

H12220

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Survey

Field No. N/A

Registry No. H12220

LOCALITY

State Washington

General Locality Olympic Coast National Marine Sanctuary

Sublocality NW Offshore Portion of Cape Flattery

2010

CHIEF OF PARTY

CAPT David O. Neander, 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;">H12220</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>Washington</u></p> <p>General Locality <u>Olympic Coast National Marine Sanctuary</u></p> <p>Sub-Locality <u>NW Offshore Portion of Cape Flattery</u></p> <p>Scale <u>1:20,000</u> Date of Survey <u>June 03 - June 29, 2010</u></p> <p>Instructions dated <u>5/11/2010</u> Project No. <u>OPR-N324-FA-10</u></p> <p>Vessel <u>NOAA Ship Fairweather</u></p> <hr/> <p>Chief of party <u>CAPT David O. Neander, NOAA</u></p> <p>Surveyed by <u>Fairweather Personnel</u></p> <p>Soundings by <u>Multibeam Echo Sounder</u></p> <p>SAR by <u>Adam Argento</u> Compilation by <u>Russ Davies</u></p> <p>Soundings compiled in <u>Fathoms</u></p>	
<p>REMARKS: <u>All times are UTC. UTM Zone 10</u></p> <p><u>The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were generated during office processing. Page numbering may be interrupted or non sequential.</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 H12220

OPR-N324-FA-10
Olympic Coast National Marine Sanctuary, WA

Scale: 1:20,000
03 June 2010 - 29 June 2010
NOAA Ship *Fairweather*
CAPT David O. Neander

A. Area Surveyed

A1. Survey Purpose

This project is being conducted in collaboration with the National Ocean Service - Office of Coast Survey (OCS) and the Olympic Coast National Marine Sanctuary (OCNMS) and their partners in order to provide contemporary hydrographic data to update the nautical charts and products in and surrounding the OCNMS. The data from this project will provide seafloor habitat information to support fishery and resource protection mandates, complete a section of the sanctuary for which there is no existing seafloor data, complete the permitting process for 24 permanent long-term moorings, and is a site of numerous historical shipwrecks (see Appendix II OCNMS Project Instructions for further details). This project will utilize Reson 7111, Reson 8160, and Reson 7125 sonars to acquire bathymetry and backscatter data.

A2. Area Description

The survey area is located in Olympic Coast National Marine Sanctuary, WA, within the sub-locality of NW Offshore Portion of Cape Flattery, see Figure 1. This survey corresponds to Sheet 2 in the modified sheet layout, see correspondence in Appendix V, "Updated Sheet Layout Proposal OPR-N324-FA-10 OCNMS, WA," dated May 25, 2010.

A3. Survey Statistics

Mainscheme and crossline mileage for MBES and shoreline acquisition were calculated and are displayed in Table 1. For vessel S220, dual acquisition of both Reson 7111 and Reson 8160 data was conducted throughout the entire survey area of H12223. For linear nautical mileage (LNM) reporting purposes, only the Reson 7111 data were used for the following figures and tables. 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
522.49	Multibeam MS mileage
552.24	FAIRWEATHER S-220
0.00	Launch 2805
0.00	Launch 2806
0.00	Launch 2807
0.00	Launch 2808
0	SideScan MS
522.49	Total MS
CROSSLINE - Mileage	
0	Single Beam XL
29.67	Multibeam XL
59.42	FAIRWEATHER S-220
0.00	Launch 2805
0.00	Launch 2806
0.00	Launch 2807
0.00	Launch 2808
29.67	Total XL
OTHER	
0	Developments/AWOIS - Mileage
0	Shoreline/Nearshore Investigation - Mileage
0	Total # of Investigated Items
0	Total Bottom Samples
39.41	Total SNM
6/3/10, 6/4/10, 6/5/10, 6/6/10, 6/10/10, 6/13/10, 6/22/10, 6/29/10	Specific Dates of Acquisition
154, 155, 156, 157, 161, 164, 173, 180	Specific Dn#s of Acquisition

Table 1: H12220 Survey Statistics

A4. Survey Quality

The entire survey is adequate to supersede previous data. ¹

A5. Survey Limits

Survey Limits were amended as discussed below:

Change Explanation	Documentation
During the course of OPR-N324-FA-10 the sheet layouts were modified several times in order to efficiently and safely operate S220 in the highly dynamic sea conditions famous on the Olympic Coast. The predominant weather during the course of OPR-N324-FA-10 came from wind and seas from the west, forcing S220 to occasionally run lines with a general east-west azimuth to minimize roll despite being perpendicular to depth contours. When	See correspondence in Appendix V, "Updated Sheet Layout Proposal OPR-N324-FA-10 OCNMS, WA," dated May 25, 2010.

Change Explanation	Documentation
seas and swell were down, S220 ran lines with a north-south azimuth parallel to the depth contours. Modifications to the sheet layout were made in cooperation and with approval from HSD Operations Branch.	

A6. Survey Coverage

Coverage Area or Water Depth	Coverage Required
> 4 meters water depth	Complete MB and Complete Backscatter

Survey coverage was completed as assigned.

