

H11447

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.* ..... RA-10-03-06

*Registry No.* ..... H11447

### LOCALITY

*State* ..... Alaska

*General Locality* ..... Wrangell Narrows

*Sublocality* ..... Mountain Point to Prowley Point

**2006**

### CHIEF OF PARTY

..... CDR Guy t. Noll, NOAA

### LIBRARY & ARCHIVES

DATE .....

**HYDROGRAPHIC TITLE SHEET**

**H11447**

**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-10-03-06**

State Alaska

General Locality Wrangell Narrows

Sub-Locality Mountain Point to Prowley Point

Scale 1:10,000 Dates of Survey 5/4/06 - 5/26/06

Instructions dated 4/1/2006 Project No. OPR-O325-RA-06

Vessel RA-1 (1001), RA-2 (1103), RA-3 (1021), RA-4 (1016), RA-5 (1006), RA-6 (1015), RA-9 (1905)

Chief of party CDR Guy T. Noll, NOAA (2006)

Surveyed by RAINIER Personnel

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

Graphic record scaled by N/A

Graphic record checked by N/A Automated Plot N/A

Verification by Matthew Foss, Peter Holmberg

Soundings in Fathoms and Feet at MLLW

**REMARKS:** All times are UTC. UTM Projection (zone #8).

Revisions and annotations appearing as endnotes were generated during office processing. As a result, page numbering may be interrupted or non-sequential.

All separates are filed with the hydrographic data.

# **Descriptive Report to Accompany Hydrographic Survey H11447**

Project OPR-O325-RA-06  
Wrangell Narrows, Alaska  
Mountain Point to Prowley Point  
Scale 1:10,000  
April-May 2006  
**NOAA Ship RAINIER (s221)**  
Chief of Party: Commander Guy T. Noll, NOAA

## **A. AREA SURVEYED**

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions OPR-O325-RA-06 dated April 1, 2006 and all other applicable direction<sup>1</sup>, with the exception of deviations noted in this report. The survey area consists of the northern section of Wrangell Narrows, Alaska, specifically Mountain Point to Prowley Point, including the town of Petersburg. This survey corresponds to sheet "A" in the sheet layout provided with the Letter Instructions. OPR-O325-RA-06 responds to a request from USCG District 17 and other constituents to update the Wrangell Narrows chart with modern multi-beam surveys for ENC creation.

One hundred percent multi-beam echosounder (MBES) coverage was obtained in the survey area in waters 4 meters and deeper as required by the project instructions. Except as noted below, vertical-beam echo sounder (VBES) data were acquired in depths from 4 to 20 meters to define the navigable area limit, aid in the planning of MBES data acquisition, and provide inshore bathymetry in navigationally significant areas. Additional VBES data were also acquired to define the zero meter depth contour in areas specifically required by the OPR-O325-RA-06 letter instructions. While in the project area, the Chief of Party expanded the zero meter contour delineation area to include additional areas of potential shoal encroachment on navigable waters. These lines were run at high tide as far inshore as was safe for the survey vessels to operate.

Although not required by the project instructions, 200% side scan sonar (SSS) was acquired for the northern 2/3 of the survey area and along all of the shoreline. All significant SSS contacts were developed with 100% multi-beam.

Limited Shoreline Verification was performed for the survey area.

Data acquisition was conducted from May 4 to May 26, 2006 (DN 124 to 146).

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<sup>1</sup> Standing Instructions for Hydrographic Surveys (March 2004), NOS Hydrographic Surveys Specifications and Deliverables (March 2004), OCS Field Procedures Manual for Hydrographic Surveying (March 2005), and all Hydrographic Surveys Technical Directives issued through May 2006.

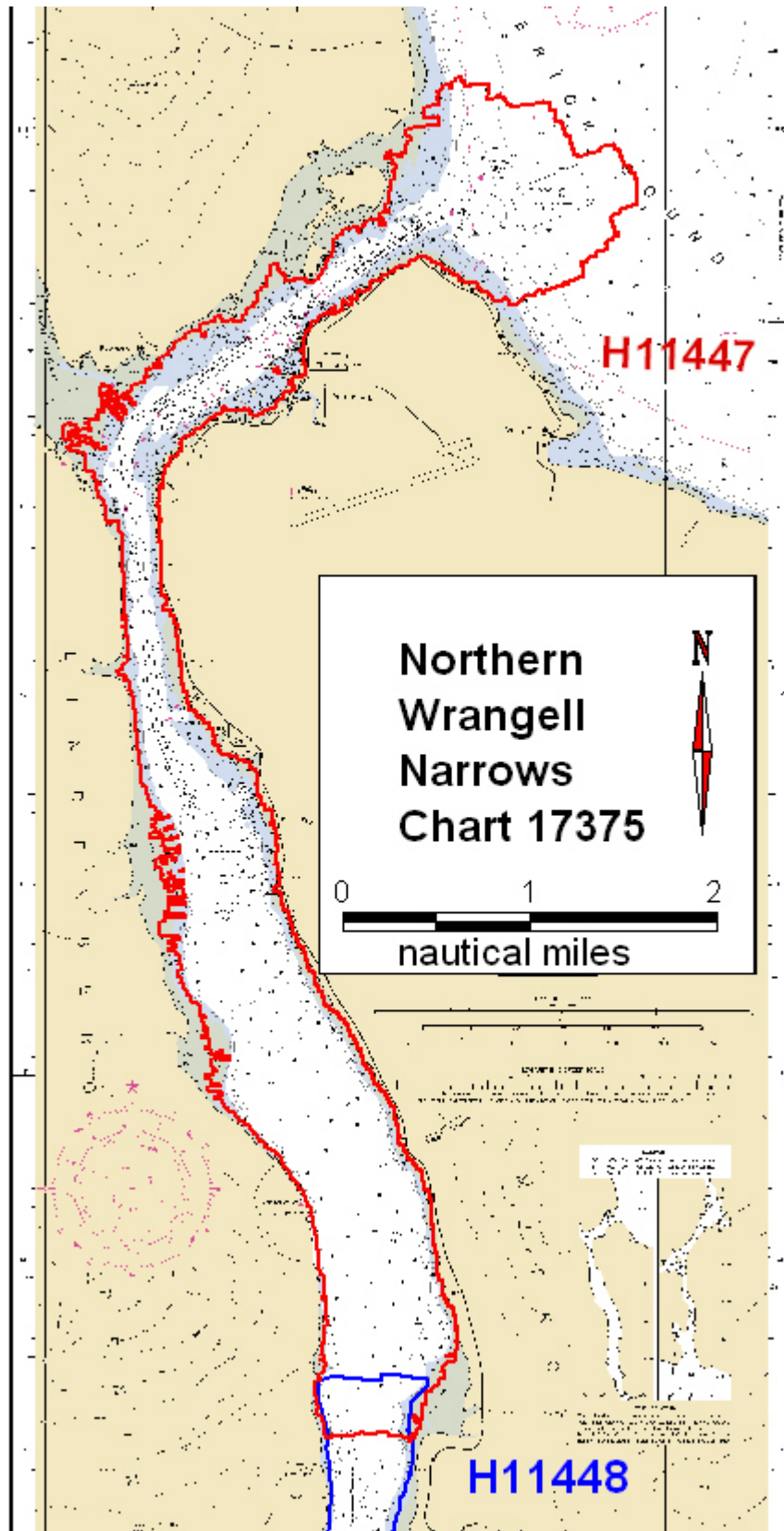


Figure 1. H11447 Survey Limits (Chart 17375).

<b>Data Acquisition Type</b>	<b>1101</b>	<b>1103</b>	<b>1006</b>	<b>1015</b>	<b>1016</b>	<b>1021</b>	<b>831</b>	<b>Total</b>
VBES (mainscheme nm)	15.3	32.0	-	-	-	-	37.8	<b>85.1</b>
MBES (mainscheme nm)	-	-	81.9	2.2	101.7	28.7	-	<b>214.5</b>
Combination lines (SSS & MBES nm)	-	-	-	91.7	-	-	-	<b>91.7</b>
Cross lines (nm)	4.8	1.1	-	-	10.3	-	-	<b>16.2</b>
Developments (nm)	-	-	-	-	-	-	-	-
Shoreline (nm)	-	-	4.75	-	-	-	-	<b>4.75</b>
Bottom Samples	-	-	-	-	-	-	-	<b>9</b>
Number of point feature items investigated *	-	-	-	-	-	-	-	<b>31</b>
Area Surveyed (sq nm)	-	-	-	-	-	-	-	<b>4.68</b>
*note: 67 line features, including piers and other shoreline construction features, were also investigated using the Trimble Pro XRS backpack acquisition system.								

*Table 1. Statistics for Survey H11447*

**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-O325-RA-06 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.

**Final Approved 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:

<b>Hull Number</b>	<b>Name</b>	<b>Acquisition Type</b>
1101	RA-1	Vertical-Beam Echosounder
1103	RA-2	Vertical-Beam Echosounder Dive Investigation
1021	RA-3	Multi-Beam Echosounder
1016	RA-4	Multi-Beam Echosounder Bottom Samples
1006	RA-5	Multi-Beam Echosounder Detached Positions
1015	RA-6	Multi-Beam Echosounder Side Scan Sonar
1905	RA-9	Vertical-Beam Echosounder (Ceeducer)

*Table 2. Data Acquisition Vessels for H11447.*

Sound velocity profiles were measured with SEACAT SBE-19 and 19+ profilers in accordance with the Specifications and Deliverables.

No unusual vessel configurations were used for data acquisition on this survey except for Vessel 1905 (RA-9). RA-9 is a 19' SAFE boat normally used for logistics and shore station support. When both of RAINIER's VBES-equipped jet boats (1101 and 1103) experienced mechanical breakdowns, RA-9 was fit with a Ceeducer portable VBES/GPS system to allow completion of the zero meter contour delineation. Additional information on this installation is included in the *OPR-O325-RA-06 Data Acquisition and Processing Report*.

**B2. Quality Control**

**Crosslines**

MBES and VBES crosslines totaled 16.2 nautical miles, comprising 5.4% of shallow water multi-beam hydrography. The mainscheme bathymetry was manually compared to the crossline nadir beams in CARIS subset mode and agreed well with differences averaging approximately 0.2 meter<sup>2</sup>, with the following exceptions:

- Crossline 207\_2217, from Vessel 1016 on DN137, included a noisy section of data which was rejected. This noise is most likely due to loss of bottom tracking half way though the line. Soundings from the portion of the line that were retained agreed to within 0.2 m of the mainscheme lines.
- VBES bathymetry from two single beam crosslines in the northeast section of the sheet, 929\_1826 and 914\_1818 from Vessel 1101 on DN 133, differed by 0.2 to 0.5 m<sup>3</sup> from the mainscheme lines. These offsets varied along the single beam line with the discrepancy increasing closer to shore. Both lines were run in the same direction and no anomalous speed changes or heave values were noted in the navigation and attitude files. Pitch values did increase as the vessel came closer to shore, but were not abnormal.

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 2006 RAINIER Hydrographic System Readiness Review package<sup>4</sup> submitted with this survey.

**Junctions**

The following contemporary survey junctions with H11447 (See Figure 1):

<u>Registry #</u>	<u>Scale</u>	<u>Date</u>	<u>Junction side</u>
H11448	1:10,000	2005	South

Depths from survey H11448 were compared to depths from survey H11447 by concurrently viewing the two preliminary smooth sheets in Mapinfo 8.0. Survey H11448 junctions well with this survey; a cursory comparison indicates differences are generally less than 0.3 meter. A few of the soundings in the junction areas differ by up to 0.7 meters, especially in the

southwest section of the junction. This may be due to differences in the sounding selection algorithm. Depths in survey H11447 were processed and delivered using CUBE, while depths in survey H11448 were processed and delivered using a TPE-weighted BASE surface.

### **Data Quality Factors**

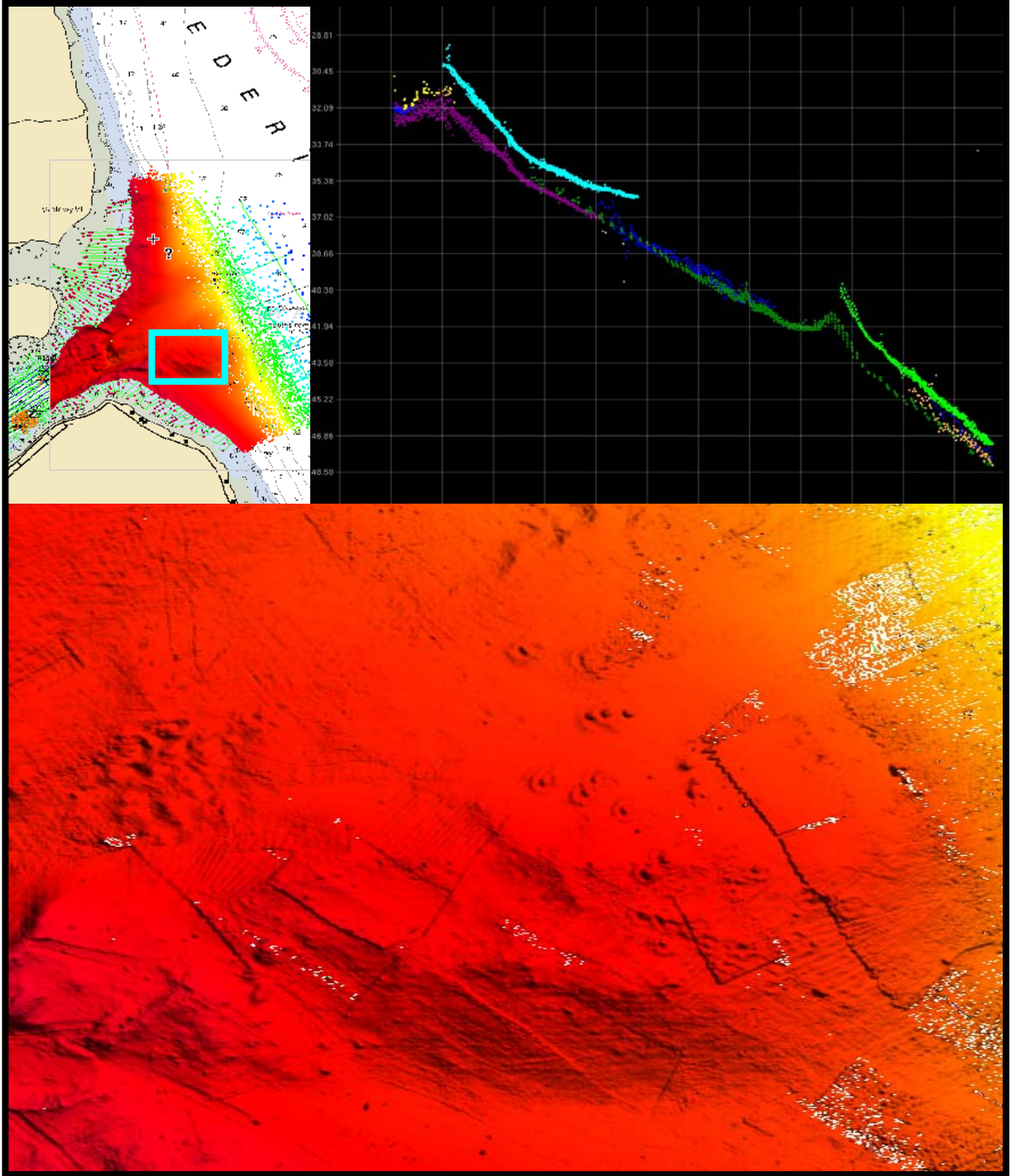
The waters within Wrangell Narrows are very dynamic. Wrangell Narrows often experiences large water level fluctuations and, as a result, strong currents throughout its length. Marked changes in tide height and current velocity throughout a day and over a tide cycle resulted in many data quality errors in this survey, of which vertical offsets and sound speed errors are most notable. In many cases, significant MBES swath overlap produced by highly dense data obscured these errors and the resultant CUBE surface correctly ignored offset soundings and accurately depicted the bottom.<sup>5</sup>

#### Water Levels

OPR-O325 bathymetric data acquired by RAINIER in both 2005 and 2006 has exhibited extensive vertical depth errors, despite the installation of a tertiary tide station on the survey grounds both years. On H11447, vertical offset errors were most prevalent in the northern section of this survey at the mouth of the Narrows, but were present throughout the survey area. Inaccurate water level correctors appear to be the largest contributor to total sounding error<sup>6</sup>.

One example of vertical offsets affecting the CUBE surface is illustrated in Figure 2. The one meter resolution depth surface has a vertical exaggeration of 10, which better highlights the vertical offsets, and displays the characteristic step artifacts that result from such an error. The cross section, shown here in Caris 6.0 Subset Mode, illustrates two errant lines in this area (light blue is line number 303\_2122 and light green is line number 302\_2119). In this case, both errant lines were acquired on the same day (DN 142) by the same boat (1016). The two lines are markedly shoaler (0.5 m) than the data acquired on other days. Given the depth of water in this area, about 30-50 meters, this difference is just within IHO Order 1 specifications<sup>7</sup>. For future surveys in this area, see recommendations in D.2.h.





*Figure 2. Step artifacts in Northern Wrangell Narrows due to large vertical offsets, most likely due to inadequate water level information.*

#### Heave and Attitude

Heave may have also played a roll in some of the vertical offset errors observed in this survey. Tidal current rips and wind driven waves were often present when surveying at the mouth of the Narrows, and boat traffic often created a wake in the Narrows itself. True Heave



was acquired and applied to most of the data in H11447, with the following exceptions:

- True Heave was not applied to Elac MBES data due to time synchronization problems between the POS MV and Hydrostar data acquisition computer. (See DAPR for additional information.)
- True Heave was not applied to 18% (95 of the 723) of the Reson multi-beam lines. Equipment operators occasionally neglected to log True Heave, or started logging too late to produce valid correctors for the entire line. CARIS HIPS 6.0 is unable to apply True Heave corrections valid for only a portion of a survey line.

An analysis of data acquisition day, acquisition boat and time of day did not show any obvious specific trends for vertical offsets. Because observed vertical offsets were usually consistent along the entire line of acquisition, the hydrographer suggests that water level measurement error, not heave artifacts, is the most significant component of depth sounding error.

#### Elac 1180 MBES Error

Some of the areas exhibiting vertical offset issues included bathymetry from the Elac 1180 acquired in conjunction with SSS coverage. Bathymetry from this MBES system is generally only utilized in depths and areas requiring IHO S-44 Order 2 data quality and is only included in lower resolution CUBE surfaces. All of the CUBE surfaces generated in waters less than 60 meters (2m, 1m, 50cm and 25cm resolution surfaces) were computed with Elac MBES bathymetry removed. This created no significant gaps in MBES coverage in those surfaces. The deeper northern section of the survey (greater than 60 m) required Elac MBES data for depths and coverage. As a result, the raw and converted Elac MBES data were not deleted from the bathymetric data set and were included in the 5m resolution CUBE surface.

#### Unexplained Error

In some areas where the surface was still affected by vertical offsets, the errant lines were removed, when possible, to avoid vertical offset artifacts in the data. The area covered by these lines had sufficient data overlap to prevent the creation of holidays by their removal. The raw data files were preserved, while the processed line files were deleted from the HDCS data to avoid inclusion in the surfaces. The following three lines were removed from H11447 dataset under these criteria:

Boat 1016 DN142 line 306\_2108

Boat 1016 DN142 line 302\_2119

Boat 1016 DN145 line 309\_1735

CeeDucer VBES

The final vertical offset error identified in this survey is evident in data acquired by the Ceeducer. For the most part (about 2/3 of the lines), depths acquired by the Ceeducer agreed within 0.2 meters of overlapping MBES data. The lines listed below, which were acquired on days 144 and 146, displayed vertical offset errors in excess of the 0.50m allowable error. Those lines that were in excess of the IHO allowable standards contained offsets that ranged from 0.5 m to as large as 0.8 m<sup>8</sup>. The lines acquired on DN 145 did not have significant vertical offsets.

DN 144	DN146	DN 146
383_2232	375_2157	306_2045
390_2221	326_2140	341_1932
675_2210	325_2139	372_2137
626_1902	302_2054	324_2134
632_1854	303_2051	371_2135
654_1823	308_2049	319_2121
656_1820	305_2053	365_2115
541_2252	314_2111	364_2112
	362_2107	312_2103
	300_2101	311_2100
	310_2056	

Ceeducer data has many possible sources of sounding error; including:

- Horizontal positional error resulting from a failure of the differential GPS corrector beacon receiver.
- Water levels, tidal rips and wind driven waves, as discussed above.
- Heave and attitudes errors. Vessel 831 (RA-9) is not equipped with an attitude sensor.

A review of Ceeducer data indicates that significant horizontal offsets were not the probable source of vertical offset error. Vertical offsets were present throughout lines and not just on steep slopes (Figure 3). Distinct bottom features covered by both Ceeducer single beam data and multi-beam data did not show signs of horizontal offsets. Thus, inadequate water levels and heave offsets are the best explanations for the observed Ceeducer vertical offsets. Ceeducer data was acquired and accepted to complete the definition of the zero meter contour in areas delineated by the project instructions and the chief of party.

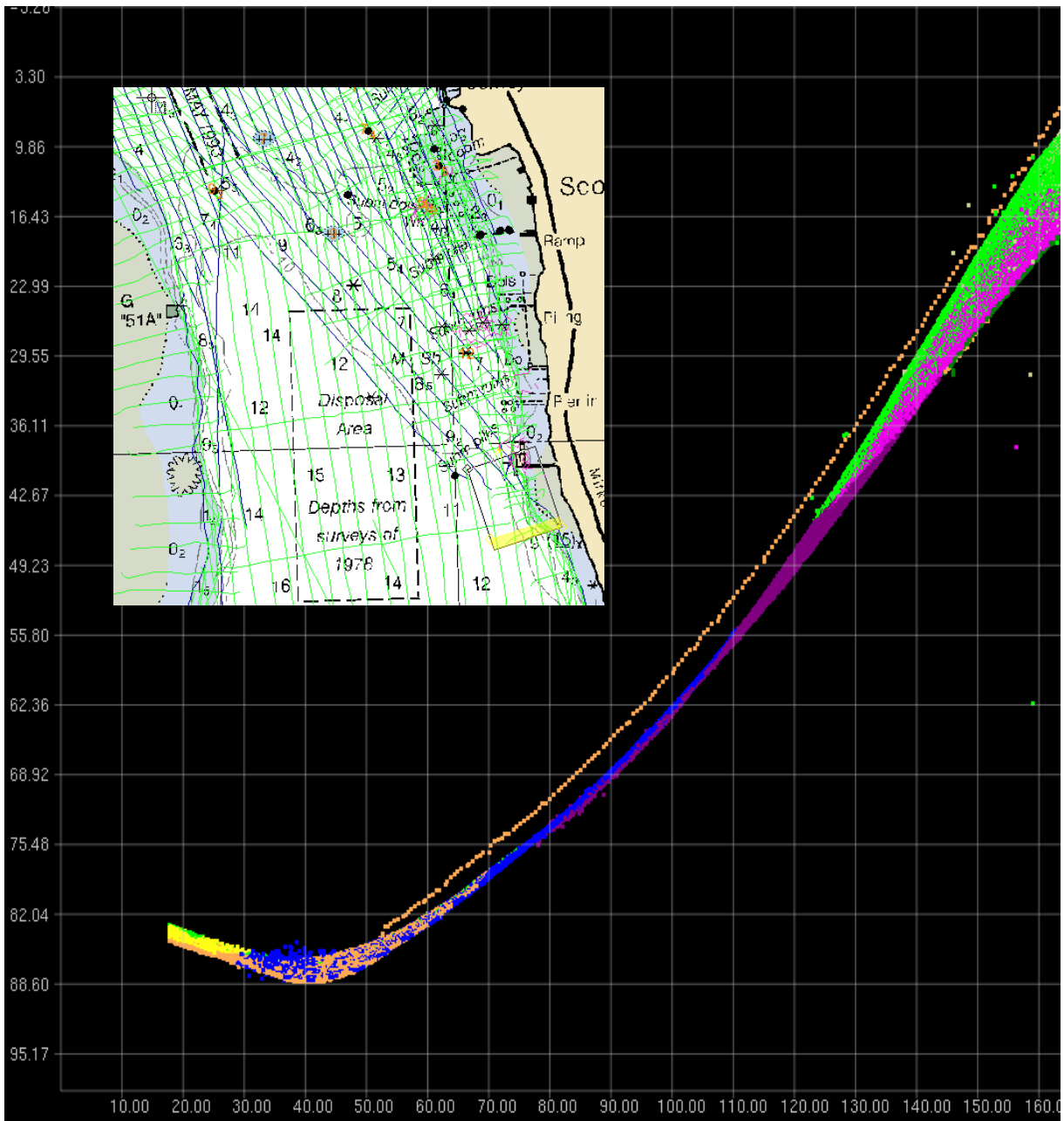


Figure 3: Ceeducer line 541\_2252 (DN 144) vertical offset from multi-beam data (sounding depth in meters). Inset shows subset selected on chart 17375.

Sound Speed Correction Errors

Characteristic "smiles" and "frowns" indicative of inaccurate sound speed corrections were present in many of the lines within Wrangell Narrows. These inconsistencies were most likely the result of freshwater mixing from the river and slough on the north end of the Narrows and the effects of strong tidal currents. In most cases, the density and overlap of bathymetric data obscured the effect of these errors in the data. In areas where the errors were noticeable in the CUBE surface, the hydrographer rejected soundings obviously in error on the outer beams.

### **B3. Data Reduction**

Data reduction procedures for survey H11447 conform to those detailed in the *OPR-O325-RA-06 DAPR*.

All soundings acquired on emergent cultural features (piers, pilings, etc.) were removed from the data set. This action was taken to ensure that the CUBE surface portrayed the true seabed.

Note that a finalized CARIS CUBE surface cannot include negative soundings. Lines of VBES hydrography were run at high tide along the shore of Wrangell Narrows in areas where delineation of MLLW was required (see Section A.). After correction for water levels, some soundings were found to have negative depths (i.e., elevations above MLLW). Under the current process, these cannot be portrayed in the finalized BASE surface, so a data gap appears. If these soundings are needed, please see the original HDCS data.

### **B4. Data Representation**

Many CUBE surfaces were used in processing H11447. Final CUBE surface resolutions and depth ranges were set in accordance with the Field Procedures Manual with field sheets smaller than  $25 \times 10^6$  nodes. One exception to this is the 5m resolution base surface. The final depth ranges were expanded to encompass the entire depth range of the northern portion of the survey (59 to 300m). Data density was sufficient as to prevent significant holidays at this resolution and a 10m surface was not generated. The submission Field Sheet and CUBE Surface structure are shown in Figures 5, 6,7 and 8.

In addition to the prescribed resolution CUBE surfaces, two higher resolution CUBE surfaces, listed below, were added in particularly rocky areas to ensure that all features were accurately portrayed<sup>9</sup> in the bathymetric model (Figure 9). This practice reduced the number of designated soundings required.

H11447\_25CM\_A

H11447\_25CM\_B

Side Scan Sonar data was split into two complete coverage mosaics to demonstrate areas covered by this technique (in addition to the required 100% SWMB). These mosaics were created at 0.5m resolution and named “H11447\_100%\_50CM” and “H11447\_200%\_50CM”.

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

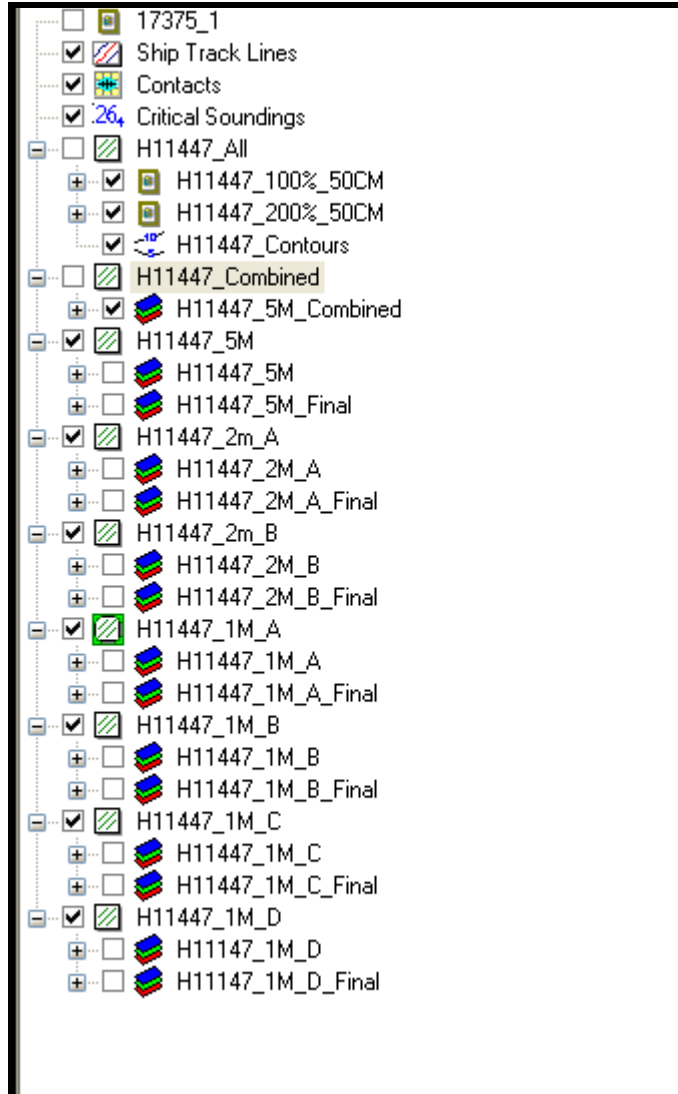


Figure 5: 5m, 2m, and 1m resolution field sheets and SSS mosaics and CUBE surfaces submitted with H11447.

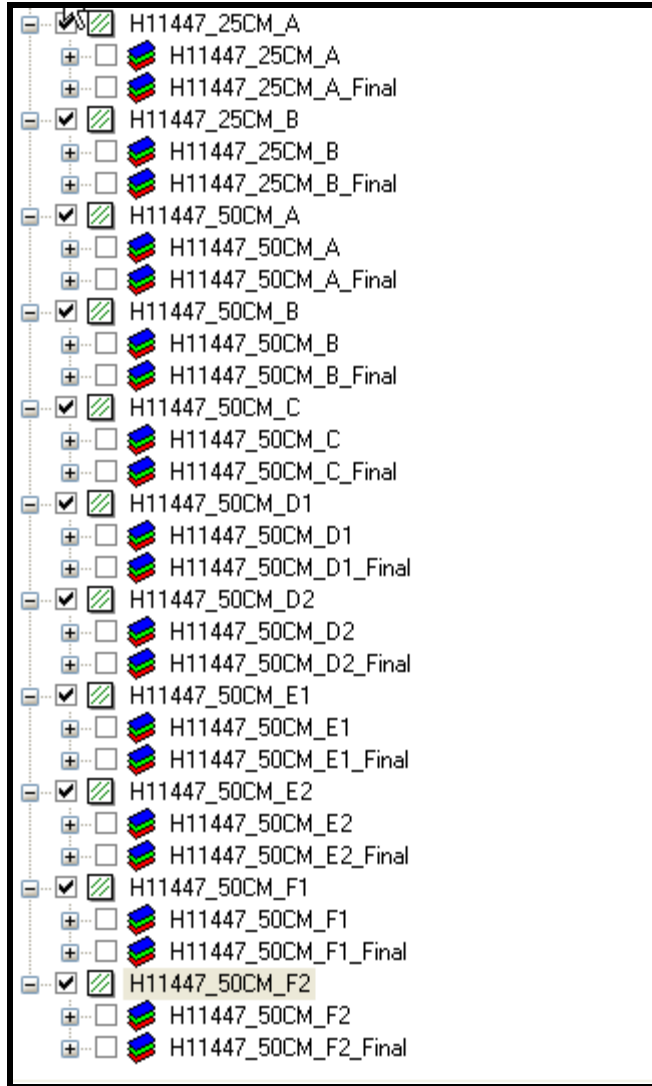


Figure 6: 25cm and 50cm resolution field sheets and CUBE surfaces submitted with H11447.

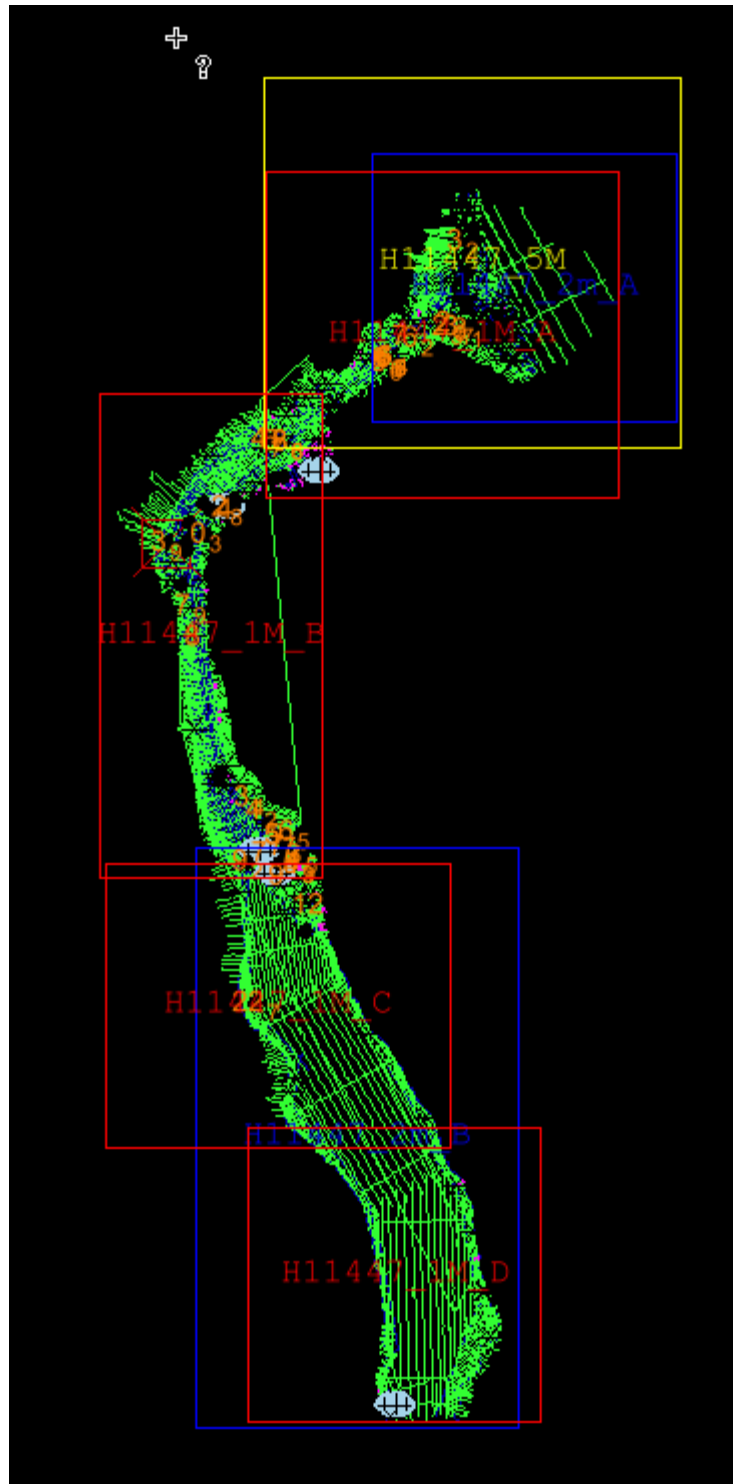


Figure 7: Layout of 5m (yellow), 2m (Blue), and 1m (Red) field sheets for H11447, overlaid on vessel tracklines from Survey H11447.



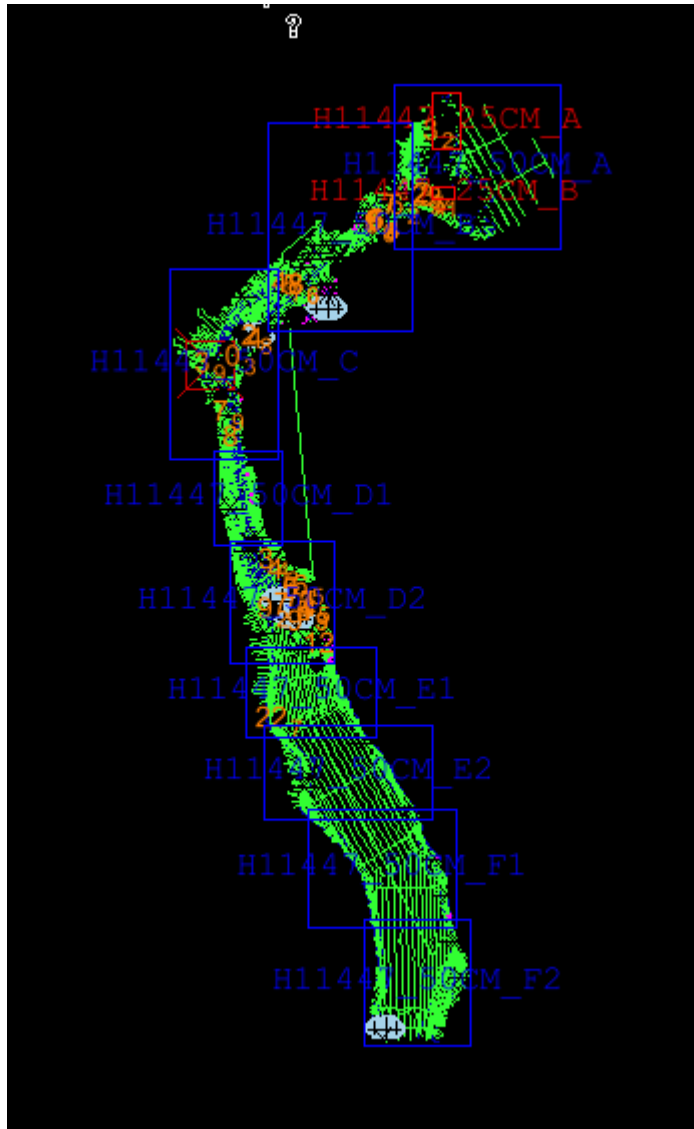


Figure 8: Layout of 50cm (blue) and 25cm (Red) field sheets for H11447, overlaid on vessel tracklines from Survey H11447.

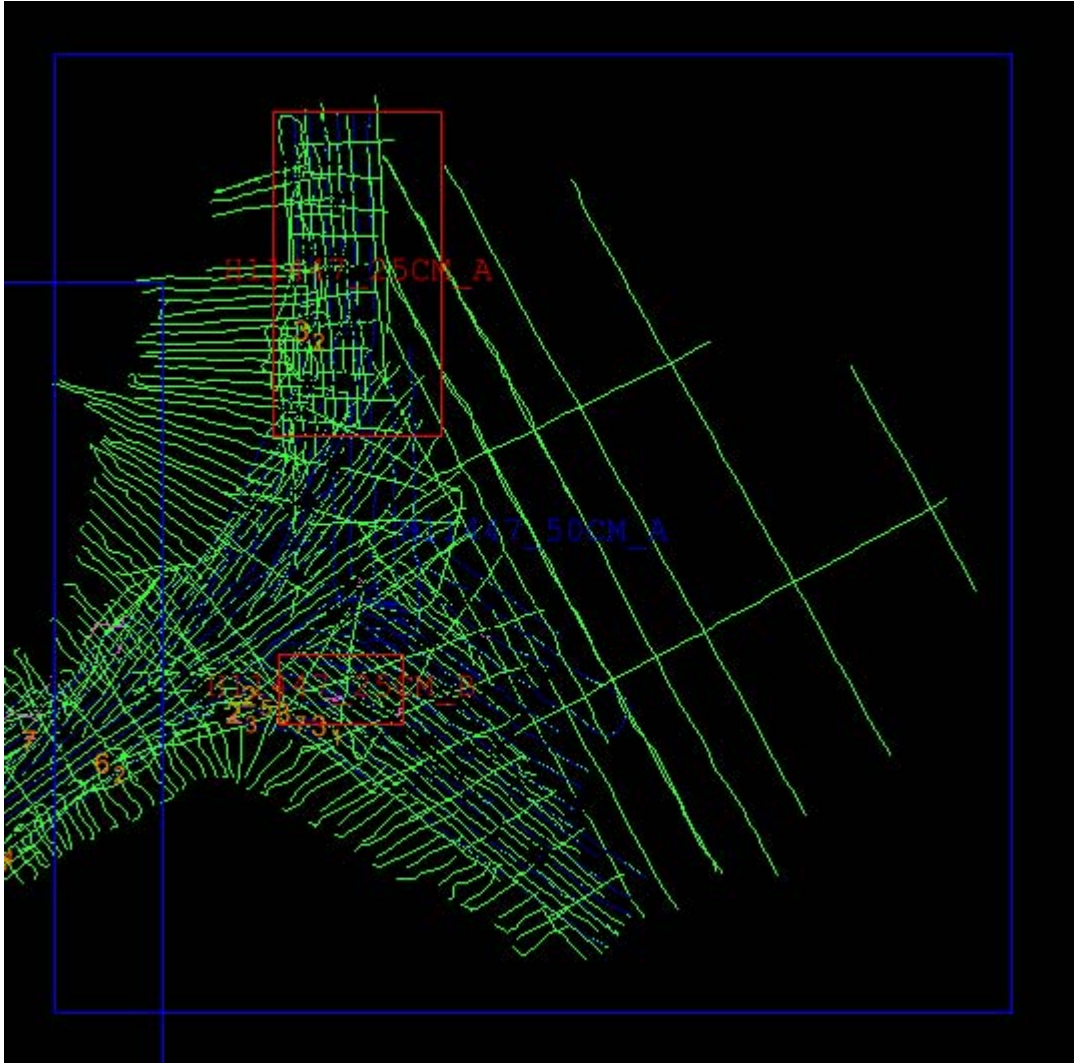


Figure 8: Close up of the layout of 25cm (Red) field sheets for H11447, overlaid on vessel tracklines from Survey H11447.

### C. VERTICAL AND HORIZONTAL CONTROL

A complete description of vertical and horizontal control for survey H11447 can be found in the *OPR-O325-RA-06 Horizontal and Vertical Control Report*,<sup>10</sup> submitted under separate cover. 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. The differential corrector beacons utilized for this survey are given in Table 3.

Location	Frequency	Operator	Distance	Priority
Level Island	265 kHz	USCG	25 nm	Primary

Table 3: Differential Corrector Source for H11447.

**Vertical Control**

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station at Ketchikan, Tongass Narrows, AK (945-0460) served as control for datum determination and as the primary source for preliminary water level reducers for survey H11447.

RAINIER personnel installed a Sutron 8210 “bubbler” tide gauge at the following subordinate station in accordance with the Letter Instructions. This station is described in detail in the *OPR-O325-RA-06 Horizontal and Vertical Control Report*.

Station Name	Station Number	Type of Gauge	Date of Installation	Date of Removal
Turn Point	945-1434	30-day	April 15, 2006	May 27, 2006

Table 4: Tide Stations installed by RAINIER personnel for H11447

All data were reduced to MLLW using **final approved water levels** from tertiary station Turn Point (945-1434) using the tide file 9451434.tid and final time and height correctors using the zone corrector file H11447CORP.zdf.

The request for Final Approved Water Levels for H11447 was submitted to CO-OPS on 05/29/06 and the Final Tide Note<sup>11</sup> was received on 7/18/06. This documentation is included in Appendix III.

In addition, the hydrographer recommends that the Continuously Operating Reference Station (CORS) at Level Island may be sufficient for a Real Time Kinematic (RTK) base for vertical control in Wrangell Narrows. See recommendation in section D.2.h.

**D. RESULTS AND RECOMMENDATIONS**

**D.1. Chart Comparison**

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

RAINIER personnel compared H11447 survey data with the most recent editions of the paper and raster charts with coverage of the survey area during data acquisition and processing. The results of these comparisons are described below, as well as in Sections D.2.b. through D.2.f.

H11447 survey soundings were formally compared with depths on the following charts:

Chart	Scale	Edition and Date	Latest Local Notice to Mariners Applied
17375	1:20,000	21 <sup>st</sup> edition 4/04	10/17/2006
17375 (inset)	1:10,000	21 <sup>st</sup> edition 4/04	10/17/2006

*Table 4: Charts compared with H1447*

There are several Army Corps of Engineers maintained channels in Wrangell Narrows, especially in survey H11447. In comparing the charted depths (17375 and 17375 inset) to the recently acquired data, the northern entrance channel (maintained at 19 ft) that runs past Petersburg contains depths deeper than those charted<sup>12</sup>. The second maintained channel, starting at green buoy number “59” and running south past Turn Point (maintained depth 21 ft), has one sounding<sup>13</sup> that is shoaler than the charted maintained depth. A 20 ft sounding<sup>14</sup> was surveyed directly off the ferry pier on the south side of the channel. A third maintained channel runs parallel to Scow Bay further south in the Narrows. The majority of the north section of this channel (charted depth 24 ft) was found to be slightly shoaler than charted, with several 22 and 23 ft depths surveyed<sup>15</sup>.

Outside the maintained channels, H11447 survey soundings were generally 3 feet to one fathom shoaler than depths on chart 17375. In most areas south of Turn Point, chart agreement was within one fathom and contours produced from survey data agree well with charted depth curves. In areas north of Turn Point up to the Mo(A) WN buoy, depths agreed to within 3 ft of the data acquired in H11447. Depths directly outside the narrows agreed within 3 fms, with the greatest discrepancies noted in the deepest areas of the survey.<sup>16</sup>

Results of comparison of H11447 with the 1:10,000 inset of the Petersburg area on chart 17375 were similar to that of the main chart. The hydrographer noted that many of the shoaler soundings in this area of the survey are located near the Petersburg boat basins, with survey soundings up to 3 feet shoaler than charted depths.<sup>17</sup>

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

Two (2) Dangers to Navigation (DTONs) were found on survey H11447<sup>18</sup>, and reported to the Marine Chart Division via email on 05/17/06 and 5/29/06, respectively. The original DTON submission package is included in Appendix IV<sup>19</sup>. Descriptions of each DTON are included in the Survey Feature Report<sup>20</sup> in Appendix I. Both DTONs have been applied to the most recent version of the downloadable chart.<sup>21</sup>

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

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

Eighteen (18) AWOIS items fall within the survey limits of H11447. Of these, fifteen were assigned for full investigation, and three were included for information. All AWOIS items assigned to H11447 were fully investigated<sup>22</sup>. Descriptions of each AWOIS item investigation are included in the Survey Feature Report<sup>23</sup> in Appendix I.

Two features, listed in table 5 and the Pydro feature report, are recommended for inclusion in the AWOIS database for further investigation.<sup>24</sup> SSS and bathymetric coverage of these items yielded inconclusive results, but indicate possible buoyant light rope floating attached to the

seabed and floating in the water column, possibly attached to a buoy. These features were not detected in the dataset until final processing after RAINIER had left the survey grounds, so no dives were performed. No surface floats were noted at these positions during shoreline investigation. The Chief of Party is confident that these features do not pose a hazard to surface navigation, and soundings on the mid-water contacts have been rejected from the bathymetry. The hydrographer does not recommend charting any features at these positions, but does recommend further investigation in the future.<sup>25</sup>

Line name	Ping number
I:/hdcs_data/h11447/1006_reson8101_hvf/2006-124/138_224	1066/83
I:/hdcs_data/h114471016_reson8125_hvf/2006-145/327_1909	372/217

*Table 5. Two designated soundings which are the primary feature for items requiring further investigation in Survey H11447*

Additional Items

Additional features investigated within the limits of H11447 are described in the Survey Feature Report in Appendix I.

**D.2. Additional Results**

**D.2.a. Prior Survey Comparison**

Prior survey comparison was not performed.

**D.2.b. Shoreline Verification**

Shoreline Source

Vector photogrammetric project CM 7309 was supplied by N/NGS3 in the form of two cartographic feature files (CFF), a line file and a point file. RAINIER was also provided positions of point features (rocks, wrecks and piles) identified in prior 1978 surveys H09791, H09792 and H09795. Shoreline features shown on the current edition of chart 17375 were filtered from a preliminary version of ENC US5AK3KM supplied by N/CS31 and used as a third source file for shoreline verification. All three sources were brought into Notebook with the appropriate S57 attribution for verification. All of the features from the aforementioned sources were compiled into a single source document named “H11447\_Original\_Comp\_Source.HOB”. Features in the sources were visually compared in Notebook, and all items that were determined to be duplicates were deleted. The order of priority for retention was ENC, CFF followed by prior survey. Features that were within 20 meters of one another were determined to be the same feature, and only one representation of that feature was preserved for verification. The deconflicted versions of the original sources were compiled to a second source document named “H11447\_Deconflicted\_Comp\_Source.HOB”. Limited shoreline verification was conducted against this composite source.

Shoreline Verification

Limited shoreline verification was conducted near predicted low water in accordance with the Standing Project Instructions and FPM sections 6.1 and 6.2. Detached positions (DPs) acquired during shoreline verification were recorded in HYPACK and/or Trimble ProXRS DGPS receivers with TSCe data collectors, logged on DP forms, and processed in Pydro 7.1. Due to major changes found during the survey, many highwater line features (docks, piers and buildings) in cultural areas were addressed using the Trimble ProXRS DGPS receivers with TSCe data collectors. These data were processed directly in Caris Notebook and imported into the H11447\_FieldVerified\_Comp\_Source.HOB layer. In addition, annotations describing shoreline were recorded on hard copy plots of digital shoreline. DP forms are included in the *Separates to be Included with Survey Data*<sup>26</sup>.

All shoreline data is submitted in Caris Notebook .hob files. The session H11447\_Notebook contains the following:

<b>HOB File</b>	<b>Purpose and Contents</b>
H11447_Original_Comp_Source.HOB	All features provided from all three sources: CFF, ENC and Prior Surveys
H11447_Deconflicted_Comp_Source.HOB	Deconflicted representation of features from all sources, brought to the field for verification.
H11447_FieldVerified_Comp_Source.HOB	Field verified source features and shoreline, including edits and updates not requiring DPs.
H11447_Pydro_Updates.HOB	New or modified items processed through Pydro.
H11447_Pydro_Delete.HOB	Deleted items processed through Pydro.

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

A marker layer was included in the H11447\_FieldVerified\_Comp\_Source.HOB to provide additional information to the cartographer and to identify features that were deleted based on visual inspection and data acquired using SSS and SWMB

Source Shoreline Changes and New Features

Items for survey H11447 that require further discussion and are associated with a detached position, have been flagged “Report” in Pydro in H11447.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.

The notebook session shows all shoreline updates, deletions and additions for survey H11447. All items that have a delete DP or GP have the associated ENC or CFF FOID number of the deleted feature in the remarks field of the delete DP. Many delete DPs have multiple FOID numbers that represent multiple features. Marker flags were used where features were deleted from the H11447\_FieldVerified\_Comp\_Source.HOB layer without an associated delete DP. ENC and CFF FOID numbers of the deleted features were also included in the marker flags



remarks field. All other notes are in the remarks tabs of their respective features that are depicted in the H11447\_FieldVerified\_Comp\_Source.HOB.

### Recommendations

The Hydrographer recommends that the shoreline as depicted in the Notebook .HOB files supersede and complement shoreline information compiled on the CFF and charts as described above.<sup>27</sup>

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

Survey H11447 included eighteen aids to navigation (ATONs) that were positioned in April 2005. Positional data for thirteen of the eighteen ATONs were acquired using the Trimble Pro XRS backpack GPS acquisition system. These ATONs included channel buoys, channel lights, daymarks and the Petersburg North Entrance Buoy. The remaining four ATONs were positioned using an Ashtech static GPS receiver and the position processed with the NGS OPUS website (See Horizontal and Vertical Control report for additional information). These four ATONs are range lights at the northern end of Wrangell Narrows which were determined to require very precise positional accuracy.<sup>28</sup>

One private ATON, the Reid Landing Dock Light (USCG light list 23130), was not found in its charted position. MBES bathymetry, SSS imagery, and digital photography all show no evidence of this aid or the piling from which it is shown. A disapproval GP is included in the Pydro PSS and the Pydro features report stating the search methods. However, local authorities consulted during final processing of this survey all attest that the light is watching properly. The Officer-In-Charge of USCGC ELDERBERRY (small buoy tender home ported in Petersburg) stated that the light is shown from the pier, and is watching properly. RAINIER digital photography of the pier in question shows no evidence of a light. On February 17, 2007, the Petersburg Harbormaster's Office stated that all charted aids in Wrangell Narrows were watching properly. Since this survey conclusively showed that the light is not in its charted position, and it is not critical for navigation of the Narrows, the hydrographer recommends that it be removed from the light list pending future re-investigation.<sup>29</sup>

All other ATONs positioned were found to serve their intended purpose and positioned correctly within the scale of the chart. The hydrographer recommends that the H11447 positional data of all fixed ATONs be updated on chart 17375 and in US Coast Guard Light List.<sup>30</sup> Positional data is located in the Pydro PSS and the Survey Features report in Appendix II.

Private ATONs that were affixed to a pier or a building, such as lights on the Marine Highway Terminal, Petro Marine Fuel Dock, Chatham Strait Seafood Pier, and Petersburg Fisheries Incorporated, were not positioned as a part of this survey.<sup>31</sup>



**D.2.d. Overhead features**

There are no overhead features in survey H11447.<sup>32</sup>

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

Survey H11447 includes one charted cable area with two charted cables and one sewer line, as shown in Figure 10. No evidence of the sewer line or the cables was present in the bathymetric data or in the SSS data. While there is no surface evidence of these features, the hydrographer recommends retaining the cable areas and sewer as charted.<sup>33</sup>

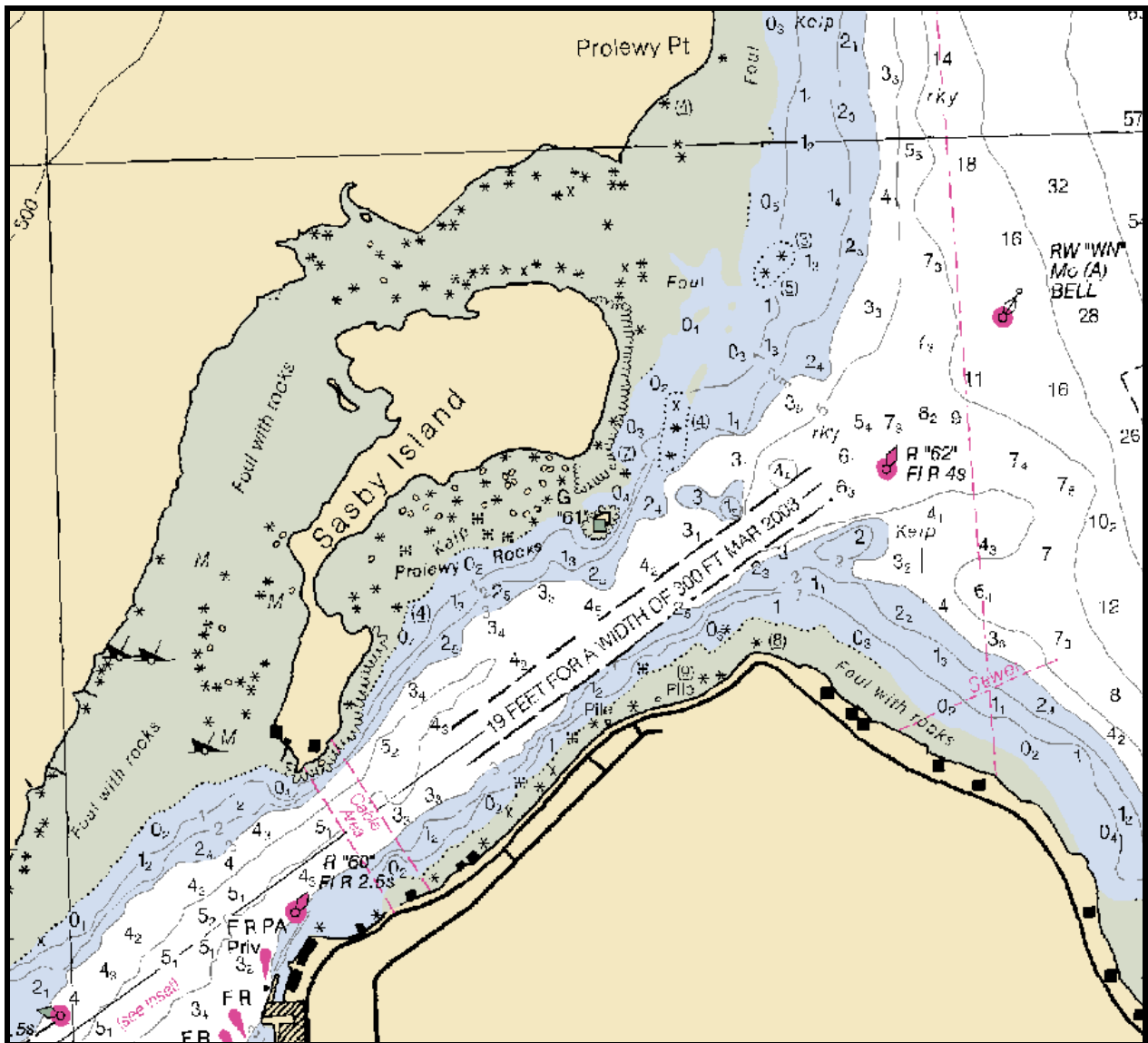


Figure 10. H11447 Cable area and Sewer Line on chart 17375.

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

While there are no charted ferry routes in Wrangell Narrows, the Alaska Marine Highway System makes regularly scheduled passages through Wrangell Narrows to service the communities of Southeast Alaska. These passages often include scheduled stops in Petersburg, Alaska. The hydrographer does not recommend charting specific ferry routes in Wrangell Narrows.<sup>34</sup>

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

Nine Bottom samples were collected for survey H11447. Eight of the nine samples were collected in areas with charted historical seabed data. Six samples agreed with historical data, while two samples were very different than that which is already charted. The dynamic water flow in Wrangell Narrows may change seabed characteristics on a regular basis and samples in dynamic areas may change rapidly. Most of the samples were taken in potential anchorage areas, and the hydrographer recommends current bottom samples supersede current charted bottom characteristics.<sup>35</sup>

### **D.2.h Miscellaneous**

- The hydrographer recommends that Chart 17375 be recompiled with all charted and notated depths in feet. The majority of the area covered by this chart is quite shallow (less than 50 feet), and would be more precisely and neatly portrayed in feet than the current fathoms. Additionally, the notated Wrangell Narrows federal project channel depths are given in feet while the surrounding area is charted in fathoms, creating a potential source of confusion for the mariner.<sup>36</sup>
- Tidal currents in Wrangell Narrows are very strong, creating a near river environment during the ebb and floods stages. Currents experienced by survey launches during operations in this area often disagreed with predictions. The hydrographer recommends CO-OPS conduct current observations in this waterway.<sup>37</sup>

**E. APPROVAL**

As Chief of Party, Field operations for hydrographic survey H11447 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 (March 2004 edition), Field Procedures Manual (March 2005 edition), Standing and Letter Instructions, and all HSD Technical Directives issued through May 2006. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report. 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-O325-RA-06	19 March 2007	N/CS34
Horizontal and Vertical Control Report for OPR-O325-RA-06	9 April 2007	N/CS34
Tides and Water Levels Package for OPR-O325-RA-06	1 June 2006	N/OPS1
Coast Pilot Report for OPR-O325-RA-06	9 April 2007	N/CS26

Approved and Forwarded:

\_\_\_\_\_  
 Guy T. Noll  
 Commander, NOAA  
 Commanding Officer

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

Survey Sheet Manager:

\_\_\_\_\_  
 Olivia A. Hauser  
 Lieutenant (Junior Grade), NOAA

Chief Survey Technician:

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

Field Operations Officer:

\_\_\_\_\_  
 Benjamin K. Evans  
 Lieutenant, NOAA

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<sup>1</sup> Filed with project records.

<sup>2</sup> Concur.

<sup>3</sup> Data from these lines was excluded from the survey during compilation.

<sup>4</sup> Filed with project records.

<sup>5</sup> Concur.

<sup>6</sup> All hydrographic survey data that did not meet IHO order 1 standards was removed from this survey during the Survey Acceptance Review (SAR) process.

<sup>7</sup> Concur.

<sup>8</sup> All listed lines of singlebeam exceeding IHO order 1 were excluded from compilation.

<sup>9</sup> Significant least depths and rock depictions from these higher resolution surfaces were preserved during compilation.

<sup>10</sup> Filed with project records.

<sup>11</sup> Final tide note is appended to this report.

<sup>12</sup> Concur.

<sup>13</sup> Do not concur. A second sounding in the 21 foot channel with a least depth of 6.89 feet located at 56° 48' 26.7" N, 132° 59' 14.7" W was detected during office processing. The shoal sounding was submitted as a DTON. See feature 1.3 in the H11447 DTON Report #2 appended to this report.

<sup>14</sup> The "20 ft sounding" located at 56° 48' 35.7" N, 132° 58' 43.9" W is actually 19.62 feet. When NOAA rounding is applied that makes it become a 19 foot sounding. This shoal sounding was submitted as a DTON during office processing. See feature 1.4 in the H11447 DTON Report #2 appended to this report.

<sup>15</sup> Concur with clarification. Four 22 foot soundings were selected during office processing and submitted as DTONs. See features 1.1, 1.2, 1.5, and 1.6 in the H11447 DTON Report #2 appended to this report.

<sup>16</sup> Concur.

<sup>17</sup> Concur.

<sup>18</sup> Both DTONs detected by the field have been applied to the survey.

<sup>19</sup> The DTON report generated by the field (H11447 DTON Report #1) is appended to this report.

<sup>20</sup> The Survey Feature Report is filed with the hydrographic records. Note: the survey feature report does not include all features from H11447. Additional features were added, some removed, and some modified in CARIS Notebook after the feature report was generated from Pydro. All features included in the compilation of H11447 have come directly from CARIS Notebook, which is the official features deliverable for this survey. Further detail of the Notebook deliverable files is discussed in section D.2.b of the report. In lieu of an all inclusive feature report several Blue Notes are included with the survey to clarify cartographic recommendations for any individual features that the compiler discerned were not inherently clear.

<sup>21</sup> Concur.

<sup>22</sup> Do not concur. AWOIS item 53211 (1.6 in AWOIS report) was not investigated.

<sup>23</sup> AWOIS items have been extracted from the survey features report and are appended to this report.

<sup>24</sup> The two features are located at 56° 46' 30.867" N, 132° 58' 14.272" W, and 56° 46' 26.843" N, 132° 58' 11.707" W.

<sup>25</sup> Recommend not compiling these features. They are not hazardous and there is inadequate information to chart them properly.

<sup>26</sup> Filed with hydrographic records.

<sup>27</sup> Concur.

<sup>28</sup> Chart using the latest ATONIS information.

<sup>29</sup> Concur.

<sup>30</sup> Concur.

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<sup>31</sup> Retain private ATONs as charted.

<sup>32</sup> Concur.

<sup>33</sup> Concur.

<sup>34</sup> Concur.

<sup>35</sup> Concur.

<sup>36</sup> Concur.

<sup>37</sup> Concur.

# H11447 DTON Report #1

**Registry Number:** H11447  
**State:** Alaska  
**Locality:** Wrangell Narrows  
**Sub-locality:** Mountain Point to Prolewy Point  
**Project Number:** OPR-O325-RA-06  
**Survey Dates:** 05/14/2006 - 05/25/2006

## Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
17375	21st	04/01/2004	1:20,000 (17375_1) 1:10,000 (17375_2)	[L]NTM: ?
17360	34th	03/01/2006	1:217,828 (17360_1)	[L]NTM: ?
16016	20th	11/01/2003	1:969,756 (16016_1)	[L]NTM: ?
531	23rd	01/01/2006	1:2,100,000 (531_1)	[L]NTM: ?
500	8th	06/01/2003	1:3,500,000 (500_1)	[L]NTM: ?
530	31st	06/01/2005	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

\* Correction(s) - source: last correction applied (last correction reviewed--"cleared date")

## Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Obstruction	3.88 m	56° 48' 14.7" N	132° 59' 21.3" W	---
1.2	Wreck	4.94 m	56° 46' 20.3" N	132° 58' 02.6" W	---

## **1 - Features from Bathymetry**



## 1.1) Profile/Beam - 654/80 from h11447 / 1016\_reson8125\_hvf / 2006-145 / 321\_1838

### DANGER TO NAVIGATION

#### Survey Summary

**Survey Position:** 56° 48' 14.7" N, 132° 59' 21.3" W  
**Least Depth:** 3.88 m (= 12.73 ft = 2.121 fm = 2 fm 0.73 ft)  
**TPU ( $\pm 1.96\sigma$ ):** THU (TPEh)  $\pm 1.376$  m ; TVU (TPEv)  $\pm 0.457$  m  
**Timestamp:** 2006-145.18:39:36.930 (05/25/2006)  
**Survey Line:** h11447 / 1016\_reson8125\_hvf / 2006-145 / 321\_1838  
**Profile/Beam:** 654/80  
**Charts Affected:** 17375\_2, 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

SWMB least depth on submerged obstruction. Obstruction was located with SSS, developed with SWMB and investigated by divers. Divers located a wooden structure which appears to be an ATON tower lying on its side, with one leg standing approx. 2.81m above the seabed. Least depth by diver least depth gauge was 3.81m, SWMB least depth is 3.71m (corrected with preliminary tides).

#### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1016_reson8125_hvf/2006-145/321_1838	654/80	0.00	000.0	Primary
h11447/dive/2006-146/dp_dive_146	1/1	0.00	000.0	Secondary
h11447/1015_k5k_200_hvf/2006-135/sonar_data060515211300	0001	6.07	235.6	Secondary
h11447/1015_k5k_200_hvf/2006-135/sonar_data060515190800	0001	6.29	219.6	Secondary

#### Hydrographer Recommendations

Chart obstruction with sounding.

#### Cartographically-Rounded Depth (Affected Charts):

2fm (17360\_1, 16016\_1, 530\_1)

2fm 0ft (17375\_2, 17375\_1, 531\_1)

3.9m (500\_1, 50\_1)

## S-57 Data

**Geo object 1:** Obstruction (OBSTRN)  
**Attributes:** CATOBS - 8:ice boom  
NATCON - 6:wooden  
QUASOU - 1:depth known  
STATUS - 1:permanent  
TECSOU - 3:found by multi-beam  
VALSOU - 3.879 m  
VERDAT - 12:Mean lower low water  
WATLEV - 3:always under water/submerged

## Office Notes

Concur.

## 1.2) Profile/Beam - 165/230 from h11447 / 1016\_reson8125\_hvf / 2006-134 / 708\_2355

### DANGER TO NAVIGATION

#### Survey Summary

**Survey Position:** 56° 46' 20.3" N, 132° 58' 02.6" W  
**Least Depth:** 4.94 m (= 16.21 ft = 2.702 fm = 2 fm 4.21 ft)  
**TPU ( $\pm 1.96\sigma$ ):** **THU (TPEh)**  $\pm 1.377$  m ; **TVU (TPEv)**  $\pm 0.458$  m  
**Timestamp:** 2006-134.23:55:34.098 (05/14/2006)  
**Survey Line:** h11447 / 1016\_reson8125\_hvf / 2006-134 / 708\_2355  
**Profile/Beam:** 165/230  
**Charts Affected:** 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

Designated Sounding is least depth on a sunken barge.

Selected and submitted as Danger to Navigation.

Wreck is ~30mx10m, standing 4m proud off the bottom. Least Depth is at NE corner. 100% SWMB coverage, near nadir beams.

#### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1016_reson8125_hvf/2006-134/708_2355	165/230	0.00	000.0	Primary
h11447/1015_k5k_100_hvf/2006-133/sonar_data060513173900	0003	1.15	272.7	Secondary
h11447/1015_k5k_200_hvf/2006-135/sonar_data060515232200	0001	8.18	310.4	Secondary
h11447/1015_k5k_100_hvf/2006-136/sonar_data060516225400	0001	11.55	260.3	Secondary
h11447/1015_k5k_100_hvf/2006-136/sonar_data060516225200	0001	17.05	213.6	Secondary
h11447/1015_k5k_100_hvf/2006-133/sonar_data060513173900	0002	20.11	053.8	Secondary

#### Hydrographer Recommendations

Hydrographer recommends charting wreck with sounding.

#### Cartographically-Rounded Depth (Affected Charts):

2  $\frac{3}{4}$ fm (17360\_1, 16016\_1, 530\_1)

2fm 4ft (17375\_1, 531\_1)

4.9m (500\_1, 50\_1)

### **S-57 Data**

**Geo object 1:** Wreck (WRECKS)  
**Attributes:** CATWRK - 2:dangerous wreck  
CONVIS - 2:not visual conspicuous  
HEIGHT - 4 m  
STATUS - 1:permanent  
TECSOU - 3:found by multi-beam  
VALSOU - 4.941 m  
VERDAT - 12:Mean lower low water  
WATLEV - 3:always under water/submerged

### **Office Notes**

Concur.

# H11447 DTON Report #2

**Registry Number:** H11447  
**State:** Alaska  
**Locality:** Wrangell Narrows  
**Sub-locality:** Mountain Point to Prolewy Point  
**Project Number:** OPR-O325-RA-06  
**Survey Dates:** 05/04/2006 - 05/25/2006

## Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
17375	21st	04/01/2004	1:20,000 (17375_1) 1:10,000 (17375_2)	[L]NTM: ?
17360	34th	03/01/2006	1:217,828 (17360_1)	[L]NTM: ?
16016	20th	11/01/2003	1:969,756 (16016_1)	[L]NTM: ?
531	23rd	01/01/2006	1:2,100,000 (531_1)	[L]NTM: ?
500	8th	06/01/2003	1:3,500,000 (500_1)	[L]NTM: ?
530	31st	06/01/2005	1:4,860,700 (530_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

\* Correction(s) - source: last correction applied (last correction reviewed--"cleared date")

## Features

No.	Feature Type	Survey Depth	Survey Latitude	Survey Longitude
1.1	Shoal	6.10 m	56° 46' 35.7" N	132° 58' 44.1" W
1.2	Shoal	6.78 m	56° 47' 15.8" N	132° 58' 59.6" W
1.3	Shoal	2.10 m	56° 48' 26.7" N	132° 59' 14.7" W
1.4	Shoal	5.98 m	56° 48' 35.7" N	132° 58' 43.9" W
1.5	Shoal	6.76 m	56° 46' 48.2" N	132° 58' 53.4" W
1.6	Shoal	6.70 m	56° 47' 04.7" N	132° 58' 57.1" W

## **1 - Danger To Navigation**

## 1.1) Profile/Beam - 2712/101 from h11447 / 1006\_reson8101\_hvf / 2006-124 / 147\_2256

### DANGER TO NAVIGATION

#### Survey Summary

**Survey Position:** 56° 46' 35.7" N, 132° 58' 44.1" W  
**Least Depth:** 6.10 m (= 20.01ft = 3.335 fm = 3 fm 2.010 ft)  
**TPU ( $\pm 1.96\sigma$ ):** THU (TPEh)  $\pm 1.377$  m ; TVU (TPEv)  $\pm 0.461$  m  
**Timestamp:** 2006-124.22:58:06.706 (05/04/2006)  
**Survey Line:** h11447 / 1006\_reson8101\_hvf / 2006-124 / 147\_2256  
**Profile/Beam:** 2712/101  
**Charts Affected:** 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

sounding shoaler than tabulated depth of channel

#### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1006_reson8101_hvf/2006-124/147_2256	2712/101	0.00	000.0	Primary

#### Hydrographer Recommendations

chart sounding

#### Cartographically-Rounded Depth (Affected Charts):

3fm ½fm (17360\_1, 16016\_1, 530\_1)

3fm 2ft (17375\_1, 531\_1)

6.9m (500\_1, 50\_1)

#### S-57 Data

**Geo object 1:** Sounding (SOUNDG)

**Attributes:** TECSOU - 3:found by multi-beam



## Office Notes

concur

## 1.2) Profile/Beam - 8955/99 from h11447 / 1006\_reson8101\_hvf / 2006-124 / 108\_2059

### DANGER TO NAVIGATION

#### Survey Summary

**Survey Position:** 56° 47' 15.8" N, 132° 58' 59.6" W  
**Least Depth:** 6.78 m (= 22.24 ft = 3.707 fm = 3 fm 4.24 ft)  
**TPU ( $\pm 1.96\sigma$ ):** THU (TPEh)  $\pm 1.377$  m ; TVU (TPEv)  $\pm 0.459$  m  
**Timestamp:** 2006-124.21:07:04.560 (05/04/2006)  
**Survey Line:** h11447 / 1006\_reson8101\_hvf / 2006-124 / 108\_2059  
**Profile/Beam:** 8955/99  
**Charts Affected:** 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

sounding shoaler than tabulated depth of channel

#### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1006_reson8101_hvf/2006-124/108_2059	8955/99	0.00	000.0	Primary

#### Hydrographer Recommendations

chart sounding

#### Cartographically-Rounded Depth (Affected Charts):

3  $\frac{3}{4}$ fm (17360\_1, 16016\_1, 530\_1)

3fm 4ft (17375\_1, 531\_1)

6.8m (500\_1, 50\_1)

#### S-57 Data

**Geo object 1:** Sounding (SOUNDG)

**Attributes:** TECSOU - 3:found by multi-beam

## Office Notes

concur

### 1.3) Profile/Beam - 5526/68 from h11447 / 1006\_reson8101\_hvf / 2006-124 / 330\_1705

## DANGER TO NAVIGATION

### Survey Summary

**Survey Position:** 56° 48' 26.7" N, 132° 59' 14.7" W  
**Least Depth:** 2.10 m (= 6.89 ft = 1.48 fm = 1 fm 0.89 ft)  
**TPU ( $\pm 1.96\sigma$ ):** **THU (TPEh)**  $\pm 1.375$  m ; **TVU (TPEv)**  $\pm 0.459$  m  
**Timestamp:** 2006-124.17:08:47.724 (05/04/2006)  
**Survey Line:** h11447 / 1006\_reson8101\_hvf / 2006-124 / 330\_1705  
**Profile/Beam:** 5526/68  
**Charts Affected:** 17375\_2, 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

sounding shoaler than tabulated depth of channel

### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1006_reson8101_hvf/2006-124/330_1705	5526/68	0.00	000.0	Primary

### Hydrographer Recommendations

chart sounding

#### Cartographically-Rounded Depth (Affected Charts):

1 fm (17360\_1, 16016\_1, 530\_1)  
 1fm 1ft (17375\_2, 17375\_1, 531\_1)  
 2.1m (500\_1, 50\_1)

### S-57 Data

**Geo object 1:** Sounding (SOUNDG)  
**Attributes:** SORDAT - 20060526  
 SORIND - US,US,nsurf,H11447  
 TECSOU - 3:found by multi-beam

## Office Notes

concur

## 1.4) Profile/Beam - 16009/49 from h11447 / 1006\_reson8101\_hvf / 2006-137 / 263\_1943

### DANGER TO NAVIGATION

#### Survey Summary

**Survey Position:** 56° 48' 35.7" N, 132° 58' 43.9" W  
**Least Depth:** 5.98 m (= 19.62 ft = 3.270 fm = 3 fm 1.62 ft)  
**TPU ( $\pm 1.96\sigma$ ):** **THU (TPEh)**  $\pm 1.376$  m ; **TVU (TPEv)**  $\pm 0.460$  m  
**Timestamp:** 2006-137.19:55:19.887 (05/17/2006)  
**Survey Line:** h11447 / 1006\_reson8101\_hvf / 2006-137 / 263\_1943  
**Profile/Beam:** 16009/49  
**Charts Affected:** 17375\_2, 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

sounding shoaler than tabulated depth of channel

#### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1006_reson8101_hvf/2006-137/263_1943	16009/49	0.00	000.0	Primary

#### Hydrographer Recommendations

chart sounding

#### Cartographically-Rounded Depth (Affected Charts):

3 ¼fm (17360\_1, 16016\_1, 530\_1)

3fm 1ft (17375\_2, 17375\_1, 531\_1)

6.0m (500\_1, 50\_1)

#### S-57 Data

**Geo object 1:** Sounding (SOUNDG)  
**Attributes:** SORDAT - 20060526  
 SORIND - US,US,nsurf,H11447  
 TECSOU - 3:found by multi-beam

## Office Notes

concur

## 1.5) Profile/Beam - 420/231 from h11447 / 1016\_reson8125\_hvf / 2006-142 / 351\_2333

### DANGER TO NAVIGATION

#### Survey Summary

**Survey Position:** 56° 46' 48.2" N, 132° 58' 53.4" W  
**Least Depth:** 6.76 m (= 22.19 ft = 3.698 fm = 3 fm 4.19 ft)  
**TPU ( $\pm 1.96\sigma$ ):** **THU (TPEh)**  $\pm 1.378$  m ; **TVU (TPEv)**  $\pm 0.458$  m  
**Timestamp:** 2006-142.23:33:35.563 (05/22/2006)  
**Survey Line:** h11447 / 1016\_reson8125\_hvf / 2006-142 / 351\_2333  
**Profile/Beam:** 420/231  
**Charts Affected:** 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

sounding shoaler than tabulated depth of channel

#### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1016_reson8125_hvf/2006-142/351_2333	420/231	0.00	000.0	Primary

#### Hydrographer Recommendations

chart sounding

#### Cartographically-Rounded Depth (Affected Charts):

3  $\frac{3}{4}$ fm (17360\_1, 16016\_1, 530\_1)

3fm 4ft (17375\_1, 531\_1)

6.8m (500\_1, 50\_1)

#### S-57 Data

**Geo object 1:** Sounding (SOUNDG)

**Attributes:** TECSOU - 3:found by multi-beam



## Office Notes

concur

## 1.6) Profile/Beam - 968/1 from h11447 / 1103\_singlebeam\_hvf / 2006-145 / 279\_2336

### DANGER TO NAVIGATION

#### Survey Summary

**Survey Position:** 56° 47' 04.7" N, 132° 58' 57.1" W  
**Least Depth:** 6.70 m (= 21.98 ft = 3.663 fm = 3 fm 3.98 ft)  
**TPU ( $\pm 1.96\sigma$ ):** **THU (TPEh)**  $\pm 1.393$  m ; **TVU (TPEv)**  $\pm 0.466$  m  
**Timestamp:** 2006-145.23:37:56.740 (05/25/2006)  
**Survey Line:** h11447 / 1103\_singlebeam\_hvf / 2006-145 / 279\_2336  
**Profile/Beam:** 968/1  
**Charts Affected:** 17375\_1, 17360\_1, 16016\_1, 531\_1, 500\_1, 530\_1, 50\_1

#### Remarks:

sounding shoaler than tabulated depth of channel

#### Feature Correlation

Address	Feature	Range	Azimuth	Status
h11447/1103_singlebeam_hvf/2006-145/279_2336	968/1	0.00	000.0	Primary

#### Hydrographer Recommendations

chart sounding

#### Cartographically-Rounded Depth (Affected Charts):

3 ½fm (17360\_1, 16016\_1, 530\_1)

3fm 4ft (17375\_1, 531\_1)

6.7m (500\_1, 50\_1)

#### S-57 Data

**Geo object 1:** Sounding (SOUNDG)

**Attributes:** TECSOU - 3:found by multi-beam

## Office Notes

concur



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

**TIDE NOTE FOR HYDROGRAPHIC SURVEY**

**DATE :** July 18, 2006

**HYDROGRAPHIC BRANCH:** Pacific  
**HYDROGRAPHIC PROJECT:** OPR-0325-RA-2006  
**HYDROGRAPHIC SHEET:** H11447

**LOCALITY:** Mountain Point to Prolewy Point, Wrangell Narrows, AK  
**TIME PERIOD:** May 4 - 26, 2006

**TIDE STATION USED:** 945-1434 Turn Point, AK  
Lat. 56 48.00'N Long. 132 58.80' W

**PLANE OF REFERENCE (MEAN LOWER LOW WATER):** 0.000 meters  
**HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:** 4.628 meters

**REMARKS: RECOMMENDED ZONING**

**Use zone(s) identified as:** SA170, SA171, SA172, SA173, SA174 & SA186

**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).

*For [Signature]*

CHIEF, PRODUCTS AND SERVICES DIVISION





# Final Tidal Zoning for OPR-O325-RA-2006, H11447 Mountain Point to Prolewy Point Wrangell Narrows, AK

**SA174**  
Time Corrector 0 mins  
Range Corrector x0.99  
Reference 945-1434

**SA173**  
Time Corrector 0 mins  
Range Corrector x1.00  
Reference 945-1434

**SA171**  
Time Corrector +6 mins  
Range Corrector x1.03  
Reference 945-1434

**SA170**  
Time Corrector +12 mins  
Range Corrector x1.02  
Reference 945-1434

**SA186**  
Time Corrector -6 mins  
Range Corrector x0.98  
Reference 945-1434

**SA172**  
Time Corrector +6 mins  
Range Corrector x1.02  
Reference 945-1434

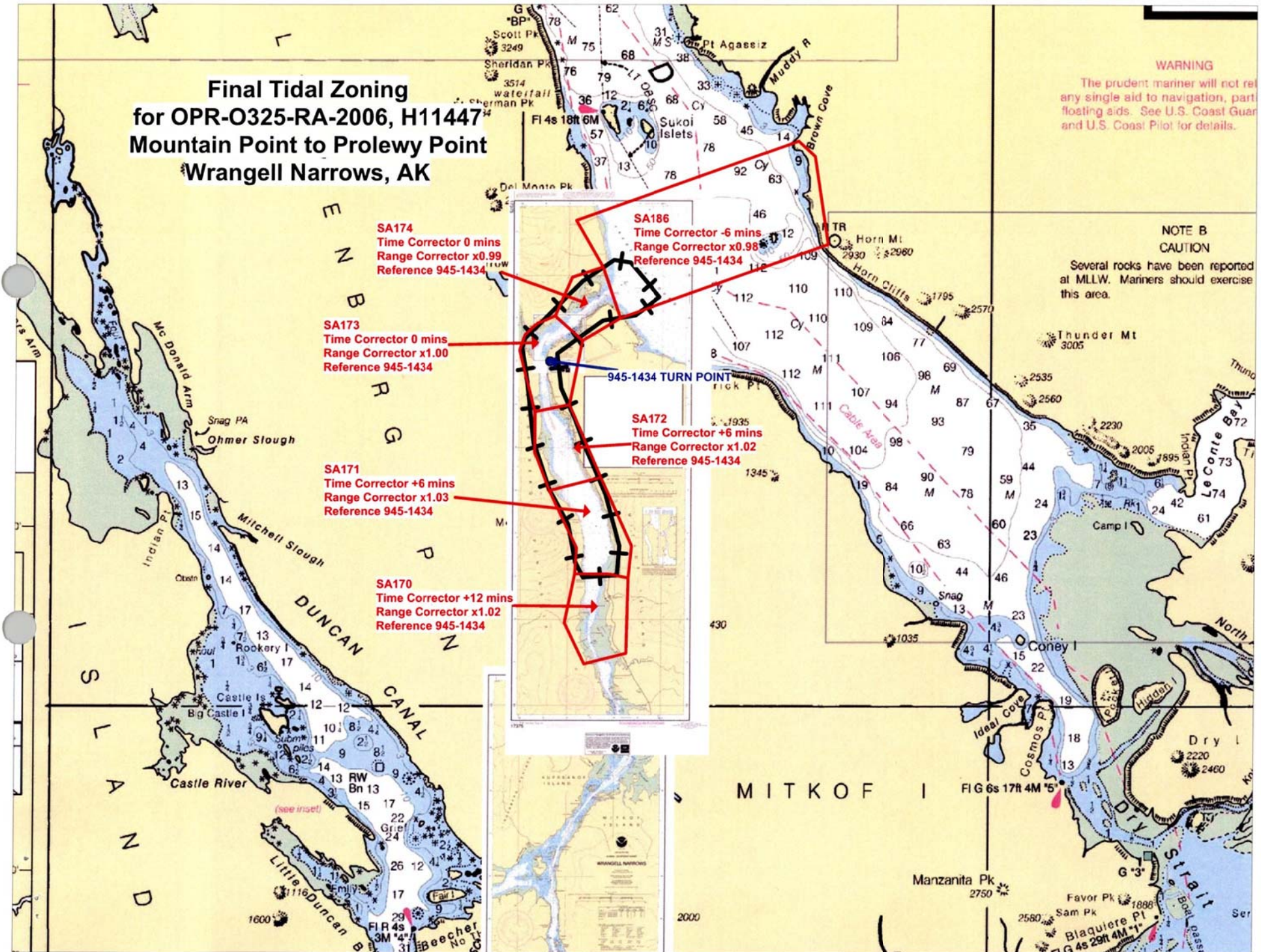
945-1434 TURN POINT

## WARNING

The prudent mariner will not rely on any single aid to navigation, particularly floating aids. See U.S. Coast Guard and U.S. Coast Pilot for details.

## NOTE B CAUTION

Several rocks have been reported at MLLW. Mariners should exercise this area.



**H11447 HCell Report**  
Peter Holmberg, Physical Scientist  
Pacific Hydrographic Branch

**Introduction**

The primary purpose of the HCell is to directly update NOAA ENC's with new survey information in International Hydrographic Organization (IHO) format S-57. HCell compilation of survey H11447 utilized Office of Coast Survey HCell Specifications Version 3.0, February 29, 2008 in conjunction with the Field and Processing Branch Features Encoding Guide for West Coast US and Alaska Version 1.3, June 16, 2008. HCell H11447 will be used to update charts 17375,1:20,000 (21st Ed.; Apr 04, NM 02/02/2008), and US5AK3KM.

**1. Compilation Scale**

The density of soundings in the HCell are compiled as appropriate to emulate those soundings of Chart 17375, 1:20,000 and the inset scale of 1:10,000. Position and density of non-bathymetric features included in the HCell have not been generalized from the scale of the hydrographic survey H11447, 1:10,000.

**2. Soundings**

**2.1 Source Data**

A 5 meter resolution Combined BASE surface, **H11447\_5m\_cmbd** was used as the basis for HCell production following Branch certification.

A survey-scale sounding (SOUNDG) feature object source layer was built from the **H11447\_5m\_cmbd** surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 survey scale using a radius table with values shown in **Table 1**. The same process was repeated at 1:5,000 for the inset area.

Upper limit (m)	Lower limit (m)	Radius (mm)
0	10	3
10	20	4
20	110	4.5

**Table 1**

## 2.2 Sounding Feature Objects

In CARIS BASE Editor soundings were manually selected from the high density sounding layers from H11447, and imported into a new layer created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that more closely represents the seafloor morphology and that emulates density and distribution of soundings on chart 17375 than is possible using automated methods. See section 10.1, Data Processing Notes, for details about the use of manual sounding selection for H11447. The sounding feature object source layer was exported as **H11447\_CS**, and imported into HOM.

## 3. Depth Areas

### 3.1 Source Data

Using the BASE surface **H11447\_5m\_cmbd** a single depth area was generated for the area of hydrography from H11447. Several small isolated depth areas were generated to encapsulate separate shoreline features surveyed outside the area of hydrography.

### 3.2 Depth Area Feature Objects

One all-encompassing depth range, 0 meters to 120 meters, was used for all depth area objects below MLLW. Upon conversion to NOAA charting units, this depth range is 0 Fathoms and 0 feet to 65 Fathoms and 4 feet.

Several separate depth areas were created to encapsulate surveyed features outside of the main survey area from the Base surface. DRVALs 1 and 2 for these areas were derived from the ENC US5AK3KM.

## 4. Meta Areas

The following Meta object areas are included in HCell 11447:

M\_QUAL            M\_CSCL  
M\_COVR

Meta area objects were constructed on the basis of perimeter lines delineating the surveyed limits, “island of coverage” for the pier surveyed outside the hydrographic limits, and extents of data gaps inside the survey area. The perimeter was first used to create the Skin of The Earth (SOTE) layer, then was duplicated to the Meta object layers and attributed per the H-Cell Specifications, ver. 3.0.

M\_QUAL was in H11447 to delineate between areas of 100% SWMB and areas of densely spaced single beam. Although each sounding has a TECSOU attribute that is marked with either “found by multi-beam” or “found by echo-sounder”, the M\_QUAL

delineation shows the exact boundaries of where full coverage from multibeam ends and partial coverage from singlebeam begins.

## **5. Survey Features**

All features from H11447 were delivered in .HOB format have been fully reviewed and addressed. Features were included, excluded, modified, or blue noted in the HCell. Shoreline features for H11447 were delivered in five different files.

- H11447\_Original\_Comp\_Source.HOB
- H11447\_Deconflicted\_Comp\_Source.HOB
- H11447\_FieldVerified\_Comp\_Source.HOB
- H11447\_Pydro\_Updates.HOB
- H11447\_Pydro\_Delete.HOB

## **6. Shoreline / Tide Delineation**

Depth areas (DEPARE) and Seabed areas (SBDARE) or Land areas (LNDARE) were created for all SOTE features.

## **7. Attribution**

All S-57 Feature Objects from H11447 have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with OCS H-Cell Specifications, ver. 3.0. Some features imported from ENC US5AK3KM into the H-Cell have missing mandatory attributes.

## **8. Layout**

### **8.1 CARIS HOM Layering Scheme**

100	Chart scale soundings
101	Survey scale soundings
200	Group 1 objects (Skin of the Earth)
300	Point objects (bottoms samples, rocks, piles, etc.)
400	Line objects (narrow piers, bulk heads, etc.)
500	Area objects (large piers)
600-602	Meta layers
800	Items used for creation of Blue Notes



## 8.2 Blue Notes

Notes regarding data sources are in CARIS HOM as layer 800 as Shapefile sets, **H11447bluenotes\_p** and **H11447\_bluenotes\_l** (with the appropriate extensions) for point and line figures, respectively.

## 9. Spatial Framework

### 9.1 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.

### 9.2 Horizontal and Vertical Units

During creation of sounding sets in CARIS BASE Editor, and creation of the HCell in CARIS HOM, units are maintained as metric with millimeter resolution. NOAA rounding is applied at the same time that conversion to chart units is made to the metric HCell base cell file, at the end of the HCell compilation process.

A CARIS environment variable, `uslXsounding_round`, controls the depth at which rounding occurs. Setting this variable to NOAA fathoms and feet displays all soundings equal to or greater than 11 fathoms as whole units. Depths shoaler than 11 fathoms are shown in fathoms and feet.

In an ENC viewer fathoms and feet display in the format `X.YZZZ`, where X is fathoms, Y is feet, and ZZZ is decimals of the foot. For fathoms and feet between 0 and 10 fathoms 4.5 feet (10.75 fms), soundings round to the deeper foot if the decimals of the foot are `X.Y75000` or greater. For fathoms and feet deeper or equal to 11 fathoms, soundings round to the deeper fathom if feet and decimals of the foot are `X.45000` (`X.Y75000`) or greater. Drying heights are in feet and are rounded using arithmetic methods. In an ENC viewer, heights greater than 6 feet will register in fathoms and feet using the above stated rules.

#### HOM Units

Sounding Units:	Meters rounded to the nearest millimeter
Spot Height Units:	Meters rounded to the nearest meter

#### Chart Unit Base Cell Units

Depth Units (DUNI):	Fathoms and feet
Height Units (HUNI):	Feet (or fathoms and feet above 6 feet)
Positional Units (PUNI):	Meters

## 10. QA/QC

### 10.1 Data Processing Notes

Manual chart scale sounding selections were made for this survey. Experience has shown that in areas where bathymetry is steep sided, as in the case of this steep edged channel, automated sounding selection is impractical. None of the default sounding suppression options offered in CARIS BASE Editor or HOM yields an acceptable density and distribution of depths, generally bunching soundings nearshore with too sparse coverage seaward. While the customized options are more practical for this type of terrain, an inordinate amount of time must be spent in experimentation with variations on the algebraic terms in order to devise the most suitable formula, and manual adjustments are still required to the resulting sounding set.

### 10.2 ENC Validation Checks

H11447 was subjected to QA and Validation checks in HOM prior to exporting to the HCell base cell (000) file. Full millimeter precision was retained in the export of the metric S-57 base cell data set. This data set was converted to a chart unit 000 file. dKart Inspector 5.0 (Service Pack 1) was then used to further check the data set for conformity using the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and errors investigated and corrected where necessary.

## 11. Products

### 11.1 HSD, MCD and CGTP Deliverables

- H11447 Base Cell File, Chart Units, Soundings compiled to 1:20,000
- H11447 Base Cell File, Chart Units, Soundings compiled to 1:10,000
- H11447 Descriptive Report including end notes compiled during office processing and certification
- H11447 HCell Report
- Blue Notes shape files

### 11.2 File Naming Conventions

HOM file set prefix: *H11447\_hc*

MCD Chart units base cell file: *US511447\_CU.000*

MCD Chart units base cell file, survey scale soundings: *US511447\_SS.000*

### **11.3 Software**

HIPS 6.1:	Management and inspection of Combined BASE surfaces
BASE Editor 2.1:	Combination of Product Surfaces and initial creation of the S-57 bathymetry-derived features
HOM 3.3:	Assembly of the H-Cell, S-57 products, QA
GIS 4.4a:	Setting the sounding rounding variable
Pydro v7.3 (r2252)	Creation of AWOIS, and DTON reports
dKart Inspector 5.0:	Validation of the base cell file

### **12. Contacts**

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

Peter Holmberg, Physical Scientist, PHB, Seattle, WA; 206-526-6843;  
Peter.Holmberg@noaa.gov.

APPROVAL SHEET  
H11447

Initial Approvals:

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