H10999

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. RA-40-03-00

Registry No. H-10999

LOCALITY

State Northeast Pacific Ocean, BC, Canada

General Locality Hodgkins Seamounts, 100 NM West of Queen Charlotte Islands

Sublocality Hodgkins Seamount

2000

CHIEF OF PARTY

Commander Daniel R. Herlihy, NOAA

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DATE September 30, 2002

NOAA FORM 77-28 (11-72)

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

REGISTER NO.

HYDROGRAPHIC TITLE SHEET

H-10999

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.
RA-40-03-00

State **Northeast Pacific Ocean, British Columbia, Canada**

General Locality **Hodgkins Seamounts, 100 NM West of Queen Charlotte Islands**

Sublocality **Hodgkins Seamount**

Scale **1:40,000** Date of Survey **7/28/00 - 8/1/00**

Instructions Date **8/10/2000** Project No. **S-O909-RA**

Vessel **RAINIER-(2120)**

Chief of Party **Commander D. R. Herlihy, NOAA**

Surveyed by **Ship personnel and physical scientists from Pacific Hydrographic Branch**

Soundings taken by echo sounder, hand lead, pole **SB 1050D LF**

Graphic record scaled by **RAINIER Personnel**

Graphic record checked by **RAINIER Personnel**

Evaluation by **L. Deodato** Automated plot by **HP DesignJet 1050**

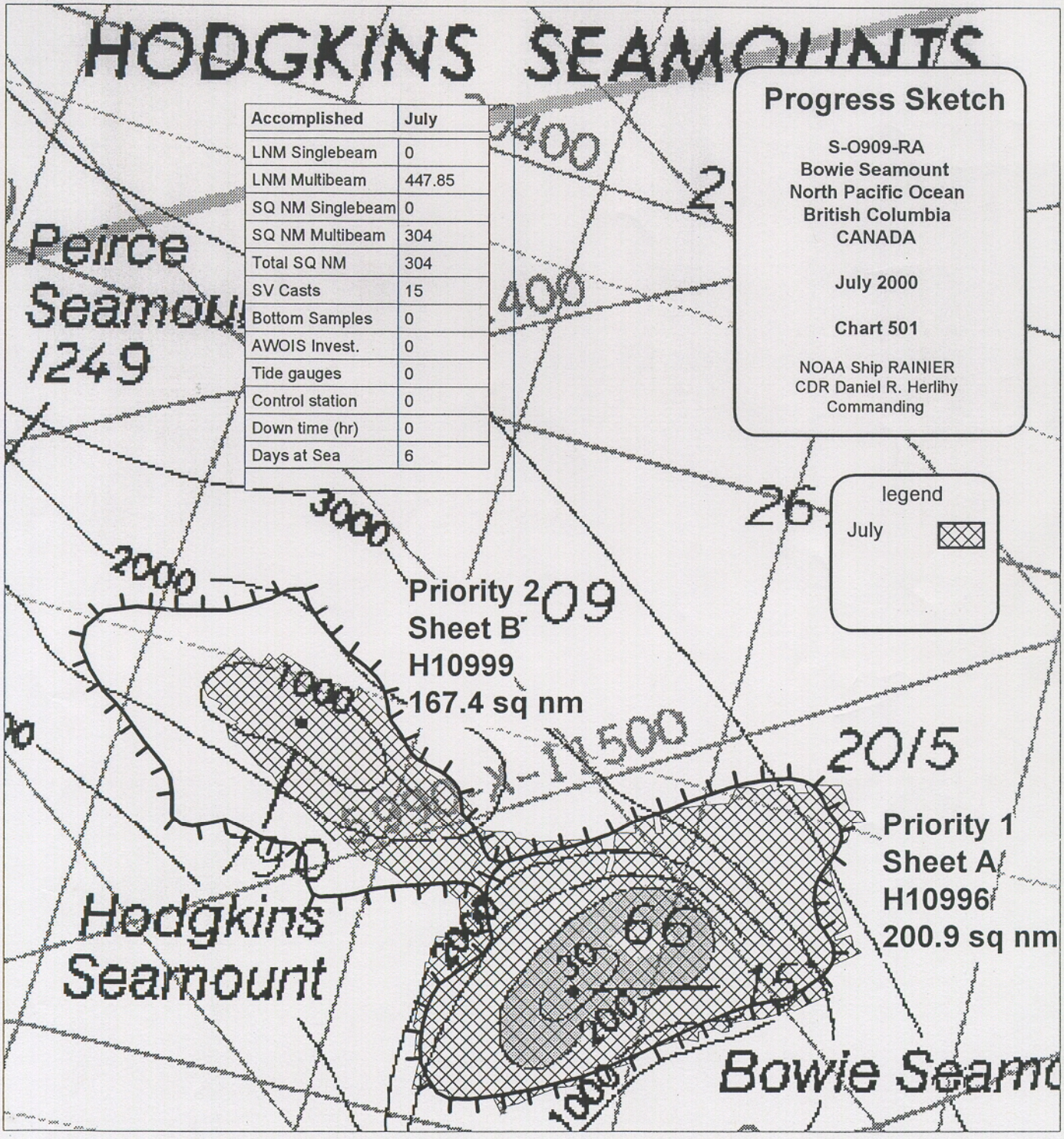
Verification by **L. Deodato, R. Davies, R. Mayor, G. Nelson**

Soundings in **Meters** at **MLLW**

REMARKS: **Time in UTC.**

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

All depths listed in this report are referenced to mean lower low water unless otherwise noted.


HODGKINS SEAMOUNTS
Progress Sketch
S-O909-RA
Bowie Seamount
North Pacific Ocean
British Columbia
CANADA
July 2000
Chart 501
NOAA Ship RAINIER
CDR Daniel R. Herlihy
Commanding
Accomplished | July
LNM Singlebeam | 0
LNM Multibeam | 447.85
SQ NM Singlebeam | 0
SQ NM Multibeam | 304
Total SQ NM | 304
SV Casts | 15
Bottom Samples | 0
AWOIS Invest. | 0
Tide gauges | 0
Control station | 0
Down time (hr) | 0
Days at Sea | 6
legend
July
Priority 2
Sheet B
H10999
167.4 sq nm
Priority 1
Sheet A
H10996
200.9 sq nm
Peirce Seamount
1249
Hodgkins Seamount
Bowie Seamo
3000
2000
1000
2015
2609

Descriptive Report to Accompany Hydrographic Surveys H10996 &[1] H10999

Project OPR-S-O909-RA-00[2] Bowie Seamount
Scale 1:40,000
July 2000
NOAA Ship RAINIER
Chief of Party: Commander Daniel R. Herlihy, NOAA

A. AREA SURVEYED

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions OPR-S-O909-RA-00[3], dated August 10, 2000, Cruise Prospectus OPR-S-O909-RA-00[4], dated June 9, 2000, and Draft Standing Project Instructions dated April 6, 1998. Interest for contemporary hydrography with full-bottom multibeam coverage in the vicinity of Bowie Seamount has been expressed by NOAA/NOS, the Canadian Hydrographic Service (CHS) - Institute of the Oceans, and the United States Geological Survey.

The survey area consists of two regions located near Bowie Seamount, which lies in the Northeast Pacific Ocean approximately 100 nautical miles west of the Queen Charlotte Islands, Canada. The priority 1 region[5] (H10996) covers Bowie Seamount itself down to approximately the 2200-meter contour, for a total area of 689 square kilometers. The priority 2 region (H10999) covers Hodgkins Seamount, which lies approximately 34.7 kilometers northwest of Bowie Seamount. Region 2 also covers the seafloor down to the 2200-meter curve for a total area of 574 square kilometers. Due to time constraints, hydrography was limited to the southwest corner of the priority 2 region, including the three shoalest peaks of Hodgkins Seamount. The survey's northern limit is latitude 53°38'00"N[6] and the southern limit is latitude 53°11'00"N[7]. The survey's western limit is longitude 136°22'00"W[8] and the eastern limit is longitude 135°18'00"W[9].

Data acquisition was conducted from July 28 to August 1, 2000 (DN 210 to 214).

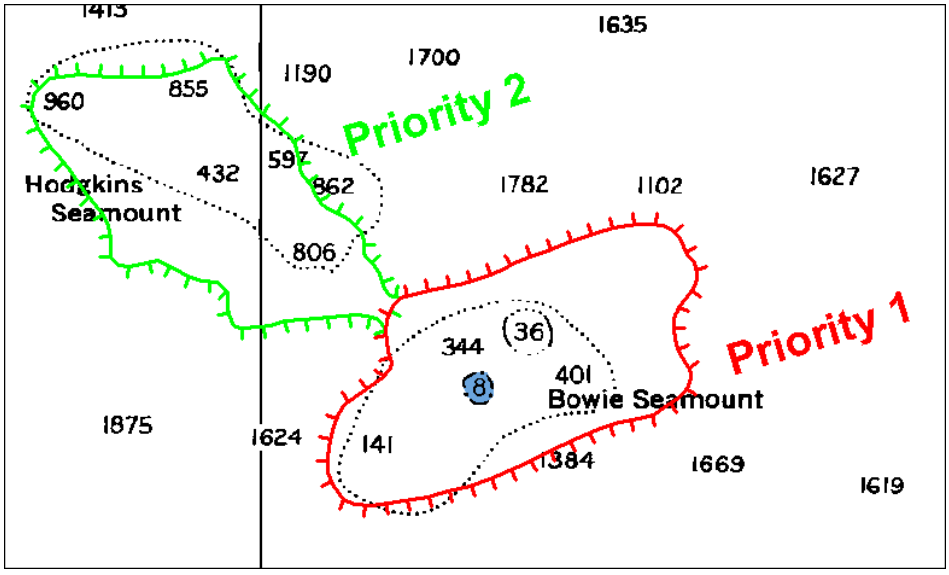


Figure 1: Survey areas of H10996 and H10999

B. DATA ACQUISTION AND PROCESSING

A complete description of data acquisition and processing systems, survey vessels, quality control procedures, and data processing methods used during the acquisition of data for S-O909-RA-00 follows.

B1. Equipment and Vessels

Data were acquired by RAINIER and her survey launches[10] (vessel numbers 2120, 2121, 2123, 2124 and 2126)[11]. RAINIER was used to acquire shallow-water and intermediate-depth multibeam soundings and sound velocity profiles. Vessels 2121, 2123, 2124 and 2126 were used to acquire shallow-water multibeam soundings and sound velocity profiles.[12]

Three different categories of echo sounder systems were utilized for project S-O909-RA. The individual systems chosen for use in a given area were decided at the discretion of the Hydrographer using the guidance stated in the Hydrographic Letter Instructions and the NOAA Field Procedures Manual (FPM). The systems chosen were also depended upon the limitations of each system, the bottom topography, and the water depth. These systems are described in the following section.

Sounding Equipment

1. Launch Shallow-Water Multibeam (SWMB) - VN 2121 and 2126[13]

Vessels 2121 and 2126 are equipped with a hull-mounted Reson SeaBat 8101, with options 033, Angle-Independent Imagery, and option 040, Extended Range Projector. The SeaBat 8101 is a 240 kHz multibeam system that measures relative water depths with a 150^{o} swath, consisting of 101 individual 1.5^{o} x 1.5^{o} beams. This system was used to obtain full-bottom coverage in depths generally from 25 meters to 200 meters, with range scale values ranging from 75 meters to 500 meters, depending upon the depth of water and across-track slope.

2. Launch Shallow-Water Multibeam (SWMB) - VN 2123 and 2124[14]

Vessels 2123 and 2124 are equipped with a hull-mounted SeaBeam/Elac 1180, which is a single frequency (180 kHz), multibeam echo sounder system for shallow- and intermediate-water depths. The transducer assembly consists of two arrays, one starboard and one port, each mounted at a 38° angle from horizontal. The SeaBeam 1180 transmits utilizing both transducer arrays pinging into 14 sectors. The receiving beamformer generates 3 narrow beams within each sector with a beam width of 1.5^{o} and a spacing of 1.25^{o}. Three subfans are one total fan. Hence, there are 14 sectors x 3 beams x 3 subfans resulting in 126 total beams. The SeaBeam/Elac 1180 was generally used in depths ranging from 40 to 350 meters, with an acquisition swath width dependent on the depth -- generally 131° for depths to 200 meters and 108° in depths from 100 meters to 350 meters. Swath width was often reduced further when surveying along steep slopes in order to reduce noise from missed pings occurring downslope.

3. Ship Shallow-Water and Intermediate-Depth Multibeam – VN 2120

RAINIER is equipped with a hull-mounted SeaBeam/Elac 1050D MKII, which is a dual frequency (180 kHz, 50 kHz), high-resolution multibeam echo sounder system for shallow- and intermediate-water depths. The SeaBeam 1050D MKII ensonifies the seafloor utilizing two narrow beamwidth transducer arrays pinging into 14 sectors. The receiving beamformer generates 3 narrow beams for each sector with a beam width of 1.5^{o} and a spacing of 1.25^{o}. Each fan is comprised of three subfans. Hence, there are 14

sectors x 3 beams x 3 subfans resulting in 126 total beams. The low frequency array (50 kHz) was used exclusively on this survey, in depths ranging from 100 to 2600 meters.

Multibeam sounding lines were run parallel to the contours at a line spacing generally three times the water depth.

Side Scan Sonar[15]

Side Scan Sonar (SSS) equipment was not used on this project. However, it should be noted that the Reson Seabat 8101 and the SeaBeam 1180 systems provide a low-resolution digital SSS record of the multibeam swath. This SSS imagery is primarily used during processing of the multibeam depth data to aid in determining whether anomalous soundings are true features or noise.

Positioning Equipment

Vessel 2120 is equipped with a Trimble DSM212L to measure and calculate position. The DSM212L is an integrated 12-channel GPS receiver and dual-channel DGPS beacon receiver. The beacon receiver can simultaneously monitor two independent U.S. Coast Guard (USCG) or Canadian DGPS beacons. There are three modes: Auto-Range, which locks onto the beacon nearest the vessel; Auto-Power which locks onto the beacon with the greatest signal strength; and Manual, which allows the user to select the desired beacon. RAINIER used Manual mode in order to maintain control over the source of differential correctors. The following parameters were monitored in real-time through Trimble's TSIPTalker software to ensure position data quality: number of satellites used in the solution, horizontal dilution of precision (HDOP), latency of correctors, and beacon signal strength. The DSM212L was configured to go off-line if the age of DGPS correctors exceeded 20 seconds, and was also configured to exclude satellites with an altitude below 8 degrees.

Vessels 2121, 2123, 2124, and 2126 are equipped with a TSS POS/MV Position and Orientation Sensor to measure and calculate position. The POS/MV is a GPS-aided inertial navigation system, which provides a blended position solution derived from both an Inertial Motion Unit (IMU) and an integrated GPS receiver. The IMU and GPS receiver are complementary sensors, and data from one are used to filter and constrain errors from the other, resulting in higher position accuracy and fewer errors than either system alone. Position accuracy is displayed in real time by the POS/MV software and was monitored to ensure positioning accuracy requirements as outlined in the NOS Hydrographic Surveys Specifications and Deliverables were not exceeded. In addition, the POS/MV software displays HDOP and number of satellites used in position computation. Data acquisition was generally halted when an HDOP of 4.0 was exceeded or the number of satellites available dropped below 4. However, because positional accuracy can be maintained by the POS/MV through short GPS outages with the help of the IMU, data acquisition was not halted during short periods of time when the HDOP and number of satellites used exceeded stated parameters.[16]

Software

Shallow-water multibeam (SWMB) echo sounder data were acquired using Triton-Elics' ISIS software version 4.54, and processed using Universal Systems Limited's CARIS HIPS software version 4.3.2, running on a Silicon Graphics, Inc. Origin 2100 with the Irix 6.5.2 operating system.[17]

Coastal Oceanographic's HYPACK MAX was utilized for vessel navigation and line tracking during acquisition of shallow-water multibeam (SWMB) data.[18]

Shallow-water and intermediate-depth multibeam data were acquired using Triton-Elics' ISIS software version 4.54, in conjunction with Elac-Nautik's HydroStar Online version 2.9.3, and processed using CARIS HIPS software version 4.3.2. Coastal Oceanographic's HYPACK MAX version 9.10 was utilized for vessel navigation and line tracking during multibeam acquisition.[19]

Multibeam data collected by RAINIER were acquired using Triton-Elics' ISIS software version 4.54 in conjunction with Elac-Nautik's HydroStar Online version 2.9.1a, and processed using CARIS HIPS software version 4.3.2.

Raw sound velocity data were processed using VELOCWIN 5.03 supplied by the NOS Hydrographic Systems and Technology Program (HSTP). VELOCWIN 5.03 uses raw salinity, temperature, and pressure measurements to create a sound velocity profile.

The Project Instructions for OPR-S-O909-RA-00 called for the collection of backscatter data in addition to the multibeam bathymetry and side-scan sonar imagery normally collected by RAINIER using Triton-Elics Isis software. Because the Extended Triton Format (XTF) does not log backscatter data, data were also recorded in the University of New Brunswick (UNB) format using Elac HydroStar Online. However, technical difficulties prevented logging of heading data in HydroStar Online, therefore no heading data were recorded in the UNB files. The UNB files were not post-processed by RAINIER. Because both XTF and UNB formats can be converted to CARIS HDCS, RAINIER suggests utilizing heading data from the converted XTF files for the backscatter data collected in the UNB format. The unprocessed UNB files are included with the digital data.

A complete list of software and versions is included in Appendix V.[20]

B2. Data Processing and Quality Control

Shallow-Water Multibeam Data[21]

Shallow-water multibeam data were monitored in real-time using the 2-D and 3-D data display windows in Isis, the on-screen display for the Reson SeaBat 8101 sonar processor, and the Elac HydroStar Online bathymetry data display. Adjustable user parameters include range scale (for both the Elac/SeaBeam 1050D and 1180, and the Reson 8101), power, gain, and pulse width (for the Reson 8101), and swath width and bottom slope type (for the Elac/SeaBeam 1050D and 1180). These parameters were adjusted as necessary to ensure the best data quality. Additionally, vessel speed was adjusted as necessary, and in accordance with the NOS Specifications and Deliverables and Standing Project Instructions, to ensure the required along-track coverage for object detection.

Following acquisition, shallow-water multibeam data were initially reviewed with the CARIS Hydrographic Data Cleaning System (HDCS) program SwathEdit. All soundings were reviewed, ping-by-ping, with obvious depth fliers identified and manually flagged as "rejected". Vessel positioning and attitude data from each system were similarly displayed and manually cleaned. Fliers or gaps in positioning and attitude data were rejected and interpolated for small periods in time and outright rejected for larger periods in time in which the characteristic of the curve was ambiguous. All soundings beyond a maximum angle of 60^{o} off-nadir were rejected in accordance with the Draft Standing Project Instructions to reduce the noise and refraction errors possible in these outer beams. Additionally, when it was determined that the quality of the data was reduced due to environmental conditions such as sea conditions or extreme variance in sound velocity, data were filtered to a lesser swath width to ensure data quality.

After review and cleaning in SwathEdit, depth, position and attitude data were merged, using the HDCS

program HDCSLineMerge, with sound velocity, tide, vessel offset, and dynamic draft correctors to compute the corrected depth and position of each sounding. All soundings were then again reviewed, spatially referenced, in HDCS Subset Mode. Data were compared with adjacent lines and crosslines for systematic errors such as tide or sound velocity errors. Questionable soundings were also compared with adjacent or overlapping data for confirmation or further rejection. Depth fliers and noisy data that were not rejected in SwathEdit were rejected in Subset Mode.

Sun-illuminated Digital Terrain Model images (DTMs) were created to demonstrate coverage and to further check for systematic errors such as tide, sound velocity, or attitude. DTMs created for quality-assurance purposes were created at three resolutions, depending upon the depth and system used. A 5-meter grid was used for the Reson Seabat 8101 in depths from 0 to approximately 200 meters. A 10-meter grid was used for data collected with the Elac/Seabeam 1180 in depths from 30 meters to approximately 500 meters. Lastly, a 15-meter grid was used for data collected using the low frequency (50 kHz) of the Elac/SeaBeam in depths greater than 200 meters.[22]

A statistical analysis of all SWMB data was performed using the CARIS Quality Control Report (QCR) function. SWMB crosslines were compared beam by beam with mainscheme soundings to statistically determine the accuracy of each beam. Beams not meeting accuracy requirements as described in the NOS Hydrographic Surveys Specifications and Deliverables were closely examined and in some cases further filtered and rejected.

To produce the final reduced data set represented by the final field sheets, all non-rejected soundings having passed all other quality-assurance checks were imported into a CARIS "workfile" by selecting shoal-biased "line by line" binning using a cell size of 1.5mm x 1.5mm at survey scale. The resultant thinned data were then imported into HPS. Since no tidal zoning scheme was supplied with this project, CARIS tides were allowed to carry through and no tide correctors were applied in HPS. Soundings were excessed in HPS ZoomEdit using a 3.8-millimeter character size, ensuring that the largest spacing between selected soundings would not exceed 5 millimeters at survey scale. Final selected soundings were saved and plotted in MapInfo at a 2-millimeter character size.

Vertical-Beam Echosounder Data

Although VBES was not processed for project OPR-S-O909-RA-00[23], VBES data were acquired concurrently with launch multibeam data and were compared to nadir beams of multibeam in real time during data acquisition to ensure multibeam data quality. Digital VBES depth data are also used by Isis to assist the Reson 8101 in tracking the bottom, and to aid as a depth filter. The latter is extremely helpful in areas of extreme relief, when the shallow-water multibeam tends to lose bottom tracking.[24]

Data processing flow diagrams are included in Appendix V[25] of this report.

Crosslines

SWMB crosslines for H10996 totaled 3.36 nautical miles, comprising 4.6% of SWMB hydrography. Data from both Reason and Elac launches was utilized in the QC report since crosslines often crossed MS soundings taken with a different system. The Quality Control Report (CARIS HIPS) for the checkline file averaged 97.19%, with a depth tolerance of 0.023, which conforms to International Hydrographic Organization (IHO) Order 2 specifications.[26] See Appendix V[27] for the detailed report

Intermediate depth multibeam crosslines for H10996 totaled 27.65 nautical miles, comprising 7.4% of mainscheme hydrography. The Quality Control Report (CARIS HIPS) for the checkline file averaged 84.99%, with a depth tolerance of 0.023. Because of the depth range in the area, up to 2764 meters, an

additional classification report was prepared with IHO statistics a/b of 5.0 and 0.05 and the checkline file averaged 97.11%.[28] See Appendix V[29] for the detailed report

Intermediate-depth multibeam crosslines for H10999 totaled 8.74 nautical miles, comprising 10.1% of mainscheme hydrography. The Quality Control Report (CARIS HIPS) for the checkline file averaged 84.21%, with a depth tolerance of 0.023. Because of the depth range in the area, up to 2397 meters, an additional classification report was prepared with IHO statistics a/b of 5.0 and 0.05 and the checkline file averaged 98.58%. See Appendix V[30] for the detailed report

Junctions

No contemporary NOAA surveys junction with H10996 or H10999.

Data Quality Factors

No unusual conditions were encountered during the survey which affected the expected accuracy and quality of survey data.[31]

B.3 Corrections to Echo Soundings

Sound Velocity

Sound velocity profiles were acquired with SeaBird Electronics Inc. SEACAT SBE19 Conductivity, Temperature, and Depth (CTD) profilers (S/N 219, 811, 2543, and 2044). Raw conductivity, temperature, and pressure data were processed using the program VELOCWIN version 5.03, which generates sound velocity profiles for CARIS and sound velocity corrector tables for HPS. Sound velocity correctors were applied to SWMB soundings in CARIS and to VBES soundings in HPS during post processing. Calibration reports and dates are included in Section III of the *Separates to be Included with Survey Data.*[32]

The speed of sound through water was determined by a minimum of one cast approximately every six to eight hours of SWMB acquisition. At the start of operations, a cast to a depth of 2026 meters, the maximum obtainable limit by RAINIER, was taken. For all subsequent casts, the depth was limited to 300 to 400 meters and values from the first deep cast were appended to the end of each individual shallower cast, since the speed of sound appears to remain uniform and unchanging at these deeper depths. In all cases, graphs of the concatenated sound velocity profiles appeared continuous.

Vessel Offsets and Dynamic Draft Correctors

The following table shows when the vessel offsets and dynamic draft correctors used for this survey were last determined:

Vessel No.	Date of Static Draft and Transducer Offset Measurements	Method of Settlement and Squat Measurement	Date of Settlement and Squat Measurement	Location of Settlement and Squat Measurement
Rainier	March 1999	OTF	March 1999	Port Angeles, WA
2121	March 1999	OTF*	March 1999	Port Angeles, WA
2123	March 2000	Rod leveling	March 2000	Shilshole Bay, WA
2124	March 2000	Rod leveling	March 2000	Shilshole Bay, WA
2126	March 1999	OTF*	March 1999	Port Angeles, WA[33]

*OTF: “On-the-fly” GPS techniques

Sensor offset and dynamic draft values were applied to VBES data in HPS and to SWMB data in CARIS. These values are stored in HPS offset tables and CARIS Vessel Configuration Files (VCFs). Vessel offset diagrams and dynamic draft tables are included in Section V[34] of the *Separates to be Included with Survey Data*. The VCFs themselves are included with the digital CARIS data.

Heave, Pitch, Roll and Heading, Including Biases and Navigation Timing Errors

SWMB launches (VN 2121, 2123, 2124, and 2126) utilized a TSS POS/MV Model 320 Position and Orientation System – Marine Vessel (POS/MV), which provides accurate navigation and attitude data to correct for the effects of heave, pitch, roll and heading. The POS generates attitude data in three axes (roll, pitch and heading) to an accuracy of 0.05° or better. Heave measurements supplied by the POS/MV maintain an accuracy of 5% of the measured vertical displacement for movements that have a period of up to 10 seconds. The POS/MV delivers heading measurements by two distinct methods. First, the Dynamic Heading Alignment determines the vessels heading by using the data supplied by the Internal Measurement Unit (IMU) and GPS receivers to achieve heading that is, at best, accurate to within 0.25°. This method suffers from drift but is relatively unaffected by noise. Second, the GPS Azimuth Measurement System (GAMS) determines the geographic vector between two GPS antennas fixed to the vessel by comparing the phase of satellite signals they receive. The error from this method is largely due to noise, but exhibits no drift. The POS/MV uses the advantages of each method to compensate for the disadvantages of the other to arrive at an optimal accuracy of 0.05°.[35] Serial numbers for this equipment are listed in Appendix V.[36]

Vessels 2123 and 2124 are equipped with a later model POS/MV version 3 which was newly introduced in 2000. Due to still unresolved technical difficulties, on numerous occasions the POS/MV was unable to obtain a GAMS solution to the baseline vector between the master and slave GPS antennae. At these times the heading value was derived solely from the IMU and was accurate to at best 0.25°. During these periods the heading accuracy was closely monitored using the POS/MV software to ensure that it never exceeded 0.5° as stated in the NOS Specifications and Deliverables for Hydrographic Surveys. On the vast majority of these occasions, heading accuracy was maintained at 0.35 ° or better. Because the accuracy decreases over time as a result of the drift of the IMU, “figure-8” maneuvers were performed after several survey lines to reinitialize the IMU and obtain better accuracy. These data were closely inspected in HDCS to ensure the quality of position and heading data.[37]

RAINIER utilizes a TSS 335B attitude sensor, which provides attitude data (heave, pitch and roll) to correct for the effects of vessel motion during survey operations. Heave resolution is 1cm, with an accuracy of 5cm or 5% of the range, whichever is the greater. The roll and pitch resolution is 0.01°, with an accuracy of 0.05° – 0.1°. During acquisition, SeaBeam depth data are corrected for roll in HYDROSTAR to account for beam steering at the transducer face. RAINIER is equipped with a Sperry MK227 standard gyrocompass to measure heading, with an accuracy of +/- 0.5 degrees.

Heave, roll, pitch, and navigation latency biases were determined during Patch Tests conducted off Shilshole Bay, WA on March 6, 2000 for vessels 2121 and 2126; in Steamer Bay, AK on April 5, 2000 for vessel 2124, and on April 12, 2000 for vessel 2123; and in Uyak Bay, Kodiak Island AK on May 15 & 18, 2000 for RAINIER. SWMB vessel offsets, dynamic draft correctors, and system bias values are contained in CARIS Vessel Configuration Files (VCFs) and were created using the program “VCFEDIT” in CARIS. These offsets and biases are applied to the sounding data during processing in CARIS. The VCFs are included with the digital HDCS data.

C. VERTICAL AND HORIZONTAL CONTROL

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. The US Coast Guard Beacons at Sitka, AK, and Annette Island, AK, in addition to the Canadian Coast Guard Beacon at Sandspit, British Columbia were the sources of differential correctors.

Vertical Control

The vertical datum for this project is Lower-Low Water Large Tide (LLWLT).[38] RAINIER installed no tide stations for this project, nor did the Letter Instructions specify a primary tide station. The Pacific Hydrographic Branch will apply final approved (smooth) tides to the survey data during final processing. A request for delivery of final approved (smooth) tides for surveys H10996 and[39] H10999 was forwarded to N/OPS1 on September 1, 2000 in accordance with FPM 4.8. Copies of the "Request for Approved Tides/Water Levels" are included in Appendix IV[40] of this report.

Water Level Correctors

Soundings were reduced to Lower-Low Water Large Tide (LLWLT)[41]. using predicted tide data. CHS provided predicted tides for the Bowie Seamount on a floppy disk. In addition, the latest TOPEX/ERS-2 analysis of satellite data dated July 23, 2000 confirmed the presence of an eddy over the Bowie Seamount. Because this eddy is caused a sea surface height anomaly, a further tide corrector of 0.15 meters was subsequently added to the predicted table. These tide data were then manipulated into a CARIS tide format. This predicted tide table is the source of final tide correctors applied to the soundings of H10996 and[42] H10999, since no tidal zoning scheme was supplied with the Letter Instructions or by CHS (Refer to Appendix V[43] for additional information).[44]

D. RESULTS AND RECOMMENDATIONS

D.1 Automated Wreck and Obstruction Information System (AWOIS) Investigations

No AWOIS items were within the limits of H10996 or[45] H10999.[46]

D.2 Chart Comparison

Surveys H10996 and[47] H10999 were[48] compared with NOS chart 501 (11th Ed.; November 1, 1997 1:3,500,000), and CHS chart 300001 (new ed. Jan 20 1989, reprint April 22 1994, notice to mariners 1997-617, 1:1,250,000).[49]

The shoalest depth surveyed on Bowie Seamount was 24.3 meters (13.3 fathoms) at 53°17’58.39”N, 135°39’02.22”W (Easting 456640.0, Northing 5905791.7) near the charted 15-fathom sounding on chart 501. This same feature is 1.75 kilometers southeast of a charted 8-fathom shoal found on CHS chart 300001. One hundred percent multibeam coverage was obtained over the entire area and no indication of an 8-fathom depth was found, although large amounts of fish or kelp were noticeable in the multibeam data, perhaps accounting for this sounding. This survey also recorded a 474.4-meter (259.4 fathom) depth at 53°20’28.54”N, 135°34’23.05”W (Easting 461845.2 Northing 5910387.1), in the vicinity of a charted 66-fathom sounding. This area was also covered with 100% SWMB. It is the Hydrographer’s opinion

that the source of this sounding could be the shoal area approximately 4.5 kilometers to the southwest of the charted sounding, and the sounding was moved during chart compilation for purposes of clarity.[50]

Comparison of chart 501[51] and H10996 also reveals that there are discrepancies in the portrayal of the 30-, 200-, and 1000-fathom depth curves around Bowie Seamount. The 30-fathom curve on chart 501 encompasses an area much greater than the surveyed 30-fathom curves, although at chart scale accurate depiction would not be possible; therefore it is the Hydrographer's opinion that the 30-fathom curve is adequately represented. The 200-fathom curve covers an area much larger than surveyed, and the Hydrographer believes it is depicted as such to encompass the 66-fathom sounding mentioned previously. Finally, while the 1000-fathom curve encompasses roughly a correctly sized area, it would better represent the actual bottom if it were shifted 9 kilometers to the northeast to agree with surveyed soundings.[52]

Discrepancies can also be observed when comparing the current surveys and CHS chart 300001. The charted depths surrounding the previously discussed 8-fathom depth are all much shoaler than those of the current survey. For instance, the shoalest surveyed sounding in the vicinity of a charted 141-fathom depth at 53°15'30.58"N, 135°48'53.36"W, is a 274-fathom sounding at 53°15'33.98"N, 135°48'14.22"W (Easting 446371.1, Northing 5901433.2). The shoalest survey sounding in the vicinity of a 36-fathom sounding charted at 53°21'46.35"N, 135°35'02.44"W, is a 487-fathom sounding at 53°21'48.81"N, 135°35'44.78"W (Easting 460501.9, Northing 5913002.8). One hundred percent multibeam covers the entire area and no indication of the 36-fathom depth was found. The 344-fathom sounding at 53°21'00.34"N, 135°41'04.7"W, is charted on a slope where survey depths range from 700 to 1000 fathoms. The 401-fathom sounding at 53°19'38.15"N, 135°30'38.26"W is also charted on a slope where survey depths range from 600 to 1000 fathoms. The 1000-fathom curve depicted on chart 300001 compares rather well to survey soundings, although appears to extend further to the northeast than depicted.[53]

The shoalest survey depth over Hodgkins Seamount was 597.7[54] meters (326 fathoms) at 53°30'22.54"N, 136°02'08.48"W (Easting 431311.4 Northing 5929089.3). This sounding is the shoalest of a series of northwest - southeast trending peaks which comprise Hodgkins Seamount. These peaks are all significantly shoaler that the charted peak of the Hodgkins Seamount on NOS chart 501, a 790-fathom[55] sounding located at 53°30'35.13"N, 136°03'29.53"W. The charted 1000-fathom[56] contour is also significantly different from the actual depth curves found during this survey. The current soundings indicate that the 1000-fathom[57] contour extends approximately 9.1 kilometers further southeast[58] and 3.1[59] kilometers further southwest that the charted contour indicates.

Survey H10999 and CHS chart 300001[60] agree well. The 326-fathom peak mentioned previously is near the charted 432-fathom sounding at 53°30'45.28"N, 136°03'55.38"W, which is charted on a slope with depths ranging from 326 fathoms to 700 fathoms. A charted 806-fathom sounding at 53°26'24.07"N, 135°55'02.0"W agrees with the current survey.[61] The only discrepancy is a charted 597-fathom[62] sounding at 53°31'30.8"N, 135°57'23.68"W, which is charted near survey depths of 900 to 1200 fathoms. However, this is at the edge of the survey and shoaler depths could possibly exist northeast of the survey boundary. The 1000-fathom curve depicted on chart 300001[63] is significantly different from that surveyed, although the entire area of the charted 1000-fathom curve was not surveyed.

D.3 Shoreline

No shoreline was within the limits of H10996 or[64] H10999.

D.4 Dangers to Navigation

No dangers to navigation were found within the limits of H10996 or[65] H10999.

D.5 Aids to Navigation

No aids to navigation exist within the survey limits of H10996 or[66] H10999.

D.6 Prior Surveys

No prior surveys were supplied for surveys H10997 or[67] H10999.

D.7 Miscellaneous

RAINIER intends to transmit data directly to CHS once approval is obtained through the U.S. State Department. The data submitted, with the exception of HPS and MapInfo data, are identical to those submitted to the Pacific Hydrographic Branch. No further exchange of data between CHS and NOAA should be necessary.

E. APPROVAL

As Chief of Party I have personally supervised the data acquisition and processing of this hydrographic survey and have inspected the final field sheets along with the Descriptive Report. I approve all field sheets, the Descriptive Report, digital data, and accompanying records. This approval constitutes the assumption of responsibility for the stated accuracy and completeness of the hydrographic survey.

Surveys H10996 and[68] H10999 are[69] complete and adequate to supersede charted soundings and features in their common areas. Although the entire second priority area was not surveyed, adequate coverage was obtained to delineate the peak of Hodgkins Seamount. There is no additional work required on this survey.[70]

Approved and Forwarded: Daniel R. Herlihy

Daniel R. Herlihy
Commander, NOAA
Commanding Officer

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

Survey Sheet Manager: Sean C Rooney

for James B. Jacobson
Chief Survey Technician, NOAA Ship RAINIER

Field Operations Officer: E. J. Van Den Ameele

Edward J. Van Den Ameele
Lieutenant, NOAA

Revisions Compiled During Office Processing and Certification

[1] PHB Revision-- Strikethrough ~~s H10996 &~~
[2] PHB Revision-- Strikethrough ~~-00~~
[3] PHB Revision-- Strikethrough ~~-00~~
[4] PHB Revision-- Strikethrough ~~-00~~
[5] Priority 1 region pertains to survey H10996
[6] PHB Revision-- Revise GP to 53°34'00"N
[7] PHB Revision-- Revise GP to 53°22'00"N
[8] PHB Revision-- Revise GP to 136°12'00"N
[9] PHB Revision-- Revise GP to 135°48'00"W
[10] PHB Revision-- Strikethrough ~~and her survey launches~~
[11] PHB Revision-- Strikethrough ~~2121, 2123, 2124 and 2126~~
[12] PHB Revision-- Strikethrough ~~Vessels 2121, 2123, 2124 and 2126 were used to acquire shallow-water multibeam soundings and sound velocity profiles~~
[13] This pertains to H10996
[14] This pertains to H10996
[15] This pertains to H10996
[16] This pertains to H10996
[17] This pertains to H10996
[18] This pertains to H10996
[19] This pertains to H10996
[20] Filed with the hydrographic data
[21] This pertains to H10996
[22] This pertains to both surveys (H10996 and H10999)
[23] PHB Revision-- Strikethrough ~~-00~~
[24] This pertains to H10996
[25] Filed with the hydrographic data
[26] This pertains to H10996
[27] Filed with the hydrographic data
[28] This pertains to H10996
[29] Filed with the hydrographic data
[30] Filed with the hydrographic data
[31] Concur
[32] Filed with the hydrographic data
[33] PHB Revision-- Strikethrough

~~2121~~	~~March 1999~~	~~OTF*~~	~~March 1999~~	~~Port Angeles, WA~~
~~2123~~	~~March 2000~~	~~Rod leveling~~	~~March 2000~~	~~Shilshole Bay, WA~~
~~2124~~	~~March 2000~~	~~Rod leveling~~	~~March 2000~~	~~Shilshole Bay, WA~~
~~2126~~	~~March 1999~~	~~OTF*~~	~~March 1999~~	~~Port Angeles, WA~~

[34] Filed with the hydrographic data
[35] This pertains to H10996
[36] Filed with the hydrographic data
[37] This pertains to H10996
[38] PHB Revision -- Soundings reduced to MLLW
[39] PHB Revision-- Strikethrough ~~s H10996 and~~
[40] Filed with the hydrographic data
[41] PHB Revision -- Soundings reduced to MLLW
[42] PHB Revision-- Strikethrough ~~H10996 and~~

[43] Filed with the hydrographic data
[44] Soundings reduced to MLLW. Approved Tide Note dated November 24, 2000 is attached.
[45] PHB Revision-- Strikethrough ~~H10996 or~~
[46] Concur
[47] PHB Revision-- Strikethrough ~~s H10996 and~~
[48] PHB Revision-- Strikethrough ~~were~~ and replace with was
[49] PHB Revision-- Strikethrough ~~CHS chart 300001 (new ed. Jan 20 1989 reprint April 22 1994, notice to mariners 1997-617~~ and replace with NIMA 17003 4th Edition, February 10, 1996
[50] This pertains to H10996
[51] Chart 501 is in meters
[52] This pertains to H10996
[53] This pertains to H10996
[54] PHB Revision-- Revise to 597.0
[55] PHB Revision-- Strikethrough ~~fathom~~ and replace with meter
[56] PHB Revision-- Strikethrough ~~fathom~~ and replace with meter
[57] PHB Revision-- Strikethrough ~~fathom~~ and replace with meter
[58] PHB Revision-- Strikethrough ~~southeast~~ and replace with northeast
[59] PHB Revision-- Strikethrough ~~3.1~~ and replace with 14
[60] PHB Revision-- Strikethrough ~~CHS chart 300001~~ and replace with NIMA chart 17003
[61] A 1386-meter(757-fathom) sounding exists in the area of the charted 806-fathom sounding.
[62] This charted sounding is outside the surveyed area
[63] PHB Revision-- Strikethrough ~~300001~~ and replace with 17003
[64] PHB Revision-- Strikethrough ~~H10996 or~~
[65] PHB Revision-- Strikethrough ~~H10996 or~~
[66] PHB Revision-- Strikethrough ~~H10996 or~~
[67] PHB Revision-- Strikethrough ~~H10997 or~~
[68] PHB Revision-- Strikethrough ~~s H10996 and~~
[69] PHB Revision-- Strikethrough ~~are~~ and replace with is
[70] Concur

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: November 24, 2000

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: S-O909-RA-2000
HYDROGRAPHIC SHEET: H-10999

LOCALITY: Bowie Seamount, British Columbia, Canada
TIME PERIOD: July 31 - August 1, 2000

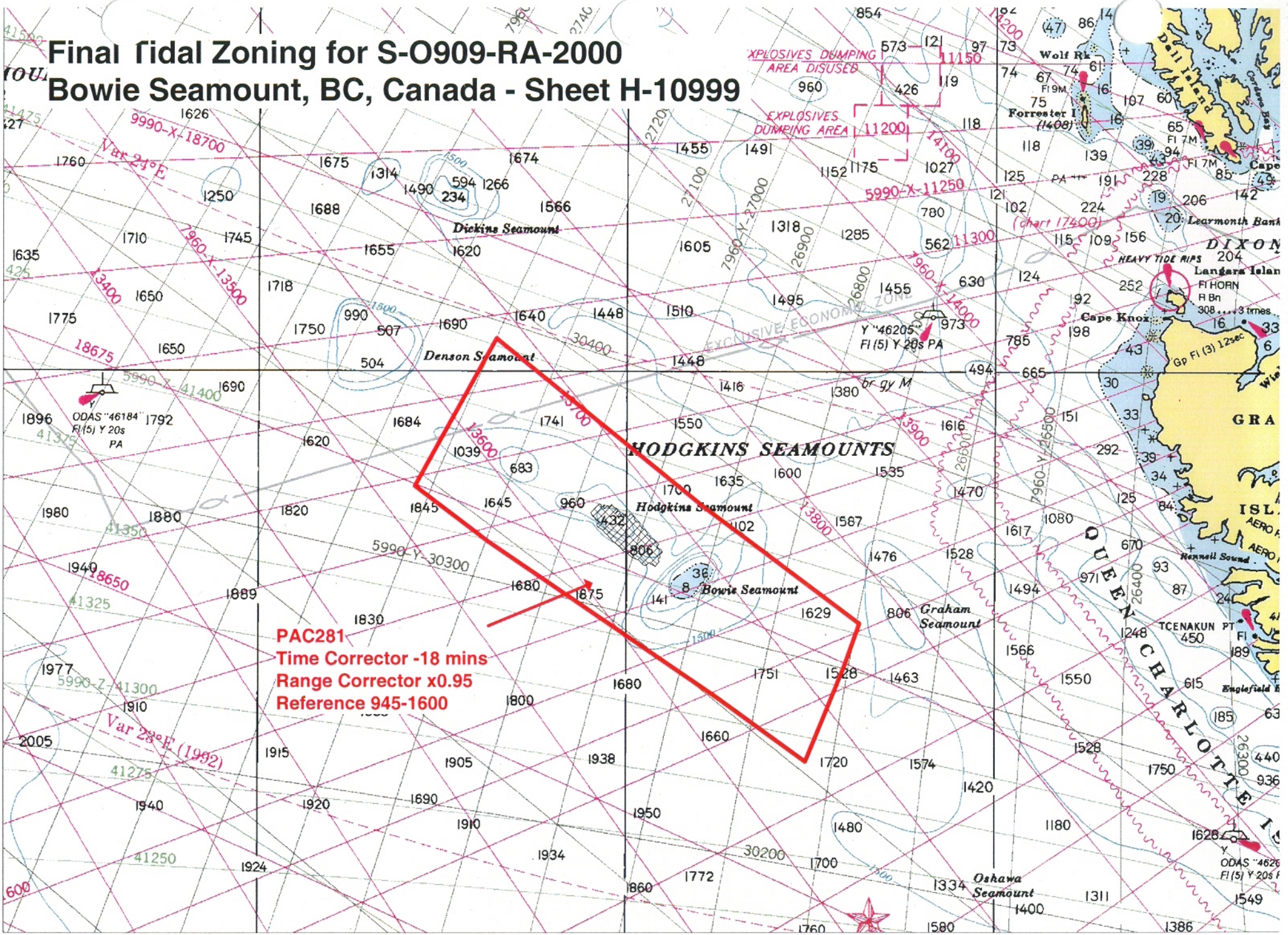
TIDE STATION USED: 945-1600 Sitka, AK
Lat. 57° 3.1'N Lon. 135° 20.5'W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.788 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: PAC281.

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.

For ----------
CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION


Final Tidal Zoning for S-O909-RA-2000
Bowie Seamount, BC, Canada - Sheet H-10999
PAC281
Time Corrector -18 mins
Range Corrector x0.95
Reference 945-1600
HODGKINS SEAMOUNTS
Hodgkins Seamount
Bowie Seamount
Dickins Seamount
Denson Seamount
Graham Seamount
Oshawa Seamount
QUEEN CHARLOTTE
DIXON
Cape Knox
Wolf Rk
Forrester I
Learmonth Bank
Langara Island
TCENAKUN PT
Rennell Sound
EXPLOSIVES DUMPING AREA DISUSED
EXPLOSIVES DUMPING AREA
EXCLUSIVE ECONOMIC ZONE
9990-X-18700
Var 24°E
7960-X-13500
5990-X-11250
7960-X-27000
7960-X-14000
5990-X-41400
5990-Y-30300
5990-Z-41300
Var 28°E (1992)
ODAS 46184
Y 46205
ODAS 4626

Final tide zone node point locations for S-O909-RA-2000,
Sheet H-10999.

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

	Tide Station Order	AVG Time Correction	Range Correction
Zone PAC281			
-136.710405 54.098035	945-1600	-18	0.95
-137.152427 53.625689			
-136.754486 53.448091			
-135.505794 52.946531			
-135.026526 52.739515			
-134.820747 53.043054			
-134.735506 53.185867			
-135.577141 53.558232			
-136.710405 54.098035			

Department of Foreign Affairs
and International Trade

CANADA

Ministère des Affaires étrangères
et du Commerce international

OTTAWA, ONTARIO
K1A OG2

July 12, 2000

UNCLASSIFIED

TCM-0307

Ms. Elizabeth Maruschak
Research Vessel Clearance Officer
Bureau of Oceans and International Environmental
and Scientific Affairs
United States Department of State
Washington, D.C. 20520
U.S.A.

Dear Ms. Maruschak:

RE: Clearance request - R/V RAINIER
July 26 - July 31, 2000

Further to your letter of June 28, 2000 requesting clearance for the RAINIER to conduct marine scientific research in waters subject to Canadian jurisdiction during the period July 26 - July 31, 2000, we are pleased to advise you that Canadian authorities consent to the proposed activities. We note there will be a Canadian scientist on board the vessel.

Please inform the vessel Captain that there will be one or possibly two Canadian fishing vessels operating in the area fishing with trap and possibly longline gear.

Consent is conditional upon the provision within a reasonable period of time of a preliminary and final report of the research activities.

Yours sincerely,

D.W. Pelkola
Deputy Director
Market Support Division (TCM)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
Marine Operations Center
1801 Fairview Avenue East
Seattle, Washington 98102-3767

NOAA Ship RAINIER

September 13, 2000

Ms. Elizabeth Maruschak
Research Vessel Clearance Officer
OES/OA Room 5805
U.S. Department of State
Washington, DC 20520

Dear Ms. Maruschak:

Enclosed please find the Preliminary Cruise Report for NOAA Ship RAINIER's recent hydrographic survey of Bowie and Hodgkins Seamounts, located within the Exclusive Economic Zone of Canada. Also attached is a copy of the ship's official Letter of Data Transmittal, indicating specific data items that are being forwarded directly to the Canadian Hydrographic Service, as per instructions contained in your Notice to Research Vessel Operators No. 66 (Revision No. 1), Post Cruise Obligations.

Please let me know if there are any additional required submissions with respect to this survey. Thank you for your attention to this matter.

Sincerely,

Daniel R. Herlihy

Daniel R. Herlihy
Commander, NOAA
Commanding Officer

United States Department of State

Bureau of Oceans and International
Environmental and Scientific Affairs
Washington, D.C. 20520
P (202) 647-0238 F (202) 647-1106

July 13, 2000

Cdr. Dan Herlihy
Commanding Officer NOAA Ship RAINIER
1801Fairview Ave. E.
Seattle, WA 98102

Re: NOAA RAINIER, 7/26/00 - 7/31/00
Marine Research Approval(s) and Scientist's Obligations to Coastal States

Dear Dr. Cdr. Dan Herlihy:

We have just received the following approval(s) for the above-referenced research cruise:

Coastal State	*Diplomatic Note*	*Approval Date*
Canada	Department of Foreign Affairs and International Trade Letter No. TCM-0307	07/12/2000

Please follow these instructions to fulfill your obligations to the clearance-granting coastal state(s):

1. **Submit PCR Form to the State Department no later than 30 days after the end date of your cruise.**
On this form, available at http://www.state.gov/www/global/oes/oceans/ntrvo66.html, you must predict the date or dates by which you will submit to our office the various data collected during your cruise. This form must be completed and returned to our office, OES/OA Attn: Roberta Barnes, no later than 30 days after the completion of your cruise.
2. **Submit cruise data to the State Department by deadline(s) indicated in your PCR Form.**
As Chief Scientist, you are also the person responsible for gathering all cruise data and forwarding that data to our office (OES/OA Attn: Roberta Barnes). You must submit the appropriate number of copies/translations of your data for each coastal state. See Notices to Research Vessel Operators website at http://www.state.gov/www/global/oes/oceans/notices.html to determine country-specific requirements. When data is available in a transferable format (ie. hard copy, disk, tapes, and/or website address) you must provide all directions for use--this includes a description of software format and hardware devices needed. Once I have credited your record, I will forward your materials to the appropriate coastal states.
3. **Always indicate the State Department File Number 2000064 on all correspondences.**
Please indicate your State Department File Number in all future correspondences regarding this cruise.

PLEASE NOTE: If data will not be available at the times indicated on your PCR Form due to sampling error, cancelled cruise, or other condition, you must notify our office with a letter of explanation. If you merely need an extension of time for submitting data, please request an extension in writing and indicate your revised due date. Should you fail to communicate with our office, we will assume that your are denying your obligation to the coastal state(s), and we will notify your sponsoring agency as well as the ship's agency of your negligence.

cc: Wanda Campbell - NOAA/AMC

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
Marine Operations Center
1801 Fairview Avenue East
Seattle, Washington 98102-3767

NOAA Ship RAINIER
September 13, 2000

PRELIMINARY CRUISE REPORT

SHIP NAME:	NOAA Ship RAINIER
OPERATING INSTITUTION:	U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS)
DATES:	July 28 to August 1, 2000
PROJECT TITLE:	Hydrographic Survey of Bowie Seamount and Hodgkins Seamount
CHIEF SCIENTIST:	Commander Daniel R. Herlihy, NOAA
CLEARANCE COUNTRIES:	Canada
FOREIGN PARTICIPANTS:	Canada
PORT CALLS:	None

DESCRIPTION OF SCIENTIFIC PROGRAM:

The purpose of this project was to provide contemporary hydrography with full-bottom, multibeam bathymetric coverage in the vicinity of Bowie and Hodgkins Seamounts, located approximately 100 nautical miles west of the Queen Charlotte Islands, Canada in the Northeast Pacific Ocean. This project responded to mutual research interests of NOAA/NOS, The Canadian Hydrographic Services - Institute of the Oceans, and the United States Geological Survey. It was additionally intended to develop and extend capabilities of the SeaBeam 1050D system aboard the NOAA Ship RAINIER for high-slope and deep-water sea-floor characterization. The survey mapped hydrographic and physiographic properties of the Bowie Seamount Area, a designated Marine Protected Area pilot project of the Oceans Directorate of Canada.

DATA OBSERVATIONS AND SAMPLES COLLECTED:

TYPE: Raw data: multibeam sonar soundings, acoustic backscatter intensity data
LOCATION: Bowie and Hodgkins Seamounts, Northeast Pacific Ocean
CUSTODIAN: NOAA Pacific Hydrographic Branch, Seattle, WA

TYPE: Processed multibeam depth soundings
LOCATION: Bowie and Hodgkins Seamounts, Northeast Pacific Ocean
CUSTODIAN: NOAA Pacific Hydrographic Branch, Seattle, WA

TYPE: Water-column sound velocity data
LOCATION: Bowie and Hodgkins Seamounts, Northeast Pacific Ocean
CUSTODIAN: NOAA Pacific Hydrographic Branch, Seattle, WA

INFORMATION ADDRESS:

Commander James Gardner, NOAA
Chief, NOAA Pacific Hydrographic Branch
7600 Sand Point Way, NE
Seattle, WA 98115
(206) 526-6835
jim.gardner@noaa.gov

SCHEDULE OF DELIVERY FOR ALL DATA RESULTS AND REPORTS:

Data Collected	Delivery to Host Countries
Raw sonar data*	Data tapes - September 2000
Processed multibeam sounding data	Data tapes - September 2000
Sound velocity profiles	Data tapes - September 2000
Descriptive Report	Data report - September 2000

*Raw data from this project will be submitted to the manufacturer of the sonar system, Seabeam Instruments Inc., for systems development purposes.

attachments: Vessel track chart

cc: N/CS3 (NOAA Hydrographic Surveys Division)
N/CS34 (NOAA Pacific Hydrographic Branch)
MOP (NOAA Marine Operations Center, Pacific)

Date: 7/26/00 2:01 PM
Sender: deLangeBoomB@pac.dfo-mpo.gc.ca
To: Ken Halcro
cc: NowakC@pac.dfo-mpo.gc.ca; CrawfordB@pac.dfo-mpo.gc.ca
Priority: Normal
Receipt requested
Subject: eddy over Bowie

Hi Ken,

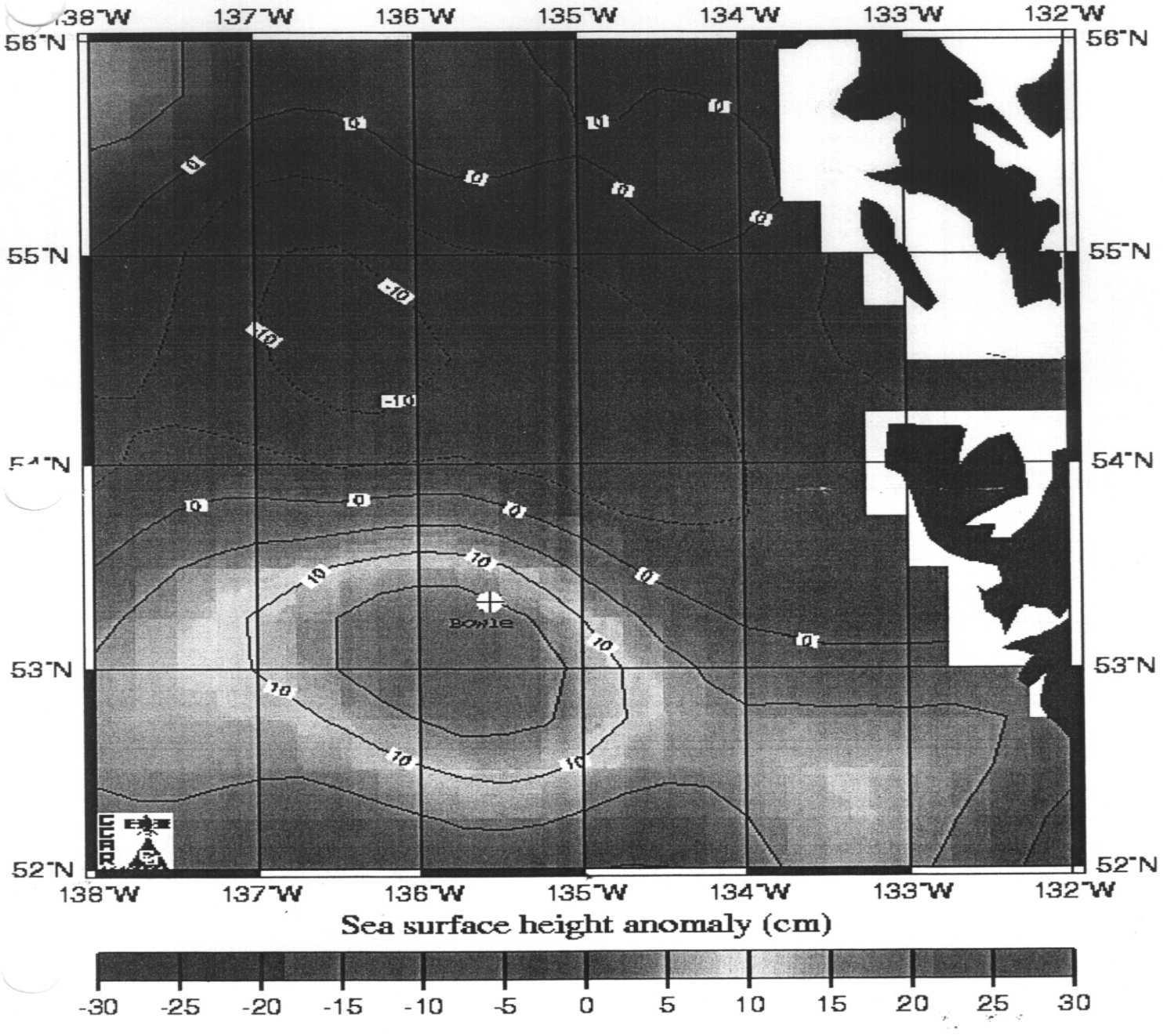
The latest TOPEX/ERS-2 Analysis is dated 23 Jul 2000. It shows the eddy in the same location with same elevations as on 11 July 2000. Based on that, I would add an extra 0.15 m to the predicted heights at Bowie Seamount.

Regards,

Bodo

Bodo de Lange Boom
Tides and Currents Analyst, Geomatics Engineering Group,
Canadian Hydrographic Service, Institute of Ocean Sciences,
P.O. Box 6000, Sidney, B.C., CANADA V8L 4B2
ph: (250) 363-6363 fax: (250) 363-6323
E-mail: bodo@pac.dfo-mpo.gc.ca
Tides Web Site: http://www.ios.bc.ca/ios/chs/tides/TIDES1.htm

TOPEX/ERS-2 Analysis Jul 23 2000



Ch. 3000

CANADA

Ship's name CSS Parizeau
Consecutive No.
Date 2/4/69

HYDROGRAPHIC NOTE

(for instructions, see overleaf)

General Locality: Pacific Ocean, 100 miles west of Queen Charlotte Islands.

Subject: Depth.

Approx. Position: Lat. 53 18 00 N Long. 135 40 05 W
Loran Co-ordinates 1L6 1150 1L7 4927
Chart affected, largest scale in use: 3000 (corrected to N.M. No. Date ... of 1969..)

Publications affected:
(quote Volume or Supplement, and page)

Full details (attach additional sheets as necessary);

Time (GMT)..... Date .....

While carrying out a provisional contour survey of the head of Bowie Seamount a least depth of 15 fathoms was recorded on the deep sea sounding machine. The ship was stopped and a lead line sounding taken, a 17 fathom sounding was the minimum obtained with the lead but this is probably accountable by the difficulty of manoeuvering the ship to place the leadsman directly over the pinnacle.

The soundings were obtained at 0820 on 28/3/69.

The position of the shoalest depth was 600 feet north of the position in which the ship was anchored. This position was monitored for a twenty four hour period by the Satellite Navigator and the actual Lat & Long will be available when the tapes have been processed. Sounding paper recording the 15 fm. depth is presently held by Dr. Scrimger of D.R.E.P. (The Gift sounder showed a much more reliable trace than the bridge Kelvin)

A replacement copy of Chart No. ..... is required, but see 4 overleaf.

Navigating Officer or Observer:

Captain:
Ship (or address):-

If Merchant Vessel add Line or
Company with Head Office address:-

(Note. - An acknowledgement of receipt will be sent and the information then used to the best advantage, which may mean immediate Notice to Mariners action or inclusion in a revision of a chart or publication in due course. When a Notice to Mariners is issued, the sender's ship or name is quoted as authority, unless as sometimes happens, the information has previously been received. An explanation of the use made of contributions would be too great a task and a further communication should only be expected when the information is of outstanding value or has unusual features.)

M 228 (Rev. 1964)

NOAA FORM 77-27(H)
(9-83)

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER
H-10999

RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	SMOOTH OVERLAYS: POS., ARC, EXCESS	NA
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	NA

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES						
ENVELOPES	1					
VOLUMES						
CAHIERS						
BOXES						

SHORELINE DATA

SHORELINE MAPS (List):

PHOTOBATHYMETRIC MAPS (List):

NOTES TO THE HYDROGRAPHER (List):

SPECIAL REPORTS (List):

NAUTICAL CHARTS (List):

OFFICE PROCESSING ACTIVITIES

The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS		
	VERIFICATION	*EVALUATION*	*TOTALS*
POSITIONS ON SHEET			
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS			
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET			109
COMPARISON WITH PRIOR SURVEYS AND CHARTS			
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT			40
GEOGRAPHIC NAMES			
OTHER (Chart Compilation)			8
USE OTHER SIDE OF FORM FOR REMARKS — TOTALS			157

Pre-processing Examination by	*Beginning Date* 01/31/2001	*Ending Date*
Verification of Field Data by Davies, R. Mayor, G. Nelson, L. Deodato	*Time (Hours)* 109	*Ending Date*
Verification Check by	*Time (Hours)*	*Ending Date*
Evaluation and Analysis by L. Deodato	*Time (Hours)* 40	*Ending Date* 07/15/2002
Inspection by R. Davies	*Time (Hours)* 5	*Ending Date* 12/07/2001

U.S. GOVT. PRINTING OFFICE 1983: 764-006/6061

APPROVAL SHEET
H-10996

Initial Approvals:

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

Date: 9-25-02

Dennis Hill,
Chief, Cartographic Team
Pacific Hydrographic Branch

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

Date: 9/25/02

John E. Lowell, Jr.
Commander, NOAA
Chief, Pacific Hydrographic Branch

****

Final Approval

Approved:

Date: 9/30/02

Samuel De Bow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10999

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.

1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
501	8/1/2001	L. Deodato	Full ~~Part~~ ~~Before~~ After Marine Center Approval Signed Via
			Drawing No. Application of soundings and features from smooth sheet.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
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			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.