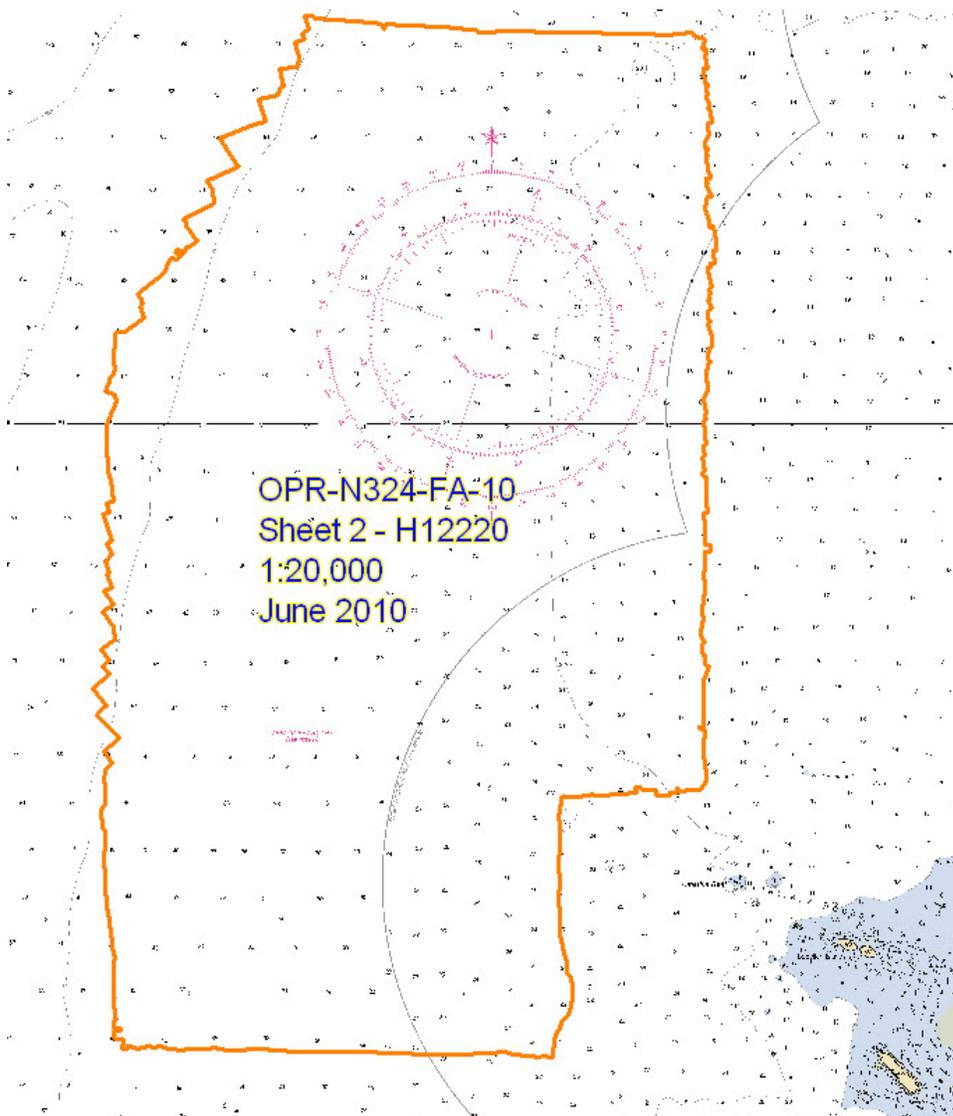


Figure 1: H12220 Survey Outline

A7. Shoreline Requirements

No shoreline was included within the extents of H12220. ²

A8. Bottom Samples

Bottom Samples were not fulfilled as assigned.

Change Explanation	Documentation
Bottom samples were not collected as part of H12220 due to time constraints. ³ The OCNMS personnel have plans for an extensive bottom sampling project after further data analysis.	

B. Data Acquisition and Processing

B1. Equipment

Fairweather S-220

Equipment and vessels used for data acquisition and survey operations during this survey are listed below in Table 2. No vessel configurations used during data acquisition deviated from the DAPR.

	FAIRWEATHER
Hull Registration Number	S220
Builder	Aerojet-General Shipyard
Length Overall	231 feet
Beam	42 feet
Draft, Maximum	15' 6"
Cruising Speed	12.5 knots
Max Survey Speed	8 knots
Primary Echo-sounder(s)	RESON 7111 & RESON 8160
Sound Velocity Equipment	SBE 19plus, MVP 200, SVP70
Attitude & Positioning Equipment	POS/MV V4
Type of operation	MBES

Table 2: Vessel Inventory

B2. Quality Control

Crosslines

Percentage of crossline miles as compared to mainscheme miles: 5.7%

Surface differencing in CARIS Bathy DataBase was used to assess crossline agreement with main scheme lines. Figure 2 depicts a difference surface between an 8-meter surface made with main scheme lines only and an 8-meter surface made with crosslines only. This difference surface is submitted digitally in the Separates IV folder. As depicted in Figure 2, crosslines tended to be deeper than main scheme surfaces by approximately 0.3 meters. The difference surfaces show agreement within the total allowable vertical and horizontal uncertainty in their common areas.⁴

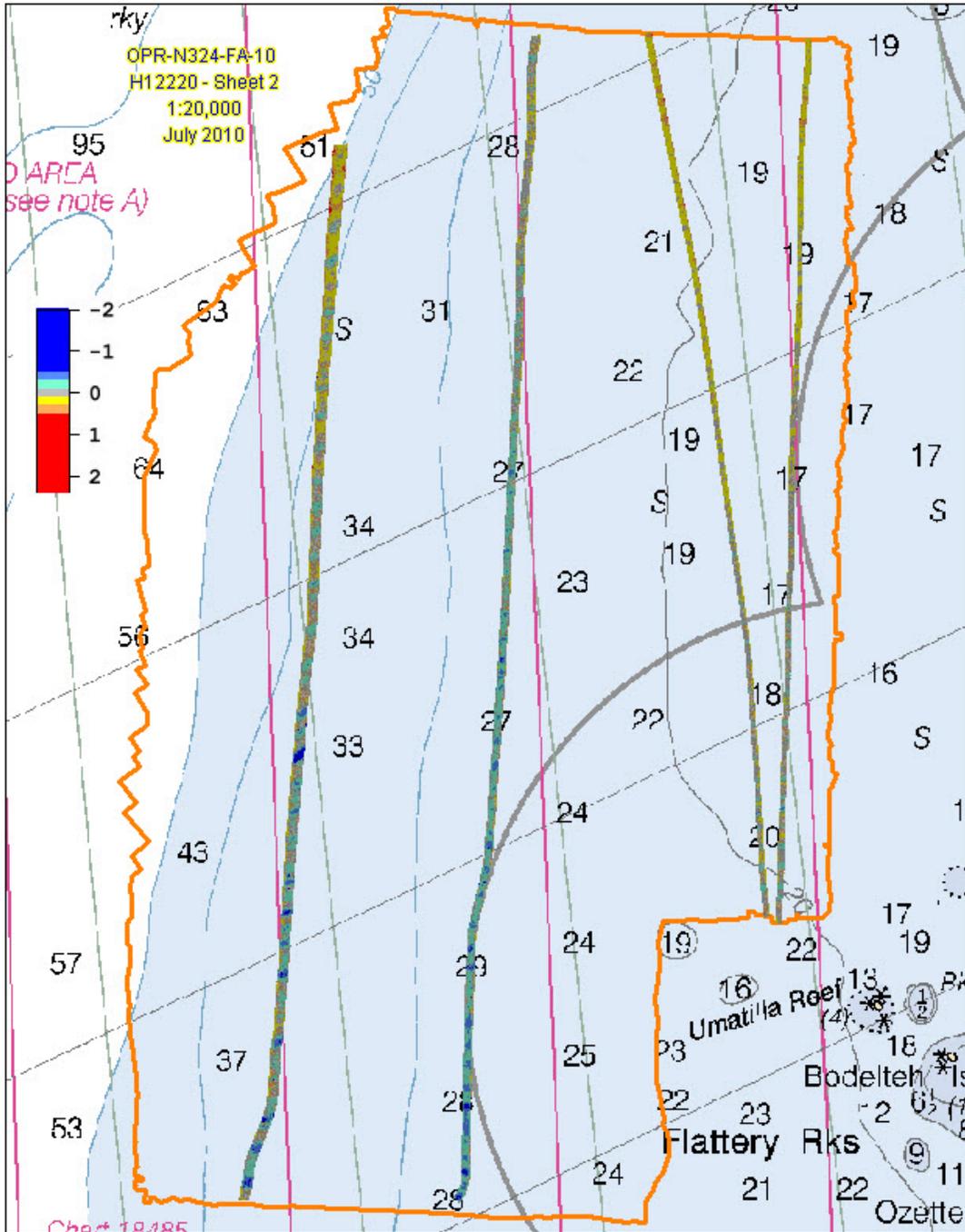


Figure 2: Crossline and main scheme differences for H12220

Uncertainty Values

Tide Values

Measured	Zoning
0.01	0.1

Sound Speed Values

Vessel	Instrument	Measured (m/s)	Surface (m/s)	Comments
S-220	CTD	0.5	0.5	
S-220	MVP	0.5	0.5	

Junctions

Registry Number:	H11083
Scale:	20000
Year:	2001
Platform:	NOAA Ship Rainier
Relative Location:	N
Comments:	Survey H12220 junctions with out-year sheet H11083 from project OPR-N342-RA-03. The area of overlap between the sheets was reviewed in Fledermaus for consistency and data were found to be in agreement within the total allowable vertical and horizontal uncertainty in their common areas within 0.3 to 0.5 meters. ⁵ The sheet limits and area of overlap for out-year sheet H11083 is depicted in Figure 3.

Registry Number:	H12219
Scale:	20000
Year:	2010
Platform:	NOAA Ship <i>Fairweather</i>
Relative Location:	E
Comments:	Survey H12220 junctions with H12219, which is Sheet 1 of the same project. ⁶ The area of overlap between the sheets was reviewed in CARIS Subset Editor for consistency and data were found to be in agreement within the total allowable vertical and horizontal uncertainty in their common areas within 0.3 to 0.5 meters. ⁷ The sheet limits and area of overlap for sheets 1 and 2 are depicted in Figure 3. Difference surfaces were created in both CARIS Bathy DataBase and Fledermaus and evaluated for anomalies.

Registry Number:	H12221
Scale:	20000
Year:	2010
Platform:	NOAA Ship <i>Fairweather</i>
Relative Location:	SE
Comments:	Survey H12220 junctions with H12221, which is Sheet 3 of the same project. ⁸ The area of overlap between the sheets was reviewed in CARIS Subset Editor for consistency and data were found to be in agreement within the total allowable vertical and horizontal uncertainty in their common areas within 0.3 to 0.5 meters. ⁹ The sheet limits and area of overlap for sheets 2 and 3 are depicted in Figure 3. Difference surfaces were created in both CARIS Bathy DataBase and Fledermaus and evaluated for anomalies.

Registry Number:	H12222
Scale:	20000
Year:	2010
Platform:	NOAA Ship <i>Fairweather</i>
Relative Location:	S
Comments:	Survey H12220 junctions with H12222, which is Sheet 4 of the same project. ¹⁰ The area of overlap between the sheets was reviewed in CARIS Subset Editor for consistency and data were found to be in agreement within the total allowable vertical and horizontal uncertainty in their common areas within 0.3 to 0.5 meters. ¹¹ The sheet limits and area of overlap for sheets 2 and 4 are depicted in Figure 3. Difference surfaces were created in both CARIS Bathy DataBase and Fledermaus and evaluated for anomalies.

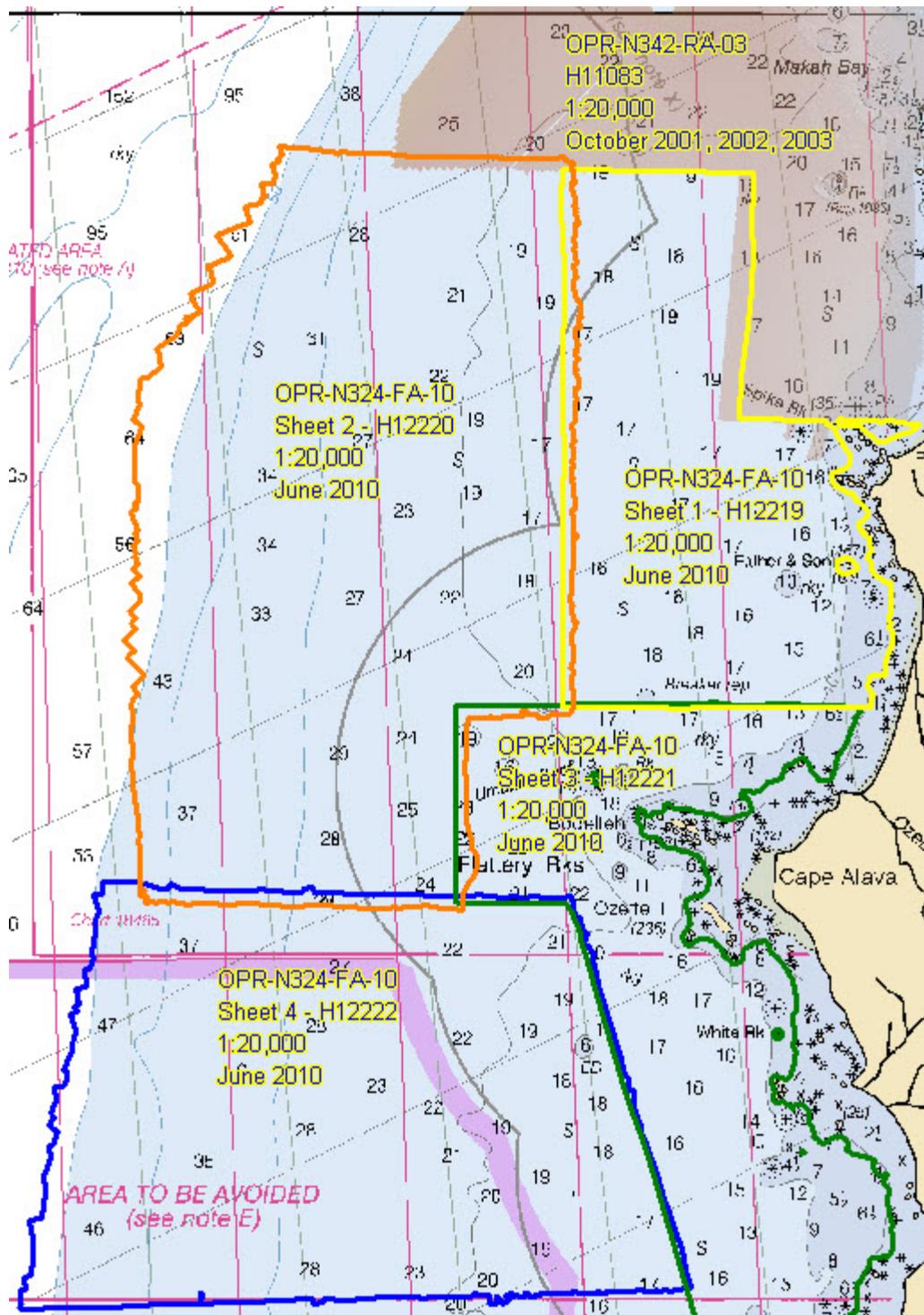


Figure 3: Survey Junctions between H12220, H12219, H12221, H12222, and H11083

Sonar System Quality Control Checks

MBES quality control checks were conducted as discussed in the Quality Control Section B of the DAPR.

Equipment Operational Effectiveness

Surface Sound Speed Fliers

Surface sound speed blowouts were observed in the data in several areas due to bubble sweep down interference in high sea states. In areas where surface sound speed spikes affected the surfaces, as depicted in Figure 4, the Hydrographer manually rejected the erroneous surface sound speed values with interpolation to ensure the surfaces honored the appropriate depths. ¹²

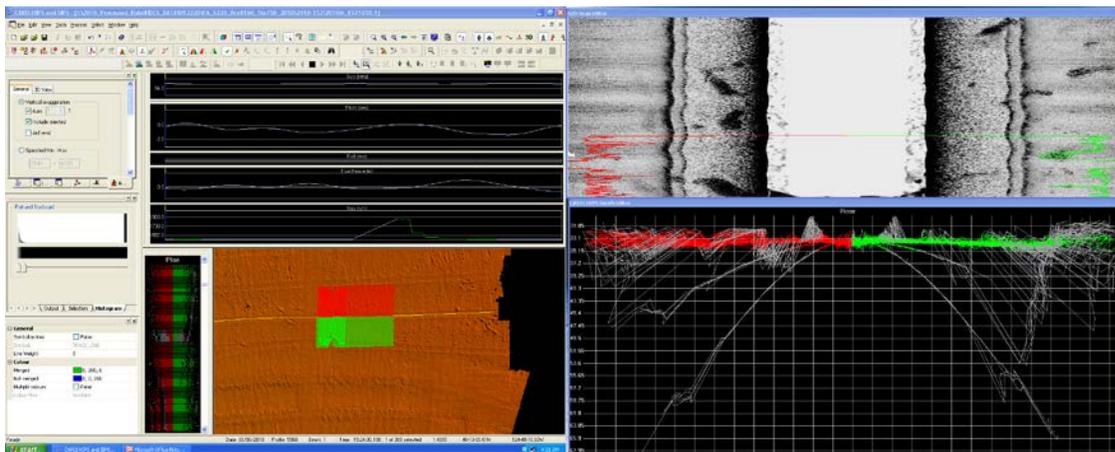


Figure 4: Surface Sound Speed blowouts on line 2010M_1571858 in position 48°13'01.4"N 124°47'53.1"W

TrueHeave Dropouts

In several areas, TrueHeave files had dropouts that caused a vertical artifact in the data. In areas where there were clear errors in the TrueHeave file, as depicted in Figure 5, the Hydrographer manually rejected data to ensure the appropriate depths were honored. In all areas, both soundings and multibeam backscatter were examined for objects and none were found. ¹³

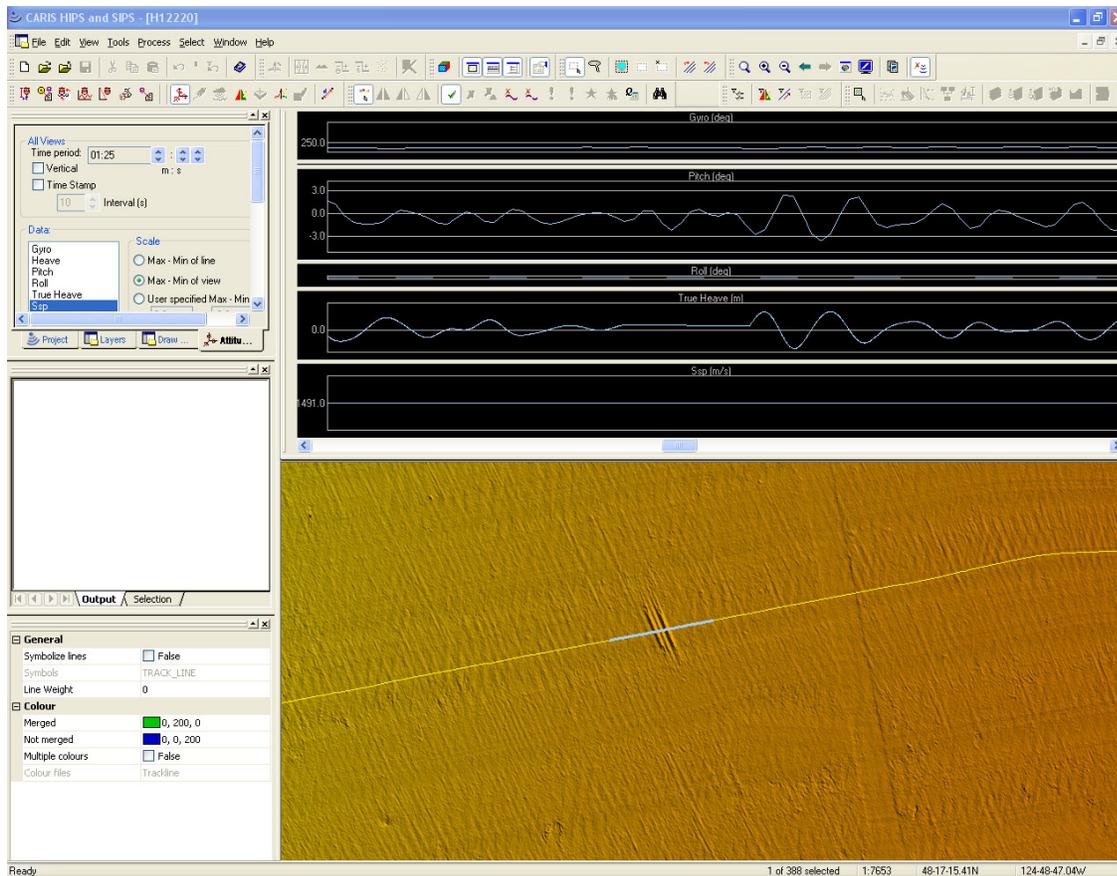


Figure 5: TrueHeave dropout on line 2010M_1542047 in position 48°17'12.9"N 124°49'43.1"W

Environmental and Other Factors Affecting Sounding Corrections

Biomass in the Water Column

Several objects were observed in the water column resulting in acoustic shadows and surface tearing. These objects were most likely bait balls or some other biological matter suspended in the water column. Where the surface inconsistencies exceeded allowable uncertainty tolerance, data were manually rejected by the Hydrographer to ensure the appropriate depths were honored. Multibeam backscatter data were evaluated in all cases for navigationally significant objects, as depicted in Figure 6, and none were found. ¹⁴

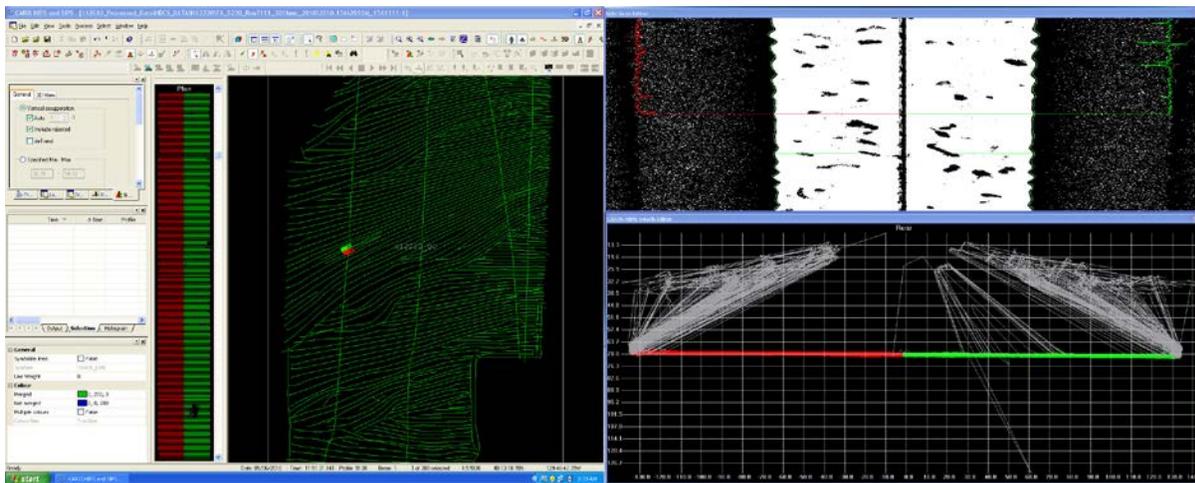


Figure 6: Objects in the water column obscuring the bottom on line 2010M_1561111 in position 48°13'54.0"N 124°53'17.7"W

Interference in the Water Column

Significant levels of acoustic interference were observed in the water column due to high sea state, as depicted in Figure 7. In all areas where interference affected the surface to exceed allowable uncertainty tolerance, data were manually rejected by the hydrographer to ensure appropriate depths were honored. Multibeam backscatter data were analyzed to ensure feature detection. ¹⁵

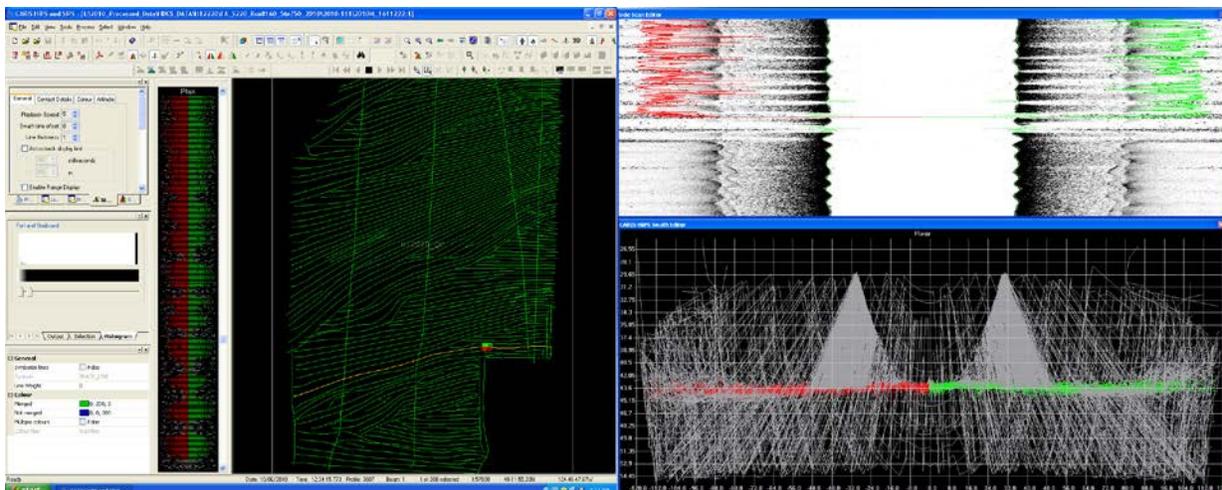


Figure 7: Acoustic interference in the water column on line 2010M_1611222 in position 48°17'12.9"N 124°49'43.1"W

Reson 7111

Project OPR-N324-FA-10 was the first project during the 2010 field season in which the Reson 7111 was used for MBES acquisition. During the Hydrographic Survey Readiness Review (HSRR) of S220 in the months prior to the start of OPR-N324-FA-10, the Reson 7111 stopped receiving acoustic returns and the transceiver was diagnosed by Reson engineers to have a number of failed cards in the transceiver box. Ultimately a senior engineer from Reson sailed with

Fairweather to repair the Reson 7111 and troubleshoot data quality issues observed during the 2009 field season (see Project Correspondence). Despite replacement of several components of the transceiver and a software update containing the first release of the IFREMER (French Research Institute for Exploration of the Sea) bottom detection algorithm, *Fairweather* personnel continued to observe nadir gaps and errant outer beam artifacts difficult to attribute to oceanographic conditions or systematic biases. Due to the suspect performance of the Reson 7111, Reson 7111 and Reson 8160 data were acquired simultaneously with tighter line spacing during H12220. ¹⁶

Frequency of Casts and Methodology:

Sound Speed measurements were conducted as discussed in the Corrections to Echo Soundings section of the DAPR.

Additional Quality Control Discussion

Holiday Assessment

Complete multibeam coverage was obtained within the limits of H12220. ¹⁷ For holidays larger than three surface grid nodes, the corresponding multibeam backscatter side scan data were examined and no navigationally significant items were found. The least depths of all navigationally significant features are represented by H12220. ¹⁸

Several holidays are present in the finalized BASE Surfaces of H12220 that were attributed to the rejection of errant noise in the multibeam data, as depicted in Figure 8. The majority of these holidays occur in the southern portion of the sheet in the two-meter and four-meter resolution surfaces. These holidays were evaluated by the Hydrographer to ensure the BASE surface honored all appropriate depths within the total acceptable sounding uncertainty. ¹⁹

The feature in the Southeast corner of the sheet in position 48°11'37.3"N 124°49'19.0"W lies between the sheet boundary of H12220 and H12221. The full extents of the feature and the least depth lie within the common area of H12221. ²⁰

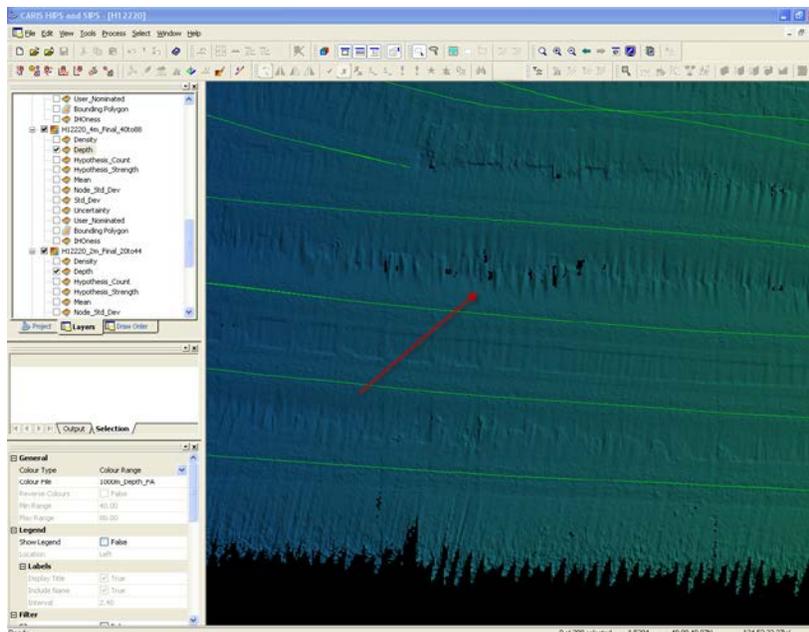


Figure 8: Holidays in BASE Surface due to rejection of errant outer beams in position 48°09'58.8"N 124°52'38.4"W

IHO Uncertainty

Total propagated uncertainty was compared with maximum allowable total vertical uncertainty and assessed visually in Caris HIPS/SIPS. "IHOness" layers are included in the deliverable H12220_QC fieldsheet for each surface.

Data Density

Density requirements for H12220 were achieved with at least 95% of finalized surface nodes containing five or more soundings (see Appendix V). ²¹

B3. Corrections to Echo Soundings

Echo Sounding Correction DAPR Deviations

Data reduction procedures for survey H12220 conform to those detailed in the DAPR.

Sounding System Calibration DAPR Deviations

No sounding system calibrations were conducted apart from those detailed in the DAPR.

B4. Data Processing

Processing Software

Software Used	Version	Service Pack	Hotfix	Used For
Caris HIPS/SIPS	7.0	1	5	Data analysis, surface creation, conversion, and processing.
Caris HIPS/SIPS	7.0	2	3	Additional cleaning and computing surfaces.

Generated Surfaces and Mosaics

Surface Name	Type	Resolution	Depth Range	Parameter	Purpose
H12220_2m	CUBE	2	N/A	NOAA_2m	Complete MBES
H12220_4m	CUBE	4	N/A	NOAA_4m	Complete MBES
H12220_8m	CUBE	8	N/A	NOAA_8m	Complete MBES
H12220_2m_20to44	CUBE	2	20-44	NOAA_2m	Complete MBES
H12220_4m_40to88	CUBE	4	40-88	NOAA_4m	Complete MBES
H12220_8m_80to176	CUBE	8	80-176	NOAA_8m	Complete MBES
H12220_Final_Combined_8m	CUBE	8	N/A	N/A	Complete MBES

All field sheet extents were adjusted using the Base 16 Calculator tool to ensure coincident nodes among all bathymetric surfaces regardless of the field sheet in which they are contained given the standard surface resolutions of 2, 4, and 8 meters. The NOAA CUBE parameters prescribed by the 2010 HSDDM were used for the creation of all CUBE BASE surfaces in survey H12220. ²²

Additional Data Processing

Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as final tide and sound velocity application is noted in the H12220_Data_Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

Data Processing Deviations

Data collection methods were altered to account for inconsistencies in the bottom detection algorithm for the Reson 7111, as discussed in the section on Equipment Operational Effectiveness. As a result, the processing methods for dealing with the suspect data were also adapted and the details of processing deviations from the DAPR are noted below. Suspected noise within allowable error specifications for survey H12220 were not rejected in CARIS HIPS. Suspected noise that incurred surface tearing beyond allowable error specifications was manually rejected by the Hydrographer in subset editor. The following cases use alternative data processing techniques that deviate from those described in the DAPR in order to address data quality issues:

Due to excessive noise, data from some days were filtered to eliminate excessive surface tearing. All lines from DN 161 and DN 164 were filtered 65 degrees from nadir on port and starboard. From DN 156, Lines 2010M_1562132 and 2010M_1562337 from the Reson 7111 were filtered 60 degrees from nadir to port only. Several lines in the southern portion of the sheet on DN 161, DN 164, and DN 173 from the Reson 8160 were filtered 40 degrees from nadir on port and starboard. In areas where this filtering resulted in holidays, data were evaluated in subset editor and reaccepted. All other rejection of soundings was accomplished manually by the Hydrographer in subset or swath editor.

Post-Processed Kinematic Data

Vessel kinematic data were post-processed using Applanix POSPac software with Single Base processing methods as described in the DAPR and in Applanix's POSPac manual. Single Best Estimate of Trajectory (SBET) files and post processed solution accuracy files named SMRMSG files are applied to all data with the exception of 22 lines noted in the H12220_S220_SBET_Log.txt and H12220_S220_SMRMSG_Log.txt submitted with the GNSS data.

For more information about the processing of horizontal control data, see section C, and the OPR-N324-FA-10 Horizontal and Vertical Control Report submitted under separate cover. The SBET and SMRMSG files were applied to the data using parameters depicted in Figure 9 and 10.

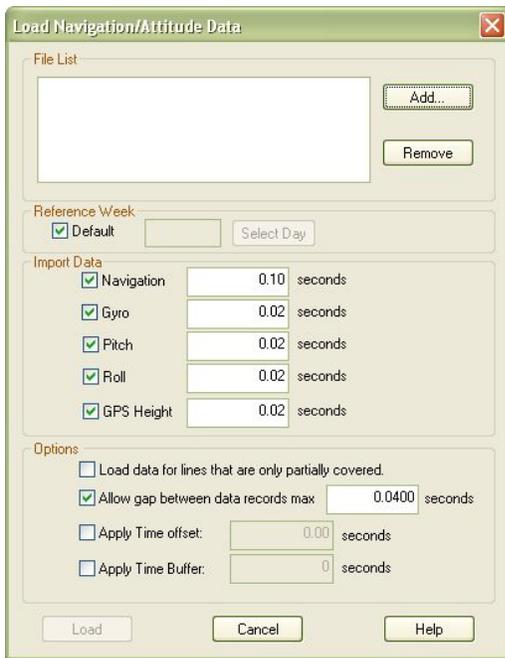


Figure 9: Application parameters for SBET files used in CARIS

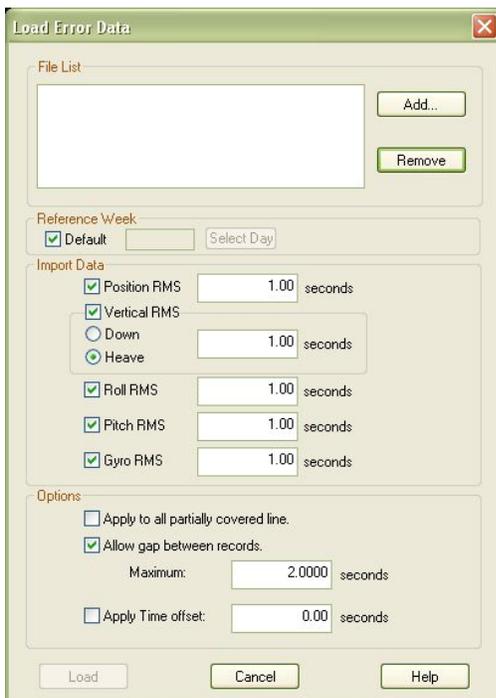


Figure 10: Application parameters for SMRMSG files used in CARIS

TrueHeave

To enable the application of TrueHeave, a POS/MV file was “fixed” using the fixTrueHeave.exe utility from CARIS. The fixed file was assigned an additional *.fixed suffix. This was performed on DN 154 for vessel S220.

C. Vertical and Horizontal Control

C1. Summary of Vertical Control Methods

Vertical Datum:	Mean Lower Low Water (MLLW)
Vertical Resolution:	0.01
Vertical Units:	meters

Tide Stations

Station Number:	944-2396
Station Type:	Primary (NWLON)
Used for Corrections:	Yes

Water Levels Used for Correction:	Final Approved
Tide File(s) Used for Correction:	9442396.tid
Time and Height Correctors:	Final
Zone Corrector File:	N324FA2010CORP.zdf

Tides Submitted	Tides Received
06 / 29 / 2010	07 / 13 / 2010

A request for delivery of final approved (smooth) tides for survey H12220 was forwarded to N/OPS1 on June 29, 2010 in accordance with the Field Procedures Manual (FPM), dated April 2010. A copy of the request is included in Appendix IV.

As per the final Tide Note for Hydrographic Survey dated July 7, 2010, and received July 13, 2010, all data were reduced to MLLW using the final approved water levels (smooth tides) from La Push, WA (9442396) by applying the tide file 9442396.tid in addition to time and height correctors through the zone corrector file N324FA2010CORP.zdf.²³

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.

C2. Summary of Horizontal Control Methods

Horizontal Coordinate System:	UTM 10
Horizontal Datum:	North American Datum of 1983 (NAD83)
Horizontal Resolution:	0.1
Horizontal Units:	meters

Positioning Method	Positioning Station Name
DGPS	Fort Stevens, WA

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential correctors from the U.S. Coast Guard beacon at Fort Stevens, WA (287 kHz) were used during real-time acquisition when not otherwise noted in the acquisition logs. The primary method of horizontal positioning of MBES soundings on H12220 was Post-Processing Kinematic (PPK) using Applanix POSPac software with Single Base processing, utilizing the station Neah Bay AF9672.

Smoothed Best Estimate of Trajectory (SBET) files were created using the Single Base method. The SBET files and their associated error files (SMRMSG) files were applied to the CARIS HDCS data in HIPS & SIPS for improved vessel kinematic accuracy. Twenty-two lines of data had dropouts that precluded SBETs from being applied to the data. The file names of these lines can be found in the file H12220_S220_SBET_Log in the SBET folder of GNSS Data. For further detail regarding the processing method used and quality control checks performed see the H12220_POSPAC_Processing_Log.xls spreadsheet located in the SBET folder of GNSS Data and the Horizontal and Vertical Control Report, submitted under separate cover.

D. Results and Recommendations

D1. Chart Comparison

Chart Comparison Methods

Chart comparison procedures were followed as outlined in section 4.5 of the FPM and section 8.1.3-D.1 of the HSSD, utilizing CARIS HIPS & SIPS software program.

Raster Comparison

Number:	18485		
Scale:	40000		
Edition:	16		
Edition Date:	03 / 2007		
Notices:	LNM	30	07 / 27 / 2010

Recommendation: Soundings from survey H12220 generally agree within one fathom with charted depths on 18485. ²⁴ There were no new changes within the survey area. Additionally, H12220 is within a charted Regulated Navigation Area and a charted Area To Be Avoided (ATBA). The charted Regulated Navigation Area corresponds with the restrictions on traffic for Vessel Traffic Services (VTS) coverage. Detailed description of VTS area extents and regulations can be found in 33 CFR Part 161, the Coast Pilot, and the applicable VTS User's Guide. The ATBA corresponds with the Olympic Coast National Marine Sanctuary, which is closed to transit for vessels over 1600 Gross Tons, carrying hazardous cargoes, or carrying oil. Detailed description of Sanctuary extents and regulations can be found in 15 CFR Part 922 and in the Coast Pilot. See notes A, D, E, F, G and H on chart 18485.

Disproved Soundings

There are no disproved soundings for this survey. ²⁵

AWOIS Items

Number of AWOIS Items Addressed:	0
Number of AWOIS Items Not Addressed:	0

There were no AWOIS items assigned as part of H12220. ²⁶

Charted Features (Non-AWOIS)

Number of Non-AWOIS Charted Features:	0
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There were no Non-AWOIS charted features as part of H12220, and none were observed in the digital data. ²⁷

Uncharted Features

There were no uncharted features as part of H12220, and none were observed in the digital data. ²⁸

Dangers to Navigation (DTON)

There were no dangers to navigation in the common area of H12220. ²⁹

Charted Shoals and Hazardous Features

There were no charted shoals or hazardous features as part of H12220. ³⁰

Channels

There were no maintained channels in the common area of H12220. ³¹

D2. Additional Results

Shoreline Investigation Results

Survey H12220 has no assigned shoreline in its common area, and no uncharted features were observed. ³²

Aids to Navigation (ATONs)

No ATONs addressed. ³³

Overhead Features (bridges, overhead cables, overhead pipelines)

No overhead features addressed. ³⁴

Submarine Features

No submarine features addressed. ³⁵

Ferry Routes

No ferry routes addressed. ³⁶

Drilling Structures, Production Platforms, and Well Heads

No drilling structures, production platforms, or well heads addressed. ³⁷

Unusual or Scientifically Significant Features

No unusual or scientifically significant features addressed. ³⁸

Construction or Dredging

No constructions or dredging addressed. ³⁹

New Surveys

No new surveys suggested. ⁴⁰

Insets

No insets suggested. ⁴¹

E. Approval Sheet

As Lead Hydrographer, I have ensured that standard field surveying and processing procedures were followed in producing this examination in accordance with the Office of Coast Survey Hydrographic Survey's Division Field Procedures Manual, NOS Hydrographic Surveys Specifications and Deliverables, and the OPR-N324-FA-10 Project Instructions. Field Operations for this basic hydrographic survey were conducted under my daily supervision with frequent checks of progress and adequacy. This survey is complete and no additional work is required.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Pacific Hydrographic Branch.

Survey H12220 is adequate to supersede charted soundings in their common areas.

The Data Acquisition and Processing Report for OPR-N324-FA-10 is submitted separately and contains additional information relevant to the survey.

Approved and Forwarded By:

Approver Name	Approver Title	Approval Date	Digital Signature
LTJG Matthew Nardi	Sheet Manager	09 / 08 / 2010	 Matthew Nardi I am the author of this document 2010.09.09 07:29:58 Z
LT Briana Welton	Field Operations Officer	09 / 08 / 2010	 Digitally signed by Briana Welton DN: cn=Briana Welton, o=NOAA Ship Fairweather, ou=NOAA, email=briana.welton@noaa.gov, c=US Date: 2010.09.09 07:22:11 Z
CAPT David O. Neander	Commanding Officer	09 / 08 / 2010	 David O. Neander 2010.09.09 06:37:38 -08'00'

Additional Reports:

Report Name	Date Sent	Recipient
Hydrographic Systems Readiness Review	2010-04-09	Pacific Hydrographic Branch
Data Acquisition and Processing Report	2010-08-15	Pacific Hydrographic Branch
Horizontal and Vertical Control Report	2010-08-15	Pacific Hydrographic Branch

Revisions Compiled During Office Processing and Certification:

-
- ¹ Concur
 - ² Concur
 - ³ All bottom samples should be retain as charted within the common area of this survey
 - ⁴ Concur
 - ⁵ Concur
 - ⁶ A common junction will be made with survey H12219 when the survey is compiled.
 - ⁷ Concur
 - ⁸ A common junction will be made with survey H12221 when the survey is compiled.
 - ⁹ Concur
 - ¹⁰ A common junction was made with survey H12222 during compilation.
 - ¹¹ Concur
 - ¹² The data is adequate for charting after the surface sound speed spikes were removed.
 - ¹³ Concur
 - ¹⁴ Concur
 - ¹⁵ Concur, the data is adequate for charting
 - ¹⁶ The data used in the compilation of the HCell is adequate to supersede charted data in the common area.
 - ¹⁷ Concur
 - ¹⁸ Concur
 - ¹⁹ Concur
 - ²⁰ Concur
 - ²¹ Concur
 - ²² The office generated 8 m resolution combined surface, H12220_8M_Combined, was used for cartographic compilation.
 - ²³ See attached Tide Note dated July 7, 2010
 - ²⁴ Concur
 - ²⁵ Concur
 - ²⁶ Concur
 - ²⁷ Concur
 - ²⁸ Concur
 - ²⁹ Concur
 - ³⁰ Concur
 - ³¹ Concur
 - ³² Concur
 - ³³ Concur with clarification, there are no ATON's in the survey area.
 - ³⁴ Concur with clarification, there are no overhead features in the survey area.
 - ³⁵ Concur with clarification, there are no submarine features in the survey area.
 - ³⁶ Concur with clarification, there are no ferry routes in the survey area.
 - ³⁷ Concur with clarification, there are no platforms or wells in the survey area.
 - ³⁸ Concur
 - ³⁹ Concur with clarification. There was no construction or dredging projects within the survey area.
 - ⁴⁰ Concur
 - ⁴¹ Concur



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : July 7, 2010

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-N324-FA-2010
HYDROGRAPHIC SHEET: H12220

LOCALITY: NW Offshore Portion of Cape Flattery, OCNMS
TIME PERIOD: June 3 - June 29, 2010

TIDE STATION USED: 944-2396 La Push, WA
Lat. 47° 54.8'N Long. 124° 38.1' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.357 meters

REMARKS: RECOMMENDED ZONING

Preliminary zoning is accepted as the final zoning for project OPR-N324-FA-2010, H12220, during the time period between June 3 to June 29, 2010.

Please use the zoning file "N324FA2010CORP" submitted with the project instructions for OCNMS. Zones PAC220 and PAC222 are the applicable zones for H12220.

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

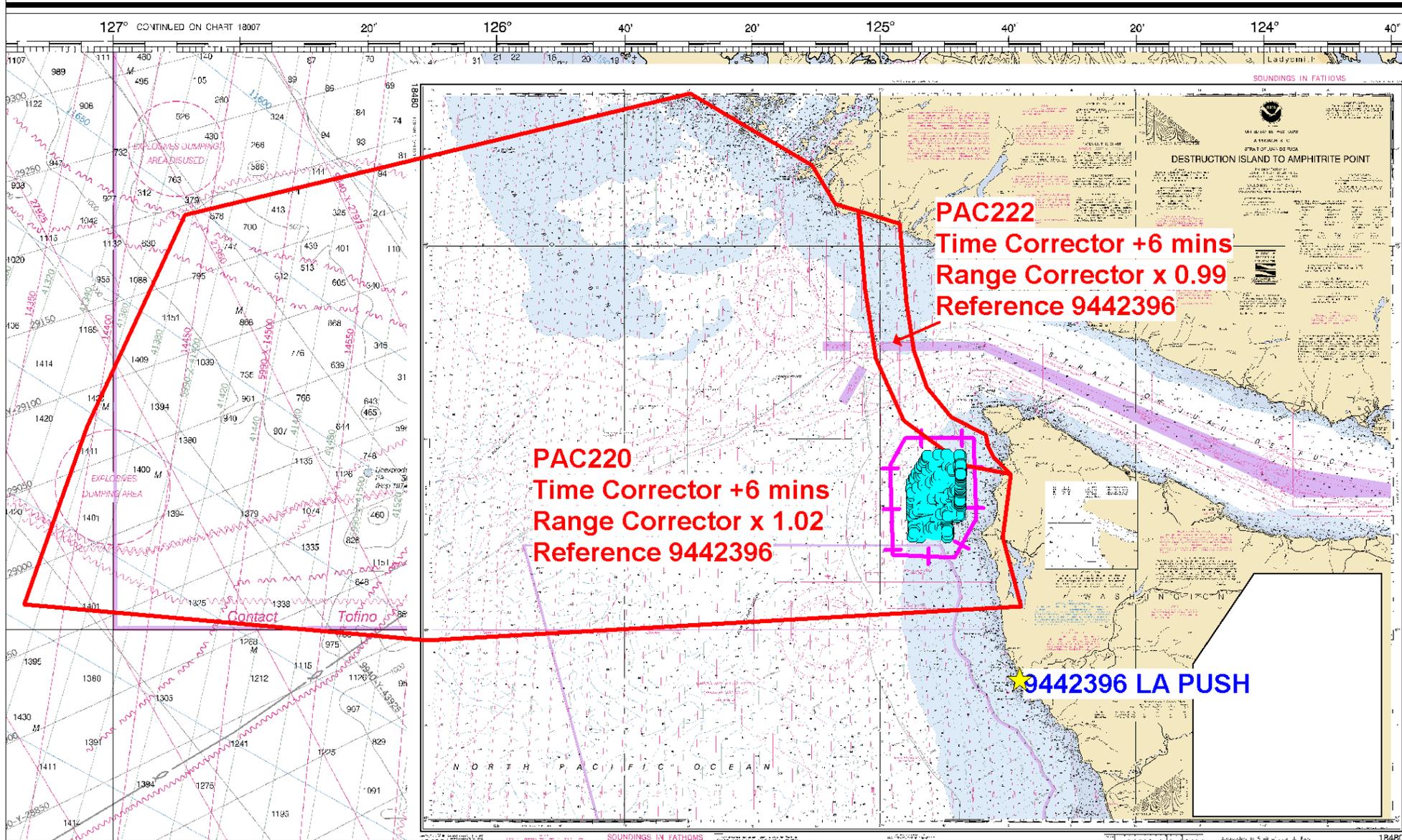
Digitally signed by Peter J. Stone
DN: cn=Peter J. Stone, o=CO-OPS, ou=NOAA/
NOS, email=peter.stone@noaa.gov, c=US
Date: 2010.07.08 12:41:49 -04'00'

CHIEF, OCEANOGRAPHIC DIVISION



Preliminary As Final Tidal Zoning for OPR-N324-FA-2010, H12220 NW Offshore Portion of Cape Flattery, OCNMS, WA

Formerly CGC89 5022, 1s. Ed., May 1949 G-1418-726 KAPP 1661



H12220 HCell Report
Russ Davies, Cartographer
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H12220 used:

Office of Coast Survey HCell Specifications: Draft, Version: 4.0, 17 March, 2010.
HCell Reference Guide: Version 2.0, 22 February, 2010.

2. Compilation Scale

Depths and features for HCell H12220 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NM Date
18485	1:40,000	16th	03/2007	10/02/2010

The following ENC was not used during compilation:

Chart	Scale
US5WA04M	1:40,000

3. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 8-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:20,000 survey scale using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
0.0	10	3
10	20	4
20	50	4.5
50	100	5

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 18485	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 H12220_SS.000
20	36.576	37.9476	20.750	20
50	91.44	92.8116	50.750	50

5. Meta Areas

The following Meta object area is included in HCell H12220.

M_QUAL

This Meta area object was 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
M_QUAL	Data quality Meta object
SBDARE	Bottom samples
SOUNDG	Soundings at the chart scale density

The *_SS HCell contains the following Objects:

DEPCNT	Generalized 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 (HUND):	Feet
Positional Units (PUND):	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

H12220 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

H12220_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:40,000
H12220_SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:20,000
H12220_DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12220_outline.gml	Survey outline
H12220_outline.xsd	Survey outline

11.2 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 3.1	Creation of soundings and bathy-derived features, meta area object, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.2	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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Pacific Hydrographic Branch
Seattle, WA
206-526-6854
Russ.Davies@NOAA.GOV

APPROVAL SHEET
H12220

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.

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 disapproval 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.