

H10887

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-10-1-99

Registry No. H-10887

LOCALITY

State Washington

General Locality Northern Puget Sound

Sublocality Sinclair Island to Lummi Island

1999

CHIEF OF PARTY
LT James M. Crocker, NOAA

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DATE DEC 20 2000

HYDROGRAPHIC TITLE SHEET

H-10887

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-10-1-99

State WashingtonGeneral locality Northern Puget SoundLocality Sinclair Island to Lummi IslandScale 1:10,000Date of survey May 24 to October 27, 1999Instructions dated 5/7/97 *Project No. OPR-N-368-PHPVessel Jensen Launch 1101 (EDP 0651) and SeaArk Launch 1102 (EDP 0652)Chief of party LT James M. Crocker, NOAASurveyed by PHP PersonnelSoundings taken by echo sounder, ~~and lead, etc.~~ ^{DIVES} Side Scan, Knudsen 320, Innerspace 448 and
EG&G 272-T, MOD III (Divers depth gauge)Graphic record scaled by PHP PersonnelGraphic record checked by PHP PersonnelEvaluation by: B. MihailovAutomated plot by HP Design Jet 650CVerification by M. Bigelow, R. Mayor, E. Domingo, D. Doles, B. MihailovSoundings in fathoms ~~XXXX~~ at ~~MSL~~ MLLW and tenths

REMARKS:

Time in UTC, revisions and marginal notes in black weregenerated during office processing. All separates are filed withthe hydrographic data as a result page numbering may be interruptedor non-sequential.All depths listed in this report are referenced to mean lower lowwater unless otherwise noted.* change No 1, dated May 4, 1999AWOIS ✓ SURF ✓ 12/6/00 by MBH

Subject: H10887: Digital Data Transmittal

Date: Tue, 02 Jan 2001 13:37:19 -0600

From: "Dennis Hill" <Dennis.Hill@noaa.gov>

Organization: NOAA, Pacific Hydrographic Branch

To: George Myers <George.Myers@noaa.gov>

CC: Jim Gardner <Jim.Gardner@noaa.gov>, Gregory Norris <Gregory.Norris@noaa.gov>

DIGITAL DATA TRANSMITTAL

DATE: 01/02/01

SUMMARY: F00451

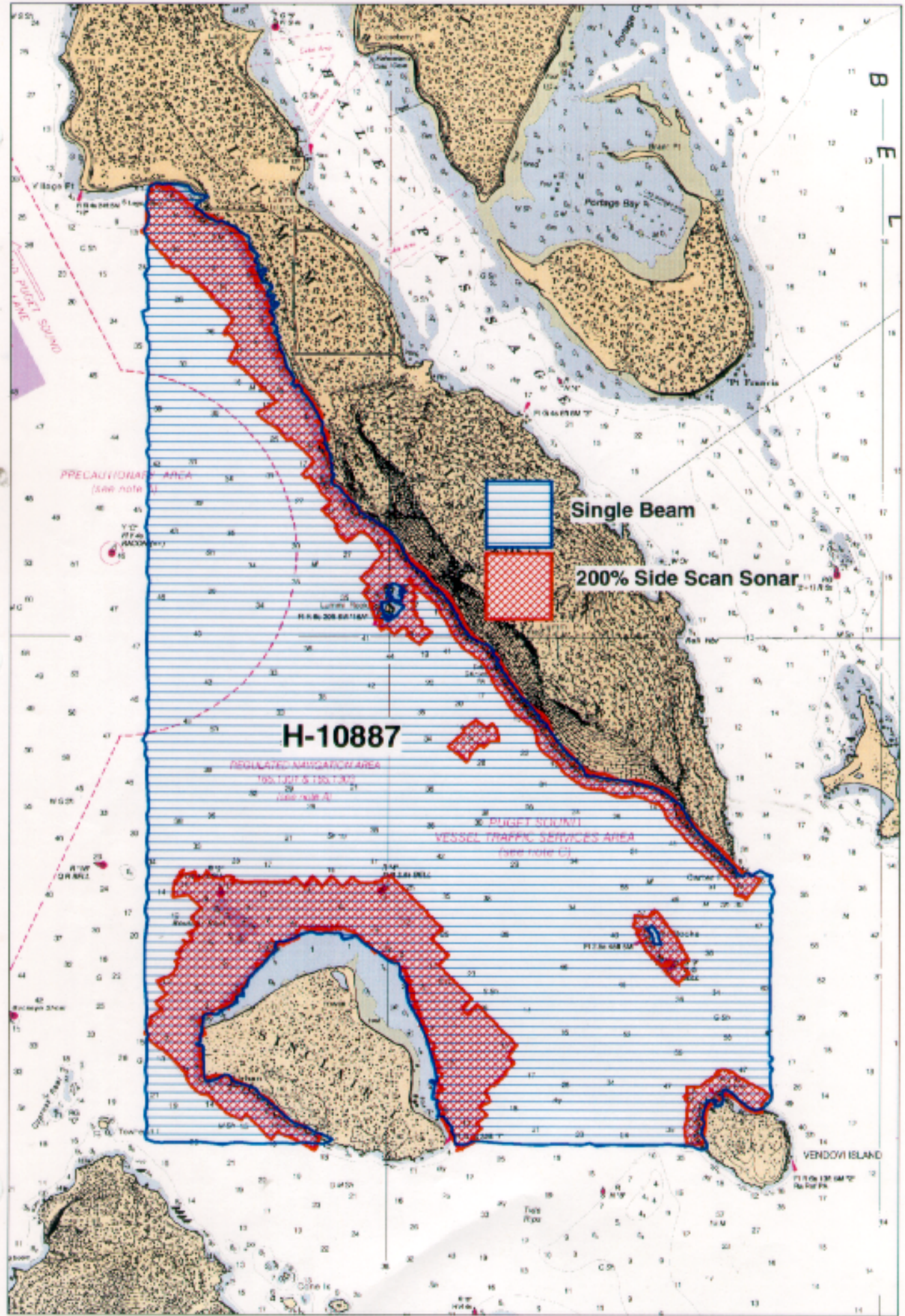
Complete package for survey H10887 and associated Hdrawings

CONTENTS:

H10887sm.dgn	:SMOOTH SHEET
18424H10.887	:HDRAWING
18430H10.887	
18431H10.887	
18424_1678.xls	:CHART HISTORY
18430_1683.xls	
18431_1684.xls	

Files have been transmitted via FTP to 205.156.4.7

B
E



Descriptive Report to Accompany Hydrographic Survey H-10887

OPR-N368-PHP
Field Number PHP-10-1-99
Scale 1:10,000
May – October 1999
Pacific Hydrographic Party
Chief of Party: Lieutenant James Crocker, NOAA

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 superceded 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.

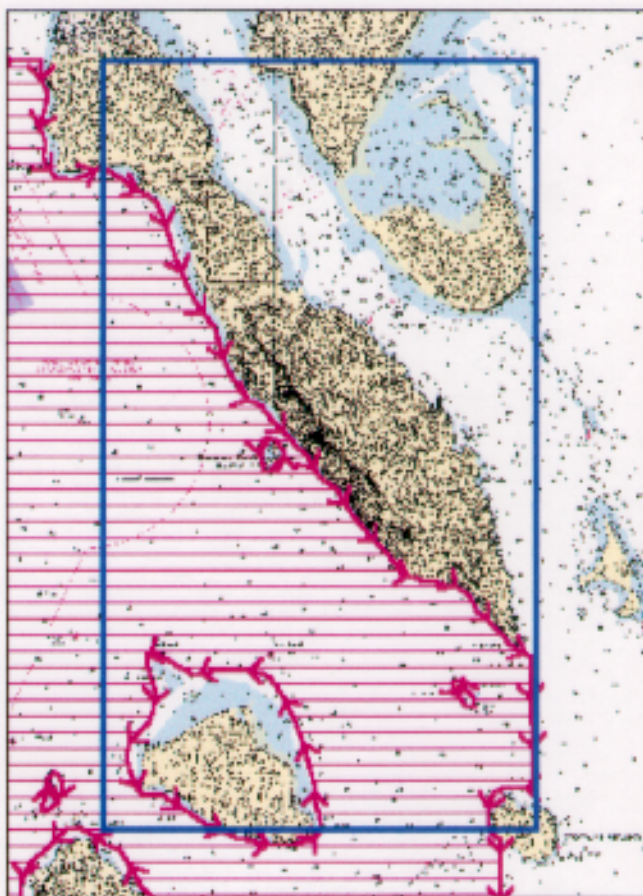
The project area includes parts of Rosario Strait and Strait of Georgia. Traffic throughout the project area includes foreign and domestic cargo ships, pleasure craft as well as tugs and barges. Oil refineries north of Lummi Island and in Anacortes are used for receipt of crude oil, shipment of petroleum 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.

The entire project area is environmentally sensitive and lies within the limits of the proposed Northwest Straits National Marine Sanctuary.

This is the sixth survey of the project. The sheet letter is M as specified by Project Instructions; registry number is H-10887; designation: Sinclair Island to Lummi Island, North Puget Sound, Washington.

B. AREA SURVEYED ✓ See Evaluation Report, Section B

H-10887 covers an area between Sinclair Island and Lummi Island as shown in the chartlet below derived from Chart 18424 (25th Ed, 1:40,000, July 12, 1997). Hydrographic limits extend from latitude $48^{\circ}35'27.735''\text{N}$ to latitude $48^{\circ}41'54.168''\text{N}$ and from longitude $122^{\circ}36'11.198''\text{W}$ to longitude $122^{\circ}42'38.108''\text{W}$ with three fathoms as the inshore sounding limit. Data acquisition was conducted from May 24, 1999 (DN 144) through October 27, 1999 (DN 300).



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	11 feet	0.4m	5 tons	Jet Drive
1102 Sea Ark ✓	0652 ✓	21 feet	8 feet	0.4m	2 tons	150 hp outboard

Both launches were used for mainscheme and development hydrography, detached positions, shoreline verification, and velocity casts. Launch 1101 was used for side scan sonar operations,

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. The Windows version VELOCWIN was used to process all cast data.

A list of software used to complete the survey is included in Appendix H along with respective versions and issue dates. *Filed with the hydrographic data.*

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 real time in HYPACK. Tape markings at measured intervals provided visual confirmation of recorded cable length deployment. 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 calibrated using 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 sonargram 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 to the 25-meter/13.7-fathom curve in accordance with Section 7.2 and Change No.1 of project instructions.

Two hundred percent coverage was achieved with line spacing of 150 meters set in patterns best suited for the bottom topography in a given area. In areas such as the west shore of the north end of Lummi Island where the slope is moderately steep, the 100 % and 200% side scan lines were oriented diagonally to the shoreline and to each other for maximum cross-contour effect while still maintaining the ability to retrieve side scan cable at an adequate rate to avoid the steeply rising bottom. In areas such as the south end of the west shore of Lummi Island where the shore is extremely steep, both the 100% and the 200% side scan lines were run parallel to the shore and to each other. In other areas where steeply sloping bottom was not a concern, the lines were run in an orthogonal pattern. The coverage was plotted on two separate swath plots and reviewed to assure acquisition of adequate overlap and full coverage. 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 sonargram assure acceptable SSS recorder tuning and served as confidence checks during operations.

Following guidelines in Section 7.2.2 of project instructions, sonargrams were manually scanned for significant contacts. A total of 377 contacts were labeled and entered into one HPS contact table. Where contacts appeared in a cluster on the sonargram, 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.

The hydrographer employed various techniques for selecting contacts for development using a combination of criteria based on height, offset, slope, and local depth. Of the 377 recorded contacts, 337 were developed with five-meter line spacing. The remaining forty contacts were determined to be insignificant based on (1) contact height less than one meter, (2) water depth at contact, (3) height exaggeration caused by proximity to the towfish or steepness of the slope and (4) extreme bottom profile; these were not developed. *Concur*

The HPS contact table is included in Appendix J, Supplemental Correspondence. *Filed with the hydrographic data.*

F. SOUNDING EQUIPMENT ✓

The following fathometers were used throughout the survey:

Vessel	DN range	Model no.	Serial no.
0651	144-159,172-300	Knudsen 320M ✓	K98577 ✓
0651	161-168	Knudsen 320M ✓	K98576 ✓
0652	144-300	Innerspace 448 ✓	239 ✓

Vessel No. 0651 ✓ For both Knudsen 320M fathometers 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. *Filed with the hydrographic records.*

A MOD III diver least depth gauge, S/N 68335, was used to obtain least depths on dive investigations. The unit was operated in accordance with Section 7.2.2.1 of the Field Procedures Manual (FPM). PTC Electronics calibrated the gauge on March 10, 1999; the calibration report is included in Appendix E. *Filed with the hydrographic records.*

G. CORRECTIONS TO SOUNDINGS ✓

Tides and Water Levels ✓

In compliance with Section 5.8 of Project Instructions, a tide station was established at the historical site shown below:

Station Number	Station Name	Latitude	Longitude
944-9932	Armitage Island	48°32'06"N	122°47'48"W

Station plots outside sheet limits

A real-time, portable acoustic gauge with satellite capability was installed to provide information on zoning, tidal datums and harmonic constants for predictions on sheet M. 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 site. * *Used to reduced final plotted data.*

Project Instructions define five tide zones within the limits of Sheet M. Time/height correctors are listed below; zone parameters are included in the Field Tide Note located in Appendix D. *Filed with the hydrographic records.*

HPS Zone	Tide Zone	Reference Station	Time Corrector	Range Ratio
16	NPS49	Cherry Point	-24.0min	x 0.90
17	NPS50	Cherry Point	-18.0min	x 0.92
18	NPS51	Cherry Point	-18.0min	x 0.95
22	NPS64	Cherry Point	-24.0min	x 0.92
26	NPS71	Cherry Point	-18.0min	x 0.91

Preliminary, six-minute, real tides recorded by the Cherry Point 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 the HPS table established for the reference station. 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.

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 2044, was used for casts 1-11. The recorder was initialized using program CAT v. 2.0. VELOCWIN was used to process casts 1-11. Below is a list of sound velocity casts for this project.

HPS Table	DN	DN range	Extrapolated Depth	Cast Latitude	Cast Longitude
1	144	144-155	140.8m	48°37'08"N	122°36'39"W
2	161	161-168	148.9m	48°38'07"N	122°37'38"W
3	172	172-176	143.6m	48°38'21"N	122°37'38"W
4	179	179-187	114.6m	48°40'06"N	122°42'24"W
5	188	188-194	110.7m	48°39'42"N	122°42'18"W
6	197	197	136.7m	48°36'25"N	122°36'25"W
7	235	235-243	110.6m	48°39'45"N	122°39'13"W
8	244	244-250	151.3m	48°37'31"N	122°36'22"W
9	252	252-256	140.7m	48°37'31"N	122°36'26"W
10	285	285	114.6m	48°39'16"N	122°42'20"W
11	300	300	114.4m	48°39'45"N	122°39'13"W

Appendix I contains copies of all velocity cast data and HPS Velocity Corrector Tables. Filed with the hydrographic data.

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. Filed with the hydrographic data.

Leadline Comparisons ✓

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

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, (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. *

Transducer and antenna offsets, static draft, and settlement and squat correctors are entered into offset tables: Table 1 for VN 0651 and Table 2 for VN 0652. Correctors are 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 analog 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. *Concur*

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.

DGPS Performance Checks ✓

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

* Filed with the hydrographic data.

Positioning Equipment ✓

The following GPS equipment was used:

Equipment Location	DN Range	Type Receiver/Antenna	Receiver Serial No.	Antenna Serial No.
VN 0651	144-208	Ashtech (v. 1E08d) ✓ CSI Beacon Rcvr MBXI	700417B1042 ✓ X-1112	700378A0272 ✓
VN 0651	209-300	Trimble DSM212L ✓ 27207	0220164491 ✓	0220166460 ✓
VN 0652	144-300	Starlink Receiver ✓	865 ✓	4207 ✓

I. SHORELINE ✓ See Evaluation Report, Section J.

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. Charts 18430 (scale 1:25000) and 18424 (scale 1:40000) were used to evaluate all shoreline. Chart 18430 covers the west half of sheet M while chart 18424 covers the entire sheet and was used for the east half. These charts were 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 disproval were also apparent. Field notes can be found on the echogram and in the HPS features file. Filed with the hydrographic data.

During final evaluation, shoreline from the prior survey H-8318 was digitized into MapInfo for comparison. In general, agreement is good between this prior and PHP shoreline verification. -CONAV

Detached positions were taken only on new features, disprovals, aids to navigation, and verified features not adequately represented by the chart. A few discrepancies in the charted shoreline were observed and are further discussed in section N. In areas where there were discrepancies, hydrographic data and detached positions were obtained to define the limits of shoreline and features. Discrepancies are noted on the final field sheet. Any shoreline feature without a detached position was verified in the field and should be retained as charted.

Because the PHP plotter prints the color brown in a shade very close to red, the color green was selected to depict correctly charted shoreline and features; recommended changes are red, and new features in black. Per table B-1 of the Hydrographic Manual, the zero depth contour estimated from hydrographic data is sketched in dashed red lines.

Shoreline shown on the smooth is in brown from chart 18430 & Chart 18424, for orientation only.

J. CROSSLINES ✓

Twenty-one miles of crosslines and 77 miles of SSS hydrography were acquired at angles greater than 45 degrees to the mainscheme lines. In total, 98 miles of crossline hydrography, representing a total of 18% of the mainscheme, were used for comparison to the mainscheme hydrography. Agreement is excellent. *Concur*

K. JUNCTIONS ✓ *See Evaluation Report, section L.*

H-10887 joins contemporary surveys H-10766, 1:10,000, 1997-98, to the west and H-10792, 1:10,000, 1998-99, to the south. The soundings and contours of the three surveys were compared and found to be in very good agreement. - *concur*

L. COMPARISON WITH PRIOR SURVEYS ✓ *See Evaluation Report, section M.*

The following priors contained data that were covered by this survey. Priors with an asterisk were available in digital format and imported as raster images into MapInfo to facilitate comparison with soundings and shoreline from the current survey:

Registry No	Date of Survey	Scale
H-9282WD ✓	1972	1:20,000
H-8318* ✓	1956	1:10,000
H-8322 ✓	1956	1:10,000

Cursory comparisons of soundings with these priors show excellent agreement in shallow areas. There appears to be some scouring in the deeper areas of the survey with surveyed depths one to two fathoms deeper than the prior soundings. These variations may be attributed to strong tidal currents in the channel areas. All current surveyed soundings within the common areas of H-9282WD are deeper than the wire drag clearance depths. ^{*CONCUR*} This is addressed further in Section N. Coverage and depths obtained are adequate to supersede prior surveys within their common areas. *Concur with clarification*

M. ITEM INVESTIGATION REPORTS ✓

Detailed reports of seven investigations are located in ^{*this report*} ~~Separate IV~~

N. COMPARISON WITH THE CHART ✓ See Evaluation Report, section O.

The survey area is represented on the following charts:

Chart No.	Date	Edition	Scale
18400	Mar. 30, 1996 ^{Feb 26 2000}	39th 41st	1:200,000
18421	Mar. 21, 1998 ^{April 15 2000}	41st 42nd	1:80,000
18423sc	Jun. 18, 1994 ^{May 1 1999}	30th 31st	1:80,000
18424	Jul. 12, 1997	25th	1:40,000
18430	Nov. 2, 1996	6th	1:25,000
18431	Oct. 5, 1996	4th	1:25,000

Charts 18400, 18421, 18423 and 18424 cover the entire survey area. Chart 18430 covers the survey area West of longitude 122°40'00"W and Chart 18431 covers the survey area north of latitude 48°42'30"W. The survey was compared with all charts but most rigorously with Charts 18430, 18431, and 18424, the largest scale charts covering the survey area. *Concur*

USCG Notices to Mariners ✓

No items of significance were noted during the duration of this survey. *Concur*

Dangers to Navigation ✓

No dangers were noted during the duration of this survey. *Concur*

Comparison of Soundings ✓

With the exception of soundings discussed in Section M, all soundings and contours are in general agreement with the chart. ^{CONCUR} There appears to be some scouring in the deeper areas of the survey with surveyed depths one to two fathoms deeper than charted soundings. This may be attributable to strong tidal currents in this area.

Comparison of Non-Sounding Features ✓

The green tint area charted within the limits of this survey on Chart 18430 represents wire drag clearances ranging from 15 to 16 fathoms. Based on mainscheme hydrography, actual depths in these areas are greater than 25 meters, the limit for 200% side scan sonar coverage. Line spacing over the green tint area is fifty meters. The line spacing was based on the observed depth and bottom relief in the areas.

Sewers ✓

The sewer charted at latitude 48°40'19.3"N, longitude 122°39'21.69"W, (chart 18430) was observed and verified at the charted position. This is a pipe approximately 8 inches in diameter. This sewer is not depicted on Chart 18424 and should be added.

Concur, with revised position shown above.

The following disproved items should be removed from the chart:

Charted feature	Position		Fix No.	Photo No.	DN
	Latitude	Longitude			
Pile (awois 52378)	48°39'46.770"N	122°38'57.425"W	16	16	166
Islet?	48°39'06.440"N ✓	122°38'07.579"W ✓	25	None	285
Pier *	48°36'51.548"N ✓	122°36'42.582"W ✓	27	26-28	285

- CONCUR
- CONCUR
- see fixes 26-28 below new features

* See private rail (boat ramp) listed below
The following are new features to be added to the chart:

New Features	Position		Fix no.	Photo No.	DN
	Latitude	Longitude			
New rock	48°38'02.772"N ✓	122°41'28.089"W ✓	6	6	155
New pile	48°37'02.439"N ✓	122°41'41.304"W ✓	7	7-9	166
New pile	48°37'02.262"N ✓	122°41'42.008"W ✓	8	7-9	166
New pile in ruins	48°37'02.199"N ✓	122°41'42.746"W ✓	9	7-9	166
New rock	48°37'28.331"N ✓	122°41'53.293"W ✓	10	10	166
New rock	48°37'00.457"N ✓	122°39'37.854"W ✓	12	12	166
New rock	48°37'54.911"N ✓	122°37'16.249"W ✓	13	13-14	166
New rock	48°37'53.908"N ✓	122°37'16.462"W ✓	14	13-14	166
New rock	48°40'14.282"N ✓	122°40'48.649"W	17	17	166
New rock	48°41'35.441"N ✓	122°41'00.309"W ✓	162	Dive	243
New rock	48°40'14.802"N ✓	122°40'09.183"W ✓	163	Dive	243
New pile	48°42'54.590"N ✓	122°41'59.975"W ✓	21	21-24	285
New pile	48°42'54.930"N ✓	122°42'00.091"W ✓	22	21-24	285
New pile	48°42'55.524"N ✓	122°41'57.855"W ✓	23	21-24	285
New pile	48°42'55.845"N ✓	122°41'56.865"W ✓	24	21-24	285
Dolphin, end of pvt dock	48°36'51.910"N	122°36'44.396"W	26	26-28	285
New pile	48°36'51.548"N ✓	122°36'42.582"W ✓	27	26-28	285
Private rail (boat ramp)	48°36'50.970"N ✓	122°36'44.154"W ✓	28	26-28	285

*(1)
(9)
(12)
(5)
*(2)
cov 1'
cov 2'
cov 2'
cov 2'
33 RK
07 RK
(2)
(2)
(2)
(2)
(2)
(2)
(2)

The following items revise existing charted features.

New Features	Position		Fix no.	Photo No.	DN
	Latitude	Longitude			
North extent of charted rock	48°37'49.753"N ✓	122°37'13.586"W ✓	1	1-2	148
South extent of charted rock	48°37'48.970"N ✓	122°37'12.023"W ✓	2	1-2	148
South extent of charted islet	48°37'51.697"N ✓	122°37'13.811"W ✓	3	3-4	148
North extent of charted islet	48°37'53.632"N ✓	122°37'16.215"W ✓	4	3-4	148
High point/extent of new ledge	48°38'04.608"N ✓	122°37'25.475"W ✓	5	5	148
South edge charted rock	48°38'05.197"N ✓	122°41'26.755"W ✓	11	11	166
Revised shoreline, Lummi rocks	48°40'13.56"N ✓	122° 37'59.95"W	Ref 2	37	148
Revised shoreline, Lummi rocks	48°40'09.04 "N	122°40'00.73" W	Ref 3	38	148

* (4)
" "
islet (1)
" "
ledge (3)
*(2)
} Dashed red

AWOIS Item 52378, a charted pile PD, is discussed in Item Investigation Report #1, located in Section M. attached to this report.

All other changes are depicted on the final field sheet. Annotated photographs and a list of detached positions are included in Appendix J. Filed with the hydrographic data.

O. ADEQUACY OF SURVEY ✓ See Eval Rpt., Section O.

H-10887 is a complete navigable area survey within the limits set forth in change No. 1 and is adequate to supersede all prior surveys.

P. AIDS TO NAVIGATION ✓ See Eval Rpt., Section P

Below is a list of aids to navigation verified with hydrographic methods in accordance with Section 4.2 of project instructions. Aids marked with an asterisk are covered in a separate Horizontal Control Report dated June 1997. Positions listed here are taken from that report or latest data available from this survey.

Navigational Aid	LLN	Latitude	Longitude	Photo No.	Fix No.
Lummi Rocks Light 16A*	19510	48°40'09.68" N ✓	122°40'07.27" W ✓	34	*
Viti Rocks Light*	19200	48°37'59.62" N ✓	122°37'21.70" W ✓	35	*
Vendovi Cove Light	19195	48°36'55.01" N ✓	122°36'41.652" W ✓	31	31
Boulder Reef Lighted Bell Buoy 2	19500	48°38'15.36" N ✓	122°41'43.842" W ✓	20	20
Sinclair Island Lighted Bell Buoy 4	19505	48°38'17.159" N ✓	122°40'03.722" W ✓	19	19
Viti Rocks Lighted Bell Buoy 9	19205	48°37'48.403" N ✓	122°37'06.897" W ✓	18	18

Q. STATISTICS ✓

Description	Quantities
Total Nautical Miles	706.91
Side Scan Sonar	77.3
SSS 100%	39.02
SSS 200%	38.28
MS Hydrography	267.38
Splits	260
Cross Lines (200% SSS)	21
Development	81.9
Square Nautical Miles	12.5
Square Nautical Miles SSS	3.7
Days of Acquisition	43
Total Number of Soundings	31724
Detached Positions	28
Bottom Samples	52
Dives	2
Velocity Casts	11
Tide Stations Installed	1

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 ✓

Project instructions specify full-scale shoreline verification, but limit inshore hydrography to the three-fathom curve. Unless the zero-meter curve is acquired, the hydrographer cannot define the shoreline. In some parts of this survey, the hydrographer can recommend shoreline compilation changes with confidence; but in others, it is not possible. If digital shoreline derived from modern photogrammetry is not available for a project area, either inshore limits of hydrography should extend to the zero curve, or shoreline verification should not be included in project instructions.

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 for approval,



Edmund Wernicke
Engineering Technician

Approved and forwarded,



James M. Crocker
LT, NOAA, Chief of Party

ITEM INVESTIGATION REPORT ✓

AREA OF INVESTIGATION

Item Number: AWOIS 52378
State and Locality: Washington, Sinclair Island to Lummi Island
Reported Position: Latitude: 48°39' 50.0" N ✓
Longitude: 122°39'05.0" W ✓
Datum: NAD83
Reported Depth: N/A
Type of Feature: Submerged pile
Largest Scale Chart: 18424; 1:25,000, 25th edition, July 12, 1997

DESCRIPTION AND SOURCE: The charted symbol and note "subm pile PA" first appeared on Chart 18421 between the 25th edition in 1976 and the 27th edition in 1979. The actual source is unknown; the note may have come from a Quad or a Nanci. The "subm pile PA" no longer appears on Chart 18421.

The symbol and note appear on Chart 18424 at latitude 48°39'47.074"N, longitude 122°38'57.48"W, 156 meters to the south of the AWOIS position, ~~its position on Chart 18421.~~

SURVEY REQUIREMENTS: 200% side scan sonar, echosounder development or 100% shallow water multibeam system coverage over 300m search radius.

METHOD OF INVESTIGATION: A visual search at approximate zero tide was conducted at both the above locations. Side Scan coverage of 200% was acquired over the search radius to a depth of 30 meters. Six contacts were recorded within the search radius and developed with echosounder.

RESULTS OF INVESTIGATION: The entire 300-meter search radius falls in a very steep, rocky area along the shore where there are no cultural features. The location on chart 18424 is approximately ten meters from the rocky shore and no evidence of a submerged pile was observed (see Photo 16). A disproval detached position was recorded at this position (Pos. No. 16, DN 166). The contacts developed within the search radius appear to be submerged rocks near the shore. Depths at the AWOIS location are 6.5-9.3 fathoms/11.9-17 meters.

COMPARISON WITH PRIOR SURVEYS: Neither a pile nor a submerged pile appears on Prior H-8318. *Concur*

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS: On the basis of the uncertain origin, the visual search, the sonargram and development hydrography, the hydrographer is satisfied that the charted submerged pile does not exist.

Delete the submerged pile charted at latitude 48°39'47.074"N, longitude 122°38'57.48"W on Chart 18424, (~~latitude 48°39' 50.0" N, longitude 122°39'05.0" W on Chart 18421~~) - *CONCUR*

ITEM INVESTIGATION REPORT ✓

AREA OF INVESTIGATION

Reference No.: Item 2
State and Locality: Washington, Sinclair Island to Lummi Island
Charted Position: Latitude: 48°39'06.30"N ✓
Longitude: 122°38'07.51"W ✓
Datum: NAD83
Reported Depth: N/A
Largest Scale Chart: 18424; 1:25,000, 25th edition, July 12, 1997
Type of Feature: Charted Islet

DESCRIPTION AND SOURCE: Small islet on chart 18424. The source is unknown.

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: A visual search at the position scaled from chart 18424 (the largest scale), was made at a minus tide (DN 285).

RESULTS OF INVESTIGATION: The visual search of this position revealed numerous rocks along a very rocky, steep shoreline. It is possible that there might have been a small islet in the past that has since deteriorated and only the supporting rocks remain and blend into the existing rocky shoreline; however, the islet is not depicted on Chart 18421. A disproval detached position, Pos. No. 25 (DN 285), was taken at the charted location in a depth of 3.0 meters.

COMPARISON WITH PRIOR SURVEYS: The islet is not depicted on Prior Survey H-8318.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:
Delete the islet charted at latitude 48°39'06.⁴⁴30" N, longitude 122°38'07.⁸⁴51" W. - concur

ITEM INVESTIGATION REPORT ✓

AREA OF INVESTIGATION

Reference No.: Item 3
State and Locality: Washington, Sinclair Island to Lummi Island
Charted Position: Latitude 48°36'51.16"N ✓
Longitude 122°36'42.34"W ✓
Datum: NAD83
Reported Depth: N/A
Largest Scale Chart: 18424; 1:25,000, 25th edition, July 12, 1997
Type of Feature: Charted marine railway

DESCRIPTION AND SOURCE: Marine railway charted on 18424. Source not known.

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: Visual search.

RESULTS OF INVESTIGATION: A small marine railway was observed in proximity to the charted feature. Its offshore limit is identified with Fix No. 28. A new pile, (Fix 27, Photo 27, DN 285) was also located in the vicinity of the charted feature. *(private boat ramp)* **Concur**

COMPARISON WITH PRIOR SURVEYS: Prior H-8318 depicts a Dol at latitude 48°36'52.884"N, longitude 122°36'38.016"W.

CHARTING RECOMMENDATIONS: Revise the charted marine railway, offshore end charted at 48°36'51.16"N, longitude 122°36'42.34"W, and chart the offshore end at latitude 48°36'51.449"N, longitude 122°36'44.035"W. Chart a pile at latitude 48°36'51.543"N, longitude 122°36'42.582"W. *Chart area as shown on smooth sheet.* **Concur**

ITEM INVESTIGATION REPORT ✓

AREA OF INVESTIGATION

Reference No.: Item 4
State and Locality: Washington, Sinclair Island to Lummi Island
Reported Position: Latitude: 48°41'35.397"N ✓
Longitude: 122°41'00.715"W ✓
Datum: NAD83
Reported Depth: N/A
Largest Scale Chart: 18424; 1:25,000, 25th edition, issued July 12, 1997
Type of Feature: SSS contact/rock

DESCRIPTION and SOURCE: SSS contact nos. 17738.4p, ht. 4.2m; 17555.9p, ht 4.1m (DN 188); and 19827.8p, ht 4.7m (DN235).

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: Echosounder development, 5-meter line spacing (DN 243). Dive investigation (DN 243). A single rock was located and least depth noted at the shoal point by digital diver depth gage. The marker buoy was relocated to this location. A detached position, fix 162, was then taken at the marker buoy.

RESULTS OF INVESTIGATION: A large rock approximately 3.6m/2.0fm in diameter and rising 4.3m/2.3fm off the bottom was located; diver least depth gauge computed the top depth at 6.0m/3.3fm.

COMPARISON WITH PRIOR SURVEYS: H-8322 depicts a sounding of 4.5 fm in the vicinity of contact.

CHARTING RECOMMENDATIONS: Chart the computed least depth of the rock, 3.3 fathoms, at latitude 48°41'35.441"N, longitude 122°41'00.309"W. - concur

ITEM INVESTIGATION REPORT ✓

AREA OF INVESTIGATION

Reference No.: Item 5
State and Locality: Washington, Sinclair Island to Lummi Island
Position: Latitude: 48°40'15.542"N ✓
Longitude: 122°40'09.976"W ✓
Datum: NAD83
Reported Depth: N/A
Largest Scale Chart: 18424; 1:25,000, 25th edition, July 12, 1997
Type of Feature: SSS contact/rock

DESCRIPTION and SOURCE: Large rock observed on sonargram inaccessible by launch due to thick kelp growth (Contact 18168.4p).

SURVEY REQUIREMENTS: NA.

METHOD OF INVESTIGATION: Dive investigation..

RESULTS OF INVESTIGATION: Echosounder development (DN 243, fix 21093.1,) and diver investigation (DN 243, fix no.163,) established a reduced depth of 1.3 meters (0.7 fathoms) at the shoal point of this rock. See also dive investigation report ~~located in~~ Appendix J. attached to this report.

COMPARISON WITH PRIOR SURVEYS: The rock is not depicted on Prior H-8318.

CHARTING RECOMMENDATIONS: Chart the rock submerged 0.7 fathoms at latitude 48°40'14.⁸⁹²97"N, longitude 122°40'09.¹⁸³6"W. - ~~CANCUR~~ (ORR)

**Pacific Hydrographic Party
Dive Plan/Investigation Form**

Date: 8/31/99 DN: 243 Survey: 17-10887

Location: West side Lummis Island

Latitude: 48°41.60' Longitude: 122°41.01' Divemaster: Crocker

Diver in Charge: Wernicke Launch: 0651 0652 Coxswain: Rothmeyer

Tenders: Brown Equipment Used: Scuba / Divers least Depth gauge

Dive Plan: #1 Descend buoy search for least depth
move buoy measure least depth

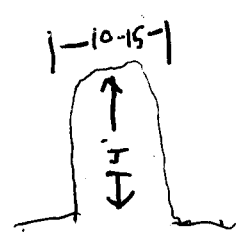
Weather: Wind: 15-20 S (Kts/dir)
Seas: 1' (ft)
Swell: (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Brown			3000	0531	2000	0538	7	40	
Crocker			3000	0531	2250	0538	7	40	
Wernicke			2250	0626	1600	0636	6	30	
Rothmeyer			3000	0626	2000	0636	6	30	

Current: .25 Knt S Visibility: 8' Bottom Type: Rky

Description & Dimensions:

#1 Large Rock



Dive #2 Attemp least depth dive on help covered shoal

Diver Gauge Information

#1 P_{in}: 14.65 P_{LD}: 26.04 P_{out}: 14.70
14.67 P_{LD} 18.70 14.67
 Time of Least Depth Measurement: #1 0532
#2 18:46:04

ITEM INVESTIGATION REPORT ✓

AREA OF INVESTIGATION

Reference No: Item 6
State and Locality: Washington, Sinclair Island to Lummi Island
Charted Position: Latitude: 48°37'53.56" N ✓
Longitude: 122°36'43.88" W ✓
Datum: NAD83
Reported Depth: 35 fathoms
Largest Scale Chart: 18424; 1:25,000, 25th edition, July 12, 1997
Type of Feature: Charted Sounding

DESCRIPTION and SOURCE: A 35-fathom charted sounding. Surrounding surveyed depths range between 55 and 58 fathoms. Source not known. Source appears to be H-8318. A 55 fm sounding plots on top of the charted 35.

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: Dual-frequency echosounder: 25-meter line spacing E-W, 60-meter spacing N-S within 300 meters of the charted sounding location (DN 300).

RESULTS OF INVESTIGATION: Full development of the area showed no variation from surrounding area which ranges between 55 and 58 fathoms. *Concur*

COMPARISON WITH PRIOR SURVEYS: A review of Prior Survey H-8318 shows soundings in agreement with this survey and no indication of a 35-fathom sounding in the general vicinity of the charted sounding.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS: The hydrographer concludes that the source of the 35-fathom sounding is most likely a compilation error. Delete the 35-fathom sounding charted at latitude 48°37'53.56"N, longitude 122°36'43.88"W, and chart the soundings from this survey. - *cascur*

ITEM INVESTIGATION REPORT ✓

AREA OF INVESTIGATION

Reference No: Item 7
State and Locality: Washington, Sinclair Island to Lummi Island
Reported Position: Latitude: 48°41'10.14"N ✓
Longitude: 122°41'59.78"W ✓
Datum: NAD83
Reported Depth: 33 fathoms
Largest Scale Chart: 18424; 1:25,000, 25th edition, issued July 12, 1997
Type of Feature: Charted depth

DESCRIPTION and SOURCE: 33-fathom depth from Chart 18424. Source not known.

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: Echosounder development at 25-meter line spacing NE-SW and 50-meter spacing NW-SE (DN 300).

RESULTS OF INVESTIGATION: Full development of the area showed no variation in depth from the surrounding area which ranges between 37.7 and 39.6 fathoms.

COMPARISON WITH PRIOR SURVEYS: Prior H-8322 depicts a 40-fathom sounding at above location.

CHARTING RECOMMENDATIONS: Delete the 33-fathom sounding charted at latitude 48°41'10.14"N, longitude 122°41'59.78"W. Chart the soundings from this survey. — *lancur*

APPROVAL SHEET

for

SURVEY H-10887

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,



LT James M. Crocker, NOAA
Chief
Navigation Response Team 3



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: February 8, 2000

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-N368-PHP-99
HYDROGRAPHIC SHEET: H-10887

LOCALITY: Northern Puget Sound, WA

TIME PERIOD: May 24, 1999 - October 27, 1999

TIDE STATION USED: 944-9424 Cherry Point, WA
Lat. 48° 51.8'N Lon. 122° 45.5'W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.515 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: NPS49, NPS50, NPS51, NPS64, NPS70,
& NPS71.

Refer to attachments for zoning information.

Note : Provided time series data are tabulated in metric units
(Meters), relative to MLLW and on Greenwich Mean Time.

Thomas V. Mesa 2/8/00

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

Final tide zone node point locations for OPR-N368-PHP-99,
Sheet H-10887.

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 NPS49			
-122.738076 48.584204	944-9424	-24	0.90
-122.810286 48.595829			
-122.823941 48.604132			
-122.816365 48.645664			
-122.777379 48.648211			
-122.690254 48.622077			
-122.716476 48.606516			
-122.703318 48.593215			
-122.738076 48.584204			
Zone NPS50			
-122.777379 48.648211	944-9424	-18	0.92
-122.75407 48.661748			
-122.658967 48.686974			
-122.628335 48.665882			
-122.622261 48.656703			
-122.690254 48.622077			
-122.777379 48.648211			
Zone NPS51			
-122.75407 48.661748	944-9424	-12	0.95
-122.777379 48.648211			
-122.816365 48.645664			
-122.881019 48.701912			
-122.886924 48.748048			
-122.837066 48.747287			
-122.712121 48.738051			
-122.706645 48.733619			
-122.68228 48.710359			
-122.658967 48.686974			
-122.75407 48.661748			

Zone NPS64

-122.62278 48.695127	944-9424	-18	0.92
-122.628335 48.665882			
-122.622261 48.656703			
-122.609823 48.640495			
-122.610103 48.611323			
-122.554573 48.578031			
-122.554573 48.585864			
-122.50964 48.667555			
-122.62278 48.695127			

Zone NPS70

-122.632316 48.539284	944-9424	-30	0.90
-122.579184 48.538285			
-122.558712 48.535392			
-122.554573 48.578031			
-122.610103 48.611323			
-122.646296 48.585732			
-122.632316 48.539284			

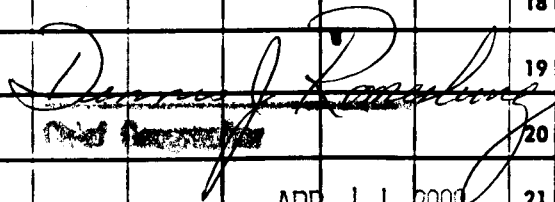
Zone NPS71

-122.703318 48.593215	944-9424	-18	0.91
-122.716476 48.606516			
-122.690254 48.622077			
-122.622261 48.656703			
-122.609823 48.640495			
-122.610103 48.611323			
-122.646296 48.585732			
-122.703318 48.593215			

GEOGRAPHIC NAMES

H-10887

Name on Survey	A ON CHART NO. 18424		B ON PREVIOUS SURVEY NO. 18430		D FROM LOCAL INFORMATION	E ON LOCAL MAPS	F P.O. GUIDE OR MAP G RAND McNALLY ATLAS	H U.S. LIGHT LIST	K
	CON U.S. QUADRANGLE MAPS								
BAKERS REEF	X		X						1
BOULDER REEF	X		X						2
BUMSTEAD SPIT BRANT POINT *	X X		X						3
CARTER POINT	X		X						4
HALE PASSAGE	X		X						5
INATI BAY LEGOE BAY	X X		X						6
LOVERS BLUFF	X		X				/		7
LUMMI ISLAND	X		X						8
LUMMI PEAK	X		X						9
LUMMI ROCKS	X		X						10
FRANCIS, POINT *	X		X						11
PORTAGE BAY *	X		X						12
PORTAGE ISLAND *	X		X						13
PUGET SOUND (title)	X		X						14
SINCLAIR ISLAND	X		X						15
VENDOVI ISLAND	X		X						16
VITI ROCKS	X		X						17
WASHINGTON (title)	X		X						18
									19
									20
									21
									22
* Do not plot within the survey limits									23
									24
									25

Dennis J. Parsons


APR 11 2000

HYDROGRAPHIC SURVEY STATISTICS

H-10887

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	2				
ENVELOPES					
VOLUMES					
CAHIERS					
BOXES					
SHORELINE DATA					
SHORELINE MAPS (List):		NA			
PHOTOBATHYMETRIC MAPS (List):		NA			
NOTES TO THE HYDROGRAPHER (List):		NA			
SPECIAL REPORTS (List):		NA			
NAUTICAL CHARTS (List):		18424, 18430, 18431			

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	43		43	
VERIFICATION OF CONTROL				
VERIFICATION OF POSITIONS				
VERIFICATION OF SOUNDINGS				
VERIFICATION OF JUNCTIONS	4		4	
APPLICATION OF PHOTOBATHYMETRY				
SHORELINE APPLICATION/VERIFICATION	87		87	
COMPILATION OF SMOOTH SHEET	165		165	
COMPARISON WITH PRIOR SURVEYS AND CHARTS	20		20	
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		60	60	
GEOGRAPHIC NAMES				
OTHER* (Chart Compilation)		61	61	
*USE OTHER SIDE OF FORM FOR REMARKS	TOTALS	319	121	440
Pre-processing Examination by R. Davies	Beginning Date 3/14/2000	Ending Date 3/15/2000		
Verification of Field Data by E. Domingo, R. Mayor, B. Mihailov	Time (Hours) 319	Ending Date 4/18/2000		
Verification Check by B. Olmstead	Time (Hours) 39	Ending Date 10/30/2000		
Evaluation and Analysis by B. Mihailov	Time (Hours) 60	Ending Date 10/26/2000		
Inspection by B.A. Olmstead	Time (Hours) 8	Ending Date 11/2/2000		

**EVALUATION REPORT
H-10887**

A. PROJECT

The hydrographer's report contains a complete discussion of the project information.

B. AREA SURVEYED

The survey area is adequately discussed in the hydrographer's report.

The hydrographer has determined the inshore limits of safe navigation by defining a Navigable Area Limit Line (NALL) throughout the survey. Charted features and soundings inshore of this limit line which have not been specifically addressed during survey operations should be retained as charted. Page-size plots of the charted area depicting the specific limits of supersession accompany this report as Attachments 1,2 and 3.

The bottom consists of mud, sand, gravel, pebbles and broken shells. Depths range from 0.0 to 66.0 fathoms.

C. SURVEY VESSELS

The hydrographer's report contains adequate information relating to survey vessels.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

HYPACK was used for all data acquisition. Survey data were processed utilizing the same Hydrographic Processing System (HPS) as used in the field, and MicroStation 95.

Processed digital data for this survey exists in the standard HPS format, a database format using the .dbf extension. In addition, the smooth sheet drawing is filed in the MicroStation format, i.e., dgn extension. Copies of these files have been forwarded to the Hydrographic Surveys Division and a backup copy retained at PHB. Database records forwarded are in the Internal Data Format (IDF) and are in compliance with specifications in existence at the time of survey processing.

The drawing files necessarily contain information, which is not part of the HPS data set such as geographic names text, line-type data, 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. 35 and No. 75.

The data is plotted using a Universal Transverse Mercator (UTM), zone 10 projection and are depicted on a single 1:10,000 scale sheet.

E. SONAR EQUIPMENT

Side Scan Sonar was utilized during this survey. Refer to section E of the hydrographer's report concerning set-up, operation and method of processing of side scan data used in the field.

F. SOUNDING EQUIPMENT

Sounding equipment has been adequately addressed in the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

Soundings and elevations below Mean High Water (MHW) have been reduced to Mean Lower Low Water (MLLW). The reducers include corrections for an actual tide, dynamic draft, and sound velocity. These reducers have been reviewed and are consistent with NOS specifications.

Predicted tides were used for the reduction of soundings during field processing. During office processing, tide reductions were derived from approved hourly heights zoned from Cherry Point, WA, gage 944-9424. Refer to the approved tide note attached to this report concerning recommended tidal zoning.

H. CONTROL STATIONS

Section H of the hydrographer's report contains adequate discussions of horizontal control and hydrographic positioning.

The positions of horizontal control stations used during hydrographic operations are published values based on NAD 83. The geographic positions of all survey data are based on NAD 83. The smooth sheet is annotated with an NAD 27 adjustment tick based on values determined with the NGS program NADCON. Geographic positions based on NAD27 may be plotted on the smooth sheet utilizing the NAD 83 projection by applying the following corrections.

Latitude:	-0.6181 seconds	(-19.101 meters)
Longitude:	4.637 seconds	(94.882 meters)

I. HYDROGRAPHIC POSITION CONTROL

Hydrographic position control is adequately discussed in the hydrographer's report.

Differential GPS (DGPS) was used to control this survey. The maximum horizontal dilution of precision (HDOP) limits of 3.75 for this survey has not been exceeded and the quality of data obtained is good. The reference site confirmation test and daily DGPS performance checks conducted in the field are adequate.

NAD 83 is used as the horizontal datum for plotting and position computations.

Additional information concerning specific control system type, calibrations and system checks can be found in the hydrographer's report and in the separates related to horizontal position control and correction to position data.

J. SHORELINE

There are no photogrammetric source data available for this survey. The shoreline depicted in brown on the smooth sheet is for orientation only, and originates with the 12th edition of chart 18424 and 6th edition of Chart 18430. The shoreline files and the survey file were merged during MicroStation processing. Additional information is found in the hydrographer's report, sections S and I.

K. CROSSLINES

Crosslines are discussed in the hydrographer's report.

L. JUNCTIONS

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Datum</u>
H-10776	1997-98	1:10,000	NAD 83
H-10792	1998-99	1:10,000	NAD 83

The junctions with surveys H-10766 and H-10792 have not formally been completed since these surveys have

H10887

been processed and forwarded for charting. However, a comparison with the present survey reveals good agreement. A few depths have been transferred to the present survey in order to better delineate the bottom configuration. The standard depth curves on the present survey have been drawn considering the 1997-99 sounding data and should be used within the common areas. "Adjoins" notes has been added to the smooth sheet to reflect this situation.

M. COMPARISON WITH PRIOR SURVEYS

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Datum</u>
H-8318	1956	1:10,000	NAD 27
H-8322	1956	1:10,000	NAD 27

Prior surveys H-8318 and H-8322 cover the entire area of the present survey. Sounding agreement is generally good with the present survey depths depicting a slightly deeper bias from 0.5-2.0 fathoms in the deeper portions (20-60 fathoms) of the survey area. Shoaler areas less than 20 fathoms common with the prior surveys reveal present survey depths generally differing from 0.5-2.0 fathoms reflecting a slightly shoaler bias. This shoaler bias is largely based on better coverage and delineation of shoals not fully surveyed in 1955-56. The present configuration of the standard depth curves shows minor changes since the last prior surveys.

Sounding differences are mostly attributed to better sounding coverage, improved positioning and sounding methods and relative accuracy of the data acquisition techniques. Additional discussion is found in the hydrographer's report, section L.

Several soundings and features in color have been transferred from H-8322 inshore of the three-fathom depth curve.



FIGURE 1

Prior survey H-8318 was classified by the Mapping and Charting Branch (MCB) Hydrographic Data Evaluation Group (HDEG) as Category 1, where no further processing is required. This survey was verified but not reviewed for chart application. Critical prior survey data from work conducted before 1955-56 was not addressed for supersession. However, this HDEG listed survey was partially applied to the chart regarding any critical corrections. The area inshore of the red dotted line in Figure 1 (H-8318) has not been superseded.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Datum</u>
H-9282WD	1972	1:20,000	NAD 27

Wire drag survey H-9282WD covers two areas in common with the present survey (West of Lummi Rocks and north of Sinclair Island). The present survey depths within the prior swept areas range from 25 to 60 fathoms and beyond the operational depth capability of the side scan sonar. Single beam sounding coverage (50 meters) was accomplished during this survey to substantiate the wire sweep information. The hydrographer found no significant shoals or any indication of depth less than indicated within the prior wire swept areas. Additional information is found in the hydrographer's report, sections E, L, and N.

Additional information regarding prior survey comparison is found in the hydrographer's report, section L.

Except for the soundings and features mentioned above, survey H-10887 is adequate to supersede prior surveys H-8318, H-8322, and H-9282WD within the area of common coverage.

N. ITEM INVESTIGATIONS

AWOIS item 52378 was assigned for survey H-10887. Six (6) additional item investigations were conducted within the survey area. Adequate discussion and disposition of these items are included in the hydrographer's report, sections M, N, and the item investigation reports (attached).

O. COMPARISON WITH CHART

Survey H-10887 was compared with the following charts.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>	<u>Datum</u>
18424	25th	July 12, 1997	1:40,000	NAD 83
18430	6th	Nov. 2, 1996	1:25,000	NAD 83
18431	4th	Oct 5, 1996	1:25,000	NAD 83

a. Hydrography

Charted hydrography originates with the previously discussed prior surveys and miscellaneous sources. The prior surveys have been adequately addressed in section M and require no further discussion.

The evaluator recommends that the single beam echo sounding coverage on the present survey is sufficient to supersede the green tint on chart 18430.

Some changes and new features along the shoreline were noted during this survey. In some cases, rocks shown on the chart were often identified in the field as high point of ledges or reefs. These features have been adequately located and appropriately depicted on the smooth sheet based on the latest survey information.

The presently charted precautionary area and vessel traffic lane within the survey area should be retained as charted.

The application of this survey to charts of a scale less than 1:40,000 may require the generalization of features such as ledges, and reefs. The recommended charting disposition of specific ledges or reefs is their depiction as isolated rocks. The application of this survey to charts of a scale greater than 1:40,000 may be accomplished with less or without generalization of features at all.

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With the exception of features mentioned above and in the preceding sections of this report, survey H-10887 is adequate to supersede charted hydrography within the common area of coverage.

b. Dangers to navigation

No dangers to navigation were discovered during survey operations and/or during office processing.

P. ADEQUACY OF SURVEY

The hydrography contained on survey H-10887 is adequate to:

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

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, March 1998 Edition.

Q. AIDS TO NAVIGATION

A total of six fixed and floating aids to navigation were located within the area of the present survey and have been adequately discussed in the hydrographer's report, section P. They were found in good condition and adequately serve their intended purpose.

No charted landmarks were verified in the area and no new features of landmark value were noted during this survey. A charted landmark (Tower) located on Sinclair Island at latitude 48/37/33N, longitude 122/40/21W should be retained as charted.

R. STATISTICS

Statistics are adequately itemized in the hydrographer's report.

S. MISCELLANEOUS

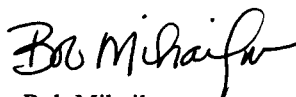
Miscellaneous information is adequately discussed in the hydrographer's report.

T. RECOMMENDATIONS

Survey H-10887 is a good hydrographic survey and no additional work is required.

U. REFERRAL TO REPORTS

Referral to reports is adequately discussed in the hydrographer's report.

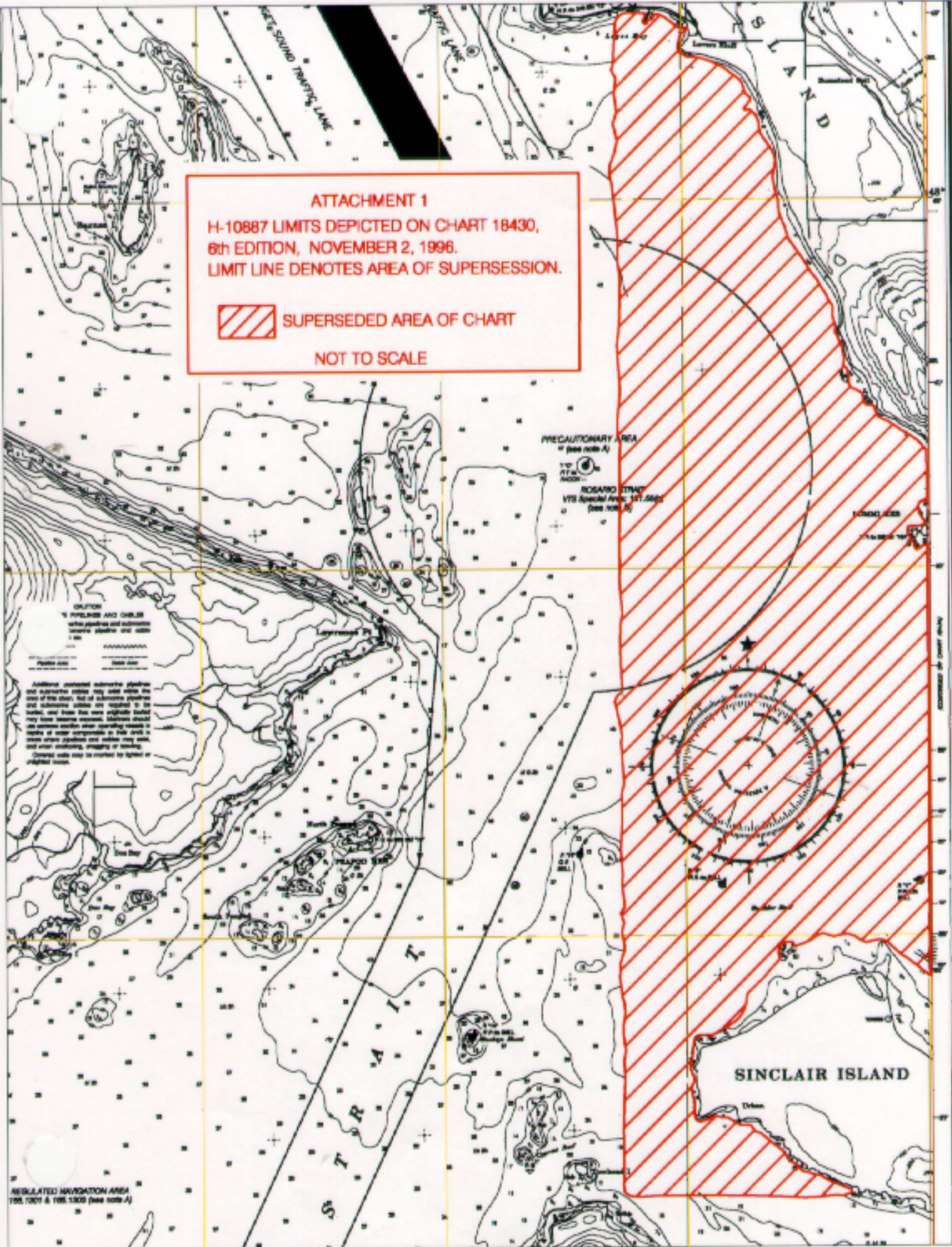


Bob Mihailov
Cartographer

ATTACHMENT 1
H-10887 LIMITS DEPICTED ON CHART 18430,
6th EDITION, NOVEMBER 2, 1996.
LIMIT LINE DENOTES AREA OF SUPERSESION.

 **SUPERSEDED AREA OF CHART**

NOT TO SCALE



PRECAUTIONARY AREA
(see note A)

10' STEEP SLOPE
ROSARIO STRAIT
VTS Special Area: 187.000
(see note A)

10' STEEP SLOPE

CONTINUED ON CHART 18431

CAUTION
PIPELINES AND CABLES
where pipelines and cables
are shown, their position and depth
is not guaranteed.

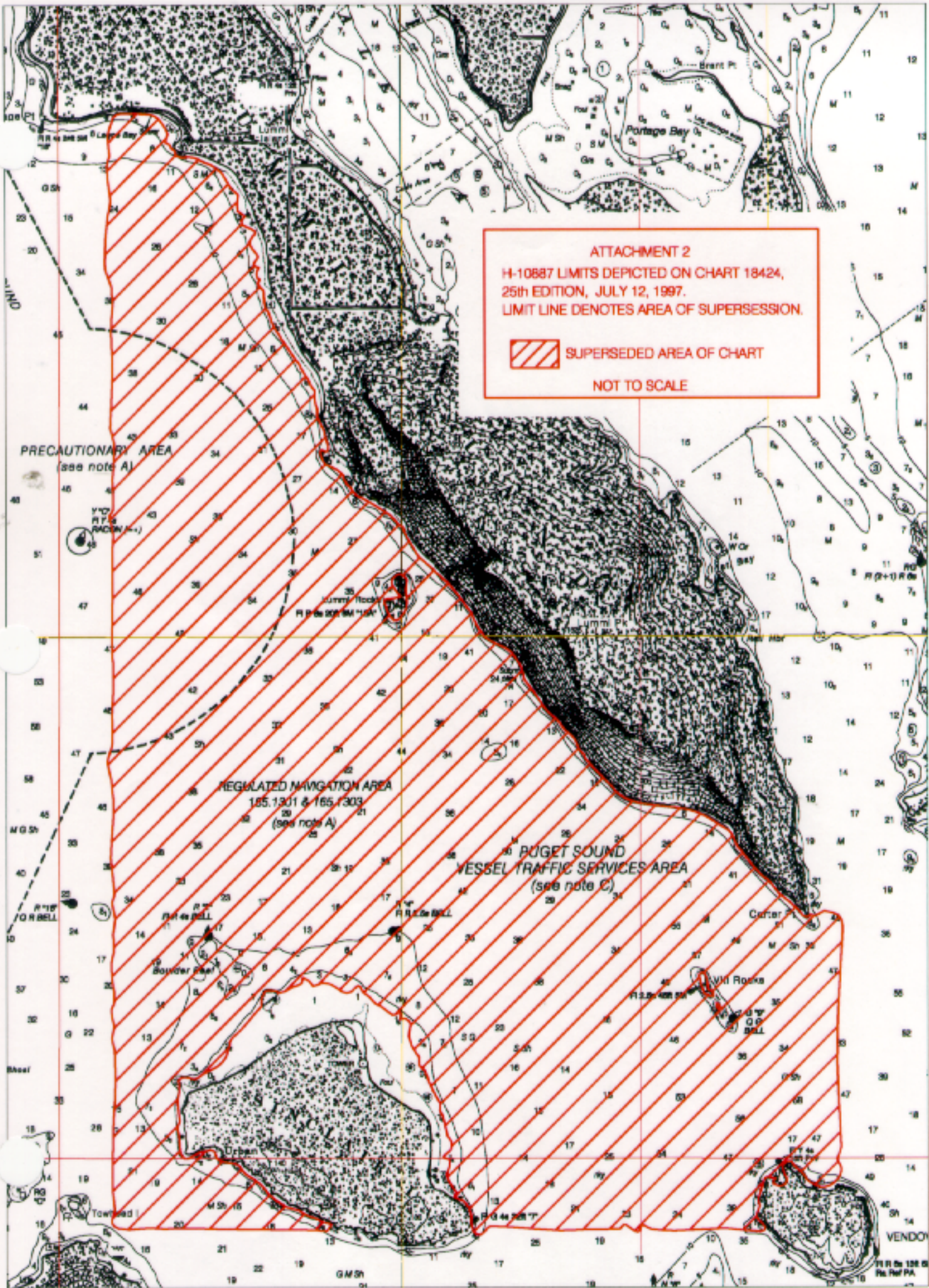
Additional uncharted submarine pipelines
and submarine cables may exist within the
area of this chart, but of submarine pipelines
and submarine cables are required to be
marked, and their true depth significantly
may have become excessive. Mariners should
use extreme caution when operating vessels in
areas of water comparable to this chart in
order to avoid pipelines and cables that may
not be marked, straight or curved.

REGULATED NAVIGATION AREA
185.1001 & 185.1002 (see note A)

ATTACHMENT 2
H-10887 LIMITS DEPICTED ON CHART 18424,
25th EDITION, JULY 12, 1997.
LIMIT LINE DENOTES AREA OF SUPERSESION.

 SUPERSEDED AREA OF CHART

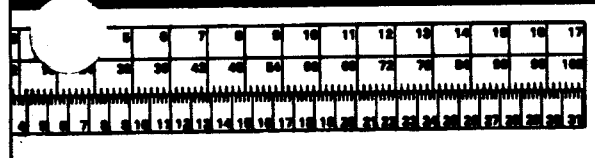
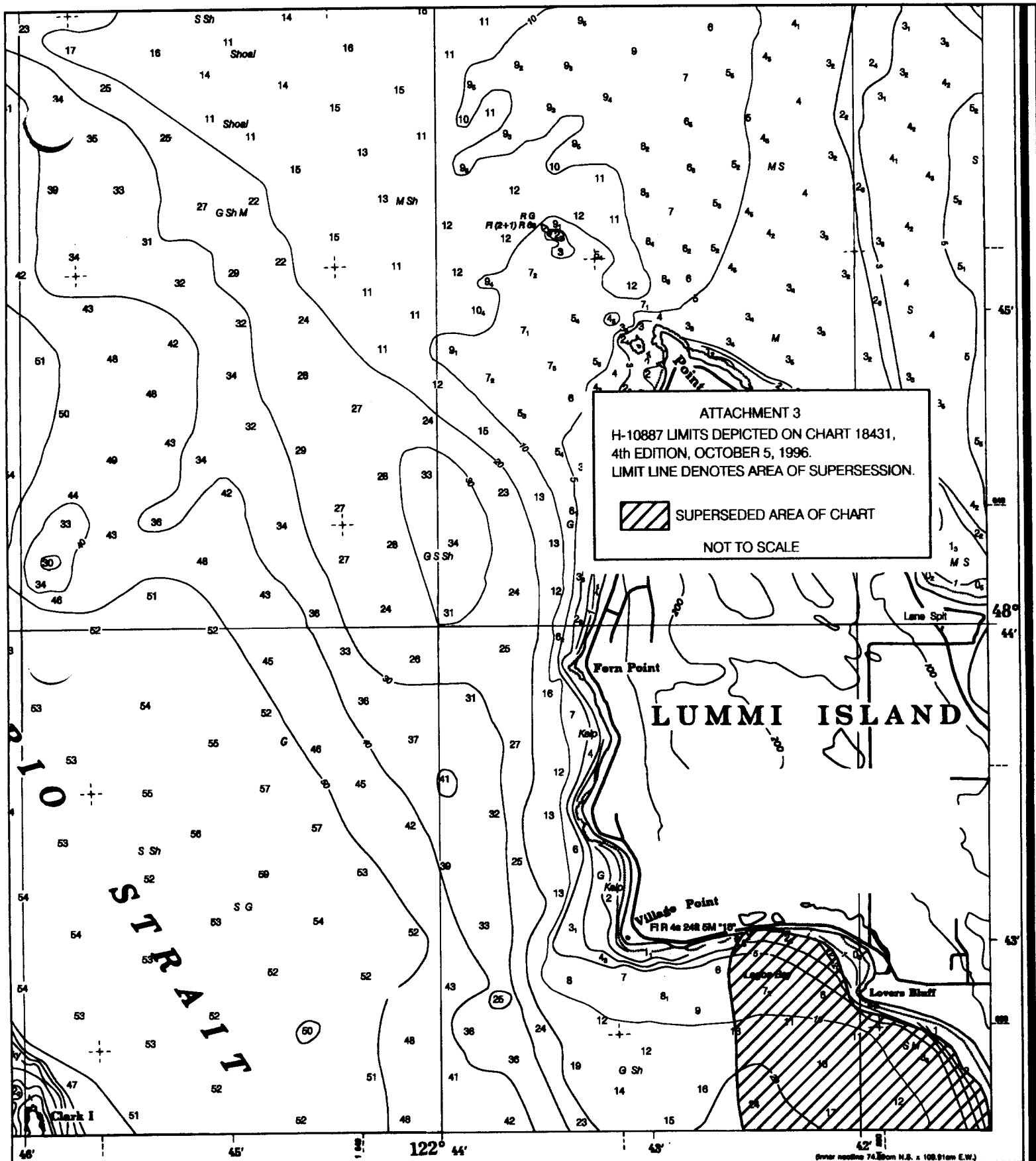
NOT TO SCALE



PRECAUTIONARY AREA
(see note A)

REGULATED NAVIGATION AREA
165.1301 & 165.1303
(see note A)

PUGET SOUND
VESSEL TRAFFIC SERVICES AREA
(see note C)



(Rosario Strait to Cherry Point)
 SOUNDINGS IN FATHOMS - SCALE 1:25,000

18431

APPROVAL SHEET
H-10887

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 survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Bruce A. Olmstead Date: 10/27/2000
Bruce A. Olmstead
Cartographer
Pacific Hydrographic Branch

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

James C. Gardner Date: 11-30-00
James C. Gardner
Commander, NOAA
Chief, Pacific Hydrographic Branch

Final Approval

Approved:

Samuel P. De Bow Date: December 20, 2000
Samuel P. De Bow
Captain, NOAA
Chief, Hydrographic Surveys Division

MARINE CHART BRANCH
RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10887

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
18424	6/6/00	B. M. Mchaefer	Full Part Before After Marine Center Approval Signed Via Drawing No. Full application of sndgs & features from smooth sheet thru chart 18430
18430	6/1/00	B. M. Mchaefer	Full Part Before After Marine Center Approval Signed Via Drawing No. Full application of sndgs & features from smooth sheet
18431	10/26/00	B. M. Mchaefer	Full Part Before After Marine Center Approval Signed Via Drawing No. Full application of sndgs & features from smooth sheet thru chart 18430
18424	1/9/01	M Kroll	Full Part Before After Marine Center Approval Signed Via Appd Sndgs + Features DN Drawing No.
18421	1/9/01	M Kroll	Full Part Before After Marine Center Approval Signed Via Fully appd Sndgs DN Drawing No. and features thru 18421
18423	1/9/01	M Kroll	Full Part Before After Marine Center Approval Signed Via Full appd sndgs DN Drawing No. and features thru 18421
18400	1/9/01	M Kroll	Full Part Before After Marine Center Approval Signed Via Full appd sndgs DN Drawing No. and features thru 18421
18430	1/9/01	M Kroll	Full Part Before After Marine Center Approval Signed Via Full app'd DN Drawing No. Sndgs and features
18431	1/9/01	M Kroll	Full Part Before After Marine Center Approval Signed Via Fully app'd DN Drawing No. sndgs + features
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.