

H10766

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-10-2-97
Registry No. H-10766

LOCALITY

State Washington
General Locality Rosario Strait
Sublocality Towhead Island to Fern Point

1997-98

CHIEF OF PARTY

LT(jg) James M. Crocker, NOAA

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DATE AUG 30 1999

HYDROGRAPHIC TITLE SHEET

H-10766

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-10-2-97

State Washington

General locality Rosario Strait

Locality Towhead Island to Fern Point

Scale 1:10,000 Date of survey 7/22/97- 8/21/98

Instructions dated May 7, 1997 Project No. OPR-N368-PHP

Vessel Jensen Launch 1101 (EDP0651), SeaArk Launch 1102 (EDP0652)

Chief of party LT(jg) James M. Crocker, NOAA

Surveyed by LT(jg) Crocker, LT(jg) E. Berkowitz, ST Brown, ST Rothmeyer, ST Simmons,
ET Wernicke Side Scan, Dives

Soundings taken by echo sounder, ~~XXXX 1833, p11~~ Raytheon DSF-6000, Innerspace 448
EG&G Models 260, 272-T, MOD III(Dive Gauge)

Graphic record scaled by PHP Personnel

Graphic record checked by PHP Personnel

Evaluation by: I Almacen Automated plot by HP Design Jet 650C
~~Processed by x~~

Verification by E. Domingo, M. Bigelow, R. Mayor, D. Doles

Soundings in fathoms ~~feet~~ at MKW ~~MLLW~~ and tenths

REMARKS: All times are UTC, revisions and marginal notes in black were
generated during office processing. All separates are filed
with the hydrographic data, as a result page numbering may be
interrupted or non-sequential.

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

AWOIS ✓ SURF ✓ 7/26/99 by MBA



UNITED STATES - WEST COAST
WASHINGTON

**ROSARIO STRAIT
NORTHERN PART**

Maximum Projection
Scale 1:25,000 at Lat. 49°30'
North American Datum of 1983
(North Celestial Pole 1984)

SOUNDINGS IN FATHOMS
OUTSIDE AND PART TO BELIEVE APPROVED
AT MEAN LOWER LOW WATER

HIGHS
Highs 11 feet above Mean High Water

AUCTIONS

Hydrographic and Topographic by the National Ocean Service, Coast
Survey, with 2003 SOUNDING DATA COLLECTED BY THE U.S.
COAST GUARD

HORIZONTAL DATUM

The horizontal reference system of this chart is North
American Datum of 1983 (NAD 83) which is based on the
North American Datum of 1983. Geographic coordinates are
given in terms of longitude and latitude measured in
degrees, minutes and seconds. The datum is based on a
mean spheroid of the earth and is not subject to change
with the chart.

TIDE INFORMATION

Name	SOUNDING	Tide Interval to date of sounding (G.M.T.)			
		Mean High Water	Mean Low Water	Mean High Water	Mean Low Water
High	0000	0000	0000	0000	0000
Low	0600	0600	0600	0600	0600
High	1200	1200	1200	1200	1200
Low	1800	1800	1800	1800	1800

NO Symbols and Abbreviations see Chart No. 1

SUPPLEMENTAL INFORMATION

Consult U.S. Coast Guard Light List for supplemental information concerning aids to navigation.

AIDS TO NAVIGATION

Consult U.S. Coast Guard Light List for supplemental information concerning aids to navigation.

CANADIAN WATERSHED FORECAST

The Canadian Marine Service issues forecasts of weather conditions for the waters of the North American Datum of 1983. The forecasts are issued daily at 0600, 1200, 1800 and 2400 hours. For more information, contact the Canadian Marine Service at 1-800-387-3447.

H-10766

SINCLAIR ISLAND

SIDE SCAN

SINGLE BEAM



OBSTRUCTION
CONK IS

Descriptive Report to Accompany Hydrographic Survey H-10766

OPR-N368-PHP

Field Number PHP-10-2-97

Scale 1:10,000

July, 1997- August, 1998

Pacific Hydrographic Field Party

Chief of Party: Lieutenant (jg) 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.

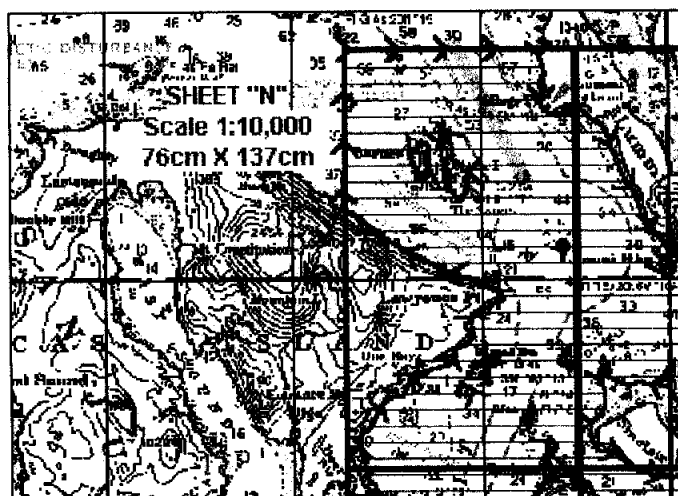
The project was authorized in response to requests from the Puget Sound Pilots, the Thirteenth Coast Guard District, and the National Ocean Service, Office of Ocean and Coastal Resource Management. The objective of this project is to supersede the charted wire drag clearance depths with modern full-bottom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

The project area includes parts of the Strait of Juan De Fuca, Rosario Strait, Haro Strait, Bellingham Channel, Middle Channel and San Juan Channel. The area is transited extensively by both commercial and pleasure vessels.

This is the second survey of the project, designated sheet letter "N," registry number H-10766. The locality is Towhead Island to Fern Point, Rosario Strait, Northern Puget Sound, Washington.

B. AREA SURVEYED (See ENAL RPT., Sec. B)

H-10766 covers an area between Towhead Island and Fern Point, as shown in the chartlet below derived from Chart 18400 (39th Ed., 1:25000, May 30, 1996). Hydrographic limits extend from longitude 122° 42' 13.193" W to 122° 48' 54.858" W and from latitude 48° 36' 30.097"N, south to 48° 44' 07.980"N. Data acquisition was conducted from July 22, 1997 (DN 203) to August 21, 1998 (DN 233).



C. SURVEY VESSELS ✓

NOAA Launch 1101, a 29-foot Jensen and NOAA Launch 1102, a 21-foot SeaArk were used for data acquisition operations as noted in the table below.

Vessel	EDP Number	Operation
1101	0651	Side Scan Sonar, Hydrography, Detached Positions, Sound Velocity Casts, and Diving.
1102	0652	Hydrography, Detached Positions, Bottom Samples, and Sound Velocity Casts.

In January 1998 the external hull mounted transducer pod, which had been replaced with a flush-mounted transducer in May 1997, was removed from the hull.

No unusual vessel configurations were used.

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

HYPACK Software produced by Coastal Oceanographics was used for all data acquisition. HPTOOLS, a program that supports HPS, was used to convert HYPACK data to HPS format. HPS was used for post-processing and MapInfo Professional/ Vertical Mapper were used in conjunction with HPS as project design and quality assurance tools. Both HPTOOLS and HPS software are produced by NOS. CAT version 3.0 was used to download data from Seacat conductivity, temperature, and depth recorders. The VELOCITY program was then used to compute sound velocity correctors.

Versions and dates of all software used to complete survey are included in Appendix H. *

No unusual acquisition or processing methods were used. *CONCUR*.

E. SONAR EQUIPMENT ✓

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

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 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 cable. Tape markings at measured intervals indicated length of cable deployed from the block up to 55 meters, the maximum deployable. Markings were at one-meter intervals up to 10 meters and at five-meter intervals thereafter.

SSS operations were conducted at a speed of 5 knots or slower. Range scales of 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 depths exceeded the limits of the cable or when depths shoaled quickly. In such cases, the hydrographer believes the resolution of the sonagram is adequate for identification of all significant contacts. Two hundred percent side scan coverage was acquired for all depths between the 3 and 24-fathom curves with the exception of the area north of Lawrence Point. This area contained an irregular bottom with a few small areas shoaler than 24 fathoms, which would have proved difficult to

interpret and scan for contacts. Therefore, this area was developed by echosounder with line spacing ranging from 5 to 50 meters depending on the depth of the area. *CONCUR*.

Track lines for 100% side scan sonar coverage were oriented north-south, northwest-southeast, and northeast-southwest, while the 200% side scan sonar coverage was oriented east-west, northwest-southeast, and northeast-southwest. A line spacing of 160 meters was used for both the 100% and 200% coverage. Mapinfo was used to plot SSS swaths and verify both 100% and 200% coverage. *CONCUR*.

The SSS recorder gain was adjusted for the best return for the prevalent bottom material. Contacts or identifiable features (e.g. bouy 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 the Project Instructions, sonagrams were manually scanned for significant contacts; these were labeled and entered in a HPS contact table. Where contacts appeared in a cluster on the sonagram, only the most significant was entered. Contact heights and raw depths were derived using HPS "Side Scan Contact Utilities".

A Mapinfo plot of the significant contacts and the sonagram were reviewed together to identify contacts requiring further investigation. Contacts were selected for development based on computed height, offset from towfish, sonagram review, and charting considerations and calculated significance outlined in section 7.2.2 of the Project Instructions. The review process included a comparison of duplicate contacts.

All investigated contacts were developed by echosounder using procedures outlined in Section 6.4 of the Field Procedures Manual (FPM). *CONCUR*.

A contact table is included in Separate III (Side Scan Sonar Data). *

F. SOUNDING EQUIPMENT ✓

An Innerspace model 448 (INN-448) single frequency echosounder, serial number 236, was used on Vessel 0652 from July 22, 1997 (DN 203) to January 23, 1998 (DN 023). It was replaced, due to failure, with the same model, serial number 239, on January 24, 1998 (DN 024). The new echosounder was used from DN 024 to the completion of the survey. Both echosounders were limited in use to depths less than 160 meters. *CONCUR*

A Raytheon, dual frequency, Digital Sounding Fathometer (DSF) 6000N, serial number A121N, was used on Vessel 0651. 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. Comparisons between the Innerspace and DSF 6000 soundings show no systemic errors. *CONCUR*

Soundings were recorded in meters with an assumed speed-of sound through water of 1500m/sec. Depths encountered in the survey area range from -1.8 meters / -1.0 fathoms (Pos. No. 28663, DN 50) to 133.1 meters / 72.8 fathoms (Pos. No. 10842, DN 223) at MLLW based on preliminary real tides. *Depths reflect same values after application of approved tides.*
Metric leadlines were used for depth comparison with the echosounder. PHP fabricated the leadlines following Hydrographic Survey Guideline (HSG) 69. Leadline calibration forms are included in Appendix E (Calibration Data).*

The MOD III S/N 68335 Diver Least Depth Gauge was used on DN 294, 196, and 197 to calculate least depths on all dive contacts (fixes 25002-25007, 36008-36014 and 36089-36090). The unit was operated in accordance with section 7.2.2.1 of the FPM. The MOD III was calibrated on March 6, 1997 by the NOAA *CONCUR* Dive Center and March 12, 1998 by PTC Electronics. The calibration reports are included in Appendix E (Calibration Data). *

G. CORRECTIONS TO SOUNDINGS ✓

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 (SBE) Model 19-03, 335m, S/N 1912344-1892, and SBE Model 19-01, 3400m, S/N 1917166-2530 were used for all casts. Data was downloaded using CAT version 3.0. The VELOCITY program was used to compute sound velocity correctors.

SEACAT S/N 1892 was used for casts nos. 1-9, and casts 11-17. It was calibrated by SEA-BIRD Electronics on February 24, 1997, and calibrated again on February 21, 1998. *CONCUR.*

SEACAT S/N 2530 was used for cast no. 10. It was calibrated by SEA-BIRD Electronics on February 10, 1998.

