

H12089

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No.

Registry No. H12089

LOCALITY

State Alaska

General Locality Southern Portion of Cook Inlet

Sublocality Passage Island to Point Naskowhak

2009

CHIEF OF PARTY

Captain Douglas D. Baird, Jr., NOAA

LIBRARY & ARCHIVES

DATE

<p style="text-align: center;">U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</p> <p style="text-align: center;">HYDROGRAPHIC TITLE SHEET</p>	<p>REGISTRY No</p> <p style="text-align: center;">H12089</p>
<p>INSTRUCTIONS – The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.</p>	<p>FIELD No: N/A</p>
<p>State <u>Alaska</u></p> <p>General Locality <u>Southern Portion of Cook Inlet, Kachemak Bay</u></p> <p>Sub-Locality <u>Passage Island to Point Naskowhak</u></p> <p>Scale <u>1:10,000</u> Date of Survey <u>08/17/2009 to 08/31/2009</u></p> <p>Instructions dated <u>7/16/2009</u> Project No. <u>OPR-P357-RA-FA-09</u></p> <p>Vessel <u>NOAA Ship Fairweather (S220)</u></p> <hr/> <p>Chief of party <u>CAPT Douglas D. Baird, NOAA</u></p> <p>Surveyed by <u>FAIRWEATHER Personnel</u></p> <p>Soundings by <u>Reson 8101, 8125 and 8111</u></p> <p>SAR by <u>Fernando Ortiz</u> Compilation by <u>Fernando Ortiz</u></p> <p>Soundings compiled in <u>Fathoms</u></p>	
<p>REMARKS: <u>All times are UTC. UTM Projection 5</u></p> <p><u>The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. Revisions and end notes in red were generated during office processing.</u></p> <p><u>Page numbering may be interrupted or non sequential.</u></p> <hr/> <p><u>All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.</u></p>	

Descriptive Report to Accompany Hydrographic Survey H12089

Project OPR-P357-FA-09

Kachemak Bay, Alaska

Scale 1:10,000

August 2009

NOAA Ship *Fairweather*

Chief of Party: Captain Douglas D. Baird, Jr., NOAA

A. AREA SURVEYED

The survey area was located in the general locality of the Southern Portion of Cook Inlet, AK , within the sub-locality of Passage Island to Point Naskowhak. This survey corresponds to Sheet F in the sheet layout provided with the Project Instructions, as shown in Figure 1 below.

Data acquisition was conducted from August 17 to August 31, 2009 (DN 229 to DN 243).

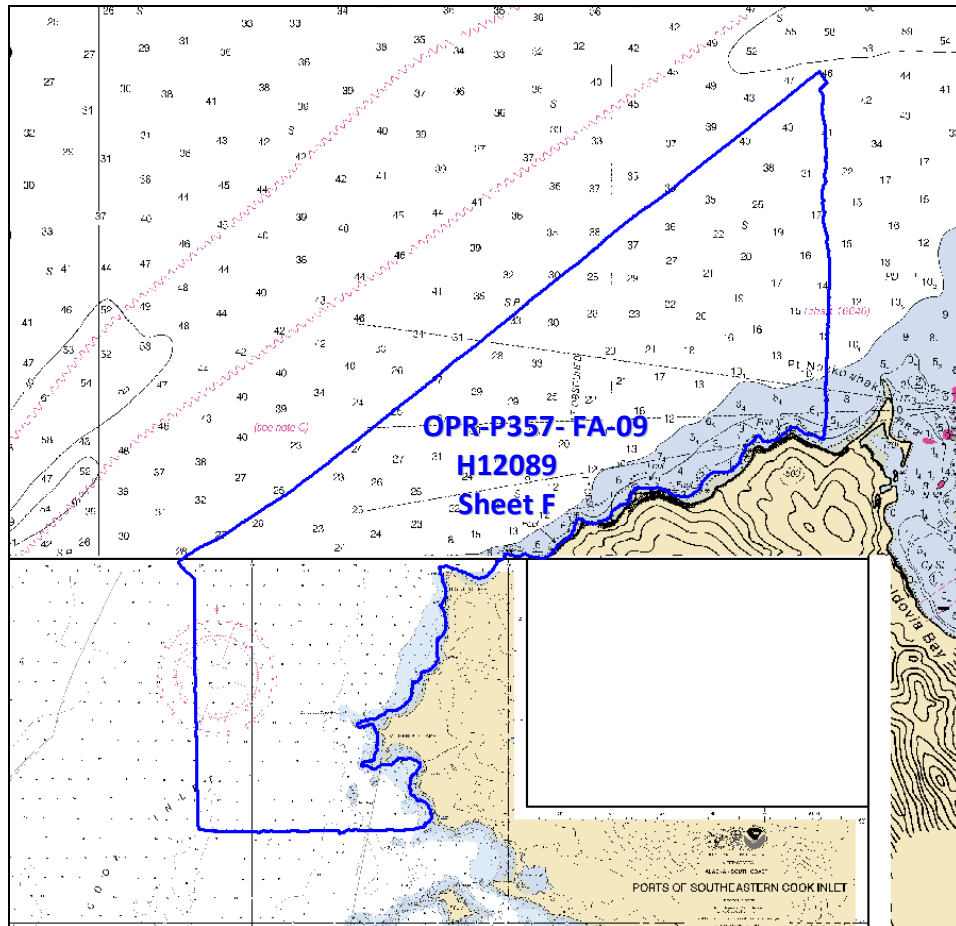


Figure 1: H12089 Survey Outline

One-hundred percent multibeam echosounder (MBES) coverage was obtained in the survey area to at least the 8-meter curve in the survey area. Data were acquired as close to shore as safely possible. Additional coverage was obtained in order to determine least depths over features or shoals.¹

Limited shoreline verification was conducted seaward of the Navigable Area Limit Line (NALL) for H12089, as per section 3.5.5.3 of the Field Procedures Manual April 2009 (FPM). Shoreline features were given S-57 attribution and included for submission in Notebook .hob files.

Mainscheme and crossline mileage for MBES and shoreline acquisition were calculated and are displayed in Table 1 below.

MAIN SCHEME - Mileage	
0	Single Beam MS
<u>563.40</u>	Multibeam MS mileage
	<u>161.11</u> FAIRWEATHER S-220
	<u>238.59</u> Launch 1010
	<u>163.71</u> Launch 1018
0	SideScan MS
<u>563.40</u>	Total MS
CROSSLINE - Mileage	
0	Single Beam XL
<u>32.72</u>	Multibeam XL
	<u>11.33</u> FAIRWEATHER S-220
	<u>8.51</u> Launch 1010
	<u>12.88</u> Launch 1018
<u>32.72</u>	Total XL
OTHER	
<u>0</u>	Developments/AWOIS - Mileage
<u>8.4</u>	Shoreline/Nearshore Investigation - Mileage
<u>18</u>	Total # of Investigated Items
<u>10</u>	Total Bottom Samples
<u>25.37</u>	Total SNM
<u>August 17 - 20, 22, 24 - 28, 30, 31</u>	Specific Dates of Acquisition
<u>229 - 232, 234, 236 - 240, 242, 243</u>	Specific Dn#s of Acquisition

Table 1: H12089 Survey Statistics

B. DATA ACQUISITION AND PROCESSING

A complete description of data acquisition/processing systems and survey vessels along with quality control procedures and data processing methods are included and described in the *NOAA Ship Fairweather 2009 Data Acquisition and Processing Report (DAPR)*, submitted under separate cover. Items specific to this survey and any deviations from the aforementioned report are discussed in the following sections. This hydrographic survey was completed as specified by Hydrographic Survey Project Instructions OPR-P357-RA-FA-09, dated Jul 16, 2009.

B.1. Equipment and Vessels

Equipment and vessels used for data acquisition and survey operations during this survey are listed below in Table 2.

	FAIRWEATHER	Launch 1010	Launch 1018	Skiff 1706	Ambar 2302
Hull Registration Number	S220	1010	1018	1706	2302
Builder	Aerojet-General Shipyard	The Boat Yard, Inc.	The Boat Yard, Inc.	MonArk	Marine Silverships, Inc
Length Overall	231 feet	28' 10"	28' 10"	17'	23'
Beam	42 feet	10' 8"	10' 8"	7'	9' 4"
Draft, Maximum	15' 6"	4' 0" DWL	4' 0" DWL	1' 3"	1' 4"
Cruising Speed	12.5 knots	24 knots	24 knots	20 knots	22 knots
Max Survey Speed	6 knots	6 knots	6 knots		
Primary Echosounder	RESON 8111 & RESON 8160	RESON 8101	RESON 8125		
Sound Velocity Equipment	SBE 19plus & 45, MVP 200, SVP70	SBE 19plus	SBE19plus, Odom Digibar Pro		
Attitude & Positioning Equipment	POS/MV V4	POS/MV V4	POS/MV V4		
Type of operations	MBES	MBES	MBES	Shore Station	Shoreline, Shore Station

Table 2: Vessel Inventory

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

B.2. Quality Control

B.2.1. Crosslines

Multibeam crosslines for this survey totaled 32.72 linear nautical miles (lnm), comprising 5.8% of the 563.40 lnm of total MBES hydrography. Both main scheme and crossline mileage are summarized in Section A, Table 1 above.

Surface differencing in CARIS Base Editor was used to assess crossline agreement with main scheme. Figure 2 includes a visual of the differences spatially.

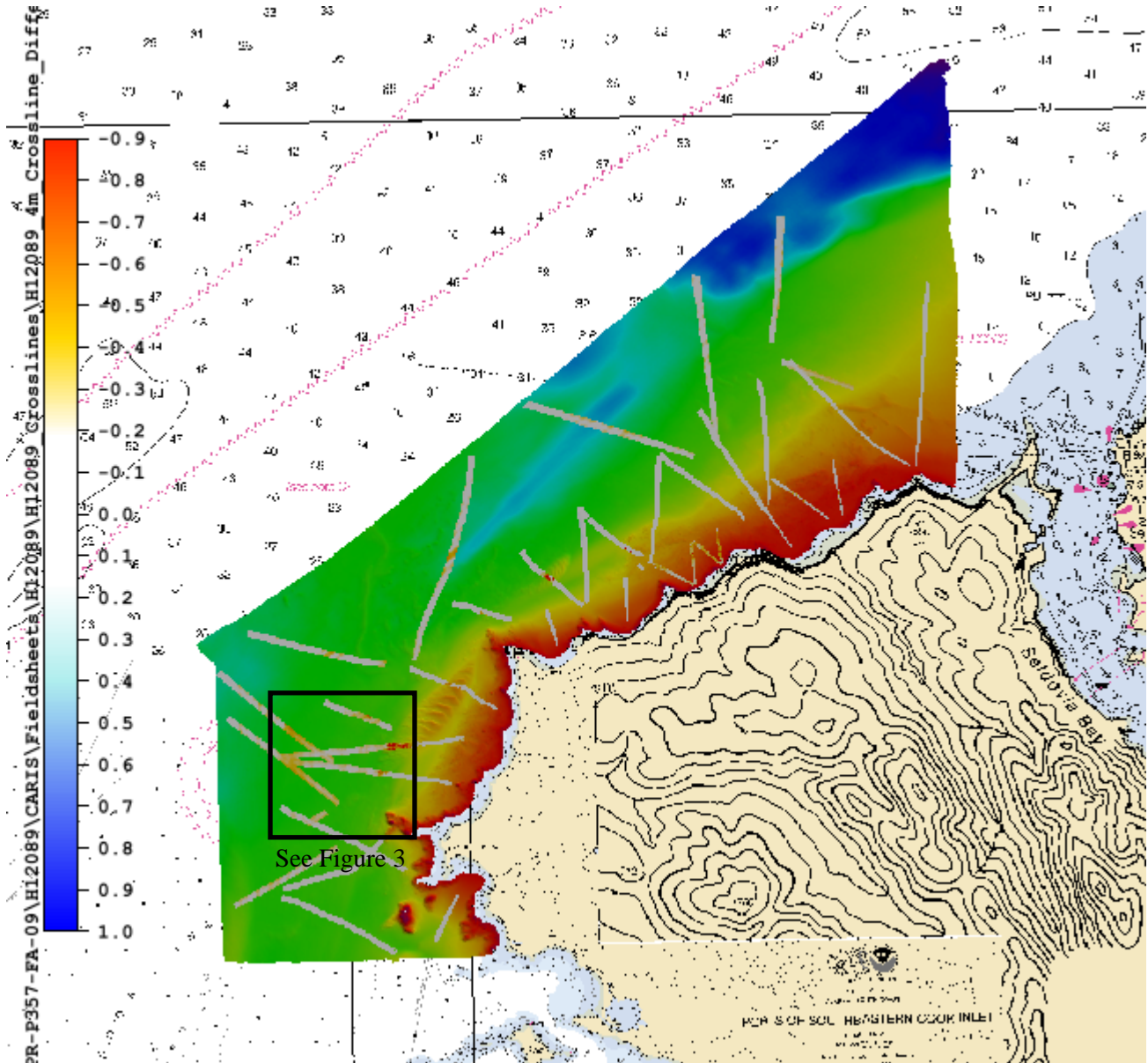


Figure 2: Crossline and main scheme differences (white indicates agreement, warm colors indicate XLs deeper than mainscheme and cool colors indicate XLs are shaller).

The majority of the crossline comparison showed agreement well within 0.30 meters.² Two exceptions were around regions of sand waves where due to the slope of the features the Combined Uncertainty and Bathymetry Estimation (CUBE) algorithm selected different hypotheses. One of the two regions can be seen in the upper right of Figure 3 below.

The last area of concern can be seen on the left side of Figure 3. The magnitude of the difference between the crossline and main scheme lines is 0.40 meters in the outer beams. This is likely due to a localized thermocline not captured by a sound velocity profile (SVP) cast. The classic “frowning” or deepening of soundings in the outer beams usually correlated with inaccuracies in the SVP can be seen in the crossline soundings, as shown in Figure 4. The main scheme data are shoaler and do not show similar “frowning,” therefore the Hydrographer believes that these difference do not put into question the quality of the main scheme data nor the resultant surfaces.³

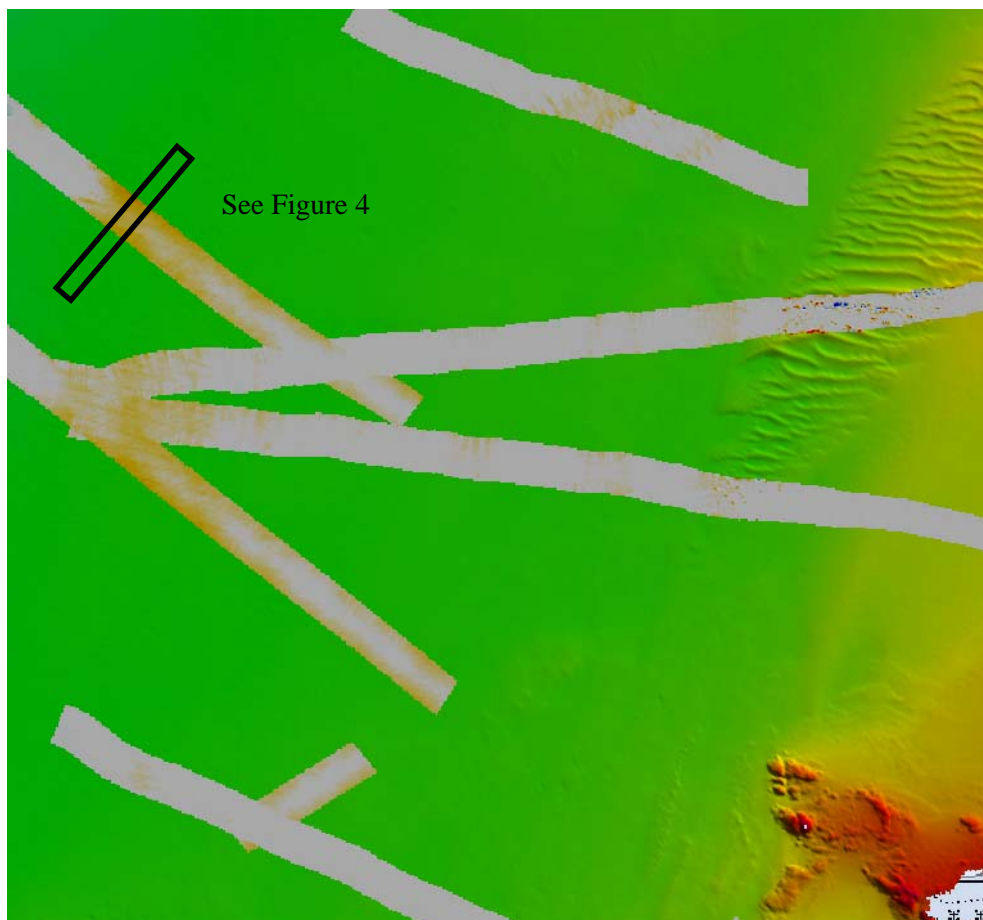


Figure 3: Blowup of Figure 2

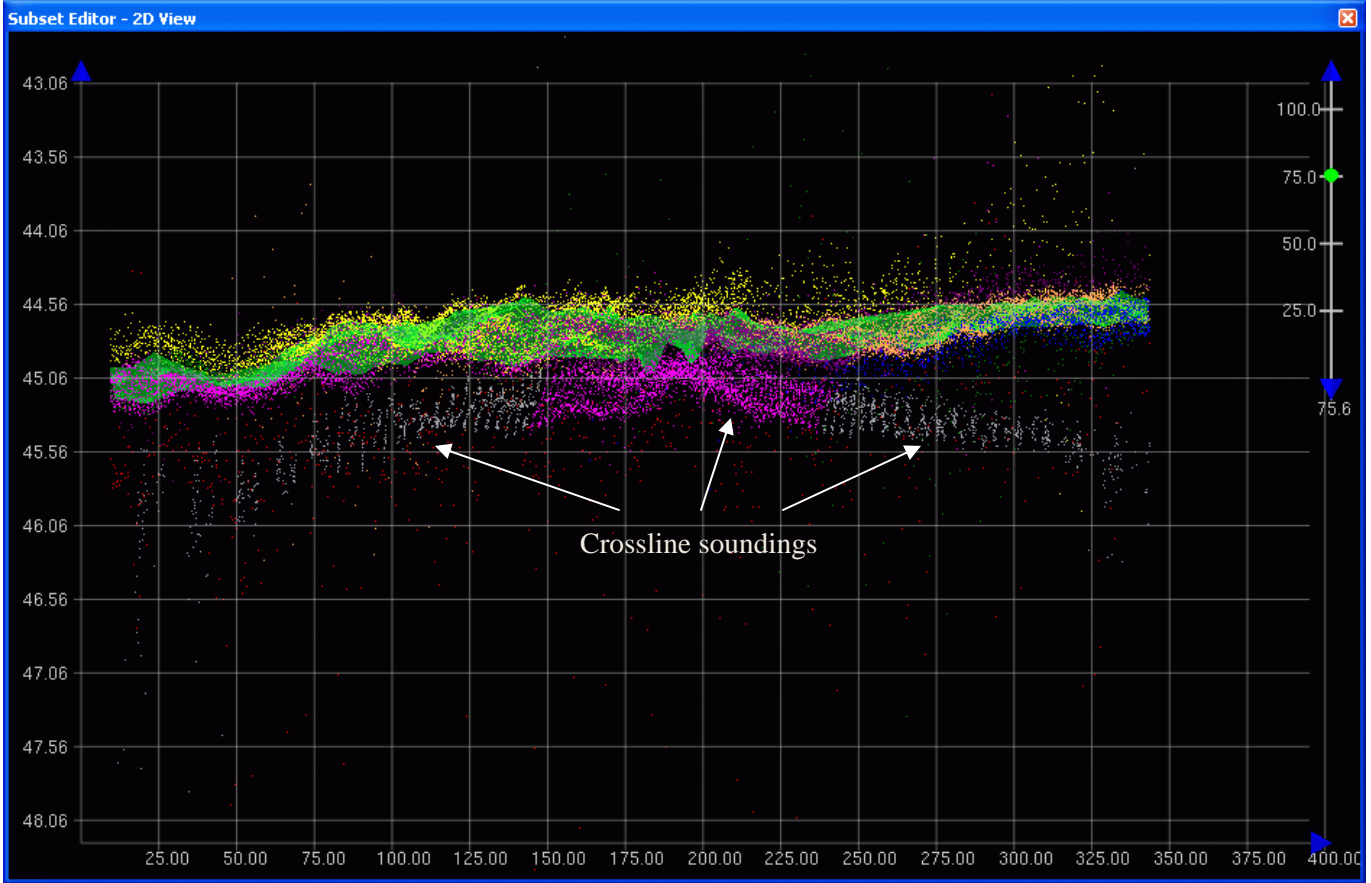


Figure 4: Cross section illustrating "frowning" in crossline

B.2.2. Junctions

Survey H12089 junctions with the three surveys of the same project listed in Table 3. The concurrent *Rainier* survey H12088 was not compared to H12089 because data were not available. The area of overlap between the *Fairweather* surveys was reviewed in CARIS Subset Editor for consistency and data were found to be in general agreement within decimeters in flat or gradually sloping areas. The sheet limits and area of overlap for Sheets E, G and K are shown in Figure 5.⁴

Junction Survey	Sheet	Survey Scale	Date of Survey	Survey Location	Platform
H12090	G	1:40,000	August 2009	Approaches to Homer	<i>Fairweather</i>
H12114	K	1:10,000	August 2009	Port Graham	<i>Fairweather</i>
H12088	E	1:10,000	August 2009	Seldovia Bay	<i>Rainier</i>

Table 3: Junction Surveys

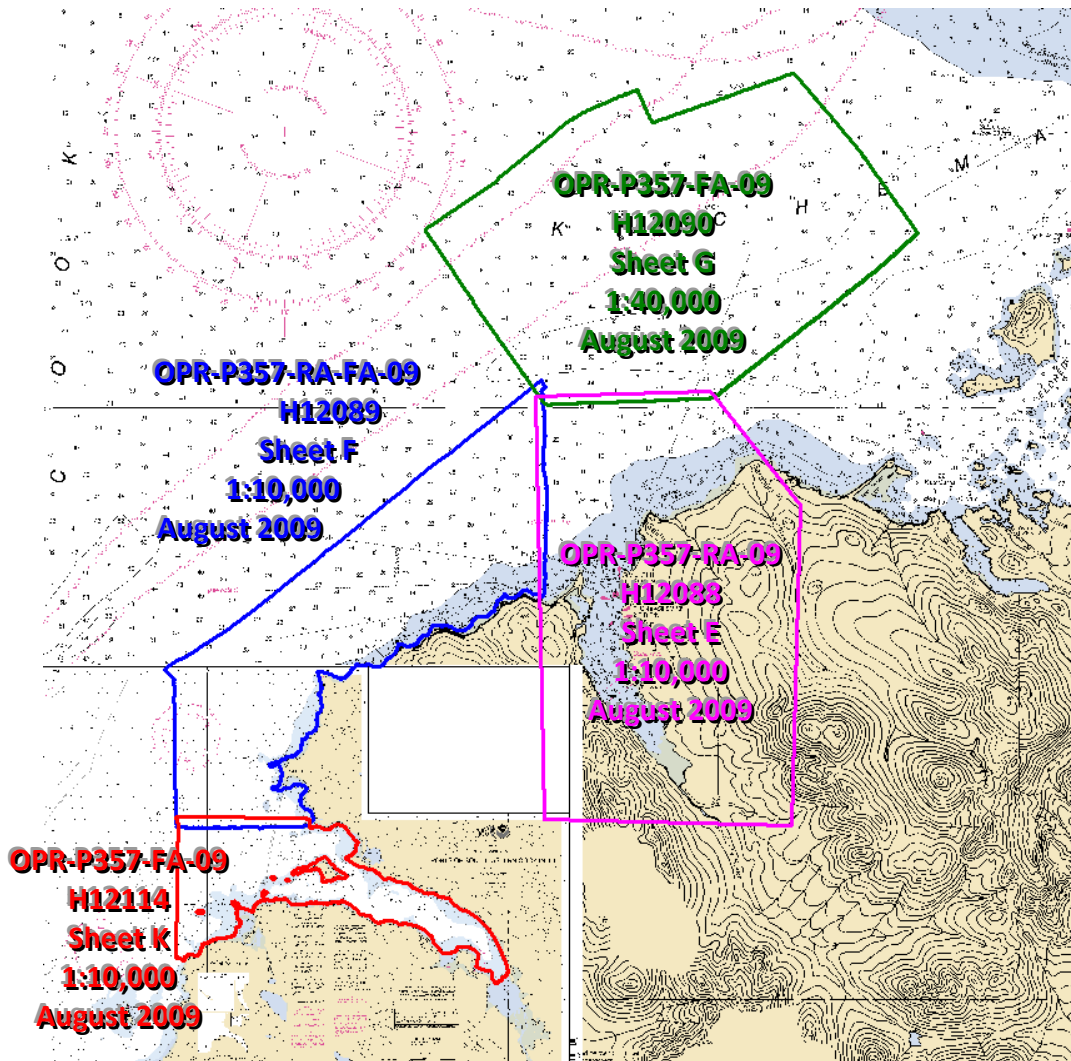


Figure 5: Junction of H12088, H12089, H12090 and H12114

B.2.3. Quality Control Checks

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

B.2.4. Data Quality Factors

B.2.4.1 TRUEHEAVE

To enable the application of true heave some POS/MV true heave files were “fixed” using the *fixTrueHeave.exe* utility from CARIS. Fixed files were assigned an additional *.fixed suffix. This was performed for the following vessels and days:

Launch 1010 days 234, 239, 240

Launch 1018 day 237, 238, and 239

B.2.4.2 SOUND VELOCITY

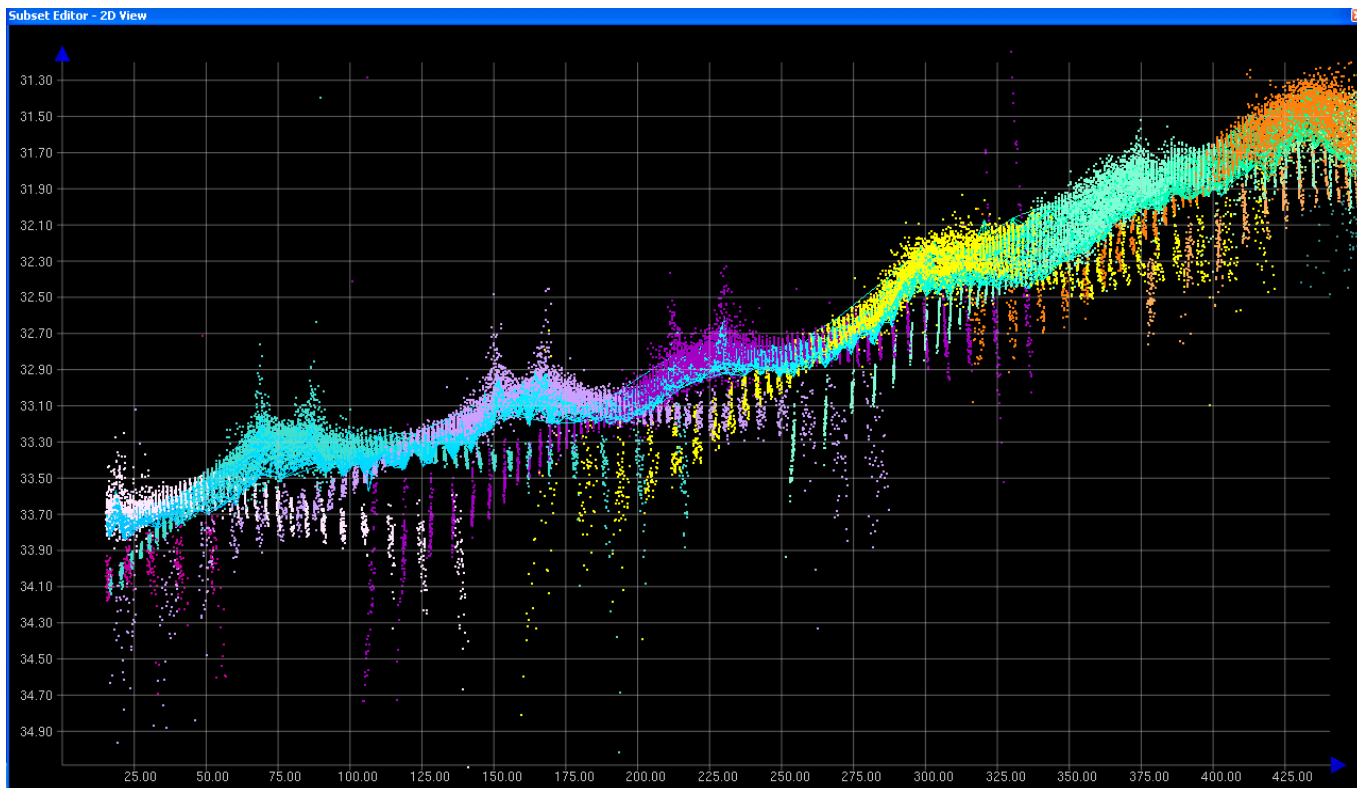


Figure 6: "Frowning" seen in offshore areas

“Frowning” in data as shown above in Figure 6 was noted offshore between Point Pogibshi and Point Naskowhak. It was likely due to strong currents and tides creating a dynamic watercolumn. The maximum offset seen between outerbeams and adjacent nadar beams was 0.5 meters in depths greater than 30 meters which is within International Hydrographic Organization (IHO) Order 1 specifications and did not affect the surfaces.⁵

B.2.4.3 BOTTOM SAMPLES

For project OPR-P357-FA-09, Hydrographic Surveys Division (HSD) made acquisition of bottom samples a lower priority than bathymetry and sidescan. Therefore, bottom samples were only partially acquired during this survey to maximize efforts towards the higher priority tasks. For record of this correspondence, see Appendix V.

B.2.4.4 DESIGNATED SOUNDINGS

In depths less than 20 meters designation of soundings followed procedures as outlined in section 5.1.1.3 of the NOS Hydrographic Surveys Specifications and Deliverables (HSSDM) dated April 2009. In depths greater than 20 meters the distance between designated soundings was 2 mm at half the finest resolution chart scale. This effected the area covered by chart 16645 (1:82,662) where the distance used between designated soundings was 80 meter, or 2 mm at 1:40,000.

B.2.4.5 There are 71 designated soundings in the critical soundings layer. The purpose for the 62 designated soundings is to preserving shoal depths, six were submitted as DTONs, and three were soundings brought into CARIS Notebook as features.⁶ UNUSUAL CONDITIONS

In the shoreline areas around Dangerous Cape and Point Pogibshi the four meter contour was not reached due to both high currents and large quantities of kelp.

B.2.5. Accuracy Standards

All data meet the data accuracy specifications as stated in the HSSDM.

In CARIS HIPS, a child layer was computed for a combined four meter grid as a difference between IHO Order 1 allowable error based on depth and the computed uncertainty of each node. All nodes in the child layer had values greater than zero indicating uncertainties less than the allowable error based on IHO Order 1 specifications.

B.3. Corrections to Echo Soundings

Data reduction procedures for survey H12089 conform to those detailed in the DAPR.

B.4. Data Processing

Initial data acquisition and processing notes are included in the acquisition and processing logs, additional processing such as final tides and sound velocity applied is most accurately tracked in the survey wide query in the *Reviewer_Qry* tab of the H12089_Data_Log spreadsheet. All of the logs are included with the digital Separates I.

Data processing procedures for survey H12089 conform to those detailed in the DAPR. Data were processed using CARIS HIPS & SIPS v6.1, Service Pack 2, and Hotfix 8. Additional processing details regarding Total Propagated Uncertainty (TPU/TPE) and CUBE Surfaces and Parameters utilized, along with any the deviations from the processing procedures outlined in the DAPR are discussed below.

B.4.1.1 TPE VALUES:

The survey specific parameters used to compute TPE in CARIS for H12089 are listed in Tables 4-6.

Tide values:	Measured	0.00 m	Zoning	0.06 m
Sound Speed Values:	Measured	1.00 m/s	Surface	1.00 m/s

Table 4: Survey Specific CARIS TPE Parameters for vessel 1010

Tide values:	Measured	0.00 m	Zoning	0.06 m
Sound Speed Values:	Measured	1.00 m/s	Surface	0.50 m/s

Table 5: Survey Specific CARIS TPE Parameters for vessel 1018

Tide values:	Measured	0.00 m	Zoning	0.06 m
Sound Speed Values:	Measured	0.50 m/s	Surface	0.50 m/s

Table 6: Survey Specific CARIS TPE Parameters for vessel S220

B.4.1.2 CUBE SURFACES:

The CARIS HIPS BASE (Bathymetry Associated with Statistical Error) surfaces created and the associated resolutions are listed below in Table 7. The CUBE parameters utilized for creating CUBE surfaces are included in Table 7. The CUBE parameters .xml file is included with digital data in the vessel configuration folder.

Fieldsheet Name	Surface Name	Depth Ranges (m)	Resolution (m)	CUBE Parameters
H12089_QC	H12089_1m	All	1	NOAA_1m
	H12089_2m	All	2	NOAA_2m
	H12089_4m	All	4	NOAA_4m
	H12089_1m_0to23_Final	-1 to 23	1	
	H12089_2m_18to40_Final	18 to 40	2	
	H12089_4m_35to85_Final	35 to 85	4	
	H12089_Final_Combined_4m		4	

Table 7: Depth Ranges, Resolutions, and CUBE Parameters

B.4.1.3 SOUND VELOCITY PROFILE EXTRAPOLATION

In reviewing the sound speeds extrapolated by Velocwin at the extended depth, several were identified as inaccurately representing the trend. Where identified, the sound speed at the greatest measured depth was used to replace the sound speed at the extended depth.

This affected one cast for vessel 1010 on August 19th at 16:42 UTC, and one for vessel S220 on August 27th at 18:48 UTC.

B.4.1.4 SWATH FILTERING

A survey line acquired by S220 on DN 234 named “2009F_2340152” was filtered at 45° from nadir on both port and starboard to remove excessive sound velocity artifacts negatively impacting the surface. The data within 45° of nadir still affects the surface but the apparent magnitude of bending is within IHO 1 specifications so they have not been addressed further. In reviewing the sound velocity profiles associated with this line, a large thermocline near the northeast end of the line was not seen at the southwestern end. It is likely that there was insufficient spatial resolution of the thermocline to correct data at high incidence angles. The sound velocity issues associated with H12089 are further discussed in section B.2.4.2 of this report.⁷

C. HORIZONTAL AND VERTICAL CONTROL

A complete description of horizontal and vertical control for survey H12089 can be found in the *OPR-P357-RA-FA-09 Horizontal and Vertical Control Report*, submitted under separate cover. A summary of horizontal and vertical control for this survey follows.

C.1. Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential Global Positioning System (DGPS) was for real-time positioning during data acquisition. Differential corrections from the U.S. Coast Guard beacon at Kenai (310 kHz) were used primarily. Kodiak Island (313 kHz) differential correctors had to be utilized for launch 1018 on DN 230. For further detail see the Acquisition and Processing logs for the particular days located in Separates I.

Post-Processed Kinematic (PPK) navigation solutions are the sole method of positioning for MBES soundings. The PPK solutions as Single Best Estimated Trajectory (SBET) files were applied to the data in CARIS HIPS. The SBETs were computed in Applanix POSpac 5.2 using the SmartBase method. The stations used in the SmartBase processing were selected by the software from the following set of Plate Boundary Observatory (PBO) stations: AC03, AC06, AC18, AC35, AC39, AC47, AC47, AC59, AV02, and SELD. Further details on SBET application and processing can be found in the *OPR-P357-RA-FA-09 Horizontal and Vertical Control Report*, submitted under separate cover.

C.2. Vertical Control

The vertical datum for this project is Mean Lower Low Water (MLLW) as specified in the Project Instructions. The operating National Water Level Observation Network (NWLON) primary tide station at Seldovia, AK (945-5500) served as control for datum determination and as the primary source for water level correctors for survey H12089.

Fairweather personnel installed a Sutron 8210 “bubbler” tide gauge at the tertiary station listed below in Table 8. The gauge was installed in order to provide information to the Center for Operational Oceanographic Products and Services (CO-OPS N/OPS1) for the determination of time and height correctors, but was not used in the final, approved tides provided by CO-OPS.

Station Name	Installer	Station Number	Type	Date of Install	Date of Removal
Port Graham	<i>Fairweather</i>	945-5437	Tertiary 30 Day	Aug. 14, 2009	Sept. 1, 2009

Table 8: Tide Gauge Information

Refer to the *OPR-P357-FA-09 Horizontal and Vertical Control Report* for further information about the *Fairweather* tide station.

A request for delivery of final approved (smooth) tides for survey H12089 was forwarded to N/OPS1 on September 7, 2009 in accordance with the Field Procedures Manual (FPM), dated April 2009. A copy of the request is included in Appendix IV.⁸

As per the Project Instructions, all data were reduced to MLLW using the final approved water levels (smooth tides) from the Seldovia, AK station (945-5500) by applying tide file 9455500.tid and time and height correctors through the zone corrector file P357FARA2009CORP.zdf. **It will not be necessary for the Pacific Hydrographic Branch to reapply the final approved water levels (smooth tides) to the survey data during final processing.**

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

Chart comparison procedures were followed as outlined in section 4.5 of the FPM and section 8.1.3-D.1 of the HSSDM, utilizing CARIS BASE Editor software program.

Survey H12089 was compared with the following charts listed in Table 9.

NOAA Chart Number	Chart Scale	Edition Number	Edition Date	Updated with Notice to Mariners through
16645	1:82,662	18 th Ed.	January 12, 2002	July 11, 2009
16646	1:20,000	13 th Ed.	November 1, 2007	July 11, 2009

Table 9: NOAA Charts compared with Survey H12089

D.1.1. Chart 16645

Based on a visual sounding comparison, soundings from survey H12089 generally agree within one to two fathoms with charted depths on chart 16645.⁹

D.1.2. Chart 16646

Based on a visual sounding comparison, soundings from survey H12089 generally agreed within one to two fathoms with charted depths on chart 16646. An area of note is around the sand waves between Point Pogibshi and Dangerous Cape shown in Figure 7. The high points of the wave features are not expressed on the chart and in most cases are two to three fathoms shoaler than the nearest charted depth.

Some of the shoaler depths represented on the chart near the shoreline appear to have been pulled off shore for cartographic representation, but remain accurate within the scale of the chart as depicted by Figure 8.¹⁰

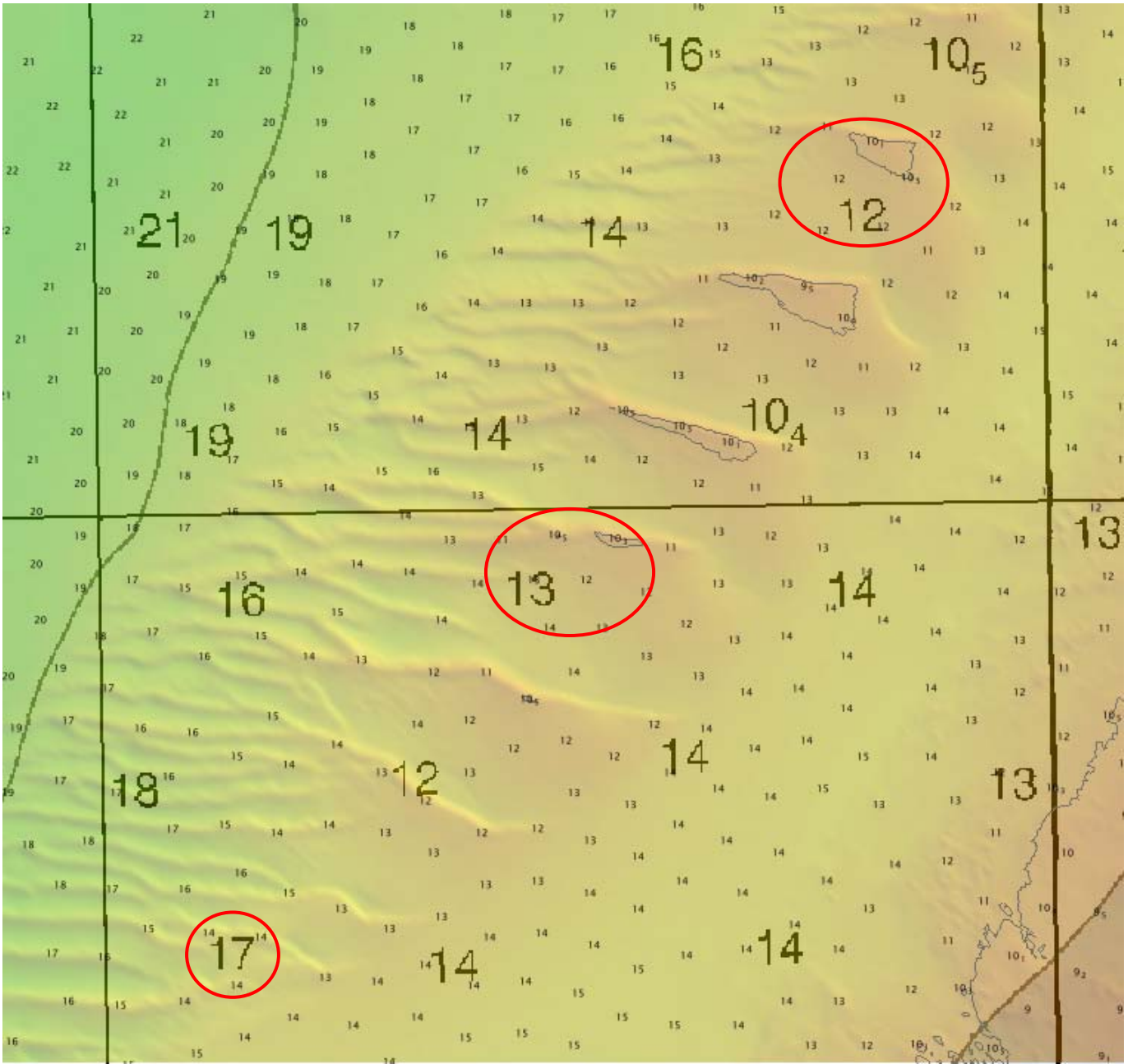


Figure 7: Sand waves between Point Pogibshi and Dangerous Cape

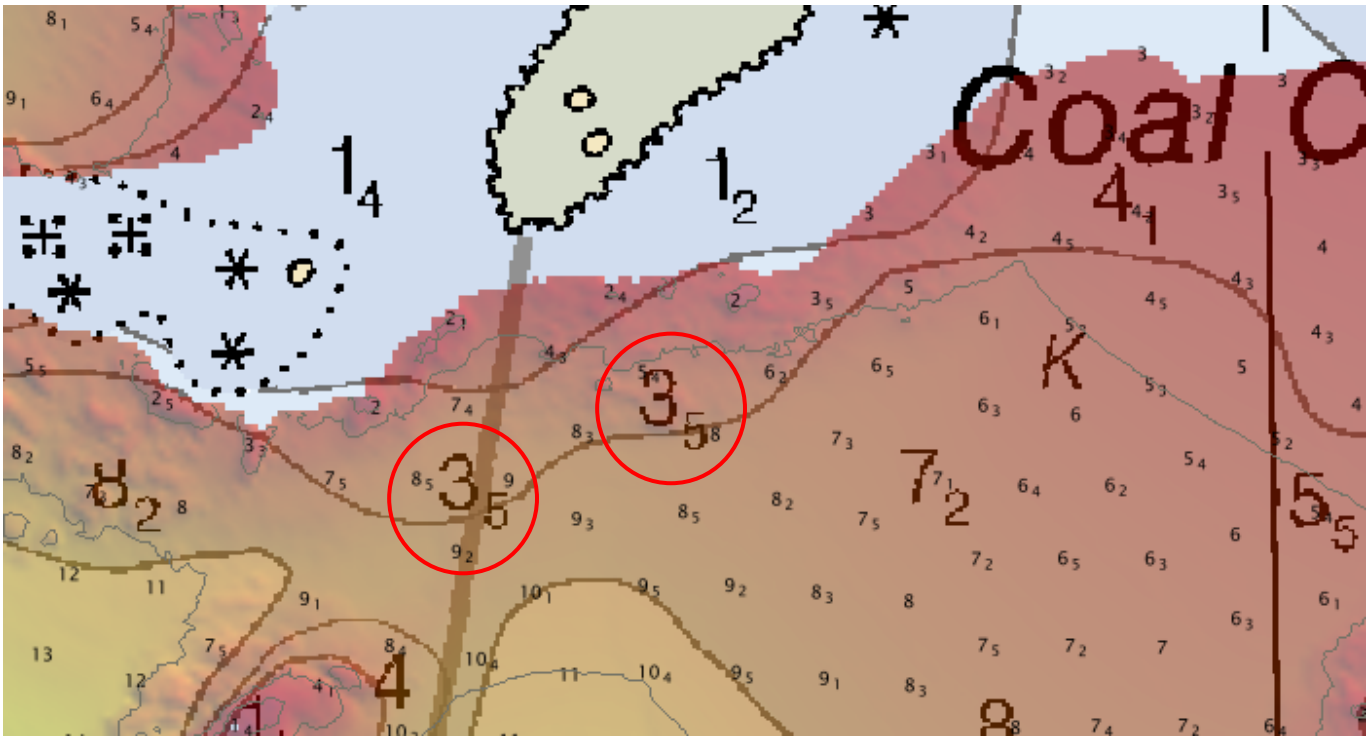


Figure 8: North side of Coal Cove

D.1.3. Chart Comparison Recommendations

The Hydrographer has determined that bottom coverage requirements have been met and data accuracy meets requirements specified by the *HSSDM*. **The surveyed soundings are adequate to supersede prior surveys in their common areas.**¹¹

D.2. Automated Wreck and Obstruction Information System (AWOIS) Investigations

There were no AWOIS items located within the limits of H12089.¹²

D.3. Dangers to Navigation

Two Dangers to Navigation (DTON) Reports were submitted to the Marine Chart Division for verification and final submission to the Seventeenth Coast Guard District. A copy of the preliminary Dangers to Navigation Reports are included in Appendix I.

One DTON was initially found and reported under the title *H12089 DTON Report 1* on September 1, 2009. Subsequently five additional DTON were reported under the title *H12089 DTON Report 2* on February 18, 2010.¹³

D.4. Additional Results

D.4.1. Shoreline Source

A composite source file (CSF) in .000 format from HSD's Operations Branch was provided with the Project Instructions. Shoreline sources that were included in the composite source file included Geographic Cell (GC) and charted features from charts 16645 and 16646 as shown in Table 10. The original file was imported into CARIS Notebook, converted to a .hob file, clipped to the sheet limits, and named H12089_Original_Composite_Source.hob to be included with the deliverables. This file was copied and named H12089_Feature_File.hob to be utilized during field verification.

D.4.2. Shoreline Verification

Fairweather personnel conducted limited shoreline verification at times near predicted low water, in accordance with the Project Instructions and section 3.5.5.3 of the FPM. During shoreline verification, detached positions (DPs) were acquired and edits to the daily field H12089_Feature_File_TRX_DnXXX.hob were recorded in CARIS Notebook and on paper DP forms and boat sheets. Scanned copies of the DP forms and boat sheets with field notations are included in the digital Separates I folder.

Charts 16646 (1:20,000) and 16645 (1:80,000) were the largest scale charts for the project area. A Mean High Water (MHW) Buffer line, offset 64 meters (0.8 mm at scale of 1:80,000) from the composite source MHW, was used during shoreline verification to determine the Navigable Area Limit Line (NALL). The NALL was determined in the field as the farthest off-shore of either the MHW buffer listed above, the 4-meter depth contour, or the inshore limit of safe navigation. All shoreline features provided in the composite source file seaward of the Navigable Area Limit Line (NALL) were verified or disproved during shoreline operations.

D.4.3. Shoreline Data Processing

Acquired and edited positions during shoreline verification operations were processed in CARIS Notebook. Features that required tide correction were processed using the Load Tide function in CARIS Notebook. Approved water levels were applied to tide correct features where appropriate.

New features and features requiring revision were given S-57 attribution. As outlined in section 4.4.10 of the FPM, features were delineated, attributed and placed on either the survey edited H12089_Final_Feature_File.hob (compiled from the field daily files) or H12089_Disprovals.hob.

Source features collected or edited by the field have source indication (SORIND) and source date (SORDAT) attribute fields populated to reflect the survey number (US,US,survey,H12089) and final survey date 20090830. Unmodified source shoreline features were left with their original SORIND and SORDAT values. The SORIND/SORDAT information for shoreline features included in the final Notebook .hob files is included in Table 10.

Shoreline Source	SORIND	SORDAT
RSD	US,US,graph,GC10700	20070700
Chart	US,US,graph,Chart 16645	20020112
Chart	US,US,graph,Chart 16646	19980919/20011129/20061117

Table 10: SORIND/SORDAT for Shoreline Features

D.5. Source Shoreline Changes, New Features and Charted Features

In accordance with section 4.4.10 of the FPM, field notes made by the Hydrographer were provided in the Remarks field for features and when appropriate recommendations to the cartographer were included in the Recommendations field.

Items disproved by the Hydrographer and deemed to not be included in the H12089_Final_Feature_File.hob file were moved to the H12089_Disprovals .hob file.

Numerous charted (16645) ledges are in conflict with hydrography. After discussion with representatives from both the Pacific Hydrographic Branch and the Atlantic Hydrographic Branch, it has been decided to leave the ledge area features intact for shore side personnel to manage.¹⁴

Three features were repositioned by MBES although the high points were not covered by MBES therefore the charted depth was retained. See remarks and recommendations fields in the Final Feature File.

D.5.1. Shoreline Recommendations

The Hydrographer recommends that the shoreline depicted in the CARIS Notebook files and final sounding files supersede and complement shoreline information compiled on the CSF and charts.¹⁵

D.6. Aids to Navigation

Survey H12089 included one (1) aid to navigation (ATON). Static GPS observations were taken on the ATON for check purposes only. The ATON was found to serve its intended purpose.¹⁶

The following fixed ATON was positioned using static GPS survey methods, see the *Horizontal and Vertical Control Report for OPR-P357-FA-09* for further information.

Light List Name	Light List Number	NAD83 (CORS96) (EPOCH: 2002.0000)	
		N Lat (DMS)	W Long (DMS)
Point Pogibshi Light	26145	59° 25' 27.88958"	151° 53' 12.84488"

Table 11: Positioned ATON

D.7. Bottom Samples

Bottom samples were collected on August 25, 2010 (DN 237) and are included as seabed areas imported into the Notebook H12089_Final_Feature_File.hob file. ¹⁷

D.8. Supplemental Reports

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>
Hydrographic Systems Readiness Review 2009	May 15, 2009	N/CS34
Data Acquisition and Processing Report 2009	March 17, 2010	N/CS34
Horizontal and Vertical Control Report for OPR-P357-FA-09	March 17, 2010	N/CS34
Tides and Water Levels Package for OPR-P357-FA-09	September 15, 2009	N/OPS1



UNITED STATES DEPARTMENT OF COMMERCE

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

April 21, 2010

MEMORANDUM FOR: Gary Nelson, NOAA
Chief, Pacific Hydrographic Branch

FROM: CAPT David O. Neander, NOAA
Commanding Officer

David O. Neander
2010.04.21
15:57:10 -08'00'

FOR: CAPT Douglas D. Baird, NOAA
Former Commanding Officer

TITLE: Approval of Hydrographic Survey H12089,
OPR-P357-FA-09

As Chief of Party, I have ensured that standard field surveying and processing procedures were adhered to during acquisition and processing of hydrographic survey H12089 in accordance with the Hydrographic Manual, Fourth Edition; Field Procedures Manual, April 2009; and the NOS Hydrographic Surveys Specifications and Deliverables, as updated for April 2009. Additional guidance was provided by applicable Hydrographic Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required. All data and reports are respectfully submitted to N/CS34, Pacific Hydrographic Branch.

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

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

Digitally signed by Weston
Renoud
Date: 2010.04.21 20:34:51 Z

HSST Weston Renoud
Hydrographic Senior Survey Technician

Digitally signed by Briana Welton
Date: 2010.04.22 18:46:30 -07'00'

LT Matthew Ringel
Field Operations Officer

Digitally signed by Lynnette
Morgan
Date: 2010.04.21 13:01:03 -08'00'

CST Lynnette V. Morgan
Chief Survey Technician

Attachment



Revisions and Corrections Compiled During Office Processing and Certification.

¹ Concur.

² Concur.

³ Concur with hydrographers comments.

⁴ H12089 junctions with H12088 to the E, H12090 to the NE and H12114 to the S. A common junction will be made with these surveys during compilation process.

⁵ Concur. Data is adequate to supersede charted data in the common area despite the offset problem.

⁶ Concur with clarification. Designated soundings were used as appropriate to the scale of the chart.

⁷ Concur.

⁸ See attached Tide note, dated Oct. 6, 2009.

⁹ Concur.

¹⁰ Concur with clarification. During compilation, some modifications were made to accommodate chart scale. Chart features as depicted in the HCell.

¹¹ Concur.

¹² Concur.

¹³ DTONs report is attached to this report. All reported DTONS have been applied to the charts.

¹⁴ Concur.

¹⁵ Concur with clarification. The submitted hob files were used in the compilation of HCell H12089. During compilation, some modifications were made to accommodate chart scale. Chart features as depicted in the HCell.

¹⁶ Chart ATONs per latest ATONIS information.

¹⁷ Fourteen bottom samples are included in the HCell. 10 Bottom samples from the survey and 4 were imported from the ENC to be retained.

H12089 DTON Report 1

Registry Number: H12089
State: Alaska
Locality: Kachemak Bay, AK
Sub-locality: Passage Island to Point Naskowhak
Project Number: OPR-P357-FA-09
Survey Date: 16 Aug. 2009

During OPR-P357-FA-09, H12089 Sheet F, a new rock was found with Reson 8101 MBES. The rock is North of Dangerous Cape in Kachemak Bay. The least depth was corrected with predicted tides. The rock is in an area charted as 8.1 fathoms on chart 16646.

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
16646	13th	11/01/2007	1:20,000 (16646_4)	[L]NTM: ?
16645	18th	01/12/2002	1:82,662 (16645_1)	[L]NTM: ?
16647	3rd	05/12/2001	1:100,000 (16647_1)	[L]NTM: ?
16640	24th	09/15/2001	1:200,000 (16640_1)	[L]NTM: ?
16013	30th	07/01/2006	1:969,761 (16013_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
1.1	Rock	3.23 m	59° 24' 22.5" N	151° 54' 09.8" W

1 - Danger To Navigation

1.1) Profile/Beam - 1298/69 from h12089 / fa_1010_reson8101_2009 / 2009-239 / 2009f_2400038

DANGER TO NAVIGATION

Survey Summary

Survey Position: 59° 24' 22.5" N, 151° 54' 09.8" W
Least Depth: 3.23 m (= 10.60 ft = 1.767 fm = 1 fm 4.60 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) ± 0.983 m ; TVU (TPEv) ± 0.200 m
Timestamp: 2009-240.00:43:03.635 (08/28/2009)
Survey Line: h12089 / fa_1010_reson8101_2009 / 2009-239 / 2009f_2400038
Profile/Beam: 1298/69
Charts Affected: 16646_4, 16645_1, 16647_1, 16640_1, 16013_1, 531_1, 500_1, 530_1, 50_1

Remarks:

During OPR-P357-FA-09, H12089 Sheet F, a new rock was found with Reson 8101 MBES. The rock is North of Dangerous Cape in Kachemak Bay. The least depth was corrected with predicted tides. The rock is in an area charted as 8.1 fathoms on chart 16646.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12089/fa_1010_reson8101_2009/2009-239/2009f_2400038	1298/69	0.00	000.0	Primary

Hydrographer Recommendations

Chart in the surveyed location.

Cartographically-Rounded Depth (Affected Charts):

1 $\frac{3}{4}$ fm (16645_1, 16640_1, 16013_1, 530_1)
 1fm 4ft (16646_4, 16647_1, 531_1)
 3.2m (500_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: QUASOU - 6:least depth known
 SORIND - US,US,survey,H12089

TECSOU - 3:found by multi-beam

VALSOU - 3.231 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Feature Images

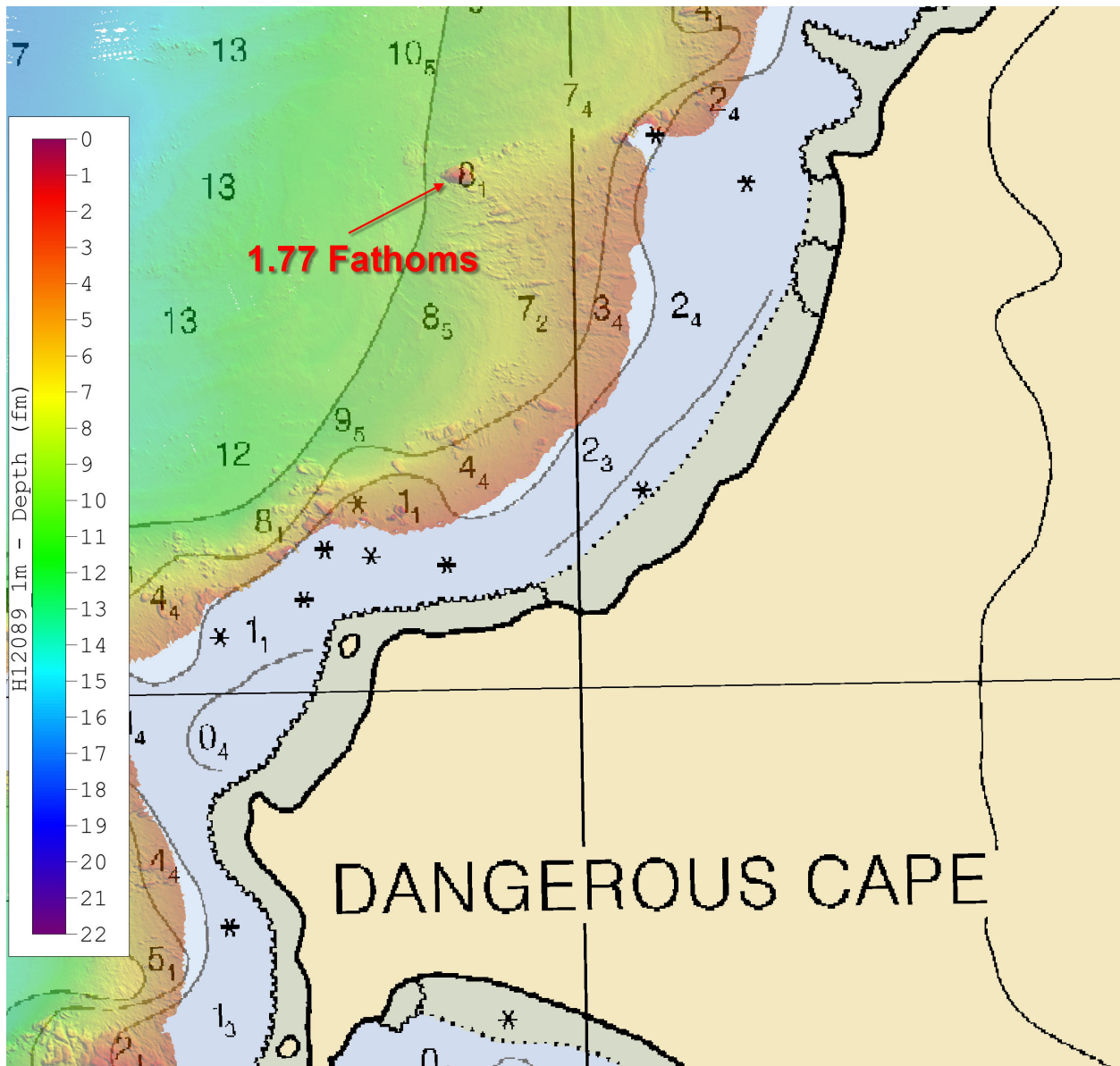


Figure 1.1.1

H12089 DTON Report 2

Registry Number: H12089
State: Alaska
Locality: Kachemak Bay, AK
Sub-locality: Passage Island to Point Naskowhak
Project Number: OPR-P357-FA-09
Survey Dates: 16 Aug. 2009 - 30 Aug. 2009

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
16646	13th	11/01/2007	1:20,000 (16646_4)	USCG LNM: 08/26/2008 (06/30/2009) CHS NTM: None (06/26/2009) NGA NTM: None (07/11/2009)
16645	18th	01/12/2002	1:82,662 (16645_1)	USCG LNM: 09/16/2008 (06/30/2009) CHS NTM: None (06/26/2009) NGA NTM: 11/27/2004 (07/11/2009)
16647	3rd	05/12/2001	1:100,000 (16647_1)	[L]NTM: ?
16640	24th	09/15/2001	1:200,000 (16640_1)	[L]NTM: ?
16013	30th	07/01/2006	1:969,761 (16013_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
1.1	Shoal	8.19 m	59° 23' 12.5" N	151° 54' 05.7" W
1.2	Shoal	3.12 m	59° 24' 30.6" N	151° 53' 44.8" W
1.3	Shoal	8.44 m	59° 23' 42.4" N	151° 54' 52.1" W
1.4	Shoal	5.28 m	59° 23' 16.3" N	151° 54' 00.2" W
1.5	Shoal	12.04 m	59° 24' 08.3" N	151° 55' 19.5" W

1 - Danger To Navigation

1.1) Profile/Beam - 56/97 from h12089 / fa_1010_reson8101_2009 / 2009-238 / 2009f_2390020

DANGER TO NAVIGATION

Survey Summary

Survey Position: 59° 23' 12.5" N, 151° 54' 05.7" W
Least Depth: 8.19 m (= 26.87 ft = 4.478 fm = 4 fm 2.87 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) ± 0.119 m ; TVU (TPEv) ± 0.220 m
Timestamp: 2009-239.00:20:44.389 (08/27/2009)
Survey Line: h12089 / fa_1010_reson8101_2009 / 2009-238 / 2009f_2390020
Profile/Beam: 56/97
Charts Affected: 16646_4, 16645_1, 16647_1, 16640_1, 16013_1, 531_1, 500_1, 530_1, 50_1

Remarks:

During OPR-P357-FA-09, H12089 Sheet F, a new rocky outcropping was found with Reson 8101 MBES. The rocky outcropping is South of Coal Cove in Kachemak Bay. The least depth was corrected with preliminary tides.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12089/fa_1010_reson8101_2009/2009-238/2009f_2390020	56/97	0.00	000.0	Primary

Hydrographer Recommendations

Extend 5 fathom contour around sounding and chart in surveyed location.

Cartographically-Rounded Depth (Affected Charts):

4 ½fm (16645_1, 16640_1, 16013_1, 530_1)

4fm 3ft (16646_4, 16647_1, 531_1)

8.2m (500_1, 50_1)

S-57 Data

[None]

Feature Images

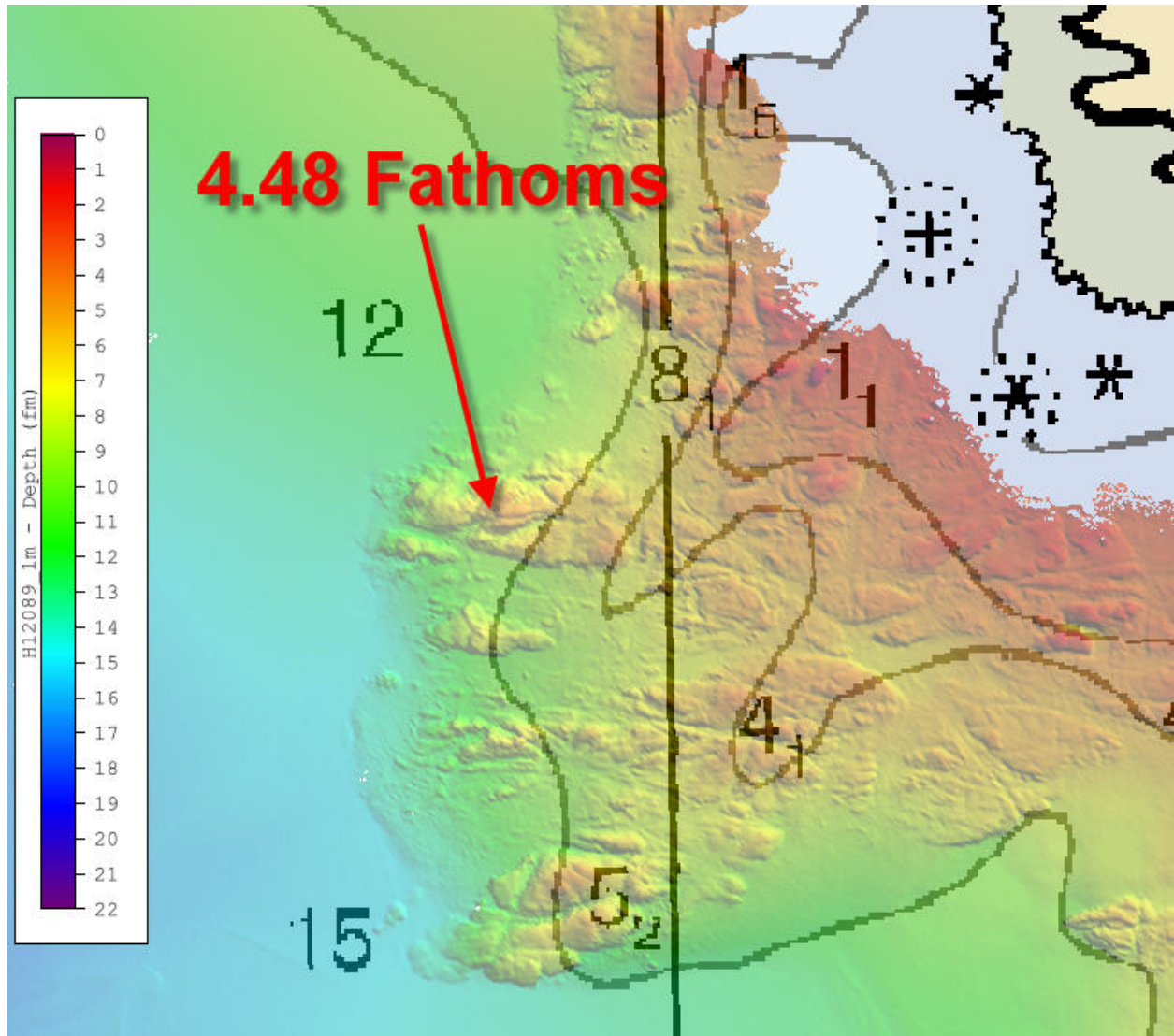


Figure 1.1.1

1.2) Profile/Beam - 1287/45 from h12089 / fa_1010_reson8101_2009 / 2009-239 / 2009f_2392320

DANGER TO NAVIGATION

Survey Summary

Survey Position: 59° 24' 30.6" N, 151° 53' 44.8" W
Least Depth: 3.12 m (= 10.23 ft = 1.704 fm = 1 fm 4.23 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.077 m ; **TVU (TPEv)** ± 0.213 m
Timestamp: 2009-239.23:22:11.325 (08/27/2009)
Survey Line: h12089 / fa_1010_reson8101_2009 / 2009-239 / 2009f_2392320
Profile/Beam: 1287/45
Charts Affected: 16646_4, 16645_1, 16647_1, 16640_1, 16013_1, 531_1, 500_1, 530_1, 50_1

Remarks:

During OPR-P357-FA-09, H12089 Sheet F, a new rock was found with Reson 8101 MBES. The rock is North of Dangerous Cape in Kachemak Bay. The least depth was corrected with preliminary tides.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12089/fa_1010_reson8101_2009/2009-239/2009f_2392320	1287/45	0.00	000.0	Primary

Hydrographer Recommendations

Chart in the surveyed location.

Cartographically-Rounded Depth (Affected Charts):

- 1 ¾fm (16645_1, 16640_1, 16013_1, 530_1)
- 1fm 4ft (16646_4, 16647_1, 531_1)
- 3.1m (500_1, 50_1)

S-57 Data

[None]

Feature Images

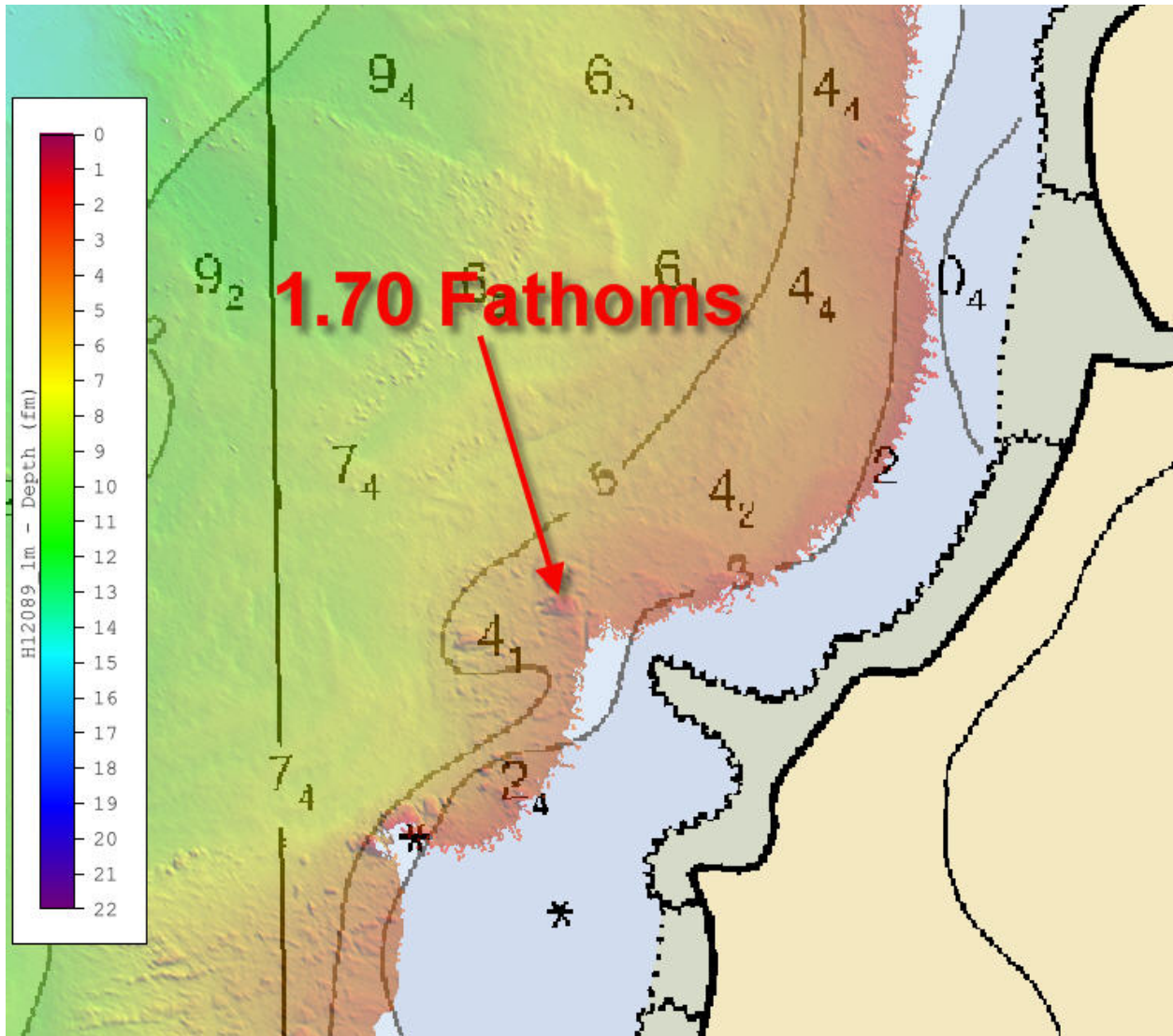


Figure 1.2.1

1.3) Profile/Beam - 713/59 from h12089 / fa_1018_reson8125_2009 / 2009-232 / 2009f_2322120

DANGER TO NAVIGATION

Survey Summary

Survey Position: 59° 23' 42.4" N, 151° 54' 52.1" W
Least Depth: 8.44 m (= 27.69 ft = 4.615 fm = 4 fm 3.69 ft)
TPU (±1.96σ): **THU (TPEh)** ±0.147 m ; **TVU (TPEv)** ±0.190 m
Timestamp: 2009-232.21:23:12.236 (08/20/2009)
Survey Line: h12089 / fa_1018_reson8125_2009 / 2009-232 / 2009f_2322120
Profile/Beam: 713/59
Charts Affected: 16646_4, 16645_1, 16647_1, 16640_1, 16013_1, 531_1, 500_1, 530_1, 50_1

Remarks:

During OPR-P357-FA-09, H12089 Sheet F, a new rocky outcropping was found with Reson 8101 MBES. The rocky outcropping is West of Dangerous Cape in Kachemak Bay. The least depth was corrected with preliminary tides.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12089/fa_1018_reson8125_2009/2009-232/2009f_2322120	713/59	0.00	000.0	Primary

Hydrographer Recommendations

Extend 5 fathom contour around sounding and chart in surveyed location.

Cartographically-Rounded Depth (Affected Charts):

- 4 ½fm (16645_1, 16640_1, 16013_1, 530_1)
- 4fm 3ft (16646_4, 16647_1, 531_1)
- 8.4m (500_1, 50_1)

S-57 Data

[None]

Feature Images

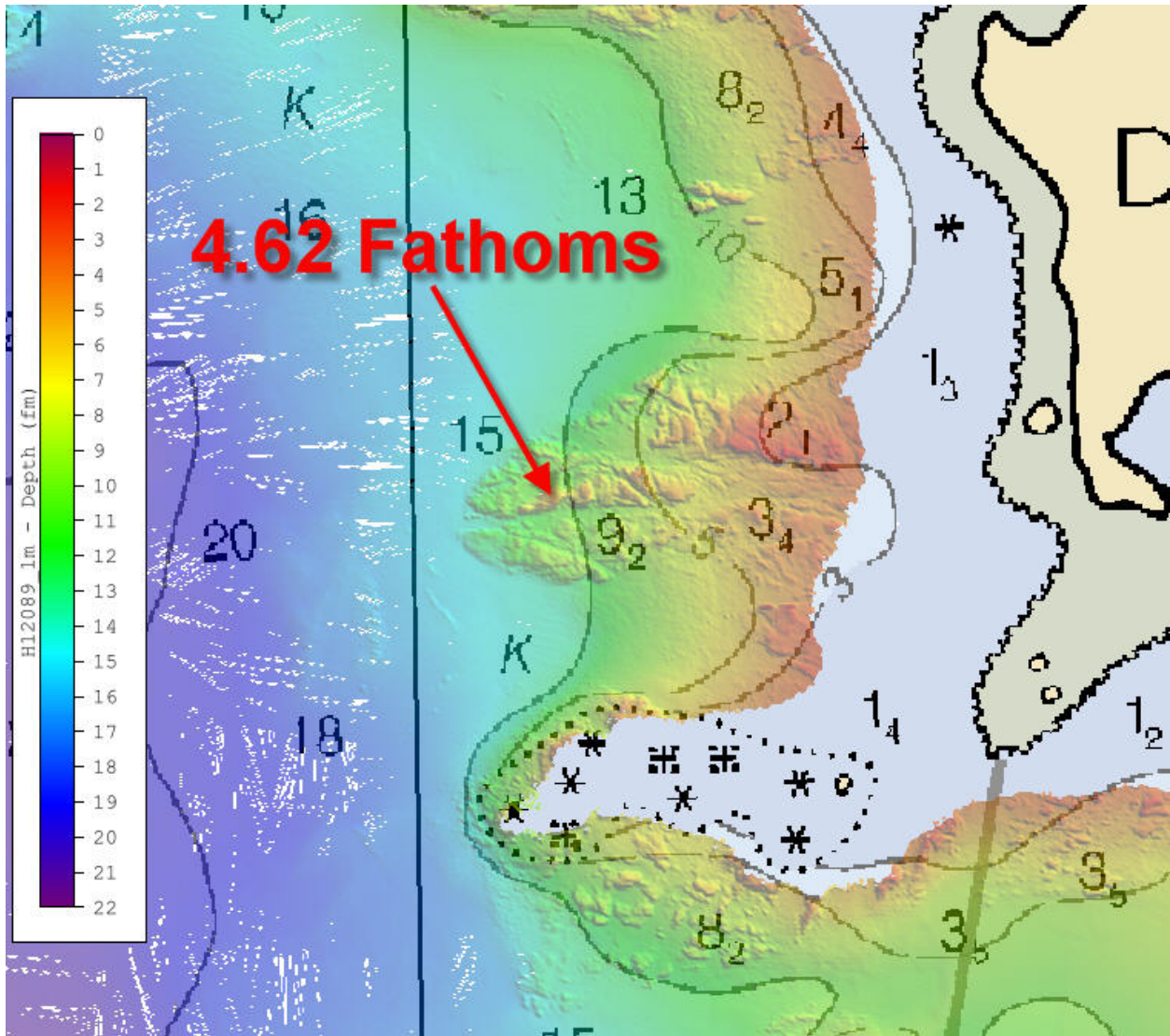


Figure 1.3.1

1.4) Profile/Beam - 2429/220 from h12089 / fa_1018_reson8125_2009 / 2009-240 / 2009f_2402027a

DANGER TO NAVIGATION

Survey Summary

Survey Position: 59° 23' 16.3" N, 151° 54' 00.2" W
Least Depth: 5.28 m (= 17.33 ft = 2.888 fm = 2 fm 5.33 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.157 m ; **TVU (TPEv)** ± 0.194 m
Timestamp: 2009-240.20:33:17.460 (08/28/2009)
Survey Line: h12089 / fa_1018_reson8125_2009 / 2009-240 / 2009f_2402027a
Profile/Beam: 2429/220
Charts Affected: 16646_4, 16645_1, 16647_1, 16640_1, 16013_1, 531_1, 500_1, 530_1, 50_1

Remarks:

During OPR-P357-FA-09, H12089 Sheet F, a new rocky outcropping was found with Reson 8101 MBES. The rocky outcropping is South of Coal Cove in Kachemak Bay. The least depth was corrected with preliminary tides.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12089/fa_1018_reson8125_2009/2009-240/2009f_2402027a	2429/220	0.00	000.0	Primary

Hydrographer Recommendations

Remove 8.1 fathom sounding to the south, extend 5 fathom contour around sounding and chart in surveyed location.

Cartographically-Rounded Depth (Affected Charts):

2 $\frac{3}{4}$ fm (16645_1, 16640_1, 16013_1, 530_1)
 2fm 5ft (16646_4, 16647_1, 531_1)
 5.3m (500_1, 50_1)

S-57 Data

[None]

Feature Images

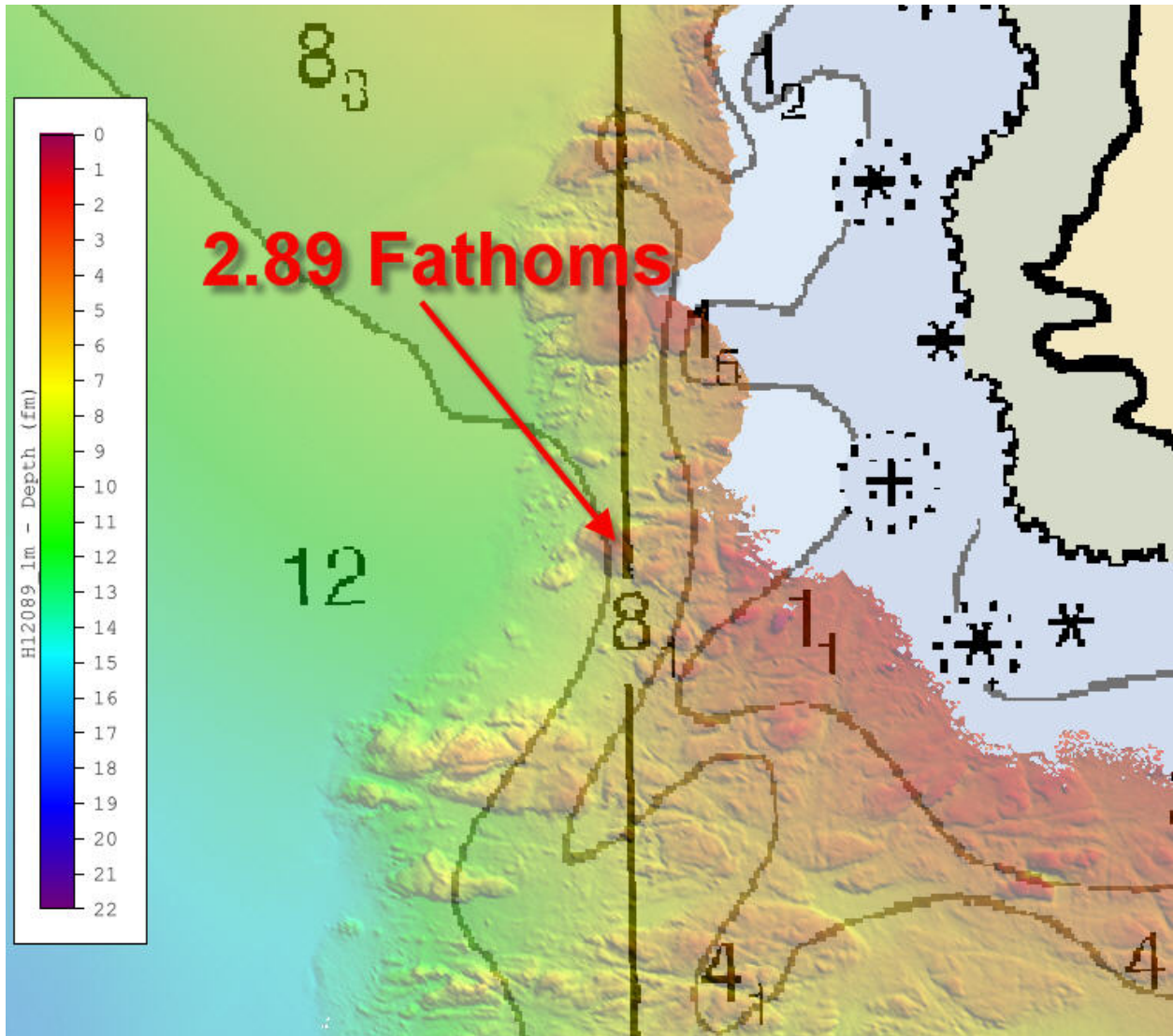


Figure 1.4.1

1.5) Profile/Beam - 634/228 from h12089 / fa_1018_reson8125_2009 / 2009-240 / 2009f_2402224

DANGER TO NAVIGATION

Survey Summary

Survey Position: 59° 24' 08.3" N, 151° 55' 19.5" W
Least Depth: 12.04 m (= 39.49 ft = 6.582 fm = 6 fm 3.49 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** ± 0.296 m ; **TVU (TPEv)** ± 0.227 m
Timestamp: 2009-240.22:26:39.294 (08/28/2009)
Survey Line: h12089 / fa_1018_reson8125_2009 / 2009-240 / 2009f_2402224
Profile/Beam: 634/228
Charts Affected: 16646_4, 16645_1, 16647_1, 16640_1, 16013_1, 531_1, 500_1, 530_1, 50_1

Remarks:

During OPR-P357-FA-09, H12089 Sheet F, a new extent to Cape Reef was found with Reson 8101 MBES. The rocky outcropping is off the west side of Cape Reef in Kachemak Bay. The least depth was corrected with preliminary tides.

Feature Correlation

Address	Feature	Range	Azimuth	Status
h12089/fa_1018_reson8125_2009/2009-240/2009f_2402224	634/228	0.00	000.0	Primary

Hydrographer Recommendations

Remove the 7.1 fathom sounding, extend the 10 fathom contour around the sounding and chart at surveyed location.

Cartographically-Rounded Depth (Affected Charts):

6 ½fm (16645_1, 16640_1, 16013_1, 530_1)
 6fm 3ft (16646_4, 16647_1, 531_1)
 12.0m (500_1, 50_1)

S-57 Data

[None]

Feature Images

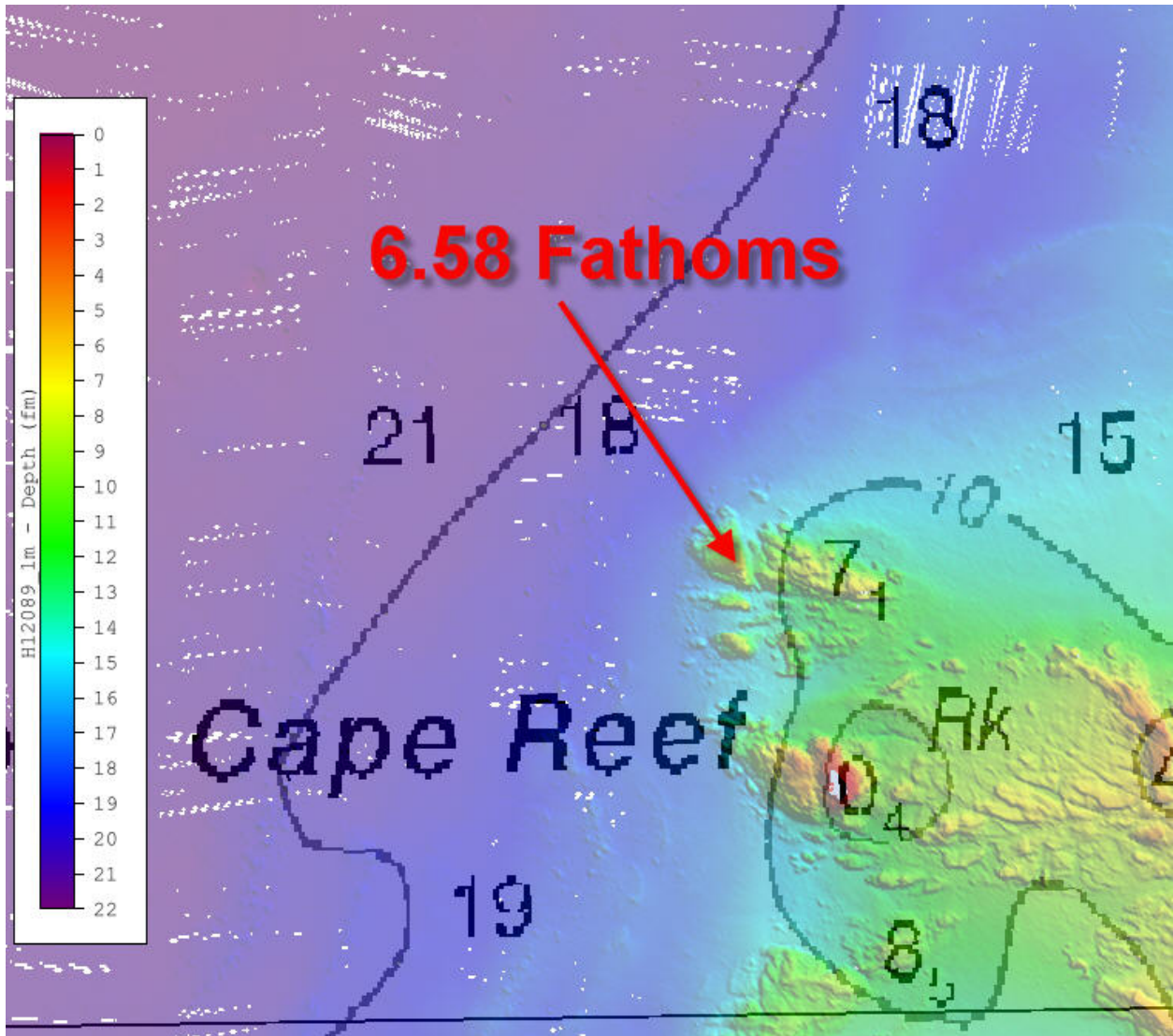


Figure 1.5.1



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : October 6, 2009

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-P357-FA-2009
HYDROGRAPHIC SHEET: H12089

LOCALITY: Passage Island to Point Naskowhad, Kachemak Bay, AK
TIME PERIOD: August 17 - 31, 2009

TIDE STATION USED: 945-5500 Seldovia, AK
Lat. 59° 26.4'N Long. 151° 43.2' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 5.252 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project OPR-P357-FA-2009, H12089, during the time period between August 17 and August 31, 2009.

Please use the zoning file "P357FARA2009CORP" submitted with the project instructions for OPR-P357-FA/RA-2009. Zones CIC12, CIC13, CIC14, CIC34, CIC35, CIC36, CIC37, CIC38, & CIC39 are the applicable zones for H12089.

Refer to attachments for zoning information.

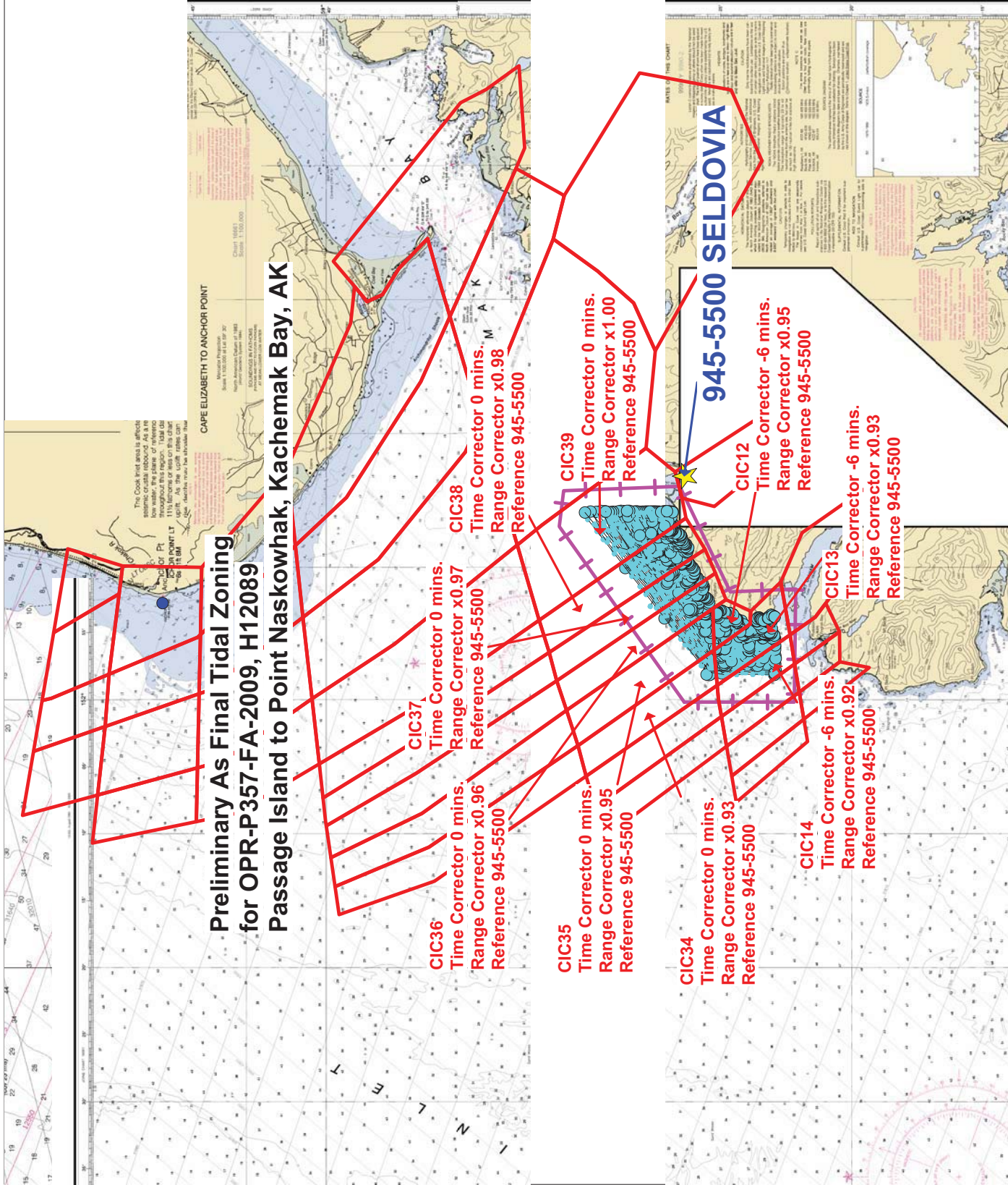
Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Peter J. Stone

Digitally signed by Peter J. Stone
DN: cn=Peter J. Stone, o=CO-OPS,
ou=NOAA/NOS,
email=peter.stone@noaa.gov, c=US
Date: 2009.10.09 08:00:46 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION





**Preliminary As Final Tidal Zoning
for OPR-P357-FA-2009, H12089**

Passage Island to Point Naskowhak, Kachemak Bay, AK

CIC36
Time Corrector 0 mins.
Range Corrector x0.96
Reference 945-5500

CIC37
Time Corrector 0 mins.
Range Corrector x0.97
Reference 945-5500

CIC38
Time Corrector 0 mins.
Range Corrector x0.98
Reference 945-5500

CIC35
Time Corrector 0 mins.
Range Corrector x0.95
Reference 945-5500

CIC39
Time Corrector 0 mins.
Range Corrector x1.00
Reference 945-5500

CIC34
Time Corrector 0 mins.
Range Corrector x0.93
Reference 945-5500

CIC14
Time Corrector -6 mins.
Range Corrector x0.92
Reference 945-5500

CIC13
Time Corrector -6 mins.
Range Corrector x0.93
Reference 945-5500

CIC12
Time Corrector -6 mins.
Range Corrector x0.95
Reference 945-5500

945-5500 SELDOVIA



H12089 HCell Report
Fernando Ortiz, Physical Scientist
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H12089 used:

Office of Coast Survey HCell Specifications: Draft, Version: 4.0, 17 March 2010.
HCell Reference Guide: Version 2.0, July 29, 2010.

2. Compilation Scale

Depths and features for HCell H12089 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NTM Date
16646	1:20,000	13th	11/2007	10/26/2010
16645	1:82,662	19th	07/2010	09/07/2010

The following ENC's were also used during compilation:

Chart	Scale
US5AK1BM	

3. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 4-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 for the 16646 chart at survey scale using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
-5	10	2
10	20	3
20	50	3.5
50	500	4

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

4. Depth Contours

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

Chart Contour Intervals in fathoms from Chart 16645	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 H12089_SS.000
0	0	0.2286	0	0
1	1.8288	2.0574	1.125	1
3	5.4864	5.715	3.125	3
5	9.144	9.3726	5.125	5
10	18.288	18.5166	10.125	10
20	36.576	37.9476	20.75	20
30	54.864	56.2356	30.75	50

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

5. Meta Areas

The following Meta object areas are included in HCell H12089:

M_QUAL
M_CSCL

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

6. Features

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

7.S-57 Objects and Attributes

The *_CS HCell contains the following Objects:

\$CSYMB	Blue Notes-Notes to the MCD chart Compiler
DEPCNT	Zero contour lines
M_CSCL	Chart Scale Meta Object
M_QUAL	Data quality Meta object
OBSTRN	Obstruction areas
SBDARE	Bottom samples- rocky seabed areas
SOUNDG	Soundings at the chart scale density
UWTROC	Rocks

The *_SS HCell contains the following Objects:

DEPCNT	Contours at chart scale intervals
SOUNDG	Soundings at the survey scale density

8. Spatial Framework

8.1 Coordinate System

All spatial map and base cell file deliverables are in an LLDG geographic coordinate system, with WGS84 horizontal, MHW vertical, and MLLW (1983-2001 NTDE) sounding datums.

8.2 Horizontal and Vertical Units

DUNI, HUNI and PUNI are used to define units for depth, height and horizontal position in the chart units HCell, as shown below.

Chart Unit Base Cell Units:

Depth Units (DUNI):	Fathoms 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

See the HCell Reference Guide for details of conversion from metric to charting units, and application of NOAA rounding.

9. Data Processing Notes

There were no significant deviations from the standards and protocols given in the HCell Specification and HCell Reference Guide.

10. QA/QC and ENC Validation Checks

H12089 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

H12089_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:20,000
H12089_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H12089_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12089_outline.gml	Survey outline
H12089_outline.xsd	

11.2 Software

CARIS HIPS Ver. 6.1	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 3.0	Creation of soundings and bathy-derived features, creation of the depth area, meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.1	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
HydroService AS, dKart Inspector Ver. 5.1, SP 1	Validation of the base cell file.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

12. Contacts

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

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APPROVAL SHEET
H12089

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

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

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