H12592

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12592

LOCALITY

State(s):	Alaska
General Locality:	Shumagin Islands, AK
Sub-locality:	5 NM West of Little Koniuji Island

2013

CHIEF OF PARTY
Richard T. Brennan, CDR/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H12592

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):	**Alaska**
General Locality:	**Shumagin Islands, AK**
Sub-Locality:	**5 NM West of Little Koniuji Island**
Scale:	**40000**
Dates of Survey:	**07/16/2013 to 09/11/2013**
Instructions Dated:	**05/31/2013**
Project Number:	**OPR-P183-RA-13**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Richard T. Brennan, 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 Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

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Descriptive Report to Accompany Survey H12592

Project: OPR-P183-RA-13

Locality: Shumagin Islands, AK

Sublocality: 5 NM West of Little Koniuji Island

Scale: 1:40000

July 2013 - September 2013

NOAA Ship *Rainier*

Chief of Party: Richard T. Brennan, CDR/NOAA

A. Area Surveyed

The survey area is referred to as Sheet 5: "5 NM West of Little Koniuji Island" within the Project Instructions. The area is directly North of Chernabura Island, Alaska (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
54° 58' 28.65" N 159° 42' 38.36" W	54° 51' 3.41" N 159° 30' 21.84" W

Table 1: Survey Limits

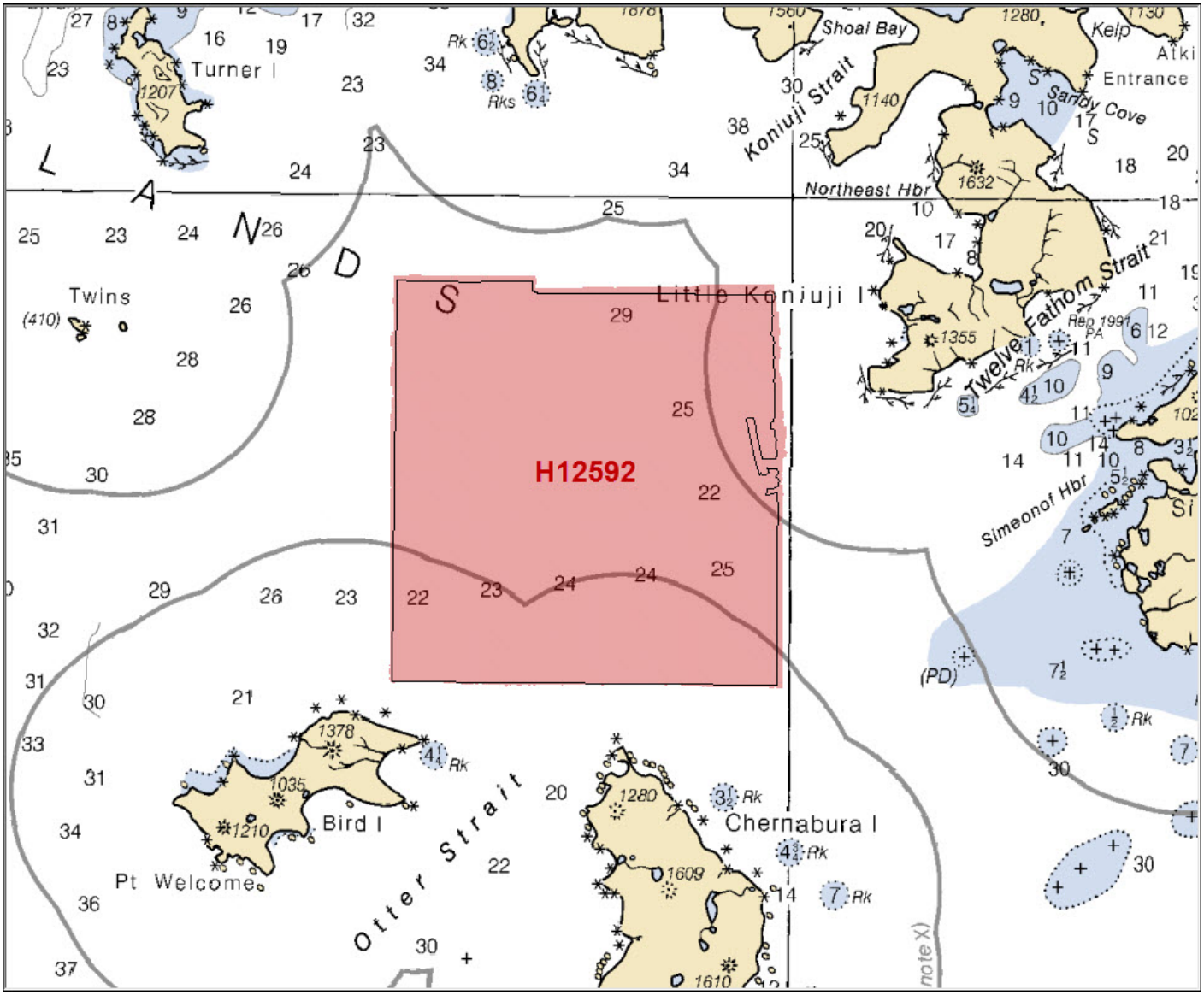

Figure 1: H12592 survey limits.

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

A.2 Survey Purpose

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charting products.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired on survey H12592 met complete multibeam echosounder (MBES) coverage requirements, including the 5 soundings per node data density requirements outlined in section 5.2.2.2 of the HSSD (Figure 2). In order to extract some descriptive statistics of the data density achievements, the density layer of each finalized surface was queried within CARIS and then examined in Excel (Figure 3). Overall, the required data density was achieved in 100.0% of the nodes and 100.0% of the total area.

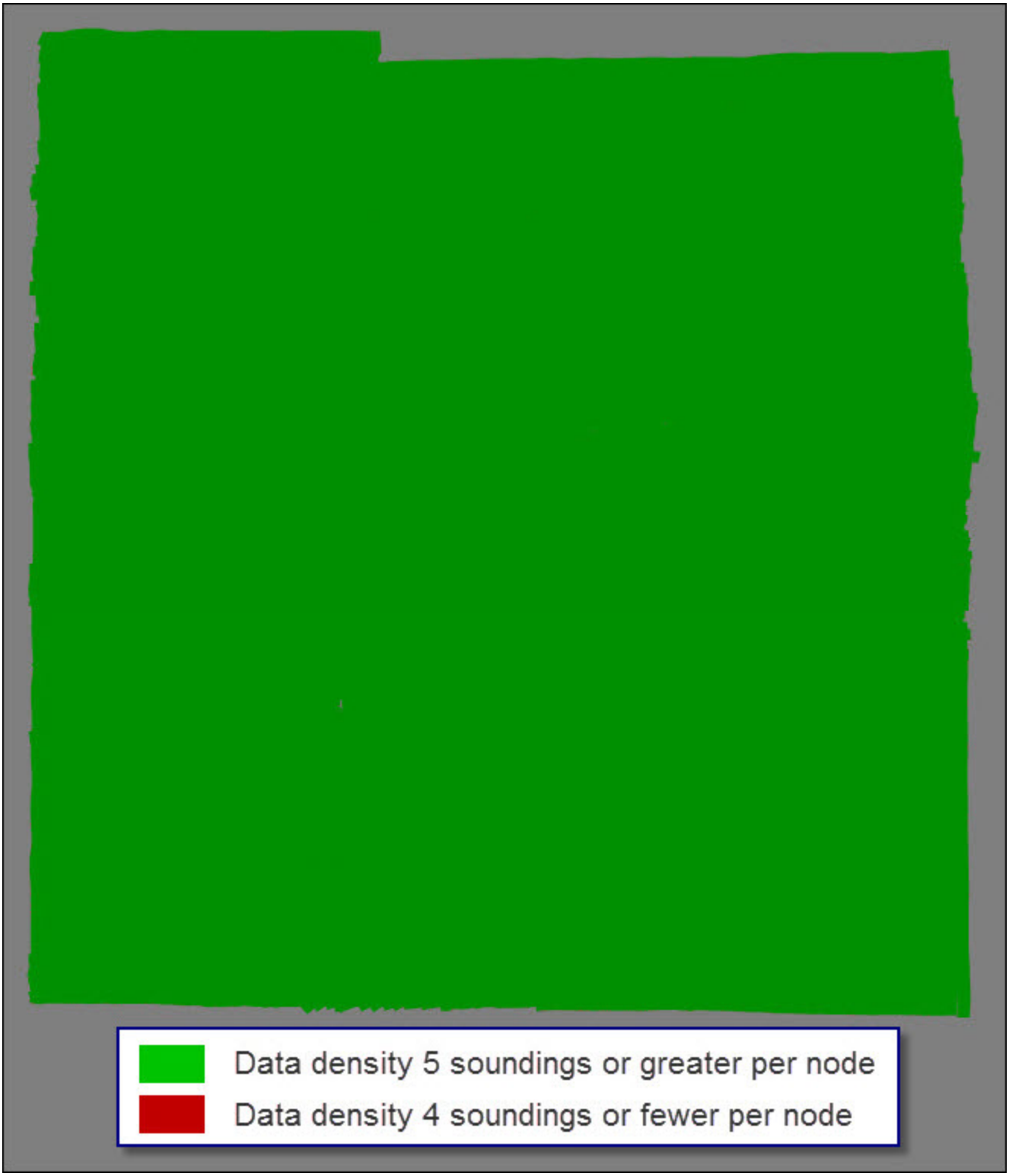

Figure 2: H12592 data density.

Resolution	Depth range	Number of nodes	Fewer than five soundings per node	Percent of nodes with greater than five soundings per node
2m	18 - 40m	5,234,943	1,595	100.0%
4m	36 - 80m	10,572,154	1,325	100.0%
	TOTAL:	15,807,097	2,920	**100.0%**
	TOTAL (by area):	190,094,236	27,582	**100.0%**

Figure 3: Summary table showing the percentage of nodes satisfying the 5 sounding density requirements, sub-divided by the appropriate depth ranges. Note: The final row has a unit of square meters, and sums the number of different resolution nodes into a common unit of area.

At the 2m resolution, the percentage of nodes with greater than 5 soundings is 99.97%, not 100%. At the 4m resolution the percentage is 99.99%, not 100%. The total is 99.98% and the total by area is 99.99%.

A.4 Survey Coverage

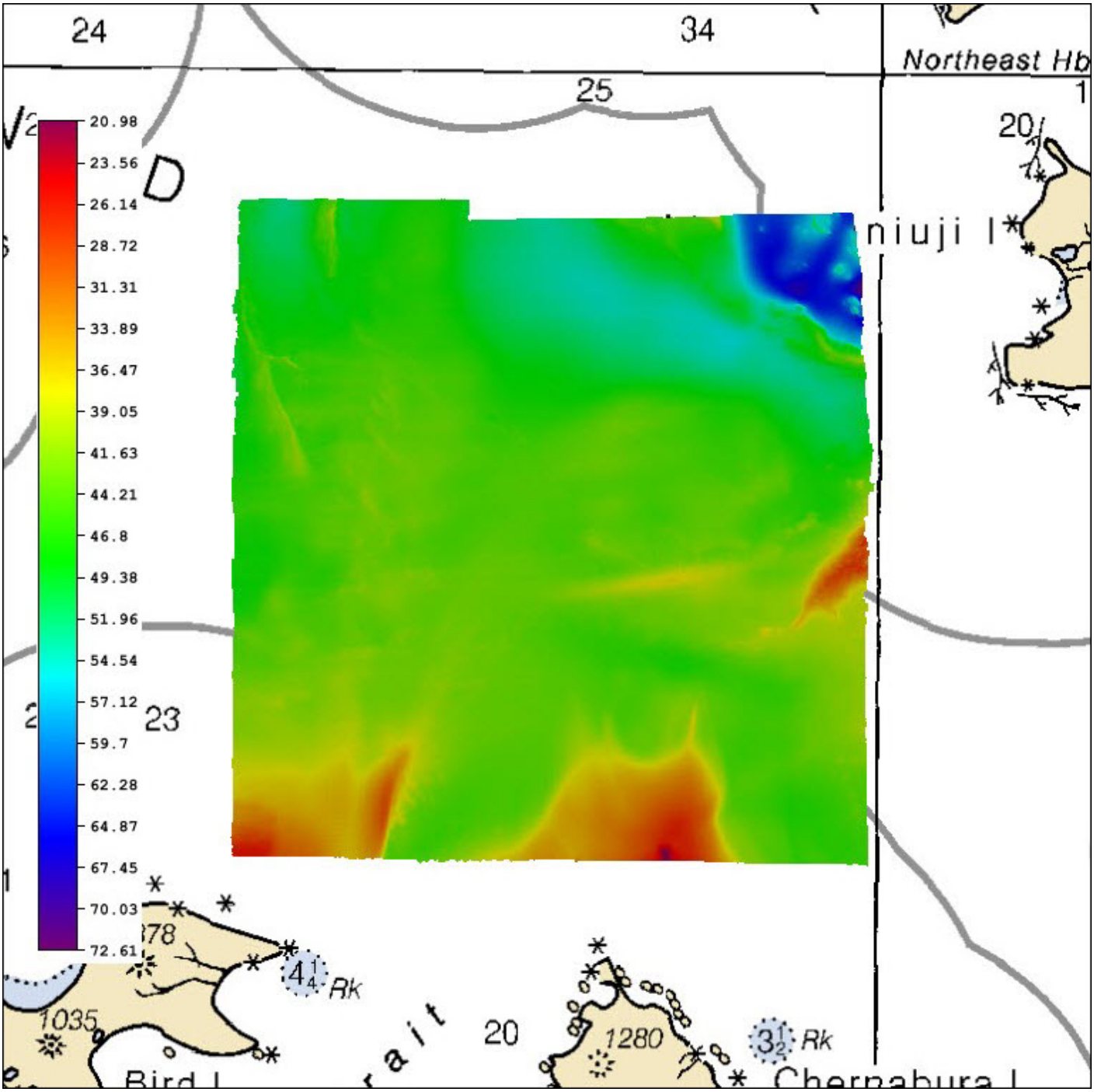

Figure 4: Acquired survey coverage overlaid on Chart 16540 (scale shows depth in meters).

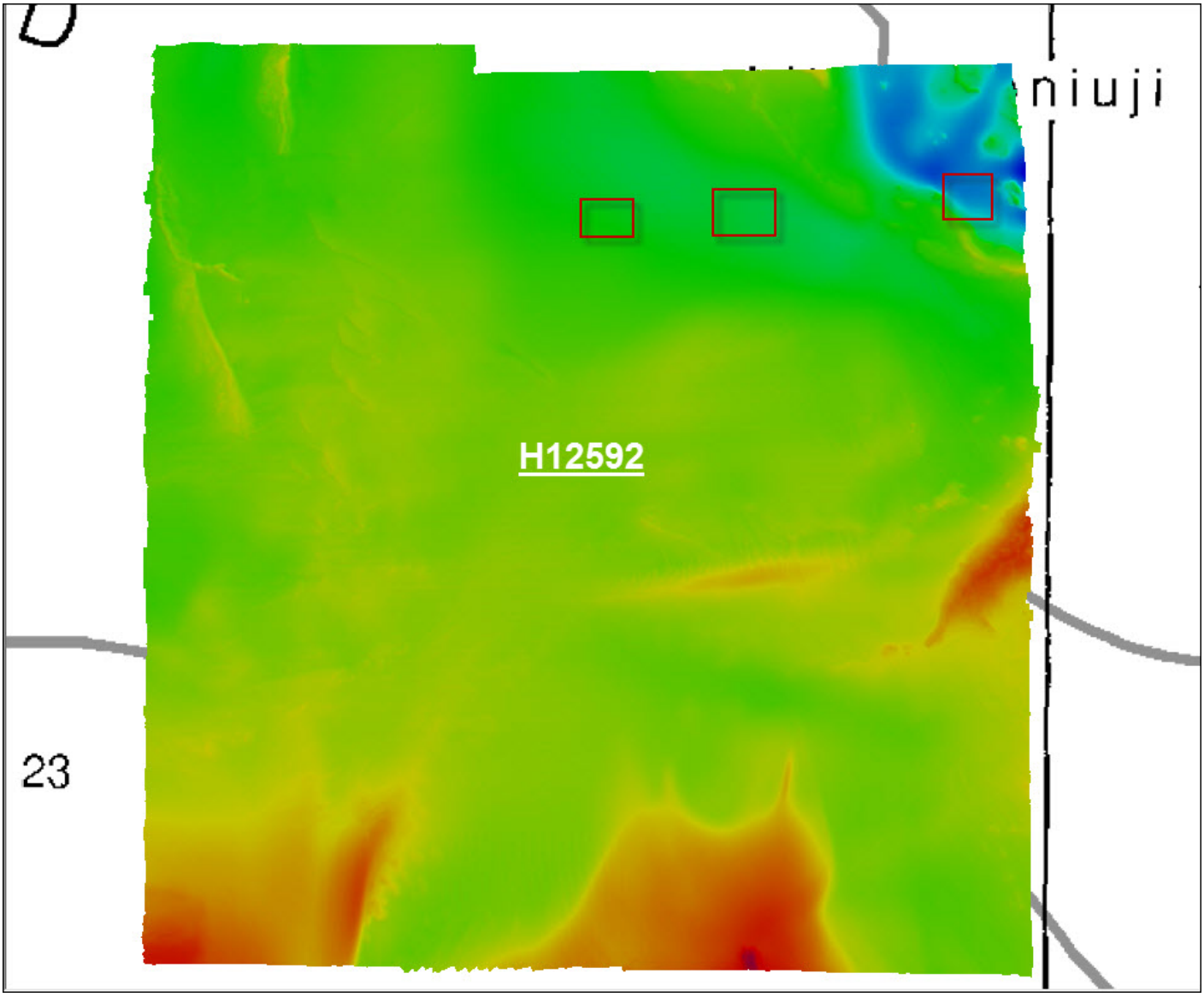

Figure 5: H12592 coverage gaps.

There are several gaps in coverage, the largest of which is 8 meters by 8 meters; all of the coverage gaps are at a depth of 30 meters or greater and are not navigationally significant (Figure 5).

A.5 Survey Statistics

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

	HULL ID	*S221*	*2801*	*2802*	*2803*	*Total*
LNM	SBES Mainscheme	0	0	0	0	0
	MBES Mainscheme	560.04	82.76	45.00	39.63	727.43
	Lidar Mainscheme	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0
	SBES/MBES Mainscheme	0	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0	0
	SBES/MBES Crosslines	34.45	0	0	0	34.45
	Lidar Crosslines	0	0	0	0	0
Number of Bottom Samples						6
Number of AWOIS Items Investigated						0
Number Maritime Boundary Points Investigated						0
Number of DPs						0
Number of Items Investigated by Dive Ops						0
Total SNM						52.79

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
07/16/2013	197
08/01/2013	213
08/11/2013	223
08/14/2013	226
08/26/2013	238
08/27/2013	239
08/28/2013	240
08/29/2013	241
09/02/2013	245
09/03/2013	246
09/11/2013	254

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

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

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*2801 (RA-4)*	*2802 (RA-5)*	*2803 (RA-3)*	*S221 (Rainier)*
LOA	28 feet	28 feet	28 feet	231 feet
Draft	3.5 feet	3.5 feet	3.5 feet	16.5 feet

Table 4: Vessels Used

All data for survey H12592 was acquired by NOAA Ship RAINIER and her survey launches (2801, 2802, and 2803). The vessels acquired MBES depth soundings, sound speed profiles, and bottom samples.

