Appendix II: Supplemental Survey Records and Correspondance.

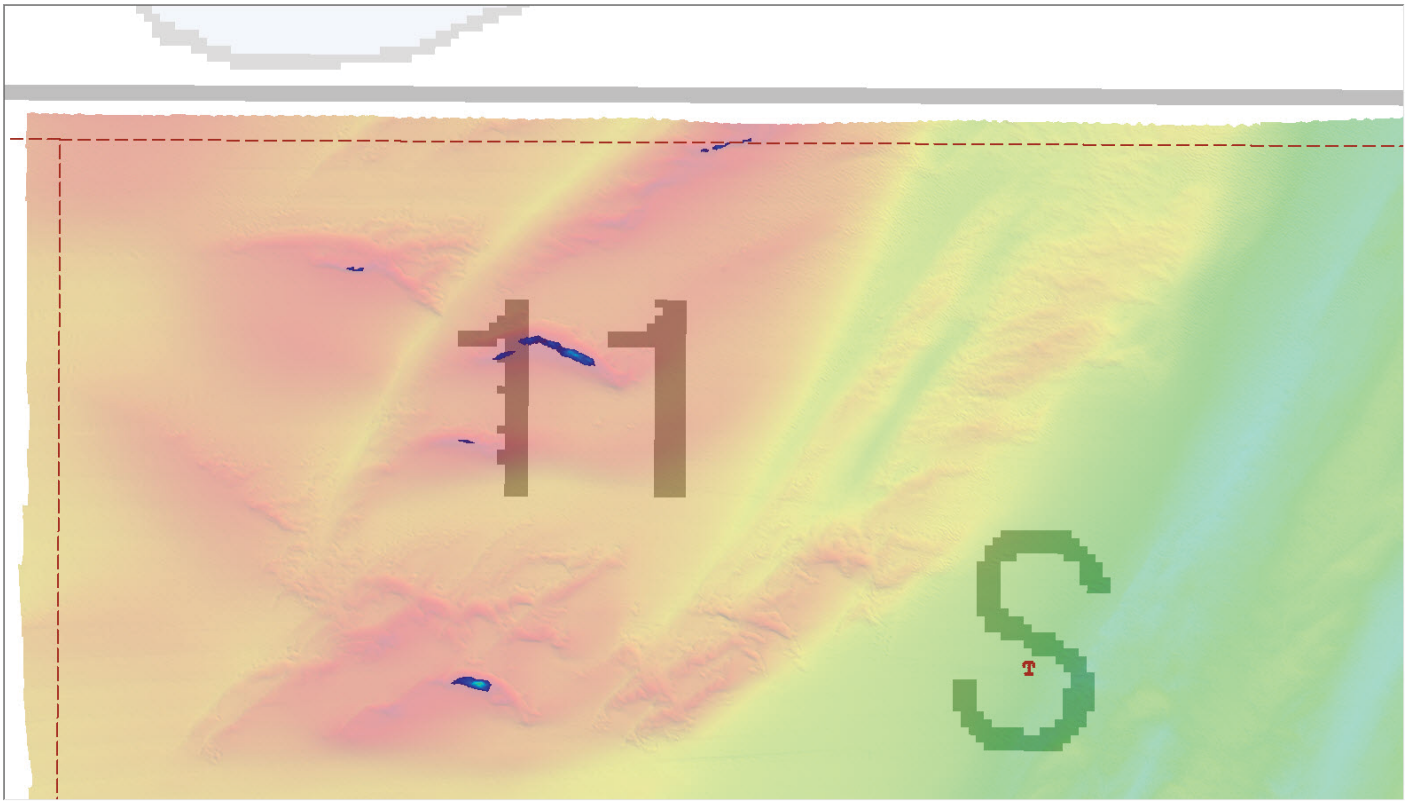


Figure 19: An image showing the extent of the 1m finalized surface (blue colors) overlaid upon the 2m surface.

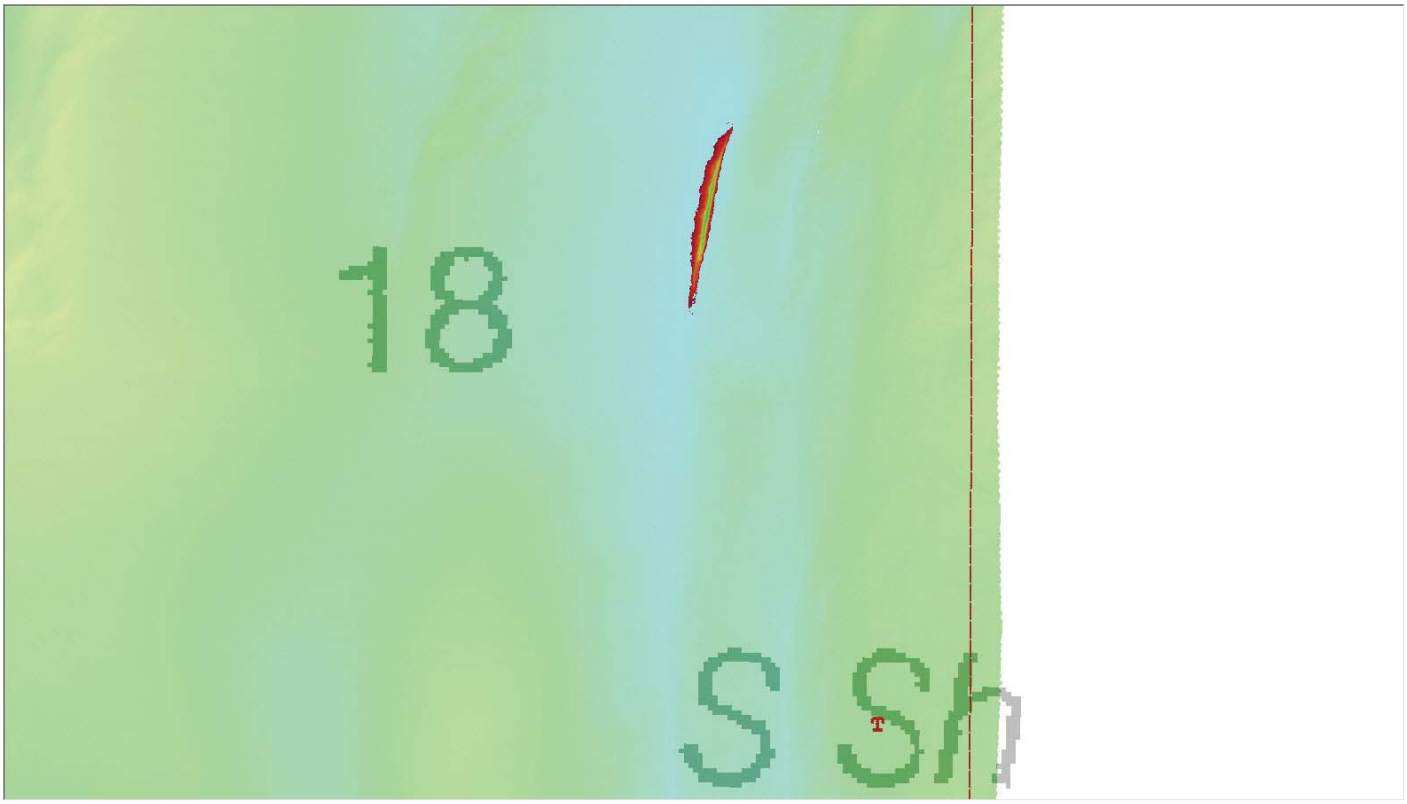


Figure 20: An image showing the extent of the 4m finalized surface (red colors) overlaid upon the 2m surface.

C. Vertical and Horizontal Control

All vertical and horizontal control activities conducted during the course of this survey are fully addressed in the following sections. No separate HVCR is submitted.

C.1 Vertical Control

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

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

2015_D304_VDatum_NAD83_MLLW.csar

All soundings submitted for H12840 has been reduced to MLLW using documented VDatum techniques.

C.2 Horizontal Control

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

The projection used for this project is UTM Zone 18N.

The following PPK methods were used for horizontal control:

Single Base

Single Base processing was the primary method used for Post Processed Kinematics (PPK) processing of Applanix TrueHeave data for Smooth Best Estimate of Trajectory (SBET) production. SBET files have been loaded for all lines for survey H12840 and are used to reduce acquired soundings to MLLW via HSD Operations Branch provided separation model.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
DUCK 3 Duck, NC	NCDU
LOYOLA Virginia Beach, VA	LS03

Table 11: CORS Base Stations

DGPS was used for real-time positioning during acquisition. All lines submitted are corrected using post-processed horizontal solutions.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Driver, VA (289 kHz)

Table 12: USCG DGPS Stations

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 Interpolation of SBETs

On occasion, the SBET altitude exhibited spikes which compromised the data's ability to meet TVU specifications. In these instances, the hydrographer utilized tools in Pydro's POSPAC Automated QC tool to interpolate the SBET (see figure 19 for an example). The interpolated SBET was exported out of the POSPAC Automated QC tool, opened in POSPAC MMS, and exported again to ensure the SBET was in the correct datum (NAD83). The new SBET contains the prefix "interpolated" for easy identification.
The following SBETs were interpolated for H12840:

DN247 Starboard lines using export_2015_247_S250S.sbet
DN247 Starboard lines using interpolated_2015_247_S250S_b.sbet
DN237 Port lines using interpolated_2015_237_S250P.sbet

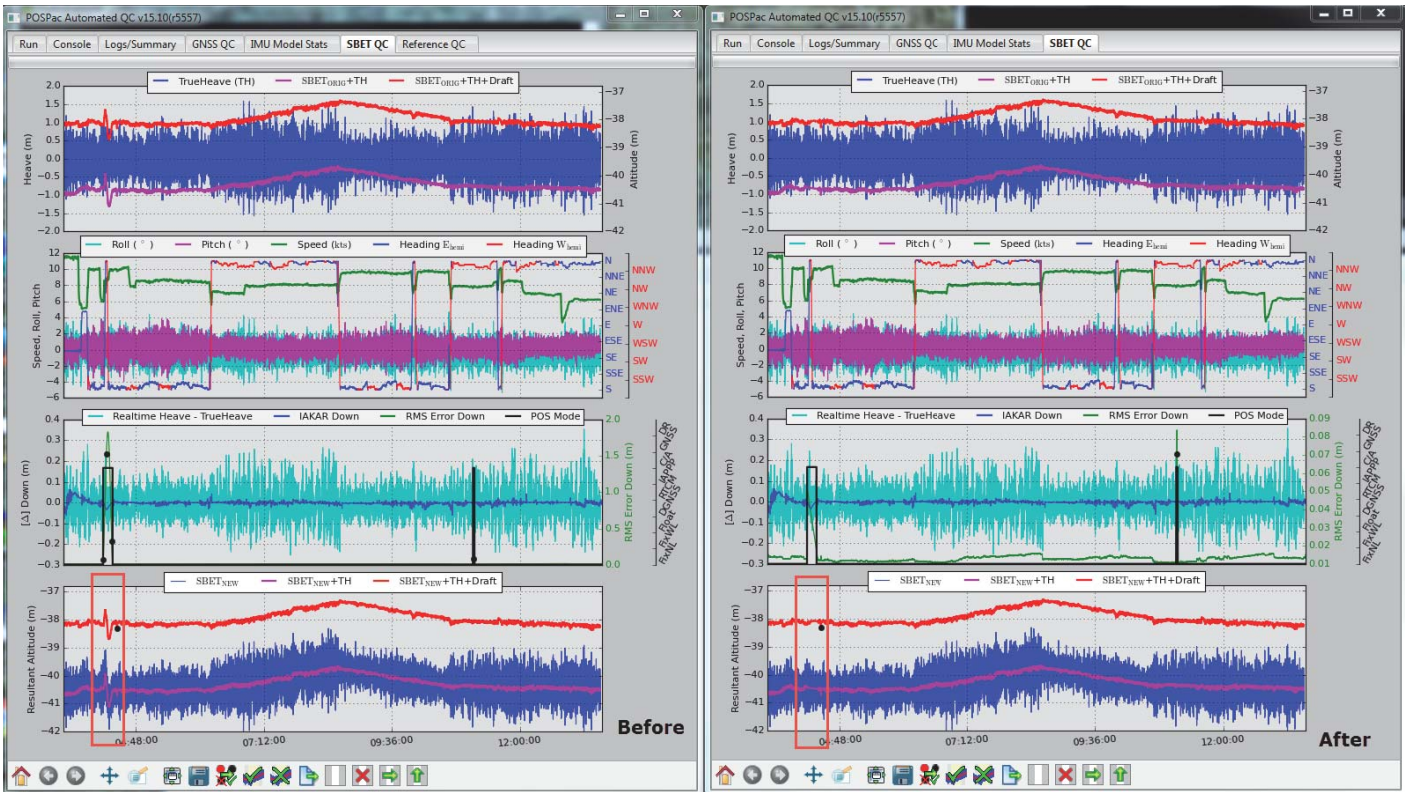


Figure 21: Example of SBET interpolation for 2015_222_S250S (example shown is from another survey). The anomalous data on the left has been edited in POSPAC AutoQC and the resultant SBET is seen on the right.

