H13088

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H13088

LOCALITY

State(s):	California
General Locality:	Channel Islands National Marine Sanctuary
Sub-locality:	Johnson's Lee and vicinity

2017

CHIEF OF PARTY
Benjamin K. Evans, CDR/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H13088**

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 National Marine Sanctuary**
Sub-Locality:	**Johnson's Lee and vicinity**
Scale:	**20000**
Dates of Survey:	**10/08/2017 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:

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Descriptive Report to Accompany Survey H13088

Project: OPR-L397-RA-17

Locality: Channel Islands National Marine Sanctuary

Sublocality: Johnson's Lee and vicinity

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 H13088, "Johnson's Lee and vicinity" (Sheet 7). This area is outlined in the project instructions and encompasses approximately 20 square nautical miles around Santa Cruz 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
33° 56' 36.39" N 120° 12' 12.88" W	33° 50' 41.7" N 119° 56' 59.67" W

Table 1: Survey Limits

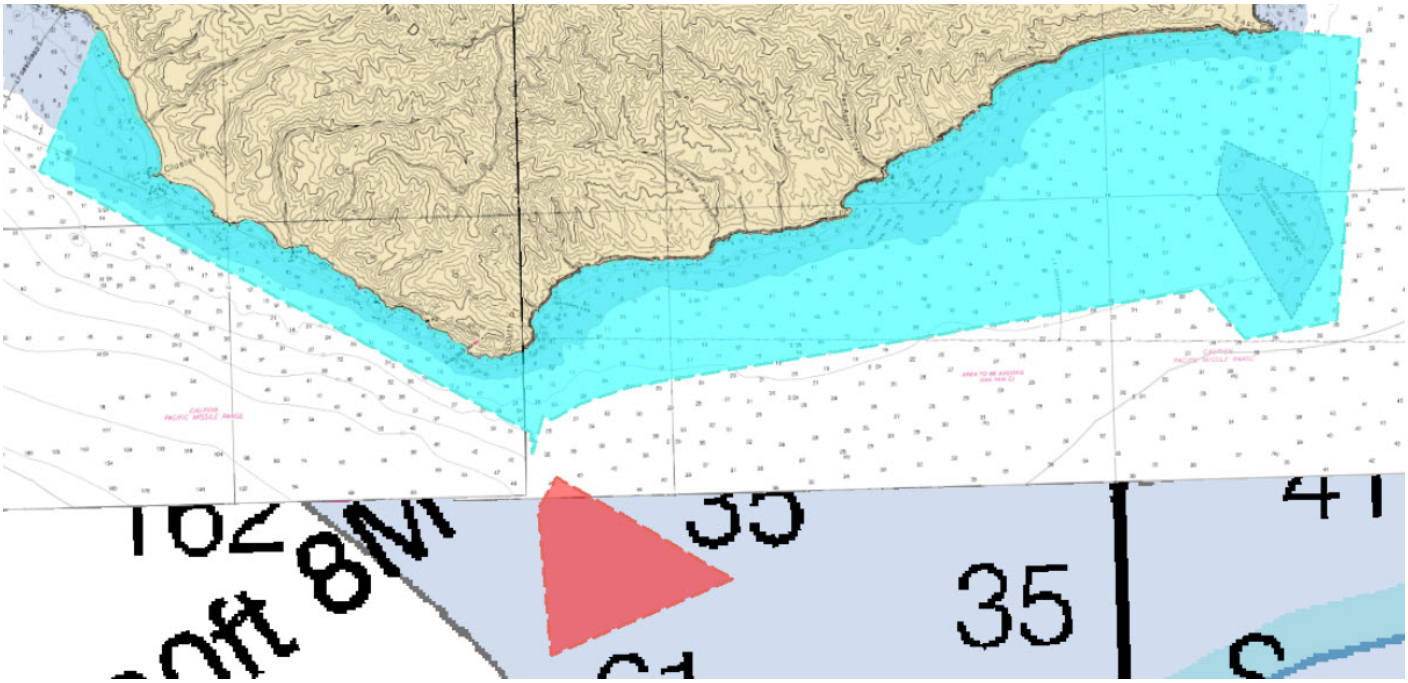


Figure 1: H13088 assigned survey area (Charts 187272, 18728, 18022).

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 of less than 40 meters, where vessel traffic is highest. This area is a popular tourist location, with regular commercial and recreational fishing, diving, and pleasure craft. It also covers Johnson's Lee, a location regularly used for anchorage in foul weather. Inaccurate charting data in these well-traveled areas poses a serious risk to life, property and the delicate ecosystem within the Channel Islands National Marine Sanctuary. H13088 multibeam and backscatter data will serve to enhance marine navigational safety, and will assist sanctuary managers, planners and researchers in the conservation of this 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 H13088 multibeam echosounder (MBES) data density. The submitted H13088 variable-resolution (VR) surface met HSSD density and full coverage requirements as shown in the histogram below.

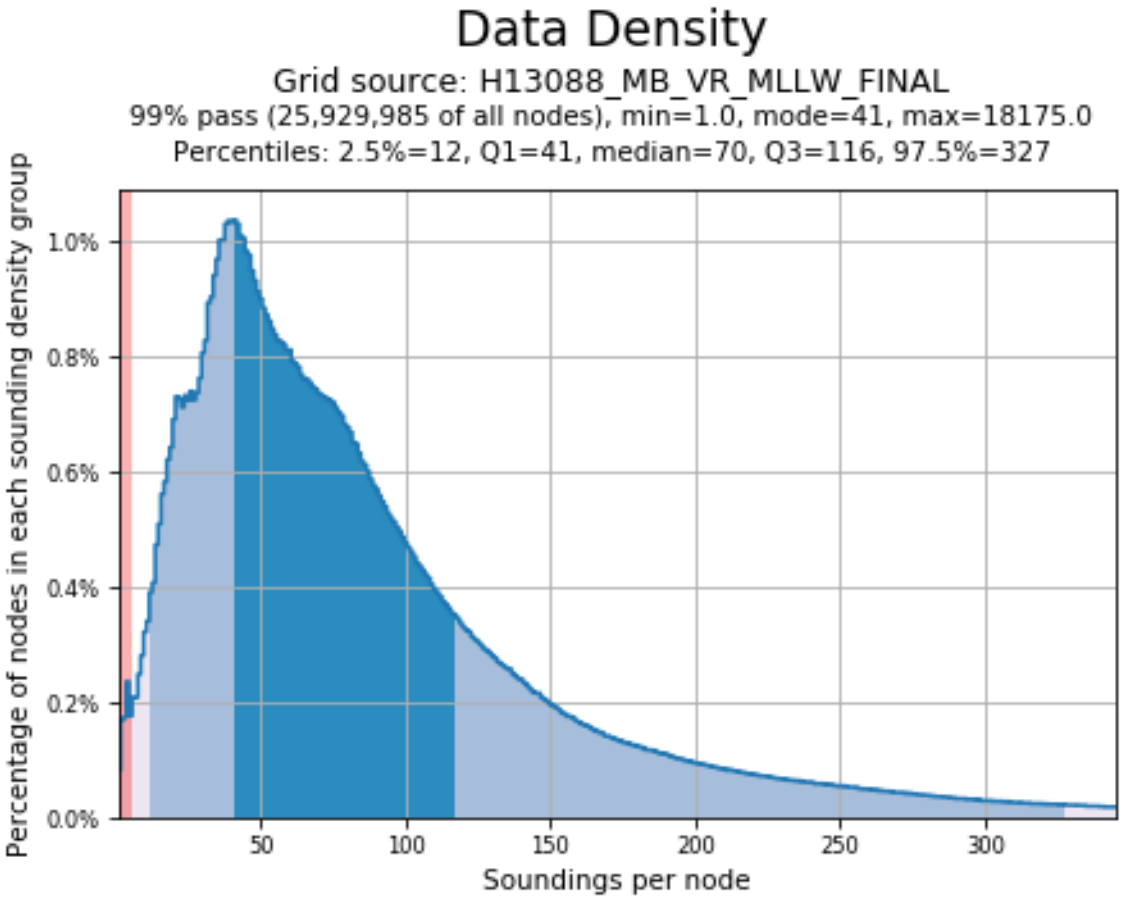


Figure 2: Pydro derived histogram plot showing HSSD density compliance of H13088 finalized variable-surface MBES data

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)

Table 2: Survey Coverage

Complete multibeam echosounder (MBES) coverage was acquired to the inshore limit of hydrography, the Navigable Area Limit Line (NALL), see Figure 5. In most areas, the NALL was found to be offshore of the

4-meter contour due to rocks, dangerous wave action, or other hazards such as thick kelp as shown in Figure 3 below. Additionally, one holiday occurred approximately 300 square meters in area, 150 meters northeast of "Ford Point" at location 33.91709 degrees N, 120.04727 degrees W. It is the product of thick kelp in the areas and it was determined unsafe to develop any further, see below (Figure 4).

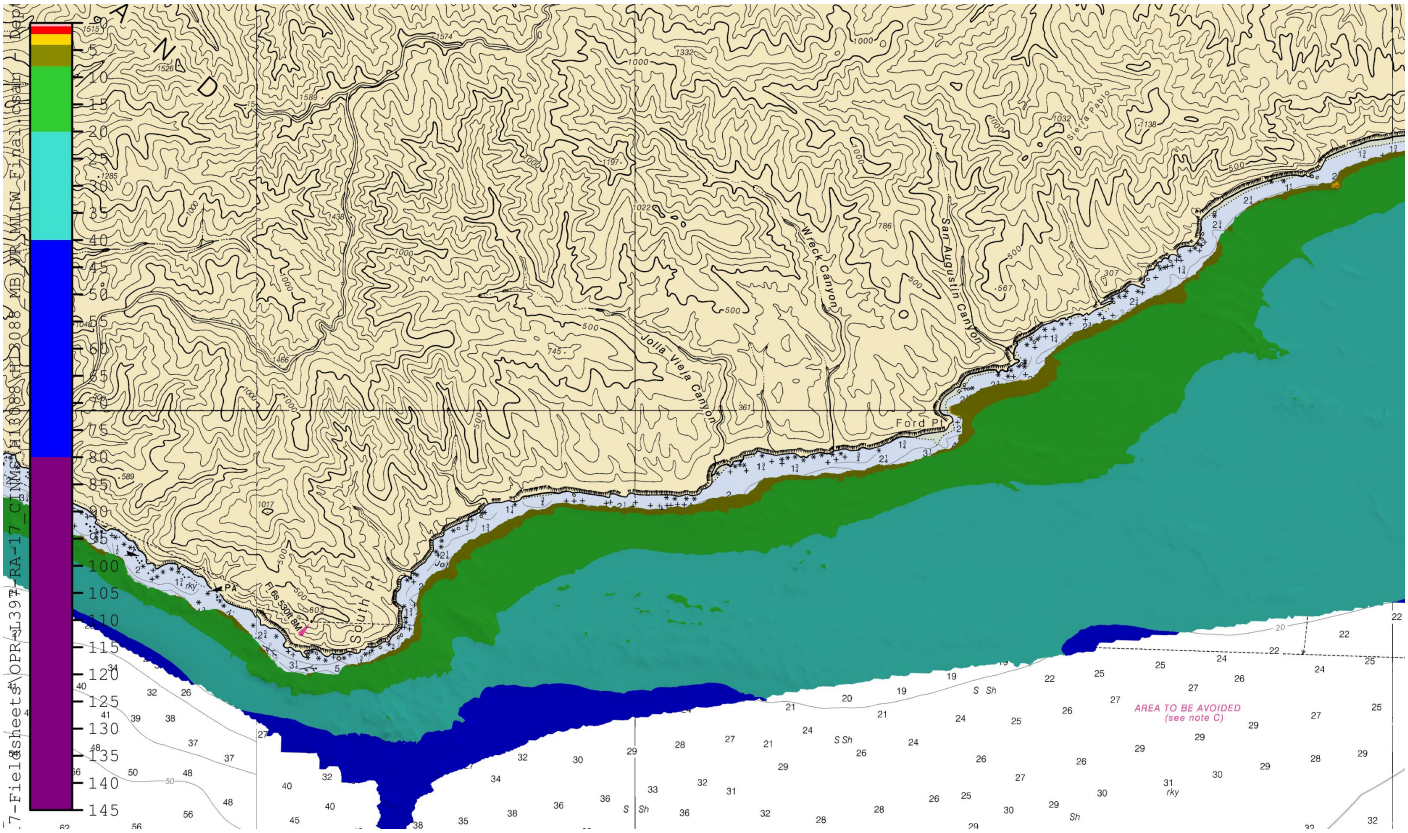


Figure 3: Example of H13088 NALL determination. Areas not developed to 4-meter "Yellow" area restricted by kelp.

