

H13117

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

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: H13117

LOCALITY

State(s): California
Oregon

General Locality: Offshore California, Oregon and Washington

Sub-locality: Mendocino Canyon to Saint George Reef

2018

CHIEF OF PARTY
Benjamin K. Evans, CDR/NOAA

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

H13117

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 Oregon**

General Locality: **Offshore California, Oregon and Washington**

Sub-Locality: **Mendocino Canyon to Saint George Reef**

Scale: **80000**

Dates of Survey: **08/20/2018 to 08/22/2018**

Instructions Dated: **06/28/2018**

Project Number: **OPR-M367-RA-18**

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 H13117

Project: OPR-M367-RA-18

Locality: Offshore California, Oregon and Washington

Sublocality: Mendocino Canyon to Saint George Reef

Scale: 1:80000

August 2018 - August 2018

NOAA Ship *Rainier*

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

A. Area Surveyed

The survey area is referred to as H13117, "Mendocino Canyon to Saint George Reef" (Sheet 4). This area is outlined in the project instructions and encompasses approximately 2220 square nautical miles in the Cascadia Margin Southwest of Crescent City, CA. This area was subsequently reduced in size and split into two sheets, see Appendix II: "Email H13117 Split with H13206".

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
41° 39' 58.64" N 124° 43' 52.23" W	41° 7' 30.95" N 124° 23' 16.14" W

Table 1: Survey Limits

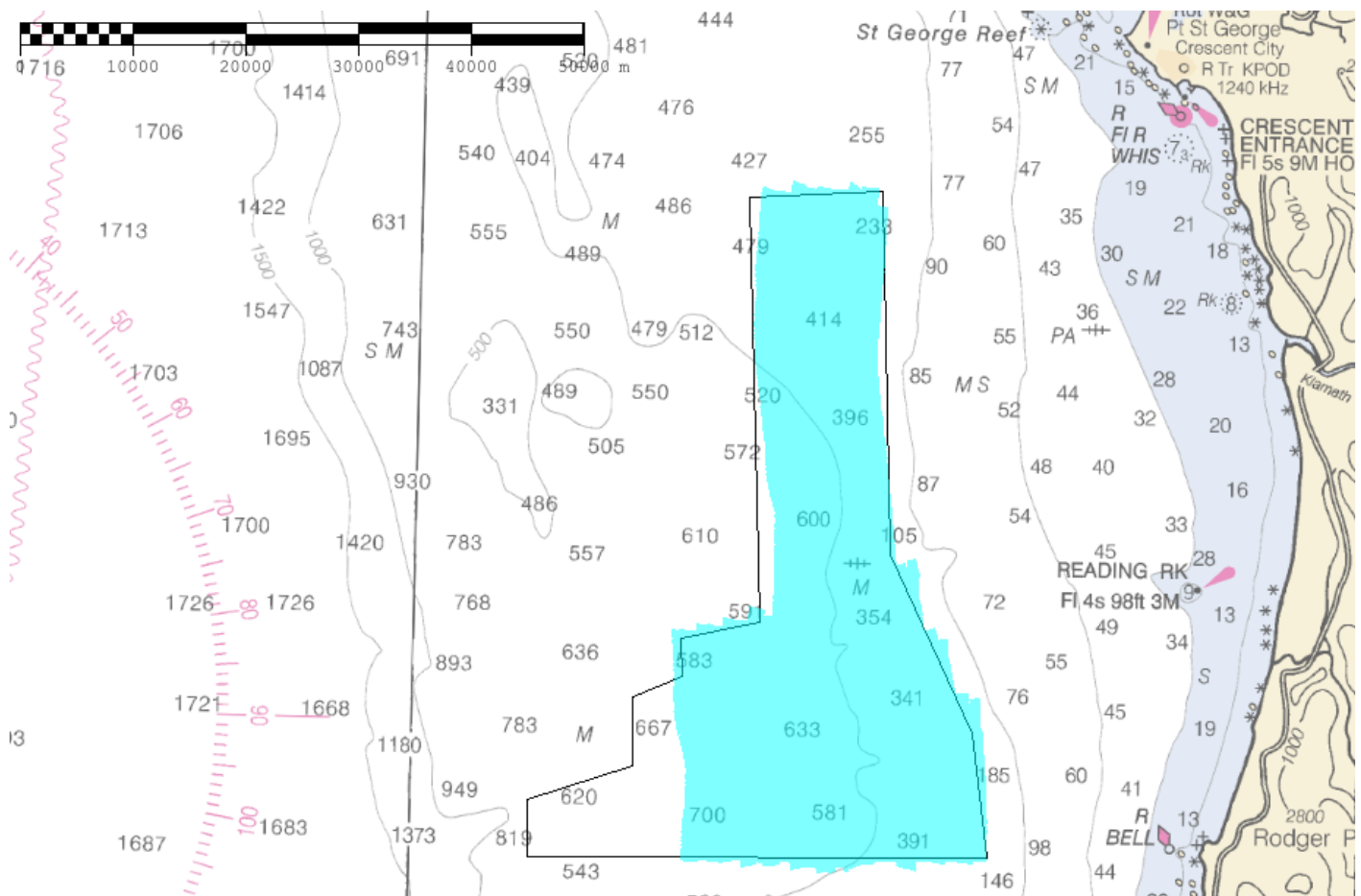


Figure 1: H13117 assigned survey area and survey coverage (Chart 18010).

Survey limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

Survey limits were acquired in accordance with the requirements in the revised limits authorized in the email mentioned above.

