H13093

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13093

LOCALITY

State(s):	California
General Locality:	Channel Islands
Sub-locality:	Vicinity of Anacapa Island

2017

CHIEF OF PARTY
Benjamin K. Evans, CDR/NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13093**

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**
Sub-Locality:	**Vicinity of Anacapa Island**
Scale:	**20000**
Dates of Survey:	**10/19/2017 to 11/06/2017**
Instructions Dated:	**08/25/2017**
Project Number:	**OPR-L397-RA-17**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Benjamin K. Evans, CDR/NOAA**
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:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

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Descriptive Report to Accompany Survey H13093

Project: OPR-L397-RA-17

Locality: Channel Islands

Sublocality: Vicinity of Anacapa Island

Scale: 1:20000

October 2017 - November 2017

NOAA Ship *Rainier*

Chief of Party: Benjamin K. Evans, CDR/NOAA

A. Area Surveyed

The survey area is referred to as H13093, "Vicinity of Anacapa Island" (sheet 9). The survey was not initially included within the Project Instructions, but was subsequently added at the request of Rainier's Commanding Officer to provide a working area when adverse conditions prevailed near the assigned sheets further west; see supplemental correspondence for more information. The area encompasses approximately 26 square nautical miles around Anacapa Island and is entirely within the Channel Islands National Marine Sanctuary (CINMS).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
34° 4' 10.51" N 119° 29' 19.31" W	33° 59' 2.59" N 119° 18' 17.18" W

Table 1: Survey Limits

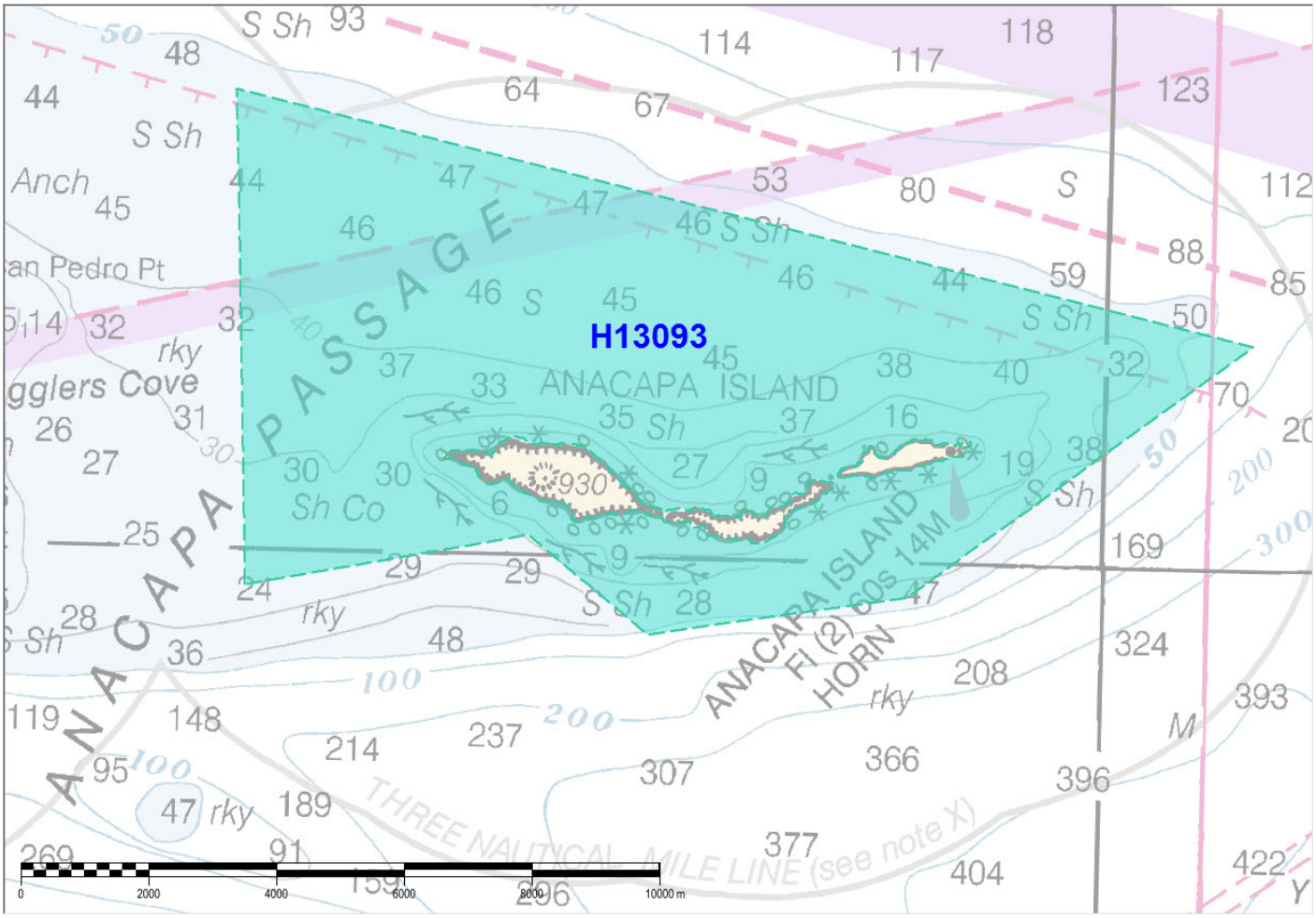


Figure 1: H13093 assigned survey area (Chart 18720).

Data were acquired within the assigned survey limits as required in the Project Instructions and HSSD unless otherwise noted in this report.

A.2 Survey Purpose

The purpose of this survey is to provide contemporary data to update National Ocean Service (NOS) nautical charting products and to generate backscatter data which will be used in habitat mapping and substrate analysis. Much of the existing depth data dates back to 1930s vintage lead line or single beam surveys, and the areas not surveyed to modern standards are predominantly located in the shallow waters (<40 meters) where vessel traffic is highest. This poses a serious risk to life, property and the delicate ecosystem within the Channel Islands National Marine Sanctuary. H13093 multibeam and backscatter data will serve to enhance marine navigational safety, and will assist sanctuary managers, planners and researchers in the conservation of this most precious national resource.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Pydro QC Tools 2 Grid QA was used to analyze H13093 multibeam echosounder (MBES) data density. The submitted H13093 variable-resolution (VR) surface met HSSD density and full coverage requirements as shown in the histograms below.

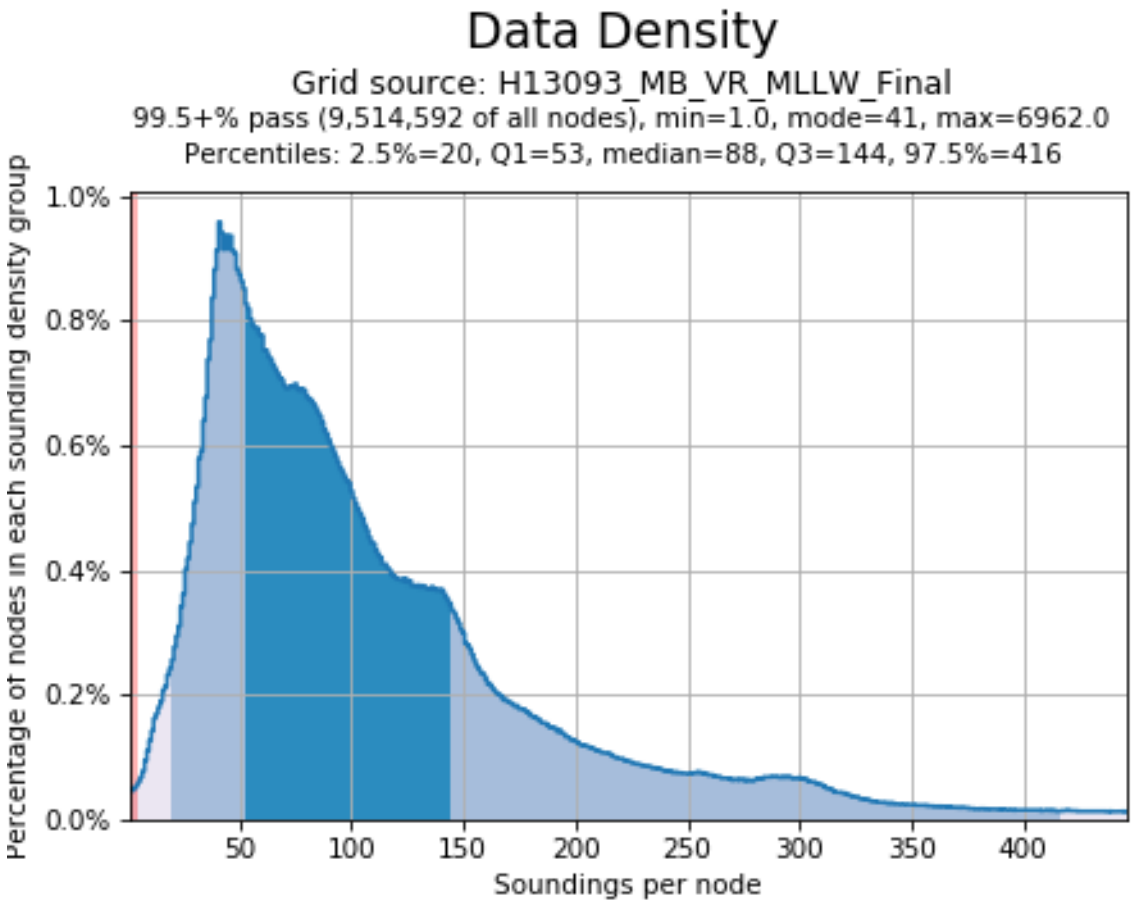


Figure 2: Pydro derived histogram plot showing HSSD density compliance of H13093 finalized variable-resolution MBES data.

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 areas	Complete Coverage (refer to HSSD Section 5.2.2.3)

Complete multibeam echosounder (MBES) coverage was acquired to the inshore limit of hydrography, the Navigable Area Limit Line (NALL). In areas where survey coverage did not reach the 4-meter depth contour, nor the assigned sheet limits, it was due to the survey vessel reaching the inshore extent of safe navigation as shown in the figure below. These areas are characterized as being very near shore, subject to dangerous wave action or other hazards such as thick kelp.

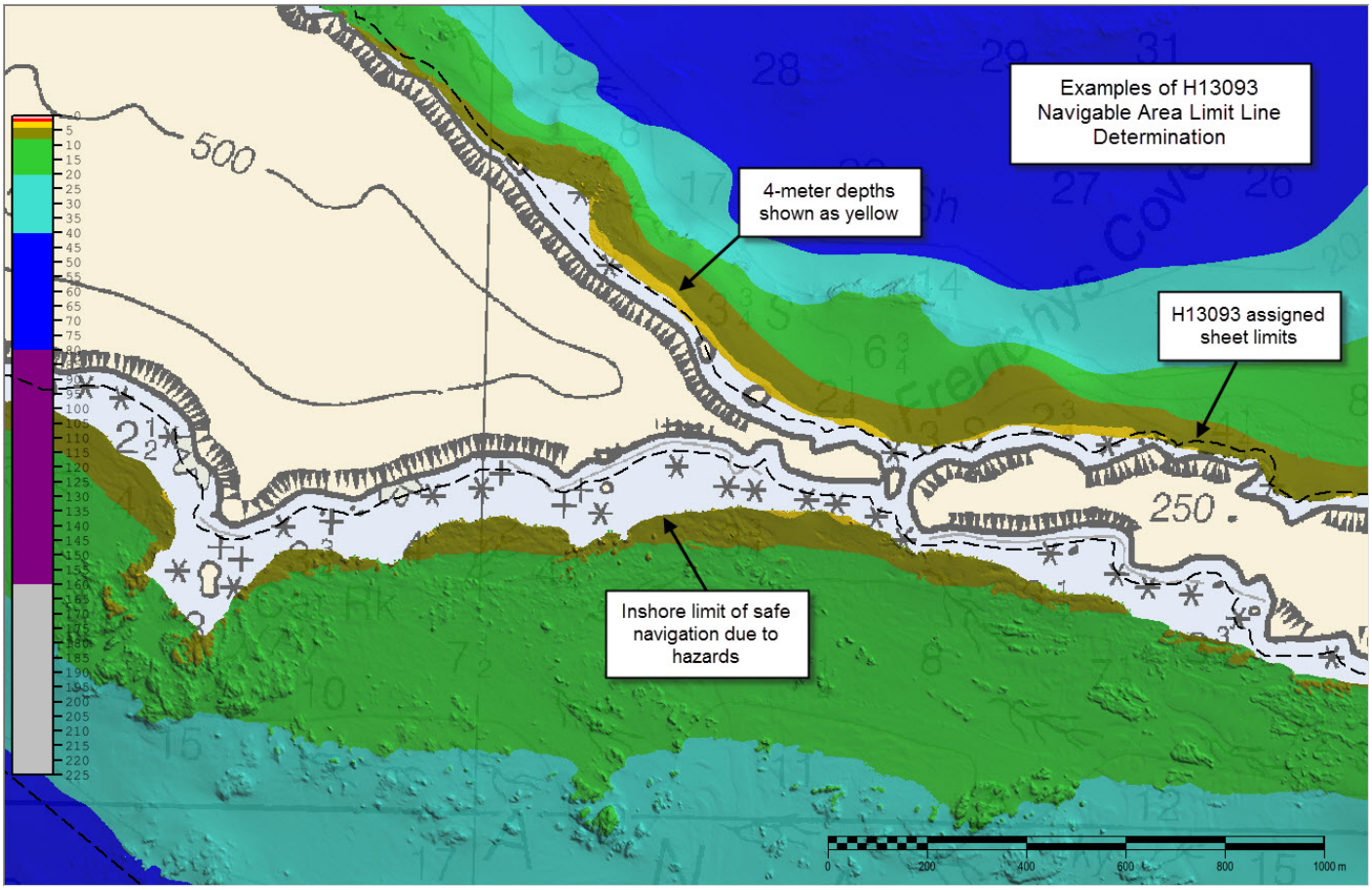


Figure 3: Examples of H13093 NALL determination.

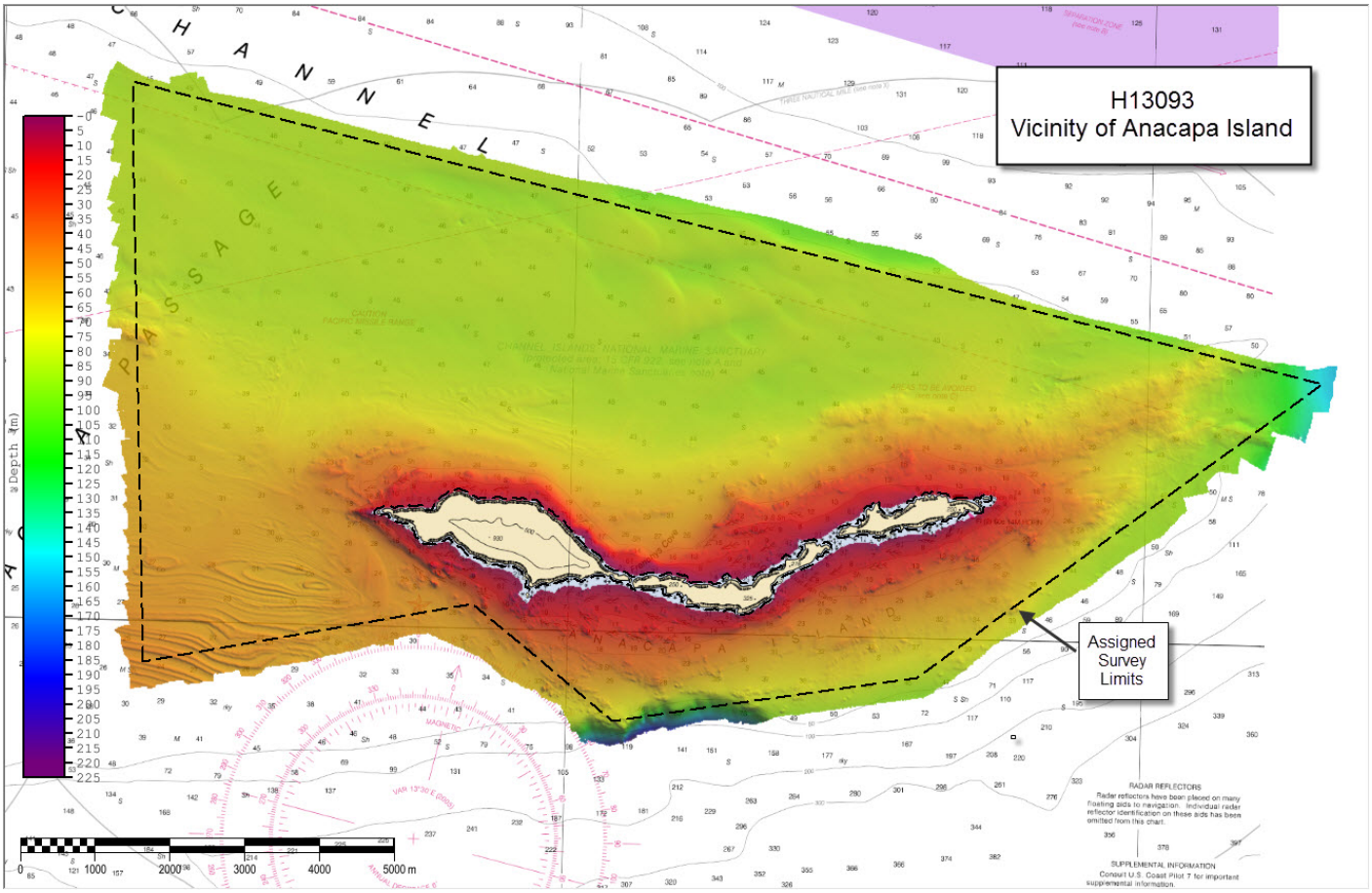


Figure 4: H13093 MBES coverage and assigned survey limits (Chart 18729).

