

F00844

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: F00844

LOCALITY

State(s): California

General Locality: CINMS and BOEM Investigations

Sub-locality: BOEM Platforms and Pipeline Investigation

2022

CHIEF OF PARTY
CAPT John Lomnicky

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

F00844

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): **California**

General Locality: **CINMS and BOEM Investigations**

Sub-Locality: **BOEM Platforms and Pipeline Investigation**

Scale: **10000**

Dates of Survey: **10/04/2021 to 10/13/2021**

Instructions Dated: **09/15/2021**

Project Number: **OPR-L397-FA-21**

Field Unit: **NOAA Ship *Fairweather***

Chief of Party: **CAPT John Lomnicky**

Soundings by: **Multibeam Echo Sounder**

Imagery by: **Multibeam Echo Sounder Backscatter**

Verification by: **Pacific 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 11N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

Table of Contents

A. Area Surveyed	1
A.1 Survey Limits.....	1
A.2 Survey Purpose.....	2
A.3 Survey Quality.....	3
A.4 Survey Coverage.....	3
A.6 Survey Statistics.....	4
B. Data Acquisition and Processing	6
B.1 Equipment and Vessels.....	6
B.1.1 Vessels.....	6
B.1.2 Equipment.....	7
B.2 Quality Control.....	7
B.2.1 Crosslines.....	7
B.2.2 Uncertainty.....	7
B.2.3 Junctions.....	8
B.2.4 Sonar QC Checks.....	8
B.2.5 Equipment Effectiveness.....	8
B.2.6 Factors Affecting Soundings.....	8
B.2.7 Sound Speed Methods.....	9
B.2.8 Coverage Equipment and Methods.....	9
B.2.9 2806 Roll Artifact.....	9
B.2.10 Holidays.....	12
B.2.11 NOAA Allowable Uncertainty.....	16
B.2.12 Density.....	17
B.3 Echo Sounding Corrections.....	18
B.3.1 Corrections to Echo Soundings.....	18
B.3.2 Calibrations.....	18
B.4 Backscatter.....	19
B.5 Data Processing.....	23
B.5.1 Primary Data Processing Software.....	23
B.5.2 Surfaces.....	24
C. Vertical and Horizontal Control	24
C.1 Vertical Control.....	25
C.2 Horizontal Control.....	25
D. Results and Recommendations	25
D.1 Chart Comparison.....	25
D.1.1 Electronic Navigational Charts.....	26
D.1.2 Shoal and Hazardous Features.....	26
D.1.3 Charted Features.....	26
D.1.4 Uncharted Features.....	26
D.1.5 Channels.....	26
D.2 Additional Results.....	27
D.2.1 Aids to Navigation.....	27
D.2.2 Maritime Boundary Points.....	27

D.2.3 Bottom Samples.....	27
D.2.4 Overhead Features.....	27
D.2.5 Submarine Features.....	27
D.2.6 Platforms.....	27
D.2.7 Ferry Routes and Terminals.....	27
D.2.8 Abnormal Seafloor or Environmental Conditions.....	27
D.2.9 Construction and Dredging.....	28
D.2.10 New Survey Recommendations.....	28
D.2.11 ENC Scale Recommendations.....	28
E. Approval Sheet.....	29
F. Table of Acronyms.....	30

List of Tables

Table 1: Survey Limits.....	1
Table 2: Survey Coverage.....	3
Table 3: Hydrographic Survey Statistics.....	5
Table 4: Dates of Hydrography.....	6
Table 5: Vessels Used.....	6
Table 6: Major Systems Used.....	7
Table 7: Survey Specific Tide TPU Values.....	7
Table 8: Survey Specific Sound Speed TPU Values.....	8
Table 9: Primary bathymetric data processing software.....	23
Table 10: Primary imagery data processing software.....	23
Table 11: Submitted Surfaces.....	24
Table 12: ERS method and SEP file.....	25
Table 13: Largest Scale ENCs.....	26

List of Figures

Figure 1: F00844 sheet limits (in blue) overlaid onto chart 18720.....	2
Figure 2: F00844 survey coverage overlaid onto Chart 18720.....	4
Figure 3: Roll artifacts produced by 2806.....	10
Figure 4: Roll artifacts, TVU, and measured offset values for select overlapping areas.....	11
Figure 5: Area where roll artifacts are present but are not obscuring the pipeline.....	12
Figure 6: Holidays along a line produced by yaw stabilization in conjunction with roll and yaw.....	13
Figure 7: Holiday due to blowout.....	14
Figure 8: Indiscernible man-made or biological features on seafloor.....	15
Figure 9: Holidays in VR surface that are not found in 16m surface. Unclear what causes the lack of display in VR surface.....	16
Figure 10: F00844 allowable uncertainty statistics.....	17
Figure 11: F00844 data density statistics.....	18
Figure 12: Backscatter, north western-most portion of sheet.....	20
Figure 13: Backscatter, north-most portion of the southeastern portion of the sheet.....	21

Figure 14: Backscatter, south-most portion of the southeastern portion of the sheet.....22
Figure 15: Backscatter calibration values.....23

Descriptive Report to Accompany Survey F00844

Project: OPR-L397-FA-21

Locality: CINMS and BOEM Investigations

Sublocality: BOEM Platforms and Pipeline Investigation

Scale: 1:10000

October 2021 - October 2021

NOAA Ship *Fairweather*

Chief of Party: CAPT John Lomnicky

A. Area Surveyed

The survey area is located 12 miles off the coast of southern California between Port Hueneme in the south and Purisima Point in the north.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
34° 37' 27.09" N 120° 43' 56.98" W	34° 7' 14.02" N 119° 22' 53.18" W

Table 1: Survey Limits

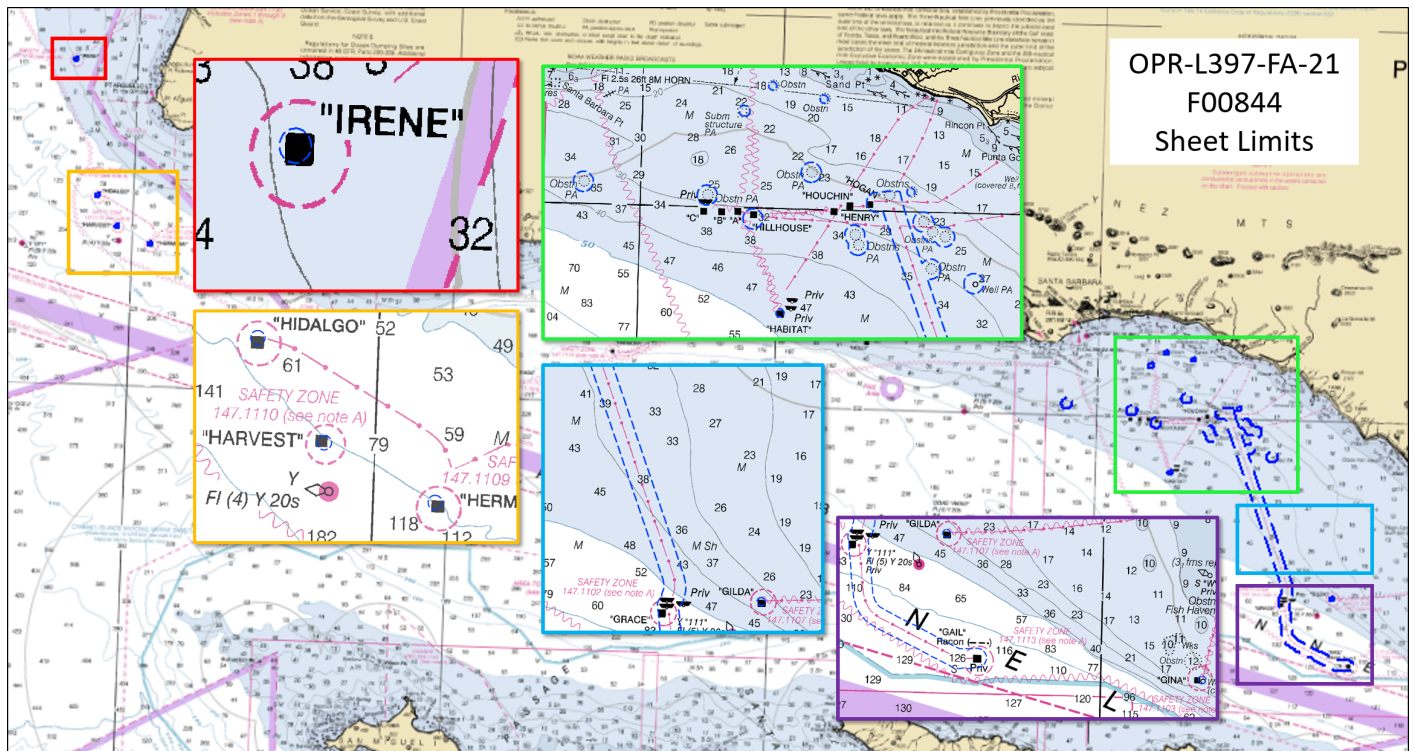


Figure 1: F00844 sheet limits (in blue) overlaid onto chart 18720.

