

# H13805

## Kitts Point to Ragged Point

OPR-E350-TJ-22  
Potomac River  
Maryland  
Virginia

### Responsible Party

DOC/NOAA/NOS/OCS --  
Office of Coast Survey

### Contact Information

HSD.Chief@noaa.gov

### Field Unit

NOAA Ship Thomas Jefferson (S222)

### Survey Dates

August 08, 2023 - September 10, 2023

### License Information

CC0-1.0

### Approver

CAPT Matthew Jaskoski, NOAA

### Platform and Sonar Equipment

#### 2903 (368926108)

Kongsberg Maritime EM 2040  
EdgeTech 4200

#### 2904 (368926109)

Kongsberg Maritime EM 2040  
EdgeTech 4200

#### S222 (369958000)

Kongsberg Maritime EM 2040

### Bathymetry Grid

#### H13805\_MB\_1m\_MLLW\_1of3 (North American Datum 1983, Mean Lower Low Water, Projected UTM 18)

			Fixed	Variable
Sounding Technique:	<b>Multibeam</b>	Full Seafloor Coverage:	<b>Yes</b>	Feature Detection Size: <b>2.0m 10%</b>
Features Detected:	<b>Yes</b>	Bathymetric Coverage:	<b>Yes</b>	Uncertainty Horizontal: <b>1m N/A</b>
Least Depth Detected:	<b>Yes</b>	Interpolated:	<b>No</b>	Uncertainty Vertical: <b>0.15m 0.75%</b>

#### H13805\_MB\_1m\_MLLW\_2of3 (North American Datum 1983, Mean Lower Low Water, Projected UTM 18)

			Fixed	Variable
Sounding Technique:	<b>Multibeam</b>	Full Seafloor Coverage:	<b>Yes</b>	Feature Detection Size: <b>2.0m 10%</b>
Features Detected:	<b>Yes</b>	Bathymetric Coverage:	<b>No</b>	Uncertainty Horizontal: <b>1m N/A</b>
Least Depth Detected:	<b>Yes</b>	Interpolated:	<b>No</b>	Uncertainty Vertical: <b>0.15m 0.75%</b>

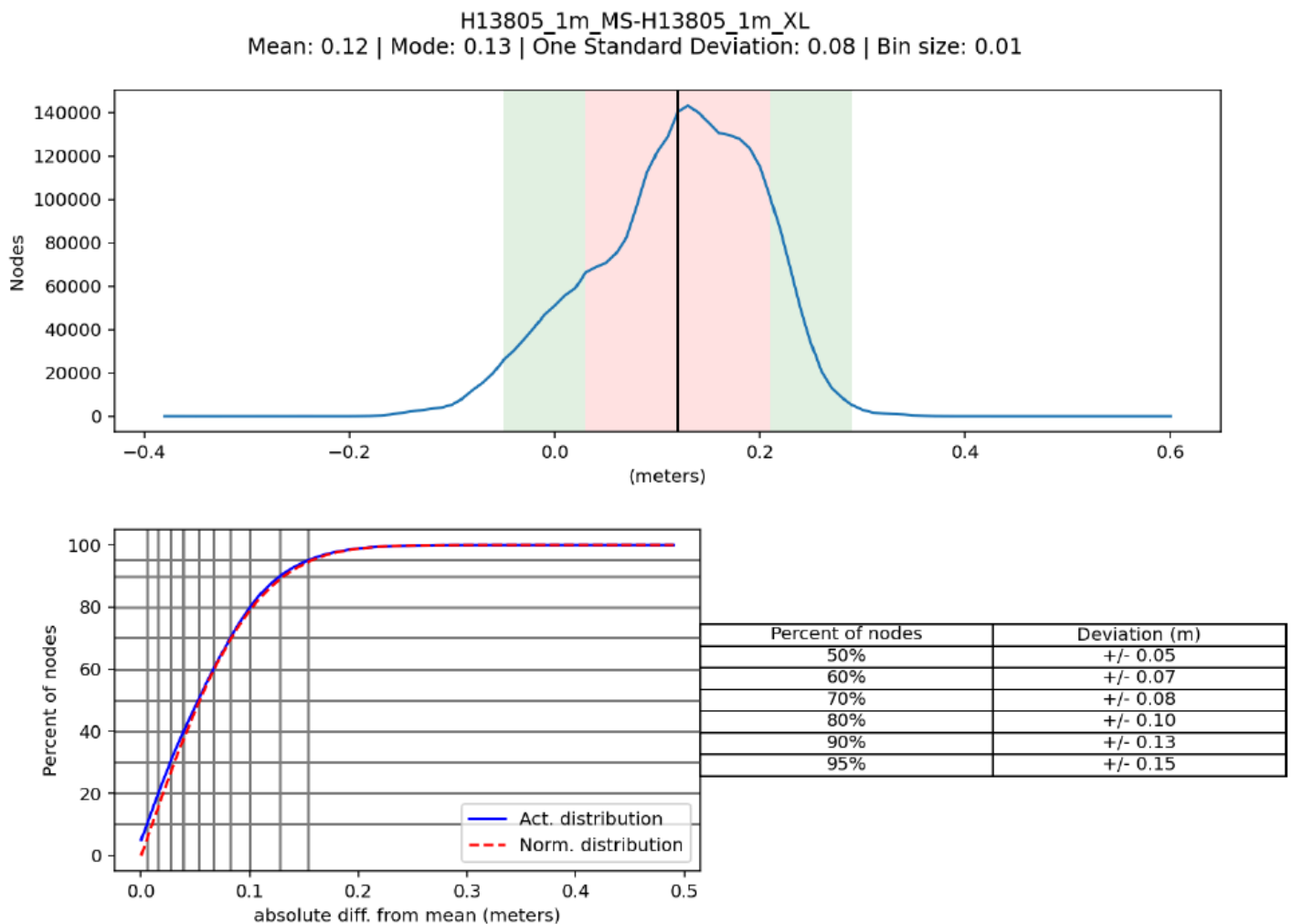
#### H13805\_MB\_1m\_MLLW\_3of3 (North American Datum 1983, Mean Lower Low Water, Projected UTM 18)