A.2 Survey Purpose

This sheet is part of larger project being conducted in collaboration with NOAA's Office of Coast Survey (OCS) and the Coastal and Marine Geology Program (CMGP) of the USGS across several large portions of the Cascadia continental margin, offshore of California, Oregon, and Washington. The primary objective of this seafloor mapping project will be to provide multibeam bathymetry, acoustic backscatter data, and water column data to address USGS Hazard Mission Area objectives by providing key offshore constraints that feed directly into earthquake, tsunami, and landslide hazard assessments as well as situational awareness products.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Pydro QC Tools 2 Grid QA was used to analyze H13117 multibeam echosounder (MBES) data density. The submitted H13117 variable-resolution (VR) surface met HSSD density and full coverage requirements as shown in the histogram below.

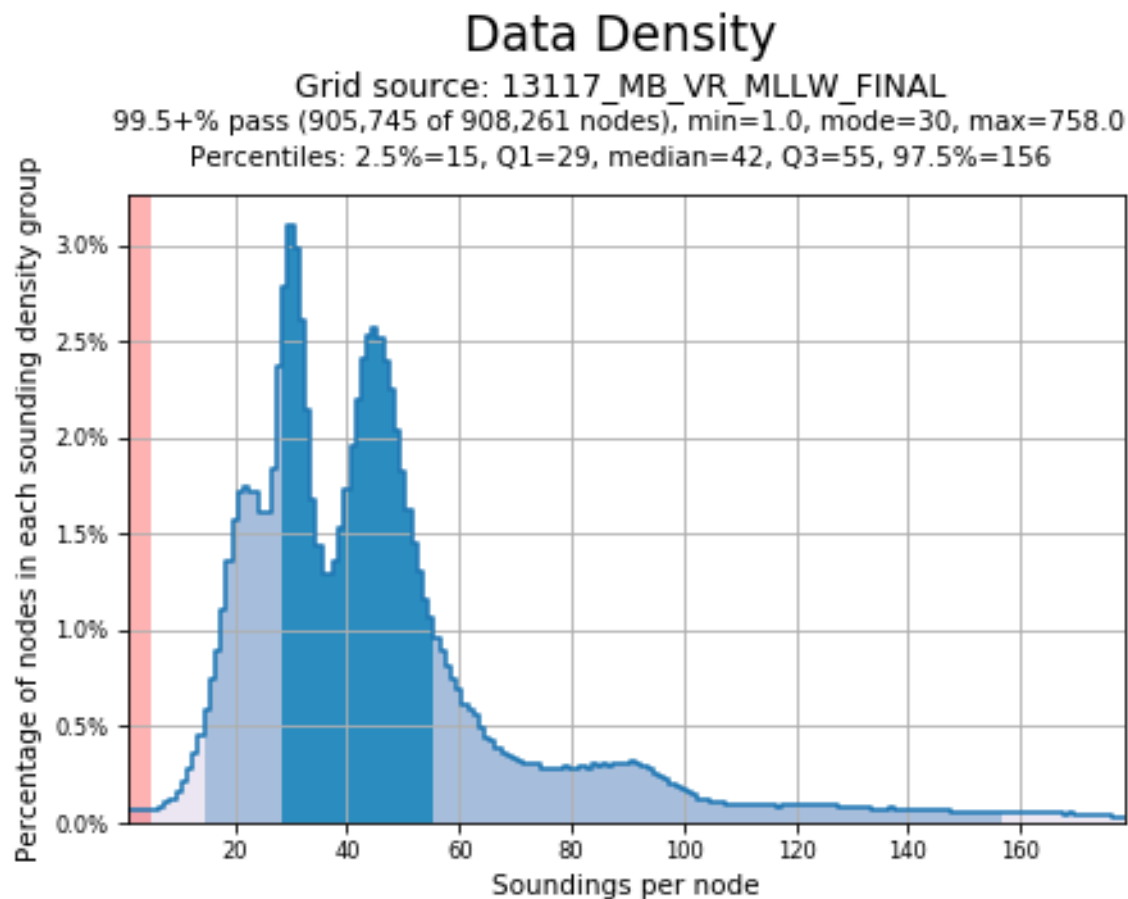


Figure 2: Pydro derived histogram plot showing HSSD density compliance of H13117 MBES data

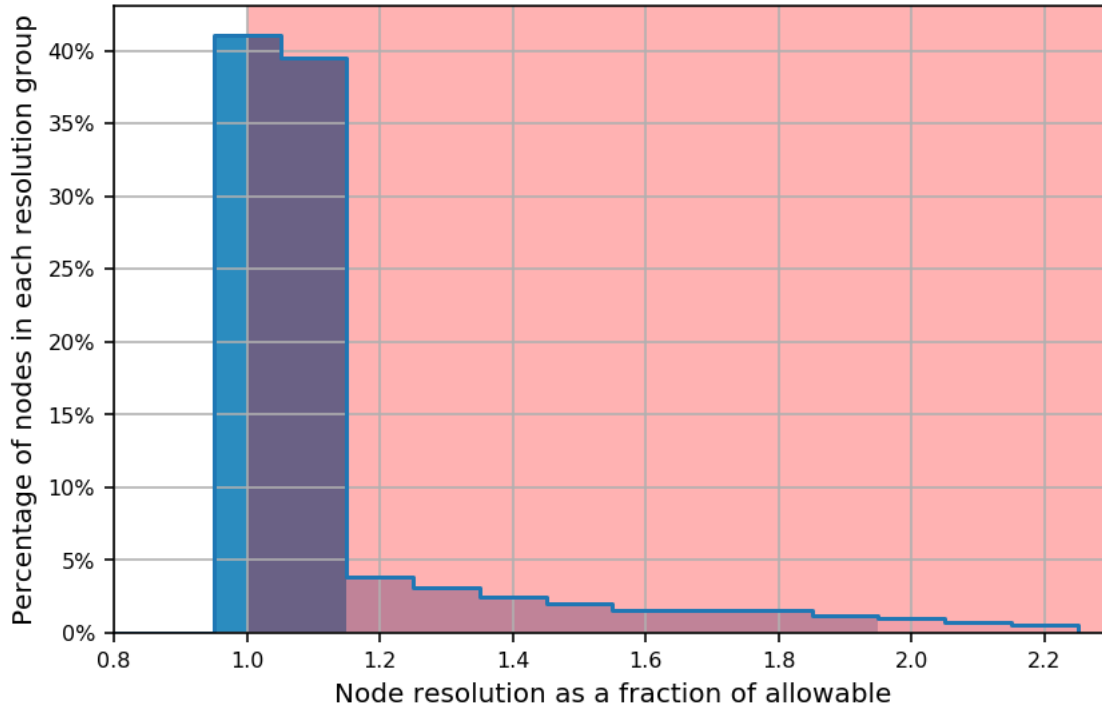
The multibeam data has been examined and are adequately represented by the surface despite not meeting the 95% resolution requirement as established in the 2018 HSSD. The submitted VR surface has a 41% resolution requirement pass rate.