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg	EM710	MBES
Reson	7125	MBES
Applanix	POS-MV V4	Attitude System
Odim Brooke Ocean (Rolls Royce Group)	MVP200	Conductivity, Temperature, and Depth Sensor
Seabird	SBE 19	Conductivity, Temperature, and Depth Sensor
Seabird	SBE 19 Plus	Conductivity, Temperature, and Depth Sensor
Reson	SVP 71	Sound Speed System
Reson	SVP 70	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines, acquired for this survey, totalled 4.7% of mainscheme acquisition.

Multibeam crosslines were acquired using the EM710 on RAINIER. A 4-meter CUBE surface was created using strictly the mainscheme lines, while a second 4-meter CUBE surface was created using only crosslines, from which a difference surface was generated in CARIS at a 4-meter resolution (Figure 6). Statistics were then derived from the difference surface and are shown in Figure 7. The average difference between the depths derived from the mainscheme and crosslines was 0.06 meters (mainscheme being shoaler) with a standard deviation of 0.17 meters.

For the respective depths, the difference surface was compared to the allowable IHO accuracy standards (Figure 8). In total, 100.0% of the depth difference between H12592 mainscheme and crossline data are within allowable IHO accuracies (Figure 9).

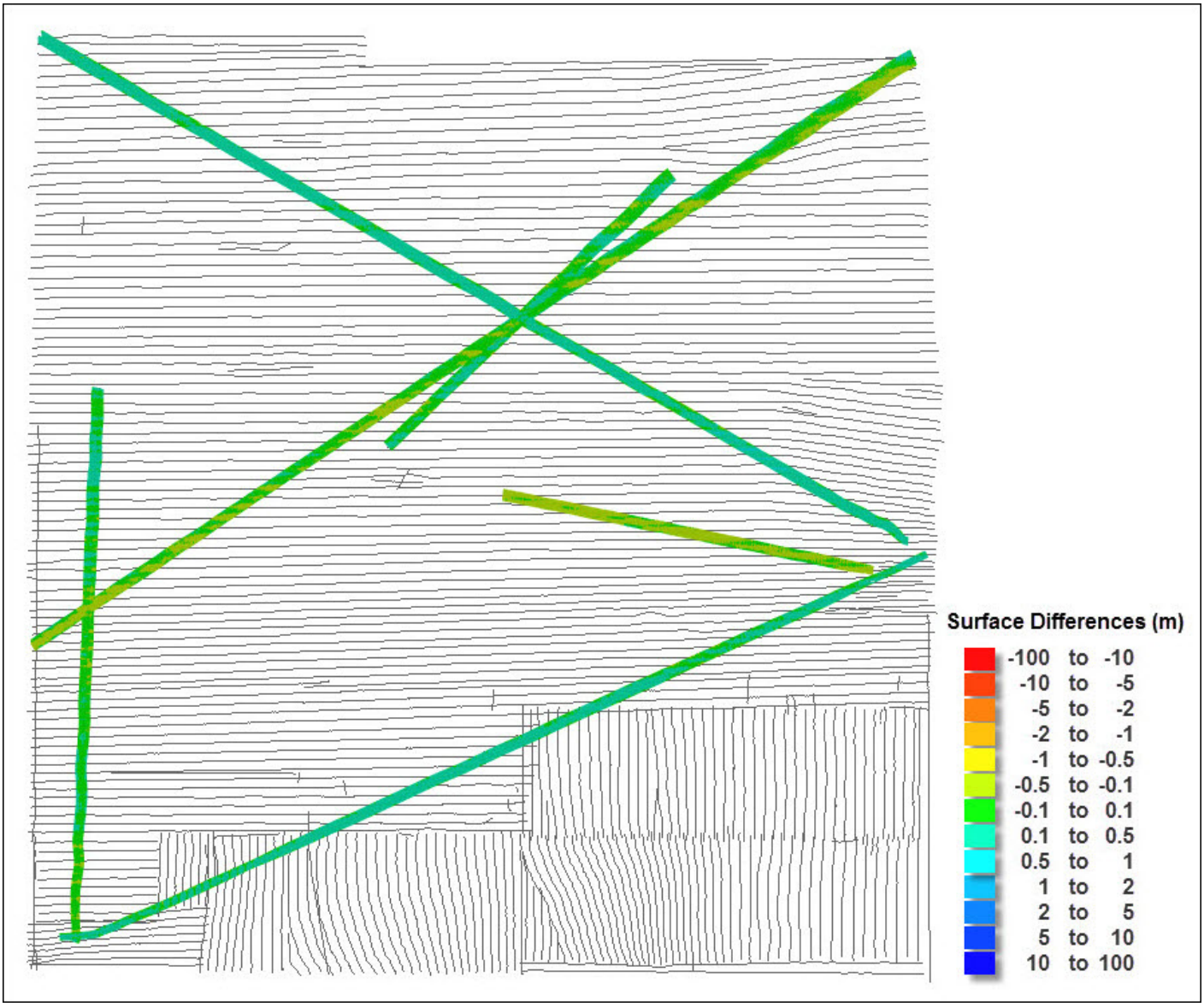

Figure 6: H12592 crosslines.

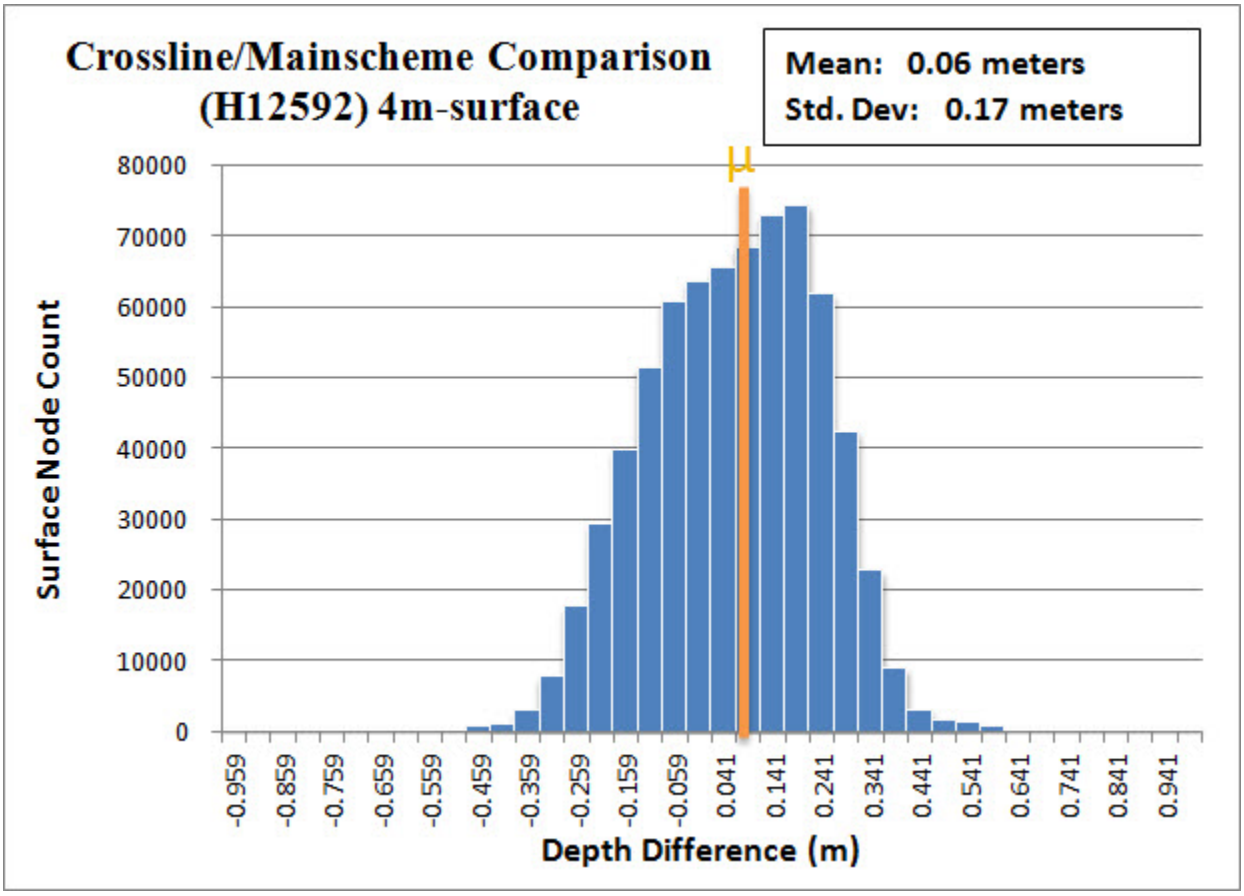

Figure 7: Crossline comparison with mainscheme lines.

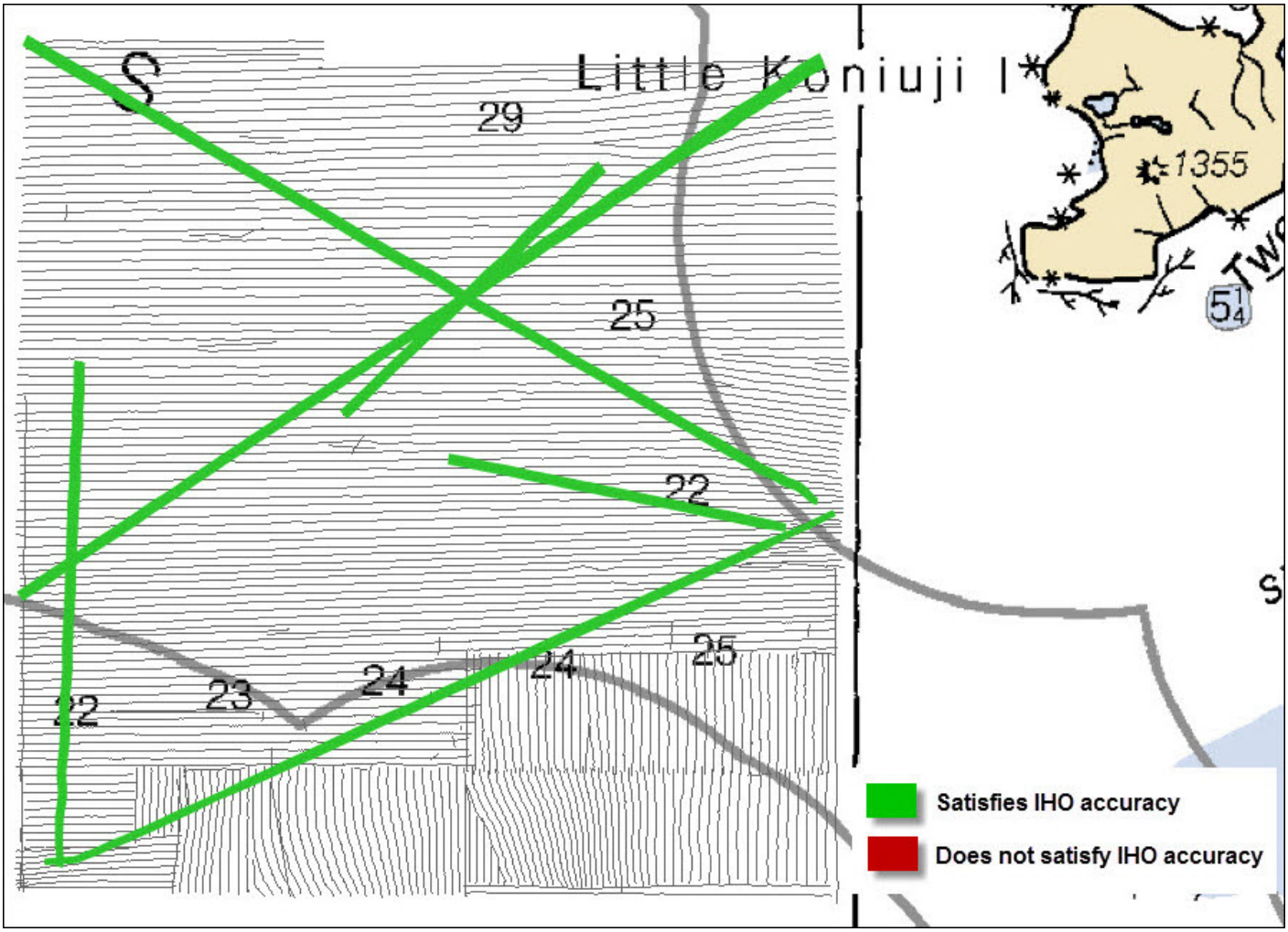

Figure 8: Depth difference between H12592 mainscheme and crossline data as compared to allowable IHO accuracy standards for the associated depths.

Depth range	IHO Order	Number of nodes	Nodes satisfying IHO accuracy	Percent nodes satisfying IHO accuracy
Less than 100m	Order 1	2,742,404	2,742,255	100.0%

Figure 9: Summary table showing percentage of difference surface nodes between H12592 mainscheme and crossline data that meet allowable IHO accuracy standards for the associated depths.
Percentage of difference surface nodes satisfying IHO accuracy is 99.99%, not 100%.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0 meters	0.045 meters

Table 6: Survey Specific Tide TPU Values

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

Table 7: Survey Specific Sound Speed TPU Values

Total propagated uncertainty values for survey H12592 were derived from a combination of fixed values for equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties. Tidal uncertainties were provided by NOAA's Center for Operational Oceanographic Products and Services (CO-OPS), and were applied to depth soundings.

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 survey H12592. Real-time uncertainties from both the EM710 and Reson 7125 were recorded and applied in post-processing. Applanix TrueHeave files are recorded on all survey vessels, which includes an estimate of the heave uncertainty, and are applied during post-processing. Finally, the post-processed uncertainties associated with vessel roll, pitch, gyro and navigation are applied in CARIS HIPS via an SBET RMS file generated in POSPac.

Uncertainty values of submitted finalized grids were calculated in CARIS using the "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). To visualize the locations in which accuracy requirements were met, for each finalized surface a custom "predicted IHO compliance" layer was created, based on the difference between calculated uncertainty of the nodes and the allowable IHO uncertainty (Figure 10). To quantify the extent to which accuracy requirements were met, the preceding "predicted IHO compliance" layers were queried within CARIS and the examined in Excel (Figure 11). Overall 100.0% by node and 100.0% by area of survey H12592 met the accuracy requirements stated in the HSSD.

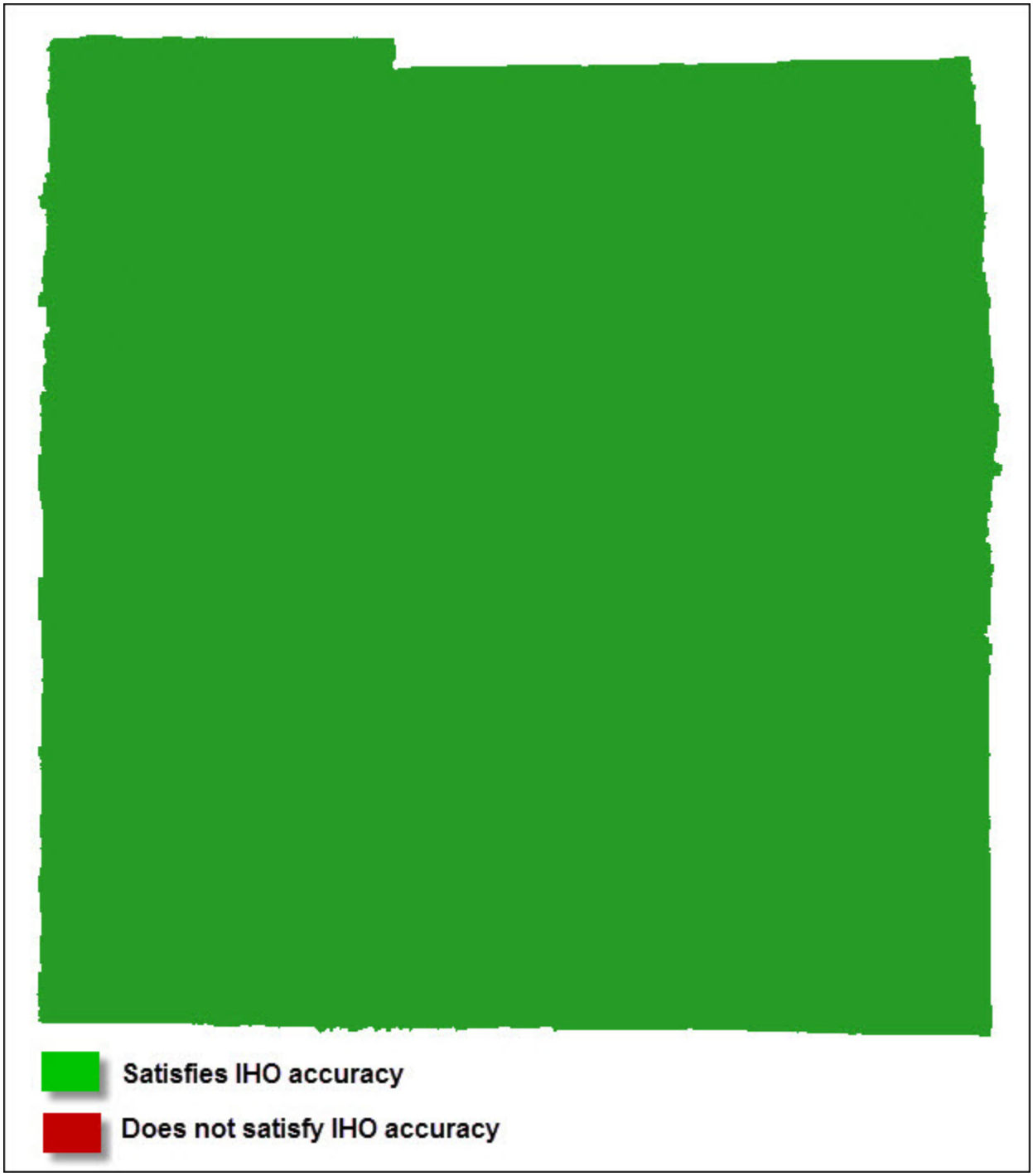

Figure 10: H12592 met IHO accuracy standards for 100% of the survey area.