			Fixed	Variable
Sounding Technique:	<b>Multibeam</b>	Full Seafloor Coverage:	<b>Yes</b>	Feature Detection Size: <b>N/A N/A</b>
Features Detected:	<b>No</b>	Bathymetric Coverage:	<b>No</b>	Uncertainty Horizontal: <b>1m N/A</b>
Least Depth Detected:	<b>No</b>	Interpolated:	<b>No</b>	Uncertainty Vertical: <b>0.15m 0.75%</b>

## Quality Control Procedure

### Crosslines

Pydro, a suite of software maintained by NOAA's Hydrographic Systems and Technology Branch (HSTB), contains various tools that aid in the analysis and quality control of hydrographic data. Vessels S222, 2904, and 2903 collected a combined total of approximately 72.89 linear nautical miles of MBES crosslines, a figure which constitutes about 4% of mainscheme mileage. A Single Resolution (SR) 1m Combined Uncertainty and Bathymetry Estimator (CUBE) surface of mainscheme data and a SR 1m CUBE surface of crossline data were differenced with the Pydro tool Compare Grids. The results of this comparison indicate that over 99.5% of grid-node comparisons between the two surfaces are within the Fraction of Allowable Error for depth/height, exceeding the specification of 95% stipulated by NOAA's 2024 Hydrographic Surveys Specifications and Deliverables (HSSD). The resulting mean of this comparison was a 0.12m difference, with a standard deviation of 0.08m, verifying the consistency of the data.

