

H10939

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. PHP 10-3-99

Registry No. H-10939

LOCALITY

State Washington

General Locality Rosario Strait

Sublocality Deception Pass to Burrows Pass

1999 - 2000

CHIEF OF PARTY

Kathryn Simmons, Acting

LIBRARY & ARCHIVES

DATE

HYDROGRAPHIC TITLE SHEET

H-10939

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-10-3-99

State WashingtonGeneral Locality Rosario StraitSublocality Deception Pass to Burrows PassScale 1:10,000Date of Survey 10/6/99 - 3/29/00Instructions Date 5/7/1997Project No. OPR-N368-PHPChange #1 dated 5/4/1999Vessel Launch 1101 (EDP 0651), Launch 1102 (EDP 0652)Chief of Party Kathryn Simmons, ActingSurveyed by LT Crocker, ST Brown, ST Rothmeyer, ST Simmons, ST WernickeSoundings taken by echo sounder, hand lead, pole K 320m, I 448, EG&G 260/272-T, M III LDGGraphic record scaled by PHP PersonnelGraphic record checked by PHP PersonnelEvaluation by M. Bigelow Automated plot by HP DesignJet 1050CVerification by M. Bigelow, R. Mayor, R. Davies, B. OlmsteadSoundings in Fathoms and tenths at MLLWREMARKS: Time in UTC.PHB Revisions: Report has been evaluated.Comments, revisions and corrections are entered as endnotes.All depths listed in this report are referenced tomean lower low water unless otherwise noted.UTM (Zone 10)

Descriptive Report to Accompany Hydrographic Survey H-10939

**OPR-N368-PHP
Field Number PHP-10-3-99
Scale 1:10,000
1999
Pacific Hydrographic Party**

A. PROJECT

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-N368-PHP, Northern Puget Sound, Washington, dated May 7, 1997, and Change No.1, dated May 4, 1999.

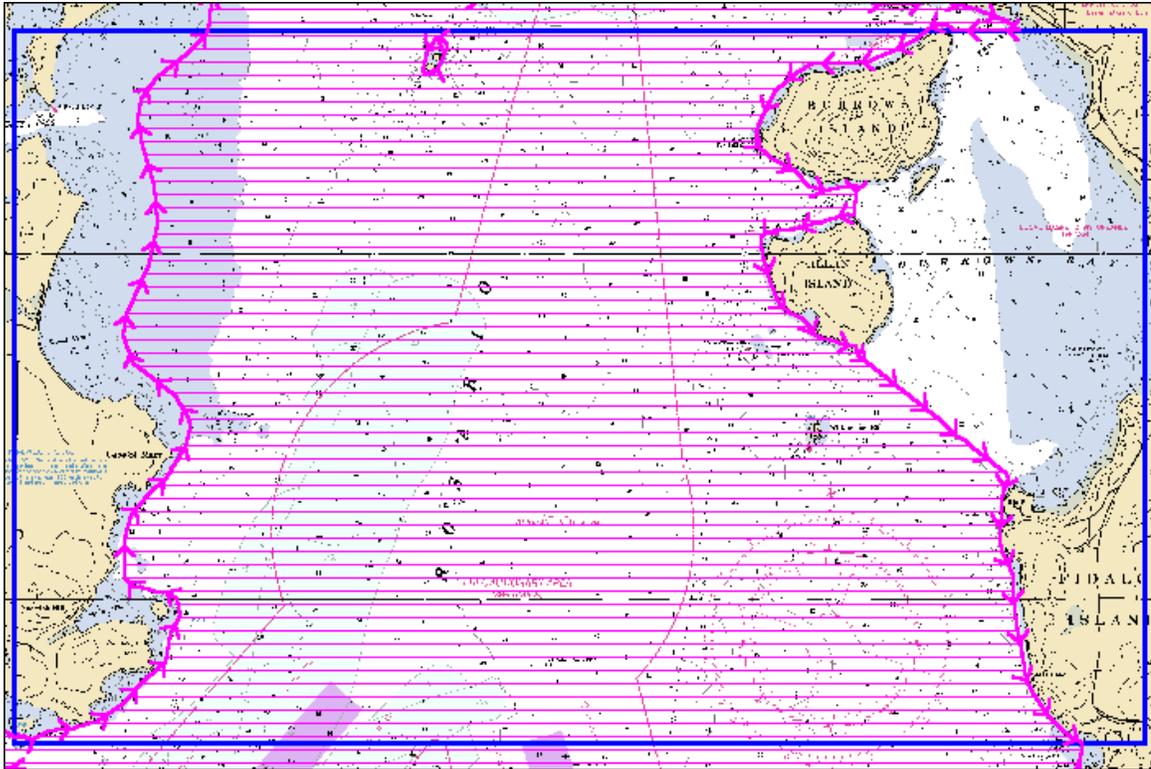
This project was authorized in response to requests from the Puget Sound Pilots, the Thirteenth Coast Guard District, and the National Ocean Service (NOS) Office of Ocean and Coastal Resource Management. The primary objective is to have the charted wire drag clearance depths superseded by modern, full-bottom-coverage hydrography. The charted wire drag clearance depths, which originate from surveys conducted in 1935, 1943, 1962 and 1972, are often considered controlling depths.

The project area includes parts of the Strait of Juan de Fuca, Rosario Strait, Haro Strait, Bellingham Channel, Middle Channel and San Juan Channel. Traffic throughout the project area is heavy and includes both foreign and domestic cargo ships, pleasure craft, automobile ferries as well as tugs and barges. Oil refineries north of Lummi Island and in Anacortes are used for receipt of crude oil, shipment of petroleum products, bunkering vessels, and receipt of alumina and liquefied petroleum gas. According to the Puget Sound Pilots, routes for approaches and departures of tankers with drafts up to 56 feet occur throughout the area.¹ The entire project area is environmentally sensitive and lies within the limits of the proposed Northwest Straits National Marine Sanctuary.

This is the eighth survey of the project. The sheet letter is J as specified by Project Instructions; registry number is H-10939; designation: Deception Pass to Burrows Channel,² Rosario Strait, Washington.

B. AREA SURVEYED

H-10939 covers an area between Deception Pass and Burrows Channel³ as shown in the chartlet below derived from Chart 18429 (8th Ed, 1:25,000, July 3, 1999). Hydrographic limits extend from latitude 48°25'10.425"N to latitude 48°29'16.218"N and from longitude 122°39'29.538"W⁴ to longitude 122°49'24.458"W, with three fathoms as the inshore sounding limit. Data acquisition was conducted from October 16, 1999⁵ (DN 279) through March 29, 2000 (DN 089).



C. SURVEY VESSELS

The following NOAA survey vessels were used throughout the project:

Vessel	EDP #	LOA	Beam	Draft	Tonnage	Power
1101 Jensen	0651	29 feet	10 feet	0.4m	5 tons	Jet Drive
1102 Sea Ark	0652	21 feet	8 feet	0.4m	2 tons	150hp outboard

Both launches were used for mainscheme hydrography. Launch 1101 was used for development hydrography, side scan sonar operations, velocity casts and dive investigations. Launch 1102

was used for bottom sample collection. No changes to the standard vessel sounding configuration were necessary for either launch.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

HYPACK Software produced by Coastal Oceanographics was used for all data acquisition. HPTOOLS, a program developed by Hydrographic Surveys Division(HSD), Systems Support Branch(SSB), N/CS32, was used to convert HYPACK data to HPS format. HPS Software, also developed by HSD/SSB, was used for hydrographic data processing. MapInfo Professional and Vertical Mapper were used in conjunction with HPS for survey planning and layout, data display, and as tools to evaluate data.

CAT version 3.0 was used to download conductivity, temperature and depth data from Seacat sound velocity probe. VELOCWIN was used to process all cast data.

A list of software used to complete the survey is included in Appendix H⁶ along with respective versions and issue dates.

E. SIDE SCAN SONAR

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:

Type	Serial Number
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 aft starboard quarter using a Kevlar cable, 55 meters long, passed through a block and powered by a Superwinch Model W115. Block and winch were mounted to a swing-arm davit. The Kevlar cable was connected to the EG&G recorder cabling with a slip-ring assembly within the winch assembly. A Dynapar Max Count 2 cable counter was used to measure deployed cable length, which was logged in real time in HYPACK. Tape markings at measured intervals provided visual confirmation of recorded cable length. Markings are at one-meter intervals up to 10 meters and at five-meter intervals thereafter. At the beginning of each survey day and as needed throughout the day, the cable counter was adjusted to reflect these tape markings.

SSS operations were conducted at a speed of 5 knots or slower when using range scales of 75 or 100 meters. At higher range scales the speed was maintained at 4 knots or slower. Range scales

of 75, 100, 150 and 200 meters were used. The SSS towfish was maintained at a height off the bottom equivalent to 8 to 20 percent of the range scale except where quickly changing depths prohibited compensatory adjustments in cable length. In such cases, the hydrographer believes the sonagram trace is adequate for identification of any significant contacts. Two hundred percent side scan coverage was acquired from the 3-fathom/5.5-meter-curve (or the limit of safe hydrography) to the 25-meter/13.7-fathom curve in accordance with Section 7.2 of project instructions as amended by Change No. 1, Paragraph 9.⁷

Two hundred percent coverage was achieved using orthogonal patterns oriented at angle to the contours where possible with line spacing of 150 meters. One-hundred-percent swaths are identified by fixes in the 20,000-29,999 range; two-hundred-percent swaths by fixes in the 30,000-39,999 range. The coverage was plotted on two separate swath plots and reviewed to assure acquisition of adequate overlap and full coverage.⁸

The SSS recorder gain was adjusted for the best return for the prevalent bottom material. Contacts or identifiable features (e.g., buoy anchors, change in bottom texture) visible on the outer edge of the sonagram assure acceptable SSS recorder tuning and served as confidence checks during operations.

Following guidelines in Section 7.2.2 of project instructions, sonagrams were manually scanned for significant contacts. A total of 805 contacts were labeled and entered into one HPS contact table. Where contacts appeared in a cluster on the sonagram, only the most significant was entered. Apparent significance was determined with the PHP-developed Contact-O-Meter, a scale proportioned for shadow length and fish height. Contact heights and raw depths were derived using the HPS Side Scan Utility Program and all recorded contacts were plotted.⁹

The hydrographer employed various techniques for selecting contacts for development. All contacts with heights greater than or equal to ten percent of the recorded depth were selected for further review. A few of these were subsequently determined to be insignificant on the basis of (1) water depth at contact, (2) height exaggeration caused by proximity to the towfish and/or (3) steepness of the slope. Final analysis entailed re-scanning all sonagrams and manually listing all of the most prominent contacts. These were entered into Mapinfo Table Priority Contacts and all of these were selected for more rigorous development.¹⁰

The HPS contact table is included in Appendix J, Supplemental Correspondence,¹¹ along with a list of "Priority Contacts."

F. SOUNDING EQUIPMENT

The following echosounders were used throughout the survey:

Vessel	Model No.	Serial No.
0651	Knudsen 320M	K98577
0651	320M	K98576
0652	Innerspace	448239

Vessel No. 0651 For both Knudsen 320M echosounders 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 and further development was not justified for other reasons.

Vessel No. 0652 The Innerspace Model 448 (INN448) is a single-frequency echosounder.

Metric leadlines were used for depth comparisons with the echosounder. PHP fabricated the leadlines following Hydrographic Survey Guideline (HSG)69. Leadline calibration forms are included in Appendix E. ¹²

G. CORRECTIONS TO SOUNDINGS

Tides and Water Levels

In compliance with Section 5.8 of Project Instructions, tide stations¹³ were established at the historical sites shown below:

Station Number	Station Name	Latitude	Longitude
944-9982	Richardson Point Lopez Island	48°26'48"N	122°54'00"W
944-9932	Armitage Island	48°32'06"N	122°47'48"W

Real-time, portable acoustic gauges with satellite capability were installed to provide information on zoning, tidal datums and harmonic constants for predictions on sheet "J." Primary tide stations at Port Townsend, WA (944-4900), Cherry Point, WA (944-9424), and Friday Harbor, WA (944-9880), serve as controls for datum determination at the above sites.

Project Instructions define nine tide zones within the limits of Sheet J. Time/height correctors are listed below; zone parameters are included in the Field Tide Note located in Appendix D. ¹⁴

HPS Zone	Tide Zone	Reference Station	Time Corrector	Range Ratio
8	NPS43	Port Townsend	36 min	x0.87
28	NPS77	Port Townsend	06 min	x0.90
29	NPS78	Port Townsend	-06 min	x0.92
30	NPS79	Port Townsend	-06 min	x0.90
31	NPS81	Port Townsend	00 min	x0.88
32	NPS82	Port Townsend	00 min	x0.86
33	NPS83	Port Townsend	-12 min	x0.86
34	NPS84	Port Townsend	06 min	x0.82
35	NPS85	Port Townsend	-12 min	x0.83

Preliminary, six-minute, real tides recorded by the Pt. Townsend reference station were downloaded from the NOAA, NOS, CO-OPS web site (<http://www.opsd.nos.noaa.gov/cgi-bin/prelimqry.pl>). Using HPTools utilities, the tides were imported into HPS Tide Table 1. Zone Utilities computed the appropriate zone for each sounding; time and height adjustments were computed; and corrected tides were applied to sounding data.

No tide station downtime was experienced during times of hydrography for this survey. ¹⁵

Velocity of Sound

Corrections for the speed of sound through the water column were computed from data obtained with a Seacat conductivity, temperature and depth recorder. SEA-BIRD Electronics Model SBE-19, S/N 1892, was used for all casts. The recorder was initialized using program CAT v. 2.0. VELOCWIN was used for processing. Below is a list of sound velocity casts for this survey.

HPS Table	DN	DN Range	Extrapolated Depth	Cast Latitude	Cast Longitude
1	278	278-298	141.0m	48°29'11"N	122°45'27"W
2	299	299-304	151.5m	48°29'08"N	122°45'27"W
3	305	305-315	155.1m	48°29'05"N	122°45'29"W
4	316	316-004	180.4m	48°29'32"N	122°44'26"W
5	005	005-027	181.0m	48°29'30"N	122°44'04"W
6	028	028-040	146.1m	48°29'30"N	122°44'04"W
7	041	041-053	151.9m	48°29'07"N	122°45'27"W
8	054	054-065	105.9m	48°29'05"N	122°45'25"W
9	067	067-079	154.1m	48°29'05"N	122°45'25"W
10	080	080-089	141.8m	48°29'11"N	122°45'29"W

Appendix I¹⁶ contains copies of all velocity cast data and HPS Velocity Corrector Tables.

SEACAT instrument S/N 1892 was calibrated on March 8, 1999. A copy of the calibration report, produced by SEA-BIRD Electronics is included in Appendix E.¹⁷

Leadline Comparisons

Periodic leadline comparisons, annotated on the echogram, confirm proper digitization of the echosounder depths. Leadline comparison forms are located in Appendix E.¹⁸

Static Draft

Static draft for VN 0652 was determined on June 3, 1997, (DN 154) . 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 persons 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 0.4 meters was determined for vessel 0651 on June 27, 1997,¹⁹ (DN 178) using a method similar to above.

Dynamic Draft

Settlement and squat measurements were conducted for VN 0651 on February 9, 1998, (DN 040) and for VN 0652 on June 3, 1997 (DN 154). All measurements were performed in Guemes Channel, WA. Field records are included in Appendix E.²⁰

Transducer and antenna offsets, static draft, and settlement and squat correctors were entered into offset tables:²¹ Table 1 for VN 0651 and Table 2 for VN 0652. Correctors were applied during processing in HPS using the Reapply Vertical Correctors Utility.

Corrections to Echosoundings

Occasional problems with misdigitization or bottom tracking were encountered during this survey. Where the echogram trace was adequate and unambiguous, the digital record was corrected to reflect the paper trace. Where the echogram trace was discontinuous, the selected soundings were deselected or rejected. Gaps in the sounding interval greater than 6mm at the scale of the survey were resurveyed.²²

H. HYDROGRAPHIC POSITION CONTROL

Horizontal Datum

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

Position Control

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The U.S. Coast Guard beacon at Whidbey Island (302kHz) and the Canadian Coast Guard beacon in Richmond, BC (320kHz) were used.

A separate Horizontal Control Report for this project was submitted to the Pacific Hydrographic Branch (PHB) in June 1997.²³

DGPS Performance Checks

DGPS performance check stations - pilings in Cornet Bay Marina and Skyline Marina - were established to Third Order, Class 1, standards. All DGPS performance checks were successful and are included in Appendix F.²⁴

Positioning Equipment

The following GPS equipment was used:

Equipment	Type	Receiver	Antenna
Location	Receiver/Antenna	Serial No.	Serial No.
VN 0651	Trimble DSM212L 27207	0220164491	0220166460
VN 0652	Starlink Receiver	865	4207

On October 12 (*DN 285*) the Starlink Receiver on Launch 0652 experienced intermittent failure, the effect of which was occasional loss of satellites which resulted in an inordinate number of “flyers” and high HDOPs. The receiver was sent for repair and reinstalled on October 28 (*DN 201*). No further problems were encountered. Hydrography acquired on this date was examined for position errors; unsatisfactory data were deleted and where the trackline was determined to be satisfactory, the data were retained.²⁵

I. SHORELINE²⁶

Digital shoreline derived from photogrammetric source data was not available for this project. Section 4.1.1 of the Project Instructions directed that shoreline for project field sheets be derived, for orientation purposes only, from NOS Charts 18421, 18424, 18429, 18430, and 18431. To facilitate verification in the field for this survey, PHP created a digital shoreline document based on BSB electronic charts produced by Maptech. Chart 18429 (scale 1:25,000) was used to evaluate all shoreline. The chart was imported into Mapinfo; a trace of the shoreline was created on the cosmetic layer, exported as a DXF file and loaded into HYPACK. Additionally, Nobeltec’s Navtrek Solo navigation software v. 1.0.74 was used with Maptech’s Chartkit, edition 2.1, in a dual-window configuration on the launch PC monitors. As the launch moved along the

shore, its position was displayed over the digital shoreline and the displayed chart simultaneously. Correctly charted features were easily verified and uncharted features or items requiring disapproval were also apparent.

No cultural features are located along the shoreline within the limits of the survey.

The natural shoreline was not examined rigorously; however, no obvious discrepancies were apparent during the course of data collection.

J. CROSSLINES

Twenty-eight miles of crosslines were acquired, 7.5 % of mainscheme hydrography. Combined with 96 miles of SSS hydrography acquired at angles greater than forty-five degrees to the mainscheme lines, crossline miles total 124, or 33% of mainscheme. Agreement is excellent.

K. JUNCTIONS

H-10939 joins contemporary surveys H-10911, 1:10,000, 1999, and H-10792, 1:10,000, 1998-99, to the north, and H-10838,²⁷ 1:10,000, 1998-9²⁸ to the south. The soundings and contours of the three surveys were compared and found to be in excellent agreement.

L. COMPARISON WITH PRIOR SURVEYS²⁹

The following priors were downloaded from the digital data base on the Internet and imported into Mapinfo to facilitate comparison with soundings and shoreline from the current survey:

Registry No.	Dates of Survey	Scale
H-6577	1940	1:10,000
H-6645	1940	1:10,000
H-6607	Dec. 1939 - April 1940	1:10,000
H-9283WD	1972	1:20,000

Prior H-9283WD

A wire drag hang occurred at latitude 48°25'09.5"N, longitude 122°47'59.0"W³⁰ at a depth of 67 feet/11.2 fathoms; depth was cleared to 57 feet/9.5 fathoms. This position is at the junction with H-10828 which recorded a least depth of 65 feet/10.9 fathoms at latitude 48°25'10.1"N,³¹

longitude 122°48'04.1"W. Survey H-10939 located several contacts in the vicinity of the hang and all were developed. Least depth from the current survey is 68 feet/11.4 fathoms ³²located at latitude 48°25'10.0"N, longitude 122°48'04.5"W (*Fix 6606, DN 305*)

Prior H-6577

Comparison of soundings shows general agreement. One exception is the 4-fathom, 2-foot, sounding charted at latitude 48°25'21.198"N, longitude 122°48'25.164"W ³³for which H-6577 is the source. The sounding location was developed to 5-meter line spacing; the least depth located within the radius of the charted sounding is 5.1 fathoms ³⁴(*Fix 31621, DN 316, and Fix 51669, DN 047*).

Priors H-6607 and H-6645

Soundings from the current survey are ³⁵slightly shoaler³⁶, primarily due to increased data density³⁷.

M. ITEM INVESTIGATION REPORTS

One AWOIS item³⁸ is located within the limits of the survey. A detailed³⁹ report is located in Separate IV. ⁴⁰

N. COMPARISON WITH THE CHART⁴¹

The survey area is represented on the following charts:

Chart No.	Date	Edition	Scale
18400	March 30, 1996	39th	1:200,000
18421	March 6, 1999	42nd	1:80,000
18423sc	May 1, 1999	31st	1:80,000
18427	March 27, 1999	19th	1:25,000
18429	July 3, 1999	8th	1:25,000

Charts 18400, 18421, 18423 and 18424 cover the entire survey area. Chart 18427 covers the survey area east of longitude 122°44'20"W. The survey was compared with all charts but most rigorously with Charts 18429 and 18427, the largest scale charts covering the survey area.

Dangers to Navigation⁴²

Two⁴³ dangers to navigation were found during the course of the survey; copies of both reports are included in Appendix A. ⁴⁴

On March 24, 2000, (*DN 084*), following a severe wind storm, the Dennis Shoal Red Buoy #6, LLN 19350, was found 1070 meters southeast of its charted position. The U.S. Coast Guard (Rob Denner, 206-220-7279) was notified immediately by telephone and a follow-up Danger to Navigation Report was issued on March 29, 2000. ⁴⁵

The second danger, issued on March 31, 2000, reported an 8.3-fathom shoal located seaward of Kellett Ledge at latitude 48°26'56.9"N, longitude 122°47'05.0"W, and a second shoal depth (7.3 fathoms) at latitude 48 26'57.8"N, longitude. ⁴⁶

Comparison of Soundings

For the most part, soundings from the current survey are consistently⁴⁷ shoaler⁴⁸ than charted. In deep areas this may be attributable to the higher data density of the current survey. Areas where⁴⁹ depths are less than 15-20 fathoms⁵⁰ are marked by many large boulders which were located with side scan sonar. Intensive contact development accounts for significant shoaler soundings in these areas of the current survey. ⁵¹

The 29-fathom sounding charted at latitude 48°26'40"N, longitude 122°47'54"W, is inside the 20-fathom curve and is most likely a charting error. A sounding of 29.3 *meters* ⁵² is depicted on prior H6607.⁵³ Surveyed depths of 18.4 fathoms (*Fix No. 31394, DN 316*) ⁵⁴ and 18.8 fathoms (*Fix No. 21613, DN 319*)⁵⁵ plot directly over the charted sounding.

Comparison of Non-Sounding Features

Three piles and one submerged pile are charted inshore of the three-fathom limit of hydrography; none⁵⁶ was confirmed.

Side scan coverage over the submerged pile charted at latitude 48°17'50.6"N,⁵⁷ longitude 122°49'05.57"W produced two contacts: contact 31346.6p, height 1.3 meters, and contact 31346.6s, height 0.2 meters. Both contacts were developed and on subsequent investigation, divers found a large rock with a height of 1.5 meters⁵⁸ at the location of contact 31346.6p, latitude 48°27'49.9"N, longitude 122°49'01.9"W. They reported the remainder of the visible bottom was strewn with smaller boulders but no pile was observed. Delete the charted submerged pile and chart the soundings from this survey. ⁵⁹

Side scan coverage failed to reach the pile charted in very shallow water at latitude 48°27'27.3"W, longitude 122°48'53.1"W. Divers investigating the charted location of the pile found a rotting pile lying on the bottom. Delete the pile charted at the above location. ⁶⁰

Two contacts were identified in the vicinity of the two piles charted at latitude 48°27'17.154"N, longitude 122°48'46.660"W, and latitude 48°27'16.474"N, longitude 122°48'45.151"W. Divers investigated the site of both contacts and found only large, flat rocks, approximately 1 meter high and 2 meters in diameter. Delete these charted piles and chart the soundings from the current survey. ⁶¹

Cables, Pipelines and Ferry Routes

As reported in the descriptive report for Survey H-10792, the cable area originating at Fidalgo Head and crossing to Burrows Island is inactive and unsigned. Chuck Mellinger in the Aids to Navigation Office of the Thirteenth Coast Guard District (206-220-7280) confirmed that the cable, which belongs to the Coast Guard, is inactive but remains in place. The Coast Guard will erect signs marking the crossing. ⁶²

O. ADEQUACY OF SURVEY

H-10939 is a complete, navigable area hydrographic survey and is adequate to supercede all prior surveys within their common areas. ⁶³

P. AIDS TO NAVIGATION

The following fixed aids to navigation were positioned with static GPS positioning to third order, class 1, standards. See Horizontal Control Report, revised June 1999.

Navigational Aid	LLN	Latitude	Longitude
Burrows Island Light	19350.	48°28'40.58"N	122°42'48.75"W
Lopez Pass Light 2	19370	48°28'52.16"N	122°49'05.58"W

Below is a list of aids to navigation verified with hydrographic methods in accordance with Section 4.2 of project instructions.

Navigational Aid⁶⁴	LLN	Latitude	Longitude	FixNo.
Williamson Rocks Red Lighted Gong Buoy 4	19335	48°35'10.419"N	122°40'10.784"W	15933
Kellett Ledge Buoy 3, green can	19340	48°35'28.375"N	122°39 08.018"W	15935
Dennis Shoal Buoy 6, red nun*	19345	48°36'16.215"N	122°37 49.173"W	15936

USCG Notices to Mariners

Notice to Mariners Weekly Supplement, Notice No. 03/00, reported that Burrows Island Light, LLN 19350, has a fog detector model that is potentially defective. Weekly Supplement 04/00 announced that sound signals with a one-mile range are no longer considered necessary for safe navigation in the Puget Sound area and proposed changing the sound signal range on the Burrows Island Light (among others) to one-half mile. Notice to Mariners Monthly Edition

Number 09/00 dated February 29, 2000, reported the red sector obscured on Burrows Island Light. Weekly supplement 12/00 proposed discontinuing the red sector on Burrows Island Light and Weekly Supplement 13/00 reported the Dennis Shoal Buoy 6, LLN 19345, off station*. Copies of these notices are included in Appendix J, Supplemental Correspondence.⁶⁵

**See Danger to Navigation Report dated March 29, 2000, in Appendix A.*⁶⁶

Q. STATISTICS

Description	Quantities
Total Nautical Miles	702
Side Scan Sonar	96
SSS 100%	47
SSS 200%	49
MS Hydrography	373
Splits	76
Cross Lines (200% SSS)	28
Development	128
Square Nautical Miles	21.1
Square Nautical Miles SSS	5.0
Days of Acquisition	37
Total Number of Selected Soundings	35102
Detached Positions	7
Bottom Samples	35
Dives	3
Velocity Casts	10
Tide Stations Installed	2

R. MISCELLANEOUS

Bottom samples were acquired and submitted to the Smithsonian Institution in accordance with Section 6.7 of Project Instructions.

No magnetic anomalies were observed.

S. RECOMMENDATIONS

Particularly, because of the sharply irregular bottom topography of this survey as well as the rest of North Puget Sound, multibeam hydrography would definitely provide a more complete and accurate portrayal of the deeper bottom contours.⁶⁷

T. REFERRAL TO REPORTS

Title	Date
Horizontal Control Report OPR-N368-PHP	June 1997
Horizontal Control Report Addendum 1	July 1997
Horizontal Control Report Addendum 2	June 1999
Coast Pilot Report	to follow

Submitted by



Kathryn Simmons
Acting Chief of Party

Revisions Compiled During Office Processing and Certification

1. PHB Revision- Concur
 2. PHB Revision- The sublocality name, Deception Pass to Burrows Channel as provided by the Hydrographic Surveys Division, was revised to Burrows Pass. Burrows Channel does not exist as a geographic name within the survey area.
 3. PHB Revision- Revise to Pass.
 4. PHB Revision- Revise to 122/39/54.00"W.
 5. PHB Revision- Revise date to October 6, 1999.
 6. PHB Revision- Filed with the Hydrographic Records.
 7. PHB Revision- Concur.
 8. PHB Revision- Concur.
 9. PHB Revision-Concur.
 10. PHB Revision- Concur
 11. PHB Revision- Filed with the Hydrographic Data
 12. PHB Revision- Filed with the Hydrographic Data.
 13. PHB Revision- Tide stations plot outside the survey limits.
 14. PHB Revision- Filed with the Hydrographic Data.
 15. PHB revision- Concur. Approved Tide Note dated May 2, 2000 is attached to this report.
 16. PHB Revision- Filed with the Hydrographic Records.
 17. PHB Revision- Filed with the Hydrographic Records.
 18. PHB Revision- Filed with the Hydrographic Records.
 19. PHB Revision-Revise date to 1997.
 20. PHB Revision- Filed with the Hydrographic Records.
 21. PHB Revision- Filed with the Hydrographic Data.
 22. PHB Revision- Concur
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23. PHB Revision- Concur

24. PHB Revision- Filed with the Hydrographic Data.

25. PHB Revision- Concur. This data was analyzed during office processing and appears to be consistent with surrounding hydrography.

26. PHB Revision- Verification of shoreline and foreshore features was not required inside the defined survey limit line. These items have been shown on the smooth sheet from prior surveys H-6577 (1940), H-6645 (1940), and H-6607 (1940).

27. PHB Revision- Revise survey number to H-10828.

28. PHB Revision- Revise year to 99.

29. PHB Revision- Prior surveys H-6577 (1940), H-6645 (1940), and H-6607 (1940) cover the entire area of the present survey. These prior surveys were conducted using single beam echo sounders, leadlines, and visual positioning. Considering the data gathering techniques used in 1940, a comparison of depths reflects general agreement with differences ranging from 0.5-1.0 fathom. There appears to be no consistent pattern of shoaling and or an increase in depths. Depth differences are likely attributed to improved positioning and sounding methods. Some shoreline features and soundings have been transferred to the present survey from the prior work. With the transfer of the items mentioned above, survey H-10939 is adequate to supersede the prior surveys within the area of common coverage.

H-9283WD is a wire drag survey that covers the middle portions of Rosario Strait and is the source for the charted green tint areas within the common area of the present survey. The hydrographer found no significant shoals or an indication of shoaling within the charted green tint areas. There were no discrepancies found with the present survey depths and the charted wire sweep clearances ranging from 9.5 to 15.6 fathoms. 200% bottom coverage was achieved in the wire drag areas with the use of side scan sonar. In addition, adequate single beam sounding coverage was also accomplished in order to substantiate the supersession of the wire sweep information and removal of the green tint areas on Chart 18429.

30. PHB Revision- Position shown is NAD 27.

31. PHB Revision- Revise least depth to 68 feet/ 11.3 fathoms, at latitude 48/25/09.1N.

32. PHB Revision- Revise least depth to 69 feet/ 11.6 fathoms. Chart this area based on the present survey information.

33. PHB Revision- Revise latitude to 48/25/23.198N and longitude to 122/48/28.164W.

34. PHB Revision- Concur.

35. PHB Revision- insert "both".

36. PHB Revision- insert "and deeper".
37. PHB Revision- add "and positioning and sounding techniques".
38. PHB Revision- insert (50435).
39. PHB Revision- insert "item investigation".
40. PHB Revision- Replace with "this report".
41. PHB Revision- Charted hydrography originates primarily with the previously discussed prior surveys and from miscellaneous sources. The following charted items appear to originate from an unknown source and are discussed as follows; The charted 1 fathom depth at latitude 48/25/53N, longitude 122/48/00W, appears to be a charting error. The present survey found depths ranging from 6.7-8.8 fathoms with no indication of any significant shoaling. Prior survey H-6577 portrays a nine fathom depth. The evaluator recommends charting this area based on the present survey data. A charted 3 ½ Rk at latitude 48/28/22.5N, longitude 122/42/21.8W was covered by the present survey. Depths found on the present survey range from 3.8 to 10.3 fathoms. The present survey depth of 3.8 fathoms was found at latitude ~~48/27/22N~~, longitude 122/42/20W. The evaluator recommends the charted 3 ½ FM Rk be retained based on an inadequate investigation. The foul notes charted at latitude 48/25/51N, longitude 122/40/32W, and latitude 48/25/14N, longitude 122/40/13W were not adequately addressed during survey operations and should be retained as charted.

48/28/22
gkm
7-25-03

Survey H-10939 is adequate to supersede charted hydrography within the areas of common coverage.

42. PHB Revision- An additional fourteen (14) potential dangers to navigation were found during office review of H-10939. These dangers were reported to the Thirteenth Coast Guard District in a letter dated May 11, 2000 and is attached to this report.
 43. PHB Revision- Replace with "Three".
 44. PHB Revision- Replace with "this report".
 45. PHB Revision- Concur. Danger to Navigation Letter is attached to this report.
 46. PHB Revision- Add 122/47/13/3W. Chart these depths as found by the present survey.
 47. PHB Revision- replace with "both slightly".
 48. PHB Revision- insert "and deeper".
 49. PHB Revision- Delete "Areas". Begin sentence with "Where".
 50. PHB Revision- insert "many areas".
 51. PHB Revision- Concur. The smooth sheet has been annotated with the note "Blids based on the side scan imagery and contact plot."
-

52. PHB Revision- Replace with 19 fathoms.
 53. PHB Revision- Replace with H-6577.
 54. PHB Revision- Replace with 18.3.
 55. PHB Revision- Replace with 19.1.
 56. PHB Revision- Replace with “one pile”.
 57. PHB Revision- Correct latitude to 48/27/50.6.
 58. PHB Revision- Correct to 1.9 meters. Insert “one fathom off the bottom”.
 59. PHB Revision- Concur with clarification. Chart 1.9 *Rk* as found by dive.
 60. PHB Revision- Concur
 61. PHB Revision- Concur with clarification. Chart 2 FM depth and note area with “*Blds*”.
 62. PHB Revision- Retain charted cable area.
 63. PHB Revision- Concur with clarification. The present survey has been supplemented by prior survey information within the common area. Reference endnotes 29 and 41.
 64. PHB Revision- Concur with clarification. Although these aids to navigation were adequately located and mark the features intended, the positions as listed in the report are incorrect. The correct geographic positions are as follows; Williamson Rocks Red Lighted Gong “4” should be latitude 48/26/50.276N, longitude 122/42/25.577W, Kellett Ledge Buoy “3”, latitude 48/26/59.942N, longitude 122/47/29.994W, Dennis Shoal Buoy “6”, latitude 48/27/05.020N, longitude 122/42/16.043W.
 65. PHB Revision- Replace with “this report”.
 66. PHB Revision- Replace with “this report”.
 67. PHB Revision- Concur
-

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS: 50435
State and Locality: Washington/Rosario Strait
Reported Position: latitude 48°25'39.56"N
longitude 122°44'40.03"W
Datum: NAD83
Reported Depth: 28 fathoms
Type of Feature: sunken wreck, stern section

DESCRIPTION and SOURCE: CL320/64 - USCG and USC&GS Chart letter reported the explosion, burning and sinking of the tanker BUNKER HILL on March 6, 1964. USC&GS vessels HODGSON and BOWIE investigated and found the tanker in two parts. NOAA Technical Report OTES-9, Performance Characteristics of the BS3, reported observation of the north wreck "probably stern section" with a least depth of 214 feet/35.6 fathoms; its position was not reported.

SURVEY REQUIREMENTS: Full investigation with 200% SSS and Echosounder development or 100% multi-beam coverage.

METHOD OF INVESTIGATION: Two hundred percent side scan sonar coverage (*DN 046, Pos. Nos. 21735-21748 and 31669-31738*), echosounder development with 5-meter spacing and crosslines (*DN 066, Pos. Nos. 58837-58931; DN 080, Pos. Nos. 60850-60878*).

RESULTS OF INVESTIGATION: The wreck was located with side scan sonar (*Contacts 21744.8p and 31729.8p*). Echosounder development located a least depth of 35.3 fathoms at latitude 48°25'39.666"N, longitude 122°44'40.598"W (*Pos. No. 60853, DN 080*).

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: The wreck is charted at latitude 48°25'37.076"N, longitude 122°44'44.271"W, with a reported depth of 28 fathoms. Delete the charted wreck. Chart the wreck and the surveyed least depth of 35.3 fathoms at latitude 48°25'39.666"N, longitude 122°44'40.598"W. *Concur chart 35 wk*



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-0070

May 11, 2000

ADVANCE
INFORMATION

Commander (OAN)
Thirteenth Coast Guard District
Federal Building
915 Second Avenue
Seattle, WA 98174-1067

Dear Sir:

During office review of hydrographic survey H-10939, Washington, Northern Puget Sound, Deception Pass to Burrows Channel, fourteen shoal depths were found and are considered to be potential dangers to navigation.

It is recommended that the enclosed Report of Dangers to Navigation be included in the Local Notice to Mariners.

Questions concerning this report should be directed to the Pacific Hydrographic Branch at (206) 526-6836.

Sincerely,

James C. Gardner
Commander, NOAA
Chief, Pacific Hydrographic Branch

Enclosure

cc: NIMA
N/CS261
NOAA Navigation Advisor, Seattle/Puget Sound Area



REPORT OF DANGERS TO NAVIGATION

ADVANCE
INFORMATION

Hydrographic Survey Registry Number: H-10939

Survey Title: State: WASHINGTON
Locality: NORTHERN PUGET SOUND PASS
Sublocality: DECEPTION PASS TO BURROWS CHANNEL

Project Number: OPR-N368-PHP

Survey Date: OCTOBER 6, 1999 - MARCH 20, 2000

Soundings are reduced to Mean Lower Low Water using approved tides and are positioned on NAD 83.

Chart affected: 18429 8th Edition July 3, 1999, scale 1:25,000, NAD 83

DANGER TO NAVIGATION

LATITUDE(N)

LONGITUDE(W)

2 fathom	48/27/18.29	122/48/35.52
3 fathom 3 feet	48/27/02.36	122/42/16.91
10 fathom 3 feet	48/25/12.33	122/48/15.06
10 fathom 1 feet	48/25/12.40	122/48/33.15
2 fathom 5 feet	48/26/59.20	122/47/44.83
4 fathom 1 feet	48/27/56.84	122/48/01.44
4 fathom	48/28/07.51	122/47/46.87
3 fathom 5 feet	48/27/45.86	122/48/11.45
4 fathom 5 feet	48/28/10.13	122/47/59.53
3 fathom	48/29/15.62	122/47/30.87
3 fathom 5 feet	48/29/17.33	122/47/44.27
9 fathom 4 feet	48/28/22.94	122/47/09.93
2 fathom 5 feet	48/29/17.79	122/47/58.47
9 fathom 2 feet	48/27/42.97	122/47/26.37

Questions concerning this report should be directed to the Chief, Pacific Hydrographic Branch at (206)526-6836.

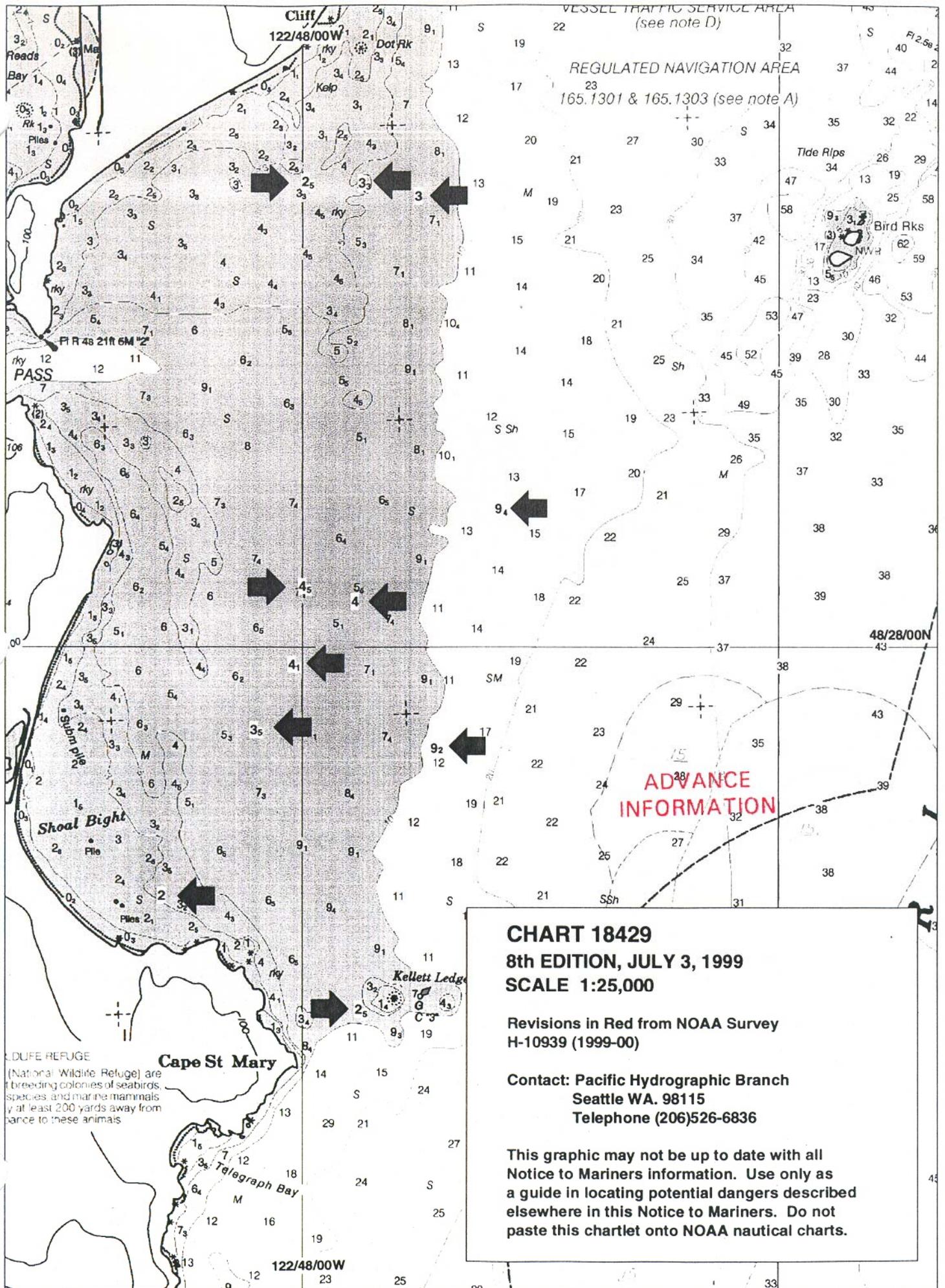


CHART 18429
8th EDITION, JULY 3, 1999
SCALE 1:25,000

Revisions in Red from NOAA Survey
H-10939 (1999-00)

Contact: Pacific Hydrographic Branch
Seattle WA. 98115
Telephone (206)526-6836

This graphic may not be up to date with all
Notice to Mariners information. Use only as
a guide in locating potential dangers described
elsewhere in this Notice to Mariners. Do not
paste this chartlet onto NOAA nautical charts.

CAPTURE REFUGE
(National Wildlife Refuge) are
breeding colonies of seabirds,
species, and marine mammals
at least 200 yards away from
harbour to these animals

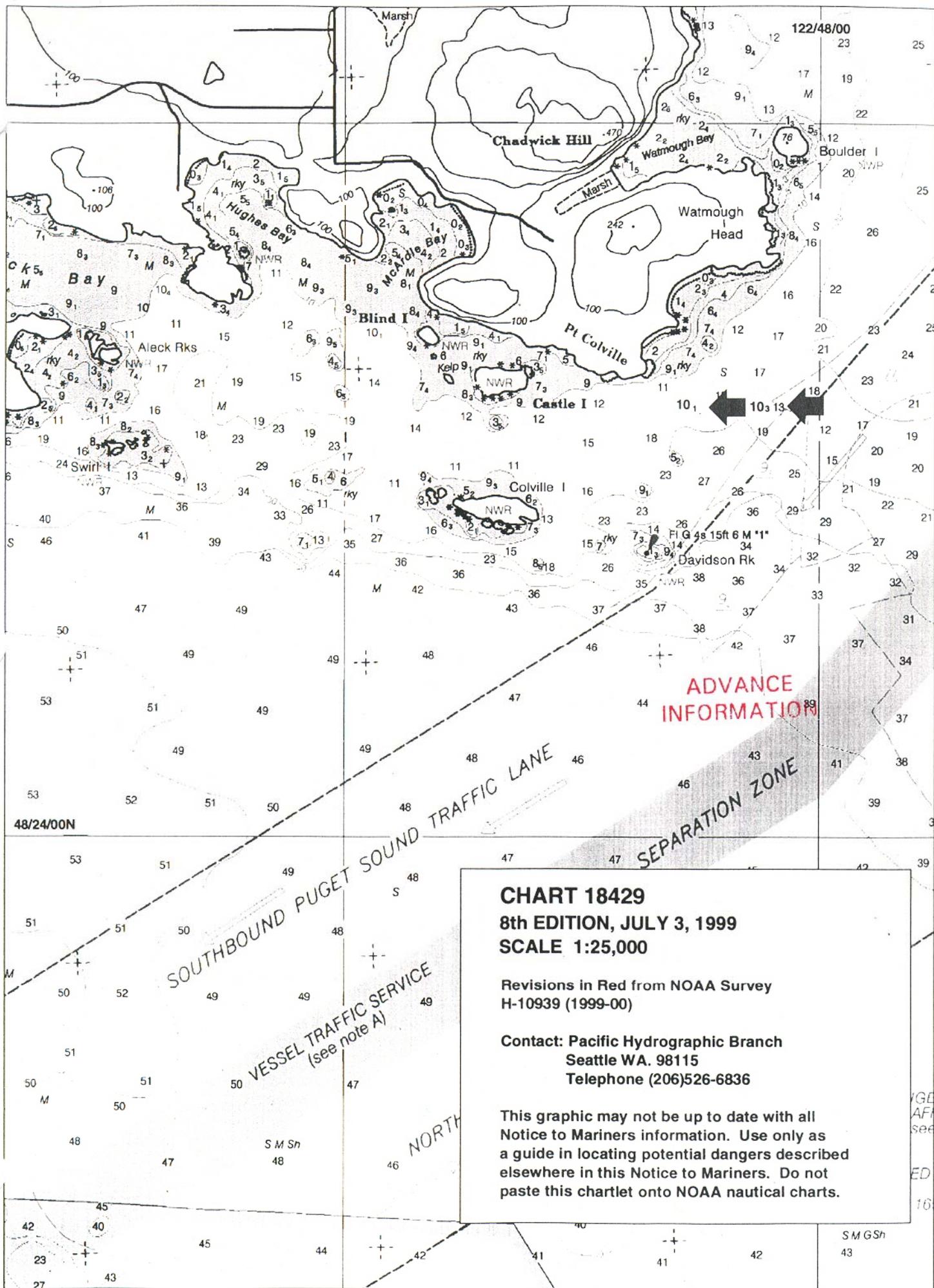


CHART 18429

8th EDITION, JULY 3, 1999

SCALE 1:25,000

Revisions in Red from NOAA Survey
H-10939 (1999-00)

Contact: Pacific Hydrographic Branch
Seattle WA. 98115
Telephone (206)526-6836

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SOUTHBOUND PUGET SOUND TRAFFIC LANE

VESSEL TRAFFIC SERVICE
(see note A)

ADVANCE
INFORMATION

SEPARATION ZONE

48/24/00N

122/48/00

CHART 18429

8th EDITION, JULY 3, 1999

SCALE 1:25,000

Revisions in Red from NOAA Survey
H-10939 (1999-00)

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SOUTHBOUND PUGET SOUND TRAFFIC LANE

VESSEL TRAFFIC SERVICE
(see note A)

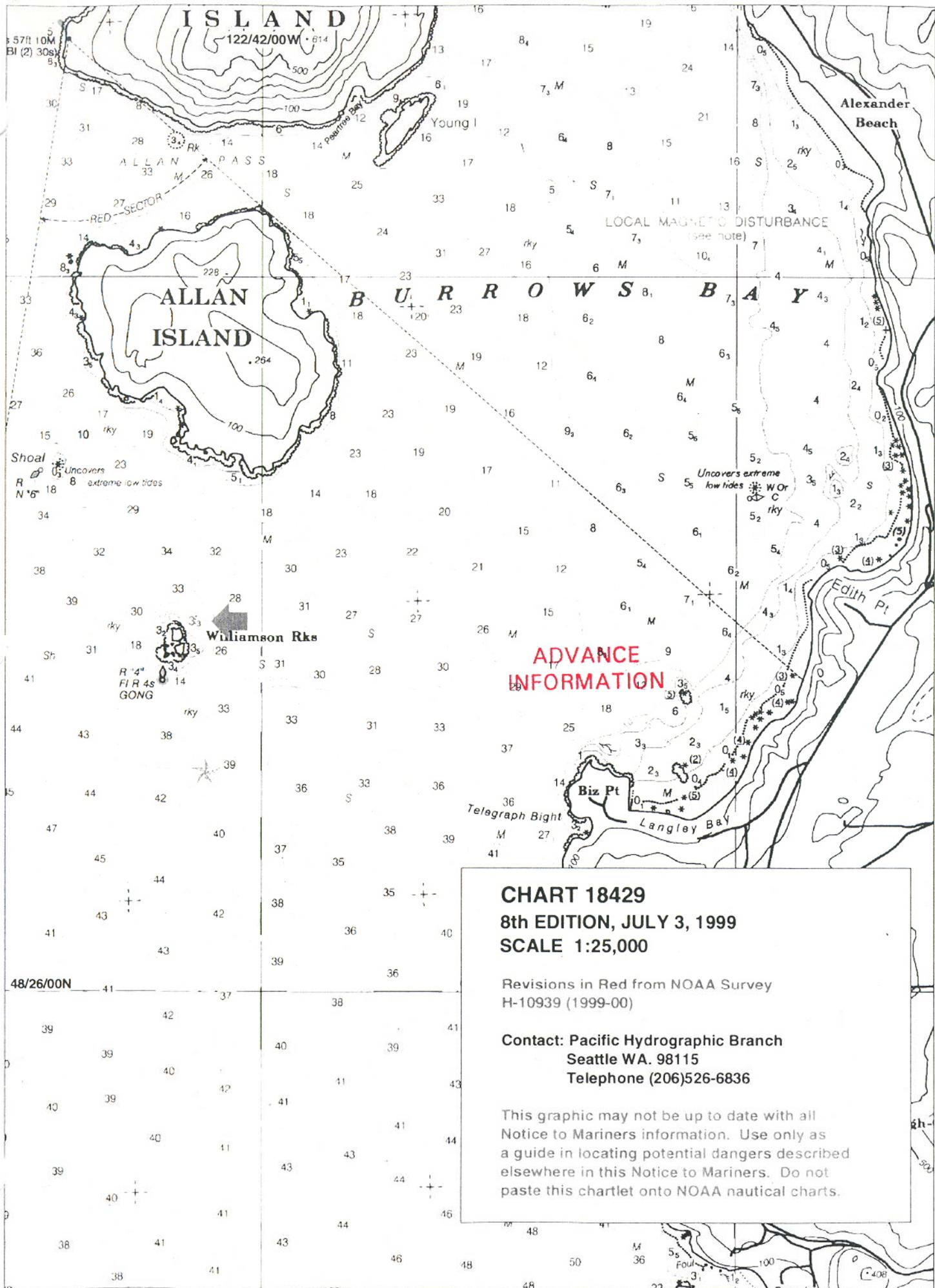
ADVANCE
INFORMATION

SEPARATION ZONE

48/24/00N

122/48/00

SM GSh
43



**ADVANCE
INFORMATION**

CHART 18429
8th EDITION, JULY 3, 1999
SCALE 1:25,000

Revisions in Red from NOAA Survey
H-10939 (1999-00)

Contact: Pacific Hydrographic Branch
Seattle WA. 98115
Telephone (206)526-6836

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paste this chartlet onto NOAA nautical charts.



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

Navigational Response Team 3
P. O. Box 189
Anacortes, Wa 98221
Phone: (360) 293-5171
Fax: (360) 293-8456

March 31, 2000

Commander
Thirteenth Coast Guard District (OAN)
Federal Building, Room 3410
915 Second Avenue
Seattle, WA 98174-1067

**ADVANCE
INFORMATION**

Dear Sir:

A Danger to Navigation Report is enclosed along with a chartlet showing the affected portions of Chart 18429, the largest-scale chart of the area.

I recommend this Danger to Navigation Report be included in the next Local Notice to Mariners.

Sincerely,



Kathryn Simmons
Navigation Response Team 3

Enclosures

cc: NIMA
N/CS26
N/CS34



DANGER TO NAVIGATION REPORT

ADVANCE
INFORMATION

SURVEY REGISTRY NUMBER: H-10939
STATE: Washington
GENERAL LOCALITY: Rosario Strait
SUBLOCALITY: Deception Pass to Burrows ^{Pass} Channel-
PROJECT NUMBER: OPR-N368-PHP

The following potential danger to navigation was discovered during hydrographic survey operations by the NOAA Pacific Hydrographic Party.

Depths on two shoals seaward of Kellett Ledge were found at shallower depths than charted:

	Latitude	Longitude	Depth
Chart	48°26'57.7"N	122°47'05.9"W	11 fathoms
Survey	48°26:56.9"N	122°47'05.0"W	8.3 fathoms
Chart	48°26'58.1"N	122°47'13.2"W	8 fathoms 1 foot
Survey	48°26'57.8"N	122°47'13.3"W	7.3 fathoms

A chartlet of NOS Chart 18429 (8th edition, July 3, 1999) is attached with surveyed depths superimposed over the chart.

Charts affected:

Chart Number	Edition	Date
18400	39th	March 30, 1996
18421	42nd	March 5, 1999
18423	30th	June 18, 1994
18429	8th	July 3, 1999
18465	32nd	August 1, 1998

Questions concerning this report should be directed to NOAA, Pacific Hydrographic Branch, N/CS34, 7600 Sand Point Way NE, Bin C25700, Seattle, WA 98115-0070, telephone number (206) 526-6853.



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

Navigation Response Team III
P. O. Box 189
Anacortes, Wa 98221
Phone: (360) 293-5171
Fax: (360) 293-8456

March 29, 2000

Commander
Thirteenth Coast Guard District (OAN)
Federal Building, Room 3410
915 Second Avenue
Seattle, WA 98174-1067

**ADVANCE
INFORMATION**

Dear Sir:

This is to follow up our telephone call to the U.S. Coast Guard on March 24, 2000, to report displacement of Dennis Shoal Buoy 6, Red Nun, LLN 19345. A Danger to Navigation Report is enclosed along with a chartlet showing the affected portions of Chart 18429, the largest-scale chart of the area.

I recommend this Danger to Navigation Report be included in the next Local Notice to Mariners.

Sincerely,

Kathryn Simmons
Navigation Response Team III

Enclosures

cc: NIMA
N/CS26
N/CS34



DANGER TO NAVIGATION REPORT

SURVEY REGISTRY NUMBER: H-10⁹³⁹~~792~~ 939

STATE: Washington

GENERAL LOCALITY: Rosario Strait

SUBLOCALITY: Deception Pass to Burrows ^{Pass} Channel

PROJECT NUMBER: OPR-N368-PHP

**ADVANCE
INFORMATION**

The following item which is a potential danger to navigation was discovered during hydrographic survey operations by the NOAA Pacific Hydrographic Party.

Item: Dennis Shoal Buoy 6, Red Nun, LLN 19345. The buoy was found 1070 meters SE of charted position.

Charted Position: latitude 48°27'27.504" N, longitude 122°42'56.016" W

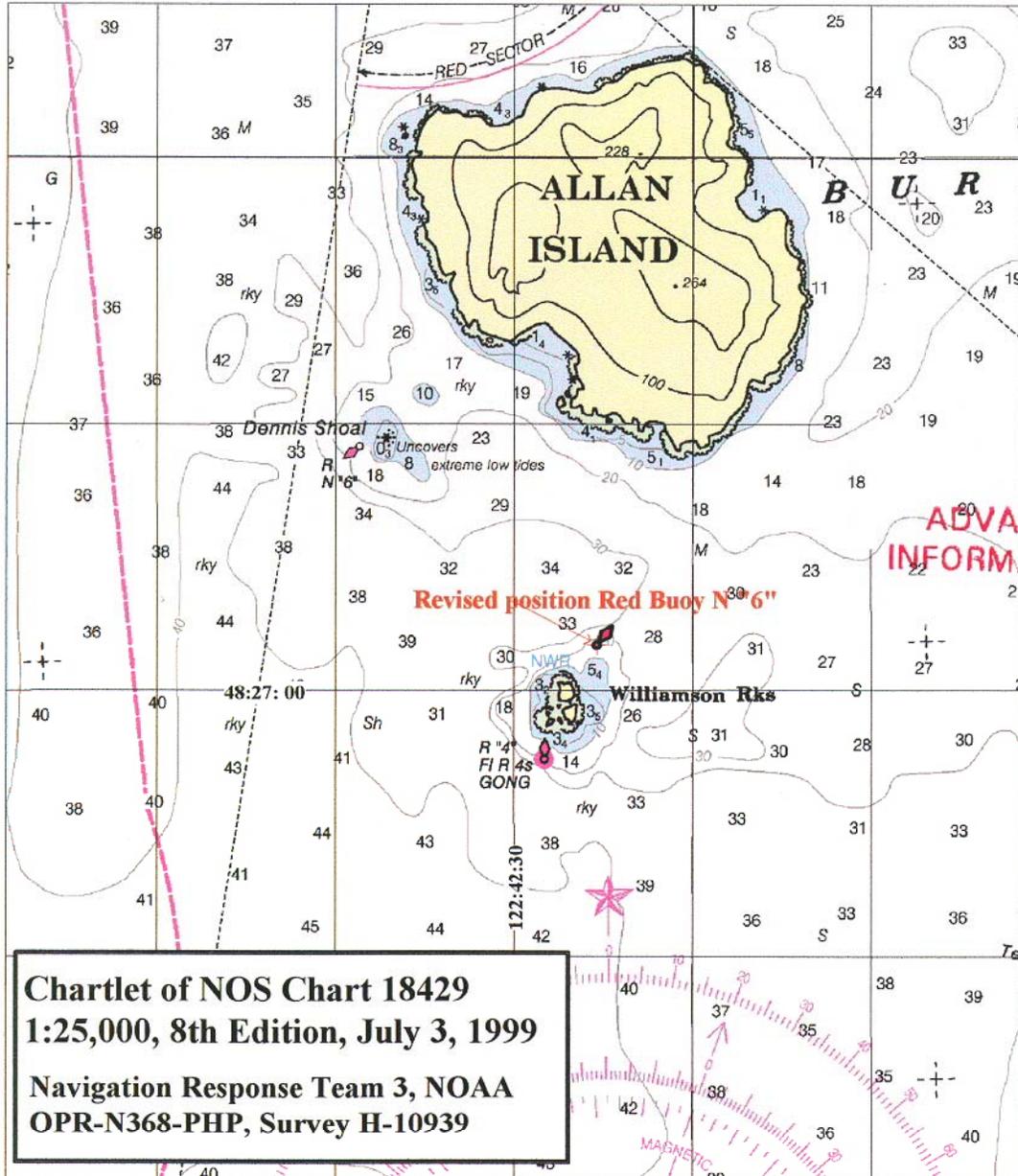
Surveyed Position: latitude 48°27'05.020" N, longitude 122°42'16.043" W ✓

A chartlet of NOS Chart 18429 (8th edition, July 3, 1999), showing the charted and surveyed positions is attached.

Charts affected:

Chart Number	Edition	Date
18400	39th	March 30, 1996
18421	42nd	March 5, 1999
18423	30th	June 18, 1994
18427	19th	March 27, 1999
18429	8th	July 3, 1999

Questions concerning this report should be directed to NOAA, Pacific Hydrographic Branch, N/CS34, 7600 Sand Point Way NE, Bin C25700, Seattle, WA 98115-0070, telephone number (206) 526-6853.



**ADVANCE
INFORMATION**

**Chartlet of NOS Chart 18429
1:25,000, 8th Edition, July 3, 1999
Navigation Response Team 3, NOAA
OPR-N368-PHP, Survey H-10939**



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

REVISED TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: May 2, 2000

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-N368-PHP-99
HYDROGRAPHIC SHEET: H-10939

LOCALITY: Rosario Strait- Deception Pass to
Burrows Channel, WA

TIME PERIOD: October 6, 1999 - March 29, 2000

TIDE STATION USED: 944-9932 Armitage Island, WA
Lat. 48° 32.1'N Lon. 122° 47.8'W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.194 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: PS197, PS198, PS199, PS200, PS203,
PS204, PS205, PS206, PS207, PS208, PS209,
PS210, PS211, PS212, PS213 & PS258.

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.

Thomas V. New 5/2/00

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

Final tide zone node point locations for OPR-N368-PHP-99,
Sheet H-10939 (revised).

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 PS197			
-122.760073 48.243261	944-9932	-30	0.93
-122.68631 48.33782			
-122.712316 48.389835			
-122.722076 48.408507			
-122.734497 48.426136			
-122.749341 48.442118			
-122.770917 48.432214			
-122.763088 48.413972			
-122.757852 48.385576			
-122.753679 48.335555			
-122.75432 48.302865			
-122.760073 48.243261			
Zone PS198			
-122.797653 48.385336	944-9932	-30	0.91
-122.779262 48.372319			
-122.753679 48.335555			
-122.757852 48.385576			
-122.763088 48.413972			
-122.770917 48.432214			
-122.796103 48.425314			
-122.793542 48.42142			
-122.793714 48.405171			
-122.797653 48.385336			
Zone PS199			
-122.796103 48.425314	944-9932	-36	0.89
-122.793542 48.42142			
-122.793714 48.405171			

-122.797653 48.385336
-122.809807 48.394001
-122.837844 48.408095
-122.851662 48.416993
-122.836178 48.418674
-122.815892 48.422335
-122.796103 48.425314

Zone PS200

-122.815892 48.422335
-122.821565 48.424509
-122.826472 48.426264
-122.830677 48.427369
-122.840476 48.42508
-122.85337 48.423364
-122.859492 48.423848
-122.860175 48.422416
-122.851662 48.416993
-122.836178 48.418674
-122.815892 48.422335

944-9932

-36

0.91

Zone PS203

-122.815892 48.422335
-122.820508 48.461997
-122.806212 48.458101
-122.793322 48.452333
-122.780666 48.44329
-122.770917 48.432214
-122.796103 48.425314
-122.815892 48.422335

944-9932

-18

0.91

Zone PS204

-122.770917 48.432214
-122.749341 48.442118
-122.767073 48.455139
-122.791447 48.469011
-122.804509 48.475138
-122.81851 48.481594
-122.820795 48.473994
-122.815856 48.4714
-122.820508 48.461997
-122.806212 48.458101
-122.793322 48.452333

944-9932

-12

0.93

-122.780666 48.44329
-122.770917 48.432214

Zone PS205

-122.804509 48.475138	944-9932	-6	0.96
-122.81851 48.481594			
-122.818445 48.4877			
-122.800414 48.495101			
-122.783348 48.486869			
-122.786451 48.483979			
-122.798976 48.476962			
-122.804509 48.475138			

Zone PS206

-122.798976 48.476962	944-9932	-12	0.96
-122.786451 48.483979			
-122.783348 48.486869			
-122.779017 48.484779			
-122.750907 48.469154			
-122.727849 48.453883			
-122.7414 48.445766			
-122.749341 48.442118			
-122.767073 48.455139			
-122.791447 48.469011			
-122.804509 48.475138			
-122.798976 48.476962			

Zone PS207

-122.68631 48.33782	944-9932	-30	0.96
-122.665326 48.366631			
-122.664063 48.401853			
-122.696786 48.428672			
-122.727849 48.453883			
-122.7414 48.445766			
-122.749341 48.442118			
-122.734497 48.426136			
-122.722076 48.408507			
-122.712316 48.389835			
-122.68631 48.33782			

Zone PS208

-122.727849 48.453883	944-9932	-30	0.98
-122.710043 48.466162			

-122.703636 48.477926
-122.696182 48.474117
-122.687509 48.464102
-122.67748 48.442476
-122.644801 48.41379
-122.657105 48.409813
-122.661012 48.401113
-122.664063 48.401853
-122.696786 48.428672
-122.727849 48.453883

Zone PS209

-122.692112 48.482722	944-9932	-30	1.00
-122.684369 48.491401			
-122.661308 48.487569			
-122.687509 48.464102			
-122.696182 48.474117			
-122.692112 48.482722			

Zone PS210

-122.684369 48.491401	944-9932	-24	1.00
-122.692112 48.482722			
-122.696182 48.474117			
-122.703636 48.477926			
-122.710336 48.48135			
-122.70096 48.492981			
-122.688778 48.493665			
-122.684369 48.491401			

Zone PS211

-122.727849 48.453883	944-9932	-12	0.98
-122.750907 48.469154			
-122.779017 48.484779			
-122.783348 48.486869			
-122.774914 48.494722			
-122.764036 48.504366			
-122.755126 48.509331			
-122.734546 48.498362			
-122.710336 48.48135			
-122.703636 48.477926			
-122.710043 48.466162			
-122.727849 48.453883			

Zone PS212

-122.755126 48.509331	944-9932	-6	0.98
-122.764036 48.504366			
-122.774914 48.494722			
-122.783348 48.486869			
-122.800414 48.495101			
-122.799921 48.519445			
-122.788254 48.522764			
-122.763488 48.513785			
-122.755126 48.509331			

Zone PS213

-122.710336 48.48135	944-9932	-12	1.01
-122.734546 48.498362			
-122.755126 48.509331			
-122.75184 48.51116			
-122.738657 48.51598			
-122.725474 48.51861			
-122.71361 48.519486			
-122.699769 48.519048			
-122.688094 48.516558			
-122.679153 48.507487			
-122.67863 48.504124			
-122.70096 48.492981			
-122.710336 48.48135			

Zone PS258

-122.820795 48.473994	944-9932	+6	0.94
-122.832303 48.467904			
-122.857016 48.46779			
-122.859813 48.484885			
-122.829455 48.490688			
-122.818445 48.4877			
-122.81851 48.481594			
-122.820795 48.473994			

Final Zoning for OPR-N368-PHP-99 Northern Puget Sound, WA Sheet H-10939

ROSARIO STRAIT
SOUTHERN PART

PROPOSED ZONING DISTRICTS
AND REGULATIONS
FOR THE OPR-N368-PHP-99
PROJECT

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FOR THE OPR-N368-PHP-99 PROJECT

944-9932 ARMITAGE ISLAND

PS212
Time Corrector -6 mins
Range Corrector x0.98
Reference 944-9932

PS205
Time Corrector -6 mins
Range Corrector x0.96
Reference 944-9932

PS206
Time Corrector -12mins
Range Corrector x0.96
Reference 944-9932

PS204
Time Corrector -12 mins
Range Corrector x0.93
Reference 944-9932

PS203
Time Corrector -18 mins
Range Corrector x0.91
Reference 944-9932

PS200
Time Corrector -36 mins
Range Corrector x0.91
Reference 944-9932

PS258
Time Corrector +6 mins
Range Corrector x0.94
Reference 944-9932

PS213
Time Corrector -12 mins
Range Corrector x1.01
Reference 944-9932

PS211
Time Corrector -12 mins
Range Corrector x0.98
Reference 944-9932

PS210
Time Corrector -24 mins
Range Corrector x1.00
Reference 944-9932

PS209
Time Corrector -30 mins
Range Corrector x1.00
Reference 944-9932

PS207
Time Corrector -30 mins
Range Corrector x0.96
Reference 944-9932

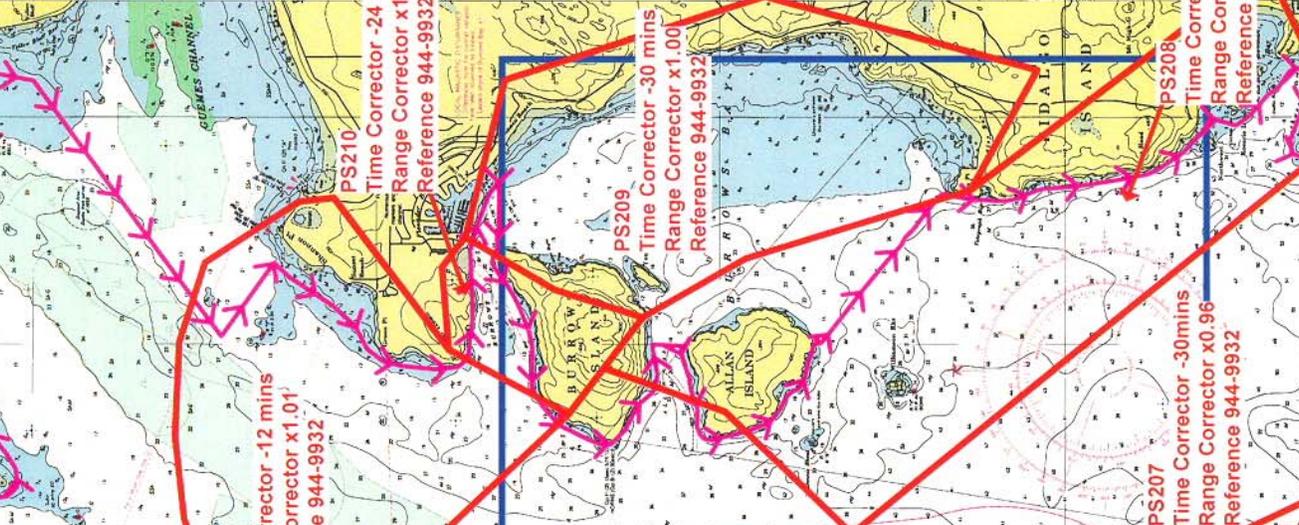
PS208
Time Corrector -30 mins
Range Corrector x0.96
Reference 944-9932

PS198
Time Corrector -30 mins
Range Corrector x0.91
Reference 944-9932

PS197
Time Corrector -30mins
Range Corrector x0.93
Reference 944-9932

PS199
Time Corrector -36 mins
Range Corrector x0.89
Reference 944-9932

Sheet "J"
H10939
Chart



APPROVAL SHEET

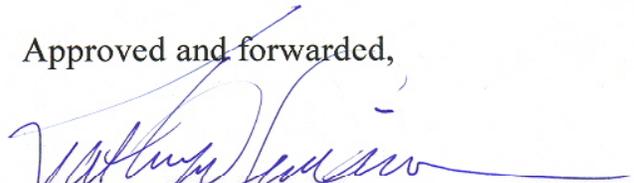
for

SURVEY H-10939

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 1998. The data were reviewed daily during acquisition and processing.

The digital data and supporting records 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/CS34, Pacific Hydrographic Branch.

Approved and forwarded,



Kathryn Simmons

Acting Chief

Navigation Response Team 3

HYDROGRAPHIC SURVEY STATISTICS

H10939

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

DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDION FILES	3				
ENVELOPES					
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			269
COMPARISON WITH PRIOR SURVEYS AND CHARTS			
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT			90
GEOGRAPHIC NAMES			
OTHER (Chart Compilation)			126
USE OTHER SIDE OF FORM FOR REMARKS			485
	TOTALS		

Pre-processing Examination by	Beginning Date	04/07/2000	Ending Date	
Verification of Field Data by M. Bigelow, B. Olmstead	Time (Hours)	269	Ending Date	
Verification Check by	Time (Hours)		Ending Date	
Evaluation and Analysis by M. Bigelow, B. Olmstead	Time (Hours)	90	Ending Date	11/04/2003
Inspection by B. Olmstead	Time (Hours)	61	Ending Date	12/04/2003

APPROVAL SHEET
H10939

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.

for Bruce A. Olmstead
Dennis Hill
Chief, Cartographic Team
Pacific Hydrographic Branch

Date: 4/7/2003

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 Descriptive Report.

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

Date: 6/20/03

AWOIS ✓ & SURF ✓ 7-16-03 by MBH

MARINE CHART BRANCH
RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10939

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
18427	6/1/2001	M. Bigelow	Full Part Before After Marine Center Approval Signed Via Drawing No. Full application of soundings and features from smooth sheet.
18429	2/9/2001	M. Bigelow	Full Part Before After Marine Center Approval Signed Via Drawing No. Full application of soundings and features from smooth sheet.
18427	8/21/03	D. Merke	Full Part Before After Marine Center Approval Signed Via Drawing No. Full application of soundings & features from smooth sheet. DN
18429	8/21/03	D. Merke	Full Part Before After Marine Center Approval Signed Via Drawing No. full application of soundings & features from smooth sheet. DN
18421	8/21/03	D. Merke	Full Part Before After Marine Center Approval Signed Via Drawing No. full application of soundings & features from smooth sheet. DN
18423	8/21/03	D. Merke	Full Part Before After Marine Center Approval Signed Via Drawing No. full application of soundings & features from smooth sheet. DN
18465	8/21/03	D. Merke	Full Part Before After Marine Center Approval Signed Via Drawing No. full application of soundings & features from smooth sheet. DN
18400	8/21/03	D. Merke	Full Part Before After Marine Center Approval Signed Via Drawing No. full application of soundings & features from smooth sheet. DN
			Full Part Before After Marine Center Approval Signed Via Drawing No.
			Full Part Before After Marine Center Approval Signed Via Drawing No.