

H11750

NOAA FORM 76-35A

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

## DESCRIPTIVE REPORT

*Type of Survey* Hydrographic Survey

*Field No.* N/A

*Registry No.* H11750

### LOCALITY

*State* Washington

*General Locality* Approaches to Puget Sound

*Sublocality* Green Point to Dungeness Bay

**2007**

### CHIEF OF PARTY

Captain Donald W. Haines, NOAA

### LIBRARY & ARCHIVES

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NOAA FORM 77-28  
(11-72)

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

REGISTRY No

**HYDROGRAPHIC TITLE SHEET**

**H11750**

**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

**RA-10-16-07**

State Washington

General Locality Approaches to Puget Sound

Sub-Locality Green Point to Dungeness Bay

Scale 1:10,000 Date of Survey Oct 25, 2007 - Nov 13, 2007

Instructions dated 8/24/2007 Project No. OPR-N372-RA-07

Vessel RA1 (1101), RA2 (1103), RA4 (1016), RA6 (1015\_Elac1180), RA6 (1015\_Klein), RA6 (1015\_Reson8101)

Chief of party Captain Donald W. Haines, NOAA

Surveyed by RAINIER Personnel

Soundings by echo sounder, hand lead, pole Seabeam/Elac 1180, Klein 5000, Reson SeaBat 8101,  
Reson SeaBat 8125, Knudsen 320M

Graphic record scaled by RAINIER Personnel

Graphic record checked by RAINIER Personnel Automated Plot N/A

SAR by Tyanne Faulkes Compilation by Sarah Wolfskehl

Soundings in Fathoms at MLLW

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

The purpose of this survey was to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were generated during office processing. Page numbering may be interrupted or non-sequential.

# **Descriptive Report to Accompany Hydrographic Survey H11750**

Project OPR-N372-RA-07  
Approaches to Puget Sound, Washington  
Green Point to Dungeness Bay  
Scale 1:10,000

October – November 2007

**NOAA Ship RAINIER (s221)**

Chief of Party: Commander Donald W. Haines, NOAA

## **A. AREA SURVEYED**

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions OPR-N372-RA-07 dated August 24, 2007 and all other applicable direction<sup>1</sup>, with the exception of deviations noted in this report. The survey area is on the southern shore of the Strait of Juan de Fuca, between Port Angeles and Dungeness Spit. This survey corresponds to sheet “M” in the sheet layout provided with the Letter Instructions. OPR-N372-RA-07 has been designated as a resurvey area due to its propensity for shoaling and its relative shoal depth near the traffic lanes. Port Angeles is a heavily used anchorage for deep draft vessels and the possibilities of silting, new obstructions and increased vessel draft are significant. Deep draft vessels carrying petroleum and other hazardous materials are often without a pilot in this area. The survey area is depicted in Figure 1.

RAINIER obtained complete multibeam echosounder (MBES) coverage in the survey area in waters deeper than 8 meters. Between the 8 meter curve and the inshore limit of hydrography, RAINIER obtained partial coverage with MBES and vertical beam echosounder (VBES) data. The inshore limit of hydrography was defined either as the 4 meter curve or the offshore extent of dense kelp areas. Side scan sonar (SSS) data were collected for reconnaissance inside the 5 fathom curve, as well as object detection in the AWOIS search area. Although submitted with this survey, the SSS data are not intended to be a coverage technique as most of the areas have complete MBES coverage.

Vertical beam echosounder (VBES) data were acquired in depths from approximately 4 to 10 meters to define the navigable area limit, aid in the planning of MBES data acquisition, and provide inshore bathymetry in navigationally significant areas. Total mileage acquired by each vessel and system is referenced in Table 1.

Limited Shoreline Verification was performed for the survey area.

Data Acquisition Type	Hull Number with Mileage (nm)					Total
	1101	1103	1021	1016	1015	
VBES (mainscheme)	27.60	22.20	-	-	-	49.80
MBES (mainscheme)	-	-	277.58	348.68	77.34	703.60
MBES + SSS (mainscheme)	-	-	-	-	30.62	30.62
Crosslines	-	-	-	-	39.79	39.79
Developments	-	-	2.60	-	11.29	13.89
Shoreline	-	6.68	-	-	-	6.68
Bottom Samples	9	-	-	-	-	9
Total Area Surveyed (sq. nm)	-	-	-	-	-	24.27

Table 1: Statistics for survey H11750

Data acquisition was conducted from 25 October to 13 November 2007 (DN 298 to 317).

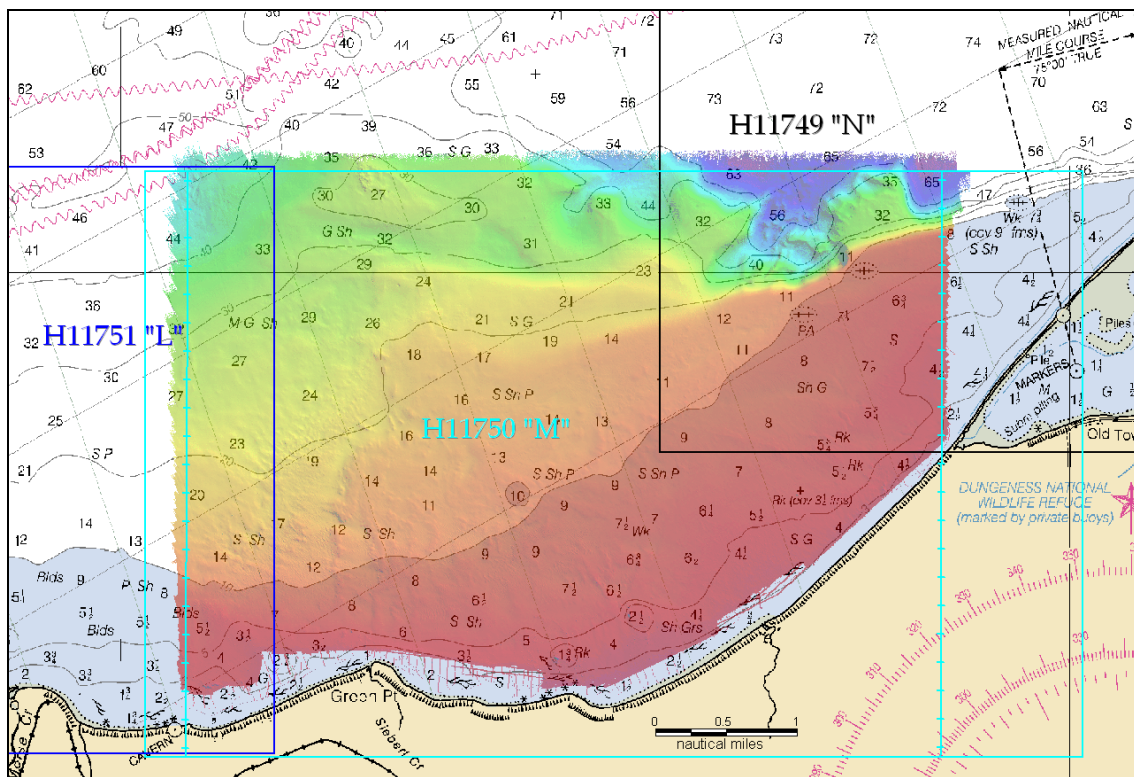


Figure 1. H11750 Survey Limits and junctions overlaid on chart 18465

**B. DATA ACQUISITION AND PROCESSING**

A complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods can be found in the *OPR-N372-RA-07 Data Acquisition and Processing Report (DAPR)*<sup>2</sup>, submitted under separate cover. Items specific to this survey, and any deviations from the DAPR are discussed in the following sections.

