

H12125

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Survey

Field No. N/A

Registry No. H12125

LOCALITY

State Oregon

General Locality Pacific Ocean - Northern Oregon

Sublocality Vicinity of Rockaway Beach

2010

CHIEF OF PARTY

..... Jonathan L. Dasler, PE (OR), PLS (OR,CA)

LIBRARY & ARCHIVES

DATE

<p style="text-align: center;">U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</p> <p style="text-align: center;">HYDROGRAPHIC TITLE SHEET</p>	<p>REGISTRY No</p> <p style="text-align: center;">H12125</p>
<p>INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.</p>	<p>FIELD No: N/A</p>
<p>State <u>Oregon</u></p> <p>General Locality <u>Pacific Ocean - Northern Oregon</u></p> <p>Sub-Locality <u>Vicinity of Rockaway Beach</u></p> <p>Scale <u>1:20,000</u> Date of Survey <u>August 27, 2009 to September 22, 2010</u></p> <p>Instructions dated <u>June 2009</u> Project No. <u>M-N928-KR-09</u></p> <p>Vessel <u>R/V Pacific Storm, R/V JAB</u></p> <hr/> <p>Chief of party <u>Jonathan L. Dasler, PE (OR) , PLS (OR,CA)</u></p> <p>Surveyed by <u>David Evans and Associates, Inc.</u></p> <p>Soundings by <u>RESON 8101-ER, RESON 7101-ER</u></p> <p>SAR by <u>Adam Argento</u> Compilation by <u>Martha Herzog</u></p> <p>Soundings compiled in <u>Fathoms</u></p>	
<p>REMARKS: <u>All times are UTC. UTM Zone 10</u></p> <p><u>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 end notes in red were generated during office processing. Page numbering may be interrupted or non sequential.</u></p> <hr/> <p><u>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/.</u></p>	

Descriptive Report to Accompany Hydrographic Survey H12125

Project M-N928-KR-09
Oregon Coastal Mapping Project
Vicinity of Rockaway Beach
Scale 1:20,000
August 2009 - October 2009
July 2010 - September 2010
David Evans and Associates, Inc.
Lead Hydrographer: Jonathan L. Dasler

A. AREA SURVEYED

David Evans and Associates, Inc. (DEA) conducted hydrographic survey operations in the Pacific Ocean along the Northern Oregon Coast. The survey area (Figure 1) is located between Manzanita, Oregon and the entrance to Tillamook Bay and seaward to the charted three nautical mile line. This project is in support of the Oregon Coastal Mapping Project established under the West Coast Governor's Agreement.

Survey H12125 was conducted in accordance with the *Statement of Work* for M-N928-KR-09 with Modification 1; dated June, 2009 and *Project Instructions* received on August 20, 2009 with the exception of multibeam resolution and density requirements and tides and water levels requirements. Required multibeam resolution and density was reduced by waiver from the Chief of the Data Acquisition and Control Branch on September 1, 2009. D EA received permission from the Hydrographic Surveys Division (HSD) on January 5, 2010 to use Global Positioning System (GPS) water levels acquired directly at the survey vessel in lieu of the tide zoning scheme included with the water levels requirements.¹ A copy of the waiver and HSD correspondence is included in Appendix V *Supplemental Survey Records and Correspondence*.

The project instructions required complete multibeam coverage within the survey limits in areas with water depth greater than eight-meters. Preliminary multibeam data and associated imagery was delivered to Oregon State University (OSU), College of Oceanic and Atmospheric Sciences (COAS) to support multiple uses of the data including: habitat mapping of proposed Marine Protected Areas (MPA), inundation modeling, and other applications in support of the West Coast Governor's Agreement. Automated Wreck and Obstruction Information System (AWOIS) items and significant features were required to meet object detection coverage requirements. The inshore limit of hydrography was defined as the most seaward of either the survey polygon depicted by the M-M928-N928-KR-09.shp file provided by Office of Coast Survey (OCS) staff or the surveyed eight-meter contour.

No AWOIS items were assigned within the H12125 survey limits.² The project instructions referenced three assigned items; two items for full investigation (AWOIS #53808 and #53809) are within H12124 survey limits and one item for background information only (AWOIS #50114) straddles H12125 and H12126 survey limits.

Fifty-four (54) bottom samples were acquired for H12125.³ For this survey, bottom samples were acquired by OSU COAS aboard a second vessel used for the Oregon Coastal Mapping Project.

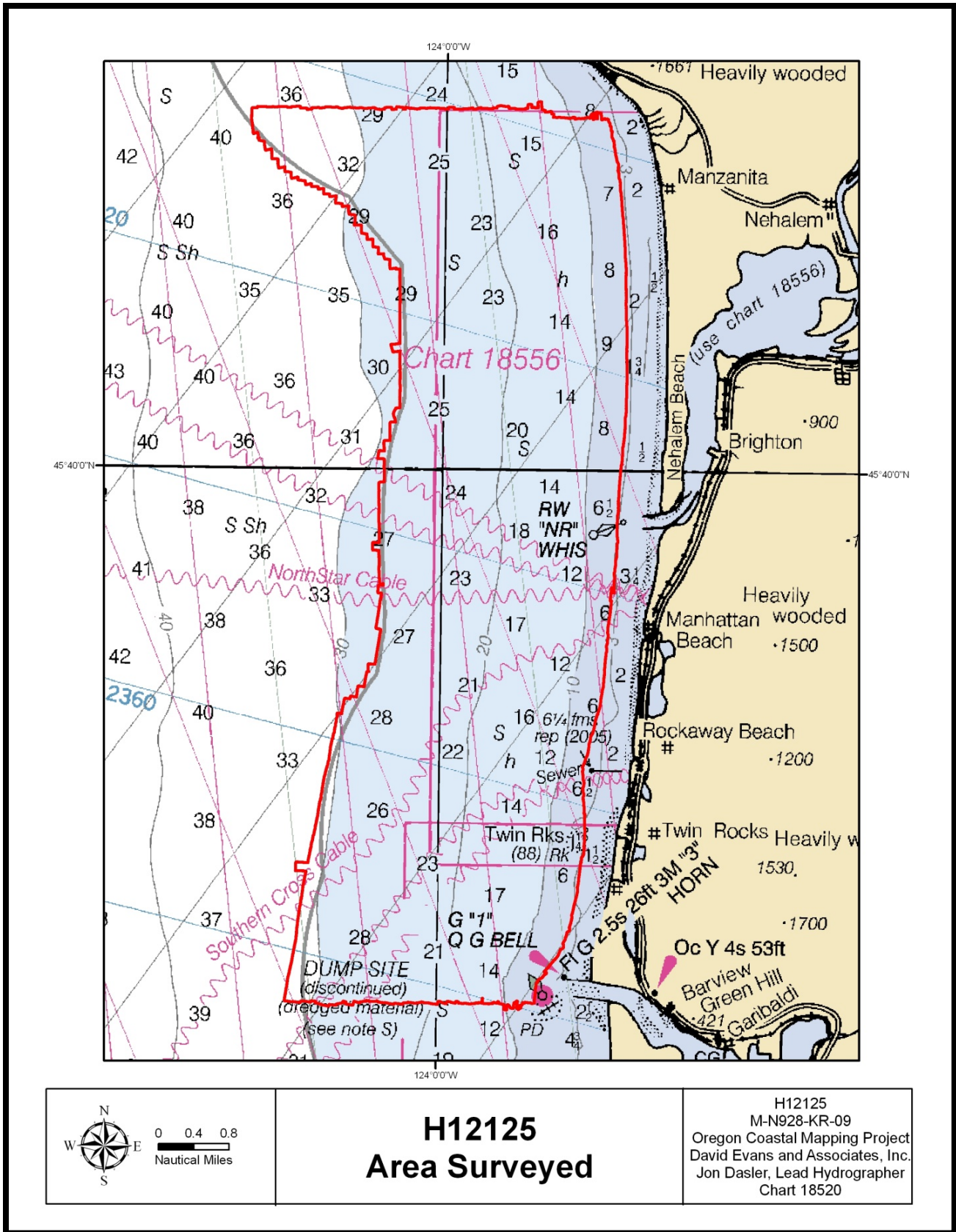


Figure 1. H12125 Area Surveyed

Data acquisition was conducted from August 27, 2009 (DN 239) to October 12, 2009 (DN 285) and from July 4, 2010 (DN 185) to September 22, 2010 (DN 265). Table 1 lists specific dates of acquisition.

Table 1. H12125 Days of Acquisition

Dates of Acquisition	
Month	Dates
August 2009	27-31
September 2009	1-5, 8-9
October 2009	11-12
July 2010	4, 10
August 2010	8, 11
September 2010	22

Detailed survey statistics of H12125 are provided in Table 2.

Table 2. H12125 Survey Statistics

Survey Statistics	Total
MBES (mainscheme nm)	831.2
Crosslines (MBES nm)	38.1
Fill (MBES nm)	49.3
Developments (MBES nm)	1.5
Number of Bottom Samples	54
Number of Item Investigations that required additional survey effort	0
Total number of square nautical miles	29.6

B. DATA ACQUISITION AND PROCESSING

B1. Equipment

Equipment and vessels used for data acquisition and survey operations during this survey are listed below in Table 3 and Table 4.

Table 3. R/V Pacific Storm Equipment and Vessel Specifications



R/V Pacific Storm	
	
Official Number (O/N)	604146
Builder	Spence Bros Boat Works
Design	Steel Displacement Hull
Year Built	1979
Length Overall	84'
Beam	24'
Cruising Speed	8.5 knots
Max Survey Speed	8.2 knots
Primary Echosounder	RESON 8101-ER
Sound Velocity Equipment	<ul style="list-style-type: none"> • Brooke Ocean MVP-30 with AML Micro SV&P and Dissolved Oxygen Sensor • Sea-Bird SEACAT SBE 19 CTD Profiler
Positioning & Attitude	<ul style="list-style-type: none"> • Navcom StarFire GPS • Applanix POS/MV 320 v4

Table 4. R/V JAB. Equipment and Vessel Specifications

R/V JAB	
	
Hull Registration Number	IAR38CATK910
Official Number (O/N)	1229272
Builder	Armstrong Marine
Design	Catamaran
Year Built	2010
Length Overall	42'
Beam	15'
Cruising Speed	30 knots
Max Survey Speed	8 knots
Primary Echosounder	RESON 7101-ER
Sound Velocity Equipment	<ul style="list-style-type: none"> • Brooke Ocean MVP-30 with AML Micro SV&P • Sea-Bird SEACAT SBE 19 CTD Profiler • RESON SVP-71
Positioning & Attitude	<ul style="list-style-type: none"> • Navcom StarFire GPS • Applanix POS/MV 320 v4

There were no vessel or equipment configurations used during data acquisition that deviated from those described in the *M-N928-KR-09 Data Acquisition and Processing Report (DAPR)*.

B2. Quality Control

Quality control is discussed in detail in Section B of the DAPR. The results from the positioning system comparison and lead line to multibeam comparison are included in Separate I *Acquisition and Processing Logs*. The sound velocity profile sensor weekly evaluation table can be found in Separate II *Sound Speed Data* of this report. Data were reviewed at multiple levels of data processing, including: CARIS Hydrographic Information Processing System (HIPS) conversion,

subset editing, and analysis of anomalies revealed in combined uncertainty and bathymetry estimator (CUBE) surfaces. Submerged significant features identified during survey were noted in the acquisition logs which were used to aid in the interpretation of data and act as a check during feature compilation.

B2.a Crosslines

A total of 38.1 nautical miles of crosslines, or 4.3% of the 882.0 nautical miles of survey lines, were run for analysis of survey accuracy.⁴ Crosslines were run in a direction perpendicular to mainscheme lines across the entire surveyed area providing a good representation for analysis of consistency. All crosslines were used for crossline comparisons.

Crossline analysis was performed using the CARIS HIPS QC Report tool, which compares crossline data to a gridded surface and reports results by beam number. Crosslines from both vessels were compared to a 1 meter CUBE surface that encompassed the entire survey area. In addition, crosslines from each vessel were compared to a 1 meter CUBE surface encompassing the mainscheme data collected by that vessel. The QC Report tabular output and plot are included in Separate IV *Crossline Comparisons* for all of the comparisons. The result of the analysis meets the requirements as stated in the National Ocean Service (NOS) *Hydrographic Surveys Specifications and Deliverables* (April 2009). There are some outliers reported in the crossline QC Report's minimum and maximum fields, which result from comparing raw crossline soundings to the gridded CUBE surface along steep slopes (high standard deviation). The multibeam data has been thoroughly reviewed to ensure that there are no fliers present in either the crosslines or underlying CUBE surface.