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the 2021 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). Coverage acquired in F00844 is shown in Figure 1.

A.2 Survey Purpose

This year the Channel Islands National Marine Sanctuary (CINMS) work will focus on the remaining survey area (prior projects 2017-2019) offshore of the Channel Islands (about 151 sq. mi.), located about 30 miles offshore of the California mainland city of Santa Barbara. The waters surrounding CINMS are highly productive and are home to recreational and commercial fishing efforts, and regularly host kayakers, surfers, sightseers, whale watchers, researchers, and Channel Islands National Park concessionaires, who all access the sanctuary via boats. Correspondingly, the abundance of sea life and aquatic habitats drives a thriving industry of recreational and commercial fishing that brings varied vessel traffic through the waters of CINMS. Additionally, major mainland port traffic transiting to and from Los Angeles and Long Beach, California routes large cargo and tanker vessels close to CINMS boundaries. The Ports of Los Angeles and Long Beach are top 10 ports in the United States for containers and tonnage. This poses a serious risk to life, property, and the delicate ecosystem of the area. Multibeam, backscatter, and water column data have been collected in support of the Bureau of Ocean Energy Management Pacific Region area around selected

offshore platforms and pipelines. Survey data from this project is intended to supersede all prior survey data in the common area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired in F00844 meet multibeam echo sounder (MBES) coverage requirements for object detection, as required by the HSSD. This includes NOAA allowable uncertainty (see Section B.2.11a and density requirements (see Section B.2.12). Crosslines were not obtained for this survey. See Section B.2.1 for more information.

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	Object detection with backscatter and water column data

Table 2: Survey Coverage

The entirety of F00844 was acquired with object detection, meeting the requirements listed above and in the HSSD. See Figure 2 for an overview of coverage.

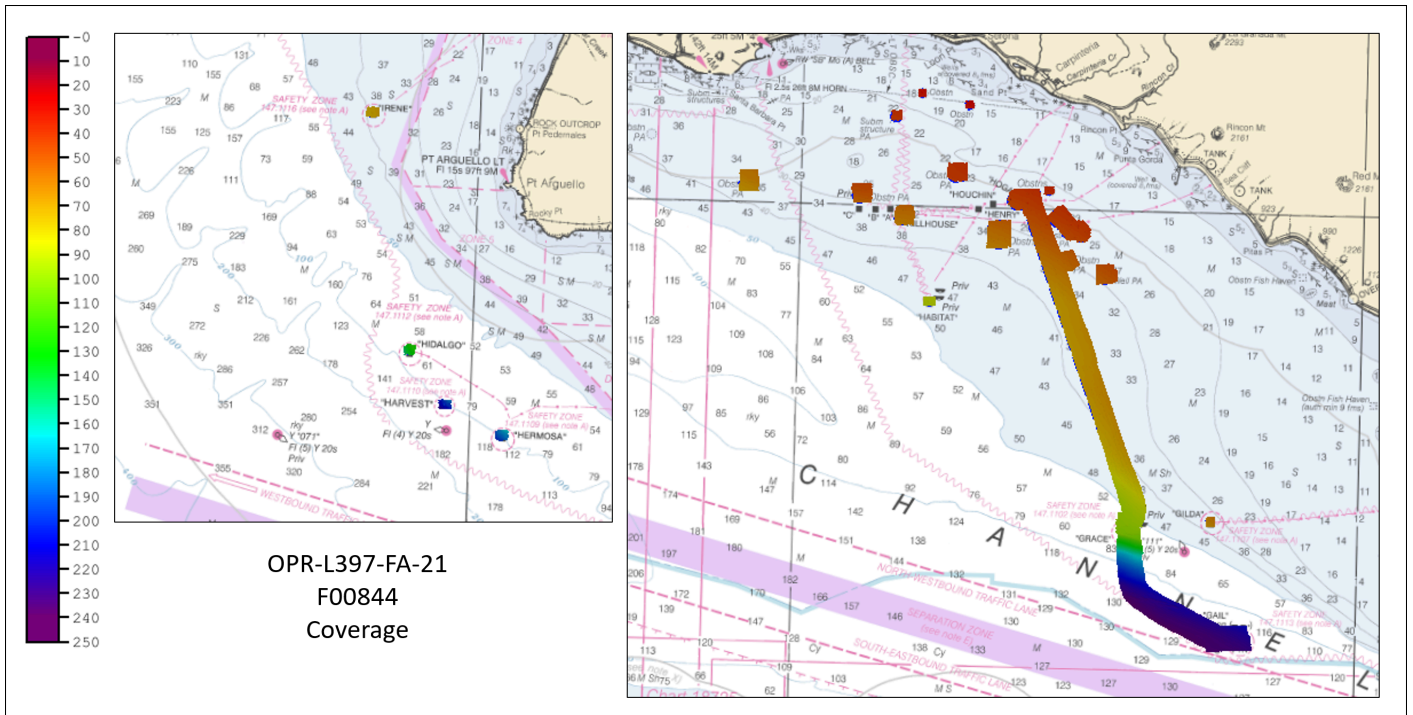


Figure 2: F00844 survey coverage overlaid onto Chart 18720

A.6 Survey Statistics

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

	HULL ID	<i>2805</i>	<i>2806</i>	<i>2807</i>	<i>2808</i>	<i>S-220</i>	<i>Total</i>
LNM	SBES Mainscheme	0.0	0.0	0.0	0.0	0.0	0.0
	MBES Mainscheme	51.02	33.54	42.1	2.11	31.97	160.73
	Lidar Mainscheme	0.0	0.0	0.0	0.0	0.0	0.0
	SSS Mainscheme	0.0	0.0	0.0	0.0	0.0	0.0
	SBES/SSS Mainscheme	0.0	0.0	0.0	0.0	0.0	0.0
	MBES/SSS Mainscheme	0.0	0.0	0.0	0.0	0.0	0.0
	SBES/MBES Crosslines	0.0	0.0	0.0	0.0	0.0	0.0
	Lidar Crosslines	0.0	0.0	0.0	0.0	0.0	0.0
Number of Bottom Samples							0
Number Maritime Boundary Points Investigated							0
Number of DPs							0
Number of Items Investigated by Dive Ops							0
Total SNM							12.08

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/04/2021	277
10/08/2021	281

Survey Dates	Day of the Year
10/13/2021	286

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-L397-FA-21 Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

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

Hull ID	2805	2806	2807	2808	S-220
LOA	8.6 meters	8.6 meters	8.6 meters	8.6 meters	70.4 meters
Draft	1.1 meters	1.1 meters	1.1 meters	1.1 meters	4.8 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV 320 v5	Positioning and Attitude System
Teledyne RESON	SVP 71	Sound Speed System
Teledyne RESON	SVP 70	Sound Speed System
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
Kongsberg Maritime	EM 710	MBES
Kongsberg Maritime	EM 2040	MBES

Table 6: Major Systems Used

The equipment was installed on the survey platform as follows: S220 utilizes the Kongsberg EM 710 MBES, a POS M/V v5 system for position and attitude, and SVP 70 surface sound speed. All launches utilize the Kongsberg EM 2040 MBES, a POS M/V v5 system for position and attitude, SVP 71 surface sound speed sensors, and Sea-Bird SBE 19plus v2 CTDs for conductivity, temperature, and depth casts.

B.2 Quality Control

B.2.1 Crosslines

Crosslines were not acquired on this sheet. This occurred due to time constraints and the irregular shape of the sheet. Thus it was decided that crosslines could not quickly and effectively be collected.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	N/A	8.05 centimeters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Measured - XBT	Surface
S-220	N/A	1 meters/second	N/A	0.5 meters/second
280X	2 meters/second	N/A	N/A	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty via device models for vessel motion and VDATUM, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey F00844. Real-time uncertainties were provided via EM 2040 MBES data, EM 710 MBES data, and Applanix Delayed Heave RMS. Following post-processing of the real-time vessel motion, recomputed uncertainties of vessel roll, pitch, gyro and navigation were applied in CARIS HIPS and SIPS via a Smoothed Best Estimate of Trajectory (SBET) RMS file generated in Applanix POSPac.