**Final Approved TCARI Water Levels have been applied to this survey.** See Section C. for additional information.

**B1. Equipment and Vessels**

Data for this survey were acquired by the following vessels:

Hull Number	Name	Acquisition Type
1101	RA-1	Vertical Beam Echosounder Bottom Samples
1103	RA-2	Vertical Beam Echosounder Detached Positions
1021	RA-3	Multibeam Echosounder
1016	RA-4	Multibeam Echosounder
1015	RA-6	Multibeam Echosounder Side Scan Sonar

*Table 2. Data Acquisition Vessels for H11750*

Sound speed profiles were measured with a SEACAT SBE-19+ profiler in accordance with the Specifications and Deliverables.

No unusual vessel configurations were used for data acquisition.

**B2. Quality Control**

**Crosslines**

Vertical Beam Echo Sounder (VBES) crosslines were not run on Survey H11750.

Multi-Beam Echo sounder (MBES) crosslines totaled 39.79 nautical miles, comprising 5.77% of mainscheme MBES hydrography. The mainscheme bathymetry was manually compared to the XL nadir beams in CARIS subset mode and agreed well. The maximum observed difference was 0.20 meters, with the crosslines usually deeper than the mainscheme lines.

A statistical Quality Control Report has been conducted on representative data acquired with each system used on this survey. Results of these tests are included in the updated 2007 RAINIER Hydrographic System Readiness Review package<sup>3</sup> submitted with this survey.

**Junctions**

The following contemporary surveys junction with H11750 (See Figure 1):

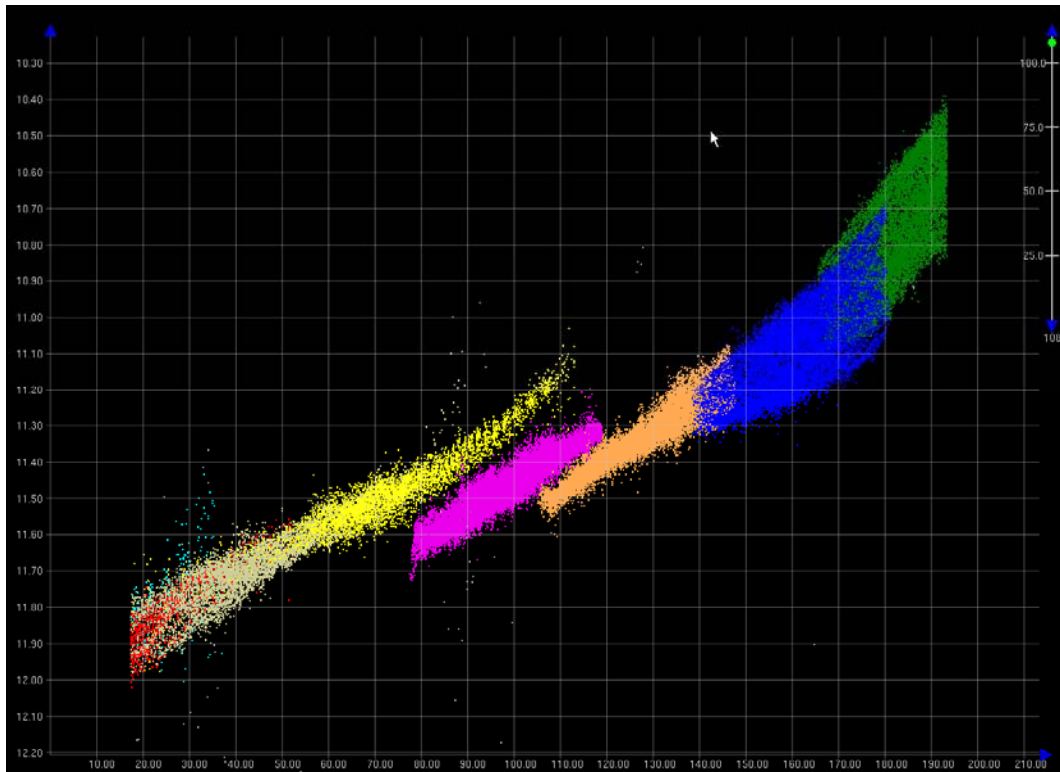
<u>Registry #</u>	<u>Scale</u>	<u>Date</u>	<u>Junction side</u>
H11749	1:10,000	2007	Northeast
H11751	1:10,000	2007	West

The survey junctions with H11749 and H11751 were manually compared using CARIS subset mode and agreed well with observed differences less than 0.2 meters in all common areas<sup>4</sup>.