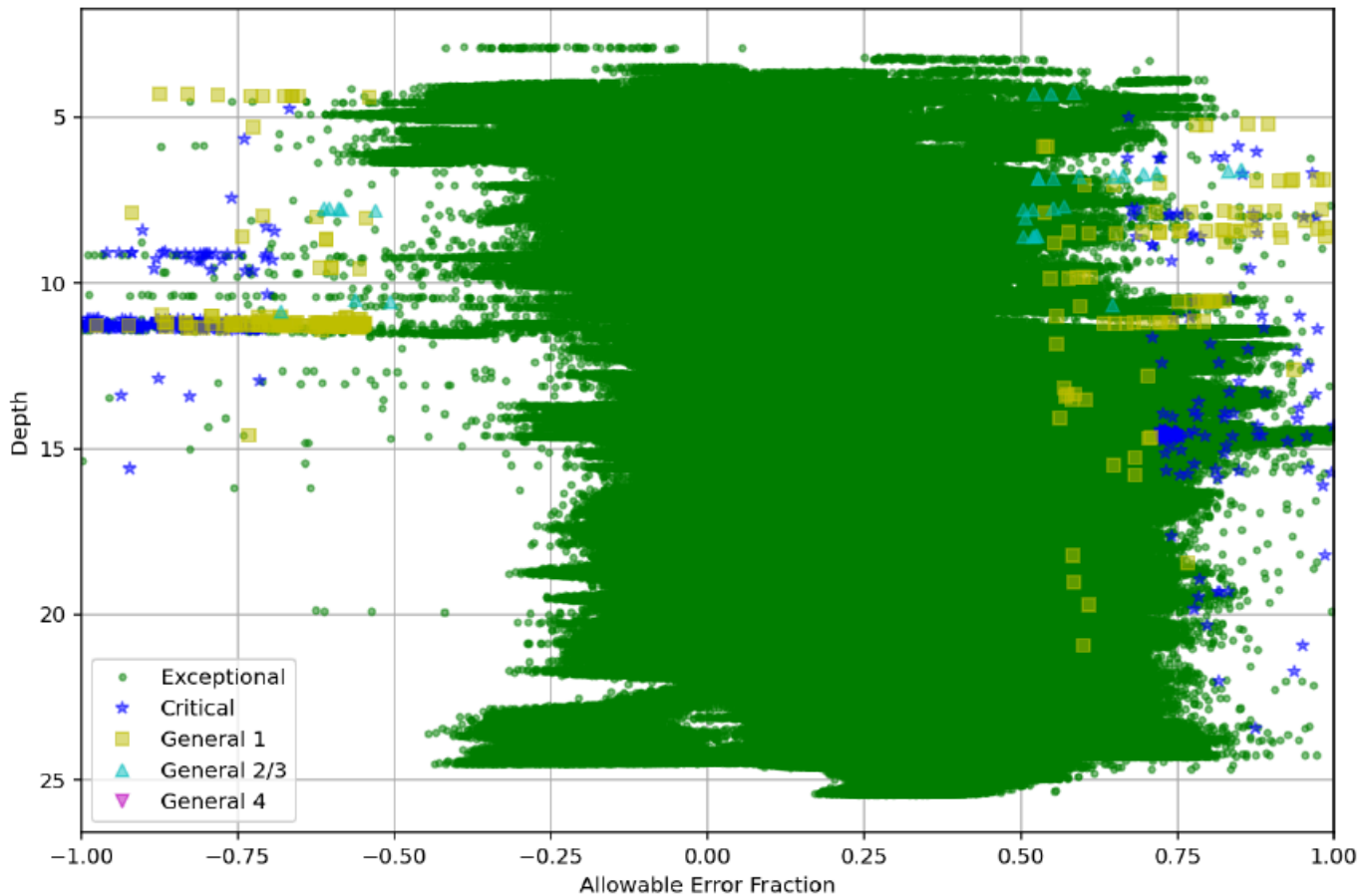


H13805 crosslines comparison statistics

## Node Depth vs. Allowable Error Fraction

Total comparisons 2823460

Passed States: Exceptional=99.98%, Critical=99.99%, General 1=100.00%, General 2/3=100.00%, General 4=100.00%,



*H13805 crosslines comparison statistics*

### Statistical Analysis

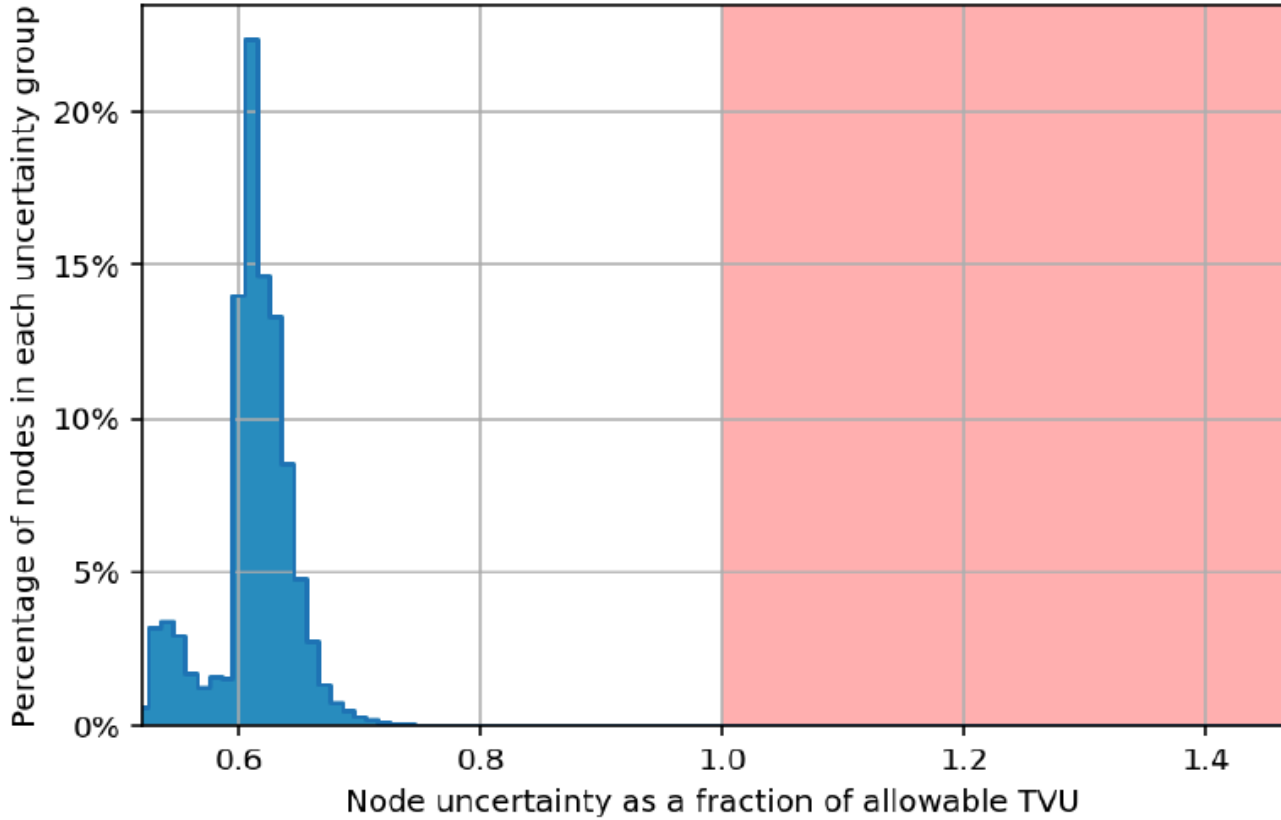
Statistical analysis of grid layers was conducted to assess the quality of the bathymetry. The "Grid QC" program contained within NOAA's Pydro 22 QC Tools was used to assess grid density, resolution, and uncertainty against allowable standards specified in the most recent edition of the HSSD. This survey was assigned quality metrics of General 1 and one of the delivered grids exceeded the specified standards. The uncertainty metrics reported in the Metadata section reflect the highest Quality Metric that was achieved for each grid.

### Uncertainty Standards - NOAA Exceptional

Grid source: H13805\_MB\_1m\_MLLW\_Final\_1of2

99.5+% pass (50,818,696 of 50,818,748 nodes), min=0.52, mode=0.61, max=2.18

Percentiles: 2.5%=0.53, Q1=0.60, median=0.61, Q3=0.63, 97.5%=0.67



*H13805 Grid 1 of 2 Uncertainty Statistics*

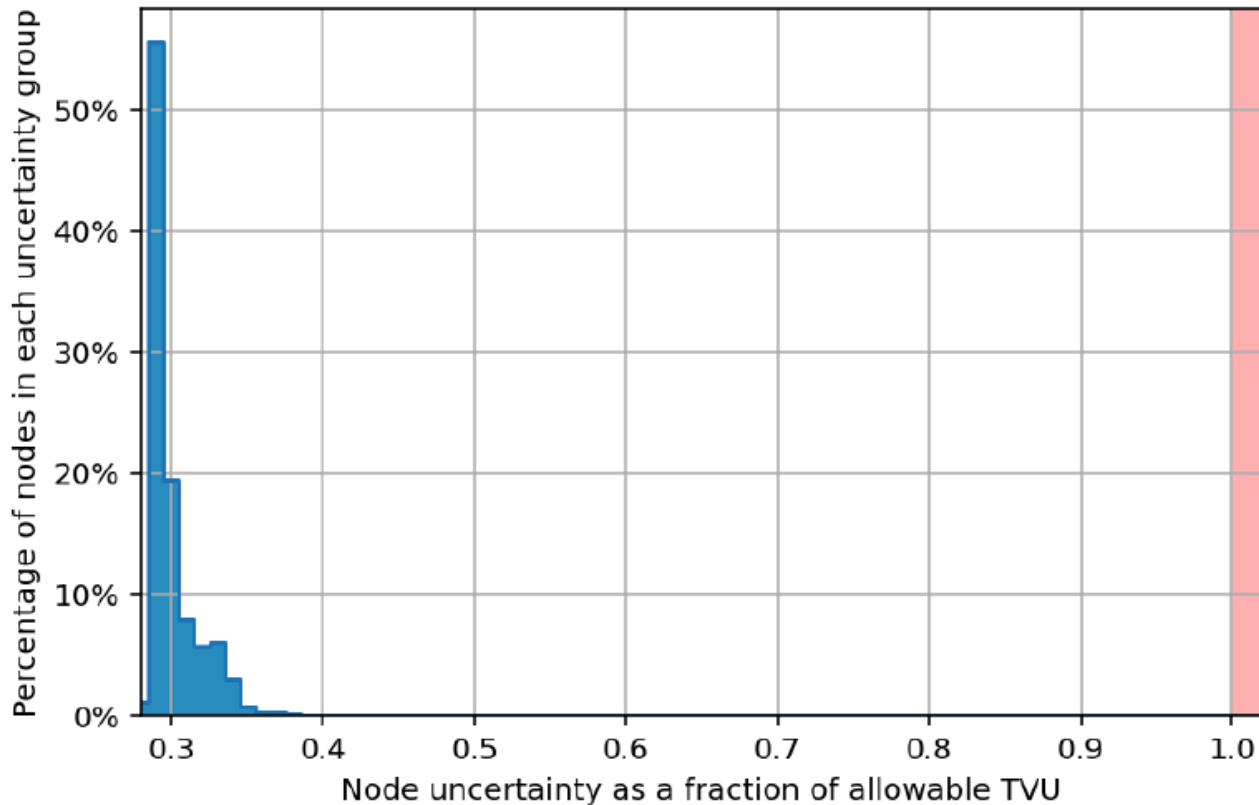
*H13805 Grid 1 of 2 Uncertainty Statistics*

## Uncertainty Standards - NOAA General 1

Grid source: H13805\_MB\_1m\_MLLW\_Final\_2of2

99.5+% pass (23,953,922 of 23,953,927 nodes), min=0.28, mode=0.29, max=1.43

Percentiles: 2.5%=0.29, Q1=0.29, median=0.29, Q3=0.30, 97.5%=0.34



*H13805 Grid 2 of 2 Uncertainty Statistics*

### Directed Editing

After initial collection, MBES data underwent a thorough process of editing and inspection to clean gridded surfaces of erroneous fliers that inaccurately affected seabed measurements, and to ensure that no systematic errors were present. Teledyne's CARIS software was used to generate and examine a 1m CUBE surface as well as its uncertainty and standard deviation layers, which guided visual inspection for fliers. In addition, the Pydro tool Flier Finder and the ArcGIS Pro tool ArcFlier (developed by NOAA physical scientist Anthony Klemm) both scan grids for anomalous data and were utilized to guide editing.

Designated soundings were selected to ensure that gridded surfaces honor the true depth of the seafloor specifically with regard to the least depths of new and existing charted features.

### Holiday Identification

Survey coverage was assessed daily by the field unit as part of night processing to identify data gaps to be addressed. Gaps in coverage that are larger than HSSD specifications are known as holidays. Various methods were utilized to aid in holiday identification including visual inspection and NOAA's Pydro 22 QC Tools "Holiday Finder". "Holiday Finder" is most commonly used for holiday identification in areas of 100% bathymetric (MBES) coverage. The hydrographer inputs a CUBE surface and the tool returns a number of files which can be used in Caris HIPS & SIPS for holiday analysis and acquisition planning. In areas where 100% bathymetric coverage was not achieved, such as in set line spacing or mixed coverage (MBES

and SSS) surveys, the "Holiday Finder" tool is not as useful. The field unit has found that the results of the "Extract Survey Outlines" tool aids in the visual identification of gaps between MBES and SSS coverage.

Multiple small holidays exist around the sheet edges due to the field unit reaching the limit of safe navigation as well as operational time constraints. Multiple holidays exist within the sheet limits due to the presence of fishing structures at the time of acquisition. One large holiday exists in the northwest of the sheet due to the presence of a light tower and significant surrounding shoaling.

### Survey Adequacy

This entire survey is adequate to supersede previous data. The data in this survey was acquired in accordance with requirements set forth in the 2024 HSSD.

### Imagery Coverage

Side scan sonars (SSS) were used in conjunction with MBES to establish acoustic intensity coverage and for object detection and recognition. After acquisition, the data was visually inspected and any object that was obviously anthropogenic or had a shadow equal or greater than 0.5m was marked as a contact to be later developed with multibeam. SSS mosaics are included in the delivery package.

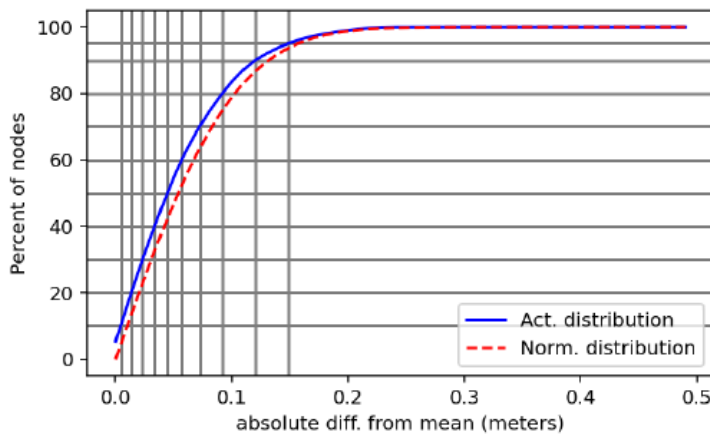
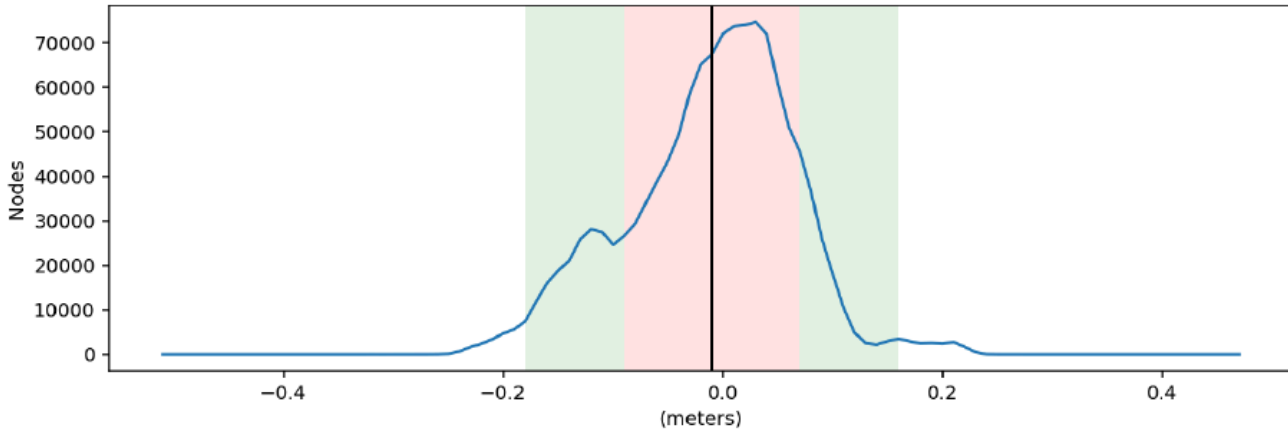
### Data Interpolation

N/A

### Junction Overlap

Survey H13805 junctions with contemporary survey H13804 within project OPR-E350-TJ-23. The Pydro 22 tool "Compare Grids" was utilized to assess the overlap of the junction. The result of the comparison indicates that 100% of grid-node comparisons between the two surfaces are within Fraction of Allowable Error standards for depth/height, exceeding the specification of 95% stipulated by NOAA's 2024 HSSD. The resulting mean of this comparison was a 0.01m difference, with a standard deviation of 0.08m which is within allowable TVU for the area.

H13805\_MB\_1m\_MLLW\_Final-H13804\_MB\_1m\_MLLW  
 Mean: -0.01 | Mode: 0.03 | One Standard Deviation: 0.08 | Bin size: 0.01



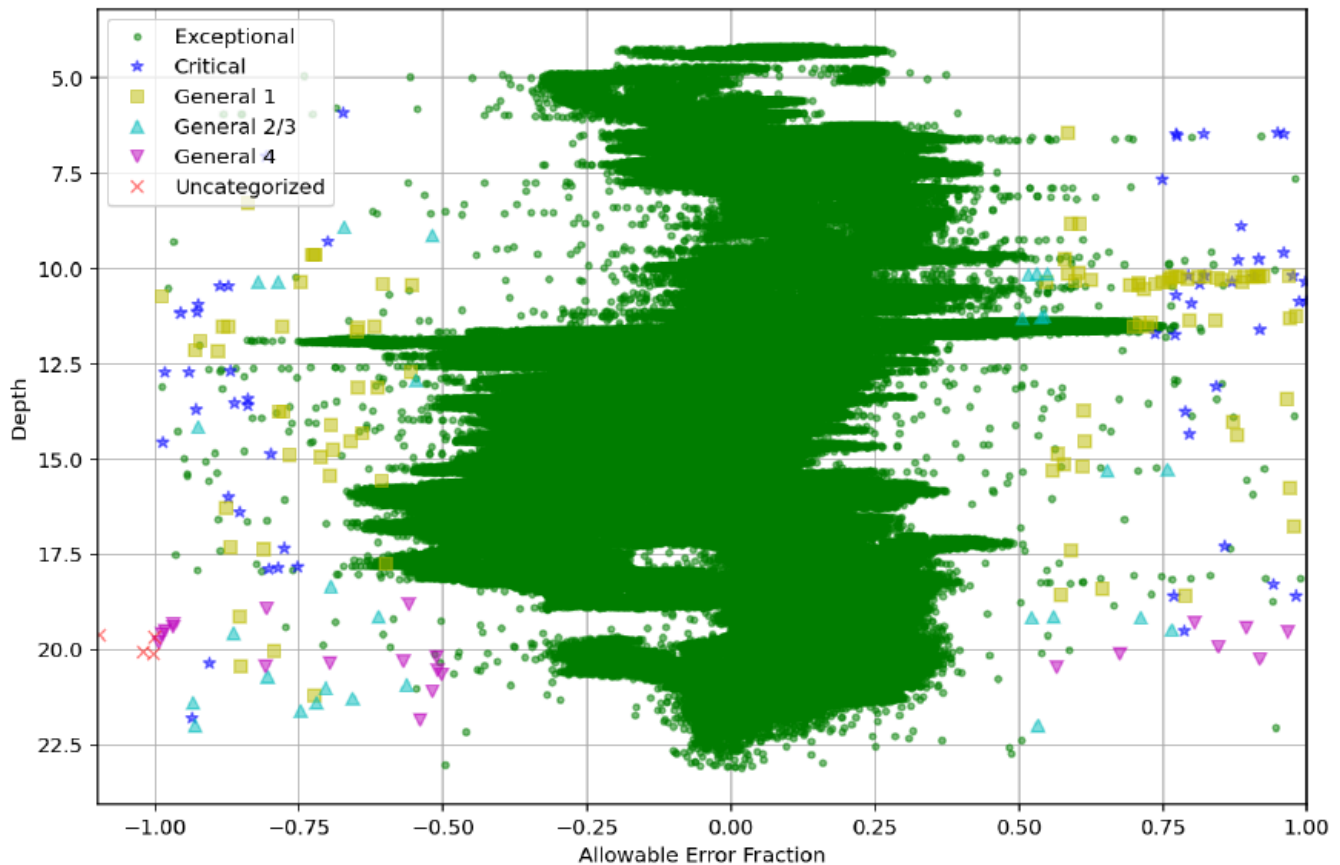
Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.12
95%	+/- 0.15

H13805-H13804 junction statistics

## Node Depth vs. Allowable Error Fraction

Total comparisons 1259894

Passed States: Exceptional=99.98%, Critical=99.99%, General 1=100.00%, General 2/3=100.00%, General 4=100.00%, Uncategorized=0.00%



*H13805-H13804 junction statistics*

### Backscatter

#### Calibration Method

N/A

#### Dynamic Range

The system echo sounders have the dynamic range to accommodate the relatively homogeneous survey area. The frequency was held constant at 300 kHz while the system automatically controlled pulse type.

#### Acquisition Configuration

No special techniques were used outside of normal considerations for quality data acquisition for a bathymetric survey.

#### Environmental Variable

Sound velocity is extremely variable in estuarine areas, such as the Potomac River. To compensate for this, casts were conducted at the start of acquisition each day and at a minimum of one every four hours in order to have an appropriate absorption coefficient.

### Acquisition Output

Please refer to Section 4.3.2.1.2 Acoustic Backscatter Imagery of the Field Procedures Manual for the backscatter post processing workflow.

### Error Source

A minor offset exists between the ship (vessel S222) and launch (vessels 2903 and 2904) data. The cause is unknown and ranges approximately 0.10-0.20m. The offset is within our allowable uncertainty. Troubleshooting steps included inspecting vessel offset and alignment configurations for anomalies, examining positioning data for anomalies, and recreating and reapplying SBETs, none of which solved the offset.

### Additional Information

Two bathymetric grids have been listed in this report: a set line spacing grid and a 100% bathymetric coverage grid. These two were extracted from a parent surface using geometry. The shapefile used for this process is included in the bathymetric grids folder with the submission package.

### Supplementals

- **Trained Marine Mammal Observers list** (*Mar 20, 2023*)
- **Final Survey Outline** (*Sep 18, 2023*)
- **NCEI Sound Speed Data** (*Sep 13, 2023*)
- **Potentially Sensitive Data Findings** (*Sep 26, 2023*)
- **Dangers to Navigation Report** (*Aug 29, 2023*)
- **Dangers to Navigation Report** (*May 15, 2024*)
- **Coast Pilot Report** (*May 22, 2024*)

## Approval Statement

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 and approved all data and metadata. The survey meets or exceeds requirements as set forth in the Project Instructions and NOS Hydrographic Surveys Specifications and Deliverables. The survey is complete and no additional work is required with the exception of any deficiencies noted in the Report of Survey.

Approver Name	Approver Title	Approver Certification
CAPT Matthew Jaskoski, NOAA	Commanding Officer	

## Personnel

Name	Title	Certification
LT Sydney Catoire, NOAA	Field Operations Officer	
Erin Cziraki	Chief Survey Technician	
Sarah Thompson	Senior Survey Technician	

<b>Full Equipment List</b>						
<b>Equipment Type</b>	<b>Manufacturer and System</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Frequency</b>	<b>Accuracy Check Date</b>
<b>2903 (368926108)</b>						
Positioning and Attitude System	Applanix POS MV 320 v5	POS MV 320 v5	3245	2023-07-20	NA	NA
Multibeam	Kongsberg Maritime EM 2040	EM2040	40143	2023-07-24	300 kHz	2023-07-24
Side-scan sonar	EdgeTech 4200	4200	40423	2023-02-24	600 kHz	2023-02-24
CTD	Sea-Bird Scientific SBE 19plus	19plus	19P36399-4630	2022-11-16	N/A	2023-03-07
Sound Speed System	Teledyne RESON SVP 70	SVP 70	1013077	2019-01-06	N/A	2023-03-16
<b>2904 (368926109)</b>						
Positioning and Attitude System	Applanix POS MV 320 v5	POS MV 320 v5	8959	2023-07-20	NA	NA
Multibeam	Kongsberg Maritime EM 2040	EM2040	40122	2023-07-24	300 kHz	2023-07-24
Side-scan sonar	EdgeTech 4200	4200	50508	2023-07-24	600 kHz	2023-07-24
Sound Speed System	Teledyne RESON SVP 70	SVP 70	1921073	2021-02-09	N/A	2023-03-16
CTD	Sea-Bird Scientific SBE 19plus	19plus	19P33589-4487	2022-11-16	N/A	2023-03-07
<b>S222 (369958000)</b>						
Positioning and Attitude System	Applanix POS MV 320 v5	POS MV 320 v5	6497	2023-03-05	NA	NA
Multibeam	Kongsberg Maritime EM 2040	EM2040	40260	2023-03-07	300 kHz	2023-03-16
CTD	Sea-Bird Scientific SBE 19plus V2	19plus	19P60744-6667	2022-11-17	N/A	2023-03-16
Sound Speed System	Valeport Thru-Hull SVS	065101	33711	2022-11-17	N/A	2023-03-16
CTD	AML Oceanographic MVP200	MVP200	M12981	2022-05-04	N/A	2022-05-04
CTD	AML Oceanographic MVP-X	MVP-X2	9001	2022-02-08	N/A	2022-02-08