H12123

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. H12123

LOCALITY

State Oregon

General Locality Pacific Ocean - Northern Oregon

Sublocality Cannon Beach

2010

CHIEF OF PARTY

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

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DATE

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

HYDROGRAPHIC TITLE SHEET

REGISTRY No

H12123

INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

FIELD No: N/A

State: **Oregon**

General Locality: **Pacific Ocean - Northern Oregon**

Sub-Locality: **Cannon Beach**

Scale: **1:20,000** Date of Survey: **October 7, 2009 to August 8, 2010**

Instructions dated: **June 2009** Project No.: **M-N928-KR-09**

Vessel: **R/V Pacific Storm, R/V JAB**

Chief of party: **Jonathan L. Dasler, PE (OR) , PLS (OR,CA)**

Surveyed by: **David Evans and Associates, Inc.**

Soundings by: **RESON 8101-ER, RESON 7101-ER**

SAR by: **Martha Herzog** Compilation by: **Anthony Lukach**

Soundings compiled in: **Fathoms at MLLW**

REMARKS: **All times are UTC. UTM Zone 10N.**

The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data with which to update nautical charts of the assigned area; and provide multi-use data in support of the West Coast Governors' Agreement.

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/.

Descriptive Report to Accompany Hydrographic Survey H12123
Project M-N928-KR-09
Oregon Coastal Mapping Project
Cannon Beach
Scale 1:20,000
October 2009, July 2010 - August 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 Cannon Beach and Arch Cape, Oregon and seaward to roughly the charted 30-fathom contour.[1] This project is in support of the Oregon Coastal Mapping Project established under the West Coast Governor's Agreement.

Survey H12123 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. DEA 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. A copy of the waiver and HSD correspondence is included in Appendix V *Supplemental Survey Records and Correspondence.*[2]

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 were 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 H12123 survey limits.[3] 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.

Fourteen (14) bottom samples were acquired for H12123. For this survey, bottom samples were acquired by OSU COAS aboard a second vessel used for the Oregon Coastal Mapping Project.

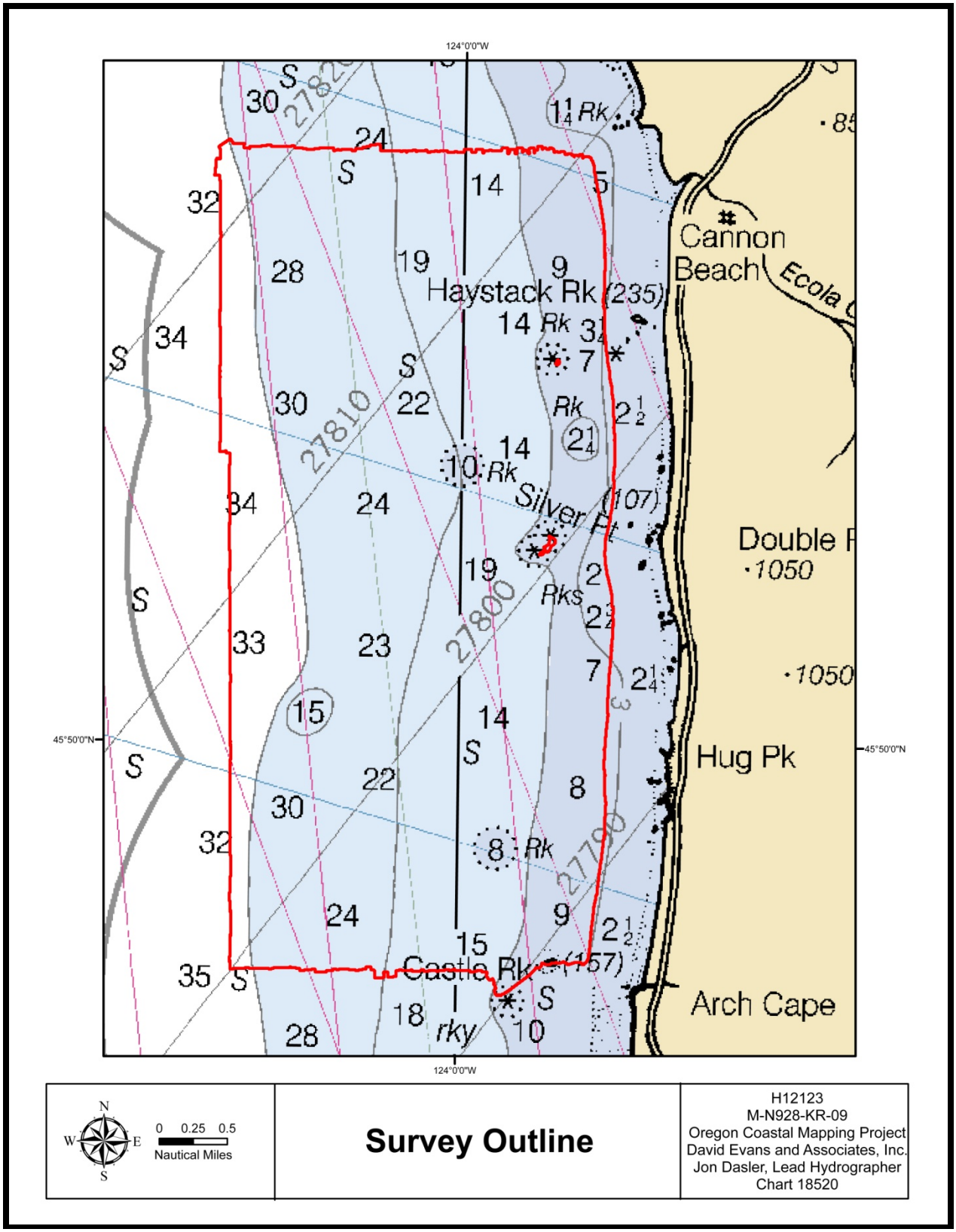

Figure 1. H12123 Area Surveyed

Data acquisition was conducted from October 7, 2009 (DN 280) to October, 11 2009 (DN 284) and from July 19, 2010 (DN 200) to August 8, 2010 (DN 220). Table 1 lists specific dates of acquisition.

Table 1. H12123 Days of Acquisition

Dates of Acquisition	
Month	**Dates**
October 2009	7-11
July 2010	19-21, 28-30
August 2010	7,8

Detailed survey statistics of H12123 are provided in Table 2.

Table 2. H12123 Survey Statistics

Survey Statistics	Total
MBES (mainscheme nm)	510.1
Crosslines (MBES nm)	38.1
Fill (MBES nm)	3.0
Developments (MBES nm)	31.0
Number of Bottom Samples	14
Number of Item Investigations that required additional survey effort	0
Total number of square nautical miles	16.8

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	• Brooke Ocean MVP-30 with AML Micro SV&P and Dissolved Oxygen Sensor • Sea-Bird SEACAT SBE 19 CTD Profiler
Positioning & Attitude	• 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	• Brooke Ocean MVP-30 with AML Micro SV&P • Sea-Bird SEACAT SBE 19 CTD Profiler
Positioning & Attitude	• 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 7.0% of the 544.1 nautical miles of survey lines, were run for analysis of survey accuracy. 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).[4] 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.[5]

The crossline comparison for the *R/V Pacific Storm* data shows beams 97 and 98 out of specification. Crossline data were processed using a dynamic 60° swath angle filter as described in the *M-N928-KR-09 DAPR*. These beams were therefore only included in the dataset when vessel roll was greater than 10°. This resulted in a very small sample size of 71 and 4 comparison points, respectively, while the average sample size was greater than 105,000. The effect of these beams on the dataset is considered negligible.[6]

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 six million node comparisons and an average difference between the crossline surface and the mainscheme surface of only .02 meters across all depths, with a 0.25-meter uncertainty at 95% confidence.

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 0.38 to 1.85 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.[7] 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 4-meter CUBE surfaces, 385 nodes out of 2,072,000 fail to meet specification. For the 2-meter CUBE surface, 6,930 nodes out of 6,282,032 fail to meet specification. For the 1-meter CUBE surface, 18,708 nodes out of 7,944,490 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	0.02	1.85	72%	3%	350%
2m CUBE	0.39	0.02	1.60	62%	6%	284%
4m CUBE	0.4	0.03	1.67	50%	6%	195%

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

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.[8]

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 exceed 0.2 meters (0.4 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

H12123 survey limits junctions with H12122 (Sheet A) to the north and H12124 (Sheet C) to the south.[10] Survey junction analysis was performed between H12123 and H12122 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 nearly 900,000 comparison points, with an average difference of 0.13 meters and an uncertainty of 0.21 meters at 95%.[11] The relatively large average difference is largely attributable to the comparison of 2009 and 2010 data, which include physical changes in the seafloor of up to 25 centimeters.

At the time of writing: survey H12124 had not been completely processed. Junction analysis between these surveys will be discussed in the H12124 descriptive report.[12]

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. However, if 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.[13]

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 20 to 30 centimeters in outer beam soundings, with some instances in deeper water reaching 50 centimeters. Figure 2 depicts all 966 sound velocity profiles collected during survey operations. While sound speed at depth is relatively constant within each survey year, the sound speed near the surface varies by nearly 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.[14]

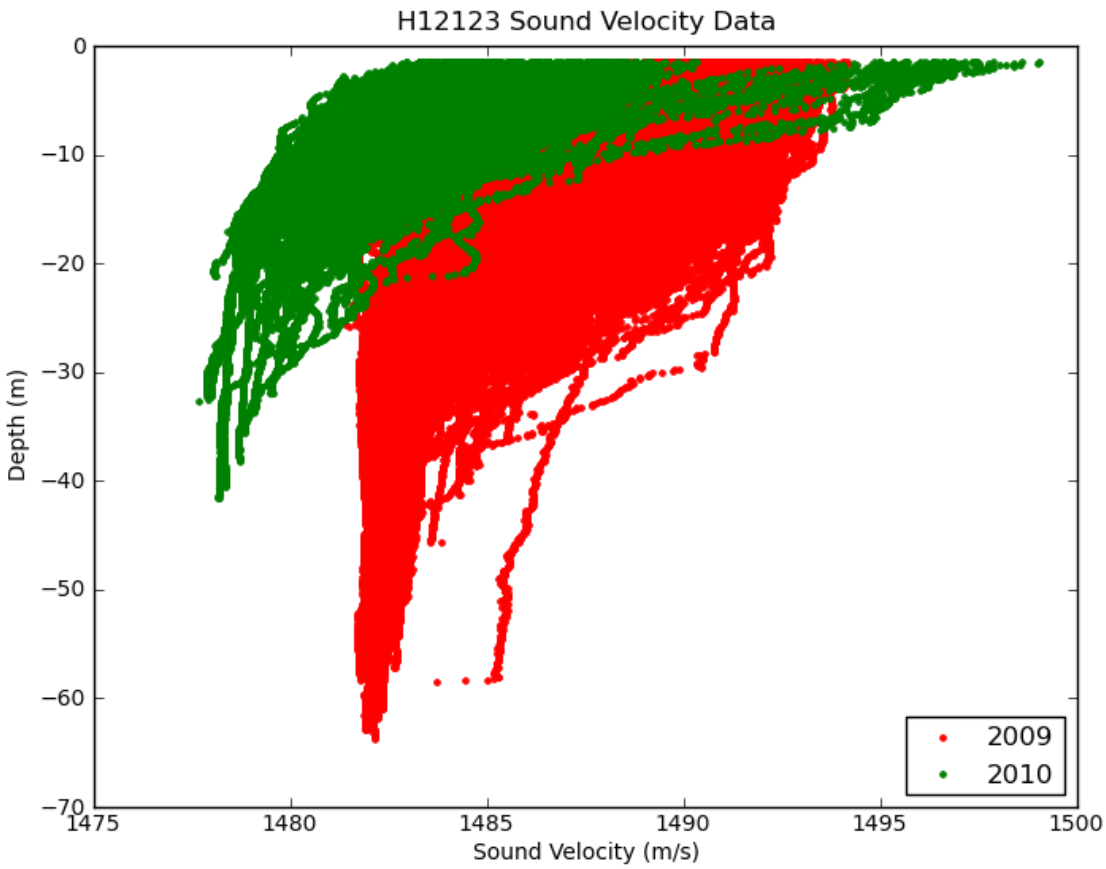

Figure 2. H12123 Sound Velocity Profile

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 35cm 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. The error is shown to be within specification in the crossline analysis, and the overall effect of the error on the final gridded surface is mitigated by a high amount of swath-to-swath overlap.[15]

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. A copy of this waiver and related email correspondence is included in Appendix V *Supplemental Survey Records and Correspondence.*[16]

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 99.6% 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.[17]

B3. Corrections to Echo Soundings

Data reduction procedures for survey H12123 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*.[18] 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.*

B3.b Additional Calibration Tests

The initial system calibration tests for the R/V *Pacific Storm* were performed on July 26, 2009 (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. Further 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. H12123 Surfaces

Surface Name	Resolution
H12123_1m	1.0m
H12123_2m	2.0m
H12123_4m	4.0m

C. HORIZONTAL AND VERTICAL CONTROL

A complete description of horizontal and vertical control for survey H12123 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	

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. 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 2), 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. [20]

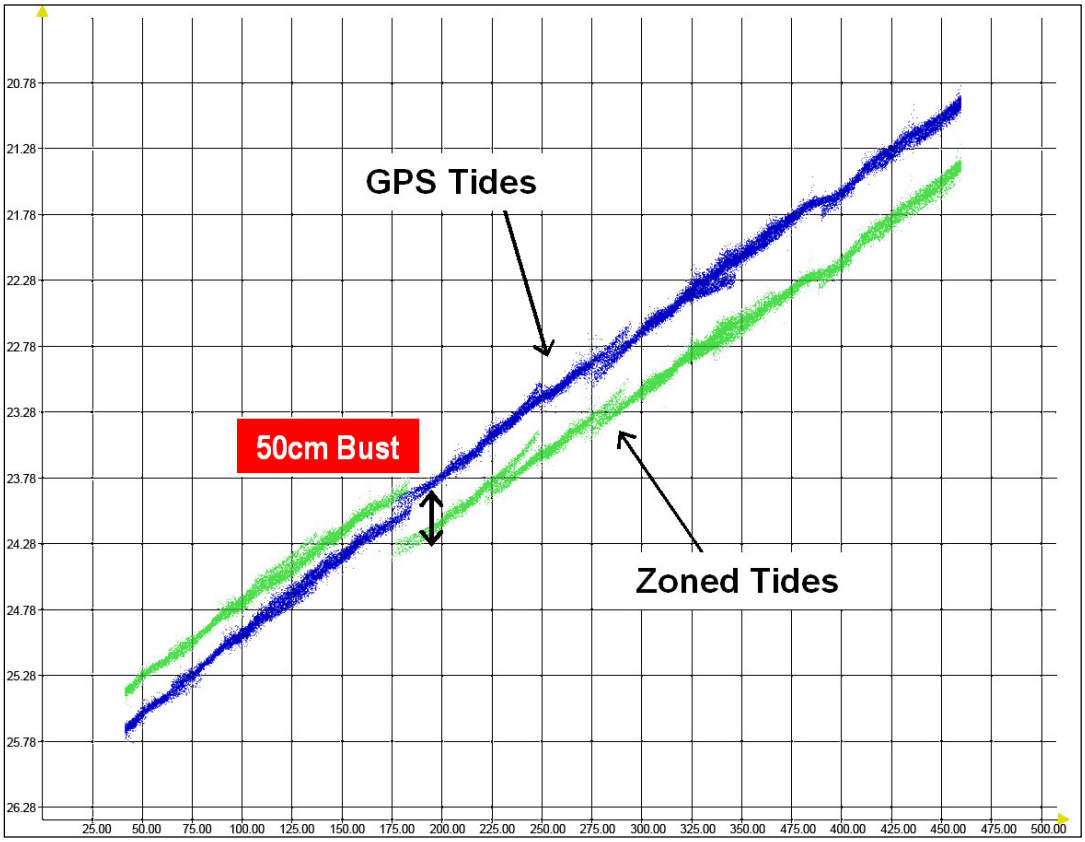

Figure 3. Depth discrepancies between tides derived from GPS and tidal zoning

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 H12123 was compared to the largest scale raster and electronic navigation charts (ENC), as shown in Table 8. 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 H12123

Chart	Scale	Edition	Edition Date	Issue Date	Latest LNM	Cleared Through Date
18520	1:185,238	27	5/1/2009	---	10/23/2010	10/26/2010
US3OR01M	---	16	8/25/2010	10/13/2010	---	11/2/2010

In general, survey H12123 depths are 0 to 2 fathoms deeper than those from the chart (Figure 4). The difference surface also shows areas of significant difference, from as much as 4 fathoms deeper to 1 fathom shoaler. 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]

The most significant discrepancy between the chart and H12123 is discussed below.