A.5 Survey Statistics

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

	HULL ID	*S221*	*2801*	*2802*	*2803*	*2804*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0	0	0
	MBES Mainscheme	102.2	48.4	47.3	72.0	55.2	325.1
	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	14.1	0	14.2	28.3
	Lidar Crosslines	0	0	0	0	0	0
Number of Bottom Samples							0
Number Maritime Boundary Points Investigated							0
Number of DPs							75
Number of Items Investigated by Dive Ops							0
Total SNM							26.0

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/19/2017	292
10/20/2017	293

Survey Dates	Day of the Year
10/21/2017	294
10/31/2017	304
11/06/2017	310

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the 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	*S221*	*2801*	*2802*	*2803*	*2804*	*1905*	*1907*
LOA	70.4 meters	8.8 meters	8.8 meters	8.8 meters	8.8 meters	5.7 meters	5.7 meters
Draft	4.7 meters	1.1 meters	1.1 meters	1.1 meters	1.1 meters	0.35 meters	0.35 meters

Table 4: Vessels Used

Figure 5: NOAA Ship RAINIER anchored near East Anacapa Island.

All data for H13093 were acquired by NOAA Ship RAINIER and survey launches 2801, 2802, 2803, and 2804. The vessels acquired depth soundings, backscatter imagery and sound speed profiles. Shoreline feature verification was conducted from RAINIER skiffs 1905 and 1907.

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS M/V v5	Positioning and Attitude System
Kongsberg	EM 2040	MBES
Kongsberg	EM710	MBES
Reson	SVP70 / SVP71	Surface Sound Speed Probes
Sea-Bird Electronics	SBE 19plus SEACAT Profiler	Conductivity, Temperature, and Depth Sensor
Odim Brooke Ocean	MVP200 Moving Vessel Profiler	Sound Speed System

Table 5: Major Systems Used

Refer to the Data Acquisition and Processing Report (DAPR) for a comprehensive description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and other survey data and any deviations from the DAPR are discussed in this report.

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 8.71% of mainscheme acquisition.

28.4 nautical miles of multibeam crosslines were acquired by RAINIER launches 2802 and 2804 across all depth ranges, water masses and boat days that were operationally practical. The Hydrographer deems them adequate for verifying and evaluating the internal consistency of H13093 survey data. Analysis was performed using the Compare Grids function in Pydro Explorer on 4-meter resolution surfaces of H13093 mainscheme only and crossline only data. 99.5+% of nodes met allowable uncertainties, for additional results, see figures 6-9 below.

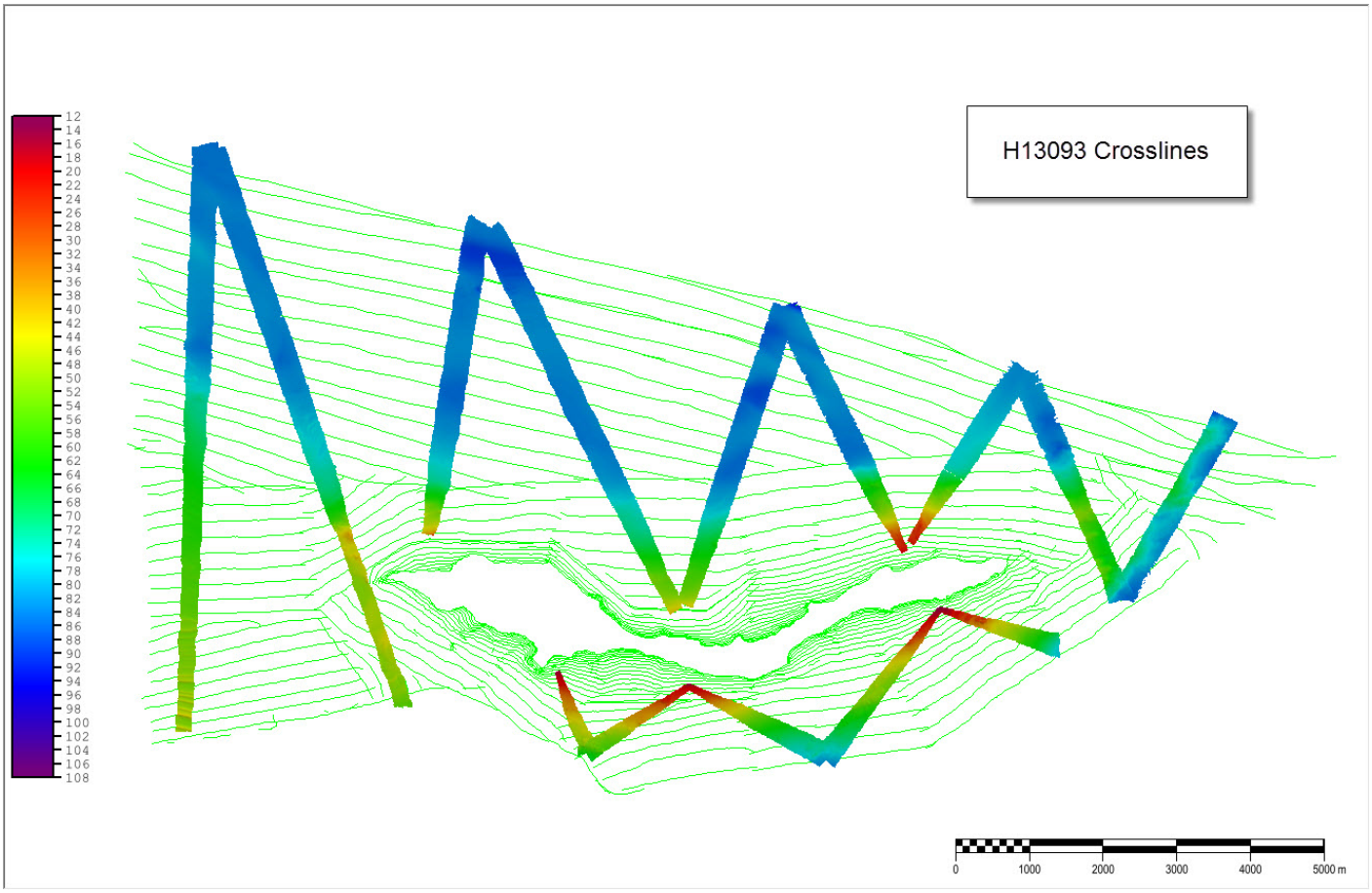


Figure 6: H13093 crossline surface overlaid on mainscheme tracklines.

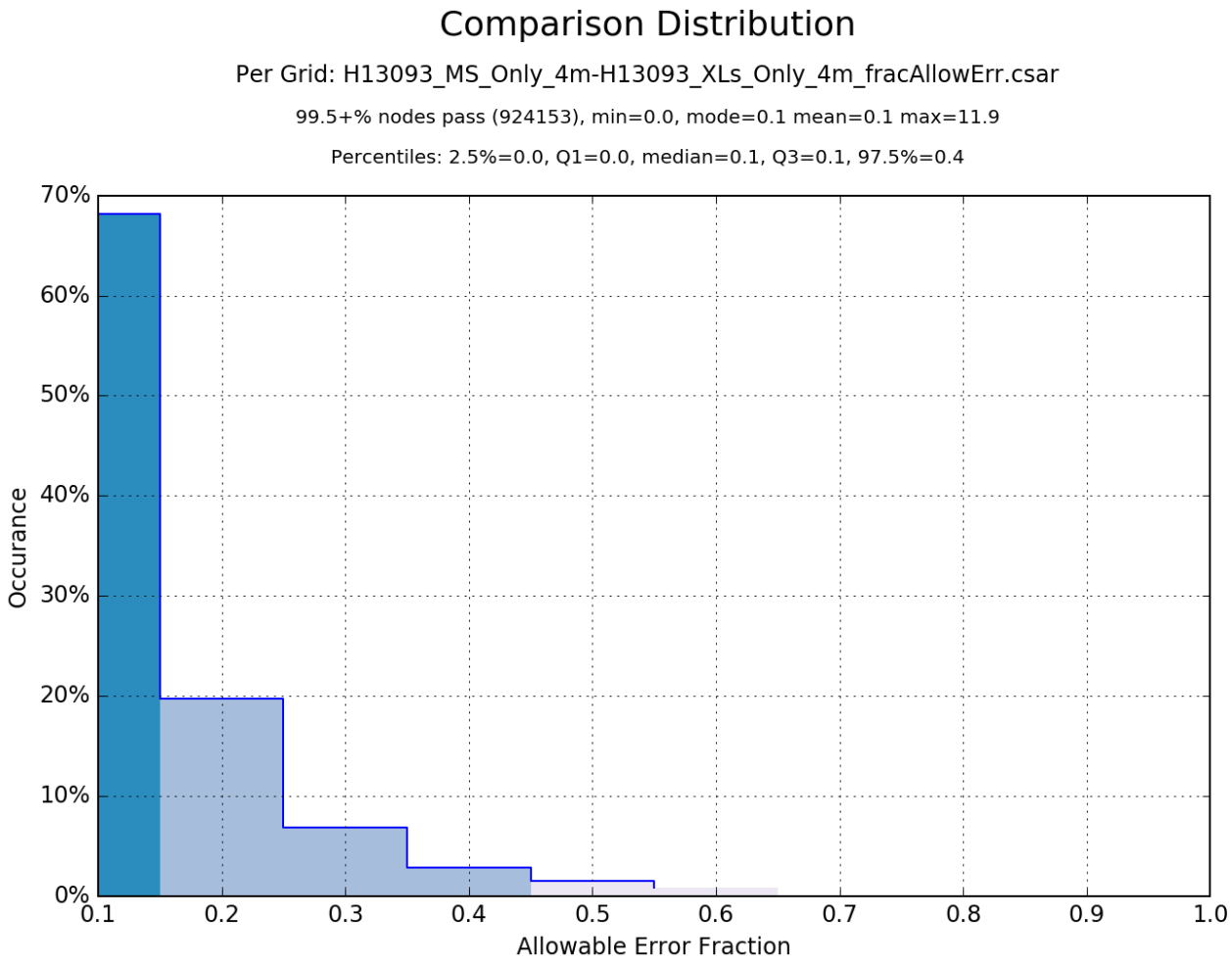
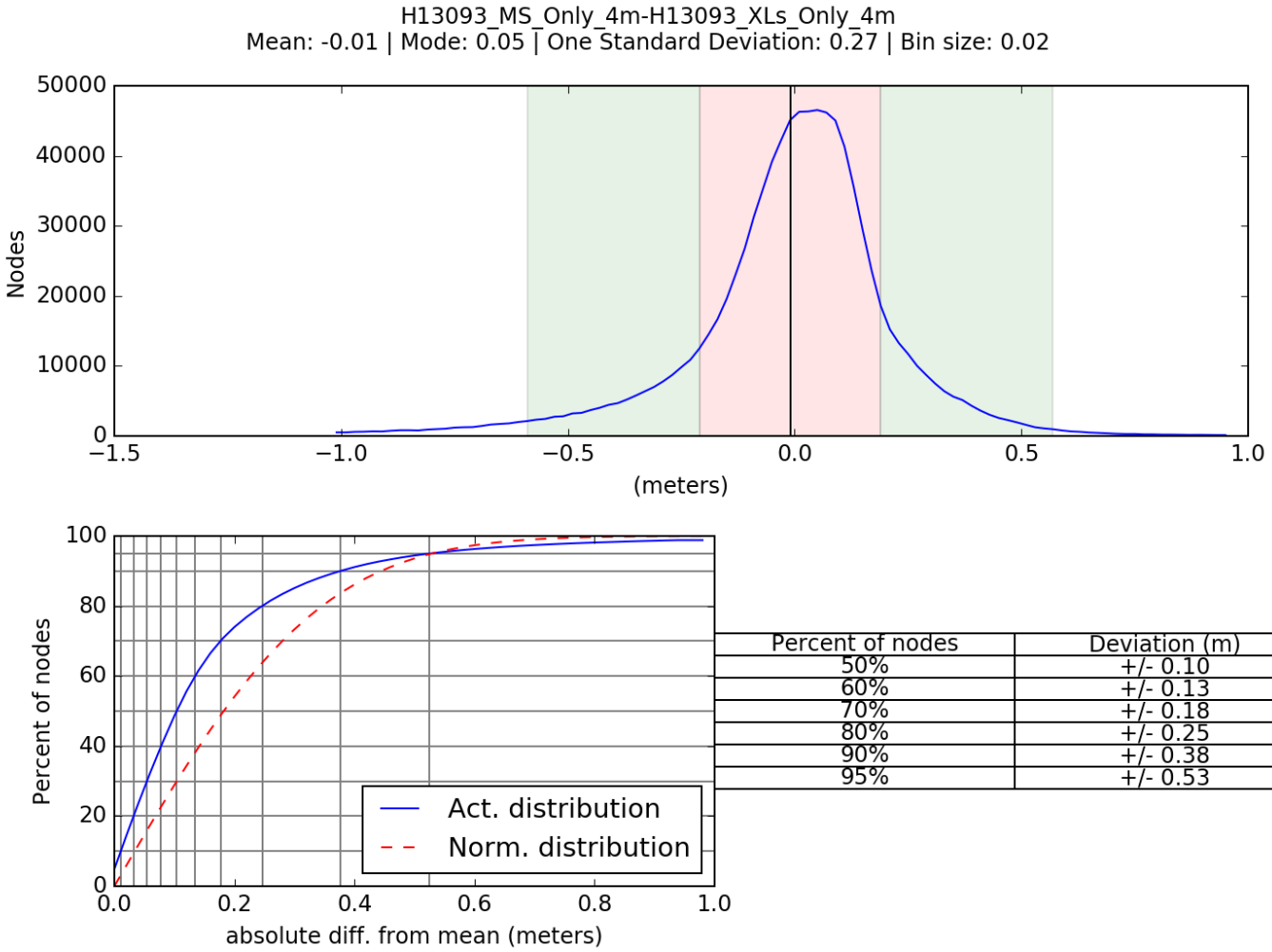


Figure 7: Pydro derived plot showing percentage-pass value of H13093 mainscheme to crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.10
60%	+/- 0.13
70%	+/- 0.18
80%	+/- 0.25
90%	+/- 0.38
95%	+/- 0.53

Figure 8: Pydro derived plot showing absolute difference statistics of H13093 mainscheme to crossline data.

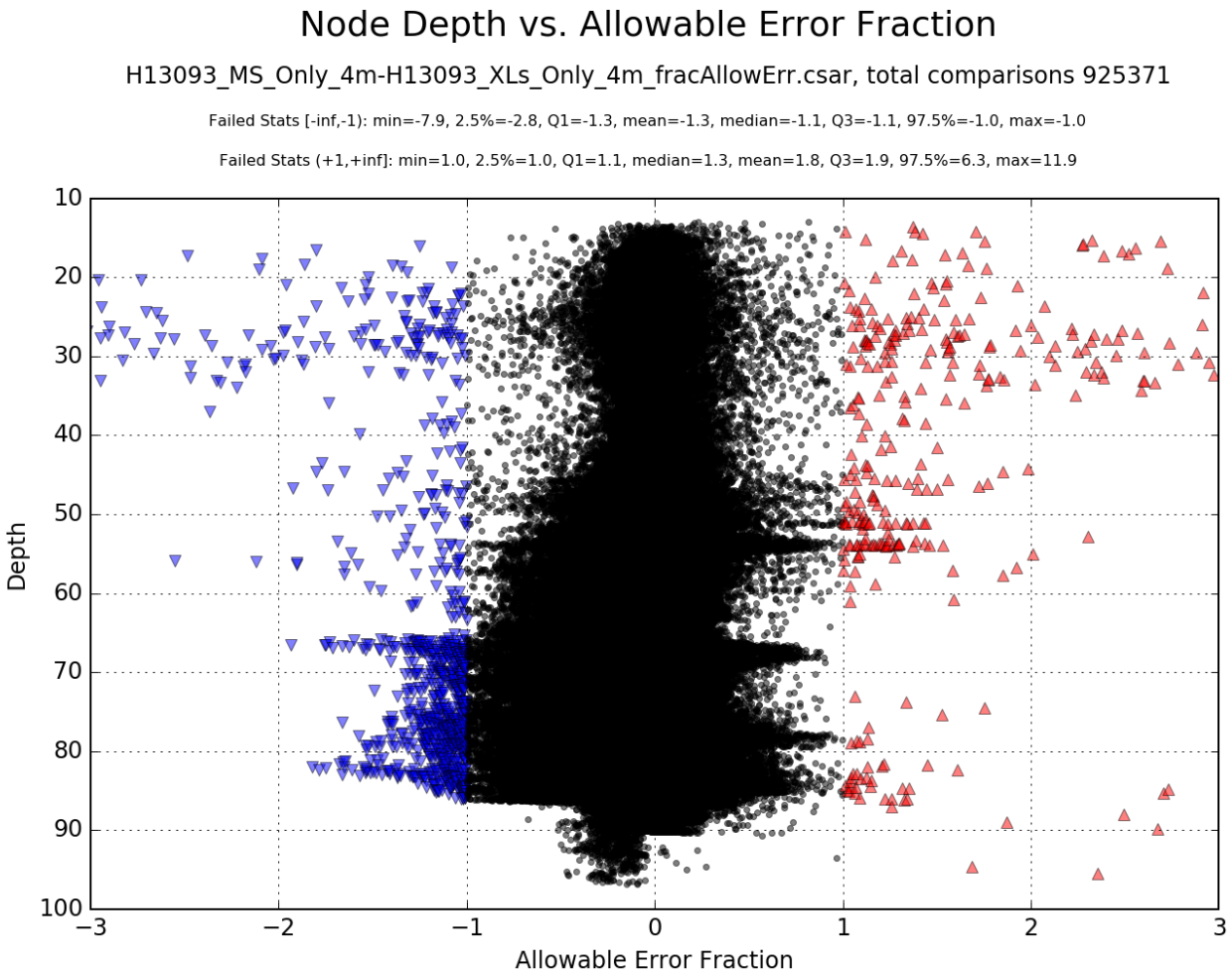


Figure 9: Pydro derived plot showing node depth vs. allowable error fraction of H13093 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning	Method
0 meters	0.082867 meters	ERS via VDATUM

Table 6: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
2801,2802,2803,2804	3 meters/second		0.15 meters/second
S221		1 meters/second	0.05 meters/second

Table 7: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13093 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. Tidal uncertainty was provided in the metadata accompanying the NOAA vertical datum transformation model used for this survey. The local VDATUM model uncertainty of 0.082867 meters was entered as the tide zoning value for TPU calculation.

