NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey **Navigable Area**

Field No. **CCOM-JHC**

Registry No. **W00244**

LOCALITY

State **Maine**

General Locality **Atlantic Ocean**

Sublocality **Offshore of Gerrish and Cutts Island**

2012

CHIEF OF PARTY

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DATE

NOAA FORM 77-28 (11-72)

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

REGISTRY No

W00244

HYDROGRAPHIC TITLE SHEET

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

FIELD No

CCOM-JHC

State **Maine**

General Locality **Atlantic Ocean**

Sub-Locality **Offshore of Gerrish and Cutts Island**

Scale **1:10,000** Date of Survey **June 5-22, 2012**

Instructions dated **n/a** Project No. **n/a**

Vessel **R/V Coastal Surveyor**

Chief of party **Dr. Semme Dijkstra, University of New Hampshire**

Surveyed by **UNH Summer Hydrographic Field Course 2012**

Soundings by echo sounder, hand lead, pole **MBES (Kongsberg EM2040)**

Graphic record scaled by **n/a**

Graphic record checked by **n/a** Automated Plot **n/a**

Verification by

Soundings in fathoms feet at MLW MLLW **Meters at MLLW**

REMARKS: **All times are UTC.**

The primary purpose of this survey is for training of students registered in the Summer Hydrographic Field Course, 2012, at the Center for Coastal and Ocean Mapping Joint Hydrographic Center at the University of New Hampshire. Data and deliverables are also prepared to NOAA specifications and are deemed suitable for nautical chart update.

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537

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. Revisions and Red notes were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. Page numbering may be interrupted or non-sequential. All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

DATE: August 10, 2012

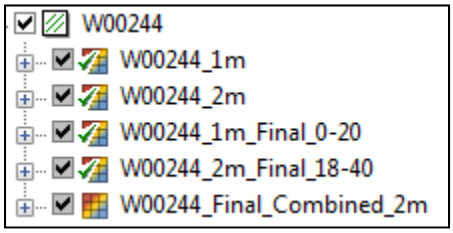
TO: Chief, Atlantic Hydrographic Branch

FROM: UNH-CCOM/JHC Summer Hydro 2012 Class

SUBJECT: UNH Summer 2012 Hydrographic Field Course Survey Data, W00244

The attached report describes hydrographic survey data acquired during the 2012 University of New Hampshire Summer Field Course, which officially ended on July 7, 2012. Since the report was written, the following has occurred:

- Twenty DTONs were submitted by the Atlantic Hydrographic Branch to the Nautical Data Branch (see email correspondence dated July 13, 2012).
- The Nautical Data Branch acknowledged receipt of 20 DTONs from this survey data (see email correspondence dated July 16, 2012).
- Final, approved zoned water levels from NOAA CO-OPS were delivered to UNH-CCOM/JHC and were applied to the HDCS data (see email correspondence dated August 2, 2012).
- A registry number, W00244, was assigned by the NOAA Office of Coast Survey Hydrographic Surveys Division to these survey data (see email correspondence dated August 6, 2012).
- A new field sheet, W00244, was created using the same geographical extents as the field sheet that was used to create finalized and combined surfaces, containing the following CUBE surfaces created from the HDCS data corrected with final, approved zone tides:



All data acquisition, processing, and analysis methods remain as described in the Descriptive Report, though the submitted HDCS depth values are changed slightly due to the application of final, zoned water levels instead of single station preliminary water levels. The consequence of this is that all screen grabs and references to surveyed soundings including designated soundings are slightly changed; however, the relative data quality has not been affected.

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2012 Summer Hydrographic Field Course
Center for Coastal and Ocean Mapping
University of New Hampshire
Durham, NH 03824 USA

Introduction

The primary objective of the data and deliverables that accompany this hydrographic survey are to meet the requirements of the Hydrographic Field Course as part of the completion of the M.S. and Graduate Certificate programs in the Ocean Mapping and Ocean Engineering curriculums at the University of New Hampshire.

A secondary objective of the survey was to investigate a geological feature identified by NOAA hydrographic survey H10763 (conducted by NOAA Ship *Rude* in 1997), at the request of Professor Wallace Bothner of the UNH Earth Sciences Department.

Finally, the survey was conducted in accordance with the best practices listed in the *2012 NOAA Field Procedures Manual*, and the data and deliverables that accompany this package have been prepared in order to meet the requirements of the *2012 NOS Hydrographic Surveys Specifications and Deliverables Manual*. For these reasons the survey deliverables are submitted to the NOAA Office of Coast Survey for the purpose of updating the nautical chart.

Summer Hydro 2012

Team "Pink": Anna Berry, Yunus Cezairli, Chris Englert, Giuseppe Masetti, Thanh Nguyen

Team "Green": Mohammad Chowdhury, Prasadh Gunasinghage, Saw Thein, Matt Wilson

Team "Zero": Xiao Guo, Norhizam Hassan, Hiroki Minami, Briana Welton

Instructors: Dr. Semme Dijkstra, CAPT Andy Armstrong, NOAA (ret.)

Boat captains: Ben Smith, Emily Terry

Acronyms and abbreviations

AML	Applied Microsystems, Ltd
BAG	Bathymetric Attributed Grid
CCOM	Center for Coastal and Ocean Mapping
CO-OPS	Center for Operational Oceanographic Products and Services
CUBE	Combined Uncertainty and Bathymetry Estimator
DGPS	Differential Global Positioning System
DN	Day Number
DTON	Danger to Navigation
ENC	Electronic Navigation Chart
FPM	Field Procedures Manual
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSSD	Hydrographic Surveys Specifications and Deliverables
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
JHC	Joint Hydrographic Center
MLLW	Mean Lower-Low Water
NAD83	North American Datum of 1983
NGDC	National Geophysical Data Center
NM	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
POS/MV	Position and Orientation System for Marine Vessels
R/V	Research Vessel
SIS	Seafloor Information System
TPU	Total Propagated Uncertainty
TVU	Total Vertical Uncertainty

Descriptive Report to Accompany Hydrographic Survey

Offshore of Gerrish and Cutts Islands, Maine

Scale 1:10,000

June 5 - 28, 2012

Center for Coastal and Ocean Mapping

Summer Hydrographic Field Operations

A. AREA SURVEYED

The Summer Hydrographic Field Course of 2012 conducted hydrographic survey operations offshore of Gerrish and Cutts Islands of the state of Maine. The area extends from nearshore to Cutts Island, to approximately 2.4 NM offshore of Gerrish Island (see Fig. 1). The nearshore limit is in this case not defined by any particular depth contour but instead by the discretion of the boat captain with regards to safety of equipment and personnel. The offshore limits extend past the charted 60 foot contour. Bounding coordinates for the area are given in Table 1. Complete coverage multibeam data was acquired over the full extent of the survey polygon depicted in Figure 1, with the exception of those areas deemed unsafe in the northernmost landward portion of the survey area.

Table 1. Bounding coordinates

	Latitude	Longitude
North	N 43° 06’ 00.23”	W 070° 39’ 02.46”
South	N 43° 02’ 20.89”	W 070° 38’ 05.22”
East	N 43° 03’ 31.67”	W 070° 36’ 53.14”
West	N 43° 03’ 24.13”	W 070° 40’ 22.39”

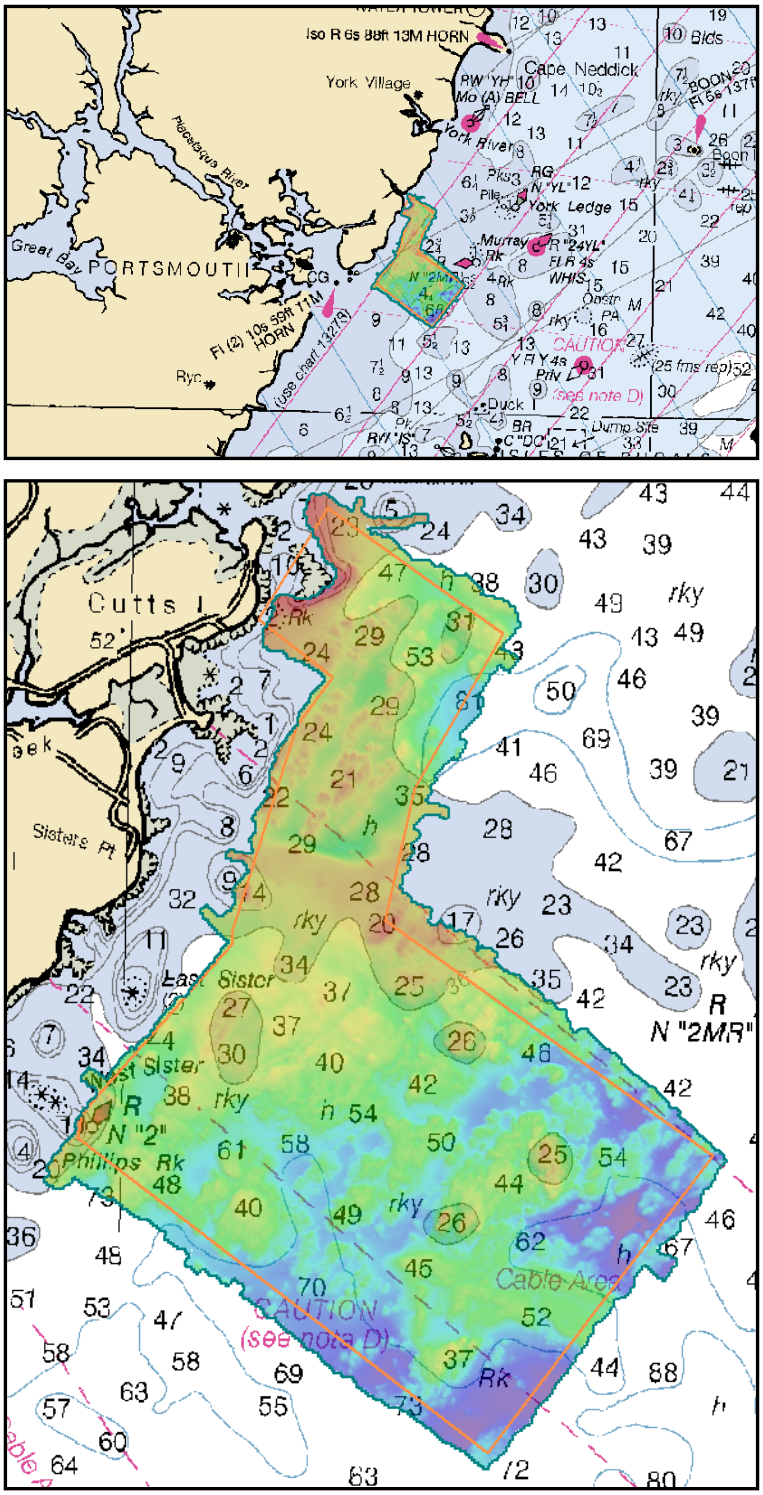


Figure 1. Summer hydrographic field course 2012 survey area, planned (orange) and accomplished (bathymetry), against chart 13260 (top), and chart 13286 (bottom)

Survey operations were conducted on the days of June 6-8, 11-15, and 18 (DN 158-160, 163-167, 170). Bottom samples were acquired on June 28 (DN 180). Table 2 lists the detailed statistics of survey operations over these days, and Table 3 lists the breakdown per day.

Table 2. Total survey statistics

Mainscheme (nm)	186.7
Crosslines (nm)	9.4
Total (nm)	196.9
Total Coverage (nm^2)	4.02

Table 3. Survey statistics by day

DN	Accomplishment
158	5.7 nm
159	27.2 nm
160	31.3 nm
163	30.8 nm
164	17.2 nm
165	32.6 nm
166	27.2 nm
167	20.4 nm
170	4.6 nm
180	22 bottom samples

B. DATA ACQUISITION AND PROCESSING

B1. Equipment

B1a. Survey vessels

The R/V Coastal Surveyor is a 12.2 m research vessel, outfitted with a Kongsberg EM2040 multibeam echo sounder, mounted on the vessel's bow ram for hydrographic survey operations. The vessel features active roll stabilization and hydraulic stabilizers to facilitate multibeam echo sounding. Specifications and equipment for the R/V Coastal Surveyor are listed in Table 4.

Table 4. Information for the R/V Coastal Surveyor

Boat Specifications	
Length	12.2 m
Beam	3.6 m
Maximum Draft	1.13 m
Flag	U.S.
Registry	U.S. Coastwise and Registry
Official Number	999206
Top Speed	10 knots
Roll Stabilization	Niad active fins
GPS	Garmin GPS17, WAAS Enabled
Primary Echo Sounder	Kongsberg EM2040
Sound Speed Equipment	AML Minos-X, AML Smart-X
Positioning and Attitude	Applanix POS/MV with IMU
RTK GPS Receiver	Trimble 5700
GPS Antennas	2 x Trimble Zephyr Antennas
Data Acquisition Software	Hypack
Additional Equipment:	Electric Anchor Winch Bow Ram Transducer Mount Navigation Computer Internal Gigabit Network

The R/V Cocheco is a 10.4 m research vessel designed primarily for towing oceanographic equipment with its hydraulic A-frame and cable winch, capable of lifting 1000 lbs. The vessel has a tow load of 1000 lbs. The vessel was outfitted with a Moving Vessel Profiler from Rolls Royce during the time of survey, however the profiler was used entirely for research purposes, and was not used to acquire sound speed information for this survey. Similarly, the vessel did not acquire any single beam bathymetry in relation to this survey. The sole purpose of the R/V

Cocheco was for the acquisition of bottom samples on June 28th, 2012, with the Wildco Shipek grab sampler, operated with the vessel's hydraulic A-frame and cable winch. Specifications and equipment for the R/V Cocheco is given in Table 5.

Table 5. Information for the R/V Cocheco

R/V Cocheco		
	***Boat Specifications***	
	Length	10.4 m
	Beam	3.6 m
	Maximum Draft	1.7 m
	Flag	U.S.
	Top Speed	16 knots
	GPS	Garmin GPS17, WAAS Enabled
	Primary Echo Sounder	Odom Echotrac CV200
	Sound Speed Equipment	Moving Vessel Profiler
	Bottom Sampler	Wildco Shipek Grab Sampler
	Differential GPS	Trimble DSM212h
	GPS Antennas	Trimble 27207
	Data Acquisition Software	Hypack
	Additional Equipment:	Hydraulic Winch and A-Frame 300 ft cable with slip ring Navigation Computer Internal Gigabit Network

B1b. Hardware and software inventories

A complete list of all hardware utilized during 2012 Summer Hydrographic Field Operations is given in Table 6, including manufacturer, model, and serial numbers.

Table 6. Hardware inventory

Function	Equipment	Manufacturer	Model	Serial Number
Echo Sounding	Multibeam Echosounder	Kongsberg	EM 2040	TX 107, RX 108
	Hydrographic Work Station	Kongsberg	HWS 14	1310

	Processing Unit	Kongsberg		201
Sound Speed	Surface Sound Speed Sensor	AML	Smart X	5273
	Sound Speed Profilers	AML	Minos X	8247
Attitude and Positioning	Position Computer System	Applanix	320 V.4 POS/MV	2171
	Inertial Motion Unit	Applanix	IMU-200 POS/MV	179
	GPS Primary Antenna (Port)	Trimble	Zephyr	6000 4297
	GPS Secondary Antenna (Starboard)	Trimble	Zephyr	6000 8122
Horizontal Positioning	GPS Base Station Receiver	Trimble	5700	220311827
	2 Radio Modems	Trimble	Trimark 3	4526152531, 4526152537
Bottom Sampler	Grab Sampler	Shipek	Shipek® Grab	

A complete list of all software utilized during 2012 Summer Hydrographic Field Operations is given in Table 7, including version and provider.

Table 7. Software inventory

Software	Version	Provider	Purpose(s)
Hypack 2012	12.0.0.1	Hypack Inc.	1. Pre-survey line planning and 2. Real-time line navigation.
SIS	3.8.4	Kongsberg Maritime	1. Onboard multibeam data acquisition, and 2. Real time data monitoring.
POSView	3.4.0.0	Applanix	1. To monitor and log position and attitude data during survey
Seacast	2.2.3	Kongsberg Maritime	1. To interface with AML Minos-X sound speed probe, and 2. To connect and download SVP data
HIPS	7.1.1	CARIS	1. To process all acquired hydrographic data.
Bathy DataBASE	3.2.1	CARIS	1. To analysis data, and 2. To create bathymetric components for chart comparison.
Fledermaus FMGT	7.3.2	Fledermaus	1. For additional data analysis, especially for multibeam backscatter mosaic creation.

B1c. Echo sounder

A Kongsberg EM2040-07 multibeam echo sounder integrated with AML Smart-X sound speed sensor was utilized to attain complete coverage within the practicable limits of the survey area. The multibeam system consists of four basic components; transmit and receive transducers, a processing unit, and a workstation, each of which are displayed in Figure 2. The transmit and receive transducers, observed in Figure 2, were mounted on the adjustable bow ram of the R/V Coastal Surveyor on June 4, 2012.

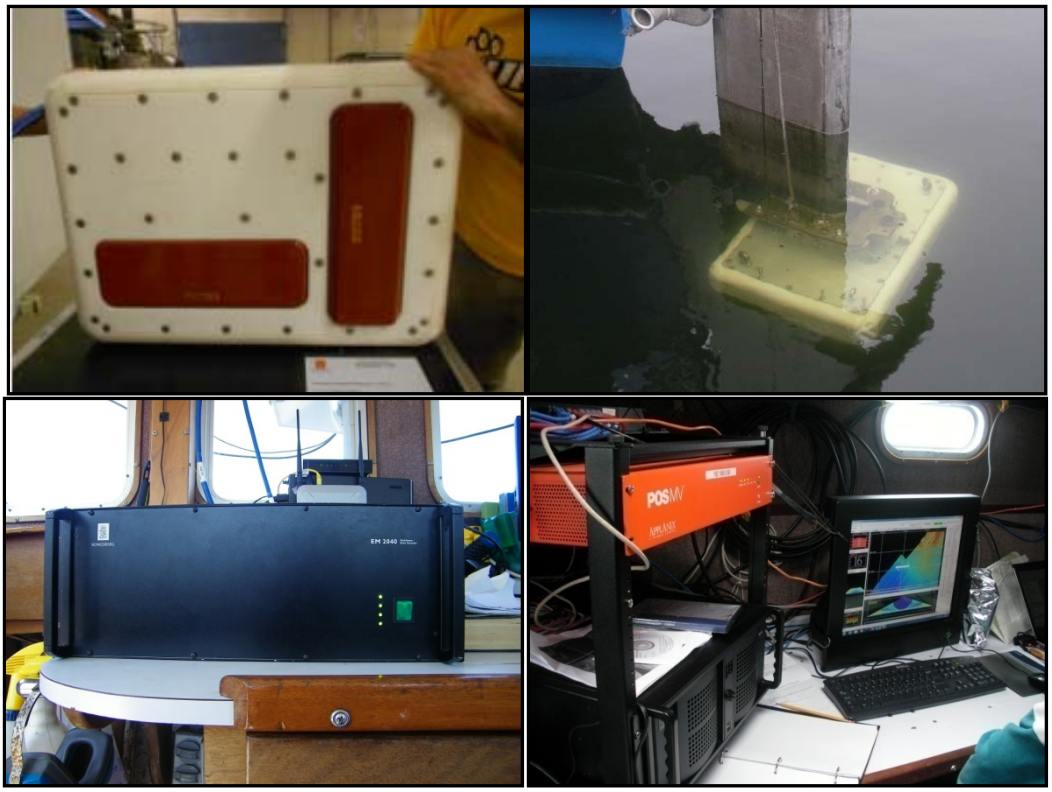


Figure 2. Kongsberg EM2040 transmit and receive transducers (top left), sonar head mounted to bow ram (top right), processing unit (bottom left), and workstation (bottom right)

The EM2040 is capable of operating frequencies between 200 - 400 kHz, which can be adjusted "on the fly" during operational status. The system features complete roll, pitch, and yaw stabilization, and dual swath capability for increased along-track sounding density. The maximum operating depth of 6000 m, and a swath up to 140°/200° is achievable for the single/dual RX modes, respectively. Furthermore the system offers sounding patterns equiangular, equidistant, and high density, as well as normal and single sector operating modes (continuous wave or frequency-modulated).

For the entirety of multibeam data acquisition, the system operated at a 300 kHz frequency, which is the ideal frequency to meet the requirements of this survey. 300 kHz provides better resolution than 200 kHz, and the attenuation associated with the higher frequency is not an issue in the depths within the survey area, which are relatively shallow (maximum depth ~30 m). In addition, it was not considered necessary to use the 400 kHz frequency, which is more applicable

to object detection and feature development work, and not for the assigned objective of this survey, which is complete coverage multibeam.

The system operated with a 140° swath (though lines were planned as though the swath were 120°, to help ensure complete coverage is achieved). High density, equidistant mode of operation was utilized as well, with 400 beams, to ensure uniform resolution across the entirety of the swath, and also to ensure adequate sounding density was achieved. The Normal mode was chosen to utilize multisector functionality, a unique feature of this multibeam that transmits three sectors at separate frequencies to minimize interference.

B1d. Position, heading, and motion reference systems

The R/V Coastal Surveyor is outfitted with an Applanix POS M/V 320 v4, which was used to measure attitude, heading, heights, and position, to be applied in real-time. As shown in Figure 3, the system includes an IMU 200, POS data processor, and dual Trimble GPS Zephyr antennas.

Figure 3. Components of the POS M/V 320 v4 integration on the R/V Coastal Surveyor include the POS computer system (top left), IMU (top right), GPS antennas (bottom left), and RTK receiver (bottom right)

A previously established base station at Odiorne Point, NH, was the source of the RTK corrections, via Trimble TriMark 3 radio modems, in CMR+ format. The base station is displayed in Figure 4.

Figure 4. RTK GPS base station at the Seacoast Science Center at Odiorne State Park, NH, includes the radio and GPS antennas (left), and Trimble radio modem and GPS receiver (right)

The furthest extent of the survey area was within 8.5 km of this source, and fixed-RTK was achieved throughout the entirety of survey operations. Positions from the POS M/V were output real-time to SIS and Hypack via serial connection. POS files were also logged in POSView for each day of acquisition at 50 Hz, though these were not used in post-processing.

B1e. Sound speed measurement systems

Transducer sound speed measurements for beam forming was attained via AML Smart-X SVP probe, mounted on the sonar head during mobilization. Full water-column corrections to sound speed were attained via AML Minos-X, which was lowered by hand over the side of the R/V Coastal Surveyor. Both sound speed probes are displayed in Figure 5.

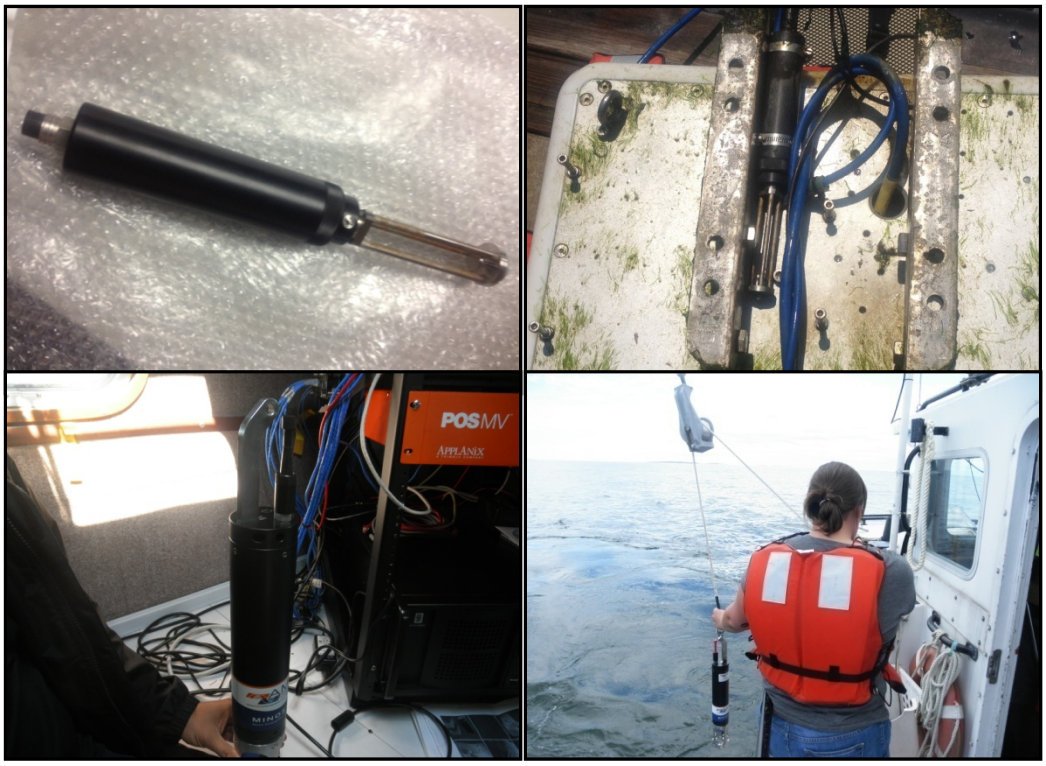


Figure 5. AML Smart-X as received (top left) and mounted to sonar head (top right), and AML Minos-X below deck (bottom left) and lowered over the side (bottom right)

Initially there was concern regarding the AML Minos-X sensor in that the date of last calibration was in 2010, which makes the sensor well out of specification. However the sensor was compared with a 2012-calibrated Seabird 19 CTD, and the results were within 1 m/s, well inside the bounds of the chosen TPU value for measured sound speed (4 m/s). Thus the AML was deemed fit for use, despite the past date of last calibration. In addition, the level of effort required to utilize an alternate means of sound speed for the real-time sound speed corrections to the SIS acquisition software were significant enough such that substitution was not desired.

Nevertheless, the hydrographer was cognizant of this issue throughout the entirety of survey operations, and near real-time processing of the acquired data was achieved. Refraction of any significant magnitude was not observed (see Section B3e).

B1f. Bottom sampler

A total of 22 bottom samples were obtained on June 28th, 2012 (DN 180). Samples were obtained with a Wildco Shipek grab sampler, displayed in Figure 6.

Figure 6. Wildco Shipek grab sampler, on deck (left), and lowered by cable winch on the A-frame of R/V Cocheco

Metadata for each sample, as well as a description of the bottom characteristics, are given in DR Section D2f (below), and the bottom sample acquisition logs (with photographs of each sample) are included in DR Separates I. The S-57 Seabed Area objects (with S-57 attributes Nature of Surface (NATSUR) and Nature of Surface qualifying term (NATQUA) completed accordingly) are included in the survey submission.

B1g. Acquisition and processing systems

Acquisition

- The Kongsberg Maritime SIS software v.3.8.4 was utilized for all multibeam data acquisition onboard the R/V Coastal Surveyor. The real-time processing capabilities of SIS were utilized, and thus waterline and vessel offsets, patch test values, and sound speed corrections were input into the system and the corrections applied during acquisition. The data output was the standard SIS format (.all).

- Hypack 2012 v.12.0.0.1 was utilized for navigation software. Line plans were created within Hypack and utilized for vessel line steering. The helmsman monitor was connected to the PC containing Hypack, and an extended desktop used to create an optimal display for line steering, tailored specifically to the boat captain's preferences. In addition, the video attachment to the helmsman's monitor included a switch, such that SIS could also be displayed, which facilitated the filling-in of data gaps and holidays, as well as allowing for adaptive line steering, should that be desired.
- Applanix POSView v. 3.4.0.0 was used to monitor and log position and attitude data during survey operations.
- Kongsberg Seacast v.2.2.3 was utilized to interface with AML Minos-X sound speed probe, to connect and download data. SIS SVP Editor was then used to correctly format the derived .asvp file prior to SIS input, and finally to transmit the sound speed data to SIS for the real-time correction.

Processing

- CARIS HIPS v.7.1.1 was utilized for the processing of all acquired hydrographic data.
- CARIS Bathy DataBASE v.3.1.1.0 was utilized for data analysis and to create bathymetric components for chart comparison.
- Fledermaus FMGT was utilized for additional data analysis, particularly for multibeam backscatter, processing and mosaic generation.

B1h. Survey mobilization

Mobilization of the R/V Coastal Surveyor occurred on June 4th, 2012, at the UNH Pier in Newcastle, NH. Vessel offsets were measured via laser, ruler, and plumb bob (see Section B3a). Measurement uncertainties were entered into the CARIS HVF and applied during the post-processing of TPU (see Section B2c).

The installation of the EM2040 sonar head onto the adjustable bow ram of the R/V Coastal Surveyor was accomplished through use of a small boat, safety lines, and careful coordination of several survey personnel, as pictured in Figure 7.

Figure 7. Installation of the Kongsberg EM2040 on the bow ram of the R/V Coastal Surveyor

System integration of the EM2040 with the POS M/V and vessel acquisition PC occurred on the afternoon of June 4th, 2012, and a Wiring Diagram with all the relevant details (connection type and parameters) is given in DR Appendix V.

Multibeam patch test calibrations (see Section B3d) occurred June 5-6, 2012, and ensuing application of the offset values and data analysis allowed for the hydrographer to have full confidence that the survey vessel was ready to commence with data acquisition.

B1i. Survey coverage

The survey area, offshore of Gerrish and Cutts Islands of the state of Maine, was surveyed with lines of a general SW/NE orientation, which was optimal for alignment with depth contours, and also for vessel stability. Incoming seas in this region are generally from the southeast, perpendicular to ship movement, and thus the vessel is more exposed to roll than pitch. Since the vessel is roll stabilized, this is the preferred scenario for optimal stability.

The survey area extends from nearshore to Cutts Island, to approximately 2.4 NM offshore of Gerrish Island (see Fig. 1). The nearshore limit is in this case not defined by any particular depth contour but instead by the discretion of the boat captain with regards to safety of equipment and personnel. The offshore limits extend past the charted 60 foot contour. Complete coverage multibeam data was acquired over the full extent of the survey area, with the exception of those areas deemed unsafe in the northernmost landward portion of the survey area, as displayed in Figure 1. Line spacing is proportional with approximate depths, and was calculated with a +/- 60° usable swath to ensure sufficient overlap. In the northernmost part of the survey area, in depths generally less than 6 m, the line spacing was 20 m, save for the nearshore areas, where lines were driven at the discretion of the boat captain with safety in mind. From about 0.4 nm to an extent of slightly more than 1 nm offshore, depths are generally between 6 - 12 m, and the line spacing was then 40 m. The furthest points offshore, from 1 - 2.4 nm, depths are generally greater than 12 m, thus the line spacing was 50 m.

B2. Quality Control

B2a. Crosslines

A total of 10.2 nm of crosslines were acquired for analysis. Note this is 5.03% of the mainscheme, which meets the HSSD specification for multibeam surveys. Crosslines were run in a direction perpendicular to the mainscheme, with the same survey platform, for proper comparison. Analysis of crossline agreement was accomplished by differencing surfaces created solely from mainscheme or crossline data. The statistics are given in Table 8, and the difference surface is observed in Figure 8.

Table 8. Difference surface of survey mainscheme and crosslines

Grid Nodes	1,775,514
Mean Difference	0.01 m
Standard Deviation	0.13 m

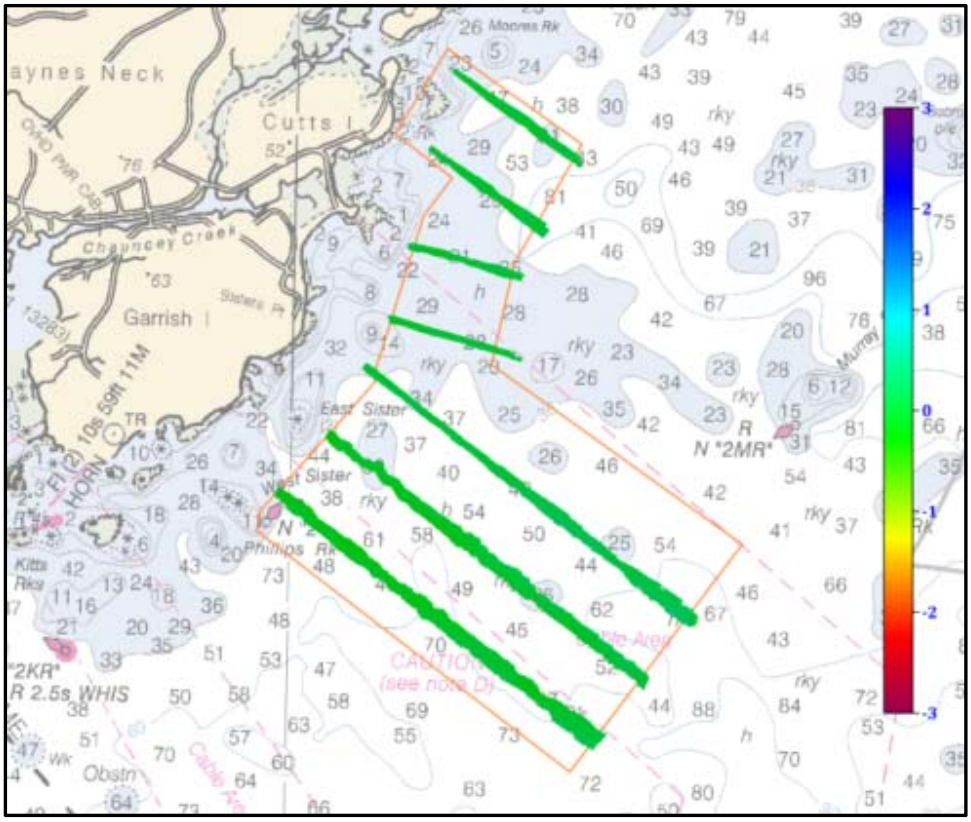


Figure 8. Difference surface of mainscheme and crosslines

B2b. Lead line comparisons

Lead line depth measurements were taken on June 5, 15, and 18 (DN 158, 168, and 170), prior to survey data acquisition, for comparison and quality control purposes. The measurements were taken adjacent and in-line with the sonar head to facilitate direct comparison. The lead line depths were within 0.01 m of the echo sounder's reported depth values.

B2c. Uncertainty

The standard deviation of all uncertainty values related to the vessel were entered into the CARIS HVF in accordance with 2012 HSSD guidance. These values are given in Table 9.

Table 9. TPU standard deviation values

TPU Standard Deviation	Value Entered in HVF
Motion Gyro (deg)	0.020
Heave %	5.000
Heave (m)	0.050
Roll (deg)	0.020
Pitch (deg)	0.020
Position Nav (m)	1.000
Timing Trans (s)	0.010
Nav Timing (s)	0.010
Gyro Timing (s)	0.010
Heave Timing (s)	0.010
Pitch Timing (s)	0.010
Roll Timing (s)	0.010
Offset X (m)	0.010
Offset Y (m)	0.010
Offset Z (m)	0.010
Vessel Speed (m/s)	0.300
Loading (m)	0.010
Draft (m)	0.010
Delta Draft (m)	0.010
MRU Align StdDev gyro	0.000
MRU Align StdDev R/P	0.000

In addition, uncertainty values for both tides and sound speed were entered into CARIS for the computation of TPU, based on 2012 FPM guidance (see Table 16).

1 and 2 meter resolution finalized CUBE surfaces were generated with final uncertainty assigned as the greater of either the uncertainty or standard deviation layers. An additional layer was then computed for both of the finalized CUBE surfaces as the maximum allowable TVU. This is a function of depth, and was calculated for each grid node, in both surfaces, based on the IHO Order I specification for maximum allowable TVU:

$$\pm\sqrt{a^2 + (b * depth)^2}$$

where a = 0.5 and b = 0.13 (for IHO Order 1). This layer of maximum allowable TVU based on IHO specification was differenced with the final uncertainty layer in each of the finalized CUBE surfaces, and the results show that 0.21% (for the 1m surface) and 0.63% (for the 2 m surface) of the grid nodes exceed IHO Order I specifications. These nodes out of specification reside either on the outer boundary of the survey area, where the outer beams have no overlap, or on the steep slopes of the bathymetry. Complete details are given in Table 10.

Table 10. Difference surface of maximum allowable TVU and uncertainty

	1 m Finalized CUBE Surface	2 m Finalized CUBE Surface
Grid Nodes	8,263,788	1,795,429
Mean Difference	0.3	0.3
Standard Deviation	0.1	0.1
Nodes Less than 0 (exceeds Maximum Allowable TVU)	17,198	11,289
Nodes greater than 0 (within Maximum Allowable TVU)	8,246,590	1,784,140
Percentage of nodes exceeding Maximum Allowable TVU	0.21%	0.63%

B2d. Junctions

The survey area has one junction with a contemporary survey, W00178 (the CCOM Summer Hydrographic Field Course area of 2006). W00178 survey operations utilized a Kongsberg 3002 multibeam echosounder, and data from this survey was acquired in the form of 2 BAG surfaces (0.5 and 1 m resolution) downloaded from the NGDC website. The 1 and 2 m BAG surfaces were each differenced from the combined surface. The statistics of the difference surfaces are given in Table 11, and the difference surface (and overlap with W00178), are observed in Figure 9.

Table 11. Difference surface of W00178 BAGs and combined surface

	W00178 BAG at 0.5 m	W00178 BAG at 1 m
Grid Nodes	487,692	132,501
Mean Difference	-0.02 m	-0.03 m
Standard Deviation	0.13 m	0.11 m

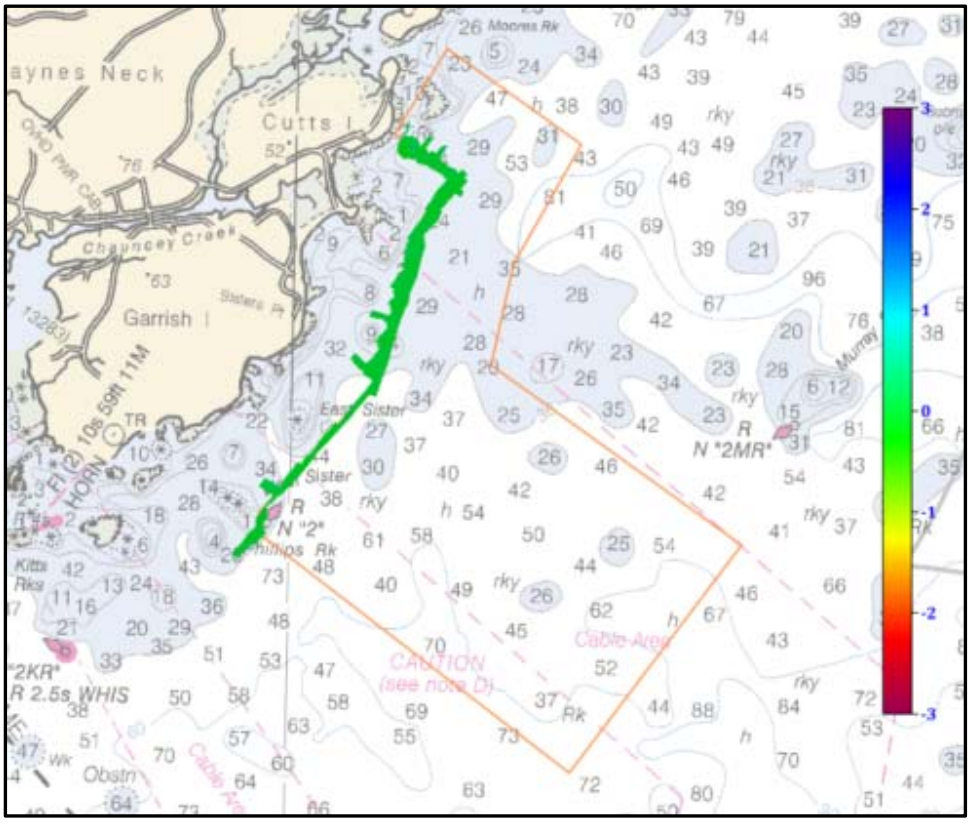


Figure 9. Difference surface of combined surface with W00178 BAG

B2e. Object detection and coverage requirements

Complete coverage requirements as dictated in the NOS Hydrographic Survey Specifications and Deliverables Manual were met by maintaining survey speeds and utilizing the high-density equidistant operating mode of the EM2040. Finalized CUBE surfaces of 1 m and 2 m encompass depth thresholds of 0-20 m, and 18-40 m, respectively, and cover all surveyed depths. 2012 HSSD specifications for data density require 95% of all nodes to contain 5 or more soundings. Statistics for both CUBE surfaces are given in Table 12, and show that the data density of both surfaces are easily within specification. The density layers of the 1 m and 2 m CUBE surfaces, colored by this specification, are observed in Figure 10. Any nodes with less than 5 soundings generally occur along the outer edge of the survey area, where the outer beams share no overlap.

