H13324

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13324

LOCALITY

State(s):	California
General Locality:	Channel Islands, CA
Sub-locality:	Smugglers Cove to Bowen Point

2019

CHIEF OF PARTY
CAPT Marc Moser

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13324**

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:	**Channel Islands, CA**
Sub-Locality:	**Smugglers Cove to Bowen Point**
Scale:	**20000**
Dates of Survey:	**10/17/2019 to 10/23/2019**
Instructions Dated:	**08/27/2019**
Project Number:	**OPR-L397-FA-19**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CAPT Marc Moser**
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.

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Descriptive Report to Accompany Survey H13324

Project: OPR-L397-FA-19

Locality: Channel Islands, CA

Sublocality: Smugglers Cove to Bowen Point

Scale: 1:20000

October 2019 - October 2019

NOAA Ship *Fairweather*

Chief of Party: CAPT Marc Moser

A. Area Surveyed

The survey area is located in Channel Islands, California within the sub locality of Smugglers Cove to Bowen Point.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
33° 57' 31.45" N 119° 43' 17.58" W	33° 59' 21.32" N 119° 28' 35.3" W

Table 1: Survey Limits

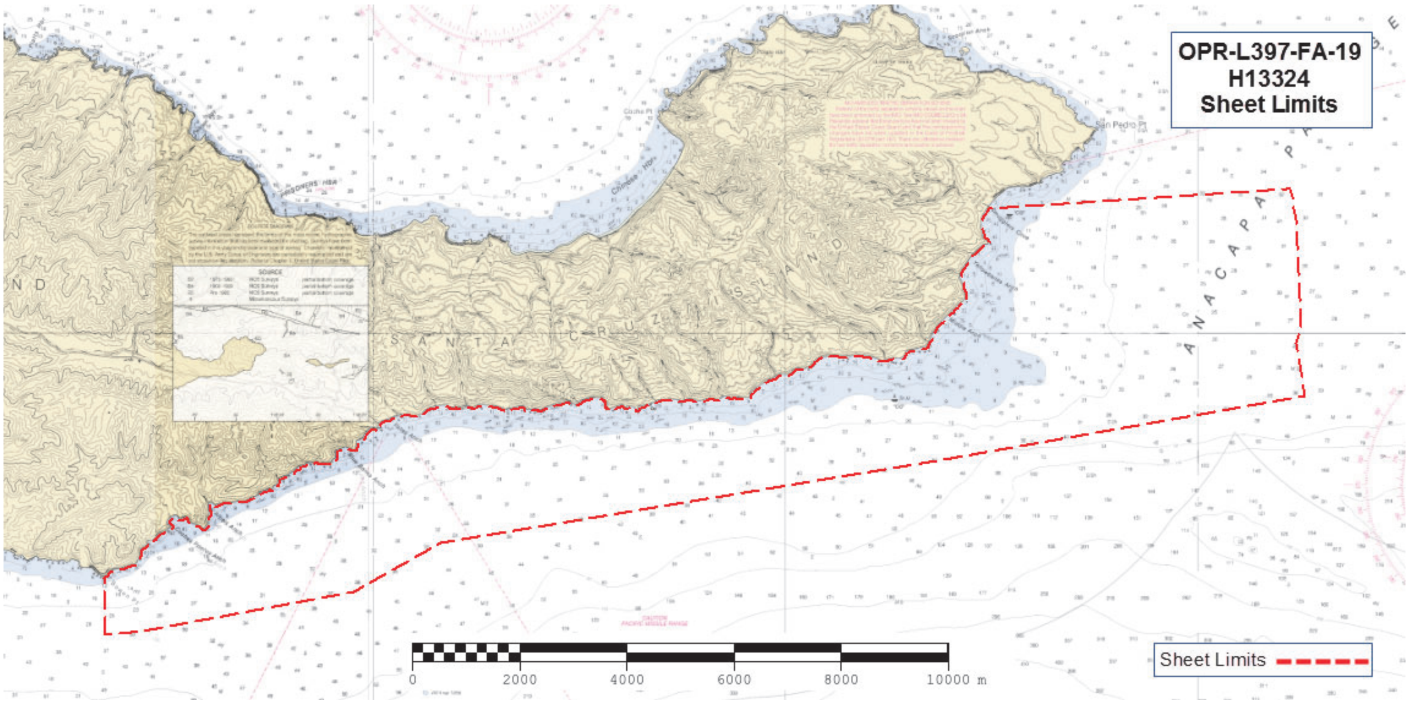


Figure 1: H13324 sheet limits (in red) overlaid onto Charts 18728 and 18729

Data were acquired to the survey limits in accordance with the requirements in the Project Instructions and the March 2019 NOS Hydrographic Surveys Specifications and Deliverables (HSSD). Coverage acquired in H13324 is shown in Figure 1. In all areas where the 3.5 meter depth contour or the sheet limits were not met, the Navigable Area Limit Line (NALL) was defined as the inshore limit of bathymetry due to the risks of maneuvering the survey vessel in close proximity to the steep and rocky shoreline. An example of such an area is shown in Figure 2.

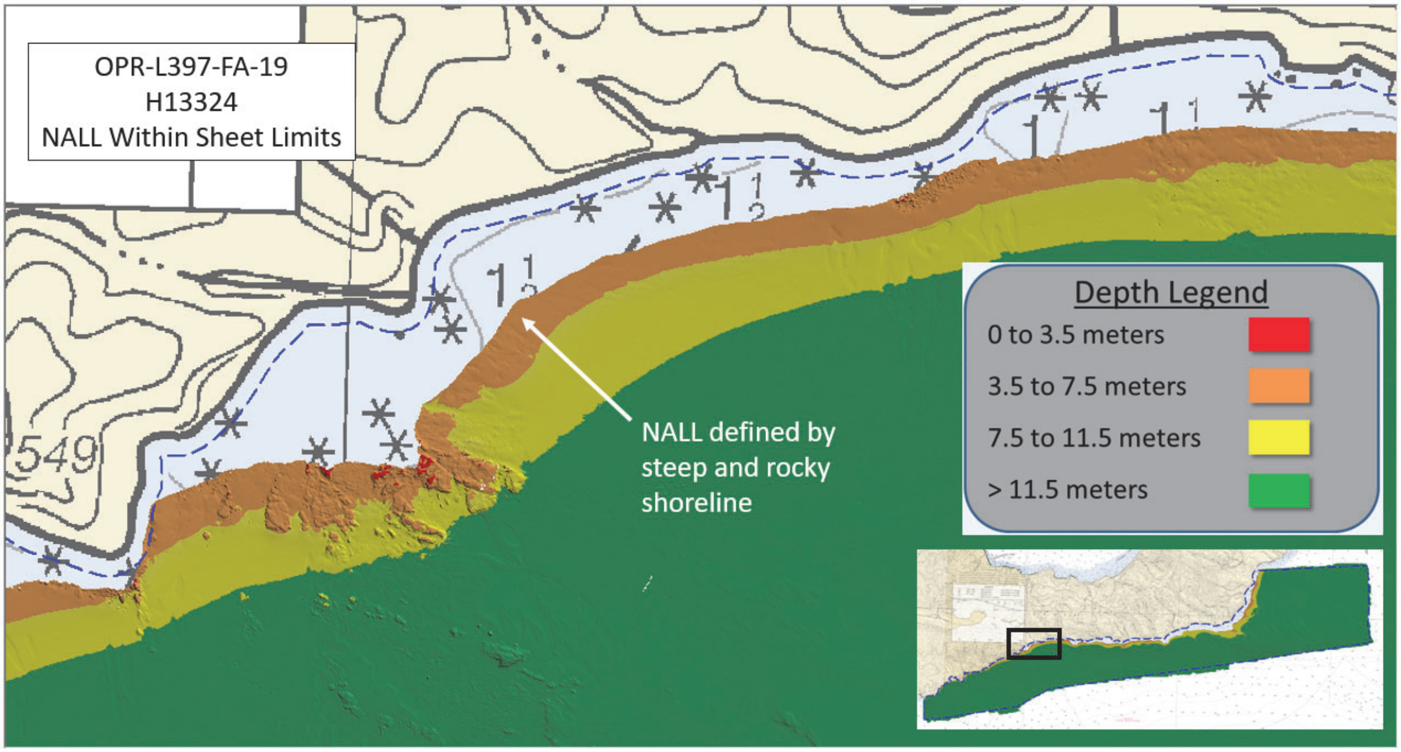


Figure 2: H13324 Area where the NALL was defined by the steep and rocky shoreline

A.2 Survey Purpose

The waters surrounding Channel Islands National Marine Sanctuary (CINMS) are highly productive and are home to recreational and commercial fishing efforts, and regularly hosts 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. The commercial fishing vessel traffic alone is responsible for the highest commercial landings value (approximately $450 million; 2005-2015) across all of California's ports. 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. Much of the existing nautical chart data dates back to 1930s lead line or single beam echo sounder surveys, and the areas not surveyed to modern standards are predominantly located in the shallow waters (<40m) where vessel traffic is highest. This poses a serious risk to life, property, and the delicate ecosystem with 64 groundings since 2000. Increasing traffic is increasing the risk, with seven of those groundings in 2015 alone. Modern survey efforts, such as a 2015 survey by NOAA Ship Bell M. Shimada, have found previously undetected pinnacles within the sanctuary. This survey will continue modern mapping efforts to identify any similar threats that may exist in these waters. The CINMS hydrographic survey will be as unique as the region itself. In addition to providing data for crucial nautical chart updates, this survey will also generate backscatter data, which will be used in habitat mapping and substrate analysis. Both multibeam echo sounder and backscatter data will not only serve to enhance marine navigational safety, but will also be used by sanctuary managers, planners, and researchers, aiding them in the conservation of this most precious resource. 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 H13324 meet multibeam echo sounder (MBES) coverage requirements for complete coverage, as required by the HSSD. This includes crosslines (see Section B.2.1), NOAA allowable uncertainty (see Section B.2.10), and density requirements (see Section B.2.11).

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	Complete Coverage

Table 2: Survey Coverage

H13324 was acquired with complete coverage MBES meeting the requirements listed above and in the HSSD. See Figure 3 for an overview of coverage.

