H11716

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Survey

Field No. N/A

Registry No. H11716

LOCALITY

State Alaska

General Locality Akutan Pass

Sublocality Unalga Island to Egg Island

2007

CHIEF OF PARTY

Dean Moyles

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

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

REGISTRY No

HYDROGRAPHIC TITLE SHEET

H11716

INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

FIELD No

State **Alaska**

General Locality **Akutan Pass**

Sub-Locality **Unalga Island to Egg Island**

Scale **1:10,000** Date of Survey **June 18, 2007 - July 22, 2007**

Instructions dated **6/15/2006** Project No. **OPR-Q191-KR-07**

Vessel **R/V Davidson, R/V R2 and R/V D2**

Chief of party **Dean Moyles**

Surveyed by **Orthmann, Reynolds, Gill, Mount, Stock, Farley, Briggs, and Poeckert**

Soundings by echo sounder, hand lead, pole **Reson SEABAT 8101 and 8111**

Graphic record scaled by **Fugro Pelagos, Inc. Personnel**

Graphic record checked by **Fugro Pelagos, Inc. Personnel** Automated Plot **N/A**

Verification by **Fernando Ortiz** Evaluation By **Toshi Wozumi**

Soundings in **Fathoms and tenths** at **MLLW**

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.

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537

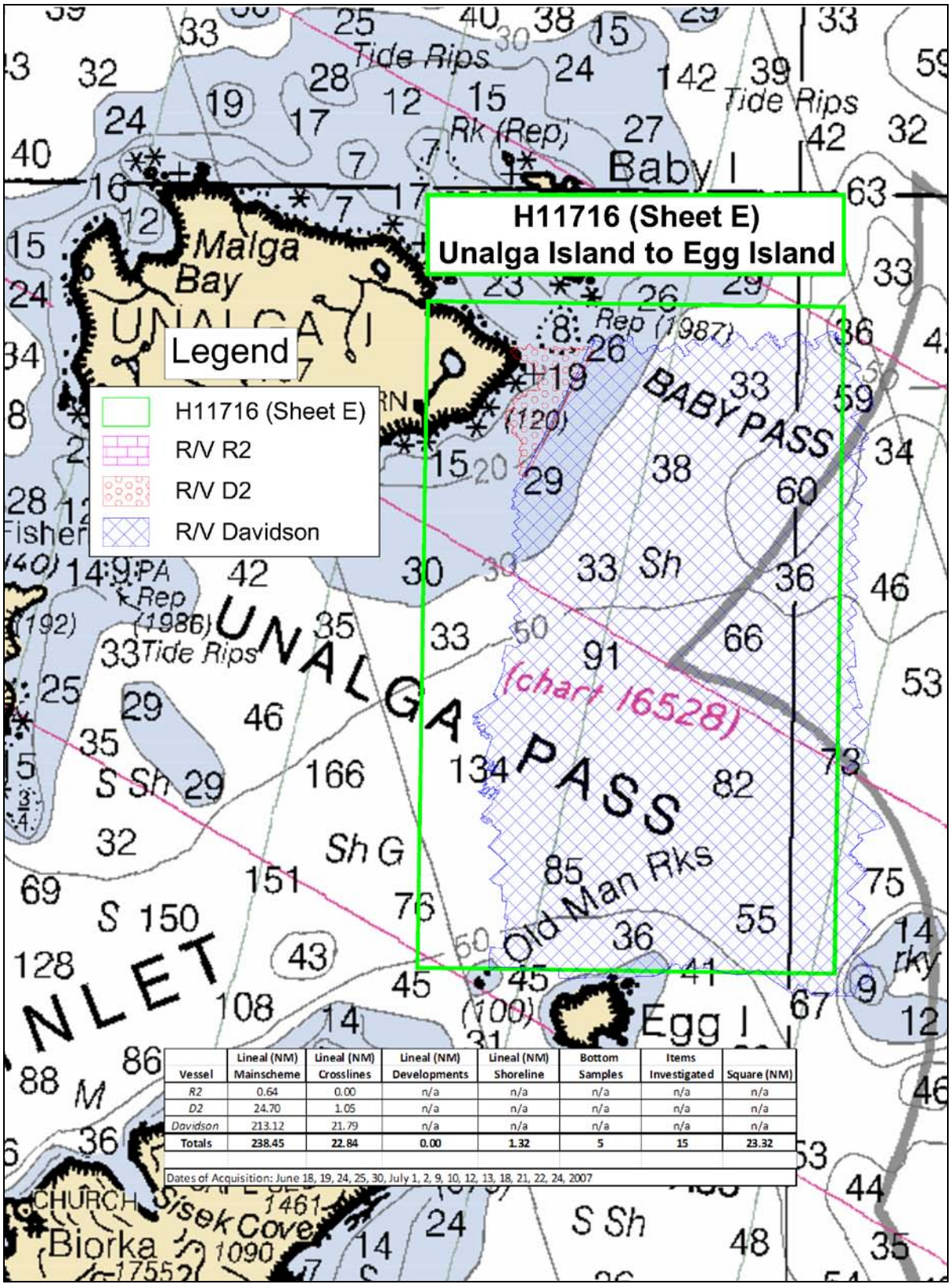
A - Area Surveyed

H11716 (Sheet E) is bound by the coordinates listed below, which encompass the area from Unalga Island to Egg Island.

Hydrographic data collection began on June 18, 2007 and ended on July 22, 2007.

Table 1 – H11716 Sheet Limits

Sheet Limits H11716 Sheet E Scale 1:10,000		
Point #	Positions on NAD83	
	Degrees Latitude (N)	Degrees Longitude (W)
1	53-52-20.64N	165-59-14.64 W
2	53-52-20.64N	166-04-33.24 W
3	53-57-40.68 N	166-04-33.24 W
4	53-57-40.68 N	166-06-12.24 W
5	53-58-26.40 N	166-06-12.24 W
6	53-58-26.40 N	165-59-14.64 W



Vessel	Lineal (NM) Mainscheme	Lineal (NM) Crosslines	Lineal (NM) Developments	Lineal (NM) Shoreline	Bottom Samples	Items Investigated	Square (NM)
R2	0.64	0.00	n/a	n/a	n/a	n/a	n/a
D2	24.70	1.05	n/a	n/a	n/a	n/a	n/a
Davidson	213.12	21.79	n/a	n/a	n/a	n/a	n/a
Totals	**238.45**	**22.84**	**0.00**	**1.32**	**5**	**15**	**23.32**

Dates of Acquisition: June 18, 19, 24, 25, 30, July 1, 2, 9, 10, 12, 13, 18, 21, 22, 24, 2007

Figure 1 H11716 Area Surveyed

B – Data Acquisition & Processing

Refer to the OPR-Q191-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, and R/V D2 acquired all soundings for H11716. 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. 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-Q191-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 22.84 nautical miles or 9.58 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.

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.

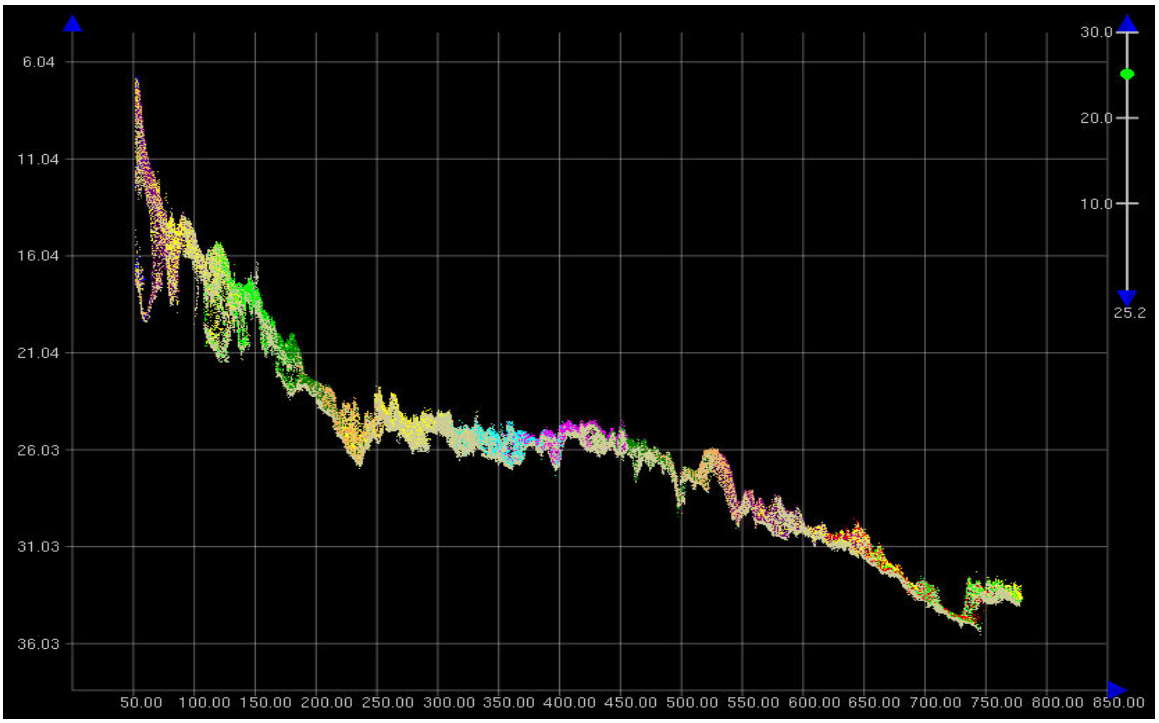


Figure 2 Profile of 2E01-TIE01

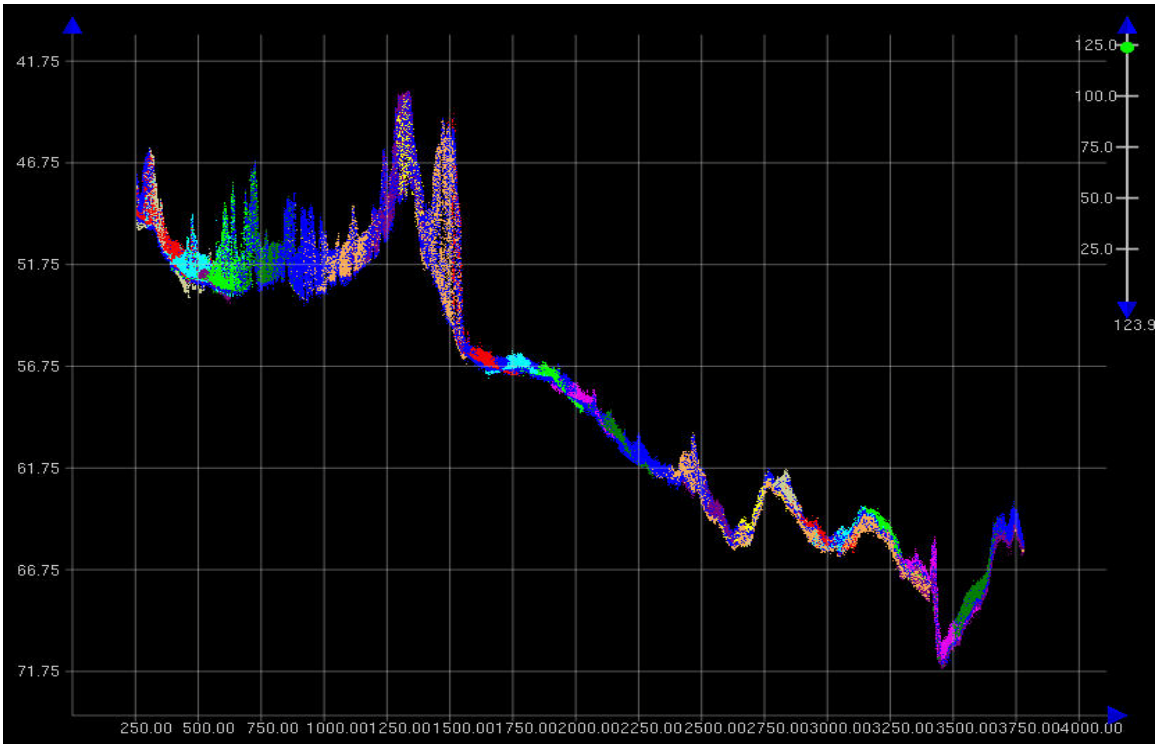


Figure 3 Profile of 3E02-TIE01B

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 = 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 H11716 had an uncertainty of about 0.20 to 0.60 meters, except for the deep water areas having extremely steep slopes or deemed to be rocky, where values ranged from 0.70 to 1.5 meters. No uncertainty values were greater than the IHO level Order 1.[2]

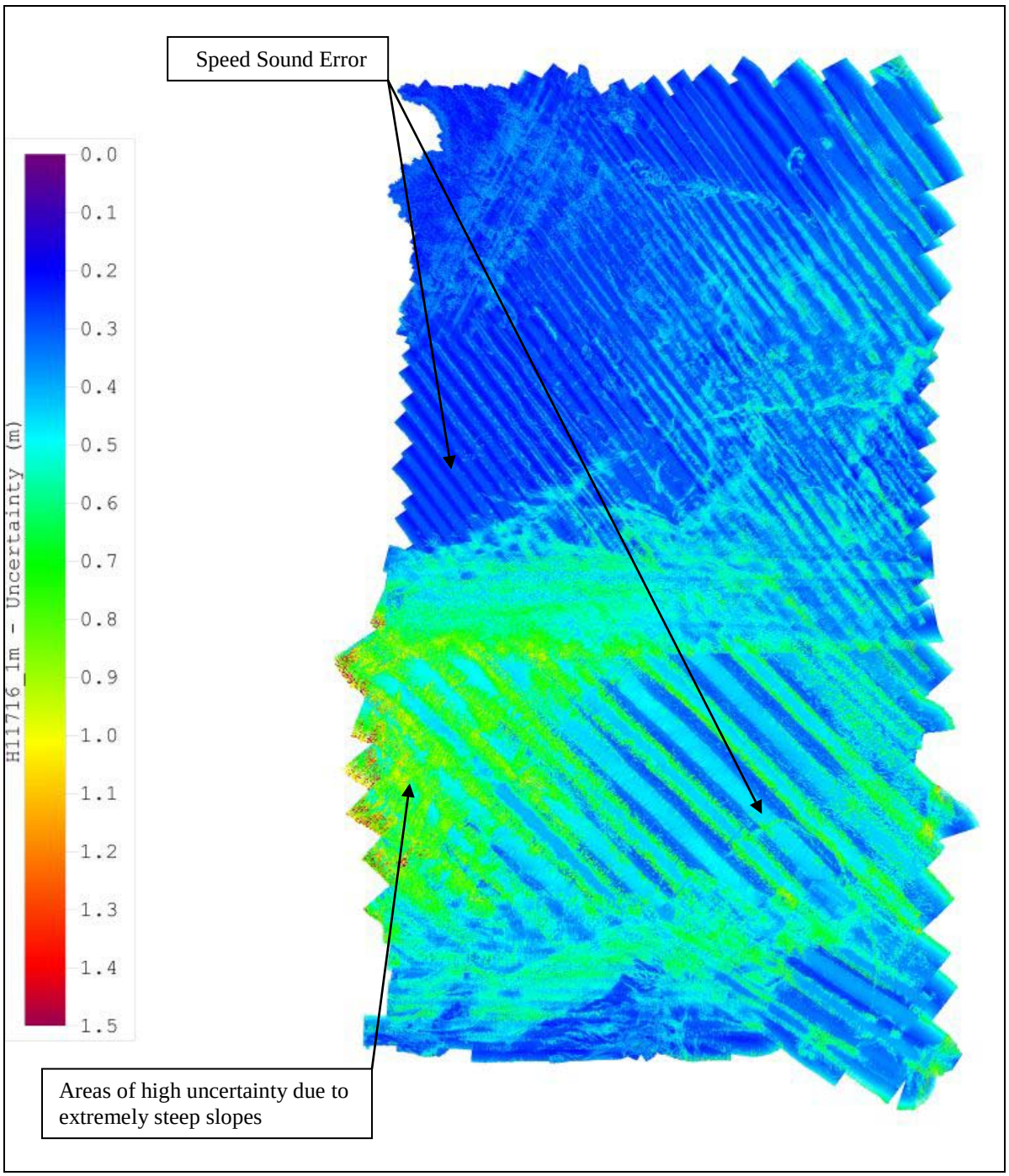


Figure 4 H11716 Uncertainty DTM

Survey Junctions

H11716 (Sheet E) junctions with:

Registry #	Scale	Date	Junction Side
H11712	1:10,000	2007	North[3]
H11717	1:10,000	2007	West[4]
H11719	1:10,000	2007	Southwest[5]
H11720	1:10,000	2007	South[6]

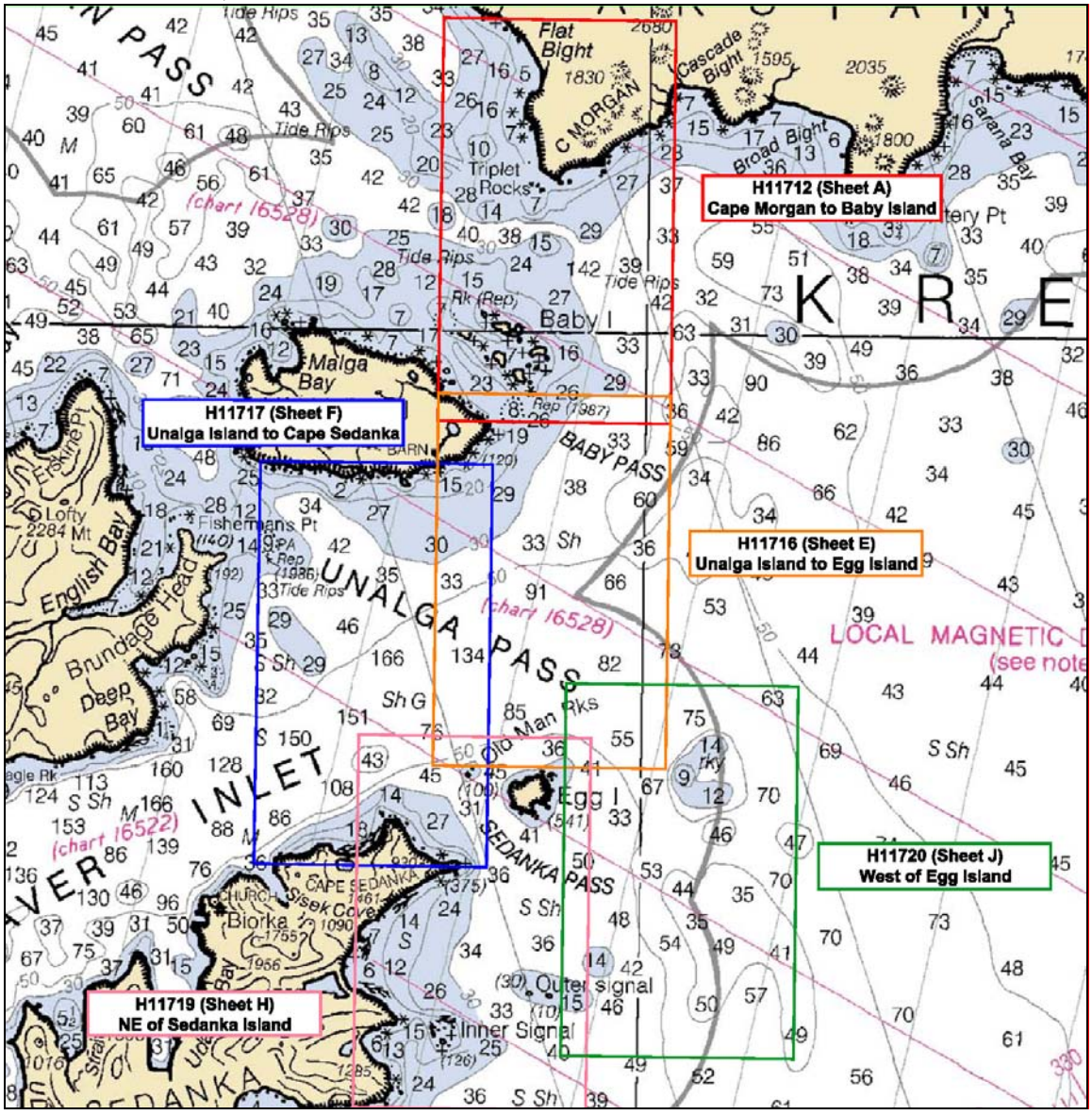


Figure 5 H11716 Survey Junctions

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.[7]

Quality Control Checks

During the hydrographic survey OPR-Q191-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 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 H11716 was excellent. Two notable problems follow:

- 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.
- During routine processing, tidal offsets were noticed in the survey area. In addition to tide gauge information, GPS heights from the survey vessels were examined and used to derive final tide zoning and to provide a better understanding of the tides within this area. No uncertainty values were greater than the IHO level Order 1.

Corrections to Echo Soundings

Refer to the OPR-Q191-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-Q191-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 H11716 is called H11716, and it contains five different BASE surfaces of different resolutions. To ensure sufficient overlap between these surfaces the follow parameters were used:

Depth Threshold: 0 to 35 meters, resolution = 1m, Name in BASE Surface H11716_1m
Depth Threshold: 30 to 50 meters, resolution = 2m, Name in BASE Surface H11716_2m
Depth Threshold: 45 to 60 meters, resolution = 4m, Name in BASE Surface H11716_4m
Depth Threshold: 50 to 150 meters, resolution = 5m, Name in BASE Surface H11716_5m
Depth Threshold: 130 to Max depth, resolution = 10m, Name in BASE Surface H11716_10m[8]

The final S57 file for this project is called "H11716_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-Q191-KR-07 Horizontal and Vertical Control Report for a detailed description of the horizontal and vertical control used. 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. John Oswald and Associates LLC (JOA) established two local control points: station "Malga A" and station "Malga B" in Malga Bay on Unalga Island, AK. Refer to Appendix II in the "OPR-Q191-KR-07 Horizontal & Vertical Control Report"[9] 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-NOAAProcessingProcedures" document for PPK processing procedure).

Table 2 - DGPS Station

Station	ID	Latitude	Longitude	Freq.	Tx. Rate

Cold Bay, AK USCG	898	55°11'25" N	162°42'24"W	289	100BPS

Vertical Control

All sounding data were initially reduced to mean lower low water (MLLW) using unverified tidal data from two tide stations located in Reef Bight and Biorka Village, 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	Gauge Type	Location	Latitude	Longitude	Operational
9462645	Sutron Xpert/Paroscientific Digiquartz (DAA H355 digital bubbler gauge)	Biorka Village, AK	53º49'44"N	166º12'59" W	June-August
9462662	Seabird SBE26 (w/submersible pressure gauge)	Reef Bight, AK	54º09'25"N	166º04'24" W	June-August

TIDES

All sounding data were reduced to MLLW initially using unverified tidal data from the two tide stations located in Reef Bight and Biorka Village, 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.

January 10, 2008, JOA issued verified tidal data and final zoning for OPR-Q191-KR-07. 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 Report in Appendix I, in the "OPR-Q191-KR-07 Horizontal & Vertical Control Report". 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.

During the OPR-Q191-KR-07 survey there were some unusual conditions regarding tidal information to note. Refer to the "OPR-Q191-KR-07 Horizontal & Vertical Control Report", Appendix I, for a more detailed description (Tidal Zoning for Krenitzens.doc) and tidal data.

D – Results and Recommendations

Chart Comparison

H11716 survey was compared with charts:

Chart No.	Scale	Edition	Edition Date
16522	40,000	6th	Feb. 2004
16528	40,000	16th	Jun. 1998
16531	80,000	7th	Feb. 2002
16520	300,000	22nd	Mar. 2004

Note: Electronic Charts US3AK61M, US4AK6FM (US5AK6BM and US5AK6CM) partially cover survey area

Comparison of Soundings

In general, the soundings from chart 16531 coincide with the soundings from H11716 to within 1 to 5 fathoms[10]; areas that do vary to any degree are as follows:

- Item # 1: Hydrographic survey H11716 revealed a depth of 55 fathoms in the vicinity of a 64 fathom sounding on chart 16531 located at 53º56’31” N, 166º00’43” W. This area was surveyed with 100% multibeam coverage. The shoaling is centered in the area depicted below. [11]
- Item # 2: Hydrographic survey H11716 revealed a depth of 50 fathoms in the vicinity of a 43 fathom sounding on chart 16531 located at 53º55’44” N, 165º59’45” W. This area was surveyed with 100% multibeam coverage.[12]

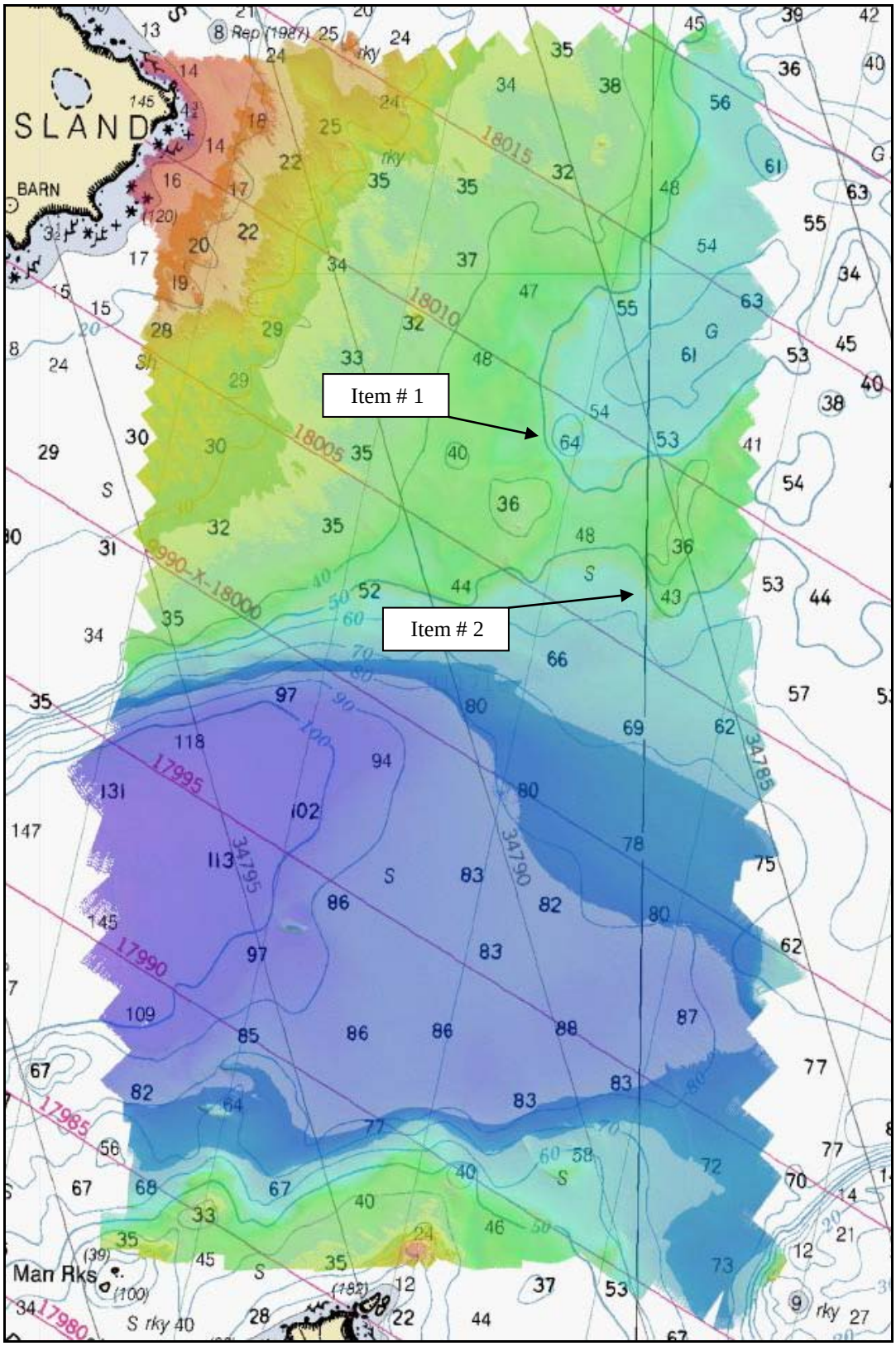


Figure 6 H11716 Chart Comparison (Chart 16531)

It should also be noted that the soundings from H11716 coincide with the soundings from charts 16522, 16528, and 16520 to within 1 to 5 fathoms.

In general, the soundings from chart US3AK61M coincide with the soundings from H11716 to within 1 to 5 fathoms; areas that do vary to any degree are as follows:

- Item # 1: Hydrographic survey H11716 revealed a depth of 120 fathoms in the vicinity of a 166.4 fathom sounding on chart US3AK61M located at 53º55'25" N, 166º03'10" W. This area was surveyed with 100% multibeam coverage. The shoaling is centered in the area depicted below.[13]
- Item # 2: Hydrographic survey H11716 revealed a depth of 89.5 fathoms in the vicinity of a 65.8 fathom sounding on chart US3AK61M located at 53º56'13" N, 166º00'03" W. This area was surveyed with 100% multibeam coverage.[14]

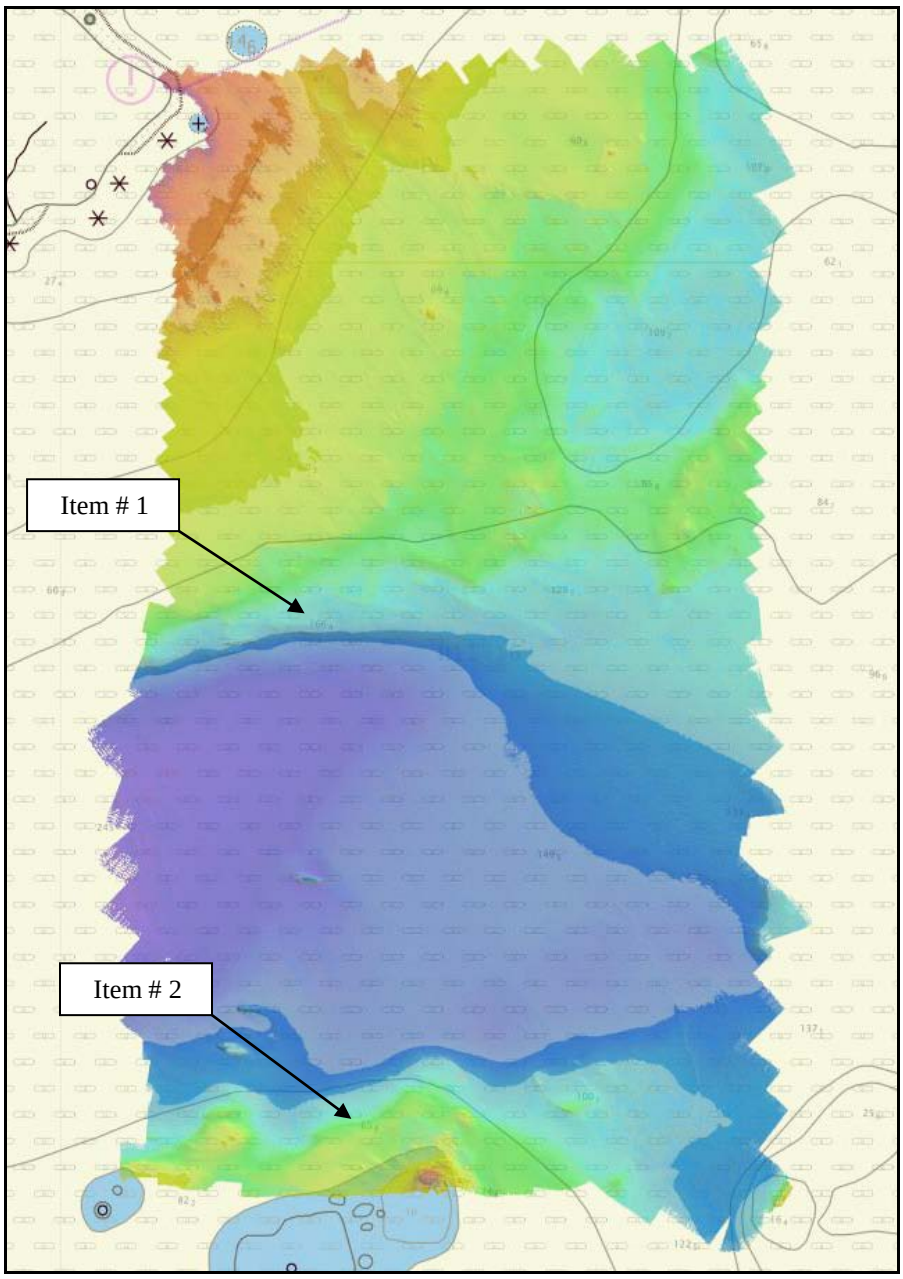


Figure 7 H11716 Electronic Chart Comparison (US3AK61M)[15]

In general, the soundings from electronic chart US4AK6FM coincide with the soundings from H11716 to within 5 to 15 meters;[16] areas that do vary to any degree are as follows:

- Item # 1: Hydrographic survey H11716 revealed a depth of 67.2 meters in the vicinity of a 40.2 meter sounding on electronic chart US4AK61M located at 53º59'17" N, 166º17'45" W. This area was surveyed with 100% multibeam coverage.[17]

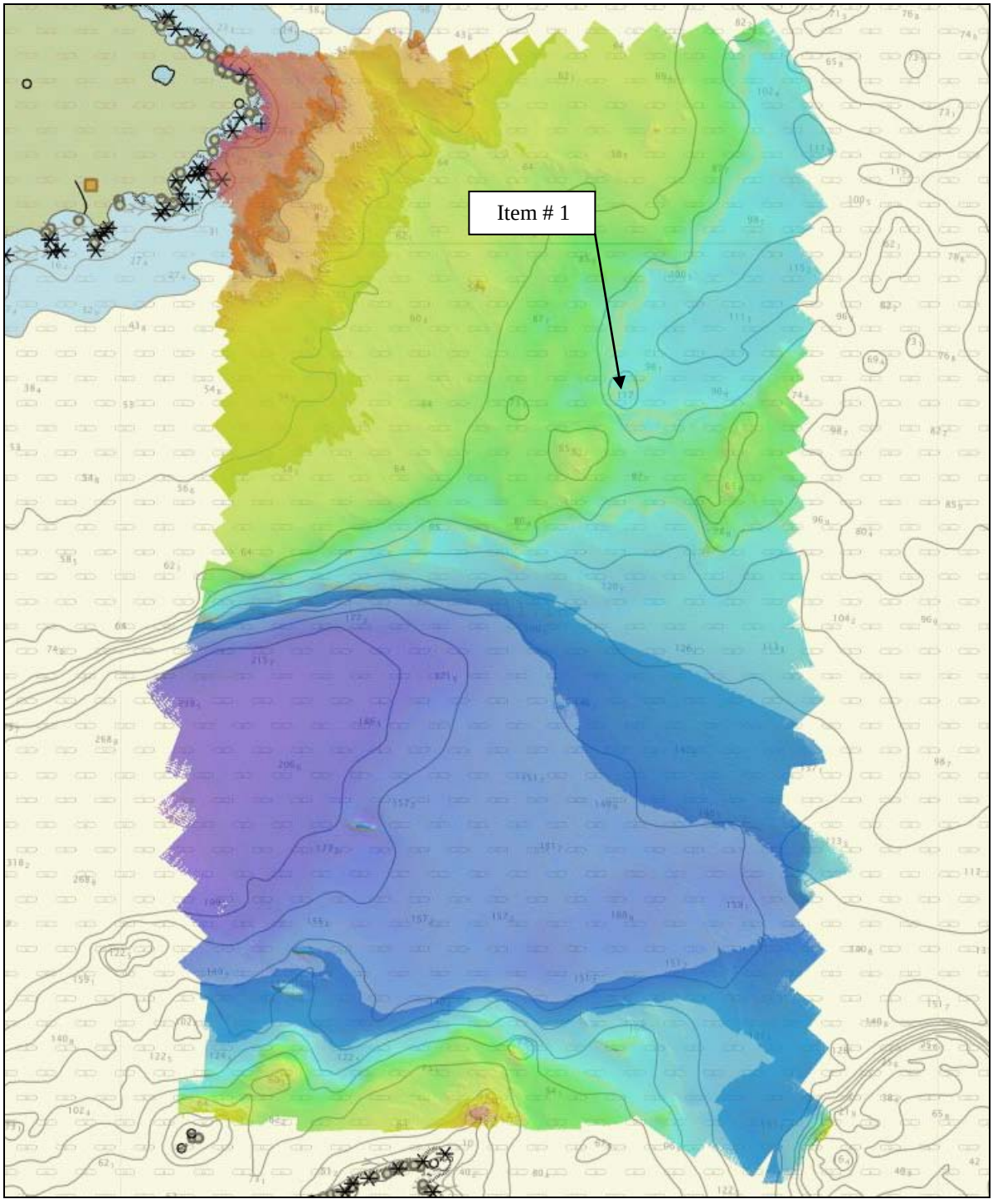


Figure 8 H11716 Electronic Chart Comparison (US4AK6FM)[18]

It should also be noted that the soundings from H11716 coincide with the soundings from electronic charts US5AK6BM and US5AK6CM to within 5 to 15 meters.[19]

Automated Wreck and Observation Information System

There were no AWOIS items assigned to H11716.[20]

Charted Features

There were no charted features labeled PA, ED, PD, or Rep within the limits of H 11716.[21]

Dangers to Navigation

No Dangers to Navigation were located during the survey of H11716.[22]

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 H11716_S57_Features file.[23]

Aids to Navigation

There were no charted aids to navigation in the survey area. No uncharted aids to navigation were found in the survey area.[24]

Shoreline Verification Results

Remote Sensing Division (RSD) provided the shoreline detail (CM-8306) 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 very accurate. RSD foul and kelp 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 CM-8306 supersede previously charted shoreline where any discrepancies occur unless noted below.[25]

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.[26]

RSD Source (CM-8306) Changes and Discrepancies				
RSD Feature	RSD Position	Remarks	Actions Taken in S57 Feature File / Recommendations	Applicable DP form(s)
Foul areas	(All)	Foul areas generally did not extend seaward enough. Extremely dense mats of kelp were encountered seaward of these areas, thick enough to be obstructions to navigation.	Extend RSD foul/obstruction areas as depicted in the S57 file. Obstruction areas are also depicted as kelp areas with duplicate object geometry.	For an example of these areas see DP JD198_117_R2

Charted Feature Changes and Discrepancies				
Chart No. and Feature	Charted Position	Remarks	Recommendations	Applicable DP form(s)
16528 & US5AK6CM Islet	53 58 20.60 N 166 04 26.88 W	Charted islet not found, full MBES coverage at position.	Remove.	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), and CARIS BASE surfaces to calculate and display the desired information for each DP. The DP forms and raw field records can be found on the Project DVD under Reports\Descriptive Report\H11716 Shoreline.

DP ITEM NUMBER : JD198_117 DP Form

Date:	17 July, 2007
Julian Day:	198
UTC Time:	21:36:39
Latitude:	53 59 56.34 N
Longitude:	166 09 19.14 W
Northing:	5984026.27
Easting:	424269.26
Raw (+Depth) or (-Height) (m):	N/A
Draft Corrector (m):	N/A
SV Corrector (m):	N/A
Tide Corrector (m):	0.05
Corrected to MLLW (m):	N/A
Corrected to MLLW (fathoms):	N/A
Corrected to MLLW (feet):	N/A

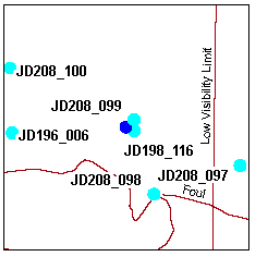
DP Comment: B_tip of shoreline 87m 214. Foul area.

Correlating DP Item Numbers:

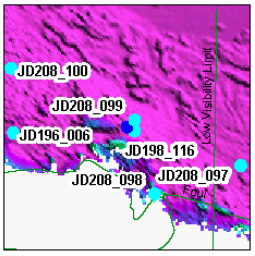
Correlating MB Least Depth:
None

Remarks/Recommendations:
Example obstruction area extension / addition. RSD foul does not extend seaward enough. Dense kelp with rocks.

Chart: 16528 Topo: Carto Code: None



DPs and RSD CM-8306
300m x 300m



DPs, RSD CM-8306, and MBES coverage
300m x 300m

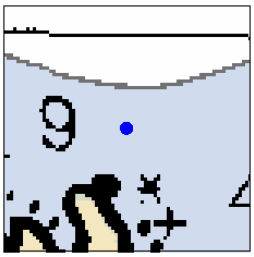


Chart
300m x 300m

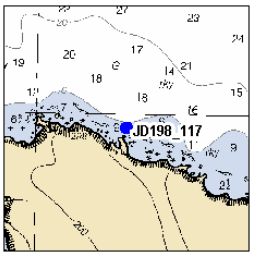


Chart
2000m x 2000m

E – Approval Sheet

Approval Sheet

For

H11716

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

OPR-Q191-KR-07 Statement of Work and 2007 Specifications & Deliverables;
Fugro Pelagos, Inc. Acquisition Procedures (2007- NOAAAcquisitionProcedures);
Fugro Pelagos, Inc. Processing Procedures (2007-NOAAProcessingProcedures);

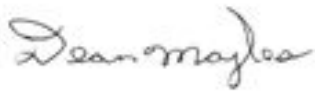
The data were reviewed daily during acquisition and processing.

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

3/7/2008

X 

Dean Moyles
ACSM Certified

Revisions Compiled During Office Processing and Certification

[1] Filed with the project records.
[2] Concur
[3] Survey is being compiled.
[4] Waiting for compilation.
[5] Waiting for compilation.
[6] Compilation competed.
[7] Concur
[8] The BASE surfaces were recomputed during office review and a combined surface was created to be used for cartographic compilation.
[9] Filed with the project records.
[10] Concur.
[11] Concur with clarification, a depth of 53 fathoms was found by multibeam in the vicinity of a 64 fathom on chart 16531.
[12] Concur.
[13] Concur with clarification. A depth of 79 fathoms was found by multibeam in the vicinity of 97 fathoms sounding on ENC US3AK61M.
[14] Concur with clarification. A depth of 49 fathoms was found by multibeam in the vicinity of a 36 fathoms sounding on chart US3AK61M.
[15] Item #2 is incorrectly positioned in the diagram.
[16] Concur.
[17] Do not concur. The position and chart number indicated do not apply to this survey.
[18] The diagram does not correspond to the item described in the descriptive report.
[19] This statement is redundant and also in contradiction with the previous chart comparison results as soundings on ENC US5AK6BM and US5AK6CM are the same as the ones on the raster charts (165422 and 16528).
[20] Concur.
[21] Concur.
[22] Concur.
[23] Four bottom samples from chart 16528 and seven new bottom samples from the present survey were imported into the HCell.
[24] Concur.
[25] Concur.
[26] Concur with clarification, all items addressed in the table have been reviewed during compilation and are either included in the HCell or have been blue-noted to be removed or modified as appropriate.

H11716 HCell Report

Toshi Wozumi, Physical Scientist
Pacific Hydrographic Branch

Introduction

The primary purpose of the HCell is to provide new survey information in International Hydrographic Organization (IHO) format S-57 to update the largest scale ENCs and RNCs in the region: NOAA RNCs, 16522 (1:40,000) and 16528 (1:40,000), and corresponding NOAA ENCs, US5AK6BM and US5AK6CM. (See section 4. Meta Areas.)

HCell compilation of survey H11716 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 and features for HCell H11716 were compiled to the largest scale chart in the region, 16522 and 16528, 1:40,000, with additional scales compiled using the M_CSCL meta area object. (See section 4. Meta Areas.)

2. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 10-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 survey scale using a Radius Table file with values shown in the table, below. The resultant sounding layer contains 23,043 depths ranging from 3.32 to 281.07 meters.

Shoal Limit (m)	Deep 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 highest resolution BASE Surface together with the extents of the soundings layer were used to digitize the hydrographic extents, which were then used to create the single, all encompassing depth area (DEPARE). This extent was then modified as needed to accommodate nearshore area features.

3.2 Depth Contours

Depth contours at the intervals on the largest scale chart are included in the H11716_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and fathom equivalent contour values are shown in the table below.

Chart Contour Intervals in Fathoms from Chart 16528	Metric Equivalent to Chart Fathoms, Arithmetically Rounded	Metric Equivalent of Chart Fathoms, with NOAA Rounding Applied	Fathoms with NOAA Rounding Applied	Fathoms with NOAA Rounding Removed for Display on H11716_SS.000
0	0	0.229	0.125	0
10	18.288	18.517	10.125	10
20	36.576	37.948	20.750	20
30	54.864	56.236	30.750	30
50	91.44	92.812	50.750	50
100	182.88	184.252	100.750	100

With the exception of the zero contours included in the H11716_CS file, contours have not been deconflicted against shoreline features, soundings and hydrography, as all other features in the H11716_CS file and soundings in the H11716_SS have been. This may result in conflicts between the H11716_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 H11716_SS.000 file contours in all cases where conflicts are found.

4. Meta Areas

The following Meta object areas are included in HCell H11716:

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 addressed by the field units are delivered to PHB where they are deconflicted against the hydrography and the largest scale chart. These features, as well as features to be retained from the chart and features digitized from the Base surface are included in the HCell. The geometry of these features is modified to emulate chart scale.

Feature generalization to emulate chart scale is accomplished primarily through reduction in the number of features included in the HCell, and in some cases generalizing area features to point objects. Some instances of reduction of area features to point objects is entrusted to the RNC division, for example rocky seabed areas that will display as point features on the RNC. Where

line and area objects are included in the HCell, complexity of the lines and edges comprising the features have been smoothed to commensurate with chart scale.

5.2 Compilation of Features to the HCell

Shoreline features for H11716 were delivered from the field in one hob file defining new features, and modification to GC or charted features. These were deconflicted against GC shoreline, the chart and hydrography during office processing.

During office processing, two submerged rocks were digitized from the original sounding dataset.

The source of all features included in the H11716 HCell can be determined by the SORIND field.

6. S-57 Objects and Attributes

The H11716_CS HCell contains the following Objects:

$CSYMB	Blue Notes
COALNE	Modified GC coastline
DEPARE	The all-encompassing depth area
DEPCNT	Modified GC MLLW
LNDARE	Islands and islets retained from the chart
LNDELV	Islands and islets retained from the chart
M_CSCL	Compilation scale meta area to define an inset, and for
M_QUAL	Data quality Meta object
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
WATTUR	Water turbulence reported by the field
WEDKLP	New and retained kelp areas

The H11716_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 H11716_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. (This is a deviation from the traditional 'fathoms and feet' charting rule that requires that all depths above MLLW will be shown in feet. The display in fathoms and feet for depths between MLLW and 2 feet above MHW accommodates S-57 rules that require the same charting units to be used for all depth units (DUNI) in an ENC.)
- 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 H11716

H11716 junctions with H11712 and H11720, submitted in March 2008. A common junction was made between H11716 and the two surveys during compilation.

10. QA/QC and ENC Validation Checks

H11716 was subjected to QA checks in S-57 Composer prior to exporting to the metric HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to chart units and NOAA rounding applied. dKart Inspector was then used to further check the data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

11. Products

11.1 HSD, MCD and CGTP Deliverables

H11716_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:40,000
H11716_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H11716_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H11716_outline.gml	Survey outline to populate SURDEX

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. 2.0	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.
Newport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

12. Contacts

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

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APPROVAL SHEET
H11716

Initial Approvals:

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

Toshi Wozumi
2010.02.25 12:21:31
-08'00'

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

Digitally signed by
Russ Davies
Date: 2010.02.26
07:25:42 -08'00'

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

Gary C. Nelson
2010.02.26
07:55:59 -08'00'

Digitally signed by David Scharff
DN: cn=David Scharff, o=OCS,
ou=NOAA,
email=david.scharff@noaa.gov, c=US
Reason: AWOIS and Surf Check
complete
Date: 2010.03.02 15:40:10 -05'00'