H12050

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.

Registry No. H12050

LOCALITY

State Washington

General Locality Approaches to Puget Sound

Sublocality Tatsolo Point to Hyde Point

2009

CHIEF OF PARTY

Donald L. Brouillette

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28
(11-72)

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

HYDROGRAPHIC TITLE SHEET

REGISTER NO.

H12050

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: Washington

General Locality: Approaches to Puget Sound

Sublocality: Tatsolo Point to Hyde Point

Scale: 1:10,000

Date of Survey: 08/15/2009 - 10/10/2009

Instructions Dated: 6/26/2009

Project No.: OPR-N360-KR-09

Vessel: M/V Defender IV(1154554), M/V Beaver(1054456)

Chief of Party: Donald L. Brouillette

Surveyed by: B.Bunge, B.Heather, K.Fankhauser, C.Pinero, R. White, J.Deming, D. Moore, T.Jamison

Soundings taken by echo sounder: Reson SeaBat 8101, Kongsberg EM 3002

Graphic record scaled by: N/A

Graphic record checked by: N/A

SAR by: J.Tegeder

Automated plot by: N/A

Compilation by: R. Davies

Soundings in: Fathoms at MLLW

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.

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/.

A. AREA SURVEYED

Williamson & Associates, Inc. conducted a hydrographic survey in the southern section of Puget Sound between Anderson Island and Steilacoom, WA. The sub-locality of this survey is described as Tatsolo Point to Hyde Point (Fig. 1 Sheet A). The survey encompassed an area of approximately 10.25 square nautical miles and was assigned registry number H12050 and designated as Sheet "A". It is bound by the coordinates listed in Table 1.

Project instructions required complete MBES in areas greater than 4 meters, and bottom samples at a 1200 - 2000 meter grid spacing (depth dependent). The depth range encountered in this area was -0.43 to 97.27 fathoms. Total cross-line length surveyed for task order OPR-N360-KR-09 was 36.59 nautical miles or 5.43 percent of the total main scheme nautical miles. Data acquisition was conducted from 15 August 2009 (Julian Day 227) to 10 October 2009 (Julian Day 283).

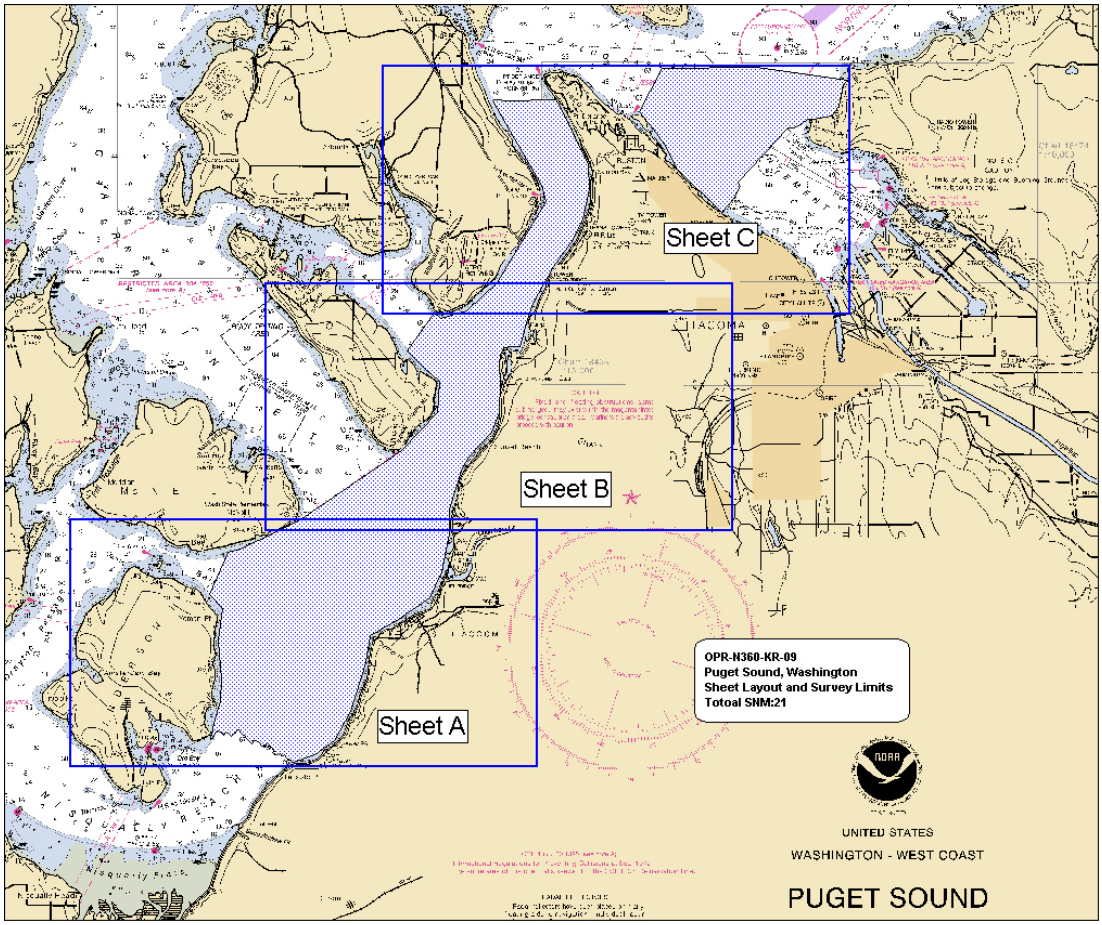


Figure 1: H12050 Sheet A

Table 1 – Sheet Bounds

Point	Latitude (North)	Longitude (West)
1	47° 11’ 59.251”	122° 43’ 54.0192”
2	47° 08’ 1.8132”	122° 43’ 54.0192”
3	47° 08’ 1.8132”	122° 32’ 59.7948”
4	47° 11’ 59.251”	122° 32’ 59.7948”
5	47° 11’ 59.251”	122° 43’ 54.0192”

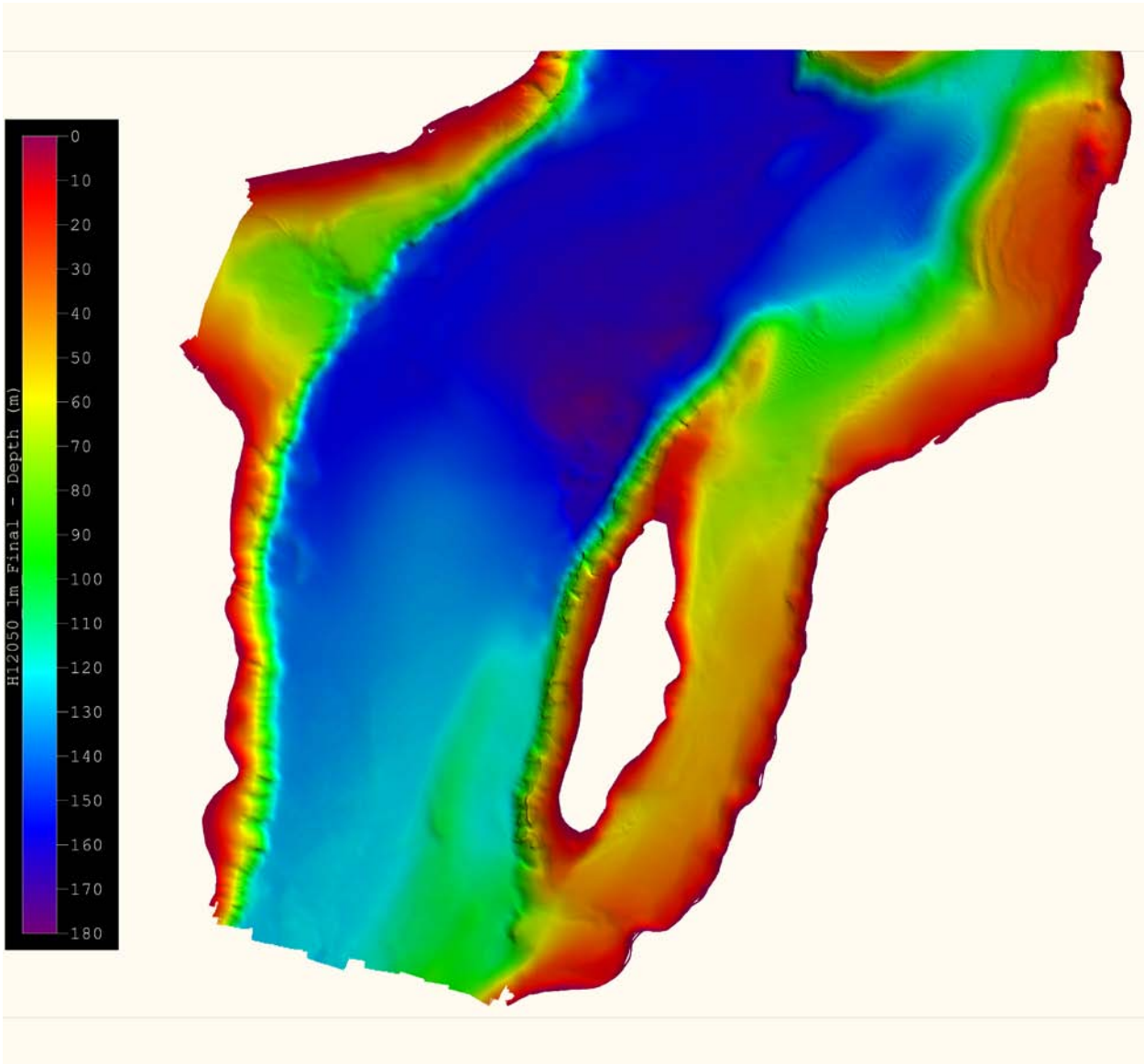


Figure 2: H12050 Surveyed Surface

B. DATA ACQUISITION AND PROCESSING

Refer to the OPR-N360-KR-09 Data Acquisition and Processing Report [1] for a detailed description of all equipment, survey vessels, processing procedures and quality control features. Items specific to this survey and any deviations from the Data Acquisition and Processing Report

are discussed in the following sections.

B1. Equipment & Vessels

The marine vessels Defender IV and Beaver acquired all multibeam data for H12050.

The Defender IV is an aluminum catamaran built by Kvichak Marine Industries. It is 54 feet in length with a 20 foot beam. It has a large aft deck with an A-Frame and Davit. A Reson 8101 was pole mounted to the port side of the defender for this project.

The M/V beaver is a 30 foot vessel with a 10 foot beam. Powering the Beaver is a 300 HP Cummins 6BTA 5.9 Marine Diesel Engine. There is a large aft deck and room in the cabin for two sonar operators and the captain. The Beaver has a top speed of 26 kts and a service speed up to 22 Kts.

B2. Quality Control

B2.a Crosslines

Quality control cross-lines were planned so that most main scheme lines would intersect with at least one cross-line, they were well distributed geographically, and that total cross-line nautical miles ran would total 5 % of the main scheme nautical miles.

Total cross-line length surveyed for task order OPR-N360-KR-09 was 36.59 nautical miles or 5.43 percent of the total main scheme nautical miles. All cross-lines were compared to the mainline BASE surface (CUBE Edited in IVS Fledermaus), using the CARIS HIPS QC report routine and the vast majority of beams passed at 95 percent confidence level or better (*see below*).

BASE Surface QC Report:

Sheet: H12050
Error values from: Uncertainty.
Number of nodes processed: 8,815,292
Number of nodes populated: 8,536,868 (96.8415793827363%)
S-44 Order 1:
Range: -1.0 to 100.0
Number of nodes considered: 3,680,759
Number of nodes within: 3,680,759 (100.0%)
Residual mean: -0.669024140289118
S-44 Order 2:
Range: 100.0 to 5000.0
Number of nodes considered: 4,856,109
Number of nodes within: 4,856,109 (100.0%)
Residual mean: -3.24043104017419

Nadir to nadir comparisons in CARIS Subset Editor were also completed to ensure accuracy. This process (comprised of selecting main scheme lines and cross-lines) aimed to calculate the

standard deviations of the difference in depth and the overall offset in depth at each cross-line/main scheme line intersection (*see below*). See also DR Separate 4 for spreadsheet analysis.

Table 2:
Sheet: H12050

Overall Depth (m) Std Dev	Overall Depth (m) Offset Average
0.178	0.125

B2.b Uncertainty Values

The finalized BASE uncertainty surfaces were split into resolutions based of depth according to the National Ocean Surveys (NOS) *Hydrographic Surveys Specifications and Deliverables* or the HSSD (April 2008). The calculated uncertainty values of all nodes in the finalized Uncertainty BASE surfaces (using only soundings that have been CUBE filtered in Fledermaus within IHO order 1 specifications, any max uncertainty measurements exceeding IHO Order 1 specifications are due to the tidal uncertainty values and are explained in section B.2. Unusual Conditions, the BASE surfaces are still within the 95% confidence level for IHO Order 1) are as follows:

Table 3:
Uncertainty Values for Sheet H12050

Depth Range (m)	Resolution (m)	Min Uncertainty (m)	Max Uncertainty (m)
0-23	1	0.458	0.518
20-52	2	0.469	0.646
46-115	4	0.470	0.652
103-350	8	0.473	0.606

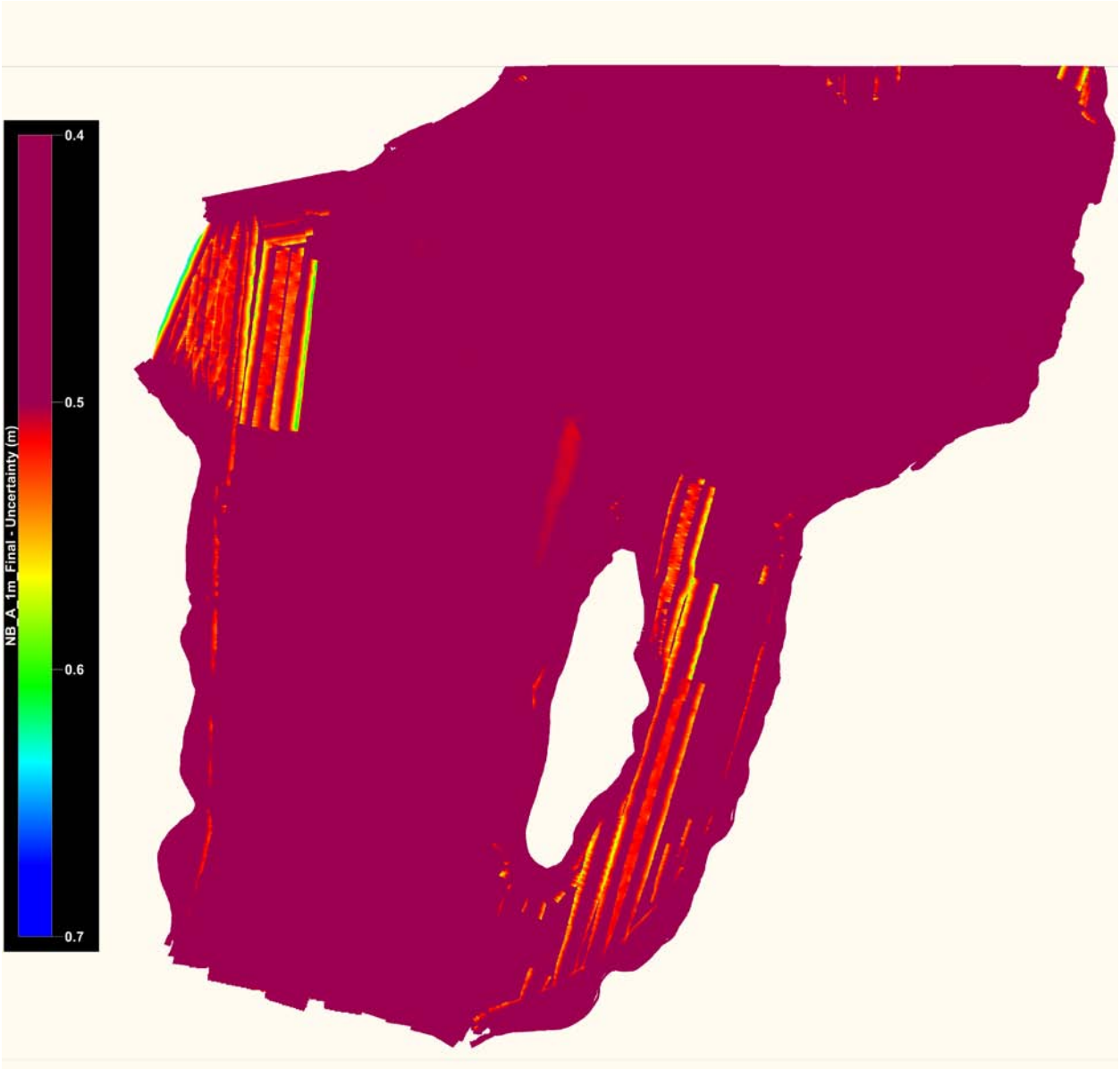


Figure 3: Uncertainty Surface H12050

B2.c Junctions

Comparisons with prior surveys were not required under the task order OPR-N360-KR-09. However comparisons were made in the southern portion of H12050 to check accuracy with neighboring survey data obtained from the NOAA website. These junction comparisons are as follows: [2]

Figure 4: H12050 Junction with contemporary survey data

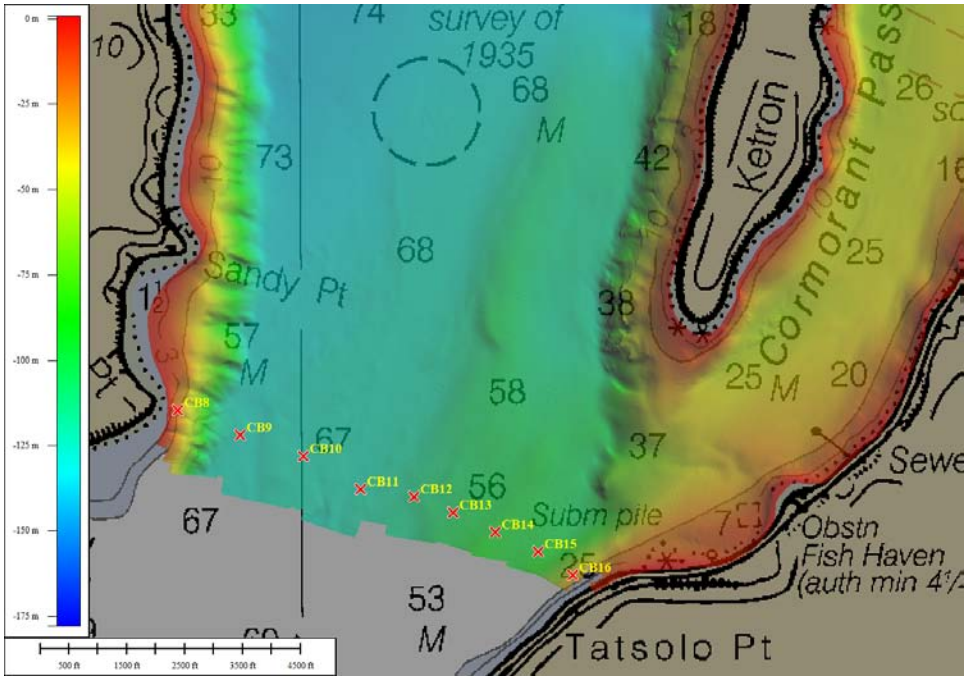


Table 4: Spot Analysis correlating with figure 4 (above)

Point ID	x (easting)	y (northing)	N360 Depth	NOAA Depth	Difference	REGISTRY #
CB8	524631.657	5221107.878	21.109	23.561	-2.452	11042
CB9	524957.828	5220977.410	125.343	126.009	-0.666	11042
CB10	525290.522	5220866.512	124.045	125.138	-1.093	11042
CB11	525591.012	5220689.625	122.348	123.727	-1.379	11042
CB12	525871.825	5220652.536	113.263	114.151	-0.888	11042
CB13	526078.460	5220569.529	104.883	105.820	-0.937	11042
CB14	526299.225	5220467.094	94.356	94.412	-0.056	11042
CB15	526523.522	5220364.659	94.612	94.860	-0.248	11042
CB16	526707.198	5220238.382	41.044	41.654	-0.610	11042

B2.d Quality Control Checks

Positioning system confidence checks were conducted on a daily basis using QINSy's real time alert display. The alert display has numerous real-time displays that were monitored throughout the survey to ensure the positional accuracies, specified in the NOS Hydrographic Surveys Specifications and Deliverables (HSSD) were achieved. The figure below shows a confidence check done during post processing. Two separate DGPS computations were used using the same GPS antenna to show that they were within 5 meters of each other.

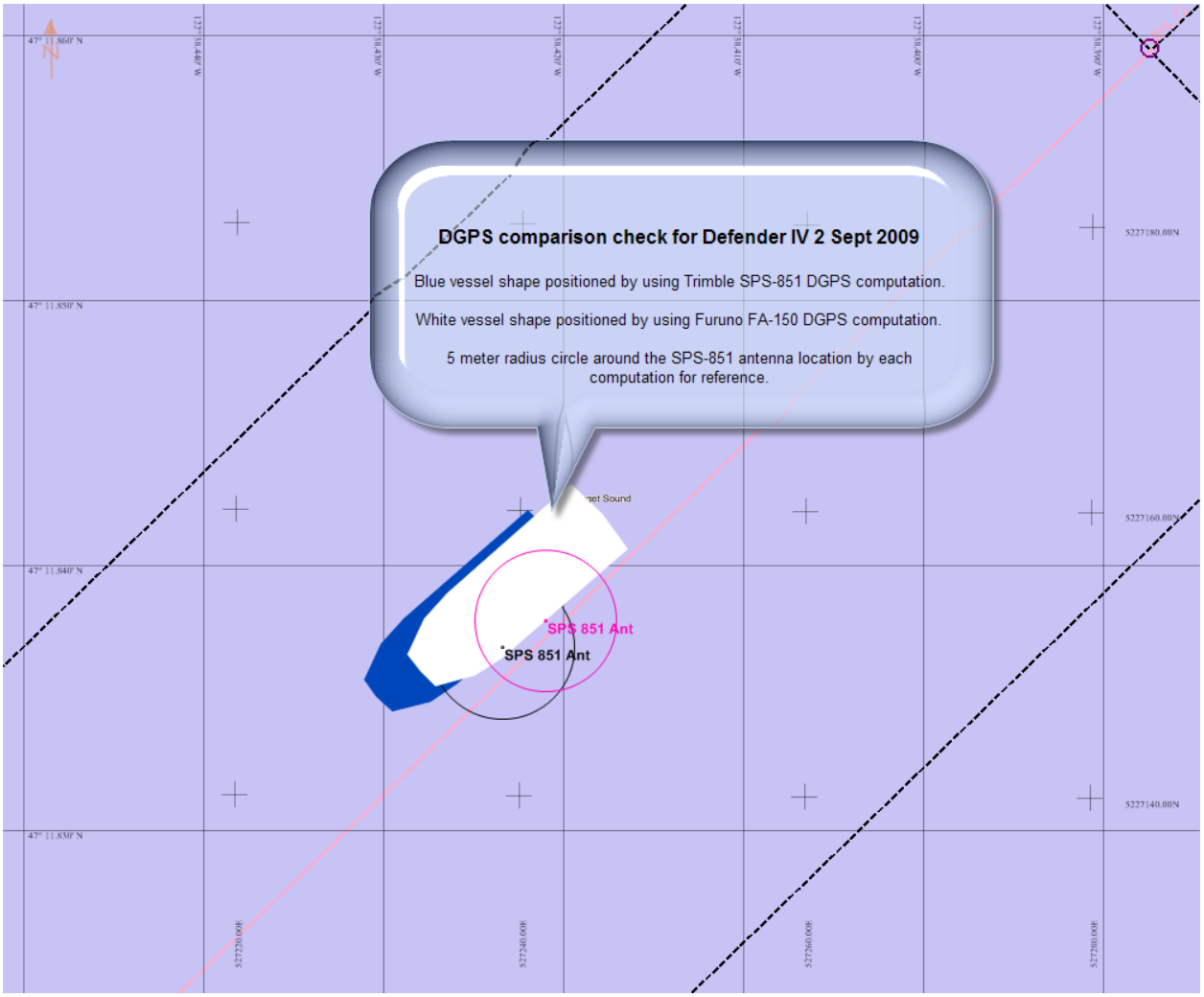


Figure 5: Position Check

B2.e Data Quality

In general, the multibeam data quality for H12050 was good. Notable problems follow:

Unusual conditions were observed in H12050 in the form of (1) vertical uncertainty due to irregular tidal fluctuations, (2) current turbidity and (3) Sub-Aquatic Vegetation (SAV).[3]

1. The Puget Sound is highly dynamic when it comes to water level predictions and observations. There are a multitude of factors represented in a large scale consideration of affects. (a) The Seattle Tacoma area is renowned for having high variability concerning low or high pressure and weather systems passing through. Storm surges can easily result causing vertical building of the water column that can last from hours to days throughout the whole of Puget Sound. (b) Smaller scale surges can occur in areas of restricted water flow during periods of high wind velocities, such as the survey area included in task order OPR-N360-KR-09. These smaller surge areas are not always located near a tidal gauge and cannot be accurately account for by a static zoning file. For example the TPU Values delivered by JOA Tides (0.1m measured and 0.2m zone) greatly increased our max values for uncertainty. The max uncertainty for the 1 meter resolution surfaces alone changed an average of 25 cm once the TPU was computed. Surface nodes that exceed IHO Order 1 were kept in for coverage purposes and represent the areas with high SAV concentrations or a tidal offset. "*Estimates for typical errors associated with tidal zoning are 0.20 m at the 95% confidence level. However, errors for this component can easily exceed 0.20 m if tidal characteristics are very complex, or not well-defined, and if there are pronounced deferential effects of meteorology on the water levels across the survey area*"(HSSD, April 2008); as the HSSD states our uncertainty in this highly diverse area is highly variable. (c) The survey areas defined by this task order also has a relatively wider variation in water level due to its distance from the oceanic source, increasing current velocity as well.

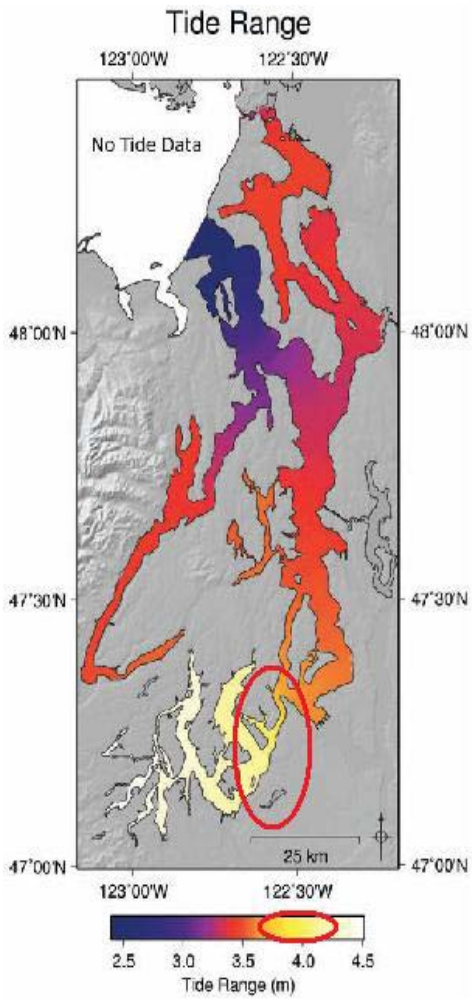


Figure 6:

Tidal range(mean higher high water–mean lower low water) for Puget Sound and Hood Canal interpolated from the Puget Sound Tide Channel Model. Red circles represent the survey areas defined by task order OPR-N360-KR-09.

Figure courtesy of Finlayson, D. (2006).

Finlayson, D. 2006. The geomorphology of Puget Sound beaches. Puget Sound Nearshore Partnership Report No. 2006-02. Published by Washington Sea Grant Program, University of Washington, Seattle, Washington.

Data courtesy of Mofjeld et al. (2002).

Mofjeld, H.O., A.J. Venturato, V.V. Titov, F.I. Gonzoález, and J.C. Newman. 2002. Tidal datum distributions in Puget Sound, Washington, based on a tide model. NOAA Tech. Memo. OAR PMEL-122. NOAA, Pacific Marine Environmental Laboratory. Seattle.

2. Currents in the Puget Sound can be violent, reaching speeds of 4-5 kts in areas. Current turbidity was visibly evident in many locations of the survey area. Problematic areas included (a) the northern and southern portions of Ketron Island where the tidal current is split and bottle-necked through Cormorant Passage. (b) Toliva Shoal in the northern are of Sheet H12050 causes a vertical bottle-neck and results in surging of the water level. This was evident while evaluating infill lines since the charting of shoals required the use of both vessels (M/V Beaver and M/V Defender IV). Some near shore and shoal areas produced vertical offsets ranging from 10-40 cm, where data from other deeper or less dynamic areas match perfectly. This occurred because of the difference in the time of acquisition and the tidal current influence of the water level in these areas. These areas produced higher vertical uncertainty values than deep central channel areas.

3. Sub-aquatic Vegetation (SAV) is present in all survey areas and is somewhat distinguishable from the benthic surface. [4] High precautions were taken not to edit out possible DTONs in these areas. Most of the SAV was left in the BASE and CUBE surfaces for coverage purposes and any DTONS present were assessed and reported according to the guidance set forth by the HSSD (April 2008).

B2.f Object Detection

Shallow water multibeam data were acquired for least depth determination on significant contacts. Sounding designation was completed using 50 to 25 cm resolution depending on the presence of SAV. Designated sounding procedures followed those set forth by the National Ocean Surveys (NOS) *Hydrographic Surveys Specifications and Deliverables* (April 2008).

B3. Corrections to Echo Soundings

Refer to the OPR-N360-KR-09 Data Acquisition and Processing Report for a detailed description of all corrections to echo soundings. No deviations from the DAPR occurred.

B3.a Additional Calibration Tests

Post of the initial MB Calibration for the M/V Beaver (EM 3002), 4 extra calibrations were performed. These calibrations are detailed in the OPR-N360-KR-09 DAPR, submitted under a separate cover.

Post of the initial MB Calibration for the M/V Defender IV(Reson 8101), daily calibration lines were run to determine the accuracy of the roll offset due to the Reson mounting pole configuration. These calibrations are detailed in the OPR-N360-KR-09 DAPR, submitted under a separate cover.

B4. Data Processing

Uncertainty BASE surfaces were built with sounding data that has been CUBE filtered to IHO Order 1 specifications. This was done in IVS Fledermaus 6.7. Finalized surfaces were built with the Data Range Resolutions set forth in the National Ocean Surveys (NOS) *Hydrographic Surveys Specifications and Deliverables* (April 2008). All BASE surfaces built from CUBE edited soundings have been included with the digital data. Details on CUBE editing procedures can be found in the OPR-N360-KR-09 DAPR, submitted under a separate cover.

The final S57 file for this project is called "H12050.000". This file contains the object and metadata S57 objects as required in the Specifications and Deliverables.[5]

C. VERTICAL AND HORIZONTAL CONTROL

Refer to the OPR-N360-KR-09 Horizontal and Vertical Control Report [6] for a detailed description of the horizontal and vertical control used on this survey. No deviations from the report occurred.

C1. Horizontal Control

The horizontal control datum for this survey was the North American Datum of 1983 (NAD83).

A combination of WAAS and USCG corrections were used for real-time DGPS corrections. This position was later corrected for offsets to the MBES sonar by CARIS HIPS in processing.

C2. Vertical Control

All sounding data were initially reduced to MLLW using predicted tidal data from the Yoman Point tide station (9446705). Predicted tides were used only for preliminary data cleaning.

Final tidal corrections were generated using the final tides from the Yoman Point tide station.

D. RESULTS AND RECOMMENDATIONS

H12050 survey data was compared to:

RNC Number	Scale	Edition	Edition Date	Corrected Through
18448	1:80,000	34th	July 2006	10/20/2009

ENC Number	Edition	Update Application Date	Issue Date
US4WA10M	7	11/03/2009	11/03/2009

D1. Comparison of Soundings

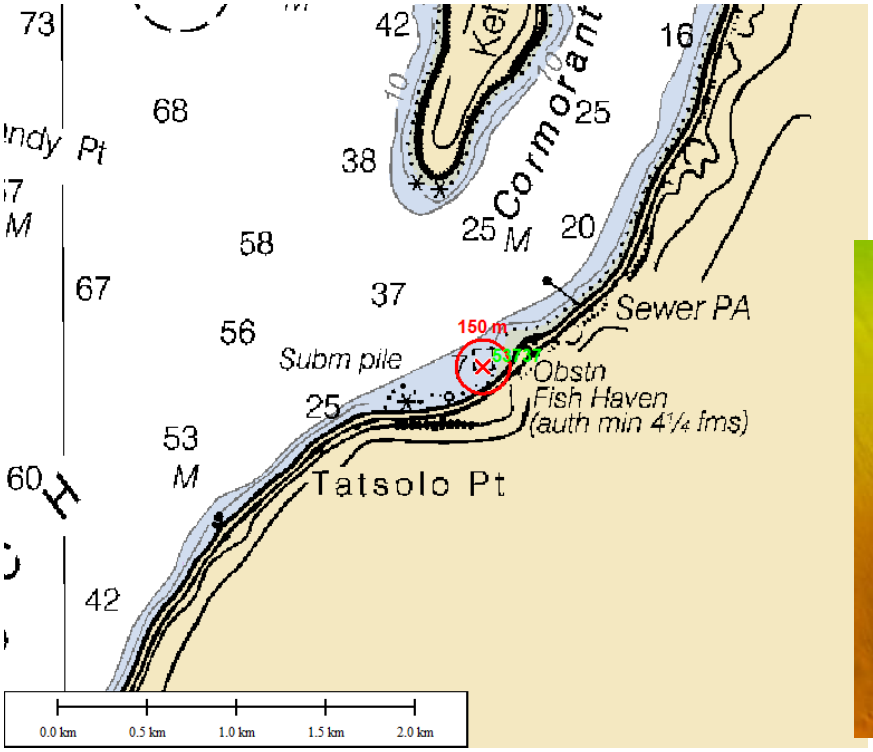
Charted soundings were compared with the surveyed data. In general, charted soundings in areas with little relief were very similar to the surveyed depths. Charted soundings on or very near slopes may be 10 or more fathoms off of the surveyed depths. These differences may be due to changes in surface since the last survey or less accurate positioning and measurements during the previous survey. The Hydrographer recommends all surveyed depths supersede previously charted soundings.[7] For more information see Appendix I.

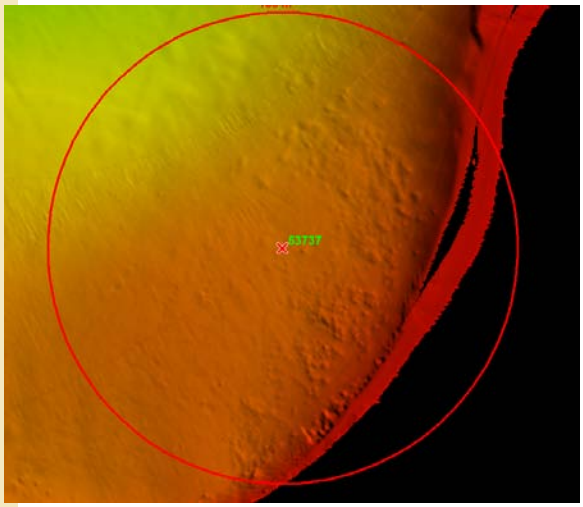
D2. AWOIS

AWOIS # 53737

REPORTED

FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53737	150m	47 8 15.29	122 38 8.4





Remarks:

The charted Obstruction Fish Haven falls within the charted bounds.

Hydrographer Recommendation:
The Hydrographer recommends expanding the Obstruction Fish Haven annotation and symbol to include the entire bounds of the obstruction on all applicable charts and updating the AWOIS database with the current position of the obstruction. [8]

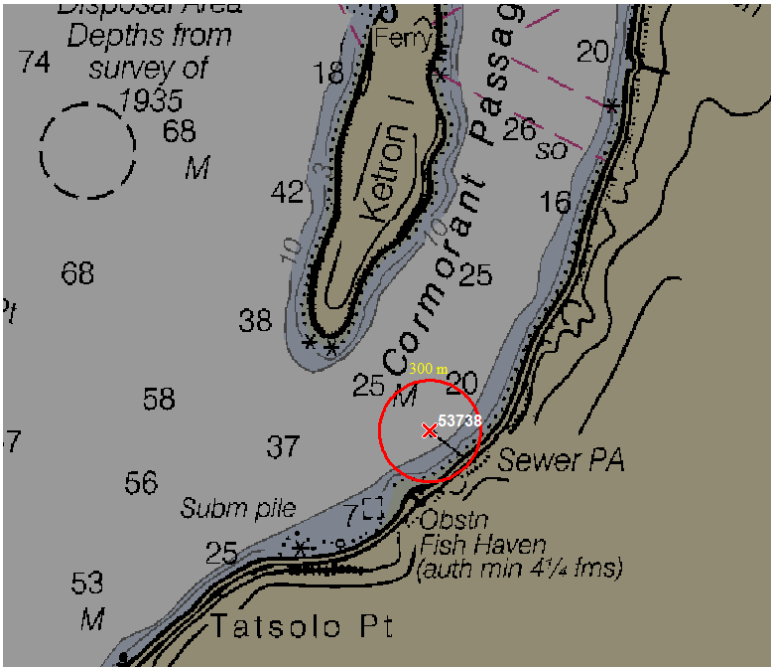
AWOIS # 53738

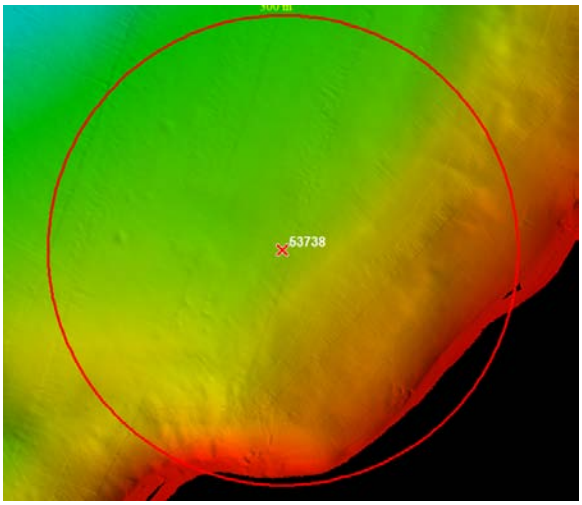
REPORTED

FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53738	150m	47 8 31.37	122 37 52.1

Remarks:
Construction of outfall sewer for final effluent discharge from Chambers Creek Basin Wastewater Treatment Plant. Position scaled from outer most NW face of the symbol which reaches 250m into shore. Charted as Sewer PA. There is no evidence in the MBES dataset to indicate an outfall exists onsite. The outfall could be buried under sediment.

Hydrographer Recommendation:
The Hydrographer recommends retaining the Sewer (PA) annotation and symbol on all applicable charts. [9]





AWOIS # 53736

REPORTED

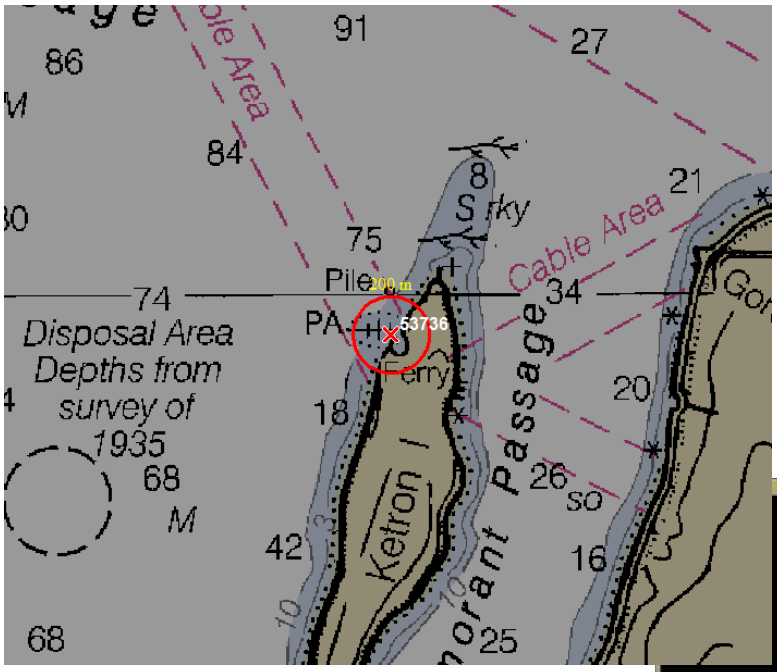
FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53736	200m	47 9 53.3	122 38 5.01

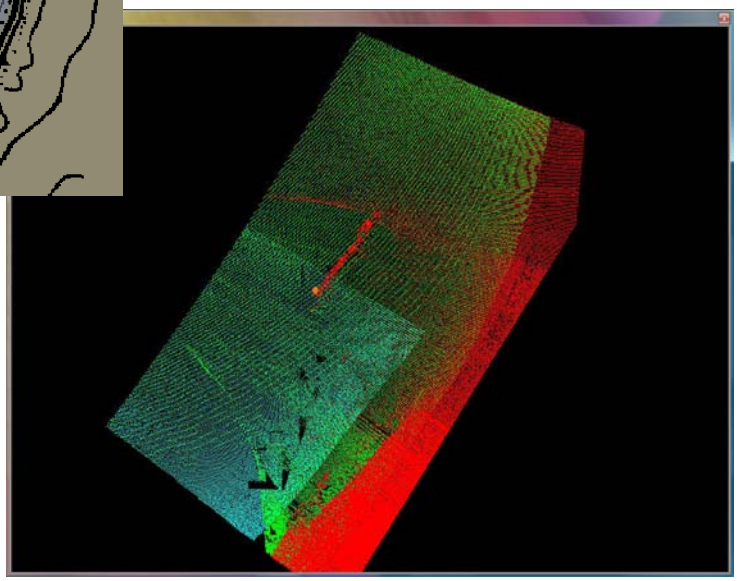
SURVEYED

FEATURE	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
Located	11.108m	47 09 53.187	122 38 06.90

Remarks:
There is little physical evidence of the charted Wreck (PA) in the MBES dataset. The position (PA) of the wreck is located dangerously close to the shoreline, MBES data was acquired as close to the shore as safely possible. The MBES data did produce evidence upon further investigation in the approximate area of the wreck.

Hydrographer Recommendation:
The Hydrographer recommends removing the wreck (PA) annotation and symbol from all applicable charts and updating the AWOIS database with the current position of the wreck. [10]

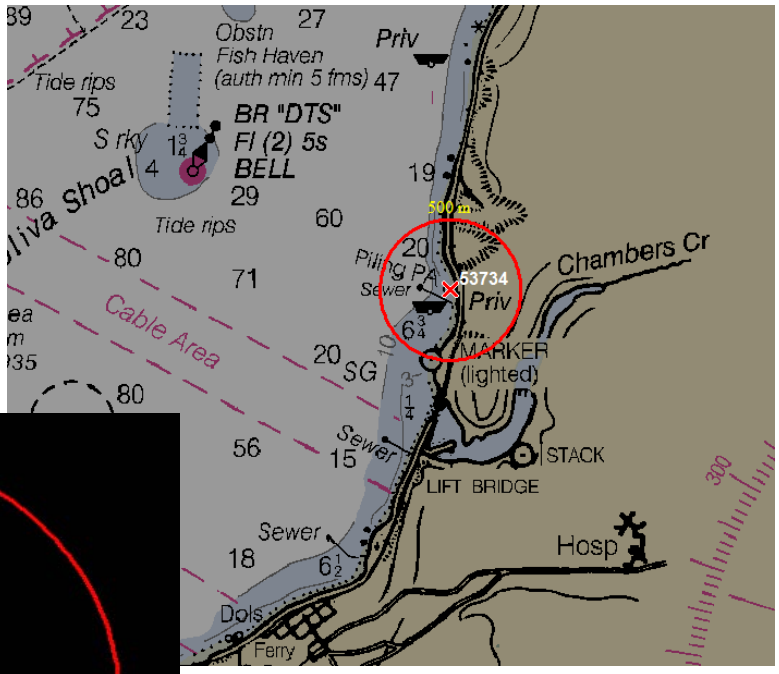


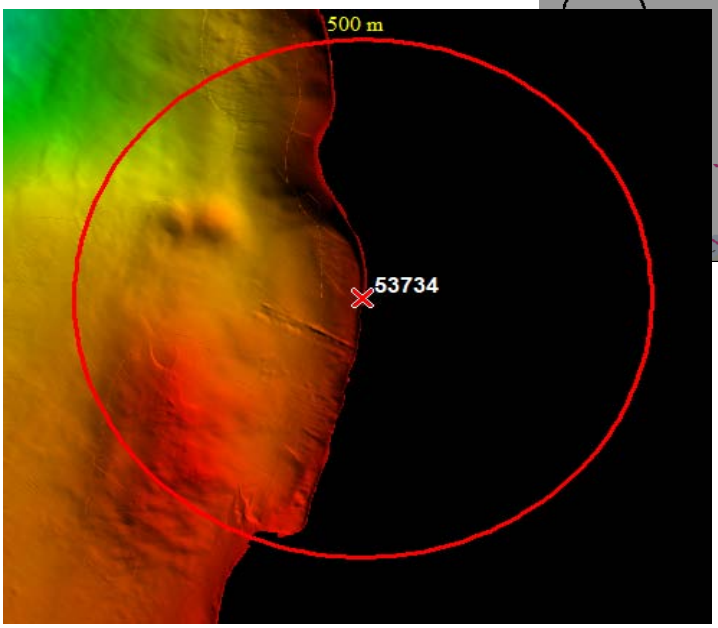


AWOIS # 53734
REPORTED

FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53734	150m	47 11 41.3	122 34 58.41

Remarks:
There is no physical evidence of the charted Piling (PA) in the MBES dataset. The position (PA) of the piling is located dangerously close to the shoreline, MBES data was acquired as close to the shore as safely possible.
Hydrographer Recommendation:
The Hydrographer recommends retaining the Piling (PA) annotation and symbol on all applicable charts. [11]





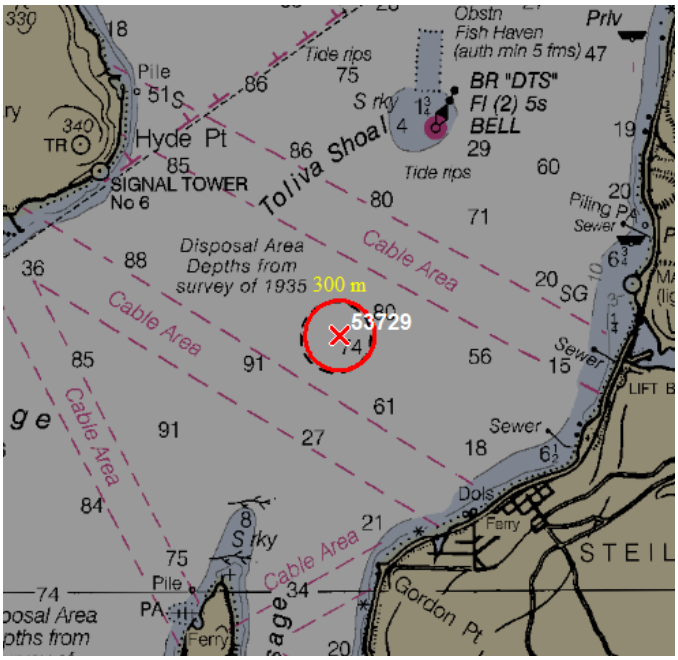
AWOIS # 53729

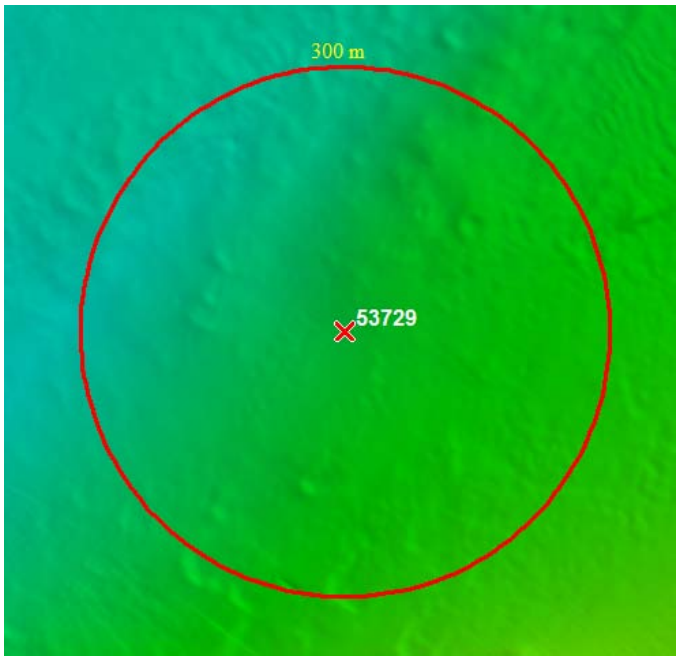
REPORTED

FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53729	300m	47 11 11.3	122 37 4.41

Remarks:
Steilacoom Disposal Site, MBES bathymetry indicates no evidence of hazardous debris.

Hydrographer Recommendation:
The Hydrographer recommends retaining the Disposal Area annotation and symbol on all applicable charts. [12]





D3. Charted Features

Sewer outfall at 47° 08' 07.96324" N, 122° 38' 19.09303" W (RNC 18440, ENC US4WA10M) was not found to exist. The Hydrographer recommends removing this from the chart. [13]

The UWTROC at 47° 09' 33.41525" N, 122° 37' 00.21746" W (RNC 18440, ENC US4WA10M) was not found to exist. The Hydrographer recommends removing this from the chart. [14]

The UWTROC at 47° 09' 56.36741" N, 122° 36' 55.53991" W (RNC 18440, ENC US4WA10M) was not found to exist. The Hydrographer recommends removing this from the chart. [15]

The UWTROC at 47° 10' 16.50465" N, 122° 36' 32.78238" W (RNC 18440, ENC US4WA10M) was not found to exist. The Hydrographer recommends removing this from the chart. [16]

The uncharted shoal at 47° 11' 30.55695" N, 122° 35' 12.32933" W (RNC 18440, ENC US4WA10M) was found to exist. The Hydrographer recommends adding this to the chart. [17]

D4. Dangers to Navigation

No dangers to navigation were found during the survey H12050. [18]

D5. Bottom Samples

Six (6) bottom samples were obtained and are included in the S-57 attributed feature file in the S-57 Feature File folder. [19] A table listing the position and description of each bottom sample is included in Appendix III, along with photographs of each sample.

D6. Aids to Navigation

The following aids to navigation were examined during this survey:

Private MORFAC at 47° 08' 4.3810" N, 122° 38' 49.3171" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [20]

Private MORFAC at 47° 08' 5.6718" N, 122° 38' 46.2644" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [21]

Private MORFAC at 47° 08' 6.0895" N, 122° 38' 45.4049" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [22]

Private MORFAC at 47° 08' 7.5322" N, 122° 38' 41.7270" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [23]

Private MORFAC at 47° 08' 37.7932" N 122° 38' 26.9727" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [24]

Private BCNSPP at 47° 09' 56.4277" N 122° 38' 4.0658" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [25]

Private MORFAC at 47° 09' 43.4434" N 122° 37' 43.7715" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [26]

Private MORFAC at 47° 09' 44.2647" N, 122° 37' 43.5923" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [27]

Private MORFAC 47° 10' 24.4366" N, 122° 36' 11.5405" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [28]

Private MORFAC at 47° 10' 24.3774" N, 122° 36' 10.2307" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [29]

Private MORFAC at 47° 11' 39.3980" N, 122° 35' 7.2863" W (RNC 18440, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends adding this to the chart. [30]

E. Approval Sheet

REGISTRY NUMBER H12050

This report and the accompanying digital data are respectfully submitted.

Field operations contributing to the accomplishment of survey H12050 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and smooth sheet have been closely reviewed and are considered complete and adequate as per the Statement of Work.

WILLIAMSON AND ASSOCIATES, INCORPORATED

Donald L. Brouillette

Digitally signed by Donald L. Brouillette
DN: cn=Donald L. Brouillette, o=WASSOC, ou=Survey, email=dbrouillette@wassoc.com, c=US
Date: 2010.01.22 13:29:45 -08'00'

Donald L. Brouillette

Hydrographer

Williamson & Associates, Incorporated

22 January 2010

Revisions Compiled During Office Processing and Certification:

[1] Filed with the project records
[2] Survey H12050 junctions H12051 to the north. A junction was made between these two surveys.
[3] Data are acceptable for charting
[4] Retain all grass and kelp in the survey area. The hydrographer did not identify or make a charting recommendation on specific areas of grass, therefore a general note could be placed on the chart indicating that grass is located near shore throughout the survey area.
[5] The file was used in the creation of H12050_CS.000
[6] Filed with the project records.
[7] Concur with clarification, except where mentioned in this report.
[8] Do not concur, retain Fish Haven as charted. There was no indication that the Fish Haven be revised.
[9] Concur
[10] Concur
[11] Concur
[12] Concur and change charted note to *Disposal Area Depths from survey of 2009*.
[13] Do not concur; evidence of the outfall does exist. Reposition outfall as found on this survey.
[14] Concur
[15] Concur
[16] Concur
[17] Concur with clarification, chart a rock with a least depth of five feet and chart this area as a rocky seabed area as shown on this HCell.
[18] Do not concur, six dangers were submitted by the field, all but one was found to be insignificant while being reviewed in the office. The one danger to navigation was forward to the USCG and MCD, see attached report. The one danger which was submitted is a five foot submerged rock at latitude 47/11/30.56N, longitude 122/35/12.33W.
[19] These six bottom samples area included in the HCell.
[20] Concur, chart dolphin at end of pier with a red light, private aid.
[21] Concur, chart dolphin at middle of the pier with a red light, private aid.
[22] Concur, chart dolphin at middle of the pier with a red light, private aid.
[23] Concur, chart dolphin at end of pier with a red light, private aid.
[24] Concur, chart private mooring buoy at the survey position.
[25] Concur chart pile at survey position
[26] Concur, chart dolphin at survey position.
[27] Concur, chart dolphin at survey position.
[28] Do not concur, retain charted dolphin at latitude 47/10/21.7N, longitude 122/36/10/6W.
[29] Do not concur, retain charted dolphin at latitude 47/10/21.1N, longitude 122/36/13.8W.
[30] Concur, chart mooring buoy at survey position.

REPORT OF DANGERS TO NAVIGATION

Hydrographic Survey Registry Number: H12050

Survey Title: State: Washington
Locality: Puget Sound
Sub-Locality: Tatsolo Pt to Hyde Pt

Project Number: OPR-N360-KR-09
Survey Dates: August 30, 2009 – October 9, 2009

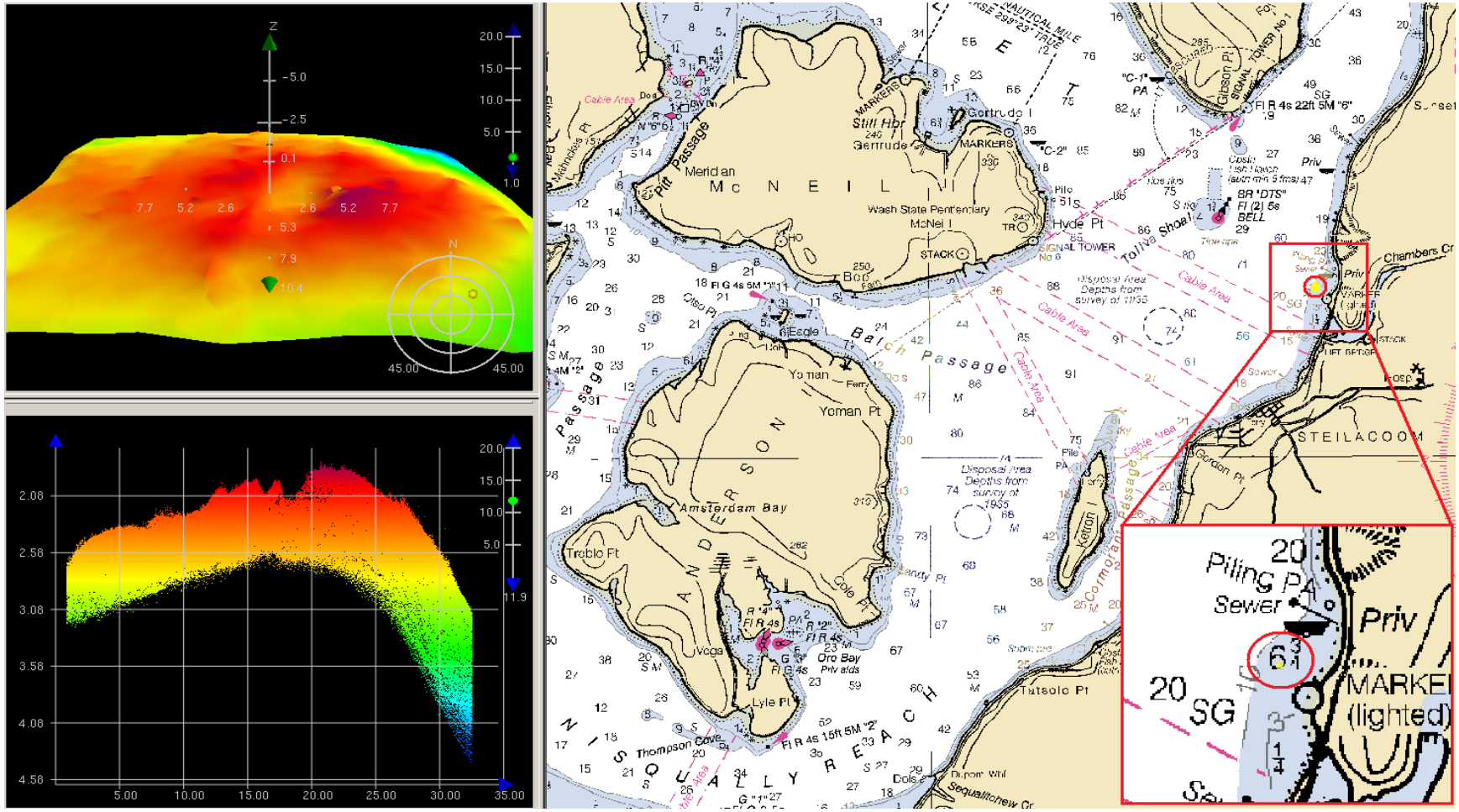
Features are reduced to Mean Lower Low Water using verified tides and are positioned on NAD83.

Charts affected: 18448 34th Edition / July 2006, scale 1:80,000, NAD 83
ENC US4 WA 10M
ENC US5 WA 18M

DANGERS TO NAVIGATION

	FEATURE	DEPTH (M)	LATITUDE	LONGITIUDE
1.	Feature / Wreck	-0.752	47-08-07.72N	122-38-26.33W
2.	Feature / Wreck	6.197	47-10-02.94N	122-36-51.11W
3.	Feature / Wreck	15.894	47-10-28.08N	122-36-12.60W
4.	Rocky / Debris Area	13.911	47-10-29.98N	122-36-04.17W
5.	Rock	14.848	47-10-38.33N	122-35-44.76W
6.	Shoal	1.752	47-11-30.56N	122-35-12.33W
7.	Rock	8.710	47-11-47.92N	122-38-49.79W
8.	Rock / Obstruction	1.985	47-10-03.04N	122-37-47.76W
9.	Possible Wreck	2.053	47-11-14.76N	122-35-14.28W

Latitude: 47-11-30.56N Longitude: 122-35-12.33W



UNCORRECTLY CHARTED SHOAL with 1.752 m least depth

Chartlet 6 of 9

Sheet A

This chartlet has been corrected through Notice to Mariners dated October 31st, 2009.
NOR FOR NAVIGATION.

	National Oceanic and Atmospheric Administration National Ocean Service	Project: OPR-N360-KR-09 Survey: H12050 State: Washington Locality: Puget Sound Sub-Locality: Tatsolo Pt to Hyde Pt Survey Scale: 1:10,000	Sounding Units: Fathoms Sounding Datum: MLLW Horizontal Datum: NAD83 Projection: UTM 10N Central Meridian: -123º Scale Factor: 0.9996	M/V Beaver JD244 2009

H12050 HCell Report

Russ Davies, Cartographer
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 RNC, 18448 (1:80,000) and corresponding NOAA ENC US4WA10M (See section 4. Meta Areas.)

HCell compilation of survey H12050 utilized Office of Coast Survey DRAFT HCell Specifications Version 4.0. For additional information on the standards and protocols used for HCell Compilation, see the DRAFT A/PHB HCell Reference Guide, version 2.0, March 17th, 2010.

1. Compilation Scale

Depths for HCell H12050 were compiled to the largest scale charts in the region, 18448_1 (1:80,000). The density and distribution of soundings from H12050 were selected to emulate the distribution on these charts. Non-bathymetric features have been generalized to chart scale.

2. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the H11827 _ 8m_ Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 survey scale using a Radius Table file with values shown in the table, below. The resultant sounding layer contains 14200 depths ranging from 0.0 to 177.274 meters.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
0	10	3
10	20	4
20	50	4.5
50	300	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 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 metric and feet equivalent contour values are shown in the table below.

Chart Contour Intervals in Fathoms from Chart 18448	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 H12050_SS.000
3	5.4864	5.715	3.125	3
10	18.288	18.5166	10.125	10

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

4. Meta Areas

The following Meta object area is included in HCell H12050:

M_QUAL

The Meta area object was constructed on the basis of the limits of the hydrography. (See 3.1 *Depth Areas.*)

5. Features

5.1 Generalization of Features to Chart Scale

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 has been modified to emulate chart scale.

Feature generalization to emulate chart scale is accomplished primarily through reduction in the number of features included in the HCell, and in some cases generalizing area features to point objects. Some instances of reduction of area features to point objects are entrusted to the RNC division, for example rocky seabed areas that will display as point features on the RNC. Where line and area objects are included in the HCell, complexity of the lines and edges comprising the features have been smoothed to commensurate with chart scale.

5.2 Compilation of Features to the HCell

Shoreline features for H11827 were delivered from the field in one hob file defining new features, or charted features, and disprovals. These were deconflicted against the chart and hydrography during office processing.

The source of all features included in the H12050 HCell can be determined by the SORIND field.

5.2 Mean High Water Used for HCells

For the purposes of determining the height at which a rock becomes an islet, the CO-OPS *"Tide Note for Hydrographic Survey"*, *"Height of High Water Above the Plane of Reference"* is used.

6. S-57 Objects and Attributes

The *_CS HCell contains the following Objects:

$CSYMB	Blue Notes
M_QUAL	Data quality Meta object
BCNSPP	Pile beacon
SBDARE	Bottom samples and rocky areas
SOUNDG	Soundings at the chart scale density
$LINES	Pipelines, outfalls or sewer lines
WRECKS	Wreck
MORFAC	Dolphins, mooring buoys
UWTROC	Rock
SLCONS	Charted shoreline

The *_SS HCell contains the following Objects:

DEPCNT	Generalized contours at chart scale intervals
SOUNDG	Soundings at the survey scale density

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 OCS HCell Specifications.

7. Blue Notes

Notes to the RNC and ENC chart compilers are included in the HCell as $CSYMB and $LINES for linear bluenotes on new pipeline features. By agreement with MCD, the NINFOM field is populated with an abbreviated version of the Blue Note (30 characters or less), describing the chart disposition, to be used by MCD in generating their Chart History spreadsheet.

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 MLLW (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):	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.

9. Data Processing Notes

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

9.1 Junction with H12050

H12050 junctions with H12051 to the north. A junction was made between these surveys.

10. QA/QC and ENC Validation Checks

H12050 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.

11. Products

11.1 HSD, MCD and CGTP Deliverables

H12050_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:80,000
H12050_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H12050_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12050_outline.gml	Survey outline to populate SURDEX
H12050_outline.xsd	

11.3 Software

CARIS HIPS Ver. 6.1	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.3	Creation of soundings and bathy-derived features, creation of the meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.1	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 View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

12. Contacts

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

Russ Davies
Cartographer
Pacific Hydrographic Branch
Seattle, WA
206-526-6883
Russ.Davies @noaa.gov

APPROVAL SHEET
H12050

Initial Approvals:

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

Russ Davies

Digitally signed by
Russ Davies
Date: 2010.10.06
07:28:38 -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.

Pete Holmberg

Digitally signed by Pete
Holmberg
DN: cn=Pete Holmberg,
o=NOAA, ou=PHB,
email=peter.holmberg@noaa.g
ov, c=US
Date: 2010.10.06 07:57:39
-07'00'

I have reviewed the H-Cell, 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

Digitally signed by Gary C. Nelson
DN: cn=Gary C. Nelson, o=NOAA,
ou=Pacific Hydrographic Branch,
email=gary.nelson@noaa.gov,
c=US
Date: 2010.10.06 13:15:03 -07'00'

Lori Knell

Digitally signed by Lori Knell
DN: cn=Lori Knell, o=NOAA, ou=NOAA HSD,
email=lori.knell@noaa.gov, c=US
Reason: AWOIS/Surf Check
Date: 2010.10.13 14:28:51 -04'00'