In addition to the usual a priori estimates of uncertainty, some real-time and post-processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties from Kongsberg MBES sonars were recorded and applied in post-processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were applied during post-processing. Finally, the post-processed uncertainties associated with vessel roll, pitch, yaw and position were applied in Caris HIPS using SBET and RMS files generated using POSPac MMS software.

Uncertainty values of the submitted finalized grid was calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA v5 within Pydro QC Tools 2 was used to analyze H13093 TVU compliance, a histogram plot of the results is shown below.

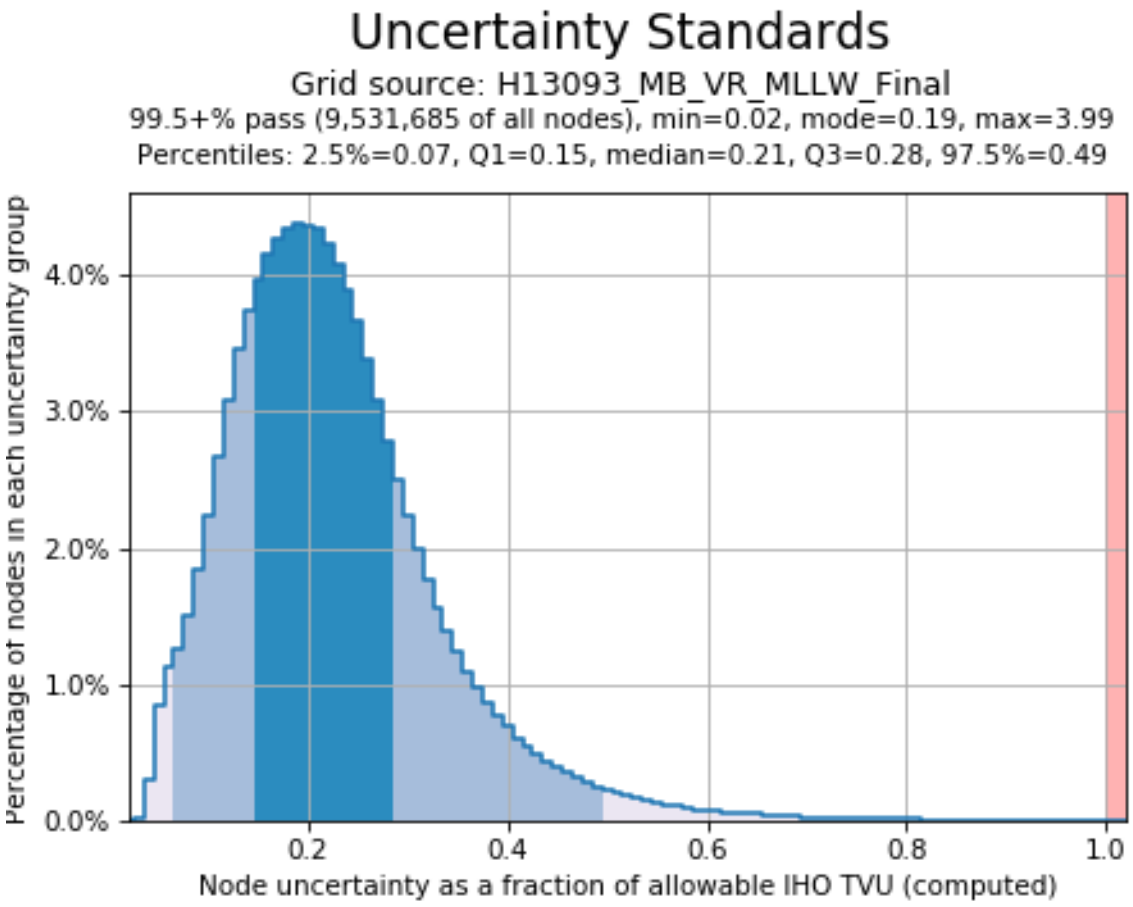


Figure 10: Pydro derived plot showing TVU compliance of H13093 finalized multi-resolution MBES data.

B.2.3 Junctions

H13093 junctions with the priority 3 area of survey W00343, a habitat mapping project conducted by NOAA Ship Reuben Lasker in 2016.

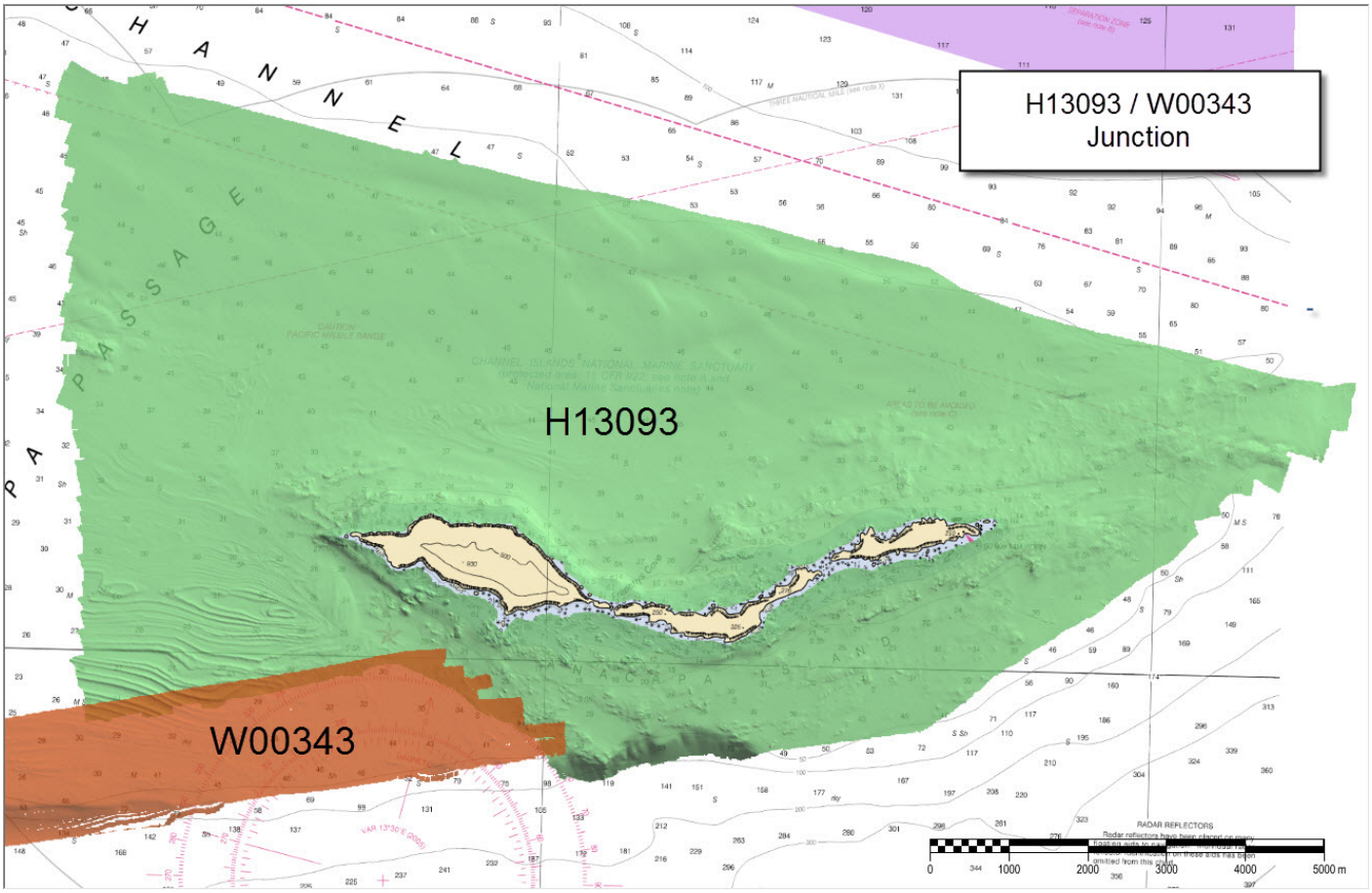


Figure 11: H13093 / W00343 Junction.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
W00343	1:40000	2016	NOAA Ship Reuben Lasker	SW

Table 8: Junctioning Surveys

W00343

The junction with survey W00343 encompassed 0.44 square nautical miles along the southwestern boundary of H13093. A comparison was made with the Compare Grids function of Pydro Explorer using a difference surface derived from 4-meter Caris .csar surfaces of each survey. Analysis of the difference surface indicated that H13093 is an average of 5.0 meters deeper than W00343 with a standard deviation of 2.02 meters. According to the Survey Acceptance Review (SAR) issued by the Pacific Hydrographic Branch, W00343 was a habitat mapping survey acquired with a Simrad ME70, a sonar normally used to collect water column data for fisheries applications. The SAR also stated that data from the ME70 are not suitable for

object detection, feature disproval or for areas of critical under-keel clearance. The W00343 SAR identified persistent heave-like artifacts throughout the entire survey, the lack of crosslines and that the survey was significantly shoaler (5.9 meters) than junction survey W00291. This information helps to explain the poor comparison between H13093 and W00343 data. H13093 was acquired under significantly higher data quality standards than was W00343 and should be considered the more accurate of the two.

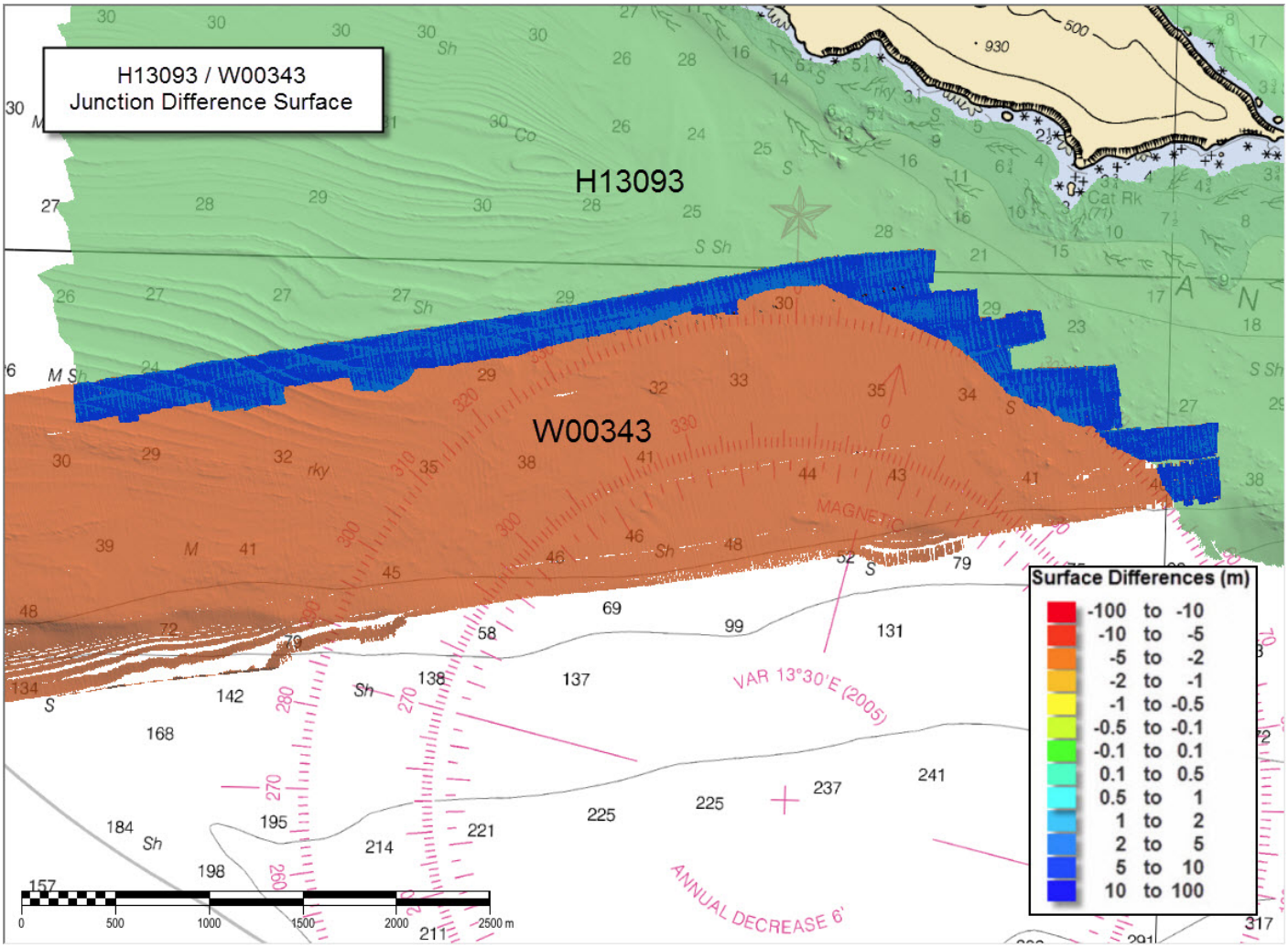
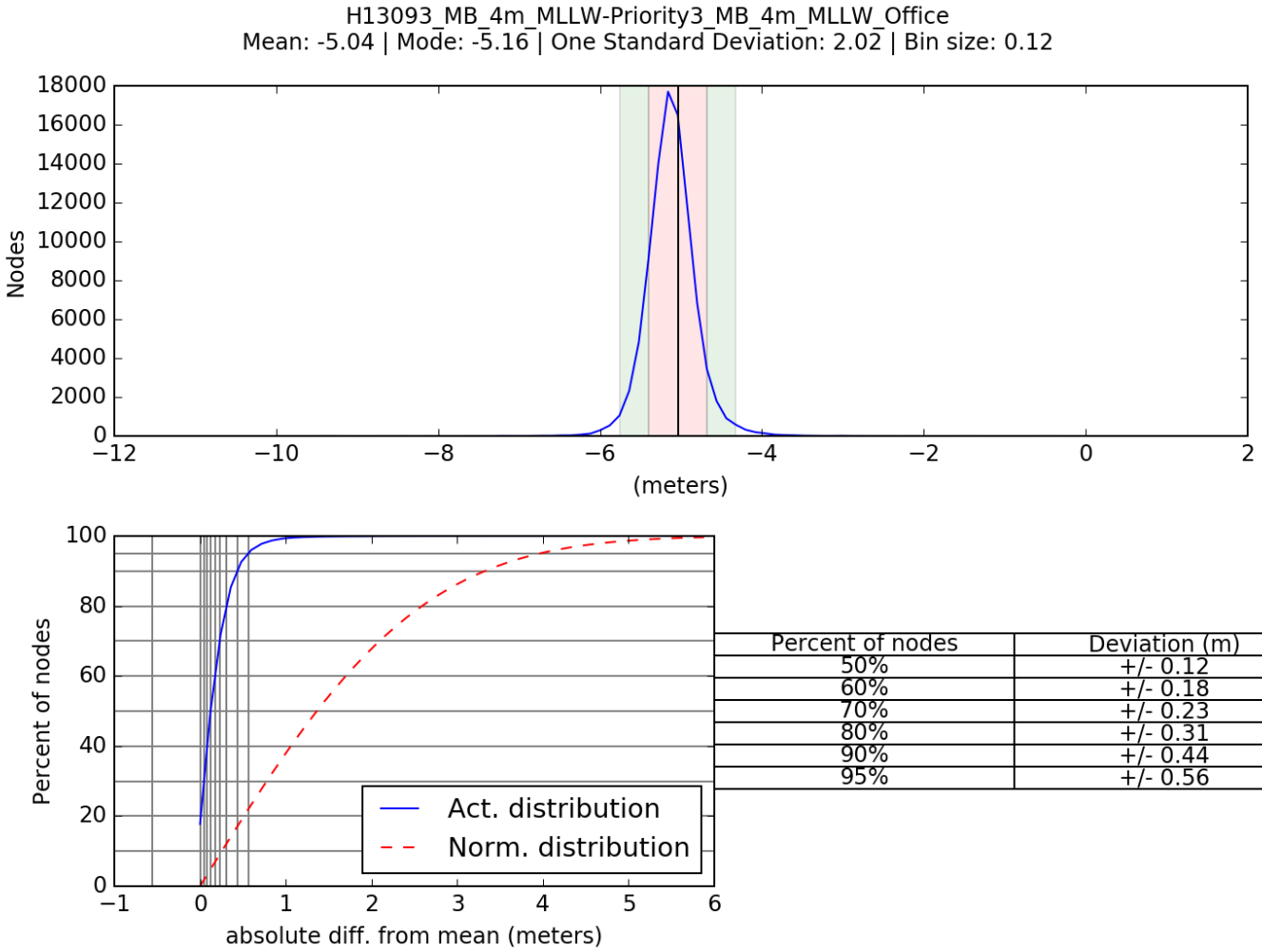


Figure 12: H13093 / W00343 junction difference surface.



