H12819

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12819

LOCALITY

State(s):	Alaska
General Locality:	Kotzebue Sound, AK
Sub-locality:	NW Portion of Good Hope Bay

2015

CHIEF OF PARTY
Edward J. Van Den Ameele, CDR/NOAA

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Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H12819**

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:	**Kotzebue Sound, AK**
Sub-Locality:	**NW Portion of Good Hope Bay**
Scale:	**40000**
Dates of Survey:	**06/26/2015 to 08/08/2015**
Instructions Dated:	**05/28/2015**
Project Number:	**OPR-S327-RA-15**
Field Unit:	**NOAA Ship Rainier**
Chief of Party:	**Edward J. Van Den Ameele, CDR/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter Side Scan Sonar**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold, red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

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Descriptive Report to Accompany Survey H12819

Project: OPR-S327-RA-15

Locality: Kotzebue Sound, AK

Sublocality: NW Portion of Good Hope Bay

Scale: 1:40000

June 2015 - August 2015

NOAA Ship Rainier

Chief of Party: Edward J. Van Den Ameele, CDR/NOAA

A. Area Surveyed

The survey area is referred to as "NW Portion of Good Hope Bay" (priority 8) within the Project Instructions. The originally assigned survey area encompassed approximately 31 square nautical miles in Kotzebue Sound, Alaska (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
66° 30' 37.8" N 163° 33' 31.32" W	66° 23' 11.4" N 163° 8' 38.4" W

Table 1: Survey Limits

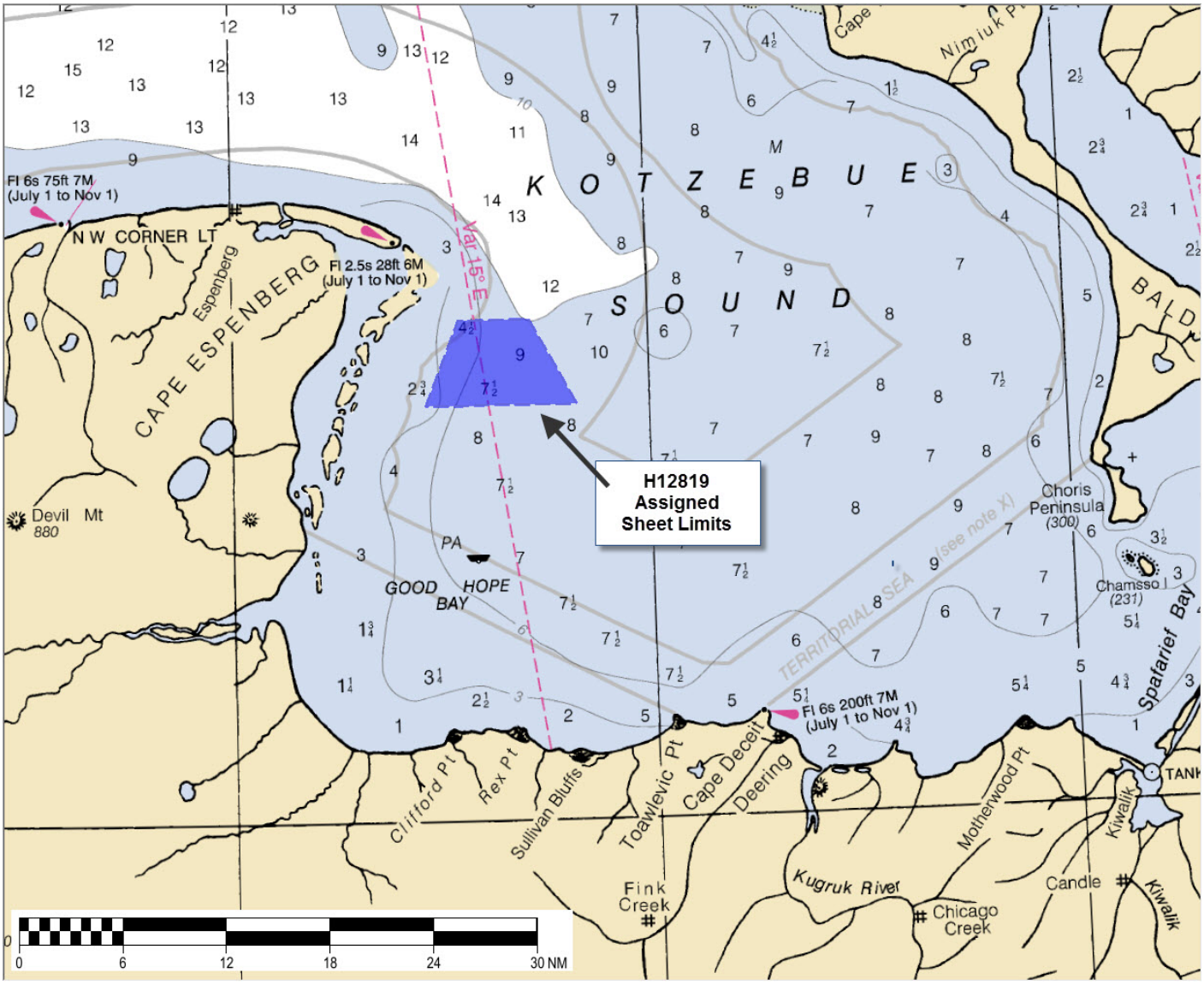


Figure 1: H12819 survey area as assigned in Project Instructions dated May 28, 2015 (Chart 16005).

H12819 data were acquired within the survey limits in accordance with the Project Instructions and the HSSD.

H12819 data was not acquired to the original sheet limits shown in Figure 1 due to several modifications to the coverage requirements, see section A.4 for more detail.

A.2 Survey Purpose

The purpose of this survey is to provide contemporary data to update National Ocean Service (NOS) nautical charting products. Information for survey priorities was collected from a number of users / customers in the region including: Alaska Marine Pilots, USCG D17 & buoy tender Hickory, Crowley Tug & Barge, as well as field reports from USCG and NOAA personnel.

A.3 Survey Quality

The survey is partially adequate to supersede previous data.

H12819 data within the revised transit corridor met quality standards as outlined in the Project Instructions and NOS Hydrographic Surveys Specifications and Deliverables (HSSD) May 2015. The finalized CSAR surface IHO compliance tool within Pydro was used to analyze H12819 MBES data. The results showed that 99.49% of H12819 nodes met HSSD object detection coverage requirements (Figure 2). Data outside the revised transit corridor is adequate to supersede previous data only when shoaler than previously charted. SSS data were qualitatively examined by hydrographer utilizing a SSS mosaic in accordance with the DAPR.

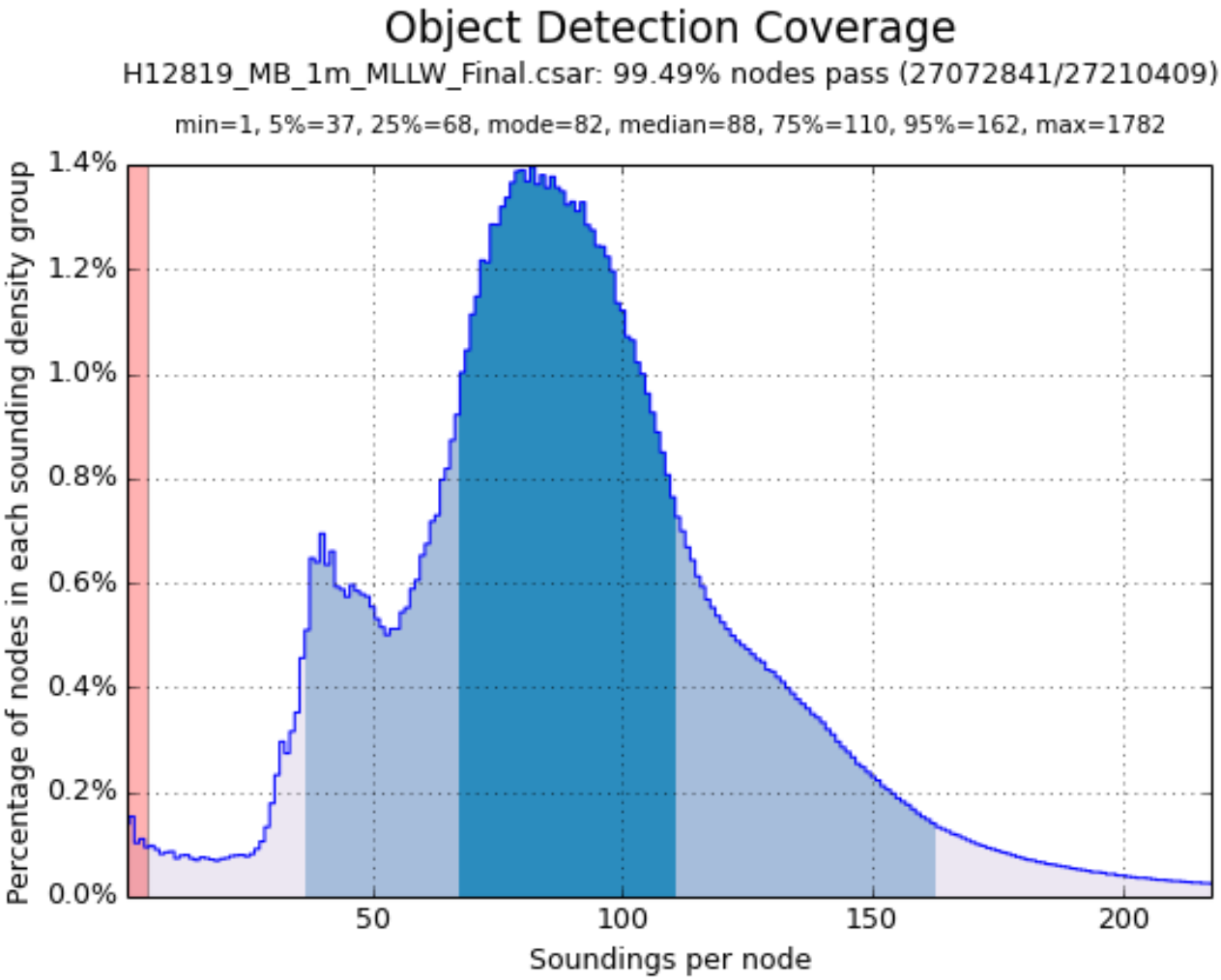


Figure 2: Pydro derived histogram plot showing HSSD object detection compliance of H12819 MBES data within the complete coverage area.

The "revised transit corridor" mentioned above can be seen in Figure 3. This corridor was a result of modifications to the original coverage requirements and is discussed in section A.4.

A.4 Survey Coverage

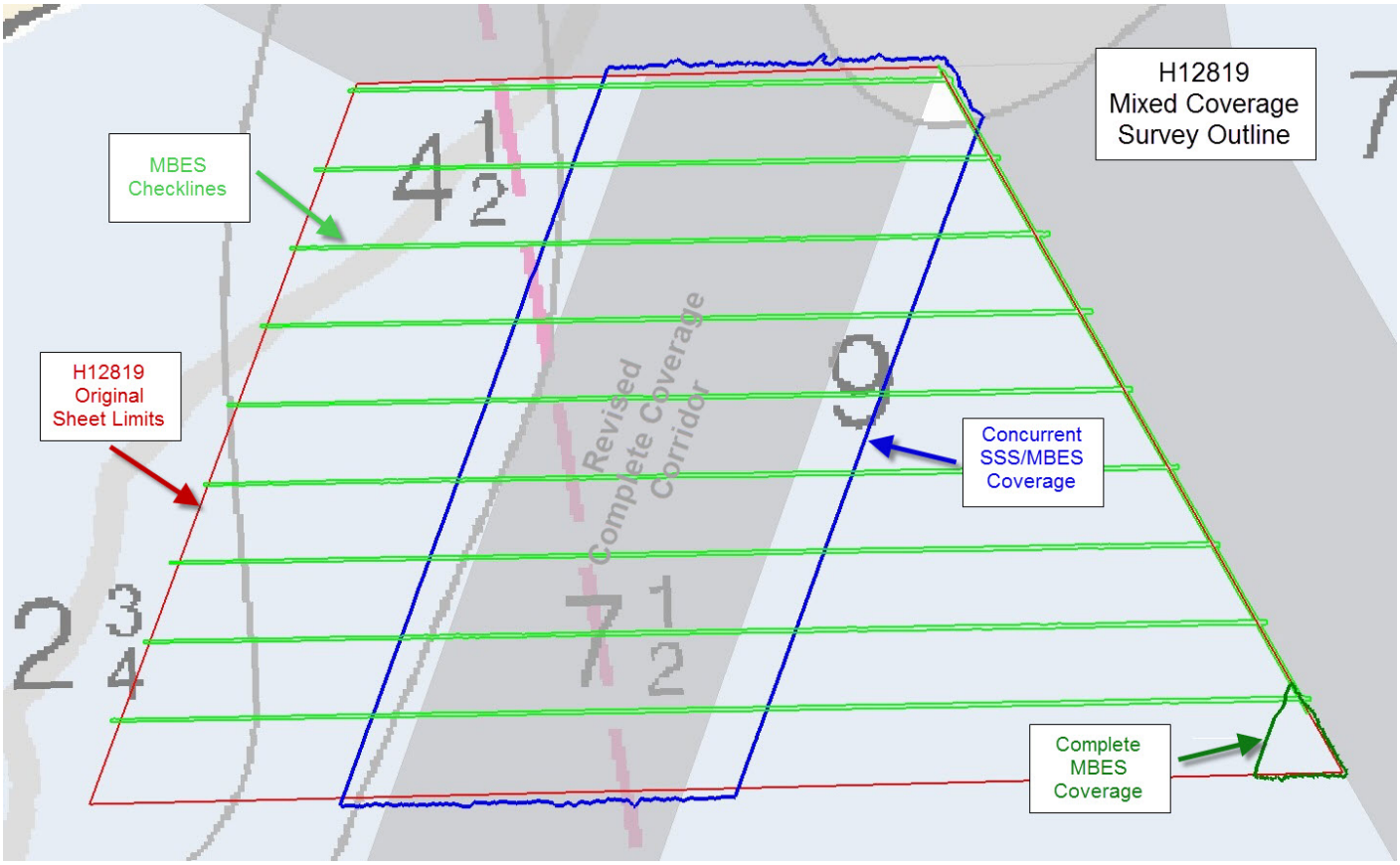


Figure 3: H12819 Mixed Coverage Survey Outline, transit corridor shown in gray.

On July 10, 2015, NOAA Hydrographic Survey Division (HSD) Operations Branch altered the coverage requirements for Kotzebue Sound surveys (Figure 4). For specific changes, refer to "OPR-S327-RAFA-15 Updated Coverage Requirements.pdf" located in the supplemental correspondence folder included with this report.

On July 13, 2015 NOAA HSD further altered coverage requirements for Kotzebue Sound surveys. For details see supplemental correspondence document "Second Change OPR-S327-RAFA-15 Updated Coverage Requirements.pdf".

These combined changes included the following: a transit corridor was developed within which H12819 was required to obtain either 100% SSS with concurrent set line spacing SBES or MBES with backscatter, or complete MBES with backscatter; the requirement for 300-meter line spacing outside the corridor was dropped. These altered coverage requirements were issued only after a substantial part of H12819 was surveyed under the original statement of work. See Figure 3 for H12819 mixed coverage survey outline.

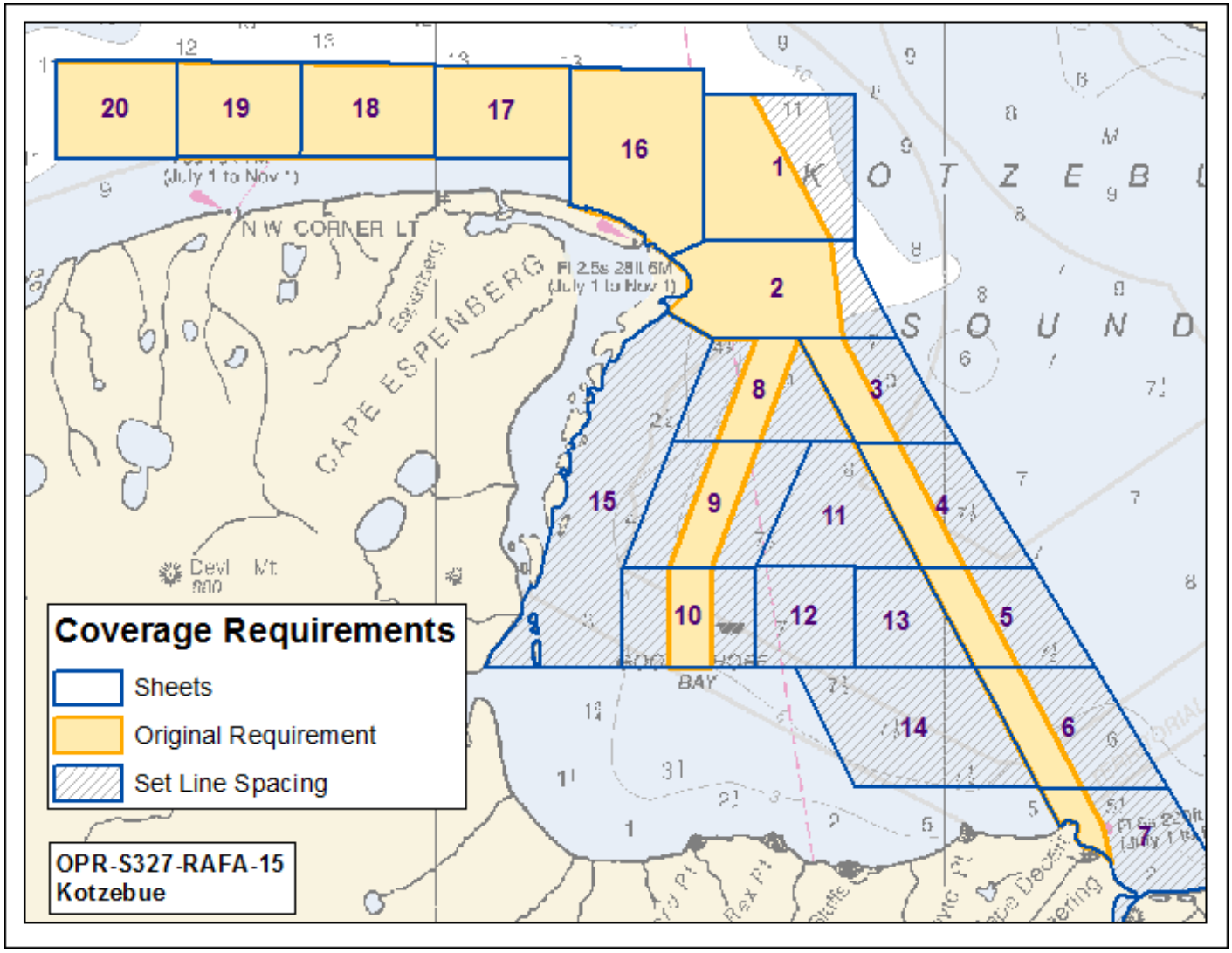


Figure 4: OPR-S327-RA-15 altered coverage requirements, July 10, 2015.

The legend in Figure 4 is somewhat misleading. The yellow does not indicate where coverage had originally been required, rather it indicates where the original coverage requirements (as stated in the Projects Instructions) were to be retained after modifications had been made to other areas of the project. See attached correspondence regarding changes to the coverage requirements.

A.5 Survey Statistics

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

	HULL ID	*2802*	*2803*	*2804*	*Total*
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	0	9.9	2.2	12.1
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0
	MBES/SSS Mainscheme	149.9	0	164.8	314.7
	SBES/MBES Crosslines	0	61.7	0	61.7
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					0
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					15.59

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
06/26/2015	177
06/27/2015	178
06/28/2015	179
06/29/2015	180
06/30/2015	181
08/01/2015	213
08/08/2015	220

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the 2015 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	*2802*	*2803*	*2804*
LOA	8.8 meters	8.8 meters	8.8 meters
Draft	1.1 meters	1.1 meters	1.1 meters

Table 4: Vessels Used

Figure 5: NOAA Ship Rainier survey launch 2802

All data for survey H12819 was acquired by NOAA Ship Rainier survey launches 2802, 2803 and 2804. The vessels acquired MBES depth soundings, backscatter data, side scan sonar imagery and sound speed profiles.

B.1.2 Equipment

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

Manufacturer	Model	Type
Applanix	POS M/V v4	Positioning and Attitude System
EdgeTech	4200-MP	Positioning System
Reson	SeaBat 7125 SV2	MBES
Reson	SeaBat 7125-B	MBES
Sea-Bird Electronics	SBE 19plus SEACAT Profiler	Conductivity, Temperature, and Depth Sensor
Reson	SVP71	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 19% of mainscheme acquisition.

Multibeam crosslines / checklines were acquired using Rainier launch 2803. A 1-meter CUBE surface was created using only H12819 mainscheme lines, and a second 1-meter surface was created using only crosslines. A 1-meter difference surface was then generated in Caris from which statistics were derived. The difference surface was compared to the IHO allowable total vertical uncertainty (TVU) standards. In total, 99.880% of the depth differences between H12819 mainscheme and crossline data met HSSD TVU standards (Figure 6). This analysis was performed on H12819 data with final tides applied and reduced to MLLW using ERZT methods.

A mainscheme to crossline comparison between H12819 data reduced to MLLW using traditional TCARI methods and ERZT methods was conducted. TCARI mainscheme to crossline data differed by an average of -0.031 meters with a standard deviation of 0.081 meters. ERZT mainscheme to crossline data differed by an average of -0.002 meters with a standard deviation of 0.068 meters (Figure 7).

Depth range	IHO Order	Number of nodes	Nodes satisfying HSSD	Percent nodes satisfying HSSD accuracy
Less than 100m	Order 1	1,133,767	1,132,405	99.880%

Figure 6: Summary table indicating percentage of difference surface nodes between H12819 mainscheme and crossline data that met HSSD allowable TVU standards.

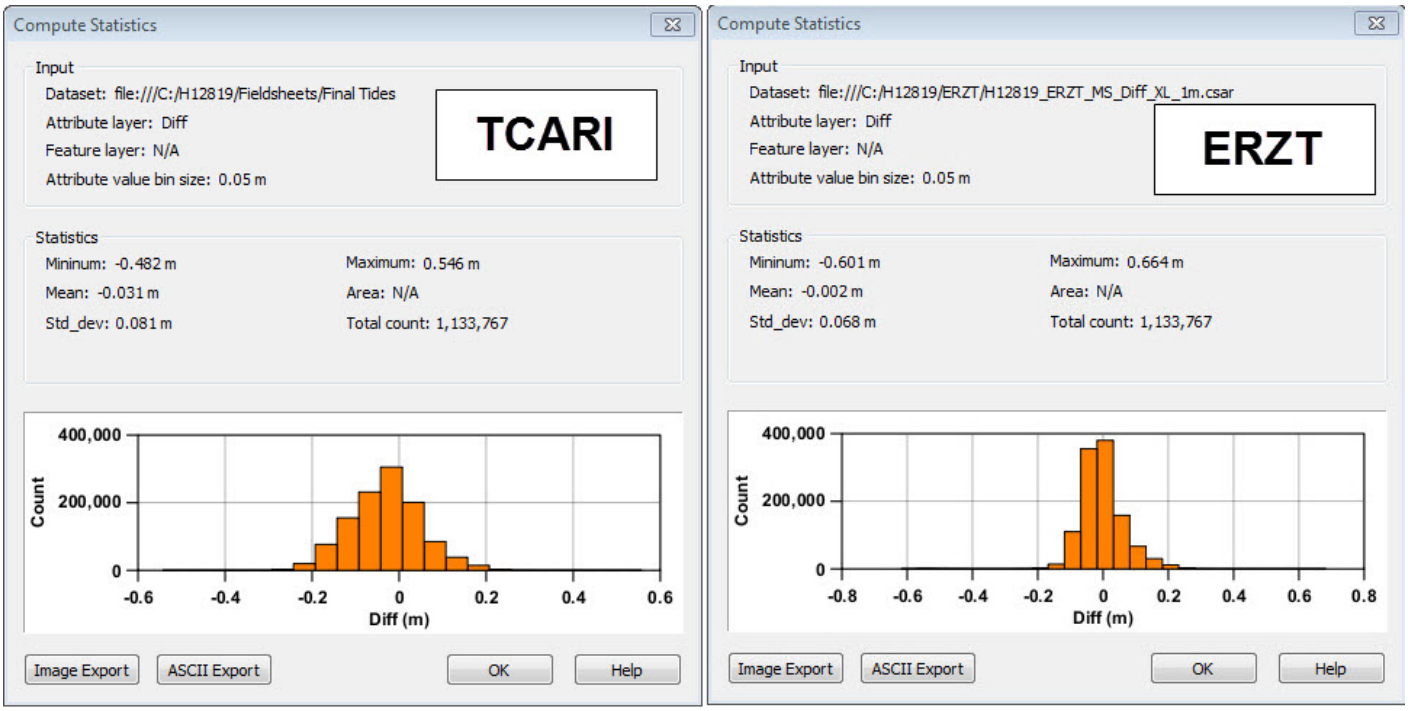


Figure 7: H12819 mainscheme to crossline comparison statistics using TCARI (left) and ERZT (right) methods.

Approximately half of the crossline acquisition does not intersect with mainscheme acquisition resulting in ~8% crossline coverage, which still meets the requirement for this survey.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0.015 meters	0 meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
2802, 2803, 2804	3 meters/second		0.15 meters/second

Table 7: Survey Specific Sound Speed TPU Values

Total Propagated Uncertainty (TPU) values for survey H12819 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 using a Tidal Constituent and Residual Interpolation (TCARI) grid. TCARI automatically calculates the uncertainty associated with water level interpolation, which is then written into the Caris HDCS files. Therefore, no tidal uncertainty values were entered into the tide value section of the Caris compute TPU function related to TCARI, however a measured tide uncertainty value of 0.015 meters was entered to account for ERZT processing methods. See the OPR-S327-RA-15 ERZT memo included in Supplemental Correspondence for further information.

In addition to the usual a priori estimates of uncertainty, some real-time and post processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties from Reson MBES sonars were recorded and applied during post processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were also applied during post processing. Finally, the post processed uncertainties associated with vessel roll, pitch, yaw and navigation, were applied in Caris HIPS using SBET / RMS files generated using POSPac software.

Uncertainty values of submitted finalized grids were calculated in Caris using the "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). The finalized CSAR IHO compliance tool within Pydro was used to analyze H12819 MBES data. The results showed that 100.00% of H12819 nodes met HSSD uncertainty requirements (Figure 8).

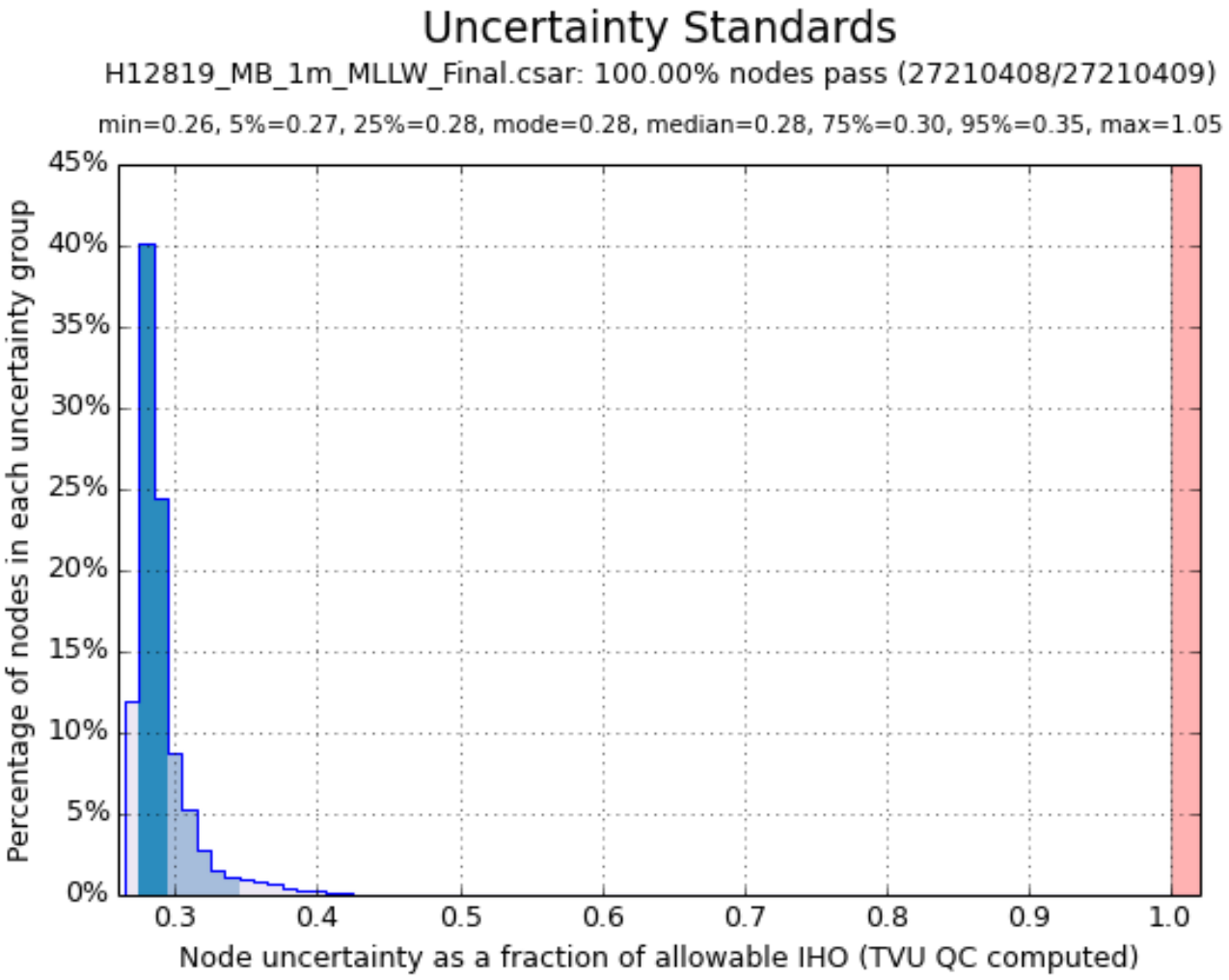


Figure 8: Pydro derived histogram plot showing HSSD uncertainty standards compliance of H12819 MBES data.

The node count in the graphic indicates that only one node failed to meet uncertainty standards, which is effectively 100% of the nodes passing.

B.2.3 Junctions

H12819 junctions with three other surveys which were all part of the same project (Figure 9). H12813 and H12814, located to the north and east of this survey respectively, were conducted by NOAA Ship Fairweather. H12820, located to the south of H12819, was conducted by NOAA Ship Rainier.

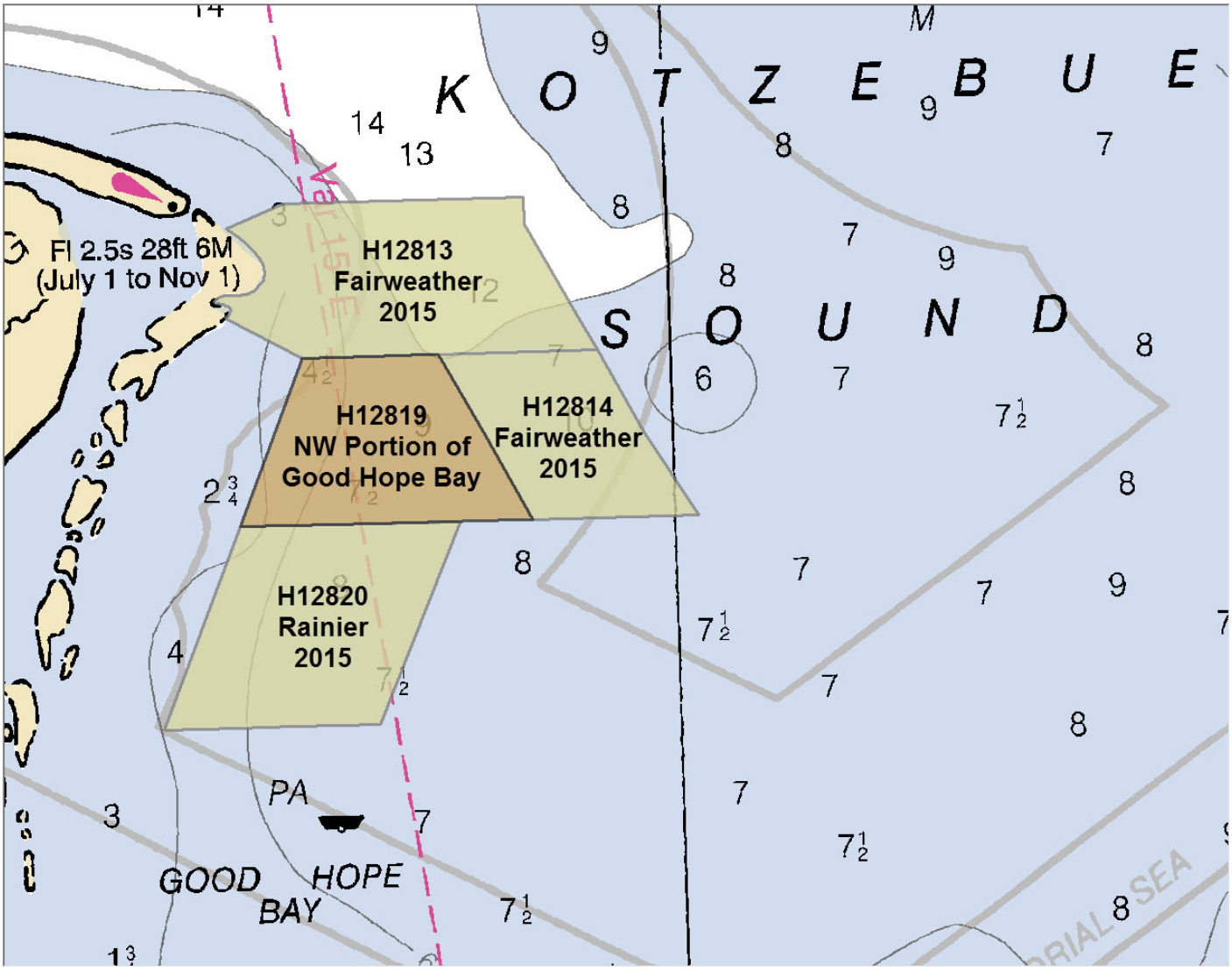


Figure 9: H12819 junction surveys (Chart 16005).

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12813	1:40000	2015	NOAA Ship Fairweather	N
H12814	1:40000	2015	NOAA Ship Fairweather	E
H12820	1:40000	2015	NOAA Ship Rainier	S

Table 8: Junctioning Surveys

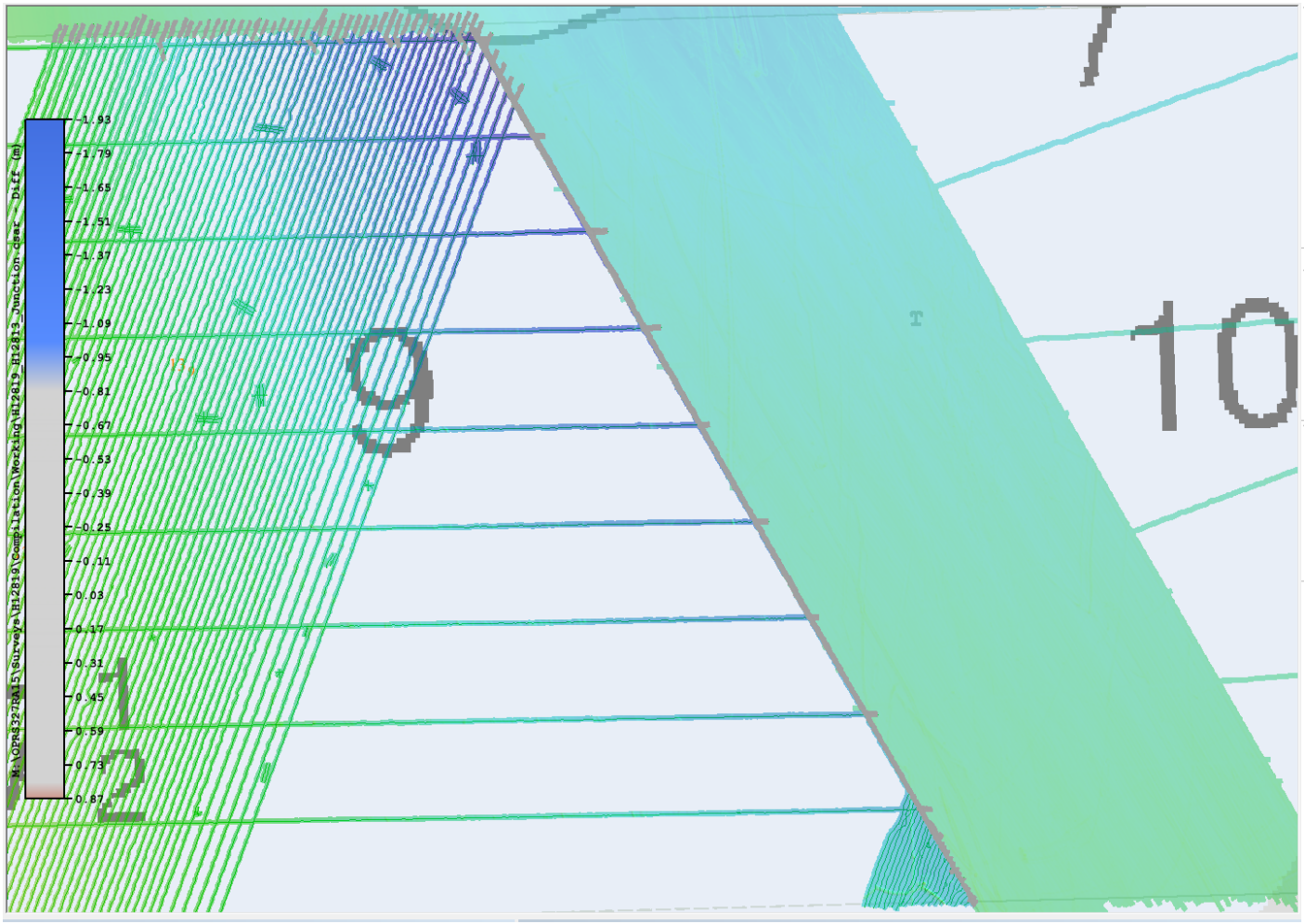
H12813

Junction analysis will be completed at the Pacific Hydrographic Branch.

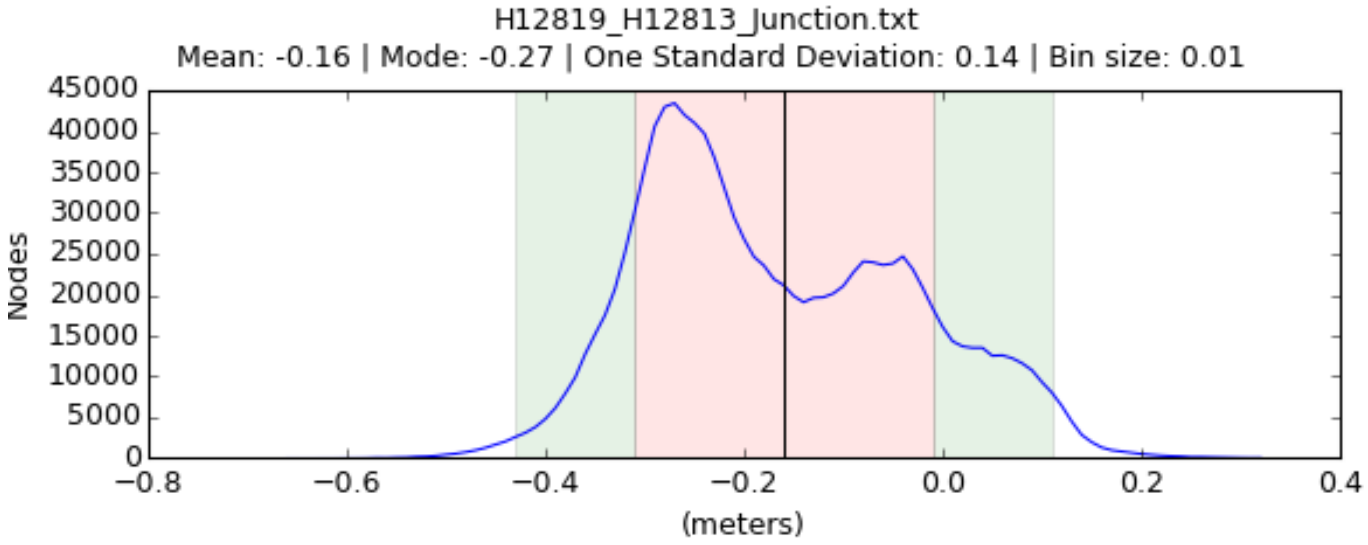
H12814

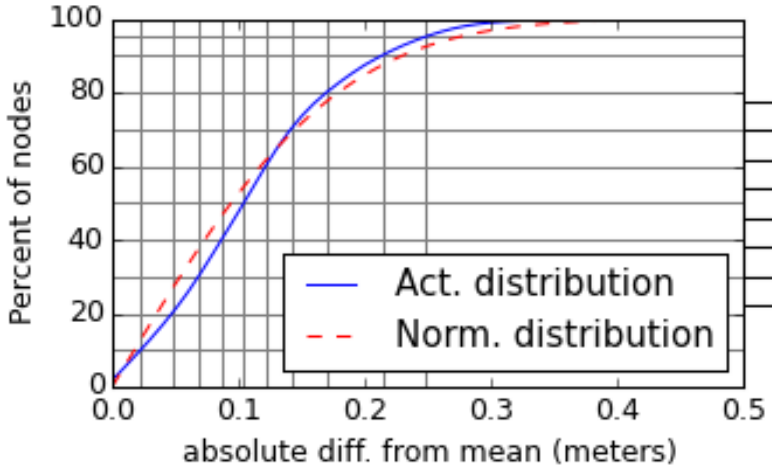
Junction analysis will be completed at the Pacific Hydrographic Branch.

Survey areas for H12813, H12814, and H12815 were modified and combined to create H12813. A junction analysis with H12813 was performed at the Pacific Hydrographic Branch. A difference surface (below) was created using the 1-meter finalized surface from H12819 and the 2-meter combined surface from H12813 and analyzed using the Pydro Explorer "BDB Surface ASCII Export Stats" tool (output below). The surfaces are in good agreement with a mean difference of 0.16 meters and 95% of all surface nodes are within +/- 0.25 meters.



H12819 and H12813 with difference surface.





Percent of nodes	Deviation (m)
50%	+/- 0.10
60%	+/- 0.12
70%	+/- 0.14
80%	+/- 0.17
90%	+/- 0.21
95%	+/- 0.25

Mean difference between H12819 and H12813 was 0.16 meters and 95% of surface nodes are within +/- 0.25 meters.

H12820

H12819 junctions to the south with Rainier survey H12820, however the independent set line spacing of each survey did not yield an optimal overlap for a comparison (Figure 10). Nonetheless, a preliminary comparison was made between 1-meter resolution surfaces from each survey with observed, not final tides applied. As expected, given that most of the junction was of outer-beam data, a modest 73.2% of H12819 / H12820 difference surface nodes satisfied HSSD accuracy standards. For the results of a junction comparison made using final tides, refer to the H12820 Descriptive Report.

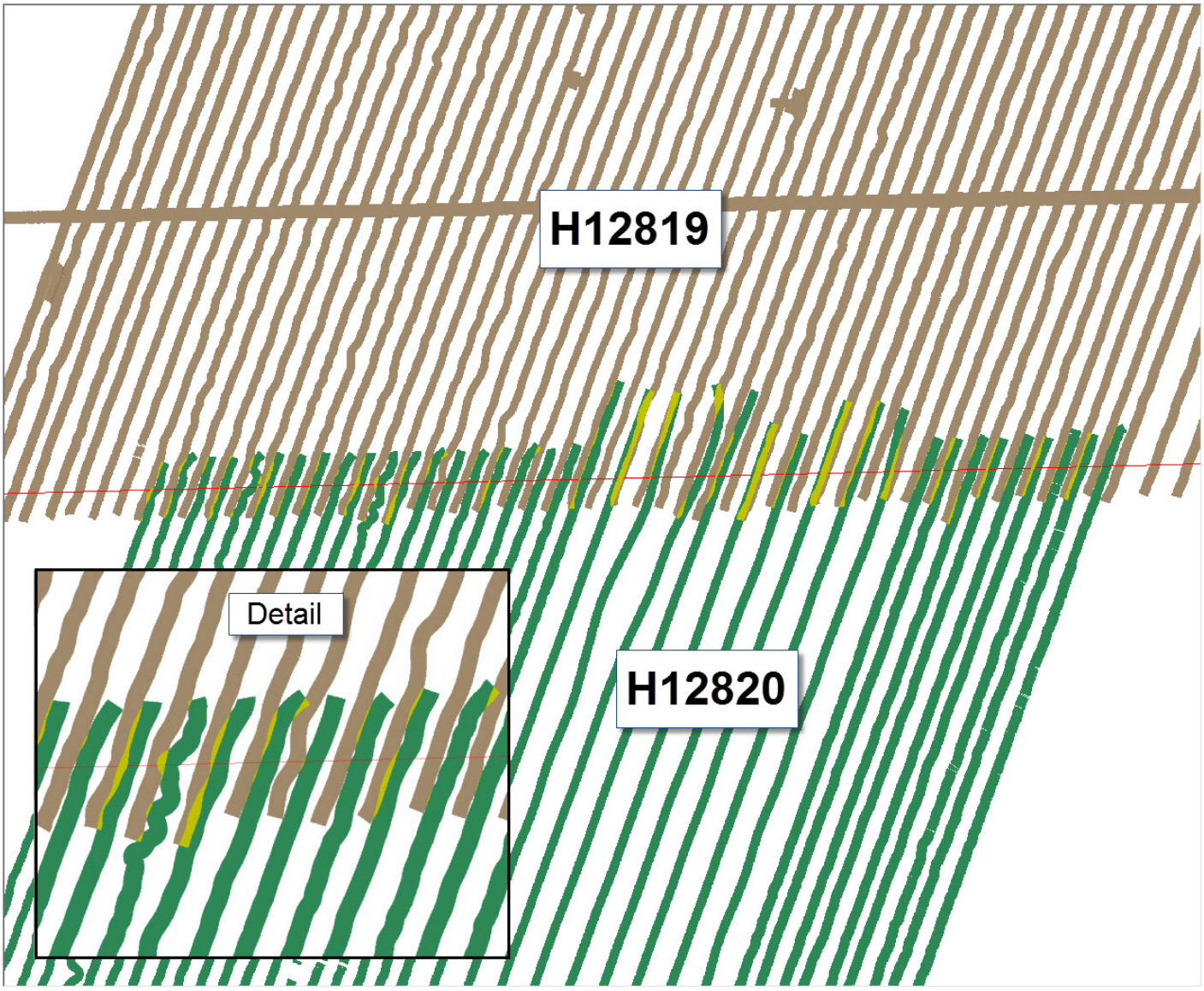


Figure 10: H12819 / H12820 Junction, note difference surface shown as yellow.

B.2.4 Sonar QC Checks

Ice scours present in survey area were utilized to assess effectiveness of SSS imagery during acquisition in an effort to comply with HSSD requirements. Estimated effective swath was noted in acquisition logs.

B.2.5 Equipment Effectiveness

Side Scan Sonar Image Quality

At the conclusion of H12819 acquisition, a decision was made to reconfigure the heading sensors of the side scan sonars (SSS). Although this change resulted in improved image quality of subsequent SSS

data, it should be noted that the previously acquired imagery was adequate for object detection purposes. Prominent seafloor scours seen during acquisition were used real-time to assess SSS system effectiveness and periodically recored in the acquisition log throughout the survey day. Contacts selected for full multibeam investigation were chosen from H12819 line data in Caris SIPS side scan editor. For further information, refer to section B.1.2 of the 2015 NOAA Ship Rainier Digital Acquisition and Processing Report (DAPR).

B.2.6 Factors Affecting Soundings

Side Scan Sonar Refraction

The presence of a strong pycnocline (a marked difference in water density) sometimes caused refraction of side scan sonar imagery, reducing the effective range of SSS data for object detection. Side scan data for this survey was acquired with hull-mounted, rather than towed systems, which precluded the option of adjusting "fish" height to optimize data quality. In order to address these sonar limitations, the majority of H12819 SSS data were acquired using one hundred meter range scale and 80-meter spaced lines, rather than the more standard 160-meter set line spacing. As a result, much greater overlap between adjacent lines was achieved essentially yielding 200% coverage which enhanced object detection ability.

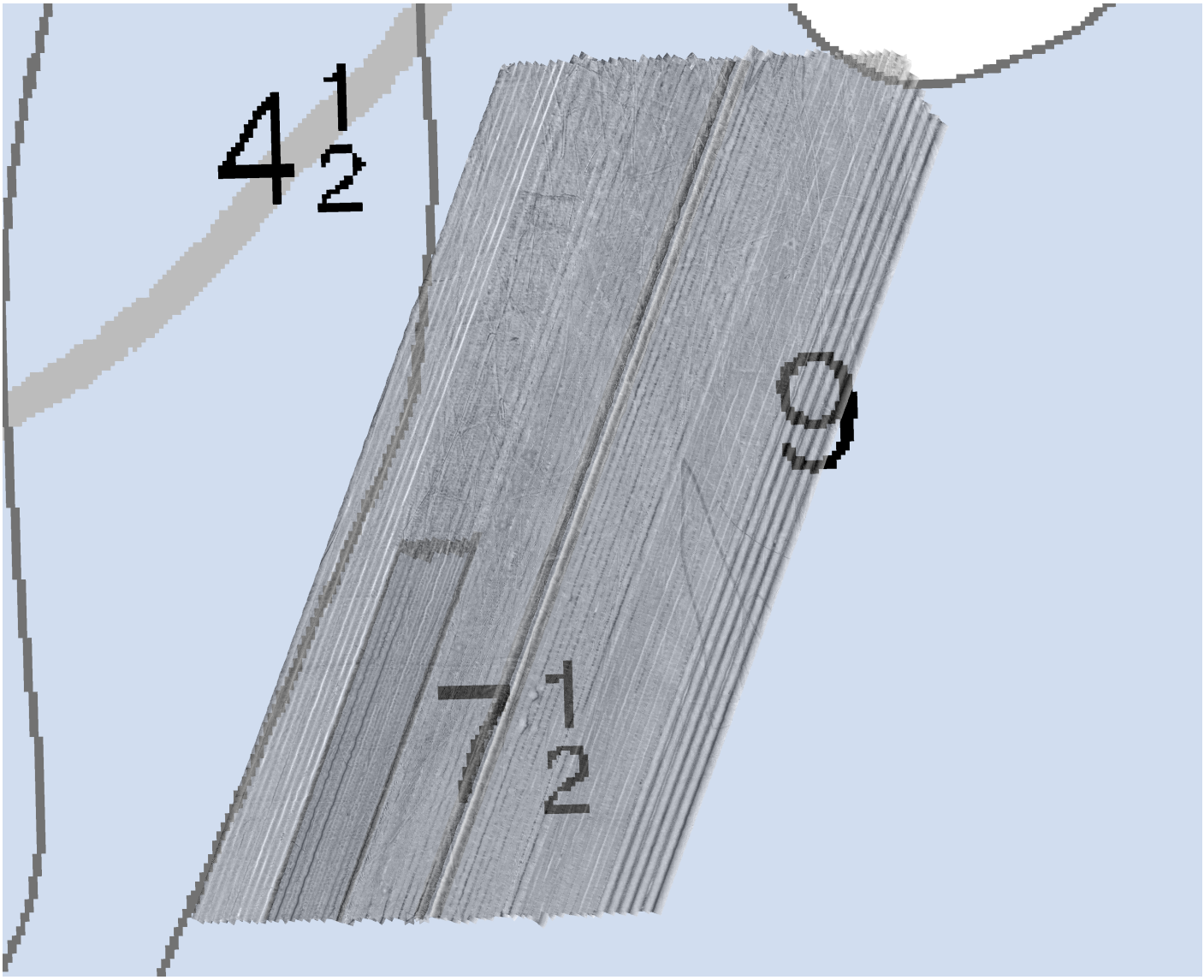


Figure 11: Mosaic of H12819 100% side scan sonar coverage (Chart 16005).

Suboptimal Sound Speed Correction

Due to variations in the water column, thermal layering, salinity differences and other factors, a distinct demarcation of water masses was sometimes observed in the field. This proved problematic in the acquisition and application of sound speed correction data. Despite the best efforts of the hydrographer to conduct sufficient sound speed casts distributed spatially and temporally, in some areas sound speed data correction was suboptimal. H12819 MBES data acquired in the southeast corner of the survey area exhibits an upward deflection of approximately 0.15 meters when viewed in Caris subset editor (Figure 12). As a result, sound speed related artifacts can be found in the submitted CUBE surface. To address this issue, the Hydrographer rejected outer beam soundings obviously in error in an attempt to produce a surface that best represented the sea floor. All examined sound speed related offsets were observed to be within NOAA HSSD standards.

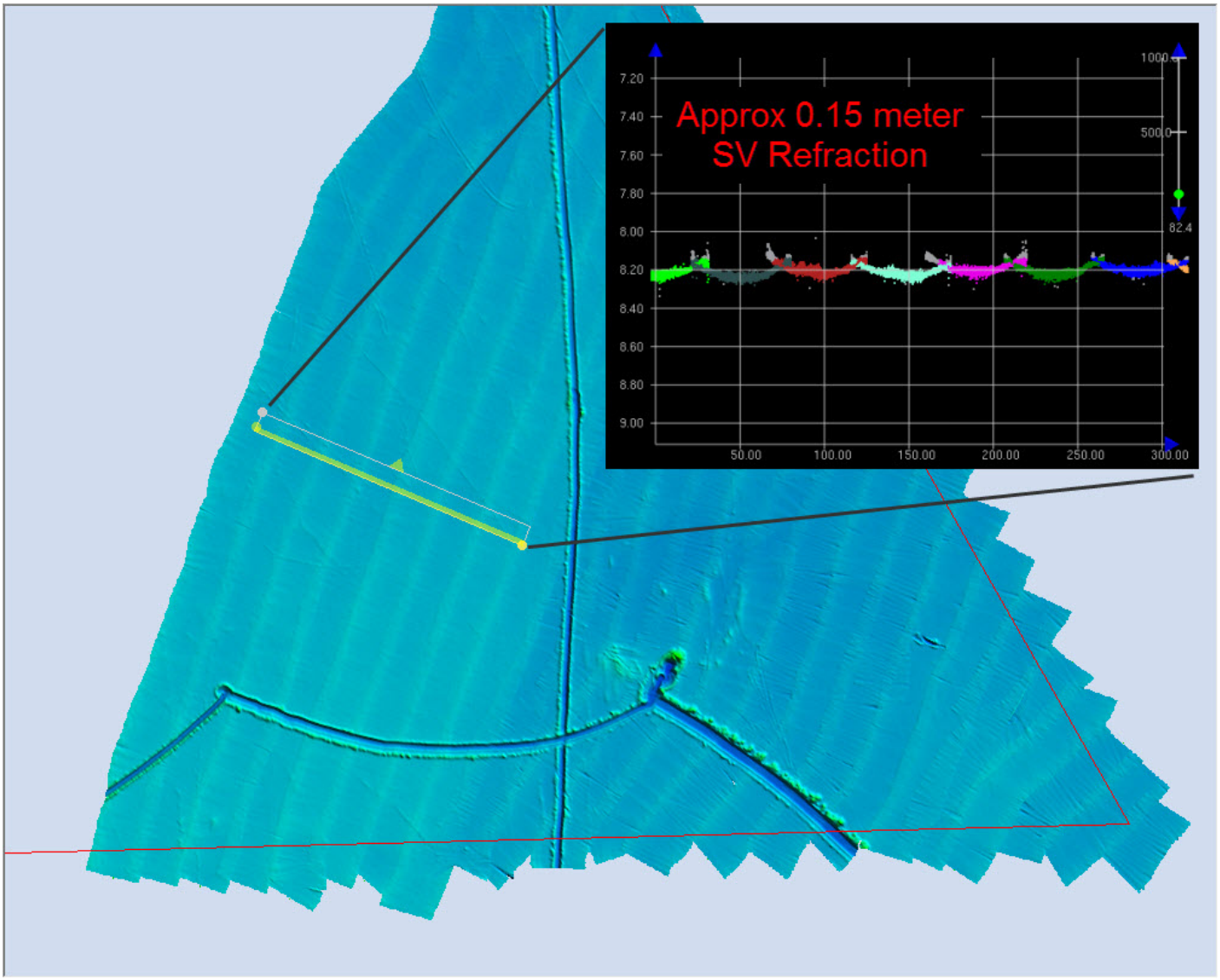


Figure 12: Surface and subset views of H12819 MBES data with suboptimal sound speed correction (rejected outer beam soundings colored gray). Note: visible sea floor scours are believed caused by winter ice drag.

Adverse Sea State

Choppy seas with wave heights of 2-4 feet were sometimes encountered during data acquisition. These conditions caused momentary loss of multibeam sonar bottom detection during extremes of vessel attitude. Heave artifacts of approximately 0.05 meters also appear related to these conditions. The resultant wayward soundings were examined and rejected in Caris subset editor to best represent the sea floor (Figure 13).

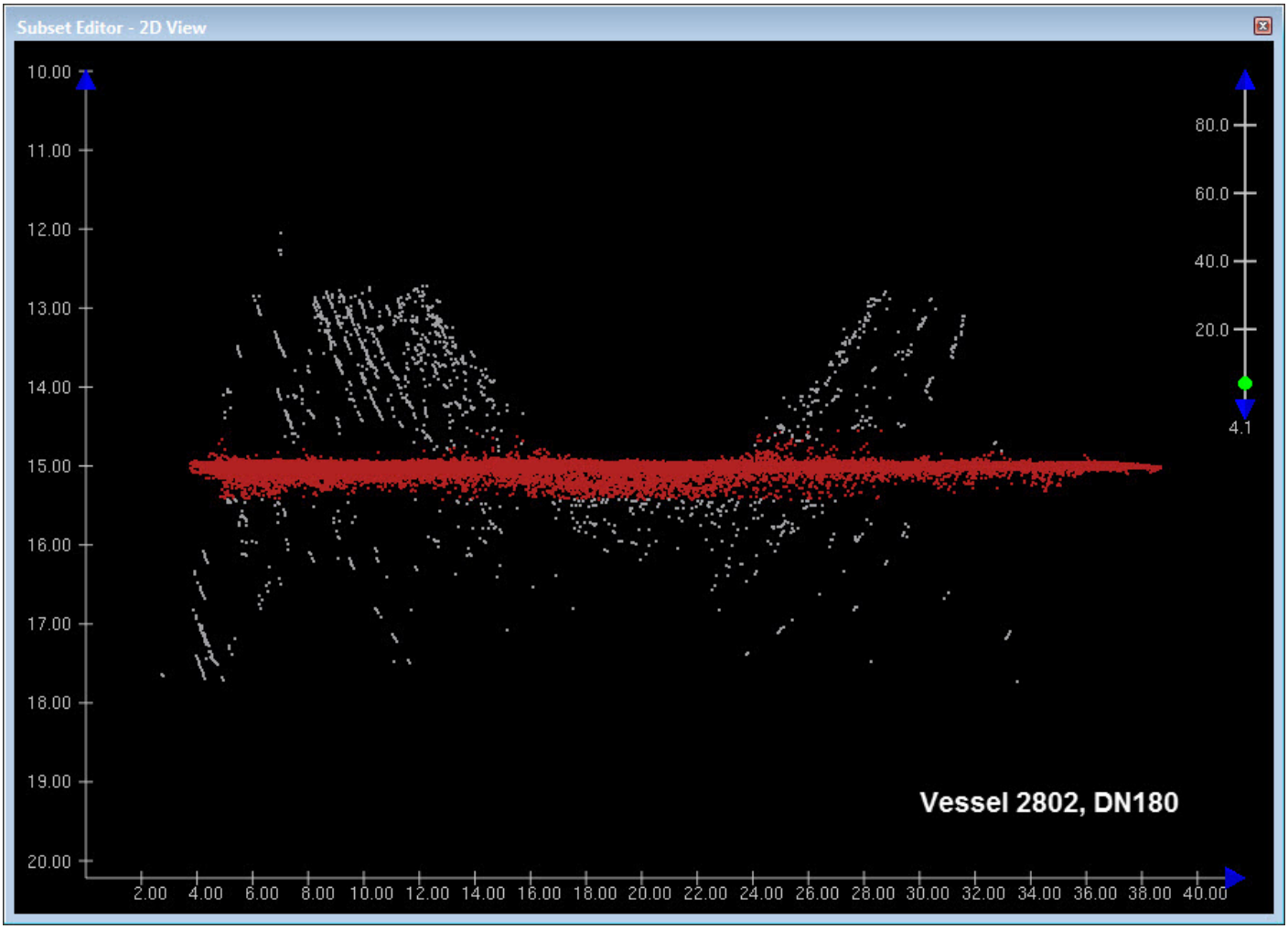


Figure 13: Subset view of poor bottom detection caused by adverse sea state, rejected soundings colored gray.

The data is adequate for charting despite the motion artifacts due to sea state.

SBET Interpolation

Eight altitude spikes were identified in the SBET applied to line 1912 from Launch 2802 on DN213. The Pydro POSPac Automated QC tool was used to interpolate the anomalous data and to export a new SBET which was applied to 2802 DN213 line 1912. With the new SBET applied, line 1912 agrees with adjacent data to within 0.15 meters.

The data subject to SBET interpolation is adequate for charting.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed profiles were acquired on Rainier's launches using SBE 19plus CTD probes at discrete locations within the survey area at least once every four hours, when significant changes in surface sound speed were observed, or when surveying in a new area. Fifty two CTD casts were acquired and applied to H12819 MBES data using the nearest in distance within time (4 hours) method.

B.2.8 Coverage Equipment and Methods

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

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

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

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter data, logged as .7k files, were acquired but not formally processed by Rainier personnel. Sample backscatter lines were reviewed on Rainier for quality control purposes. The data was submitted directly to the National Centers for Environmental Information (NCEI).

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 Profile V_5_3_3.

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
H12819_MB_1m_MLLW	CUBE	1 meters	9.8 meters - 17.3 meters	NOAA_1m	SSS with Concurrent MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12819_MB_1m_MLLW_Final	CUBE	1 meters	9.8 meters - 17.3 meters	NOAA_1m	SSS with Concurrent MBES
H12819_2802_HF_SS_1m_100	SSS Mosaic	1 meters	-	N/A	100% SSS
H12819_2802_LF_SS_1m_100	SSS Mosaic	1 meters	-	N/A	100% SSS
H12819_2804_LF_ss_1m_Gain10	SSS Mosaic	1 meters	-	N/A	100% SSS

Table 9: Submitted Surfaces

Based on HSSD requirements, no soundings were designated within the H12819 survey area.

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:

ERZT

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

Station Name	Station ID
Red Dog Dock, AK	9491094

Table 10: NWLON Tide Stations

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

Station Name	Station ID
Kotzebue, AK	9490424
Cape Espenberg, AK	9490096
Goodhope Bay, AK	9469833

Table 11: Subordinate Tide Stations

File Name	Status
9491094.tid	Final Approved
9490424.tid	Final Approved
9490096.tid	Final Approved
9469833.tid	Final Approved

Table 12: Water Level Files (.tid)

File Name	Status
S327FARA2015_Final.tc	Final

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

A request for final approved tides was sent to N/OPS1 on 08/21/2015. The final tide note was received on 01/29/2016.

CO-OPS delivery of final tides for this project was significantly delayed; see Appendix II, Supplemental Correspondence document "CO-OPS_Delayed_Kotzebue Tides.pdf" for details. In addition, see supplemental correspondence regarding final tides data gaps.

Correspondence noted above is appended to this report. See attached Tide Note dated January 28, 2016.

Non-Standard Vertical Control Methods Used:

Ellipsoid to Chart Datum Separation File:

H12819_SeparationModel_B_1000m.csar

Ellipsoidally Referenced Zoned Tides (ERZT) methods were used to transform between the ellipsoid and water level data. A 1000-meter resolution separation model between the ellipsoid and MLLW was computed using the real-time position measurements observed during the survey relative to the water line and the loaded TCARI tide file. "GPS tides" were then computed using the above separation model and the corrected GPS-height-to-water level data (SBET). For additional information see the OPR-S327-RA-15 ERZT Memo submitted separately.

See attached ERZT Capability Memo.

C.2 Horizontal Control

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

The projection used for this project is Universal Transverse Mercator (UTM) Zone 3 North..

The following PPK methods were used for horizontal control:

Single Base

Vessel kinematic data (POS files) were post-processed with Applanix POSPac and POSGNSS software using In-Fusion SingleBase processing methods described in the DAPR. SBET and RMS data were applied to all H12819 survey lines.

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
9715	Tern Tower (Rainier's Point Espenberg station)
9677	Ernie (Fairweather's Point Espenberg station)

Table 14: User Installed Base Stations

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between H12819 survey data and Chart 16005 using a 1-meter Caris CUBE surface and selected soundings.

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
16005	1:700000	11	05/2015	08/25/2015	08/22/2015

Table 15: Largest Scale Raster Charts

16005

H12819 sounding data coincides with three charted depths as shown in Figure 14. H12819 soundings agree to within one half fathom over the charted 7 1/2 fathom depth and to within 1 fathom over the charted 9 fathom depth. H12819 soundings from the 1,000 meter spaced checklines north and south of the charted 4 1/2 fathom depth are approximately two fathoms deeper than Chart 16005.

The 6-fathom depth contour identified by H12819 data, was located approximately 2,400 meters west (inshore) of the currently charted position (Figure 15).

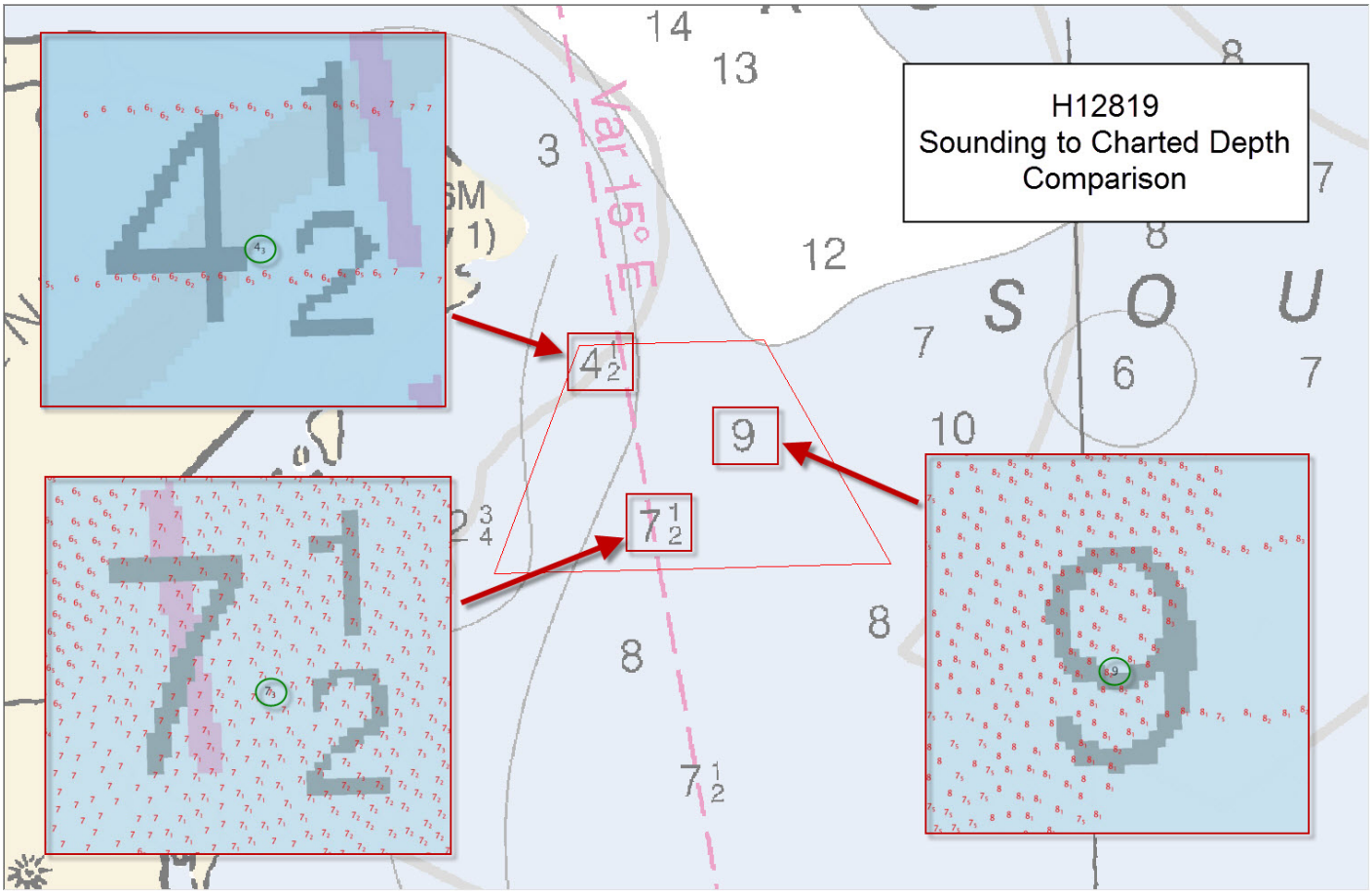


Figure 14: H12819 Soundings (in red) overlaid on Chart 16005. (ENC US2AK92M depths circled in green)

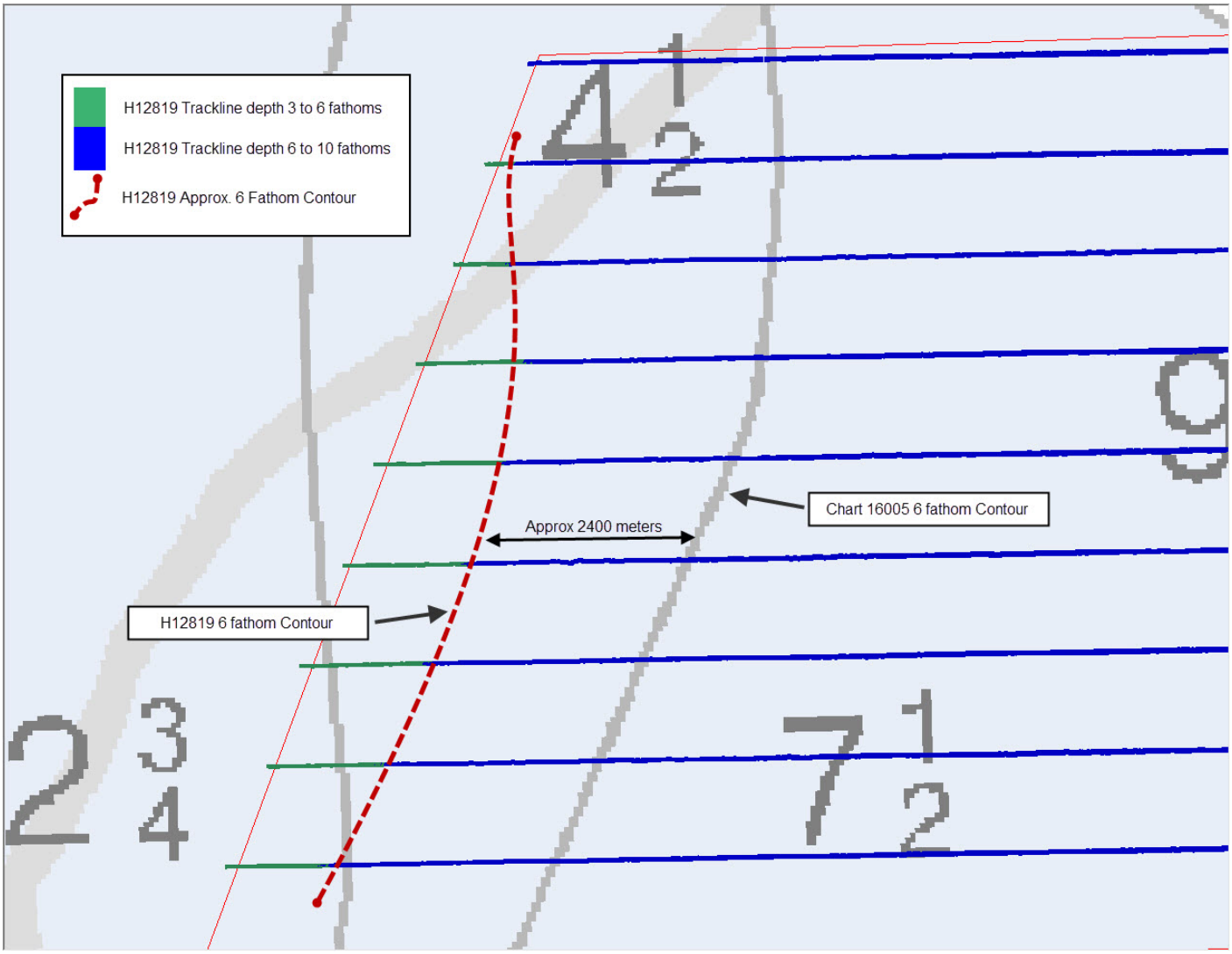


Figure 15: Location of H12819 6-fathom depth contour approximately 2,400 meters west of charted (16005) position.

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?
US2AK92M	1:700000	7	05/02/2011	11/13/2014	NO
US1AK90M	1:1587870	10	03/18/2015	03/18/2015	NO

Table 16: Largest Scale ENCs

US2AK92M

In the area of survey H12819, Electronic Navigation Chart (ENC) US2AK92M coincides with Chart 16005, therefore a comparison between H12819 and the ENC is equivalent to the preceding comparison with Chart 16005.

US1AK90M

An offset between ENC US1AK90M and Chart 16005 of approximately 4000 meters was observed prior to acquisition of survey H12819. The matter was brought to the attention of the project manager at the HSD Operations Branch, see "Kotzebue Sheets_ENC Offset.pdf" in H12819 Supplemental Correspondence folder in appendix II. No comparison was made between survey H12819 and ENC US1AK90M.

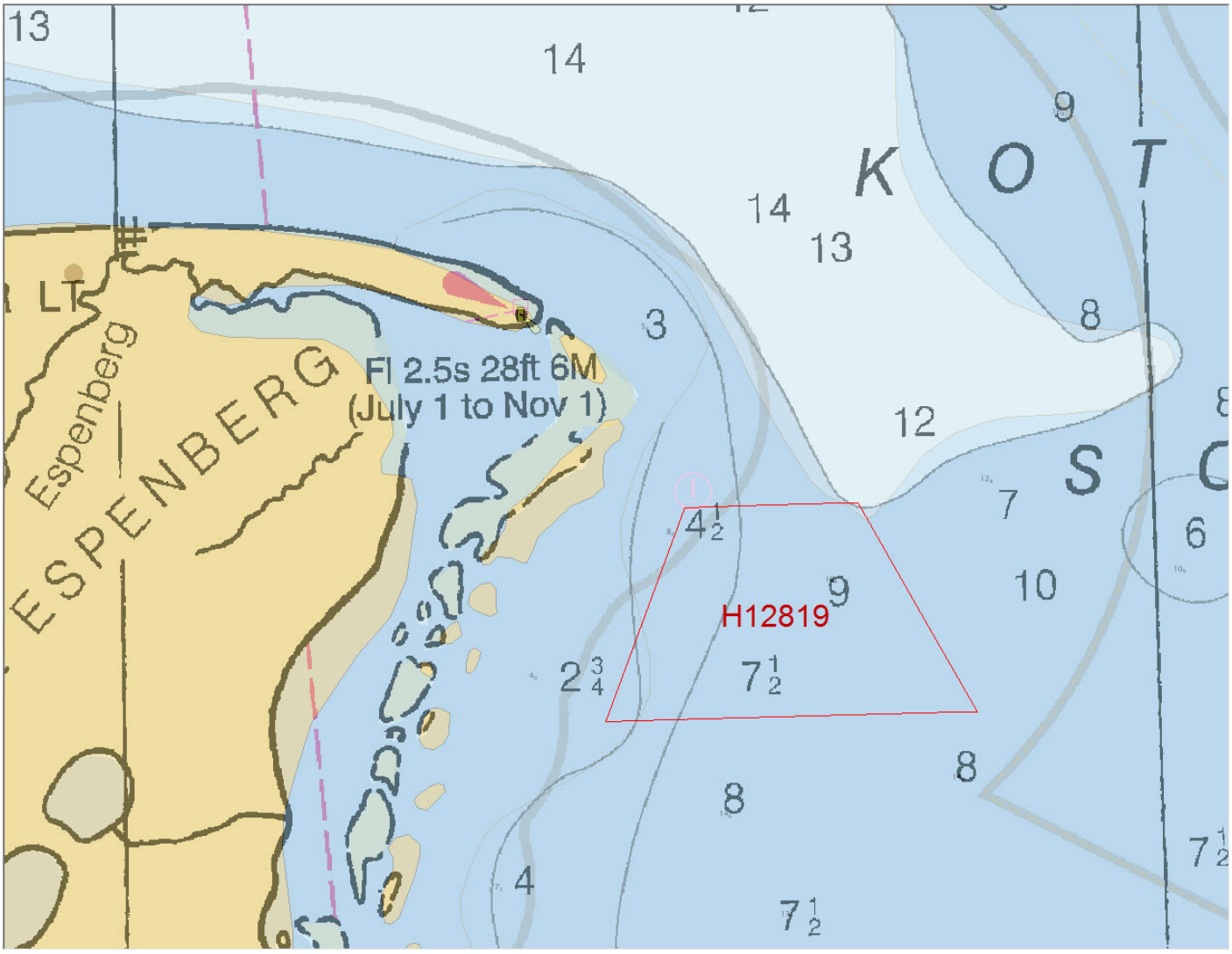


Figure 16: Chart 16005 overlaid on ENC US1AK90M showing offset.

See attached correspondence regarding the ENC offset.

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 labeled PA, ED, PD or Rep 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

The one assigned bottom sample for this survey was not acquired due to an ordered earlier than scheduled departure from the project area.

D.2 Additional Results

D.2.1 Shoreline

Shoreline investigation was not assigned for this survey.

D.2.2 Prior Surveys

No prior surveys were provided for this project.

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 known 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

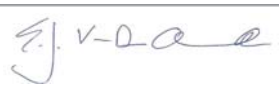
No new insets are recommended for this area.

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
Edward J. Van Den Ameele, CDR/NOAA	Commanding Officer, NOAA Ship Rainier	03/17/2016	
Adam Pfundt, LT/NOAA	Field Operations Officer, NOAA Ship Rainier	03/17/2016	 Adam Pfundt 2016.03.17 14:52:30 -07'00'
James B. Jacobson	Chief Survey Technician, NOAA Ship Rainier	03/17/2016	 James Jacobson I have reviewed this document 2016.03.17 14:19:07 -08'00'
B.D. Jackson	Senior Survey Technician, NOAA Ship Rainier	03/17/2016	 James Jacobson I am signing for Barry Jackson 2016.03.17 14:18:23 -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 : January 28, 2016

HYDROGRAPHIC BRANCH: Alaska
HYDROGRAPHIC PROJECT: OPR-S327-RA-2015
HYDROGRAPHIC SHEET: H12819

LOCALITY: NW Portion of Goodhope Bay, Kotzebue Sound, AK
TIME PERIOD: June 26 - August 8, 2015

TIDE STATION USED: 9491094 Red Dog Dock, AK
Lat.67° 34.6' N Long. 164° 03.9' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.240 meters

TIDE STATION USED: 9490424 Kotzebue, AK
Lat. 66° 54.3' N Long. 162° 35.0' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.192 meters

TIDE STATION USED: 9490096 Cape Espenberg, AK
Lat. 66° 35.1' Long. 164° 15.06'
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.27 meters

TIDE STATION USED: 9469833 Goodhope Bay, AK
Lat. 66° 13.8' Long. 163° 54.3'
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.477 meters

REMARKS: RECOMMENDED Grid

Please use the TCARI grid "S327FARA2015_Final.tc" as the final grid for project OPR-S327-RA-2015, H12819, during the time period between June 26 and August 8, 2015.

Refer to attachments for grid 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: Tidal datums at Goodhope Bay and Cape Espenberg are provisional due to higher uncertainties resulting from either a lack of benchmarks or data processing that accounted for gauge slippage events.

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DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2016.01.28 13:07:56 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Final TCARI Grid for OPR-S327-RA-2015, H12819
NW Portion of Goodhope Bay, Kotzebue Sound, AK
9491094 RED DOG DOCK
9490424 KOTZEBUE, KOTZEBUE SOUND
9490096 CAPE ESPENBERG
9469833 GOODHOPE BAY
bing
Image courtesy of NASA Earthstar Geographics SIO © 2016 Microsoft Corporation

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
NOAA Ship *Rainier* (S-221)
2002 SE Marine Science Dr, Newport, OR 97365

March 04, 2016

MEMORANDUM FOR: Lieutenant Commander Michael Gonsalves, NOAA
Chief, Operations Branch
Hydrographic Surveys Division

FROM: Commander Edward J. Van Den Ameele, NOAA
Commanding Officer

SUBJECT: OPR-S327-RA-15 H12819 ERS/ERZT Capability Memo

NOAA Ship *Rainier* personnel conducted an evaluation of utilizing Ellipsoidal Referenced Survey (ERS) methods using Ellipsoidally Referenced Zoned Tides (ERZT) per the OPR-S327-RA-15 Project Instructions (PIs) to reduce sounding data to chart datum, and compared these methods with traditional reduction methods utilizing observed water levels and Tidal Constituent and Residual Interpolation (TCARI). Results indicate that the differences between the two methods are within acceptable limits and both are valid methods for reducing sounding data to chart datum. Procedures, results, and recommendations are in the attached report.

It is recommended that survey H12819 be reduced to Mean Lower-Low Water (MLLW) using ERZT, as detailed in the attached report.

It is understood that upon review of this report, a determination will be made for the final vertical transformation technique to be used to create the final deliverables.

Attachment:
H12819 ERZT Report

H12819 ERZT Report

1.0 Introduction

This document describes the methods and results of the vertical datum analysis component of the vertical control requirements of the Hydrographic Survey Project Instructions for OPR-S327-RA-15 Kotzebue Sound. This report specifically addresses survey H12819.

The Project Instructions required *Rainier* to recommend the final vertical transformation technique after comparing crossline data. The recommendations and supporting data included in this report are intended for use by the Hydrographic Surveys Division (HSD) to support the final decision on the use of ellipsoidally-referenced zoned tides (ERZT) methods to reduce hydrographic data to chart datum using the field-generated separation model in lieu of reduction using measured water levels and the Tidal Constituent and Residual Interpolation (TCARI) methodology for the OPR-S327-RA-15 surveys.

The basis of this analysis is a comparison of the results of using both TCARI and ERZT bathymetry for vertical control for each survey, and a comparison of different ERZT separation models (SEP).

2.0 Procedure

The ERZT evaluation was conducted with a standard operating procedure (SOP) provided by HSD as a primary reference. Though the SOP was utilized as an initial reference, *Rainier* did not find that it adequately addressed all issues required for utilization. *Rainier* addressed this through development of our own SOPs, and numerous emails, phone calls, and decisions as hydrographers. The general procedure is outlined below.

Survey data for H12819 were reduced to Mean Lower Low Water (MLLW) using the final approved TCARI grid and water levels to produce the traditional surfaces and time series data. Survey data were also independently reduced to MLLW using a field-created ERZT SEP applied to the data with GPS tides and then merged. ERZT SEPs were first created at a fine resolution (100m) to use in analysis and troubleshooting of vertical positioning, primarily in the case of SBET data.

Smoothed Best Estimate of Trajectories (SBETs) were generated using a PPK single base method as outlined in OPR-S327-RA-15 HVCR. In error, *Rainier* SBETs for this project have been produced in WGS84 rather than NAD83. Due to the significant effort required to re-export and re-apply all SBETs, the decision was made in consultation with HSD and Hydrographic Systems Technology Branch (HSTB) to keep data in WGS84.The TCARI method does not utilize the vertical component of the SBET data in the process of reducing to MLLW; thus, the incorrect datum, WGS84 instead of NAD83, only affects the horizontal component of positioning when using TCARI to reduce to MLLW. This error introduces a bias into the horizontal positioning; the total difference between NAD83 and WGS84 within the survey area is within allowable horizontal position uncertainties. It should be noted that the SEP produced from this survey will be vertically referenced to WGS84 and not NAD83.

Once all SBETs were resolved, and a consistent ERZT SEP model could be generated with a majority of the SBETs being correct, a coarser ERZT SEP was generated (1000m) for sounding reduction in application of GPS Tides. ERZT SEP models were also compared to an estimated separation surface (ESEP) provided by HSTB based on Geoid12B, the TCARI model amplitudes, and a model of sea-surface topography. These ESEP models provided by HSTB were used as an additional means of evaluation and troubleshooting and were not used to reduce final data to MLLW.

ERZT uncertainty was calculated using a standard error estimator, wherein the mean of the ERZT standard deviation layer was divided by the square root of an estimated number of survey lines in a given node. This value was then applied when computing Total Propagated Uncertainty (TPU).

Crossline difference surfaces (main-scheme versus crossline data) and statistics were generated for each method of reduction to MLLW and compared against one another.

ERZT SEPs generated by *Rainier* were also compared to the HSTB-created ESEPs as a means of comparison and troubleshooting. Difference surfaces and statistics of these two SEPs were also evaluated.

3.0 Results

This report will answer two questions:

ÅWhat are the quantitative and qualitative differences between the two reduction methods?

ÅWhich method of reduction to MLLW is appropriate for this specific survey?

3.1 ERZT Model

The ERZT model separation surface, H12819_SeparationModel_B_1000m.csar, was generated by RA using the ERZT SOP (Figure 1). This model provides the separation between the WGS84 ellipsoid and MLLW datum. The slope of the separation model was examined for errors and inconsistencies that could produce vertical offsets in reduced data.

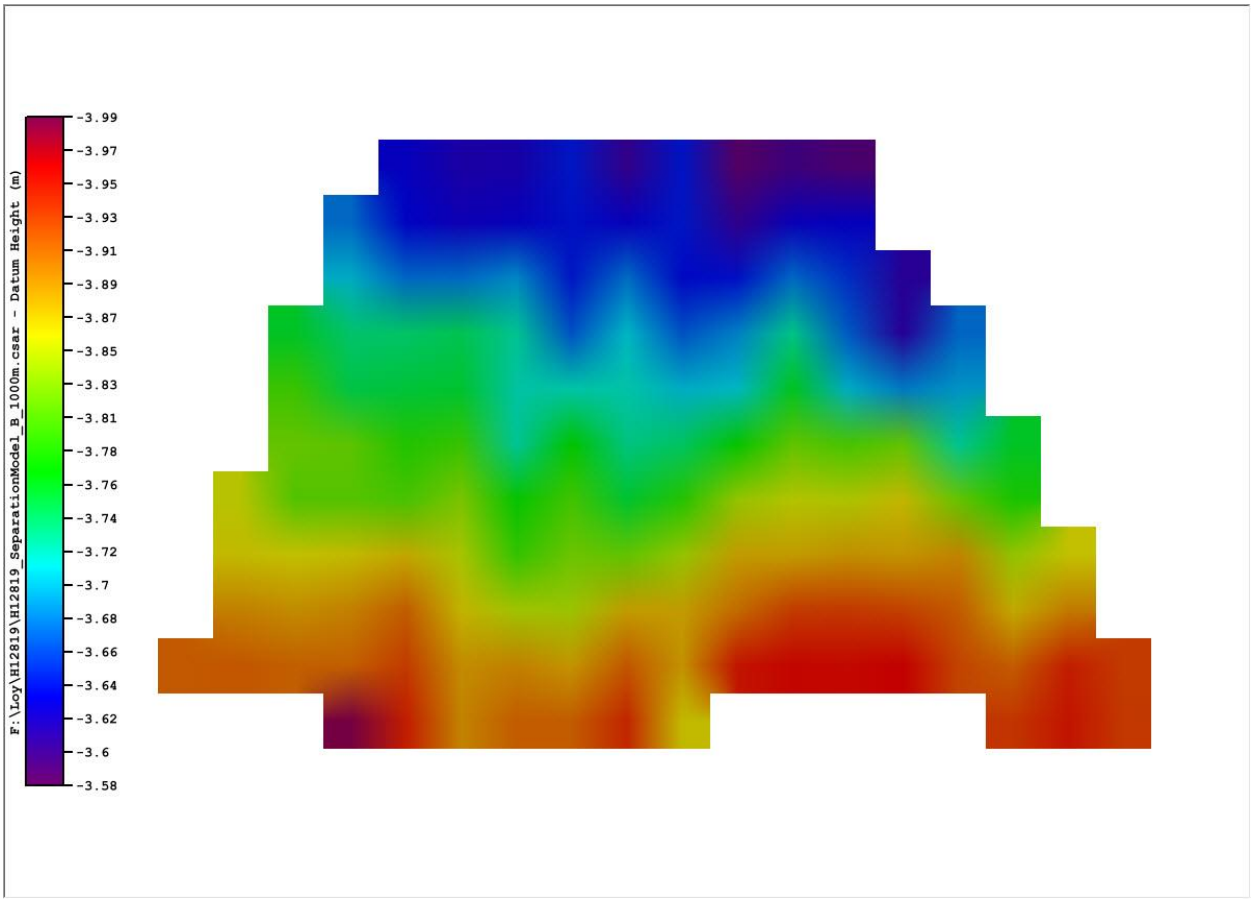


Figure 1. Image of H12819 ERZT SEP with 1000m resolution.

The separation surface is free of gaps and anomalies within the H12819 survey area. Variability in the ERZT separation surface is due to variation in the SBETs, Tide Model, Sea Surface topography, heave, dynamic and static draft. More gradual trends represent the variation of the SEP over large distances.

Examining the SEP alone within the limits of H12819 there are no anomalous spikes or discontinuities, suggesting the overall vertical positioning and using the model as a means of sounding reduction are both reasonable.

3.2. Quantitative Analysis

H12819	TCARI XL - MS Difference (m)		ERZT XL - MS Difference (m)		ESEP - ERZT (WGS84) Difference (m)		TCARI MLLW - ERZT MLLW Difference (m)	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
	-0.031	0.081	-0.002	0.068	-0.07	0.04	0.00	0.06

Table 1. Results of difference surface analyses for H12819.

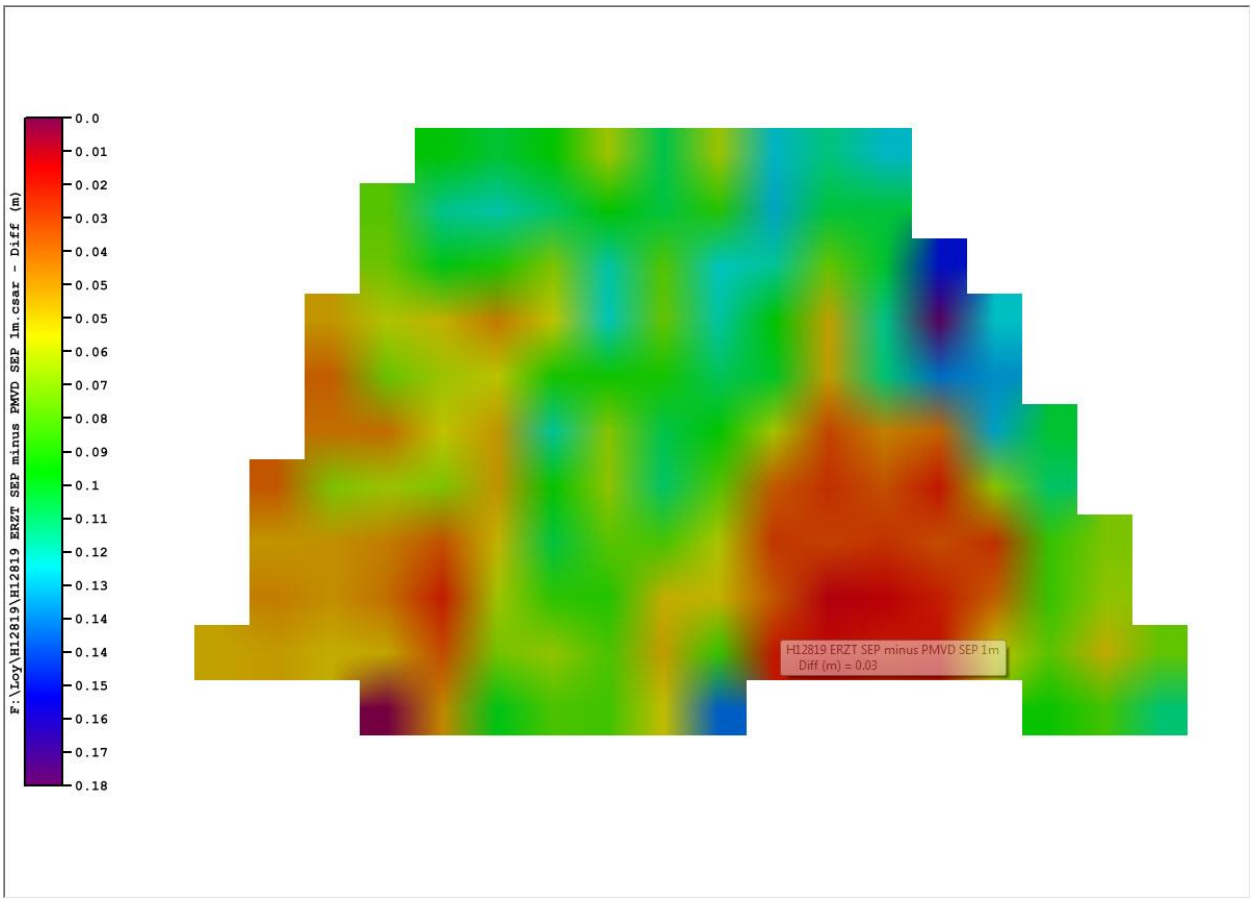


Figure 2. Image of H12819 ESEP - ERZT SEP difference surface 1000m resolution

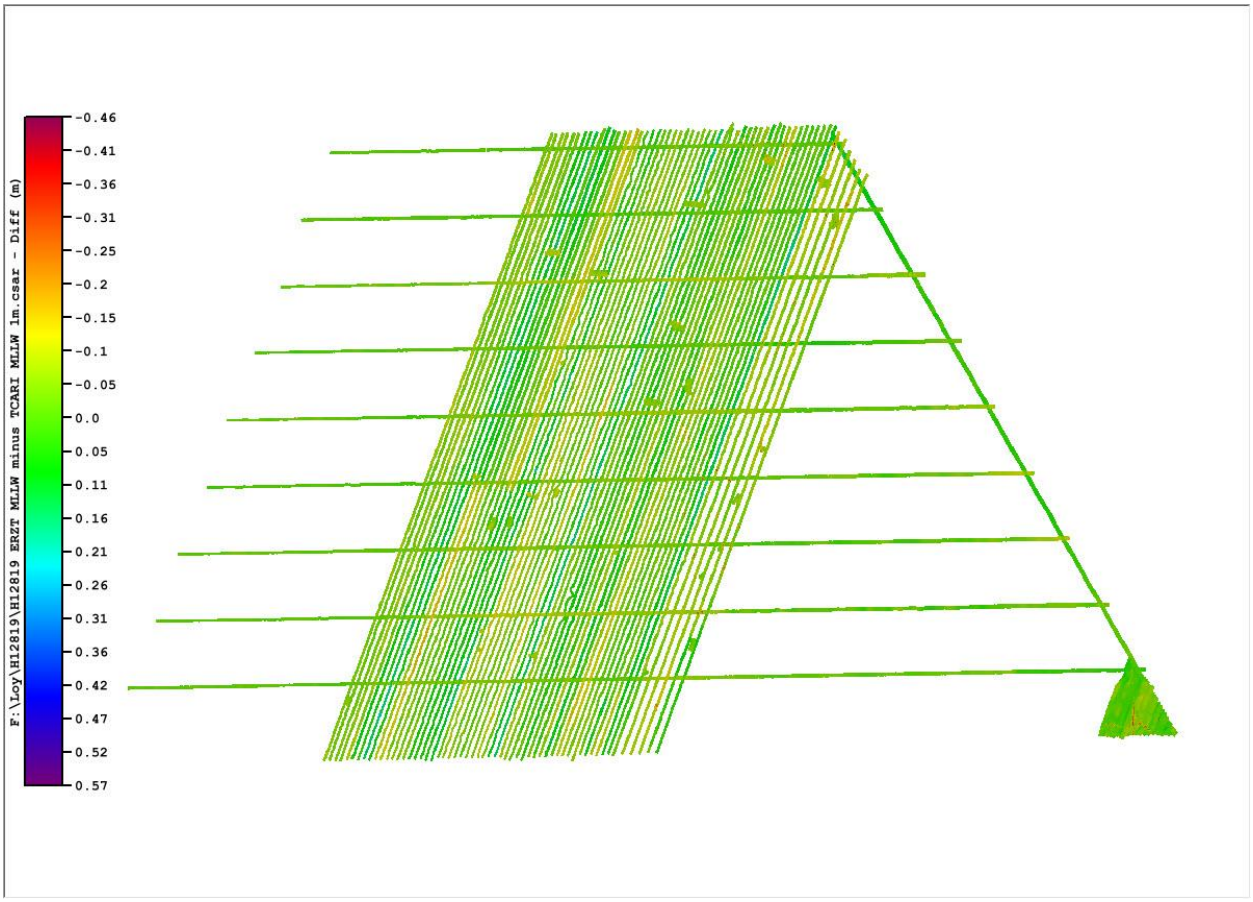


Figure 3. Image of H12819 ERZT MLLW - TCARI MLLW difference surface 1000m resolution

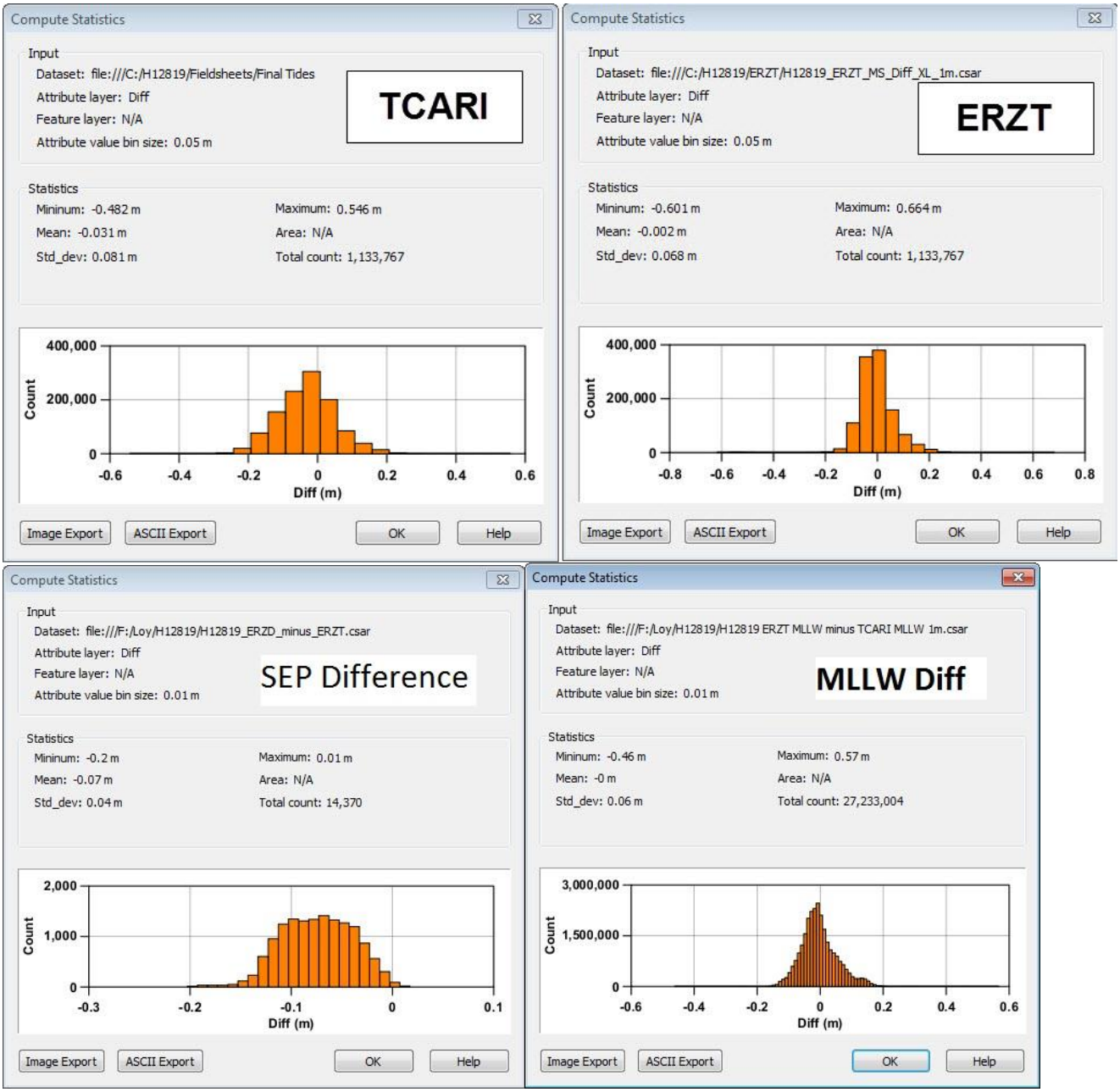


Figure 4. Histograms of crossline differences (TCARI and ERZT), SEP-ESEP model difference, and ERZT-MLLW difference

For survey H12819, the ERZT reduced data show a smaller mean difference and standard deviation in the crossline depth analysis. This result suggests for this survey, ERZT is an acceptable and more consistent method of sounding reduction.

A difference surface of PMVD minus ERZT were created to examine the variation between field vessel derived separation models as compared to those created using datum differences at tide stations.

The two realizations of MLLW were differenced, and show zero mean difference, and a small standard deviation, suggesting that both realizations of bathymetry data are equivalent, and that both methods of reduction are the same.

4.0 Interpolation and Uncertainty

For H12819 the following SBETs required interpolation using Pydro AutoQC due to the reasons noted:

Day	Vessel	Interpolated SBET	Interpolation Length (NM)	Notes
213	2802	2015_213_2802_Interp2_SBET.out	2.07	Interpolation to correct for incorrect vertical solution

Table 2. Interpolated SBETs for H12819.

The following shows the uncertainty value determination:

Surface	Mean of Std_Dev child layer (Mean) (m)	Estimated lines per cell (N)	Resultant uncertainty (Mean/Sqrt(N)) (m)
H12819_SeparationModel_B_1000m.csar	0.047	10	0.015

Table 3. Uncertainty determination for H12819.

Post-processed position solutions were consistently accurate for the entirety of H12819 following SBET correction and interpolation. The use of AutoQC to interpolate a long line of data is reasonable given that the line and before/after results can be compared to adjacent data spatially and temporally. As a result, no ERS specific holidays exist for lines reduced to MLLW via ERZT. Had there been ERS holidays or lines that could not be adjusted with interpolation in AutoQC the TCARI-reduced data still remains adequate for chart applications.

For H12819 an estimate of 10 lines was used as a reasonable value for the number of lines in a given node of the separation model. For the SEP model created for this sheet, any given SEP cell at 1000m resolution could have had as many as 17 survey lines or as few as 1 inside its bounds. With minimal guidance or tools the value of 10 was used. Use of a larger or smaller value changes the final SEP model uncertainty by up to centimeters.

5.0 Results and Recommendations

For H12819 it is recommended that soundings be reduced to MLLW through use of the ERZT method. Quantitative analysis of crosslines for this survey demonstrates ERZT as a more consistent reduction

method compared to TCARI. Qualitatively, hydrographers involved in the production of the survey believe the ERZT reduced data to be a potential improvement as compared to the TCARI reduction, due to the greater accuracy, precision, and potential for faster data analysis and submission.

For future ERZT and ERS surveys, the following recommendations should be considered:

1. Procedures and workflows should be fully tested and documented prior to delivery to the *Rainier*. The ERZT SOP as provided from HSD did not provide any detail on how to determine uncertainty. Numerous references to VDatum were also in the SOP, though no VDatum model exists for Alaska during the time of survey. The SOP focused on crosslines, though for *Rainier* the irregular and inconsistent application of incorrect single base antenna heights combined with the occasional need to interpolate would require analysis of all lines. Crosslines alone without Vdatum or other reference SEP might not be fully representative of the ERS specific conditions of an area. To best troubleshoot SBETs, a comparison is required to discover any bias. Without this comparison, a bias would be difficult to quickly troubleshoot.
2. NOAA HSSD and Project Instructions should be updated to specify the vertical and horizontal datums of all positions and separation models.
3. Best practices and tools to determine ERZT uncertainty should be explored. Determination of applied SEP model resolution should be evaluated further, likely in consideration of the tide model resolution in areas where ERZT could be applied. Geographic information system type tools could be used to better count and determine uncertainty for a grid allowing for standardized procedures and results.
4. *Rainier* ERS SOPs and data submission for items related to vertical reduction of soundings should be independently evaluated by OCS staff for consistency and to minimize errors. *Rainier* SBETs have been processed and exported in a WGS84 datum for some time, though most NOAA specifications require NAD83.
5. Due to staffing challenges on *Rainier*, only a few crewmembers aboard are familiar with software used in the processing and troubleshooting of these SBETs. *Rainier* personnel need additional training on ERS and ERZT theory, as well as hands on training on how to use associated equipment and software most effectively to ensure *Rainier* capability of ERS.
6. Numerous SBETs on *Rainier* required reprocessing due to incorrect antenna height values initially entered. All SBETs have been created on an ñincorrectò datum of WGS84, when HSSD requirements are NAD83. *Rainier* should update and improve their quality control procedures and have procedures reviewed by outside unit experts.
7. Original SBETs were typically generated and applied within 2 weeks upon receipt of base station data for the Kotzebue project, though due to equipment limitations of radio range and data throughput, base station downloads were infrequent. Low internet bandwith also limited ability for the ship to download required clock and ephemeris data in a consistent and timely manner. Full use of ERZT methods and troubleshooting occurred months after completion of the project.
8. *Rainier* only has 2 POSPAC MMS keys, limiting the amount of data that can be processed concurrently. Increasing the number of projects to be processed simultaneously would be advantageous given the possibility for *Rainier* to have 5 different POSMV units operating simultaneously.
9. *Rainier*, HSD and HSTB should attempt to resolve SBETs using ERZT methods sooner, and investigate methods to improve data throughput and processing time.
10. Implementation of decimeter or centimeter level real time corrections (SBAS, RTK, RTG, etc) should be further investigated for potential to minimize post processing efforts while ensuring high precision and accurate vertical positioning.
11. With proper control of vessel positioning, ERZT methodology could offer significant possibilities to reduce overall survey submission time, particularly in areas with well established tidal control. Reduced dependency upon tertiary tide stations and/or concurrent hydrographic data collection

adds additional time for data acquisition, and greater operational flexibility. Data could conceivably be reduced and submitted without having or waiting for receipt of final tides packages from CO-OPS, minimizing field unit waiting and burden. Continue efforts on implementing full ERS/ERZT methods.

12. Analysis of ERZT SEP models allows sheet managers and other processors to evaluate vertical positioning quality in a visual manner, allowing for õdirected editingò techniques to be applied to problem troubleshooting. These visual and surface based approaches are often more approachable for many users than detailed inspection of PPK graphs, and determination if errors also overlap with sonar data collection. This could significantly alter SBET processing workflows by reducing total QC performed and only focusing on problematic data.
13. The following published resources were useful as references in this effort and should be disseminated more widely.
    a. Measuring the Water Level Datum Relative to the Ellipsoid During Hydrographic Survey, Rice and Riley, 2011. http://ushydro.thsoa.org/hy11/0427A_08.pdf - This describes ERZT theory.
    b. Ellipsoidally Referenced Surveying for Hydrography, Mills and Dodd, 2014 https://www.fig.net/resources/publications/figpub/pub62/Figpub62.pdf - A good general resource for ERS topics.
    c. INVESTIGATION OF THRESHOLD CROSSING HEIGHT VARIATIONS FOR WIDE AREA AUGMENTATION SYSTEM (WAAS) LOCALIZER PERFORMANCE WITH VERTICAL GUIDANCE (LPV) APPROACH PROCEDURES, Johnson and DiBenedetto, 2007. https://www.faa.gov/air_traffic/flight_info/avn/flightinspection/onlineinformation/pdf/06-27_Official_Final_Report_Body.pdf - Describes datum differences and application to aviation for WGS84 and NAD83.

Fwd: Fwd: Kotzebue Tides

1 message

OPS - Rainier (Steven Loy) <ops.rainier@noaa.gov> Thu, Dec 10, 2015 at 7:18 AM
To: Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Eli Smith <eli.r.smith@noaa.gov>, Michael Bloom - NOAA Federal <michael.g.bloom@noaa.gov>, "shane.mallory@noaa.gov" <shane.mallory@noaa.gov>, Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>, "patricia.pyda@noaa.gov" <patricia.pyda@noaa.gov>, "Samuel.W.Mckay@noaa.gov" <samuel.w.mckay@noaa.gov>, "shelley.devereaux@noaa.gov" <shelley.devereaux@noaa.gov>, "dylan.kosten@noaa.gov" <dylan.kosten@noaa.gov>, Sarah Chappel - NOAA Federal <sarah.l.chappel@noaa.gov>, Christopher Wood <christopher.m.wood@noaa.gov>, Danial Palance - NOAA Federal <danial.g.palance@noaa.gov>, "Matthew.Bissell@noaa.gov" <matthew.bissell@noaa.gov>, "jennifer.kraus@noaa.gov" <jennifer.kraus@noaa.gov>, Timothy Brown - NOAA Federal <timothy.brown@noaa.gov>, Chief ST Rainier <ChiefST.Rainier@noaa.gov>
Cc: _OMAO MOP CO Rainier <CO.Rainier@noaa.gov>, "XO Rainier (LCDR Mark Van Waes)" <XO.Rainier@noaa.gov>

RA Survey,

FYI, Kotzebue final tides remain delayed due to a failed data server upgrade. See below for details.

V/r,
LT Loy

-------- Forwarded Message --------
Subject: Fwd: Kotzebue Tides
Date: Thu, 10 Dec 2015 11:14:13 -0500
From: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>
To:_OMAO MOP OPS Rainier <OPS.Rainier@noaa.gov>, _OMAO MOP OPS Fairweather <OPS.Fairweather@noaa.gov>, Douglas Bravo - NOAA Federal <ChiefST.Fairweather@noaa.gov>, CO - Fairweather (Zezula) <CO.Fairweather@noaa.gov>, CDR Rick Brennan <CO.Rainier@noaa.gov>
CC: Megan Greenaway - NOAA Federal <Megan.Greenaway@noaa.gov>, Adam Pfundt - NOAA Federal <adam.pfundt@noaa.gov>, Matthew Forney - NOAA Federal <Matthew.Forney@noaa.gov>, Steven Loy - NOAA Federal <steven.loy@noaa.gov>, Bart Buesseler - NOAA Federal <Bart.O.Buesseler@noaa.gov>, Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>

Fairweather and Rainier,

Processing tides for Kotzebue Sound has been delayed (see below). Kotzebue is a high priority but they have no time estimates. We will let you know when we hear more.

Thank you and Happy Holidays,
Starla Robinson

---------- Forwarded message ----------
From: **Michael Gonsalves - NOAA Federal** <michael.gonsalves@noaa.gov>
Date: Wed, Dec 9, 2015 at 7:33 PM
Subject: Kotzebue Tides
To: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>
Cc: Corey Allen - NOAA Federal <corey.allen@noaa.gov>, Megan Greenaway - NOAA Federal <Megan.Greenaway@noaa.gov>

Starla,

At this week's Tri-Office meeting, CO-OPS informed us that they recently experienced a significant problem when they attempted to upgrade some of their data servers. At this time, some of the data from Kotzebue Sound, while intact, is completely inaccessible. The top levels are aware of this problem and are endeavoring to find a solution; however, there is no time line as yet as to when this will be resolved. Until such time as it is resolved, the processing of tides for Kotzebue Sound are on hold. Please advise the FA and RA.

~~ michael.gonsalves, LCDR/NOAA
HSD Operations Branch, Chief

--

Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>

Fwd: Re: H12812 Final Tides data gap errors

1 message

Adam Pfundt <ops.rainier@noaa.gov> Fri, Feb 19, 2016 at 10:11 AM
To: Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Danial Palance <danial.g.palance@noaa.gov>, "michael.g.bloom@noaa.gov" <michael.g.bloom@noaa.gov>, Sarah Chappel - NOAA Federal <sarah.l.chappel@noaa.gov>, ENS Christopher Wood <christopher.m.wood@noaa.gov>
Cc: "chiefst.rainier@noaa.gov" <chiefst.rainier@noaa.gov>

Kotz sheet managers,

I wanted to forward the email chain below regarding some of the issues associated with tide notes for Kotzebue surveys. Because not all of the associated gauges were operating during all periods of acquisition the calculations using the approved TCARI varied. This has all been stated and approved from CO-OPS but is worth including in supplemental correspondence.

V/r,

LT Pfundt

-------- Forwarded Message --------
Subject: Re: H12812 Final Tides data gap errors
Date: Mon, 01 Feb 2016 12:14:35 -0500
From: Lijuan Huang - NOAA Affiliate <Lijuan.Huang@noaa.gov>
To: Barry Gallagher <Barry.Gallagher@noaa.gov>
CC: Matthew Forney - NOAA Federal <Matthew.Forney@noaa.gov>, Corey Allen - NOAA Federal <Corey.Allen@noaa.gov>, Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>, ChiefST.Fairweather <ChiefST.Fairweather@noaa.gov>, _OMAO MOP OPS Fairweather <OPS.Fairweather@noaa.gov>, _OMAO MOP OPS Rainier <OPS.Rainier@noaa.gov>, Chief ST Rainier <ChiefST.Rainier@noaa.gov>, Steven Eykelhoff - NOAA Federal <Steven.J.Eykelhoff@noaa.gov>, Daniel Devereaux - NOAA Federal <Daniel.R.Devereaux@noaa.gov>, HPT <NOS.COOPS.HPT@noaa.gov>

Don't change the residual controls because of this altering message. By doing that, you'll force TCARI to use a "less-optimal" solution for the entire survey period. Using this final tide note as an example, verified data at Kotzebue 9490424 is available after 06/29 08:48, so TCARI will use the "optimal" solution after that. If you remove the residuals from Kotzebue, TCARI will use the "less optimal" solution for the entire survey period.

Hope this helps.

Thanks,
Lijuan

On Fri, Jan 29, 2016 at 4:28 PM, Barry Gallagher <barry.gallagher@noaa.gov> wrote:

> Matt just forwarded the message and Lijuan was correct, the TC file co-ops supplied is operating correctly. The message is just alerting you that a primary residual gauge in the preferred solution is not available and it is switching to a different solution for the given time. If CO-OPS says that the grid is ok (which they did) then you do not need to do anything additional.
>
> ```
> Data gap or gauge failure at date/time and gauge(s): 2015-06-28 18:52:21  ['9490424']
> Using solution based on gauges: ['9491094', '9469833', '9490096']
> ```

bg

On 1/29/2016 4:18 PM, Barry Gallagher wrote:

> Being a late add on this email chain I haven't seen the error messages. What Lijuan was saying is that TCARI can hold multiple solution sets, for example one with Cape E and one without.
>
> There are warning messages for two cases that usually cause people confusion. One is when surveying outside the grid which will still make water levels. The other is when residuals aren't available and it switches to an alternate "less-optimal" solution. It sounds like you might have seen this latter case.
>
> If you send me your error messages I can likely determine what is happening. If that isn't enough I'd ask for the TC file (from coops) and a line of nav from FA.
>
> bg
>
> On 1/29/2016 3:30 PM, Matthew Forney - NOAA Federal wrote:
>
> > Thanks Lijuan, Cristina, and Corey!
> >
> > It sounds like we at OCS and the Ship just need to create a new .tc file to remove those residuals. No rush on this today. We can work with HSD Ops on Monday to try and find a resolution. Hope everyone has a great weekend and it was great to see those present at FPW. Thanks again for all the correspondence and help.
> >
> > V/R,
> > Matt
> >
> > LT Matthew Forney
> > Operations Officer
> > NOAA Ship *Fairweather*
> > 1010 Stedman Street
> > Ketchikan, Alaska 99901
> >
> > Cell: 907-254-2842
> > Iridium: 808-659-0054
> > Personal Cell: 513-235-5328
> >
> > On Fri, Jan 29, 2016 at 12:27 PM, Lijuan Huang - NOAA Affiliate <lijuan.huang@noaa.gov> wrote:
> >
> > > Hi Barry,
> > > We have saved the solution without residual data at Cape E in the .tc file. I think the error message is just for an FYI, FA/RA is supposed to be able to get tide reductions from the grid?
> > >
> > > Matt, the grid has been QCed that without the residual data at Cape E, tide reductions are still within hydro specs.
> > >
> > > Thanks,
> > > Lijuan
> > >
> > > Sent from my iPhone
> > >
> > > On Jan 29, 2016, at 2:13 PM, Corey Allen - NOAA Federal <corey.allen@noaa.gov> wrote:

Hey Matt,
Sitting at airport so limited in ability to troubleshoot.... Can you confirm verified data exists for those days? I'll teach out to coops, but assuming no verified data so we may need to adjust the tc file to remove residuals from those gauges....we just need to make sure we appropriately adjust the tpu values and aren't then blowing budget.

Corey

On Friday, January 29, 2016, Matthew Forney - NOAA Federal <matthew.forney@noaa.gov> wrote:

> Hello Starla,
>
> I wanted to inform you that we did recieve Final Tides for all of our Kotz Surveys. It seems that we are getting errors when applying the files that were downloaded and used in TCARI. Attached are three (3) files. One a screen shot of the errors in Pydro. Second, the TCARI Error Log, and an excel detailing the boats and the lines that did not have final tides applied. It looks like the first four days and final two days of acquisition. Please advise on how to proceed. I appreciate any and all feedback you can provide.
>
> V/R,
> Matt
>
> LT Matthew Forney
> Operations Officer
> NOAA Ship *Fairweather*
> 1010 Stedman Street
> Ketchikan, Alaska 99901
>
> Cell: 907-254-2842
> Iridium: 808-659-0054
> Personal Cell: 513-235-5328
>
> ---------- Forwarded message ----------
> From: **Steven Eykelhoff - NOAA Federal** <Steven.J.Eykelhoff@noaa.gov>
> Date: Fri, Jan 29, 2016 at 11:22 AM
> Subject: H12812 Final Tides data gap errors
> To: OPS Fairweather <OPS.Fairweather@noaa.gov>, Douglas Bravo - NOAA Federal <ChiefST.Fairweather@noaa.gov>
>
> Please find attached a screen shot of the pydro command screen, error log file and spreadsheet indicating the days tides will not apply to.
>
> --
> Steven Eykelhoff
>
> NOAA Ship Fairweather (S-220)
> 1010 Stedman St

Ketchikan, AK 99901

Ship Cell: 907-254-2842
Iridium: 808-659-0054
Cell: 315-520-2663
Email: steven.j.eykelhoff@noaa.gov

--
J. Corey Allen
Team Lead, Operations Branch
Hydrographic Surveys Division
Office of Coast Survey, NOAA
Corey.Allen@noaa.gov
301.713.2777 x119 (Office)
301.717.7271 (Cell)

--
Lijuan Huang
NOAA/NOS/CO-OPS/Hydro Planning Team
1305 East-West Highway
N/OPS3, Sta. 7134 SSMC4
Silver Spring, MD 20910-3218
Email: lijuan.huang@noaa.gov
Phone: 240-533-0613

Fwd: Re: OPR-S327-RAFA-15 Updated Coverage Requirements

1 message

Adam Pfundt <ops.rainier@noaa.gov> Tue, Jul 14, 2015 at 6:08 PM
To: Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Danial Palance - NOAA Federal <danial.g.palance@noaa.gov>, Christopher Wood <christopher.m.wood@noaa.gov>, Eli Smith <eli.r.smith@noaa.gov>, Michael Bloom - NOAA Federal <michael.g.bloom@noaa.gov>
Cc: _OMAO MOP ChiefST RAINIER <ChiefST.Rainier@noaa.gov>

Kotzebue Sheet Managers,

The coverage requirements for Kotzebue sheets continues to change. Sheet 16 is the only sheet remaining with coverage requirements consistent with the original Project Instructions.

A corridor has been developed for sheets 8-10 and a second corridor has been established for sheets 17-20. The associated files are located here:

K:\Projects\2015_Projects\OPR-S327-RA-15_Kotzebue_Sound\Shoreline\GIS Files\Corridor

At present these corridors require full bottom coverage with either 100% MBES or 100% SSS with concurrent MBES and MBES development of contacts. Please plan on creating 80m line spacing to fill these corridor areas with SSS and 1000m spaced lines running perpendicular for crosslines. Any questions please let me know.

V/r,

FOO

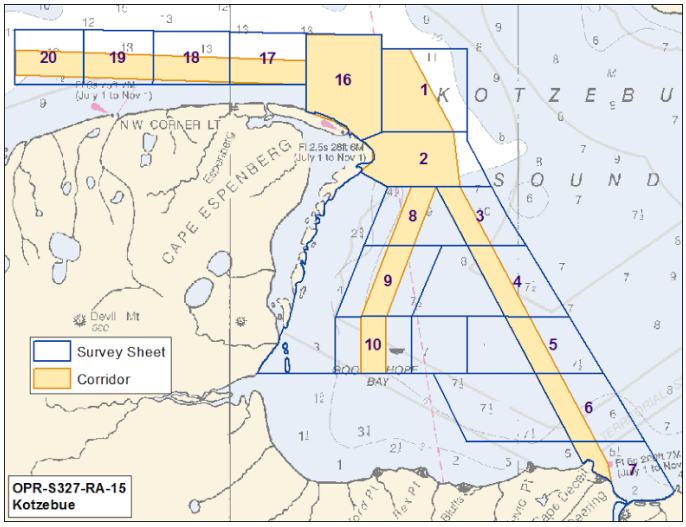
-------- Forwarded Message --------
Subject: Re: OPR-S327-RAFA-15 Updated Coverage Requirements
Date: Tue, 14 Jul 2015 11:17:27 -0400
From: Starla Robinson - NOAA Federal <Starla.Robinson@noaa.gov>
To: David J. Zezula <CO.Fairweather@noaa.gov>
CC:CO - Rainier <CO.Rainier@noaa.gov>, _OMAO MOP OPS Rainier <OPS.Rainier@noaa.gov>, _OMAO MOP ChiefST RAINIER <ChiefST.Rainier@noaa.gov>, Michael Gonsalves - NOAA Federal <Michael.Gonsalves@noaa.gov>, Kathryn Pridgen - NOAA Federal <Kathryn.Pridgen@noaa.gov>, Eric Berkowitz - NOAA Federal <Eric.W.Berkowitz@noaa.gov>, Megan Greenaway - NOAA Federal <Megan.Greenaway@noaa.gov>, Corey Allen - NOAA Federal <Corey.Allen@noaa.gov>, Katrina Wyllie - NOAA Federal <Katrina.Wyllie@noaa.gov>, _OMAO MOP OPS Fairweather <OPS.Fairweather@noaa.gov>, Douglas Bravo - NOAA Federal <ChiefST.Fairweather@noaa.gov>, Timothy Smith - NOAA Federal <Timothy.M.Smith@noaa.gov>, Jacklyn James - NOAA Federal <Jacklyn.C.James@noaa.gov>

Attached is the corridor shapefile.

Thanks,
Starla

On Tue, Jul 14, 2015 at 10:13 AM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

> CO's,
>
> Based on present acquisition rates, and with consultation with the navigation manager we are refining the priorities on the Kotzebue Project. Specifically we wish to 1) develop transit corridors within sheets 17 -20, 3-7, and 8-10; 2) develop the shoal around Cape Espenberg in sheets 1, 2 and 16; and 3) forego the 300 meter line spacing zones outside the preceding areas.
>
> When launch operations are untenable the ships may survey outside the corridors.
>
> Sheets 19 and 20 are dependent on a tide gauge that will be removed 7/30. So while COOPS feel they can resolve vertical control without the gauge, they cannot speak towards the accuracy at this point in time. If possible we would like the Rainier to prioritize the corridor in sheets 19 and 20 for this leg.
>
> These are our latest thoughts on the matter. Does this make sense from the field's perspective?
>
> Thank you,
> Starla



On Mon, Jul 13, 2015 at 4:05 PM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

Hello Fairweather and Rainier,

We are planning to amend the coverage requirements to focus on complete coverage corridors, and drop the 300m line spacing outside of sheets 1, 2, and 16.

Sheets 1, 2, and 16 cover the point of Cape Espenberg. As an area of converging traffic we intend to retain the coverage requirements as stated in the previous email. Our primary objective after that is to acquire the corridors for the North, Deering, and Good Hope Bay.

The Fairweathers next leg (Clarence or Kotzebue) will be determined by how much we get done in Kotzebue this leg. Given the weather constraints it will be hard to predict the progress we can achieve on the launch sheets.

I will have another shapefile with a 2nm corridor for sheets 17 through 20, soon.

Thank you for your flexibility on this project,
Starla

On Sun, Jul 12, 2015 at 4:18 PM, David J. Zezula <co.fairweather@noaa.gov> wrote:

My only concern it that AIS Data show's that coastal traffic is cutting the corner inside the 20m curve. If the intent of our survey is to provide marine traffic with a full bottom corridor it seems we should be doing that where they are already transiting. 8-20 m on sheet 2 and 16 is going to be a significant effort, but I don't see a way around it and still provide the mariner CATZOC A.

DZ

On 7/12/2015 10:32 AM, CO - Rainier wrote:

All,

Attached is RA's coverage on Sheet 16 after 72 hours of ship operations. It's not a considerable extra effort extending 100% MBES north to the sheet limits of 16-20, so I recommend we hold fast with the original requirements in waters deeper than 20m.

Requirements inshore of the 20m contour on sheets 16-20 may be worth further consideration. Completing 100% MBES or 100% SSS coverage in the 8-20m "ribbon" will be the most time consuming and least efficient part of these surveys. It is debatable how much value would be added to the surveys, and we have a high degree of confidence from survey results so far that we would not miss any significant shoals or features in this area by shifting to set line spacing inshore of 20m. Recommend that inshore of 20m (or perhaps 18, as that's the 10-fathom curve), coverage requirements are set line spacing no greater than 300m apart, with all shoals and features further developed. This would roughly coincide with the southern limit of FA's proposed corridor anyway.

Also, we've found to date that we can only get launches out about 50% of the time due to weather (Have yet to have launches in the water for a full day so far, out of 5 days on project this leg), so we want to be able to get the most bang for the buck when we can get boats out.

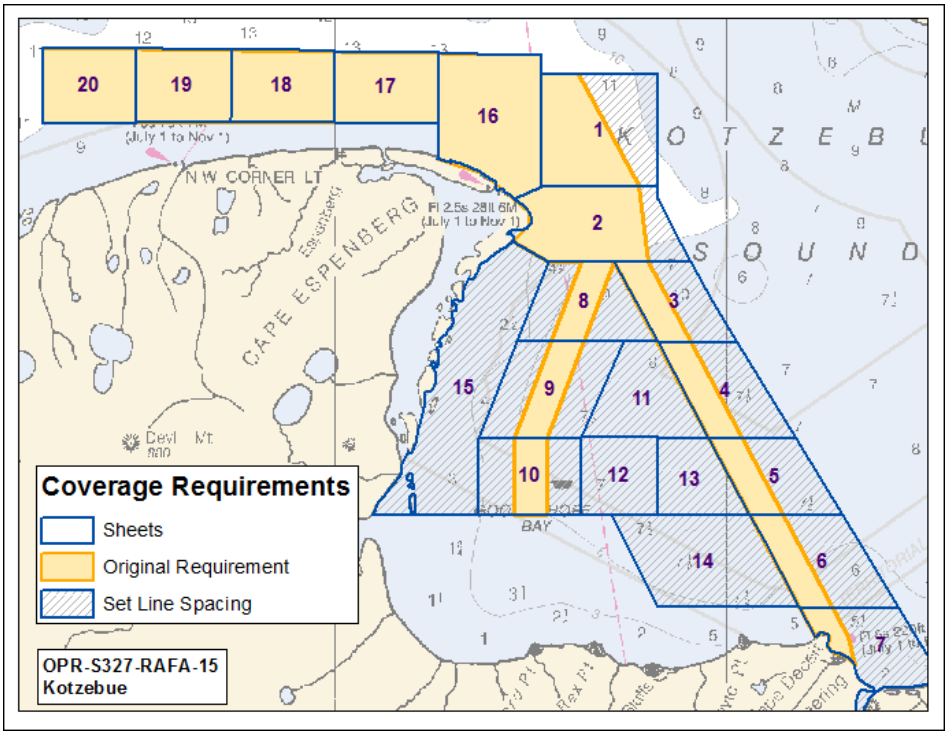
-EJ

--
CDR E.J. Van Den Ameele, NOAA
Commanding Officer, NOAA Ship Rainier
2002 SE Marine Science Drive
Newport, OR 97365
Land Line (541) 867-8770

Ship's Cell (206) 660-8747
At sea: (301) 713-7771

On 7/11/2015 12:26 PM, David J. Zezula wrote:

> Starla,
>
> Thought we were doing a 2nm wide corridor on sheets 17-20 also? See Attached.
>
> DZ
>
> On 7/10/2015 1:52 PM, Starla Robinson - NOAA Federal wrote:
>
> > *Fairweather* and *Rainier*,
> >
> > Based on preliminary data acquired by *Fairweather* and *Rainier*, we are altering the coverage requirements for Kotzebue Sound as follows (New requirement highlighted in red):
> >
> > **Greater than 20 meters water depth (outside of the designated set line spacing zone):** Complete MBES coverage with backscatter.
> >
> > **8 meters to 20 meters water depth (outside of the designated set line spacing zone):** Either 1) 100% SSS with concurrent set line spacing SBES or MBES with backscatter, or 2) complete MBES with backscatter. Note: Complete MBES is sufficient for both determination of least depth identified with SSS and for disproving a feature - 100% SSS is insufficient to disprove a feature. Refer to Section 6.1.2 of the HSSD to confirm proper SSS acquisition parameters. Gaps in SSS coverage should be treated as gaps in MBES coverage and addressed accordingly.
> >
> > **Inshore limit to 8 meters water depth OR in the designated set line spacing zone:** No greater than 300 meter Set Line Spacing SBES or MBES with backscatter. Please ensure the following: 1) Indications of shoaling falling between set line spacing main scheme lines must be investigated 2) Set Line Spacing Line orientation should be approximately perpendicular to isobaths whenever possible.
> >
> > Attached is a shapefile designating the boundary for the set line spacing zone.
> >
> > Thank you,
> > Starla Robinson



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Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration

Office: 301-713-7202 x125
Cell: 360-689-1431

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David Zezula, CDR/NOAA

Commanding Officer
NOAA Ship Fairweather (S-220)
2002 SE Marine Science Dr.
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(907) 254-2842: Ships Cell
(907) 254-2836: CO Cell
(301) 713-7779: VOIP

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David Zezula, CDR/NOAA

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Corridor_Poly_0714.zip
3K

Fwd: Kotzebue Sheets / ENC Offset

1 message

Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> Thu, Jun 18, 2015 at 9:57 PM
To: CST RAINIER <chiefst.rainier@noaa.gov>, Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>, Adam Pfundt - NOAA Federal <adam.pfundt@noaa.gov>

Hello Chief and Barry,

I didn't see the CC. ENC US1AK90M has an offset from US2AK92M. Does ENC US2AK92M match up?

Happy Hydroing,
Starla

---------- Forwarded message ----------
From: **Starla Robinson - NOAA Federal** <starla.robinson@noaa.gov>
Date: Thu, Jun 18, 2015 at 5:45 PM
Subject: Re: Kotzebue Sheets / ENC Offset
To: Adam Pfundt <ops.rainier@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

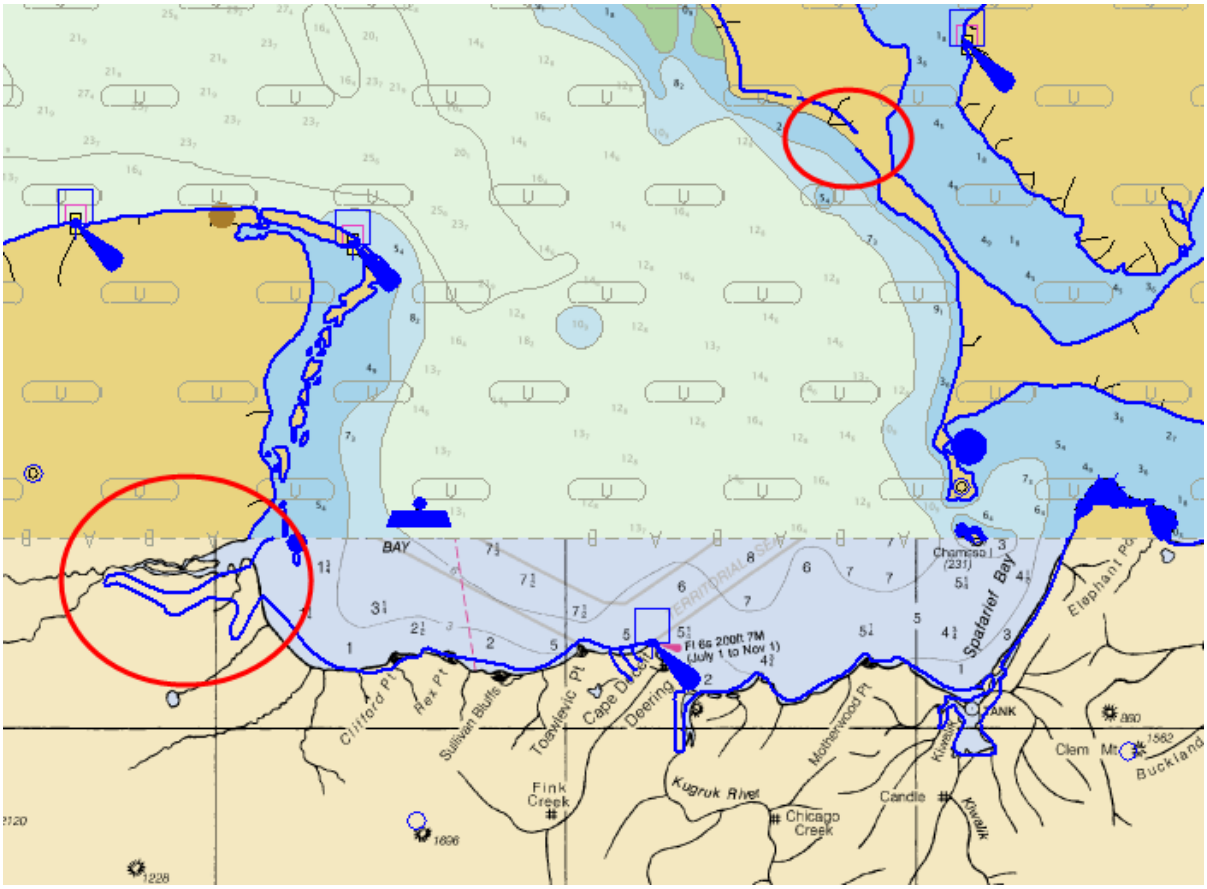
Hey Adam,

I took a look, I think the issue is US1AK90M is off by about 4000 meters. I think its ok as long as it lines up with US2AK92M and its corresponding raster 16005. While I was preparing the CSF I digitized the shoreline from 16005 because the adjacent raster did not have it, and the rest of the shoreline is GC, which for that coast agrees well.

I suppose the next question is for **Corey**...
The charts/encs clearly have an offset on both sides of the bay, actually in both ENC's. If someone inspects US1AK90M, US2AK92M, and US5AK97, there are clear offsets. US2AK92M disagrees with US5AK97M by 2000 meters on the eastern shore. US5AK97 is our last adventures data, and I would trust that over the rest. How should we best report this? I had thought it would be brought up in the DR, but it occurs to me that maybe we should be addressing it sooner.... on the other hand someone must have noticed this in 2012.

I hope this is primarily a chart scale issue. Please let me know.

Thank you,
Starla



On Thu, Jun 18, 2015 at 5:07 PM, Starla Robinson - NOAA Federal <starla.robinson@noaa.gov> wrote:

> Thank you Adam, That looks terrible. I will see what I can do from this end. - Starla

On Thu, Jun 18, 2015 at 4:51 PM, Adam Pfundt <ops.rainier@noaa.gov> wrote:

> Starla,
>
> I wanted to get some clarification on Kotzebue sheet limits before we get on project. Opening the various files associated with the project has created some confusion. In Caris the raster chart and the PRF agree well. However when opening in Hypack there is an offset that is created and varies depending on zoom. We have reached out to Hypack for guidance or assistance in getting the chart and CSF to agree for planning and acquisition purposes.
>
> When opened in Caris the ENC does not agree well with the raster chart or PRF. I'm not sure if all these descrepencies are a product of scale. They do not appear to be projection associated issues. We are

planning on doing everything for this project in UTM zone 3 north. I wanted to make sure we get the correct locations for all sheet limits and associated files. Could you check the display of raster vs. PRF vs. ENC and let us know what we should use to guide our planning and acquisition?

Thanks,

Adam

-------- Forwarded Message --------
Subject: Kotzebue Sheets / ENC Offset
Date: Wed, 17 Jun 2015 22:38:06 +0000
From: Barry Jackson - NOAA Federal <barry.jackson@noaa.gov>
To:ops <OPS.Rainier@noaa.gov>

FOO,

Thought this might help:

Attached is a Caris screen grab showing the misalignment between the ENC and RA's Kotzebue sheets. Also notice the differences in shoreline represented. The CSF shoreline tracts well with the sheet limits, meaning it does not align with the ENC either. As you know, the raster chart displays correctly in Caris and ArcGIS, but not in Hypack.

Thanks,

Jackson

--
Starla D. Robinson, Physical Scientist
NOS - OCS - HSD - Operations Branch
National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

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Starla D. Robinson, Physical Scientist
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National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

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Starla D. Robinson, Physical Scientist
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National Oceanic Atmospheric Administration
Office: 301-713-7202 x125
Cell: 360-689-1431

APPROVAL PAGE

H12819

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- H12819_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12819_GeoImage.pdf

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

Approved: 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: 2016.12.21 07:20:11 -08'00'

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

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

Approved: Digitally signed by BROWN.KURT.E.1156712600 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=BROWN.KURT.E.1156712600 Date: 2016.12.20 13:00:09 -08'00'

Kurt Brown
Physical Scientist, Pacific Hydrographic Branch