

H13647

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: H13647

**LOCALITY**

State(s): Louisiana

General Locality: Approaches to Calcasieu

Sub-locality: 55 NM South of Cameron

**2022**

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

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**H13647**

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: **55 NM South of Cameron**

Scale: **80000**

Dates of Survey: **08/12/2022 to 08/24/2022**

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**

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 H13647

Project: OPR-K356-KR-22

Locality: Approaches to Calcasieu

Sublocality: 55 NM South of Cameron

Scale: 1:80000

August 2022 - August 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 H13647 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                     |
|--------------------------------------|-------------------------------------|
| 28° 59' 37.25" N<br>93° 16' 35.83" W | 28° 36' 13.23" N<br>93° 11' 8.61" 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.

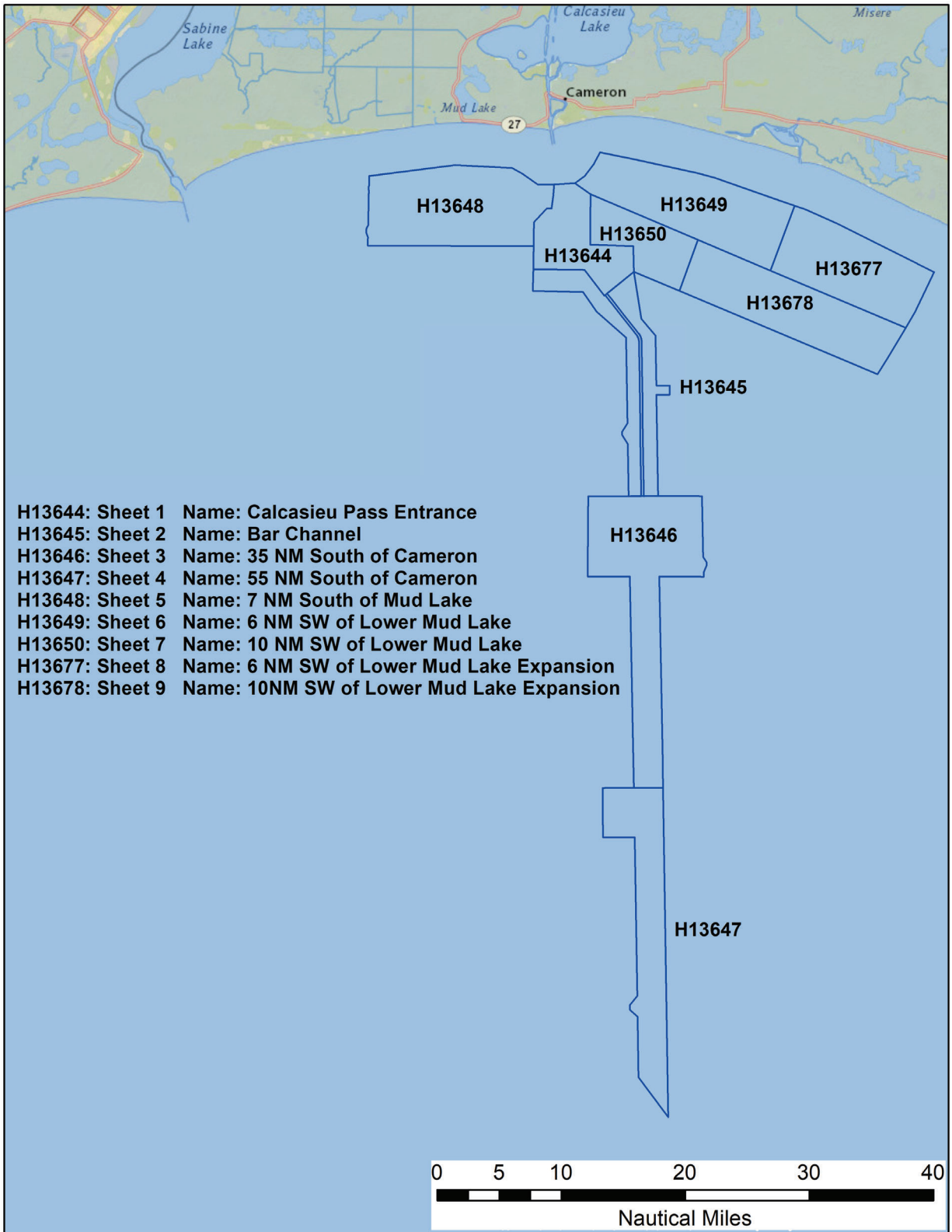


Figure 1: OPR-K356-KR-22 Assigned Survey Areas

## 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% multibeam echosounder (MBES) coverage was obtained over the entire survey area. Backscatter was logged during all multibeam acquisition. This coverage type follows Option A 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 disapproval radii as depicted in the Project Reference File (PRF).

Figure 2 shows the H13647 survey outline in relation to the assigned survey area.

