NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey	Hydrographic	
Field No.	David Evans and Associates, Inc.	
Registry No.	H12041	
	LOCALITY	
State	Virginia	
General Locality	Southern Chesapeake Bay	
Sublocality	East of Smith Point	
	2009	
	CHIEF OF PARTY	
Jonathan l	L. Dasler, PE (OR), PLS (OR,CA)	
LIB	RARY & ARCHIVES	
DATE		

Sub-Locality East of Smith Point						
Scale 1:10,000	Date of Survey	July 20, 2009 to December 15, 2009				
Instructions dated June 1, 2009	Project No.	OPR-E349-KR-09				
Vessel R/V Theory and R/V Chinook						
Chief of party Jonathan L. Dasler, PE (OR), PLS (OR, CA)						
Surveyed by David Evans and Associates, Inc.						
Soundings by echo sounder, hand lead, pole RESON 7125, R2	Sonic 2024, Ed	geTech 4200-FS, EdgeTech 4200-HFL				
Graphic record scaled by N/A						
Graphic record checked by N/A	Automated Plot	N/A				
Verification by Atlantic Hydrographic Branch						
Soundings in Meters at MLLW						
H-Cell Compilation Units: Feet at MLLW						
REMARKS: All times are UTC. Projection is NAD83, UTM Zone 18N.						
The purpose of this contract is to provide NOAA with mo						
with which to update nautical charts of the assigned area	· ·	njurogrupine survey unu				
Bold, Italic, Red notes in the Descriptive Report were many		ce processina				
SUBCONSULTANTS: Zephyr Marine, P.O. Box 1575, Pete		•				
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NOAA FORM 77-28 SUPERSEDES FORM C&GS-537

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Acronyms and Abbreviations

AML Applied Microsystems, Ltd

AWOIS Automated Wreck and Obstruction Information System

BAG Bathymetric Attributed Grid

CO-OPS Center for Operational Oceanographic Products and Services

CTD Conductivity, Temperature and Depth

CUBE Combined Uncertainty and Bathymetry Estimator

DAPR Data Acquisition and Processing Report

DEA David Evans and Associates, Inc.

DN Day Number

DTON Danger to Navigation

ENC Electronic Navigation Charts
GPS Global Positioning System

HIPS Hydrographic Information Processing System IHO International Hydrographic Organization

IAKAR Inertially-Aided Kinematic Ambiguity Resolution

MLLW Mean Lower-Low Water MVP Moving Vessel Profiler

NAD83 North American Datum of 1983

NGS National Geodetic Survey

NOAA National Oceanic and Atmospheric Administration

NOS National Ocean Service

NWLON National Water Level Observation Network

OCS Office of Coast Survey

OPUS On-line Positioning User Service

POS/MV Position and Orientation System for Marine Vessels

R/V Research Vessel

SBET Smooth Best Estimate and Trajectory

SVP Sound Velocity Profiler
TPE Total Propagated Error
ZDF Zone Definition File

Descriptive Report to Accompany Hydrographic Survey H12041

Project OPR-E349-KR-09 Southern Chesapeake Bay, Virginia East of Smith Point Scale 1:10,000 July 2009 – December 2009

David Evans and Associates, Inc.

Lead Hydrographers: Jonathan L. Dasler, Jason C. Creech

A. AREA SURVEYED

David Evans and Associates, Inc. (DEA) conducted hydrographic survey operations in the Southern Chesapeake Bay, Virginia. The survey area (Figure 1) is west of Tangier Island on the eastern side of the traffic separation zone that extends north from the entrance of the Great Wicomico River to Smith Point. *Concur.*

Survey H12041 was conducted in accordance with the *Statement of Work* and *Hydrographic Survey Project Instructions** for OPR-E349-KR-09 dated June 2009 and the Draft National Ocean Service (NOS) Skunk Stripe Specifications issued to DEA via email by the Chief of the Data Acquisition and Control Branch. A copy of this email is included in Appendix IV - *Supplemental Records and Correspondence***. *Concur. *Filed with original field reports.* **Included with survey deliverables.

The project instructions required 200% side scan sonar coverage of the survey area with multibeam sonar data acquired in conjunction with side scan sonar operations. The survey was conducted over 80m set line spacing and 130m set line spacing per 100% coverage (50m and 75m side scan sonar ranges, respectively). Automated Wreck and Obstruction Information System (AWOIS) items and significant side scan contact investigations were acquired to meet complete coverage requirements. The inshore limit of hydrography was defined as the most seaward of either the survey polygon depicted by the *OPR-E349-KR-09_region.shp* file provided by Office of Coast Survey (OCS) staff or the surveyed 18-foot contour.

Twenty-six (26) bottom samples were acquired for H12041 on July 20, 2009 (Day Number 201). Eight (8) AWOIS item investigations were assigned to this survey for full investigation. *Concur*.

Data acquisition was conducted from August 29, 2009 (Day Number 241) to December 15, 2009 (Day Number 349). Table 1 lists specific dates of acquisition. *Concur.*

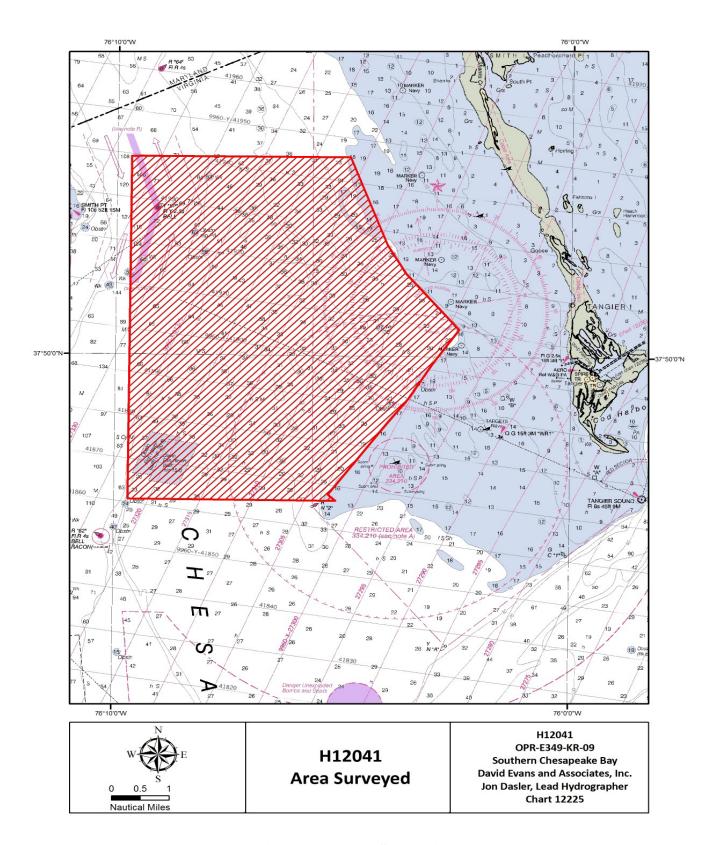


Figure 1. H12041 Survey Area

Table 1. H12041 Days of Acquisition

Dates of Acquisition					
Month Dates					
August	29-30				
September	5, 12-13, 22-24, 28				
October	1, 3-4, 29-31				
November	15-16				
December	7, 15				

Detailed survey statistics of H12041 are provided in Table 2.

Table 2. H12041 Survey Statistics

Survey Statistics	Research Vessels (R/V) Theory and Chinook
MBES (mainscheme nm)	987.80
Crosslines (MBES nm)	41.29
Developments (MBES nm)	38.36
Number of Item Investigations that required additional survey effort	28
Total number of square nautical miles	31.62

B. DATA ACQUISITION AND PROCESSING

B1. Equipment

Equipment and vessels used for data acquisition and survey operations during this survey are listed below in Table 3 and 4.

Table 3. R/V Theory Equipment and Vessel Specifications

	R/V Theory
	THEORY
Hull Registration Number	IAR34CATA808
Official Number (O/N)	1217549
Builder	Armstrong Marine
Design	Catamaran
Year Built	2008
Length Overall	36'
Beam	13'
Draft, Maximum	3'
Cruising Speed	26 knots
Max Survey Speed	9 knots
Primary Echosounder	RESON 7125-B
Side Scan Sonar	Edgetech 4200-FS and 4200-HFL
Sound Velocity Equipment	Brooke Ocean MVP-30 with AML Smart SV & P Reson SVP-70 Sea-Bird SEACAT SB-19 CTD Profiler
Positioning & Attitude	Applanix POS/MV 320 v4

Table 4. R/V Chinook Equipment and Vessel Specifications

R/V Chinook **Hull Registration Number** IAR28CATJ607 Official Number (O/N) AK-8018-AG **Builder Armstrong Marine** Design Catamaran Year Built 2008 28' **Length Overall** Beam 10.5' **Draft, Maximum Cruising Speed** 27 knots **Max Survey Speed** 9 knots **Primary Echosounder** R2Sonic 2024 **Side Scan Sonar** Edgetech 4200-FS Applied Microsystems MicroSV **Sound Velocity Equipment** AML SVPlusV2 Sea-Bird SEACAT SB-19 CTD Profiler **Positioning & Attitude** Applanix POS/MV 320 v4

There were no vessel or equipment configurations used during data acquisition that deviated from those described in the *OPR-E349-KR-09 Data Acquisition and Processing Report* (DAPR)*. *Concur.* **Included with survey deliverables*.

B2. Quality Control

Quality control is discussed in detail in Section B of the DAPR*. The results from the positioning system comparison and bar-to-multibeam comparison is included in Separate I Acquisition and Processing Logs** and the sound velocity profile sensor weekly evaluation table can be found in Separate II Sound Speed Data** section of this report. Data were reviewed at multiple levels of data processing including: CARIS Hydrographic Information Processing System (HIPS) conversion, subset editing, and analysis of anomalies revealed in combined uncertainty and bathymetry estimator (CUBE) surfaces. Both baring and submerged significant features identified during survey were noted in the acquisition logs and saved to Hypack target files, Isis cursor log files, or Target Pro contact files and then displayed during HIPS editing to aid in the interpretation of data and act as a check during feature compilation. Concur. *Included with survey deliverables. **Filed with original field reports.

B2.a Crosslines

A total of 41.3 nautical miles of crosslines, or 4.2% of mainscheme lines, were run for analysis of survey accuracy. Crosslines were run in a direction perpendicular to mainscheme lines across the entire surveyed area providing a good representation for analysis of consistency. All crosslines were used for crossline comparisons. *Concur*.

Crossline analysis was performed using the CARIS HIPS QC Report tool, which compares crossline data to a gridded surface and reports results by beam number. Crosslines were compared to a 1 meter CUBE surface that encompassed the entire survey area. Because 200 kHz (R/V Chinook) and 400 kHz (R/V Theory) frequencies were used, the crossline analysis was done per frequency and using all the crosslines. These surfaces were not included with the deliverables due to file size. The QC Report tabular outputs and plots are included in Separate IV Crossline Comparisons**. The results of the analysis meet the requirements as stated in the NOS Hydrographic Surveys Specifications and Deliverables (April 2009)*** for all frequency comparisons. Concur. ** Filed with original field reports. ***2010 version of NOS HSSD available here http://www.nauticalcharts.noaa.gov/hsd/specs/specs.htm.

B2.b Uncertainty

The calculated uncertainty values of all nodes within the unfinalized CUBE surfaces range from 0.186 meters to 0.417 meters. The higher value is in deep water on the outer swath of a main scheme line with no overlap from adjacent survey lines. No area within the survey exceeds International Hydrographic Organization (IHO) Order 1 specifications for depth accuracy. *Concur.*

During HIPS processing, the "greater of the two" option was selected, where the calculated uncertainty from total propagated error (TPE) is compared to the standard deviation of the soundings influencing the node, and the greater value is assigned as the final uncertainty of the node. As a result, the uncertainty of the finalized surface and associated Bathymetric Attributed Grids (BAGs) increased for nodes where the standard deviation of the node was greater than the calculated uncertainty. *Concur.*

B2.c Junctions

H12041 junctions with survey H12040 to the west, and with surveys H12043 and H12044 to the south. At the time of writing: surveys H12042 and H12043 have not been completely processed. Junction analysis between these surveys and H12041 will be discussed in their respective descriptive reports.

Survey junction analysis with H12040 was performed by visually reviewing survey data in Caris HIPS subset mode and by performing a surface to surface comparison in Caris Bathy DataBASE. In general, the depth differences between H12041 and H12040 are within 10 centimeters. *Concur.*

B2.d Unusual Conditions or Data Degradation

There is an error in the Reson 7125 bottom tracking algorithm that causes bottom detection (beams 86-115 and 140-168) to lock on to stronger sonar returns bleeding over from more nadir returns. This may be related to the amplitude bottom detection used near nadir and the bottom detection locking on to the strong nadir return signal, rather than the actual bottom return for that designated beam area. These artifacts occur in two areas near nadir and are more prevalent on a hard bottom, when the amplitude of the nadir return is the strongest. The artifacts run along track and can exceed 20 centimeters in the raw soundings, but are reduced to 5 to 10 centimeters in the CUBE surface. *Concur.*

There is vertical offset between data collected using the Reson 7125 at 400 kHz (*R/V Theory*) and the R2Sonic 2024 at 200 kHz (*R/V Chinook*), where the 200 kHz data is approximately 10 centimeters deeper than the 400 kHz data. The frequency dependant offset appears to be the result of increased penetration by the 200 kHz into muddy unconsolidated sediments. The original vessel survey, vessel files, and weekly bar checks were reviewed to verify that the vertical offset was not a result of an incorrect offset entry. *Concur.*

B2.e Object Detection and Coverage Requirements

Survey speeds were maintained to meet object detection requirements were met or exceeded throughout the survey. Concur with clarification. For feature development, object detection requirements were met, and for standard mainscheme and crossline acquisition, a variation of the complete coverage requirements as dictated in the email from DACB Chief (included in DR Appendix V) were met. This Appendix is included with survey deliverables.

Demonstration of 200% side scan sonar coverage was achieved by producing two separate 100% 50-cm mosaics. A fill plan was created for all holidays in water depths 18 feet or deeper. Occasional small areas were observed to have poor quality coverage resulting from biomass or crossing vessel wakes. A 27-meter long swath of low quality side scan imagery resulting from the tow fish momentarily flying up into the survey vessel wake was noted during review. The corresponding 200% coverage was reviewed and determined to be of high quality with no features. Further, multibeam from both 100% and 200% coverage provided quality data over 200% side scan nadir and outer ranges and showed a uniform seafloor. Given the quality of 200% side scan imagery and the multibeam coverage, this area was not flagged for rerun. *Concur.*

Multibeam data were acquired in conjunction with side scan sonar. A fill plan was created for all significant holidays that extended across the multibeam trackline. The coverage requirement for the Draft NOS Skunk Stripe Specifications survey was achieved. The sounding density requirement of 95% of all nodes populated with at least 3 soundings per node was verified by exporting the density child layer of each CUBE surface (finalized using depth thresholds) to an ASCII txt file and compiling statistics on the density values. All 2 and 4 meter surfaces (H12041_10f4 to H12041_40f4) created using the Draft Skunk Stripe Specifications were reviewed in this manner. Density statistics of individual item investigation surfaces using Complete Coverage requirements were not created but there was a manual review to ensure that each significant feature had either a designated sounding from a nadir beam or the node overlying the least depth had a density of at least three soundings. Concur with clarification. 3 soundings per node density requirement also a variation of the standard requirement as dictated in the email from DACB Chief, included in DR Appendix V, included with survey deliverables.

B3. Corrections to Echo Soundings

Data reduction procedures for survey H12041 are detailed in the *OPR-E349-KR-09 DAPR**, submitted under a separate cover. The Reson 7125 acquired using the 400 kHz frequency and the R2Sonic 2024 acquired using the 200 kHz frequency. Both datasets were filtered using the CARIS surface filter with errors values from Standard Deviation at 2.6 (99.06%) Confidence Level. For detailed information pertaining to applied filters please refer to the multibeam processing logs in Separate I *Acquisition and Processing Logs***. *Concur. *Included with survey deliverables. **Filed with original field reports.*

B3.a Deviations from DAPR

An additional patch test for the *R/V Theory* was run on December 16, 2009 (DN350) as the DAPR* was being prepared for delivery to AHB and therefore not reported in the document. This was a close out patch test run prior to removing the survey vessel from the water for storage over the winter. *Concur.* **Included with survey deliverables*.

A reporting error was found in the DAPR* after it was submitted where the *R/V Theory* roll and yaw columns in Table 14 are incorrectly labeled. The column labeled Yaw (°) actually reports roll values and the column labeled Roll (°) lists yaw values. This error has been corrected in Table 5 on the following page. Additionally, the values from December 16, 2009 (DN350) patch test have been added to the table. *Concur.* **Included with survey deliverables*.

Table 5. R/V Theory biases applied when using POS/MV

DN	Latency	Pitch (°)	Roll (°)	Yaw (°)	X (m)	Y (m)	Z (m)	Comments
167	0.000	-3.300	-0.550	-0.900	1.950	-0.516	1.000	200 kHz, Patch values are from DN337 of NOAA11
170	0.000	-3.800	-0.300	-1.100	1.950	-0.516	1.000	200 kHz, Confidence Checks
170	0.000	-4.300	-0.600	-1.500	1.860	-0.513	1.000	400 kHz, Confidence Checks
170	0.000	-3.800	-0.300	-1.100	1.950	-0.516	1.000	200 kHz, Confidence Checks - Wreck Test
170	0.000	-4.300	-0.600	-1.500	1.860	-0.513	1.000	400 kHz, Confidence Checks - Wreck Test
171	0.000	-3.800	-0.300	-1.100	1.950	-0.516	1.000	200 kHz, Patch Test
171	0.000	-4.300	-0.600	-1.500	1.860	-0.513	1.000	400 kHz, Patch Test
172	0.000	-3.800	-0.300	-1.100	1.950	-0.516	1.000	200 kHz, Start of Survey
189	0.000	-2.629	-0.574	-1.279	1.860	-0.513	1.000	400 kHz, Patch Test - New Reson Rx Installed
189	0.000	-3.043	-0.405	-1.000	1.950	-0.516	1.000	200 kHz, Patch Test - New Reson Rx Installed
190	0.000	-2.629	-0.574	-1.279	1.860	-0.513	1.000	400 kHz, Restart Survey
262	0.000	-2.586	-0.588	-1.320	1.860	-0.513	1.000	400 kHz, Patch Test
294	0.000	-2.588	-0.532	-1.400	1.860	-0.513	1.000	400 kHz, Boat pulled (Patch Values from Day 304)
304	0.000	-3.150	-0.344	-1.540	1.950	-0.516	1.000	200 kHz, Patch Test
305	0.000	-2.588	-0.532	-1.400	1.860	-0.513	1.000	400 kHz, Patch Test
315	0.000	-2.650	-0.539	-1.200	1.860	-0.513	1.000	400 kHz, Patch Test - Reson 7P upgraded from MR6 to MR6.3
324	0.000	-2.944	-0.522	-1.400	1.860	-0.513	1.000	400 kHz, Patch Test
338	0.000	-3.085	-0.499	-1.370	1.860	-0.513	1.000	400 kHz, Patch Test
350	0.000	-3.640	-0.499	-1.433	1.860	-0.513	1.000	400 kHz, Patch Test

B3.b Additional Calibration Tests

The initial system calibration tests for the *R/V Theory* were performed on June 19, 2009 (DN170). Additional tests were performed periodically to verify the adequacy of the known system biases. Additional discussion on calibration tests can be found in the *OPR-E349-KR-09 DAPR**. *Concur. *Included with survey deliverables*.

B4. Data Processing (Data Representation)

B4.a Multibeam

CUBE surface resolutions and depth ranges were set in accordance with the NOS Hydrographic Surveys Specifications and Deliverables (April 2009)* and the Draft NOS Skunk Stripe Specifications**. Concur. *2010 version of NOS HSSD available here http://www.nauticalcharts.noaa.gov/hsd/specs/specs.htm. **Authorization to utilize Draft NOS Skunk Stripe Specifications included in DR Appendix V, submitted with survey deliverables.