3.3.2 Base Station Outages

Throughout acquisition of H12840, the preferred base station used for single base processing was NCDU (DUCK, Duck, NC). During acquisition there was an outage of the DUCK station, requiring the use of an alternate station. The station used was LS03 (LOYOLA, Virginia Beach, VA) with ship to station distance ranging approximately 80km. Though LS03 was far outside the recommended base station range of 40km, the SBETs that used LS03 were only applied on data acquired during DN 246. No adverse effects are seen in the data.

D. Results and Recommendations

D.1 Chart Comparison

The hydrographer has compared a sounding plot from the surveyed area to the charted soundings. There are no charted contours to compare.

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
12204	1:80000	38	12/2012	06/23/2015	07/04/2015
12200	1:419706	51	05/2014	06/23/2015	06/27/2015

Table 13: Largest Scale Raster Charts

12204

Chart 12204 only covers a small part of the southern portion of the survey area. Soundings were compared individually and general trends were inspected in between charted soundings.

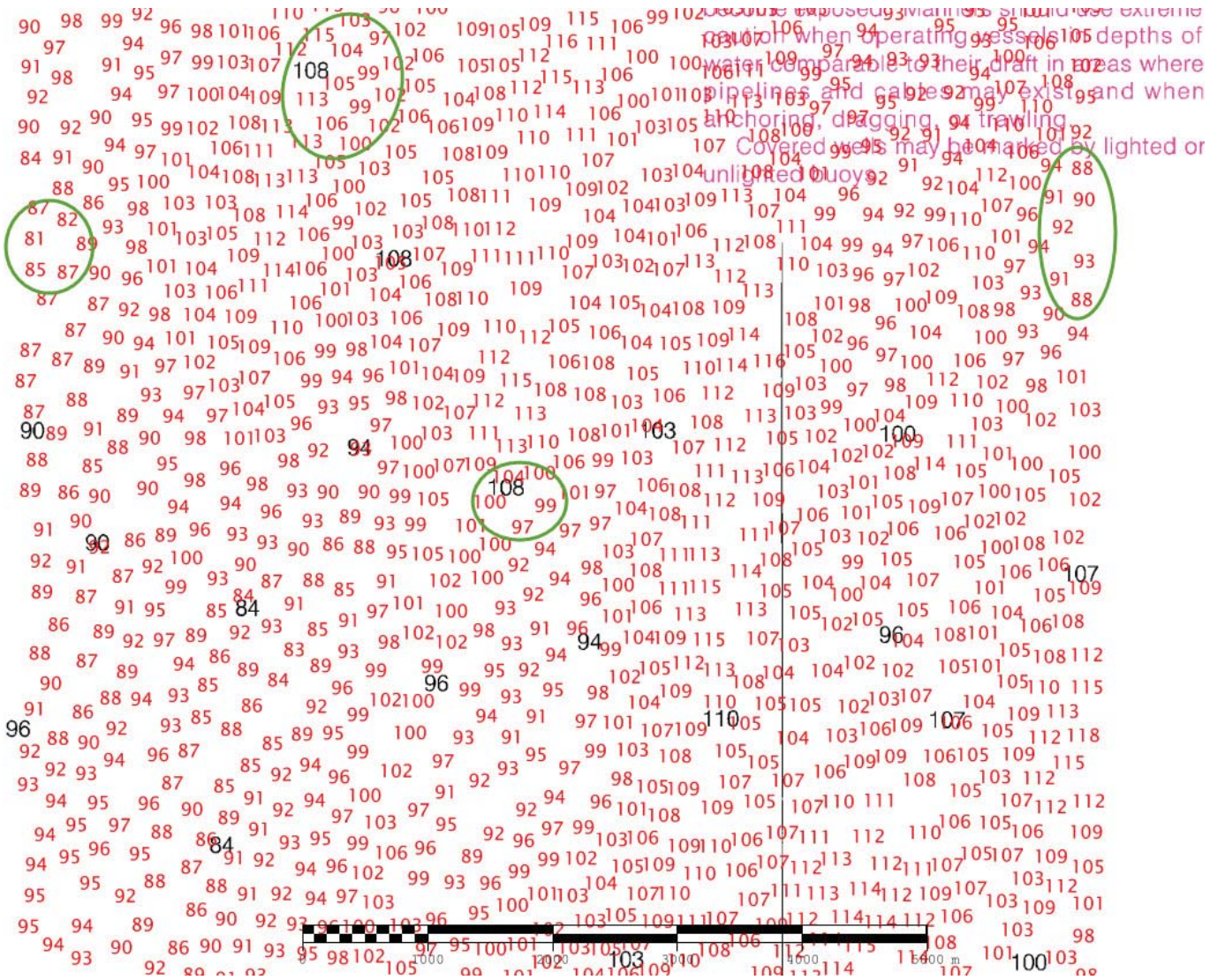


Figure 22: Areas that are shallower than charted soundings are highlighted with green circles.

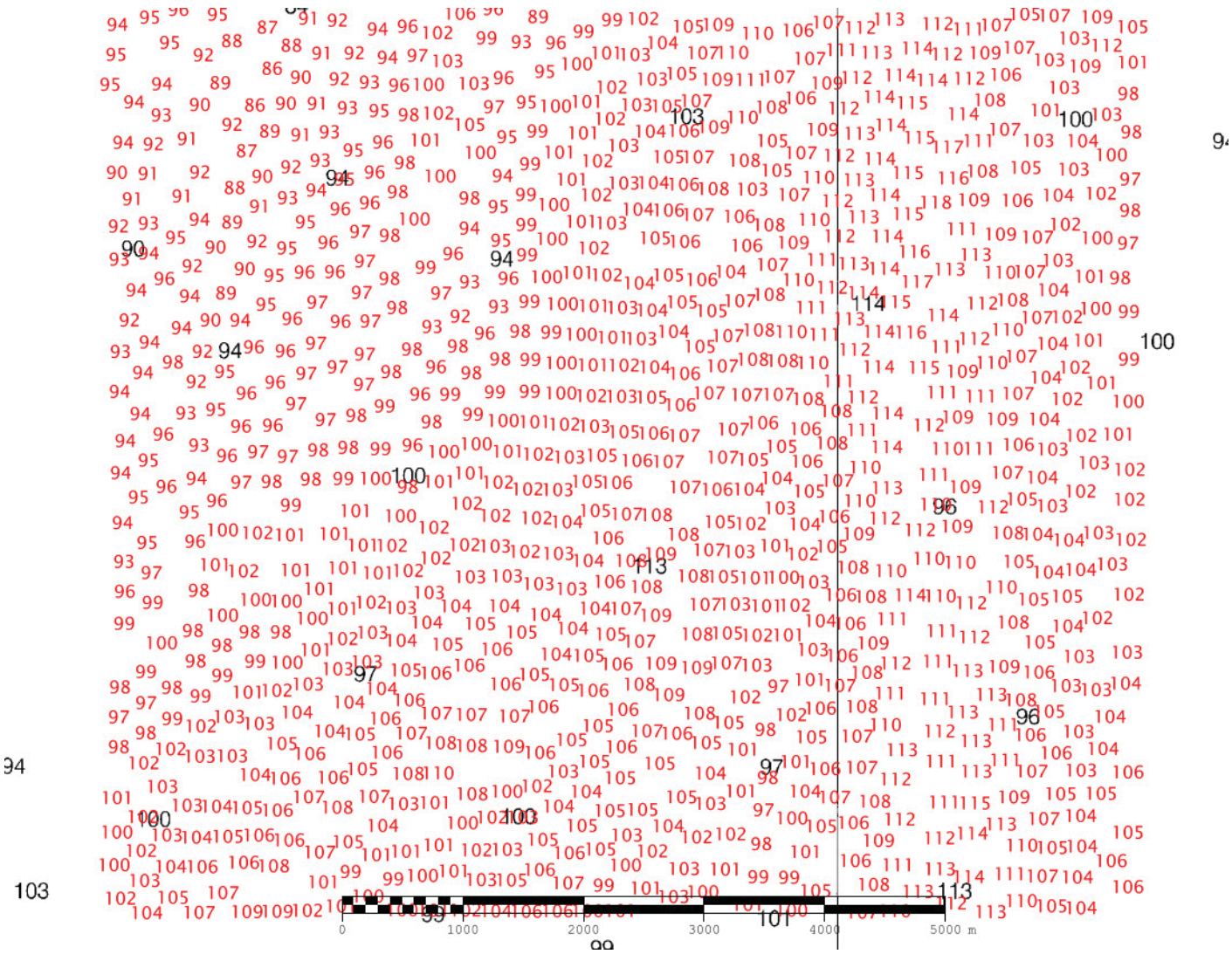


Figure 23: Soundings in the image showing the southern half show good agreement with only some areas that are deeper than charted.

12200

Chart 12200 is a rather small scale chart with few soundings and no contours covering the survey area. When viewing the modeled survey data with a sufficient color range, mild shoals do appear. The current soundings agree within 1 fathom, however, the long distances between soundings fail to portray some of the deeper and shoaler features. In all cases the shoals are very mild and only vary from the nearby charted soundings by about 1-2 fathoms. An example of this can be seen in Figure 24.