Percent of nodes	Deviation (m)
50%	+/- 0.12
60%	+/- 0.18
70%	+/- 0.23
80%	+/- 0.31
90%	+/- 0.44
95%	+/- 0.56

Figure 13: Pydro derived plot showing H13093 / W00343 comparison statistics.

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

Sonar Settings Optimized for Backscatter Acquisition

Due to the emphasis on acquiring high quality and consistent backscatter for this project, the Kongsberg EM2040 sonar systems were operated in fixed pulse length settings. Kongsberg SIS software was manually set to "Long" or "Short" pulse lengths by the Hydrographer-in-Charge. Generally, "Long" pulse length was selected unless the vessel would be working in waters less than 20 meters deep for extended periods, in which case "Short," would be selected. Operating in this manner created far fewer changes in pulse length

compared to running the sonar in "Auto" mode. Fewer changes in pulse length creates more consistent backscatter imagery and requires less post-processing adjustment to intensity levels. The field unit carefully monitored the quality of bathymetry to ensure that the negative impacts of a set pulse length were minimal.

B.2.6 Factors Affecting Soundings

Suboptimal Sound Speed Correction

Due to water column variations such as thermal layering and salinity differences, a distinct demarcation of water masses was sometimes encountered in the field. At times, this proved problematic in the acquisition and application of optimal sound speed correction data. Despite the best efforts of the hydrographers to conduct sufficient sound speed casts distributed spatially and temporally, in some areas, particularly in the northern part of the survey, sound speed correction was suboptimal. This was evidenced by the appearance of systematic artifacts in the survey grid and the characteristic "smiles" or "frowns" of the data when viewed in subset editor. To address this issue, the Hydrographer rejected outer beam soundings obviously in error in an attempt to produce a surface that best represented the sea floor. All examined sound speed related offsets were observed to be within NOAA HSSD standards.

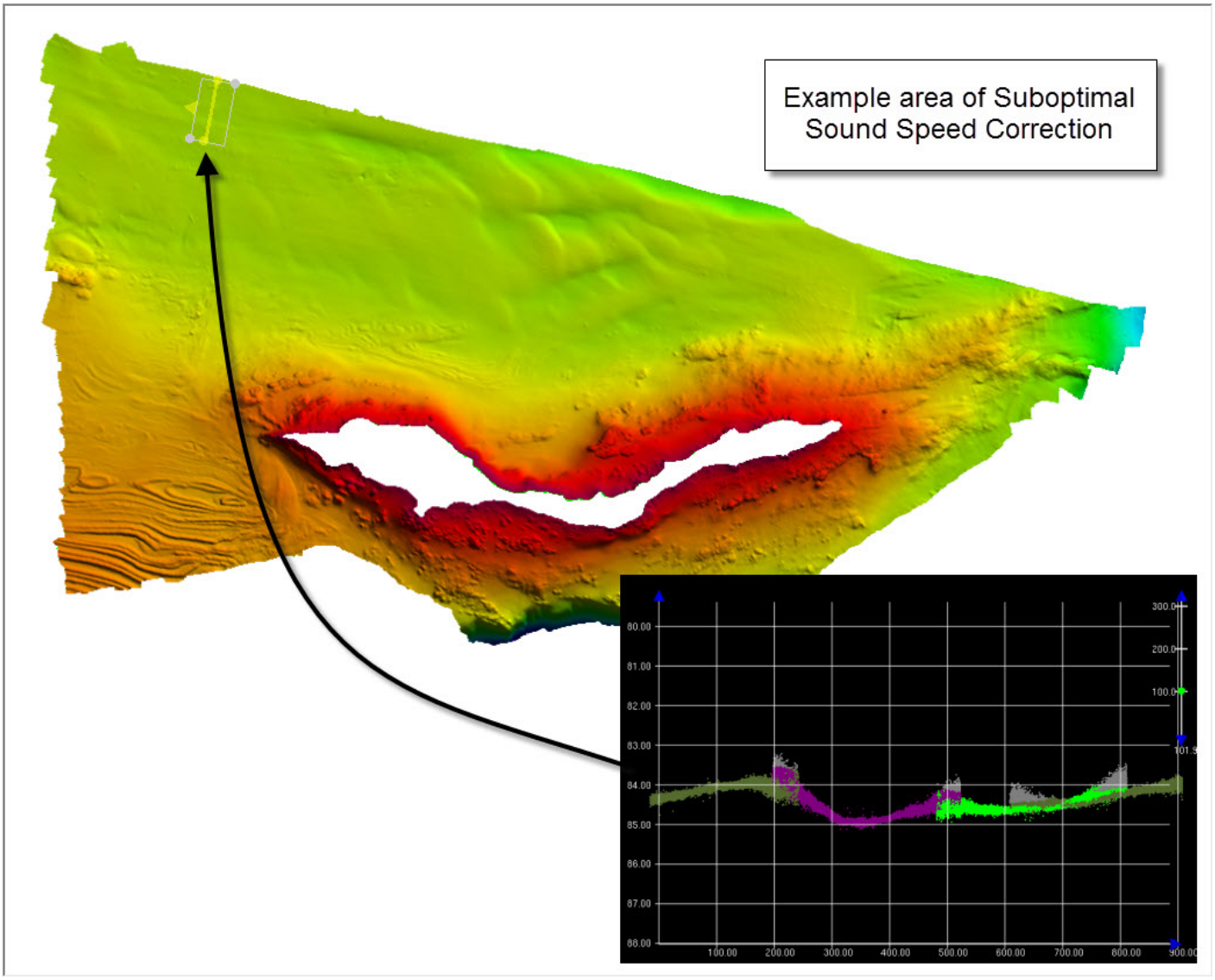


Figure 14: Example of area with suboptimal sound speed correction. Inset shows subset view with rejected sounding colored grey.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: 42 sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, when significant changes to surface sound speed were observed, or when operating in a new area. For MBES operations from S221, sound speed profiles were acquired using the Odim Brooke Ocean MVP200. Launch sound speed profiles were acquired using Sea-Bird 19plus SEACAT Profilers. All casts were concatenated into a master file and applied using the "Nearest distance within time" (4 hours) profile selection method with the following exceptions: S221 DN304 survey lines were sound speed corrected using file 2804_DN304_Concat.svp due to pronounced sound speed artifacts in the data when the master concatenated file was used. A similar issue with 2802 DN294 MBES lines was corrected by post-processing sound speed data using only the casts acquired by that boat on that day. The issue with the master concatenated file may be related to the inclusion of ship

casts and the apparent thinning of the MVP200 profiles that occurs during processing. Application of the individual launch profiles mentioned above, greatly reduced the artifacts; all examined sound speed related offsets were observed to be within the NOAA HSSD standards.

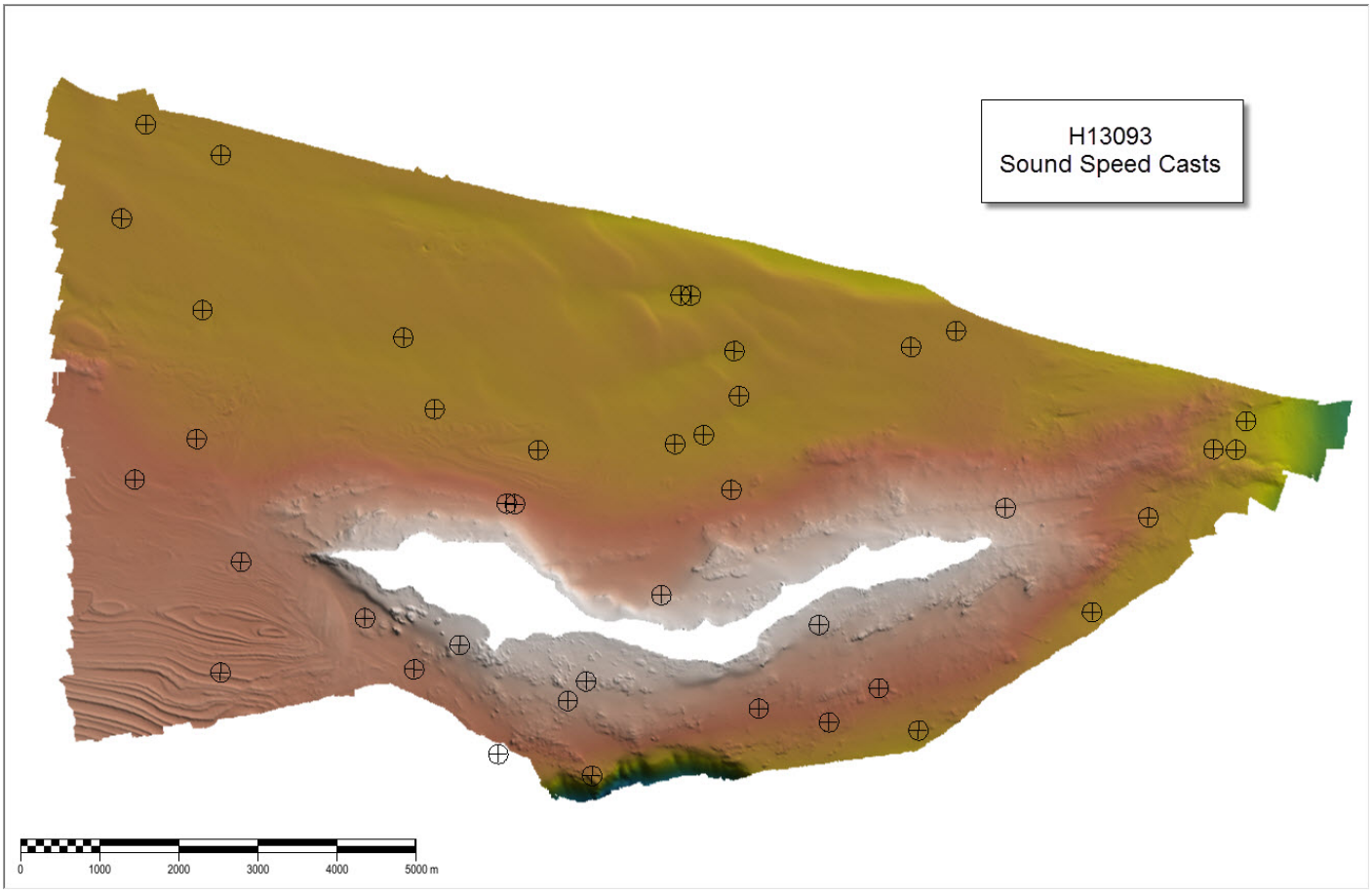


Figure 15: H13093 sound speed cast locations.

B.2.8 Coverage Equipment and Methods

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

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 was acquired as .all files logged during MBES operations and subsequently processed by personnel aboard Rainier. One mosaic per vessel per frequency has been delivered with this report. All backscatter processing procedures utilized follow those detailed in the DAPR.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Extended Attribute File V_5_6.

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
H13093_MB_VR_MLLW	CUBE	999 meters	0.87 meters - 219.69 meters	VR	Complete MBES
H13093_MB_VR_MLLW_Final	CUBE	999 meters	0.87 meters - 219.69 meters	VR	Complete MBES

Table 9: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids as specified in HSTD 2017-2. The resolution values indicated in the above table are not accurate: the XML-DR schema used to generate this report did not accommodate variable-resolution grids. The "999" value was entered merely as a place holder.

Three critical soundings were created for this survey; all were identified as Dangers to Navigation.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

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

Traditional Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Santa Monica	9410840
Santa Barbara	9411340
Oil Platform Harvest	9411406
Los Angeles	9410660
Port San Luis	9412110
Monterey	9413450

Table 10: NWLON Tide Stations

File Name	Status
H13093_TCARI_Features.tid	Final Approved

Table 11: Water Level Files (.tid)

File Name	Status
L397RA2017Rev.tc	Final

Table 12: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 11/08/2017. The final tide note was received on 11/17/2017.

H13093 shoreline features were tide corrected using a .tid file created in Pydro utilizing the "TCARI TID file via S-57" function then loaded in Caris Notebook. H13093 MBES data were reduced to MLLW using ERS via VDATUM processing methods.

ERS Methods Used:

ERS via VDATUM

Ellipsoid to Chart Datum Separation File:

OPR-L397-RA-17_VDatumArea_xyNAD83-MLLW_geoid12b.csar

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control for this survey.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

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

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 SBET Processing Method

Precise Positioning-Real Time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS 8.1 software to produce SBETs for post-processing horizontal correction.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between H13093 survey data and Electronic Navigational Charts (ENC) US5CA67M and US5CA58M using CUBE surfaces, selected soundings and contours created in Caris. A

positional offset between the two ENCs was identified at the junction of these charts at the east end of the H13093 survey area (Figure 16).

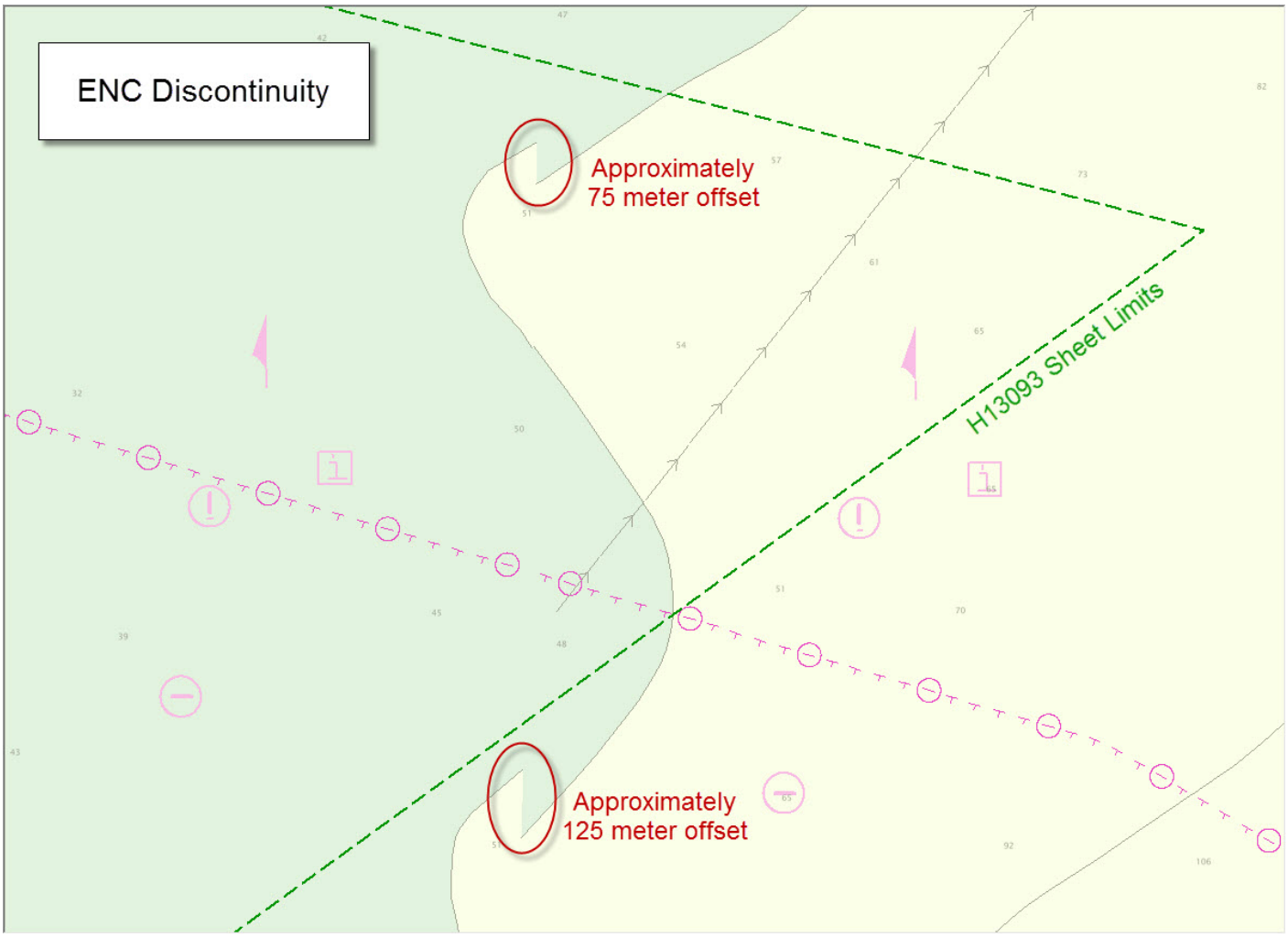


Figure 16: ENC Discontinuity. Red circles identify areas with positional offsets between the ENCs of approximately 75 to 125 meters within the H13093 survey area.