In order to keep CUBE surfaces at a manageable size, the main survey area was broken up into six (4) Field Sheets (H12041_10f4, etc.). When combined the Fields Sheets encompass the entire area of acquired multibeam bathymetry. CUBE surfaces using complete coverage specifications were created over each multibeam investigation of a significant contact. The name of each Field Sheet corresponds to the primary side scan sonar contact name. A BAG was created for each finalized CUBE surface and both the CUBE and BAG surfaces have been included with the digital data. All investigation CUBE surfaces were combined into a single grid prior to BAG creation. Concur with clarification. The main survey area was broken up into four (4) Field Sheets. A variation of the complete coverage requirements were met, as authorized in DR Appendix V, included with survey deliverables.

C. HORIZONTAL AND VERTICAL CONTROL

Traditional zoning from water level stations was used for OPR-E349-KR-09 with zoning and verified water level files provided by Center for Operational Oceanographic Products and Services (CO-OPS). *Concur.*

Prior to survey acquisition, a global positioning system (GPS) base station with a dual frequency (L1/L2) receiver were established to enable post-processing of survey vessel navigation and attitude data. The base station was located on Tangier Island (TANGIER and logged raw dual frequency (L1/L2) GPS observables at one second epochs. A base station position relative to the North American Datum of 1983 (NAD83) (CORS96) (Epoch 2002) was derived from the National Geodetic Survey (NGS) On-line Positioning User Service (OPUS) and based on a 24-hour data file, with one second-epoch logging prior to commencement of survey operations. *Concur.*

DGPS navigation was logged during acquisition but ultimately overwritten with a post-processed Inertially-Aided Kinematic Ambiguity Resolution (IAKAR) navigation solution. The HIPS Load Attitude and Navigation tool was used to load position, heading and attitude data from a smoothed best estimate trajectory (SBET) file created from Applanix POSPac 5.2 MMS. Post-processed uncertainty estimates for position, attitude and heading were applied using the HIPS Load Error Tool and used during the calculation of TPE. *Concur*.

A complete description of horizontal and vertical control for survey H12041 can be found in the *OPR-E349-KR-09 Horizontal and Vertical Control Report**, submitted under separate cover. A

summary of horizontal and vertical control for this survey follows. *Concur. *Not included with survey deliverables.*

C1. Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary water level stations at Windmill Point, Virginia (863-6580) and Lewisetta, Virginia (863-5750) served as control for datum determination and provided water level correctors for the project. *Concur*.

C2. Discussion of Tide Zoning

Tide zoning was included within the Tide and Water Levels Instructions for OPR-E349-KR-2009. A modified version of the HIPS Zone Definition File (ZDF) *E349KR2009_RevisedCORP* provided by CO-OPS was used to apply zoned tides to the multibeam data. The modified file, named *E349KR2009_RevisedCORP_*1s, used a HIPS Interval value of 1 second rather than the default value of 360 seconds which was used in the file received by CO-OPS. The interval value controls the frequency of tide zoning interpolation. The default value of 360 seconds is too infrequent to properly correct for the assigned zoning boundaries where it would be possible for the survey vessel to pass through a zone without a zoned tide corrector being applied if the vessel was not within the zone boundary for longer than 359 seconds. No modifications were made to zone boundaries or time and range correctors. *Concur.*

Table 6 includes the zoning information for each zone used for the survey.

Zone	Reference Station	Corrector (min.)	Ratio
SCB108	8636580	48	1.12
SCB116	8635750	-84	1.05
SCB115	8635750	-84	1.21
SCB122	8635750	-72	1.05
SCB123	8635750	-72	1.21
SCB133	8635750	-60	1.05
SCB136	8635750	-48	1.05

Table 6. Tide Zones

It is difficult to associate a precise vertical error due to tides. However, this survey included the logging of GPS water levels and follow-on deliverables will include soundings reduced to chart datum from GPS observations. Errors observed are a composite from various sources such as measurement error, tides, heave, refraction, transducer draft, and settlement and squat. Though vertical errors are still visible in the data they are small and are generally 10 cm or less as this survey is relatively close to the Lewisetta NWLON station. In some extreme cases errors approach 25 cm, however this is well within the 20 cm to 45 cm maximum allowable error for tides and water levels. The largest contributing factor to water level errors in the Chesapeake Bay is meteorological influences which cannot be accounted for by zoning. The hydrographer

strongly recommends the application of GPS tides to improve vertical accuracy when applying this survey to the nautical chart. *Concur*.

C3. Horizontal Control

The horizontal datum for this project is NAD83. Differential GPS (DGPS) corrections were received from the U.S. Coast Guard (USCG) beacon at Driver, Virginia (301 kHz) or from the secondary beacon at Annapolis, MD (289 kHz). Some DGPS outages from the primary beacon occurred during survey operations. The system was set up to automatically switch to the secondary beacon when the primary signal was lost. All of the primary navigation data were collected in DGPS mode. Additionally, during acquisition GPS base stations were constructed and logged data simultaneously with acquisition to provide post-processed IAKAR navigation solutions. *Concur.*

Navigation and attitude data were post-processed using Applanix POSPac MMS software, which produced an IAKAR navigation solution relative to NAD83. The real-time navigation and attitude logged during acquisition was overwritten with post-processed data during HIPS processing. Post-processed navigation, attitude and GPS heights were applied to all HIPS data though only the navigation and attitude were used in the creation of the survey deliverables. As discussed in the DAPR*, post-processed GPS heights were used to compute a GPS tide using an ellipsoid to MLLW separation file created using VDatum. Though present for each survey line GPS Tides were not applied to the survey data during the merge process (the Apply GPS Tides box was not checked during merge in Caris HIPS) and are for reference only. Further discussion on the computation of GPS tides and the creation of the separation model can be found in the pending OPR-E349-KR-09 Ellipsoid Referenced Survey Deliverables**. *Concur. *Included with survey deliverables.*

D. RESULTS AND RECOMMENDATIONS

D1. Chart Comparison

D1.a Survey Agreement with Chart

During the course of data acquisition and processing H12041 was compared to the largest scale raster and electronic navigation charts (ENC). The results of these comparisons are described below, as well as in Sections D1.b through D1.f of this report. *Concur.*

Contours and soundings used during the chart comparison were generated from combined HIPS product surfaces. Soundings and contours were generated from a 50-meter HIPS product surface (1:10,000) of the entire survey area, which was compiled from all finalized CUBE surfaces for the survey. The product surfaces, contours, and soundings were created solely for the chart comparison and have not been submitted as a final deliverable. *Concur.*

In addition, a surface was generated from the ENCs that correspond to the largest scale raster charts in the area. A Difference surface was produced using the ENC and the 50-meter combined surface to aid in the chart comparison. *Concur*.

H12041 contours and soundings were compared in CARIS HIPS to the depths and contours on the charts listed in Table 7. *Concur*.

Table 7. Charts compared to H12041

Chart	Scale	Edition	Edition Date	Issue Date	Latest LNM	Cleared Through Date
12225	1:80,000	58	05/01/2009		49/09	11/17/2009
12228	1:40,000	32	03/01/2008		49/09	12/01/2009
12285	1:80,000	39	03/01/2008		50/09	12/15/2009
US5VA16M		15		11/19/2009		11/10/2009

With the exception of the shipping lane east of Smith Point, survey H12041 depths are generally zero to five feet (0.0 meters to 1.52 meters) deeper than charted (Figure 2). *Concur.*

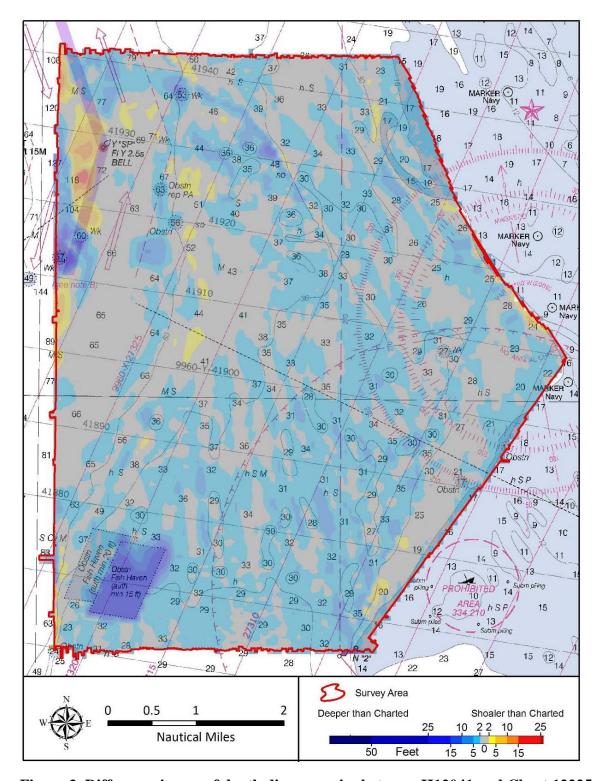


Figure 2. Difference image of depth discrepancies between H12041 and Chart 12225

The most significant discrepancies between the chart and H12041 are described as follows:

- 1. There are some significant differences between survey and charted depths are in the shipping lanes near the traffic separation zone (Figure 4). Shoaling of up to 20 feet (6.10 meters) has been observed within the southbound lane. This same area also shows severe deepening with some surveyed depths over 50 feet (15.24 meters) deeper than charted. *Concur.*
- 2. The area encompassing the *Obstrn Fish Haven* (auth min 15ft) shows significant deepening due the use of the authorized minimum depth of 15 feet in the difference analysis. Survey depths in this area were found to be much deeper than the authorized minimum depth. *Concur*.

D1.b Comparison to Significant Shoals

H12041 survey area contains one significant shoal (Figure 3). Surveyed depths in this area are generally one to two feet (0.30 meters to 0.61 meters) deeper than charted. The shoal appears to have migrated southerly. *Concur.*

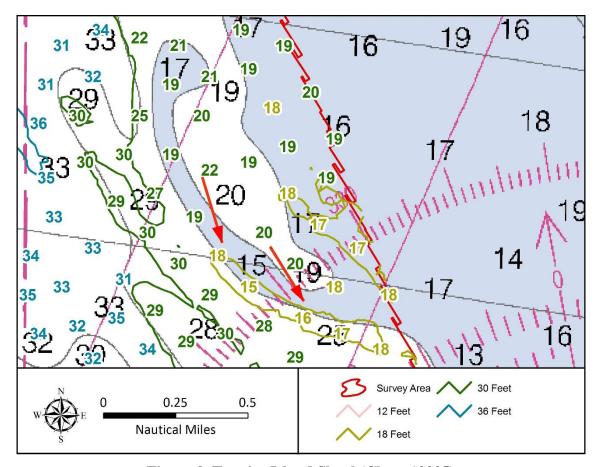


Figure 3. Tangier Island Shoal (Chart 12225)

The latest electronic and raster versions of the relevant charts were reviewed to ensure that all U.S. Coast Guard Local Notice to Mariners (LNM) issued during survey acquisition, impacting the survey area, were applied and addressed by this survey. *Concur.*

D1.c Comparison to Charted Features

Eight (8) AWOIS items were assigned for investigation to H12041 (Figure 4). A complete description is available in Appendix II Survey Feature Report*. Concur. *Included with survey deliverables.

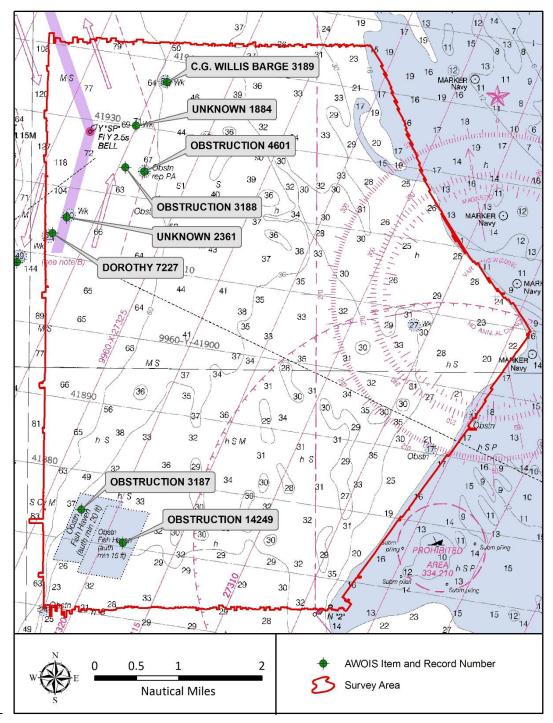


Figure 4. H12041 AWOIS Items

Assigned AWOIS items for H12041 are listed as follows:

- AWOIS 1884, charted 71-ft wreck was located at the charted position with 200% side scan sonar coverage. Complete multibeam coverage was run on the wreck at contact 242-180848-S and a multibeam least depth of 68.2ft (20.78 m) was determined. The hydrographer recommends charting the area in accordance with the survey data. *Concur.*
- The AWOIS 2361, charted 60-ft wreck, was found at position 37/51/47.259N, 76/09/27.530W, within the charted radius by 200% side scan sonar and complete multibeam coverage was acquired over all significant contacts. Complete multibeam coverage was run on the wreck at contact 242-160617-S and a multibeam least depth of 59.3ft (18.09m) was determined. The hydrographer recommends charting the wreck in accordance with the survey data. *Concur.*
- AWOIS 3187 is a Reported 29-ft Obstruction which was removed from the charts in accordance with 5th District Local Notice to Mariners 28/09. The AWOIS radius was surveyed with 200% side scan sonar and complete multibeam coverage was acquired over all significant contacts. A least depth of 23.3ft (7.12m) was found within the charted Obstrn Fish Haven (auth min 20ft) on a fish haven structure at position 37/48/15.655N, 76/08/52.658W, rising 6.6ft (2.30m) from the natural bottom. The fish haven was added to the chart after 5th District Local Notice to Mariners 29/09 was issued. Complete multibeam coverage was acquired to ensure a least depth was obtained on all significant features over a large area of numerous side scan contacts within the AWOIS radius. These features, which are all part of the Virginia Marine Resources Commission Northern Neck Reef, have been flagged with designated soundings. The hydrographer recommends retaining the Obstrn Fish Haven (auth min 20ft) as currently charted on the raster charts and adding this obstruction to US5VA16M. The hydrographer also recommends removing the charted *Obstrn Fish Haven* (auth min 15ft) adjacent to this area from all charts. Do not concur. Individual obstructions do not need to be charted within Obstrn Fish Haven minimum authorized depth. Recommend to retain Obstrn Fish Haven (auth min 15ft).
- AWOIS 3188 is uncharted. AWOIS records indicate an obstruction reported approximately 20ft off the bottom in 65ft of water. Investigation within the AWOIS radius with 200% percent side scan sonar and complete multibeam coverage revealed no significant contacts. The hydrographer recommends charting the area in accordance with the survey data.
 Concur.
- The AWOIS 3189 charted 53-ft wreck is the C. G. WILLIS barge. The charted submerged wreck was located at the charted position with 200% side scan sonar coverage over the AWOIS search area. Complete multibeam coverage was run on the wreck at contact 241-215647-P and a multibeam least depth of 51.6 ft (15.73m) was determined. The hydrographer recommends charting the wreck in accordance with the survey data. *Concur.*

- AWOIS 4601 charted 63ft *Obstrn rep PA* was not found with 200% side scan sonar. Complete multibeam coverage found a feature rising from the natural bottom 2.1ft (0.63m) at position 37/52/23.000N, 76/08/16.445W with a least depth of 66.4ft (20.23m), which may be the charted obstruction. The hydrographer recommends charting the area in accordance with the survey data. *Concur.*
- The charted 57-foot Wk (Dorothy), AWOIS 7227, was located with 200% side scan sonar and complete multibeam coverage was run over the contact at position 37/51/36.419N, 76/09/41.274W. The multibeam least depth is 71 feet (21.6 meters). Contact 174-140245-S. The hydrographer recommends charting the wreck as depicted in the S-57 feature file and removing the wire drag clearance symbol from all charts. *Concur with clarification*. *Feature not included with survey H12041*, *but is included in junctioning survey H12040*.
- AWOIS 14249, charted *Obstrn Fish Haven (auth min 15ft)*, was investigated with 200% side scan sonar (Figure 5). Complete multibeam coverage was acquired over all significant contacts. A least depth of 23.3ft (7.12m) was found west of the charted fish haven on a fish haven structure at position 37/48/15.655N, 76/08/52.658W, rising 6.6ft (2.30m) from the natural bottom. Where too numerous side scan contacts occurred to log within the northwest area of the AWOIS radius, complete multibeam coverage was acquired over a large area to ensure all significant features were observed. These features, which are all part of the Virginia Marine Resources Commission Northern Neck Reef, have been flagged with designated soundings. The hydrographer also recommends removing the charted *Obstrn Fish Haven (auth min 15ft)* and retaining the *Obstrn Fish Haven (auth min 20ft)* west of this area as currently charted. *Do not concur. Recommend to retain Obstrn Fish Haven (auth min 15ft)*.

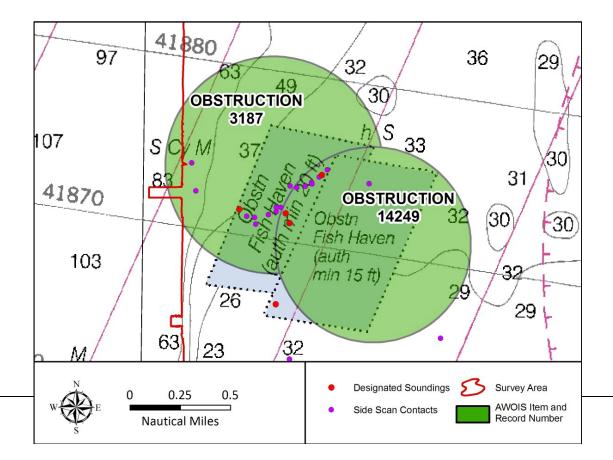


Figure 5. AWOIS 3187 and 14249 Radii showing SSS Contacts on Chart 12225.

D1.d Comparison of Soundings in Designated Anchorages and Along Channels

H12041 survey area does not contain any anchorage area or channels. *Concur.*

D1.e New Submerged Features

New submerged features are listed in tabular format in Appendix II *Survey Feature Report**. The most significant features were reported in the S-57 feature file. *Concur. *Included with survey deliverables*.

D1.f Dangers to Navigation (DtoN)

Six (6) Dangers to Navigation (DtoN) were located during survey H12041 and have been submitted to AHB. All DtoNs were reviewed by AHB and forwarded on to the Marine Chart Division (MCD). *Concur*.

All DtoNs are included in the S-57 feature file and should be charted as depicted in the file and listed in Table 8 below. Concur. All submitted DtoNs reside on the most recent chart update used during review. Refer to DR Appendix I.

Applied to Raster AHB Submitted DtoN Feature Chart **Applied to ENC** to MCD Yes Yes Yes Obstruction 2 Obstruction Yes No Yes 3 Obstruction Yes No Yes Yes No Yes 4 Wreck 5.1 No No Yes Obstruction No No Yes 5.2 Obstruction 6 Buoy No No Yes

Table 8. H12041 DtoN Charting Status

D2. Additional Results

D2.a Shoreline Investigations

Shoreline investigation was not required for OPR-E349-KR-09. *Concur*.

D2.b Comparison with Prior Surveys

Comparison with prior surveys was not required under this task order. *Concur.*

D2.c Aids to Navigation (AtoN)

All U.S. Coast Guard aids to navigation (AtoN) within the survey limits were found to be correctly charted and serving their intended purpose. *Concur*.

D2.d Overhead Clearance

There are no overhead bridges, cables or other structures, which would impact overhead clearance in the survey area. *Concur*.

D2.e Cables, Pipelines and Offshore Structures

There were no charted or observed submarine cables or pipelines, drilling structures, production platforms, or well heads within the survey area. *Concur*.

D2.f Environmental Conditions Impacting the Quality of the Survey

Although the survey exceeds IHO Order 1 accuracy requirements, environmental conditions degraded the quality of the survey data. The open waters of the Chesapeake Bay are notorious for localized wind-driven tides that can not always be recorded or modeled with stationary gauges. The hydrographer recommends that any future surveys in areas frequently subjected to meteorological conditions that locally affect tidal ranges, and which require stringent survey accuracies, such as Object Detection surveys, use kinematic GPS methodology for water level correction. *Concur.*

D2.g Construction Projects

No active construction projects were observed in H12041 survey area. *Concur*.

D2.h Bottom Characteristics

Twenty-six (26) bottom samples were obtained on July 20, 2009 (Day Number 201) and are included in the S-57 attributed feature file in the *Supporting Data* folder. A table listing the position and description of each bottom sample is included in Appendix V *Supplemental Survey Records and Correspondence**, along with photographs of each sample. *Concur. *Included with survey deliverables.*

E. LETTER OF APPROVAL

The letter of approval for this report and accompanying data follows on the next page.



LETTER OF APPROVAL

OPR-E349-KR-09 REGISTRY NO. H12041

This report and the accompanying data are respectfully submitted.

Field operations contributing to the accomplishment of survey H12041 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and associated data have been closely reviewed and are considered complete and adequate as per the OPR-E349-KR-09 *Statement of Work Statement* and *Hydrographic Survey Project Instructions* dated June 2009.

Jonathan L. Dasler, PE (OR), PLS (OR, CA) ACSM/THSOA Certified Hydrographer Chief of Party

> Jason Creech Lead Hydrographer

David Evans and Associates, Inc.
December 2009

F. SUPPLEMENTAL REPORTS

Listed below are supplemental reports submitted separately that contain additional information relevant to this survey:

<u>Title</u>	Submittal Date
OPR-E349-KR-09 Data Acquisition and Processing Report	12/18/09
OPR-E349-KR-09 Horizontal and Vertical Control Report	TBD

H12041 Dangers to Navigation Report

Registry Number: H12041 **State:** Virginia

Locality: Southern Chesapeake Bay

Sub-locality: East of Smith Point

Project Number: OPR-E349-KR-09

Survey Dates: 08/30/2009 - 10/30/2009

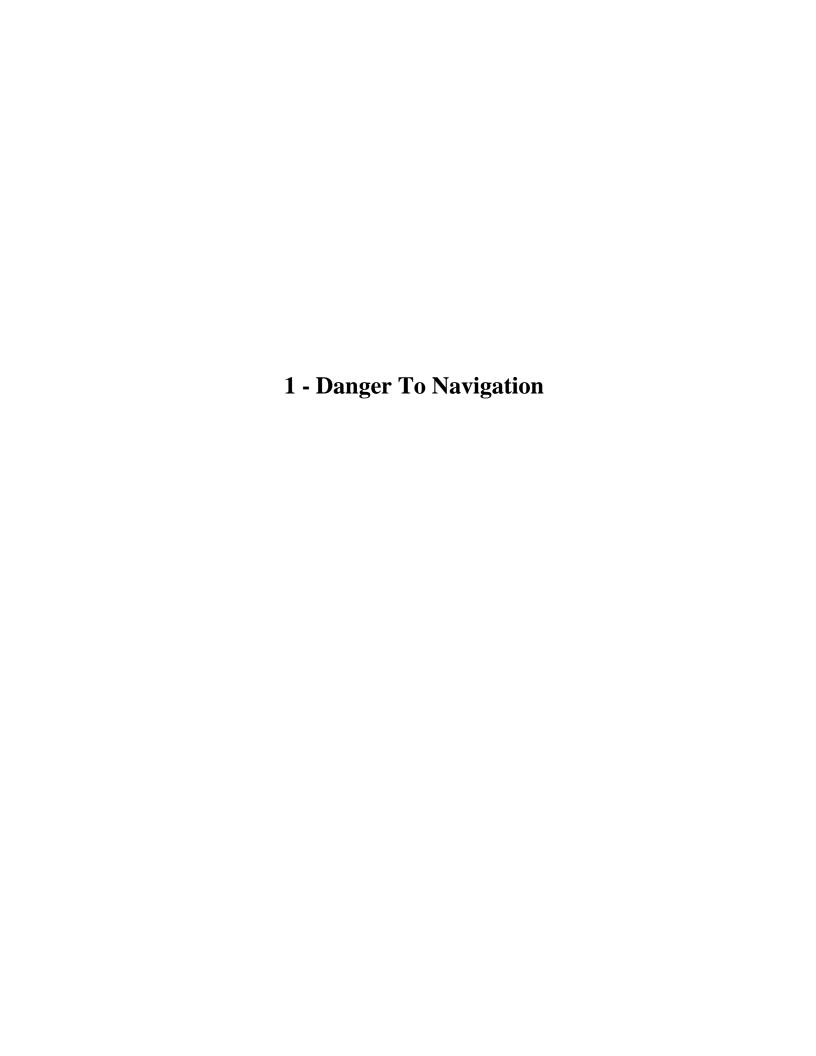
Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
12285	39th	03/01/2008	1:40,000 (12285_18)	[L]NTM: ?
12228	32nd	03/01/2008	1:40,000 (12228_1)	USCG LNM: 11/03/2009 (11/03/2009) NGA NTM: 08/02/2008 (11/14/2009)
12225	58th	05/01/2009	1:80,000 (12225_1)	USCG LNM: 10/27/2009 (11/03/2009) NGA NTM: 08/02/2008 (11/14/2009)
12230	64th	03/01/2009	1:80,000 (12230_1)	[L]NTM: ?
12280	9th	06/01/2009	1:200,000 (12280_2)	USCG LNM: 10/27/2009 (11/03/2009) NGA NTM: 11/23/2002 (11/14/2009)
13003	49th	04/01/2007	1:1,200,000 (13003_1)	[L]NTM: ?

^{*} Correction(s) - source: last correction applied (last correction reviewed--"cleared date")

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	56-ft Obstruction	Obstruction	17.04 m	37° 51' 59.3" N	076° 08' 04.3" W	
1.2	17ft Obstruction	Obstruction	5.29 m	37° 49' 04.9" N	076° 03' 55.9" W	
1.3	27-ft Wreck	Wreck	8.25 m	37° 50' 33.7" N	076° 04' 11.9" W	
1.4	17-ft OBSTRN	Obstruction	5.33 m	37° 49' 29.0" N	076° 03' 16.6" W	
1.5	21ft OBSTRN	Obstruction	6.41 m	37° 49' 57.3" N	076° 03' 21.7" W	
1.6	22ft OBSTRN	Obstruction	6.76 m	37° 48' 28.3" N	076° 04' 39.4" W	
1.7	BOYSPP	GP	[None]	37° 48' 05.1" N	076° 09' 23.6" W	



1.1) 56-ft Obstruction

DANGER TO NAVIGATION

Survey Summary

Survey Position: 37° 51′ 59.3″ N, 076° 08′ 04.3″ W

Least Depth: $\frac{17.04 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.017 \text{ m}}{(-55.91 \text{ ft} - 9.319 \text{ fm} - 9 \text{ fm} \cdot 1.91 \text{ ft})} = \frac{17.$

TPU ($\pm 1.96\sigma$): THU (TPEh) [None]; TVU (TPEv) [None]

Timestamp: 2009-302.19:59:22.000 (10/29/2009)

GP Dataset: H12041 DtoN 1.txt

GP No.: 1

Charts Affected: 12228 1, 12285 18, 12225 1, 12230 1, 12280 2, 13003 1

Remarks:

The least depth was acquired with a Reson 7125 shallow water multibeam sonar, reduced to Mean Lower Low Water using post-processed GPS water levels, and should be considered preliminary. Positions are referenced from post-processed navigation using a contractor installed GPS base station and are on NAD83.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12041_DtoN_1.txt	1	0.00	0.000	Primary

Hydrographer Recommendations

DtoN 1 appears to be a rectangular, man-made, object rising 1.4m above the natural bottom. Chart 56-ft Obstruction.

Cartographically-Rounded Depth (Affected Charts):

56ft (12228_1, 12285_18, 12225_1, 12230_1, 12280_2) 9 1/4fm (13003_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: OBJNAM - 56-ft Obstruction

QUASOU - 6:least depth known

SORDAT - 20091215

SORIND - US, US, graph, H12041

TECSOU - 2,3:found by side scan sonar, found by multi-beam

VALSOU - 17.042 m 17.017 m

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 12228_1; 32nd Ed., 1:40,000 and smaller scale charts as an obstruction, least depth 56 feet (17.042 m). Office processing determined that the least depth of this obstruction is different from the initial DToN submission to MCD. Delete charted obstruction, least depth changed to 17.017m. Chart 56-ft obstruction at the present survey position.

Feature Images

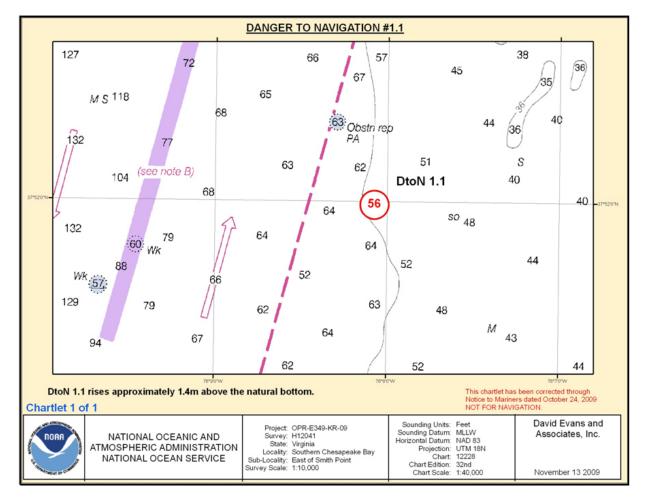


Figure 1.1.1

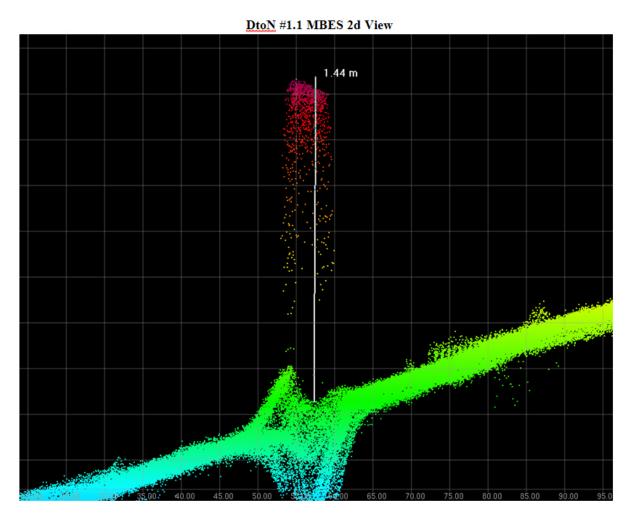


Figure 1.1.2

DtoN #1.1 MBES 3d View



Figure 1.1.3

DtoN #1.1 Sidescan Sonar View 241-181225-P

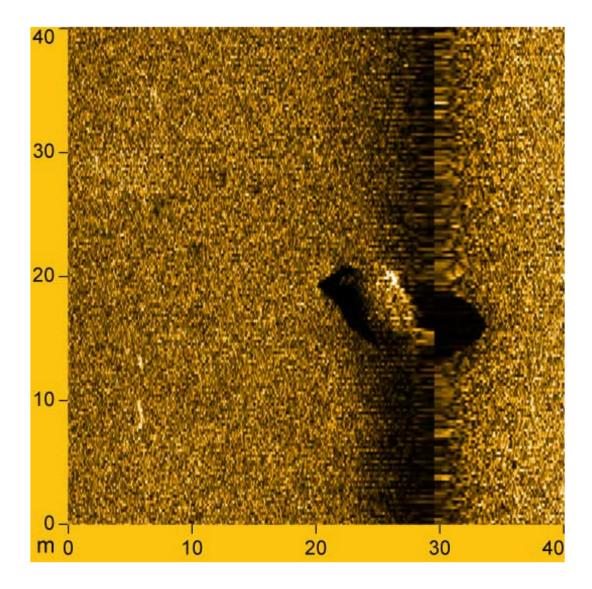


Figure 1.1.4

1.2) 17ft Obstruction

DANGER TO NAVIGATION

Survey Summary

Survey Position: 37° 49' 04.9" N, 076° 03' 55.9" W

Least Depth: 5.29 m (= 17.35 ft = 2.892 fm = 2 fm 5.35 ft) 5.165m

TPU ($\pm 1.96\sigma$): **THU** (**TPEh**) [None]; **TVU** (**TPEv**) [None]

Timestamp: 2009-303.15:41:39.000 (10/30/2009)

GP Dataset: H12041_DtoN#2.xls

GP No.: 1

Charts Affected: 12228_1, 12285_18, 12225_1, 12280_2, 13003_1

Remarks:

Feature Correlation

Address		Feature	Range	Azimuth	Status
	H12041_DtoN#2.xls	1	0.00	0.000	Primary

Hydrographer Recommendations

DtoN 2 appears to be an object rising 1.4m above the natural bottom. Recommend charting 17ft obstruction at surveyed location.

Cartographically-Rounded Depth (Affected Charts):

```
17ft (12228_1, 12285_18, 12225_1, 12280_2)
2 <sup>3</sup>/<sub>4</sub>fm (13003_1)
```

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: QUASOU - 6:least depth known

SORDAT - 20091215

SORIND - US, US, graph, H12041

TECSOU - 2,3: found by side scan sonar, found by multi-beam

VALSOU - 5.289 m 5.165 m

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 12228_1; 32nd Ed., 1:20,000 and smaller scale charts as an obstruction, least depth 17 feet (5.289 m). Office processing determined that the least depth of this obstruction is different from the initial DtoN submission to MCD. Delete charted obstruction, least depth changed to 5.165m. Chart 17-ft obstruction at the present survey position0

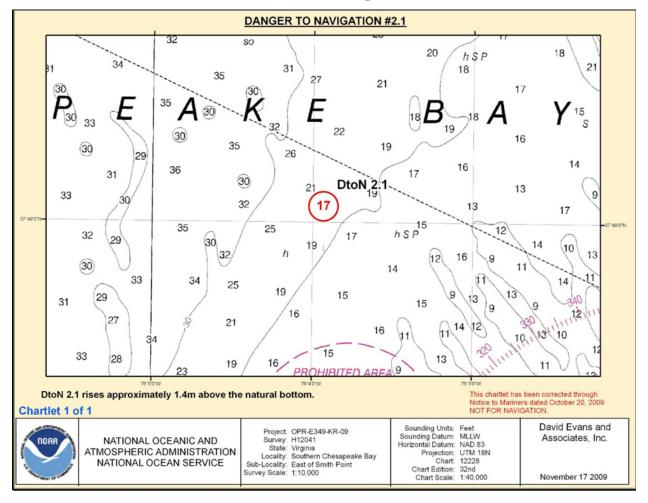


Figure 1.2.1

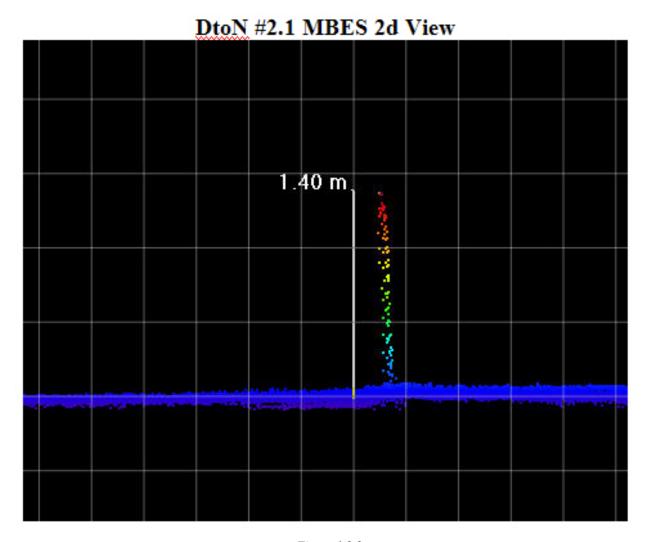


Figure 1.2.2



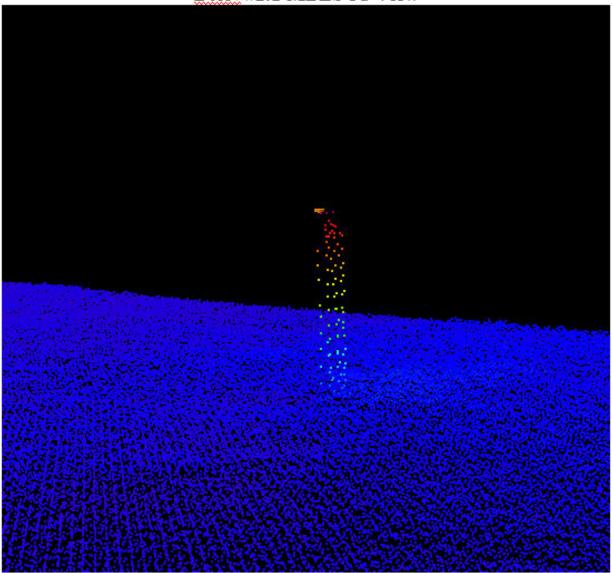


Figure 1.2.3

DtoN #2.1 Sidescan Sonar View 274-135728-S

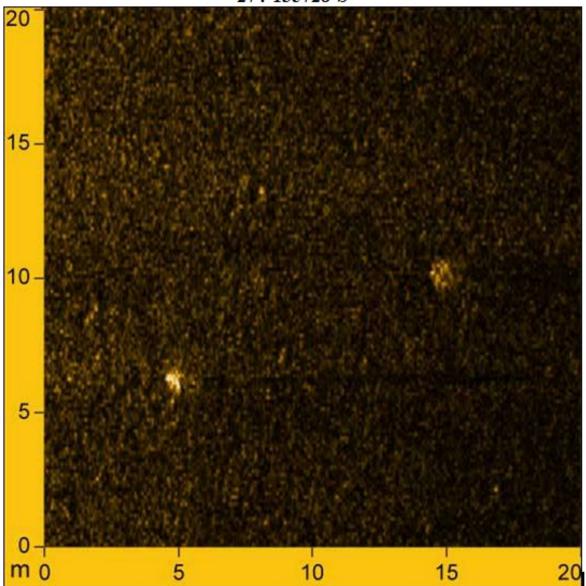


Figure 1.2.4

1.3) 27-ft Wreck

DANGER TO NAVIGATION

Survey Summary

Survey Position: 37° 50′ 33.7″ N, 076° 04′ 11.9″ W

Least Depth: 8.25 m (= 27.07 ft = 4.512 fm = 4 fm 3.07 ft) 8.158 m

TPU ($\pm 1.96\sigma$): **THU** (**TPEh**) [None] ; **TVU** (**TPEv**) [None]

Timestamp: 2009-303.16:34:54.000 (10/30/2009)

GP Dataset: H12041 DtoN#3.xls

GP No.: 1

Charts Affected: 12228 1, 12285 18, 12225 1, 12280 2, 13003 1

Remarks:

DtoN 4 appears to be a wreck with approximate dimensions of 14m by 5m rising 1.6m above the natural bottom.

The least depth was acquired with a Reson 7125 shallow water multibeam sonar, reduced to Mean Lower Low Water using post-processed GPS water levels, and should be considered preliminary. Positions are referenced from post-processed navigation using a contractor installed GPS base station and are on NAD83.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12041_DtoN#3.xls	1	0.00	0.000	Primary

Hydrographer Recommendations

Recommend charting 27ft Wreck at current survey location.