The Measured MVP Sound Speed Uncertainty value applied to the data is 2 m/s.

B.2.3 Junctions

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

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: Casts were conducted at a minimum of one every four hours during launch acquisition. Casts were conducted more frequently in areas where the influx of freshwater had an effect on the speed of sound in the water column and when there was a change in surface sound speed greater than two meters per second. MVP casts on S220 were not conducted. Instead, the ship used casts taken by the launches.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 2806 Roll Artifact

Roll artifacts due to inclement sea state are present throughout data collected by Launch 2806 as depicted in Figures 3 through 5. There are many areas where the offset of two overlapping swaths exceed the maximum allowable TVU values (Figure 4). While the artifacts are present in the surface, they did not impact the ability to observe the pipelines in the data. No area with roll artifacts obscured the pipeline (see Figures 3 through 5). Nadir depths are consistent between vessels and lines.

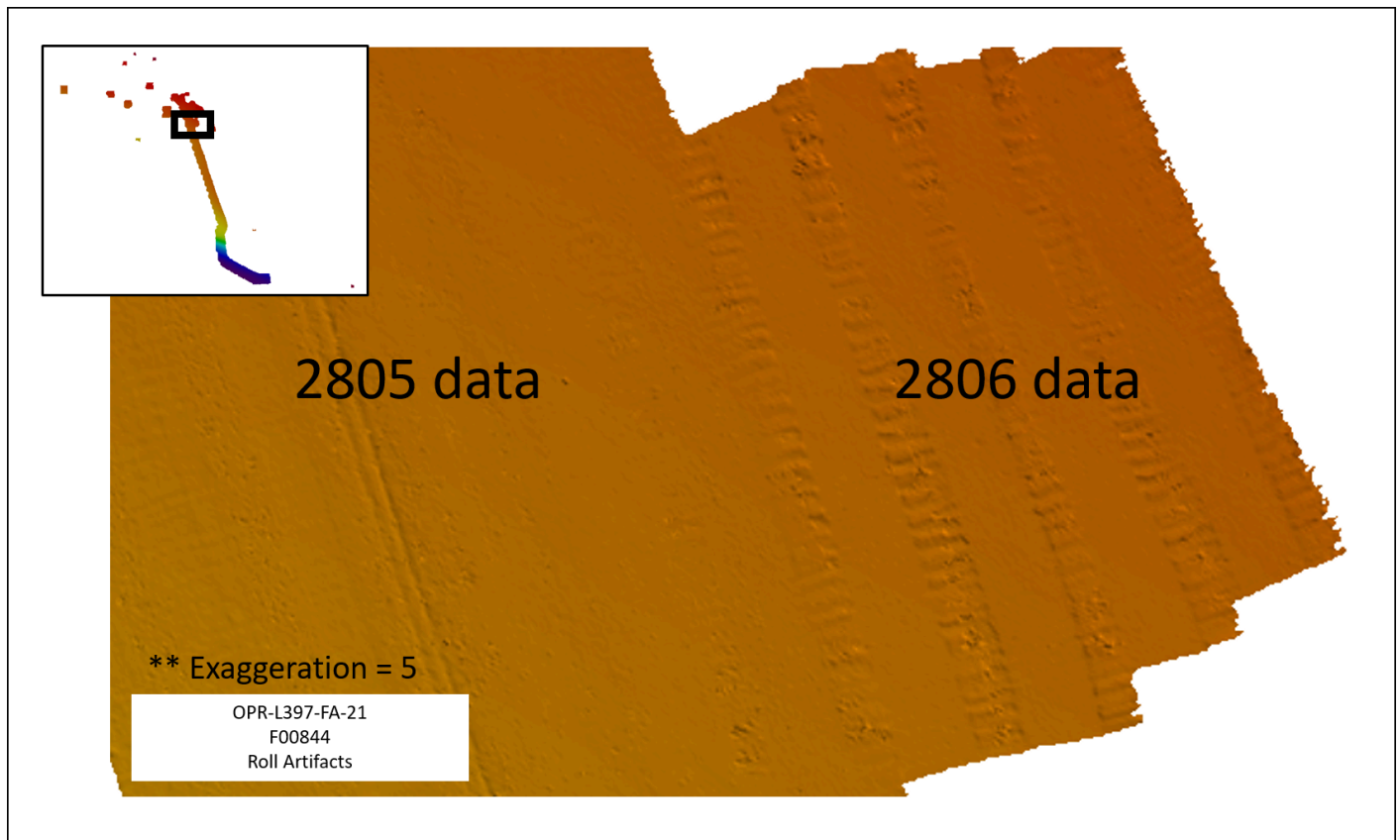


Figure 3: Roll artifacts produced by 2806

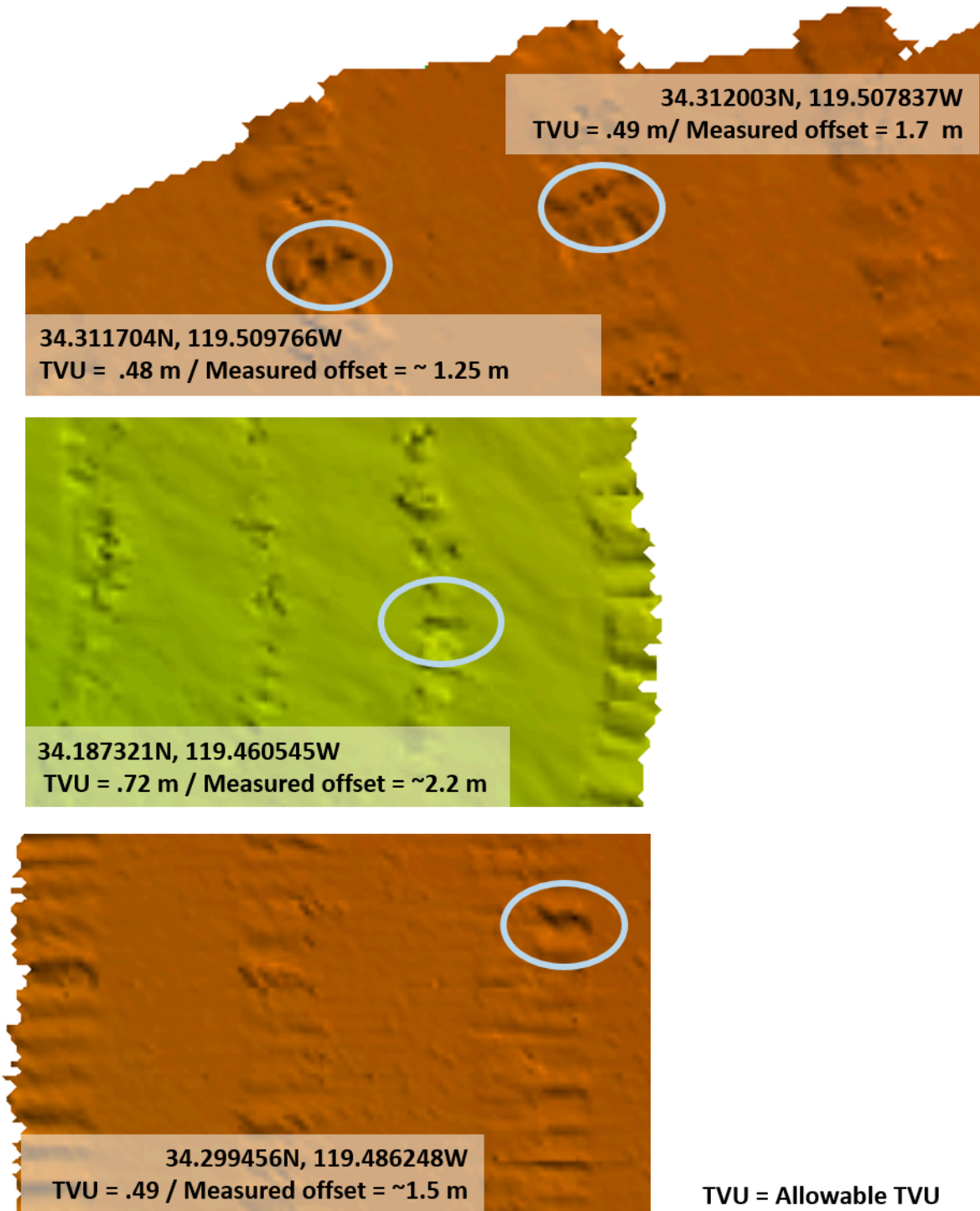


Figure 4: Roll artifacts, TVU, and measured offset values for select overlapping areas