Additional crossline analysis was performed by computing a 1 meter CUBE surface from the crossline data. This surface was then differenced from the 1 meter CUBE surface that encompassed the survey area, and statistics compiled on the resulting nodes. This yielded over 5 million node comparisons and an average difference between the crossline surface and the mainscheme surface of -0.01 meters across all depths, with a 0.22 meters uncertainty at 95% confidence.⁵

B2.b Uncertainty

During HIPS processing, the "greater of the two" option was selected, where the calculated uncertainty from total propagated uncertainty (TPU) is compared to the standard deviation of the soundings influencing the node and where the greater value is assigned as the final uncertainty of the node. As a result, the uncertainty of the finalized surface and associated Bathymetric Attributed Grids (BAGs) increased for nodes where the standard deviation of the node was greater than the calculated uncertainty. The calculated uncertainty values of all nodes within the finalized CUBE surfaces range from 0.37 to 1.62 meters. The high uncertainty error is an artifact of the application of GPS water levels as is discussed in detail below, and of steep relief in rocky seabed which generates high standard deviation values per grid node. All uncertainty statistics were derived from finalized surfaces that were created with depth threshold bounds appropriate for the resolution of the survey.

Given the large range of depths encountered in the survey area, the allowable International Hydrographic Organization (IHO) uncertainty varied considerably. To determine if surface grid

nodes met specification, a ratio of the node uncertainty to the allowable uncertainty at that depth was determined. As a percentage, this value represents the amount of the error budget utilized by the uncertainty value at each node. Values over 100% exceed specification.

As shown in Table 5 below, both uncertainty and the allowable error utilized have low average values and a tight standard deviation (StdDev). The maximum values, however, are significant outliers that fail to meet specification. For the 8-meter CUBE surface, all 10,421 nodes meet specification. For the 4-meter CUBE surfaces, 3,984 nodes out of 3,905,515 fail to meet specification. For the 2-meter CUBE surfaces, 85,071 nodes out of 10,858,532 fail to meet specification. For the 1-meter CUBE surfaces, 3,869 nodes out of 10,426,016 fail to meet specification.

Table 5. CUBE Uncertainty

CUBE Uncertainty Statistics						
	Uncertainty (m)			Allowable error utilized		
	Average	StdDev	Maximum	Average	StdDev	Maximum
1m CUBE	0.38	0.01	0.90	71%	2%	175%
2m CUBE	0.39	0.04	1.62	62%	8%	246%
4m CUBE	0.40	0.03	1.18	50%	6%	131%
8m CUBE	0.41	0.03	0.74	41%	3%	72%

The nodes which fail to meet specification were carefully reviewed in CARIS HIPS and found to fall within three categories: failure due to high standard deviation resulting from steep or rocky terrain, failure due to high standard deviation at the junction between the 2009 and 2010 datasets and failure due to high uncertainty from the inclusion of high GPS vertical RMS error.⁶

The majority of nodes that were reported out of specification were coincident with areas of steep or rocky terrain. Reviewing the underlying data in these regions in subset shows good agreement between survey lines and few anomalies. The high standard deviation which results in the node being reported as out of specification is considered an artifact of gridding data over a steep and variable seafloor.⁷

The 2009 and 2010 datasets exhibit differences of over one meter at their junction due to physical changes in the seafloor that occurred over the time frame between the two datasets. The datasets show good agreement over rocky areas, which is evidence of no systematic errors between the surveys, but do not agree in the sandy areas surrounding rocks, as shown in Figures 2 and 3 below. These differences over the sandy bottom are attributable to sediment transport between the 2009 and 2010 collection efforts, and are representative of a true physical difference in the seafloor.⁸ As a result, nodes which fail due to high standard deviation at the junction between the datasets are considered within specification. The junction between the two datasets occurs in the vicinity of Twin Rocks and along the south-west sheet edge.

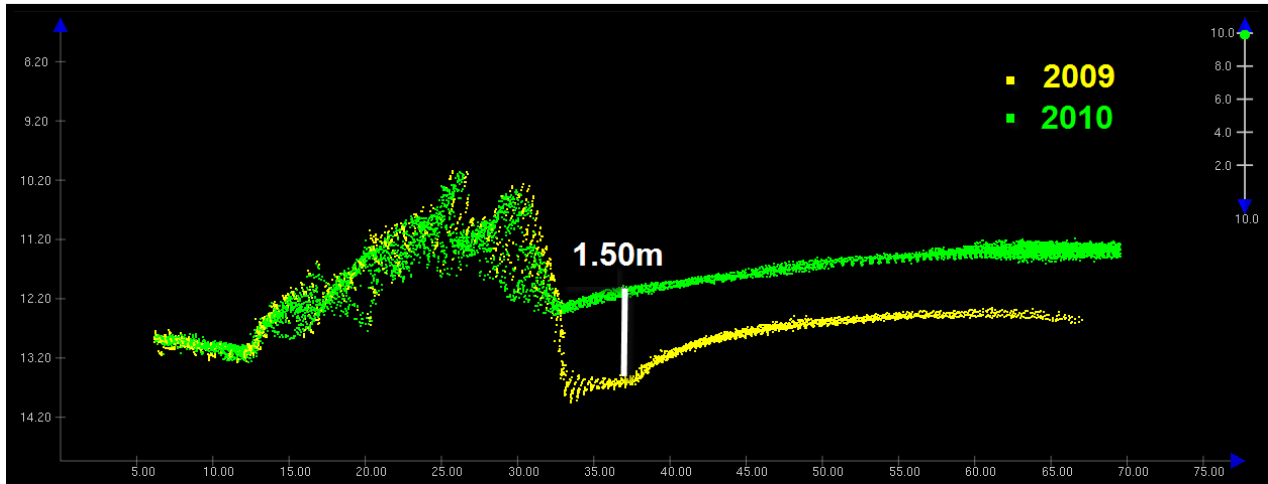


Figure 2. Difference Between 2009 and 2010 Seafloor

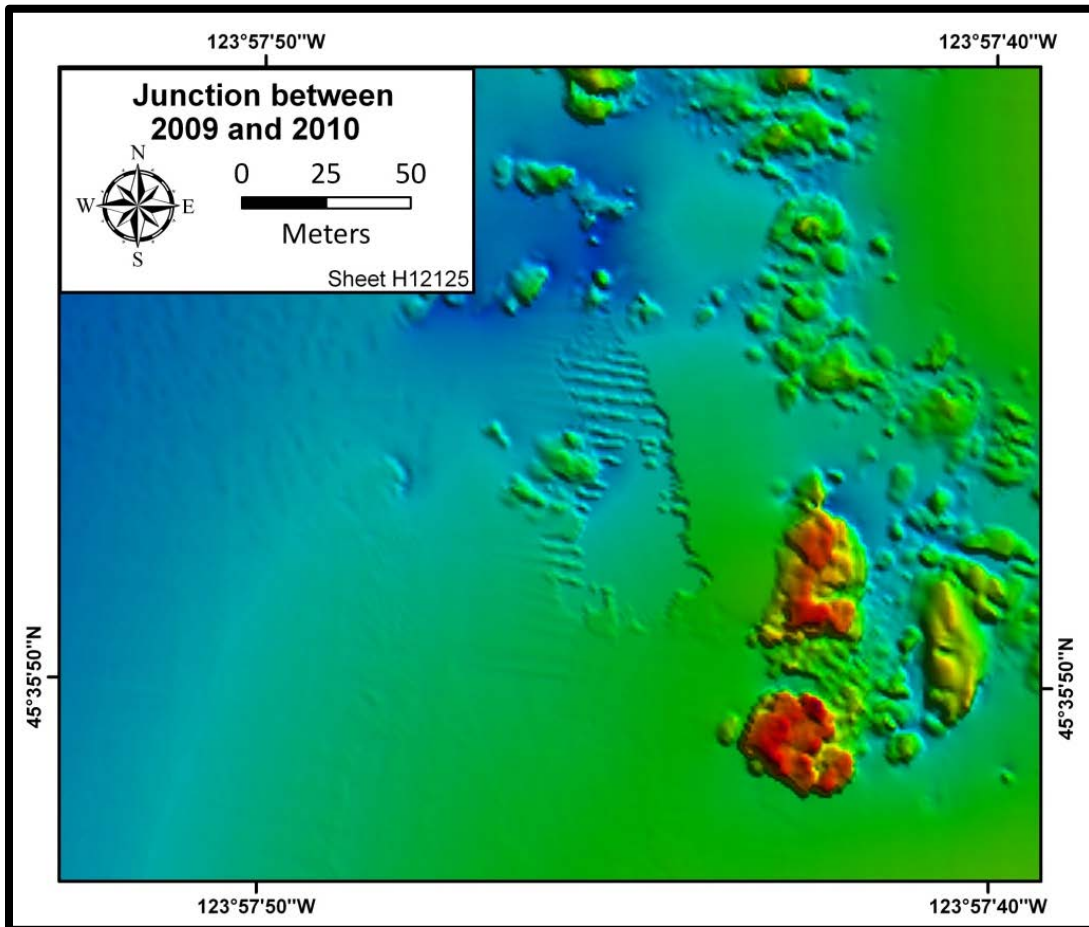


Figure 3. Plan View of the 2009 and 2010 Survey Junction

High GPS vertical root mean square (RMS) error as determined by POSpac post-processing software resulted in some nodes being reported as out of specification. In each instance of high

RMS, the GPS height signal was reviewed for abnormal fluctuations, and the corresponding CUBE standard deviation was consulted to determine if the soundings were abnormal. If the height signal was found to be abnormal, the fluctuations in the corresponding GPS tide values were removed by a hydrographer through interpolation as discussed in section B2.d below. The resulting corrected data did not exhibit any unusual degradation and agreed well with neighboring lines and crosslines. Though the high error GPS height signal was removed from the processed depths for those nodes, the corresponding RMS error could not be removed from the uncertainty layer produced by the CARIS CUBE. The high uncertainty of these specific nodes, which contain erroneous RMS values that approach 0.9 meters (95% confidence level), are considered a processing artifact and not representative of the actual uncertainty. As a result, all nodes are considered within specification.⁹

B2.c Junctions

H12125 survey limits junctions with H12124 (Sheet C) to the north and H12126 (Sheet E) to the south. Survey junction analysis was performed between H12125 and H12124 to the north by visually reviewing survey data in CARIS HIPS subset mode and by performing surface to surface comparisons in CARIS Bathy Database. The surface-to-surface difference yielded 2,517,030 comparison points, with an average difference of 0.03 meters and an uncertainty of 0.536 meters at 95%. The junction includes overlap of nearshore 2009 data collected on sheet H12125 with 2010 collection on sheet H12126. The relatively high uncertainty observed in the surface difference is due to the influence of physical changes in the nearshore seafloor of up to 2 meters between the 2009 and 2010 datasets.¹⁰

At the time of writing, survey H12126 had not been completely processed. Junction analysis between these surveys will be discussed in the H12126 descriptive report.¹¹

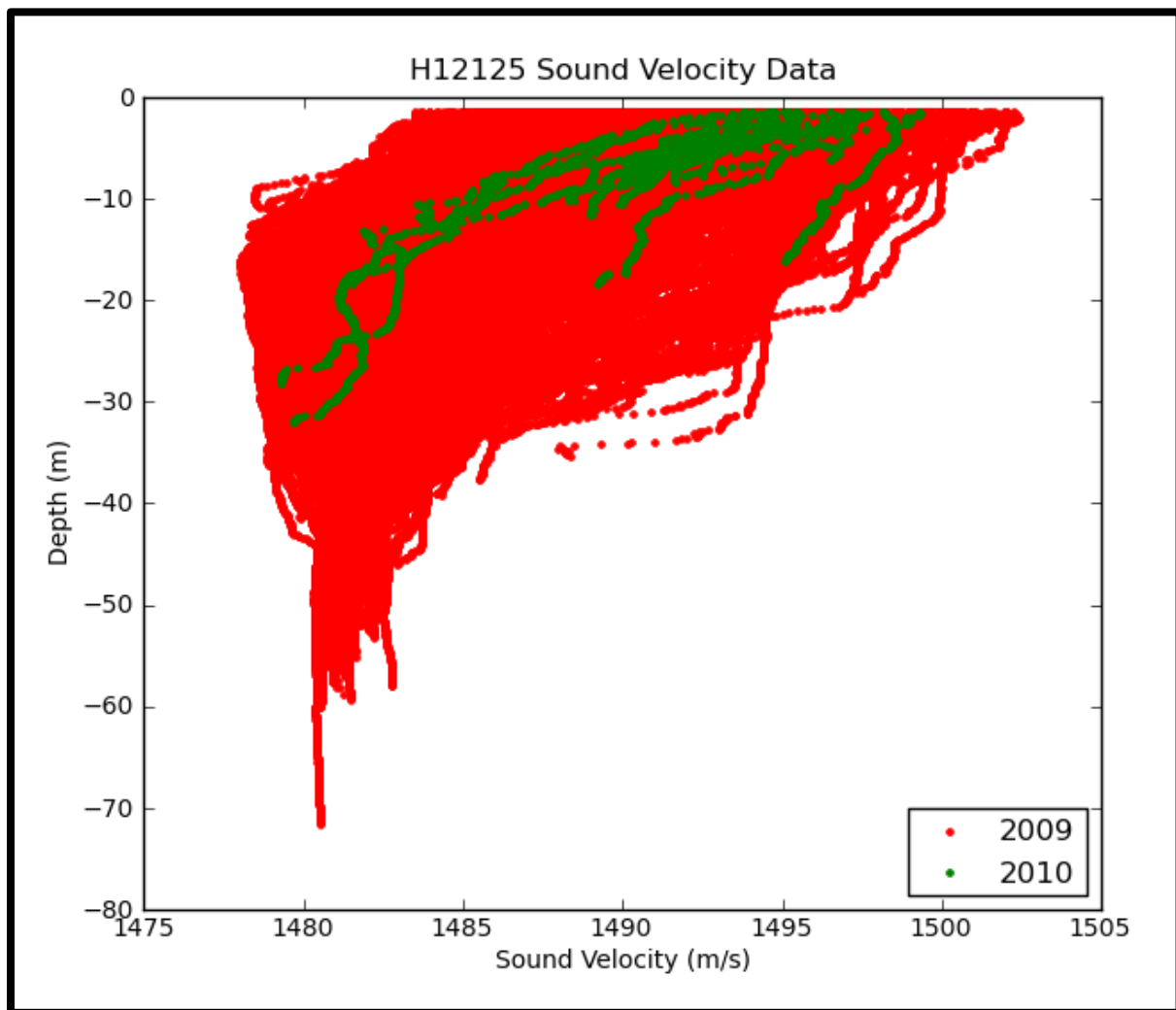
B2.d Unusual Conditions or Data Degradation

Several survey lines were affected by very high GPS vertical RMS error as determined by POSPac post-processing, as discussed in Section B.2b. These areas are evident as sections of unusually high uncertainty in the CUBE uncertainty layer. In each instance, the GPS height signal was reviewed for abnormal fluctuations or anomalies. If there were no abnormal fluctuations present in the tide signal and the sounding data showed good agreement with neighboring survey lines, the data was deemed reliable and the high RMS ignored. If, however, anomalies were present, the GPS signal was removed by the hydrographer and a linear interpolation was performed between the stable GPS tide values on either side of the high RMS data. The underlying sounding data was then inspected by a hydrographer to ensure good agreement with neighboring survey lines.¹²

Survey data were adversely affected by very steep sound velocity gradients and high variability in the sound velocity profile. Although an MVP30 moving vessel profiler was used to measure sound velocity profiles every 10 to 15 minutes, the variability in between casts resulted in errors of 15 to 25 centimeters in outer beam soundings, with some instances in deeper water reaching 35 centimeters. Figure 4 depicts all 1,438 sound velocity profiles collected during survey operations. While sound speed at depth is relatively constant over the course of the survey, the sound speed near the surface varies by over 20 meters per second. In addition, the depth of the sound speed gradient maximum varies by over 30 meters. As a result of this high degree of

variability in sound velocity, refraction artifacts are still present within the dataset, despite frequent sound velocity casts from the MVP in accordance with procedures described in the DAPR.¹³ As described in the DAPR, a weekly comparison of sound velocity casts was made between the MVP30 and a Seabird SBE-19 CTD to verify the performance of the sound velocity and depth sensor in the MVP30 towfish. Results from these comparisons are included in Separate II *Sound Speed Data* along with a copy of annual calibration reports for all sound speed sensors.

Figure 4. H12125 Sound Velocity Profile



The dataset include beam pattern artifacts on the port side of the Reson 8101 data collected by the R/V *Pacific Storm*. The origin of the error is unknown, though it resembles a refraction artifact in structure. The magnitude of the error is depth and beam dependent, with the error increasing with increasing depth and port beam angle, reaching approximately 45 centimeters of error in deep water at the outermost port-side beams. The direction of the error is consistent, with depths at the outer beams on the port side reporting deeper, and the port-side swath resembling a slight frown in shape. The port-side error is frequently masked by sound-velocity induced

refraction errors as discussed above; however, its effect in aggregate is evident in the crossline analysis. In the crossline analysis the error is shown to be within specification, and the overall effect of the error on the final gridded surface is mitigated by a high amount of swath-to-swath overlap.¹⁴

B2.e Object Detection and Coverage Requirements

As discussed in the *M-N928-KR-09 DAPR*, a waiver from NOAA's Data Acquisition and Control Branch was granted to reduce the CUBE surface density, resolution, and depth threshold requirements for the survey.¹⁵ A copy of this waiver and related email correspondence is included in Appendix V *Supplemental Survey Records and Correspondence*.

The sounding density requirement of 95% on all nodes populated with at least three soundings was verified by exporting the density child layer of each CUBE surface (finalized using depth thresholds) to an ASCII txt file and compiling statistics on the density values. More than 98.5% of all final CUBE surface nodes contained three or more soundings.

Complete coverage requirements were verified by a comprehensive review of the CUBE surface to ensure no holidays spanning more than three nodes were present in the surface. Object detection coverage requirements were verified by review of temporary CUBE surfaces of the appropriate object detection resolution created over significant features.

Multibeam data were acquired in conjunction with individual sonar beam backscatter time series (SNIPPETS) data. A fill plan was created for all holidays that did not meet the density or coverage requirement.¹⁶

B3. Corrections to Echo Soundings

Data reduction procedures for survey H12125 are detailed in the *M-N928-KR-09 DAPR*, submitted under a separate cover.

B3.a Deviations from DAPR

A RESON SVP71 sound velocimeter, S/N 2008029, was used to measure sound velocity at the Reson 7101 multibeam head onboard the R/V *JAB*. These measurements were input into the Reson 7-P processor to provide accurate velocities during acquisition. Due to logistical and time constraints it was not possible to recalibrate the SVP71 within six months of the start of survey. A waiver was granted from the Chief of the Data Acquisition and Control Branch on June 18, 2010 to allow for the use of this sensor with the requirement to make periodic comparisons to other calibrated sound speed sensors onboard the R/V *JAB*.¹⁷ Daily comparisons were conducted between the SVP71 and the primary SV sensor, the AML Micro-SV. Results from these comparisons are included in Separate II *Sound Speed Data* along with a copy of the most recent calibration report (July 2009) for the SVP71. A copy of the waiver from the Chief of the Data Acquisition and Control Branch is included in Appendix V *Supplemental Survey Records and Correspondence*.

One data file was incorrectly named during acquisition. Data files were named according to the year, survey vessel, day of the year, and UTC time at the time of collection. Due to an error in the Hypack software used to aid in data collection, one data file from DN247 in 2009 was

incorrectly named 2013PS1872126.XTF, instead of 2009PS2470759.XTF according to convention. The naming error did not affect the integrity of the data or the file.¹⁸

B3.b Additional Calibration Tests

The initial system calibration tests for the R/V *Pacific Storm* were performed on July 26, 2009, day number (DN207). Additional tests were performed periodically to verify the adequacy of the known system biases and document changes in alignment of the Reson 8101.

For the R/V *JAB*, initial system calibration tests were performed on July 01, 2010 (DN182). Additional tests were performed periodically to verify the adequacy of the known system biases and document changes in alignment of the Reson 7101. Additional discussion on calibration tests can be found in the *M-N928-KR-09* DAPR.

B4. Data Processing (Data Representation)

B4.a Multibeam

A BAG was created for each finalized CUBE surface and both the CUBE and BAG surfaces have been included with the digital data. Table 6 lists the CUBE surfaces and BAGs submitted with this survey. Both CUBE and BAG surfaces utilize depth thresholds corresponding to their resolution as described in the *M-N928-KR-09* DAPR.¹⁹

Table 6. H12125 Surfaces

Surface Name	Resolution
H12125_1m	1.0m
H12125_2m	2.0m
H12125_4m	4.0m
H12125_8m	8.0m

C. HORIZONTAL AND VERTICAL CONTROL

A complete description of horizontal and vertical control for survey H12125 can be found in the *M-N928-KR-09 Horizontal and Vertical Control Report*, submitted under separate cover. A summary of horizontal and vertical control for this survey follows.

Real-time navigation logged during acquisition was overwritten with a post-processed navigation solution created from Applanix POSPac MMS using the SmartBase option. GPS reference stations from the National Geodetic Survey (NGS) National and Cooperative Continuously Operating Reference Stations (CORS) or the UNAVCO (University NAVSTAR Consortium) Plate Boundary Observatory (PBO) were used during each post-processing session. Table 7 lists the reference stations used in the network subdivided by data provider. North American Datum of 1983 (NAD83) coordinates of the base stations are included in the *M-N928-KR-09 Horizontal and Vertical Control Report*.

Table 7. GPS Base Stations Used During SmartBase Processing

NGS	UNAVCO	UNAVCO
CHZZ	P395	P411
FTS5	P396	P402
LFLO	P397	P375
P367	P398	P374
P415	P404	
PABH	P405	
FTS6	P407	
CORV	P408	
CABL	P365	

Post-processed uncertainty estimates for position, attitude, and heading were applied using the HIPS Load Error Tool and used during the calculation of TPU.

C1. Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). To improve vertical accuracy of this survey, soundings were reduced to MLLW using post-processed GPS water levels.²⁰ The VDatum derived separation model, *NOrgGRS.bin*, was used to reduce soundings from NAD83 ellipsoid heights to MLLW as described in the *M-N928-KR-09 DAPR*. The separation model has been included with the digital deliverables.

Traditional zoning from water level stations was not used for this project, though zoning provided by Center for Operational Oceanographic Products and Services (CO-OPS) and verified water level files for the survey have been included with the digital deliverables.

C2. Discussion of GPS Tides

The decision to use GPS Tides in lieu of discrete zoning was made for the entire project rather than on a sheet by sheet basis. As shown in the example for H12124 (Figure 5), the use of GPS Tides considerably improved swath to swath agreement of adjacent survey lines. In many cases, the use of GPS tides removed 50- to 60-centimeter offsets between adjacent survey lines reduced with discrete zoning.

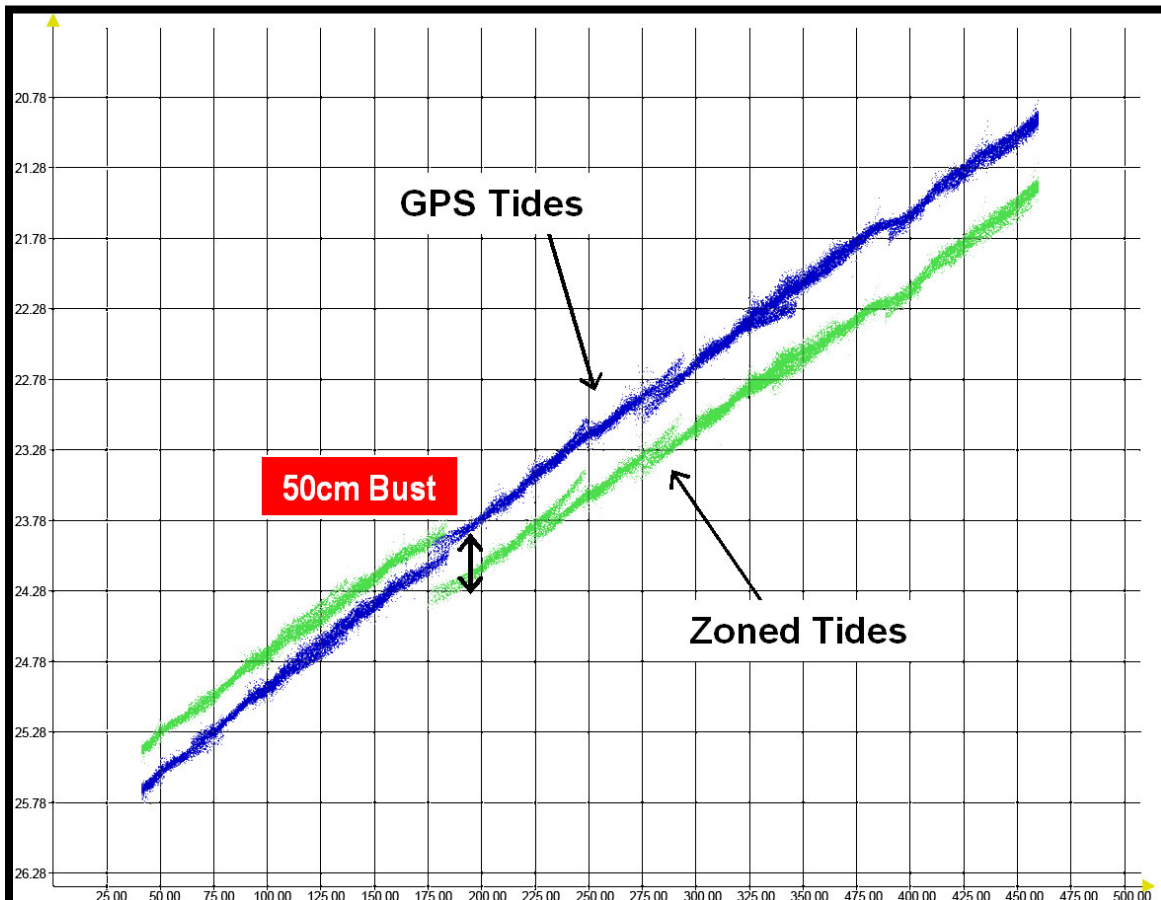


Figure 5. Depth Discrepancies Between Tides Derived from GPS and Tidal Zoning

C3. Horizontal Control

The horizontal datum for this project is NAD83. Differential GPS (DGPS) and Starfire Global Navigation Satellite System (GNSS) positioning were used simultaneously throughout acquisition with DGPS positions only used for a real-time confidence check. DGPS corrections were received from the U.S. Coast Guard (USCG) beacon at Ft. Stevens, OR (287 kHz) or from the secondary beacon at Appleton, WA (300 kHz). All of the primary real-time navigation data were collected using the Starfire Real Time GIPSY (RTG) corrections and are referenced to the International Terrestrial Reference Frame (ITRF) 2005. Real-time navigation data were overwritten by post-processed Smoothed Best Estimate Trajectory (SBET) data referenced to NAD83.

D. RESULTS AND RECOMMENDATIONS

D1. Chart Comparison

D1.a Survey Agreement with Chart

During the course of data acquisition and processing H12125 was compared to the largest scale raster and electronic navigation charts (ENC). Table 8 lists the charts and edition dates used for the chart comparison. The results of these comparisons are described below, as well as in Sections D1.b through D1.f of this report.

The latest electronic and raster versions of the relevant charts were reviewed to ensure that all U.S. Coast Guard Local Notice to Mariners (LNM) issued during survey acquisition, impacting the survey area, were applied and addressed by this survey. A surface was generated from the ENC using both the ENC sounding and contours layers. A difference surface was produced using the ENC and a four-meter combined surface to conduct the chart comparison.

Table 8. Charts Compared to H12125

Chart	Scale	Edition	Edition Date	Issue Date	Latest LNM	Cleared Through Date
18520	1:185,238	27	5/1/2009	---	11/2/2010	11/13/2010
18556	1:20,000	25	1/1/2004	---	11/2/2010	11/13/2010
18558	1:20,000	38	7/1/2006	---	11/2/2010	11/13/2010
US3OR01M	---	17	11/15/2010	11/15/2010	11/9/2010	11/20/2010

In general, survey H12125 depths are 0 to 1 fathoms deeper than those from the chart (Figure 6). The difference surface also shows areas of significant difference, from as much as 4 fathoms deeper to 3 fathoms shallower. These more significant differences are mostly a byproduct of comparing a dense dataset to a surface produced from a triangulated irregular network (TIN) of a small scale ENC composed of sparse soundings and contours. Most of the significant variations occur in the vicinity of charted rocks where the surveyed seafloor is being compared to the interpolated surface. Given the scale of the underlying chart, most of these discrepancies are not considered navigationally significant.²¹

ENC US3OR01M, which covers the survey area for sheet H12125 does not include higher resolution data available on raster charts 18556 and 18558.²² Contours and selected soundings were generated from a 4-meter HIPS product surface of the entire sheet to evaluate the agreement of the survey with these charts. The product surfaces, soundings, and contours were generated solely for the chart comparison and have not been submitted as a final deliverable.

The most significant discrepancy between the charts and H12125 is discussed below.

There is shoaling of over 3 fathoms centered near the charted 8 fathom sounding at the northeast corner of the survey area when compared to chart 18520 and the ENC (Figure 7). When compared with chart 18556, there is 5 to 10 feet of shoaling in the same area, a westward movement of the 30-foot contour approximately 100 meters (5mm at chart scale), and a westward movement of the 60-foot contour approximately 150 meters (7.5mm at chart scale).²³

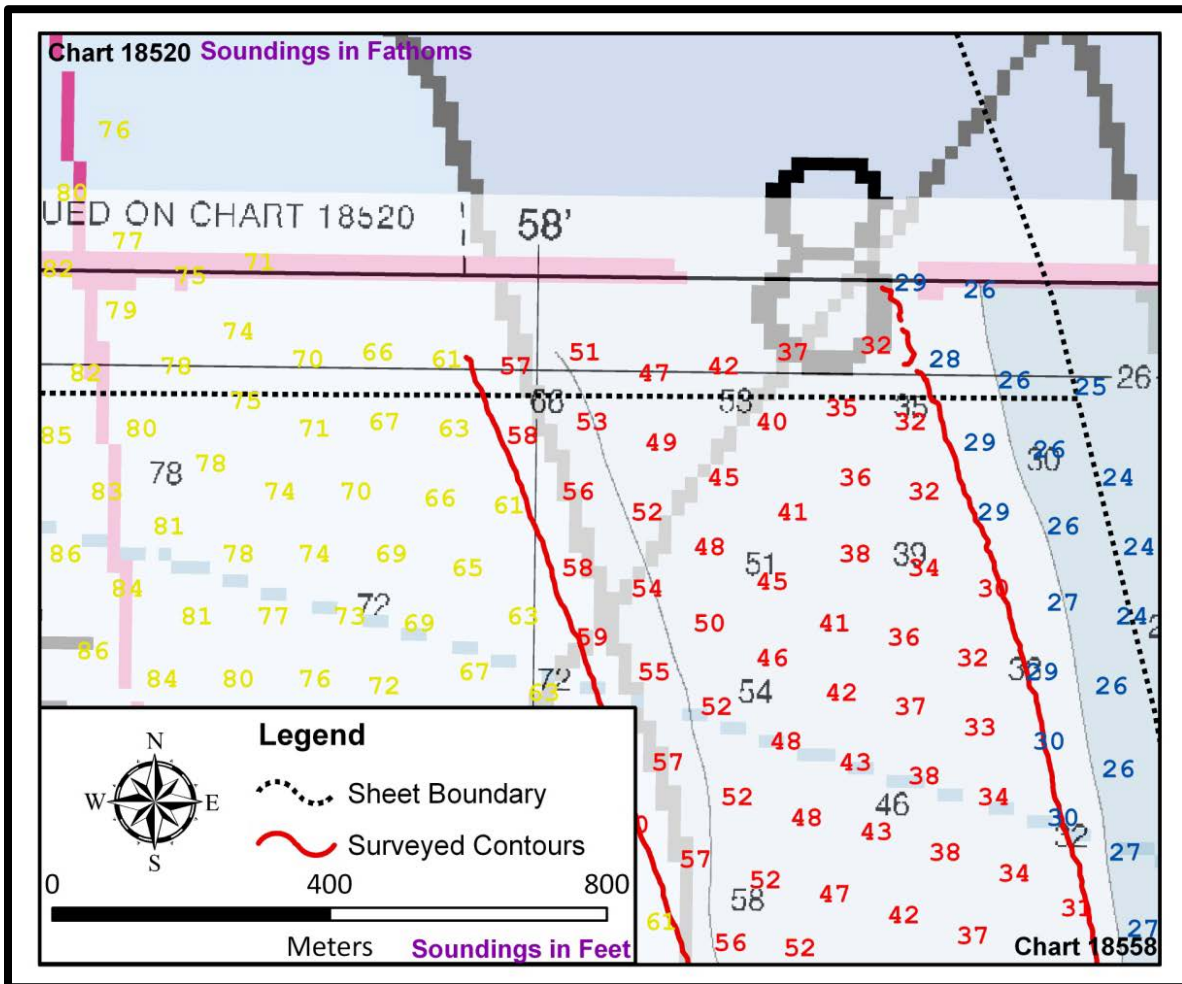


Figure 7. North-East Edge of Survey Area

D1.b Comparison to Significant Shoals

The H12125 survey area contains one significant shoal, the Tillamook Bar, which lies at the south-east corner of the survey area (Figure 8). Survey data show a general deepening and contraction of the contours defining the shoal.²⁴ The western edge of the 30-foot contour has migrated east approximately 70 meters. Significant variation was observed in the surveyed depths between 2009 and 2010 survey efforts, and within the 2010 survey effort, as is discussed in section D2.f below.

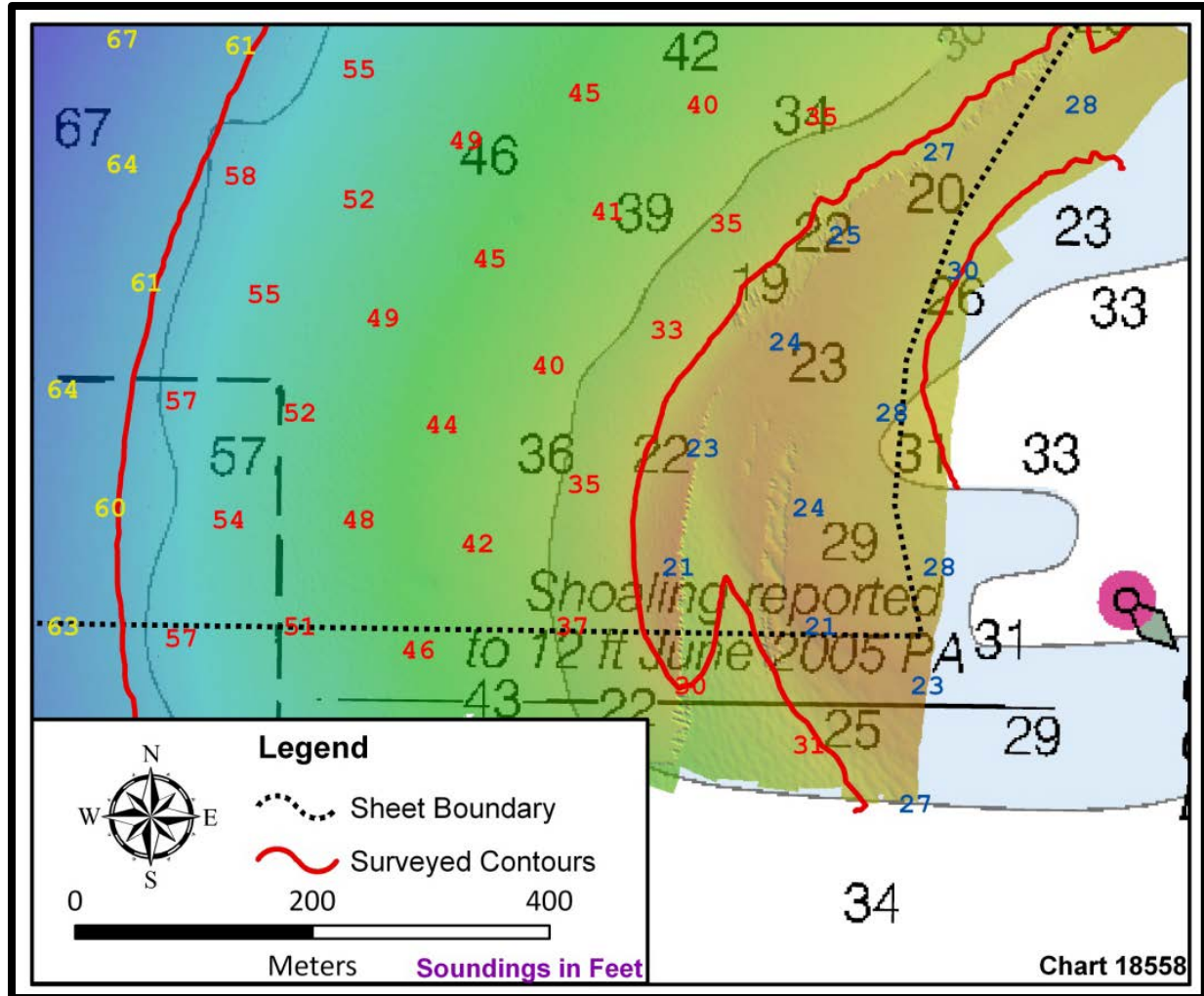


Figure 8. Tillamook Bar

D1.c Comparison to Charted Features

There are no charted features on sheet H12125. An approximately 50-meter segment of the search radius for AWOIS #50114 overlaps with the south-east corner of the surveyed area. There was no evidence of an obstruction within the region of overlap.²⁵

D1.d Comparison of Soundings in Designated Anchorages and Along Channels

H12125 survey area does not contain any anchorage areas or channels.²⁶

D1.e New Submerged Features

Several new areas of rocky seabed were identified by the survey.²⁷ The most prominent submerged rocks within each of these areas were designated as point features. All of these features are listed in Appendix II *Survey Feature Report*.

D1.f Dangers to Navigation

Two (2) Dangers to Navigation (Dton) were located during survey H12125 and have been submitted to PHB. All Dtons were reviewed by PHB and forwarded on to the Marine Chart Division (MCD).²⁸ As depicted in Table 9, both Dangers to Navigation have been added to the larger scale raster charts 18556 and 18558; however, only Dton #1 was added to the ENC and small scale raster chart 18520.

Table 9. H12125 Dton Charting Status

Dton	Feature	Applied to Raster Chart	Applied to ENC	PHB Submitted to MCD
1	UWTROC	Yes	Yes	Yes
2	UWTROC	Yes	No	Yes

Dton #1 was originally reported to PHB in October, 2009 with least depth unknown using partial coverage from the R/V *Pacific Storm* survey effort. Additional coverage acquired in 2010 resulted in a known least depth. The least depth is 0.424 meters (1.391 feet) more shoal than the depth reported in the Dton report and represented on the chart.²⁹ The position of the least depth is as depicted in Table 10 and is approximately 18 meters to the north-east of the position reported in the Dton report.

Table 10. Revised Dton Position and Depth

Dton	Feature	Depth (m)	Latitude (N)	Longitude (W)
1	UWTROC	2.103	45/35/49.833	123/57/42.199

Both Dtons #1 and #2 are included in the S-57 feature file. The attributes and position of Dton #1 in the feature file represent the known least depth and surveyed position as described above. Both Dtons should be charted as depicted in the file.

D.2 Additional Results

D2.a Shoreline Investigations

Shoreline investigation was not required for M-N928-KR-09.³⁰

D2.b Comparison with Prior Surveys

Comparison with prior surveys was not required under this task order.³¹

D2.c Aids to Navigation (Aton)

The U.S. Coast Guard aid to navigation (Atons) within the survey limits was found to be correctly charted and serving its intended purpose.³²

D2.d Overhead Clearance

There are no overhead bridges, cables, or other structures which would impact overhead clearance in the survey area.³³

D2.e Cables, Pipelines and Offshore Structures

There are no charted or observed pipelines, drilling structures, production platforms, or well heads within the survey area. There are several charted undersea cables in the survey area, however none of them are detectable in the multibeam bathymetry.³⁴

D2.f Environmental Conditions Impacting the Quality of the Survey

Significant change occurred in the location and extent of the Tillamook Bar between the 2009 and 2010 survey effort, and between the 2010 mainscheme and 2010 fill collection efforts. Data collected in July of 2010 (DN185) show over four meters of vertical change from data collected in September of 2009 (DN245 and DN251). This vertical change equates to a roughly seventy-meter eastward migration of the shoal. Significant change, including the development of one meter sand waves, was also observed between the mainscheme collection in July 2010 (DN185), and the collection of fill data in August of 2010 (DN223), as shown in Figure 9 below.

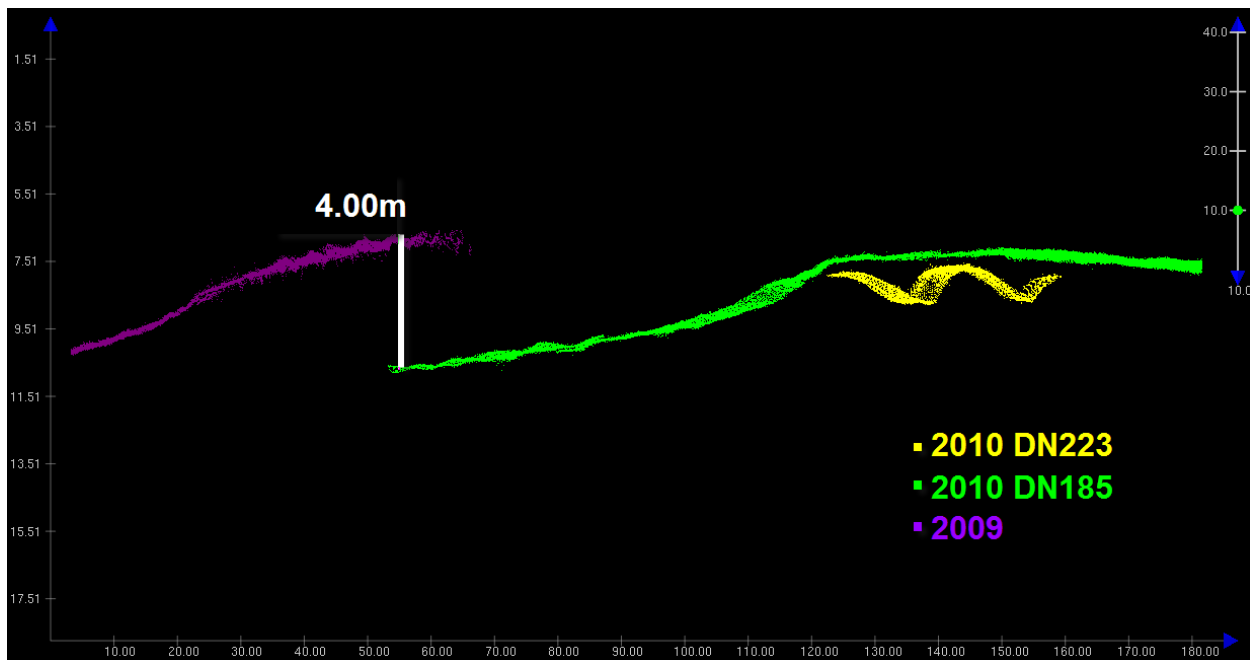


Figure 9. Cross Section of Tillamook Bar Data

The transient seafloor off of Tillamook Bar was discussed with the U.S. Army Corps of Engineers, Portland District to see if any dredging had occurred between September of 2009 and August of 2010. The Portland District reported that no dredging had taken place and that they observe Tillamook Bar as a highly dynamic seafloor feature in their hydrographic surveys of the area.

D2.g Construction Projects

No active construction projects were observed in H12125 survey area.³⁵

D2.h Bottom Characteristics

Fifty-four (54) bottom samples were obtained between September 9 and September 15, 2009 (DN 252 to 258) and are included in the S-57 attributed feature file in the *Supporting Data* folder. A table listing the position and description of each bottom sample is included in Appendix V *Supplemental Survey Records and Correspondence*, along with photographs of each sample. Bottom samples were obtained on a 2,000-meter grid to meet survey requirements.³⁶



DAVID EVANS
AND ASSOCIATES INC.

LETTER OF APPROVAL

M-N928-KR-09
REGISTRY NO. H12125

This report and the accompanying data are respectfully submitted.

Field operations contributing to the accomplishment of survey H12125 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and associated data have been closely reviewed and are considered complete and adequate as per the *M-N928-KR-09 Statement of Work* dated June 2009, and *Project Instructions* received on August 20, 2009.

Digitally signed by Jon Dasler
DN: cn=Jon Dasler,
email=jld@deainc.com, o=David
Evans and Associates, Inc., c=US
Date: 2010.12.14 09:39:12 -08'00'

Jonathan L. Dasler, PE (OR), PLS (OR, CA)
ACSM/THSOA Certified Hydrographer
Chief of Party

Digitally signed by Jason Creech
DN: cn=Jason Creech,
email=jasc@deainc.com,
o=David Evans and Associates,
Inc., c=US
Date: 2010.12.14 09:39:47 -08'00'

Jason Creech
Lead Hydrographer

David Evans and Associates, Inc.
September 2010

Revisions Compiled During Office Processing and Certification

¹ Concur. The waiver is appended to this report.

² Concur.

³ Concur.

⁴ Crossline total falls below the required 5%, but was determined to be adequate for comparison purposes.

⁵ Concur.

⁶ Concur. The data is adequate to supersede charted data.

⁷ Concur. The data is adequate to supersede charted data.

⁸ Concur with clarification. In areas of overlap between 2009 and 2010 data, the SAR review ensured deeper data were rejected and that least depth would be honored in the final combined surface from which H12125_SS.000 soundings are derived.

⁹ Concur.

¹⁰ Concur. The data is adequate to supersede charted data.

¹¹ Concur. A common junction was made with H12124. H12126 has not been compiled at this time.

¹² Concur.

¹³ Concur. The data is adequate to supersede charted data

¹⁴ Concur. The data is adequate to superseded charted data.

¹⁵ Concur. The waiver is appended to this report.

¹⁶ Concur. No significant holidays exist in the data.

¹⁷ Concur.

¹⁸ Concur.

¹⁹ A 4-meter finalized combined surface created during the SAR was used as the basis for compilation.

²⁰ Concur.

²¹ Concur. Chart features and depths as depicted in the HCell.

²² Concur.

²³ Concur. Chart depths as depicted in the HCell and update charted contours based on the survey data.

²⁴ Concur. Chart depths as depicted in the HCell and update charted contours based on the survey data.

²⁵ Concur.

²⁶ Concur.

²⁷ Concur with clarification. Although rocky seabed areas were submitted by the contractor, none were included in the HCell as they were insignificant at chart scale.

²⁸ Concur.

²⁹ Concur with clarification. The correct least depth for DTON#1 is included in the HCell. DTON#2 has also been included in the HCell. Chart both per H12125_CS.000

³⁰ Concur.

³¹ Concur.

³² Chart per latest ATONIS information.

³³ Concur.

³⁴ Concur with clarification. Charted cables have been blue noted to be retained.

³⁵ Concur.

³⁶ Concur. Bottom sampling was much denser than required in some areas, 44 of the collected bottom samples were imported into the H12125 HCell. One bottom sample was imported from the ENC to be retained. Also, general blue notes were included for Charts 18556 and 18558.

H12125 Danger to Navigation Report

Registry Number: H12125
State: Oregon
Locality: Pacific Ocean - Northern Oregon
Sub-locality: Vicinity of Rockaway Beach
Project Number: M-N928-KR-09
Survey Dates: 20090904 - 20091011

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18558	38th	07/01/2006	1:20,000 (18558_1)	[L]NTM: ?
18556	25th	01/01/2004	1:20,000 (18556_1)	[L]NTM: ?
18520	26th	10/01/2005	1:185,238 (18520_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	33rd	02/01/2009	1:1,200,000 (18007_1)	[L]NTM: ?
501	12th	11/01/2002	1:3,500,000 (501_1)	[L]NTM: ?
530	32nd	06/01/2007	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - source: last correction applied (last correction reviewed--"cleared date")

Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Rock	2.53 m	45° 35' 49.4" N	123° 57' 42.8" W	---
1.2	Rock	5.28 m	45° 35' 56.1" N	123° 57' 45.5" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H12125_dton.xls**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 45° 35' 49.4" N, 123° 57' 42.8" W
Least Depth: 2.53 m (= 8.29 ft = 1.382 fm = 1 fm 2.29 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) [None] ; TVU (TPEv) [None]
Timestamp: 2009-284.14:31:25.000 (10/11/2009)
GP Dataset: H12125_dton.xls
GP No.: 1
Charts Affected: 18556_1, 18558_1, 18520_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

UWTROC

Depths were acquired with multibeam sonar, corrected using verified zoned tides, and should be considered preliminary. Positions are referenced from real-time navigation augmented with the StarFire subscription service and are on NAD83.

DtoN 1 is a rock approximately 125m due west of Twin Rocks. The true least depth and dimensions of this feature is unknown due to it being too shallow to survey safely.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12125_dton.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Chart as a dangerous underwater rock of uncertain depth.

Cartographically-Rounded Depth (Affected Charts):

8ft (18556_1, 18558_1)

1 ¼fm (18520_1, 18003_1, 18007_1, 530_1)

2.5m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 3:doubtful sounding
SORDAT - 20091011
SORIND - US,US,nsurf,H12125
TECSOU - 3:found by multi-beam
VALSOU - 2.527 m
WATLEV - 3:always under water/submerged

Feature Images

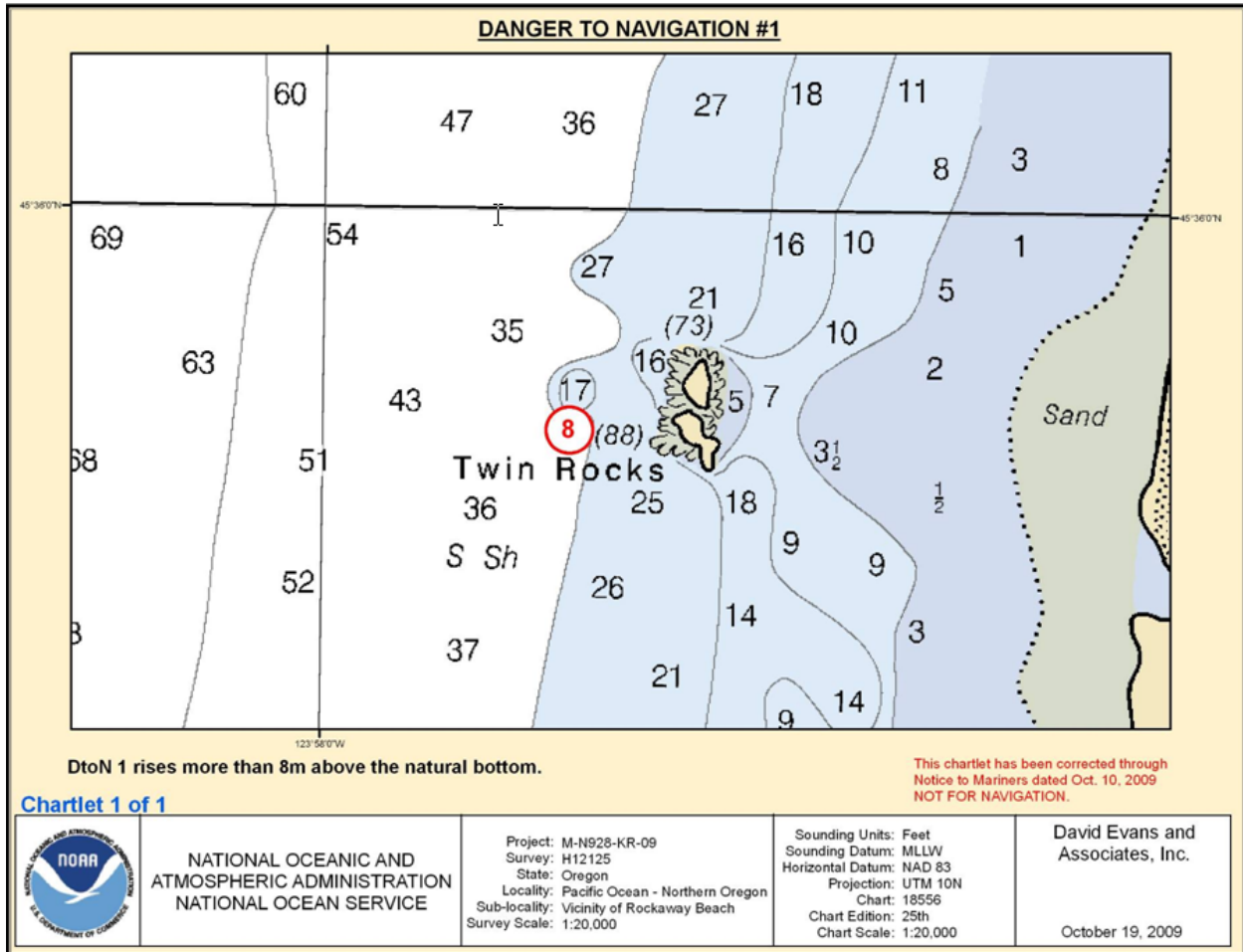


Figure 1.1.1

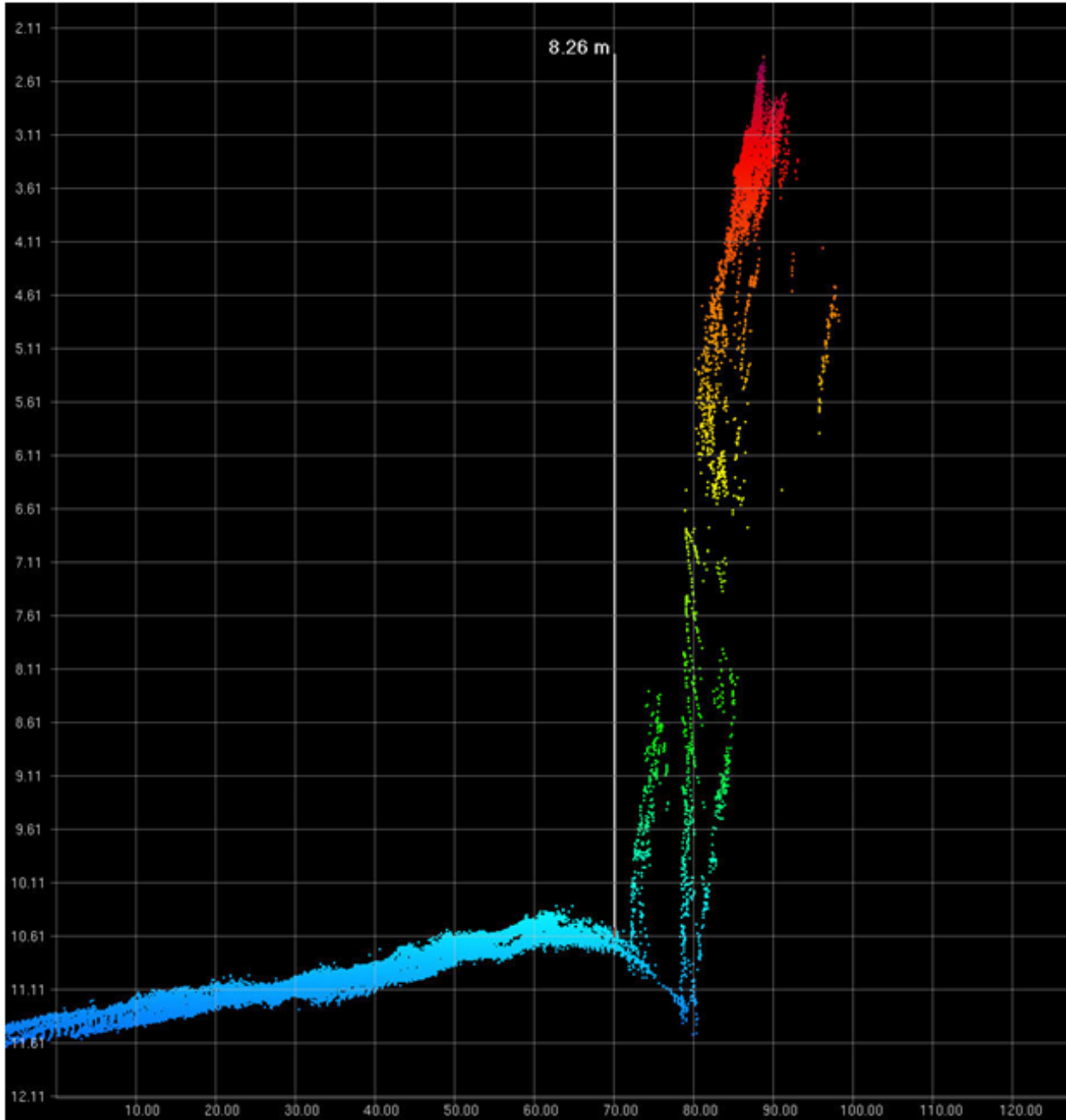


Figure 1.1.2

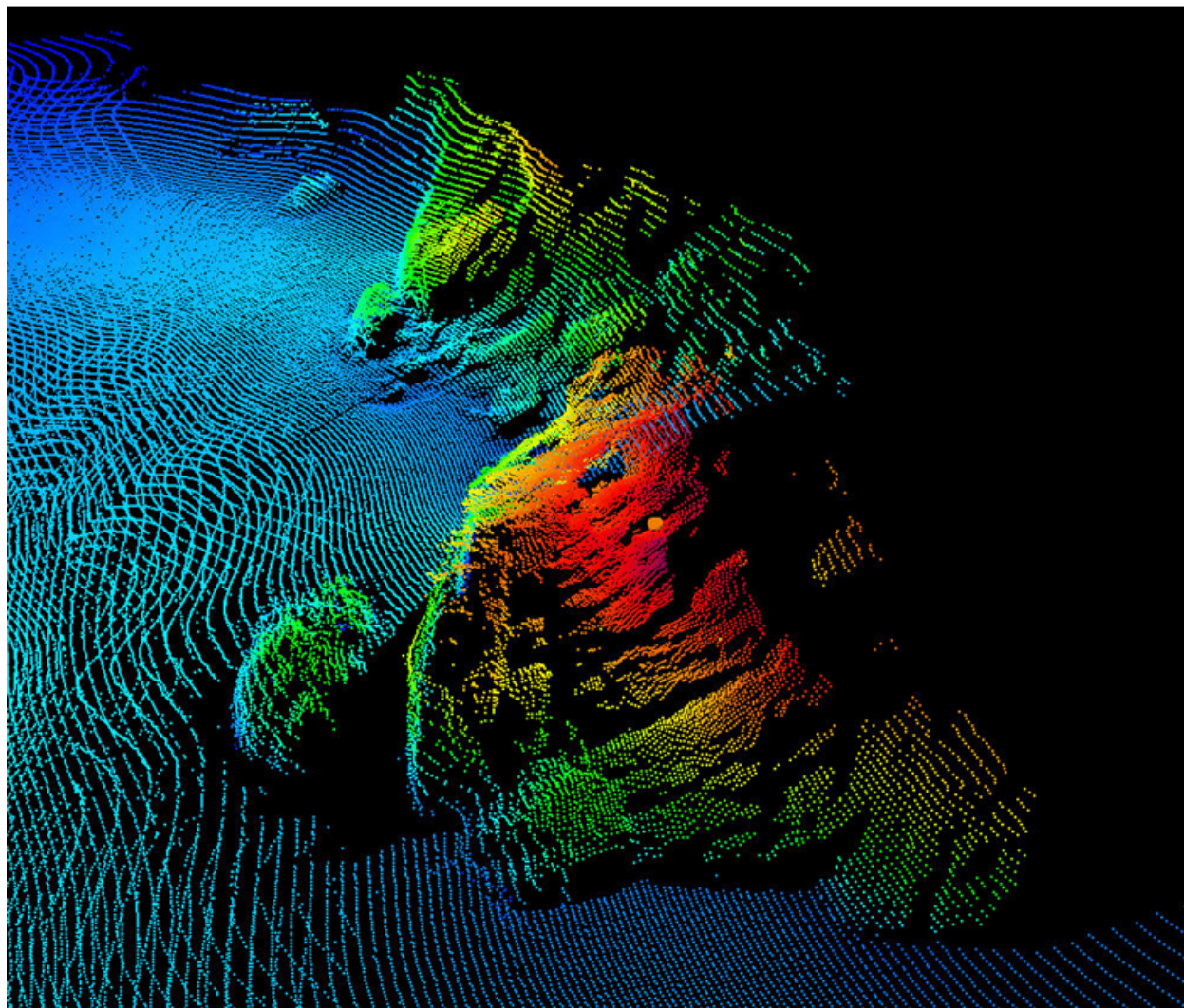


Figure 1.1.3

1.2) GP No. - 2 from H12125_dton.xls**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 45° 35' 56.1" N, 123° 57' 45.5" W
Least Depth: 5.28 m (= 17.33 ft = 2.889 fm = 2 fm 5.33 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) [None] ; TVU (TPEv) [None]
Timestamp: 2009-247.17:31:33.000 (09/04/2009)
GP Dataset: H12125_dton.xls
GP No.: 2
Charts Affected: 18556_1, 18558_1, 18520_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

UWTROC

Depths were acquired with multibeam sonar, corrected using verified zoned tides, and should be considered preliminary. Positions are referenced from real-time navigation augmented with the StarFire subscription service and are on NAD83.