Copies of both calibration reports are included in Appendix E. ✱

Data from the following casts were used to determine velocity correctors:

HPS Table	Day Number Acquired	Day Number Range	Extrapolated Depth	Cast Latitude	Cast Longitude
1	205	203-211	144.1m	48°43'09"N	122°44'49"W
2	212	212-218	127.7m	48°40'24"N	122°43'18"W
3	219	219-226	137.5m	48°38'54"N	122°43'24"W
4	245	245-259	151.8m	48°39'54"N	122°43'36"W
5	261	261-279	123.0m	48°39'24"N	122°43'24"W
6	296	287-300	145.8m	48°39'48"N	122°43'24"W
7	309	308-325	138.2m	48°39'24"N	122°43'24"W
8	013	013-022	135.6m	48°38'56"N	122°43'18"W
9	026	026	99.5m	48°43'12"N	122°44'24"W
10	048	041-050	105.6m	48°38'18"N	122°44'30"W
11	097	097-112	121.7m	48°40'06"N	122°43'42"W
12	118	117-124	137.3	48°40'12"N	122°43'36"W
13	128	127-138	110.6	48°40'03"N	122°43'36"W
14	166	163-174	112.0	48°38'18"N	122°44'12"W
15	183	166 & 183	147.3	48°40'18"N	122°43'46"W
16	196	196-209	153.7	48°38'34"N	122°44'13"W
17	222	222 & 233	133.9	48°40'25"N	122°43'37"W

All casts were extended in the Velocity program using the most probable slope, to the extrapolated depth above. *CONCUR*

Leadline Comparison ✓

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

Static Draft ✓

Static Draft for VN 0651 was determined on June 27, 1997 (DN 178). First, the depth of the transducer face from a reference mark on the hull was measured. Next, with the launch in the water (fuel tanks half full and two crewmen aboard) the depth from this reference mark to the waterline was measured. Averaging

the two measurements, a static draft of 0.4 meters was calculated. (NOTE: Historical draft on 0651 has been 0.5 meters. In May 1997, a new flush-mount transducer was installed changing its draft to 0.4 meters.) *Concur*

A static draft of 0.4 meters was determined for vessel 0652 on June 3, 1997, (DN 154) using a similar method as above. *Concur*

Dynamic Draft ✓

Settlement and squat measurements for VN 0651 were conducted June 18, 1997, and conducted again on February 9, 1998, after removal of an unused echosounder transducer altered the hull.

Settlement and squat measurements for VN 0652 were conducted June 3, 1997.

All measurements were conducted in Guemes Channel, WA. Field records are included in Appendix E. *

Settlement and squat correctors are entered into offset tables 1, used before February 1998, and 3, used after February 1998, for VN 0651 and in 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. *Data was analyzed during office processing and found to contain no significant problems.*
Tide Correctors

In accordance with Section 5.8 of the Project Instructions, a real time portable acoustic gauge with satellite capability was installed and leveled on July 8, 1997 (DN 189) at the following location:

Station Number	Station Name	Latitude	Longitude
944-9932	Armitage Island	48° 32.1'N	122° 47.8'W

This station provided information on zoning, tidal datums, and harmonic constants for predictions on sheet "N." Primary tide stations at Port Townsend, WA (944-4900); Cherry Point, WA (944-4900); and Friday Harbor, WA (944-9880) served as controls for datum determination at the Armitage site.
Approved Tide Note dated January 28, 1999 is attached to this report.

On March 18, 1998, two boards were replaced to correct for parity errors that were being observed during satellite transmissions. On June 10, 1998, a time error of four seconds was noticed in the satellite data transmissions. This error was corrected on June 12, 1998, when the time on the gauge was reset to the correct GMT time. Bracketing levels were completed on August 5, 1998 and on September 30, 1998. The bracketing levels revealed an error from the opening level run, see Tide Note in Appendix D. A report on the bracketing levels and all leveling data are included in Appendix D (Tides and Water Levels). *

Parameters for the three tide zones shown below were provided along with Project Instructions and entered into HPS; zone parameters are included in the Field Tide Note found in Appendix D (Tides and Water Levels). *

Tidal Zone	HPS DPAS Zone #	Time Corrector	Range Corrector
NPS49	1	-24 min	0.90
NPS50	2	-18 min	0.92
NPS51	3	-18 min	0.95

In accordance with 5.9 of the Project Instructions the Cherry Point station was used as a reference for tidal data on this survey. Real-time, six-minute, unverified tide data from this gauge, downloaded from the Ocean and Lake Levels Division web site, were converted into a preliminary, smooth tide table using the DPAS Tide Utilities program in HPS. The preliminary, smooth tide table created with the unverified tide data from the Cherry Point gauge was used as a replacement to predicted tide table. Recorded soundings were sorted into the appropriate zone and correctors applied.

No tide stations experienced down time during periods of hydrography. *CONCUR .*

H. HYDROGRAPHIC POSITION CONTROL (*See EVAL RPT. SECS. H & I*)

Horizontal Datum ✓

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). A separate Horizontal Control Report for this project was submitted to the Pacific Hydrographic Branch (PHB) in June 1997. DGPS performance check stations were established to Third Order, Class 1 standards at pilings in Cornet Bay Marina and Skyline Marina. *CONCUR .*

Position Control ✓

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The USCG beacon at Whidbey Island (302 kHz) was used during all hydrographic operations.

Accuracy requirements as specified in the FPM, Section 3.2, were met *CONCUR .*

The reference site was confirmed using the program MONITOR on May 20-21, 1997 (DN's 140-141). Copies of the scatter plot (Horizontal Position Control and Corrections to Position Data) were included in the Horizontal Control Report, dated June 1997, submitted for this project. *

DGPS Performance Checks ✓

Fixed-point DGPS performance checks were obtained per FPM, section 3.4.4.1, using the sites established at Cornet Bay, and Skyline Marina and the Third Order station, Davidson Rock Light. All DGPS performance checks were successful and are included in Appendix F. * *CONCUR*

Positioning equipment ✓

The following GPS equipment was used:

Equipment location	Type of Receiver/Antenna	Receiver Serial No.	Antenna Serial No.
VN 0651	Ashtech (v. 1E08d) CSI Beacon Rcvr MBXI	700417B1042 X-1112	700378A0272
VN 0652	Ashtech (v. 1E08d) CSI Beacon Rcvr MBXI	700417B1043 X-1212	700378A0402
VN 0652	Starlink Receiver	865	4207

The Starlink receiver in VN 1102 was installed on January 14, 1998 (DN 014), replacing the Ashtech receiver.

I. SHORELINE (See EVAL RPT., Sec. J)

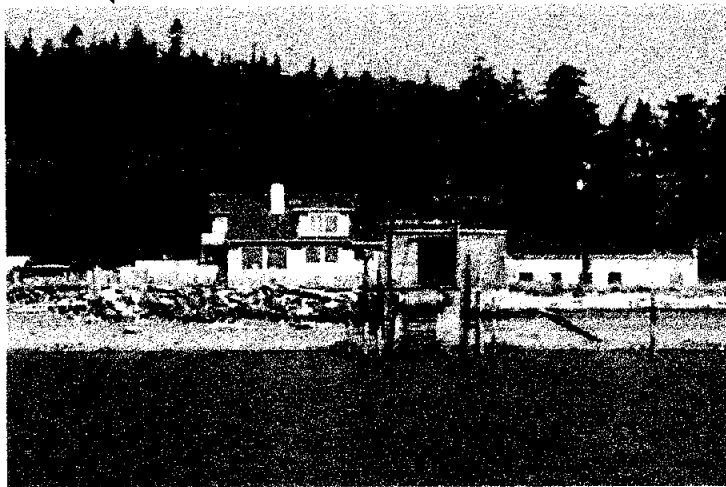
There were no photogrammetric source data supplied with this project. Shoreline from NOS Chart 18430 was used for orientation purposes only and is shown in brown on the final field sheet. New features to the charted shoreline are shown in black. To facilitate verification in the field for this survey, PHP created a digital shoreline document based on BSB electronic Chart 18430, 6th Edition, produced by Blue Marble Graphics. The chart was imported into Mapinfo; a trace of the shoreline was created on the cosmetic layer, saved as a DXF file and imported into HYPACK. As the launch moved along the shore, its position was displayed over the digital shoreline. Correctly charted features were easily verified and uncharted features or items requiring disproval were also readily apparent.

Detached positions were only taken on new features, disprovals, aids to navigation, and verified features not adequately represented by the chart. All shoreline features without a detached position were verified in the field and should be retained as charted. *CONCUR*.

New Features: ✓

Many of the new features to the shoreline were ledges or new limits to charted ledges. Charted rocks that are incorporated in the new ledges were found in the field to be high points on the ledges and should be retained as part of the new ledge. *CONCUR*.

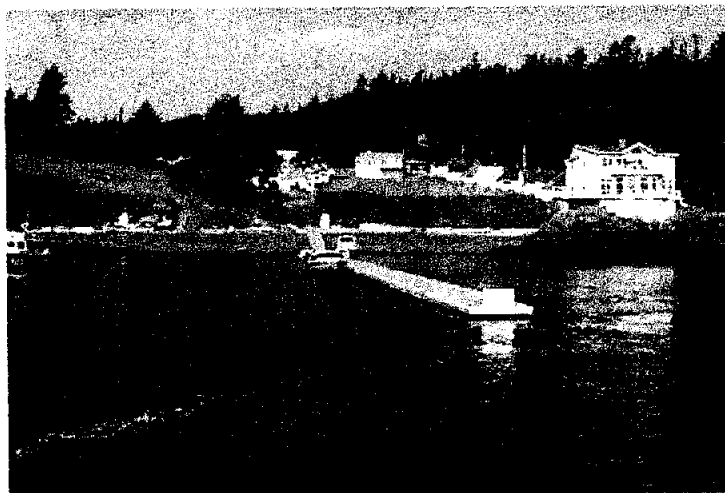
A small vessel railway was positioned by Fix 30248, DN 104, at the location of a charted rock. The detached position was taken at the center of the rails, with the GPS antenna even with the seaward most pile. A photograph of the small vessel railway is shown below. *Shown on smooth sheet as small boat railway launch ramp.*



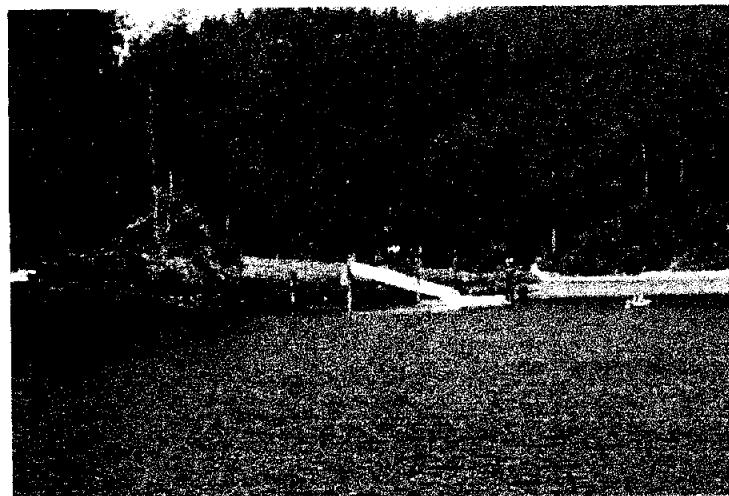
A small boat ramp was positioned by fix 30250, DN 104. The detached position was taken in the center of the boat ramp. The boat ramp is approximately 3 meters wide.

Fix # 30250 - Lat. 48/43/00.4 N, Long. 122/42/36.6 W (small boat ramp)

A charted floating pier at position 37572, DN 233, was observed to be removed in the winter with the anchor blocks being marked by two buoys, Fixes 30962 and 30963, DN 118. The photo below shows the pier as observed in the summer.



A floating pier and its support piles were positioned by Fix 30984, DN 118. The detached position was taken at a pile located at the seawardmost extent of the pier. A public mooring buoy, fix 30983, DN 118, was also positioned. The picture below illustrates the pier and the mooring buoy to the right of the picture.



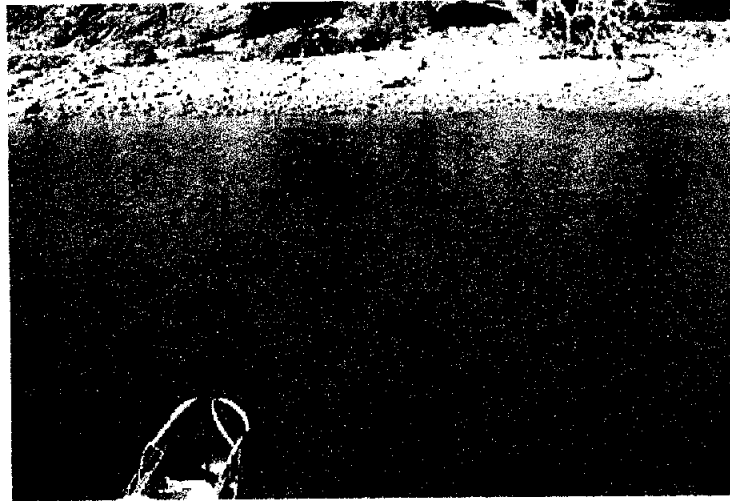
Fix # 30984 - 48/38/02.2 N, 122/47/16.1 W (floating pier)
 Fix # 30983 - 48/38/03.2 N, 122/47/12.8 W (public mooring buoy) (shown on Smooth Sheet)

Disproval

Ten charted rocks were disproved. Most all of the rocks disproved were found in the field to be located onshore. Those that were not readily observed onshore where searched for both visually and with the echosounder. A new rock was positioned at Fix 30743, DN 117, to replace the position of two disproved charted rocks, Fixes 37573 and 37575, DN 233. Fix # 30743 - 48/40/21.2 N, 122/46/43.9 (New rock) * (S)

A rock and covered rock charted at latitude: 48°37'00.98"N longitude: 122°48'24.84"W and latitude: 48°37'00.41"N longitude: 122°48'23.00"W respectively were not observed in the field. The charted rocks location were developed with 5 meter line spacing on DN 138, Fix 34067 to 34106. The soundings from the development indicated submerged rocks in the areas where the rocks were located but did not indicate that either of the rocks exposes at MLLW. The hydrographer recommends removing the rock symbol and charting two covered rocks as defined by the hydrography. CONCUR with clarification. Delete the presently charted rock unless originating from misc. source and chart area based on present survey H-10766
 PHP-10-02-97

A charted stump was searched for visually and with the echosounder. A disproval detached position was taken at the charted position, Fix 37572, DN 233. The photo below illustrates the area searched.



