D00165

NOAA Form 76-35A

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	D00165

LOCALITY

State:	OregonWashington
General Locality:	Pacific Ocean
Sub-locality:	25 Nautical Miles West of the Oregon-Washington Coast

2012

CHIEF OF PARTY
Richard T. Brennan, CDR/NOAA

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**D00165**

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

State:	**Oregon and Washington**
General Locality:	**Pacific Ocean**
Sub-Locality:	**25 Nautical Miles West of the Oregon-Washington Coast**
Scale:	**40000**
Dates of Survey:	**05/17/2012 to 11/01/2012**
Instructions Dated:	**05/11/2012**
Project Number:	**S-M921-FARA-12**
Field Unit:	**NOAA Ship *Rainier***
Chief of Party:	**Richard T. Brennan, CDR/NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Sea Level**
H-Cell Compilation Units:	***feet at Mean Lower Low Water***

Remarks:

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. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

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Descriptive Report to Accompany Survey D00165

Project: S-M921-FARA-12

Locality: Pacific Ocean

Sublocality: 25 Nautical Miles West of the Oregon-Washington Coast

Scale: 1:40000

May 2012 - November 2012

NOAA Ship *Rainier*

Chief of Party: Richard T. Brennan, CDR/NOAA

A. Area Surveyed

The survey area is 25 nautical miles west of the Washington-Oregon Coast. This survey corresponds to Sheet 2 in the sheet layout provided with the Project Instructions (Figure 1).

A.1 Survey Limits

Data was acquired within the following survey limits:

Northeast Limit	Southwest Limit
48.5246916667 N 125.022297222 W	44.574775 N 124.207494444 W

Table 1: Survey Limits

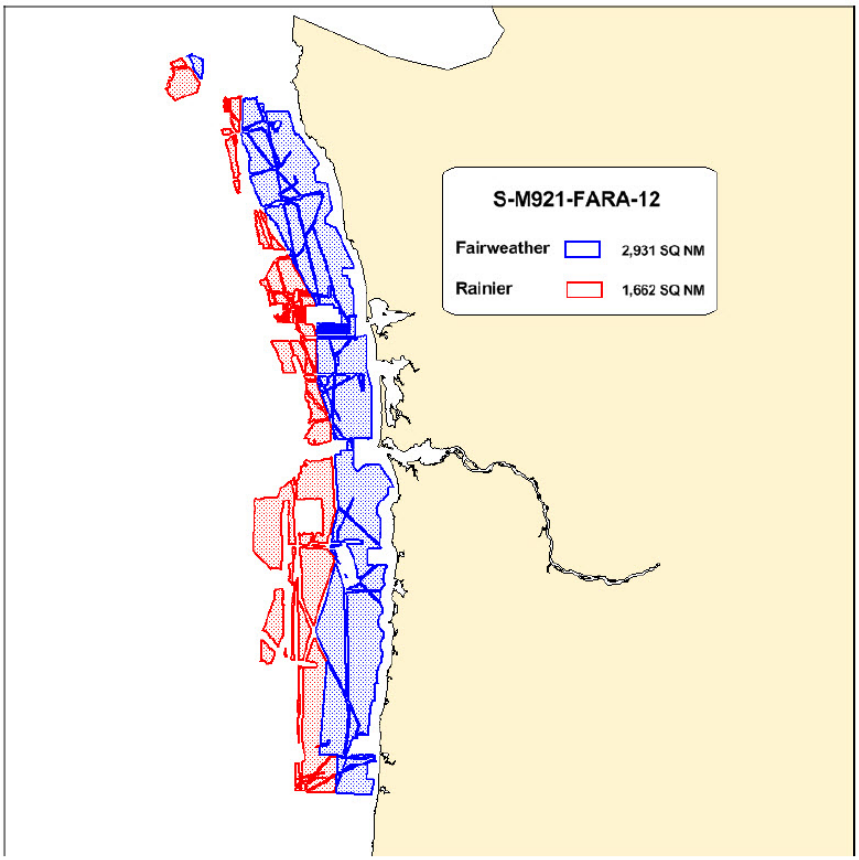

Figure 1: D00165 survey limits.

According to the Project Instructions, data was only to be acquired on survey D00165 during transits of the Pacific coast. As such, the entirety of the survey limits were not acquired in the two transits included in this survey.

A.2 Survey Purpose

The purpose of this project is to acquire data during FAIRWEATHER and RAINIER transits from the home port of Newport, OR and their working grounds in Alaska and Washington.

A.3 Survey Quality

The survey is partially adequate to supersede previous data.

For survey D00165, minimal sound speed profiling was conducted, and no control was applied to account for water levels. The survey does show reasonable agreement with previously charted depths, and could be considered to augment the more sparse regions of the charts. However, in the shoaler areas, like the approaches to Yaquina River or Puget Sound, data from survey D00165 should not supersede existing data.

A.4 Survey Coverage

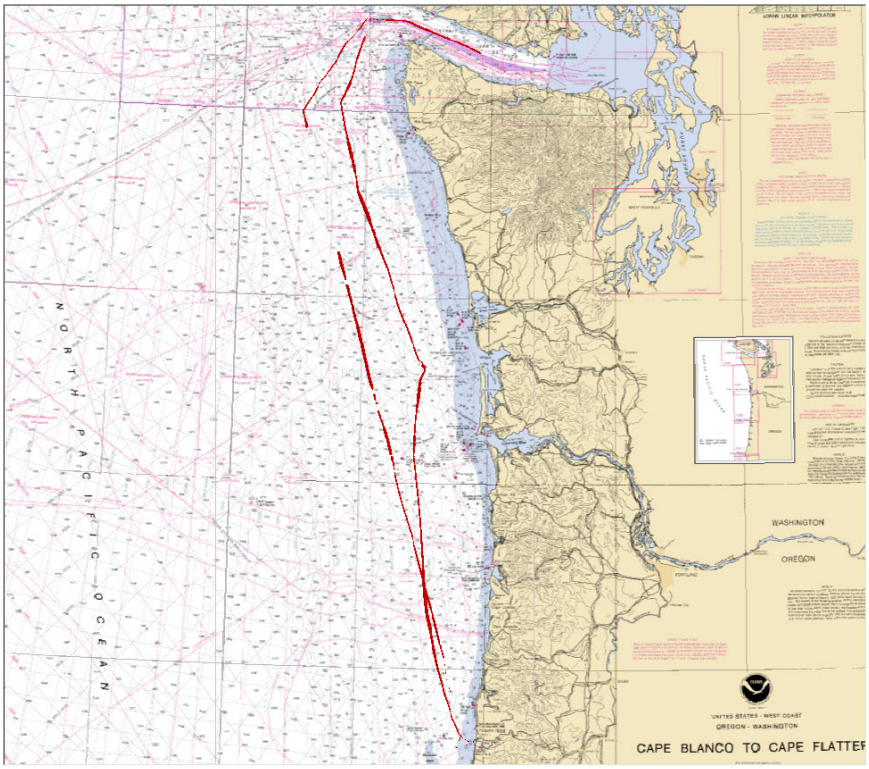

Figure 2: D00165 survey coverage.

In the areas surveyed, survey coverage was in accordance with the requirements in the Project Instructions.

A.5 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*S221*	*Total*
LNM	**SBES Mainscheme**	0	0
	MBES Mainscheme	505.88	505.88
	Lidar Mainscheme	0	0
	SSS Mainscheme	0	0
	SBES/MBES Combo Mainscheme	0	0
	SBES/SSS Combo Mainscheme	0	0
	MBES/SSS Combo Mainscheme	0	0
	SBES/MBES Combo Crosslines	0	0
	Lidar Crosslines	0	0
Number of Bottom Samples			0
Number of DPs			0
Number of Items Items Investigated by Dive Ops			0
Total Number of SNM			3.9

Table 2: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates
05/17/2012
05/18/2012
10/31/2012
11/01/2012

Table 3: Dates of Hydrography

A.6 Shoreline

No shoreline was assigned for this project.

A.7 Bottom Samples

There were no bottom samples assigned for this project.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***S221***
LOA	231 feet
Draft	16.5 feet

Table 4: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	**Model**	**Type**
Kongsberg	EM710	MBES
Applanix	POS/MV 320 V4	Positioning and Attitude System
Reson Inc.	SVP70	Sound Speed System
Rolls-Royce Group ODIM Brooke Ocean	MVP200	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

As survey D00165 was designated as a transit survey, no crosslines were acquired. However, in one instance the northbound and southbound transit lines intersected one another. In this area, a 32-meter BASE surface was created using strictly the northbound lines, while a second 32-meter surface was created using the southbound lines, from which a difference surface was generated (Figure 3). Statistics were then derived from the difference surface, yielding a mean difference of 0.48 meters (northbound being deeper) and a standard deviation of 1.32 meters (Figure 4). It should be noted that the average depth in this area of overlap was 350 meters, which has an allowable uncertainty (by IHO Order 2 standards) of 8 meters.

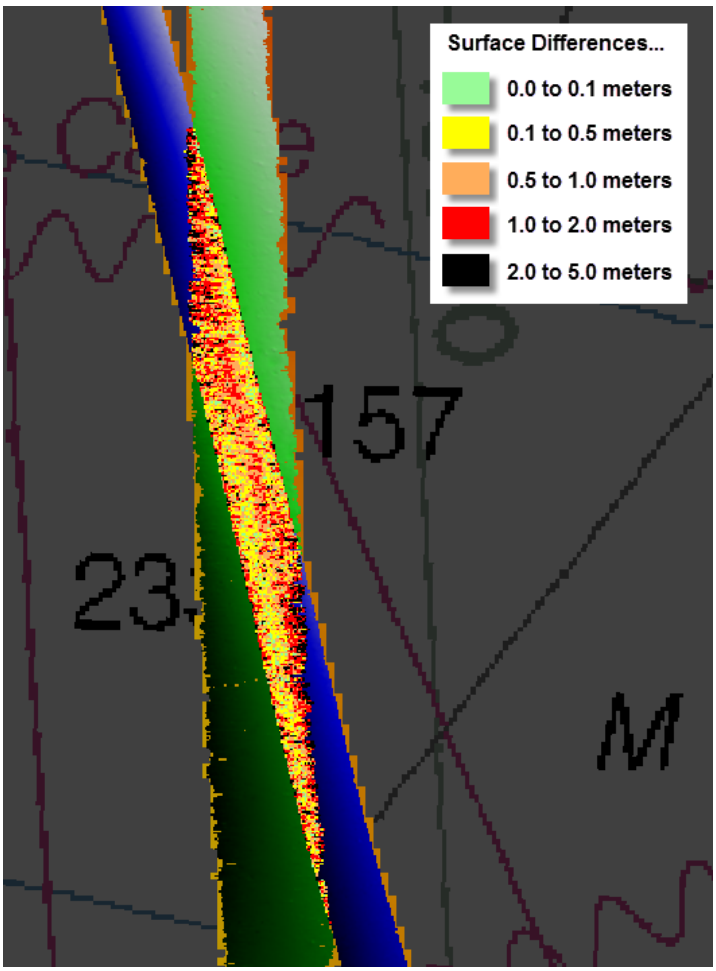

Figure 3: D00165 difference surface of northbound and southbound transit lines in area of overlap. The average depth in the area of overlap was 350 meters.

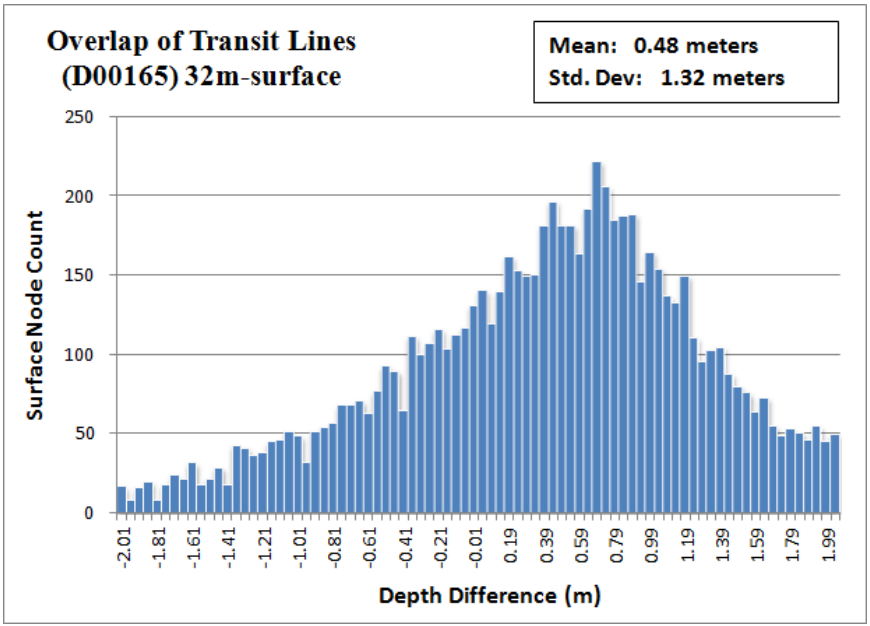

Figure 4: D00165 difference surface statistics of northbound and southbound transit lines in areas of overlap. Average difference was 0.48 meters in 350 meters of water.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
1.25meters	0meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
S221			0.05meters/second

Table 7: Survey Specific Sound Speed TPU Values

In accordance with the Project Instructions, there was no vertical control for this project; as such, the tidal uncertainty was unavailable. Similarly, only a single, static MVP cast was taken for the entire survey, making an estimate of the MVP measured uncertainty impractical. Lacking these major inputs to the uncertainty model, the propagated uncertainty of the soundings is of questionable merit. For these reasons, no comparison was made between the alleged uncertainty of the soundings and the allowable IHO uncertainty. A 1.25 meter (1-sigma) uncertainty was entered into the tide measured uncertainty to ensure the

reported uncertainties of the surfaces were at least 2.5 meters (2-sigma), thus ensuring any derived product from D00165 could not be interpreted as an IHO Order 1 survey.

B.2.3 Junctions

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

B.2.5.1Kongsberg EM710 Data Artifact

At present, there is a suspected integration problem within RAINIER's workflow between acquiring EM710 multibeam data (integrated with an Applanix POS M/V), and later processing said data within CARIS HIPS. The result is an apparent oscillation of the outerbeams, which can be up to ±0.15 meters in magnitude. For a further discussion, refer to Section B.3.1.1 - Processing EM710 data with CARIS SVC Module.

B.2.5.1Loss of Sonar Bottom Tracking

Large sections of the southbound trackline had to be rejected due to a loss of bottom tracking with the EM710 (Figure 5). With a loss of bottom track, the swath consisted entirely of noise, necessitating the exclusion of the data. These data gaps were focused in deep water, typically exceeding charted depths of 500 fathoms.

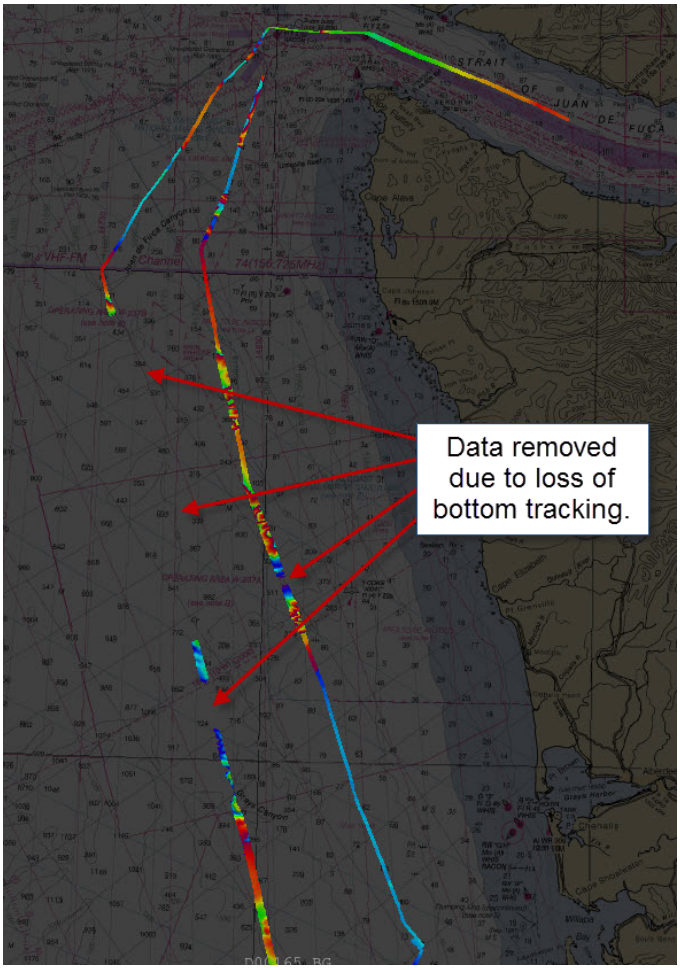

Figure 5: Sections of data removed due to loss of bottom tracking.

B.2.6 Factors Affecting Soundings

B.2.6.1 None Exist

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: A single cast was applied to the entire survey.

One sound speed cast was acquired for this survey on DN139 and applied to all lines (including those logged on DN305 and DN306). Given the infrequent casting, there are large areas (mostly in the extreme north and south) with up to a meter of refraction error (Figure 6). It should be noted that not all of the survey is infected with these refraction errors. Figure 7 shows both the location of the single sound speed cast taken, in addition to the area in which the north and southbound lines intersect. In spite of the cast being removed from the area of intersection by over 70 nautical miles, the lines show little to no error due to refraction (Figure 8).

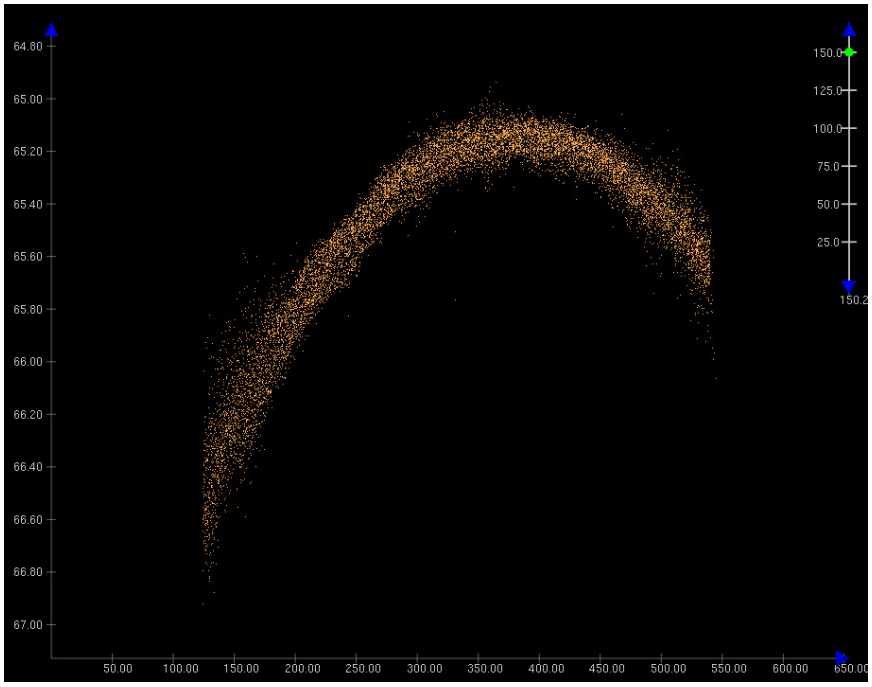

Figure 6: Illustration of typical refraction artifact due to infrequent sound speed sampling.

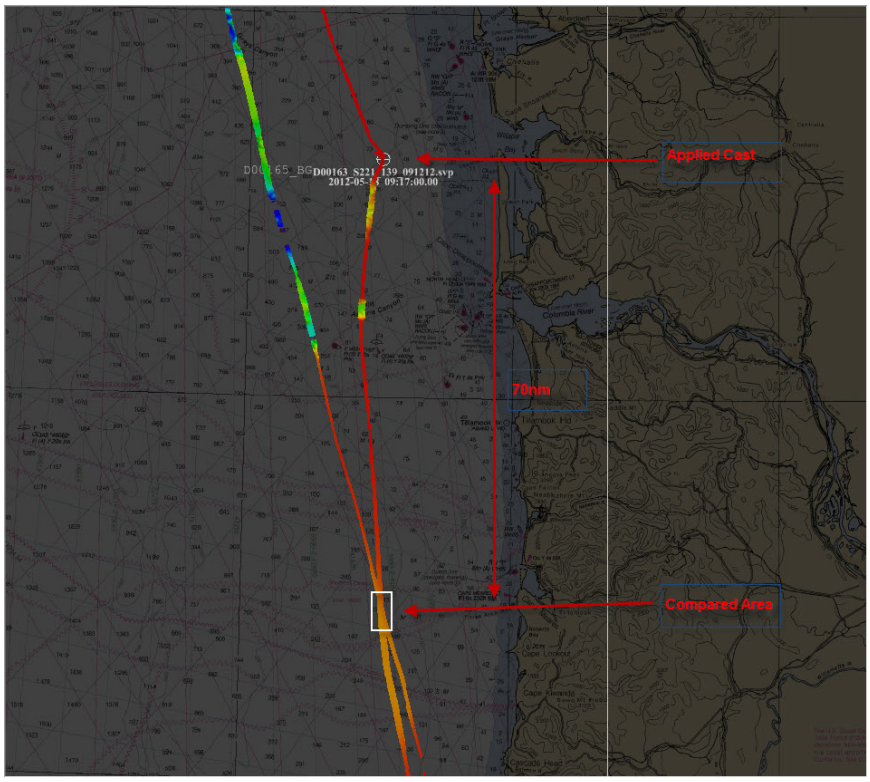

Figure 7: Location of the single sound speed cast and the area of intersection between the north and southbound survey lines.

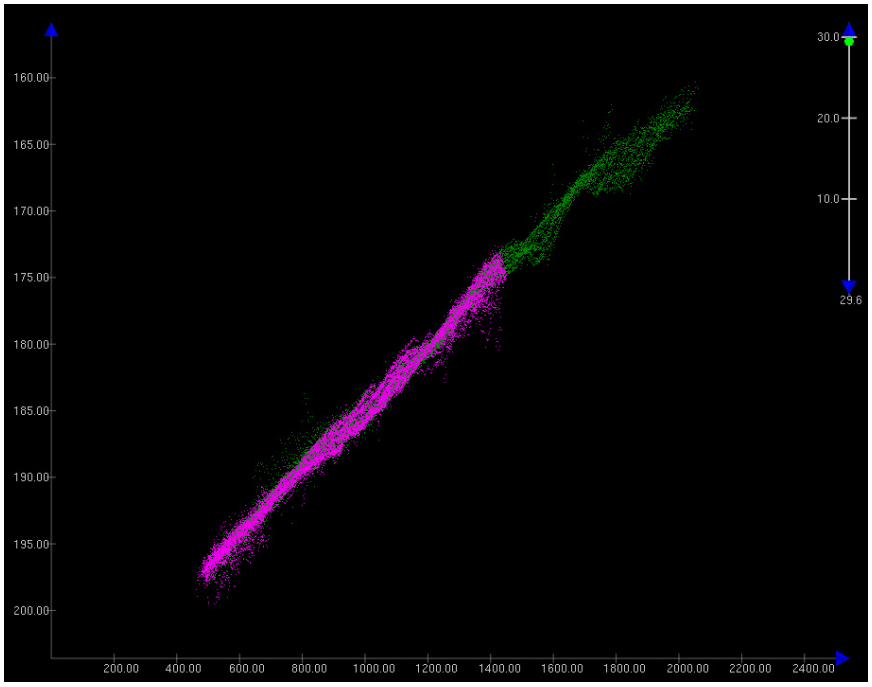

Figure 8: Cross-section of the north (green) and southbound (pink) survey lines highlighted in Figure 7. Note the minimal refraction error.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

B.3.1.1 - Processing EM710 data with CARIS SVC Module

At the time of this writing, CARIS has confirmed there is an error in the HIPS implementation of the Simrad Sound Velocity Correction (SVC) module, particularly when True Heave is applied to EM710 data (see Supplemental Correspondence - TrueHeave_Error_in_CARIS.pdf). To circumvent this problem, all EM710 data was sound velocity corrected using a custom Simrad SVC-free license, which forced HIPS to use the CARIS (technically, OMG) SVC module. Figure 9 shows a comparison between the best results achieved when using the Simrad SVC module (top), and CARIS SVC module (bottom). A sample line, in which True Heave was applied to Simrad data, is not shown as it yields markedly worse results than those depicted in Figure 9 (top). It should be noted that a small (±0.15 meter) artifact still persists in the outerbeams of the EM710, which may be related to a residual error within the ship's acquisition configuration. The artifact is being actively pursued by both ship's personnel and appropriate groups ashore.

B.3.1.2 - Lines without True Heave and the Heave Offset Vector

As mentioned in Section B.3.1.1, all EM710 lines were processed using the CARIS SVC module, with True Heave being applied. When EM710 data is processed in this manner, the heave offset vector within the CARIS HIPS Vessel File (HVF) should be left as zero, see Figure 10 - red highlight. However, if True Heave is unavailable, EM710 data (processed with the CARIS SVC module) with a zeroed heave offset vector will induce an artifact (Figure 11 - bottom). To mitigate this artifact, the offset vector between the ship's reference point and the sonar's transmit array was placed into the heave offset vector of the CARIS HVF (Figure 10 - blue highlight). Five lines did not have True Heave applied for survey D00165 (Line 0005 of DN139 and Lines 0036 through 0039 of DN305). These lines were processed with the non-zero heave offset vector, resulting in a marked improvement in the data quality (Figure 11 - top).

B.3.1.3 - Redundant Inertial Navigation System with EM710

On DN260, a Kongsberg Seapath 330+ position and attitude system was installed on RAINIER (in addition to the POS M/V) in order to troubleshoot the Kongsberg artifact discussed in Section B.2.5.1 of this report. This position and attitude sensor data was logged simultaneously with the POS M/V data into the raw Kongsberg .ALL files. For survey D00165, data logged on DN305 and DN306 contains both of these data sources. Because of this, the file conversion process deviates from the DAPR for these days. If reconversion is necessary, the CARIS HIPS Conversion Wizard must be set as shown in Figure 12 in order to use the POS M/V sensors. Specifically, the Position System must be set to "3", with the "Manual Override" checked; while the Heading, Heave, Roll and Pitch sensors set to "MRU 1". It is important to note that the HIPS default settings will use the Seapath sensor, which requires a different CARIS vessel file not included with Survey D00165. The same vessel file (S221_Simrad-EM710.hvf) is used for all EM710 data acquired in this survey.

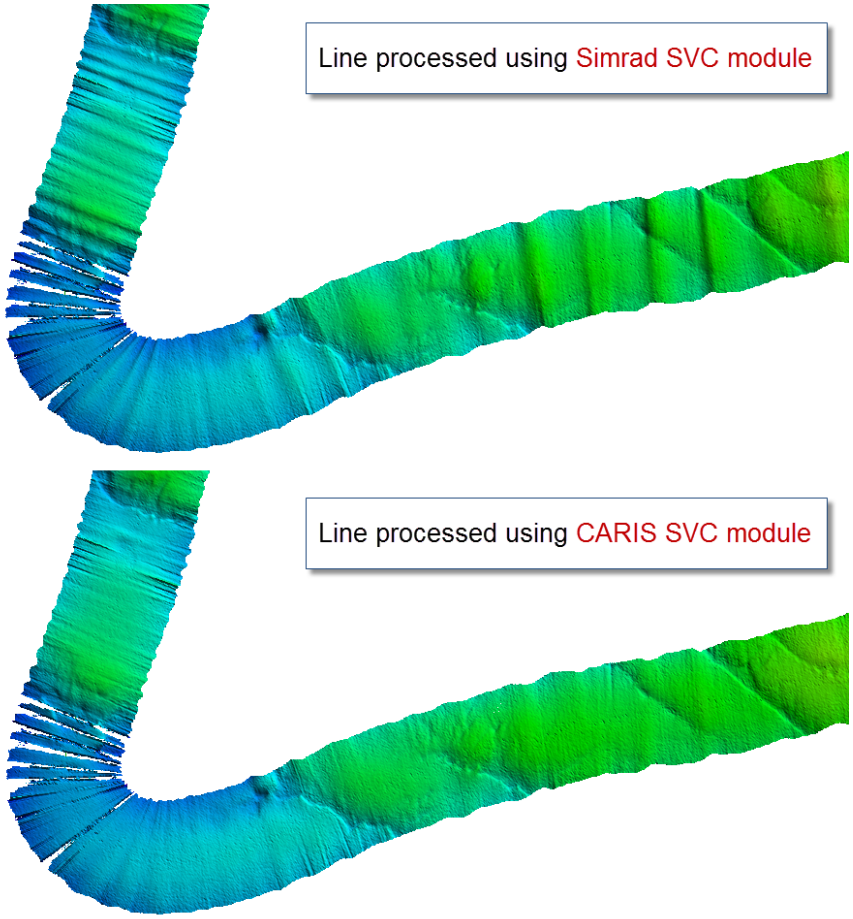

Figure 9: Comparison of gridded data when using the Simrad (top) versus CARIS (bottom) sound velocity correction module. Surfaces shown with 10x exaggeration.

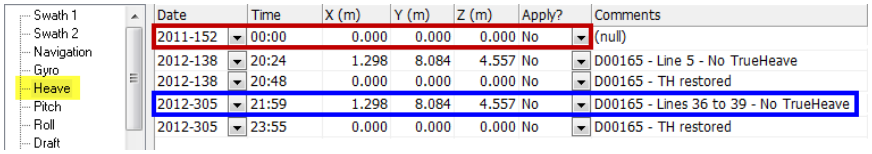

Figure 10: CARIS vessel file showing configurations for both EM710 data logged with True Heave (red) and without True Heave (blue).

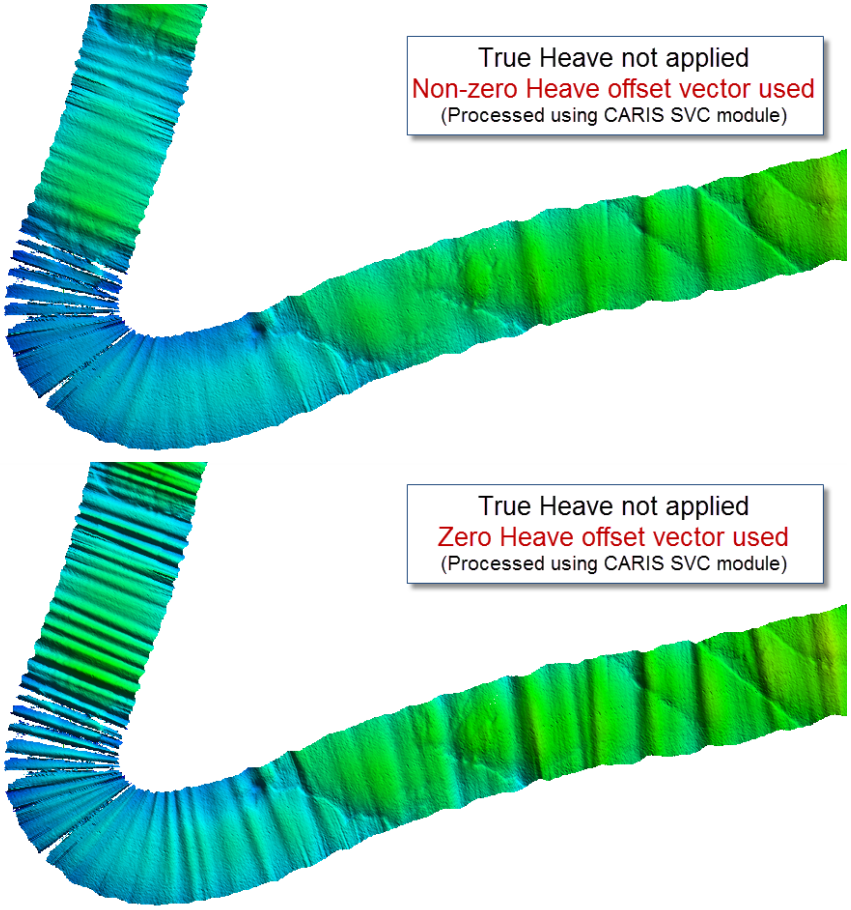

Figure 11: Comparison of gridded data when CARIS sound velocity correction module is used, in the absence of True Heave being applied, both with (top) and without a non-zero heave offset vector entered into the CARIS vessel file.

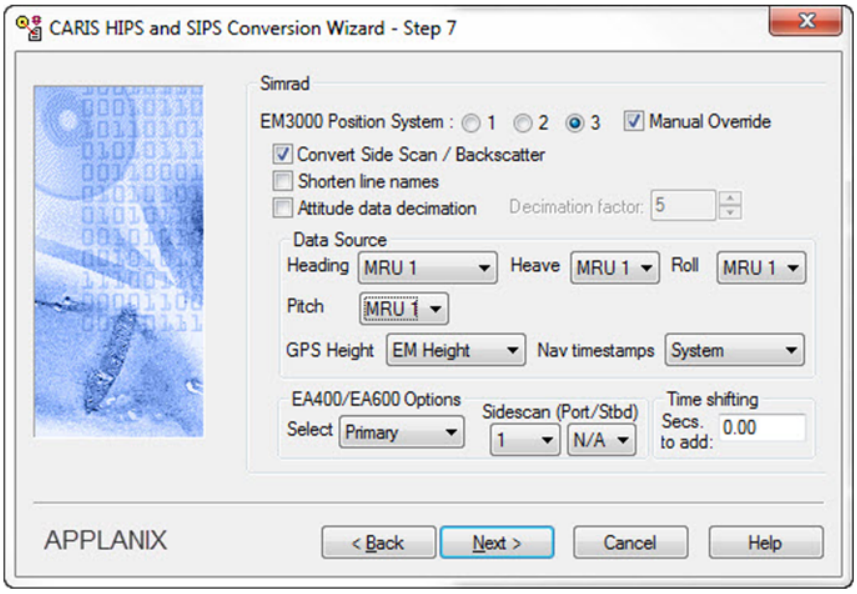

Figure 12: Conversion settings for the EM710 data acquired on DN305 and DN306, in order to use the Applanix POS M/V position and attitude records.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter was logged as a .ALL file and submitted directly to NGDC, and is not included with the data submitted to the Branch.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAA Catalogue Control Version 5.2 and NOAA Profile Product Version 2.0

Software programs and versions used for data processing are described in the DAPR.

B.5.2 Surfaces

The following CARIS surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
D00165_CUBE_8m	CUBE	8 meters	9 meters - 1584 meters	NOAA_8m	MBES TracklineSBES Set Line Spacing
D00165_CUBE_16m	CUBE	16 meters	9 meters - 1584 meters	NOAA_16m	MBES TracklineSBES Set Line Spacing
D00165_CUBE_32m	CUBE	32 meters	9 meters - 1584 meters	NOAA_32m	MBES TracklineSBES Set Line Spacing
D00165_CUBE_8m_0to160m_Final	CUBE	8 meters	9 meters - 160 meters	NOAA_8m	MBES TracklineSBES Set Line Spacing
)00165_CUBE_16m_144to320m_Fina	CUBE	16 meters	144 meters - 320 meters	NOAA_16m	MBES TracklineSBES Set Line Spacing
00165_CUBE_32m_288to1584m_Fin	CUBE	32 meters	288 meters - 1584 meters	NOAA_32m	MBES TracklineSBES Set Line Spacing
D00165_CUBE_32m_Combined	CUBE	32 meters	9 meters - 1584 meters	NOAA_32m	MBES TracklineSBES Set Line Spacing

Table 8: CARIS Surfaces

In some areas, primarily the approaches to the Yaquina River (extreme south end of the survey), depths are shoaler than 72 meters. However, given the lack of vertical control and inadequate sound speed profiling associated with this survey, it would be inappropriate to use the data from survey D00165 for the approaches to a port. To emphasize this, the data was intentionally left gridded at a coarse resolution. Further, software limitations make it impractical to grid the entire survey at resolutions much finer than 8 meters.

In accordance with the HSSDM, the data was gridded at a maximum (coarsest) resolution of 32 meters. In several instances, a coarser resolution surface would be more appropriate, owing to the extreme depths (exceeding 1500 meters).

C. Vertical and Horizontal Control

C.1 Vertical Control

The vertical datum for this project is Mean Sea Level. In accordance with the Project Instructions, there was no vertical control requirement for this project. As such a zero tide file was applied to all survey lines.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The following DGPS Stations were used for horizontal control:

DGPS Stations
Whidbey Island, WA (302) kHz
Fort Stevens, OR (287) kHz

Table 9: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
18003	1:736560	20	11/2006	04/26/2013	04/26/2013

Table 10: Largest Scale Raster Charts

18003

In accordance with the Project Instructions, chart comparisons were not required for survey D00165; however, a cursory examination of the gridded data was made against the small scale (18003) chart as well as the larger scale (18480, 18500, 18520, and 18561) charts in the area. No discrepancies of navigational significance were noted between the survey data and the raster charts.

The following are the largest scale charts that cover the area: 18581, 18561, 18460, 18480, 18500, 18520. The following are the largest scale ENCs that cover the area: US5OR44M, US5OR43M, US4WA36M, US3WA01M, US3WA03M, US3OR01M. The charted features that fell within and near the survey coverage were examined during the SAR and none of them could be identified in the data. Due to the field statement on data quality and recommendations in section A.3 of the DR, the reviewer recommends that all charted features be retained.

D.1.2 AWOIS Items

No AWOIS items exist for this survey.

D.1.3 Charted Features

No assigned charted features exist for this survey.

D.1.4 Uncharted Features

No assigned uncharted features exist for this survey.

D.1.5 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.6 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.7 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

There is a charted channel on chart 18561, the channel is the main entrance to the Yakina Bay in Oregon, in Addition, on chart 18460 there is a charted traffic separation schema and precautionary areas on the Strait of Juan de Fuca in WA.

D.2 Additional Results

D.2.1 Shoreline

Shoreline verification was not required for this survey.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

No assigned Aids to navigation (ATONs) exist for this survey.

There are ATONs marking the entrance and channel into Yaquina Bay, however, they were not investigated during this survey.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No assigned submarine features exist for this survey.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

No significant features exist for this survey.

D.2 Construction and Dredging

There is no present or planned construction or dredging within the survey limits.

The channel into Yaquina Bay is regularly maintained by USACE, although no maintenance activity was observed at the time of the survey.

E. Approval Sheet

As Chief of Party, Field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

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 Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives, with the exception of deficiencies noted in the Descriptive Report. Thus survey is complete and no additional work is required, again, with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
Richard T. Brennan, CDR/NOAA	Chief of Party	04/29/2013	 Richard T. Brennan 2013.05.13 23:36:40 -07'00'
Michael O. Gonsalves, LT/NOAA	Field Operations Officer	04/29/2013	 Michael O. Gonsalves 2013.05.13 15:00:50 -08'00'
James B. Jacobson	Chief Survey Technician	04/29/2013	 James Jacobson I have reviewed this document 2013.05.13 16:06:58 -08'00'

F. Table of Acronyms

Acronym	Definition
AFF	Assigned Features File
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSDM	Hydrographic Survey Specifications and Deliverables Manual

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Exectutive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

APPROVAL PAGE

D00165

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NGDC for archive

- D00165_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- D00165_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101
Date: 2015.07.30 08:04:52 -07'00'

Approved:_____

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

The survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Digitally signed by EVANS.BENJAMIN.K.1237217094
Reason: I am approving this document
Date: 2015.07.30 12:22:39 -07'00'

Approved:_____

CDR, Benjamin K. Evans, NOAA
Chief, Pacific Hydrographic Branch