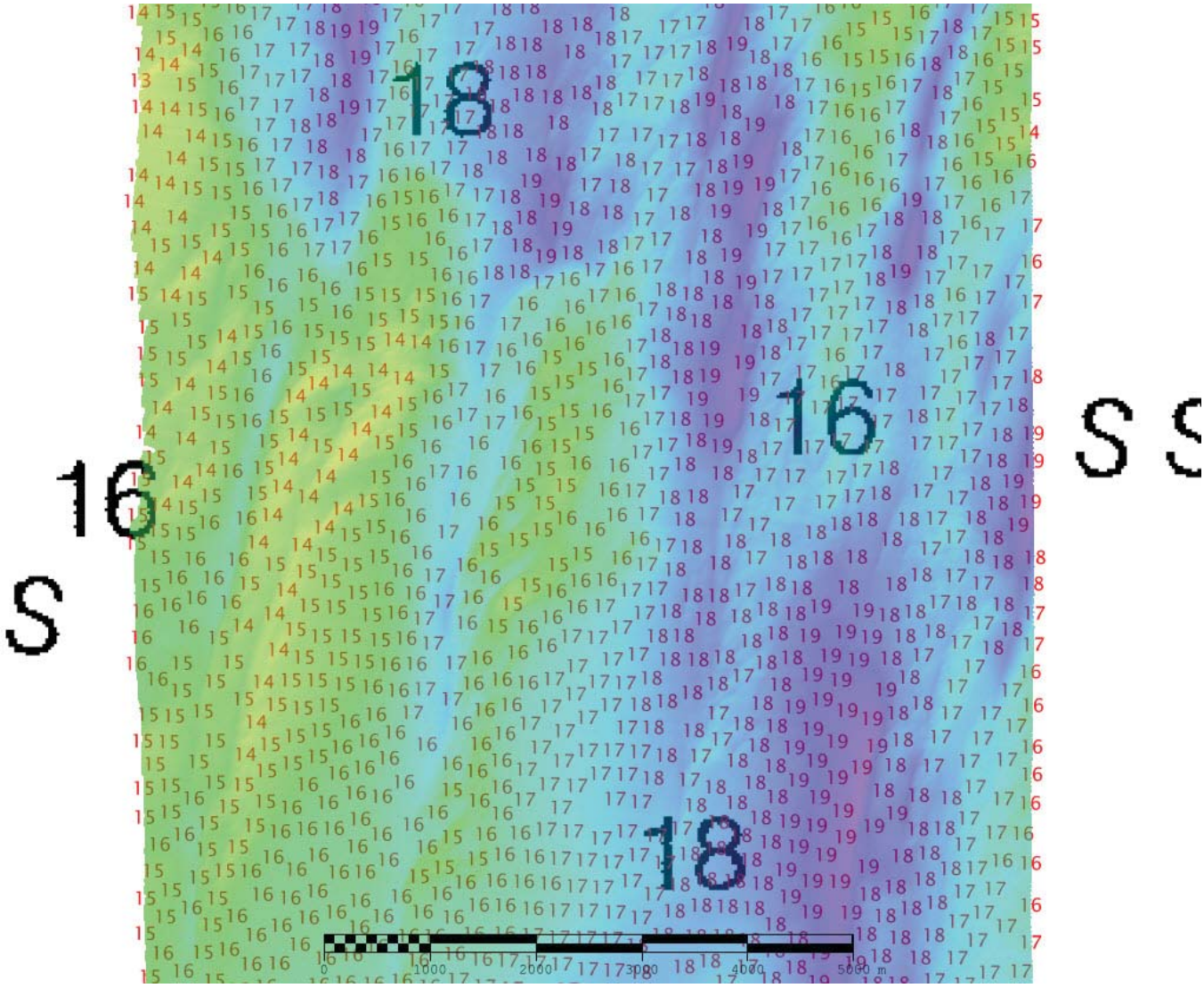


Figure 24: Example of a mild shoal not represented between two charted 16 fathom soundings.

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?
US3DE01M	1:80000	15	05/06/2015	05/31/2015	NO
US4NC31M	1:80000	18	10/09/2014	06/03/2015	NO

Table 14: Largest Scale ENCs

US3DE01M

ENC US4NC31M soundings correspond with RNC 12204 soundings. Refer to RNC 12204 for chart comparison.

US4NC31M

ENC US4NC31M soundings correspond with RNC 12204 soundings. Refer to RNC 12200 for chart comparison.

D.1.3 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.4 Charted Features

No charted features exist for this survey.

D.1.5 Uncharted Features

An uncharted wreck was found in the central portion of H12840. The highest point of the wreck reaches about 1 meter shallower than the general bathymetry of the surrounding area. The least depth was marked using a designated sounding and a new wreck feature was added to H12840's Final Feature File. The wreck is not deemed to be a danger to navigation by the hydrographer.

D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.7 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.8 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.1.9 Bottom Samples

Ten bottom samples were attempted on H12840 from the sample locations suggested by the Hydrographic Surveys Division Operations Branch (HSD Ops). Of the ten samples, nine were successful in obtaining a sample while one was unsuccessful after three empty attempts. Generally, the samples consisted of fine grey sand with white broken shells. The nine successful samples were included in the Final Feature File. Samples that were assigned by HSD Ops that were located in the Naval Mine Warfare Training Field were not attempted due to potential snagging hazards.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

D.2.2 Prior Surveys

Prior survey comparisons exist for this survey, but were not investigated.

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

Field operations for this hydrographic survey were conducted under the direct supervision of the then Chief of Party, Commander Marc S. Moser, 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 and Specifications Deliverables Manual, 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
LCDR Matthew Jaskoski, NOAA	Chief of Party	08/13/2016	Digitally signed by JASKOSKI.MATTHEW.J.1275636262 Date: 2016.08.23 12:24:42 -04'00'
LT Nicholas Morgan	Field Operations Officer	08/13/2016	MORGAN.NICHOLAS.C.1292288138 2016.08.23 12:44:41 -04'00'

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

APPENDIX I

TIDES AND WATER LEVELS

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : November 17, 2015

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-D304-FH-2015
HYDROGRAPHIC SHEET: H12840

LOCALITY: 30 Miles East of Currituck Beach, NC
TIME PERIOD: August 22 - October 17, 2015

TIDE STATION USED: 8651370 Duck, NC
Lat. 36° 11.0'N Long. 75° 44.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.027 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project OPR-D304-FH-2015, H12840, during the time period between August 22 - October 17, 2015.

Please use the zoning file D304FH2015CORP submitted with the project instructions for D304-FH-2015. Zone SA57 is the applicable zone for H12840.

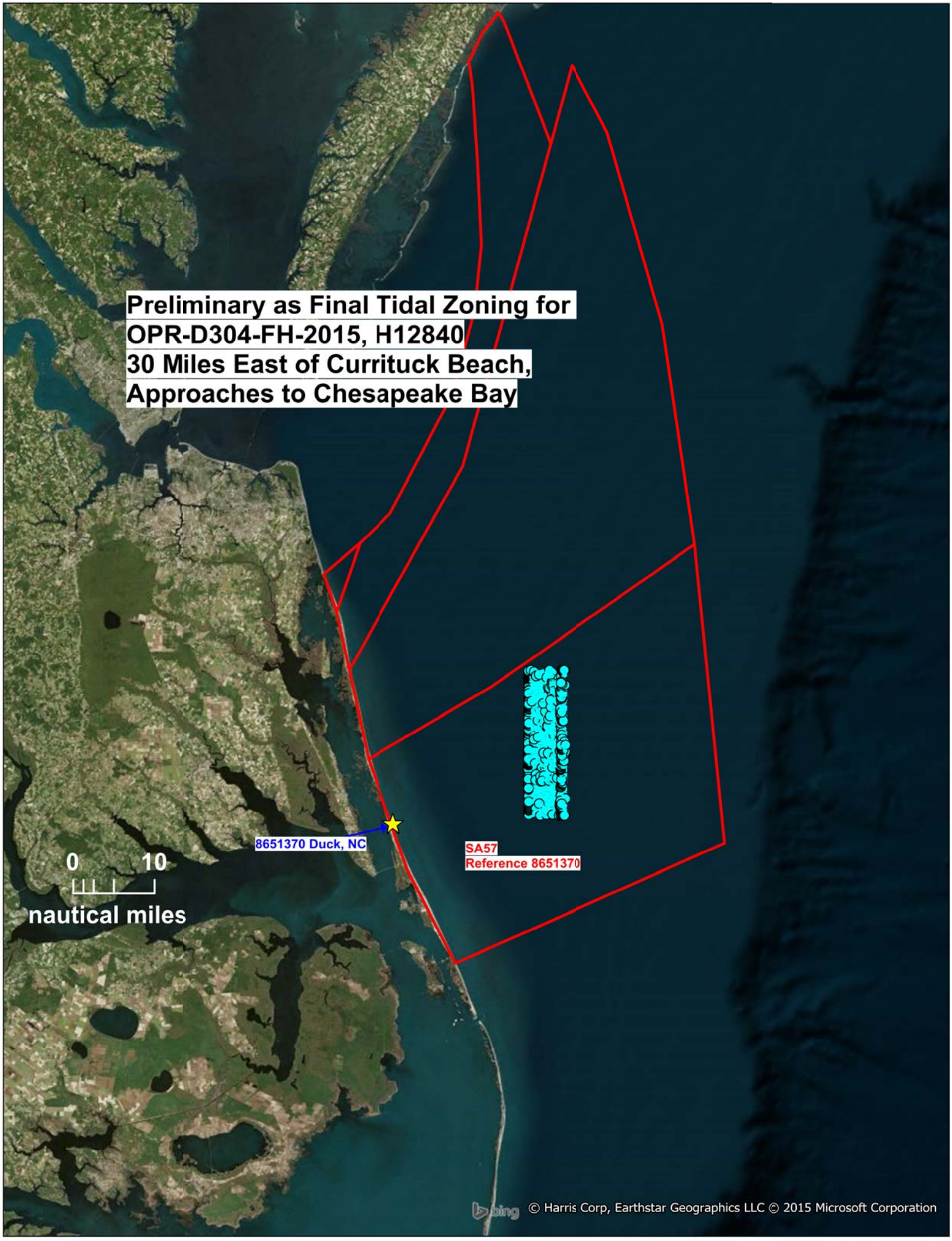
Refer to attachments for zoning information.

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).

HOVIS.GERALD.THOMAS.JR.1365860250

Digitally signed by HOVIS.GERALD.THOMAS.JR.1365860250
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2015.11.19 15:37:25 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Preliminary as Final Tidal Zoning for
OPR-D304-FH-2015, H12840
30 Miles East of Currituck Beach,
Approaches to Chesapeake Bay
8651370 Duck, NC
SA57
Reference 8651370
0
10
nautical miles
© Harris Corp, Earthstar Geographics LLC © 2015 Microsoft Corporation

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Ship FERDINAND R. HASSLER (MOA-FH)
29 Wentworth Road
New Castle, NH 03854

November 05, 2015

MEMORANDUM FOR: Gerald Hovis, Chief, Products and Services Branch, N/OPS3

FROM: CDR Marc Moser, NOAA, NOAA Ship FERDINAND R. HASSLER (MOA-FH)

SUBJECT: Request for Approved Tides/Water Levels

Please provide the following data:

1. Tide Note
2. Final zoning in MapInfo and .MIX format
3. Six Minute Water Level data (Co-ops web site)

Transmit data to the following:

Atlantic Hydrographic Branch (N/CS33)
439 West York St
Norfolk, VA 23510

NOAA Ship FERDINAND R. HASSLER (MOA-FH)
29 Wentworth Road
New Castle, NH 03854

These data are required for the processing of the following hydrographic survey:

Project No.:	OPR-D304-FH-15
Registry No.:	H12840
State:	North Carolina
Locality:	Approaches to Chesapeake Bay
Sublocality:	30 Miles East of Currituck Beach

Attachments containing:

1) an Abstract of Times of Hydrography,
2) digital MID MIF files of the track lines from Pydro

cc: N/CS33

Year_DOY	Min Time	Max Time
2015_234	22:18:16	23:55:39
2015_235	00:09:07	12:41:58
2015_236	05:23:02	23:41:45
2015_237	00:26:18	23:54:14
2015_238	00:08:45	23:53:23
2015_239	00:15:07	15:18:55
2015_246	04:11:15	23:53:51
2015_247	00:10:11	23:52:31
2015_248	00:09:20	13:18:43
2015_249	14:39:56	23:49:23
2015_250	00:16:38	23:26:54
2015_253	00:11:12	12:05:27
2015_261	00:15:13	09:14:07
2015_262	00:10:06	05:10:01
2015_290	04:35:46	05:29:42

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov>

Final Tide Notes for OPR-D304-FH-2015, Registry Nos. H12840, H12841, and H12843 (Revised)

1 message

Hua Yang - NOAA Affiliate <hua.yang@noaa.gov> Fri, Nov 20, 2015 at 8:52 AM
To: "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>
Cc: Corey Allen - NOAA Federal <Corey.allen@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Castle Parker - NOAA Federal <Castle.E.Parker@noaa.gov>, AHB Chief - NOAA Service Account <ahb.chief@noaa.gov>, Gerald Hovis - NOAA Federal <gerald.hovis@noaa.gov>, "_NOS.CO-OPS.HPT" <nos.coops.hpt@noaa.gov>

DATE: 11/20/2015

MEMORANDUM FOR: LCDR Briana Welton
Commanding Officer, Ferdinand Hassler

FROM: Gerald Hovis
Chief, Products and Services Branch, N/OPS3

SUBJECT: Delivery of Tide Requirements for Hydrographic Surveys

This is notification that the preliminary zoning is accepted as the final zoning for survey project OPR-D304-FH-2015, Registry Nos. H12840, H12841, and H12843 (Revised), during the time period between August 05 and October 24, 2015. The accepted reference station for Registry Nos. H12840, H12841, and H12843 (Revised) is Duck, NC (8651370).

Included with this memo are Tide Notes in .PDF format, stating the preliminary zoning has been accepted as the final zoning.

Thanks,

Hua Yang

Hydrographic Planning Team
NOAA/National Ocean Service
Center for Operational Oceanographic Products and Services
Station 7128
1305 East West Highway, SSMC4
Silver Spring, MD 20910
Office: 301-713-2890 x210
Email: Hua.Yang@noaa.gov
Web: http://tidesandcurrents.noaa.gov/

Hydro Hot List: http://tidesandcurrents.noaa.gov/hydro.shtml

3 attachments

H12843Rev.pdf
598K

H12841.pdf

604K

H12840.pdf
604K

Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>

H12840 1m, 4m surface exemption request

9 messages

Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov> Wed, Jan 20, 2016 at 8:49 AM
To: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>
Cc: Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Patrick Berube - NOAA Federal <patrick.j.berube@noaa.gov>

Hi Starla,

By kind of strange coincidence the survey depths just barely get shallow enough to poke into the 1m finalized surface range and similarly the depths barely get deep enough to poke into the 4m finalized depth range. Would it be reasonable just to submit a 2m Finalized surface for this survey? I attached some screengrabs to show you the extent of the area I'm talking about for both the 1m and 4m finalized surfaces.

Let me know what you think.

-Nick

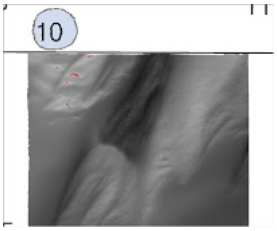
--
LT Nick Morgan, NOAA
Navigation Officer
NOAA Ship Ferndiand R. Hassler

Physical Address *(UPS/FedEx):*
UNH Judd Gregg Marine Research Complex
29 Wentworth Rd.
New Castle, NH 03854

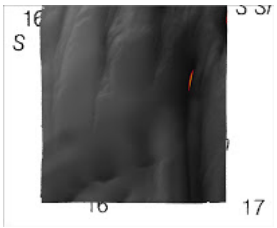
Mailing Address*:*
PO Box 638
New Castle, NH 03854

Ship's landline: 603-431-4500
Ship's cell: 603-812-8748
Cell Phone: 907-617-0963

2 attachments



H12840_1m_final_surf_exemption.jpg
68K



H12840_4m_final_surf_exemption.jpg
62K

Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> Wed, Jan 20, 2016 at 9:14 AM
To: Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>
Cc: Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Patrick Berube - NOAA Federal <patrick.j.berube@noaa.gov>, Paul Turner - NOAA Federal <Paul.Turner@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Megan Greenaway - NOAA Federal <megan.greenaway@noaa.gov>

Hello Nick,

I will defer to AHB. Just out of curiousity what are the ranges? Are they in the overlap zone?

Thanks,
Starla
[Quoted text hidden]

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov> Wed, Jan 20, 2016 at 9:21 AM
To: Starla Robinson - NOAA Federal <starla.robinson@noaa.gov>
Cc: Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Patrick Berube - NOAA Federal <patrick.j.berube@noaa.gov>, Paul Turner - NOAA Federal <Paul.Turner@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Megan Greenaway - NOAA Federal <megan.greenaway@noaa.gov>

Hi Starla,

Yes the entirety of the 1m finalized surface is in the "overlap" zone between 18m-20m. Likewise, the 4m finalized suface is contained in the "overlap" zone between 36m-40m.

-Nick
[Quoted text hidden]

Castle Parker - NOAA Federal <castle.e.parker@noaa.gov> Wed, Jan 20, 2016 at 9:47 AM
To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>
Cc: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Patrick Berube - NOAA Federal <patrick.j.berube@noaa.gov>, Paul Turner - NOAA Federal <paul.turner@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Megan Greenaway - NOAA Federal <megan.greenaway@noaa.gov>, Matthew Jaskoski - NOAA Federal <matthew.jaskoski@noaa.gov>

Good day,

I will chime in for AHB; What is the depth range for the 1m area, and also the 4m area, and in general, what are your depth ranges?

Regarding the 1m resolution…. Does the 2m honor the soundings in that small geographic area within the submitted image? You could generate a small 1m grid over that area and include it as a finalized depth threshold grid. The 1m grid would not have to encompass the entire area, but only the area of the 1m depth range. Based upon the amount of coverage in the 1m image, AHB would accept a 2m in that area if the 2m grid honors the soundings in the area and the difference between the grid and soundings do not exceed ½ of the allowable error and the density requirement is met; and, if and only if HSD OPS agrees with the waiver. If accepted, the waiver needs to be included in the documentation.

Regarding the 4m area, one can generate a small 4m grid common to the area that extends in that depth range of which is per spec. AHB would be willing to accept a 2m grid that covers the depth range of the 4m, if the density requirement of the 2m grid for the 4m depth range met the density spec. ? It would be better to include the 4m depth range data in the 2m grid, based upon the combining process, which would take the 1m, 2m, and combine it at 2m resolution. It's better to go with the higher combined resolution of 2m rather than 4m.

I suggest a small 1m grid over the 1m depth range area, get HSD OPS to grant the waiver on dropping the 4m grid, and submit only the small 1m and the remaining survey area at 2m resolution. HSD OPS will need to grant the waiver or submit the grids per HSSD.

Does this work for you?

Regards,

Gene

Castle Eugene Parker

NOAA Office of Coast Survey

Atlantic Hydrographic Branch

Hydrographic Team Lead / Physical Scientist

castle.e.parker@noaa.gov

office (757) 441-6746 x115

From: Starla Robinson - NOAA Federal [mailto:starla.robinson@noaa.gov]
Sent: Wednesday, January 20, 2016 9:15 AM
To: Nicholas Morgan - NOAA Federal
Cc: Castle Parker - NOAA Federal; OPS.Ferdinand Hassler - NOAA Service Account; Patrick Berube - NOAA Federal; Paul Turner - NOAA Federal; Michael Gonsalves - NOAA Federal; Megan Greenaway - NOAA Federal
Subject: Re: H12840 1m, 4m surface exemption request

[Quoted text hidden]

Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov> Wed, Jan 20, 2016 at 10:02 AM
To: Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>
Cc: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Patrick Berube - NOAA Federal <patrick.j.berube@noaa.gov>, Paul Turner - NOAA Federal <paul.turner@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Megan Greenaway - NOAA Federal <megan.greenaway@noaa.gov>, Matthew Jaskoski - NOAA Federal <matthew.jaskoski@noaa.gov>

Thanks Gene,

I'll go ahead and review to see if it meets the criteria you request and send you the results.

-Nick
[Quoted text hidden]

Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov> Wed, Jan 20, 201
To: Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>
Cc: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, Patrick Berube - NOAA Federal <patrick.j.berube@noaa.gov>, Paul Turner - NOAA Federal <paul.turner@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Megan Greenaway - NOAA Feder <megan.greenaway@noaa.gov>, Matthew Jaskoski - NOAA Federal <matthew.jaskoski@noaa.gov>

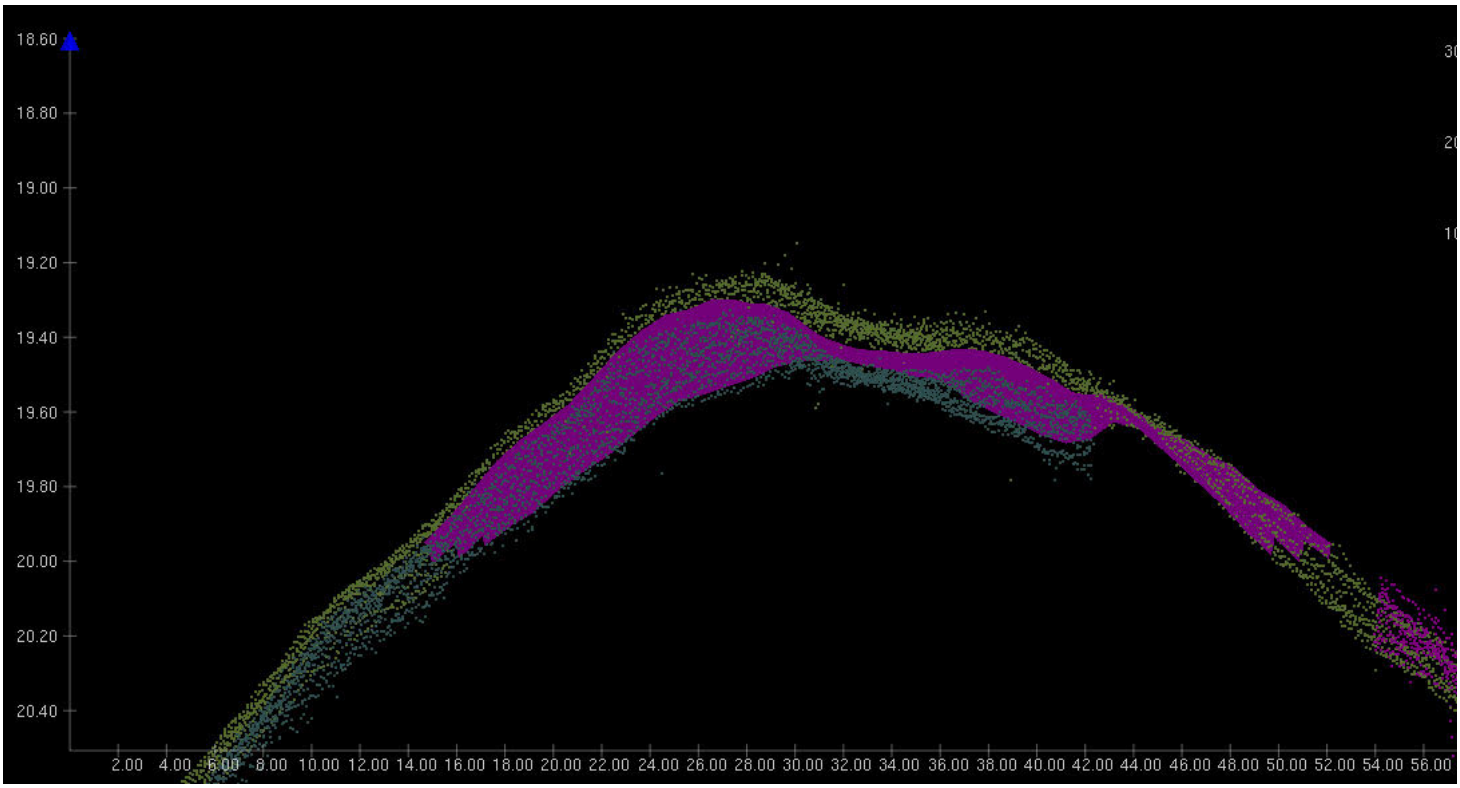
Gene,

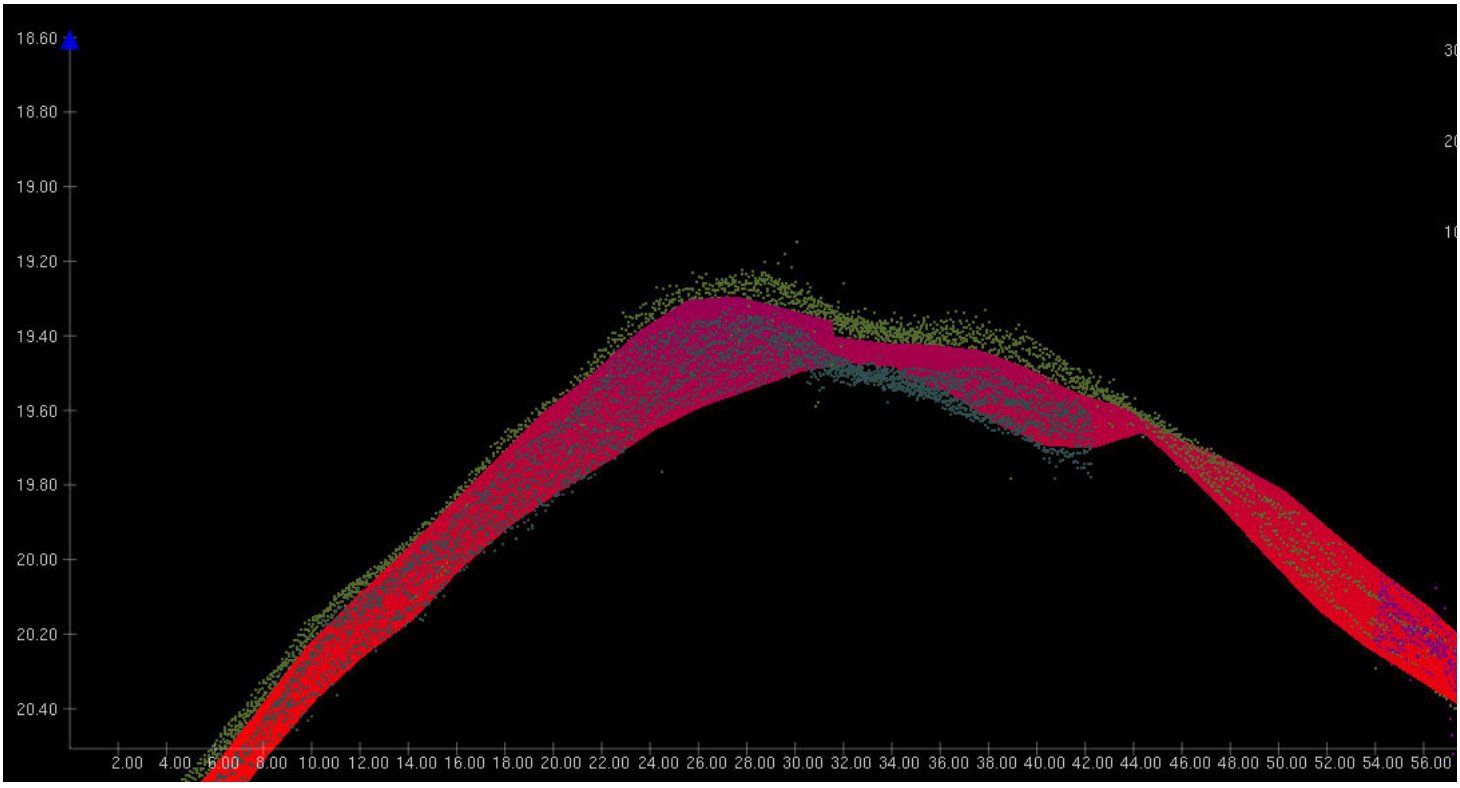
Below are screen grabs comparing the 1m and 2m ability to model the least depths. It's a fairly rounded top to the shoal so both surfaces don't have much trouble representing it. This is ind

the area around it. There are no sharp pinnacles. Also at the bottom, there is a screengrab showing the density layer of the 2m finalized surface over the area covered by the 4m finalized su
There is easily 5 or more soundings per node.

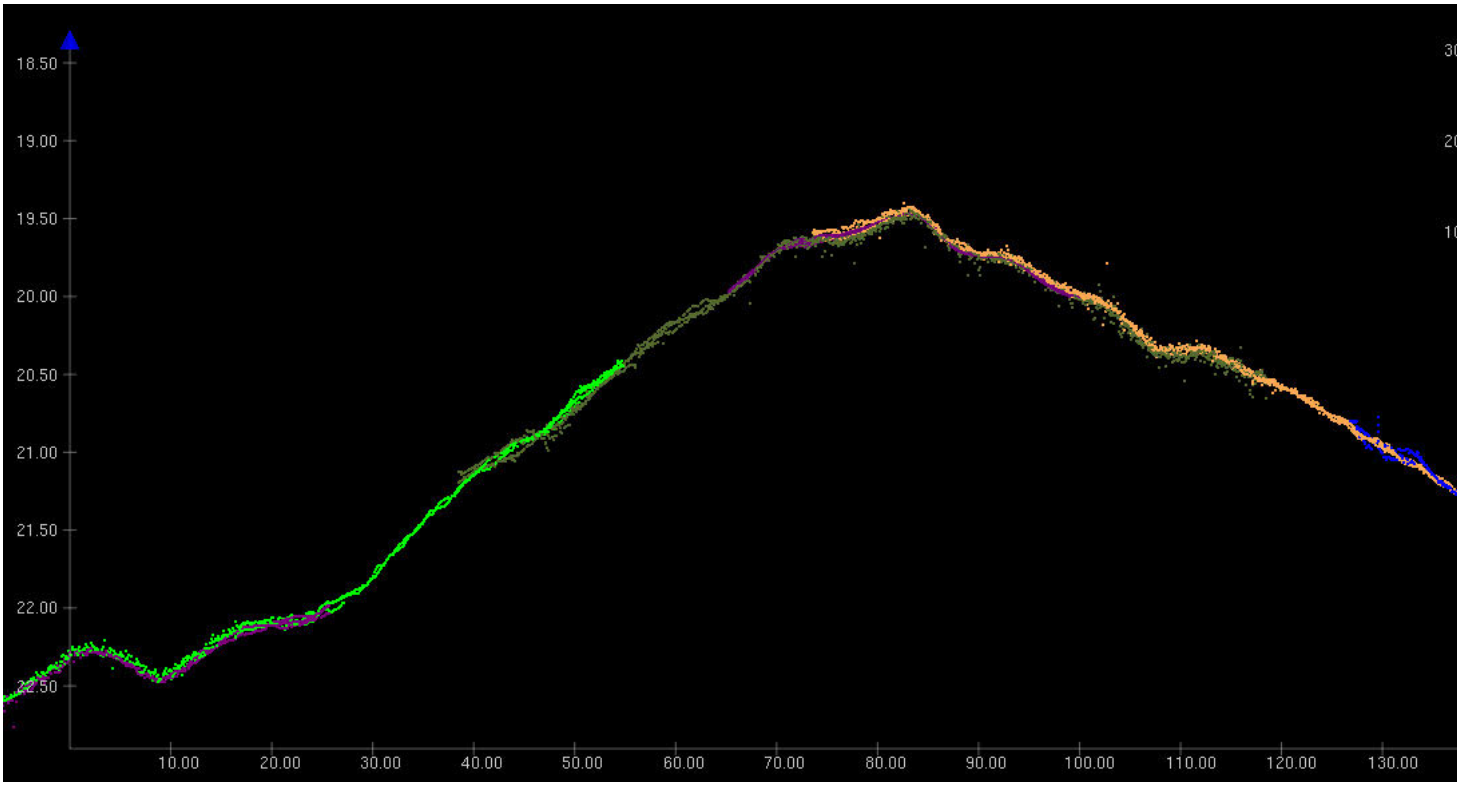
Let me know if you have any additional questions.

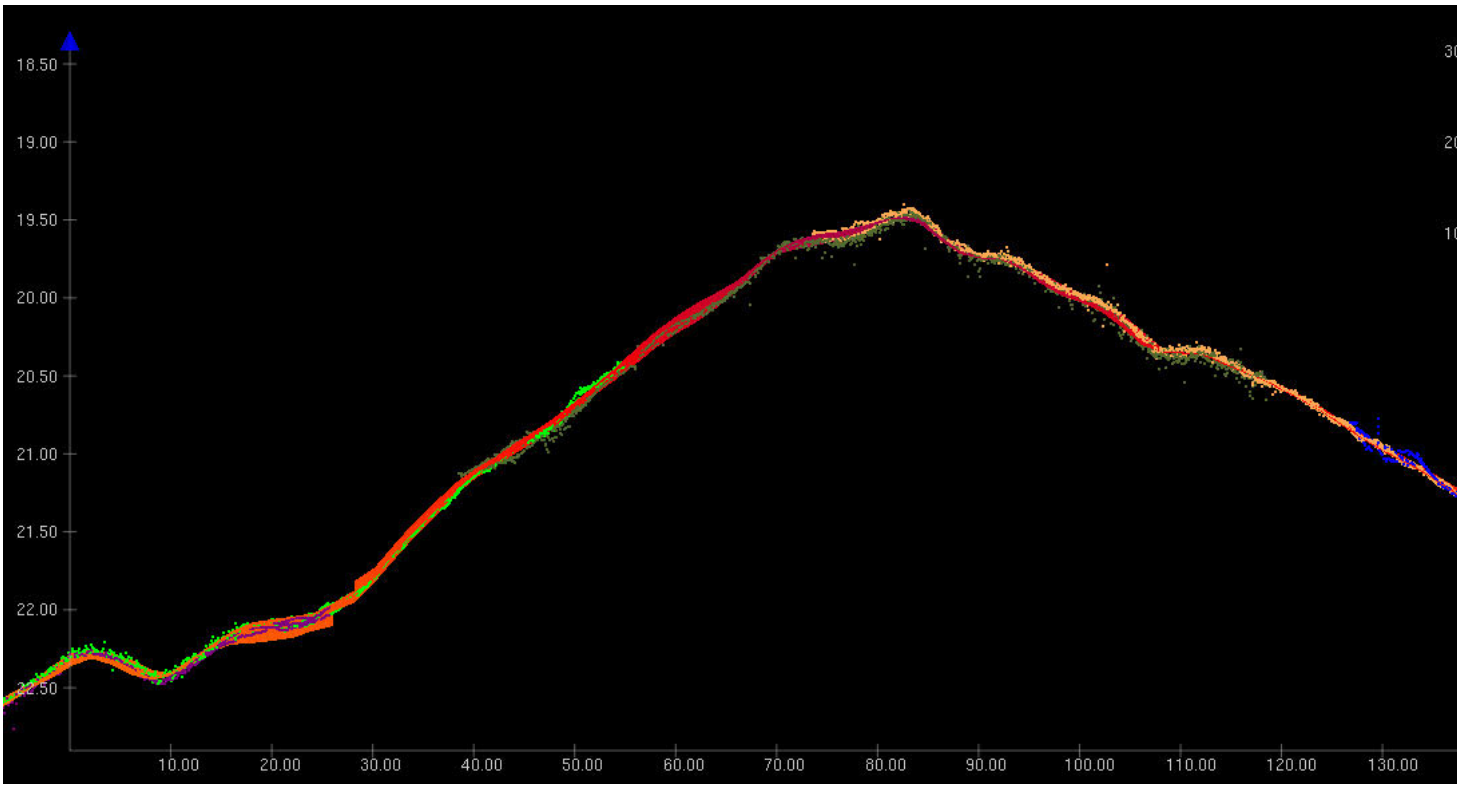
-Nick



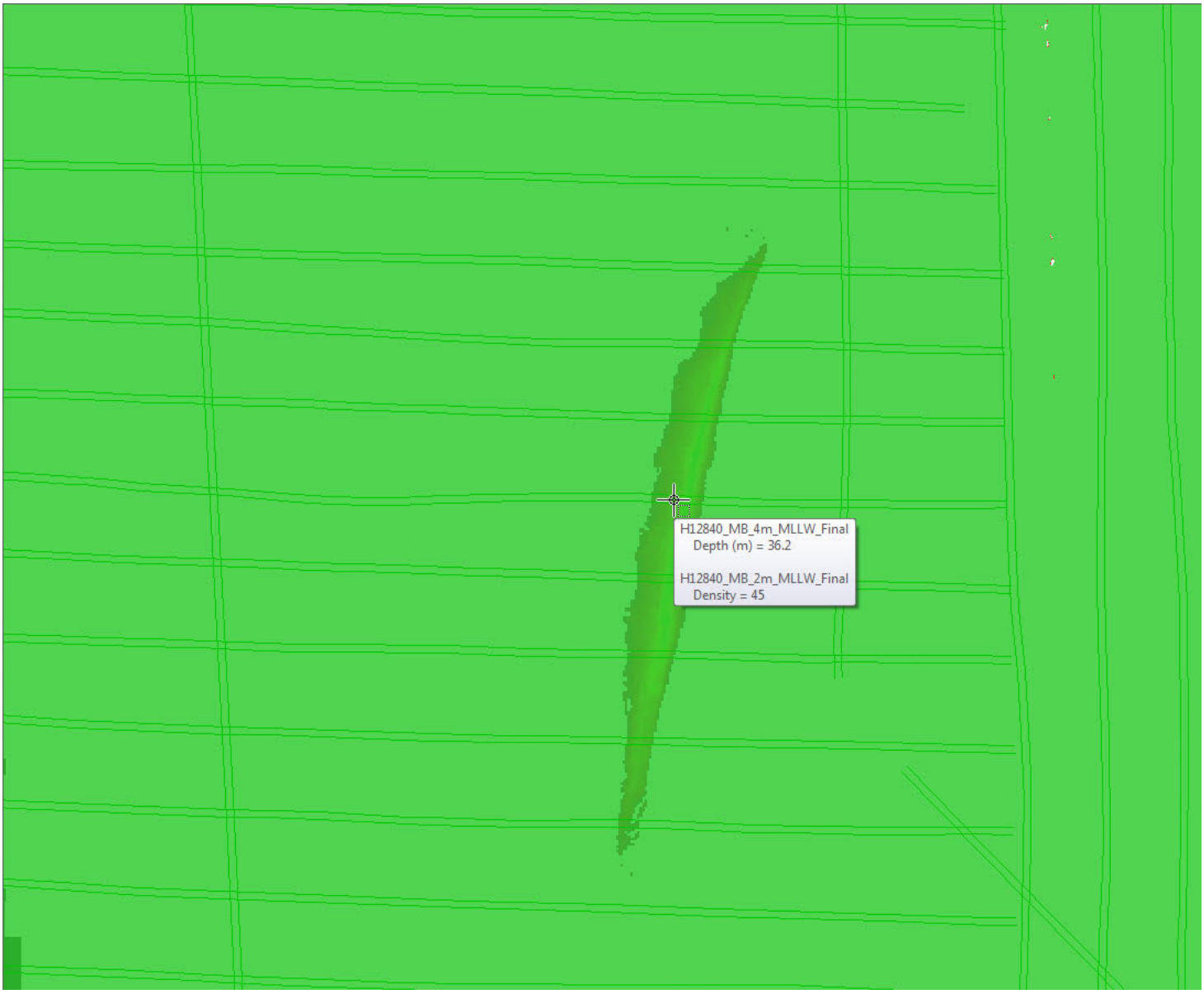


The two images above show one of the shoaler areas that reaches the 1m resolution depth range. The top is the 1m surface and bottom is the 2m finalized surface. Both surfaces model th
depth near identical.





This is another shoaler location where it reaches the 1m resolution depth range. Again, the 1m and 2m finalized are both modeling the least depth identically.



This shows the sliver of the 4m finalized surface with the 2m density surface overlaid. Green denotes >4 soundings per node.

[Quoted text hidden]

Castle Parker - NOAA Federal <castle.e.parker@noaa.gov> Wed, Jan 20, 2016 at 1:34 PM
To: Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>
Cc: Matthew Jaskoski - NOAA Federal <matthew.jaskoski@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>

Thanks Nick.

I think that I'd stand by my suggestion at the end of my email response… "I suggest a small 1m grid over the 1m depth range area, get HSD OPS to grant the waiver on dropping the 4m grid, and submit only the small 1m and the remaining survey area at 2m resolution. HSD OPS will need to grant the waiver or submit the grids per HSSD. "

However, the final decision is not mine nor AHB. I would suggest to ensure that the grids that you submit are the agreement and acceptance from the Project Planner and HSD OPS. If you don't want to do the small 1m resolution grids, then get HSD OPS to agree on the deviation from HSSD, and deliver a 2m grid for the entire survey.

Thanks for the opportunity for input.

Regards,

gp

Castle Eugene Parker

NOAA Office of Coast Survey

Atlantic Hydrographic Branch

Hydrographic Team Lead / Physical Scientist

castle.e.parker@noaa.gov

office (757) 441-6746 x115

From: Nicholas Morgan - NOAA Federal [mailto:nicholas.morgan@noaa.gov]
Sent: Wednesday, January 20, 2016 12:31 PM
To: Castle Parker - NOAA Federal
Cc: Starla Robinson - NOAA Federal; OPS.Ferdinand Hassler - NOAA Service Account; Patrick Berube - NOAA Federal; Paul Turner - NOAA Federal; Michael Gonsalves - NOAA Federal; Megan Greenaway - NOAA Federal; Matthew Jaskoski - NOAA Federal

[Quoted text hidden]

[Quoted text hidden]

Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov> Tue, Feb 16, 2016 at 2:20 PM
To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>
Cc: Matthew Jaskoski - NOAA Federal <matthew.jaskoski@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>

Hi Starla,

I'm not sure I got an exact confirmation from Ops on this but I've had this survey on the back burner for a while. Gene recommends keeping a 1m surface for that area but I would prefer to exclude such tiny little areas. Would Ops be alright with us omitting the 1m surface and just documenting with images in the DR showing that the 1m and 2m surfaces represent the area identically? If not I can just include the full 1m suface that we have. It's not that big of deal at this point.

As for the 4m, that would be more advantageous to get rid of because if we include it then we have a combined surface that is forced to use a 4m resolution even though only a tiny little portion of the survey falls in the 4m depth range.

-Nick
[Quoted text hidden]

Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> Sat, Aug 13, 2016 at 6:40 AM
To: Nicholas Morgan - NOAA Federal <nicholas.morgan@noaa.gov>, Matthew Jaskoski - NOAA Federal <Matthew.Jaskoski@noaa.gov>, "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>, "CO.Ferdinand Hassler - NOAA Service Account" <co.ferdinand.hassler@noaa.gov>

Sorry FH,

I miss-emailed this. The direction is no 4 meter required, please still submit the 1 meter grid.

Thanks,
Starla

---------- Forwarded message ----------
From: **Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>
Date: Tue, Feb 16, 2016 at 6:53 PM
Subject: Fwd: H12840 1m, 4m surface exemption request
To: Corey Allen - NOAA Federal <corey.allen@noaa.gov>

Hello Nick,

I talked to Corey and LCDR Gonsalves. If you can meet the tpu and density standards with the 2 meter grid rather than you are meeting and exceeding spec and are not required to submit a 4 meter resolution grid. Please still submit the 1 meter grid.

Thanks,
Starla

---------- Forwarded message ----------
From: **Nicholas Morgan - NOAA Federal** <nicholas.morgan@noaa.gov>
Date: Tue, Feb 16, 2016 at 2:20 PM
Subject: Re: H12840 1m, 4m surface exemption request
[Quoted text hidden]
[Quoted text hidden]

--
[Quoted text hidden]
NOS - OCS - Hydrographic Survey Division - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-2702 x125
Cell: 360-689-1431
Website: In-House Planned Hydrographic Surveys -2016

Bryan Chauveau - NOAA Federal <bryan.chauveau@noaa.gov>

Fwd: NOAA Office of Coast Survey Profile Data accession 0160257 published

Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> Mon, Apr 24, 2017 at 2:56 PM
To: Bryan Chauveau - NOAA Federal <bryan.chauveau@noaa.gov>

Thank you for asking. Is this the email you are looking for? - Starla

——— Forwarded message ———
From: **OPS.Ferdinand Hassler - NOAA Service Account** <ops.ferdinand.hassler@noaa.gov>
Date: Tue, Feb 14, 2017 at 11:22 AM
Subject: Fwd: NOAA Office of Coast Survey Profile Data accession 0160257 published
To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>

FYI,

This correspondence is too late to include in the submission but just wanted to let you know that NODC files were successfully submitted as part of project OPR-D304-FH-16 Approaches to Chesapeake Bay.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*
29 Wentworth Road
New Castle, NH, 03854

——— Forwarded message ———
From: **Nicholas Morgan - NOAA Federal** <nicholas.morgan@noaa.gov>
Date: Tue, Feb 14, 2017 at 11:20 AM
Subject: Fwd: NOAA Office of Coast Survey Profile Data accession 0160257 published
To: "OPS.Ferdinand Hassler - NOAA Service Account" <ops.ferdinand.hassler@noaa.gov>

OPR-D304-FH-16 NODC SVP files archived.

——— Forwarded message ———
From: **NCEI archive manager** <archivist@nodc.noaa.gov>
Date: Tue, Feb 14, 2017 at 10:05 AM
Subject: NOAA Office of Coast Survey Profile Data accession 0160257 published
To: NODC.submissions@noaa.gov, nicholas.morgan@noaa.gov
Cc: John.Relph@noaa.gov

NCEI has archived and published the following NOAA Office of Coast Survey Profile data set:

Oceanographic profile data collected from CTD and sound velocimeter - moving vessel profiler casts aboard FERDINAND R. HASSLER as part of project OPR-D304-FH-16 in the North Atlantic Ocean from 2016-02-17 to 2016-03-23 (NODC Accession 0160257)

You can find your new data set and associated metadata at
https://accession.nodc.noaa.gov/0160257

LT Nick Morgan, NOAA
Operations Officer
NOAA Ship Ferndiand R. Hassler

***Physical Address** (UPS/FedEx):*
UNH Judd Gregg Marine Research Complex
29 Wentworth Rd.
New Castle, NH 03854

***Mailing Address**:*
PO Box 638
New Castle, NH 03854

Ship's landline: 603-431-4500
Ship's cell: 603-812-8748
Cell Phone: 907-617-0963

Starla D. Robinson, Physical Scientist
NOS - OCS - Hydrographic Survey Division - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-2702 x125
Cell: 360-689-1431
Website: HSD PIanned Hydrographic Surveys

From:	James J. Miller
To:	Russell Quintero - NOAA Federal
Cc:	Briana Welton - NOAA Federal; CO HASSLER; OPS.Ferdinand Hassler - NOAA Service Account; Starla Robinson - NOAA Federal; Tyanne Faulkes - NOAA Federal; Castle Parker - NOAA Federal; Clinton Marcus - NOAA Federal; Grant Froelich; Janice Eisenberg - NOAA Federal; John Doroba - NOAA Federal; Patrick Debroisse - NOAA Federal
Subject:	Re: Project workflow for processing
Date:	Monday, February 13, 2017 9:40:35 PM
Attachments:	2017-02-09_11-14-48.png 2017-02-13_20-10-51.png 2017-02-09_9-04-45.png 2017-02-13_20-12-07.png 2017-02-13_19-59-48.png 2017-02-09_11-05-38.png

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Russell,

Thank you for the detailed information. I appreciate all the points you and Starla have discussed and your understanding on this issue.

If this was a tide-referenced survey, there would be no problem because SVC was applied after loading delayed heave and tides. In terms of SVC, I think of SBETs as providing a (potentially) refined solution, not the "correct" solution because there is always uncertainty in our measurements. The SBET provides refined attitude information for the ray tracing, but it does not provide a radically different solution compared to using raw attitude. This is why it had such a small effect on the soundings. And this is why I do not consider it a failure to meet specs.

A similar example would be if someone elected not to load delayed heave. Yes, we recommend loading delayed heave because it provides a smoother result, but failing to use it does not constitute a failure to meet specs.

I suppose this entire discussion hinges on what a blunder is, and what is covered by the uncertainty budget. Clearly we all agree that the recommended Caris workflow was not followed during OPR-G309-FH-16 because SVC was not re-applied after loading SBETs. Yet it is not clear to me that this fails the specs. To my knowledge, the specs provide minimum requirements for the data but they do not prohibit any processing mistakes.

In my opinion, failing to re-apply SVC after loading SBETs provided a less precise solution and introduced uncertainty to the sounding measurements. It did not introduce a static offset, since it made some soundings slightly deeper and others slightly shallower. The degree of uncertainty that was introduced is identical to it being a tide-referenced survey, since we would consider the raw attitude and delayed heave as adequate for SVC ray tracing in that case. Yet for this ERS project, we are saying that same practice fails to meet the specs.

In addition, the 2016 HSSD does distinguish between an error budget and an uncertainty budget (images below). I suppose it is debatable whether this issue falls within the description of sound speed errors in 5.2.3.5, but it is worth consideration.

Respectfully,
James

5.2.3.5 Error Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the errors associated with the determination of depth (corrections to echo soundings). Error estimate ranges for six of these errors (measurement error, transducer draft error, dynamic draft error, sound speed error, heave error and tide/water level error) are presented below. These errors are inherent to hydrographic surveying and all have practical minimums that are usually achievable only under ideal circumstances or with highly specialized equipment. In addition, some errors may be dependent on depth (e.g. sound speed).

Sound speed error: The factors associated with this error include (1) the ability to accurately measure sound speed or calculate sound speed from temperature, conductivity and pressure, (2) the spatial and temporal changes of sound speed throughout the survey area and (3) how the sound speed profile is used to convert measured time to depth. In addition, this error encompasses depth errors associated with refraction for multibeam systems. The expected minimum is 0.20 meter and the allowable maximum is 0.30 meter plus 0.5% of the depth.

5.2.3.6 Uncertainty Budget Analysis for Depths

The hydrographer shall discuss (in Section B.2 of the Descriptive Report) the methods used to minimize the uncertainty associated with the determination of depth (corrections to echo soundings). A sample of uncertainty components and common values are presented below. These uncertainties are inherent to hydrographic surveying and all have practical minimums that are usually achievable only under ideal circumstances or with highly specialized equipment. The survey system uncertainty components and key survey system component offsets shall then be used to calculate the depth uncertainty estimate for the soundings per the Total Propagated Uncertainty Model.

James J. Miller
Physical Scientist
NOAA Office of Coast Survey
Atlantic Hydrographic Branch
439 W York St | Norfolk, VA | 23510
757-441-6746 x 111

On Mon, Feb 13, 2017 at 7:54 PM, Russell Quintero - NOAA Federal <russell.quintero@noaa.gov> wrote:

> What if the mistake was a tide file with a 1m static offset? MHHW instead of MLLW, for example. All internal checks line up, no statistical issues...passes all of our QC until a sharp-eyed PS notices it during SAR.
>
> That's a clear blunder, and it "blows spec." If it's only a 0.2m offset? That's still not within spec, because it's an Uncertainty Budget, not an Error Budget. Mistakes don't get a pass just for being small enough.
>
> We made another ship reconvert lines because they used the wrong datum for a handful of lines, even though the induced offset was minor. We would have done the same even if it was most of their survey. Mistakes have to be fixed.
>
> This one is really unsatisfying all around because it's the perfect storm of a small effect affecting a large volume of data...but being inconvenient doesn't change that the right answer is still right. If this was a contractor, our answer would be the same; even if it risked making that TO unprofitable. We don't have to worry about turning a profit, just a never ending pile of work we would rather work on, but our answer has to be consistent.
>
> We stand by ready to concur with a request to waive redoing the analysis if the reprocessed data is barely different. We have no desire to be punitive here, and we have every reason to strive to make both the field and office as efficient as possible. We are extremely sympathetic and Starla and I both worked on the wording of the bad news email to ensure it didn't come across as negative in any way; but that doesn't change that the right answer is to make it right.
>
> Very Respectively,
> Russell

On Mon, Feb 13, 2017 at 19:30 Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> wrote:

> How about adding rednotes to all the surveys that differ from the DAPR? As James said these errors are on the magnatude of centimeters. When a contractor sent in data with the wrong TVU calculated this made all surfaces fail TVU specifications. We are talking about apples and oranges here.

On Mon, Feb 13, 2017 at 4:17 PM Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

> Precisely James, we would have the contractor fix it. We had a contractor resubmit a year's worth of data for having the wrong TVU values. It was an error. It had to be fixed.
>
> Given the amount of effort we all put into this it is hard to have this delay. Correcting blunders is a cost of doing business, regardless of whether a contractor or a ship is responsible for the product. I know we are eager for the finish line but it is a bit further. I have added CMD Welton and LT Quintero in case they have any ideas to add to how we can help get there.
>
> Sincerely,
> Starla

On Mon, Feb 13, 2017 at 6:34 PM, James J. Miller <james.j.miller@noaa.gov> wrote:

> If this exact same situation applied to a contractor, would OPS require the contractor to re-process the data?

The error predominantly ranges from 0.5 - 1cm, with the occasional difference reaching 4cm. The vast majority of the project coverage will only affect a small-scale fathoms chart (1:432,000) where the error is unlikely to change the rounded depths on the chart. Processing and personnel resources are limited on the Hassler. Do we really think it is prudent and worthwhile to spend our limited time this way?

James J. Miller
Physical Scientist
NOAA Office of Coast Survey
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439 W York St | Norfolk, VA | 23510
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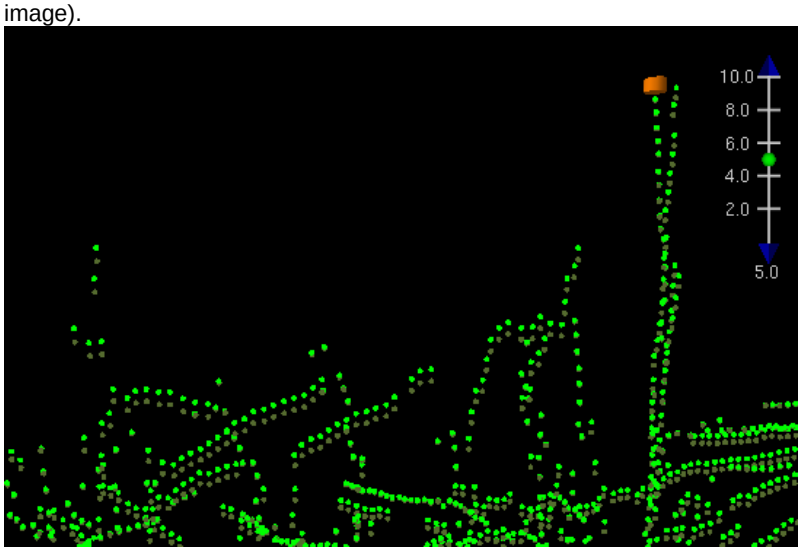
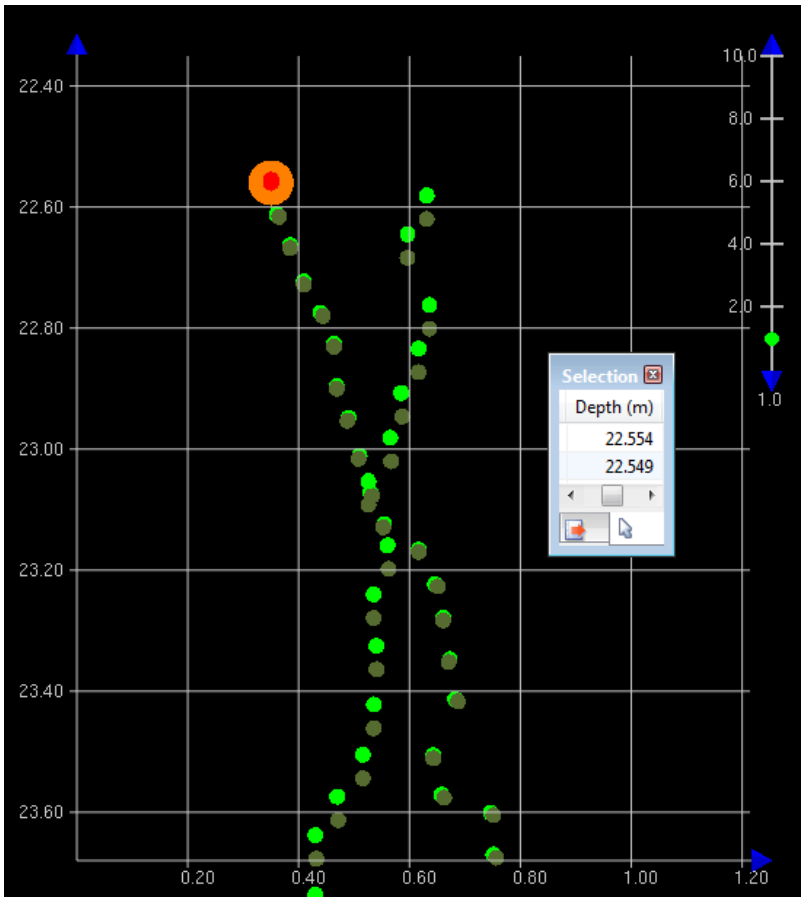
On Mon, Feb 13, 2017 at 5:52 PM, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> wrote:

> I am currently out sick. When I get back to the office I will talk to Ben to see if I can work with AHB and the FH to fix the surveys that I was survey manager on (I think there were three).
>
> Tyanne
>
> On Mon, Feb 13, 2017 at 2:47 PM Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:
>
> > HSD understands the desire to not reprocess this data, however after much soul searching and deliberation including consultation with the Chief of HSD... reprocess the data. The TVU budget is not for blunders. Captain Brennan has requested that the ship provide a plan on how to resolve this in a timely manner.
> >
> > To help speed things up, we think you could do a difference surface of the final surfaces with the previous products. By showing there is no statistically significant difference between the two surfaces, you could make the argument that the analysis (cross-lines, junctions, and chart comparisons) does not need to be redone. HSD can then issue a waiver concurring with this.
> >
> > Sincerely,
> > Starla
> >
> > On Thu, Feb 9, 2017 at 12:35 PM, James J. Miller <james.j.miller@noaa.gov> wrote:
> >
> > > Hi Clint,
> > >
> > > Our testing is consistent with your findings. Survey H12859 has one wreck that we used for additional testing. The vertical difference between processing methods ranged from 0.005 - 0.040 m over the wreck. The least depth of the wreck would change by 0.005 m depending on the processing method (second image).
> > >
> > > 
> > >



Survey H12932 (OPR-G309-FH-16) has one wreck that we tested. The vertical differences between processing methods were even smaller, ranging from 0.004 - 0.010 m. The least depth of the wreck would change by 0.004 m depending on the processing method.

We are relieved that prepossessing appears to be unnecessary for H12843 and OPR-G309-FH-16. Thanks again for identifying this problem and helping with the testing.

Thanks,
James

James J. Miller
Physical Scientist
NOAA Office of Coast Survey
Atlantic Hydrographic Branch
439 W York St | Norfolk, VA | 23510
757-441-6746 x 111

On Thu, Feb 9, 2017 at 12:23 PM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:

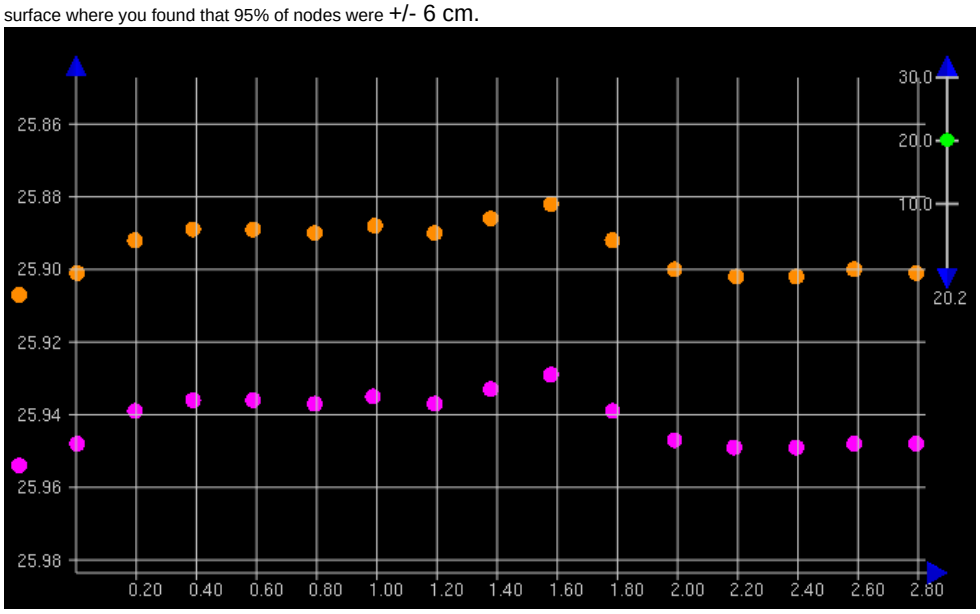
> Hi all,
>
> After taking another sub-section of H12843 for reprocessing, it was found that 95% of the nodes were +/- 2cm. I will go so far as to say the difference would likely be even smaller if I had filtered the one XL present, which is what the FH did (I believe).
>
> I took a total of 37 lines in an area of general bathymetry (no features) and followed the same procedure as previously noted. Taking the data from conversion thru SBETs, and re-applying SVC after SBETs.
>
> Looking at the data in subset, there was little to no difference between the two projects.
>
> After talking with Gene, we determined that it would not be necessary to reprocess the entire survey for such a small difference. Yay!

You might want to just double check with them (CO, Gene, Bri), but I don't think it is necessary for you to go back and reprocess the OPR-G309-FH-16 data.

Hope this all helped.

Cheers,
Clint Marcus
Physical Scientist
NOAA Office of Coast Survey
Atlantic Hydrographic Branch
Phone: (757) 441-6746 ext 208
Cell: (541) 264-6406

On Thu, Feb 9, 2017 at 9:12 AM, James J. Miller <james.j.miller@noaa.gov> wrote:

> Hi Clint,
>
> Thanks for all the helpful information and screen shots. For your next test subset, I think it would be worth comparing the original survey lines (re-SVC not conducted after SBETs) to the test lines at the sounding level in Subset Editor. When comparing surfaces, they often exhibit apparent vertical differences along slopes and features due to small horizontal shifts, rather than actual vertical changes. We are curious about the magnitude of the vertical difference between the soundings.
>
> Even though survey H12859 was not affected by this issue because SVC was run after loading SBETs, we conducted a test because it is in the vicinity of H12843. We re-processed test copies of the H12859 crosslines and did not re-SVC after loading SBETs. As viewed in Subset Editor, the vertical difference between processing methods mostly ranged from 2-3 cm and reached a maximum of 5 cm in some areas. This seems similar to the H12843 difference surface where you found that 95% of nodes were +/- 6 cm.
>
> 
>
>
> I will follow your lead and try testing a couple features on H12859 and the OPR-G309-FH-16 surveys. Worth checking how the least depths are affected.
>
> James J. Miller
> Physical Scientist
> NOAA Office of Coast Survey
> Atlantic Hydrographic Branch
> 439 W York St | Norfolk, VA | 23510
> 757-441-6746 x 111
>
> On Thu, Feb 9, 2017 at 7:42 AM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:
>
> > Hi Nick,
> > With the soundings all being from development lines, there is good parity within the data. The soundings were for the most part all of a Quality Flag of 3. We are going to process another subset of H12843 to help validate our findings. The screen shot attached is of a subset over the wreck showing the density of soundings. We'll keep you posted with our findings.

Cheers,

Clint Marcus
Physical Scientist
NOAA Office of Coast Survey
Atlantic Hydrographic Branch
Phone: (757) 441-6746 ext 208
Cell: (541) 264-6406

On Wed, Feb 8, 2017 at 8:26 PM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:

> Also, it could be possible that a horizontal change in position of the soundings could exacerbate the vertical difference in a sharp feature like a wreck but correct me if I'm wrong.
>
> Nick
>
> On Feb 8, 2017, at 6:32 PM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:
>
> Hi James, et. al.
>
> I ran a small subset of lines (8) on H12843 that were developement lines over a wreck. I made a local project and took the lines through the entire processing workflow and re-SVC'd after the application of SBETs. I created a combined 2m surface which I then differenced with the field submitted combined surface. The result was that 95% of nodes had a +/- 6cm difference. There were localized differences of up to 52cm over the wreck. Unfortunately, I did not difference the soundings before and after the post-SBET SVC. I believe Gene and Bri were going to talk about how to proceed with H12843.
>
> Hope that helps in the decision making process. I don't have the data in front of me, unfortunately, so I don't have any screen grabs available. I can send some out in the morning when I get to the office.
>
> Thanks,
> Clint
>
> Clint Marcus
> Physical Scientist
> NOAA Office of Coast Survey
> Atlantic Hydrographic Branch
> Phone: (757) 441-6746 ext 208
> Cell: (541) 264-6406
>
> On Wed, Feb 8, 2017 at 6:11 PM, James J. Miller <james.j.miller@noaa.gov> wrote:
>
> > Hi everyone,
> >
> > Thank you Clint for identifying this issue. And thank you all for clarifying that the proper workflow is to run (or re-run) SVC after loading the SBET if gyro, pitch, roll, heave or GPS height are applied. Unfortunately, this workflow was not followed during project OPR-G309-FH-16, which consists of 8 surveys and over 500 SNM of coverage. This issue is also relevant for the survey Clint is reviewing (H12843). Due to the large amount of data that is affected, it would take a significant amount of time to re-run SVC, re-Merge, re-check the designated soundings, and re-compute the grids. So in the interest of saving time, we were curious whether the problem is small enough to be documented in the DRs without reprocessing the data.
> >
> > To asses the magnitude of the problem, we re-processed test copies of the crosslines for several surveys in project OPR-G309-FH-16 and conducted a comparison between running SVC before or after applying SBETs. As viewed in Subset Editor, the vertical difference between these methods did not exceed 1 cm (see image below), even in the outermost beams which exhibited larger offsets than nadir beams (as expected). Depths ranged from 20-45 m. At least from our testing on project OPR-G309-FH-16, the magnitude of the offset is small enough that reprocessing does not seem worthwhile.
> > <2017-02-08_17-14-54.png>

Clint, what did your reprocessed test lines show on survey H12843? How large were the vertical offsets between running SVC before or after loading SBETs? Greater than 1 cm?

Thanks,
James

James J. Miller
Physical Scientist
NOAA Office of Coast Survey
Atlantic Hydrographic Branch
439 W York St | Norfolk, VA | 23510
757-441-6746 x 111

On Wed, Feb 8, 2017 at 8:54 AM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:

> Hi Starla,
>
> I just wanted to bring you in the loop. Clint found an error in our processing workflow during a SAR of H12843 (2015 Chesapeake) that involved not re-applying SV after applying SBETs. James Miller did a test with our Wilmington data that compared data without SV after SBETs and with SV after SBETs. In his test, we found that the difference is only on the order of about 1cm. It sounds like AHB is going to run a quick test of their own to see if they get similar results. We will have to figure out a course of action on this. We expect it to be a drop in the bucket in terms of the total uncertainty but we'll see.
>
> Let us know if you or HSD has any thoughts or recommendations on this.
>
> Thanks,
> -Nick
>
> Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*
> 29 Wentworth Road
> New Castle, NH, 03854
>
> On Wed, Feb 8, 2017 at 7:59 AM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:
>
> > Ok, James just did a comparison with some of our Wilmington data and found that the difference was ~1cm generally. It's a limited sample size but he can probably share the results with you shortly.
> >
> > Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*
> > 29 Wentworth Road
> > New Castle, NH, 03854
> >
> > On Wed, Feb 8, 2017 at 7:00 AM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:
> >
> > > Hey Nick,
> > > Just got done talking with Gene. We're gonna try a few test lines and compare the difference before we would move forward with re-processing the entire survey. Basically, the same thing James is doing out there for you. Thanks again for looking into that.
> > >
> > > Cheers,
> > >
> > > Clint Marcus
> > > Physical Scientist
> > > NOAA Office of Coast Survey
> > > Atlantic Hydrographic Branch
> > > Phone: (757) 441-6746 ext 208
> > > Cell: (541) 264-6406
> > >
> > > On Tue, Feb 7, 2017 at 4:51 PM, OPS.Ferdinand Hassler - NOAA Service Account <ops.ferdinand.hassler@noaa.gov> wrote:

So we got a quick response from Caris that SVC does need to happen after applying new attitude/nav data such as an SBET. I did a quick check of our 2016 Chesapeake Surveys and those seem to be processed that way so that's good. However, our 2016 Wilmington surveys are all processed without SVC after SBETs. I believe we may end up going back for those and re-applying SV. James is doing a brief comparison to see what kind of difference we see in the data between the two. I imagine though that it varies survey to survey as to how different your SBET is from your original POS data.

-Nick

Field Operations Officer, NOAA Ship *Ferdinand R. Hassler*
29 Wentworth Road
New Castle, NH, 03854

On Tue, Feb 7, 2017 at 2:35 PM, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> wrote:

> Hi all,
>
> As far as I remember SVC is not required again unless you are using a Kongsberg system. I will try to dig up the email if I have one...
>
> Tyanne
>
> On Tue, Feb 7, 2017 at 11:34 AM, Clinton Marcus - NOAA Federal <clinton.r.marcus@noaa.gov> wrote:
>
> > Thanks for the quick reply. I'll be standing by to see what CARIS has to say. Thanks again.
> >
> > Cheers,
> >
> > Clint Marcus
> > Physical Scientist
> > NOAA Office of Coast Survey
> > Atlantic Hydrographic Branch
> > Phone: (757) 441-6746 ext 208
> > Cell: (541) 264-6406
> >
> > On Tue, Feb 7, 20

...

[Message clipped]

APPROVAL PAGE

H12840

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

- H12840_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12840_GeoImage.pdf

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.

Digitally signed by HILLSTROM.BRIANA.WELTON.1267667531
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=HILLSTROM.BRIANA.WELTON.1267667531
Date: 2017.07.12 14:40:07 -04'00'

Approved:_____

Lieutenant Commander Briana Welton Hillstrom, NOAA
Chief, Atlantic Hydrographic Branch