Delete "Stump" from chart and chart the area based on the present survey.

An area charted as a submerged structure PA, latitude 48°42'04.9"N longitude 122°46'36.7"W, was developed with the echosounder, Fix 33508 to 33526, DN 138. Depths ranged from 1.8m (0.5 fm) to 3.3 m (1.8 fm). The area was also visually searched at low tide on DN 233. With good bottom visibility, no signs of a submerged structure were observed. A disproval detached position was not taken at the charted location since the area was developed with soundings. The hydrographer recommends removing the submerged structure PA from the chart. *CONCUR. Delete "subm structure PA" note and chart the area based on the present survey.*

A charted public mooring buoy, latitude 48°41'55.0"N longitude 122°45'56.8"W, was not located and should be removed from the chart. *CONCUR.* The area was searched and a disproval detached position, Fix 37576, DN 233, was taken at the charted location. The photo below illustrates two of the three charted mooring buoys at that location. *Retain the existing seven (?) mooring buoys as charted on both sides of Clark Island.*



J. **CROSSLINES** ✓

Crosslines were run perpendicular to the mainscheme hydro for 32.46 miles. Approximately 50.00 miles of SSS data were run at angles greater than 45 Degrees to the mainscheme, also used for comparison, giving a total crossline to mainscheme percentage of 12.2. Agreement was excellent. *CONCUR.*

K. JUNCTIONS (See EVAL RPT., Sec. L)
(1995-96)

H-10766 joins survey H-10621 1:10,000 1996 at the north end. Soundings and contours, in fathoms, of the two surveys were compared and found to be in very good agreement. Adjacent sheets to the East and South comprise future surveys of project OPR-N368-PHP. *CONCUR*

L. COMPARISON WITH PRIOR SURVEYS (See EVAL RPT., Sec. M)

A cursory comparison of soundings with ^{WD} prior surveys H-8318 (1:10,000, 1956), H-8322 (1:10,000, 1956), H-8333 (1:10,000, 1955), and H-9282 (1:20,000, 1972) indicate depth variations up to 2 fathoms. These variations may be attributed to the use of more modern survey equipment. Only a small portion of the prior wire drag survey was in depths less than 24 fathoms where 200% side scan sonar coverage was acquired. This is addressed further in section N. Coverage and depths obtained are adequate to supercede prior *CONCUR* surveys within their common areas. A more rigorous comparison will be performed by PHB following the application of smooth tides.

M. ITEM INVESTIGATION REPORTS (See EVAL RPT., Sec. N)

Item Investigation Reports for the following are included in *Separate IV. this report and copies filed with the hydrographic data.*

- | | |
|-----|--|
| M1 | Charted 25 fathom sounding |
| M2 | Charted 6 ₃ fathom sounding |
| M3 | Charted 8 ₁ fathom sounding |
| M4 | Charted 9 fathom sounding |
| M5 | Charted 40 fathom sounding |
| M6 | Charted 40 fathom sounding |
| M7 | Charted 18 fathom sounding |
| M8 | Charted 7 ₄ fathom sounding |
| M9 | Charted 9 ₅ fathom sounding |
| M10 | Charted 9 ₂ fathom sounding |
| M11 | Charted 3 ₅ fathom sounding |
| M12 | Charted 6 ₅ fathom sounding |
| M13 | Charted 7 ₃ fathom sounding |
| M14 | Charted 7 ₂ fathom sounding |
| M15 | Charted 3 fathom sounding |
| M16 | Charted rock awash symbol |

Refer to Item Investigation Reports for respective charting recommendations included in this report.

This survey did not contain any AWOIS Items. *CONCUR*.

N. COMPARISON WITH THE CHART (See EVAL RPT., Sec. O)

H-10766 affected the following charts:

Chart	Scale	Edition	Date
18400	1:200,000	4 ²⁰ th	August 30, 1997
18421	1:80,000	413 ⁹ th	Mar. July 22, 1997 B
18423	1:80000	30 th	June 18, 1994
18424	1:40,000	25 th	July 12, 1997
18430	1:25,000	6 th	November 2, 1996
18431	1:25,000	4 th	October 5, 1996

This survey was compared to a 1:10,000-scale digital enlargement of Chart 18430, 6th edition, using MapInfo. The Pacific Hydrographic Branch will perform a follow-up comparison after smooth tides have been applied.

Dangers to Navigation ✓

No dangers to navigation were identified within the limits of this survey. *CONCUR*

Comparison of Soundings ✓

With the exception of soundings discussed in section M, all other soundings and contours are in general agreement with the charts. Discrepancies of 1 to 2 fathoms or less were observed in some areas and were not addressed since smooth tides may change the preliminary depths of this survey into better agreement with the charted soundings. *CONCUR*

Comparison of Non-sounding Features ✓

The green tint area charted within the limits of this survey represent wire drag clearances ranging from 15 to 17 fathoms. Most of these areas were located in depths greater than 24 fathoms and did not receive 200% side scan coverage. Line spacing, at the maximum, was 100 meters and reduced to 10 meters in some locations of the green tint areas. The line spacing was based on the bottom relief observed during this survey as well as compared to soundings from prior surveys. In areas where bottom relief was irregular, the line spacing was reduced to determine shoalest sounding. In the areas where 100 meter line spacing was used, 1 to 2 fathoms relief changes were consistently observed between adjacent lines following the general trend of the bottom relief. The survey area also experienced strong tidal currents ranging in speeds up to 3 knots. These currents produced distinctive surface currents and eddies in the vicinity of known shoals. The hydrographer did not see any of these shoal indicators in the area of the green tint surveyed with 100 meter line spacing. This, coupled with the consistent bottom relief and no reported hangs on the prior wire drag survey, suggest that no significantly shoaler sounding would be found if the line spacing were reduced. The hydrographer recommends this survey supercede the prior wire drag survey and that the green tint be removed from the chart and replaced with the soundings of this survey. *CONCUR*

A charted submerged rock at latitude $48^{\circ}42'07.8''N$ longitude $122^{\circ}46'34.4''W$, is located in 4 fathoms approximately 40 meters from a 1.7 fathoms / 2.6 meters sounding from this survey, Fix 33045, DN 133. The submerged rock was not visible from the surface and not dove on for verification. The hydrographer *5* recommends removing the charted submerged rock and charting a submerged rock at the location of the 1.4 fathom sounding. *CONCUR with clarification. Chart as 13 rky.*

O. ADEQUACY OF SURVEY (*See EVAL RPT., Secs. M, O and P*)

The survey is a complete navigable area hydrographic survey and is adequate to supercede all prior surveys within their common areas. Two-hundred-meter line spacing was used in areas with depths greater than 80 meters/43.7 fathoms. One-hundred-meter line spacing or less was used in areas with depths less than 80 meters/43.7 fathoms. Two-hundred percent side scan sonar coverage was acquired in most all areas with depths less than 43.9 meters/24-fathoms as per section 7.2 of the Project Instructions. *CONCUR with clarification.*

P. AIDS TO NAVIGATION (*See EVAL RPT., Sec. Q*)

Four fixed and three floating aids to navigation were located within the survey limits and verified in accordance with section 4.2.3 of the project instructions. Three of the fixed lights were positioned to third order triangulation using static GPS methods. The lights positioned are listed in the table below. These positions will be forwarded to the U.S. Coast Guard, by their request, along with the positions of the

remaining lights in the project area once they have been positioned. A copy of NOAA Form 76-40 (Nonfloating Aids or Landmarks for Charts) is located in Appendix J. *attached to this report.*

Navigational Aid	Light List Number	Characteristic	Surveyed Position	Charted Position	Light List Position
Peapod Rocks Light 15	19490	Fl G 4s	48°38'32.234"N 122°44'37.108"W	48°38'32.107"N 122°44'37.061"W	None
The Sisters Light 17	19515	Fl G 2.5s	48°41'41.124"N 122°45'25.305"W	48°41'40.128"N 122°45'25.092"W	48°41.7'N 122°45.4'W
Village Point Light 18	19520 ⁵	Fl R 4s	48°43'00.827"N 122°43'06.620"W	48°43'00.084"N 122°43'06.168"W	None

Q. STATISTICS ✓

<u>Description</u>	<u>Quantities</u>
Total Positions	35457
Total Detached Positions	113
Total Nautical Miles Hydrography	656.65
Nautical Miles Sidescan Hydrography	111.94
Velocity Casts	17
Days of Production	73
Bottom Samples	36
Tide Stations	1
Dives	11
Square Nautical Miles Hydrography	23.79
Square Nautical Miles Sidescan	4.83

R. MISCELLANEOUS ✓

Bottom samples were acquired and forwarded to the Smithsonian Institute in accordance with section 6.7 of the Project Instructions. A copy of the Oceanographic Log Sheet-M, Bottom Sediment Data (NOAA Form 75-44) is included in Separate II. *

Duplicate fixes occurred on several days and they were not discovered until correction of the error was too complicated and affected several data sets. With two exceptions, where two consecutive fixes were duplicated, only single fixes were duplicated. No conflicts in the data were observed due to the duplicate fixes. A list of the duplicate fixes is included in Appendix J. *

No magnetic disturbances were observed. *CONCUR.*

S. RECOMMENDATIONS

While researching shoreline features, the hydrographer was informed that recent shoreline photogrammetry is available but has not been compiled for the area defined by this project. The hydrographer recommends the shoreline photography be compiled and applied to support this survey. This information would have also aided with this project had it been made available to the hydrographer before the project was started. *CONCUR.*
(No latest shoreline photogrammetric data for the area is available at the present time.)

T. REFERRAL TO REPORTS ✓

Title

Date

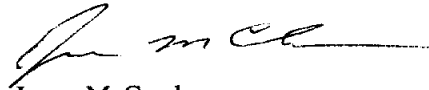
Horizontal Control Report
OPR-N368-PHP

June 1997
Supplemental report to follow

Coast Pilot Report

To follow

Approved and forwarded,



James M. Crocker
Lieutenant (jg), NOAA
Chief, PHP

Item Investigation Data

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M1-Charted 25 fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 25 fathoms (45.7 meters) sounding appears on Charts 18430, 18431, 18424, 18423, and 18421. The source of the sounding is prior survey H-1953, 1889. The sounding was not disproved by prior survey H-8322, 1956 and was retained on the chart. ✓

SOURCE POSITION: Charted position - Latitude: 48° 42' 48.6" N
Longitude: 122° 43' 43.2" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 222 an echosounder development was conducted over the area with a minimum line spacing of 10 meters (fix 37,124 to 37,188).

RESULTS OF INVESTIGATION: Depths defined by the development ranged from 33.2 fathoms (60.7 meters) to 38.7 fathoms (70.8 meters).

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8322 depicts a least depth of 25 fathoms (19.2 meters) which was retained from H-1953. The depths adjacent to the sounding agree with depths from this survey. *The present survey found depths ranging from 23-28 fathoms within 100 meters west of the charted prior depth*

CHARTING RECOMMENDATIONS: Delete 25 fathoms (45.7 meters) sounding charted at latitude: 48° 42' 48.6" N, longitude: 122° 43' 43.2" W and chart soundings from this survey. *CONCUR*

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M2-Charted 6₃ fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 6₃ fathoms (11.9 meters) sounding appears on Charts 18430 and 18421 as a 6 ½ fathom sounding.

SOURCE POSITION: Charted position - Latitude: 48° 38' 09.3" N
Longitude: 122° 45' 08.8" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 97 an echosounder development was conducted over the area with a minimum line spacing of 5 meters (fix 29120 to 29188). A dive investigation of the developed least depth was conducted on DN 196, Fix 36008. ✓

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 36008, was taken at the buoy to mark the diver's least depth of 10.7 fathoms (19.2 meters). ✓

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth of 6.6 fathoms (12.1 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. *concur*

CHARTING RECOMMENDATIONS: Delete 6₃ fathoms (11.9 meters) sounding charted at latitude: 48° 38' 09.3" N, longitude: 122° 45' 08.8" W and chart soundings from this survey. *CHART 103 RK @*

*48/38/09.5
122/45/07.9
36008*

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36008
DAY-OF-THE-YEAR 196 LATITUDE 48/38/09 N
START TIME 12:36 LONGITUDE 122/45/08 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.64 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 45.32 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 21.14 decibars
COMPUTED LEAST DEPTH 21.14 meters

Time of LD Measurement (UTC): 16:31:22
LD Measurement (m): 21.14
Tide Corrector (m): -1.9
Corrected Least Depth (m): 19.2

Comments: 10.5 ~~ftm~~ fm

Charted 63 ftm sounding disproved - least depth on large

Bedrock feature taken at high point

Recommendation: Remove charted 63 from chart chart sounding
from this survey.

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

Date: 7/15/98 DN: 196 Survey: H-10766, sheet A
 Location: Perpetual Rocks, Rosario Strait
 Latitude: 48 38.22 Longitude: 122 45 19 Divemaster: Crocker
 Diver in Charge: Wernicke Launch: 0651 0652 Coxswain: Wernicke
 Tenders: Brown Equipment Used: SCUBA

Dive Plan: Least Dive investigations w/ ROTH dive gauge, circle search

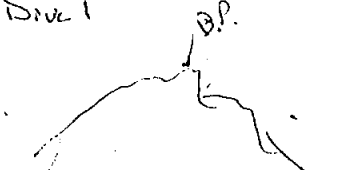
Weather: Wind: Calm (Kts/dir)
 Seas: Calm (ft)
 Swell: None (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Rothmeyer	—	—	2800	0420	1600 0431	0430	7 min	73 ft	C
Crocker	—	—	3100	0420	1700 0431	0430	7 min	73 ft	C
ROTH			1600	445	300	9:55	5 min	68 ft	E
Crocker			1700	445	800	9:55	5 min	68 ft	E

Current: 0 Visibility: _____ Bottom Type: rocky

Description & Dimensions:

Dive 1



Dive 2



Diver Gauge Information

Dive 1 P_{in}: 14.64 P_{LD}: 45.32 P_{out}: Fix# 36008
 Dive 2 P_{in}: 14.58 P_{LD}: 40.03 P_{out}: Fix# 36009

Time of Least Depth Measurement: _____

14.58

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M3-Charted 8₁ fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 8₁ fathom (14.9 meters) sounding appears on Chart 18430 and on Charts 18421, 18423, and 18400 as a 8 fathom sounding.

SOURCE POSITION: Charted position - Latitude: 48° 41' 35.6" N
Longitude: 122° 46' 40.9" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 133 an echosounder development was conducted with East - West oriented lines over the area with a minimum line spacing of 10 meters, 5 meters over shoalest soundings (fix 33079 to 33195). The area was further developed with North - South oriented lines and a drift search on DN 233 (fix 37673 to 37786) ✓

RESULTS OF INVESTIGATION: A ^{6.0}~~5.8~~ fathom (10.7 meter) sounding was located at fixes 37726 and 37774. These soundings were located approximately 80 meters north of the charted 8₁ fathoms sounding. A ^{6.1}~~7.8~~ fathom (14.4 meter) sounding, fix 37735, was found to correspond with the charted 8₁ fathoms sounding.

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8322 shows corresponding depth of 6.1 fathoms (11.1 meters) to the surveyed ^{6.0}~~5.8~~ fathom (10.7 meter). Survey H-8322 is the source of the charted 8₁ fathoms. The prior survey soundings are found to be in good agreement with this survey. CONCUR ✓

CHARTING RECOMMENDATIONS: Chart the ^{6.0}~~5.8~~ fathom (10.7 meter) sounding, latitude: 48° 41' 38.44" N, longitude: 122° 46' 40.63" W, from this survey to Chart 18430 to further define the shoal that extends south from the southern tip of Barnes Island. CONCUR ✓

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M4-Charted 9 fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 9 fathom (14.9 meters) sounding appears on Chart 18430.

SOURCE POSITION: Charted position - Latitude: 48° 41' 35.23" N
Longitude: 122° 46' 02.17" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 166 an echosounder development was conducted with East - West oriented lines over the area with a minimum line spacing of 5 meters (fix 34864 to 34927). The area was further developed with 5 meter North - South oriented lines on DN 233 (fix 37577 to 37672) ✓

RESULTS OF INVESTIGATION: A ^{6.2} fathom (11.1 meter) sounding was located at fix 37589, DN 233, latitude: 48° 41' 35.97" N, longitude: 122° 46' 02.69" W

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8322 shows a corresponding depth of 6.1 fathoms (11.1 meters) to the surveyed 6.0 fathom (11.1 meter) sounding. Survey H-8322 is the source of the charted 9 fathoms which is adjacent to the 6.1 fathom sounding. The prior survey soundings are found to be in good agreement with this survey. *CONCUR* ✓

CHARTING RECOMMENDATIONS: Delete the 9 fathom (14.9 meters) sounding charted at latitude: 48° 41' 35.23" N, longitude: 122° 46' 02.17" W and chart the ^{6.2 *} fathoms (11.1 meter) sounding at latitude: 48° 41' 35.97" N, longitude: 122° 46' 02.69" W. *CONCUR.* ✓ *Chart 61*

** based on actual fathoms.*

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M5-Charted 40 fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: ✓ The 40 fathoms (73.1 meters) sounding appears on Charts 18430.

SOURCE POSITION: Charted position - Latitude: 48° 38' 38.58" N ✓
Longitude: 122° 43' 20.21" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 222 an echosounder development was conducted over the area with a minimum line spacing of 10 meters (fix 37,331 to 37,384). ✓

RESULTS OF INVESTIGATION: Depths defined by the development ranged from 42.3 fathoms (77.3 meters) to 43.6 fathoms (79.7 meters). *CONCUR* ✓

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 depicts a least depth of 40 fathoms (73.1 meters) and appears to be the source of the chart. The depths adjacent to the sounding agree with depths from this survey. *CONCUR*.

CHARTING RECOMMENDATIONS: Delete 40 fathoms (73.1 meters) sounding charted at latitude: 48° 38' 38.58" N, longitude: 122° 43' 20.21" W and chart soundings from this survey. *CONCUR*. ✓

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M6-Charted 40 fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 40 fathoms (73.1 meters) sounding appears on Charts 18430, 18423, and 18421.

SOURCE POSITION: Charted position - Latitude: 48° 38' 16.30" N ✓
Longitude: 122° 43' 25.03" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 222 an echosounder development was conducted over the area with a minimum line spacing of 10 meters (fix 37,385 to 37,438). ✓

RESULTS OF INVESTIGATION: Depths defined by the development ranged from 41.5 fathoms (75.9 meters) to 42.5 fathoms (77.7 meters). *CONCUR* ✓

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 depicts a least depth of 40 fathoms (73.1 meters) and appears to be the source of the chart. The depths adjacent to the sounding agree with depths from this survey. *CONCUR*

CHARTING RECOMMENDATIONS: Delete 40 fathoms (73.1 meters) sounding charted at latitude: 48° 38' 16.30" N, longitude: 122° 43' 25.03" W and chart soundings from this survey. *CONCUR* ✓

ITEM INVESTIGATION REPORT

ITEM NO.: M7-Charted 18 fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 18 fathoms (32.9 meters) sounding appears on Charts 18430, 18423, and 18421.

SOURCE POSITION: Charted position - Latitude: 48° 39' 59.85" N
Longitude: 122° 43' 59.68" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: The area was first developed with echosounder using East - West oriented lines spaced at 20 meters, with 5 meter spacing over the shoalest soundings, on DN 100 (fix 30115 to 30149). On DN 222 an echosounder development, using North - South oriented lines, was conducted over the area with a minimum line spacing of 5 meters (fix 37,301 to 37,330).

RESULTS OF INVESTIGATION: A least depth of 20 fathoms (36.7 meters) was determined on DN 222, fix 37310, latitude: 48° 39' 59.18" N, longitude: 122° 44' 00.25" W. *Concur.*

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 depicts a least depth 18 of fathoms (32.9 meters) and is the source for the chart. The depths adjacent to the sounding agree with depth from this survey. *CONCUR. Supersede the area based on the latest survey information.*

CHARTING RECOMMENDATIONS: Delete 18 fathoms (32.9 meters) sounding charted at latitude: 48° 39' 59.85" N, longitude: 122° 43' 59.68" W and chart soundings from this survey. *CONCUR.*

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M8-Charted 7₄ fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: ✓ The 7₄ fathoms (14.0 meters) sounding appears on Charts 18430 and 18431, as a 7 1/2 fathom sounding on charts 18400 and 18421.

SOURCE POSITION: Charted position - Latitude: 48° 42' 40.82" N ✓
Longitude: 122° 46' 08.98" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 127 an echosounder development was conducted over the area with a minimum line spacing of 5 meters (fix 31396 to 31447). A dive investigation of the developed least depth was conducted on DN 197, Fix 36089. *CONCUR* ✓

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 36089, was taken at the buoy to mark the diver's least depth of 7.5 fathoms (13.8 meters), latitude: 48° 42' 41.04" N, longitude: 122° 46' 08.68" W. ✓

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8322 shows a depth 7.7 fathoms (14.1 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. *CONCUR*

CHARTING RECOMMENDATIONS: Delete 7₄ fathoms (14.0 meters) sounding charted at latitude: 48° 42' 40.82" N, longitude: 122° 46' 08.98" W and chart soundings from this survey. *CONCUR* ✓

*CHART "7₃ Rk" at position
as found by this survey.*

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36089
DAY-OF-THE-YEAR ~~196~~ 197 LATITUDE 48/42/41 N
START TIME 12:36 LONGITUDE 122/46/09 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.62 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 37.12 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 15.50 decibars
COMPUTED LEAST DEPTH 15.52 meters

Time of LD Measurement (UTC): 18:20:11
LD Measurement (m): 15.52
Tide Corrector (m): -1.7
Corrected Least Depth (m): 13.8

Comments: 7.5 FTM fm ✓

Large "bedrock Ridge" with several peaks. Least Depth
taken on shallowest point.

Recommendation: _____

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

Date: 7/16/98 DN: 196 197 Survey: H-10766 Sheet N
 Location: N Clark Island, Lawrence PT
 Latitude: _____ Longitude: _____ Divemaster: Crocker
 Diver in Charge: Crocker Launch: 0651 0652 Coxswain: _____
 Tenders: _____ Equipment Used: Squalor, Mod III

Dive Plan: _____

Weather: _____ Wind: calm (Kts/dir)
 Seas: calm (ft)
 Swell: calm (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Crocker	—	—	3100	0601	1700 1700	0614	10	60	B
Brown	—	—	3200	0601	200	0614	10	60	B
Brown		B	3500	0657	200 500	711	10	80	E
Rothman	—	—	2800	0657	200 500	711	10	80	C

Current: slight drift Visibility: 5-10m Bottom Type: Rock

#2. Strong surface current @ 1kt Fix 36090

Description & Dimensions:



Diver Gauge Information

P_{in}: 14.08 P_{LD}: 37.12 P_{out}: _____ Fix 36089

Time of Least Depth Measurement: _____

P_{in} 14.15 P_{LD} 42.10 Fix 36090

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M9-Charted 9, fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 9, fathoms (18.0 meters) sounding appears on chart 18430, on charts 18400 and 18421, as a 9 ¾ fathom sounding, and on chart 18423 as a 9₄ fathom sounding. ✓

SOURCE POSITION: Charted position - Latitude: 48° 39' 59.69" N ✓
Longitude: 122° 44' 40.16" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 100 an echosounder development was conducted over the area with a minimum line spacing of 5 meters (fix 29989 to 30081). A dive investigation of the developed least depth was conducted on DN 197, Fix 36090. *Concur* ✓

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 36090, was taken at the buoy to mark the diver's least depth of 9.4 fathoms (17.3 meters), latitude: 48° 39' 59.54" N, longitude: 122° 44' 39.66" W. *Concur* ✓

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 9.9 fathoms (18.1 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. *CONCUR*.

CHARTING RECOMMENDATIONS: Delete 9, fathoms (18.0 meters) sounding charted at latitude: 48° 39' 59.69" N, longitude: 122° 44' 40.16" W and chart soundings from this survey. *CONCUR*. ✓

*chart "92 Rk" at position
is found by this survey.*

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36090
DAY-OF-THE-YEAR ~~196~~ 197 LATITUDE 48/39/59 N
START TIME 12:36 LONGITUDE 122/44/40 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.65 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 42.10 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 18.92 decibars
COMPUTED LEAST DEPTH 18.92 meters

Time of LD Measurement (UTC): 19:19:51
LD Measurement (m): 18.9
Tide Corrector (m): -1.6
Corrected Least Depth (m): 17.3

Comments: 9.5 fms fm
Large bedrock feature least depth taken at high point

Recommendation: _____

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

Date: 7/16/98 DN: 196 197 Survey: H-10966 Sheet N
 Location: N Clark Island, Lawrence PT
 Latitude: _____ Longitude: _____ Divemaster: Crocker
 Diver in Charge: Crocker Launch: 0651 0652 Coxswain: _____
 Tenders: _____ Equipment Used: Scuba, Med Hel

Dive Plan: _____

Weather: _____ Wind: calm (Kts/dir)
 Seas: calm (ft)
 Swell: calm (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Crocker	—	—	3100	0601	1700 1700	0614	10	60	B
Brown	—	—	3200	0601	200	0614	10	60	B
Brown		B	3500	0657	200 500	711	10	80	E
Rothmeyer	—	—	2400	0657	200 500	711	10	80	C

Current: Slight Drift Visibility: 5-10m Bottom Type: Rock

#2. Strong Surface Current 1KT Fix 36090

Description & Dimensions:



Diver Gauge Information

P_{in}: 14.08 P_{LD}: 37.12 P_{out}: Fix 36089

Time of Least Depth Measurement: _____

P_{in} 14.15 P_{LD} 42.10 Fix 36090

ITEM INVESTIGATION REPORT

ITEM NO.: M10-Charted 9₂ fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 9₂ fathoms (17.1 meters) sounding appears on chart 18430, on charts 18400 and 18421, as a 9 ¼ fathom sounding, and on chart 18423 as a 9₁ fathom sounding.

SOURCE POSITION: Charted position - Latitude: 48° 38' 15.05" N
Longitude: 122° 44' 51.50" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 097 an echosounder development was conducted over the area with a minimum line spacing of 5 meters (fix 29217 to 29276). A dive investigation of the developed least depth was conducted on DN 196, Fix 36009. CONCUR

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 36009, was taken at the buoy to mark the diver's least depth of 8.6 fathoms (15.8 meters), latitude: 48° 38' 15.37" N, longitude: 122° 44' 52.85" W. CONCUR

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 9.3 fathoms (17.0 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. CONCUR

CHARTING RECOMMENDATIONS: Delete 9₂ fathoms (17.1 meters) sounding charted at latitude: 48° 38' 15.05" N, longitude: 122° 44' 51.50" W and chart soundings from this survey. CONCUR

CHART "8₃ RK" at position
Found by this survey.

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36009
DAY-OF-THE-YEAR 196 LATITUDE 48/38/15 N
START TIME 12:36 LONGITUDE 122/44/53 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.58 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 40.03 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 17.53 decibars
COMPUTED LEAST DEPTH 17.54 meters

Time of LD Measurement (UTC): 16:54:42
LD Measurement (m): 17.54
Tide Corrector (m): -1.7
Corrected Least Depth (m): 15.8

Comments: 8.6 fpm fur

Several bedrock ridges least depth taken at high point
of feature.

Recommendation: _____

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

Date: 7/15/98 DN: 196 Survey: H-10766, sheet N
 Location: Peperid Rocks, Ross Sea Strait
 Latitude: 48 38.22 Longitude: 122 45 19 Divemaster: Crocker
 Diver in Charge: Wernicki Launch: 0651 0652 Coxswain: Wernicki
 Tenders: Brown Equipment Used: SCUBA

Dive Plan: Least Dive investigation w/ ROATH dive gauge, circle search.

Weather: Wind: Calm (Kts/dir)
 Seas: Calm (ft)
 Swell: None (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Rothmeyer	—	—	2800	0420	1600 0431	0430	7 min	73 ft	C
Crocker	—	—	3100	0420	1700 0431	0430	7 min	73 ft	C
Roth.			1600	4:45	300	9:55	5 min	68 ft	E
Crack.			1700	4:45	800	9:55	5 min	68 ft	E

Current: 0 Visibility: _____ Bottom Type: rocky

Description & Dimensions:



Diver Gauge Information

Dive 1 P_{in}: 14.64 P_{LD}: 45.32 P_{out}: Fix# 36008
 Dive 2 P_{in}: 14.58 P_{LD}: 40.03 P_{out}: Fix# 36009

Time of Least Depth Measurement: _____

7458

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M11-Charted 3₅ fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: ✓ The 3₅ fathoms (7.0 meters) sounding appears on chart 18430, on charts 18400 and 18421, as a 3 ½ fathom sounding, and on chart 18423 as a 3₅ fathom sounding.

SOURCE POSITION: Charted position - Latitude: 48° 37' 26.04" N ✓
Longitude: 122° 43' 48.00" W ✓

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 048 an echosounder development was conducted over the area with a minimum line spacing of 5 meters (fix 27838 to 27889). A dive investigation of the developed least depth was conducted on DN 196, Fix 36010. *CONCUR* ✓

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 36010, was taken at the buoy to mark the diver's least depth of 3.9 fathoms (7.2 meters), latitude: 48° 37' 26.87" N, longitude: 122° 43' 48.28" W. *(ON LARGE ROCKY BEDROCK)*

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 3.8 fathoms (6.9 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. *CONCUR.*

CHARTING RECOMMENDATIONS: Delete 3₅ fathoms (7.0 meters) sounding charted at latitude: 48° 37' 26.04" N, longitude: 122° 43' 48.00" W and chart soundings from this survey. *CONCUR.* ✓

*CHART "35 RK" at position
Found by this survey.*

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36010
DAY-OF-THE-YEAR 196 LATITUDE 48/37/27 N
START TIME 12:36 LONGITUDE 122/43/48 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.60 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 27.32 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 8.75 decibars
COMPUTED LEAST DEPTH 8.79 meters

Time of LD Measurement (UTC): 17:33:05
LD Measurement (m): 8.79
Tide Corrector (m): -1.6
Corrected Least Depth (m): 7.2

Comments: 3.9 FTM fm

Large boulders rocky bedrock shoal w/ small kelp growth.
Least depth taken at high point of shoal.

Recommendation: _____

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

Date: 7/15/98 DN: 196 Survey: H-10766

Location: Beckage Shoal, NE Doe Island 25971.

Latitude: _____ Longitude: _____ Divemaster: Crocker

Diver in Charge: Wernicke Launch: (0651) 0652 Coxswain: _____

Tenders: _____ Equipment Used: _____

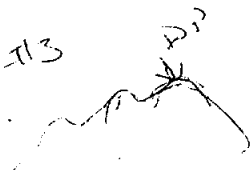
Dive Plan: Least depth dive investigation w/ MSD III

Weather: Wind: calm (Kts/dir)
 Seas: calm (ft)
 Swell: swell (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Rothmeyer		E	2800	520	2000	5:30	10	40	
Crocker		E	3000	520	2200	5:30	10	40	
Wernicke	-	-	2100	609	700	622	10	60	B
Brewer	-	-	2000	609	300	622	10	60	B

Current: _____ Visibility: _____ Bottom Type: _____

Description & Dimensions:



Diver Gauge Information

P_{in}: 14.60 P_{LD}: 27.32 P_{out}: Fix 3640

Time of Least Depth Measurement: _____

P_{in} 14.60 P_{LD} 37.50 Fix 3601

3+

2nd

ITEM INVESTIGATION REPORT

ITEM NO.: M12-Charted 6, fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 6, fathoms (12.5 meters) sounding appears on chart 18430, on chart 18421, as a 6 $\frac{3}{4}$ fathom sounding, and on chart 18423 as a 6₄ fathom sounding.

SOURCE POSITION: Charted position - Latitude: 48° 38' 06.14" N
Longitude: 122° 46' 40.54" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 321 an echosounder development was conducted over the area with a minimum line spacing of 5 meters (fix 25997 to 26092). A dive investigation of the developed least depth was conducted on DN 196, Fix 36013. *CONCUR*

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 36013, was taken at the buoy to mark the diver's least depth of 6.6 fathoms (12.1 meters), latitude: 48° 38' 06.46" N, longitude: 122° 46' 40.24" W. *CONCUR*

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 6.8 fathoms (12.4 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. *CONCUR*.

CHARTING RECOMMENDATIONS: Delete 6, fathoms (12.5 meters) sounding charted at latitude: 48° 38' 06.14" N, longitude: 122° 46' 40.54" W and chart soundings from this survey. *CONCUR*.

*CHART "6.3 RK" at position
Found by this survey.*

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36013
DAY-OF-THE-YEAR 196 LATITUDE 48/38/06 N
START TIME 12:36 LONGITUDE 122/46/40 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.60 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 34.00 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 13.36 decibars
COMPUTED LEAST DEPTH 13.39 meters

Time of LD Measurement (UTC): 17:00:34

LD Measurement (m): 13.39

Tide Corrector (m): -1.6 -1.3

Corrected Least Depth (m): 11.8 12.1

Comments: 6.5 ftm dm

Bedrock shoal w/ small kelp growing off rocks least
depth on highpoint of shoal

Recommendation: _____

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

Date: 7/15/99 DN: 190 Survey: 17-10706
 Location: NE Doe Island Target 26089, 7/4 School 1st 26974
 Latitude: _____ Longitude: _____ Divemaster: Crocker
 Diver in Charge: Wernicke Launch: 0651 0652 Coxswain: _____
 Tenders: _____ Equipment Used: _____

Dive Plan: _____

Weather: Wind: calm (Kts/dir)
 Seas: calm (ft)
 Swell: _____ (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Wernicke	30 23	B	3000	645	2000	656	10	50 49	C
Brown	30 23	B	3100	645	1300	656	10	50	C
Wernicke	75 50	C	200	715	1300	722	7	60	
Brown	20	C	1300	715	500	722	7	60	

Current: _____ Visibility: _____ Bottom Type: _____

Description & Dimensions:

Diver Gauge Information

P_{in}: 14.00 P_{LD}: 34.00 P_{out}: Fix 36013

Time of Least Depth Measurement: _____

P_{in} 14.60 P_{LD} 36.66 P_{out} Fix 36014

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M13-Charted 7₃ fathom sounding ✓
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 7₃ fathoms (13.7 meters) sounding appears on chart 18430, on chart 18421, as a 7 ✓
½ fathom sounding, and on chart 18423 as a 7₁ fathom sounding.

SOURCE POSITION: Charted position - Latitude: 48° 38' 02.26" N ✓
Longitude: 122° 46' 53.26" W ✓

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 321 an echosounder development was conducted over the ✓
area with a minimum line spacing of 5 meters (fix 25839 to 25996). A dive investigation of the
developed least depth was conducted on DN 196, Fix 36011. *Concur*

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and ✓
marked by a buoy. A detached position, fix 36011, was taken at the buoy to mark the diver's least depth
of 7.8 fathoms (14.4 meters), latitude: 48° 38' 01.48" N, longitude: 122° 46' 53.59" W.

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 7.5 fathoms (13.7
meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in
good agreement with this survey. *CONCUR.*

CHARTING RECOMMENDATIONS: Delete 7₃ fathoms (13.7 meters) sounding charted at latitude:
48° 38' 02.26" N, longitude: 122° 46' 53.26" W and chart soundings from this survey. *CONCUR.*

*CHART "7₅ RK" at position
found by this survey.*

NOAA FORM 76-40
(8-74)

Replaces C&GS Form 567.

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

NONFLOATING AIDS OR LANDMARKS FOR CHARTS

REPORTING UNIT (Field Party, Ship or Office)		STATE	LOCALITY	DATE	ORIGINATING ACTIVITY	
<input type="checkbox"/> TO BE CHARTED	<input checked="" type="checkbox"/> TO BE REVISED	WA	Northern Point Sound	10/14/98	<input checked="" type="checkbox"/> HYDROGRAPHIC PARTY	
<input type="checkbox"/> TO BE DELETED	The following objects HAVE <input type="checkbox"/> HAVE NOT <input type="checkbox"/>				<input type="checkbox"/> PHOTO FIELD PARTY	
OPR PROJECT NO.	JOB NUMBER				<input type="checkbox"/> COMPILATION ACTIVITY	
					<input type="checkbox"/> FINAL REVIEWER	
					<input type="checkbox"/> QUALITY CONTROL & REVIEW GRP.	
					<input type="checkbox"/> COAST PILOT BRANCH	
					(See reverse for responsible personnel)	
DESCRIPTION (Record reason for deletion of landmark or aid to navigation. Show triangulation station names, where applicable, in parentheses)		DATUM		METHOD AND DATE OF LOCATION (See instructions on reverse side)		CHARTS AFFECTED
CHARTING NAME	SURVEY NUMBER	POSITION		OFFICE	FIELD	
		N LATITUDE	W LONGITUDE			
		"	"			
		D.M. Meters	D.P. Meters			
Peapack Rocks	PHP-10-2-97	48° 38'	122° 44'		F-1-GPS	18400 18421 18423
Light 15	LLN 19490					18430
The Sisters	Positioned to Third Order	48° 41'	122° 45'		F-1-GPS	18400 18421 18423
Light 17	LLN 19515					18430
Village Point	Positioned to Third Order	48° 43'	122° 43'		F-1-GPS	18400 18421 18423
Light 18	LLN 19520					18430 18431

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36011
DAY-OF-THE-YEAR 196 LATITUDE 48/38/01 N
START TIME 12:36 LONGITUDE 122/46/54 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.60 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 37.50 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 15.78 decibars
COMPUTED LEAST DEPTH 15.79 meters

Time of LD Measurement (UTC): 18:28:05
LD Measurement (m): 15.79
Tide Corrector (m): -1.7 -1.4
Corrected Least Depth (m): 14.1 14.4

Comments: 7.8 FTHs per
Southern Bedrock ^{outcrop} ~~feature~~ Least Depth taken at high point
of edge of feature

Recommendation: _____

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

Date: 7/15/98 DN: 196 Survey: H-10766

Location: Buckeye Shoal, NE Doe Island 25971.

Latitude: _____ Longitude: _____ Divemaster: Crocker

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

Tenders: _____ Equipment Used: _____

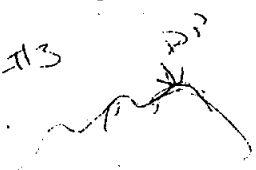
Dive Plan: Least depth dive Investigation w/ MOD III

Weather: _____ Wind: calm (Kts/dir)
 Seas: calm (ft)
 Swell: swell (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
<u>Rothmeyer</u>		<u>E</u>	<u>2800</u>	<u>520</u>	<u>2000</u>	<u>5:30</u>	<u>10</u>	<u>40</u>	
<u>Crocker</u>		<u>E</u>	<u>3000</u>	<u>520</u>	<u>2200</u>	<u>5:30</u>	<u>10</u>	<u>40</u>	
<u>Wernicke</u>	-	-	<u>2100</u>	<u>609</u>	<u>700</u>	<u>622</u>	<u>10</u>	<u>60</u>	<u>B</u>
<u>Brown</u>	-	-	<u>2000</u>	<u>609</u>	<u>300</u>	<u>622</u>	<u>10</u>	<u>60</u>	<u>B</u>

Current: _____ Visibility: _____ Bottom Type: _____

Description & Dimensions:



Diver Gauge Information

^{1st} P_{in}: 14.60 P_{LD}: 27.32 P_{out}: Fix 3610

Time of Least Depth Measurement: _____

^{2nd} P_{in}: 14.60 P_{LD}: 37.50 P_{out}: Fix 3601

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.00

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1997
AWOIS NUMBER: none CONTACT NUMBER: 50731.4p
FIX NUMBER: 25006
DAY-OF-THE-YEAR 296 LATITUDE 48/38/00 N
START TIME 11:44 LONGITUDE 122/46/48 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/21/97
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.66 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 39.32 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 17.03 decibars
COMPUTED LEAST DEPTH 17.06 meters

Time of LD Measurement (UTC): 19:15:48
LD Measurement (m): 17.06 m
Tide Corrector (m): -2.3 m
Corrected Least Depth (m): 14.8 m

Comments: Fact = 48.6 Fathom = 8.1 ✓

Strong current Beakrock feature least depth on 10/3/97
point found during survey.

Recommendation: _____

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

Date: Oct 21, 1997 DN: 294 Survey: H-10766
 Location: Doc Bay Hunted 7ftm Shoal
 Latitude: 48° 38.0' Longitude: 122 46.8 Divemaster: Berkowitz
 Diver in Charge: Crocker Launch: 0651 0652 Coxswain: Wernick
 Tenders: Crocker Equipment Used: Least Depth & Diver Comm

Dive Plan: Descend Bay Search for least depth

Weather: Wind: Light (Kts/dir)
 Seas: Light (ft)
 Swell: None (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Mark	20min	B	2400	1851	0100	1906	10	60	F
Eric	20min	B	2000	1851	0800	1906	10	60	E

Current: Strong 1kt Visibility: _____ Bottom Type: Rocky

Description & Dimensions: Booy moved to possible least depth. Short search do to current.

Diver Gauge Information

P_{in}: 14.66 P_{LD}: 39.32 P_{out}: _____

Time of Least Depth Measurement: _____

✓

ITEM INVESTIGATION REPORT ✓

ITEM NO.: M14-Charted 7₂ fathom sounding ✓
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO.: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 7₂ fathoms (13.4 meters) sounding appears on chart 18430, on charts 18400 and 18421, as a 7 ¼ fathom sounding, and on chart 18423 as a 7₁ fathom sounding. ✓

SOURCE POSITION: Charted position - Latitude: 48° 37' 34.50" N ✓
Longitude: 122° 46' 51.65" W ✓

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: On DN 324 and 325, an echosounder development was conducted over the area with a minimum line spacing of 5 meters (fix 26849 to 27071). A dive investigation of the developed least depth was conducted on DN 196, Fix 36014. ✓

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 36014, was taken at the buoy to mark the diver's least depth of 7.7 fathoms (14.1 meters), latitude: 48° 37' 34.35" N, longitude: 122° 46' 51.75" W. *Concur* ✓

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 7.3 fathoms (13.4 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. *Concur*.

CHARTING RECOMMENDATIONS: Delete 7₂ fathoms (13.4 meters) sounding charted at latitude: 48° 37' 34.50" N, longitude: 122° 46' 51.65" W and chart soundings from this survey. *CONCUR*.

CHART "7₃ RK" @ position listed above.

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.10

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1998
AWOIS NUMBER: CONTACT NUMBER:
FIX NUMBER: 36014
DAY-OF-THE-YEAR 196 LATITUDE 48/37/34 N
START TIME 12:36 LONGITUDE 122/46/52 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/12/98
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.60 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 36.66 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 15.20 decibars
COMPUTED LEAST DEPTH 15.21 meters

Time of LD Measurement (UTC): 19:27:15
LD Measurement (m): 15.21
Tide Corrector (m): -1.1
Corrected Least Depth (m): 13.8 14.1

Comments: 7.7 fms fm

Bedrock bottom Least Depth Taken at High point of
feature

Recommendation: _____

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

Date: 7/15/99 DN: 190 Survey: 17-10766
 Location: NE Doe Island target 26089, 7/4 shot tgt 26974
 Latitude: _____ Longitude: _____ Divemaster: CROCKETT
 Diver in Charge: Wernicke Launch: 0651 0652 Coxswain: _____
 Tenders: _____ Equipment Used: _____

Dive Plan: _____

Weather: _____ Wind: calm (Kts/dir)
 Seas: calm (ft)
 Swell: _____ (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Wernicke	30 23	B	3000	645	2000	656	10	50 49	C
Brown	30 23	B	3100	645	1300	656	10	50	C
Wernicke	7 50	C	200	715	1300	722	7	60	
Brown	20	C	1300	715	500	722	7	60	

Current: _____ Visibility: _____ Bottom Type: _____

Description & Dimensions:

Diver Gauge Information

P_{in}: 14.60 P_{LD}: 34.00 P_{out}: Fix 36013

Time of Least Depth Measurement: _____

P_{in} 14.60 P_{LD} 36.66 Fix 36014

ITEM INVESTIGATION REPORT

ITEM NO.: M15-Charted 3 fathom sounding
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

DESCRIPTION: The 3 fathoms (5.5 meters) sounding appears on charts 18430, 18421, and 18423.

SOURCE POSITION: Charted position - Latitude: 48° 37' 43.87" N
Longitude: 122° 47' 41.56" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: A dive investigation of the side scan sonar contact was conducted on DN 294, Fix 25005. The area was further developed on DN 321 with the echosounder using a minimum line spacing of 5 meters (fix 25567 to 25753). *Concur*

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 25005, was taken at the buoy to mark the diver's least depth of 2.5 fathoms (4.9 meters), latitude: 48° 37' 43.32" N, longitude: 122° 47' 40.99" W. The divers depth was found to be shoaler than the depths of the echosounder development. *Concur*

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 3 fathoms (5.5 meters) and appears to be the source of the charted sounding. Adjacent soundings are found to be in good agreement with this survey. *Concur*

CHARTING RECOMMENDATIONS: Delete 3 fathoms (5.5 meters) sounding charted at latitude: 48° 37' 43.87" N, longitude: 122° 47' 41.56" W and chart soundings from this survey. *CONCUR*

*CHART "23 RK" at position
found by this survey.*

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.00

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1997
AWOIS NUMBER: none CONTACT NUMBER: 50384.4p
FIX NUMBER: 25005
DAY-OF-THE-YEAR 296 LATITUDE 48/37/42 N
START TIME 11:44 LONGITUDE 122/47/36 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/21/97
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.71 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 25.19 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 7.24 decibars
COMPUTED LEAST DEPTH 7.29 meters

Time of LD Measurement (UTC): 18:19:59

LD Measurement (m): 7.29 m

Tide Corrector (m): - 2.4

Corrected Least Depth (m): 4.9 m

Comments: Fcet = 16.1 fathoms = 2.7

Large boulder / rocky formation, - Bedrock least depth,
taken at High point of feature.

Recommendation: _____

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

Date: Oct 21 1947 DN: 294 Survey: H-10766
 Location: Essex Orows Island Charted 3 FT
 Latitude: 48° 37.7' Longitude: 122° 47.6 Divemaster: Berkowitz
 Diver in Charge: Crocker Launch: 0651 0652 Coxswain: Wernick
 Tenders: Crocker Equipment Used: Mod 3, Dive Coms.

Dive Plan: Test Dive Comms and least depth circle search

Weather: Wind: Calm (Kts/dir)
 Seas: calm (ft)
 Swell: None (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Mark	—	—	2600		500		10	40	B
Eric	—	—	3000		2000		10	40	B

Current: 1/4 kts Visibility: 8-10 ft Bottom Type: Rocky w/ kelp

Description & Dimensions: Large Boulder / rocky ~~mass~~ formation
 TLT # 50384.4p Least Depth at shallowest point.

Diver Gauge Information

P_{in}: 14.71 P_{LD}: 25.19 P_{out}: _____

Time of Least Depth Measurement: _____

ITEM INVESTIGATION REPORT ✓

Subm rock
ITEM NO.: M16-Charted ~~rock~~ ~~awash~~ symbol
AWOIS NUMBER: N/A
SURVEY: H-10766

CHART NO: 18430 (1:25,000)
EDITION: 6th
CHART DATE: November 2, 1996

Subm rock @ Level of chart datum
DESCRIPTION: The ~~rock~~ ~~awash~~ symbol appears on charts 18430 and 18421.

SOURCE POSITION: Charted position - Latitude: 48° 36' 46.62" N
Longitude: 122° 48' 10.22" W

SURVEY REQUIREMENTS: N/A

METHOD OF INVESTIGATION: A dive investigation of the side scan sonar contact was conducted on DN 294, Fix 25007. The area was further developed on DN 314 (fix 25290 to 25461) and (fix 34110 to 34153) with the echosounder using a minimum line spacing of 5 meters. *Concur* ✓

RESULTS OF INVESTIGATION: Divers searched the area and a least depth was measured and marked by a buoy. A detached position, fix 25007, was taken at the buoy to mark the diver's least depth of 2.2 fathoms (4.1 meters), latitude: 48° 36' 46.71" N, longitude: 122° 48' 09.83" W. The divers depth was found to be shoaler than the depths of the echosounder developments. *Concur* ✓

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8333 shows a depth 3.2 fathoms (5.8 meters) at the location of the charted rock but does not show a rock awash. The hydrographer does not know the source of the rock awash. Prior survey soundings in this area are found to be in good agreement with this survey. *CONCUR.*

CHARTING RECOMMENDATIONS: Delete rock awash charted at latitude: 48° 36' 46.62" N, longitude: 122° 48' 10.22" W and chart ~~rock~~ ^{*subm rock*} with least depth defined by soundings from this survey. *CONCUR. CHART "2 Rk" at position as found by this survey.*

LEAST DEPTH USING SMLGAUGE PROGRAM, VERSION 3.00

NOAA UNIT: PACIFIC FIELD PARTY YEAR 1997
AWOIS NUMBER: none CONTACT NUMBER: 50103.5s
FIX NUMBER: 25007
DAY-OF-THE-YEAR 296 LATITUDE 48/36/48 N
START TIME 11:44 LONGITUDE 122/48/30 W

CAST MEASUREMENT INSTRUMENT SEACAT S/N:1892 CD:02/21/97
LEAST DEPTH DIVER GAUGE, SERIAL NUMBER 68335

DIVER'S PREDIVE GAUGE PRESSURE 14.68 psia
DIVER'S GAUGE PRESSURE AT DESIGNATED LEAST DEPTH 23.55 psia

COMPUTED PRESSURE AT DESIGNATED LEAST DEPTH 6.13 decibars
COMPUTED LEAST DEPTH 6.19 meters

Time of LD Measurement (UTC): 20:14:35

LD Measurement (m): 6.19m

Tide Corrector (m): -2.1m

Corrected Least Depth (m): 4.1m

Comments: Fect = 13.5 Fathoms = 2.2

Large Boulder / rocky formation, Bedrock Least Depth
Taken at High point of feature

Recommendation: _____

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

Date: Oct 21 1977 DN: 294 Survey: H-10766
 Location: Booy Bay Submerged Rock TWT # 50103.5s
 Latitude: 48° 36.77 Longitude: 124° 48.5 Divemaster: Bankowitz
 Diver in Charge: Crocker Launch: 0651 0652 Coxswain: Wernicke
 Tenders: Rothmeyer Equipment Used: Mod II least Depth Gauge
Dive COM.
 Dive Plan: Descend buoy search for least Depth

Weather: Wind: Light (Kts/dir)
 Seas: Light (ft)
 Swell: None (ft)

Diver	Surface Interval	Rep Group	P _{in}	T _{in} GMT	P _{out}	T _{out} GMT	Bottom Time	Max Depth	Group
Eric		E	2500	1955	1700	2003	:08	30	
Sim	NA	NA	3000	1955	2000	2003	:08	30	A

Current: Strong 1kt Visibility: 8' Bottom Type: Rocky

Description & Dimensions:

Diver Gauge Information

P_{in}: 14.68 P_{LD}: 23.55 P_{out}: _____

Time of Least Depth Measurement: _____

APPROVAL SHEET

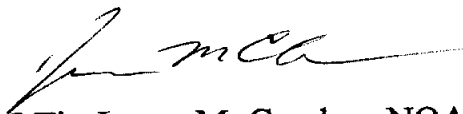
for

SURVEY H-10766

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,



LTjg James M. Crocker, NOAA
Chief
Pacific Hydrographic Party

GEOGRAPHIC NAMES

H-10766

Name on Survey	A 18450, 18723 B ON PREVIOUS SURVEY C ON U.S. QUADRANGLE MAPS D FROM LOCAL INFORMATION E ON LOCAL MAPS F P.O. GUIDE OR MAP G RAND McNALLY ATLAS H U.S. LIGHT LIST K										
	A	B	C	D	E	F	G	H	K		
BARNES ISLAND	X		X							1	
BUCKEYE SHOAL	X		X							2	
BUOY BAY	X		X							3	
CLARK ISLAND	X		X							4	
CYPRESS REEF	X		X							5	
DOE BAY (Locale)	X		X							6	
DOE BAY	X		X							7	
DOE ISLAND	X		X							8	
FERN POINT	X		X							9	
LAWRENCE POINT	X		X							10	
LEGOE BAY	X		X							11	
LITTLE SISTER	X		X							12	
LUMMI ISLAND	X		X							13	
NORTH PEAPOD	X		X							14	
ORCAS ISLAND	X		X							15	
PEAPOD ROCKS	X		X							16	
PICKETT, MOUNT	X		X							17	
ROSARIO STRAIT	X		X							18	
SOUTH PEAPOD	X		X							19	
THE SISTERS	X		X							20	
TOWHEAD ISLAND	X		X							21	
VILLAGE POINT	X		X							22	
WASHINGTON (Title)	X		X							23	
										24	
STRAIT OF GEORGIA	X		X							25	

Dennis J. Rosenberg
 Chief Geographer
 NOV 13 1998



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: January 28, 1999

HYDROGRAPHIC BRANCH: Pacific

HYDROGRAPHIC PROJECT: OPR-N368-PHP

HYDROGRAPHIC SHEET: H-10766

LOCALITY: Rosario Strait, Towhead Island to Fern Point, Northern Puget Sound, WA

TIME PERIOD: July 22, 1997 - August 21, 1998

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

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: NPS49, NPS50, NPS51 & NPS71
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.

Note 2: Use tide data from the appropriate station for each zone according to the order in which they are listed in the "Tidezone" corrector files. For example, tide station one (TS1) would be the first choice for an applicable zone followed by TS2, etc. when data are not available. All zones within a survey sheet may not have the same order of applicable tide stations.

For 

CHIEF, REQUIREMENTS AND ENGINEERING BRANCH



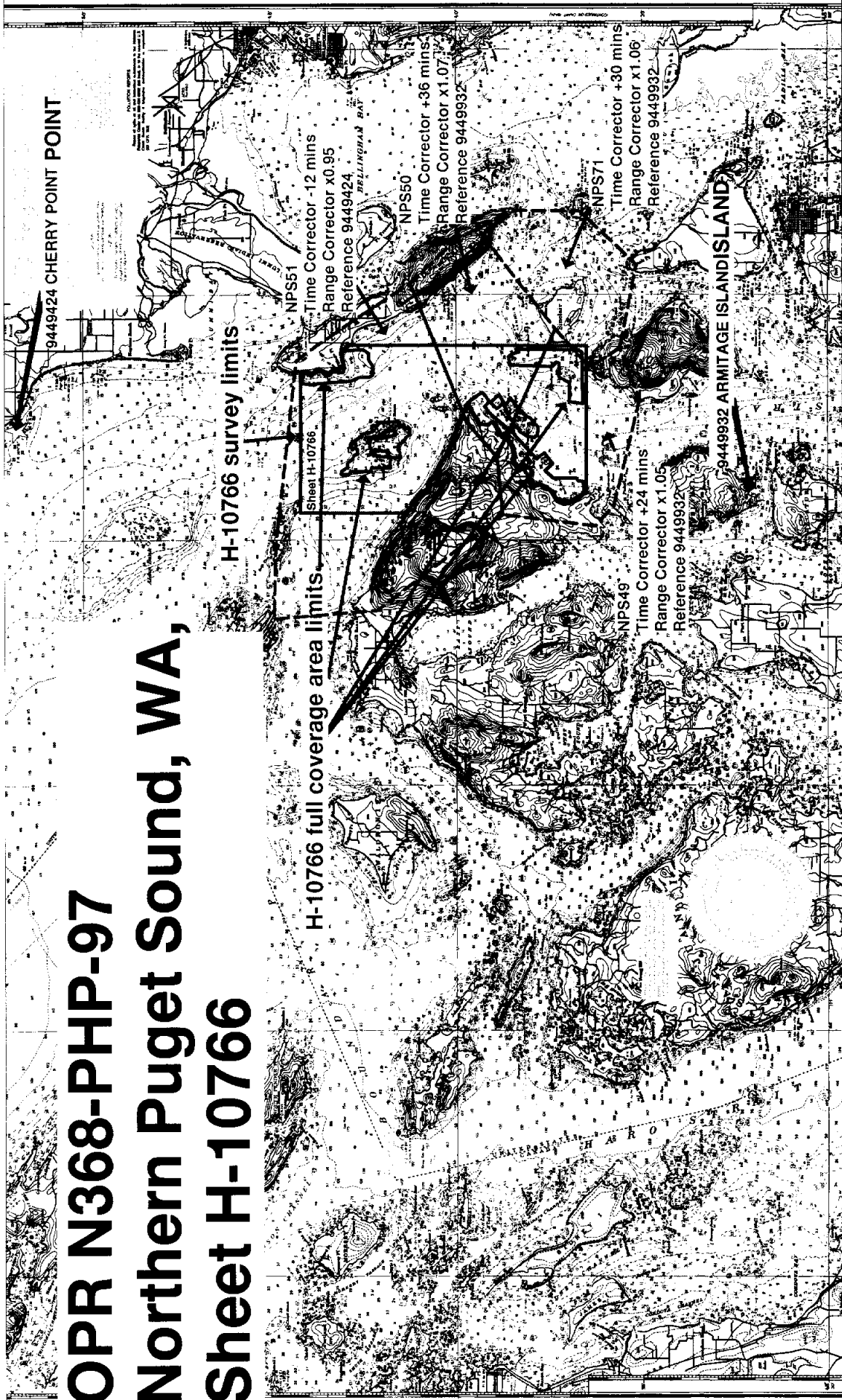
Final tide zone node point locations for OPR-N368-PHP-97,
 Sheet H-10766.

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	944-9932	+24	1.05
-122.810286	48.595829	944-9424	-24	0.90
-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	944-9932	+36	1.07
-122.75407	48.661748	944-9424	-18	0.92
-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	944-9932	+36	1.10
-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 NPS71				
-122.703318	48.593215	944-9932	+30	1.06
-122.716476	48.606516	944-9424	-18	0.91
-122.690254	48.622077			
-122.622261	48.656703			

-122.609823 48.640495
-122.610103 48.611323
-122.646296 48.585732
-122.703318 48.593215

OPR N368-PHP-97 Northern Puget Sound, WA, Sheet H-10766



HYDROGRAPHIC SURVEY STATISTICS

H-10766

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):	None
PHOTOBATHYMETRIC MAPS (List):	None
NOTES TO THE HYDROGRAPHER (List):	None
SPECIAL REPORTS (List):	None
NAUTICAL CHARTS (List):	18430, 6th Edition, Nov. 2, 1996, 18431 4th ED., Oct. 5, 1996

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 (Selected)			
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	238.75		238.75
COMPARISON WITH PRIOR SURVEYS AND CHARTS		30.0	30.0
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		61.0	61.0
GEOGRAPHIC NAMES			
OTHER (Chart Compilation)		128.0	128.0
*USE OTHER SIDE OF FORM FOR REMARKS			
	TOTALS	238.75	219.0
			451.75

Pre-processing Examination by M. Bigelow	Beginning Date 2/1/99	Ending Date 2/3/99
Verification of Field Data by M. Bigelow, D. Doles, E. Domingo, R. Mayor	Time (Hours) 238.75	Ending Date 6/11/99
Verification Check by B. Olmstead	Time (Hours) 9	Ending Date 6/15/99
Evaluation and Analysis by I. Almacen	Time (Hours) 91.0	Ending Date 6/16/99
Inspection by B. Olmstead	Time (Hours) 7	Ending Date 6/17/99

EVALUATION REPORT

H-10766

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. A page-size plot of the charted area depicting the specific limits of supersession accompanies this report as Attachment 1.

The bottom consists of mud, sand, gravel, pebbles and broken shells. Depths range from 0.0 to 68.0 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 Modified Transverse Mercator (MTM) 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 and Armitage Island, WA, gage 944-9932. Refer to the approved tide note attached to this report concerning recommended tidal zoning.

H. CONTROL STATIONS

Section H of the hydrographer's report contain 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: -0.621 seconds (-19.186 meters)
Longitude: 4.653 seconds (95.188 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 latest photogrammetric source data available for this survey. The shoreline depicted in brown on the smooth sheet is for orientation only, and originates with the 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 I and S.

K. CROSSLINES

Crosslines are discussed in the hydrographer's report.

L. JUNCTIONS

The junction with survey H-10621 was not formally completed since this survey was processed previously. However, a comparison with the present survey reveals good agreement. An "Adjoins" note has been added to the smooth sheet.

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
H-8333	1955	1:10,000	NAD 27

Prior surveys H-8318, H-8322 and H-8333 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 the 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.

Surveys H-8318 and H-8333 were classified by the Mapping and Charting Branch (MCB), Hydrographic Data Evaluation Group (HDEG) as Category 1, where no further processing is required. These surveys were verified but not reviewed for chart application. Critical prior survey data from work conducted before 1955-56 was not addressed for supersession. However, these HDEG listed surveys were partially applied to the chart regarding any critical corrections.

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

Prior wire drag survey H-9282WD covers the shoal area north of Lawrence Point, the middle section of Rosario Strait and an area off the coast of Lummi Island, SW of Village Point. The hydrographer found no significant shoals or an indication of shoaling within the charted green tint areas. There were no conflicts found with the present survey depths and the charted wire sweep clearances ranging from 15 to 17 fathoms. An adequate single beam sounding coverage was accomplished during this survey to substantiate the supersession of the wire sweep information and removal of the green tint areas on chart 18430. The depths within the tinted areas with the exception of a few identified and developed shoaler soundings ranges approximately from 25 to 60 fathoms. Additional information is found in the hydrographer's report, Section N.

The presently charted rocks at latitude 48/41/23.5N, longitude 122/48/55.0W and latitude 48/38/28.0N, longitude 122/45/04.0W, originating from surveys H-8322 and H-8333 respectively were not investigated during this survey. These features were not mentioned in

the hydrographer's report and have been transferred to the smooth sheet. These rocks should be retained as charted.

The scattered submerged rocks charted off the west shore of Barnes Island in the vicinity of latitude 48/42/05N, longitude 122/46/47W, and originating from survey H-8322 were investigated during this survey. The bottom was found to be fairly rough with shoaler depths of 2.2-2.9 fathoms. It is recommended that this area be charted based on the present survey with an "rky" notation.

Several other features such as rocks, reef and ledges originating from the above mentioned prior surveys located within the NALL were carried forward in colors to the smooth sheet to delineate the shoreline areas covered by this survey.

The following charted rocks originating from survey H-8333 were found a part of the present high water line. These features should be deleted from the chart and their respective locations be delineated based on the latest survey information.

<u>Feature</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
Rock awash	48/40/46.0	122/47/57.5
Rock awash	48/40/39.5	122/47/33.6
Rock awash	48/40/21.9	122/46/44.9
Rock awash	48/40/15.7	122/46/24.9
Rock awash	48/40/05.1	122/45/48.4
Rock awash	48/40/03.9	122/45/44.8
Rock awash	48/39/42.2	122/44/33.5

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

Except for the features mentioned above, survey H-10766 is adequate to supersede the prior surveys within the area of common coverage.

N. ITEM INVESTIGATIONS

There were no AWOIS items assigned for survey H-10766. However, there were sixteen (16) item investigations conducted within the survey area. Discussion and disposition of these items are included in the hydrographer's report, section M, and the item investigation reports (attached).

O. COMPARISON WITH CHART

Survey H-10766 was compared with the following charts.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>	<u>Datum</u>
18430	6th	Nov. 2, 1996	1:25,000	NAD 83
18431	4th	Oct. 5, 1996	1:25,000	NAD 8

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 adequacy of the single beam echo sounding coverage of the wire swept areas over depths more than 24 fathoms resulted in the recommended supersession of the charted wire sweep information and deletion of the green tint on chart 18430 covered by this survey.

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.

A few ledges charted at the following locations and originating from miscellaneous sources were not investigated during this survey. These ledges should be retained as charted.

<u>Latitude (N)</u>	<u>Longitude (W)</u>
48/36/44	122/48/19
48/36/53	122/48/25
48/36/55	122/48/28
48/37/32	122/47/55
48/37/38	122/47/55
48/37/47	122/47/49
48/38/24	122/46/32
48/38/27	122/46/25
48/38/37	122/45/54
48/38/46	122/45/48
48/38/48	122/45/37
48/38/52	122/45/22
48/39/26	122/45/05

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.

With the exception of features mentioned above and in the preceding sections of this report, survey H-10766 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-10766 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 with the following exceptions.

In the event that the field units submission of survey data will exceed four weeks from the completion of field work, the Chief of Party will submit a written explanation for the delay indicating the anticipated transmittal date to the Chief of the appropriate processing section. Marine Center ships will forward their explanation through the Marine Center Director. Fieldwork for survey H-10766 was completed August 21, 1998 but not received for office processing until October 16, 1998.

Q. AIDS TO NAVIGATION

Three (3) fixed aids to navigation located within the area of the present survey have been adequately discussed in the hydrographer's report, section P. The following additional aids to navigation were located during this survey.

<u>Name of Aid</u>	<u>Lt. List #</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
Cypress Reef Daybeacon C	19480	48/36/48.7	122/43/20.9
Buckeye Shoal Lighted Bell Buoy 14	19485	48/37/26.9	122/43/46.8
Rosario Strait Lighted Bell Buoy 16	19495	48/38/24.4	122/42/55.0
Traffic Lane Lighted Buoy C	19520	48/40/32.4	122/42/47.4

The mooring buoys charted on the east and west side of Clark Island are permanent year-round public access buoys maintained by the Washington State Park Service. One of the eight previously charted buoy at latitude 48/41/55.6 N, longitude 122/45/56.9 W, was missing during this survey. No information was obtained by the hydrographer as to when it will be replaced with a new buoy. The existing buoys 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.

The green MWR labels indicating the area around Peapod Rocks, The Sisters and Little Sister islets as a National Wildlife Refuge should be retained as charted.

All aids to navigation located within the area of the present survey were adequately investigated. They were found in good condition and adequately serve their intended purpose.

R. STATISTICS

Statistics are adequately itemized in the hydrographer's report.

S. MISCELLANEOUS

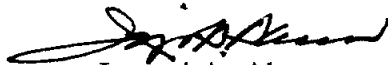
Miscellaneous information is adequately discussed in the hydrographer's report.

T. RECOMMENDATIONS

Survey H-10766 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.



Isagani A. Almacén
Cartographer

APPROVAL SHEET
H-10766

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: 6/18/99
Bruce A. Olmstead
Senior Cartographer, Cartographic Section
Pacific Hydrographic Branch

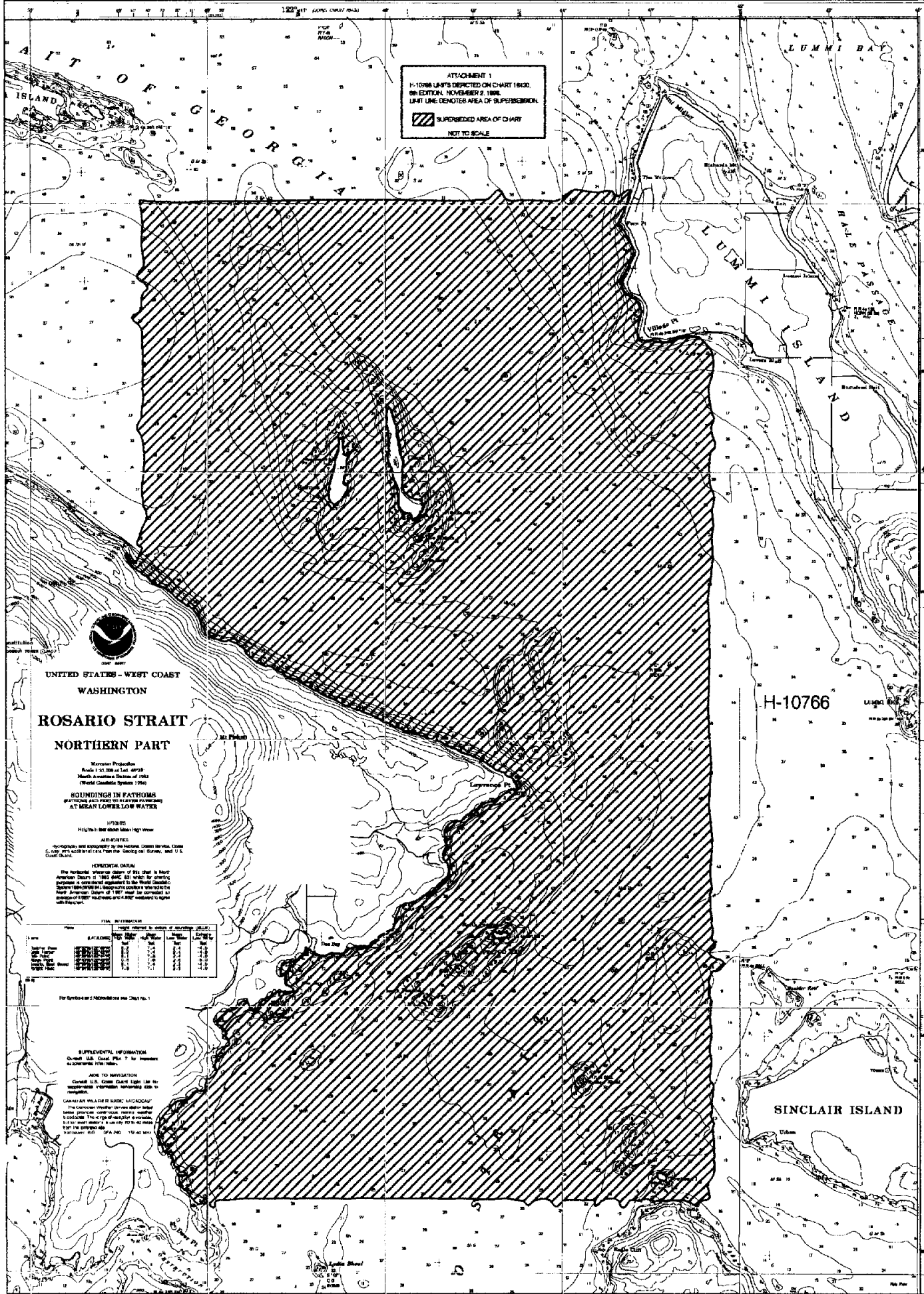
I have reviewed the smooth sheet, accompanying data, and reports. This survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Evaluation Report.

James C. Gardner Date: 7-1-99
James C. Gardner
Commander, NOAA
Chief, Pacific Hydrographic Branch

Final Approval

Approved:

Samuel P. De Bow Date: August 30, 1999
Samuel P. De Bow
Commander, NOAA
Chief, Hydrographic Surveys Division



ATTACHMENT 1
 H-10766 LIGHT'S DEPICTED ON CHART 18430
 ON EDITION, NOVEMBER 2, 1988
 LIGHT LINE DENOTES AREA OF SUPERSESSION
 [Hatched Box] SUPERSEDED AREA OF CHART
 NOT TO SCALE



UNITED STATES - WEST COAST
 WASHINGTON
ROSARIO STRAIT
 NORTHERN PART

Maximum Depth
 Fathoms 120.00 at Lat. 49°31'
 Mean Sea Level of 1983
 (World Geodetic System 1984)

SOUNDINGS IN FATHOMS
 (AT MEAN LOWER LOW WATER)

HEIGHTS IN FEET ABOVE HIGH WATER

ADVERTISED
 Soundings are accompanied by the Hydrographic Service, Coast and Geodetic Survey, U.S. Coast Guard.

HYDROGRAPHIC DATA
 The hydrographic data of this chart is based on American Charts of 1883 and 1885, and other soundings from 1883 to 1983. The hydrographic data is based on the Coast and Geodetic Survey, U.S. Coast Guard, and other sources. The hydrographic data is based on the Coast and Geodetic Survey, U.S. Coast Guard, and other sources.

NAME	TYPE	DEPTH (FATHOMS)	DEPTH (METERS)	REMARKS
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
7	7	7	7	
8	8	8	8	
9	9	9	9	
10	10	10	10	
11	11	11	11	
12	12	12	12	
13	13	13	13	
14	14	14	14	
15	15	15	15	
16	16	16	16	
17	17	17	17	
18	18	18	18	
19	19	19	19	
20	20	20	20	
21	21	21	21	
22	22	22	22	
23	23	23	23	
24	24	24	24	
25	25	25	25	
26	26	26	26	
27	27	27	27	
28	28	28	28	
29	29	29	29	
30	30	30	30	
31	31	31	31	
32	32	32	32	
33	33	33	33	
34	34	34	34	
35	35	35	35	
36	36	36	36	
37	37	37	37	
38	38	38	38	
39	39	39	39	
40	40	40	40	
41	41	41	41	
42	42	42	42	
43	43	43	43	
44	44	44	44	
45	45	45	45	
46	46	46	46	
47	47	47	47	
48	48	48	48	
49	49	49	49	
50	50	50	50	
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53	53	53	53	
54	54	54	54	
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62	62	62	62	
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64	64	64	64	
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66	66	66	66	
67	67	67	67	
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69	69	69	69	
70	70	70	70	
71	71	71	71	
72	72	72	72	
73	73	73	73	
74	74	74	74	
75	75	75	75	
76	76	76	76	
77	77	77	77	
78	78	78	78	
79	79	79	79	
80	80	80	80	
81	81	81	81	
82	82	82	82	
83	83	83	83	
84	84	84	84	
85	85	85	85	
86	86	86	86	
87	87	87	87	
88	88	88	88	
89	89	89	89	
90	90	90	90	
91	91	91	91	
92	92	92	92	
93	93	93	93	
94	94	94	94	
95	95	95	95	
96	96	96	96	
97	97	97	97	
98	98	98	98	
99	99	99	99	
100	100	100	100	

For Symbols and Abbreviations see Chart No. 1

SUPPLEMENTAL INFORMATION
 Consult U.S. Coast Pilot 7 for present navigational information.

NOTE TO NAVIGATORS
 Consult U.S. Coast Pilot 7 for the most up-to-date information concerning this area.

CANALIAN WEAVER'S BIRD: "MIGRATORY"
 The Canadian Weaver's Bird is a small bird with a long tail and a long beak. It is found in the coastal areas of the Pacific Northwest. It is a small bird with a long tail and a long beak. It is found in the coastal areas of the Pacific Northwest.

H-10766

SINCLAIR ISLAND

MARINE CHART BRANCH
RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10766

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
18430	4/23/99	[Signature]	Full Part Before After Marine Center Approval Signed Via <i>Full application of</i> Drawing No. <i>sundings & features from smooth sheet.</i>
			Full Part Before After Marine Center Approval Signed Via Drawing No.
			Full Part Before After Marine Center Approval Signed Via Drawing No.
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