Resolution	Depth range	IHO Order	Number of nodes	Nodes satisfying IHO accuracy	Percent nodes satisfying IHO accuracy
2m	18 - 40m	Order 1	5,371,188	5,371,188	100.0%
4m	36 - 80m	Order 1	10,569,143	10,569,143	100.0%
		TOTAL:	15,940,331	15,940,331	100.0%
		TOTAL (by area):	190,591,041	190,591,041	100.0%

Figure 11: Summary table showing the percentage of nodes satisfying the indicated IHO accuracy level, sub-divided by the appropriate depth ranges. Note: The final row has a unit of square meters, and sums the number of different resolution nodes into a common unit of area.

B.2.3 Junctions

Eight junction comparisons were completed for H12592 (Figure 12). Four of these surveys (H12590, H12591, H12593, H12594) were acquired concurrently with this survey, two surveys (H12472, H12473) were completed in 2012 by NOAA Ship RAINIER, and two surveys (H11682, H12119) were completed in 2007 and 2009 respectively by NOAA Ship FAIRWEATHER. In addition to these junctions, there is a lidar survey (H12102) completed in 2009 which has a small overlap with H12592. Depth comparisons were performed using CARIS difference surfaces and CARIS Subset Editor.

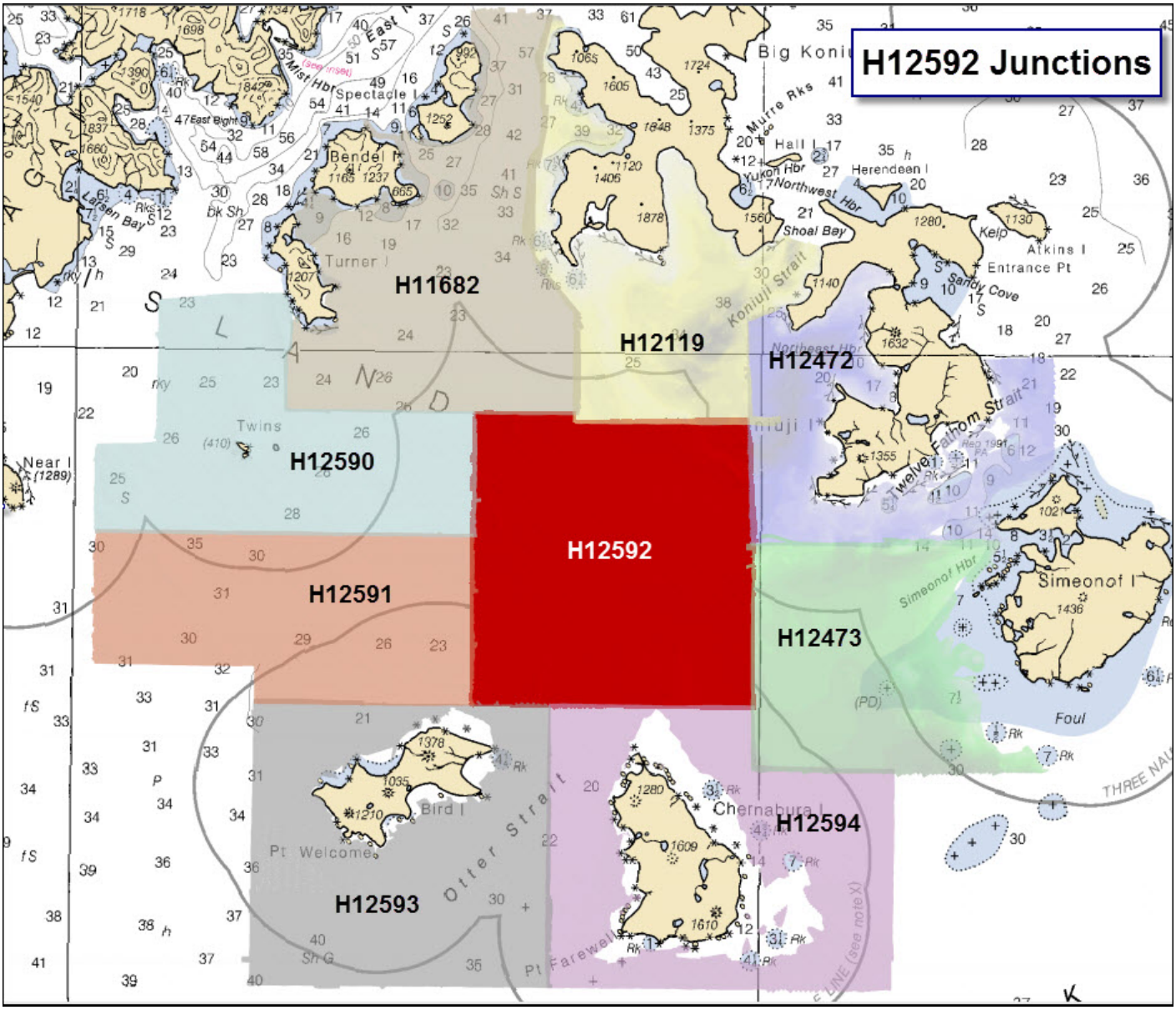

Figure 12: H12592 junction overview.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12590	1:40000	2013	NOAA Ship RAINIER	W
H12591	1:40000	2013	NOAA Ship RAINIER	W
H12593	1:40000	2013	NOAA Ship RAINIER	S
H12594	1:40000	2013	NOAA Ship RAINIER	S
H12472	1:40000	2012	NOAA Ship RAINIER	E
H12473	1:40000	2012	NOAA Ship RAINIER	E
H11682	1:20000	2007	NOAA Ship FAIRWEATHER	N
H12119	1:40000	2009	NOAA Ship FAIRWEATHER	N
H12102	1:10000	2009	Fugro LADS	S

Table 8: Junctioning Surveys

H12590

Overlap with survey H12590 was approximately 220 meters wide along the western boundary of H12592, narrowing to 90 meters on the northern side (Figure 13). Depths in the junction area range from 47 to 50 meters. A difference surface analysis between CUBE depth layers for each survey showed H12590 to be an average of 0.02 meters deeper than H12592, with a standard deviation of 0.11 meters (Figure 14). This is well within allowable IHO Order 1 accuracy at these depths.

Figure 13: Junction between H12590 (light blue) and H12592 (red) in meters on Chart 16540.

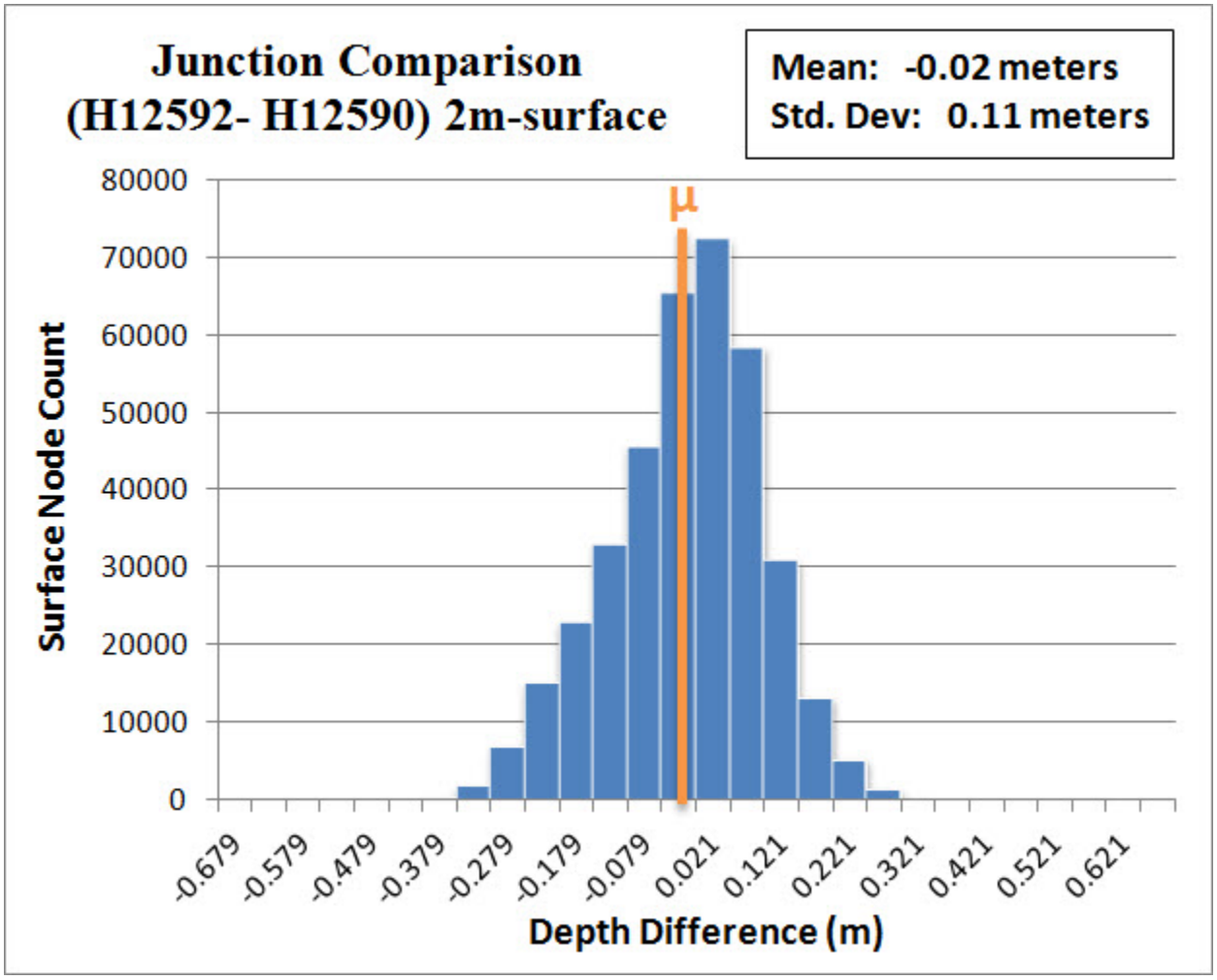

Figure 14: Difference surface statistics between H12590 and H12592 CUBE depth layers (2m grid size). H12590 is an average of 0.02m deeper.

H12591

Overlap with survey H12591 was approximately 200 meters wide along the western boundary of H12592, narrowing to 120 meters on the southern side (Figure 15). Depths in the junction area range from 25 to 48 meters. A difference surface analysis between CUBE depth layers for each survey showed H12591 to be an average of 0.02 meters shoaler than H12592, with a standard deviation of 0.10 meters (Figure 16). This is well within allowable IHO Order 1 accuracy at these depths.

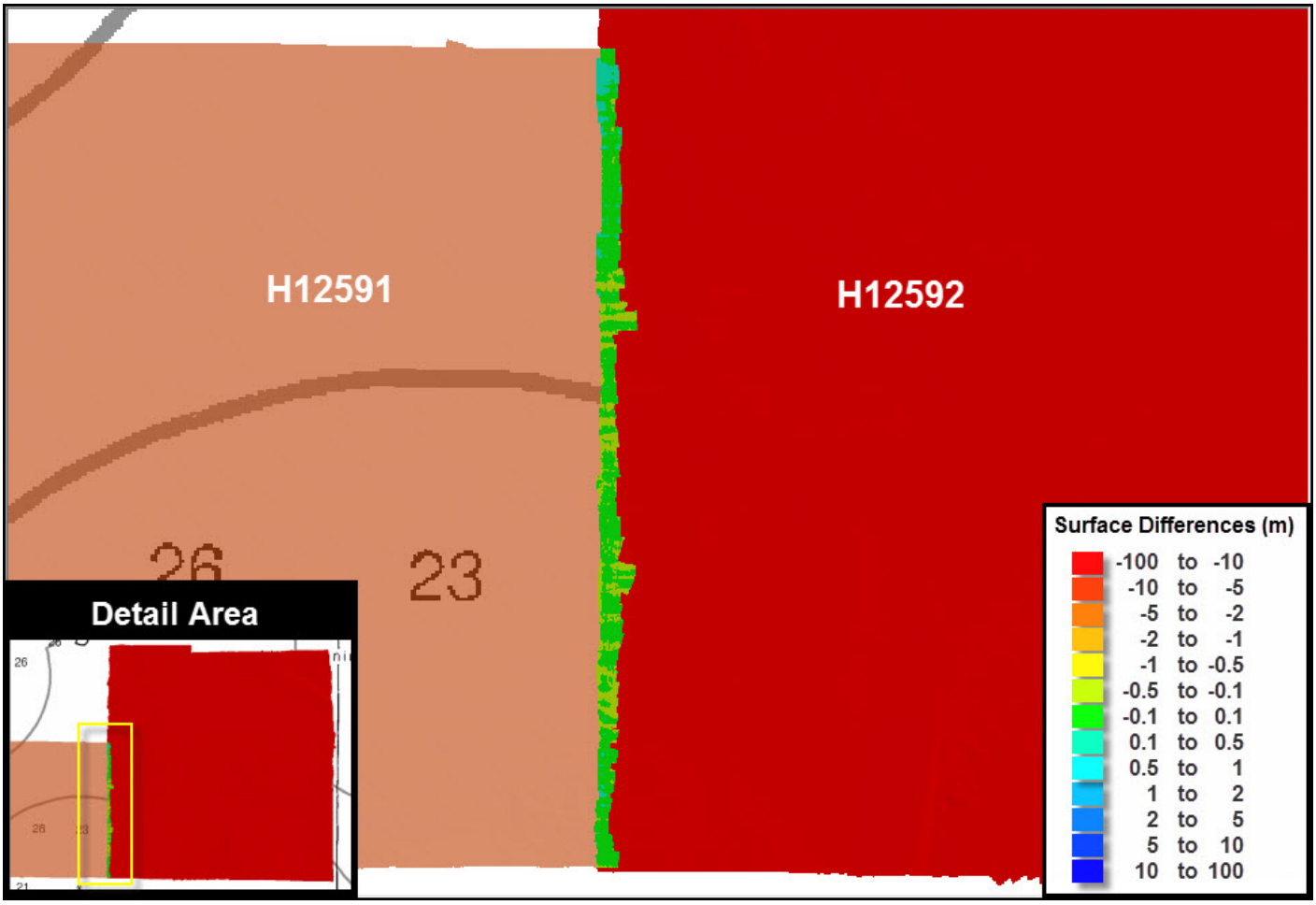

Figure 15: Junction between H12591 (orange) and H12592 (red) in meters on Chart 16540.

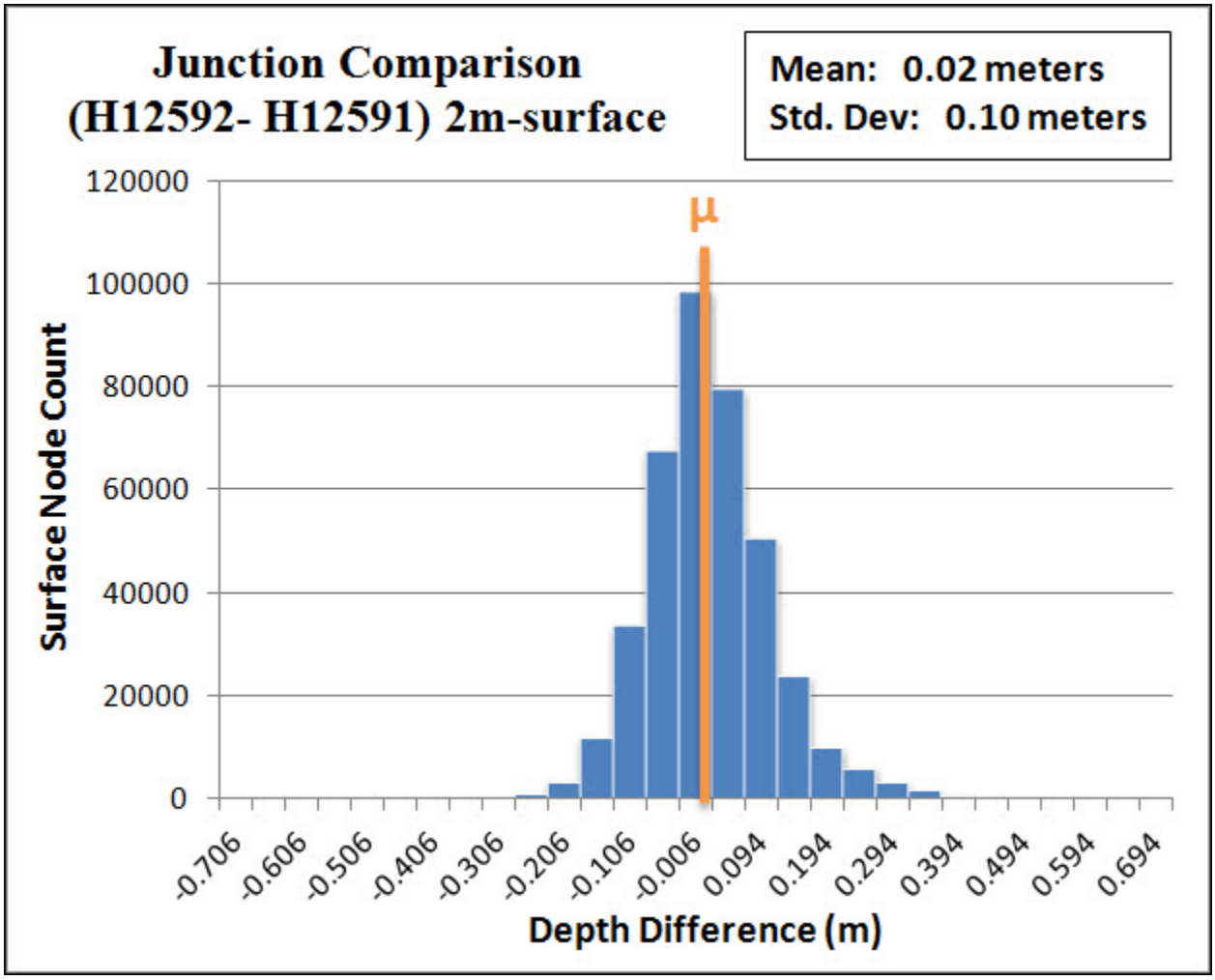

Figure 16: Difference surface statistics between H12591 and H12592 CUBE depth layers (2m grid size). H12591 is an average of 0.02m shoaler.

H12593

Overlap with survey H12593 was approximately 160 meters wide along the southern boundary of H12592, narrowing to 110 meters on the eastern side (Figure 17). Depths in the junction area range from 25 to 44 meters. A difference surface analysis between CUBE depth layers for each survey showed H12593 to be an average of 0.03 meters deeper than H12592, with a standard deviation of 0.08 meters (Figure 18). This is well within allowable IHO Order 1 accuracy at these depths.