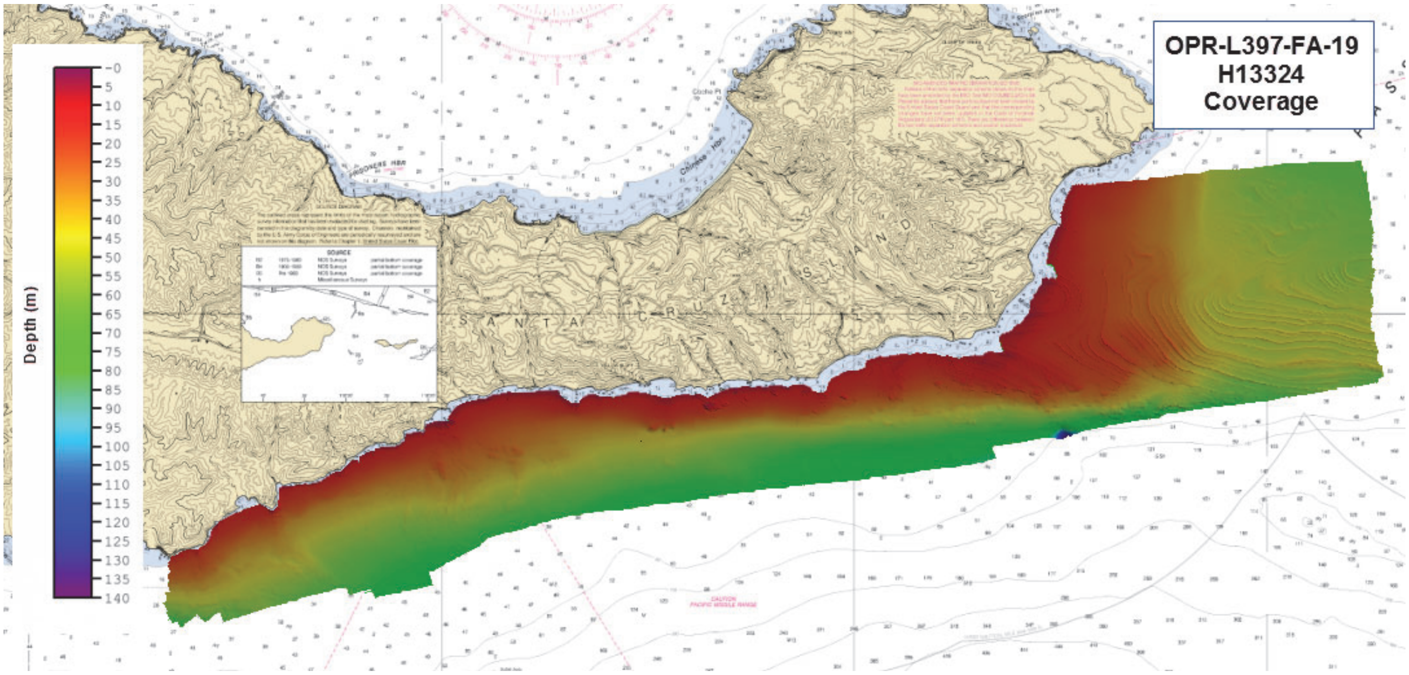


Figure 3: H13324 survey coverage overlaid onto Charts 18728 and 18729

A.6 Survey Statistics

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

	HULL ID	*S220*	*2805*	*2806*	*2807*	*2808*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0	0
	MBES Mainscheme	58.93	65.65	109.65	83.02	72.41	385.78
	Lidar Mainscheme	0	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0	0
	SBES/MBES Crosslines	0	0	0	3.90	0	3.90
	Lidar Crosslines	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							18.22

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/17/2019	290
10/18/2019	291

Survey Dates	Day of the Year
10/19/2019	292
10/20/2019	293
10/23/2019	296

Table 4: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the OPR-L397-FA-19 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	***S220***	***2805***	***2806***	***2807***	***2808***
LOA	70.4 meters	8.6 meters	8.6 meters	8.6 meters	8.6 meters
Draft	4.8 meters	1.1 meters	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg Maritime	EM 710	MBES
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus V2	Conductivity, Temperature, and Depth Sensor
AML Oceanographic	MVP200	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 71	Sound Speed System
Teledyne RESON	SVP 70	Sound Speed System
Applanix	POS MV 320 v5	Positioning and Attitude System

Table 6: Major Systems Used

The equipment was installed on the survey platforms as follows: S220 utilizes the Kongsberg EM 710 MBES, Teledyne RESON SVP 70 surface sound speed sensors, and AML Oceanographic MVP200 for conductivity, temperature, and depth (CTD) casts. All launches utilize Kongsberg EM 2040 MBES, Teledyne RESON SVP 71 surface sound speed sensors, and Sea-Bird Scientific 19plus CTD casts. All MBES survey vessels are equipped with POS MV v5 systems for positioning and attitude.

B.2 Quality Control

B.2.1 Crosslines

Crosslines were collected, processed and compared in accordance with Section 5.2.4.2 of the HSSD, however, the requirement for crossline mileage to be approximately 4% of mainscheme mileage was not met. To evaluate crosslines, a surface generated via data strictly from crosslines were created. From these two surfaces, a difference surface (mainscheme - crosslines = difference surface) was generated (Figure 4), and is submitted in the Separates II Digital Data folder. Statistics show the mean difference between depths derived from mainscheme data and crossline data was -0.01 meters and 95% of nodes falling within +/- 0.13 meters (Figure 5). For the respective depths, the difference surface was compared to the allowable NOAA uncertainty standards. In total, 100% of the depth differences between H13324 mainscheme and crossline data were within allowable NOAA uncertainties.