**Data Quality Factors**

Vertical Offset Errors

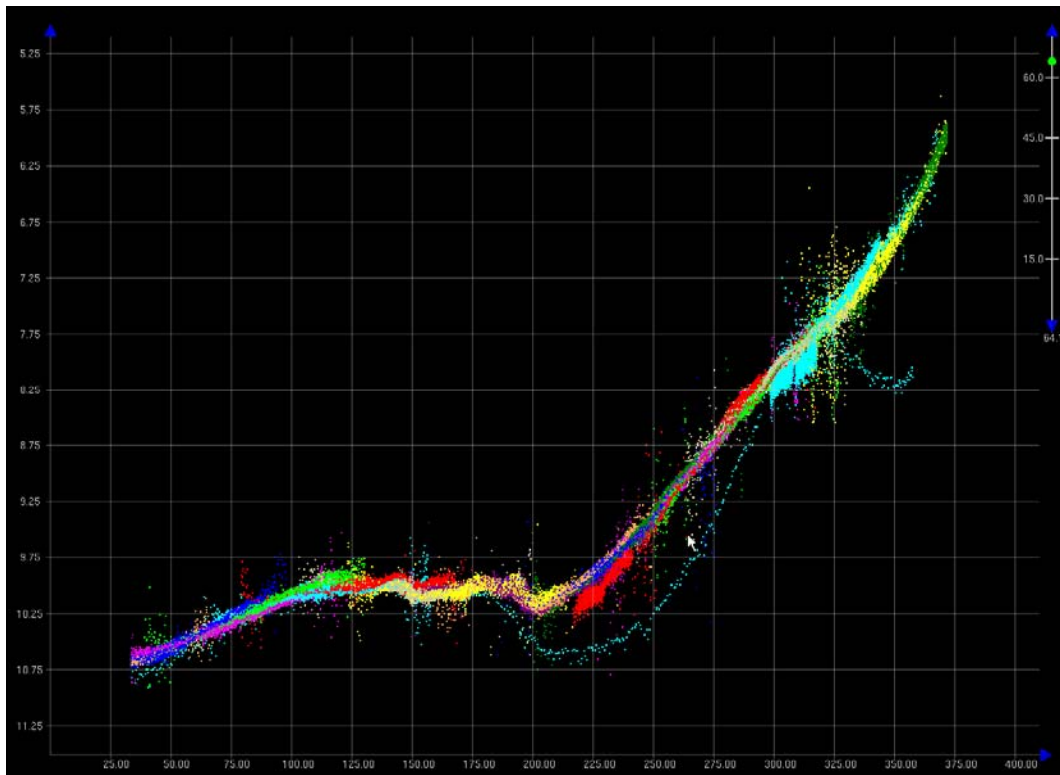
Offsets appeared in data collected on different days. Most offsets appeared in the eastern portion of the sheet in water shallower than 10 fathoms. The offsets averaged 0.15 meters with a maximum observed value of 0.3 meters, and varied day to day, leading to a preliminary conclusion that it is tide related. If so, the maximum value of 0.3 meters is within the allowable tide error budget of 0.45 meters as outlined in the NOS Hydrographic Surveys Specifications and Deliverables (April 2007)<sup>5</sup>.



*Figure 2. Vertical Offset Error (vertical exaggeration is 108)  
 Yellow line is 1021 DN 312, Pink line is 1016 DN 310, Orange line is 1016 DN 311*

### 1101 Heave Errors

VBES data from Launch 1101 is consistently different when compared to MBES data in the same areas (waters shoaler than 10 meters). At the time of the survey, Launch 1101 used the DMS-05 heave sensor, and was unable to compensate for rapid acceleration through turns. This error was only noted on the shoreward start/end of these lines when it was necessary to quickly turn 1101 to get out of the shallows<sup>6</sup>.



*Figure 3. VBES Heave Error in Launch 1101 data (vertical exaggeration is 64)*

### Sound Speed Artifacts

Sound velocity anomalies were observed from Launch 1015 on Day Number 312 in lines 312\_2140 to 312\_2320. Soundings in the outer beams were rejected in subset editor in CARIS when compared to nearby lines and coverage was not affected.



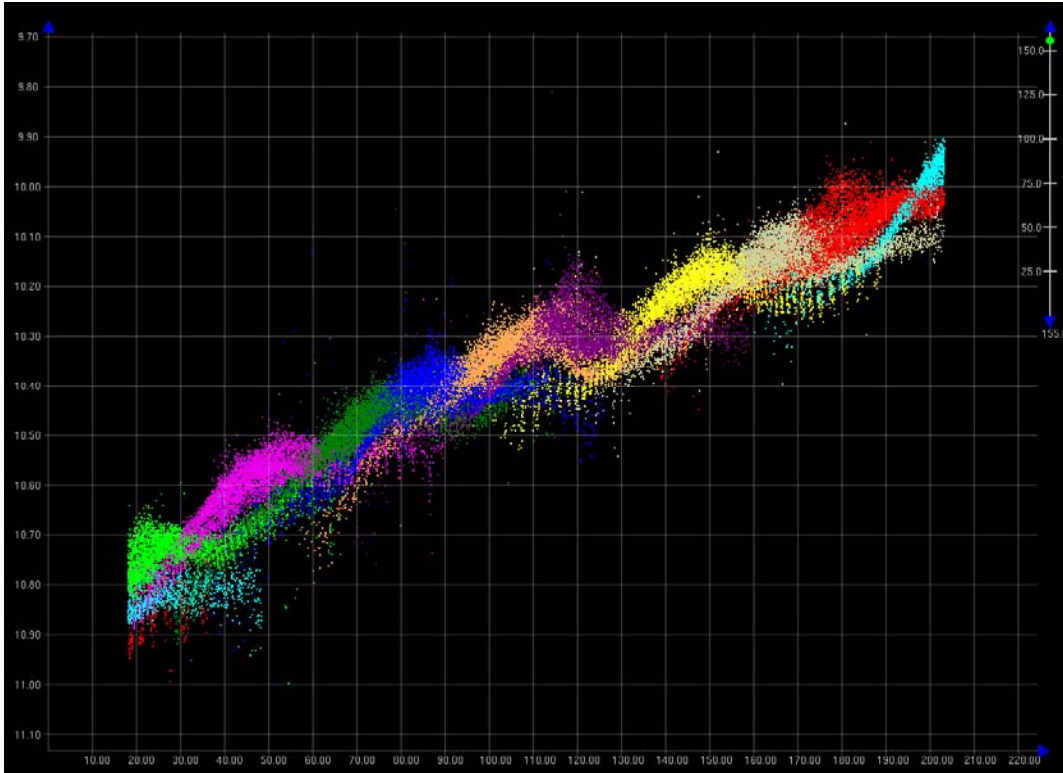


Figure 4. Sound velocity errors from Launch 1015 (vertical exaggeration is 156)

Holidays

Due to time constraints, RAINIER did not obtain coverage over the 2 ¾ fathoms shoal, 1,250 meters west of Green Point. Inside the 8 meter curve, RAINIER only obtained VBES data with 100 meter line spacing.

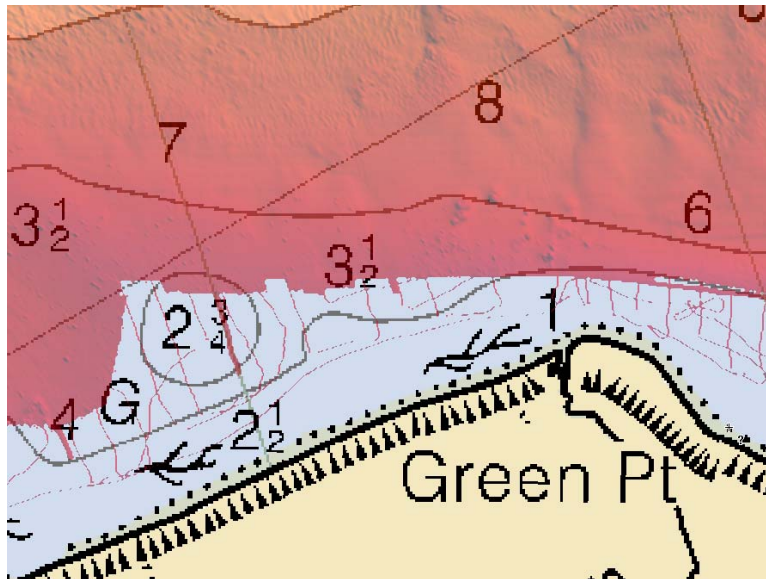


Figure 5. VBES coverage over 2 ¾ fathoms shoal (Chart 18465)



### B3. Data Reduction

Data reduction procedures for survey H11750 conform to those detailed in the *OPR-N372-RA-07 DAPR*.

### B4. Data Representation

Many BASE surfaces were used in processing H11750. Final BASE surface resolutions and depth ranges were set in accordance with RAINIER's standard in the table below. The submission Field Sheet and BASE Surface structure is shown in Figure 6. The layout of fieldsheets is shown in Figures 7 through 9.

<b>Depth Range (m)</b>	<b>Resolution (m)</b>	<b>CUBE Parameter Disambiguation Method Advanced Option</b>
0-16	0.50	Shallow
14-31.5	1	Shallow
28.5-63	2	Deep
57-158	5	Deep

*Table 3: Resolutions utilized for H11750*

Soundings and contours were generated in CARIS HIPS from the final combined BASE surface for field unit review purposes. They are included for reference only and are not intended as a deliverable.

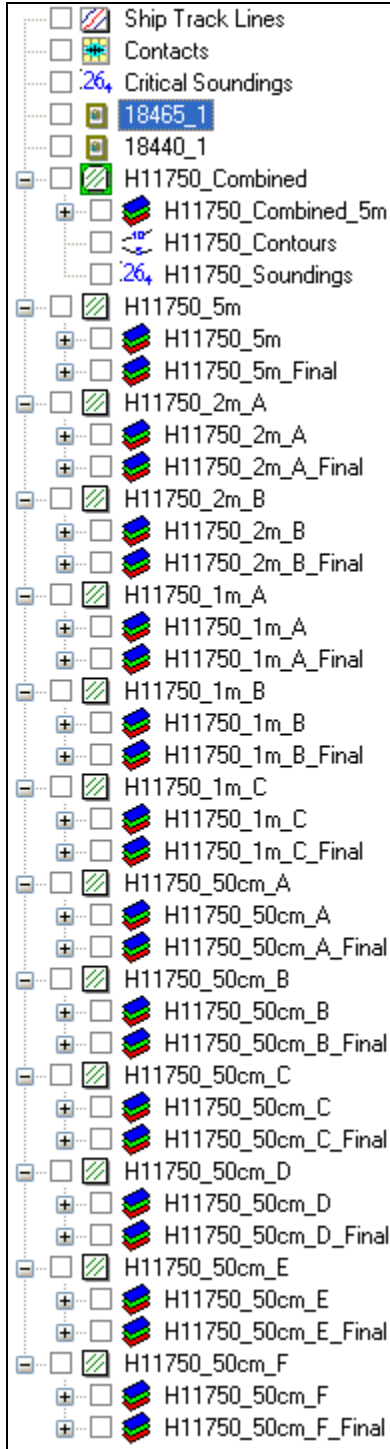


Figure 6. Field sheets and BASE surfaces submitted with H11750



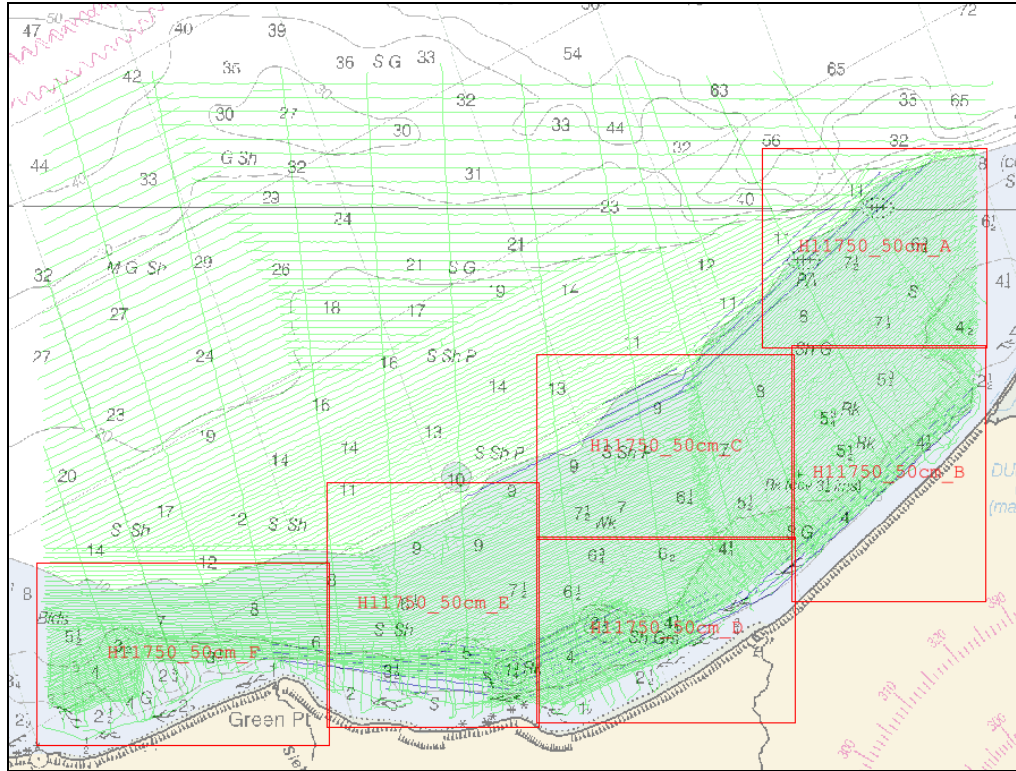


Figure 9. Layout of 50cm field sheets for H11750, overlaid on NOAA Chart 18465

**C. VERTICAL AND HORIZONTAL CONTROL**

Project OPR-N372-RA-07 did not require static GPS observations or other horizontal control work, and all tide corrections were generated from CO-OPS maintained tide stations. Thus, no Horizontal and Vertical Control Report will be submitted.

**Horizontal Control**

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. The differential corrector beacons utilized for this survey are given in Table 4. Changes in the corrector source were noted in the data acquisition logs.

Location	Frequency	Operator	Distance	Priority
Whidbey Island	302 kHz	USCG	25 nm	Primary
Robinson Point	323 kHz	USCG	59 nm	Secondary

Table 4. Differential Corrector Sources for H11750

**Vertical Control**

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide stations at Port Angeles, WA (944-4090), Port Townsend, WA (944-4900) and Friday Harbor, WA (944-9880) served as control for datum determination and as the primary source for water level reducers for survey H11750.

No tertiary gauges were required.

All data were reduced to MLLW using **final approved water levels** from station Port Angeles, WA (944-4090), Port Townsend, WA (944-4900) and Friday Harbor, WA (944-9880) using the tide files 9444090\_verified\_MSL\_thru\_20071113.txt, 9444900\_verified\_MSL\_thru\_20071113.txt, and 9449880\_verified\_MSL\_thru\_20071114.txt and **final** time and height correctors using the Tidal Constituent And Residual Interpolator (TCARI) corrector file N372RA2007-TCARI.tc.

The request for Final Approved Water Levels for H11750 was submitted to CO-OPS on 14 November 2007 and the Final Tide Note was received on 6 December 2007. This documentation is included in Appendix IV.

**D. RESULTS AND RECOMMENDATIONS**

**D.1. Chart Comparison**

**D.1.a. Survey Agreement with Chart**

Survey H11750 was compared with the following charts<sup>7</sup>:

Chart	Scale	Edition and Date	Local Notice to Mariners Applied Through
18465	1:80,000	37 <sup>th</sup> Ed; May 2005	04/12/2008
18440	1:150,000	29 <sup>th</sup> Ed; Sep 2007	03/08/2008

*Table 5. Charts compared with H11750*

Survey H11750 was also compared with the provided composite source file (See § D.2.b). No ENC comparisons were performed.

**Chart 18465**

Bathymetry generally agreed with charted depths within 1 fathom with the exceptions of water deeper than 50 fathoms and a shoaler sounding shown in Figure 10. In water deeper than 50 fathoms (in the northeast corner of the survey), the charted depths agreed within 2 fathoms. Contours show a general deepening outside the 3 fathom curve<sup>8</sup>.



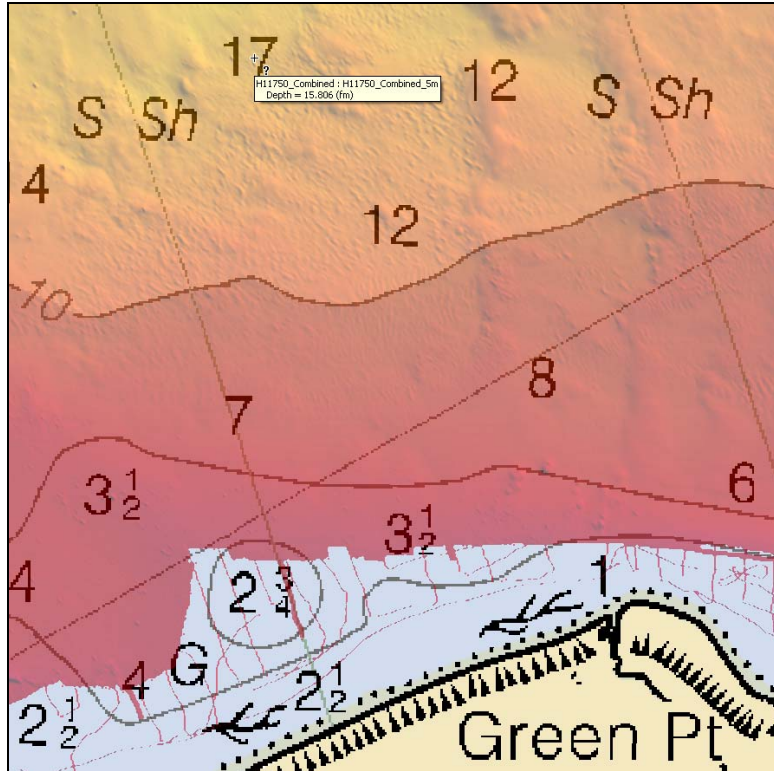


Figure 10. 15.8 fathom sounding over charted 17 fathom sounding (Chart 18465)

As mentioned in § B2, Data Quality Factors, RAINIER did not obtain complete MBES coverage over the charted 2 ¾ fathoms shoal 1,250 m west of Green Point (Figure 5). The Hydrographer recommends retaining this shoal as charted<sup>9</sup>.

RAINIER obtained complete MBES over the 2 ½ fathoms shoal 3,400 meters east of Green Point (Figure 11). The Hydrographer recommends updating the position of the shoal<sup>10</sup>.

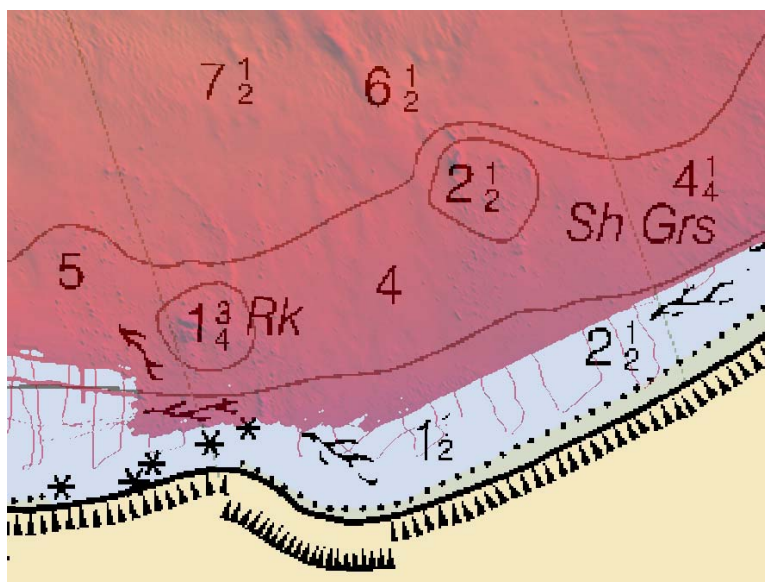


Figure 11. Charted 2 ½ fathoms shoal east of Green Point

The charted PA wreck (Figure 12) assigned for AWOIS investigation (see § D.1.c) was disproved with complete MBES and SSS. The Hydrographer recommends removing it from the chart<sup>11</sup>. There is also a dangerous wreck charted just to the northeast of the PA wreck. This dangerous wreck was seen in both the bathymetry and the imagery, although the remains are widely distributed with minimal relief. The Hydrographer recommends retaining the charted wreck and updating the position and sounding information as per the digital data<sup>12</sup>.

Three rocks are charted in the southeast corner of the survey (Figure 12, left, Chart 18465). The southwestern rock, with a depth of 3 ¼ fathoms, is the significant feature. The northern and eastern rocks, with depths 5 ¾ and 5 ½ fathoms respectively, are relatively minor, as compared to the surrounding depths and nearby features. The Hydrographer recommends changing the charted southwestern (3 ¼ fms) rock and legend to match that on chart 18440, retaining the northern (5 ¾ fms) and eastern (5 ½ fms) rocks as charted, and updating the position and sounding information on all three rocks<sup>13</sup>.

The Hydrographer recommends that survey soundings supersede all prior survey and charted depths in the area of complete MBES and where discussed above<sup>14</sup>.

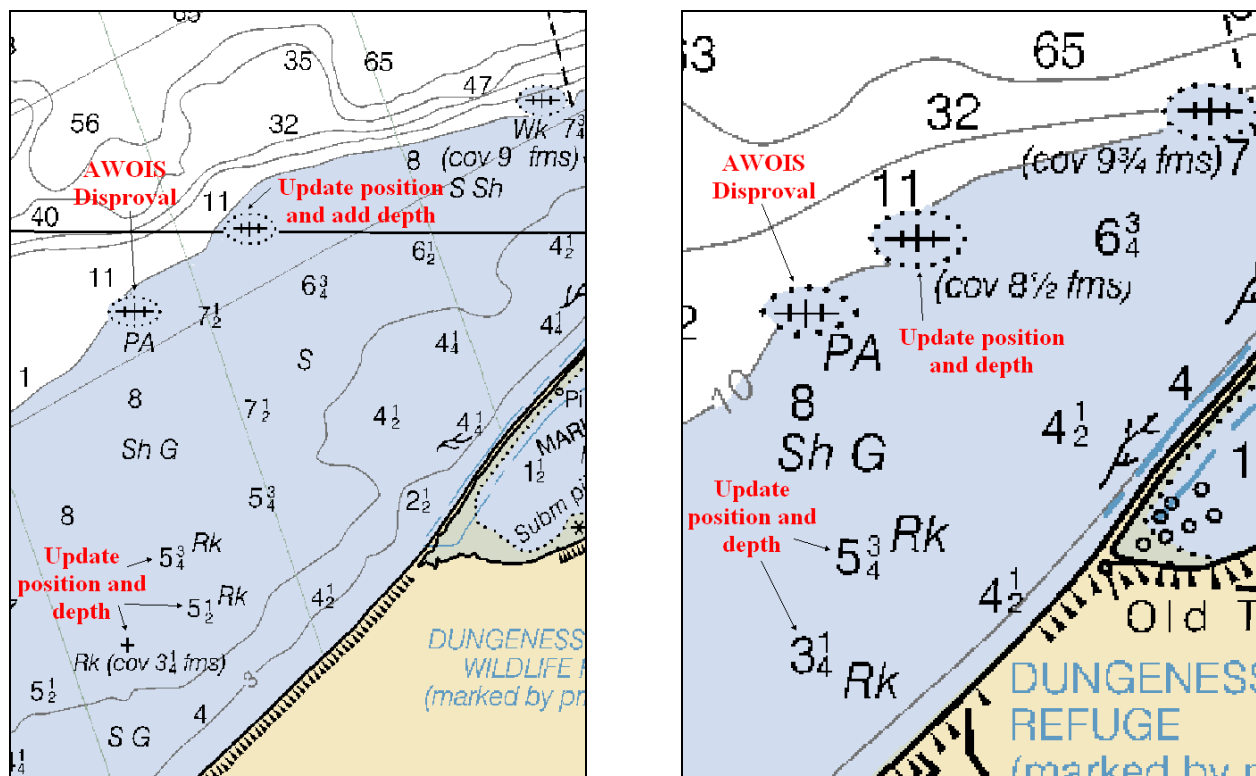


Figure 12. Charted rocks and wrecks on Charts 18465 (left) and 18440 (right)

**Chart 18440**

Bathymetry agreed with charted depths within 1 fathom.



As mentioned in § B2, Data Quality Factors, RAINIER did not obtain complete MBES coverage over the charted  $2\frac{3}{4}$  fathoms sounding 1,250 m west of Green Point (Figure 13). The Hydrographer recommends retaining this sounding as charted<sup>15</sup>.

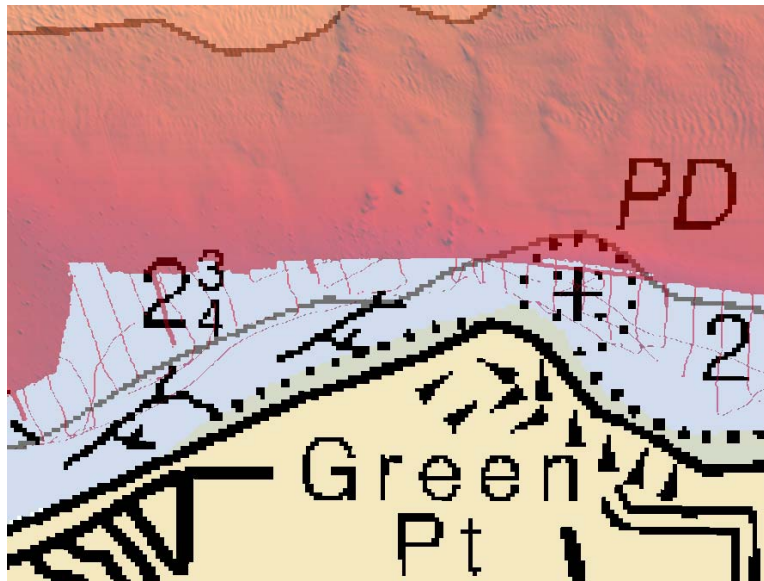


Figure 13. VBES coverage over  $2\frac{3}{4}$  fathoms sounding (Chart 18440)

As on Chart 18465, the charted PA wreck (Figure 12) assigned for AWOIS investigation (see § D.1.c) was disproved with complete MBES and SSS. The Hydrographer recommends removing it from the chart. As above, the charted dangerous wreck northeast of the PA wreck was seen in both the bathymetry and the imagery, although the remains are widely distributed with minimal relief. The Hydrographer recommends retaining the charted wreck and updating the position and sounding information as per the digital data<sup>16</sup>.

Of the three rocks that appear on Chart 18465 (Figure 12), only the southwestern ( $3\frac{1}{4}$  fms) and northern ( $5\frac{3}{4}$  fms) rocks are charted on 18440. The Hydrographer recommends retaining the rocks as charted and updating the position and sounding information as per the digital data<sup>17</sup>.

Just to the northeast of Green Point is a charted PD rock awash (Figure 14). Although outside the area of complete MBES coverage, this rock was not seen during shoreline verification, in the VBES star pattern, or in the partial SSS imagery. This feature is not charted on 18465. The Hydrographer recommends removing the charted rock awash<sup>18</sup>.

There is a charted PA rock with depth  $1\frac{3}{4}$  fathoms 2,500 meters east of Green Point (Figure 14). This rock was seen in the bathymetry. The Hydrographer recommends updating the position of the rock and removing the legend "PA"<sup>19</sup>.

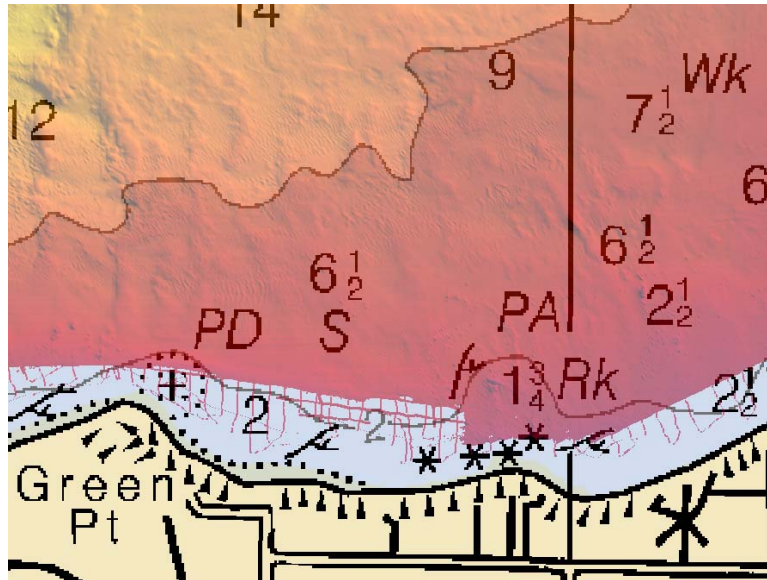


Figure 14. Charted PD rock awash and PA rock (Chart 18440)

The Hydrographer recommends that survey soundings supersede all prior survey and charted depths in the area of complete MBES and where discussed above<sup>20</sup>.

#### D.1.b. Dangers to Navigation

No dangers to navigation (DTONs) were found in survey H11750<sup>21</sup>.

#### D.1.c. Other Features

##### Automated Wreck and Obstruction Information System (AWOIS) Investigations

One (1) AWOIS item falls within the survey limits of H11750 and was assigned for full investigation<sup>22</sup>. A description of the AWOIS item investigation is included in the Survey Feature Report in Appendix II as well as Notebook session H11750\_Notebook.wrk.

##### Additional Items

Additional features investigated within the limits of H11750 are described in the Survey Feature Report in Appendix II.

#### D.2. Additional Results

##### D.2.a. Prior Survey Comparison

Prior survey comparison was not performed.

##### D.2.b. Shoreline Verification

Shoreline Source

A composite source file 0-1N\_372.000 was provided with the project instructions. This composite source was trimmed to the sheet boundaries and printed on paper “boat sheets” and displayed in Hypack for field verification.

Shoreline Verification

Limited shoreline verification was conducted near predicted low water on DN 285 in accordance with the Specifications and Deliverables and FPM sections 6.1 and 6.2.

No detached positions (DPs) were acquired during shoreline verification. Instead, designated soundings from the bathymetry indicate revisions to features. Annotations describing shoreline were recorded on hard copy plots of digital shoreline.

All shoreline data are submitted in Caris Notebook .hob files. The session H11750\_Notebook.wrk contains the following:

<b>HOB File</b>	<b>Purpose and Contents</b>
H11750_Reference	Contains the survey sheet limits
H11750_Original_Comp_Source	The original composite HOB contains the features from the Composite source clipped to the limits of the survey sheet. This file remains unaltered through delivery to the processing branch.
H11750_Field_Verified.hob	The Field verified layer contains the Original_Comp_Source HOB with survey updates. Features contained in the Field_Verified HOB include (a) new features (b) modification due to attribution, geometry, feature object class, or position (c) features from multiple sources (i.e. deconfliction) (d) Features not addressed remain in the Field Verified layer. This includes features inshore of the NALL and features from multiple sources which cannot be deconflicted.
H11750_Disprovals.hob	Features from Composite Source that have been disproved are in this layer. These include (a) features that no longer exist (b) features that have been modified

*Table 6. List and Description of Notebook HOB files*

Source Shoreline Changes and New Features

Items for survey H11750 that require further discussion and are associated with a designated sounding have been flagged “Report” in Pydro in H11750.pss. Investigation methods and recommendations are listed in the Remarks and Recommendation tabs. These features are included in the Survey Feature Report in Appendix I.

## Recommendations

The Hydrographer recommends that the shoreline as depicted in the Notebook .HOB files supersede and complement shoreline information compiled in the Composite Source and charts as described above.

### **D.2.c. Aids to Navigation**

There are no Aids to Navigation within the limits of H11750<sup>23</sup>.

### **D.2.d. Overhead Features**

There are no overhead features within the limits of survey H11750<sup>24</sup>.

### **D.2.e. Submarine Cables and Pipelines**

There is one submarine cable area charted in the northwest corner of the survey. No cable was detected in the full coverage MBES in this area. There are no pipelines charted within the limits of H11750, and none were detected by the survey<sup>25</sup>.

### **D.2.f. Ferry Routes**

There are no ferry routes charted within the limits of survey H11750, and none were observed to be operating in the area.

### **D.2.g. Bottom Samples**

Within the area of Survey H11750 nine (9) bottom samples were obtained inside the 10 fathom curve. Priority was placed on verifying pre-existing charted bottom characteristics on Chart 18465. Within these locations bottom samples were spaced no more than 2000 meters apart in accordance with the NOS Hydrographic Surveys Specifications and Deliverables (April 2007) and OCS Field Procedures Manual for Hydrographic Surveying (March 2007). All bottom samples are included in H11750.PSS file and in the H11750\_Pydro\_Updates.hob file<sup>26</sup>.

### **D.2.h. Other Findings**

There were no other findings within the limits of survey H11750.

**E. APPROVAL**

As Chief of Party, Field operations for hydrographic survey H11750 were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports. The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual (April 2007 edition), Field Procedures Manual (March 2007 edition), Standing and Letter Instructions, and all HSD Technical Directives issued through November 2007. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required. All data and reports are respectfully submitted to N/CS34, Pacific Hydrographic Branch.

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

<u>Title</u>	<u>Date Sent</u>	<u>Office</u>
Data Acquisition and Processing Report for OPR-N372-RA-07	2/29/2008	N/CS34
Coast Pilot Report for OPR-N372-RA-07	TBD	N/CS26



, CDR/NOAA

Digitally signed by Donald W. Haines, CDR/NOAA  
 DN: cn=Donald W. Haines, CDR/NOAA, c=US, o=NOAA/NMAO/  
 MOC-P, ou=NOAA Ship RAINIER, email=co.rainier@noaa.gov  
 Reason: I am approving this document  
 Date: 2008.07.02 15:11:54 -08'00'

Approved and Forwarded:

\_\_\_\_\_  
 Commander Donald W. Haines, NOAA  
 Commanding Officer

In addition, the following individuals were also responsible for overseeing data acquisition and processing of this survey:

Survey Sheet Manager:



I am the author of this document  
 2008.07.02 15:35:18 -08'00'

\_\_\_\_\_  
 Ensign Anna-Elizabeth Villard-Howe, NOAA  
 Navigation Officer

Chief Survey Technician:



I have reviewed this document  
 2008.07.02 09:58:03 -08'00'

\_\_\_\_\_  
 James B. Jacobson  
 Chief Survey Technician, NOAA Ship RAINIER

Field Operations Officer:



I have reviewed this document  
 2008.07.02 11:28:20 -08'00'

\_\_\_\_\_  
 Lieutenant Charles J. Yoos, III, NOAA  
 Field Operations Officer

**Revisions Compiled During Office Processing and Certification:**

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<sup>1</sup> Standing Instructions for Hydrographic Surveys (January 2006), NOS Hydrographic Surveys Specifications and Deliverables (April 2007), NOS Field Procedures Manual for Hydrographic Surveying (March 2007), and all Hydrographic Surveys Technical Directives issued through the dates of data acquisition.

<sup>2</sup> Filed with Project Records

<sup>3</sup> Filed with Project Records

<sup>4</sup> Concur. HCell H11750 was compiled to junction with HCell H11749.

<sup>5</sup> Concur

<sup>6</sup> The heave errors fall within Specifications.

<sup>7</sup> H11750 was compared with chart 18465, 1:80,000, 38<sup>th</sup> Ed., May 2008, NTM May 17, 2008 and chart 18440, 1:150,000, 29<sup>th</sup> Ed., Sep. 2007, NTM Sep. 15, 2007.

<sup>8</sup> Concur

<sup>9</sup> Concur

<sup>10</sup> Concur. Chart as depicted in the HCell.

<sup>11</sup> Concur. The wreck, AWOIS #52054, has been removed from the HCell.

<sup>12</sup> Concur. Chart wreck as depicted in the HCell.

<sup>13</sup> Concur. Chart three rocks as depicted in the HCell

<sup>14</sup> Concur

<sup>15</sup> Concur

<sup>16</sup> Concur

<sup>17</sup> Concur. Chart rocks as appropriate for chart scale.

<sup>18</sup> Concur

<sup>19</sup> Concur

<sup>20</sup> Concur

<sup>21</sup> Concur

<sup>22</sup> See endnote #11

<sup>23</sup> Concur

<sup>24</sup> Concur

<sup>25</sup> Concur with clarification. A small segment of a charted pipeline is within the limits of H11750; however it was not detected in the data. It is recommended the pipeline be retained as charted.

<sup>26</sup> Chart bottom samples as depicted in the HCell.





**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
National Ocean Service  
Silver Spring, Maryland 20910

**TIDE NOTE FOR HYDROGRAPHIC SURVEY**

**DATE :** December 5, 2007

**HYDROGRAPHIC BRANCH:** Atlantic Hydrographic Branch

**HYDROGRAPHIC PROJECT:** OPR-N372-RA-2007

**HYDROGRAPHIC SHEET:** H11750

**LOCALITY:** Green Point to Dungeness Bay, Puget Sound, WA

**TIME PERIOD:** October 25 - November 13, 2007

**TIDE STATION USED:** 944-4090 Port Angeles, WA  
Lat. 48° 07.5' N Long. 123° 26.5' W

**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters

**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 1.987 meters

**TIDE STATION USED:** 944-4900 Port Townsend, WA  
Lat. 48° 6.7' N Long. 122° 45.5' W

**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters

**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 2.389 meters

**TIDE STATION USED:** 944-9880 Friday Harbor, WA  
Lat. 48° 32.8' N Long. 123° 0.6' W

**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters

**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 2.167 meters

**REMARKS: RECOMMENDED ZONING**

Please use the TCARI grid "N372RA2007-TCARI.tc" submitted with the project instructions as the final grid for project OPR-N372-RA-2007, H11750, during the time period between October 25 - November 13, 2007

**Refer to attachments for zoning information.**

**Note 1:** Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

**Peter J. Stone**  
Digitally signed by Peter J. Stone  
DN: cn=Peter J. Stone, o=CO-OPS, ou=NOAA/  
NOS, email=peter.stone@noaa.gov, c=US  
Date: 2008.06.30 15:50:08 -04'00'

CHIEF, PRODUCT AND SERVICES DIVISION





**H11750 HCell Report**  
Sarah Wolfskehl, Physical Scientist  
Pacific Hydrographic Branch

**1. Specifications, Standards and Guidance Used in HCell Compilation**

HCell compilation of survey H11750 used:

Office of Coast Survey HCell Specifications: Draft, Version: 4.0, 17 March, 2010.  
HCell Reference Guide: Version 2.0, 22 February, 2010.

**2. Compilation Scale**

Depths and features for HCell H11750 were compiled to the largest scale raster chart shown below:

Chart	Scale	Edition	Edition Date	NTM Date
18465	1:80,000	38th	May, 2008	May 17, 2008

**3. Soundings**

A survey-scale sounding (SOUNDG) feature object layer was built from the H11750 5-meter 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.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
0	20	4
20	60	5
60	150	6

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

**4. Depth Contours**

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

Chart Contour Intervals in Fathoms from Chart 17372	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 H11750_SS.000
3	5.486	5.715	3.125	3
5	9.144	9.3726	5.125	5
10	18.288	18.5166	10.125	10
20	36.576	37.9476	20.75	20
30	54.564	56.2356	30.75	30
40	73.152	74.5236	40.75	40
50	91.44	92.8116	50.75	50

With the exception of the zero contours included in the \*\_CS file, 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, COALNE 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.

### 5. Meta Areas

The following Meta object areas are included in HCell H11750:

M\_QUAL

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

### 6. Features

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

### 7.S-57 Objects and Attributes

The \*\_CS HCell contains the following Objects:

\$CSYMB	Blue Notes
M_QUAL	Data quality Meta object
SBDARE	Bottom samples
SOUNDG	Soundings at the chart scale density
UWTROC	Rock features
WEDKLP	Kelp area
WRECKS	Wrecks

The \*\_SS HCell contains the following Objects:

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

## **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
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.

## **10. QA/QC and ENC Validation Checks**

H11750 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**

H11750_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:80,000
H11750_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H11750_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H11750_outline.gml	Survey outline
H11750_outline.xsd	Survey outline

**11.2 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 depth area, 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, SP 1	Validation of the base cell file.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

**12. Contacts**

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

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 Physical Scientist  
 Pacific Hydrographic Branch  
 Seattle, WA  
 206-526-6859  
[Sarah.Wolfskehl@noaa.gov](mailto:Sarah.Wolfskehl@noaa.gov).

APPROVAL SHEET  
H11750

Initial Approvals:

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

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

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