H12051

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. H12051

LOCALITY

State Washington

General Locality Approaches to Puget Sound

Sublocality Hyde Point to Point Fosdick

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

REGISTER NO.

H12051

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: Washington

General Locality: Approaches to Puget Sound

Sublocality: Hyde Point Point Fosdick

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: T. Wozumi

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 near Fox Island, WA. The sub-locality of this survey is described as Hyde Point to Point Fosdick (Fig. 1 Sheet B). The survey encompassed an area of approximately 6.09 square nautical miles and was assigned registry number H12051 and designated as Sheet "B". 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 from -0.88 fathoms to 91.4 fathoms. Data acquisition was conducted from 15 August 2009 (Julian Day 227) to 10 October 2009 (Julian Day 283). 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.

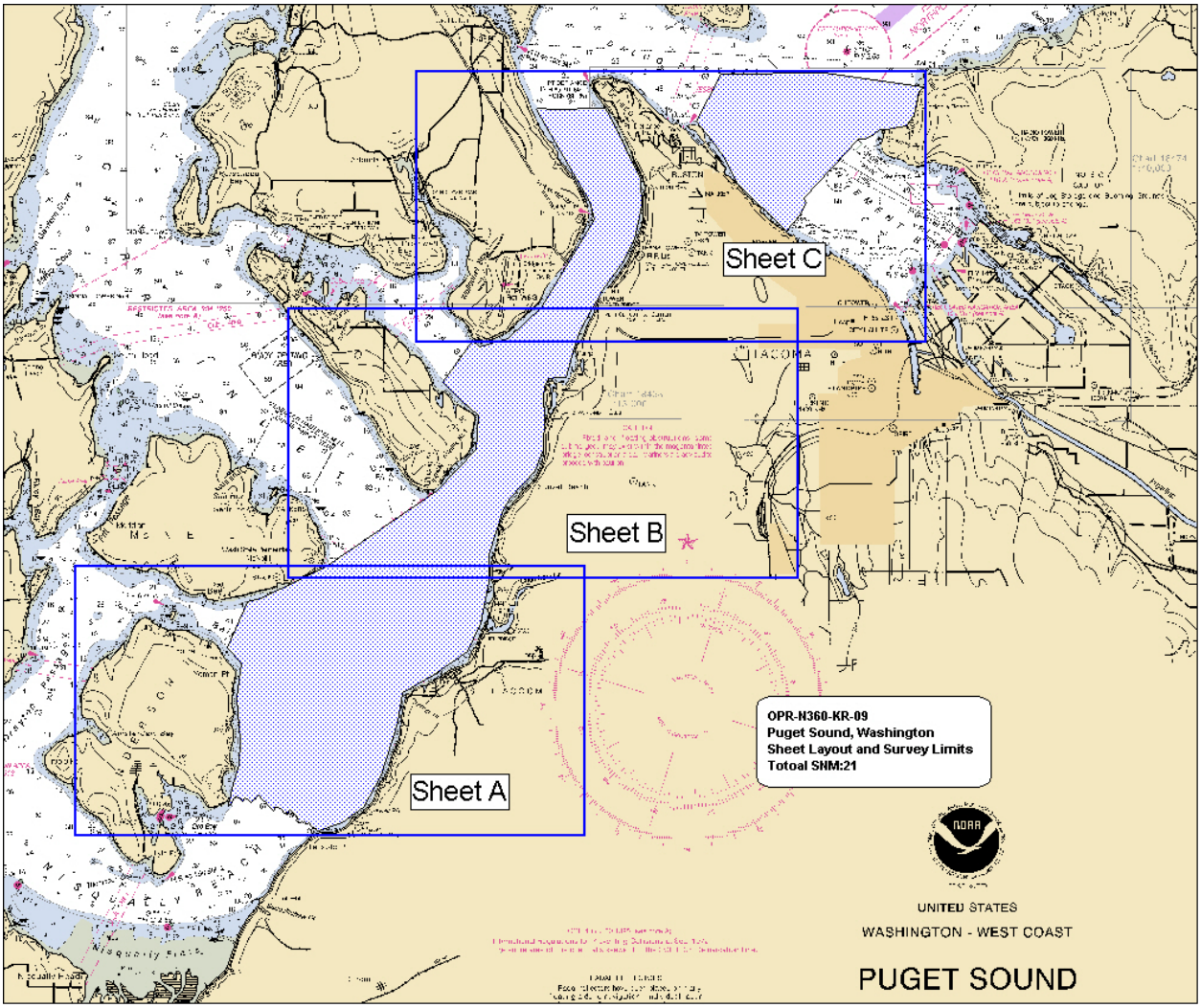


Figure 1: H12051 Sheet B

Table 1 – Sheet Bounds

Point	Latitude (North)	Longitude (West)
1	47° 15’ 45.2”	122° 34’ 05.8”
2	47° 15’ 45.7”	122° 32’ 20.46.3”
3	47° 11’ 47.7”	122° 35’ 0.9”
4	47° 11’ 47.7”	122° 38’ 56.7”

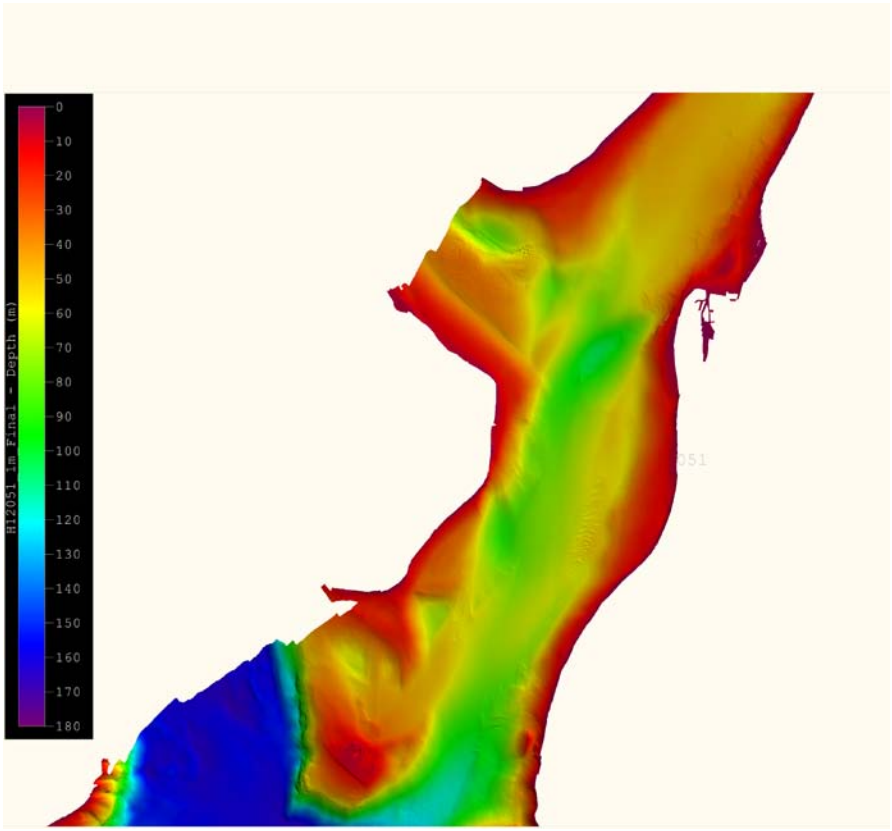


Figure 2: H12051
Surveyed Surface

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 H12051.