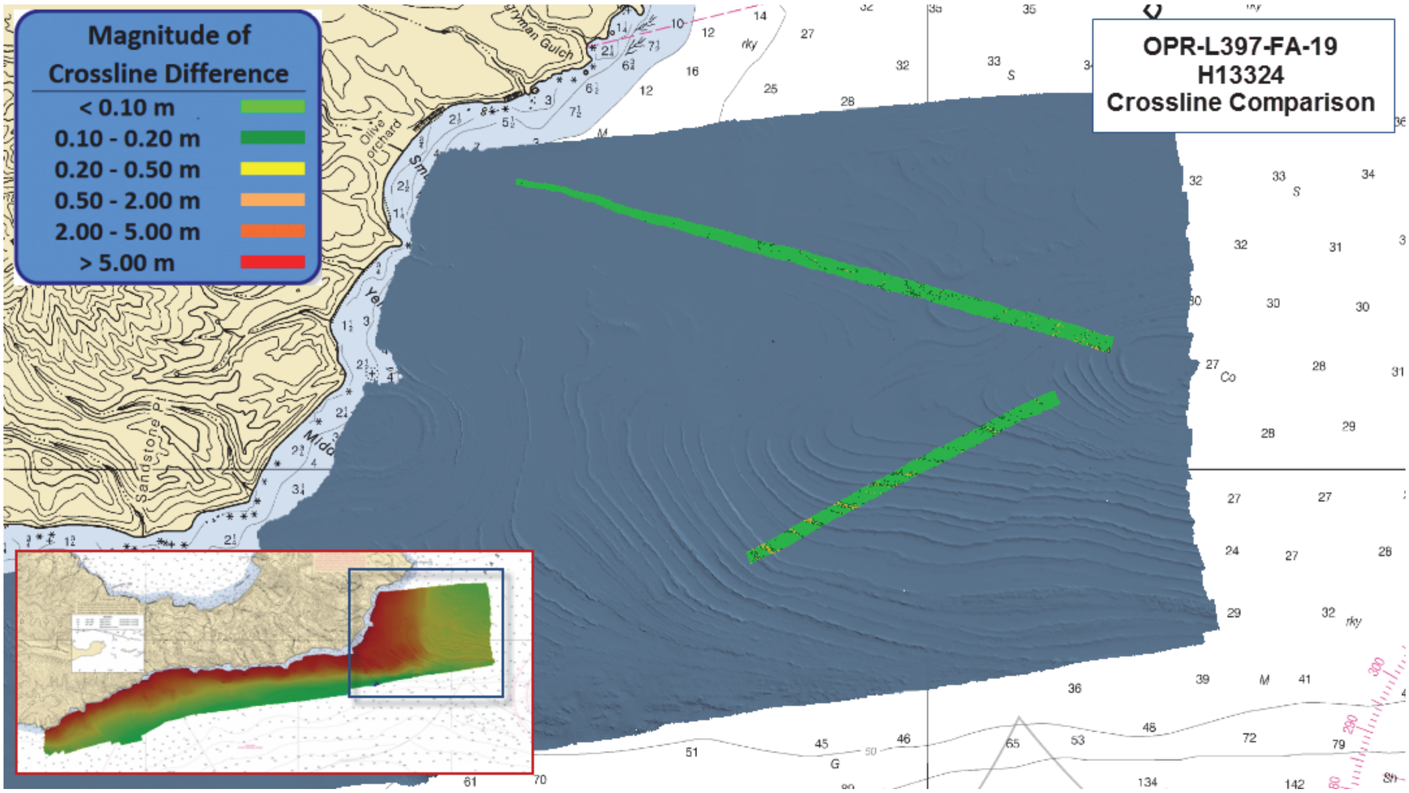


Figure 4: Overview of H13324 crosslines

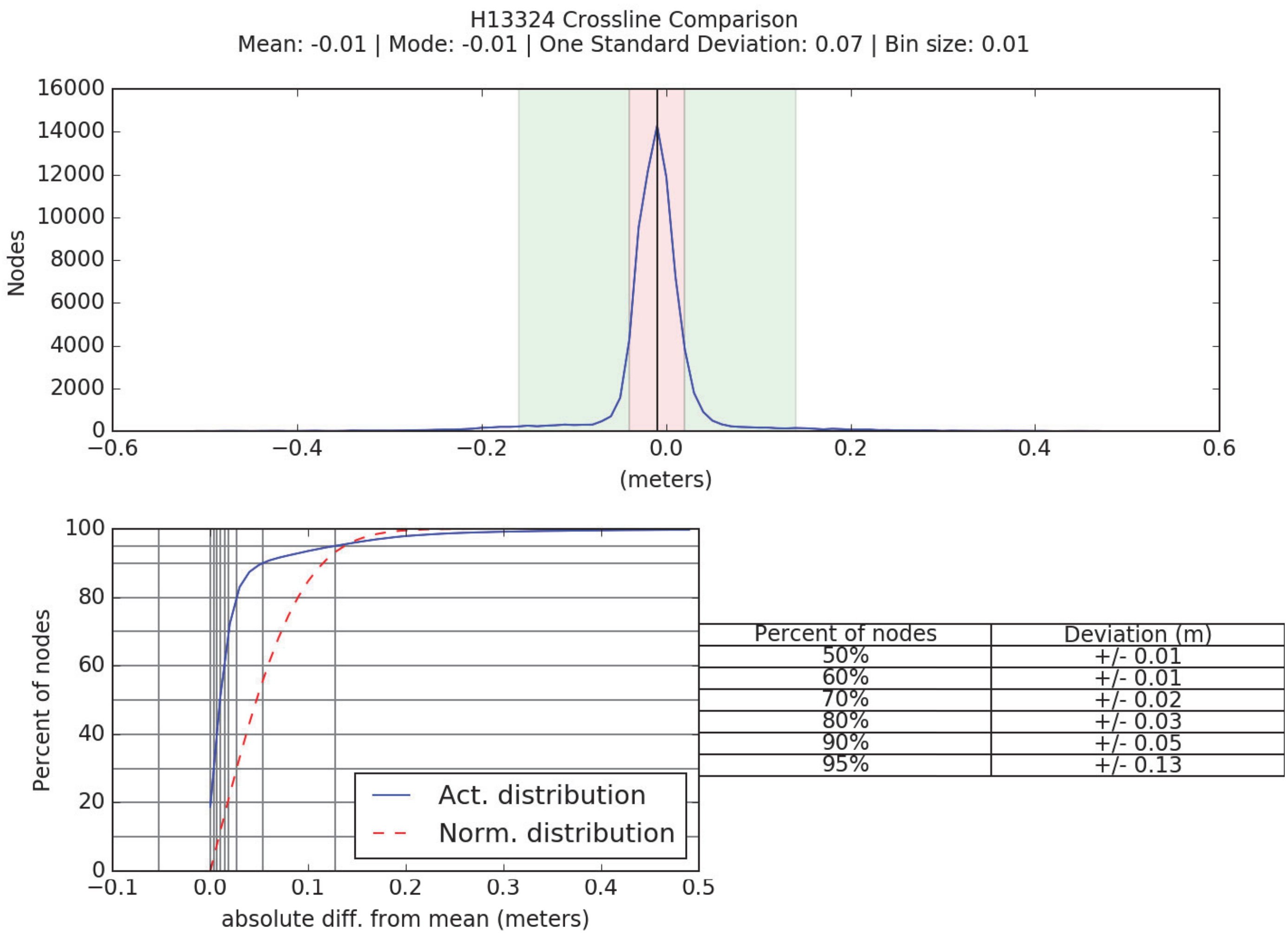


Figure 5: H13324 crossline and mainscheme difference statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.078 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S220	N/A	1 meters/second	0.5 meters/second
280x (all launches)	2 meters/second	N/A	0.5 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

In addition to the usual a priori estimates of uncertainty provided via device models for vessel motion and VDATUM, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of survey H13324. Real-time uncertainties were provided via EM 710 and EM 2040 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.

B.2.3 Junctions

H13324 junctions with two adjacent surveys from this project, H13323 and H13325, and one adjacent survey from a separate project, as shown in Figure 6. Data overlap between H13324 and each adjacent survey was achieved. These areas of overlap between surveys were reviewed in CARIS HIPS and SIPS by surface differencing (at equal resolutions) to assess surface agreement. The multibeam data were also examined in CARIS Subset Editor for consistency and agreement. The junctions with H13324 are generally within the NOAA allowable uncertainty in their areas of overlap. For all junctions with H13324, a negative difference indicates H13324 was shoaler and a positive difference indicates H13324 was deeper.

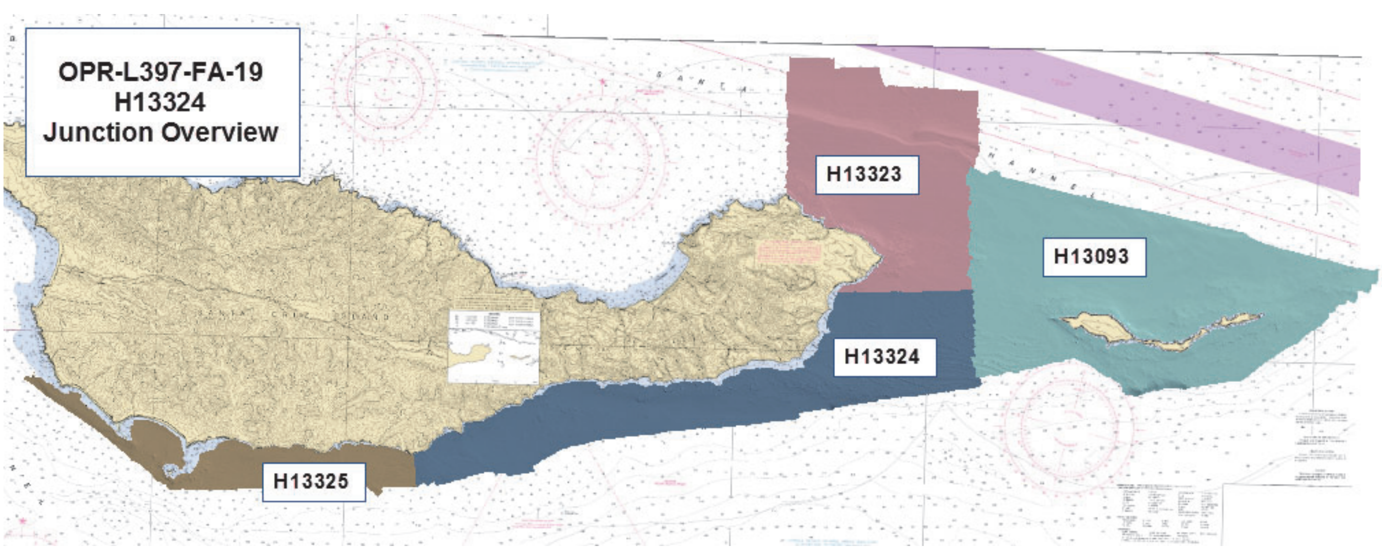


Figure 6: Overview of H13324 junction surveys

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13323	1:20000	2019	NOAA Ship FAIRWEATHER	N
H13325	1:20000	2019	NOAA Ship FAIRWEATHER	W
H13093	1:20000	2017	NOAA Ship RAINIER	E

Table 9: Junctioning Surveys

H13323

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the variable resolution surface from H13324 and the variable resolution surface from H13323 (Figure 7). The statistical analysis of the difference surface shows a mean of -0.04 meters with 95% of the nodes having a maximum deviation of +/- 0.29 meters, as seen in Figure 8. It was found that 99.5+% of nodes are within NOAA allowable uncertainty.

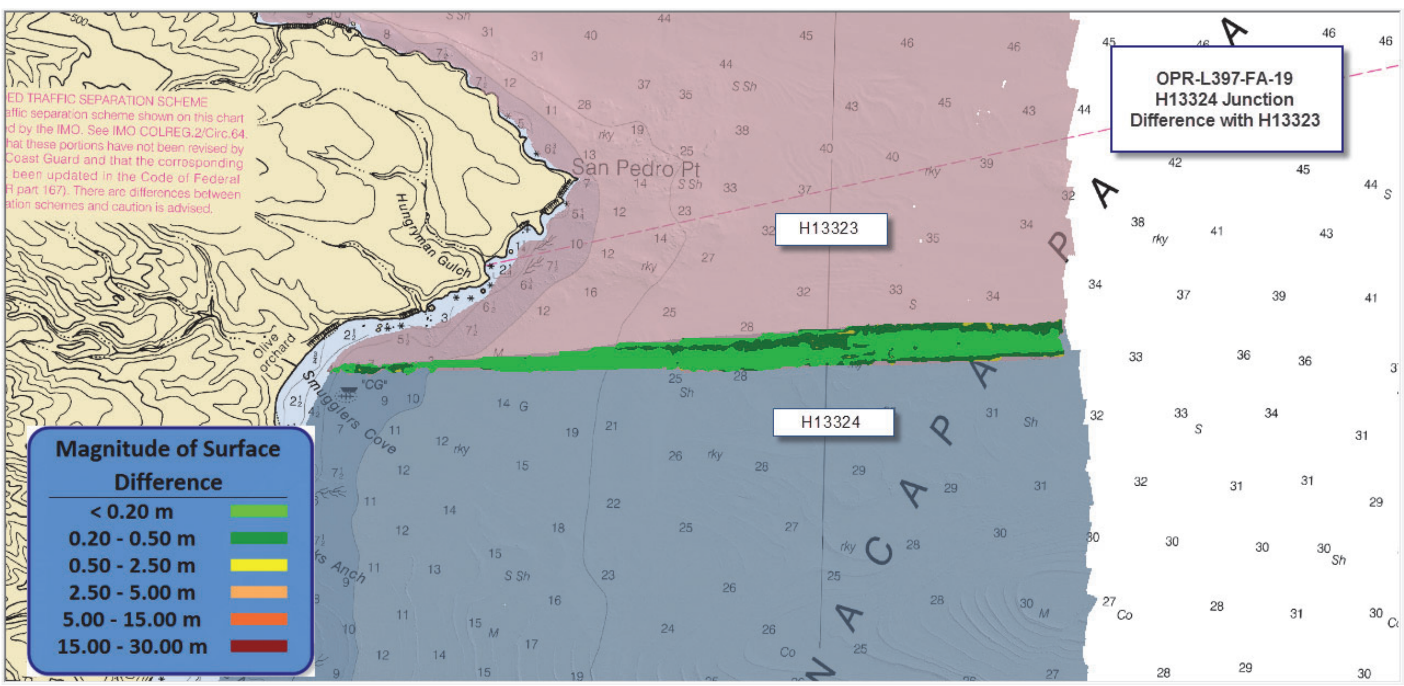
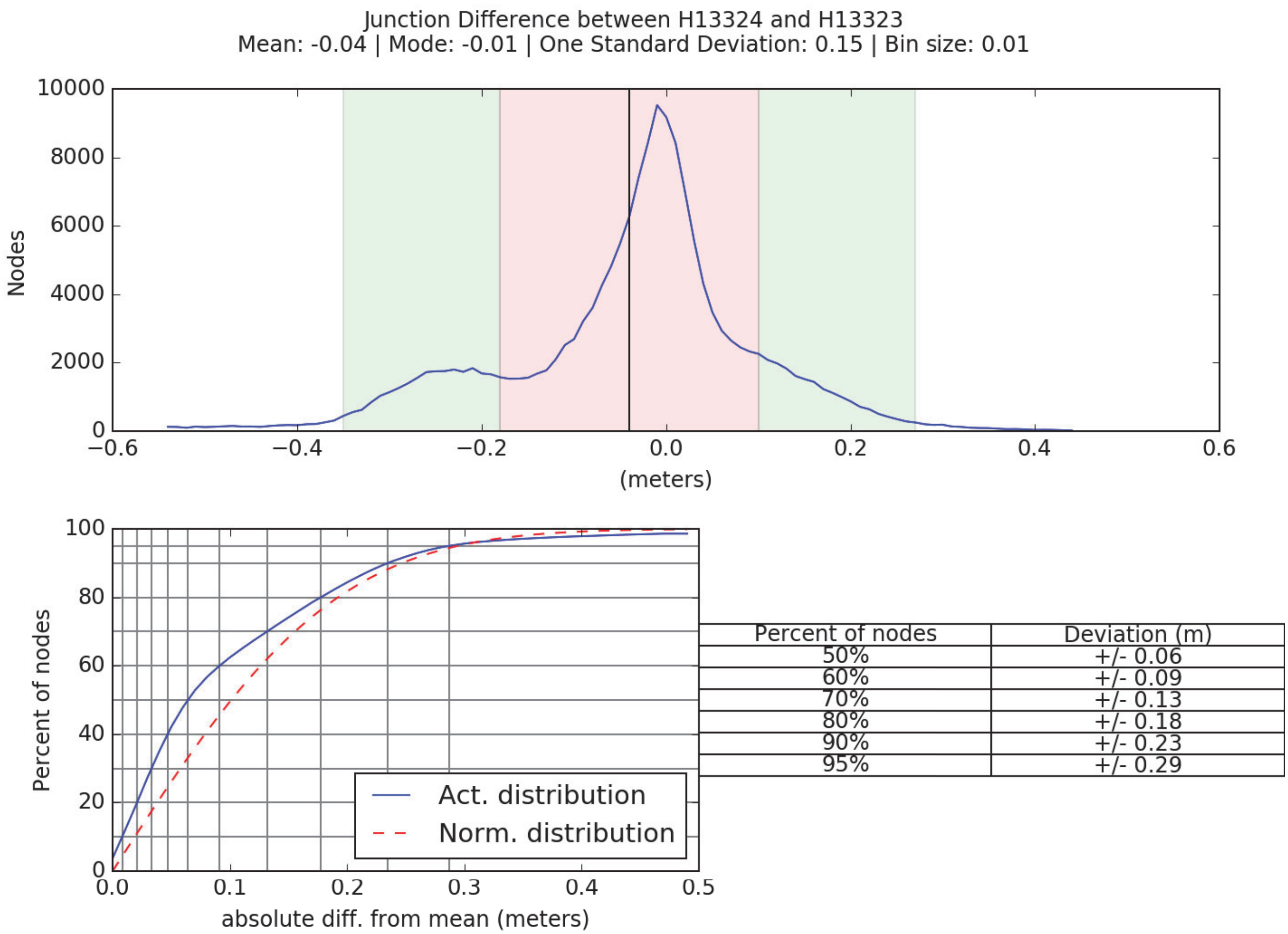


Figure 7: Difference surface between H13324 (blue) and junctioning survey H13323 (pink)



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.09
70%	+/- 0.13
80%	+/- 0.18
90%	+/- 0.23
95%	+/- 0.29

Figure 8: Difference surface statistics between H13324 and H13323

<u>H13325</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the variable resolution surface from H13324 and the variable resolution surface from H13325 (Figure 9). The statistical analysis of the difference surface shows a mean of -0.03 meters with 95% of the nodes having a maximum deviation of +/- 0.21 meters, as seen in Figure 10. It was found that 99.5+% of nodes are within NOAA allowable uncertainty.

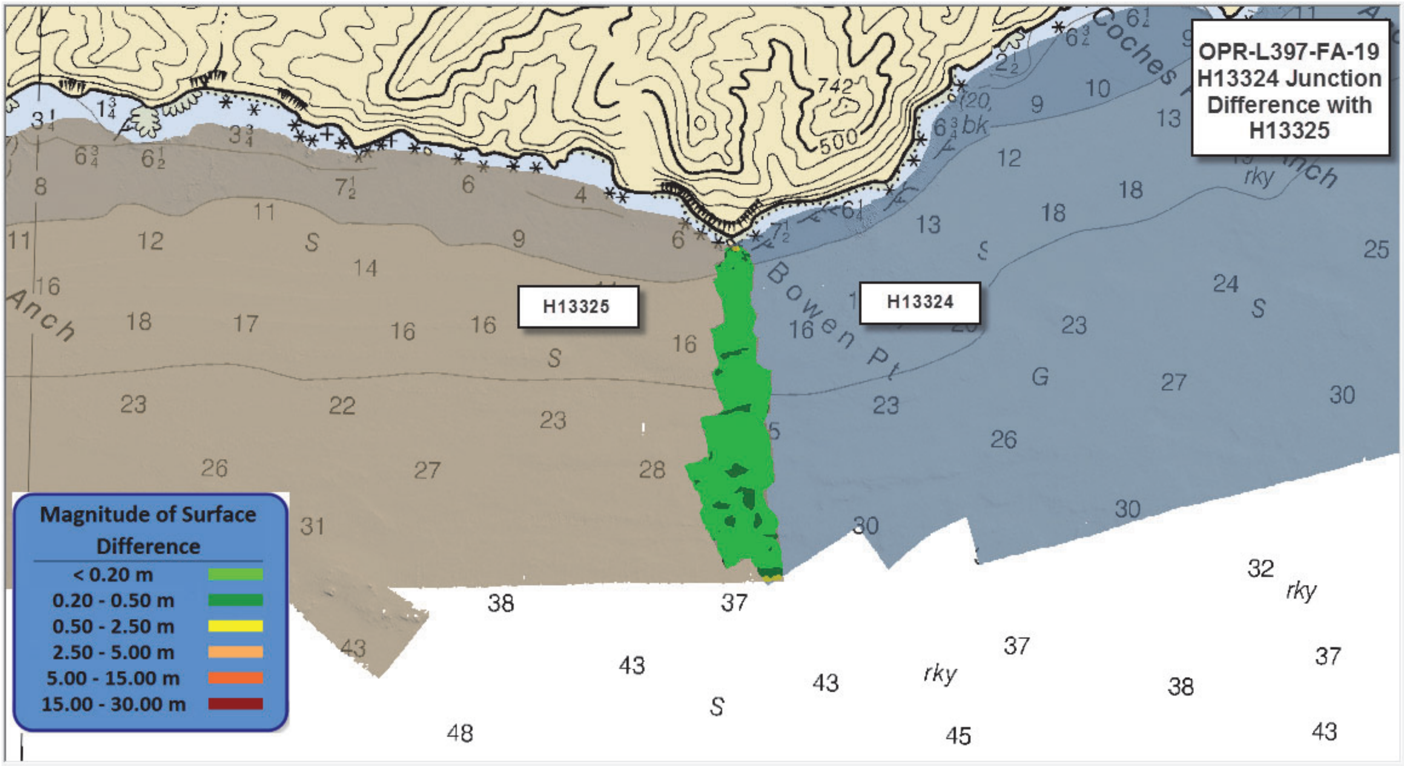
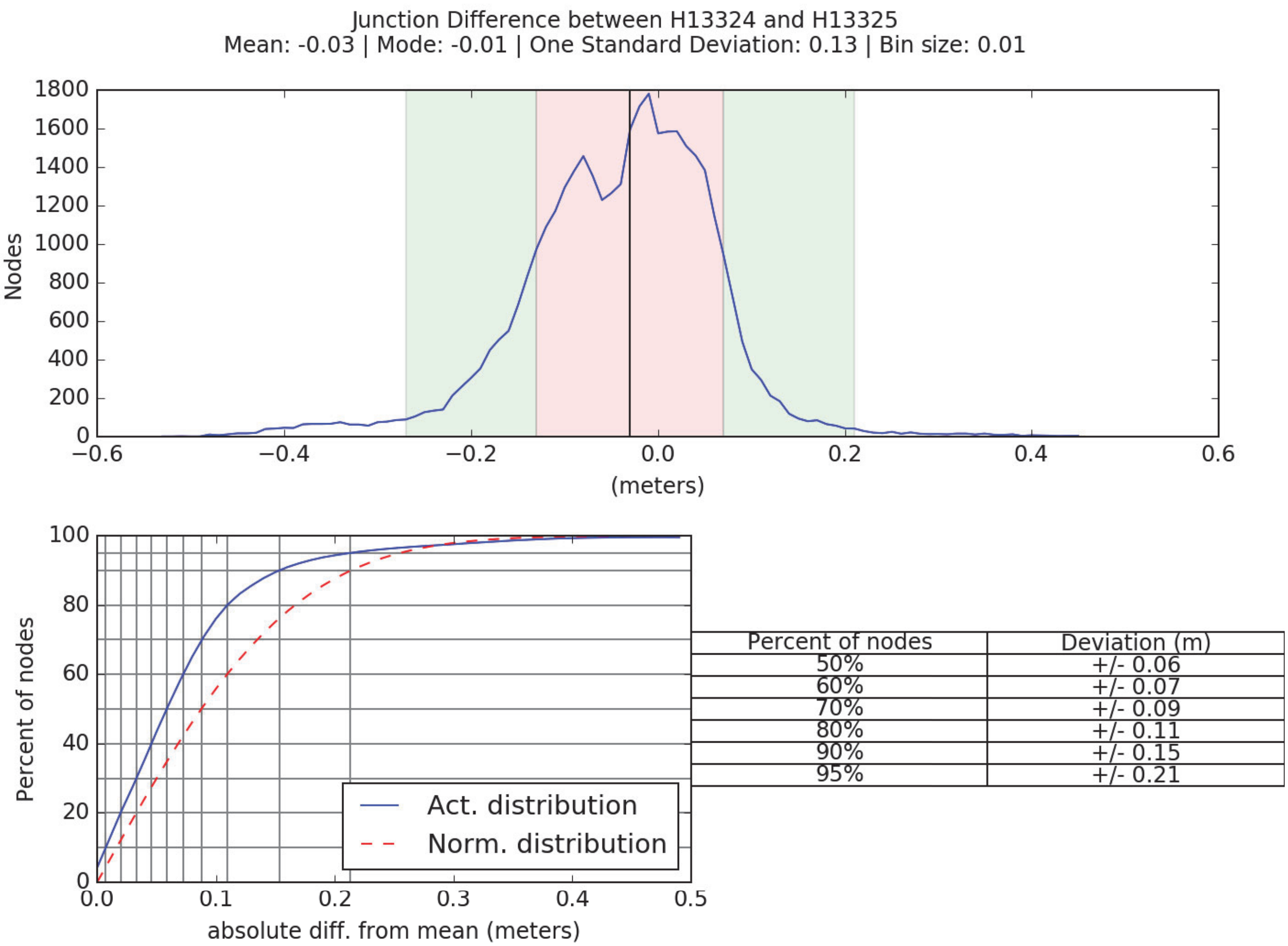


Figure 9: Difference surface between H13324 (blue) and H13325 (brown)



Percent of nodes	Deviation (m)
50%	+/- 0.06
60%	+/- 0.07
70%	+/- 0.09
80%	+/- 0.11
90%	+/- 0.15
95%	+/- 0.21

Figure 10: Difference surface statistics between H13324 and H13325

<u>H13093</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between the variable resolution surface from H13324 and the variable resolution surface from H13093 (Figure 11). The statistical analysis of the difference surface shows a mean of 0.13 meters with 95% of the nodes having a maximum deviation of +/- 0.38 meters, as seen in Figure 12. It was found that 99.5% of nodes are within NOAA allowable uncertainty.