Resolution Requirements - Full Coverage

Grid source: H13117_MB_VR_MLLW

41% pass (373,089 of 908,263 nodes), min=0.80, mode=1.0, max=2.30

Percentiles: 2.5%=1.0, Q1=1.0, median=1.1, Q3=1.1, 97.5%=1.9



H13117 VR Resolution Requirements

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
All waters in survey area	Complete coverage MBES data, backscatter data and water column data. Refer to HSSD Section 5.2.2.3.

Table 2: Survey Coverage

Complete multibeam, backscatter, and water column data were acquired to the revised sheet limits of H13117. The assigned survey area was reduced as discussed in section A above and is depicted visually in the graphic below (Figure 4.) No gaps in coverage (holidays) were detected when using Pydro QC Tools 2 software.

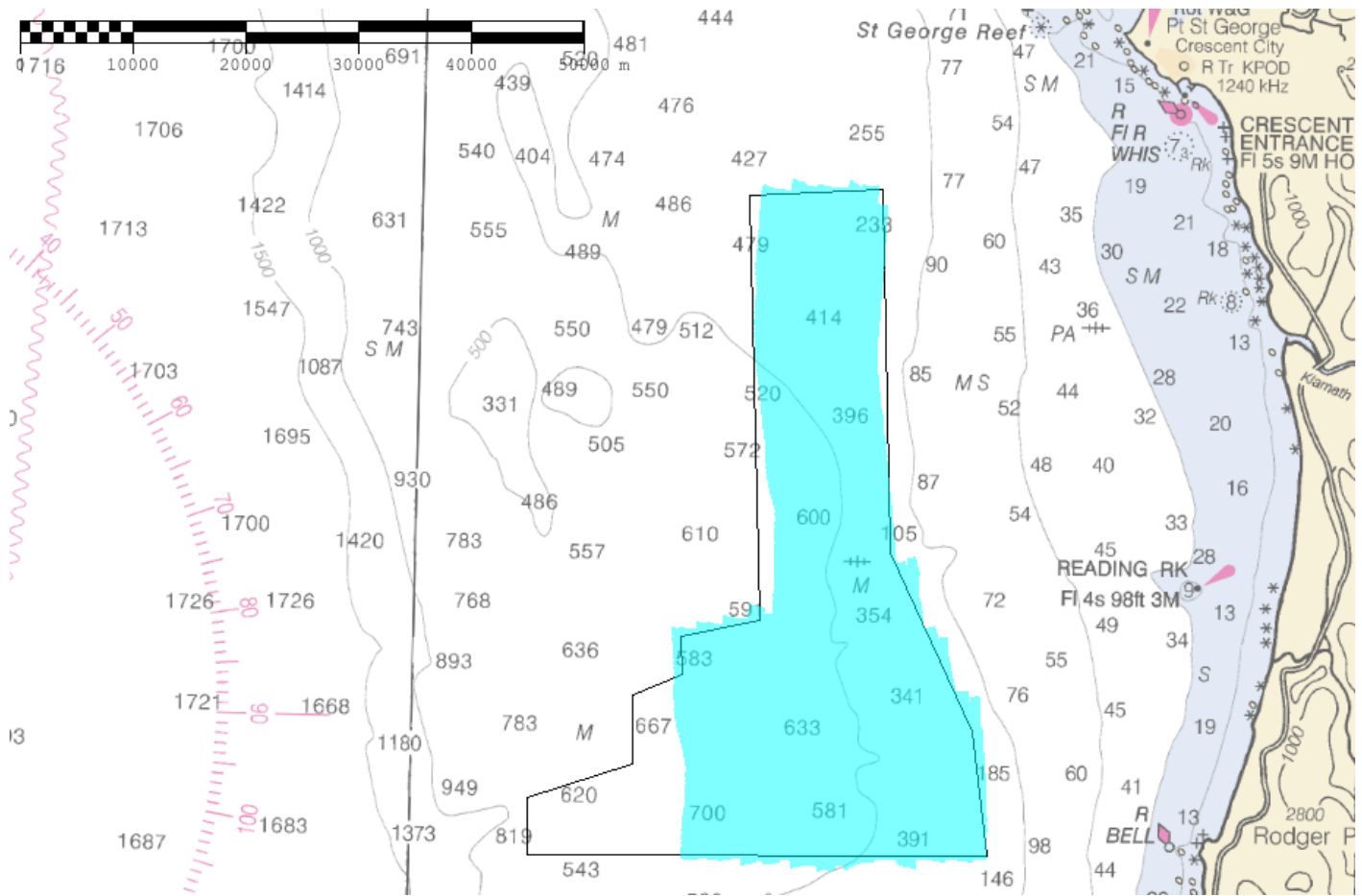


Figure 3: H13117 MBES coverage and assigned survey limits (Chart 18010)

A.5 Survey Statistics

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

	HULL ID	<i>S-221</i>	<i>Total</i>
LNM	SBES Mainscheme	0	0
	MBES Mainscheme	455	455
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/SSS Mainscheme	0	0
	MBES/SSS Mainscheme	0	0
	SBES/MBES Crosslines	0	0
	Lidar Crosslines	0	0
Number of Bottom Samples			0
Number Maritime Boundary Points Investigated			0
Number of DPs			0
Number of Items Investigated by Dive Ops			0
Total SNM			288.96

Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
08/22/2018	234
08/21/2018	233

Survey Dates	Day of the Year
08/20/2018	232

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	<i>S-221</i>
LOA	70.4 meters
Draft	4.7 meters

Table 5: Vessels Used

All data for H13117 were acquired by NOAA Ship RAINIER. The vessel acquired depth soundings, backscatter imagery, water column data, and sound speed profiles.

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS MV v5	Positioning and Attitude System
Kongsberg Maritime	EM 710	MBES
Teledyne RESON	SVP 70	Surface Sound Speed System
Lockheed Martin Sippican	Deep Blue	Temperature Sensor

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 0.00% of mainscheme acquisition.

The priority for this project was to maximize overall MBES coverage and crosslines were not acquired for H13117. A waiver from HSD Operations Branch has been received, see attachments.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.173 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
S-221		4 meters/second	.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13117 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. Due to limitations in the XmIDR program, the "Measured MVP" field was used to display the Expendable Bathythermograph (XBT) uncertainty.

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 H13117 TVU compliance; a histogram plot of the results is shown below (Figure 4).

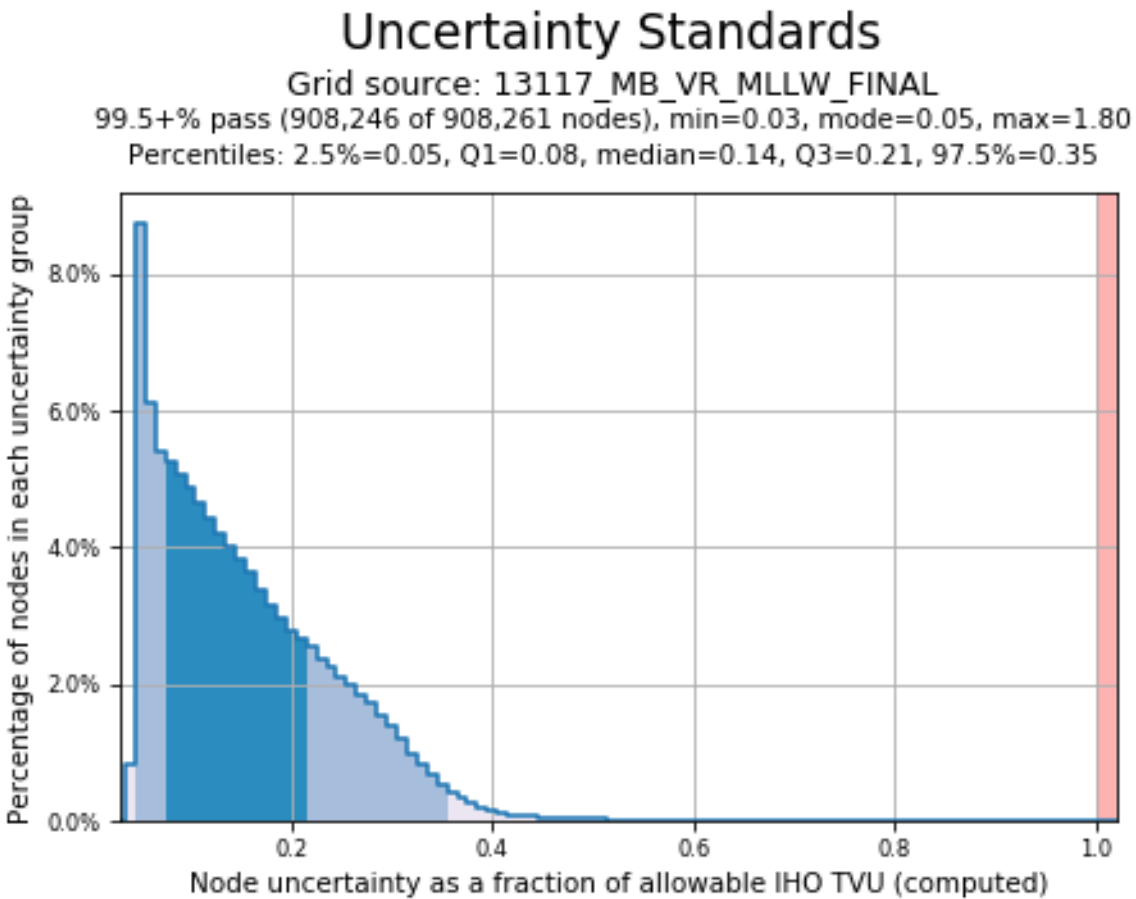


Figure 4: Pydro derived plot showing TVU compliance of H13117 finalized multi-resolution MBES data.