Table 12. Data density of finalized CUBE surfaces

	Finalized Surface 0-20 m	Finalized Surface 18-40 m
Nodes	8,263,788	1,795,429
Mean Soundings Numbers/Node	71.1	119.3
Nodes with < 5 soundings	5,943	2,780
Percentage of nodes with ≥ 5 soundings	99.93%	99.85%

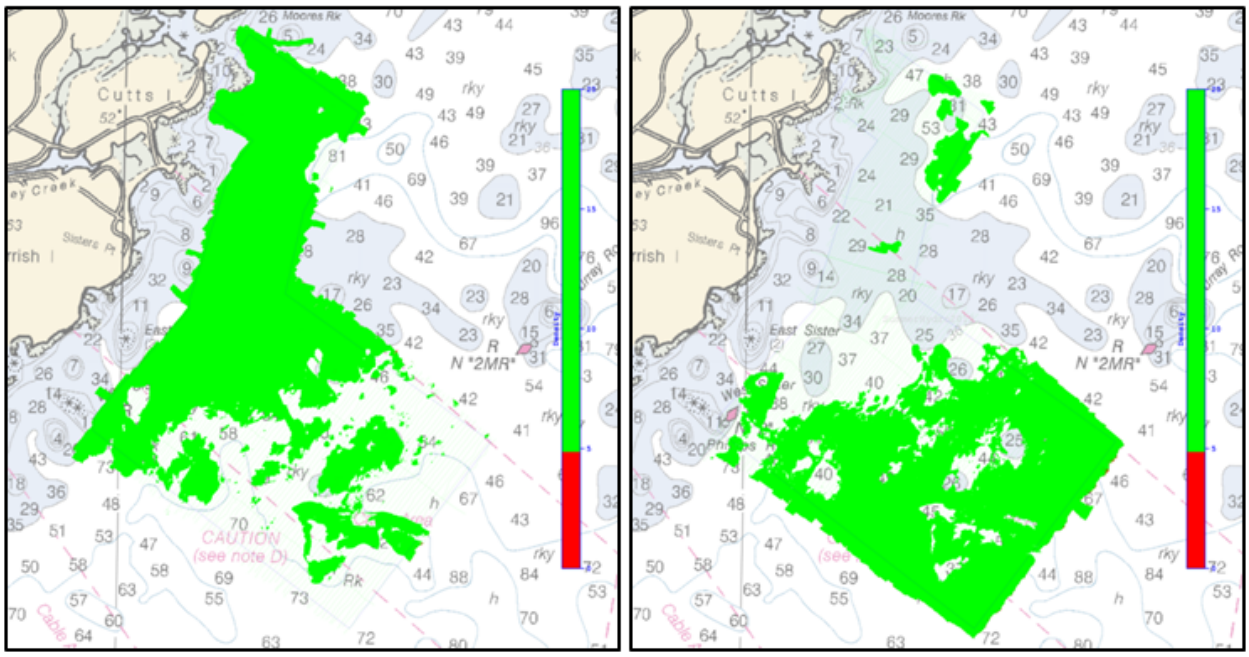


Figure 10. Sounding density layer of both the 1m (left) and 2m (right) finalized CUBE surfaces, colored by NOAA specification (< 5 soundings = red, > 5 soundings = green)

B2f. Observed data artifacts

Heave artifacts are evident in the computed surfaces of a magnitude up to 20 cm. An example is given in Figure 11 (approximate position, 43-05-42N, 070-38-17W). Application of True Heave in CARIS only exacerbates the magnitude of the observed artifact, so the True Heave operation was not performed. The observed heave artifacts are attributed to inadequate induced heave correction during times of high seas or after sharp turns.

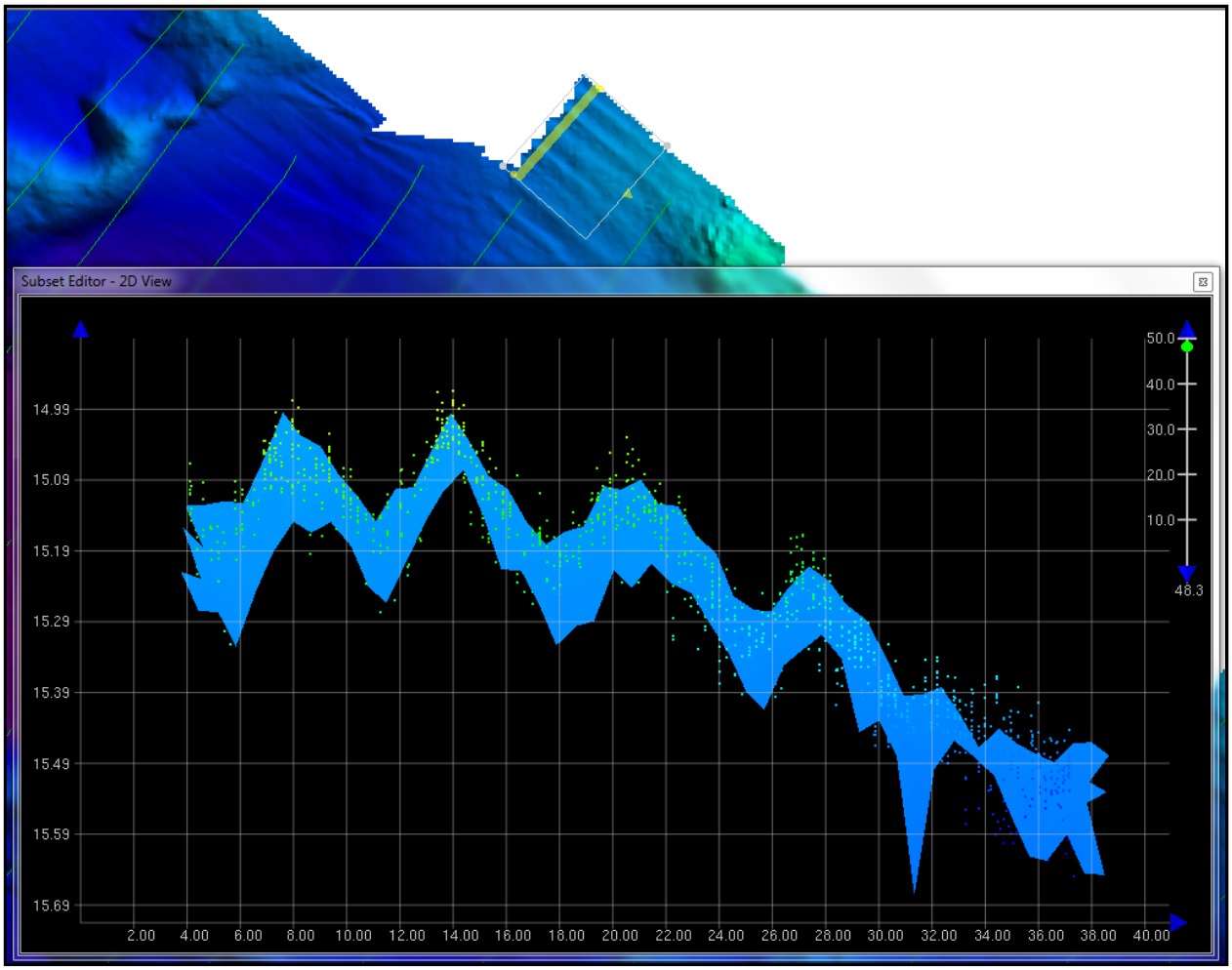


Figure 11. Heave artifact affecting computed bathymetric surface (vertical exaggeration=5), as observed in CARIS HIPS plan view (top) and Subset Editor 2D view (bottom)

B3. Corrections to Echo Soundings

B3a. Vessel offsets

Linear offsets for the R/V Coastal Surveyor, between IMU, primary GPS antenna, and sonar mounting plate, were taken from the archived values at CCOM (see DR Appendix V), and are verified on an annual basis via offset survey with total station. These offsets were verified once more by the class using laser, ruler, and plumb bob, on June 4th, 2012. Offsets from the sonar mounting plate to the EM2040 transducers (RX and TX) were measured by ruler prior to installation.

The vessel offsets are displayed below in Figure 12, and were entered directly into SIS, to be applied real-time during acquisition.

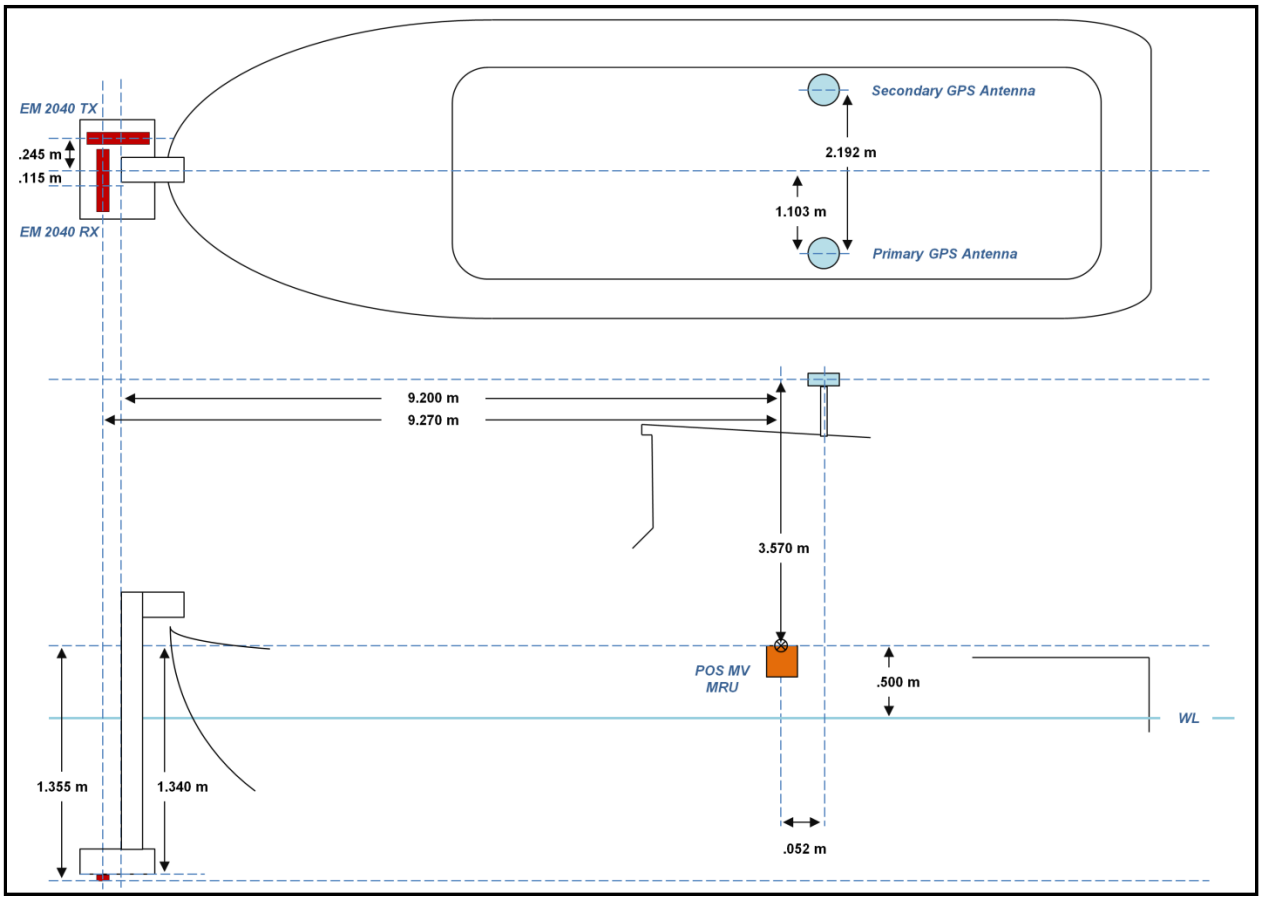


Figure 12. Measured offsets of the R/V Coastal Surveyor

In addition, a CARIS HVF was created, entitled "Coastal_Surveyor_Normal_300kHz.hvf", to be used for post-processing in CARIS HIPS. The HVF was created according to specifications of the EM2040 at the 300 kHz and Normal mode of operation. All physical offsets, multibeam calibration values, and a waterline value were entered into the HVF as "0" (once the final values were entered in SIS, to be applied real-time). A dynamic draft table from 2006 was entered in the HVF for application in post-processing. The physical offsets from IMU to transducer and antenna were entered into the TPU offset values, as well as TPU standard deviation values in accordance with the 2012 FPM (listed above in Table 9). See Section B4 for all the details concerning the HVF and ensuing data processing.

B3b. Static draft

Static draft readings were taken everyday onboard the R/V Coastal Surveyor while the vessel was stationary, and while within the survey area, via clear draft tube, conveniently positioned as to facilitate direct measurement from waterline to the IMU. A base value 0.5 m was entered into SIS, with the intent to enter any deviations from the nominal 0.5 m value in the CARIS HVF for post-processing. However, very little variation was observed in this static draft value, such that the standard deviation of the measurement was less than 5 mm. This standard deviation value is less than the nominal 1 cm value entered into the TPU standard deviation value for draft, thus it was deemed not necessary to input the static draft variation into the CARIS HVF, as it is more than accounted for in the TPU.

B3c. Dynamic draft

Determination of the R/V Coastal Surveyor dynamic draft was contingent upon available ship-time, and fell behind other priorities (such as testing of various settings of the EM2040, which occurred directly after acquisition was complete), thus an updated dynamic draft table was not generated. The values generated in 2006 survey operations (see DR Appendix V) were applied in CARIS post-processing via the HVF, and is displayed in Table 13 (note that the draft values are listed in the CARIS convention, which is positive down).

Table 13. Dynamic draft values

Draft (m)	Speed (m/s)
-0.025	0.514
-0.040	1.029
-0.043	1.543
-0.035	2.058
-0.017	2.572
0.012	3.087
0.053	3.601
0.104	4.116
0.166	4.630
0.239	5.144

B3d. Patch test

To determine the relative angular offsets between the IMU sensor and the multibeam transducer for the R/V Coastal Surveyor, three patch tests were performed in the local survey area at the beginning of the project. The patch test results for each group on June 5th (DN 157) and June 6th (DN 158) are listed in Table 14. All lines were run at approximately 6 knots to 8 knots. The procedure was conducted in accordance with the best practices listed in the 2012 Field Procedures Manual.

Table 14. Patch test results by group

Group	DN	Latency	Pitch (°)	Roll(°)	Heading(°)	Remarks
Pink	157	0.00	1.50	-1.40	---	Did not have time to accomplish Heading lines
Green	157	0.00	1.70	-1.40	-0.80	These values entered into SIS initially
Zero	158	0.00	1.71	-1.35	-1.12	Values averaged for the 4 team members

The Pink and Green group patch tests on DN 157 were conducted within the shallower waters of the river, due to high seas offshore. Patch tests values were derived in both SIS and CARIS HIPS, and the results analyzed. The Green group values had the highest confidence based on the results, and those were the initial values entered into SIS on the morning of DN 158 for ensuing data acquisition. The Zero group then conducted another patch test that morning in the deeper waters offshore, and then began data acquisition for this survey in the afternoon. The locations of the patch tests are displayed in Figure 13 (groups Pink and Green), and Figure 14 (group Zero).

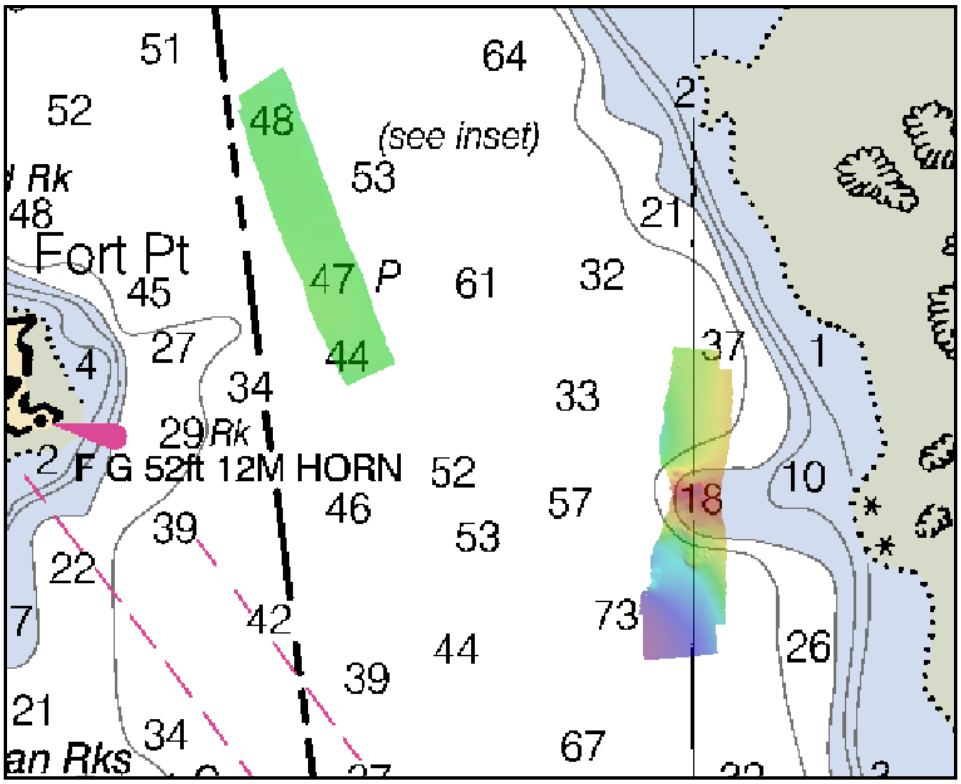


Figure 13. Location of patch test within Portsmouth Harbor (image center approximately 43-04-16.66N, 070-42-09.27W). The charted 18 foot sounding represents a proud rise off the bottom, suitable for timing, pitch, and heading calibration, while the flat, deeper area off Fort Point was suitable for roll

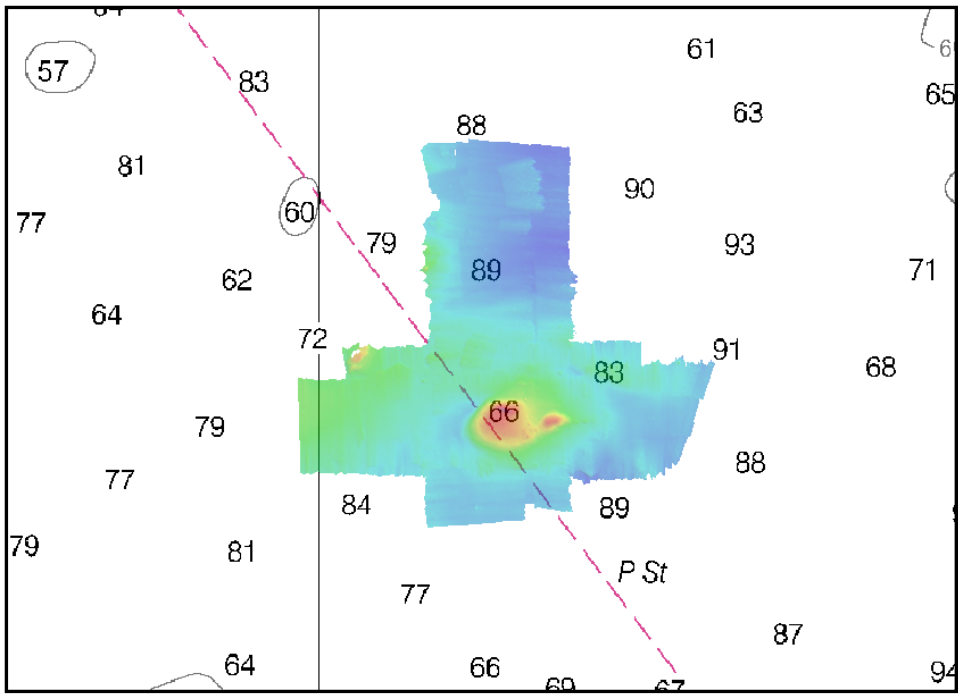


Figure 14. Location of patch test outside of Portsmouth Harbor (image center approximately 43-02-18.83N, 070-39-46.58W). The charted 66 foot sounding represents a significant natural rise in the seafloor, with the flat bottom northward, thus a viable location for determination of each calibration value

On the evening of DN 158, analysis in post-processing of the Pink group patch test revealed an additional 0.1 degrees of roll correction necessary. **The final patch test values entered into SIS for this survey were 0 (timing), 1.7 degrees (pitch), -1.3 degrees (roll), and -0.8 degrees (yaw).**

B3e. Sound speed corrections

The AML Smart-X probe, mounted to the sonar head, provided the real-time sound speed corrections necessary for beam forming. The AML Minos-X probe was utilized for the full water-column correction of sound speed, and was cast at the start, midpoint, and end of data acquisition, or as deemed necessary throughout the day based on data analysis, and the corrections applied in SIS real-time.

Prior to survey operations, analysis of archived sound speed data in this approximate vicinity allowed the hydrographer to have confidence that this sampling rate (3-4 casts per day) would be sufficient based on the 60° planned swath (this analysis is included in DR Separates I, entitled "SummerHydro2006_variability assessment.doc"). In the event of refraction of a significant magnitude, outer beams beyond 60° could be filtered, as the survey line planning based on 60° allowed for sufficient overlap even without the outermost beams.

In any event, near real-time processing of the acquired data while on the vessel revealed that refraction was not of concern throughout the entirety of survey operations, and the 3-4 casts acquired per day, with the supplied AML Minos-X sensor, was sufficient for sound speed corrections. A value of 4 m/s was utilized in TPU calculations, which is consistent with this sampling rate. Post-processing sound speed corrections were a possibility in the CARIS HIPS workflow, however was not necessary in this survey.

To further ensure sounding error due to refraction was of no significance throughout this survey, the acquired sound speed profiles were analyzed using ray tracing calculations (see DR Separates I, entitled "SummerHydro2012_variability_assessment.doc"). A sounding depth bias is attained by computing the horizontal and vertical position of the ray paths as a function of elapsed travel time for each launch angle from the multibeam for the newly acquired sound speed profile, and comparing those positions of the sound speed profile previously acquired. As observed in the analysis, only on a few occasions did the sounding depth bias due to refraction reach even *half* of the maximum allowable sounding error due to refraction according to 2012 HSSD requirements.

Locations of all collected samples are displayed in Figure 15, and the sound speed profiles are included within DR Separates II.

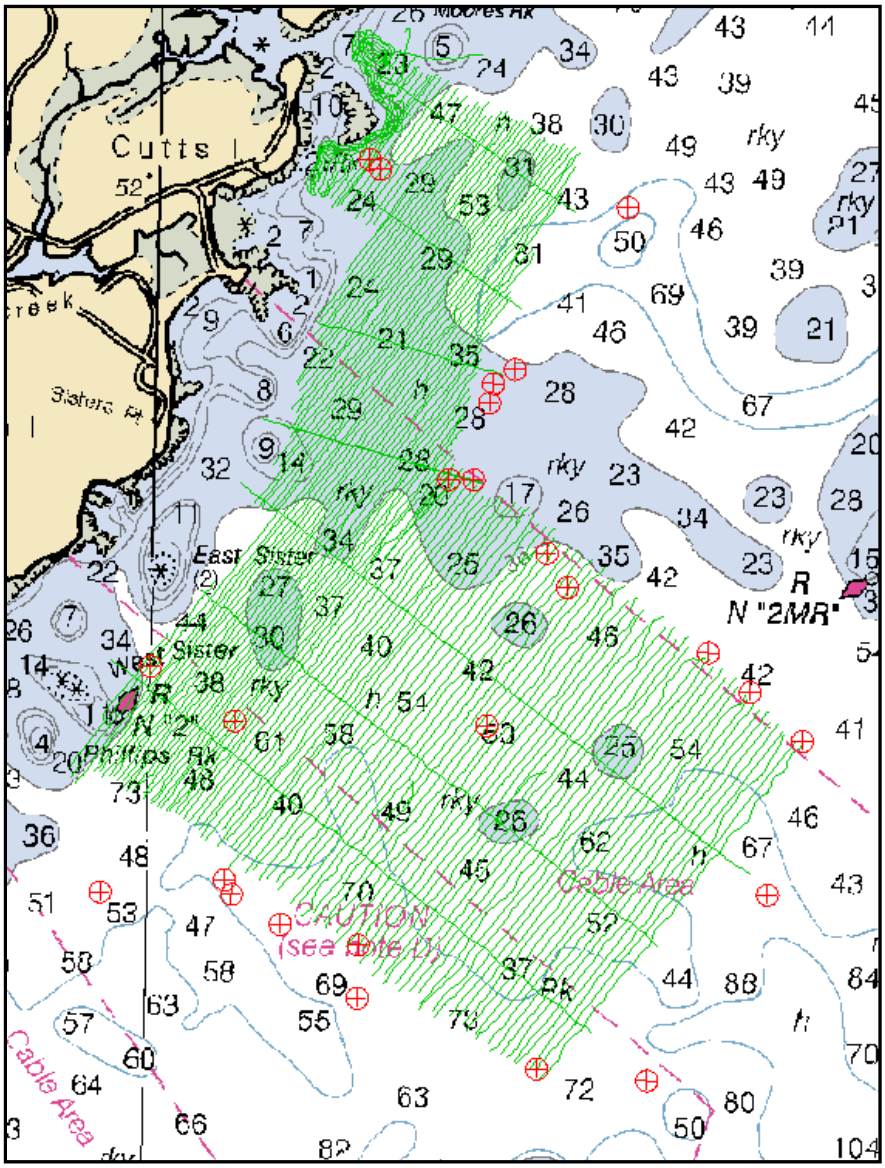


Figure 15. Sound speed sampling locations

B3f. Tide and water level corrections

Soundings were reduced to MLLW using t~~he prelimin~~ary *verified* data from the permanent NOAA water level gauge at Fort Point, NH (station ID: 8423898). A~~n updated~~ zoning ~~file~~ (.zdf) was ~~not~~ provided by CO-OPs, ~~thus no zoning file was used.~~ Furthermore, corresponding uncertainty values for tide zoning and measurements were not supplied either, thus nominal values within the range of acceptable values for tidal uncertainty were utilized in accordance with the 2012 FPM Appendix IV. **Note that it ~~will be~~ *was* necessary to reapply water level corrections once the verified water levels and final zoning file are available.**

B4. Data Processing

B4a. CARIS HIPS workflow

Project and vessel file creation

- A CARIS HIPS project was created, entitled "SummerHydro2012_FINAL", for conversion of the SIS output data (.all) into the HDCS structure used in HIPS.
- The HVF, entitled "Coastal_Surveyor_Normal_300kHz", was created specifically for the Kongsberg EM2040 by way of a device models extensible markup language (XML) file, which contains the parameters of this particular sonar. The XML file was generated by CARIS for the EM2040 and was sent to CCOM on June 4th, 2012, via email.
- Linear offsets between the R/V Coastal Surveyor's reference point and the EM2040 sonar head were set into SIS, thus the Swath X, Y, Z fields in the HVF were set to zero.
- Linear offsets between the R/V Coastal Surveyor's reference point and the main GPS antenna were input into POSView, thus the Navigation X, Y, Z fields in the HVF were set to zero.
- The initial angular relative offsets were entered into the CARIS HVF to correct the acquired patch test data on DN 153. On DN 158, the values were input into SIS, and the HVF values set to zero. Also on DN 158, the first day of acquisition, a final patch test was conducted in the morning, and an additional roll correction of 0.1 degrees was noted and accounted for in the HVF in post-processing. On DN 159, the final calibration

values were input into SIS, and the HVF values set to zero. A summary of how the angular relative offsets were applied is displayed in Table 15.

Table 15. Application of patch test values in SIS and CARIS

	Values Entered into SIS			Values Entered into HVF		
DN	**Pitch**	**Roll**	**Yaw**	**Pitch**	**Roll**	**Yaw**
153	0	0	0	1.7	-1.4	-0.8
158	1.7	-1.4	-0.8	0	0.1	0
159	1.7	-1.3	-0.8	0	0	0

- Static draft measurements were taken daily on the R/V Coastal Surveyor via clear draft tube. A base value of 0.5 m was set into SIS, and daily variations accounted for within the HVF. However, over the 9 days of acquisition, this measurement varied so little (standard deviation of +/- 5 mm), it was easily accounted for in the draft uncertainty value entered into the HVF (1 cm), and thus not entered into the HVF.
- TPU offsets values were entered into the HVF based on Figure 12 (see Section B3a).
- TPU standard deviation values were entered into the HVF based on guidance from the 2012 FPM (see Section B2c).

Data conversion and correctors

- The acquired data from SIS (.all) was converted into CARIS HDCS format using the CARIS Conversion Wizard. Ground coordinates (UTM-NAD83, Zone 19N) were selected, and no filters were applied during the conversion.
- After conversion, the projection and all of the converted lines were opened within HIPS, and the preliminary tide data from Fort Point, entitled "8423898.tid", was applied to reduce all sounding data to MLLW.
- Data was processed onboard during survey operations soon after it was acquired with the specific intent to monitor for data artifacts due to refraction. None were noticed, in the outermost beams or otherwise, thus is was not deemed necessary to apply any additional sound speed corrections in post-processing with HIPS.
- The merge operation in CARIS was then performed, without applying any smoothing to the sensors.
- TPU was computed for all lines, with values for tides and sound speed based on 2012 FPM guidance. The values are displayed in Table 16.

Table 16. TPU values of tides and sound speed

Tide	
Measured: 0.03 m	Zoning: 0.025 m
Sound Speed	
Measured: 4.0 m/s	Surface: 1.0 m/s

Data cleaning

- All lines were reviewed in HIPS navigation and attitude editors. Small positional "jumps" were discovered during the navigation review, but these were quite minimal. One small line with a navigation break was removed from the project, as it was also quite

minimal (only 40 seconds) and was considered extraneous, since it resided outside of the survey area. This line is displayed in Figure 16.

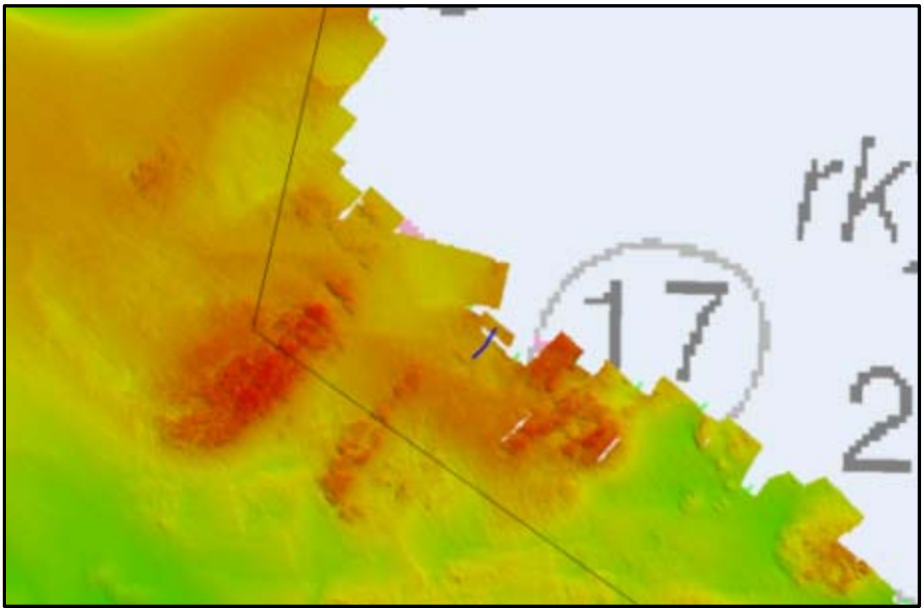


Figure 16. Line of extraneous data removed from data submission due to navigation anomaly

- A field sheet named "SummerHydro2012" was created bounded by the following coordinates: 43°02'N, 070°41'W (SW corner), and 43°06.5'N, 070°36'W (NE corner), and was used for creating temporary surfaces (utilized for analysis and cleaning) and for final surface creation.
- An exploratory CUBE surface was created and used as a tool to focus and prioritize the data cleaning, using the standard deviation, uncertainty, hypothesis count, and hypothesis strength layers of the CUBE surface as a guide.
- Guided by the exploratory CUBE surface, CARIS Subset Editor was used as the primary data cleaning tool, with 100 m subset tiles for accountability.
- CARIS Swath Editor was only utilized in the shallowest part of the survey area, near shore to Cutts Island.

Sounding designation and surface finalization

- Soundings were designated based on 2012 HSSD Section 5.2.1.2 requirements, for both vertical distance of the sounding from the CUBE surface with respect to depth and maximum allowable TVU, and for horizontal distance of shoal sounding separation with respect to chart scale. In addition, another sounding was designated, that being the least depth of a charted rock within the survey area. Altogether, this criteria resulted in a total of 7 designated soundings within the survey area, as observed in Figure 17.

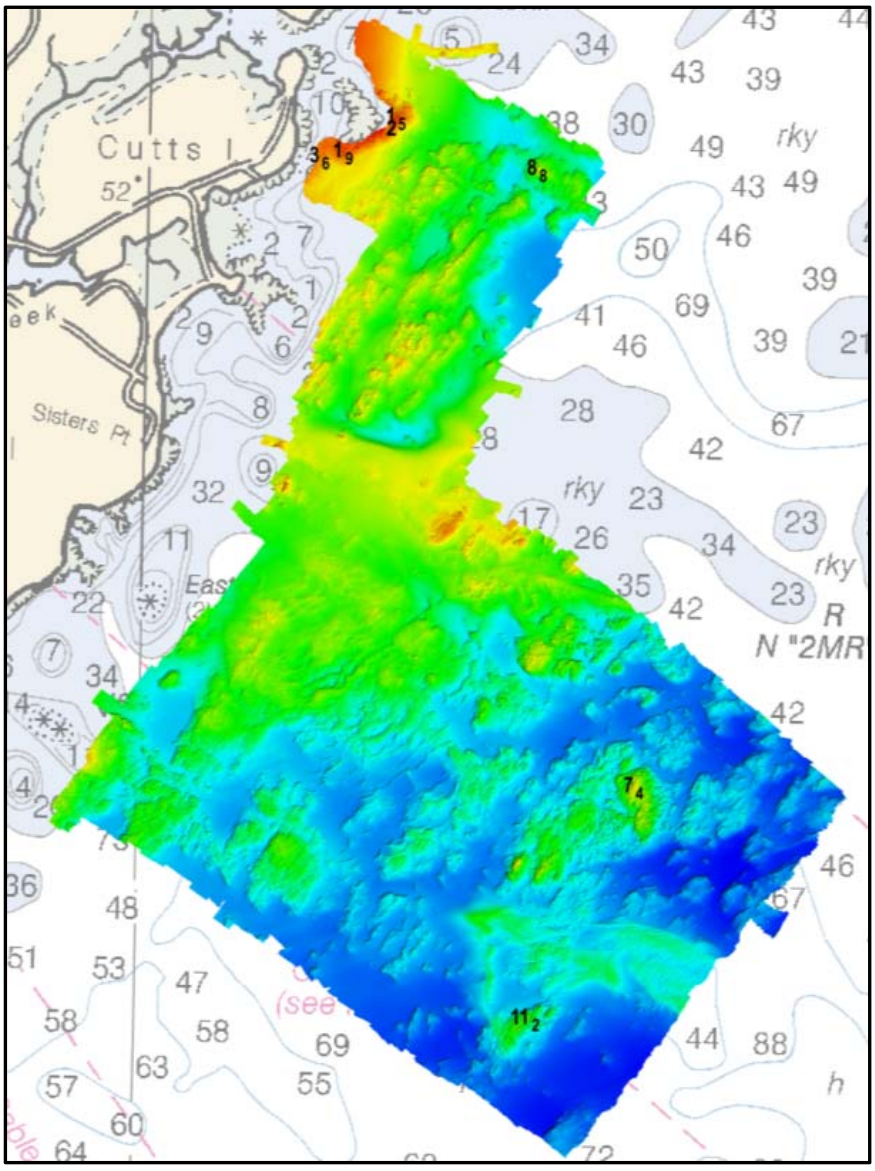


Figure 17. Designated soundings within the Summer Hydro 2012 survey area

- The 1 m and 2 m CUBE surfaces were finalized (both .csar), and are entitled "SummerHydro2012_1m_Final_0-20" and "SummerHydro2012_2m_Final_18-40".
- Final uncertainty was assigned from "greater of the two", either standard deviation or uncertainty.
- Designated soundings were applied to the finalized CUBE surfaces.
- Depth thresholds were applied to the finalized 1 m and 2 m CUBE surfaces as defined by the 2012 HSSD specifications for complete coverage multibeam, 0-20 m and 18-40 m, respectively.

B4b. Creation of soundings and contours

- Sounding selections and depth contours were generated to facilitate additional data analysis and chart comparison.
- Surface combining, and the generation of sounding selections, and depth contours, was accomplished with CARIS Bathy DataBASE, and in accordance with the best practices in place at the Atlantic Hydrographic Branch of the NOAA Office of Coast Survey.
- The finalized 1 m and 2 m CUBE surfaces were first combined, such that the ensuing sounding selection and depth contours would have a continuous, uniform coverage over the entire survey area. The combined surface (.csar) is entitled "SummerHydro2012_Combined_2m", and was created with a 2 m resolution, on UTM NAD83 Zone 19N, and with least depth and least uncertainty as the primary and secondary rules to resolve conflicts (respectively).
- The sounding selection criteria was shoal-biased at a 1 mm to the largest scale raster chart coverage (1:20,000), with designated soundings applied, which resulted in 28,205 extracted soundings.
- In order to create generalized contours based on the 1:20,000 chart scale, a triangulated-irregular network (TIN) was created from the sounding selection, and a surface interpolated from the TIN, resulting in what is essentially a bathymetric surface based entirely on the extracted soundings.
- The TIN interpolated surface was then shifted by -0.229 m (0.75 ft) so that the extracted contours are in agreement with the NOAA sounding rounding convention.

- Contours are extracted at an interval consistent with those charted at the largest chart scale (6, 12, 18, 30, 60, 120 ft), and can be observed in Figure 18.

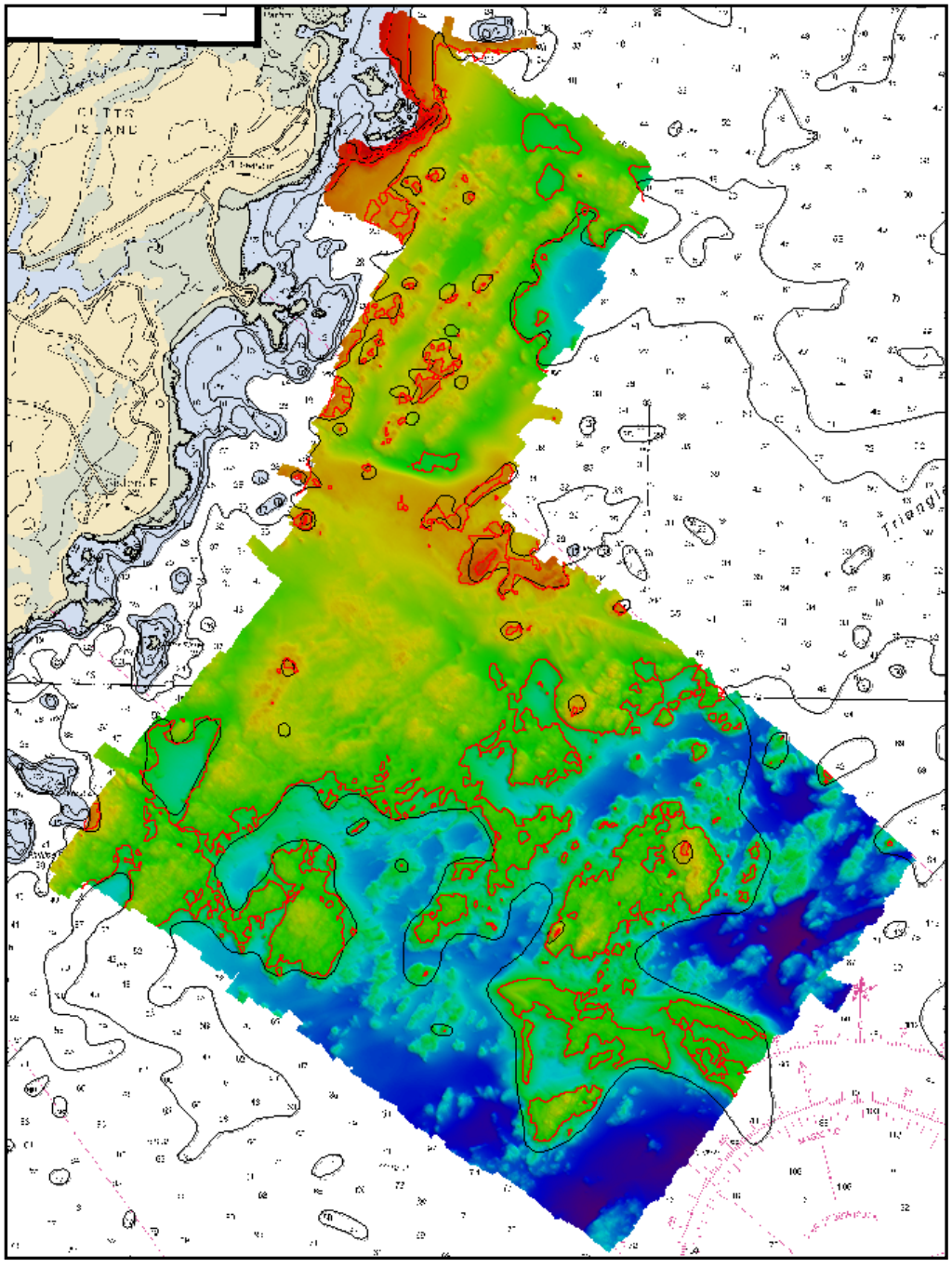


Figure 18. Combined surface with created contours (red) and chart 13283 contours (black) overlay

C. VERTICAL AND HORIZONTAL CONTROL

C1. Vertical Control

The vertical datum for this project is MLLW, and the National Water Level Observation Network (NWLON) primary water level station at Fort Point (8423898), New Hampshire, provided water level correctors for this survey. The correction was performed in CARIS HIPS with a tide file entitled "8423898.tid:", which contains preliminary water levels recorded over all days of acquisition. A request for approved water levels, final zoning, and a Tidal Constituents and Residual Interpolation (TCARI) grid was sent to the NOAA Center for Operational Oceanographic Products and Services (CO-OPS) on June 25th, 2012, and this request is included in Appendix IV. Relevant information for the Fort Point water level station is given in Table 17.

Table 17. Fort Point tide gauge metadata

Gauge ID	Model	Established	Present Installation	Gauge Type	Location	Operational	NOAA Chart
8423898	NOAA Primary	Aug 12, 1976	Jul 3 2003	Acoustic	43°4.3' N 70°42.7' W	Permanent	13283

C2. Horizontal Control

The horizontal datum for this survey is NAD83, and all projections to UTM Zone 19N. RTK operations were established via DGPS corrections received from a previously installed base station at Odiorne Point, New Hampshire. The DGPS corrections were broadcast from the roof of the Sea Coast Science Center in Odiorne, and received on the R/V Coastal Surveyor by a Trimble Trimmark 3 radio modem. Position was then supplied to the POS/MV via serial cable, and coupled with attitude via IMU, horizontal control was established. Throughout the entirety of survey operations, radio reception was continuously monitored to ensure fixed RTK was achieved. Though the radio antenna at Odiorne was found to be damaged and replaced on June 14, 2012 (DN 166), this was done prior to acquisition, and there was no impact to RTK operations. Furthermore, no adverse affects were noticed during those days of data acquisition prior to replacement of the damaged antenna.

D. RESULTS AND RECOMMENDATIONS

D1. Chart comparison

D1a. Survey agreement with chart

The survey area coincides with the raster navigation charts (RNC) listed in Table 18.

Table 18. Raster navigation charts affected by this survey

Chart	Edition	Edition Date	Scale	Name
13283_1	21	3/1/2011	1:20,000	Portsmouth Harbor Cape Neddick Harbor to Isles of Shoals
13274_2	28	4/1/2011	1:40,000	Great Boars Head to Cutts Island
13278_1	27	10/1/2009	1:80,000	Portsmouth to Cape Ann
13286_1	31	6/1/2011	1:80,000	Cape Elizabeth to Portsmouth
13260_1	40	5/1/2007	1:378,838	Bay of Fundy - Cape Code ME-NH-MA

The survey area coincides with the electronic navigation charts (ENC) listed in Table 19.

Table 19. Electronic navigation charts affected by this survey

Cell	Edition	Application Date	Issue Date	Name
US5NH02M	15	6/1/2011	3/5/2011	Portsmouth Harbor Cape Neddick Harbor to Isles of Shoals
US4MA04M	18	5/19/2011	4/24/2012	Portsmouth to Cape Ann
US3EC10M	29	4/20/2011	2/1/2012	Bay of Fundy to Cape Cod

The survey results are compared to the largest scale chart only, and not each of the above listed charts, in accordance with the 2012 HSSD guidance. In this case, the largest scale chart products are RNC 13283_1 and ENC US5NH02M. ENC US5NH02M was digitized from RNC 13283_1 and thus the bathymetry contained within these products are the same. The chart comparison will only be conducted with 13283_1, however the analysis will be applicable to US5NH02M.

The 21st edition of RNC 13283_1 was used for the comparison (edition date 3/1/2011), corrected through Notice to Mariner's 5/26/2012, and Local Notice to Mariner's 5/15/2012.

The chart comparison was facilitated by importing the soundings from the associated ENC (US5NH02M) and creating an interpolated surface from these ENC soundings. Similarly, an interpolated surface was created from survey scale soundings, and the two interpolated surfaces differenced. The result is shown below in Figure 19.

In Figure 19 there appear to be areas of significant difference between the surveyed and charted bathymetry, but with the exception of some shoal areas (discussed below), the surveyed soundings agreed favorably with those charted (generally within 2-3 feet). The areas of apparent discrepancy (particularly the deeps in the southeastern portion of the survey area), are merely the result of charted contours drawn to a generalized scale (1:20,000) and therefore unable to capture the highly dynamic seafloor in this region. An example of this is shown in Figure 20.

Furthermore, the area of apparent shoaling in the southernmost part of the survey area (see Fig. 19, approximately 43-02-47.55N, 070-38-12.84W), is a result of the least depth of the charted rock, accounted for in the chart as a feature, and not included in the ENC soundings. As discussed below in Section D1c., the surveyed least depth sounding and position is as charted.

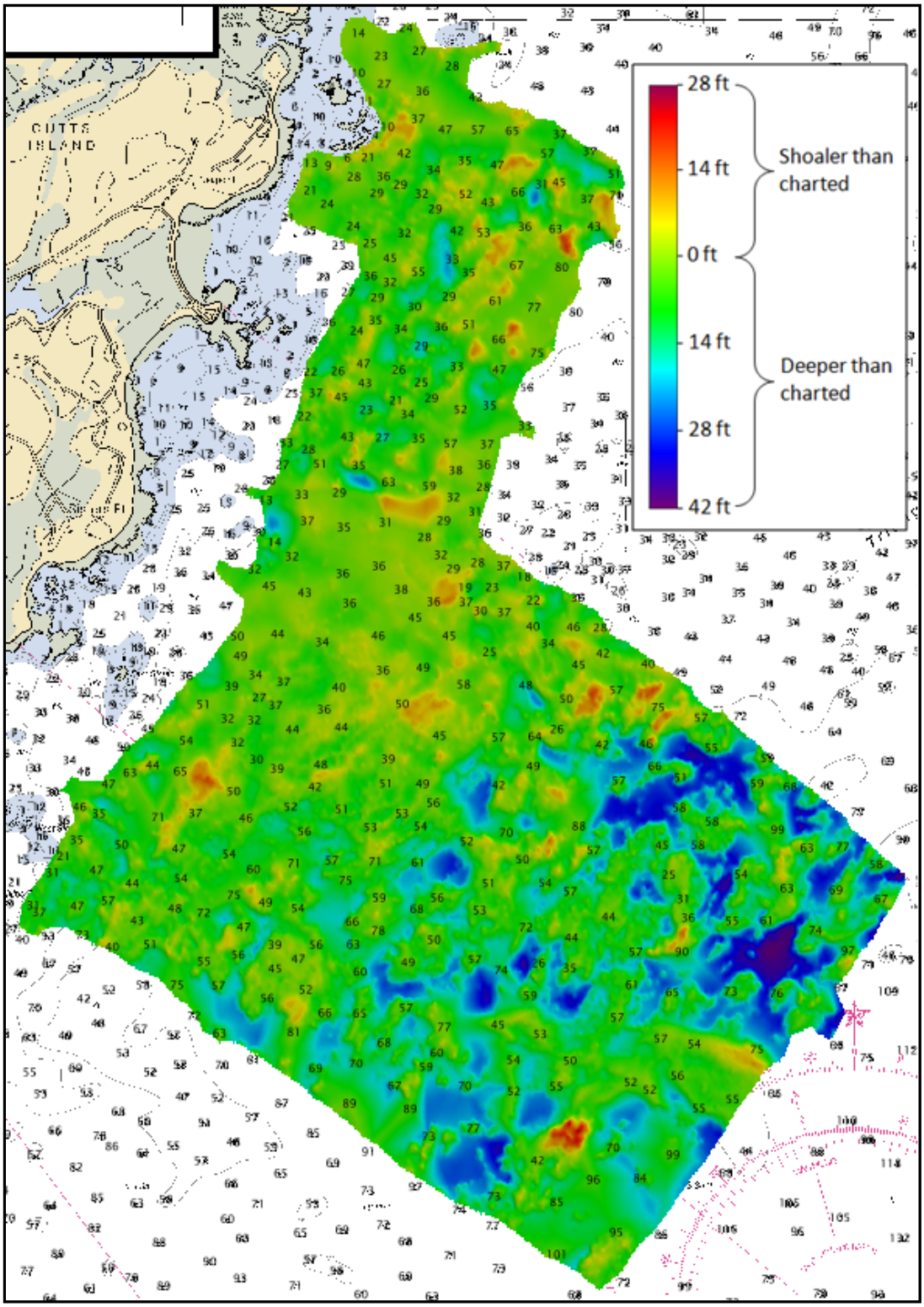


Figure 19. Difference surface of charted and surveyed bathymetry (soundings are from chart 13283)

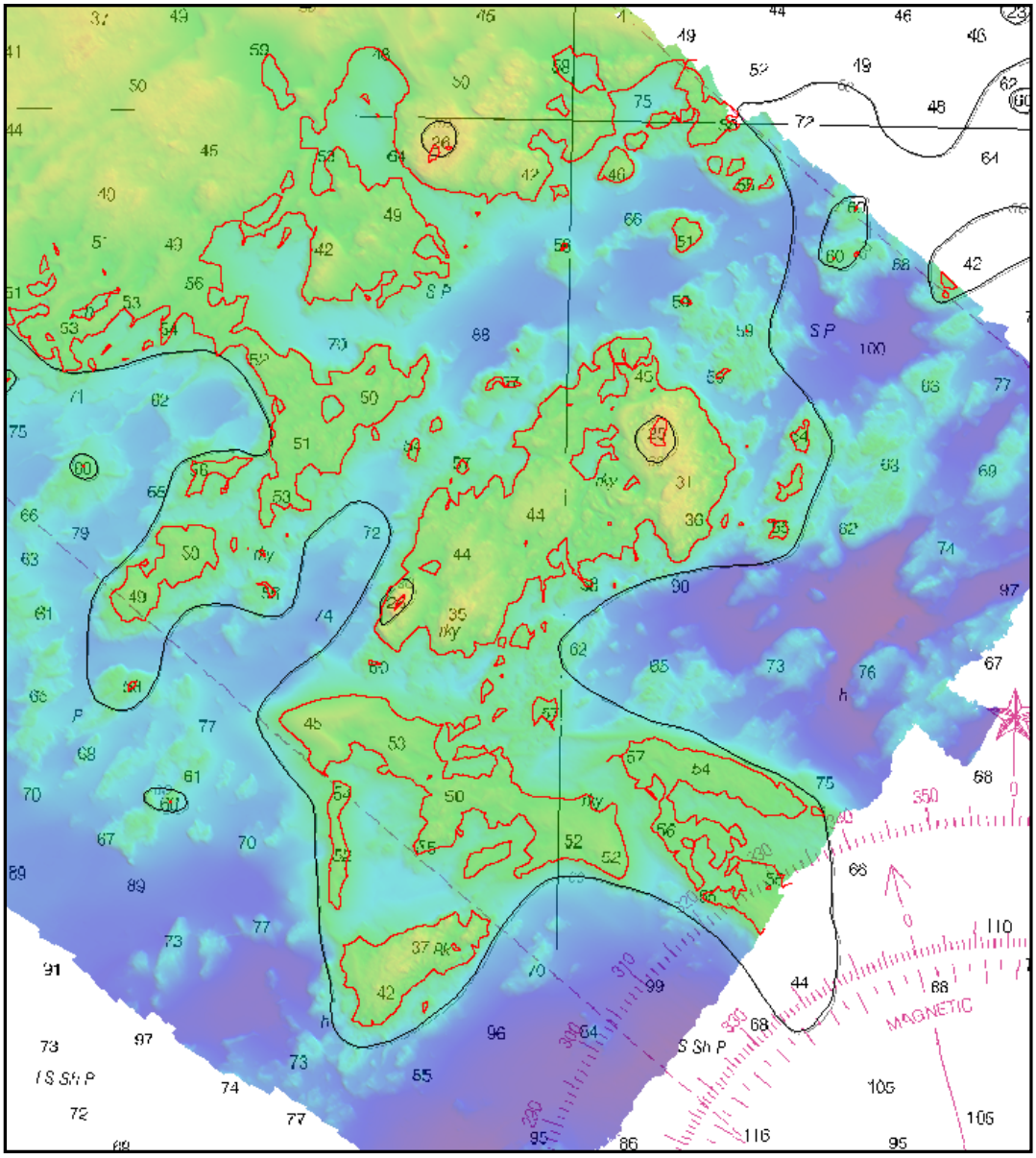


Figure 20. Combined surface with survey contours (red) and chart 13283 contours (black) overlay for comparison. Note the actual bathymetry is much more dynamic than the charted contours, which are drawn according to shoal-biased sounding selection based on 1:20,000 chart scale.

D1b. Comparison to significant shoals

The shoals off the eastern shore of Cutts Island have advanced further seaward, as exhibited by the advancement of the 6, 12 and 18 foot contours, observed in Figure 21. The most significant of these shoal soundings, with respect to safety of navigation, were sent as Dangers to Navigation (see Appendix I).

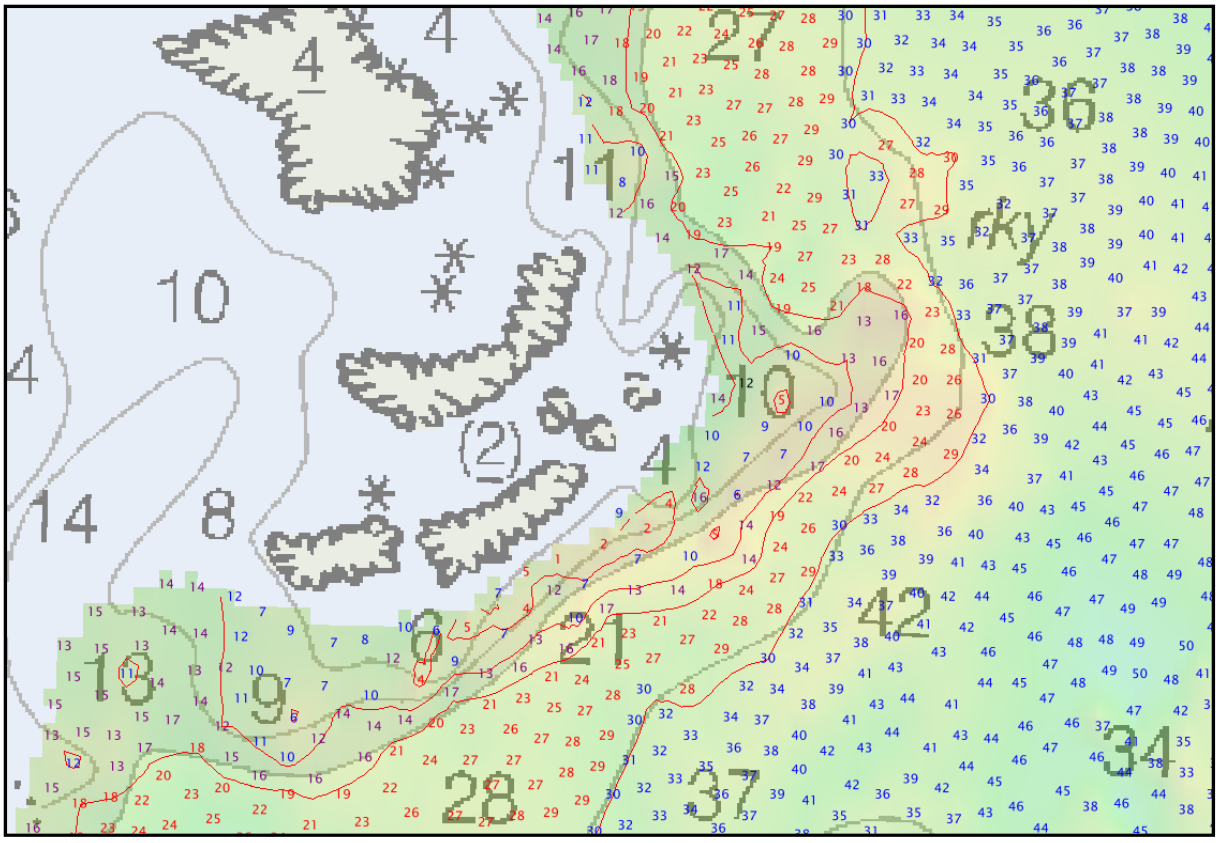


Figure 21. Shoal area and rocks off Cutts Island

The 29 foot shoal observed in Figure 22, located at 43-05-31.55N, 070-38-52.26W, was found to be significantly shoaler than charted, and should be updated to reflect the surveyed least depth and position.

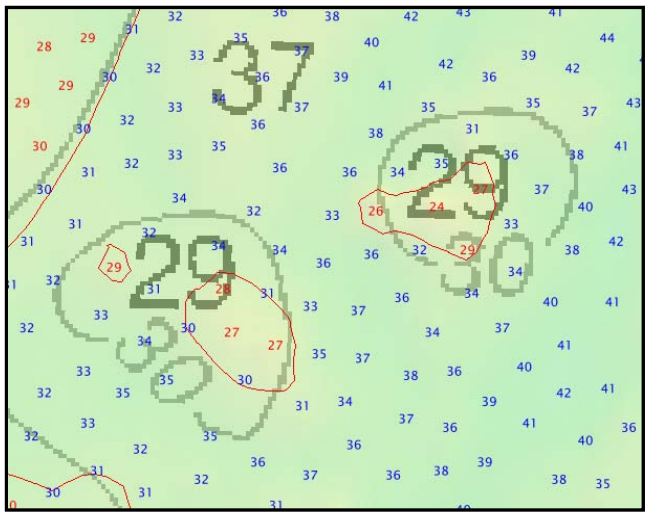


Figure 22. Charted 29 foot shoal

The charted 27 foot shoal observed in Figure 23, located at 43-04-48.03N, 070-38-56.60W, has shifted west and now encompasses a larger area. The least depth position and contour line should be updated accordingly.

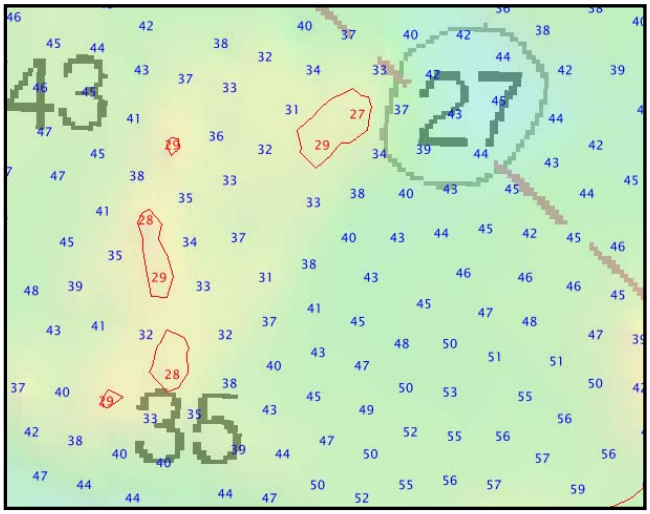


Figure 23. Charted 27 foot shoal

All other charted shoals compare within 2-3 feet of survey soundings.

D1c. Comparison to charted features

The survey contains 1 charted feature, a charted underwater rock located at 43-02-47.53N, 070-38-16.05W. As observed in Figure 24, the rock was found with a least depth and position as charted. An S-57 Feature File containing this feature is included with the survey submission.

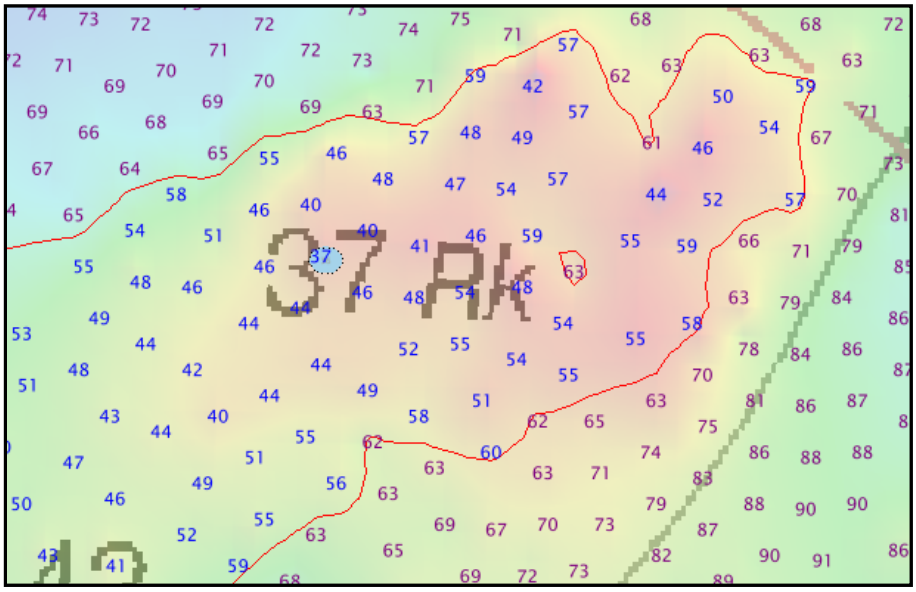


Figure 24. Charted 37 foot rock

D1d. New submerged features

No new submerged features were found during this survey.

D1e. Dangers to navigation

24 potential Dangers to Navigation (DTON) were sent to the Atlantic Hydrographic Branch (AHB) on June 29th, 2012, which includes each of the shoals discussed here in Section D, as well as several others. Metadata and screen captures of each of the 24 potential DTONs are included in Appendix I of this report.

D2. Additional Results

Along the northeastern part of the survey area (image center approximately 43-05-13.66N, 070-38-16.50W), observed in Figure 25, survey soundings were found significantly shoaler than those charted, and the chart should be updated accordingly.

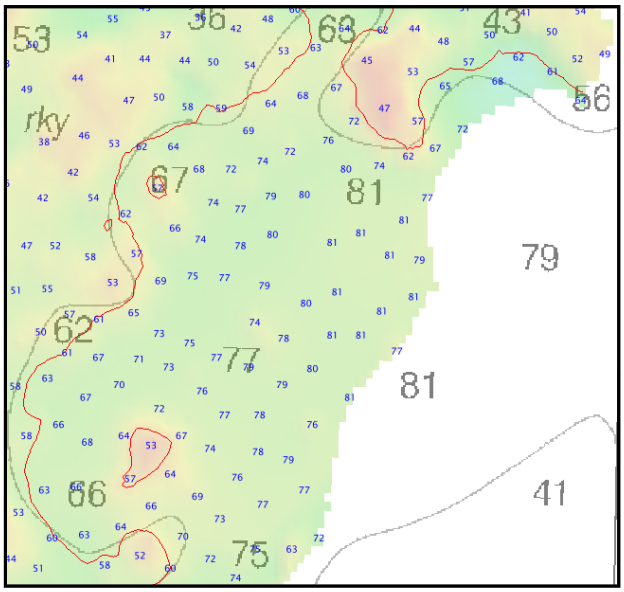


Figure 25. Shoaling in northeastern part of survey area

Along the central, eastern part of the survey area (image center approximately 43-04-25.27N, 070-38-39.58W), observed in Figure 22, survey soundings were found significantly shoaler than charted, and the chart should be updated accordingly.

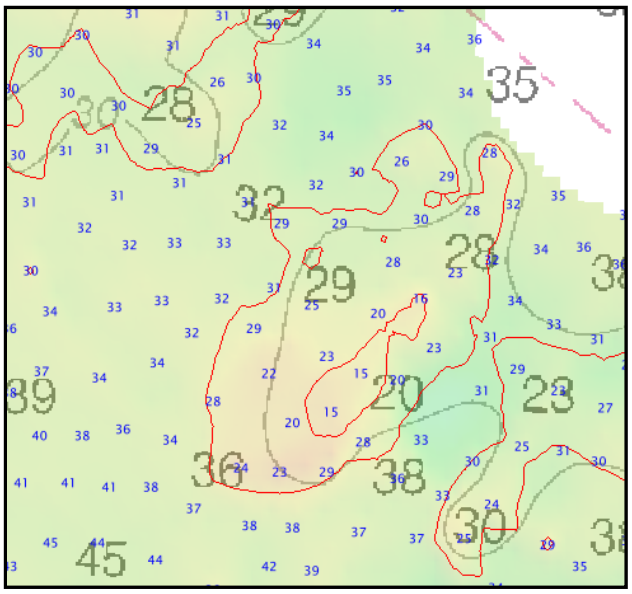


Figure 26. Shoaling in central, eastern part of survey area

In the central part of the survey area (image center approximately 43-04-02.24N, 070-39-08.42W), observed in Figure 27, survey soundings were significantly shoaler than charted, and the chart should be updated accordingly.

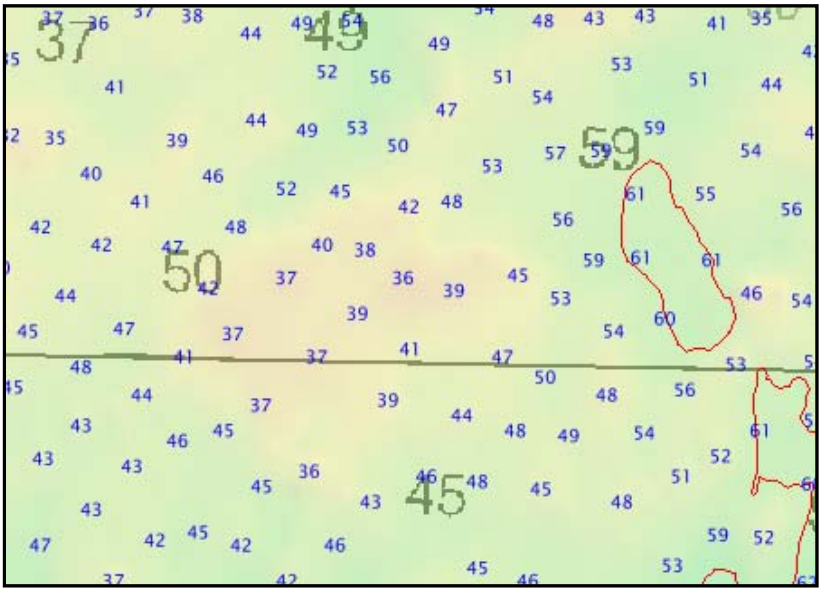


Figure 27. Shoaling in central part of survey area

D2a. Shoreline investigations

A shoreline investigation was not conducted during this survey.

D2b. Comparison with prior surveys

The survey area overlaps with two prior surveys (H10763 and H10771), both conducted in 1997 by NOAA Ship *Rude* with a Reson Seabat 9003. XYZ data for each prior survey was downloaded from the NGDC website. The XYZ data is of a much coarser resolution than the Summer Hydro 2012 combined surface, thus a standard difference surface may indicate significant discrepancies that were induced primarily from this difference in resolution. For this reason the combined surface was instead differenced with the un-gridded XYZ data, the results of which are listed in Table 20, and displayed in Figures 28 and 29. The systematic discrepancy with each prior survey is attributed to system bias between the Seabat 9003 and the Kongsberg EM2040.

Table 20. Difference surface of combined surface and prior survey data

	H10763's ungridded nodes	H10771's ungridded nodes
Nodes	2,378	9,146
Mean Difference	-0.1 m	-0.2 m
Standard Deviation	0.3 m	0.4 m

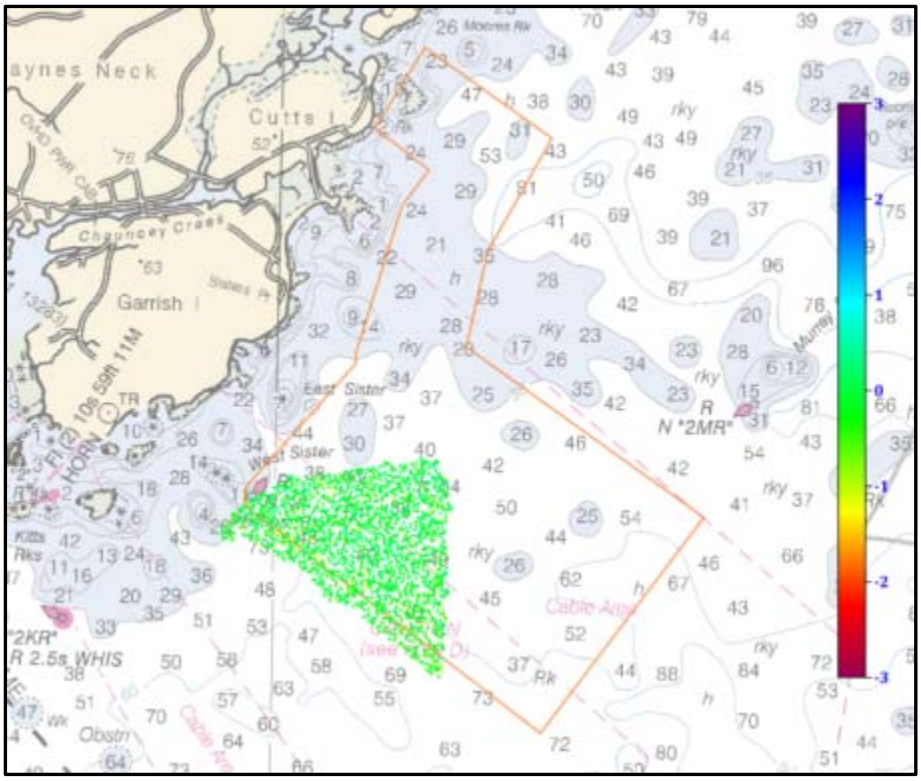


Figure 28. Difference surface of combined surface with H10763 ungridded nodes

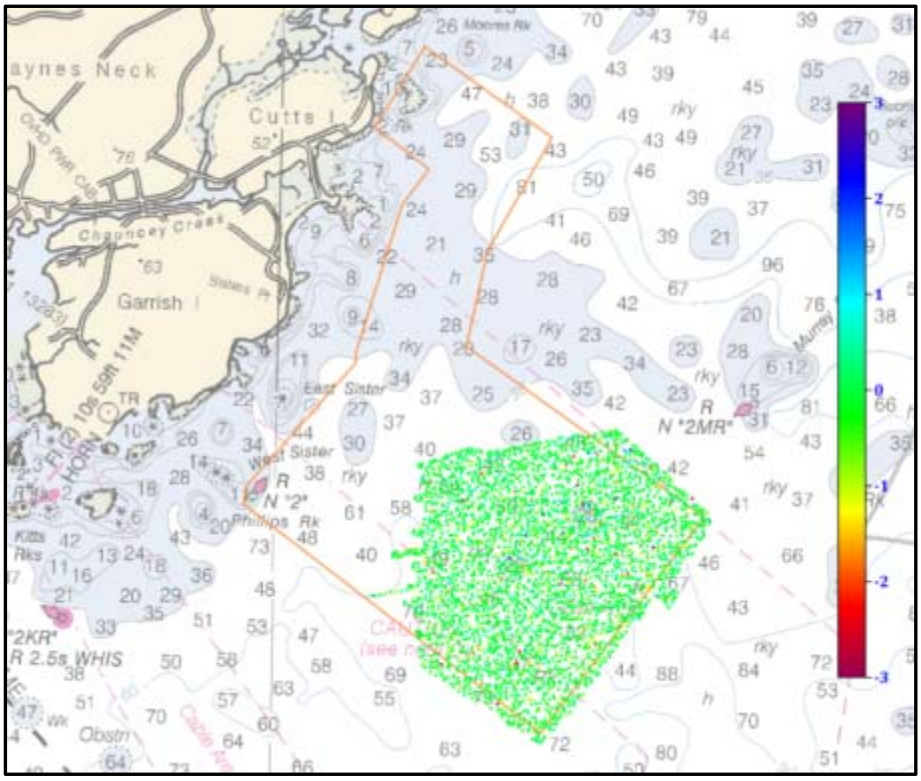


Figure 29. Difference surface of combined surface with H10771 ungridded nodes

D2c. Aids to navigation

One aid to navigation, located at 43-03-35.94N, 070-40-09.90W, was found as charted and serving its intended purpose.

D2d. Overhead clearance

There were no areas of critical overhead clearance within the survey area.

D2e. Cables, pipelines, and offshore structures

Though the survey area contains a charted cable area, there was no evidence of any submerged cables noted in the bathymetry.

D2f. Bottom characteristics

Multibeam backscatter mosaics

To facilitate analysis of bottom characteristics, multibeam backscatter was processed during acquisition, and georeferenced backscatter mosaics were generated with Fledermaus Geocoder Toolbox (mosaics included within the *Public Relations Constituent Products* folder of the field submission). The final mosaics were created with a 35 cm and 75 cm resolution. The backscatter mosaics were utilized when planning the locations for bottom sampling, which served to "truth" areas of interest within the backscatter (and bathymetry), as well as to verify (or disprove) charted seabed areas. The various settings of the multibeam were held constant during survey data acquisition, which greatly facilitated the generation of the backscatter mosaics.

Sediment outflow

Mosaic generation of the multibeam backscatter revealed a unique bottom type in the northernmost portion of the survey area, which is also the shallowest, near shore area. The backscatter depicts areas of vastly different intensity from those areas around it. Subsequent

bottom sampling revealed the area was very fine sand. Furthermore, displaying the backscatter against satellite orthoimagery revealed very clear correlation with sediment outflow from Cutts Island. The orthoimagery also shows other areas of clear sediment outflow, outside of the survey area, from which this same backscatter intensity and bottom type could be inferred.

Figure 30. Areas of very find sand from sediment outflow as depicted in multibeam backscatter mosaic

The "V-Shaped" feature

During survey data acquisition, daily processing revealed an unexplained geological feature, which became the subject of great interest and speculation at CCOM-JHC, particularly amongst the geologists, as to the origin and composition of what became known as the "V-shaped" feature. The approximate location is 43-03-06N, 070-38-29W, and the feature is displayed in

Figure 31. The V-shaped feature was considered a top-priority for bottom sampling, however the grab sampler in this location returned only seaweed (see below). This is indicative of a hard bottom (i.e. rock), though this is not definitive.

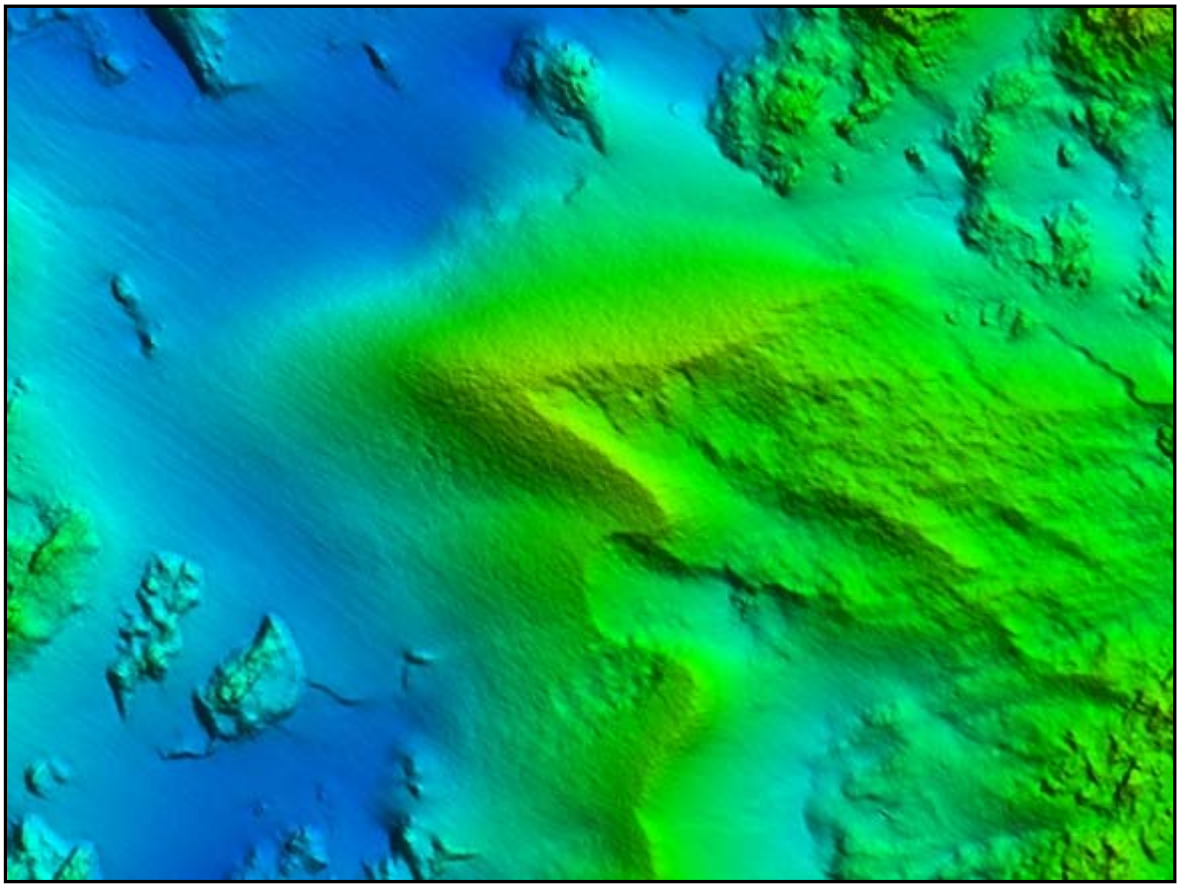


Figure 31. The "V-shaped" feature, from a 1 m resolution bathymetric surface (vertical exaggeration=5)

Lobster traps

As was to be expected from working within this particular sub-locality, there were a great number of lobster traps within the survey area. The boat captain and survey party had to be constantly vigilant during acquisition to steer clear of such traps. During post-processing of the bathymetric data, sharp features were often observed protruding from the bottom, of a size and shape consistent with these traps. However it was not known for certain whether these features were indeed traps, thus the features were retained in the bathymetry, in the interest of safety of

navigation. The suspected traps observed below in Figure 32 are located in the approximate position of 43-02-58N, 070-37-34W.

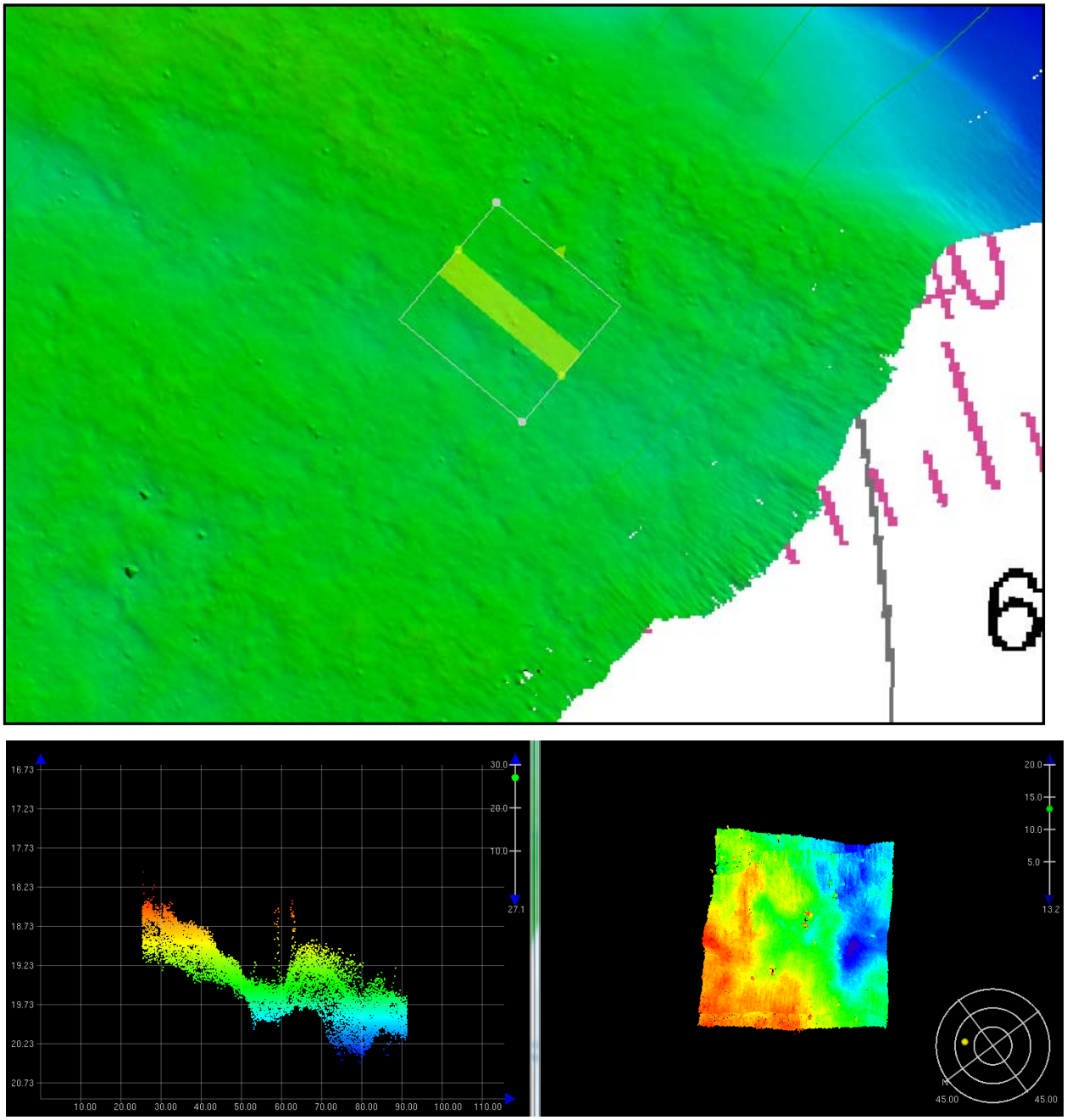


Figure 32. Suspected lobster traps, shown in plan view with the bathymetric surface (top), and 2D view (bottom left) and 3d view (bottom right) in CARIS HIPS Subset Editor

Bottom sampling

Only one day was allotted for bottom sampling, thus an efficient plan was needed to ensure samples of the highest priority were acquired, balanced with available time and an optimal vessel transit. Bottom sample prioritization was accomplished through usage of multibeam bathymetry, backscatter mosaics, and the need to verify (or disprove) currently charted seabed information. In this way, a fair balance was achieved between CCOM-JHC research purposes and nautical chart update objectives. The chosen locations are observed in Figure 33.

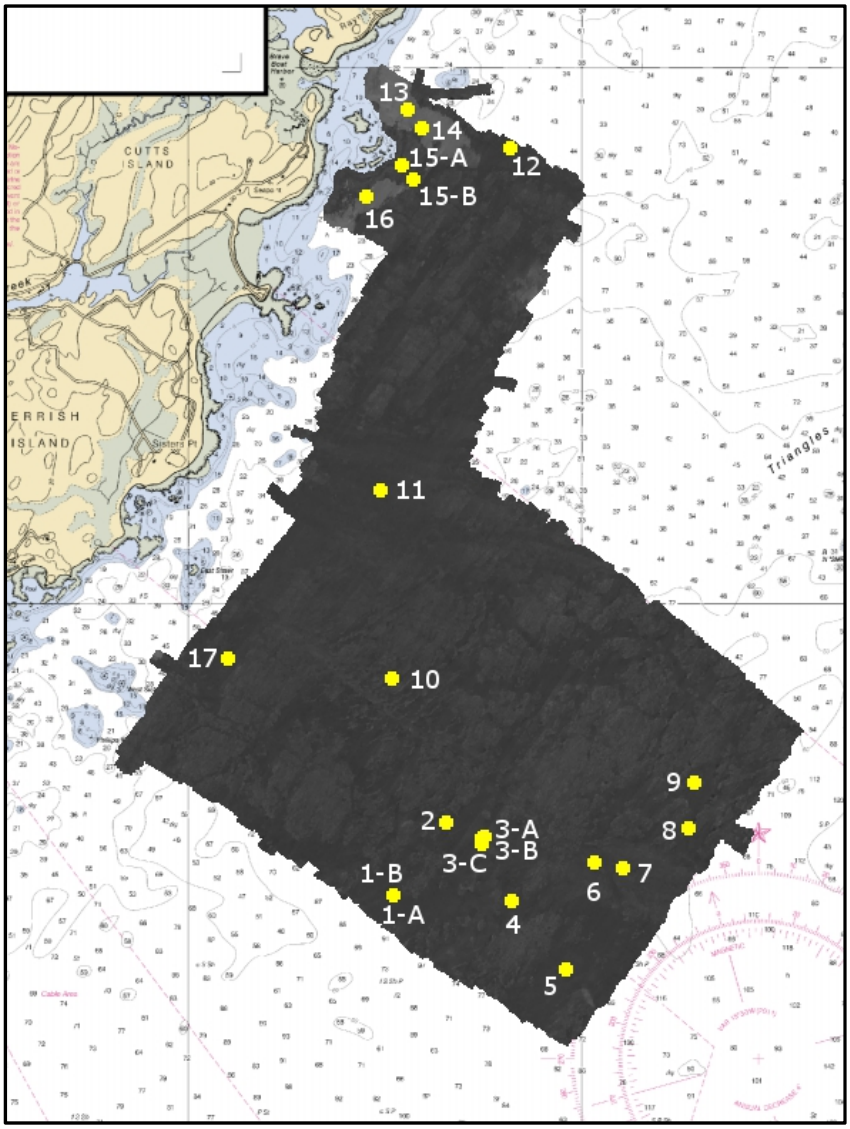


Figure 33. Locations of bottom samples, with the multibeam backscatter mosaic in the background against chart 13283

Table 21 gives the exact time and location of each sample, color, and S-57 attribution (NATSUR (Nature of Surface), and NATQUA (Nature of Surface - Qualifying Terms)).

Table 21. Bottom sample metadata

Sample	Time (UTC)	DN	Latitude ° N	Longitude °W	Color	NATSUR	NATQUA
01_A	13:48:28	180	43 - 02 - 54.7	70 - 38 - 57.54	brown	sand, pebble, shell	medium, -, broken
01_B	14:04:20	180	43 - 02 - 54.7	70 - 38 - 57.54	brown	sand, pebble, shell	medium, -, broken
02	14:11:04	180	43 - 03 - 10.81	70 - 38 - 41.35	pink, brown, gray	pebble, sand, shell	-, coarse, broken
03_A	14:20:01	180	43 - 03 - 07.28	70 - 38 - 30.22	N/A	Seaweed	Seaweed
03_B	14:27:53	180	43 - 03 - 06.23	70 - 38 - 30.51	N/A	Seaweed	Seaweed
03_C	14:32:14	180	43 - 03 - 07.64	70 - 38 - 29.62	N/A	Seaweed	Seaweed
04	14:41:43	180	43 - 02 - 53.36	70 - 38 - 21.43	gray, brown	sand, gravel, shell	coarse, coarse, broken
05	14:51:46	180	43 - 02 - 38.02	70 - 38 - 04.93	brown, black	sand, pebble	fine, -
06_A	15:01:52	180	43 - 03 - 01.94	70 - 37 - 56.15	No Sample	No Sample	No Sample
06_B	15:09:56	180	43 - 03 - 01.99	70 - 37 - 56.74	No Sample	No Sample	No Sample
07	15:17:23	180	43 - 03 - 00.84	70 - 37 - 47.42	N/A	Seaweed	Seaweed
08	15:25:51	180	43 - 03 - 09.74	70 - 37 -27.50	black, brown	pebble, gravel, shell	-, coarse, broken
09	15:35:03	180	43 - 03 - 19.96	70 - 37 - 25.77	brown, black	sand, shell	medium, broken
10	15:50:25	180	43 - 03 - 43.13	70 - 38 - 57.66	black, brown	sand, pebble, shell	coarse, -, broken
11	16:00:42	180	43 - 03 - 25.26	70 - 39 - 01.32	brown	pebble,	-, broken,

						shell, sand	coarse
12	16:12:39	180	43 - 05 - 41.71	70 - 38 - 21.74	pink-brown	pebble, gravel, sand	-, 0, coarse
13	16:24:41	180	43 - 05 - 50.26	70 - 38 - 52.93	brown	sand	fine
14	16:32:19	180	43 - 05 - 46.21	70 - 38 - 48.77	brown	sand	fine
15_A	16:41:01	180	43 - 05 - 37.93	70 - 38 - 54.69	N/A	Seaweed	Seaweed
15_B	16:46:32	180	43 - 05 - 34.87	70 - 30 - 51.45	black	pebble, sand	-, coarse
16	16:56:32	180	43 - 05 - 30.97	70 - 39 - 05.69	gray	sand	fine
17	17:12:16	180	43 - 03 - 47.64	70 - 39 - 47.82	black, white, pink	sand, shell, pebble	coarse, broken, -

E. LETTER OF APPROVAL

All field operations were conducted under direct supervision of the Chief of Party, and this report and the associated data have been carefully reviewed to be considered complete and adequate, as to meet both IHO Order I standards and NOS Hydrographic Surveys Specifications and Deliverables requirements. It is recommended that this survey be used to update the nautical chart; to supersede all soundings, contours, and features within the common areas of any prior surveys.

Dr. Semme Dijkstra, University of New Hampshire
Certified (IHO Category A) Hydrographer
Chief of Party

CCOM-JHC
2012

Descriptive Report Appendices

Appendix I.

Tides and Water Levels

Briana Welton <briana.welton@noaa.gov>

Fwd: Fwd: Request of tide information for Summer Hydro 2012

5 messages

Carolyn Lindley <carolyn.lindley@noaa.gov> Fri, Jun 15, 2012 at 9:44 AM
To: Corey Allen <Corey.Allen@noaa.gov>, Briana Welton <Briana.Welton@noaa.gov>
Cc: "Gerald.Hovis" <Gerald.Hovis@noaa.gov>, "_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Pat Burke <Pat.Burke@noaa.gov>, Marc S Moser <marc.s.moser@noaa.gov>, Carl Kammerer <Carl.Kammerer@noaa.gov>

Hi Corey, Bri,

Could you guys help us corral this request and submit via the Sharepoint? We'll need the GIS files in MapInfo Table format or ESRI Shape. I don't have anyone available to look at this project until probably last week of June/first week of July at the earliest due to competing priorities and resource constraints so a due date of 7/15 would be helpful. Also, do you have any information on the subordinate at York Harbor? Is it being installed to NOS spec? Does zoning need to be off of it? Is the course planning on submitting the data to CO-OPS? That would involve some decisions on our end at the branch chief level since more than just HPT would be impacted.

I'm not sure who is in charge of the UNH summer hydro course but if for out years we can include it in FY planning, that would be helpful for us.

Thanks,
Carolyn

——— Original Message ———
Subject: Fwd: Request of tide information for Summer Hydro 2012
Date: Fri, 15 Jun 2012 08:03:14 -0400
From: Carl Kammerer <carl.kammerer@noaa.gov>
To: Carolyn Lindley <carolyn.lindley@noaa.gov>

Did you get this request for support?

Carl

——— Forwarded message ———
From: **Carl Kammerer** <carl.kammerer@noaa.gov>
Date: Thu, May 31, 2012 at 10:04 AM
Subject: Fwd: Request of tide information for Summer Hydro 2012
To: Gerald Hovis <gerald.hovis@noaa.gov>

Jerry,

Can you forward this on to the hydro team for me? It's for UNH's summer hydro course. I think we already have all the zoning done from past work. I'm not sure about the TCARI grid. They are putting a temporary gage (MWWL) in York Harbor, if that helps with anything at all.

Thanks,
Carl

——— Forwarded message ———
From: **Hiroki Minami** <hminami@ccom.unh.edu>
Date: Thu, May 31, 2012 at 1:29 PM
Subject: Request of tide information for Summer Hydro 2012
To: carl.kammerer@noaa.gov
Cc: sthein@ccom.unh.edu, tnguyen@ccom.unh.edu, Briana Welton <briana.welton@noaa.gov>

Dear Carl Kammerer,

Good morning.

I am Hiroki and a member of tide team for Summer Hydro in this year.

As Bri and I ask you yesterday, we need tide information around Portsmouth Harbor.

There are two areas we plan to survey. Attached files are maps of our survey areas.

- SummerHydro2012 - Survey Areas.tif (geotif including two areas enclosed by red and black line)

- Survey Area1.kml

- Survey Area2.kml

Please provide us the following information for this areas,

1. Discrete tidal zoning (.zdf file)
2. TCARI grid (.tc file), if possible

Sincerely yours,

Hiroki MINAMI

GEBCO scholarship student

Center for Coastal and Ocean Mapping/ Joint Hydrographic Center University of New Hampshire

24 Colovos Rd.

Durham N.H., USA 03824

Phone (603) 862-4425

Email hmu264@wildcats.unh.edu or hminami@ccom.unh.edu

–

Carl L Kammerer

Oceanographer
NOAA-National Ocean Service
Center for Operational Oceanographic Products and Services (CO-OPS)
@ NOAA-University of New Hampshire - Joint Hydrographic Center
24 Colovos Road, Durham, NH 03824
carl.kammerer@noaa.gov

office: 603-862-3285 - cell: 301-908-1545 - fax: 603-862-0839

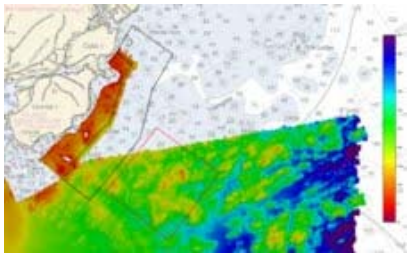
–

Carl L Kammerer

Oceanographer
NOAA-National Ocean Service
Center for Operational Oceanographic Products and Services (CO-OPS)
@ NOAA-University of New Hampshire - Joint Hydrographic Center
24 Colovos Road, Durham, NH 03824
carl.kammerer@noaa.gov

office: 603-862-3285 - cell: 301-908-1545 - fax: 603-862-0839

3 attachments



SummerHydro2012 - Survey Areas.tif
1259K

Survey Area1.kml
2K

Survey Area2.kml
2K

Briana Welton <briana.welton@noaa.gov> Fri, Jun 15, 2012 at 12:49 PM
To: Carolyn Lindley <carolyn.lindley@noaa.gov>
Cc: Corey Allen <Corey.Allen@noaa.gov>, "Gerald.Hovis" <Gerald.Hovis@noaa.gov>, "_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Pat Burke <Pat.Burke@noaa.gov>, Marc S Moser <marc.s.moser@noaa.gov>, Carl Kammerer <Carl.Kammerer@noaa.gov>, Andy Armstrong <andy.armstrong@noaa.gov>, Semme Dijkstra <s.dijkstra@unh.edu>

Hi Carolyn and Corey (cc Andy and Semme),

I've added Andy and Semme to this email chain as they are the instructors of the annual UNH Summer Hydro Field Course and are in the most appropriate position to respond to your request for out year coordination and planning, and hopefully better describe the intentions of the field work we are currently doing with respect to submission to NOAA.

From my perspective as a student in the class, I think we are requesting an existing zone or TCARI file (.zdf and/or .tc) of the survey area offshore of Gerrish Island. Attached is a .zdf of the area that we have from 2006, but are wondering if there is anything more contemporary available.

Many thanks for the help,

Bri
[Quoted text hidden]

NH_CORP.zdf
2K

Carolyn Lindley <carolyn.lindley@noaa.gov> Fri, Jun 15, 2012 at 1:08 PM
To: Briana Welton <briana.welton@noaa.gov>
Cc: Corey Allen <Corey.Allen@noaa.gov>, "Gerald.Hovis" <Gerald.Hovis@noaa.gov>, "_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Pat Burke <Pat.Burke@noaa.gov>, Marc S Moser <marc.s.moser@noaa.gov>, Carl Kammerer <Carl.Kammerer@noaa.gov>, Andy Armstrong <andy.armstrong@noaa.gov>, Semme Dijkstra <s.dijkstra@unh.edu>

Hi Bri,

Thank you for the additional information. Could you send us GIS files in *.tab or *.shp format? While we can create zdf's we don't have the ability to translate them back into the GIS layer file.

Thanks,
Carolyn

[Quoted text hidden]

--
Carolyn Lindley
Hydrographic Planning Team lead
Products and Services Branch/Oceanographic Division
Center for Operational Oceanographic Products and Services
(o) 301-713-2890 x166
(c) 240-620-7122

Briana Welton <briana.welton@noaa.gov> Fri, Jun 15, 2012 at 2:41 PM
To: Carolyn Lindley <carolyn.lindley@noaa.gov>
Cc: Corey Allen <Corey.Allen@noaa.gov>, "Gerald.Hovis" <Gerald.Hovis@noaa.gov>, "_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Pat Burke <Pat.Burke@noaa.gov>, Marc S Moser <marc.s.moser@noaa.gov>, Carl Kammerer <Carl.Kammerer@noaa.gov>, Andy Armstrong <andy.armstrong@noaa.gov>, Semme Dijkstra <s.dijkstra@unh.edu>

Hi Carolyn,

The attached shape file should depict the black line in the attached screengrab of our survey area. Thank you for looking in to this for us.

Many thanks,

Bri
[Quoted text hidden]

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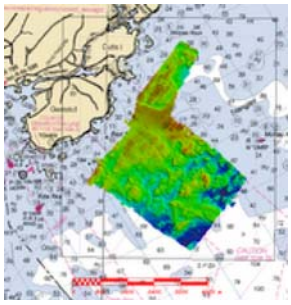
2 attachments



UNHSummerHydro2012_SurveyArea.PNG
503K

UNH_SummerHydro2012_survey_area_cvrage_Polygon.zip
2K

Briana Welton <briana.welton@noaa.gov> Mon, Jun 25, 2012 at 1:23 PM
To: Carolyn Lindley <carolyn.lindley@noaa.gov>
Cc: Corey Allen <Corey.Allen@noaa.gov>, "Gerald.Hovis" <Gerald.Hovis@noaa.gov>, "_NOS.CO-OPS.HPT" <NOS.COOPS.HPT@noaa.gov>, Pat Burke <Pat.Burke@noaa.gov>, Marc S Moser <marc.s.moser@noaa.gov>, Carl Kammerer <Carl.Kammerer@noaa.gov>, Andy Armstrong <andy.armstrong@noaa.gov>, Semme Dijkstra <s.dijkstra@unh.edu>, Matthew Wilson <Matthew.Wilson@noaa.gov>, AHB Chief <ahb.chief@noaa.gov>

All (added cc Matt Wilson and AHB Chief),

Attached is a final tide request for the 2012 UNH summer hydro class survey. It was created in Pydro just as I would have done if we were functioning as a NOAA field unit. My understanding is that this survey will be submitted to AHB.

Best regards,

Bri
[Quoted text hidden]

UNH_SummerHydro2012_Final_Water_Level_Request.zip
82K

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
<Unknown 'Field Unit' (Pydro: Config...PSS Metadata)>

June 25, 2012

MEMORANDUM FOR: Gerald Hovis, Chief, Products and Services Branch, N/OPS3

FROM: <Unknown 'Field Unit' and/or 'Lead Hydrographer' (Pydro: Config...PSS Metadata)>
SUBJECT: Request for Approved Tides/Water Levels

Please provide the following data:

1. Tide Note
2. Final TCARI grid
3. Final zoning in MapInfo and .MIX format
4. Six Minute Water Level data (Co-ops web site)

Transmit data to the following:

Atlantic Hydrographic Branch (N/CS33)
439 West York St
Norfolk, VA 23510

Director, JHC
Chase Ocean Engineering Lab
24 Colovos Road
Durham, NH 03824

These data are required for the processing of the following hydrographic survey:

Project No.:	TBD (UNH Summer Hydro 2012)
Registry No.:	TBD
State:	Maine
Locality:	Southern Maine
Sublocality:	Vicinity of Eastern Gerrish Island

Attachments containing:

1) an Abstract of Times of Hydrography,
2) digital MID MIF files of the track lines from Pydro

cc: N/CS33

Year_DOY	Min Time	Max Time
2012_158	16:58:55	18:11:02
2012_159	15:24:12	20:01:00
2012_160	14:23:31	19:44:20
2012_163	14:01:33	19:39:32
2012_164	14:16:50	17:31:56
2012_165	14:19:10	19:15:30
2012_166	14:25:32	19:23:19
2012_167	14:34:58	19:29:58
2012_170	14:41:14	19:22:25
2012_171	14:01:52	17:25:30

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : July 31, 2012

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: UNH Summer Hydro 2012
HYDROGRAPHIC SHEET:

LOCALITY: Vicinity of Eastern Gerrish Island, ME
TIME PERIOD: June 6 - June 19, 2012

TIDE STATION USED: 842-3898 Fort Point, NH
Lat. 43° 4.3'N Long. 70° 42.7' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.735 meters

REMARKS: RECOMMENDED ZONING

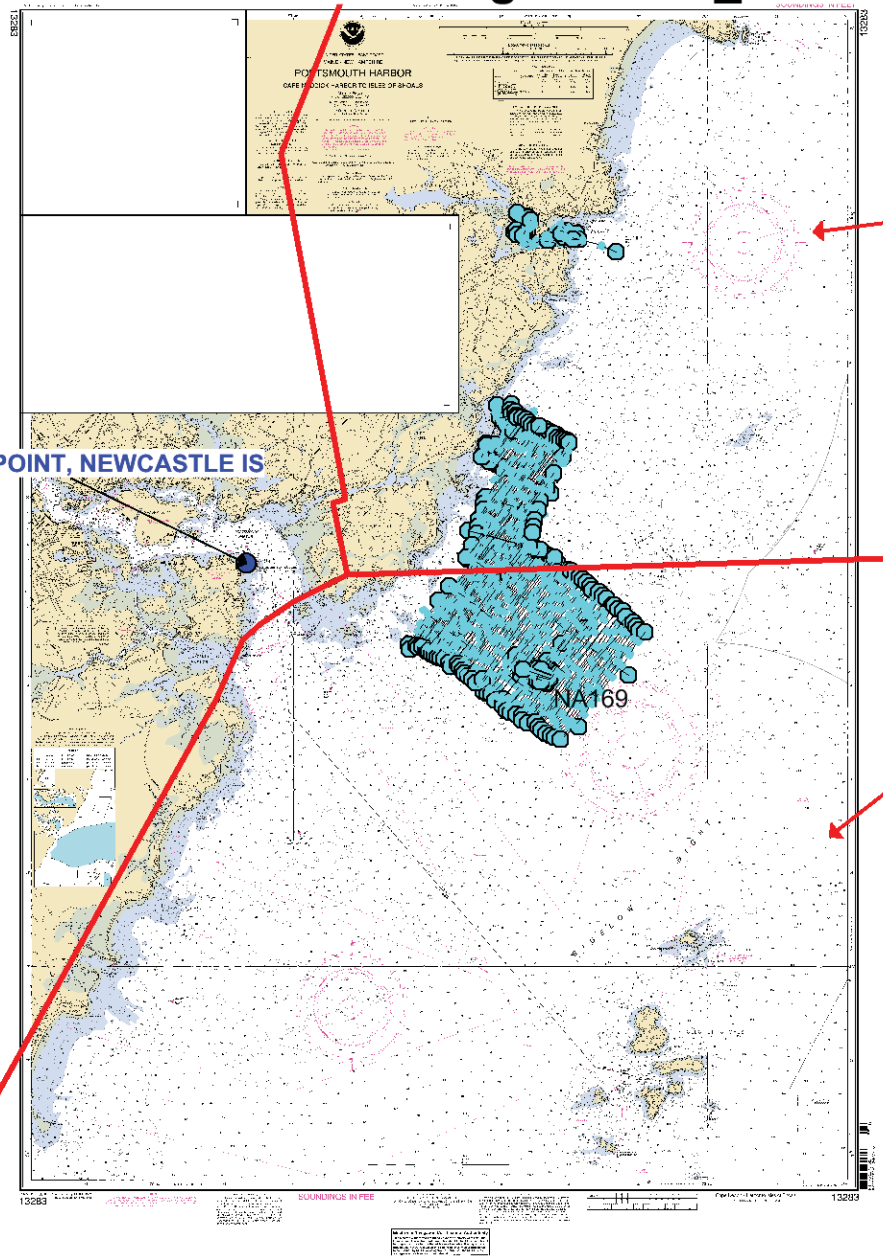
Please use the zoning file UNH2012CORP for UNH Summer Hydro 2012. Zones NA168 and NA169 are the applicable zones for UNH Summer Hydro 2012.

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).

_____
CHIEF, PRODUCTS AND SERVICES BRANCH

Discrete Tidal Zoning for UNH_Summer_2012



NA168
Time Corrector: -6
Range Ratio x 1.01
Reference: 8423898

8423898 FORT POINT, NEWCASTLE IS

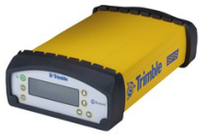
NA169
Time Corrector: -6
Range Ratio x 1
Reference: 8423898

Appendix II.

Supplemental Survey Records and Correspondence

Wiring Diagram onboard the R/V Coastal Surveyor, applicable to 2012 Summer Hydro field operations.

RTK Receiver



In com4
19200/CMR

POS/MV
(IP 192.168.0.50)

Out com1
GGA,ZDA,HDT 9600/N-8-1-N

Out com3
100 Hz, TSS1 19200/N-8-1-N

Hypack Computer
(IP 192.168.0.41)

Switch

Display for Bridge

EM 2040
Transducer and Receiver

EM 2040
Processing Unit
(IP 157.237.20.40)

Attitude
In com2
19200

Time, Position
In com1
9600

com3
9600/N-5-N

EM 2040
Hydrographic Work Station
(IP 192.168.0.42)

Processing Laptop
(IP 192.168.0.2)

Surface Sound Speed Sensor

Sound Speed Profiler

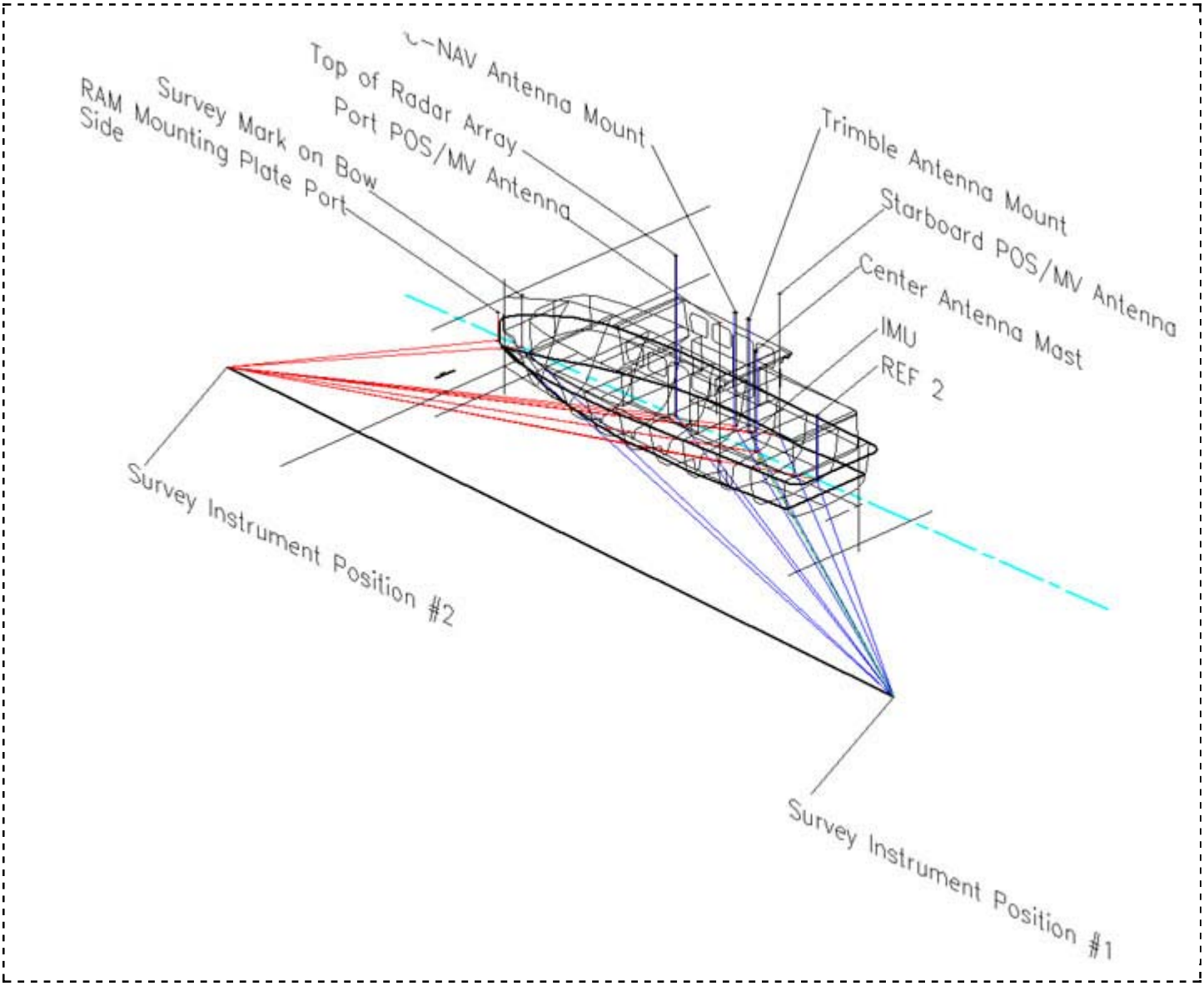
Serial Connection
Ethernet Connection (Ship Network)
Ethernet Connection (EM 2040)
Monitor Cable

RVCS Offsets

From CCOMwiki

This section contains information that is believed to be correct, but which could use verification from a source other than the author. Please verify if you can!

Vessel Layout



This section contains information that is believed to be correct, but which could use verification from a source other than the author. Please verify if you can!

	Station #1			Station #2			Difference			Delta-L	Average		
										(Closure)			
	x	y	z	x	y	z	x	y	z		x	y	z
IMU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REF2	-2.3842	-0.0002	-1.3223	-2.3942	0.0002	-1.3243	-0.0100	0.0004	-0.0020	0.0102	-2.3892	0.0000	-1.3233
Aft Antenna Mt. Base plate mark	-0.1673	0.0192	-2.3763	-0.1265	-0.0002	-2.3793	0.0408	-0.0194	-0.0030	0.0453	-0.1469	0.0095	-2.3778
Port POS/MV Antenna Mount	0.0430	-1.1014	-3.4993	0.0590	-1.0799	-3.4993	0.0160	0.0215	0.0000	0.0268	0.0510	-1.0907	-3.4993
Stdb POS/MV Antenna Mount	0.0935	1.1255	-3.5283	0.0972	1.1127	-3.5283	0.0037	-0.0128	0.0000	0.0133	0.0954	1.1191	-3.5283
Trimble Antenna Mount	0.7092	0.6474	-2.7543	0.7729	0.6245	-2.7523	0.0637	-0.0229	0.0020	0.0677	0.7411	0.6360	-2.7533
C-Nav Antenna Mount	1.2745	0.6474	-2.7473	1.2218	0.6795	-2.7543	-0.0527	0.0321	-0.0070	0.0621	1.2482	0.6635	-2.7508
Radar Array Top	2.7159	-0.1710	-4.1033	2.7590	0.0030	-4.0873	0.0431	0.1740	0.0160	0.1800	2.7375	-0.0840	-4.0953
Survey mark on Bow	8.3385	-0.0033	-0.9733	8.3400	0.0030	-0.9723	0.0015	0.0063	0.0010	0.0066	8.3393	-0.0002	-0.9728
Transducer mount top Port-Aft cor	9.0083	-0.1911	-0.3033	9.0100	-0.1663	-0.2983	0.0017	0.0248	0.0050	0.0254	9.0092	-0.1787	-0.3008
fixed Transducer Center of face	-0.4754	-0.1612	0.5487	sight not taken							-0.4754	-0.1612	0.5487

	RESULT (corrected for pitch)			Deviation		
	z-correction		2.7			
	x-distance		274.5			
	angle		0.56355			
	x'	y'	z'	delta-x	delta-y	delta-z
IMU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
REF2	-2.4021	0.0000	-1.3467	0.0129	0.0000	0.0234
Aft Antenna Mt. Base plate mark	-0.1703	0.0095	-2.3791	0.0234	0.0000	0.0013
Port POS/MV Antenna Mount	0.0166	-1.0907	-3.4986	0.0344	0.0000	-0.0007
Stdb POS/MV Antenna Mount	0.0606	1.1191	-3.5272	0.0347	0.0000	-0.0011
Trimble Antenna Mount	0.7139	0.6360	-2.7459	0.0271	0.0000	-0.0074
C-Nav Antenna Mount	1.2210	0.6635	-2.7384	0.0271	0.0000	-0.0124
Radar Array Top	2.6970	-0.0840	-4.0682	0.0404	0.0000	-0.0271
Survey mark on Bow	8.3293	-0.0002	-0.8907	0.0100	0.0000	-0.0821
Transducer mount top Port-Aft cor	9.0058	-0.1787	-0.2122	0.0034	0.0000	-0.0886
fixed Transducer Center of face	-0.4700	-0.1612	0.5440	-0.0054	0.0000	0.0047

Categories: Verification | Boats | RVCS

- This page was last modified on 4 December 2009, at 11:05.
- This page has been accessed 117 times.

Squat and Settlement Measurements for the

R/V Coastal Surveyor

Results

Center for Coastal and Ocean Mapping Hydrographic Field Course

Summer 2006

Version 0.1

Introduction

Measurements of settlement and squat were performed for the R/V Coastal Surveyor using RTK GPS. 18 measurement runs, each of 3 minutes in duration were performed at varying speeds. For each run, ellipsoidal height, pitch, speed-over-ground, speed-through-water and engine RPM were recorded at 1=second intervals. Eight measurement runs were performed into the tidal current, eight against the tidal current and 2 stationary with respect to the tidal current. Local tidal height measurements were recorded during the duration of the data taking runs which were used to correct measured ellipsoidal heights.

For each run, height of the transducer face was calculated from tidal-corrected mean ellipsoidal height reported at the IMU by the POSMV. Additional vertical translation due to vessel pitch was not included in the analysis, as this is accounted for by the EM3002 sonar.

Unfortunately, attempts at recording of speed-through-water was unsuccessful due to a computer glitch for many of the data runs. Therefore, speed-through-water was estimated by correcting mean speed-over-ground measurements recorded by the POS-MV for the mean tidal current. The mean tidal current was determined from the average of the speed-over-ground measurements obtained by the two stationary (dead-in-the-water) measurement runs.

Results

A plot of the settlement and squat characteristics of the R/V Coastal Surveyor represented as tidally corrected ellipsoidal height vs. ship-speed-through-the-water is shown in Figure 1. In this plot, red points indicate measurements against the current, while blue points indicate measurements with the current.

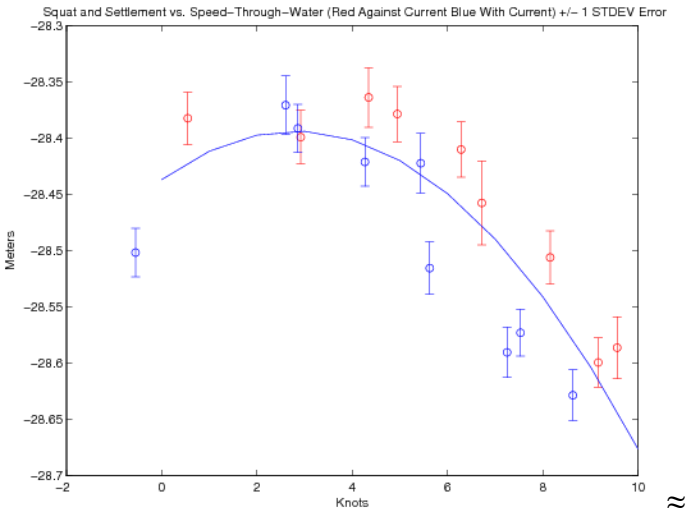


Figure 1. Tidal corrected ellipsoidal height measurements for the R/V Coastal Surveyor. (Negative values indicate a lower riding vessel.)

The difference in measurements evident between those taken with and against the current is due to our coarse method of subtracting the mean current from each speed. However the fit of a second-degree polynomial provides a good representation of the data.

We then subtract the zero-speed height from the curve to give a relative height measurement for settlement and squat. The resulting curve is shown below.

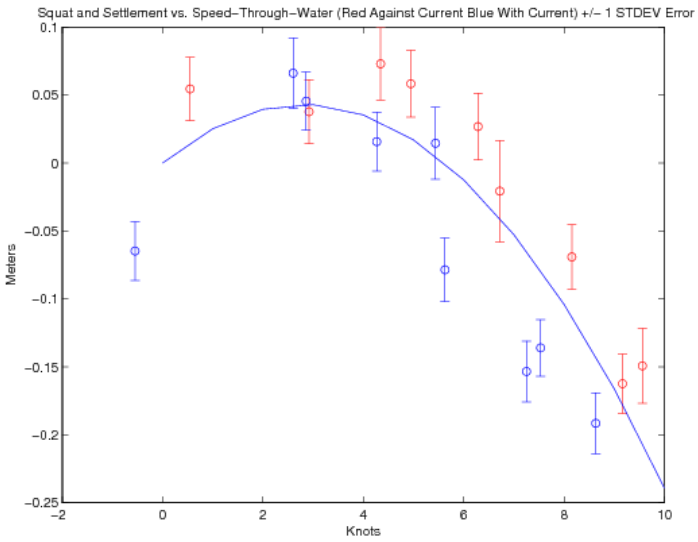


Figure 3. Squat and Settlement plot.

A table of the polynomial coefficients for this shifted plot can be found in Table 1. A table of values evaluated from the polynomial fit can be found in Table 2.

Table 1.

Polynomial Term	Coeficients with speeds scaled [(speed-5)/10] Coefficient
x^2	-0.547
x^1	-0.239
x^0	28.197

Table 2.

Speed (kts - (m/s))	Height (m)
0.000+/-0.790 (0.000*/-0.406)	0.000+/-0.0448
1.000+/-0.790 (0.514*/-0.406)	0.025+/-0.0448
2.000+/-0.790 (1.029*/-0.406)	0.040+/-0.0448
3.000+/-0.790 (1.543*/-0.406)	0.043+/-0.0448
4.000+/-0.790 (2.058*/-0.406)	0.035+/-0.0448
5.000+/-0.790 (2.572*/-0.406)	0.017+/-0.0448
6.000+/-0.790 (3.087*/-0.406)	-0.012+/-0.0448
7.000+/-0.790 (3.601*/-0.406)	-0.053+/-0.0448
8.000+/-0.790 (4.116*/-0.406)	-0.104+/-0.0448
9.000+/-0.790 (4.630*/-0.406)	-0.166+/-0.0448
10.000+/-0.790 (5.144*/-0.406)	-0.239+/-0.0448

Theory to Practice:

In the course of the Coastal Surveyor's patch test for the EM3002 sonar, two lines were run over the same piece of sea floor at speeds of 6 and 9 knots to assess the navigation time bias of the sonar system. A portion of these each overlapping run over flat seafloor provided an ideal real-world measurement of the squat and settlement characteristics of

the vessel. The two runs were completed within 15 minutes of each other such that tidal differences may be neglected. However, lever-arm offsets between the IMU and sonar transducer were not entered into the sonar system for these lines. Therefore, the sonar could not correct for vertical translations due to pitch.

To compare our settlement and squat measurements with data from these two lines, we must recalculate our settlement and squat curve, this time without omitting the effect of pitch on the vertical translation of the transducer. These calculations produce the following curve and table.

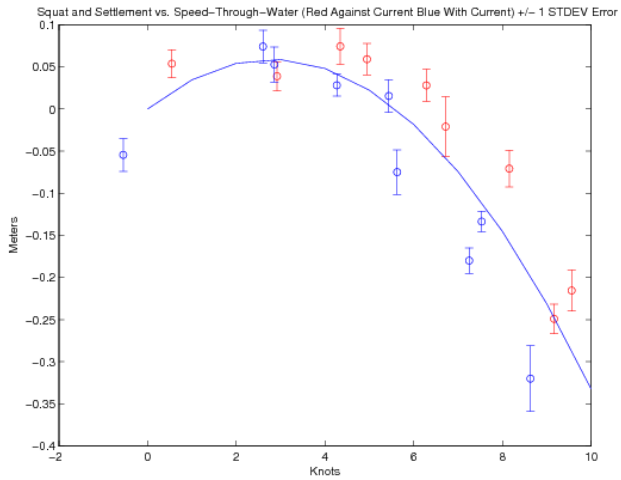


Figure 3. Settlement and Squat including vertical translation from vessel pitch.

Table 3.

Speed (kts - (m/s))	Height (m)
0.000+/-0.790 (0.000*/-0.406)	0.000+/-0.0536
1.000+/-0.790 (0.514*/-0.406)	0.035+/-0.0536
2.000+/-0.790 (1.029*/-0.406)	0.054+/-0.0536
3.000+/-0.790 (1.543*/-0.406)	0.059+/-0.0536
4.000+/-0.790 (2.058*/-0.406)	0.048+/-0.0536
5.000+/-0.790 (2.572*/-0.406)	0.022+/-0.0536
6.000+/-0.790 (3.087*/-0.406)	-0.018+/-0.0536
7.000+/-0.790 (3.601*/-0.406)	-0.074+/-0.0536
8.000+/-0.790 (4.116*/-0.406)	-0.145+/-0.0536
9.000+/-0.790 (4.630*/-0.406)	-0.231+/-0.0536
10.000+/-0.790 (5.144*/-0.406)	-0.333+/-0.0536

From each of the patch test lines, a portion of the data near nadir in the along-track direction after the patch test corrections had been applied. The area of data used for comparison and a plot of that data is illustrated in Figure 4.

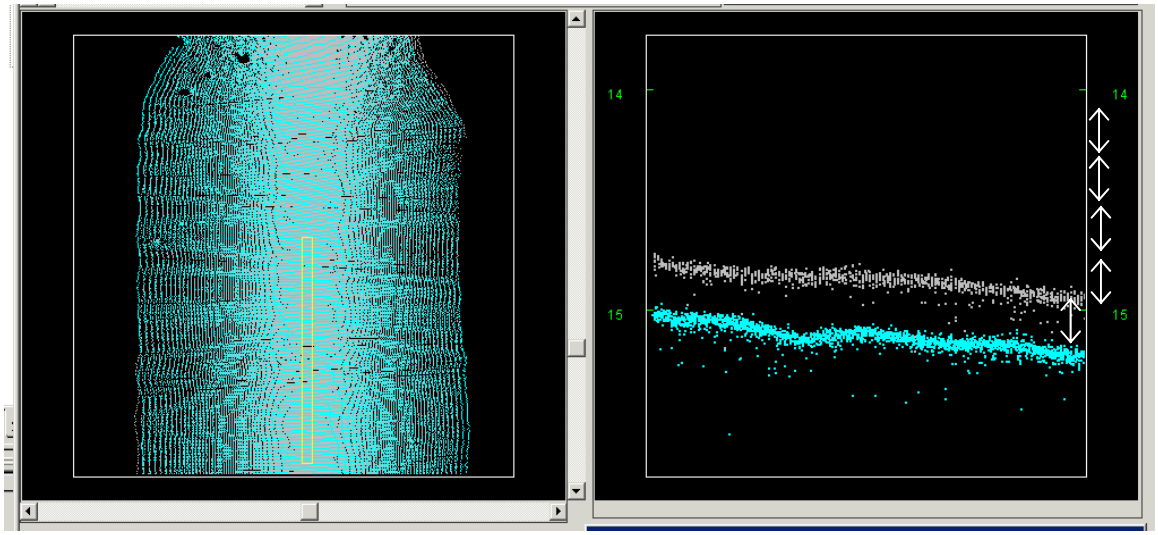


Figure 4. In this screenshot, the yellow rectangle in the left window illustrates near-nadir data that has been extracted and plotted in the right window. The right window shows the along-track trend of the two lines and the clear offset due to settlement and squat.

The offset between lines is roughly .25 meters, as measured by the double arrows in Figure 4. Using the values of the pitch-influenced squat and settlement measurements in Table 3. above, the expected offset is -.018 – (-.231) = .213m, a reasonable agreement.

Appendix II.

Survey Features Report

DTONs - Twenty
AWOIS - None
Wrecks - None
Maritime Boundaries - None

UNH DtoN SOUNDG

Registry Number:

State: Maine

Locality: United States - East Coast

Sub-locality: Cutts Island to Gerrish Island

Project Number: UNH Summer Survey Project 2012

Survey Dates: 06/11/2012 - 06/18/2012

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
13283	21st	03/01/2011	1:20,000 (13283_1)	USCG LNM: 1/24/2012 (6/19/2012) CHS NTM: None (5/25/2012) NGA NTM: None (6/30/2012)
13274	27th	06/01/2007	1:40,000 (13274_2)	[L]NTM: ?
13286	30th	03/01/2004	1:80,000 (13286_1)	[L]NTM: ?
13278	26th	06/01/2005	1:80,000 (13278_1)	[L]NTM: ?
13260	40th	05/01/2007	1:378,838 (13260_1)	[L]NTM: ?
13009	33rd	05/01/2007	1:500,000 (13009_1)	[L]NTM: ?
13006	34th	05/01/2007	1:675,000 (13006_1)	[L]NTM: ?
13003	49th	04/01/2007	1:1,200,000 (13003_1)	[L]NTM: ?

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

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	40ft SOUNDG	Shoal	12.30 m	43° 03' 52.5" N	070° 39' 51.1" W	---
1.2	11ft SOUNDG	Shoal	3.32 m	43° 05' 35.4" N	070° 39' 13.4" W	---
1.3	36ft SOUNDG	Shoal	11.03 m	43° 03' 49.8" N	070° 39' 11.7" W	---
1.4	6ft SOUNDG	Shoal	1.95 m	43° 05' 34.5" N	070° 39' 08.5" W	---
1.5	4ft SOUNDG	Shoal	1.15 m	43° 05' 35.3" N	070° 39' 04.9" W	---
1.6	1ft SOUNDG	Shoal	0.32 m	43° 05' 37.9" N	070° 39' 01.1" W	---
1.7	8ft SOUNDG	Shoal	2.39 m	43° 05' 46.0" N	070° 38' 59.3" W	---
1.8	1ft SOUNDG	Shoal	0.44 m	43° 05' 38.7" N	070° 38' 58.5" W	---

1.9	6ft SOUNDG	Shoal	2.03 m	43° 05' 39.3" N	070° 38' 56.0" W	---
1.10	5ft SOUNDG	Shoal	1.58 m	43° 05' 41.3" N	070° 38' 54.8" W	---
1.11	36ft SOUNDG	Shoal	11.13 m	43° 03' 54.2" N	070° 38' 54.4" W	---
1.12	23ft SOUNDG	Shoal	7.23 m	43° 05' 31.2" N	070° 38' 52.7" W	---
1.13	23ft SOUNDG	Shoal	7.10 m	43° 04' 56.9" N	070° 38' 47.6" W	---
1.14	36ft SOUNDG	Shoal	10.91 m	43° 04' 02.0" N	070° 38' 44.4" W	---
1.15	38ft SOUNDG	Shoal	11.55 m	43° 03' 53.3" N	070° 38' 42.7" W	---
1.16	15ft SOUNDG	Shoal	4.51 m	43° 04' 21.5" N	070° 38' 39.7" W	---
1.17	32ft SOUNDG	Shoal	9.69 m	43° 05' 15.7" N	070° 38' 35.6" W	---
1.18	29ft SOUNDG	Shoal	8.94 m	43° 04' 48.7" N	070° 38' 22.4" W	---
1.19	18ft SOUNDG	Shoal	5.66 m	43° 04' 19.8" N	070° 38' 20.0" W	---
1.20	24ft SOUNDG	Shoal	7.42 m	43° 03' 32.8" N	070° 37' 48.8" W	---

1 - Dangers To Navigation

1.1) 40ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 03' 52.5" N, 070° 39' 51.1" W
Least Depth:	12.30 m (= 40.37 ft = 6.728 fm = 6 fm 4.37 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-166.15:10:57.000 (06/14/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117489 00001(022600110D310001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117489 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

40ft (13283_1, 13274_2, 13278_1, 13286_1)

6 ¾fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120614
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product.

Feature Images

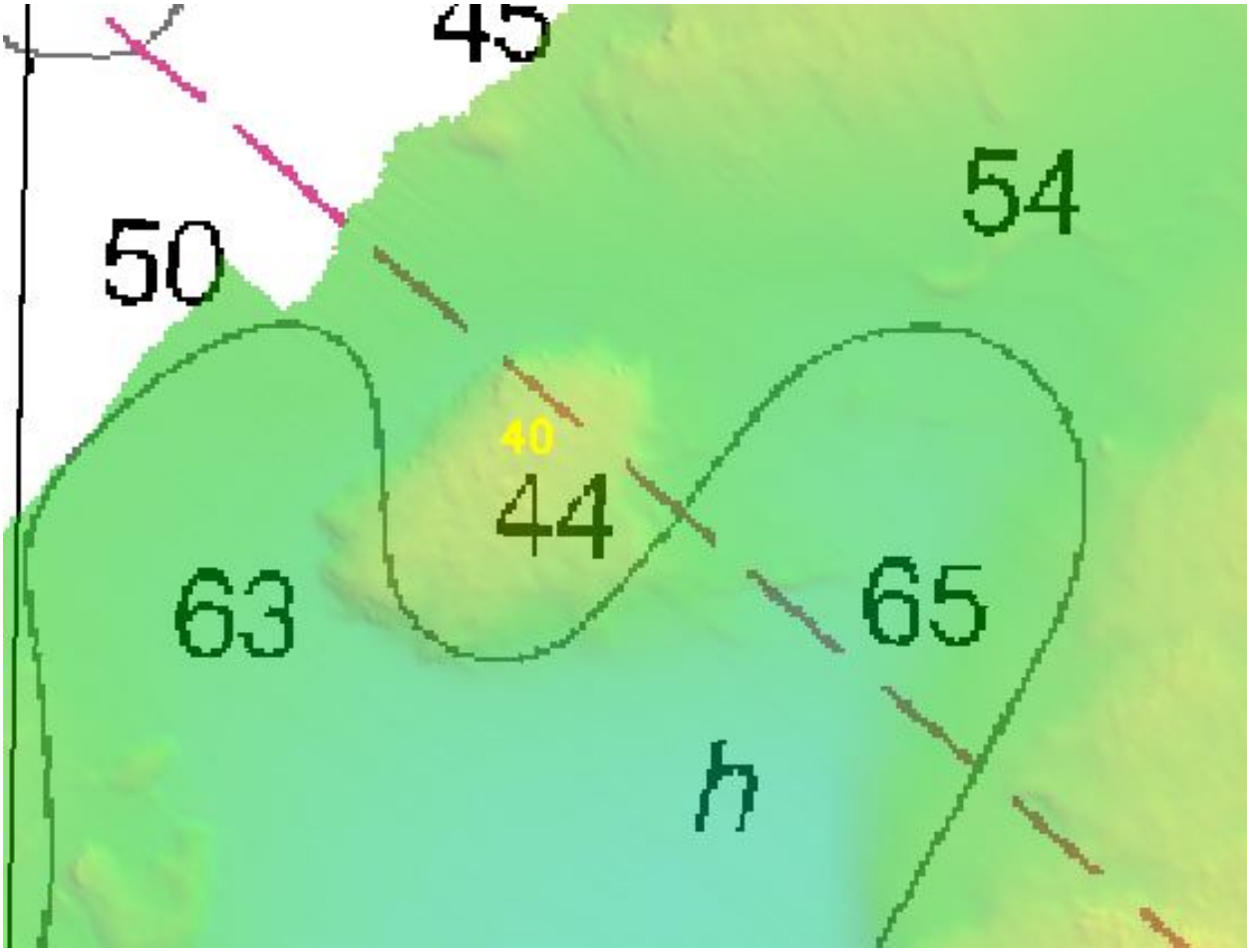
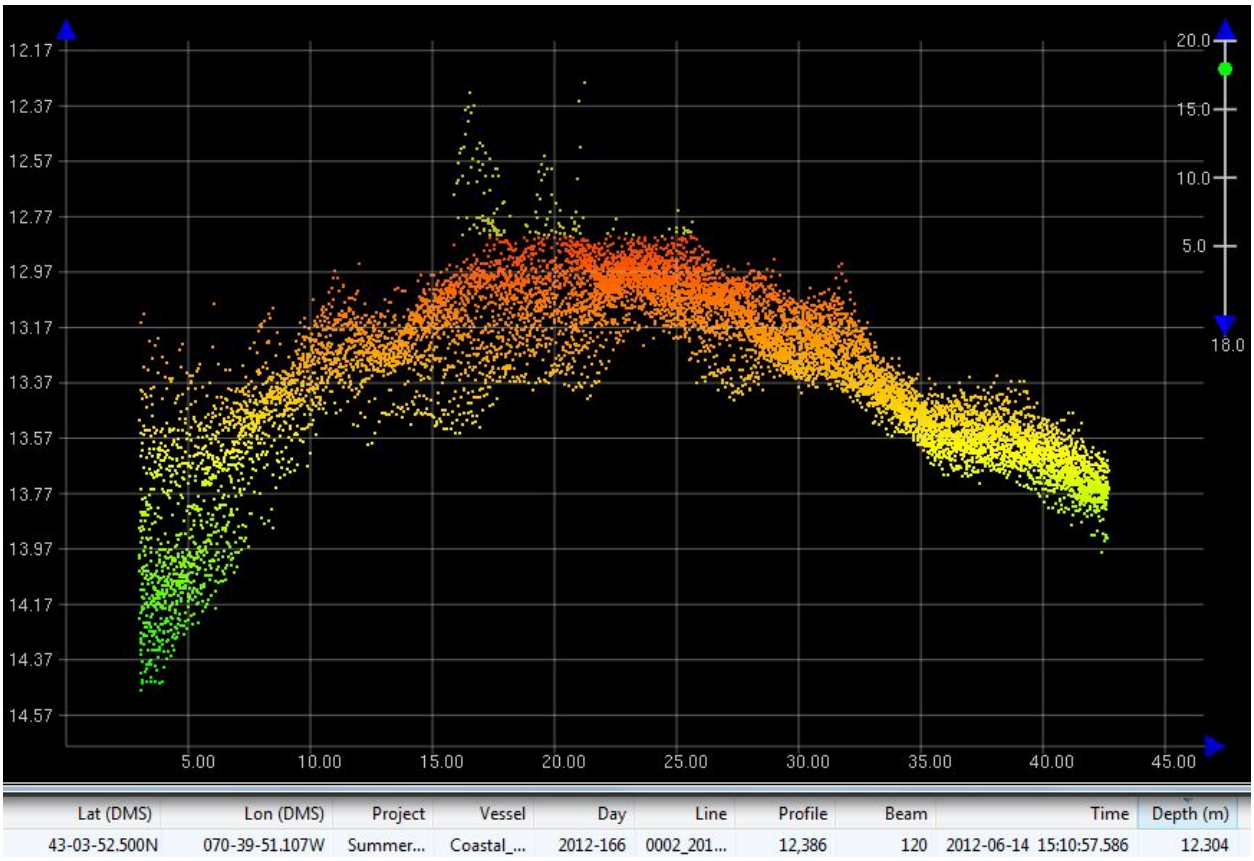


Figure 1.1.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-03-52.500N	070-39-51.107W	Summer...	Coastal_...	2012-166	0002_201...	12,386	120	2012-06-14 15:10:57.586	12.304

Figure 1.1.2

1.2) 11ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 35.4" N, 070° 39' 13.4" W
Least Depth:	3.32 m (= 10.91 ft = 1.818 fm = 1 fm 4.91 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.14:56:55.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117466 00001(022600110D1A0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117466 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

11ft (13283_1, 13274_2, 13278_1, 13286_1)

1 ¾fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product.

Feature Images

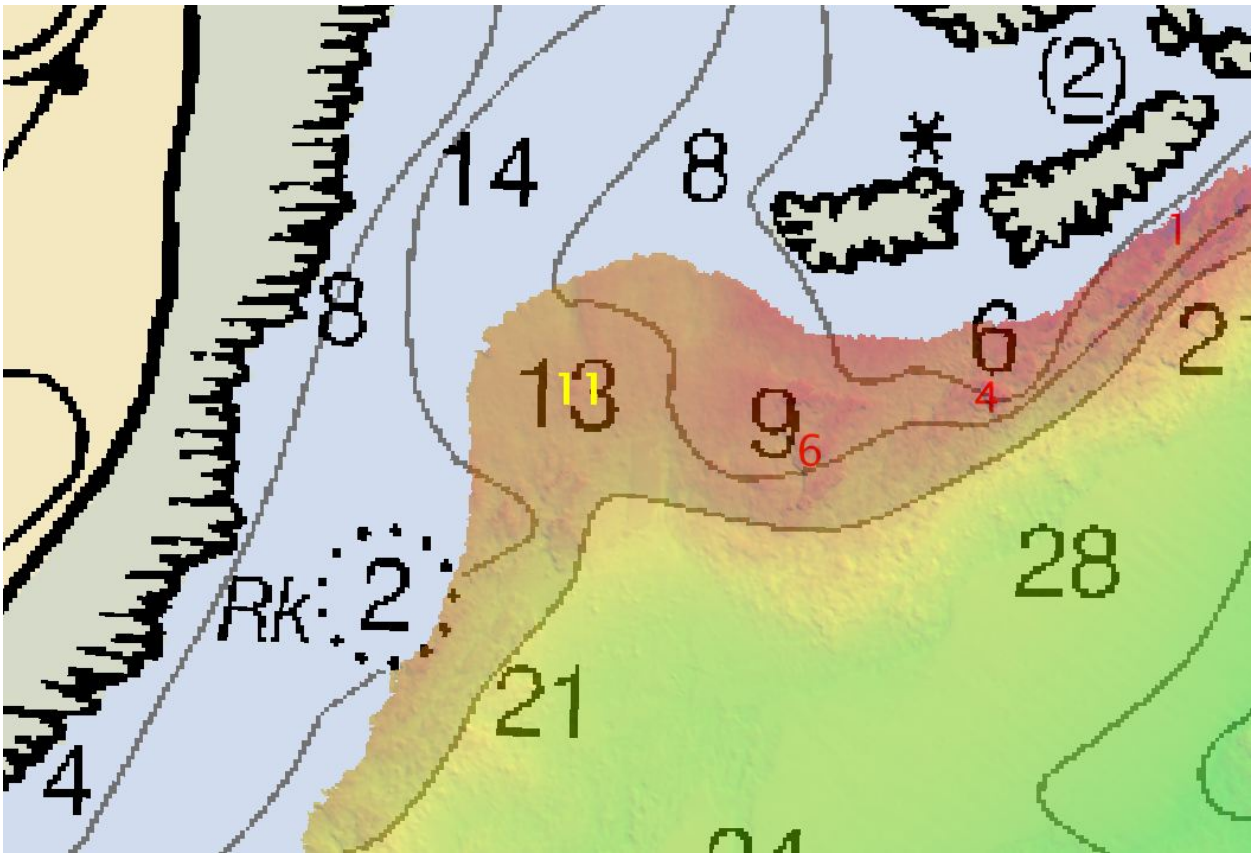
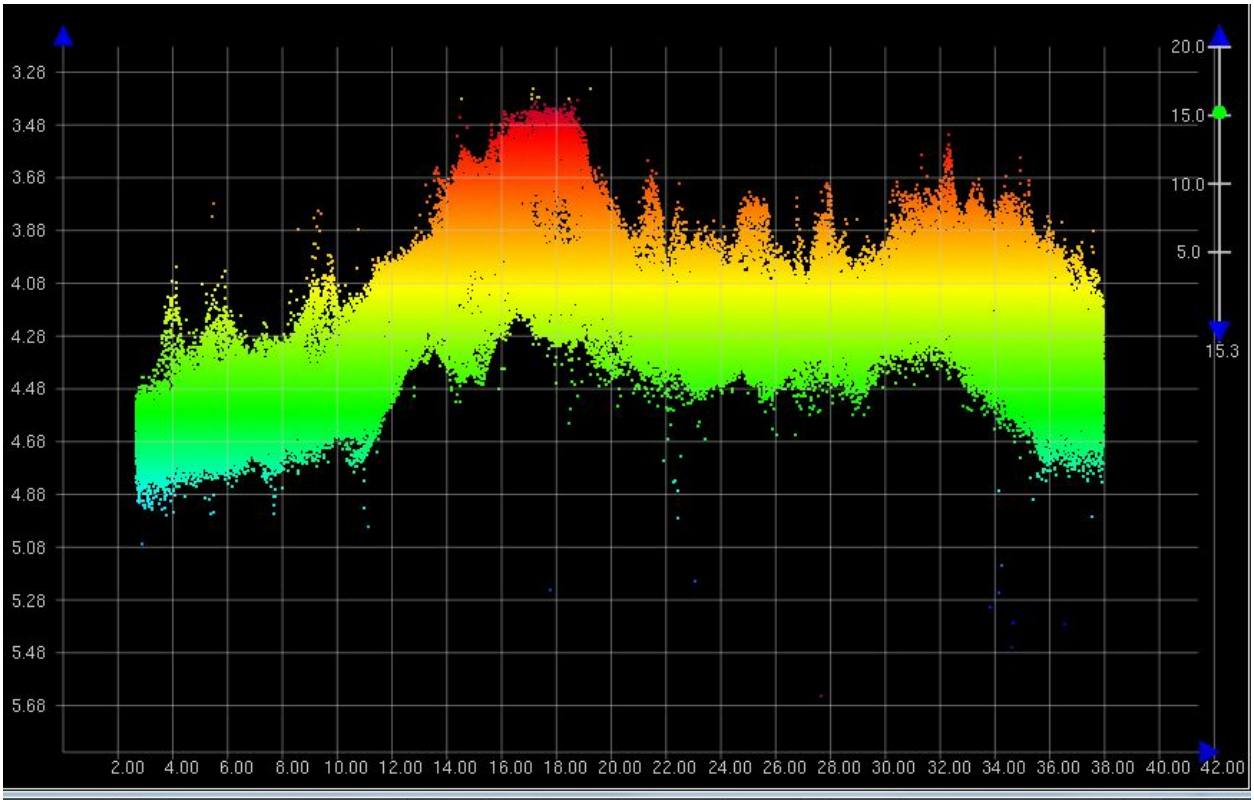


Figure 1.2.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-35.368N	070-39-13.403W	Summer...	Coastal_...	2012-167	0002_201...	6,671	313	2012-06-15 14:56:55.156	3.324

Figure 1.2.2

1.3) 36ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 03' 49.8" N, 070° 39' 11.7" W
Least Depth:	11.03 m (= 36.17 ft = 6.029 fm = 6 fm 0.17 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-166.19:33:08.000 (06/14/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117487 00001(022600110D2F0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117487 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

36ft (13283_1, 13274_2, 13278_1, 13286_1)

6fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120614
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product.

Feature Images

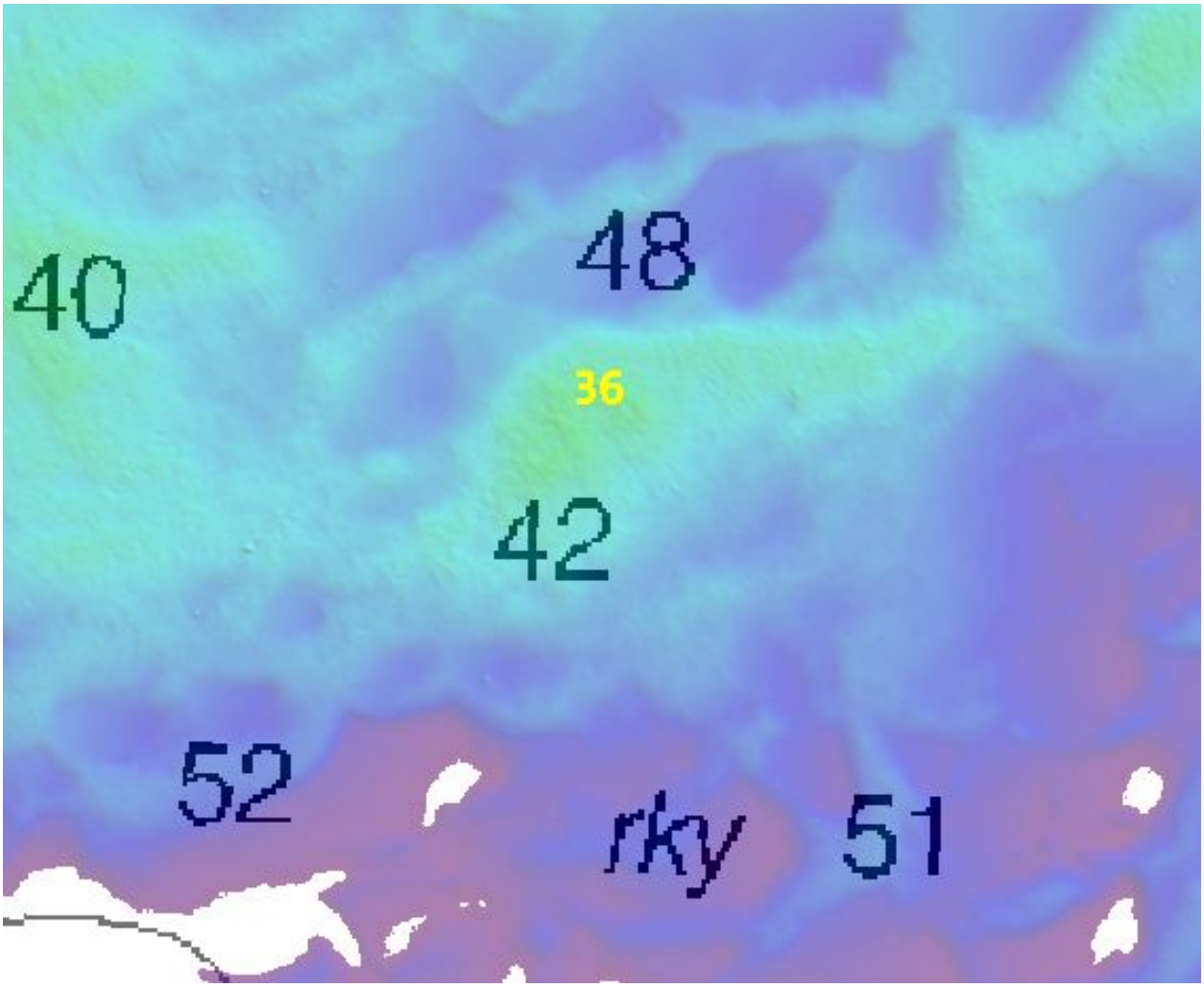
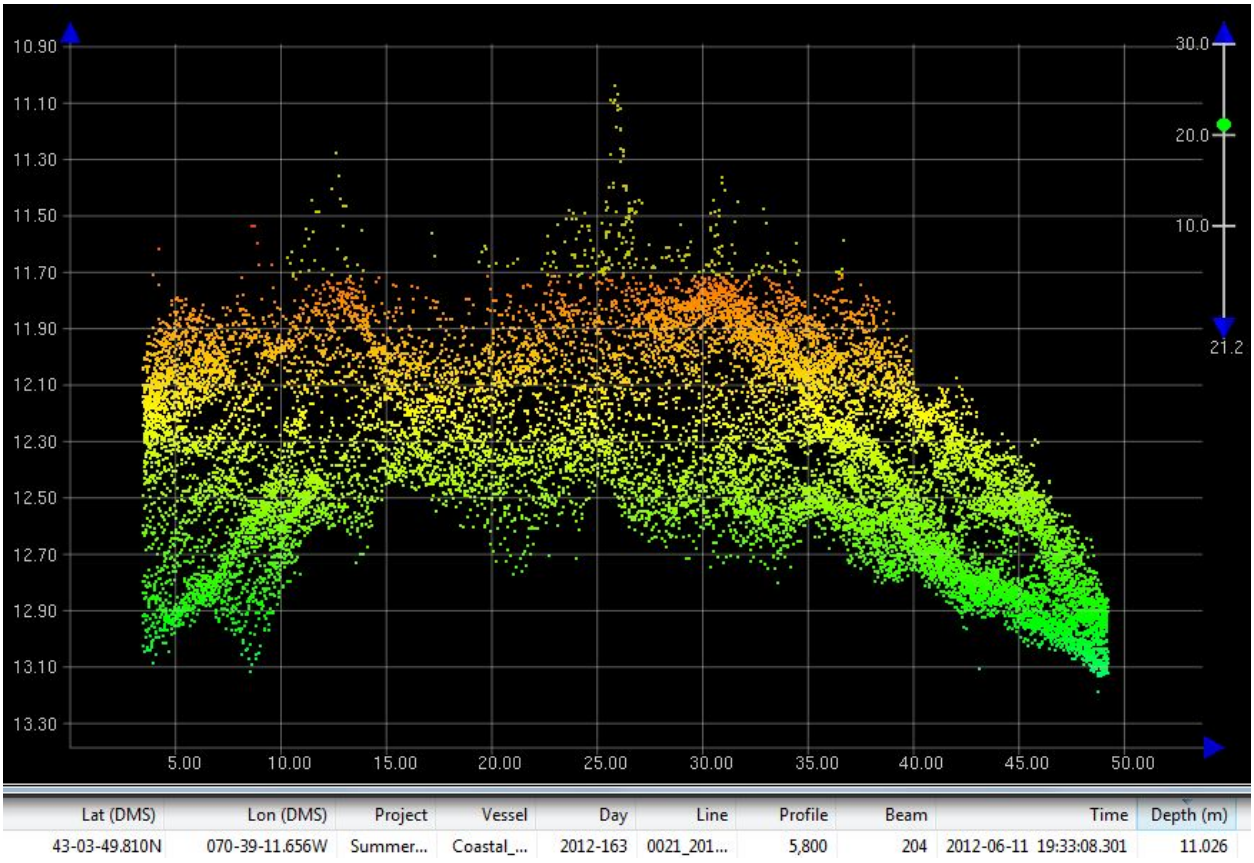


Figure 1.3.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-03-49.810N	070-39-11.656W	Summer...	Coastal_...	2012-163	0021_201...	5,800	204	2012-06-11 19:33:08.301	11.026

Figure 1.3.2

1.4) 6ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 34.5" N, 070° 39' 08.5" W
Least Depth:	1.95 m (= 6.39 ft = 1.065 fm = 1 fm 0.39 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-170.14:49:06.000 (06/18/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117467 00001(022600110D1B0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117467 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

6ft (13283_1, 13274_2, 13278_1, 13286_1)

1fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120618
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product.

Feature Images

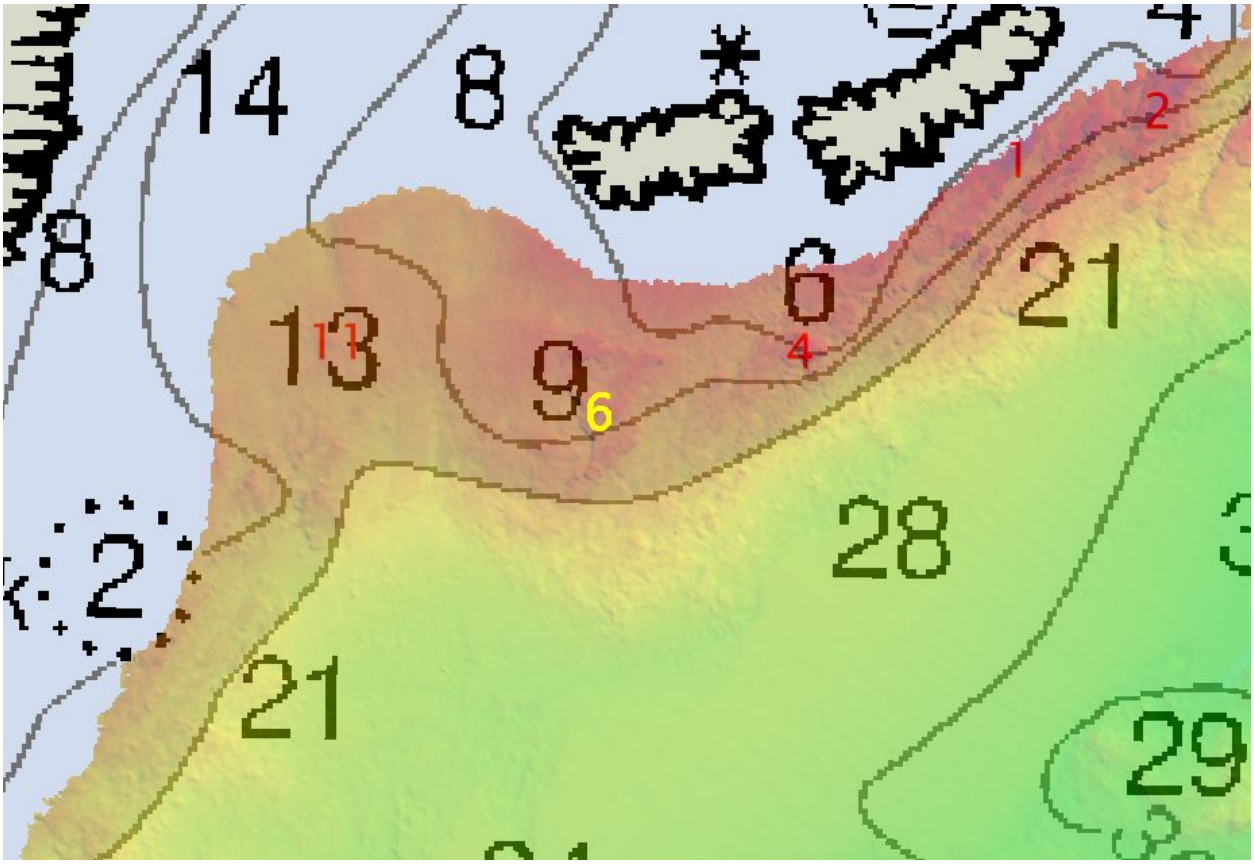
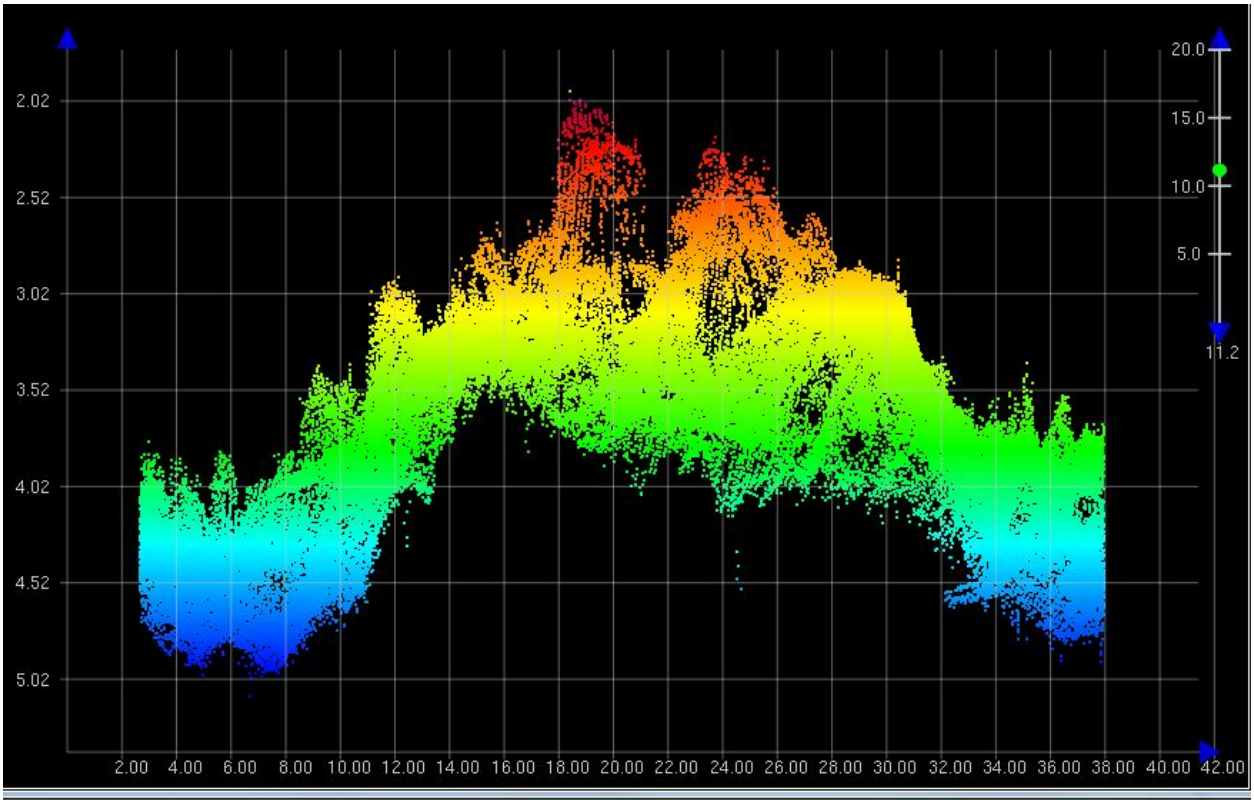


Figure 1.4.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-34.475N	070-39-08.522W	Summer...	Coastal_...	2012-170	0004_201...	374	199	2012-06-18 14:49:06.562	1.948

Figure 1.4.2

1.5) 4ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 35.3" N, 070° 39' 04.9" W
Least Depth:	1.15 m (= 3.76 ft = 0.627 fm = 0 fm 3.76 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.14:55:34.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117468 00001(022600110D1C0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117468 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

4ft (13283_1, 13274_2, 13278_1, 13286_1)

0 ½fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product.

Feature Images

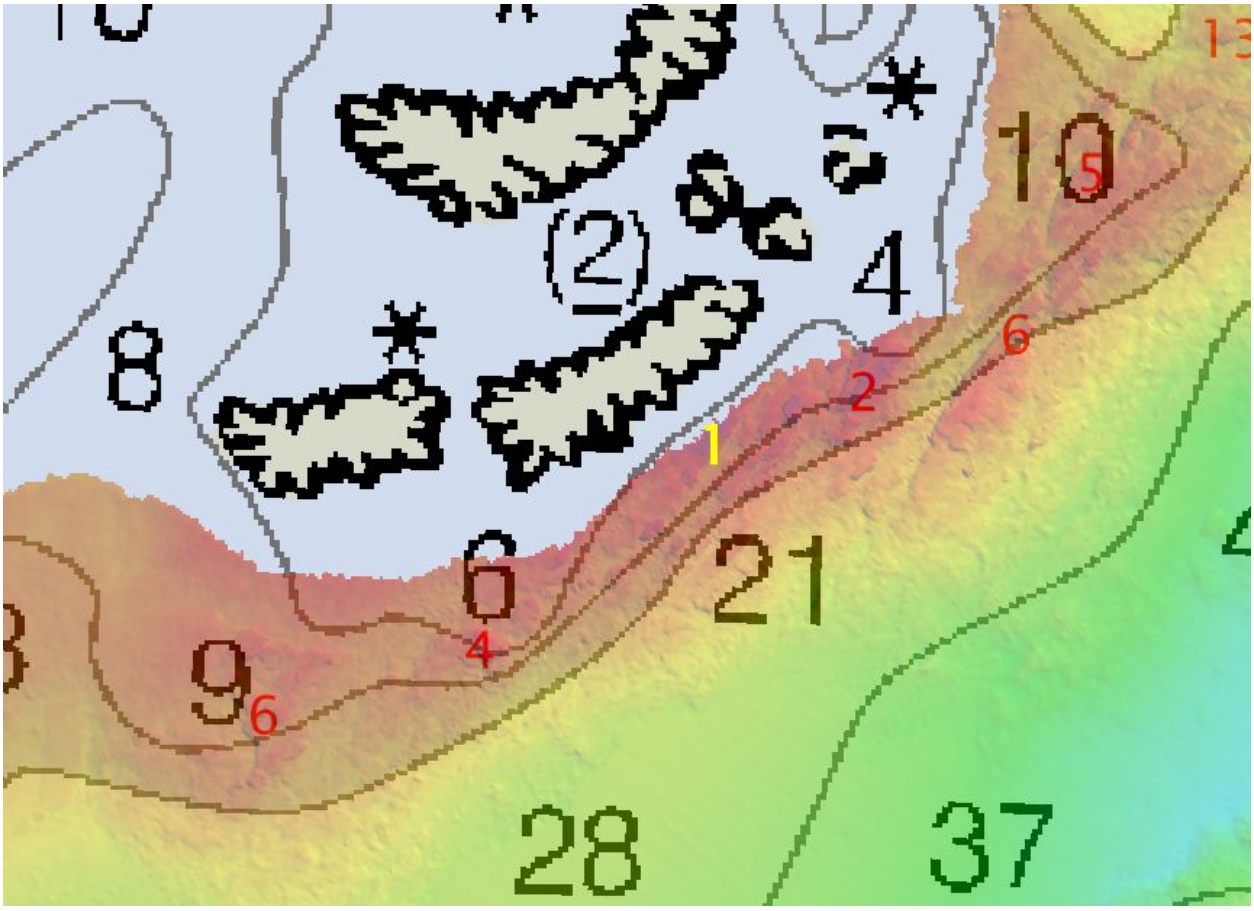


Figure 1.5.1

1.6) 1ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 37.9" N, 070° 39' 01.1" W
Least Depth:	0.32 m (= 1.06 ft = 0.177 fm = 0 fm 1.06 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.14:39:00.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117469 00001(022600110D1D0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117469 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

1ft (13283_1, 13274_2, 13278_1, 13286_1)

0fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product.

Feature Images

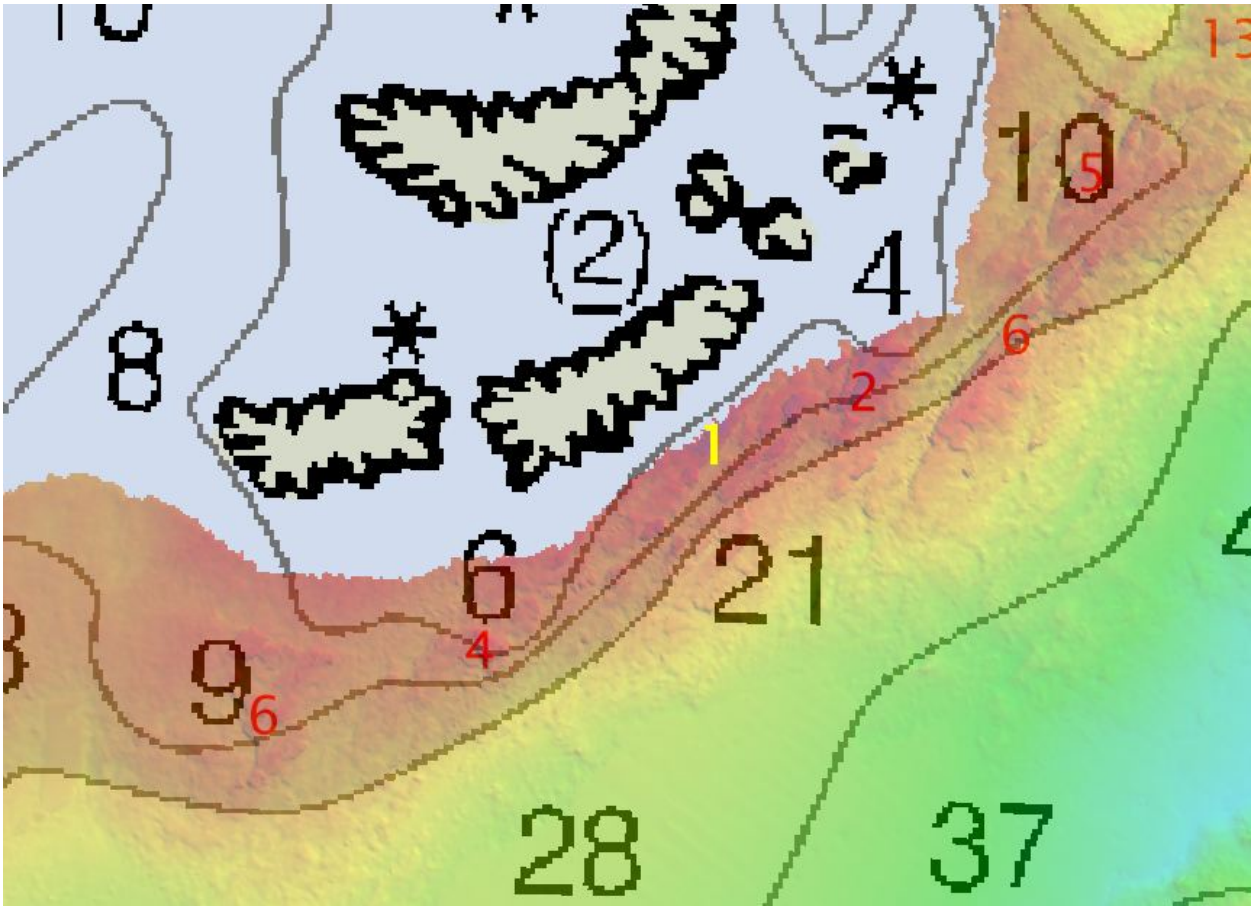
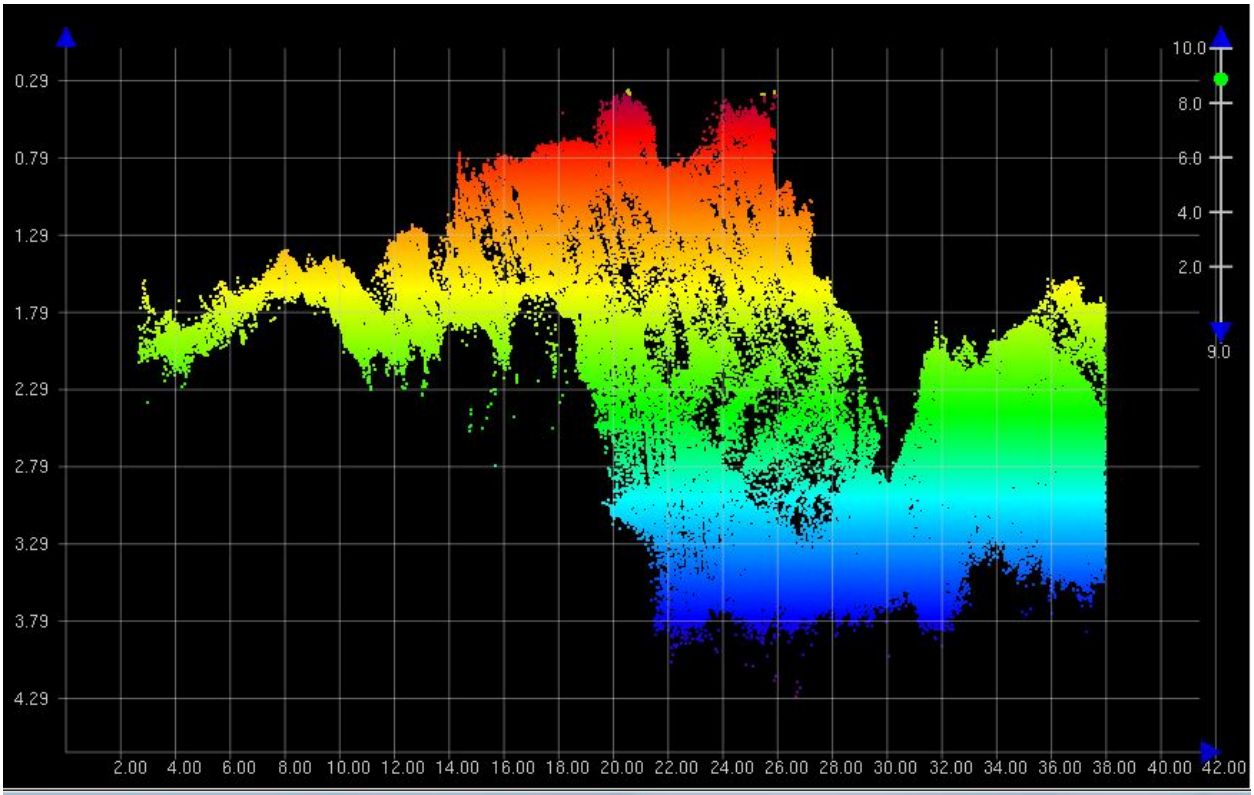


Figure 1.6.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-37.908N	070-39-01.085W	Summer...	Coastal_...	2012-167	0001_201...	5,967	52	2012-06-15 14:39:00.755	0.324

Figure 1.6.2

1.7) 8ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 46.0" N, 070° 38' 59.3" W
Least Depth:	2.39 m (= 7.85 ft = 1.309 fm = 1 fm 1.85 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.14:41:31.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117474 00001(022600110D220001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117474 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

8ft (13283_1, 13274_2, 13278_1, 13286_1)

1 ¼fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product.

Feature Images

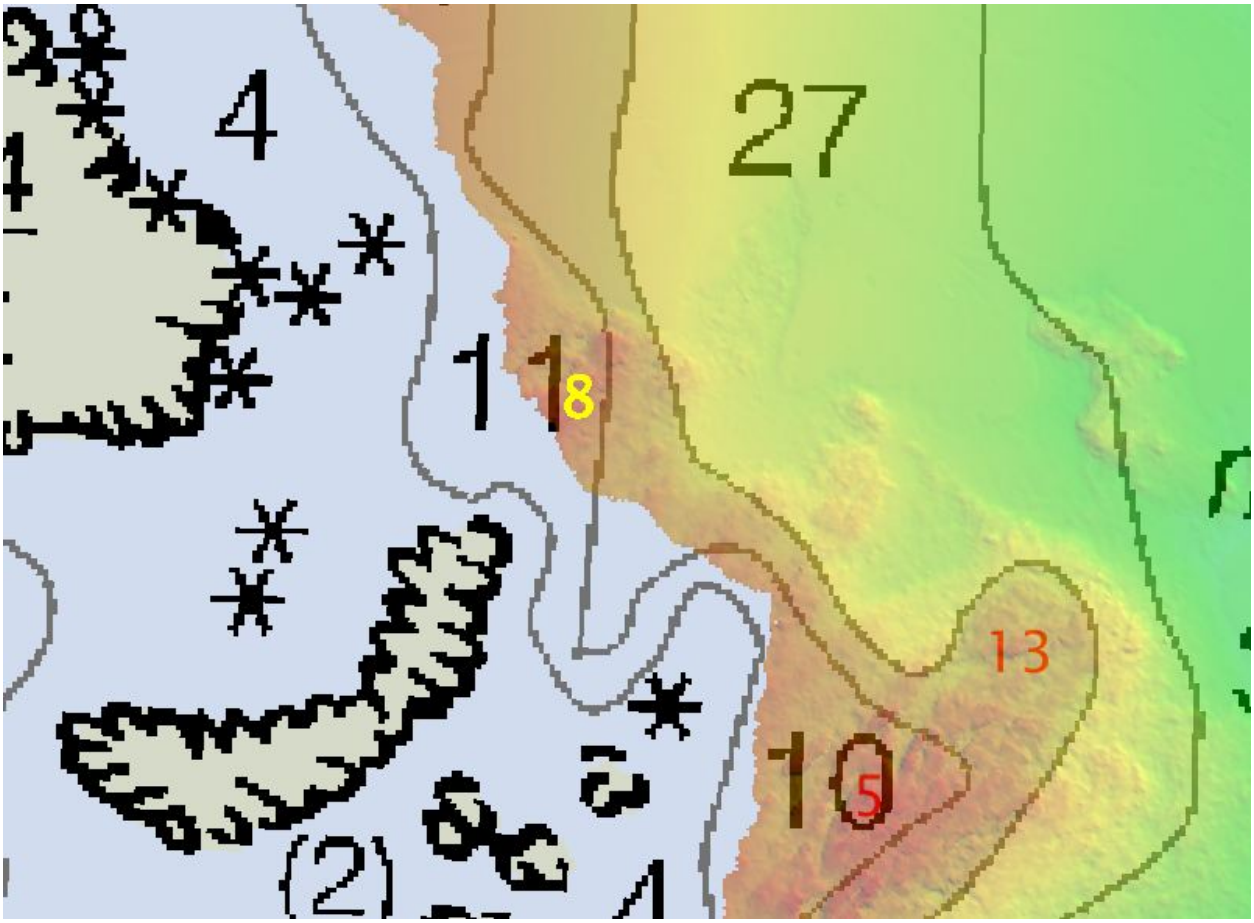


Figure 1.7.1

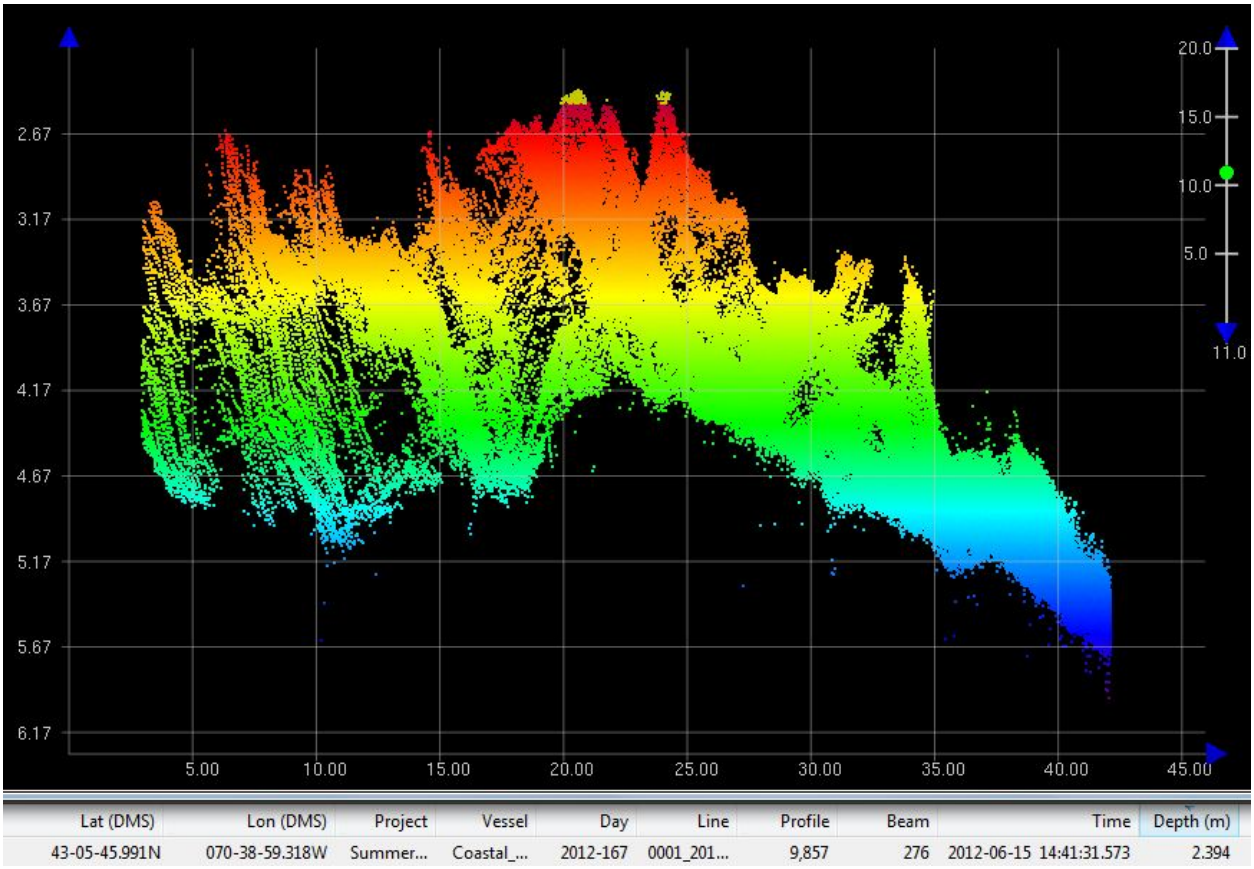

20.0
15.0
10.0
5.0
11.0
2.67
3.17
3.67
4.17
4.67
5.17
5.67
6.17
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Lat (DMS) Lon (DMS) Project Vessel Day Line Profile Beam Time Depth (m)
43-05-45.991N 070-38-59.318W Summer... Coastal_... 2012-167 0001_201... 9,857 276 2012-06-15 14:41:31.573 2.394

Figure 1.7.2

1.8) 1ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 38.7" N, 070° 38' 58.5" W
Least Depth:	0.44 m (= 1.45 ft = 0.242 fm = 0 fm 1.45 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.14:54:22.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117470 00001(022600110D1E0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117470 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

1ft (13283_1, 13274_2, 13278_1, 13286_1)

0 ¼fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

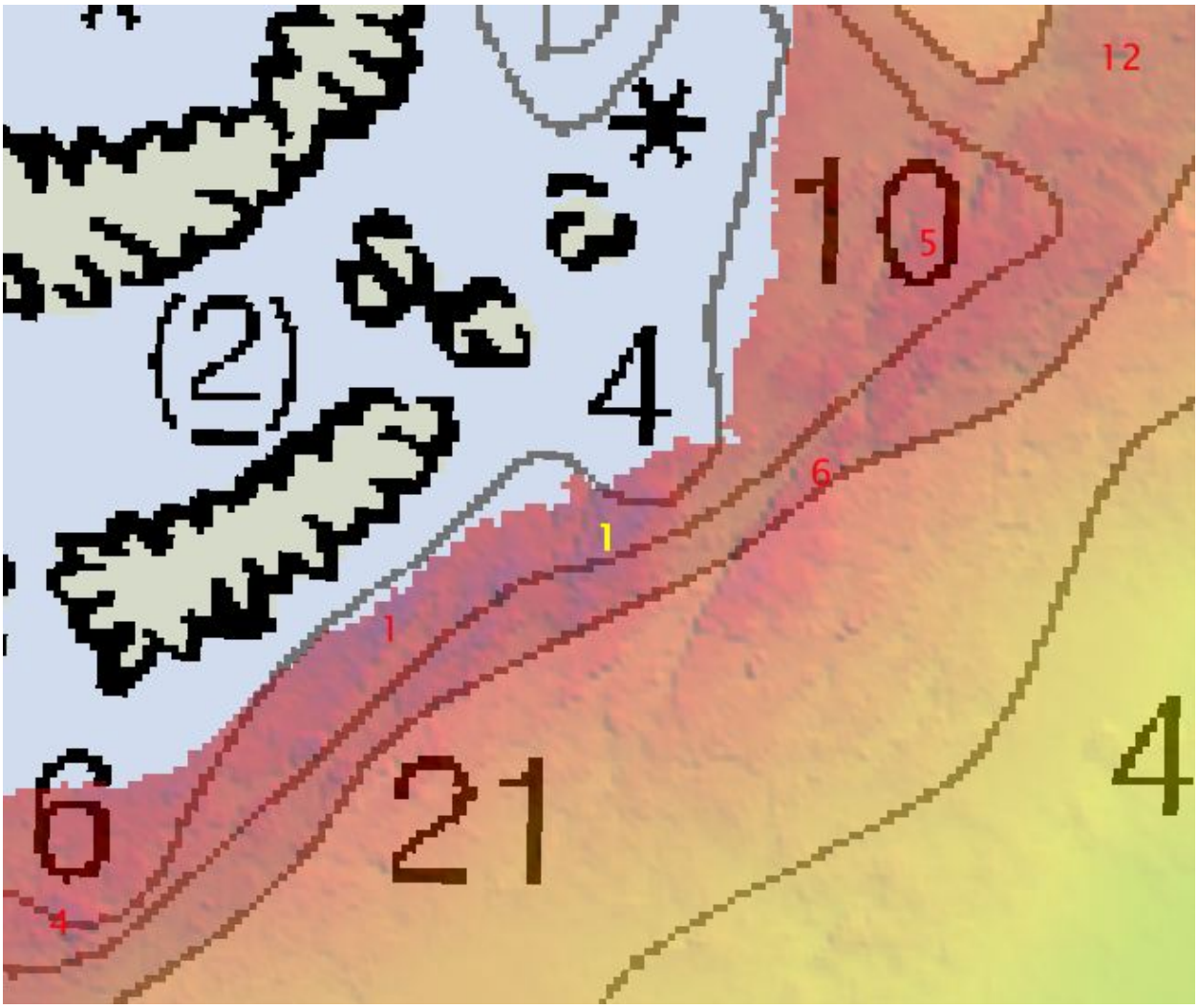
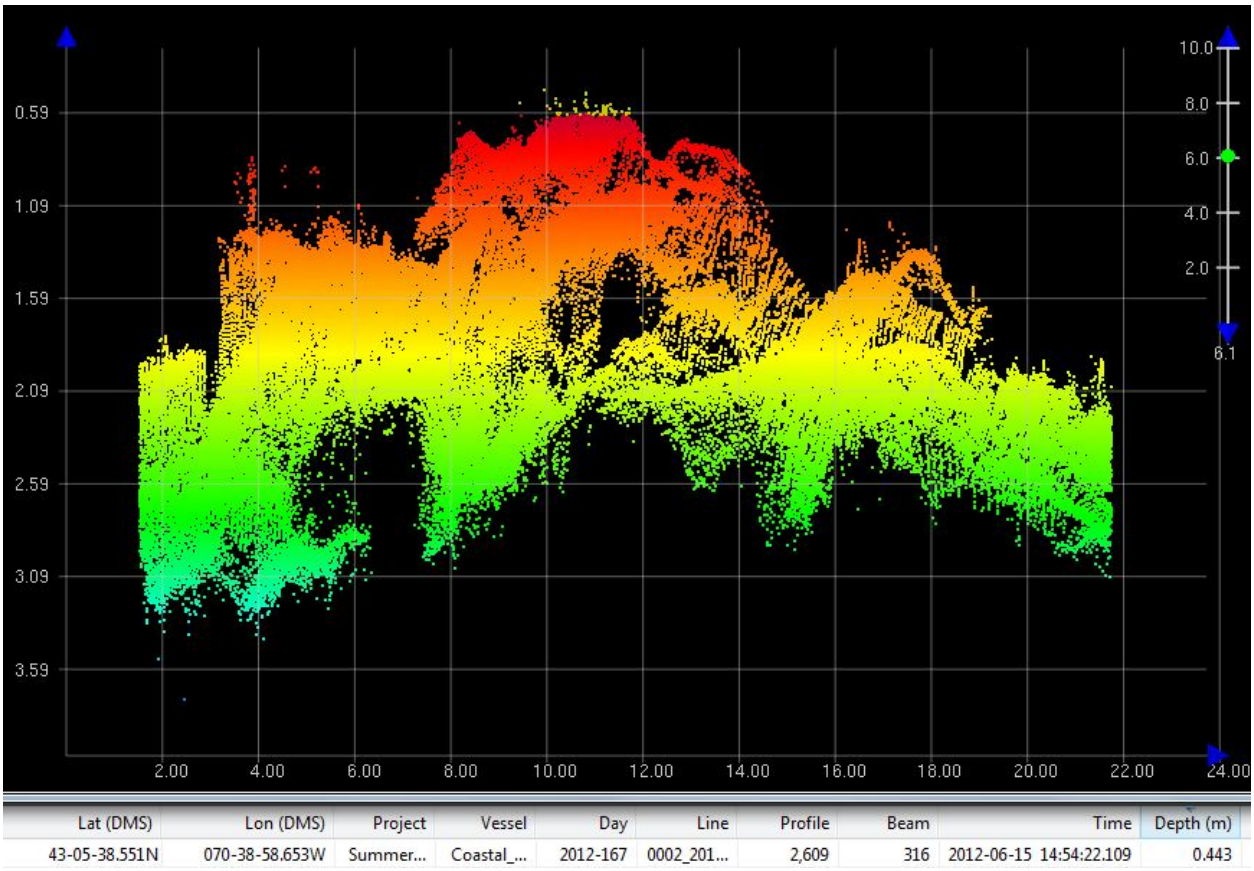


Figure 1.8.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-38.551N	070-38-58.653W	Summer...	Coastal_...	2012-167	0002_201...	2,609	316	2012-06-15 14:54:22.109	0.443

Figure 1.8.2

1.9) 6ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 39.3" N, 070° 38' 56.0" W
Least Depth:	2.03 m (= 6.65 ft = 1.109 fm = 1 fm 0.65 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.14:53:26.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117471 00001(022600110D1F0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117471 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

6ft (13283_1, 13274_2, 13278_1, 13286_1)

1fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

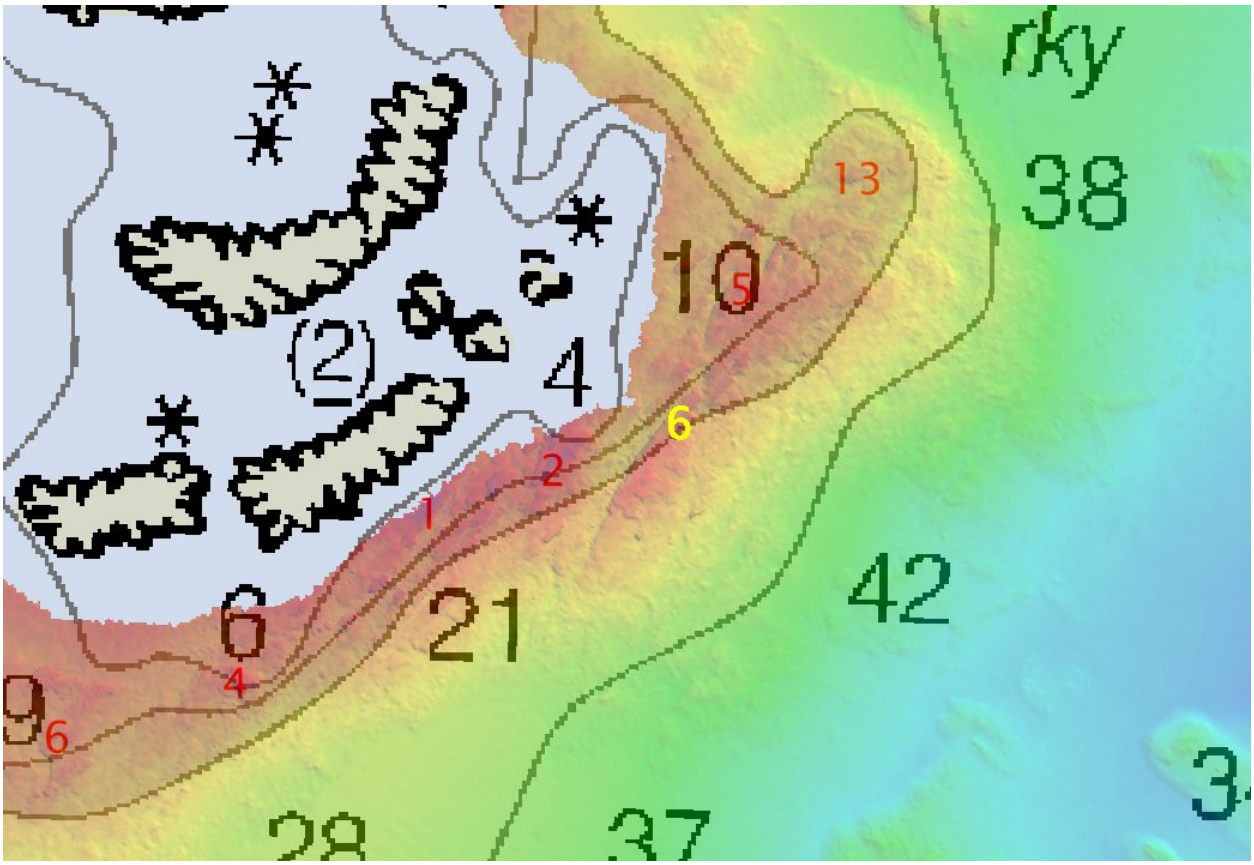
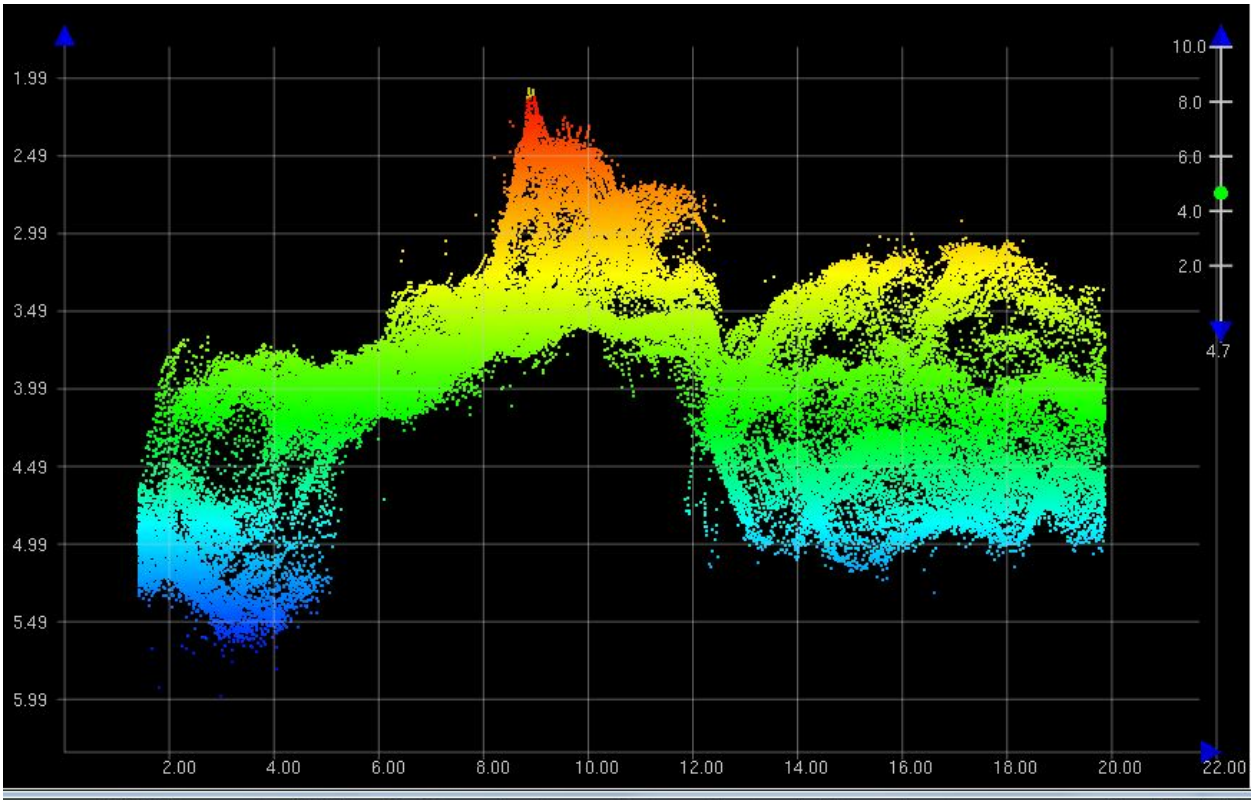


Figure 1.9.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-39.335N	070-38-55.999W	Summer...	Coastal_...	2012-167	0002_201...	1,829	364	2012-06-15 14:53:49.211	2.028

Figure 1.9.2

1.10) 5ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 41.3" N, 070° 38' 54.8" W
Least Depth:	1.58 m (= 5.17 ft = 0.862 fm = 0 fm 5.17 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.14:53:26.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117472 00001(022600110D200001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117472 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

5ft (13283_1, 13274_2, 13278_1, 13286_1)

0 ¾fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

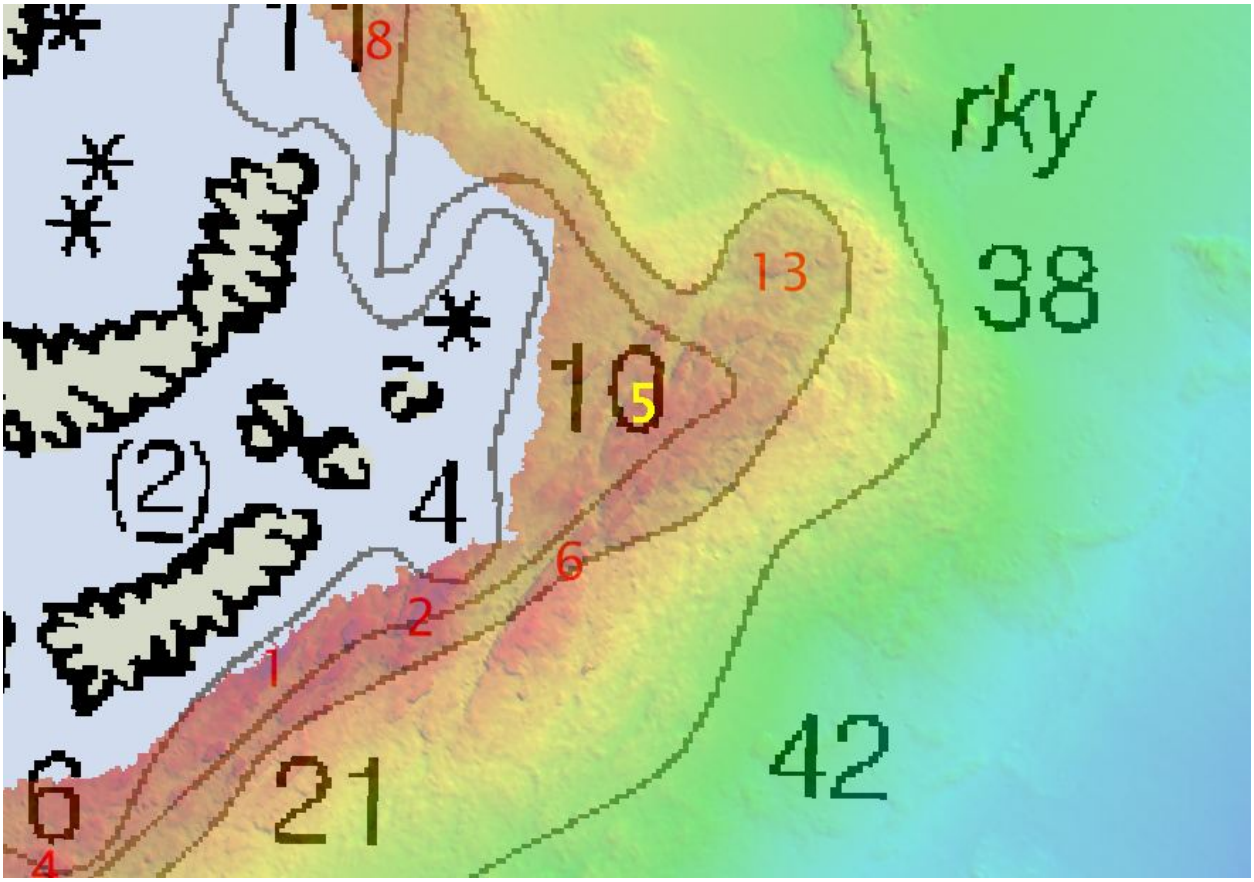
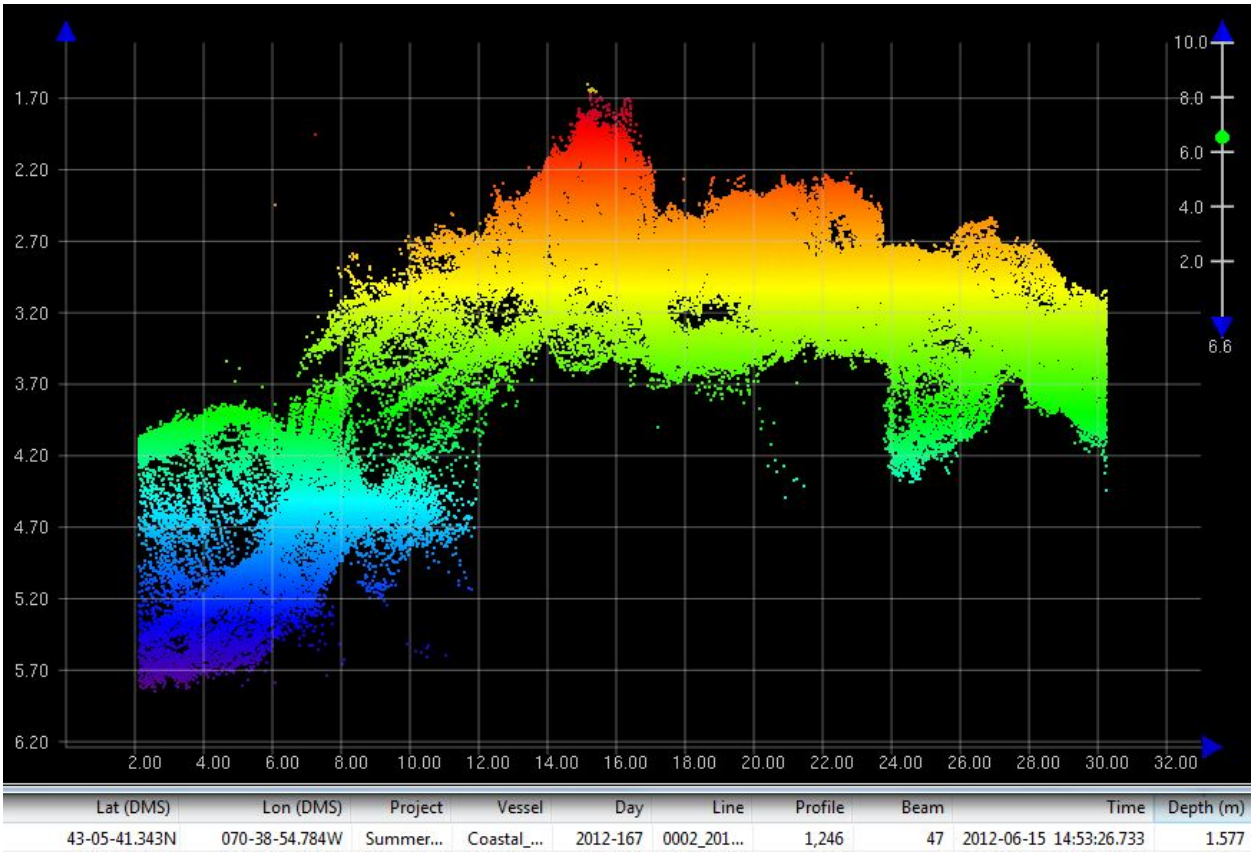


Figure 1.10.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-41.343N	070-38-54.784W	Summer...	Coastal_...	2012-167	0002_201...	1,246	47	2012-06-15 14:53:26.733	1.577

Figure 1.10.2

1.11) 36ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position: 43° 03' 54.2" N, 070° 38' 54.4" W

Least Depth: 11.13 m (= 36.51 ft = 6.084 fm = 6 fm 0.51 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2012-163.18:02:54.000 (06/11/2012)

Dataset: UNH_GerrishIsland_DtoN_SOUNDG.000

FOID: US 0001117486 00001(022600110D2E0001/1)

Charts Affected: 13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117486 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

36ft (13283_1, 13274_2, 13278_1, 13286_1)

6fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)

Attributes: QUASOU - 1:depth known

SORDAT - 20120611

SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

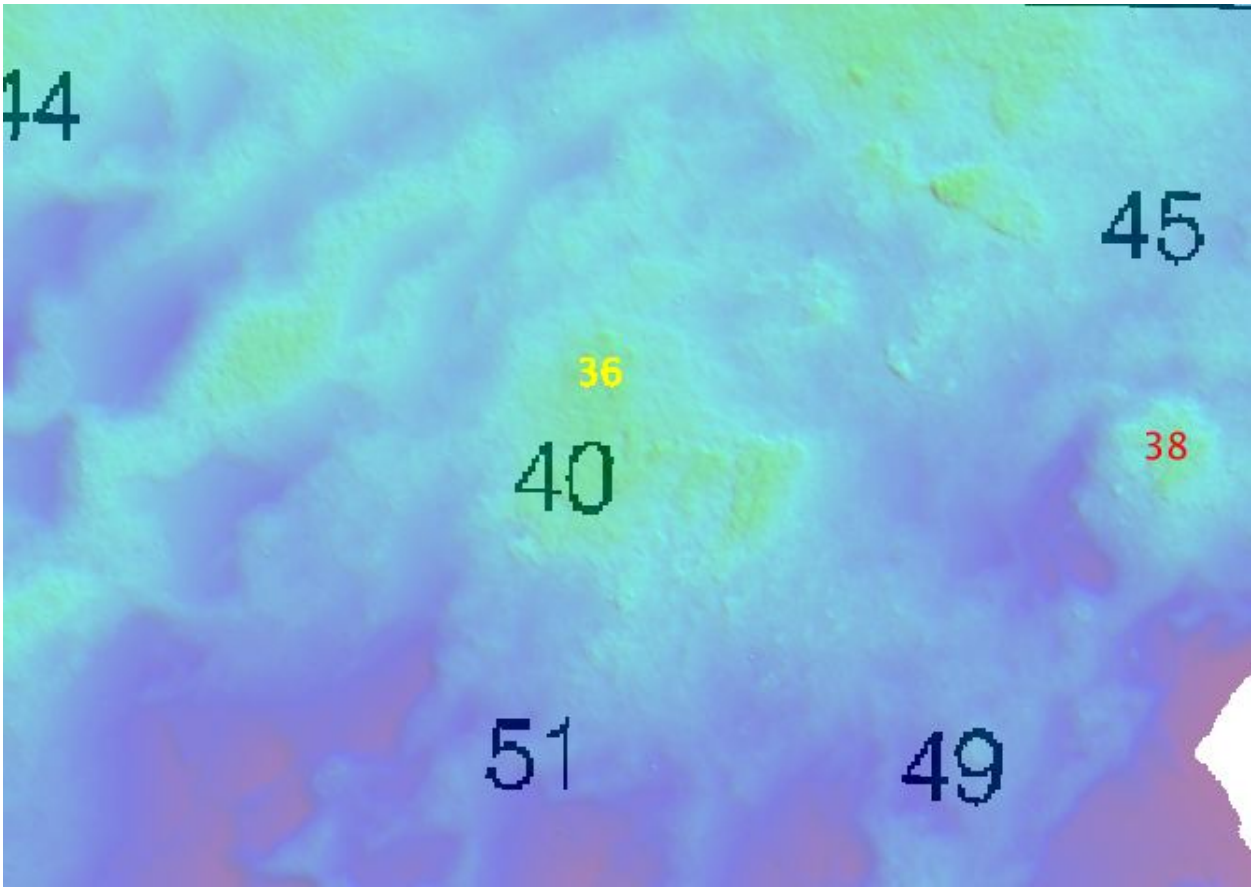
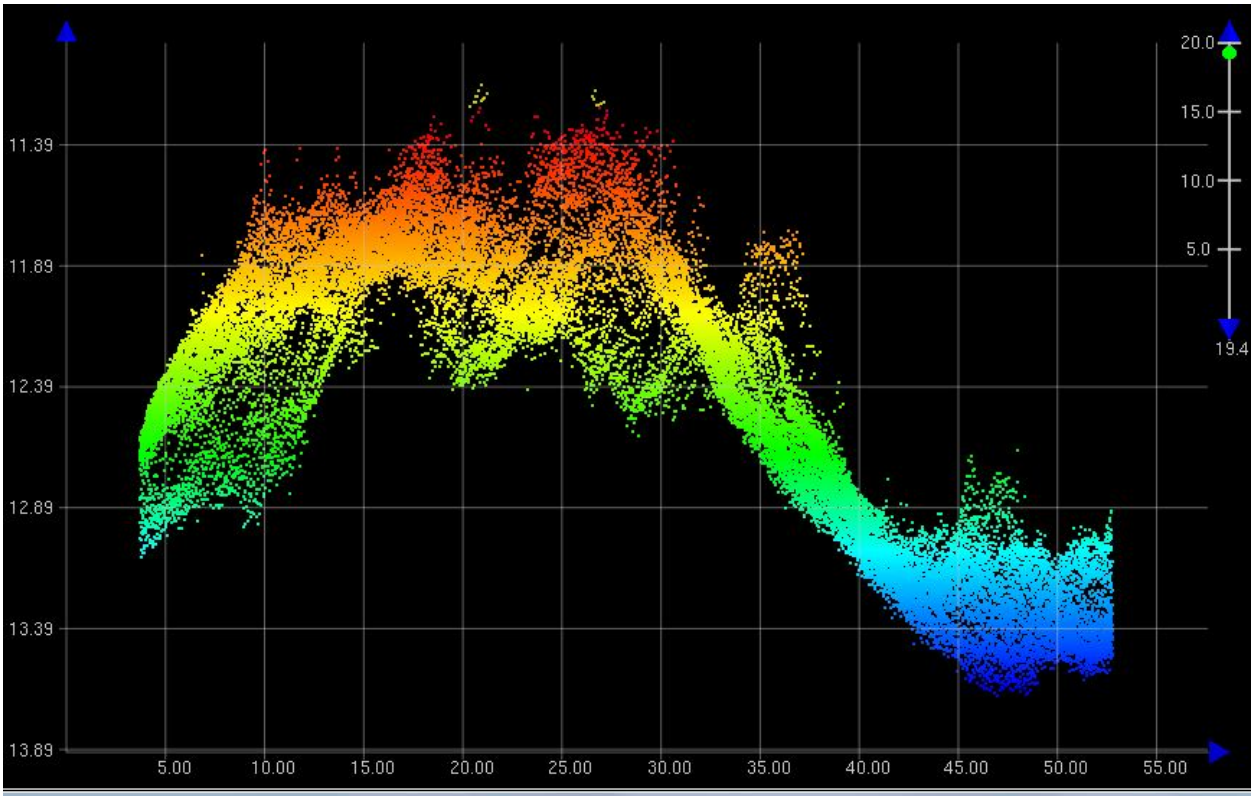


Figure 1.11.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-03-54.200N	070-38-54.445W	Summer...	Coastal_...	2012-163	0014_201...	4,447	224	2012-06-11 18:02:58.188	11.127

Figure 1.11.2

1.12) 23ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 31.2" N, 070° 38' 52.7" W
Least Depth:	7.23 m (= 23.71 ft = 3.952 fm = 3 fm 5.71 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.17:24:09.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117492 00001(022600110D340001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117492 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

23ft (13283_1, 13274_2, 13278_1, 13286_1)

4fm (13260_1, 13009_1, 13006_1, 13003_1)

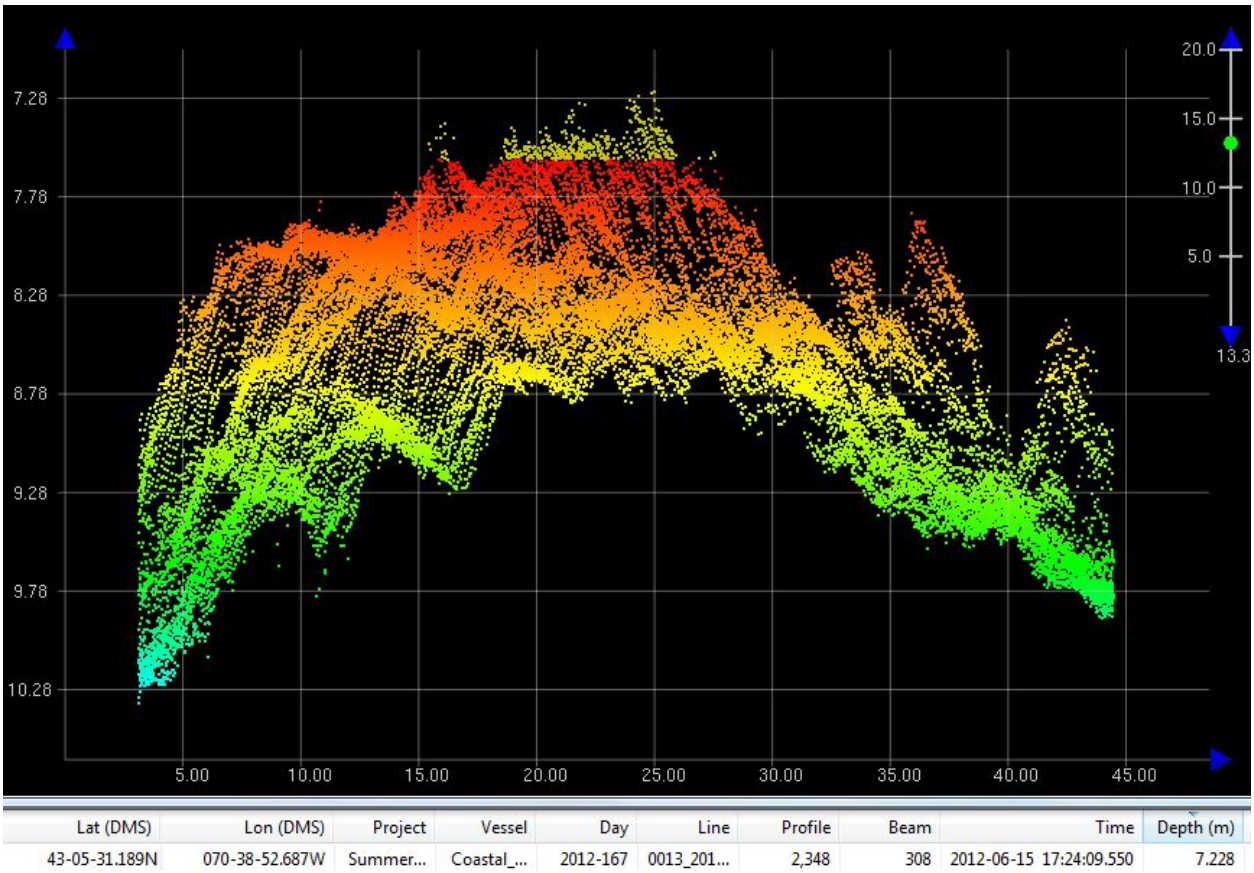
S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-31.189N	070-38-52.687W	Summer...	Coastal_...	2012-167	0013_201...	2,348	308	2012-06-15 17:24:09.550	7.228

Figure 1.12.1

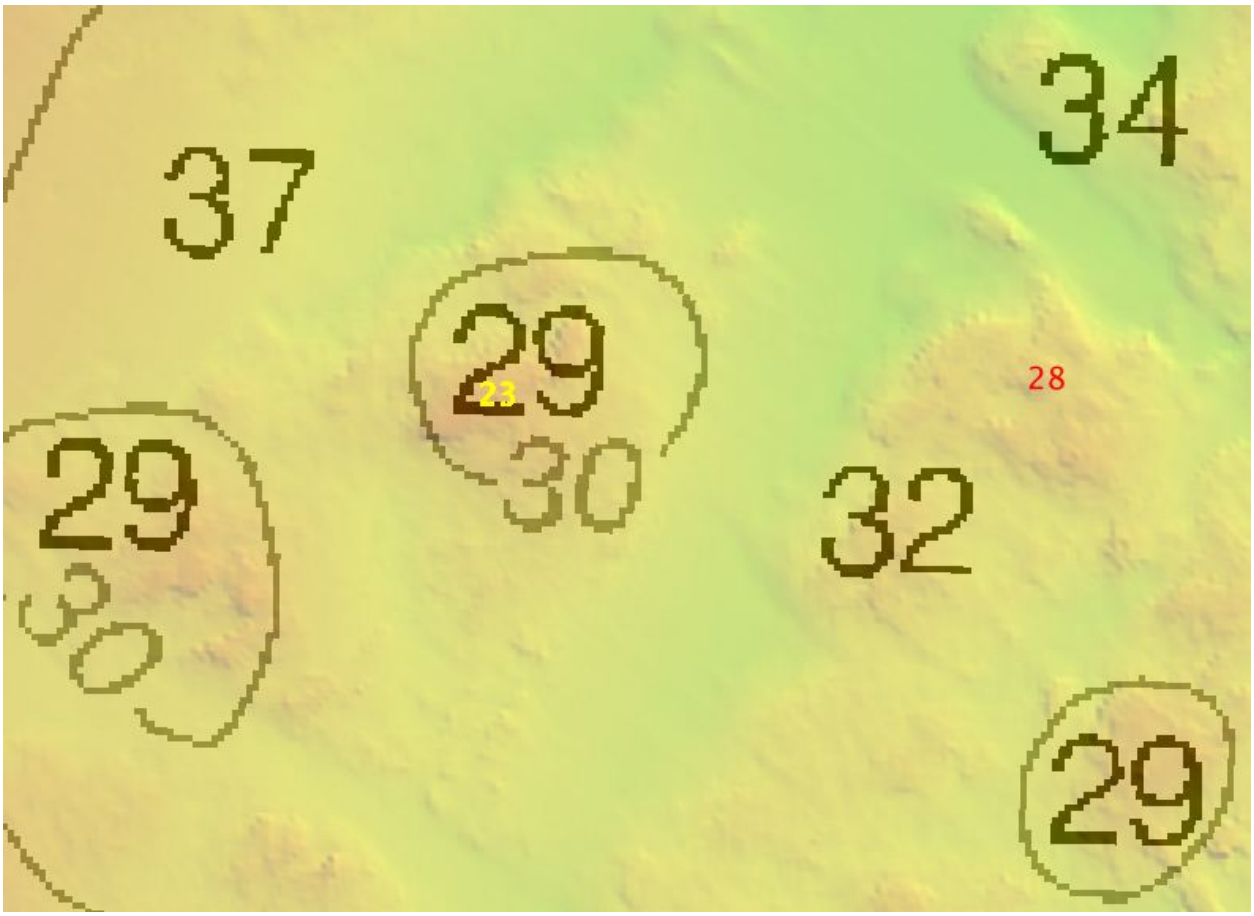


Figure 1.12.2

1.13) 23ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 04' 56.9" N, 070° 38' 47.6" W
Least Depth:	7.10 m (= 23.29 ft = 3.882 fm = 3 fm 5.29 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-166.16:10:59.000 (06/14/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117479 00001(022600110D270001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117479 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

23ft (13283_1, 13274_2, 13278_1, 13286_1)

3 ¾fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120614
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

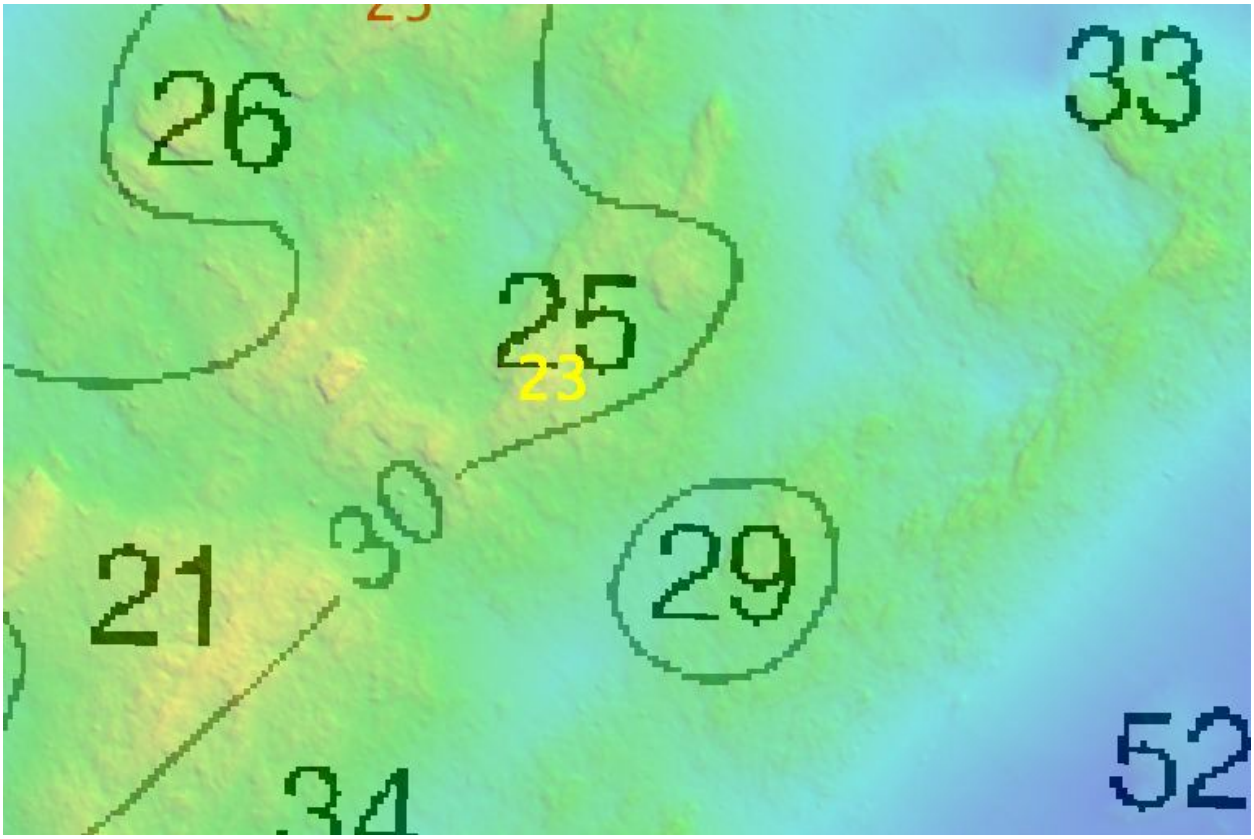


Figure 1.13.1

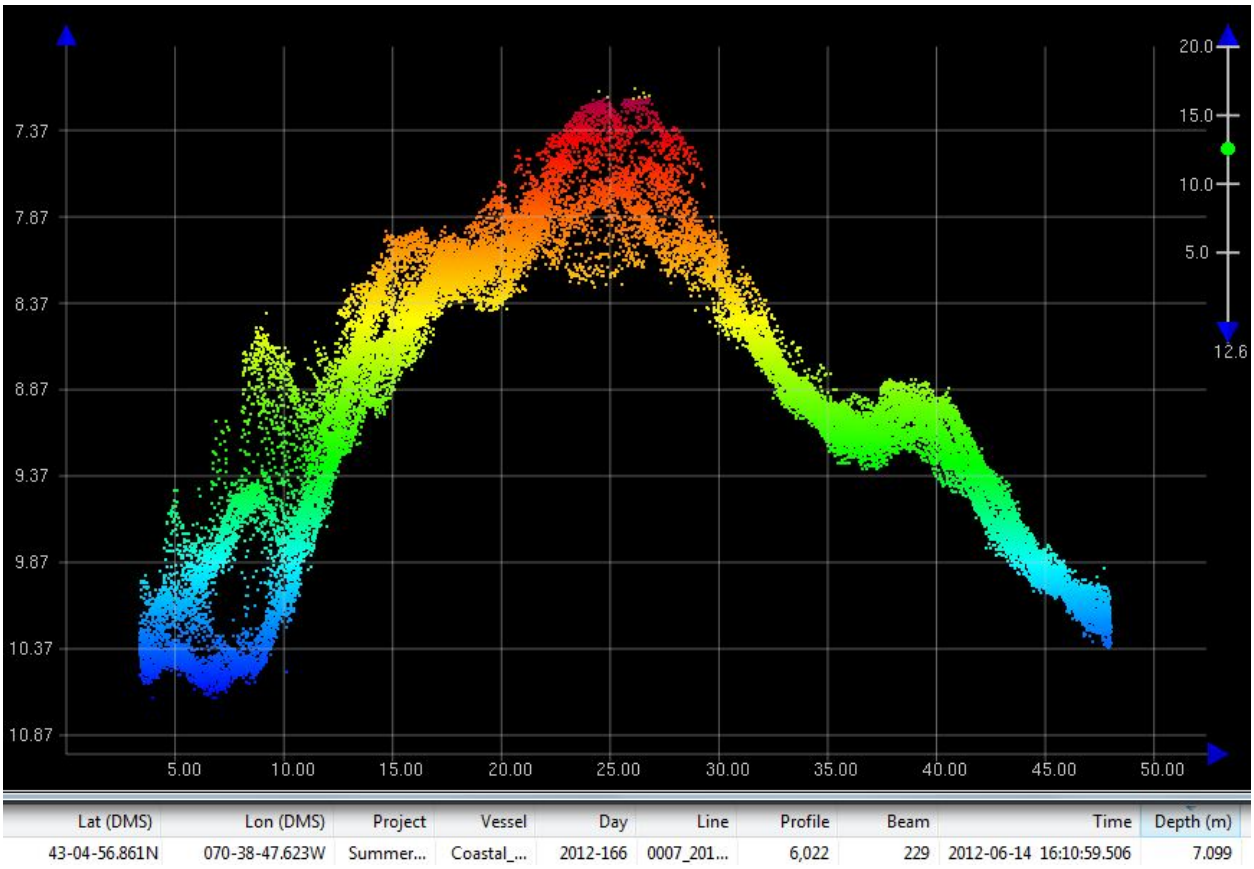

20.0
15.0
10.0
5.0
12.6
7.37
7.87
8.37
8.87
9.37
9.87
10.37
10.87
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Lat (DMS) Lon (DMS) Project Vessel Day Line Profile Beam Time Depth (m)
43-04-56.861N 070-38-47.623W Summer... Coastal_... 2012-166 0007_201... 6,022 229 2012-06-14 16:10:59.506 7.099

Figure 1.13.2

1.14) 36ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position: 43° 04' 02.0" N, 070° 38' 44.4" W

Least Depth: 10.91 m (= 35.80 ft = 5.967 fm = 5 fm 5.80 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2012-163.18:01:27.000 (06/11/2012)

Dataset: UNH_GerrishIsland_DtoN_SOUNDG.000

FOID: US 0001117484 00001(022600110D2C0001/1)

Charts Affected: 13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

[None]

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117484 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

36ft (13283_1, 13274_2, 13278_1, 13286_1)

6fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)

Attributes: QUASOU - 1:depth known

SORDAT - 20120611

SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

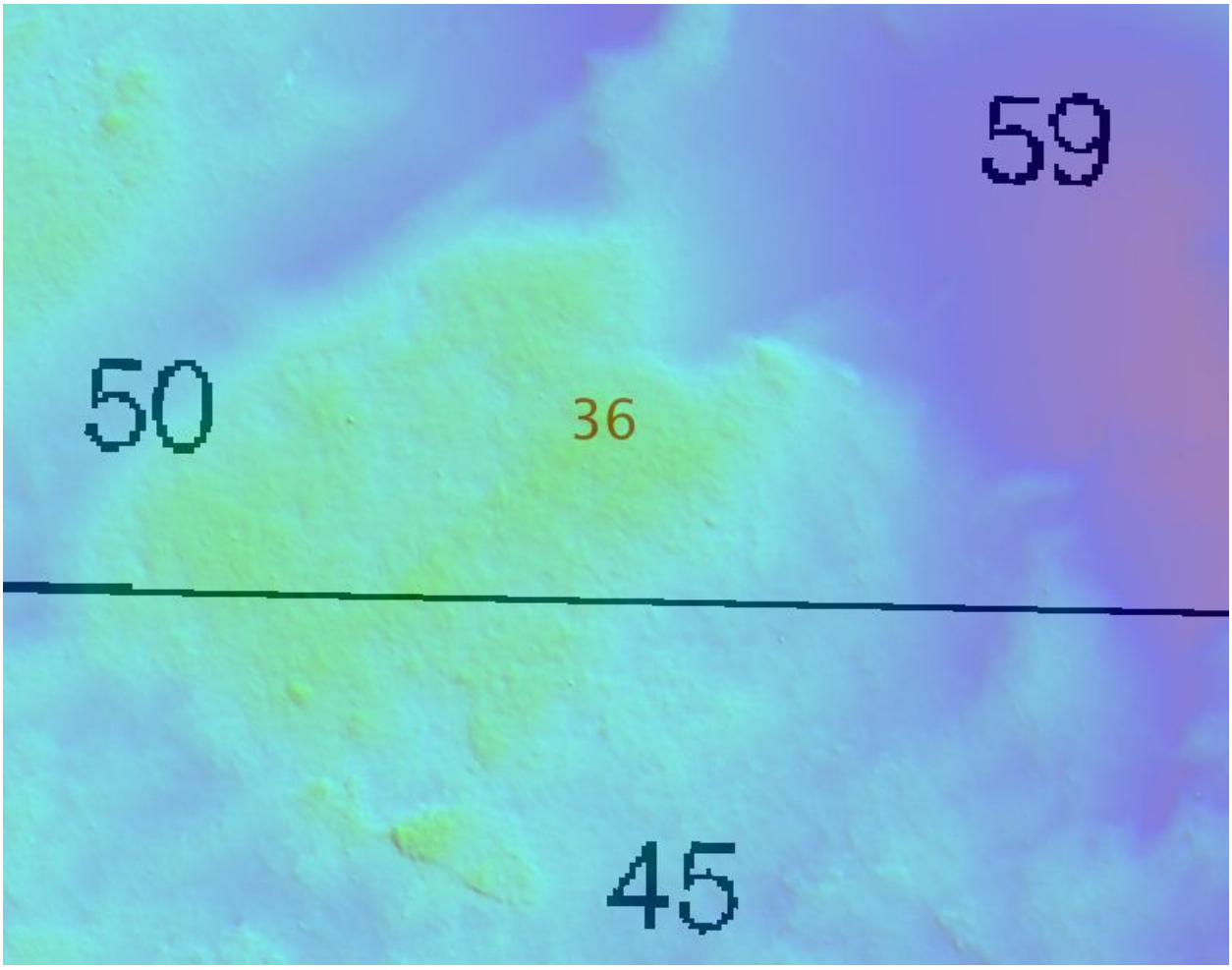
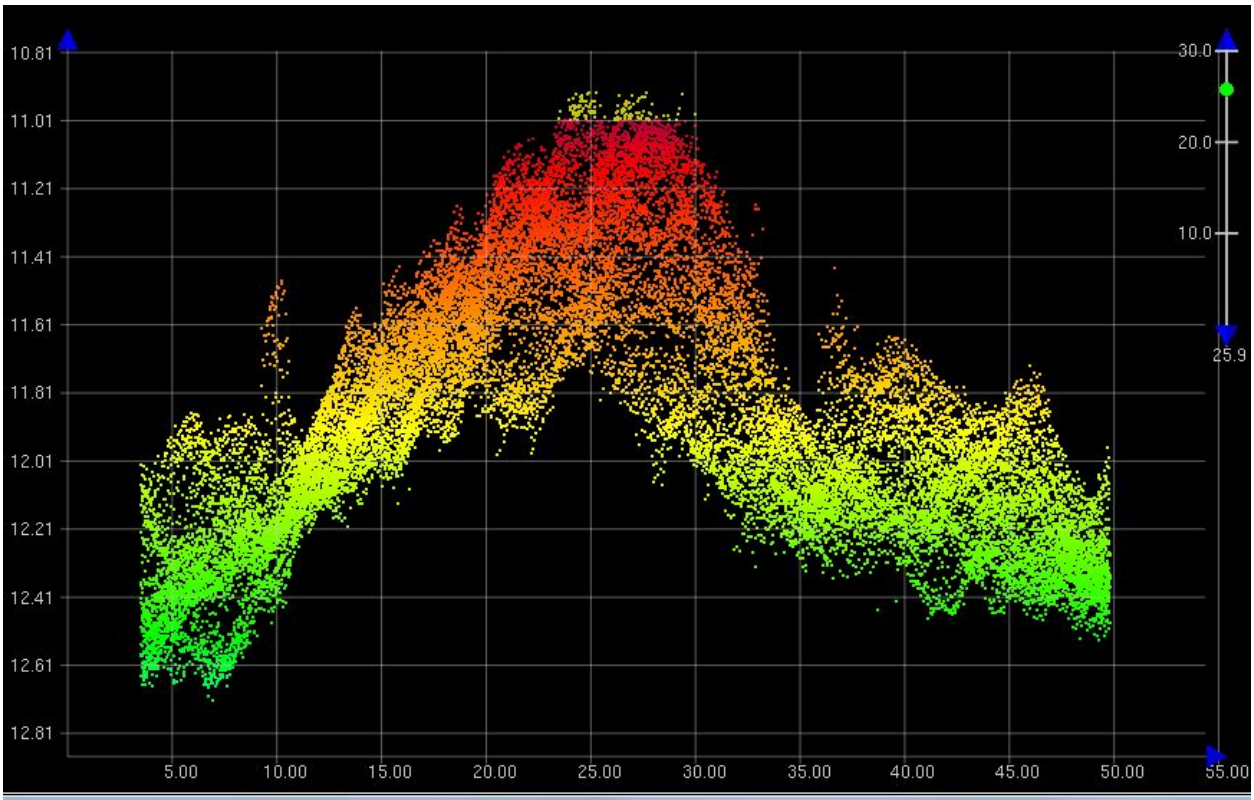


Figure 1.14.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-04-02.036N	070-38-44.367W	Summer...	Coastal_...	2012-163	0014_201...	3,202	36	2012-06-11 18:01:27.296	10.913

Figure 1.14.2

1.15) 38ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 03' 53.3" N, 070° 38' 42.7" W
Least Depth:	11.55 m (= 37.88 ft = 6.314 fm = 6 fm 1.88 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-163.16:31:24.000 (06/11/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117485 00001(022600110D2D0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117485 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

38ft (13283_1, 13274_2, 13278_1, 13286_1)

6 ¼fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120611
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

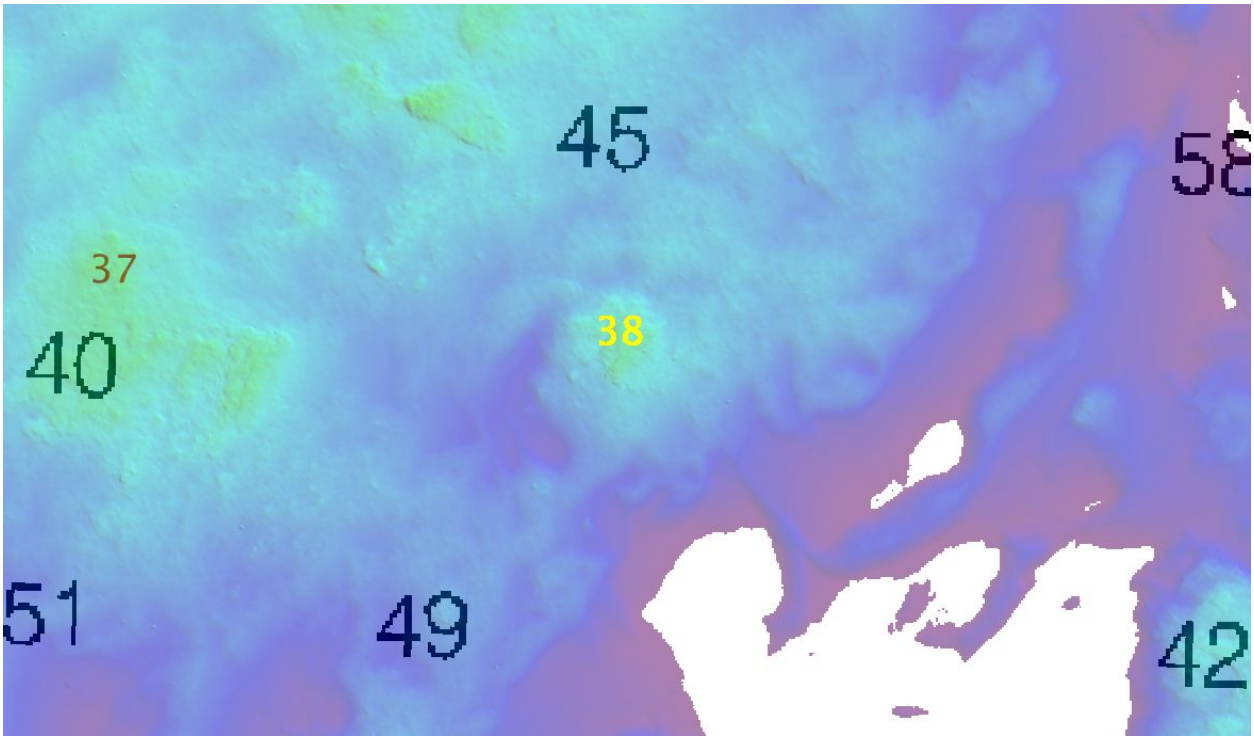
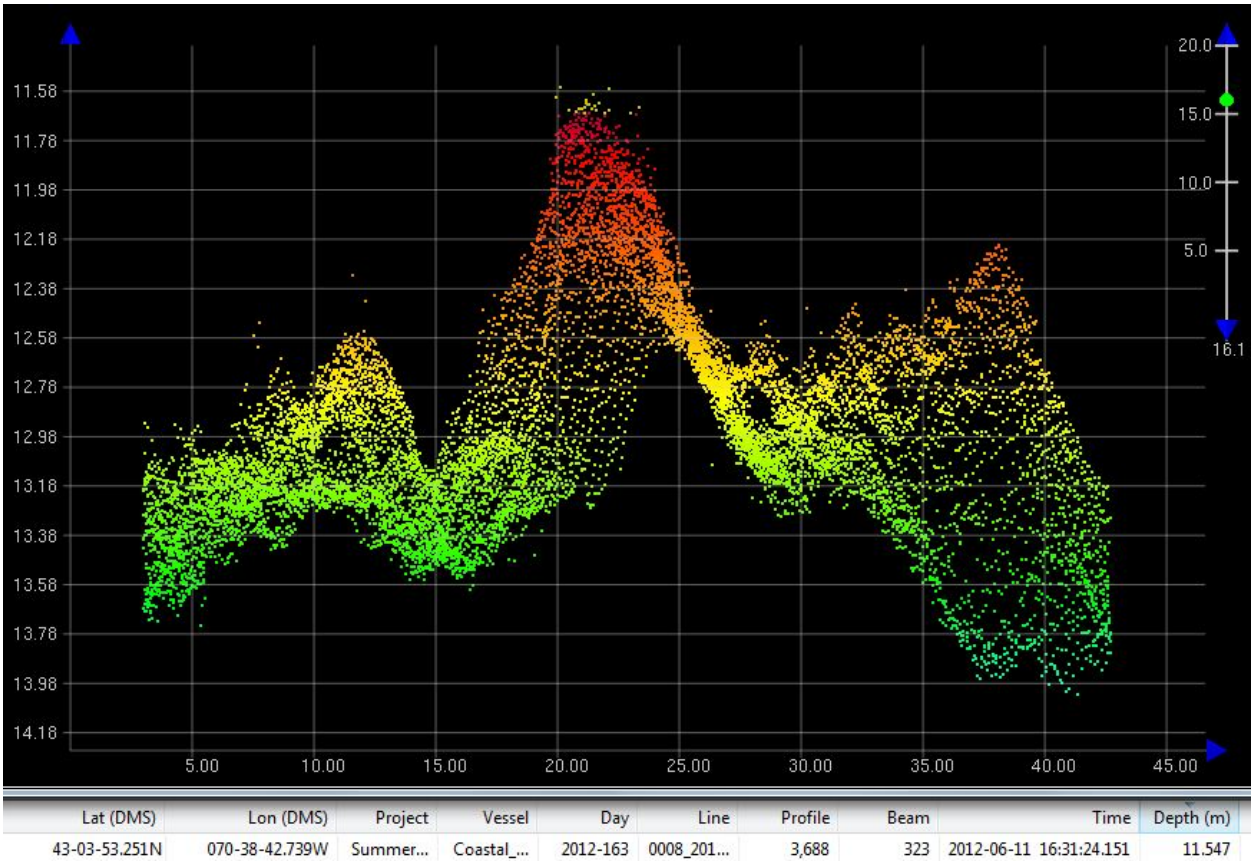


Figure 1.15.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-03-53.251N	070-38-42.739W	Summer...	Coastal_...	2012-163	0008_201...	3,688	323	2012-06-11 16:31:24.151	11.547

Figure 1.15.2

1.16) 15ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 04' 21.5" N, 070° 38' 39.7" W
Least Depth:	4.51 m (= 14.81 ft = 2.468 fm = 2 fm 2.81 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-163.19:27:22.000 (06/11/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117481 00001(022600110D290001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117481 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

15ft (13283_1, 13274_2, 13278_1, 13286_1)

2 ½fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120611
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

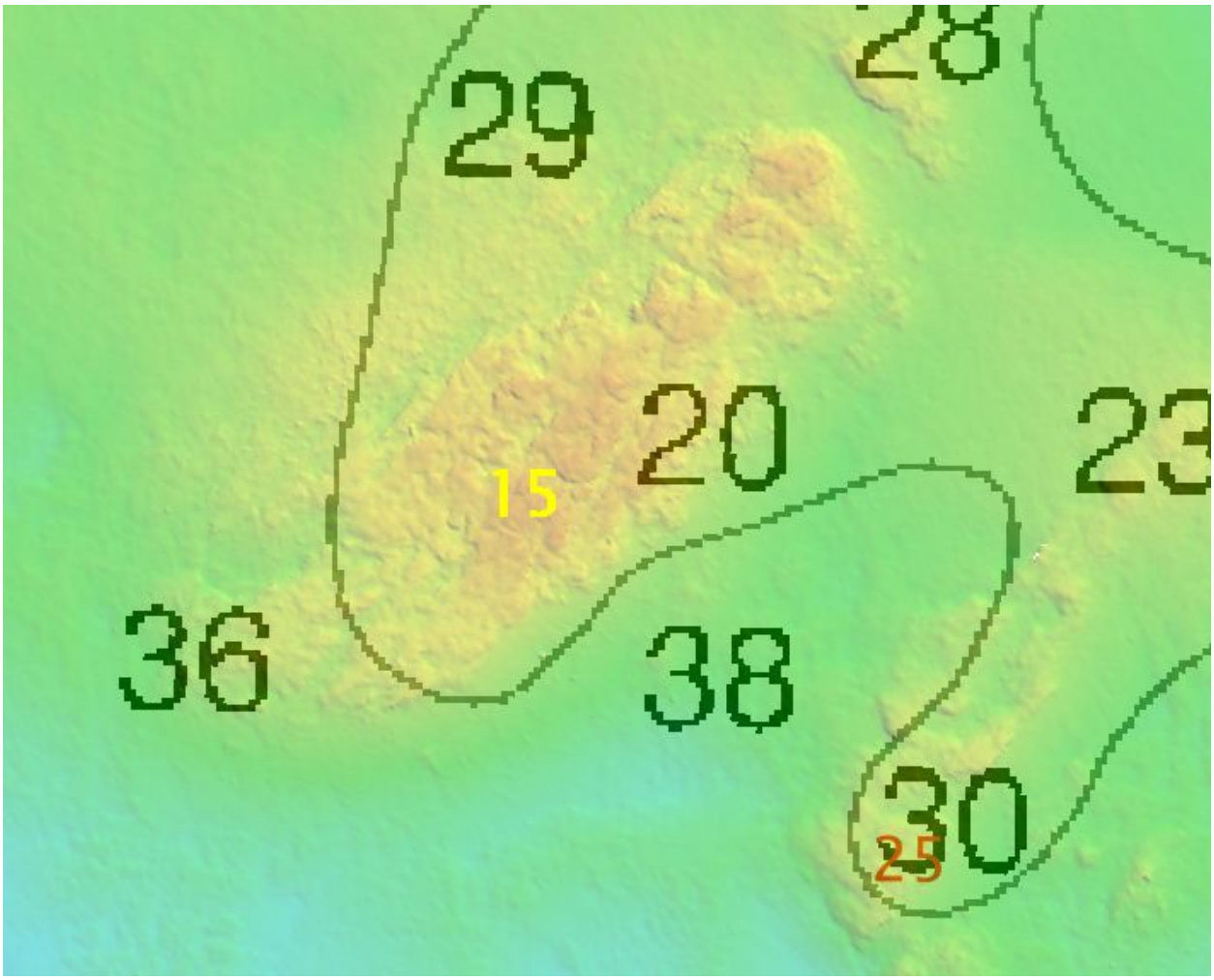
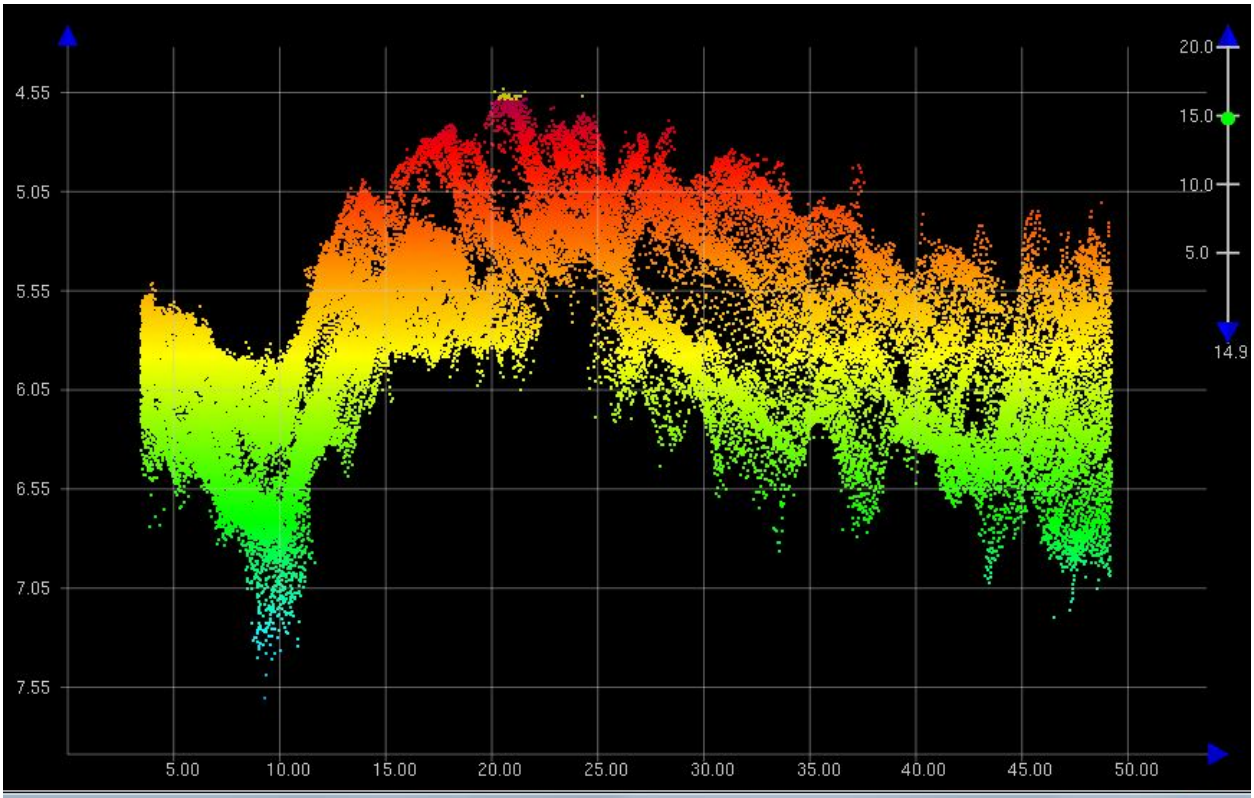


Figure 1.16.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-04-21.486N	070-38-39.654W	Summer...	Coastal_...	2012-163	0021_201...	1,329	275	2012-06-11 19:27:22.864	4.513

Figure 1.16.2

1.17) 32ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 05' 15.7" N, 070° 38' 35.6" W
Least Depth:	9.69 m (= 31.78 ft = 5.297 fm = 5 fm 1.78 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-166.17:12:45.000 (06/14/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117477 00001(022600110D250001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117477 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

32ft (13283_1, 13274_2, 13278_1, 13286_1)

5 ¼fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120614
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

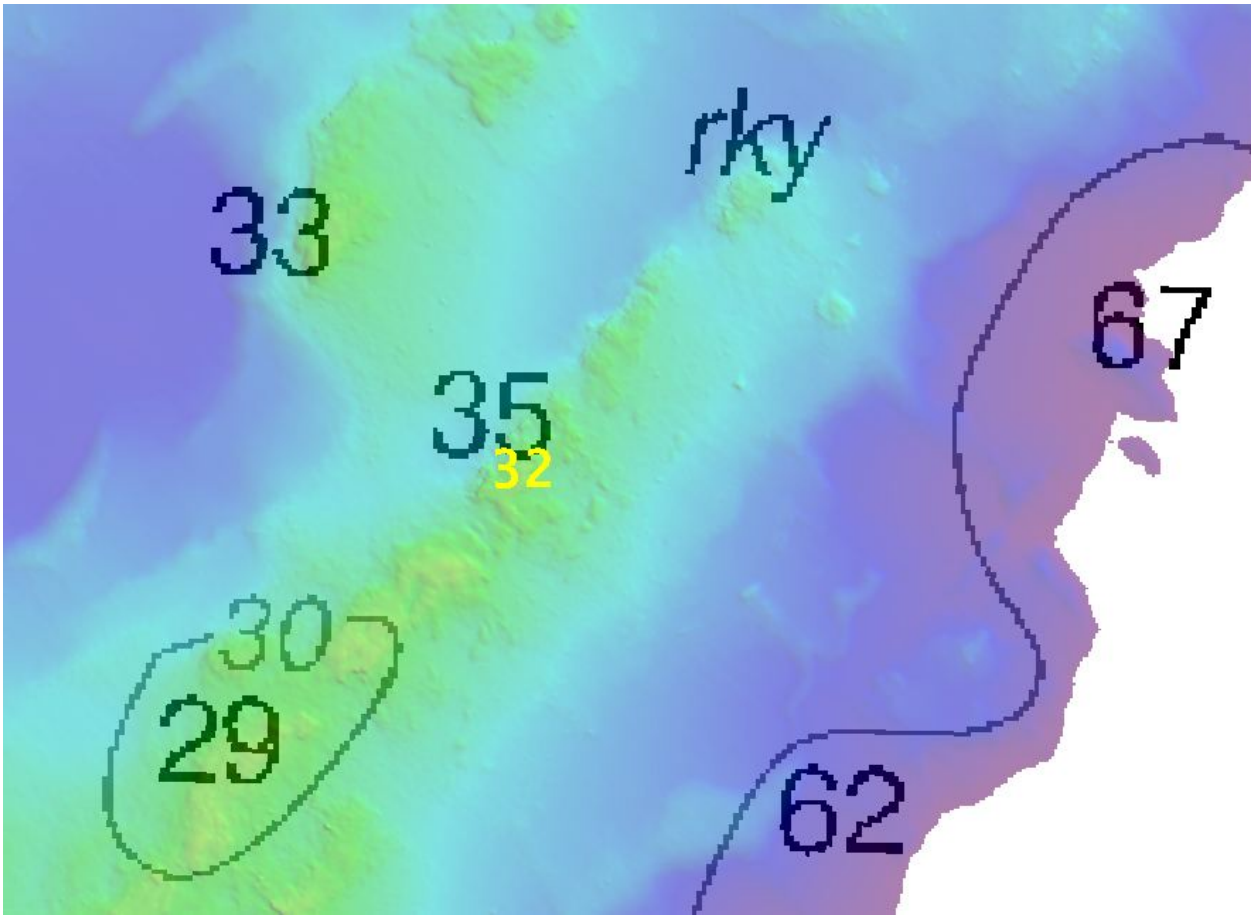
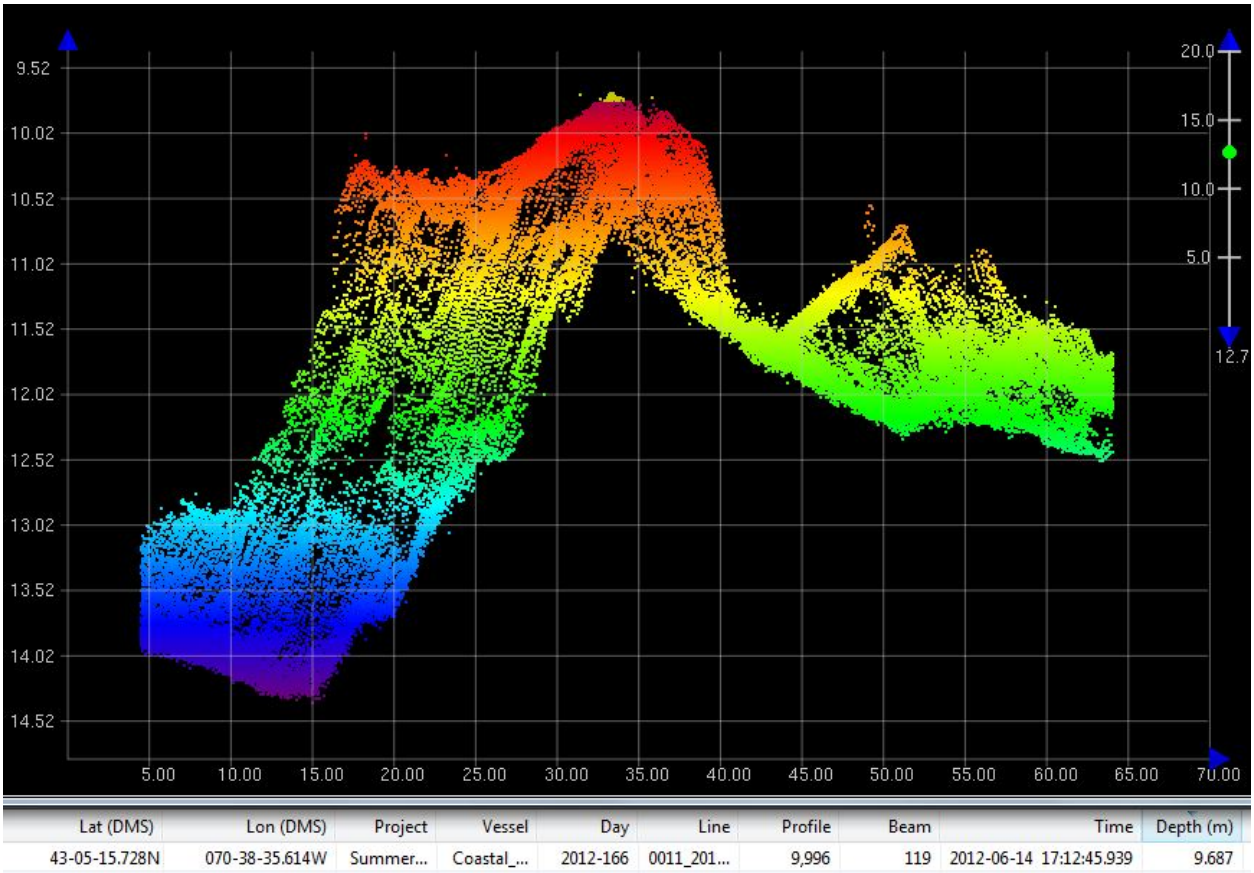


Figure 1.17.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-05-15.728N	070-38-35.614W	Summer...	Coastal_...	2012-166	0011_201...	9,996	119	2012-06-14 17:12:45.939	9.687

Figure 1.17.2

1.18) 29ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 04' 48.7" N, 070° 38' 22.4" W
Least Depth:	8.94 m (= 29.33 ft = 4.888 fm = 4 fm 5.33 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-167.15:43:39.000 (06/15/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117480 00001(022600110D280001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117480 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

29ft (13283_1, 13274_2, 13278_1, 13286_1)

4 ¾fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120615
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

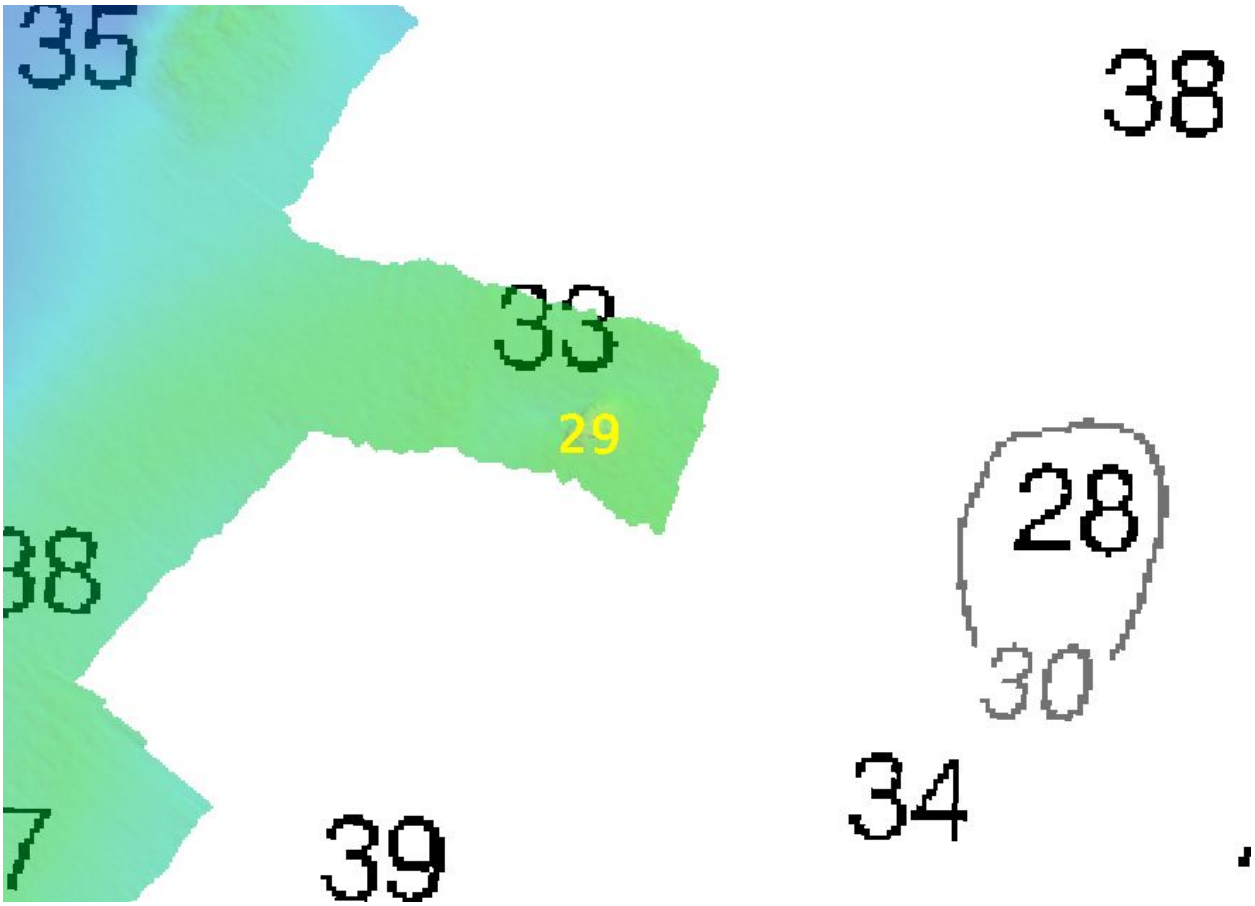
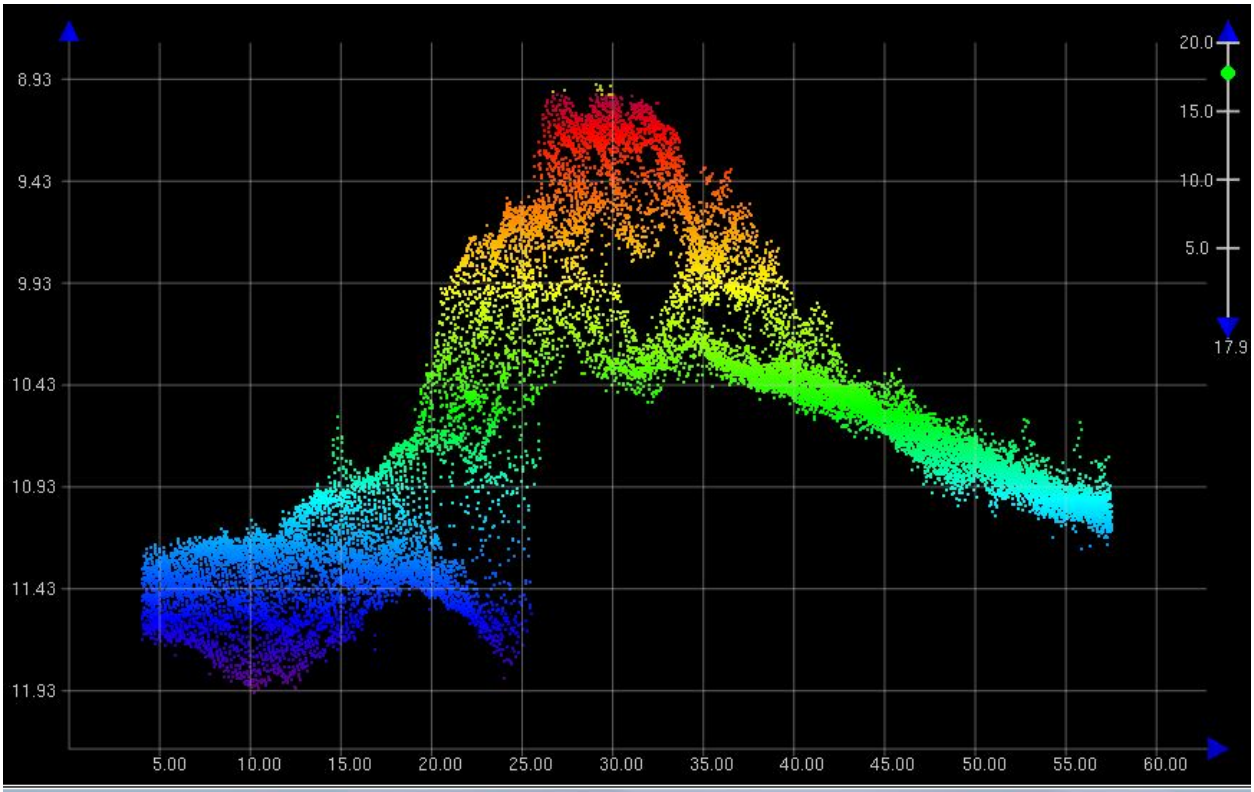


Figure 1.18.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-04-48.728N	070-38-22.368W	Summer...	Coastal_...	2012-167	1003_201...	4,692	295	2012-06-15 15:43:39.756	8.939

Figure 1.18.2

1.19) 18ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 04' 19.8" N, 070° 38' 20.0" W
Least Depth:	5.66 m (= 18.57 ft = 3.095 fm = 3 fm 0.57 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-163.16:54:35.000 (06/11/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117483 00001(022600110D2B0001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117483 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

18ft (13283_1, 13274_2, 13278_1, 13286_1)

3fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120611
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a shoal in the final sounding selection for the nautical charting update product

Feature Images

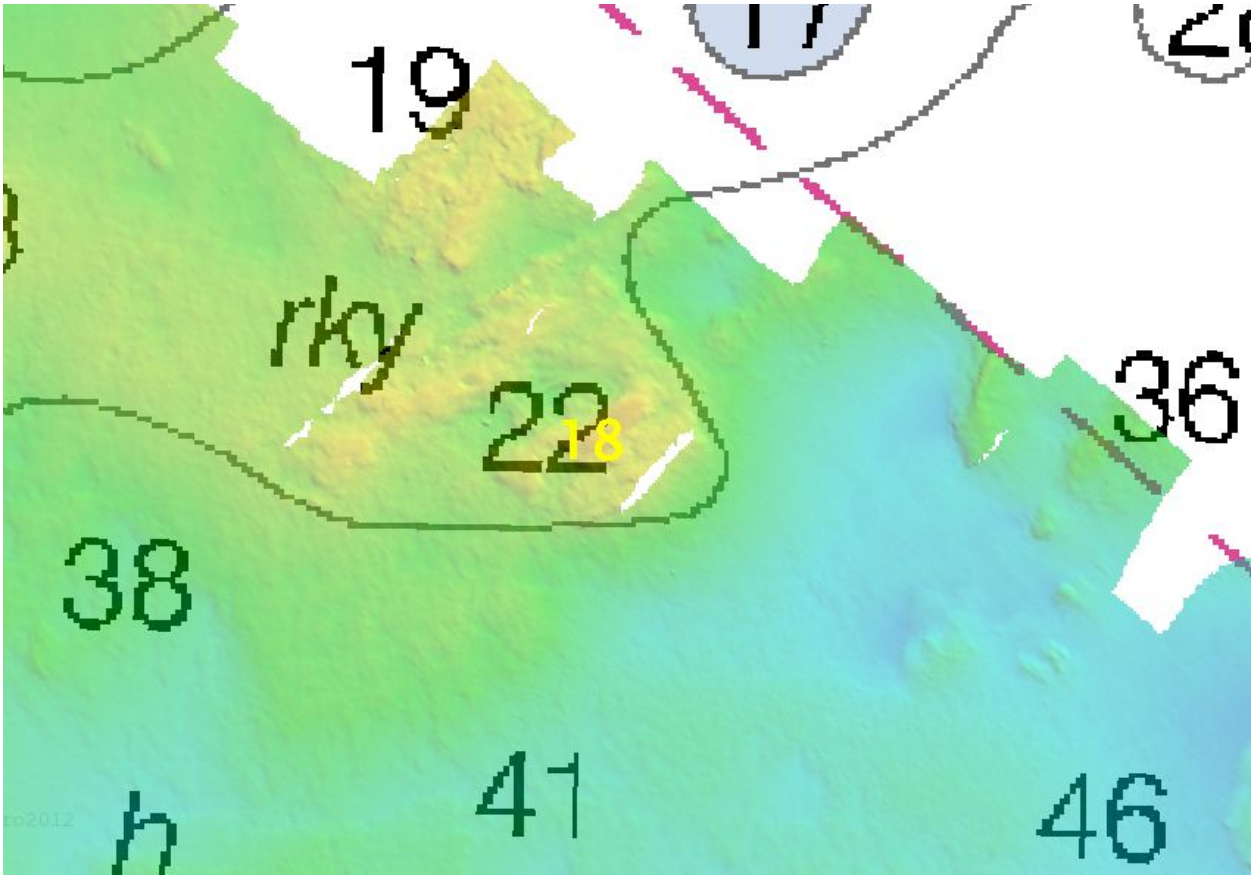
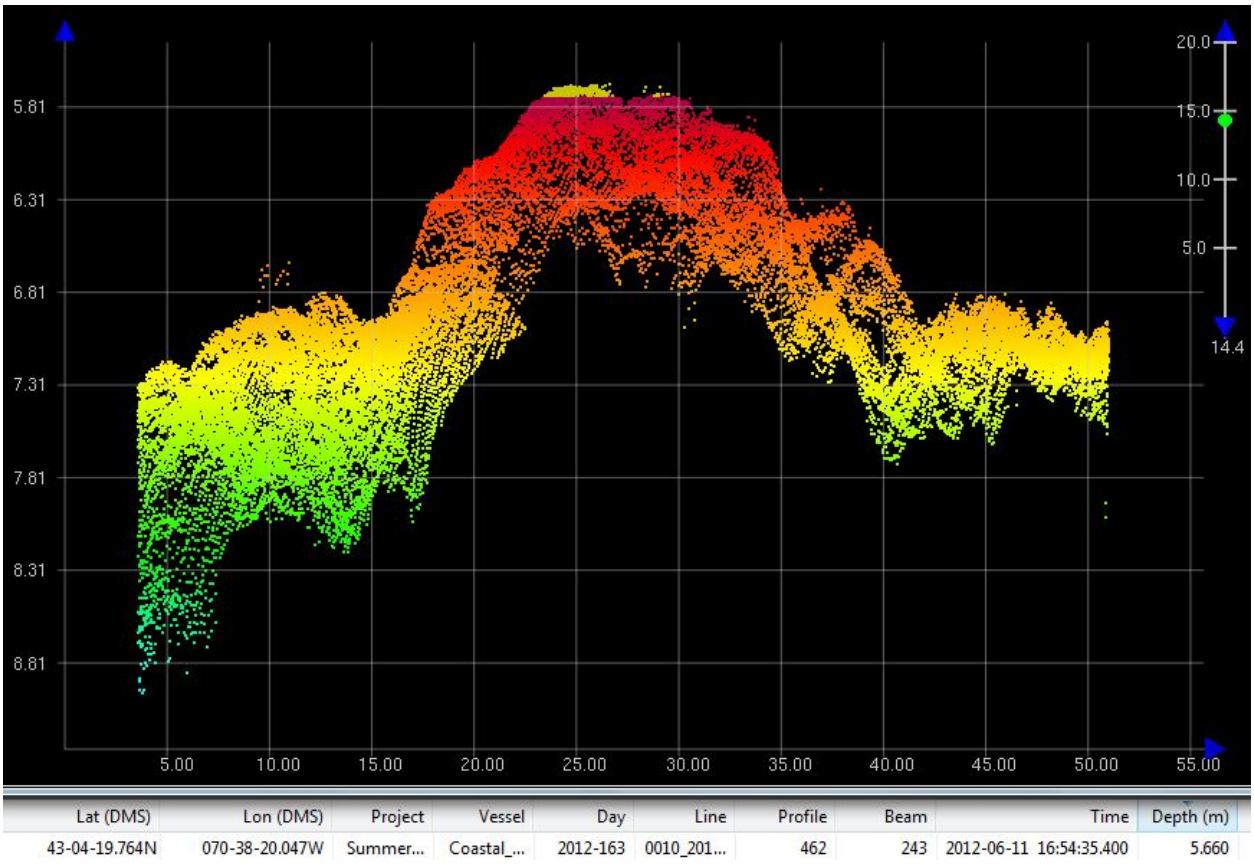


Figure 1.19.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-04-19.764N	070-38-20.047W	Summer...	Coastal_...	2012-163	0010_201...	462	243	2012-06-11 16:54:35.400	5.660

Figure 1.19.2

1.20) 24ft SOUNDG

DANGER TO NAVIGATION

Survey Summary

Survey Position:	43° 03' 32.8" N, 070° 37' 48.8" W
Least Depth:	7.42 m (= 24.35 ft = 4.059 fm = 4 fm 0.35 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2012-163.19:24:05.000 (06/11/2012)
Dataset:	UNH_GerrishIsland_DtoN_SOUNDG.000
FOID:	US 0001117490 00001(022600110D320001/1)
Charts Affected:	13283_1, 13274_2, 13278_1, 13286_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Shoal soundings submitted by the UNH summer project survey team. No data has been submitted for verification. Sounding values are referenced to MLLW and corrected with preliminary observed water levels. Positioning was RTK GPS and with NAD83 horizontal datum.

Feature Correlation

Source	Feature	Range	Azimuth	Status
UNH_GerrishIsland_DtoN_SOUNDG.000	US 0001117490 00001	0.00	000.0	Primary

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

24ft (13283_1, 13274_2, 13278_1, 13286_1)

4fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 1:depth known
	SORDAT - 20120611
	SORIND - US,US,graph,OSD-UNH2012

Office Notes

Shoal sounding DToN is represented as a dangerous rock, least depth 24 feet, in the final sounding selection for the nautical charting update product.

Feature Images

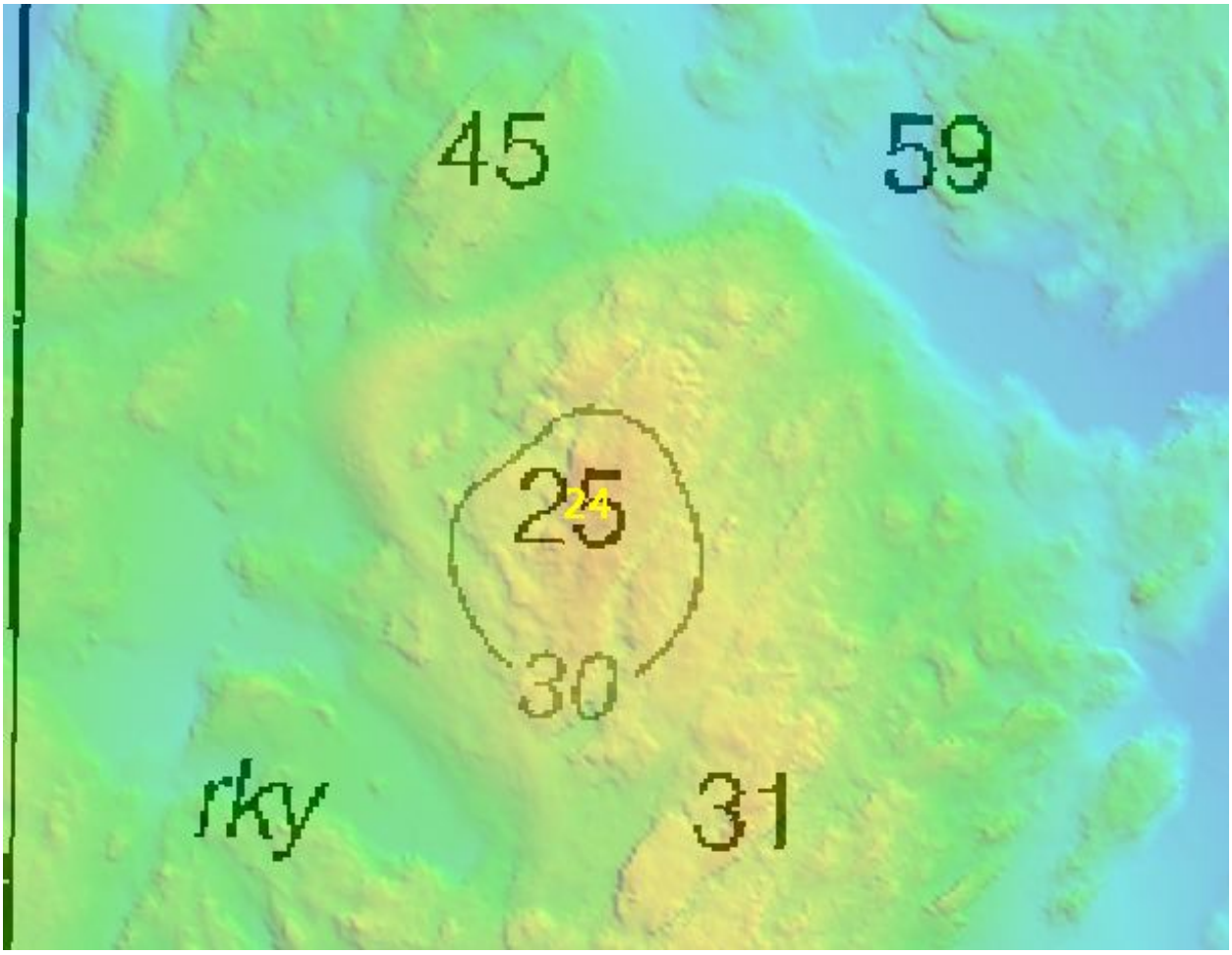
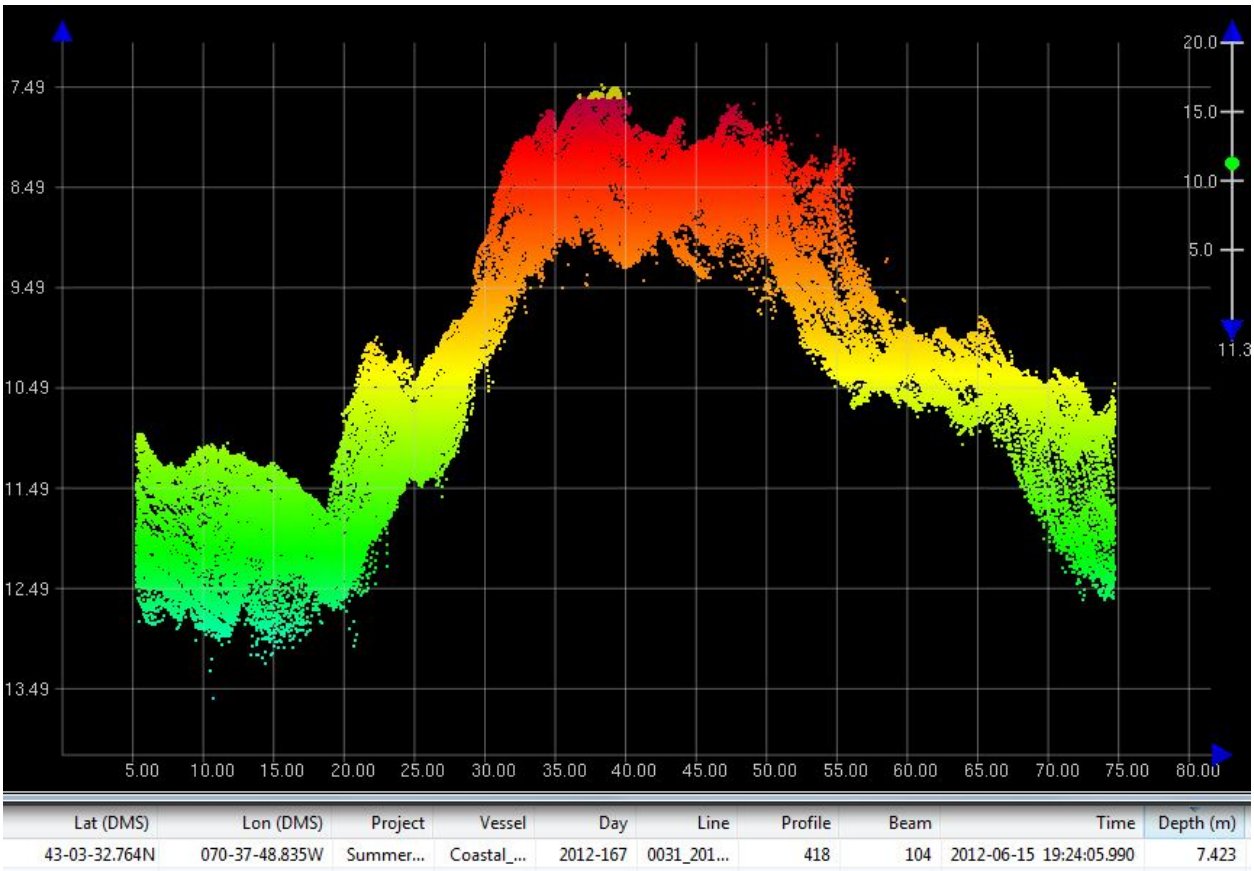


Figure 1.20.1



Lat (DMS)	Lon (DMS)	Project	Vessel	Day	Line	Profile	Beam	Time	Depth (m)
43-03-32.764N	070-37-48.835W	Summer...	Coastal_...	2012-167	0031_201...	418	104	2012-06-15 19:24:05.990	7.423

Figure 1.20.2

APPROVAL PAGE

W00244

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 NGDC for archive

- W00244_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- W00244_GeoImage.pdf

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

Approved: _____ _____

LT Abigail Higgins
Chief, Atlantic Hydrographic Branch