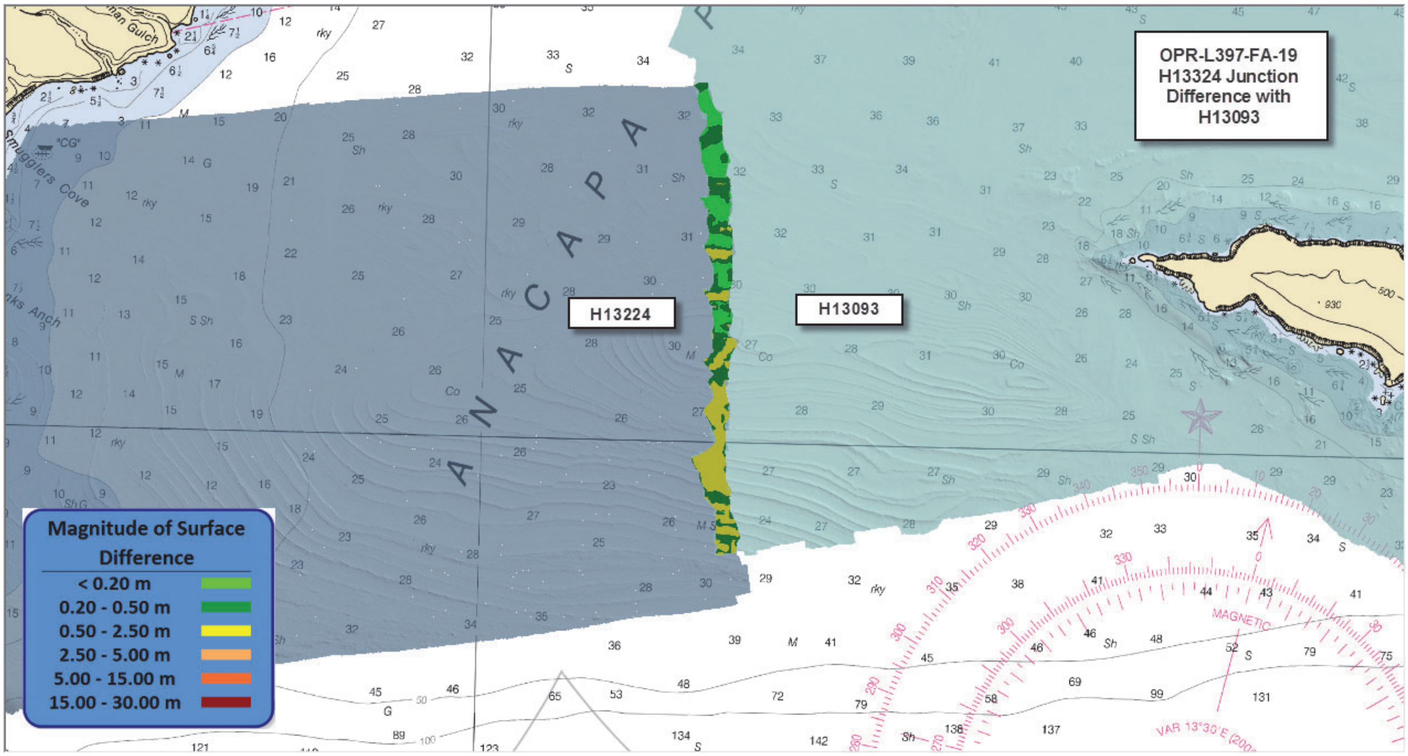
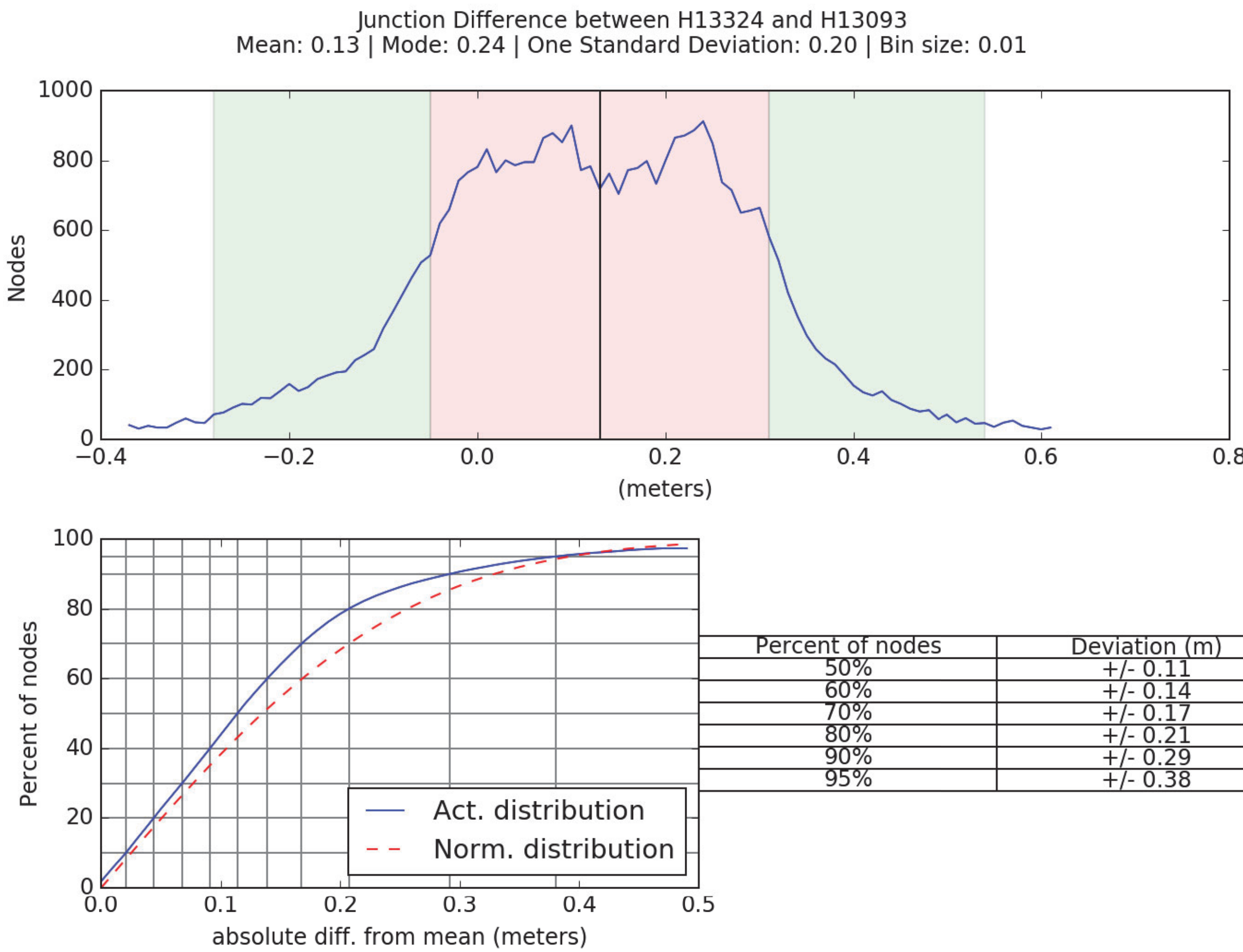


Figure 11: Difference surface between H13324 (blue) and H13093 (green)



Percent of nodes	Deviation (m)
50%	+/- 0.11
60%	+/- 0.14
70%	+/- 0.17
80%	+/- 0.21
90%	+/- 0.29
95%	+/- 0.38

Figure 12: Difference surface statistics between H13324 and H13093

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

<u>Sound Speed Issues</u>

In certain areas, particularly the inshore areas of the survey, sound speed issues were apparent, visible primarily as "frowns" (see Figure 13). Given the location of the issues, the most probable cause is subsurface mixing that was not modeled on the surface. Surfaces were not significantly impacted and the data still meet NOAA allowable uncertainty parameters from HSSD Section 5.1.3. As such, the data remain sufficient to supersede previous data.

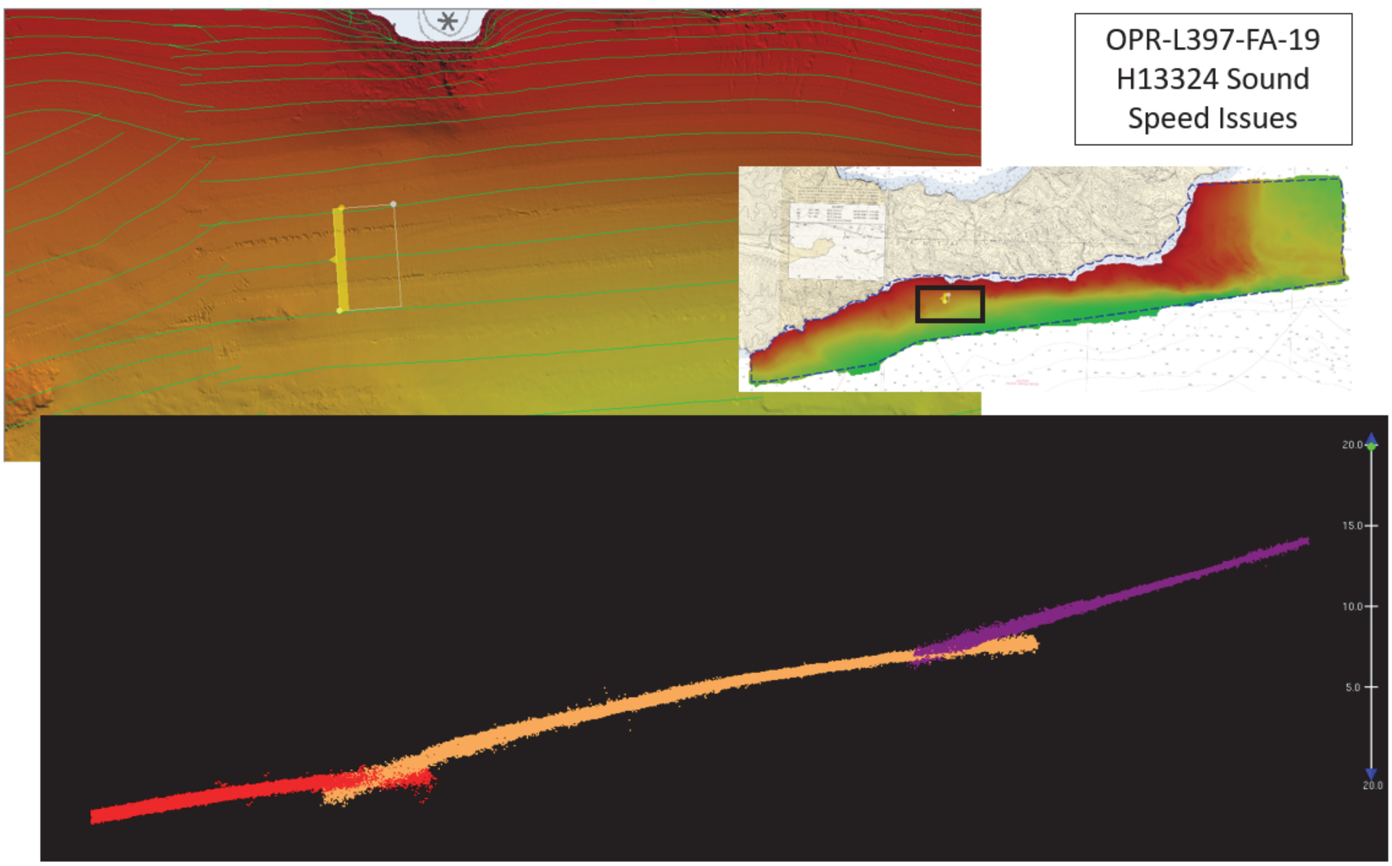


Figure 13: Example of sound speed issues visible in data (surface exaggerated 20x in subset editor)

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 there was a change in the surface sound speed greater than two meters per second. MVP casts on S220 were conducted at an average interval of 1 hour, guided by observation of the surface sound speed and targeted to deeper areas. All sound speed methods were used as detailed in the DAPR.

