H12452

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12452

LOCALITY

State(s):	Alaska
General Locality:	Chirikof Island and Vicinity, AK
Sub-locality:	Offshore NW Chirikof Island

2012

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	**H12452**

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:	**Chirikof Island and Vicinity, AK**
Sub-Locality:	**Offshore NW Chirikof Island**
Scale:	**40000**
Dates of Survey:	**06/24/2012 to 08/22/2012**
Instructions Dated:	**05/15/2012**
Project Number:	**OPR-P133-RA-12**
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. Notes in red were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. Page numbering may be interrupted or non-sequential. All pertinent records for this survey, including the Descriptive Report, 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 H12452

Project: OPR-P133-RA-12

Locality: Chirikof Island and Vicinity, AK

Sublocality: Offshore NW Chirikof Island

Scale: 1:40000

June 2012 - August 2012

NOAA Ship *Rainier*

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

A. Area Surveyed

The project area is referred to as Sheet 7: "Chirikof Island and Vicinity, AK" within the Project Instructions. The area covers a 6 by 13 NM area northwest of Chirikof Island (Figure 1). The southeastern corner of the sheet is approximately 2 NM northwest of Nagai Rocks. It is located roughly between the three nautical mile line and the Territorial Sea boundary.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
55° 58" 45.96' N 155° 41" 42.29' W	55° 52" 27.2' N 156° 5" 27.56' W

Table 1: Survey Limits

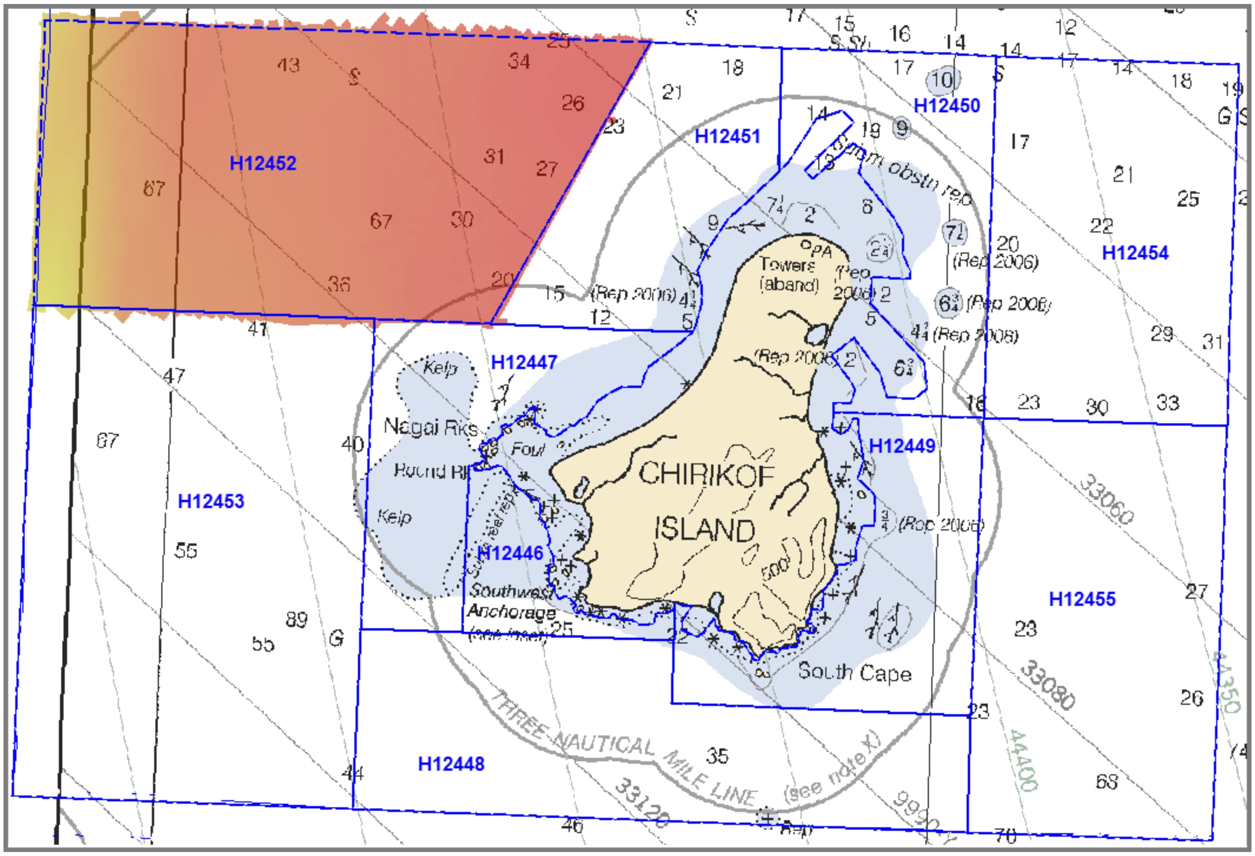


Figure 1: H12452 survey limits.

Survey limits were acquired in accordance with the requirements in the Project Instructions and the Hydrographic Survey Specifications and Deliverables Manual (HSSDM).

A.2 Survey Purpose

This project is being conducted in support of NOAA's Office of Coast Survey to provide contemporary hydrographic data in order to update the nautical charting products and reduce the survey backlog within the area. The need for nautical chart updates is due to an increasing number of passenger vessels, tour vessels and large fishing fleets in the area. In addition, the data may be used to create DTM maps in support of the efficiencies in longline and pot fisheries, while minimizing habitat disruption.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired on survey H12452 met complete multibeam coverage requirements, including the 5 soundings per node data density requirement outlined in section 5.2.2.2 of the HSSDM (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 statistics were compiled in MS Excel. Density failures occurred at the edges of sheet acquisition and between a few lines in the outerbeams in the center of the survey (Figure 3). A data density threshold of five soundings or greater per node was statistically achieved in 100.0% of the nodes (Figure 4).

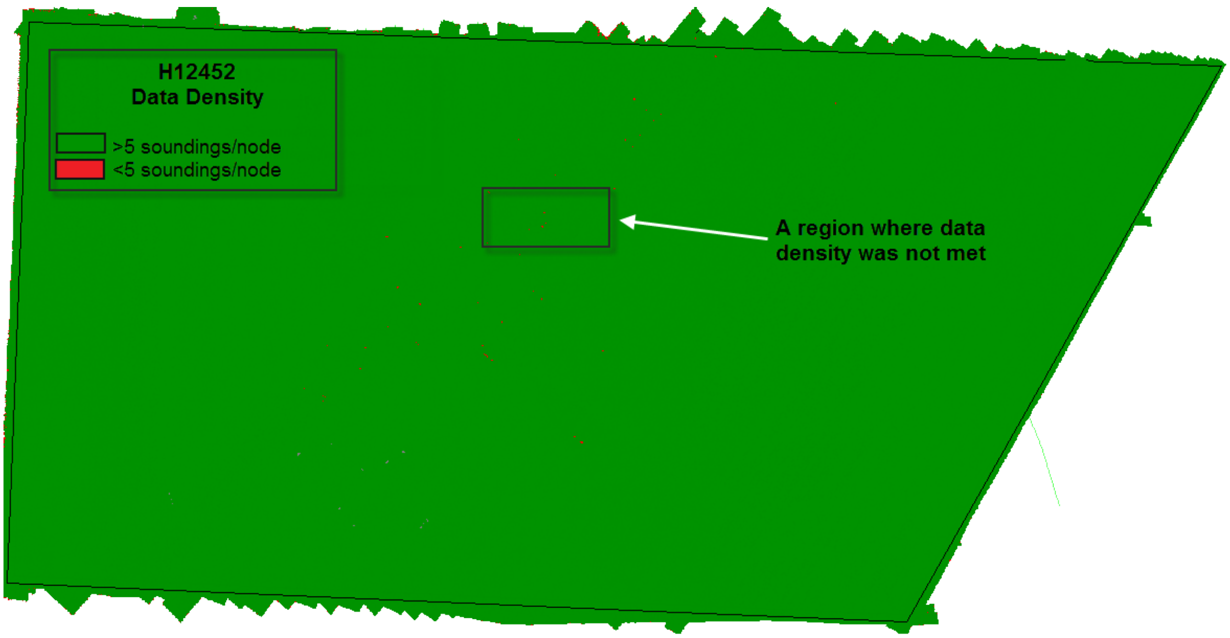


Figure 2: H12452 data density. Areas in green meet the threshold of 5 soundings per node; red areas have a data density less than 5 soundings per node.

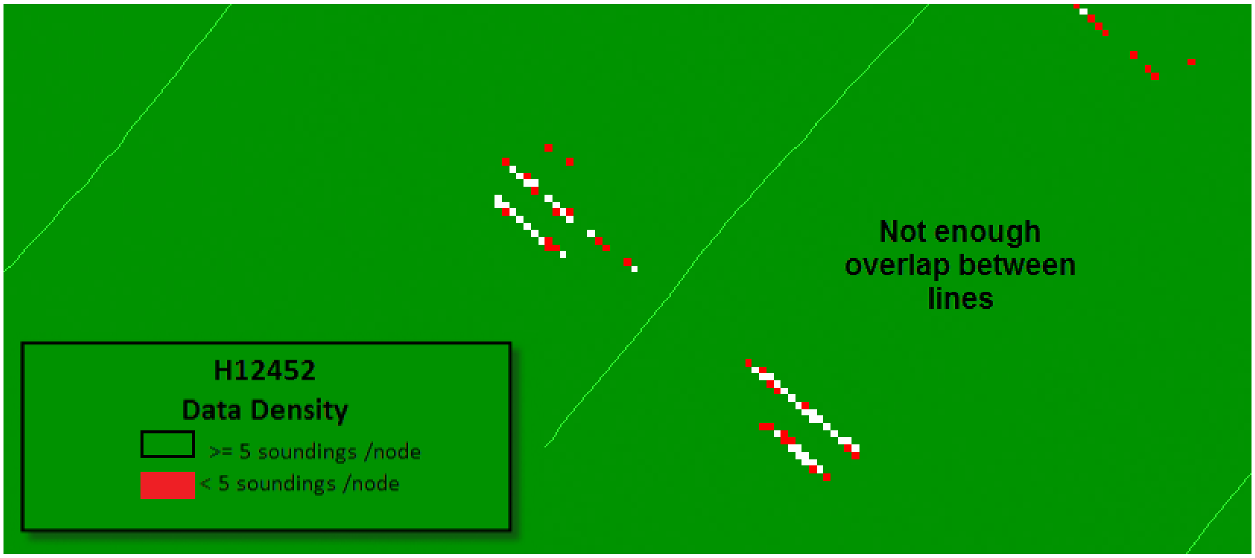


Figure 3: Examples of data density failures between lines. Areas in green meet the threshold of 5 soundings per node; red areas have a data density less than 5 soundings per node.

H12452 Density Statistics				
Resolution	Depth range	Number of nodes	Fewer than five soundings per node	Percent of nodes with greater than five soundings per node
4m	36 - 80m	11,679,786	4,511	100.0%
8m	72 - 160m	1,920,107	1,676	99.9%
16m	144 - 320m	38,031	223	99.4%
	TOTAL:	13,637,924	6,410	**100.0%**
	TOTAL (by area):	319,499,360	236,528	**99.9%**

Figure 4: Summary table showing the percentage of nodes satisfying the 5 sounding per node 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.

A.4 Survey Coverage

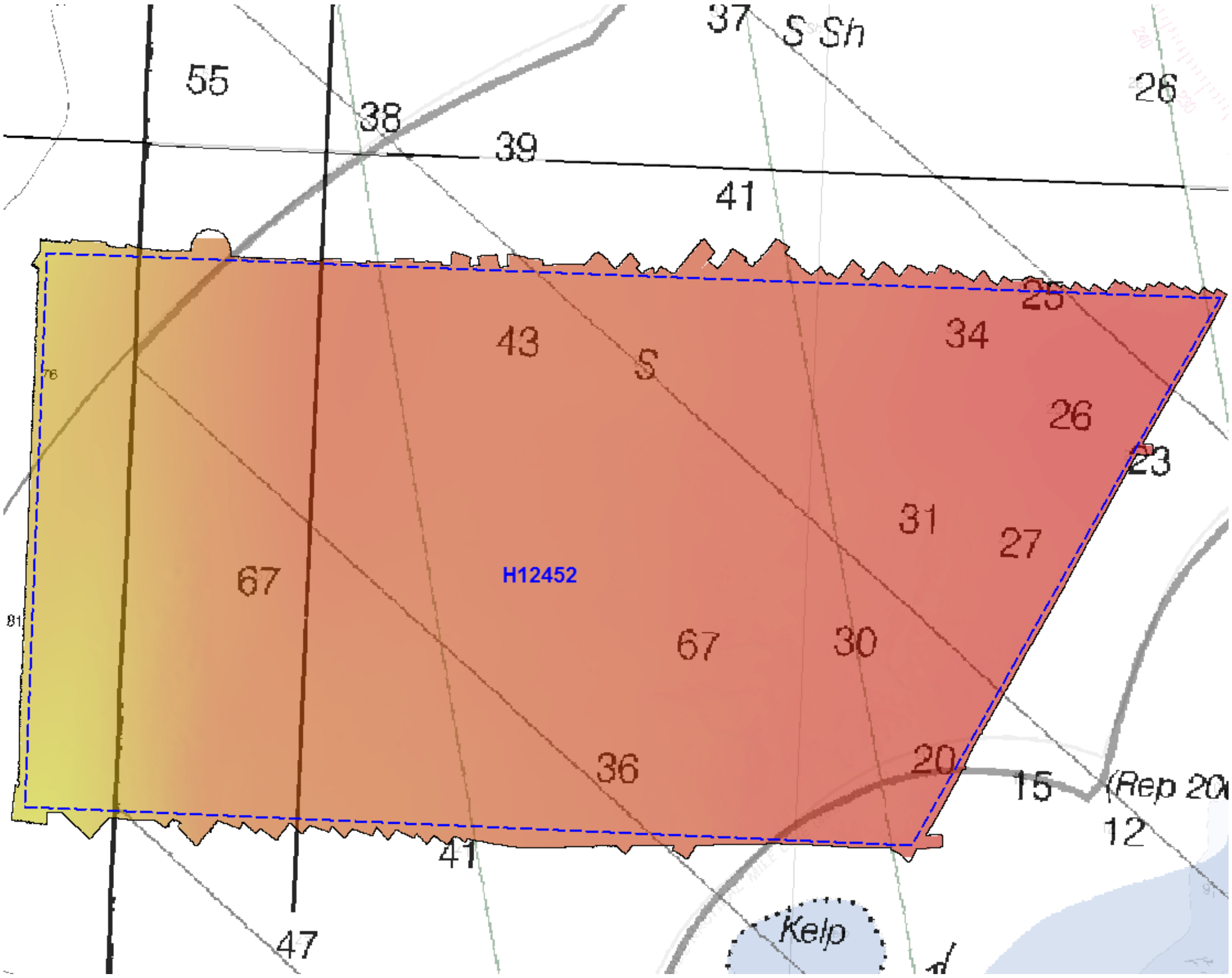


Figure 5: H12452 survey coverage over Chart 16587

Complete MBES coverage was achieved within the limits of hydrography specified in the Project Instructions and the HSSDM.

A.5 Survey Statistics

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

	Vessel	*S221*	*2804*	***Total***
LNM	**SBES Mainscheme**	0	0	0
	MBES Mainscheme	518.6	34.9	553.5
	Lidar Mainscheme	0	0	0
	SSS Mainscheme	0	0	0
	SBES/MBES Combo Mainscheme	0	0	0
	SBES/SSS Combo Mainscheme	0	0	0
	MBES/SSS Combo Mainscheme	0	0	0
	SBES/MBES Combo Crosslines	35.6	11.9	47.5
	Lidar Crosslines	0	0	0
Number of Bottom Samples				1
Number AWOIS Items Investigated				0
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Items Investigated by Dive Ops				0
Total Number of SNM				77.2

Table 2: Hydrographic Survey Statistics

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

Survey Dates	**Julian Day Number**
06/24/2012	176
07/12/2012	194
07/13/2012	195
07/22/2012	204
08/05/2012	218
08/06/2012	219
08/09/2012	222
08/11/2012	224
08/22/2012	235

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

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

B.1.1 Vessels

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

Hull ID	***S221***	***2804***
LOA	231 feet	28 feet
Draft	16.5 feet	3.5 feet

Table 4: Vessels Used

Data was acquired by NOAA Ship RAINIER (S221) and NOAA Ship RAINIER Launch 2804 (RA-6). Both vessels acquired shallow water multibeam (MBES) soundings and sound velocity profiles. Launch 2804 collected bottom samples.

B.1.2 Equipment

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

Manufacturer	Model	Type
Kongsberg	EM710	MBES
Applanix	POS-MV V4	Vessel Attitude System
Rolls Royce Odim Brooke Ocean Technology	MVP 200	Sound Speed System
Reson	7125	MBES
Reson	SVP 70	Sound Speed System
Reson	SVP 71	Sound Speed System
Seabird	SBE 19	Conductivity, Temperature and Depth Sensor

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines, acquired for this survey, totalled 0.08% of mainscheme acquisition.

Multibeam crosslines acquired by 2804 (RA-6) and S221 were compared to the mainscheme data acquired by S221 and 2804 (RA-6). The crosslines covered 47.5 nautical miles, comprising 8.5% of the 553 nautical miles of mainscheme lines. Separate 4-meter resolution CUBE surfaces were created for the mainscheme and crossline data. A difference surface was created, subtracting the crossline surface from the mainscheme surface (Figure 7). Statistics were derived from the difference surface and are shown in Figure 8. The mainscheme and crossline difference averaged -0.02 meters (mainscheme being shoaler), with a standard deviation of 0.42 meters. H12452 survey depth range is 44 to 166 meters. Areas of largest deflection are most likely due to sound velocity refraction (Figure 9).

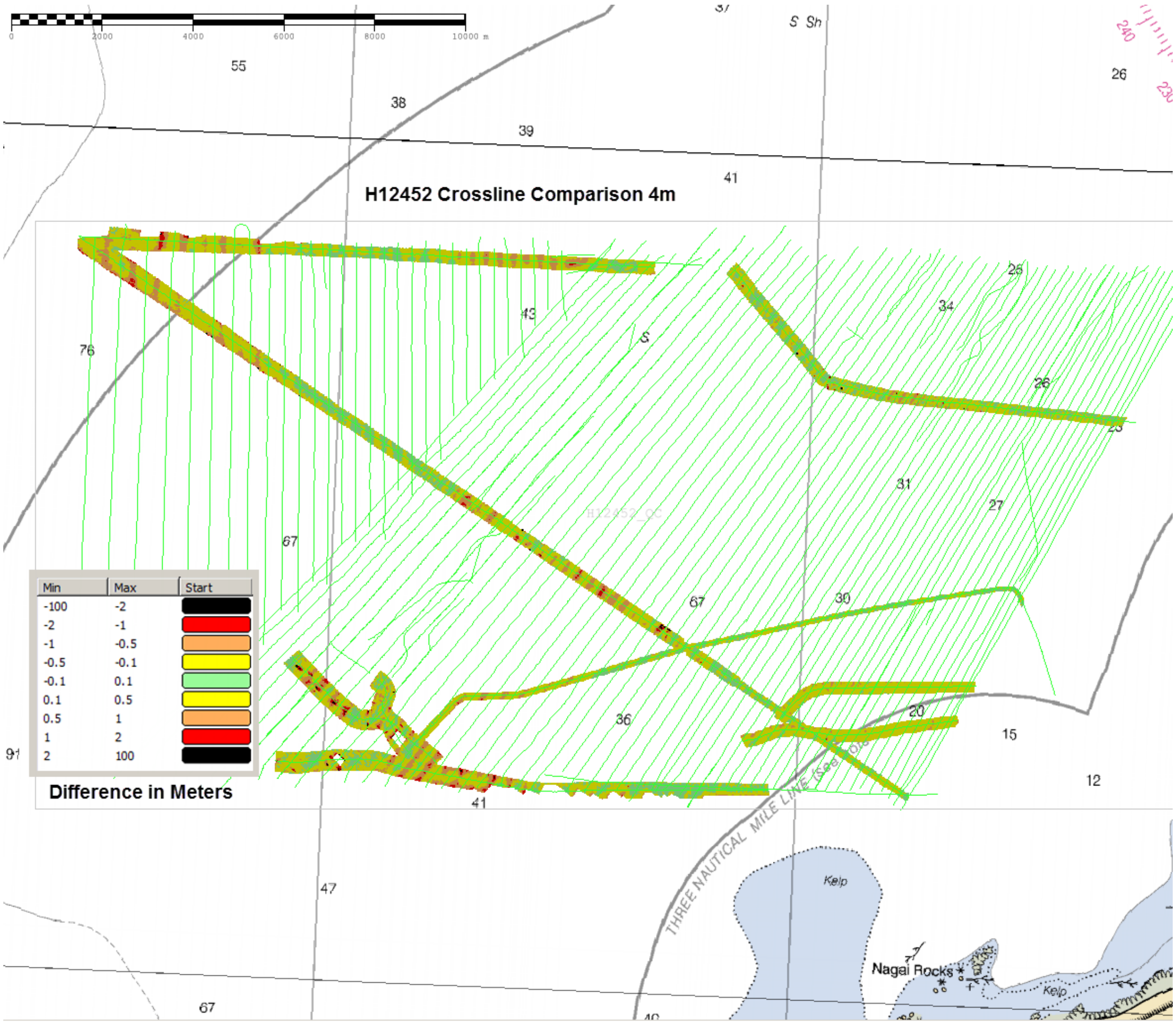


Figure 6: H12452 crossline comparison showing the difference in meters between the mainscheme and crossline soundings for the 4 meter surface.

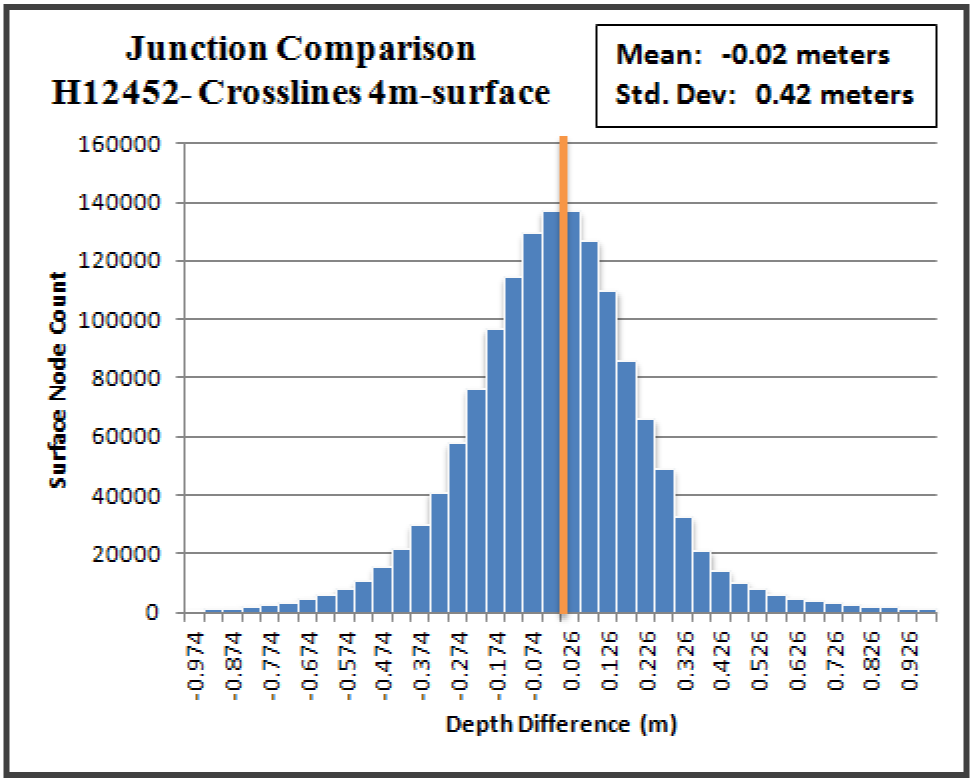


Figure 7: Histogram of 4-meter resolution difference surface between mainscheme and crosslines. The average difference was -0.02 meters and the standard deviation was 0.42 meters.

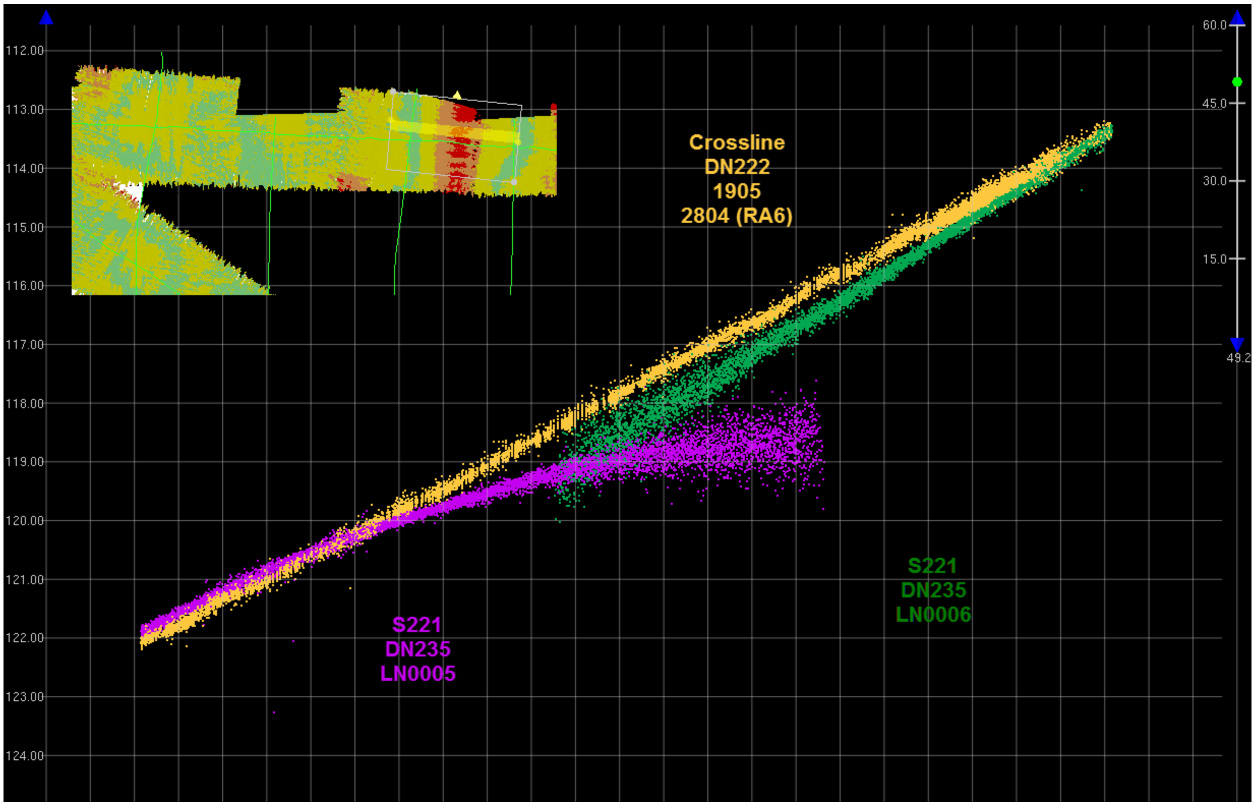


Figure 8: Crosslines in subset editor depicting separation between DN235 S221 lines 0005 and 0006 and DN222 2804 line 1905. This subset location was an exceptionally bad area. Sound velocity artifacts and outerbeam noise are discussed in Section B.2.6.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0 meters	0.14 meters

Table 6: Survey Specific Tide TPU Values

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

Table 7: Survey Specific Sound Speed TPU Values

Uncertainty values of submitted, finalized grids were calculated in CARIS using the "Greater of the Two" between uncertainty and standard deviation (scaled to 95%). To visualize the locations in which accuracy requirements were met, for each finalized surface, a custom "IHOness" layer was created, based on the difference between calculated uncertainty of the nodes and the allowable IHO uncertainty (Figure 10). To quantify the extents to which accuracy requirements were met, the preceding "IHOness" layers were queried within CARIS and then exported to Excel (Figure 11). Overall, all data passed for IHO Order 2 and 99.9% of survey H12452 met the accuracy requirements for Order 1 as stated in the HSSDM. Sound velocity artifacts and outerbeam noise may indicate why IHOness failed in some areas.

Figure 9: H12452 met IHO accuracy standards for 99.9% of the data. Green passed the IHO threshold, yellow failed the threshold by less than 0.1 meters, and red failed the threshold by greater than 0.1 meters.

H12452 IHO Accuracy Statistics					
Resolution (m)	Depth range (m)	IHO Order	Number of nodes	Nodes satisfying IHO accuracy	Percent nodes satisfying IHO accuracy
4	36 - 80	Order 1a	11,724,807	11,720,163	100.0%
8	72 - 160	Order 1a	1,245,680	1,240,780	99.6%
8	100 - 160	Order 2	637,284	637,284	100.0%
16	144 - 320	Order 2	37,675	37,946	100.7%
		TOTAL:	13,645,446	13,636,173	99.9%
		TOTAL (by area):	276,965,232	276,646,704	99.9%

Figure 10: Summary table showing the percentage of nodes satisfying the indicated IHO accuracy level, sub-divided by the appropriate depth ranges. 99.9% of the data passed IHO accuracy requirements.

B.2.3 Junctions

Junction comparisons were completed for surveys H12447, H12453, H12451, and H11687 (FAIRWEATHER, 2006), Figure 12. Surveys H12447, H12453, and H12451 were acquired concurrently with H12452. Depth comparisons were performed using CARIS difference surfaces compiled at the finest resolution for the depth range. Statistics were computed in CARIS, then exported to MS Excel for analysis. For the surveys acquired this year, multibeam was examined in CARIS Subset Editor for consistency and agreement.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H11687	1:135000	2006	NOAA Ship FAIRWEATHER	W
H12447	1:40000	2012	NOAA Ship RAINIER	SE
H12453	1:40000	2012	NOAA Ship RAINIER	S
H12451	1:40000	2012	NOAA Ship RAINIER	E

Table 8: Junctioning Surveys

H11687

A 16-meter surface of data acquired during survey H12452 was compared with a 16-meter surface of FAIRWEATHER survey H11687. Overlap between survey H12452 and H11687 averaged 245 meters along the western border of H12452 (Figure 13). The average difference in depth is -0.72 meters (H11687 being deeper), with a standard deviation of 0.49 meters (Figure 14). Depths for the junction range from 140 to

160 meters. The Descriptive Report for FAIRWEATHER survey H11687 indicates that sound velocity casts were taken every 15 minutes. However, velocity errors were still seen in the data. Due to the errors seen in the outerbeams of the data, filters were run on both the port and starboard beams and the remaining errors were manually cleaned in CARIS HIPS, as described in the Descriptive Report. It seems likely that remaining outerbeam noise and sound velocity problems in FAIRWEATHER survey H11687, combined with sound velocity issues in the outerbeams of survey H12452 has led to a discrepancy in the overlap between the two surfaces.

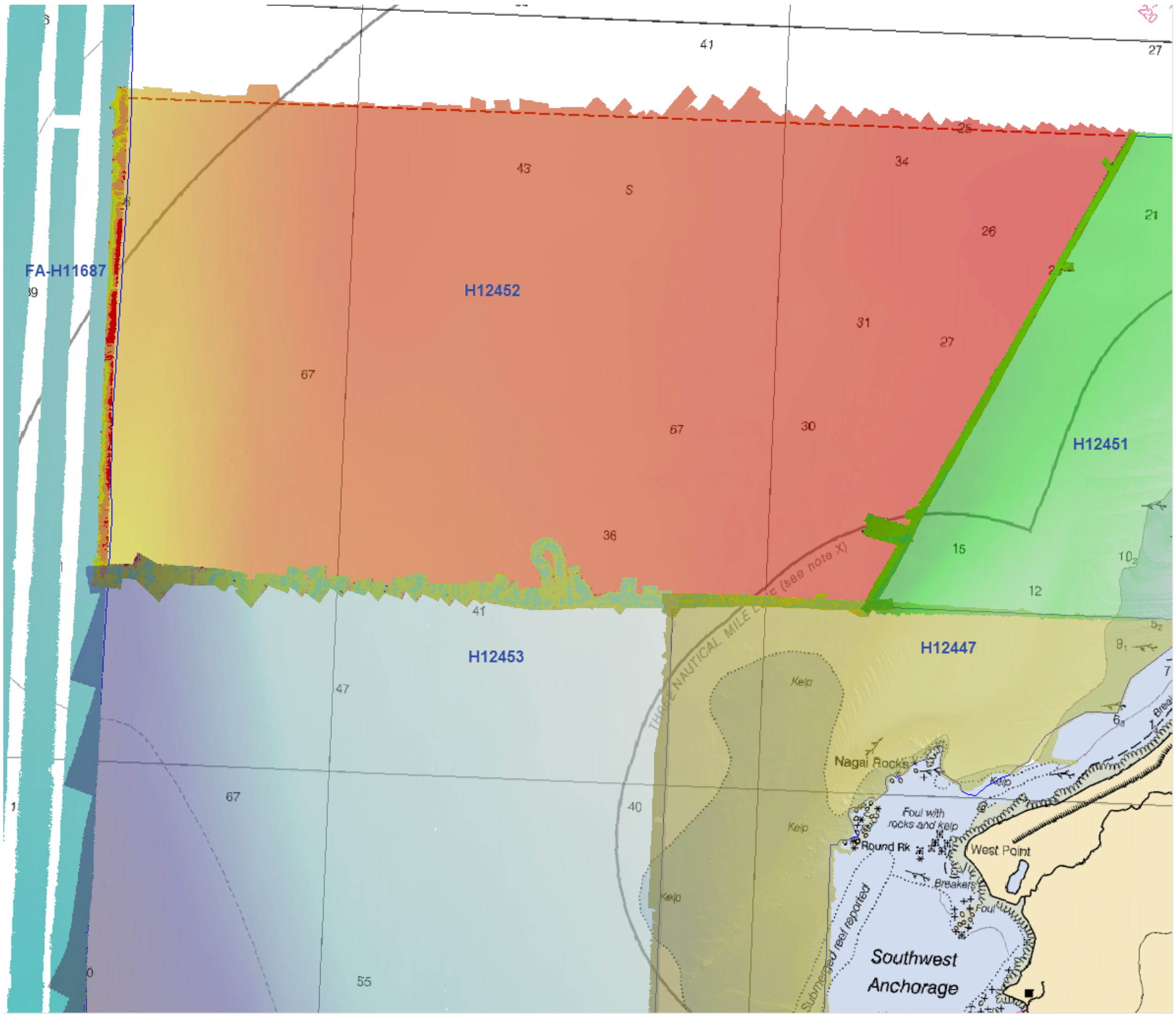


Figure 11: H12452 junctions overview.

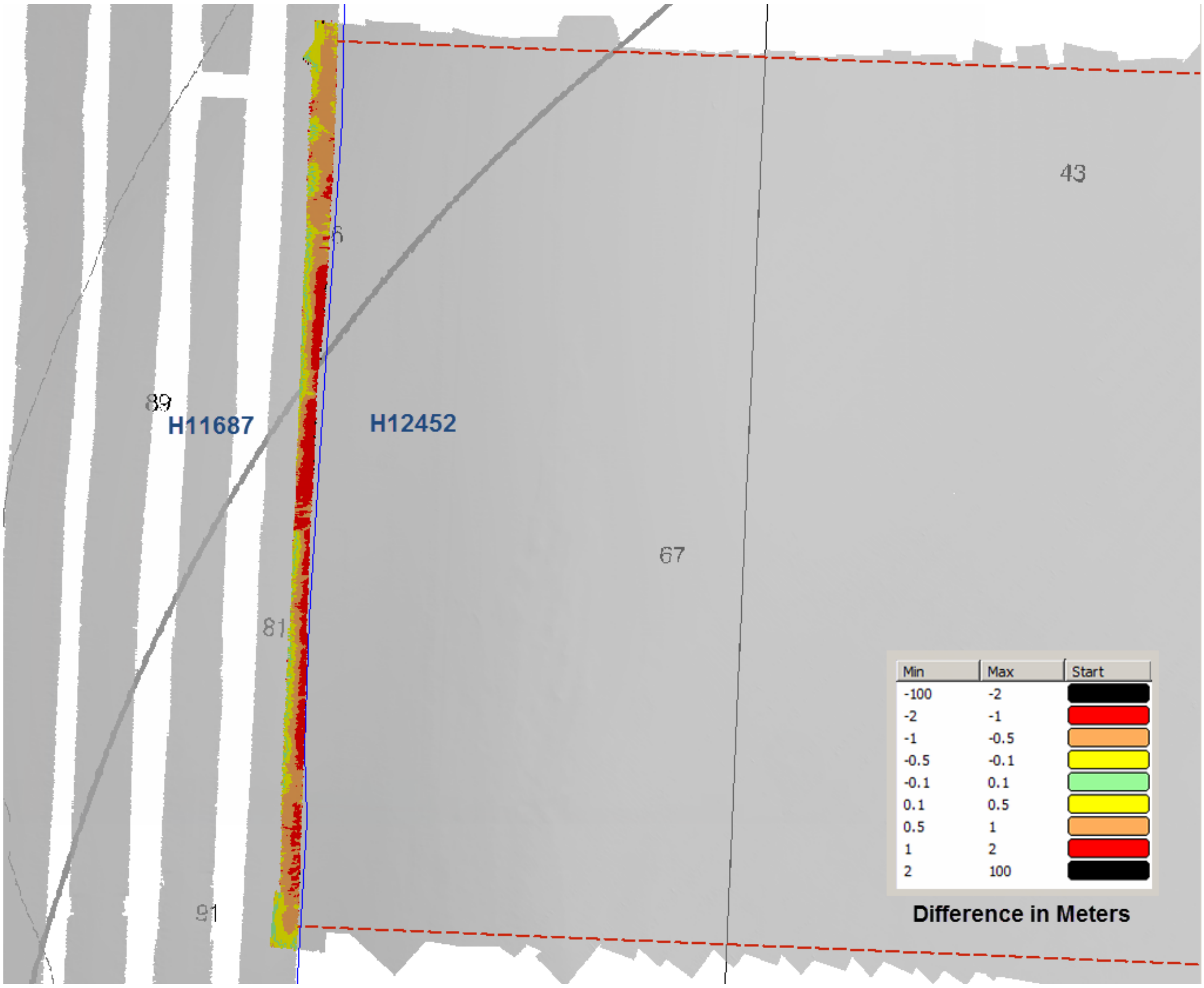


Figure 12: 16-meter difference surface of the junction of survey H12452 and H11687.

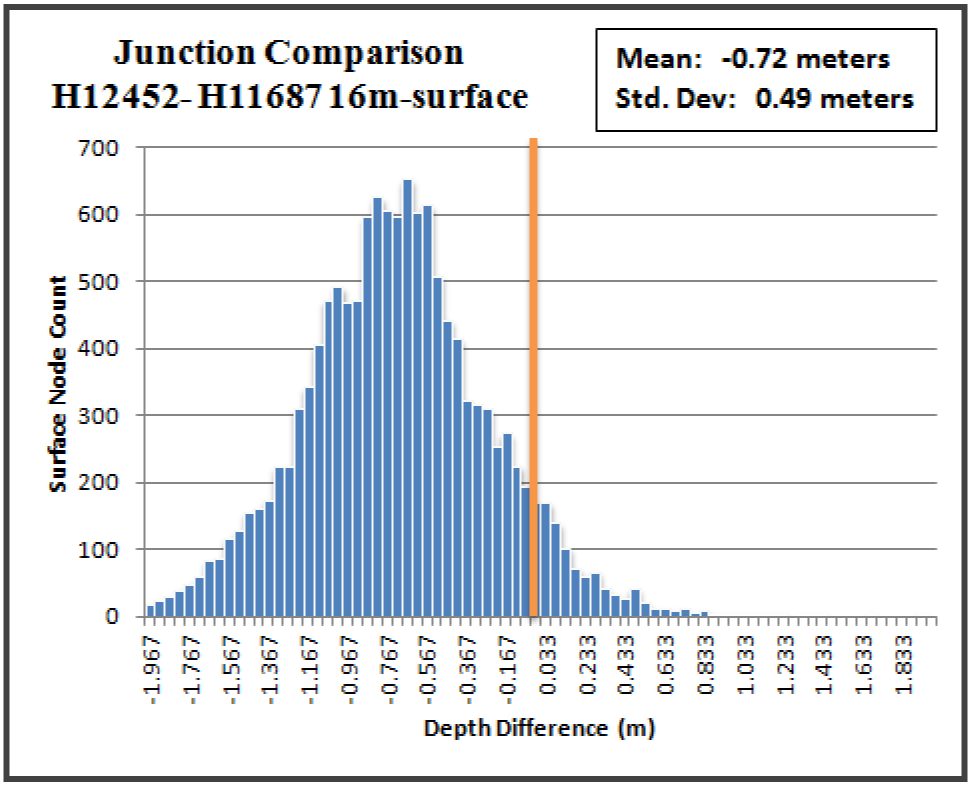


Figure 13: Difference surface statistics between junction of H12452 and H11687. Depths average a difference of -0.72 meters with a standard deviation of 0.49 meters.

<u>H12447</u>

Overlap with survey H12447 ranged from 155 to 260 meters for a 3 kilometer stretch along the SE portion of survey H12452 (Figure 15). A difference surface analysis between CUBE depth surfaces for each survey showed H12452 to be on average 0.01 meters shoaler, with a standard deviation of 0.14 meters (Figure 16). This is well within allowable IHO Order 1 accuracy at these depths.

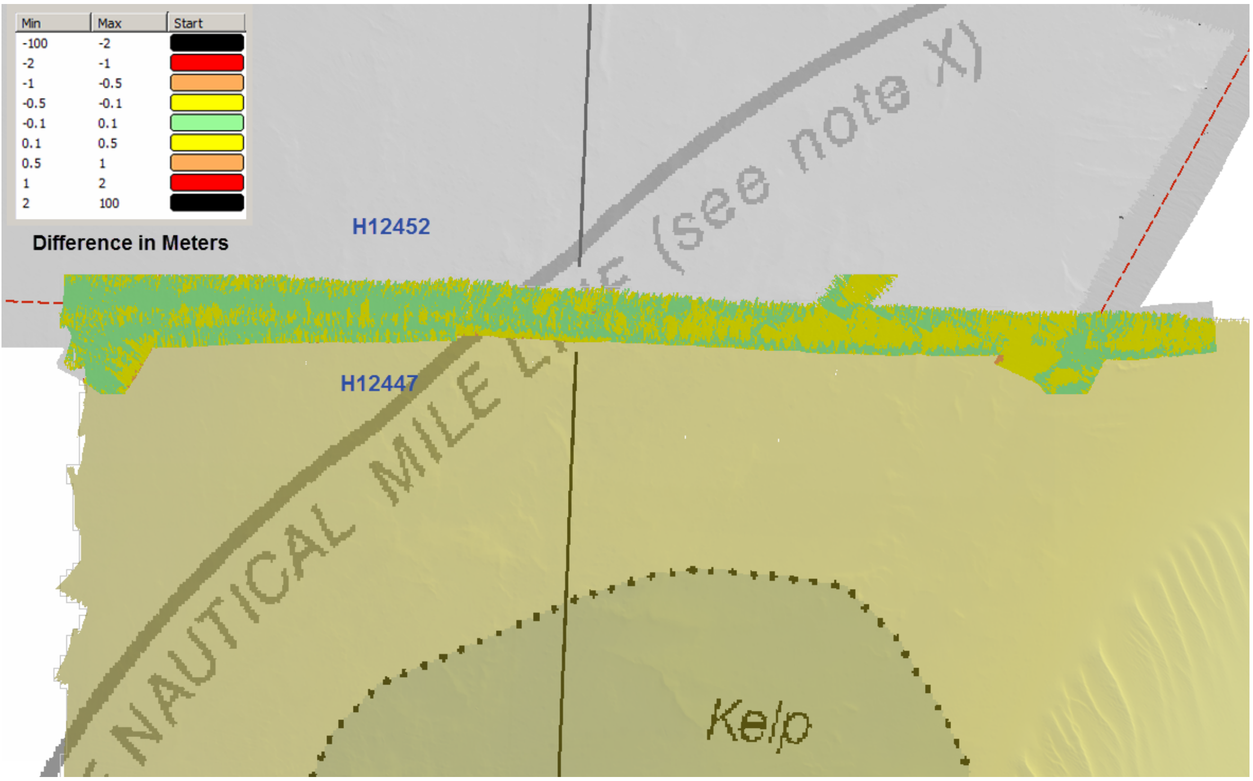


Figure 14: 4-meter difference surface of the junction of survey H12452 and H12447.

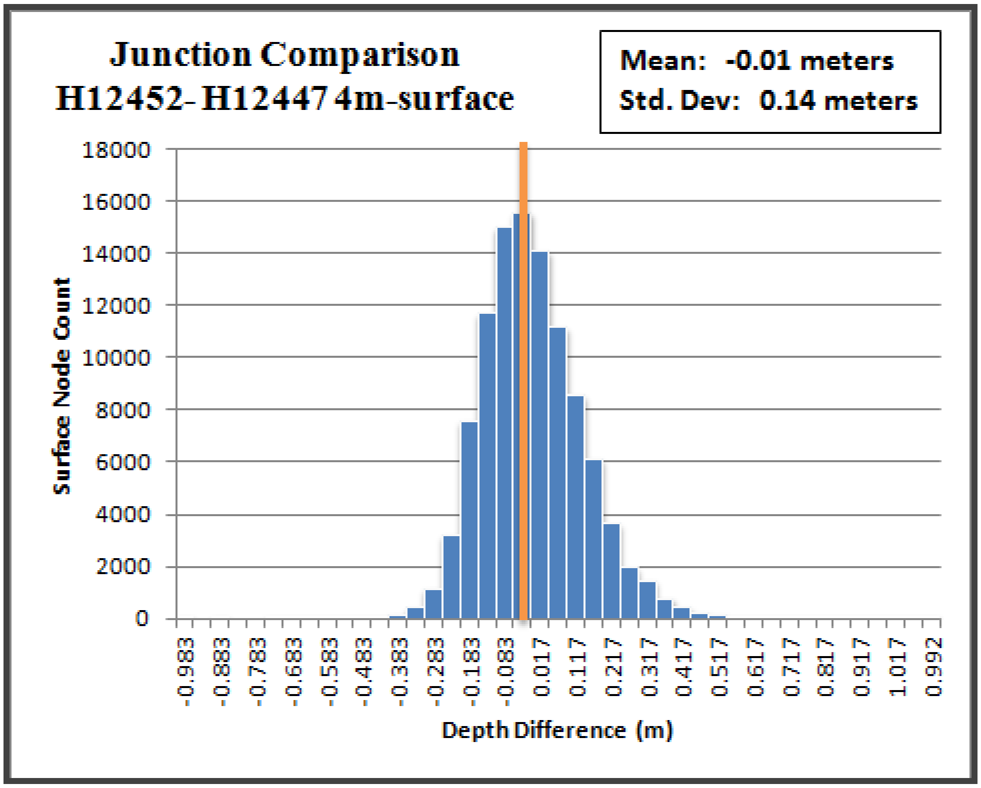


Figure 15: Difference surface statistics between junction H12452 and H12447. Average depth differences were -0.01 meters (H12452 being shoaler) with a standard deviation of 0.14 meters.

<u>H12453</u>

Overlap with survey H12453 averaged 400 meters across, along the SW border of survey H12452 (Figure 17). Depths for the junction range from 65 to 165 meters. A difference surface analysis between CUBE depth surfaces for each survey showed average depths between the two surveys to be the same (0.00 meters), with a standard deviation of 0.78 meters (Figure 18). This is well within allowable IHO Order 1 accuracy at these depths.

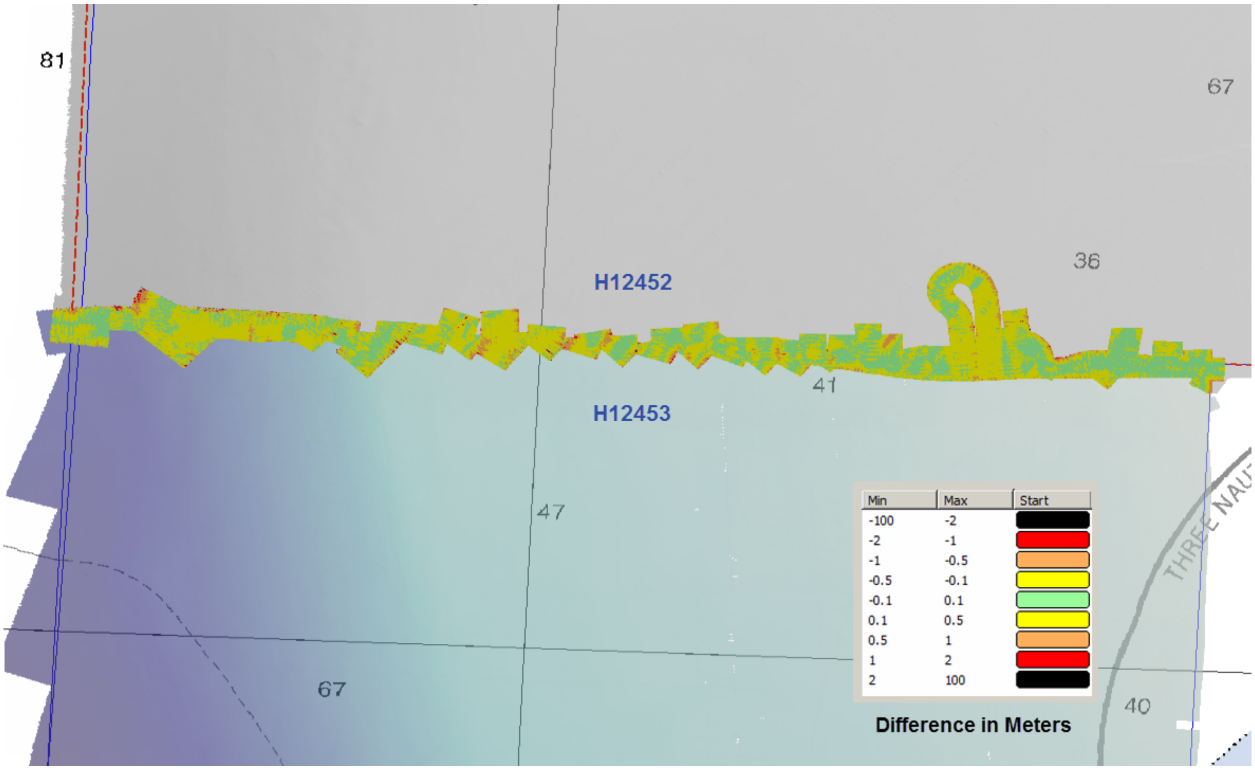


Figure 16: 4-meter difference surface of the junction of survey H12452 and H12453 in meters.

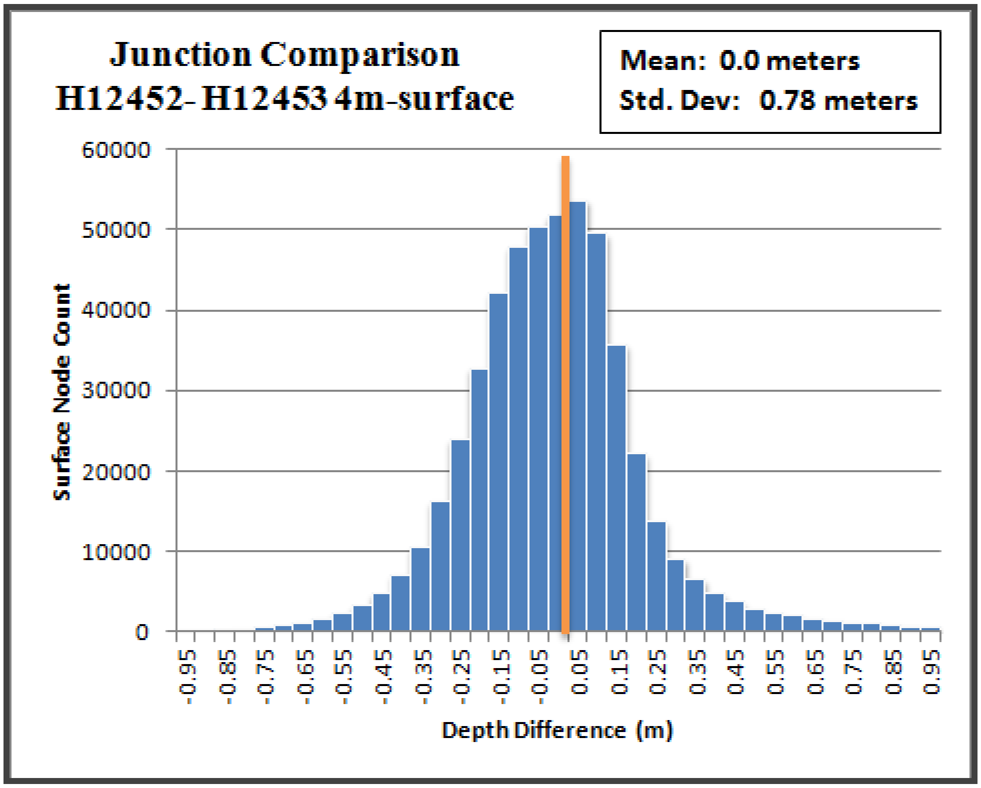


Figure 17: Difference surface statistics between junction H12452 and H12453. Depths average a difference of 0.0 meters with a standard deviation of 0.78 meters.

H11687 is a prior survey which has been applied to the chart. It was not treated as a junctional survey in compilation of the chart update product.

H12451

Overlap with survey H12451 ranged from 160 to 260 meters along the eastern boundary of survey H12452 (Figure 19). A difference surface analysis between CUBE depth surfaces for each survey showed H12452 to be on average 0.01 meters shoaler, with a standard deviation of 0.66 meters (Figure 20). This is well within allowable IHO Order 1 accuracy at these depths.

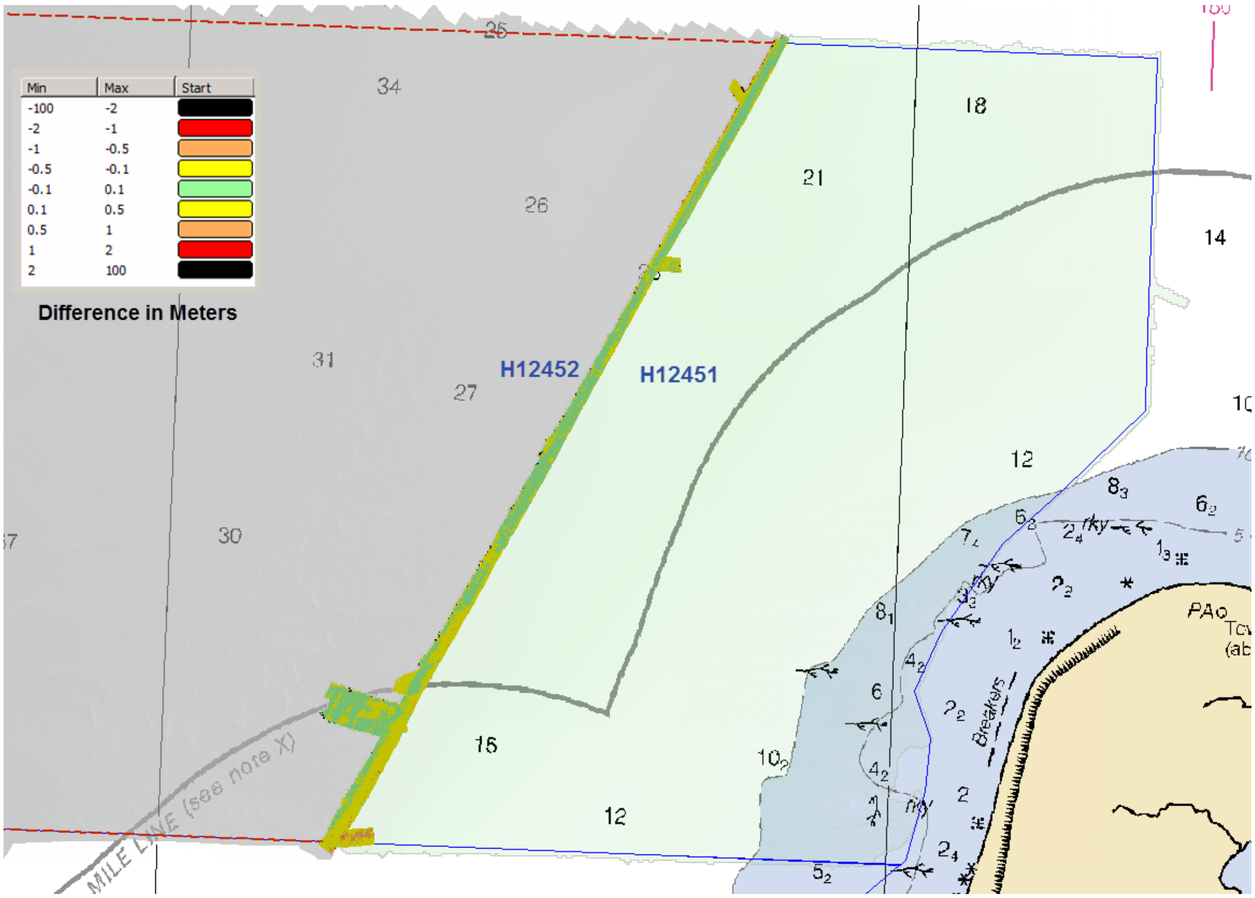


Figure 18: 4-meter difference surface of the junction of survey H12452 and H12451 in meters.

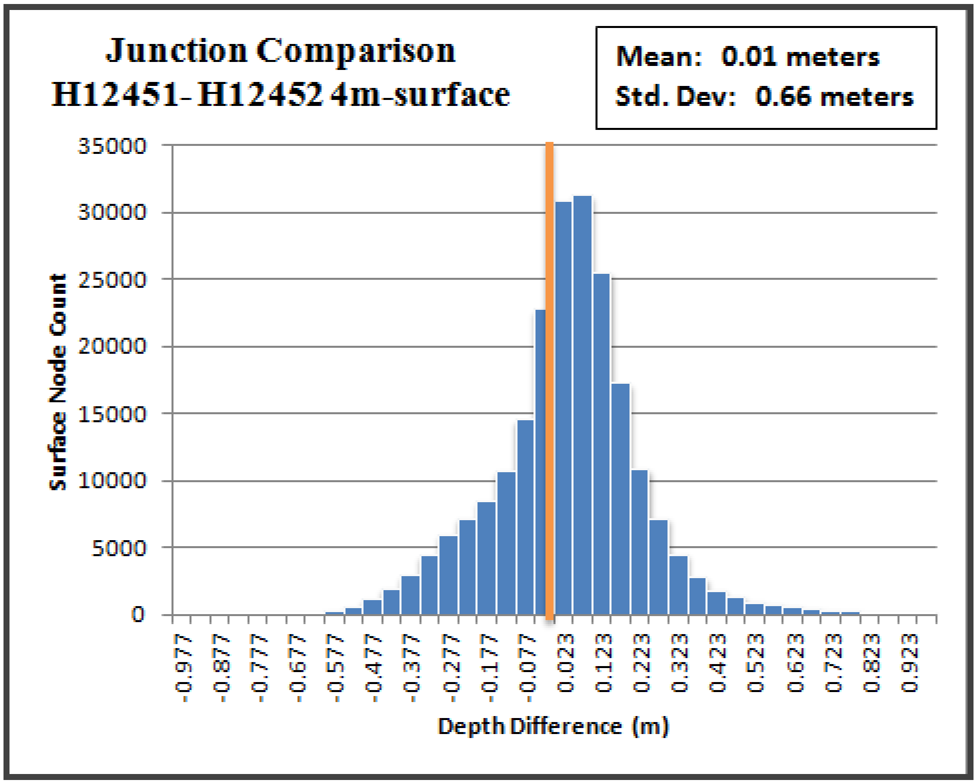


Figure 19: Difference surface statistics between junction H12452 and H12451. Depths average a difference of 0.01 meters with a standard deviation of 0.66 meters.

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

Kongsberg EM710 Data Artifact

At the time of this writing, there is a suspected integration problem within RAINIER's workflow between acquired EM710 multibeam data (integrated with an Applanix POS M/V), and later processing said data within CARIS HIPS. The result is an apparent oscillation of the outerbeams, which in some cases exceeded ±0.50 meters in magnitude (Figure 21). For a further discussion, refer to Section B.3.1.1 - Processing EM710 data with CARIS SVC Module.

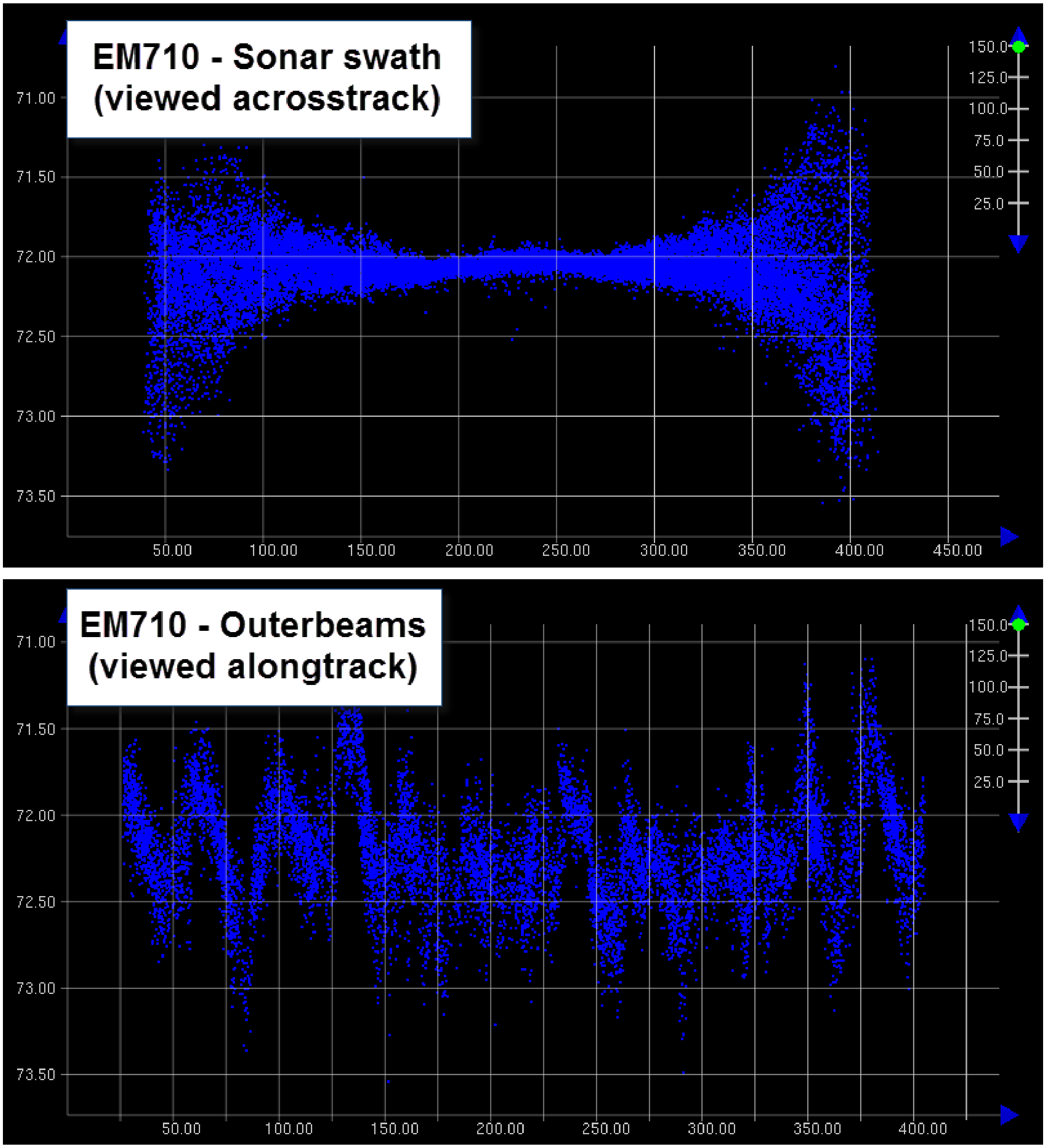


Figure 20: A single line of EM710 data [DN219 - Line 0022]. When viewed acrosstrack the data appears to be experiencing outerbeam scattering (top); however, when viewed alongtrack, an oscillation associated with the Rainier EM710 artifact is seen (bottom).

<u>Sound Speed Profile Failure</u>

Eleven of the 232 sound speed casts acquired by the ship were not applied to the ship's data because of an inaccurate salinity profile. In these erroneous casts, the MVP200 did not acquire the correct salinity, skewing the sound speed profile (Figure 22). These inaccurate casts caused sound velocity artifacts within the data as seen in Figures 23 and 24. These casts were identified and removed from the final concatenated

SVP file and not applied to the survey. It is worth noting, a few weeks after acquisition concluded on survey H12452, the sound speed sensor within the MVP200 physically failed and was taken out of service.

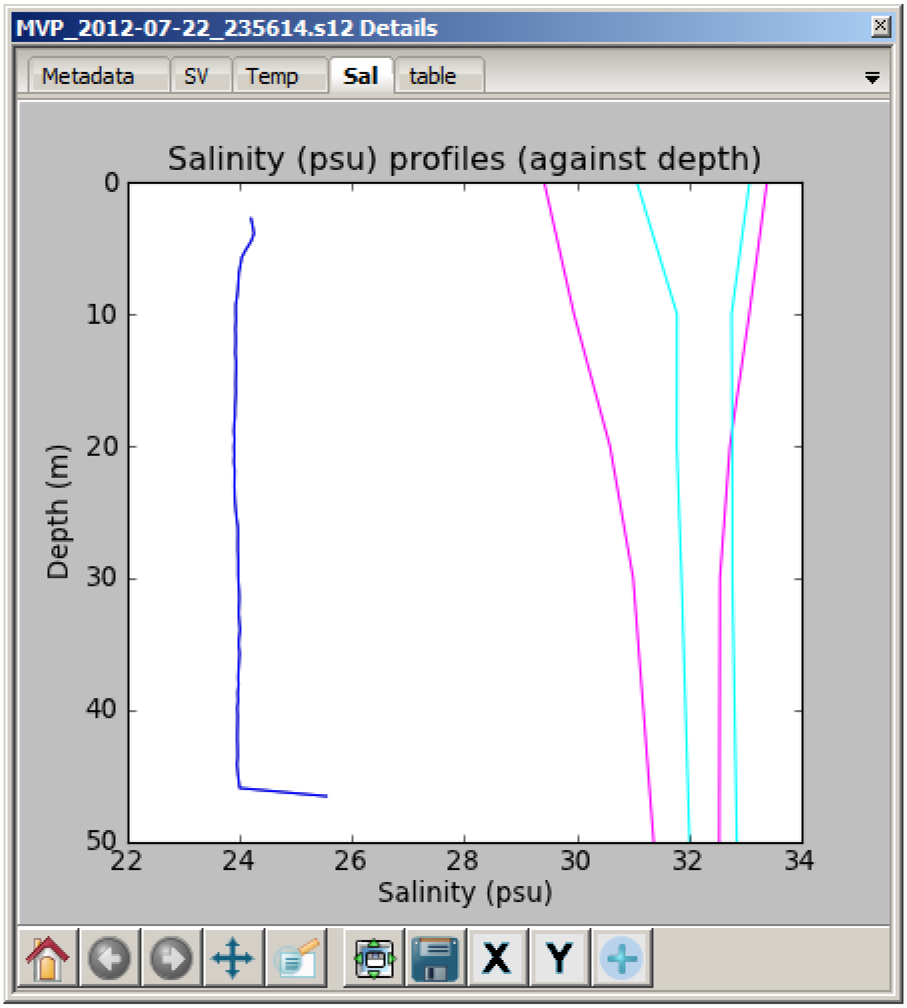


Figure 21: A representative incorrect salinity profile, likely caused by a failing sensor. The associated sound speed cast was removed from survey H12452.

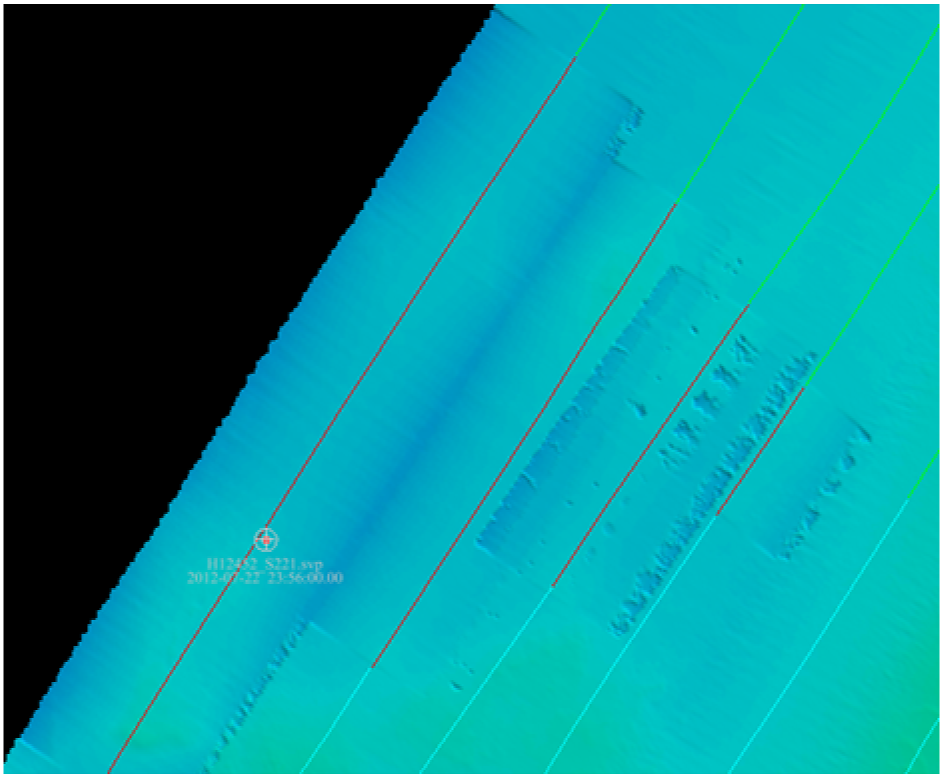


Figure 22: Prior to cast removal, data artifact caused by inaccurate SV profile.

Figure 23: Inaccurate SV profile removed and new profile applied.

B.2.6 Factors Affecting Soundings

Sound Speed Data Artifiacts

Due to the dynamic nature of the sound speed within the survey area, there are associated data artifacts seen within the data. These artifacts are most pronounced in the outer beams, and generally present themselves in the form of a “frown” (Figure 25). In areas where the CUBE surface was negatively impacted by the outer beams, the data was flagged as rejected to bring the surface back to the "true" seafloor. In some areas, outer beams were deflected by up to 0.30 meters; however, it is in the opinion of the Hydrographer that the data meets the requirements set forth in the HSSDM and should supersede charted data.

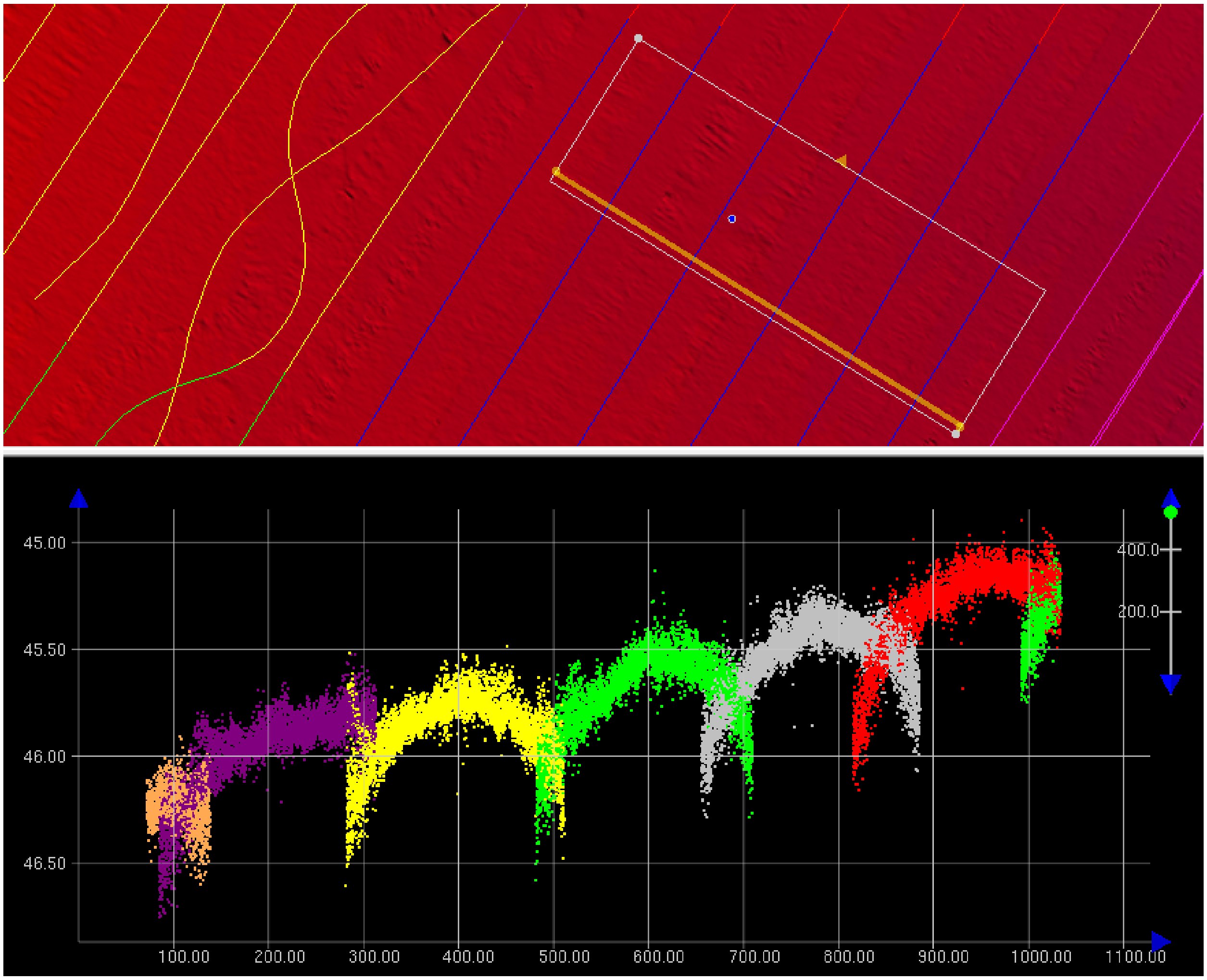


Figure 24: Sample sound speed artifact seen in data acquired with the EM710 on DN195.

<u>Modified EM710 Waterline Value</u>

A routine part of acquisition with the EM710 is a measurement of the ship's waterline immediately before commencing operations, or immediately after any evolution that is suspected to impact said waterline (e.g. the deployment/recovery of launches); see 2012 RA DAPR. On DN218, however, a waterline measurement was taken that was suspected to be in error (-0.077 meters). Though the day was particularly calm, the measurement was not in keeping with historic values and led to a vertical shift in the data acquired by the ship on this day. To address this, an average (-0.228 meters) of the waterline value taken on this day and a prior day under similar loading conditions was used for DN218 on survey H12452. On several other days (DN176, DN204, DN224), the waterline value was not properly archived, so, based on the loading conditions and historic values, estimated waterline values were used (-0.155m, -0.200m, -0.170m). These changes were observed to improve vertical agreement in the data for survey H12452 and were properly archived for input into the HIPS vessel file.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: During ship acquisition, the RAINIER conducted casts approximately every 15 minutes, except in the case of line number 0030 on DN176 (Figures 26), where data was also acquired across survey H12453. Therefore, the applied cast was taken outside of the survey area. Cast frequency with launch data was dictated by changes of more than two meters per second in sound speed at the surface. This did not exceed the Field Procedures Manual's dictated frequency of four hours.

Casts were grouped by vessel and applied within CARIS using the "Nearest in distance within time (4 hours)" profile selection method. Refer to the DAPR for more information on EM710 sound speed correction.

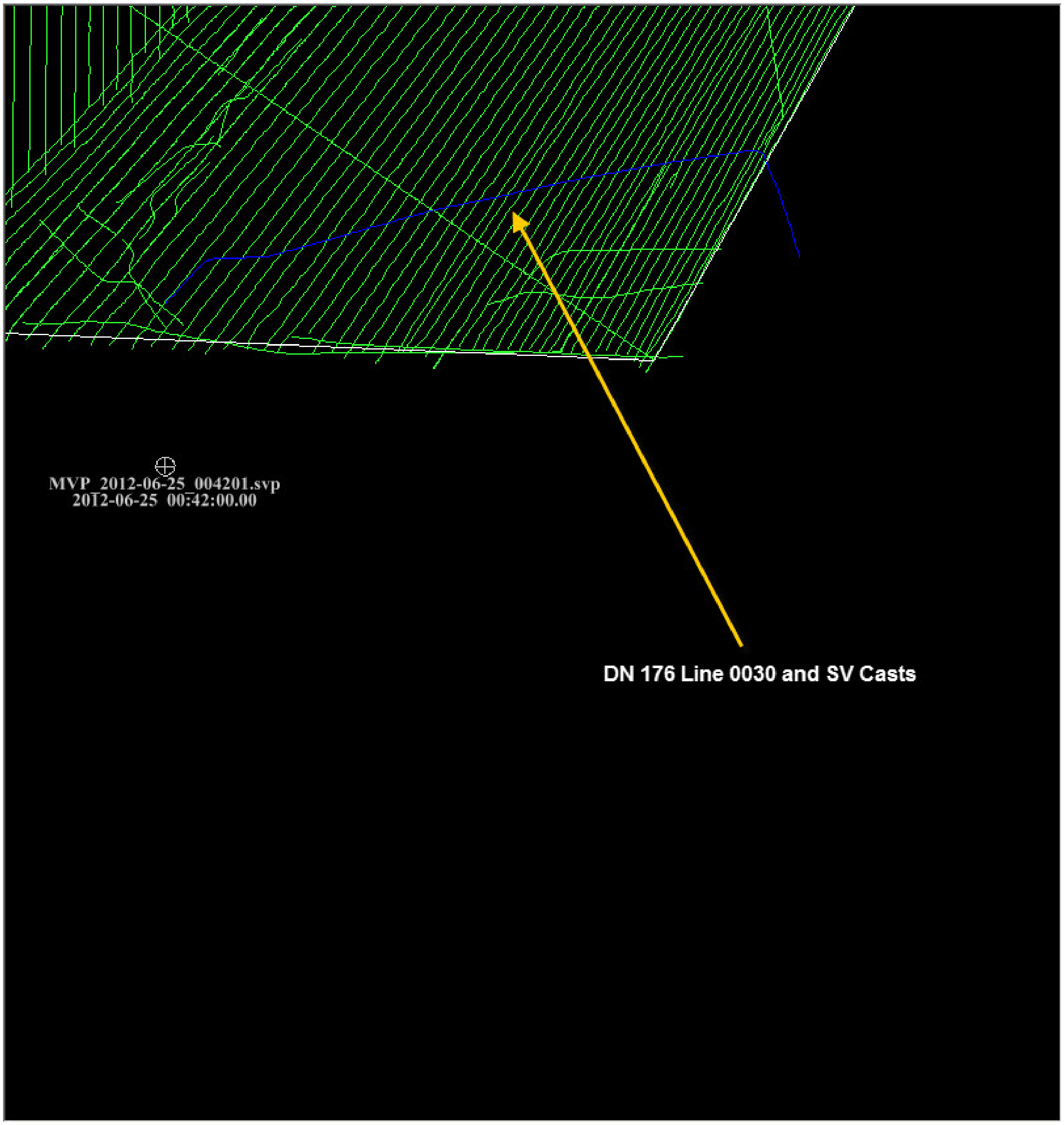


Figure 25: Sound speed cast acquired outside the survey limits of H12452.

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

B.3.1.1 - Processing EM710 data with CARIS SVC Module

At the time of this writing, both Kongsberg and CARIS have confirmed there is an error in the HIPS implementation of the Simrad Sound Velocity Correction (SVC) module, particularly when True Heave is applied to EM710 data (see Supplemental Correspondences - EM710_SV_Error_in_CARIS.pdf and TrueHeave_Error_in_CARIS.pdf). To circumvent this problem, all EM710 data was sound velocity corrected using a custom Simrad SVC-free license, which forced HIPS to use the CARIS (technically, OMG) SVC module. Figure 27 shows a comparison between the best results achieved when using the Simrad SVC module (top), and CARIS SVC module (bottom). It should be noted that a residual artifact still persists within the outerbeams (see Section B.2.5.1 - Kongsberg EM710 Data Artifact), and is being actively investigated by both ship's personnel and appropriate groups ashore.

B.3.1.2 - Lines without True Heave and the Heave Offset Vector

As mentioned in Section B.3.1.1, all EM710 lines were processed using the CARIS SVC module, with True Heave being applied. When EM710 data is processed in this manner, the heave offset vector within the CARIS HIPS Vessel File (HVF) should be left as zero, see Figure 28 - red highlight. However, if True Heave is unavailable, EM710 data (processed with the CARIS SVC module) with a zeroed heave offset vector will induce an artifact (Figure 29 - bottom). To mitigate this artifact, the offset vector between the ship's reference point and the sonar's transmit array was placed into the heave offset vector of the CARIS HVF (Figure 28 - blue highlight). Five lines in survey H12452 had corrupted True Heave files (DN204 - Line 0008; DN219 - Lines 0011, 0016, 0020; and DN224 - Line 0000), see Figure 30. For these lines with questionable True Heave, the True Heave records were deleted from the HDCS data and were reprocessed with the non-zero heave offset vector, resulting in a marked improvement in the data quality (Figure 29 - top).

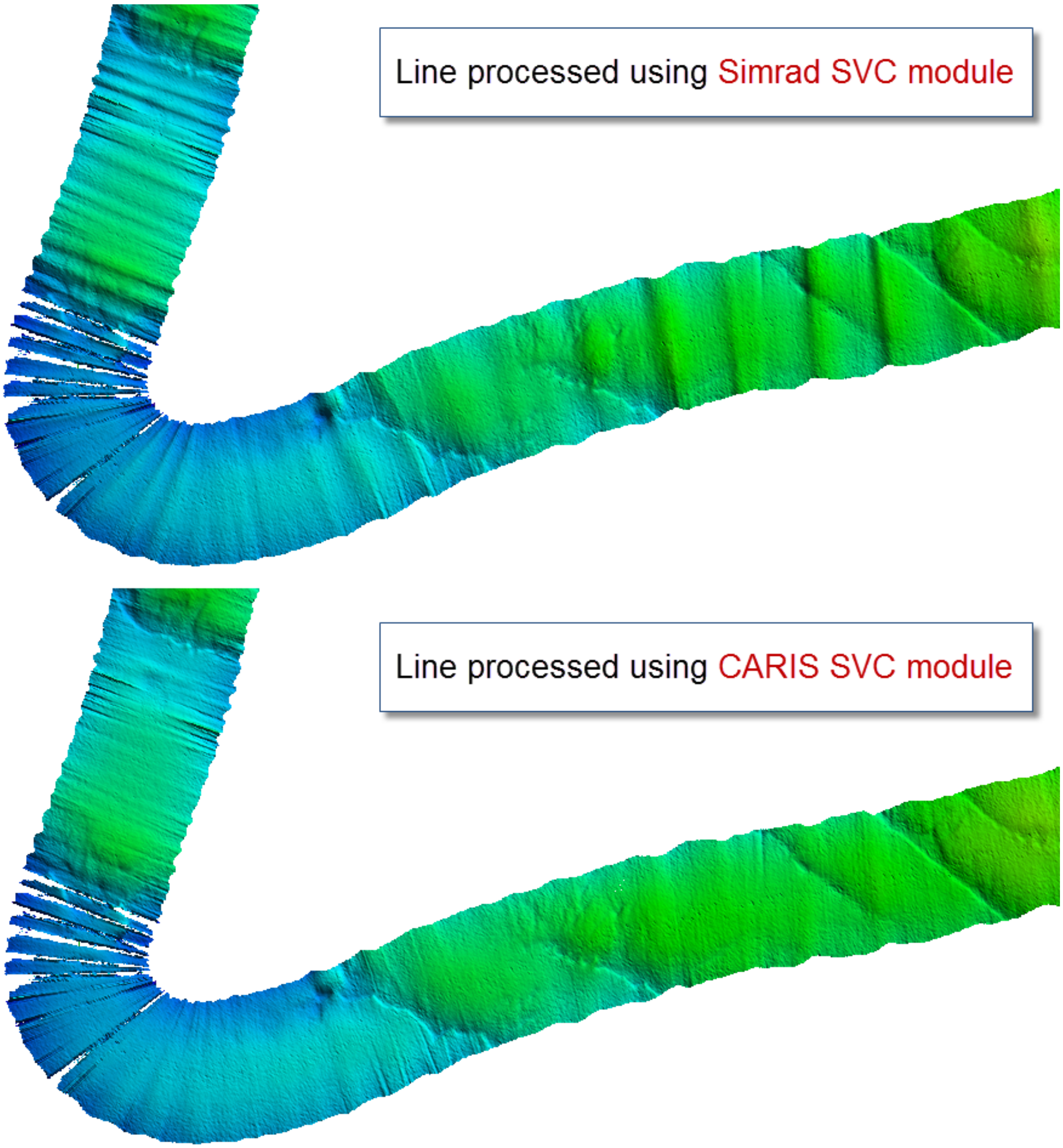
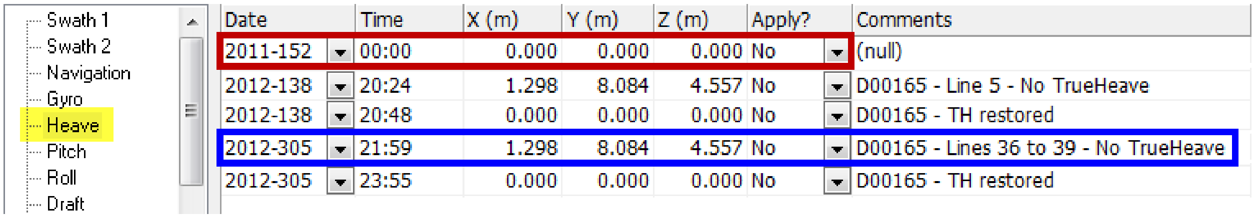


Figure 26: Comparison of gridded data when using the Simrad (top) versus CARIS (bottom) sound velocity correction module. Surfaces are not from survey H12452, but are representative of the artifact.



Date	Time	X (m)	Y (m)	Z (m)	Apply?	Comments
2011-152	00:00	0.000	0.000	0.000	No	(null)
2012-138	20:24	1.298	8.084	4.557	No	D00165 - Line 5 - No TrueHeave
2012-138	20:48	0.000	0.000	0.000	No	D00165 - TH restored
2012-305	21:59	1.298	8.084	4.557	No	D00165 - Lines 36 to 39 - No TrueHeave
2012-305	23:55	0.000	0.000	0.000	No	D00165 - TH restored

Figure 27: CARIS vessel file showing configurations for both EM710 data logged with True Heave (red) and without True Heave (blue).

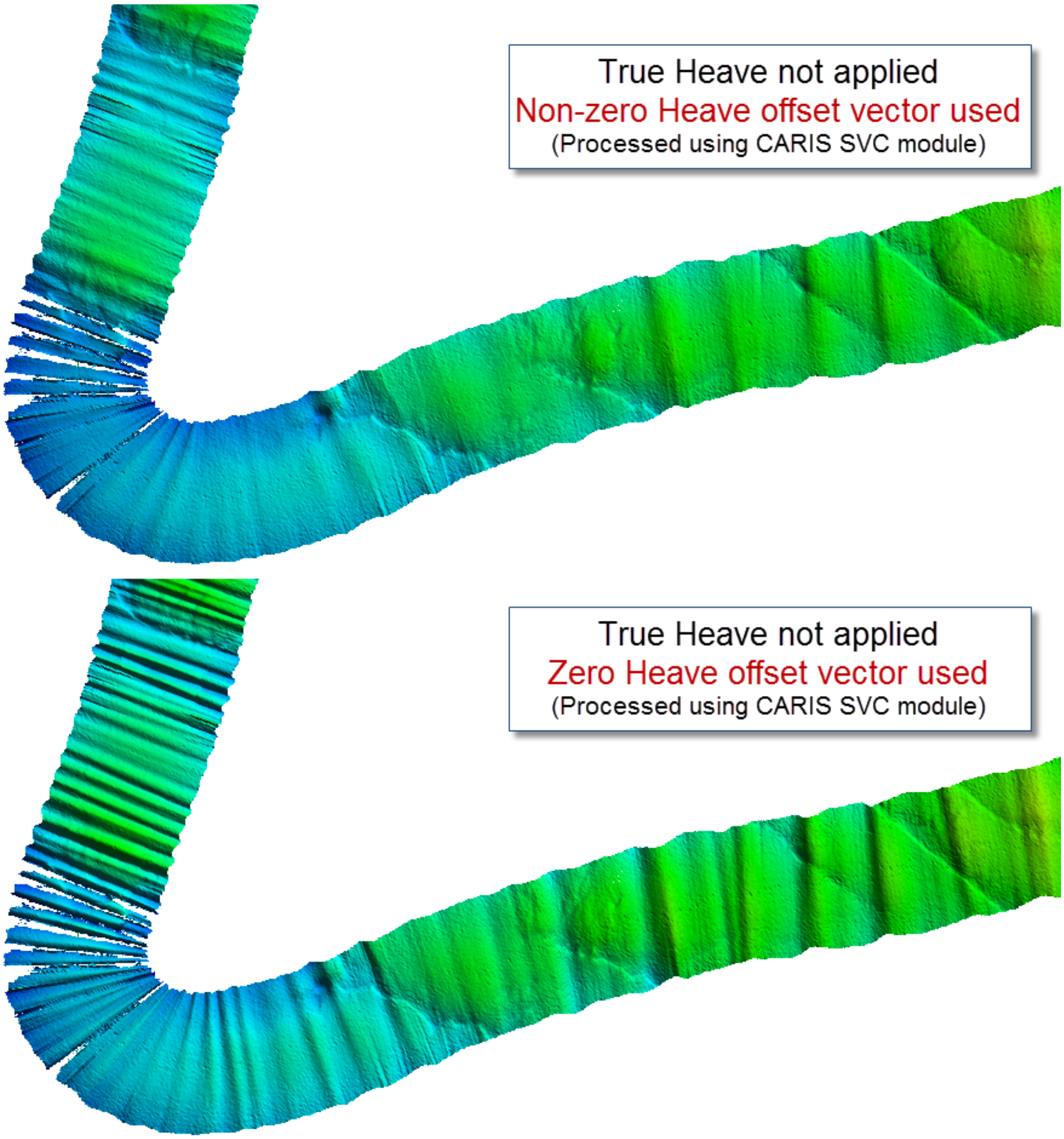


Figure 28: Comparison of gridded data when the CARIS sound velocity correction module is used, in the absence of True Heave being applied, both with (top) and without (bottom) a non-zero heave offset vector entered into the CARIS vessel file. Surfaces are not from survey H12452, but are representative of the artifact.

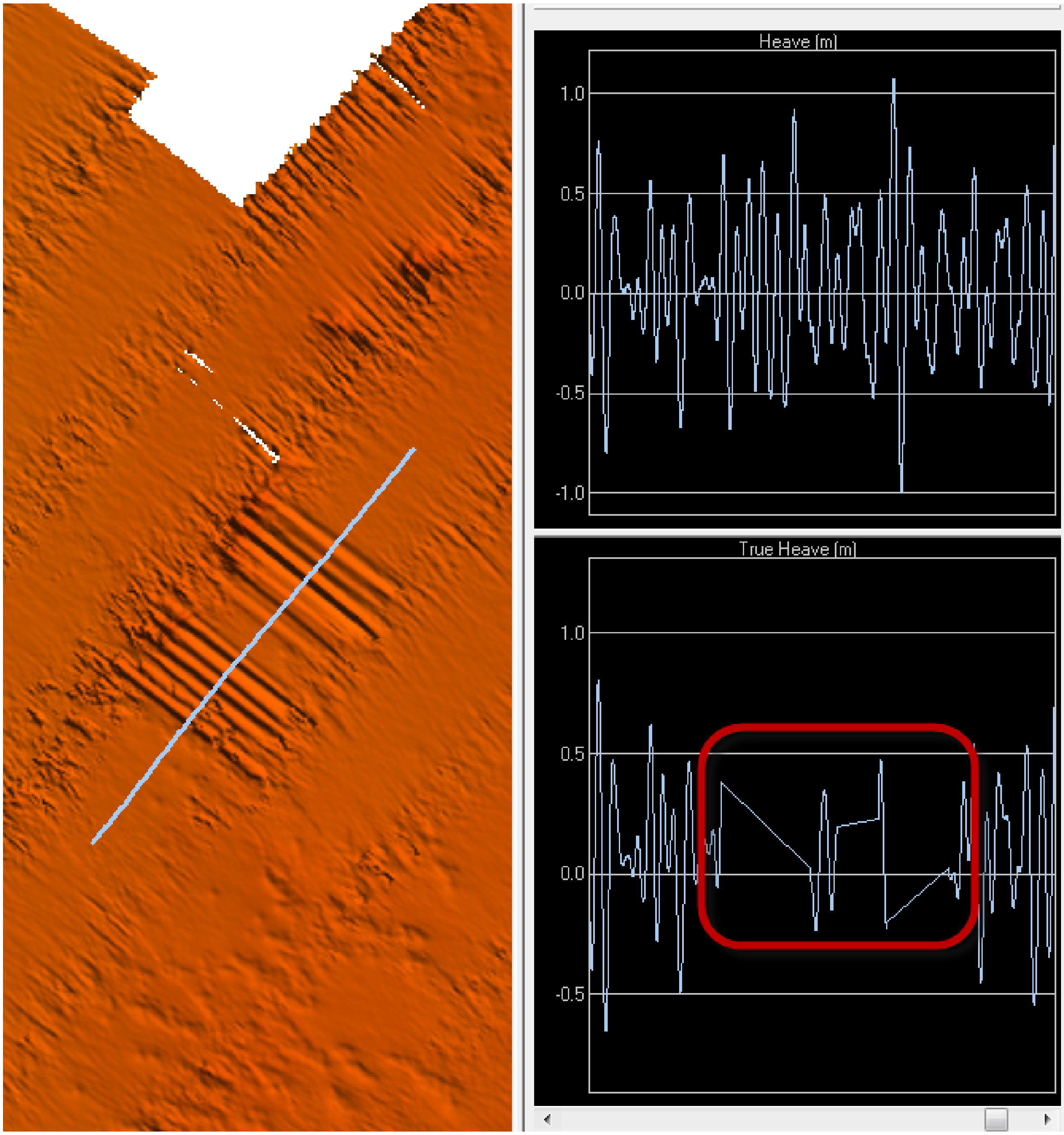


Figure 29: Sample line within survey H12452 in which momentary gaps in the True Heave file led to vertical artifacts within the surface. True Heave was removed from all such lines.

B.3.2 Calibrations

The following calibrations were conducted after the initial system calibration discussed in the DAPR:

Calibration Type	Date	Reason
patch test	2012-06-25	Patch test completed to correct for alignment biases.

Table 9: Calibrations not discussed in the DAPR.

A new patch test for the Kongsberg EM710 was acquired on DN177 and was processed and entered into the SIS acquisition software on DN178 (See DAPR for additional information). One line from H12452 was acquired prior to this patch test. Patch test correction values, determined in CARIS, were entered into the HVF under DN176 to compensate for alignment biases not accounted for in SIS.

B.4 Backscatter

Backscatter data was acquired, but was not formally processed by RAINIER personnel. However, periodic spot checks were performed to ensure backscatter quality. Backscatter data will be sent to NGDC for archival.

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 Catalogue Control Version 5.2 and NOAA Profile Product Version 2.0.

This survey was processed using CARIS HIPS 7.1 - Service Pack 2 - Hotfix 6. To prevent the use of the Simrad SVC, a custom HIPS license (CARIS_Cwsite1_26_04_2013_14_12_21.sit) was used. All other software programs and versions used for data processing are described in 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
H12452_4m	CUBE	4 meters	40 meters - 170 meters	NOAA_4m	Complete MBES
H12452_8m	CUBE	8 meters	40 meters - 170 meters	NOAA_8m	Complete MBES
H12452_16m	CUBE	16 meters	40 meters - 170 meters	NOAA_16m	Complete MBES
H12452_4m_36Mto80m_Final	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H12452_8m_72Mto160m_Final	CUBE	8 meters	72 meters - 160 meters	NOAA_8m	Complete MBES
H12452_16m_144to320m_Final	CUBE	16 meters	144 meters - 320 meters	NOAA_16m	Complete MBES
H12452_16m_Combined	CUBE	16 meters	40 meters - 170 meters	NOAA_16m	Complete MBES

Table 10: Submitted Surfaces

An 8m final combined surface was created during the Survey Acceptance Review and it was used for the cartographic compilation of this chart update product.

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	9459450

Table 11: NWLON Tide Stations

File Name	Status
9459450.tid	Final Approved

Table 12: Water Level Files (.tid)

File Name	Status
P133RA2012CORP.zdf	Final

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

A request for final approved tides was sent to N/OPS1 on 08/22/2012. The final tide note was received on 08/29/2012.

Tide report is appended to this document

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 5N.

The horizontal datum for this project is North American Datum of 1983 (NAD83). To improve positional accuracy, all real time position and attitude data were acquired using POSView and were post processed using precise point positioning (PPP) in POSPac MMS 5.4 (See DAPR for more details). The data on DN194 through DN235 were processed using a version of P1_C1 DCB without an ionospheric model. SBETs and RMS data were applied to all data according to the processes outlined in the DAPR. POSPac SBETs were not applied for DN224 and lines 0009-0017 on DN219 due to a corrupt POS file. DGPS was applied to these lines and no horizontal offsets were evident within the data.

DGPS correctors were used for positioning in real time. The DGPS receiver on S221 was not functioning properly for part of this survey, and was providing corrector information intermittently. During these outages, S221 continued to acquire depth data, with the understanding that positional data would be overwritten with more accurate post-processed position information from POSPac (post-processed positional data, i.e. POSPac SBETs). No positional offsets were noted in any of the data on survey H12452.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Kenai (310 kHz)
Cold Bay (289 kHz)
Kodiak (313 kHz)

Table 14: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

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
16587	1:135000	2	02/2012	10/30/2012	10/27/2012

Table 15: Largest Scale Raster Charts

16587

Chart comparison procedures were followed as outlined in Section 4.5 of the FPM and Section 8.1.4 - D.1 of the HSSDM, using CARIS HIPS. Chart 16587 is the largest scale chart for this area, and the one used for comparison.

Contours and soundings were created from survey H12452 data using CARIS HIPS and visually compared to Chart 16587 soundings (Figures 32 and 33). The surveyed soundings were found to be shoaler than previously charted depths. None of the changes are dangerous to navigation. The Hydrographer recommends that data from H12452 supersede charted data.

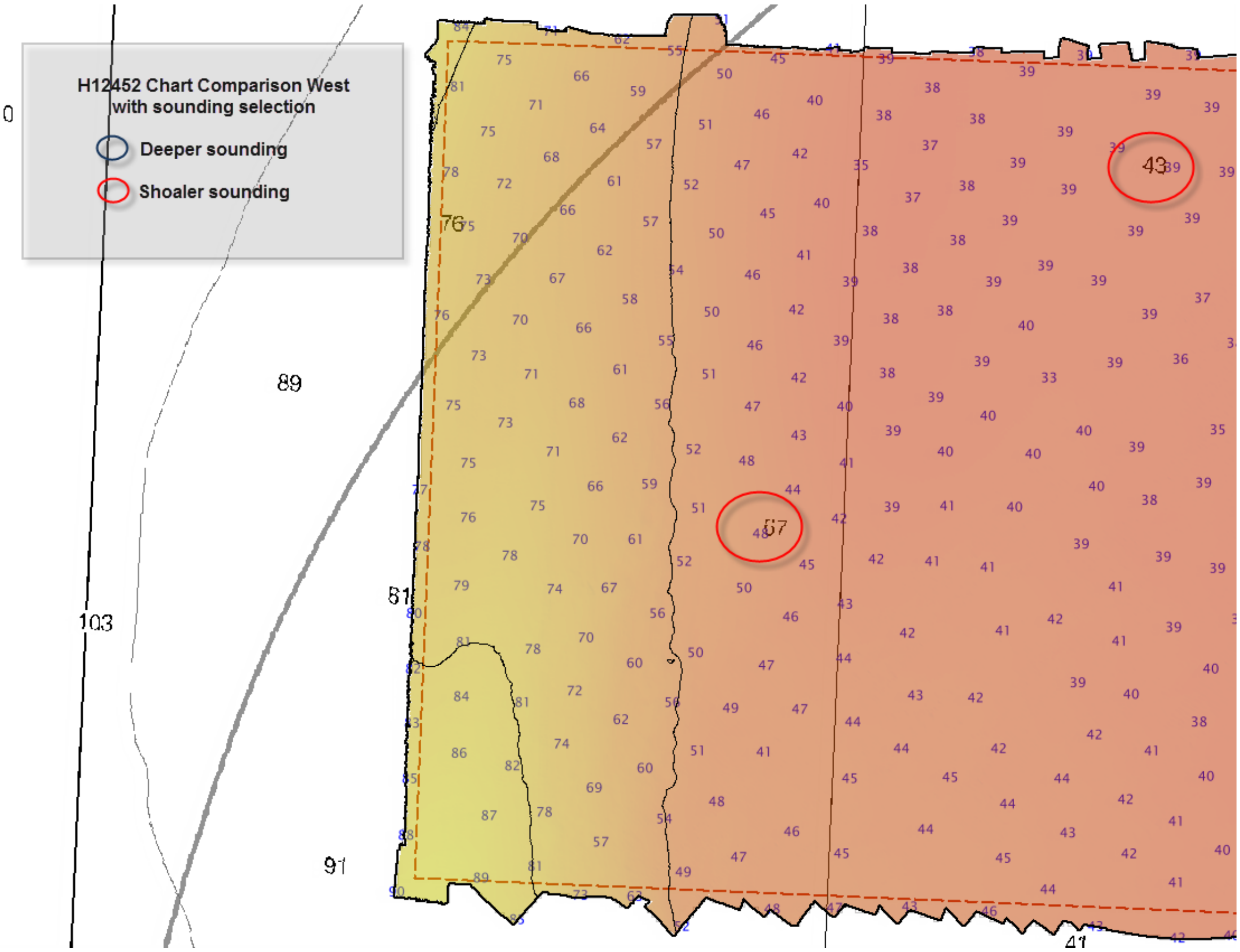


Figure 30: Western comparison of charted (16587) depths to those derived from H12452. All soundings are in fathoms. Chart soundings are in a larger type font while survey soundings are denoted in a smaller blue text. Red circles indicated shoaler survey soundings and blue circles mark deeper than charted soundings.

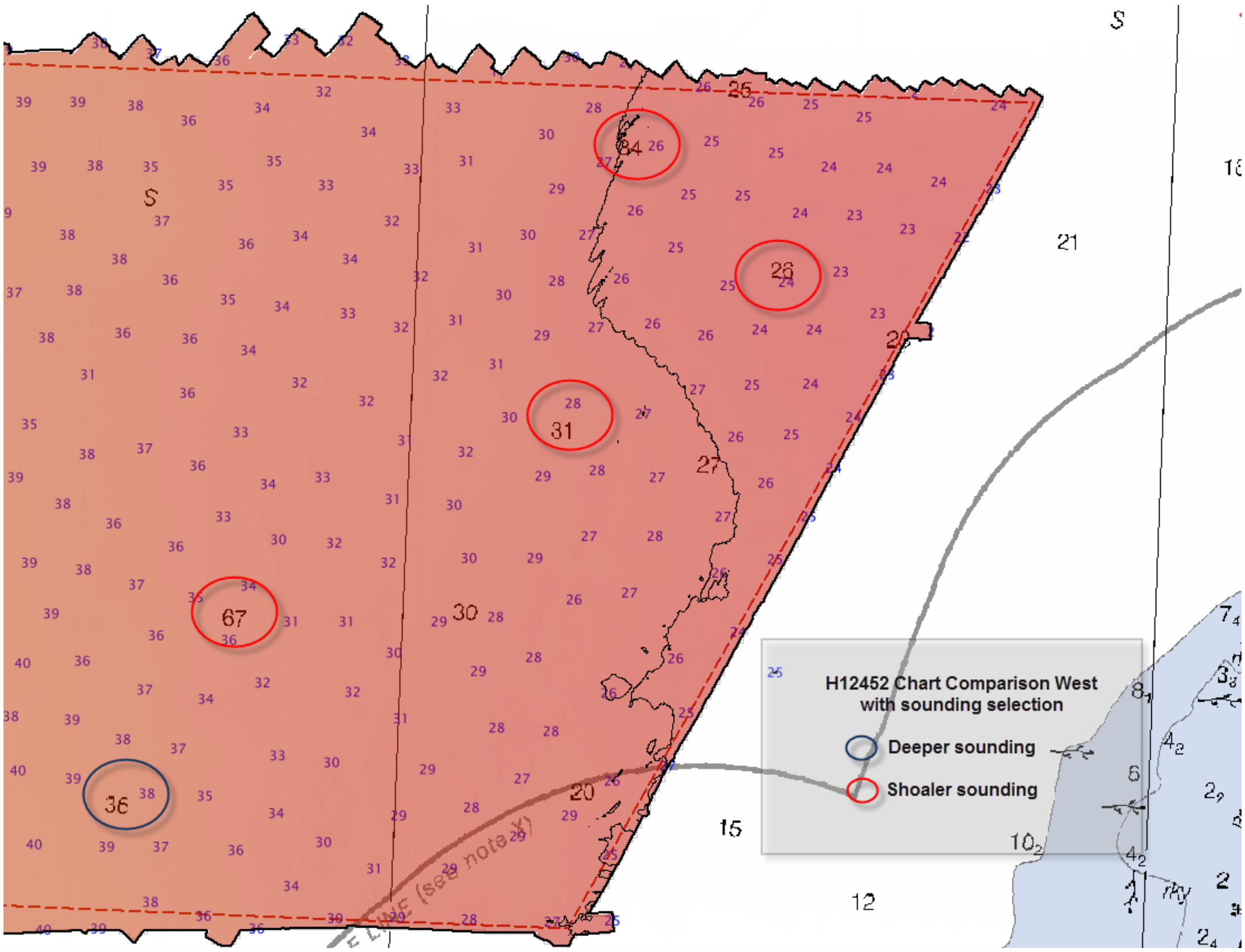


Figure 31: Eastern comparison of charted (16587) soundings to those derived from H12452. All soundings are in fathoms. Chart soundings are in a larger type font, while survey soundings are denoted in a smaller blue text. Red circles indicated shoaler survey soundings and blue circles mark deeper than charted soundings.

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?
US4AK5XM	1:135000	1	01/31/2011	01/31/2011	NO

Table 16: Largest Scale ENCs

<u>US4AK5XM</u>

ENC US4AK5XM coincides with raster Chart 16587. The depths and contours on the ENC match the raster, and the comparison between survey H12452 and the ENC is equivalent to the preceding comparison with Chart 16587

D.1.3 AWOIS Items

No AWOIS items exist 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

Six bottom samples were submitted with the Final Features File, five of which were unproductive. The remaining bottom characteristic was compiled to the chart update product.

D.2 Additional Results

D.2.1 Shoreline

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

Shoreline was not collected for H12452.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

Aids to navigation (ATONs) do not exist for this survey.

D.2.4 Overhead Features

Overhead features do not exist for this survey.

D.2.5 Submarine Features

Submarine features do not 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

There is no present or planned construction or dredging within the survey limits.

D.2.10 New Survey Recommendations

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

D.2.11 New Inset Recommendations

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, Standing and 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	05/20/2013	Richard T. Brennan 2013.05.24 15:24:46 -08'00'
Michael O. Gonsalves, LT/NOAA	Field Operations Officer, NOAA Ship RAINIER	05/20/2013	Michael O. Gonsalves 2013.05.20 11:30:05 -08'00'
James B. Jacobson	Chief Survey Technician, NOAA Ship RAINIER	05/20/2013	James Jacobson I have reviewed this document 2013.05.25 16:02:51 -08'00'
Brandy E. Geiger	Survey Technician, NOAA Ship RAINIER	05/20/2013	Brandy Geiger Digitally signed by Brandy Geiger DN: cn=Brandy Geiger, o=NOAA, ou, email=brandy.e.geiger@noaa.gov, c=US Date: 2013.05.20 13:05:13 -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
TPU	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 : August 27, 2012

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P133-RA-2012
HYDROGRAPHIC SHEET: H12452

LOCALITY: Offshore NW Chirikof Island, Chirikof Island and Vicinity, AK
TIME PERIOD: June 25 - August 22, 2012

TIDE STATION USED: 9459450 Sand Point, AK
Lat. 55° 20.2'N Long. 160° 30.1' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.988 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project OPR-P133-RA-2012, H12452, during the time period from June 25 to August 22, 2012.

Please use the zoning file P133RA2012CORP submitted with the project instructions for OPR-P133-RA-2012. Zones SWA175 and SWA180 are the applicable zones for H12452.

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).

HOVIS.GERALD.THOMAS.1365860250

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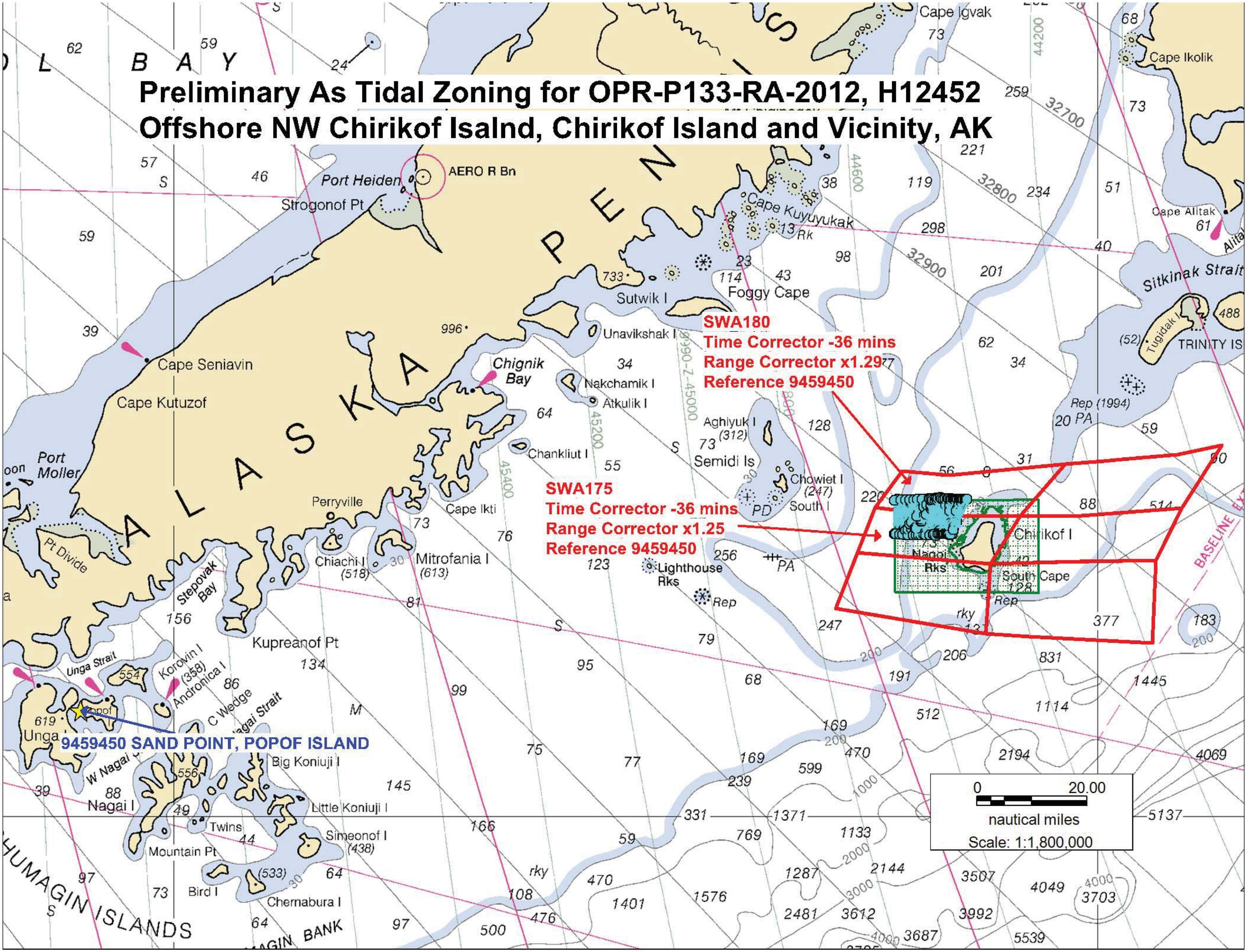
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.1365860250
Date: 2012.08.29 09:51:03 -04'00'

CHIEF, PRODUCTS AND SERVICES BRANCH

Preliminary As Tidal Zoning for OPR-P133-RA-2012, H12452
Offshore NW Chirikof Isalnd, Chirikof Island and Vicinity, AK



APPROVAL PAGE

H12452

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

- H12452_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12452_GeoImage.pdf

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

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
Date: 2013.12.30 08:55:44 -08'00'

Approved:______________________

Peter Holmberg
Acting Chief, Pacific Hydrographic Branch

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

BARRY.CATHLEEN.JEANNETTE.1365891407
2013.12.30 10:37:48 -08'00'

Approved:______________________

Cathleen Barry
Cartographer, Pacific Hydrographic Branch