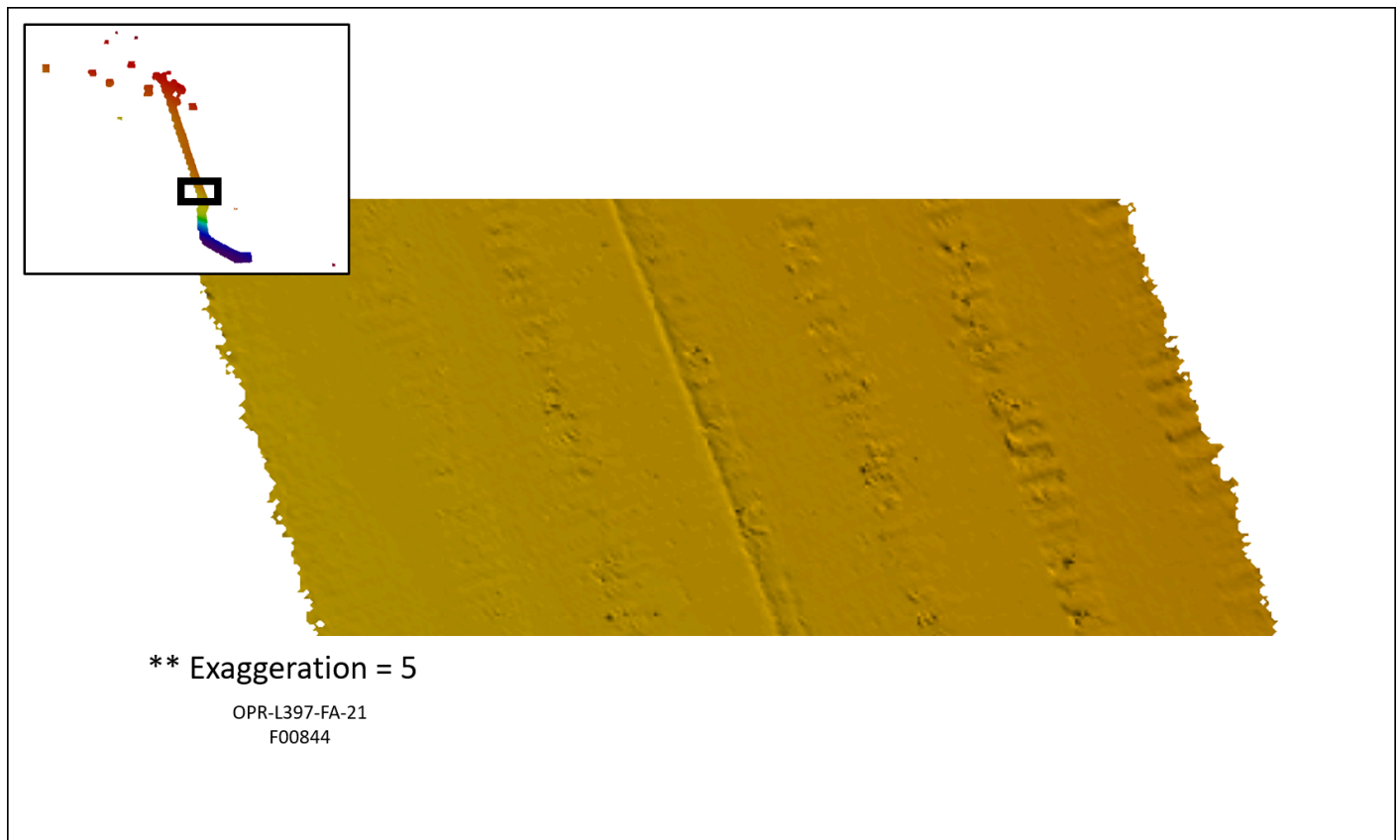


Figure 5: Area where roll artifacts are present but are not obscuring the pipeline

B.2.10 Holidays

F00844 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Thirty-seven holidays which meet the definition described in the HSSD for object detection were identified via HydrOffice QC Tools Holiday Finder tool. This tool automatically scans the surface for holidays as defined in the HSSD and was run in conjunction with a visual inspection of the surface by the hydrographer.

The majority of the holidays were produced due to excessive sea state. The movement of the vessel created gaps between sectors due to yaw stabilization being turned off because of backscatter acquisition guidance. These holidays are predominantly located on the outer-most edges of the surveyed area where there is no overlap from an adjacent swath (Figure 6). One holiday was produced by a partial blowout (Figure 7). The final holiday was produced by an indiscernible man-made or biological feature (Figure 8). Several holidays in the VR surface were found (Figure 9). However, further investigation of this area using a 16 m surface revealed that these holidays did not exist. It is unclear what caused the lack of display in VR surface but not in the 16 m surface.

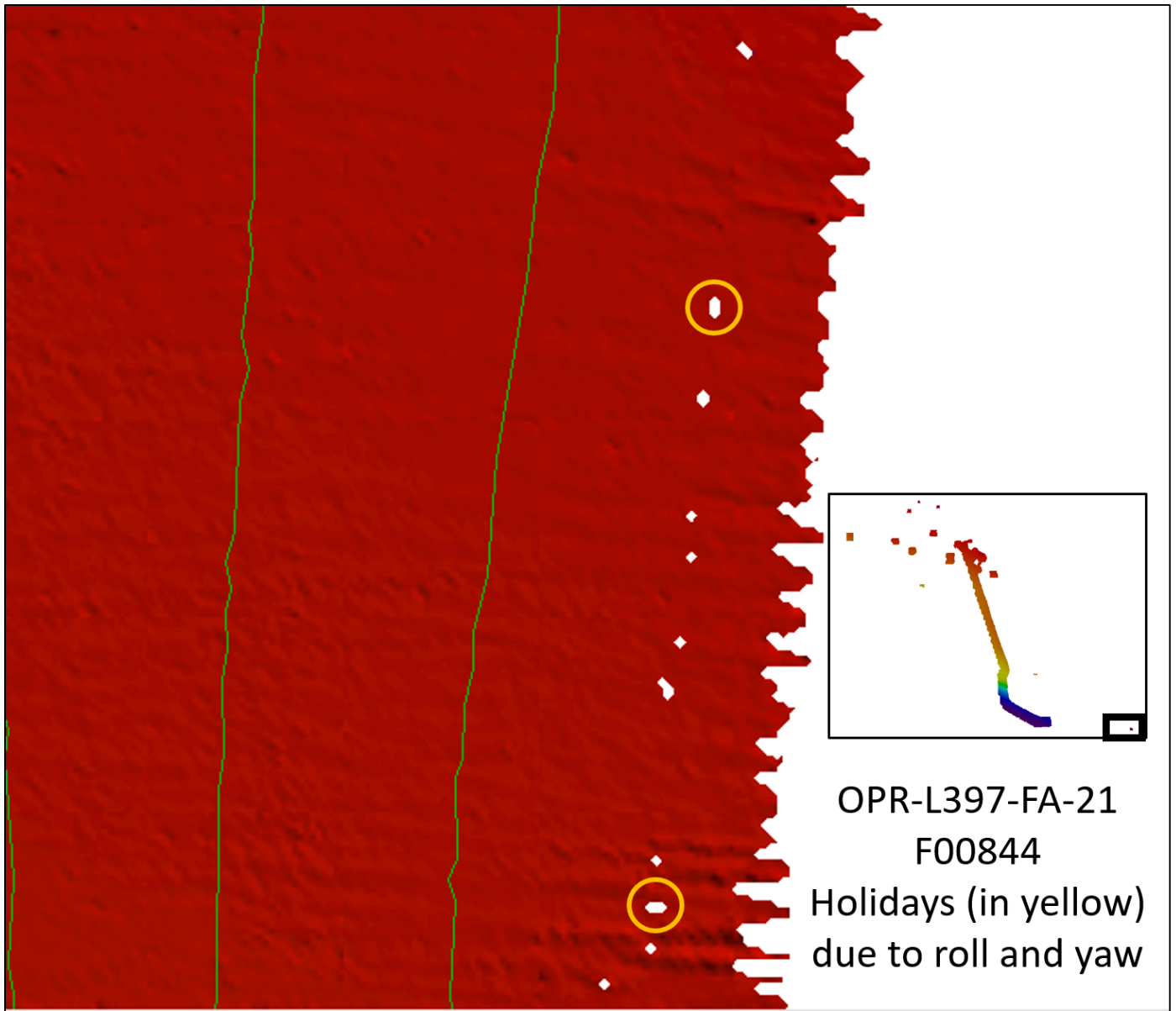


Figure 6: Holidays along a line produced by yaw stabilization in conjunction with roll and yaw