B.2.8 Coverage Equipment and Methods

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

B.2.9 NOAA Allowable Uncertainty

The surface was analyzed using HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Overall, 99.5% of nodes within the surface meet NOAA Allowable Uncertainty specifications for H13324. For a graphical representation of compliance with uncertainty standards, see Figure 14 below.

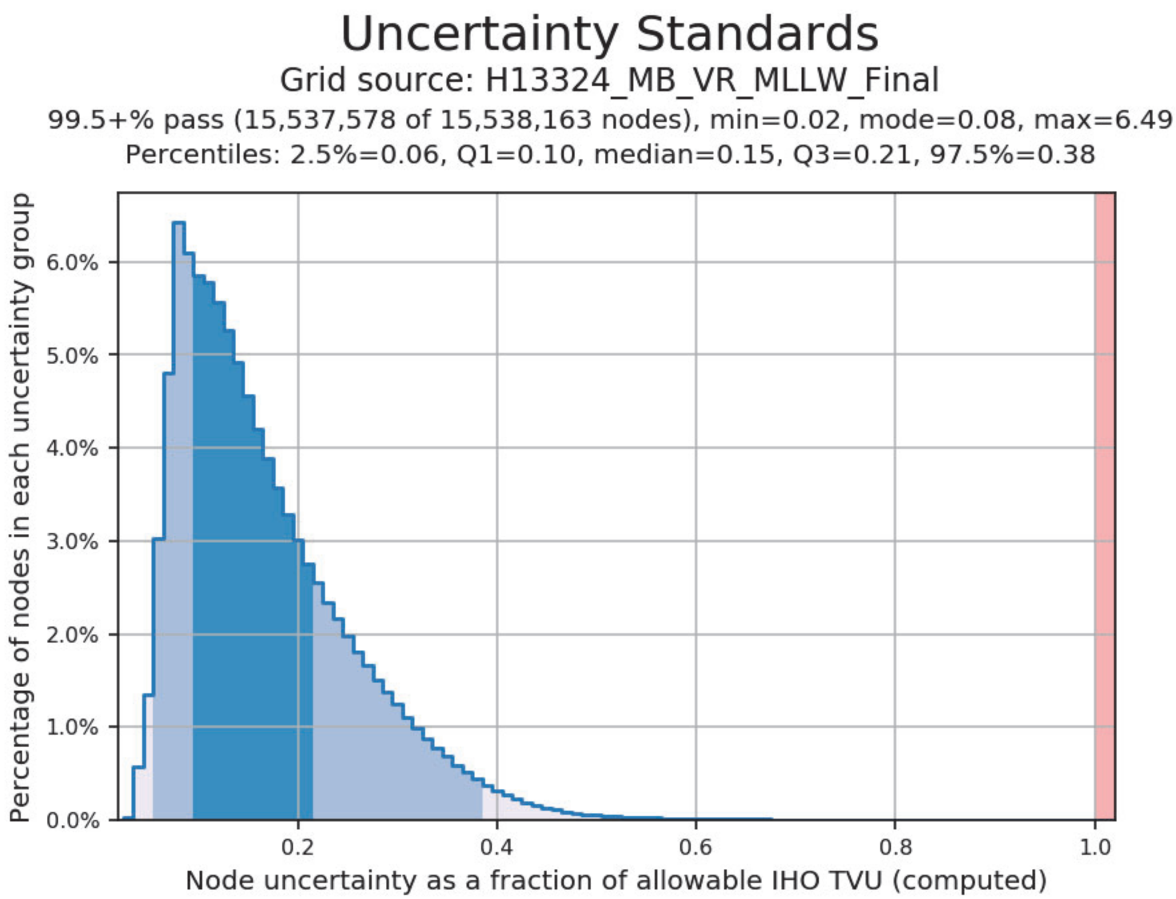


Figure 14: H13324 compliance with uncertainty standards

B.2.10 Density

The surface was analyzed using the HydrOffice QC Tools Grid QA feature to determine compliance with specifications. Density requirements for H13324 were achieved with at least 99.5% of surface nodes containing five or more soundings as required by HSSD Section 5.2.2.4. For a graphical representation of compliance with density requirements, see Figure 15 below.

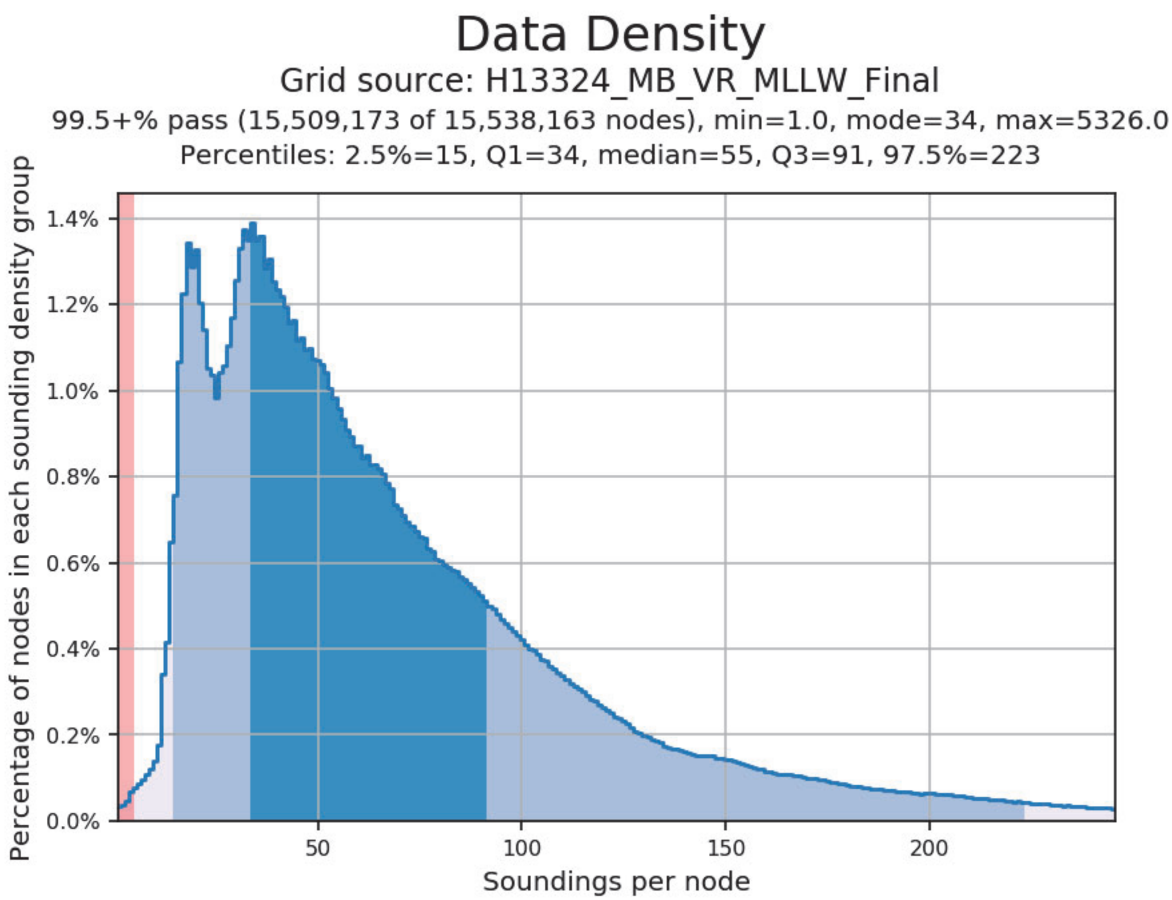


Figure 15: H13324 compliance with density requirements

B.2.11 Holidays

H13324 data were reviewed in CARIS HIPS and SIPS for holidays in accordance with Section 5.2.2.3 of the HSSD. Two holidays which meet the 3 by 3 node definition 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.

One holiday was the result of not achieving enough overlap between lines while the second holiday was the result of a blowout due to weather (Figure 16). Both holidays were unable to be addressed due to weather and time constraints in the project area.

