

H11697

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Survey

Field No. OPR-O322-KR-07

Registry No. H11697

LOCALITY

State Alaska

General Locality Chatham Strait

Sublocality SE of Tenakee Inlet

2007

CHIEF OF PARTY

Dean Moyles, Fugro Pelagos

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DATE

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION HYDROGRAPHIC TITLE SHEET	REGISTRY No H11697
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
<p> State <u>Alaska</u> General Locality <u>Chatham Strait</u> Sub-Locality <u>SE of Tenakee Inlet</u> Scale <u>1:20,000</u> Date of Survey <u>August 08, 2007 - September 04, 2007</u> Instructions dated <u>6/15/2006</u> Project No. <u>OPR-O322-KR-07</u> Vessel <u>R/V Davidson (1066485), R/V R2 (623241), R/V D2 (647782), Shoreline Skiff (WN6739NW)</u> Chief of party <u>Dean Moyles</u> Surveyed by <u>ORTHMANN, REYNOLDS, GILL, MOUNT, STOCK, FARLEY, BRIGGS, POECKERT, ET AL</u> Soundings by echo sounder, hand lead, pole <u>RESON 8101 (R2 & D2 - HULL MOUNT), RESON 8111 (DAVIDSON - HULL MOUNT) and</u> Graphic record scaled by <u>FUGRO PELAGOS, INC. PERSONNEL</u> Graphic record checked by <u>FUGRO PELAGOS, INC.</u> Automated Plot <u>N/A</u> Verification by <u>F. Ortiz, A. Foster</u> Soundings in <u>Meters</u> at <u>MLLW</u> </p>		
<p> REMARKS: All times are UTC. The purpose of this survey was to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were generated during office processing. Page numbering may be interrupted or non-sequential. </p>		

A - Area Surveyed

H11697 (Sheet B) is bound by the coordinates listed below, which encompass the area SE of Tenakee Inlet.

Hydrographic data collection began on August 8, 2007 and ended on September 4, 2007.

Table 1 – H11697 Sheet Limits

Sheet Limits H11697 Sheet B Scale 1:20,000		
Point #	Positions on NAD83	
	Degrees Latitude (N)	Degrees Longitude (W)
1	57-47-45.36 N	135-01-46.47 W
2	57-47-45.36 N	134-36-43.84 W
3	57-34-35.40 N	134-36-43.84 W
4	57-34-35.40 N	135-01-46.47 W

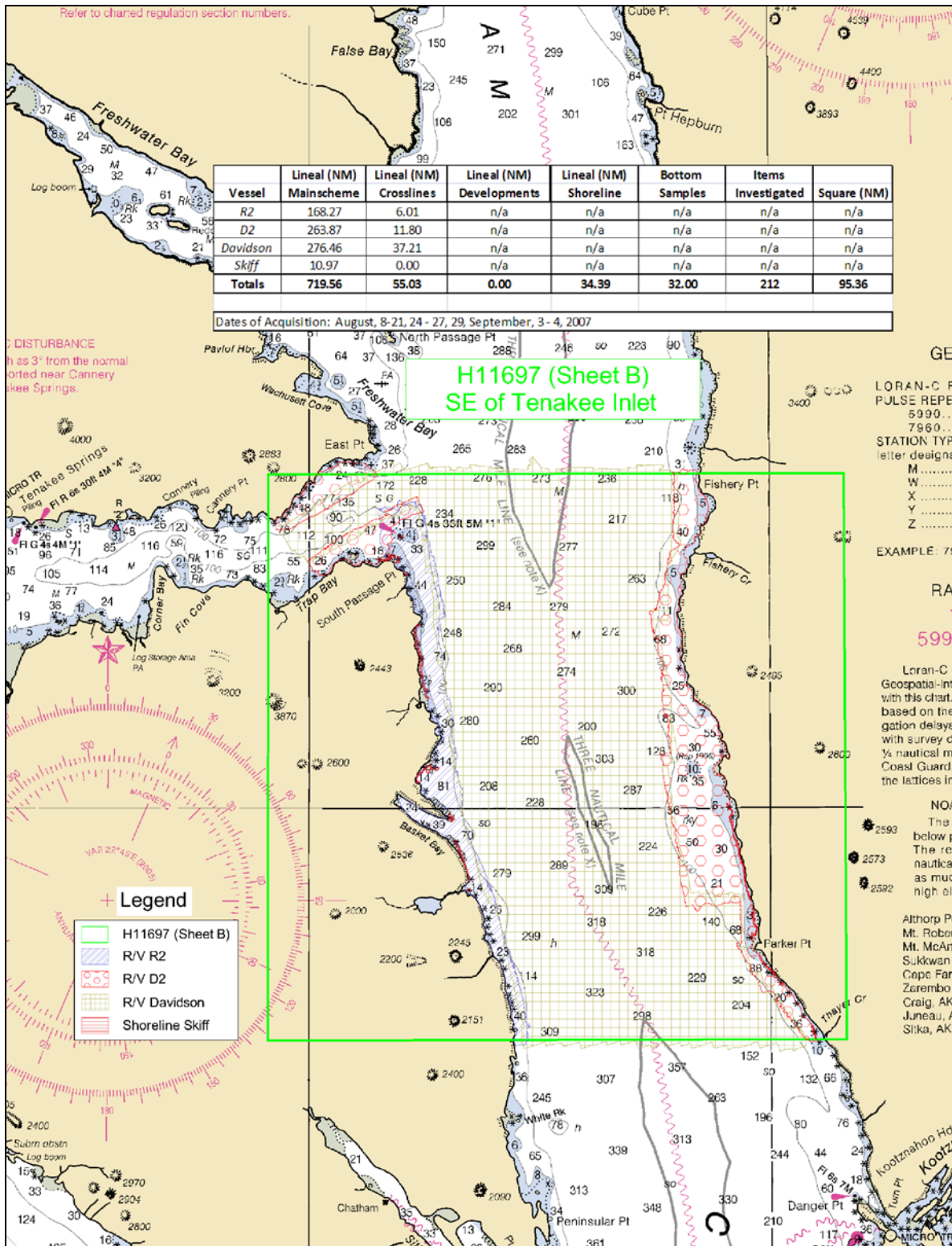


Figure 1 H11697 Area Surveyed



B – Data Acquisition & Processing

Refer to the OPR-O322-KR-07 Data Acquisition and Processing Report ¹ for a detailed description of all equipment, survey vessels, processing procedures, and quality control features. Items specific to this survey and any deviations from the Data Acquisition and Processing Report are discussed in the following sections.

Equipment & Vessels

The R/V Davidson, R/V R2, R/V D2, and the Shoreline Skiff acquired all soundings for H11697. The R/V Davidson, 175 feet in length with a draft of 17.75 feet, was equipped with a 100 kHz Reson 8111 with option 033 (pseudo Side Scan) for multibeam data acquisition. R/Vs R2 & D2, 29 feet in length with a draft of 5.7 feet, were equipped with a 240 kHz Reson 8101 with option 033 (pseudo Side Scan) for multibeam data acquisition. The Shoreline Skiff, 24 feet in length with a draft of 1.42 feet, was equipped with a 455 kHz Reson 8125 with option 033 (pseudo Side Scan) for multibeam data acquisition. All vessels were also equipped with two AML sound velocity and pressure sensors (SV&P) for sound velocity profiles. Vessel attitude and position were measured using an Applanix Position and Orientation System for Marine Vessel (POS/MV 320) (v4) with XTF files logged in Triton ISIS (v7.0.413.9).

Heights were taken on features awash or above the water level by visual estimation, using simultaneous comparison to a known reference (the vessel's bow).

Refer to OPR-O322-KR-07 Data Acquisition & Processing Report for a complete listing of equipment and vessel descriptions.

Quality Control

Crosslines

Crosslines were planned and well distributed throughout the survey to ensure adequate quality control. Total crossline length surveyed was 55.03 nautical miles or 7.6 percent of the total main scheme line length, exceeding the 5 percent planned. Each crossline was compared to all main scheme lines it intersected, using the CARIS HIPS QC report routine.

The majority of QC Reports fall well within the required accuracy specifications. However, beams that fall below the 95 percent confidence level in the QC report are associated with areas and conditions illustrated below. It should be noted that these locations are in agreement with the surrounding adjacent lines and are considered well within the required specifications.²

The majority of beams that fall below the 95 percent confidence level are located in areas having extremely steep slopes and/or rocks. Figures 2 and 3 below provide examples.