Dton 2 is a rock approximately 240m northwest of Twin Rocks. The true least depth and dimensions of this feature is unknown due to it being too shallow to survey safely.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12125_dton.xls	2	0.00	000.0	Primary

Hydrographer Recommendations

Chart as a dangerous underwater rock of uncertain depth.

Cartographically-Rounded Depth (Affected Charts):

17ft (18556_1, 18558_1)

2 ¾fm (18520_1, 18003_1, 18007_1, 530_1)

5.3m (501_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)

Attributes: QUASOU - 3:doubtful sounding
SORDAT - 20090904
SORIND - US,US,nsurf,H12125
TECSOU - 3:found by multi-beam
VALSOU - 5.283 m
VERDAT - 12:Mean lower low water
WATLEV - 3:always under water/submerged

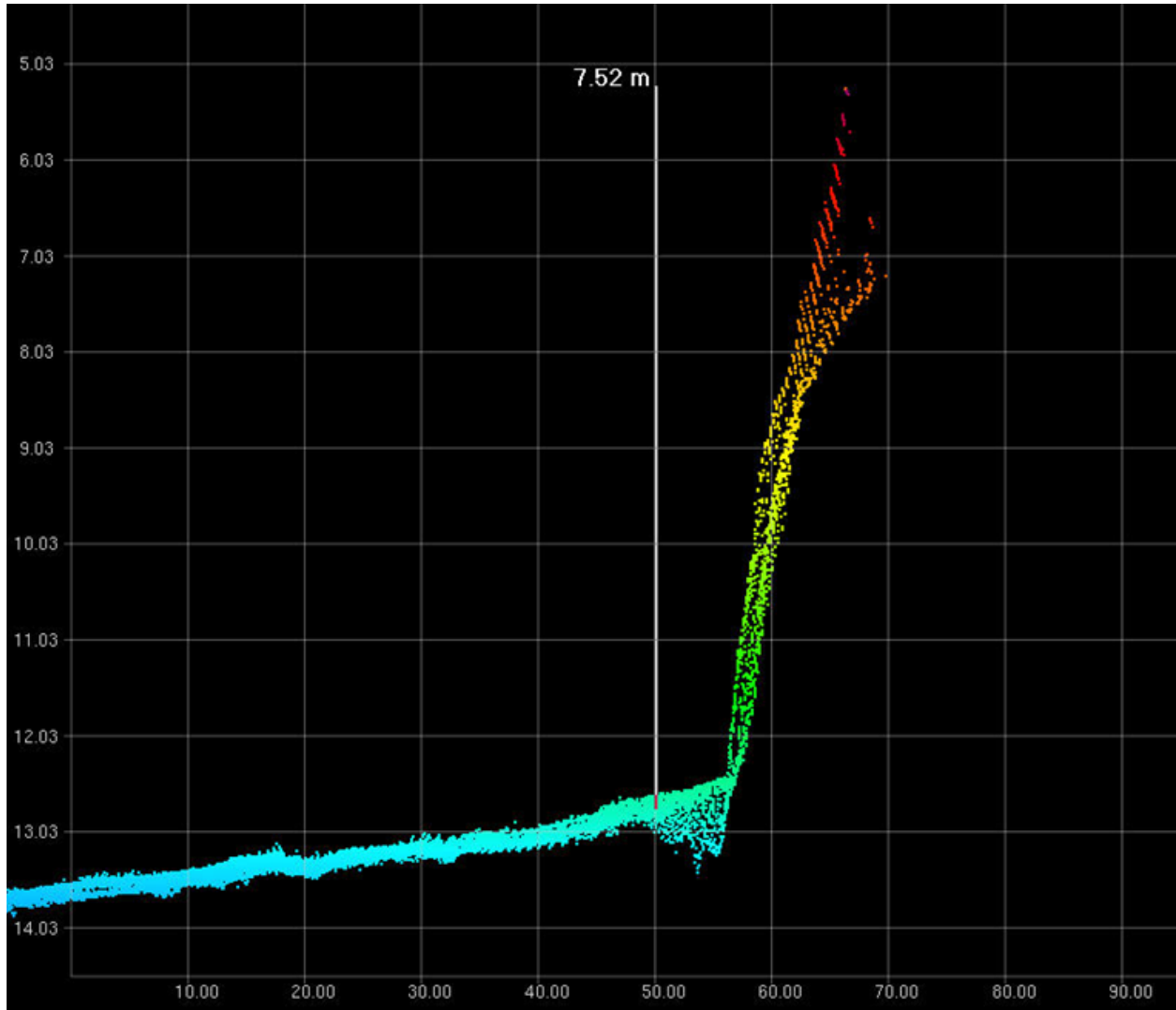


Figure 1.2.2

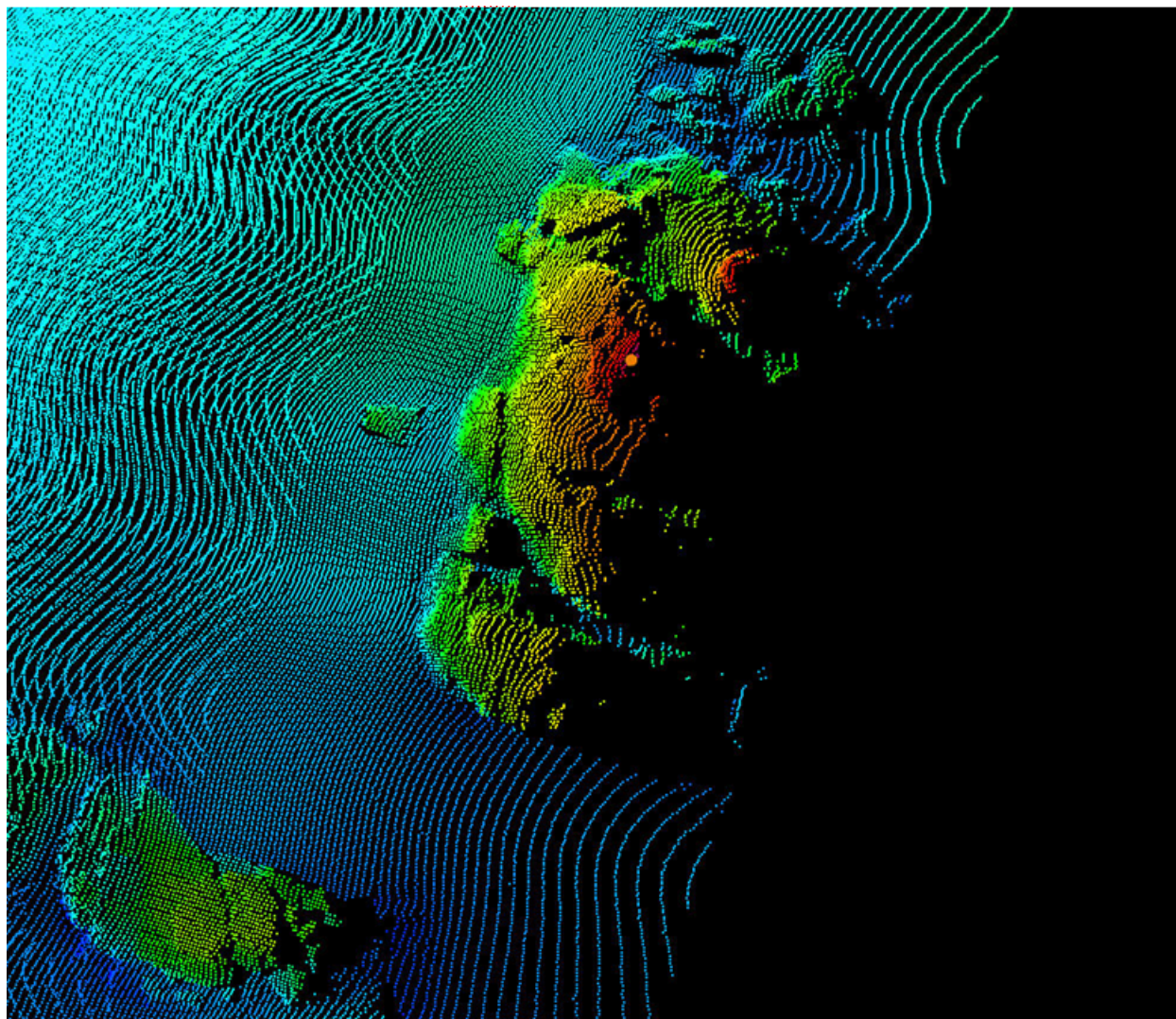


Figure 1.2.3

Jason Creech

From: Ben Evans [Benjamin.K.Evans@noaa.gov]
Sent: Tuesday, September 01, 2009 9:24 AM
To: Jason Creech
Cc: Lori.Knell; Jeffrey Ferguson; Jon Dasler
Subject: Re: DEA Sounding Density

Jason,

Your compromise proposal sounds very reasonable. NOAA agrees to relax the resolution and sounding density requirements to the values you have proposed for the surveys assigned to David Evans and Associates as part of OPR-N928-KR-09. Please include these non-standard values and reference this correspondence in the Descriptive Report for all affected surveys, with additional detail included as appropriate in the Data Acquisition and Processing Report. We will also notify the Atlantic Hydrographic Branch of this change.

For the record, we note the following:

- The reduced resolution allowed by this waiver may require DEA to increase use of designated soundings to ensure that any shoal features are adequately represented in the final gridded surface (as per Section 5.1.1.3 of the 2009 NOS Hydrographic Surveys Specifications and Deliverables).
- This waiver permits deviation from the 2009 edition of the NOS Hydrographic Surveys Specifications and Deliverables, issued in April 2009. DEA's price proposal and final work plan for this project were dated July 2 and July 16, 2009, respectively.
- This waiver applies only to the work awarded under Task Order 3 of contract DG133C-08-CQ-0006 (survey projects OPR-M928-KR-09 and OPR-N928-KR-09).

Lori - please file a copy of this email with the records for this task order, and let AHB know to expect this.

Regarding planning tools - We have used some spreadsheets in the past to estimate beam footprint size for different sonar/depth/swath angle regimes, but don't have anything tailored for these new sounding density requirements that I'm aware of.

Thanks,

Ben

Jason Creech wrote:

Ben

For the Oregon Coast we have looked at some data that we have already acquired using the 8101 with a 55 to 60 degree swath filter to see what grid resolutions support a minimum of 3 sounding per node. We propose the following depth range / resolution combinations while using the new maximum propagation distance.

Depth Range (m)	Resolution (m)
-----------------	----------------

0-18	1
15-40	2
35-70	4
65 to project max	8

It appears that these combinations will allow us to populate 95% of all nodes with 3 or more soundings without needing to acquire additional data. We are concerned about the possible need to acquire additional data considering our project cost estimates did not account for this new specification. We have already completed several areas for the project that would require long ship transit times and additional survey days in order to return to these sites to increase sounding density.

We are in the process of building some planning tools to help estimate sonar dependent maximum swath widths for specific depths in order to estimate survey plans in the future. I'm just wondering, but has NOAA already prepared anything similar to this?

Thanks again for your willingness to work with us on this issue.

Jason

From: Ben Evans [<mailto:Benjamin.K.Evans@noaa.gov>]
Sent: Thursday, August 20, 2009 8:39 AM
To: Jason Creech
Cc: Lori.Knell; Jeffrey Ferguson
Subject: Re: DEA Sounding Density

Jason,

Good to talk to you. Just to summarize where we left things:

Sounding Density:

- If compromise is required on the sounding density requirements in the 2009 Specs, NOAA's general preference would be to relax grid resolution requirements before sounding density requirements.
- DEA will analyze an existing dataset characteristic of the expected OR Coast survey area, to determine what grid resolution could be met while still maintaining a minimum of 3 soundings per node for 95% of the grid cells.
- Based on the results of this analysis, we'll work together to come to a final decision on a waiver from the 2009 Specs. We'll also resolve the ambiguity in resolution and density requirements for "skunk stripe" MBES run concurrently with SSS.

Chesapeake Water Levels:

- I will raise this with Jeff Ferguson and EJ Van den Aneelee on their return to the office next week.
- DEA will provide a summary of its GPS-based water levels methods for this survey, TPU estimation for these methods, and comparison of survey results using traditional gauge/zone water levels and the GPS methods for a subset of data.
- Based on this, we'll work together to come to a decision on if/how to submit the Chesapeake surveys with GPS water levels, possibly prior to closeout of the 90 day gauge.

Thanks, and I hope everything goes well with your new arrival.

Ben

Jason Creech wrote:
Hey Ben

Yesterday Lori mentioned that you wanted to discuss some of the 2009 HSSD density issues with me. Can you give me a call when you have a chance? I'm sure you are busy preparing for tomorrow's press event.

Thanks and I look forward to speaking with you.

Jason

Jason Creech
Lead Hydrographer

David Evans and Associates, Inc. | Marine Services Division
2801 SE Columbia Way, Ste. 130 | Vancouver, WA 98661
jasc@deainc.com | Phone: 804.516.7829 | Fax: 360.314.3250

www.deainc.com

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LCDR Ben Evans, NOAA
Chief, Data Acquisition and Control Branch (N/CS35)
NOAA Office of Coast Survey
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Silver Spring, MD 20910
voice: (301) 713-2700 x111
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--

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cell: (240) 687-4602

Jason Creech

From: Lori.Knell [Lori.Knell@noaa.gov]
Sent: Wednesday, November 04, 2009 10:27 AM
To: Jon Dasler; Jason Creech
Cc: Benjamin.K.Evans@noaa.gov
Subject: Official Delivery Address Change

Jon and Jason,

We have officially changed the delivery address from the Atlantic Hydrographic Branch to the Pacific Hydrographic Branch. You will ship all data, reports and survey records for each completed project for the Oregon Coast Mapping Project (M-M928-KR-09 and M-N928-KR-09) to:

Chief, Pacific Hydrographic Branch, N/CS34 National Ocean Service, NOAA 7600 Sand Point Way, NE Building 3, BIN C15700 Seattle, Washington 98115-0070

Thank you,

Lori Knell

--

Lori Knell
Physical Scientist, Data Acquisition Control Branch Hydrographic Surveys Division NOAA
Lori.Knell@noaa.gov 301.713.2700 x114

Jon Dasler

From: Lori.Knell [Lori.Knell@noaa.gov]
Sent: Tuesday, January 05, 2010 6:59 AM
To: Jon Dasler
Subject: Updated information

Jon,

I had a meeting with Jeff and Ben before the holidays and I realize there were a few things I meant to pass along before I left. Here are a few of the topics we discussed. (Some of them we already went over)

- * ERS data for the Chesapeake Bay will be submitted to C Request as soon as we have access to the budget, it will be the first task order
- * The continuation of Vdatum in the Chesapeake Bay is highly likely but we need more time to make the final decision, we may even be able to accept the ERS data alone but separate cost estimates is helpful at this point, which I already received
- * ERS data will be accepted for the Oregon Coast surveys if the tidal zoning is that bad. If this how the data is submitted make sure to explain everything in the DR

Please let me know if you have any questions.

Thank you,
Lori

--

Lori Knell
Physical Scientist, Data Acquisition Control Branch Hydrographic Surveys Division NOAA
Lori.Knell@noaa.gov 301.713.2700 x114

Jon Dasler

From: Ben Evans [Benjamin.K.Evans@noaa.gov]
Sent: Friday, June 18, 2010 10:01 AM
To: Jon Dasler
Cc: Lori.Knell; Jason Creech
Subject: Re: Annual SV Calibration

Jon,

Your proposed approach to cross compare the SV71 with recently calibrated AML SV sensors and CTDs is acceptable. Please document your processes in the DR and DAPR as appropriate, and include a copy of this correspondence. Note that all standard requirements for maximum TPU of soundings and resulting gridded data will still apply.

Lori - please archive a copy of this email with the records for this task order. This waiver applies to the 2010 Oregon Coast work only.

Thanks,

Ben

Jon Dasler wrote:

> Ben,
>
> This season we will be using a Reson 7101 on the Oregon Coast. It
> turns out the SVP71 provided with that system was last calibrated in
> July, 2009. There will not be time to ship this probe to Denmark for
> calibration prior to deployment. Can we compare the sensor against one
> or more of our AML SV sensors as proof of performance within
> specifications in lieu of a more recent calibration? We will be using
> an MVP30 in addition to the SV71 at the head and can make real-time
> comparisons when the MVP sensor is towed near the vessel. We also
> conduct weekly comparisons between our MVP sensor and a SeaBird which
> could both be compared to the SV71. All of our other sensors have been
> calibrated this spring as required. Let me know if this will be
> acceptable.
>
> Regards,
>
> Jon
>
> *Jon Dasler, P.E., P.L.S.
> Vice President, Director of Marine Services*
>
> *David Evans and Associates, Inc.** | Marine Services Division**
> *2801 SE Columbia Way, Ste. 130 | Vancouver, WA 98661 jld@deainc.com |
> Office: 360.314.3202 | Cell: 503.799.0168 | Fax:
> 360.314.3250
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fax: (301) 713-4533
cell: (240) 687-4602

Jason Creech

From: Lori.Knell@noaa.gov
Sent: Wednesday, September 22, 2010 7:08 AM
To: Jason Creech
Cc: Jon Dasler; 'Benjamin K Evans'
Subject: RE: Coverage Clarification

Jason,

After reading your email and assuming you made all efforts possible to collect the information, we agree the holidays do not require fill.

Consider this email a waiver to allow you to complete this project without filling in the specific holidays you mention in the email below.

Thank you,
Lori

From: Jason Creech [mailto:Jasc@deainc.com]
Sent: Tuesday, September 21, 2010 9:27 AM
To: Lori.Knell@noaa.gov; Ben Evans
Cc: Jon Dasler
Subject: Coverage Clarification

Lori

We are in the process on finalizing our fill plan for the Oregon Coast project and have a question regarding the Complete and Object Detection Coverage requirements in the HSSD.

Both requirements allow for a maximum holiday of 3 nodes. We have several holidays that fall on the side or base of underwater rocks which span more than 3 nodes. The features are creating a shadowing effect which prevents full ensonification of the rocks. Some of these features have been developed with varying line azimuths but we are still unable to fill the holidays. We are confident that we have the least depth of these features as it would be physically impossible for a shoaler sounding to fall in the shadow.

I'm sure other contractors and NOAA field units have experienced this issue in the past. I've attached 2 excel files with screen shots. One image shows the CUBE surface and the other shows full resolution soundings.

Before we end survey operations we want to make certain that these holidays do not require fill. If it is acceptable to leave these holidays in the surfaces we'd also like to have an email waiver to include with the DRs. We have a good weather window today through Thursday so we hope to complete survey operations this week.

Let me know if you have any questions.

Thanks,
Jason

H12125 HCell Report
Martha Herzog, Physical Scientist
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H12125 used:

Office of Coast Survey HCell Specifications: Version: 4.0, 2 June, 2010.
HCell Reference Guide: Version 2.0, 2 June, 2010.

2. Compilation Scale

Depths and features for HCell H12125 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NTM Date
18556	1:20,000	25th	01/01/2004	4/02/2011
18558	1:20,000	38th	07/01/2006	4/02/2011
18520	1:185,238	27th	5/01/2009	4/09/2011

The following ENC's were also used during compilation:

Chart	Scale
US5AK4CM	1:185,238

3. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 4-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:8,000 and 1:20,000 survey scales using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
0	10	3
10	20	4
20	50	4.5
50	200	5

In CARIS BASE Editor soundings were manually selected from the high density sounding layers (SS) and imported into a new layer (CS) created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that closely represents the seafloor morphology.

4. Depth Contours

Depth contours at the intervals on the largest scale chart are included in the H12125_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and feet equivalent contour values are shown in the table below.

Chart Contour Intervals in Feet from Charts 18556 and 18558	Metric Equivalent to Chart Feet, Arithmetically Rounded	Metric Equivalent of Chart Feet, with NOAA Rounding Applied	Feet with NOAA Rounding Applied	Feet with NOAA Rounding Removed for Display on H12125_SS.000
18	5.4864	5.715	3.125	18
30	9.3726	9.144	5.125	30
60	18.288	18.517	10.125	60
120	36.576	37.9476	20.75	120
180	54.864	56.236	30.75	180

Contours have not been deconflicted against shoreline features, soundings and hydrography, as all other features in the H12125_CS file and soundings in the H12125_SS have been. This may result in conflicts between the H12125_SS file contours and HCell features at or near the survey limits. Conflicts with M_QUAL, and SBDARE objects, should be expected. HCell features should be honored over H12125_SS.000 file contours in all cases where conflicts are found.

5. Meta Areas

The following Meta object areas are included in HCell H12125:

M_QUAL
M_CSCL

The Meta area objects were constructed on the basis of the limits of the hydrography.

6. Features

Features addressed by the field units are delivered to PHB where they are deconflicted against the hydrography and the largest scale chart. These features, as well as features to be retained from the chart and features digitized from the Base Surface, are included in the HCell. The geometry of these features may be modified to emulate chart scale per the HCell Reference Guide on compiling features to the chart scale HCell.

7. Spatial Framework

7.1 Coordinate System

All spatial map and base cell file deliverables are in an LLDG geographic coordinate system, with WGS84 horizontal, MHW vertical, and MLLW (1983-2001 NTDE) sounding datums.

7.2 Horizontal and Vertical Units

DUNI, HUNI and PUNI are used to define units for depth, height and horizontal position in the chart units HCell, as shown below.

Chart Unit Base Cell Units:

Depth Units (DUNI):	Feet
Height Units (HUNI):	Feet
Positional Units (PUNI):	Meters

During creation of the HCell in CARIS BASE Editor and CARIS S-57 Composer, all soundings and features are maintained in metric units with as high precision as possible. Depth units for soundings measured with sonar maintain millimeter precision. Depths on rocks above MLLW and heights on islets above MHW are typically measured with range finder, so precision is less. Units and precision are shown below.

BASE Editor and S-57 Composer Units:

Sounding Units:	Meters rounded to the nearest millimeter
Spot Height Units:	Meters rounded to the nearest decimeter

See the HCell Reference Guide for details of conversion from metric to charting units, and application of NOAA rounding.

7.3 S-57 Object Classes

The CS HCell contains the following Object Classes:

\$CSYMB	Blue Notes (points) —Notes to the MCD chart Compiler
M_QUAL	Data quality Meta object
M_CSCL	Compilation scale meta object
OBSTRN	Obstruction area objects
SBDARE	Bottom samples
SOUNDG	Soundings at chart scale density

*H12125 The M_QUAL is adequate for NDB product searches except for features in these object classes which reside outside the M_QUAL limits.

The SS HCell contains the following Object Classes:

DEPCNT	Generalized contours at chart scale intervals (See table under section 4.)
SOUNDG	Soundings at the survey scale density (See table under section 3.)

8. Data Processing Notes

There were no significant deviations from the standards and protocols given in the HCell Specification and HCell Reference Guide.

9. QA/QC and ENC Validation Checks

H12125 was subjected to QA checks in S-57 Composer prior to exporting to the metric HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to chart units and NOAA rounding applied. dKart Inspector was then used to further check the data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

10. Products

10.1 HSD, MCD and CGTP Deliverables

H12125_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:20,000 and 1:185,238
H12125_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:8,000 and 1:20,000
H12125_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12125_outline.gml	Survey outline
H12125_outline.xsd	Survey outline

10.2 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.3	Creation of soundings and bathy-derived features, creation of the meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.2	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
HydroService AS, dKart Inspector Ver. 5.1, SP 1	Validation of the base cell file.

11. Contacts

Inquiries regarding this HCell content or construction should be directed to:

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APPROVAL SHEET
H12125

Initial Approvals:

The survey evaluation and verification has been conducted according to branch processing procedures and the HCell compiled per the latest OCS HCell Specifications.

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, S-57 classification and attribution of soundings and features, cartographic characterization, and verification or disproof of charted data within the survey limits. The survey records and digital data comply with OCS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

I have reviewed the HCell, accompanying data, and reports. This survey and accompanying digital data meet or exceed OCS requirements and standards for products in support of nautical charting except where noted in the Descriptive Report.