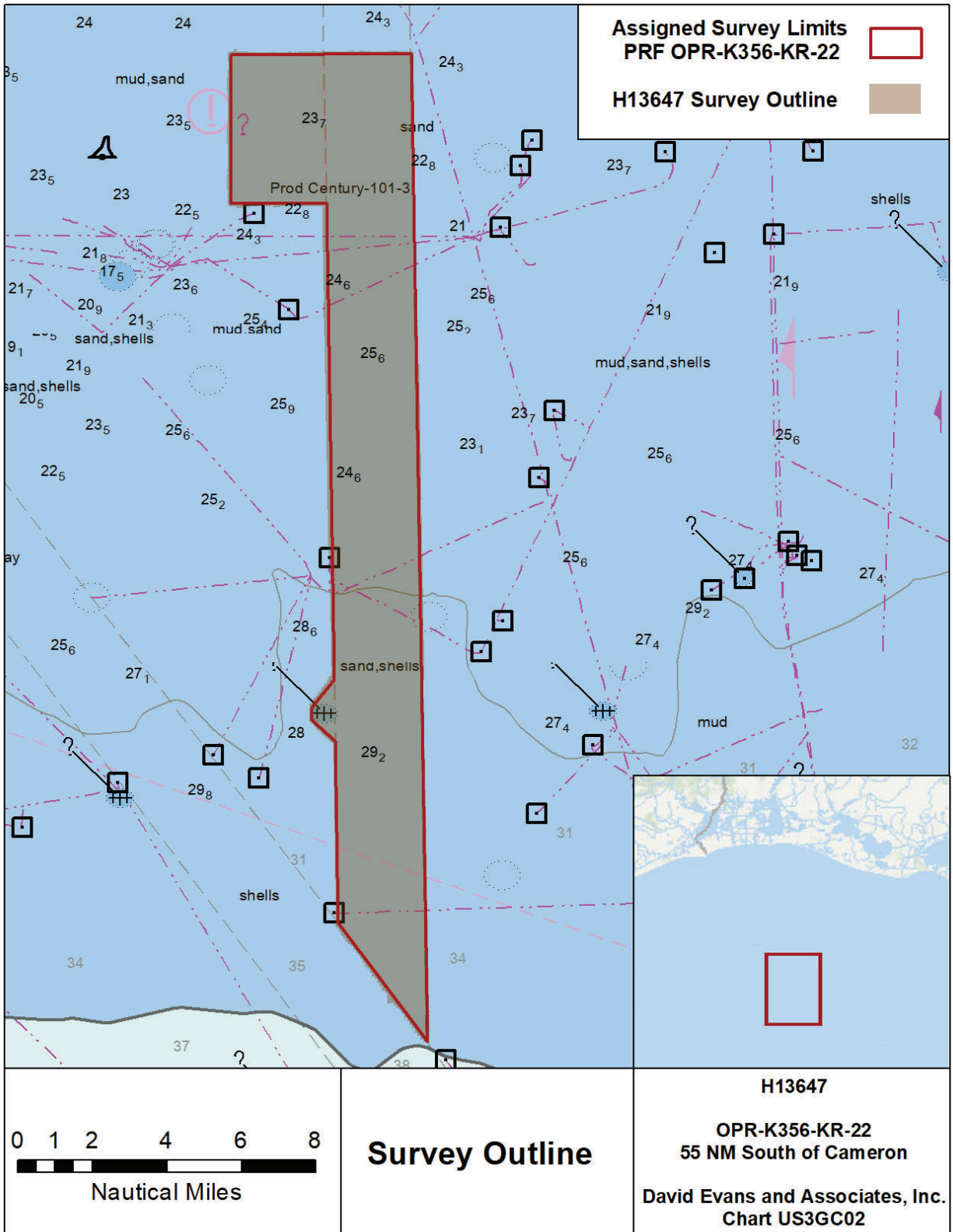


Figure 2: H13647 Survey Outline

## A.6 Survey Statistics

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

|   | <b>HULL ID</b>                  | <i>S/V<br/>Blake</i> | <i>Total</i> |
|---|---------------------------------|----------------------|--------------|
| <b>LNM</b>  | <b>SBES<br/>Mainscheme</b>      | 0.0                  | 0.0          |
|   | <b>MBES<br/>Mainscheme</b>      | 1313.12              | 1313.12      |
|   | <b>Lidar<br/>Mainscheme</b>     | 0.0                  | 0.0          |
|   | <b>SSS<br/>Mainscheme</b>       | 0.0                  | 0.0          |
|   | <b>SBES/SSS<br/>Mainscheme</b>  | 0.0                  | 0.0          |
|   | <b>MBES/SSS<br/>Mainscheme</b>  | 0.0                  | 0.0          |
|   | <b>SBES/MBES<br/>Crosslines</b> | 61.76                | 61.76        |
|   | <b>Lidar<br/>Crosslines</b>     | 0.0                  | 0.0          |
| <b>Number of<br/>Bottom Samples</b>                         |                                 |                      | 2            |
| <b>Number Maritime<br/>Boundary Points<br/>Investigated</b> |                                 |                      | 0            |
| <b>Number of DPs</b>  |                                 |                      | 0            |
| <b>Number of Items<br/>Investigated by<br/>Dive Ops</b>     |                                 |                      | 0            |
| <b>Total SNM</b>  |                                 |                      | 56.77        |

*Table 3: Hydrographic Survey Statistics*

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

| <b>Survey Dates</b> | <b>Day of the Year</b> |
|---------------------|------------------------|
| 08/12/2022          | 224                    |
| 08/15/2022          | 227                    |
| 08/16/2022          | 228                    |
| 08/17/2022          | 229                    |
| 08/19/2022          | 231                    |
| 08/20/2022          | 232                    |
| 08/21/2022          | 233                    |
| 08/22/2022          | 234                    |
| 08/23/2022          | 235                    |
| 08/24/2022          | 236                    |

*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:

|                |                  |
|----------------|------------------|
| <b>Hull ID</b> | <i>S/V Blake</i> |
| <b>LOA</b>     | 82.0 feet        |
| <b>Draft</b>   | 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:

| <b>Manufacturer</b> | <b>Model</b>  | <b>Type</b>                     |
|---------------------|---------------|---------------------------------|
| Teledyne RESON      | SeaBat T50-R  | MBES                            |
| 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 4.70% 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 2-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 2-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.

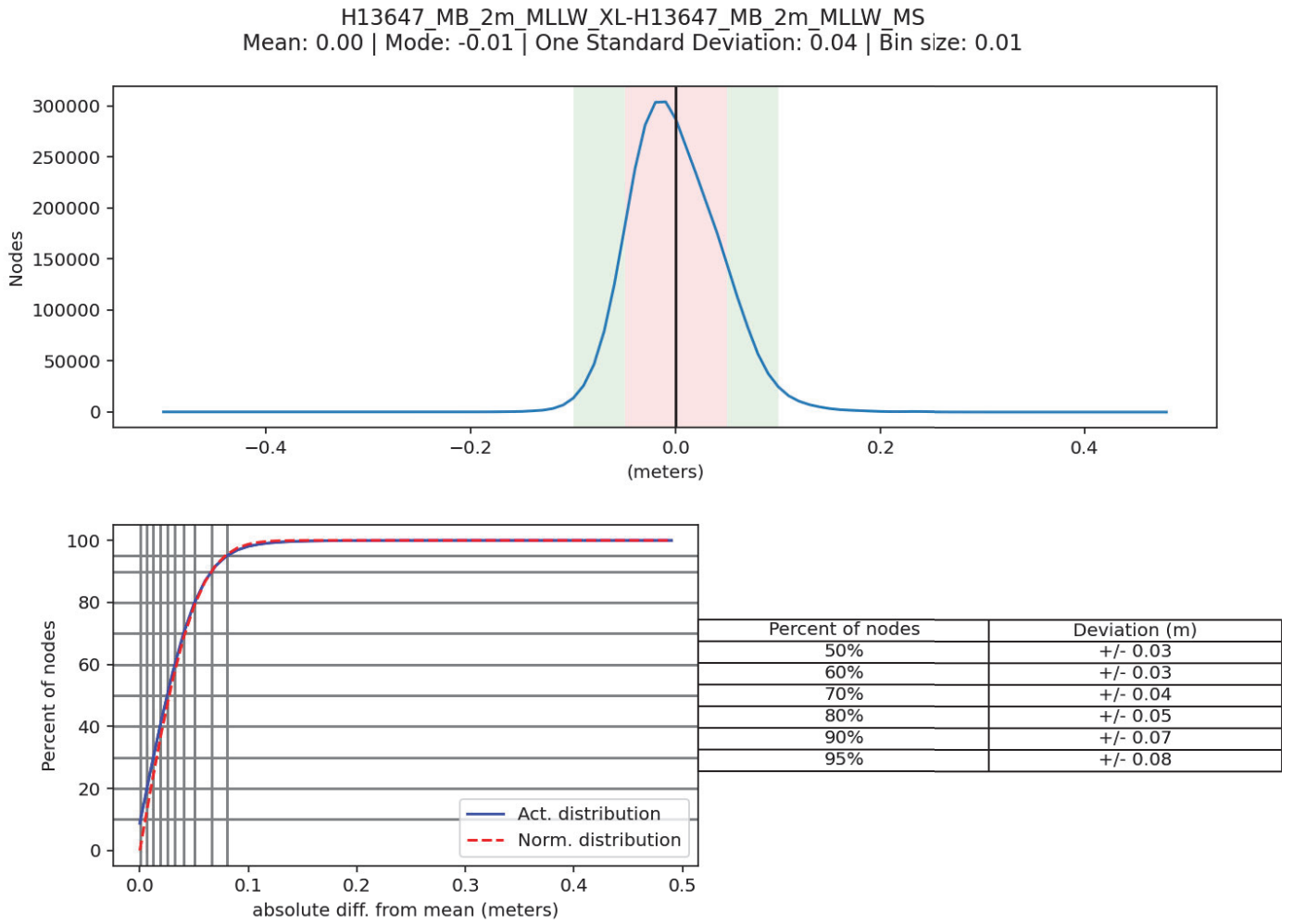


Figure 4: H13647 Crossline Difference

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

| Method         | Measured    | Zoning      |
|----------------|-------------|-------------|
| ERS via VDATUM | 0.05 meters | 0.13 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 |

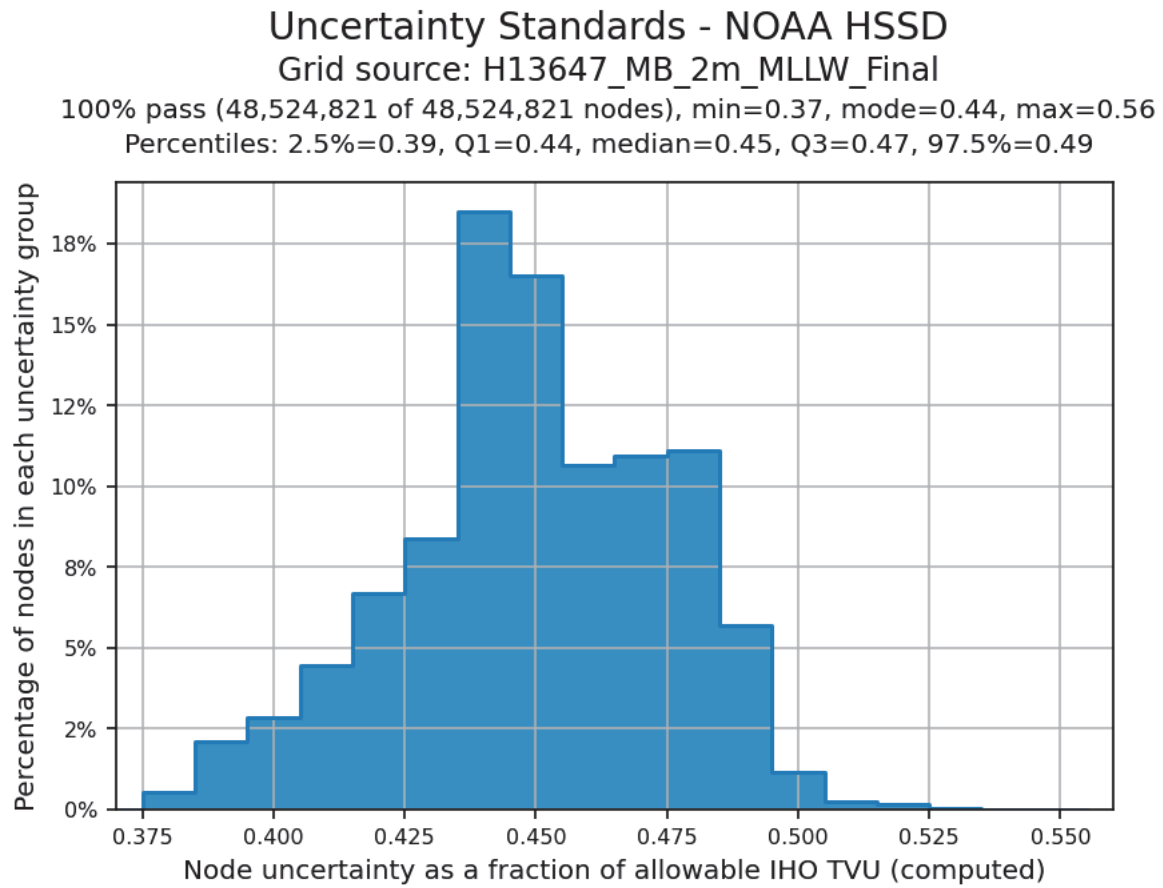
*Table 8: Survey Specific Sound Speed TPU Values.*

The datum separation (Zoning) uncertainty value of 13.0 centimeters used to compute Total Propagated Uncertainty (TPU) listed in Table 7 corresponds to the value included in the original Project Instructions for the survey. Modifications to the task order issued after the start of survey operations, which expanded the survey area, included new Project Instructions listing a datum separation uncertainty of 12.0 centimeters. DEA received permission from the NOAA Hydrographic Surveys Division (HSD) Project Manager to continue to use the original value during processing for the survey. Related correspondence is included in Appendix II. The change in datum separation uncertainty resulted from a separation model revision issued during the survey and prior to the task order modification. The revised model resolved errors in the original model that were discovered by DEA and reported to NOAA. The OPR-K356-KR-22 DAPR includes more information on the model update.

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 surfaces are shown in Figure 5.



*Figure 5: Node TVU Statistics - 2 meter, Finalized*

### B.2.3 Junctions

Survey H13647 junctions with current survey H13646. Figure 6 depicts H13647 and the junctioning survey.

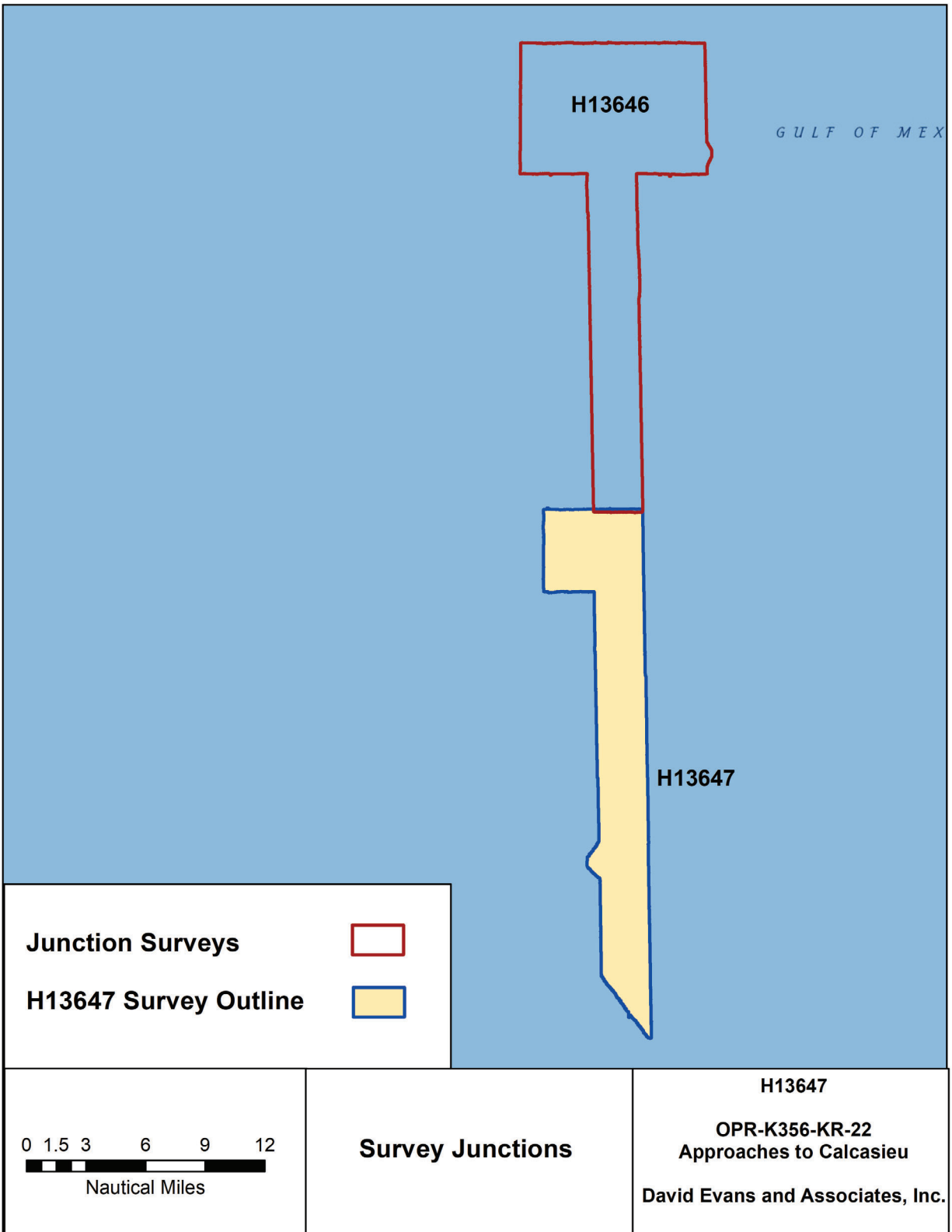


Figure 6: Survey Junctions with Registry Number H13647

The following junctions were made with this survey:

| Registry Number | Scale   | Year | Field Unit                       | Relative Location |
|-----------------|---------|------|----------------------------------|-------------------|
| H13646          | 1:10000 | 2022 | David Evans and Associates, Inc. | N                 |

*Table 9: Junctioning Surveys*

### H13646

The mean difference between H13647 and H13646 is 1 centimeter (H13647 deeper than H13646), shown in Figure 7.

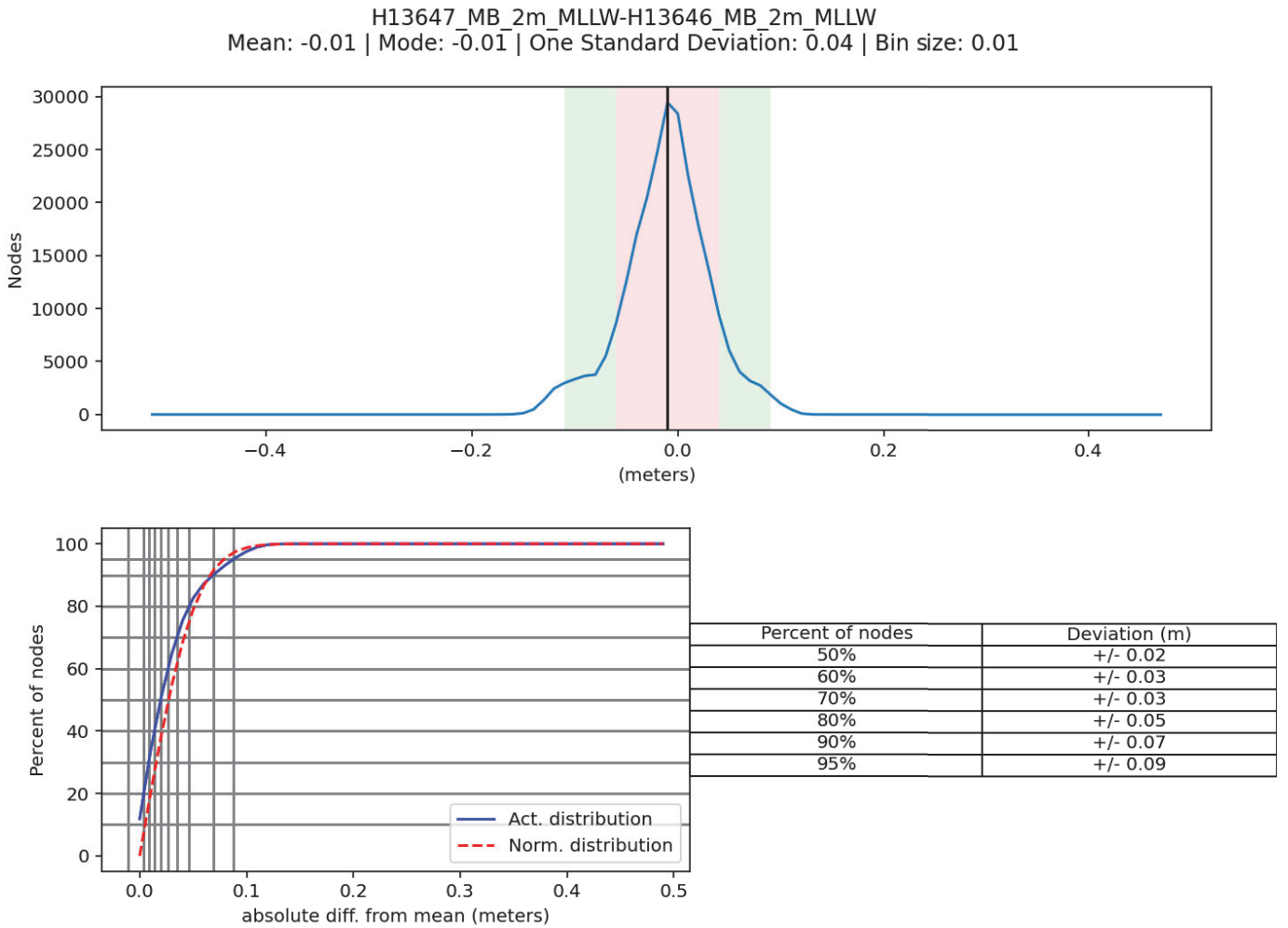


Figure 7: Distribution Summary Plot of Survey H13647 2-meter vs H13646 2-meter

### 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.

### **B.2.5 Equipment Effectiveness**

There were no conditions or deficiencies that affected equipment operational effectiveness.

### **B.2.6 Factors Affecting Soundings**

There were no other factors that affected corrections to soundings.

### **B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: Approximately 20-minute intervals

For H13647 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" with a two-hour interval.

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

During H13647 survey operations, the S/V Blake acquired the first cast of the day after starting multibeam data acquisition on August 15, 2022 (DN227). The first cast of the day was acquired within one minute of the first sonar ping of the day.

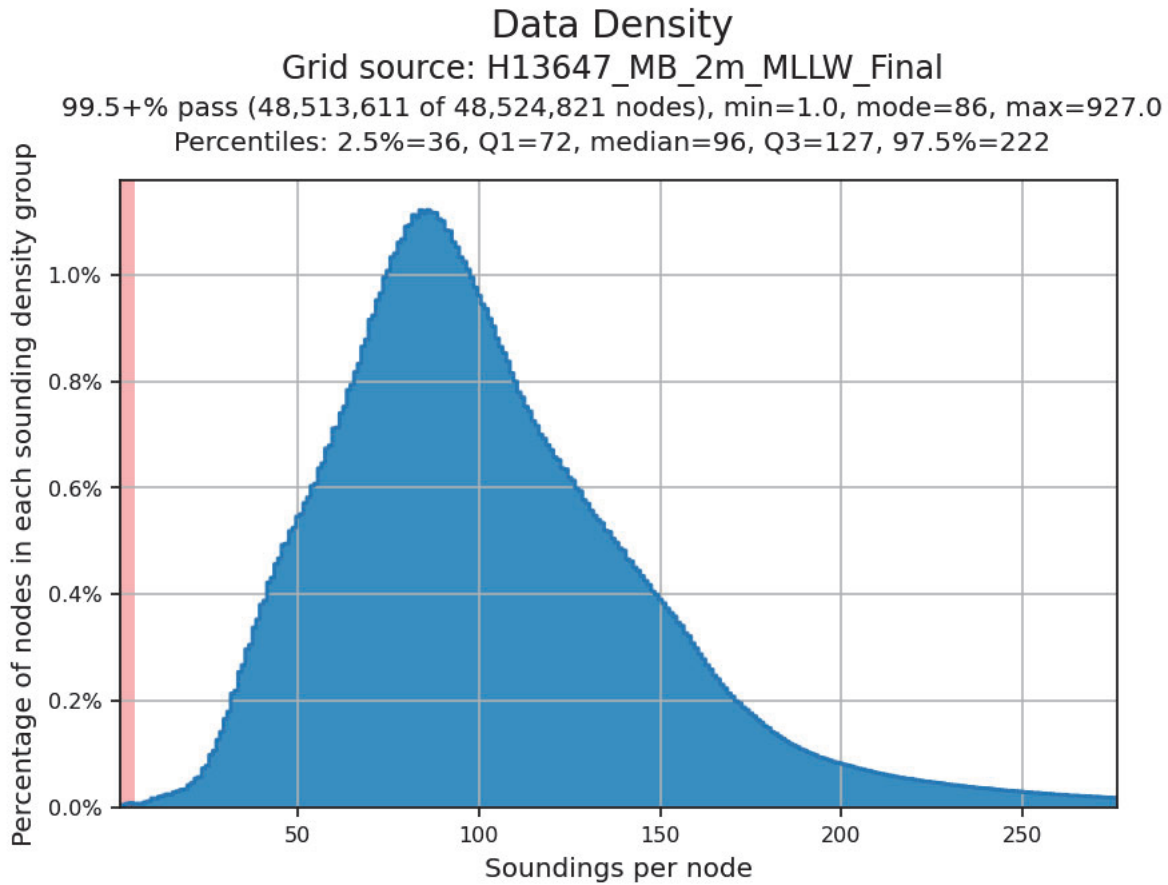
### **B.2.8 Coverage Equipment and Methods**

Survey speeds were maintained to meet or exceed along-track sounding density requirements.

Multibeam data were thoroughly reviewed for holidays and areas of poor-quality coverage due to biomass, vessel wakes, or other factors. Feature investigations were performed with multibeam sonar to obtain a least depth, meeting the survey's coverage requirements. Survey coverage for feature disprovals was acquired inside disapproval 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 8.



*Figure 8: Node Density Statistics - 2 meter, Finalized*

## **B.3 Echo Sounding Corrections**

### **B.3.1 Corrections to Echo Soundings**

Data reduction procedures for survey H13647 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 H13647 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 H13647 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:

| <b>Manufacturer</b> | <b>Name</b> | <b>Version</b>   |
|---------------------|-------------|--|
| CARIS               | HIPS/SIPS   | 11.4.8, After DN192: 11.4.13,<br>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:

| <b>Manufacturer</b> | <b>Name</b> | <b>Version</b> |
|---------------------|-------------|----------------|
| QPS                 | FMGT        | 7.10.1         |

*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       |
|-----------------------------------|---------------------------------------|------------|-------------------------------------|-------------------|---------------|
| H13647_MB_2m_MLLW.csar            | CARIS Raster Surface (CUBE)           | 2 meters   | 22.222 meters<br>-<br>39.076 meters | NOAA_2m           | Complete MBES |
| H13647_MB_2m_MLLW_Final.csar      | Finalized CARIS Raster Surface (CUBE) | 2 meters   | 22.222 meters<br>-<br>39.076 meters | NOAA_2m           | Complete MBES |
| H13647_MBAB_2m_BL_350kHz_1of1.tif | MB Backscatter Mosaic                 | 2 meters   | 0.0 meters -<br>0.0 meters          | N/A               | Complete MBES |

*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.

## C. Vertical and Horizontal Control

A summary of the horizontal and vertical control for survey H13647 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<br>+_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 H13647 survey depths to a digital surface generated from the Band 3 electronic navigational chart (ENC) covering the survey area. A 5-meter product surface was generated from a triangular irregular network (TIN) created from the ENC's soundings, depth contours, and depth features. An additional 5-meter HIPS product surface was generated from the 2-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 chart used during the comparison was 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 ENC used in the chart comparison is listed in Table 14. Figure 9 shows the magnitude of differences along the comparison area.

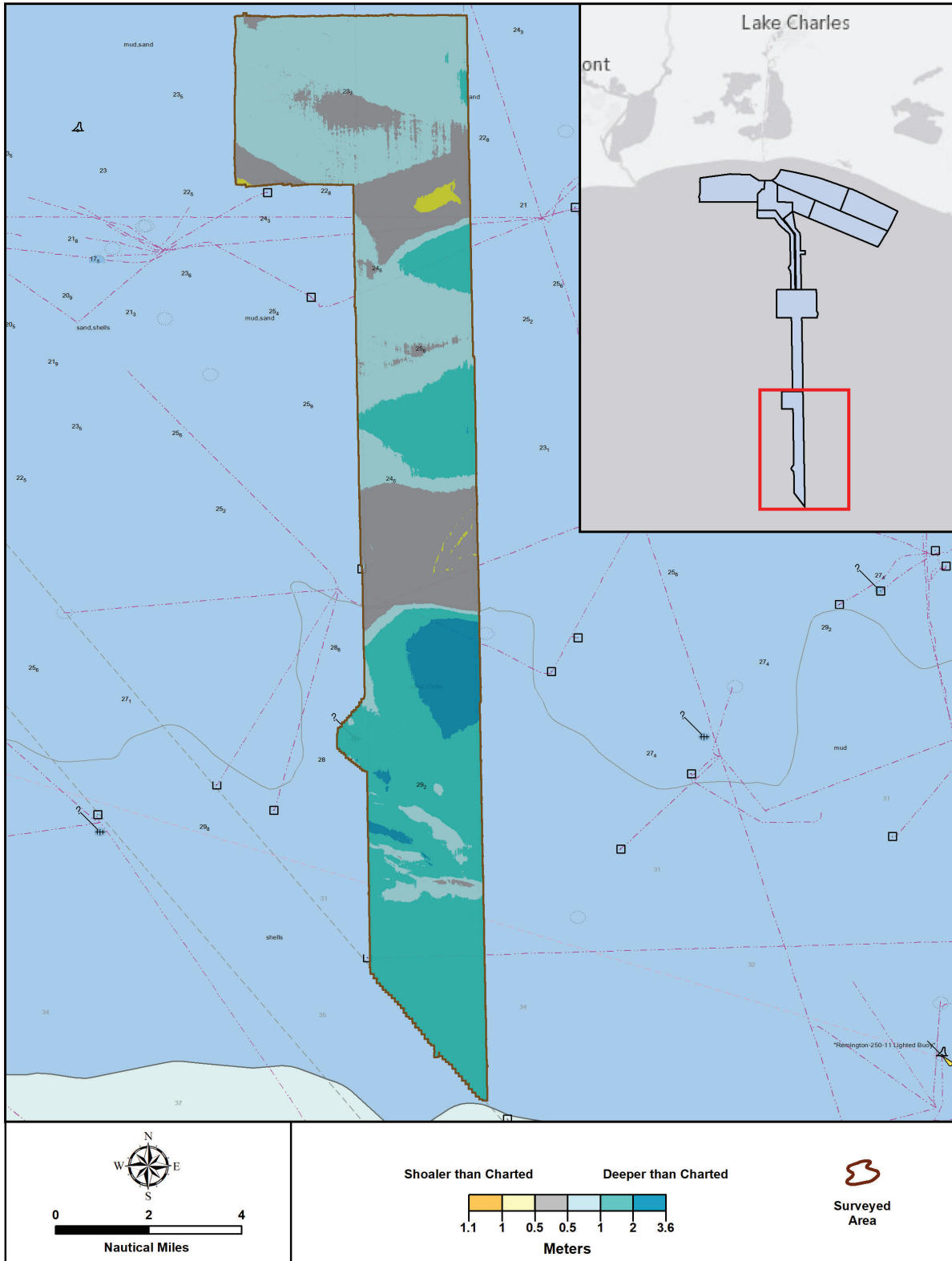


Figure 9: Depth Difference Between H13647 and US3GC02M

### D.1.1 Electronic Navigational Charts

The following are the largest scale ENC's, which cover the survey area:

| ENC      | Scale    | Edition | Update Application Date | Issue Date |
|----------|----------|---------|-------------------------|------------|
| US3GC02M | 1:250000 | 46      | 10/19/2022              | 12/12/2022 |

*Table 14: Largest Scale ENC's*

### D.1.2 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

### 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 Final Feature File (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."

### 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.

### D.1.5 Channels

The survey area encompasses portions of the Calcasieu Pass Safety Fairway (33 CFR 166.200). The hydrographer recommends encoding the name of safety fairways in the ENC's. Safety fairways are included in the Code of Federal Regulations (CFR).

## 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**

Two bottom samples were acquired on August 24, 2022 (DN236). The bottom sampling plan followed suggested sample locations included in the provided 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. No sections of pipeline were observed to be exposed at the time of survey.

**D.2.6 Platforms**

No platforms exist for this survey.

**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 during survey operations.

**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,<br>PE, PLS, CH | NSPS-THSOA<br>Certified Hydrographer,<br>Chief of Party                        | 02/01/2023    | <br>Digitally signed by<br>Jonathan L. Dasler, PE,<br>PLS, CH<br>Date: 2023.02.01<br>08:32:52 -08'00' |
| Jason Creech, CH                   | NSPS-THSOA<br>Certified Hydrographer,<br>Charting Manager /<br>Project Manager | 02/01/2023    | <br>Digitally signed<br>by Jason Creech<br>Date: 2023.02.01<br>08:35:10 -08'00'                      |
| James Guilford                     | IHO Cat-A<br>Hydrographer,<br>Lead Hydrographer                                | 02/01/2023    | <br>Digitally signed by<br>James Guilford<br>Date: 2023.02.01<br>08:53:31 -08'00'                    |
| Jason Dorfman                      | Lead Hydrographer  | 02/01/2023    | <br>Digitally signed by Jason Dorfman<br>Date: 2023.02.01 09:00:31 -08'00'                           |
| Sam Werner                         | Data Processing<br>Manager   | 02/01/2023    | <br>Digitally signed by<br>Sam Werner<br>Date: 2023.02.01<br>09:02:39 -08'00'                        |

## F. Table of Acronyms

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

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

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