OPR-L397-FA-21
F00844
Holiday due to blowout

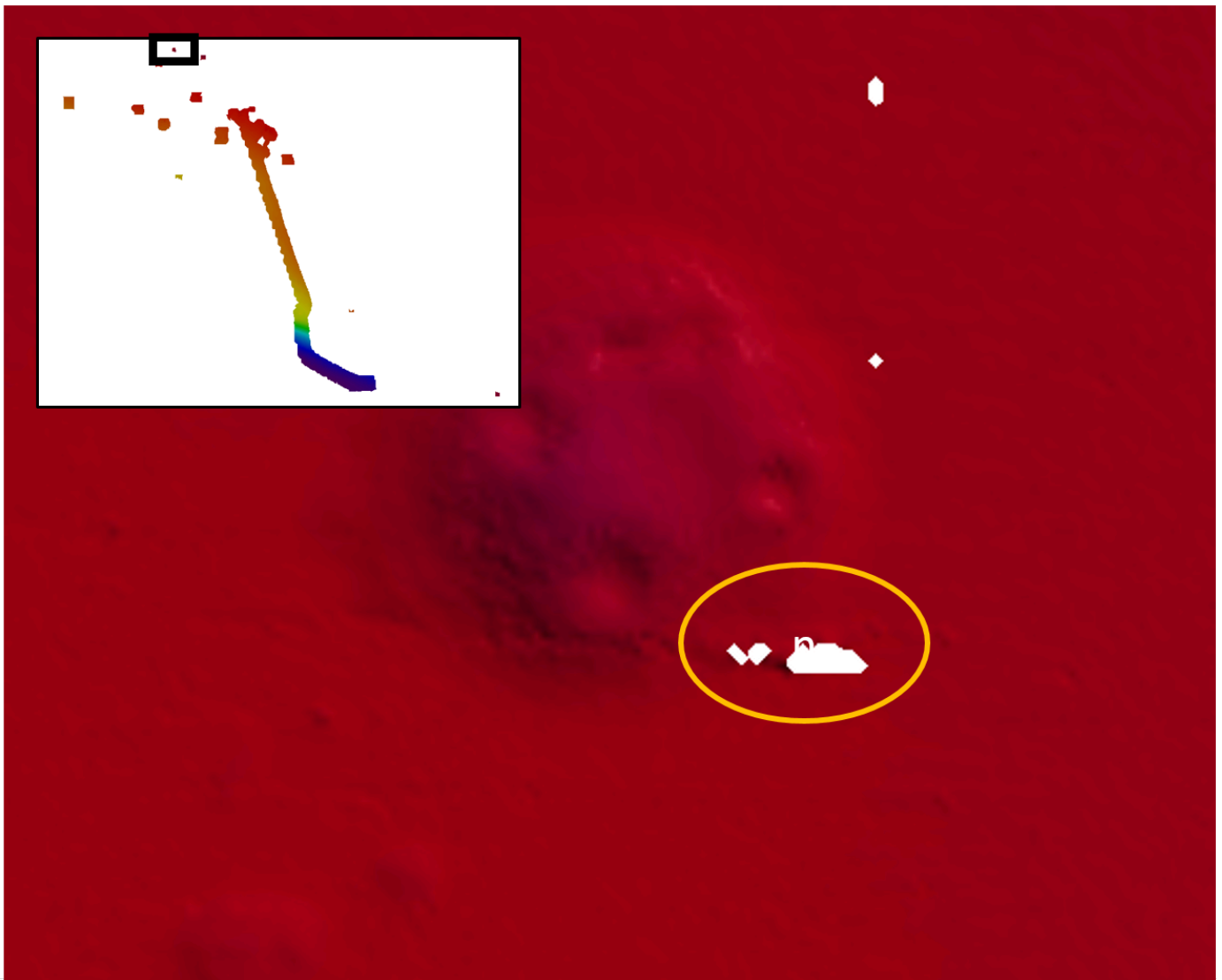


Figure 7: Holiday due to blowout

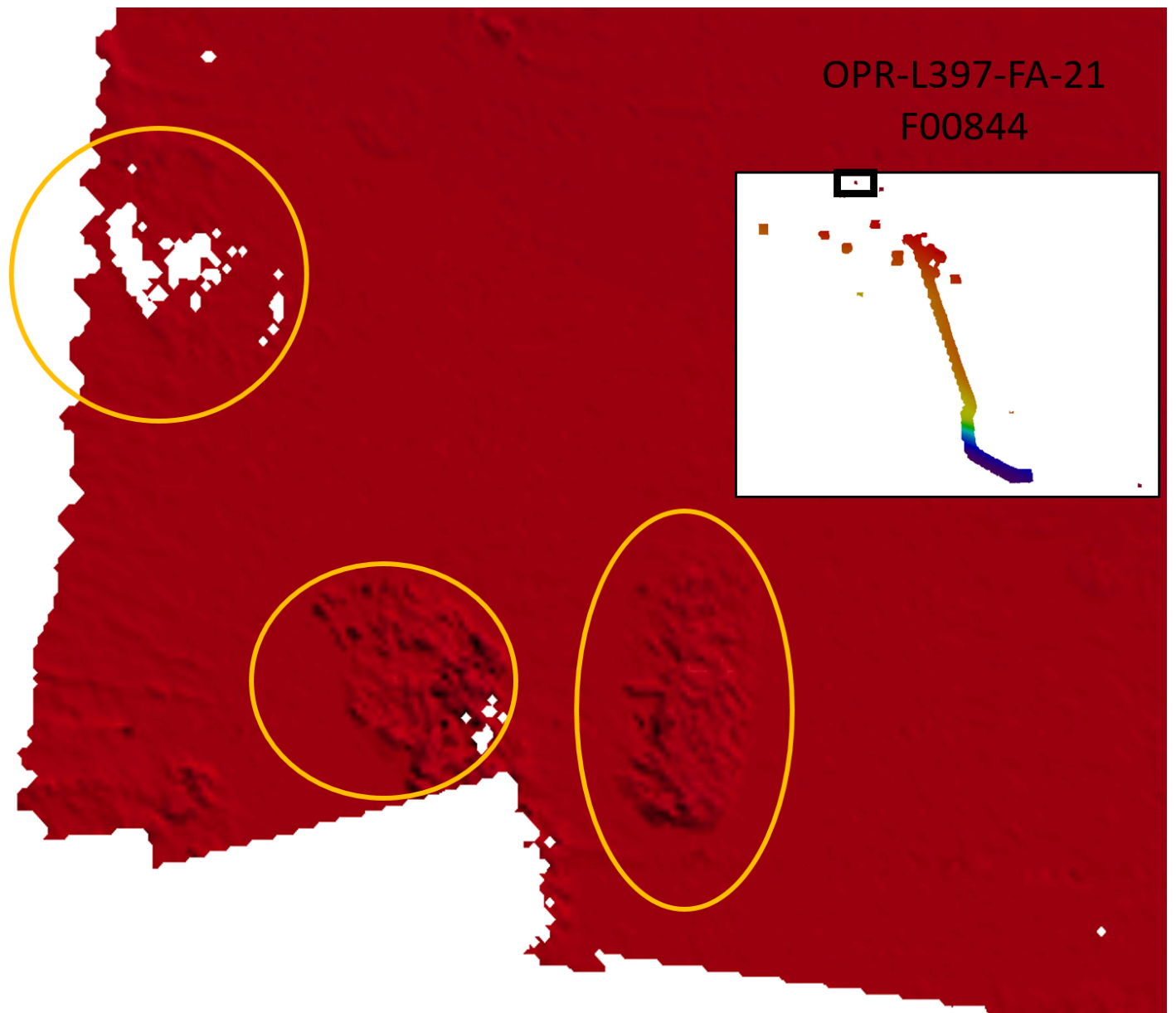


Figure 8: Indiscernible man-made or biological features on seafloor

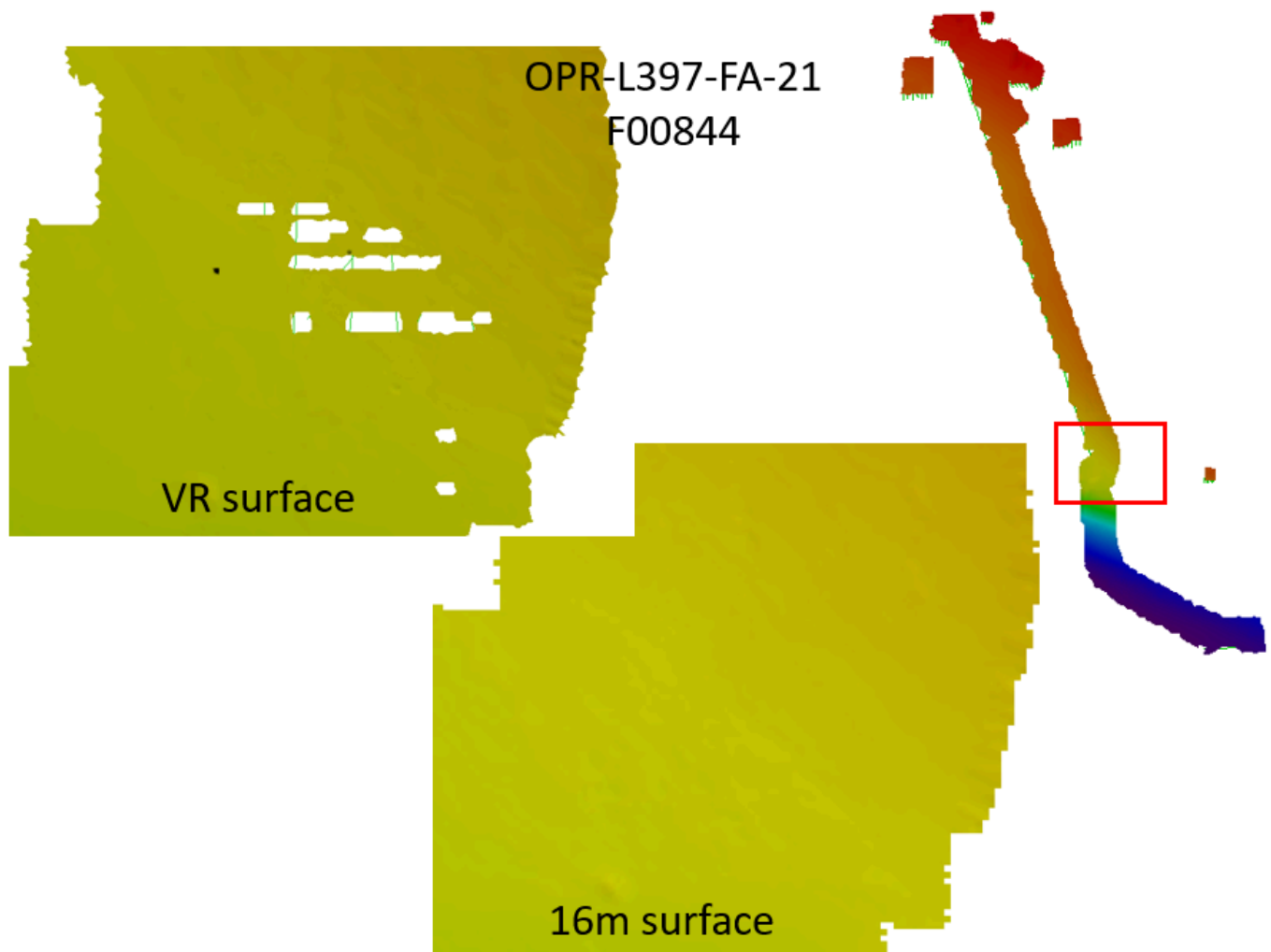


Figure 9: Holidays in VR surface that are not found in 16m surface. Unclear what causes the lack of display in VR surface

B.2.11 NOAA Allowable Uncertainty

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, over 99.50% of nodes within the surface meet NOAA Allowable Uncertainty specifications for F00844 (Figure 10).

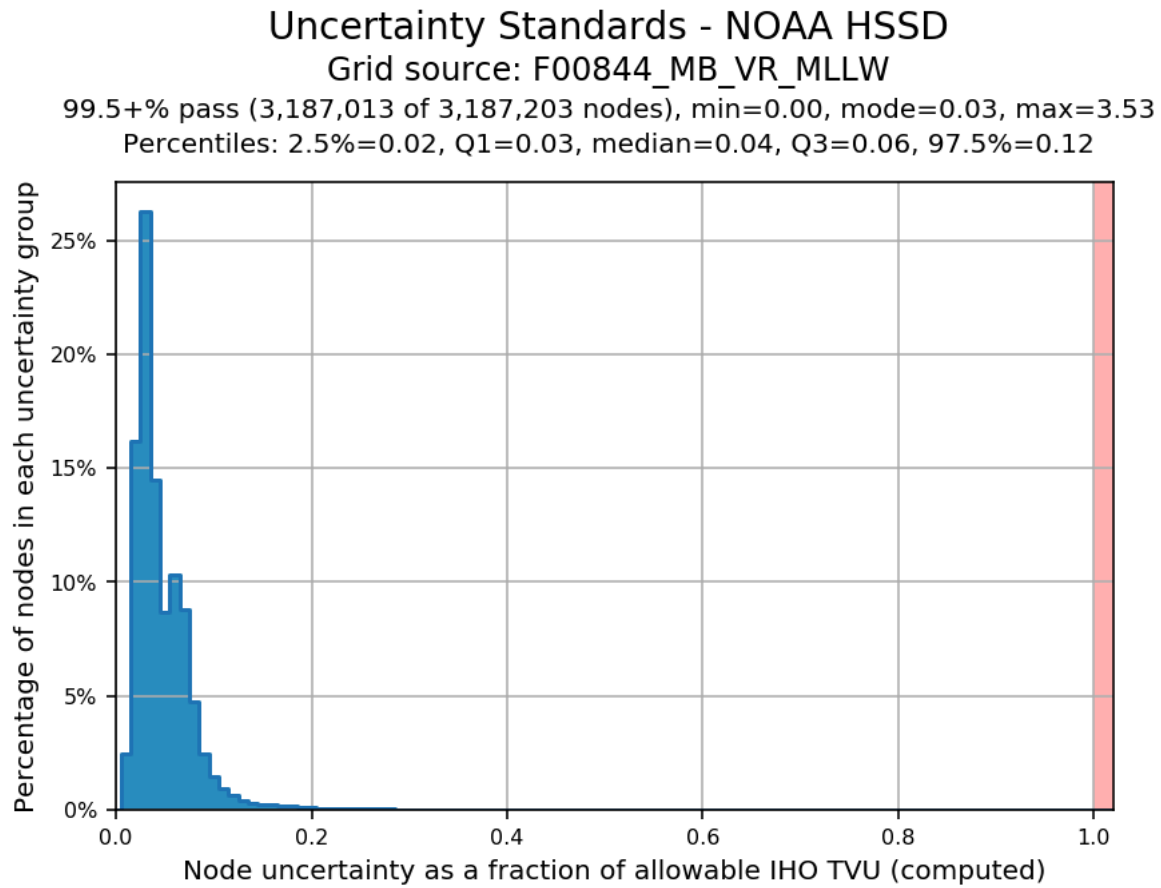


Figure 10: F00844 allowable uncertainty statistics

B.2.12 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Density requirements for F00844 were achieved with at least over 99.50% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.3 (Figure 11).

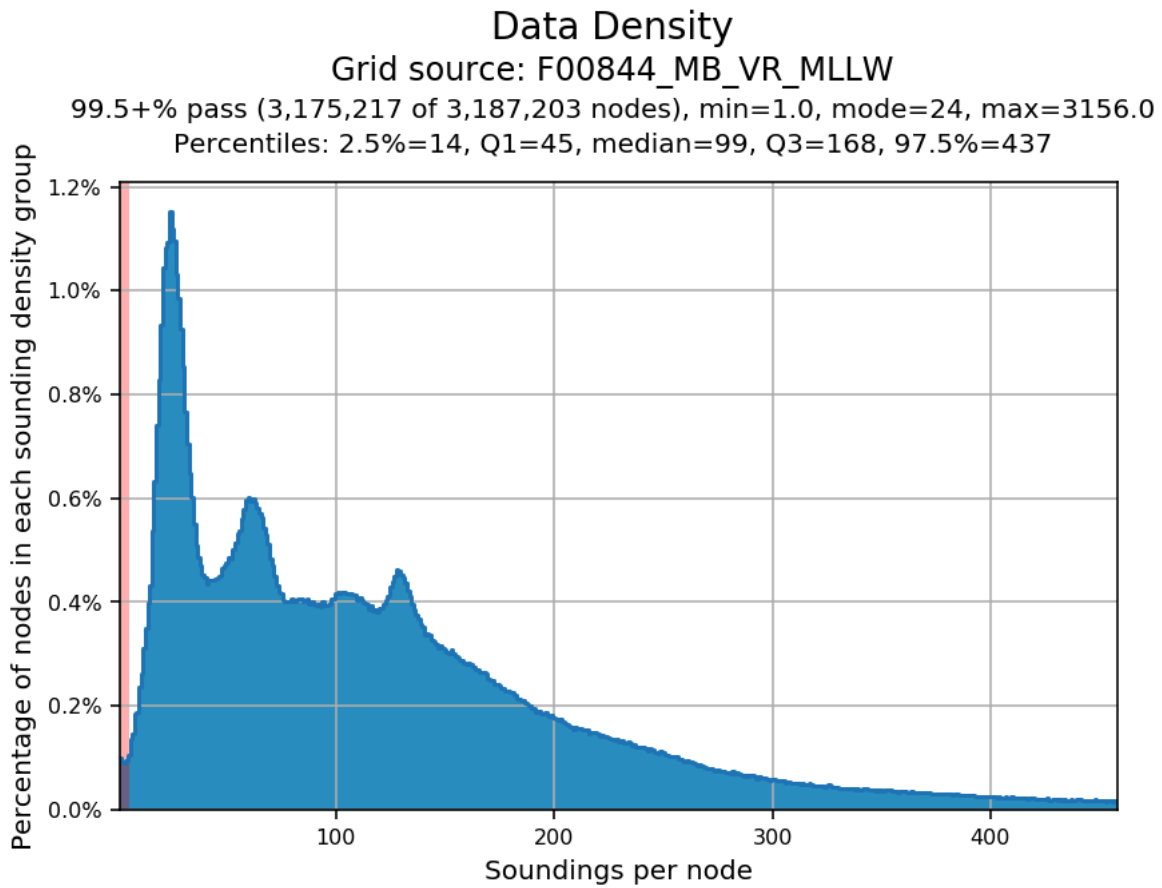


Figure 11: F00844 data density statistics

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data were stored in the .all file for Kongsberg systems. All backscatter were processed to GSF files and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.9.0 . See Figures 12, 13, and 14 for a greyscale representation of the complete mosaic.

A relative backscatter calibration was performed by the field unit via a backscatter calibration site in order to bring the survey systems on each of the launches into alignment. See Figure 15 for a table of the calibration values entered into the Processing Settings within FMGT. Approximate inter-calibration corrections for offsets between EM 2040 sonar systems were applied to the mosaic.

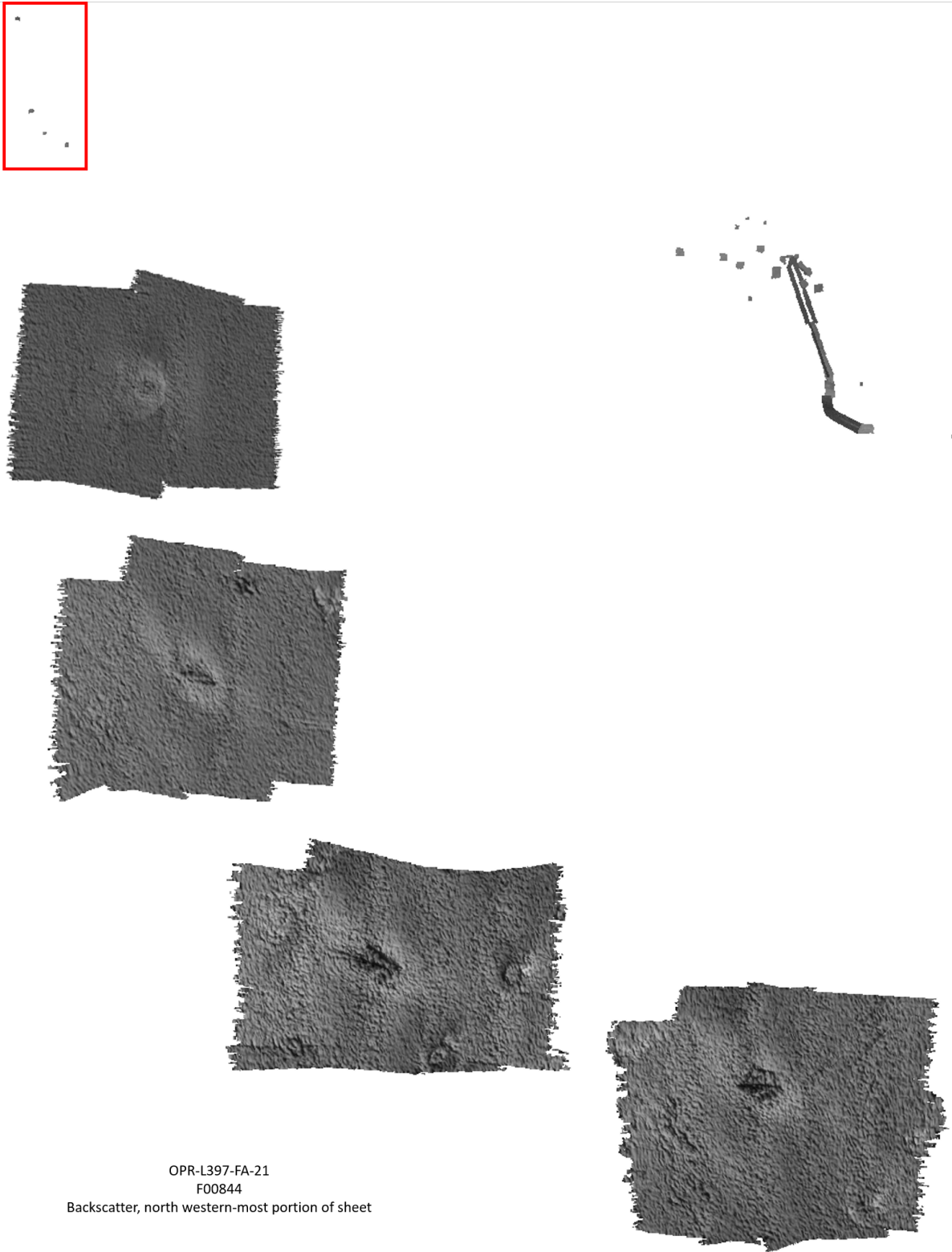


Figure 12: Backscatter, north western-most portion of sheet

OPR-L397-FA-21
F00844
Backscatter, north-most portion of the southeastern
portion of the sheet

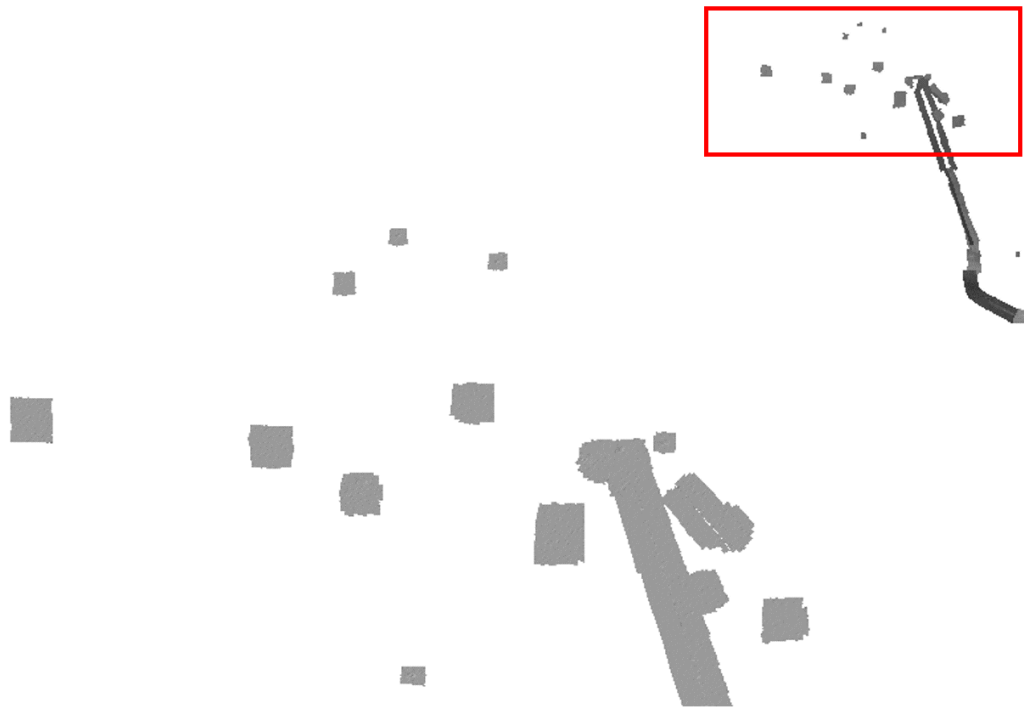


Figure 13: Backscatter, north-most portion of the southeastern portion of the sheet