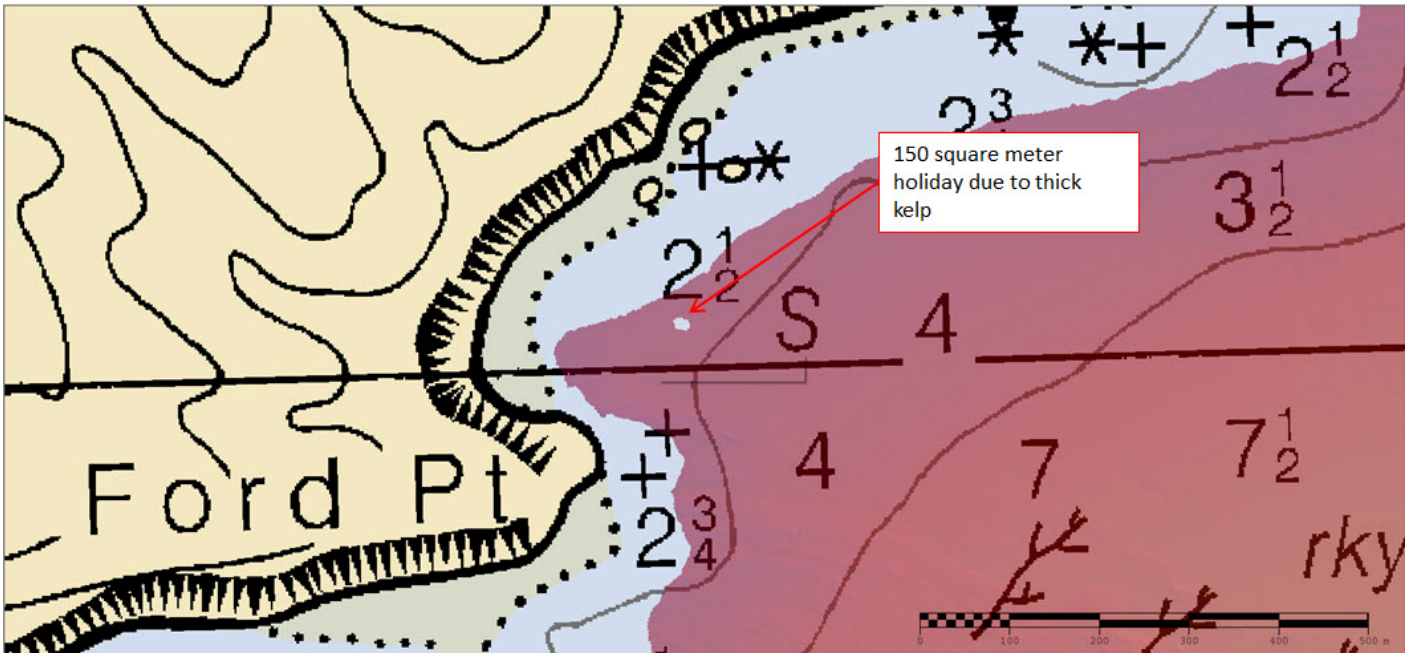


Figure 4: Holiday in coverage caused by thick kelp, unable to develop further.

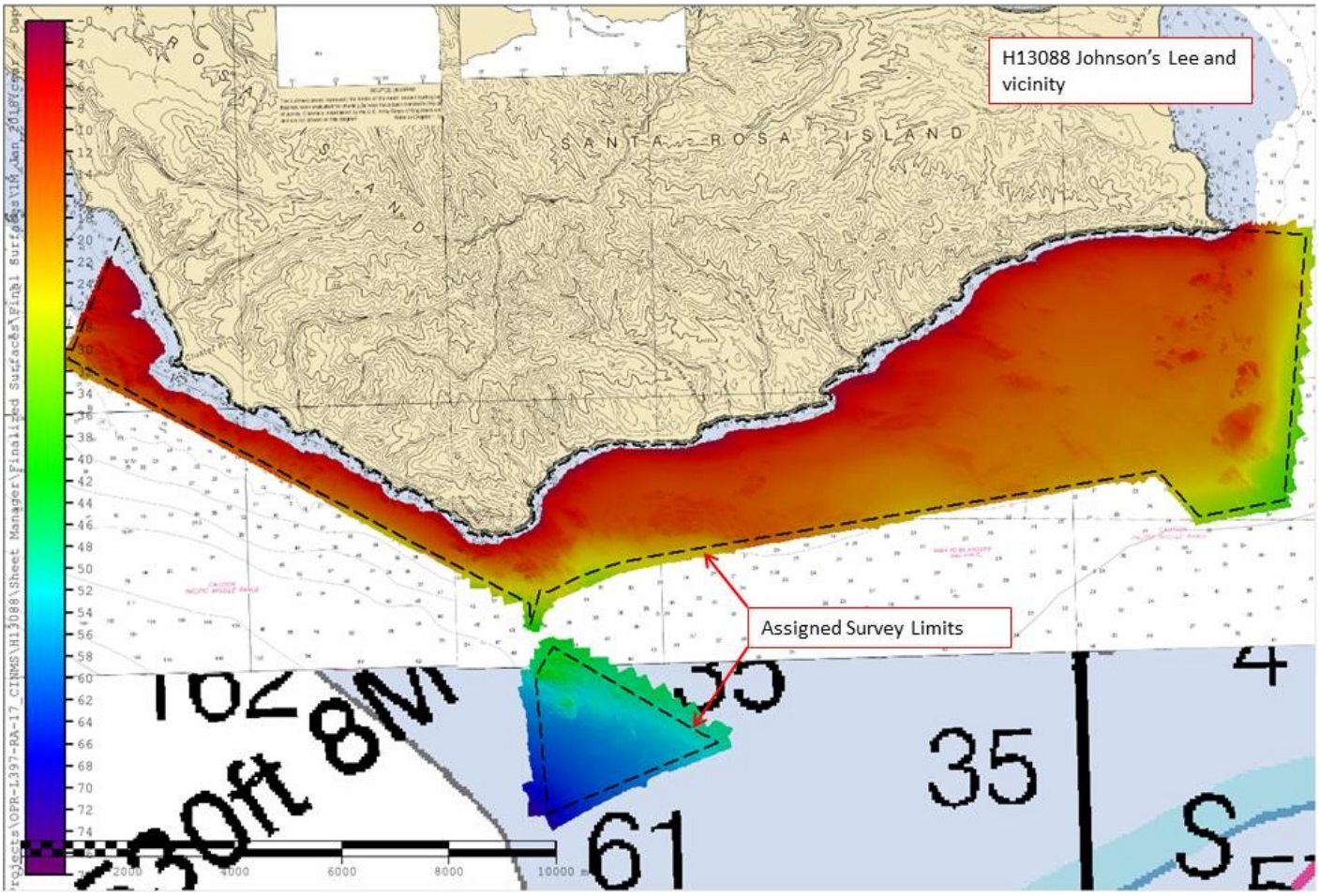


Figure 5: H13088 MBES coverage and assigned survey limits (Charts 18727, 19728, and 18022)

A.6 Survey Statistics

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

	HULL ID	*S221*	*2804*	*2803*	*2802*	*2801*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0	0	0
	MBES Mainscheme	16.20	109.30	130.37	75.17	135.43	466.47
	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	4.33	0	10.10	3.52	3.38	21.33
	Lidar Crosslines	0	0	0	0	0	0
Number of Bottom Samples							0
Number Maritime Boundary Points Investigated							0
Number of DPs							64
Number of Items Investigated by Dive Ops							0
Total SNM							19.65

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
10/08/2017	281
10/09/2017	282

Survey Dates	Day of the Year
10/12/2017	285
10/22/2017	295
10/23/2017	296
11/05/2017	309
11/06/2017	310

Table 4: 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 5: Vessels Used

Figure 6: NOAA Survey Launch 2803 near Santa Cruz Island

All data for H13088 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
Odim Brooke Ocean	MVP200 Moving Vessel Profiler	Sound Speed System
Sea-Bird Electronics	SBE 19plus SEACAT Profiler	Conductivity, Temperature, and Depth Sensor
Reson	SVP70 / SVP71	Surface Sound Speed Sensors
Kongsberg	EM710	MBES
Kongsberg	EM 2040	MBES
Applanix	POS M/V v5	Positioning and Attitude System

Table 6: 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

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 4.57% of mainscheme acquisition.

21.33 nautical miles of multibeam crosslines were acquired by RAINIER S221 and launches 2801, 2802, and 2803 across most depth ranges and 3 boat days. The Hydrographer deems them adequate for verifying and evaluating the internal consistency of H13088 survey data. Analysis was performed using the Compare Grids function in Pydro Explorer on 2-meter resolution finalized surfaces of H13088 mainscheme only and crossline only data. 99.5+% of nodes met allowable uncertainties. For additional results, see figures below.

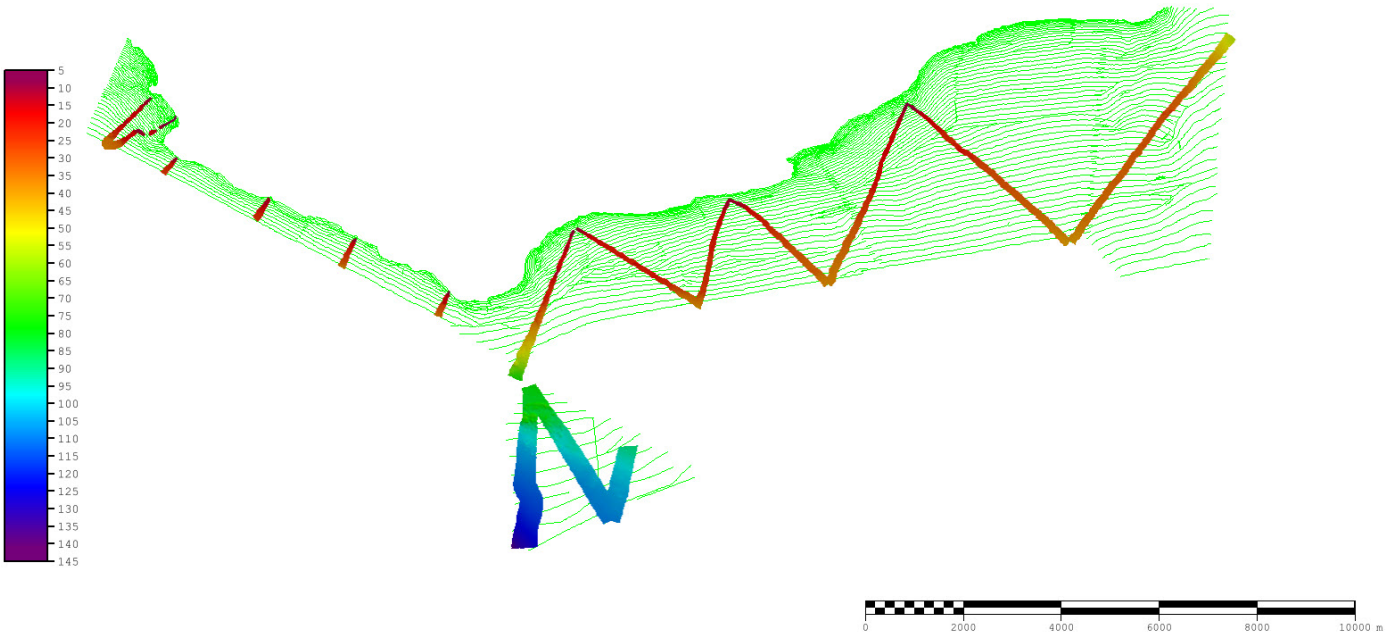


Figure 7: H13088 crossline surface overlaid on mainscheme tracklines.

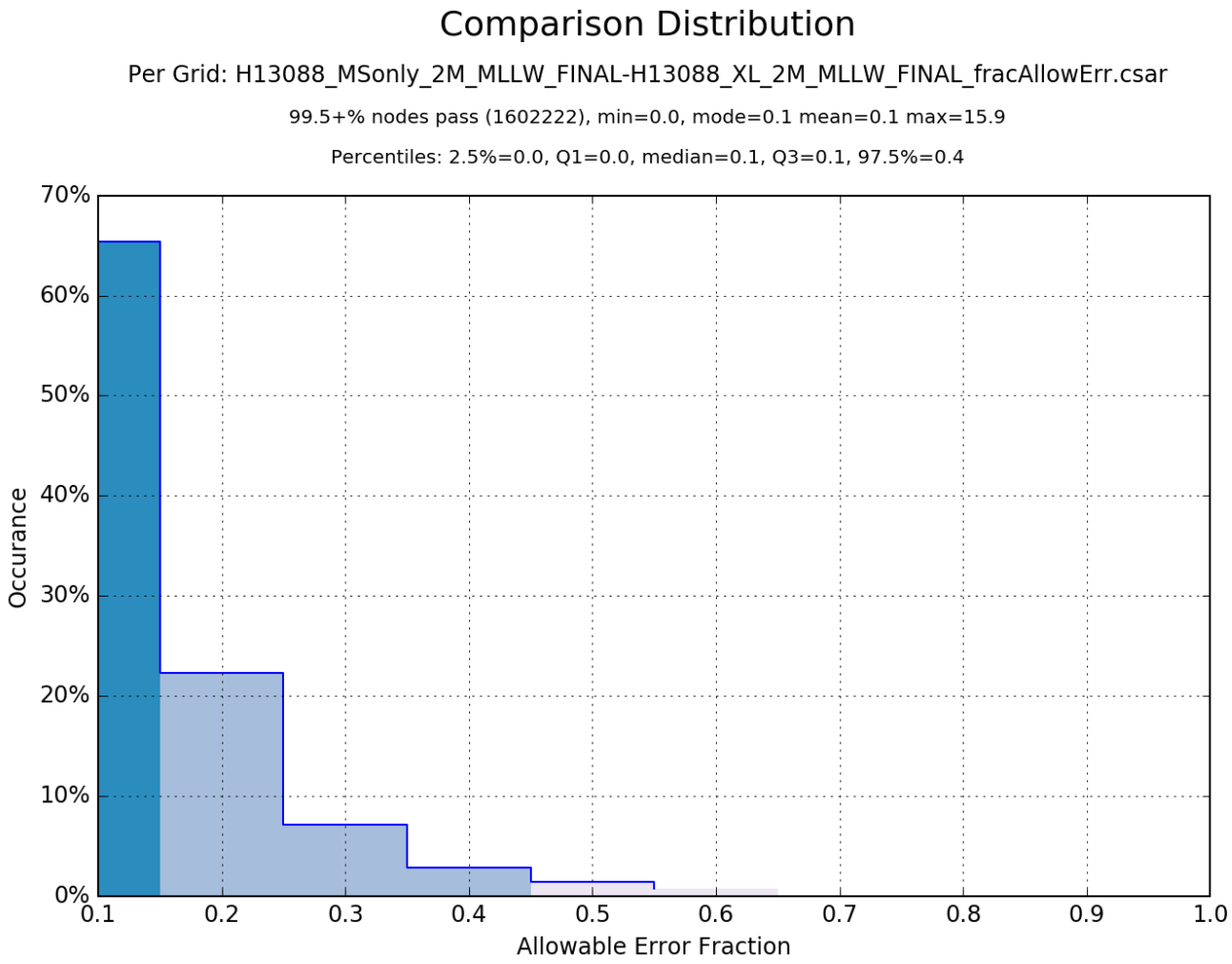


Figure 8: Pydro derived plot showing percentage-pass value of H13088 mainscheme to crossline data.

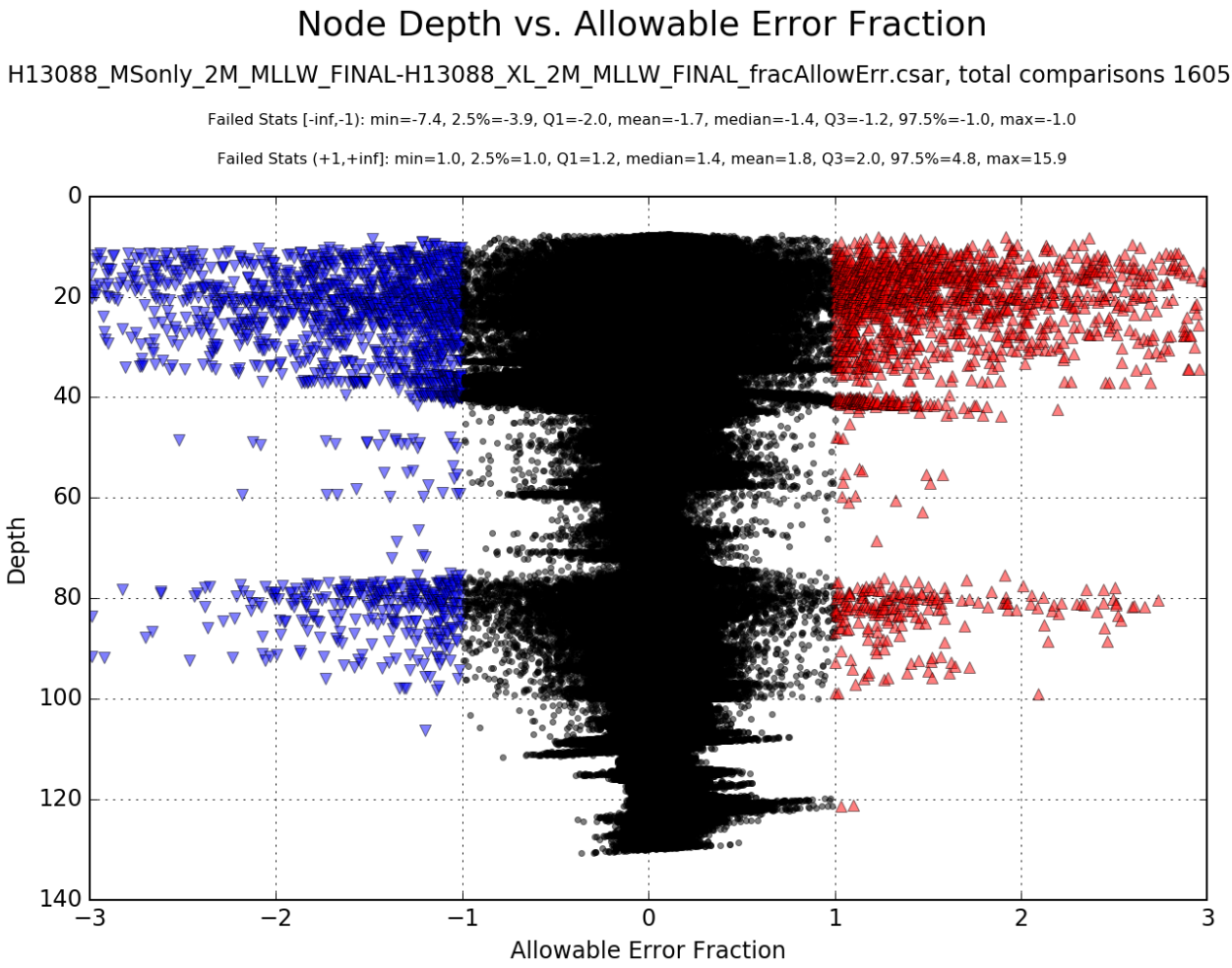
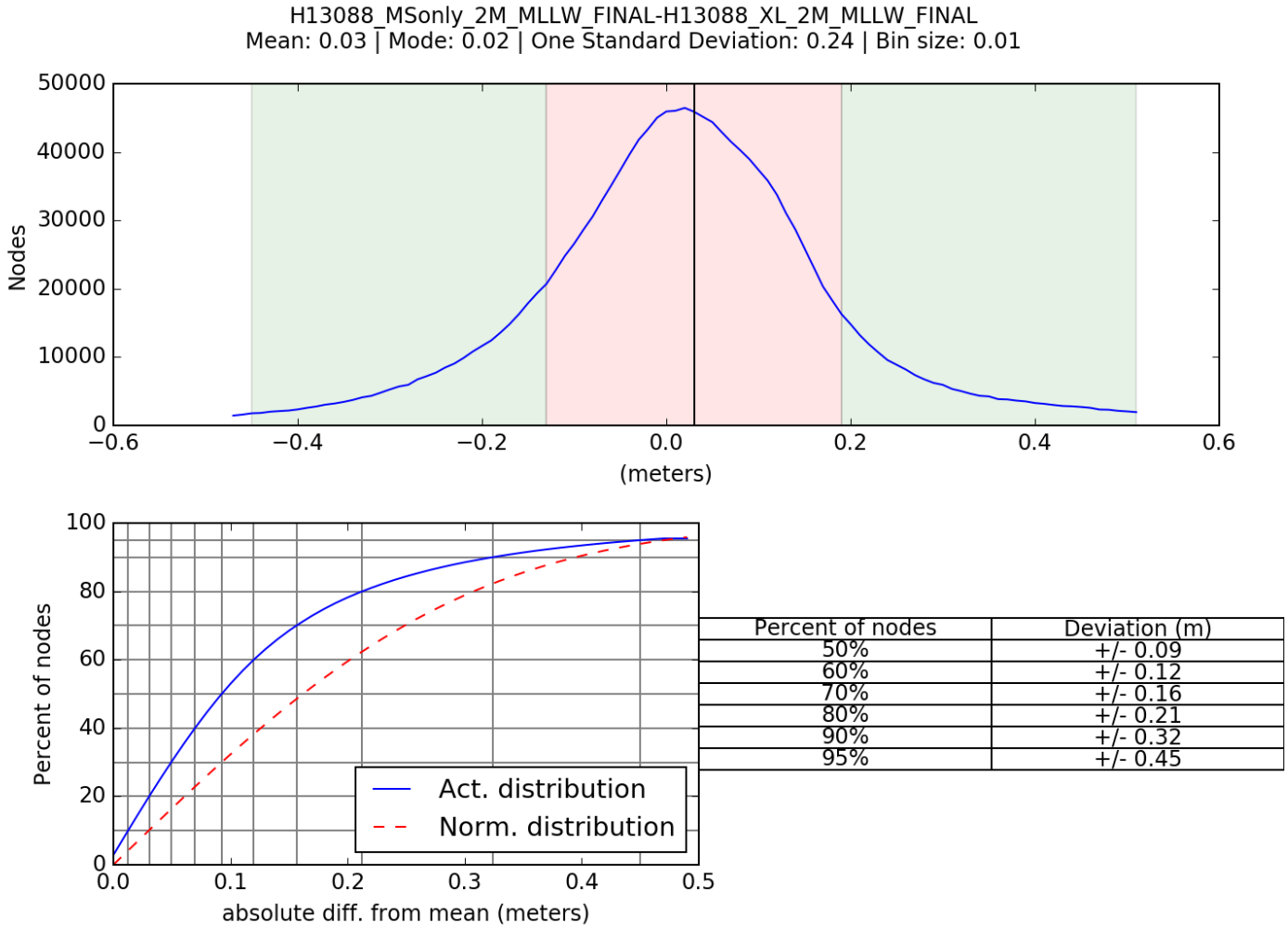


Figure 9: Pydro derived plot showing node depth vs. allowable error fraction of H13088 mainscheme to crossline data.



Percent of nodes	Deviation (m)
50%	+/- 0.09
60%	+/- 0.12
70%	+/- 0.16
80%	+/- 0.21
90%	+/- 0.32
95%	+/- 0.45

Figure 10: Pydro derived plot showing absolute difference statistics of H13088 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.082867 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S221		1 meters/second	.05 meters/second
2801,2802,2803,2804	3 meters/second		.15 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13088 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 postprocessed 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 H13088 TVU compliance, a histogram plot of the results is shown below (Figure 11).

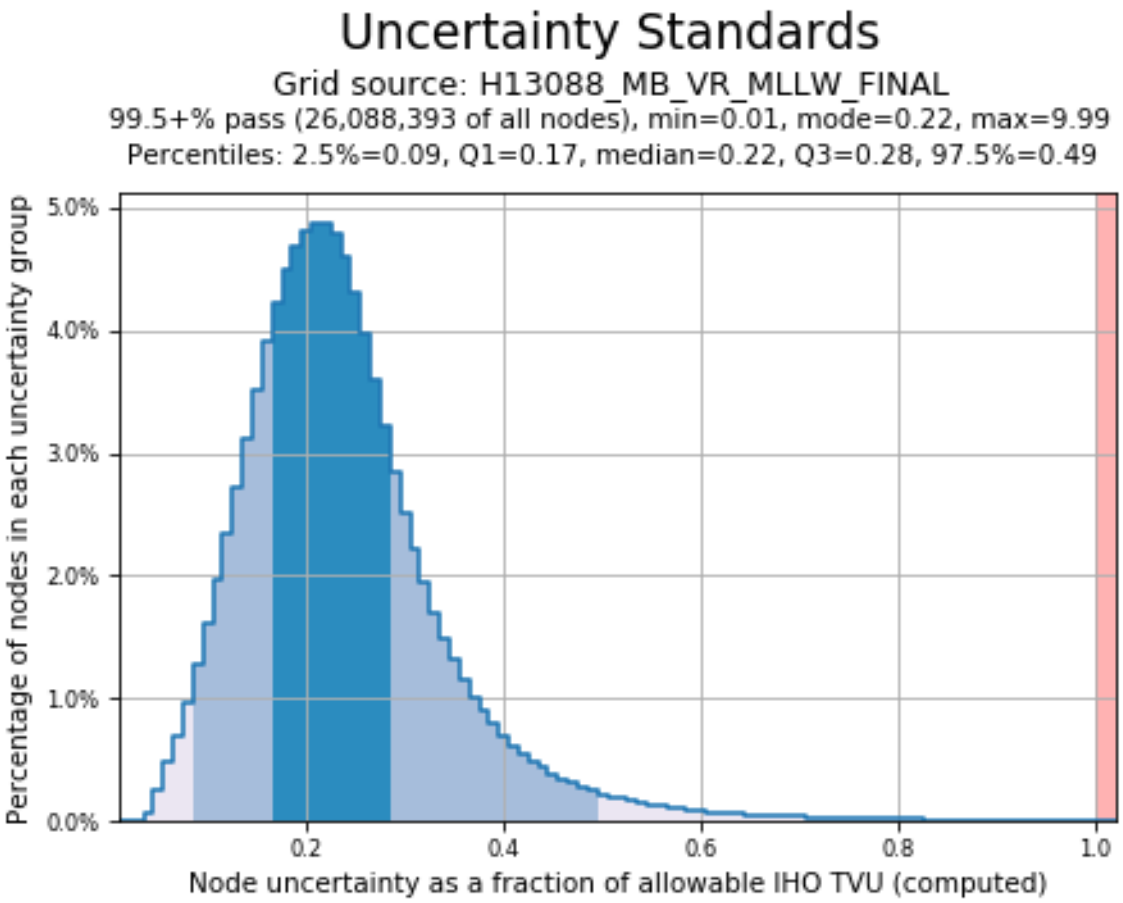


Figure 11: Pydro derived plot showing TVU compliance of H13088 finalized multi-resolution MBES data.

B.2.3 Junctions

H13088 junctions with two surveys, the priority 1A area of survey W00343 and W00291, both conducted by NOAA Ship Bell Shimada.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
W00343	1:40000	2016	NOAA Ship Bell Shimada	SW
W00291	1:20000	2015	NOAA Ship Bell Shimada	SE

Table 9: Junctioning Surveys

W00343

The junction with survey W00343 encompassed 0.21 square nautical miles along three lines in the southwestern portion of the H13088 survey area. A comparison was made with the Compare Grids function of Pydro Explorer using a difference surface derived from 16-meter Caris .csar surfaces of each survey. Analysis of the difference surface indicated that H13088 is an average of 4.85 meters deeper than W00343 with a standard deviation of 0.44 meters. According to its Survey Acceptance Review (SAR),W00343 was a habitat mapping survey acquired with a Simrad ME70, a sonar normally used to collect water column data for fisheries applications. Data from the ME70 are not suitable for object detection, feature disapproval or for areas of critical under-keel clearance. This information helps to explain the poor comparison between H13088 and W00343 data. The sign, large magnitude, and relatively low standard deviation of this offset suggest a systematic, rather than random error in the SHIMADA dataset. The hydrographer suspects that there may have been an error in static offset application during W00343 acquisition and/or processing. The hydrographer recommends that H13088 fully supersede W00343 in the common area.

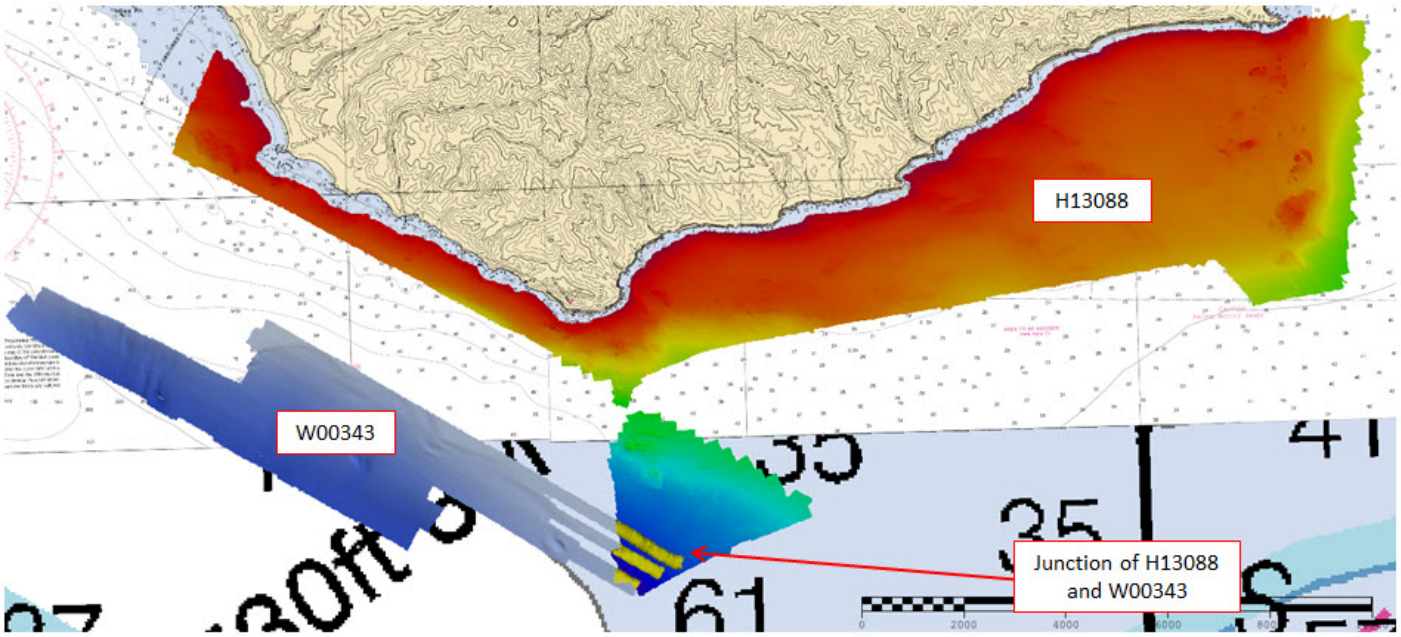


Figure 12: H13088/W00343 Junction highlighted in gold

W00291

The junction with survey W00291 encompassed 1.09 square nautical miles along the southeastern boundary of H13088, and a set of lines running northeast across the main section of the survey area. A comparison was made with the Compare Grids function of Pydro Explorer using a difference surface derived from 8-meter Caris .csar surface of H13088 and a .bag surface of W00291. Analysis of the difference surface indicated that H13088 is an average of 1.12 meters deeper than W00291 with a standard

deviation of 0.34 meters. W00291 was a habitat mapping survey acquired with a Simrad ME70, a sonar normally used to collect water column data for fisheries applications. Data from the ME70 are not suitable for object detection, feature disapproval or for areas of critical under-keel clearance. This information helps to explain the poor comparison between H13088 and W00291 data. The sign, large magnitude, and relatively low standard deviation of this offset suggest a systematic, rather than random error in the SHIMADA dataset. The hydrographer suspects that there may have been an error in static offset application during W00291 acquisition and/or processing. The hydrographer recommends that H13088 fully supersede W00291 in the common area.

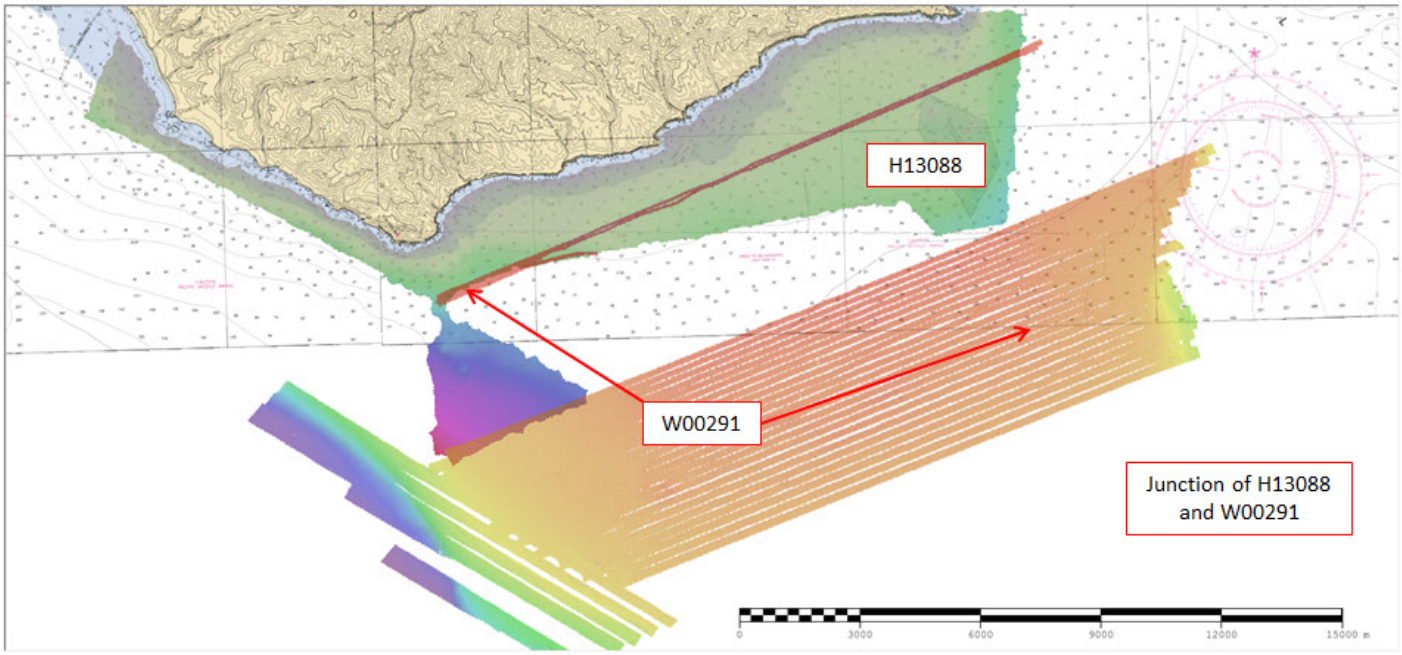


Figure 13: H13088/W00291 Junction

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 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, especially at the beginning of the project, 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 southern 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, as shown in Figure 14. 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.

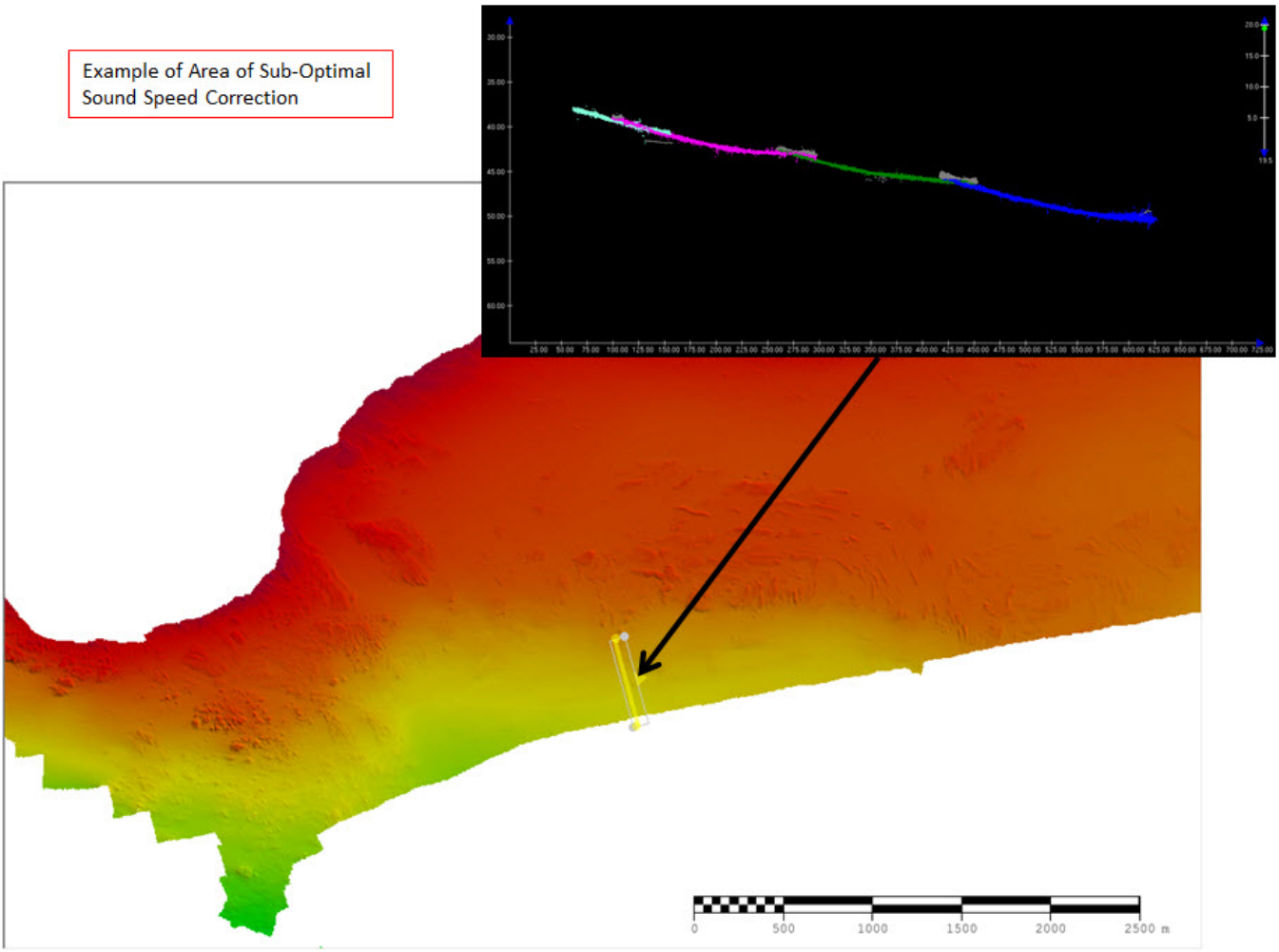


Figure 14: Example of area with suboptimal sound speed correction.
Inset shows subset view with rejected sounding colored gray.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: 49 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. Two casts were taken outside of the survey area, but were included in the survey as the hydrographer determined they were still valuable correctors of the MBES data collected. All casts were concatenated into a master file and applied using the "Nearest distance within time" (4 hours) profile selection method. All examined sound speed related offsets were observed to be within the NOAA HSSD standards.

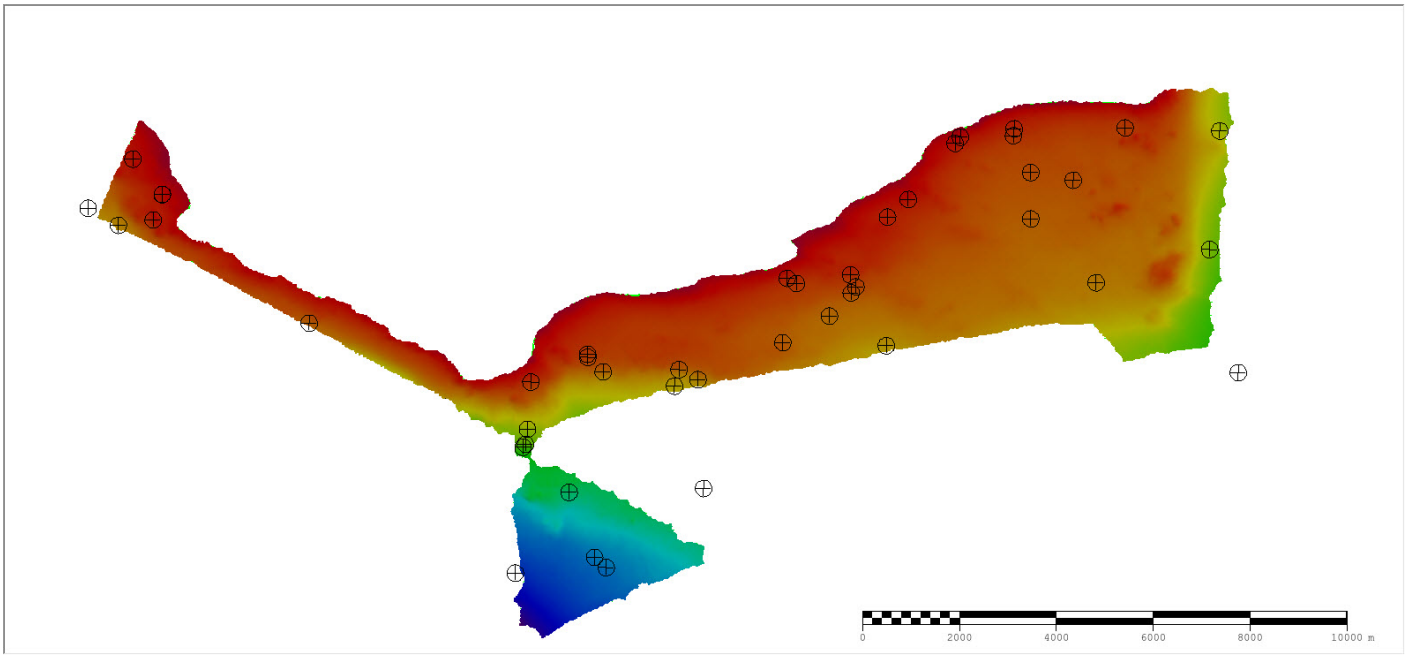


Figure 15: H13088 sound speed cast locations.

B.2.8 Coverage Equipment and Methods

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

B.2.9 H13088 Flier Finder

Pydro QC Tools 2 "Flier Finder" check was performed on H13088 data and 62 fliers were detected. All were inspected in CARIS HIPS Subset Editor and found to be false positives. The results of Flier Finder are included in Appendix II of this report.

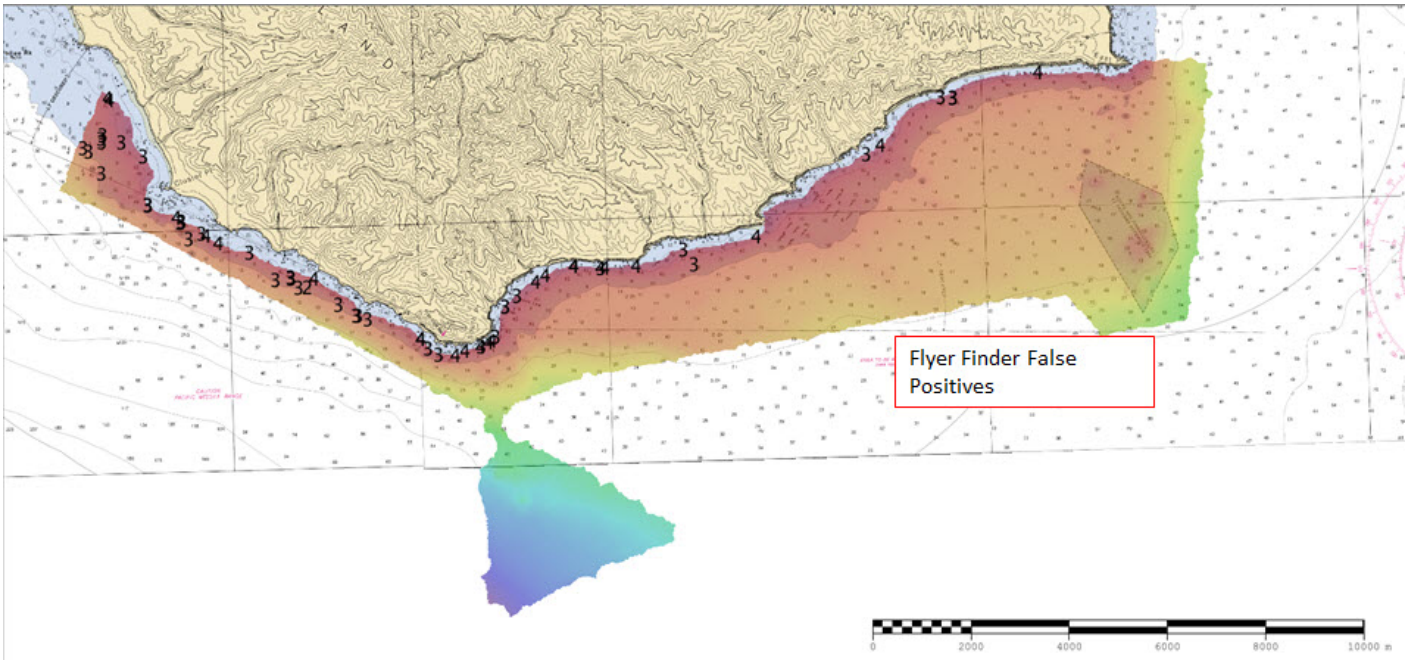


Figure 16: Flier Finder false positive locations.

B.2.10 H13088 Scan Features

Pydro QC Tools 2 "Scan Features" check was performed on H13088 data and an erroneous error was detected on feature US_0000000104_00001. It is flagged as not having a "SORDAT" attribute, even though one is present in the Final Feature File.

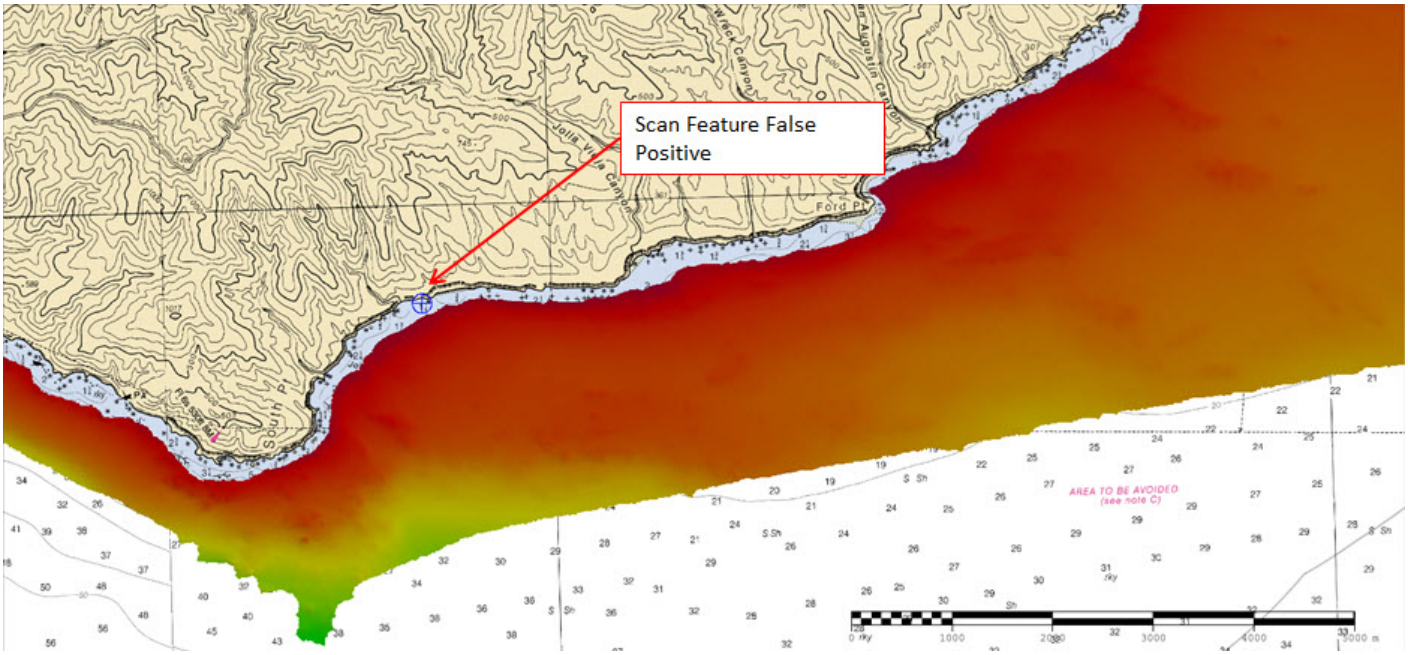


Figure 17: Location of false positive Scan Features item

B.2.11 H13088 ValSou Check

Pydro QC Tools 2 "ValSou" check was performed on H13088 data and an erroneous error was detected. A Designated Sounding, used to note a potential DTON (Position 33.9090 degrees N, 120.1550 degrees W) is flagged as having an inconsistent sounding, but this was determined to be an issue with the resolution of the .hob file being too coarse to reference the appropriate node, see Figure 18.

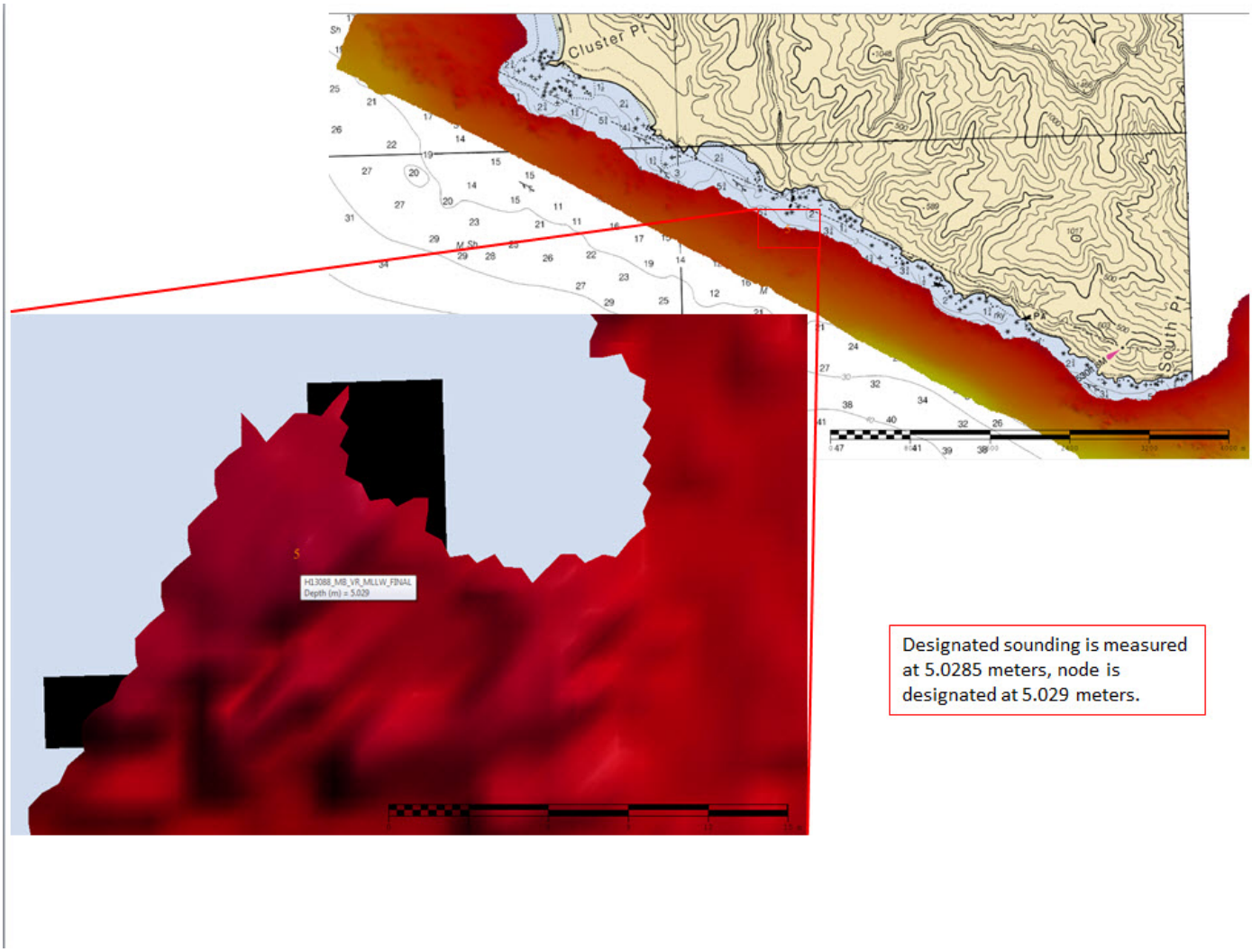


Figure 18: False Positive VALSOU check on designated sounding

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 logged and .all files and were sent to the Processing Branch. Backscatter was processed by the field unit. One 2-meter resolution mosaic was created for each vessel and frequency for sheet H13088. Fledermaus Geocoder Toolbox, "FMGT" a product of QPS, was used to process backscatter and produce backscatter mosaics. The product version used is 7.7.8. Errors were encountered during processing; a "Auto Time-Sync Algorithm Failure" error occurred while pairing the .all and HDCS data. This is due to an offset between GPS time and UTC time being misapplied due to a version conflict between Caris and FMGT. Troubleshooting efforts between the field unit and HSTB resulted in the solution of adding a -2.0 second merge offset to the data sets and produced backscatter mosaics. An email from HSTB and the field unit RAINIER is located in the Correspondence folder of this report.

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
H13088_MB_VR_MLLW.csar	CUBE	999 meters	1.0 meters - 141.5 meters	VR	Complete MBES
H13088_MB_VR_MLLW_FINAL.csar	CUBE	999 meters	1.0 meters - 141.5 meters	VR	Complete MBES

Table 10: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids as specified in HTD 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 placeholder.
Two critical soundings were created for this survey; both were identified as potential Dangers to Navigation.

C. Vertical and Horizontal Control

Shoreline features were reduced to MLLW using traditional tide methods via TCARI. All MBES bathymetry were acquired relative to the ellipsoid and reduced to MLLW via VDatum. 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
Monterey	9413450
Port San Luis	9412110
Los Angeles	9410660
Oil Platform Harvest	9411406
Santa Barbara	9411340
Santa Monica	9410840

Table 11: NWLON Tide Stations

File Name	Status
H13088_Tides.tid	Final Approved

Table 12: Water Level Files (.tid)

File Name	Status
L397RA2017Rev.tc	Final

Table 13: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 12/04/2017. The final tide note was received on 12/11/2017.

H13088 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. H13088 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

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 10 North.

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

The following DGPS Stations were used for horizontal control:

DGPS Stations

Table 14: USCG DGPS Stations

C.3 Additional Horizontal or Vertical Control Issues

C.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 H13088 survey data and Electronic Navigational Charts (ENC) US5CA66M and US3CA69M 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 south end of the main H13088 survey area.

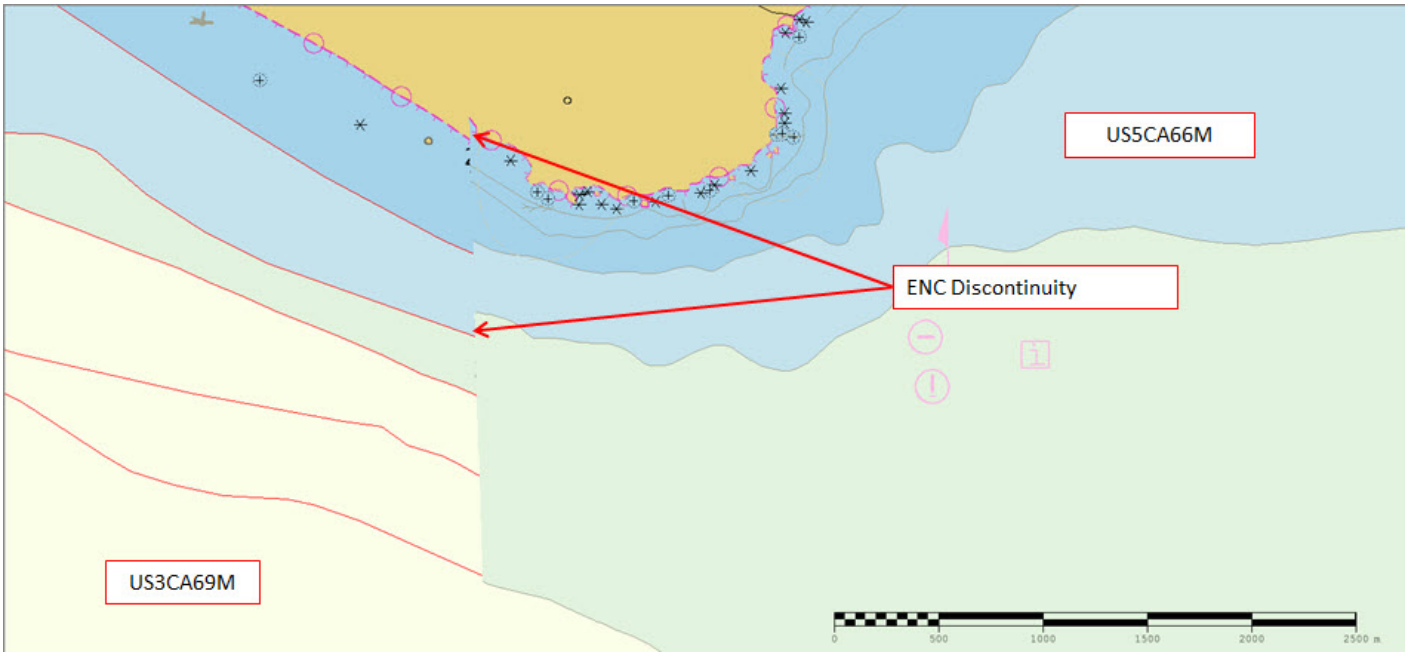


Figure 19: ENC Discontinuity. Red arrows identify areas with positional offsets between the US5CA66M and US3CA69M ENCs of approximately 100 to 125 meters within the H13088 survey area.

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?
US5CA66M	1:40000	23	10/26/2017	12/29/2017	NO
US3CA69M	1:232188	4	08/24/2017	08/24/2017	NO

Table 15: Largest Scale ENCs

US5CA66M

ENC US5CA66M covers approximately two thirds of the survey area in greater detail than US3CA69M and was used for comparison where possible, see (Figure 20).

Comparison between the soundings on H13088 and depth curves US5CA66M revealed the following: a sounding of 9.4 fathoms was found outside the 10 fathom depth curve and directly under a 13 fathom depth on the ENC (Figure 21). A 13 fathom sounding was found between 21 fathom and 19 fathom depths, on the 20 fathom depth curve of the ENC (Figure 22).

H13088 contour analysis found that while most of the charted depth curves were offshore of the newly surveyed contours, there were 3 distinct points where the 10 fathom charted depth curve did not completely cover the appropriate contour areas (Figure 23).

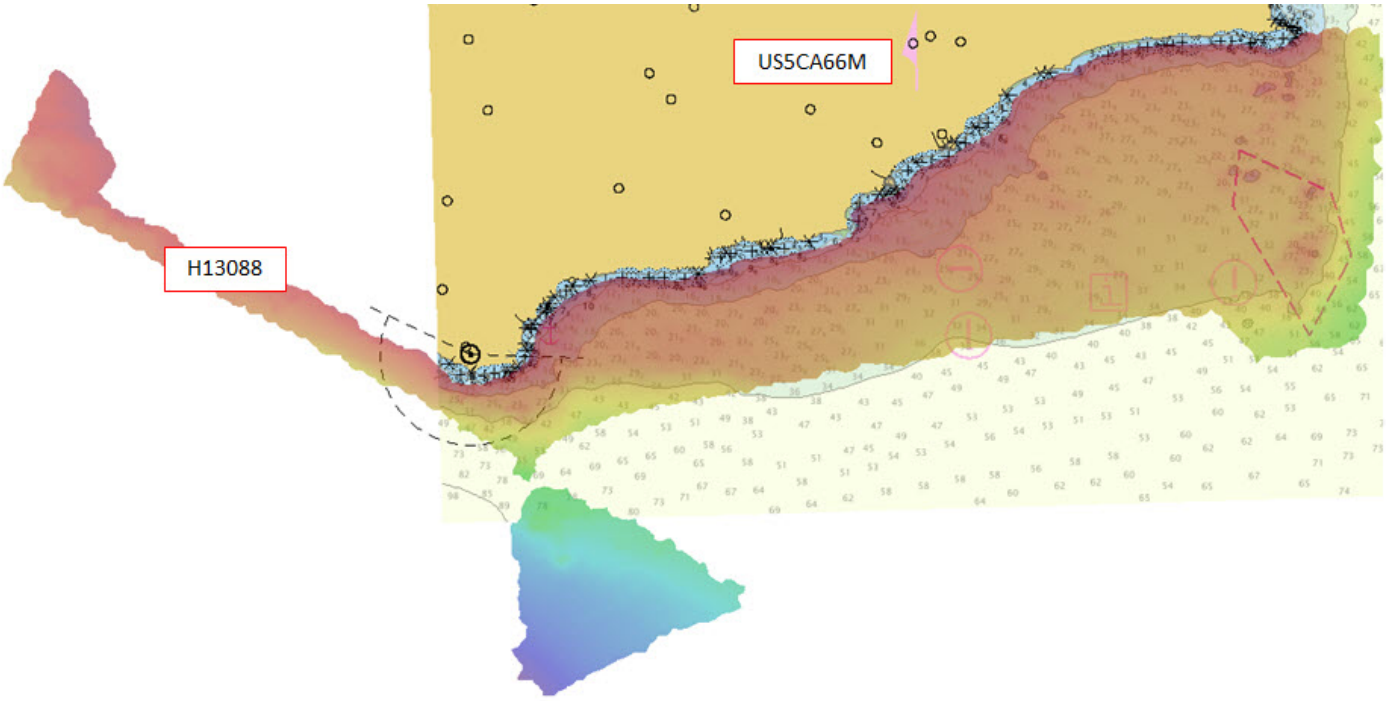


Figure 20: Section of US3CA66M overlaid with H13088 survey outline. US3CA69M overlays this entire area and covers the remaining surveyed areas.

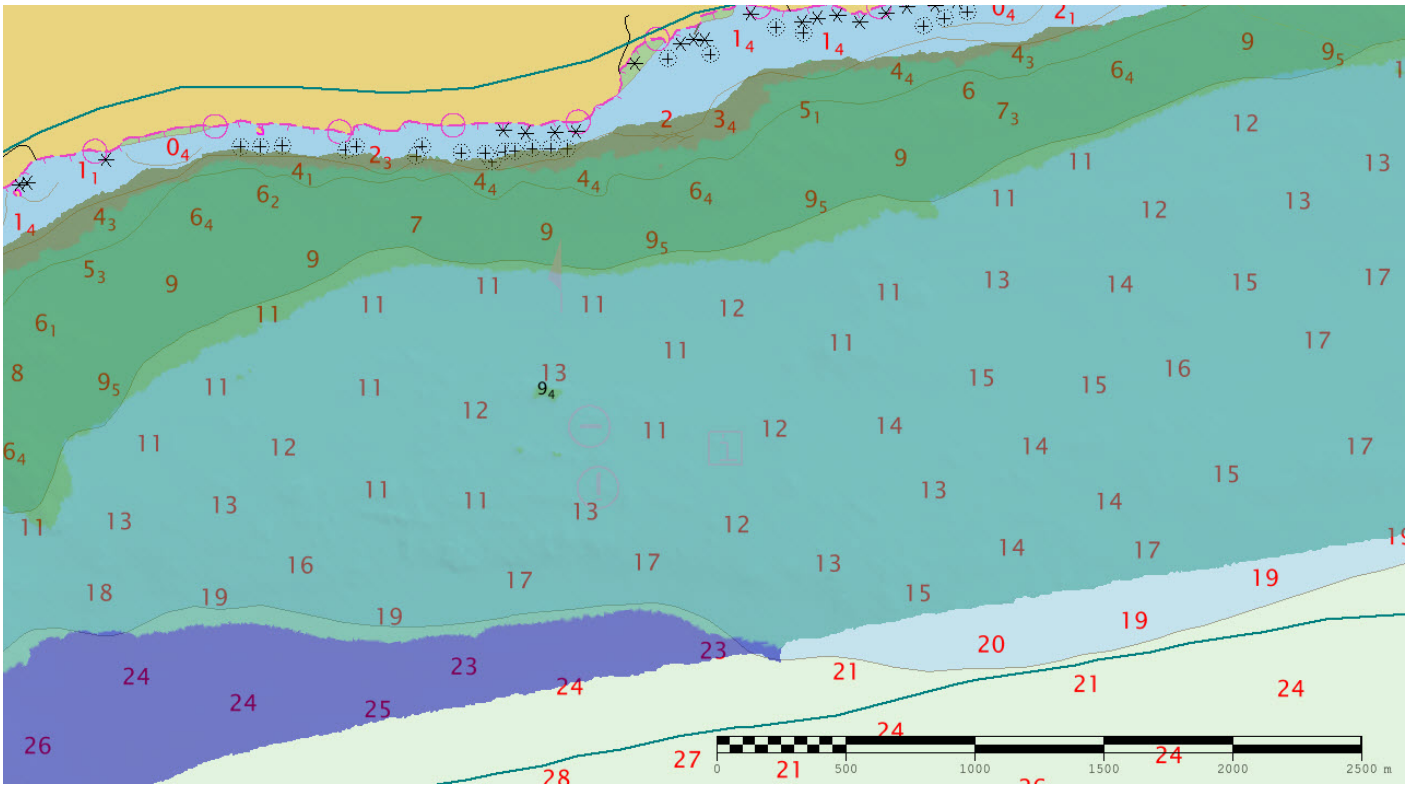


Figure 21: 9.4 fathom sounding below 13 fathom depth on US3CA66M.

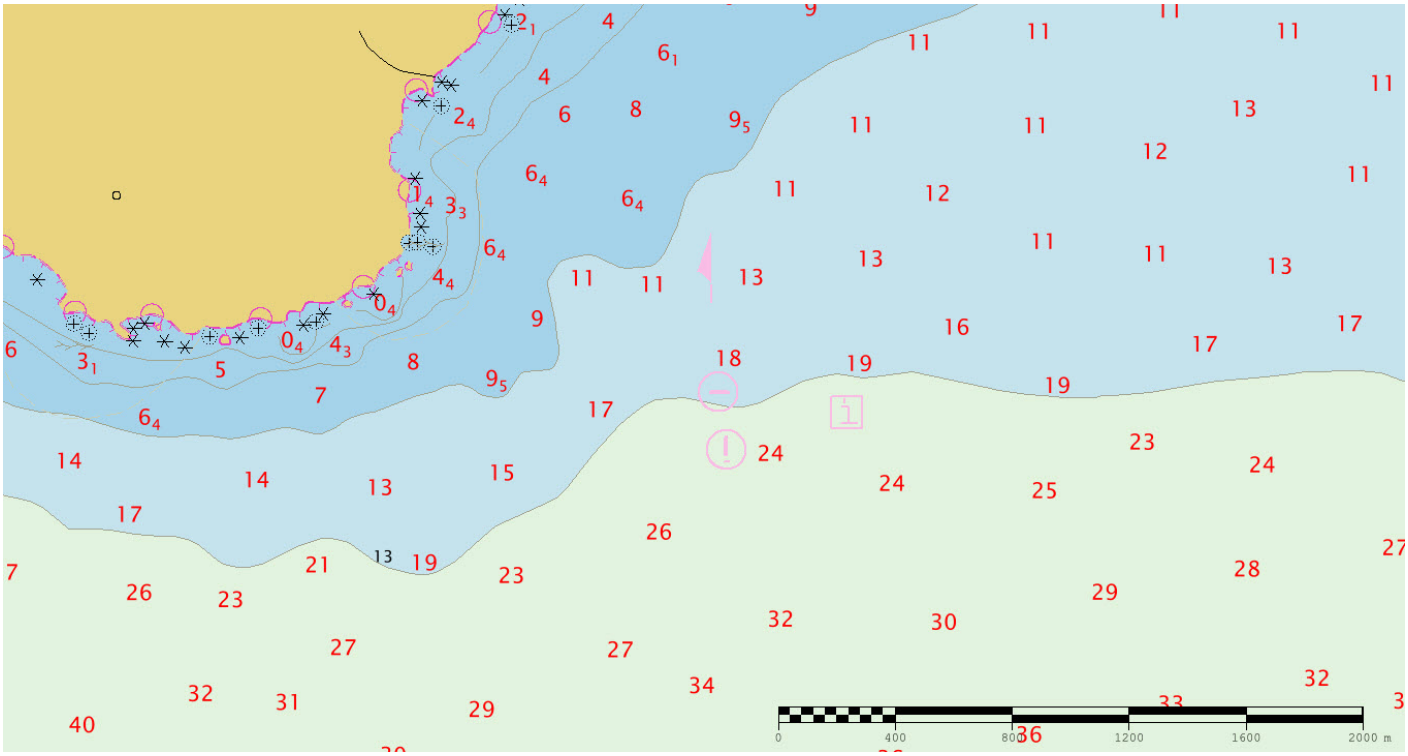


Figure 22: 13 fathom sounding on 20 fathom depth curve of US3CA66M.

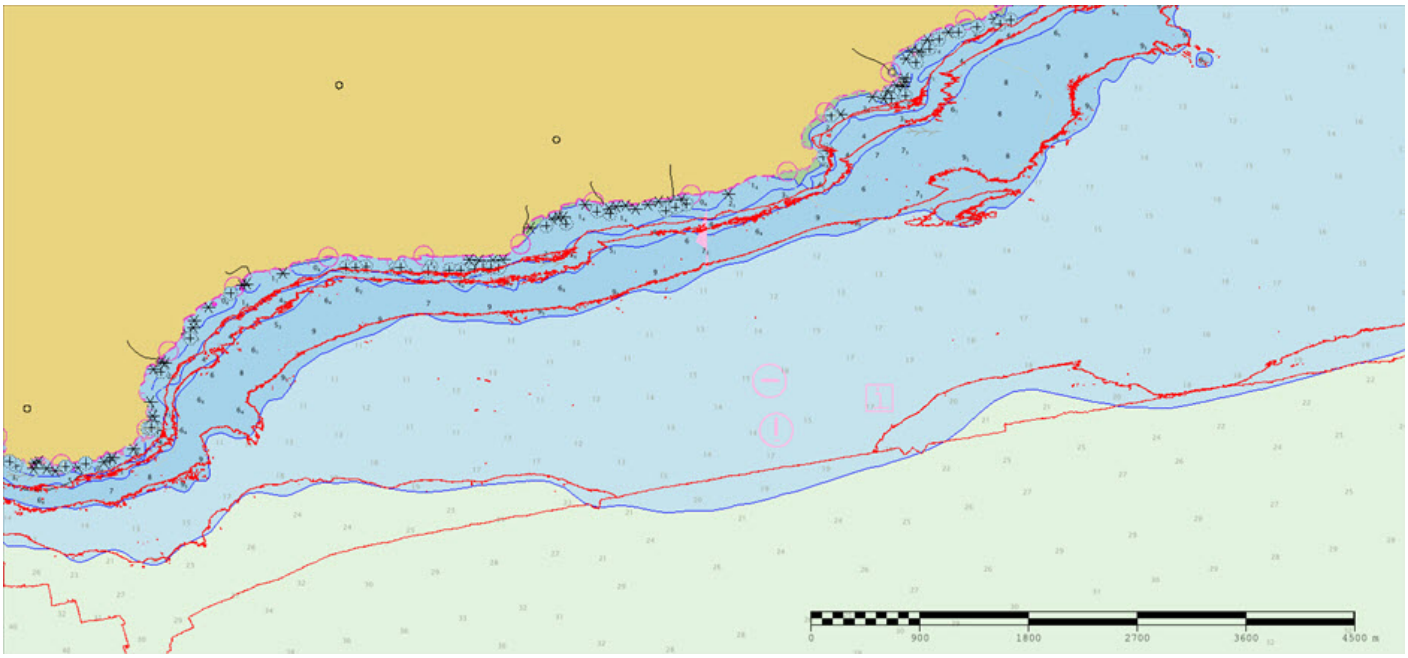


Figure 23: Image of disparity between the surveyed 10 fathom contour and the charted 10 fathom depth curve on ENC US5CA66M.

US3CA69M

ENC US3CA69M covers the remainder of the survey area and was used for areas that US5CA66M did not cover, see (Figure 24).

H13088 survey soundings and ENC depths generally agree to within approximately 1 fathom.

H13088 contour analysis found the surveyed 10 fathom contour inshore of the charted 10 fathom depth curve on the west side of the surveyed area (Figure 25).

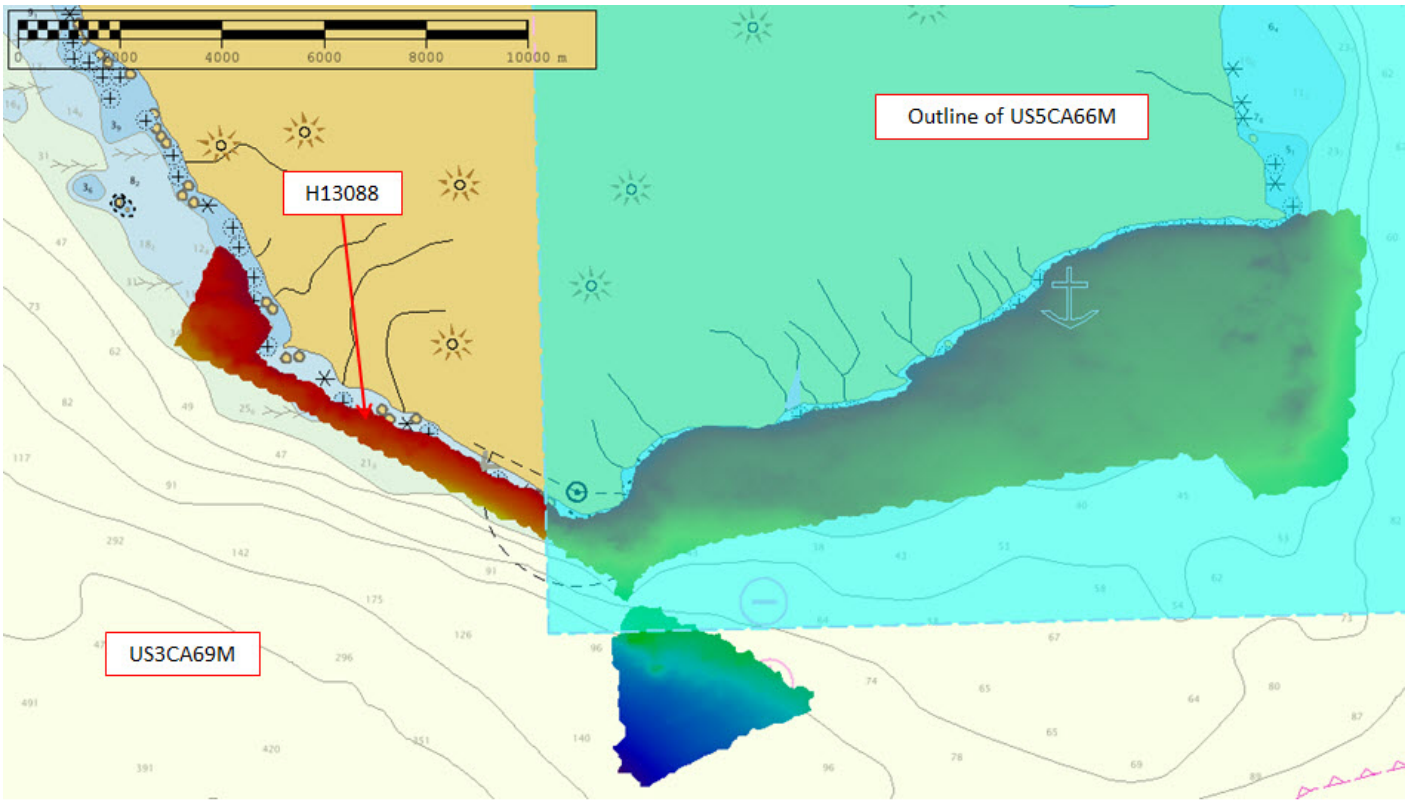


Figure 24: Section of US3CA69M overlaid with H13088 survey outline.
Blue highlighted area represents the extents of US5CA66M coverage.

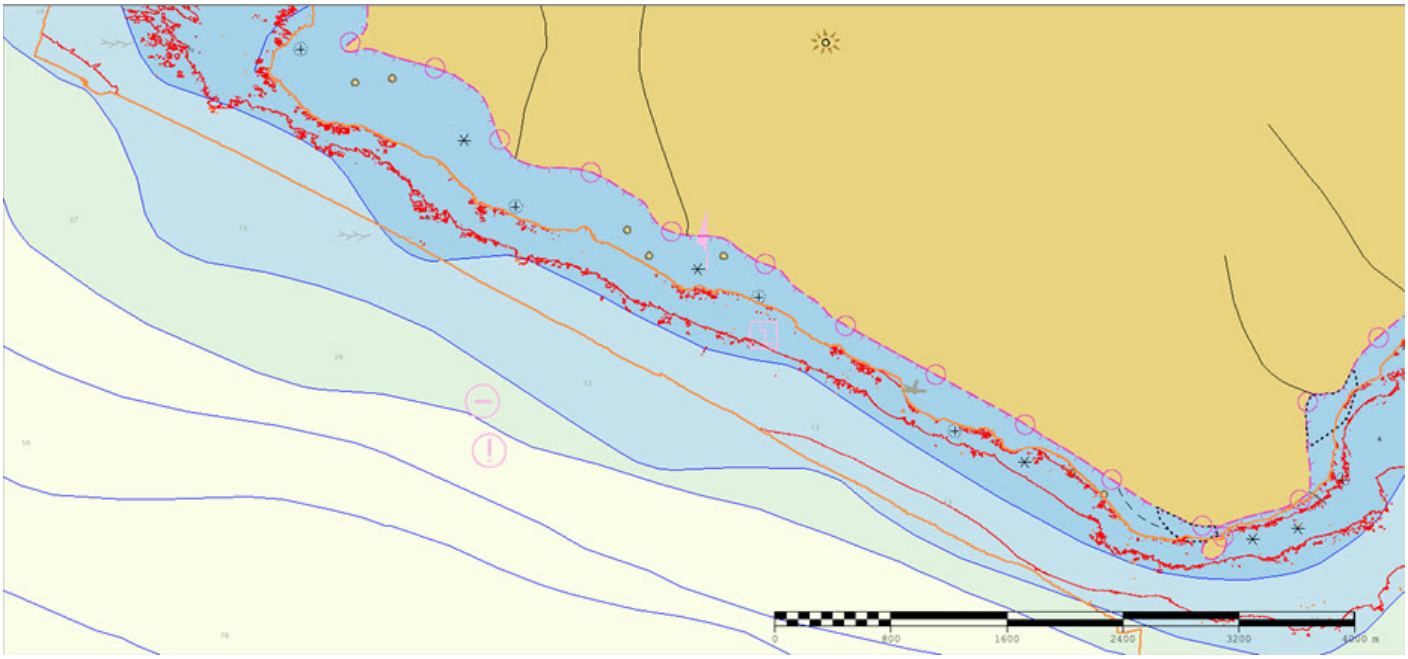


Figure 25: Comparing the surveyed 10 fathom contour and the charted 10 fathom depth curve on ENC US3CA69M.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

The hydrographer confirmed the existence of PA wreck on shoreline in approximate location charted, 33.9003 degrees N 120.1294 degrees W. Wreckage is neither prominent nor dangerous, and would not be useful to navigation. This location is well inside of the NALL and would not have been safe to approach to conduct further verification.

D.1.4 Uncharted Features

No new navigationally significant features were detected that were not included in the H13088 Final Feature file or elsewhere in this report.

D.1.5 Shoal and Hazardous Features

Features of navigational significance are discussed in the chart comparison sections above or are included in the H13088 Final Feature File submitted with this report.

D.1.6 Channels

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

There exists a charted anchorage named, "Johnson's Lee," at location 33.9008 degrees N, 120.1041 degrees W. This anchorage was used by RAINIER during the project and provided adequate holding ground and shelter from weather out of the north and west. MBES data was collected in the anchorage area and no dangers or significant disagreement from charted depths were found.

D.1.7 Bottom Samples

A bottom sample requirement was not specified in the project instructions, however photos at seventeen individual sites were obtained using a Go Pro camera attached to a CTD probe. Video footage was recorded during the CTD cast and still photos where derived from the footage to obtain a "virtual bottom sample'. A copy of the pertinent acquisition log is also include with photos to link each bottom sample site with a lat/ long. These images and acquisition logs are included with the Separates section of this report for archival purposes.

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 H13088_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.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

One ATON, the South Point Light (Light List # 2755) was observed in the field and appears to be serving its intended purpose.

Figure 26: The South Point Light, located in the small white house on the ridge.

