

H11637

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.* ..... H11637

### LOCALITY

*State* ..... Alaska

*General Locality* ..... Northeastern Price William Sound

*Sublocality* ..... Orca Bay

2007

### CHIEF OF PARTY

..... Commander Andrew L. Beaver, NOAA

### LIBRARY & ARCHIVES

DATE .....

## HYDROGRAPHIC TITLE SHEET

H11637

INSTRUCTIONS - The hydrographic sheet should be accompanied by this form,  
filled in as completely as possible, when the sheet is forwarded to the office.

FIELD NO.

n/a

State AlaskaGeneral Locality Northeastern Prince William SoundSublocality Orca BayScale 1:20,000Date of Survey 9/11/2007 - 10/11/2007Instructions Dated 8/3/2007Project No. OPR-P132-FA-07Vessel FAIRWEATHER S220Chief of Party CDR Doug BairdSurveyed by NOAA Ship FAIRWEATHERSoundings taken by echo sounder Reson 8101 and Reson 8111Graphic record scaled by N/AGraphic record checked by N/AEvaluation by Annie Raymond Automated plot by N/AVerification by Andrew ClosSoundings in Fathoms and Feet at MLLWREMARKS: Time in UTC. UTM Projection Zone 6Revisions 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.

# Descriptive Report to Accompany Hydrographic Survey H11637

Project OPR-P132-FA-07

Northeastern Prince William Sound, Alaska

Scale 1:20,000

November, 2007

**NOAA Ship FAIRWEATHER**

Chief of Party: Commander Andrew L. Beaver, NOAA

## A. AREA SURVEYED

The survey area was located in Northeastern Prince William Sound, within the sub-locality of Orca Bay. This survey corresponds to Sheet K in the sheet layout provided with the Letter Instructions, as shown in *Figure 1* below. The survey area is bounded on the Northeast corner at 60° 40.9' N, 146° 25.3' W and the Southwest corner at 60°31.7'N, 146°39.9'W. H11637 as completed is smaller than originally assigned to the FAIRWEATHER. The original sheet extended south to the southern shore of Orca Bay. The sheet was cut short to here due to time constraints.

Data acquisition was conducted from September 11 to October 11, 2007 (DN 254 to DN 284).

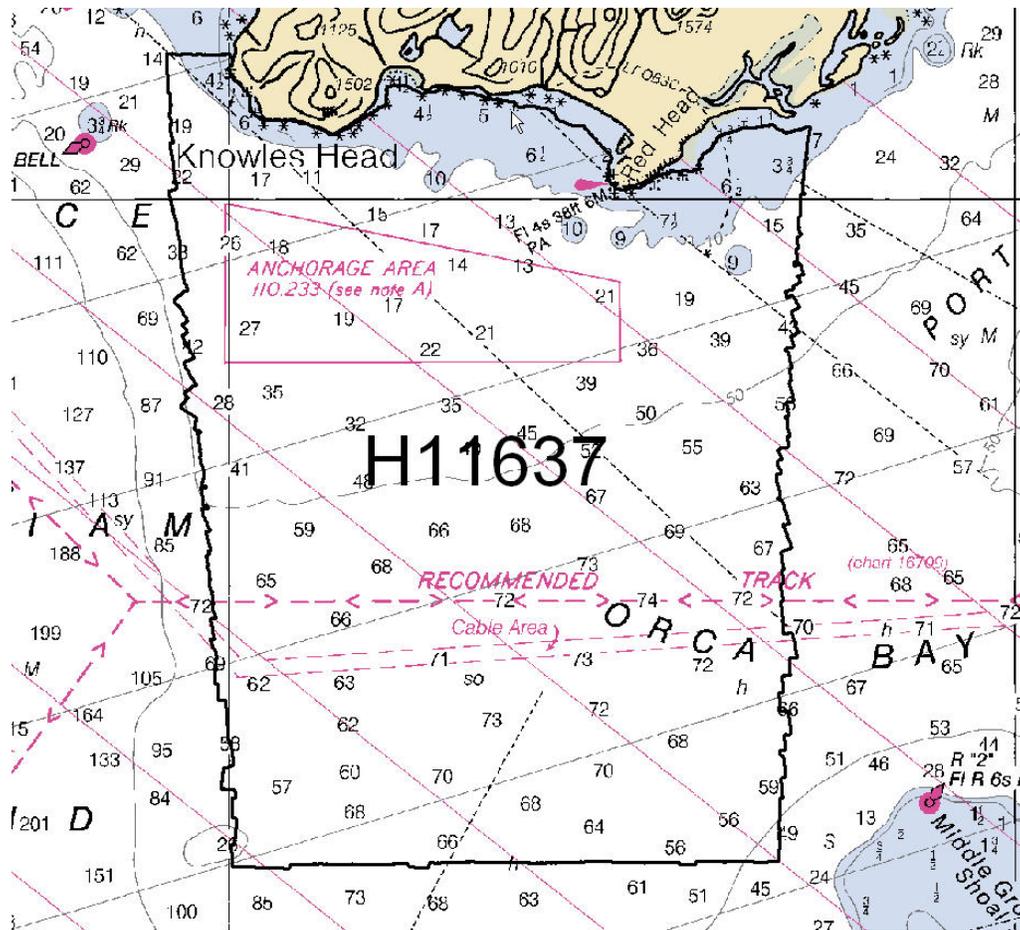


Figure 1: H11637

One hundred percent multibeam echosounder (MBES) coverage was obtained in the survey area offshore of the 4-meter depth curve. When conditions allowed, multibeam echosounder (MBES) data were acquired parallel to contours. Additional coverage was obtained when determining least depths over features or shoals offshore of the Navigable Area Limit Line (NALL), which is defined as the furthest offshore of either the 4-meter depth contour or a distance of 0.8 mm (64 meters on the 1:80,000 chart 16708) from the Mean High Water line at the scale of the largest scale chart.

Shoreline data were acquired for H11637. These features were attributed as S-57 objects for submittal.

## B. DATA ACQUISITION AND PROCESSING

A complete description of data acquisition and processing systems and survey vessels along with quality control procedures and data processing method is included and described in the *OPR-P132-FA-07 Data Acquisition and Processing Report (DAPR)*<sup>1</sup>, submitted under separate cover. Items specific to this survey and any deviations from the aforementioned report are discussed in the following sections. This hydrographic survey was completed as specified by Hydrographic Survey Project Instructions OPR-P132-FA-07, dated August 3, 2007.

### B1. Equipment and Vessels

Equipment and vessels used for data acquisition and survey operations during this survey are listed below in *Table 1*.

	FAIRWEATHER	Jensen Launch 1010	Jensen Launch 1018	MonArk	Ambar 700
<b>Hull Registration Number</b>	S220	1010	1018	1706	2302
<b>Builder</b>	Aerojet-General Shipyard	The Boat Yard, Inc.	The Boat Yard, Inc.	MonArk	Marine Silverships, Inc
<b>Length Overall</b>	231 feet	28' 10"	28' 10"	17'	23'
<b>Beam</b>	42 feet	10' 8"	10' 8"	7'2"	9' 4"
<b>Draft, Maximum</b>	15' 6"	4' 0" DWL	4' 0" DWL	1' 3"	1' 4"
<b>Cruising Speed</b>	12.5 knots	24 knots	24 knots	20 knots	22 knots
<b>Max Survey Speed</b>	10 knots	10 knots	10 knots		
<b>Primary Echosounder</b>	RESON 8111 & RESON 8160	RESON 8101	RESON 8101		
<b>Sound Velocity Equipment</b>	SBE 19plus & 45, MVP 200	SBE 19plus	SBE19plus		
<b>Attitude &amp; Positioning Equipment</b>	POS/MV V4	POS/MV V4	POS/MV V4		
<b>Type of operations</b>	MBES / Bottom Samples	MBES	MBES	Shoreline	Shoreline, Bottom Samples

*Table 1: Vessel Inventory*

No vessel configurations used during data acquisition deviated from the *DAPR*.

**B2. Quality Control**

Internal consistency and integrity of data among acquisition platforms collected for survey H11637 were manually examined by the Hydrographer in CARIS subset mode. The internal consistency and integrity of data collected for survey H11637 were found to be good as the data agreed within accuracy standards stated in the *NOS Hydrographic Surveys Specifications and Deliverables Manual (HSSDM)*.<sup>2</sup> Data quality for survey H11637 was evaluated through examination of CUBE and BASE surfaces that were generated from raw soundings. CUBE hypothesis count and strength were used to identify any areas of ambiguity where the surface model required manual review. All areas of high standard deviation were examined in raw soundings using either subset editor or swath editor in CARIS HIPS and SIPS to eliminate noise and identify significant shoals. Soundings and surfaces in overlapping coverage and outer beams were reviewed for systematic errors and excessive noise. In general, the data were consistent in comparisons between day-day, vessel-vessel, and line-line coverage with minor errors in water-level and sound-velocity correction observed in the upper areas of Sheep Bay.

**Crosslines**

Shallow water multibeam crosslines for this survey totaled 68.79 linear nautical miles (lnm), comprising 7.86% of the 874.78 lnm of total MBES hydrography, however mainscheme lines acquired near shore in Knowles Bay on DN284 received no crosslines coverage. The last crosslines were acquired on DN283. Crosslines could not be acquired for DN284 due to time constraints. Both mainscheme and cross line mileage are summarized in *Table 2*.

<b>MAIN SCHEME - Mileage</b>	
Single Beam MS	0.00
Multibeam MS mileage	874.78
SideScan MS	0.00
<b>Total MS</b>	<b>874.78</b>
<b>CROSSLINE - Mileage</b>	
Single Beam XL	0.00
Multibeam XL	68.79
<b>Total XL</b>	<b>68.79</b>
<b>OTHER</b>	
Developments/AWOIS - Mileage	0.00
Shoreline/Nearshore Investigation - Mileage	10.10
<b>Total # of Investigated Items</b>	<b>7.00</b>
<b>Total Bottom Samples</b>	<b>45.00</b>
<b>Total SNM</b>	<b>90.95</b>
Specific Dates of Acquisition	11 to October 12, 2007
Specific Dn#s of Acquisition	(DN 254 to DN 284)

*Table 2. H11637 Mainscheme and Crossline Statistics Summary*

The Hydrographer has determined through manual examination of the data that the crossline agreement with mainscheme data meet the vertical accuracy requirements as stated in the *HSSDM*.<sup>3</sup> There was no significant difference found between the nadir-to-nadir comparison of soundings from the cross lines and the mainscheme lines. Discrepancies were only found when comparing the outer beam data. The vertical offsets in the outerbeam data were thought to be caused by sound velocity errors as discussed in the sound velocity section below.