Cartographically-Rounded Depth (Affected Charts):

27ft (12228_1, 12285_18, 12225_1, 12280_2) 4 ½fm (13003_1)

S-57 Data

Geo object 1: Wreck (WRECKS)

Attributes: CATWRK - 2:dangerous wreck

OBJNAM - Wreck

QUASOU - 6:least depth known

SORDAT - 20091215

SORIND - US, US, graph, H12041

TECSOU - 2,3: found by side scan sonar, found by multi-beam

VALSOU - 8.252 m 8.158 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 12228_1; 32nd Ed., 1:40,000 and smaller scale charts as a wreck, least depth 27 feet (8.252 m). Office processing determined that the least depth of this wreck is different from the initial DtoN submission to MCD. Delete charted wreck, least depth changed to 8.158m. Chart 27-ft wreck at the present survey position0

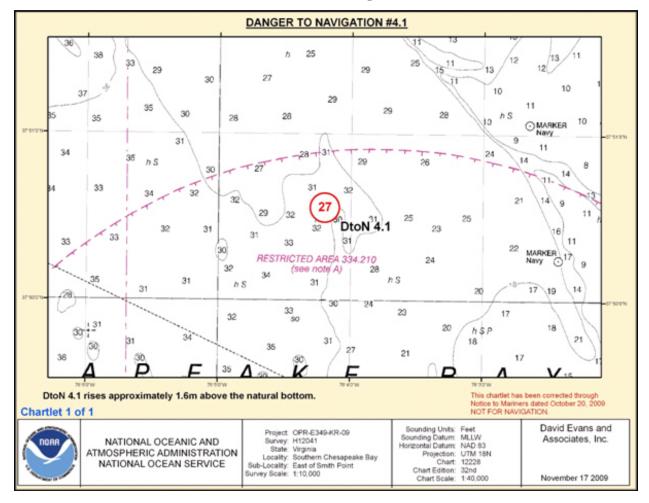


Figure 1.3.1

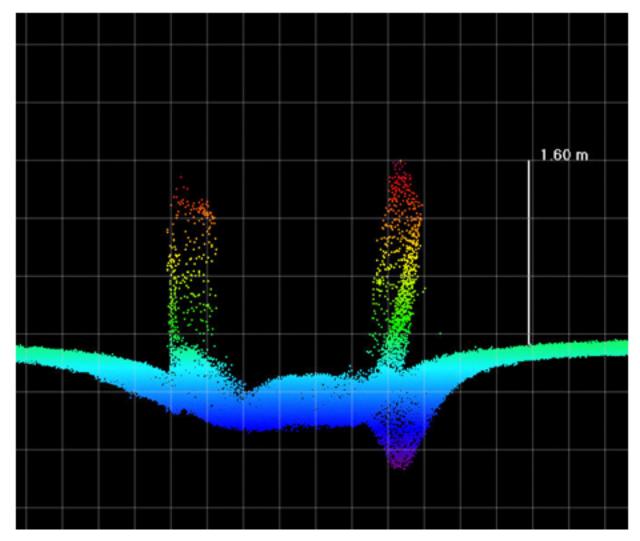


Figure 1.3.2

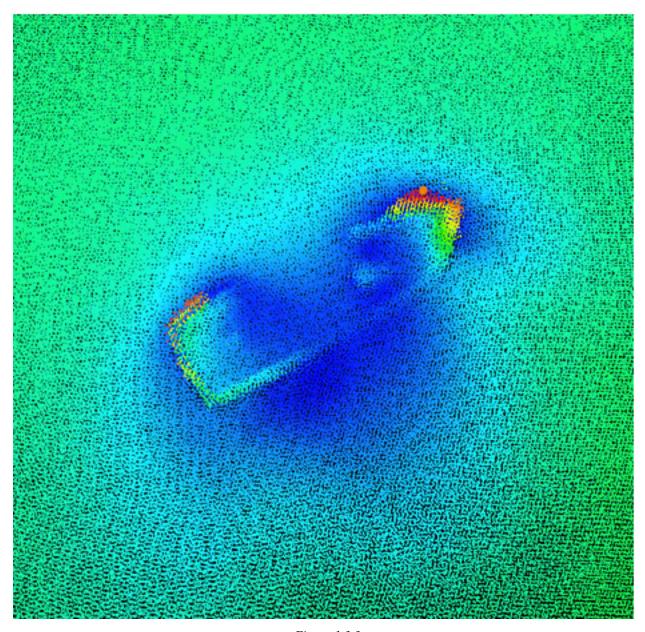


Figure 1.3.3

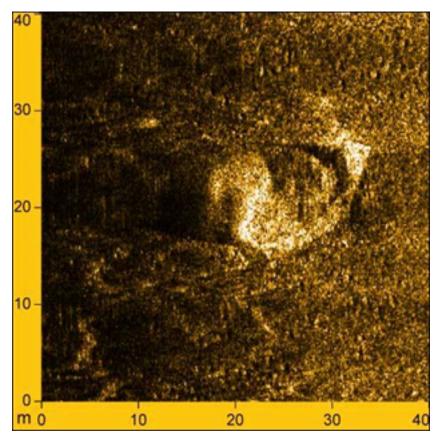


Figure 1.3.4

1.4) 17-ft OBSTRN

DANGER TO NAVIGATION

Survey Summary

Survey Position: 37° 49' 29.0" N, 076° 03' 16.6" W

Least Depth: 5.33 m (= 17.48 ft = 2.913 fm = 2 fm 5.48 ft) 5.165 m

TPU ($\pm 1.96\sigma$): THU (TPEh) [None]; TVU (TPEv) [None]

Timestamp: 2009-303.15:52:55.000 (10/30/2009)

GP Dataset: H12041 DtoN#3.xls

GP No.: 2

Charts Affected: 12228 1, 12285 18, 12225 1, 12280 2, 13003 1

Remarks:

DtoN 3 appears to be an object rising 1.3m above the natural bottom.

The least depth was acquired with a Reson 7125 shallow water multibeam sonar, reduced to Mean Lower Low Water using post-processed GPS water levels, and should be considered preliminary. Positions are referenced from post-processed navigation using a contractor installed GPS base station and are on NAD83.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12041_DtoN#3.xls	2	0.00	0.000	Primary

Hydrographer Recommendations

Recommend charting 17ft Obstruction at current survey location.

Cartographically-Rounded Depth (Affected Charts):

17ft (12228_1, 12285_18, 12225_1, 12280_2) 2 ³/₄fm (13003_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)
Attributes: OBJNAM - Obstruction

QUASOU - 6:least depth known

SORDAT - 20091215

SORIND - US, US, graph, H12041

TECSOU - 2,3:found by side scan sonar, found by multi-beam

VALSOU - 5.328 m 5.165 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 12228_1; 32nd Ed., 1:40,000 and smaller scale charts as an obstruction, least depth 17 feet (5.328 m). Office processing determined that the least depth of this obstruction is different from the initial DtoN submission to MCD. Delete charted obstruction, least depth changed to 5.165m. Chart 17-ft obstruction at the present survey position0

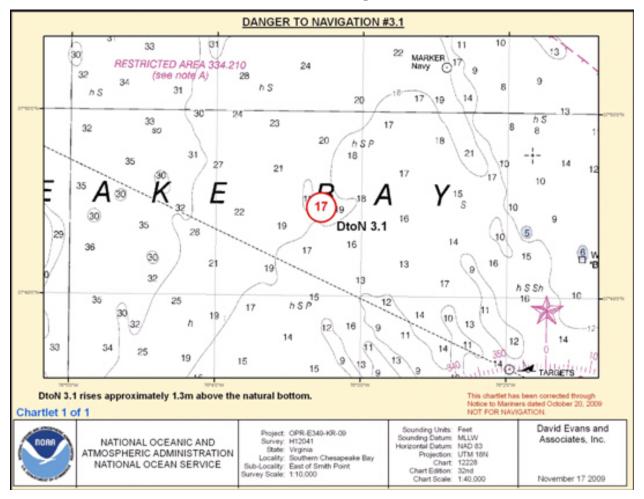


Figure 1.4.1

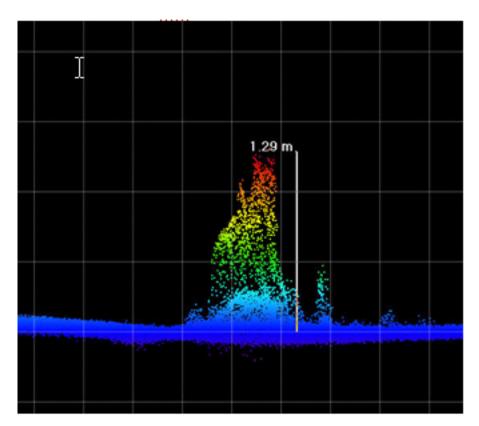


Figure 1.4.2

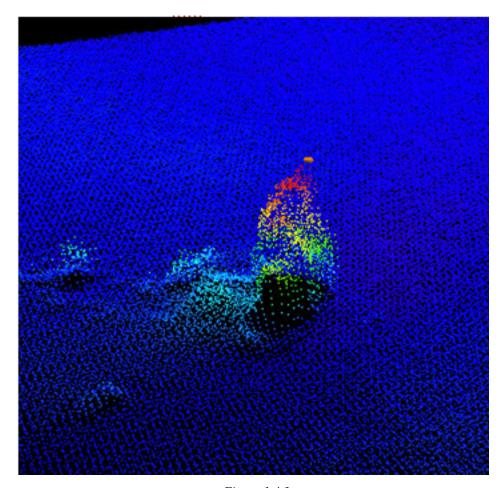


Figure 1.4.3

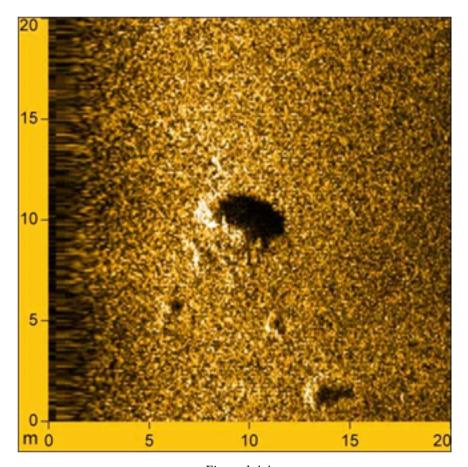


Figure 1.4.4

1.5) 21ft OBSTRN

DANGER TO NAVIGATION

Survey Summary

Survey Position: 37° 49′ 57.3″ N, 076° 03′ 21.7″ W

Least Depth: 6.41 m (= 21.04 ft = 3.507 fm = 3 fm 3.04 ft)

TPU ($\pm 1.96\sigma$): THU (TPEh) [None]; TVU (TPEv) [None]

Timestamp: 2009-274.17:56:59.000 (10/01/2009)

GP Dataset: H12041_DtoN#5.xls

GP No.: 1

Charts Affected: 12228 1, 12285 18, 12225 1, 12280 2, 13003 1

Remarks:

The least depths were acquired with a Reson 7125 shallow water multibeam sonar, reduced to Mean Lower Low Water using zoned, verified water levels, and should be considered preliminary.

Positions are referenced from post-processed navigation using a conractor installed GPS base station and are on NAD83.

DtoN 5.1 is a 21ft Obstruction that raises approximately 0.72 meters from this seafloor.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12041_DtoN#5.xls	1	0.00	0.000	Primary

Hydrographer Recommendations

Recommend charting a 21 ft OBSTRN at the current survey location.

Cartographically-Rounded Depth (Affected Charts):

21ft (12228_1, 12285_18, 12225_1, 12280_2) 3 ½fm (13003_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)
Attributes: OBJNAM - 21ft OBSTRN

QUASOU - 6:least depth known

SORDAT - 20091215

SORIND - US, US, graph, H12041

TECSOU - 2,3:found by side scan sonar, found by multi-beam

VALSOU - 6.414 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 12228_1; 32nd Ed., 1:40,000 and smaller scale charts as a dangerous obstruction, least depth 21 feet (6.41m). Office processing determined the feature is insignificant as an obstruction based on its small size and height off the seafloor. Delete 21 ft dangerous obstruction. Chart 21-ft shoal sounding at the present survey position.

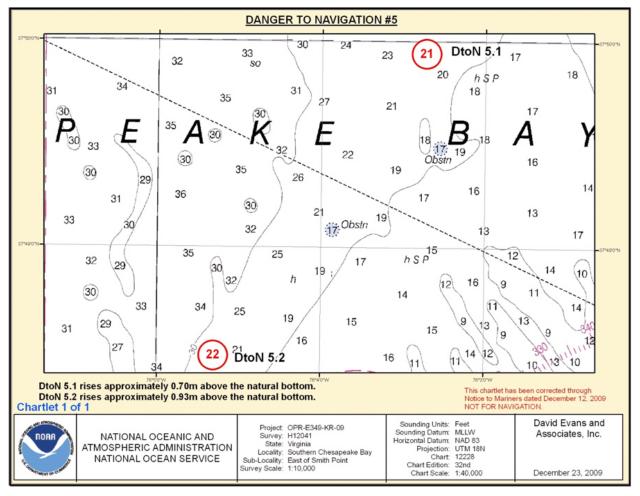


Figure 1.5.1

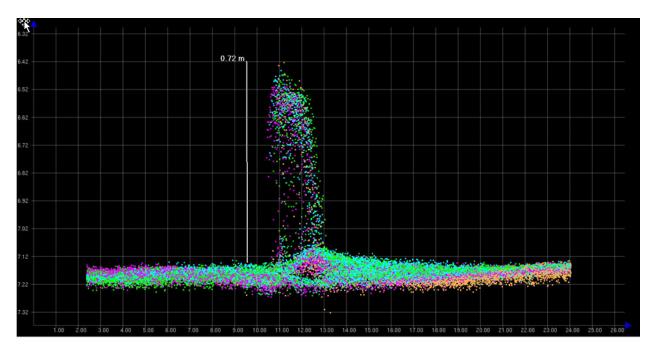


Figure 1.5.2

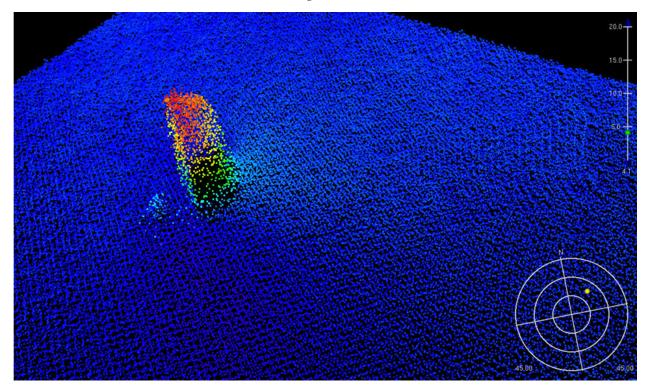


Figure 1.5.3

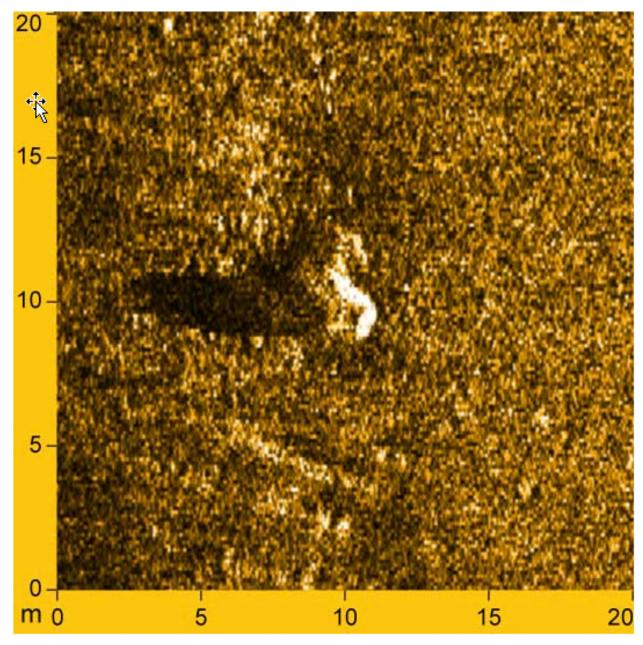


Figure 1.5.4

1.6) 22ft OBSTRN

DANGER TO NAVIGATION

Survey Summary

Survey Position: 37° 48′ 28.3″ N, 076° 04′ 39.4″ W

Least Depth: 6.76 m = 22.17 ft = 3.695 fm = 3 fm = 4.17 ft

TPU ($\pm 1.96\sigma$): THU (TPEh) [None]; TVU (TPEv) [None]

Timestamp: 2009-303.15:26:37.000 (10/30/2009)

GP Dataset: H12041 DtoN#5.xls

GP No.: 2

Charts Affected: 12228 1, 12285 18, 12225 1, 12280 2, 13003 1

Remarks:

The least depths were acquired with a Reson 7125 shallow water multibeam sonar, reduced to Mean Lower Low Water using zoned, verified water levels, and should be considered preliminary.

Positions are referenced from post-processed navigation using a conractor installed GPS base station and are on NAD83.

DtoN 5.2 is a 22ft Obstruction that raises approximately 0.93 meters from this seafloor.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12041_DtoN#5.xls	2	0.00	0.000	Primary

Hydrographer Recommendations

Recommend charting a 22 ft OBSTRN at the current survey location.

Cartographically-Rounded Depth (Affected Charts):

22ft (12228_1, 12285_18, 12225_1, 12280_2) 3 ³/₄fm (13003_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: OBJNAM - 22ft OBSTRN

QUASOU - 6:least depth known

SORDAT - 20091215

SORIND - US, US, graph, H12041

TECSOU - 2,3: found by side scan sonar, found by multi-beam

VALSOU - 6.758 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 12228_1; 32nd Ed., 1:40,000 and smaller scale charts as a dangerous obstruction, least depith 22 feet (6.758 m). Office processing determined the feature is insignificant as an obstruction based on its small size and height off the sea floor. Delete 22 ft dangerous obstruction. Chart 22-ft shoal sounding at the present survey position.

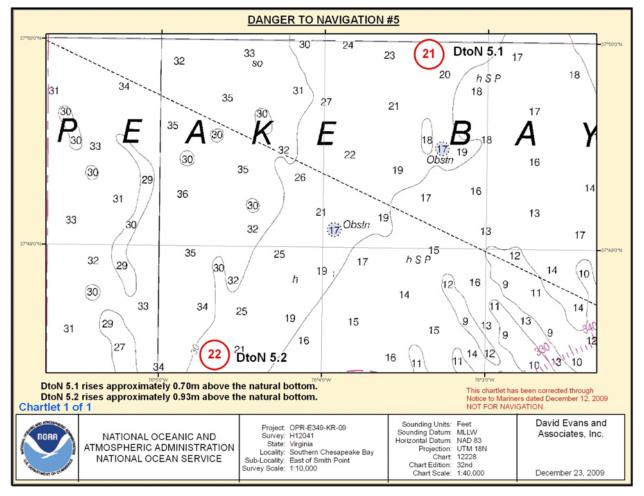


Figure 1.6.1

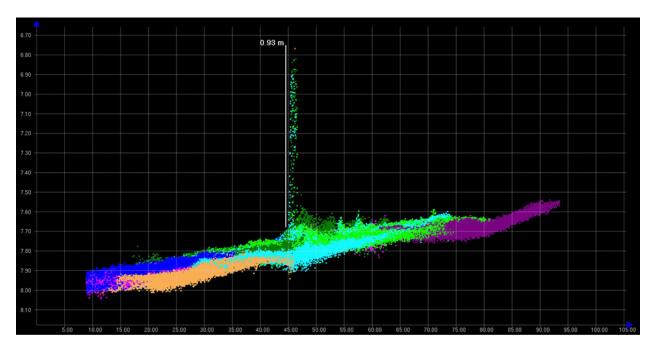


Figure 1.6.2

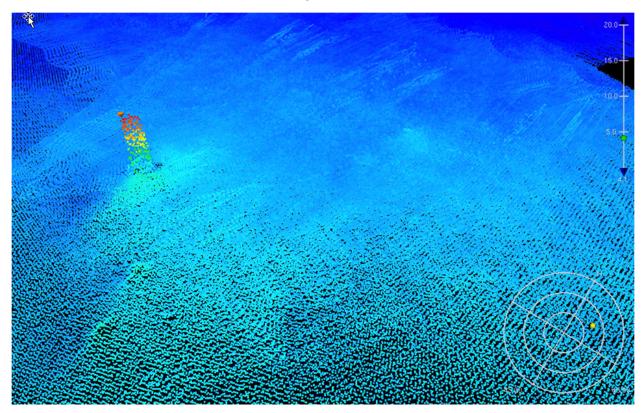


Figure 1.6.3

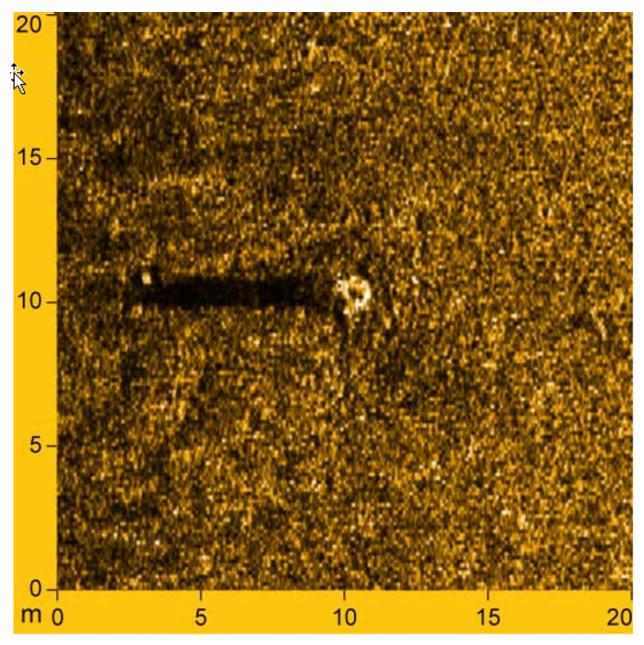


Figure 1.6.4

1.7) BOYSPP

DANGER TO NAVIGATION

Survey Summary

Survey Position: 37° 48′ 05.1″ N, 076° 09′ 23.6″ W

Least Depth: [None]

TPU ($\pm 1.96\sigma$): THU (TPEh) [None]; TVU (TPEv) [None]

Timestamp: 2009-242.17:19:12.000 (08/30/2009)

GP Dataset: H12041_DtoN_6.txt

GP No.: 1

Charts Affected: 12228_1, 12285_18, 12225_1, 12280_2, 13003_1

Remarks:

The item was found during hydrographic survey operations.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12041_DtoN_6.txt	1	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting the special purpose buoy on the affected charts: 12225, 12228, and 12280.

S-57 Data

Geo object 1: Buoy, special purpose/general (BOYSPP)

Attributes: BOYSHP - 2:can (cylindrical)

CATSPM - 56:artificial reef mark

COLOUR - 6:yellow

OBJNAM - Buoy Special Purpose

SORDAT - 20091215

SORIND - US, US, graph, H12041

Office Notes

Concur with clarification. Shown on chart 12228_1; 32nd Ed., 1:40,000 and smaller scale charts as a yellow private aid "marking the fish haven. Retain as charted.

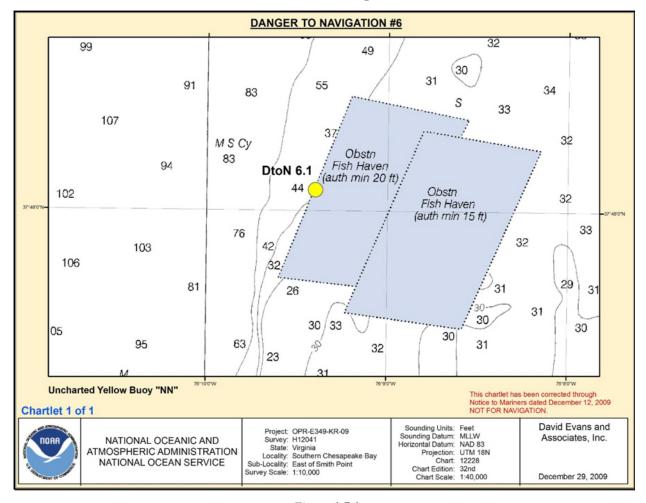
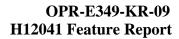


Figure 1.7.1



Figure 1.7.2

APPENDIX II SURVEY FEATURE REPORT





Registry Number: H12041 **State:** Virginia

Southern Chesapeake Bay, Virginia **Locality:**

Sub-locality: Project Number: East of Smith Point

OPR-E349-KR-09

Survey Date: August 29, 2009 to December 15, 2009

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AWOIS 1884 (INFORMATION)

REPORTED

FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS 1884	100	37/52/54.54	76/08/25.69

SURVEYED

FEATURE	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
WRECK 68.2ft	(20.78 m)	37/52/55.871	76/08/23.311

Remarks:

AWOIS 1884, charted 71-ft wreck was located at the charted position with 200% side scan sonar coverage and complete multibeam coverage. The MBES least depth is 68.2ft (20.78 m). Contact 242-180848-S.

Hydrographer Recommendation:

The hydrographer recommends charting the area in accordance with the survey data.

Concur with clarification. Delete charted 71 ft non-dangerous wreck. Chart 68 ft non-dangerous wreck at the survey position.

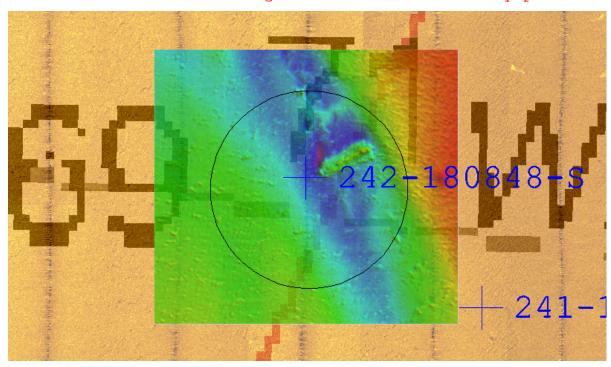


Figure 1. AWOIS 1884 Radius. Multibeam with concurrent side scan sonar and contact. Chart 12225.



AWOIS 2361

REPORTED

FEATURE RADIUS LATITUDE (N) LONGITUDE (W) AWOIS 2361 50m 37/51/48.16 76/09/27.39

SURVEYED

FEATURE LEAST DEPTH LATITUDE (N) LONGITUDE (W) WRECK 59.3ft (18.09m) 37/51/47.259 76/09/27.530

Remarks:

The AWOIS 2361, charted 60-ft wreck, was found at position 37/51/47.259N, 76/09/27.530W, within the charted rad ius by 200% side scan sonar and complete multibeam coverage. The MBES least depth is 59.3ft (18.09m). Contact 242-160617-S.

Hydrographer Recommendation:

The hydrographer recommends charting the wreck in accordance with the survey data.

Concur with clarification. Delete charted 60 ft dangerous wreck. Chart 59 ft dangerous wreck at the survey position.

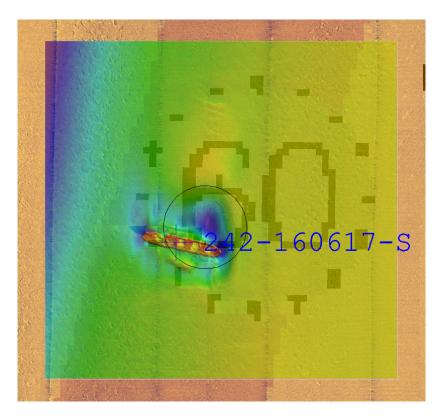


Figure 2. AWOIS 1884 Radius. Multibeam with concurrent side scan sonar and contact. Chart 12225.



AWOIS 3187

DED	OPTED
KEP	UKIED

FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS 3187	1000m	37/48/18.46	76/09/10.78

SURVEYED

SURVEIED			
FISH HAVEN CORNER	RS LATITUDE	(N)	LONGITUDE (W)
NW	37/48/30.29		76/09/12.05
NE	37/48/24.07		76/08/33.55
SE	37/47/42.63		76/09/35.88
SW	37/47/39.87		76/08/59.62
FEATURES	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
LD Fish Haven	23.3ft (7.12m)	37/48/15.655	76/08/52.658
242-174405-S 27.0ft	(8.237m)	37/48/04.148	76/09/08.720
255-133413-S 24.0ft	(7.17m)	37/48/04.061	76/09/06.142
248-160910-P 24.0ft	(7.32m)	37/48/12.826	76/09/01.775
	FISH HAVEN CORNER NW NE SE SW FEATURES LD Fish Haven 242-174405-S 27.0ft 255-133413-S 24.0ft	FISH HAVEN CORNERS LATITUDE NW 37/48/30.29 NE 37/48/24.07 SE 37/47/42.63 SW 37/47/39.87 FEATURES LEAST DEPTH LD Fish Haven 23.3ft (7.12m) 242-174405-S 27.0ft (8.237m) 255-133413-S 24.0ft (7.17m)	FISH HAVEN CORNERS LATITUDE (N) NW 37/48/30.29 NE 37/48/24.07 SE 37/47/42.63 SW 37/47/39.87 FEATURES LEAST DEPTH LATITUDE (N) LD Fish Haven 23.3ft (7.12m) 37/48/15.655 242-174405-S 27.0ft (8.237m) 37/48/04.148 255-133413-S 24.0ft (7.17m) 37/48/04.061

Remarks:

AWOIS 3187 is a Reported 29-ft Obstruction which was removed from the charts in accordance with 5th District Local Notice to M ariners 28/09. The AWOIS radius was surveyed with 200% side scan sonar and complete multibeam coverage was acquired over all significant contacts. A least depth of 23.3ft (7.12m) was found within the charted *Obstrn Fish Haven (auth min 20ft)* on a fish haven structure at position 37/48/15.655N, 76/08/52.658W, rising 6.6ft (2.30m) from the natural bottom. The fish haven was added to the chart after 5th District Local Notice to Marin ers 29/09 was issued.

Significant contacts 242-174405-S, 255-133413-S and 248-160910-P are within the AWOIS radius and charted fish haven perimeter. Other contacts within the AWOIS radius are not significant (241-140412-S, 241-160902-S and 241-145159-S).

Where too num erous side scan contacts occurred to log within the AWOIS radius, complete multibeam coverage was acquired over a large area to ensure all significant features were observed. These features, which are all part of the Virginia Marine Resources Commission Northern Neck Reef, have been flagged with designated soundings.

In addition, the least depth of the fish haven and contacts 248-160910-P and 255-133413-S lie within the AWOIS radius and perimeter of AWOIS 14249.

Hydrographer Recommendation:

The hydrographer recommends retaining the *Obstrn Fish Haven* (auth min 20ft) as currently charted on the raster charts and adding this obstuction to US5VA16M. The hydrographer also



recommends removing the charted *Obstrn Fish Haven (auth min 15ft)* adjacent to this area from all charts.

Concur with clarification. Retain dangerous fish havens (authorized minimum 15 and 20ft) as charted. See also H-Cell Report.

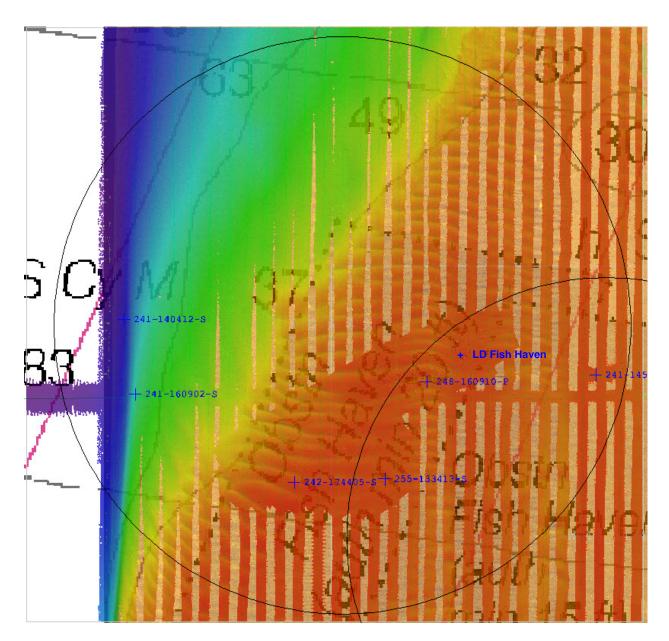


Figure 3. AWOIS 3187 Radius. Multibeam with concurrent side scan sonar and contacts. Chart 12225.



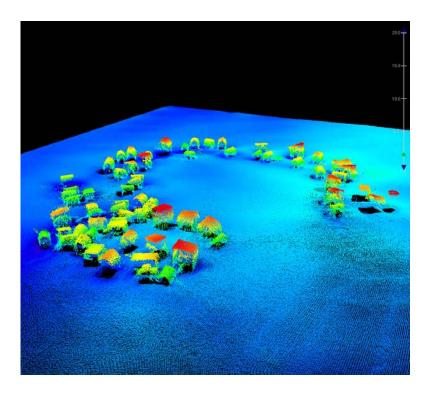


Figure 4. Least depth in fish haven.

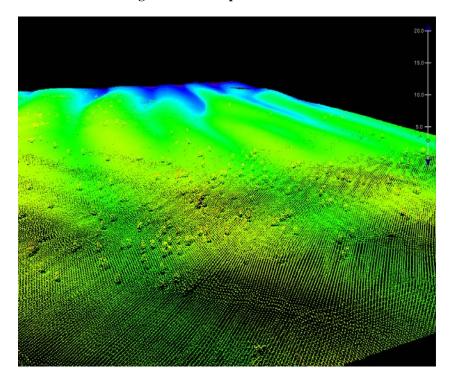


Figure 5. Contact 242-174405-S, CARIS 3D View



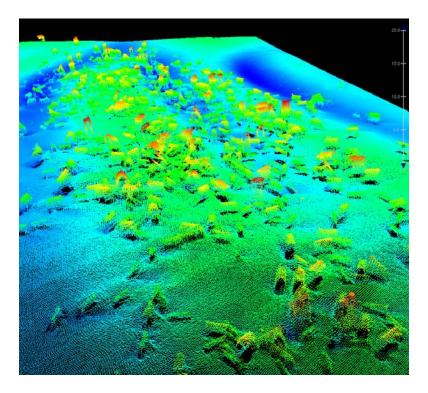


Figure 6. Contact 248-160910-P, CARIS 3D View

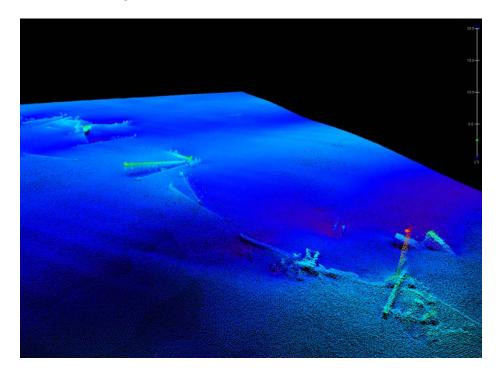


Figure 7. Contact 255-133413-S CARIS 3D View



AWOIS 3188 (INFORMATION)

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FEATURE RADIUS LATITUDE (N) LONGITUDE (W)
AWOIS 3188 50m 37/52/24.45 76/08/34.78

SURVEYED

FEATURE LEAST DEPTH LATITUDE (N) LONGITUDE (W)

DISPROVAL N/A N/A N/A

Remarks:

AWOIS 3188 is uncharted. AWOIS records indicate an obstruction reported approximately 20ft off the bottom in 65ft of water. Investigation within the AWOIS radius with 200% percent side scan sonar and complete multibeam coverage revealed no significant contacts.

Hydrographer Recommendation:

The hydrographer recommends charting the area in accordance with the survey data.

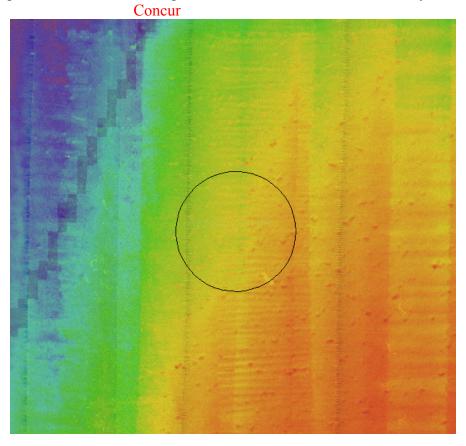


Figure 8. AWOIS 3188 Radius. Multibeam with concurrent side scan sonar. Chart 12225.



AWOIS 3189

REPORTED

FEATURE RADIUS LATITUDE (N) LONGITUDE (W) AWOIS 3189 250m 37/53/26.05 76/07/58.07

SURVEYED

FEATURE LEAST DEPTH LATITUDE (N) LONGITUDE (W) WRECK 51.6 ft (15.73m) 37/53/25.250 76/07/57.969

Remarks:

The AWOIS 3189 charted 53-ft wreck is the C. G. WILLIS barge. The charted submerged wreck was located at the charted position with 200% side scan sonar coverage and complete multibeam coverage. A multibeam least depth 51.6 ft (15.73m) was found. Contact 241-215647-P.

Hydrographer Recommendation:

The hydrographer recommends charting the wreck in accordance with the survey data.

Concur with clarification. Delete charted 53 ft dangerous wreck. Chart

51-ft wreck at the survey position.

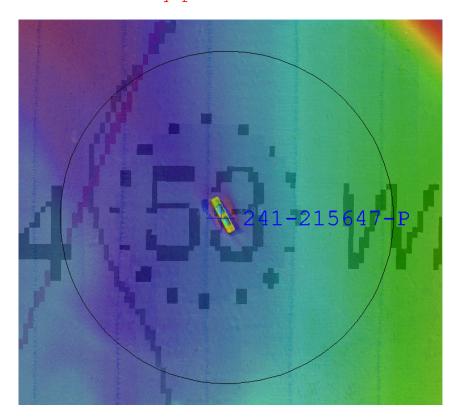


Figure 9. AWOIS 3189 Radius. Multibeam with concurrent side scan sonar and contact. Chart 12225.



AWOIS 4601

REPORTED

FEATURE RADIUS LATITUDE (N) LONGITUDE (W)
AWOIS 4601 100m 37/52/21.65 76/08/17.58

SURVEYED

FEATURE LEAST DEPTH LATITUDE (N) LONGITUDE (W) OBSTRUCTION 66.4ft (20.23m) 37/52/23.000 76/08/16.445

Remarks:

AWOIS 4601 charted 63ft *Obstrn rep PA* was not found with 200% side scan sonar. Complete multibeam coverage found a feature rising from the natural bottom 2.1ft (0.63m) at position 37/52/23.000N, 76/08/16.445W with a least depth of 66.4ft (20.23m), which may be the charted obstruction.

Hydrographer Recommendation:

The hydrographer recommends charting the area in accordance with the survey data.

Concur with clarification. Chart according to survey data, delete previously reported obstruction.

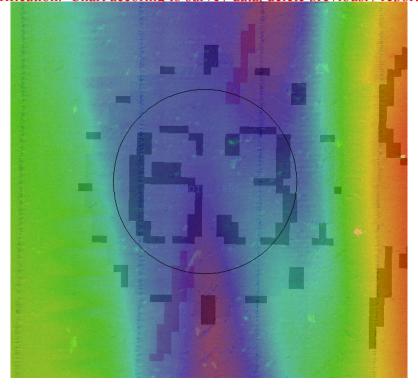


Figure 10. AWOIS 4601 Radius. Multibeam with concurrent side scan sonar. Chart 12225.



AWOIS 7227
REPORTED

SURVEYED			
AWOIS 7227	100m	37/51/36.63	76/09/40.08
FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)

S

FEATURE	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
WRECK	71 ft (21.6m)	37/51/36.417	76/09/41.280

Remarks:

The charted wreck, AWOIS 7227 (Dorothy), was locat ed at the charted position with 200% side scan coverage and complete multibeam coverage. The multibeam least depth on the wreck is 71 feet (21.6 meters). Contacts 242-135105-P, 241-143503-S.

This AWOIS was also reported in survey H12040.

Hydrographer Recommendation:

The hydrographer recommends charting the wreck as depicted in the S-57 feature file and removing the wire drag clearance symbol from all charts. Concur.

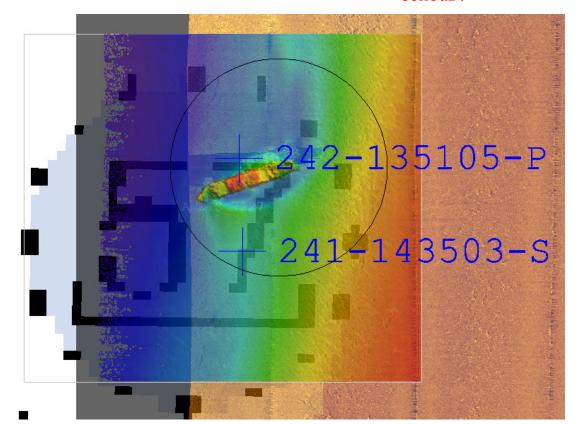


Figure 11. AWOIS 7227 Radius. Multibeam with concurrent side scan sonar and contact. Chart 12225.



AWOIS 14249

REPORTED	RTED
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FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS 14249	900m	37/47/55	76/08/33

SURVEYED

FISH HAVEN CORNERS	LATITUDE (N)	LONGITUDE (W)
NW	37/48/21.14	76/44/47.53
NE	37/48/16.65	76/08/09.89
SE	37/47/33.83	76/09/13.78
SW	37/47/30.20	76/08/34.93

SIGNIFICANT FEATURES	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
248-160910-P 24.0ft	(7.32m)	37/48/12.826	76/09/01.775
255-133413-S 24.0ft	(7.17m)	37/48/04.061	76/09/06.142
242-195722-P 30.6ft	(9.33m)	37/47/36.855	76/09/09.441
LD Fish Haven	23.3ft (7.12m)	37/48/15.655	76/08/52.658

Remarks:

AWOIS 14249, charted *Obstrn Fish Haven (auth min 15ft)*, was investigated with 200% side scan sonar and complete multibeam coverage was acquired over all significant contacts. A least depth of 23.3ft (7.12m) was found west of the charted fish haven on a fish haven structure at position 37/48/15.655N, 76/08/52.658W, rising 6.6ft (2.30m) from the natural bottom.

Contacts 241-145159-S, 248-160910-P, 255-133413-S li e within the AWOIS radius. Contact 242-195722-P does not lie within the AW OIS radius, however is within the charted obstruction perimeter. With the exception of contact 241-145159-S, all are significant. Where too numerous side scan c ontacts occurred to log within the northwest area of the AWOIS radius, complete multibeam coverage w as acquired over a large area to ensure all significant f eatures were observed. These features, which are all part of the Virginia Marine Resources Commission Northern Neck Reef, have been flagged with designated soundings.

In addition, the least depth of the fish haven and contacts 248-160910-P and 255-133413-S lie within the AWOIS radius and perimeter of AWOIS 3187.

Hydrographer Recommendation:

• The hydrographer also recommends removing the charted *Obstrn Fish Haven* (auth min 15ft) and retaining the *Obstrn Fish Haven* (auth min 15ft) west of this area as currently charted.

Concur with clarification. Retain dangerous obstruction fish haven (auth minimum 15 ft) as charted. See also H-Cell Report.



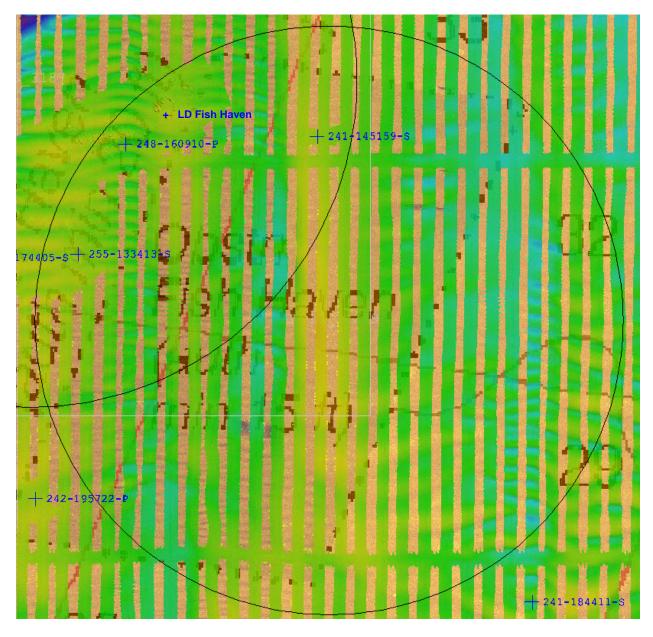


Figure 12. AWOIS 14249 Radius. Multibeam with concurrent side scan sonar and contacts. Chart 12225.



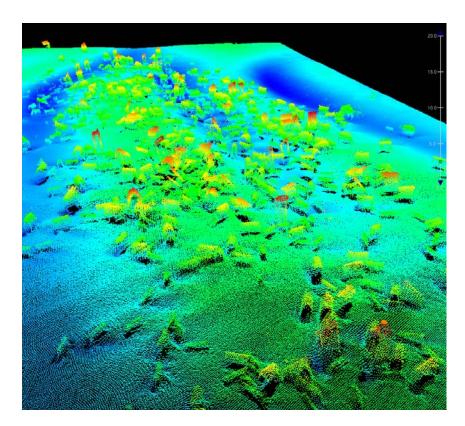


Figure 13. Contact 248-160910-P CARIS 3D View

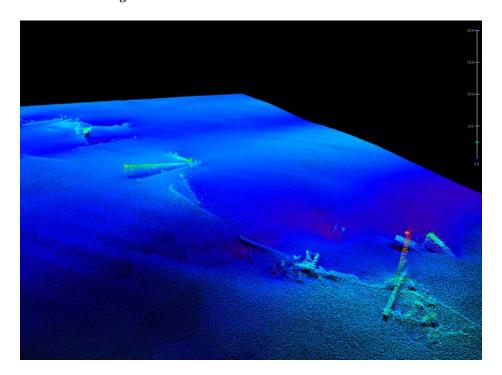


Figure 14. Contact 255-133413-S CARIS 3D View



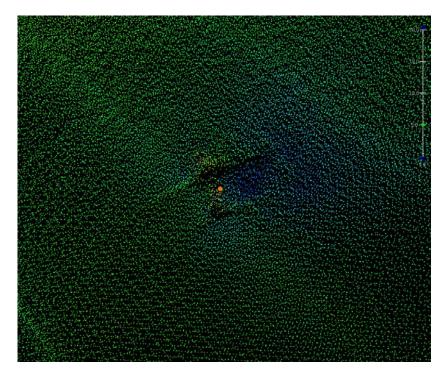


Figure 15. Contact 242-195722-P CARIS 3D View

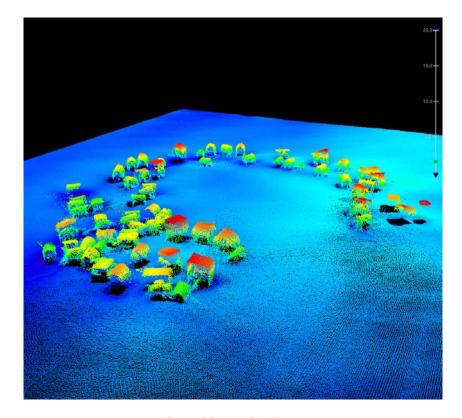


Figure 16. LD Fish Haven

Appendix II S-57 Features

H12041 Survey Features WRECKS

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
		37.890347N	076.132769W	AWOIS item # 3189 Barge rises approximately 4.25m off the natural seafloor. FS 241-215647-P
				Concur. Chart 51-ft wreck at survey position.
	-	37.882187N	076.139809W	AWOIS item # 1884 Charted Wreck rises approximately 0.95m off the natural seafloor. FS 242-180848-S
				Concur. Chart 68-ft wreck at survey position.
		37.863128N	076.157647W	AWOIS item # 2361 Charted Wreck rises approximately 7.73m off the natural seafloor. FS 242-160617-S.
				Concur. Chart 59-ft wreck at survey position.
	-	37.842681N	076.069962W	H12041 DtoN #4. Wreck stands 1.9m proud. FS 274-200033-P
				Concur. See Appendix I "1.3) 27-ft Wreck'" of Descriptive Report.
		37.860116N	076.161467W	AWOIS item # 7227 Charted Wreck is approximately 15.4m off the natural seafloor.FS 242-135105-P. This feature is also reported in H12040 feature file.
				Concur with clarification. Feature not included with survey H12041, but is included in junctioning survey H12040.
		37.888528N	076.156284W	FS 242-184024-P. Object rises 0.30m off the natural seafloor in channel it is signicant as it appears to be a wreck partially buried.
				Concur with clarification. Feature is a wreck. Add 84-ft wreck at survey position.

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
		37.832583N	076.056024W	H12041 DTON # 5.1. Vertical object rises 0.75m off the natural bottom. FS 274-121138-P
				Concur. See Appendix I "1.5) 21-ft Obstruction" of Descriptive Report.
		37.807852N	076.077613W	H12041 DTON # 5.2 Vertical object. approximately 0.90m proud. FS 274-124249-P.
				Concur. See Appendix I "1.6) 22ft Obstruction" of Descriptive Report.
		37.875131N	076.116524W	FS 255-194615-P. Object stands 0.74m proud from surrounding sea floor.
				Concur with clarification. Obstruction determined insignificant. Chart as 36 ft shoal sounding.
		37.887299N	076.137355W	FS 241-174839. Vertical object is approximately 1.34m off the natural bottom.
				Do not concur. The feature is not navigationally significant.
		37.801128N	076.151706W	AWOIS item # 3187 Fish haven structures. FS 242-174405-S.
				Concur with clarifiction. See Appendix II "AWOIS #3187 feature report" of the Descriptive Report.
		37.882423N	076.131005W	FS 242-153533-S. Mound rises approximately 1.65m off the natural seafloor.
				Do not concur. Feature is not an obstruction but natural topography. No cartographic action is necessary.

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
		37.818025N	076.065531W	H12041 DTON # 2. Vertical object rises 1.17m off natural seafloor. FS 274-135728-S
				Concur. See Appendix I "1.2) 17-ft Obstruction" of Descriptive Report.
		37.894880N	076.161156W	FS 241-152845-S. Feature stands approximately 1.0m off natural bottom. Also. reported in H12040 feature report and S-57 feature file.
				Do not concur. The feature is not navigationally significant.
		37.793571N	076.152623W	FS 242-195722. Small feature possibly associated with AWOIS 14294.
				Concur with clarification. See Appendix II "AWOIS #14294 feature report" of the Descriptive Report.
		37.880508N	076.138274W	FS 241-174446-P. Vertical feature is approximately 0.51m proud. Signficant as it is in the shipping lane.
				Concur with clarification. Obstruction determined insignificant. Chart as 63 ft shoal soundinghart 63-ft obstruction.
		37.881572N	076.131123W	FS 242-153507-S. Mounds rises approximately 1.3m off natural seafloor. Full MBES coverage.
				Do not concur. Feature is not an obstruction but natural topography. No cartographic action is necessary.
		37.840466N	076.046192W	FS 274-185234-P. Vertical object rises 0.7m off natural seafloor.
				Concur with clarification. Obstruction determined insignificant. Chart as 23 ft shoal sounding.

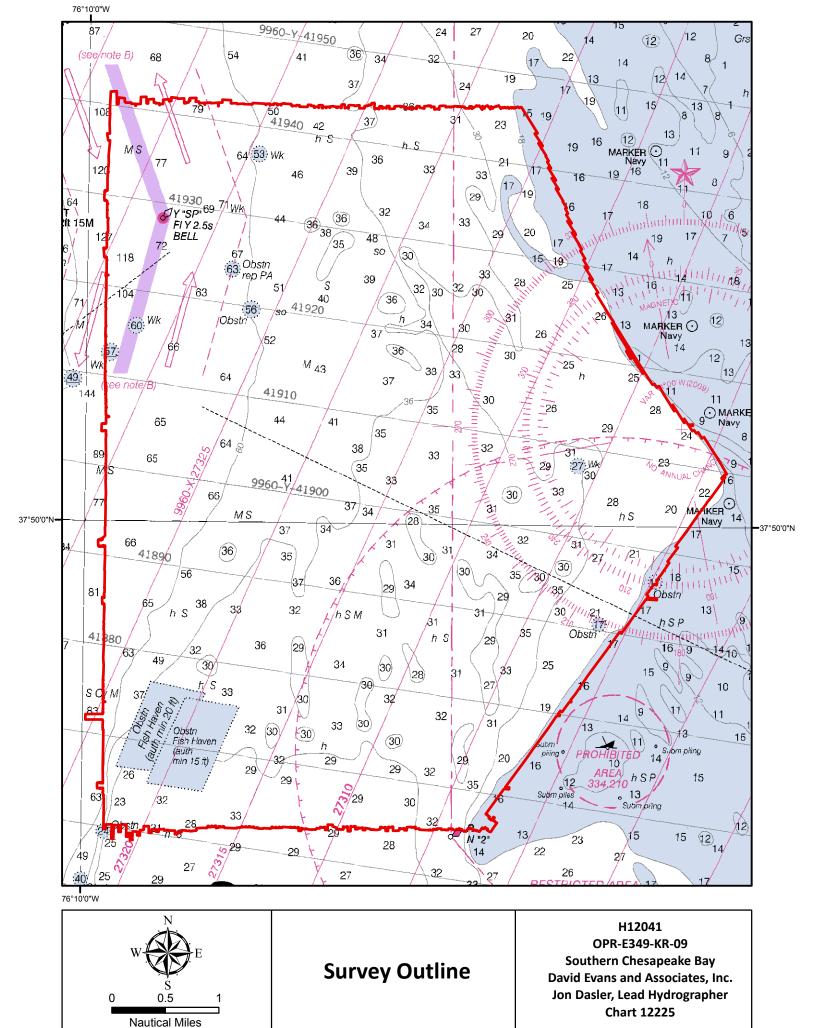
ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
		37.880710N	076.131284W	FS 242-153436-S. Mound rises approximately 2.80m off natural seafloor. Full MBES coverage.
				Do not concur. Feature is not an obstruction but natural topography. No cartographic action is necessary.
		37.879702N	076.155521W	FS 241-194026-S. Feature rises 1.50m from natural seafloor in channel.
				Concur with clarification. Obstruction determined insignificant. Chart as 79 ft shoal sounding.
		37.804349N	076.147961W	AWOIS item 3187 Fish haven structures. FS 248-160910-P
				Concur with clarification. See Appendix II "AWOIS #3187 feature report" of the Descriptive Report.
	1	37.824712N	076.054608W	H12041 DTON #3. Verical object rises approximately 1.31m off natural seafloor. FS 274-170704-S
				Concur. See Appendix I "1.4)17-ft Obstruction" of Descriptive Report.
		37.866476N	076.134523W	H12041 DTON #1. Rectangular object rises 1.53m off natural seafloor. FS 241-181225-P.
				Concur. See Appendix I "1.1) 56-ft Obstruction" of Descriptive Report.
		37.869911N	076.155651W	FS 241-193415-S. Vertical object rising approximately 1.0m off natural bottom in channel.

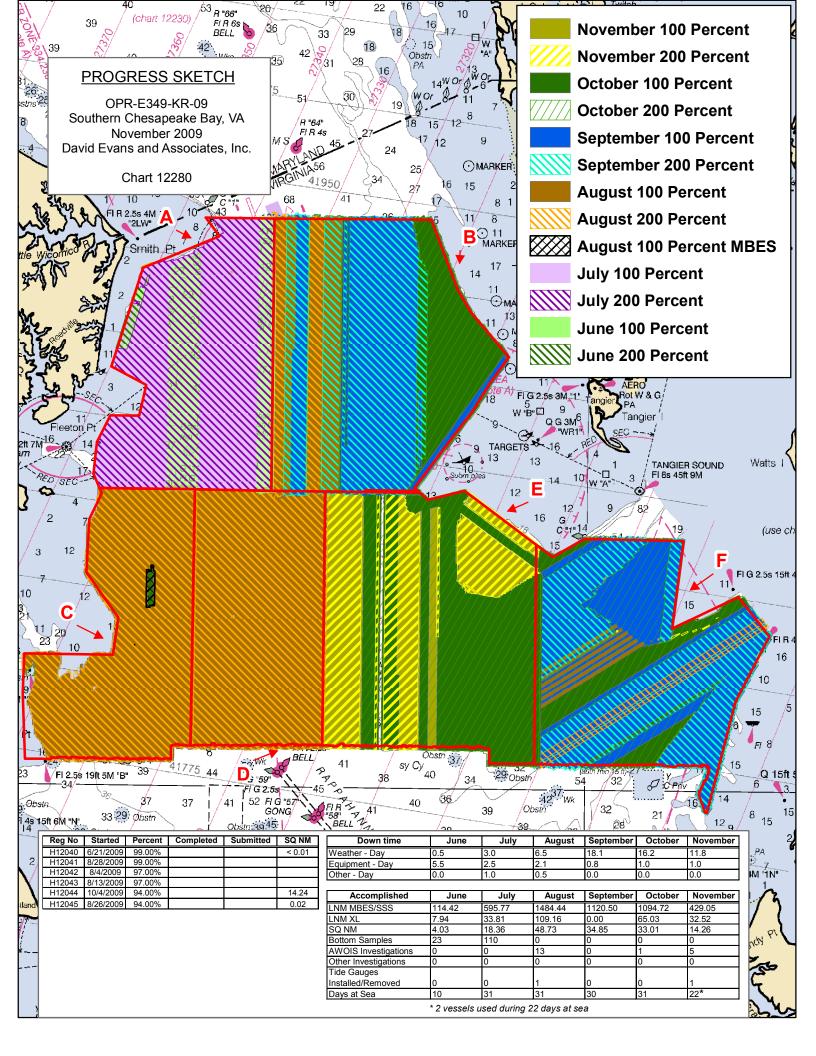
ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
				Concur with clarification. Obstruction determined insignificant. Chart survey soundings in common areaChart 79-ft obstruction.
		37.800313N	076.151290W	AWOIS Item #14249 Fish Haven features. FS 255-133413-S
				Concur with clarification. See Appendix II "AWOIS #14249 feature report" of the Descriptive Report.
	-	37.875555N	076.122655W	FS 303-202936-S. mound stands 1.5m proud
				Do not concur. Feature is not an obstruction but natural topography. No cartographic action is necessary.

H12041 Survey Features BOYSPP

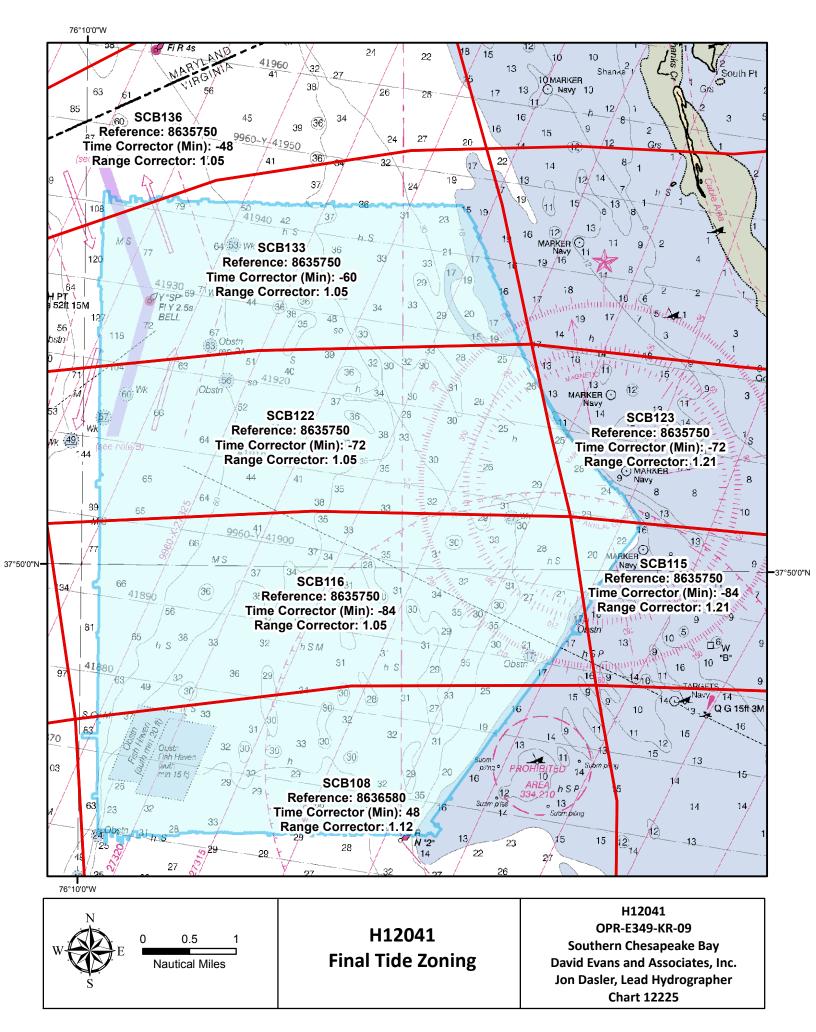
ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
		37.801429N	076.156566W	Virginia Marine Resources Commission (VMRC) Northern Neck Artificial Reef Buoy
				Concur. See Appendix I "1.7)BOYSPP" of Descriptive Report.

APPENDIX III FINAL PROGRESS SKETCH AND SURVEY OUTLINE





APPENDIX IV TIDES AND WATER LEVELS



OPR-E349-KR-09 H12041

Times of Hydrography

	, , ,						
Date	Julian Date	Min Time	Max Time				
08/29/2009	241	13:53	22:17				
08/30/2009	242	12:10	21:30				
09/05/2009	248	11:42	21:45				
09/12/2009	255	12:38	22:07				
09/13/2009	256	11:59	13:03				
09/22/2009	265	10:04	20:13				
09/23/2009	266	14:06	21:03				
09/24/2009	267	12:28	21:43				
09/28/2009	271	12:11	12:26				
10/01/2009	274	12:05	22:10				
10/03/2009	276	11:52	21:58				
10/04/2009	277	11:56	15:58				
10/29/2009	302	15:27	21:36				
10/30/2009	303	15:07	17:06				
10/31/2009	304	13:29	13:54				
11/15/2009	319	12:27	21:25				
11/16/2009	320	11:55	15:29				
12/07/2009	341	16:23	17:11				
12/15/2009	349	15:46	16:50				

FINAL TIDE ZONING H12041 OPR-E349-KR-09

Zone	Time Corrector (Min)	Range Ratio	Reference Station
SCB108	48	1.12	8636580
SCB116	-84	1.05	8635750
SCB115	-84	1.21	8635750
SCB122	-72	1.05	8635750
SCB123	-72	1.21	8635750
SCB133	-60	1.05	8635750
SCB136	-48	1.05	8635750

NOTE: Global Positioning System (GPS) water levels were acquired directly at the survey vessel however, traditional zoning from water level stations were used for submittal. Zoning and verified water level files were provided by CO-OPS.

Shyla Allen

From:

Sent: Tuesday, October 27, 2009 2:16 PM To: Jason Creech Ben Evans: Lori.Knell Cc: Re: [Fwd: Discrete Zoning error for OPR-E349-KR-2009] Subject: Jason, Yes you are correct.....all measurement errors should be 0.02. My mistake. Jerry Creech wrote: > Jerry > Thanks for the zoning uncertainty estimates. I'd like to have a value > checked before we move forward. > Windmill Point and Tangier Island > Is the 0.04 m Processing Error correct? If so the TPE (95% CI) should > be 0.172m. If the TPE (95% CI) is truly 0.156 then the Processing > error should be 0.02 (the same as Lewisetta to WP). > Thanks again. > > Jason > ----Original Message----> From: Ben Evans [mailto:Benjamin.K.Evans@noaa.gov] > Sent: Friday, October 23, 2009 10:31 AM > To: Jason Creech > Cc: Lori.Knell > Subject: [Fwd: Discrete Zoning error for OPR-E349-KR-2009] > Jason, > See below for zoning uncertainty estimates. > > Ben > ----- Original Message -----> Subject: Discrete Zoning error for OPR-E349-KR-2009 > Date: Fri, 23 Oct 2009 13:27:56 -0400 > From: Gerald.Hovis <Gerald.Hovis@noaa.gov> Lori.Knell <Lori.Knell@noaa.gov>, Benjamin K Evans > To: > <Benjamin.K.Evans@noaa.gov> NOS.COOPS.HPT@noaa.gov <4AD491FE.7080805@noaa.gov> <4ADF3E09.9010800@noaa.gov> > References: > <4ADF629B.9000209@noaa.gov> <4AE0BDE1.7060106@noaa.gov> > > Ben/Lori/Jason,

Gerald.Hovis [Gerald.Hovis@noaa.gov]

```
> Please pass on to Jason Creech.
> Below is a summary of the errors we compute when providing the TPE for
> project. Remember that our error at 95% CI is given as:
> @ 95\% CI = b + 1.96s
> b = systematic errors and biases.
> s = random errors at the one-standard deviation level.
> Where
> TPE @ 95% CI = Datum Error + 1.96*SQT((Measurement Error)2+(Processing
> Error)2+(Zoning Error)2)
> And
> Zoning Error (at the 95% confidence interval) = 1.96 * SQT((Sum of
> differences2)/(# of measurements))
> Datum Error being a bias is not included in the root mean square,
> however, Processing Error , Measurement Error, and Tidal Zoning Error
> being random errors are included.
> Also see.....http://vdatum.noaa.gov/docs/est_uncertainties.html
> The specific errors you requested are below but remember that one
> cannot
> just take the arithmetic sum of all values to get the total error.
> The Error Estimation between Lewisetta and Windmill Point:
> Datum Error (tertiary station)
                                                = 0.03 m (idealized based
> on 3 months of data)
> Datum Error (Windmill Pt)
                                                = 0.018 \text{ m (actual)}
> Measurement Error
                                                   = 0.01 m
> Processing Error
                                                      = 0.02 m
> Zoning Error
                                                        = 0.049 \text{ m}
                                                     = 0.099 \text{ m } */_
> _/*Zoning Error (95% CI)
> TPE (95% CI)
                                                     = 0.124 \text{ m}
> The Error Estimation between Windmill Point and Tangier Island:
> Datum Error (tertiary station) = 0.03 m (idealized based
> on 3 months of data)
> Datum Error (Tangier Island)
                                              = 0.018 m (actual)
> Measurement Error
                                                  = 0.01 m
> Processing Error
                                                    = 0.04 \text{ m}
> Zoning Error
                                                       = 0.067 \text{ m}
> /_*Zoning Errror (95% CI)
                                                  = 0.133 \text{ m *}_{-}/
> TPE (95% CI)
                                                   = 0.156 \text{ m}
> Jerry
```

Sent: Tue 10/13/2009 10:23 AM

Nou replied on 10/21/2009 7:10 AM.

Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

Jason Creech

From: Lori.Knell [Lori.Knell@noaa.gov]

To: Jason Creech

Cc: Benjamin.K.Evans@noaa.gov; Jon Dasler Revised tides for OPR-E349-KR-09 Subject: Attachments: 3 E349KR2009_Rev.zip(592KB)

Jason,

These are the revised tide requirements for the Chesapeake Bay project. This email contains a .ZIP file containing all pertinent MapInfo files, as well as tidal zoning graphics in PDF, are attached to this email. Six minute predictions for Lewisetta, VA (863-5750) and Windmill Point, VA (863-6580) may be retrieved in one month increments over the internet from the CO-OPS Home Page at http://tidesandcurrents.noaa.gov/olddata/ by clicking on "Predicted Water Level". Additionally, the files are posted to the Sharepoint website under the project name "OPR-E349-KR-2009 Revised Project Instructions" in Project Support Templates > FY09 > TO CO-OPS > From HSD > KR > OPR-E349-KR-2009 Revised. If you have any questions about this please let me know. Thanks, Lori

Lori Knell Physical Scientist, Data Acquisition Control Branch Hydrographic Surveys Division NOAA Lori.Knell@noaa.gov 301.713.2700 x114

APPENDIX V SUPPLEMENTAL RECORDS AND CORRESPONDENCE

Jason Creech

From: Matthew Wilson [Matthew.Wilson@noaa.gov]

Sent: Wednesday, June 17, 2009 12:20 PM

To: Jason Creech

Cc: Castle.E.Parker@noaa.gov

Subject: Re: Question Regarding Final Tide Notes

Jason,

Regarding your question about deliverables:

To rehash, for the upcoming Ches Bay sheets, DEA has planned a set line spacing survey (200%SSS w/ concurrent MB and MB developments). DEA inquired to AHB whether 1m res grids are acceptable, and if the "Deep" CUBE setting is acceptable when creating the grids.

- for a "skunk stripe" survey of 200% SSS run concurrently with MB, according to the 2009 NOS Specs, the MB coverage requirements are the same within the swath as for Complete Coverage requirements. Complete MB requirements specify a resolution of 1m for Depth Range of 0-23m.

Hence, 1m res MB grids are acceptable.

- Deep CUBE setting is to be used when small features are located separately with SSS. SSS is your primary means of object detection, hence the Deep CUBE setting is appropriate.

__

Respectfully,

Matthew J. Wilson Physical Scientist NOAA Atlantic Hydrographic Branch 757-441-6746x112 matthew.wilson@noaa.gov

Sent: Wed 9/23/2009 7:56 AM

📵 You replied on 10/21/2009 11:41 AM.

Jason Creech

From: Ben Evans [Benjamin.K.Evans@noaa.gov]

To: Jason Creech Cc: Lori.Knell; Jon Dasler

[Suspected Spam] Re: skunk stripe specs Subject:

Attachments:

Jason,

I was out of Coast Survey for advent of the new density requirements, so may not have the whole story on the reason they were introduced. However, my understanding of the history and the physics is that this requirement are not really related to object detection at all (that would be grid resolution), but rather improving the statistical confidence of the CUBE depth and uncertainty solutions for each node. So, in my opinion it is appropriate that a sounding density requirement apply to multibeam bathymetry associated with side scan.

I've addressed your more specific questions inline in red below.

I am not sure of the source of CAPT Lowell's comments on this issue, and it is certainly possible that he has been present for higher level discussions than I have been privy to. However, as chief of the marine chart division, this issue would not normally fall within his purview or authority.

Thanks - again, please let me know if I can answer any further questions. Once everything's clear, I'll ask Lor to summarize for the record.

Thanks.

Ben

Jason Creech wrote:

Ben

Thanks for getting back to me on this. We've had some discussion in-house on the proposed skunk stripe multibeam requirements and I've included questions/comments in your original email below.

We do have a general question about the necessity to have any density requirements for skunk stripe data and are wondering if you can briefly discuss what is pushing this requirement? It may be helpful if you could bring us up to date on the new density requirements in general. We're getting lots of questions from our staff.

Please let me know if I need to clarify any of my comments.

Thanks again for having this conversation with us.

Jason

From: Ben Evans [mailto:Benjamin.K.Evans@noaa.gov]

Sent: Friday, September 18, 2009 10:59 AM

To: Jason Creech Cc: Lori.Knell

Subject: skunk stripe specs

Jason.

Got your message, and am now back at my desk. We actually had some internal

discussions on skunk stripe multibeam requirements earlier this week, and arrived at a set of revised specifications which we think are more appropriate for this work:

For main scheme multibeam bathymetry acquired concurrently with 200% side scan coverage ("skunk stripe"):

- Grid resolutions of 2m for depths less than 20 meters and 4m for depths 20 40
 meters are acceptable. Ok, this is coarser than we are currently using but will
 minimize sounding density issues. We are in the process of updating our surfaces to
 meet this new standard.
- Minimum sounding density shall be 3 soundings per node. Is this a hard minimum or do you mean 95% of all nodes populated with 3 or more? With skunk stripe there will always be some nodes on the edge of the swaths that have less than 3 nodes. We've looked at some test lines with the resolutions proposed above and we see less than 1% of soundings with less than 3 soundings per node. Yes sorry, I should have been more specific: 95% of nodes shall have 3 soundings (and you're right, the edge effects complicate this again, part of the justification for relaxing the resolution and density specs)
- Small holidays in the multibeam coverage due to mid-water targets or attitude dynamics are acceptable where adjacent soundings show no evidence of significant shoaling, and the 200% side scan coverage does not indicate the presence of a feature. Ok, this is how we have always interpreted the specs. We don't fill small holidays where we have underlying 200% SSS that does not indicate the presence of a contact or shoal.

For multibeam developments of targets identified in side scan sonar:

• Coverage as per the "Complete Multibeam Coverage" specification (Section 5.1.2.2) over the feature and the immediate surrounding seabed (with designated soundings as required). As we read the Specs, Complete Coverage requires Object detection for significant shoals and features in waters shoaler than 30m. In water deeper than 30m we will use Complete Multibeam Coverage. We always designate significant features even if the grid represents the feature. We aren't currently running separate investigations if we feel that we get a valid least depth of significant features during mainscheme survey. If significant features are outside of the survey line or not completely ensonified we run an item investigation. We do have concerns about density requirements over significant features and the immediate seabed. Is there really the need to have more than 4 soundings on the seabed at the base of a significant feature if this feature is properly ensonified and the least depth is designated? Of course there may be areas on the edges of grids that could be out of spec. due to edge effect discussed above or due to shadows cast by the significant features that are being investigated. Again, I should have been more clear here. What was intended is that multibeam developments meet the baseline "complete" specification, i.e., for this purpose omit the 7th bullet on page 91.

However, I do note that given the relaxed requirements for skunk stripe multibeam, a higher resolution and density grid (and possibly additional development lines to support it) may be required for nearnadir contacts covered by main scheme multibeam.

As for the "immediate seabed" statement - you have interpreted it correctly. The intent is that we would have "complete" multibeam coverage of the contact and the *immediate* area (no more than a couple of grid cells-width) around its base. This will provide at least some indication of the full relief and any scour associated with the feature, which can augment the side scan imagery interpretation and, if necessary or desired, feature identification.

Regarding tools for demonstrating sounding density:

- You may use any method to evaluate the density and resolution requirements you
 would like, provided that you can demonstrate these results to NOAA. We are
 currently using ArcGIS to analyze the HIPS density layer exported to raster. I believe
 Caris is working on an update to the Surface QC Tool that will validate surface bases
 on user input density.
- For the purposes of this requirement, NOAA will not differentiate between the soundings actually falling within the square grid cell, and the soundings within the circular capture radius (provided the maximum sounding propagation distance is set to no greater than the grid resolution divided by sqrt(2), as required by the Specs and Deliverables)
- We note that the density layer feature in CARIS may be helpful. I see that you used the word "may" here. Are you aware of any issues where HIPS is not reporting density as defined by HSSD? No issues that I'm personally aware of - the intent here is to provide a possible solution (which it doesn't sound like you need, as you've already got your ArcGIS analysis) without being perscriptive.

Let me know what you think - if this works for you, we'll formalize it in an email for the record. If you'd like to discuss this further, feel free to give me a call.

Thanks,

Ben

LCDR Ben Evans, NOAA
Chief, Data Acquisition and Control Branch (N/CS35)
NOAA Office of Coast Survey
SSMC3, Station 6815
1315 East West Highway
Silver Spring, MD 20910
voice: (301) 713-2700 x111
fax: (301) 713-4533
cell: (240) 687-4602

Shyla Allen

From: Jason Creech

Sent: Friday, July 31, 2009 11:30 AM

To: Shyla Allen; Michael Christy; John Staly; Amanda Bittinger

Cc: Jon Dasler

Subject: AHB discussion

I just got off the phone with Matt Wilson at AHB and have answers (my interpretation in red) to our questions...

1. Early on we discussed submitting 1m CUBE surfaces over the survey area, but after reading more into the 2009 Specs propagation requirements and receiving the new CUBEparms.xlm file we are wondering if we should just follow the depth dependent grid-resolution thresholds that are in the 2009 specs? This would mean that we would create both 1 and 2 meter surfaces for some areas. We could also use thresholds when finalizing.

Matt said to create surfaces bases on the depth dependent grid-resolution thresholds. He will follow up with us regarding using the threshold option when finalizing. This is something that they do at the end of compilation but he is not sure if they need it at time of delivery.

I just got the following reply...

Just getting back to you regarding your question. The 1m and 2m surfaces will be fine as deliverables for the Chesapeake sheet we had discussed (you don't need to depth threshold). However please include the fieldsheets you use to create the surfaces.

2. We are currently preparing our MBES and SSS fill plans for H12040 and will most likely start acquiring fill tomorrow. We have a question about what truly constitutes a holiday in skunk stripe data. We are running fill if we have a large along track holiday (rejected line, disconnected sounder, etc), but do we need to worry about small 5 node holidays or gaps in the outer swath considering that we have 200 SSS?

Not a concern unless there is a significant contact that falls on the holiday. We don't have to meet the complete coverage MBES requirement for node population. If we have lots of outages or sparse data we should probably fill, but don't worry about isolated cases.

3. I asked about the following requirement in the 2009 specs.

If charted sounding falls between 2 sounding lines, and the charted depth is shoaler than adjacent depths from both lines, then the field unit must "split" the lines to verify or disprove the charted sounding.

Matt said not to do this unless there appears to be a feature or significant sounding that was missed by the skunk stripe data. If the whole chart or sections of the chart appear to be shoaler than the survey we should run spilts. That would be a lot of splits!

Please let me know if you have any questions.

Jason

Jason Creech Lead Hydrographer



David Evans and Associates, Inc. | Marine Services Division

2801 SE Columbia Way, Ste. 130 | Vancouver, WA 98661 Office: 360.314.3200 | Direct: 804.516.7829 | Fax: 360.314.3250

jasc@deainc.com | www.deainc.com

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OPR-E349-KR-09 Bottom Sampling

Sheet B, H12041

Sample	Time (UTC)	Day Number	Easting	Northing	COLOR	NATSUR	NATQUA
B1	17:53:30	201	399573.66	4183675.18	7	4	2
B2	17:47:38	201	401521.78	4183672.74	7	4	2
В3	17:40:26	201	403590.21	4183704.58	7	4	2
B4	17:35:19	201	404624.23	4183688.52	9	4	3
B5	18:00:33	201	399535.99	4185684.59	7	4	2
В6	18:07:10	201	401551.3	4185681.17	7	4	2
B7	18:14:34	201	403510.73	4185655.73	7	4	2
B8	18:21:48	201	405432.24	4185668.42	7-7	4-3	2-2
В9	19:00:42	201	399436.73	4187669.90	7-7	4-3	1-2
B10	18:48:52	201	401610.72	4187652.25	7	4	2
B11	18:42:42	201	403563.27	4187646.39	7	4	2
B12	18:37:01	201	405553.35	4187625.55	7	4	1
B13	18:29:59	201	407176.74	4187761.26	7	1-4	2-1
B14	19:08:31	201	399511.13	4189623.88	7-7	3-4	2-1
B15	19:23:37	201	401545.52	4189636.90	7-7	4-3	2-2
B16	19:38:32	201	403499.39	4189674.99	7	4	2
B17	21:29:57	201	405573.99	4189658.95	7	4	2
B18	21:24:38	201	407314.21	4189619.67	2	3	2
B19	21:58:42	201	399591.37	4191586.88	7	4	2
B20	21:48:47	201	401669.86	4191699.46	7-7	4-7	2-1
B21	21:43:24	201	403539.12	4191695.79	7	1-4	1-2
B22	21:37:27	201	405484.67	4191653.88	7	4	2
B23	22:06:22	201	399548.61	4193562.99	7	4	2
B24	22:19:40	201	401520.04	4193659.78	7-7	4-3	2-2

OPR-E349-KR-09 Bottom Sampling

Sheet B, H12041

Sample	Time (UTC)	Day Number	Easting	Northing	COLOR	NATSUR	NATQUA
B25	22:33:12	201	403487.51	4193627.81	7	4	2
B26	22:42:07	201	404826.35	4193686.75	9	4	3

































B 0 1 7



















B 0 2 3

2 cm

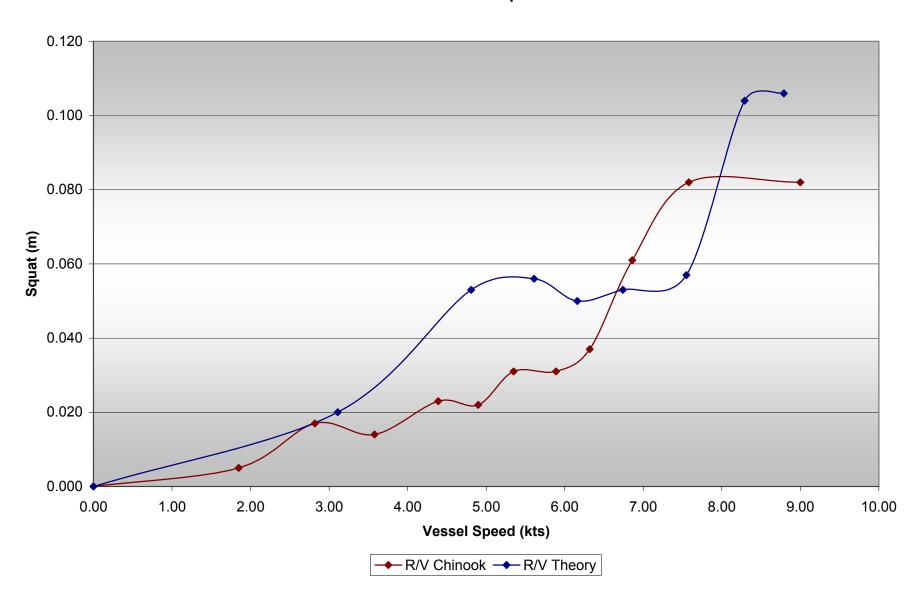






OPR-E349-KR-09 Settlement and Squat Results					
R/V CI	R/V Chinook		R/V Theory		
Speed (kts)	Squat (m)	Speed (kts)	Squat (m)		
0.00	0.000	0.00	0.000		
1.85	0.005	3.11	0.020		
2.82	0.017	4.81	0.053		
3.58	0.014	5.61	0.056		
4.39	0.023	6.16	0.050		
4.90	0.022	6.74	0.053		
5.35	0.031	7.55	0.057		
5.89	0.031	8.29	0.104		
6.32	0.037	8.79	0.106		
6.86	0.061				
7.58	0.082				
9.00	0.082				

Vessel Settlement and Squat Results



This Document is for Office Process use only and is intended to supplement, not supersede or replace, information/recommendations in the Descriptive or H-Cell Reports.

AHB COMPILATION LOG

General Survey Information			
REGISTRY No.	H12041		
PROJECT No.	OPR-E349-KR-09		
FIELD UNIT	DAVID EVANS AND ASSOCIATES		
DATE OF SURVEY	2009/07/20 - 2009/12/15		
LARGEST SCALE CHART	12228_1, edition 32, 2008/03/01, 1:40,000		
ADDITIONAL CHARTS	12225_1, edition 59, 2009/12/01, 1:80,000		
SOUNDING UNITS	Meters at MLLW		
COMPILER	Dinah O. Morris		

G G 11	File Name		
Source Grids	H:\Compilation\H12041_E349_DEA\AHB_H12041\SAR Final Products\GRIDS		
	H12041_1of4_2m_Final.csar		
	H12041_2of4_2m_Final.csar		
	H12041_3of4_2m_Final.csar		
	H12041_4of4_2m_Final.csar		
	H12041_1of4_4m_Final.csar		
	H12041_2of4_4m_Final.csar		
	H12041_3of4_4m_Final.csar		
	H12041_4of4_4m_Final.csar		
Surfaces	File Name		
12 11 11 11	H:\Compilation\H12041_E349_DEA\AHB_H12041\COMPILE\Working		
Combined	H12041_4m_Combined.csar		
Interpolated TIN	\Interpolated TIN\H12041_12m_InterpTIN.csar		
Shifted Interpolated TIN	\Shifted Surface\H12041_12m_InterpTIN_Shifted.csar		
Final HOBs	File Name		
rmai 110bs	H:\Compilation\H12041_E349_DEA\AHB_H12041\COMPILE\FinalHOB's		
Survey Scale Soundings	H12041_SS_Soundings.hob		
Chart Scale Soundings	H12041_CS_Soundings.hob		
Contour Layer	H12041_Contours.hob		
Feature Layer	H12041_Features.hob		
Meta-Objects Layer	H12041_MetaObjects.hob		
Blue Notes	H12041_BlueNotes.hob		
ENC Retain Soundings	H12041_ENC_Soundings.hob		

Meta-Objects Attribution			
Acronym	Value		
M_COVR			
CATCOV	1 – coverage available		
SORDAT	20091215		
SORIND	US,US,graph,H12041		
M_QUAL			
CATZOC	6 – zone of confidence U (data not assessed)		
INFORM	R/V Theory, R/V Chinook		
POSACC	10 m		
SORDAT	2009/12/15		
SORIND	US,US,graph,H12041		
SUREND	20091215		

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SURSTA	20090720
DEPARE	
DRVALV 1	11.6519ft
DRVALV2	141.8058ft
SORDAT	20101101
SORIND	US,US,graph,H12041
M_CSCL	
CSCALE	N/A
SORDAT	N/A
SORIND	N/A

SPECIFICATIONS:

I. COMBINED SURFACE:

a. Number of ESAR Final Grids:b. Resolution of Combined (m):4 m

II. SURVEY SCALE SOUNDINGS (SS):

a. Attribute Name: Depth

b. Selection criteria: Radius, Shoal biasc. Radius value is: mm at map scale

i. Use single-defined radius: N/A

ii. Or use radius table file: H12041_SS_SSR_40k.txt

0.0000	3.6576	0.8
3.6576	5.4864	0.9
5.4864	9.1440	1.2
9.1440	10.9728	1.2
10.9728	18.28800	1.3
18.28800	45.7200	1.7
		300

d. Queried Depth of All Soundings

i. Minimum: 3.552 m ii. Maximum: 43.222 m

III. INTERPOLATED TIN SURFACE:

a. Resolution (m): 12 m

b. Interpolation method:

Natural Neighbor

c. Shift value: -0.75 ft

IV. CONTOURS:

a. Attribute Name: Depth

b. Use a Depth List: H12041_depth_contours.txt

c. Output Options: Create contour lines

i. Line Object: DEPCNTii. Value Attribute: VALDCO

V. FEATURES:

a. Number of Chart Features:b. Number of Non-Chart Features:9

VI. CHART SURVEY SOUNDINGS (CS):

a. Number of ENC CS Soundings: 523b. Attribute Name: Depth

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c. Selection criteria:

Radius, Shoal bias

d. Radius value is:

Distance on the ground (m)

i. Use single-defined radius:

i fautus:

ii. Or use radius table file:

H12041_CS_SSR_40k.txt

0.0000	3.6576	225
3.6576	5.4864	265
5.4864	9.1440	450
9.1440	10.9728	475
10.9728	18.28800	575
18.28800	45.7200	680

e. Enable Filter:

Interpolated != 1

f. Number Survey CS Soundings: 477

VII. NOTES:

ENC Information:

Name: USVA16M Chesapeake Bay

Edition: 20

Update Application Date: 3/15/2010

Chart: 12228

ATLANTIC HYDROGRAPHIC BRANCH H-CELL REPORT to ACCOMPANY SURVEY H12041 (2009)

This H-Cell Report has been written to supplement and/or clarify the original Descriptive Report (DR) and pass critical compilation information to the cartographers in the Marine Chart Division. Sections in this report refer to the corresponding sections of the Descriptive Report.

B. DATA ACQUISITION AND PROCESSING

B.2 QUALITY CONTROL

The AHB source depth grid for the survey's nautical chart update product were 2m and 4m resolution BASE surface (*.CSAR), which were combined at 4m resolution. The survey scale soundings were created from the surface using a sounding spacing range (SSR) file. A TIN was created from the survey scale soundings, from which an interpolated surface of 12m resolution was generated. The chart scale soundings were selected using an SSR file from only the non-interpolated nodes of this surface to preserve absolute continuity between the charted depths, the survey scale soundings and the original source grid node. The chart scale soundings are a subset of the survey scale soundings. The surface model was referenced when selecting the chart scale soundings, to ensure that the selected soundings portray the bathymetry within the common area.

The interpolated TIN surface of 12m resolution was shifted by the NOAA sounding rounding value of -0.75 feet. The shifted interpolated TIN was used to generate depth contours in feet which included 12, 18, 30, 36 and 60ft. The depth contours are forwarded to MCD for reference only. The contours were utilized during chart scale sounding selection and quality assurance efforts at AHB. The depth contours are incorporated into the SS H-Cell product as per 2009 H-Cell Specifications.

The compilation products (Final *.HOB files) for this survey are detailed in the H12041 AHB Compilation Log contained within this document. The Final HOB files include depth areas (DEPARE), depth contours (DEPCNT), soundings (SOUNDG), meta-objects (M_COVR, M_QUAL), cartographic Blue Notes (\$CSYMB), and features (BOYSPP, OBSTRN, WRECKS, SBDARE and SNDWAV).

As dictated by Hydrographic Technical Directive 2008-8, the Final HOB files were combined into two separate H-Cell files in S-57 format. Both S-57 files were exported from CARIS Bathy DataBASE in meters, and then converted from metric units into feet using CARIS HOM ENC 3.3. Quality assurance and topology checks were conducted using CARIS S-57 Composer 2.1 validation tests and DKART Inspector 5.0 validation tests.

The final H-Cell products are two S-57 files, in Lat/Long NAD-83. The contents of these two H-Cell deliverables are listed in the table below:

<u>TABLE 1</u> - Contents of H-Cell Files				
H12041_CS	Scale 1:40,000			
Object Class Types	Geographic	Cartographic	Meta	
S-57 Object Acronyms	DEPARE	\$CSYMB	M_COVR	
	OBSTRN		M_QUAL	
	SBDARE			
	SNDWAV			
	SOUNDG			
	BOYSPP			
	WRECKS			
H12041_SS	.000	Sca	le 1:10,000	
Object Class Types	Geographic			
S-57 Object Acronyms	DEPCNT			
	SOUNDG			

B.2.4 Junctions and Prior Surveys

Survey H12041 (2009) junctions with survey H12043 (2009) to the southwest and H12040 (2009) to the west. Most present survey depths compare within 2 foot of junctioning survey depths to the west, and within 1 feet of junctioning survey depths to the southwest. Most present survey depths compare within 2 feet of the charted hydrography to the southeast, 5 feet to the north and east.

B.4 DATA PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

CARIS Bathy DataBASE version 3.0/HF8 CARIS S-57 Composer version 2.2 CARIS HOM ENC version 3.3/SP3/HF8 DKART Inspector version 5.1

C. HORIZONTAL AND VERTICAL CONTROL

The hydrographer makes adequate mention of horizontal and vertical control used for this survey in section C of the DR and in the OPR-E349-KR-09 Horizontal and Vertical Control Report. The sounding datum for this survey is Mean Lower Low Water (MLLW), and the vertical datum is Mean High Water (MHW). Horizontal control used for this survey during data

acquisition is based upon the North American Datum of 1983 (NAD83), UTM projection zone 18 North.

D. <u>RESULTS AND RECOMMENDATIONS</u>

D.1 CHART COMPARISON 12228_1 (32nd Edition, MAR/2008)

Chesapeake Bay Pocomoke and Tangier Sounds Corrected through NM 8/2/2008 Corrected through LNM 9/28/2010 Scale 1:40,000

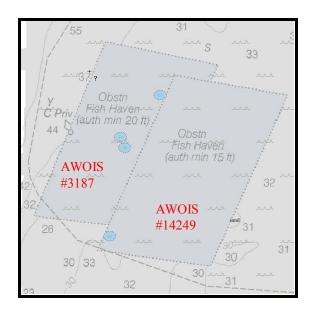
ENC COMPARISON US5VA16M

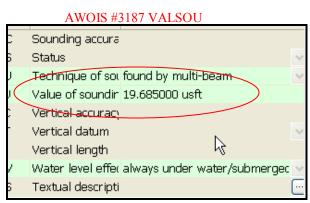
Chesapeake Bay Pocomoke and Tangier Sounds Edition 20 Application Date 2010/03/15 Issue Date 2010/09/29 Chart 12228

D.2 ADDITIONAL RESULTS

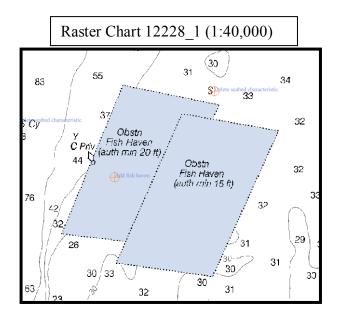
The charted hydrography originates with prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section D and Appendix I and II of the DR. The hydrographer recommends that any charted features not specifically addressed either in the H-Cell files or the Blue Notes should be retained as charted. The following exceptions are noted:

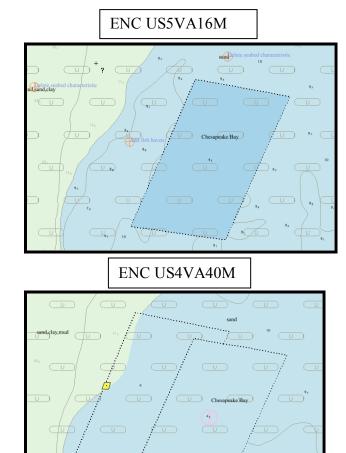
- a. AWOIS Item #14249 and #3187 are charted *Obstrn Fish Havens*. Both should remain charted with the authorized minimum depth.
- b. AWOIS Item #3187 is charted as a Fish Haven with an authorized minimum depth of 20 ft. The VALSOU for this is only 19.68 in the ENC (US4VA40M).



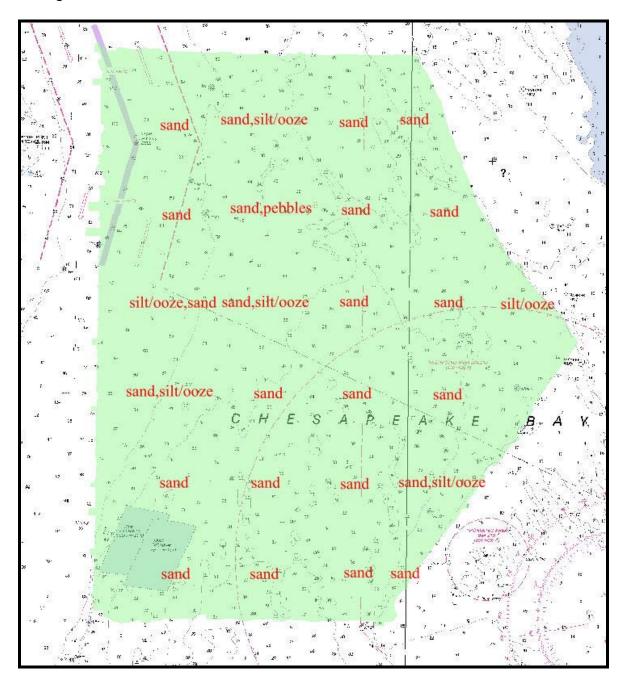


c. There are two connected fish haven's that are displayed on Chart 12228 (1:40,000). In ENC US5VA16M there is only one fish haven portrayed. ENC US4VA40M includes both fish haven areas. ENC US5VA16M which is associated with Chart 12228 needs to be updated. Add fish haven.

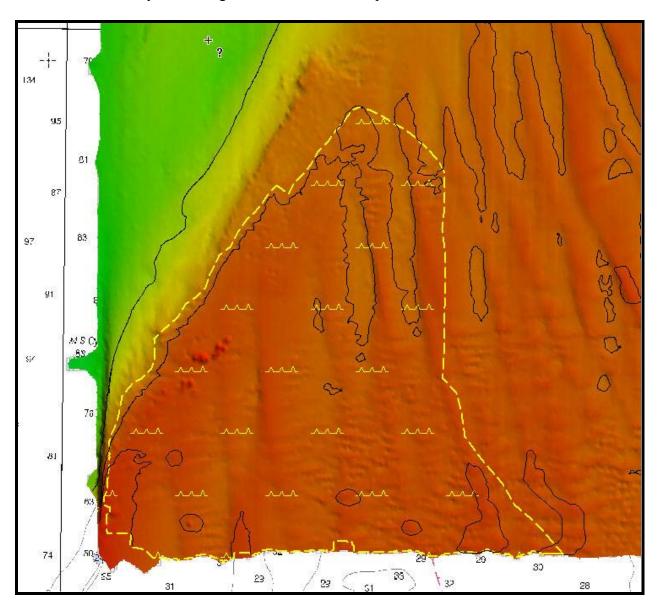




d. A collection of 26 bottom samples were included for chart update, 25 samples were retained. Most charted seabed characteristics were superceded by the survey findings.

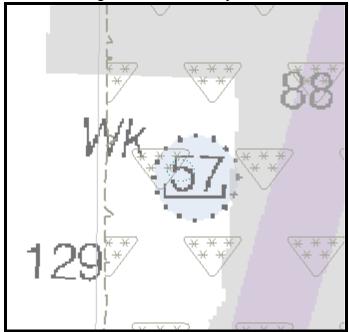


e. One sandwave (SNDWAV) area was included with the H-Cell. This area was defined by undulating sandwaves with an amplitude of 1m or more.



(12m Interpolated TIN - Vertical Exaggeration 10x)

f. AWOIS item #7227 has been addressed in junctioning survey H12040 and has been removed from the coverage area of this survey.



D.6 MISCELLANEOUS

Chart compilation was completed by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compilation data will be forwarded to the Marine Chart Division in Silver Spring, Maryland. See section D.1 of this report for a list of the Raster Charts and Electronic Navigation Charts (ENC) used for compiling the present survey.

D.7 ADEQUACY OF SURVEY

The present survey is adequate to supersede the charted bathymetry within the common area. Any features not specifically addressed either in the H-Cell files or the Blue Notes should be retained as charted. Refer to section D and Appendix I and II of the DR for further recommendations by the hydrographer.

APPROVAL SHEET H12041

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth contours, disposition of critical depths, cartographic symbolization, and verification or disproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with National Ocean Service and Office of Coast Survey requirements except where noted in the Descriptive Report and the H-Cell Report.

All final products have undergone a comprehensive review per the Hydrographic Surveys Division Office Processing Manual and are verified to be accurate and complete except where noted.

Dinah O. Morris

Hydrographic Intern
Atlantic Hydrographic Branch

I have reviewed the H-Cell files, accompanying data, and reports. This survey and accompanying Marine Chart Division deliverables meet National Ocean Service requirements and standards for products in support of nautical charting except where noted.

Approved:

CDR Richard T. Brennan, NOAAChief, Atlantic Hydrographic Branch