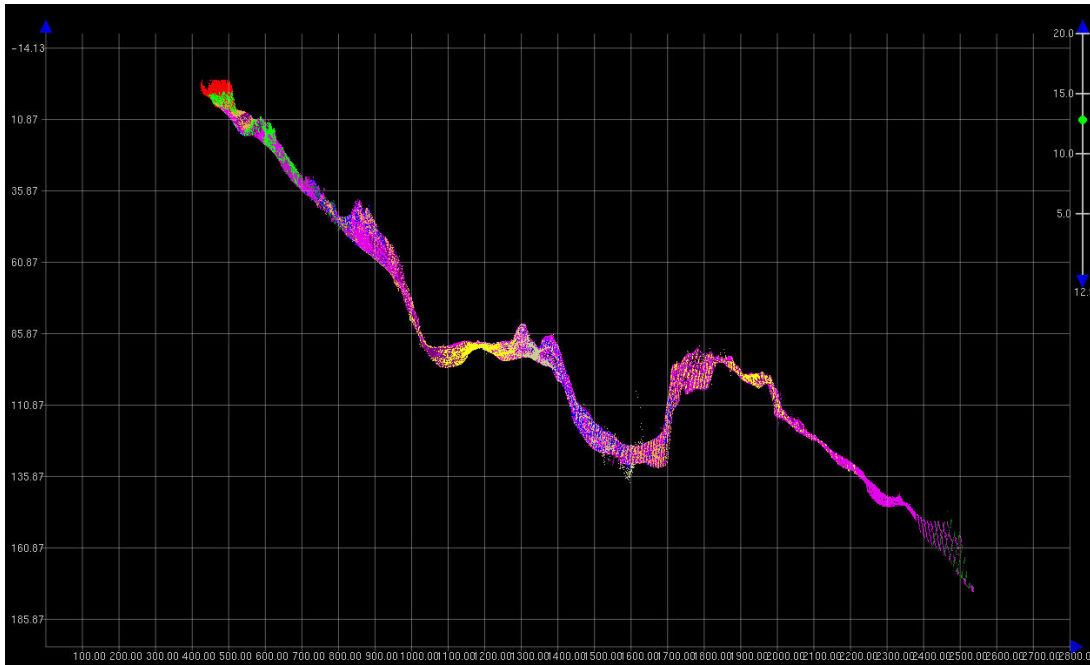


Figure 2 Profile of 2B01-TIE01

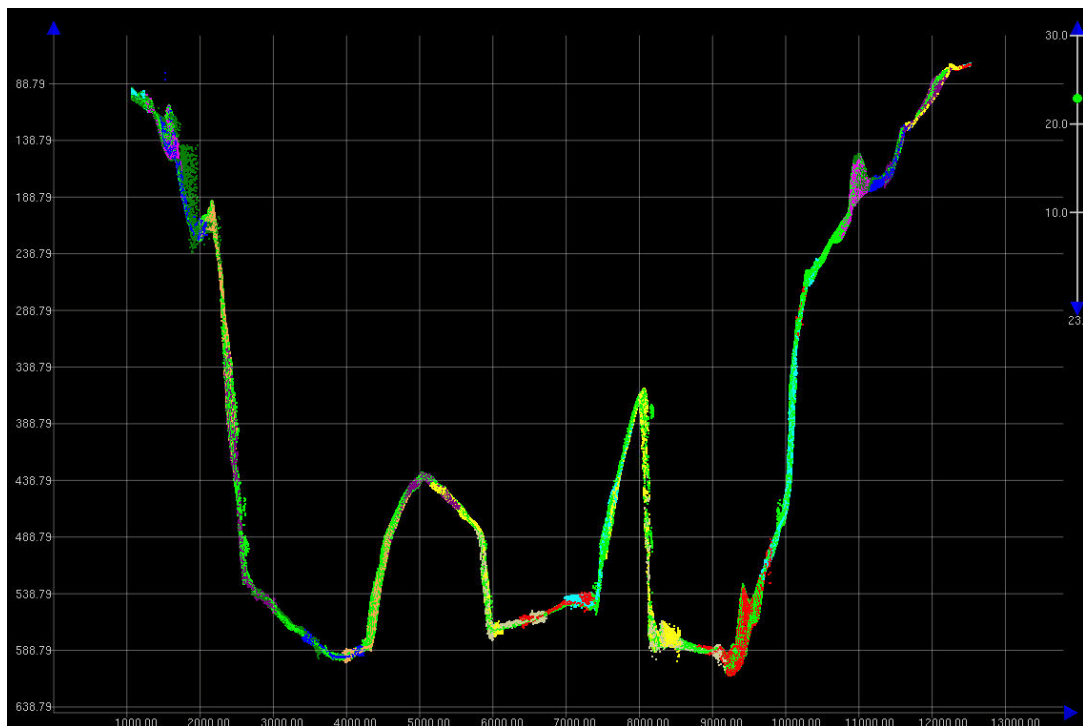


Figure 3 Profile of 3B04-TIE02



Note: The QC reports were generated based on the given accuracy specification of:

$$\pm \sqrt{[a^2 + (b * d)^2]}$$

where, $a = 0.5$, $b = 0.013$, and $d = \text{depth}$.

However, since a variance of a difference, rather than a variance from a mean is being used, the a and b values were defined in the user defined option within the CARIS HIPS QC Report routine:

$$a = 0.5 * \sqrt{2} = 0.707$$

$$b = 0.013 * \sqrt{2} = 0.018$$

Uncertainty Values (CARIS BASE Surface)

The majority of H11697 had an uncertainty of about 0.25 to 0.65 meters, except for the deep water areas having extremely steep slopes or deemed to be rocky, where values ranged from 1.2 to 1.5 meters. No uncertainty values were greater than the IHO level Order 1.

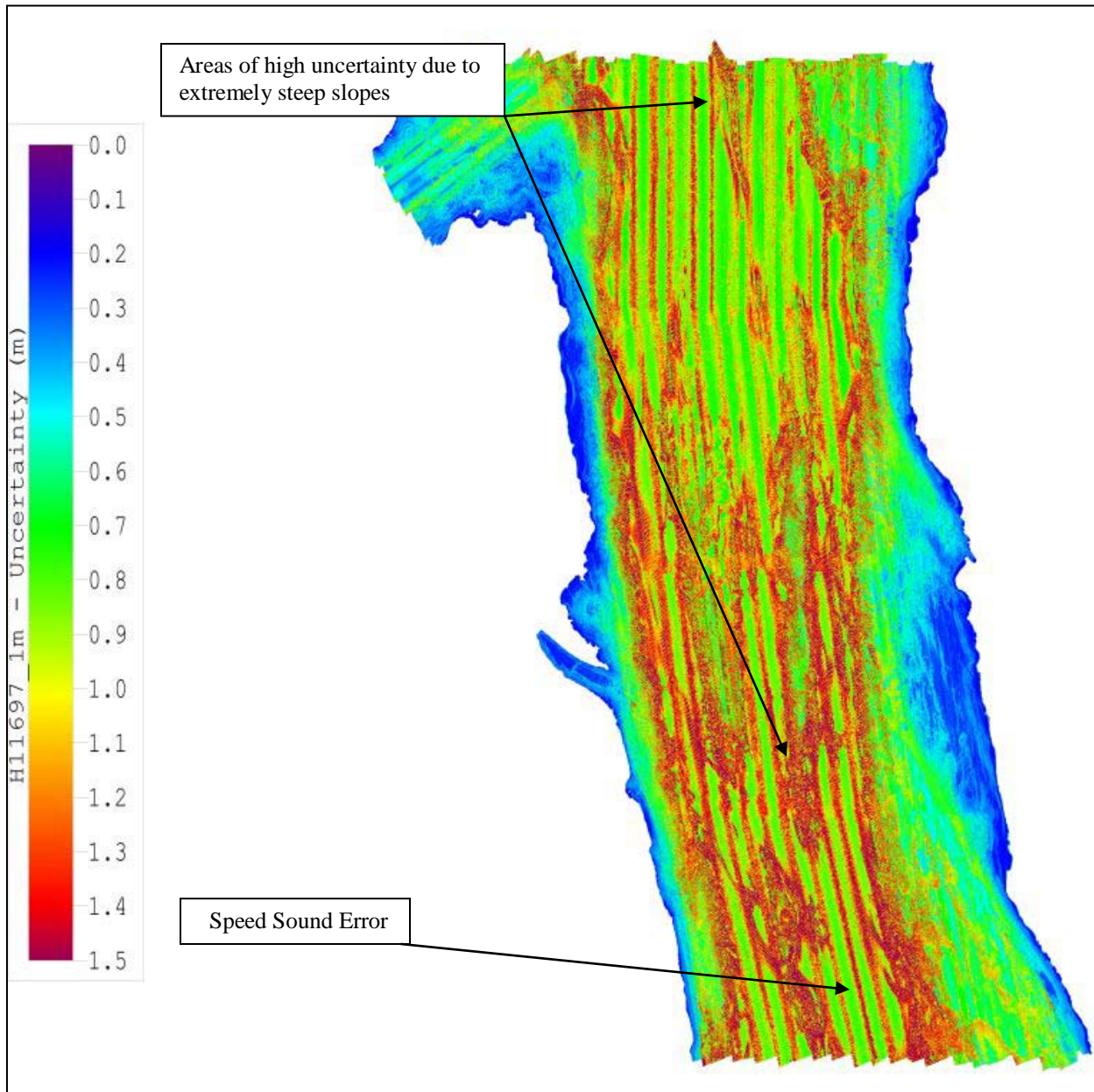


Figure 4 H11697 Uncertainty DTM

Survey Junctions

H11697 (Sheet B) junctions with:

Registry #	Scale	Date	Junction Side
H11696	1:20,000	2007	North
H11698	1:20,000	2007	South

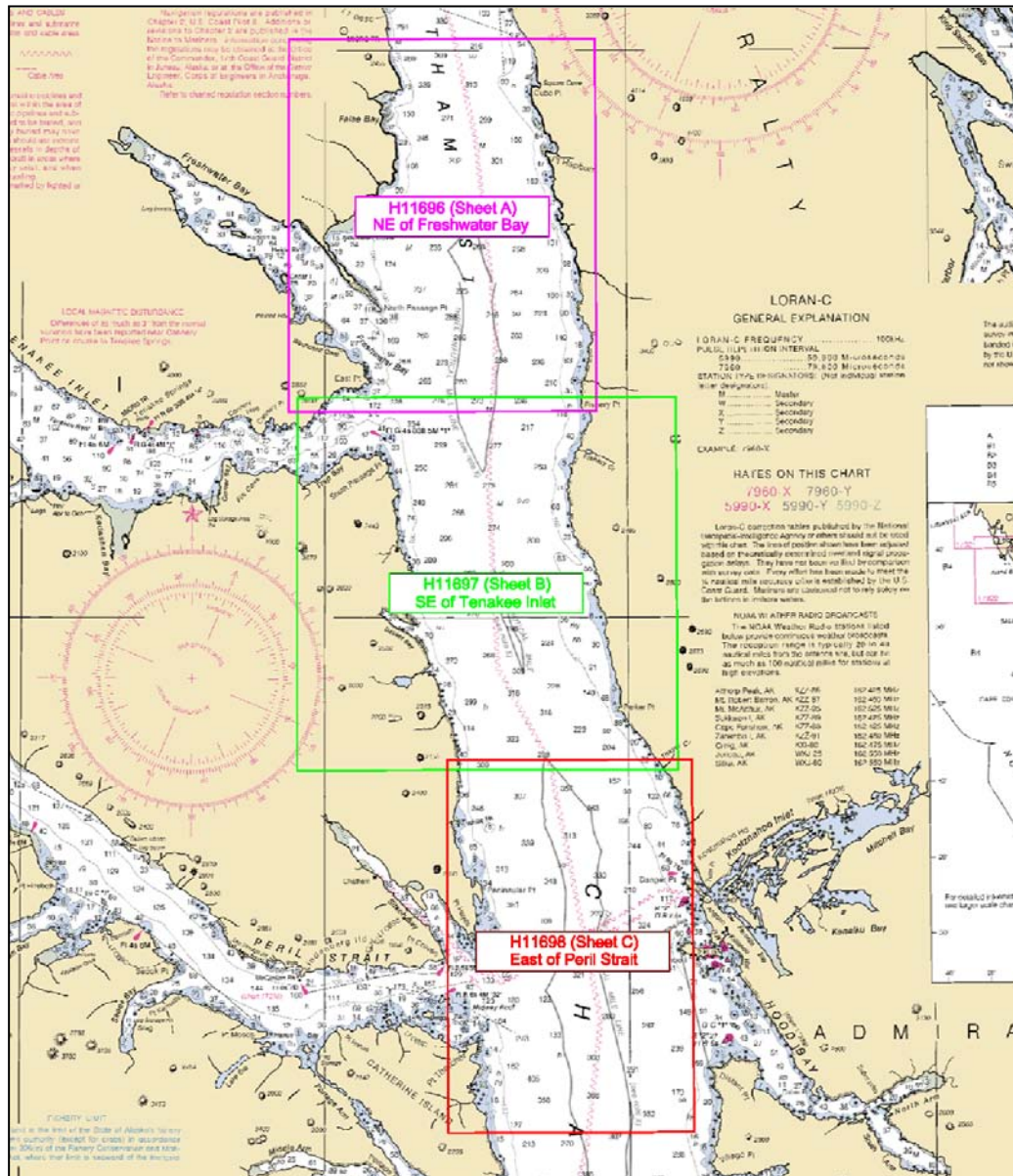


Figure 5 H11697 Survey Junctions

The surveys are in agreement along their common borders. The agreement was noted in the field using the CARIS CUBE surfaces during subset cleaning. The conformity is also apparent in the final combined BASE surfaces.³



Quality Control Checks

During the hydrographic survey OPR-O322-KR-07 the survey vessels conducted a number of confidence checks. These consisted of the vessels running two lines in the opposite direction over a reference surface (normally the patch test site). The data sets collected with the Reson 8125 (Shoreline Skiff), 8101 (R2 & D2), and 8111 (Davidson) compared within 5 to 10 centimeters.

Positioning system confidence checks were conducted on a daily basis using the POS/MV controller software. The controller software had numerous real time displays that were monitored throughout the survey to ensure the positional accuracies specified in the NOS Hydrographic Surveys Specifications and Deliverables (April 2007) were achieved. These include, but were not limited to the following: GPS Status, Position Accuracy, Receiver Status (which included HDOP), and Satellite Status. During periods of high HDOP and/or low number of available satellites, survey operations were suspended.

Data Quality

In general, the multibeam data quality for H11697 was excellent. One notable problem follows:

- During data acquisition and routine processing, a general downward and/or upward cupping was noticed in the across track sounding profiles for certain areas. This is possibly due to a high volume of thermal layering and strong undercurrents in the water column. This problem was addressed by conducting SVP casts more frequently and reducing the line spacing interval. Even though this SVP error is noticeable on the uncertainty surface DTM in Figure 4 above, the data are well within the required specifications.

Corrections to Echo Soundings

Refer to the OPR-O322-KR-07 Data Acquisition and Processing Report for a detailed description of all corrections to echo soundings. No deviations from the report occurred.

Data Processing

Refer to the OPR-O322-KR-07 Data Acquisition and Processing Report for a detailed description of the processing flow.

The final Bathymetric with Associated Statistical Error (BASE) surface for H11697 is called H11697, and it contains six different BASE surfaces of different resolutions. To ensure sufficient overlap between these surfaces the following parameters were used:



Depth Threshold: 0 to 15 meters, resolution = 1m, Name in BASE Surface H11697_1m
 Depth Threshold: 10 to 45 meters, resolution = 2m, Name in BASE Surface H11697_2m
 Depth Threshold: 40 to 60 meters, resolution = 4m, Name in BASE Surface H11697_4m
 Depth Threshold: 50 to 150 meters, resolution = 5m, Name in BASE Surface H11697_5m
 Depth Threshold: 130 to 500 meters, resolution = 10m, Name in BASE Surface H11697_10m
 Depth Threshold: 400 to Max depth, resolution = 15m, Name in BASE Surface
 H11697_15m⁴

The final S57 file for this project is called “H11697_S57_Features.000”. This file contains all shoreline and bottom sample feature data for this project in S57 format as required in the Specifications and Deliverables.

C – Horizontal & Vertical Control

Refer to the OPR-O322-KR-07 Horizontal and Vertical Control Report for a detailed description of the horizontal and vertical control used.⁵ No deviations from the report occurred. A summary of the project’s horizontal and vertical control follows.

Horizontal Control

The horizontal control datum for this survey was the North American Datum of 1983 (NAD83). All raw positions were originally collected in WGS84 and transformed to NAD83 during the post-processed kinematic GPS (PPK) routine.

It was necessary to acquire dual frequency GPS data at known locations on the ground so that a PPK solution could be used for final positioning. Sub-contractor John Oswald and Associates LLC (JOA) established two local control points: station “Angoon A” and station “Angoon B” in Angoon, AK. Refer to Appendix II in the “OPR-O322-KR-07 Horizontal & Vertical Control Report” for additional information.

Vessel position was determined in real time using a Trimble Zephyr L1/L2 GPS antenna, which was connected to a Trimble BD950 L1/L2 GPS card residing in the POS/MV. The POS/MV was set up via Com 2 to accept USCG differential corrections, which were output from a CSI MBX-3S Coast Guard beacon receiver. Note: since the pseudo range corrections received by the POS/MV are based on the NAD83 position of the reference station antenna, all DGPS-based final positions are NAD83. However, final positions were determined by a post-processed kinematic (PPK) solution using POSpac 4.3 processing software, which output a final solution in NAD83. (Refer to the “2007-NOAA Processing Procedures” document for PPK processing procedure).

Table 2 - DGPS Stations

Station	ID	Latitude	Longitude	Freq.	Tx. Rate
Biorka, AK USCG	890	56°51'18" N	135°32'05" W	305	100BPS
Level Island, AK USCG	891	56°28'03" N	133°04'32" W	295	100BPS



Vertical Control

All sounding data were initially reduced to mean lower low water (MLLW) using unverified tidal data from three tide stations located in Warm Spring Bay, False Bay, and Mitchell Bay, AK. Sub-contractor John Oswald & Associates LLC (JOA) operated the gauges and e-mailed the data to the R/V Davidson at the end of every Julian day.

Table 3 - Tide Gauges

Gauge	Model	Gauge Type	Location	Latitude	Longitude	Operational
9451625	H350XL/355	Digital Bubbler	Warm Spring Bay, AK	57°05'18"N	134°49'30" W	April-September
9452328	H350XL/355	Digital Bubbler	False Bay, AK	57°40'00"N	134°56'06" W	April-September
9451953	H350XL/355	Digital Bubbler	Mitchell Bay, AK	57°32'24"N	134°25'30" W	August-September

TIDES

All sounding data were reduced to MLLW initially using unverified tidal data from the three tide stations located in Warm Spring Bay, False Bay, and Mitchell Bay, AK. Tidal data for a twenty-four hour period UTC, (Alaska Daylight Time to UTC was +8 hours) was assembled by JOA and e-mailed to the R/V Davidson at the end of every Julian Day. A cumulative file for the gauges was updated each day by appending the new data. Refer to the OPR-O322-KR-07 Horizontal and Vertical Control Report for additional tidal information and station descriptions.

The tidal zoning was modified by JOA, providing a more elaborate zoning scheme from those zones issued in the Statement of Work. For additional information, refer to JOA's Final Technical Report.

November 5, 2007, JOA issued verified tidal data and final zoning for H11696, H11697, H11698, H11699, H11702, H11703, H11704, H11705, H11706, H11707, & H11708 of OPR-O322-KR-07. On January 2, 2008, JOA issued verified tidal data and final zoning for H11700 & H11701 of OPR-O322-KR-07. All sounding data were then re-merged using CARIS HIPS and SIPS tide routine. Verified tidal data were used for all final Navigation BASE surfaces and S57 Feature files.⁶



D – Results and Recommendations

Chart Comparison⁷

H11697 survey was compared with charts:

Chart No.	Scale	Edition	Edition Date
17320	217,828	17th	Nov. 2005
16016	969,756	20th	Nov. 2003

Note: Electronic chart (US3AK3BM) covers only a portion of the survey.

Comparison of Soundings

In general, the soundings from chart 17320 coincide with the soundings from H11697 to within 1 to 5 fathoms; areas that do vary to any degree are as follows:⁸

- Item # 1: Hydrographic survey H11697 revealed a depth of 306 fathoms in the vicinity of a 208 fathom sounding on chart 17320 located at 57°40'30" N, 134°52'13" W. This area was surveyed with 100% multibeam coverage.
 - Item # 2: Hydrographic survey H11697 revealed a depth of 11.3 fathoms in the vicinity of a 30 fathom sounding on chart 17320 located at 57°41'23" N, 134°43'15" W. This area was surveyed with 100% multibeam coverage. The shoaling is centered in the area depicted below.
-

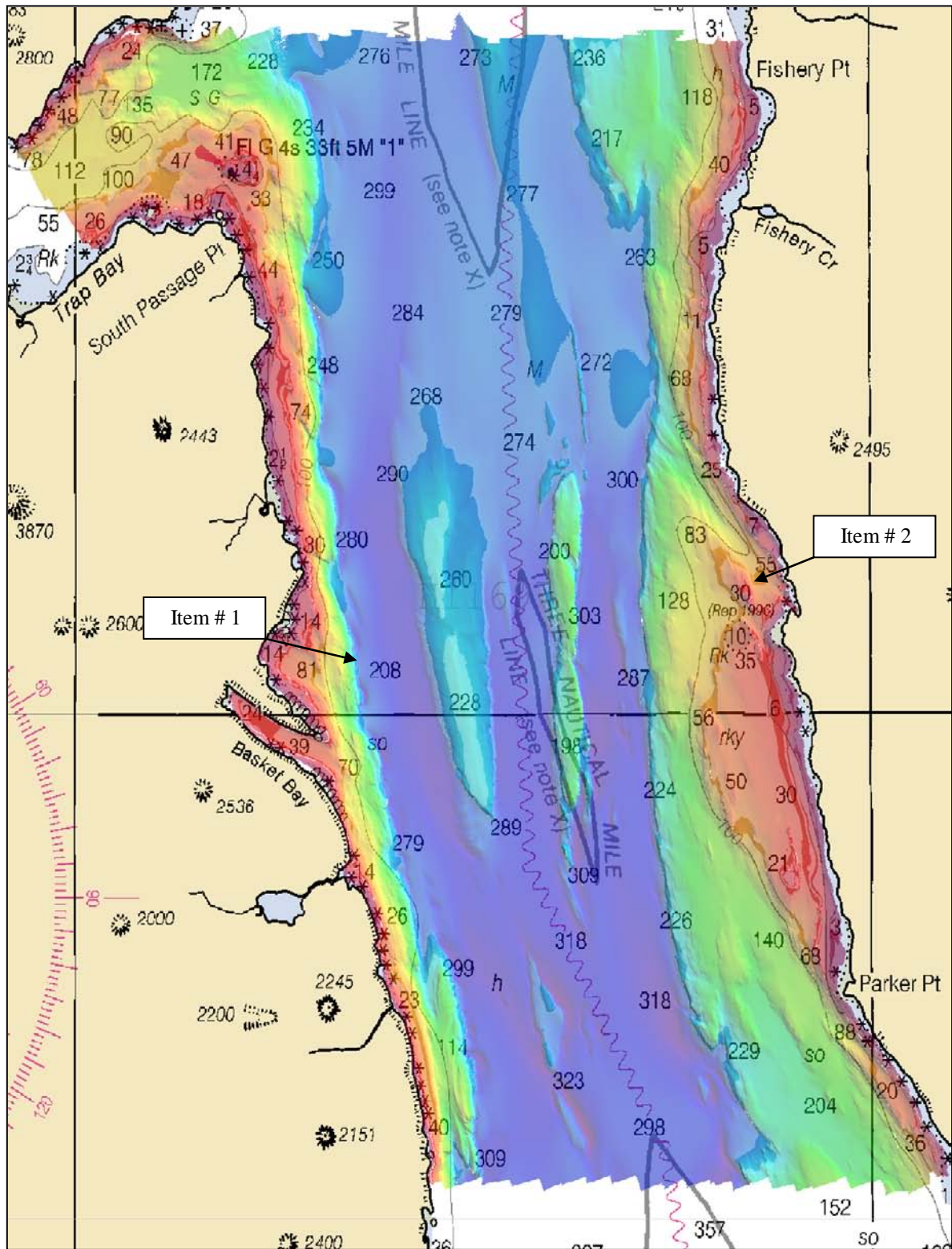


Figure 6 H11697 Chart Comparison (Chart 17320)



In general, the soundings from electronic chart US3AK3BM coincide with the soundings from H11697 to within 5 to 15 meters⁹; areas that do vary to any degree are as follows:

- Item # 1: Hydrographic survey H11697 revealed a depth of 555 meters in the vicinity of a 512 meter sounding on electronic chart US3AK3BM located at 57°42'03" N, 134°53'04" W. This area was surveyed with 100% multibeam coverage.¹⁰
 - Item # 2: Hydrographic survey H11697 revealed a depth of 106 meters in the vicinity of a 18.2 meter sounding on electronic chart US3AK3BM located at 57°40'55" N, 134°43'20" W. This area was surveyed with 100% multibeam coverage. It should be noted that located approximately 850 meters to the NE is a 20.7 meter sounding.¹¹
 - Item # 3: Hydrographic survey H11697 revealed a depth of 60 meters in the vicinity of a 10.9 meter sounding on electronic chart US3AK3BM located at 57°40'04" N, 134°42'24" W. This area was surveyed with 100% multibeam coverage. It should be noted that located approximately 400 meters to the E is a 11.7 meter sounding.¹²
 - Item # 4: Hydrographic survey H11697 revealed a depth of 565 meters in the vicinity of a 380.3 meter sounding on electronic chart US3AK3BM located at 57°40'31" N, 134°52'15" W. This area was surveyed with 100% multibeam coverage.¹³
 - Item # 5: Hydrographic survey H11697 revealed a depth of 340 meters in the vicinity of a 208.4 meter sounding on electronic chart US3AK3BM located at 57°36'07" N, 134°50'31" W. This area was surveyed with 100% multibeam coverage.¹⁴
-

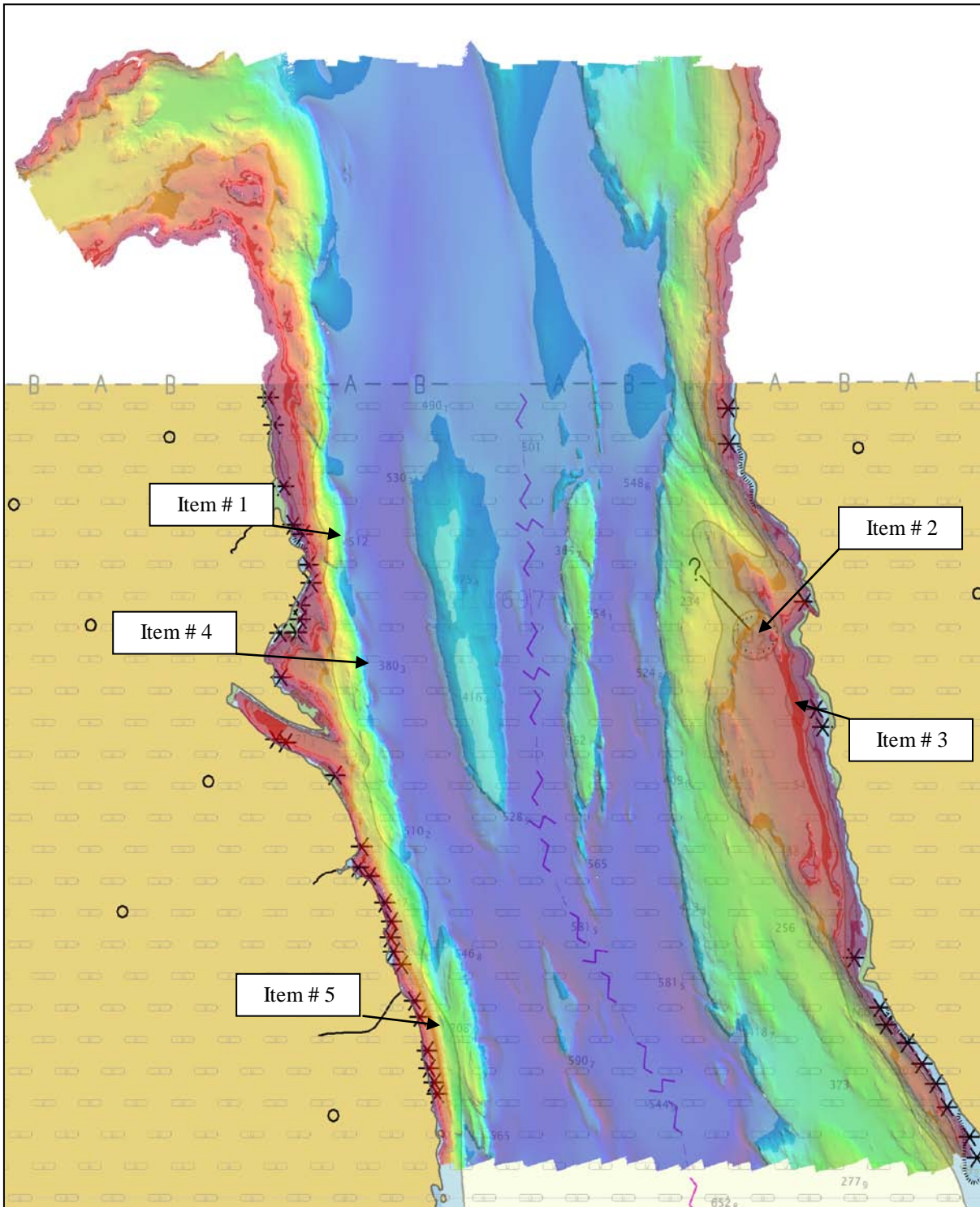


Figure 7 H11697 Electronic Chart Comparison (Chart US3AK3BM)



Automated Wreck and Observation Information System

There were no AWOIS items assigned to H11697.¹⁵

Charted Features

All charted features residing on charts incorporated within H11697 (see Listing of Charts above) were investigated¹⁶ and are as follows:

- (Rep 1996) 10 fathom shoal located at 57°40'51" N and 134°43'20" W; survey lines were conducted to provide 200% coverage over the area. The multibeam data was reviewed in CARIS HIPS and the shoal was not located. H11697 survey did reveal a shoal with a least depth of 20.7m (11.3 fathoms) located approximately 850 meters to the NE. It is noted as Item # 2 above in Figure 7 H11697 Electronic Chart Comparison (Chart US3AK3BM). It is recommended that the (Rep 1996) 10 fathom shoal be removed from the charts¹⁷ and the charts updated to reflect the submitted H11697 CARIS BASE Surface.¹⁸

Dangers to Navigation

No Dangers to Navigation were located during the survey of H11697.¹⁹

Bottom Samples

The R/Vs Davidson, R2, and D2 were fitted to obtain bottom samples as specified in the Statement of Work. The purpose of this was to characterize the bottom in charted anchorages and for general bottom classification.

Samples were taken with a Van Veen grab sampler and position was recorded with WinFrog (v3.7.0). Sediment retrieved from the sampler was analyzed and then encoded with the appropriate S57 attributes. Positions and descriptions of all samples are found in the H11697_S57_Features file.²⁰

Aids to Navigation

Throughout survey operations the position and description of all charted Aids to Navigation were recorded and logged as specified in the Statement of Work. Positions and descriptions were recorded and logged using WinFrog (v3.7.0). All Aids to Navigation surveyed in H11697 were compared to current charts²¹ and Light List VI to ensure they are correct and undamaged as per the April 2007 Specifications and Deliverables. No deviations to note.

Shoreline Verification Results

Remote Sensing Division (RSD) provided the shoreline detail (AK0401B) for this survey. Since the RSD shoreline was the official shoreline source provided by NOAA, primary focus was given to its verification during this survey. However, charted features were investigated if practical as were any significant new features observed during the course of shoreline verification. Significant features were deemed to be those potentially dangerous to navigation and / or seaward of the 4m contour.

Visual inspection during shoreline verification determined the RSD shoreline to be very accurate. RSD foul areas commonly needed some adjustment but the MHW line and point features provided by RSD were particularly good. Any discrepancies are detailed below.

The Hydrographer recommends that the RSD MHW from (AK0401B) supersede previously charted shoreline where any discrepancies occur unless noted below.

The following tables itemize any errors or discrepancies found in the RSD source and charted shoreline. Note that RSD and charted features that were found to be positioned accurately are not itemized here and are not included in the S57 feature file. New features (features not in the RSD source/chart but found during field investigation) do appear in the S57 feature file, but are generally not itemized here. ²²

RSD Source (AK0401B) Changes and Discrepancies				
RSD Feature	RSD Position	Remarks	Actions Taken in S57 Feature File / Recommendations	Applicable DP form(s)
Fouls (2)	Foul Areas Within Extents: 57 45 54.71 N 134 57 41.44W 57 45 41.74 N 134 564.20 W	Observed that two RSD Foul Areas need to be combined and extended.	Modified using MBES coverage and visual observation. Chart as depicted in the S-57 feature file.	JD242_012 JD242_020
Foul	Center at: 57 42 42.64 N 134 54 52.46 W	RSD foul area not as extensive as RSD depicts. RSD Foul needs refinement.	Modified using MBES coverage. Chart as depicted in the S-57 feature file.	N /A
Foul	Center at: 57 37 25.07 N 134 52 22.66 W	RSD foul area not as extensive as RSD depicts. RSD Foul needs refinement.	Modified using MBES coverage. Chart as depicted in the S-57 feature file.	N /A



RSD Source (AK0401B) Changes and Discrepancies				
RSD Feature	RSD Position	Remarks	Actions Taken in S57 Feature File / Recommendations	Applicable DP form(s)
Foul	Extents: 57 37 12.83 N 134 52 21.26 W 57 36 21.09 N 134 51 41.04 W	RSD foul area not as extensive as RSD depicts. RSD Foul needs refinement.	Modified using MBES coverage. Chart as depicted in S-57 feature file.	N /A
Rock	57 36 32.27 N 134 51 53.39 W	RSD Rock 45122 not found, full MBES coverage at position.	Do not chart.	JD242_157
Rock	57 35 00.31 N 134 51 07.00 W	RSD Rock 44710 not found, full MBES coverage at position.	Do not chart.	N/A
Rock	57 41 13.02 N 134 42 08.52 W	RSD Rock 44780 observed to be on top of new ledge, MB coverage at full MBES coverage at position.	Move to top of ledge.	N/A
Foul	Extents: 57 46 13.26 N 134 43 12.85 W 57 46 33.56 N 134 42 52.67 W	RSD foul area observed to be a ledge.	Remove RSD foul area and chart ledge as depicted in the S-57 feature file.	JD241_164 JD241_168

Charted Feature Changes and Discrepancies ²³				
Chart No. and Feature	Charted Position	Remarks	Recommendations	Applicable DP form(s)
17320 Rock	57 47 25.41 N 135 00 07.75 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17300 Rock	57 47 20.65 N 134 00 12.20 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 47 11.44 N 135 00 19.76 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A



17300 Rock	57 47 16.16 N 135 00 25.85 W	Observed that the rock is actually a ledge.	Remove rock. Chart ledge as depicted in the S-57 feature file.	JD227_073
17320 Rock	57 47 02.20 N 135 00 38.51 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 46 42.61 N 135 01 05.00 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17300 Rock	57 46 47.89 N 135 01 06.94 W	Observed that the rock is actually a ledge.	Remove rock. Chart ledge as depicted in the S-57 feature file.	JD227_067
17320 Rock	57 45 55.43 N 134 58 14.37 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 45 55.15 N 134 57 54.58 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17300 Rock	57 45 43.22 N 134 57 09.19 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 45 43.18 N 134 56 35.32 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_028
17300 Rock	57 45 47.79 N 134 56 30.16 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 45 46.34 N 134 56 05.45 W	Charted rock not found, full MBES coverage at position.	Remove. Possibly "new" rock located 66m to the North as depicted in the S-57 feature file.	N/A
17320 Rock	57 45 24.71 N 134 55 39.72 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17300 Rock	57 44 35.21 N 134 55 05.03 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A



17320 Rock	57 44 32.78 N 134 55 06.86 W	Observed that the rock is actually a ledge.	Remove rock. Chart ledge as depicted in the S-57 feature file.	JD242_054
17320 Rock	57 44 15.09 N 134 55 06.35 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 43 47.63 N 134 55 14.25 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 42 42.54 N 134 54 52.36 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 42 14.05 N 134 54 38.33 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 41 31.34 N 134 54 12.24 W	Charted rock not found, full MBES. Observed that the rock is actually a ledge.	Remove rock. Chart ledge as depicted in the S-57 feature file.	JD242_085
17320 Rock	57 40 55.46 N 134 54 32.42 W	Observed that the rock is actually a ledge.	Remove rock. Chart ledge as depicted in the S-57 feature file.	JD242_095
17320 Ledge	Extents: 57 41 15.91 N 134 54 33.11 W 57 41 00.36 N 134 54 50.72 W	Ledge exists but doesn't conform to MBES data and was observed to extend beyond the charted ledge extents.	Remove existing ledge and chart ledge as depicted in the S-57 feature file.	JD242_084 JD242_088 JD242_096
17320 Ledge	Extents: 57 40 12.20 N 134 54 44.42 W 57 39 42.10 N 134 53.57.14 W	Ledge exists but doesn't conform to MBES data and was observed to extend beyond the charted ledge extents.	Remove existing ledge and chart ledge as depicted in the S-57 feature file.	JD242_101 JD242_105 JD242_114
17320 MHW	Extents: 57 39 44.97 N 134 54 00.99 W 57 40 15.48 N 134 55 58.57 W	Charted MHW does not conform to MBES data. RSD MHW is a better indication of the true MHW line.	Revise Charted MHW to the RSD MHW.	N/A



17320 Rock	57 39 38.35 N 134 55 04.07 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_122
17320 Rock	57 39 35.40 N 134 54 48.83 W	Charted rock not found, full MBES. Observed that the rock is actually a ledge.	Remove rock. Chart ledge as depicted in the S-57 feature file.	JD242_123
17320 Ledge	Extents: 57 39 19.11 N 134 54 00.79 W 57 38 43.51 N 134 53 14.95 W	Ledge exists but doesn't conform to MBES data and was observed to extend beyond the charted ledge extents.	Remove existing ledge and chart ledge as depicted in the S-57 feature file.	JD242_123 JD242_124 JD242_125 JD242_128 JD242_130
17320 Rock	57 38 19.45 N 134 52 58.39 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_133
17320 Rock	57 37 57.70 N 134 52 46.27 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_139
17320 Rock	57 37 24.41 N 134 52 13.88 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 37 12.70 N 134 52 15.36 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_143
17320 Rock	57 36 26.26 N 134 51 39.65 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_158
17320 Rock	57 36 14.77 N 134 51 31.11 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_163
17320 Rock	57 35 50.57 N 134 51 21.83 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_165
17320 Rock	57 35 37.64 N 134 51 18.26 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A

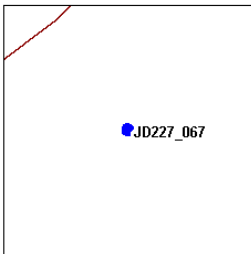
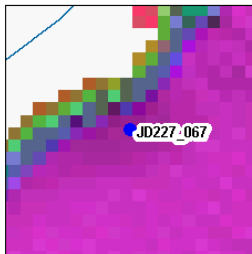
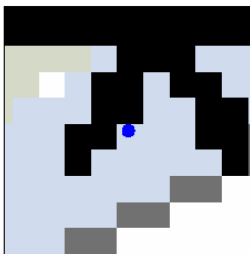
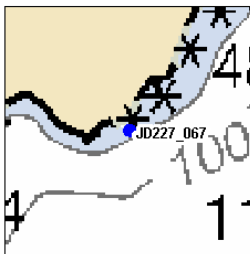


17320 Rock	57 35 27.84 N 134 51 12.24 W	Charted rock not found, full MBES coverage at position.	Remove.	JD242_169
17320 Rock	57 35 18.52 N 134 51 07.54 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 35 24.78 N 134 38 53.35 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 35 39.62 N 134 39 14.39 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 36 08.05 N 134 40 05.91 W	Charted rock not found, full MBES coverage at position.	Remove.	JD241_093
17320 Rock	57 36 56.66 N 134 40 52.92 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 41 16.85 N 134 42 05.70 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 MHW	Extents: 57 41 48.44 N 134 42 12.36 W 57 42 34.51 N 134 43 19.42 W	Charted MHW does not conform to MBES data. RSD MHW is a better indication of the true MHW line.	Revise Charted MHW to the RSD MHW.	N/A
17320 Rock	57 43 13.53 N 134 43 54.89 W	Charted rock not found, full MBES coverage at position.	Remove.	N/A
17320 Rock	57 43 38.93 N 134 43 55.45 W	Charted rock found to be 2 individual rocks.	Remove single rock symbol and replace with 2 rocks as depicted in the S-57 feature file.	N/A



Shoreline Correlator Sheet

ArcMap (v9.2) with the Shoreline Correlator add-on, written by the Fugro Pelagos Inc. GIS department, aided in the processing of the investigation results. The Correlator utilized the WinFrog log files to create an individual DP form for all acquired DPs. The Correlator was mapped to the log file, tide file, photos, NOAA Chart (largest scale available)²⁴, and CARIS BASE Surfaces²⁵ to calculate and display the desired information for each DP. The DP forms and raw field records can be found on the Project USB Drive under; OPR-O322-KR-07\H11697\Final_Deliverables\Reports\Descriptive Report\H11697 Shoreline.

DP ITEM NUMBER : JD227_067		DP Form																																															
<table border="1"> <tr><td>Date:</td><td>15 August, 2007</td></tr> <tr><td>Julian Day:</td><td>227</td></tr> <tr><td>UTC Time:</td><td>18:42:11</td></tr> <tr><td>Latitude:</td><td>57 46 45.22 N</td></tr> <tr><td>Longitude:</td><td>135 01 09.17 W</td></tr> <tr><td>Northing:</td><td>6404131.49</td></tr> <tr><td>Easting:</td><td>498857.30</td></tr> <tr><td>Raw (+Depth) or (-Height) (m):</td><td>N/A</td></tr> <tr><td>Draft Corrector (m):</td><td>N/A</td></tr> <tr><td>SV Corrector (m):</td><td>N/A</td></tr> <tr><td>Tide Corrector (m):</td><td>0.22</td></tr> <tr><td>Corrected to MLLW (m):</td><td>N/A</td></tr> <tr><td>Corrected to MLLW (fathoms):</td><td>N/A</td></tr> <tr><td>Corrected to MLLW (feet):</td><td>N/A</td></tr> <tr><td>DP Comment:</td><td>B charted rk is ledge</td></tr> </table>		Date:	15 August, 2007	Julian Day:	227	UTC Time:	18:42:11	Latitude:	57 46 45.22 N	Longitude:	135 01 09.17 W	Northing:	6404131.49	Easting:	498857.30	Raw (+Depth) or (-Height) (m):	N/A	Draft Corrector (m):	N/A	SV Corrector (m):	N/A	Tide Corrector (m):	0.22	Corrected to MLLW (m):	N/A	Corrected to MLLW (fathoms):	N/A	Corrected to MLLW (feet):	N/A	DP Comment:	B charted rk is ledge	<table border="1"> <tr><td>Correlating DP Item Numbers:</td><td>N/A</td><td>N/A</td></tr> <tr><td></td><td>N/A</td><td>N/A</td></tr> </table> <table border="1"> <tr><td>Correlating MB Least Depth:</td><td>None</td></tr> </table> <table border="1"> <tr><td>Remarks/Recommendations:</td><td>Observed that the rock is actually a ledge. Remove rock. Chart ledge as depicted in the S-57 feature file.</td></tr> <tr><td>Chart:</td><td>17300</td><td>Topo:</td><td></td><td>Carto Code:</td><td>None</td></tr> </table>		Correlating DP Item Numbers:	N/A	N/A		N/A	N/A	Correlating MB Least Depth:	None	Remarks/Recommendations:	Observed that the rock is actually a ledge. Remove rock. Chart ledge as depicted in the S-57 feature file.	Chart:	17300	Topo:		Carto Code:	None
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 <p>JD227_067</p>		 <p>JD227_067</p>																																															
<p>DPs and AK0401B RSD 200m x 200m</p>		<p>DPs, MBES Coverage, and AK0401B RSD 200m x 200m</p>																																															
 <p>JD227_067</p>		 <p>JD227_067</p>																																															
<p>DP and Chart 200m x 200m</p>		<p>DP and Chart 2000m x 2000m</p>																																															



E – Approval Sheet

Approval Sheet

For

H11697

Standard field surveying and processing procedures were followed in producing this survey in accordance with the following documents:

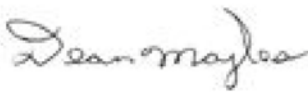
OPR-O322-KR-07 Statement of Work and 2007 Specifications & Deliverables;
Fugro Pelagos, Inc. Acquisition Procedures (2007- NOAAAcquisitionProcedures);
Fugro Pelagos, Inc. Processing Procedures (2007-NOAAProcessingProcedures);

The data were reviewed daily during acquisition and processing.

This report has been reviewed and approved. All records are forwarded for final review and processing to the Chief, Pacific Hydrographic Branch.

Approved and forwarded,

Dean Moyles,
Lead Hydrographer
Fugro Pelagos, Inc. Survey Party

X 

Dean Moyles
ACSM Certified



Revisions Compiled During Office Processing and Certification

¹ Filed with Project Records.

² Concur.

³ Concur

⁴ SAR Note 2 states, “Surfaces were finalized by the reviewer at higher resolutions and differing depth ranges. A maximum resolution of 10 m was used instead of the 15m submitted and the 1m and 4m surfaces was extended to include the depths previously covered by the submitted 2m and 5m surfaces.”

⁵ Filed with Project Records.

⁶ Concur. Office Final BASE surfaces applied verified tide zone file, ‘OPR-O322-KR-07’.

⁷ Hydrographer failed to use two of the three largest scale charts covering the survey area during survey data acquisition and for DR chart comparison,

- NW corner of survey area: chart 17300, Stephens Passage to Cross Sound, including Lynn Canal, Ed. 31, Sep/05, Tenakee Inlet inset, scale 1:100,000)
- SW corner of survey area: chart 17338, Peril Str.-Hoonah Snd. to Chatham Str., Ed. 14, Jun/05, scale 1:40,000

and SAR failed to catch and correct this error. SAR Note 7 refers to Chart 17320 and is both incorrect (the date of the new edition is Mar/08) and irrelevant since the hydrographer was using the latest edition of 17320 available at the time of the survey in 2007. Therefore only chart 17320 (1:217, 828 scale) was used for chart comparison and SAR rendering submitted DR Section D – Results and Recommendations for Tenakee Inlet and the west side of Chatham Strait incorrect. Complete chart comparison was performed during compilation in areas where the large scale charts were available as well as standard review of all other submitted results and recommendations. Also, per H11697 SAR Note 5, all 53 submitted designated soundings were individually reviewed during compilation and several were used for Hcell sounding selection.

⁸ Concur with clarification, several other areas showed differences greater than 5 fms, chart as shown in the HCell.

⁹ Do not concur, 36 of the 57 charted soundings on ENC ‘US3AK3BM’ within the survey area are *not* within 5-15m of survey soundings as stated in the DR (including the 5 items in Figure 7, Endnotes 10-14 below), and 18 of these are greater than 33m different meeting the hydrographer’s criteria for itemization in Figure 7 of the DR. However all but two survey soundings are deeper than the charted sounding and the two significantly shoaler soundings are still deep enough to not be a hazard to navigation, 99m (57-43-33.85N 134-54-18.89W) and 108m (57-40-31.81N 134-54-09.66W).

¹⁰ Concur.

¹¹ Concur.

¹² Concur.

¹³ Concur.

¹⁴ Concur.

¹⁵ Concur.

¹⁶ Do not concur. All charted features in survey area were not investigated because all charts of survey area were not used for chart comparison.

¹⁷ Concur.

¹⁸ Concur with clarification. New BASE surfaces were created during SAR and charts should be updated with office generated BASE surface, ‘H11697_Combined_10m’.

¹⁹ During compilation a 2.1m sounding was found 100m offshore on the south approach to Little Basket Bay (57-37-49.3N 134-52-34.3W) between charted 17 and 33 fathom soundings (Chart 17338) and an Office DTON report was submitted 30 Sept 2009.

²⁰ Concur with clarification. Bottom samples that contradicted office-generated Rocky Seabed Areas were deleted from the Hcell. No bottom samples were transferred from the charts that are common to this survey.



²¹ Use latest ATONIS information.

²² Concur with clarification, all items addressed in the tables have been reviewed during compilation and are either included in the HCell or have been blue noted to be removed or modified as appropriate.

²³ The modifications and /or revisions take into account the hydrographer did not address the largest scale chart in all cases. Chart as shown on the HCell. All items addressed in the tables have been reviewed during compilation and are either included in the HCell or have been blue noted to be removed or modified as appropriate.

²⁴ Largest scale charts were not used in area of Charts 17338 and 17320, West Side of Chatham Strait.

²⁵ Per SAR Notes 1 and 2, new BASE surfaces were generated at PHB.

H11697 Danger to Navigation Report

Registry Number: H11697
State: Alaska
Locality: Chatham Strait
Sub-locality: SE of Tenakee Inlet
Project Number: OPR-O322-KR-07
Survey Dates: 08/08/07 - 09/04/07

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
17338	14th	06/01/2005	1:40,000 (17338_1)	[L]NTM: ?
17320	18th	03/01/2008	1:217,828 (17320_1)	[L]NTM: ?
16016	21st	10/01/2007	1:969,756 (16016_1)	[L]NTM: ?
531	24th	07/01/2007	1:2,100,000 (531_1)	[L]NTM: ?
500	8th	06/01/2003	1:3,500,000 (500_1)	[L]NTM: ?
530	32nd	06/01/2007	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	Rock	2.09 m	57° 37' 49.3" N	134° 52' 34.3" W	---

1 - Danger To Navigation

1.1) 13543/23**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 57° 37' 49.3" N, 134° 52' 34.3" W
Least Depth: 2.09 m (= 6.84 ft = 1.140 fm = 1 fm 0.84 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.223 m ; **TVU (TPEv)** ± 0.205 m
Timestamp: 2007-229.23:28:21.484 (08/17/2007)
Survey Line: h11697 / r2 / 2007-229 / 1b05-sh006
Profile/Beam: 13543/23
Charts Affected: 17338_1, 17320_1, 16016_1, 531_1, 500_1, 530_1, 50_1

Remarks:

[None]

Feature Correlation

Address	Feature	Range	Azimuth	Status
h11697/r2/2007-229/1b05-sh006	13543/23	0.00	000.0	Primary

Hydrographer Recommendations

Chart as surveyed.

Cartographically-Rounded Depth (Affected Charts):

1fm (17338_1, 17320_1, 16016_1, 530_1)

1fm 1ft (531_1)

2.1m (500_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 SORDAT - 20070904
 SORIND - US,US,nsurf,H11697
 TECSOU - 3:found by multi-beam

VALSOU - 2.085 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Feature Images

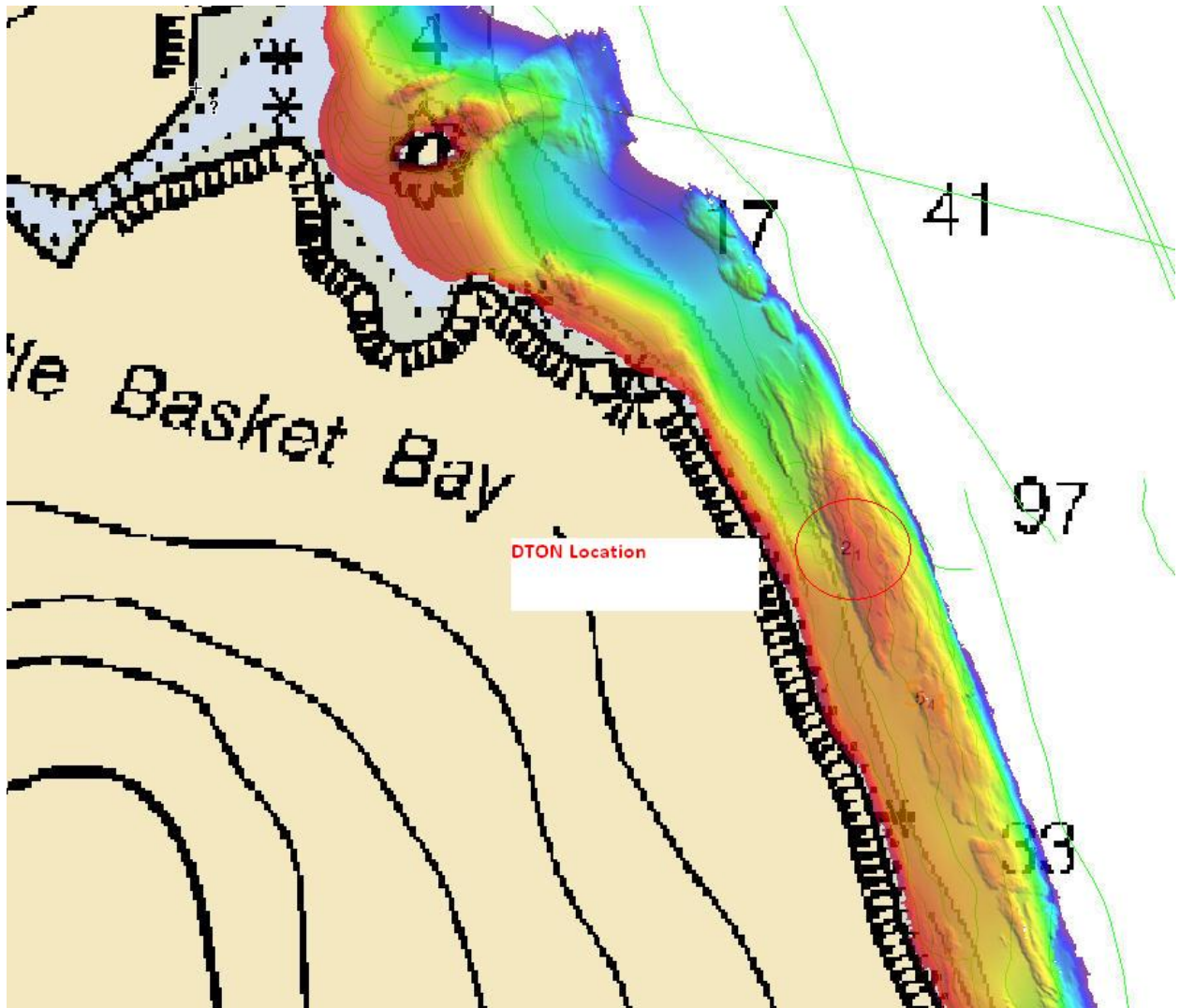


Figure 1.1.1

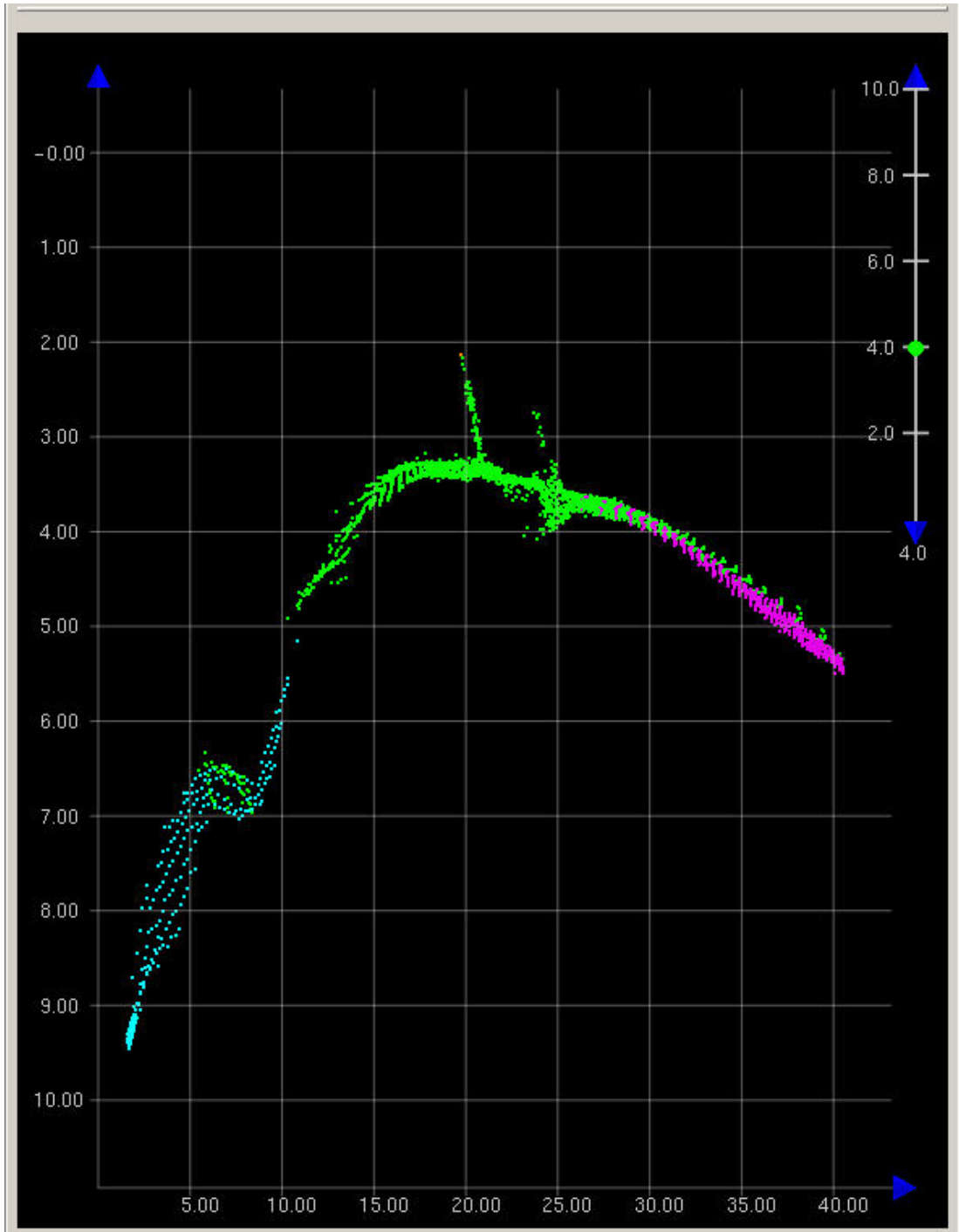


Figure 1.1.2

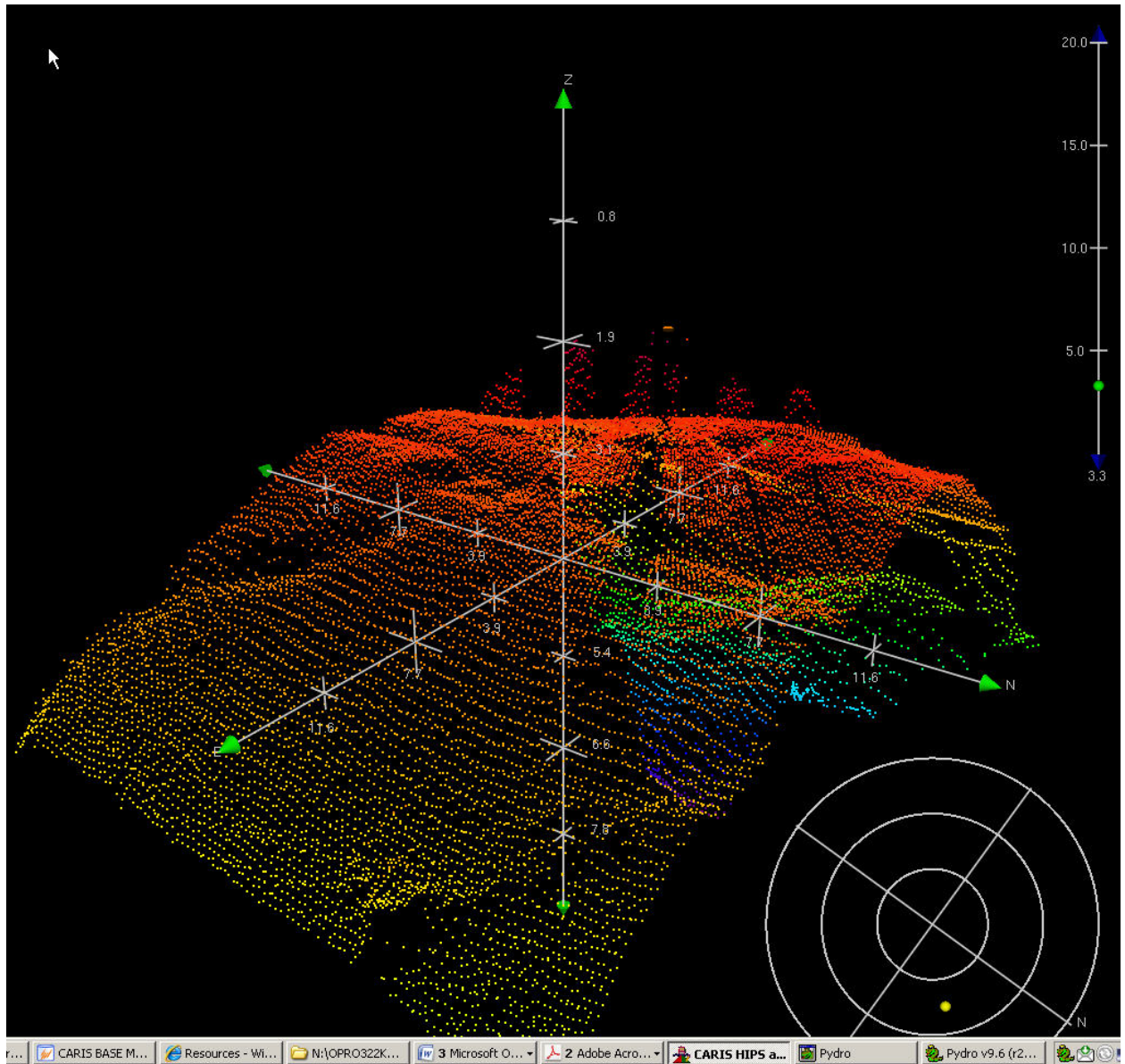


Figure 1.1.3

H11697 HCell Report
Albert Foster, ERT Hydrographic 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, US3AK3BM, and NOAA RNC, 17300, 17320 and 17338.

HCell compilation of survey H1 1697 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

Depths for HCell H1 1697 were compiled to the largest scale charts in the region, 17338 (1:40,000), 17300 (1:100,000 Tenakee Inlet Inset) and 17320 (1:217,828). Non-bathymetric features have not been generalized to chart scale; their position, characterization and density are as delivered from the field.

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 (17338), 1:40,000 (17300) and 1:42,000 (1732) survey scale using a Radius Table file with values shown in the table, below. The resultant sounding layer contains 28,563 depths ranging from 0 to 636.4 meters.

Upper limit (m)	Lower limit (m)	Radius (mm)
0	10	3
10	20	4
20	50	4.5
50	500	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 10m 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 *_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
0	0	0.2286	0
3	5.4864	5.715	3.125
10	18.288	18.5166	10.125
100	182.88	184.2516	101.25

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

Some modifications made to GC shoreline MLLW contours, to bring the GC shoreline into agreement with H11697 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 H11697:

M_QUAL
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. In addition, the product of the survey scale features file, HXXXXX_Features.000, is archived at PHB.

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 H11697 were delivered from the field in nine 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, several submerged rocks, seventeen ledges, six obstruction areas and numerous rocky seabeds were digitized directly from the high resolution BASE Surfaces or used the BASE surfaces to edit field-submitted S57 features.

The source of all features included in the H11697 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 (-h) 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 (-2.3 m) from US3AK3BM was used for H11697.

6. S-57 Objects and Attributes

The *_CS HCell contains the following Objects:

\$CSYMB	Blue Notes
COALNE	Modified GC coastline
DEPARE	The all-encompassing depth area
DEPCNT	Modified GC MLLW
LNDARE	Islet area features
M_QUAL	Data quality Meta object
M_CSCL	Areas of multiple scale charts
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
WEDKLP	Kelp point features

The *_SS HCell contains the following Objects:

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

All S-57 Feature Objects in the *_CS HCell have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with current guidance and the OCS HCell Specifications.

7. Blue Notes

Notes to the RNC and ENC chart compilers are included in the HCell as \$CSYMB 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 in the same step, 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 above 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 above 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 H11508

H11697 junctions with H11698, submitted in November 2009, and H11696, submitted in January 2010. A common junction was not made between H11697 and H11698 during the earlier compilation, so the northern extent of H11698 should supersede H11697 in the common area.

9.2 Conflicts between Shoreline and Hydrography

There are numerous instances of GC shoreline in conflict with hydrography. These were examined using the highest resolution Surfaces. CARIS HIPS was also used to resolve ambiguities in some cases. Conflicts were resolved by making modifications to the GC shoreline.

10. QA/QC and ENC Validation Checks

H11697 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 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

- H11697 Base Cell File, Chart Units, Soundings and features compiled to multiple scales, 1:40,000 in the area of chart 17338, 1:100,000 in the area of chart 17300 and 1:217,828 in the area of chart 17320.
- H11697 Base Cell File, Chart Units, Soundings compiled to 1:10,000.
- H11697 Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items.
- H11697 Survey outline to populate the SURDEX.

11.2 File Naming Conventions

- | | |
|---|----------------------------|
| • Chart units base cell file, chart scale soundings | H11697_CS.000 |
| • Chart units base cell file, survey scale sounding set | H11697_SS.000 |
| • Descriptive Report package | H11697_DR.pdf |
| • Survey outline | H11697_Outline.gml & *.xsd |

11.3 Software

CARIS HIPS Ver. 6.1	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 2.2	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.
Caris Easy View 1.0	Independent inspection of final HCells.

12. Contacts

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

Albert Foster, ERT, PHB, Seattle, WA; 206-526-6841; Albert.Foster@noaa.gov.

**APPROVAL SHEET
H11697**

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 disproval of charted data within the survey limits. The survey records and digital data comply with OCS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

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.