H11334

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. Sheet A

Registry No. H11334

LOCALITY

State Alaska

General Locality Behm Canal

Sublocality Eastern Rudyerd Bay

2004

CHIEF OF PARTY

CDR John E. Lowell, Jr., NOAA

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

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

REGISTER NO.

HYDROGRAPHIC TITLE SHEET

H11334

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.
Sheet A

State: Alaska

General Locality: Behm Canal

Sublocality: Eastern Rudyerd Bay

Scale: 1:10,000

Date of Survey: 10/23/2004 - 11/06/2004

Instructions Date: 5/12/2004

Project No.: OPR-O193-FA

Vessel: NOAA Ship Fairweather, S-220, and launches 1010, 1018, 2302

Chief of Party: CDR John E. Lowell, Jr., NOAA

Surveyed by: ST Keene, CST Morgan, LT Wetzler

Soundings taken by echo sounder: Reson 8111ER, Reson 8101ER

Graphic record scaled by: Fairweather Personnel

Graphic record checked by: Fairweather Personnel

Evaluation by: K. VanSant, P. Holmberg

Automated plot by: N/A

Verification by: P. Holmberg

Soundings in: Fathoms at MLLW

REMARKS: Time in UTC. UTM Projection Zone 9

Revisions and annotations appearing as endnotes were generated during office processing.

All separates are filed with the hydrographic data.

As a result, page numbering may be interrupted or non-sequential

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Descriptive Report to Accompany Hydrographic Survey H11334

Project OPR-O193-FA
Behm Canal, Alaska
Scale 1:10,000
November 2004
NOAA Ship FAIRWEATHER
Chief of Party: Commander John E. Lowell, Jr., NOAA

A. AREA SURVEYED

This hydrographic survey was completed as specified by the Hydrographic Survey Letter Instructions for OPR-O193-FA, dated May 12, 2004, with changes dated August 6, 2004 and September 22, 2004, as well as the Draft Standing Project Instructions dated March 21, 2002[1]. The purpose of this survey was to provide contemporary surveys to update National Ocean Service (NOS) nautical charts.

The survey area was located in Behm Canal, within the sub-locality of Eastern Rudyerd Bay. This survey corresponds to Sheet A in the sheet layout provided with the Letter Instructions, as shown in Figure 1 below. The lakes and rivers within the survey limits were not surveyed, because there were no accessible navigable waters from Rudyerd Bay.

Data acquisition was conducted from October 23 to November 6, 2004 (DN 297 to DN 311).

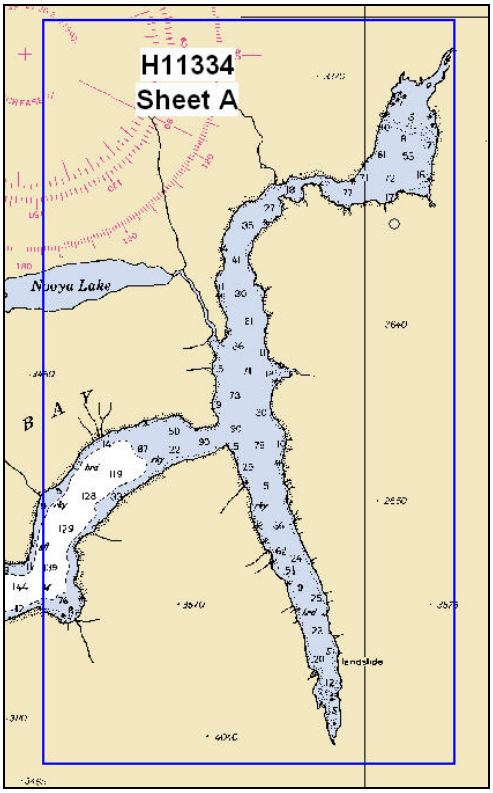


Figure 1: H11334 Sheet A Survey Limits

B. DATA ACQUISTION AND PROCESSING

A complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods can be found in the *FAIRWEATHER Data Acquisition and Processing Report – 2004* (DAPR)[2], submitted under separate cover. Items specific to this survey and any deviations from the aforementioned report are discussed in the following sections.

B1. Equipment and Vessels

NOAA Ship FAIRWEATHER (S220) is a 231' hydrographic survey vessel, equipped with a Reson 8111ER multibeam echosounder (MBES) system. The FAIRWEATHER's survey launches 1010 and 1018 are high speed, 29' aluminum hull Jensen survey launches. Both survey launches are equipped with Reson 8101ER MBES systems. Vessel 2302 is an AMBAR 700, used during shoreline acquisition.

FAIRWEATHER (S220), Launch 1010 and Launch 1018 are each equipped with an Applanix Position and Orientation System for Marine Vessels (POS/MV) 320 version 3. They are also equipped with Applanix TrueHeave and Precise Timing. Sound velocity correctors were acquired on all platforms with a SeaBird SeaCat SBE 19plus sound velocity profiler.

On October 25, 2004 (DN 299), Launch 1010 was configured to receive differential global positioning system (DGPS) correctors from the portable DGPS reference station established for this project. Two lines of MBES data were acquired using the portable DGPS reference station for differential correctors instead of the Coast Guard beacon at Annette Island. Refer to the Horizontal Control section of this report for further information. No other vessel configurations used during data acquisition deviated from the DAPR.

B2. Quality Control

Data Coverage

One hundred percent multibeam echosounder (MBES) coverage was obtained in the survey area at least to depths of eight meters and often shoaler. Data were acquired as close to shore as safely possible. Additional coverage was obtained in order to determine least depths over features or shoals.

There are data gaps in some portions of the final data set, even though 100% MBES coverage was obtained. These areas were investigated with MBES, but the processed Hydrographic Data Cleaning System (HDCS) data were deleted due to positioning problems. There were no navigationally significant features found within these areas[3]. Refer to the Quality Control section of this report for further information.

During acquisition on October 26, 2004 (DN 300), the FAIRWEATHER acquired lines of data in such a way that created a data gap near the western sheet limit for survey H11334. Data were acquired over this area, but the lines were applied to survey H11335, Sheet B of

this project. During processing, these files were copied and added to the data set for survey H11334. They extend beyond the survey limits, but were clipped in the CARIS Fieldsheets to include only the relevant area.

Crosslines

Shallow water multibeam crosslines for this survey totaled 2.86 linear nautical miles (lnm), comprising 3.6% of the 79.84 lnm of total SWMB hydrography. The main scheme lines acquired by the ship for survey H11335, which were copied for use in survey H11334 were not included in the calculations of total linear nautical miles of hydrography.

Some crosslines acquired for survey H11334 had to be deleted due to positioning errors in the data, so the total lnm of crosslines acquired does not meet the required 5% of the total hydrography. However, the uncertainty weighted BASE surfaces created in CARIS have reduced the need for using crosslines to check for systematic errors in the data[4]. The Hydrographer has determined, through manual examination of the data, that the crossline agreement is good.

Junctions

Survey H11334 junctions with H11335, which is Sheet B of the same project. The area of overlap between the sheets was reviewed in CARIS Subset Editor for consistency and data were found to be in good general agreement within one meter[5]. The sheet limits and area of overlap for Sheets A and B are shown in Figure 2.

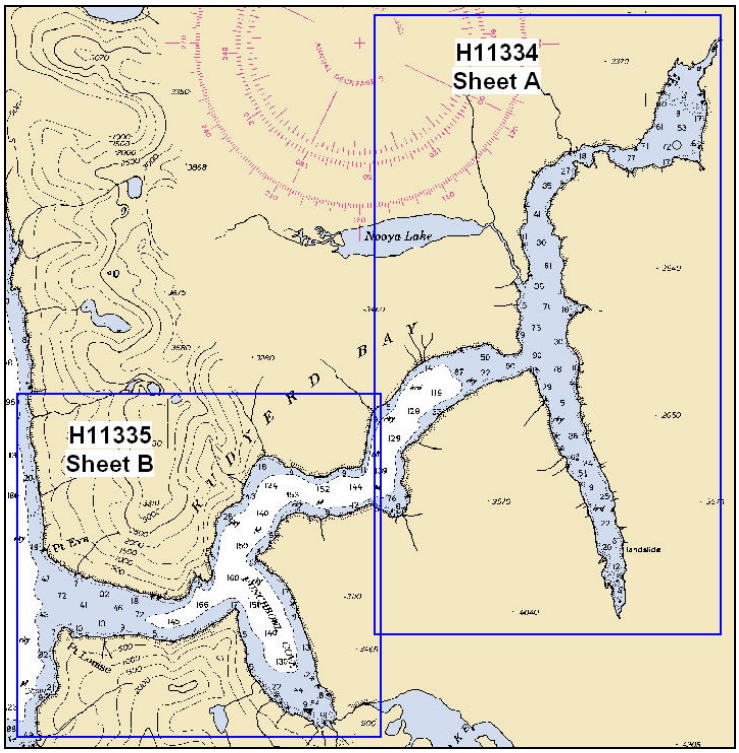


Figure 2: Junction Between H11334 and H11335

Accuracy Standards

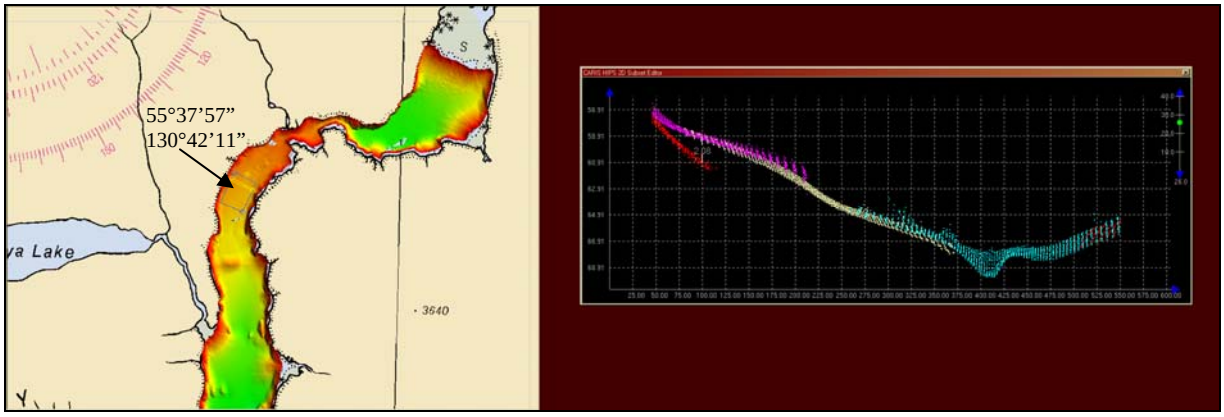
There were known errors associated with some of the data acquired during this survey that affected overall data accuracy. These problems are discussed in the Data Quality Factors and Corrections to Echo Soundings sections of this report. This Accuracy Standards section is included in this report to describe how problem data were treated and why the Hydrographer believes the data still meet requirements.

Total propagated error (TPE) filters were applied in CARIS HIPS to all sounding data from survey H11334. Only those soundings that satisfied the International Hydrographic Organization (IHO) requirements for both horizontal and vertical accuracy were accepted, as specified in the *NOS Hydrographic Surveys Specifications and Deliverables*.

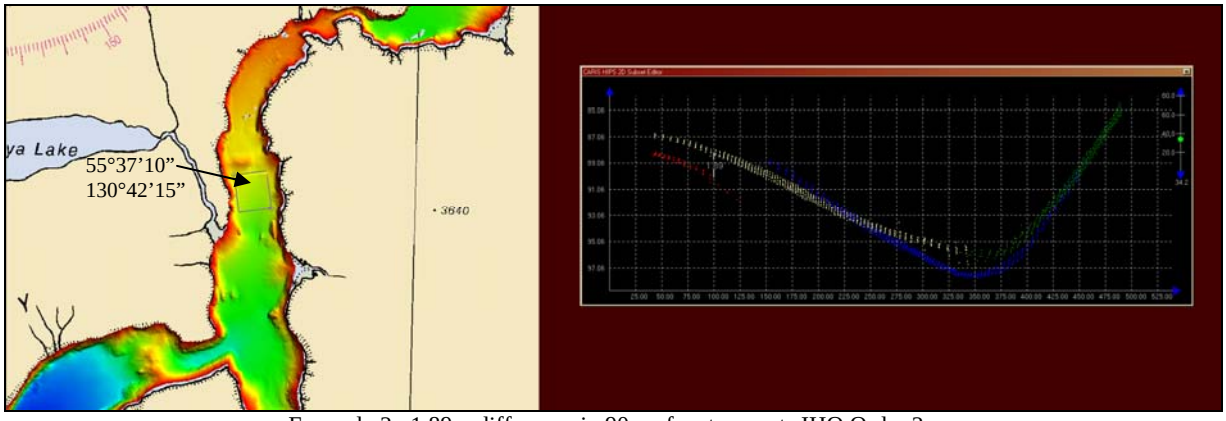
The function of TPE is to track the effect of systematic errors on individual soundings. Soundings that pass through the TPE filter have a calculated error value that is within IHO specifications. Physical errors, such as poor satellite geometry or changing water mass, are not accounted for within the TPE model. Therefore, soundings with acceptable systematic error values may not be in agreement with soundings on adjacent lines, because physical errors in the measurements were not accounted for.

The main sources of error in the data set from this survey were sound velocity (SV) and roll bias, which are depth dependent errors. In near shore areas of depths less than 30m, there is good correlation between swaths and data meets IHO Order 1 specifications. At depths greater than 30m, the SV and roll bias errors become exaggerated. Though the errors were reduced as much as possible, as described in the Corrections to Echo Soundings portion of this report, there are still remnants in some of the data.

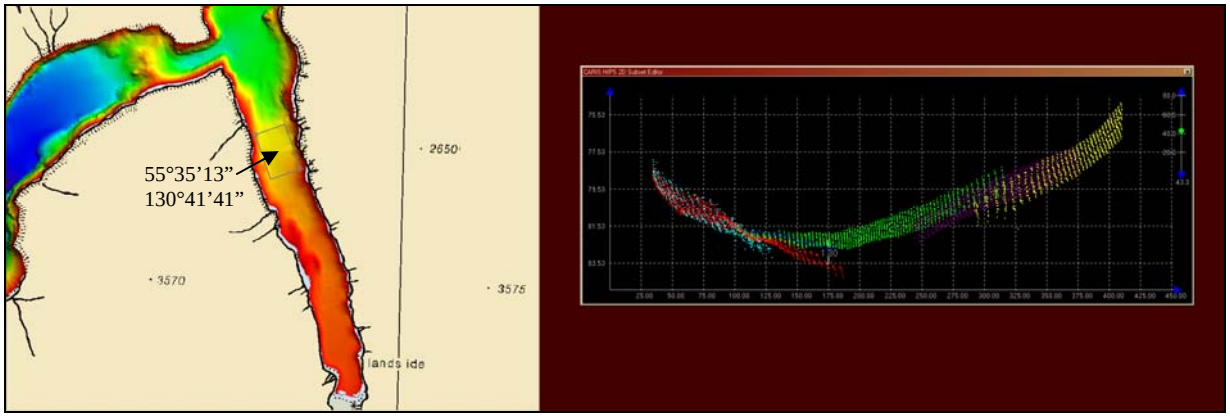
In several localized areas, shown by the examples in Figure 3 below, differences between sounding values from adjacent lines of data exceed specifications. Example 1 of Figure 3 shows a portion of data overlap where the disagreement between lines is not within IHO acceptable limits. The data in Examples 2 and 3 do not satisfy IHO Order 1 specifications for their respective depths, but are within the IHO Order 2 acceptable error.



Example 1: 2.08m difference in 60m of water does not meet IHO requirements.



Example 2: 1.89m difference in 90m of water meets IHO Order 2.



Example 3: 1.30m difference in 80m of water meets IHO Order 2.

Figure 3: Localized areas with problem data in depths greater than 30m

Sounding data could have been rejected in CARIS Subset Editor, to the effect of shaping the bottom. However, this would introduce an element of human bias. Instead, it was decided to filter data as much as possible while maintaining 100% coverage. Correctors were applied as discussed in the Corrections to Echosounding section below, obvious flyers were rejected and the rest of the data were left intact.

This decision to leave most of the data intact did not affect the overall integrity of the data set. Though differences between sounding values in certain areas were not within IHO Order 1 specifications, the use of the Bathymetry Associated with Statistical Error (BASE) surfaces produced in CARIS HIPS improved the representation of the bottom. The mathematical formulas used for the generation of BASE surfaces weight soundings from near nadir beams more heavily than soundings from the outer beams. Since it is the outer beams that generally have a larger associated error value than nadir beams, this weighting helps to minimize the error introduced into the BASE surface. The result is a surface that is a better representation of the bottom than the sounding data alone, as seen in Figure 4[6].

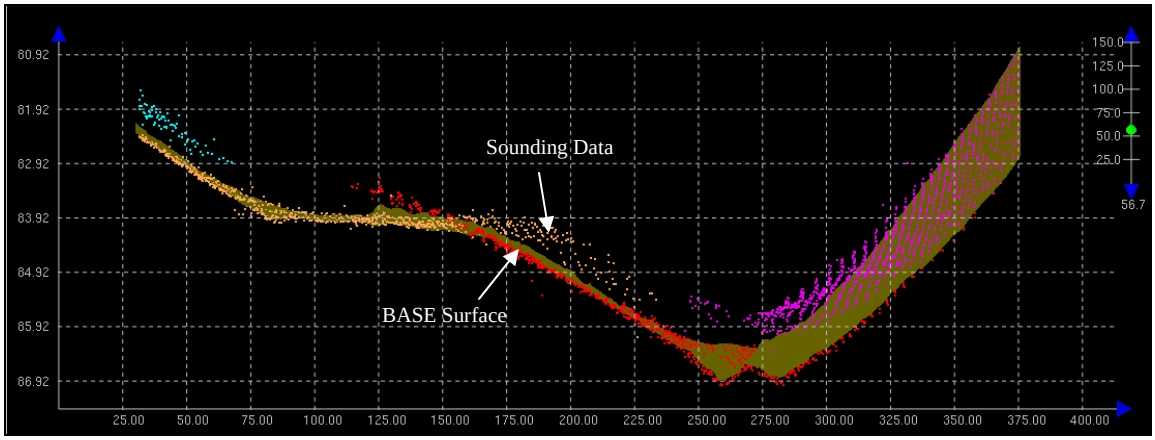


Figure 4: The BASE surface creates a better representation of the bottom than the sounding swaths alone, by weighting the nadir beams more heavily than the outer beams.

Problem data in this survey were limited to localized sections of overlapping lines, in depths greater than 30m. The Hydrographer has determined that the errors were minimized by the BASE surfaces, so that IHO Order 1 accuracy requirements have been met. The BASE surfaces and associated soundings should be considered adequate to supersede prior surveys[7].

Data Quality Factors

TRUE HEAVE:
True heave could not be applied to data from October 23, 2004 (DN 297), due to a corrupt file. Data quality from that day does not appear to have been affected by the lack of true heave, due to the negligible swell in the protected fjord.

POSITIONING:
Due to the steep terrain and high latitude of Eastern Rudyerd Bay, it was difficult to maintain an adequate number of satellites as required for GPS positioning and GPS Azimuth Measurement Subsystem (GAMS). The POS M/V occasionally indicated that the GAMS status was “Not Ready”. The tall surrounding cliffs also blocked the signal for DGPS correctors in some areas. Most days of data acquisition were hampered by these problems. In the interest of efficiency, data were acquired when GAMS was “Not Ready” as long as the Horizontal Dilution of Precision (HDOP) remained less than four and the GAMS Heading

Accuracy was less than 0.5°. The lines on which these problems were encountered are noted in the daily acquisition logs.

On November 5, 2004 (DN 310), poor satellite geometry and limited reception of differential correctors made it impossible to maintain good positioning information for some lines. It was decided to continue with acquisition and note problems in the acquisition log, since the data being acquired was intended to fill in data gaps. There were no navigationally significant features found on this day, so any lines from DN 310 with poor positioning data were removed from the final HDCS data set.

SOUND VELOCITY:
There was a large amount of fresh water flowing into the bay during data acquisition, which caused some sound velocity problems in the data. CTD casts were taken at regular time intervals and in different geographic areas, in order to obtain sound velocity profiles to be used in data processing. However, the outer beams in some of the data still displayed curvature due to refraction through the water column. These lines were filtered as much as possible and more data were acquired over these areas in order to obtain adequate coverage. The sound velocity issues in the data were handled as discussed in the Data Reduction portion of this report.

ROLL:
On October 24, 2004 (DN 298), there was a problem noted with the roll calibration of Launch 1010. This problem grew slowly, but steadily worse throughout the project. The source of the error is believed to be instability in the sonar mounting system, which was noted to have loose bolts. However, this was not determined until data acquisition was completed for this survey, so the problem could not be addressed directly. Instead, correctors had to be adjusted during processing in order to bring the data into self agreement. Refer to the Data Reduction section for further information.

B3. Corrections to Echo Soundings

Data reduction procedures for survey H11334 conform to those detailed in the *FAIRWEATHER Data Acquisition and Processing Report – 2004*, with the exceptions as discussed below.

SOUND VELOCITY:
Data from October 24, 2004 (DN 298) exhibited significant sound velocity (SV) problems. It was believed that one of the CTD casts was not performed close enough to the area of data acquisition, and thus did not provide an accurate sound velocity profile. However, there were casts done both the previous and following days (DN 297 and DN 299) which were in closer proximity to the acquired lines. These alternate casts were applied to the data during processing as noted in the Acquisition and Processing Logs. The Hydrographer felt justified in applying sound velocity casts to data acquired outside of the normal four to six hour window, due to the fact that the water mass in Rudyerd Bay varied more geographically than temporally. The sound velocity error in the data from DN 298 within this area was drastically improved, as shown in Figure 5.

Data from November 3, 2004 (DN 308) also had sound velocity problems within the southern arm of the bay. Since there were no other casts that could be applied to this data, it was filtered in CARIS to eliminate any beams past 40° from nadir, thus reducing the amount of curvature error introduced into the data set.

ROLL:
During data processing, inconsistencies were noted in the data, but the source of the problems was originally believed to be SV. After further acquisition and processing, it became apparent that there was also a roll bias error in the data from Launch 1010. In an attempt to minimize the effects of this error, the hydrographer made appropriate changes to the .hvf for Launch 1010. Refer to the *1010 Vessel Report* in Appendix III of the *FAIRWEATHER Data Acquisition and Processing Report – 2004* for a discussion of these changes.

Figure 5 shows two before and after examples of problem data. The images on the left show the data with the original SVP and roll bias correctors applied. The images on the right are the same data after the alternate CTD casts were applied and the roll bias value in the .hvf for Launch 1010 was updated. It is apparent that these changes improved the consistency within the data.

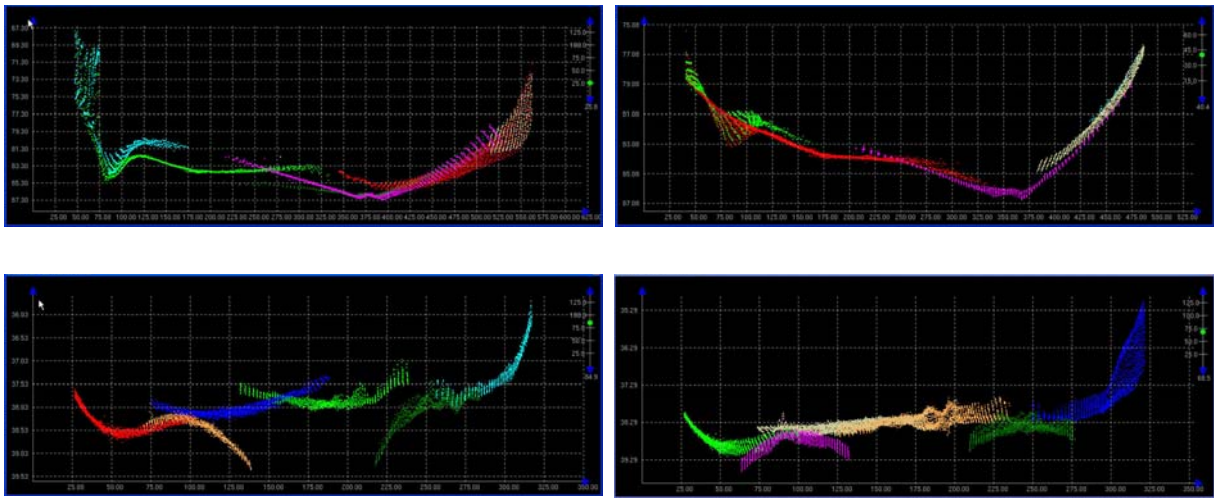


Figure 5: Before (left) and after (right) examples of data with Sound Velocity and Roll problems corrected as described above. Colors do not necessarily match.

C. HORIZONTAL AND VERTICAL CONTROL

A complete description of horizontal and vertical control for survey H11334 can be found in the *OPR-O193-FA-04 Horizontal and Vertical Control Report*[8], submitted under separate cover. A summary of horizontal and vertical control for this survey follows.

Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. Differential corrections from

the U.S. Coast Guard beacon at Annette Island (323 kHz) were utilized during this survey, as well as a portable DGPS reference station MOM1, established by FAIRWEATHER personnel within the survey limits.

Two lines of sounding data were acquired by Launch 1010 on October 25, 2004 (DN 299) using the portable DGPS reference station MOM1, instead of the Coast Guard beacon. Further use of the portable DGPS reference station was prevented due to the loss of the equipment sometime between the evening of November 2 and November 4, 2004 (DN 307 - DN 309). A storm induced landslide is believed to have swept the transmitter and all associated gear into the water. The equipment could not be retrieved.

Refer to the Horizontal and Vertical Control Report for this project for further information regarding the portable DGPS reference station.

Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station at Ketchikan, AK (945-0460) served as control for datum determination and as the primary source for water level reducers for survey H11334.

FAIRWEATHER personnel installed a Sutron 8210 “bubbler” tide gauge at the tertiary station listed below. The gauge was installed in order to provide information to Center for Operational Oceanographic Products and Services (CO-OPS N/OPS1) for the determination of time and height correctors, in accordance with the Project Instructions.

Station Name	Station Number	Type of Gauge	Date of Installation	Date of Removal
Rudyerd Bay	945-0651	30 Day	October 19, 2004	November 6, 2004

Gauge #9 (S/N 002332) was initially installed on October 10, 2004 (DN 284). However, subsequent pressure sensor and time failure of this gauge necessitated replacement of the gauge. The data acquired by gauge #9 was not usable.

The replacement gauge (#14, S/N 024444) was installed on October 19, 2004 (DN 293) and acquired usable data until November 4, 2004 (DN 309). A landslide at the site of the tide gauge destroyed most of the equipment and severed the tubing from the gauge to the orifice. No further water level data were acquired. Remnants of the station and equipment were removed on November 6, 2004 (DN 311).

Refer to the Horizontal and Vertical Control Report for this project for further information about the tide station.

All data were reduced to MLLW using unverified observed tides from station Ketchikan, AK by applying tide file 9450406.tid and time and height correctors through the revised zone corrector file O193FA2004CORP_rev.zdf.

The Pacific Hydrographic Branch will apply final approved (smooth) tides to the survey data during final processing[9]. A request for delivery of final approved (smooth) tides for survey H11334 was forwarded to N/OPS1 on November 12, 2004 in accordance with the Field Procedures Manual (FPM) 4.8. A copy of the request is included in Appendix 5.

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison

Using the bathymetric depths inserted in Pydro, survey H11334 was compared with charts 17420 (26th Ed.; September 22, 2001, 1:229,376) and 17424 (6th Ed.; October 13, 1990, 1:80,000). Both charts have been updated with the Notice to Mariners through June 5, 2004 and the most recent Notice to Mariners from November 13, 2004 was consulted. There were no new changes within the survey area.

Chart 17420

Depths from survey H11334 generally agreed within one to two fathoms with depths on chart 17420[10].

Chart 17424

Depths from survey H11334 generally agreed within one to two fathoms[11] with depths on chart 17424. 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.

Recommendations

The Hydrographer has determined that bottom coverage requirements have been met and data accuracy is as discussed in the Accuracy Standards portion of this report. The BASE surfaces and associated soundings are adequate to supersede prior surveys in their common areas[12]. Final chart comparisons will be made at the Pacific Hydrographic Branch after the application of smooth tides.

D.2 Shoreline

Shoreline Source

There were two sources of shoreline provided for this project. The Mean High Water (MHW) line was provided in vector format from photogrammeteric survey CM-8314 (NAD 27) at the scale of 1:20,000. The Mean Lower Low Water (MLLW) line was provided in vector format from project AK0307 (NAD 83) GC-10557 at the scale of 1:20,000. In addition, features shown on the current editions of charts 17424 and 17420 that were not depicted on the

shoreline source documents were digitized in MapInfo by FAIRWEATHER personnel and displayed in the shoreline acquisition software TerraSync for field verification.

Shoreline Verification

FAIRWEATHER personnel conducted limited verification of the Cartographic Feature File (CFF) shoreline using Launches 1018 and 2302. Operations were conducted at times near predicted low water, in accordance with the Standing Project Instructions and FPM, sections 6.1 and 6.2. Most shoreline windows corresponded to times in the late afternoon, when it was starting to get dark outside. As a result, some of the pictures taken of features were difficult to discern and others were deemed unusable. Those included in Pydro were the best of the available photographs, though the quality of most is still poor.

Detached positions (DPs) and generic positions (GPs) acquired during shoreline verification were recorded in TerraSync and on DP forms. Scanned copies of the DP forms are included in the digital Separates folder and hard copies can be found with the Separates to be Included with Survey Data[13]. In addition, annotations describing shoreline were recorded on hard copy plots of the digital shoreline[14].

Terminology used during shoreline verification followed standards agreed upon between the Pacific Hydrographic Branch and FAIRWEATHER personnel. The term “Noted” indicates that the feature is correctly located within the scale of the chart or source, as confirmed from a distance. The term “Verified” was used when the existence of the feature was confirmed in close proximity and the feature is correctly located within the scale of the survey.

During shoreline verification, the charted (17424) rock located at 55°37’58”N, 130°41’44”W was found to be the seaward most extent of a ledge. No DP was recorded at the position, but the ledge was drawn on the hard copy of the boat sheet and then transferred to the H11334_Shoreline_Updates.hob layer in the CARIS Notebook, as shown in Figure 6[15].

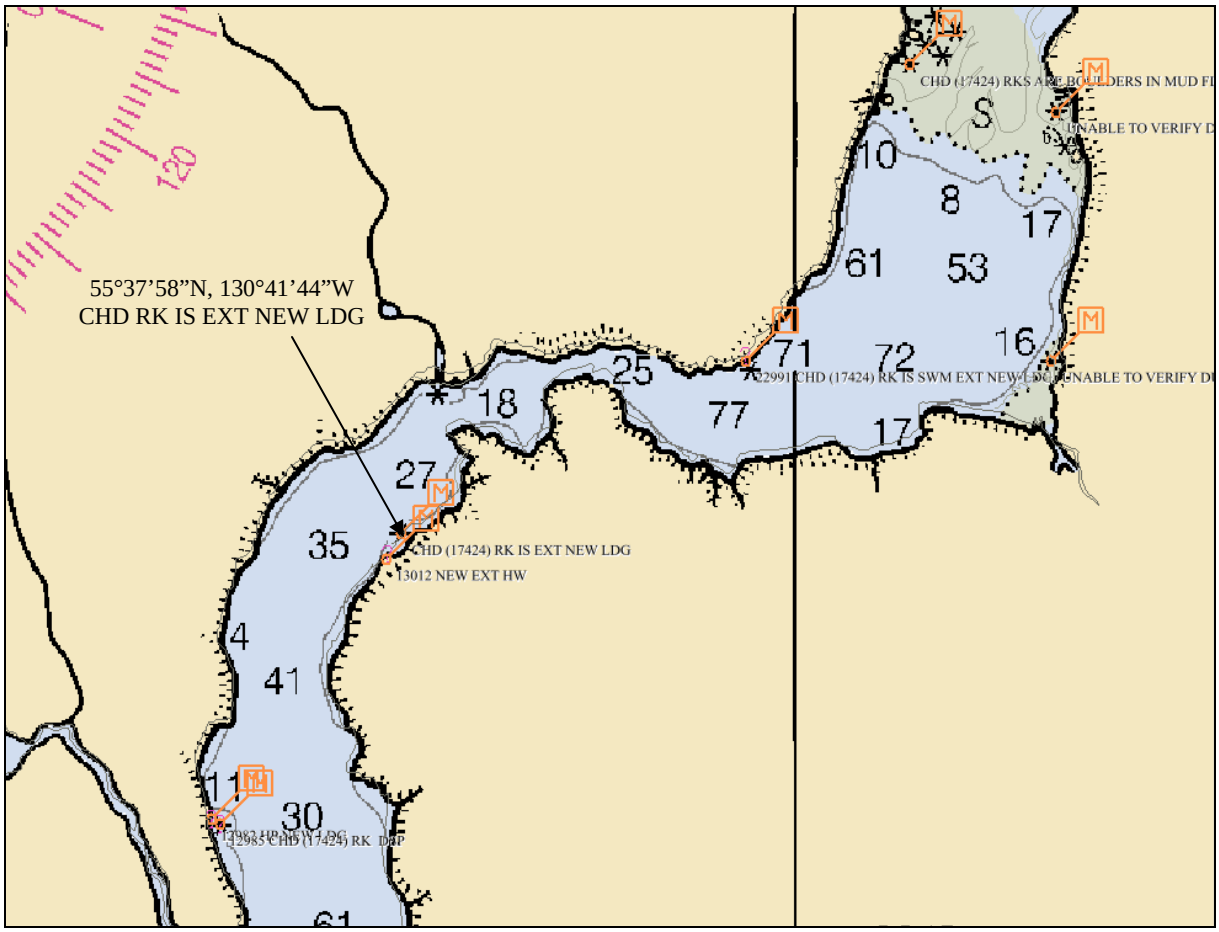


Figure 6: Location of new ledge with no DP, as depicted in CARIS Notebook.

Shoreline Data Processing

In an effort to streamline the data pipeline from the field to the processing branch, MapInfo tables and workspaces were not used for shoreline processing by FAIRWEATHER personnel. Instead, Pydro and CARIS Notebook were used exclusively. Charted shoreline and features were digitized into a CARIS Notebook .hob file with an associated marker layer for notations. Positions acquired during shoreline verification operations were processed in GPS Pathfinder and inserted as DP/GP in Pydro. The DPs and GPs indicate revisions to features, or features not found during shoreline verification.

Investigation or survey methods are listed under the Remarks tab in Pydro. Some rock disprovals and ledge extents had to be imported into Pydro as GPs instead of DPs, because there had been no height/depth associated with the item in TerraSync. Pydro cannot insert features as DPs if there is a zero in the height/depth field. GPs do not have tides applied.

Features were flagged as Primary, unless there were multiple DPs/GPs taken on the same feature. In that case, the most important DP was marked Primary and the associated GPs were flagged Secondary.

Items for survey H11334 associated with a detached or generic position that needed further discussion were flagged Report in Pydro. Investigation methods and recommendations were provided in the Remarks and Recommendations tabs. A report with these items was generated and saved as H11334_Shoreline_Report.pdf in Appendix 4[16].

All primary detached positions and bottom samples were imported from the Pydro .xml to three separate stand alone .hob files in CARIS Notebook 2.2 Beta. These were named H11334_Add_ Features.hob, H11334_Modify_Features.hob, H11334_Delete_Features.hob. The marker layers associated with these .hob files shows the display name and any remarks for each feature.

New HW/MLLW features and any changes to the source shoreline, such as ledges, were digitized with S57 attribution in the H11334_Shoreline_Updates.hob file. The associated marker layer was used to label any new features that did not have an associated DP or GP. Charted shoreline, when used for reference purposes or when source data were not available, was digitized with S57 attribution in the Notebook H11334_Charted_Shoreline.hob file. Comments regarding charted features were transferred from the boat sheet to the H11334_Charted_Shoreline marker layer. Any remaining comments on the boat sheet from observations made in the field, including field notes made by the Hydrographer regarding verification of source features, were entered in the H11334_Shoreline_Notes marker layer.

The verified CFF shoreline was imported to CARIS Notebook as non-editable shape files, then converted to a .hob editable layer named H11334_CFF_Shoreline.hob. All objects in this layer have S-57 attribution.

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 CFF and charts[17].

D.3 Automated Wreck and Obstruction Information System (AWOIS) Investigations

There were no AWOIS items were located within the limits of H11334[18].

D.4 Dangers to Navigation

There were no dangers to navigation found within the survey limits[19].

D.5 Aids to Navigation

There were no aids to navigation within the survey limits[20].

D.6 Bottom Samples

Bottom samples were collected on November 6, 2004 (DN 311) and are included as seabed classifications along with the other S-57 features in the Pydro Preliminary Smooth Sheet. The bottom sample positions were also imported to the Notebook H11334_Bottom_Samples.hob file.

D.7 Coast Pilot Report

There were at least two landslides within the survey limits noted by FAIRWEATHER personnel. Unstable terrain may be common in Eastern Rudyerd Bay and should be noted in the Coast Pilot. The relevant chapter of *Coast Pilot 8*; 26th Ed., 2004, has been edited and will be submitted in digital form to the Coast Pilot Branch[21].

D.8 Miscellaneous

Multiple landslides occurred in Eastern Rudyerd Bay after multibeam and shoreline acquisition was completed for survey H11334. The locations of the known landslides are indicated in Figure 6. Refer to the Horizontal and Vertical Control reports for more information, but it is recommended that the shore stations at these locations not be reoccupied during future surveys.

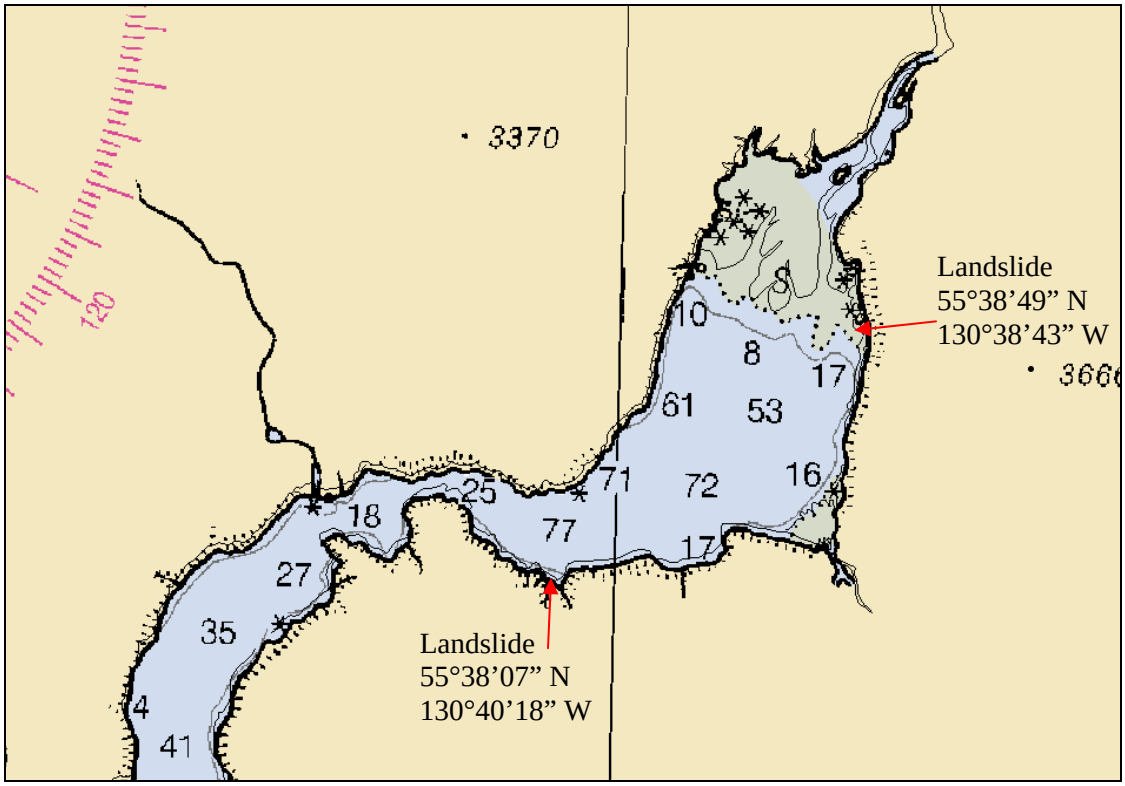


Figure 7: Locations of landslides within survey limits

E. APPROVAL

As Chief of Party, I have ensured that standard processing procedures were followed in producing this examination in accordance with the Hydrographic Manual, Fourth Edition, Hydrographic Survey Guidelines, Field Procedures Manual and the NOS Hydrographic Surveys Specifications and Deliverables, as updated for 2002[22].

The digital data and supporting records have been reviewed, are considered complete and adequate for charting purposes, and are approved. All records are forwarded for final review and processing to N/CS34, Pacific Hydrographic Branch.

Survey H11334 is complete and adequate to supersede prior surveys in their common areas. No additional work is required for this survey[23].

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

Title	Date Sent	Office
Data Acquisition and Processing Report – 2004	TBD[24]	N/CS34
Horizontal and Vertical Control Report for OPR-O193-FA-04	TBD[25]	N/CS34
Tides and Water Levels Package for OPR-O193-FA-04	TBD[26]	N/OPS1
Coast Pilot Report for OPR-O193-FA-04	TBD[27]	N/CS26

Approved and Forwarded:

John E. Lowell, Jr.
Commander, NOAA
Commanding Officer

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

Survey Sheet Manager:

Jennifer A. Keene
Survey Technician, NOAA

Field Operations Officer:

Mark A. Wetzler
Lieutenant, NOAA

[1] Do not concur, standing instructions are dated April 15, 2003.
[2] Filed with project records.
[3] Office review of rejected data also revealed no navigtationally significant features or shoaling. While rejected data fails to meet horizontal positioning requirements in NOS Hydrographic Surveys Specifications and Deliverables version (2003 version), it falls within the IHO S-57 Catalog Quality of Data, Zone of Confidence for the surrounding data. See the H-Cell Supplemental Report for more on Quality of Data characterization and attribution for these areas.
[4] Concur with clarification. While there's common agreement in the hydrographic community that uncertainty weighted BASE surfaces generally negate the need for crosslines, there is no official Office of Coast Survey stand on the issue. Not all possible errors are accounted for in the TPE calculations.
[5] Concur.
[6] Concur.
[7] Concur.
[8] Filed with project records.
[9] Concur, approved tides were applied during the quality review on May 5, 2005.
[10] Concur.
[11] Do not concur, differences range from 1 to 11 fathoms.
[12] Concur.
[13] Filed with project records.
[14] Filed with project records.
[15] The charted rock was disproved by multibeam and ledge delineated as delivered.
[16] During office processing a comprehensive listing of all features delivered was generated, titled H11334_Features.xls. This document is filed with the project records.
[17] Shoreline has been evaluated against existing shoreline, chart features, hydrography, and utilized or modified as needed.
[18] Concur.
[19] Concur.
[20] Concur.
[21] Coast Pilot has been updated.
[22] Specs and Deliverables applicable to this survey are dated 2003.
[23] Concur.
[24] 5/2/2005
[25] 7/15/2005
[26] 11/8/2004
[27] 9/22/2004

H11334 HCell Supplemental Report

Peter Holmberg, Physical Scientist
Pacific Hydrographic Branch

Introduction

The primary purpose of the HCell is to directly update NOAA ENCs with new survey information in International Hydrographic Organization (IHO) format S-57. HCell compilation of survey H11334 utilized Office of Coast Survey HCell Specifications Version 2.0, draft, April 2, 2007. HCell H11334 will be used to update chart 17424,1:80,000 (7th Ed.; March, 2004, NM 3/10/2007). There is no ENC for this area.

1. Compilation Scale

The density of soundings in the HCell are compiled as appropriate to emulate those soundings of Chart 17424, 1:80,000. Position and density of non-bathymetric features included in the HCell have not been generalized from the scale of the hydrographic survey, 1:10,000.

2. Soundings

2.1 Source Data

A 5 m resolution Combined BASE surface, **H11334_5m_cmbd**, was used as the basis for HCell production following Branch certification. This surface contained three designated soundings, none of which were submitted as DtoNs.

The combined BASE surface, **H11334_5m_cmbd**, contained some small gaps in the data, the cause and acceptance of the gaps is documented in section 3.2 of H11334_DR.doc. To maintain the density of shoal soundings in some areas of the data set where data is sparse small sections of data were manually selected (see soundings in red in figure 1).

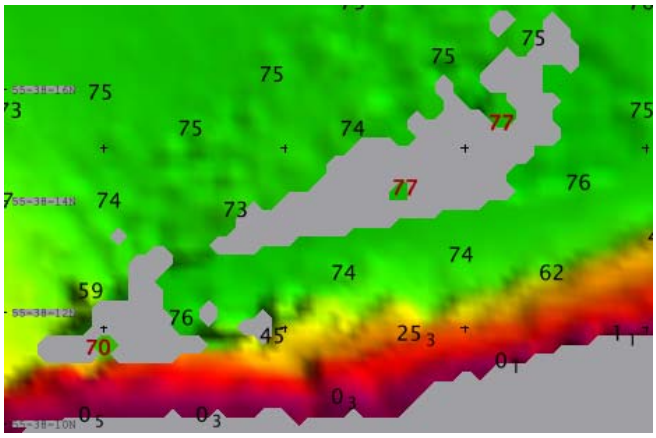


Figure 1. Manually selected soundings (shown in red).

A survey-scale sounding (SOUNDG) feature object source layer was built from the **H11334_5m_cmbd** surface in CARIS BASE Editor. A shoal-biased selection radius of 5 mm was used at a 1:10,000 survey scale.

2.2 Sounding Feature Objects

In CARIS BASE Editor soundings were manually selected from the high density sounding layer, **H11334_soundings_ss,** and imported into a new layer created to accommodate chart density depths, **H11334_soundings_cs**. Manual selection was used in lieu of an automated routine to accomplish a density and distribution that more closely represents the seafloor morphology. The hand selection also more closely emulates density and distribution of soundings on chart 17424 than is possible using automated methods. See section 10.1, Data Processing Notes, for details about the use of manual sounding selection for H11334. The sounding feature object source layer was exported as **H11334_soundings_cs**, and imported into HOM.

3. Depth Areas

3.1 Source Data

The BASE surface **H11334_5m_cmbd** was used to generate both an all encompassing depth area, and, for survey evaluation and verification purposes only, a set of chart equivalent contours. No actual depth contours were delivered per OCS HCell Specifications ver.1.2, draft.

3.2 Depth Area Feature Objects

One all-encompassing depth range, 0 meters to 300 meters, was used for all depth area objects below MLLW. Upon conversion to NOAA charting units, this depth range is 0 fathoms to 164 fathoms.

Five separate depth areas were created for ledges ranging from -4.481 meters to 0 meters. Upon conversion to NOAA charting units, this depth range is -14.7 fathoms to 0 fathoms.

4. Meta Areas

The following Meta object areas are included in HCell 11334:

M_QUAL
M_COVR
M_NSYS

Meta area objects were constructed on the basis of perimeter lines delineating the hydrographic limits, “islands of coverage” for point features surveyed outside the

hydrographic limits, and extents of data gaps inside the survey area. These perimeters were first used to create the Skin of The Earth (SOTE) layer, then were duplicated to the Meta object layers and attributed per the HCell Specifications, ver. 1.2, draft.

5. Survey Features

There are 5 ledges and 5 rocks (UWTROCs) included in the H11334 HCell. These features have been characterized per HCell Specifications, ver. 2.0. Ledges are shown as SBDARE area objects and include the geometrically coincident intertidal depth area required for proper S-57 characterization.

Extents of some of the ledges acquired during shoreline operations conflicted with the depths from the Nav surface. During office processing, hydrography and the limits of the hydrographic coverage were used to refine the ledge extents.

Bottom samples gathered during field operations have been applied to the HCell and replace charted bottom characteristics.

6. Shoreline / Tide Delineation

Depth areas (DEPARE) and Seabed areas (SBDARE) were created for ledges. The depth range of the depth areas is -4.481 meters to 0.0 meters. Per OCS HCell specifications ver. 2.0 “if no ENC exists, use the smallest listed Mean High Water value in the paper chart TIDAL INFORMATION box.”

7. Attribution

All S-57 Feature Objects have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with OCS HCell Specifications, ver. 2.0.

8. Layout

8.1 CARIS HOM Layering Scheme

100	Soundings (chart scale)
101	Soundings (survey scale)
200	Group 1 objects (Skin of the Earth)
300	Point objects (UWTROC, SBDARE)
500	Area objects (SBDARE for ledges)
600-602	Meta layers
800	Blue Notes

8.2 Blue Notes

Notes regarding data sources are in CARIS HOM layer 800 and as Shapefile sets, **H11134bluenotes_p** and **H11334bluenotes_l** (with the appropriate extensions) for point and line features, respectively.

9. Spatial Framework

9.1 Coordinate System

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

9.2 Horizontal and Vertical Units

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

A CARIS environment variable, uslXsounding_round, controls the depth at which rounding occurs. Setting this variable to NOAA fathoms and feet displays all soundings from 0 to equal to or greater than 11 fathoms as whole units.

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

<u>HOM Units</u>

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

<u>Chart Unit Base Cell Units</u>

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

10. QA/QC

10.1 Data Processing Notes

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

10.2 ENC Validation Checks

H11334 was subjected to QA and Validation checks in HOM prior to exporting to the HCell base cell (000) file. Full millimeter precision was retained in the export of the metric S-57 base cell data set. This data set was converted to a chart unit 000 file. dKart Inspector 5.0 (Service Pack 1) was then used to further check the data set for conformity using the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and errors investigated and corrected where necessary.

11. Products

11.1 HSD, MCD and CGTP Deliverables

- H11334 Base Cell File, Chart Units, Soundings compiled to 1:80,000
- H11334 Base Cell File, Chart Units, Soundings compiled to 1:10,000
- H11334 Descriptive Report including end notes compiled during office processing and certification
- H11334 HCell Supplemental Report
- Blue Notes shape files
- BAG (Bathymetry Attributes Grid)
- 000 Features File

11.2 File Naming Conventions

HOM file set prefix: *H11334_hc*

MCD Chart units base cell file: *US511334_CU.000*

MCD Chart units base cell file, survey scale soundings: *US511334_SS.000*

BAG (for CGTP): *H11334_5m.bag*

Features File (for CGTP): *H11334_Features.000*

11.3 Software

HIPS 6.0:	Management and inspection of Combined BASE surfaces
BASE Editor 1.0:	Combination of Product Surfaces and initial creation of the S-57 bathymetry-derived features
BASE Editor 2.0:	Creation of BAG deliverable
CARIS Notebook 2.2:	Management and inspection of shoreline files
HOM 3.3:	Assembly of the HCell, S-57 products, QA
GIS 4.4a:	Setting the sounding rounding variable
dKart Inspector 5.0:	Validation of the base cell file

12. Recommendations

PHB recommends changing chart contours for chart 17424 to a standard set of 3, 10, 50, and 100 fathoms, with blue tint to 10 fathoms.

13. Contacts

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

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

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: May 6, 2005

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-O193-FA-2004
HYDROGRAPHIC SHEET: H11334

LOCALITY: Eastern Rudyard Bay, AK

TIME PERIOD: October 23 - November 5, 2004

TIDE STATION USED: 945-0460 Ketchikan, AK
Lat. 55° 20.0'N Lon.131° 37.5'W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.433 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: SA80 & SA80A

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 new 1983-2001 National Tidal Datum Epoch (NTDE).

Note 2: The Fairweather was unable to conduct closing levels at the subordinate gauge, Rudyerd Bay (945-0651). Therefore Rudyerd Bay cannot be used for tide correction. The control water level station at Ketchikan (945-0460) is used as the reference station for the purpose of providing tide correction. The gauge at Rudyerd Bay was used for final zoning.

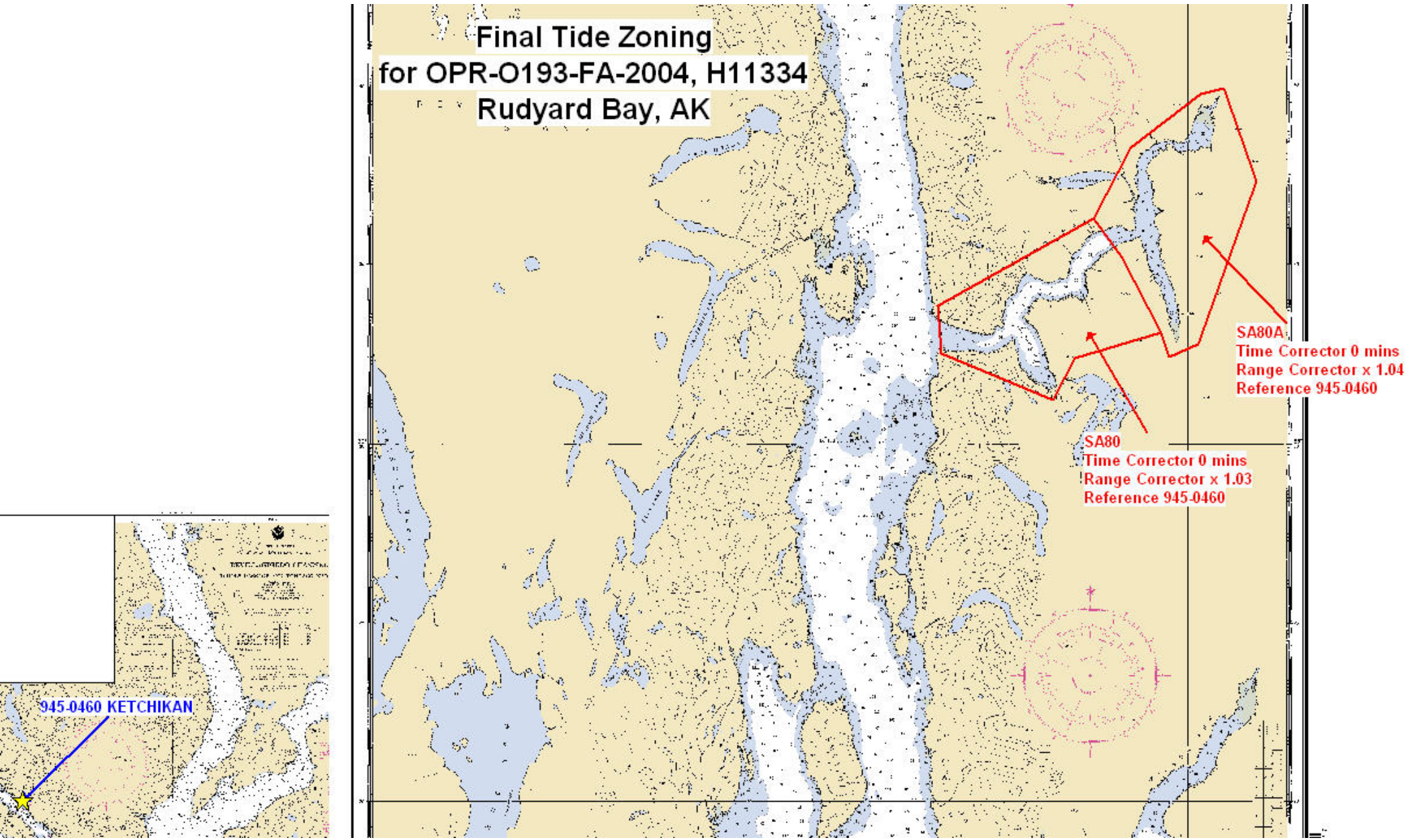
Thomas K. Moon 6/6/05

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

Final tide zone node point locations for OPR-O193-FA-2004, H11334

Format: Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction
Longitude in decimal degrees (negative value denotes Longitude West),
Latitude in decimal degrees

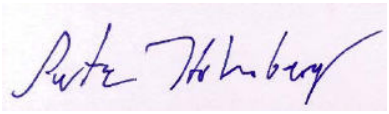
	Tide Station Order	AVG Time Correction	Range Correction
Zone SA80	945-0460	0	1.03
-130.873177 55.564335			
-130.74451 55.605122			
-130.722106 55.587451			
-130.689265 55.552208			
-130.759993 55.539985			
-130.778434 55.520475			
-130.869921 55.542466			
-130.873177 55.564335			
Zone SA80A	945-0460	0	1.04
-130.74451 55.605122			
-130.714101 55.638176			
-130.656411 55.662891			
-130.638159 55.665642			
-130.611389 55.622512			
-130.658845 55.546919			
-130.682775 55.540708			
-130.689265 55.552208			
-130.722106 55.587451			
-130.74451 55.605122			


Final Tide Zoning
for OPR-O193-FA-2004, H11334
Rudyard Bay, AK
SA80A
Time Corrector 0 mins
Range Corrector x 1.04
Reference 945-0460
SA80
Time Corrector 0 mins
Range Corrector x 1.03
Reference 945-0460
945-0460 KETCHIKAN

APPROVAL SHEET
H11334

Initial Approvals:

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



Pete Holmberg
2007.06.29 13:13:25 -07'00'

The survey and associated records have been inspected with regard to survey coverage, 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.

Cathleen Barry, Cartographer
2007.06.29 13:15:10 -07'00'

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.

CDR Donald W. Haines, NOAA
Approval of Document
2007.06.29 13:23:38 -07'00'

J. Corey Allen
AWOIS and SURF Check Completed
2007.07.16 09:28:19 -04'00'