## **Junctions**

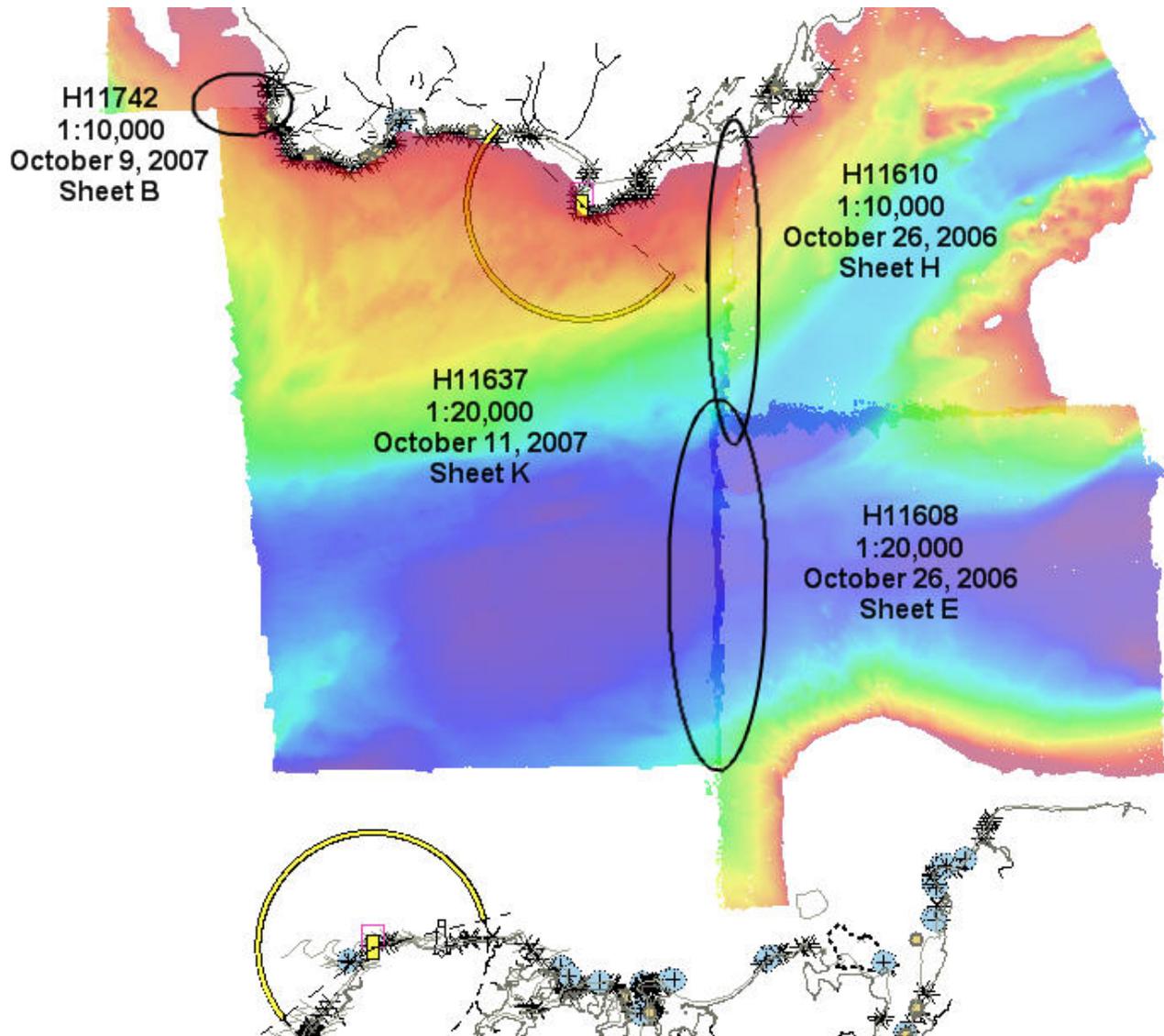
### **SAME PROJECT JUNCTIONS:**

Survey H11637 junctions with Survey H11742, Sheet B, from this same project. The area of overlap between the sheets was approximately 100 meters wide. Data were reviewed in CARIS Subset Editor and depths were found to be consistent between the two surveys, meeting the requirements as stated in the *HSSDM*.<sup>4</sup> The area of overlap between Sheet B and Sheet K is shown in *Figure 2*.

### **OPR-P158-FA-06 JUNCTIONS:**

Survey H11637 junctions with survey H11610 and H11608 from a previous project.<sup>5</sup> The overlap for each ranges from 100 meters to 500 meters wide. The area of overlap was reviewed in CARIS Subset Editor and depths were found to be consistent between the two surveys, meeting the requirements as stated in the *HSSDM*.<sup>6</sup>

The areas of overlap for H11637 are shown below in *Figure 2*.



*Figure 2: Junctions on Sheets H11742 from OPR-P132-FA-07 and H11610 and H11608 from a previous project.*

### Quality Control Checks

MBES quality control checks were conducted as discussed in the quality control section of the DAPR.

### Data Quality Factors

#### COVERAGE ASSESSMENT:

Coverage Assessment followed procedures as outlined in the DAPR. Data were obtained starting from the north shore by Knowles Head and working south. Data were collected with 100% bottom coverage to approximately 1/2 nm south of Middle Ground Shoal light according to the resolution shown in *Table 3*. Some locations with low data density caused small holes in the surface. Each location was analyzed by creating an interpolated surface from the appropriate resolution cube surface.<sup>7</sup> The interpolated surface was created in CARIS HIPS and SIPS with a 5x5 square interpolation using the 12 nearest neighbors.

Any hole in the original surface that disappeared in the interpolation was deemed not to be a holiday. There was only one significant occurrence of this within the sheet limits, in the northeast corner, but it disappeared in the interpolation surface. Areas of sparse data showed no signs of sudden shoaling.

Depth Ranges (m)		Resolution
Low	High	
0	30	1.5
20	60	4
50	150	10

*Table 3: Caris BASE Surface Depth Ranges and Resolutions used throughout the project*

**DESIGNATED SOUNDINGS:**

Designation of 43 soundings followed procedures as outlined in the DAPR.

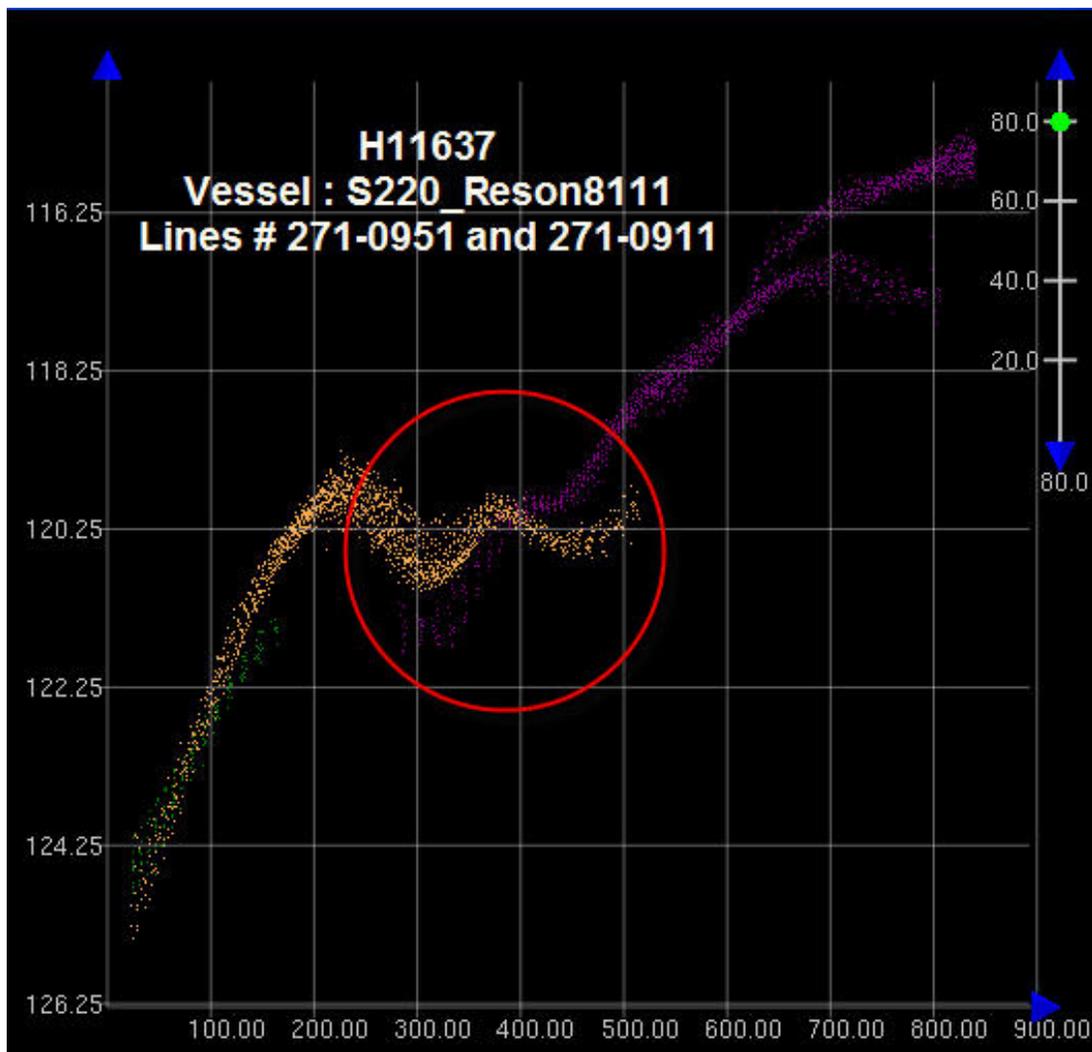
**TRUEHEAVE:**

TrueHeave was used throughout the entire project except where a TrueHeave file did not exist as a result of human error on the day of acquisition or the TrueHeave file was corrupted for an unknown reason. One-hundred and nineteen lines in H11637 did not have TrueHeave applied. A “Fix TrueHeave” tool was used to create a TrueHeave.fixed file and applied to all lines that would not accept the original TrueHeave file. FA-S220 did not accept TrueHeave.fixed for lines on days 271, 269, 268, and 280. FA-1010 did not accept the TrueHeave.fixed for lines on day 268. FA-1018 did not except TrueHeave.fixed for lines on day 279. Lines from FA-1018 on day 2007-279 had a 0.3 meter data shifting at a depth of 6 meters- as a result of the lack of TrueHeave, however no divergences found exceeded the standards stated in the HSSDM.<sup>8</sup>

**SOUND VELOCITY:**

Sound velocity was found to cause problems in outer beam soundings throughout the entire survey. Overlapping outer beam data were often found to diverge by more than the IHO orders 1 or 2 error budget. To mediate this issue significant cleaning of outer beam data occurred. All lines were filtered to at least 70 degrees from nadir on both starboard and port sides. Where necessary more data were filtered. Lines #1018 2007-270-2238 through 270-2327 and #S220 2007-266, -268, -271, -277 were filtered to 65 degrees from nadir on both starboard and port sides. All cross lines were filtered to 60 degrees from nadir on both starboard and port sides. Throughout the sheet more pings needed to be rejected due to sound velocity error, and yet other pings were reaccepted if sound velocity did not cause significant spreading in the data. This manual inspection of the data was conducted using CARIS subset and swath editor.

Sound velocity errors in the outer beams caused divergences and disagreements from one line to the next. This type of offset of approximately 1% of depth is seen throughout the entire field sheet. Throughout most of the project, the majority of overlap has been filtered out as explained above, however, in some locations such as shown below where there was more than normal overlap, some disagreement between lines, as shown in *figure 3*, is still seen.



*Figure 3: Sound Velocity Errors in the Outer Beams*

The sound velocity error caused the most significant problems in the outer beams. Below, *figure 4* shows a location of overlap of three lines. The lines show an offset of approximately 1 meter at a depth of 100 meters between the grey and yellow mainscheme lines with the blue cross line. It is believed that this is caused by sound velocity errors in the two mainscheme lines, as those pings are far from nadir. The pings from the crossline are near nadir and believed to be more accurate in this case.<sup>9</sup>

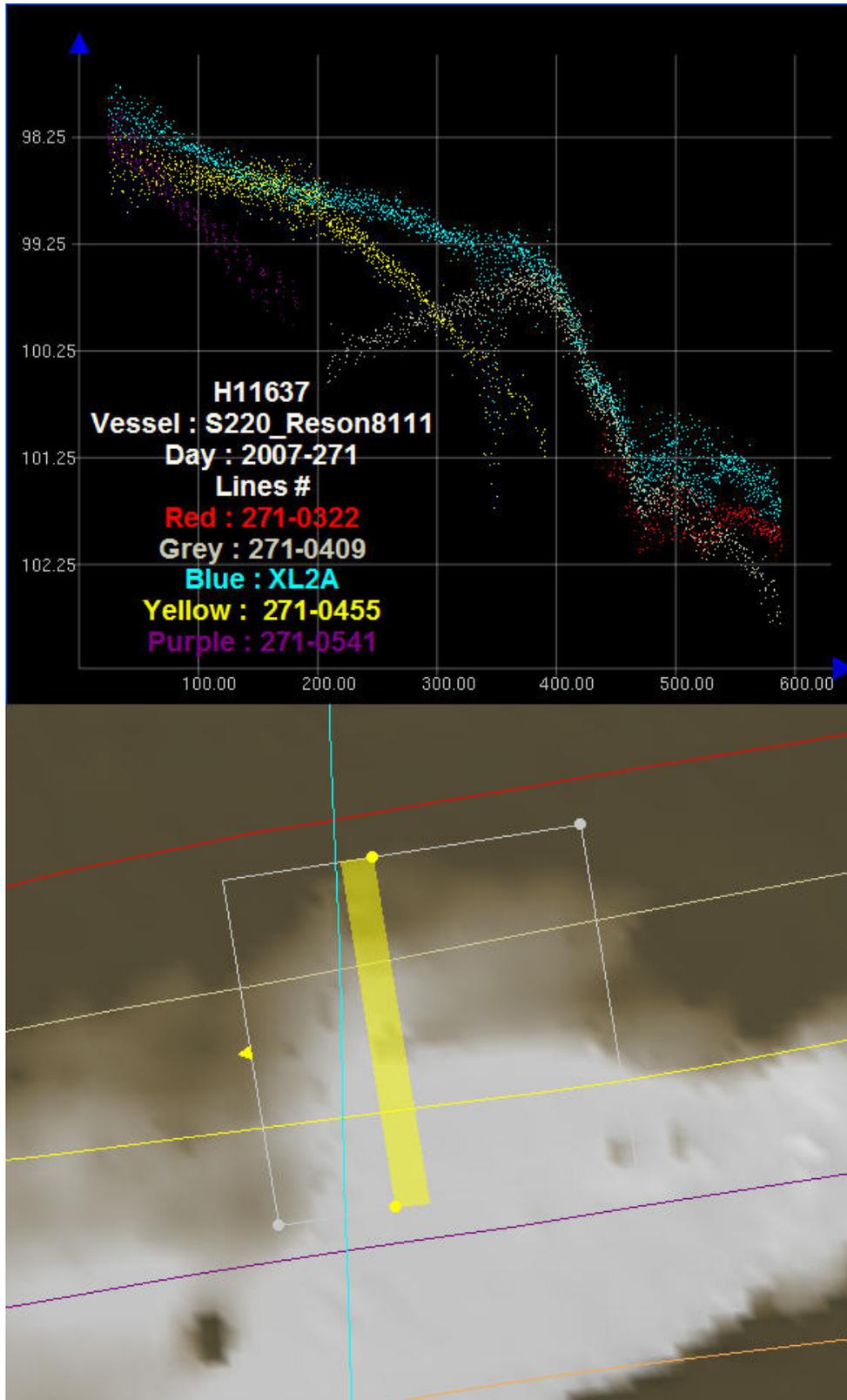


Figure 4: Sound Velocity Errors in the Outer Beams as shown in CARIS HIPS and SIPS

Accuracy Standards

All data meet the data accuracy specifications as stated in the *HSSDM*.<sup>10</sup> However, one example at the crossing of two lines acquired by vessel S220 on two separate days showed a vertical data shift with a spread approximately within requirements set by the HSSDM for the error budget.<sup>11</sup> It resembles a tidal error since the data were acquired on two separate days and is uniform for the whole line. It may also be a sound velocity error since the two lines have less overlap than was normally acquired. The offset between lines #270-1744 and #269-2332 are shown below in *Figure 4*. As the spread of the data all throughout the survey stayed within IHO order 1 error budget the hydrographer still recommends the use of this data for the purpose of charting. This demonstrates the necessity of having an optimum level of overlap between data lines. In areas of significant sound velocity error, more overlap than was acquired between the lines shown in *Figure 5* is necessary.

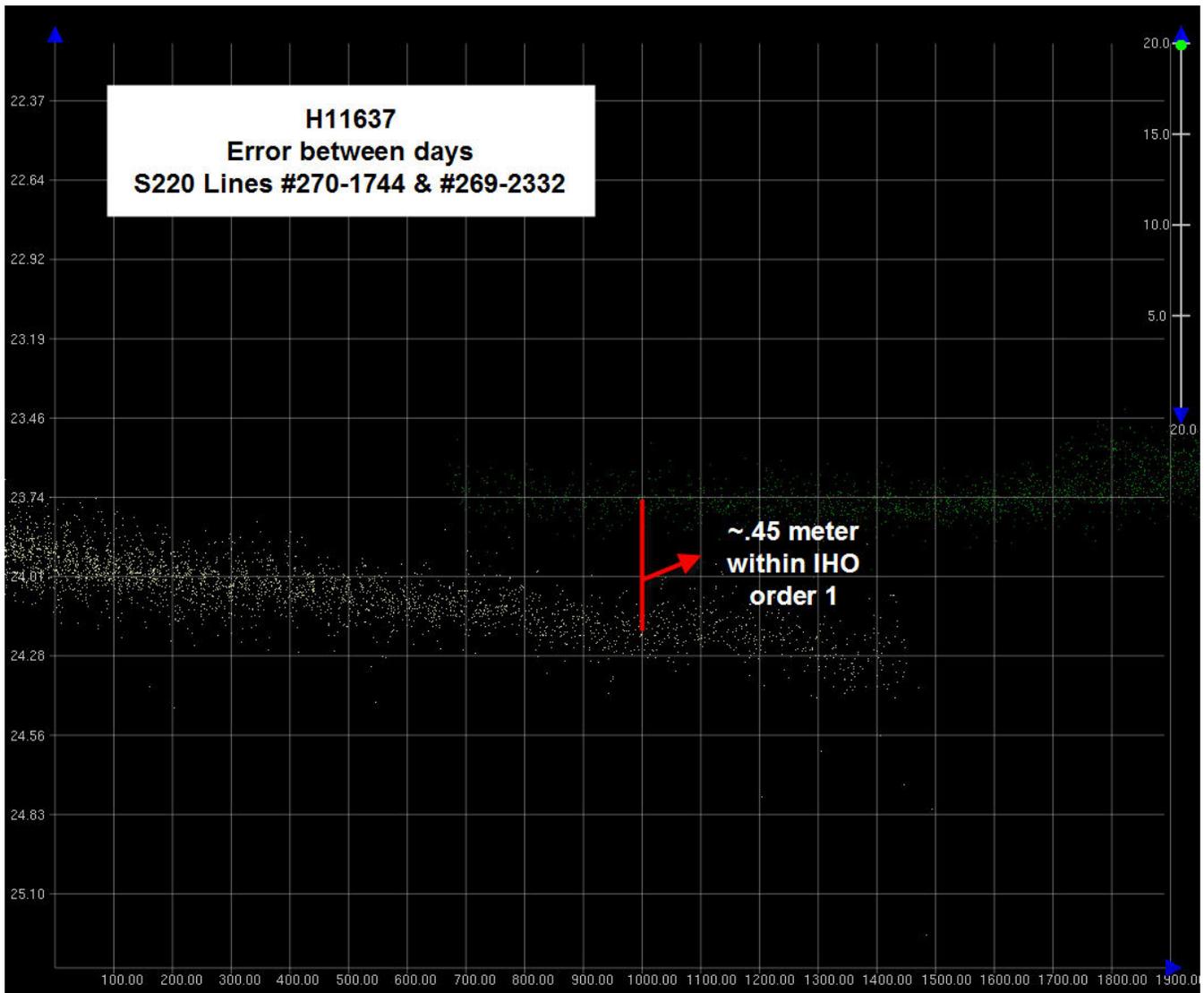


Figure 5: Possible sound velocity or tidal error

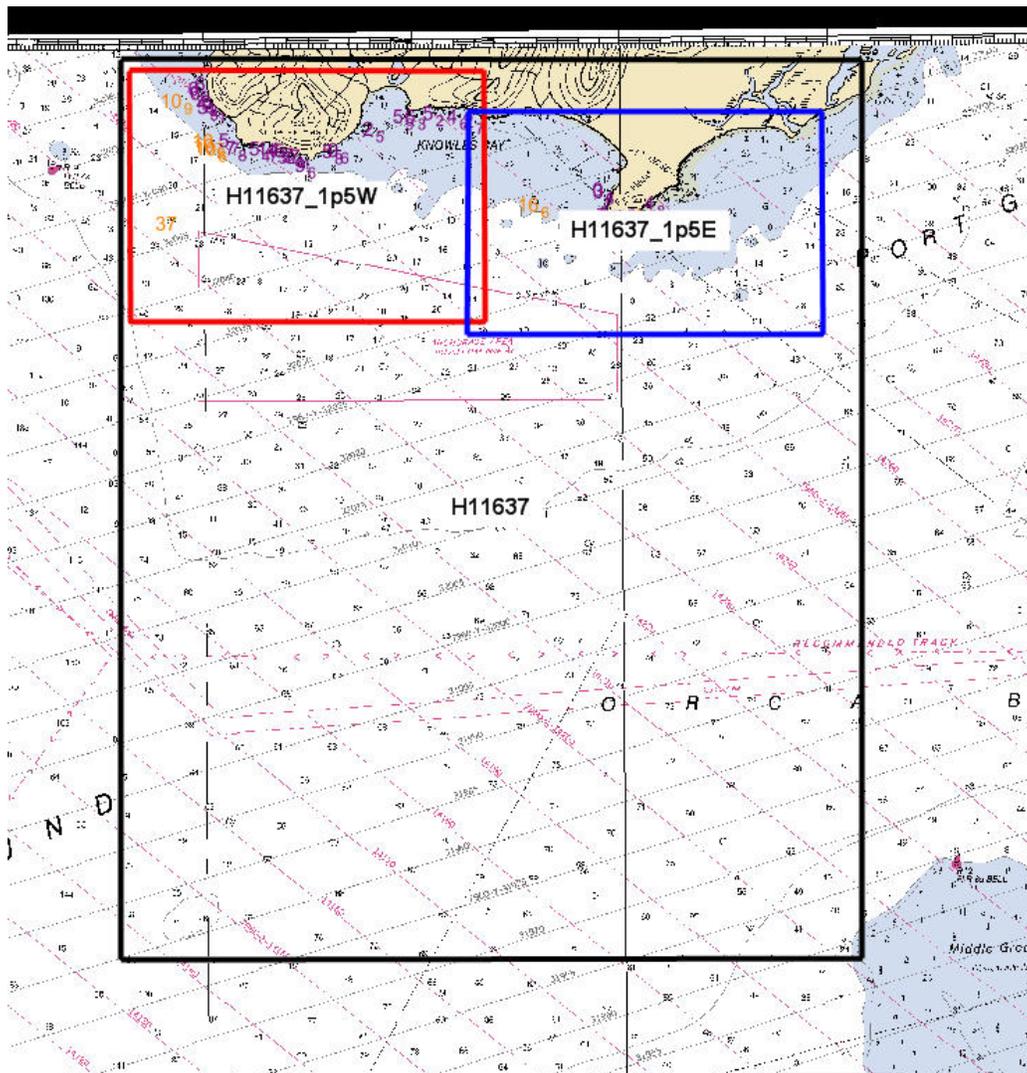
### B3. Corrections to Echo Soundings

Data reduction procedures for survey H11637 conform to those detailed in the DAPR.<sup>12</sup>

### B4. Data Processing

Data processing procedures for survey H11637 conform to those detailed in the DAPR, with the exceptions discussed below. In the cleaning process extensive filtering was used to remove outer beams data effected by sound velocity problems. This filtering was discussed above in the section on Sound Velocity.

There are three fieldsheets fulfilling the various resolution requirements for survey H11637. Fieldsheet H11637 is the largest, encompassing the entire survey area to the ten-meter and the four-meter resolution. Two additional fieldsheets (H11637\_1p5W and H11637\_1p5E) cover the 0-30 meter depths with a 1.5 meter resolution. The fieldsheet areas of coverage are displayed in *Figure 6*.



**Figure 6: H11637 Fieldsheets**

Surfaces for three different resolutions were created to cover the whole area at their respective depths as shown in *table 4*. A finalized surface was created for each surface to crop each surface to their relevant depths and to snap the surfaces to all designated soundings. A combined surface of all the finalized surfaces was created with a ten-meter resolution in the fieldsheet H11637. It was from the combined surface that the contour and sounding layers were generated. Multiple fieldsheets were created for the 1.5 meter resolution as shown in *table 4*. This was necessary due to computational limitations of the processing hardware. The finalized surfaces of the 1.5 meter four-meter, and ten-meter resolutions were combined in the H11637 fieldsheet. The combined surface has a resolution of ten-meters.

Fieldsheet	Resolution (m)
H11637	10 m, 4 m
H11637_1p5E	1.5 m
H11637_1p5W	1.5 m

**Table 4: H11637 fieldsheets and surface resolutions**

### C. HORIZONTAL AND VERTICAL CONTROL

FAIRWEATHER personnel did not establish any horizontal or vertical control stations for this project. No Horizontal and Vertical Control Report is required.<sup>13</sup> A summary of horizontal and vertical control for this survey follows.

#### 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. Differential corrections came from the U.S. Coast Guard beacons at Cape Hinchinbrook (292 kHz), Potato Point (298 kHz). The ATONs, Red Head Light and Johnstone Point Light, were not positioned via static GPS.<sup>14</sup>

#### 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 Valdez (945-4240) and Cordova (945-4050) served as control for datum determination and as the primary source for water level reducers for survey H11637 during acquisition.

A request for delivery of final approved water level data (smooth tides) for survey H11637 was forwarded to N/OPS1 on October 18, 2007 in accordance with the *Field Procedures Manual (FPM)*, dated March 2007 (FPM). A copy of the request is included in Appendix IV.<sup>15</sup>

FAIRWEATHER received the Tide Note for Hydrographic Survey H11637 on November 3, 2007. The Tide Note for Hydrographic Survey H11637 states that preliminary zoning is accepted as the final zoning correctors. Final approved water level data were received by the FAIRWEATHER on November 10, 2007 for NWLON Valdez (945-4240) and Cordova (945-4050). The Tide Note for Hydrographic Survey H11637 and ancillary correspondence are included in Appendix IV.

As per the Letter Instructions, all data were reduced to MLLW using the final approved water levels (smooth tides) from Cordova (945-4050) by applying tide file 9454050.tid and file 9454240.tid and time and height correctors through the zone corrector file P132FA2007CORP.zdf on December 5, 2007.

**D. RESULTS AND RECOMMENDATIONS**

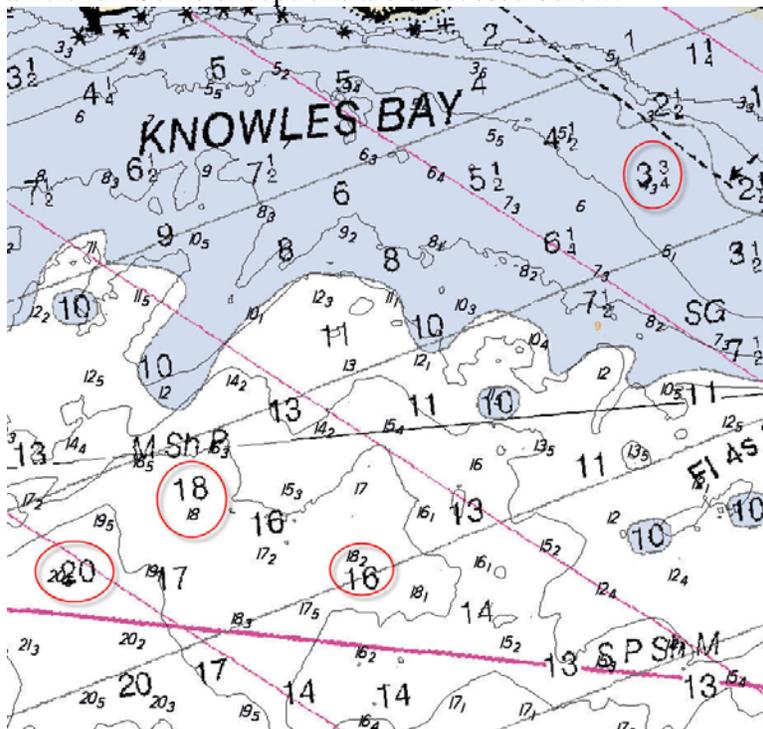
**D.1 Chart Comparison**

Chart comparison procedures were followed as outlined in the *FPM*.

Survey H11637 was compared with charts 16700 (29<sup>th</sup> Ed.<sup>16</sup>; July 2004, 1:200,000), 16708 (26<sup>th</sup> Ed.<sup>17</sup>; October 2004, 1:79,291) and 16709 (23<sup>rd</sup> Ed.<sup>18</sup>; April 2005, 1:80,000). Chart 16708 has been updated with the Notice to Mariners through October 9, 2004.<sup>19</sup> Chart 16709 has been updated with the Notice to Mariners through April 2, 2005.<sup>20</sup> Chart 16700 has been updated with Notice to Mariners through July 17, 2004.<sup>21</sup> The most recent Notice to Mariners from May 2008 was consulted. There were no new changes within the survey area.

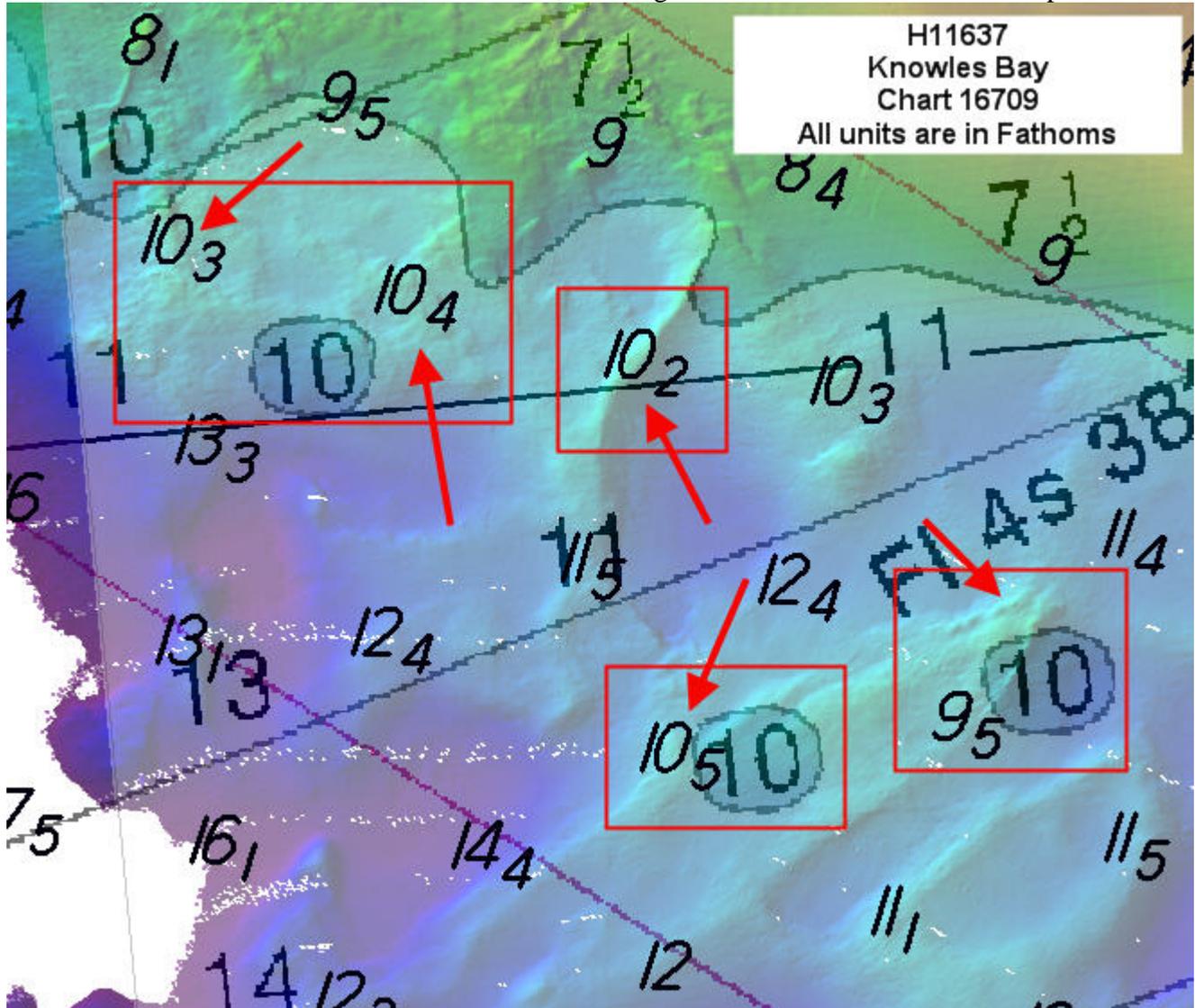
**Charts 16700, 16708, and 16709**

Depths from survey H11637 generally agreed within one to two fathoms with depths on charts 16700, 16709, and 16708.<sup>22</sup> Some of the shoaler depths represented on the chart near the shoreline appear to have been pulled off shore for cartographic representation, but remain accurate within the scale of the chart as seen in *Figure 7*.<sup>23</sup> The soundings selected are an arbitrary sampling of charted soundings demonstrating the overall trend. Some exceptions are discussed below.



*Figure 7. Charted (16709) sounding agree well with the generated soundings. All units are in fathoms.*

Several 10-fathom shoals charted on 16709 show a slight shifting from the 10-fathom shoals shown in the data of H11637. The figure below, *figure 8*, shows several locations of the slight shift in the locations of the shoals. All 3 shoals indicated on the chart at the east end of Knowles Bay near Red Head, are representative of the actual shoals, however they miss the least depths shown in the data. One shoal showing a least depth of 10.2 fathoms just out sided of the 10 fathom curve is not represented on the chart. Chart 16708 better coincides with the data, showing little or no shift over these examples.



*Figure 8. Charted (16709) 10 Fathom sounding shifted from actual 10 fathom shoal. All units are in fathoms.*

Inside Knowles Bay, a 1.5 fathom sounding is charted seaward of the 3 fathom curve and near a 5 fathom sounding. This is shown below in *figure 9* with chart 16708 in the background. Chart 16709 is the same.<sup>24</sup>

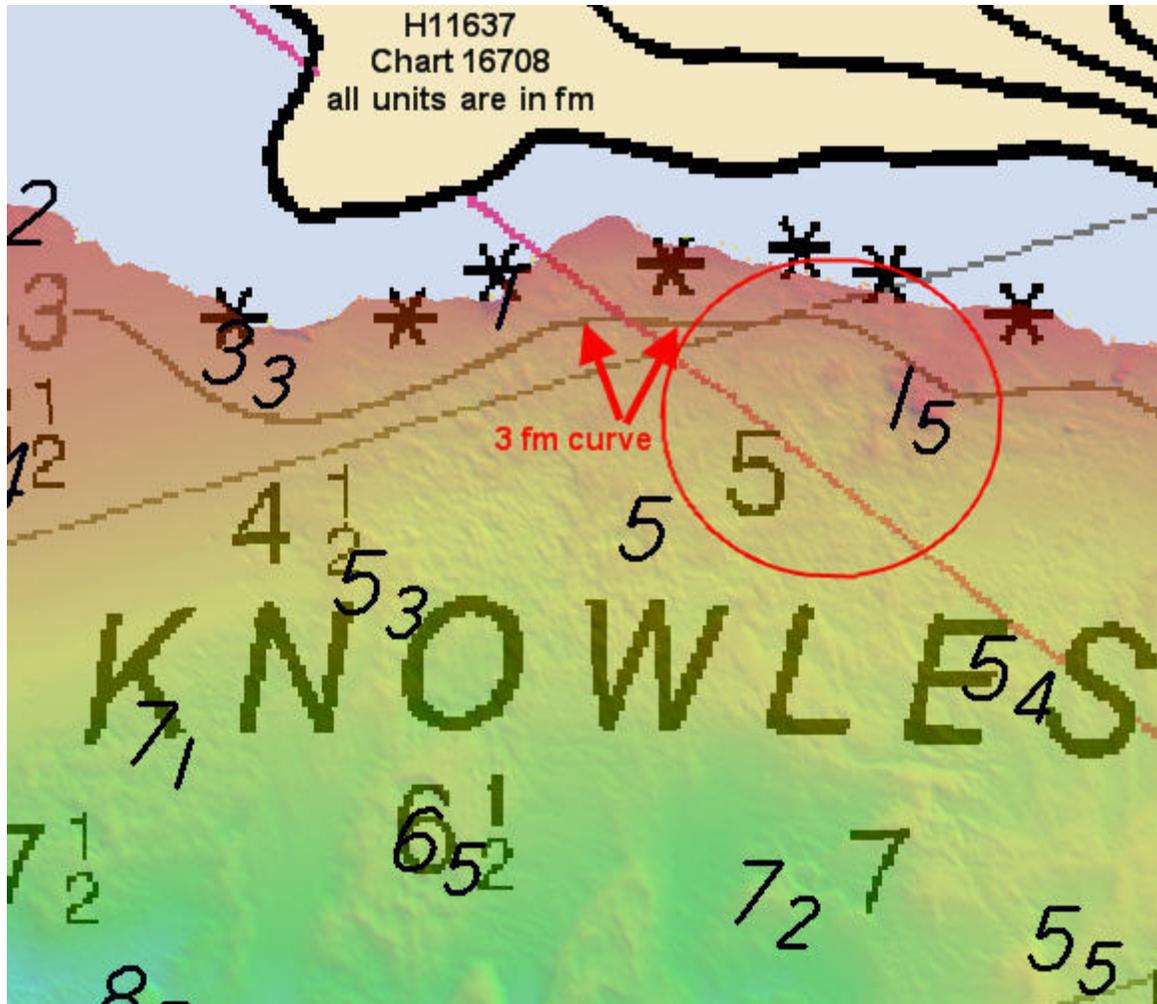


Figure 9. Charted (16708) 1.5 Fathom sounding seaward of 3 Fathom curve. Shown in CARIS HIPS & SIPS.

Southeast of Red Head there is an uncharted shoal. A 9.8 fathom sounding exists between a 13 fathom and a 14 fathom sounding as shown below in figure 10. It was decided not to declare this a DTON since it is very close to and not offshore of a charted 9 fathom shoal.<sup>25</sup>

Northwest of Johnstone Pt. a large charted shoal shows a least depth of 26 fathoms. H11637 borders on the east side of the shoal but does not cover it as shown below in figure 11. A least depth over this shoal was not acquired and from the data it is believed that the least depth is to the West of the H11637 survey boundary. The ten-meter combined surface shows a 59 meter sounding on the west edge of the surface within 170 meters of the 26 fathom sounding. The edge of H11637 shows significant shoaling towards the west with a least depth of 48 fathoms and no indication of plateauing, also shown in figure 11. Soundings from the 1947 survey, H07628, are plotted in figure 11. It is not believed that the chart 16709 is created from the 1947 data since the shoal appears to be shifted in the 1947 data and since the chart 16709 indicates source data from between 1970-1989. Source data from those years, covering the shoal, could not be found, however the soundings from the 1947 indicate a steep shoaling from approximately 68 fathoms to 28 fathoms or a total rise of 40 vertical fathoms over a horizontal range of approximately 240 meters, agreeing well with the shoaling on the edge of H11637 of 10 fathoms over a horizontal range of 50 meters. With that slope it is reasonable that the data could reach 29 fathoms in 170 meters.<sup>26</sup>

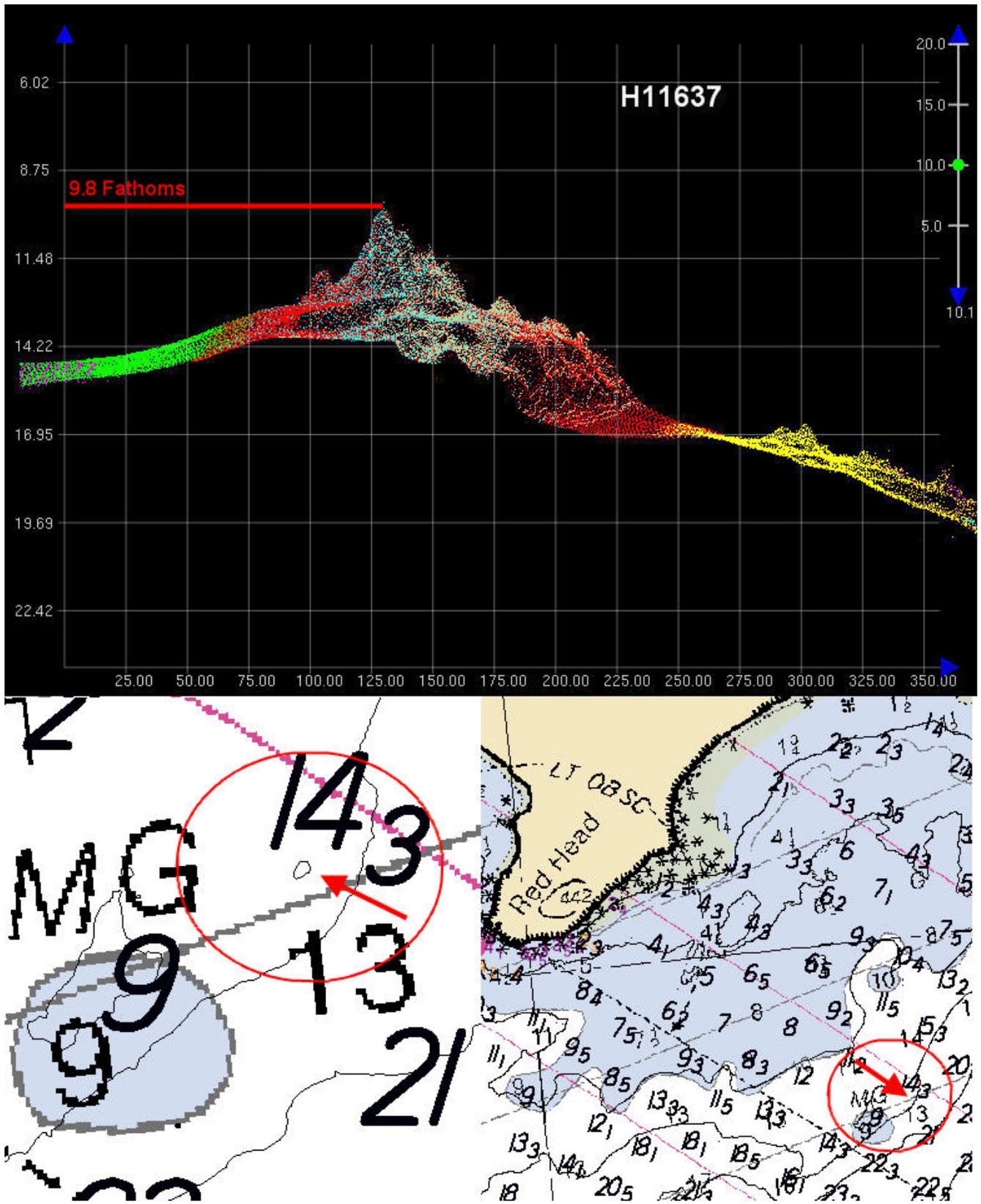


Figure 10. Charted (16709) 9.8 Fathom sounding east of Red Head, all vertical units are in Fathoms.

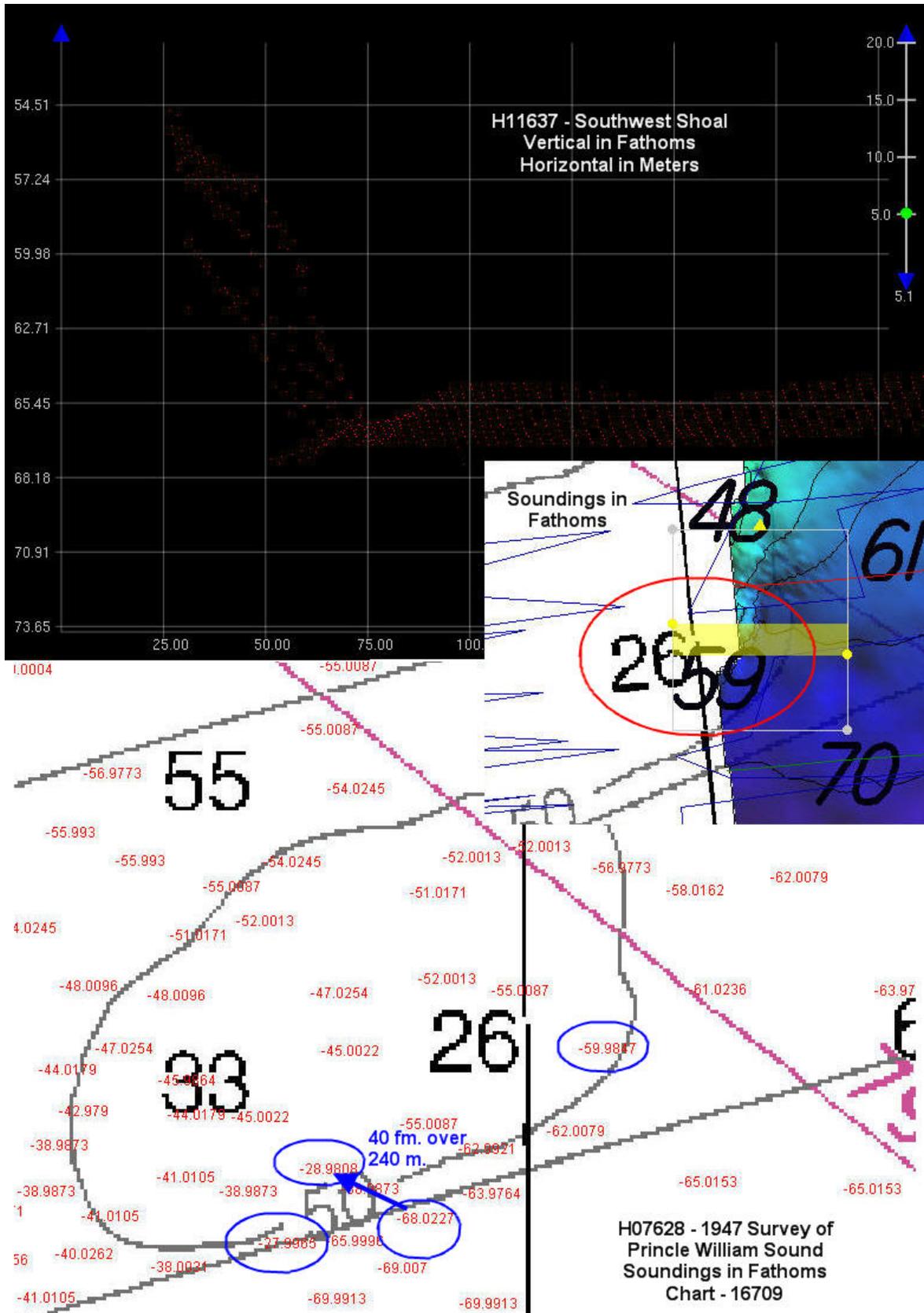


Figure 11. Charted (16709) Fathom soundings Northwest of Johnstone Pt, all vertical units are in Fathoms

## Chart Comparison Recommendations

The Hydrographer has determined that bottom coverage requirements have been met and data accuracy meets requirements specified by the *HSSDM*. **The surveyed soundings are adequate to supersede prior surveys in their common areas.**<sup>27</sup> Based on the application of verified water level data (smooth tides) by FAIRWEATHER, final chart comparisons are not required by the Pacific Hydrographic Branch.

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

There were no AWOIS items located within the limits of H11637.<sup>28</sup>

## Dangers to Navigation

There were no Dangers to Navigation found within the survey limits.<sup>29</sup>

## D.2 Additional Results

### Shoreline Verification and Processing

FAIRWEATHER conducted limited shoreline verification at times near predicted low water, in accordance with the Field Procedures Manual and HTD-2007-7. A composite source file from the Hydrographic Survey Division's (HSD) Operations Branch was provided with the project instructions and included: Geographic Cell (GC) or Digital Document (DD) Shoreline compiled by the Remote Sensing Division (RSD) from current and prior photogrammetric surveys; and charted features compiled by HSD's Operations Branch. Navigationally significant charted (16700, 16708, and 16709) features located within the survey limits were also digitized into the composite source layer. All shoreline features on the north shore from the composite source seaward of the Navigable Area Limit Line (NALL) were verified or disproved during shoreline operations.<sup>30</sup>

Detached positions (DPs) acquired during shoreline verification were recorded in Trimble TerraSync 2.4.1 and on paper DP forms. Scanned copies of the DP forms are included in the digital Separates folder and hard copies can be found with the *Separates to be Included with Survey Data*. In addition, annotations describing shoreline were recorded on hard copy plots (boat sheets) of the digital shoreline.

DPs were inserted into Pydro where they were tide corrected, S57 attributed and resolved according to Pydro flagging logic. A survey feature report for shoreline items was generated and included as H11637\_Survey\_Features.pdf in Appendix II. The report includes all significant shoreline items requiring specific attention that were flagged Report in Pydro. Investigation or survey methods for these items were included under the Remarks tab and, when appropriate, recommendations to the cartographer were included in the Recommendations tab.<sup>31</sup>

Shoreline deliverable .HOB files were compiled in Caris Notebook 3.0. Edits to existing source shoreline features were made in the H11637\_Composite\_Source.hob file, with GC (DD) and charted features modified or deleted as necessary. Field notes accompanying verified source features were entered in the Remarks attribute field. DPs were imported into Notebook from Pydro; these features are included in the H11637\_Updates and/or H11637\_Disprovals .HOB files.<sup>32</sup>

If a source feature was edited in Notebook, the SORIND and SORDAT attribute fields were modified to reflect the survey number (US,US,graph, H11637) and final survey date(20071011). Unmodified source shoreline features were left with their original SORIND and SORDAT values. The SORIND/SORDAT information for shoreline features included in the final Notebook .HOB files is included in *Table 5*.

Shoreline Source	SORIND	SORDAT
Survey	US,US,graph,survey H09424	19740320
NGS	US,US,reprt,NGS Data	19970101
	US,US,reprt,DD-6457	19980401
	US,US,reprt,DD-6166	19980701
RNC	US,US,graph,chart 16708	20010209
RNC	US,US,graph,Chart 16709	20010821
RNC	US,US,graph,Chart 16708	20040207
RSD	US,US,chart,graph,chart 19700	20030806
Survey	US,US,graph, H11637	20071011

*Table 5. SORIND/SORDAT Shoreline Features*

For a more detailed description of shoreline verification and processing refer to the DAPR.

### Source Shoreline Changes and New Features

Numerous charted (16700, 16708, and 16709) rocks were disproved with 100 percent SWMB coverage. The rocks were deleted from the Composite Source .HOB and added to the Disprovals.HOB file and it is recommended by the Hydrographer that the chart reflect the near shore features as shown in the composite source file.<sup>33</sup>

The shoreline near and around Knowles Head, in Knowles Bay, and around Red Head are strewn with rocks and ledges. The entire shoreline, especially around Knowles Head and Red Head, is a rocky shoreline. Few distinct high point rocks exist seaward of the NALL line but the shoreline is characterized with ledges and rocky foul areas shoreward of the NALL line. Four ledges were noted by the field party at the locations: ((60° 41.62N,246° 40.03W),(60° 41.08N,146° 39.33W), (60° 41.38N,146° 34.77W), and (60° 40.25N,146° 30.17W)). These positions represent the seaward most extents of the ledges. Though the charted (16700, 16708, and 16709) rocks shoreward of the NALL were not disproved, the Hydrographer recommends that some of the shoreline charted (16700, 16708, 16709) rocks shoreward of the NALL be replaced by the new ledges and rocky foul areas.<sup>34</sup> Rocky seabed area lines were digitized in areas where ledges were observed shoreward of the NALL by the field party. These ledges were visually observed from the launch and the seaward most extents were positioned as stated above, however their actual contours were not positioned by the field party.

### Shoreline Recommendations

The Hydrographer recommends that the chart reflect the near shore features as they are shown in the CARIS Notebook file, Composite Source.<sup>35</sup>

### **Aids to Navigation**

Survey H11637 included three (3) Aids to Navigation (ATON).<sup>36</sup> Due to limitation in time, static GPS positions were not obtained for any ATONs in this project. However, the Knowles Head light and the Red Head light were found by visual inspection to be operational and in their approximate charted locations.

### **Bottom Samples**

Bottom samples were collected on October 10, 2007 (DN 283) and October 11, 2007 (284) and are included as seabed classifications along with the other S57 features in the Pydro Preliminary Smooth Sheet.<sup>37</sup> The bottom sample positions were also imported to the Notebook H11637\_Updates.hob file.

### **Proposed Grounding Site**

The State of Alaska and the Prince William Sound Regional Citizens Advisory Council (PWS RCAC) delineated a grounding site in the northeast corner of this sheet as a location for large vessels in distress to intentionally go aground. It was believed that this location had a shallow gradient and a soft, muddy bottom, allowing a large vessel to go aground with a low risk of causing severe hull damage. However, this project found this not to be the case.

The proposed grounding site was found to be a shallow, hard bottom with two underwater ledges. One ledge blocks the east approach and the other ledge just east of Red Head blocks the west approach as shown below in *figure 12*. The three bottom samples taken in the proposed grounding site were “Medium Pebbles”, “Course Pebbles”, and “Rock”, verifying the suspicion of a hard, possibly hazardous bottom for a ship going aground.<sup>38</sup>

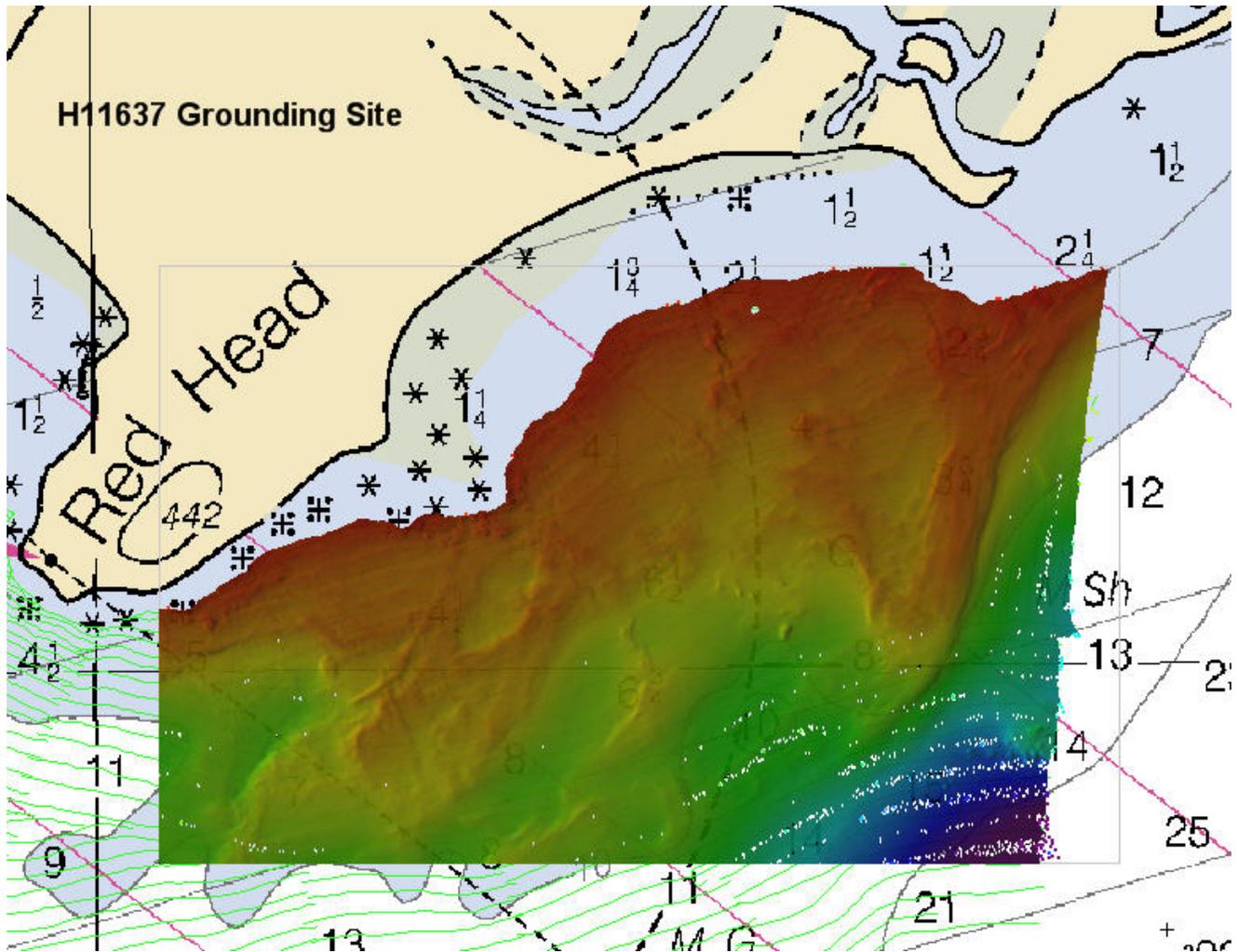


Figure 12. Grounding Site shown with a 1 meter resolution base surface.

To the west of Red Head, a potential alternate grounding site may exist. Shown in figure 13 is an area that is shallow, smooth, and gentle gradient, which appears to consist of a relatively soft bottom. The one bottom sample acquired in the area showed a sand and gravel surface. The bottom sample location is shown in the south west corner of the area in figure 13.<sup>39</sup>

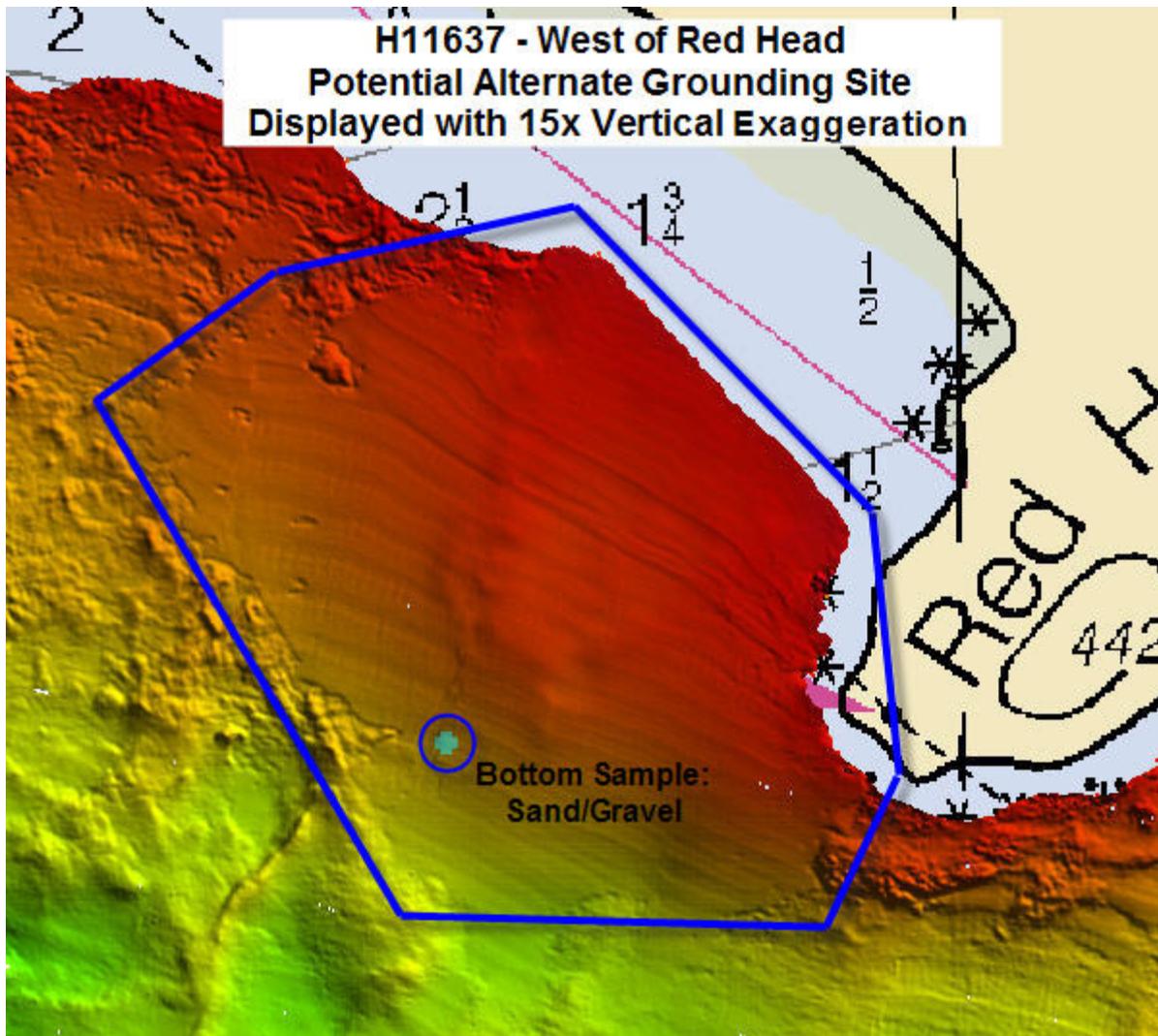


Figure 13. Potential Alternate Grounding Site shown with a 1.5 meter resolution and 15x vertical exaggeration

**E. Supplemental Reports**

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

<b><u>Title</u></b>	<b><u>Date Sent</u></b>	<b><u>Office</u></b>
Hydrographic Systems Readiness Review Memo 2007	April 23, 2007	N/CS34
OPR-P132-FA-07 Data Acquisition and Processing Report	Under same cover	N/CS34
OPR-P132-FA-07 Horizontal & Vertical Control Report	N/A	N/CS34, N/OPS1
OPR-P132-FA-07 Tides and Water Levels Package	Under same cover	N/OPS1
OPR-P132-FA-07 Coast Pilot Report	March 5, 2008	N/CS26



**UNITED STATES DEPARTMENT OF COMMERCE**

National Oceanic and Atmospheric Administration  
NOAA Marine and Aviation Operations  
NOAA Ship FAIRWEATHER S-220  
1010 Stedman Street  
Ketchikan, AK 99901

May 30, 2008

MEMORANDUM FOR: CDR David Neander, NOAA  
Chief, Pacific Hydrographic Branch

FROM: CDR Douglas D. Baird, NOAA   
Commanding Officer, NOAA Ship FAIRWEATHER

TITLE: Approval of Hydrographic Survey H11637,  
OPR-P132-FA-07

Digitally signed by Doug Baird  
DN: cn=Doug Baird, o=NOAA Ship FAIRWEATHER,  
ou=NOAA, email=co.fairweather@noaa.gov, c=US  
Reason: I am approving this document  
Date: 2008.05.30 16:40:28 -0800

As Chief of Party, I have ensured that standard field surveying and processing procedures were adhered to during acquisition and processing of hydrographic survey H11637 in accordance with the Hydrographic Manual, Fourth Edition; Hydrographic Survey Guidelines; Field Procedures Manual, March 2007; and the NOS Hydrographic Surveys Specifications and Deliverables, as updated for April, 2007. Additional guidance was provided by applicable Hydrographic Technical Directives. 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.

I acknowledge that all of the information contained in this report is complete and accurate to the best of my knowledge.

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

**Llian Breen**

Digitally signed by Llian Breen  
DN: cn=Llian Breen, c=US, o=NOAA,  
ou=Fairweather, email=lilian.  
breen@noaa.gov  
Reason: I am the author of this document  
Date: 2008.05.30 18:50:05 +01'00'

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ENS Llian Breen  
Survey Manager



Matthew Ringel  
I agree to specified portions of this  
document  
2008.05.30 18:25:19 Z

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LT Matthew Ringel  
Field Operations Officer

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CST Lynnette V. Morgan  
Chief Survey Technician

Attachment



## Revisions Compiled During Office Processing and Certification

- <sup>1</sup> Filed with the project records.
- <sup>2</sup> Concur.
- <sup>3</sup> Concur.
- <sup>4</sup> Concur.
- <sup>5</sup> Depths between junction surveys were consistent and coverage appears to be adequate.
- <sup>6</sup> Concur with clarification. Two, approximately 150 meter by 75 meter holidays exist between H11610 and H11637 both occur in greater than 30 fathoms depth. Locations 60° 38.81'N, 146° 25.82'W & 60° 38.11'N, 146° 25.82'W. The holidays were addressed during the Survey Acceptance Review and it was determined that the all shoals have been captured and the data is adequate to supersede charted data in the common area.
- <sup>7</sup> Interpolated surface was not used for compilation.
- <sup>8</sup> Concur.
- <sup>9</sup> Concur.
- <sup>10</sup> Concur.
- <sup>11</sup> Concur.
- <sup>12</sup> Concur.
- <sup>13</sup> Concur with clarification. A negative HVCR memo was submitted for this project and is filed with project records.
- <sup>14</sup> Description of horizontal and vertical control equipment and methods found in the DAPR, filed with the project records. Chart with latest ATONIS information.
- <sup>15</sup> Concur with clarification. DR originally stated that the tide note was found in Appendix V. This has been corrected to Appendix IV.
- <sup>16</sup> Chart 16700, Ed. 31 was used for compilation of this survey.
- <sup>17</sup> Chart 16708, Ed. 27 was used for compilation of this survey.
- <sup>18</sup> Chart 16709 Ed. 24 was used for compilation of this survey.
- <sup>19</sup> Corrected through LNM Nov. 11/08.
- <sup>20</sup> Corrected through LNM Aug. 19/08.
- <sup>21</sup> Corrected through LNM Jan. 20/09.
- <sup>22</sup> Concur.
- <sup>23</sup> Concur.
- <sup>24</sup> Concur with clarification. Chart 16708 shows the 3 fathom contour inshore of the 1fm5ft sounding, but chart 16709 has the 3fm contour offshore of the 1fm5ft sounding. Adjust charted contours using latest survey information.
- <sup>25</sup> Concur with clarification. This sounding was included in the HCell.
- <sup>26</sup> Concur. The most shoal point lies in the junction survey H11752 and the sounding has been selected.
- <sup>27</sup> Concur. These data are adequate to supersede charted data in the common area.
- <sup>28</sup> Concur.
- <sup>29</sup> Concur.
- <sup>30</sup> Concur.
- <sup>31</sup> Concur.
- <sup>32</sup> Concur.
- <sup>33</sup> Concur.
- <sup>34</sup> Concur.
- <sup>35</sup> Concur.
- <sup>36</sup> Chart per the latest ATONIS publication.
- <sup>37</sup> 45 bottom samples were collected during H11637 and 45 are included in the HCell. An additional 16 were imported from the ENC to be retained.
- <sup>38</sup> Concur with clarification. Pacific Hydrographic Branch will follow up on this issue.
- <sup>39</sup> Concur.



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

**TIDE NOTE FOR HYDROGRAPHIC SURVEY**

**DATE :** October 29, 2007

**HYDROGRAPHIC BRANCH:** Pacific  
**HYDROGRAPHIC PROJECT:** OPR-P132-FA-2007  
**HYDROGRAPHIC SHEET:** H11637

**LOCALITY:** Orca Bay, Northeastern Prince William Sound, AK  
**TIME PERIOD:** September 11 - October 12, 2007

**TIDE STATION USED:** 945-4050 Cordova, AK  
Lat. 60° 33.4'N Long. 145° 45.3' W

**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters  
**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 3.559 meters

**REMARKS: RECOMMENDED ZONING**

Preliminary zoning is accepted as the final zoning for project OPR-P132-FA-2007, H11637 during the time period between September 11 and October 12, 2007.

Please use the zoning file "P132FA2007CORP" submitted with the project instructions for OPR-P132-FA-2007. Zones PWS61 & PWS64 are the applicable zones for H11637.

**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, c=US, o=CO-OPS,  
ou=NOAA/NOS, email=peter.stone@noaa.gov  
Reason: I am approving this document  
Date: 2007.11.06 07:06:01 -05'00'

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CHIEF, PRODUCT AND SERVICES DIVISION



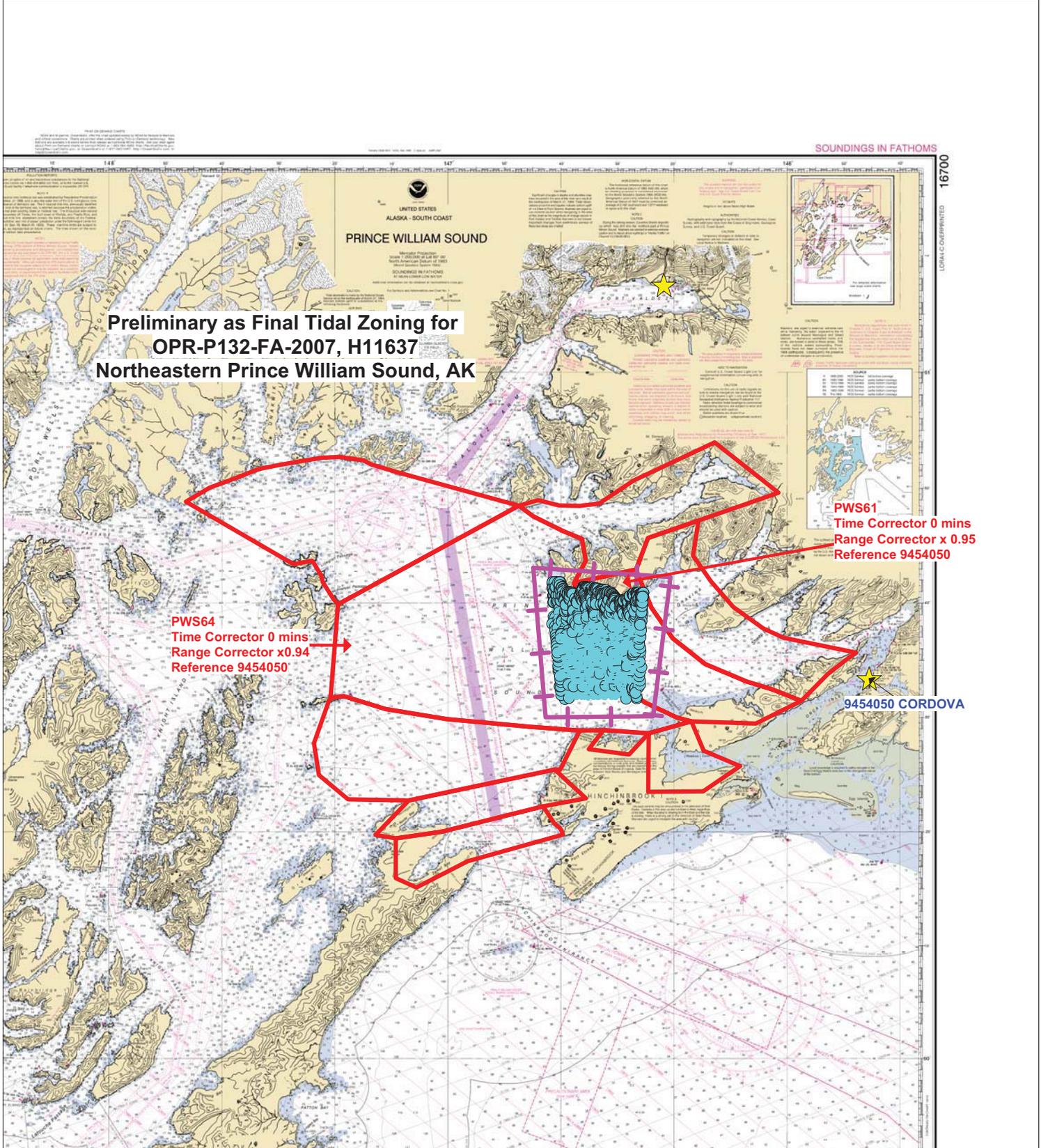
UNITED STATES  
ALASKA - SOUTH COAST  
PRINCE WILLIAM SOUND

**Preliminary as Final Tidal Zoning for  
OPR-P132-FA-2007, H11637  
Northeastern Prince William Sound, AK**

**PWS64**  
Time Corrector 0 mins  
Range Corrector x0.94  
Reference 9454050

**PWS61**  
Time Corrector 0 mins  
Range Corrector x 0.95  
Reference 9454050

**9454050 CORDOVA**



UNITED STATES  
ALASKA - SOUTH COAST  
**PRINCE WILLIAM SOUND**

Mercator Projection  
Scale 1:200,000 at Lat 65° 00'  
North American Datum of 1983  
SOUNDINGS IN FATHOMS  
4.5 MEAN LOWER LOW WATER

**Preliminary Discrete Tidal Zoning for OPR-P132-FA-2007  
Northeastern Prince William Sound, AK**

**PWS71**  
Time Corrector 0 mins  
Range Corrector x0.99  
Reference 9454240

**9454240 VALDEZ**

**PWS65**  
Time Corrector +6 mins  
Range Corrector x0.99  
Reference 9454240

**PWS61**  
Time Corrector 0 mins  
Range Corrector x 0.95  
Reference 9454050

**PWS60**  
Time Corrector 0 mins  
Range Corrector x 0.97  
Reference 9454050

**PWS64**  
Time Corrector 0 mins  
Range Corrector x0.94  
Reference 9454050

**9454050 CORDOVA**

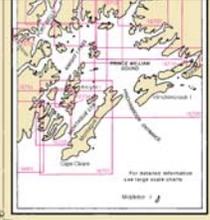
**PWS54**  
Time Corrector 0 mins  
Range Corrector x 0.93  
Reference 9454050

**PWS55**  
Time Corrector 0 mins  
Range Corrector x 0.94  
Reference 9454050

**PWS53**  
Time Corrector 0 mins  
Range Corrector x 0.91  
Reference 9454050

**PWS51**  
Time Corrector 0 mins  
Range Corrector x 0.89  
Reference 9454050

**PWS63**  
Time Corrector 0 mins  
Range Corrector x 0.93  
Reference 9454050



SOURCE	
1984-2001	NCS Survey
1979-1983	NCS Survey
1974-1978	NCS Survey
1969-1973	NCS Survey
1964-1968	NCS Survey
1959-1963	NCS Survey
1954-1958	NCS Survey
1949-1953	NCS Survey
1944-1948	NCS Survey
1939-1943	NCS Survey
1934-1938	NCS Survey
1929-1933	NCS Survey
1924-1928	NCS Survey
1919-1923	NCS Survey
1914-1918	NCS Survey
1909-1913	NCS Survey
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9-13	NCS Survey
4-8	NCS Survey
0-4	NCS Survey

LOBBY-COVERPRINTED

**H11637 HCell Report**  
Andrew Clos, Hydrographer Intern  
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 ENC and RNC in the region: NOAA ENC, US4AK24M, NOAA RNC 16709.

HCell compilation of survey H11637 utilized Office of Coast Survey HCell Specifications Version 3.1, with approved modifications to better align with PHB's HCell process and to meet MCD needs.

**1. Compilation Scale**

Half of the survey area is 1:79,291 (chart 16708), while the other half is 1:80,000 (chart 16709). Non-bathymetric features have not been generalized to chart scale; their position, characterization and density are as delivered from the field. An M\_CSCL layer was created for the 1:80,000 portion and the survey was compiled at 1:79,291.

**2. Soundings**

A survey-scale sounding (SOUNDG) feature object layer was built from the 10-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. The resultant sounding layer contains 86,095 depths ranging from 0.445 to 144.443 meters.

Upper limit (m)	Lower limit (m)	Radius (mm)
0	10	3
10	20	4
20	50	4.5
50	200	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 Areas and Depth Contours**

**3.1 Depth Areas**

The extents of the highest resolution BASE Surface together with the extents of the soundings layer were used to digitize the hydrographic extents, which were then used to create the single, all encompassing depth area (DEPARE).

### 3.2 Depth Contours

Depth contours at the intervals on the largest scale chart are included in the H11637\_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The generalized metric and fathom equivalent contour values are shown in the table below.

Chart Contours in Fathoms	Metric Equivalent of Chart Contours	Metric Equivalent of Chart Contours Generalized	Actual Value of Chart Contours
3	5.4864	5.715	3.125
10	18.288	18.5166	10.125
50	91.44	92.8116	50.750

Contours delivered in the H11637\_SS file have not been deconflicted against shoreline features, soundings and hydrography as all other features in the H11637\_CS file and soundings in the H11637\_SS have been. This results in conflicts between the H11637\_SS file contours and HCell features at or near the survey limits. Conflicts with M\_COVR, M\_QUAL, DEPARE, COALNE and SBDARE objects, and with DEPCNT objects representing MLLW, should be expected. HCell features should be honored over H11637\_SS.000 file contours in all cases where conflicts are found.

Some modifications made to GC shoreline MLLW contours, to bring the GC shoreline into agreement with H11637 hydrography, necessitated inclusion of several DEPCNT features in the HCell. These 0 value contours have not been generalized. See 9.2 *Conflicts between Shoreline and Hydrography*.

### 4. Meta Areas

The following Meta object areas are included in HCell H11637:

M\_QUAL  
M\_COVR  
M\_CSCL

Meta area objects were 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 gathered by field units are delivered to PHB and applied to the preliminary HCell without reduction in number or character. This preliminary HCell is used to perform evaluation and verification of survey soundings and features, features are deconflicted against hydrography, and geometry is corrected as needed. Linear and area features are also digitized against the BASE Surfaces, and features to be retained are imported from the chart. This features file is used as the basis for the final HCell compilation with features reduced to the largest scale RNC and ENC. No reduction in detail occurred between the field submitted features and the HCell features. Therefore, no Features.000 file was created.

Pending further guidance from MCD, features generalization has been accomplished primarily through reduction in the number of features included in the HCell. Generalizing area features to point objects is entrusted to the RNC division. Where line and area objects are included in the HCell, complexity of the lines and edges comprising the features have been smoothed commensurate with chart scale.

## 5.2 Compilation of Features to the HCell

Shoreline features for H11637 were delivered from the field in five different hob files defining new features, modification to GC or charted features, and disprovals. These were deconflicted against GC shoreline, the chart and hydrography during office processing.

During office processing, four ledges, and numerous rocky seabeds were digitized from the high resolution BASE Surfaces.

The source of all features included in the H11637 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.

For the purpose of compilation of intertidal depth areas, a MHW (-10.991fm) value is used for defining the DRVAL1 (Depth Range Value) attribute field for the DEPARE component of the feature, where DRVAL2 is always 0.0. The MHW value from US4AK24M was used for H11637.

## 6. S-57 Objects and Attributes

The H11637\_CS HCell contains the following Objects:

\$CSYMB	Blue Notes
COALNE	Modified GC coastline
DEPARE	The all-encompassing depth area
DEPCNT	Modified GC MLLW
LNDARE	Land area object
M_COVR	Data coverage Meta object
M_QUAL	Data quality Meta object
M_CSCL	Delineation of compilation scale
OBSTRN	Obstruction area object
SBDARE	Modified GC ledges and reefs, bottom samples, and rocky seabed areas
SOUNDG	Soundings at the chart scale density
UWTROC	Rock features

The H11637\_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 H11637\_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 features with the Blue Note information located in the INFORM field. 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

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

Conversion to fathoms and feet charting units with NOAA rounding ensures that:

- All depths deeper or equal to 11 fathoms display as whole fathoms.
- All depth units between 0 fathoms (MLLW) and 11 fathoms display as fathoms and whole feet.
- All depth units skyward of 0 fathoms (MLLW) to 2.0 feet above MHW display in feet for values that round to 5 feet or less, and in fathoms and feet skyward of that.
- All height units (HUNI) which have been converted to charting units, and that are 2.00 feet above MHW and greater, are shown in feet.

In an ENC viewer fathoms and feet depth units (DUNI) display in the format X.YZZZ, where X is fathoms, Y is feet, and ZZZ is decimals of the foot. In an ENC viewer, heights (HUNI) display as whole feet.

## 9. Data Processing Notes

### 9.1 Junction with H11610, H11752, H11608, H11742 and H11743

Survey	Compared during sounding selection	Bathymetry compared	Submitted date
H11752	Yes	Yes	January 2009
H11610	Yes	Yes	June 2007
H11743	Yes	Yes	March 2009
H11608	No	Yes	May 2007
H11742	No	Yes	July 2008

## 10. QA/QC and ENC Validation Checks

H11637 was subjected to QA checks in S-57 Composer prior to exporting to the HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to a chart units and NOAA rounding applied. dKart Inspector was then used to further check the data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

## 11. Products

### 11.1 HSD, MCD and CGTP Deliverables

- H11637 Base Cell File, Chart Units, Soundings and features compiled to 1:79,291.
- H11637 Base Cell File, Chart Units, Soundings compiled to 1:10,000.
- H11637 Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items.
- H11637 Survey outline to populate the SURDEX.

### 11.2 File Naming Conventions

- Chart units base cell file, chart scale soundings H11637\_CS.000
- Chart units base cell file, survey scale sounding set H11637\_SS.000
- Descriptive Report package H11637\_DR.pdf
- Survey outline H11637\_Outline.gml & \*.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 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	Validation of the base cell file.

## 12. Contacts

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

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APPROVAL SHEET  
H11637

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 disapproval 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.