- There is shoaling of up to 1 fathom near the charted 5-fathom sounding in the north-east corner of the survey area[22]

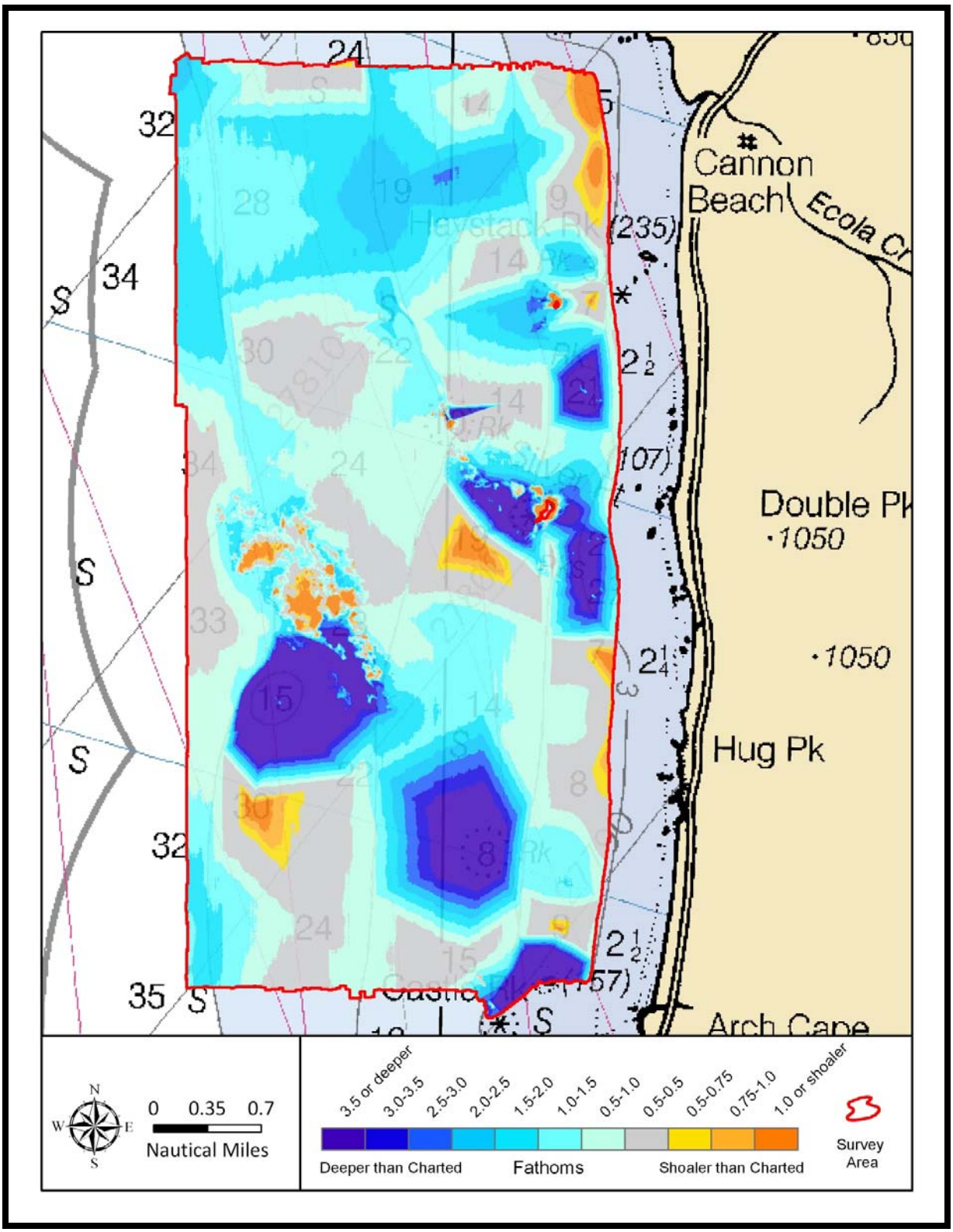

Figure 4. Depth discrepancies between H12123 and US3OR01M; Chart 18520 displayed

D1.b Comparison to Significant Shoals

H12123 survey area contains no significant shoals.[23]

D1.c Comparison to Charted Features

No AWOIS items were located within the limits of survey H12123. Two charted features were located within the limits of H12123 and are discussed below.[24]

The charted and surveyed locations of the rocks, which cover and uncover off of Silver Point, agree well. As shown in Figure 5, the center of the surveyed area for the southernmost rock lies approximately 110 meters, or 0.6 millimeters at chart scale, to the east-south-east, and the northern rock lies 60 meters, or 0.3 millimeters at chart scale, to the south of the charted position. The rocks are visible in imagery published by the National Agriculture Imagery Program (NAIP). Due to the shift in position of both rocks, the ENC feature was disproved. The feature file includes under water rocks that depict the base of these rocks by identifying the most shoal depth obtained. The hydrographer recommends charting these rocks as awash and using the one meter BAG and NAIP imagery to estimate the geographic position of their high points.[25]

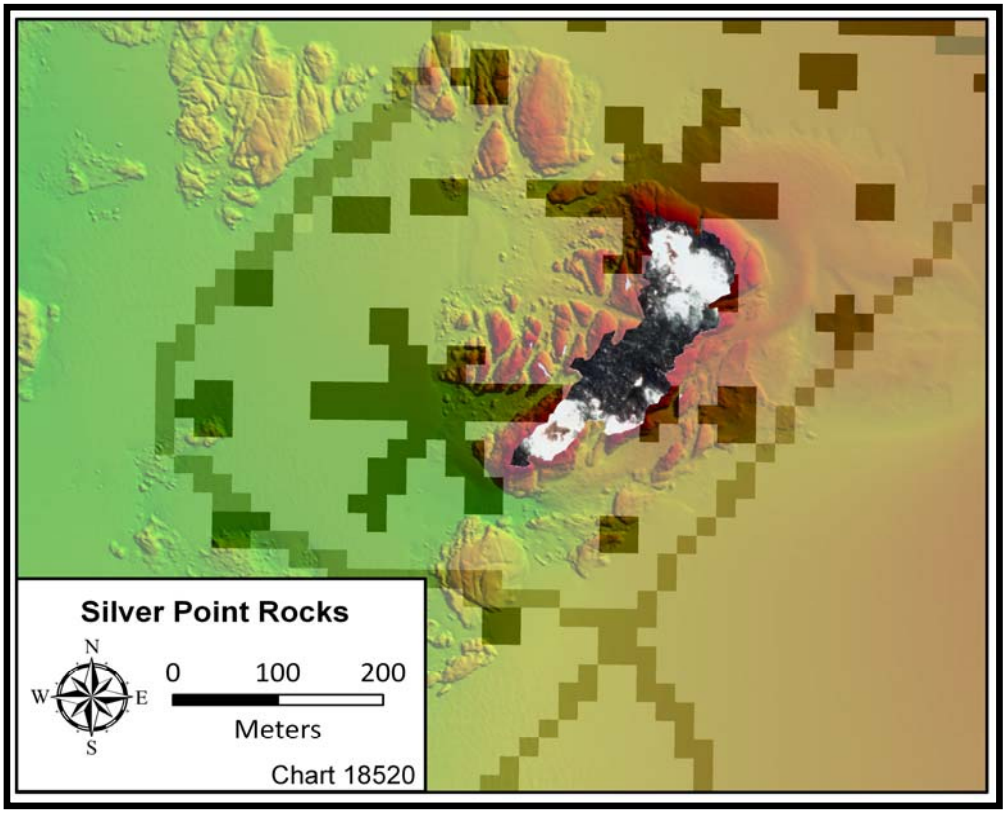

Figure 5. Comparison of data to charted rocks off Silver Point

The charted and surveyed positions of the rock, which covers and uncovers between Silver Point and Tillamook Head, agree well. As shown in Figure 6, the center of the surveyed area lies approximately 90 meters, or 0.5 millimeters at chart scale, south east of the charted position. Due to the shift in position of the rock, the ENC feature was disproved. The feature file includes under water rocks that depict the base of these rocks by identifying the most shoal depth obtained. The hydrographer recommends charting these rocks as awash and using the one meter BAG and NAIP imagery to estimate the geographic position of their high points. [26]

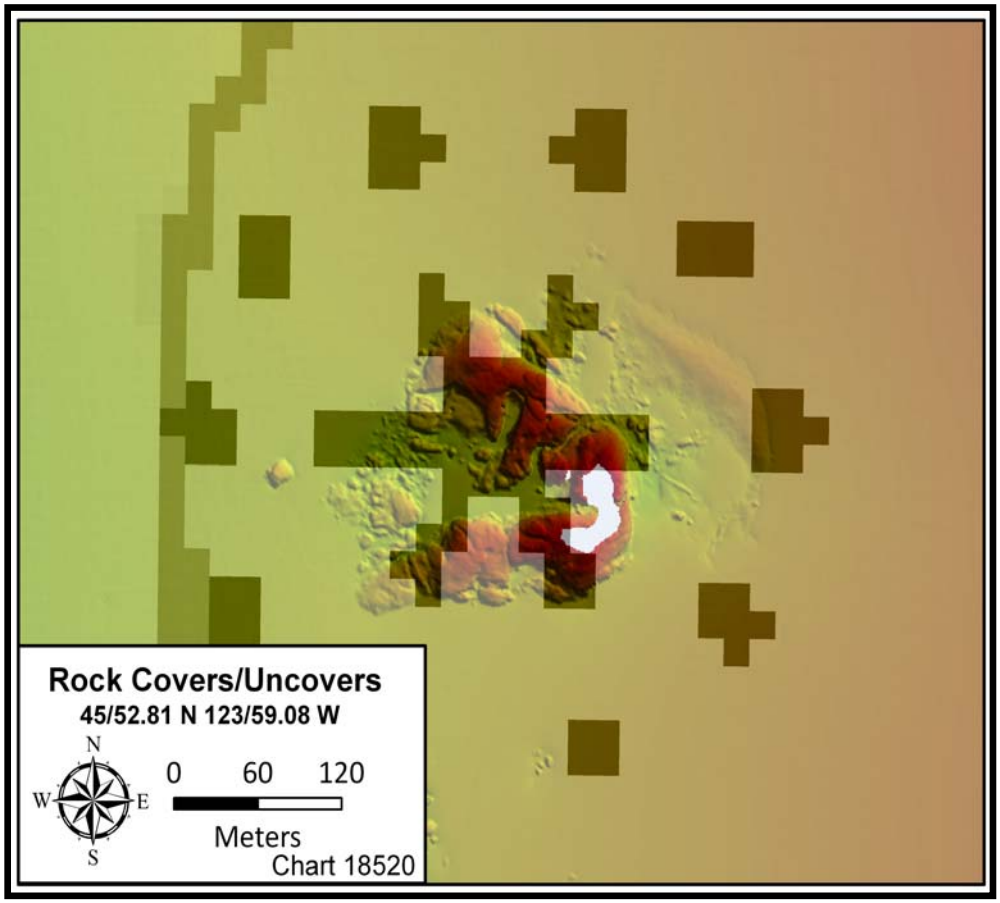

Figure 6. Comparison of data to charted rock

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

H12123 survey area does not contain any anchorage areas or channels. [27]

D1.e New Submerged Features

Several new areas of rocky seabed were identified by the survey. 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.* [28]

D1.f Dangers to Navigation

Six (6) Dangers to Navigation (DtoN) were located during survey H12123 and have been submitted to PHB using preliminary water levels. All DtoNs were reviewed by PHB and forwarded on to the Marine Chart Division (MCD).[29]

All DtoNs are listed in Table 9 below and are included in the S-57 feature file and should be charted as depicted in the file. An additional DtoN, #3.2, was submitted in 2009, but was superseded by DtoN #4.

Table 9. H12123 DtoN Charting Status

DtoN	Feature	Applied to Raster Chart	Applied to ENC	PHB Submitted to MCD
1	UWTROC	Yes	Yes	Yes
2	UWTROC	Yes	Yes	Yes
3.1	UWTROC	Yes	Yes	Yes
3.3	UWTROC	Yes	Yes	Yes
4	UWTROC	Yes	Yes	Yes
5	UWTROC	Yes	Yes	Yes

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)

There were no U.S. Coast Guard aids to navigation (AtoNs) found within the survey limits.[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 were no charted or observed submarine cables or pipelines, drilling structures, production platforms, or well heads within the survey area.[34]

D2.f Environmental Conditions Impacting the Quality of the Survey

Every effort was made to survey as close as possible to awash or baring features.
Working close to dangerous features in the presence of ocean swell required the close and constant coordination of both members of the survey crew and the vessel captain. This close coordination and the use of a purpose built vessel enabled data to be collected much closer to shore and to dangerous rocks than would normally be possible. At times awash rocks and baring rocks were visible close aboard the survey vessel. However, the environmental conditions did

not allow time for the survey crew to safely estimate the height and position of these features. Annotations were entered into the log once the risk to the vessel had passed.

D2.g Construction Projects

No active construction projects were observed in H12123 survey area.[35]

D2.h Bottom Characteristics

Fourteen (14) bottom samples were obtained on September 10, 2009 (Day Number 253) 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]

Revisions Compiled During Office Processing and Certification

[1] Concur.
[2] Attached to this report.
[3] Concur.
[4] Concur.
[5] Concur.
[6] Concur, data meets specification.
[7] Concur with clarification. The data is adequate for charting despite the high uncertainty values, which are expected in these cases.
[8] Concur.
[9] Concur.
[10] Common junctions were made with H12122 and H12124, both of which have been compiled.
[11] Concur.
[12] Concur. The H12124 DR states that there is an average difference of 0.00 meters with a 0.22 meter uncertainty at 95%.
[13] Concur.
[14] Concur with clarification. The data is adequate for charting despite the refraction errors in the outer beams.
[15] Concur. The data is adequate to supersede charted data.
[16] Attached to this report.
[17] Concur. No significant holidays exist in the data.
[18] Concur.
[19] A 4-meter finalized combined surface was created during the SAR process and was used as the basis for compilation.
[20] Concur.
[21] Concur with clarification. Chart depths and features as depicted in the HCell.
[22] Concur with clarification. Shoaling near charted 5-fathom sounding in the north-east corner of the survey area appears to be closer to 3.5-fathoms, rather than 1-fathom as described. Chart as depicted in the HCell.
[23] Concur.
[24] Concur.
[25] Do not concur. An OBSTRN area object is in place of data gap, identifying area as “rocky foul”.
[26] Do not concur. A UWTROC point object is in place of data gap, as per HCell Reference Guide.
[27] Concur.
[28] The rocky seabed areas are included in the HCell.
[29] Concur. All DTONs have been applied to the charts and all are included in the HCell.
[30] Concur.
[31] Concur.
[32] Concur.
[33] Concur.
[34] Concur.
[35] Concur.
[36] All surveyed bottom samples were compiled. Three bottom samples were retained.

