H12448

NOAA Form 76-35A

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12448

LOCALITY

State:	Alaska
General Locality:	Chirikof Island and Vicinity, AK
Sub-locality:	Offshore South Chirikof Island

2012

CHIEF OF PARTY
Richard T. Brennan, CDR/NOAA

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**H12448**

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:	**Alaska**
General Locality:	**Chirikof Island and Vicinity, AK**
Sub-Locality:	**Offshore South Chirikof Island**
Scale:	**40000**
Dates of Survey:	**06/12/2012 to 08/08/2012**
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 Echosounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**
H-Cell Compilation Units:	***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. Revisions and Rednotes 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/.

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H12448

Project: OPR-P133-RA-12

Locality: Chirikof Island and Vicinity, AK

Sublocality: Offshore South 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 3: "Offshore South Chirikof Island" within the Project Instructions. The area is directly south of Chirikof Island, Alaska.

A.1 Survey Limits

Data was acquired within the following survey limits:

Northeast Limit	Southwest Limit
55.7616666667 N 155.472166667 W	55.6953333333 N 155.87 W

Table 1: Survey Limits

Figure 1: H12448 survey limits.

Survey Limits were acquired in accordance with the requirements in the Project Instructions and the Hydrographic Surveys 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 are due to an increasing number of passenger vessels, tour vessels and large fishing fleets in the area. In addition, the data would 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 H12448 met complete multibeam coverage requirements, including the 5 soundings per node data density requirements outlined in section 5.2.2.2 of the HSSDM as seen in Figures 2 and 3.

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	1,042,677	1,308	99.87%
4m	36 - 80m	5,002,719	5,668	99.89%
8m	72 - 160m	1,509,676	2,038	99.87%
	TOTAL:	7,555,072	9,014	99.88%

Figure 2: H12448 density statistics.

Figure 3: H12448 density surface.

A.4 Survey Coverage

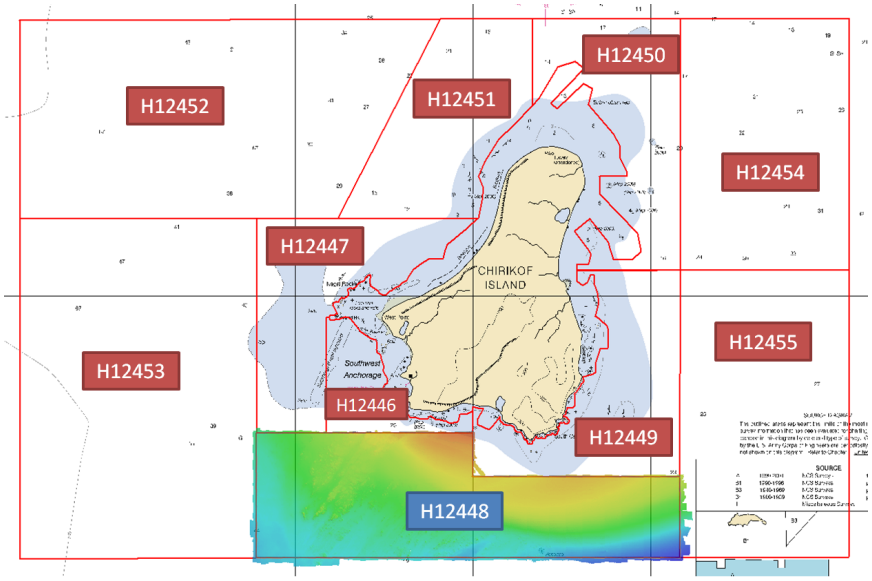


Figure 4: H12448 coverage as part of OPR-P133-RA-12.

Complete multibeam (MBES) coverage was achieved within the limits of hydrography as defined in the Project Instructions with the exception of several small holidays throughout the survey in depths greater than 30 meters (Figure 5). Many of these holidays were due to data blowouts experienced during persistent heavy seas. There are also several areas where post-processing of position data caused a shift which created long thin holidays between lines.

None of these holidays pose a danger to navigation.

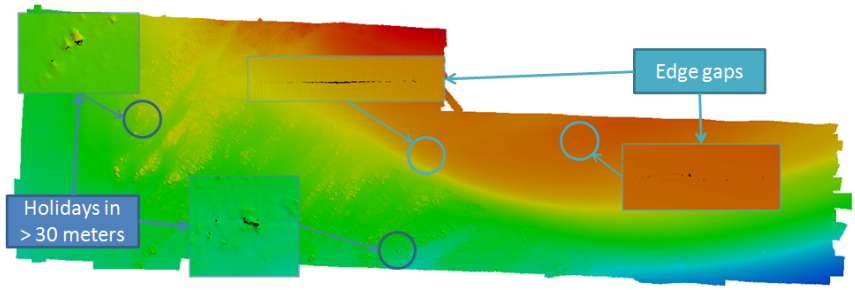


Figure 5: H12448 holidays, black pixels indicate holidays.

Data is adequate for charting.

A.5 Survey Statistics

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

	HULL ID	*S221*	*2801*	*2802*	*2804*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0	0
	MBES Mainscheme	362.30	6.36	0	0	368.66
	Lidar Mainscheme	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0
	SBES/MBES Combo Mainscheme	0	0	0	0	0
	SBES/SSS Combo Mainscheme	0	0	0	0	0
	MBES/SSS Combo Mainscheme	0	0	0	0	0
	SBES/MBES Combo Crosslines	0	0	37.91	10.55	48.46
	Lidar Crosslines	0	0	0	0	0
Number of Bottom Samples						9
Number of DPs						0
Number of Items Items Investigated by Dive Ops						0
Total Number of SNM						47.52

Table 2: Hydrographic Survey Statistics

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

Survey Dates
06/12/2012
06/20/2012
06/21/0012
06/26/2012
06/28/0012
07/11/0012
07/18/0012
07/19/2012
07/20/0012
07/23/0012
07/25/0012
08/08/2012

Table 3: Dates of Hydrography

A.6 Shoreline

All assigned shoreline features were investigated and attributed in accordance with the Project Instructions and the HSSDM. Shoreline features were submitted as part of the Final Features File.

A.7 Bottom Samples

Bottom samples were acquired in accordance with the Project Instructions and the HSSDM (Figure 6). Nine samples were collected and are submitted as part of the Final Features File.

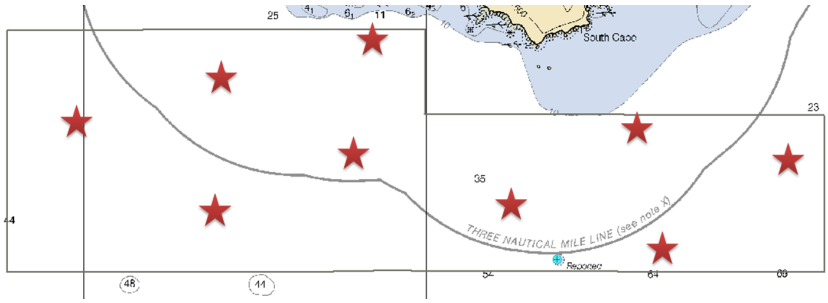


Figure 6: H12448 bottom sample locations overlaid on Chart 16587.

Eight bottom samples and one rocky seabed area recommended for charting.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

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

B.1.1 Vessels

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

Hull ID	***S221***	***2801***	***2802***	***2804***
LOA	231 feet	28 feet	28 feet	28 feet
Draft	16.5 feet	3.5 feet	3.5 feet	3.5 feet

Table 4: Vessels Used

Data was primarily acquired by RAINIER (S221), with crosslines and limited mainscheme data acquired with survey launches (2801, 2802, and 2804) (Table 4). The vessels acquired multibeam echosounder (MBES) 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
Reson	SVP 70	Sound Speed System
Reson	SVP 71	Sound Speed System
ODIM Brooke Ocean (Rolls Royce Group)	MVP200	Sound Speed System
Seabird	SBE 19 Plus	Sound Speed System
Applanix	POS-MV V4	Vessel Attitude and Positioning System
Reson	7125	MBES
Kongsberg	EM710	MBES

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam crosslines were acquired using a Reson 7125 on vessels 2802 (RA-5) and 2804 (RA-6). 48.46 nm of crosslines were acquired, which accounted for 13.1% of mainscheme hydrography. 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 surface difference was generated at a 4-meter resolution (Figure 7). Statistics were then derived from the difference surface and examined in Excel (Figure 8). The average difference between the depths derived from mainscheme and crosslines was 0.02 meters (mainscheme being deeper) with a standard deviation of 0.22 meters. The largest differences were seen in the Southeast section of the survey where the seafloor sloped down from 40m depth to 100m depth.

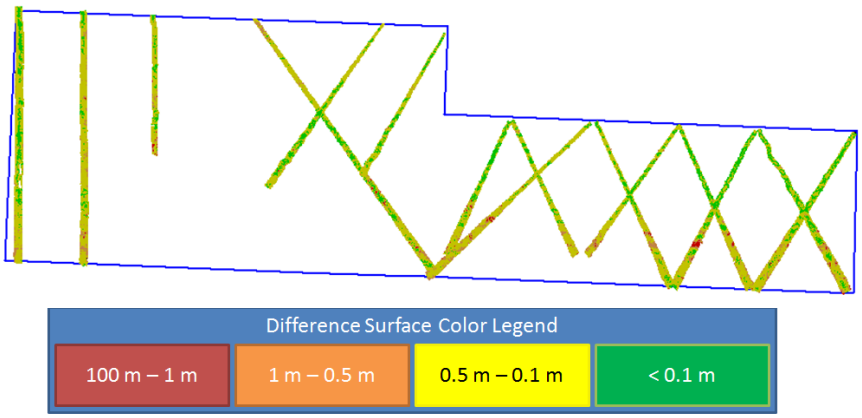


Figure 7: Crossline difference surface, 4-meter resolution.

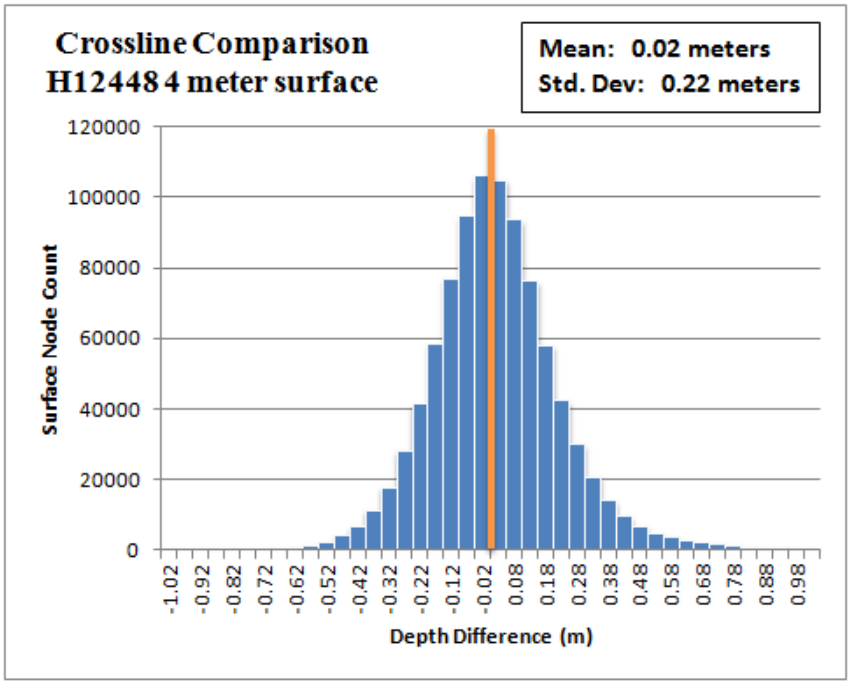


Figure 8: Crossline comparison with mainsheme statistics.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0meters	0.14meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
2801 (RA-4)	3 meters/second		0.15 meters/second
2802 (RA-5)	3 meters/second		0.15 meters/second
2804 (RA-6)	3 meters/second		0.15 meters/second
S221		1meters/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" of among total propagated 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 extent to which accuracy requirements were met, statistics were calculated of the preceding "IHOness" layers within CARIS and then examined in Excel (Figure 9). Overall, 100.0% of survey H12448 met the IHO accuracy requirements, and therefore met the project requirements as stated in the HSSDM.

Post-processed uncertainties of the survey vessels' position and attitude were produced using Applanix POSPac processing software (in addition to improved estimates of the position and attitude values themselves). For RAINIER (S221) only position uncertainties were applied. For launches 2801 (RA-4), 2802 (RA-5), and 2804 (RA-6) vessel position and attitude uncertainty were applied.

CARIS Surface Statistics

Resolution (m)	Depth range (m)	IHO Order	Number of nodes	Nodes satisfying IHO accuracy	Percent nodes satisfying IHO accuracy
2m	18 - 40	Order 1a	2,055,437	2,055,437	100.0%
4m	36 - 80	Order 1a	5,005,508	5,005,508	100.0%
8m	72 - 100	Order 1a	1,100,036	1,100,036	100.0%
8m	100 - 160	Order 2	464,370	464,370	100.0%
		TOTAL:	8,625,351	8,625,351	100.0%

Figure 9: Table of node agreement with IHO standards, by depth range.

Figure 10: H12448 IHOness visualized.

B.2.3 Junctions

Six junction comparisons were completed for H12448. Five of these surveys (H12446, H12447, H12449, H12453, H12455) were acquired concurrently with this survey, and one survey (H11687) was completed in 2006 by NOAA Ship FAIRWEATHER. Depth comparisons were performed using the CARIS Difference Surface, the CARIS Tool Tip, and CARIS Subset Editor.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12446	1:25000	2012	NOAA Ship RAINIER	N
H12447	1:40000	2012	NOAA Ship RAINIER	NW
H12449	1:40000	2012	NOAA Ship RAINIER	NE
H12453	1:40000	2012	NOAA Ship RAINIER	W
H12455	1:40000	2012	NOAA Ship RAINIER	E
H11687	1:135000	2006	NOAA Ship FAIRWEATHER	S

Table 8: Junctioning Surveys

H12446

A 4-meter surface of data acquired during survey H12448 was compared with a 4-meter surface of H12446 data, yielding a mean difference of -0.01 meters (H12448 being shoaler) with a standard deviation of 0.24 meters. The areas where the surveys overlapped ranged from 50 to 300 meters in width for the 8,000 meters along the northern boundary of H12448.

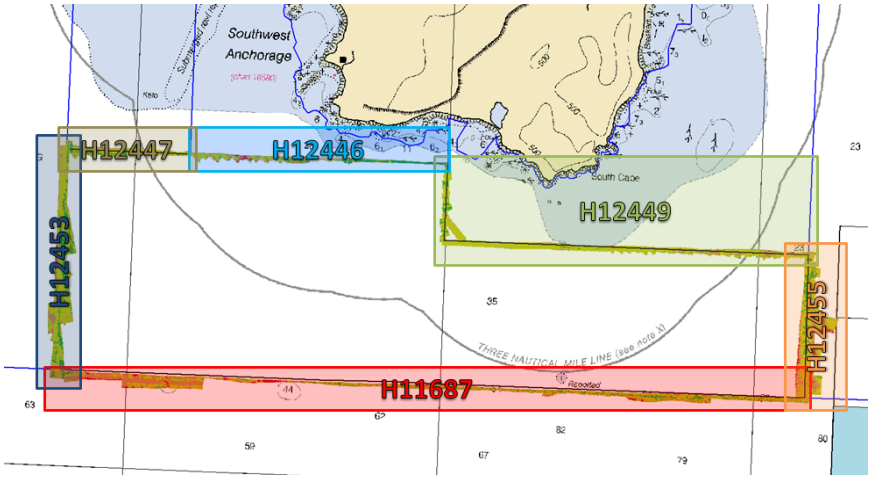


Figure 11: Overview of junctions for H12448.

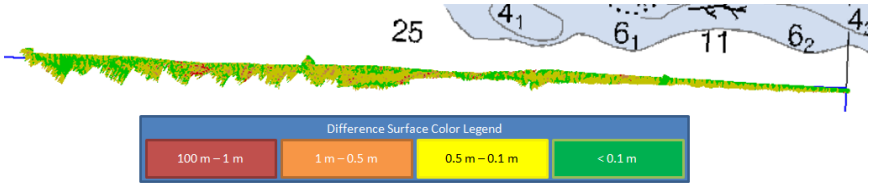


Figure 12: Junction coverage with H12446.

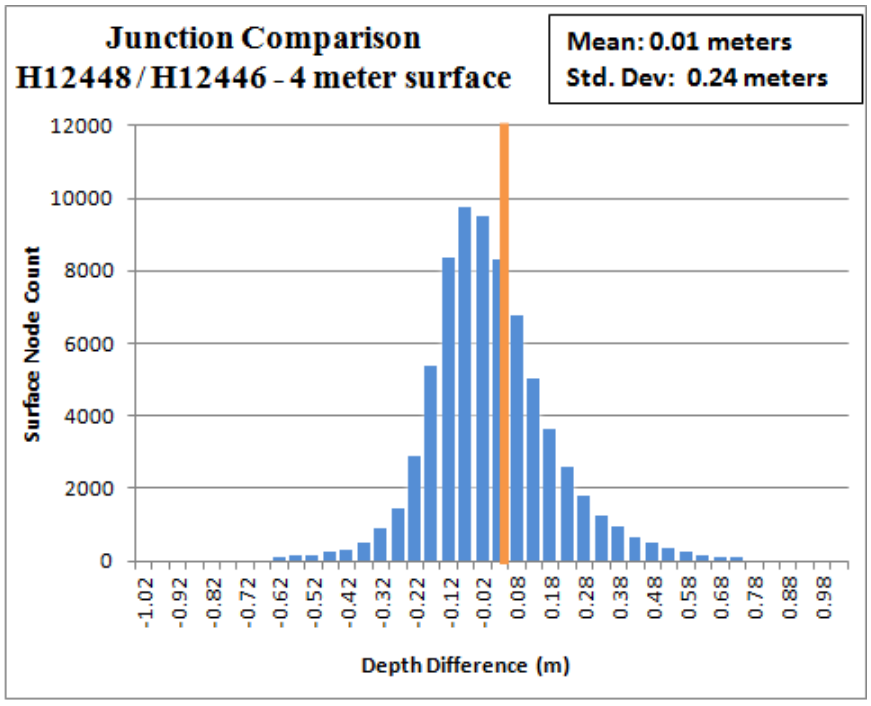


Figure 13: Junction histogram with H12446.

H12447

A 4-meter surface of data acquired during survey H12448 was compared with a 4-meter surface of H12447 data, yielding a mean difference of -0.03 meters (H12448 being shoaler) with a standard deviation of 0.23 meters. Areas where the surveys overlapped were, on average, 150 meters wide for the 4,000 meters along the northern boundary of H12448.

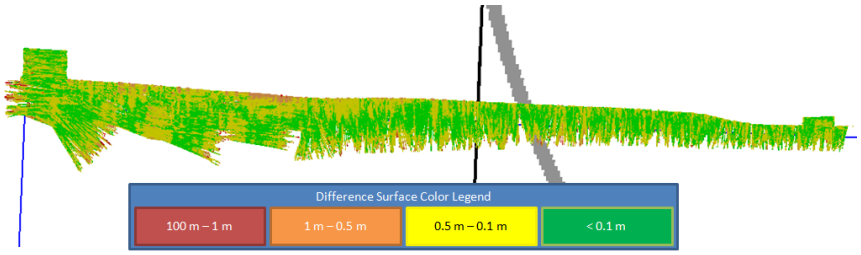


Figure 14: Junction coverage with H12447.

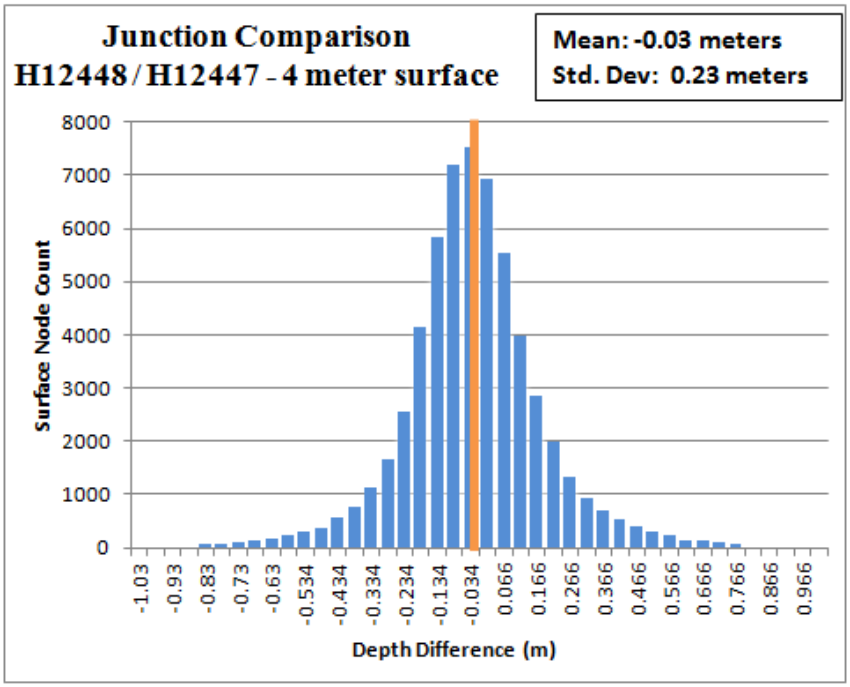


Figure 15: Junction histogram with H12447.

H12449

A 4-meter surface of data acquired during survey H12448 was compared with a 4-meter surface of H12449 data, yielding a mean difference of -0.19 meters (H12448 being shoaler) with a standard deviation of 0.17 meters. The areas where the surveys overlapped ranged from 200 to 300 meters in width for the 14,000 meters along the northern boundary of H12448.

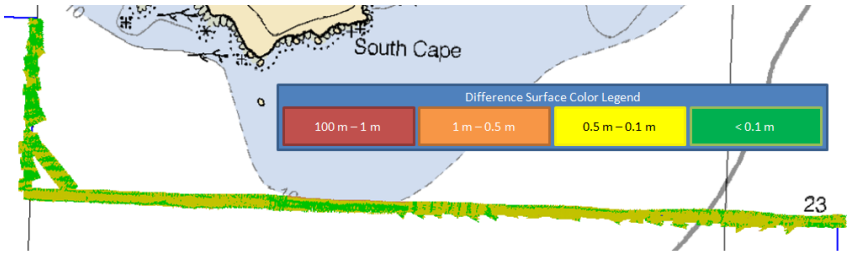


Figure 16: Junction coverage with H12449.

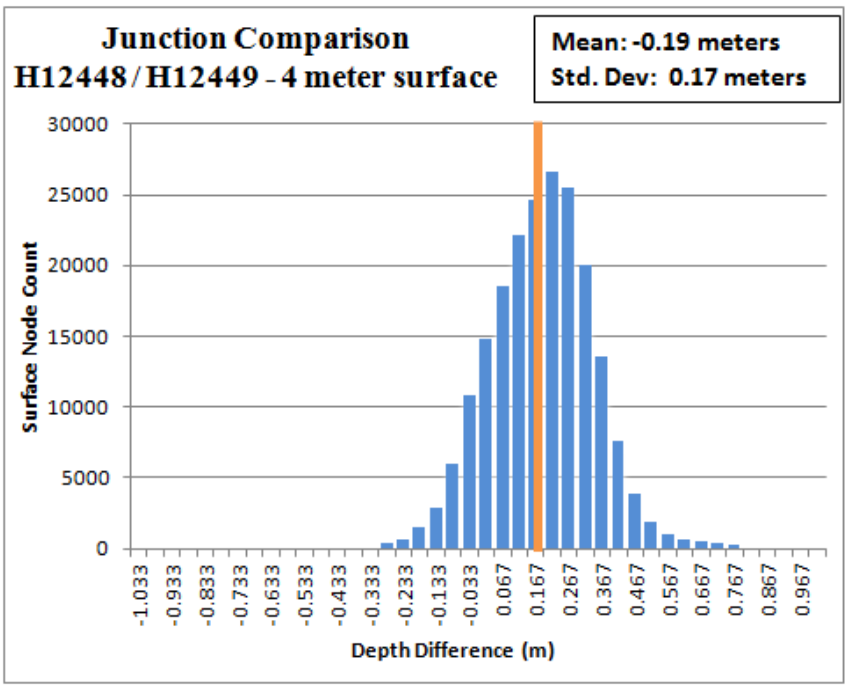


Figure 17: Junction histogram with H12449.

H12453

An 8-meter surface of data acquired during survey H12448 was compared with a 8-meter surface of H12453 data, yielding a mean difference of 0.07 meters (H12448 being deeper) with a standard deviation of 0.27 meters. The areas where the surveys overlapped ranged from 300 to 700 meters in width for the 8,000 meters along the western boundary of H12448.

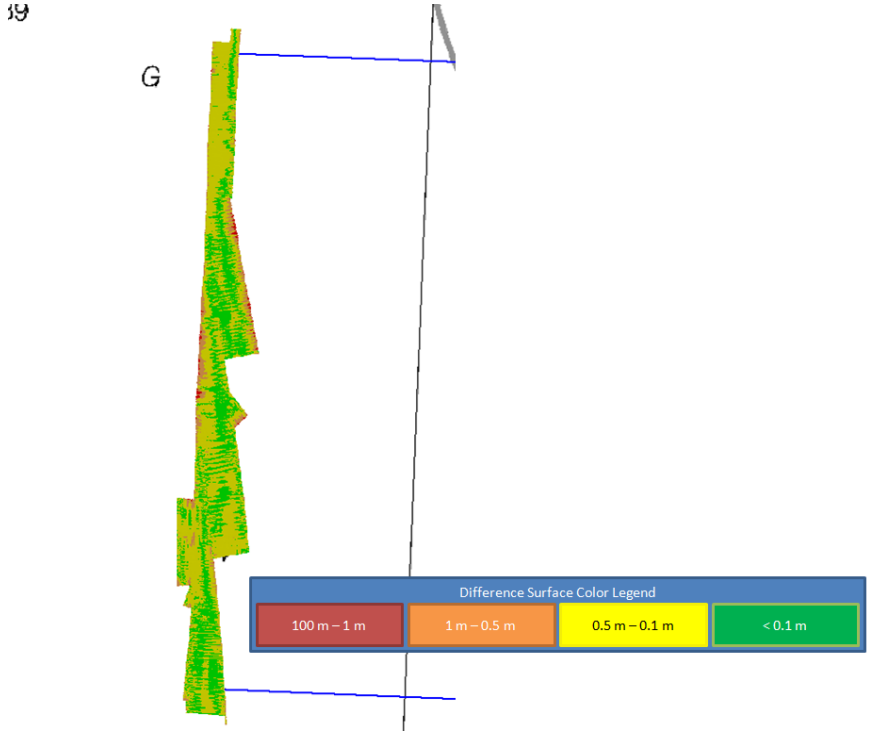


Figure 18: Junction coverage with H12453.

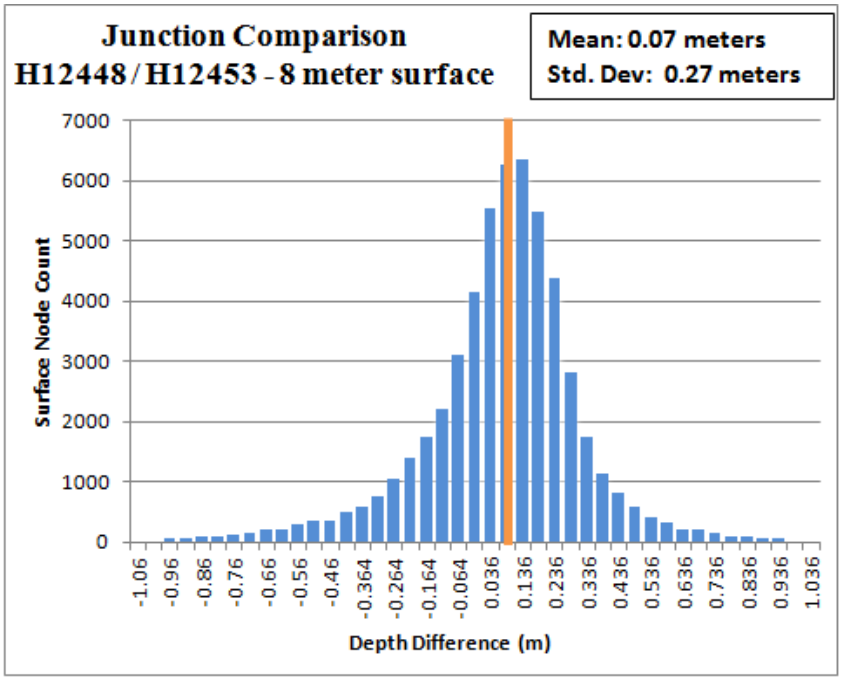


Figure 19: Junction histogram with H12453.

H12455

A 4-meter surface of data acquired during survey H12448 was compared with a 4-meter surface of H12455 data, yielding a mean difference of -0.16 meters (H12448 being shoaler) with a standard deviation of 0.27 meters. The areas where the surveys overlapped ranged from 300 to 500 meters in width for the 5,000 meters along the eastern boundary of H12448.

Figure 20: Junction coverage with H12455.

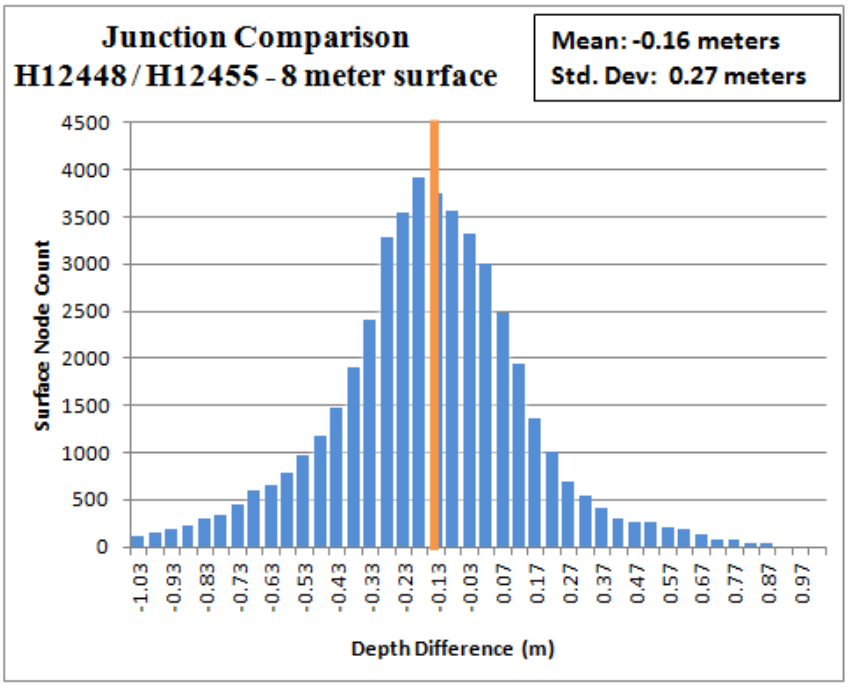


Figure 21: Junction histogram with H12455.

H11687

A 16-meter surface of data acquired during survey H12448 was compared with a 16-meter surface of FAIRWEATHER survey H11687 data, yielding a mean difference of 0.23 meters (H12448 being deeper) with a standard deviation of 0.53 meters. Data from H11687 showed sound speed artifacts, contributing to the large mean difference and standard deviation. The areas where the surveys overlapped ranged from 50 to 200 meters in width for the 25,000 meters along the southern boundary of H12448.

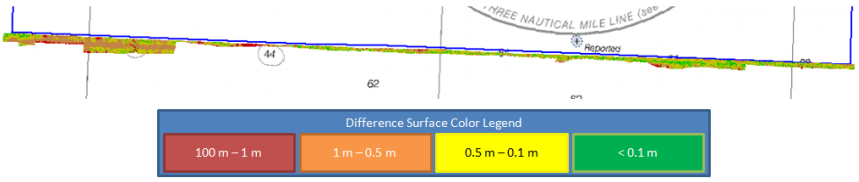


Figure 22: Junction coverage with H11687.

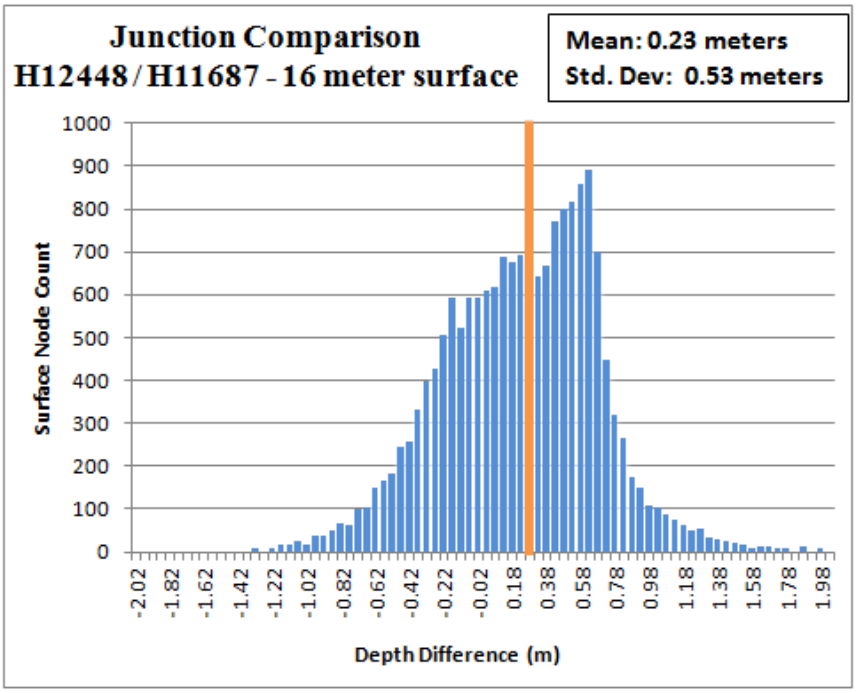


Figure 23: Junction histogram with H11687.

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

B.2.5.1Kongsberg EM710 Artifact

During the 2012 Hydrographic Survey Readiness Review, an artifact was identified in bathymetric data acquired with the RAINIER's Kongsberg EM710. This heave-like artifact amplifies with vessel dynamics; in particular, as the magnitude of the ship's pitch and heave increases (e.g. in heavy weather), so too does the magnitude of the depth errors. Figure 24 shows an overhead view of two representative survey lines acquired in similar depths (~90 meters) on different days. On the left, data was acquired in a more dynamic regime (8 foot seas), while the right was acquired on a calmer day (4 foot seas) -- both lines are gridded at a 4-meter resolution with equivalent vertical exaggerations. The survey lines of Figure 24 are shown in CARIS subset view in Figure 25. Figure 25 (top) demonstrates the characteristic undulation of the nadir pings of the ship's system, when in heavy seas. By way of contrast, Figure 25 (bottom), acquired in a less dynamic environment, is nearly free of the artifact. While not an absolute rule, every 1-degree of vessel pitch leads to about 0.1 meters of vertical bias. Representatives from Kongsberg, Applanix and CARIS have been contacted with regard to this problem, and ship's personnel are actively investigating a remedy to this issue; however, at the time of this writing, the artifact still persists. Although the artifact was minimal within survey H12448, it nonetheless exists within the data. The examples below are not data from H12448 and are not representative of the overall quality of this particular survey. The artifact seen on survey H12448 had a magnitude of approximately +/- 0.15 meters.

To mitigate problems associated with this artifact, ship's acquisition was only conducted in a sea state that was commensurate with minimizing vessel dynamics. It is in the opinion of the Hydrographer that all data acquired by the EM710 for this survey (H12448) is adequate to supersede the chart.

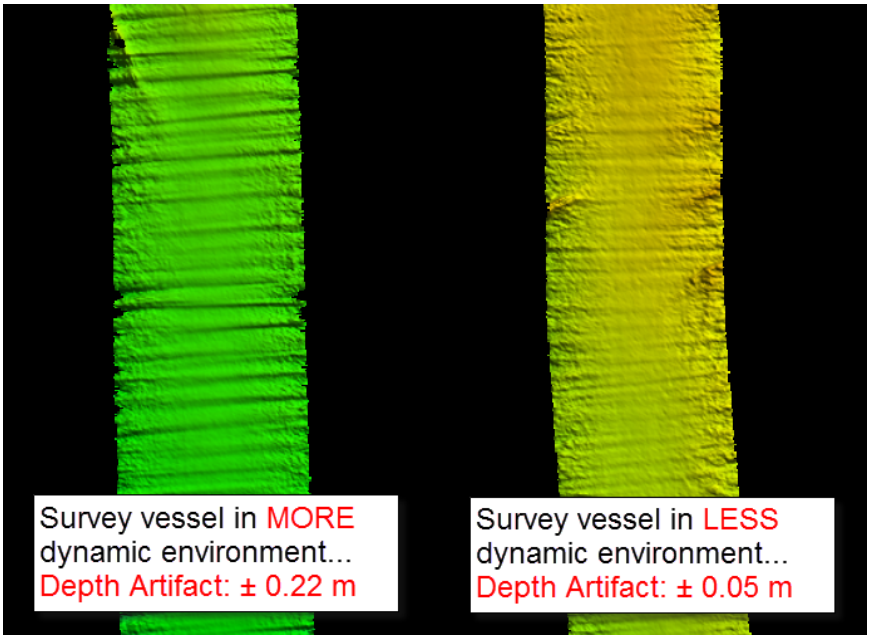


Figure 24: Overhead view of two representative survey lines, acquired on different days, using the Rainier's Kongsberg EM710. Data acquired in heavier seas (left) displayed a characteristic undulation in the gridded seafloor, while calmer days (right) yielded a smoother representation of the bottom. This example is not taken from H12448 data.

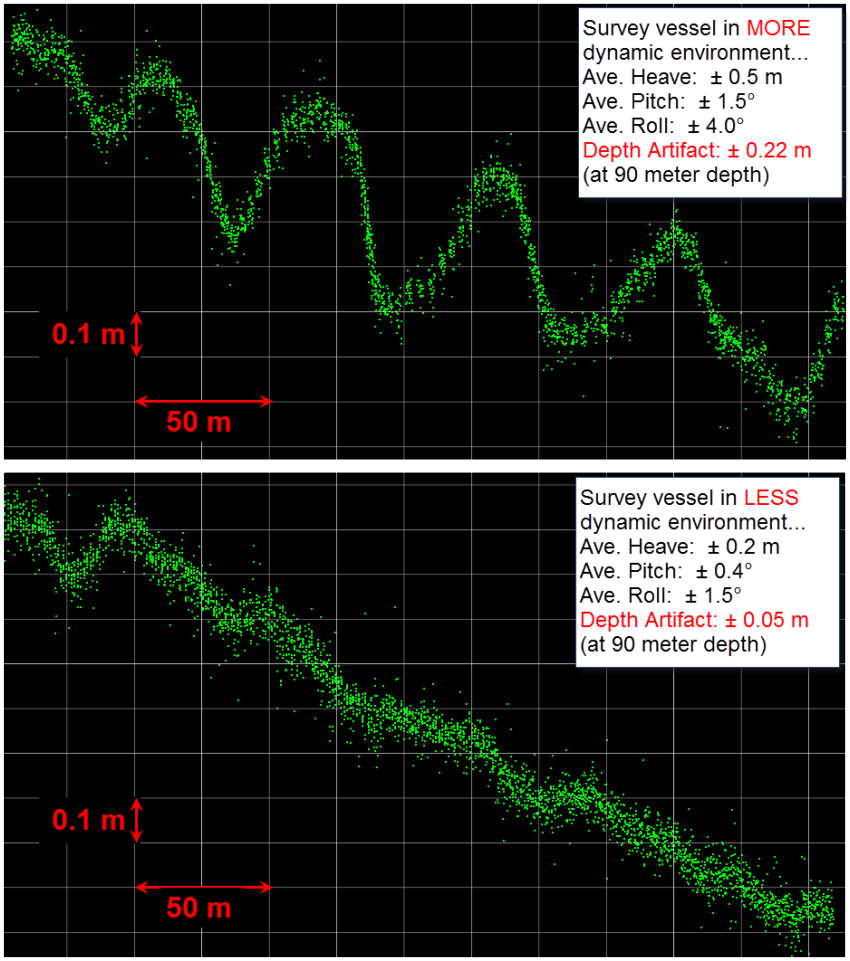


Figure 25: Cross section view of representative data acquired using the Rainier's Kongsberg EM710, over a smooth seafloor, on both dynamic (top) and calm (bottom) sea states. Notice that with increased vessel dynamics, there is an increased artifact in the processed depths. This example is not taken from H12448 data.

B.2.6 Factors Affecting Soundings

B.2.6.1 Sound Speed Profile Failure

Fifteen of the 133 sound speed casts collected by S221's MVP200 were not applied to the ship's data because of an inaccurate salinity profile. Conductivity data for these casts was far outside the historic ranges and significantly different from other casts (Figure 26). These inaccurate casts caused sound speed artifacts within the data as seen in Figure 27 below. Removing the casts removed the artifacts (Figure 28). These casts were identified and removed from the final concatenated SVP file and not applied to the survey.

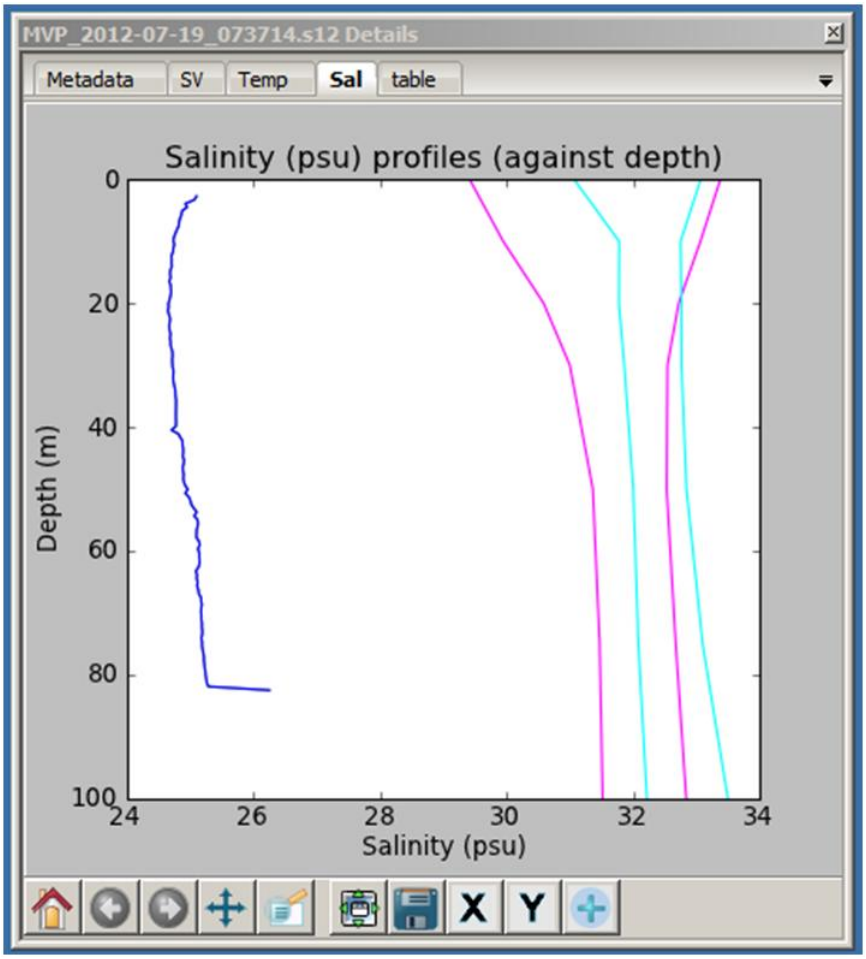


Figure 26: Representative inaccurate salinity profile.

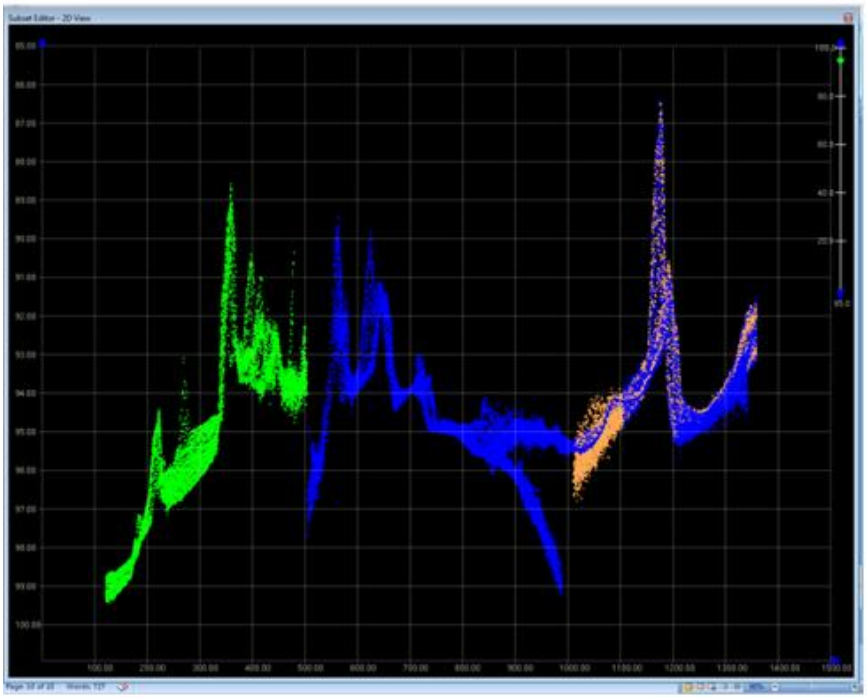


Figure 27: Data artifact caused by inaccurate sound speed profile.

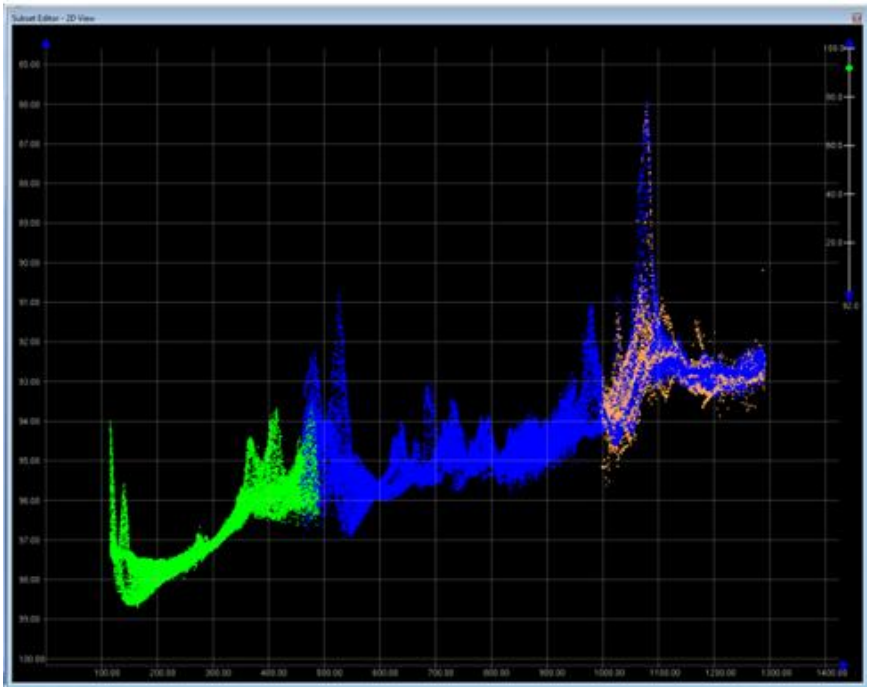


Figure 28: Data artifact resolved with removal of inaccurate sound speed profile.

B.2.6.1 Sound Speed Data Artifiacts

Due to the dynamic nature of the sound speed within the survey area, and included casts or a lesser quality, there are associated artifacts seen within the data. These artifacts are most pronounced in the outer beams, and resulted in the largest errors when a "smile" adjoined a "frown". Typical errors were on the order of 0.5 meters, but in some areas (i.e. deeper water) exceeded 1.0 meter (Figure 29). In areas where the CUBE surface used data containing the refraction error, the data containing the error was flagged as rejected to bring the CUBE surface back to the true seafloor. Not all areas could be flagged as rejected as it would have created holidays. In these areas the sound speed artifact remained (Figure 30).

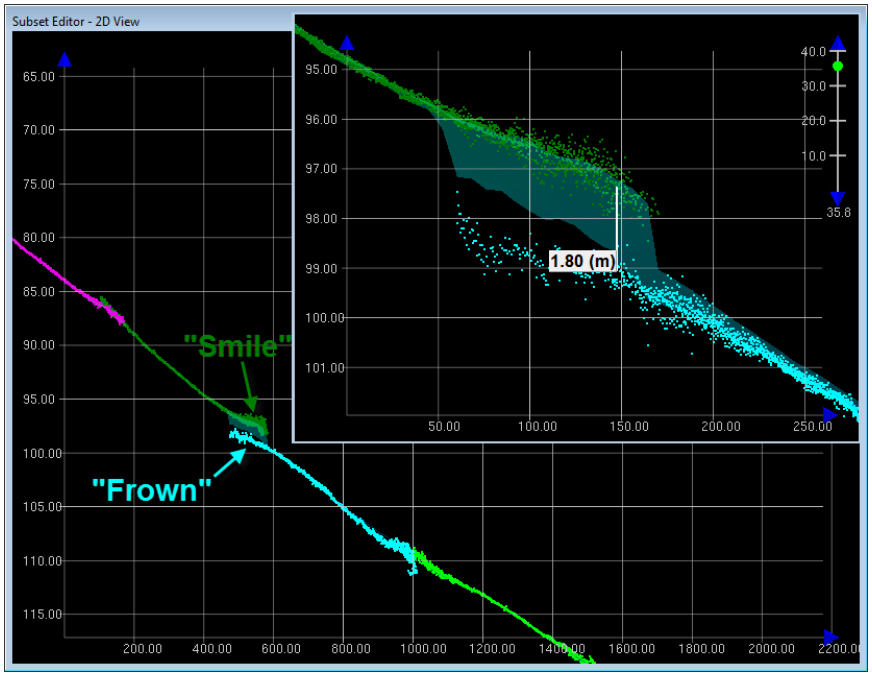


Figure 29: Outer beam refraction artifact displayed in CUBE surface, overlaid in green.

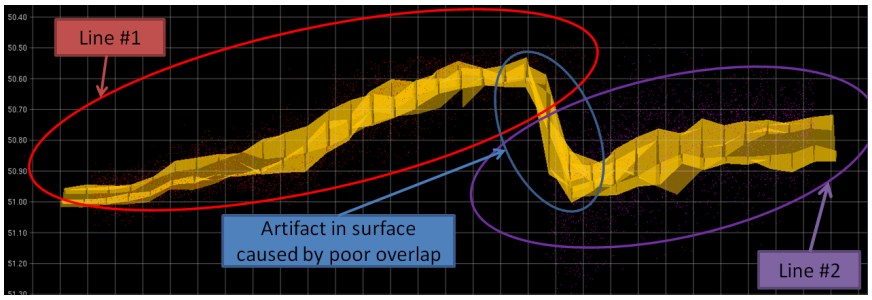


Figure 30: Sound speed artifact caused in areas of poor overlap.

Data is adequate for charting.

B.2.6.1 Modified EM710 Waterline Value

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 two days (DN164, DN200), however, waterline measurements were taken that were suspected to be in error (-0.003m, -0.710m), likely due to large seas at the times of observation. These measurements were not in keeping with historic values and led to a vertical shift in the data acquired by the ship on these days. To address this, waterline values taken from previous days and under similar loading conditions (-0.155m, -0.177m) were used for survey H12448. On a third day (DN201), the waterline value was not properly archived, so, based on the loading conditions, an estimated value of -0.200 meters was used. These changes were observed to improve vertical agreement in the data for survey H12448 and are documented in the HIPS vessel file.

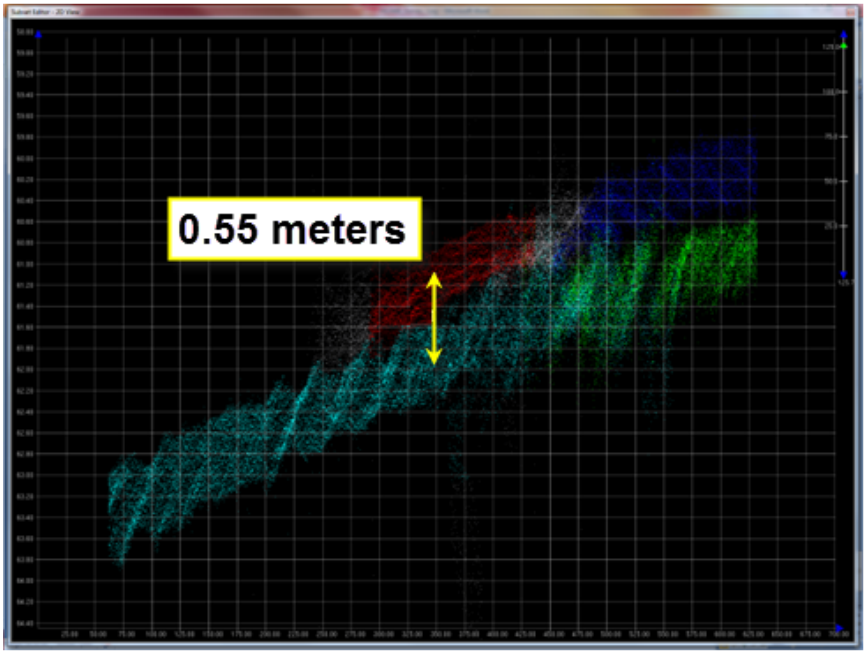


Figure 31: H12448 waterline offset in data, DN200.

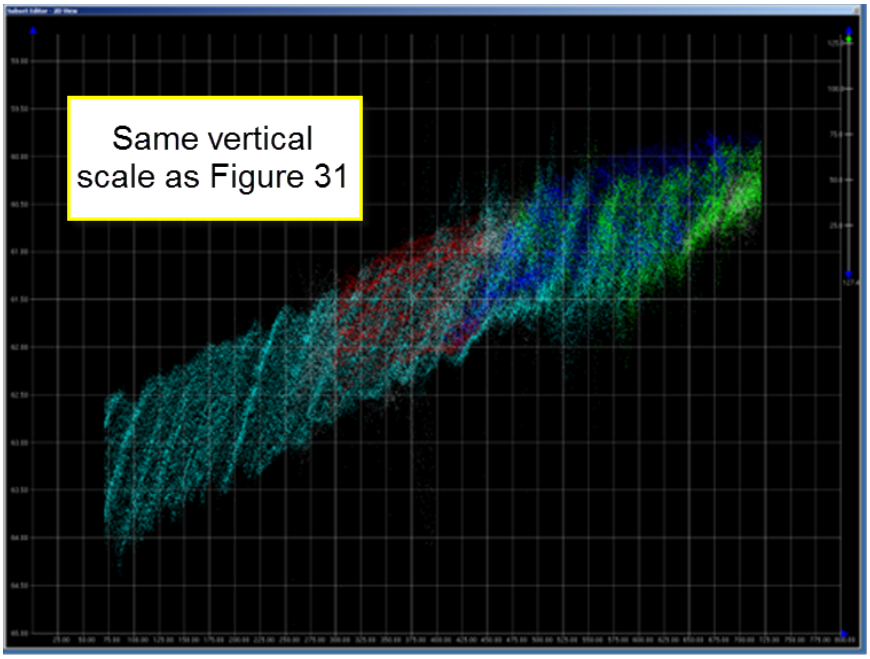


Figure 32: H12448 after improved waterline value applied, DN200.

Data is adequate for charting.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed profiles were acquired on S221 using the MVP200 approximately every 15 minutes with efforts made to distribute the casts throughout the survey area. Launch sound speed profiles were acquired using the SBE-19 plus CTDs at discrete locations at least once every four hours. Sound speed casts were concatenated by vessel and applied to the data using the 'Nearest in distance within time (4 hours)' profile selection method. On DN201, excessive temporal sound speed variation required a single line (0012) to be processed using a three hour selection window.

For DN164, the ship's MVP was unavailable due to a personnel shortage, so a single SVP cast was used to correct the data. For this day sound speed was applied nearest in distance within time of five hours (Figure 33), rather than nearest in distance within time of four hours. The affected line was compared to adjacent survey lines and found to agree well.

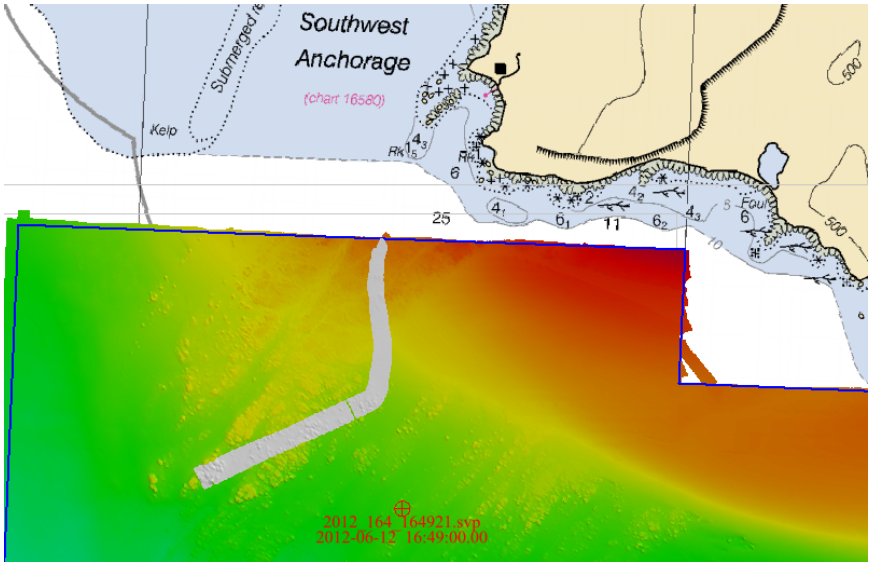


Figure 33: H12448 survey area (in white) which was processed nearest in distance within time of five hours, with cast location and time.

Data is adequate for charting.

B.2.8 Coverage Equipment and Methods

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

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR with the exception of the application of SBETs to one line logged on DN210 (see Section C.2 - Horizontal Control)

B.3.2 Calibrations

The 2012 HSRR survey calibration and patch test for the Kongsberg EM710 took place on DN177 and was processed and entered into the SIS software on DN178 (See DAPR for additional information). Six lines from H12448 were 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. The six lines from DN164 agreed well to surrounding data and were not investigated further.

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 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 Catalogue Control Version 5.2 and NOAA Profile Product Version 2.0

B.5.2 Surfaces

The following CARIS surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12448_QC_2m	CUBE	2 meters	-	NOAA_2m	Complete MBES
H12448_QC_4m	CUBE	4 meters	-	NOAA_4m	Complete MBES
H12448_QC_8m	CUBE	8 meters	-	NOAA_8m	Complete MBES
H12448_QC_2m_Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12448_QC_4m_Final	CUBE	4 meters	36 meters - 80 meters	NOAA_4m	Complete MBES
H12448_QC_8m_Final	CUBE	8 meters	72 meters - 160 meters	NOAA_8m	Complete MBES
H12448_8m_Combined	CUBE	8 meters	18 meters - 160 meters	NOAA_8m	Complete MBES

Table 9: CARIS Surfaces

H12448_Office_Combined_8m.csar created during office processing was used for compilation.

C. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station in Sand Point, AK (9459450), served as control for datum determination and as a source for water level reducers for survey H12448. A complete description of the vertical and horizontal control for this survey can be found in the accompanying OPR-P133-RA-12 Horizontal and Vertical Control Report (HVCR), submitted under separate cover.

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 10: NWLON Tide Stations

File Name	Status
9459450.tid	Final Approved

Table 11: Water Level Files (.tid)

File Name	Status
P133RA2012CORP.zdf	Final

Table 12: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 07/25/2012. The final tide note was received on 08/09/2012.

One additional line of data was collected on 08/07/2012 (DN221, incorrectly attributed to DN220 in CARIS) for additional coverage. As preliminary tides were accepted as final zoning and applied to all data, the tides request was not resubmitted.

Tide note appended.

C.2 Horizontal Control

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

The following PPK methods were used for horizontal control:

Single Base

All data unless specifically noted was processed using Applanix POSPac MMS in Single Base mode as described in the DAPR. The processing used a base station installed by RAINIER personnel on Chirikof Island. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all data, except DN221 which was solely positioned with DGPS and is detailed below. Reference the DAPR for a description of the positioning methods used.

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
Chirikof Island, AK	n/a

Table 13: User Installed Base Stations

Precise Point Positioning (PPP) was used for ship's acquisition on DN164 and DN178. DN164 was the first day of acquisition and took place prior to the base station being operational on DN172. One short line was acquired on DN178 and processed with PPP, as it agreed well with the surrounding data was not reprocessed in single base for H12448.

DGPS positioning was intermittent for data acquired by RAINIER (S221), however when available was used for raw positioning. DGPS was used as the final positioning for DN221 as the raw logged position and attitude file was corrupt and could not be post-processed. Positioning was evaluated and agreed well with surrounding data.

Data adequate for charting.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Cold Bay (289 kHz)
Kenai (310 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	08/07/2012	08/18/2012

Table 15: Largest Scale Raster Charts

16587

Comparison was performed with Chart 16587 (1:135000) using a CARIS sounding layer. There are only six charted depths and one feature on Chart 16587 that falls within the survey area of H12448. Overall the charted depths were in general agreement with soundings from H12448 with most soundings within 6 fathoms of charted depths. The charted feature, a reported rock, was disproved by complete multibeam coverage.

Refer to Figure 34 for a comparison of surveyed and charted depths. The reported rock has been disproved by multibeam survey, as the shoalest sounding in the area was 48 fathoms (Figure 35). It is recommended that H12448 data supersede the charted depths on Chart 16587.

Description of specific feature investigations are included in the Final Feature File submitted with this survey.

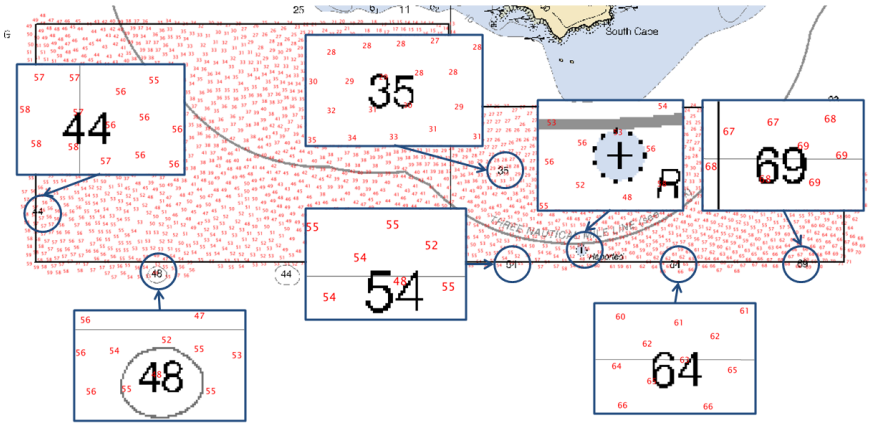


Figure 34: Overview of Chart 16587 comparison.

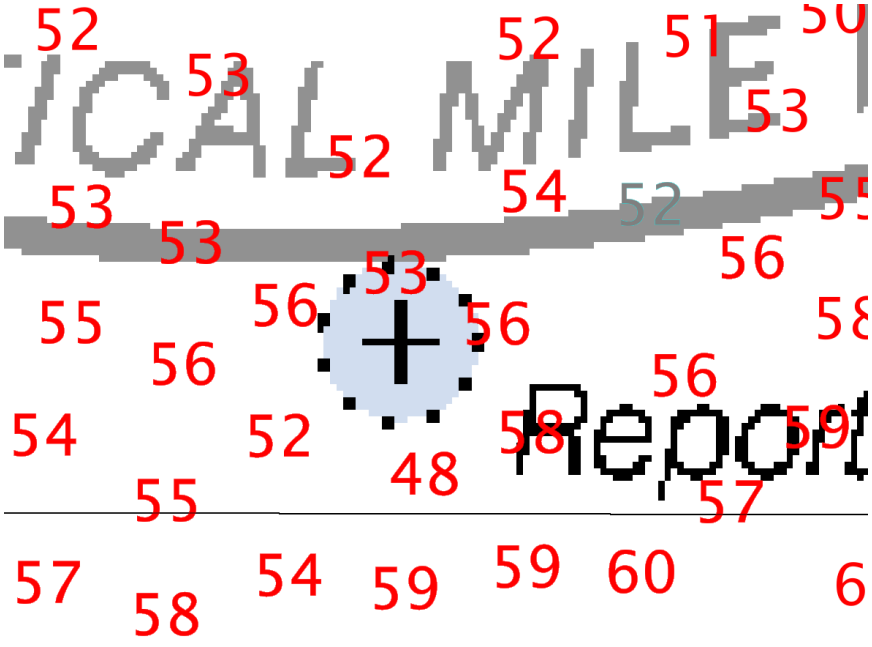


Figure 35: H12448 soundings over reported rock.

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

US4AK5XM

ENC US4AK5XM coincides with raster 16587. The depths and contours on the ENC match the raster, and the comparison between survey H12448 and the ENC is equivalent to the preceding comparison with Chart 16587.

D.1.3 AWOIS Items

Number of AWOIS Items Addressed: 1
Number of AWOIS Items Not Addressed: 0

The AWOIS Item # 54093, a charted rock, was disproved by complete multibeam coverage. Although H12448 coverage did show a rock feature on the seafloor, the least depth in the area was 48 fathoms (Figure 36).

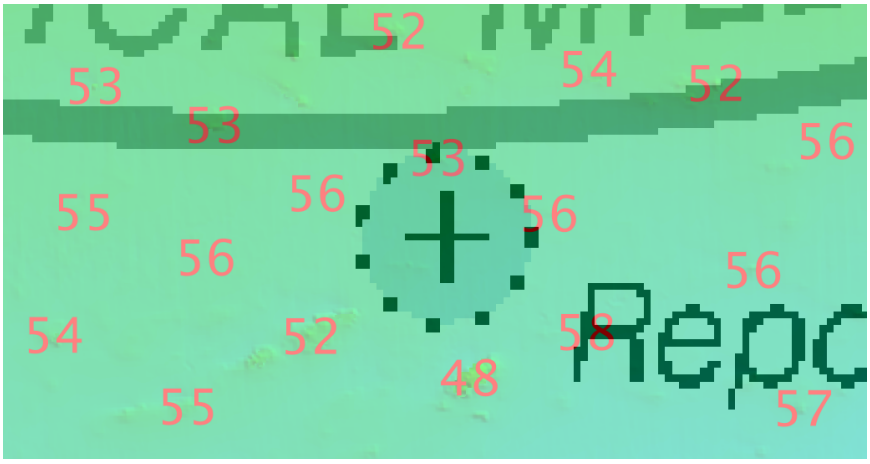


Figure 36: H12448 charted rock with overlays of soundings in fathoms and a CARIS 8 meter surface.

D.1.4 Charted Features

The charted rock, AWOIS Item # 54093, was disproved by complete multibeam coverage. Although H12448 coverage did show a rock feature on the seafloor, the least depth in the area was 48 fathoms.

D.1.5 Uncharted Features

No uncharted features exist for this survey.

D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.7 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.8 Channels

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

D.2 Additional Results

D.2.1 Shoreline

There was one assigned feature for this survey, a charted rock (AWOIS Item # 54093). This feature was addressed and attributed as "delete" as the rock was disproved by complete multibeam coverage. The addressed feature and bottom samples are described in the Final Features File submitted with this survey.

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 Construction and Dredging

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

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	01/11/2013	
Michael O. Gonsalves, LT/NOAA	Field Operations Officer, NOAA Ship RAINIER	01/11/2013	 Michael O. Gonsalves 2013.01.16 08:14:49 -08'00'
James B. Jacobson	Chief Survey Technician, NOAA Ship RAINIER	01/11/2013	 Digitally signed by James Jacobson Reason: I have reviewed this document Date: 2013.01.22 15:01:08 -08'00'
Bart O. Buesseler, ENS/NOAA	Junior Officer, NOAA Ship RAINIER	01/11/0013	 ENS Bart Buesseler 2013.01.14 13:51:40 -08'00'

F. Table of Acronyms

Acronym	Definition
AFF	Assigned Features File
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
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
HSSDM	Hydrographic Survey Specifications and Deliverables Manual

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	Exectutive 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 : July 27, 2012

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P133-RA-2012
HYDROGRAPHIC SHEET: H12448

LOCALITY: Offshore South Chirikof Island,Chirikof Island and Vicinity,AK
TIME PERIOD: June 12 - July 25, 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, H12448, during the time period from June 12 to July 25, 2012.

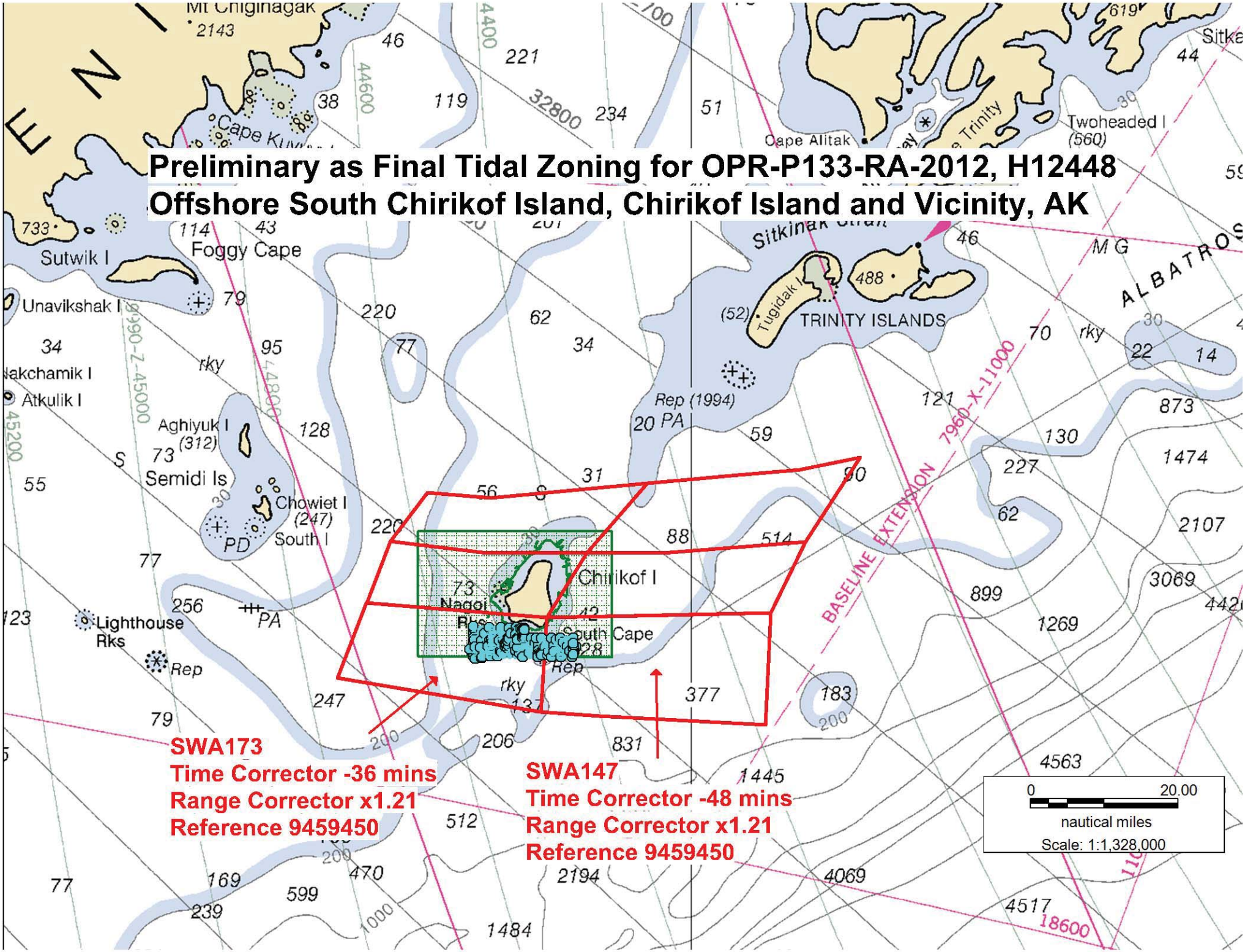
Please use the zoning file P133RA2012CORP submitted with the project instructions for OPR-P133-RA-2012. Zones SWA147 and SWA173 are the applicable zones for H12448.

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).

STONE.PETER.J.1365842546
Digitally signed by STONE.PETER.J.1365842546
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=STONE.PETER.J.1365842546
Date: 2012.08.09 09:17:18 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION


Preliminary as Final Tidal Zoning for OPR-P133-RA-2012, H12448
Offshore South Chirikof Island, Chirikof Island and Vicinity, AK
SWA173
Time Corrector -36 mins
Range Corrector x1.21
Reference 9459450
SWA147
Time Corrector -48 mins
Range Corrector x1.21
Reference 9459450
0
20.00
nautical miles
Scale: 1:1,328,000
Mt Chiginagak
2143
Cape Kuyuyak
Foggy Cape
Sutwik I
Unavikshak I
Atkulik I
Aghiyuk I
(312)
Semidi Is
Chowiet I
(247)
South I
PD
PA
Lighthouse
Rks
Rep
Chirikof I
Nagoi
South Cape
Rep (1994)
20 PA
Cape Alitak
Twoheaded I
(560)
Sitkinak Strait
Tugidak I
TRINITY ISLANDS
488
(52)
ALBATROS
BASELINE EXTENSION
7960-X-11000
32800
44600
44800
45200
990-Z-45000

1 - AWOIS Features

1.1) US 0000258879 00001 / Features.000

Survey Summary

Survey Position:	55° 41' 55.6" N, 155° 36' 08.4" W
Least Depth:	[None]
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2006-244.00:00:00.000 (09/01/2006)
Dataset:	Features.000
FOID:	US 0000258879 00001(02260003F33F0001)
Charts Affected:	16587_1, 16580_1, 16013_1, 531_1, 500_1, 530_1, 50_1

Remarks:

UWTROC/remrks: Dangerous rock disproved by multibeam, average depth of 100m in area, AWOIS Item # 54093

Hydrographer Recommendations

Remove rock from chart

S-57 Data

Geo object 1:	Underwater rock / awash rock (UWTROC)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20060900
	SORIND - US,US,graph,Chart 16587
	TECSOU - 3:found by multi-beam
	WATLEV - 3:always under water/submerged

Office Note: Concur.

APPROVAL PAGE

H12448

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

- H12448_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12448_GeoImage.pdf

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

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101
Date: 2013.06.18 09:51:20 -07'00'

Approved:_____

Pete Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

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

David Zezula
2013.06.18 10:10:10 -07'00'

Approved:_____

CDR David Zezula, NOAA
Chief, Pacific Hydrographic Branch