H13649

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13649

LOCALITY

State(s):	Louisiana
General Locality:	Approaches to Calcasieu
Sub-locality:	6 NM SW of Lower Mud Lake

2022

CHIEF OF PARTY
Jonathan L. Dasler, PE, PLS, CH

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Date:

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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H13649

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

State(s):	**Louisiana**
General Locality:	**Approaches to Calcasieu**
Sub-Locality:	**6 NM SW of Lower Mud Lake**
Scale:	**20000**
Dates of Survey:	**08/26/2022 to 12/04/2022**
Instructions Dated:	**08/11/2022**
Project Number:	**OPR-K356-KR-22**
Field Unit:	**David Evans and Associates, Inc.**
Chief of Party:	**Jonathan L. Dasler, PE, PLS, CH**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter Side Scan Sonar**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/. Products created during office processing were generated in NAD83 UTM 15N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

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Descriptive Report to Accompany Survey H13649

Project: OPR-K356-KR-22

Locality: Approaches to Calcasieu

Sublocality: 6 NM SW of Lower Mud Lake

Scale: 1:20000

August 2022 - December 2022

David Evans and Associates, Inc.

Chief of Party: Jonathan L. Dasler, PE, PLS, CH

A. Area Surveyed

David Evans and Associates, Inc. (DEA) conducted a hydrographic survey of the assigned area in the vicinity of Calcasieu Pass and Cameron, LA. Survey H13649 was conducted in accordance with the Statement of Work and Hydrographic Survey Project Instructions dated August 11, 2022.

The Hydrographic Survey Project Instructions reference the National Ocean Service (NOS) Hydrographic Survey Specifications and Deliverables Manual (HSSD) (March 2022) as the technical requirements for this project.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
29° 44' 8.72" N 93° 18' 48.93" W	29° 35' 44.31" N 93° 0' 58.65" W

Table 1: Survey Limits

Survey limits were surveyed in accordance with the requirements in the Project Instructions and the HSSD. The assigned survey areas are outlined in Figure 1.

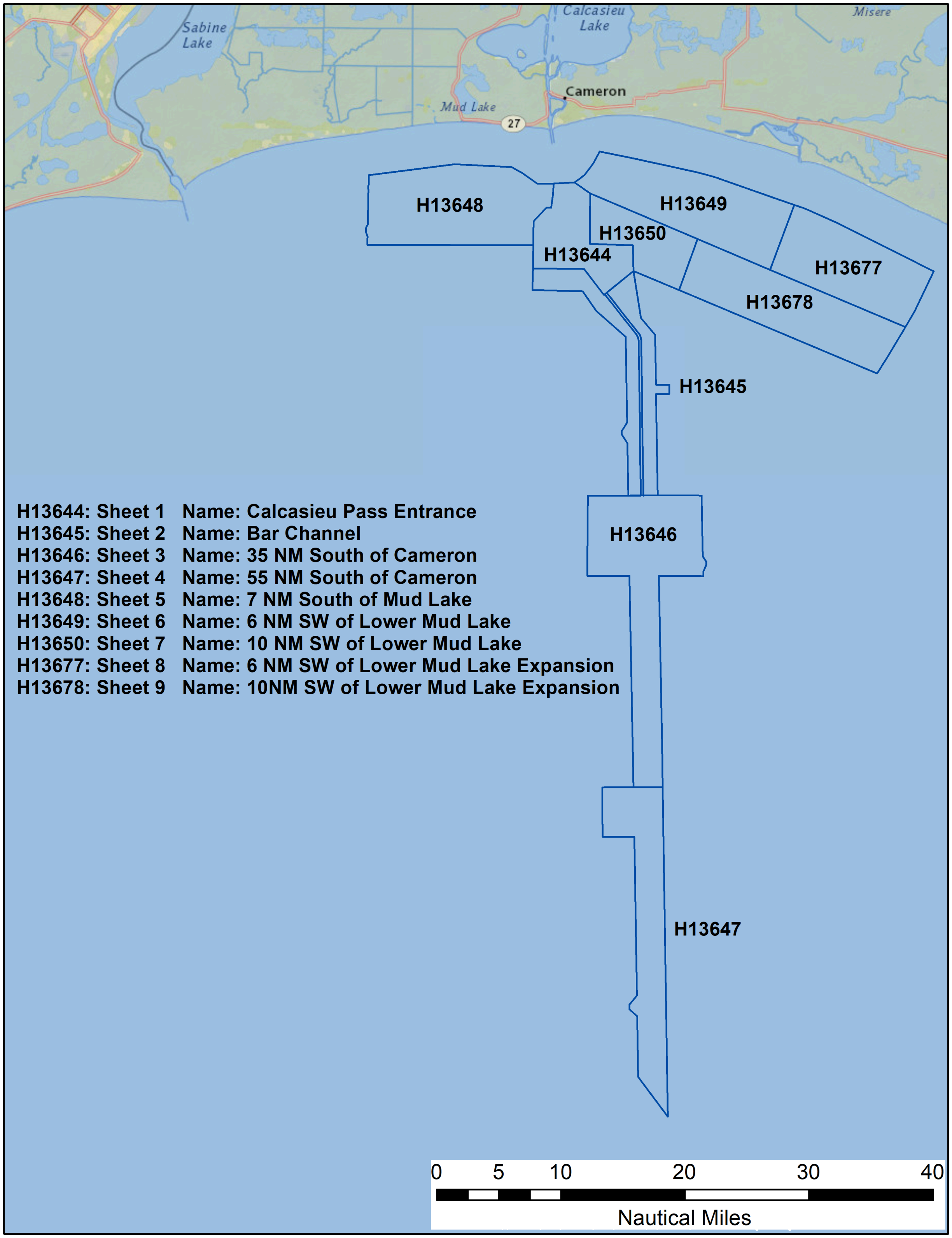


Figure 1: OPR-K356-KR-22 Assigned Survey Areas

A.2 Survey Purpose

The purpose of this survey, defined in the Project Instructions, is as follows: "Since 2020, the Louisiana Coast has been hit by six hurricanes and two named tropical storms, several of which caused serious damage to the Port of Lake Charles. The Port of Lake Charles is ranked in the top 15 US ports based on annual cargo Tonnage. This cargo includes petroleum products, rice, flour, other food products, as well as a variety of bulk cargoes utilized in manufacturing (1). The proposed survey area was identified in NOAA's Hydrographic Health Model as an area of significant need, and correspondence with the Lake Charles Pilot's Association revealed a critical need for updated hydrographic data and charting products in the approaches and anchorages to the Port of Lake Charles.

In addition to undiscovered hazards to navigation from hurricanes that still may exist in the survey area, new LNG terminals are proposed for the Port of Lake Charles which will benefit from updated charts of the channels and surrounding waters.

This survey will provide contemporary data to update National Ocean Service (NOS) nautical charting products and services, improving the safety of maritime traffic and services available to the Port of Lake Charles by reducing the current risk that is present due to outdated bathymetry. Survey data from this project is intended to supersede all prior survey data in the common area."

(1) https://www.bts.gov/content/tonnage-top-50-us-water-ports-ranked-total-tons

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Acquire backscatter data during all multibeam data acquisition (refer to HSSD Section 6.2).
All waters in survey area	Complete Coverage (refer to HSSD Section 5.2.2.3).

Table 2: Survey Coverage

Complete Coverage using 100% side scan sonar (SSS) coverage was collected concurrently with multibeam echosounder (MBES) data over the entire survey area. Backscatter was logged during all multibeam acquisition. This coverage type follows Option B of the Complete Coverage requirement specified in Section 5.2.2.3 of the 2022 HSSD. In all cases, the inshore limit of hydrography was the Navigable Area Limit

Line (NALL) as defined in Section 1.3.2 of the HSSD; however, for this survey, the inshore limit was not encountered and the full extent of the assigned boundary was met.

Survey coverage for feature disprovals followed disproval radii as depicted in the Project Reference File (PRF).

Figure 2 shows the H13649 survey outline in relation to the assigned survey area.

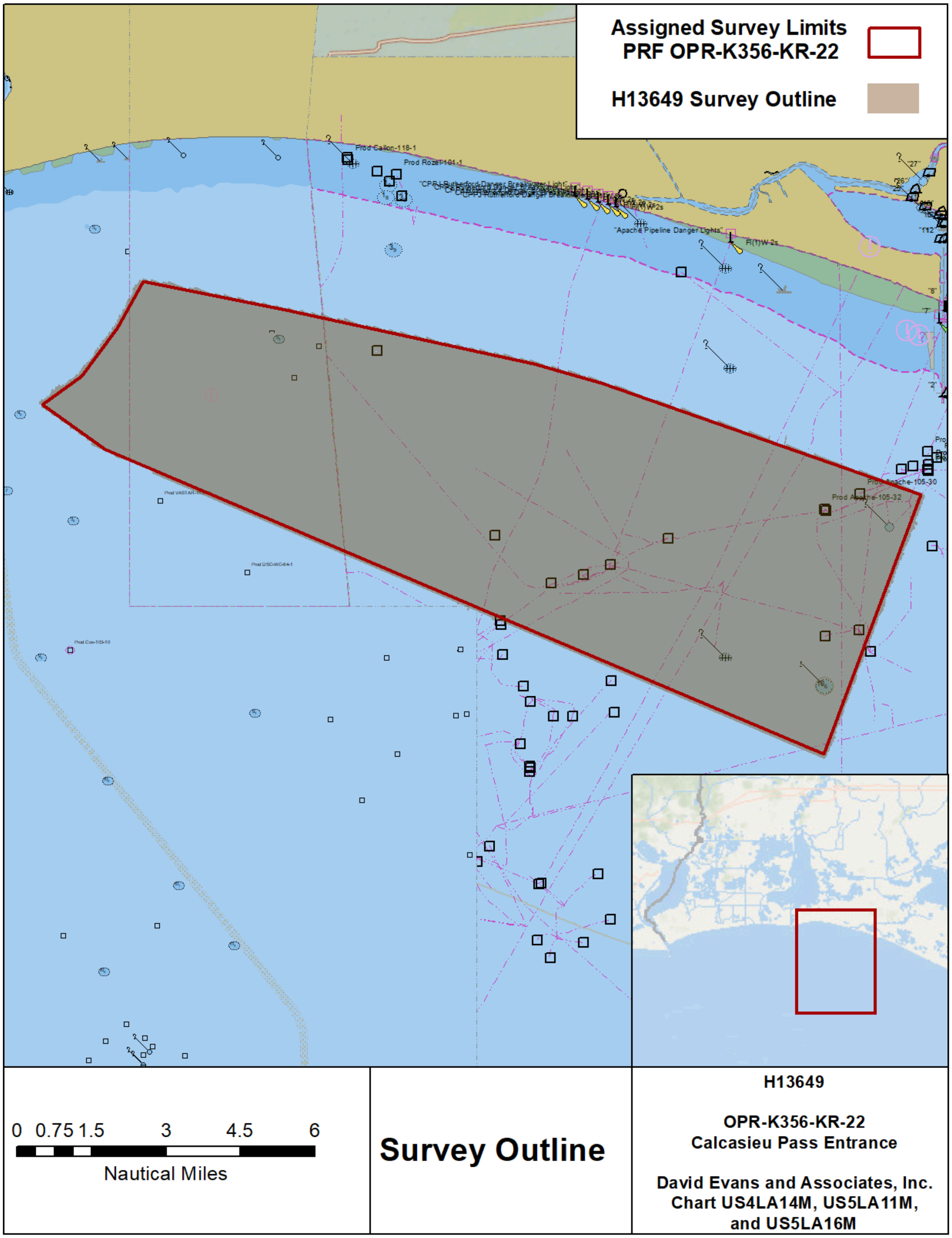


Figure 2: H13649 Survey Outline

A.6 Survey Statistics

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

	HULL ID	*S/V Blake*	*Total*
LNM	**SBES Mainscheme**	0.0	0.0
	MBES Mainscheme	67.34	67.34
	Lidar Mainscheme	0.0	0.0
	SSS Mainscheme	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0
	MBES/SSS Mainscheme	1450.4	1450.4
	SBES/MBES Crosslines	74.2	74.2
	Lidar Crosslines	0.0	0.0
Number of Bottom Samples			4
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			61.15

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/26/2022	238
09/10/2022	253
09/11/2022	254
09/14/2022	257
09/15/2022	258
09/16/2022	259
09/17/2022	260
09/18/2022	261
09/19/2022	262
09/20/2022	263
09/21/2022	264
09/22/2022	265
09/23/2022	266
09/24/2022	267
09/25/2022	268
10/13/2022	286
11/07/2022	311
12/04/2022	338

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

The OPR-K356-KR-22 Data Acquisition and Processing Report (DAPR), submitted with survey H13644, details equipment and vessel information as well as data acquisition and processing procedures. There were no vessel or equipment configurations used during data acquisition that deviated from those described in the DAPR.

The S/V Blake is an 82-foot aluminum catamaran with a 27-foot beam and a draft of 4.5 feet (Figure 3).

B.1.1 Vessels

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

Hull ID	***S/V Blake***
LOA	82.0 feet
Draft	4.5 feet

Table 5: Vessels Used

Figure 3: S/V Blake

B.1.2 Equipment

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

Manufacturer	Model	Type
Teledyne RESON	SeaBat T50-R	MBES
EdgeTech	4205	SSS
EdgeTech	4200	SSS
Applanix	POS MV 320 v5	Positioning and Attitude System
AML Oceanographic	MicroX SV	Sound Speed System
AML Oceanographic	MVP30-350	Sound Speed System
AML Oceanographic	SmartX	Sound Speed System

Table 6: Major Systems Used

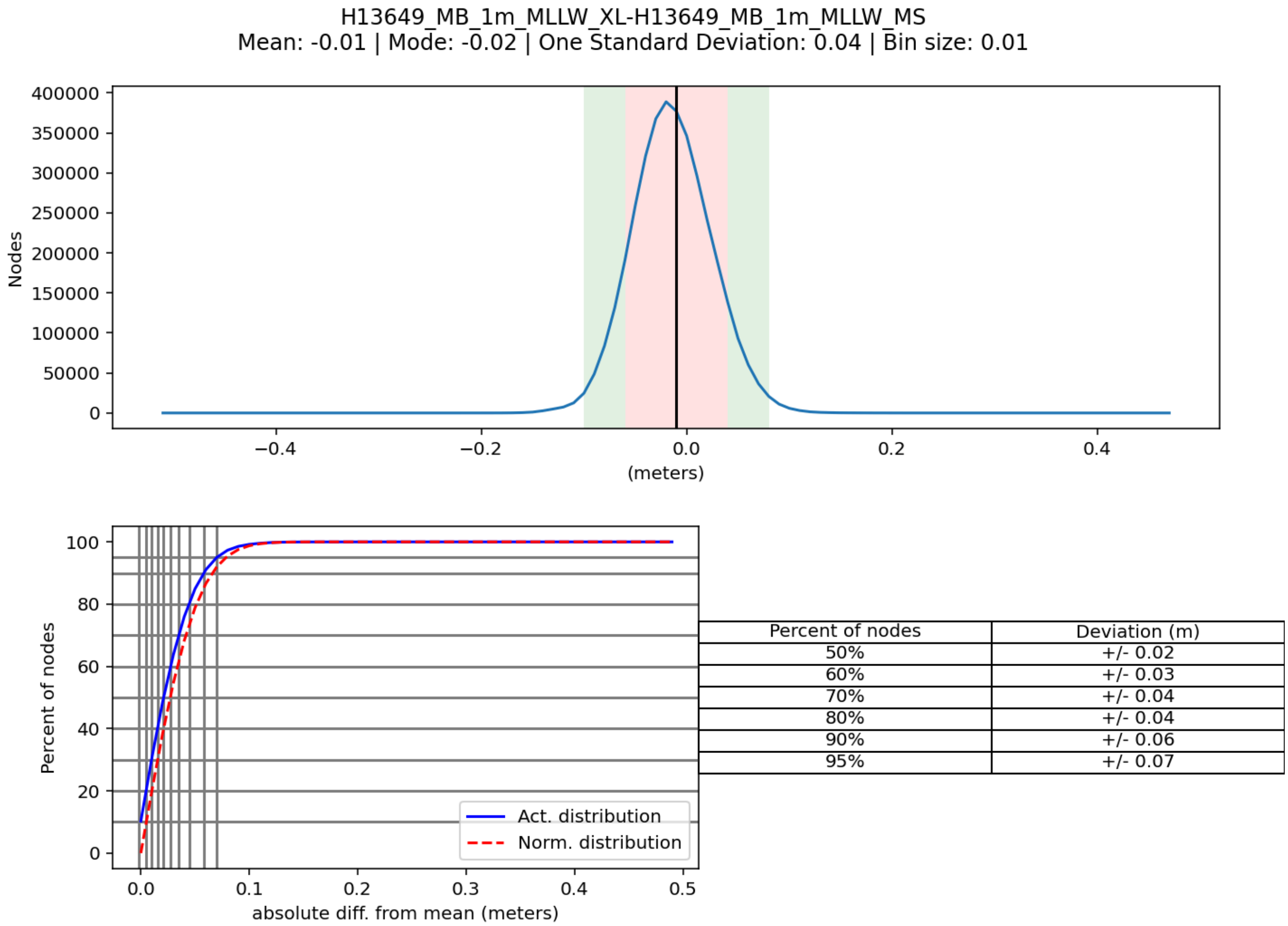
B.2 Quality Control

B.2.1 Crosslines

Multibeam crosslines were run across 4.89% of the entire survey area to provide a varied spatial and temporal distribution for analysis of internal consistency within the survey data.

Crossline analysis was performed using the CARIS Hydrographic Information Processing System (HIPS) Quality Control (QC) Report tool, which compares crossline data to a gridded surface and reports results by beam number. Crosslines were compared to a 1-meter Combined Uncertainty and Bathymetry Estimator (CUBE) surface encompassing mainscheme, fill, and investigation data for the entire survey area.

DEA performed an additional crossline analysis using the NOAA Pydro Compare Grids tool to analyze the differences between gridded mainscheme depths and gridded crossline depths. Input grids were 1-meter resolution CUBE surfaces of mainscheme and crossline depths. Results from the crossline-to-mainscheme difference analysis are depicted in Figure 4, with units represented in meters.



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.03
70%	+/- 0.04
80%	+/- 0.04
90%	+/- 0.06
95%	+/- 0.07

Figure 4: H13649 Crossline Difference

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.05 meters	0.12 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S/V Blake	n/a meters/second	1.0 meters/second	n/a meters/second	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Additional discussion of these parameters is included in the DAPR. The S/V Blake used an AML MVP30-350 with integrated Micro SVP&T to acquire sound speed measurements. The measurement uncertainty for these sensors is listed in the Moving Vessel Profiler (MVP) column in Table 8.

During surface finalization in HIPS, the "Uncertainty" option was selected, where uncertainty values from the source surface are applied to the finalized surface uncertainty. This method, which incorporates grid uncertainties computed during the TPU process, was deemed to better reflect actual grid uncertainty when compared to the option to use standard deviation values scaled to 95% confidence interval.

To determine if the surface grid nodes met the International Hydrographic Organization (IHO) Order 1a specification, a ratio of the final node uncertainty to the allowable uncertainty at that depth was established. As a percentage, this value represents the amount of error budget utilized by the Total Vertical Uncertainty (TVU) at each node. Values greater than 100% indicate nodes exceeding the allowable IHO uncertainty. The resulting calculated TVU values of all nodes in the submitted finalized surface are shown in Figure 5.

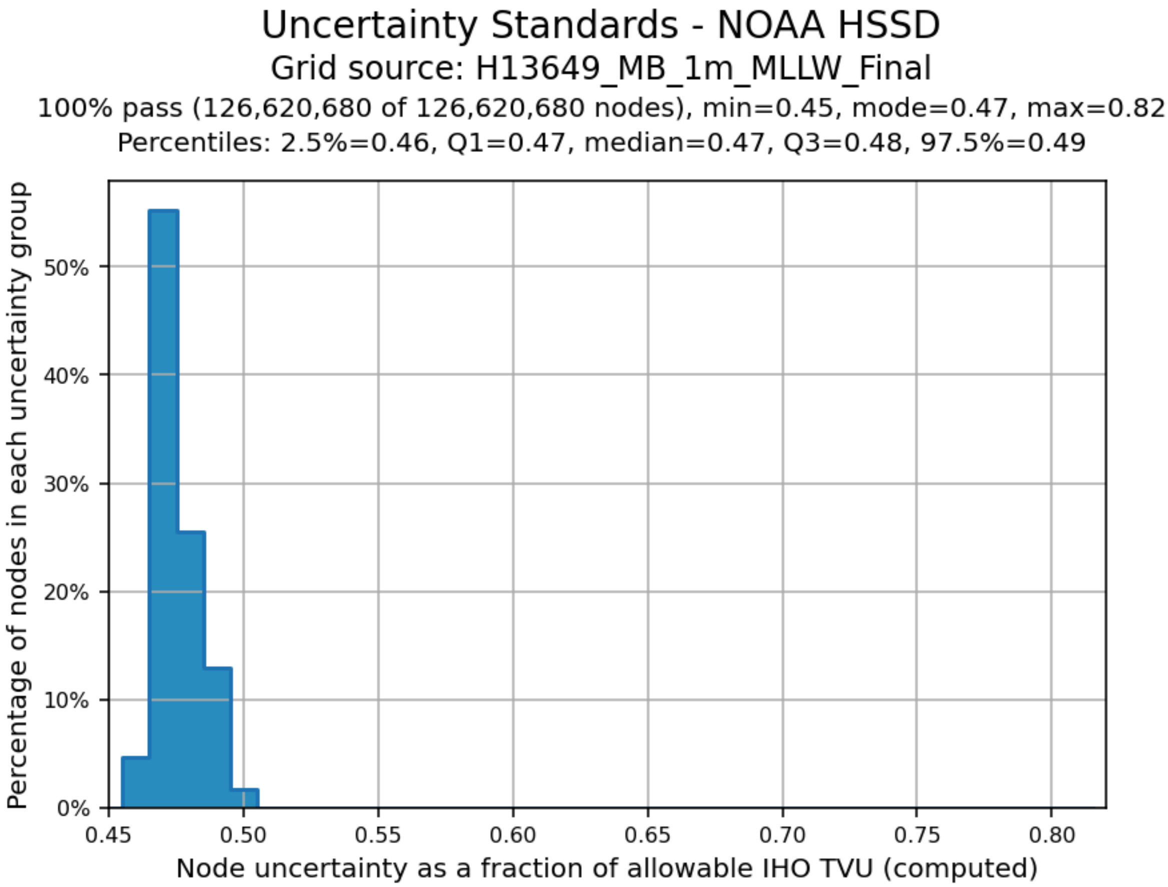


Figure 5: Node TVU Statistics - 1 meter, Finalized

B.2.3 Junctions

Survey H13649 junctions with current surveys H13644, H13650, H13677, and H13678, and prior surveys H11830 and H11831. Figure 6 depicts H13649 and the junctioning surveys.

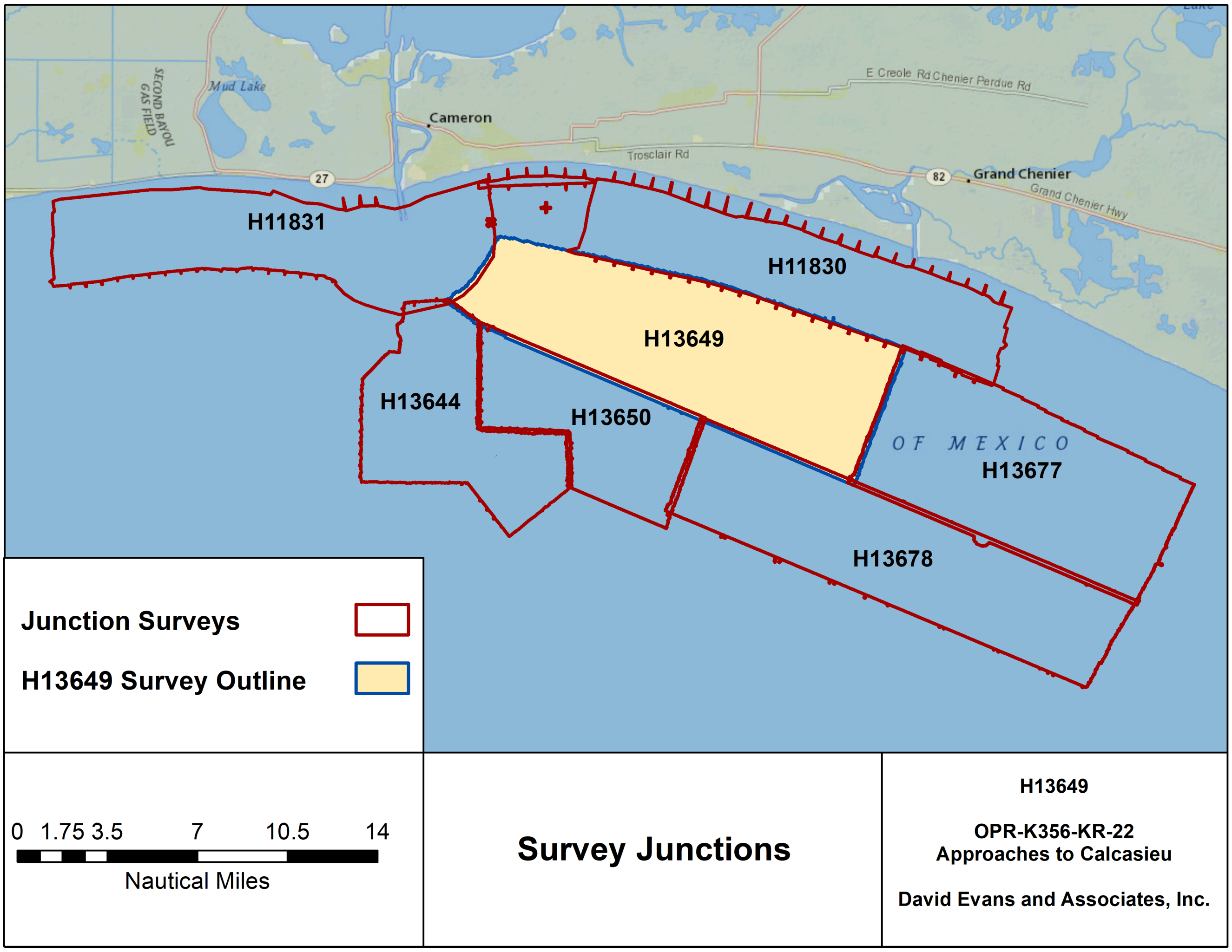


Figure 6: Survey Junctions with Registry Number H13649

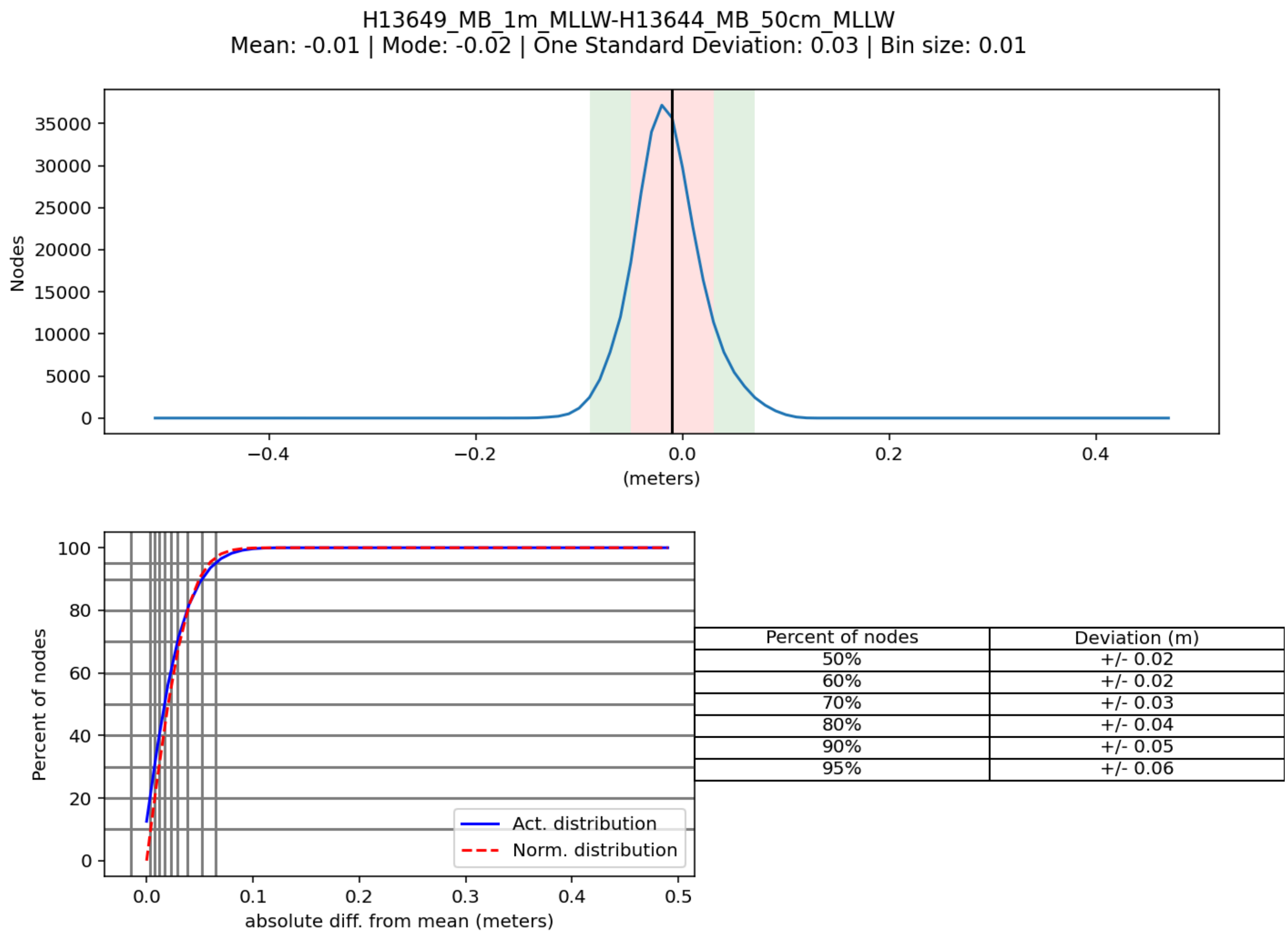
The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13644	1:10000	2022	David Evans and Associates, Inc.	SW
H13650	1:20000	2022	David Evans and Associates, Inc.	S
H13677	1:20000	2022	David Evans and Associates, Inc.	E
H13678	1:20000	2022	David Evans and Associates, Inc.	SE
H11830	1:10000	2008	C&C Technologies	N
H11831	1:10000	2008	C&C Technologies	NW

Table 9: Junctioning Surveys

<u>H13644</u>

The mean difference between H13649 and H13644 is 1 centimeter, shown in Figure 7.



Percent of nodes	Deviation (m)
50%	+/- 0.02
60%	+/- 0.02
70%	+/- 0.03
80%	+/- 0.04
90%	+/- 0.05
95%	+/- 0.06

Figure 7: Distribution Summary Plot of Survey H13649 1-meter vs. H13644 50-centimeter

<u>H13650</u>

At the time of writing, data from survey H13650 was still being processed. The Descriptive Report (DR) for H13650 will include the junction analysis with H13649.

H13677

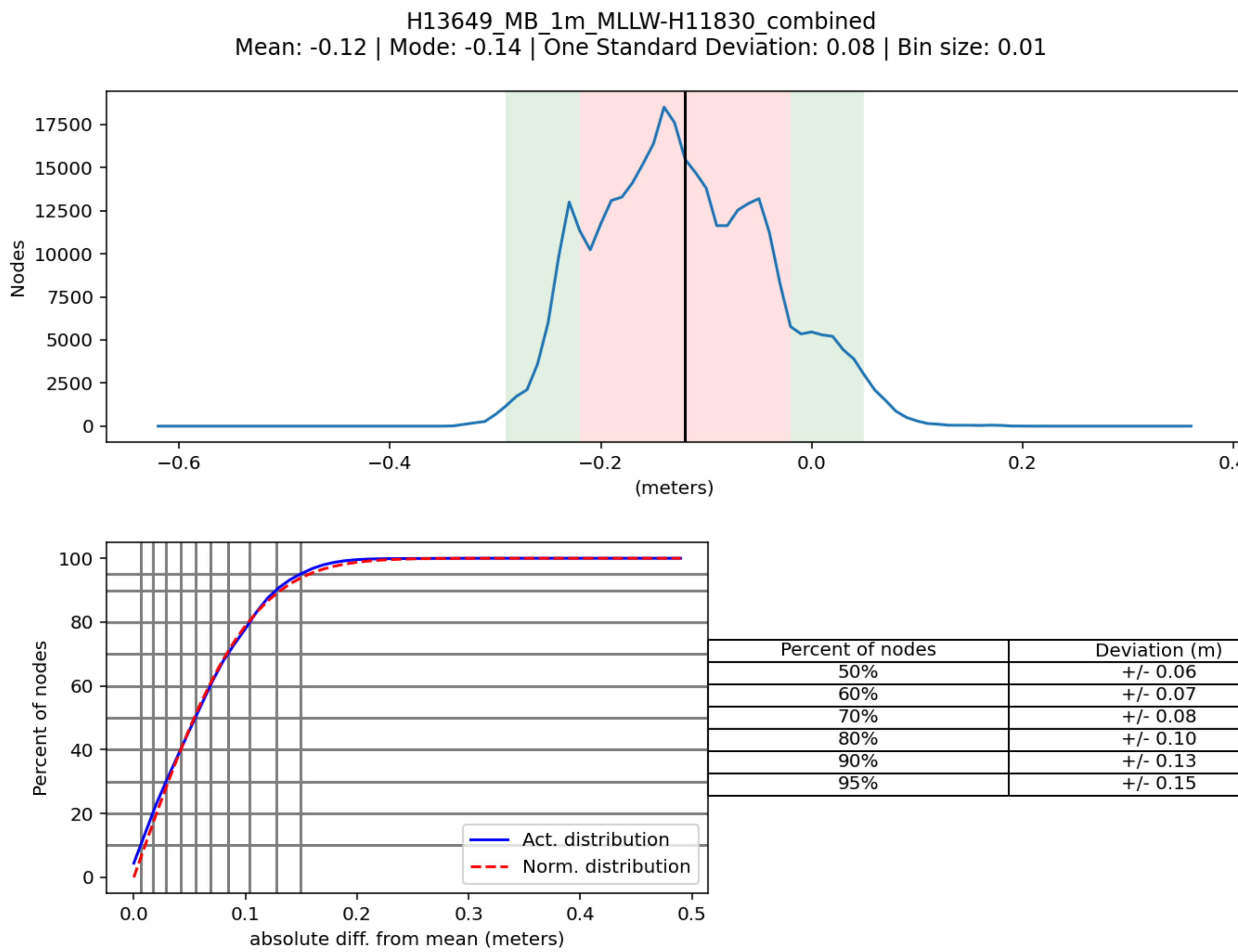
At the time of writing, data from survey H13677 was still being processed. The DR for H13677 will include the junction analysis with H13649.

H13678

At the time of writing, data from survey H13678 was still being processed. The DR for H13678 will include the junction analysis with H13649.

H11830

The mean difference between H13649 and H11830 is 12 centimeters (H13649 deeper than H11830), shown in Figure 8. Differences are likely caused by a combination of factors including natural bottom change since the prior survey was conducted 14 years ago, and differences in tide correction methods for these surveys. Prior survey H11830 was reduced to MLLW using a tide zoning scheme relying on water levels from the NOAA National Water Level Observation Network (NWLON) station at Calcasieu Pass, LA (8768094). Survey H13649 used GPS Tides computed from post-processed navigation using Real Time Extended (RTX) methods and a VDatum-based separation model.

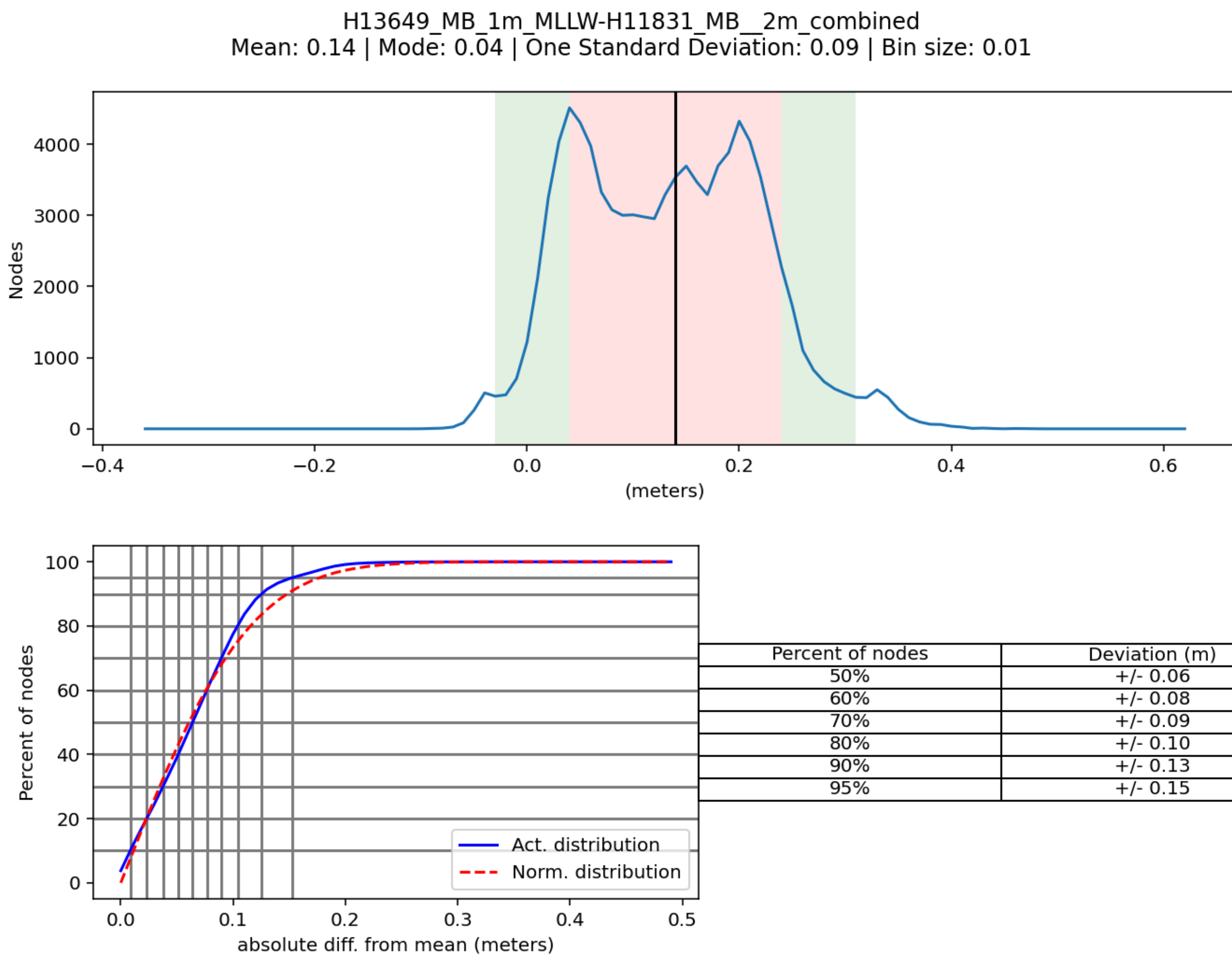


Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.07
70%	+/- 0.08
80%	+/- 0.10
90%	+/- 0.13
95%	+/- 0.15

Figure 8: Distribution Summary Plot of Survey H13649 1-meter vs. H11830 4-meter

<u>H11831</u>

The mean difference between H13649 and H11831 is 14 centimeters (H13649 shoaler than H11831), shown in Figure 9. Differences are likely caused by a combination of factors including natural bottom change since the prior survey was conducted 14 years ago, and differences in tide correction methods for these surveys. Prior survey H11831 was reduced to MLLW using a tide zoning scheme relying on water levels from the NOAA NWLON station at Calcasieu Pass, LA (8768094). Survey H13649 used GPS Tides computed from post-processed navigation using RTX methods and a VDatum-based separation model.



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.08
70%	+/- 0.09
80%	+/- 0.10
90%	+/- 0.13
95%	+/- 0.15

Figure 9: Distribution Summary Plot of Survey H13649 1-meter vs. H11831 2-meter

B.2.4 Sonar QC Checks

Quality control is discussed in detail in Section B of the DAPR.

Multibeam data were reviewed at multiple levels of data processing, including CARIS HIPS conversion, subset editing, and analysis of anomalies revealed in CUBE surfaces.

Side scan data were reviewed at multiple levels of data processing, including during the initial SonarWiz import and preliminary stages of bottom-tracking, navigation review, and contact identification. Data were also reviewed during the final stages of mosaic generation, data coverage and quality assessment, and contact correlation and attribution.

B.2.5 Equipment Effectiveness

Sea Grass on MVP Towfish

During H13649 survey operations, floating sea grass would frequently catch on the MVP towfish causing the fish to fly slightly lower in the water column and affect sensor readings. The additional weight of the sea grass also caused stress to the cable, leading to re-terminations of the towfish and impacting efficiency of survey due to downtime for equipment repairs. The towfish would be brought onboard and cleared of sea grass while underway. Any sound speed casts that were unable to complete a full measurement of the water column, or were otherwise affected, were rejected. This issue did not impact the accuracy or quality of the sounding data.

Side Scan Time Jump Errors

At the start of side scan survey operations in H13649 the field crew observed a number of “time jump” errors when importing HYPACK HSX files into Chesapeake Technology's SonarWiz software for processing. After troubleshooting this issue with software developers, it was determined that HYPACK’s method of deriving ping times from side scan data recorded through a network connection with Edgetech's Discover software occasionally resulted in mis-ordered time stamps written to the HSX file. In these cases, an initial ping appeared to have occurred after the subsequent ping. The magnitude of these backwards time jumps was extremely small (on the order of milliseconds), and in all cases there was no apparent effect on the processed side scan data or resulting mosaic, and did not impact the processor’s ability to discern contacts or evaluate coverage.

DEA worked with HYPACK to resolve this issue, and HYPACK released a series of updates to their side scan survey package. The final update, implemented on this survey on September 23, 2022 (DN266), resolved the backwards time jump issue for the remainder of the project. Reviewers importing side scan data using SonarWiz or other software should be aware of these inconsequential error messages on HSX files logged prior to DN266.

Note, these “time jumps” differ from “time gaps”, which were also observed in a few instances throughout the project for unknown reasons. However, SonarWiz import settings were configured to identify time gaps exceeding one second. The few existing gaps were re-surveyed with quality data.

B.2.6 Factors Affecting Soundings

Bottom changes during survey operations

The removal of a jack-up rig that was located along the southern edge of the survey area caused misalignments between multibeam soundings acquired when the rig was in place (September 9, 2022) and data collected after its removal (November 7, 2022). Removal operations disturbed the bottom at the site of the jack-up rig as well as the surrounding area. In most areas of disagreement, the hydrographer allowed the CUBE algorithm to estimate a gridded depth without manually cleaning the misaligned sounding data. In some areas, where newer post-removal data were up to 50 centimeters shoaler than previously acquired data, older sounding data were manually rejected to allow the CUBE surface to properly depict the shoaler depths.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Approximately 20-minute intervals

For H13649 survey operations, casts were distributed both temporally and spatially based on observed changes in sound speed profiles. Sound speed readings were applied in CARIS HIPS using the "nearest in distance within time" option with a two-hour interval.

All sound speed profiles were acquired within 500 meters of the survey limits.

During H13649 survey operations, the S/V Blake acquired the first cast of the day after starting multibeam data acquisition on September 18, 2022 (DN261). The first cast was acquired within nine minutes of the first ping of the day.

B.2.8 Coverage Equipment and Methods

Survey speeds were maintained to meet or exceed along-track sounding density requirements and side scan sonar ensonification requirements.

Multibeam data and side scan mosaics were thoroughly reviewed for holidays and areas of poor-quality coverage due to biomass, vessel wakes, or other factors. Significant side scan sonar contacts were developed with multibeam sonar to obtain a least depth, meeting the survey’s coverage requirements. Survey coverage for feature disprovals was acquired inside disproval radii to meet the coverage requirement for the area. Additional discussion of coverage methods can be found in the DAPR.

B.2.9 Density

The sounding density requirement of 95% of all nodes, populated with at least five soundings per node, was verified by analyzing the density layer of the finalized surface. Surface results are stated in Figure 10.

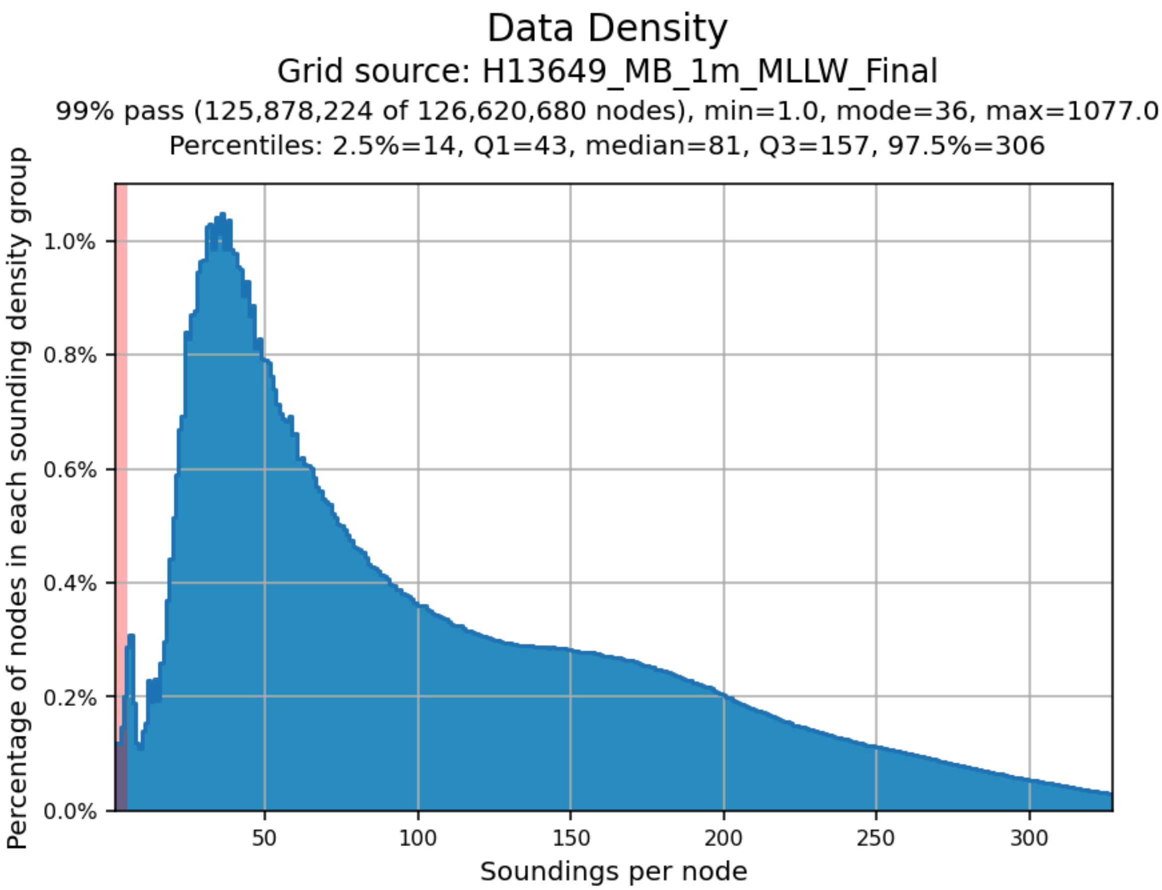


Figure 10: Node Density Statistics - 1 meter, Finalized

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

Data reduction procedures for survey H13649 are detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Multibeam time series backscatter data (RESON 7058 normalized backscatter datagram) were logged in HYPACK 7K format and are included with the H13649 raw digital deliverables. Backscatter data were referenced to processed multibeam bathymetric data and processed in QPS FMGT. A 2-meter backscatter mosaic is included with the H13649 processed deliverables. For data management purposes, the names of multibeam crosslines have been appended with the suffix _XL. This change was made to HIPS files only. The original file names of raw data files (HYPACK HSX and 7K) have been retained. A GSF export containing the final bathymetry and backscatter with edits retains the original file names of the raw data files but with the postfix "_merged."

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
CARIS	HIPS/SIPS	11.4.13, GSF export only: 11.4.16 beta

Table 10: Primary bathymetric data processing software

The following software program was the primary program used for imagery data processing:

Manufacturer	Name	Version
QPS	FMGT	7.10.1
Chesapeake Technology, Inc.	SonarWiz	7.09.05 Beta B (64-bit)

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2022.

A detailed listing of all data processing software is included in the OPR-K356-KR-22 DAPR.

B.5.2 Surfaces

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

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13649_MB_1m_MLLW.csar	CARIS Raster Surface (CUBE)	1 meters	6.175 meters - 14.999 meters	NOAA_1m	Complete MBES
H13649_MB_1m_MLLW_Final.csar	Finalized CARIS Raster Surface (CUBE)	1 meters	5.336 meters - 14.999 meters	NOAA_1m	Complete MBES
H13649_MBAB_2m_BL_350kHz_1of1	MB Backscatter Mosaic	2 meters	0.0 meters - 0.0 meters	N/A	Complete MBES
H13649_SSSAB_1m_540kHz_1of1	SSS Mosaic	1 meters	0.0 meters - 0.0 meters	N/A	100% SSS

Table 12: Submitted Surfaces

Bathymetric grids were created relative to Mean Lower Low Water (MLLW) in CUBE format using Complete Coverage resolution requirements as specified in the HSSD. Grid resolution for the backscatter mosaic was determined by the HSSD frequency-dependent resolution requirement.

A coverage holiday in the side scan mosaic is present in the north west area of the sheet under a platform where it was not safe to navigate.

Due to safety concerns, the side scan range scale was extended to 100 meters during acquisition around a series of uncharted jack-up rigs located in the southwest corner of the survey area. The side scan contact file includes contacts on the jack-up rigs; however they are not included in the FFF. Further discussion of these uncharted jack-up rigs is included in Section D.1.5.

C. Vertical and Horizontal Control

A summary of the horizontal and vertical control for survey H13649 follows.

C.1 Vertical Control

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

ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR-K356_KR-22_VDatum +_NAD83(2011)-MLLW_Geoid09.csar

Table 13: ERS method and SEP file

C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983 (2011).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 15.

The following PPK methods were used for horizontal control:

- RTX

The separation model listed in Table 13 was provided with the Project Instructions and used for sounding correction within the assigned survey area. Real-time navigation for all MBES survey lines were overwritten with post-processed navigation solutions in SBET format. Additional discussion on post-processing methods and survey control is included in the DAPR.

D. Results and Recommendations

D.1 Chart Comparison

The chart comparison was performed by comparing H13649 survey depths to a digital surface generated from Band 4 and Band 5 electronic navigational charts (ENCs) covering the survey area. A 60-meter product surface was generated from a triangular irregular network (TIN) created from the ENC's soundings, depth contours, and depth features. An additional 60-meter HIPS product surface was generated from the 1-meter CUBE surface. The chart comparison was conducted by creating and reviewing a difference surface using the ENC surface and survey surface as inputs. The chart comparison also included a review of all assigned charted features within the survey area. The results of the comparison are detailed below.

The relevant charts used during the comparison were reviewed to check that all United States Coast Guard (USCG) Local Notice to Mariners issued during survey acquisition, and impacting the survey area, were applied and addressed by this survey.

The ENCs used in the chart comparison are listed in Table 14. Figures 11 through 13 show the magnitude of differences along the comparison area.

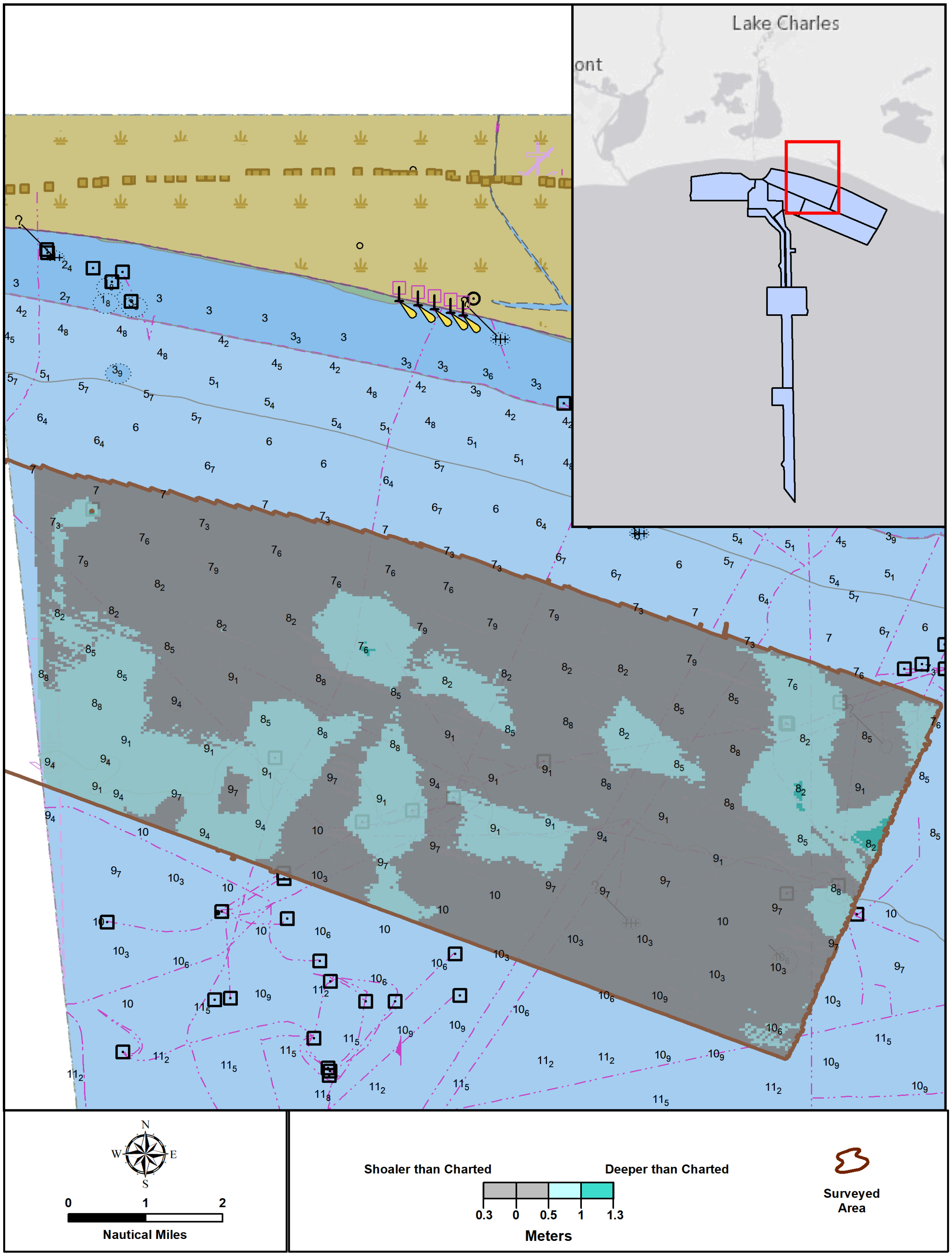


Figure 11: Depth Difference Between H13649 and US4LA14M

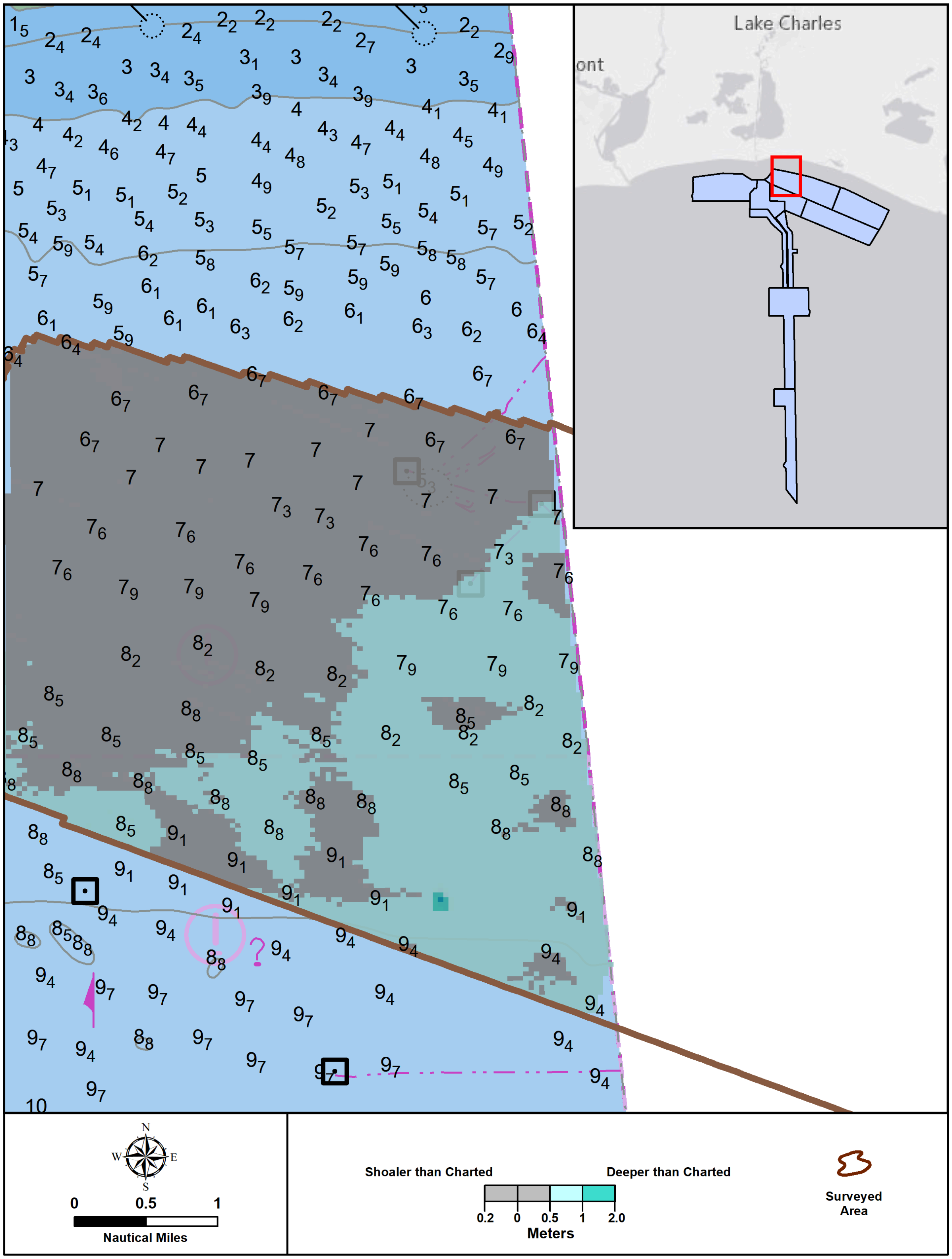


Figure 12: Depth Difference Between H13649 and US5LA11M

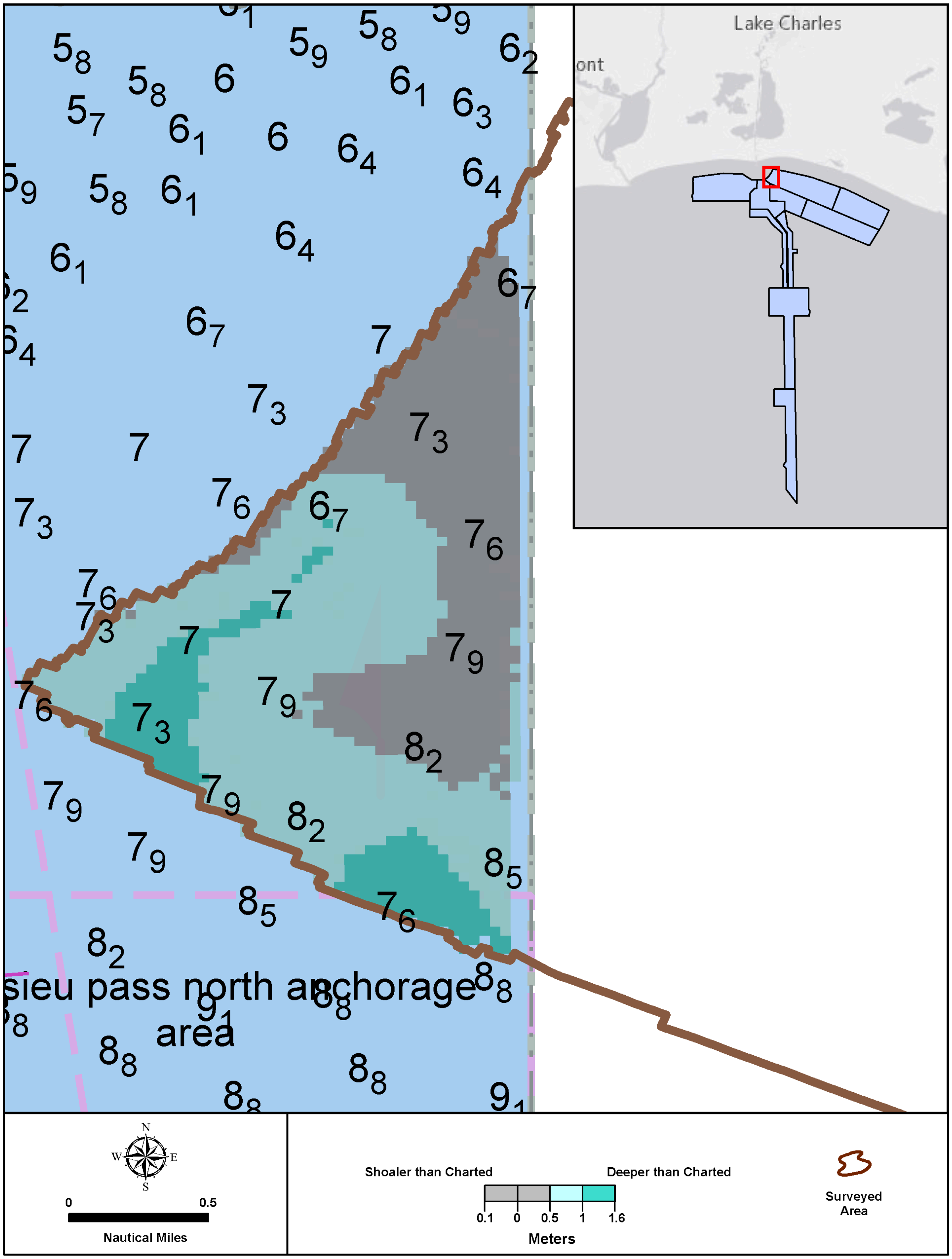


Figure 13: Depth Difference Between H13649 and US5LA16M

D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date
US4LA14M	1:80000	32	01/10/2022	12/08/2022
US5LA11M	1:50000	45	05/09/2022	10/12/2022
US5LA16M	1:50000	20	08/29/2022	08/29/2022

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

Two Danger to Navigation (DtoN) reports were submitted for this survey

- H13649 DtoN 01, submitted September 20, 2022, reported an uncharted platform within the survey area. This DtoN has been added to the ENCs using preliminary survey data.
- H13649 DtoN 02, submitted October 7, 2022, reported an uncharted obstruction within the survey area. This DtoN has been added to the ENCs using preliminary survey data.

The hydrographer recommends updating the charts to depict the DtoNs as portrayed in the Final Feature File (FFF).

D.1.3 Charted Features

All assigned features included in the project Composite Source File (CSF) have been addressed by the survey and are included in the FFF.

All disproved features have been included in the FFF with a description of "Delete." All new features have been included in the FFF with the surveyed feature depicted and a description of "New."

Contact heights included in the side scan contact .000 file have been sourced from the shadow height measurement obtained from SonarWiz. Due to the limitations in computing accurate heights from side scan shadow lengths, contact heights may not match heights from correlating contacts or feature heights measured from multibeam data included in the FFF. The height field for contacts created on baring features observed in side scan data has been intentionally left blank.

D.1.4 Uncharted Features

All uncharted features are portrayed in the FFF as surveyed and attributed with the description of "New." Refer to the FFF for additional information.

A cluster of six uncharted jack-up rigs, five of which were unlit, were discovered in the Calcasieu Pass North Anchorage Area along the border between the H13649 and H13650 survey areas. These jack-up rigs were reported to the NOAA project manager, the NOAA navigation manager, and the USCG. Related correspondence is included in Appendix 2.

D.1.5 Channels

No channels exist within the survey limits.

D.2 Additional Results

D.2.1 Aids to Navigation

No Aids to navigation (ATONs) exist for this survey.

D.2.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.2.3 Bottom Samples

Four bottom samples were acquired on December 4, 2022. The bottom sampling plan followed suggested sample locations included in the PRF.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

Assigned submerged pipelines that are within the survey area are included in the FFF. In total, 36 sections of exposed pipeline were reported to the Bureau of Safety and Environmental Enforcement (BSEE) on January 13, 2023 and February 14, 2023. Correspondence related to this reporting is included in Appendix II.

D.2.6 Platforms

Charted platforms whose position was more than 40 meters (2mm at survey scale) from the surveyed position of the platform are included in the FFF with the description of “Delete”. The surveyed positions of these platforms are included in the FFF with the description of “New”. This process was approved by Hydrographic Surveys Division (HSD) and Atlantic Hydrographic Branch (AHB) staff. Correspondence related to this process is included in Appendix II.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor or Environmental Conditions

No abnormal seafloor or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

No construction or dredging activities were observed. A jack-up rig was temporarily located within the survey area during survey operations. This rig (Paragon MSS3) was placed in the area after it began to sink during transport. The rig was repaired, refloated, and removed from the survey area in early November 2022. Placement and removal of the rig disturbed the bottom resulting in misalignments between multibeam data collected when the rig was in place and after it was removed. Impacts to data are discussed in Section B.2.6.

D.2.10 New Survey Recommendations

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

D.2.11 ENC Scale Recommendations

No new ENC scales are recommended for this area.

E. Approval Sheet

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

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

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

Report Name	Report Date Sent
Data Acquisition and Processing Report	2022-11-18

Approver Name	Approver Title	Approval Date	Signature
Jonathan L. Dasler, PE, PLS, CH	NSPS-THSOA Certified Hydrographer, Chief of Party	03/16/2023	Digitally signed by Jonathan L. Dasler, PE, PLS, CH Date: 2023.03.16 11:58:15 -07'00'
Jason Creech, CH	NSPS-THSOA Certified Hydrographer, Charting Manager / Project Manager	03/16/2023	Digitally signed by Jason Creech, CH Date: 2023.03.16 11:59:24 -07'00'
James Guilford	IHO Cat-A Hydrographer, Lead Hydrographer	03/16/2023	Digitally signed by James Guilford Date: 2023.03.16 12:00:32 -07'00'
Jason Dorfman	Lead Hydrographer	03/16/2023	Digitally signed by Jason Dorfman Date: 2023.03.16 12:01:38 -07'00'
Sam Werner	Data Processing Manager	03/16/2023	Digitally signed by Sam Werner Date: 2023.03.16 12:02:32 -07'00'

F. Table of Acronyms

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

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

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
RTX	Real Time Extended
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
SSSAB	Side Scan Sonar Acoustic Backscatter
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Propagated Uncertainty
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDF	Zone Definition File