

H12250

NOAA FORM 76-35A
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey: Hydrographic Multibeam & 200% Sidescan

Project No. : OPR-K354-KR-10

Registry No. : H12250

LOCALITY

State: Louisiana

General Locality: Gulf of Mexico

Sublocality: Northwest Ship Shoal

2012

CHIEFS OF PARTY
Scott Croft, Tara Levy

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DATE: _____

NOAA FORM 77-28 (11-72)		U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION		REGISTRY No: H12250	
HYDROGRAPHIC TITLE SHEET					
				FIELD NUMBER: Sheet 8	
State: <u>Louisiana</u>					
General Locality: <u>Gulf of Mexico</u>					
Locality: <u>Northwest Ship Shoal</u>					
Scale: <u>1:40,000</u> Date of Survey: <u>February 2010 to December 2011</u>					
Instructions Dated: <u>May 2010</u> Project Number: <u>OPR-K354-KR-10</u>					
Vessels: <u>M/V Inez McCall</u>					
Chiefs of Party: <u>Scott Croft, Tara Levy</u>					
Surveyed by: <u>C&C Technologies Personnel</u>					
Soundings taken by echosounder, hand lead line, or pole: <u>Simrad EM3002 Multibeam Echo sounder</u>					
Verification by: <u>NA Atlantic Hydrographic Branch Personnel</u>					
Soundings in: Feet: <u>X</u> Fathoms: _____ Meters: <u>XXXX</u> at MLW: _____ MLLW: <u>X</u>					
Remarks: Hydrographic Survey of Sheet 8 (H12250)					
<u>Data collection in meters, referenced to MLLW, later converted into feet</u>					
<u>200% side scan sonar, with concurrent multibeam coverage</u>					
<u>UTC time was used exclusively</u>					
<u>Grab samples were not taken</u>					
<u>Tidal Zones: CGM 716, 717, 718, 732, 733, WGM 266, 414, 415, 416</u>					
<u>Tidal Station: 8762075 (Port Fourchon, LA)</u>					

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 Rednotes 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/>.

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DESCRIPTIVE REPORT TO ACCOMPANY HYDROGRAPHIC SURVEY H12250

INTRODUCTION

The purpose of this survey is to provide accurate hydrographic data to NOAA in order to update existing nautical charts in a high commercial traffic area in the Gulf of Mexico near the Louisiana coast.

A. AREA SURVEYED

The survey area is located at Northwest Ship Shoal in the Gulf of Mexico. Illustrations No.1 and 2 show the layout of H12250 (Sheet 8) of Project OPR-K354-KR-10. Water depths in the survey area range from 3.18 m to 10.80 m Mean Lower Low Water. Survey statistics including the total survey line and crossline nautical miles, number of investigations and acquisition dates are shown in Tables No. 1 – 3.

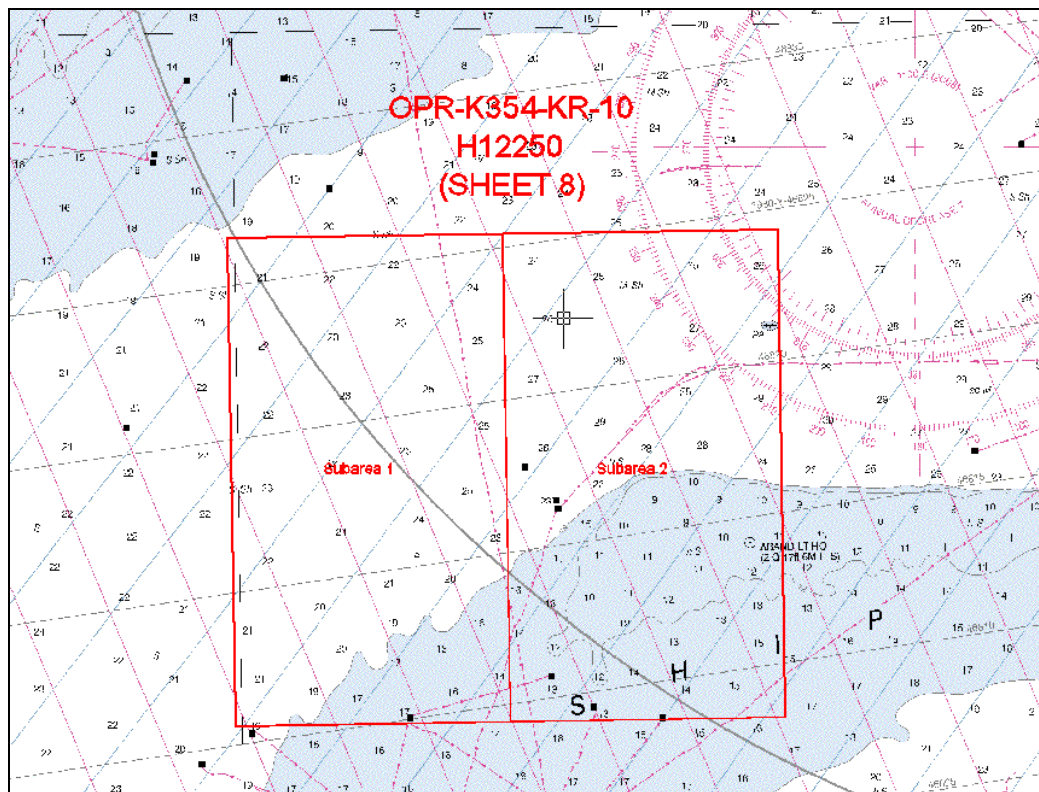


Illustration No. 1. Large Scale Survey Outline Graphic.

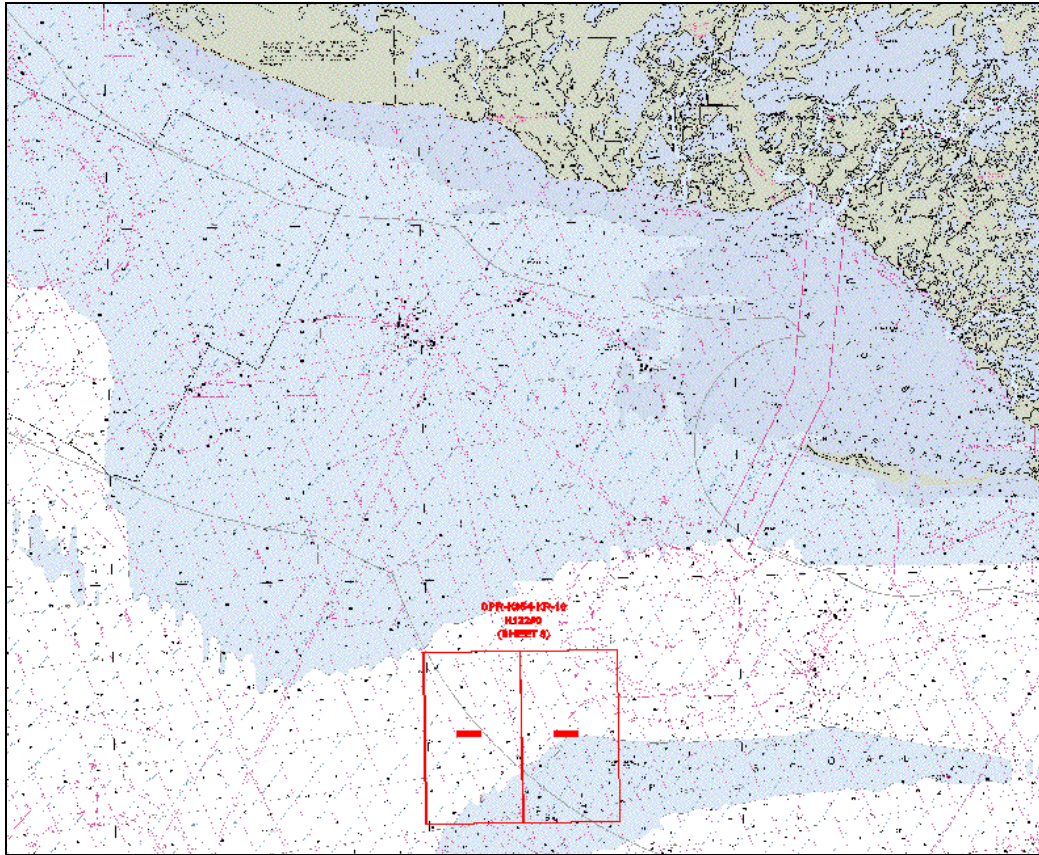


Illustration No. 2. Small Scale Survey Outline Graphic.

Table No. 1. Survey Line Statistics

	<i>Inez McCall</i>	Total
LNM Side Scan + Multibeam	749.51	749.51
LNM Crosslines	40.82	40.82
LNM Investigations	0.24	0.24

Table No. 2. Additional Survey Statistics

Total square nautical miles of survey area	27.23
Number of items investigated	1

Table No. 3. Data acquisition dates

Month	Day	Year
February	14, 15, 16	2011
March	14, 15, 16, 17, 18, 19	2011
April	1, 2, 3, 6, 7, 13, 14	2011
May	7, 8, 9, 12, 16, 17, 18	2011
November	22, 24	2011
December	30	2011



B. DATA ACQUISITION AND PROCESSING

Refer to the OPR-K354-KR-10 Data Acquisition and Processing Report (DAPR) for additional information regarding survey systems, operational, processing and quality control procedures. Additional and supplemental information is included in this descriptive report.

B.1. Equipment

Survey operations were conducted from the *M/V Inez McCall*. The vessel is 33.5 meters long and 7.5 meters wide with an approximate draft of 2.75 meters. A central reference point was established prior to the survey from which all relevant offsets were measured. Primary systems and equipment utilized on the *M/V Inez McCall* are listed in Table No. 4.

Table No. 4. Equipment List

System	Manufacturer	Model
Multibeam Echo Sounder	Simrad	EM3002
Side Scan Sonar	Klein	5000
Single Beam Echo Sounder	ODOM	Echotrac DF3200 MK II
Motion Sensor	Applanix	POS MV-320 V.3
Primary Positioning System	CNAV	2050
Secondary Positioning System	CNAV	2050
Tertiary Positioning System	Applanix	POS MV-320 V.3
Sound Speed at Transducer	YSI Electronics	600R
Sound Speed Profiler	Seabird	SBE19
SSS collection	Chesapeake Technology Inc.	SonarWiz Map
Multibeam collection	C&C Technologies	Hydromap
SSS Cable Payout Indicator	Subsea Systems, Inc	PI-5600

B.2. Quality Control

B.2.1. Survey Methods

For management purposes, the survey area was divided into two subareas (labeled 1 and 2) with separate line-plans in order to conduct survey operations. The main survey lines were oriented east to west throughout both subareas. Two hundred percent (200%) side scan sonar (SSS) coverage and concurrent set line spacing multibeam echosounder (MBES) data were acquired in accordance with the coverage requirements as stated in the Project Instructions for this survey. Additional high-resolution multibeam developments were conducted over significant features (see section B.4.2 for more details).

The shallowest charted soundings determined survey line spacing and the side scan sonar range scale. In the northern portion of subarea 1 charted water depths range from 19 to 25 feet with a line spacing of 90 m. In the lower southern portion of subarea 1, which encompasses a portion of Ship Shoal, the charted water depths range from 14 to 21 feet and have a line spacing was set to 60 m. Charted water depths in the northern half of subarea 2 range from 23 to 29 feet and line spacing was set to 90 m. The southern half of subarea 2 is



dominated by Ship Shoal and charted water depths over the shoal range from 9 to 16 feet. Line spacing was set to 60 m over the Shoal, and set to 40 m in the shallowest portions for water depths generally 12 feet or less. SSS was operated with a range of 100, 75, and 50 for line spacing of 90, 60 and 40 m, respectively.

The criteria of acquiring 200% SSS coverage for object detection was accomplished using the aforementioned parameters and Technique 2 as set forth in Section 6.1 of the HSSD (2010). The SSS tracklines used to generate coverage mosaics were identified by an odd/even numbering system.

B.2.2. Crosslines

Crosslines were run prior to the collection of main line data and perpendicular to the mainscheme lines so that quality control statistics could be performed after each main line was completed. Based on pre-plot calculations, the total crossline miles were 40.82 nm, while the total main line miles were 749.51 nm. The cross lines comprised 5.4 percent of the total data set as compared to the mainscheme lines, compliant with set line spacing crossline requirements of Section 5.2.4.3 of the HSSD (2010), which states that lineal mileage of crosslines will be at least 4% of mainscheme mileage in areas surveyed with set line spacing coverage. Rerun line miles are not included in these totals.

As can be seen in the sample statistics found in Separates V, the main line and cross line depth values generally showed good agreement. Each main line was compared to all cross lines for which there was overlapping data. The graphs show the mean difference, RMS difference, and confidence interval for each beam.

Crossline comparisons were also performed in CARIS HIPS/SIPS 7.1 using the surface difference tool. Separate 1-m BASE surfaces of the mainscheme lines and crosslines were created for each subarea and a difference BASE surface computed. The difference surfaces were examined using a color range map in 0.2 m increments from -0.6 to 0.6 m.

The majority of difference values for subarea 1 are within -0.4 to 0.2 m (Illustration No. 3). These values are within the maximum allowable TVU (total vertical uncertainty) for water depths of 3.78 to 9.57 m, which ranges from ± 0.50 to ± 0.52 m. However, the difference values between the crosslines and mainlines ranges from -0.61 to 0.33 m, the extreme values of which are greater than the maximum allowable TVU. For this reason, the difference surface was further examined with a separate colormap to evaluate the differences that are between -0.5 and -0.7 m (Illustration No. 4). This value was found to be small and occurred in localized areas on the edges of crossline and mainline data overlap. Therefore, the majority of the depth values of the mainlines and crosslines do not differ by more than the maximum allowable TVU in subarea 1.

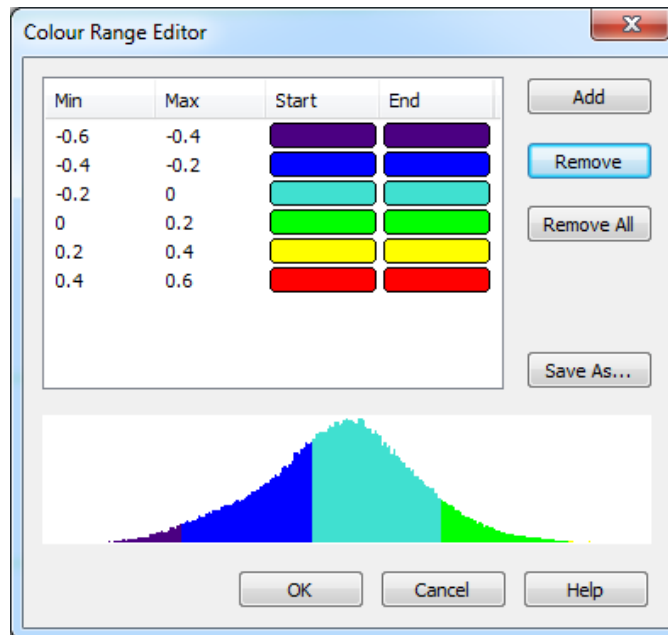


Illustration No. 3. Color range map and histogram used to evaluate the depth differences between mainlines can crosslines for Subarea 1.

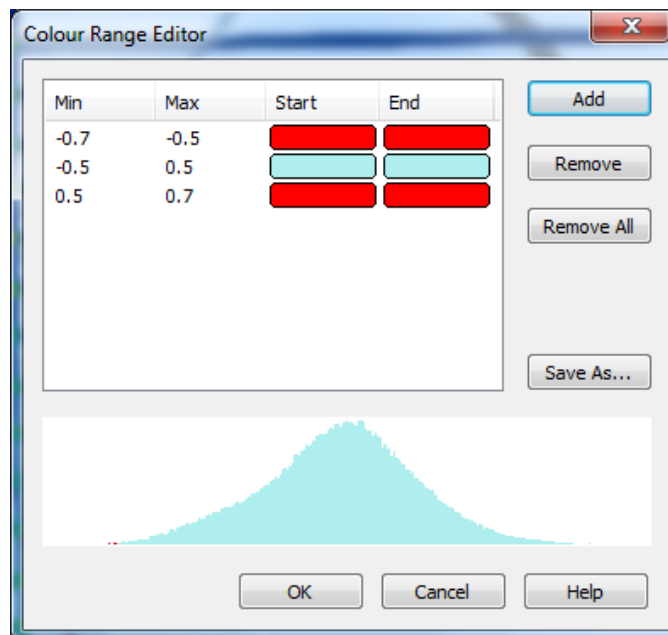


Illustration No. 4. Color range map used to evaluate the more extreme depth differences between mainlines and crosslines in Subarea 1.

The majority of difference values for subarea 2 are within -0.2 to 0.4 m (Illustration No. 5). These values are within the maximum allowable TVU for water depths of 3.18 and 10.80 m, which ranges from ± 0.50 to ± 0.52 m. However, the difference values between the crosslines and mainlines ranges from -0.49 to 0.63 m, the extreme values of which are greater than the maximum allowable TVU. For this reason, the difference surface was further examined with a separate colormap to evaluate the differences that are between 0.5 and 0.7 m (Illustration

No. 6). This value was found to constitute a relatively small amount and occurred in localized areas on the edges of crossline and mainline data overlap. Therefore, the majority of the depth values of the mainlines and crosslines do not differ by more than the maximum allowable TVU in subarea 2.

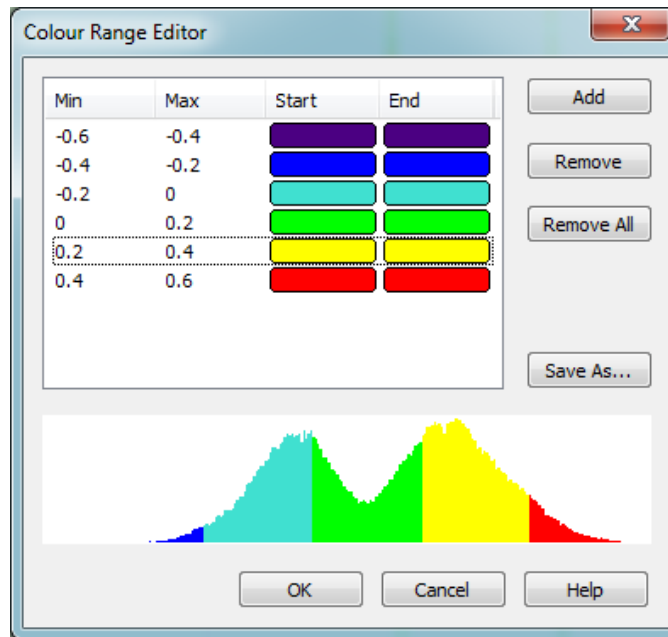


Illustration No. 5. Color range map and histogram used to evaluate the depth differences between mainlines and crosslines for Subarea 2.

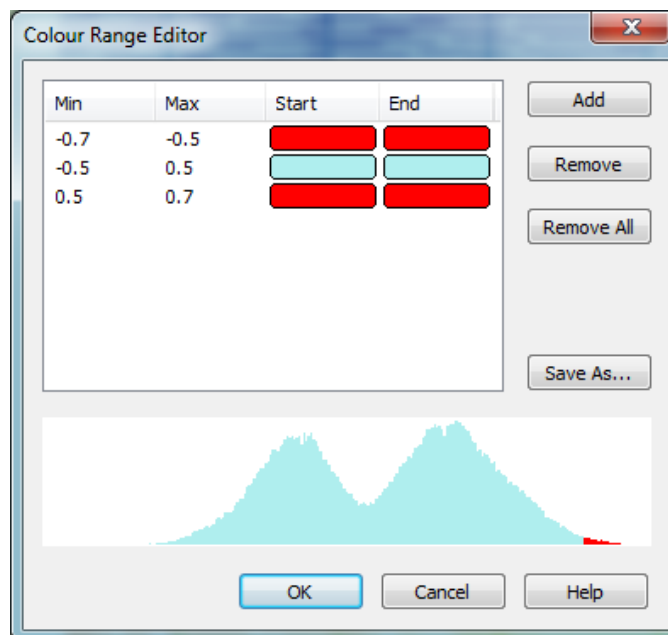


Illustration No. 6. Color range map used to evaluate the extreme depth differences between mainlines and crosslines in Subarea 2.

In addition, higher standard deviation is evident in the middle portions of crosslines H12250-TIE-106, H12250-TIE-107 and H12250-TIE-108 of Subarea 2. These crosslines were split generally in half and the separate halves were run on separate days; 106-1, 107-1 and 108-1 were run on March 19, 2011, whereas 106-2, 107-2 and 108-2 were run on April 3, 2011. The project logs indicate that the crosslines were split on March 19, 2011 due to the shallow water depths over Ship Shoal. The higher standard deviation occurs at the overlap of the crossline halves. Separate BASE surfaces for the lines run on March 19th and April 3rd were created, and a difference surface between the BASE surfaces generated. The majority of the differences range between -0.49 and -0.04 m and the majority of values are between -0.4 and -0.2 m (Illustration No. 7). The crosslines run on March 19th, 2011 are consistently shoaler than those run on April 3, 2011.

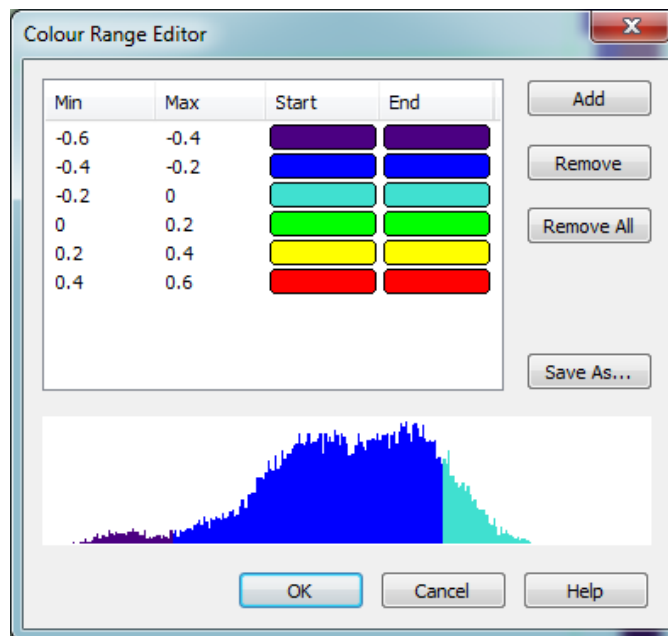


Illustration No. 7. Color range map used to evaluate differences between crossline halves in Subarea 2.

Statistical crossline information was also generated by comparing each of the crosslines to the depth layer of the 1-m BASE surface of the main survey lines. For crosslines 101-1, 102-1, 103-1, 104-1, 105-1, 107-2 and 108-2, in general, >99% of crossline soundings were considered to meet IHO Order 1a standards. For crosslines 106-1, 107-1 and 108-1, in general, >96% of crossline soundings were considered to meet IHO Order 1a standards. Crossline comparisons generated with the CARIS QC report utility are shown in Separate IV.

B.2.3. Uncertainty

CARIS HIPS was used to compute the Total Propagated Uncertainty (TPU) for each sounding. The measured tide uncertainty parameter was set to 0.009 m and the zoning parameter set to 0.102 m. The measured sound speed parameter was set to 2 m/s and the surface sound speed parameter to 0.800 m/s. All BASE surfaces were created based upon the IHO Order 1a standards.

B.2.4. Survey Junctions

The H12250 survey has three contemporary OPR-K354-KR-10 survey junctions. Details of these surveys are shown in Table No. 5 and outlined in Illustration No. 8. Although continuous multibeam coverage is not obtained within a survey or between surveys due to the set-line spacing multibeam survey operations, a CARIS difference surface between the 1-m BASE surfaces of the junction surveys and the 1-m BASE surfaces of survey H12250 was computed to ensure general agreement of depths where overlap of sounding data occurred. Difference surfaces were created with the CARIS Difference Surface tool with H12250 as Surface 1 and the adjoining survey as Surface 2. The difference surfaces were initially evaluated with a user-defined color range map in 0.2 m increments from -0.6 to 0.6 m. A summary of each junction analysis follows.

Table No. 5. H12250 Survey Junctions.

Registry Number	Scale	Year	Sublocality
H12249	40000	2010	Central Ship Shoal
H12253	40000	2010	Southwest Ship Shoal
H12246	40000	2010	6 NM N of West Ship Shoal

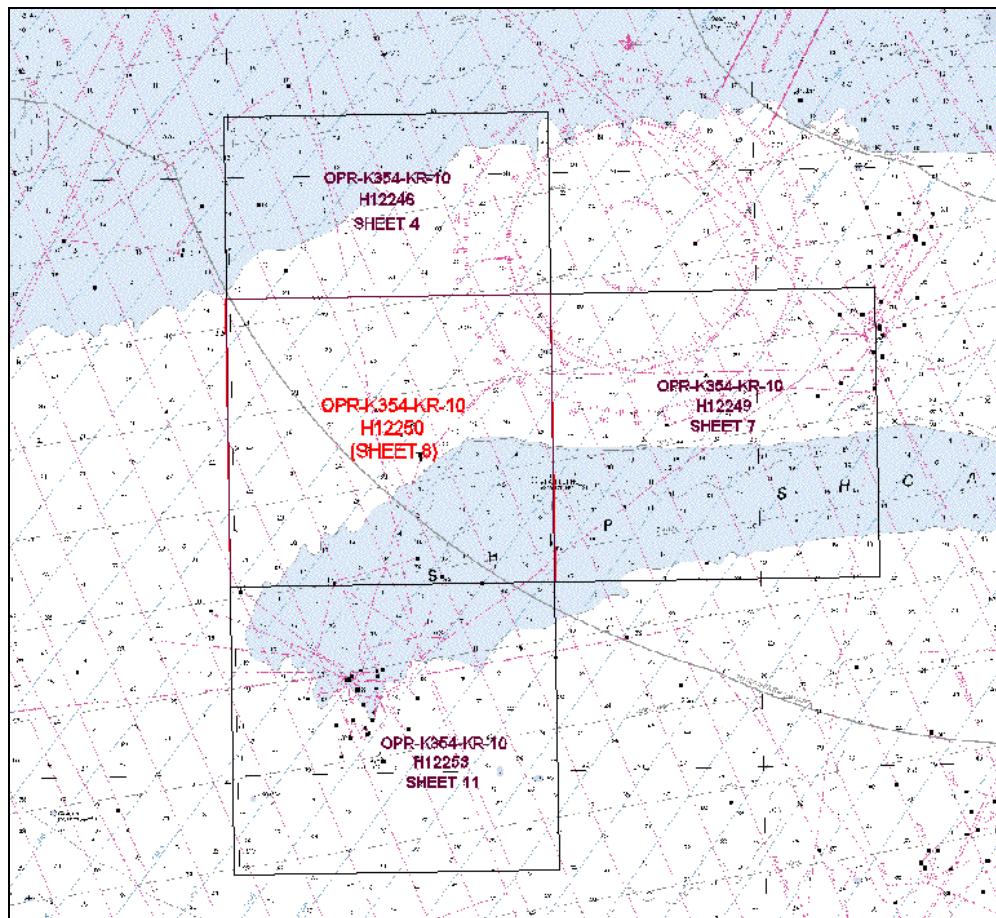


Illustration No. 8. H12250 Survey Junctions.

Junction with H12246

The northern margin of survey H12250 junctions with the southern margin of survey H12246. Subareas 1 and 2 of each survey overlap one another and crossline data of each survey overlaps mainline data of the adjoining survey. The 1-m BASE surfaces of H12250 were compared to the finalized 1-m BASE surfaces of H12246. The depth differences between Subareas 1 of each survey range between -0.26 and 0.41 m (Illustration No. 9). The depth differences between Subareas 2 of each survey range between -0.45 and 0.07 m (Illustration No. 10). Between Subareas 2 of each survey, H12250 data is generally shoaler than H12246 data, whereas between Subareas 1, the depth data from each survey is more comparable.

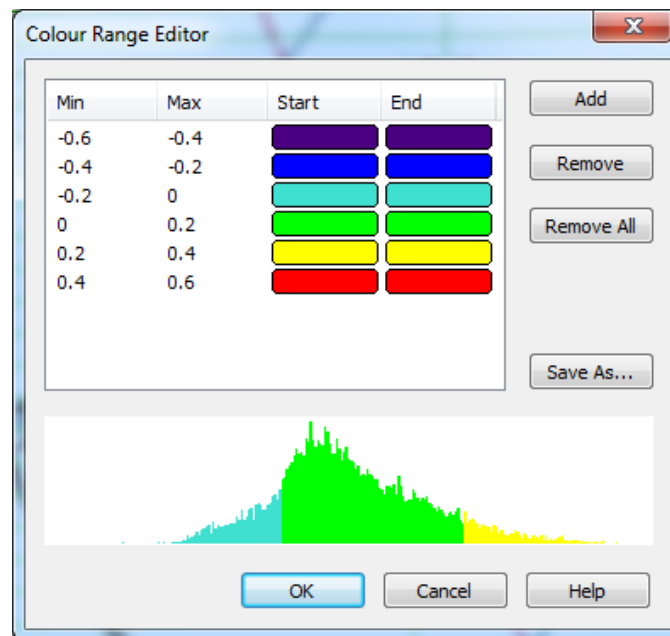


Illustration No. 9. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 1 of H12250 and Subarea 1 of H12246.

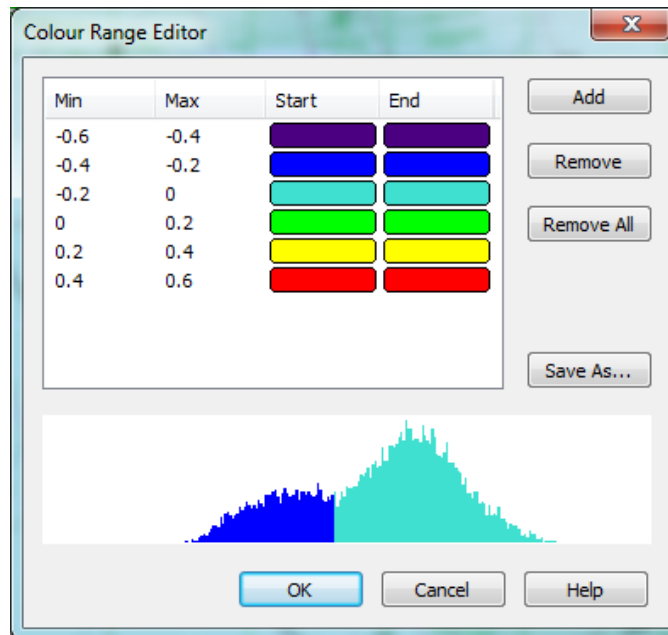


Illustration No. 10. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 2 of H12250 and Subarea 2 of H12246.

Junction with H12249

The eastern margin of survey H12250 junctions with the western margin of survey H12249 and mainline data of each survey area overlaps. The majority of depth differences range between -0.4 and 0.4 m (Illustration No. 11). Although the maximum differences range between -0.47 and 0.58 m, the amount >0.5 m is minimal and is mainly associated with outer swath data overlap (Illustration No 12).

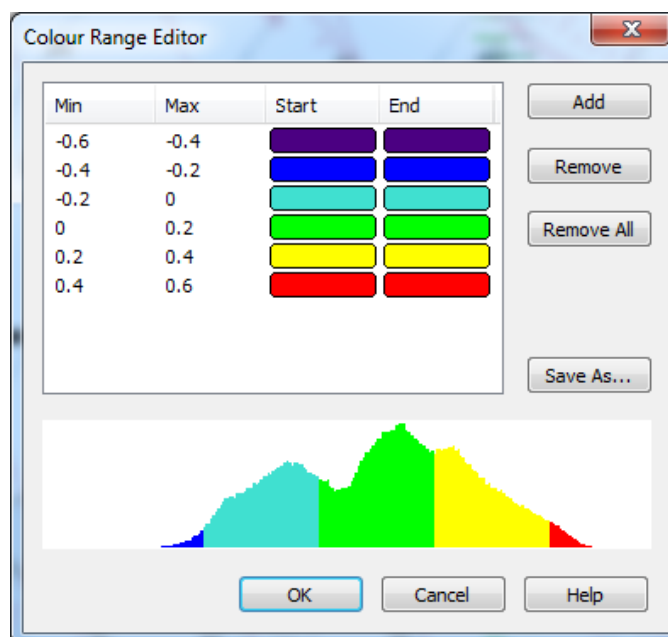


Illustration No. 11. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 2 of H12250 and Subarea 1 of H12249.

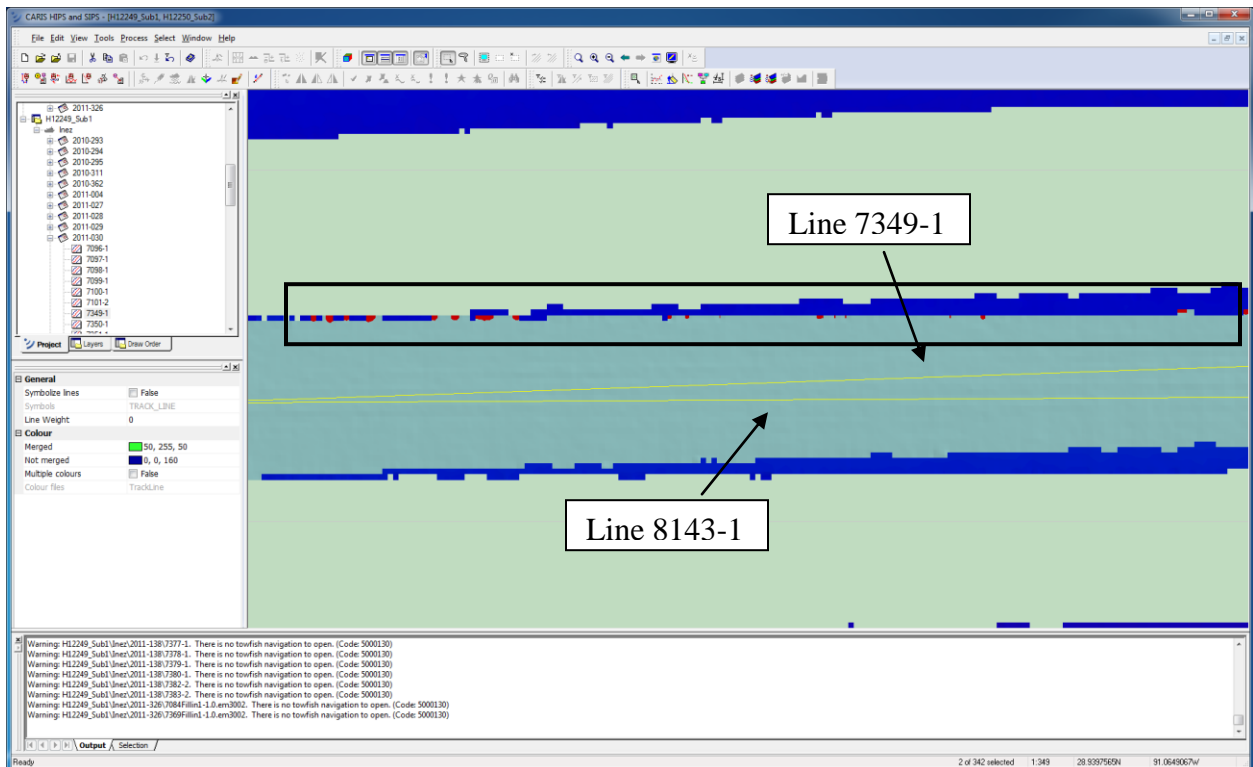


Illustration No. 12. Sample region of higher depth difference (black box) associated with outer swath data.

Junction with H12253

The southern margin of survey H12250 junctions with the northern margin of survey H12253 and preliminary 1-m BASE surfaces were created for each subarea of H12253 to which H12250 was compared. Any changes to this junction analysis will be addressed in the Descriptive Report of H12253. Subareas 1 and 2 of each survey overlap one another and crossline data of each survey overlaps mainline data of the adjoining survey.

The majority of depth differences between Subareas 1 of each survey range between 0.0 and 0.4 m (Illustration No. 13), however, there is a significant portion of difference data between 0.4 and 0.6 m. For this reason, the difference surface was further examined with a separate colormap to evaluate the differences that are between 0.5 and 0.7 m (Illustration No. 14). These values occur mainly where the crosslines of H12253 overlap line 8110-1 of H12250. In general, the mainline and crossline data of H12253 are shoaler than the mainline and crossline data of H12250.

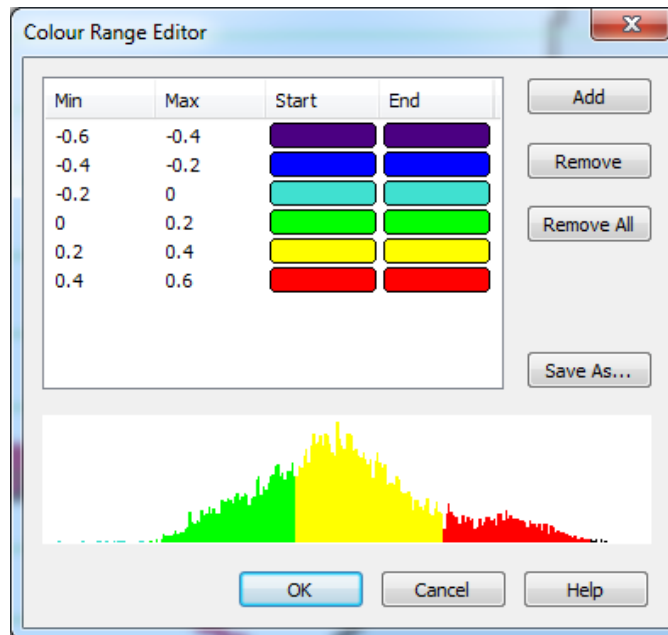


Illustration No. 13. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 1 of H12250 and Subarea 1 of H12253.

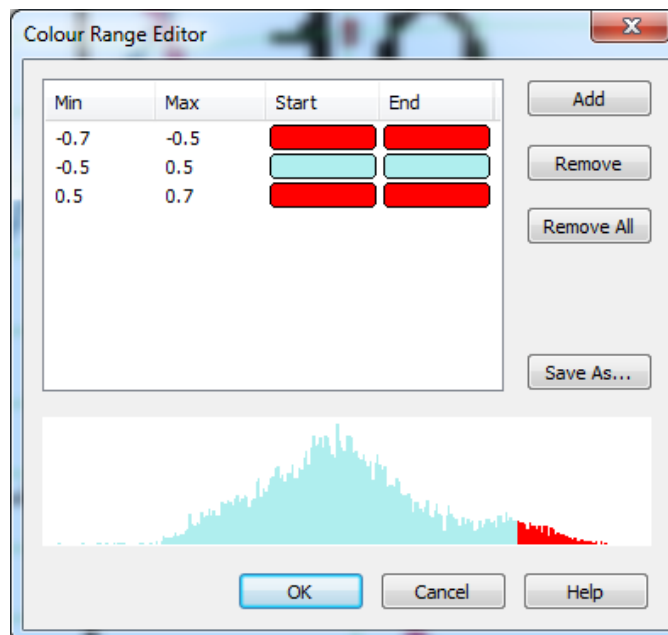


Illustration No. 14. Color range map and histogram used to evaluate the more extreme depth differences between the junction of Subarea 1 of H12250 and Subarea 1 of H12253.

The depth differences between Subareas 2 of each survey range between -0.19 and 0.64 m (Illustration No. 15). Because there is a relatively significant portion of data between 0.4 and >0.6 m, the difference surface was further examined with a separate colormap to evaluate the differences that are between 0.5 and 0.7 m (Illustration No. 16). These values occur mainly where the crosslines of H12253 overlap the mainlines of H12250 and especially on the

overlap of crossline H12253-TIE-107-1. In general, the mainlines and crosslines of H12253 are shoaler than the mainlines and crosslines of H12250.

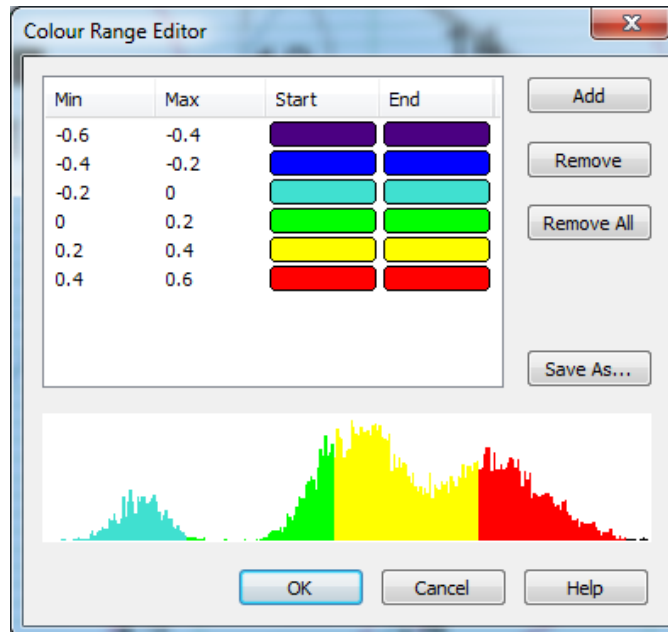


Illustration No. 15. Color range map and histogram used to evaluate the depth differences between the junction of Subarea 2 of H12250 and Subarea 2 of H12253.

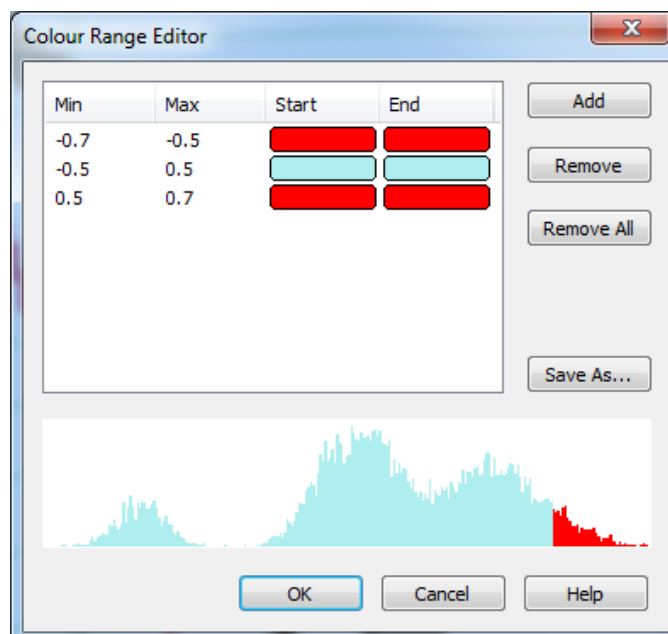


Illustration No. 16. Color range map and histogram used to evaluate the more extreme depth differences between the junction of Subarea 2 of H12250 and Subarea 2 of H12253.

B.2.5. Sonar System Quality Control

A total of five patch tests were performed to calibrate the multibeam system. An initial patch test took place south of Cameron, LA on July 6, 2010 (Table No. 6). Another four patch tests were performed; the first outside of Port Fourchon, LA on the 14th of June 2011, the second was south of Cameron, LA on June 30th, 2011, a third on September 22th, 2011 outside Port of Fourchon, LA and the fourth south of Port Fourchon, LA, on November 11, 2011.

On June 14th, 2011 a patch test was performed for the commencement of the 2011 NOAA project OPR-K354-KR-11. A second test was done as a check on the quality of the first calibration. The results from the June 30th patch tests were used as the final angular offsets. This was done because of concerns with the accuracy of the heading results (Table No. 7).

On September 22th, 2011, the EM3002 stopped working. After troubleshooting the topside and connections, it was determined that the problem was below the waterline, either with the cable or with the transducer. The boat was put into dry dock; the transducer and cable were replaced and a new patch test was performed. Results are shown in Table No. 8.

On November 11, 2011 another patch test was conducted after noticing misalignment in investigation multibeam data in CARIS. Results are shown in Table No. 9. The vessel file in CARIS was updated and correctors applied for data between September 22 and November 11, 2011.

Table No. 6: Patch test results (July 6, 2010-south of Cameron, LA)

Roll	Pitch	Heading
-0.236°	2.440°	358.430°

Table No. 7: Patch test results (June 30, 2011 – south of Cameron, LA)

Roll	Pitch	Heading
-0.125°	4.463°	-1.665°

Table No. 8: Patch test results (September 22, 2011 – south of Port Fourchon , LA)

Roll	Pitch	Heading
-0.117°	4.755°	-1.569°

Table No. 9: Patch test results (November 11, 2011 – south of Port Fourchon , La)

Roll	Pitch	Heading
-0.17°	3.72°	2.521°

The angular sector on the multibeam was set so that the criterion of two times water depth, as well as all accuracy, resolution, and detection criteria as set forth in Sections 5.2 and 5.3 of the “Specifications and Deliverables” document, were met.

Leadlines were conducted daily, when possible, to assess whether draft corrections needed to be applied in the multibeam collection software. The lead line logs are included in Separate I – Data Acquisition and Processing Logs.



An Odom Echotrac MKII single beam echosounder was used as an independent check on the multibeam system. Sound velocity was imported daily into the echo sounder.

Sound velocity casts were performed daily to measure the sound speed in the water column. Often casts were performed more than once to ensure accurate multibeam bottom detection. The water column sound speed was compared to the sound speed at the transducer, which was measured with an Endeco YSI sound speed profiler. Refer to the Data Acquisition and Processing Report for a description of sound speed corrections and to Separates II – Sound Speed Data for additional information.

In Subarea 2 there are two lines (8227-1 and 8237-2) and one line in Subarea 1 (8049-1) that has data overlap and navigation gaps in the very beginning of each line. This is thought to have occurred when a line was stopped and a new line run but not re-named, which caused the original data to be over-written improperly. In addition, there are several regions of higher standard deviation evident in Subarea 1. The first occurs at line 8096-1 where the 8096Fillin1-1 line has been added to the BASE surface; a portion of line 8096-1 was re-run due to bad navigation and data gaps. The second occurs in the vicinity of line 8109-1, which, according to the project logs, was offline due to platform operations. Fill-in lines were conducted later in the survey; these lines are shoaler than the main survey lines.

B.2.6. Unusual Conditions/Factors Affecting Soundings/Imagery

Shallow water was a factor that affected sonar imagery in this survey area. The quality of the side scan sonar was monitored closely and the height of the tow fish adjusted to keep it flying as high as possible in the water column.

Another factor concerns a geological feature (Ship Shoal). The multibeam data collected over this feature was very noisy, which made crossline comparisons difficult. In addition, particularly over the shallowest portion of Ship Shoal in subarea 2, there is irregular bathymetry that is evident in the both the BASE surface depth layer as well as the standard deviation layer. Because these features are not particularly evident at the transition between the subareas 1 and 2 or on the crosslines of subarea 2, although these features could in part represent bedforms such as sandwaves, it is also possible that these features are an artifact, possibly from heave.

B.3. Corrections to Echo Soundings

Prior to data collection on October 7th 2010, the computer for the EM3002 control software was swapped out due to a hardware failure. At this time, the positional and angular EM3002 mounting offsets in the control software (SIS) were also changed. No change should have been made to the offsets, and all future data was collected using these incorrect values.

To correct this error, the HIPS vessel file was updated with a second entry under Swath 1. This entry, beginning on October 7th (2010-280), uses the HVF correction values found in Tables No. 9 and No. 10 below to adjust the data.

Due to the shallow water in the area, the angular, along track, and across track values went unnoticed. The vertical offset of nearly 0.4 meters was noticed right away when the lead line performed prior to data collection on 2010-280 was off by 0.4 meters. This error was corrected for in the multibeam control software as a subtraction to the waterline to CRP (draft) value. Because of this real-time correction, the 0.398-meter vertical offset is not entered in the HIPS vessel file.

To correct the angular offsets, the patch test results from June 30th, 2011 were used (Refer to Section B.2). This was done because after testing, the roll value from this patch test better corrected the data.

On November 11, 2011 another patch test was conducted after noticing misalignment in investigation multibeam data in CARIS. The vessel file in CARIS was updated and correctors applied for data between September 22 and November 11, 2011. In addition, the vessel file was also updated for data collected after November 11 with the correct heading value, which was not corrected for in SIS.

Table No. 10: Multibeam positional offsets (from CRP)

	Y (Forward)	X (Starboard)	Z (Vertical)
Correct value (in SIS)	14.518 m	0.170 m	3.048 m
Incorrect value (in SIS)	14.80 m	0.00 m	2.65 m
HVF correction	-0.282	0.170	0.398

Table No. 11: Multibeam angular offsets

	Roll (Positive starboard down)	Pitch (Positive bow up)	Heading (Positive clockwise)
Correct value (in SIS)	-0.125	4.463	358.335 (-1.665)
Incorrect value (in SIS)	0.10	9.3	3.28
HVF correction	-0.225	-4.837	-4.945

B.4. Data Processing

B.4.1. Coverage BASE Surfaces and Mosaics

Multibeam data processing was conducted using CARIS HIPS/SIPS 6.1 SP2 on the vessel and CARIS HIPS/SIPS 7.1.0 with Hot Fixes 1, 2 and 3 in the office. One BASE surface was created for each subarea at a scale of 1:40000 with a resolution of 1 m, in accordance with Section 5.2.2.2 and 5.2.2.3 of the HSSD (2010), which states that a 1-m BASE surface will be created for 0 – 22 m water depths. One BASE surface was created for investigations at a scale of 1:40000 and a resolution of 0.5 m.

Side scan sonar data was processed using Chesapeake Technologies SonarWiz4 V.4.04.0118. All of the side-scan sonar data collected for this project has been layback corrected. 1-m resolution mosaics were created for even and odd lines in each subarea to ensure 100% SSS coverage mosaics.

B.4.2. SSS Imagery and Contacts

Side scan sonar data was evaluated twice and all contacts with a shadow identified on each 100% SSS coverage. These contacts were correlated and evaluated in either the CARIS HIPS/SIPS or CARIS Notebook map window with respect to BASE surfaces and charted information. In accordance with Section 6.3.2 of the HSSD (2010), in water depths of less than or equal to 20 m, contacts with heights computed from the shadow length of 1 m or more were considered significant. All significant contacts not fully developed with mainscheme MBES coverage were investigated with additional MBES coverage. A sounding that represented the least depth of each significant contact was designated using CARIS HIPS/SIPS. A list of all side scan sonar contacts is contained in Separate V and significant features are represented and attributed in the S-57 feature file. Refer to the Data Acquisition and Processing Report for details on the side scan sonar contact processing and correlation workflow.

C. VERTICAL AND HORIZONTAL CONTROL

The vertical datum for the soundings is Mean Lower Low Water (MLLW). Tide and water level corrections were determined and applied in accordance with the CO-OPS Statement of Work. Data from Port Fourchon, LA (8762075) was used as the source of tides. Verified tides with final tide zoning were applied to the data

The horizontal datum for the survey is the North American Datum of 1983 (NAD 83) and the projection is Universal Transverse Mercator (UTM) Zone 15 North.

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

D.1.1. Charts and Notices to Mariners

Chart comparisons were performed in CARIS HIPS/SIPS 7.1 using the final BASE surfaces of mainscheme and investigation lines, colored depth ranges, and sounding layers. The data was compared to the largest scale chart in this area, summarized in Tables No. 12 and 13.

Table No. 12. Nautical Charts used for Comparison

Chart Number	Scale	Edition	Edition Date
11356	1:80,000	38	Jun 08

Table No. 13. Nautical Chart Correction Dates

Chart Number	Corrected Through	
	NM	LNM
11356	Jun 14/08	Jun 03/08

The Local Notices to Mariners (LNM) were reviewed for the duration of the survey for which the majority of data was collected (between February 14 and May 18, 2011). The last

Notice to Mariners reviewed was LNM 21/11 8th Dist on 5/24/2011. No Notice to Mariners was issued within the survey bounds during survey operations. In addition, because additional data was acquired in November and December, 2011, the Local Notice to Mariners was further evaluated; no Notice to Mariners was issued within the survey area between May 18 and December 30, 2011.

D.1.2. Charted Soundings

Charted soundings were compared to a sounding layer as well as color range maps. The sounding layers were generated from a 1-m BASE surface with a 450-ft single-defined radius for both subareas. (Refer to the Data Acquisition and Processing Report for sounding selection criteria). Depths in the northern portion of the survey area range from 23 – 31 ft and the deepest part of the survey area is location in the northern section of subarea 2. The southern section of the survey area is dominated by Ship Shoal. A shallow (11 – 18 ft) region of Ship Shoal is located mainly in the southern portion of subarea 2 and bounded to the north, south and east by depths ranging from 18 – 16 m. Refer to Illustrations No. 17 and 18.

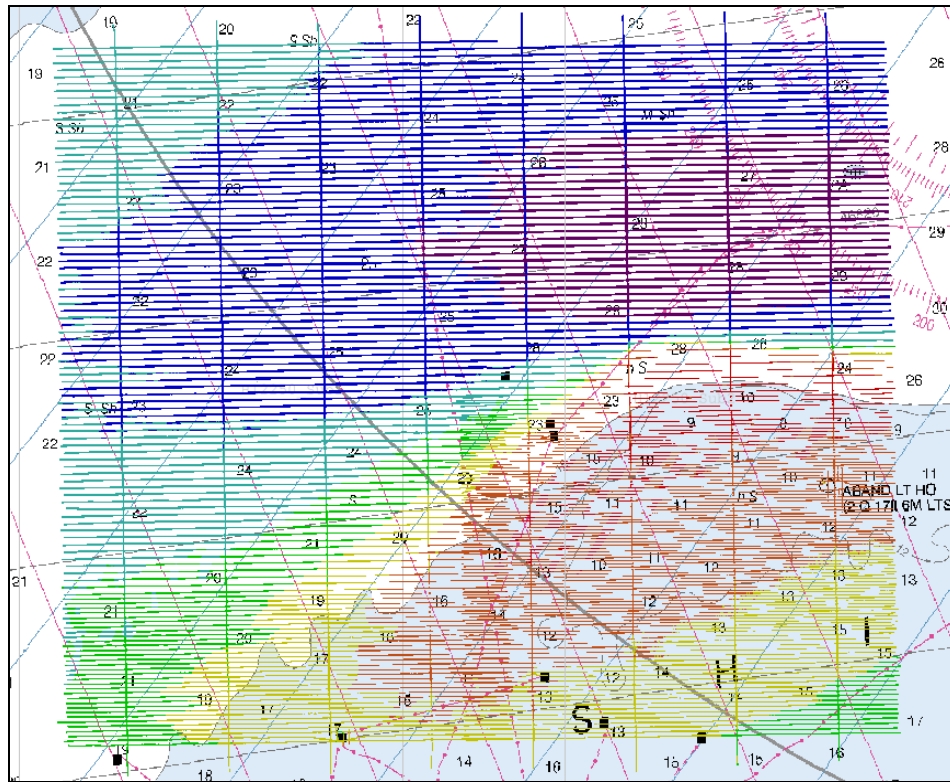


Illustration No. 17. H12250 Survey area with colored depth ranges shown in Illustration No 18.

Min	Max	Start	End
3	4		
4	5		
5	6		
6	7		
7	8		
8	9		
9	10		
10	11		

Illustration No. 18. CARIS color range map (in meters) used for Illustration No. 17.

In the northwest and central western portions of the survey area (mainly the northern and western portions of subarea 1), surveyed soundings are 3 to 5 feet deeper than charted depths. In the northeastern portion of the survey area (mainly the northern portion of subarea 2), surveyed soundings are generally 1 to 3 feet deeper than charted depths. In the central portion of subarea 1, charted depths and surveyed soundings are more comparable, and generally agree to within a foot.

Ship Shoal occupies a significant portion of the survey area, mainly in the southeast corner of subarea 1 and the southern half of subarea 2. The Shoal is delineated by the 18-ft contour. In order to evaluate differences and similarities between the charted contour and surveyed soundings, a color range chart was created in CARIS with soundings of 0 to 5.486 m in red and soundings greater than 5.486 m in blue; 5.486 m represents ~18 ft (Illustration No. 19). Surveyed soundings less than 18 feet extend north of the charted 18-ft contour; this is evident in the sounding layer as well, where surveyed soundings to the north of the currently charted 18-ft contour are up to 12 feet shoaler than charted depths (Illustration No. 20). In the southeastern portion of the survey, surveyed soundings greater than 18 feet are within the bounds of the charted 18-ft contour. In this section, surveyed soundings are generally 3 to 4 feet deeper than charted depths (Illustration No. 21). In the western portion of the shoal, surveyed soundings 18 feet and greater are within the charted 18-ft contour. However, within this boundary, charted depths and surveyed soundings are generally more comparable and either match very well or surveyed soundings are 1 – 2 feet shoaler than charted depths (Illustration No. 22).

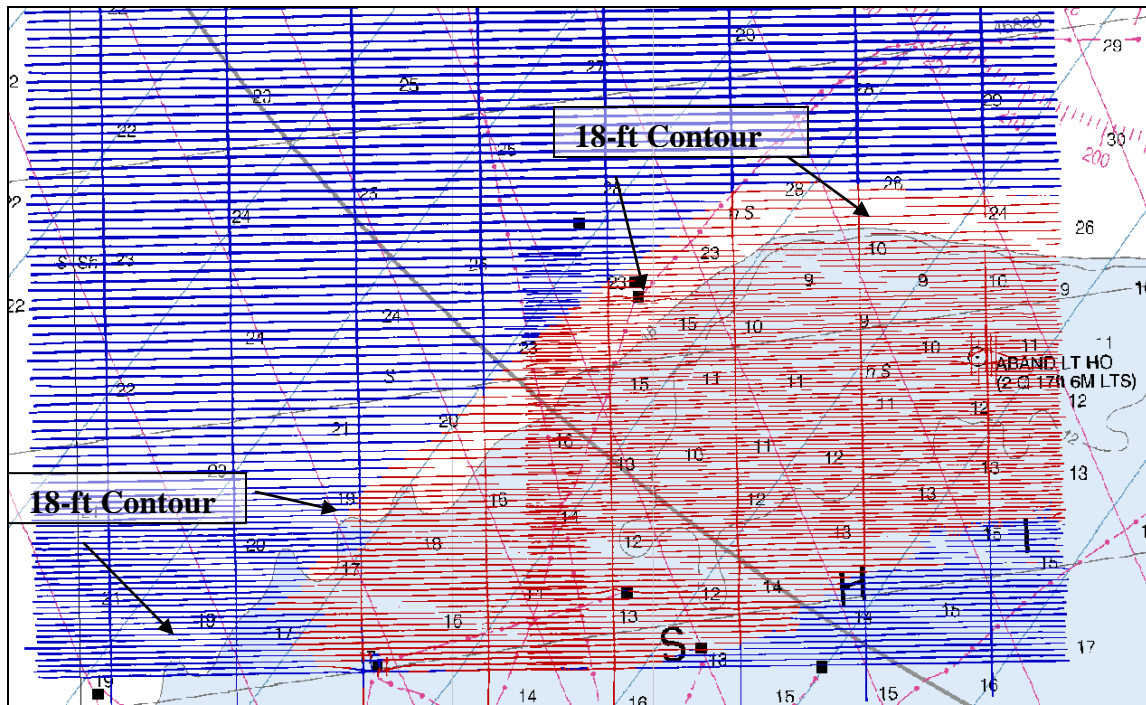


Illustration No. 19. Comparison of charted 18-ft contour and surveyed soundings. Soundings of 0 to 5.486 m are in red and soundings greater than 5.486 m in blue; 5.486 m represents ~18 ft.

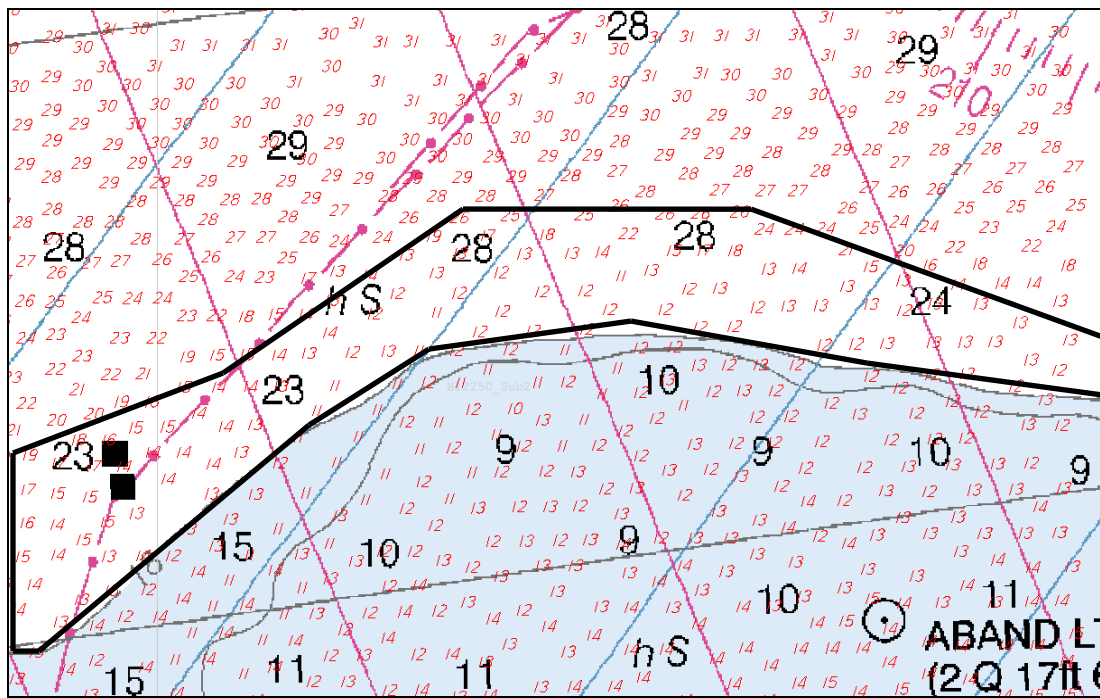


Illustration No. 20. Surveyed soundings to the north of the currently charted 18-ft contour are up to 15 feet shallower than charted depths (black polygon).

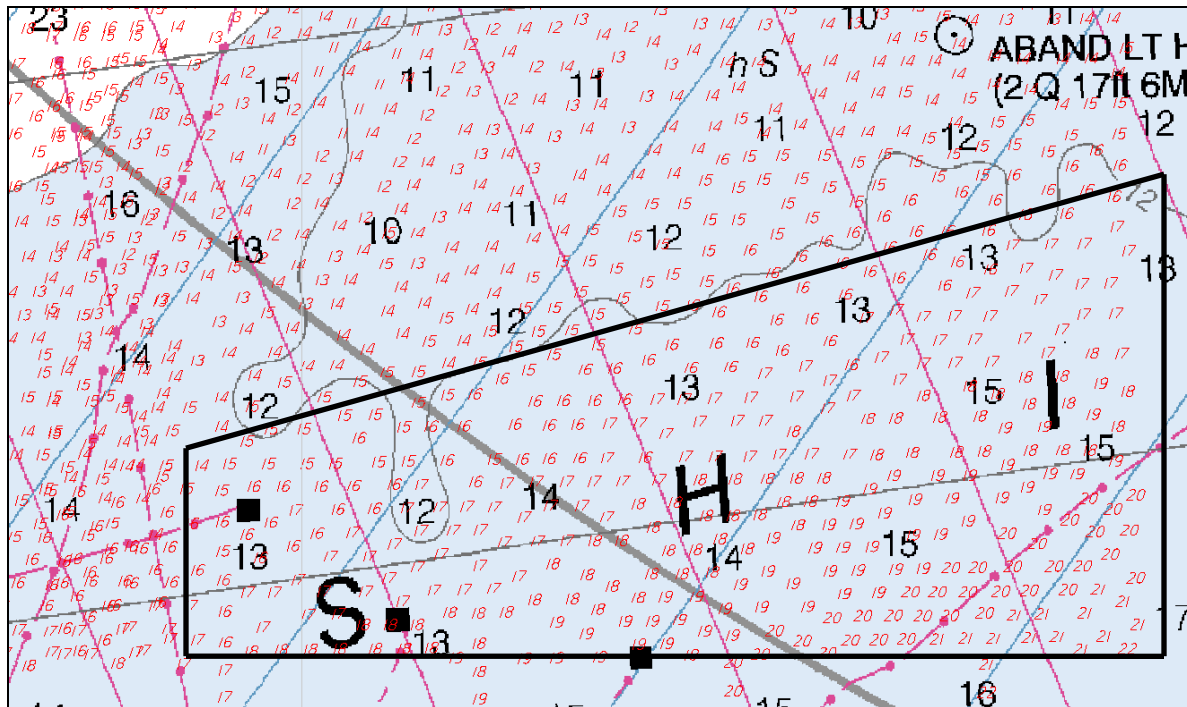


Illustration No. 21. Surveyed soundings in the southernmost area of the Shoal that was surveyed are generally 3 – 4 feet deeper than charted depths (black polygon).

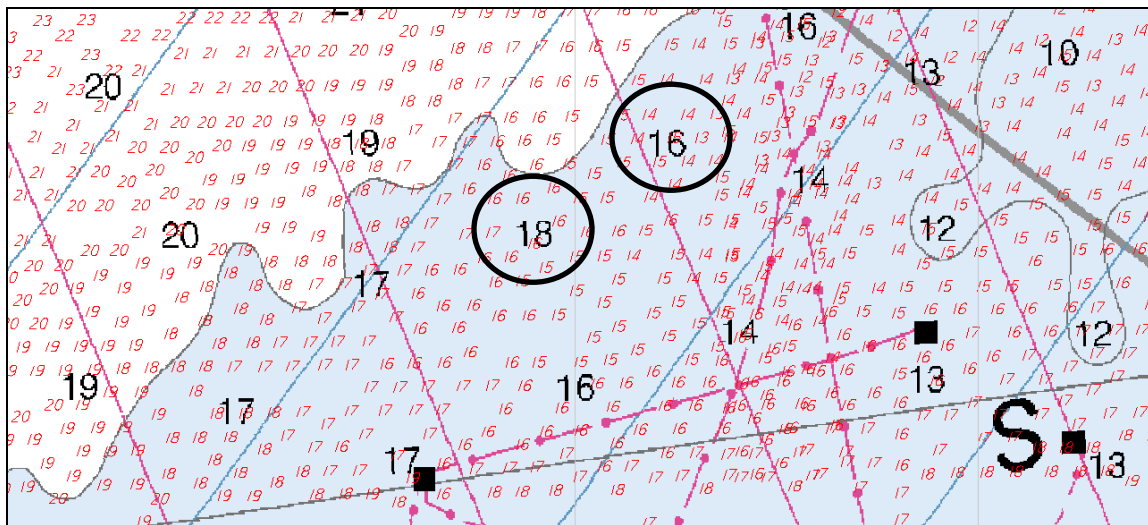


Illustration No. 22. Surveyed soundings in the western portion of the surveyed shoal that are 1 – 2 feet shallower than charted depths shown in black circles.

A shallower portion of the Shoal is also delineated by the 12-ft contour. Evaluation of the sounding layer shows that the majority of the surveyed soundings within the 12-ft contour are greater than 12 feet. This is especially true within the southern portion of the 12 foot contour. In the northern portion of the 12-ft contour, as well as to the north of both the 12-ft and 18-ft contours, there are several surveyed soundings of 11 and 12 feet (Illustration No. 23).

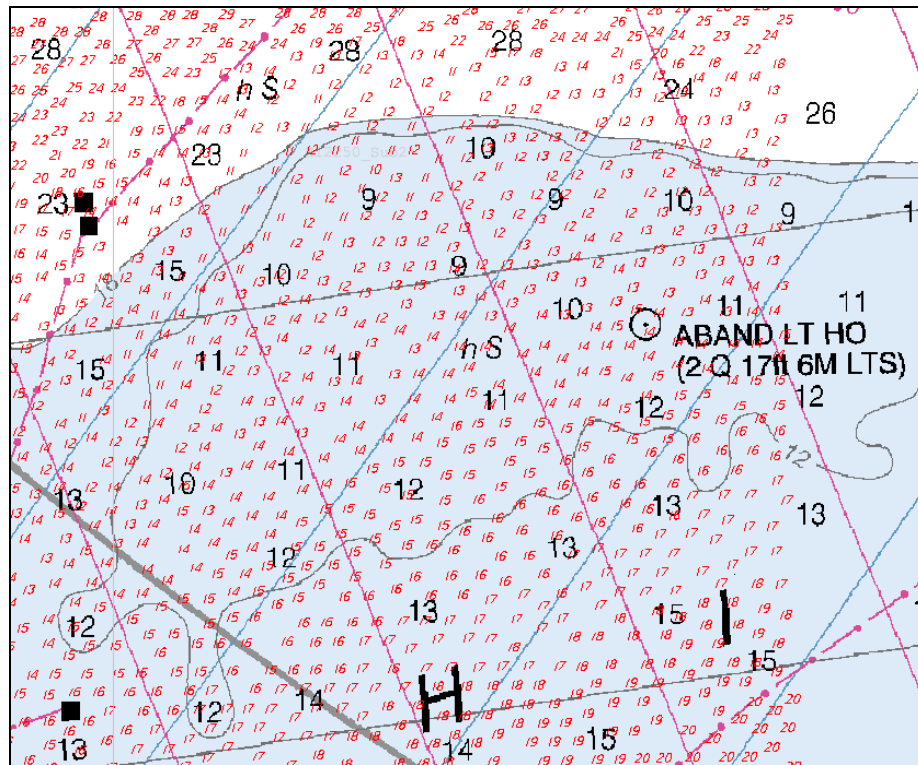


Illustration No. 23. Delineation of the portion of the 12-ft contour that was surveyed; within the northern portion of the 12-ft contour, as well as to the north of both the 12-ft and 18-ft contours, there are several surveyed soundings of 11 and 12 feet.

D.1.3. Charted Features

D.1.3.1. AWOIS

One AWOIS item was assigned for full investigation within the survey area (Table No. 14). The AWOIS radius overlaps survey H12249, the data of which completes the full coverage search of the radius. No significant contact was found within of the AWOIS radius area and the hydrographer recommends that the AWOIS item be removed from chart 11356. Refer to Appendix II: Survey Feature Report for details.

Table No. 14. AWOIS item assigned for full investigation.

AWOIS Record	Chart Latitude	Chart Longitude	Chart Action/Comments
8467	28°57'00.832" N	91°04'00.340" W	Remove from Chart 11356

D.1.3.2. Investigation Items

One investigation was conducted in the survey area (Table No. 15). A potential target was located in the multibeam data on line 8050-1 between shotpoints 27 and 28; this item was not associated with a SSS contact. Further multibeam investigation was conducted on December 30, 2011. These data did not show anything that resembled a contact, and the original mainline data was further cleaned to best represent the nature of the seafloor.

Table No. 15. Investigation Item.

Subarea	Least Depth (m)	Investigation Latitude	Investigation Longitude	Remarks
1	N/A	28°55'34.39 N	91°07'41.68 W	Disproved by MB investigation

D.1.3.3. Danger to Navigation Reports

No Danger to Navigation Report was submitted for this survey.

D.1.3.4. Existing Infrastructure

The structures in Table No. 16 were found as charted; these include two platforms and the abandoned Ship Shoal Lighthouse. The position of each structure was obtained from the layback corrected primary sidescan sonar contact. Refer to the Data Acquisition and Processing Report for details on primary and secondary contacts. No previously uncharted platforms were observed during the survey. Table No 17 shows a list of structures that are currently charted, but were no longer present at the time of the survey. The positions of these platforms were obtained from Chart 11356.

Table No. 16. Structures found as charted

Surveyed Position			
Latitude	Longitude	Structure Name	Chart Action/Comments
28°53'12.603 N	91°08'06.594 W	SS 99 A	Remain as charted
28°53'35.695 N	91°06'31.301 W	SS 99 E	Remain as charted
28°54'52.148 N	91°04'16.319 W	ABAND LT HO (2 Q 6M LTS)	Remain as charted

Table No. 17. Charted platforms not present at time of survey.

Charted Position		
Latitude	Longitude	Chart Action
28°55'39.799 N	91°06'46.770 W	Remove from chart
28°55'19.761 N	91°06'26.136 W	Remove from chart
28°55'14.703 N	91°06'24.847 W	Remove from chart
28°53'16.826 N	91°06'03.152 W	Remove from chart
28°53'09.888 N	91°05'16.969 W	Remove from chart

D.1.3.5. Feature Report

A Final Feature File for obstructions and infrastructure, has been submitted as a CARIS .hob file in a CARIS Notebook project.



D.2. Additional Results

D.2.1. Prior Surveys

Survey H12250 does not junction with surveys prior to 2010. Refer to Section B.2.4 for information on contemporary survey junctions and Section D.1 for comparison to nautical chart 11356.

D.2.2. Aids to Navigation

No Aids to Navigation are charted within the survey area and none were found during survey operations; Abandoned Ship Shoal Lighthouse is addressed in Section D.1.3.4.

D.2.3. Additional Infrastructure

Several submarine pipelines are charted within the survey, which were not observed within the multibeam or side scan sonar survey data. However, there are several possible uncharted pipeline exposures that were observed mainly within the side scan sonar data; one potential pipeline feature (SSS contact 091-070917S) is evident in the multibeam data. Information on these exposures can be found in the contact listing in Separates V.

D.2.4. Significant Scientific/Practical Findings

Large scale linear northwest – southeast wave-like bottom features are evident over the Ship Shoal (mainly over the shoalest portion in Subarea 2) that are apparent in both the bathymetry (Illustration No. 24 - high vertical exaggeration) and the SSS (Illustration No. 25). These features are also evident in Subarea 1, but mainly north and west of the Shoal.

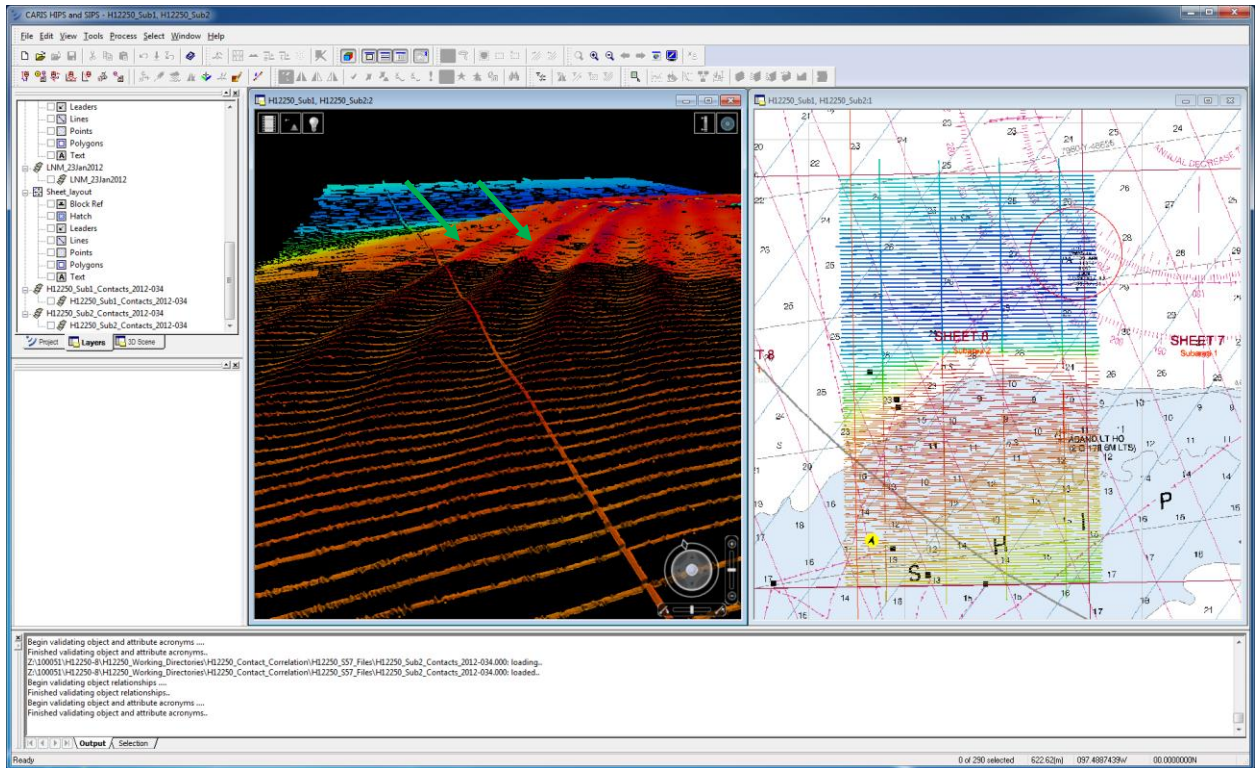


Illustration No. 24. Large scale wave-like features along Ship Shoal (green arrows point to several of these features).

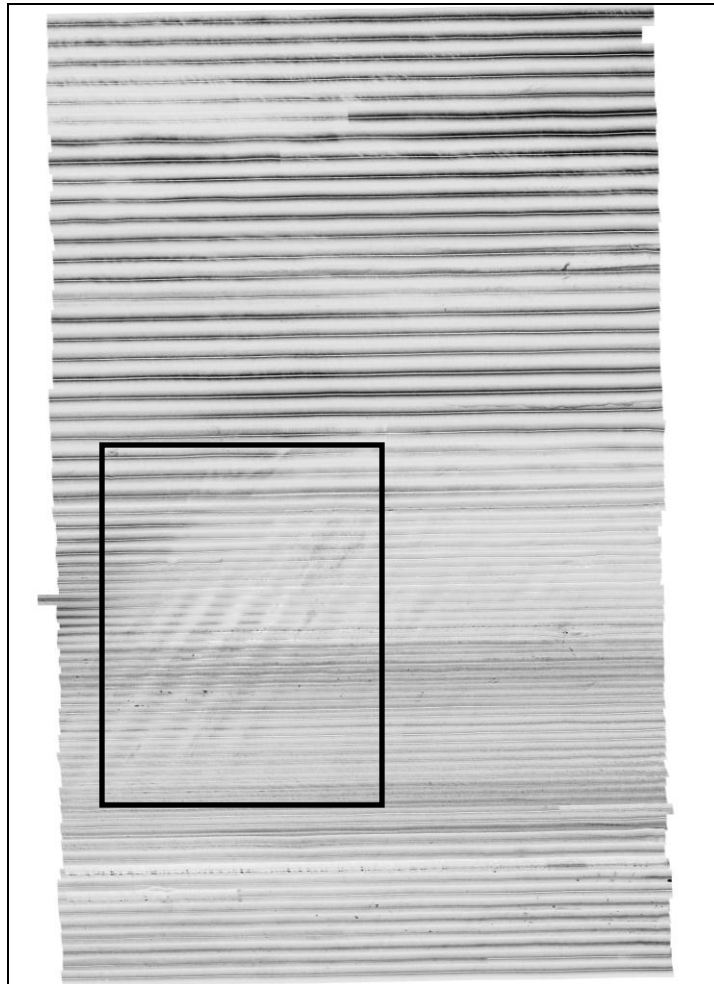


Illustration No. 25. Features in the SSS (shown in the black box) that appear to correlate to large scale wave-like features evident in the bathymetry (Illustration No. 24) over Ship Shoal. Mosaic is the created from the odd lines of subarea 2.



E. APPROVAL SHEET

LETTER OF APPROVAL

REGISTRY NUMBER H12250

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of the survey H12250 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and CARIS project have been closely reviewed and are considered complete and adequate as per the Statement of Work.

This report is accompanied by the Data Acquisition and Processing Report for project OPR-K354-KR-10.

A handwritten signature in black ink, appearing to read 'Tara Levy'.

Tara Levy
Chief of Party
C&C Technologies
February 2012

APPENDIX I

TIDES AND WATER LEVELS

The verified tidal data applied to all multibeam echo sounder data was downloaded from the following website for Port Fourchon, LA, tide station 8762075:

http://tidesandcurrents.noaa.gov/station_retrieve.shtml?type=Historic%20Tide%20Data&state=Louisiana&id1=876

ABSTRACT OF TIMES OF HYDROGRAPHY

Project: OPR-K354-KR-10

Contractor Name: C & C Technologies, Inc.

Inclusive Dates: February 14, 2011 - December 30, 2011

Registry No.: H12250 (Sheet 8)

Date: February 2012

Sheet Number: 8

Field Work is Complete

Time (UTC)

Date	Julian Day	Start	End	Year
2/14/2011	045	2009	2400	2011
2/15/2011	046	0000	1213	2011
2/15/2011	046	1328	1713	2011
2/15/2011	046	1737	1925	2011
2/15/2011	046	2052	2400	2011
2/16/2011	047	0000	0118	2011
2/16/2011	047	0140	0520	2011
3/14/2011	073	1636	1719	2011
3/14/2011	073	1733	2031	2011
3/14/2011	073	2219	2318	2011
3/15/2011	074	0515	0833	2011
3/15/2011	074	0903	1200	2011
3/15/2011	074	1422	1426	2011
3/15/2011	074	1522	2400	2011
3/16/2011	075	0000	0738	2011
3/17/2011	076	0646	1819	2011
3/17/2011	076	1837	2117	2011
3/18/2011	077	0022	0101	2011
3/18/2011	077	0435	0639	2011
3/18/2011	077	0705	1659	2011
3/18/2011	077	1741	2353	2011
3/19/2011	078	0001	0147	2011
3/19/2011	078	0217	0357	2011
3/19/2011	078	0514	1355	2011
3/19/2011	078	1521	1814	2011
3/19/2011	078	1847	1909	2011

4/1/2011	091	0611	0729	2011
4/1/2011	091	0821	1140	2011
4/1/2011	091	1425	2006	2011
4/1/2011	091	2042	2140	2011
4/2/2011	092	0314	0344	2011
4/2/2011	092	0621	0843	2011
4/2/2011	092	0907	2318	2011
4/3/2011	093	0520	0742	2011
4/6/2011	096	0710	1127	2011
4/7/2011	097	1427	1832	2011
4/7/2011	097	1948	2250	2011
4/13/2011	103	0318	1313	2011
4/13/2011	103	1530	1843	2011
4/13/2011	103	2209	2334	2011
4/14/2011	104	0428	0512	2011
5/6/2011	126	1320	2344	2011
5/7/2011	127	0008	0434	2011
5/7/2011	127	1513	2203	2011
5/8/2011	128	0155	1002	2011
5/8/2011	128	1028	2400	2011
5/9/2011	129	0000	0244	2011
5/9/2011	129	0259	0741	2011
5/9/2011	129	0804	1005	2011
5/9/2011	129	1032	1112	2011
5/9/2011	129	1257	1340	2011
5/9/2011	129	1845	1927	2011
5/12/2011	132	1416	1627	2011
5/16/2011	136	0551	1026	2011
5/17/2011	137	1654	2400	2011
5/18/2011	138	0000	0124	2011
11/22/2011	326	0240	0523	2011
11/22/2011	326	0626	0649	2011
11/24/2011	328	0550	0622	2011
12/30/2011	364	1244	1350	2011
12/30/2011	364	1442	1450	2011
12/30/2011	364	1603	1619	2011

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

No supplemental records and correspondence

APPENDIX III SURVEY

FEATURES REPORT

No DTONs or Maritime Boundaries

H12250_AWOIS ITEMS

Registry Number: H12250

State: Louisiana

Locality: Gulf of Mexico

Sub-locality: Northwest Ship Shoal

Project Number: OPR-K354-KR-10

Survey Date: 02/14/2010 to 12/30/11

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
11356	38th	06/01/2008	1:80,000 (11356_1)	[L]NTM: ?
11340	73rd	08/01/2008	1:458,596 (11340_1)	[L]NTM: ?
1116A	73rd	08/01/2008	1:458,596 (1116A_1)	[L]NTM: ?
411	52nd	09/01/2007	1:2,160,000 (411_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	AWOIS 8467: JO ANN	AWOIS	[no data]	[no data]	[no data]	---

1.1) AWOIS #8467 - AWOIS 8467: JO ANN

No Primary Survey Feature for this AWOIS Item

Search Position: 28° 57' 00.8" N, 091° 04' 00.3" W
Historical Depth: [None]
Search Radius: 1000
Search Technique: S2, MB, SD
Technique Notes: [None]

History Notes:

HISTORY

NM6/58-- TUG JO ANN, STEEL HULL, 52 FEET LONG, REPORTED SUNK IN 1
APPROX. POS. LAT. 28-57N, LONG. 91-04W. SUNK IN APPROX. 26 FEET. 1
(ENT 4/7/93, SJV)

Survey Summary

Charts Affected: 11356_1, 1116A_1, 11340_1, 411_1

Remarks:

HISTORY

NM6/58-- TUG JO ANN, STEEL HULL, 52 FEET LONG, REPORTED SUNK IN 1
APPROX. POS. LAT. 28-57N, LONG. 91-04W. SUNK IN APPROX. 26 FEET. 1
(ENT 4/7/93, SJV)

Feature Correlation

Source	Feature	Range	Azimuth	Status
AWOIS_EXPORT	AWOIS # 8467	0.00	000.0	Primary

Hydrographer Recommendations

Not observed during survey operations, either visually or within survey data; AWOIS 8467.

Remove from chart 11356

S-57 Data

[None]

Office Notes

SAR: No evidence of wreck in AWOIS 8467 radius.

COMPILATION: Concur. No indication of wreck during present survey operations. Delete charted dangerous sunken wreck, PA.

APPROVAL PAGE

H12250

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

- H12250_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12250_GeoImage.pdf

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

Approved: _____
LT Abigail Higgins
Chief, Atlantic Hydrographic Branch