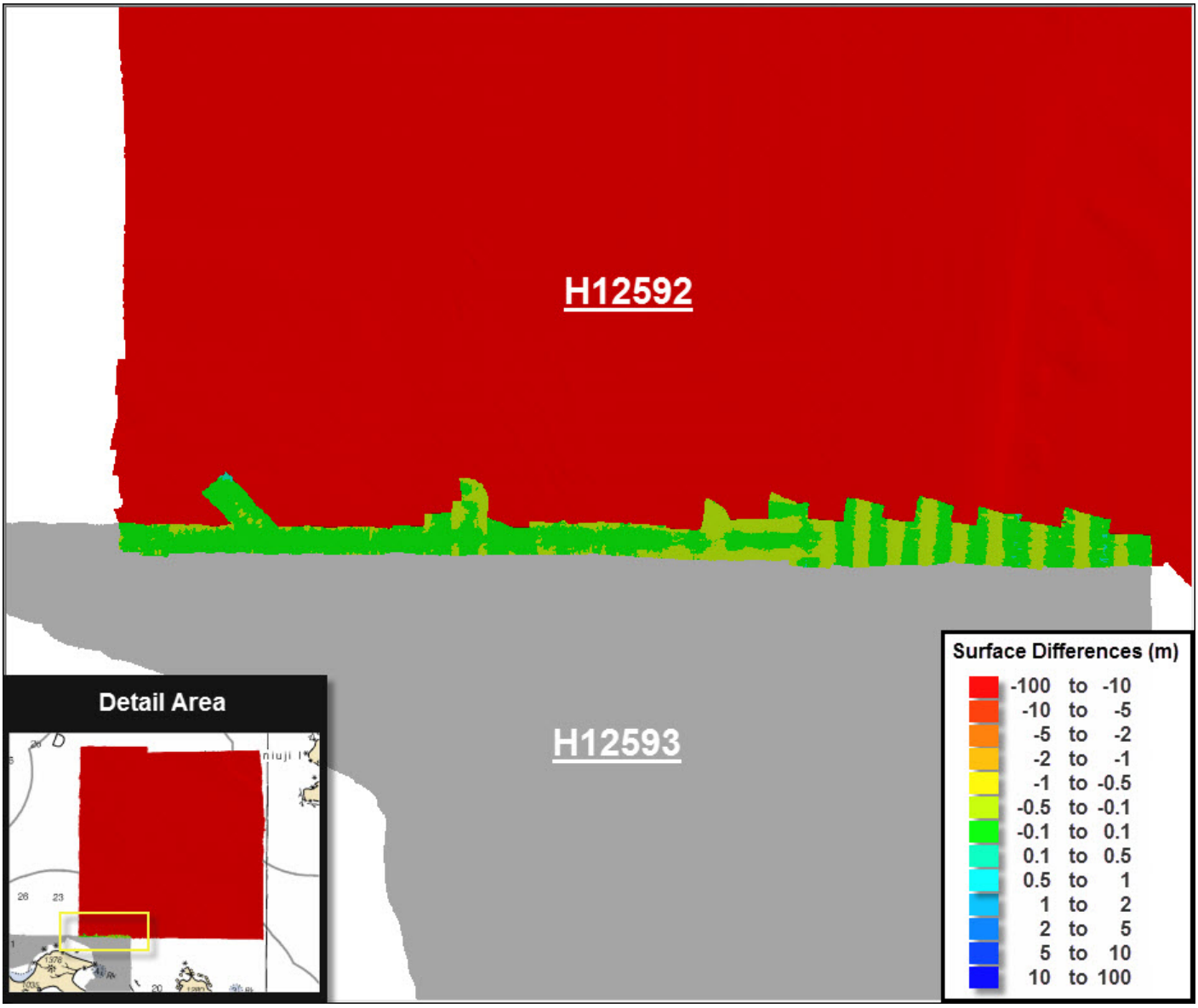

Figure 17: Junction between H12593 (gray) and H12592 (red) in meters on Chart 16540.

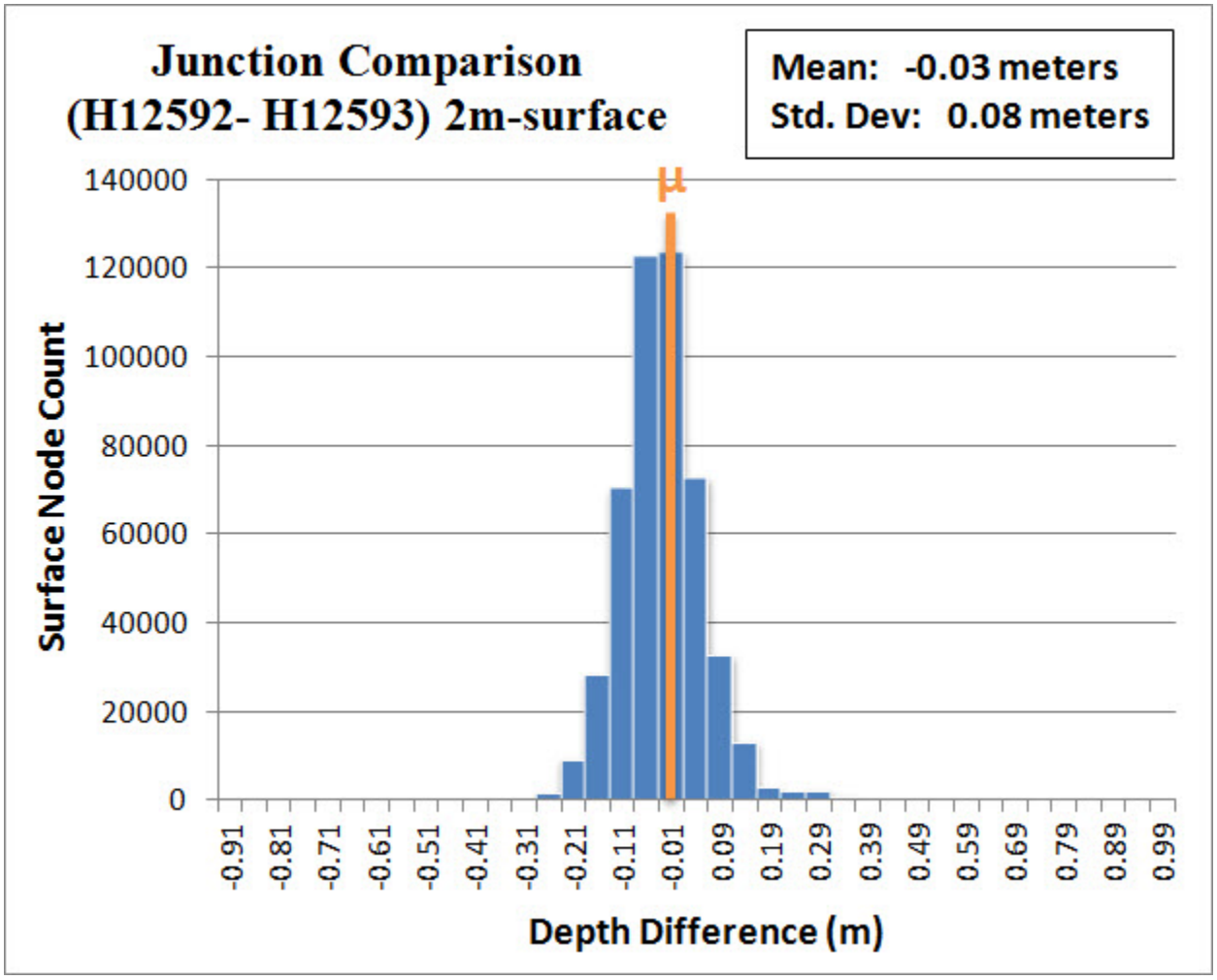

Figure 18: Difference surface statistics between H12593 and H12592 CUBE depth layers (2m grid size). H12593 is an average of 0.03m deeper.

H12594

Overlap with survey H12594 was approximately 225 meters wide along the southern boundary of H12592, narrowing to 155 meters in the center (Figure 19). Depths in the junction area range from 21 to 46 meters. A difference surface analysis between CUBE depth layers for each survey showed H12594 to be an average of 0.03 meters deeper than H12592, with a standard deviation of 0.08 meters (Figure 20). This is well within allowable IHO Order 1 accuracy at these depths.

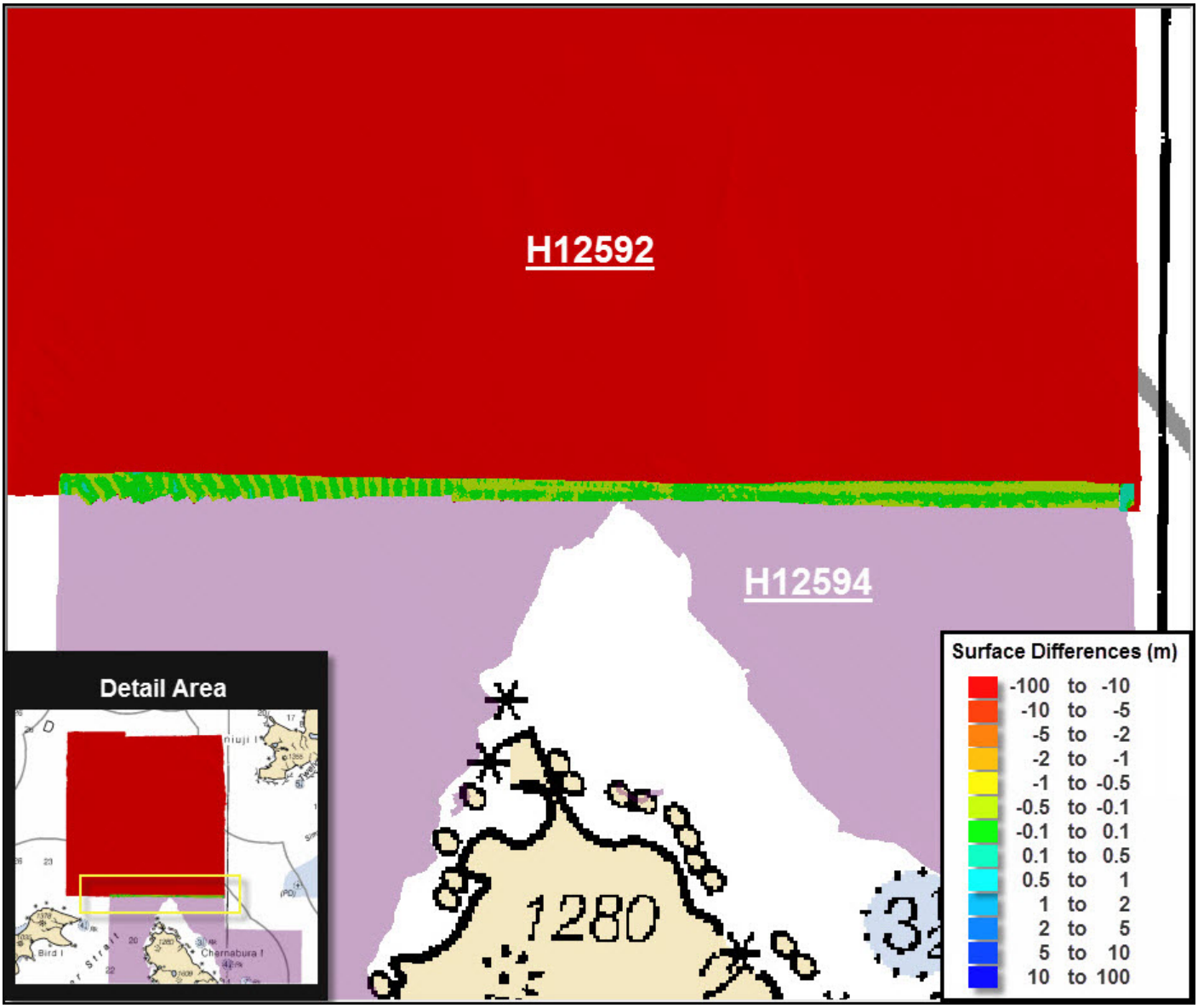

Figure 19: Junction between H12594 (purple) and H12592 (red) in meters on Chart 16540.

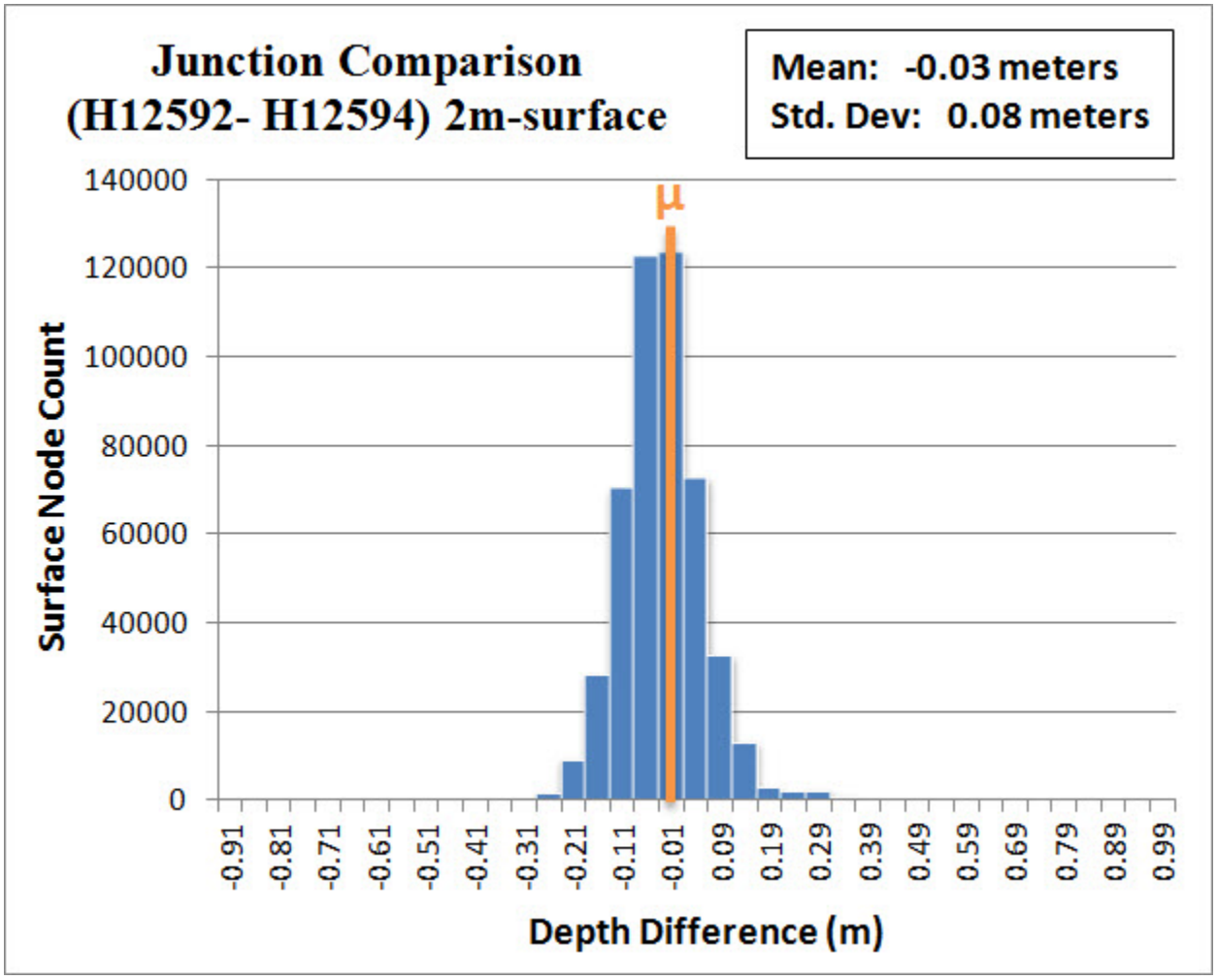

Figure 20: Difference surface statistics between H12594 and H12592 CUBE depth layers (2m grid size). H12594 is an average of 0.03m deeper.

H12472

Overlap with survey H12472 was approximately 250 meters wide along the eastern boundary of H12592, narrowing to 70 meters on the northern side (Figure 21). Depths in the junction area range from 42 to 71 meters. A difference surface analysis between CUBE depth layers for each survey showed H12472 to be an average of 0.11 meters shoaler than H12592, with a standard deviation of 0.12 meters (Figure 22). This is well within allowable IHO Order 1 accuracy at these depths.

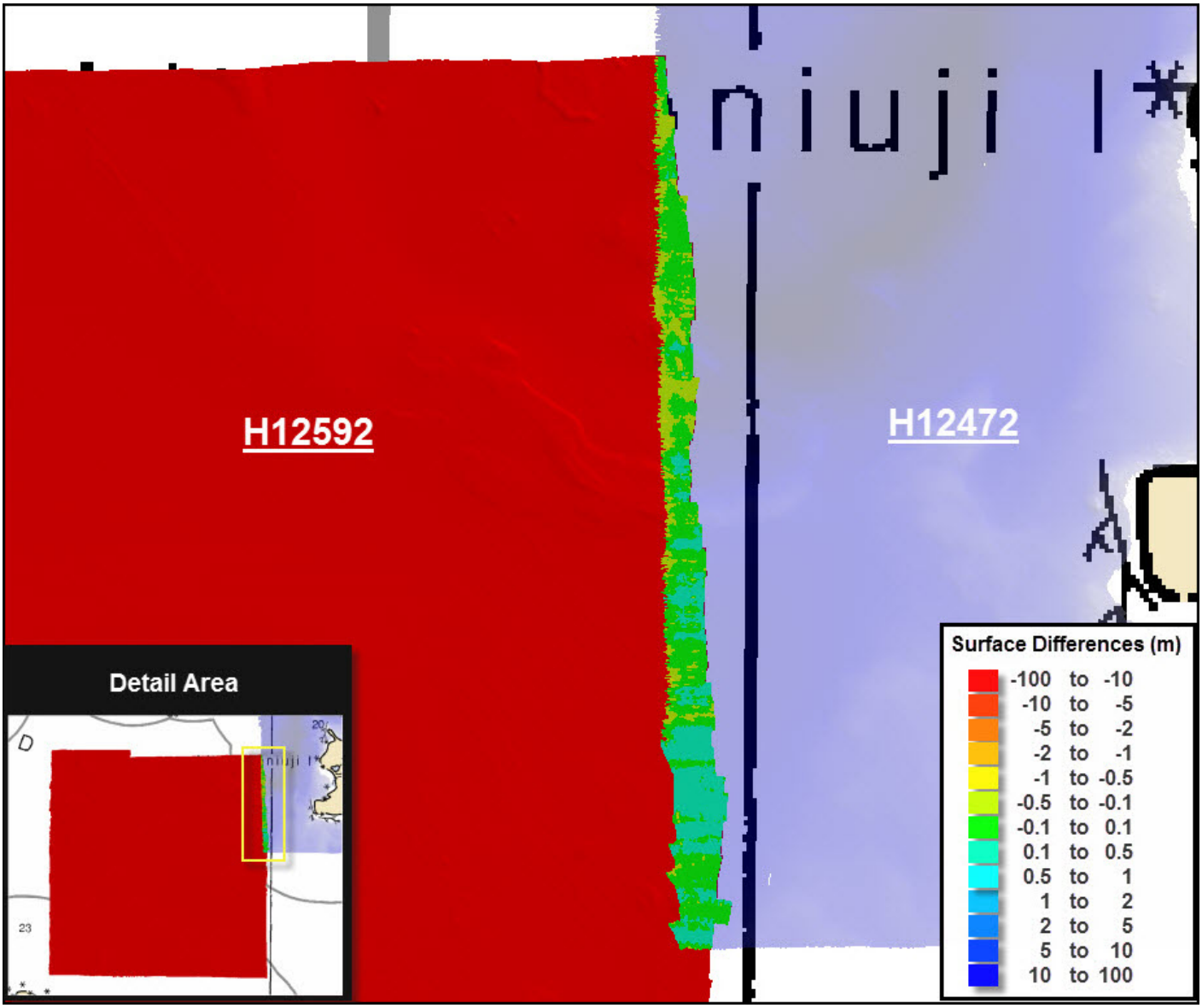

Figure 21: Junction between H12472 (blue) and H12592 (red) in meters on Chart 16540.

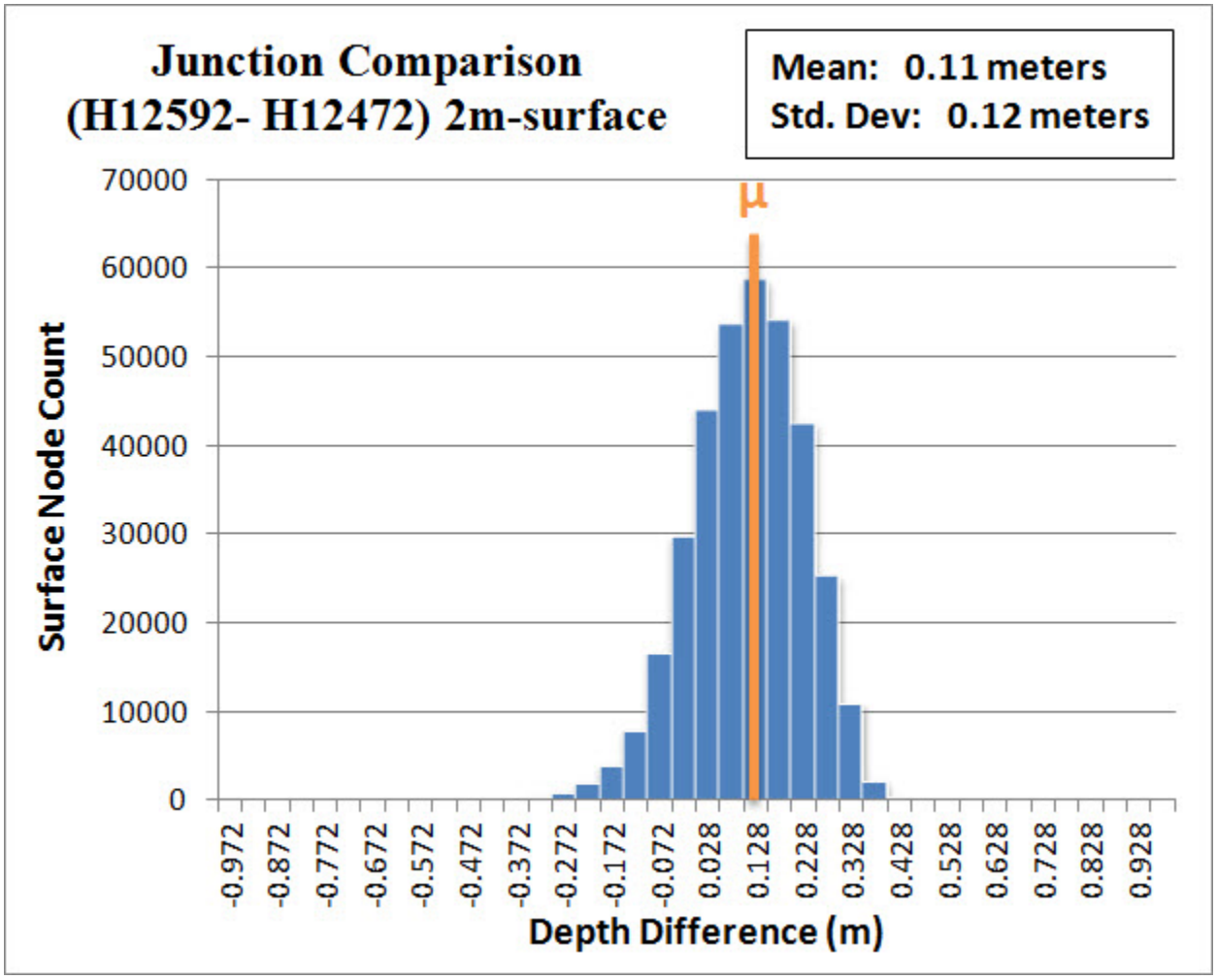

Figure 22: Difference surface statistics between H12472 and H12592 CUBE depth layers (2m grid size). H12472 is an average of 0.11m shoaler.

H12473

Overlap with survey H12473 was approximately 200 meters wide along the eastern boundary of H12592, narrowing to 80 meters on the northern side (Figure 23). Depths in the junction area range from 28 to 45 meters. A difference surface analysis between CUBE depth layers for each survey showed H12473 to be an average of 0.12 meters shoaler than H12592, with a standard deviation of 0.18 meters (Figure 24). This is well within allowable IHO Order 1 accuracy at these depths.

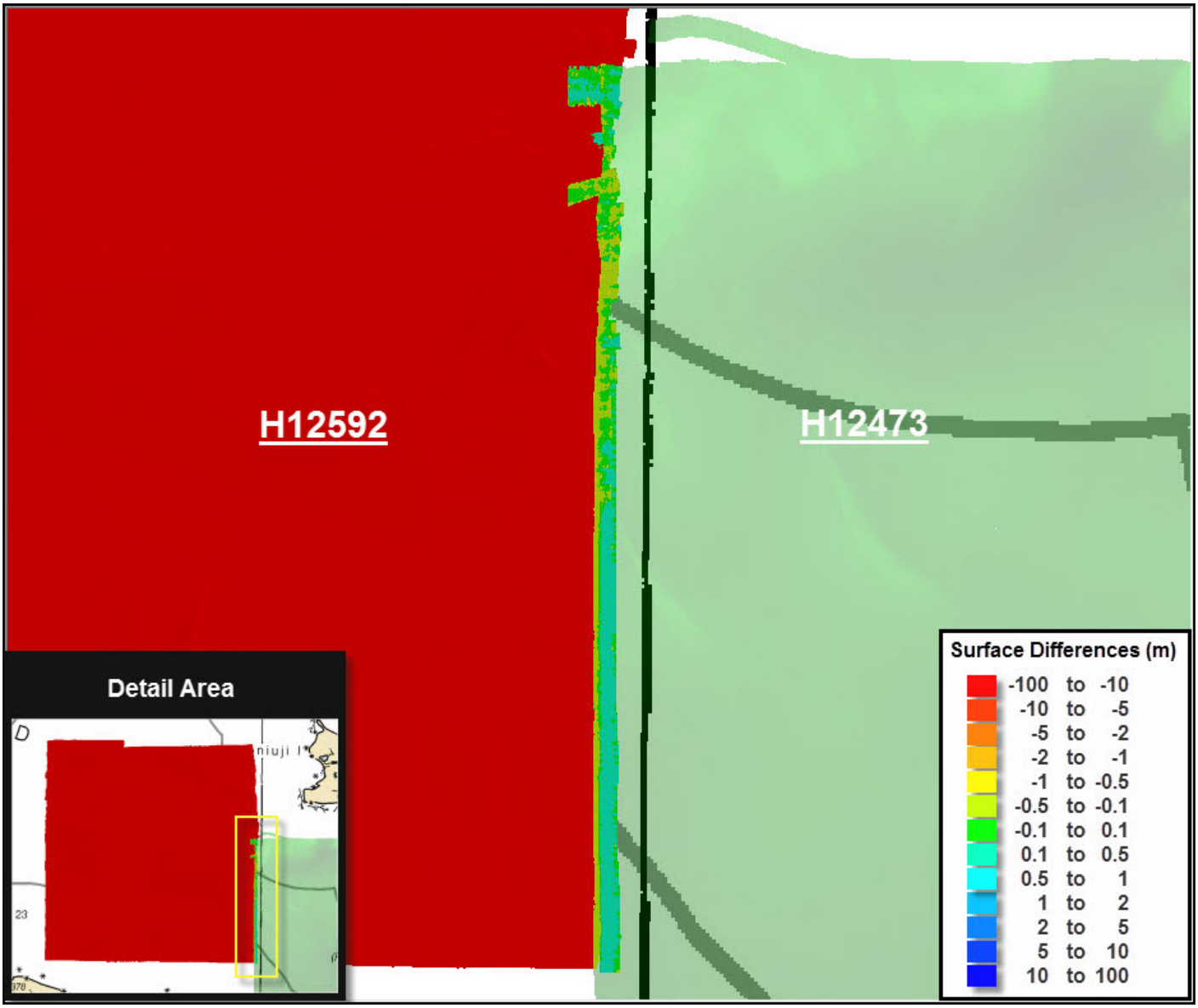

Figure 23: Junction between H12473 (green) and H12592 (red) in meters on Chart 16540.

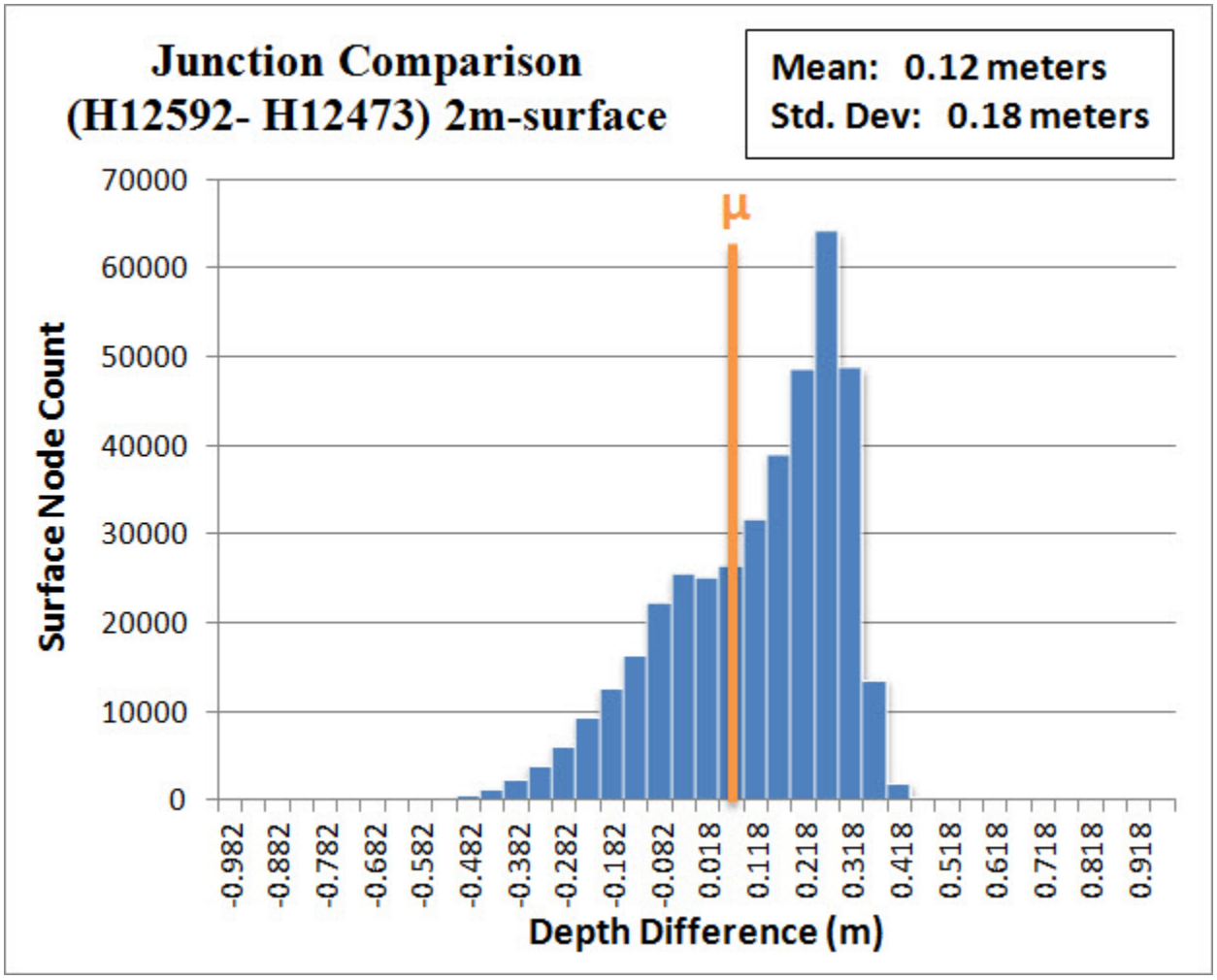

Figure 24: Difference surface statistics between H12473 and H12592 CUBE depth layers (2m grid size). H12473 is an average of 0.12m shoaler.

H11682

Overlap with survey H11682 was approximately 220 meters wide along the northern boundary of H12592, narrowing to 135 meters on the western side (Figure 25). Depths in the junction area range from 44 to 52 meters. A difference surface analysis between CUBE depth layers for each survey showed H11682 to be an average of 0.22 meters deeper than H12592, with a standard deviation of 0.23 meters (Figure 27). Although there is general agreement between the two surveys, there is a feature located near the center of the junction that results in a difference of over one meter (Figure 26); this seems to be at least partially due to the coarse resolution of the junction survey (10 meters) and the associated variation in gridding. This depth discrepancy does not pose a hazard to navigation.

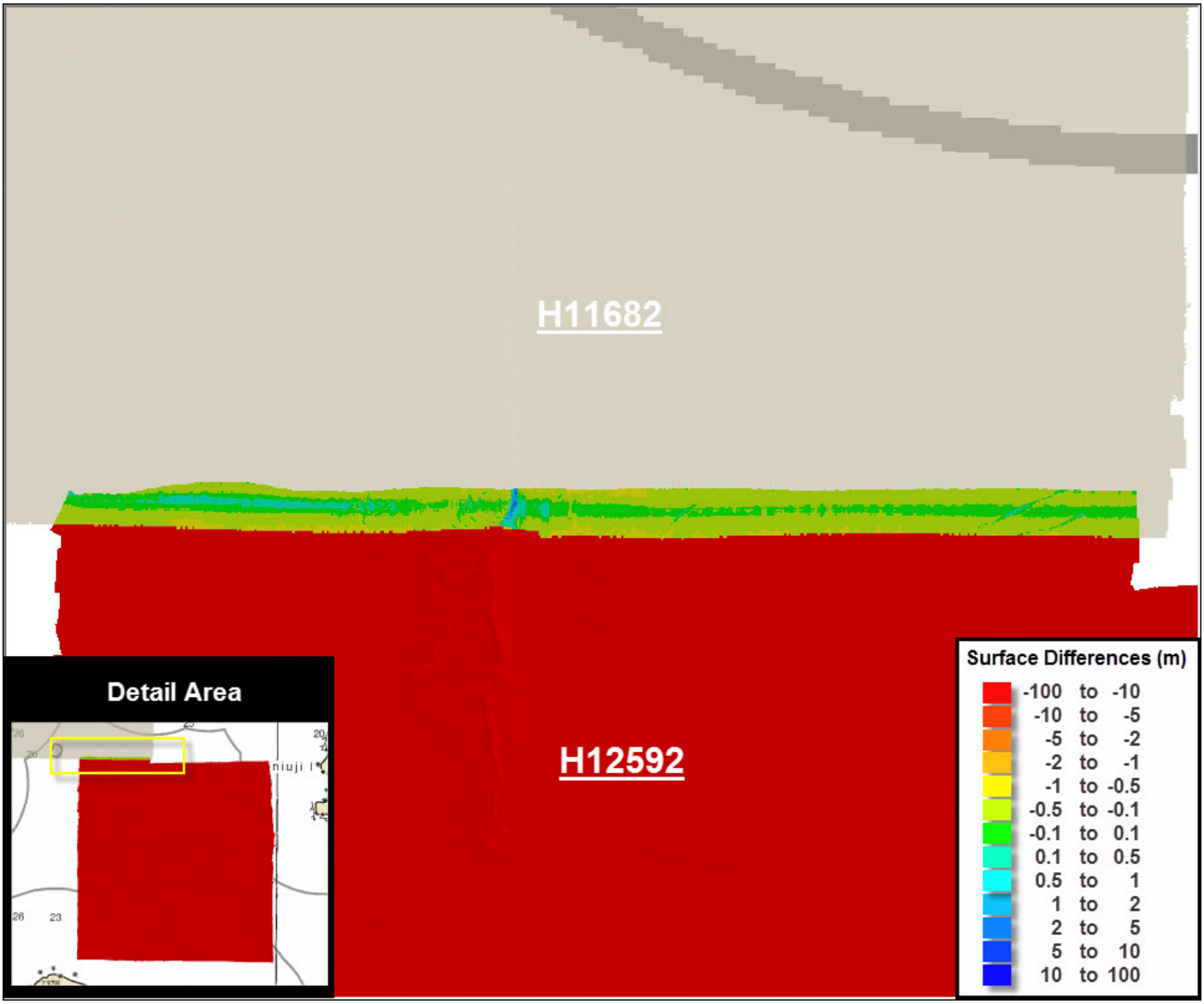

Figure 25: Junction between H11682 (brown) and H12592 (red) in meters on Chart 16540.

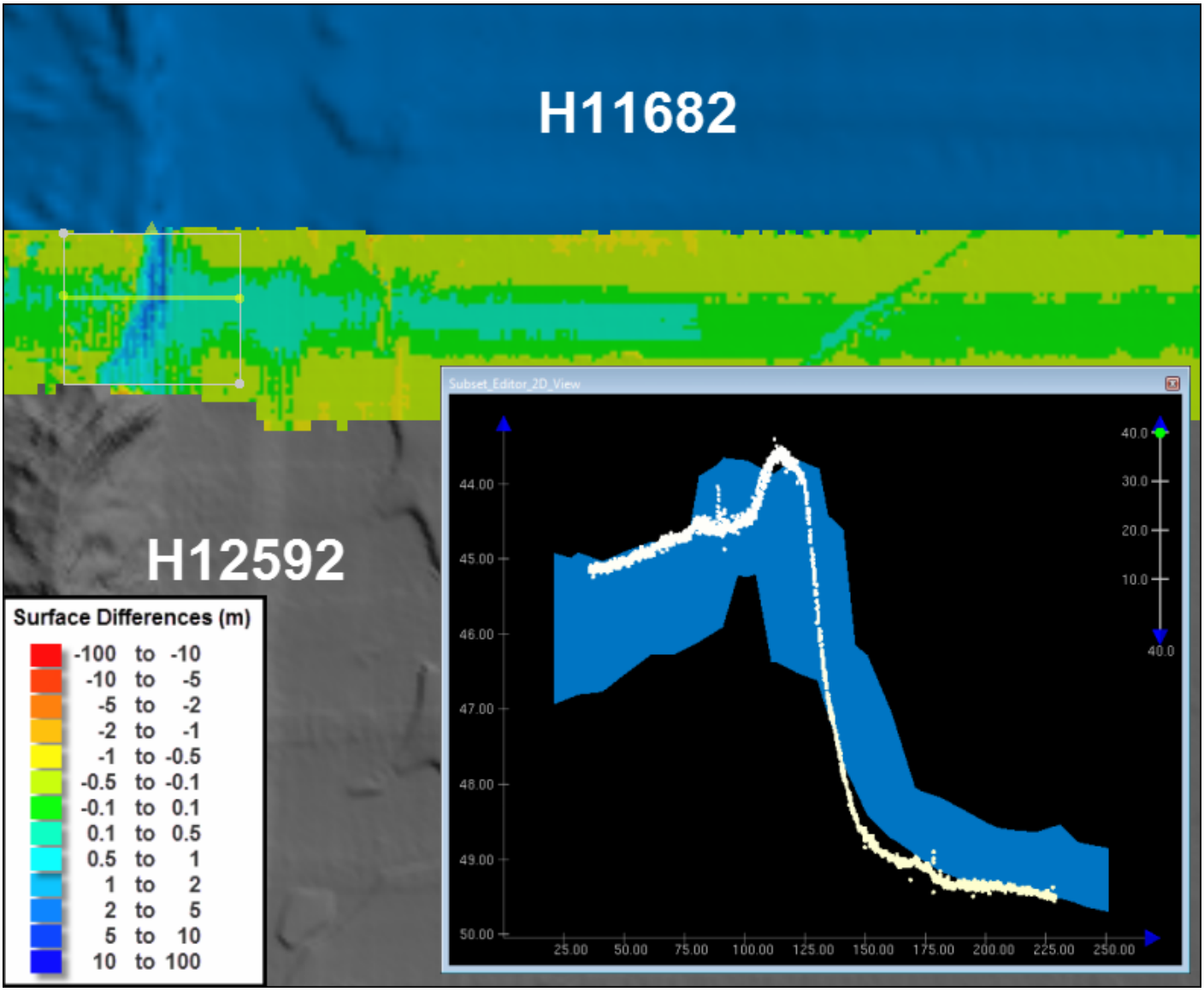

Figure 26: Subset view of feature in junction area with depth discrepancy.

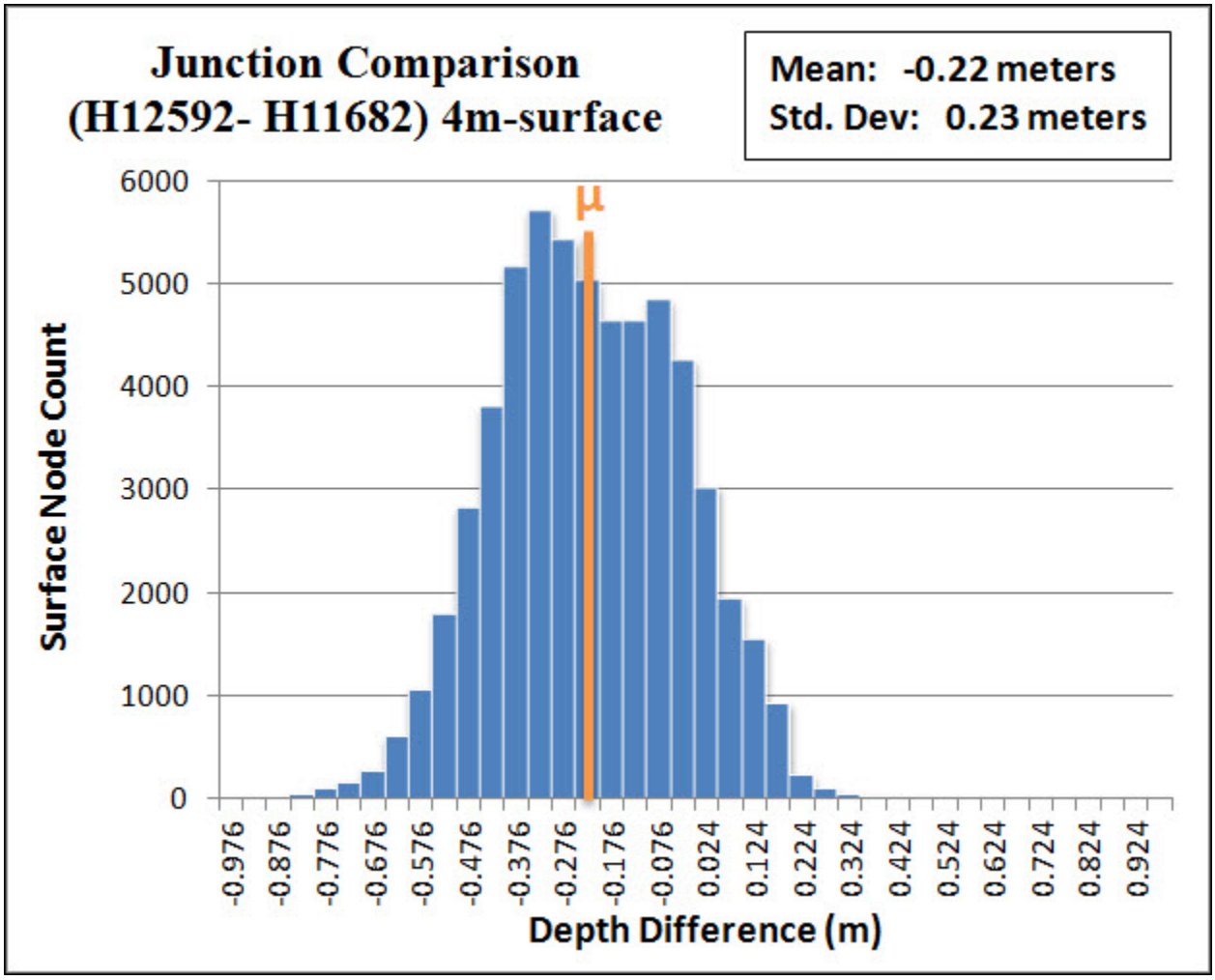

Figure 27: Difference surface statistics between H11682 and H12592 CUBE depth layers (10m and 4m grid size, respectively). H11682 is an average of 0.22m deeper.

H12119

Overlap with survey H12119 was approximately 250 meters wide along the northern boundary of H12592, narrowing to 125 meters on the western side (Figure 28). Depths in the junction area range from 48 to 63 meters. A difference surface analysis between CUBE depth layers for each survey showed H12119 to be an average of 0.08 meters shoaler than H12592, with a standard deviation of 0.14 meters (Figure 29). This is well within allowable IHO Order 1 accuracy at these depths.

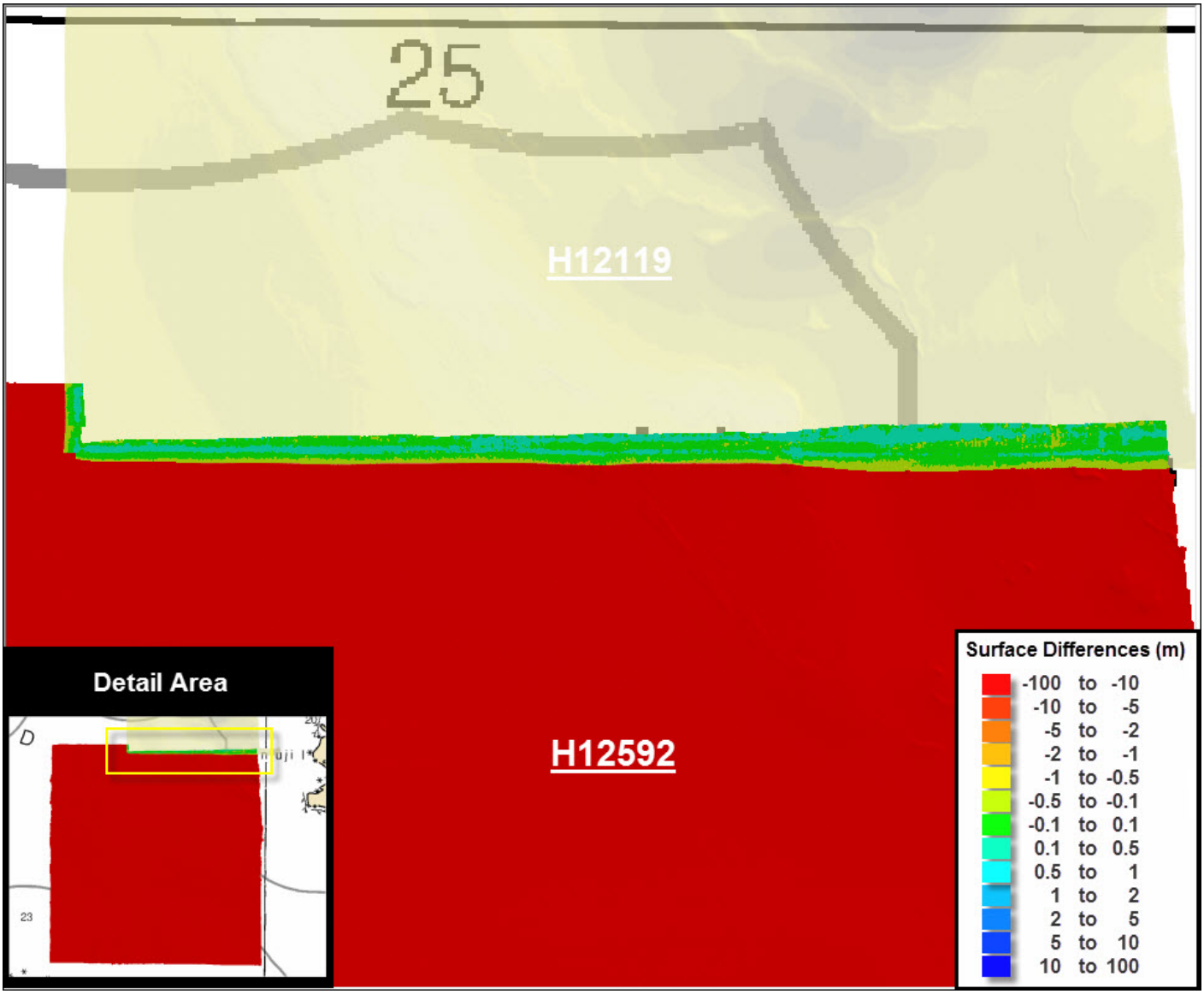

Figure 28: Junction between H12119 (yellow) and H12592 (red) in meters on Chart 16540.

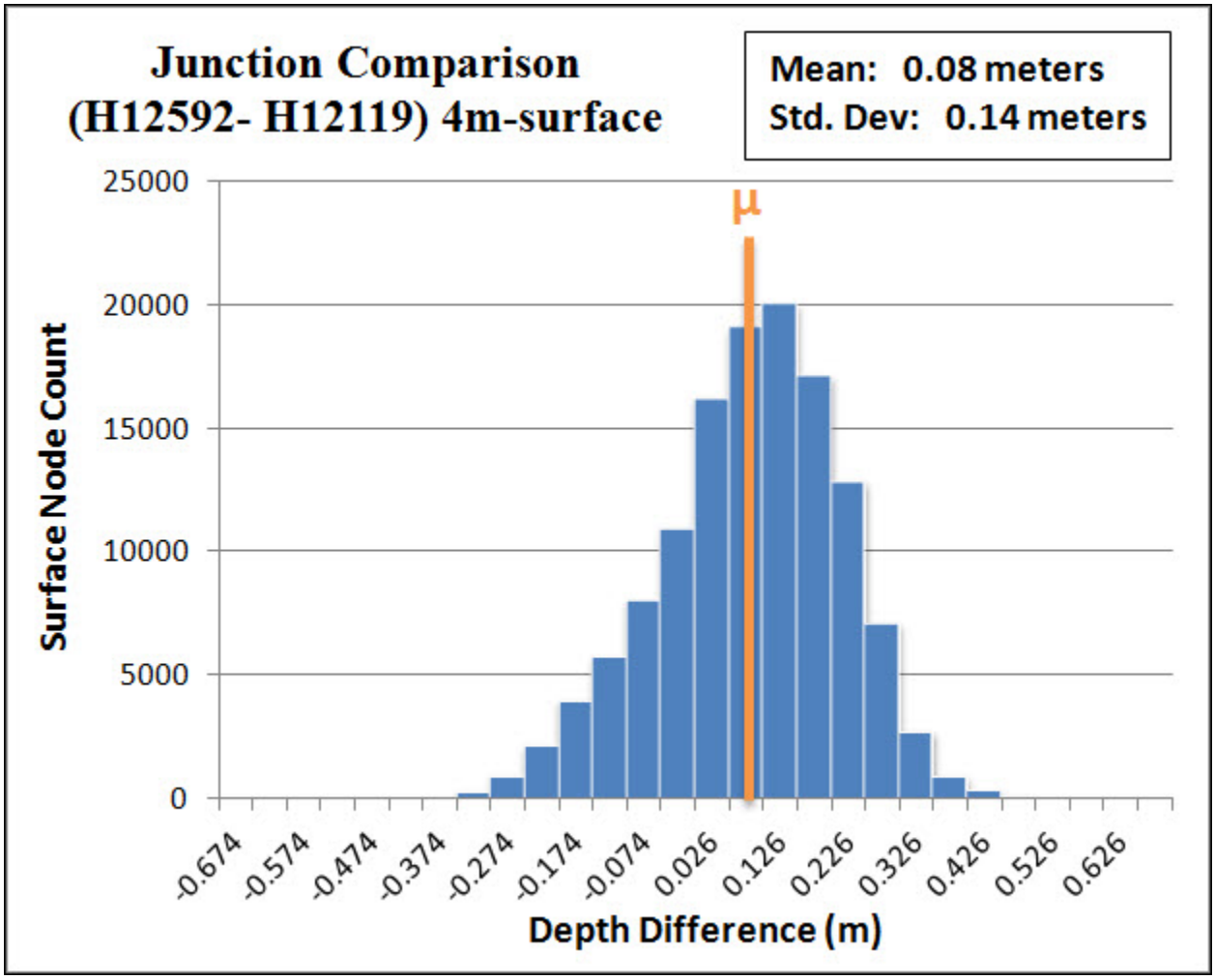

Figure 29: Difference surface statistics between H12119 and H12592 CUBE depth layers (4m grid size). H12119 is an average of 0.08m shoaler.

H12102

There is a small area of overlap between lidar survey H12102 and H12592. Although there is general agreement between the two surveys, the lidar data in this area is of low density and is not suitable for a full junction analysis with H12592. A full junction analysis was performed between H12102 and H12594, which can be found in the H12594 Descriptive Report.

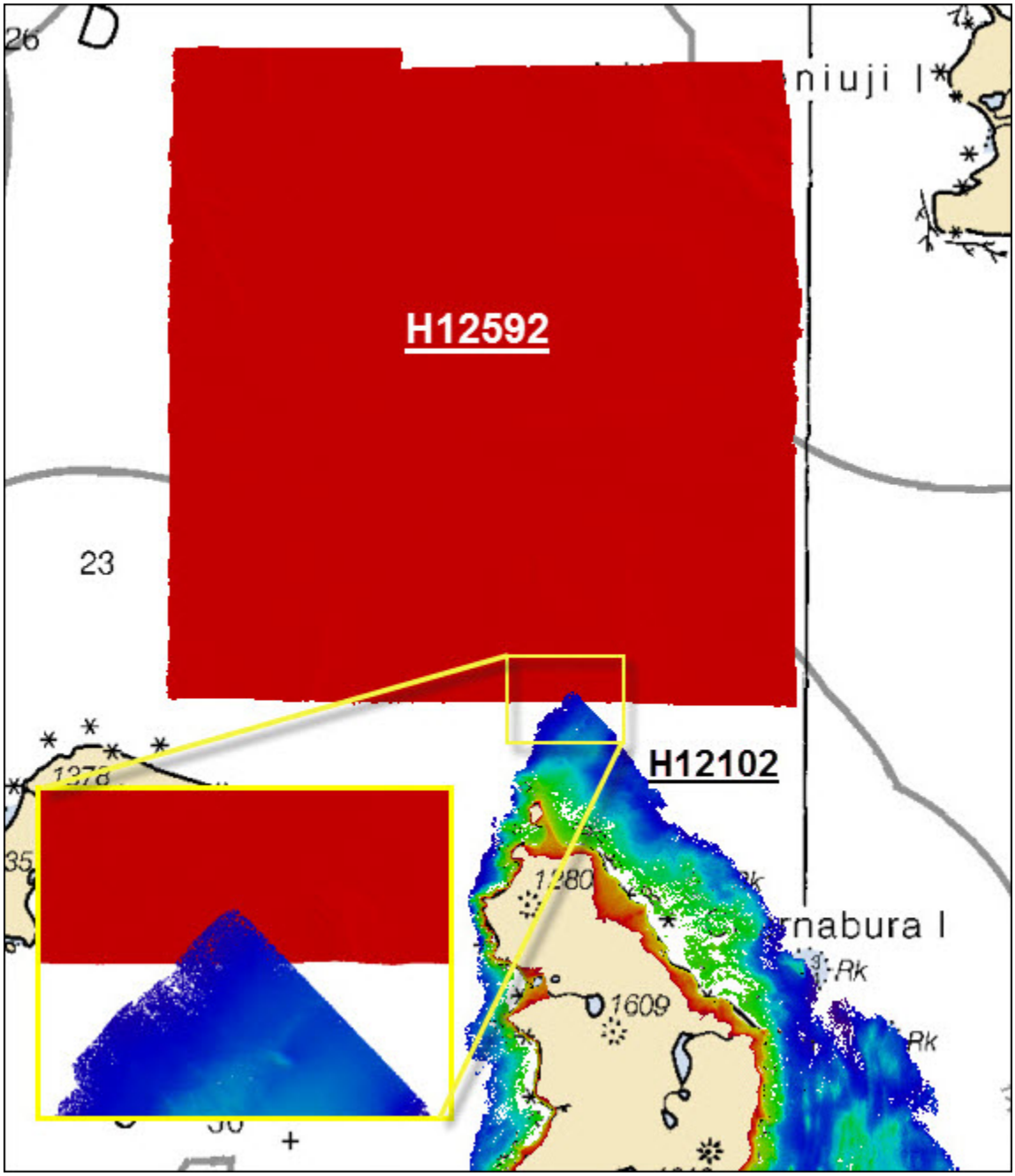

Figure 30: Junction between H12102 (rainbow) and H12592 (red) on Chart 16540.

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

Ellipsoid-to-Tidal Surface Comparison

Using the GPS height determined from the SBET file, data from H12592 was referenced to the ellipse and gridded. As a QC tool an ERS to MLLW difference surface was created to identify artifacts. By differencing this ellipsoidally-referenced surface (ERS) from the traditional tidally-referenced surface, one should only see the ellipsoidal slope across the length of the survey. Any deviations from this slope would therefore be the result of an error intrinsic to either the ERS or tidal processing work flow. Misprojected SBETs, current-induced dynamic draft, incorrect waterline measurements, corrupt TrueHeave files, or poorly-modeled water levels are all examples of artifacts that can be identified through the difference of the ERS and tidally-referenced surfaces.

The depth gradient between the MLLW and the ERS surfaces is expected to be similar in magnitude and position as the EGM2008-WGS84 geoid-ellipsoid separation model published by the National Geospatial-Intelligence Agency (NGA). In review, it was found that the two models compare well - exhibiting a signature northwest to southeast gradient of depth differences across the survey area - particularly considering the 2.5' resolution of the NGA surface and the expected differences between the geoid and MLLW (Figure 31).

Seven lines were excluded from this difference surface due to problems with the application of TrueHeave and/or SBETs (see 5.3.1 Corrections to Echo Soundings & C.3 Additional Horizontal or Vertical Control Issues).

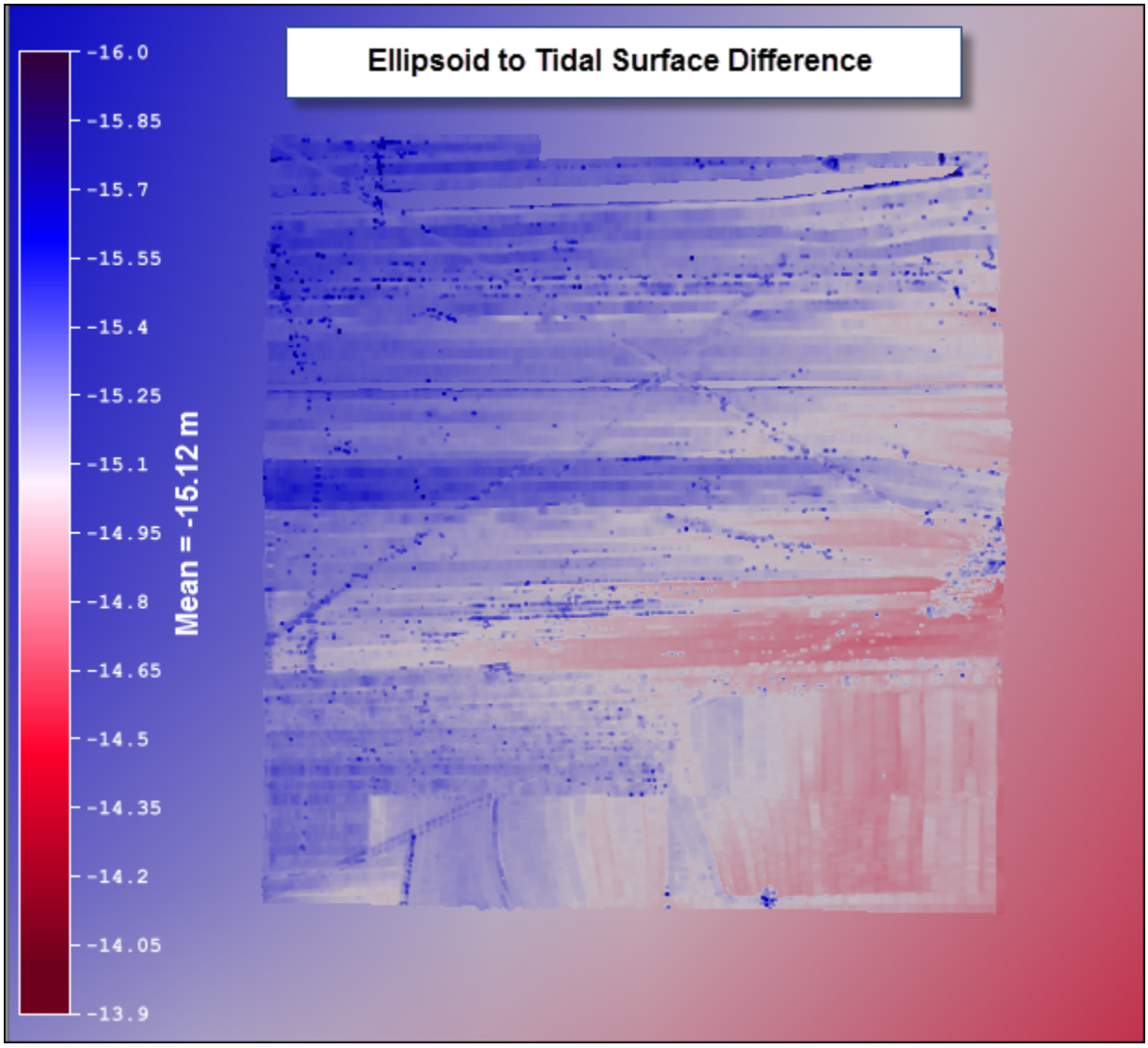

Figure 31: Difference surface between the ellipsoidally-referenced and tidally-referenced surfaces. Difference surface is overlaid on the EGM2008-WGS84 geoid-ellipsoid separation model.

Sound speed artifacts

Despite casts being taken as frequently as every 15 minutes, with consideration to spatial distribution, sound speed artifacts were seen within the data. These artifacts occurred as "smiles" or "frowns" due to inadequately modeled refraction. In these areas, the outer beams were flagged as rejected to assist the gridding algorithm in bringing the surface back to better represent the true seafloor. Although this artifact exists within the data, it is within uncertainty standards specifications as stated within Section 5.1.3 of the HSSD. The Hydrographer finds that the data is adequate to supersede charted data (Figure 32).

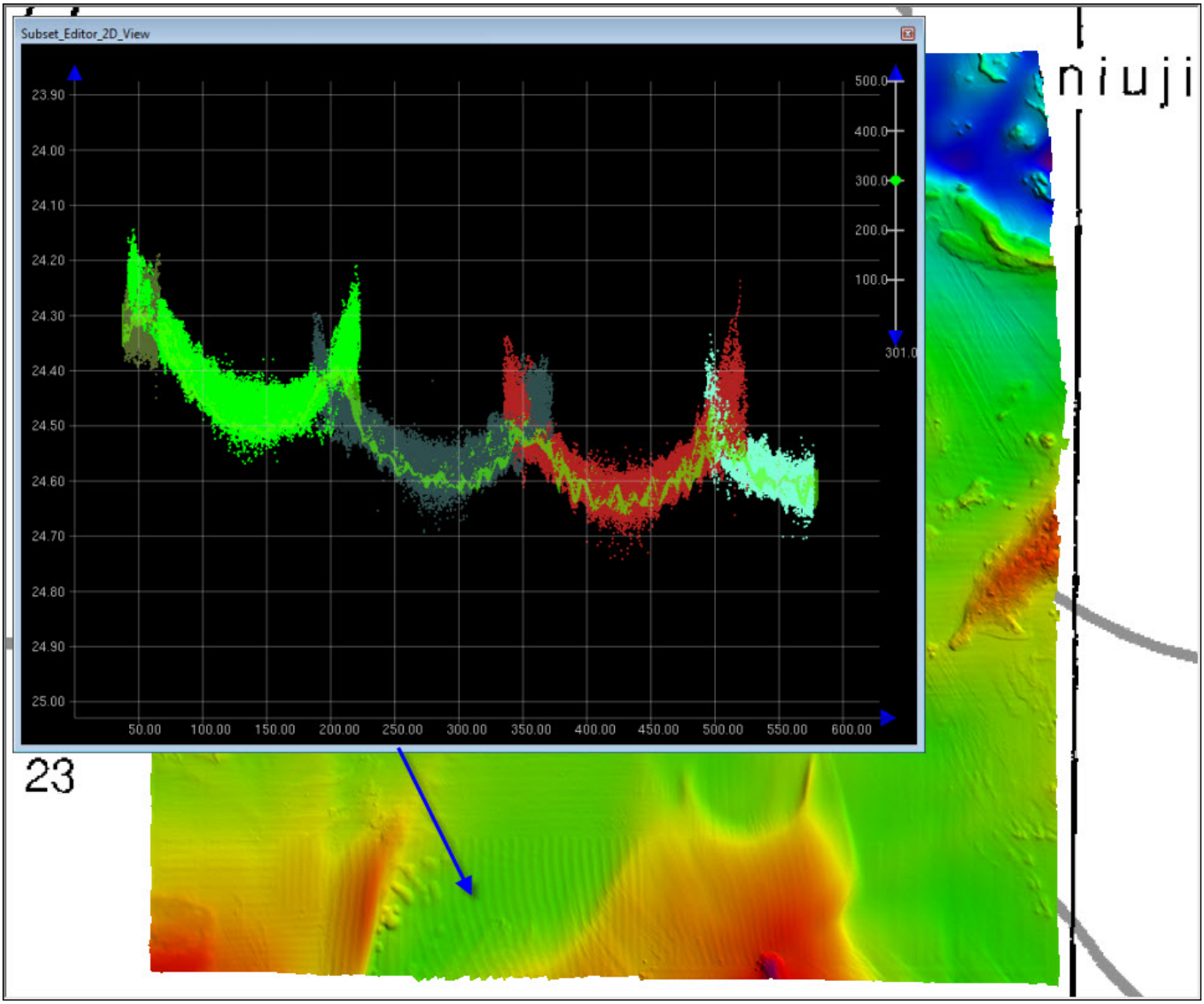

Figure 32: Example of sound speed artifact seen within H12592 with a BASE surface vertical exaggeration of 15.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: For data collected by launches, sound speed profiles were acquired using the SBE 19plus CTDs at discrete locations within the survey area at least once every four hours, when large changes in surface sound speed were apparent, and when moving to a new area. For data collected on S221 (RAINIER), sound speed profiles were acquired using the Rolls Royce MVP200 approximately every 15 minutes or when recommended by "CastTime", a cast frequency program developed at the University of New Hampshire. All casts were concatenated into a master file for the entire survey and applied to lines using the "Nearest in distance within time (4 hours)" profile selection method (Figure 33).

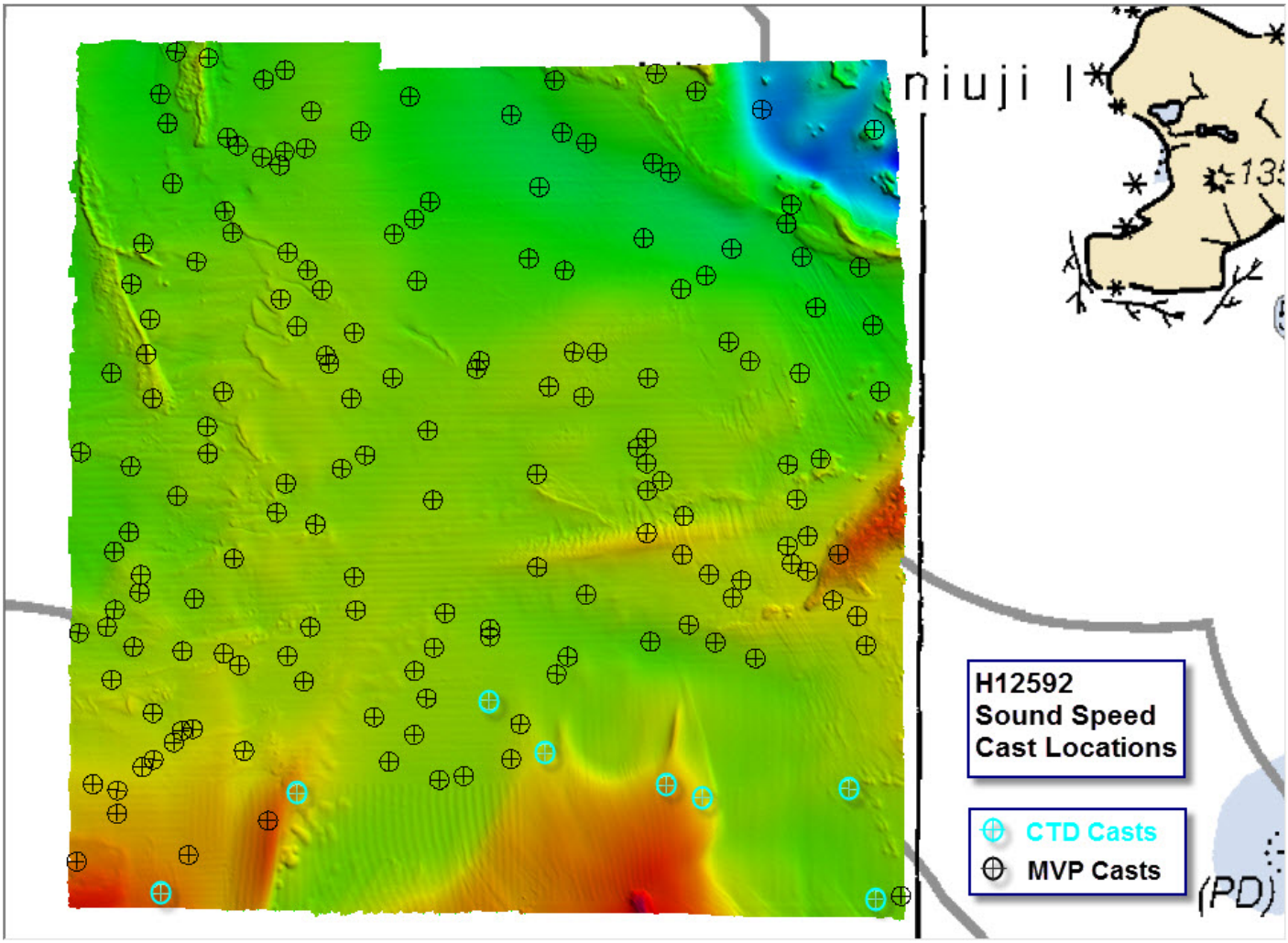

Figure 33: Locations of H12592 sound speed casts.

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

Application of TrueHeave to line "0000_20130716_194918_Rainier " created a navigation artifact and thus the TrueHeave record was removed from this line (Figure 34). Examination of the line in Subset Editor shows strong agreement when compared to surrounding data.

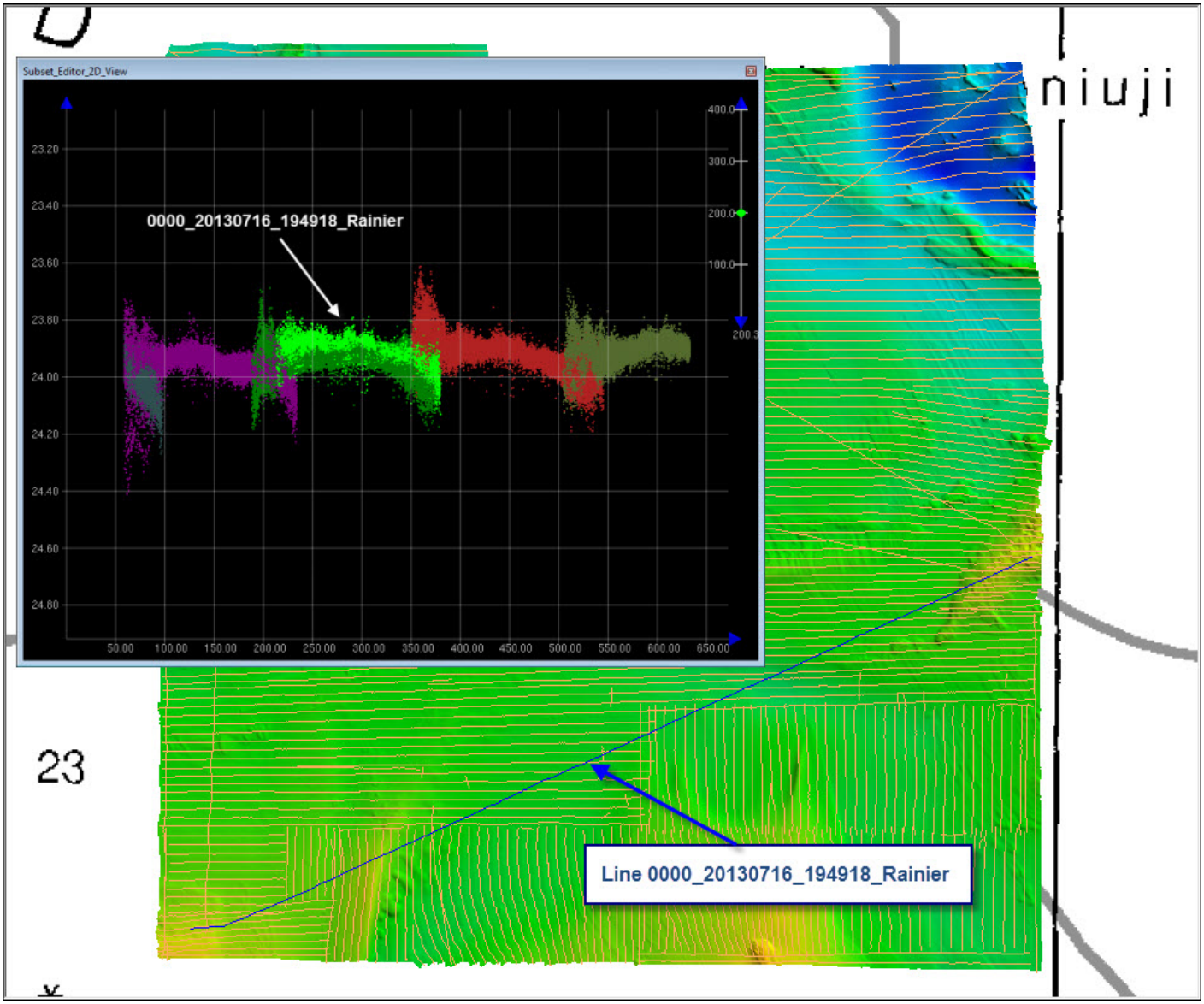

Figure 34: Single survey line collected without TrueHeave.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter data was acquired, but not formally processed by RAINIER personnel. However, periodic spot checks were performed to ensure backscatter quality. Backscatter was logged as .7k or .All files and submitted to NGDC, but is not included with the data submitted to the Branch.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAA Extended Attribute Files Version 5_3_2.

All final data processing was performed using CARIS HIPS and SIPS 8.0.4. It should be noted that all Kongsberg EM710 data was intentionally processed without the Simrad Sound Velocity Correction (SVC) module. This was done in order to avoid a known error in the SVC module associated with reverse-mounted transducers. To accomplish this, a custom CARIS license file was used, which excluded the licensing for the Simrad SVC. For further details, refer to the DAPR.

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
H12592_2m	CUBE	2 meters	20 meters - 72 meters	NOAA_2m	Complete MBES
H12592_4m	CUBE	4 meters	20 meters - 72 meters	NOAA_4m	Complete MBES
H12592_2m_Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12592_4m_Final	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H12592_4m_Combined	CUBE	4 meters	20 meters - 72 meters	NOAA_4m	Complete MBES

Table 9: Submitted Surfaces

C. Vertical and Horizontal Control

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

C.1 Vertical Control

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

Standard Vertical Control Methods Used:

Discrete Zoning

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

Station Name	Station ID
Sand Point, AK	9459450

Table 10: NWLON Tide Stations

The following subordinate water level stations were established for this survey:

Station Name	Station ID
Bird Island, AK	9459251

Table 11: Subordinate Tide Stations

File Name	Status
9459450.tid	Verified Observed
9459251.tid	Verified Observed

Table 12: Water Level Files (.tid)

File Name	Status
H12592CORF.zdf	Final

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

A request for final approved tides was sent to N/OPS1 on 09/12/2013. The final tide note was received on 11/18/2013.

The tide station installed by RAINIER personnel on Bird Island, AK (945-9251) was used as the primary control for datum determination and as a source for water level reducers from 2348 UTC on 13 July (DN194) through 0436 UTC on 18 August (DN230). The National Water Level Observation Network (NWLON) tide station in Sand Point, AK (945-9450) served as a subordinate gauge during this time. During the time of acquisition when the Bird Island gauge was not operational, the NWLON tide station in Sand Point served as the primary gauge. A complete description of the vertical and horizontal control for this survey can be found in the accompanying Horizontal and Vertical Control Report (HVCR), submitted under separate cover.

Tide note is appended to this report.

C.2 Horizontal Control

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

The projection used for this project is UTM - 04 North.

<u>The following PPK methods were used for horizontal control:</u>

Single Base

In conjunction with this project, a GPS base station was established by RAINIER personnel on Bird Island, AK; the station was operational from DN192 through DN207 and from DN222 through 245. During the times when the Bird Island base station was not operational (DN208 through DN221 and DN246 through DN254), a Plate Boundary Observatory station on Chernabura Island (ChernaburaAK2008, AC12) was used for post-processing. There was one exception: Data from S221 DN226 was collected while the Bird Island base station was operational, but the SBET using Bird Island could not be fully processed; this data was instead post-processed using the Chernabura Island base station.

Vessel kinematic data was post-processed with Applanix POSPac and POSGNSS software using Single Base processing methods described in the DAPR.

Differential Global Positioning System (DGPS) correctors were used for horizontal control when the post-processing methods stated above were not possible. DGPS was used for 0000_20130716_194918_Rainier, 0009_20130828_231930_Rainier, 0034_20130829_192006_Rainier, 0035_20130829_201439_Rainier, 0031_20130801_141354_Rainier, 0032_20130807_142613_Rainier, 2803_2013RA2232344 due to SBET files not overlapping with the lines (see C.3.3.1 Lines without SBETs).

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
ChernaburaAK2008	AC12

Table 14: CORS Base Stations

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
Bird Island, AK	N/A

Table 15: User Installed Base Stations

The following DGPS Stations were used for horizontal control:

DGPS Stations
Cold Bay, AK (289 kHz)
Kodiak, AK (313 kHz)

Table 16: USCG DGPS Stations

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 Lines without SBETs

SBETs could not be applied to the following lines due to time extents not overlapping with the line; 0000_20130716_194918_Rainier, 0009_20130828_231930_Rainier, 0034_20130829_192006_Rainier, 0035_20130829_201439_Rainier, 0031_20130801_141354_Rainier, 0032_20130807_142613_Rainier, 2803_2013RA2232344. DGPS was used for positioning for these lines.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between survey H12592 and Chart 16540 using CARIS CUBE surfaces and a sounding layer. All data from H12592 should supersede charted data.

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
16540	1:300000	13	10/2010	10/12/2010	10/30/2010

Table 17: Largest Scale Raster Charts

16540

A comparison was performed with Chart 16540 (1:300000) using a CARIS sounding layer based on the combined 4-meter CUBE surface from H12592 (Figure 35). The survey area contains only eight soundings on the existing chart. Although there is general agreement between H12592 survey soundings and charted depths, there is shoaling on the southern and eastern portions of the survey area that is not represented on the chart. The areas shoal to a least depth of 11-fathoms and do not pose a danger to navigation.

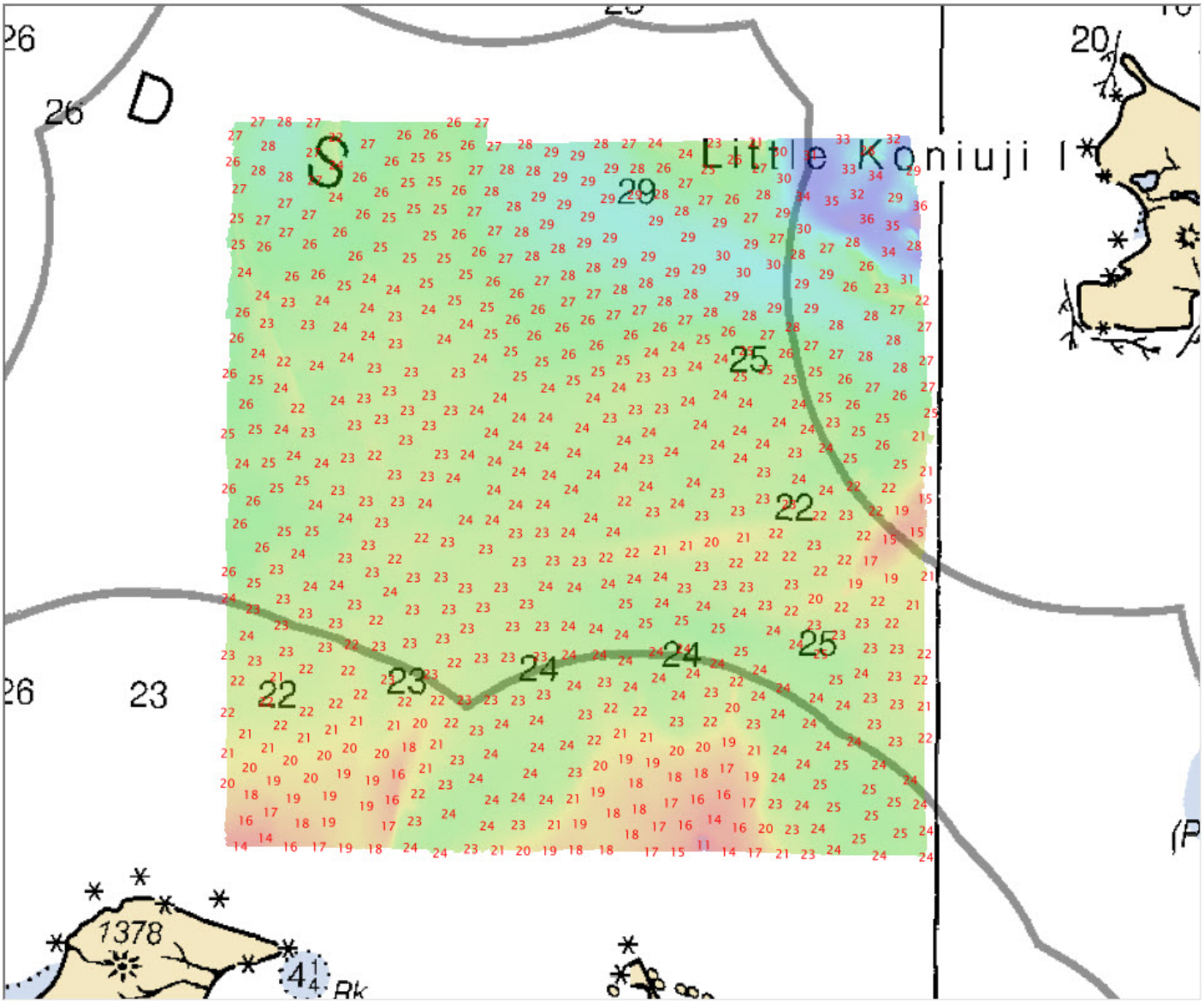

Figure 35: Chart 16540 depth comparison in fathoms.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US3AK50M	1:300000	17	06/29/2011	06/29/2011	NO

Table 18: Largest Scale ENCs

US3AK50M

ENC US3AK50M was digitized from Chart 16540 and coincides with the raster. The depths on the ENC match the raster, and the comparison between survey H12592 and the ENC is equivalent to the H12592 preceding comparison with Chart 16540. The Hydrographer recommends that a sounding set derived from survey H12592 supersede charted depths.

D.1.3 AWOIS Items

No AWOIS items were assigned for this survey.

D.1.4 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.5 Charted Features

No charted features exist for this survey.

D.1.6 Uncharted Features

No uncharted features exist for this survey.

D.1.7 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.8 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.9 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.1.10 Bottom Samples

Bottom samples were acquired in accordance with the Project Instructions and the HSSD. Six bottom samples were proposed and acquired for this survey (Figure 36). All samples were labeled in accordance with the HSSD with S-57 attribution and can be found in the Final Feature File.

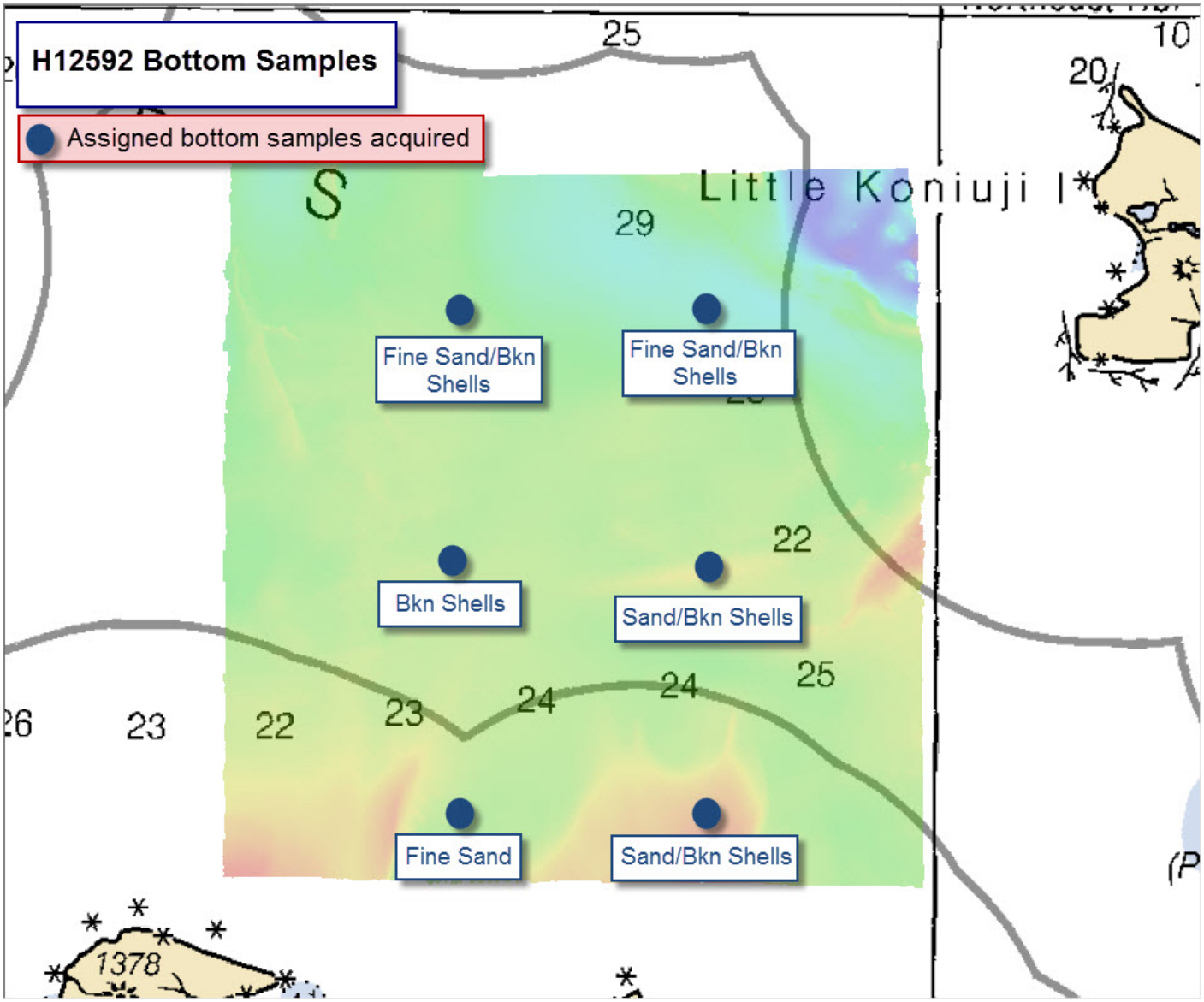

Figure 36: Bottom sample locations and characteristics for H12592.

D.2 Additional Results

D.2.1 Shoreline

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

Shoreline was assigned for all surveys in this project. H12592 is an offshore survey and no shoreline features were located within it's limits.

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 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

No significant features 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 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
Richard T. Brennan, CDR/NOAA	Commanding Officer, NOAA Ship RAINIER	12/11/2013	Richard T. Brennan 2013.12.18 12:05:47 -08'00'
Meghan McGovern, LT/NOAA	Field Operations Officer, NOAA Ship RAINIER	12/11/2013	Date: 2013.12.11 10:42:01 -08'00'
James B. Jacobson	Chief Survey Technician, NOAA Ship RAINIER	12/11/2013	James Jacobson I have reviewed this document 2013.12.11 10:44:32 -08'00'
Christiane I. Reiser	Hydrographic Assistant Survey Technician, NOAA Ship RAINIER	12/11/2013	Christiane I. Reiser 2013.12.11 10:39:12 -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 Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSD	Hydrographic Survey Specifications and Deliverables

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

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPE	Total Porpagated 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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : November 18, 2013

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P183-RA-13
HYDROGRAPHIC SHEET: H12592

LOCALITY: 5NM West of Little Koniuji Island, Shumagin Islands, AK
TIME PERIOD: July 16, 2013 - September 12, 2013

TIDE STATION USED: 945-9450 Sand Point, AK
Lat. 55° 19.9'N Long. 160° 30.3' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.988 meters

TIDE STATION USED: 945-9251 Bird Island, AK
Lat. 54° 50.1' N Long. 159° 45.6' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.928 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: SWA204, SWA204A, SWA205

Refer to attachments for zoning 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: Use tide data from the appropriate station with applicable zoning correctors for each zone according to the order in which they are listed in the Tidezone corrector file (*.ZDF). For example, tide station one (TS1) would be the first choice for an applicable zone followed by TS2, etc. when data are not available.

HOVIS.GERALD.THOMAS.1365860250

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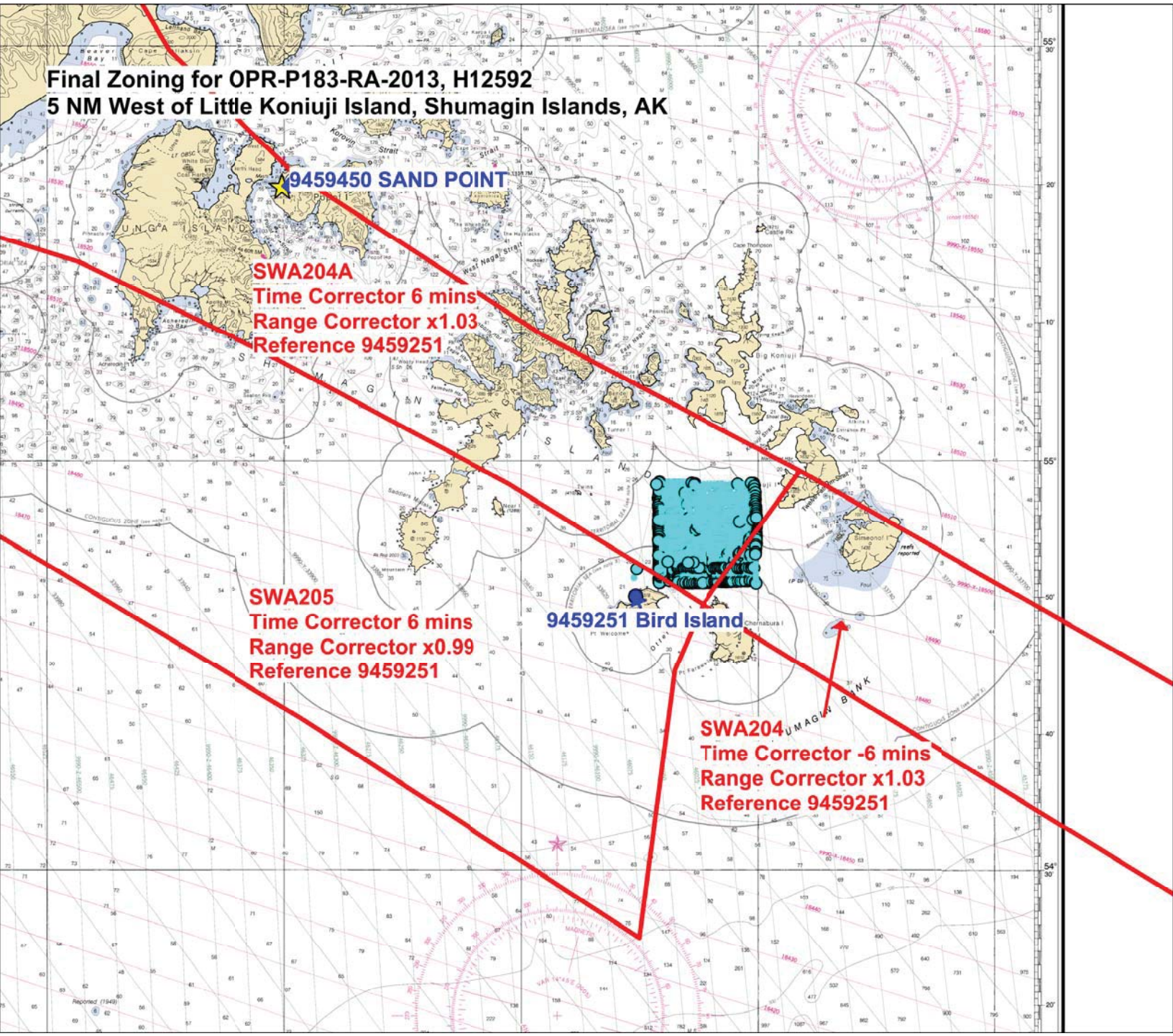
Date: 2013.11.19 12:13:06 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Final Zoning for OPR-P183-RA-2013, H12592
5 NM West of Little Koniuji Island, Shumagin Islands, AK
9459450 SAND POINT
SWA204A
Time Corrector 6 mins
Range Corrector x1.03
Reference 9459251
SWA205
Time Corrector 6 mins
Range Corrector x0.99
Reference 9459251
9459251 Bird Island
SWA204
Time Corrector -6 mins
Range Corrector x1.03
Reference 9459251

APPROVAL PAGE

H12592

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 NGDC for archive

- H12592_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12592_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Approved:_____

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Date: 2014.10.21 14:13:56 -07'00'

Kurt Brown
Physical Scientist, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved:_____

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
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Date: 2014.10.21 14:11:10 -07'00'

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch