

H10535

NOAA FORM 78-35A	
U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE	
DESCRIPTIVE REPORT	
Type of Survey	Navigable Area Survey
Field No.	PHP-10-3-94
Registry No.	H-10535
LOCALITY	
State	Washington
General Locality	Puget Sound
Sublocality	Vendovi Island to Hat Island
1994	
CHIEF OF PARTY Lieutenant Guy T. No11	
LIBRARY & ARCHIVES	
DATE	JUN 21 1995

HYDROGRAPHIC TITLE SHEET

H-10535

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.

PHP-10-3-94

State Washington

General locality Puget Sound

Locality Vendovi Island to Hat Island

Scale 1:10,000 Date of survey April 18, - July 22, 1994

Instructions dated 3/10/94; Change #1 4/29/94 Project No. OPR-N264-PHP

Vessel VN 1101 (EDP 0651) and VN 1102 (EDP 0652)

Chief of party LT Guy T. Noll, NOAA

Surveyed by LT G.T. Noll, LT R.A. Fletcher, ST L.K. Simmons, ET E.O. Wernicke, ST R.W. Adams

Soundings taken by echo sounder, hand lead, pole Innerspace Model 448, DSF-6000N

Graphic record scaled by PHP Personnel

Graphic record checked by PHP Personnel

Evaluation by: R. Davies Automated plot by HP Design Jet 650L

Verification by L. Deodato

Soundings in ~~fathoms~~ ~~feet~~ meters and decimeters at ~~MLW~~ MLLW

REMARKS: Time in UTC, revisions and marginal notes in black were generated during office processing. All separates are filed with the hydrographic data, as a result page numbering may be interrupted or non-sequential.
All depths listed in this report are referenced to mean lower low water unless otherwise noted.

SC 12-199
6/21/95

Surf 1/2 Accois
check, 8/1/95 MDA

Descriptive Report to Accompany Hydrographic Survey H-10535

Field Number PHP 10-3-94

Scale 1:10,000

1994

Pacific Hydrographic Party
Chief of Party: LT Guy T. Noll

A. PROJECT ✓

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-N264-PHP, Guemes Channel, Washington, issued March 10, 1994, as amended by Change No. 1 dated April 29, 1994, and by letter from Hydrographic Surveys Branch received on June 27, 1994.

Hydrographic survey H-10535 was conducted to acquire 100% side scan sonar coverage of the uncharted anchorage area to the east and south of Vendovi Island and in the navigable areas from Vendovi Island to Hat Island. The project was authorized in conjunction with a request from the Puget Sound Pilots for an expedited survey of Guemes Channel and the anchorage and northern approaches to the oil terminals at March Point. The pilots' primary concern is to have the charted depths superseded by modern hydrography. The project area is environmentally sensitive and would suffer a significant impact if an oil spill from a tanker grounding occurred.

This survey's sheet letter is "B" as specified by the project instructions and it is the second survey for Project OPR-N264-PHP.

B. AREA SURVEYED - See Eval Rpt, section 1

The area surveyed for H-10535 extends from latitude 48°37'00.0"N south to latitude 48°31'36.0"N. The 10-fathom curve generally defines the east-west limits except in the areas east and south of Vendovi Island, west of Saddlebag Island and around Huckleberry Island where the inshore limit is the 5-meter curve. Because of the configuration of the survey area and size constraints of the HDAPS plotter, Sheet "B" was subdivided at latitude 48°35'00.0"N. The northern section was designated "B-N", the southern "B-S." Plotter sheet "B-N" was oriented at 0° with overall sheet limits measuring 58 cm by 80 cm. Plotter sheet "B-S" was skewed to 90° with overall sheet limits measuring 58 cm by 70 cm. Hydrographic limits for H-10535 are within those required by the Hydrographic Manual (Section 1.2.3, pp. 1-6).

Data acquisition for Sheet B hydrography was conducted from April 18, 1994, (DN 108) through July 22, 1994 (DN 203).

C. SURVEY VESSELS ✓

NOAA Launch 1102 (EDP No. 0652), a 21-foot SeaArk, was used for mainscheme and crossline hydrography as well as for bottom samples, detached positions and development hydrography. NOAA Launch 1101 (EDP No. 0651), a 29-foot Jensen was used for mainscheme and development hydrography as well as for side scan sonar operations. No changes to the standard vessel sounding configuration were necessary for either vessel.

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

The standard HDAPS software suite was used throughout this survey. Program names and versions are listed in Appendix VI.*

The following non-HDAPS computer programs were used:

<u>Program Name</u>	<u>Version</u>	<u>Date</u>
VELOCITY	2.10	1994
NADCON	1.01	1989
INVERS3D	1.00	1991
MONITOR	1.31	1993
GEOID90	1.00	1990

Version 5.01 of the PC-DAS SURVEY Program was used for data acquisition on 0652. The master printout was annotated whenever software problems affected the data.

E. SONAR EQUIPMENT ✓

Side scan sonar (SSS) operations were conducted using an EG&G model 260 slant-range correcting SSS recorder and an EG&G 272-T dual-channel (single frequency) towfish. The following sonar equipment was used throughout the survey:

<u>Type</u>	<u>S/N</u>
272-T Towfish	015598
260 Recorder	015602

The towfish was operated on the 100 kHz frequency and was configured with a 20° beam depression. It was deployed from the starboard quarter using a lightweight, 50-meter EG&G cable passed through a block and powered by an electric winch. Block and winch were mounted to a swing-arm davit. Tape markings at measured, one-meter intervals indicated length of cable deployed from the block up to the maximum deployable of 43 meters.

SSS operations were conducted at a speed of 5 knots or slower, using range scales of 100 and 150 meters. The SSS towfish was maintained at a height off the bottom equivalent to 8 to 20 percent of the range scale except where depths exceeded the limits of the cable within the allowable range scales. In such cases, the hydrographer believes the resolution of the sonargram is adequate for identification of any significant contacts. In fact, because the deep areas are generally narrow with very steep slopes, contact images were often misleading to the opposite extreme; i.e., with heights exaggerated.

The SSS recorder gain was adjusted for the best return for the prevalent bottom material. The rapidly changing topography, particularly in Padilla Bay (B-S), together with strong, sometimes converging currents, as well as changes in bottom material, necessitated close monitoring and frequent tuning of the SSS recorder in order to achieve the best return. Hence, twice-daily confidence checks as prescribed in Section 7.3 of the Project Instructions would not have been meaningful. Identifiable features on the outer edge of the sonargram assure acceptable SSS recorder tuning and were periodically annotated as confidence checks.

Sonargrams were occasionally degraded from sea surface return or prop wash. All degraded sonargrams were rejected and rerun, or the acceptable swath width was reduced appropriately.

SSS lines were oriented North-South over the anchorage area in south Bellingham Bay (B-N) which is gently sloped and predominantly featureless. Because of the extreme steepness of the channels in Padilla Bay, line orientation on B-S was problematic in several respects : a) Cross-contour lines would have resulted in some positioning distortion and it would have been extremely difficult, if not impossible, to maintain a safe and acceptable fish height in the steepest areas. Moreover, achievement of 100% coverage with cross-contour lines would have necessitated towfish deployment inside the 5-meter curve; in most cases near shore, even the 20-meter curve was too close to shore for prudent deployment. b) Towing along the contours caused both position distortion and contact height exaggeration. However, only this latter method enabled acquisition of the 100% coverage specified in Change No. 1 to Project Instructions.

Following the guidelines in Section 7.3.2 of the Project Instructions, sonargrams were manually scanned for significant contacts; these were labeled and entered into the HDAPS contact tables. Where clumps of contacts appeared on the sonargram, only the most significant were entered. Table 1 contains 25 contacts for B-N; Table 2 contains 30 contacts found on B-S.*

Using the contact heights and raw depths derived with the HDAPS Side Scan Utility Program, several contacts were determined to be significant and were developed (see Section N). Subsequent to these investigations, the HDAPS "sift" function was created and was employed to identify any remaining significant contacts requiring further investigation; i.e., significance determined by comparison with surrounding sounding data. The program logic is based on the guidelines for developing groups of contacts as specified in Section 7.3.2 of the Project Instructions. User input parameters include

navigationally hazardous depth threshold and radius for sounding comparisons. (Documentation of the program is included in Separate V.)*

Using a threshold depth of 18 meters and a chartable radius for two-digit depths of 3.3mm at the survey scale of 1:10,000; i.e., 33 meters, six contacts were identified for further development. Of the six contacts identified for development, three were included in the contact cluster north of Jack Island (see Item Investigation Report N1), two were included in the development of the 5-fathom charted sounding near Huckleberry Island (see Item Investigation Report N3) and the sixth was observed downslope in steep terrain.

At the scale of Chart 18427 (1:25,000), chartable radius is equivalent to 82.5 meters. Sifting at this scale, no contacts were identified for further development. (The chartable radius for Chart 18424 (1:40,000) is 132 meters.)

Contact tables and sifting printouts are included in Separate V.*

F. SOUNDING EQUIPMENT ✓

Innerspace Model 448 (IN-448) single frequency echosounder, Serial Number 239, modified with custom EPROMS for HDAPS, was used on Vessel No. 0652 from DN 108 to DN 203.

The steep terrain of this survey, particularly when combined with strong currents or debris in the water column, stretched the digitizing ability of the IN-448. On DN 109 the nominal gain setting was increased to 40 decibels with no noticeable effect; a further increase to 60 decibels, again, produced no significant improvement. On DN 110 the nominal gain was reset to the factory setting. Hydrography over steep terrain was planned around tides and collected at slow speeds.

Raytheon, dual-frequency, Digital Sounding Fathometers (DSF) 6000N were used on Vessel No. 0651. Failures of the power and processor board were a recurring problem requiring four changes in units:

<u>Serial No.</u>	<u>Period of Use</u>
A115N	DN 126 - DN 137
B038N	DN 138 - DN 152
A124N	DN 154 - DN 165
B038N	DN 155 - DN 179
A124N	DN 181 - DN 195

The high-frequency beam was selected for plotting throughout the survey. The low-frequency depth was scanned and edited only when the high-frequency did not track the bottom or when a more significant depth was acquired with the low-frequency beam.

Soundings were recorded in meters with an assumed speed-of-sound through water of 1500 m/sec. Depths encountered in the survey area range from 0.4 meters (Pos. No. 3779, DN 138) to 92 meters (Pos. No. 3927, DN 153) based on predicted tides.

Occasional breaks in the continuity of the echogram occurred when rapid changes in range scale were required. The hydrographer does not consider these breaks significant unless greater than 6mm at the survey scale (Section 1.4.6, Hydrographic Manual) or if they occurred over a shoaling trend (potential missed peak), in which cases the section or line was resurveyed.

Metric leadlines were used for depth comparisons with the echosounder. PHP fabricated the leadlines following Hydrographic Survey Guideline (HSG) 69. Each leadline is 1/4-inch steering tiller rope. Shrink tubing, secured with epoxy glue, marks one-meter intervals from one to thirty. With the line under six pounds of constant tension, markings were calibrated with a steel surveyor's tape. The throwing end is a standard six-pound lead weight shackled to a stainless steel thimble bent to the bitter end. Leadline calibration forms are included in Separate IV (Sounding Equipment Calibration and Corrections).*

G. CORRECTIONS TO SOUNDINGS ✓

Velocity of Sound

Corrections for the speed of sound through the water column were computed from data obtained with an Applied Microsystems Laboratories (AML) Velocity of Sound Profiler (S/N 03004). The VELOCITY Program was used to determine the speed of sound correctors. On DN 109 three AML casts were conducted: one at the west end of Guemes Channel, a second at the east end (Padilla Bay) and a third near Vendovi Island. Comparison of data from these casts revealed no significant differences in the thermocline

at these separate locations; on this basis, all subsequent casts were performed in the deep hole in Padilla Bay. The following casts were used to determine the velocity correctors:

HDAPS Table	DN	DN Range	Extrapolated Depth	Cast Position	
				Latitude	Longitude
1	109	102-118	110.2	48°31'29"N	122°34'00"W
2	119	119-130	109.6	48°31'29"N	122°34'01"W
3	131	131-139	079.9	48°21'35"N	122°34'00"W
4	140	140-150	101.7	48°33'00"N	122°34'30"W
5	151	151-160	102.2	48°31'30"N	122°34'00"W
6	161	161-171	100.7	48°31'40"N	122°34'00"W
7	172	178-188	065.0	48°32'31"N	122°33'50"W
8	189	189-200	099.4	48°32'10"N	122°33'40"W

Separate IV^{*} contains copies of all velocity cast data and HDAPS Velocity Corrector Tables.

The AML instrument was calibrated by Northwest Regional Calibration Center on April 15, 1994 (DN 105). A copy of this calibration report is included in Separate IV.^{*}

Leadline Comparisons ✓

Leadline comparisons were taken on most days of hydrography to confirm proper digitization of the echosounder depth. These are annotated on the echograms; no systematic drift or error was observed.

Static Draft ✓

Static draft for VN 0652 was determined on April 12, 1994 (DN 102). First, the depth of the transducer face from a reference mark on the hull was measured. Next, with the launch in the water (fuel tanks half full and two crewmen aboard) the depth from this reference mark to the waterline was measured. Combining the two measurements, a static draft of 0.4 meters was calculated.

A static draft of 0.5 meters was determined for VN 0651 on May 3, 1994, (DN 124) using a method similar to above.

Dynamic Draft ✓

Settlement and squat measurements for VN 0652 were conducted on April 5, 1994, (DN 095) in Guemes Channel at Pier 1 in Anacortes, WA. Settlement and squat measurements for VN 0651 were conducted on May 4, 1994, (DN 124) at the same location. Field records are included in Separate IV.^{*}

Settlement and squat correctors are applied on line to all survey data via the HDAPS Offset Tables.^{*} Offset Table 1 corresponds to VN 0651; Offset Table 2 corresponds to VN 0652. Settlement and squat correctors are reapplied during field processing using the REAPPLY program in HDAPS.

Corrections to Echosoundings ✓

Problems with echosounder misdigitization occurred frequently where bottom topography was both very steep and very deep. Where the echogram trace was adequate and unambiguous, the digital record was corrected to reflect the analog trace. *Data was analyzed during office processing and found to be consistent with surrounding depth information.*

Tide Correctors ✓

In compliance with Section 5.9 of Project Instructions, one tidal zone based on data for reference station Friday Harbor, Washington, (944-9880) was established for the survey. A range ratio of x1.08 was applied to predicted tides at Friday Harbor; no time correction

was required. Table No. 4 was used for April; tables for subsequent months were numbered sequentially.

H. CONTROL STATIONS - See Eval Rpt, section 2

Horizontal Datum

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). A copy of the HDAPS Control Station Table is included in ^{this report} Appendix III (List of Horizontal Control Stations). A separate Horizontal Control Report OPR-N264-PHP, Guemes Channel, was submitted to N/CG245 on April 22, 1994.*

I. HYDROGRAPHIC POSITION CONTROL

Position Control

Differential GPS (DGPS) provided position control throughout this survey based on two DGPS beacons established and maintained by the Canadian Coast Guard: "Victoria" at Race Rocks, BC, and "Vancouver" at Point Atkinson, BC. The beacon at Point Atkinson was repositioned on May 10, 1994, DN 130 (see letter in Appendix VI).*

<u>Reference Station</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Ellips. Height</u>
Race Rocks	48°17'52.2582"N	123°31'54.7474"W	-6.031m
Point Atkinson (DN102-126)	49°19'48.7252"N	123°15'52.9669"W	7.860m
(DN 130-203)	49°19'49.4018"N	123°15'52.4445"W	22.050m

DGPS Beacons plot outside the sheet limits.

Per FPM, Section 3.4.6.3, the reference sites were confirmed using the program MONITOR. A copy of the scatter plots and the outlier.sum files are included in Separate* III (Horizontal Position Control and Corrections to Position Data).

A DGPS base station was also established at the office location for use in the event of failure of both Canadian stations. The base station is described in the Horizontal Control Report in accordance with Field Procedures Manual (FPM), Section 3.4.6.

DGPS Performance Checks

Per FPM, Section 3.4.4.1, DGPS performance checks were obtained on days of hydrography using a mark on Pier "C" at Cap Sante Marina. The mark was positioned to Third Order, Class I standards (see Horizontal Control Report). All DGPS performance checks were successful; check forms are located in the data files.* Mark on Pier "C" at Cap Sante Marina plots outside the sheet limits.

Positioning Equipment

The following GPS equipment was used:

<u>Equipment Location</u>	<u>Type of Receiver/Antenna</u>	<u>Receiver Serial No.</u>	<u>Antenna Serial No.</u>
VN 0651	Ashtech (v.1E08D) CSI Beacon Rcvr MBX1	700417B1139 X-1212	700378A0272
VN 0652	Ashtech (v.1E08D) CSI Beacon Rcvr MBX1	700417A1141 X-1211	700378B0402

The unique serial numbers for all equipment are annotated on the daily master printout.*

J. SHORELINE *See EVAL Report, section 2*

Sources

High-water shoreline detail shown on the field sheet was transferred by hand from 1:10,000-scale enlargements of Chart 18427 and Chart 18424. The DP/Bottom Sample overlay includes shoreline transferred from T-11229.

Verification

Shoreline verification was not a requirement for this survey. However, mainscheme hydrography and buffer lines indicate only slight discrepancies with the shoreline as charted, discrepancies which may be attributable to distortion caused by the enlargement process. The most significant discrepancy is the point at Boat Harbor which both chart and enlargement show to be truncated by approximately 50 meters. The point is depicted accurately on T-11229. This is confirmed by the 1.4-meter sounding (Pos. No. 3263+4, DN 110) located immediately offshore of the steep, bedrock point; the sounding appears to be 50-60 meters seaward of the point as depicted on the chart. *This shoreline change was not applied to the smooth sheet because it is only an approximate delineation and new updated photography was recently flown and will be used to update the next edition of the chart.*

K. CROSSLINES ✓

Nautical miles of crossline total 8.59 (including buffer lines along shore), representing 4% of the mainscheme hydrography on H-10535. Side scan sonar operations were conducted perpendicular to mainscheme, providing an additional 84.85 miles of crosslines and raising the total percentage to 43. Agreement is generally good and well within limits defined in Section 4.6.1 of the Hydrographic Manual.

L. JUNCTIONS ✓ See Eval Rpt, section 5

H-10535 hydrography joins Survey H-10534 (Guemes Channel) at the south. Overlapping soundings were obtained per section 4.3.2 of the Hydrographic Manual; junction contours are well-matched and soundings agree within the prescribed limits.

M. COMPARISON WITH PRIOR SURVEYS See Eval Report, section 6

The survey was compared cursorily with prior surveys H-8331, H-8319, H-8318, H-8317, and H-1815. No discrepancies were noted. Pacific Hydrographic Section, N/CG245. will perform a more rigorous comparison following application of smooth tides.

N. ITEM INVESTIGATION REPORTS

Item Investigation Reports for the following developed features are included in ^{this report.} ~~Separate~~ VI:

N1	SSS Contact Cluster
N2	12-fathom shoal
N3	5-fathom charted sounding
N4	6.5-fathom charted sounding
N5	SSS Contacts

O. COMPARISON WITH THE CHART See Eval Report, section 7

This survey was compared to stable-based 1:10,000-scale enlargements of Chart No. 18427, 1:25,000, 14th Edition, April 21, 1990, and Chart No. 18424, 1:40,000, 24th Edition, July 31, 1993. SEE EVAL Report section 7a. for editions of chart 18427

Dangers to Navigation

No dangers to navigation were identified within the limits of this survey; however, in several instances, surveyed soundings were found to be shallower than charted soundings. The hydrographer recommends that, subsequent to application of smooth tides, PHS plot the following soundings on a chart letter for inclusion on the next edition of Chart 18427.

Position Number	DN	Surveyed Depth	Geographic Position	
			Latitude	Longitude
4725+5	181	7.0m(3.8fm) 3.94	48°32'03.162"N	122°34'08.649"W
4701+2	181	22.9m(12.5fm)	48°32'24.817"N	122°34'08.744"W
5704+5	193	11.4m(6.2fm) ?	48°32'18.850"N	122°33'35.904"W (See Eval Rpt, section 7a.)

The above depths were reported as dangers to navigation, see attached letter, dated Oct 3, 1994. Depths are based on predicted tides.

Comparison of Soundings

Soundings were converted to and plotted in fathoms to facilitate comparison with charted soundings.

Chart 18427, 1:30,000, 14th Edition, April 21, 1990

The deep hole between Saddlebag and Huckleberry Islands defined by the 40-fathom (73-meter) curve appears to be filling in to the south somewhat and expanding east-west: ~110 meters to the west and as much as 60 meters to the east.

Immediately south of this hole the channel defined by the 30-fathom (55-meter) curve has shifted westward and has narrowed from a minimum width of 600 meters to a minimum of 436 meters. Eastward of this channel the bottom is marked by a rise to 24 fathoms (44 meters). Scouring has apparently occurred on both sides of the rise, pushing the 20-fathom (36.6-meter) contour eastward 100 meters.

North of Huckleberry Island the chart depicts a north-south ridge with a least depth of 16 fathoms (29.2 meters) at the north end charted at latitude 48°32'29"N, longitude 122°34'07.2"W and a least depth of 16 fathoms at the south end charted at latitude 48°32'23.5"N, longitude 122°34'07.0"W. The ridge peak was developed (see N2 in Separate VI) and a least depth of 12.5 fathoms (22.9 meters) was located at latitude 48°32'24.817"N, longitude 122°34'07.817"W (Pos. No. 4701+2, DN 181). The peak trends north-south 121 meters from the 26-meter sounding at latitude 48°32'26.983"N, longitude 122°34'08.924 (Pos. No. 5688+2, DN 189) to the 26.6-meter sounding at latitude 48°32'23.108"N, 122°34'08.059"W (Pos. No. 4715+8, DN 181)

Chart No. 18424, 1:40000, 24th Edition, July 31, 1993.

From latitude 48°32'30" northward, the survey was compared to Chart 18424. The only contour line charted within the sheet limits is the 10-fathom (18.3-meter) contour. Current hydrography is consistent with the chart with the exception of a stretch along the eastern sheet limits between latitude 48°33'00" and latitude 48°34'30" where the 10-fathom curve has shifted eastward by as much as 300 meters. Otherwise, surveyed soundings are comparable with charted soundings.

Comparison of non-Sounding Features

With the exception of navigation aids, no non-sounding features are charted within the survey limits and none were found.

CMC

P. ADEQUACY OF SURVEY ✓

This survey is a complete navigable area hydrographic survey and is adequate to supersede all prior surveys within their common areas. Furthermore, the acquisition of 100% side

scan sonar coverage within the navigable waters of this survey ensures that no unknown hazards exist within its limits.

*Concur
See EWAR Report, section 7*

Q. AIDS TO NAVIGATION *See EWAR Report, section 7.d*

All aids to navigation, private aids and landmarks within the survey limits of H-10535 were located with hydrographic detached positions. Agreement with charted positions was excellent. No discrepancies were noted.

R. STATISTICS ✓

<u>Description</u>	<u>Quantities</u>
Total Positions	2411
Total Detached Positions	4
Total Nautical Miles Hydrography	346
Square Nautical Miles Hydrography	10
Velocity Casts	10
Days of Production	21
Bottom Samples	10
Tide Stations	1

S. MISCELLANEOUS ✓

Bottom samples were taken in accordance with Hydrographic Manual, Sections 1.6.3 and 4.7.1. No significant changes were noted. Bottom sample positions and descriptions are plotted on the detached position plot. Copies of Oceanographic Log Sheet-M, Bottom Sediment Data, (NOAA Form 75-44) are included with hydrographic data. *

T. RECOMMENDATIONS ✓

The hydrographer recommends that the use of side scan sonar for full bottom coverage be limited to depths less than or equal to 150% of the proposed or anticipated maximum draft of vessels expected to transit the surveyed area. SSS data collected at extreme depths add little or nothing to overall survey quality.

ITEM INVESTIGATION REPORT

ITEM NO.: N1
SSS Contact Cluster

CHART NO.: 18424 (1:40,000)
EDITION: 24th
CHART DATE: April 21, 1990

SURVEY: H-10535

DESCRIPTION AND SOURCE OF ITEM: Apparent boulder field observed with side scan sonar conducted DN 144 (Pos. Nos. 5001-5003) and DN 158 (Pos. Nos. 5183-5185).

SOURCE POSITION: Boulder field lies off the northeast shore of Jack Island and extends 390 meters north-south from latitude 48°35'18.684"N (contact No. 5002.29P, DN 144) to latitude 48°35'02.914"N (contact No. 5001.17P, DN 144) and approximately 320 meters east-west from longitude 122°36'27.105"W (contact No. 5184.10S, DN 158) to longitude 122°36'40.321"W (contact No. 5001.45P, DN 158).

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: Development hydrography was conducted on DN 165 (Pos. Nos. 4610-4641, VN 0652) and DN 178 (Pos. Nos. 5348-5483, VN 0651). The entire field was developed with 10-meter line spacing from reference line -20 to reference line 400. Five-meter splits were run from reference line -15 to line -65. (See development track plot.)

RESULTS OF INVESTIGATION: The boulder field consists of numerous small boulders 1-2 meters high, most of which are on a slope and inside the 10-fathom depth curve. None constitutes a new, uncharted danger to navigation. During the course of mainscheme hydrography in the same vicinity, an 8.5-meter spike was observed on a steep slope in 25 meters of water. The spike was located at latitude 48°35'00.302"N, longitude 122°36'29.951"W (Pos. No. 4540, DN 157, VN 0652). On DN 178 the spike was investigated with the dual-frequency echosounder (VN 0651, Pos Nos. 5484-5492) combining a drift search and 10-meter line spacing. No evidence of a spike was found. An examination of the data from DN 157 reveals that the spike appeared at the outer edge of the steep slope off Jack Island. The line was run at 3700 rpm; but the speed was cut dramatically just before the sounding was acquired. The hydrographer believes the spike is a ghost image caused by the change in the aspect of the boat when the speed was abruptly reduced. This interpretation is supported by side scan sonar data; i.e., no contacts are visible in the vicinity of the spike.

U. REFERRAL TO REPORTS ✓

Title

Date

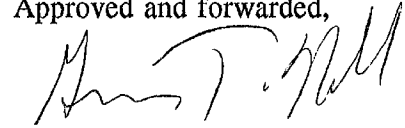
1994 Horizontal Control Report
OPR-N264-PHP
Coast Pilot Report

April 21, 1994

Submitted for approval,

Approved and forwarded,


Kathryn Simmons
Survey Technician


Guy T. Noll
Lieutenant, NOAA
Chief of Party

COMPARISON WITH PRIOR SURVEYS: Prior survey comparison performed by the Pacific Hydrographic Section.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

No soundings or features are charted within the area of the boulder field. Chart the boulder field from latitude 48°35'18.684"N (contact No. 5002.29, DN 144) to latitude 48°35'02.914"N (contact No. 5001.17, DN 144) and from longitude 122°36'27.105"W (contact No. 5184.10, DN 158) to longitude 122°36'40.321"W (contact No. 5001.45, DN 158).

Chart soundings in area as shown on the smooth sheet. Boulders were noted on the sounding plot.

ITEM INVESTIGATION REPORT

ITEM NO.: N2
12-fathom shoal

CHART NO.: 18427 (1:30,000)
EDITION: 14th
CHART DATE: April 21, 1990

CHART NO.: 18424 (1:40,000)
EDITION: 24th
CHART DATE: July 31, 1993

SURVEY: H-10535

DATUM: NAD83

DESCRIPTION AND SOURCE OF ITEM: Peak observed during mainscheme hydrography (Pos. No. 3014+3, Dn 108, VN 0652) with least depth of 26.3 meters/14 fathoms. Contacts also observed on side scan sonar with computed heights of 4.3 to 6.0 meters.

SOURCE POSITION: Pos. No. 3014+3: latitude 48°32'26.714"N
longitude 122°34'08.895"W
Contact 5526.72P: latitude 48°32'24.723"N
longitude 122°57'42.69"W
Contact 5769.14S: latitude 48°32'26.669"N
longitude 122°34'08.744"W
Contact 5769.16S: latitude 48°32'24.723"N
longitude 122°34'07.957"W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: Single-frequency echosounder development with 5-10-meter line spacing (Pos. Nos. 3758-3849, DN 138, VN 0652), also with drift search and crosshatch pattern (Pos. Nos. 4681-4718, DN 181, VN 0652). Dual-frequency echosounder development with 5-meter line spacing (Pos. Nos. 5493-5521, DN 178, VN 0651) and cross-hatch (Pos. Nos. 5566-5691, DN 189, VN 0651).

RESULTS OF INVESTIGATION: Development revealed a ridge trending north-south with two peaks. The north peak has a least depth of 25.0 meters/13.6 fathoms (chart depth 13^{1/2} fathoms) located at latitude 48°32'26.776"N, longitude 122°34'08.744"W (Pos. No. 5678+4, DN 189, VN 0651) The south peak least depth of 22.9 meters/12.5 fathoms (12^{1/2} chart depth) was located at latitude 48°32'24.817"N, longitude 122°34'07.817"W (Pos. No. 4701+2, DN 181). The ridge extends 121 meters from the 26-meter/14.2-fathom (14-

fathom chart depth) sounding at latitude 48°32'26.983"N, longitude 122°34'08.924 (Pos. No. 5688+2, DN 189) to the 26.6-meter/14.5- fathom (14^{1/2} fathoms chart depth) sounding at latitude 48°32'23.108"N, 122°34'08.059"W (Pos. No. 4715+8, DN 181)

COMPARISON WITH PRIOR SURVEYS: Prior survey comparison performed by the Pacific Hydrographic Section.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

Chart 18427 depicts a ridge with least depths of 16 fathoms/29.2 meters charted at latitude 48°32'23.5"N, longitude 122°34'07"W and at latitude 48°32'29"N, longitude 122°34'07.2"W.

Chart 18424 depicts a single sounding of 16 fathoms/29.2 meters at latitude 48°32'30"N, longitude 122°34'07"W. Replace the charted soundings with the soundings from this

survey: ^{Chart} Chart a (23.1m) 12 1/2 FATHOM sounding at lat. 48/32/24.817N, long. 122/34/07.275W

ITEM INVESTIGATION REPORT

ITEM NO.: N3
5-Fathom Charted Sounding

CHART NO.: 18427 (1:25,000)
EDITION: 15th
CHART DATE: July 25, 1992

SURVEY: H-10535

DESCRIPTION AND SOURCE OF ITEM: 5-fathom sounding on Chart 18427 200 meters south of Huckleberry Island. Sounding originated with 1955 Survey H-8331. Several SSS contacts were also observed in the vicinity of this sounding.

SOURCE POSITION: Charted Sounding: latitude 48°32'03.0"N
longitude 122°34'11.5"W
Contact 5656.10P: latitude 48°32'03.323"N
longitude 122°34'11.920"W
Contact 5656.06S: latitude 48°32'02.530"N
longitude 122°34'10.886"W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 181 a drift search for the 5-fathom/9.1-meter charted sounding was conducted (Pos. Nos. 4719-4726, VN 0652). Development hydrography of the SSS contacts was conducted on DN 193 with 5-meter line spacing and a cross-hatch pattern.

RESULTS OF INVESTIGATION: In the immediate vicinity of the charted 5-fathom sounding, a least depth of 13.6 meters/7.4 fathoms ($7^{1/4}$ fathoms chart depth) was observed at latitude 48°32'03.164"N, longitude 122°34'11.706" (Pos. No. 4721+7). Sixty-two meters east of this position a shoal depth of 7.0 meters/3.8 fathoms ($3^{3/4}$ fathoms chart depth) was observed at latitude 48°32'03.162"N, longitude 122°34'08.649"W (Pos. No. 4725+5)

COMPARISON WITH PRIOR SURVEYS: Prior survey comparison performed by the Pacific Hydrographic Section.

CHARTING RECOMMENDATIONS: Chart the $3^{3/4}$ -fathom shoal depth from this survey at latitude 48°32'03.162"N, longitude 122°34'08.649"W. *Concur Remove the charted 5-fathom depth at lat. 48/32/03N, long. 122/24/11W.*

(7.2 m) = 4 Fm

ITEM INVESTIGATION REPORT

ITEM NO.: N4
6^{1/2}-Fathom Charted Sounding

CHART NO.: 18427 (1:25,000)
EDITION: 15th
CHART DATE: July 25, 1992

SURVEY: H-10535

DESCRIPTION AND SOURCE OF ITEM: 6^{1/2}-fathom sounding on Chart 18427; sounding originated with 1955 survey H-8331.

SOURCE POSITION: Charted Sounding: latitude 48°32'14.5"N
longitude 122°33'37.0"W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 181 a drift search for the 6^{1/2}-fathom/11.9-meter charted sounding was conducted (Pos. Nos. 4727-4731, VN 0652).

RESULTS OF INVESTIGATION: A peak was located with a least depth of 12.0 meters/6.5 fathoms (6^{1/2} fathoms chart depth) at latitude 48°32'13.281"N, longitude 122°33'37.924"W (Pos. No. 4728+10, VN 0652). Nearer to the charted sounding, a depth of 12.5 meters/6.8 fathoms (6^{3/4} fathoms chart depth) was observed at latitude 48°32'14.407"N, longitude 122°33'37.686"W (Pos. No. 4729+1, VN 0652).

COMPARISON WITH PRIOR SURVEYS: Prior survey comparison performed by the Pacific Hydrographic Section.

CHARTING RECOMMENDATIONS: At chart scale, surveyed least depth is close enough to charted depth so that no change in charted soundings is warranted. *Do not concur*
Remove charted 6 1/2 FATHOM depth. Chart (12.1m) 6 1/2 FATHOM sounding at lat. 48/32/13.281 N
long. 122/33/37.924 W.

ITEM INVESTIGATION REPORT

ITEM NO.: N5
SSS Contacts

CHART NO.: 18427 (1:25,000)
EDITION: 15th
CHART DATE: July 25, 1992

SURVEY: H-10535

DESCRIPTION AND SOURCE OF ITEM: Three SSS contacts were observed north of Saddlebag Island

SOURCE POSITION: Contact 5625.15P latitude 48°32'18.3"N
longitude 122°33'36.7"W
Contact 5625.18P: latitude 48°32'18.6"N
longitude 122°33'36.9"W
Contact 5625.20P: latitude 48°32'18.4"N
longitude 122°33'36.8"W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: Although the depth of the above contacts was sufficient to classify them as insignificant, an attempt was made to confirm their existence. On DN 193, VN 0651, development hydrography was conducted over the target area, with several passes over the center line and 10-meter spacing to either side.

RESULTS OF INVESTIGATION: An ambiguous trace appeared on the fathogram on several occasions. The two most significant are the 11.4-meter/6.2-fathom (6-fathom chart depth) sounding at latitude 48°32'18.850"N, longitude 122°33'35.904"W (Pos. No. 5704+5) and the 14.8-meter/8.1-fathom (8-fathom chart depth) sounding at latitude 48°32'18.911"N, longitude 122°33'37.084"W.

COMPARISON WITH PRIOR SURVEYS: Prior survey comparison performed by the Pacific Hydrographic Section.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:
The nearest charted soundings are 8^{1/2} fathoms (15.5 meters) ~150 meters to the NE and 6^{1/2} fathoms (11.9 meters) ~150 meters to the SE. However, the 11.4-meter/6.2-fathom (6-fathom chart depth) sounding lies just inside the charted 10-fathom/18.3-meter curve.

Given the facts that (a) the trace appeared repeatedly on the echogram, (b) the soundings are located on a shoal in very rocky terrain, and (c) SSS contacts were observed at the same location, the hydrographer recommends charting the 6-fathom sounding at latitude $48^{\circ}32'18.850''\text{N}$, longitude $122^{\circ}33'35.904''\text{W}$. Do not concur, remove 6-fathom depth,

See Emsc Report, section 7.a.

CONTROL STATIONS as of 26 Mar 1994

No	Type	Latitude	Longitude	H	Cart	Freq	Vel Code	MM/DD/YY	Station Name
1		048:31:15.939	122:36:49.060	-14	250	0.0	0.0	04/04/94	DGPS BASE, RAILROAD AND O AVE.
2		048:30:47.711	122:35:56.312	39	139	0.0	0.0	04/04/94	CAP SANTE HEAD
3		048:30:38.734	122:36:23.102	-18	139	0.0	0.0	04/04/94	SOUTH HARBOR POINT
4		048:30:38.702	122:36:30.226	-17	139	0.0	0.0	04/04/94	CAP SANTE MARINA PIER A
5		049:19:49.402	123:15:52.445	-11	250	0.0	0.0	05/26/94	PT ATKINSON, BC (VANCOUVER)
6		048:17:52.258	123:31:54.747	-6	250	0.0	0.0	04/11/94	RACE ROCKS, BC (VICTORIA)
7		048:30:45.594	122:36:29.916	0	139	0.0	0.0	04/15/94	FIXED POINT PERFORMANCE CHECK
8		048:31:02.764	122:36:22.480	-17	139	0.0	0.0	04/20/94	T6ST
9		048:30:54.081	122:36:33.887	-17	139	0.0	0.0	04/20/94	R9S1
10		048:30:54.423	122:36:29.105	0	139	0.0	0.0	04/22/94	ENDG
11		048:30:45.730	122:36:21.355	0	139	0.0	0.0	04/22/94	ENDC
12		048:30:51.740	122:36:26.280	0	139	0.0	0.0	04/22/94	ENDK
13		048:30:48.166	122:36:14.590	0	139	0.0	0.0	04/22/94	ENDQ

VANCOUVER
AS OF 5-26-94

*



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Coast and Geodetic Survey
Seattle, Washington 98115-0070

October 3, 1994

Commander (OAN)
Thirteenth Coast Guard District
915 2nd Ave Room 3410
Seattle, WA 98174-1067

**ADVANCE
INFORMATION**

Dear Sir:

During the office processing of hydrographic survey H-10535 in the vicinity of Anacortes, Washington, three dangers to navigation have been discovered. These dangers affect the following charts:

<u>Chart</u>	<u>Edition/Date</u>	<u>Datum</u>
18424	24th Ed., 7/31/93	NAD83
18427	14th Ed., 4/21/90	NAD83

It is recommended that these dangers to navigation be included in the Local Notice to Mariners.

Questions concerning this report should be directed to the Pacific Hydrographic Section at (206) 526-6853.

Sincerely,

Kathryn A. Timmons

Kathryn A. Timmons
Commander, NOAA
Chief, Pacific Hydrographic Section

Enclosure

cc: DMA/HTC
N/CG221



Hydrographic Survey Registry Number: H-10535

Survey Title: State: Washington
Locality: Puget Sound
Sublocality: Vendovi Island to Hat Island

Project Number: OPR-N264-PHP

Survey Date: April - July, 1994

**ADVANCE
INFORMATION**

Features are reduced to Mean Lower Low Water using predicted tides.

<u>Danger to Navigation</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>	
Shoal, 3.8 Fathoms *	48/32/03.162	122/34/08.649	7.2 m = 3.94 Fm (4)
Shoal, 12.5 Fathoms	48/32/24.817	122/34/07.275	
Shoal, 6.2 Fathoms	48/32/18.850	122/33/35.904	

* Only on chart 18527

Questions concerning this report should be directed to the Pacific Hydrographic Section at
(206) 526-6853.

APPROVAL SHEET

for

SURVEY H-10535

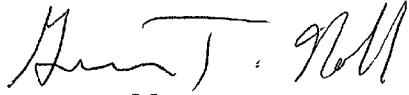
Standard field surveying and processing procedures were followed in producing this survey in accordance with the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; and the Field Procedures Manual, as updated for 1994. The data were reviewed daily during acquisition and processing.

Considerable programming was performed by myself on the new HDAPS Contact Sifting function. This function is a computerized algorithm following the contact significance principles outlined in the Project Instructions for OPR-N264-PHP. I hereby certify that the function fulfills the requirements of the project instructions to the best of my knowledge and ability to test.

The field sheets and supporting data have been reviewed by me, are considered complete and adequate for charting purposes, and are approved. All records are forwarded for final review and processing to N/CG245, Pacific Hydrographic Section.

Approved and Forwarded,

DATE: August 25, 1994


Guy T. Noll
Lieutenant, NOAA
Chief, Pacific Hydrographic Party



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Ocean and Earth Sciences
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

ORIGINAL

DATE: August 4, 1994

MARINE CENTER: Pacific

HYDROGRAPHIC PROJECT: OPR-N264-PHP

HYDROGRAPHIC SHEET: H-10535

LOCALITY: Washington, Guemes Channel, Puget Sound

TIME PERIOD: April 18 - July 14, 1994

TIDE STATION USED: 944-8794 Anacortes, Fidalgo Island, Wa.
Lat. $48^{\circ} 31.2'N$ Lon. $122^{\circ} 36.8'W$

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 9.81 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 7.4 ft.

REMARKS: RECOMMENDED ZONING

1. South of $48^{\circ} 35.0'N$, times and heights are direct on Anacortes, Wa. (944-8794).
2. North of $48^{\circ} 35.0'N$, apply a +0 hr 12 min time correction, and heights are direct on Anacortes, Wa. (944-8794).

Note: Times are tabulated in Greenwich Mean Time.

Walter M. Fisher
CHIEF, DATUMS SECTION





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Ocean and Earth Sciences
Silver Spring, Maryland 20910

ORIGINAL

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: November 21, 1994

MARINE CENTER: Pacific

HYDROGRAPHIC PROJECT: OPR-N264-PHP

HYDROGRAPHIC SHEET: H-10535

LOCALITY: Washington, Guemes Channel, Puget Sound

TIME PERIOD: July 22, 1994

TIDE STATION USED: 944-9880 Friday Harbor, San Juan Island, Wa.
Lat. $48^{\circ} 32.8'N$ Lon. $123^{\circ} 0.6'W$

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 3.74 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 7.0 ft.

REMARKS: RECOMMENDED ZONING

1. South of $48^{\circ} 35.0'N$, apply a +15 time correction, and a X1.08 range ratio to heights using Friday Harbor, Wa. (944-9880).
2. North of $48^{\circ} 35.0'N$, apply a +30 min time correction, and a X1.08 range ratio to heights using Friday Harbor, Wa. (944-9880).

Notes: Times are tabulated in Greenwich Mean Time.
The data for Friday Harbor, Wa. (944-9880) is stored in Next Generation Water Level Measurement System temporary file #744-9880.

Steph Thomas S. Sheehan

CHIEF, DATUMS SECTION



NOAA FORM 76-155 (11-72)		U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION						SURVEY NUMBER H-10535		
GEOGRAPHIC NAMES										
Name on Survey	<div style="display: flex; justify-content: space-between;"> A ON 18424 B ON 18427 C ON H-8318 D H-8319 E H-8317 F T-11229 G USGS TOPO. MAP H U.S. LIGHT LIST K </div>									
	BELLINGHAM BAY	X			X			X		
BOAT HARBOR	X	X			X	X	X			2
DOT ISLAND	X	X				X	X			3
GUEMES ISLAND	X	X	X		X		X			4
HAT ISLAND		X				X	X			5
HUCKLEBERRY ISLAND	X	X			X	X	X			6
JACK ISLAND	X		X		X		X			7
LONG BAY							X			8
PADILLA BAY	X	X	X		X	X	X			9
SADDLEBAG ISLAND	X	X			X	X	X			10
SAMISH ISLAND	X				X		X			11
SOUTHEAST POINT		X					X			12
VENDOVI ISLAND	X		X	X	X		X			13
WASHINGTON (title)	X	X					X			14
WILLIAM POINT	X				X		X			15
										16
										17
										18
					Approved:					19
										20
					<i>Charles E. Harrington</i>					21
					Chief Geographer - N/CG-2-15					22
					DEC - 8 1994					23
										24
										25

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

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	SMOOTH OVERLAYS: POS., ARC, EXCESS	
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	
DESCRIP- TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR- GRAMS
ACCORDION FILES	1		
ENVELOPES			
VOLUMES			
CAHIERS			
BOXES			1

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			2411
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	EVALUATION	TOTALS
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS	25		25
VERIFICATION OF SOUNDINGS	221		221
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET	19		19
COMPARISON WITH PRIOR SURVEYS AND CHARTS		6	6
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		19	19
GEOGRAPHIC NAMES			
OTHER*			
*USE OTHER SIDE OF FORM FOR REMARKS			
TOTALS	265	25	290

Pre-processing Examination by LT M. Larsen	Beginning Date 9/6/94	Ending Date 10/6/94
Verification of Field Data by L. Deodato	Time (Hours) 265	Ending Date 3/29/95
Verification Check by J. Stringham, R. Davies	Time (Hours) 6	Ending Date 3/29/95
Evaluation and Analysis by R. Davies	Time (Hours) 25	Ending Date 4/3/95
Inspection by B. Olmstead	Time (Hours) 25	Ending Date 5/26/95

**EVALUATION REPORT
H-10535**

1. INTRODUCTION

Survey H-10535 is a navigable area hydrographic survey accomplished by the Pacific Hydrographic Party under the following Project Instructions.

OPR-N264-PHP, dated March 10, 1994
CHANGE NO. 1, dated April 29, 1994

This survey was conducted in Washington state and covers the northern portion of Padilla Bay between Guemes and Samish Islands and between Vendovi and Hat Islands. The surveyed area extends from latitude 48/31/36N to latitude 48/37/00N, and from longitude 122/31/00W to longitude 122/36/39W. The inshore limit of hydrography is the 5-meter depth curve. The bottom consists of mud and shells. Depths range from 0.6 meters near shore to 90 meters offshore.

Side scan sonar was used on this survey to search the area between regular sounding lines for indications of possible dangers and bottom irregularities. The sonar search was conducted with 100% swath coverage of the bottom within the area specified in the project instructions. Significant side scan sonar contacts identified in the field were adequately investigated by echo sounder developments.

Depth curves depicted on the smooth sheet were selected from those authorized through HSG 69. However, instead of drafting all authorized curves only those curves considered necessary for the reasonable portrayal of the bottom were drafted. The selected curves are the 1, 2, 5, 10, 20, 40, 60 and 80 meter. A note was added to the smooth sheet to identify these values. A few supplemental depth curves have been added to the smooth sheet in brown where warranted. Bottom characteristics are annotated on this survey.

Predicted tides for Friday Harbor were used for the reduction of soundings during field processing. Approved hourly heights zoned from Anacortes, Fidalgo Island and Friday Harbor, San Juan Island, gages 944-8794 and 944-9880, were used during office processing.

The field sheet parameters have been revised to center the hydrography on the office plot. Soundings have been corrected for dynamic draft, actual tides and sound velocity. Hydrographic positioning was obtained using differential GPS based on Canadian beacons. Data are plotted using a Modified Transverse Mercator projection and are depicted on a single sheet at a scale of 1:10,000.

Survey data processed using the same Hydrographic Data Acquisition/Processing System (HDAPS) software suite used by the hydrographer; the Hydrographic Processing System (HPS), Release 19940714; and AutoCad, Version 12.

At the time of the survey certification the format for the transmission of digital data had not been finally approved. In the interim, digital data for this survey exists in the standard HPS format which is a database format using the .dbf extension. In addition, the sounding plot, created with the .dbf data and enhanced using the AutoCad system, is filed both in the AutoCad drawing format, i.e., .dwg; and in the more universally recognized graphics transfer format, .dxf. Copies of these data files will be retained at PHS until data transfer protocols are developed and improved.

The drawing files necessarily contain information which is not part of the HPS data set such as geographic name text, line-type, and minor symbolization. In addition, those soundings deleted from the drawing for clarity purposes, remain unrevised in the HPS digital files to preserve the integrity of the original hydrographic data set. Cartographic codes used to describe the digital data are those authorized by Hydrographic Survey Guideline No. 75.

2. CONTROL AND SHORELINE

Sections H and I of the hydrographer's report and the 1994 Horizontal Control Report for OPR-N264-PHP, contain adequate discussions of horizontal control and hydrographic positioning.

Positions of horizontal control stations used during hydrography originate with the Hydrographic Surveys Branch memorandum, *Canadian West Coast DPGS Beacon Status*, dated March 1, 1994 and subsequent facsimile correspondence from the Canadian Coast Guard Western Region, dated May 20, 1994. The latter correspondence was necessitated by a relocation of the reference beacons in use during the survey. The successful completion of a reference site confirmation using program MONITOR and daily system calibrations provide adequate checks regarding the suitability of the beacons for use during a hydrographic survey. Although the raw data listings provided by the hydrographer incorrectly recorded the location of the latest reference beacon the monitoring of the station performance and daily calibrations confirm that the beacon was broadcasting correctly.

A horizontal dilution of precision (HDOP) not to exceed 3.75 was computed for survey operations. The quality of 17 positions exceeded the limit in terms of HDOP. These positions are isolated and occur randomly throughout the survey area. A review of the data, however, indicates that none of these fixes are used to position dangers to navigation. The features or soundings located by these fixes are consistent with the surrounding information. These fixes are considered acceptable.

Positions of horizontal control stations used during hydrography are 1994 field values based on NAD 83.

The final sounding plot is annotated with a NAD 27 adjustment tick based on values determined with NGS program NADCON. Geographic positions based on NAD 27 may be plotted on the smooth sheet utilizing the NAD 83 projection by applying the following

corrections.

Latitude: -0.619 seconds (-19.127 meters)
Longitude: 4.615 seconds (94.613 meters)

The year of establishment of control stations shown on the sounding plot originates with the horizontal control records for this survey.

The following shoreline map applies to this survey.

	<u>Photo Date</u>	<u>Scale</u>
T-11229	1952	10,000

Originally authorized by the Project Instructions, this shoreline map was subsequently eliminated from the project documentation. An office review disclosed that the age of the photography was not sufficiently recent to provide an accurate representation of the shoreline and attached cultural features. Authorization was granted by N/CG241 (via e-mail message Maurice Hickson to Dennis Hill, dated August 5, 1994) to substitute nautical chart information. As a result shoreline was digitized from chart 18424, 24th Edition, July 31, 1993; scale 1:40,000 and Chart 18427, 15th Edition, July 25, 1992; scale 1:25,000, and then used to construct the shoreline appearing on the final sounding plot.

3. HYDROGRAPHY

With the exception of the area inshore of the approximate location of the 5-meter depth curve, hydrography is adequate to;

- a. delineate the bottom configuration, determine least depths, and draw the standard depth curves;
- b. reveal there are no significant discrepancies or anomalies requiring further investigation;
- c. show the survey was properly controlled and soundings are correctly plotted.

4. CONDITION OF SURVEY

The hydrographic records and reports received for processing are adequate and conform to the requirements of the Hydrographic Manual, 4th Edition, revised through Change No. 3, the Hydrographic Survey Guidelines, and the Field Procedures Manual, April 1994 edition, except for the following.

Four fixed aids to navigation were not adequately located during survey operations. All major lights, nonfloating fixed aids, which fall within the survey area need to be located or verified that their position is charted correctly. See section 7.d of this report.

5. JUNCTIONS

Survey H-10535 junctions with the following survey.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H-10534	1994	1:10,000	South

The junction with survey H-10534 is complete.

There are no contemporary surveys to the north, east and west. A comparison with charted depths reveals good agreement with the present survey.

6. COMPARISON WITH PRIOR SURVEYS

H-1815(1887) 1:20,000

Survey H-1815 covers the entire area of the present survey. Depths vary between one to three meters shoaler than the present survey. Shoreline has generally remained stable throughout the survey area over the past 100 years. These differences are largely attributed to the relative accuracy of the data acquisition techniques between these surveys and the dynamic natural processes since 1887.

H-8317(1955-56) 1:10,000
H-8318(1955-56) 1:10,000
H-8319 (1956) 1:10,000
H-8331(1955) 1:10,000

Surveys H-8317, H-8318, H-8319 and H-8331 cover the entire area of the present survey. Shoreline has generally remained stable throughout the survey area over the past forty years. Depths vary between one to two meters with a pattern of deepening in the main channel. These differences are largely attributed to the relative accuracy of the data acquisition techniques between these surveys and the dynamic natural processes that have occurred since the 1950's.

The prior hydrographic surveys listed above cover the entire area of the present survey. However, the present survey's specification of terminating hydrography at the 5-meter depth curve resulted in a significant exclusion zone between the present hydrography and the high water line. It is assumed that in this zone all soundings and features originating with prior surveys are not superseded. Rather than transfer all individual sounding or features from priors to the present survey to make it complete, selected features were transferred in brown from charts 18424 and 18427. All charted soundings and features inside the 5-meter curve within the common area of this survey are to be retain as charted with the exception of the 7.2 meter (3.9 FA) sounding found at latitude 48/32/03.1N, longitude 122/34/08.6W. This

(4 Fm)

7.2 meter sounding should be charted and the charted 5 fathom sounding at latitude 48/32/03N, and longitude 122/34/11W should be removed.

There are no AWOIS Items which originate with the above mentioned prior surveys.

With the exceptions noted above, H-10535 should supersede the prior surveys within the common area.

7. COMPARISON WITH CHART

Chart 18424, 24th Edition, July 31, 1993; scale 1:40,000

Chart 18427, 15th Edition, July 25, 1992; scale 1:25,000

Chart 18427, 16th Edition, December 10, 1994; scale 1:25,000

The two editions of chart 18427, are identical except for the three dangers to navigation submitted during pre-processing.

a. Hydrography

Charted hydrography originates with the prior surveys mentioned in section 6 and miscellaneous sources and requires no further discussion, except for the following.

An 11.4 meter sounding (6.2 fathom) at latitude 48/32/18.85N, longitude 122/33/35.90W, originates from a dangers to navigation letter dated Oct. 3, 1994 (attached). During office processing, this sounding was found to be a stray trace and not supported by any additional information. This depth should be removed from the next chart edition.

Except for the depths and features inside of the 5-meter depth curve and the sounding mentioned in section 6 of this report, survey H-10535 is adequate to supersede charted hydrography within the common area.

b. AWOIS

There were no AWOIS items within the survey area..

c. Controlling Depths

There are no channels with controlling depths found within the survey area.

d. Aids to Navigation

There are two floating aids within the survey area. The floating aids were located and serve there intended purpose. There are four fixed aids within the survey area. These fixed aids to navigation were not positioned adequately and or verified to the requirements in the

project instructions. The following positions for the fixed aids listed below were received from N/CG221, Mapping and Charting Branch, and were used to plot their position on the smooth sheet.

<u>Light List Name</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>
Vendovi Island Light 2	48/36/31.38	122/35/53.62
William Point Light	48/34/58.45	122/33/37.78
Huckleberry Island Light 6	48/32/08.70	122/33/27.50
Saddlebag Island Light 7	48/32/10.90	122/33/56.80

There are no landmarks charted within the survey area. The hydrographer recommended no features of landmark value.

e. Geographic Names

Names appearing on the smooth sheet and in the survey title have been approved by the Chief Geographer.

f. Dangers to Navigation

No dangers to navigation were generated during survey operations. Three dangers to navigation were generated during office processing. See attached letter. On danger, an 11.4 meters sounding at latitude 48/32/18.85N, longitude 122/33/35.90W was disproved during office processing and should be deleted from the next chart edition.

8. COMPLIANCE WITH INSTRUCTIONS

Survey H-10535 adequately complies with the project instructions, except where noted in this report.

9. ADDITIONAL FIELD WORK

This is a good hydrographic survey. No additional field work is recommended.

C. Russ Davies
C.R. Davies
Cartographer

APPROVAL SHEET
H-10535

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproval of charted data. The digital data have been completed and all revisions and processing have been entered in the magnetic tape record for this survey. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Bruce A. Olmstead Date: 5/26/95
Bruce A. Olmstead
Senior Cartographer, Hydrographic Processing Unit
Pacific Hydrographic Section

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.

Kathy Timmons Date: 6/13/95
Kathy Timmons
Commander, NOAA
Chief, Pacific Hydrographic Section

Final Approval

Approved:

Andrew A. Armstrong III Date: 6/28/95
Andrew A. Armstrong III
Captain, NOAA
Chief, Hydrographic Surveys Branch