B.2.3 Junctions

No junction areas were identified for this survey.

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

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

B.2.5 Equipment Effectiveness

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

B.2.6 Factors Affecting Soundings

Maximum Depth Ranges and Sea State

Artifacts in the data were found (see Figure 5 for an example) correlating to data collection days of increased wind and sea state. These were further correlated to pitching of the ship, and are most likely caused by momentary dropouts of surface sound speed data. These artifacts, when found to affect the BASE surface, were rejected by the hydrographer. The the rejected soundings did not cause any holidays at the surveyed depth.

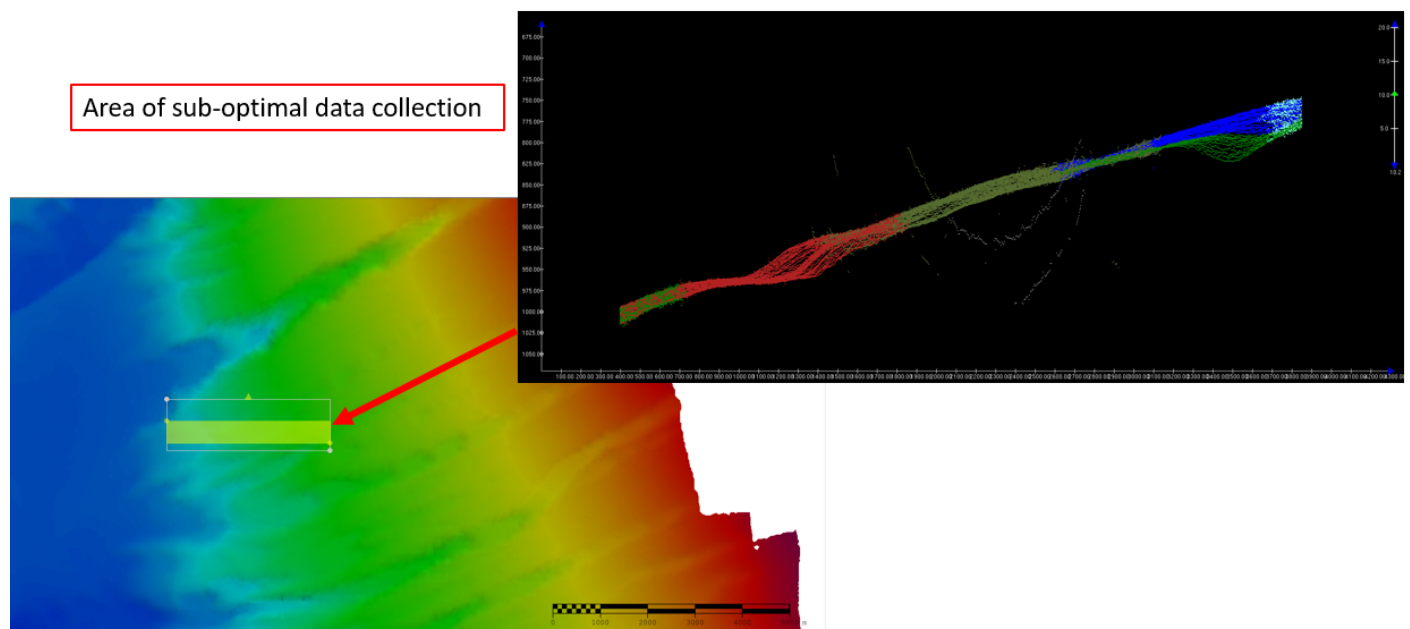


Figure 5: Example of area with artifact

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: At least every 4 hours.

A total of 16 sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours or when operating in a new area. For MBES operations from S221, sound speed

profiles were acquired using the Lockheed Martin Sippican Deep Blue XBTs. All casts were concatenated into a master file and applied using the "Nearest distance within time" (4 hours) profile selection method.

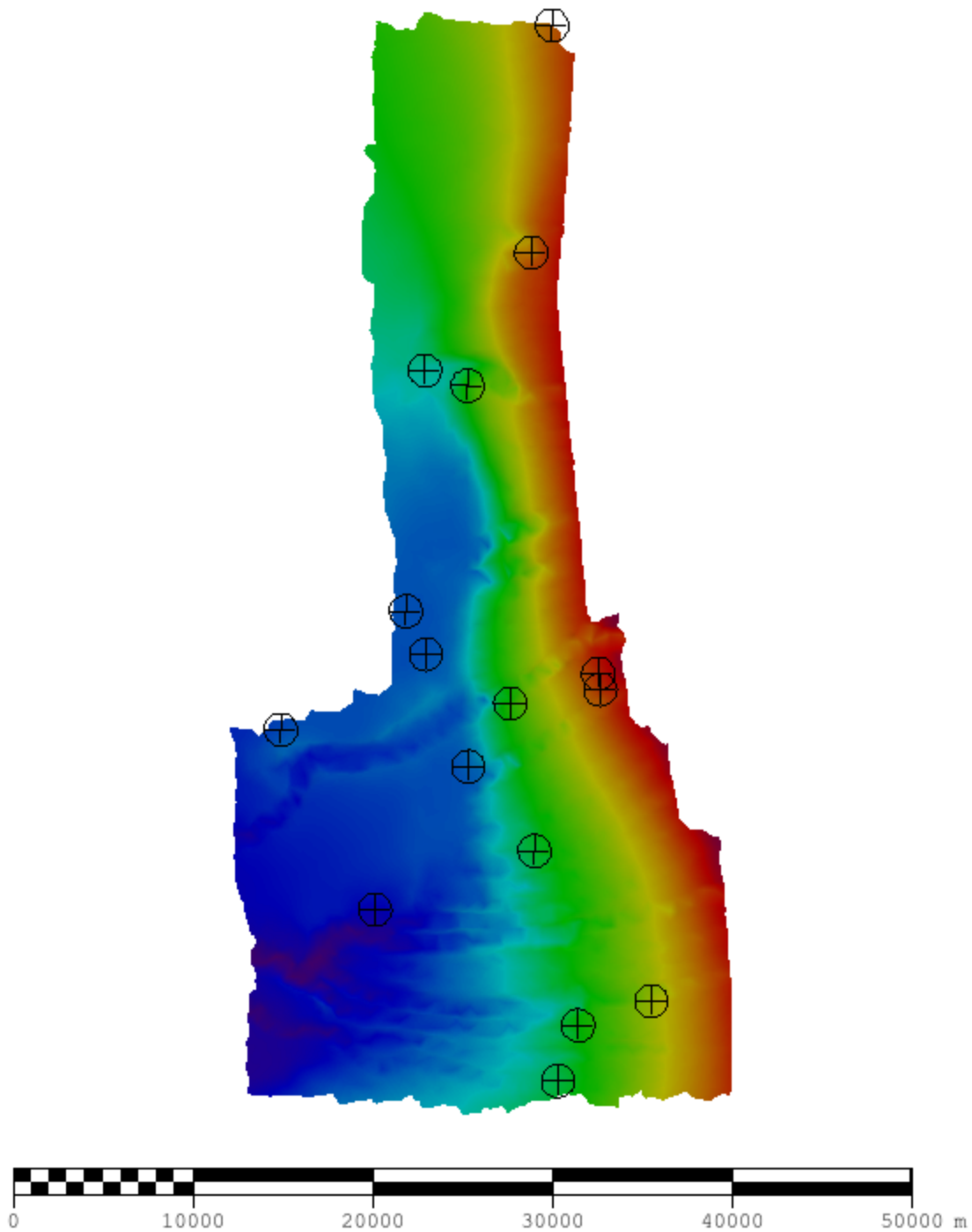


Figure 6: H13117 sound speed cast locations.

B.2.8 Coverage Equipment and Methods

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

B.2.9 H13117 Flier Finder

Pydro QC Tools 2 "Flier Finder V6" check with default settings was performed on H13117 data and no fliers were detected.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data were logged as .all files for delivery to NOAA's Pacific Hydrographic Branch. The field unit processed the backscatter data and generated backscatter mosaics. One mosaic per vessel per frequency was generated for H13117. To create the mosaics, processed HDCS lines were paired with the raw .all files in Fledermaus Geocoder Toolbox version 7.8.1.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following Feature Object Catalog was used: NOAA Profile V_5_7.

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
H13117_MB_VR_MLLW_FINAL.csar	CARIS VR Surface (CUBE)	Variable Resolution	205.9 meters - 1323.9 meters	NOAA_VR	Complete MBES
H13117_MB_VR_MLLW.csar	CARIS VR Surface (CUBE)	Variable Resolution	205.9 meters - 1323.9 meters	NOAA_VR	Complete MBES

Table 9: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for "Ranges" style variable resolution bathymetric grids as specified in HSSD 2018. No soundings were designated in this survey and no Dangers to Navigation (DTONs) were detected throughout the survey area.

C. Vertical and Horizontal Control

There were no tide gauges or base stations installed by the survey vessel crew for this project; no Horizontal and Vertical Control Report (HVCR) was submitted.

C.1 Vertical Control

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

ERS Methods Used:

ERS via VDATUM

Ellipsoid to Chart Datum Separation File:

shapefile_xyNAD83-MLLW_geoid12b.csar

C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983.

The projection used for this project is UTM 10N.

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 H13117 survey data and Electronic Navigational Charts (ENC) US3OR03M using CUBE surfaces, selected soundings, and contours created in Caris.

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?
US3OR03M	1:196948	21	08/17/2018	10/13/2015	NO

Table 10: Largest Scale ENCs

US3OR03M

US3OR03M covers the entire survey area. Comparison between the soundings and contour curves between H13117 and US3OR03M revealed very few differences (see Figures 7 and 8). These inconsistencies were not deemed navigationally significant.

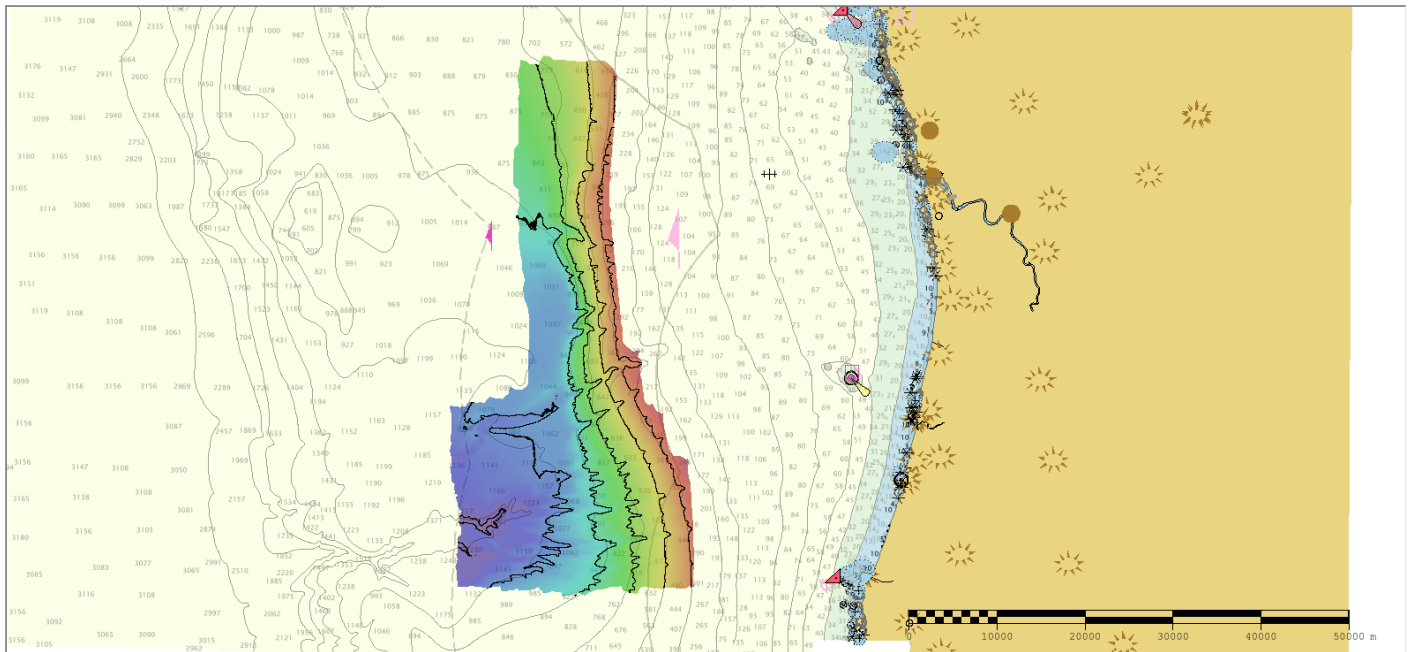


Figure 7: Comparison of US3OR03M contours (grey) and H13117 derived contours (black)

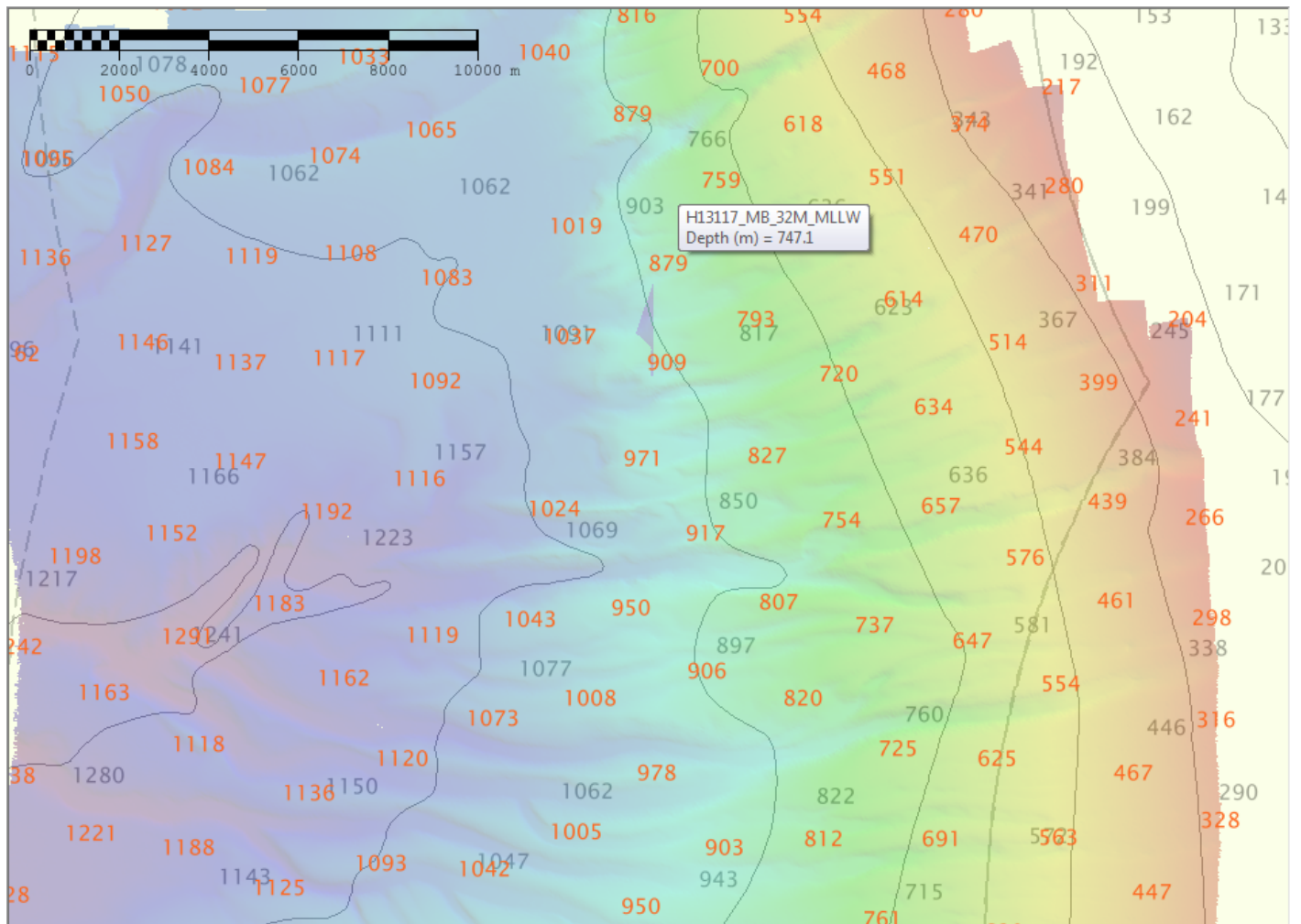


Figure 8: Sample comparison of US3OR03M soundings (grey) and H13117 derived soundings (orange)

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No uncharted features exist for this survey.

D.1.5 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.6 Channels

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

D.1.7 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results**D.2.1 Shoreline**

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

No Aids to navigation (ATONs) exist for this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.8 Abnormal Seafloor and/or Environmental Conditions

No abnormal seafloor and/or environmental conditions exist for this survey.

D.2.9 Construction and Dredging

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

D.2.10 New Survey 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 Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
Benjamin K. Evans, CDR/NOAA	Commanding Officer NOAA Ship Rainier	12/13/2018	 Digitally signed by EVANS.BENJAMIN.K.1237217094 Date: 2018.12.21 13:44:43 -08'00'
Andrew Clos, LT/NOAA	Field Operations Officer NOAA Ship Rainier	12/13/2018	 Digitally signed by OWEN.HADLEY.ANNE.14 10967070 Date: 2018.12.21 12:49:14 -08'00'
James B. Jacobson	Chief Survey Technician NOAA Ship Rainier	12/13/2018	 JACOBSON.JAMES.BRYAN.1269 664017 I have reviewed this document 2018.12.21 07:43:37 -08'00'
Michael D. Card, ENS/NOAA	Sheet Manager NOAA Ship Rainier	12/13/2018	CARD.MICHAEL.DO UGLAS.1011746507 Digitally signed by CARD.MICHAEL.DOUGLAS.1011746507 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=CARD.MICHAEL.DOUGLAS.1011746507 Date: 2018.12.20 15:45:34 -08'00'

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Station
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
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
MBAB	Multibeam Echosounder Acoustic Backscatter
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
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
SSSAB	Side Scan Sonar Acoustic Backscatter
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 States Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positioning System timing message
ZDF	Zone Definition File



Michael Card - NOAA Federal <michael.card@noaa.gov>

Fwd: Cascadia Margin and CalDIG Project Adjustments

1 message

CO Rainier - NOAA Service Account <co.rainier@noaa.gov>
To: Michael Card - NOAA Federal <michael.card@noaa.gov>

Tue, Oct 9, 2018 at 8:43 AM

FYI, re. XLs on Cascadia Margin.

----- Forwarded message -----

From: **Paul Turner - NOAA Federal** <paul.turner@noaa.gov>

Date: Fri, Aug 10, 2018 at 6:12 AM

Subject: Cascadia Margin and CalDIG Project Adjustments

To: _OMAO MOP CO Rainier <co.rainier@noaa.gov>, Richard Brennan <richard.t.brennan@noaa.gov>, Corey Allen <corey.allen@noaa.gov>, Ashley Chappell <ashley.chappell@noaa.gov>

Cc: Megan Greenaway <megan.greenaway@noaa.gov>, Meredith Payne - NOAA Federal <meredith.payne@noaa.gov>, Lorraine Robidoux <lorraine.robidoux@noaa.gov>

All:

Following up on Cdr Evans feed-back from the Cascadia Margin project regarding crosslines. I can remove that requirement within the final PI's for the CalDIG project unless there are any objections from this group. This will help limit time taken away from the USGS operations. I could also 'un-assign' crosslines for any un-opened H_sheets for the Cascadia Margin project.

However I feel like holidays still need to be ran for both projects so we have complete coverage.

Paul

--

Paul Turner
Integrated Ocean and Coastal Mapping
NOAA's Office of Coast Survey
[1315 East West Hwy](#), SSMC3 Rm.6203
Silver Spring, MD 20910

240-533-0043
Paul.Turner@noaa.gov

--

CDR Benjamin K. Evans, NOAA
Commanding Officer
NOAA Ship *Rainier* (S-221)



UNITED STATES DEPARTMENT OF COMMERCE
 National Oceanic and Atmospheric Administration
 NOAA Ship Rainier
 2002 SE Marine Science Drive
 Newport, OR 97365-5229

November 16th, 2018

MEMORANDUM FOR: Paul Turner, NOAA
 Cascadia Margin and CalDIG Project Manager, HSD

FROM: Commander Benjamin Evans, NOAA
 Commanding Officer, NOAA Ship *Rainier*

SUBJECT: Waiver Request: Crossline and Holiday Acquisition
 Projects: OPR-L373-RA-18 and OPR-M367-RA-18

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Due to the priorities of USGS and BOEM to maximize the amount of area covered by MBES data, *Rainier* is requesting a waiver to modify our crossline and holiday acquisition requirements. *Rainier* requests that the requirement to acquire crossline data and fill in gaps in MBES coverage be waived for surveys with projects OPR-L373-RA-18 and OPR-M367-RA-18.

The following sheets are affected:

H13117, H13118, H13119, H13137, H13206, D00248, H13151 and H13152.

Justification

These surveys are primarily for seafloor mapping and sub-bottom profiling as opposed to nautical charting. The surveys areas are miles offshore of the Oregon and California coasts and in sufficiently deep water that the potential for hazards to navigation is extremely small.

The partnering organizations (USGS and BOEM) do not have use for crossline or holiday coverage, and specifically requested that we dispense with this requirement. As a result, the crossline requirement was not met on all surveys of these projects. While every effort was made to avoid holidays, some small gaps between lines do exist and were not filled.

Decision

Waiver is:

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 Granted

 Denied

cc: Chief, HSD OPS; OPS-RA, CHST-RA



APPROVAL PAGE

H13117

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)
- One backscatter mosaic
- Processed survey data and records
- 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: _____
Commander Olivia Hauser, NOAA
Chief, Pacific Hydrographic Branch