H12123 Danger to Navigation Report

Registry Number: H12123

State: Oregon

Locality: Pacific Ocean - Northern Oregon

Sub-locality: Cannon Beach

Project Number: M-N928-KR-09

Survey Date: Oct. 7th 2009

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
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	18.28 m	45° 52' 03.3" N	124° 00' 00.8" W	---
1.2	Rock	16.28 m	45° 49' 14.7" N	123° 59' 36.1" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H12123_dton.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 45° 52' 03.3" N, 124° 00' 00.8" W

Least Depth: 18.28 m (= 59.97 ft = 9.995 fm = 9 fm 5.97 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2009-280.17:05:33.000 (10/07/2009)

GP Dataset: H12123_dton.xls

GP No.: 1

Charts Affected: 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 with approximate dimensions of 280m by 100m and rising 20m above the natural bottom.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12123_dton.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Chart as surveyed.

Cartographically-Rounded Depth (Affected Charts):

10fm (18520_1, 18003_1, 18007_1, 530_1)

18.3m (501_1, 50_1)

S-57 Data

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

Attributes: QUASOU - 1:depth known

SORDAT - 20091007

SORIND - US,US,survy,H12123

TECSOU - 3:found by multi-beam

VALSOU - 18.278 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Feature Images

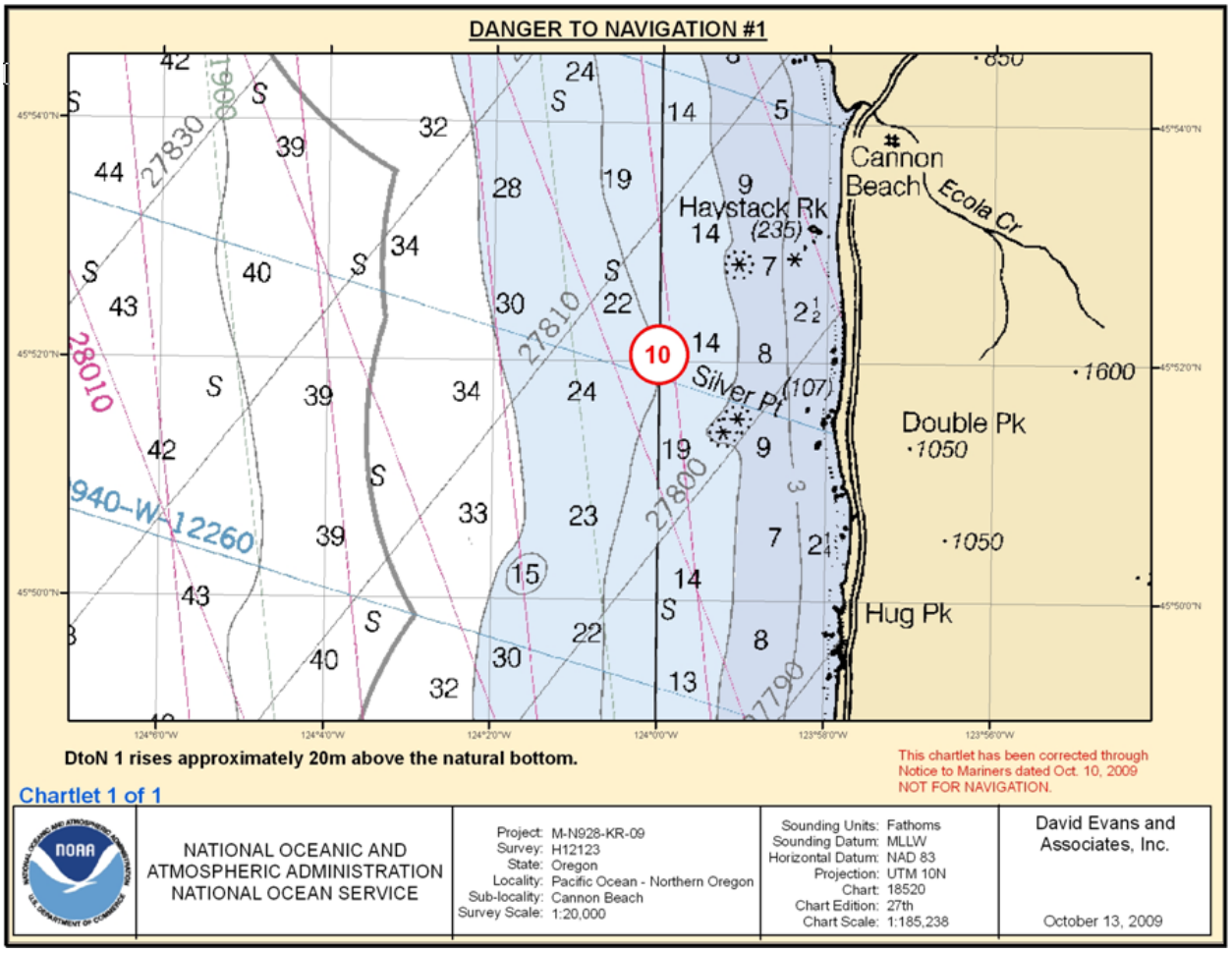

Figure 1.1.1

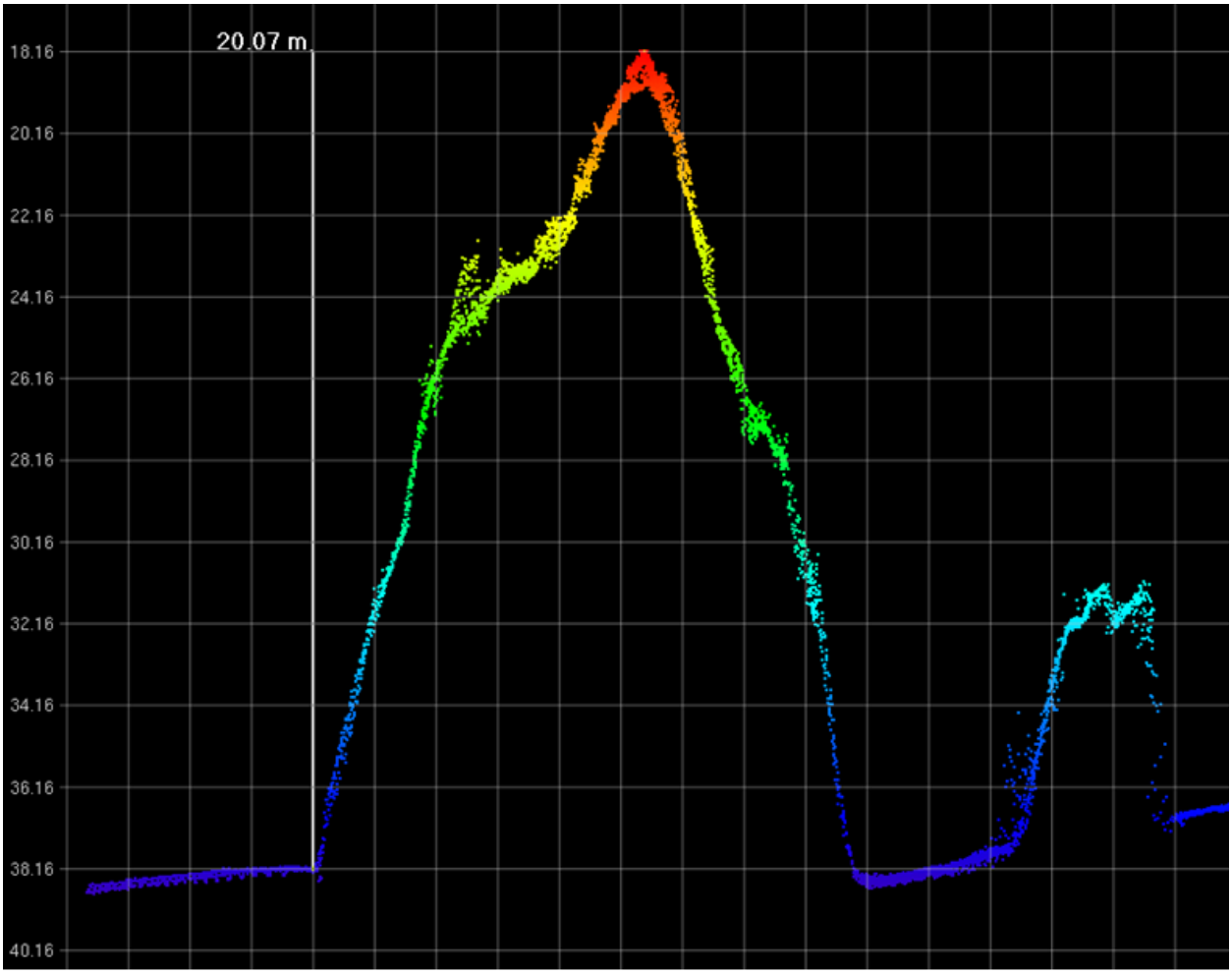
20.07 m
18.16
20.16
22.16
24.16
26.16
28.16
30.16
32.16
34.16
36.16
38.16
40.16

Figure 1.1.2

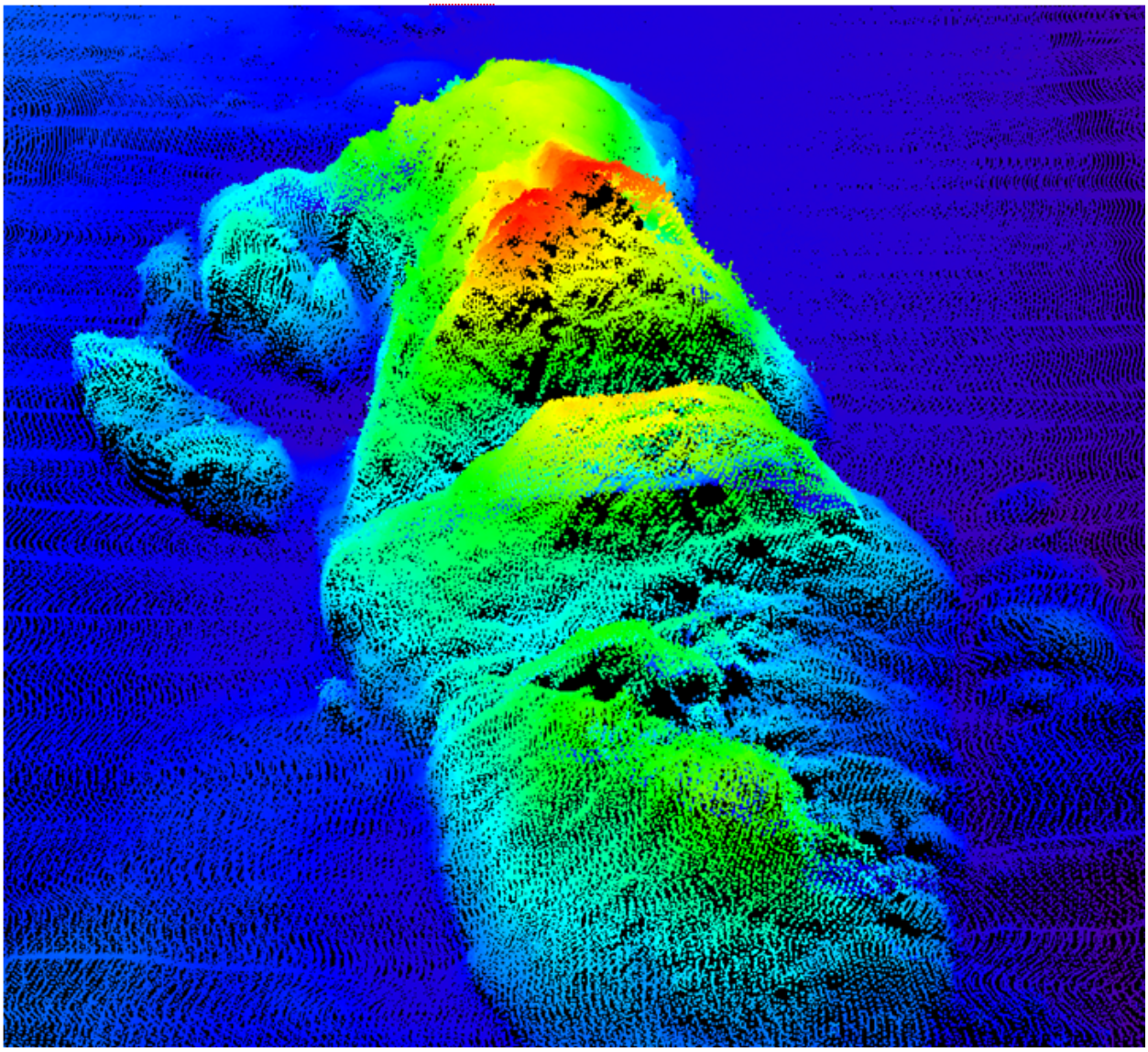

Figure 1.1.3

1.2) GP No. - 2 from H12123_dton.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 45° 49' 14.7" N, 123° 59' 36.1" W

Least Depth: 16.28 m (= 53.42 ft = 8.903 fm = 8 fm 5.42 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2009-282.15:04:17.000 (10/09/2009)

GP Dataset: H12123_dton.xls

GP No.: 2

Charts Affected: 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 with approximate dimensions of 70m by 25m and rising 10.3m above the natural bottom.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12123_dton.xls	2	0.00	000.0	Primary

Hydrographer Recommendations

Chart as surveyed.

Cartographically-Rounded Depth (Affected Charts):

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

16.3m (501_1, 50_1)

S-57 Data

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

Attributes: QUASOU - 1:depth known

SORDAT - 20091009

SORIND - US,US,survy,H12123

TECSOU - 3:found by multi-beam

VALSOU - 16.281 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Feature Images

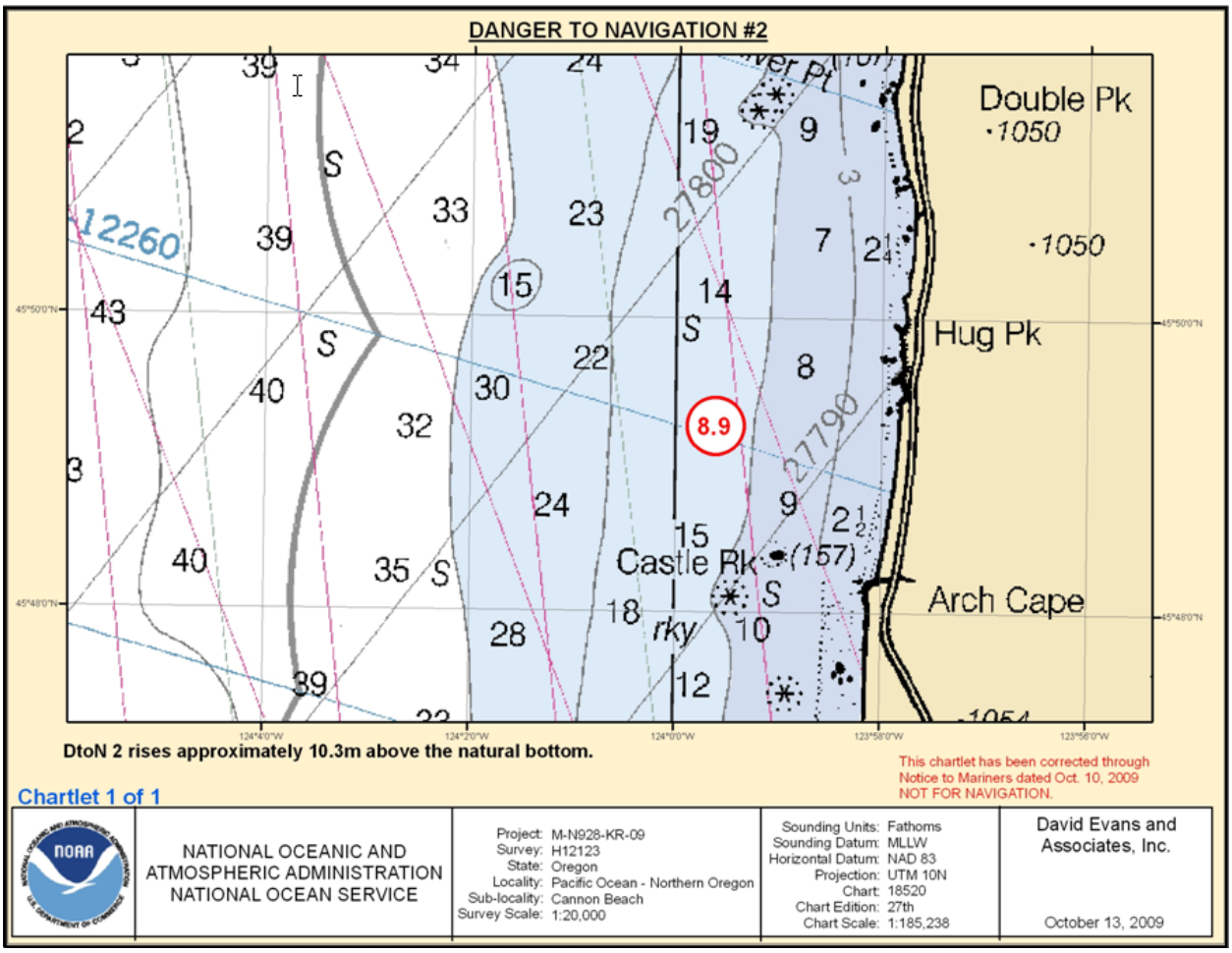

Figure 1.2.1

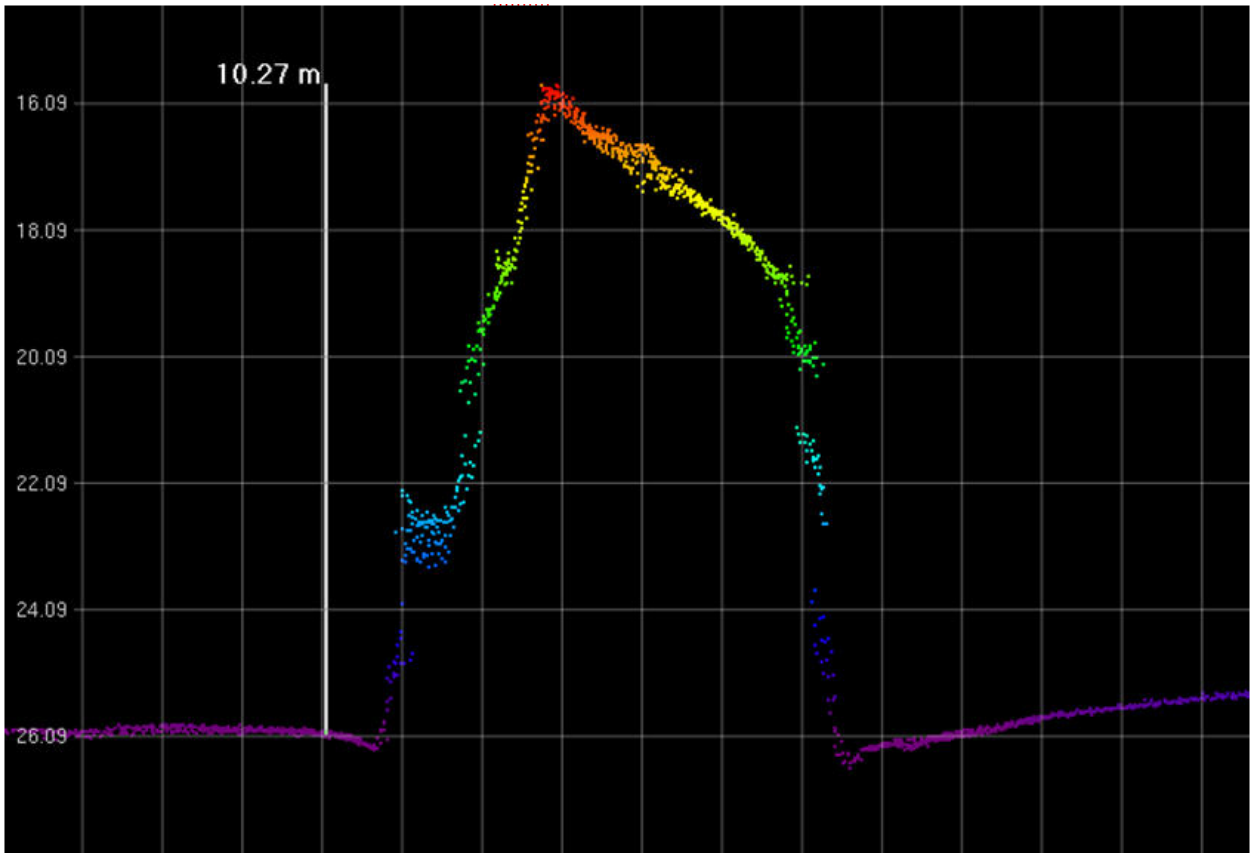

Figure 1.2.2

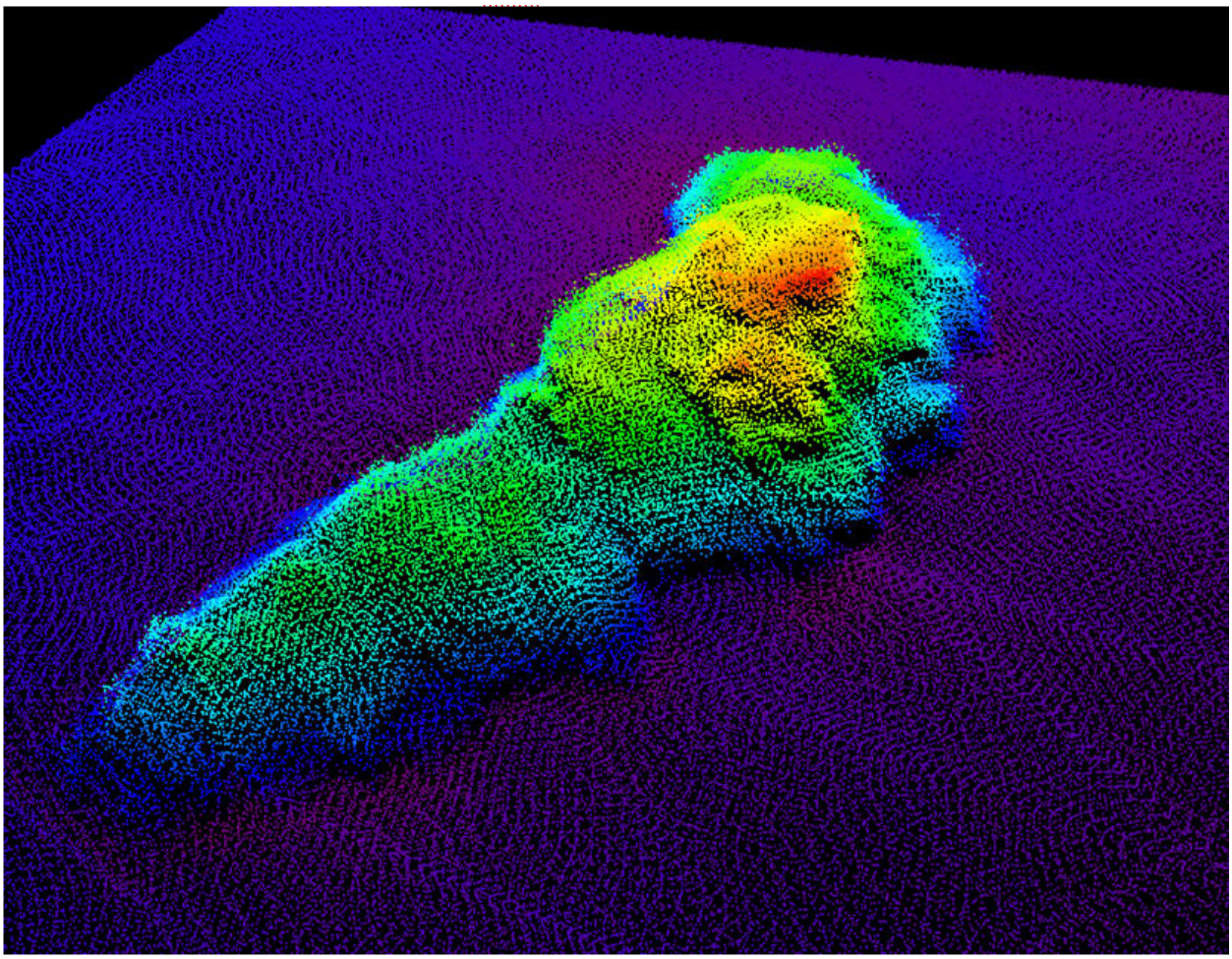

Figure 1.2.3

H12123 Danger to Navigation Report

Registry Number: H12123

State: Oregon

Locality: Pacific Ocean - Northern Oregon

Sub-locality: Cannon Beach

Project Number: M-N928-KR-09

Survey Dates: 07/21/2010 - 07/22/2010

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
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	4.15 m	45° 52' 15.1" N	123° 58' 47.0" W	---
1.2	Rock	7.77 m	45° 51' 16.1" N	123° 58' 41.1" W	---
1.3	Rock	4.97 m	45° 50' 57.1" N	123° 58' 34.1" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H12123_dtons.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position:	45° 52' 15.1" N, 123° 58' 47.0" W
Least Depth:	4.15 m (= 13.62 ft = 2.269 fm = 2 fm 1.62 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2010-202.21:10:41.000 (07/21/2010)
GP Dataset:	H12123_dtons.xls
GP No.:	1
Charts Affected:	18520_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

DtoN 3.1 is a rock with approximate dimensions of 300m by 70m and rises approximately 11m above the natural bottom.

Depths were acquired with Multibeam Sonar relative to the NAD83(CORS96) ellipsoid.

Depths are corrected to chart datum using VDatum and should be considered preliminary.

Positions are referenced from post-processed kinematic GPS and are on NAD83.

Hydrographer Recommendations

Hydrographer recommends charting rock

Cartographically-Rounded Depth (Affected Charts):

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

4.2m (501_1, 50_1)

S-57 Data

Geo object 1:	Underwater rock / awash rock (UWTROC)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20100721
	SORIND - US,US,graph,H12123
	TECSOU - 3:found by multi-beam
	VALSOU - 4.15 m

WATLEV - 3:always under water/submerged

Feature Images

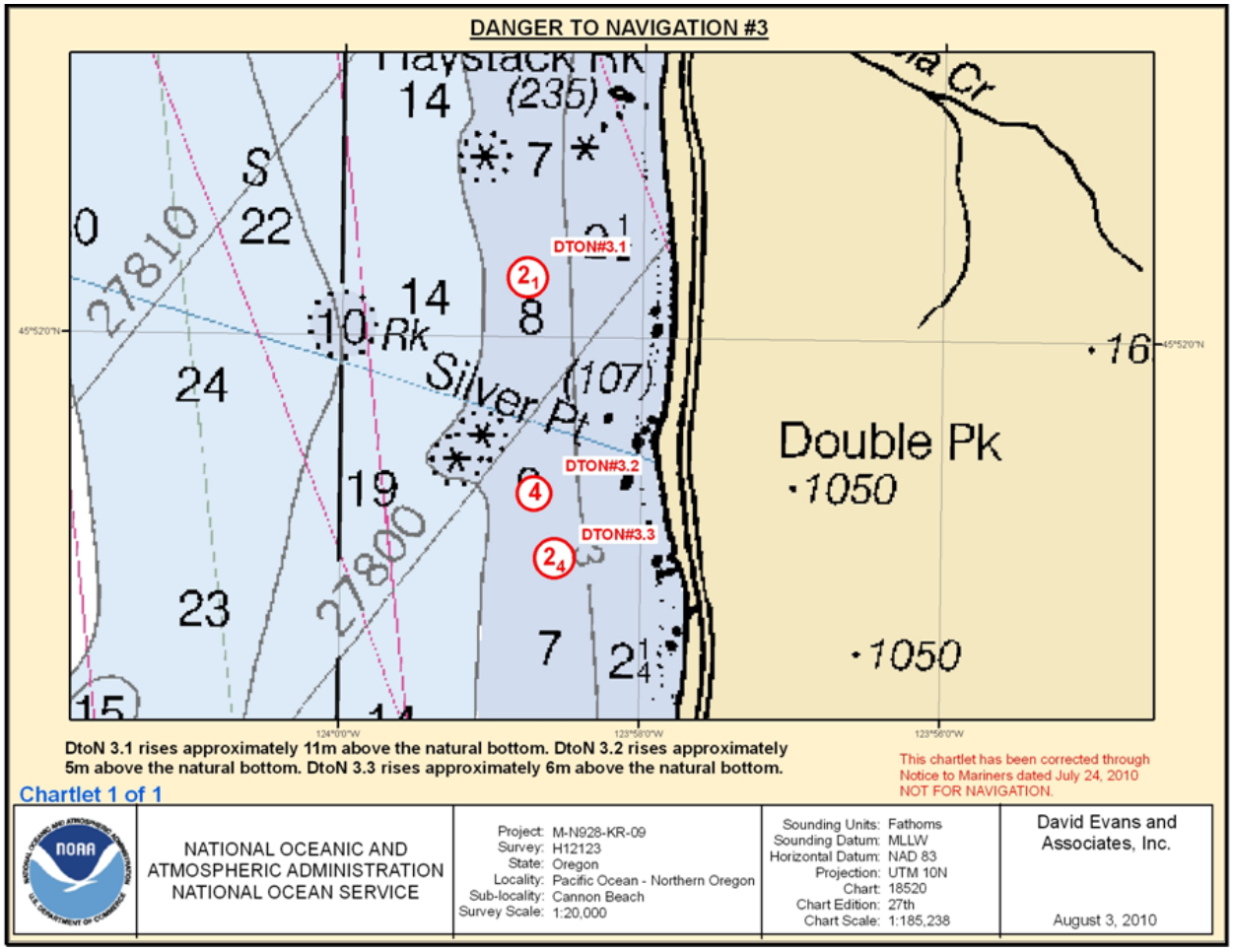

Figure 1.1.1

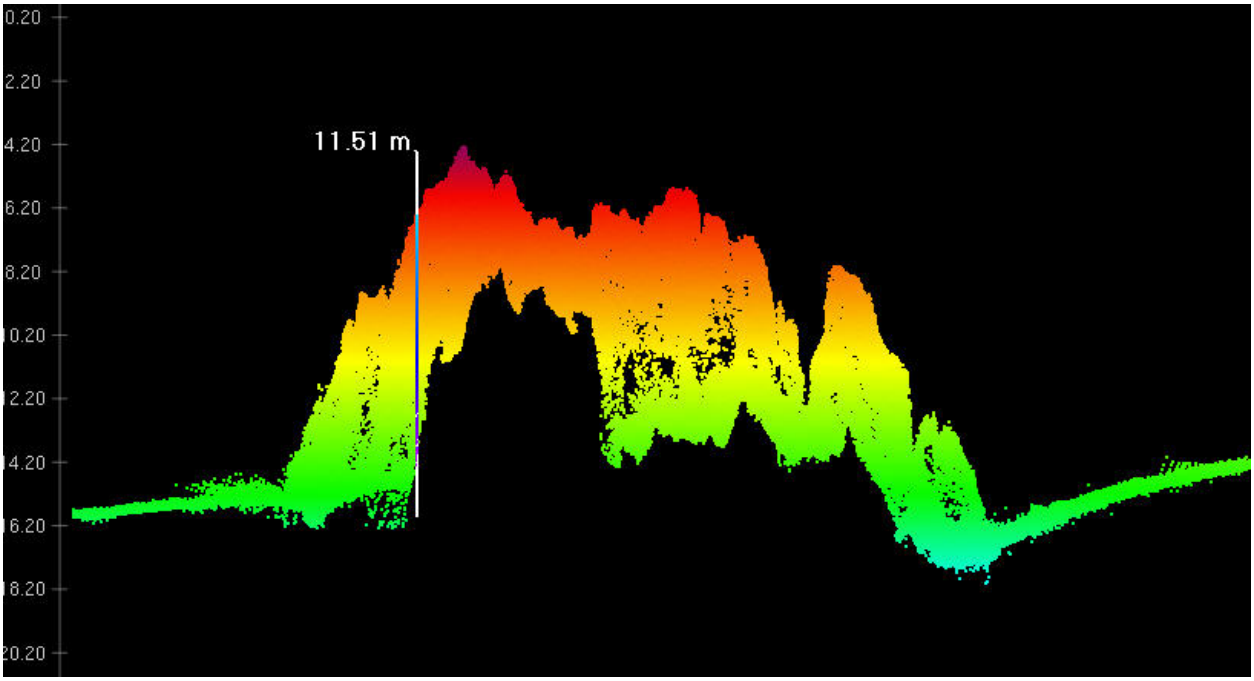

Figure 1.1.2

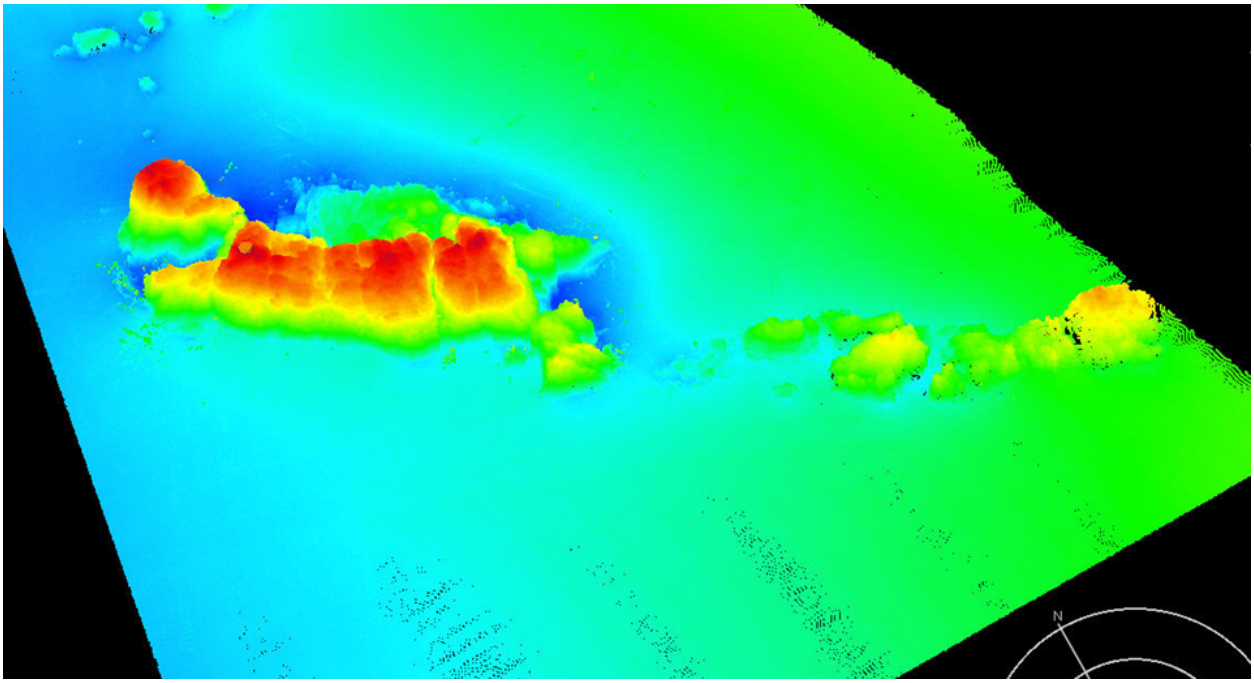

Figure 1.1.3

1.2) GP No. - 2 from H12123_dtons.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position:	45° 51' 16.1" N, 123° 58' 41.1" W
Least Depth:	7.77 m (= 25.49 ft = 4.249 fm = 4 fm 1.49 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2010-202.22:33:37.000 (07/21/2010)
GP Dataset:	H12123_dtons.xls
GP No.:	2
Charts Affected:	18520_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

DtoN 3.2 is a rock with approximate dimensions of 80m by 130m and rises approximately 5m above the natural bottom.

Depths were acquired with Multibeam Sonar relative to the NAD83(CORS96) ellipsoid.

Depths are corrected to chart datum using VDatum and should be considered preliminary.

Positions are referenced from post-processed kinematic GPS and are on NAD83.

Hydrographer Recommendations

Hydrographer recommends charting rock

Cartographically-Rounded Depth (Affected Charts):

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

7.8m (501_1, 50_1)

S-57 Data

Geo object 1:	Underwater rock / awash rock (UWTROC)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20100721
	SORIND - US,US,graph,H12123
	TECSOU - 3:found by multi-beam
	VALSOU - 7.77 m

WATLEV - 3:always under water/submerged

Feature Images

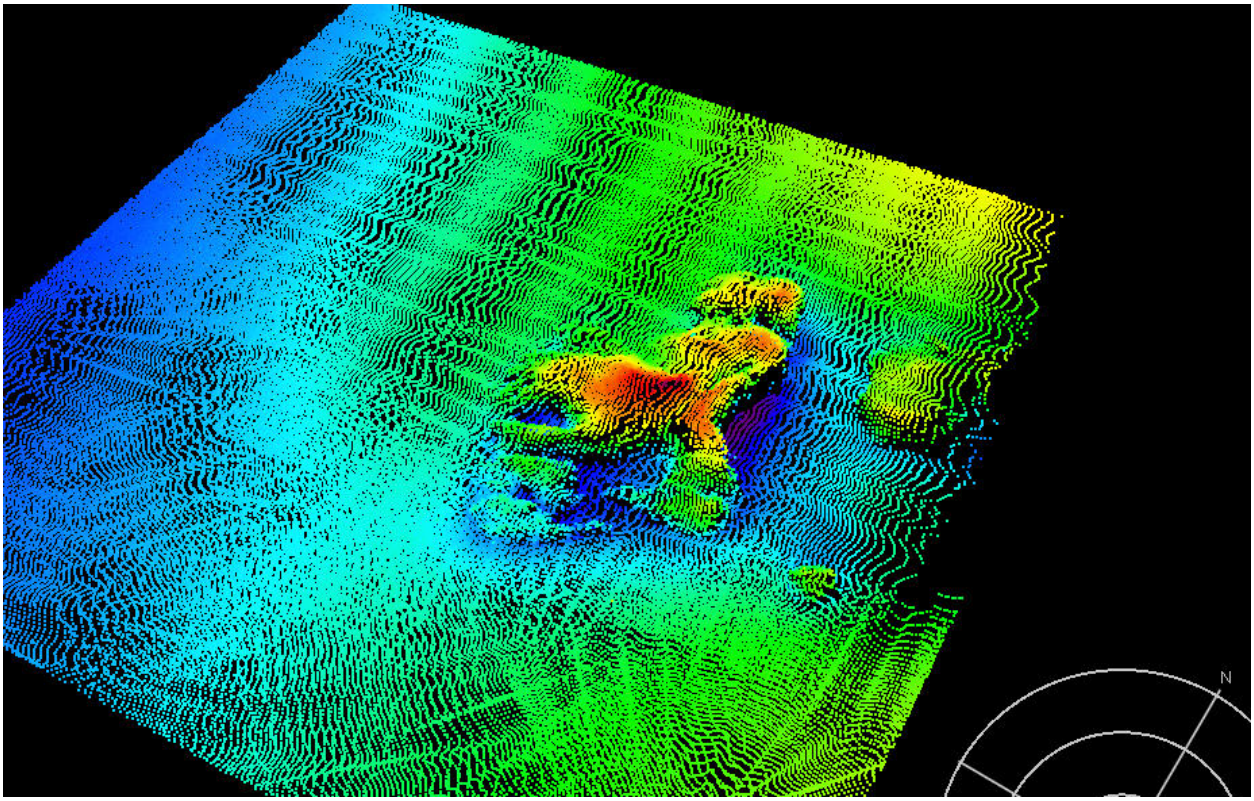

Figure 1.2.1

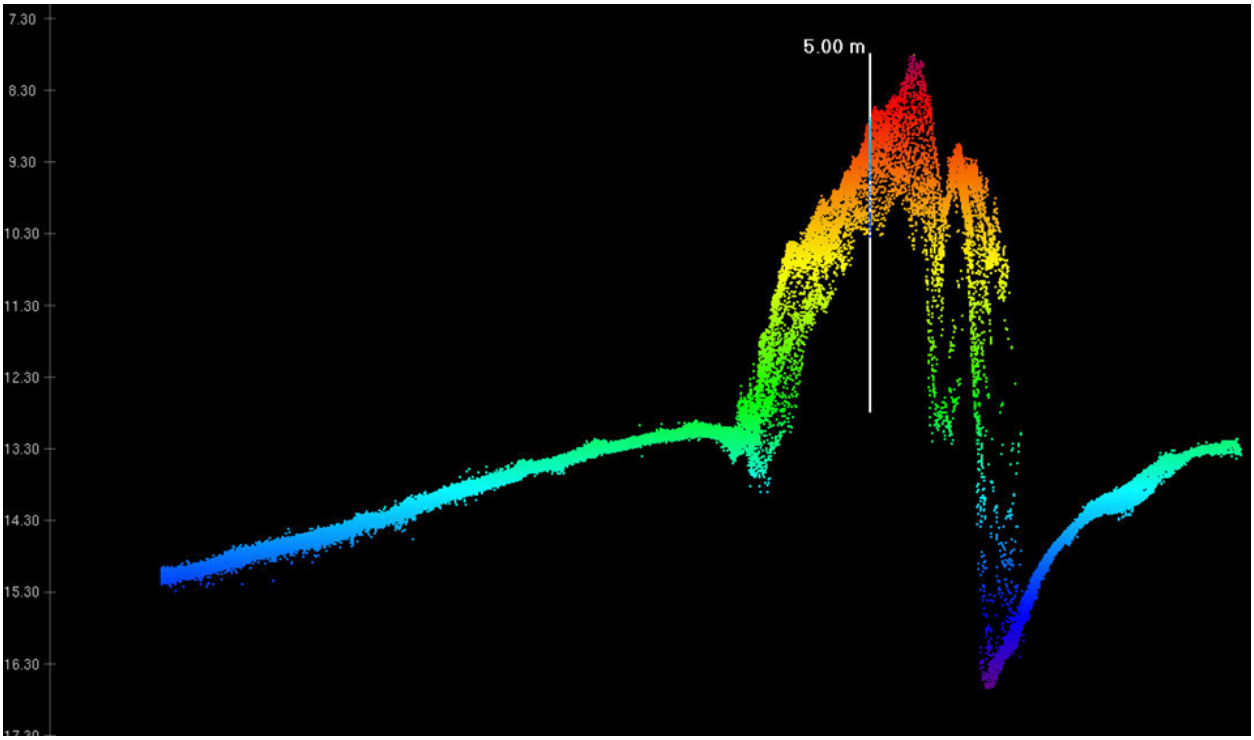

Figure 1.2.2

1.3) GP No. - 3 from H12123_dtons.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position:	45° 50' 57.1" N, 123° 58' 34.1" W
Least Depth:	4.97 m (= 16.31 ft = 2.718 fm = 2 fm 4.31 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2010-203.00:01:03.000 (07/22/2010)
GP Dataset:	H12123_dtons.xls
GP No.:	3
Charts Affected:	18520_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

DtoN 3.3 is a cluster of four rocks with approximate dimensions of 250m by 150m and the shoalest of which rises approximately 6m above the natural bottom.

Depths were acquired with Multibeam Sonar relative to the NAD83(CORS96) ellipsoid.

Depths are corrected to chart datum using VDatum and should be considered preliminary.

Positions are referenced from post-processed kinematic GPS and are on NAD83.

Hydrographer Recommendations

Hydrographer recommends charting rock cluster

Cartographically-Rounded Depth (Affected Charts):

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

5.0m (501_1, 50_1)

S-57 Data

Geo object 1:	Underwater rock / awash rock (UWTROC)
Attributes:	QUASOU - 6:least depth known
	SORDAT - 20100722
	SORIND - US,US,graph,H12123
	TECSOU - 3:found by multi-beam
	VALSOU - 4.97 m

WATLEV - 3:always under water/submerged

Feature Images

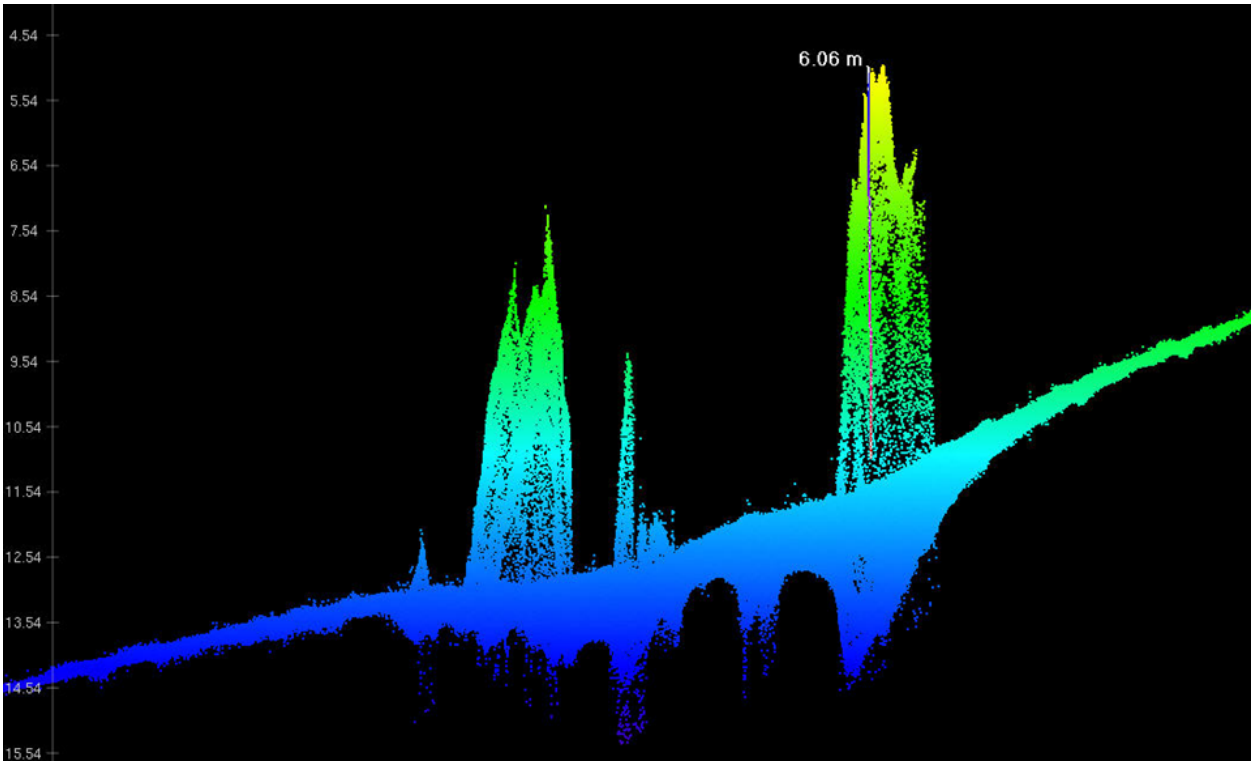

Figure 1.3.1

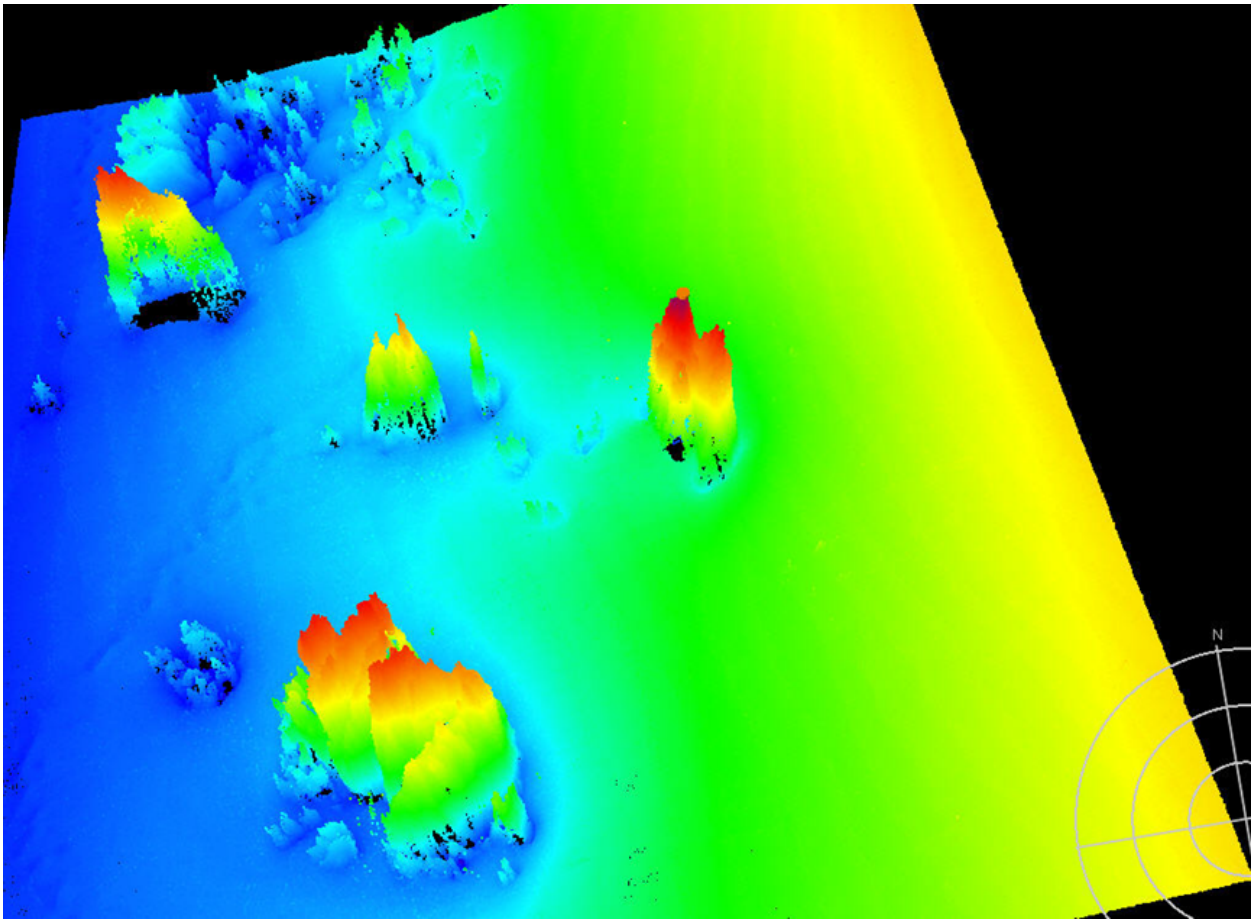

Figure 1.3.2

Dangers to Navigation for H12123

Registry Number: H12123

State: Oregon

Locality: Pacific Ocean-- Northern Oregon

Sub-locality: Cannon Beach

Project Number: M-N928-KR-09

Survey Date: 07/29/2010

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
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	3.88 m	45° 51' 16.5" N	123° 58' 36.4" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H12123_DtoN_4.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 45° 51' 16.5" N, 123° 58' 36.4" W

Least Depth: 3.88 m (= 12.74 ft = 2.123 fm = 2 fm 0.74 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2010-210.20:57:20.000 (07/29/2010)

GP Dataset: H12123_DtoN_4.xls

GP No.: 1

Charts Affected: 18520_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

This feature was found during hydrographic survey operation.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12123_DtoN_4.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Chart dangerous rock.

Cartographically-Rounded Depth (Affected Charts):

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

3.9m (501_1, 50_1)

S-57 Data

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

Attributes: SORDAT - 20100729

SORIND - US,US,graph,H12123

TECSOU - 3:found by multi-beam

VALSOU - 3.882 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Feature Images

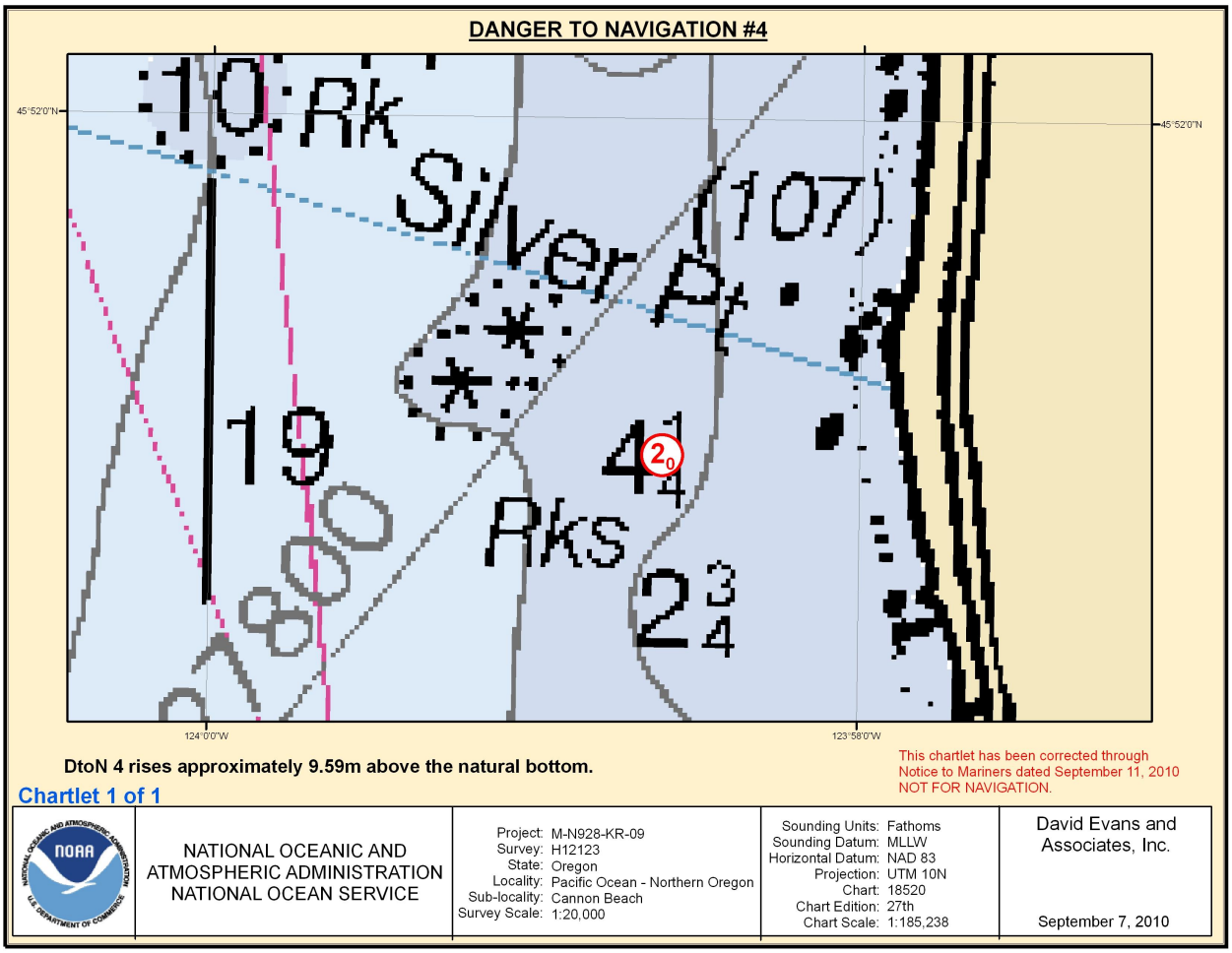

Figure 1.1.1

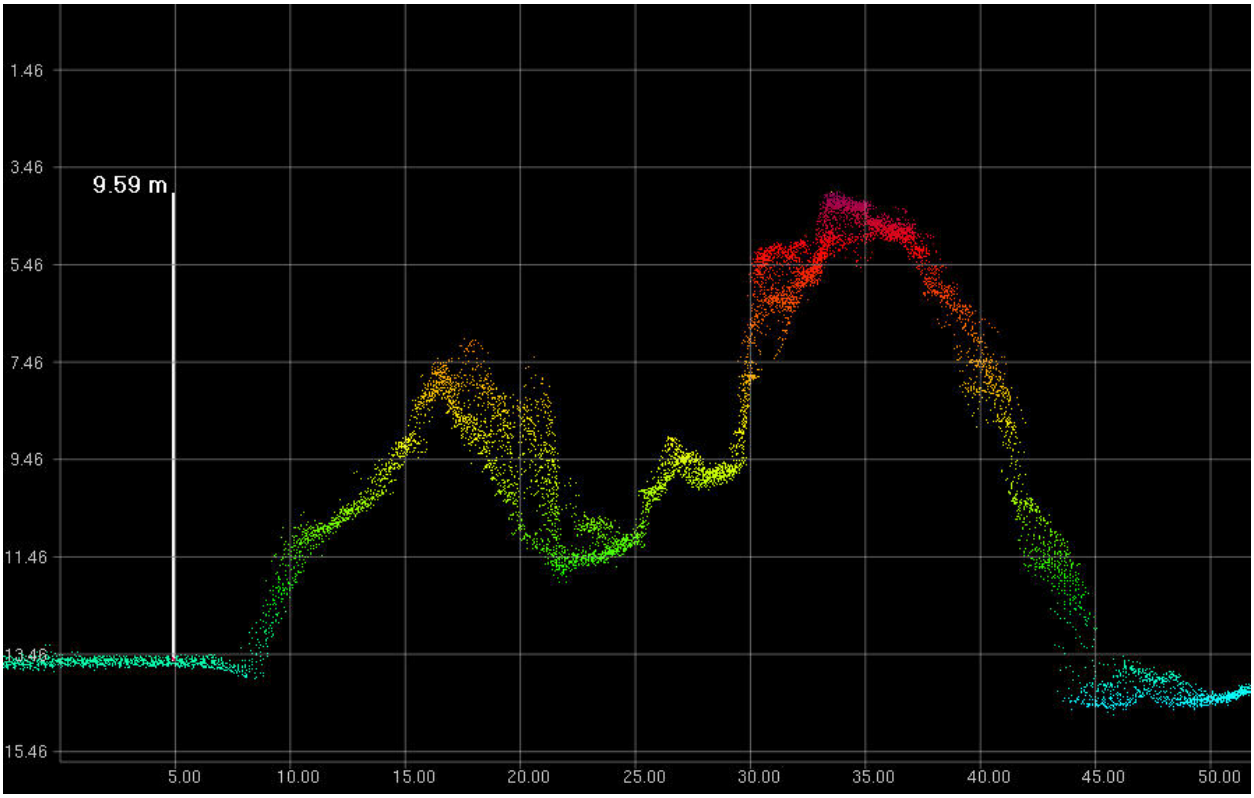
9.59 m
1.46
3.46
5.46
7.46
9.46
11.46
13.46
15.46
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00

Figure 1.1.2

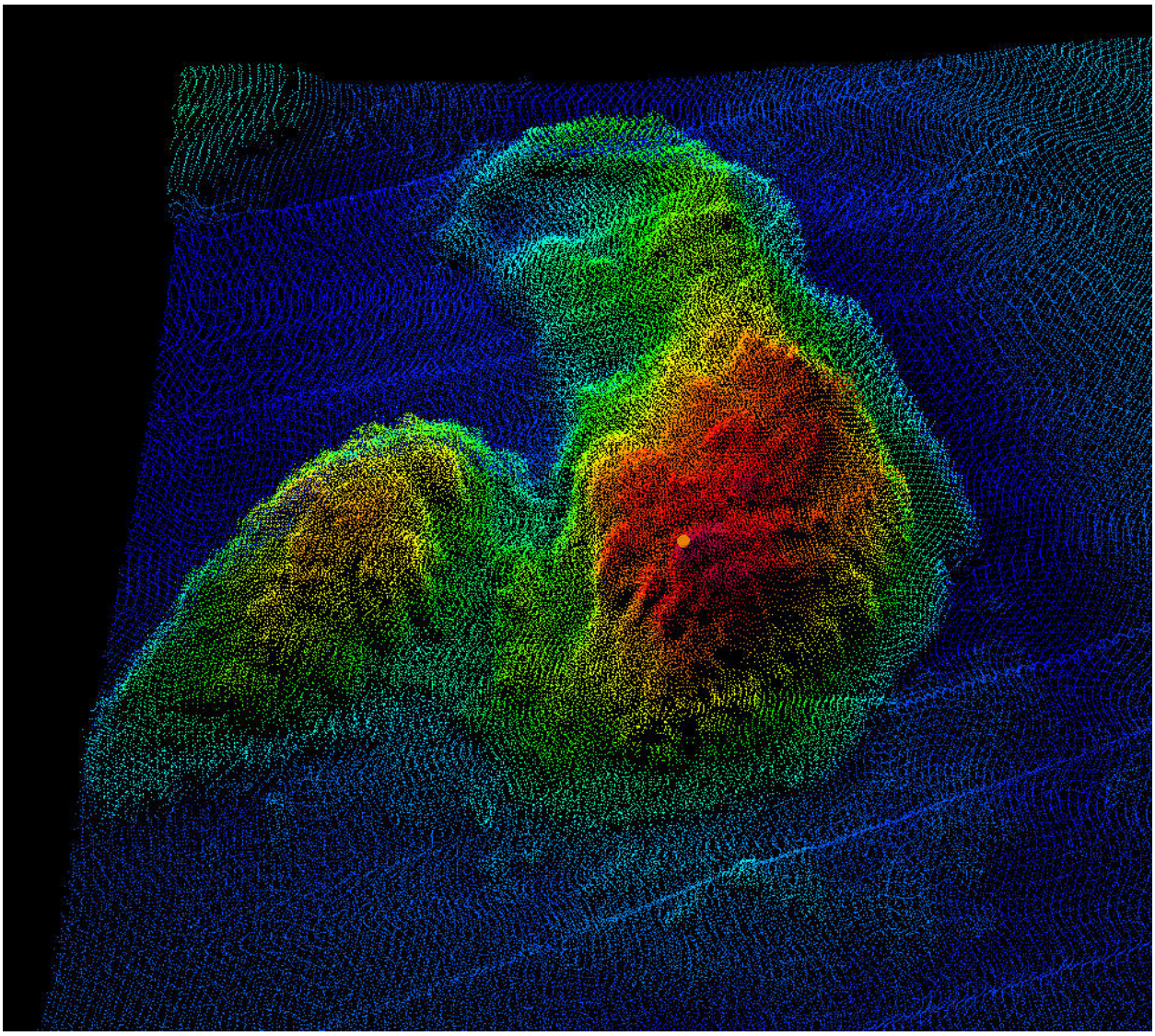

Figure 1.1.3

Dangers to Navigation for H12123

Registry Number: H12123

State: Oregon

Locality: Pacific Ocean-- Northern Oregon

Sub-locality: Cannon Beach

Project Number: M-N928-KR-09

Survey Date: 07/21/2010

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
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	5.89 m	45° 53' 04.1" N	123° 58' 41.9" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H12123_DtoN_5.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 45° 53' 04.1" N, 123° 58' 41.9" W

Least Depth: 5.89 m (= 19.33 ft = 3.222 fm = 3 fm 1.33 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2010-202.23:16:15.000 (07/21/2010)

GP Dataset: H12123_DtoN_5.xls

GP No.: 1

Charts Affected: 18520_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

New rock found during hydrographic data collection.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H12123_DtoN_5.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Chart dangerous rock.

Cartographically-Rounded Depth (Affected Charts):

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

5.9m (501_1, 50_1)

S-57 Data

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

Attributes: SORDAT - 20100721

SORIND - US,US,graph,H12123

TECSOU - 3:found by multi-beam

VALSOU - 5.892 m

WATLEV - 3:always under water/submerged

Feature Images

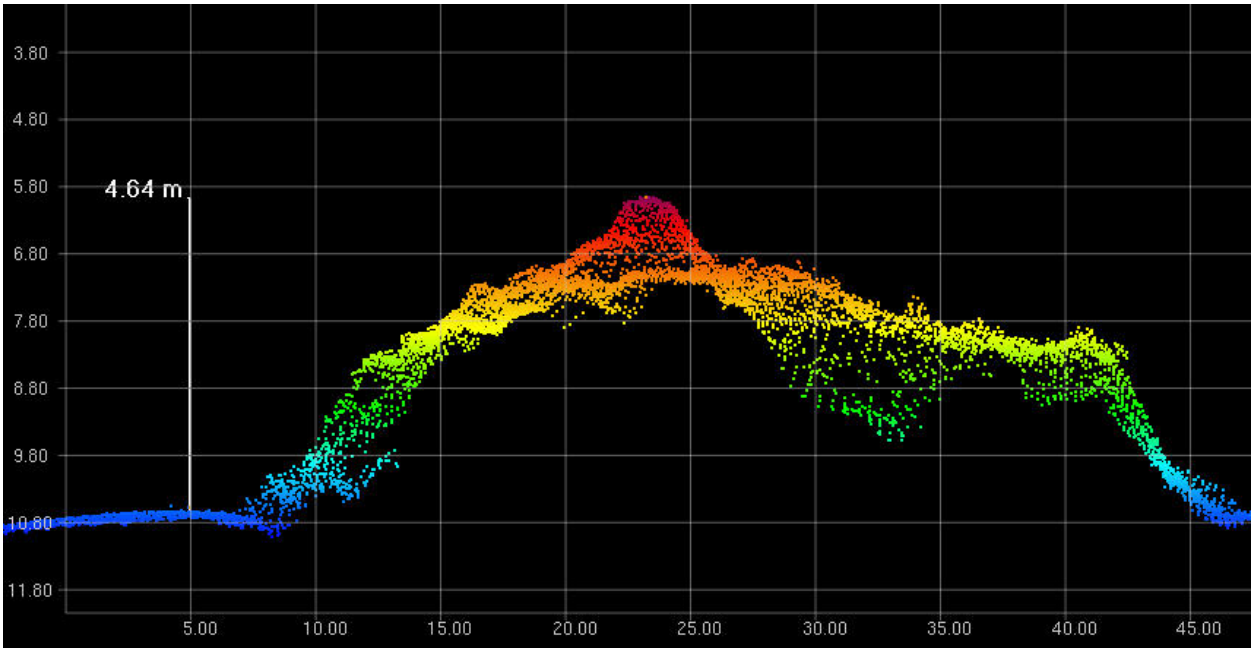

Figure 1.1.1

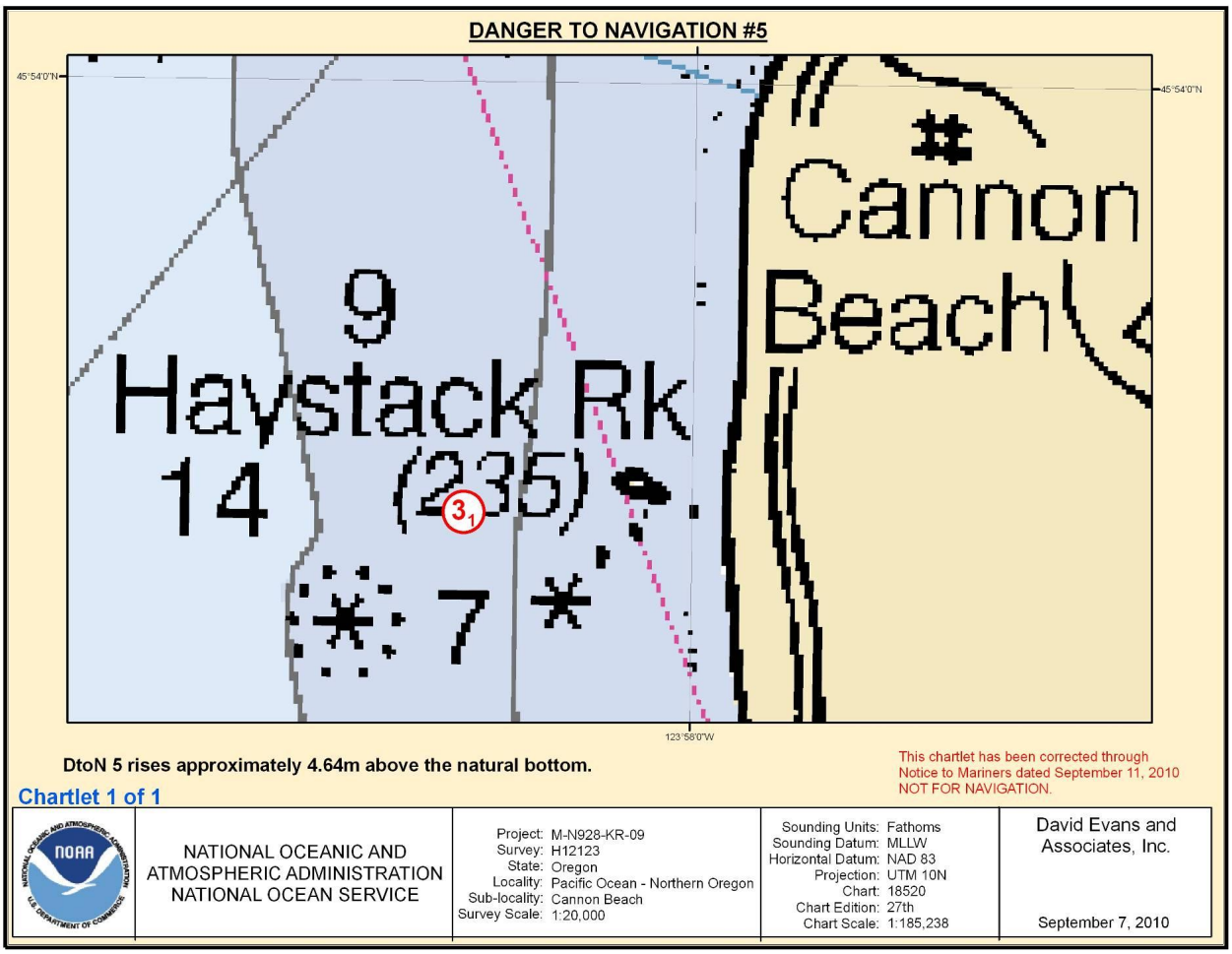
DANGER TO NAVIGATION #5
45°54'0"N
45°54'0"N
Cannon
Beach
9
Haystack Rk
14
(235)
3
1
7
123°58'0"W
DtoN 5 rises approximately 4.64m above the natural bottom.
This chartlet has been corrected through
Notice to Mariners dated September 11, 2010
NOT FOR NAVIGATION.
Chartlet 1 of 1
NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE
Project: M-N928-KR-09
Survey: H12123
State: Oregon
Locality: Pacific Ocean - Northern Oregon
Sub-locality: Cannon Beach
Survey Scale: 1:20,000
Sounding Units: Fathoms
Sounding Datum: MLLW
Horizontal Datum: NAD 83
Projection: UTM 10N
Chart: 18520
Chart Edition: 27th
Chart Scale: 1:185,238
David Evans and
Associates, Inc.
September 7, 2010

Figure 1.1.2

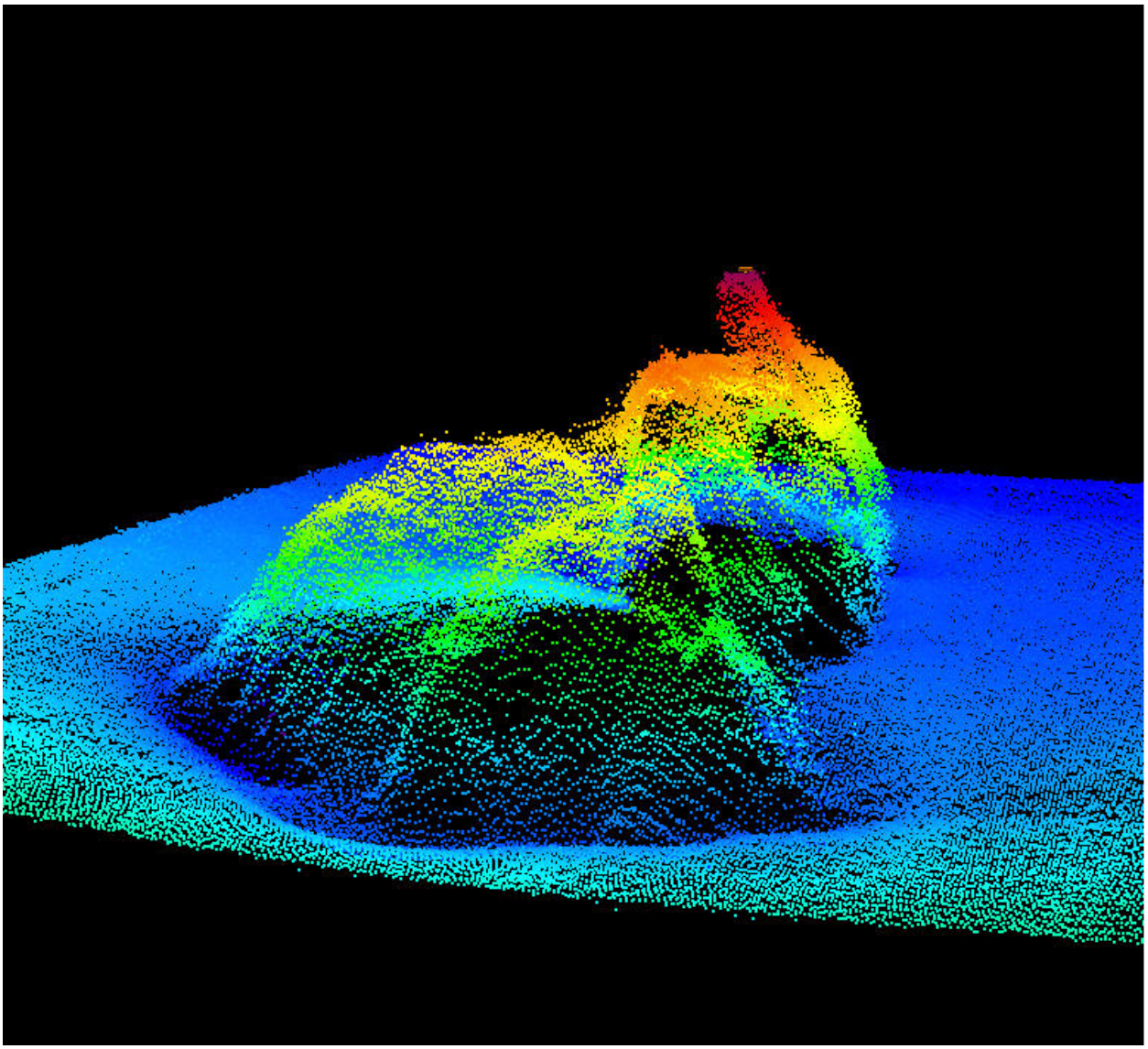

Figure 1.1.3

APPENDIX V
SUPPLEMENTAL RECORDS AND CORRESPONDENCE

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 of 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 Ameele 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
SSMC3, Station 6815
1315 East West Highway
Silver Spring, MD 20910
voice: (301) 713-2700 x111
fax: (301) 713-4533
cell: (240) 687-4602

--
LCDR Ben Evans, NOAA
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NOAA Office of Coast Survey
SSMC3, Station 6815
1315 East West Highway
Silver Spring, MD 20910
voice: (301) 713-2700 x111
fax: (301) 713-4533
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
>
> www.deainc.com <http://www.deainc.com/>
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>

--
LCDR Ben Evans, NOAA
Chief, Data Acquisition and Control Branch (N/CS35) NOAA Office of Coast Survey SSMC3, Station 6815
1315 East West Highway
Silver Spring, MD 20910
voice: (301) 713-2700 x111
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

David Evans and Associates, Inc.
2801 SE Columbia Way, Ste. 130
Vancouver, WA 98661
Phone: 360-314-3200
Fax: 360-314-3250

M-N928-KR-09

H12123 Bottom Samples

Sample_ID	Target_Name	Time_(UTC)	Date	Longitude_(W)	Latitude_(N)	Depth_(fa)	COLOR	NATSUR	NATQUA
89SG	DEA 11	22:10	9/10/2009	-123.988583	45.903750	11	8,1,2	4	1
90SG	DEA 10	22:34	9/10/2009	-124.014667	45.903583	24	8,1,2	4	1
91SG	DEA 9	22:48	9/10/2009	-124.040300	45.903433	34	8,1,2	4,3	1
92SG	DEA 12	23:01	9/10/2009	-124.040017	45.885500	35	8,1,2	4,3	1
93SG	DEA 13	23:18	9/10/2009	-124.014150	45.885783	25	8,1,2	4	1
94SG	DEA 14	23:31	9/10/2009	-123.988350	45.885933	14	8,1,2	4	1
95SG	DEA 16	23:43	9/10/2009	-123.988217	45.868033	14	8,1,2	4	1
96SG	DEA 18	23:56	9/10/2009	-123.987733	45.849667	14	8,1,2	4	1
97SG	DEA 20	00:08	9/10/2009	-123.987450	45.831983	13	8,1,2	4	1
98SG	DEA 22	00:20	9/10/2009	-123.987117	45.814083	12	8,1,2	4	1
99-2SG	DEA 21	00:39	9/10/2009	-124.013033	45.813950	22	8,2,1	4,3	1
100SG	DEA 19	00:58	9/10/2009	-124.013450	45.831850	24	8,2,1	4,3	1
101-3SG	DEA 17	01:26	9/10/2009	-124.013467	45.843467	25	NA	9,10	NA
102SG	DEA 15	01:43	9/10/2009	-124.014600	45.867917	25	8,2,1	4,3	1

OREGON 25
9/2 #89SG

OREGON 25
9/2 # 905G

OREGON 25
9/2 # 91 SG

OREGON 25
9/2 #925G

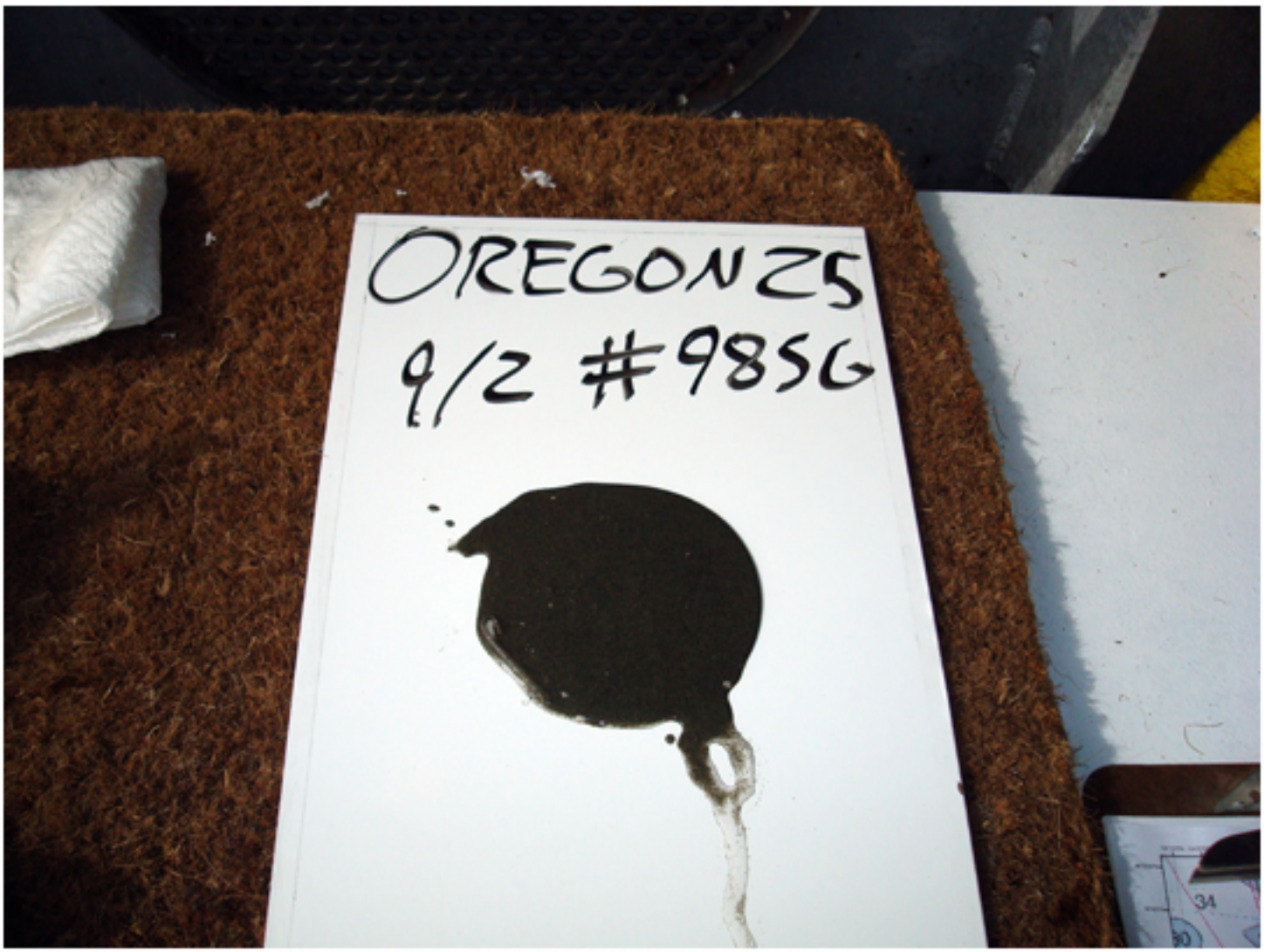
OREGON ZS
9/2 #93 SG
EXPO
93SG

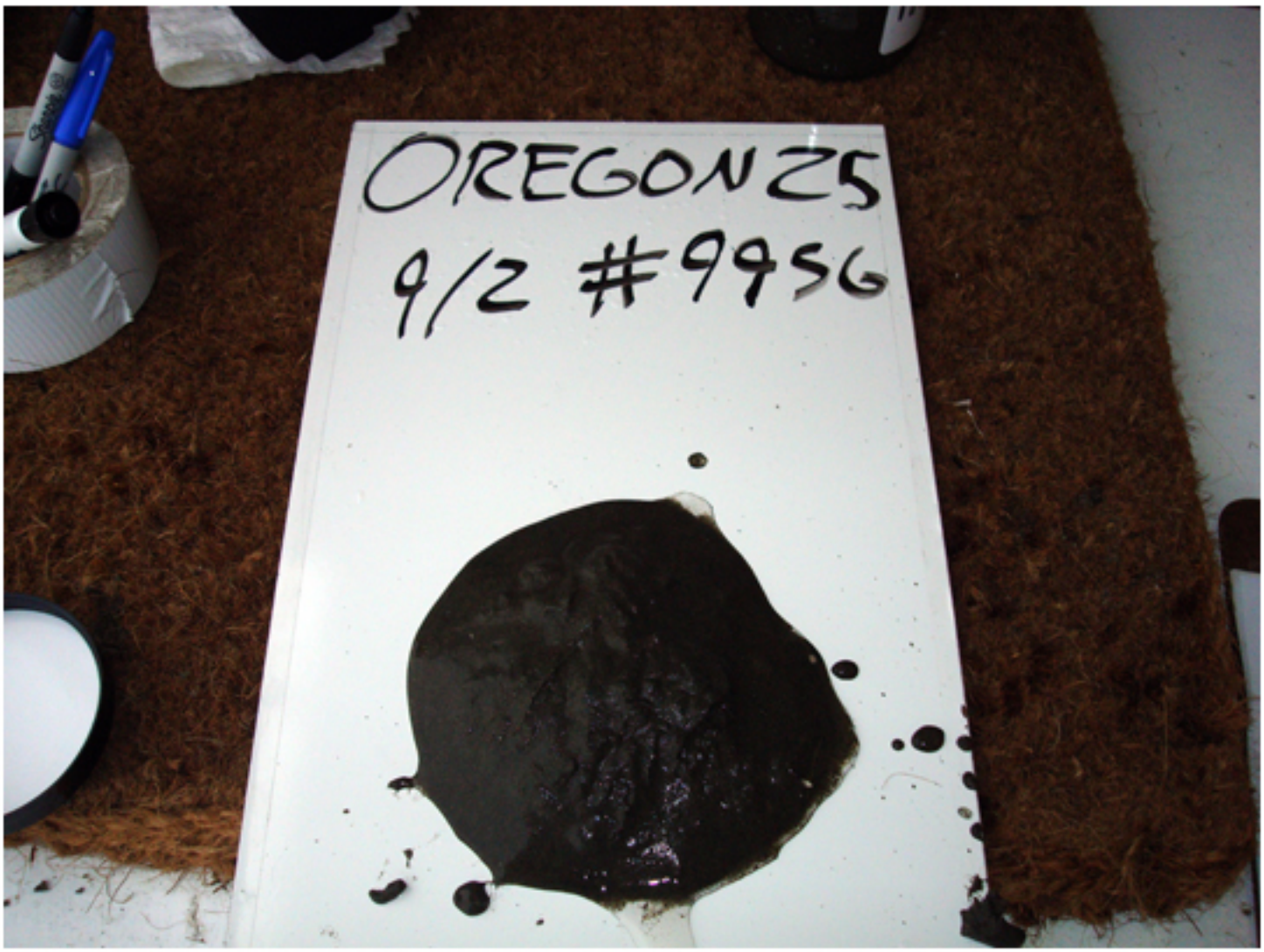
OREGON 25
9/2 #94 SG

OREGON 25
9/2 #95SG

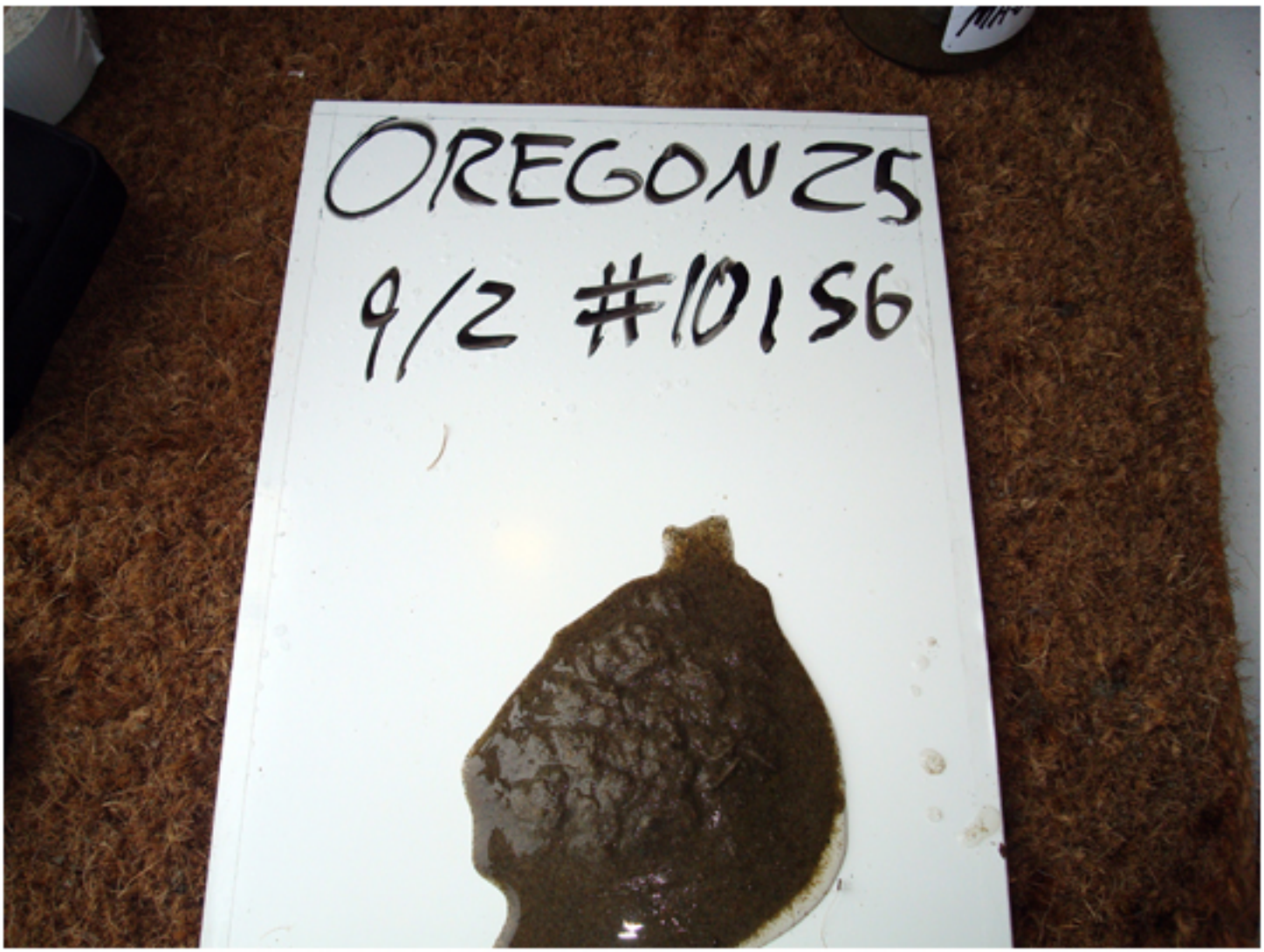
OREGON 25
9/2 #965G

OREGON 25
9/2


OREGON 25
9/2 #985G


OREGON 25
9/2 #9956

OREGON 25
9/2 #10056


OREGON 25
9/2 #10156

OREGON 25
4/2 #10256

H12123 HCell Report

Anthony Lukach, ERT Contractor
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H12123 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 H12123 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NTM Date
18520	1:185,238	27th	05/01/2009	12/04/2010

The following ENCs were also used during compilation:

Chart	Scale
US3OR01M	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 1:30,000 survey scale 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	500	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 *_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and fathom equivalent contour values are shown in the table below.

Chart Contour Intervals in Fathoms from Chart 18520	Metric Equivalent to Chart Fathoms, Arithmetically Rounded	Metric Equivalent of Chart Fathoms, with NOAA Rounding Applied	Fathoms with NOAA Rounding Applied	Fathoms with NOAA Rounding Removed for Display on H12123_SS.000
3	5.4864	5.715	3.125	3
10	18.288	18.517	10.125	10
20	36.576	37.034	20.750	20
30	54.864	56.236	30.750	30

5. Meta Areas

The following Meta object areas are included in HCell H12123:

M_QUAL

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):	Fathoms and 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
OBSTRN	Obstruction area objects
SBDARE	Bottom samples, reefs, intertidal areas, and rocky seabed areas
SOUNDG	Soundings at chart scale density
* UWTROC	Rock features

* 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

H12123 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

H12123_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:185,238
H12123 _SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:30,000
H12123 _DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12123 _outline.gml	Survey outline
H12123 _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 meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.1	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4	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.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

11. Contacts

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

Anthony Lukach
ERT Contractor
Pacific Hydrographic Branch
Seattle, WA
206-526-6871
Tony.lukach@noaa.gov

APPROVAL SHEET
H12123

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.

Digitally signed by
Anthony Lukach
Date: 2011.05.16
16:24:40 -07'00'

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 disproval 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.

Katie Reser
2011.05.25
09:43:18 -07'00'

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.

Digitally signed by
NELSON.GARY.C.1365885318
DN: c=US, o=U.S. Government,
ou=DoD, ou=PKI, ou=OTHER,
cn=NELSON.GARY.C.13658853
18
Date: 2011.05.25 09:18:55
-07'00'