OPR-L397-FA-21
F00844
Backscatter, south-most portion of the southeastern
portion of the sheet

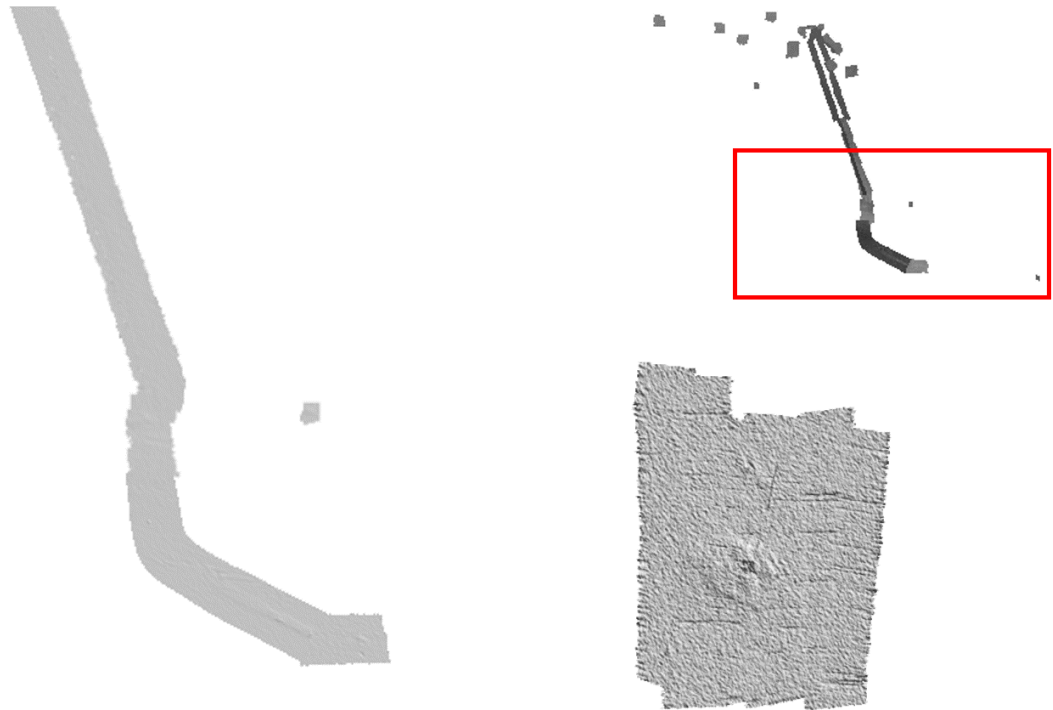


Figure 14: Backscatter, south-most portion of the southeastern portion of the sheet

	200				300				400		
	Short CW	Med CW	Long CW	FM (Both)	Short CW	Med CW	Long CW	FM (Both)	Short CW	Med CW	Long CW
2805	0.6	0.3	0.0	0.0	0	0.45	0.9	0	-1.2	-0.75	-0.3
2806	-	-	-	-	-	-	-	-	-	-	-
2807	0.6	0.45	0.3	0.6	-0.9	-0.45	0	-1.2	0.3	0.75	1.2
2808	1.5	1.2	0.9	0.6	-0.3	0.15	0.6	0	-2.4	-1.5	-0.6

Figure 15: Backscatter calibration values

The backscatter data was re-processed during office review and does not reflect the calibration that was noted in this section. New GSF files and mosaics were produced using FMGT 7.9.6.

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 and SIPS	11.3

Table 9: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus	7.9.0

Table 10: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2021.

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
F00844_MB_VR_MLLW.csar	CARIS VR Surface (CUBE)	Variable Resolution	22.7 meters - 240.3 meters	NOAA_VR	Object Detection
F00844_MB_VR_MLLW_Final.csar	CARIS VR Surface (CUBE)	Variable Resolution	22.7 meters - 240.3 meters	NOAA_VR	Object Detection

Table 11: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for F00844. The surfaces have been reviewed where noisy data, or "fliers" are incorporated into the gridded solutions causing the surface to be shoaler or deeper than the true sea floor. Where these spurious soundings cause the gridded surface to vary from the reliably measured seabed by greater than the maximum allowable Total Vertical Uncertainty at that depth, the noisy data have been rejected by the hydrographer and the surface recomputed.

Flier Finder, part of the QC Tools package within HydrOffice, was used to assist the search for spurious soundings following gross cleaning. Flier Finder was run iteratively until all remaining flagged fliers were deemed to be valid aspects of the surface.

C. Vertical and Horizontal Control

Per Section 5.2.2.1.3 of the 2020 Field Procedures Manual no Horizontal and Vertical Control Report has been generated for F00844.

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-L397-FA-21_100m_NAD83_2011- MLLW_geoid18.csar

Table 12: ERS method and SEP file

ERS methods were used as the final means of reducing F00844 to MLLW for submission.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD 83).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 11.

The following PPK methods were used for horizontal control:

- RTX

Vessel kinematic data were post-processed using Applanix POSPac processing software and RTX positioning methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all MBES data in CARIS HIPS and SIPS.

WAAS

During real-time acquisition, all platforms received correctors from the Wide Area Augmentation System (WAAS) for increased accuracies similar to USCG DGPS stations. WAAS and SBETs were the sole methods of positioning for F00844 as no DGPS stations were available for real-time horizontal control.

D. Results and Recommendations

D.1 Chart Comparison

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
US3CA69M	1:232188	26	01/18/2022	01/18/2022
US4CA68M	1:100000	17	11/18/2022	01/09/2023
US5CA65M	1:50000	47	09/13/2021	11/18/2021

Table 13: 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 charted features are attributed in the Final Feature File.

During survey operations a mischarted pipeline was discovered in the survey area. A seep and pipeline reporting PDF with the updated pipeline location can be found in supplemental records.

D.1.4 Uncharted Features

Survey F00844 has six new features that are addressed in the F00844 Final Feature File. These six features are all new offshore platforms (OFSPLF). These offshore platforms were already charted, but MBES revealed a more accurate placement of their position.

D.1.5 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines 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

No bottom samples were required for this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

There are 24 pipelines and 1 submarine cable within the F00844 survey. Nine of these pipelines as well as the singular submarine cable are either fully or partially visible in the MBES data. There is no indication of the other 14 pipelines in the MBES data. MBES data was collected for a significant portion of PIPSOL 0681. Analysis of the surface and backscatter revealed that the charted pipeline is partially mis-positioned. That pipeline is recommended for deletion and a new pipeline (PIPSOL 0258) which more accurately fits the surface was created.

D.2.6 Platforms

There are 17 platforms within the F00844 survey. Six were repositioned to an area that more accurately describes their location on the chart. The rest were retained as charted.

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 present or planned construction or dredging exist within the survey limits.

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 Specifications and 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 with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
LTJG Carly Robbins	Operations Officer	05/20/2022	 Digitally signed by ROBBINS.CARLY.A 9534 NN.1555089534 Date: 2022.05.24 07:21:30 -07'00'
CAPT John Lomnicky	Commanding Officer	05/20/2022	 Digitally signed by LOMNICKY.JOHN.JOSEPH.125792 0239 Location: CO, NOAA Ship FAIRWEATHER Date: 2022.05.23 08:07:26 -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