

**W00450**

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

**DESCRIPTIVE REPORT**

Type of Survey: External Source Data

Registry Number: W00450

**LOCALITY**

State(s): Maine

General Locality: Maine Coastline

Sub-locality: Vicinity of Booth  
Bay and Johns Bay

**2017**

Maine Coastal Mapping Initiative

**LIBRARY & ARCHIVES**

Date:

**HYDROGRAPHIC TITLE SHEET**

**W00450**

**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): **Maine**

General Locality: **Maine Coastline**

Sub-Locality: **Vicinity of Booth Bay and Johns Bay**

Scale: **1:40,000**

Dates of Survey: **04/12/2017 to 10/02/2017**

Project Number: **ESD-AHB-18**

Data Source: **Maine Coastal Mapping Initiative**

Chief of Party: **Kerby Dobbs, Project Hydrographer**

Soundings by: **multibeam**

Imagery by: **multibeam**

Verification by: **Atlantic Hydrographic Branch**

Soundings Acquired in: **Meters at Mean Lower Low Water**

**Remarks:**

*The purpose of this survey is to provide contemporary data to update National Oceanic and Atmospheric Administration (NOAA) nautical charts. Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via <https://www.ncei.noaa.gov/>.*

*Products created during office processing were generated in NAD83 UTM 19N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.*



Prepared in cooperation with the Bureau of Ocean Energy Management and National Oceanic and Atmospheric Administration

# 2017 Descriptive Report of Seafloor Mapping: Southport Island to Monhegan Island, Gulf of Maine

Chief of Party - Kerby Dobbs, Project Hydrographer, Contractor to the Maine Coastal Program

**Disclaimer**

These data and information published herein are accurate to the best of our knowledge. Data synthesis, summaries and related conclusions may be subject to change as additional data are collected and evaluated. While the Maine Coastal Program makes every effort to provide useful and accurate information, investigations are site-specific and (where relevant) results and/or conclusions do not necessarily apply to other regions. The Maine Coastal program does not endorse conclusions based on subsequent use of the data by individuals not under their employment. The Maine Coastal Program disclaims any liability, incurred as a consequence, directly or indirectly, resulting from the use and application of any of the data and reports produced by staff. Any use of trade names is for descriptive purposes only and does not imply endorsement by The State of Maine.

For an overview of the Maine Coastal Mapping Initiative (MCMI) information products, including maps, data, imagery, and reports visit <http://www.maine.gov/dacf/mcp/planning/mcmi/index.htm>.

## **Acknowledgements**

The Maine Coastal Mapping Initiative would like to acknowledge the efforts of the University of Maine sediment laboratory personnel, Hodgdon Vessel Services, and Maine Geological Survey staff for contributing to the success of the 2017 survey season. The individual contributions made by many were an integral part of sampling, analysis, and synthesis of data collected for this project. Funding for this study was provided by provided by the Bureau of Ocean Energy Management (cooperative agreement number M14AC00008) and the National Oceanic and Atmospheric Administration (award numbers NA15NOS4190208 and NA14NOS419006).

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## **ABSTRACT**

During the survey season (April-September) of 2017 the Maine Coastal Mapping Initiative (MCMCI) conducted hydrographic surveying using a multibeam echosounder (MBES) in the waters off of mid-coast Maine. The surveying was conducted in part to support the Federal Bureau of Ocean and Energy Management's (BOEM) efforts to enhance coastal resiliency through identification and characterization of potential sand and gravel resources on the outer continental shelf that may be used for beach nourishment. The surveys also coincide with state efforts to update coastal data sets and increase high resolution bathymetric coverage for Maine's coastal waters. A total of approximately 128 mi<sup>2</sup> (332 km<sup>2</sup>) of high-resolution multibeam data were collected in the surveyed area. During the 2017 survey season the MCMCI also collected sediment samples, water column data, and video in 68 locations.

## 1.0 Area Surveyed

The 2017 mainscheme survey area was located off Maine’s mid-coast region in the Gulf of Maine, with a sub-locality of Southport Island to west of Monhegan Island as shown in Figure 1. The approximately 128 mi<sup>2</sup> (332 km<sup>2</sup>) mainscheme survey area adjoins the eastern extent of the areas mapped by MCFI in 2015 (data were submitted and accepted by NOAA, whom lists the survey as W00289) (Figure 2). These data were not collected in direct accordance with the *NOS Hydrographic Surveys Specifications and Deliverables* and the *Field Procedures Manual* requirements; however, both documents were referenced during acquisition for guidance.

Mainscheme survey limits are listed in Table 1. Specific dates of data acquisition for the mainscheme survey are listed in Appendix A.

Table 1 – 2017 mainscheme survey limits

Southwest Limit	Northeast Limit
43° 35.801” N	43° 51.361” N
69° 39.248” W	69° 23.366” W

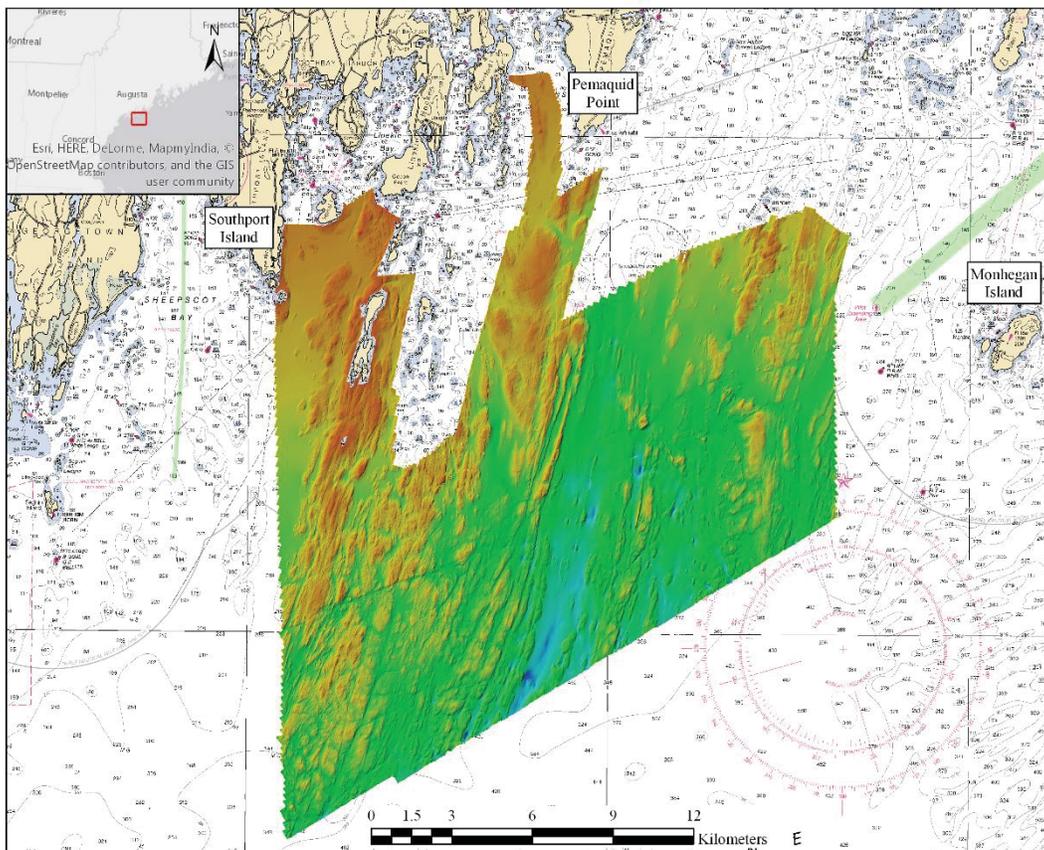


Figure 1 – General locality of 2017 mainscheme survey coverage off mid-coast Maine

## 1.1 Survey Purpose

This survey was conducted by the State of Maine Coastal Mapping Initiative (MCMI) as part of a multi-agency cooperative agreement partially funded by the Bureau of Ocean and Energy Management (BOEM). The purpose of this project was to enhance coastal resiliency through identification and characterization of potential sand and gravel resources in waters of federal jurisdiction that may be used for beach replenishment. This project also coincides with state efforts to update coastal data sets for Maine's coastal waters and provides new data in the areas covered by National Oceanic and Atmospheric Administration (NOAA) nautical charts 13288, 13293, and 13301 in mid-coast Maine. Additional objectives included habitat classification for planning purposes. These data were acquired and processed to meet Office of Coast Survey bathymetry standards as best as possible, and were shared with the UNH-NOAA Joint Hydrographic Center / Center for Coastal and Ocean Mapping for review.

## 1.2 Survey Quality

The entire survey should be adequate to supersede previous data.

## 1.3 Survey Coverage

Numerous small holidays (gaps in MBES coverage) exist within the surveyed area, and normally occurred as sonic shadows in areas of locally high relief and/or highly irregular bathymetry. Analyses of bathymetric data show that the least depths were achieved over all features, and that holidays have not compromised data integrity.