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*). [2]

BASE Surface QC Report:

Sheet: H12051
Error values from: Uncertainty.
Number of nodes processed: 5,205,365
Number of nodes populated: 5,204,092 (99.9755444623%)
S-44 Order 1:
Range: -1.6 to 100.0
Number of nodes considered: 4,408,598
Number of nodes within: 4,408,598 (100.0%)
Residual mean: -0.682857529026409
S-44 Order 2:
Range: 100.0 to 5000.0
Number of nodes considered: 795,494
Number of nodes within: 795,494 (100.0%)
Residual mean: -3.32058848890701

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: H12051

Overall Depth (m) Std Dev	Overall Depth (m) Offset Average
0.121	0.141

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 H12051

Depth Range (m)	Resolution (m)	Min Uncertainty (m)	Max Uncertainty (m)
0-23	1	0.458	0.527
20-52	2	0.469	0.645
46-115	4	0.470	0.670
103-350	8	0.481	0.514

Figure 3: Uncertainty Surface of Sheet H12051

B2.c 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 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.

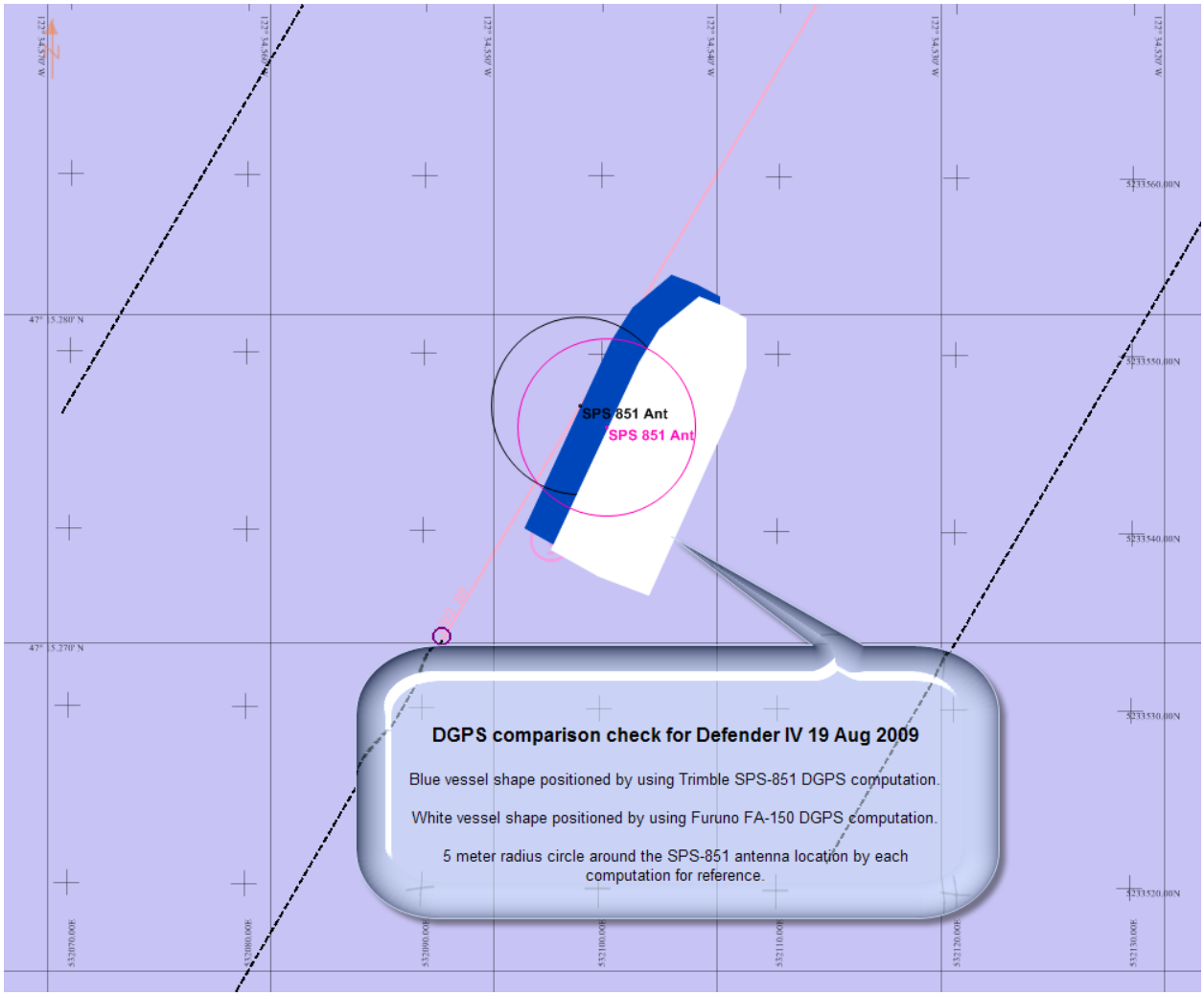


Figure 4: Position Check

B2.d 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 and in the northern section of H12052 to check accuracy with neighboring survey data obtained from the NOAA database. [3]

B2.e Data Quality

In general, the multibeam data quality for H12051 was good. Notable problems follow:

Unusual conditions were observed in H12051 in the form of (1) vertical uncertainty due to irregular tidal fluctuations, (2) current turbidity and (3) Sub-Aquatic Vegetation (SAV). [4]

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. (refer to figure 5 below).

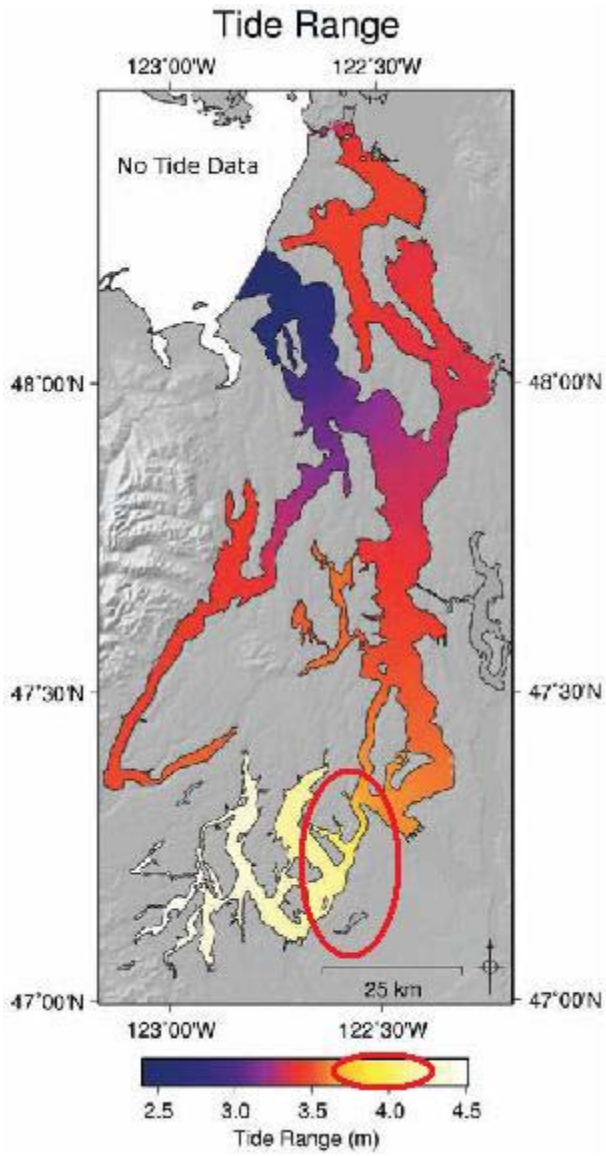


Figure 5: Tide Range

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 Toliva Shoal in the southern area of Sheet H12051 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.

3. Sub-aquatic Vegetation (SAV) is present in all survey areas and is somewhat distinguishable from the benthic surface. 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 report 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 “H12051.000”. 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

H12051 survey data was compared to:

RNC Number	Scale	Edition	Edition Date	Corrected Through
18448	1:80,000	34th	July 2006	10/20/09

ENC Number	Edition	Update Application Date	Issue Date
US4WA10M	7	11/03/09	11/03/09

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 V.

D2. AWOIS

AWOIS # 53731

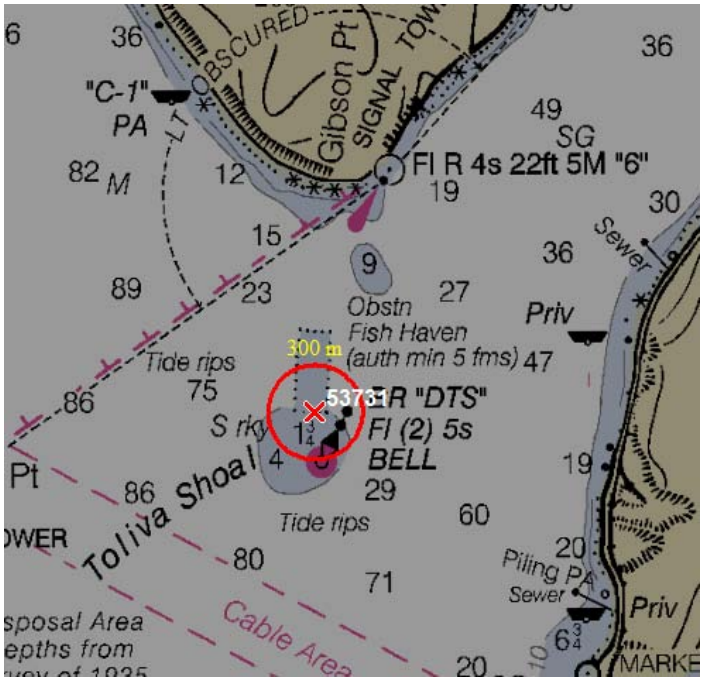
REPORTED

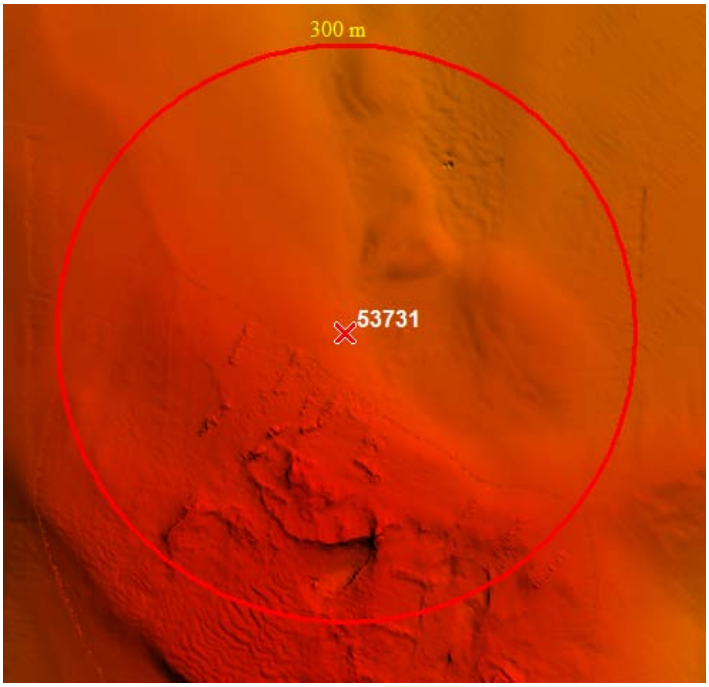
FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53731	300m	47 12 19	122 36 27

Remarks:
The charted Obstruction Fish Haven falls within the charted bounds.

Hydrographer Recommendation:

The Hydrographer recommends completely re-charting the location and bounds of the fish haven annotation and symbol to include the entire bounds of the manmade objects outside and south of the charted fish haven on all applicable charts and updating the AWOIS database with the current position of the Fish Haven. [8]





AWOIS # 53735

REPORTED

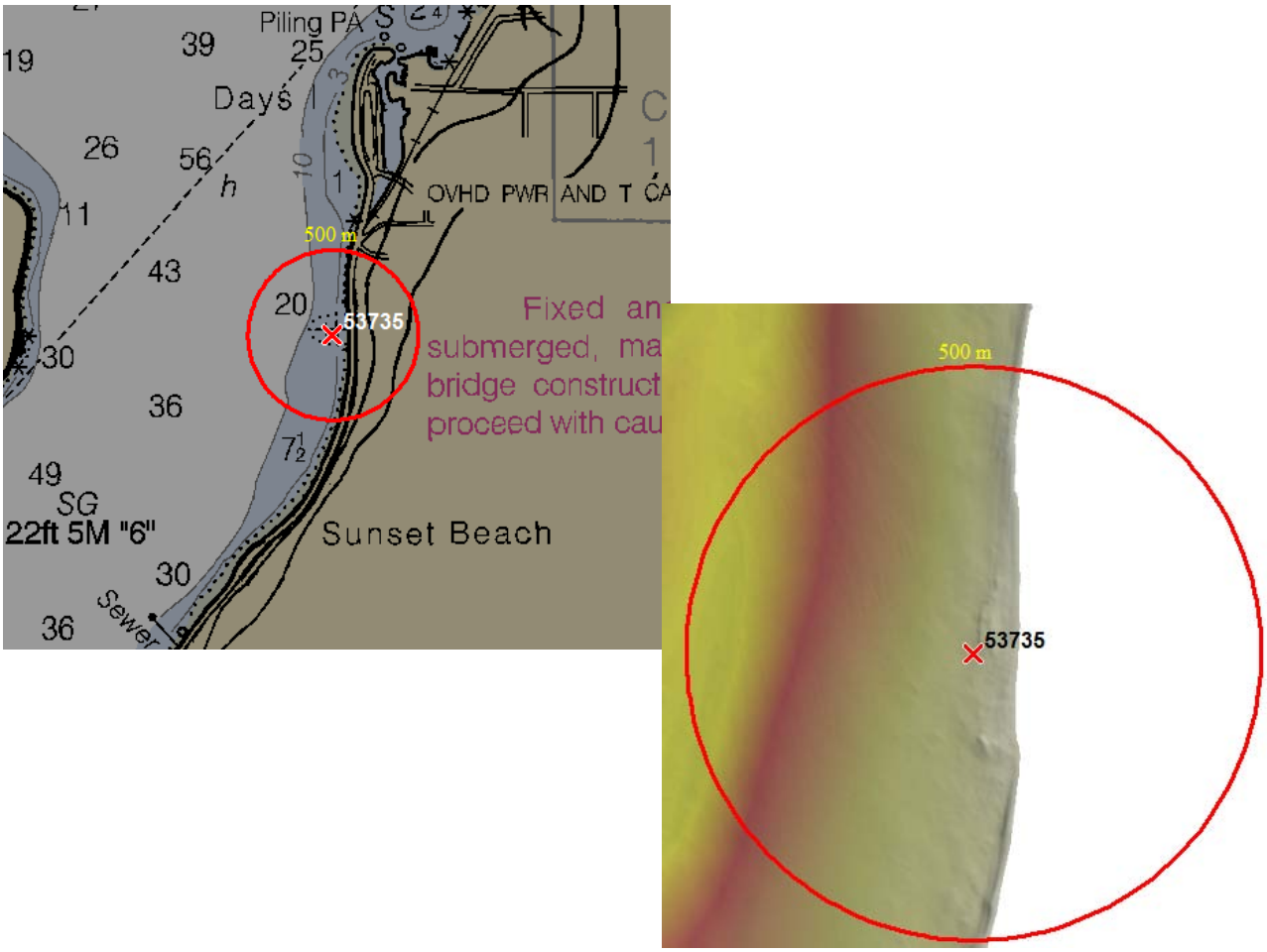
FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53735	500m	47 13 47.3	122 33 56.41

SURVEYED

FEATURE	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
Wreck	4.838m	47 13 49.3176	122 33 54.9623

Remarks:

Hydrographer Recommendation:
The Hydrographer recommends retaining the wreck annotation and symbol on all applicable charts and updating the AWOIS database with the current position of the wreck. [9]



AWOIS # 53733

REPORTED

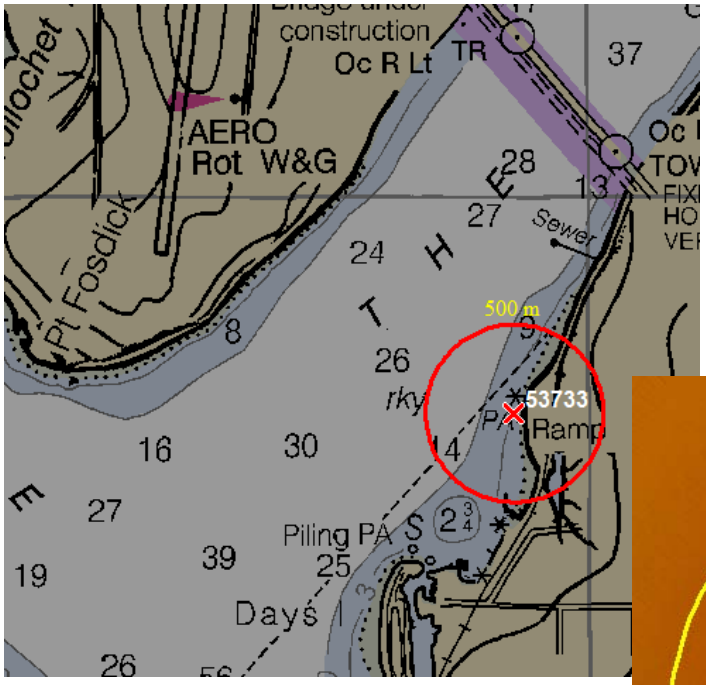
FEATURE	RADIUS	LATITUDE (N)	LONGITUDE (W)
AWOIS #53733	500m	47 15 8.91	122 33 14.41

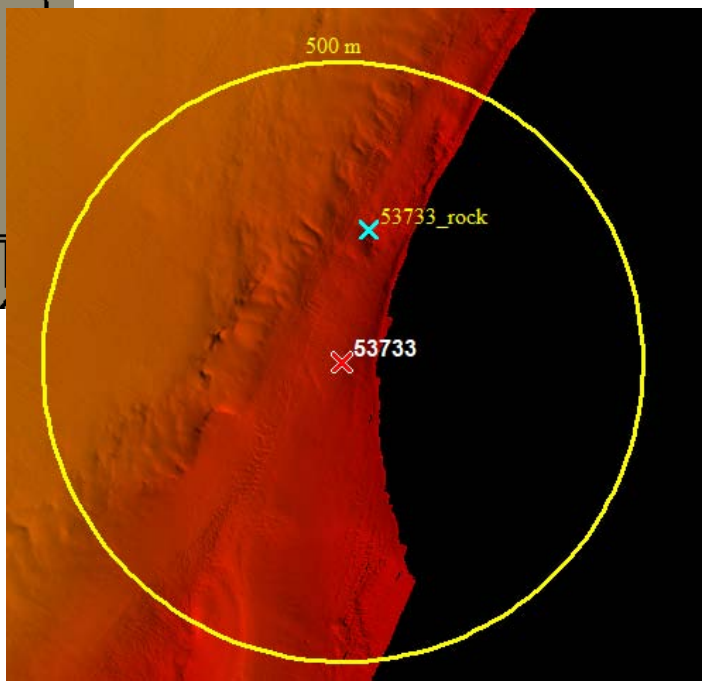
SURVEYED

FEATURE	LEAST DEPTH	LATITUDE (N)	LONGITUDE (W)
Rock	2 fathom 5 foot	47-15 .261	122-33 .199

Remarks:
The closest rock to the published AWOIS item is 223.7m at a bearing of 11° 43' 37.4".

Hydrographer Recommendation: The Hydrographer recommends moving the rock annotation and symbol on all applicable charts and updating the AWOIS database with the current position of the rock. [10]





D3. Charted Features

The outfall at 47° 14' 47.24426" N, 122° 33' 16.89653" W (RNC 18448, ENC US4WA10M) was not found to exist. The Hydrographer recommends removing this from the chart. [11]

Toliva Shoal at 47° 12' 12.22017" N, 122° 36' 25.55705" W (RNC 18448, ENC US4WA10M) was found to exist. The Hydrographer recommends the shoal area should be updated to reflect current bathy dataset.[12]

D4. Dangers to Navigation

No dangers to navigation were found during the survey H12051. [13]

D5. Bottom Samples

Seven (7) bottom samples were obtained and are included in the S-57 attributed feature file in the S-57 Feature File folder.[14] A table listing the position and description of each bottom sample is included in Appendix II, along with photographs of each sample.

D6. Aids to Navigation [15]

The following aids to navigation were examined during this survey:

- Buoy Toliva Shoal Isolated Danger Lighted Buoy at 47-12-08.4795 N, 122-36-25.3765 W (RNC 18448, ENC US5WA22) found to exist and to be serving its intended purpose
- Buoy Gibson Point Light at 47-13-06.5146 N, 122-36-06.2192 W (RNC 18448, ENC US4WA10M) found to exist and to be serving its intended purpose
- Private MORFAC at 47-12-21.3608 N, 122-35-04.6293 W (RNC 18448, ENC US4WA10M) found to exist and to be serving its intended purpose. The Hydrographer recommends that this be added to the charts. [16]

E. Approval Sheet

REGISTRY NUMBER H12051

This report and the accompanying digital data are respectfully submitted.

Field operations contributing to the accomplishment of survey H12051 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
18 February 2010

Revisions Compiled During Office Processing and Certification:

[1] Filed with the project records
[2] Concur
[3] Survey H12051 junctions H12050 to the south and H12052 to the north. A junction was made between H12050 and H12051. The junction between H12051 and H12052 will be made at a later date.
[4] Data are acceptable for charting
[5] The file was used in the creation of H12050_CS.000
[6] Filed with the project records
[7] Concur
[8] Concur, see HCell for depiction
[9] Concur with clarification, Remove charted wreck, chart wreck with least depth at the surveyed position.
[10] Concur, chart rock as found on this survey
[11] Do not concur, remove charted outfall at 47/14/43.8N, 122/33/21.2W, remove charted rock at 47/14/48.7N, 122/33/18.2W. Chart outfall as seen on surface at 47/14/47.1N, 122/33/16.6W. Chart rock as positioned by this survey at 47/14/50N, 122/33/17.5W.
[12] Concur
[13] Concur
[14] The seven bottom samples are included in the HCell. There is a blue note to retain a bottom sample at 47/12/17.0N, 122/38/10.2W. All other bottom samples have been blue noted to be removed.
[15] Chart per latest ATONIS information
[16] Concur

H12051 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 H12051 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 H12051 were compiled to the largest scale chart in the region, 18448_1 (1:80,000). The density and distribution of soundings from H12051 were selected to emulate the distribution on the chart. Non-bathymetric features have been generalized to chart scale.

2. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the H12051 _ 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 9221 depths ranging from -1.00 to 166.941 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 fathoms 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 H12051_SS.000
0	0.0	0.2286	0.0	0
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 H12051:

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 H12051 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 H12051 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:

$AREAS	New Fish Haven limits
$CSYMB	Blue Notes
M_QUAL	Data quality Meta object
OBSTRN	Obstructions, rocky seabed areas
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
SNDWAV	Sand waves
DEPCNT	Zero contour

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 H12051

H12051 junctions with H12050 to the south and H12052 to the north. A junction was made between survey H12051 and H12050. A junction will be made between H12051 and H12052 at a later date.

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

H12051_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:80,000
H12051_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H12051_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items

H12051_outline.gml Survey outline to populate SURDEX
H12051_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
H12051

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.

Digitally signed
by Russ Davies
Date: 2010.10.06
15:44:36 -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.

Digitally signed by Pete
Holmberg
DN: cn=Pete Holmberg,
o=NOAA, ou=PHB,
email=peter.holmberg@noaa.go
v, c=US
Date: 2010.10.07 11:27:20 -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.

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: 2010.10.07 10:41:03 -07'00'

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 14:42:53 -04'00'