H11858

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey HYDROGRAPHIC

Field No.

Registry No. H11858

LOCALITY

State Oregon

General Locality Columbia River

Sublocality Bachelor Island to Kelley Point

2008 - 2009

CHIEF OF PARTY

Jonathan L. Dasler, PE (OR), PLS (OR, CA)
David Evans and Associates, Inc.

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NOAA FORM 77-28 (11-72)

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

REGISTER NO.

H11858

HYDROGRAPHIC TITLE SHEET

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.

State: Oregon

General Locality: Columbia River

Sublocality: Bachelor Island to Kelley Point

Scale: 1:10,000

Date of Survey: September 5, 2008 - February 18, 2009

Instructions Dated: 4/1/2008

Project No.: OPR-N338-KR-08

Vessel: R/V Theory, R/V Preston

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

Surveyed by: David Evans and Associates, Inc.

Soundings taken by echo sounder: RESON 7125, RESON 8101

Graphic record scaled by: N/A

Graphic record checked by: N/A

Evaluation by: M. Herzog, J. Tegeder

Automated plot by: N/A

Verification by: M. Herzog, J. Tegeder, K. Reser

Soundings in: Feet at Columbia River Datum (CRD)

REMARKS: Time in UTC. UTM Projection Zone 10

Revisions and annotations appearing as endnotes were generated during office processing.

As a result, page numbering may be interrupted or non-sequential

All separates are filed with the hydrographic data.

Subconsultants: Zephyr Marine, P.O. Box 1575, Petersburg, AK 99833

Descriptive Report to Accompany Hydrographic Survey H11858
Project OPR-N338-KR-08
Columbia River, Oregon
Bachelor Island to Kelley Point
Scale 1:10,000
September 2008 – February 2009
David Evans and Associates, Inc.
Lead Hydrographers: Jonathan L. Dasler, Jason C. Creech

A. AREA SURVEYED

David Evans and Associates, Inc. (DEA) conducted hydrographic survey operations on the Columbia River, Oregon. The survey area (Figure 1) extends from the Columbia River Mile (CRM) 89 to 101.4.

Survey H11858 was conducted in accordance with the *Statement of Work* for OPR-N338-KR-08; dated April 1, 2008, with the exception of tides and water levels requirements. Due to the Columbia River Datum (CRD), the project chart datum, being a non-tidal gradient datum and the complex hydrodynamics of the Columbia River, OPR-N338-KR-08 was approved as a pilot project for the use of Global Positioning System (GPS) water levels acquired directly at the survey vessel. This change was approved after the receipt of the Statement of Work.[1]

The project instructions required three categories of multibeam coverage: Complete, Object Detection, and Set Line Spacing. In water depths greater than four meters, complete multibeam coverage was required. Automated Wreck and Obstruction Information System (AWOIS) items and the main shipping channel were acquired to meet object detection coverage requirements. Twenty-five (25) meter set line spaced multibeam bathymetry was required from the four meter water depths to the "inshore limit of hydrography". The inshore limit of hydrography was defined as the seaward most extent of either the two meter contour or the equivalent to 0.8 millimeters at the scale of the largest scale nautical chart from the mean high water (MHW) line. Though not required by contract, multibeam side scan data was acquired but not processed.

Fourteen (14) bottom samples were acquired for H11858. One AWOIS item investigation assigned to this survey.

Data acquisition was conducted from September 5, 2008 (DN249) to February 18, 2009 (DN049). Table 1 lists specific dates of acquisition.

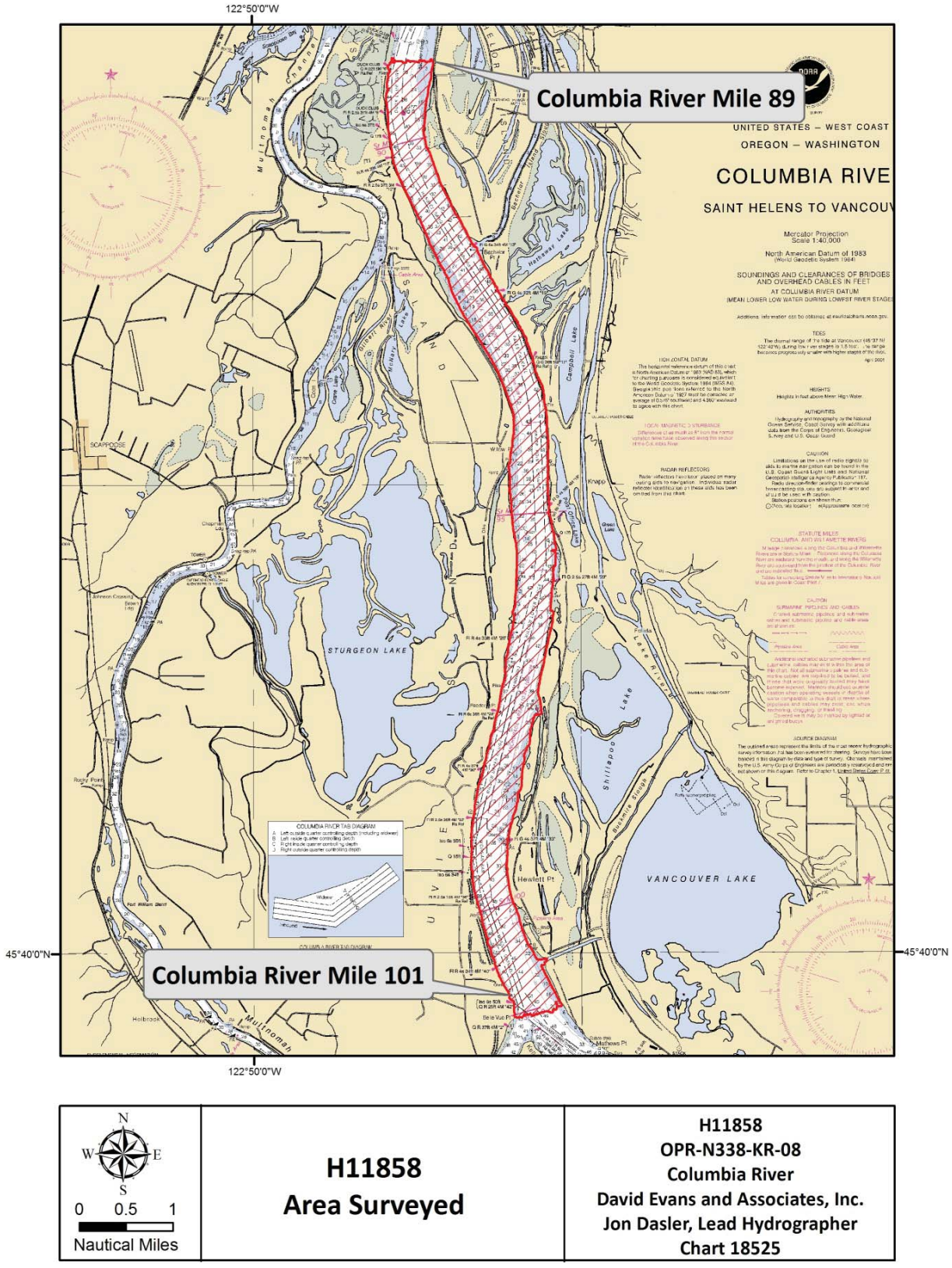


Figure 1. H11858 Survey Area

Table 1. H11858 Days of Acquisition

Dates of Acquisition	
Month	**Dates**
September 2008	5-7, 9-11, 14-17
February 2009	9-12, 16-18

Detailed survey statistics of H11858 are provided in Table 2.

Table 2. H11858 Survey Statistics

Survey Statistics	***Research Vessels (R/V) THEORY and PRESTON***
MBES (mainscheme nm)	314.9
Crosslines (MBES nm)	18.0
Developments (MBES nm)	0
Number of Item Investigations that required additional survey effort	0
Total number of square nautical miles	4.31

B. DATA ACQUISITION AND PROCESSING

B1. Equipment

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

Table 3. R/V Theory Equipment and Vessel Specifications

R/V Theory	
	
Hull Registration Number	IAR34CATA808
Official Number (O/N)	1217549
Builder	Armstrong Marine
Design	Catamaran
Year Built	2008
Length Overall	36’
Beam	13’
Draft, Maximum	3’
Cruising Speed	26 knots
Max Survey Speed	9 knots
Primary Echosounder	RESON 7125-B
Sound Velocity Equipment	Brooke Ocean MVP-30 with AML Smart SV & P Reson SVP-70 Sea-Bird SEACAT SB-19 CTD Profiler
Positioning & Attitude	Applanix POS/MV 320 v4 RTK compatible

Table 4. R/V Preston Equipment and Vessel Specifications

R/V Preston	
	
Hull Registration Number	ABTJOHNB3090
Official Number (O/N)	WN0437NX
Builder	Action Boats Inc.
Design	Custom Monohull Jet
Year Built	1990
Length Overall	31’
Beam	8.5’
Draft, Maximum	16”
Cruising Speed	24 knots
Max Survey Speed	7 knots
Primary Echosounder	RESON 8101
Sound Velocity Equipment	Sea-Bird SEACAT SB-19 CTD Profiler AML SV Plus
Positioning & Attitude	Applanix POS/MV 320 v4 RTK compatible

There were no vessel or equipment configurations used during data acquisition that deviated from those described in the *OPR-N338-KR-08 Data Acquisition and Processing Report* (DAPR).[2]

B2. Quality Control

Quality control is discussed in detail in Section B of the DAPR. The results from the positioning system comparison and bar-to-multibeam comparison is included in Separate I *Acquisition and Processing Logs* and the sound velocity profile sensor weekly evaluation table can be found in Separate II *Sound Speed Data* section of this report.[3] 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. Both baring and submerged significant features identified during survey were noted in the acquisition logs and saved to Hypack target files or Isis Cursor log files and then displayed during HIPS editing to aid in the interpretation of data and act as a check during feature compilation.

B2.a Crosslines

A total of 18.0 nautical miles of crosslines, or 5.7% of mainscheme 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.

Due to the dynamic shifting of sand waves, data acquired significantly later than the majority of the mainscheme bathymetry, specifically the crosslines from February 17, 2009 (DN048) were not included in the Preston crossline analysis for H11858.

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 were compared to a 50-centimeter CUBE surface that encompassed the entire survey area. This surface was not included with the deliverables due to its large file size. The QC Report tabular output and plots are included in Separate IV *Crossline Comparisons*.[4] The results of the analysis exceed the requirements as stated in the National Ocean Service (NOS) *Hydrographic Surveys Specifications and Deliverables* (April 2007).[5]

B2.b Uncertainty

The calculated uncertainty values of all nodes within the unfinalized CUBE surfaces range from 0.116 meters to 0.218 meters.

During HIPS processing, the "greater of the two” option was selected, where the calculated uncertainty from total propagated error (TPE) is compared to the standard deviation of the soundings influencing the node, and 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. No area within the survey exceeds International Hydrographic Organization (IHO) Order 1 specifications for depth accuracy.[6]

B2.c Junctions

H11858 junctions with survey H11857 to the north and with survey H11859 to the south. Junctions were visually reviewed in Caris HIPS subset mode.

In general, the depth differences between H11858 and H11857 are within 10 centimeters, with the greatest differences correlating to the natural migration of sand waves.[7] Due to the dynamic shifting of sand waves, data acquired significantly later than the majority of the mainscheme bathymetry, specifically fill from February 27, 2009 and March 2, 2009 (DN058 and DN061), were not used in the junction analysis.

In general, the depth differences between H11858 and H11859 are within 15 centimeters, with the greatest differences correlating to the natural migration of sand waves.[8] Due to the dynamic shifting of sand waves, data acquired significantly later than the majority of the mainscheme bathymetry, specifically fill from January 19, 2009, February 9, 2009, and February 17, 2009 (DN019, DN040 and DN048), were not used in the junction analysis.

B2.d Unusual Conditions or Data Degradation

Artifacts in Reson 7125 Bottom Tracking Algorithm

There is an error in the Reson 7125 bottom tracking algorithm that causes bottom detection (beams 86-115 and 140-168) to lock on to stronger sonar returns, bleeding over from more nadir returns. This may be related to the amplitude bottom detection used near nadir and the bottom detection locking on to the strong nadir return signal, rather than the actual bottom return for that designated beam area. These artifacts occur in two areas near nadir and are more prevalent on a hard bottom, when the amplitude of the nadir return is the strongest. The artifacts run along-track and can exceed 20 centimeters in the raw soundings, but are reduced to 5 to 10 centimeters in the CUBE surface (Figure 2).[9] Attempts to remove these artifacts during survey operations with changes in sonar settings were unsuccessful. Reson is aware of this issue and is working towards a resolution with a different bottom tracking algorithm.

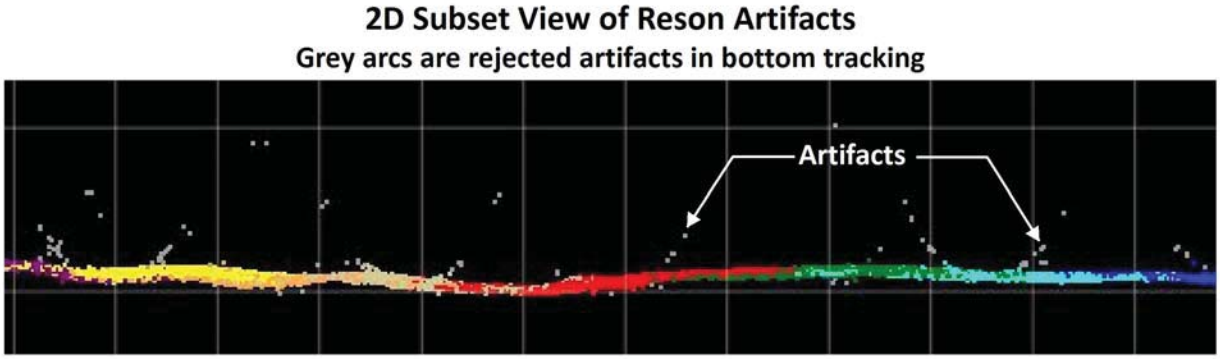


Figure 2. Artifacts in Reson 7125 Bottom Tracking Algorithm

Reson 7125 Sound Speed Profiler Drop-outs

The Reson 7125 is equipped with an SVP70 sound speed profiler at the head to aid in beam forming. Occasionally a bubble of air will pass over the profiler causing a large change in the sound speed read at the sonar head. This causes small sound speed errors in the data which last for 5-10 profiles.[10]

Snags and Deadheads

Snags and deadheads are common along the Columbia River. Any feature, submerged or baring that was determined to be seasonal or transient in nature was removed from the data.

B2.e Object Detection and Coverage Requirements

Survey speeds were maintained at less than 9 knots so that object detection requirements were exceeded throughout the survey.[11]

High resolution, 50-centimeter CUBE surfaces were created over the entire survey area. The disambiguation method selected to create all 50-centimeter CUBE surfaces was “Shoal,” which corresponds to the NOS *Hydrographic Surveys Specifications and Deliverables* (April 2007) Object Detection Coverage requirements. Survey coverage was reviewed to ensure that no data gaps (more than 3 connected open nodes) were present within AWOIS radii and maintained navigation channels.

Outside maintained navigation channels Complete Coverage requirements were demonstrated by creating one meter CUBE surfaces with “Deep” disambiguation method selected, which corresponds to the NOS *Hydrographic Surveys Specifications and Deliverables* (April 2007) Complete Coverage requirements. Survey coverage was reviewed to ensure that no data holidays (more than 3 connected open nodes) were present. In a telephone conversation on January 7, 2009 between the Pacific Hydrographic Branch (PHB) and DEA it was agreed that the one meter surfaces would be created and reviewed by DEA hydrographers, but not submitted with the delivered dataset in order to reduce data storage needs.

B3. Corrections to Echo Soundings

Data reduction procedures for survey H11858 are detailed in the OPR-N338-KR-08 *DAPR*, submitted under separate cover. The multibeam swath angle filter that was applied to each survey day varied depending on location, conditions, and sonar type. In general, Reson 7125 survey lines were unfiltered and used the entire 128 degree swath. Reson 8101 survey lines were filtered at a 60/60-degree angle from nadir for mainscheme hydrography and 60/90 or 60/75 for survey lines along the shoreline. For detailed information pertaining to applied filters please refer to the multibeam processing logs in Separate I *Acquisition and Processing Logs.*

The survey area for H11858 contained numerous bearing features. The least depths of baring features were marked as “Examined” and the rest of the structure was flagged as "Rejected" to the mudline. The use of the examined sounding flag to track baring items aided hydrographers during the feature management compilation process. Baring features are not included in the finalized bathymetric sounding set. This was done to ensure that the generated surface represented the true river bottom and submerged features.

B3.a Deviations from DAPR

The post-survey calibration report for Applied Microsystems AML SV Plus (serial number 3591) has not yet been received from the manufacturer. The AML3591 was compared to another AML SV Plus (serial number 3592) as well as both AML Smart SV&Ps (serial numbers 5110 and 5111) as part of a weekly confidence check for sound speed determination. All comparisons passed within the National Oceanic and Atmospheric Administration (NOAA) specifications.

Multibeam swath coverage images of sun illuminated depth and uncertainty layers have not been submitted as this requirement has been dropped from recent versions of NOS *Hydrographic*

Surveys Specifications and Deliverables. These layers have been submitted in both BAG and CUBE format.[12]

There are no other deviations from the OPR-N338-KR-08 DAPR.

B3.b Additional Calibration Tests

The initial system calibration tests for the *S/V Theory* and *S/V Preston* were performed on August 15, 2008 (DN228) and August 29, 2008 (DN242), respectively. Additional tests were performed periodically to verify the adequacy of the known system biases and document changes in alignment offsets due to sensor remounting and sonar strikes on submerged objects. Additional discussion on calibration tests can be found in the OPR-N338-KR-08 DAPR.

B4. Data Processing (Data Representation)

CUBE surface resolutions and depth ranges were set in accordance with the NOS *Hydrographic Surveys Specifications and Deliverables* (April 2007). Final CUBE surfaces were created at a 50-centimeter resolution to meet Object Detection requirements. Some data gaps exist in the 50-centimeter grids; however, the grids still meet coverage requirements for the survey. Near shore coverage, in some areas less than 4 meters used, Set Line spacing and gaps are present between survey lines. Additionally, coverage outside of the maintained channel only required a one meter resolution and small data gaps may be visible in the 50-centimeter surfaces, but still meet requirements in these areas.[13] Complete Coverage requirements were met and all data gaps, three nodes or greater, were filled prior to ceasing survey operations with one exception.

There is a data gap 464ft (141.43m) long by 148ft (45.11m) wide at CRM 101.5 on the Washington shore. There were moored barges in this area during the entire survey.

In order to keep CUBE surfaces at a manageable size, the main survey area was broken up into six Field Sheets organized by corresponding Columbia River Mile (H11858_CRM_89-91, etc.). When combined the Fields Sheets encompass the entire area of acquired multibeam bathymetry. A BAG was created for each finalized CUBE surface and both the CUBE and BAG surfaces have been included with the digital data.

C. HORIZONTAL AND VERTICAL CONTROL

Due to the CRD, the project chart datum, being a non-tidal gradient datum and the complex hydrodynamics of the Columbia River, the project chart datum, OPR-N338-KR-08 was approved as a pilot project for the use of GPS water levels acquired directly at the survey vessel. With the exception of tide reduction of baring features, 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

Prior to survey acquisition, three GPS base stations with a dual frequency (L1/L2) receiver were established in Oregon at the CO-OPS water level station in St Helens (STHL) and in Washington at the Fazio Brothers facility near Shillapoo Lake (FAZIO) and at DEA's Marine Services office

in Vancouver, Washington (DEMSI). The base stations logged raw dual frequency (L1/L2) GPS observables at one second epochs as well as broadcast real-time kinematic (RTK) corrections to the survey vessels. The base station closest to the area surveyed broadcast the RTK correctors. This base station was later used to post-process the navigation data. Base station positions relative to the North American Datum of 1983 (NAD83) (CORS96) (Epic 2002) were derived from the NGS (National Geodetic Survey) On-line Positioning User Service (OPUS) and were based on a 24-hour data file, with one second-epoch logging prior to commencement of survey operations.

A separation model of CRD relative to NAD83 was created and formatted to allow for direct integration with Hypack and Caris HIPS. The model input used a river profile of CRD relative to North American Vertical Datum of 1988 (NAVD88) provided by the U.S. Army Corps of Engineers (USACE), Portland District (the designated stewards of CRD). GEOID 03 was used to transfer the NAVD88 to CRD relationship directly to the NAD83 ellipsoid, which allowed direct computation of GPS water levels from ellipsoid heights recorded at the survey vessel. The model file (.bin) used to compute GPS water levels in HIPS, has been included with the digital deliverables.

RTK navigation was logged during acquisition and applied during preliminary data processing, but ultimately overwritten with a post-processed Inertially-Aided Kinematic Ambiguity Resolution (IAKAR) navigation solution. The HIPS Load Attitude and Navigation tool was used to load position, GPS height, and attitude data from a smoothed best estimate trajectory (SBET) file create from Applanix POSPac.

A complete description of horizontal and vertical control for survey H11858 can be found in the OPR-N338-KR-08 *Horizontal and Vertical Control Report*, submitted under separate cover.[14] A summary of horizontal and vertical control for this survey follows.

C1. Vertical Control

The vertical datum for this project is the CRD, an adopted low-water gradient datum relative to NAVD88. There are known problems in the NGS level lines between Oregon and Washington due to the long level runs without the ability to run tie lines across the Columbia River. GPS observations have documented large vertical differences in published bench mark elevations across the Columbia River. Whereas CO-OPS water level gauges are located in Oregon and Washington and are directly referenced to NGS published bench mark elevations, and the known issue with the level lines between Oregon and Washington, a decision was jointly made by the USACE and NOAA to use NGS OPUS solutions to establish vertical consistency in the relationship of CRD relative to NAVD88. The USACE, Portland District (designated stewards of CRD) conducted surveys that established OPUS derived NAVD88 elevations on historic bench marks referencing CRD. A result of these surveys was a profile of Columbia River Datum relative to OPUS derived NAVD88 elevations which were consistent across the Columbia River. The profile defined CRD relative to NAVD88 for each River Mile (RM) from RM 23 to RM 145 on the Columbia River and RM 0 to RM 26 on the Willamette River. This profile is used by the USACE, Portland District for hydrographic surveys and dredging operations to maintain the Federal Channel on the Columbia and Willamette rivers.

To improve vertical accuracy of this survey, soundings were reduced to CRD using GPS water levels measured at the survey vessel. Water levels were derived from post processed GPS heights and application of a separation model of the CRD to NAD83 ellipsoid relationship. Data reduction procedures, including detailed discussions of the CRD model generation and GPS water levels computations, for survey H11858 are detailed in the OPR-N338-KR-08 DAPR.

To verify GPS water levels, a comparison was made by vessel static observations adjacent to the CO-OPS water level station 9439201 located in Saint Helens, OR, and CO-OPS water level station 9440083 located in Vancouver, WA. To obtain water levels relative to the CO-OPS defined CRD, the Hydrographer selected Station Datum when downloading data from the CO-OPS web site. This is consistent with obtaining CRD values for any CO-OPS station on the Columbia River above RM 23. Adjustments were required to correct CO-OPS water level data to CRD based on the updated USACE CRD profile used to maintain the Columbia and Willamette rivers. CO-OPS is aware of this issue and is working toward resolving the problem.

It should be noted that these adjustments were applied to CO-OPS water level data for comparison purposes of water level data relative to the revised USACE profile relative to OPUS derived NAVD88 elevations. This method was approved for project OPR-N388-KR-08 by the Office of Coast Survey, Hydrographic Surveys Division Chief as it is consistent with the USACE, Portland District, methods for maintaining the Federal Channel in the Columbia and Willamette rivers. Further, CO-OPS should adjust water level stations on Columbia River Datum and part of the Columbia PORTS® system to be consistent with the defined CRD profile by the USACE, Portland District. Tables 5 and 6 lists corrections to be applied to CO-OPS data to be consistent with the USACE, Portland District CRD profile.

Table 5. Corrections Applied to 9439201 Saint Helens, Oregon

Description of Adjustment	Adjustment (m)
Revised CRD value to 1.291m from 1.286m NAVD88	-0.005
Total Adjustment to CO-OPS Data in St Helens, Oregon	**-0.005**

Table 6. Corrections Applied to 9440083 Vancouver, Washington

Description of Adjustment	Adjustment (m)
Revised CRD value to 1.576m from 1.610m NAVD88	0.034
Total Adjustment to CO-OPS Data in Vancouver, WA	**0.034**

Water level observations and gauge comparison data may be found in Appendix IV *Tides and Water Levels*. No configurations used during data acquisition deviated from those described in the OPR-N338-KR-08 DAPR.

C2. Discussion of GPS Tides

The coordinates of the GPS base stations used during acquisition and processing of H11858 are included in Table 7. The reference base stations used for both RTK and post processing are listed in the survey acquisition logs and POSPac processing logs included in Separate I *Acquisition and Processing Logs*.

Table 7. H11858 NAD83 Base Station Positions

RTK Base Station ID	Latitude (N)	Longitude (W)	Ellipsoid Height
FAZIO	45/42/56.60629	122/45/34.14311	-7.858m
STHL	45/51/47.95572	122/47/46.32988	-7.715m
DEMSI	45/36/59.91780	122/38/26.25942	-0.366m

As discussed in the OPR-N338-KR-08 DAPR, the use of GPS water levels eliminated large errors associated with discrete zoning and significantly reduced vertical uncertainty for this survey. Typical tide zoning artifacts for the survey area could exceed 30 centimeters, but as a result of using GPS water levels there are no visual tidal artifacts present in this survey.

C3. Horizontal Control

The horizontal datum for this project is the NAD83. Differential GPS (DGPS) and RTK 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 Fort Stevens, Washington (287 kHz) or from the secondary beacon at Appleton, Washington (300 kHz). Some DGPS outages from the primary beacon occurred during survey operations. The system was set up to automatically switch to the secondary beacon when the primary signal was lost, so all of the secondary navigation data were collected in DGPS mode.

Navigation and attitude data were post-processed using Applanix POSPac MMS software, which produced an IAKAR navigation solution relative to NAD83. The GPS reference station and position used during post-processing were identical to those used for RTK broadcast during acquisition.

The real-time navigation and attitude logged during acquisition was overwritten with post-processed data during HIPS processing. Post-processed navigation, attitude and GPS heights were applied to all HIPS data unless POSPac processing errors created data outages in the SBET files, which prevented application to some survey lines. These survey lines, which use real-time sensor data, including RTK navigation and GPS heights, are listed in Table 8.

Table 8. Survey Lines Using Real-time Sensor Data

Survey Vessel (R/V)	Day Number (DN)	Survey Line
Theory	260	2008TH2601910

Quality checks of RTK navigation procedures and comparison to post processed data discussed in the OPR-N338-KR-08 DAPR and OPR-N338-KR-08 *Horizontal and Vertical Control Report* demonstrate that the use of RTK is also a reliable method to obtain GPS water levels. Survey lines using RTK have been thoroughly reviewed and exceed accuracy requirements for the survey.

D. RESULTS AND RECOMMENDATIONS

D1. Chart Comparison

D1.a Survey Agreement with Chart

During the course of data acquisition and processing, H11858 was compared to the largest scale raster and electronic navigation charts (RNC and ENC). The results of these comparisons are described below, as well as in Sections D1.b through D1.f of this report.

Contours and soundings used during the chart comparison were generated from combined HIPS product surfaces. Soundings and contours were generated from a 5-meter HIPS product surface (1:10,000) of the entire survey area, which was compiled from all finalized CUBE surfaces for the survey. The product surfaces, contours, and soundings were created solely for quality assurance and chart comparison and have not been submitted as a final deliverable.

H11858 contours and soundings were compared in Caris HIPS to the depths and contours on the charts listed in Table 9.

Table 9. Charts compared to H11858

Chart	Scale	Edition	Edition Date	Issue Date	Latest LNM	Cleared Through Date
18525	1:40,000	24	07/01/2005	02/27/2009	08/09	11/25/2008
US5OR14M	--	24	--	02/27/2009	--	--
US5OR15M	--	27	--	03/02/2009	--	--

Survey H11858 depths were compared to the charted soundings on Charts 18525 and the corresponding ENCs US5OR14M and US5OR15M. In general there is good agreement between depths from survey H11858 and the chart.[15]

The latest electronic and raster versions of the relevant charts were reviewed to ensure that all USCG Local Notice to Mariners (LNM) issued during survey acquisition, and impacting the survey area were applied and addressed by this survey.

D1.b Comparison to Significant Shoals

Surveyed depths around Fishtrap Shoal, on the Oregon Shore between CRM 91 and 92, agree with charted depths.[16] There are no other charted shoals within the H11858 survey area.

D1.c Comparison to Charted Features

One (1) AWOIS investigation was assigned within survey H11858 (Figure 3).[17] The item was disproved with 100% shallow water multibeam.[18] A complete description is available in Appendix II *Survey Features Report.*[19]

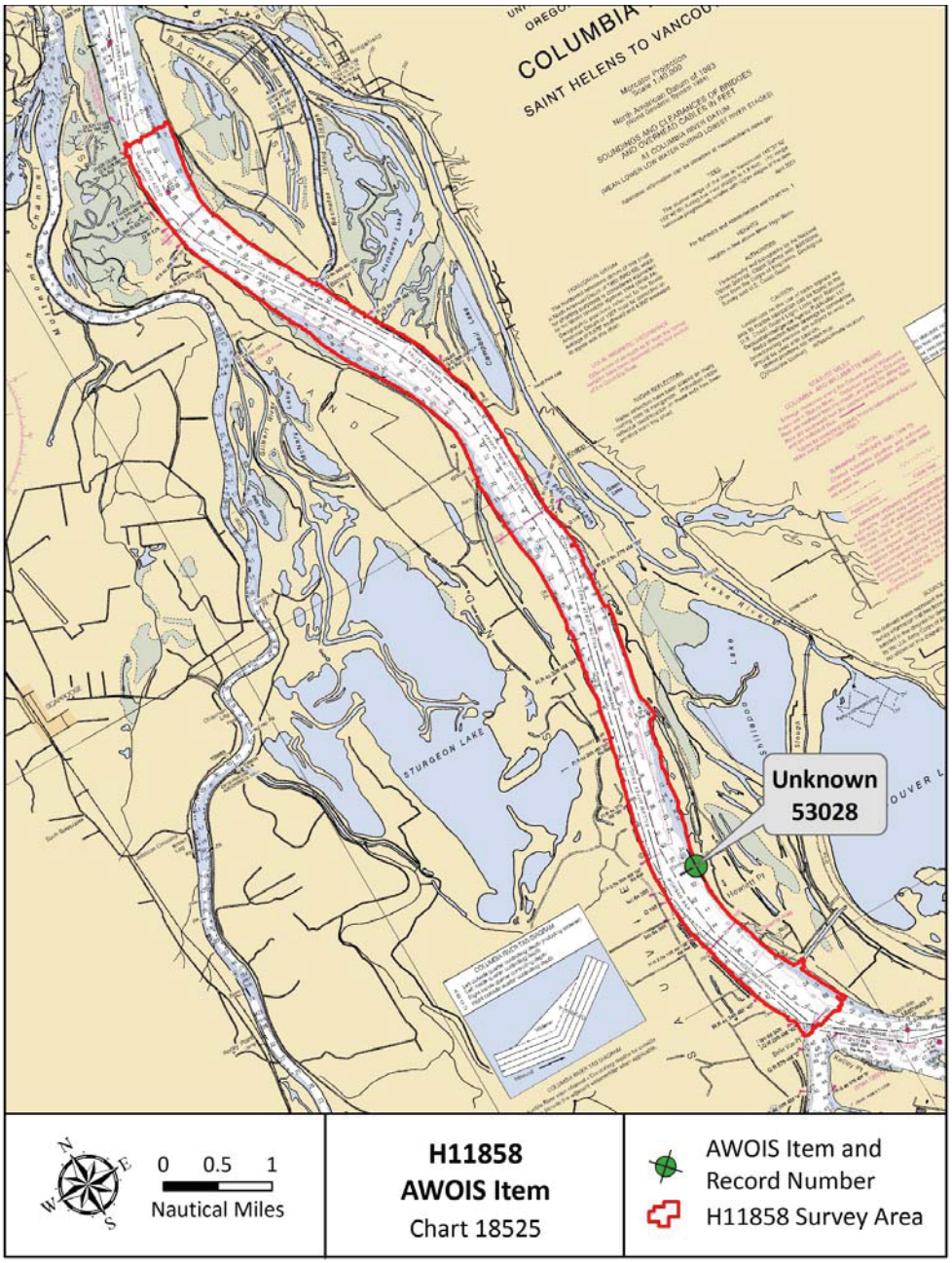


Figure 3. H11858 AWOIS Investigations

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

There are two Designated Anchorages within survey H11858, one is located between CRM 91 and CRM 94, and the other is located between CRM 96 to CRM 99. Depths within the anchorages are generally the same or deeper than charted with one exception. There is a mound on the eastern border of the anchorage at CRM 98.4. The mound has a least depth of 13 feet (3.96m) and has been designated as an obstruction (see Appendix II *Survey Feature Report*, Appendix V *Supplemental Records and Correspondence* and D1.e below).[20]

There are eight named Columbia River Channel sections within survey H11858. The project depth is 40 feet for all eight channels and survey H11858 depths are generally deeper. The most recent channel survey is reported to have occurred in January 2009 at which time, a minimum depth of 41 feet was found in the left outside quarter of the Willow Upper Range. Table 10 lists the Columbia River channels affected by survey H11858.

Table 10. Columbia River Channels and Minimum Depths

Name of Channel	Project Depth (ft)	Controlling Depth (ft)	H11856 Minimum Survey Depth (ft)
Duck Club Turn	40	42	41
Henrici Range	40	43	40
Fales Channel	40	43	40
Knapp Point Channel	40	42	39
Willow Lower Range	40	41	36
Willow Upper Range	40	41	38
Morgan Bar	40	43	41
Morgan Channel	40	41	40

Three (3) of the eight channels, though generally deeper than the project depth, had shoaler soundings than 40 feet.[21]

- Surveyed depth of 36 feet (10.97m) was found in the right outside quarter of Willow Lower Range at 45/43/05.878N, 122/45/58.986W and several depths of 39 feet (11.89m) were found throughout the channel.
- Surveyed depth of 38 feet (11.58m) was found in the left outside quarter Willow Upper Range at 45/41/52.848N, 122/46/18.018W.
- Surveyed depth of 39 feet (12.03m) was found in the right outside quarter of Knapp Point Channel at 45/44/23.441N, 122/45/38.764W.

D1.e New Submerged Features

New submerged features are listed in tabular format in Appendix II *Survey Feature Report*.[22] Two new items of interest are discussed below.

There is an uncharted mound at 45/41/48.046N, 122/46/08.081W (CRM 98.4) in the eastern edge of the anchorage. The mound was charted with a 12 foot sounding on the 35th edition of

chart 18525 dated July 2005, but was removed on the 36th edition of chart 18525 dated April 2009. The surveyed least depth over the mound is 13 feet.[23]

A point feature rising approximately 0.8m off the natural bottom was found at 45/49/28.799N, 122/47/44.078W (CRM 91) in the center of the channel at Duck Club Turn. The surveyed least depth of the obstruction is 49ft.[24]

D1.f Dangers to Navigation

Two (2) DtoNs were located during survey H11858 and have been submitted to PHB. All DtoNs were reviewed by PHB and those deemed worthy of charting were forwarded to the Marine Chart Division (MCD). Table 11 indicates charting status for each DtoN. Copies of the DEA DtoN submissions are included in Appendix I *Danger to Navigation Reports*.[25]

- DtoN #1 is a large mound that has been charted as an obstruction.
- DtoN #2 is two large cylindrical objects that have been charted as obstructions.

Table 11. DtoN Charting Status

DtoN	Feature	Applied to Raster Chart	Applied to ENC	PHB Submitted to MCD
DtoN 1	Obstruction	Yes	Yes	Yes
DtoN 2.1 and 2.2	Obstruction	Yes	Yes	Yes

D.2 Additional Results

D2.a Shoreline Investigations

Shoreline verification was not required for survey H11858. Figure 4 shows a new private dock observed on the west bank of the Columbia River at CRM 101. The Hydrographer recommends that the charted shoreline and shoreline features be updated.[26]

Figure 4. Private Dock at CRM101

D2.b Comparison with Prior Surveys

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

D2.c Aids to Navigation (AtoN)

All USCG aids to navigation (AtoN) within the survey limits were found to be correctly charted and serving their intended purpose.[27]

D2.d Overhead Clearance

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

D2.e Cables, Pipelines and Offshore Structures

A charted pipeline area 450 meters-wide spans the river between CRM 100 and 101. No pipelines were visible in the multibeam data.[28]

D2.f Environmental Conditions Impacting the Quality of the Survey

Although the survey exceeds IHO Order 1 accuracy requirements, environmental conditions degraded the quality of the survey data. Due to the dynamic nature of the Columbia River with its heavy sediment transport, sand wave migration (up to one meter of downstream migration per day), has altered the river bottom over time, creating an offset between fill and mainscheme data.[29]

The difference in offset varies over the survey, depending upon the local sand wave formation and the time between fill and mainscheme data collection. Figure 5 shows an example of downstream sand wave migration impacting agreement between mainscheme and fill data.

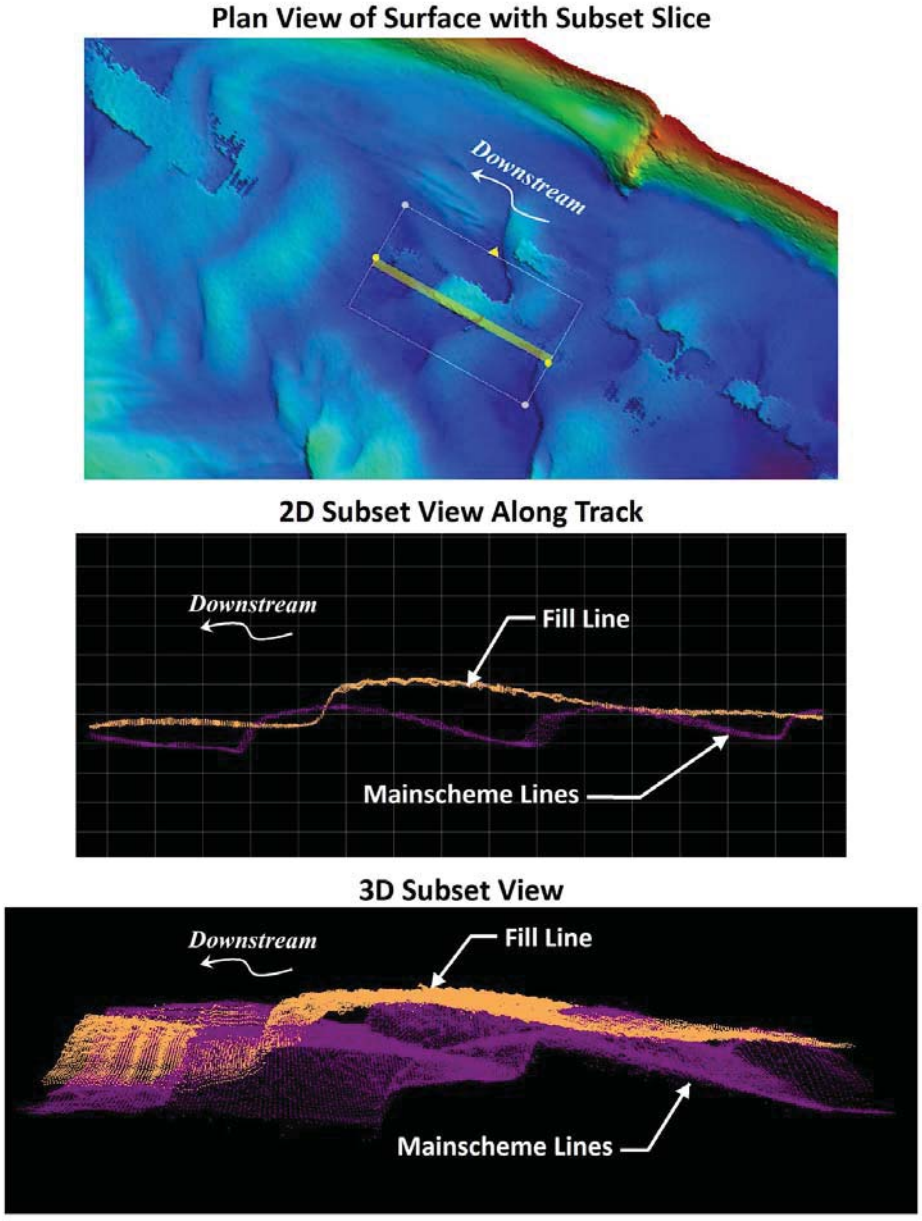


Figure 5. Sand Wave Migration

D2.g Construction Projects

No construction or dredging activities were observed during survey operations.

D2.h Bottom Characteristics

Fourteen (14) bottom samples were obtained on September 27, 2008 (Day Numbers 271) and are included in the S-57 attributed feature file in the *Supporting Data* folder.[30] 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.

E. LETTER OF APPROVAL

The letter of approval for this report and accompanying data follows on the next page.

DAVID EVANS AND ASSOCIATES INC.

LETTER OF APPROVAL

OPR-N338-KR-08
REGISTRY NO. H11858

This report and the accompanying data are respectfully submitted.

Field operations contributing to the accomplishment of survey H11858 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 OPR-N338-KR-08 *Statement of Work*, dated April 1, 2008.

Digitally signed by Jon Dasler
DN: cn=Jon Dasler, email=jld@deainc.com, o=David Evans and Associates, Inc., c=US
Date: 2009.06.25 09:44:57 -07'00'

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: 2009.06.25 09:45:34 -07'00'

Jason Creech
Lead Hydrographer

David Evans and Associates, Inc.
March 2009

F. SUPPLEMENTAL REPORTS

Listed below are supplemental reports submitted separately that contain additional information relevant to this survey:

Title	Submittal Date
OPR-N338-KR-08 Data Acquisition and Processing Report	June 17, 2009
OPR-N338-KR-08 Horizontal and Vertical Control Report	TBD

Revisions and Corrections Compiled During Office Processing and Certification

[1] See HVCR filed with project records.
[2] Filed with project records.
[3] Separates are filed with hydrographic records.
[4] Filed with hydrographic records.
[5] Concur.
[6] Concur. These data are adequate to supersede charted data in the common area.
[7] Concur. Compiler recommends a note be added to the charts stating that mariners use caution when navigating outside the maintained channels.
[8] Concur. Compiler recommends a note be added to the charts stating that mariners use caution when navigating outside the maintained channels.
[9] Despite the artifacts from the bottom tracking algorithm, the data meets specification.
[10] Despite the sound speed errors from the surface sound speed sensor dropouts, the data meets specification.
[11] Concur.
[12] Concur.
[13] Concur.
[14] Filed with project records.
[15] Concur with clarification. The southern end of this survey also falls on Chart 18526 (59th Ed., June 2009, 1:20,000). A cursory comparison was conducted during compilation and there was good agreement between the chart and survey data.
[16] Concur. Update charted depths with survey depths.
[17] Concur with clarification. There are nine AWOIS items within the limits of H11858. Only one was assigned and investigated.
[18] Concur with clarification. AWOIS 53028 is a charted wreck located at 45-41-10.2N, 122-46-09.8W. Upon investigation, it was determined that a debris field was located in the vicinity of the charted wreck, but no wreck was found. It is recommended that the charted wreck be removed and replaced with a new obstruction feature at 45-41-09.010N, 122-46-08.752W with a least depth of 16.732ft.

Additionally, there were two other wrecks identified during H11858. One wreck, located at 45-43-33.254N, 122-46-00.318W with a least depth of 5.249ft, is approximately 70 meters to the northeast of a charted wreck that is AWOIS 53025. Recommend updating the position and information for AWOIS 53025 with the surveyed information.

The other wreck identified is located at 45-40-04.822N, 122-46-23.023W with a least depth 12.795ft near a charted obstruction (submerged pile). The wreck is included in the HCell and it is recommended that it be added to the AWOIS database.
[19] See attached feature report.
[20] Concur. The obstruction and updated soundings are included in HCell H11858.
[21] The US Army Corps of Engineers Portland District has been contacted and have been made aware of the survey results. Given the fact that the Columbia River Channels are continually being dredged, it is recommended that the tabulated depths for each channel be updated with the latest survey information.
[22] See attached feature report.

[23] Concur. The 13ft mound is included in HCell H11858 as an obstruction.
[24] Concur with clarification. The obstruction is not included in HCell H11858 because it is located inside a maintained channel with a depth that is deeper than the controlling depth.
[25] All reported DTONs have been applied to the latest editions of the charts and are included in the HCell. See attached DTON report.
[26] Concur with clarification. Since the new private dock was not positioned or included in the submitted feature file, it is not included in the HCell. Further investigation is recommended to position the private dock for charting.
[27] Chart ATONs according to latest ATONIS information.
[28] Recommend retaining pipeline as charted.
[29] These data are adequate to supersede charted data in the common area despite the shifting nature of the sandwaves. Compiler recommends a note be added to the chart stating that mariners use caution when navigating outside the maintained channels.
[30] Fourteen bottom samples were collected during H11858 and all are included in the HCell. No charted bottom samples were retained.

APPENDIX I
DANGER TO NAVIGATION RECORDS

DANGER TO NAVIGATION 1

Jason Creech

From: Jason Creech
Sent: Thursday, October 02, 2008 10:15 AM
To: 'gary.nelson@noaa.gov'
Cc: 'Crescent Moegling'; Jon Dasler
Subject: H11836_DTON_1 Submission
Attachments: H11858_DTON_1.doc

Gary,

Attached is a Danger to Navigation report for H11858_DTON_1. The attached file includes the danger report, standard chartlet, and supporting images. Please let me know if you have any questions or require any additional information on this danger to navigation.

Thanks,
Jason

Jason Creech
Lead Hydrographer
David Evans and Associates, Inc.
(804) 516-7829

Jason Creech

From: Gary Nelson [Gary.Nelson@noaa.gov]
Sent: Friday, October 03, 2008 7:36 AM
To: Jason Creech
Subject: Re: H11836_DTON_1 Submission

Jason,

Thanks. I will process the DTON today. Could you please include Dave.Neander@noaa.gov on future submissions.

Regards,

Gary
> Gary,
>
>
>
> Attached is a Danger to Navigation report for H11858_DTON_1. The
> attached file includes the danger report, standard chartlet, and
> supporting images. Please let me know if you have any questions or
> require any additional information on this danger to navigation.
>
>
>
> Thanks,
>
> Jason
>
>
>
>
>
> Jason Creech
>
> Lead Hydrographer
>
> David Evans and Associates, Inc.
>
> (804) 516-7829
>
>
>

Jason Creech

From: Gary Nelson [Gary.Nelson@noaa.gov]
Sent: Friday, October 03, 2008 9:26 AM
To: mcd.dton@noaa.gov
Cc: brooke.mcmahon@noaa.gov; Russ Davies; Crescent Moegling; David Neander
Subject: DTON for H11858

Attachments: H11858_DTON_1.doc

H11858_DTON_1.doc (535 KB)

The attached 1 DTON submitted by the field unit has been reviewed by PHB and is approved for dissemination.

Attachment - H11858_dton_1.doc

REPORT OF DANGER TO NAVIGATION

H11858 #1

Hydrographic Survey Registry Number: H11858
Survey Title: State: OREGON
General Locality: COLUMBIA RIVER
Sublocality: BACHELOR ISLAND TO KELLEY POINT

Project Number: OPR-N338-KR-08
Field Unit: David Evans and Associates, Inc.
Survey Date: September 7, 2008

Depths were acquired with Multibeam Sonar. Depths are corrected using RTK GPS tides and should be considered preliminary.

Positions are referenced from contractor installed real-time kinematic GPS network and verified using the USCG DGPS beacon at Fort Stevens, Oregon.

Charts affected:
- 18525 35th Edition/June 7, 2008, 1:40,000 scale

The following item was found during hydrographic survey operations.

DANGER TO NAVIGATION #1 (depths adjusted to CRD)

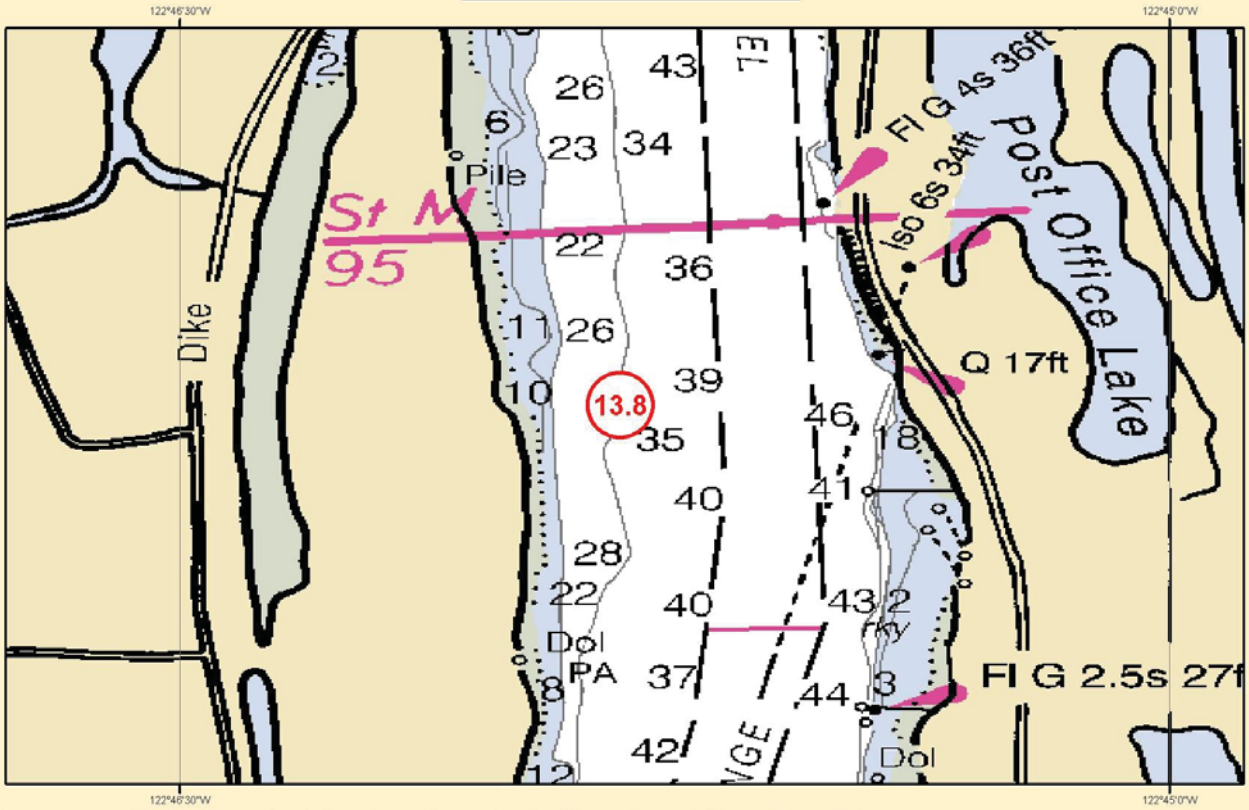
FEATURE	DEPTH (M)	DEPTH (FT)	LATITUDE (N)	LONGITUDE(W)
1 - OBSTRN	4.20	13.8	45/44/25.445N	122/45/49.551W

The obstruction is a large mound rising approximately 7.37m (24.2ft) above the natural bottom. The mound is located west of the navigation channel, however remains in a highly navigated area. It has approximate dimensions of 30m x 38m x 7.4 m.

Questions concerning this report should be directed to the Chief, Pacific Hydrographic Branch at (206) 525-6835.

1 - Danger To Navigation

DANGER TO NAVIGATION #1



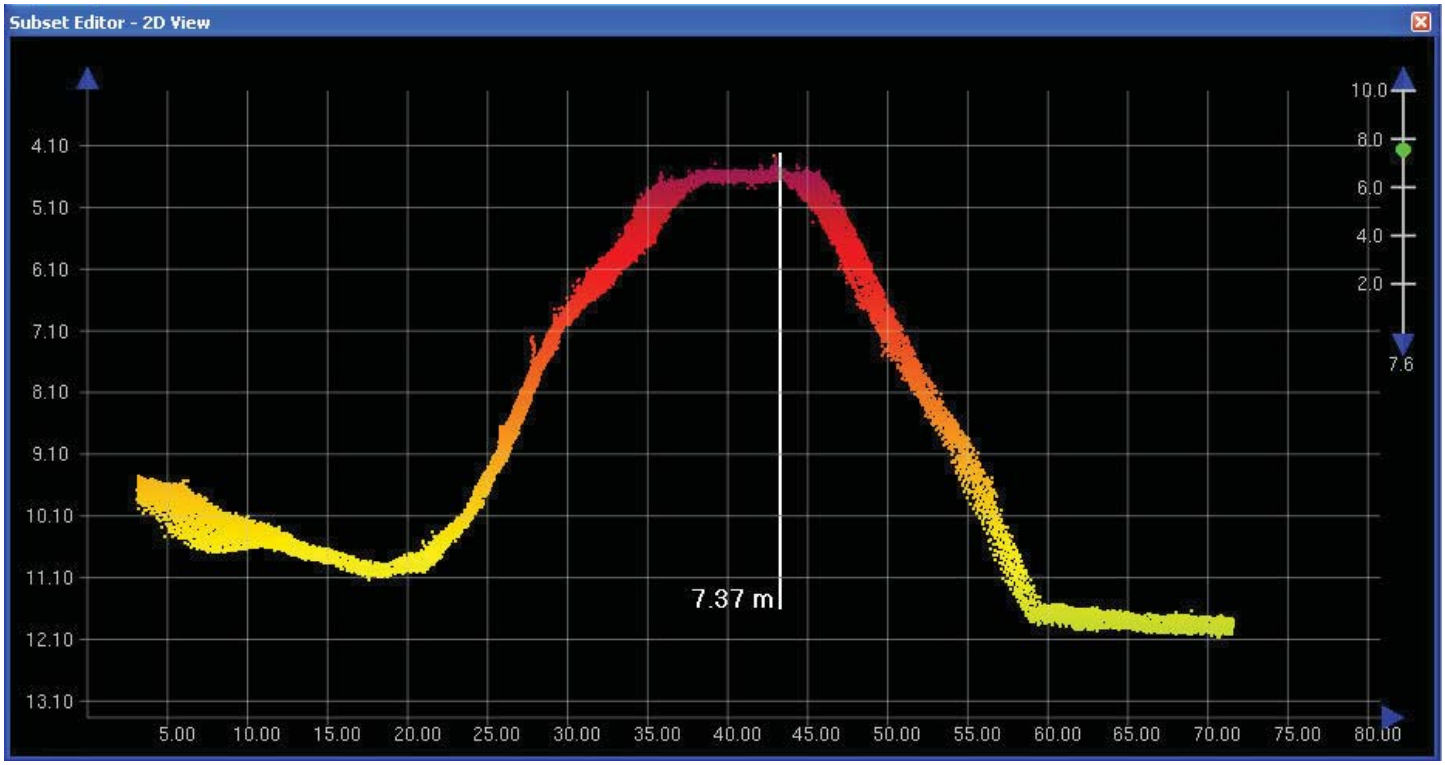
Large mound in highly navigated waters. Approximate dimensions of 30m x 38m x 7.4m

This chartlet has been corrected through Notice to Mariners dated June 7, 2008
NOT FOR NAVIGATION.

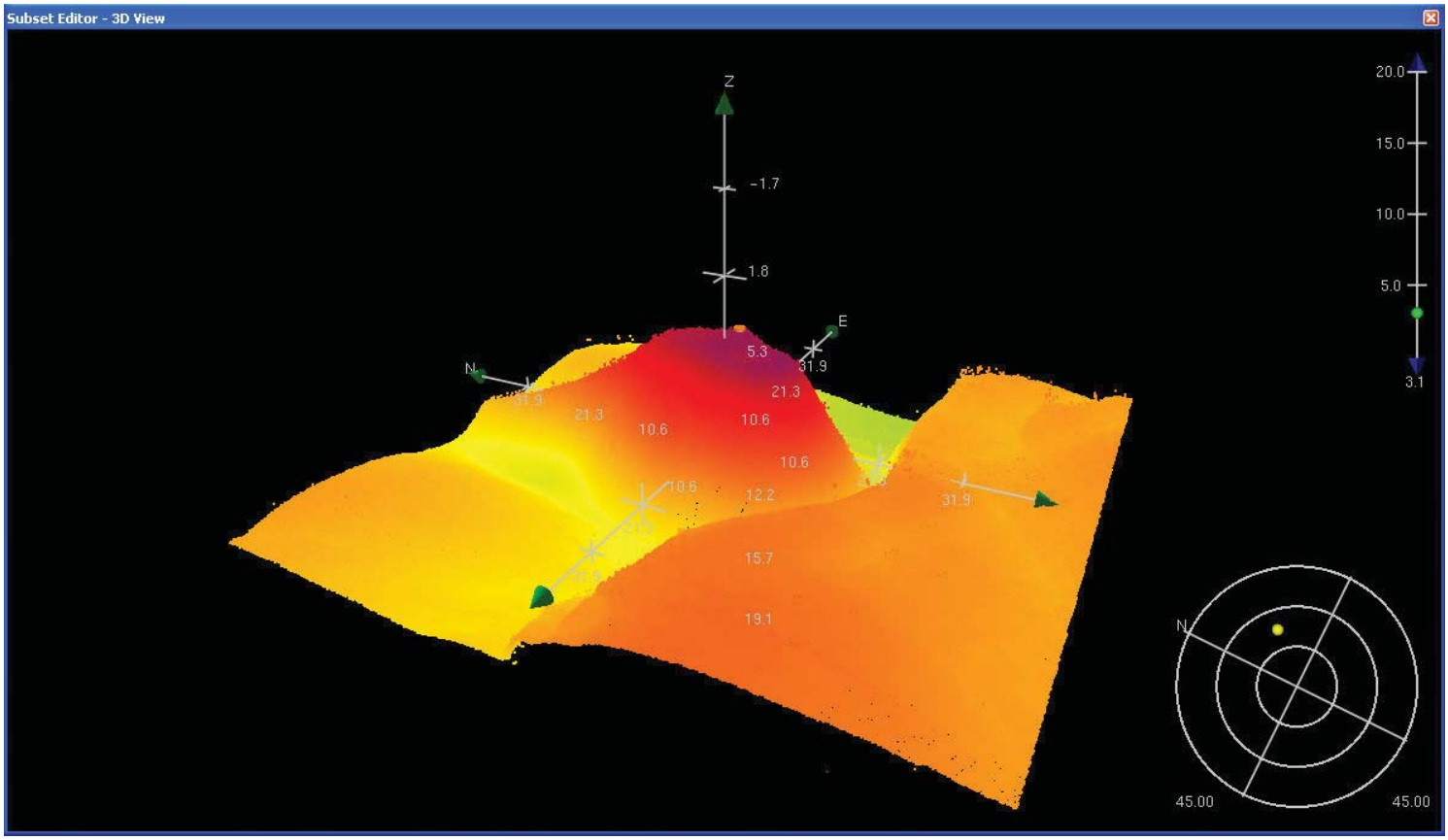
Chartlet 1 of 1

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE	Project: OPR-N388-KR-08 Survey: H11858 State: Oregon Locality: Columbia River Sub-Locality: Bachelor Island to Kelley Point Survey Scale: 1:10,000	Sounding Units: Feet Sounding Datum: Columbia River Horizontal Datum: NAD 83 Projection: UTM 10N Chart: 18525_1 Chart Edition: 35th Chart Scale: 1:40,000	David Evans and Associates, Inc. October 2, 2008

DTON 1.1 MBES 2D View



DTON 1.1 MBES 3D View



DANGER TO NAVIGATION 2

Jason Creech

From: Jason Creech
Sent: Tuesday, February 03, 2009 1:22 PM
To: Gary Nelson
Cc: 'Dave.Neander@noaa.gov'; 'Crescent.Moegling@noaa.gov'; Jon Dasler
Subject: H11858_DTON_2 Submission
Attachments: H11858_DTON_2.doc

Gary,

Attached is a Danger to Navigation report for H11858_DTON_2. The attached file includes the danger report, standard chartlet, and supporting images. Please let me know if you have any questions or require any additional information on this danger to navigation.

Thanks,
Jason

Jason Creech
Lead Hydrographer
David Evans and Associates, Inc.
(804) 516-7829

Danger to Navigation

Registry Number: H11585

State: Oregon

Locality: Columbia River

Sub-locality: Bachelor Island to Kelley Point

Project Number: OPR-N338-KR-08

Survey Date: 06/20/2008

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
18525	35th	07/01/2005	1:40,000 (18525_1)	[L]NTM: ?
18003	20th	11/01/2006	1:736,560 (18003_1)	[L]NTM: ?
18007	32nd	07/01/2005	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	Obstruction	6.34 m	45° 41' 18.7" N	122° 46' 13.0" W	---
1.2	Obstruction	6.24 m	45° 41' 12.7" N	122° 46' 13.4" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H11858_dtons.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 45° 41' 18.7" N, 122° 46' 13.0" W

Least Depth: 6.34 m (= 20.80 ft = 3.467 fm = 3 fm 2.80 ft)

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

Timestamp: 2008-172.21:15:14.000 (06/20/2008)

GP Dataset: H11858_dtons.xls

GP No.: 1

Charts Affected: 18525_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

OBSTRN. Vertical Datum: Columbia River Datum. The obstruction is a large cylindrical object with approximate dimensions of 12x3 meters. The obstruction rises approximately 2.2 meters off the bottom.

This feature was found during multibeam data acquisition. Depths are corrected using RTK GPS tides and should be considered preliminary.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11858_dtons.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Chart obstruction with a least depth of 21 ft.

Cartographically-Rounded Depth (Affected Charts):

21ft (18525_1)

3 ½fm (18003_1, 18007_1, 530_1)

6.3m (501_1, 50_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: QUASOU - 6:least depth known

RECDAT - 20080915

SORDAT - 9/15/2008

SORIND - US,US,surve,H11858

TECSOU - 3:found by multi-beam

VALSOU - 6.34 m

WATLEV - 3:always under water/submerged

1.2) GP No. - 2 from H11858_dtons.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 45° 41' 12.7" N, 122° 46' 13.4" W

Least Depth: 6.24 m (= 20.47 ft = 3.412 fm = 3 fm 2.47 ft)

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

Timestamp: 2008-172.21:15:14.000 (06/20/2008)

GP Dataset: H11858_dtons.xls

GP No.: 2

Charts Affected: 18525_1, 18003_1, 18007_1, 501_1, 530_1, 50_1

Remarks:

OBSTRN. Vertical Datum: Columbia River Datum. The obstruction is a large cylindrical object with approximate dimensions of 12x3 meters. The obstruction rises approximately 2.6 meters off the bottom.

This feature was found during multibeam data acquisition. Depths are corrected using RTK GPS tides and should be considered preliminary.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11858_dtons.xls	2	0.00	000.0	Primary

Hydrographer Recommendations

Chart obstruction with a least depth of 20 ft.

Cartographically-Rounded Depth (Affected Charts):

20ft (18525_1)

3 ¼fm (18003_1, 18007_1, 530_1)

6.2m (501_1, 50_1)

S-57 Data

Geo object 1: Obstruction (OBSTRN)

Attributes: QUASOU - 6:least depth known

RECDAT - 20080915

SORDAT - 20080915

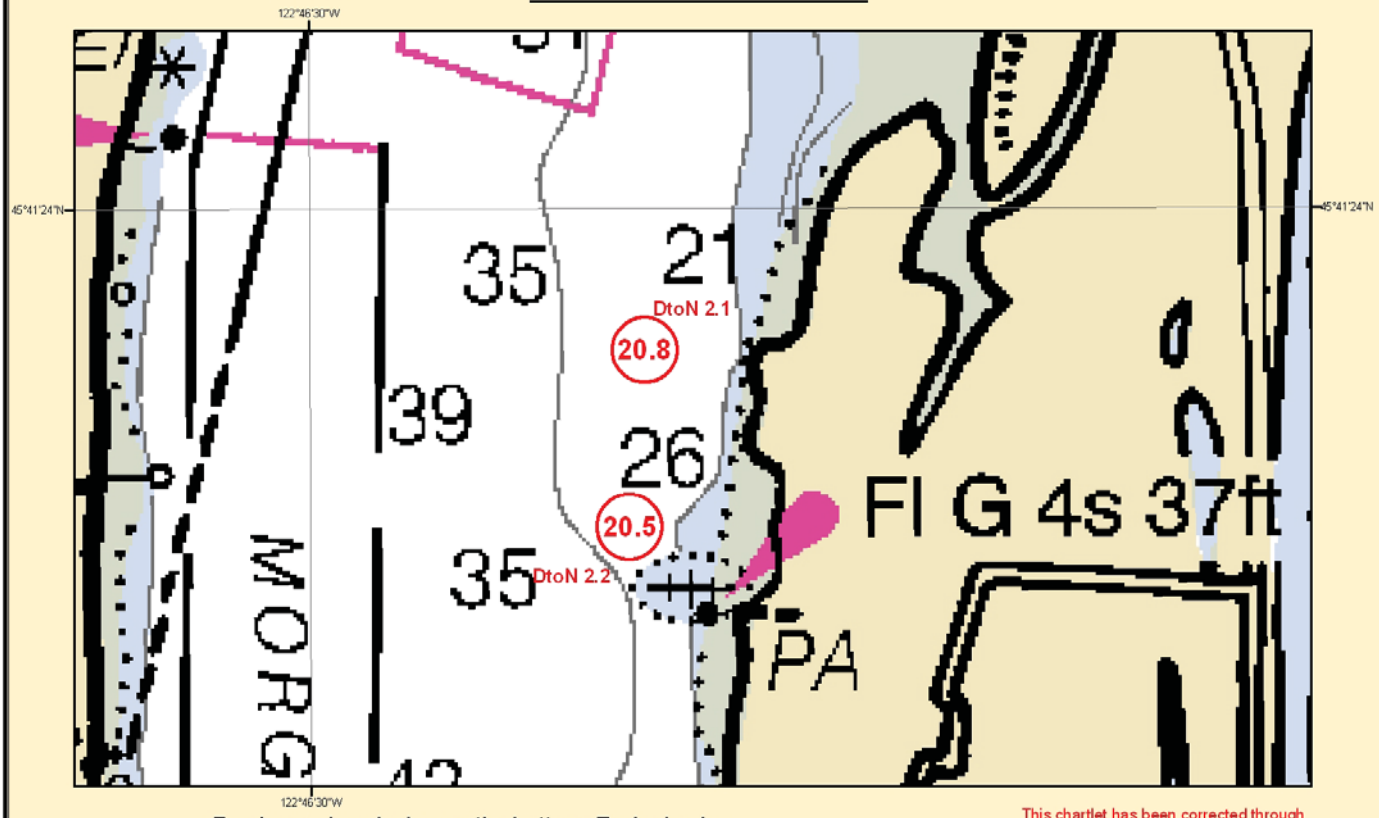
SORIND - US,US,surve,H11858

TECSOU - 3:found by multi-beam

VALSOU - 6.24 m

WATLEV - 3:always under water/submerged

DANGER TO NAVIGATION #2



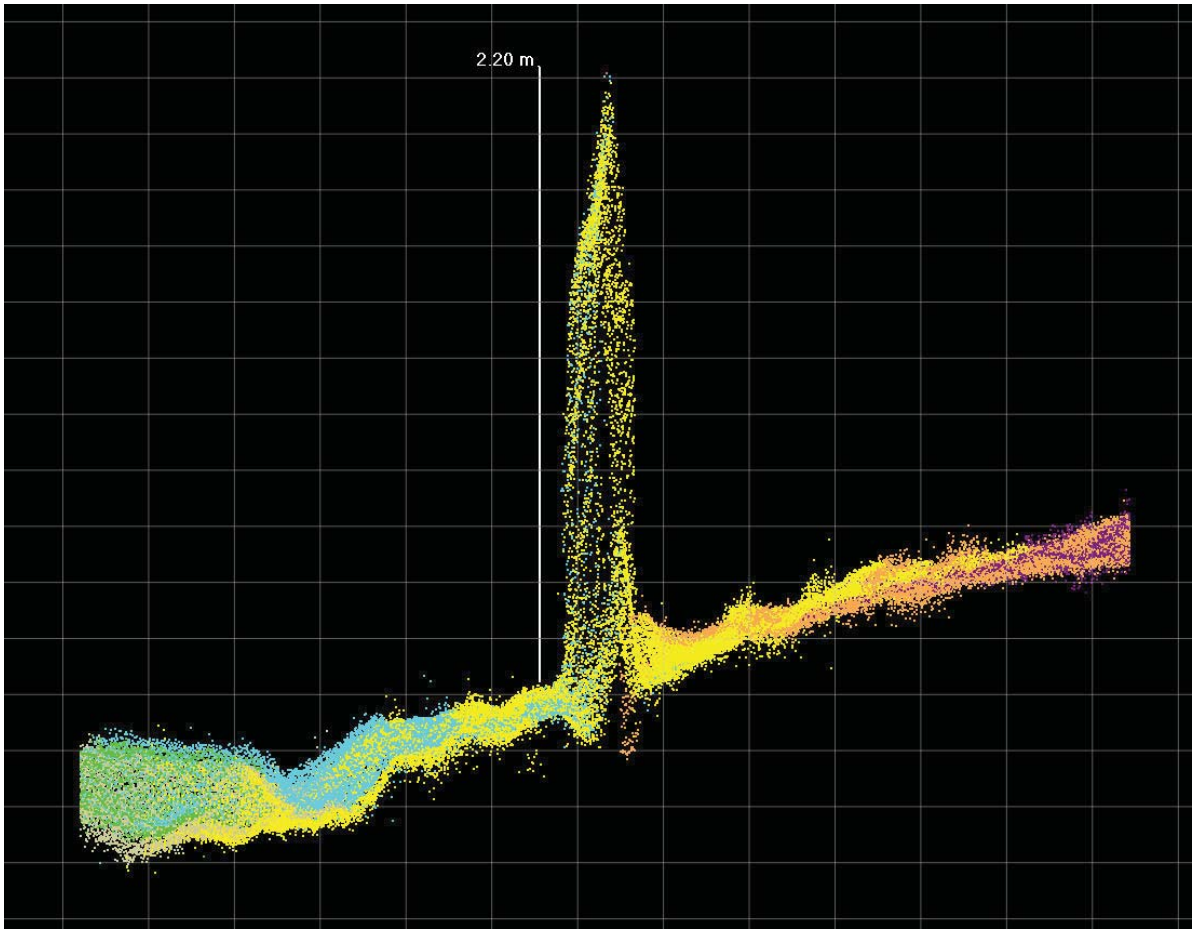
Two large pipes laying on the bottom. Each pipe has approximate dimensions of 12m x 3m x 2m .

This chartlet has been corrected through Notice to Mariners dated December 20, 2008
NOT FOR NAVIGATION.

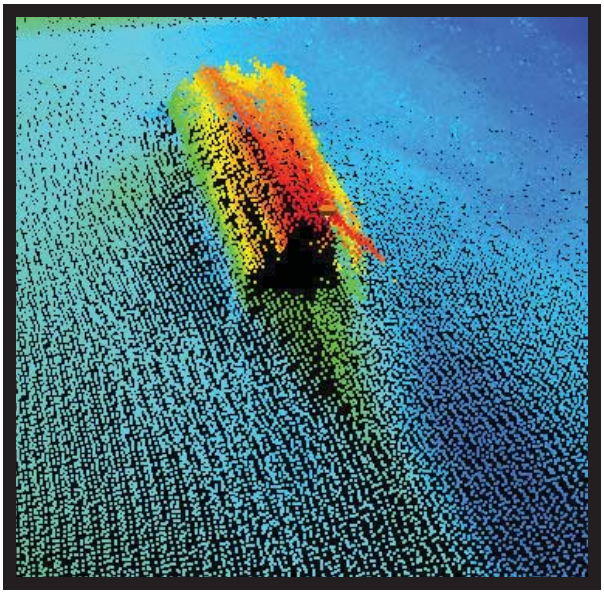
Chartlet 1 of 1

	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE	Project: OPR-N388-KR-08 Survey: H11858 State: Oregon Locality: Columbia River Sub-Locality: Bachelor Island to Kelley Point Survey Scale: 1:10,000	Sounding Units: Feet Sounding Datum: Columbia River Horizontal Datum: NAD 83 Projection: UTM 10N Chart: 18525_1 Chart Edition: 35th Chart Scale: 1:40,000	David Evans and Associates, Inc. January 22, 2009

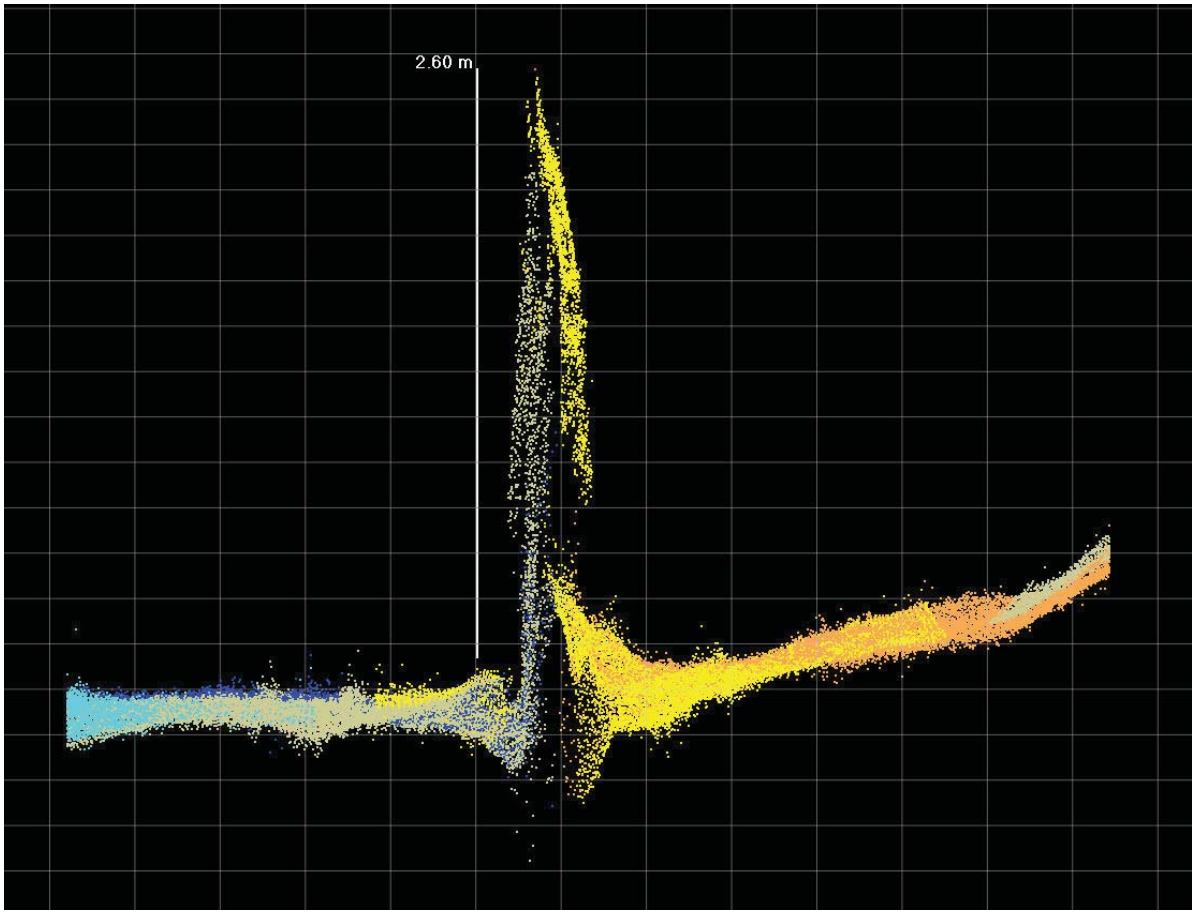
DTON 2.1 MBES 2D View



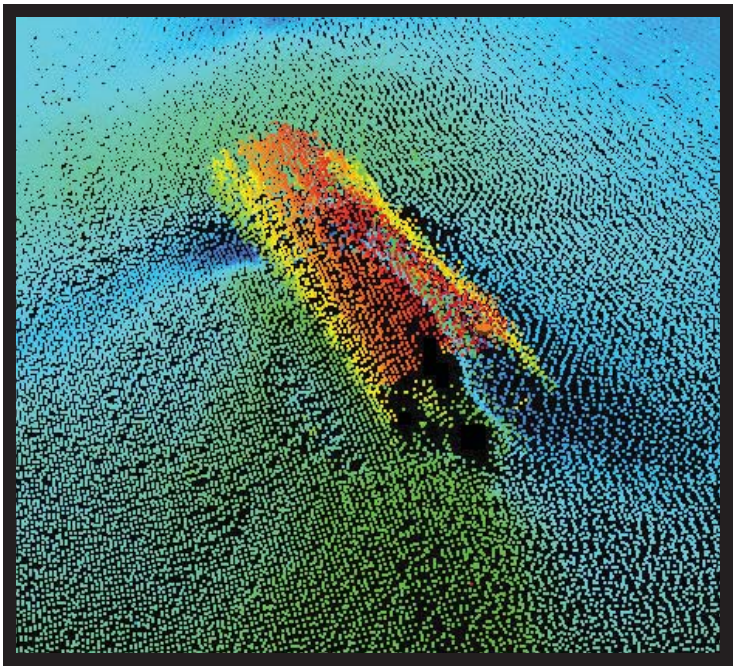
DTON 2.1 MBES 3D View



DTON 2.2 MBES 2D View



DTON 2.2 MBES 3D View



APPENDIX II
SURVEY FEATURE REPORT

Registry Number: H11855
State: Oregon
Locality: Columbia River
Sub-locality: Wallace Island to Walker Island
Project Number: OPR-N338-KR-08
Survey Date: September 5, 2008 – February 18, 2009

List of Features

List of Figures

AWOIS # 53028

REPORTED

FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53028	100m	45/41/10.2	122/46/9.8

SURVEYED

FEATURE	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
	7.24m	45/41/10.648	122/46/11.922

Remarks:
Charted wreck (AWOIS 53028) at 045/41/10.2N, 122/46/9.8W was disproved with 100% shallow water multibeam. A debris field with a least depth of 16.8ft (5.11m) of was found within the AWOIS (Figure 1). Another singular item, not within the debris field, was found farther offshore with a least depth of 23.6ft (7.24m) at 45/41/10.648N and 122/46/11.922W (Figure 2). A large pipe (H11858 DtoN #2) was found 25m outside of the AWOIS radius.

Hydrographer Recommendation:
The hydrographer recommends removing the wreck annotation and updating the AWOIS database as disproved.

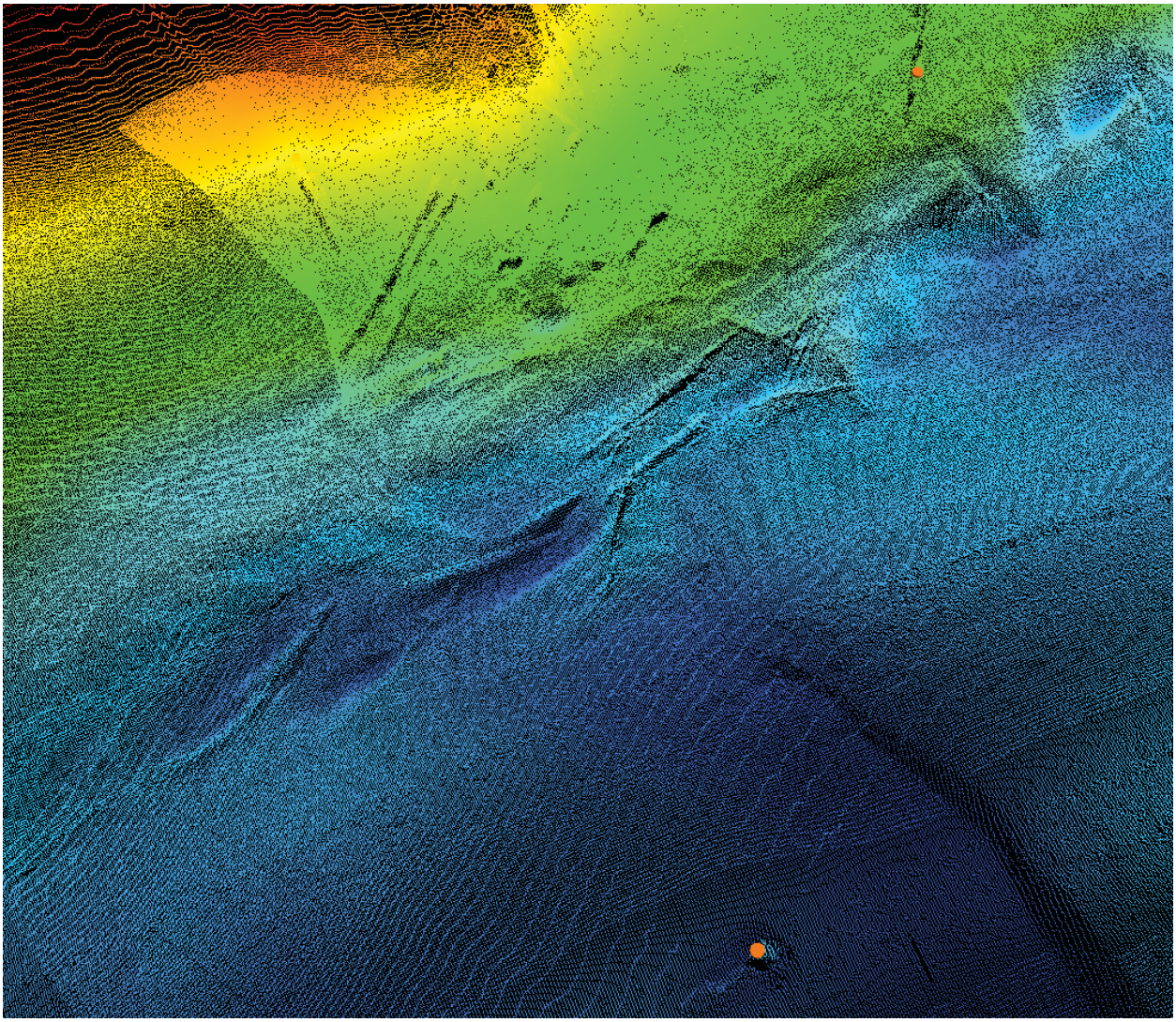


Figure 1 Debris Field and offshore, singular least depth

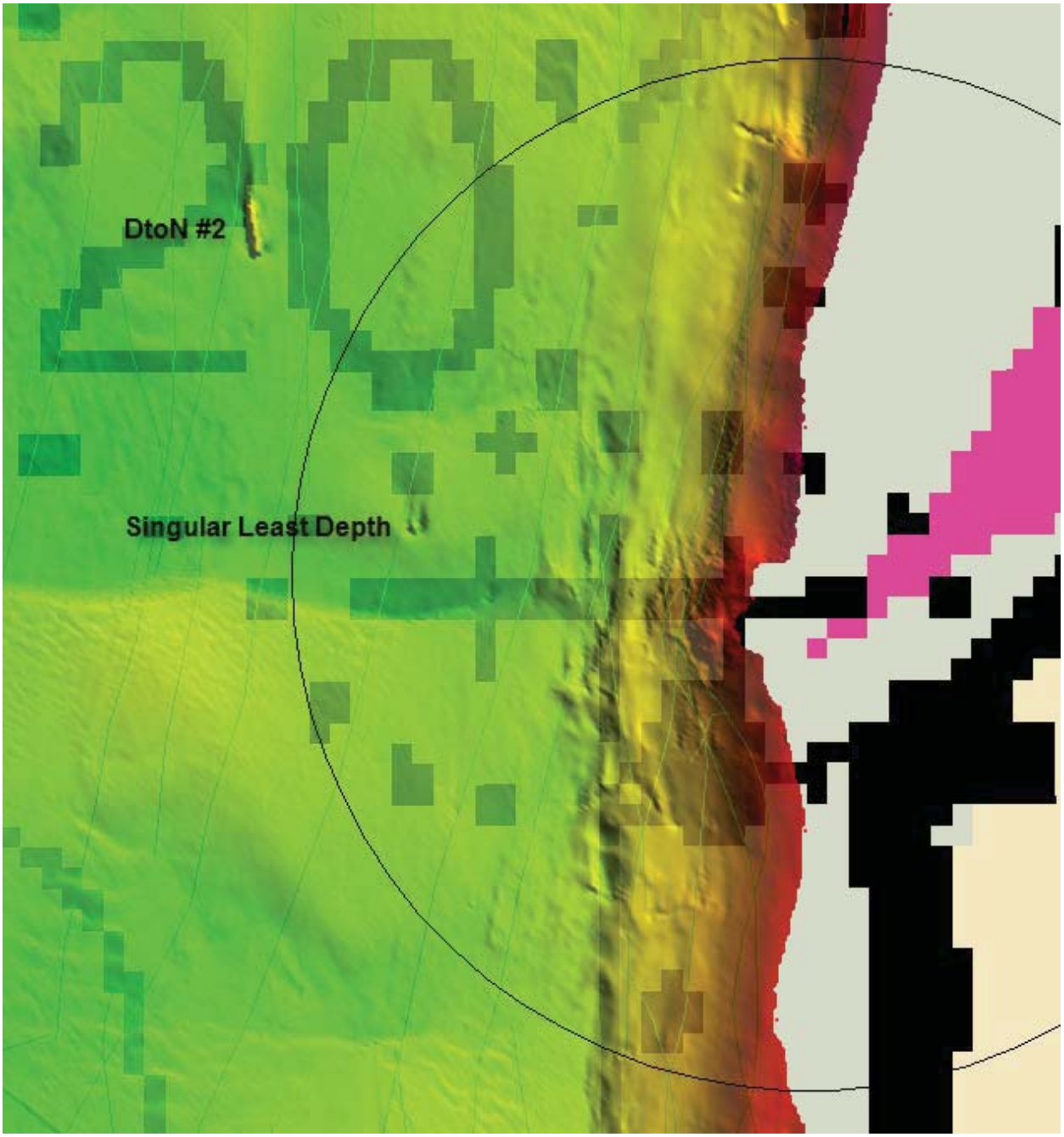


Figure 2 Chart 18525, AWOIS radius and MBES coverage

Appendix II
S-57 Features

OPR-N338-KR-08
H11858
Survey Features
BOYLAT

Disproved:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
45-42-38.343N	122-45-41.359W	--	--	Private aid not seen

OPR-N338-KR-08
H11858
Survey Features
MORFAC

Disproved:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
45-45-14.052	122-45-30.339	--	--	Dolphin must be outside of coverage. Disproved. Charted in wrong location.

OPR-N338-KR-08
H11858
Survey Features
OBSTRN

Disproved:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
45-40-03.998	122-46-21.940	--	--	Charted obstruction not found
45-40-03.940	122-46-21.064	--	--	Charted obstruction not found
45-39-57.701	122-46-20.336	--	--	Charted obstruction not found

New:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
--	--	45-41-18.699	122-46-12.990	DTON # 2.1 Large cylindrical object with approximate dimensions of 12m x 3m and rises approximately 2.2m off the natural bottom
--	--	45-41-12.702	122-46-13.399	DTON # 2.2 Large cylindrical object with approximate dimensions of 12m x 3m and rises approximately 2.6m off the natural bottom
--	--	45-44-25.445	122-45-49.551	DTON # 1.1 A large mound rising approximately 7.37m above the natural bottom with approximate dimensions of 30m x 38m.
--	--	45-49-28.798	122-47-44.077	Pointy obstruction in channel
--	--	45-47-21.617	122-46-31.886	Ruined pile dike
--	--	45-45-08.921	122-45-54.155	Mound >1m

OPR-N338-KR-08
H11858
Survey Features
PILPNT

Disproved:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
45-45-15.736N	122-45-58.950W	--	--	No pile seen. Even checked SSS backscatter

OPR-N338-KR-08
H11858
Survey Features
UWTROC

Disproved:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
45-41-29.241N	122-46-37.109W	--	--	Charted rock not found

OPR-N338-KR-08
H11858
Survey Features
WRECKS

Disproved:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
45-43-31.126	122-46-01.475	--	--	Charted wreck diproved. Wreck found 70m to north
45-46-29.724	122-46-28.775	--	--	Charted wreck not seen seen in MB data. Charted wreck not seen on shore by field crew. Disproved.
45-41-09.948	122-46-10.259	--	--	Charted wreck not found

New:

ENC Latitude (N)	ENC Longitude (W)	Surveyed Latitude (N)	Surveyed Longitude (W)	Remarks
--	--	45-40-04.822	122-46-23.023	New wreck found next to piledike
--	--	45-43-33.254	122-46-00.318	New wreck found 70m to north of AWOIS 53025

H11858 HCell Report

Katie Reser, Physical Scientist
Pacific Hydrographic Branch

Introduction

The primary purpose of the HCell is to provide new survey information in International Hydrographic Organization (IHO) format S-57 to update the largest scale ENC and RNC in the region: NOAA ENCs US5OR15M and US5OR14M, and NOAA RNCs 18526 and 18525.

HCell compilation of survey H11858 used Pacific Hydrographic Branch HCell Reference Guide Version 2.0-Draft.

1. Compilation Scale

Depths for HCell H11858 were compiled to the largest scale charts in the region, 18526 (59th Ed., June 2009, 1:20,000) and 18525 (36th Ed., April 2009, 1:40,000). The density and distribution of soundings from H11858 were selected to emulate the distribution on the charts. Non-bathymetric features have been generalized to chart scale.

2. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 0.5-meter combined surface, **H11858_Final_Combined_50cm**, in CARIS BASE Editor. A shoal-biased selection was made at 1:7,500 and 1:10,000 scale for the main chart areas using a Radius Table file with values shown in the table, below.

Upper limit (m)	Lower 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 and imported into a new layer created to accommodate chart and inset density depths. Manual selection was used to accomplish a density and distribution that closely represents the seafloor morphology.

3. 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 generalized metric and feet equivalent contour values are shown in the table below.

Chart Contours in Feet	Metric Equivalent of Chart Contours	Metric Equivalent of Chart Contours NOAA Rounded	Actual Value of Chart Contours
0	0.00	0.00	0.00
6	1.829	2.0574	6.75
12	3.658	3.8862	12.75
18	5.486	5.715	18.75
30	9.144	9.3726	30.75
60	18.288	18.5166	60.75

Contours delivered in the *_SS file have not been de-conflicted against shoreline features, soundings and hydrography as all other features in the *_CS file and soundings in the *_SS have been. This results in conflicts between the *_SS file contours and HCell features at or near the survey limits. HCell features should be honored over *_SS.000 file contours in all cases where conflicts are found.

4. Meta Areas

The following Meta object areas are included in HCell H11858:

M_QUAL
M_CSCL

Meta area objects were constructed on the basis of the limits of the hydrography. Due to the complexity of the extents generated during contour creation from the **H11858_Final_Combined_50cm** surface, the limits of the coverage area were derived from a combination of auto-generating from the surface and extensive node filtering.

5. Features

Shoreline features for H11858 were delivered from the field in one S-57 file defining new features and modification to GC or charted features. The features included in the HCell were de-conflicted against the chart and hydrography during office processing.

There were three DTONs identified during H11858. All reported DTONs have been charted and all are included in the HCell.

There are nine AWOIS items in the limits of H11858. Only one AWOIS item was assigned and formally investigated. A second AWOIS item was not formally addressed; however, enough information was obtained to recommend the database be updated. There was not enough information to update the remaining seven AWOIS items in the survey area.

Fourteen bottom samples were collected during H11858 and all are included in the HCell. No charted bottom samples were retained.

The source of all features included in the H11858 HCell can be determined by the SORIND field.

6. S-57 Objects and Attributes

The *_CS HCell contains the following Objects:

SOUNDG	Chart scale soundings
OBSTRN	Foul ground and obstructions
WRECKS	Wreck
PILPNT	Piles
SBDARE	Bottom samples
M_QUAL	Data quality meta object
M_CSCL	Compilation scale meta object
$CSYMB	Blue notes

The *_SS HCell contains the following Objects:

SOUNDG	Soundings at the survey scale density
DEPCNT	NOAA rounded contours at chart scale intervals

All S-57 Feature Objects in the *_CS HCell have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with current guidance and the PHB HCell Reference Guide.

7. Blue Notes

Notes to the RNC and ENC chart compilers are included in the HCell as $CSYMB features with the blue note information and charting disposition located in the NINFOM field.

8. Spatial Framework

8.1 Coordinate System

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

8.2 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 CRD and heights on islets above MHW are typically measured with range finder, and therefore have lower precision. 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

Conversion to charting units and application of NOAA rounding is completed in the same step, at the end of the HCell compilation process.

Conversion to feet charting units with NOAA rounding ensures that:

- All depths display as whole feet.
- All height units (HUNI) which have been converted to charting units, and that are 2.0 feet above MHW and greater, are shown in feet.

9. Data Processing Notes

9.1 Junctions

H11858 junctions with surveys H11857 and H11859. H11857 has already been compiled and a junction was made between the surveys. A common junction will be made with survey H11859 when it is compiled.

9.2 Conflicts between Shoreline and Hydrography

There are instances of charted shoreline in conflict with hydrography. These were examined using the highest resolution Surfaces. Conflicts were given a blue note with a recommendation to adjust the charted shoreline using the new survey data.

10. QA/QC and ENC Validation Checks

H11858 was subjected to QA checks in S-57 Composer prior to exporting to the HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to a 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 have been approved by MCD as inherent to and acceptable for HCells.

11. Products

11.1 HSD, MCD and CGTP Deliverables

- H11858 Base Cell File, Chart Units, Soundings compiled to 1:20,000 and 1:40,000
- H11858 Base Cell File, Chart Units, Soundings compiled to 1:7,500 and 1:10,000
- H11858 Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
- H11858 Survey Outline to populate SURDEX

11.2 File Naming Conventions

- Chart units base cell file, chart scale soundings H11858_CS.000
- Chart units base cell file, survey scale soundings H11858_SS.000
- Descriptive Report package H11858_DR.pdf
- Survey outline H11858_Outline.gml & *xsd

11.3 Software

CARIS HIPS Ver. 6.1	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.2	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. 2.0	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	Validation of the base cell file.
Northport Systems, Inc., Fugawi Marine ENC Ver.3.1.0.435	Independent inspection of final HCells using a COTS viewer.

12. Contacts

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

Katie Reser, Physical Scientist, PHB, Seattle, WA; 206-526-6864;
Katie.Reser@noaa.gov.

APPROVAL SHEET
H11858

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

Katie Reser
2010.06.02
09:14:20 -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.

Sarah Wolfskehl
2010.06.02
11:13:00 -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.

Gary C. Nelson
2010.06.02
12:43:47
-07'00'