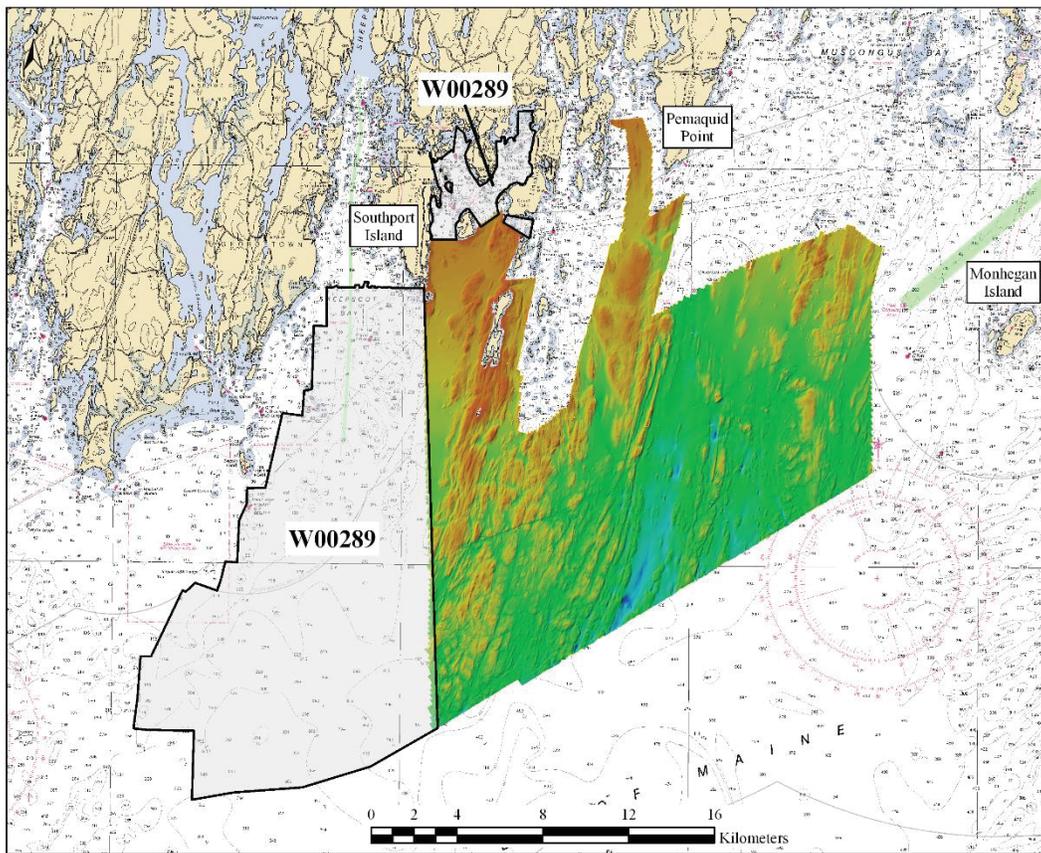


Figure 2 – 2017 survey relative to 2015 survey (NOAA survey ID W00289); plotted over RNC 13288

## 2.0 Data Acquisition

The following sub-sections contain a summary of the systems, software, and general operations used for acquisition and preliminary processing during the 2017 survey season.

### 2.1 Survey Vessel

All data were collected aboard the Research Vessel (R/V) Amy Gale (length = 10.7 m, width = 3.81 m, draft = 0.93 m) (Figure 3), a former lobster boat converted to a survey vessel and contracted to the MCMI. The vessel was captained by Caleb Hodgdon of Hodgdon Vessel Services based out of Boothbay Harbor, Maine. The EM2040C transducer, motion reference unit (MRU), AML MicroX surface sound speed probe, and dual GNSS antennas were pole-mounted to the bow; pole raised (for transit) and lowered (for survey) via a pivot point at the edge of the bow. The main cabin of the vessel served as the data collection center and was outfitted with four display monitors for real time visualization of data during acquisition.



Figure 3 – R/V Amy Gale shown with pole-mounted dual GPS antennas, Kongsberg EM2040c multibeam sonar, MRU (not visible), and surface sound speed probe (not visible) in acquisition mode

### 2.2 Acquisition Systems

The real-time acquisition systems used aboard the R/V Amy Gale during the 2017 survey are outlined in Table 2. Data acquisition was performed using the Quality Positioning Services (QPS) QINSy (Quality Integrated Navigation System; v.8.16) acquisition software. The modules within QINSy integrated all systems and were used for real-time navigation, survey line planning, data time tagging, data logging, and visualization.

Table 2 – Major systems used aboard R/V Amy Gale

Sub-system	Components
Multibeam Sonar	Kongsberg EM2040C and processing unit
Position, Attitude, and Heading Sensor	Seapath 330 processing unit, HMI unit, dual GPS/GLONASS antennas, MRU 5 motion reference unit (subsea bottle)
Acquisition Software and Workstation	QINSy software v.8.16 and 64-bit Windows 7 PC console
Surface Sound Velocity (SV) Probe	AML Micro X with SV Xchange
Sound Velocity Profiler (SVP)	Teledyne Odom Digibar S sound speed profiler
Ground-truthing/Sediment Sampling Platform	Ponar grab sampler, GoPro Hero video camera, dive light, dive lasers, YSI Exo I sonde

### 2.3 Vessel Configuration Parameters

Prior to the 2017 survey season, the MCMC contracted Doucet Survey, Inc. to perform high-definition (precision  $\pm 5\text{mm}$ ) 3D laser scanning of the Amy Gale and all external MBES system components (e.g. MRU, GPS antennas, and EM2040C) (Figure 4). The purpose of the laser scan survey was to refine and or verify the precision of hand-made vessel reference frame measurements. All points were referenced to the center point of the base of the MRU (mounted inside the pole and directly atop the EM2040C transducer) (Figure 5), which served as the origin (e.g. 0,0,0), where ‘x’ was positive forward, ‘y’ was positive starboard, and ‘z’ was positive down. The laser scan survey results only differed from hand-made measurements by  $\leq 3\text{mm}$  for all nodes of interest. Reference measurements for each component were entered into the Seapath 330 Navigation Engine (Table 3) and converted so all outgoing datagrams would be relative to the location of the EM2040C transducer (e.g. EM2040C was used as the monitoring point for all outgoing datagrams being received by QINSy during acquisition). Additional configuration and interfacing of all systems were established during the creation of a template database in the QINSy console. See appendices for specific settings as entered in the Seapath 330 Navigation Engine (Appendix B) and for the template database (Appendix C) used during data acquisition while online in QINSy. Configuration settings of the EM2040c were assigned in the EM Controller module of QINSy (Appendix D).

Table 3 – 2017 equipment reference frame measurements for Seapath 330

	x (m)	y (m)	z (m)
MRU	0.000	0.000	0.00
Antenna 1 (port)	0.158	-1.245	-3.000
Antenna 2 (starboard)	0.158	1.252	-3.035
EM2040C	0.036	0.000	0.133

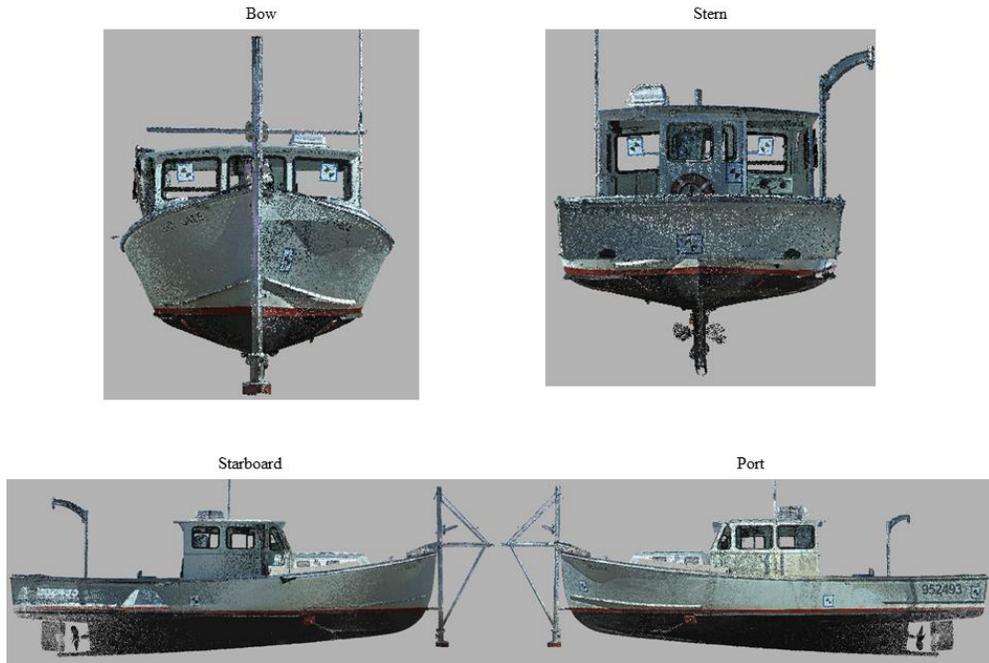


Figure 4 – Amy Gale RGB color images generated from 3D laser scan survey (GPS antennas and external cabling not included in survey) data (.pts file converted to .las for visualization)



Figure 5 – Amy Gale origin (point 201 in RGB images) for vessel reference frame(s); origin is center point within the base of the pole (center point of base within internally-mounted motion reference unit (MRU) point 201 in images above)

## 2.4 Survey Operations

The following is a general summary of daily survey operations. Once the survey destination was reached, the sonar pole mount was lowered into survey position and its bracing rods were fastened securely to the hull of the ship via heavy-duty ratchet straps. Electric power to all systems was provided by a 2000 watt Honda *eu2000i* generator. Immediately following power-up, all interfacing instruments were given time to stabilize (e.g. approximately 30-45 minutes for Seapath to acquire time tag for GPS). Next, the desired QINSy project (e.g. mainscheme, inshore, etc.) was selected for data acquisition. All files (e.g. raw sonar files, sound speed profiles, grid files, etc.) were recorded and stored within their respective project subfolders on a local drive. Prior to surveying, a sound speed cast was taken and imported into the 'imports' folder of the current project. After confirming a close match between the upcast and downcast data, the profile was applied to the sonar (EM2040C) in the QINSy Controller module. Data were gridded at 4-meters for real-time visualization. Raw sonar files were logged in the QINSy Controller module in .db format and saved directly onto the hydrographic workstation computer. All data were backed up daily on an external hard drive. At the end of each day's survey, sonar and navigation systems were powered down and the pole mount was raised and fastened for transit back to port. Upon arriving at the dock, all external instruments/hardware were visually inspected and rinsed with freshwater to prevent corrosion.

## 2.5 Survey Planning

Line planning and coverage requirements were designed to meet the specifications set forth in the BOEM grant, but also met requirements for NOAA hydrographic standards (NOAA Field Procedures Manual, 2014). In the mainscheme area, parallel lines were mostly planned in several days prior to surveying and run in a NE-SW or E-W pattern, depending on the location. Lines were spaced at consistent intervals to obtain a minimum of 10% overlap between full swaths. Soundings from beam angles outside of  $\pm 60$  degrees from the nadir were blocked from visualization during acquisition, thus increasing the true minimum full-swath overlap. This online blocking filter was recommended by Quality Positioning Services field engineers with the intent of eliminating noisy outer beams from the final product, thereby increasing the overall contribution of higher quality soundings. All data was acquired at approximately 6 - 6.5 knots, although some areas required slower speeds to ensure safe operation of the vessel around obstructions (e.g. fishing gear, docks, ledges, etc.).

## 2.6 Calibrations

One patch test was conducted aboard the R/V Amy Gale at the beginning of the 2017 survey season to correct for alignment offsets. During the test, a series of lines were run to determine the latency, pitch, roll, and heading offset. The patch test data were processed using the Qimera (v.1.3.3) patch test tool. After calibration was complete, offsets (Table 4) were entered in to the template database in QINSy. Overall, roll and pitch offsets calculated for this patch test were comparable to calibrations from previous seasons. Full built-in self-tests (BIST) were performed at semi-regular intervals throughout the season to determine if any significant deviations in background noise were present at the chosen survey frequency of 300KHz.

Table 4 – 2017 patch test calibration offsets for EM2040C

	<u>4/11/2017</u>
Latency (seconds)	0.00
Roll (degrees)	0.24
Pitch (degrees)	0.64
Heading (degrees)	-0.81

## 3.0 Quality Control

### 3.1 Crosslines

Crosslines were run (staggered to save time on turns; in lieu of 900 meters as per BOEM requirement; U.S. Department of the Interior, 2014) to act as a data quality check (Figure 6). Crosslines were filtered during post-processing to remove soundings greater than 45 degrees from the nadir. After filtering, the two-dimensional surface area of the crossline surface totaled approximately 14% of mainscheme acquisition. Crossline sounding agreement with mainscheme data was evaluated by using the crosscheck tool in Qimera v.1.5.4, which performs a beam-by-beam statistical analysis. The mean difference between soundings was -0.03 meters with a standard deviation of 0.48 meters; 95% of all differences were less than 0.96 meters from the mean (Figure 7). Summary statistics for this analysis are shown in Table 5. Additional statistical plots generated from this analysis are reported in Appendix E. Raw difference data, reference surfaces, and sonar files used for this analysis were submitted with the data in these surveys.

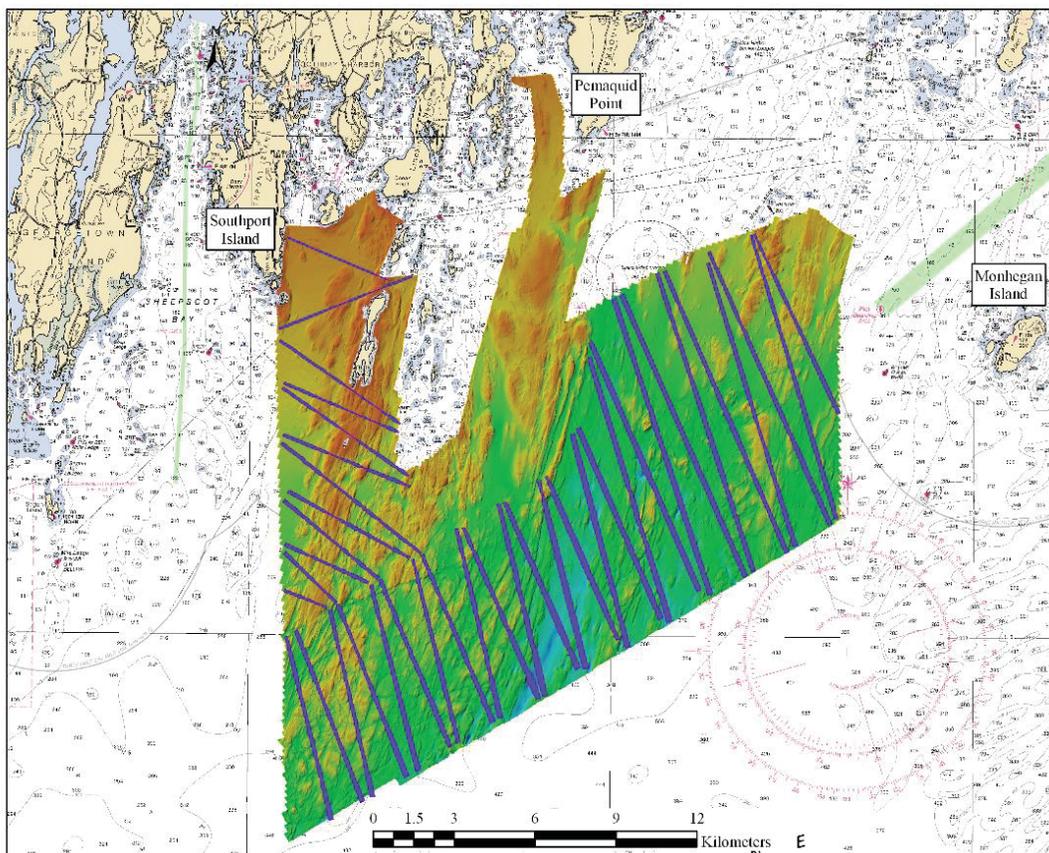


Figure 6 – Location of crosslines (shown in purple, beams filtered outside  $\pm 45^\circ$ ) and mainscheme data

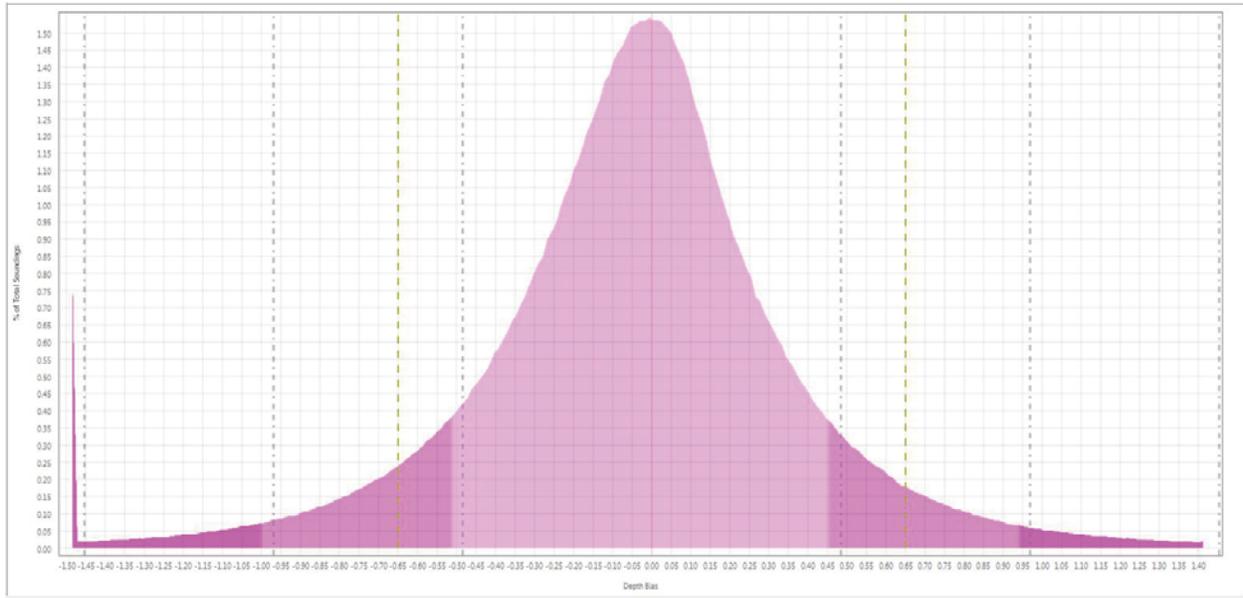


Figure 7 – 2017 crosslines difference histogram; pink areas represent the 95% confidence interval based on normal distribution; yellow dashed lines represent limit of IHO Order 1 test vertical tolerance; gray dashed lines on histogram represent  $\pm$ sigma 1, 2, and 3

Table 5 – Crossline difference (Qimera crosscheck) summary statistics

<b># of Points of Comparison</b>	3538845
<b>Data Mean</b>	-63.398 m
<b>Reference Mean</b>	-63.369 m
<b>Difference Mean</b>	-0.029323 m
<b>Difference Median</b>	-5.949037 m
<b>Std. Deviation</b>	0.484515 m
<b>Data Z - Range</b>	-110.00 m to -30.59 m
<b>Ref. Z - Range</b>	-100.32 m to -31.99 m
<b>Diff Z - Range</b>	-24.80 m to 12.90 m
<b>Mean + 2*stddev</b>	0.998352 m
<b>Median + 2*stddev</b>	6.918066 m
<b>Ord 1 Error Limit</b>	0.650330 m
<b>Ord 1 P-Statistic</b>	0.044592
<b>Ord 1 - # Rejected</b>	157804
<b>Order 1 Survey</b>	ACCEPTED

\*Order 1 parameters: a = 0.25 and b = 0.013

### 3.2 Junctions

The junctions shown in Table 6 were made with this survey. Survey W00289 was conducted by the State of Maine Coastal Mapping Initiative aboard the Amy Gale in 2015 during the course of project OSD-

AHB-16. The areas of overlap between the 2017 survey and the junction survey (NOAA survey ID W00289) were evaluated for sounding agreement by performing surface (4-meter resolution) difference tests in Fledermaus (v.7.7.7, 64-bit), where the junctioning surface was subtracted from the new 2017 surface (re-projected in NAD83). A summary of surface difference test results is shown in Table 7. The extent of overlap between the 2015 base surface and the corresponding 2017 junction surface is illustrated in Figure 8. The surfaces used for these tests are submitted with the data in these surveys.

Table 6 – 2017 mainscheme survey junctions

<b>Registry Number</b>	<b>Scale</b>	<b>Year</b>	<b>Field Unit</b>	<b>Relative Location(s)</b>
W00289	1:10,000	2015	Amy Gale	W and N

Table 7 – Summary of surface difference test results for overlapping (junction) surveys

<b>Junction Surface ID</b>	<b>New Surface ID</b>	<b>Median (m)</b>	<b>Mean (m)</b>	<b>Std. Dev. (m)</b>
W00289_MB_4m_MLLW _combined_Final	MCFI_2017_mainscheme_4m_mllw	0.03	0.04	0.63

Several factors were thought to contribute to the high standard deviation in the overlapping mainscheme surveys: poor agreement in rocky areas, filtering procedures, and survey conditions. The most disagreement between surfaces was in areas with a steep, rocky seabed. In addition, the W00289 data included soundings from all beam angles ( $\pm 65$  degrees from the nadir), whereas the 2017 data were filtered to exclude soundings from beams  $> \pm 60$  degrees from the nadir. Although the 2015 data were not revisited for this analysis, it is possible that poor quality data from the outermost beams (where applicable) caused greater disagreement in certain areas. Lastly, the resulting surface shows variable along-track difference values (relative to 2017 survey direction), suggesting excessive heave during the 2017 survey contributed to a large portion of the disagreement observed over areas with a flat seabed.

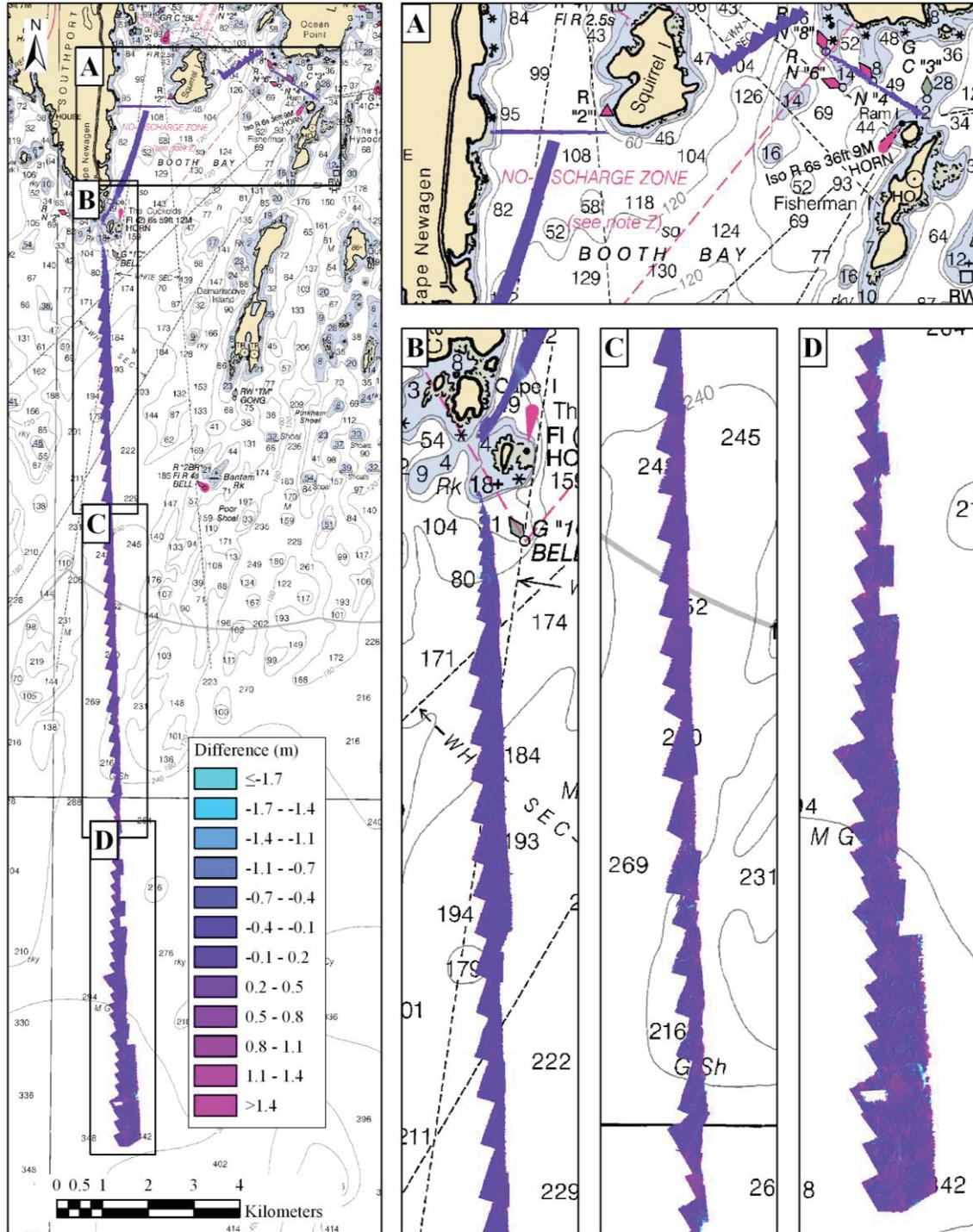


Figure 8 – Junctioning areas between W00289 and 2017 mainscheme survey (4-meter surfaces) shown as surface difference results; scale in A is 1:50,000; scale in B through D is 1:40,000

### **3.3 Equipment Effectiveness**

#### Sonar

Sonar data were acquired with a Kongsberg EM2040C set to a survey frequency of 300 kHz, high-density beam forming, with 400 beams per ping. Although the EM2040C allowed full swath widths at this frequency, lines from previous year's survey run at comparable depths contained considerable noise in outer beams ( $> \pm 60$  degrees from the nadir; as identified by QPS engineers). As a result (and as per QPS recommendation), soundings greater than  $\pm 60$  degrees from the nadir were not included in final bathymetric surfaces.

#### Hydrographic Workstation

A motherboard failure occurred within the hydrographic workstation PC during systems start-up on the morning of September 27, 2017. The system could not be replaced prior to the scheduled end (November 30<sup>th</sup>) of the survey season. Thus, no additional survey data was collected after September 14, 2017.

### **3.4 Sound Speed Methods**

Sound speed cast frequency: A total of 135 sound speed casts were taken within the boundaries of the 2017 mainscheme survey. All sound speed cast measurements were collected using the Teledyne Odom Digibar S profiler. Sound speed casts were taken as needed throughout the survey, which was generally when the observed surface sound speed (monitored and visualized in real-time using the AML MicroX SV sensor) differed from the surface sound speed in the active profile by more than 2 meters per second. In certain instances, supplemental casts were taken when there was reason to suspect significant changes in the water column (e.g. change in tide, abrupt changes in seafloor relief, etc.). During the collection of sound speed casts, logging was stopped to download and apply the new cast and was resumed when the boat circled around and came back on the survey line. Throughout the duration of the survey, the surface sound speed was observed in real-time (by the AML Micro X SV probe). Although sound speed data were recorded in raw sonar files, the raw sound velocity profiles (.csv) were also submitted with the survey data.

A quality comparison between the AML Micro X SV sensor and the Teledyne Odom Digibar S profiler was not performed. However, real-time comparisons between surface sound speed observed by the AML Micro X SV and the surface sound speed entry in the Digibar S profile suggested these instruments were in agreement.

### **4.0 Data Post-processing**

The following is a summary of the procedures used for post-processing and analysis of survey data using Qimera (v.1.5.4, 64-bit edition) and Fledermaus (v.7.7.7, 64-bit edition) software.

#### **4.1 Horizontal Datum**

The horizontal datum for these data is WGS 84 projected in UTM zone 19N (meters).

#### **4.2 Vertical Datum and Water Level Corrections**

The vertical datum for these data is mean lower-low water (MLLW) level in meters. A tidal zoning file (.zdf; provided by NOAA CO-OPS) containing time and range corrections for verified data referenced from the Portland, ME (8418150) tide gauge was applied to all areas surveyed (Figure 9). Time corrections, tide height offsets, and tide scale (range) for each zone are listed in Table 8.

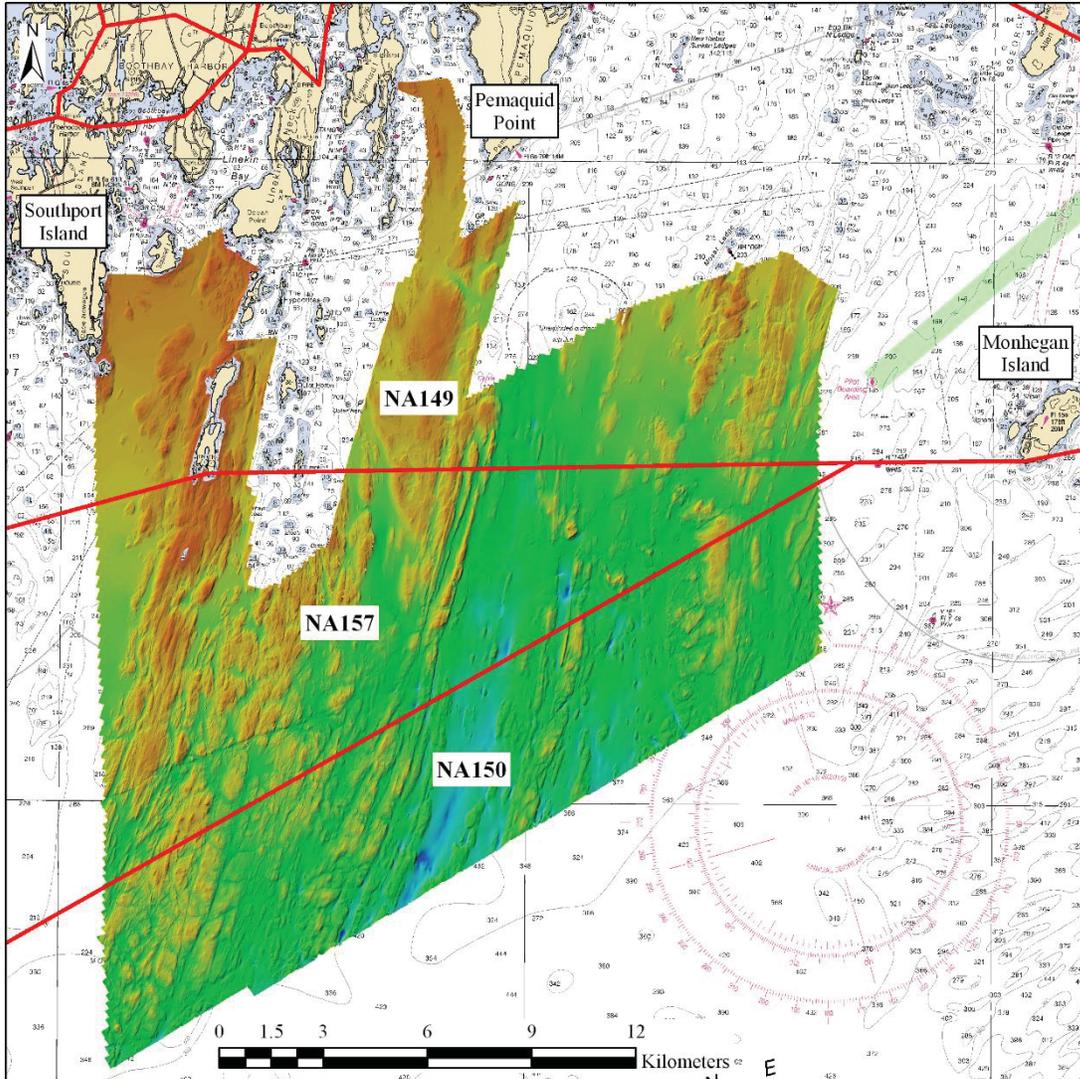


Figure 9 – Tide zones (outlined in red) relative to 2017 mainscheme survey extent

Table 8 – Tide zones and corrections referenced to verified Portland (8418150) tide data

Zone ID	Time Correction (mins.)	Tide Offset (m)	Tide Scale	Survey Area
NA149	-6	0	0.96	Mainscheme
NA150	-6	0	0.95	Mainscheme
NA157	-6	0	0.95	Mainscheme

### 4.3 Processing Workflow

The general post-processing work flow in Qimera was as follows:

1. Create project
2. Add raw sonar files (e.g. metadata extracted and processed bathymetry data converted to .qpd, including vessel configuration and sound velocity)
3. Add tide zoning file (.zdf) and associated tide data and integrate into raw files
4. Create dynamic surface with NOAA\_4m CUBE settings enabled
5. Review and edit soundings/clean surface with 3D editor tool
6. Export final surface to .BAG file and CUBE surface
7. Export processed data in .GSF format for backscatter processing

#### CUBE

A CUBE (Combined Uncertainty and Bathymetry Estimator) surface was created for editing and as a starting point for final products. The 'NOAA\_4m' configuration (Figure 10) was selected for each surface. The mainscheme survey was gridded at 4 meters based on the average depth of the area and in accordance with NOAA's survey recommendations (NOAA, 2014).

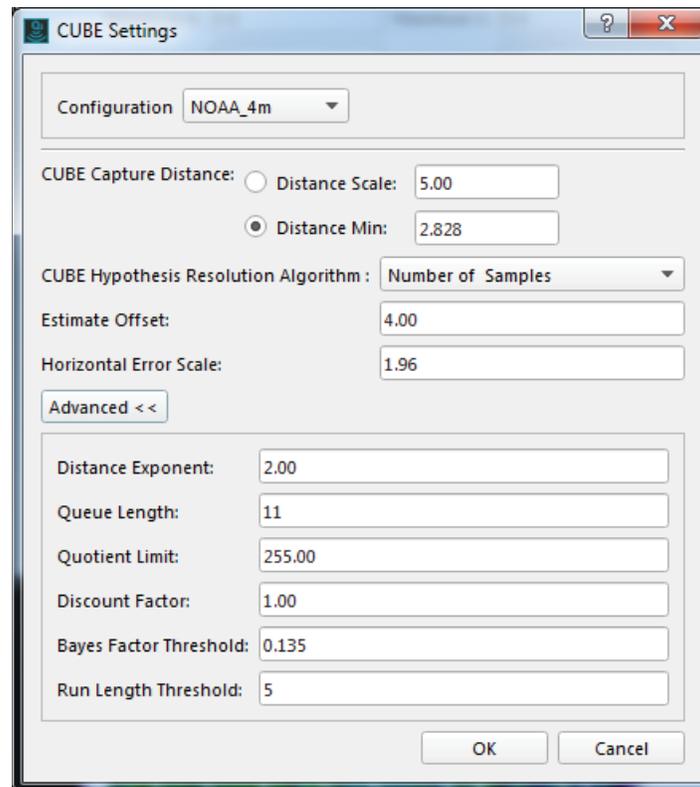


Figure 10 – CUBE settings parameters window shown with settings for NOAA 4-meter grid resolution

#### 4.4 Final Surfaces

The following surfaces and BAGs were submitted with the survey data.

Table 9 – Surfaces submitted with 2017 survey data

Surface Name	Resolution (m)	Depth Range (m)	Surface Parameter
MCMI_2017_mainscheme_4m_MLLW	4	1 - 154	N/A
MCMI_2017_crosslines_4m_MLLW	4	37 - 137	N/A

#### 4.5 Backscatter

Backscatter was logged in the raw .db files. The .db files also hold the navigation record and bottom detections for all lines of surveys. Processed files containing multibeam backscatter data (snippets and beam-average) were exported from Qimera v.1.5.4. in .GSF format. QPS Fledermaus Geocoder Toolbox (FMGT; v.7.7.7, 64-bit edition) was used to import, process, and mosaic time-series backscatter data. Default backscatter processing settings were used to create the mosaic, except for the Angle Varied Gain (AVG) filter and AVG window size, which were set to 'Adaptive' and '100', respectively. The 4-meter backscatter mosaic of the data is shown in Figure 11. The GSF files containing the extracted were submitted with the data in this survey. Processed mosaics (Table 10) were saved in geoTiff format and also submitted.

Table 10 – Backscatter mosaics submitted with 2017 survey data

Mosaic Name	Pixel Size (m)
MCMI_2017_mainscheme_backscatter_4m	4

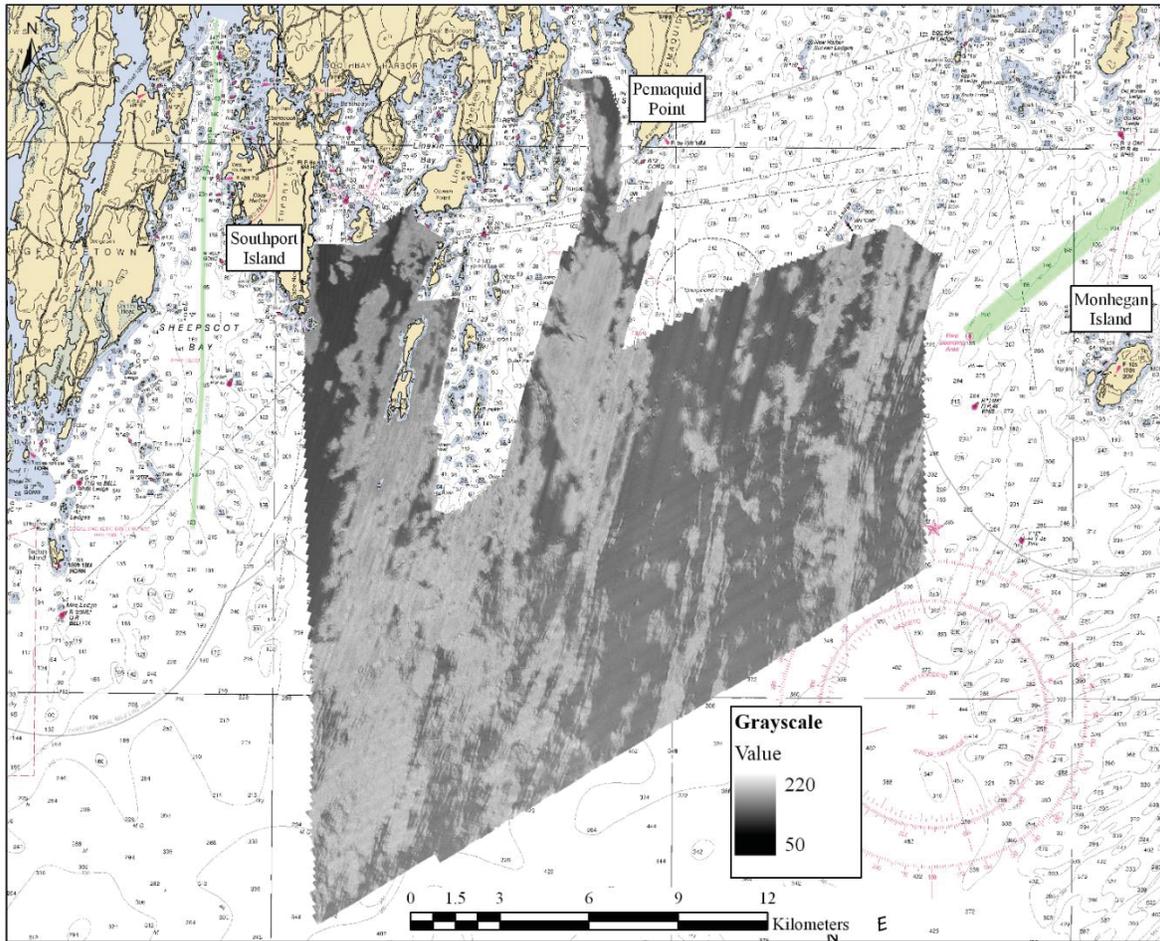


Figure 11 – Backscatter mosaic (4-meter pixel size) of 2017 mainscheme survey

## 5.0 Results

### 5.1 Charts Comparison

The hydrographer conducted a qualitative comparison of reclassified bathymetry data and depth contours from the surveyed area to the charted soundings and contours. The largest scale raster navigational charts which cover the survey areas are listed in Table 11. Prior hydrographic surveys in the vicinity were conducted by NOAA between 1888 and 1969 and consisted only of partial bottom coverage. These data were not compared with data collected by the MCMI.

Table 11 – Largest scale raster charts in survey area

<b>Chart</b>	<b>Scale</b>	<b>Source Edition</b>	<b>Source Date</b>	<b>NTM Edition</b>	<b>NTM Date</b>
13288	1:80,000	43	7/1/2010	95	2/28/2015
13293	1:40,000	35	10/1/2010	84	2/28/2015
13301	1:40,000	21	8/1/2011	53	2/28/2015

Chart 13288

Small scale charts (< 1:80,000) inherently contain very generalized contours. As shown in Figure 12, the agreement between chart contours and new survey data (contoured at 60 feet intervals; same as chart) is good at depths less than 300 feet (91.4 meters). However, agreement becomes poor at depths beyond 300 feet, especially in the southwest portion of the surveyed area. This disagreement is most likely due to the low resolution and lack of full bottom coverage during prior surveys rather than over generalization. It is recommended that contours showing disagreement over broad areas be revised.

Chart 13293

Surveyed depths have good overall agreement with charted contours (Figure 13), although individual soundings may disagree at any given location.

Chart 13301

Surveyed depths have good overall agreement with charted contours (Figure 14), although individual soundings may disagree at any given location.

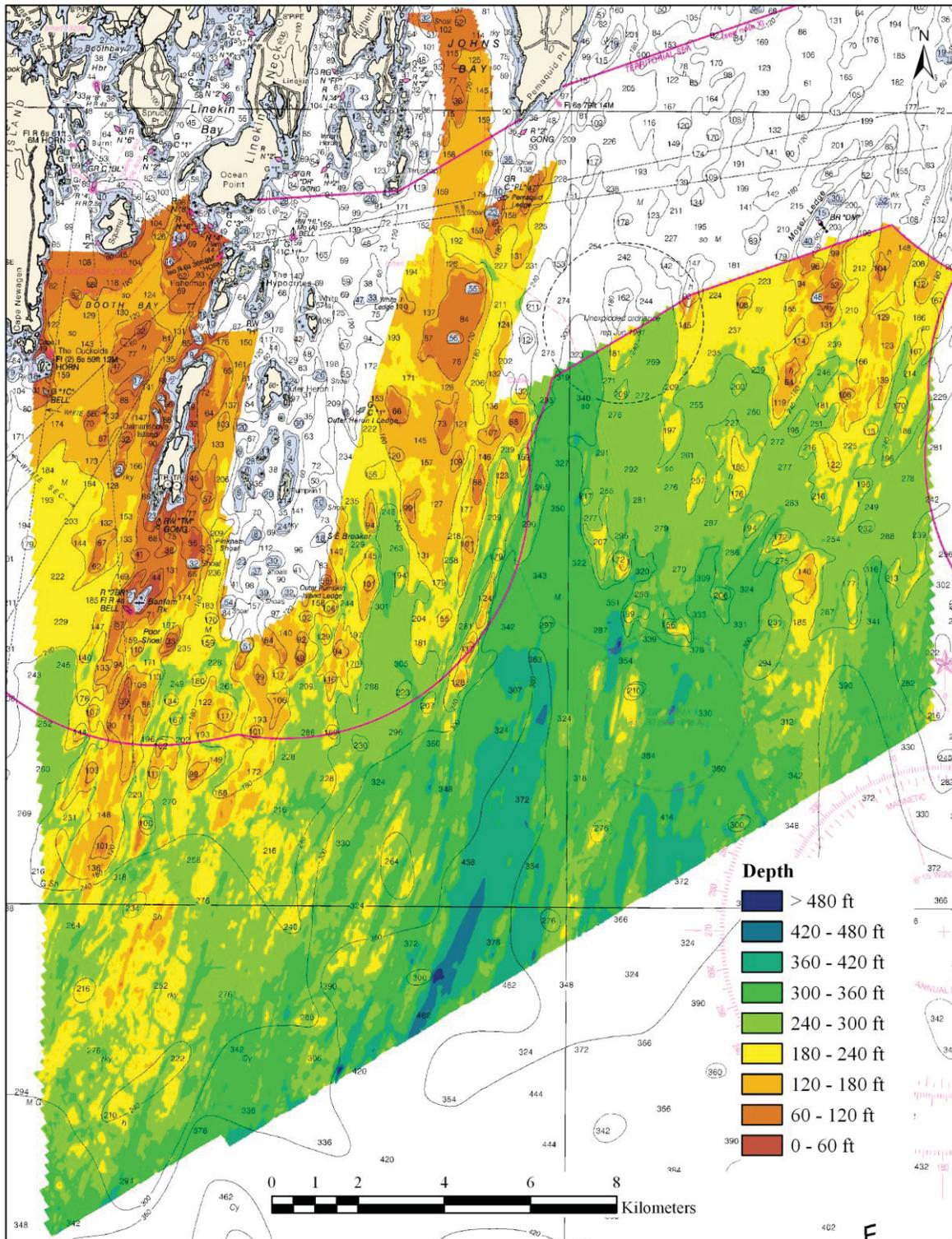


Figure 12 – Comparison between surveyed depth (reclassified at 60-foot intervals) and chart 13288 contours (60-foot interval)

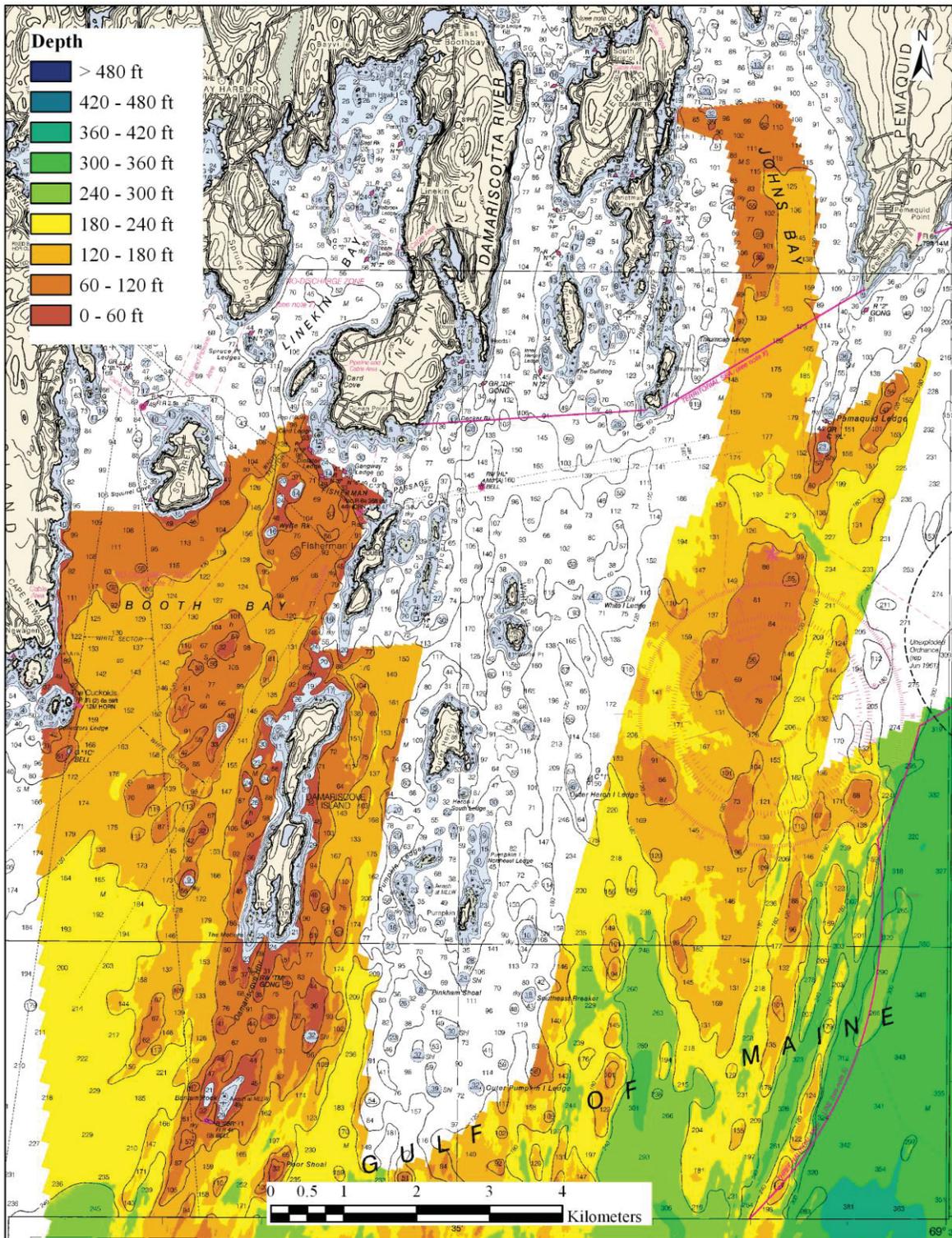


Figure 13 – Comparison between surveyed depth (reclassified at 60-foot intervals) and chart 13293 contours (60-foot interval)

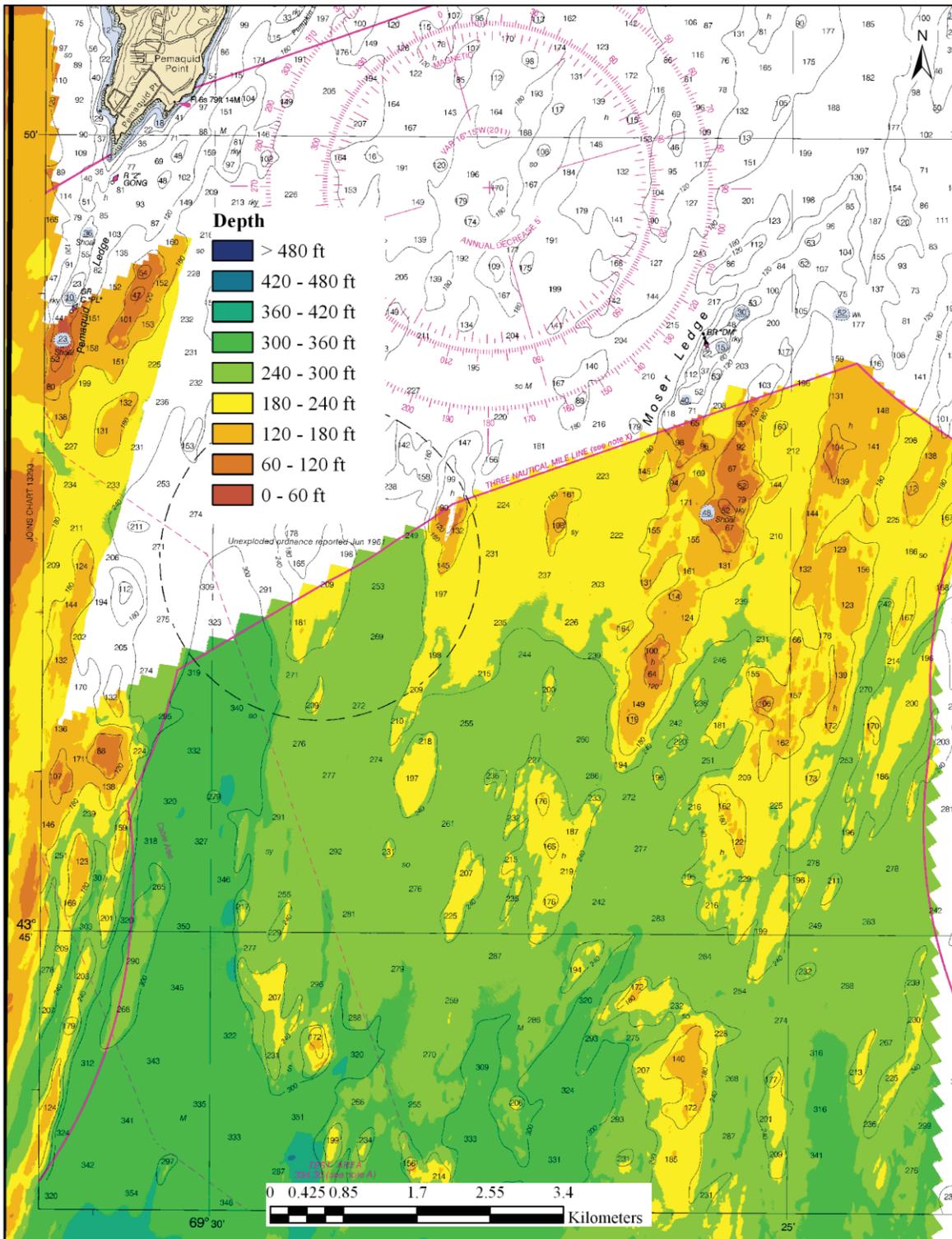


Figure 14 – Comparison between surveyed depth (reclassified at 60-foot intervals) and chart 13301 contours (60-foot interval)

## 5.2 Uncharted Features

A large, uncharted wreck was found in federal waters approximately 16.26 kilometers (8.8 nautical miles) due south of Pemaquid Point (Figure 15). The object was identified in real-time by the hydrographer on July 26, 2017. After completion of the planned survey line, the vessel returned to the site to acquire additional soundings in the immediate vicinity of the feature. Three additional lines were run parallel to the long axis of the feature: directly atop the interpreted center line, offset 58 meters to port, and offset 58 meters to starboard. These additional lines were included in the final bathymetric surface and were submitted with the data in this survey. An additional 2-meter surface was created to visualize and illustrate the feature at finer resolution (Figure 15a). Raw sonar file names that included soundings of this feature are listed in Table 12.

The depth of this feature was approximately 86 meters. Coordinates and additional attributes are listed in Table 13. The suspected wreck is oriented southwest (bow)-northeast (stern), and appears to be upright but slightly listing to port (southeast). Several attempts were made by the MCFI crew to obtain video and/or grab samples of the feature. The depth of the feature made precise sampling attempts difficult, and turbid water prohibited visualization during video review. However, bottom samples contained many coarse fragments of decomposed wood and small chips of coal.

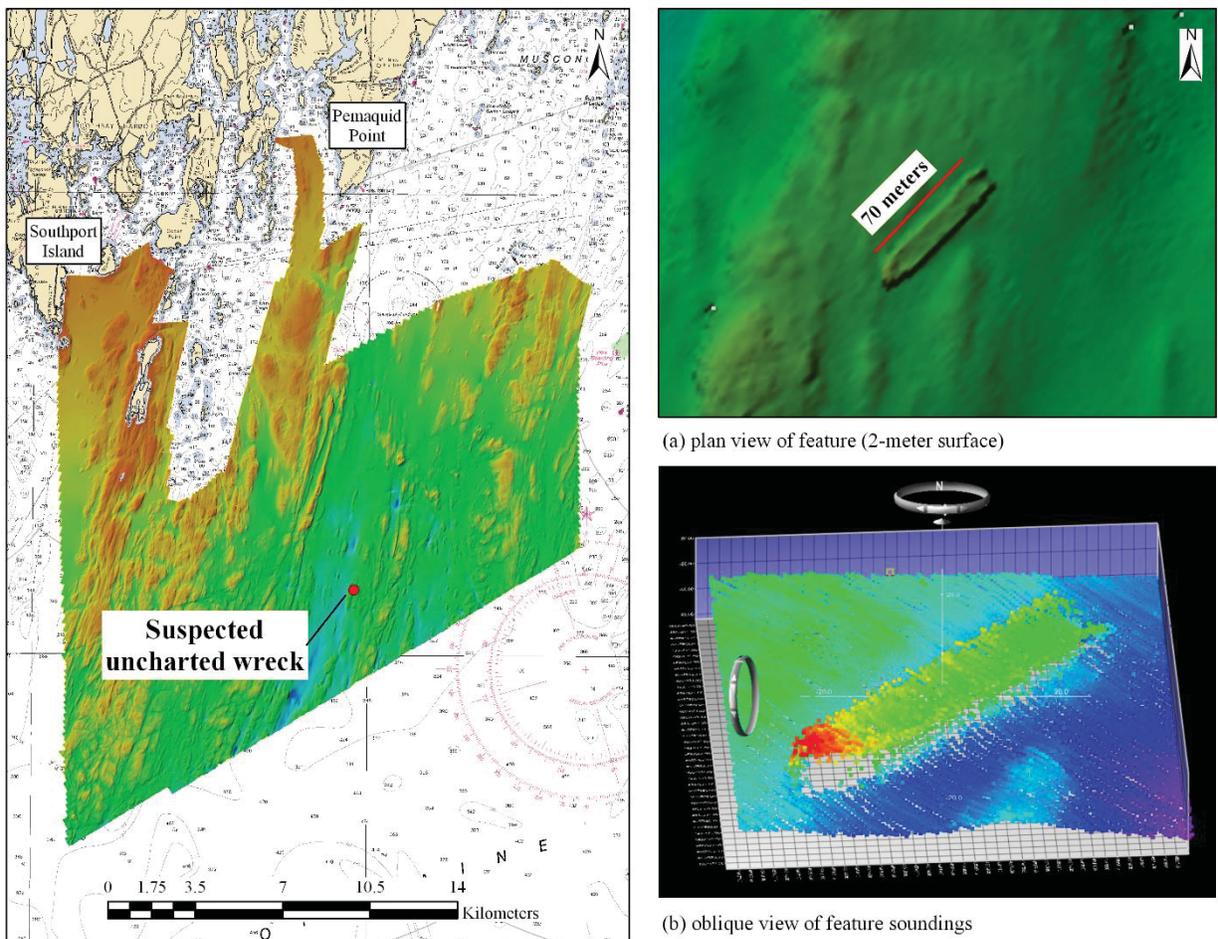


Figure 15 – Suspected uncharted wreck located in 2017 survey area

Table 12 – Raw sonar files with soundings of suspected wreck

**File Name (file#\_hhmmss(utc time)\_mmddyy\_vessel name – file suffix #)**

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0687_162644_072617_Amy Gale – 0001.db
0689_173227_072617_Amy Gale – 0001.db
0690_173504_072617_Amy Gale – 0001.db
0691_173652_072617_Amy Gale – 0001.db

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Table 13 – Coordinates and summary attributes of suspected uncharted wreck

<b>Lat.</b>	<b>Long.</b>	<b>Depth (m)</b>	<b>Length (m)</b>	<b>Width (m)</b>	<b>Orientation</b>
43 41.4225 N	69 30.3990 W	86	70	12-14	SW-NE

### 5.3 Bottom Samples

A total of 68 bottom samples, 44 in state water and 24 in federal waters, were collected to supplement existing sediment data collected previously by other agencies (Maine Geological Survey and University of Maine) in the survey area (Figure 16). The results of grain-size and video analyses were used to calibrate, refine, and digitize interpretations of seafloor substrate. These data were also used to investigate how these data relate to benthic infauna in the survey area. A shapefile containing bottom sample locations and attributes (e.g. textural classification) was also submitted with the data in this report.

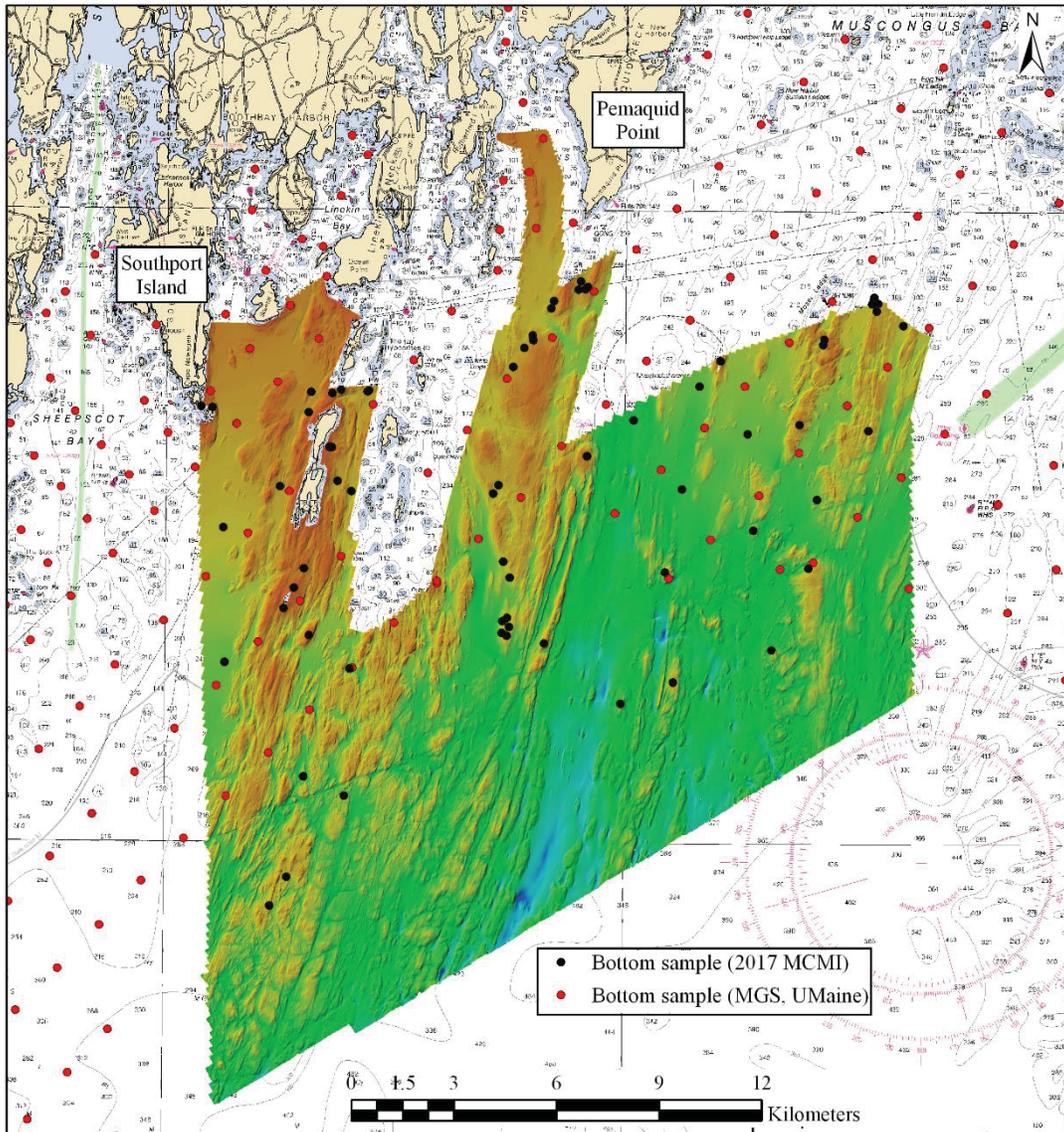


Figure 16 – Bottom sample locations (black circles) within 2017 mainscheme survey area. Orange circles represent all pre-existing sample sites collected in the survey areas by Maine Geological Survey and University of Maine

## 6.0 Summary

A total of approximately 128 mi<sup>2</sup> (331 km<sup>2</sup>) of high-resolution multibeam data were collected in the mainscheme survey area by MCFI between April and September 2017. With the exception of numerous small holidays, multibeam coverage was 100% in all areas surveyed. Survey data were processed with 1, 2, and 4 m grid resolution. The consistency of hydrographic data collected aboard the R/V Amy Gale was reflected in the results of the surface difference tests between crosslines and junction survey data, where mean vertical differences for all tests were less than 0.04 meters. Standard deviations of all tests were relatively low and comparable to those achieved by small NOAA vessels (e.g. *Ferdinand R. Hassler*) for similar surveys in Maine’s coastal waters. Comparisons between these survey data and the largest scale nautical charts in the immediate vicinity show good overall agreement except for in the southwest portion

of the surveyed area at depths greater than 91 meters. Overall, these data are of sufficient quality to supersede previous data collected in the vicinity. It is recommended that the corresponding charts be updated to reflect these data.

A large (~ 70-meter length), uncharted wreck was found in federal waters approximately 16.26 kilometers (8.8 nautical miles) due south of Pemaquid Point. Small, decomposed wood fragments and coal chips were recovered during bottom sampling attempts. However, water clarity was too poor to visualize the target feature.

A total of 68 bottom samples, 44 in state water and 24 in federal waters, were collected to supplement existing sediment data collected previously by other agencies (Maine Geological Survey and University of Maine) in the survey area.

MCMI has utilized final data products for high-resolution backscatter and bathymetry to refine existing seafloor sediment maps and determine the spatial extent of sand deposits within federal water. When combined with existing geophysical (e.g. seismic reflection profiles and side-scan sonar) data, these data may also be used to refine interpretations of coastal/nearshore geomorphology and three-dimensional assessments of potential sediment resources/valley fill in the region. In addition, these data are a critical component of benthic habitat classification and modeling performed by MCMI. Overall, these data have a variety of applications and are an invaluable resource to public and private agencies who wish to more effectively manage and understand coastal and marine resources.

These data were acquired and processed to meet Office of Coast Survey bathymetry standards as best as possible, and were shared with the UNH-NOAA Joint Hydrographic Center / Center for Coastal and Ocean Mapping for review.

Please contact the Maine Coastal Mapping Initiative for additional information or data requests.

## References

NOAA, 2014. NOS hydrographic surveys specifications and deliverables: U.S Department of Commerce National Oceanic and Atmospheric Administration. Page 89.

U.S. Department of the Interior, 2014. Proposed geophysical and geological activities in the Atlantic OCS to identify sand resources and borrow areas north Atlantic, mid-Atlantic, and south Atlantic-Straits of Florida planning areas, *final environmental assessment*. OCS EIS/EA BOEM 2013-219 U.S. Department of the Interior Bureau of Ocean Energy Management Division of Environmental Assessment Herndon, VA, January 2014.

APPROVAL PAGE

W00450

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

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Processed survey data and records
- GeoPDF of survey products
- Backscatter mosaic
- Bottom Samples

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.

Approved: \_\_\_\_\_

**Commander Meghan McGovern, NOAA**  
Chief, Atlantic Hydrographic Branch