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 and/or Environmental Conditions

Approximately 6000 meters east of San Augustin Canyon, of the SW coast of Santa Rosa Island there is a large area marked "ROCKS AND PINNACLES TO 5 3/4 FATHOMS REPORTED". This feature was investigated using complete MBES coverage and flagged for removal in the Final Feature file, as all shoal areas can now be accurately depicted.

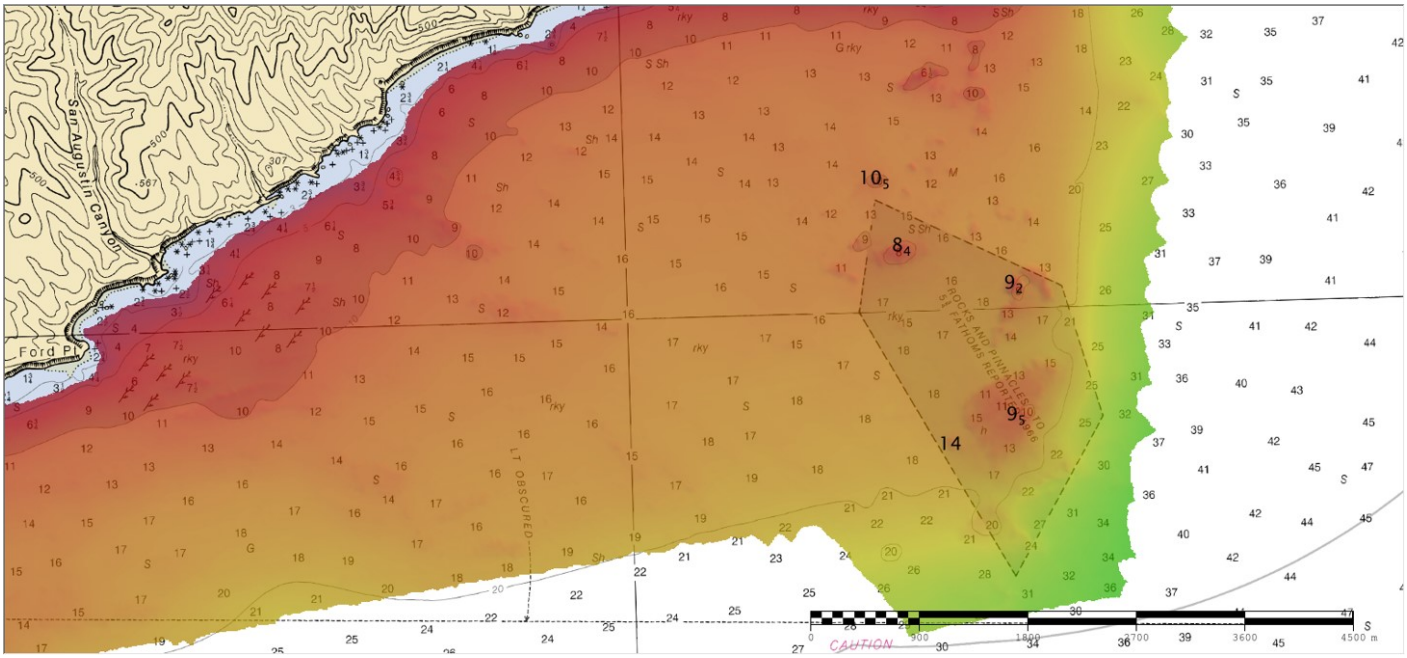


Figure 27: Depiction of the charted area feature recommended for removal, with least soundings highlighted.

D.2.9 Construction and Dredging

No present or planned construction or dredging 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 NOAA Ship Rainier	04/03/2018	Digitally signed by EVANS.BENJAMIN.K.1237217094 Date: 2018.04.04 21:46:04 -07'00'
Scott E. Broo, LT/NOAA	Field Operations Officer NOAA Ship Rainier	04/03/2018	Digitally signed by BROO.SCOTT.EDWARD.1396599976 Date: 2018.04.05 07:29:06 -07'00'
James B. Jacobson	Chief Survey Technician NOAA Ship Rainier	04/02/2018	JACOBSON.JAMES.BRYAN.1269664017 I have reviewed this document 2018.04.05 12:52:06 -07'00'
Michael D. Card, ENS/NOAA	Sheet Manager NOAA Ship Rainier	04/03/2018	

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	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
PRF	Project Reference File

Acronym	Definition
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 : December 08, 2017

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-L397-RA-2017
HYDROGRAPHIC SHEET: H13088

LOCALITY: Johnsons Lee and vicinity

Channel Islands National Marine Sanctuary, CA

TIME PERIOD: October 08 - November 06, 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, H13088, during the time period between October 08 - November 06, 2017.

Refer to attachments for grid information.

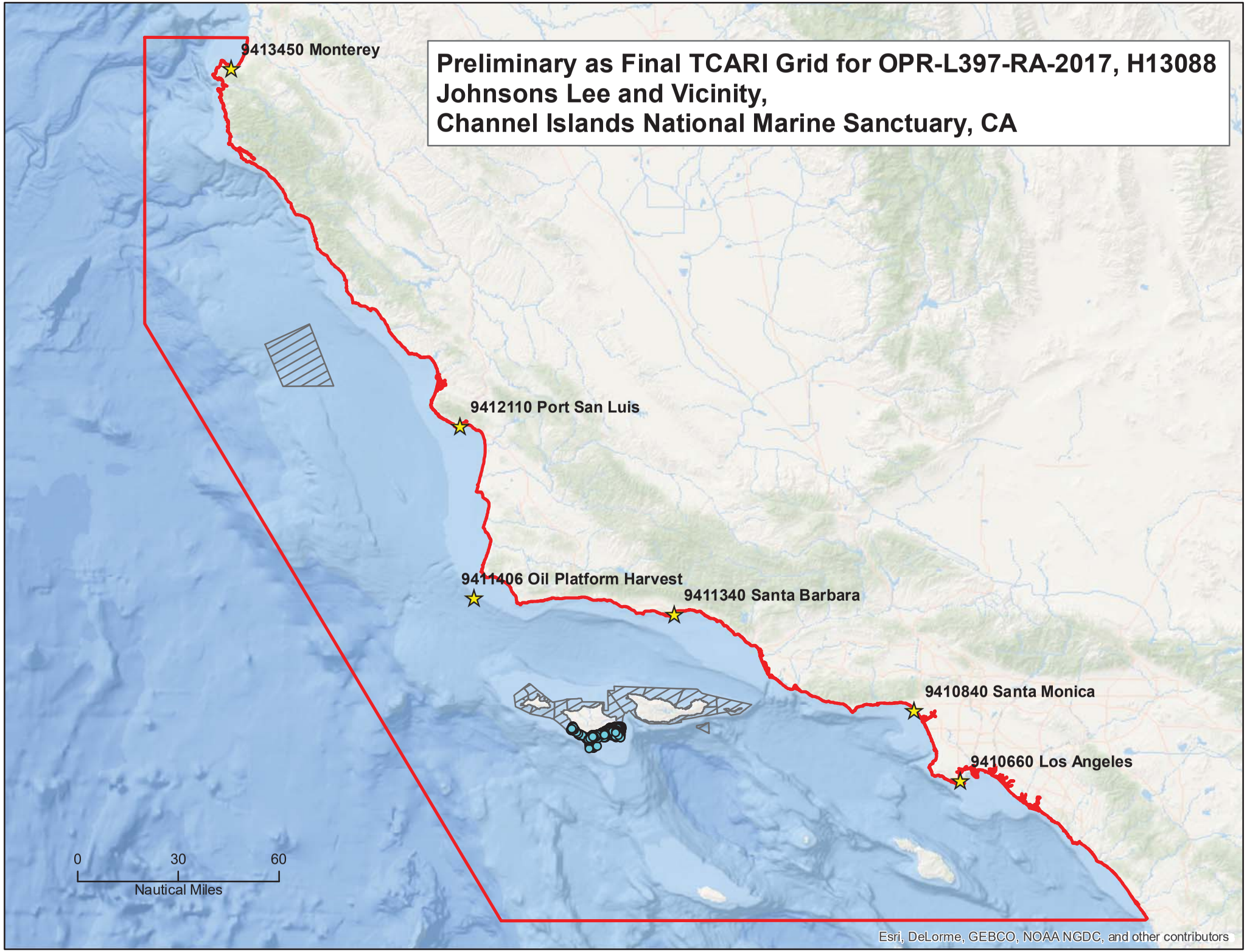
Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

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, H13088. 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.

HOVIS.GERALD.THOMAS.JR.1365860250

Digitally signed by HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2017.12.11 13:38:06 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Preliminary as Final TCARI Grid for OPR-L397-RA-2017, H13088
Johnsons Lee and Vicinity,
Channel Islands National Marine Sanctuary, CA
9413450 Monterey
9412110 Port San Luis
9411406 Oil Platform Harvest
9411340 Santa Barbara
9410840 Santa Monica
9410660 Los Angeles
0
30
60
Nautical Miles
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

michael hewlett - NOAA Federal <michael.hewlett@noaa.gov>

Re: BS Time sync error

michael hewlett - NOAA Federal <michael.hewlett@noaa.gov>
To: Jennifer Kraus - NOAA Federal <jennifer.kraus@noaa.gov>

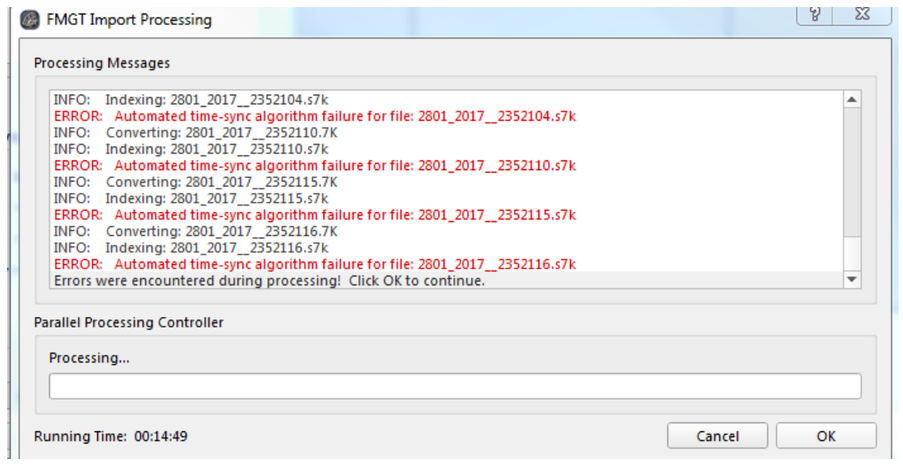
Mon, Sep 18, 2017 at 2:19 PM

Mr. Greenaway,

The lines in the screen shot are from one day of acquisition which did not import into FMGT. We also tried to import another day with the same frequency but the same error occurred. Also, the same day but a different frequency came across the same error. I looked over the HDCS file folders and all the lines seem to have relatively similar file sizes. I have not yet tried to import them after reapplying SBETs and RMS but that will be the next step. I will get back to you with the results from that. As far as the time offsets, should I set it to +/- 1 second and see if the error still occurs? Thank you for the help.

Regards,
Michael Hewlett

On Sat, Sep 16, 2017 at 12:02 PM, Jennifer Kraus - NOAA Federal <jennifer.kraus@noaa.gov> wrote:

> Hi Sam,
>
> I'm going to defer these questions to the current owner of these lines, Michael Hewlett. I think he said he's reapplying SBETS to troubleshoot some other issues, so perhaps that will also fix this.
>
> Thanks for the help!
>
> V/r
> Jen
>
> On Sat, Sep 16, 2017 at 10:21 AM, Samuel Greenaway - NOAA Federal <samuel.greenaway@noaa.gov> wrote:
>
> > Jen,
> >
> > Apologizes for the tardy reply. Busy with your boats.
> >
> > So the whole time-sync thing is needed because Caris uses an internal time (I think almost identical to GPS time), and FMGT needs to figure out the right number of leap-seconds to go between that and UTC time.
> >
> > Not sure what is happening with these specific lines. I think when you import, you can specify a time offsets (often about +/- 1 second) or have FMGT try to figure it out. This is not a saturday and is not near midnight...
> >
> > Do the lines have data (HDCS? backscatter?) We have readers for the 07k, but perhaps not simple to use. Are the files about the same size as others that do not have this problem?
> >
> > Is this just a few lines or a whole day?
> >
> > Sam
> >
> > On Wed, Sep 13, 2017 at 4:39 PM, Jennifer Kraus - NOAA Federal <jennifer.kraus@noaa.gov> wrote:
> >
> > > Mr. Greenaway,
> > >
> > > Thoughts on the following error? None of these lines imported. Thanks!
> > >
> > > 
> > >

> > --
> > ENS Jennifer Kraus
> > Junior Officer
> > NOAA Ship *Rainier*
> > (505) 710-9016
> > 2002 SE Marine Science Drive
> > Newport, OR 97365
>
> --
> LCDR Samuel Greenaway, NOAA
> Chief, Hydrographic Systems and Technology Branch
> Office of Coast Survey
> National Oceanic and Atmospheric Administration
> cell: 206-427-9554
> office: 301-713-2653 x152

--
ENS Jennifer Kraus
Junior Officer
NOAA Ship *Rainier*
(505) 710-9016
2002 SE Marine Science Drive
Newport, OR 97365

APPROVAL PAGE

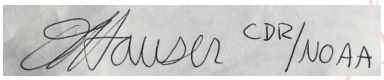
H13088

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 products

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:  Digitally signed by HAUSER.OLIVIA.A.1275636009 Date: 2018.11.07 09:39:45 -08'00'

Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch