

H13584

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

**DESCRIPTIVE REPORT**

Type of Survey: Navigable Area

Registry Number: H13584

**LOCALITY**

State(s): Northern Mariana Islands

General Locality: Western Pacific Ocean

Sub-locality: Sarigan Island and Zealandia Bank

**2022**

CHIEF OF PARTY  
Hector L. Casanova, CAPT/NOAA

LIBRARY & ARCHIVES

Date:

**HYDROGRAPHIC TITLE SHEET**

**H13584**

**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): **Northern Mariana Islands**

General Locality: **Western Pacific Ocean**

Sub-Locality: **Sarigan Island and Zealandia Bank**

Scale: **10000**

Dates of Survey: **05/17/2022 to 08/23/2022**

Instructions Dated: **01/07/2022**

Project Number: **OPR-T381-RA-22**

Field Unit: **NOAA Ship *Rainier***

Chief of Party: **Hector L. Casanova, CAPT/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:**

*Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of survey data is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via <https://www.ncei.noaa.gov/>. Products created during office processing were generated in NAD83(MA11) UTM 55N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.*

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## Descriptive Report to Accompany Survey H13584

Project: OPR-T381-RA-22

Locality: Western Pacific Ocean

Sublocality: Sarigan Island and Zealandia Bank

Scale: 1:10000

May 2022 - August 2022

**NOAA Ship *Rainier***

Chief of Party: Hector L. Casanova, CAPT/NOAA

### A. Area Surveyed

This survey is referred to as H13584, "Sarigan Island and Zealandia Bank" (sheet 14) within the Project Instructions. The assigned survey area encompassed an estimated 1,470 square nautical miles, centered approximately 70 nautical miles north of Saipan Island in the Western Pacific Ocean.

#### A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
17° 4' 48.23" N 145° 31' 28.66" E	15° 51' 0.32" N 146° 13' 45.54" E

*Table 1: Survey Limits*

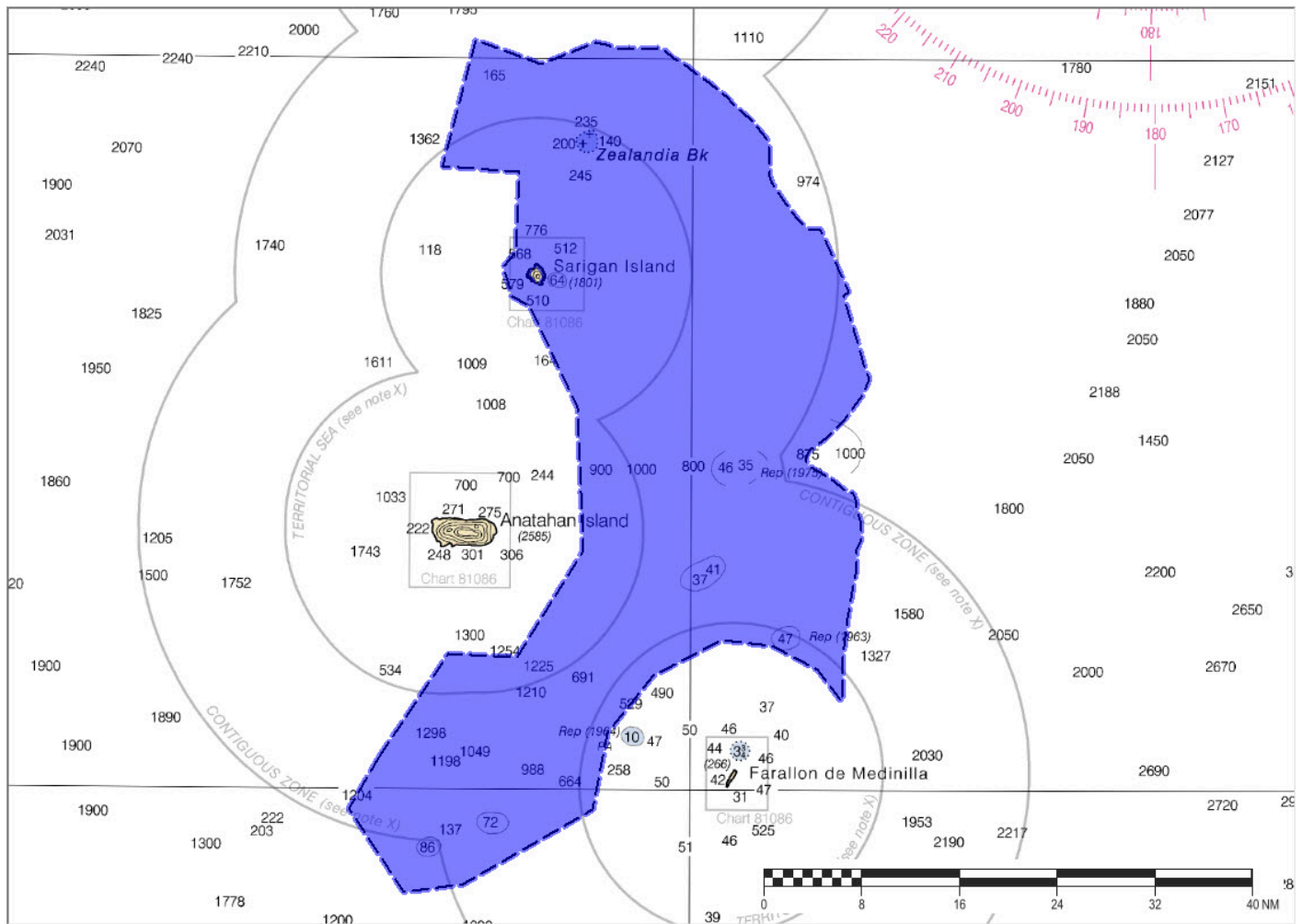


Figure 1: H13584 assigned survey limits.

The originally assigned survey limits extended into areas with depths greater than RAINIER could efficiently acquire quality multibeam data. Therefore we requested, and the Operations Branch approved, that we survey to the 1,500 meter depth contour and not beyond. See Supplemental Records for more information.

This project's requirement to coordinate hydrographic operations with reef diving priorities, imposed significant limitations on the amount of MBES data we could acquire for this survey. Although we could not survey as extensively as hoped, we did acquire 237 square nautical miles of bathymetric data for this survey.



## A.2 Survey Purpose

The ecosystem surrounding the Commonwealth of the Northern Mariana Islands (CNMI) is experiencing stress imposed by climate change and other environmental factors. This survey is part of extensive hydrographic project intended to map the bathymetry and habitat around the CNMI in support of nautical charting and habitat mapping.

With the collaboration and partnership of the National Centers for Coastal and Ocean Science (NCCOS), the NOAA Coral Reef Conservation Program (CRCP), and the National Marine Fisheries Service (NMFS), this survey will also study the health of coral reef systems, ocean chemistry, and fisheries habitat. This team has developed a strategy to map the waters from nearshore to depths greater than 1000 meters. Within these waters, the ship's crew and visiting scientists will map bathymetry and backscatter and characterize habitat, while concurrently performing coral reef assessment dives and collecting other oceanographic observations.

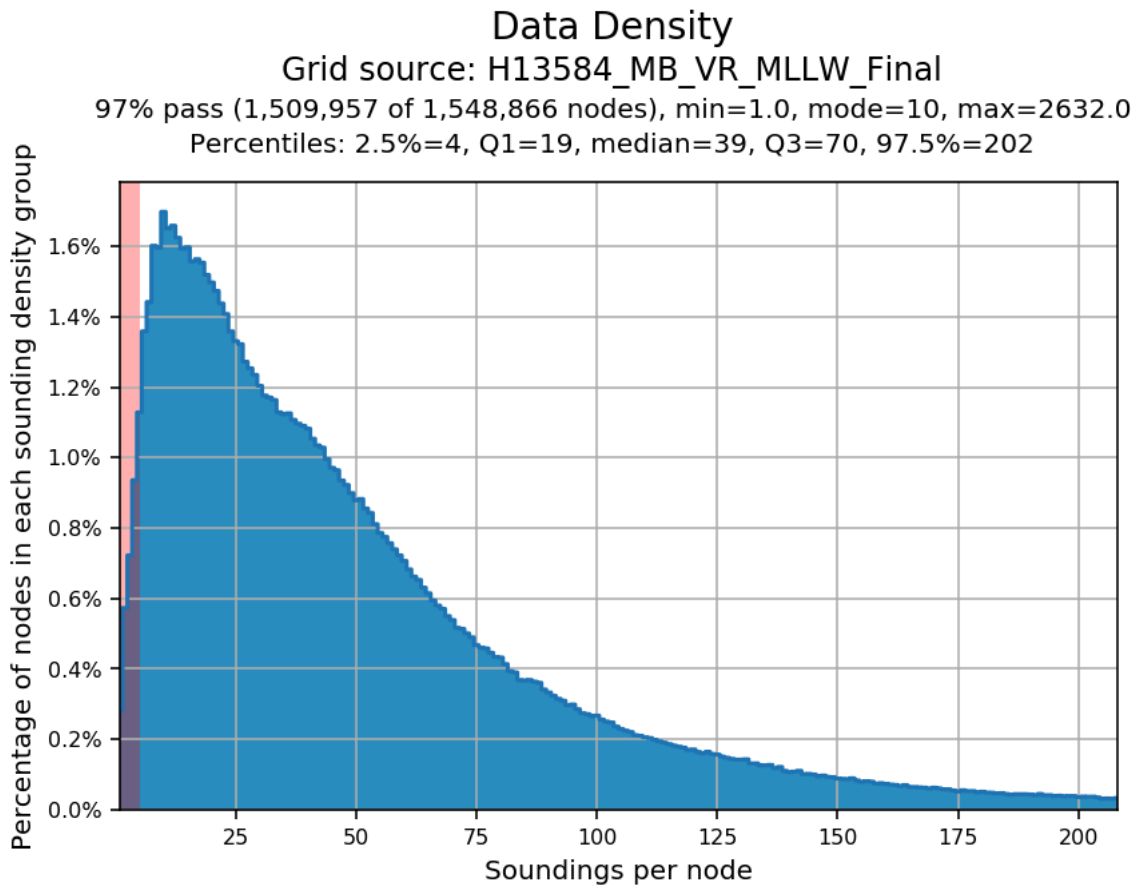
Data collected during this mission are pivotal to long-term biological and oceanographic monitoring of coral reef ecosystems around the CNMI. Data from this survey will add to information collected during prior monitoring and mapping projects. Oceanographic and ecological time series data will allow scientists to evaluate potential changes in environmental conditions and coral reef health in the Mariana Archipelago. This will enable federal and state resource managers to more effectively conserve the coral reef ecosystems of the CNMI, and to manage ecosystems services. Data collected during this survey also support monitoring components of the CRCP Coral Reef Ecosystem Integrated Observing System.

## A.3 Survey Quality

The entire survey is adequate to supersede previous data.

We used Pydro QC Tools (v3.7.0) Grid QA to analyze H13584 multibeam echosounder (MBES) data density. Analysis of the submitted H13584 finalized variable-resolution (VR) surface showed that 97% of grid nodes met HSSD density requirements. Grid QA results determined that a lower than expected percentage of H13584 nodes met full coverage resolution requirements as explained below.

For project OPR-T381-RA-22 Resolution Requirements graphs produced by Pydro's Grid QA tool have been showing relatively low percentages of grid nodes meeting full coverage resolution requirements. The likely cause of this issue is RAINIER's use of 64m grids in depths greater than 1000m to maintain a reasonable data density. Since the Grid QA tool was written to match the HSRR specifications with a maximum 32m grid in all waters greater than 640m, RAINIER grids created using the 64m increase in resolution will always fail the resolution requirements check in areas exceeding 1000m. This will of course decrease the percentage of grid nodes meeting coverage resolution requirements. For surveys with a large percentage of area greater than 1000m in depth, this reduction can be significant. The OCS QC tools team has been made aware of this issue and are working on a solution for this deviation from the specifications. See the Supplemental Records of the sheet submission for more information.



*Figure 3: Pydro derived plot showing HSSD density compliance of H13584 finalized variable resolution MBES data.*

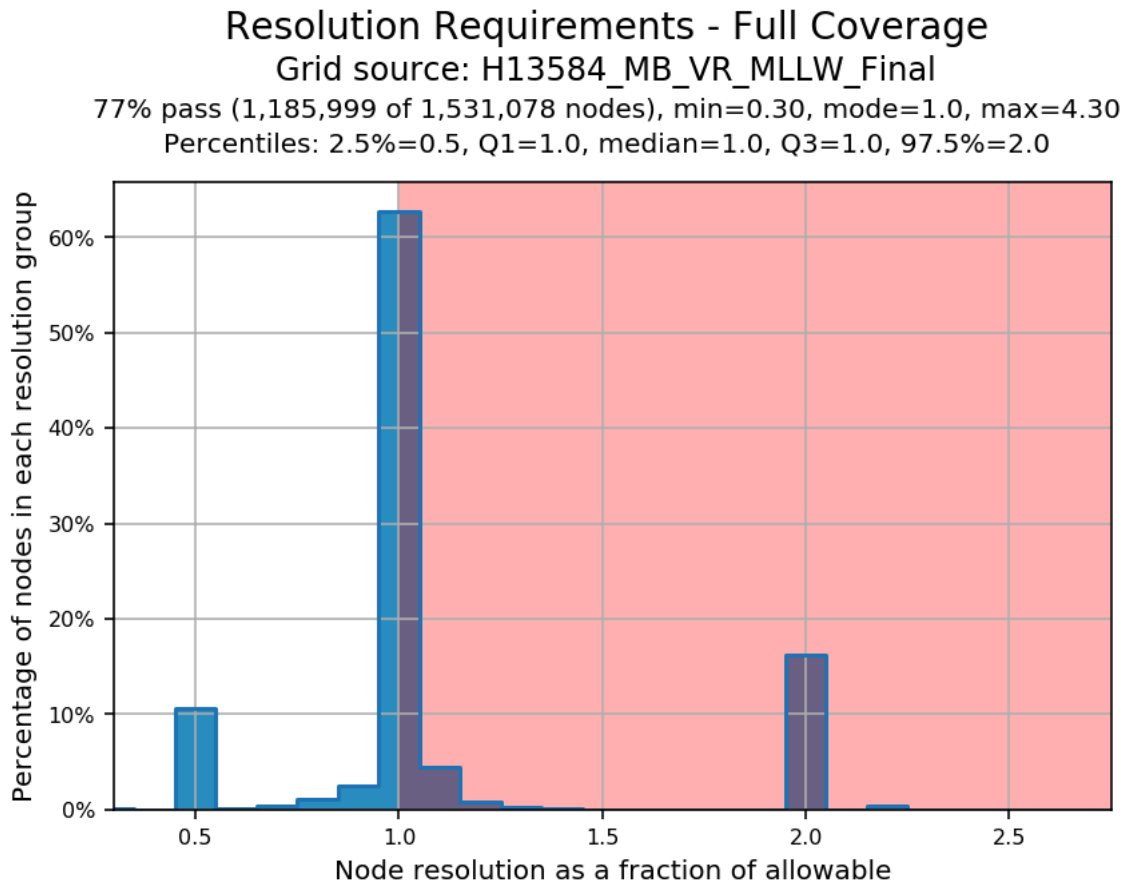


Figure 4: Pydro derived plot showing Grid QA results of H13584 full coverage resolution requirements.

### 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	Complete Coverage (Refer to HSSD Section 5.2.2.3)

Table 2: Survey Coverage

Survey coverage was in accordance with the requirements listed above and in the HSSD.



## A.6 Survey Statistics

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

	<b>HULL ID</b>	<b>S221</b>	<b>2803</b>	<b>Total</b>
<b>LNM</b>	<b>SBES Mainscheme</b>	0.0	0.0	0.0
	<b>MBES Mainscheme</b>	435.2	19.0	454.2
	<b>Lidar Mainscheme</b>	0.0	0.0	0.0
	<b>SSS Mainscheme</b>	0.0	0.0	0.0
	<b>SBES/SSS Mainscheme</b>	0.0	0.0	0.0
	<b>MBES/SSS Mainscheme</b>	0.0	0.0	0.0
	<b>SBES/MBES Crosslines</b>	52.2	0.0	52.2
	<b>Lidar Crosslines</b>	0.0	0.0	0.0
<b>Number of Bottom Samples</b>			0	
<b>Number Maritime Boundary Points Investigated</b>			0	
<b>Number of DPs</b>			4	
<b>Number of Items Investigated by Dive Ops</b>			0	
<b>Total SNM</b>			237.8	

*Table 3: Hydrographic Survey Statistics*

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

<b>Survey Dates</b>	<b>Day of the Year</b>
05/17/2022	137
05/18/2022	138
05/26/2022	146
05/27/2022	147
06/18/2022	169
06/29/2022	180
08/05/2022	217
08/09/2022	221
08/20/2022	232
08/21/2022	233
08/22/2022	234
08/23/2022	235

*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:

<b>Hull ID</b>	<b><i>S221</i></b>	<b><i>2803</i></b>
<b>LOA</b>	70.4 meters	8.8 meters
<b>Draft</b>	4.7 meters	1.1 meters

*Table 5: Vessels Used*



*Figure 6: NOAA Ship RAINIER (S221) surveying Mariana Islands with survey launch 2803 alongside, dive boat astern.*

All data for H13584 were acquired by NOAA Ship RAINIER and survey launch 2803. The vessels acquired depth soundings, backscatter imagery and sound speed profiles.

### **B.1.2 Equipment**

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

<b>Manufacturer</b>	<b>Model</b>	<b>Type</b>
Applanix	POS MV 320 v5	Positioning and Attitude System
Kongsberg Maritime	EM 710	MBES
Kongsberg Maritime	EM 2040	MBES
ODIM Brooke Ocean	MVP200	Sound Speed System
Sea-Bird Scientific	SBE 19plus	Conductivity, Temperature, and Depth Sensor
Teledyne RESON	SVP 70	Sound Speed System
Lockheed Martin Sippican	Deep Blue XBT	Sound Speed System

*Table 6: Major Systems Used*

## **B.2 Quality Control**

### **B.2.1 Crosslines**

RAINIER (S221) acquired 52.2 nautical miles (11.4% of mainscheme) of MBES crosslines across all depth ranges, water masses and boat days that were operationally practical, in order to evaluate the internal consistency of H13584 sonar data. We performed crossline analysis using the Compare Grids function within Pydro Explorer on Caris variable-resolution surfaces of H13584 mainscheme only and crossline only data. Results showed that 99.5+% of grid nodes met allowable uncertainties as shown in the Pydro generated plots below.

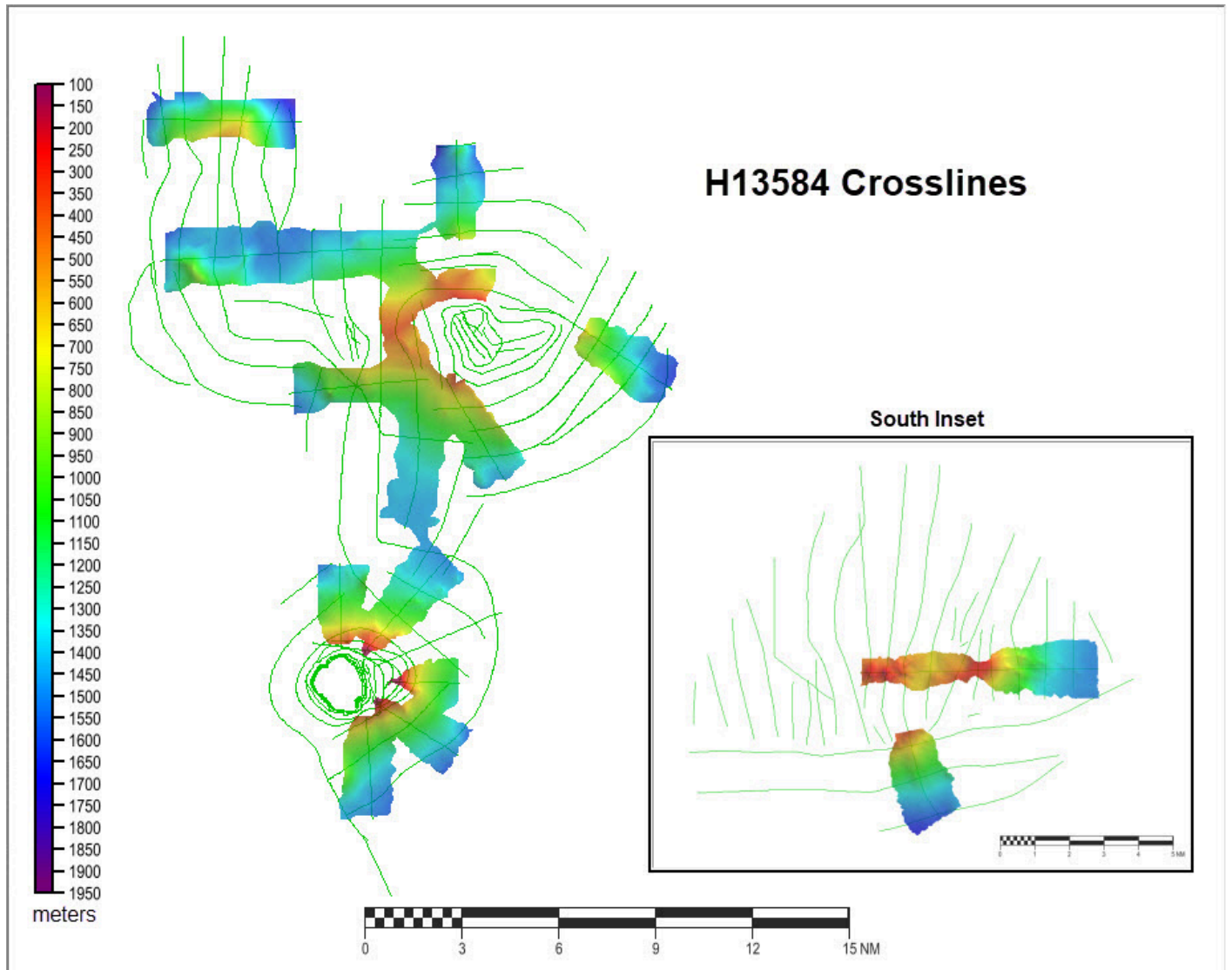


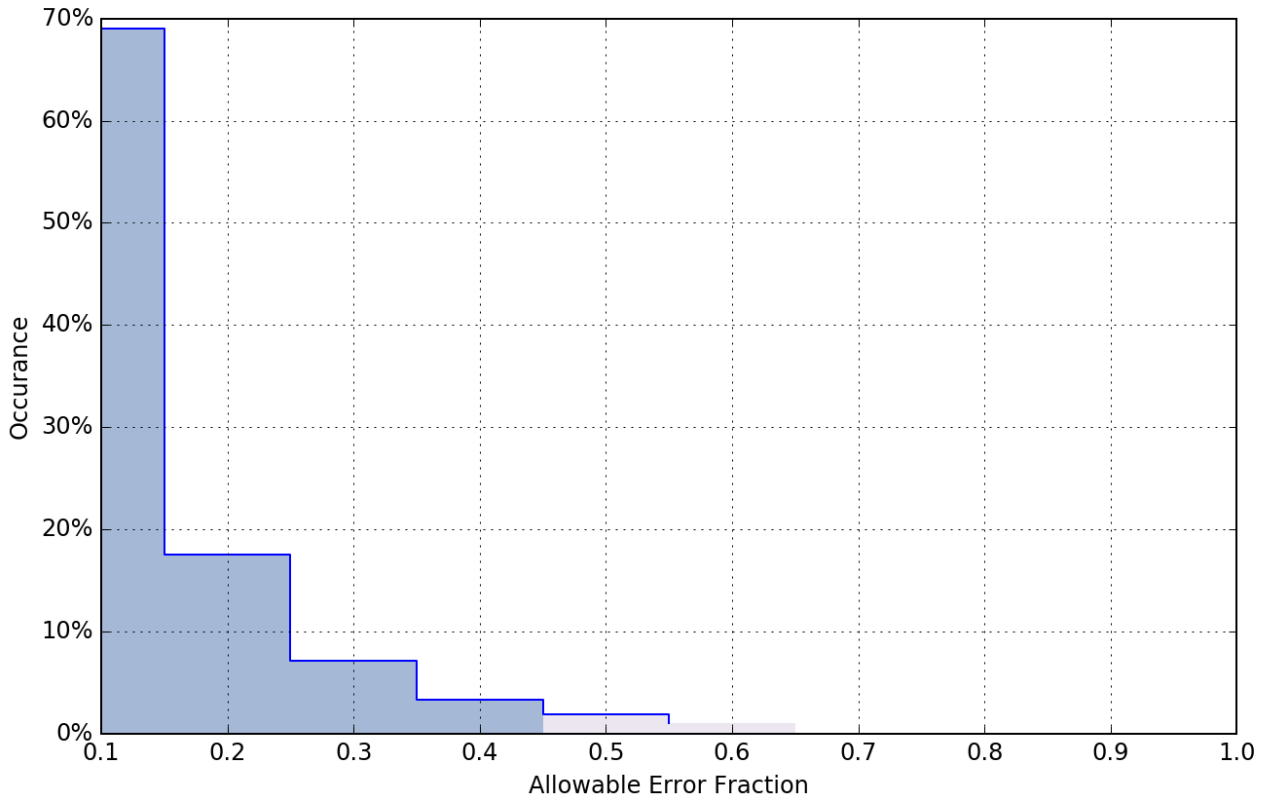
Figure 7: H13584 crossline only surface overlaid on mainscheme tracklines.

