W00326

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

DESCRIPTIVE REPORT

Type of Survey:	External Source Data
Registry Number:	W00326

LOCALITY

State(s):	Virginia
General Locality:	VA Coastline
Sub-locality:	Quinby Inlet to Chincoteague

2014

NOAA National Geodetic Survey

Remote Sensing Division

LIBRARY & ARCHIVES

Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

W00326

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**Virginia**
General Locality:	**VA Coastline**
Sub-Locality:	**Quinby Inlet to Chincoteague**
Scale:	**10000**
Dates of Survey:	**11/01/2013 to 07/01/2014**
Project Number:	**OSD-RSD-16**
Data Source:	**NOAA Remote Sensing Division**
Chief of Party:	**Michael Aslaksen, Chief, Remote Sensing Division**
Soundings by:	**Topo-bathymetric Lidar**
Imagery by:	**N/A**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**Meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/.

Descriptive Report Summary to Accompany **W00301** *W00326 has been designated as a subset of W00301*	
Project	OSD-RSD-16
Survey	W00301
State	Delaware, Maryland, Virginia
Locality	N/A
Sub Locality	VA,MD,DE Coastline
Scale of Survey	variable
LASER Used	Riegl VQ-820G Lidar Sensors
Horizontal Datum	North American Datum of 1983
Vertical Datum	Mean Lower Low Water (MLLW)
Vertical Datum Correction	VDATUM
Projection	Latitude-Longitude (NAD83) - UTM Zone 18
Field Unit	Dewberry, Quantum Spatial, RC&A, Woolpert
Survey Dates	Nov, 2013 to July, 2014
Chief of Party /Data Originator	NOAA Remote Sensing Division Chief Mike Aslaskan

A. Area Surveyed

This topo-bathy lidar survey was acquired in accordance with the requirements defined in the National Geodetic Survey (NGS) Sandy Supplemental Statement of Work Volume 4. Please see the NGS Remote Sensing Division (RSD) DR/DAPR report for any deviations from this requirement.

The data set contains outer coast and inlet data from Cape Charles, VA to Delaware Bay. This is a subset of a larger Post Hurricane Sandy topo-bathy lidar data set that extends from South Carolina to New York. The entire data set spans 140 blocks and has been broken down into four sections for submission to OCS. This data set contains block 63 through block 88, as outlined in Figure 1. See Appendix A. Bathymetric Coverage for grid coverage by block.

Data were acquired within the following survey limits:

Table 1 Bounding Coordinates

Northeast Limit	Southwest Limit
39-11.328334 N	37-04.807757 N
075-02.908947 W	075-58.956516 W

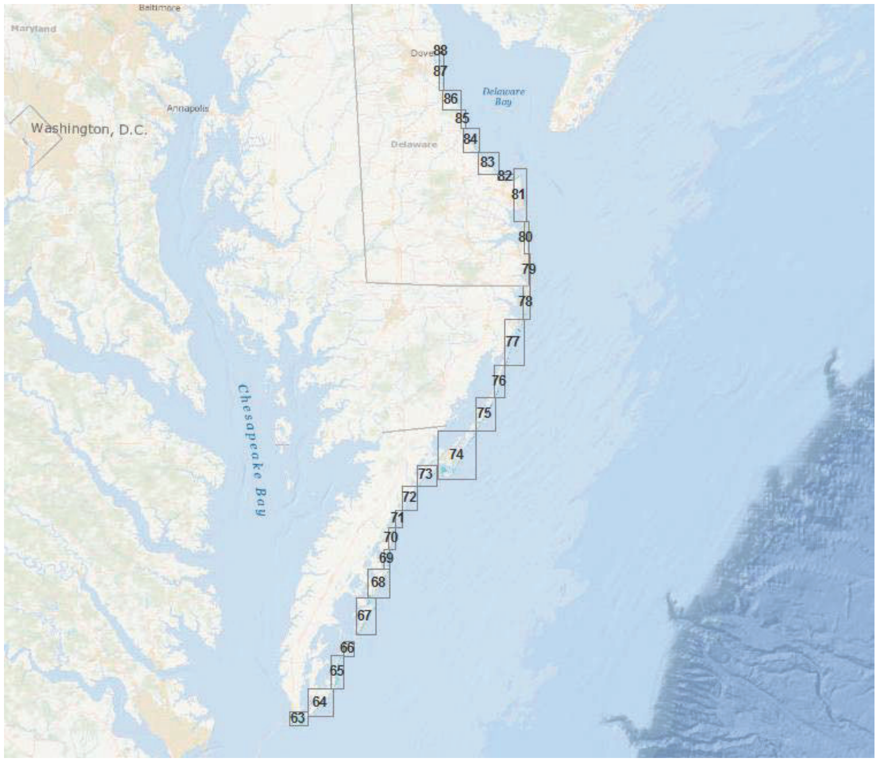

Figure 1 Image depicts region of coverage broken up by assigned block 63 through 88. The data contains topo-bathy lidar coverage of inlets and near shore outer coast, gridded at 3m resolution. See Appendix A for bathymetric coverage by block.

B. Survey Purpose

The purpose of this survey was to update the national shoreline after Hurricane Sandy by the NOAA Remote Sensing Division (RSD). Data collection and processing was managed by private contractor, Dewberry. The survey limits and methods were determined by RSD.

C. Intended Use of Survey

In conjunction with RSD's Geographic Cell (GC) shoreline product, data is adequate to supersede soundings and intertidal areas and add or modify features to the chart. The coverage meets Office of Coast Survey (OCS) Reconnaissance Coverage requirements for lidar data. The data should not be used to disprove submerged features due to excess water column noise described in Section D. Data Acquisition and Processing.

D. Data Acquisition and Processing

For a description of original data acquisition and processing systems, survey equipment, quality control procedures and data processing methods the following documents have been included with this data submission from the Remote Sensing Division and contractor:

DR_DAPR_VA1408_W003001_signed (RSD)
Supplemental_Sandy_Final_Report_of_Survey_20151030 (Dewberry)

Analysis for charting and additional product generation, as discussed in this document, was performed by the Sandy Integrated Ocean and Coastal Mapping Group at the UNH/NOAA Joint Hydrographic Center.

The lidar LAS files and aerial imagery were processed in ArcMAP 10.4.0, LP360 2015.1.76.7 for ArcMAP extension and Caris Base Editor 4.1. In LP360 the data were reviewed to confirm that classification was correct, point source IDs were assigned to flight lines, data were in MLLW, fliers were removed, and to identify any additional features not included in the RSD shoreline files. The aerial imagery was combined by block in ArcMAP and exported to GeoTIFF for ease of use within Caris. Caris Base Editor was used for final grid creation in CSAR and BAG format and S-57 feature file attribution.

Seven classes of data, identified in the following table, were extracted by RSD from the full lidar data set, converted to MLLW, inverted to Z positive down, and clipped to MHW for chart submission.

Table 2 Lidar Classes Submitted from RSD

Lidar Class	Category
1	Unclassified
2	Ground
25	Water Column
26	Bathymetry
27	Water Surface
29	Submerged Features
30	S-57 Features

Class 2 ground and class 26 bathymetry represent the bare earth points. Potential chart features are not represented in these classes. Class 29 and 30 are reserved for features. Within the entire data set, Block 74 was the only block to have data in either class 29 or 30. Four aquaculture pens (Figure 2) were classified to class 30 and have been included in the final grid. All other features, such as those represented in the shoreline file (piers, buoys, pilings, etc.), are located in class 1 unclassified, along with noise and other miscellaneous points not classified. Occasionally, features are also included in additional classes, such as 25 water column or 27 water surface.

Figure 2 Class 30 LAS points in yellow represent aquaculture pens in block 74. Background Chart 12210, scale 1:80,000.

The algorithm used to automatically classify the ground points for land and bathymetric elevations tracks and selects the bottom edge of the data set. This can result in data points not being included in the ground or bathymetry class that may otherwise be considered ground or seafloor, as well as a possible deep bias to the data in areas. As a consequence, the density of the gridded data can be reduced by missing data points or shoal depths excluded.

In Figure 3, only the bottom edge of what appears to be bathymetry is classified as “bathymetry” (green), while the rest is classified “water column” (light blue). Of these data only the bathymetry class (green points) would be included in an elevation model, demonstrating the reduced density and the potential to exclude shoal points.

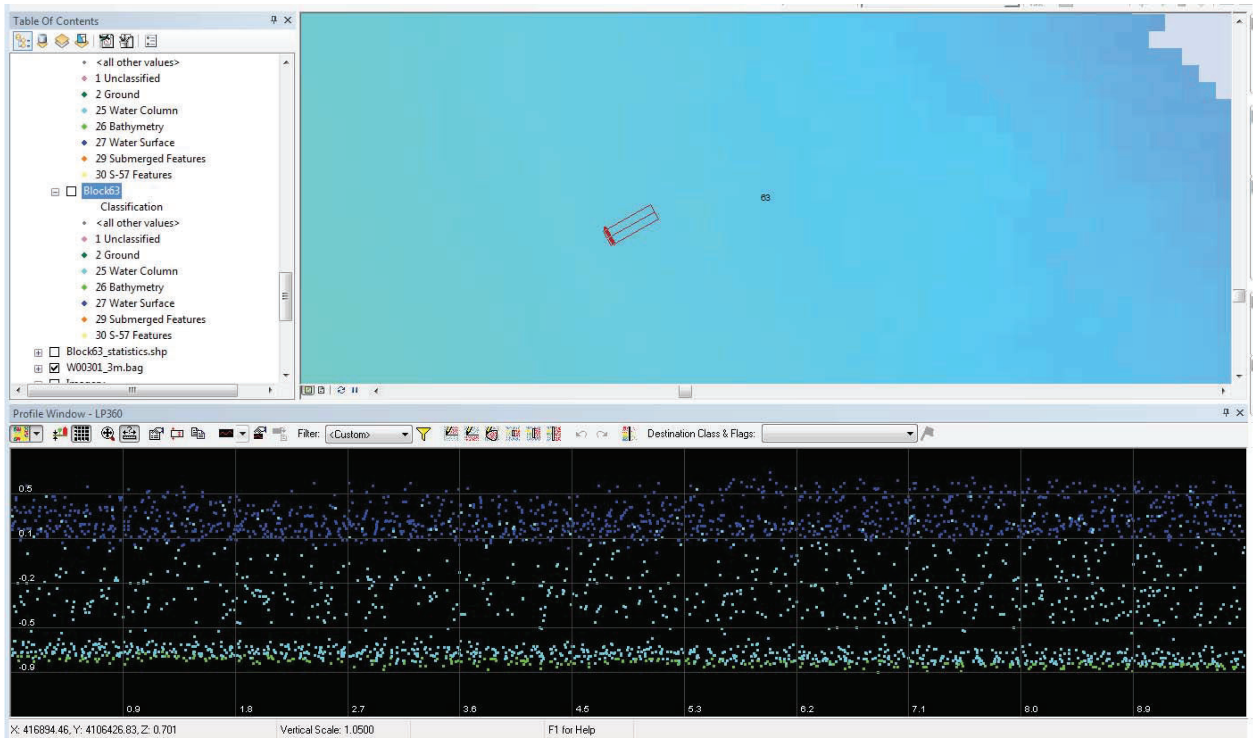

Figure 3 LP360 profile contains lidar bathymetry from 6 flight lines, classified as water surface (navy blue), water column (turquoise), and bathymetry (green). The bathymetry points (green) are used to generate the 3m grid in the map window. The bottom tracking algorithm classifies the bottom edge of the bathymetric points, excluding all other possible bathymetric points.

Identification of submerged features was very challenging and near impossible for this data set. The sensitivity of the sensor was increased to improve bathymetric measurements, as described on page 31 the RSD DR DAPR. This resulted in increased noise in the water column, making it difficult to identify any submerged contacts. This was apparent when an above-water feature disappeared in the water column noise. Figure 4 displays the profile view (right) of sloping pilings displayed in the aerial imagery (center) marked by the RSD shoreline point feature (red). In the profile view, pilings above water represented as unclassified pink data points, are not discernible in the water column (turquoise), even though they must certainly be there.

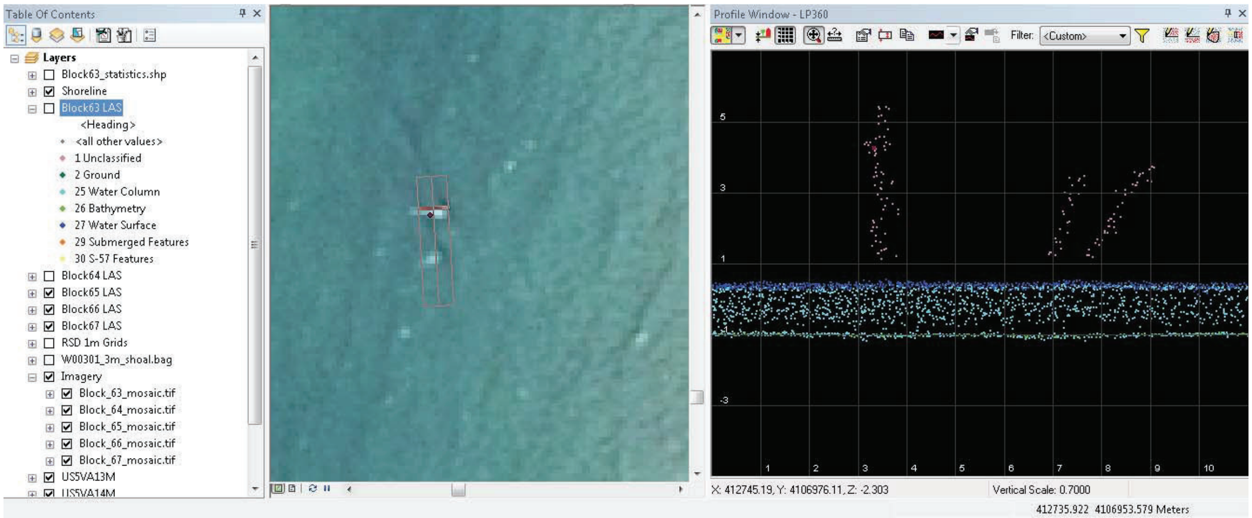

Figure 4 The LP360 ArcGIS extension profile window (right) displays three pilings in 4 feet of water. The pilings are not discernible below the water surface (blue points). Block 63, position 37-06-18.143N 75-58-55.14W

Minimal editing was performed of the lidar LAS files. Fliers were removed from Block 63 and 82 and the edited LAS files were exported from LP360 and used to grid the data in Caris Base Editor. Block 74 does not contain point source ID's, used to differentiate flight lines, and was not corrected.

In LP360, the chart, LAS files, aerial imagery, and final shoreline GC11174 were used to search for and identify any additional features in the data, not included in the RSD shoreline. The features are digitized at survey scale and included in final feature file W00301_FFF.000. The features include pilings, breakers, shoreline construction, beacons/buoys, obstructions and cartographic notes.

A 3 m grid surface was generated for the entire data set. This surface meets the HSSD data density requirements of greater than 95% of nodes have 5 soundings or more (Figure 5). An additional 1m surface was created for reference. The flight lines were collected at 20% sidelap, which limits the dataset to meeting OCS Reconnaissance Coverage requirements for lidar. The RSD and contractor reports mistakenly state 50% sidelap. This discrepancy was confirmed with RSD.

Table 3 Bathymetric Surfaces

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
W00301_LI_3m_MLLW	BAG/CSAR	3 m	-4.56 to 4.22 m	Shoalest Depth	Reconnaissance Coverage
W00301_LI_1m_MLLW	BAG/CSAR	1 m	-4.56 to 4.42 m	Shoalest Depth	Reference

Three additional HOB files were generated from the 3 m surface and submitted with this data set; a survey scale sounding layer with 40 m radius spacing, a 3 ft contour, and coverage polygon. In addition, a shape file outlining blocks 63 through 84, as seen in Figure 1, is included.

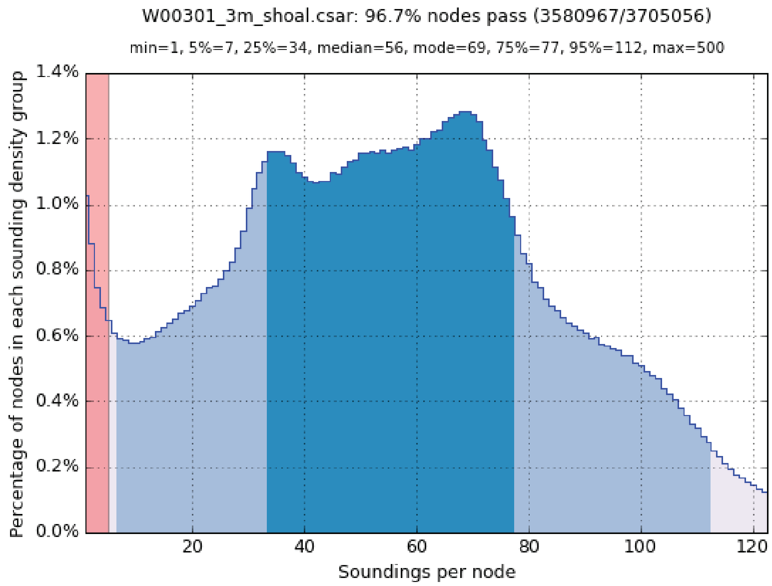

Figure 5 Representation of sounding density per node for the 3 m surface.

E. Uncertainty

The standard deviation for the 3 m gridded surface ranges from 0 to 1.49 m with an average of 4 cm. These values are reflective of the bottom detection algorithm used to classify bottom points and not necessarily the standard deviation of the true ground points.

For information on positional accuracy of the data refer to pg 41, Section 5.0 Uncertainty, of the RSD DR DAPR.

F. Results and Recommendations

The following are the largest scale RNCs and ENCs that cover the survey area:

Table 4 Raster Navigational Charts (RNC)

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
12216	1:40,000 1:10,000	29	6/1/2012	1/19/20216	1/30/2016
12222	1:40,000	55	2/1/2015	3/4/2016	3/12/2016
12224	1:40,000	26	8/1/2014	12/22/2015	1/30/2016
12208	1:50,000	16	7/1/2013	10/20/2015	3/5/2016
12210	1:80,000 1:20,000	41	3/1/2016	1/26/2016	1/30/2016
12211	1:80,000 1:20,000	46	5/1/2016	1/19/2016	1/30/2016
12214	1:80,000	49	11/1/2010	10/27/2015	1/30/2016
12221	1:80,000	82	2/1/2014	1/5/2016	1/30/2016
12304	1:80,000	47	10/1/2014	10/27/2015	1/30/2016

Table 5 Electronic Navigation Charts (ENC)

ENC	Scale	Edition	Update Application	Issue Date
US4DE11M	1:80,000	29.7	05/11/2015	11/4/2015
US4DE12M	1:80,000	18.0	1/10/2013	10/29/2015
US4VA1AM	1:80,000	1.4	10/30/2014	11/4/2015
US4VA12M	1:80,000	24.23	11/14/2014	2/23/2016
US4VA50M	1:80,000	21.6	5/26/2015	2/22/2016
US4VA70M	1:80,000	14.16	10/30/2013	1/28/2016
US5DE10M	1:40,000	15.1	1/9/2013	7/15/2015
US5MD50M	1:20,000	7.6	12/15/2014	12/23/2015
US5VA13M	1:40,000	31.3	9/9/2015	2/23/2016
US5VA14M	1:40,000	23.6	6/19/2015	2/23/2016
US5VA71M	1:20,000	13	1/27/2016	1/27/2016

The dataset was reviewed for dangers to navigation, areas of significant bathymetric cover related to chart scale, and areas of significant shoreline change that may warrant return by a hydrographic platform. Survey scale soundings generated from the three meter surface were used to evaluate differences with the chart.

Of the twenty-six blocks of data submitted, fourteen have significant bathymetric coverage (SBC) that could be used to update soundings on the chart. Twelve blocks do not have significant bathymetric coverage. The following table highlights which blocks do (light grey) or do not (dark grey) have bathymetry and the corresponding RNCs and ENCs that cover the area. Blocks are considered insignificant bathymetric coverage if the laser did not penetrate the water surface, there is no data below MLLW, or the bathymetric coverage is so close to shore it would not warrant a sounding on the largest scale chart. For visual representation of coverage by block see Appendix A. Bathymetric Coverage.

Table 6 Significant bathymetric coverage and corresponding charts by block.

Block	SBC	1:10,000	1:20,000	1:40,000	1:80,000	ENC Inset	ENC
63	Y			12222, 12224, 12208	12221		US5VA13M, US4VA12M
64	N			12222, 12224	12221		US5VA14M, US4VA12M, US4VA1AM, US5VA13M
65	Y			12224	12221		US5VA14M, US4VA1AM
66	Y			12224	12221		US5VA14M, US4VA1AM
67	Y			12224	12221, 12210		US4VA70M, US4VA1AM, US5VA14M
68	N				12210		US4VA70M
69	N				12210		US4VA70M
70	Y				12210		US4VA70M
71	N				12210		US4VA70M
72	Y				12210		US4VA70M
73	Y		12210		12210, 12211	US5VA71M	US4VA70M
74	Y		12210		12210, 12211	US5VA71M	US4VA70M, US4VA50M
75	Y				12211		US4VA50M
76	Y				12211		US4VA50M
77	Y		12211		12211	US5MD50M	US4VA50M

78	Y		12211		12211	US5MD50M	US4VA50M
79	N			12216	12211, 12214		US4DE11M, US5DE10M
80	N			12216	12214		US4DE11M, US5DE10M
81	Y	12216		12216	12304, 12214		US4DE11M, US5DE10M
82	Y	12216		12216	12304, 12214		US4DE11M, US5DE10M
83	N			12216	12304, 12214		US4DE11M, US5DE10M
84	N				12304		USDE12M
85	N				12304		USDE12M
86	N				12304		USDE12M
87	N				12304		USDE12M
88	N				12304		USDE12M

Significant shoreline change has occurred along the coast from Chincoteague Inlet to Cape Charles, VA (block 63 through 74). The general trend has been shoreline regression and inlet migration. This is demonstrated in Figure 6, Great Machipongo Inlet, which highlights 1 of 11 inlets with significant change along this stretch of coastline. The RSD generated MHW line (red) and MLLW line (orange) delineate the shoreline at the time of data acquisition compared to the largest scale chart. No bathymetry was obtained within Great Machipongo Inlet. All 11 inlets are included in Appendix B. Inlet Migration. Depending on vessel traffic and lack of hydrographic data, some of these inlet regions may warrant further development by a hydrographic platform.

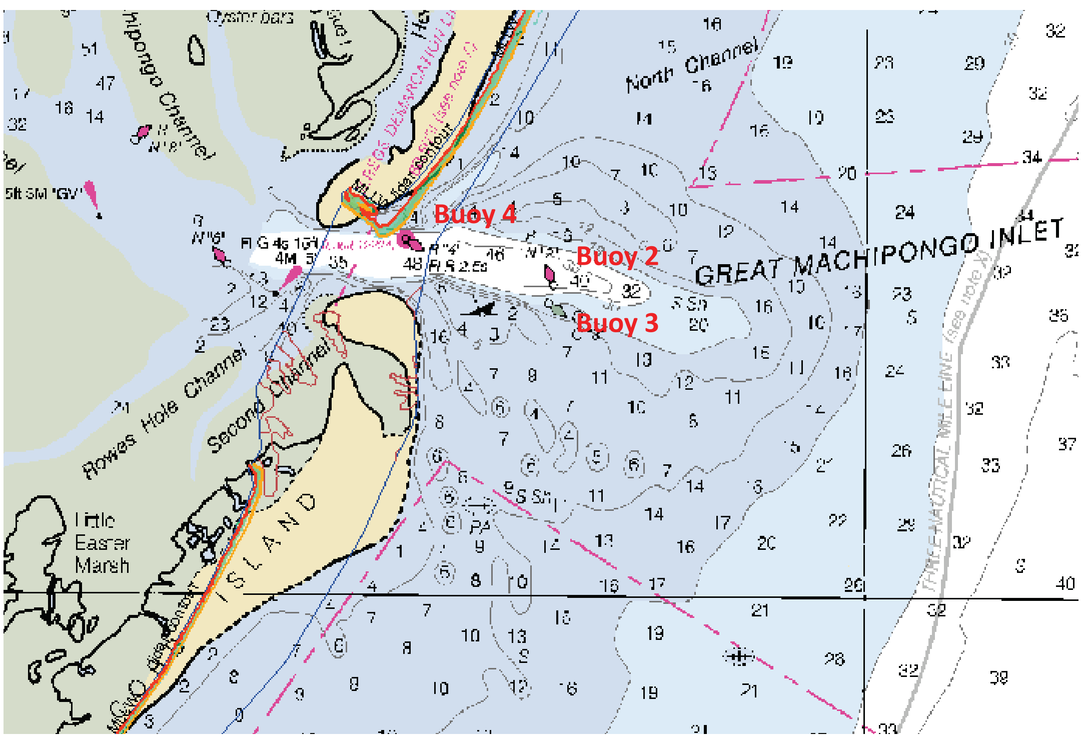

Figure 6 At Great Machipongo Inlet, VA there is substantial change in inlet morphology between RSD lidar and chart 12221, scale 1:80,000.

At Great Machipongo Inlet (Figure 6), buoy 4 is not seen in the aerial imagery or lidar coverage. Nor are buoy 2 or 3 which are covered solely by imagery. Despite these buoys being missing in the data, the

Local Notice to Mariners and chart updates indicate the charted positions are correct since the lidar data was collected. The lidar for Great Machipongo inlet, in block 67, was collected on 11/24/13, 5/21/14 and 5/22/14. The aerial imagery was collected 1/12/14. The LNM history shows that buoy 4 was notified missing in March (LMN 09/14) and buoy 3 in July (LNM 28/14). LNM 32/14 explains that buoys 2 and 3 will be repositioned around the time the lidar flight lines were run and may explain why they are not present in the imagery.

Table 7 Local Notice to Mariners for Machipongo Inlet

LNM Date	Notice	Date Applied to 12210
07/13	Great Machipongo Inlet Lighted Buoy 4 relocated from 37-21-59.894N 075-43-08.678W to 37-21-58.715N 075-43-11.396W	10/29/13
09/14	Great Machipongo Inlet Buoy 4 Missing The ACOE Dredge MURDEN will be conducting dredging operations in Chincoteague Inlet until 05 March, 2014.	
28/14	Great Machipongo Inlet Buoy 3 Missing	
32/14	On or about 15 May, 2014 the following aids to navigation changes will occur: A. Great Machipongo Inlet Buoy 2 (LLNR 6805) will be relocated to approximate position 37-21-48.000N, 075-42-43.000W. B. Great Machipongo Inlet Buoy 3 (LLNR 6810) will be relocated to approximate position 37-21-41.000N, 075-42-43.000W.	
43/15	Relocate Great Machipongo Inlet Buoy 2 to 37-21-43.078N, 075-42-10.270W Relocate Great Machipongo Inlet Buoy 3 to 37-21-37.094N, 075-42-12.284W Reocate Great Machipongo Inlet Buoy 4 to 37-21-58.045N, 075-43-11.979W	10/29/15

The chart is offset from the data in two locations. The first is at Indian River Inlet, block 80, on chart 12216/ENC USDE10M (Figure 7). The second is at Ocean City Inlet, block77, Chart 12211/ENC USVA50M (Figure 8).

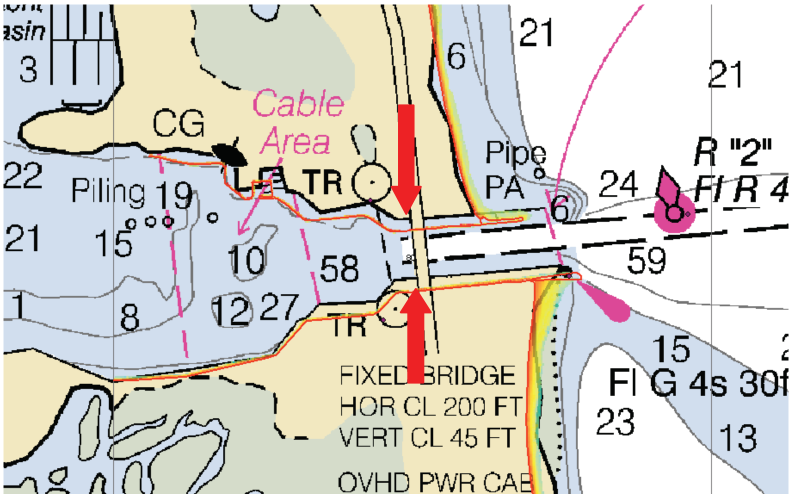

Figure 7 RSD shoreline (RED) of Indian River Inlet is offset with shoreline on Chart 12216, scale 1:80,000.

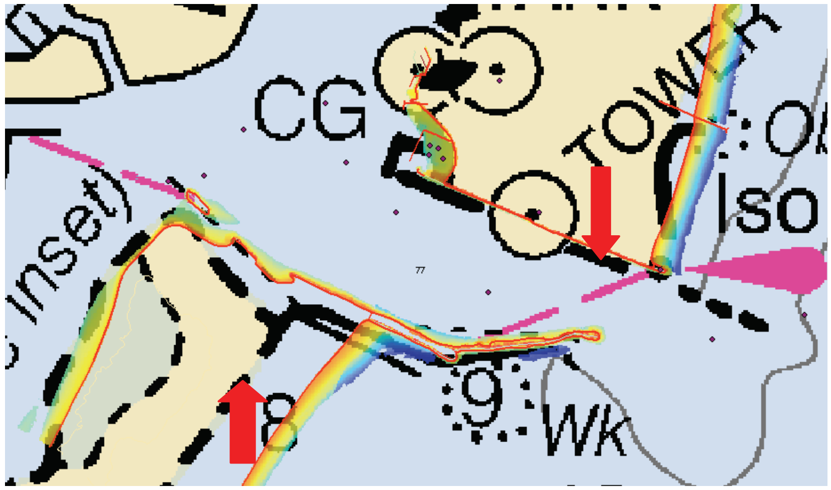

Figure 8 RSD shoreline (red) in Ocean City Inlet is offset with shoreline on Chart 12211, scale 1:80,000.

Five above water charted wrecks were not seen in the aerial imagery or lidar data and are noted with cartographic notes in the feature file.

Within Delaware Bay, in the most northern section of data, blocks 88 through 85, the lidar data does not penetrate deep enough to delineate MLLW. MLLW is not included in the RSD shoreline for that region.

Features that fell outside the GC shoreline boundary extents, visible in the lidar or imagery, were included in the feature file. This generally included breakers or buoys, and the occasional obstruction as shown in Figure 9.

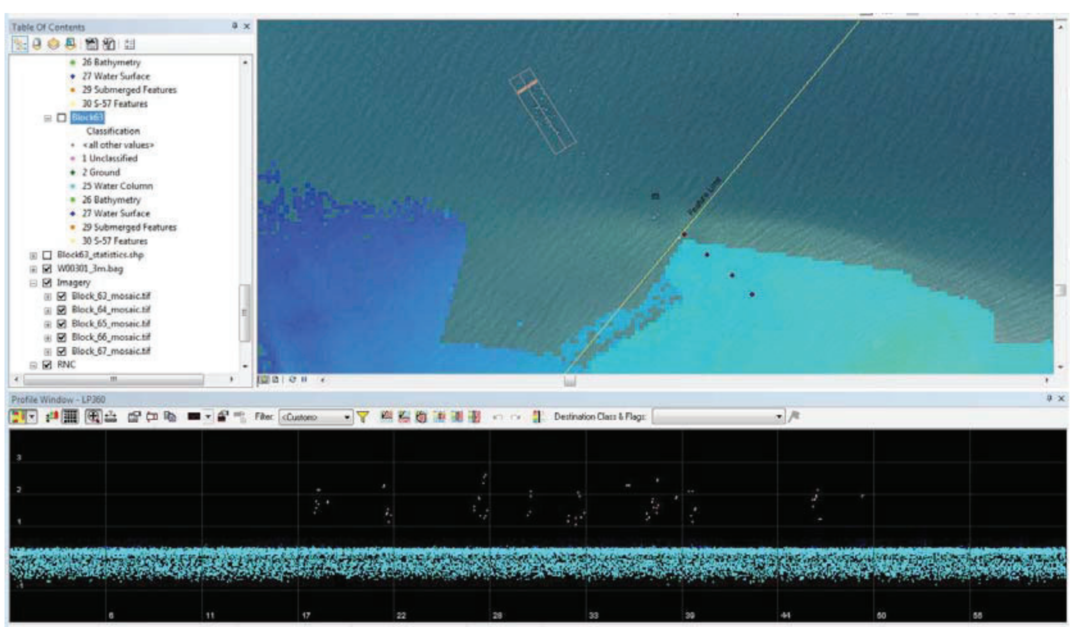

Figure 9 Beyond the extents of the bathymetric coverage and the feature file limit line (yellow), several uncharted pilings exist in the imagery and lidar data. The lidar profile view (lower) shows the cross section of the pilings represented as unclassified (pink) above the water surface (navy blue) and water column (turquoise). The extension of these pilings (possible pier ruins) from the RSD delineated data is included in W00301_FFF.

Several shoreline constructions and pilings not included in the final shoreline, but represented in the imagery and lidar data are included in the feature file. Figure 10 highlights a charted dock that was excluded, even though it meets the length requirements to be charted at the scale of the Ocean City Inlet inset (1:20,000).

Figure 10 Unclassified lidar points (pink) detect pier not digitized in RSD shoreline (blue). Left: background Chart 12211 inset, 1:20,000.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water. VDatum was used by RSD to convert the LAS files from the ellipsoid to MLLW. The horizontal datum for this project is North American Datum of 1983 (NAD83). For more details on the positioning methods used see the RSD DR DAPR submitted with this dataset.

H. Additional Results

Gaps in coverage exist due to flight line patterns (left and center) and environmental conditions (right) as seen in Figure 11.

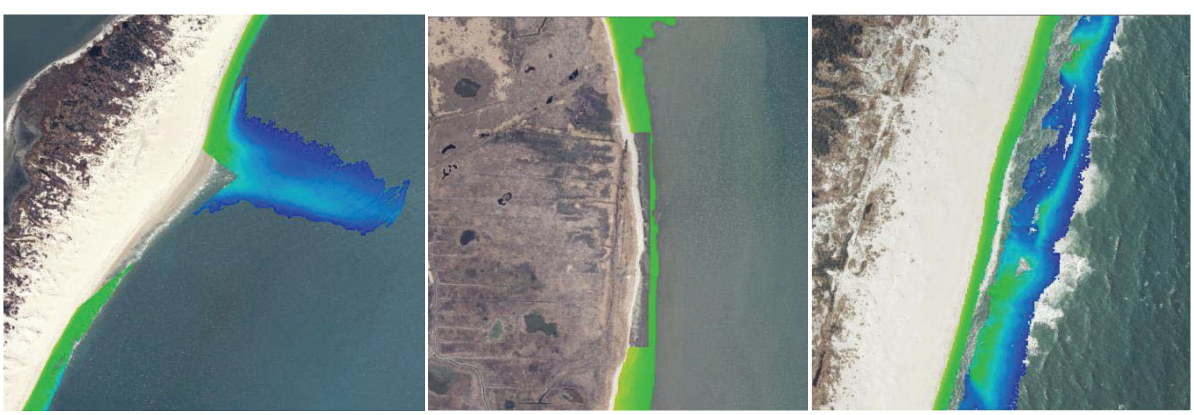

Figure 11 Examples of gaps in lidar coverage from W00301.

Several NOAA Ship Thomas Jefferson surveys, H12856 (2015), H12180 (2010), and H12039 (2007) junction with W00301, however there are very small segments of overlap between surveys. The small comparison area, over large time scales, combined with the migratory sandy seabed environment make a significant comparison difficult and does not serve to assess the accuracy of the lidar data.

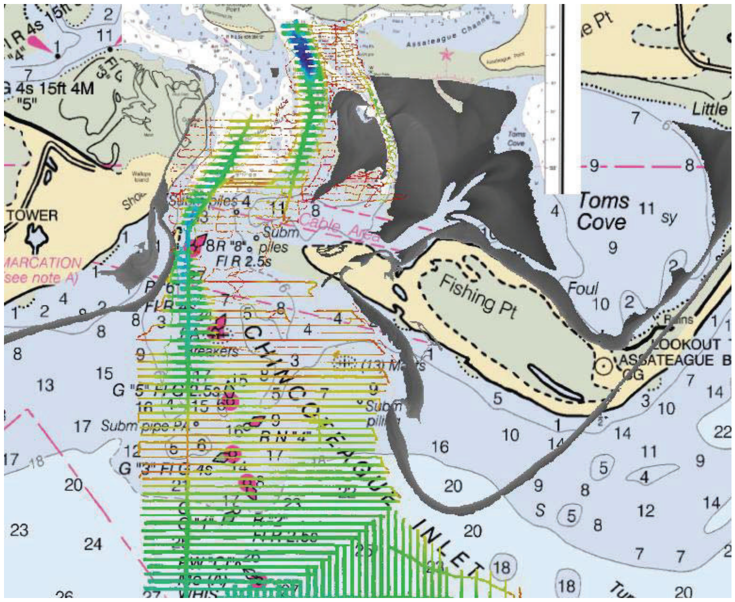

Figure 12 Junction survey H12856 (rainbow depth range) and W00301 (grayscale depth range) in Chincoteague Inlet

I. Approval

All records from RSD are included with the JHC IOCM products for final review and processing to the Processing Branch. The survey data meets or exceeds requirements for reconnaissance lidar data as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede or modify charted sounding data in their common areas but are not adequate to disprove charted submerged features. This survey is complete and no additional work is required with the exception of deficiencies noted in the Survey Summary Report.

Approver Name	Approver Title	Approval Date	Signature
Andrew Armstrong	Co-Director, JHC	7/11/2016	Digitally signed by Andrew A. Armstrong, III DN: cn=Andrew A. Armstrong, III, o=NOAA/NOS/OCS, ou=Joint Hydrographic Center, email=andy.armstrong@noaa.gov, c=US Date: 2016.07.11 13:32:40 -04'00'

Appendix A. Bathymetric Coverage

Images represent bathymetric coverage of W00301_3m_shoal by block, over the largest scale chart.

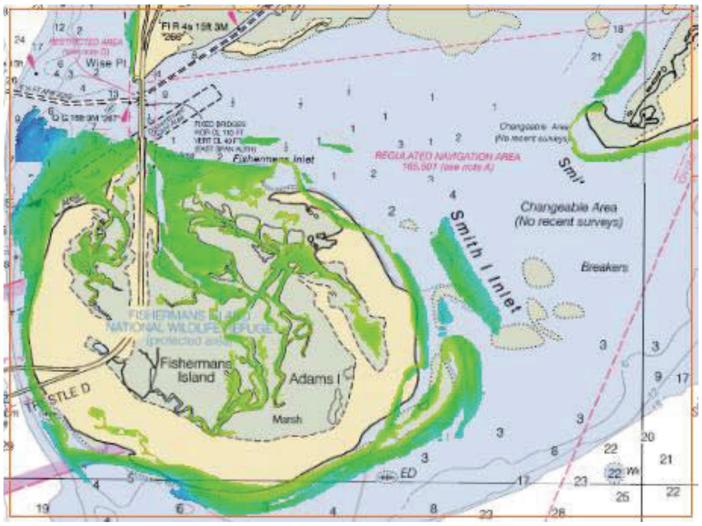

Figure 1 Block63

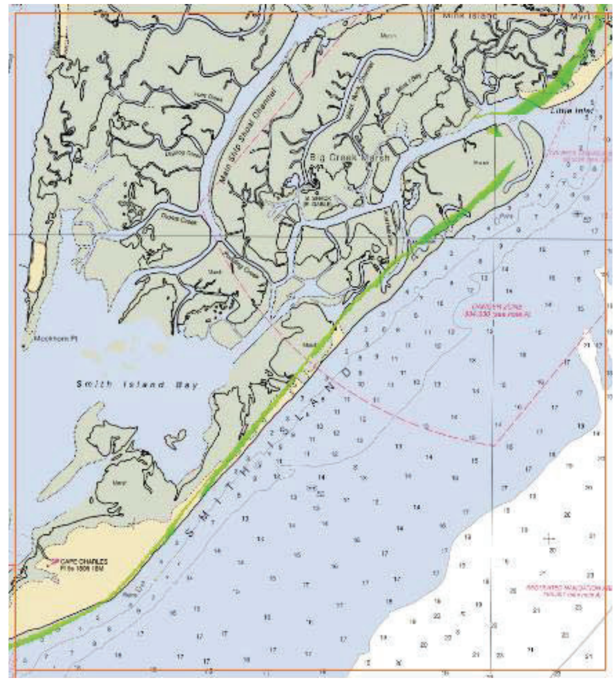

Figure 2 Block 64

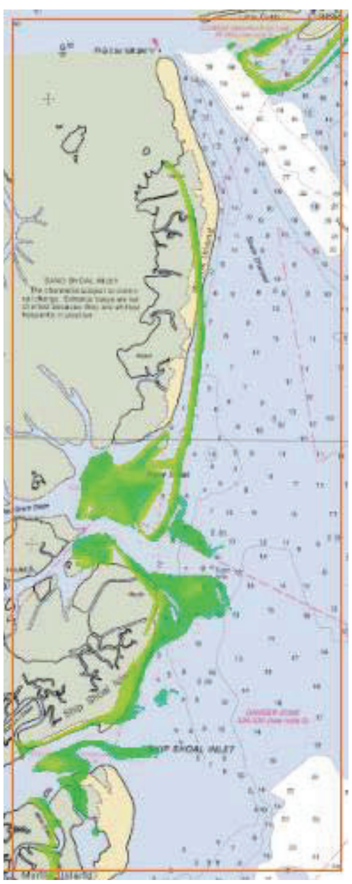

Figure 3 Block 65

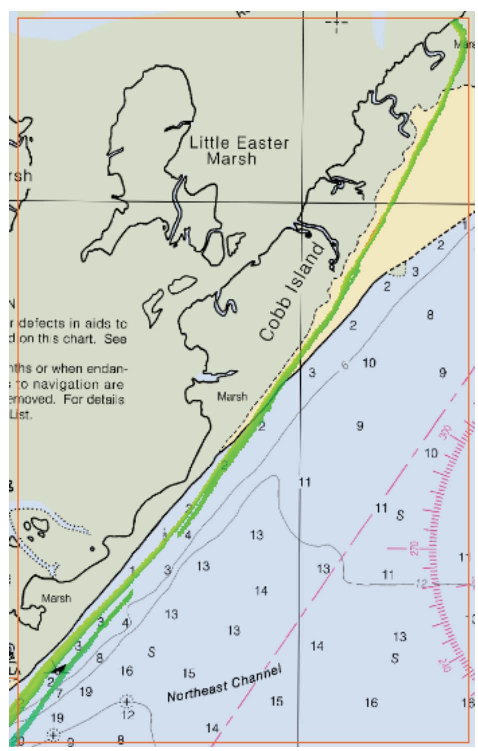

Figure 4 Block 66

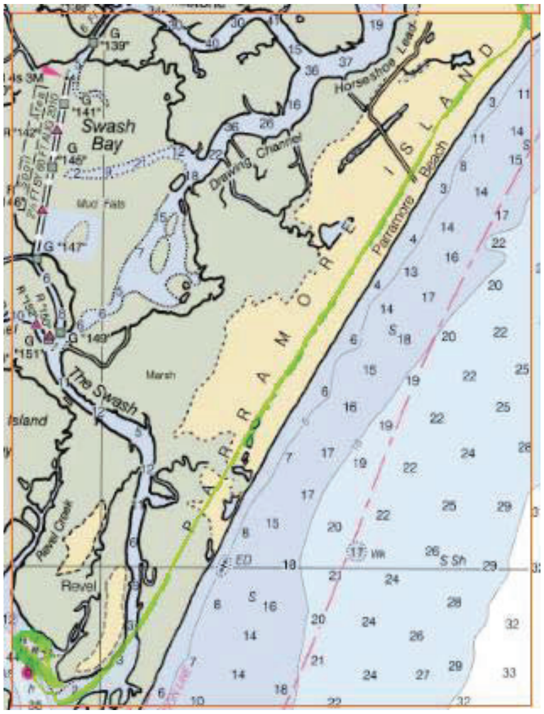

Figure 5 Block 67

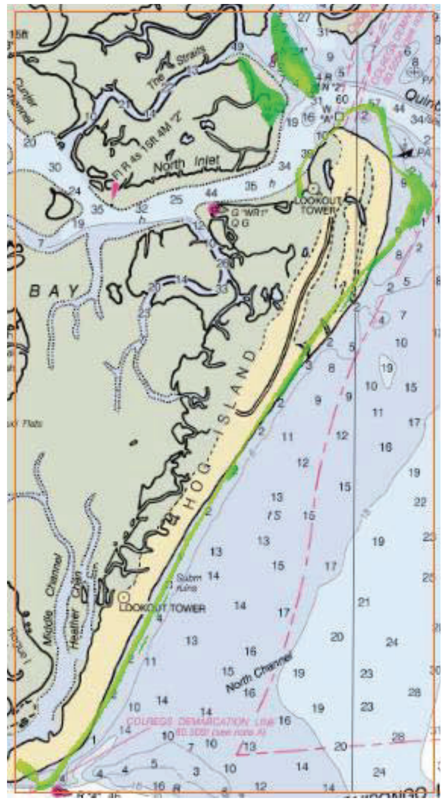

Figure 6 Block 68

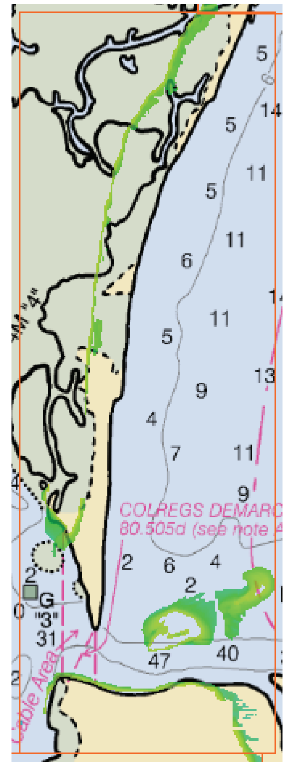

Figure 7 Block 69

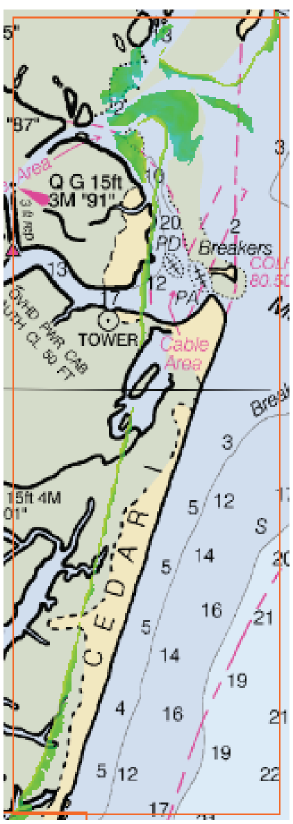

Figure 4 Block 70

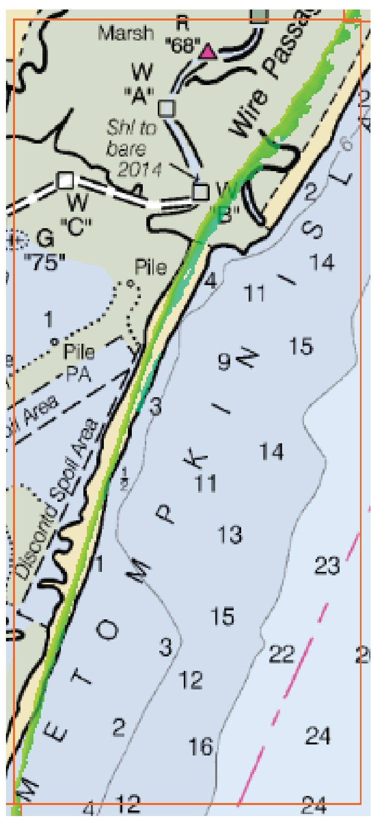

Figure 9 Block 71

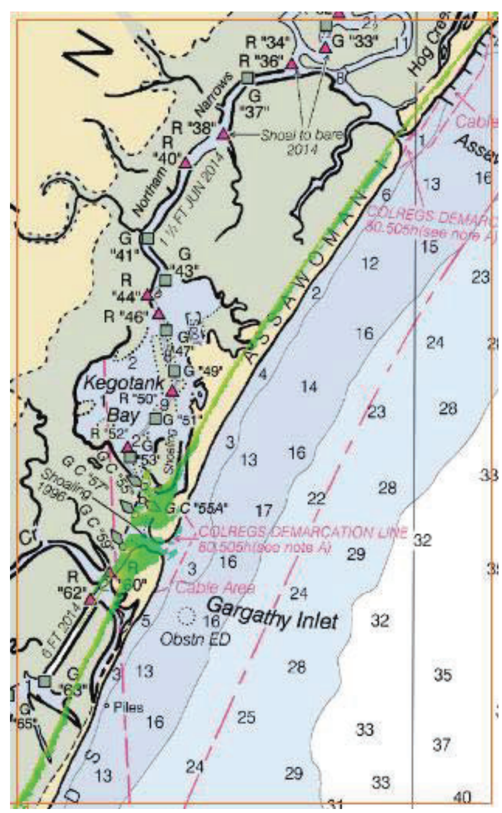

Figure 10 Block 72

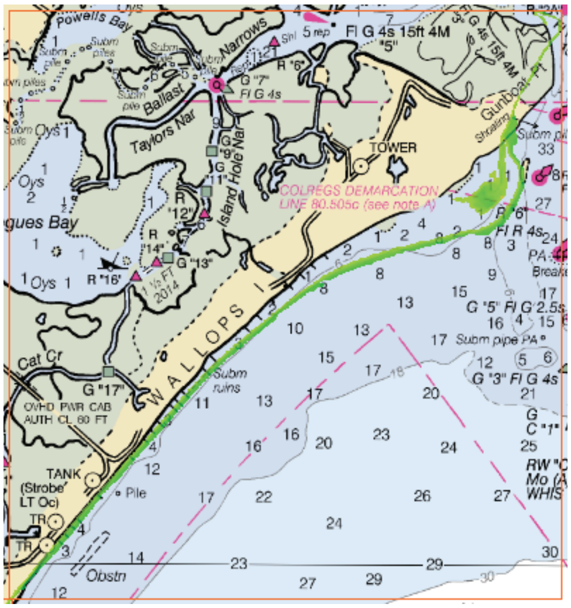

Figure 5 Figure 73

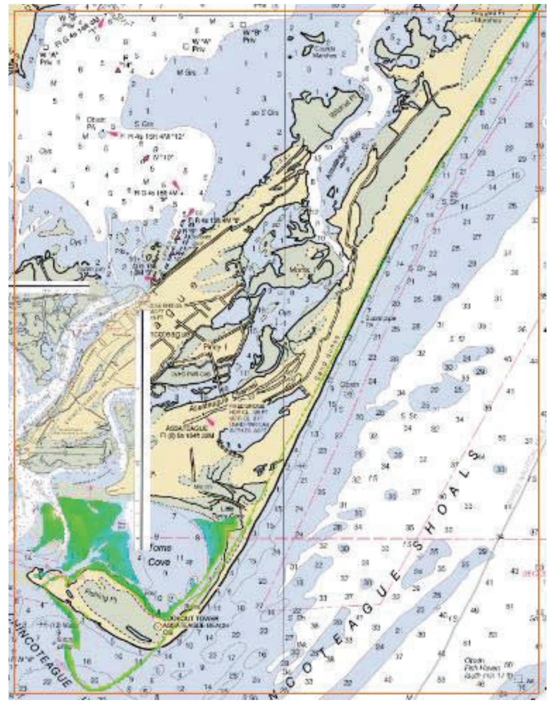

Figure 12 Block 74

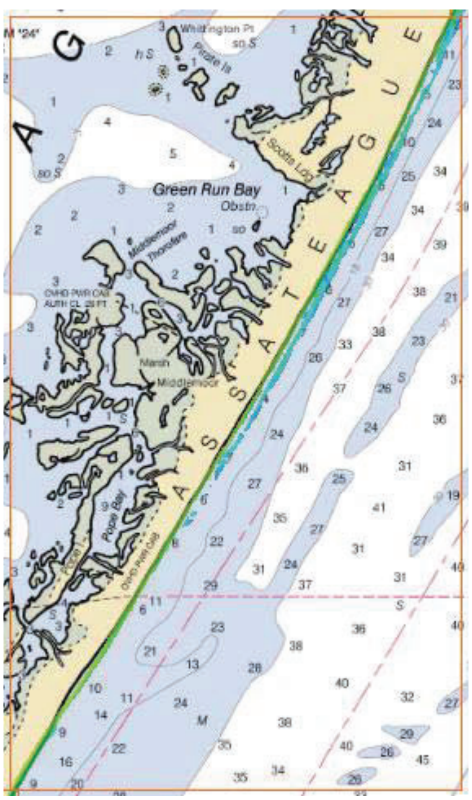

Figure 13 Block 75

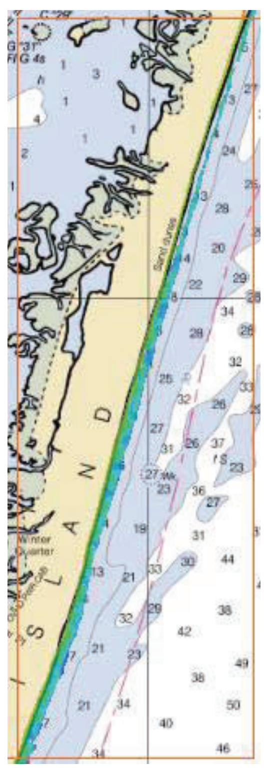

Figure 6 Block 76

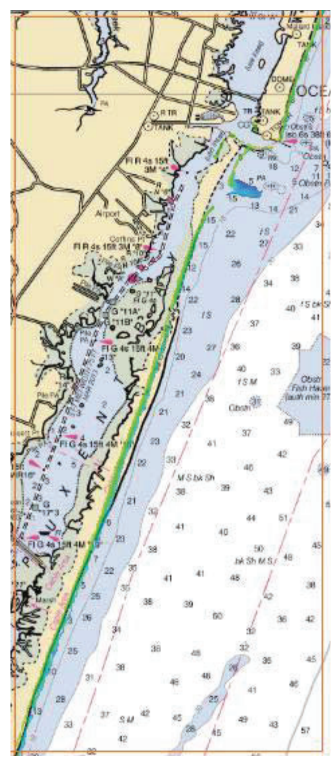

Figure 15 Block 77

Figure 16 Block 78

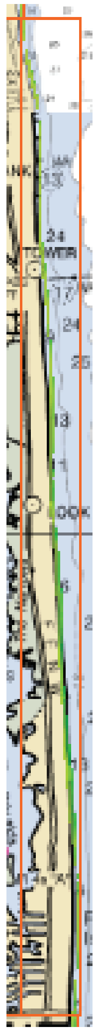

Figure 17 Block 79

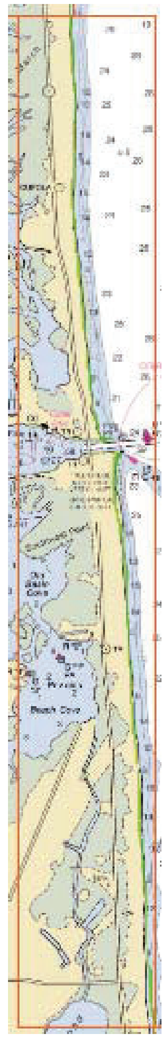

Figure 18 Block 80

Figure 19 Block 81

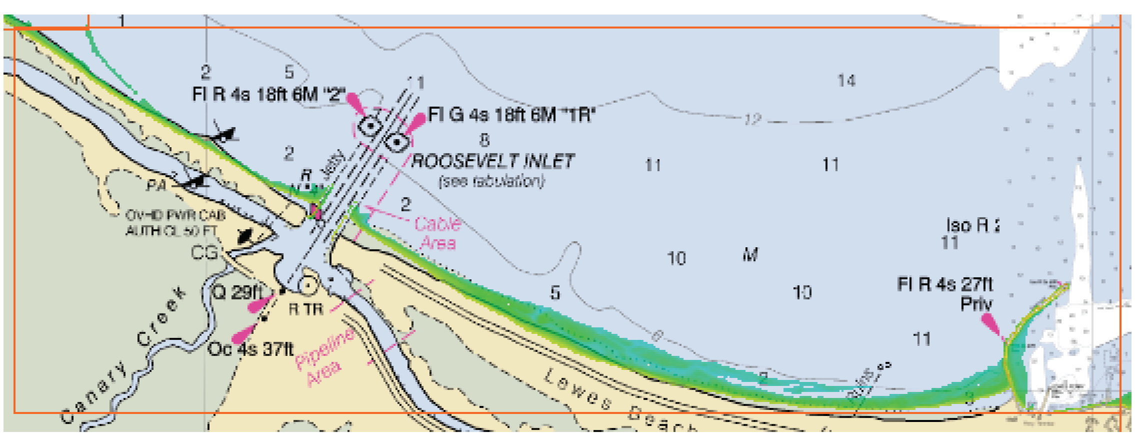

Figure 20 Block 82

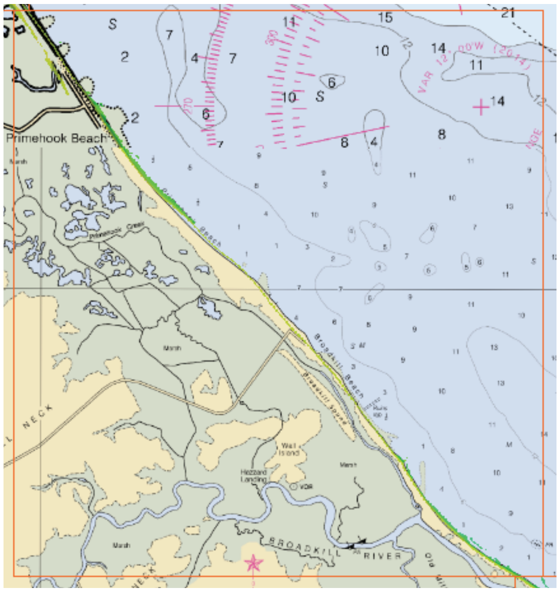

Figure 21 Block 83

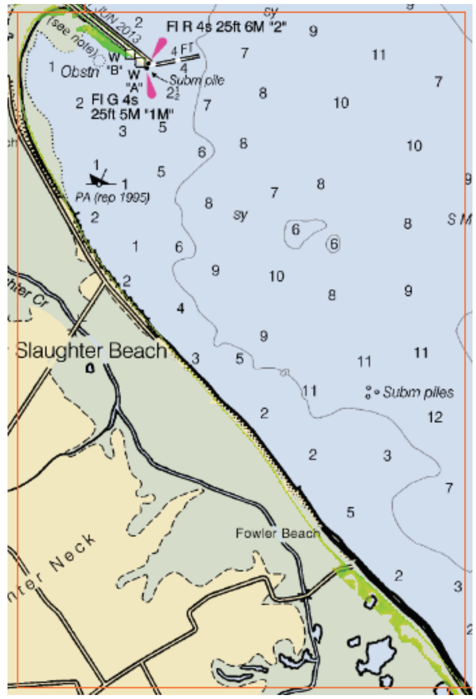

Figure 22 Block 84

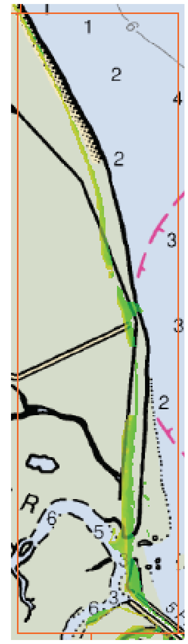

Figure 23 Block 85

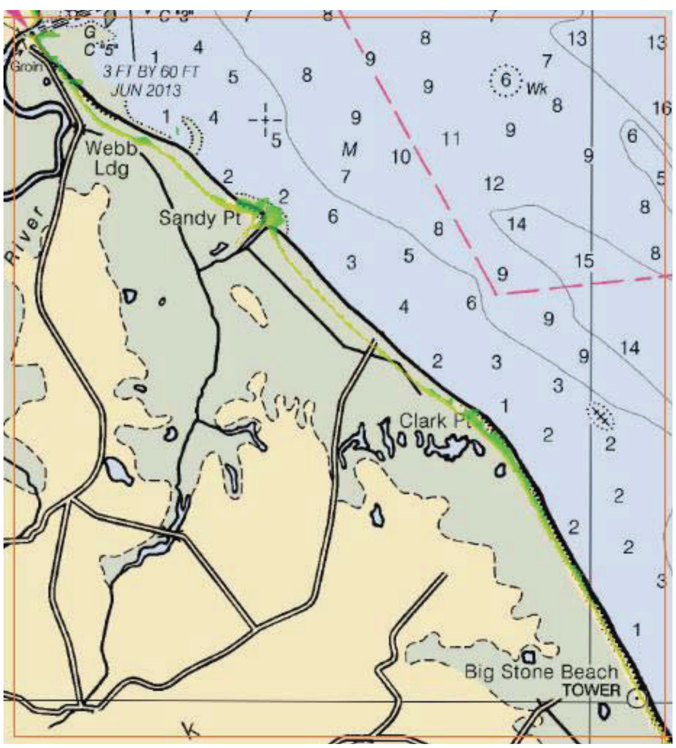

Figure 8 Block 86

Figure 25 Block 87

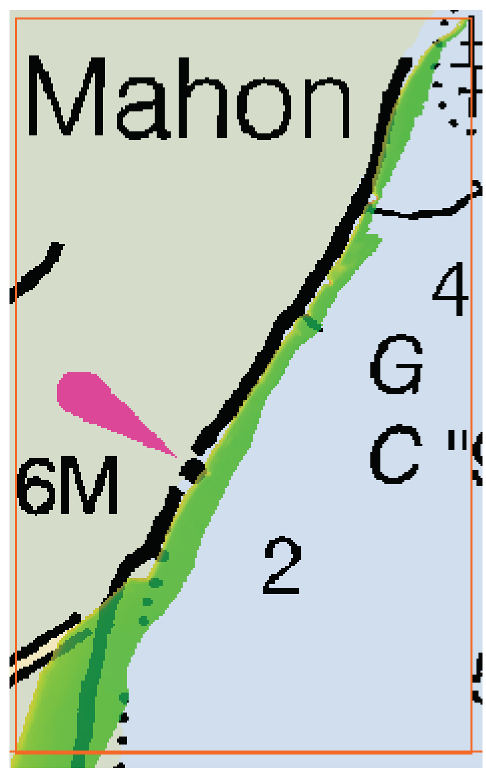

Figure 7 Block 88

Appendix B. Inlet Migration

Significant shoreline change has occurred along the Virginia coast, from Chincoteague Inlet to Fisherman's Island (Block 63 through 74), with the greatest migrations at the inlets. Each inlet is highlighted here, listed from North to South. Vessel traffic for the majority of these inlets is low. Of the 11 inlets, three display vessel traffic in the 2011 AIS Vessel Density map service: Chincoteague Inlet, Wachapreague Inlet, and Great Machipongo Inlet. Chincoteague is the only one maintained by the US Army Corps. Shoreline derived from these surveys should supersede existing charted shoreline.

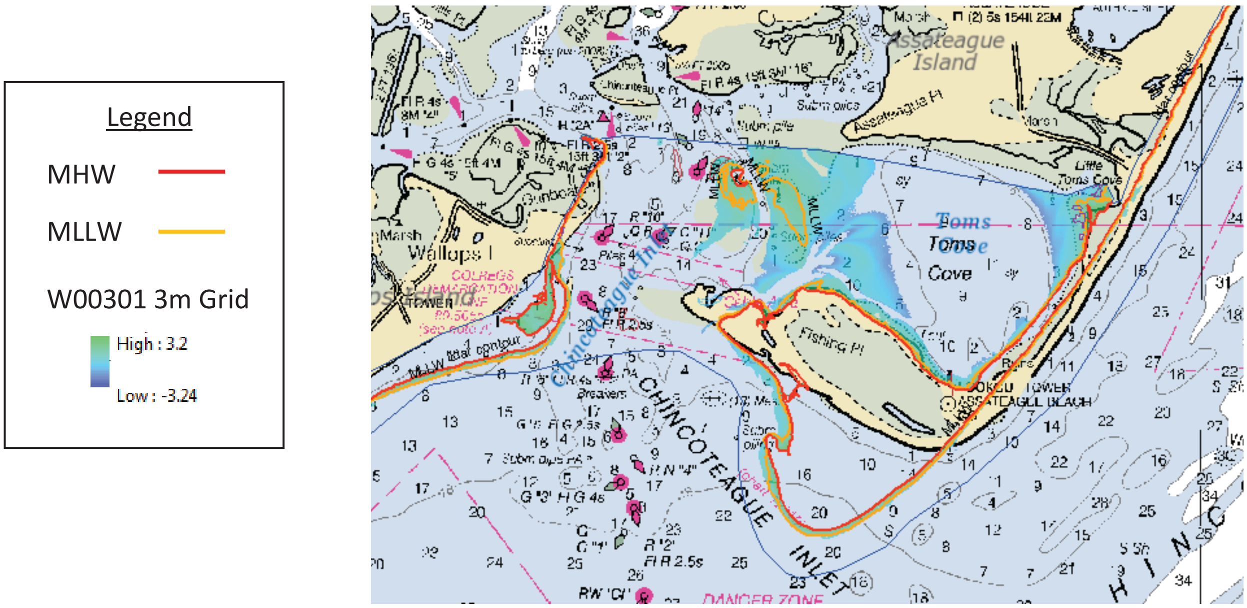

Figure 1 Chincoteague Inlet, Block 73-74

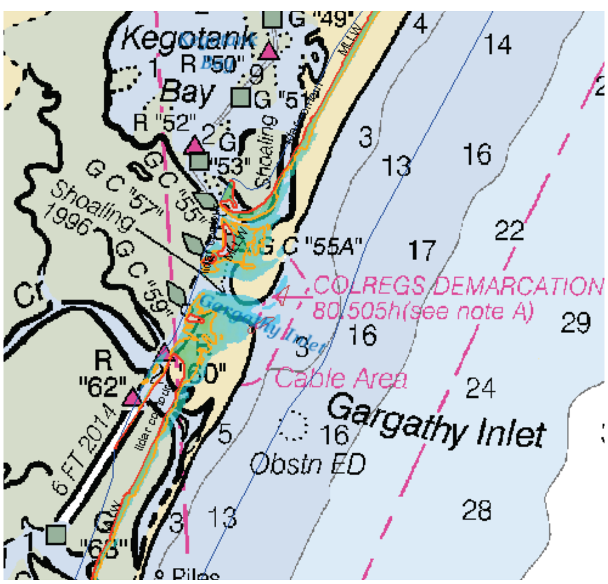

Figure 2 Gargathy Inlet, Block 72

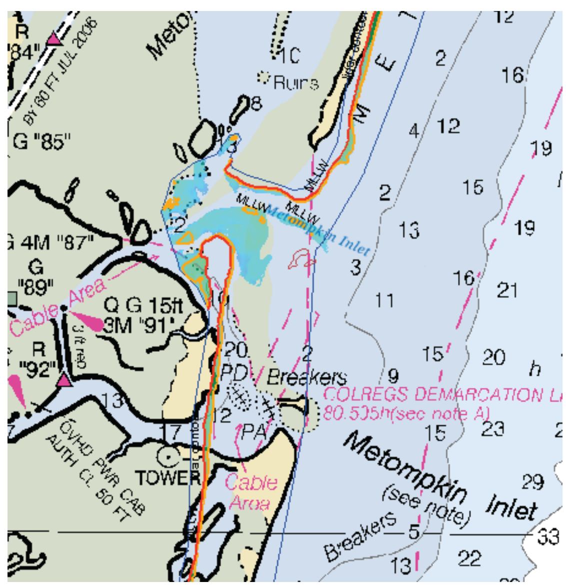

Figure 3 Metompkin Inlet, Block 70

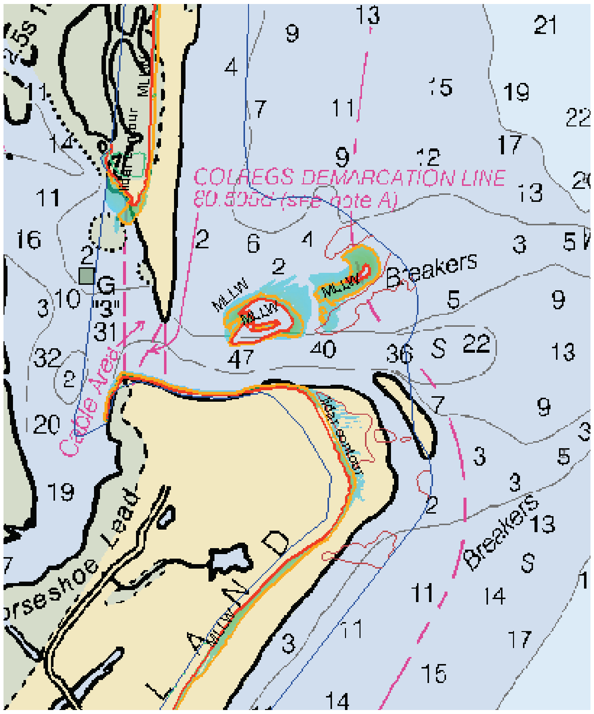

Figure 4 Wachapreague Inlet, Block 69

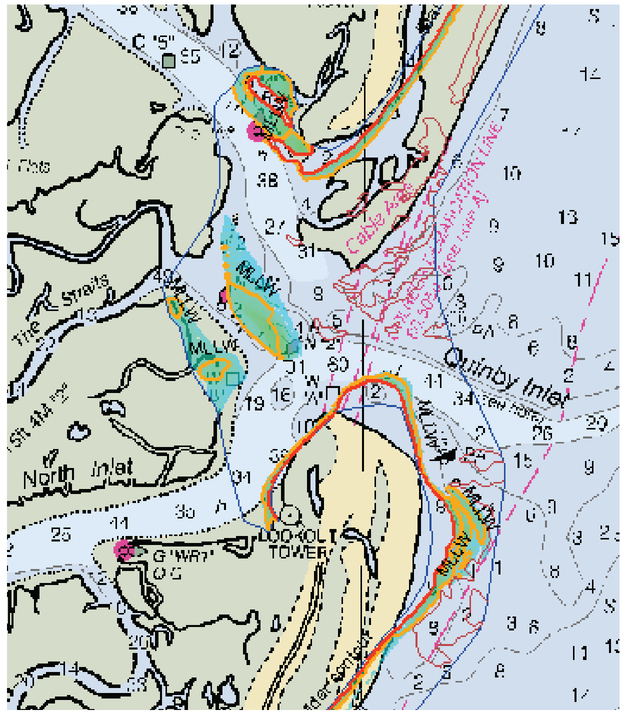

Figure 5 Quinby Inlet, Block 67-68

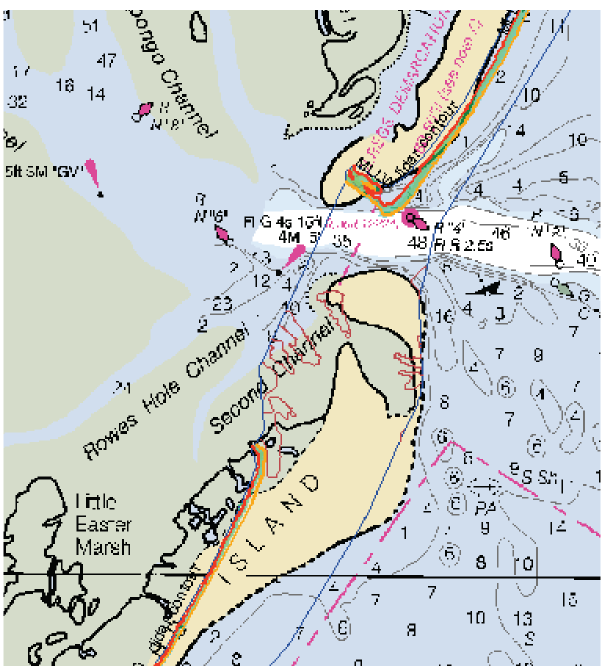

Figure 6 Great Machipongo Inlet, Block 66-67

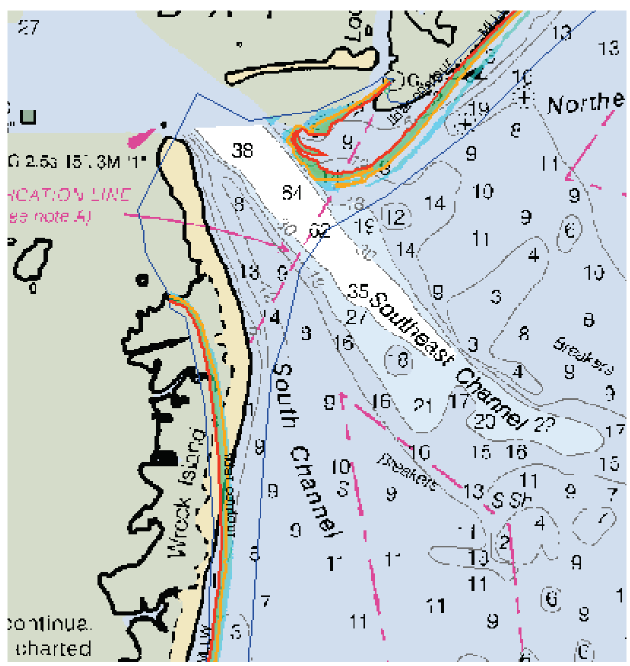

Figure 7 Sand Shoal Inlet, Block 65

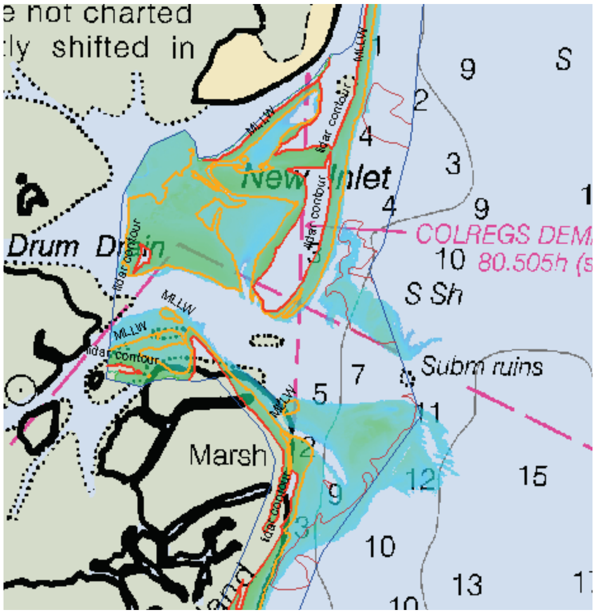

Figure 8 New Inlet, Block 65

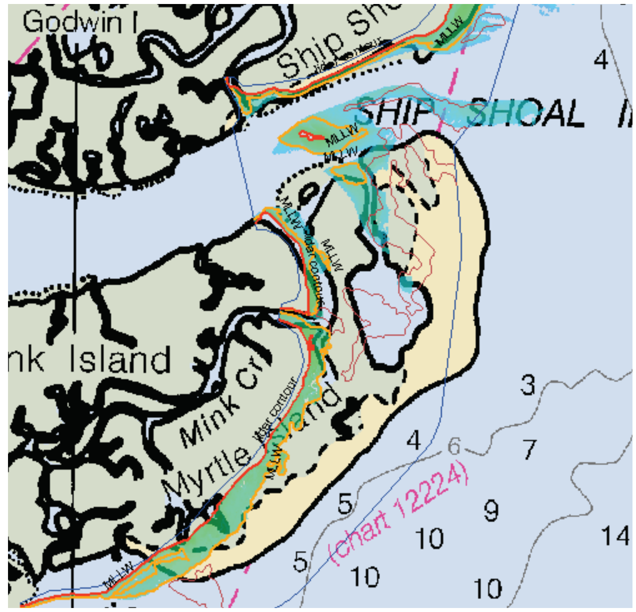

Figure 9 Ship Shoal Inlet, Block 65

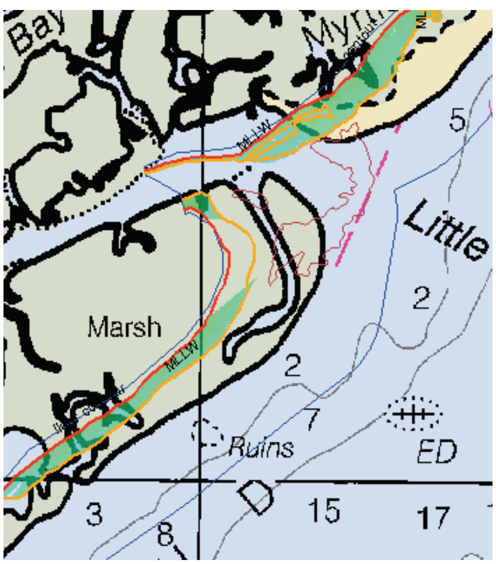

Figure 10 Little Inlet, Block 64

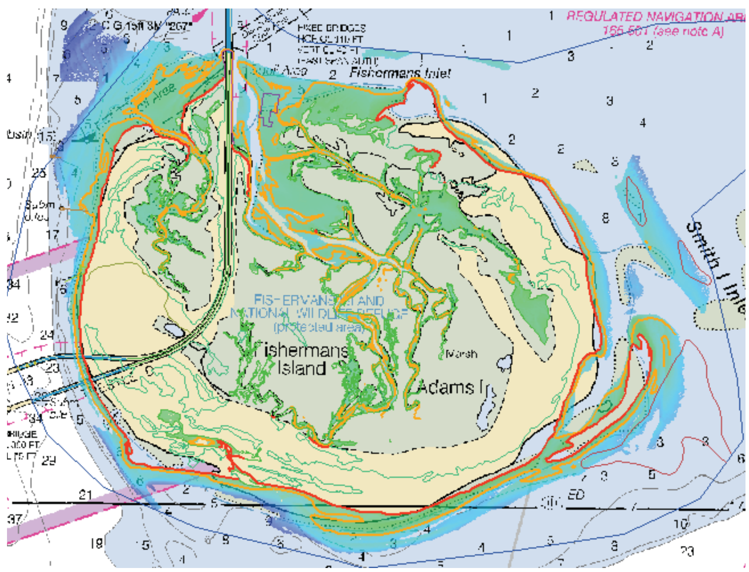

Figure 9 Smith Inlet and Fisherman's Island, Block 63

APPENDIX I

TIDES AND WATER LEVELS

Survey W00326 does not include supplemental tide or water level information.

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

Survey W00326 does not include supplemental survey records or correspondence.

APPROVAL PAGE

W00326

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

The following products will be sent to NCEI for archive

- W00326_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records

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

Digitally signed by Jasmine Cousins
DN: cn=Jasmine Cousins, o=NOAA, ou=Atlantic Hydrographic Branch, email=jasmine.cousins@noaa.gov, c=US
Date: 2016.09.28 11:02:50 -04'00'

Approved:____

LCDR Briana Welton, NOAA
Chief, Atlantic Hydrographic Branch