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	Preliminary?
US5CA67M	1:40000	4	08/24/2017	11/09/2017	NO
US5CA58M	1:20000	10	08/24/2017	11/15/2017	NO

Table 13: Largest Scale ENCs

US5CA67M

ENC US5CA67M covers all of survey H13093 with the exception of an area approximately 1200 x 1200 meters at the eastern edge of the assigned sheet (Figure 17).

A comparison between H13093 derived contours and ENC US5CA67M revealed the following: Three fathom depth contour data from the ENC and H13093 is incomplete, especially around West Anacapa Island, however where a comparison was possible, the agreement was generally good (Figure 18). The ENC 5-fathom depth contour data is incomplete; large gaps exist especially on the north side of West and East Anacapa Island. Where comparison was possible, offsets of approximately 50 meters were common. At the south side of West Anacapa Island, H13093 data identified several 5-fathom depth contours that are uncharted on the ENC; they are approximately 200 meters offshore of the existing ENC 5-fathom depth contour (Figure 19). The ENC 10-fathom depth contour agreed well or was approximately 50 meters offshore of the H13093 derived locations.

H13093 data revealed a 15-fathom shoal area seaward of the ENC charted 20-fathom depth contour and is surrounded by deeper depths (Figure 20).

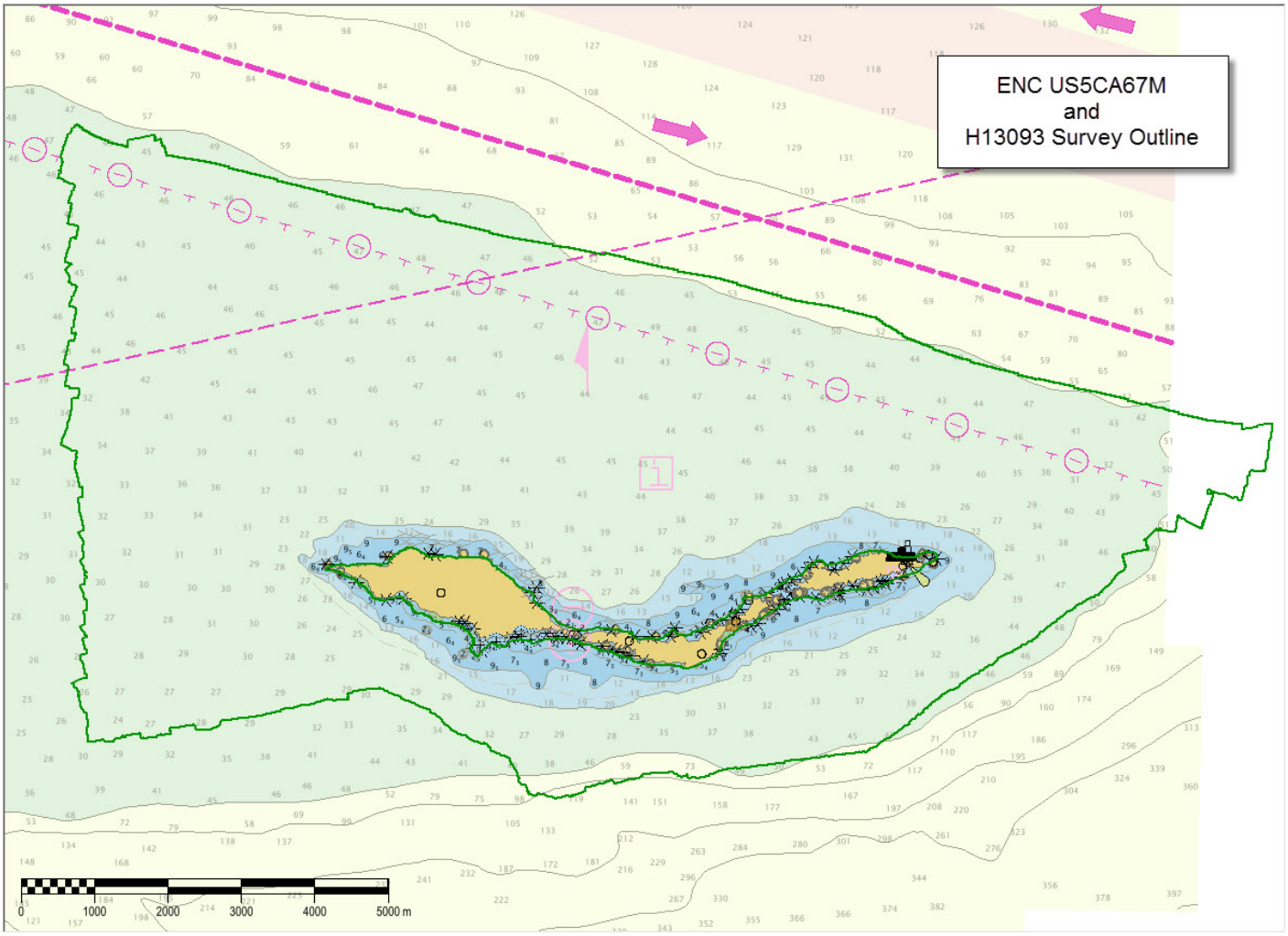


Figure 17: Section of ENC US5CA67M overlaid with H13093 survey outline. ENC US5CA58M joins to the east.

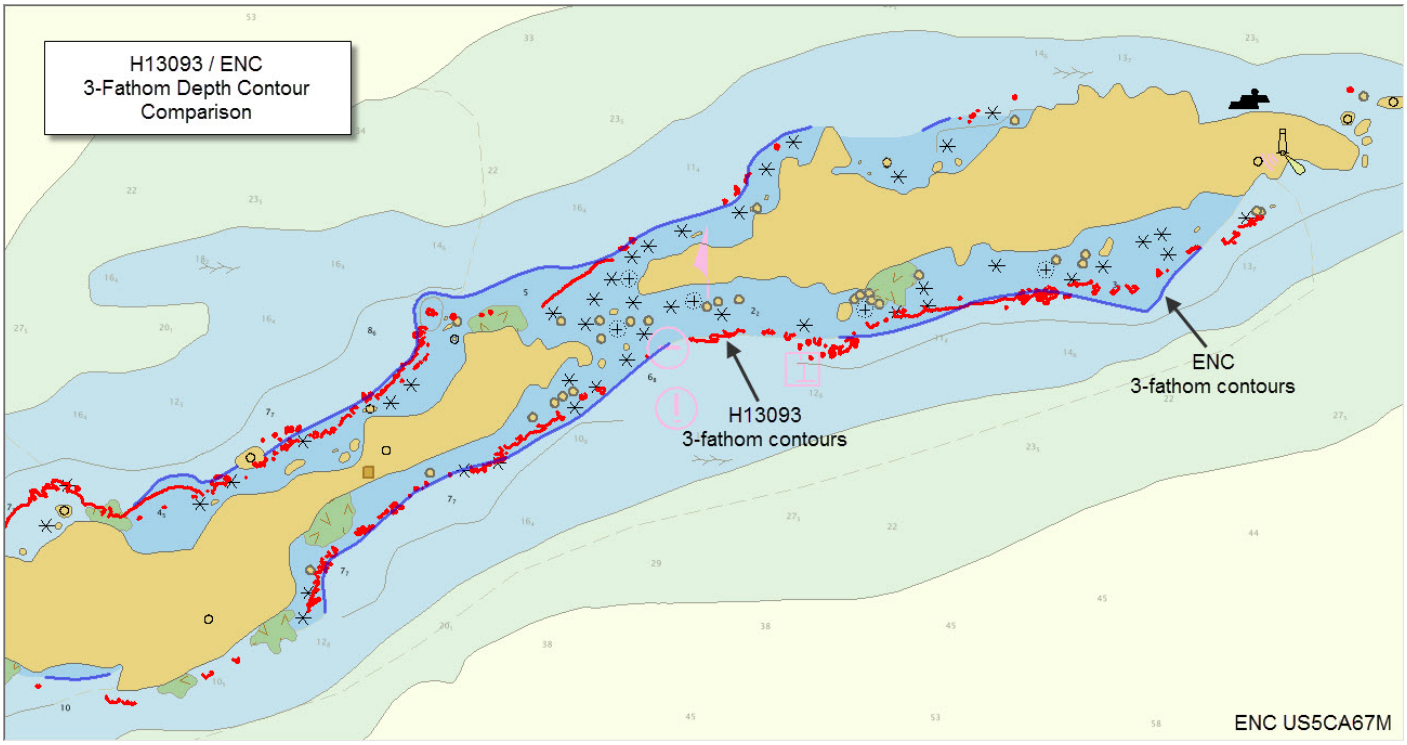


Figure 18: Section of ENC US5CA67M showing comparison between 3-fathom depth contours from the ENC (in blue) and H13093 (in red) data.

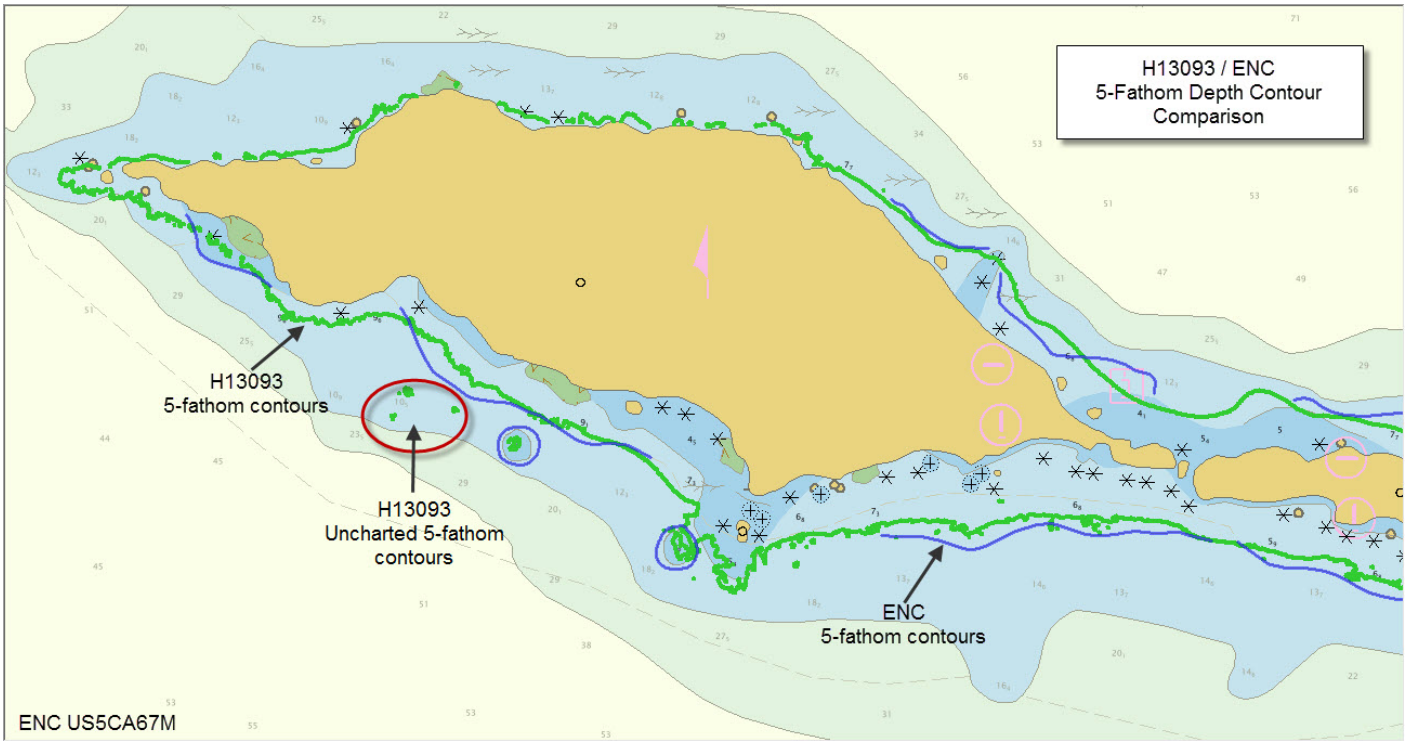


Figure 19: Section of ENC US5CA67M showing comparison between 5-fathom depth contours from the ENC (in blue) and H13093 (in green) data including previously uncharted offshore 5-fathom depths.

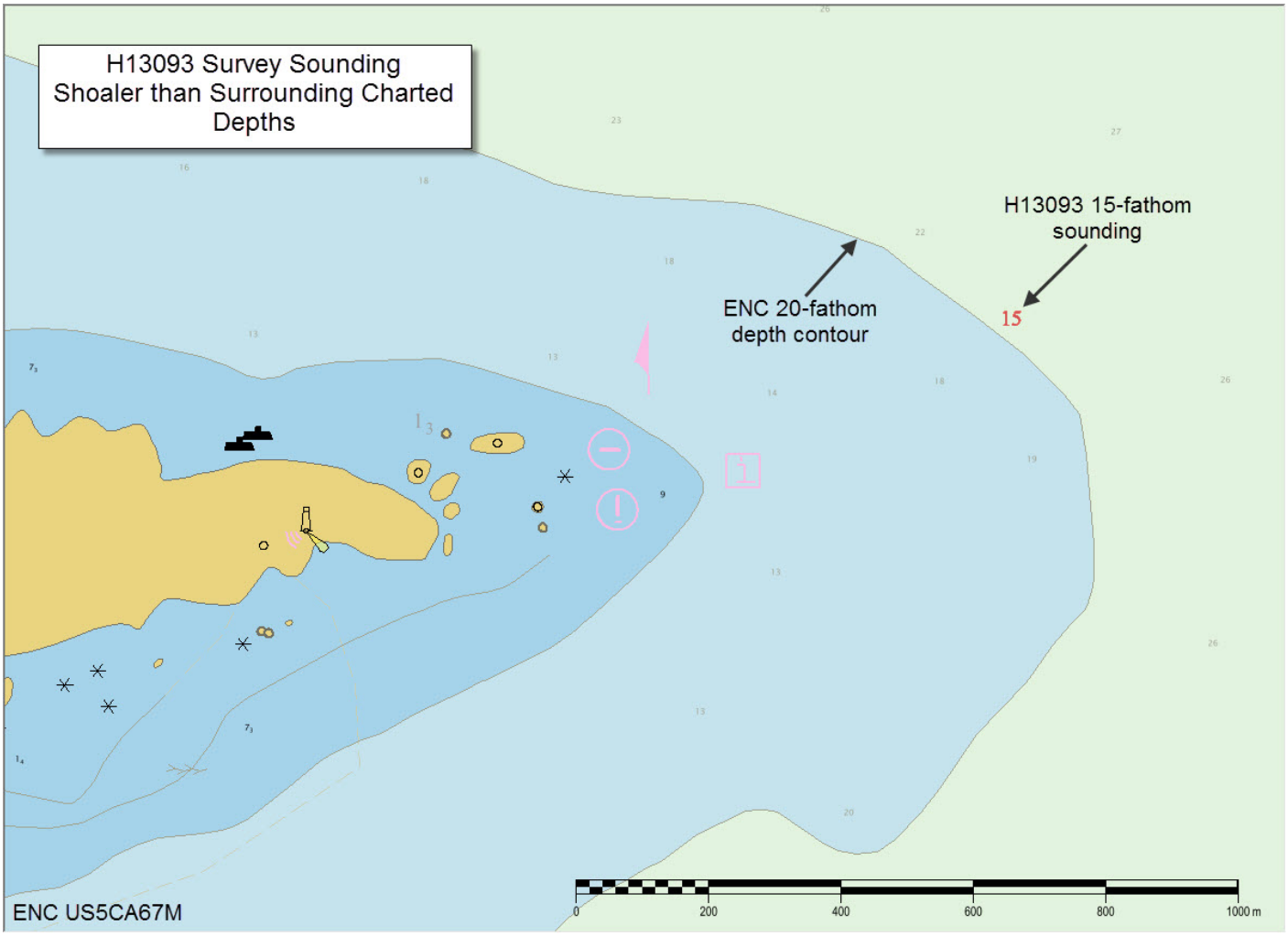


Figure 20: H13093 15-fathom soundings seaward of charted 20 fathom contour.

US5CA58M

H13093 survey soundings and ENC depths agree to within approximately 1 fathom in the common area.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

There are no charted features with the label PA, ED, PD or Rep within the H13093 survey area.

D.1.4 Uncharted Features

No new navigationally significant features were detected that were not included in the H13093 Final Feature file or elsewhere in this report.

D.1.5 Dangers to Navigation

The following DTON reports were submitted:

DTON Report Name	Date Submitted
H13093_DTON_Report	2017-11-13

Table 14: DTON Reports

Three dangers to navigation were identified in the H13093 survey area and were submitted to the Marine Chart Division's (MCD) Nautical Data Branch in one report. The Danger to Navigation Report is included in Appendix II of this report.

D.1.6 Shoal and Hazardous Features

Features of navigational significance are discussed in the chart comparison sections above or are included in the H13093 Final Feature File submitted with this report.

D.1.7 Channels

H13093 is located approximately one half nautical mile south of the South-Eastbound Traffic Lane within the Santa Barbara Channel.

D.1.8 Bottom Samples

There was no bottom sample requirement for this survey and none were taken.

D.2 Additional Results

D.2.1 Shoreline

Limited shoreline verification was conducted in accordance with applicable sections of NOAA HSSD and FPM using the Project Reference File (PRF) and Composite Source File (CSF) provided with the Project Instructions. In the field, all assigned features that were safe to approach, were addressed as required with S-57 attribution and recorded in the H13093_Final_Feature_File (FFF) to best represent the features at chart

scale. This file also includes new features found in the field as well as recommendations to update, retain or delete assigned features.

The provided shoreline from the CSF around Anacapa Island, particularly the eastern end, was observed to deviate significantly from the actual coastline as well as from the acquired shoreline data. When physically possible, offshore features were re-positioned in the field, however the shoreline skiffs lacked the equipment to make corrections to Anacapa Island's entire coastline. As a check after the fact, the Hydrographer downloaded vector data from the NGS NOAA Shoreline Data Explorer website; it showed good agreement with H13093 hydrographic and shoreline data of the common area. The Hydrographer recommends that the ENC be updated with the much more accurate NGS shoreline.

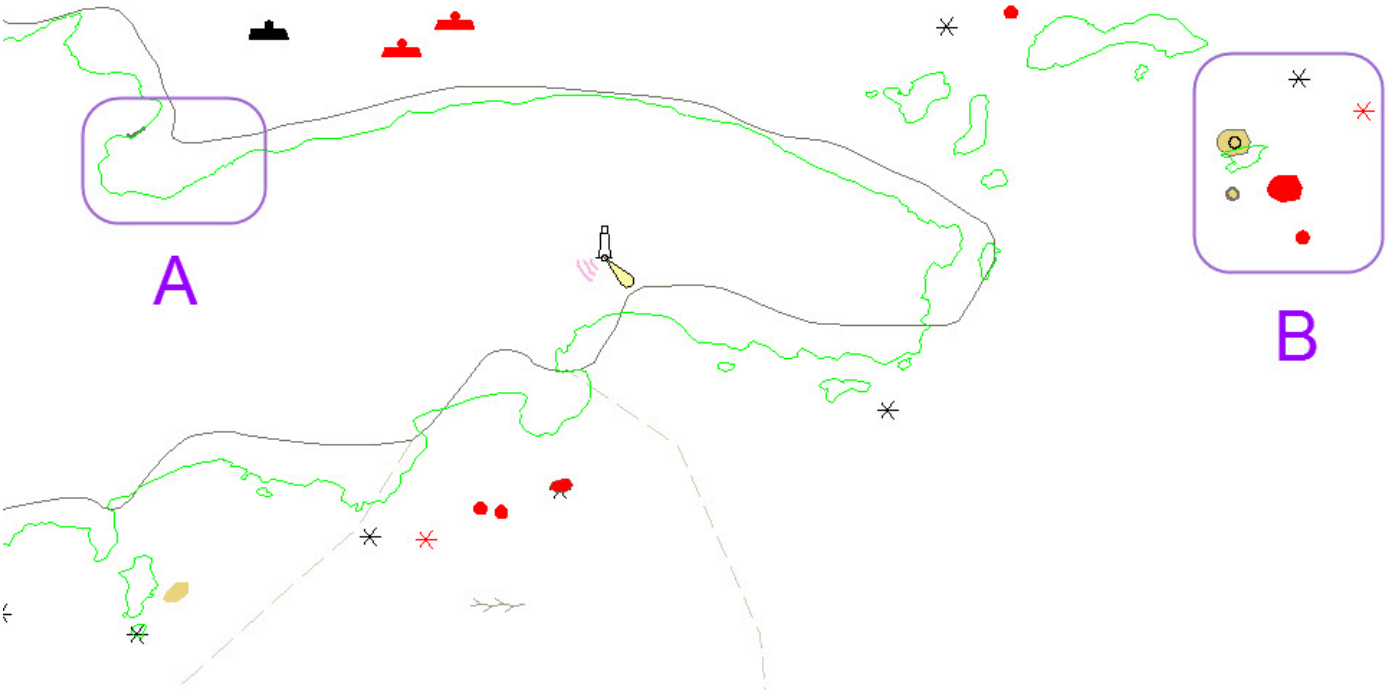


Figure 21: An example of poor CSF shoreline at the eastern end of Anacapa Island (CSF shoreline is black with red rejected, NGS shoreline is green). Block "A" includes a new pier that is positioned inshore of the charted CSF shoreline but matches up well with the NGS shoreline. Block "B" includes 2 islets and a rock that were repositioned ~40-50m to the northwest, a new position that matches well with the NGS shoreline.

D.2.2 Prior Surveys

No prior survey comparisons were provided for this survey.

D.2.3 Aids to Navigation

No Aids to Navigation (ATON) were specifically assigned for this survey. The Anacapa Island Light was visually verified and appeared to be serving its intended purpose.

Figure 22: Anacapa Island Light.

D.2.4 Overhead Features

No overhead features were observed within the H13093 survey area.

D.2.5 Submarine Features

No charted submarine features exist within the H13093 survey area.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist within the H13093 survey area.

D.2.7 Platforms

No platforms exist within the H13093 survey area.

D.2.8 Significant Features

H13093 MBES data revealed a strikingly dynamic seafloor to the southwest of West Anacapa Island. The vertical relief of the swirling ridges measure up to approximately 6 meters high.

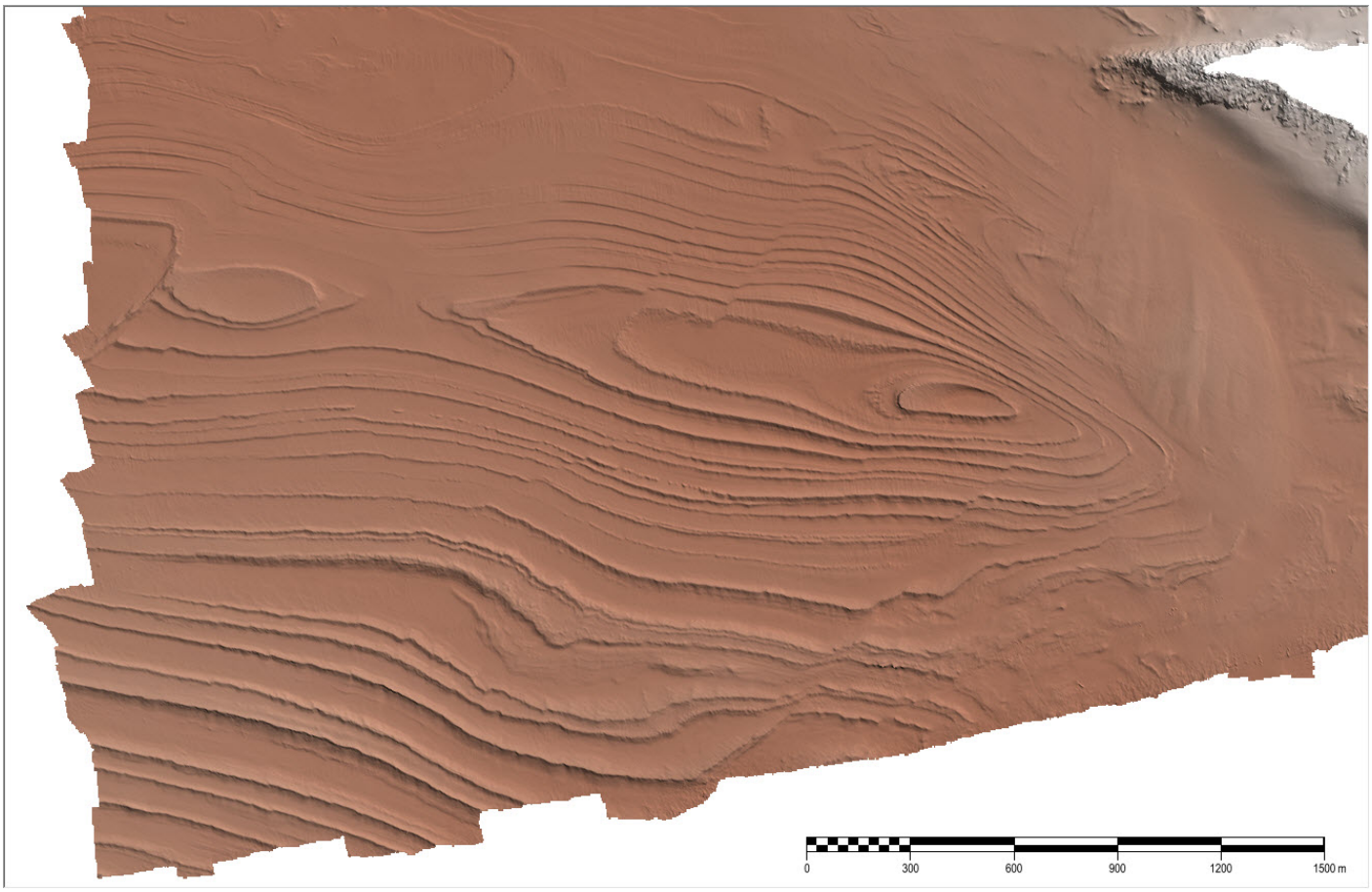


Figure 23: H13093 dynamic seafloor topography.

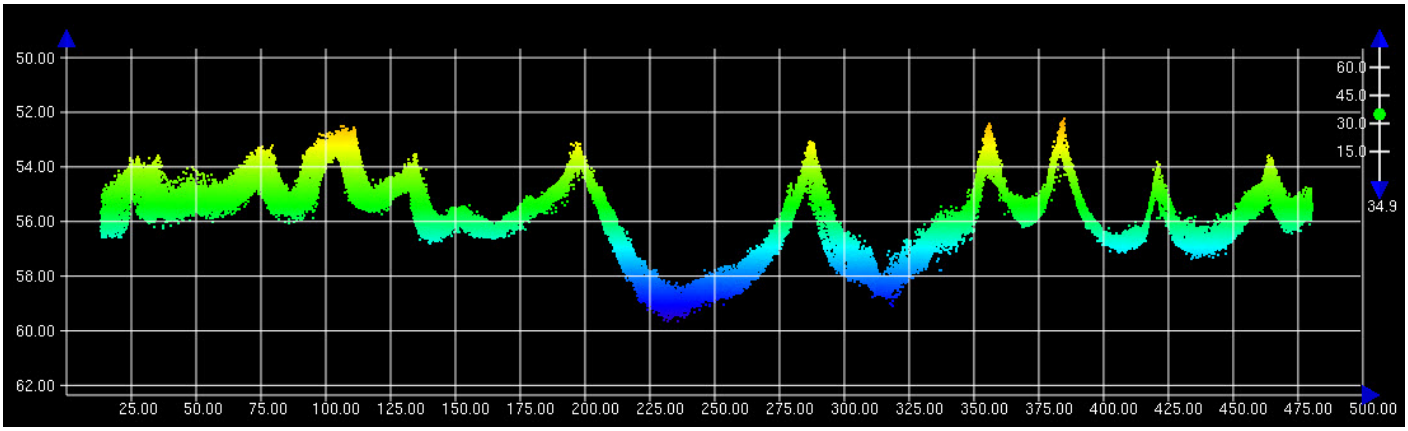


Figure 24: Subset view of dynamic H13093 seafloor area.

D.2.9 Construction and Dredging

No present or planned construction or dredging are known to exist within the survey limits.

D.2.10 New Survey Recommendation

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

D.2.11 Inset Recommendation

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 and Specifications Deliverables Manual, 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
Benjamin K. Evans, CDR/NOAA	Commanding Officer	01/10/2018	EVANS.BENJAMIN.K.1237217094 2018.01.09 14:33:08 -08'00'
Scott E. Broo, LT/NOAA	Field Operations Officer	01/10/2018	BROO.SCOTT.EDWARD.1396599976 Digitally signed by BROO.SCOTT.EDWARD.1396599976 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=BROO.SCOTT.EDWARD.1396599976 Date: 2018.01.22 17:49:22 -08'00'
James B. Jacobson	Chief Survey Technician	01/10/2018	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2018.01.12 14:28:38 -08'00'
B.D. Jackson	Senior Survey Technician	01/10/2018	B Jackson

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	Continually Operating Reference Staiton
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
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
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
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	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	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
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPE	Total Propagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : November 17, 2017

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-L397-RA-2017
HYDROGRAPHIC SHEET: H13093

LOCALITY: Vicinity of Anacapa Island,
Channel Islands and Vicinity

TIME PERIOD: October 19 - November 7, 2017

TIDE STATION USED: Los Angeles, CA 9410660
Lat.33° 43.2' N Long. 118° 16.4' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.448 meters

TIDE STATION USED: Santa Monica, CA 9410840
Lat. 34° 0.5' N Long. 118° 30' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.428 meters

TIDE STATION USED: Santa Barbara, CA 9411340
Lat. 34° 24.2' N Long. 119° 41.6' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.415 meters

TIDE STATION USED: Oil Platform Harvest, CA 9411406
Lat. 34° 28.1' N Long. 120° 40.9' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.373 meters

TIDE STATION USED: Port San Luis, CA 9412110
Lat. 35° 10.1' N Long. 120° 45.2' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.408 meters

TIDE STATION USED: Monterey, CA 9413450
Lat. 36° 36.3' N Long. 121° 53.3' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.412 meters

REMARKS: RECOMMENDED Grid

Please use the TCARI grid "L397RA2017Rev.tc" as the final grid for project OPR-L397-RA-2017, H13093, during the time period between October 19 - November 7, 2017.

Refer to attachments for grid information.

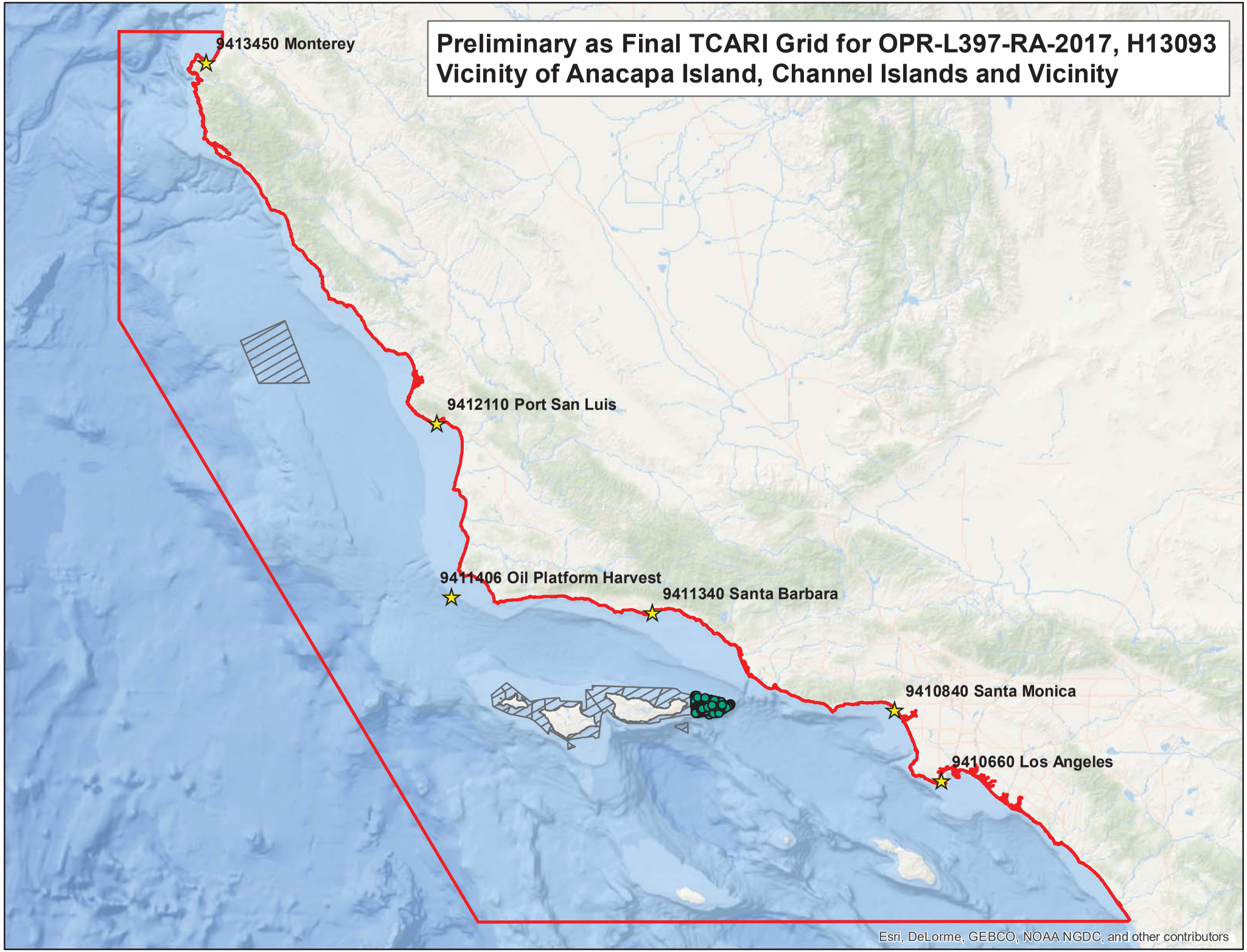
Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: Annual leveling for Los Angeles (9410660) and Port San Luis (9412110) was not completed in FY17. A review of the verified leveling records from October 2007 - March 2016 shows the tide station benchmark networks to be stable within an allowable 0.009 m tolerance. This Tide Note may be used as final stability verification for survey OPR-L397-RA-2017, H13093. CO-OPS will immediately provide a revised Tide Note should subsequent leveling records indicate any benchmark network stability movement beyond the allowable 0.009 m tolerance.

BURKE.PATRICK.B.1365830335

Digitally signed by BURKE.PATRICK.B.1365830335
Date: 2017.11.17 12:08:51 -05'00'

CHIEF, OCEANOGRAPHIC DIVISION


Preliminary as Final TCARI Grid for OPR-L397-RA-2017, H13093
Vicinity of Anacapa Island, Channel Islands and Vicinity
9413450 Monterey
9412110 Port San Luis
9411406 Oil Platform Harvest
9411340 Santa Barbara
9410840 Santa Monica
9410660 Los Angeles
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

H13093 DTON Report

Registry Number: H13093
State: California
Locality: Channel Islands and Vicinity
Sub-locality: Vicinity of Anacapa Island
Project Number: OPR-L397-RA-17
Survey Dates: 10/21/2017 - 10/31/2017

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18729	13th	10/01/2005	1:40,000 (18729_1)	USCG LNM: 11/5/2013 (7/11/2017) NGA NTM: None (7/22/2017)
18720	33rd	08/01/2008	1:232,188 (18720_1)	[L]NTM: ?
18740	42nd	03/01/2007	1:234,270 (18740_1)	[L]NTM: ?
18022	35th	08/01/2005	1:868,003 (18022_1)	[L]NTM: ?
18020	38th	10/01/2007	1:1,444,000 (18020_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	32nd	06/01/2007	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - *source: last correction applied (last correction reviewed--"cleared date")*

Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Shoal	5.50 m	34° 00' 23.2" N	119° 25' 49.0" W	---
1.2	Shoal	3.62 m	34° 00' 13.1" N	119° 25' 29.2" W	---
1.3	Shoal	1.93 m	34° 00' 41.8" N	119° 23' 00.6" W	---

1 - Dangers To Navigation

1.1) Profile/Beam 400/224 / 0022_20171031_191901_2801_304

DANGER TO NAVIGATION

Survey Summary

Survey Position:	34° 00' 23.2" N, 119° 25' 49.0" W
Least Depth:	5.50 m (= 18.04 ft = 3.007 fm = 3 fm 0.04 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.084 m ; **TVU (TPEv)** ±0.091 m
Timestamp:	2017-304.19:19:21.491 (10/31/2017)
Survey Line:	h13093 / 2801_em2040 / 2017-304 / 0022_20171031_191901_2801_304
Profile/Beam:	400/224
Charts Affected:	18729_1, 18720_1, 18740_1, 18022_1, 18020_1, 501_1, 530_1, 50_1

Remarks:

DTON is a 3-fathom survey sounding over a 9-fathom charted depth. It is located near the recommended anchorage described as follows in the Coast Pilot: "About the only protection from northeasters is to anchor as close as possible in the bight immediately west of Cat Rock, on the south side of the west island. "

Feature Correlation

Source	Feature	Range	Azimuth	Status
0022_20171031_191901_2801_304	400/224	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 3-fathom depth at position 34º00'23.1584"N, 119º25'48.9889"W

Arithmetically-Rounded Depth (Unit-wise Affected Charts):

3fm (18729_1, 18720_1, 18740_1, 18022_1, 18020_1, 530_1)

5.5m (501_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20171106
	SORIND - US,US,graph,H13093

TECSOU - 3:found by multi-beam

Feature Images

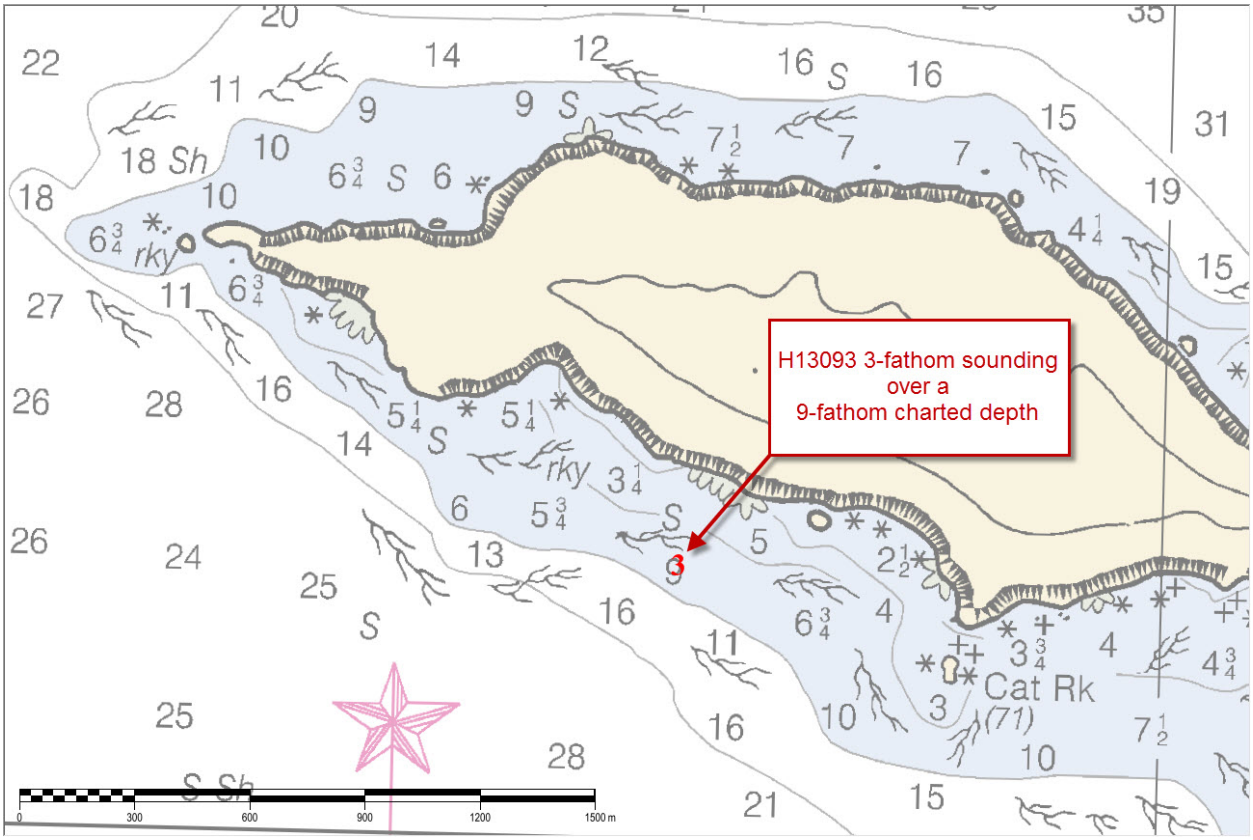
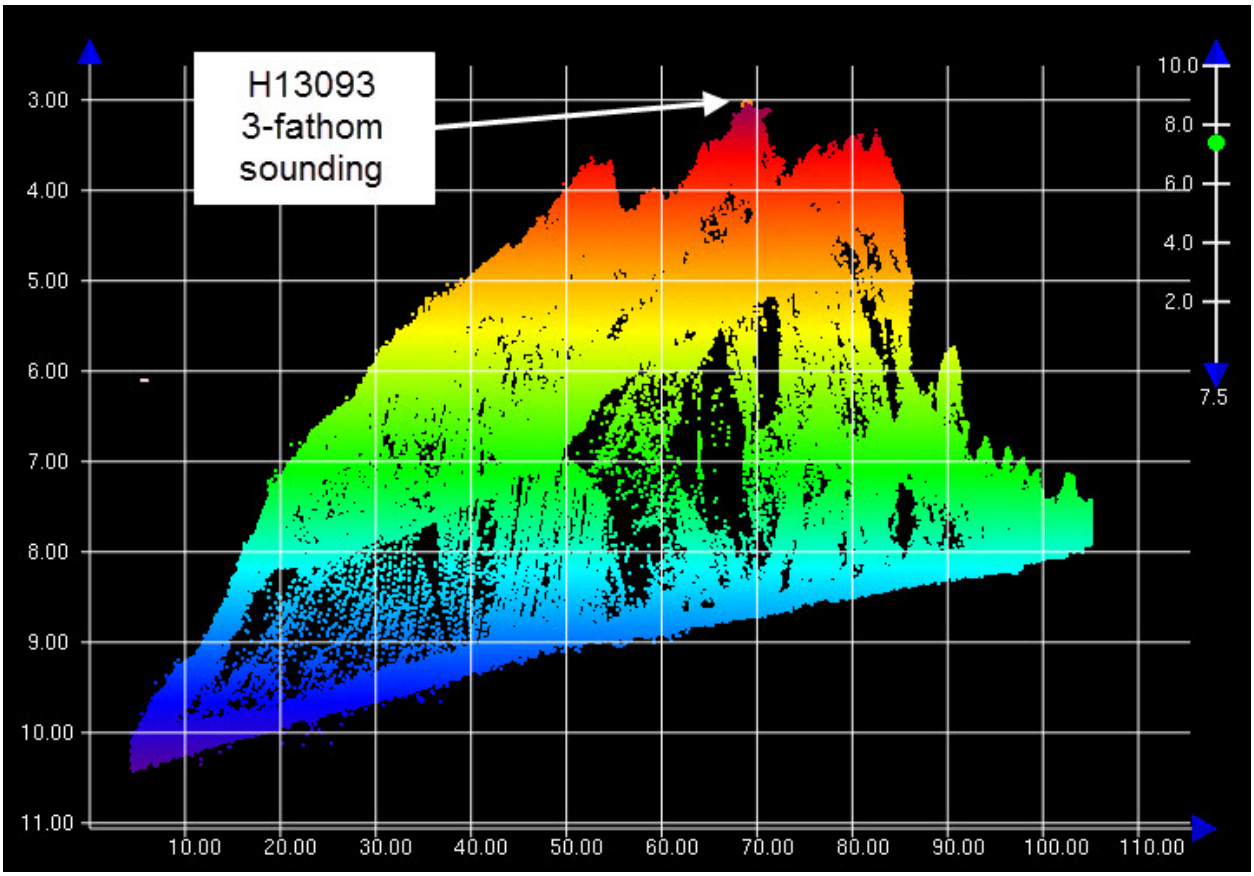


Figure 1.1.1


H13093
3-fathom
sounding
3.00
4.00
5.00
6.00
7.00
8.00
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7.5

Figure 1.1.2

1.2) Profile/Beam 5772/90 / 0018_20171031_181946_2801_304

DANGER TO NAVIGATION

Survey Summary

Survey Position:	34° 00' 13.1" N, 119° 25' 29.2" W
Least Depth:	3.62 m (= 11.89 ft = 1.982 fm = 1 fm 5.89 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.096 m ; **TVU (TPEv)** ±0.373 m
Timestamp:	2017-304.18:24:23.213 (10/31/2017)
Survey Line:	h13093 / 2801_em2040 / 2017-304 / 0018_20171031_181946_2801_304
Profile/Beam:	5772/90
Charts Affected:	18729_1, 18720_1, 18740_1, 18022_1, 18020_1, 501_1, 530_1, 50_1

Remarks:

DTON is a 2-fathom survey sounding located between the charted 10-fathom and 3-fathom contours. It is located near the recommended anchorage described as follows in the Coast Pilot: "About the only protection from northeasters is to anchor as close as possible in the bight immediately west of Cat Rock, on the south side of the west island. "

Feature Correlation

Source	Feature	Range	Azimuth	Status
0018_20171031_181946_2801_304	5772/90	0.00	000.0	Primary

Hydrographer Recommendations

Chart 2-fathom depth at position 34º00'13.1224"N, 119º25'29.1803"W

Arithmetically-Rounded Depth (Unit-wise Affected Charts):

2fm (18729_1, 18720_1, 18740_1, 18022_1, 18020_1, 530_1)

3.6m (501_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20171106
	SORIND - US,US,graph,H13093

TECSOU - 3:found by multi-beam

Feature Images

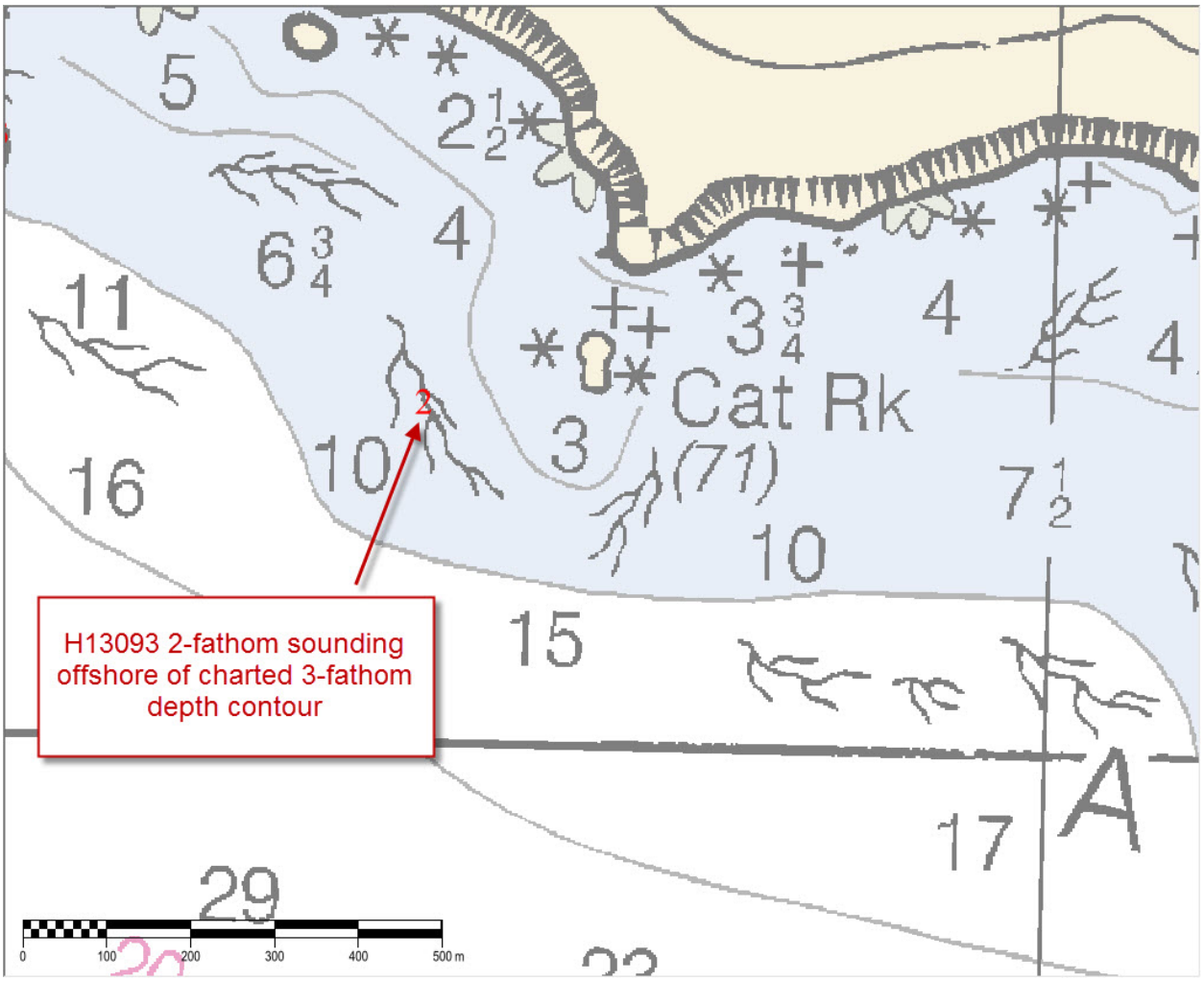
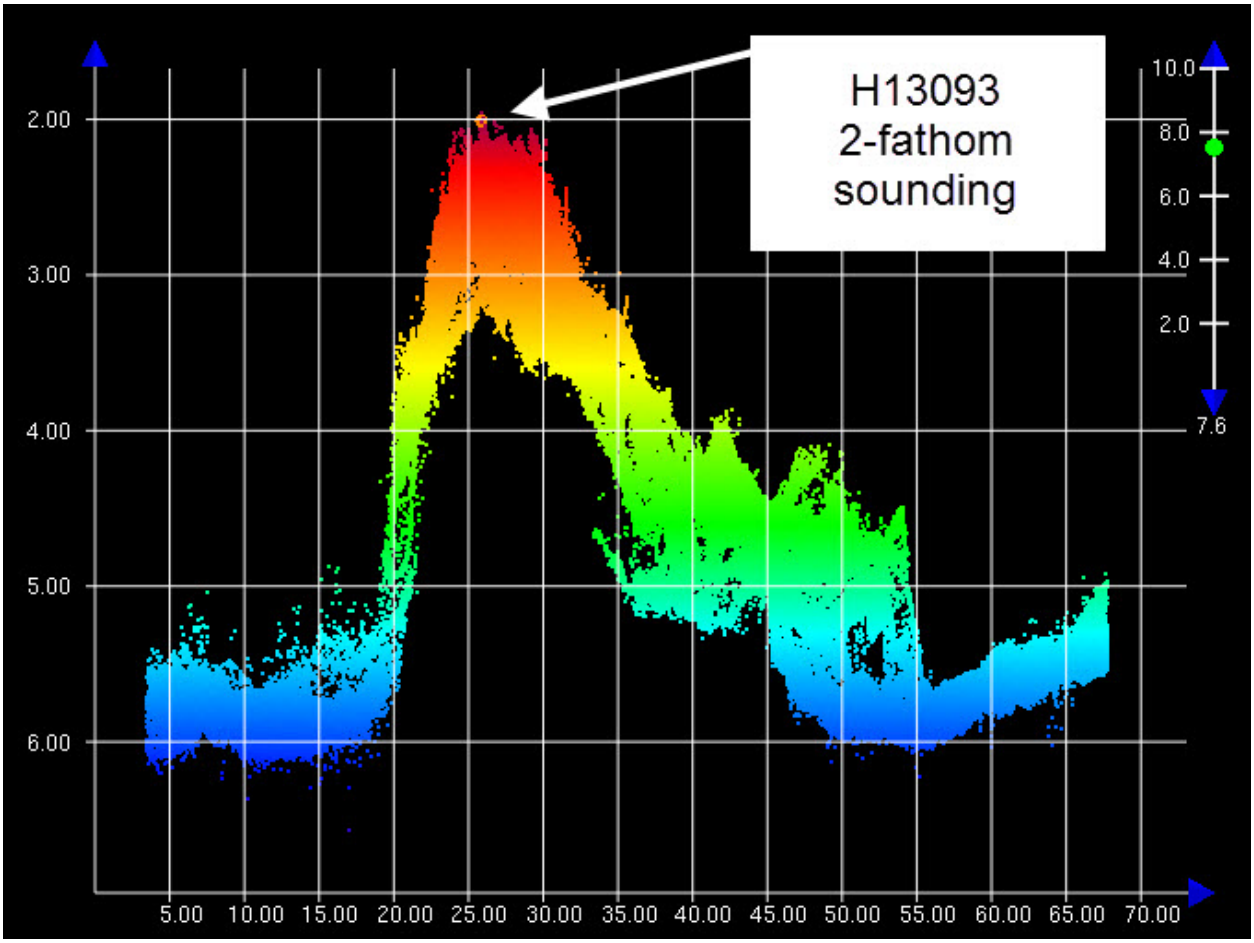


Figure 1.2.1


H13093
2-fathom
sounding
2.00
3.00
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5.00
6.00
5.00 10.00 15.00 20.00 25.00 30.00 35.00 40.00 45.00 50.00 55.00 60.00 65.00 70.00
10.0
8.0
6.0
4.0
2.0
7.6

Figure 1.2.2

1.3) Profile/Beam 561/381 / 0022_20171021_193939_2803_294

DANGER TO NAVIGATION

Survey Summary

Survey Position:	34° 00' 41.8" N, 119° 23' 00.6" W
Least Depth:	1.93 m (= 6.34 ft = 1.057 fm = 1 fm 0.34 ft)
TPU (±1.96σ):	**THU (TPEh)** ±0.100 m ; **TVU (TPEv)** ±0.280 m
Timestamp:	2017-294.19:40:04.298 (10/21/2017)
Survey Line:	h13093 / 2803_em2040 / 2017-294 / 0022_20171021_193939_2803_294
Profile/Beam:	561/381
Charts Affected:	18729_1, 18720_1, 18740_1, 18022_1, 18020_1, 501_1, 530_1, 50_1

Remarks:

DTON is a 1-fathom survey sounding located offshore the charted 3-fathom contour.

Feature Correlation

Source	Feature	Range	Azimuth	Status
0022_20171021_193939_2803_294	561/381	0.00	000.0	Primary

Hydrographer Recommendations

Chart a 1-fathom depth at position 34º00'41.8266"N, 119º23'00.6061"W

Arithmetically-Rounded Depth (Unit-wise Affected Charts):

1fm (18729_1, 18720_1, 18740_1, 18022_1, 18020_1, 530_1)

1.9m (501_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20171106
	SORIND - US,US,graph,H13093
	TECSOU - 3:found by multi-beam

Feature Images

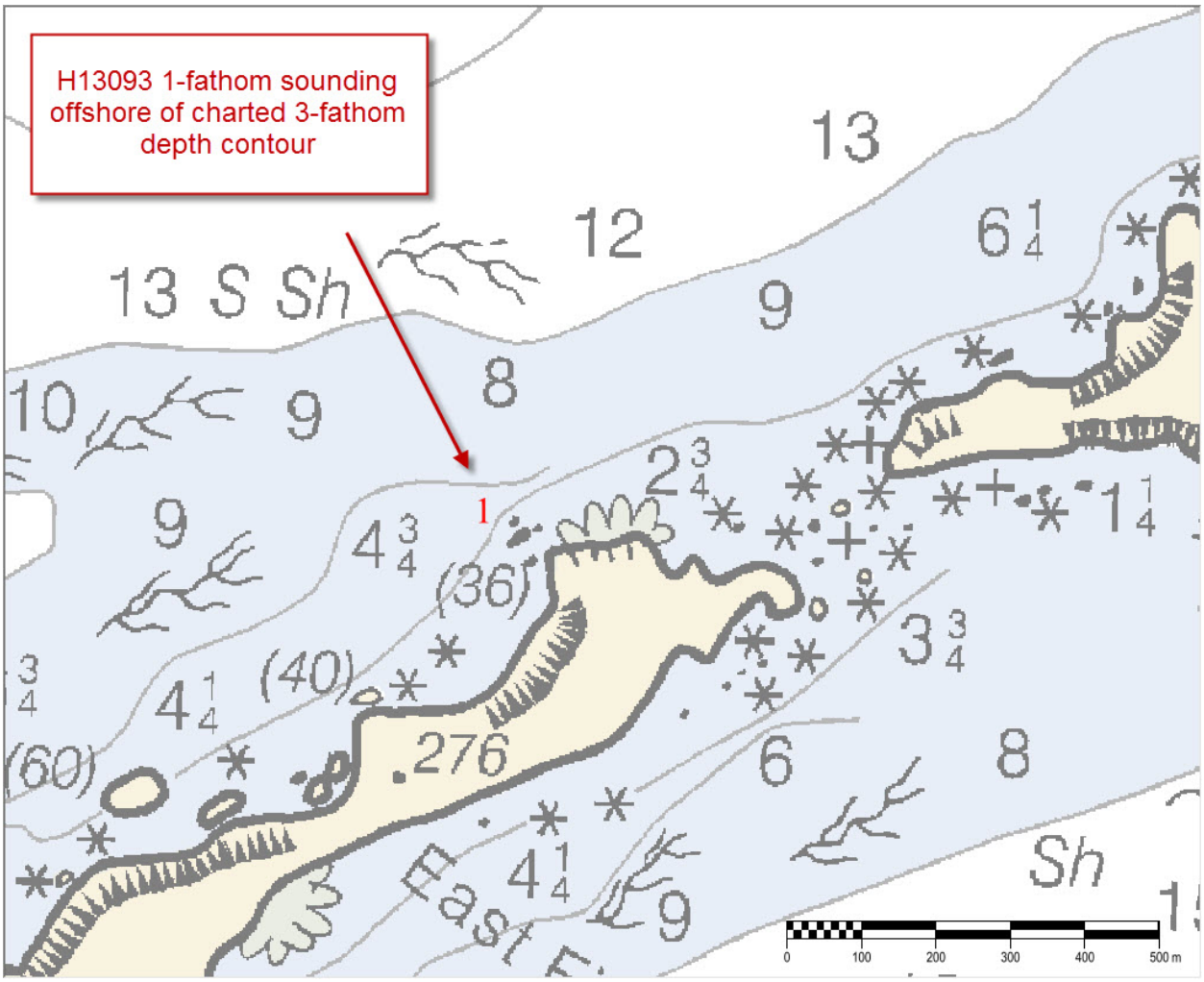
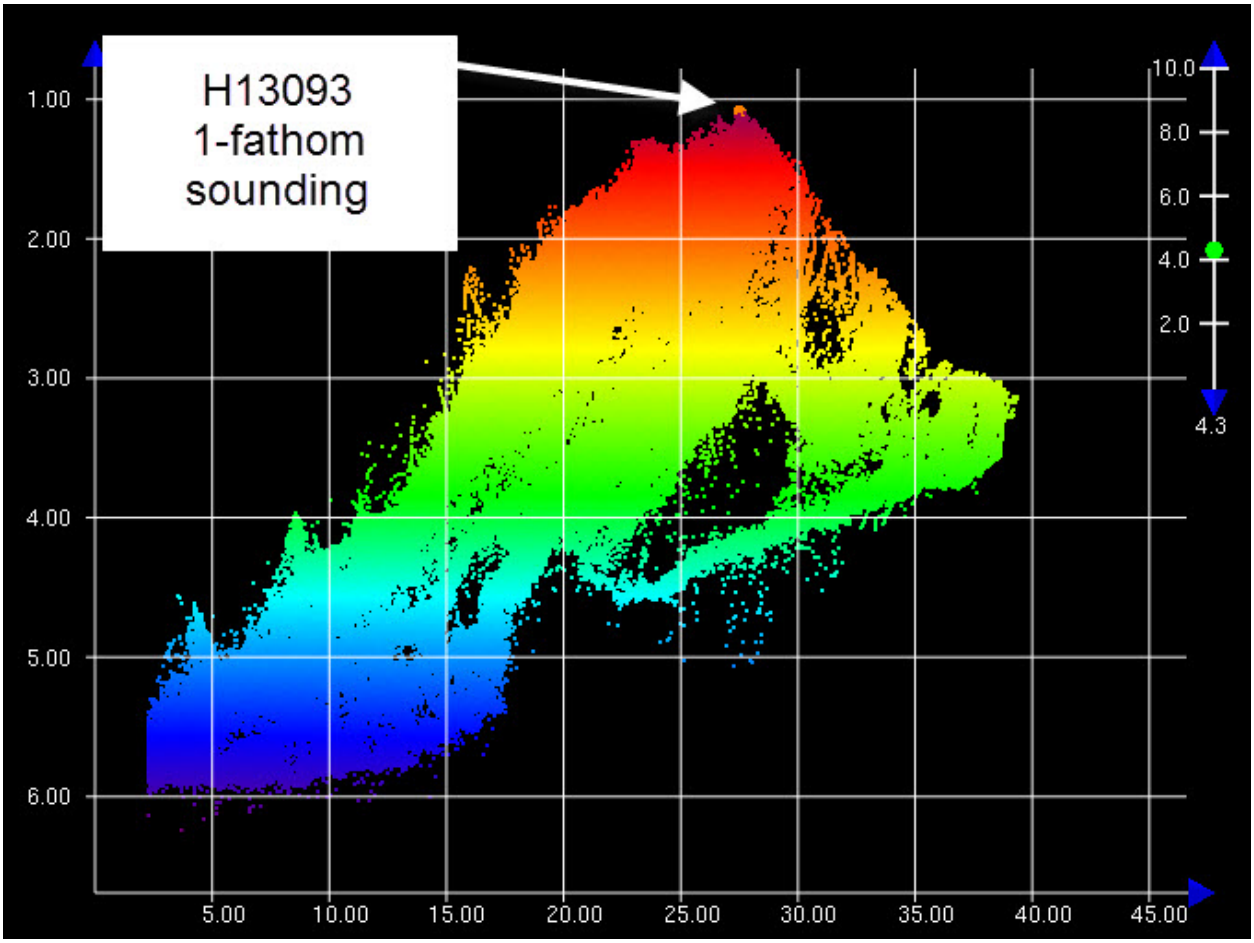


Figure 1.3.1


H13093
1-fathom
sounding
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4.00
5.00
6.00
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15.00
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25.00
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35.00
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45.00
10.0
8.0
6.0
4.0
2.0
4.3

Figure 1.3.2

Re: H13093, Anacapa Island / Lasker Junction

1 message

Samuel Greenaway - NOAA Federal <samuel.greenaway@noaa.gov> Thu, Dec 21, 2017 at 3:16 PM
To: OPS Rainier - NOAA Service Account <ops.rainier@noaa.gov>
Cc: CO RAINIER <co.rainier@noaa.gov>, Jim Jacobson <ChiefST.Rainier@noaa.gov>, Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Scott Broo - NOAA Federal <scott.e.broo@noaa.gov>, Kurt Mueller - NOAA Federal <kurt.mueller@noaa.gov>, Grant Froelich <grant.froelich@noaa.gov>

Andrew et al,

I think the survey in question was acquired before we got aboard to help them sort out offsets, etc.

Seeing that the draft of the transducer is about 5.2 meters, I expect that the data in that survey was in fact transducer relative. I did help them resolve a horrendous heave artifact in this data (a many minute long timing error), but I do not know if the chief Scientist resubmitted the survey to Coast Survey- I suspect not.

One takeaway from all this is the careful work we do in the survey world to resolve biases and deliver products that are well controlled is a) not easy and b) very valuable. But making this point to folks who just want to go make a map is difficult without sounding like a jerk.

So yes, the RA data is no doubt superior. Having these data sets side by side will help tell the story of why is is worth having a proper mapping ship do mapping work. Even with the right set up, there are any number of ways to bollox up a survey. We (OCS) have helped significantly here - but as with many things, it is hard to help just a little.

For the branches- I think a good question is how much we want this data for the chart.

v/r,

Sam

On Wed, Dec 20, 2017 at 7:45 PM, OPS Rainier - NOAA Service Account <ops.rainier@noaa.gov> wrote:

> Hi CO,
>
> The area of overlap is 60+ meters deep. The Lasker survey from 2016 (W00343) was found to be more shallow by 5 meters compared to H13093 and 5.9 meters more shallow than a Shimada survey in the same area.
>
> V/R,
> LT Clos
>
> On Wed, Dec 20, 2017 at 3:59 PM, CO RAINIER <co.rainier@noaa.gov> wrote:
>
> > FOOs,
> >
> > How deep is the water in the junction area?
> >
> > These results are not surprising. When AHB reviewed ME70 data in the same area, they determined that there was sufficient ambiguity in the metadata that they could not determine if offsets had been applied, or if so if they had been applied with the correct sign. As a result, they assigned the data horizontal and vertical uncertainties roughly scaled to the size of the vessel. I believe OCS has determined that no ME70 data for this area will be applied to the charts in less than 100m of water (where the HSSD jumps from IHO S-44 Order 1 to Order 2 requirements) - but this would appare to exceed even that.
> >
> > CO

On 12/20/2017 1:21 PM, OPS Rainier - NOAA Service Account wrote:

> Hi CO and LCDR Greenaway,
>
> We noticed a 5 meter difference between H13093 (Rainier 2017 CINMS) and a 2016 Rueben Lasker survey W00343 and I have heard some of your names in passing while discussing hydro survey standards as they pertain to our fisheries ships.
>
> If you have any insight as to how the Lasker might have been set up in 2016, I'd be interested in hearing what you know. For example, did anyone in the hydro community help them with their offsets and processing? Perhaps we can help them out a little more, especially if this is an easy fix or something that might have just been left out of processing or the HVF.
>
> I didn't think we were planning to chart the Lasker data, but after speaking with Kurt Mueller (SAR reviewer of W00343) it sounds like some of the data from the Channel Islands "W" surveys could make its way to the chart (pending comparison to Rainier 2017 data?)
>
> Chief Jacobson thinks that the Lasker data may not have draft applied and that sounds like a very plausible explanation to me.
>
> Here is the excerpt from the draft DR of H13093:
>
> "The junction with survey W00343 encompassed 0.44 square nautical miles along the southwestern boundary of H13093. A comparison was made with the Compare Grids function of Pydro Explorer using a difference surface derived from 4-meter Caris .csar surfaces of each survey. Analysis of the difference surface indicated that H13093 is an average of 5.0 meters deeper than W00343 with a standard deviation of 2.02 meters. According to the Survey Acceptance Review (SAR) issued by the Pacific Hydrographic Branch, W00343 was a habitat mapping survey acquired with a Simrad ME70, a sonar normally used to collect water column data for fisheries applications. The SAR also stated that data from the ME70 are not suitable for H13093 NOAA Ship Rainier 18 object detection, feature disproval or for areas of critical under-keel clearance. The W00343 SAR identified persistent heave-like artifacts throughout the entire survey, the lack of crosslines and that the survey was significantly shoaler (5.9 meters) than junction survey W00291. This information helps to explain the poor comparison between H13093 and W00343 data. H13093 was acquired under significantly higher data quality standards than was W00343 and should be considered the more accurate of the two."
>
> V/R,

--
CDR Ben Evans, NOAA
Commanding Officer
NOAA Ship RAINIER (s221)

--
LCDR Samuel Greenaway, NOAA
Chief, Hydrographic Systems and Technology Branch
Office of Coast Survey
National Oceanic and Atmospheric Administration
cell: 206-427-9554
office: 240-847-8241

APPROVAL PAGE

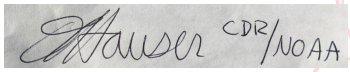
H13093

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
- Bottom Samples
- 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.

Approved: 

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Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch