H12501

NOAA Form 76-35A

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12501

LOCALITY

State:	Virginia
General Locality:	Approaches to Chesapeake Bay, VA
Sub-locality:	30 NM East of Cape Charles, VA

2012

CHIEF OF PARTY
LCDR Benjamin K. Evans, NOAA

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Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**H12501**

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:	**Virginia**
General Locality:	**Approaches to Chesapeake Bay, VA**
Sub-Locality:	**30 NM East of Cape Charles, VA**
Scale:	**40000**
Dates of Survey:	**08/28/2012 to 09/11/2012**
Instructions Dated:	**03/02/2012**
Project Number:	**OPR-D304-FH-12**
Field Unit:	**NOAA Ship *Ferdinand R. Hassler***
Chief of Party:	**LCDR Benjamin K. Evans, 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. Revisions and Red notes were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. The final disposition of features is addressed in the Appendix III Feature Report. The discussion of surveyed features in the body of the Descriptive Report are a record of the field unit's report and were not edited for content during AHB processing. Page numbering may be interrupted or non-sequential. All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

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Descriptive Report to Accompany Survey H12501

Project: OPR-D304-FH-12

Locality: Approaches to Chesapeake Bay, VA

Sublocality: 30 NM East of Cape Charles, VA

Scale: 1:40000

August 2012 - September 2012

NOAA Ship *Ferdinand R. Hassler*

Chief of Party: LCDR Benjamin K. Evans, NOAA

A. Area Surveyed

A.1 Survey Limits

Data was acquired within the following survey limits:

Northeast Limit	Southwest Limit
37.091739 N 75.166457 W	37.011926 N 75.342227 W

Table 1: Survey Limits

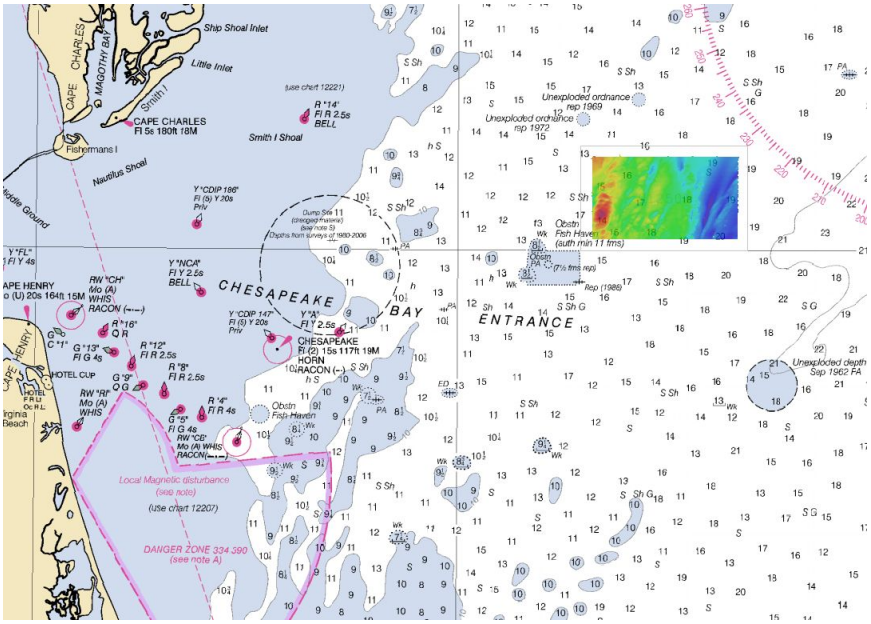


Figure 1: General locality of survey H12501

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

A.2 Survey Purpose

The primary purpose of H12501 is to support safe navigation through the acquisition and processing of hydrographic data for updating the National Ocean Service's (NOS) nautical charting products.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

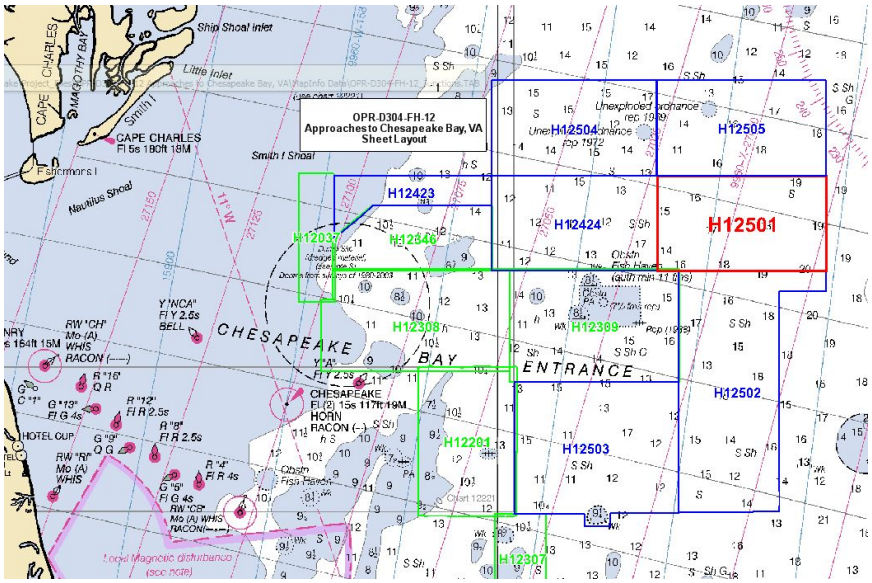


Figure 2: Project OPR-D304-FH-12 Sheet Layout

Survey Coverage was in accordance with the requirements in the Project Instructions and the HSSD.

A.5 Survey Statistics

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

	HULL ID	*S250*	*Total*
LNM	**SBES Mainscheme**	0.00	0.00
	MBES Mainscheme	689.41	689.41
	Lidar Mainscheme	0.00	0.00
	SSS Mainscheme	0.00	0.00
	SBES/MBES Combo Mainscheme	0.00	0.00
	SBES/SSS Combo Mainscheme	0.000	0.00
	MBES/SSS Combo Mainscheme	0.00	0.00
	SBES/MBES Combo Crosslines	27.61	27.61
	Lidar Crosslines	0.00	0.00
Number of Bottom Samples			9
Number of DPs			0
Number of Items Items Investigated by Dive Ops			0
Total Number of SNM			38.51

Table 2: Hydrographic Survey Statistics

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

Survey Dates
08/29/2012
08/30/2012
08/31/2012
09/06/2012
09/07/2012
09/09/2012
09/10/2012
09/11/2012

Table 3: Dates of Hydrography

Mileage reported is from the port Reson 7125 only. Starboard lines ran concurrently accounted for an additional 697.44 LNM

A.6 Shoreline

The survey area is offshore and no shoreline investigation was required in the project instructions.

A.7 Bottom Samples

Bottom samples were taken in areas deemed significant after analysis of acquired bathymetry and backscatter by the field unit. Nine bottom samples were taken within the limits of sheet H12501; all received the appropriate S-57 attribution and are included in the sheet's Final Feature File (FFF).

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	3.85 meters

Table 4: Vessels Used

FERDINAND R. HASSLER (S250) collected all data within the limits of H12501.

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 V4	Vessel Positioning and Attitude System
Hemisphere	MBX-4	Positioning System
Brooke Ocean	MVP-30	Sound Speed System
AML	Smart SV&P	Sound Speed System
Sea-Bird	45 MicroTSG	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Because dual head frequency modulated mode (FM) was used for all mainscheme coverage, crosslines were acquired exclusively with the port head in continuous wave (CW) mode.

A geographic plot of crosslines is shown in Figure 3. 27.6 nautical miles of crosslines were acquired. This accounts for 4.0% of mainscheme distance and satisfies NOS Specifications and Deliverables (2012).

Crosslines were filtered to remove soundings greater than 45 degrees from nadir. To evaluate crossline agreement, two 1 meter surfaces were created: one from the cross line soundings, the other from mainscheme

soundings. These two surfaces were differenced using CARIS HIPS and SIPS. The statistical analysis of the differences between the mainscheme and cross line surfaces are shown in Figure 4. The average difference between the surfaces is 0.05 meters; 95% of all differences were less than 0.14 meters.

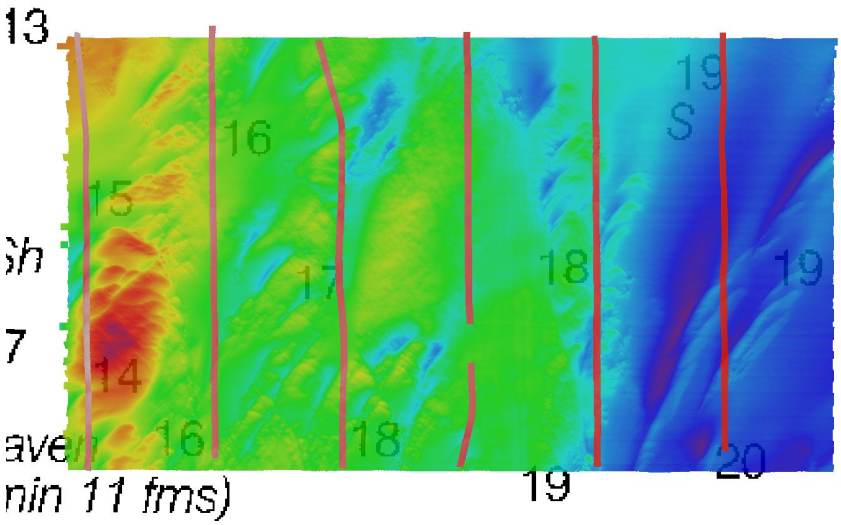


Figure 3: Crosslines (shown in red) and mainscheme data

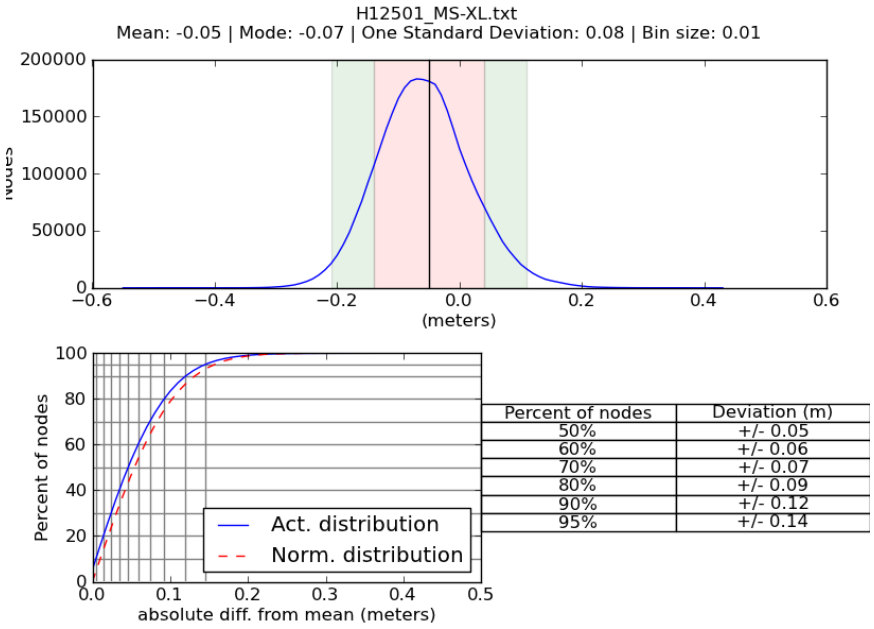


Figure 4: H12501 Crossline Difference Statistics - Mainscheme minus Crossline

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0.01meters	0.09meters

Table 6: Survey Specific Tide TPU Values

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

Table 7: Survey Specific Sound Speed TPU Values

CO-OPS did not provide a tidal uncertainty in the Project Instructions due to lack of available water level time series data. Tide uncertainties provided by CO-OPS for the adjoining sheets in the 2011 project OPR-D304-FH-11were used for this project.

B.2.3 Junctions

The areas of overlap between sheet H12501 and its junction sheets were reviewed in CARIS Subset Editor for sounding consistency. The H12501 surface was differenced with junction surfaces to assess agreement.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12309	1:40000	2011	NOAA Ship THOMAS JEFFERSON	SW
H12424	1:40000	2012	NOAA Ship FERDINAND R. HASSLER	W
H12502	1:40000	2012	NOAA Ship FERDINAND R. HASSLER	S
H12505	1:40000	2012	NOAA Ship FERDINAND R. HASSLER	N

Table 8: Junctioning Surveys

H12309

No comparison was made in the field. Data was not available at this time.

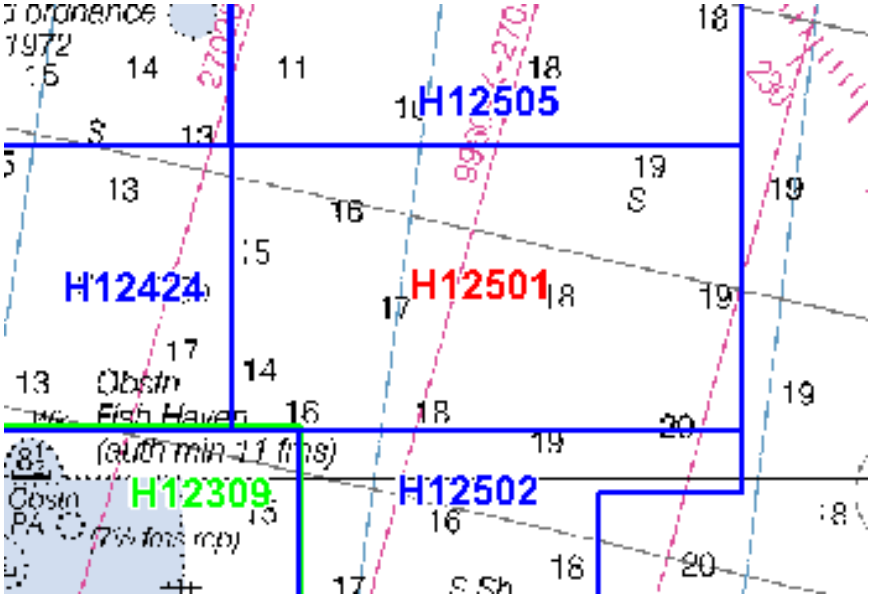
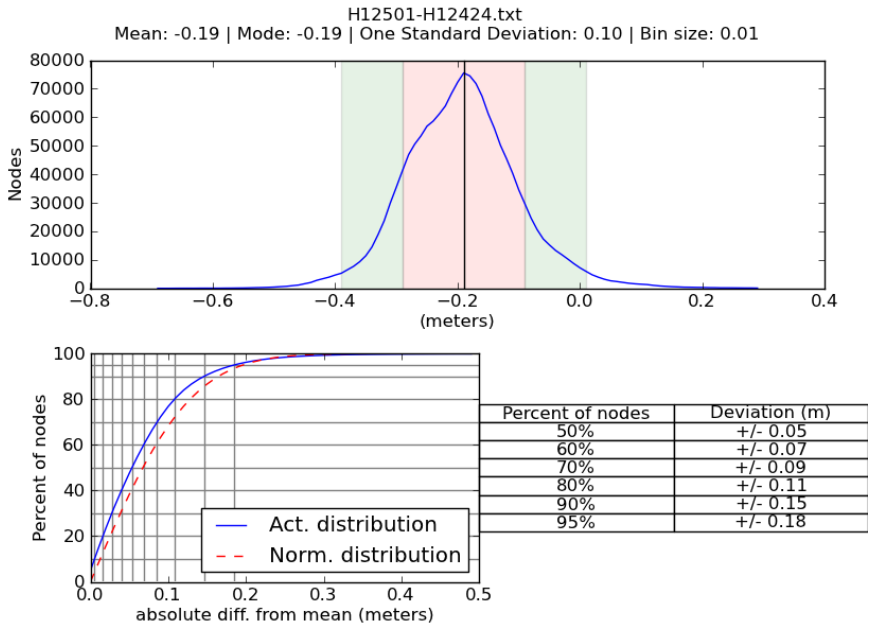


Figure 5: H12501 Junctions

H12424

A difference surface showed that survey H12424 agreed to within -1.18 to 0.65 meters when compared to H12501. Majority of H12424 agreed with H12501 on average of -0.19 meters with a standard deviation of 0.10 meters. 95% of all the differenced surface nodes are in the range -0.37 to -0.01 meters. Survey H12424 is within Project OPR-D304-FH-12 as is H12501. Survey dates for H12424 are from 07/14/2012 to 10/15/2012.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.07
70%	+/- 0.09
80%	+/- 0.11
90%	+/- 0.15
95%	+/- 0.18

Figure 6: Difference Surface Statistics - H12501 minus H12424

H12502

A difference surface showed that survey H12502 agreed to within -0.81 to 1.83 meters when compared to H12501. Majority of H12502 agreed with H12501 on average of 0.00 meters with a standard deviation of 0.09 meters. Over 95% of all the differenced surface nodes are in the range of -0.20 to 0.20 meters. Survey H12502 is within Project OPR-D304-FH-12 as is H12501. Survey dates for H12502 are from 09/07/2012 to 09/28/2012.

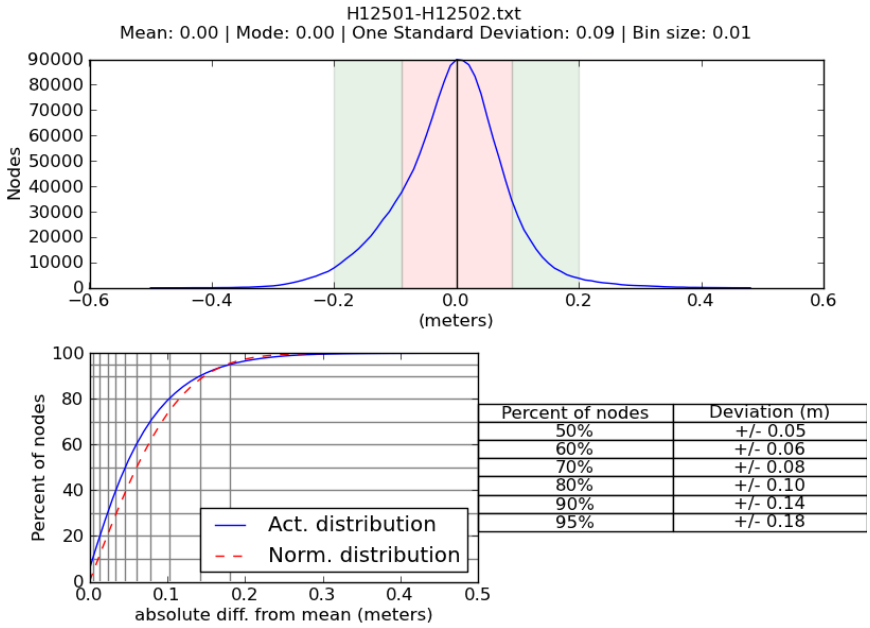


Figure 7: Difference Surface Statistics - H12501 minus H12502

H12505

A difference surface showed that survey H12505 agreed to within -1.04 to 1.09 meters when compared to H12501. Majority of H12505 agreed with H12501 on average of 0.14 meters with a standard deviation of 0.06 meters. Over 95% of all the differenced surface nodes are in the range of 0.02 to 0.26 meters. Survey H12505 is within Project OPR-D304-FH-12 as is H12501. Survey dates for H12505 started 10/11/2012 and are tentatively expected to be completed in December 2012, post completion of this report.

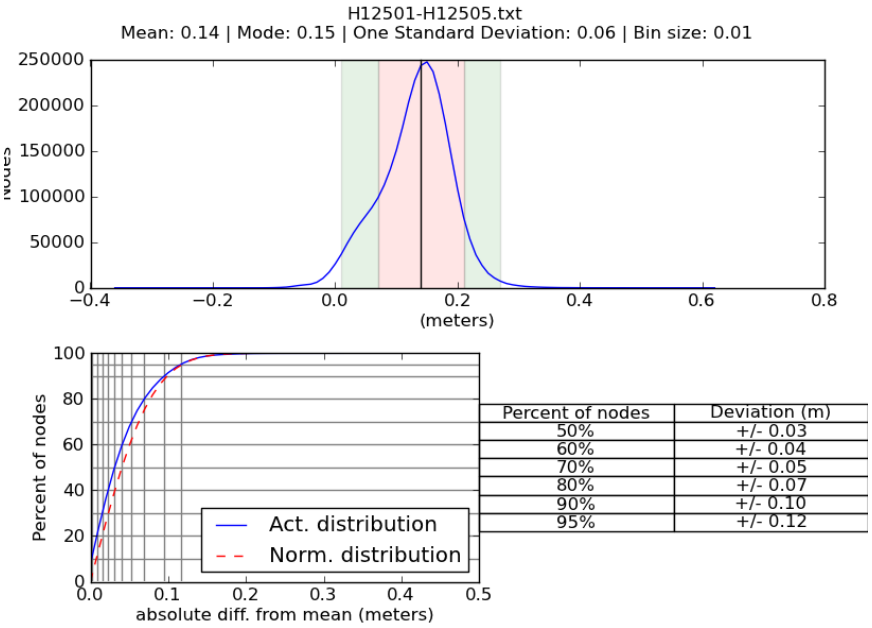


Figure 8: Difference Surface Statistics - H12501 minus H12505

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

B.2.5.1Applanix Trueheave dropouts

The internally logged POS file used for Trueheave had gaps in the IMU data for six lines. Because Caris linearly interpolates across a gap in the data record, these data gaps resulted in large heave errors in the corrected soundings. An example of this interpolation across a data gap and the bathymetric effect is shown in Figure 9 and Figure 10. These data gaps occurred during the following lines:

Port -
Dn241 _224322
Dn242 _160709, _180302 and _225403
Dn243 _114626
Dn251 _150753

The data gaps were corrected on Dn241 by application of the concurrently logged Ethernet POS file. In these cases, the Ethernet POS file is submitted under the survey's RAW data in addition to the internally logged files.

For Dn242 and Dn243 the Ethernet POS file could not be successfully applied, likely because of the size of these files (approximately 2.5 GB). On Dn251 the Ethernet POS file was not recorded. For these lines,

the Trueheave files were manually removed from the HDCS directory and the lines were SVP corrected and merged. These lines are thus corrected with real-time heave rather than Trueheave.

Following these corrections, the large heave artifacts caused by these data gap is completely eliminated. However, because the advantages of Trueheave over real time heave was lost for these lines, there are some residual heave artifacts. While these artifacts are generally small, they are particularly evident on the line 150753 of Dn251 for the port head. On this line the half-amplitude of the residual heave artifact is 0.15 to 0.20 meters.

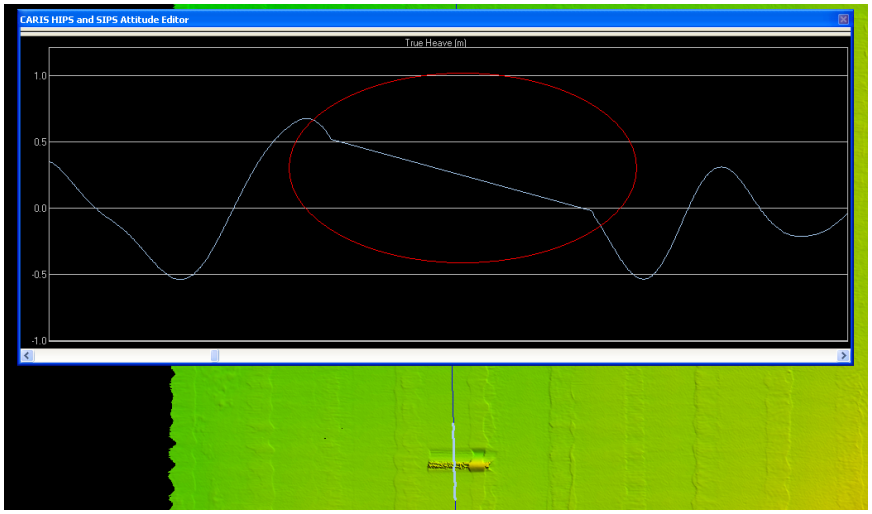


Figure 9: Example of Trueheave dropouts seen in BASE surfaces and Attitude Editor before correction - Interpolated section circled in red

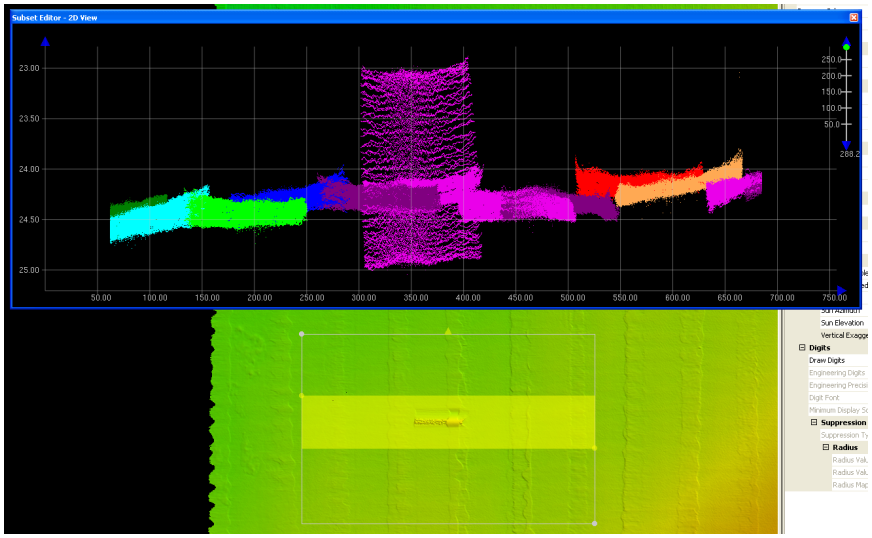


Figure 10: Example of Trueheave dropouts seen in BASE surfaces and Subset Editor before correction

B.2.6 Factors Affecting Soundings

B.2.6.1 None Exist

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed casts were generally taken using the MVP approximately every 20 minutes.

The sound speed correction method of nearest in distance within time of one hour was used for the entire survey with the exception of starboard Dn255 lines _205020, _213952 and _205544 which were applied within four hours.

B.2.8 Coverage Equipment and Methods

A density analysis was run to calculate number of soundings per surface node. Five or more soundings per node were present in over 99% of the 1 meter surface. For additional detail refer to H12501_Standards_Compliance report submitted in Appendix II of this report. Note that there are four sections of this report; all sections refer to the 1 meter surface which needed to be split due to computer memory allocation issues.

B.2.9 Vertical Offsets

Vertical offsets are present throughout sheet H12501. Many of these are likely to be due to errors from the zoned tide approach as this offshore survey area is approximately 60 nautical miles from the controlling guage. Additionally, variations in vessel loading could have contributed to these offsets. The following figure is an example of an area with the greatest vertical offsets which causes artifacts in the BASE surface. The discrepancy between the outer beams of the holiday lines is likely due to surface sound speed variations. The vertical offset is likely due to a combination of tidal zoning errors and errors in properly accounting for vessel loading. Without robust GPS derived vertical heights on this sheet, it is difficult to separate these effects.

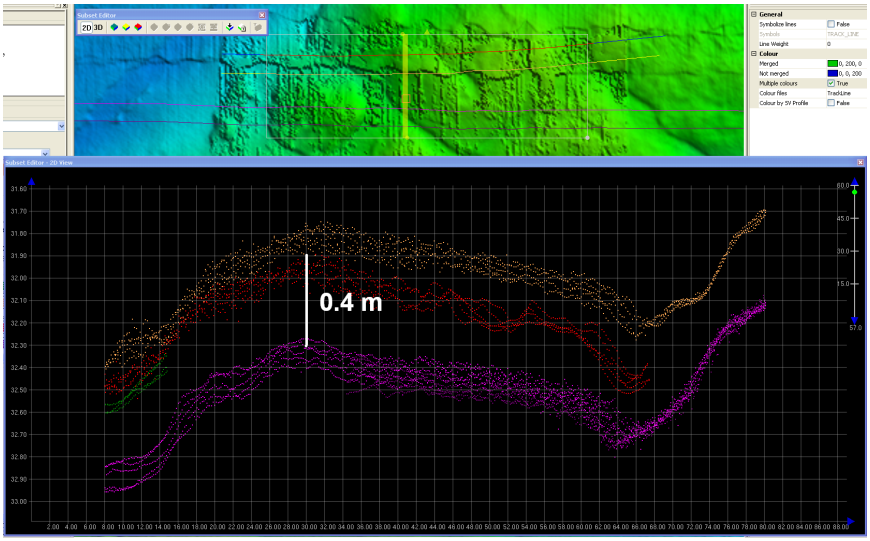


Figure 11: Vertical Offsets shown in Subset Editor (37-02-03N, 075-15-44W)

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 file also holds the navigation and bottom detections for all lines of survey H12501. After initial processing of the bathymetric data, GSF files were exported from CARIS and paired with the raw file in the raw data directory. The files were paired, imported and processed using Fledermaus Geocoder Toolbox, version 7.3.2b-beta, build 406, 64-bit version.

The GSF files containing the extracted backscatter are saved in the "Backscatter" folder under the processed data directory in accordance with instruction from HSD Ops dated 6/28/2012. The processed mosaic is saved as both a geoTIFF and a scalar attached to the bathymetric Fledermaus .sd object in the same folder location.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: 5.2

There were no software updates or additions since the DAPR. CARIS HDCS lines were all converted and processed using CARIS HIPS and SIPS 7.1 Service Pack 2. CARIS HIPS and SIPS contains a 1 second leap second in SP2 which is not accounted for in previous versions. This effects the loading of navigation/ attitude data and Trueheave.

B.5.2 Surfaces

The following CARIS surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12501_1m	CUBE	1.0 meters	0 meters - 999 meters	NOAA_1m	Object Detection
H12501_1m_Final	CUBE	1.0 meters	24.04 meters - 40.28 meters	NOAA_1m	Object Detection

Table 9: CARIS Surfaces

B.5.3 Total Vertical Uncertainty Analysis

A custom layer was created on finalized surfaces showing the uncertainty of individual nodes in relation to the allowable uncertainty for their depths. This layer was exported and run through a custom Python script resulting in statistical analysis. 100% of nodes within survey H12501 met the vertical uncertainty standards of section 5.1.3 of the Hydrographic Surveys Specifications and Deliverables (2012 Edition). See H12501_Standards_Compliance report submitted in Appendix II of this report.

C. Vertical and Horizontal Control

Refer to the Horizontal and Vertical Control Report (HVCR) for a complete description of data acquisition and processing methods used during OPR-D304-FH-12.

C.1 Vertical Control

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

Standard Vertical Control Methods Used:

Discrete Zoning

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

Station Name	Station ID
Chesapeake Bay Bridge Tunnel, VA	8638863
Duck, NC	8651370

Table 10: NWLON Tide Stations

File Name	Status
8651370.tid	Verified Observed
8638863.tid	Verified Observed

Table 11: Water Level Files (.tid)

File Name	Status
D304FH2012CORP.zdf	Final

Table 12: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 09/15/2012. The final tide note was received on 11/09/2012.

Preliminary zoning is accepted as the final zoning for project OPR-D304-FH-2012, H12501 during the time period between August 28 to September 11, 2012 per Tide Note submitted in Appendix I of this report.

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

2012_D304_VDatum_Ellip_MLLW.xyz

VDatum was evaluated prior of data submittal. Due to IMU data gaps, GPS outages and unexplainable vertical anomalies in the post processed trajectory, VDatum was not the chosen vertical transformation tool for H12501. GPS Tides have been computed using the aforementioned separation file but all data being submitted is vertically corrected using discrete zoning verified tides. For additional detail, refer to the VDatum Evaluation Memo for analysis of VDatum application submitted in Appendix II of this report.

C.2 Horizontal Control

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

The following PPK methods were used for horizontal control:

Smart Base

All data submitted as H12501, with the exception of the following lines, has SBETs and SMRMSGs applied for post-processed position/attitude and TPU values, respectively. Refer to the D304-FH-12 HVCR for specific values used while processing and applying these files.

The following lines do not have post-processed position and attitude due to post-processed solution gaps and have DGPS poisitioning.

Port -
Dn251 _150753 and _155909
Dn253 _213232
Dn254 _145900

Starboard -
Dn243 _123535

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
Acushnet 6	ACU6
Chesapeake Light	COVX
Driver 6	DRV6
Loyola W	LOYW
Loyola	LS03
Moriches 5	MOR5
Moriches 6	MOR6
Buxton	NCBX
Duck 3	NCDU
Middle Township	NJCM
Wallops Island	VAWI

Table 13: CORS Base Stations

All data was collected real-time with DGPS correctors applied to the navigation solution.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Driver, Virginia (289kHz)

Table 14: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

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
12200	1:419706	50	07/2011	06/28/2011	07/09/2011

Table 15: Largest Scale Raster Charts

12200

Survey soundings of H12501 are generally in agreement with charted depths on Raster Chart 12200. Surveyed soundings over the southernmost 18 fathom charted depth and the 14 fathom charted depth are about 1 fathom shallower. The central 17 fathom charted sounding has surveyed depths of 16.5 fathoms. There are no charted depth curves in the survey area of H12501.

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	1:419706	13	08/02/2012	10/23/2012	NO

Table 16: Largest Scale ENCs

US3DE01M

ENC US3DE01M contains no soundings different than RNC 12200. See previous discussion for comparison with chart 12200.

D.1.3 AWOIS Items

No AWOIS items exist for this survey.

D.1.4 Charted Features

No charted features exist for this survey.

D.1.5 Uncharted Features

No uncharted features exist for this survey.

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.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

Aids to navigation (ATONs) do not exist for this survey.

D.2.4 Overhead Features

Overhead features do not exist for this survey.

D.2.5 Submarine Features

Submarine features do not 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 Construction and Dredging

There is no present or planned construction or dredging within the survey limits.

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 and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives with the exception of discrepencies noted in this report. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required.

Report Name	Report Date Sent
Hydrographic Survey Readiness Review Memo	2012-07-03
OPR-D304-FH-12 Data Acquisition and Processing Report	2013-01-07

Approver Name	Approver Title	Approval Date	Signature
LCDR Benjamin K. Evans, NOAA	Chief of Party	01/06/2013	
LT Samuel F. Greenaway, NOAA	Field Operations Officer	01/06/2013	
David T. Moehl	Senior Survey Technician	01/06/2013	

F. Table of Acronyms

Acronym	Definition
AFF	Assigned Features File
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
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
HSSDM	Hydrographic Survey Specifications and Deliverables Manual

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
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Exectutive 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 9, 2012

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-D304-FH-2012
HYDROGRAPHIC SHEET: H12501

LOCALITY: 30 NM East of Cape Charles, Approaches to Chesapeake Bay, VA
TIME PERIOD: August 28 - September 11, 2012

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: 1.026 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project OPR-D304-FH-2012, H12501, during the time period between August 28 to September 11, 2012.

Please use the zoning file D304FH2012CORP submitted with the project instructions for OPR-D304-FH-2012. Zones SA46 is the applicable zone for H12501.

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).

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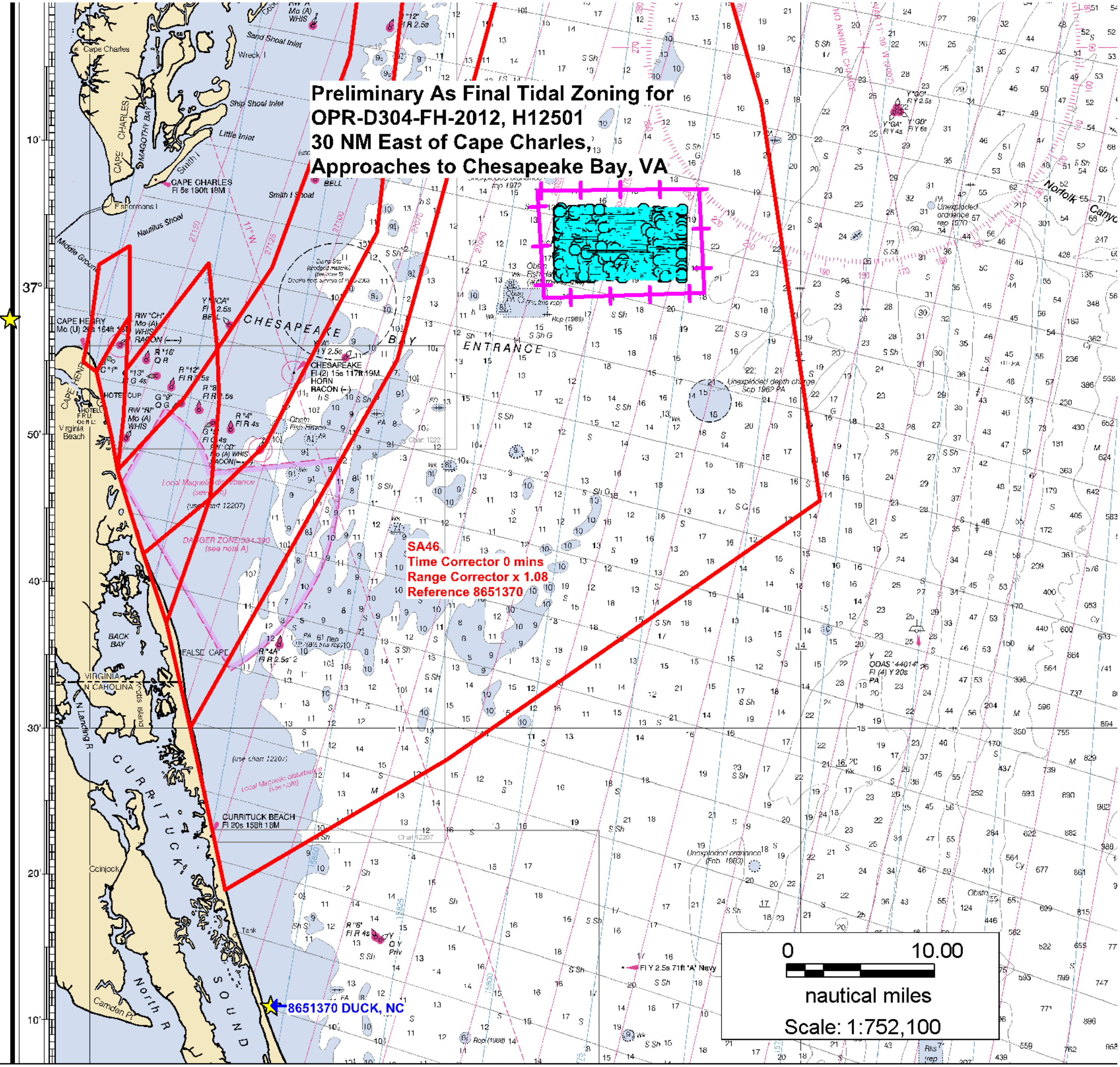
Date: 2012.11.14 08:57:35 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Preliminary As Final Tidal Zoning for
OPR-D304-FH-2012, H12501
30 NM East of Cape Charles,
Approaches to Chesapeake Bay, VA
SA46
Time Corrector 0 mins
Range Corrector x 1.08
Reference 8651370
8651370 DUCK, NC
0
10.00
nautical miles
Scale: 1:752,100

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

NO SUPPLEMENTAL SURVEY RECORDS OR CORRESPONDENCE IN SURVEY h12501

APPENDIX III

FEATURES REPORT

DTONS -- NONE

AWOIS -- NONE

WRECK -- NONE

MARITIME BOUNDARIES -- NONE

APPROVAL PAGE

H12501

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

The following products will be sent to NGDC for archive

- H12501_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12501_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.

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Date: 2013.05.23 14:12:45 -04'00'

Approved:_____

LT Abigail Higgins, NOAA
Chief, Atlantic Hydrographic Branch