### Comparison Distribution

Per Grid: H13584\_VR\_MS\_Only-H13584\_VR\_XL\_Only\_fracAllowErr.csar

99.5+% nodes pass (287484), min=0.0, mode=0.1 mean=0.1 max=7.7

Percentiles: 2.5%=0.0, Q1=0.0, median=0.0, Q3=0.1, 97.5%=0.4



*Figure 8: Pydro derived plot showing node percentage pass value of H13584 mainscheme to crossline MBES data.*

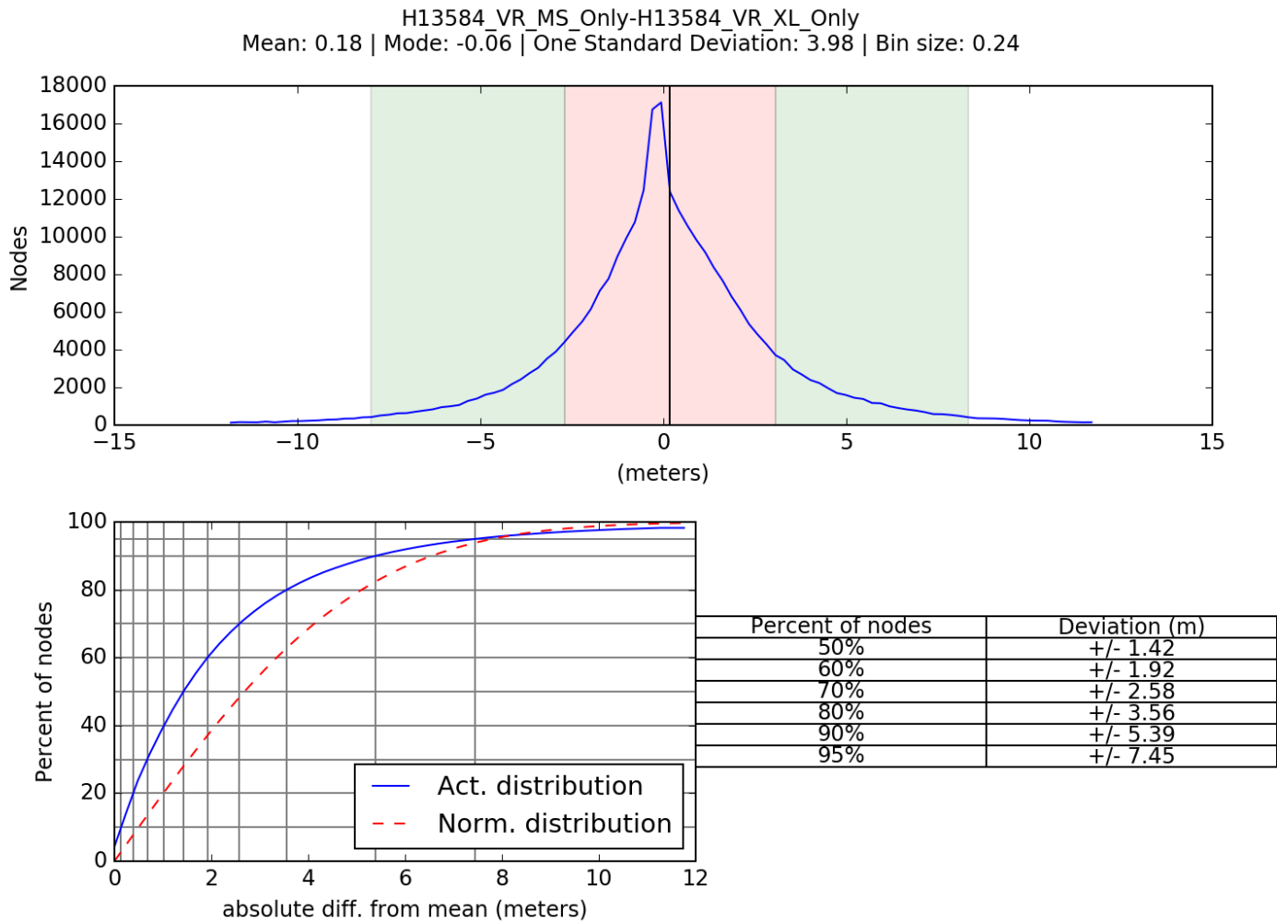


Figure 9: Pydro derived plot showing absolute difference statistics of H13584 mainscheme to crossline MBES data.

### B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0.0 meters	0.11 meters

Table 7: Survey Specific Tide TPU Values.

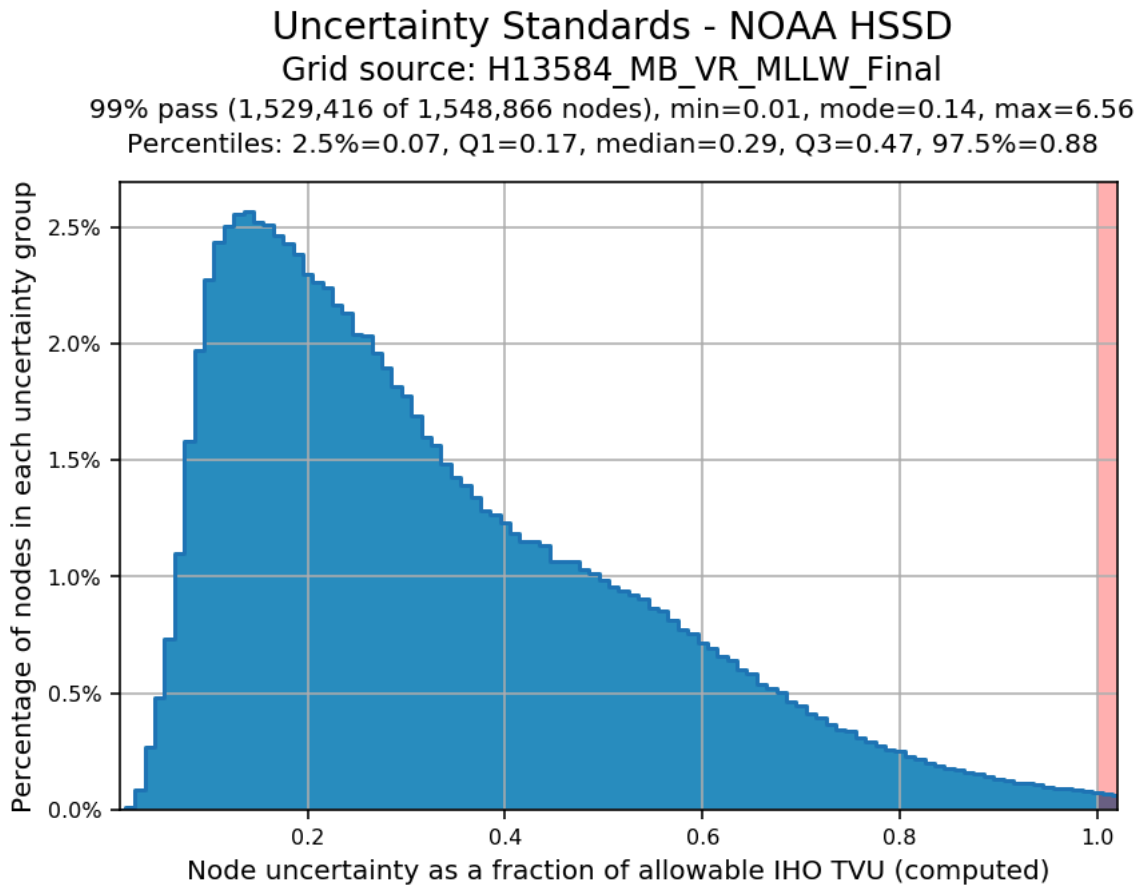
<b>Hull ID</b>	<b>Measured - CTD</b>	<b>Measured - MVP</b>	<b>Measured - XBT</b>	<b>Surface</b>
S221	N/A	1 meters/second	4 meters/second	0.05 meters/second
2803	3 meters/second	N/A	N/A	0.05 meters/second

*Table 8: Survey Specific Sound Speed TPU Values.*

Total Propagated Uncertainty (TPU) values for survey H13584 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 metadata for the NOAA vertical datum transformation model used for this survey.

In addition to the usual a priori estimates of uncertainty, real-time and post-processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties for position, navigation and vessel motion data from Applanix POS MV were applied during acquisition and initially in post-processing. POSpac SBET and RMS files were subsequently applied in Caris HIPS to supersede POS MV uncertainties associated with GPS height and position.

Uncertainty values of the submitted finalized grids were calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA v6 within Pydro QC Tools was used to analyze H13584 TVU compliance. H13584 met HSSD requirements in 99% percent of grid nodes as shown in the histogram plot below.



*Figure 10: Pydro derived plot showing TVU compliance of H13584 finalized multi-resolution MBES data.*

### **B.2.3 Junctions**

H13584 junctions with two contemporary surveys that were assigned as part of the same project, OPR-T381-RA-22: H13586 to the west and H13585 to the southeast.

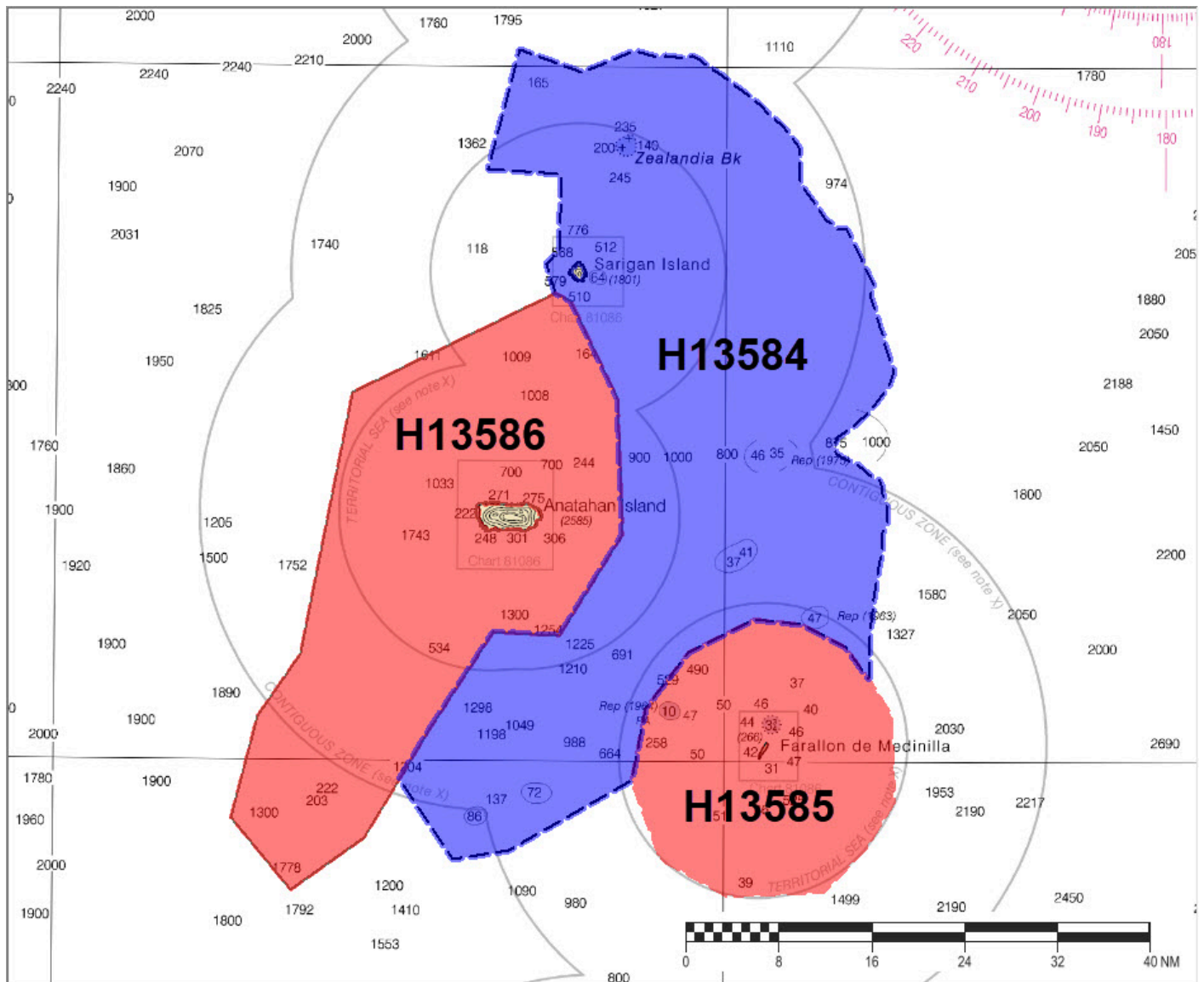


Figure 11: H13584 junction surveys.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13586	1:10000	2022	RAINIER	W
H13585	1:10000	2022	RAINIER	SE

Table 9: Junctioning Surveys

H13586

We performed the comparison between H13584 and H13586 on finalized, variable-resolution surfaces from both surveys using the Compare Grids program within Pydro Explorer. Results of the comparison showed that 99.5% of grid nodes in the common area met NOAA allowable error standards as shown in the figure below.

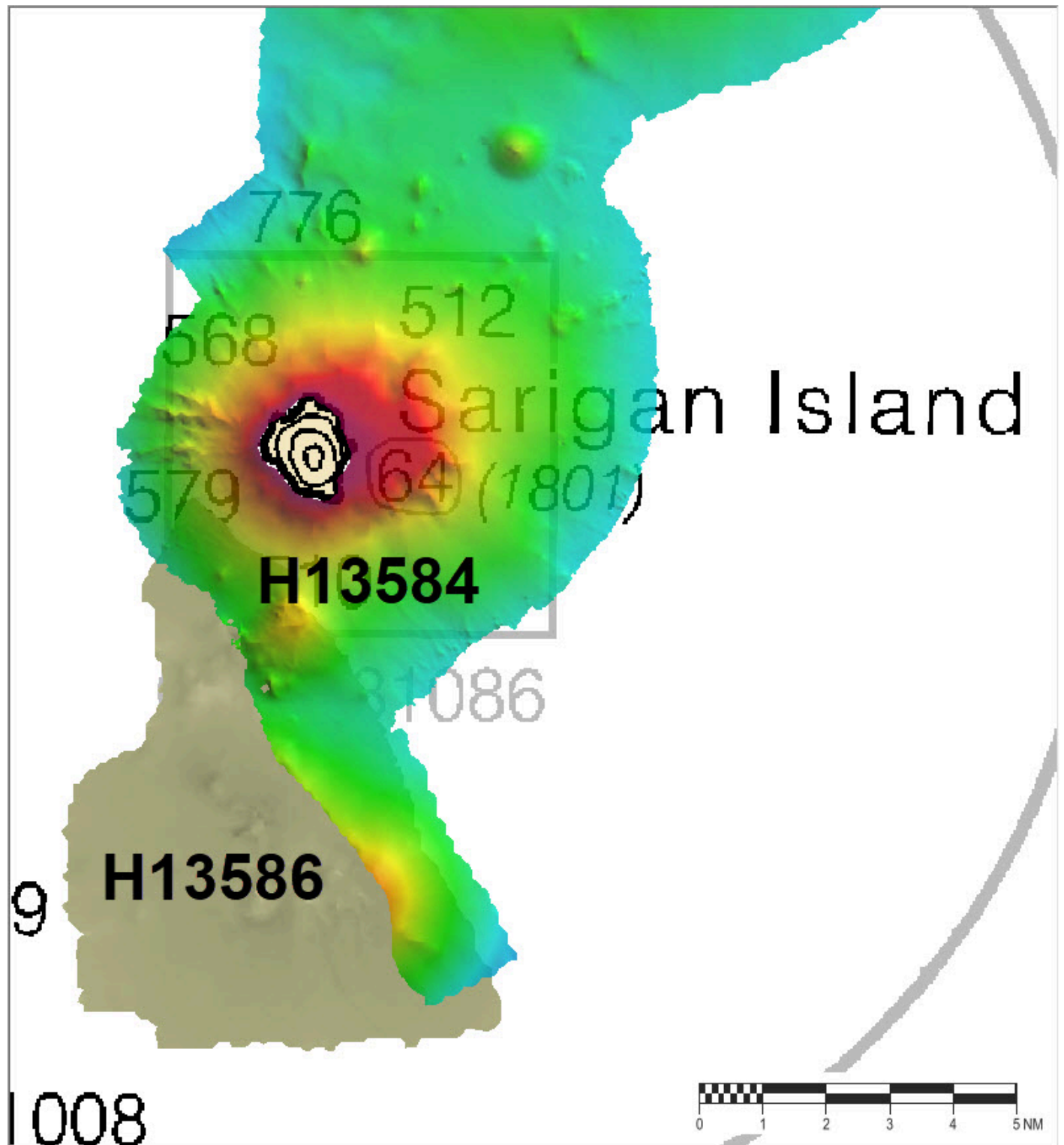


Figure 12: H13584 / H13586 junction.

## Comparison Distribution

Per Grid: H13584\_MB\_VR\_MLLW\_Final-H13586\_MB\_VR\_MLLW\_Final\_fracAllowErr.csar

99.5+% nodes pass (36182), min=0.0, mode=0.1 mean=0.1 max=6.0

Percentiles: 2.5%=0.0, Q1=0.0, median=0.1, Q3=0.1, 97.5%=0.3

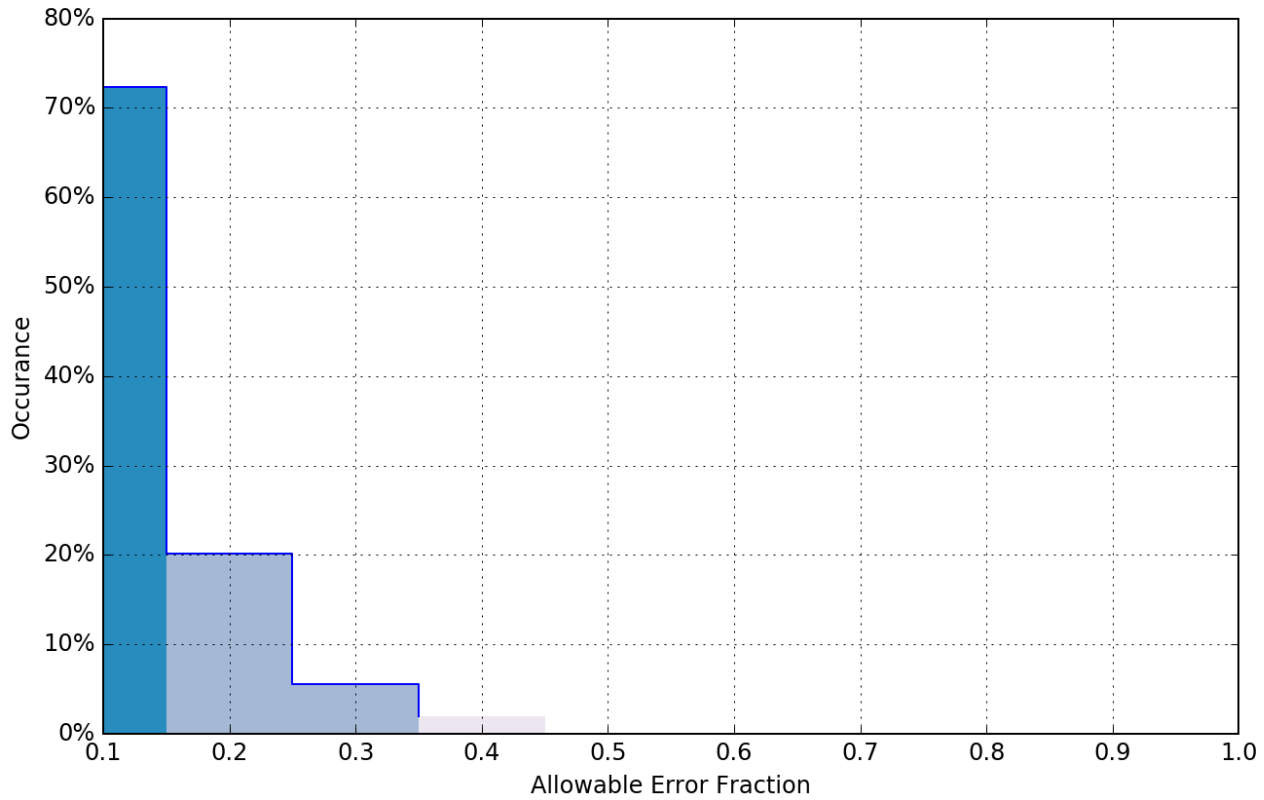


Figure 13: Pydro derived plot showing H13584 / H13586 VR surface comparison statistics.

### H13585

No data were acquired on survey H13585 because access to the area was prohibited by the U.S. Navy which uses Farallon de Medinilla Island for live fire military exercises.

### **B.2.4 Sonar QC Checks**

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

### **B.2.5 Equipment Effectiveness**

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

### **B.2.6 Factors Affecting Soundings**

There were no other factors that affected corrections to soundings.

### **B.2.7 Sound Speed Methods**

Sound Speed Cast Frequency: We acquired thirty-seven sound speed profiles ("casts") for this survey at discrete locations within the assigned area at least once every four hours, when significant changes to surface sound speed were observed, or when shifting operations to a new area. We applied the majority of sound speed profiles to H13584 MBES data using a master concatenated .SVP file and the "Nearest distance within Time (4 hours) profile selection method. We found that in a small number of cases, Caris was using shallow water launch casts to sound speed correct deep water ship data. We corrected this issue by applying ship-only casts to ship MBES data.

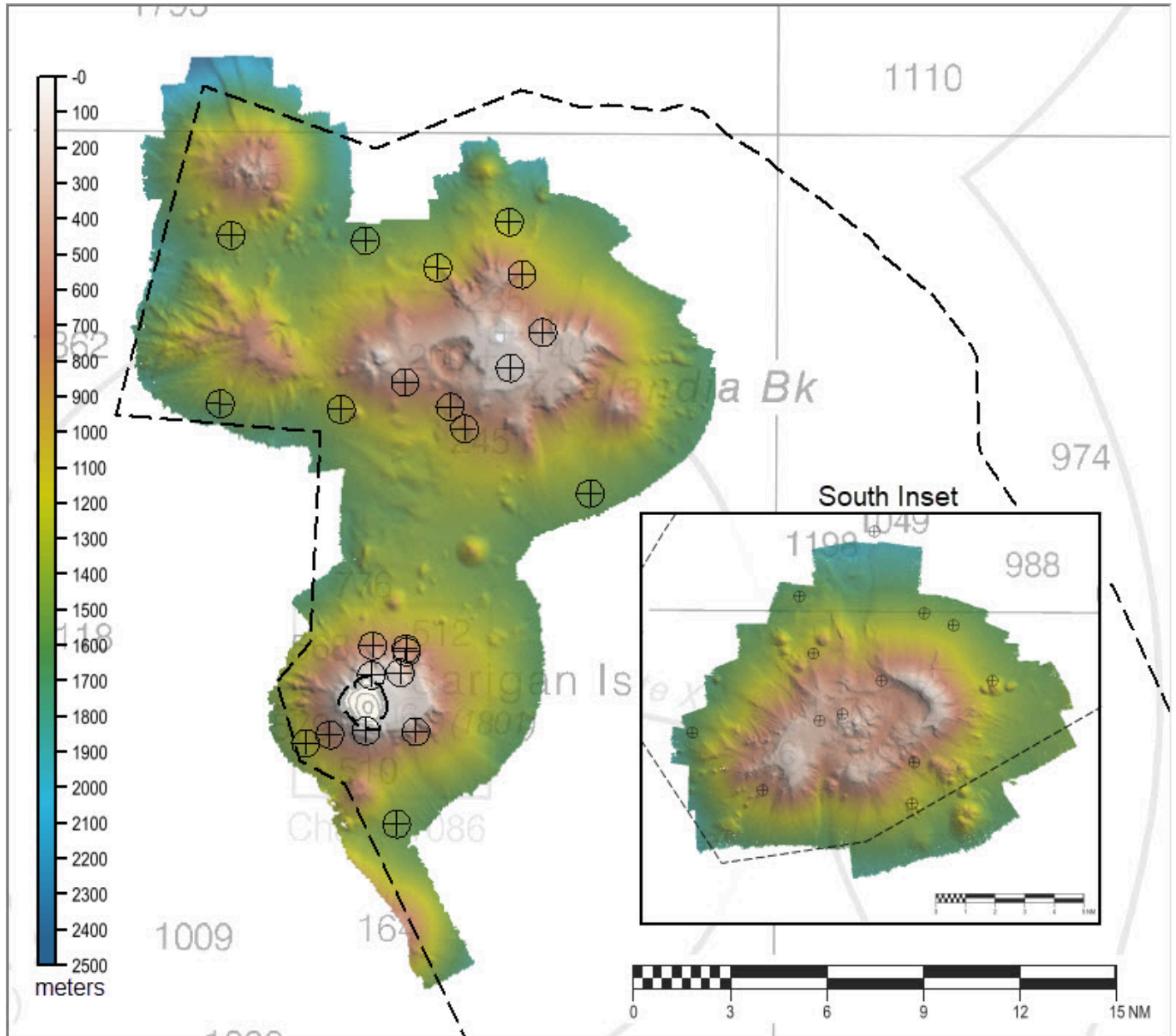


Figure 14: H13584 sound speed cast locations.

### 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 data were acquired as .all files logged during MBES operations and subsequently processed by RAINIER personnel. The .GSF files created during processing, and backscatter mosaic data has been delivered with this report. Backscatter processing procedures are described in the DAPR.

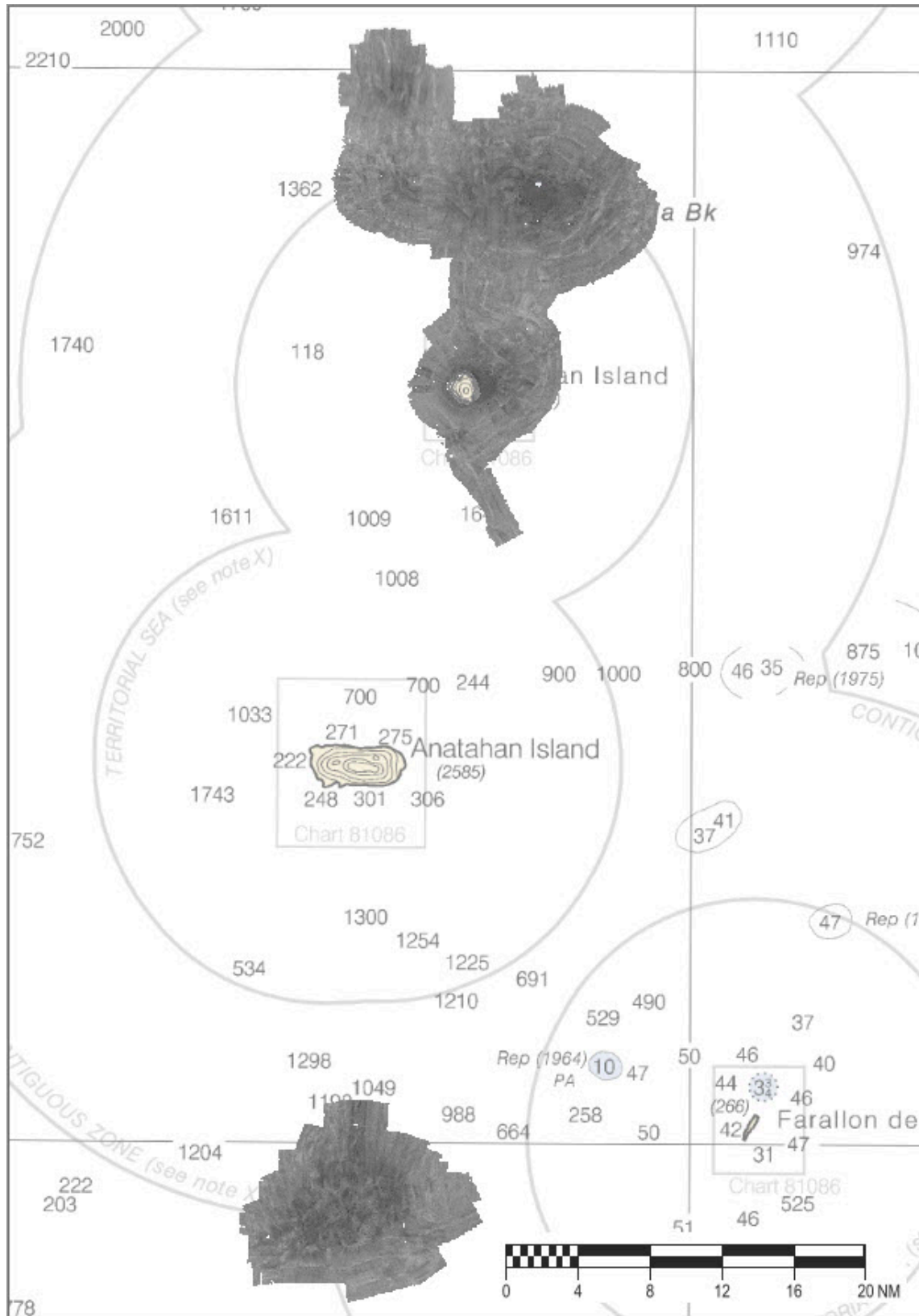


Figure 15: H13584 multibeam acoustic backscatter overview.

## B.5 Data Processing

### B.5.1 Primary Data Processing Software

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

Manufacturer	Name	Version
N/A	N/A	N/A

*Table 10: Primary bathymetric data processing software*

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

Manufacturer	Name	Version
N/A	N/A	N/A

*Table 11: Primary imagery data processing software*

The following Feature Object Catalog was used: NOAA Profile 2022v2.

### 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
H13584_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	5.7 meters - 2438.3 meters	NOAA_VR	Complete MBES
H13584_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	5.7 meters - 2438.3 meters	NOAA_VR	Complete MBES

*Table 12: Submitted Surfaces*

The submitted H13584 surfaces were generated using NOAA recommended parameters for depth-based (Ranges) Caris variable-resolution bathymetric grids. Following correspondence with the Project Manager, we generated the submitted surfaces with an updated Range/Resolution file,

NOAA\_DepthRanges\_CompleteCoverage\_2022\_RA, that includes 64-meter grids for depths exceeding 1,000 meters. See Supplemental Records for more information.

We used Pydro Flier finder tool with default settings as a quality control check of submitted H13584 grid data. We examined each potential flier identified by the program, rejected errant soundings, then re-ran the process until we were satisfied that all remaining fliers identified were false-positives and represent actual seafloor topography.

## C. Vertical and Horizontal Control

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

### C.1 Vertical Control

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

#### ERS Datum Transformation

The following ellipsoid-to-chart vertical datum transformation was used:

Method	Ellipsoid to Chart Datum Separation File
ERS via VDATUM	OPR_T381- RA-22_GuamCNMI_EC_ERTDM2021_NAD83(MA11)- MLLW OPR_T381- RA-22_GuamCNMI_EC_ERTDM2021_NAD83(MA11)- MHW

*Table 13: ERS method and SEP file*

All submitted H13584 MBES data were vertically referenced to the ellipsoid. VDATUM models included with the Project Instructions were used for referencing H13584 data to MLLW and MHW.

### C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983 (MA11).

The projection used for this project is Universal Transverse Mercator (UTM) Zone 55.

### RTK

Precise Positioning-Real time Extended (PP-RTX) processing methods were used in Applanix POSPac MMS (v8.5) software for post-processing horizontal correction of submitted H13584 MBES data.

### WAAS

The Wide Area Augmentation System (WAAS) was used for real-time horizontal control during data acquisition.

## **D. Results and Recommendations**

### **D.1 Chart Comparison**

#### **D.1.1 Electronic Navigational Charts**

The following are the largest scale ENC's, which cover the survey area:

<b>ENC</b>	<b>Scale</b>	<b>Edition</b>	<b>Update Application Date</b>	<b>Issue Date</b>
US5SP08M	1:45602	9	09/30/2020	09/30/2020
US2SP01M	1:931650	19	09/07/2021	09/07/2021

*Table 14: Largest Scale ENC's*

#### **D.1.2 Shoal and Hazardous Features**

Two charted shoal areas reported in 1963 and 1975 were located outside the area of H13584 survey coverage and not addressed.

#### **D.1.3 Charted Features**

Refer to the H13584 Final Feature File (FFF) submitted with this report for information regarding unverified charted features.

#### **D.1.4 Uncharted Features**

We identified no new features with navigational significance within the H13584 survey area.

#### **D.1.5 Channels**

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

### **D.2 Additional Results**

#### **D.2.1 Aids to Navigation**

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

#### **D.2.2 Maritime Boundary Points**

No Maritime Boundary Points were assigned for this survey.

#### **D.2.3 Bottom Samples**

No bottom samples were required for this survey.

#### **D.2.4 Overhead Features**

No overhead features exist for this survey.

#### **D.2.5 Submarine Features**

No submarine features exist for this survey.

#### **D.2.6 Platforms**

No platforms exist for this survey.

#### **D.2.7 Ferry Routes and Terminals**

No ferry routes or terminals exist for this survey.

**D.2.8 Abnormal Seafloor or Environmental Conditions**

No abnormal seafloor or environmental conditions exist for this survey.

**D.2.9 Construction and Dredging**

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

**D.2.10 New Survey Recommendations**

We recommend that the remaining assigned H13584 survey area be completed when practical.

**D.2.11 ENC Scale Recommendations**

No new ENC scales are recommended for this area.

## E. Approval Sheet

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
Hector L. Casanova, CAPT/NOAA	Chief of Party	09/09/2022	 Digitally signed by CASANOVA.HECTOR.LUIS. 1253816461 Date: 2022.10.27 10:03:41 -07'00'
Collin H. Walker, LT/NOAA	Field Operations Officer	09/09/2022	 WALKER.COLLIN.HAR RISON.1523758540 2022.10.27 08:56:24 -07'00'
James B. Jacobson	Chief Survey Technician	09/09/2022	 JACOBSON.JAMES.BRYAN.12 69664017 I have reviewed this document 2022.10.21 12:44:43 -07'00'
Michael R. Fulton	Sheet Manager	09/09/2022	 FULTON.MICHAEL. RYAN.1591165646 Digitally signed by FULTON.MICHAEL.RYAN.15911656 46 Date: 2022.10.27 08:18:56 -07'00'

## F. Table of Acronyms

<b>Acronym</b>	<b>Definition</b>
<b>AHB</b>	Atlantic Hydrographic Branch
<b>AST</b>	Assistant Survey Technician
<b>ATON</b>	Aid to Navigation
<b>AWOIS</b>	Automated Wreck and Obstruction Information System
<b>BAG</b>	Bathymetric Attributed Grid
<b>BASE</b>	Bathymetry Associated with Statistical Error
<b>CO</b>	Commanding Officer
<b>CO-OPS</b>	Center for Operational Products and Services
<b>CORS</b>	Continuously Operating Reference Station
<b>CTD</b>	Conductivity Temperature Depth
<b>CEF</b>	Chart Evaluation File
<b>CSF</b>	Composite Source File
<b>CST</b>	Chief Survey Technician
<b>CUBE</b>	Combined Uncertainty and Bathymetry Estimator
<b>DAPR</b>	Data Acquisition and Processing Report
<b>DGPS</b>	Differential Global Positioning System
<b>DP</b>	Detached Position
<b>DR</b>	Descriptive Report
<b>DTON</b>	Danger to Navigation
<b>ENC</b>	Electronic Navigational Chart
<b>ERS</b>	Ellipsoidal Referenced Survey
<b>ERTDM</b>	Ellipsoidally Referenced Tidal Datum Model
<b>ERZT</b>	Ellipsoidally Referenced Zoned Tides
<b>FFF</b>	Final Feature File
<b>FOO</b>	Field Operations Officer
<b>FPM</b>	Field Procedures Manual
<b>GAMS</b>	GPS Azimuth Measurement Subsystem
<b>GC</b>	Geographic Cell
<b>GPS</b>	Global Positioning System
<b>HIPS</b>	Hydrographic Information Processing System
<b>HSD</b>	Hydrographic Surveys Division

<b>Acronym</b>	<b>Definition</b>
<b>HSSD</b>	Hydrographic Survey Specifications and Deliverables
<b>HSTB</b>	Hydrographic Systems Technology Branch
<b>HSX</b>	Hypack Hysweep File Format
<b>HTD</b>	Hydrographic Surveys Technical Directive
<b>HVCR</b>	Horizontal and Vertical Control Report
<b>HVF</b>	HIPS Vessel File
<b>IHO</b>	International Hydrographic Organization
<b>IMU</b>	Inertial Motion Unit
<b>ITRF</b>	International Terrestrial Reference Frame
<b>LNM</b>	Linear Nautical Miles
<b>MBAB</b>	Multibeam Echosounder Acoustic Backscatter
<b>MCD</b>	Marine Chart Division
<b>MHW</b>	Mean High Water
<b>MLLW</b>	Mean Lower Low Water
<b>NAD 83</b>	North American Datum of 1983
<b>NALL</b>	Navigable Area Limit Line
<b>NTM</b>	Notice to Mariners
<b>NMEA</b>	National Marine Electronics Association
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NOS</b>	National Ocean Service
<b>NRT</b>	Navigation Response Team
<b>NSD</b>	Navigation Services Division
<b>OCS</b>	Office of Coast Survey
<b>OMAO</b>	Office of Marine and Aviation Operations (NOAA)
<b>OPS</b>	Operations Branch
<b>MBES</b>	Multibeam Echosounder
<b>NWLON</b>	National Water Level Observation Network
<b>PDBS</b>	Phase Differencing Bathymetric Sonar
<b>PHB</b>	Pacific Hydrographic Branch
<b>POS/MV</b>	Position and Orientation System for Marine Vessels
<b>PPK</b>	Post Processed Kinematic
<b>PPP</b>	Precise Point Positioning
<b>PPS</b>	Pulse per second

<b>Acronym</b>	<b>Definition</b>
<b>PRF</b>	Project Reference File
<b>PS</b>	Physical Scientist
<b>RNC</b>	Raster Navigational Chart
<b>RTK</b>	Real Time Kinematic
<b>RTX</b>	Real Time Extended
<b>SBES</b>	Singlebeam Echosounder
<b>SBET</b>	Smooth Best Estimate and Trajectory
<b>SNM</b>	Square Nautical Miles
<b>SSS</b>	Side Scan Sonar
<b>SSSAB</b>	Side Scan Sonar Acoustic Backscatter
<b>ST</b>	Survey Technician
<b>SVP</b>	Sound Velocity Profiler
<b>TCARI</b>	Tidal Constituent And Residual Interpolation
<b>TPU</b>	Total Propagated Uncertainty
<b>USACE</b>	United States Army Corps of Engineers
<b>USCG</b>	United States Coast Guard
<b>UTM</b>	Universal Transverse Mercator
<b>XO</b>	Executive Officer
<b>ZDF</b>	Zone Definition File