F00668

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	F00668

LOCALITY

State(s):	Pennsylvania
General Locality:	Vicinity of Philadelphia
Sub-locality:	Delaware River

2015

CHIEF OF PARTY
Robert W. Mowery

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**F00668**

State:	**Pennsylvania**
General Locality:	**Vicinity of Philadelphia**
Sub-Locality:	**Delaware River**
Scale:	1: **10,000**
Dates of Survey:	**10/20/2015 to 10/22/2015**
Instructions Dated:	**09/30/2015**
Project Number:	**S-D927-BH2-15**
Field Unit:	**NOAA R/V Bay Hydro II**
Chief of Party:	**Robert W. Mowery**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**
H-Cell Compilation Units:	***meters at Mean Lower Low Water***

Remarks:

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

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Descriptive Report to Accompany Survey F00668

Project: S-D927-BH2-15

Locality: Vicinity of Philadelphia

Sublocality: Delaware River

Scale: 1:10000

October 2015 - October 2015

NOAA R/V *Bay Hydro II*

Chief of Party: Robert W. Mowery

A. Area Surveyed

F00668 encompassed two separate areas of the Delaware River near Philadelphia, Pennsylvania. The approximate area for the survey was 0.50 square nautical miles.

The downriver section, charted Navy Anchorage 10, had an area approximately 0.11 square nautical miles. The outline was approximately 0.45 nautical miles long, 0.26 nautical miles wide at its widest point, and 0.19 nautical miles wide at its narrowest point. The second area of F00668 was approximately 1.10 nautical miles upriver from Navy Anchorage 10 near Gloucester City. The upriver area was triangle shaped, approximately 0.27 square nautical miles and had an outline approximately 1.53 nautical miles long by 0.21 nautical miles wide at its widest point. The upriver extent of this survey was at Interstate 76, Walt Whitman Bridge, while the downriver extent was 2.62 nautical miles south west of the Walt Whitman Bridge (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
39° 52' 33.96" N 75° 8' 16.53" W	39° 52' 29.12" N 75° 7' 7.35" W

Table 1: Survey Limits

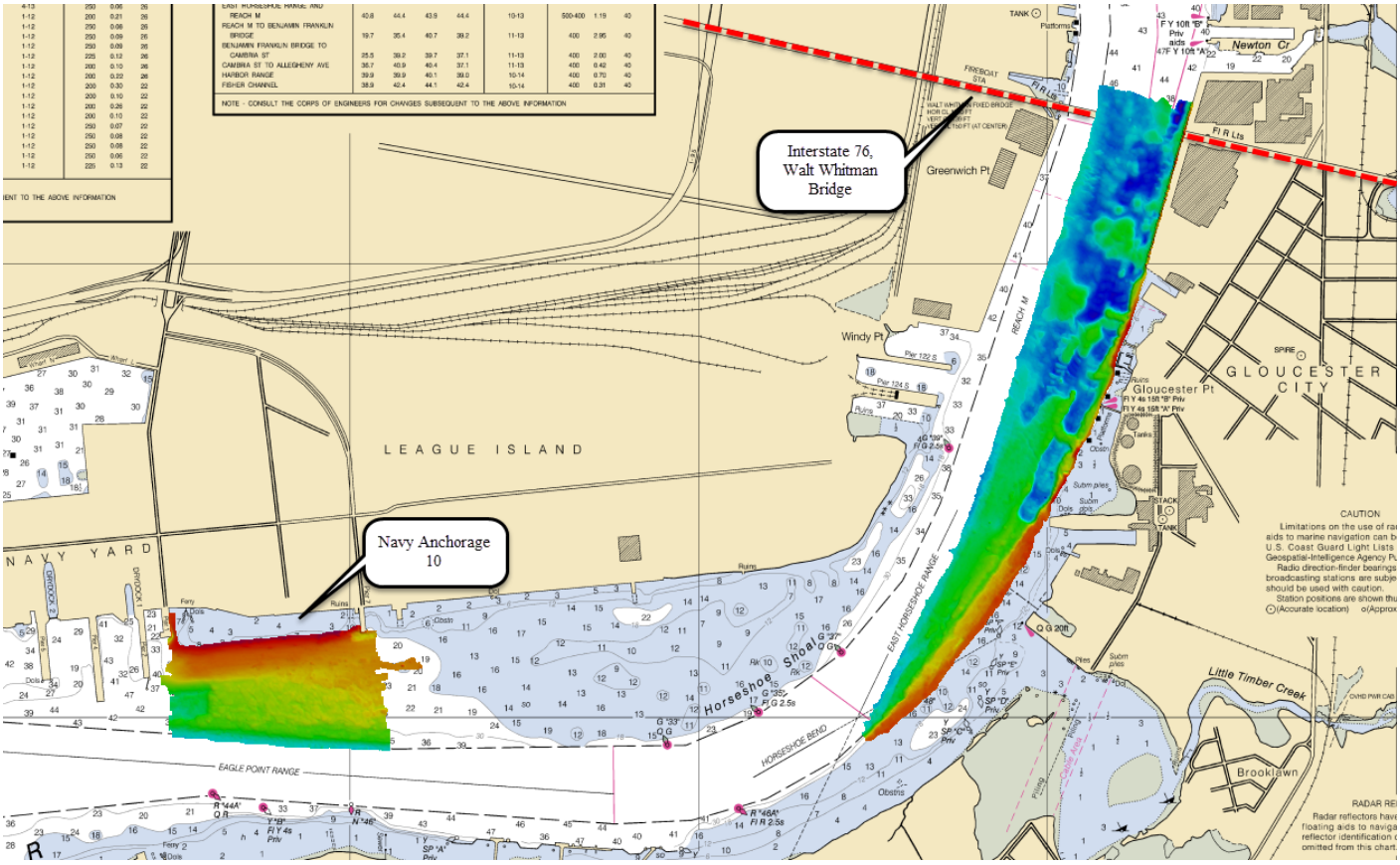

Figure 1: F00668 Survey limits, relative to Interstate 76, Walt Whitman Bridge.

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

A.2 Survey Purpose

Survey F00668 is a Navigable Area Survey that is intended to supersede all bathymetry, seafloor features, and bottom characteristics within the assigned survey area as defined by the Project Instructions (PI) for updating of NOAA Chart 12313 and NOAA Electronic Navigational Chart (ENC) US5PA12M. This survey was a request from the Philadelphia Pilots and was requested due to increasing size of container vessels maneuvering in the area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

All data was acquired and processed within the specifications set forth in the Hydrographic Surveys Specifications and Deliverables Manual (HSSD) and Field Procedures Manual for Hydrographic Surveying (FPM). In order to extract descriptive statistics of the data density achievement, the density layer of each

finalized surface was queried within CARIS and examined in Excel (Figure 2). This analysis indicated that the 0.5m mainscheme surface exceeded the 95% requirement as set forth in the HSSD (Figure 3).

Sounding Density of F00668 MBES BASE Surfaces				
Resolution	Depth range	Number of nodes	Fewer than five soundings per node	Percent of nodes with greater than five soundings per node
0.5M	0-20M	5,095,398	11,382	99.8%
	TOTAL:	5,095,398	11,382	99.8%

Figure 2: F00668 Sounding density statistics for the 0.5M CUBE Surface.

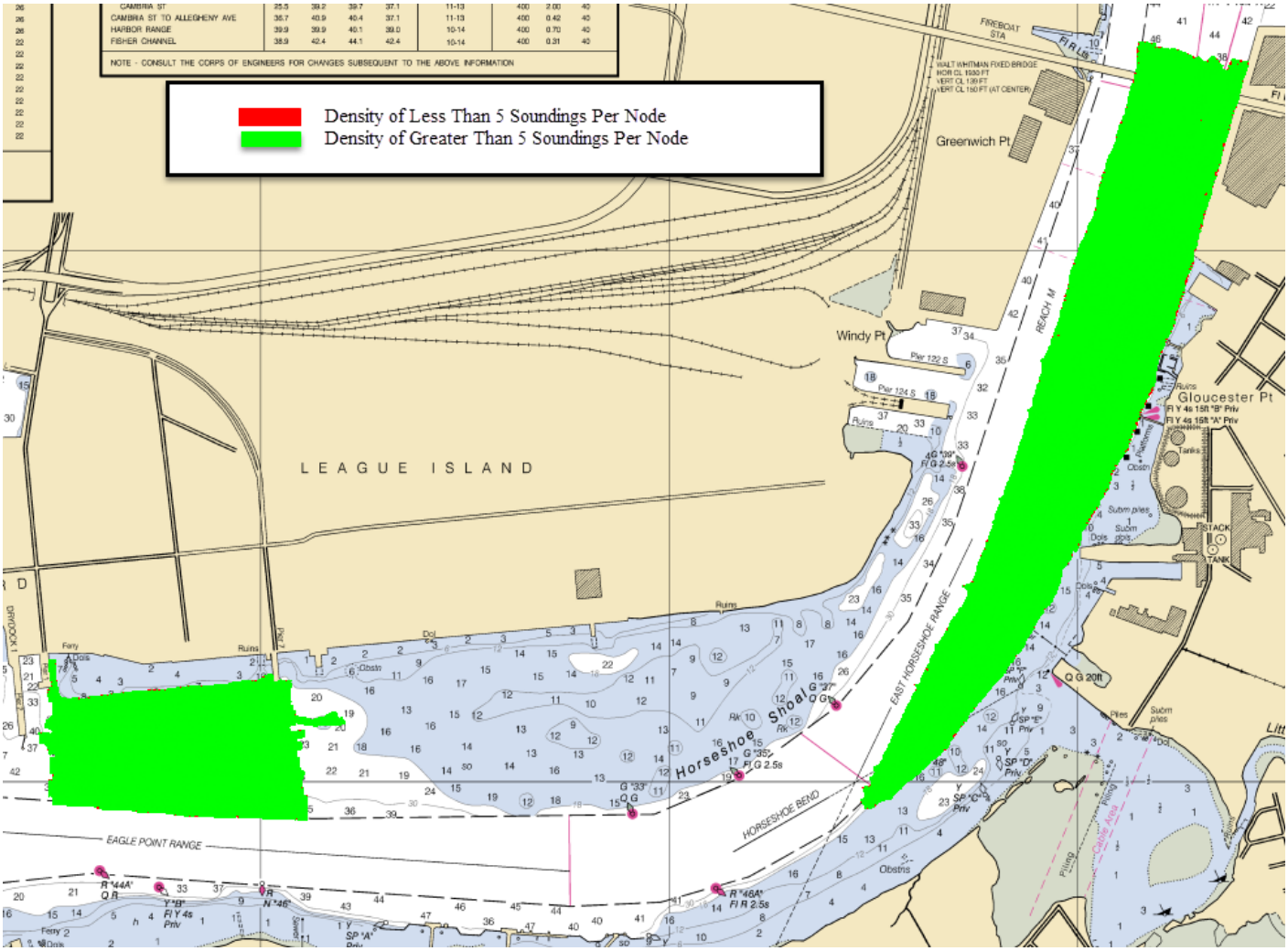

Figure 3: Sounding density for F00668, 0.5M CUBE Surface.

A.4 Survey Coverage

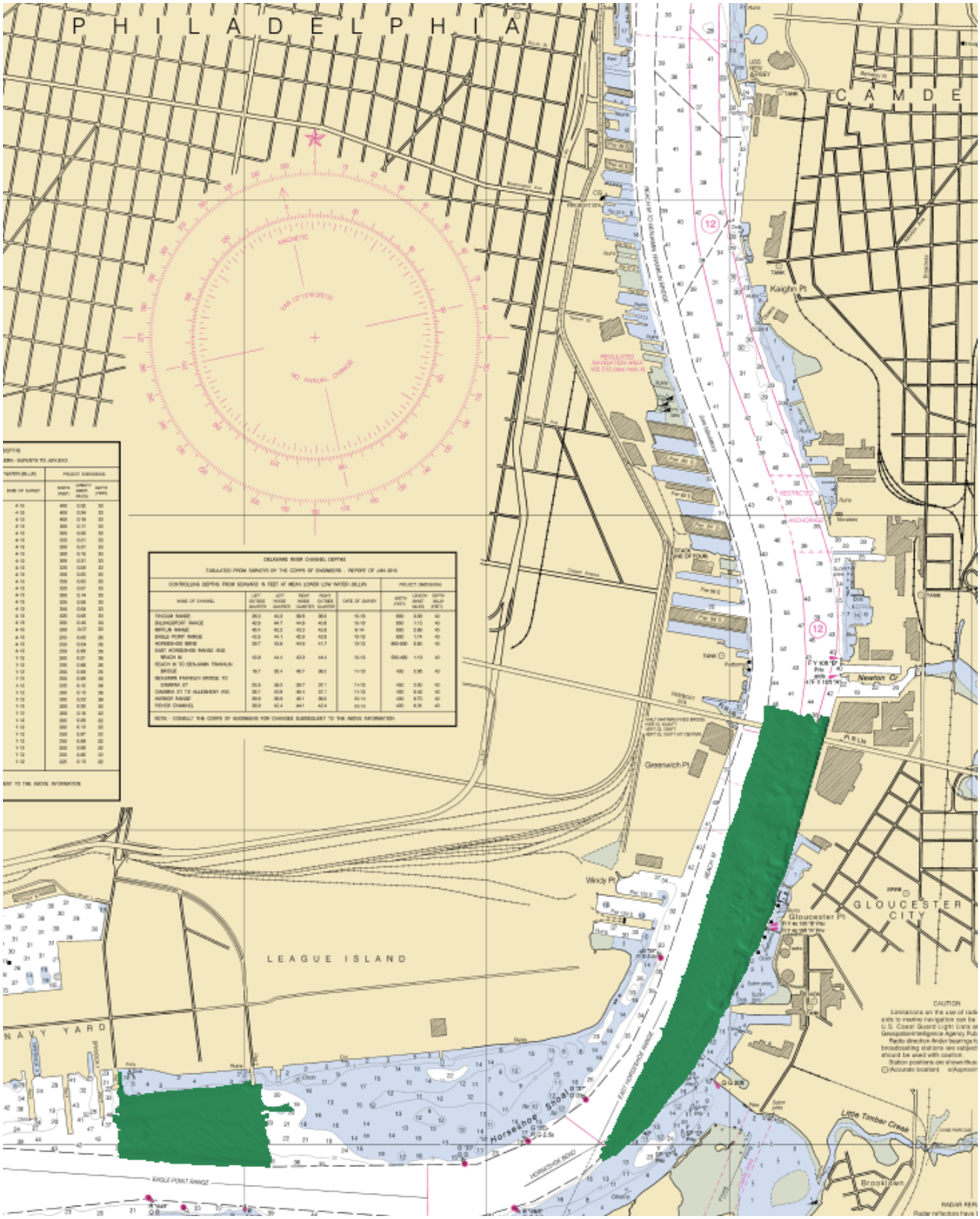

Figure 4: Object detection MBES coverage, in green, overlaid onto Chart 12313.

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

A.5 Survey Statistics

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

	HULL ID	***S5401***	***Total***
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	27.42	27.42
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	2.81	2.81
	Lidar Crosslines	0	0
Number of Bottom Samples			5
Number of AWOIS Items Investigated			0
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			0.36

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/20/2015	293
10/21/2015	294
10/22/2015	295

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

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

B.1.1 Vessels

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

Hull ID	***S5401***
LOA	17.3 meters
Draft	1.8 meters

Table 4: Vessels Used

R/V BAY HYDRO II collected all MBES data, sound velocity data, and attitude date for F00668.

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongberg	EM2040	MBES
Applanix	POS M/V V5	Positioning and Attitude System
SonTek	CastAway	Conductivity, Temperature, and Depth Sensor
Valport	miniSVS	Sound Speed System

Table 5: Major Systems Used

Vessel configurations, equipment operations, and data acquisition and processing were consistent with specifications described in the Data Acquisition & Processing Report (DAPR).

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 10% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with section 5.2.4.3 of the HSSD. R/V BAY HYDRO II collected 2.81 linear nautical miles (LNM) of MBES of total crosslines, equating to 10% of mainscheme MBES data (Figure 5) that exceeds the 4% requirement for object detection MBES. Of the 2.81 LNM of crosslines, 0.84LNM of MBES crosslines were in the Navy Anchorage 10, equating to 8.72% of mainscheme MBES data in that area. The remaining 1.97 LNM of MBES crosslines were in the area near Gloucester City, equating to 11.53% of mainscheme MBES data in that area.

To evaluate the crosslines, a 50cm CUBE surface was created using strictly mainscheme lines, and a second 50cm CUBE surface was created using only crosslines. From these two surfaces, a difference surface was generated at a 50cm resolution. This difference surface is submitted digitally in the Separates II folder. The comparison indicated that the two surfaces had a mean difference of 0.16m and a standard deviation of 0.14m, showing good internal consistency (Figure 6). The greatest difference was found to be at the shoaling edge of dredge scours.

In addition to performing a crossline comparison using surface differencing, the CARIS QC Report was used to compare the MBES crossline sounding to the depth estimates of the 50cm CUBE surface. The depth differences are calculated between each MBES crossline ping and mainscheme surface; and that depth difference is then compared to allowable NOAA uncertainties. The output QC Report classifies the percentage of pings meeting NOAA orders by beam angle. This table was copied and examined in Excel

(Figure 7). Over 95% of the crosslines analyzed were within NOAA Order 1a for the entire swath width. For further discussion of NOAA standards, refer to Section B.2.2, Uncertainty.

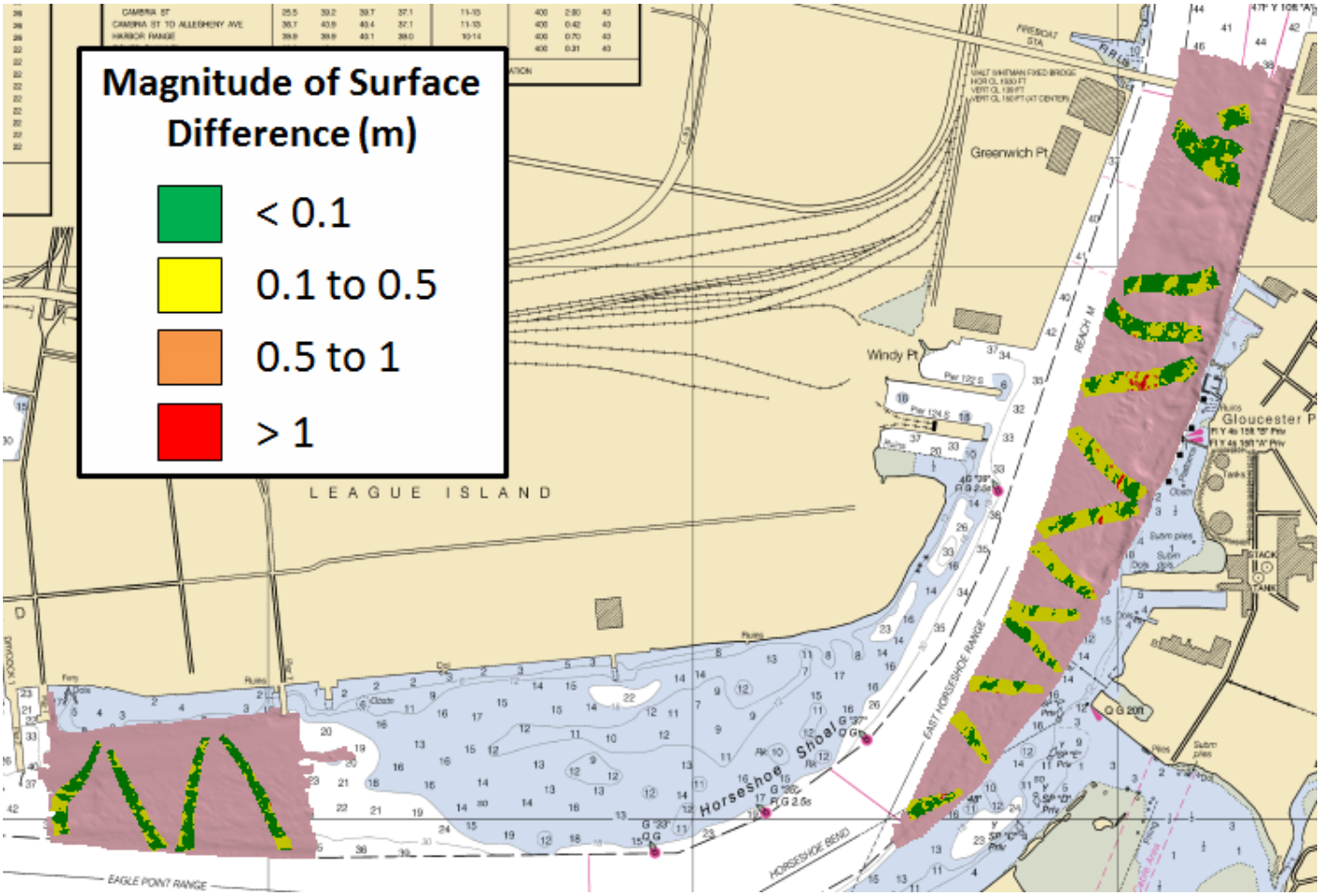

Figure 5: Magnitude of the crossline difference surface, overlaid onto F00668 (in pink) and Chart 12313.

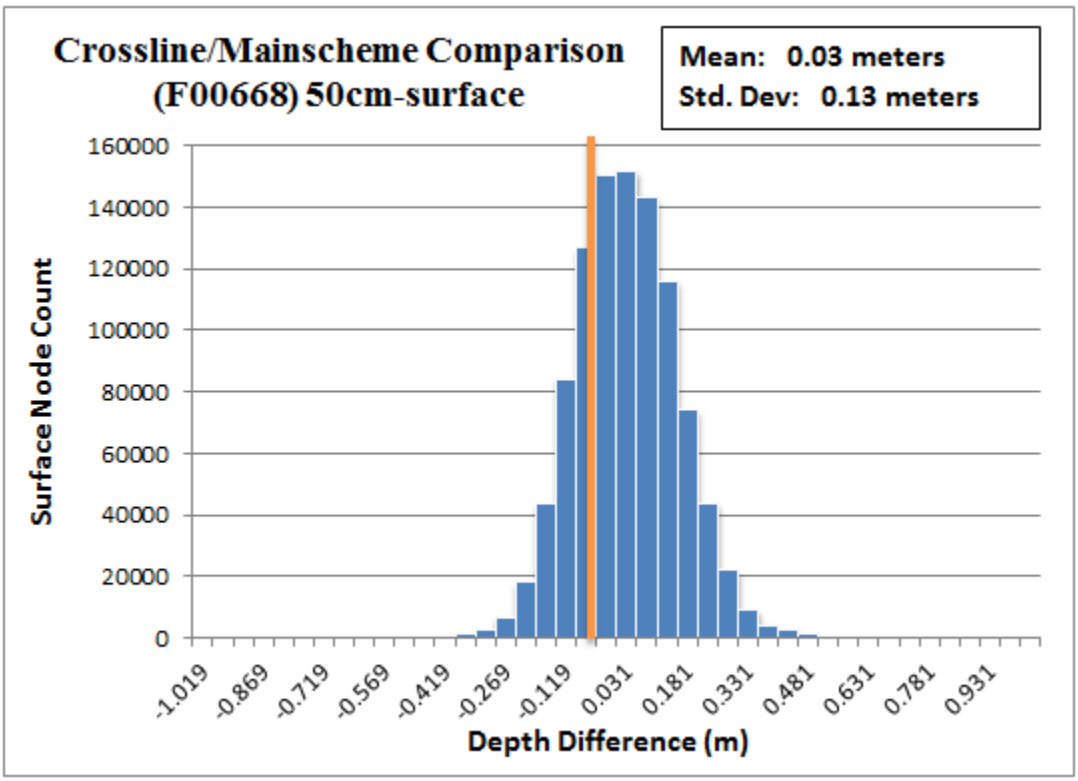

Figure 6: Mainscheme verses crossline difference comparison graph, with zero difference being represented by an orange line.

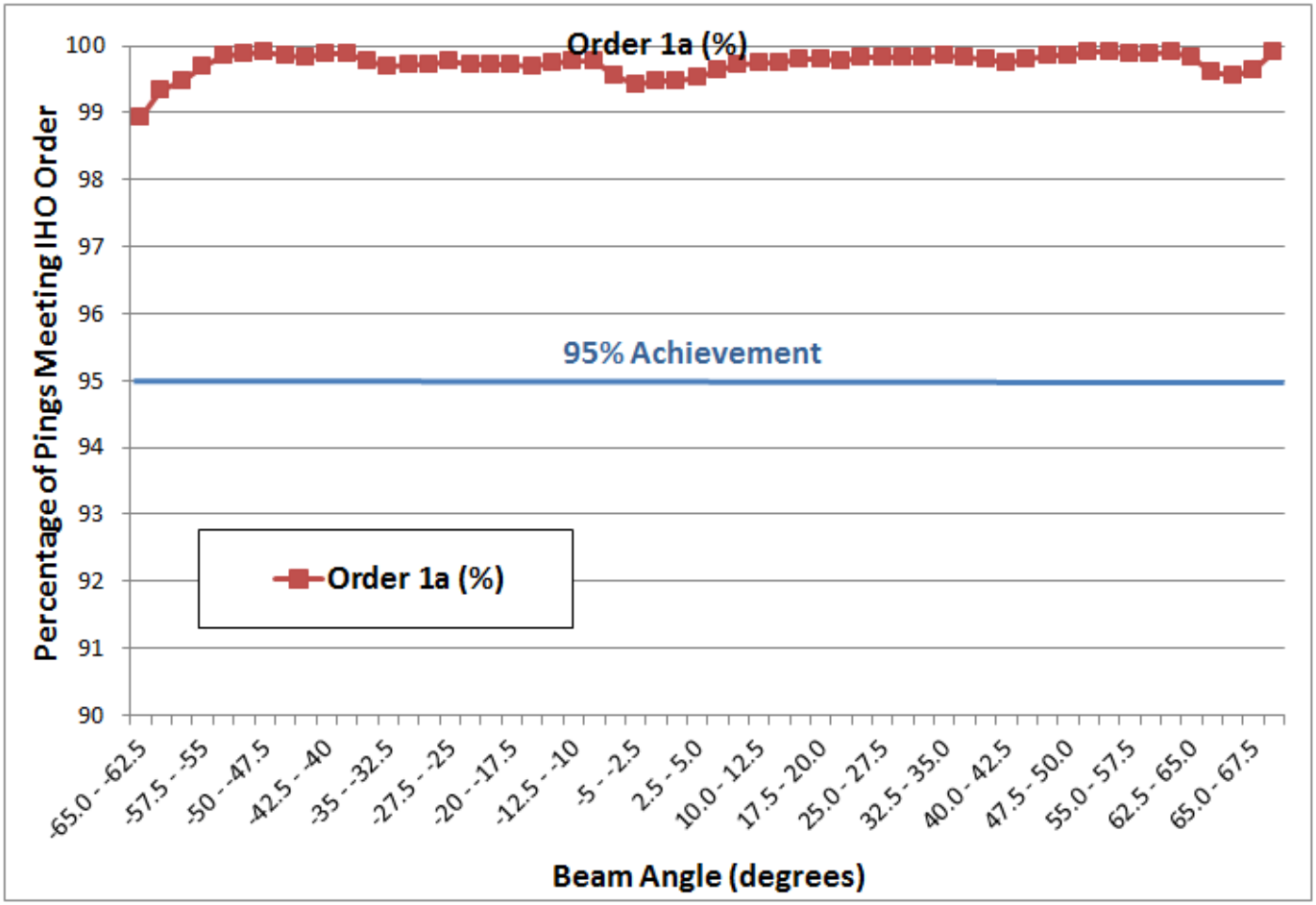

Figure 7: CARIS crossline quality control report.

B.2.2 Uncertainty

Hull ID	Measured - CTD	Measured - MVP	Surface
S5401	4.0 meters/second	N/A meters/second	0.5 meters/second

Table 6: Survey Specific Sound Speed TPU Values

In addition to the apriori estimates of sound speed uncertainty, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of F00668. Real-time uncertainties from the EM2040 were recorded and applied in CARIS. The post-processed uncertainties associated with vessel roll, pitch, gyro, and navigation were directly applied to the POSPac file via Real Time Kinematics (RTK). These RTK correctors were applied using an NTRIP server software and used the existing US Army Corps of Engineers (USACE) VRS Network in Philadelphia. Reference the DAPR for information regarding RTK acquisition and processing.

Uncertainty values of submitted finalized grids were calculated in CARIS using the "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). To visualized the locations in which accuracy requirements were met for the 50cm finalized surface, a custom predicted NOAA-compliance layer was created, based on the difference between calculated uncertainty of the nodes and the allowable NOAA uncertainty (Figure 8). To quantify the extent to which accuracy requirements were met, the preceding predicted NOAA compliance layers were queried within CARIS and examined in Excel (Figure 9). Overall, 100% by node of F00668 met the accuracy requirements stated in Section 5.1.3 of the HSSD.

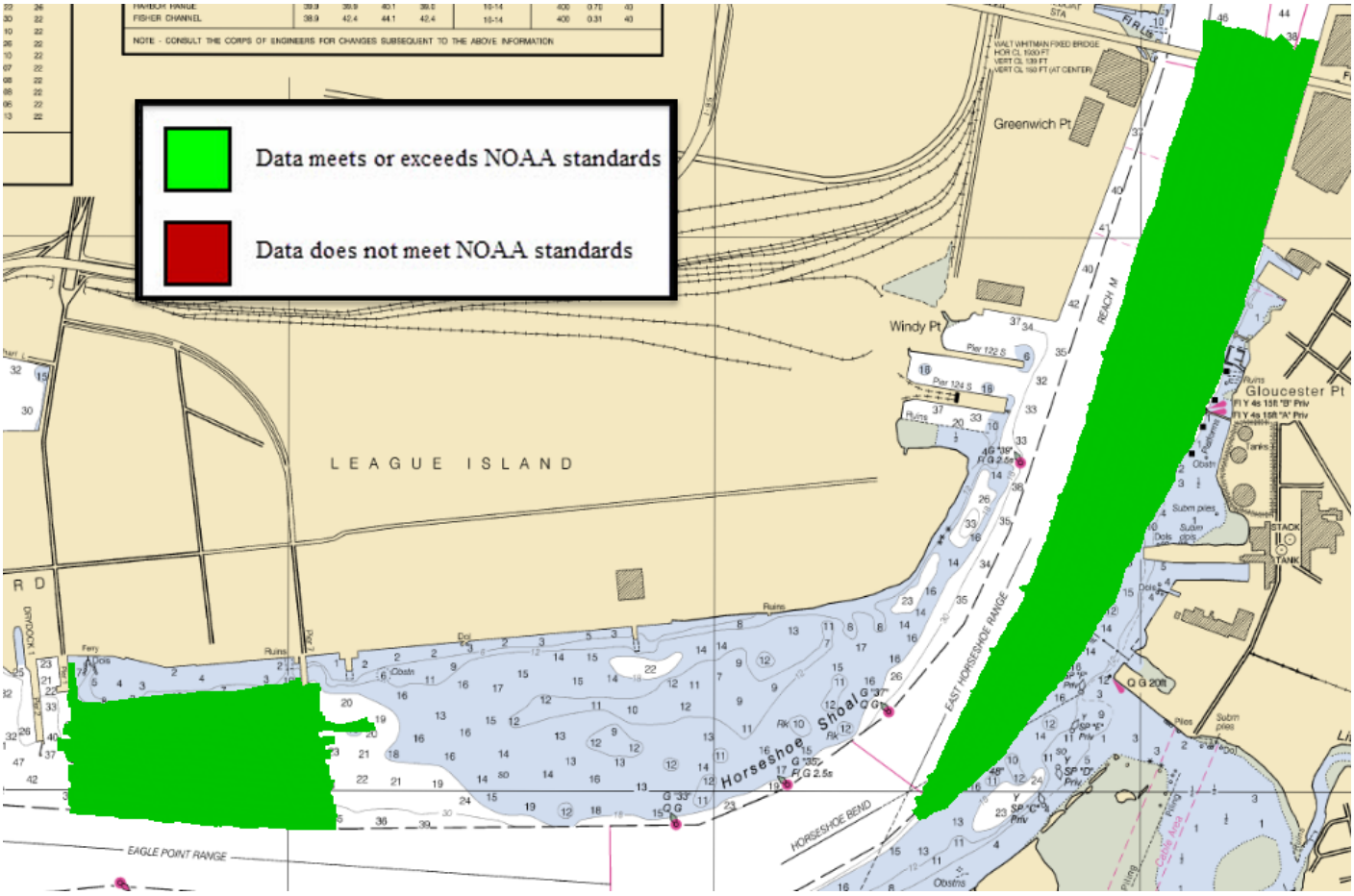

Figure 8: F00668 MBES data colored by NOAA-compliance and overlaid onto Chart 12313.

F00668 CARIS BASE Surface NOAA Statistics					
Resolution	Depth range	NOAA Order	Number of nodes	Nodes satisfying NOAA accuracy	Percent nodes satisfying NOAA accuracy
50cm	0 - 20m	Order 1	5,138,896	5,138,896	100.0%
		TOTAL:	5,138,896	5,138,896	100.0%

Figure 9: Summary table showing the percentage of nodes satisfying applicable NOAA accuracy levels for F00668.

B.2.3 Junctions

There were no junctions with this survey.

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

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

B.2.5 Equipment Effectiveness

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

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed casts for MBES survey were acquired via CTD profiles. Casts were conducted at the start of the day and at the end of data collection for that area. When data collection for one area was completed, and the vessel moved to the second area, a cast was collected before data collection, then at the end of the day. Additional casts were conducted if the interval was nearing four hours as required by the HSSD, or when sound speed variations of greater than 2m/s were observed.

The distribution of the sound speed profile casts is shown in Figure 10, below.

Surface sound speed was collected in real time and integrated into the Kongsberg EM2040 bathymetric data.

Sound speed was corrected for in CARIS via the "Nearest in Time" option for all days.

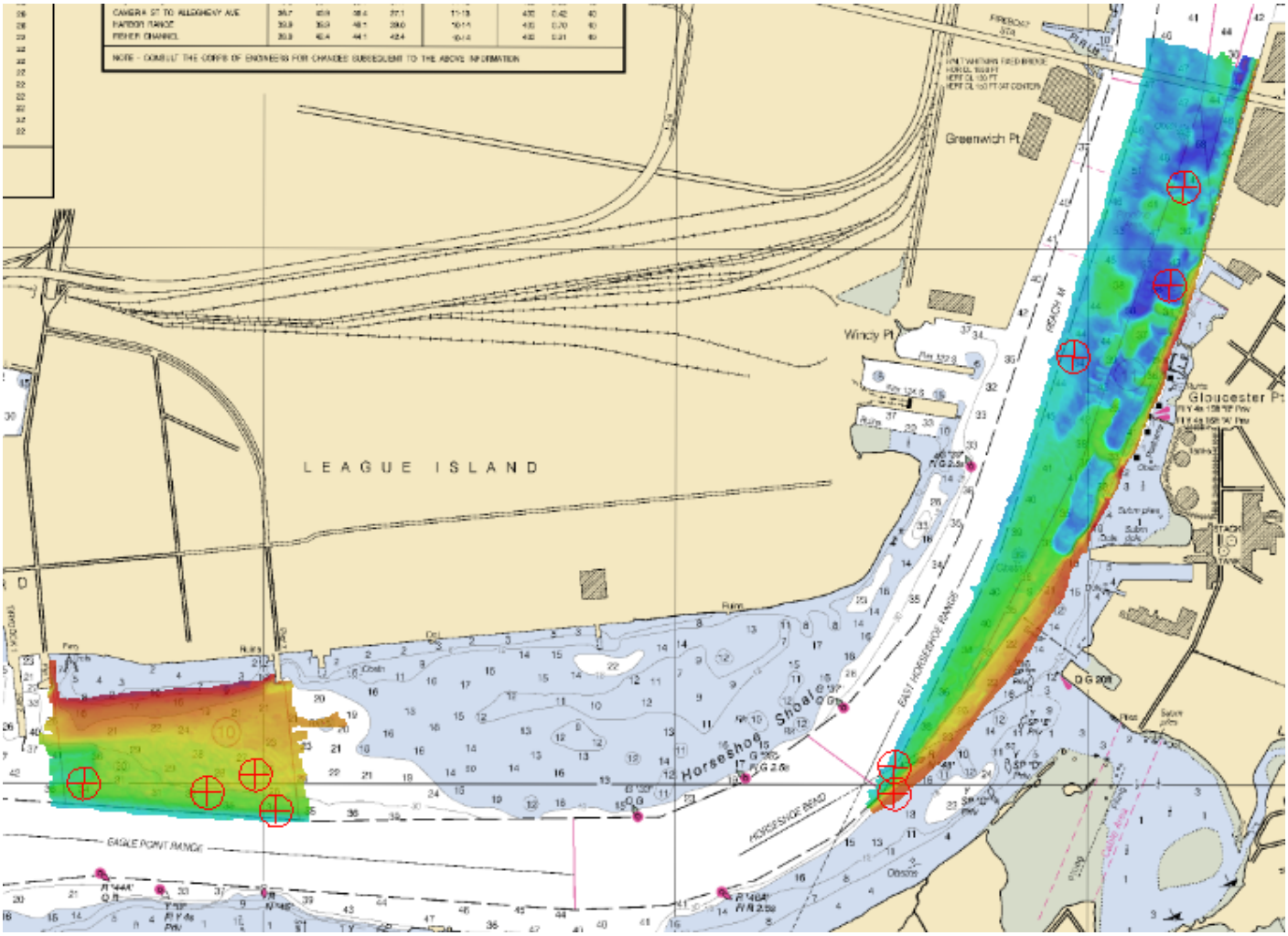

Figure 10: F00668 CTD cast position, in red, relative to survey area.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 Holiday Assessment

Two types of holidays occurred in F00668. The first type of holiday was an area where no data was collected. There was one of this type of holiday and it occurred in the area around the charted ATON. This holiday is approximately four meters long and runs parallel to the river itself. This holiday was caused by

running the survey line parallel to a sharp slope that runs along the sea floor in that area (See Figure 11), and is commonly referred to as "slope effect". Due to the proximity of the holiday to a floating ATON, a perpendicular line could not be run to gain full coverage of the area.

The second type of holiday was a density holiday, an area where the data density did not meet the NOAA standard of five soundings per node; three of these holiday exist. The first is over the charted 39 foot obstruction, located west of Gloucester Point. In this area, there are two 0.5m by 1.0m lines, 0.5m apart, where only one or two sounding per none were collected (See Figure 12). This holiday was hypothesized to have been created as a result of the angled, linear section of the obstruction leaving a shadow behind it on the first pass over the object; then only ensonifying the object in the outer beams on the second pass. The second density holiday is located west of Delaware River Port Authority bulkhead, 24m south of the Walt Whitman Bridge (See Figure 13), and had a density of one to four soundings per node. This holiday is 5.81m long by 1.49m wide, and is located at the edge of a slope. This holiday was hypothesized to have been the result of slope effect. The third area is in the southeastern section of the Navy Anchorage (Anchorage 10). In this area, two 2.75m long density holiday line occur 10.5n apart, and are also located at the edge of a slope (See Figure 14). This holiday was also hypothesized to have been the result of slope effect. None of the density holidays were recognized to have existed until the vessel had left the area, therefore the holidays were never required.

Along the New Jersey side of the river, from the Delaware River Port Authority bulkhead south approximately 1100m, the 18ft contour was only sporadically ensonified (See Figure 15). In these area, reaching the 18ft contour was not attempted due to safety concerns for the vessel and sonar equipment.

See accompanying Holiday Layer file for more in depth details.

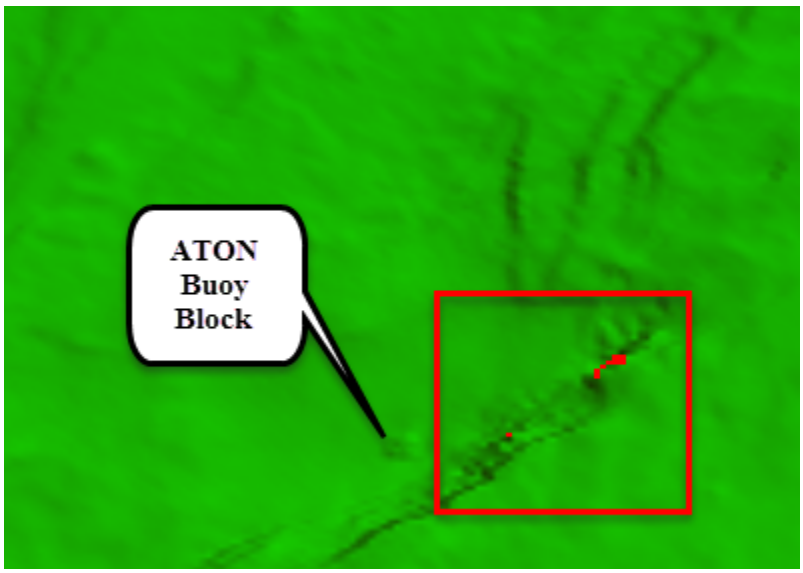

Figure 11: MBES holiday, in red box, located proximal to a charted buoy block and a steep slope.

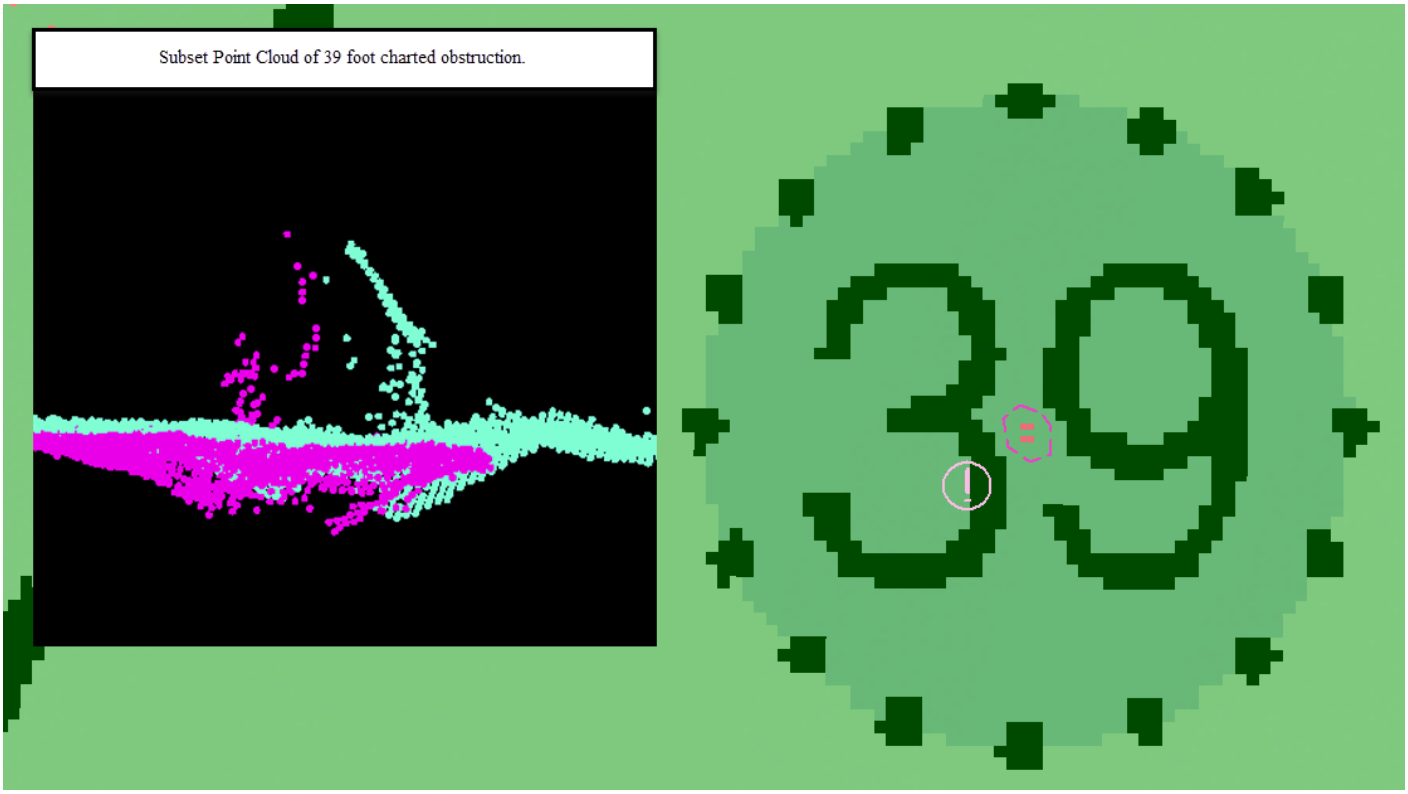

Figure 12: CARIS subset point cloud of charted 39 foot obstruction west of Gloucester Point to indicate a possible reason for the density holiday, in red, at that location.

Figure 13: Density holiday, in pink, west of Delaware River Port Authority bulkhead.

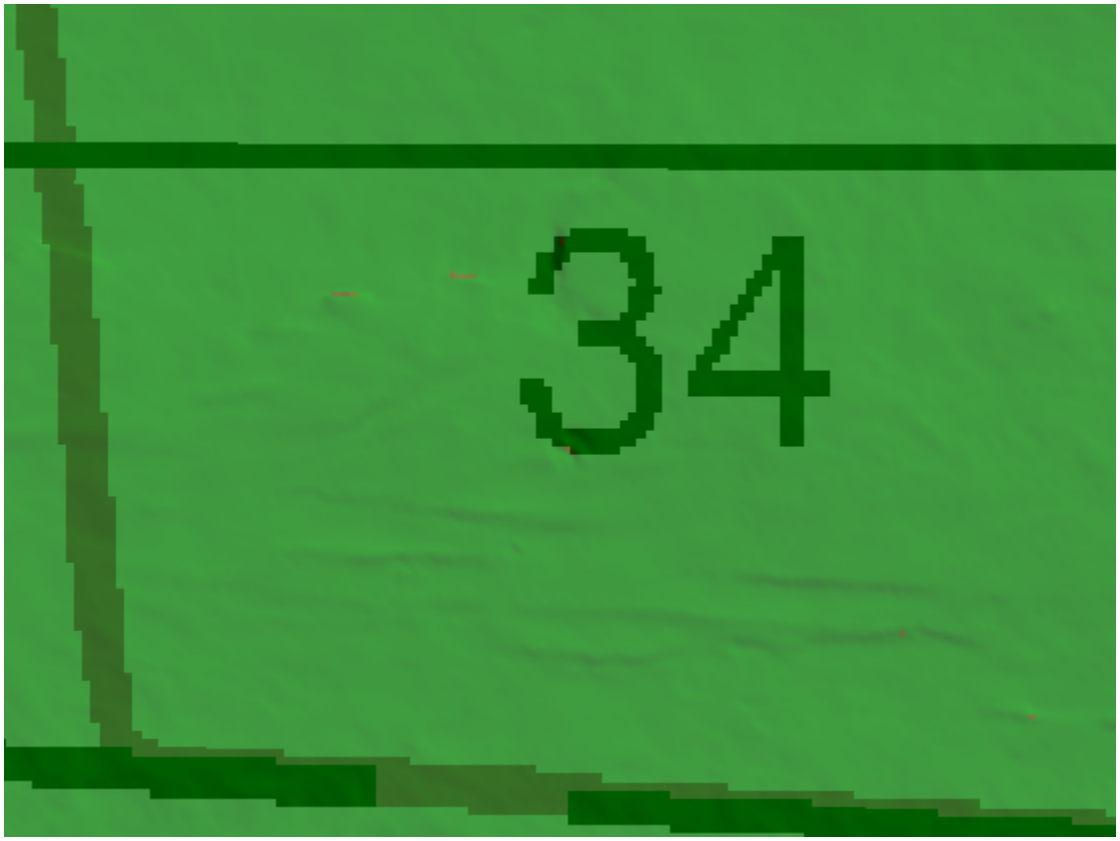

Figure 14: Density holiday, in pink, in southeastern area of Navy Anchorage (Anchorage 10).

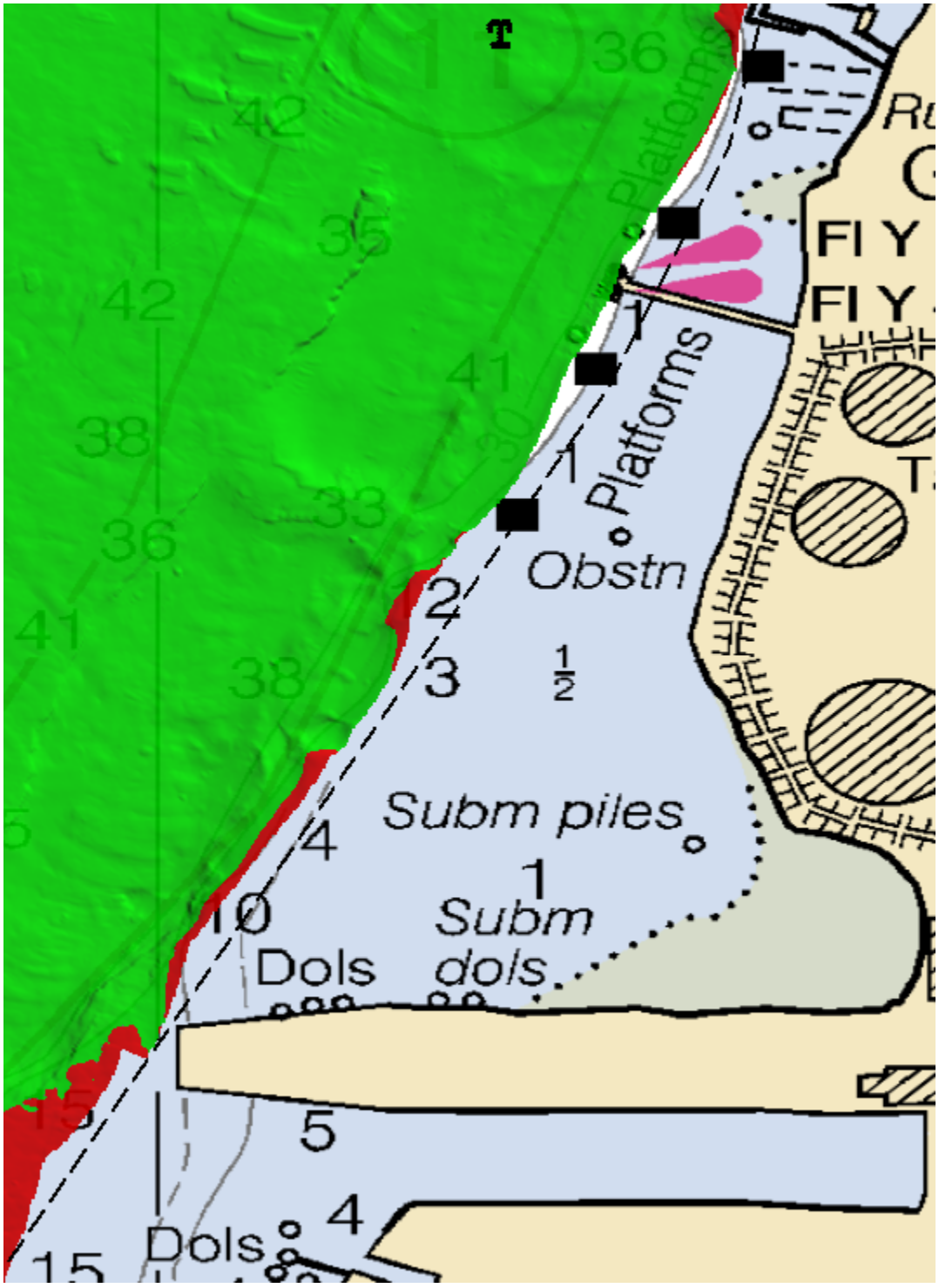

Figure 15: Location south of Delaware River Port Authority bulkhead where 18ft contour was not fully obtained with MBES data. Project outline requirements, in black, depths greater than 18ft, in green, and depths less than 18ft, in red.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter was logged as a Kongsberg .all file and has been sent to the Processing Branch. Backscatter was not processed by the field unit.

B.5 Data Processing

B.5.1 Software Updates

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

The following Feature Object Catalog was used: The following Feature Object Catalog was used: NOAA Profile V_5_3_2.

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

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
F00668_MBES_50cm_MLLW	CUBE	50 centimeters	2.08 meters - 20.49 meters	NOAA_0.5m	Object Detection
F00668_MBES_50cm_MLLW_Finalized	CUBE	50 centimeters	2.08 meters - 20.49 meters	NOAA_0.5m	Object Detection

Table 7: Submitted Surfaces

The surfaces have been reviewed where noisy data, or 'fliers' are incorporated into the gridded solution causing the surface to be shoaler than the true seafloor. Where these spurious sounding cause the gridded

surface to be shoaler than the reliably measured seabed by greater than the maximum allowable vertical uncertainty at that depth, the noise was rejected and the surface recomputed.

After reviewing the child "depth" layer, it was observed that there were 771 nodes that exceed 20m. However, all of these nodes were located in an area that was above the Walt Whitman Bridge, outside of the the outline set fourth by the PI's (See Figure 16). Since all of the nodes inside of the PI's project outline were less than 20m, only 50cm CUBE surfaces were created.

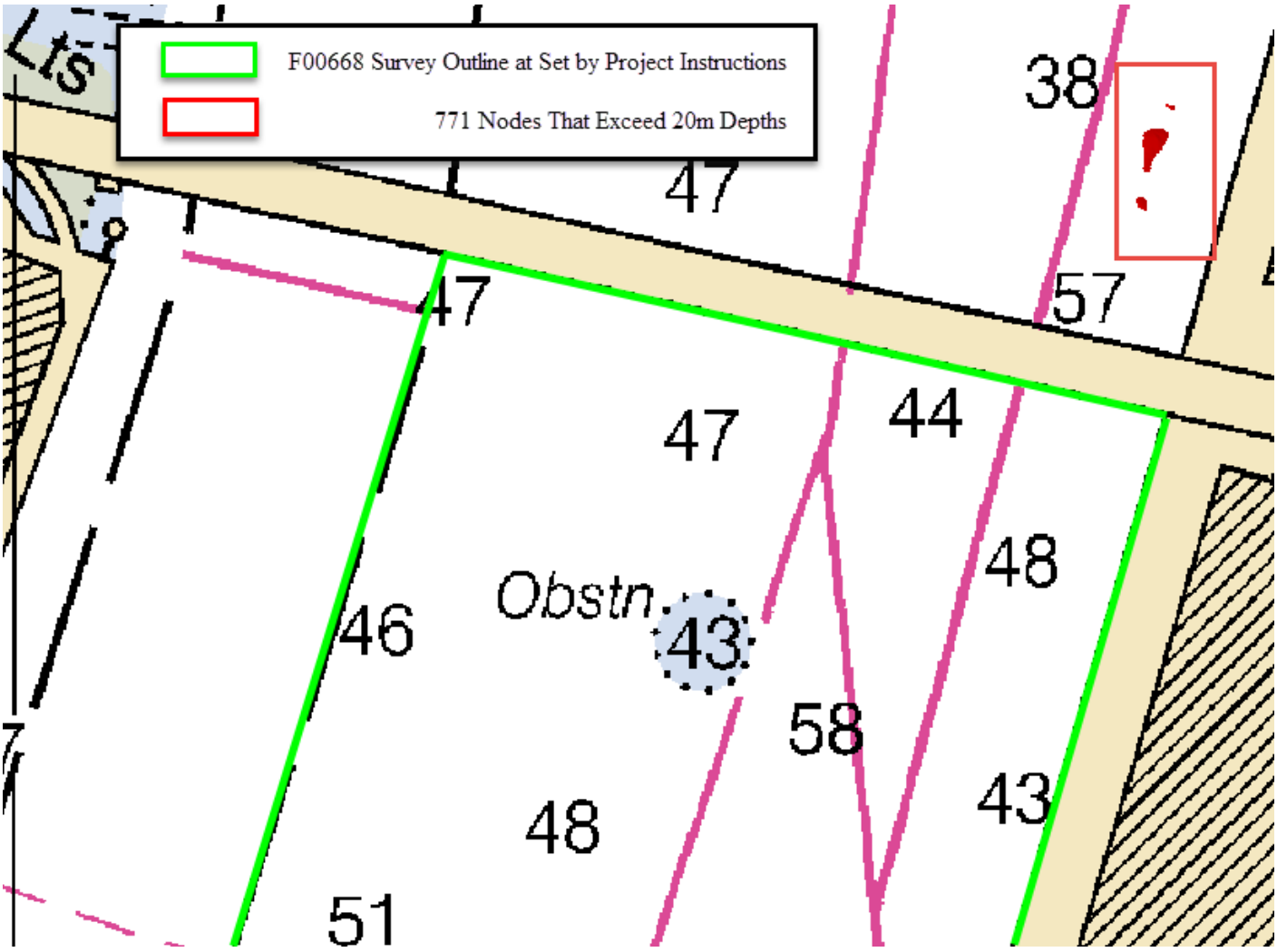

Figure 16: Survey F00668 Project Instruction determined outline, in green, compared to 771 nodes that exceed 20m, outlined in red.

C. Vertical and Horizontal Control

RTK was used for vertical control and the real time solution was written directly to the POSPac file. In CARIS, a GPS tide was calculated during the "Merge" process, then a VDatum separation model was applied to reduce the data to MLLW.

C.1 Vertical Control

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

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

2015_D927_VDatum_NAD83_MLLW.csar

As referenced in Section B.5.3, VDatum was performed for this survey. A separation file was provided to the field with the Project Instructions. The separation file is included with the data submission of the DR.

The RTK solutions were used to calculate ellipsoid heights required for the VDatum process. The RTK solution were written directly to the POSPac file via an NTRIP server, refer to the DAPR for further procedures.

The Descriptive Report for F00668 does not contain Section B.5.3.

C.2 Horizontal Control

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

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

RTK data was directly written to the POSPac file during acquisition. These correctors were streamed using a Network Transport of RTCM via Internet Protocol (NTRIP) and were collected by the US Army Corps of Engineers Philadelphia District via their Virtual Reference System (VRS). The USACE Virtual Reference System is a network of fourteen (USAGE operated and maintained) Continually Operating Reference Stations (CORS) in eastern Pennsylvania, New Jersey, Maryland, and Delaware.

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 RTK in Vertical Control

The RTK data, as detailed in section C.2, was used to further increase the accuracy associated with the vertical control by applying, in real time, atmospheric variations.

D. Results and Recommendations

D.1 Chart Comparison

A sounding selection was created, in feet, at a scale of 1:15000 from the F00668 Finalized 50cm resolution surface for comparison with raster Chart 12313 and ENC US5PA12M. These soundings were then compared to each of the soundings located on the charts for continuity.

Soundings between Chart 12313 and ENC US5PA12M were compared and evaluated for agreement. The two sources were found to be in close agreement with differences of one foot or less.

D.1.1 Raster Charts

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

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
12313	1:15000	53	05/2012	11/19/2015	11/19/2015

Table 8: Largest Scale Raster Charts

12313

NOAA Chart 12313 overlaps with all F00668 data and is generally one to two feet shallower than F00668 in the southern, Navy Anchorage (Anchorage 10), section of the survey (Figure 17), and one to three feet shallower than the northern, Gloucester Point, section of the survey (Figure 18). The data for the area off of Gloucester Point, between the southern tip of the Delaware River Port Authority's bulkhead, south, to the Gloucester Point Fuel Terminal's southern mooring structure indicates that scouring is occurring. In this area the F00668 data is two to ten feet deeper than charted depths (See Figure 19).

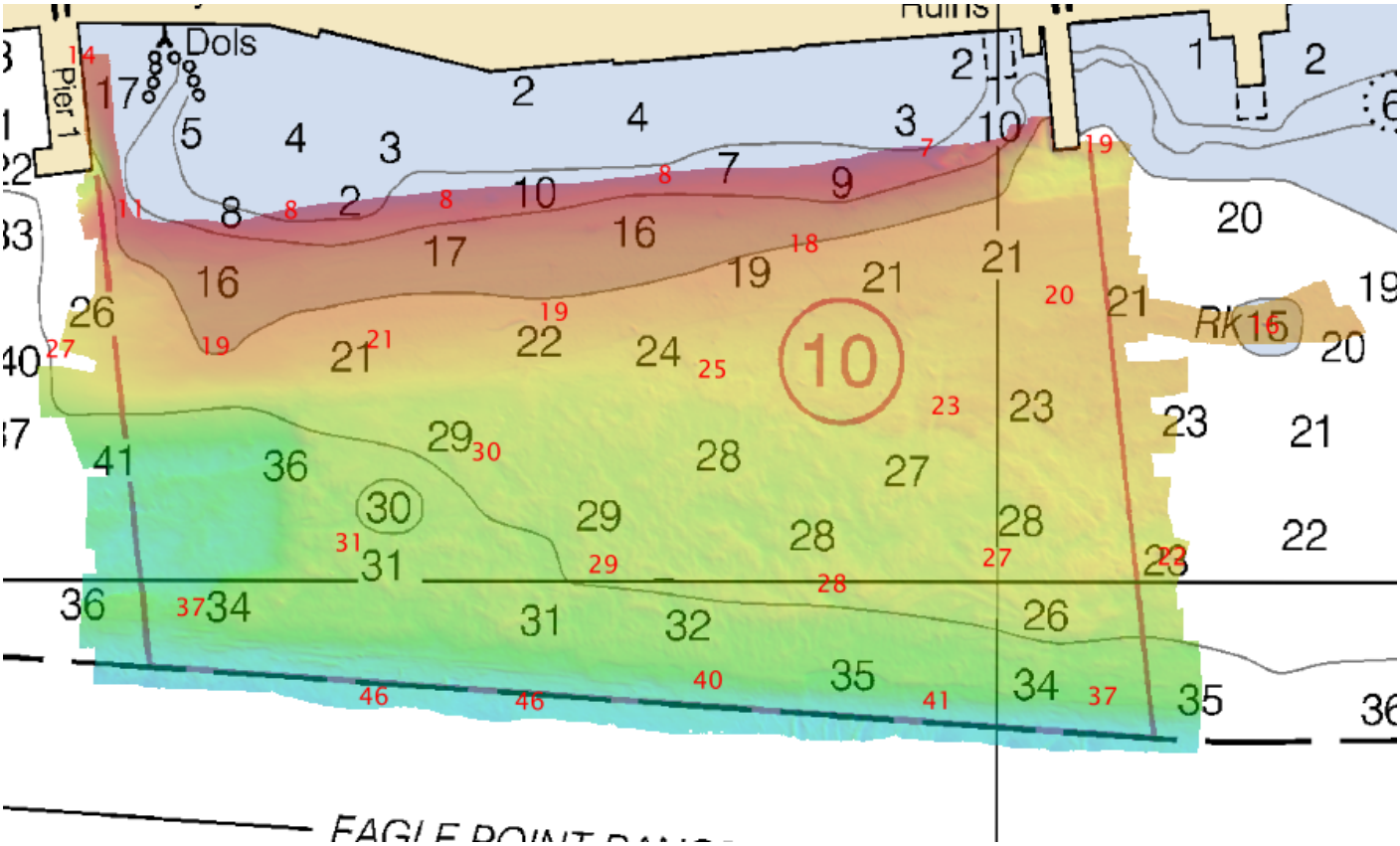

Figure 17: F00668 soundings, in red, compared with sounding from Chart 12313 of the Navy Anchorage (Anchorage 10) section of the survey, in black. Soundings are in feet.

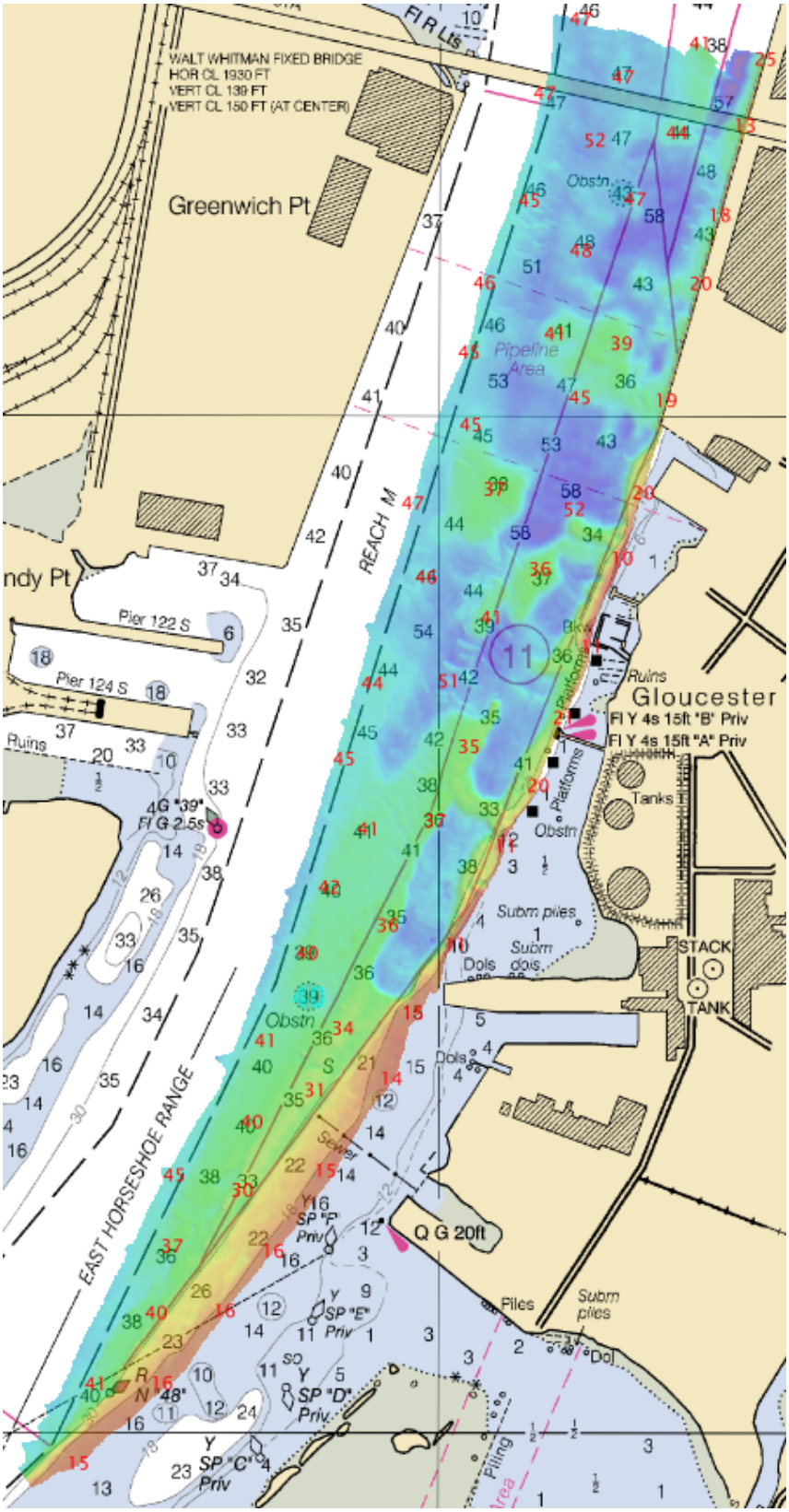

Figure 18: F00668 soundings, in red, compared with sounding from Chart 12313 of the Gloucester Point section of the survey, in black. Soundings are in feet.

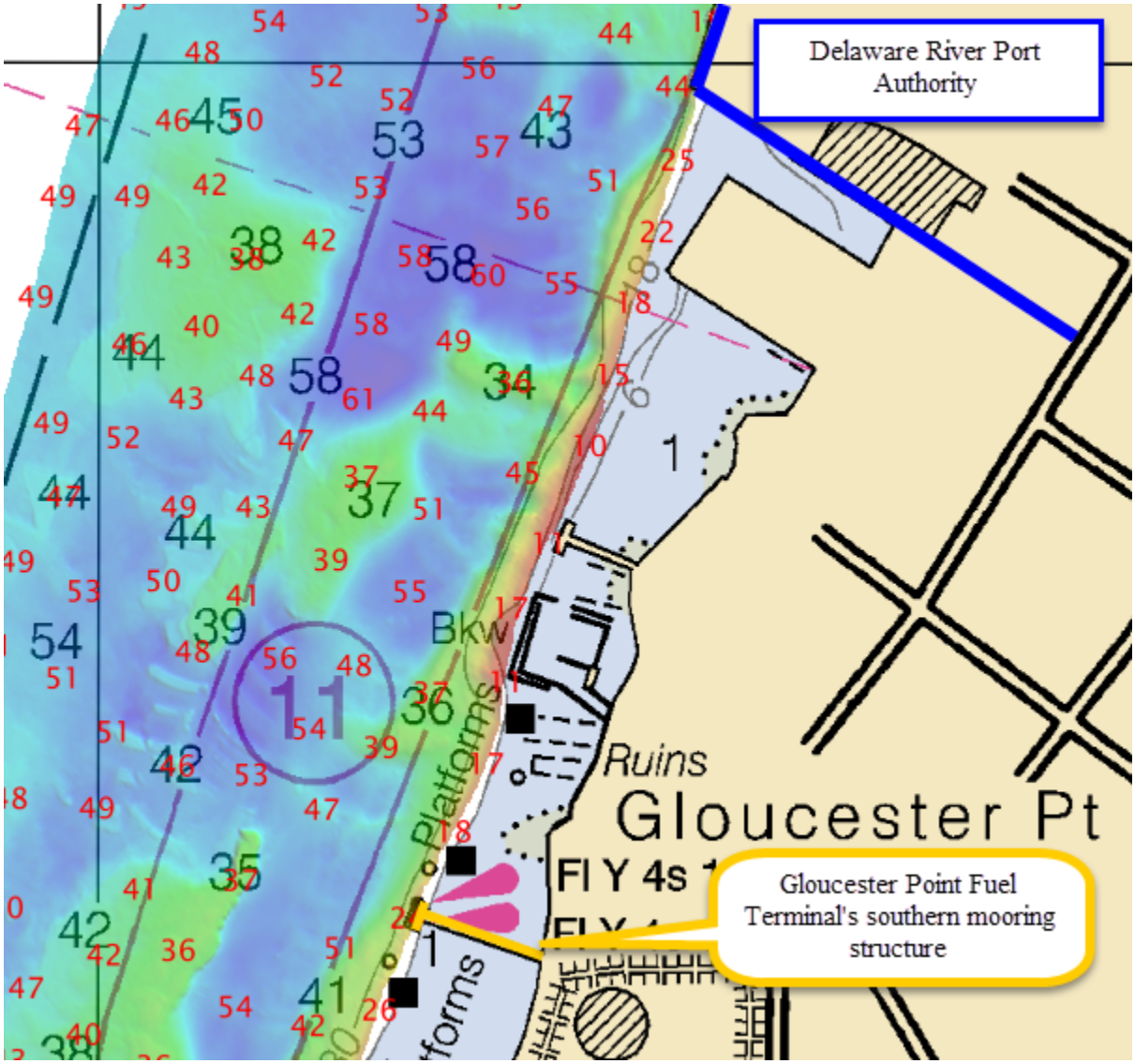

Figure 19: F00668 soundings, in red, compared with soundings from Chart 12313, in black. Subset taken from area off of Gloucester Point, indicating scouring. Soundings are in feet.

D.1.2 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5PA12M	1:15000	27	12/01/2015	12/01/2015	NO

Table 9: Largest Scale ENCs

US5PA12M

Analysis shows ENC US5PA12M to be in good agreement with F00668 data, within one to two feet, in the Navy Anchorage (Anchorage 10) section of the survey (See Figure 20), and generally in good agreement, within one to three feet, in the Gloucester Point section of the survey (See Figure 21). As with the RNC comparison, the data for the area off of Gloucester Point, between the southern tip of the Delaware River Port Authority's bulkhead, south, to the Gloucester Point Fuel Terminal's southern mooring structure indicates that scouring is occurring. In this area the F00668 data is two to four feet deeper than charted depths (See Figure 22).

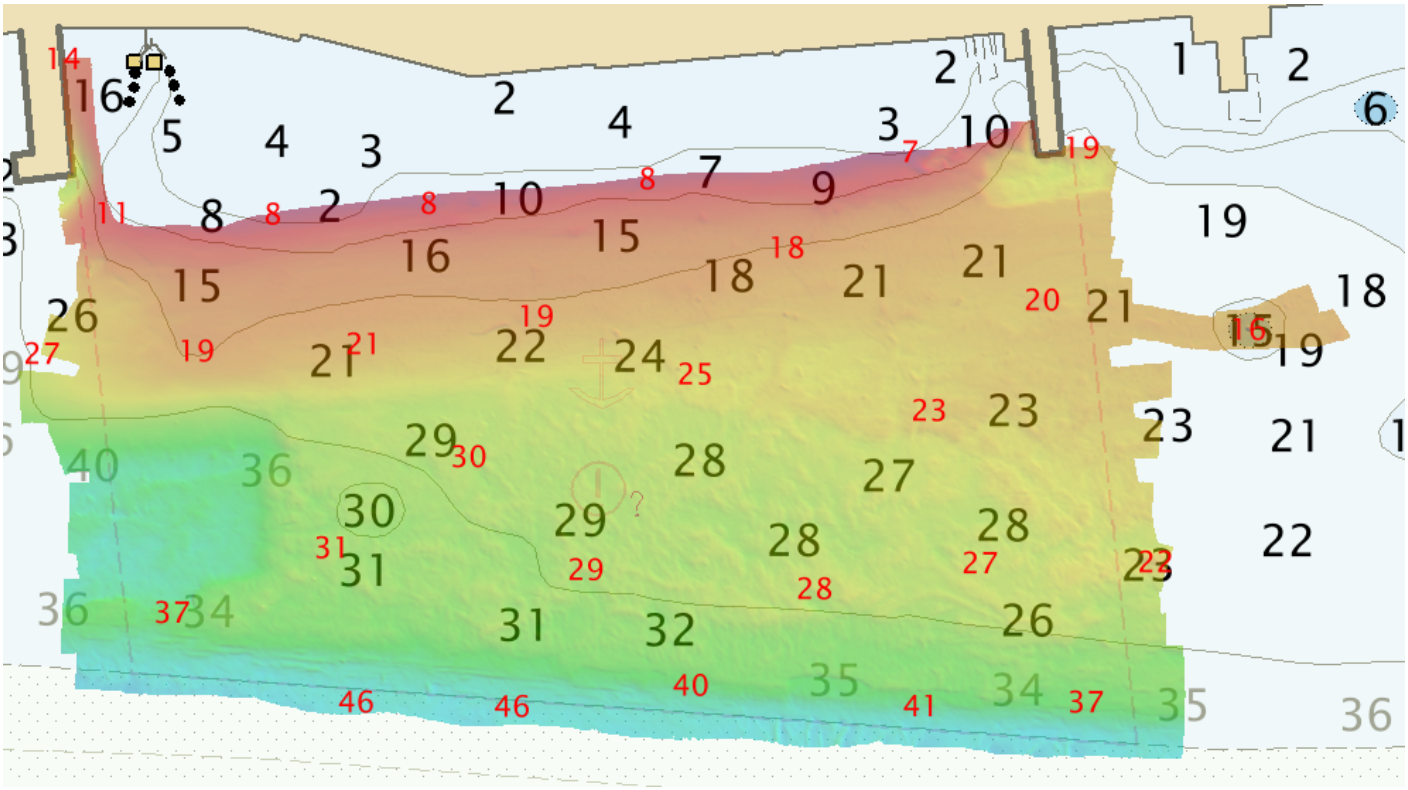

Figure 20: F00668 soundings, in red, compared with sounding from NOAA ENC US5PA12M of the Navy Anchorage (Anchorage 10) section of the survey, in black. Soundings are in feet.

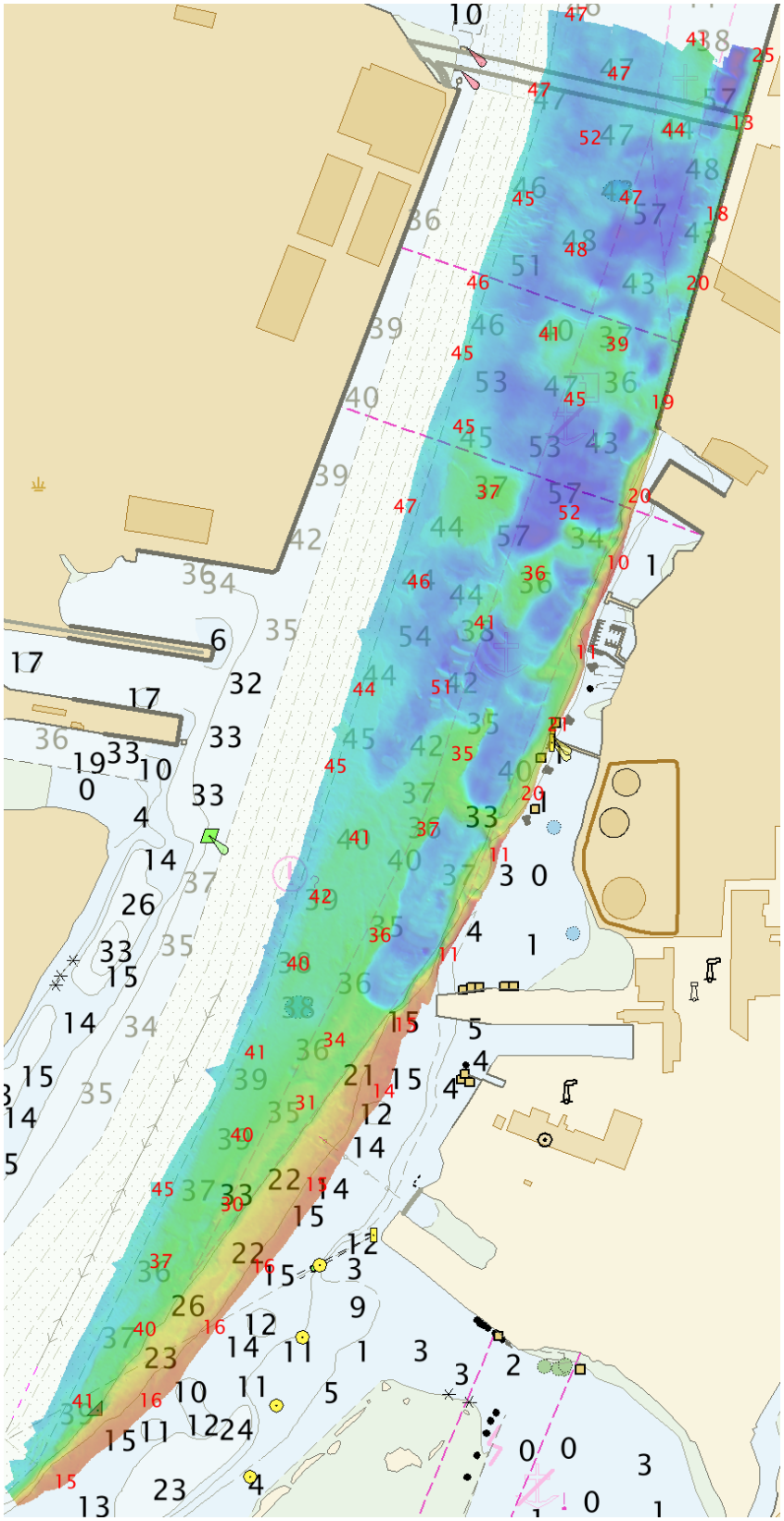

Figure 21: F00668 soundings, in red, compared with sounding from NOAA ENC US5PA12M of the Gloucester Point section of the survey, in black. Soundings are in feet.

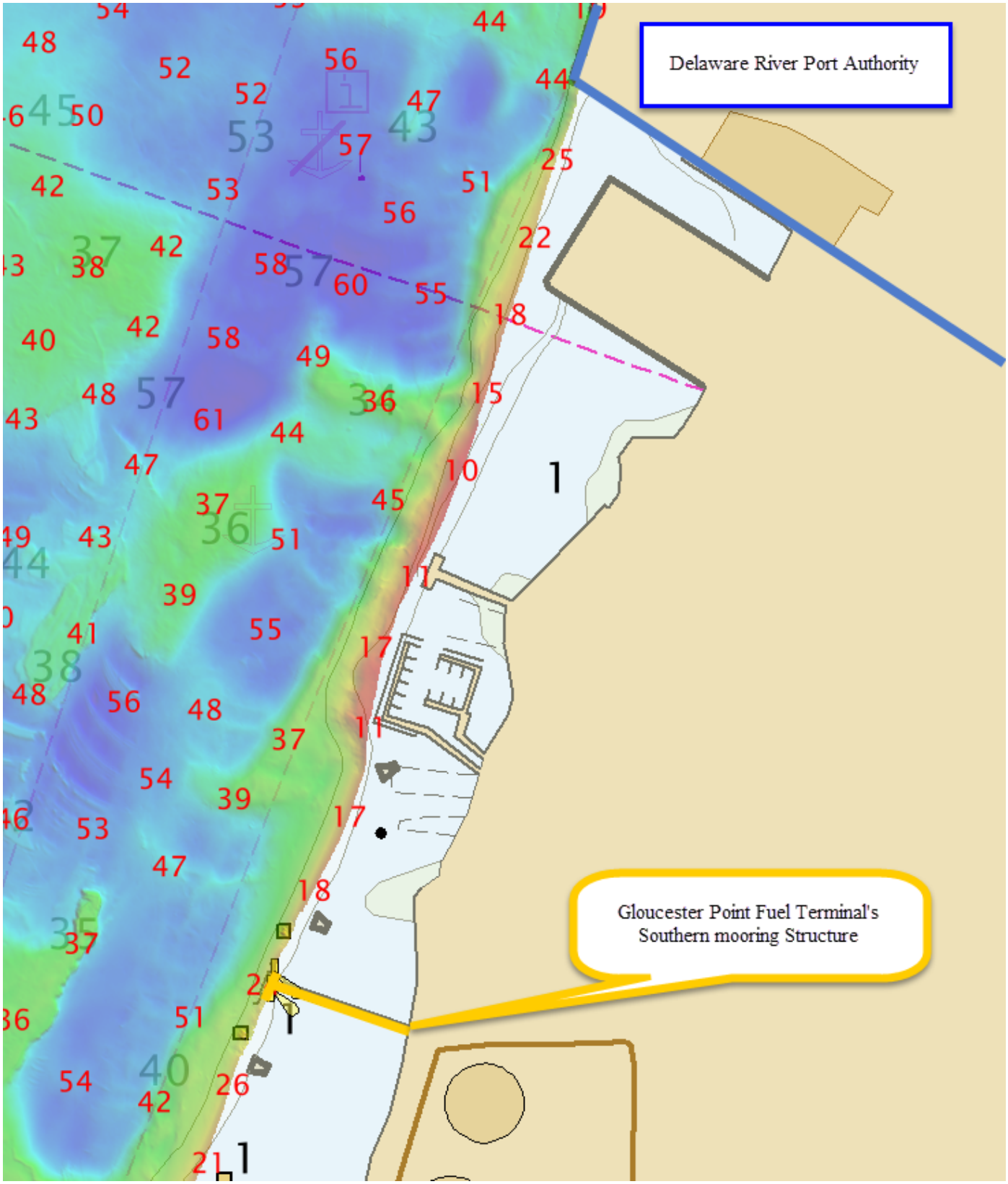

Figure 22: F00668 soundings, in red, compared with soundings from NOAA ENC US5PA12M, in black. Subset taken from area off of Gloucester Point, indicating scouring. Soundings are in feet.

D.1.3 AWOIS Items

No AWOIS items were assigned for this survey.

D.1.4 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.5 Charted Features

There were fifteen assigned charted features and two unassigned charted features in F00668. Eight of the features were inside the three meter curve and unapproachable by R/V BAY HYDRO II. These features, all of which are charted as dolphins, were given a cursory visual inspection. Six of these dolphins were not visible above the water line, while the remaining two were seen. Five of the remaining seven features were mooring platforms, see section D.2.7 of this document for further information. The remaining two features were submerged obstructions, were ensonified using MBES, and were found to be in good agreement with the chart (within one to two feet). Photographs and further details can be found in the Final Feature File accompanying this submission.

D.1.6 Uncharted Features

Uncharted features exist for this survey, but were not investigated because of vessel limitations. The uncharted feature was a linear series of nine dolphins that extended approximately 88m from the shore, on the western side of Delaware River, approximately 67m south (down river) of a charted pier; in the Navy Anchorage (Anchorage 10). The approximate location and description of the features are included in the Final Feature File associated with this submission.

D.1.7 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.8 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.9 Channels

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

Three (3) anchorage areas exist within the survey limits of F00668 and are denoted as Anchorage Area 10, 11, and 12 on NOS chart 12313.

D.1.10 Bottom Samples

Five bottom samples were acquired for this survey, see the Final Feature File for further details.

D.2 Additional Results

D.2.1 Shoreline

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

Limited Shoreline Verification was assigned in the Project Instructions and conducted as part of survey F00668.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

One unassigned ATON was in F00668. It was found to be on station and serving its intended purpose. See the Final Feature File for further details.

D.2.4 Overhead Features

Overhead features exist for this survey, but were not investigated. This overhead feature was the Walt Whitman bridge which delineated the northern (up river) edge of the survey area, and was not inside the survey area.

D.2.5 Submarine Features

A charted submerged sewer pipe runs perpendicular to the shoreline from the New Jersey (eastern side) of the Delaware River, at the southern edge of Gloucester Point, to approximately 229m off shore. This sewer pipe was not visible in the MBES data of the area.

D.2.6 Ferry Routes and Terminals

Ferry routes and/or terminals exist for this survey, but were not investigated (See Figure 23).

Figure 23: Charted ferry terminal at southern edge of Navy Anchorage, Anchorage 10.

D.2.7 Platforms

Five mooring platforms were assigned in F00668. After investigation, all were found to be accurately charted. See the Final Feature File for more information.

Four (4) production platforms were assigned for investigation as part of F00668 and were submitted with the Final Feature File.

D.2.8 Significant Features

There are significant features within the F00668 survey area, however, zero currently uncharted features were found. See Final Feature File for further detail.

D.2.9 Construction and Dredging

Present and/or planned construction or dredging exists within the survey limits, but was not investigated.

D.2.10 New Survey Recommendation

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

D.2.11 Inset Recommendation

No new insets are recommended for this area.

E. Approval Sheet

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

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

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

Approver Name	Approver Title	Approval Date	Signature
Robert Mowery	Chief of Party	12/21/2015	MOWERY.ROBERT.WILLIAM.1379754488 Digitally signed by MOWERY.ROBERT.WILLIAM.1379754488 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=MOWERY.ROBERT.WILLIAM.1379754488 Date: 2015.12.21 11:05:43 -05'00'

F. Table of Acronyms

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

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

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

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : October 28, 2015

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: S-D927-BH2-2015
HYDROGRAPHIC SHEET: F00668

LOCALITY: Delaware River, PA
TIME PERIOD: October 20-22, 2015

TIDE STATION USED: 8545240 Philadelphia, PA
Lat. 39° 56.0'N Long. 75° 8.5' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.917

REMARKS: RECOMMENDED ZONING

Preliminary zoning for this project was provided under project S-D927-BH2-2015. Preliminary zoning is accepted as the final zoning for Registry No. F00668 for the time period between October 20 and 22, 2015.

Please use the zoning file D927BH22015CORP submitted with the project instructions for S-D927-BH2-2015. Zones DB47 and DB48 are the applicable zones for F00668.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

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DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2015.10.30 10:35:24 -04'00'

CHIEF, PRODUCTS AND SERVICES BRANCH

APPROVAL PAGE

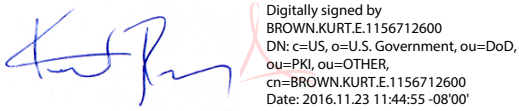
F00668

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

- F00668_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- F00668 _GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Approved: 

Kurt Brown
Physical Scientist, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: 

CDR Benjamin K. Evans, NOAA
Chief, Pacific Hydrographic Branch