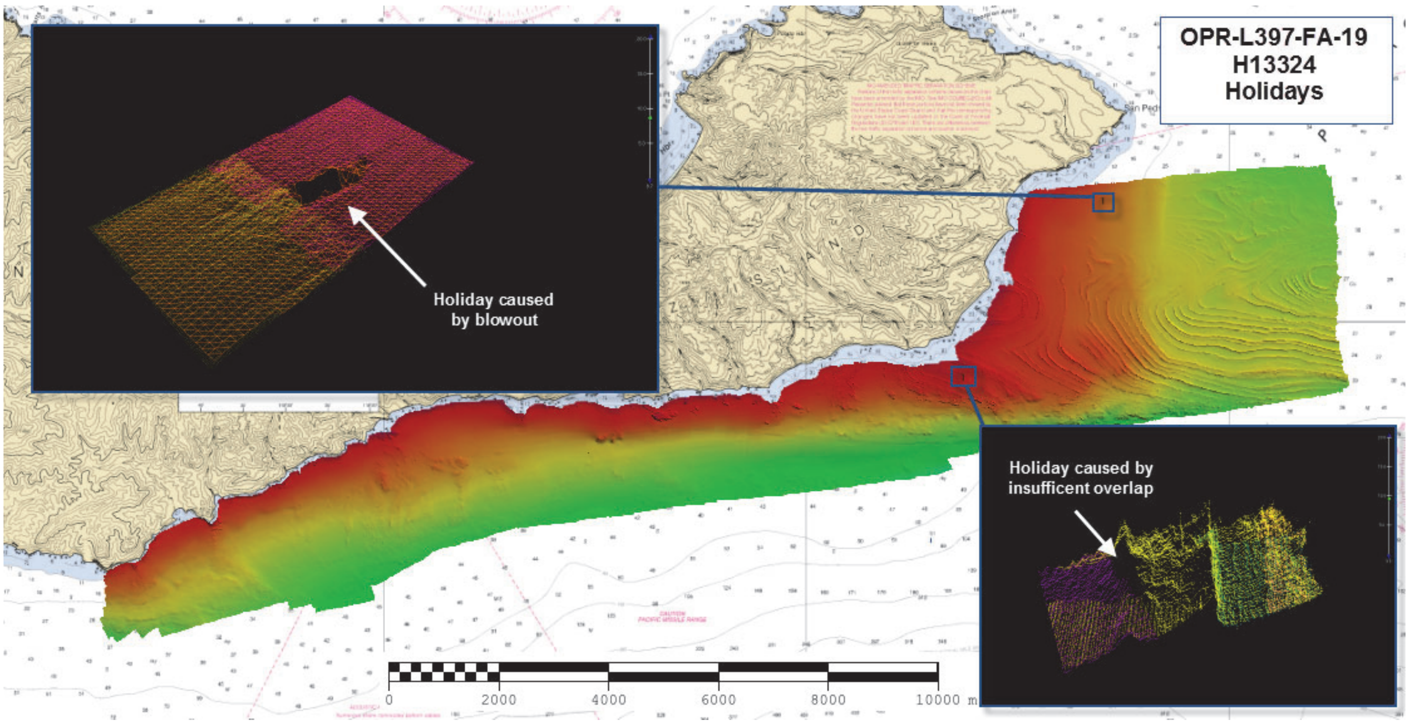


Figure 16: Overview of H13324 holidays

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 were stored in the .all file for Konsgberg systems. All backscatter were processed to GSF files, and a floating point mosaic was created by the field unit via Fledermaus FMGT 7.8.10. See Figure 17 for a greyscale representation of the complete mosaics.

A relative backscatter calibration was performed by HSTB via a patch test in order to bring the survey systems on each of the launches into alignment. See Figure 18 for a table of the calibration values entered into the Processing Settings within FMGT. Approximate inter-calibration corrections for the offsets between sonar systems were applied to the mosaic.

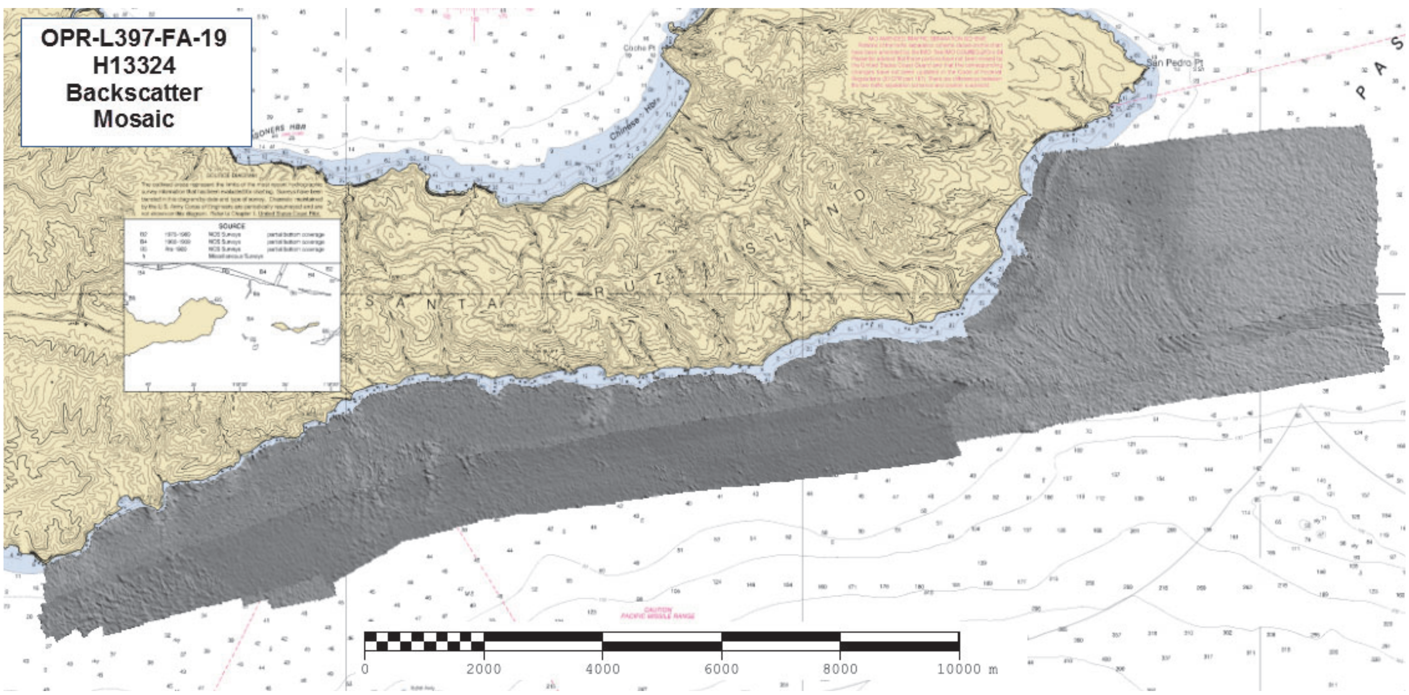


Figure 17: H13324 backscatter mosaic

	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	-1.1	-1.4	-1.8	2.7	-0.7	-0.9	-1.0	-1.4	3	3.9	4.8
2806	1.8	1.8	1.8	2.4	-0.1	-0.3	-0.4	-0.8	3.6	4.65	5.7
2807	-0.3	-0.15	0	0	0	-0.2	-0.3	-0.7	3.3	4.2	5.1
2808	0	0.6	1.2	1.6	-0.3	-0.5	-0.6	-1.0	1.8	2.7	3.6

Figure 18: Backscatter calibration values

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	11.1.3

Table 10: Primary bathymetric data processing software

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

Manufacturer	Name	Version
QPS	Fledermaus	7.8.10

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Profile Version 2019.

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
H13324_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	1.2 meters - 138.3 meters	NOAA_VR	Complete MBES
H13324_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	1.2 meters - 138.3 meters	NOAA_VR	Complete MBES

Table 12: Submitted Surfaces

The NOAA CUBE parameters defined in the HSSD were used for the creation of all CUBE surfaces for H13324. 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 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.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final separation model reduction and sound speed application are noted in the H13324 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

C. Vertical and Horizontal Control

Per section 5.1.2.3 of the 2014 Field Procedures Manual, no Horizontal and Vertical Control Report has been generated for H13324.

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-19_100m_NAD83-MLLW_geoid12a.csar

Table 13: ERS method and SEP file

ERS methods were used as the final means of reducing H13324 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 as 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 H13324 as no DGPS stations were available for real-time horizontal control.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was performed between survey H13324 and ENCs US5CA66M and US5CA67M using CARIS HIPS and SIPS sounding and contour layers derived from the surface. The contours and soundings were overlaid on the chart to visually assess differences between the surveyed soundings and charted depths.

In general, the surveyed soundings agreed with the majority of charted depths. The ENCs were compared to the surface by extracting all soundings from the chart and creating an interpolated TIN surface which could be differenced with the surface from H13324. The resulting surface is in Figure 19.

All data from H13324 should supersede charted data. In general surveyed soundings agree with the majority of charted depths. A full discussion follows below.

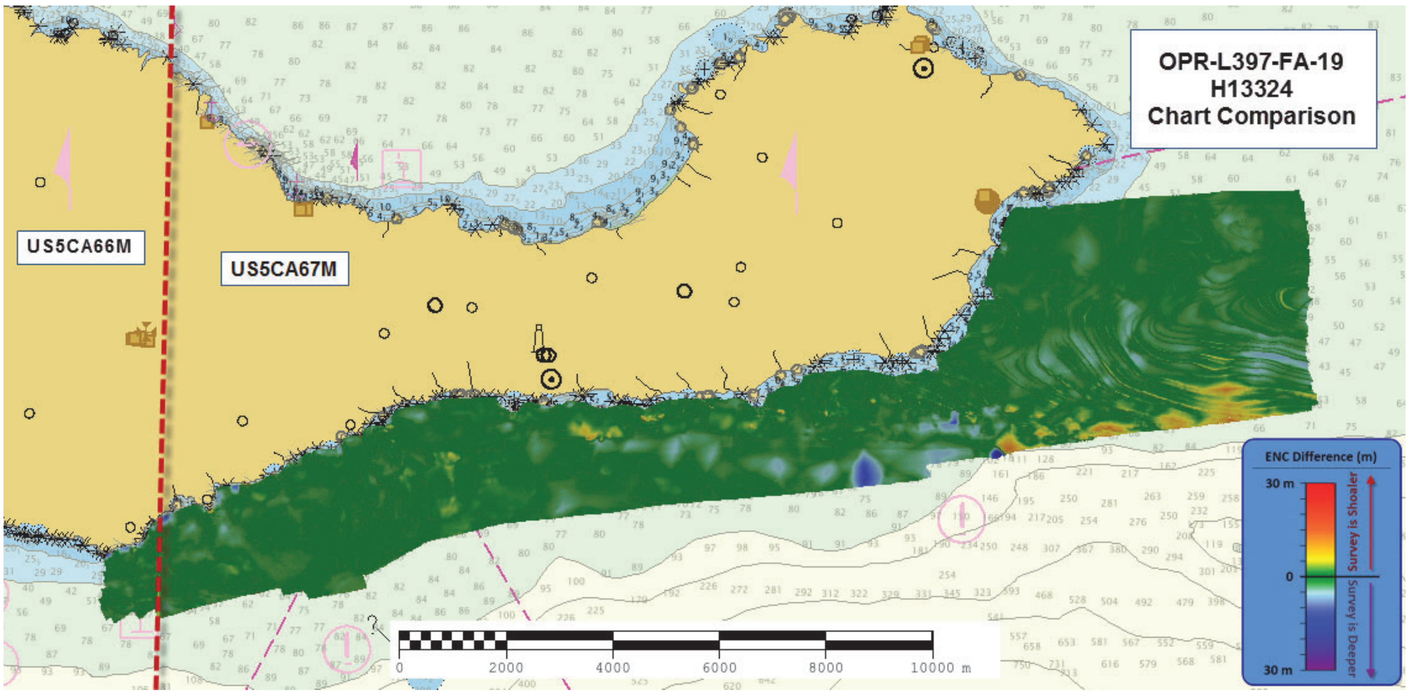


Figure 19: Difference surface between H13324 and interpolated TIN surface from US5CA66M and US5CA67M

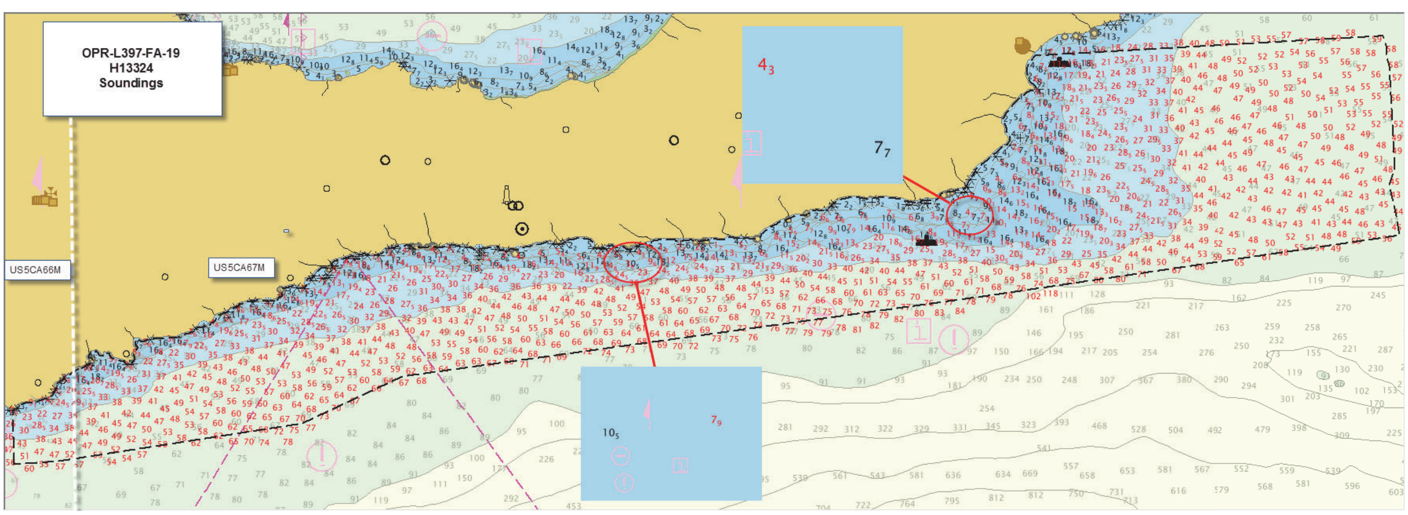


Figure 20: Overview of H13324 soundings (Red) overlaid onto US5CA66M and US5CA67M (Black)

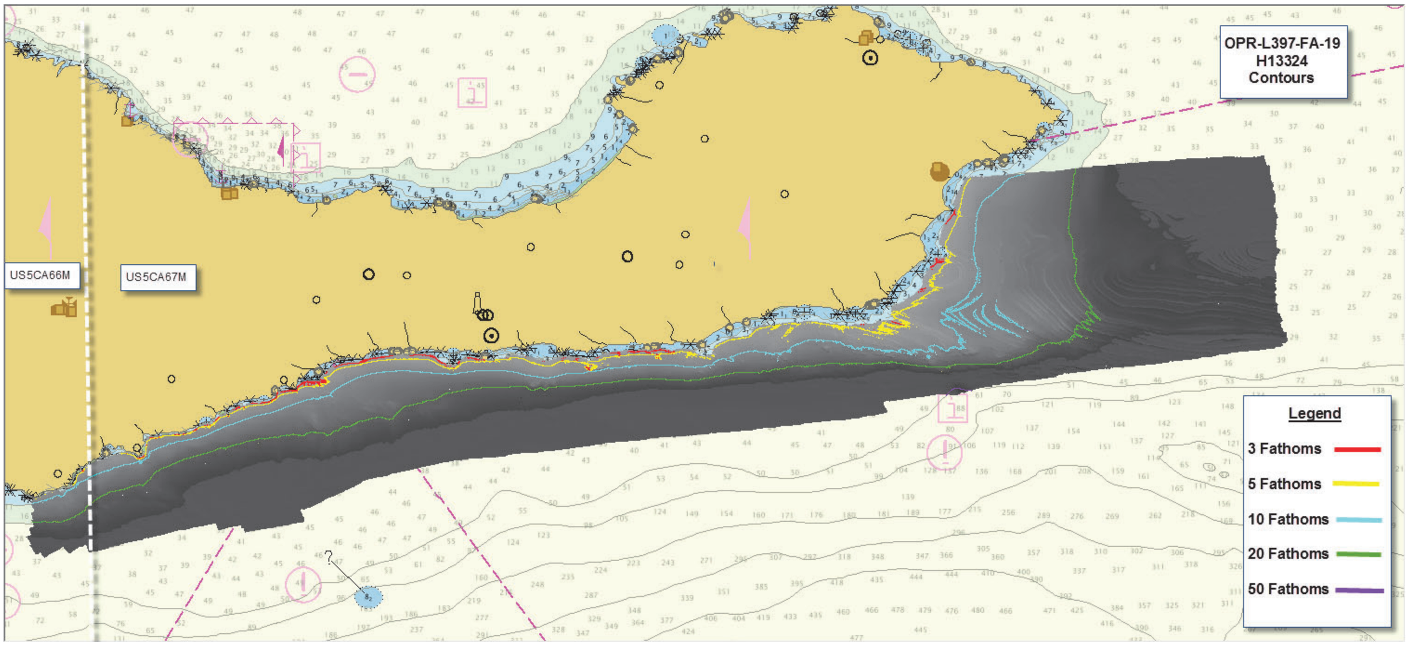


Figure 21: Overview of H13324 contours overlaid onto US5CA66M and US5CA67M

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
US5CA66M	1:40000	6	05/24/2019	10/04/2019
US5CA67M	1:40000	5	06/27/2019	10/04/2019

Table 14: Largest Scale ENCs

D.1.2 Shoal and Hazardous Features

There are rocky areas along the shoreline with some rocks rising as much as six meters off the seafloor, as shown in Figure 24. Caution is advised to mariners in these areas. No Danger to Navigation Reports were submitted for this survey.

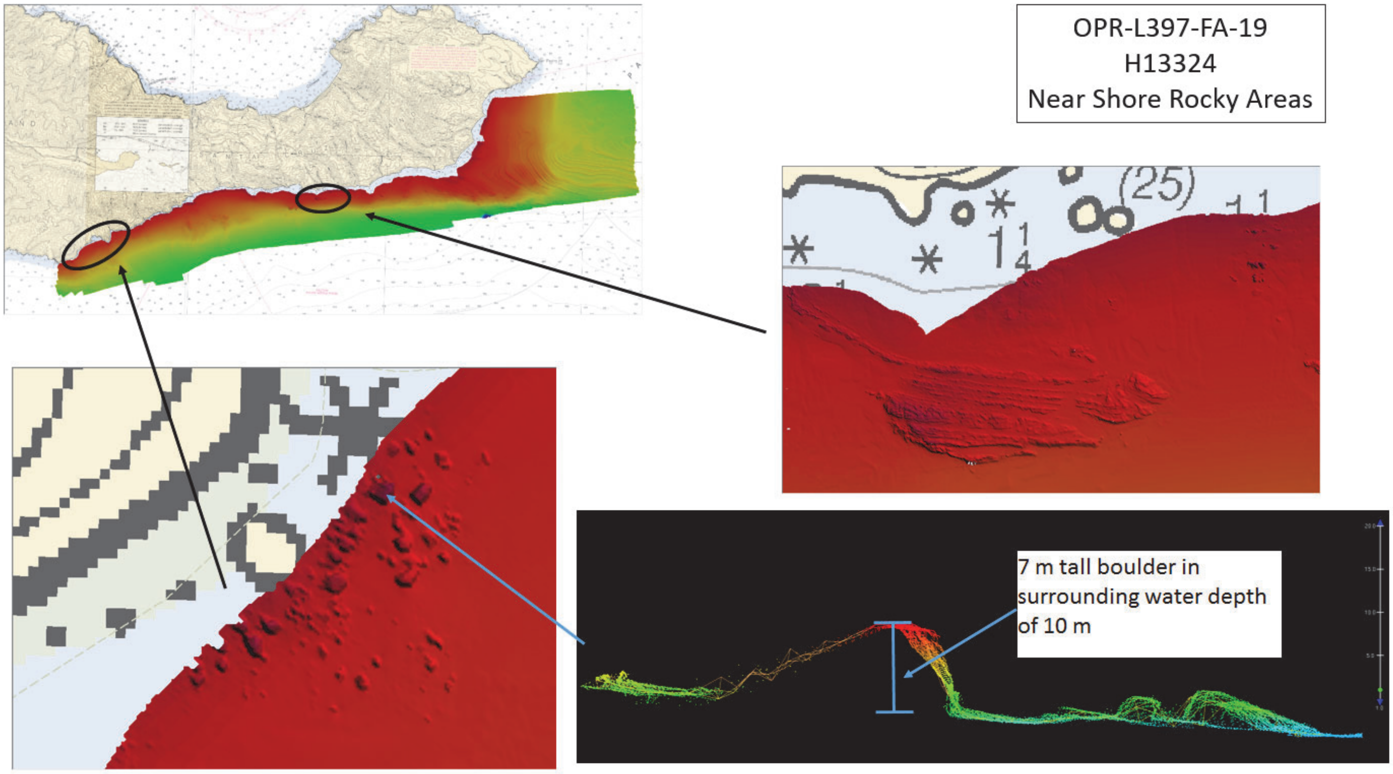


Figure 22: Highlighted areas of rocky shorelines

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Channels

No channels exist for this survey.

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

No submarine features exist for this 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 and/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 insets 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
CAPT Marc Moser	Chief of Party	07/16/2020	MOSER.MARC.STANTON.1163193902 MOSER.MARC.STANTON.1163193902 2020.07.29 13:23:32 -07'00'
LT Marybeth Head	Operations Officer	07/16/2020	HEAD.MARYBETH.1474026490 Digitally signed by HEAD.MARYBETH.1474026490 Date: 2020.07.29 13:02:42 -07'00'
Alissa Johnson	Chief Survey Technician	07/16/2020	Alissa Johnson Digitally signed by Alissa Johnson Date: 2020.07.29 13:00:09 -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

APPROVAL PAGE

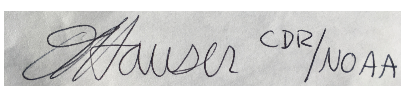
H13324

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- GeoPDF of survey product

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



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Date: 2021.03.11 17:17:23 -08'00'

Approved:____

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch