

H10684

NOAA FORM 76-35A

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

## DESCRIPTIVE REPORT

Type of Survey ..... Navigable Area  
Field No. .... PHP 10-3-96  
Registry No. .... H-10684

### LOCALITY

State ..... Washington  
General Locality ..... Southern Puget Sound  
Sublocality ..... Dana Passage

1996

CHIEF OF PARTY  
LT Richard A. Fletcher, NOAA

### LIBRARY & ARCHIVES

DATE ..... SEP 24 1997

**HYDROGRAPHIC TITLE SHEET**

H-10684

**INSTRUCTIONS** - The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

FIELD NO.

PHP 10-3-96

State Washington

General locality Southern Puget Sound

Locality Dana Passage

Scale 1:10,000 Date of survey May 14 to July 19, 1996

Instructions dated November 1, 1995\* Project No. OPR-N210-PHP

Vessel Jensen Launch 1101 (EDP 0651), MonArk Launch 1102 (EDP 0652)

Chief of party LT Richard A. Fletcher, NOAA

Surveyed by Pacific Hydrographic Party Personnel

Soundings taken by Side Scan echo sounder, ~~Hand Lead, potx~~ Inner Space 448, DSF-6000N, EG&G Models 260, 272

Graphic record scaled by PHP Personnel

Graphic record checked by PHP Personnel

Evaluation by: L. Deodato Automated plot by HP Design Jet 650C

Verification by M. Bigelow, R. Mayor, L. Deodato

Soundings in ~~fathoms~~ feet at ~~MLW~~ MLLW

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.

\*

Change 1 dated November 1, 1995, Change 2 dated March 5, 1996

SURF ✓ AWOL ✓ 9/25/97 by MDA

## **Descriptive Report to Accompany Hydrographic Survey H-10684**

Field Number PHP 10-3-96  
Scale 1:10,000  
1996

Pacific Hydrographic Party  
Chief: LT Richard A. Fletcher

### **A. PROJECT ✓**

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-N210-PHP, Southern Puget Sound, Washington and Change No. 1, both issued November 1, 1995. *Change 2 was issued March 5, 1996.*

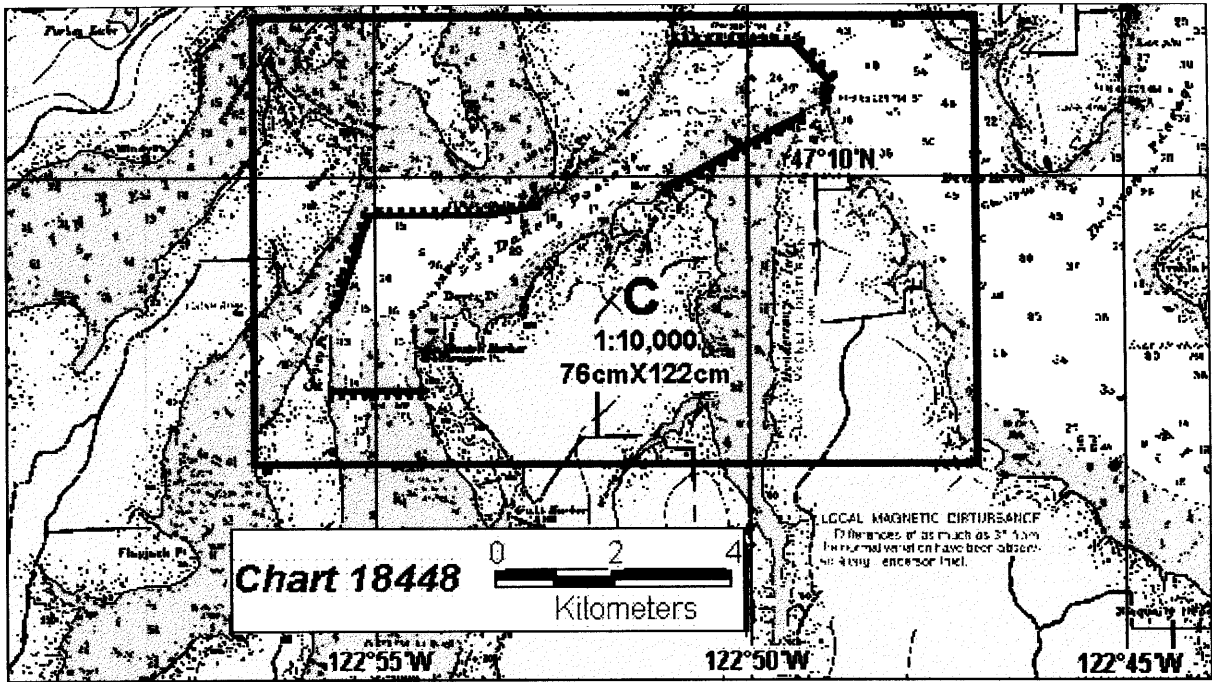
The project was authorized in response to requests from the Puget Sound Pilots and the Thirteenth Coast Guard District. The objective is to update the charted hydrography which dates from 1935 and 1986 surveys.

The project area includes Shilshole Bay through which the Lake Washington Ship Canal in Seattle is entered (H-10665). The southern portion of the project includes restricted and critical traffic routes to the port of Olympia, the Washington State Capitol, which lies to the south of the project area.

This is the third survey for the project and the second of the southern portion. It covers the area known as Dana Passage. The sheet letter is "C" as specified by the project instructions; registry number is H-10684; designation: Dana Passage, Puget Sound, Washington.

### **B. AREA SURVEYED ✓ *See Eval Report, Section B***

The area surveyed for H-10684 covers Dana Passage from Johnson Point, southwest to the mouth of Budd Inlet. The chartlet on the next page shows the approximate survey limits.



Data acquisition was conducted from May 18<sup>4</sup>, 1996 (DN 13<sup>5</sup>) through July 19, 1996 (DN 201).

### C. SURVEY VESSELS ✓

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

### D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

HYPACK software produced by Coastal Oceanographics was used for all data acquisition. HSDUTILS, a program written by Hydrographic Surveys Division, Systems Support Branch, N/CS3, were used to convert HYPACK data to HDAPS format; and the standard NOS HDAPS software suite was used for post-processing. HDAPS program names and versions are listed in Appendix VI. \*

The following non-HDAPS computer programs were used in field work for data supporting this survey:

<u>Program Name</u>	<u>Version</u>	<u>Date</u>	<u>Usage</u>
HYPACK	5.90	1996	Data Acquisition
VELOCITY	2.11	1994	Sound Velocity Corrections
NADCON	1.01	1989	NAD83 to NAD27 ✓
INVERS3D	1.00	1991	Horizontal Control
MONITOR	2.00	1994	DGPS beacon check
GEOID93	2.00	1993	GPS ellipsoidal elevation
CAT	2.00	1994	Velocity casts

Real tides from the Yoman Point gauge were downloaded and PHP calculated tide correctors were applied during field processing (see Section G. Corrections to Soundings for details).

### E. SONAR EQUIPMENT ✓

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

<u>Type</u>	<u>S/N</u>
272-T Towfish	015598 (DN 163
272-T Towfish	0012681 (DN 165 - 201)
260 Recorder	015602 (DN 163 - 201)

The towfish was operated on the 100 kHz frequency and was configured with a 20° beam depression. On both vessels it was deployed from the aft starboard quarter using a Kevlar cable passed through a block and powered by a Superwinch Model W115. The 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 50 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, using range scales of 75 or 100 meters. At higher range scales the speed was maintained at 4 knots or slower. Range scales of 75, 100, and 150 meters were used. The SSS towfish was maintained at a height off the bottom equivalent to 8 to 20 percent of the range scale except where quickly changing depths prohibited compensatory adjustments in cable length. In such cases, the hydrographer believes the sonargram trace is adequate for identification of any significant

contacts. Two hundred percent side scan coverage was acquired from the 5-meter curve to the 20-meter curve in accordance with Section 7.2 of the project instructions. *Concur*

Side scan track lines were oriented along the contours with 75-meter line spacing. Even-numbered lines represent 100% coverage; odd-numbered lines represent 200% coverage. Position numbers used: 10,000-12361.

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

Following guidelines in Section 7.3.2 of Project Instructions, sonargrams were manually scanned for significant contacts; these were labeled and entered into HDAPS contact tables. Where contacts appeared in a cluster on the sonargram, only the most significant was entered. Apparent significance was determined with the PHP-developed Contact-O-Meter, a scale proportioned for shadow length and fish height. Contact heights and raw depths were derived using the HDAPS Side Scan Utility Program and all recorded contacts were plotted.

The HDAPS "group" function was used to identify duplicate contacts within a 33-meter radius. The "sift" function was then employed to identify contacts recommended for further investigation; i.e., significance determined by comparison with surrounding sounding data. The program logic is based on the guidelines for developing groups of contacts as specified in Section 7.2.2 of the Project Instructions. User input parameters include navigationally hazardous depth threshold and radius for sounding comparisons.

The hydrographer sifted the contacts using a threshold depth of 14 meters (Olympia project depth of 30 ft +  $\approx$  15 ft tide range = 45ft  $\approx$  14 m) and a chartable radius 66 meters for double-digit depths of 3.3 mm at chart scale.

The sonargram was reviewed together with the sifting printout. Contacts were selected for development based on the following factors: calculated significance, computed height, offset from towfish, and sonargram review; the review process included comparison of duplicate contacts.

Contact tables, final sifting printouts, and SSS investigation report forms are included in Separate V. *\**

Contacts were developed by echosounder using procedures outlined in section 7.2.2 of the Field Procedures Manual (FPM). *Concur*

## F. SOUNDING EQUIPMENT ✓

An Innerspace model 448 (INN-448) single frequency echosounder, Serial Number 239, modified with custom EPROMS, was used on Vessel No. 0652.

Raytheon, dual-frequency, Digital Sounding Fathometer (DSF) 6000N, Serial Number A221N, was used on Vessel No. 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.

Soundings were recorded in meters with an assumed speed-of-sound through water of 1500 m/sec. Depths encountered in the survey area range from -2.4 meters (Pos. No. 7471) to 57.5 meters (Pos. No. 7051) at MLLW based on preliminary tide data from the Yoman Point gauge. *The smooth sheet is plotted in Feet. Depths range from -8 ft to 186 ft based on approved tides.*

Metric leadlines were used for depth comparisons with the echosounder. PHP fabricated the leadlines following Hydrographic Survey Guideline (HSG). Lead line calibration forms are included in Separate IV (Sounding Equipment Calibration and Corrections). \*

## G. CORRECTIONS TO SOUNDINGS ✓ *See Eval Rpt., section 6*

### 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. SBE Model 19-03. 335M, S/N 1912344-1892 was used for all casts. The recorder was initialized and downloaded using program CAT v.2.0. The VELOCITY program was used to compute sound velocity correctors. Data from the following casts were used to determine the velocity correctors:

HDAPS Table	DN	DN Range	Extrapolated Depth	Cast Position	
				Latitude	Longitude
1	137	137-148	68.1m	47°09'00"N	122°53'30"W
2	149	149-164	67.6m	47°09'08"N	122°54'13"W ✓
3	165	165-177	71.5m	47°09'06"N	122°53'10"W
4	178	178-189	70.9m	47°09'30"N	122°53'30"W
5	190	190-201	71.7m	47°09'30"N	122°53'30"W

Soundings correctors were applied to both high and low frequency soundings. *All velocity casts were taken within the survey area.*

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

The SEACAT instrument was calibrated by Northwest Regional Calibration Center on November 20, 1995. A copy of the calibration report is included in Separate IV. \*

#### Lead line Comparisons ✓

Periodic leadline comparisons confirmed proper digitization of the echosounder depth.

#### Static Draft ✓

Static draft for VN 0652 was determined on May 15, 1996, (DN 136). First, the depth of the transducer face from a reference mark on the hull was measured. Next, with the launch in the water (fuel tanks half full and two crewmen aboard) the depth from this reference mark to the waterline was measured. Combining the two measurements, a static draft of 0.4 meters was calculated.

A static draft of 0.5 meters was determined for VN 0651 on June 7, 1996, (DN 159) using a method similar to above.

#### Dynamic Draft ✓

Settlement and squat measurements for VN 0651 were conducted on June 7, 1996, (DN 159) in Budd Inlet, WA. Data from these measurements are included in Offset Table 1. \*

Vessel 0652 was configured for side scan sonar operations on January 8, 1996, (DN 008) and settlement and squat corrections were calculated based on measurements conducted on January 12, 1996, (DN 012) at Navy Pier "D" in Port Gardner, WA. Field records are included in Separate IV. \*

Offset Table 1\* corresponds to VN 0651; Offset Table 2\* corresponds to VN 0652. Settlement and squat correctors are reapplied during field processing using the REAPPLY program in HDAPS.

#### Corrections to Echosoundings ✓

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 sounding(s) was deselected or rejected; in those cases where the resulting sounding interval was greater than 6 mm at the scale of the survey, the line was resurveyed. *Review of this data during office processing revealed no significant discrepancies.*



## Tide Correctors ✓

In compliance with Section 5.8 of the Project Instructions, two tide stations were established to provide information on zoning, tidal datums (reducers), and harmonic constants for predictions. Real time portable acoustic gauges were installed at the following stations:

Station #	Station Name	Latitude	Longitude	
944-6705	Yoman Point, Anderson Island	47° 11.8'N	122° 56.3'W	Historical Site
944-6807	Budd Inlet, WA	47° 6.0'N	122° 53.8'W	Established by PHP

Four tide zones ( 30, 31, 32 and 33) were established on Sheet C as specified by project instructions. These tide zones are illustrated in section 5.9 of the Project Instructions. The zones are also shown in the graphics section at the end of the Project Instructions.

Tidal correctors were not applied as specified in the Project Instructions. Preliminary data from the Yoman Point gauge (raw water levels above or below mean lower low water) were acquired, adjusted with the difference between correctors from the tidal zone at Yoman Point, Zone 29, and the tidal zones used in the survey. The following time and height corrections were applied to soundings during field processing: *Approved Tide Note dated March 14, 1997 is attached.*

Tidal Zone	Month	Table #	Time Corrector	Height Corrector Ratio
30	May	1	:00	1.02
	June	5	:00	1.02
31	May	2	:06	1.03
	June	6	:06	1.03
32	May	3	:06	1.06
	June-July	7	:06	1.06
33	May	4	:06	1.07
	June-July	8	:06	1.07

## H. CONTROL STATIONS ✓ *See Eval Report, Section H*

### 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 PHB in March 1996.

Two DGPS performance check stations were established to Third Order, Class 1, standards: (1) a piling at Zittel's Marina and (2) a piling at Boston Harbor Marina. Check stations have been on smooth sheet 25 control points 102, 103 and identified as Piles. <sup>This report</sup>  
 A list of horizontal control stations can be found in ~~Appendix III~~.

**I. HYDROGRAPHIC POSITION CONTROL** See Eval Report, Section I.

Position Control ✓

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The U. S. Coast Guard beacon on Point Robinson, Vashon Island, WA, frequency 323 kHz, was used during all hydrographic operations. Accuracy requirements were met as specified in the Hydrographic Manual and FPM.

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

DGPS Performance Checks ✓

Fixed-point DGPS performance checks were obtained per FPM, Section 3.4.4.1, using the sites established at Zittel's Marina and at Boston Harbor. All DGPS performance checks were successful; check forms are included with the raw data.

Positioning Equipment ✓

The following GPS equipment was used:

<b>Equipment Location</b>	<b>Type of Receiver/Antenna</b>	<b>Receiver Serial No.</b>	<b>Antenna Serial No.</b>
VN 0651	Ashtech (v.1E08D) CSI Beacon Rcvr MBX1	700417B1042 X-1112	700378A0272
VN 0652	Ashtech (v.1E08D) CSI Beacon Rcvr MBX1	700417B1043 X-1212	700378B0402

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

Antenna offset and layback correctors are applied on-line.

\* Filed with the hydrographic data.

## J. SHORELINE ✓ *See Eval Report, Section J*

Digital shoreline derived from photogrammetric source data was not a component of this project. NOS Charts ~~18445~~, 18456, and 18448 were used as shoreline source for this survey. To facilitate verification in the field for this survey, PHP created a digital shoreline document based on BSB electronic Charts 18445, 25th edition and 18456, 18th edition, produced by Blue Marble Geographics. The charts were 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 disapproval were also readily apparent. (The 26th edition of Chart 18445 was available in electronic version for comparison during final processing.) *Chart 18445 was not used for survey H-10684 to depict shoreline in brown on smooth sheet.*

Detached Positions (DP) were taken on all additions, disapprovals and the charted lights (verification) and are plotted on the DP plot submitted with this survey. *Concur*

## K. CROSSLINES ✓

Approximately 13 miles of crosslines and 48 miles of SSS lines were run at various angles greater than 45° to the mainscheme. This is 38% of the mainscheme hydrography. The comparisons of soundings at crossings are within the specifications described in section 4.6.1 of the Hydrographic Manual. They reveal no errors in positions or with the sounding equipment and the operation of the sounding equipment.

## L. JUNCTIONS ✓

H-10684 does not junction with any contemporary surveys. *concur*

## M. COMPARISON WITH PRIOR SURVEYS ✓ *See Eval Report, Section M*

A cursory comparison of soundings with prior surveys H-6198 (1936) and H-6197 (1936) indicate only minor changes in contours. Prior Survey comparisons will be performed by Pacific Hydrographic Branch following the application of smooth tides. *concur*

## N. ITEM INVESTIGATION REPORTS

Item Investigation Reports for AWOIS items 52265, 52266 and 52267 are included in ~~Separate VI.~~ *this report.*

**O. COMPARISON WITH THE CHART** ✓ See Eval Report, Section O

This survey was compared to a 1:10,000-scale enlargements of the following charts:

Chart	Scale	Version	Date
18448	1:80,000	27th	October 30, 1993
18456	1:20,000	18th	May <sup>20</sup> 30, 1995

The Pacific Hydrographic Branch will perform a follow-up comparison after smooth tides have been applied.

**Dangers to Navigation** ✓

No dangers to navigation were reported for this survey. *concur*

**Comparison of Soundings** ✓

Comparison of chart 18448 shows excellent agreement with no significant differences. *Do not concur*

Comparison of 18456 shows excellent agreement with the chart. One area centered at 47°08'18" N, 122°54'45" W indicates a little shoaling is taking place in the depression approximately 400 m SW of Dofflemyer Point.

**Comparison of non-Sounding Features**

The chart depicts kelp in a number of places within the survey area. None was observed that would impede safe navigation. The hydrographer recommends removing kelp symbols off of Brisco Point at 47°09'43"N, 122°52'52"W and at Itsami ledge at 47°10'21"N, 122°50'13"W. *✓ Bk concur*

The narrow, converging channels and the sharp relief of the topography in combination result in swirling currents and tide rips as charted. The Sewer running north from shore starting at latitude 47°08'24"N longitude 122°54'20"W was seen at numerous times on the side scan sonagram and should remain as charted. *concur*

**P. ADEQUACY OF SURVEY** ✓ See Eval Rpt., section P

This survey is a complete navigable area hydrographic survey and is adequate to supersede all prior surveys within their common areas. Fifty-meter line spacing was run throughout the *Do not concur*

survey area and 200% SSS coverage from the 5-meter to the 20-meter curve was completed where safety for personnel and equipment allowed.

#### Q. AIDS TO NAVIGATION ✓

Three fixed aids and the Hartsene Island fish pen lights (six) were verified in accordance with Section 4.2.3 of the project instructions. The description and Light List numbers of the verified items are below.

Navigation Aid	Light List #
Brisco Point Light 8	17395
Doffelmeyer Point Light	17400
<del>Hartsene</del> <sup>Arstine</sup> Island fish Pen Lights (6)	17393
Itsami Ledge Light 7	17390

No changes to the charted positions or characteristics of the aids to navigation described above are recommended. *concur*

#### R. STATISTICS ✓

Description	Quantities
Total Positions	10348
Total Detached Positions	21
Total Nautical Miles Hydrography	205
Nautical Miles Side Scan Hydrography	48
Square Nautical Miles Hydrography	4
Velocity Casts	5
Days of Production	24
Bottom Samples	34
Tide Stations	2

#### S. MISCELLANEOUS ✓

Mainscheme data was assigned position numbers 1 to 9,999; Side Scan data 10,000 and up.

Bottom samples were acquired and forwarded to the Smithsonian Institute in accordance

with Section 6.7 of the project instructions. Positions and descriptions of the samples are plotted on the Bottom Sample plot. A copy of Oceanographic Log Sheet-M, Bottom Sediment Data (NOAA Form 75-44) is included in Separate II. \*

No magnetic disturbances were observed. *concur*

Field processing on this survey was suspended for the duration of the field examination FE-427. Therefore the field processing and subsequent submittal of this survey was not completed within the standard 6 weeks from the end of data collection.

**T. RECOMMENDATIONS** ✓

None

**U. REFERRAL TO REPORTS** ✓

**Title**

**Date**

Horizontal Control Report  
OPR-N210-PHP

March 1996

Coast Pilot Report

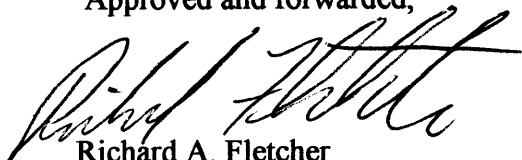
To follow

Submitted for approval,



Eric W. Berkowitz  
Lieutenant (jg), NOAA  
Assistant Chief, PHP

Approved and forwarded,



Richard A. Fletcher  
Lieutenant, NOAA  
Chief, PHP

\* Filed with the hydrographic data.

CONTROL STATIONS ✓

Stn	Type	Date	Remark	Longitude	Easting	Northing C	Hgt	Freq	Vel
	Carto	Latitude							
101		03/26/96	ROBINSON PT USCG DGPS BEACON						
	0	47:23:15.004		122:22:29.101	45849.2	33896.3	0	0.0	0
102		03/26/96	ZITTLES PERFORMANCE CHECK PT						
	0	47:09:55.215		122:48:29.009	13125.4	9116.8	0	0.0	0
103		03/26/96	BOSTON HBR PERFORMANCE CHEK PT						
	0	47:08:28.420		122:54:13.622	5863.4	6443.2	0	0.0	0

# ITEM INVESTIGATION REPORT ✓

ITEM NO: N1  
AWOIS #: 52265  
SURVEY: H-10684

CHART NO: 18448  
EDITION: 27th ED  
Chart Date: Oct 30, 1993

**DESCRIPTION:** Disposal Area, 900' Radius [see attached AWOIS printout]

**SOURCE:** CL 936/71 & CL 201/77

**TECHNIQUES:** ES, S2  
**TYPE:** Full

**SOURCE POSITION:** 47°10'59.34" N 122°50'34.49" W

**METHOD OF INVESTIGATION:** Echosounder

The entire disposal area was surveyed during main scheme hydrography with 50m line spacing using a single beam echosounder, INN448. 25-meter splits were run over the area using a DSF 6000N dual beam echosounder. All but the southeastern most edge of the disposal area is deeper than 36 meters & was ensonified with 100% coverage.

## RESULTS OF INVESTIGATION:

No indication of any dumping or shoaling due to dumping was observed.

## COMPARISON WITH PRIOR SURVEYS:

The prior survey was conducted before the disposal area was established. Sounding comparison with H-6197 showed excellent agreement.

## COMPARISON WITH THE CHART & CHARTING RECOMMENDATIONS:

No change to charted disposal area recommended. *concur*

*Revise note to reflect  
depths from survey of  
1946.*

*184*



## ITEM INVESTIGATION REPORT ✓

**ITEM NO:** N2  
**AWOIS #:** 52266  
**SURVEY:** H-10684

**CHART NO:** 18448  
**EDITION:** 27th  
**Chart Date:** Oct 30, 1993

**DESCRIPTION:** Area of aquaculture nets. ACOE permit 071-OYB-1-007440.  
10/95 letter from DNR states nets have been completely removed.

**SOURCE:** CL 968/89 established area with aquaculture nets..  
10/95 letter from WA state DNR.

**TECHNIQUES:**  
**TYPE:** information only

**SOURCE POSITION:** 47°10'29.34"N 122°51'28.49"W

**METHOD OF INVESTIGATION:** Side Scan Sonar

The area was covered by 25-meter line spacing during main scheme hydrography and was covered by 200% side scan sonar coverage.

### RESULTS OF INVESTIGATION:

No evidence of the nets or any associated debris were observed. *Concur*

### COMPARISON WITH PRIOR SURVEYS:

H-6197 was conducted prior to the establishment of the nets. Sounding comparison was in general agreement.

### COMPARISON WITH THE CHART & CHARTING RECOMMENDATIONS:

No change to the chart recommended. *concur*

# ITEM INVESTIGATION REPORT ✓

ITEM NO: N3  
AWOIS #: 52267  
SURVEY: H-10684

CHART NO: 18448  
EDITION: 27th  
Chart Date: Oct 30, 1993

**DESCRIPTION:** Fish Haven 1600' x 650' consisting of 10,000 cubic yards of large quarry rock, large precast concrete pieces and fiberglass modules. USACOE permit # 071-OYB-009289. Minimum depth called for is 30'.

**SOURCE:** CL 968/89

**TECHNIQUES:** S2, ES, DI, ##  
**TYPE:** Full

**SOURCE POSITION:** 47°10'41.34"N 122°51'16.49"W

**METHOD OF INVESTIGATION:** ES,S2

The entire search area was covered by 50-meter echosounder lines during main scheme hydrography, 10-meter development lines perpendicular the main scheme lines and 200% SSS coverage.

## RESULTS OF INVESTIGATION:

A large are of debris was observed on the sonargrams and echograms within the charted area. No depths shallower than permitted by the USACOE were found, 30 ft. *Depths of 65 ft. to 112 ft. were found by the present survey.*

## COMPARISON WITH PRIOR SURVEYS:

Establishment of the fish haven was after all prior surveys. Sounding comparison with H-6197 (1936) showed excellent agreement, *R7*

## COMPARISON WITH THE CHART & CHARTING RECOMMENDATIONS:

Leave fish haven as charted. *concur*

**APPROVAL SHEET**

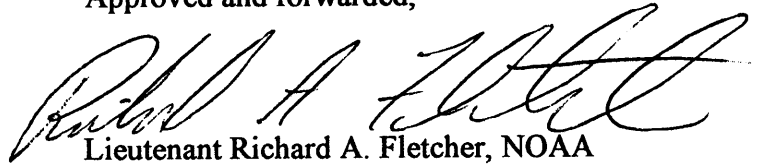
for

**H-10684**

Standard field surveying and processing procedures were followed in producing this navigable area hydrographic survey in accordance with the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; and the Field Procedures Manual, as updated for 1996. 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,

A handwritten signature in black ink, appearing to read "Richard A. Fletcher". The signature is written in a cursive style with a large, sweeping initial "R".

Lieutenant Richard A. Fletcher, NOAA  
Chief, Pacific Hydrographic Party

GEOGRAPHIC NAMES

Name on Survey	A ON CHART NO. 18455, 18445, 18448 B ON PREVIOUS SURVEY NO. 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		
BIG FISHTRAP (bay)	X		X								1
BOSTON HARBOR	X		X								2
BRISCO POINT	X		X								3
BUDD INLET	X		X								4
COOPER POINT	X		X								5
DANA PASSAGE	X		X								6
DICKENSON POINT	X		X								7
DOFFLEMYER POINT	X		X								8
DOVER POINT	X		X								9
ELD INLET	X		X								10
HARSTINE ISLAND	X		X								11
HENDERSON INLET	X		X								12
HUNTER POINT	X		X								13
ITSAMI LEDGE (bar)	X		X								14
JEAL POINT	X		X								15
JOHNSON POINT	X		X								16
LITTLE FISHTRAP (bay)	X		X								17
PEALE PASSAGE	X		X								18
PUGET SOUND (title)	X		X								19
SQUAXIN ISLAND	X		X					Approved:			20
SQUAXIN PASSAGE	X		X					<i>Charles C. Loy</i>			21
TUCKSEL POINT	X		X					Chief Geographer			22
WASHINGTON (title)	X		X								23
ZANGLE COVE	X		X					MAY 12 1997			24
											25



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

### TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: March 14, 1997

HYDROGRAPHIC BRANCH: Pacific  
HYDROGRAPHIC PROJECT: OPR-N210-PHP  
HYDROGRAPHIC SHEET: H-10684

LOCALITY: Washington, Puget Sound, Dana Passage

TIME PERIOD: May 14 - July 19, 1996

TIDE STATION USED: 944-6705 Yoman Point, Anderson Island, Wa.  
Lat. 47° 10.8'N Lon. 122° 40.5'W  
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters  
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.826 meters

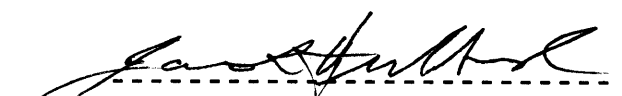
TIDE STATION USED: 944-6807 Budd Inlet, Wa.  
Lat. 47° 05.9'N Lon. 122° 53.7'W  
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters  
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.128 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: PS25, PS26, PS30, PS31, PS32, PS33, PS34  
& PS35

Refer to attachment(s) for zoning information.

Note: Provided time series data are tabulated in metric units  
(meters) and on Greenwich Mean Time.

  
CHIEF, Tidal Analysis Branch



Final tide zone nodal point locations for OPR N210-PHP-96.

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 PS1				
-122.535432	47.663657	944-7130	0	0.98
-122.513474	47.707568			
-122.391762	47.691029			
-122.405646	47.661072			
-122.419719	47.661024			
-122.535432	47.663657			
Zone PS23				
-122.571554	47.180768	944-6705	0	1.00
-122.659779	47.098678	944-6807	-6	0.93
-122.698942	47.129624	944-7130	42	1.19
-122.719881	47.141365			
-122.678356	47.177384			
-122.642049	47.201396			
-122.571554	47.180768			
Zone PS24				
-122.719881	47.141365	944-6705	0	1.02
-122.757377	47.102731	944-6807	-6	0.95
-122.728315	47.063504	944-7130	42	1.21
-122.659779	47.098678			
-122.698942	47.129624			
-122.719881	47.141365			
Zone PS25				
-122.757377	47.102731	944-6705	0	1.04
-122.796016	47.13122	944-6807	-6	0.96
-122.736695	47.152043	944-7130	42	1.23
-122.719881	47.141365			
-122.757377	47.102731			
Zone PS26				
-122.758302	47.171956	944-6705	6	1.05
-122.736695	47.152043	944-6807	-6	0.98
-122.796016	47.13122	944-7130	42	1.25
-122.80523	47.153605			
-122.764484	47.185645			
-122.758302	47.171956			

Zone PS27

-122.754974	47.178746	944-6705	0	1.04
-122.758302	47.171956	944-6807	-6	0.96
-122.736695	47.152043	944-7130	42	1.23
-122.709969	47.158342			
-122.754974	47.178746			

Zone PS28

-122.748019	47.191957	944-6705	0	1.02
-122.754974	47.178746	944-6807	-6	0.95
-122.709969	47.158342	944-7130	42	1.21
-122.679063	47.177046			
-122.748019	47.191957			

Zone PS29

-122.739209	47.214749	944-6705	0	1.00
-122.748653	47.232949	944-6807	-6	0.93
-122.75984	47.21032	944-7130	42	1.19
-122.748019	47.191957			
-122.679063	47.177046			
-122.642049	47.201396			
-122.699883	47.217907			
-122.718389	47.203752			
-122.739209	47.214749			

Zone PS30

-122.80523	47.153605	944-6705	6	1.04
-122.764484	47.185645	944-6807	0	0.96
-122.807866	47.245528	944-7130	48	1.23
-122.776886	47.316372			
-122.84815	47.313777			
-122.848732	47.300666			
-122.875092	47.277581			
-122.872137	47.241176			
-122.845912	47.20473			
-122.815776	47.175121			
-122.80523	47.153605			

Zone PS31

-122.816833	47.083805	944-6807	0	0.98
-122.860598	47.119762	944-7130	48	1.25
-122.873239	47.15251			
-122.875936	47.164354			
-122.871715	47.16722			
-122.845912	47.20473			
-122.815776	47.175121			
-122.816833	47.083805			

Zone PS32

-122.875936	47.164354	944-6807	0	0.99
-122.871715	47.16722	944-7130	48	1.27
-122.875936	47.206205			
-122.913087	47.228564			

-122.947775 47.226669  
-122.948127 47.211078  
-122.950966 47.196331  
-122.938105 47.164094  
-122.926677 47.142393  
-122.884492 47.137796  
-122.873239 47.15251  
-122.875936 47.164354

Zone PS33

-122.926677 47.142393	944-6807	0	1.00
-122.947844 47.054361	944-7130	48	1.28
-122.911026 47.026036			
-122.877115 47.060289			
-122.884492 47.137796			
-122.926677 47.142393			

Zone PS34

-122.926677 47.142393	944-6807	0	1.01
-122.938105 47.164094	944-7130	48	1.29
-123.032762 47.071334			
-122.991092 47.03038			
-122.947844 47.055027			
-122.926677 47.142393			

Zone PS35

-122.938105 47.164094	944-6807	6	0.99
-122.950966 47.196331	944-7130	54	1.27
-123.021836 47.165961			
-122.985948 47.129824			
-122.938105 47.164094			



**HYDROGRAPHIC SURVEY STATISTICS**

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			1	
ENVELOPES					
VOLUMES					
CAHIERS					
BOXES					

**SHORELINE DATA**

SHORELINE MAPS (List): **Not Applicable (Shoreline in brown from Charts 18448 and 18456)**  
 PHOTOBATHYMETRIC MAPS (List): **Not Applicable**  
 NOTES TO THE HYDROGRAPHER (List): **Not Applicable**  
 SPECIAL REPORTS (List): **Not Applicable**  
 NAUTICAL CHARTS (List): **18448, 27th Ed., Oct. 30, 1993, 18465, 18th Ed., May 20, 1995**

**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			10348	
POSITIONS REVISED				
SOUNDINGS REVISED				
CONTROL STATIONS REVISED				
	TIME-HOURS			
	VERIFICATION	EVALUATION	TOTALS	
PRE-PROCESSING EXAMINATION				
VERIFICATION OF CONTROL				
VERIFICATION OF POSITIONS				
VERIFICATION OF SOUNDINGS				
VERIFICATION OF JUNCTIONS				
APPLICATION OF PHOTOBATHYMETRY				
SHORELINE APPLICATION/VERIFICATION				
COMPILATION OF SMOOTH SHEET	111.5		111.5	
COMPARISON WITH PRIOR SURVEYS AND CHARTS	20		20	
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		10	10	
GEOGRAPHIC NAMES				
OTHER*				
*USE OTHER SIDE OF FORM FOR REMARKS				
	<b>TOTALS</b>	131.5	10	141.5

Pre-processing Examination by <b>Pacific Hydrographic Branch</b>	Beginning Date 10/2/96	Ending Date 10/2/96
Verification of Field Data by <b>M. Bigelow, R. Mayor, L. Deodato</b>	Time (Hours) 131.5	Ending Date 5/19/97
Verification Check by <b>B. Olmstead</b>	Time (Hours) 7	Ending Date 6/13/97
Evaluation and Analysis by <b>L. Deodato</b>	Time (Hours) 10	Ending Date 5/21/97
Inspection by <b>B. Olmstead</b>	Time (Hours) 12	Ending Date 7/9/97

# **EVALUATION REPORT**

**H-10684**

## **A. PROJECT**

Project information is discussed in the hydrographer's report.

## **B. AREA SURVEYED**

The survey area is adequately discussed in the hydrographer's report. Depths generally range from -8 to 186 feet. The bottom consists primarily of sand, shells, and pebbles.

## **C. SURVEY VESSELS**

Survey vessel information is found in the hydrographer's report.

## **D. AUTOMATED DATA ACQUISITION AND PROCESSING**

Survey data were processed using the same Hydrographic Data Acquisition/Processing System (HDAPS) software used by the hydrographer, the Hydrographic Processing System (HPS), AutoCad (Version 12.0), and MicroStation 95.

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

The drawing files necessarily contain information, which is not part of the HPS data set such as geographic 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 field sheet parameters have been revised to center the hydrography on the office plot. The data is plotted using a Modified Transverse Mercator projection and are depicted on a single sheet.

## **E. SONAR EQUIPMENT**

Refer to section E of the hydrographer's report concerning set-up, operation and processing of side scan sonar data.

## **F. SOUNDING EQUIPMENT**

Sounding equipment is discussed in the hydrographer's report.

## **G. CORRECTIONS TO SOUNDINGS**

The sounding data 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 reduction of soundings during field processing. During office processing, tide reductions were derived from approved hourly heights zoned direct from the following tide gages: Yoman Point, Anderson Island, Washington, gage 944-6705, Budd Inlet, Washington, gage 944-6807.

## **H. CONTROL STATIONS**

Control stations are discussed in the hydrographer's report and separates.

The positions of horizontal control stations used during hydrographic operations are field 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.

Data based on NAD 27 may be referenced to this survey by applying the following corrections:

Latitude: -0.655 seconds (-20.212 meters)  
Longitude: 4.498 seconds (94.737 meters)

## **I. HYDROGRAPHIC POSITION CONTROL**

Hydrographic position control is adequately discussed in the hydrographer's report and supplemented as follows: A horizontal dilution of precision (HDOP) not to exceed 3.75 was computed for survey operations. The quality of several positions exceeds limits in terms of horizontal dilution of precision (HDOP). These positions are isolated and occur randomly throughout the survey area. A review of the data, however, suggests that none of these fixes are used to position dangers to navigation. The features or soundings located by these fixes are consistent with the surrounding information. These fixes are considered acceptable.

## **J. SHORELINE**

There are no photogrammetric source data for this survey. The shoreline shown in brown on the smooth sheet was taken from the raster of charts 18448 and 18456 for orientation only.

## **K. CROSSLINES**

Crosslines are discussed in the hydrographer's report.

## **L. JUNCTIONS**

There are no contemporary surveys which junction survey H-10684.

## **M. COMPARISON WITH PRIOR SURVEYS**

H-6197 (1936) 1:10,000

H-6198 (1936) 1:10,000

The prior surveys listed above cover the entire area of the present survey. Sounding agreement with the present survey generally reveals 1-7 foot differences. However, some larger differences are noted along the shoreline where the bottom slopes off rapidly. There appears to be no consistent pattern of shoaling or an increase in depths and the configuration of depth curves common to the present and prior surveys depict little change. The differences with the prior surveys may be attributed to greater sounding coverage, improved positioning and sounding methods, and relative accuracy of the data acquisition techniques.

Itsami Ledge was not properly developed during the survey and the least depth of 6 feet originating from H-6197 at latitude 47/10/19.76N, longitude 122/50/15.56W was transferred to the present survey. The present survey found a depth of nine feet in the vicinity of the prior survey sounding.

Three rocks originating from prior survey H-6197 were investigated but not found during survey operations. However, the hydrographer did not provide adequate documentation to conclusively disprove these charted features. The evaluator recommends that these rocks be retained on the chart and are listed below:

<u>Feature</u>	<u>Latitude N</u>	<u>Longitude W</u>
Rock	47/10/21.6	122/51/36.9
Rock	47/09/45.4	122/51/38.7
Rock	47/11/03.4	122/51/01.1

In addition, the following items have been transferred from the prior surveys to the smooth sheet.

<u>Feature</u>	<u>Latitude N</u>	<u>Longitude W</u>	<u>Prior Survey</u>
S G	47/10/25.5	122/50/45.5	H-6197
rky	47/10/24.5	122/50/19.0	"
Tide Rips	47/09/30.0	122/52/15.0	H-6198
Tide Rips	47/09/39.0	122/52/56.5	"
Tide Rips	47/08/53.0	122/54/26.5	"
S	47/09/35.0	122/52/35.0	"
rky	47/09/34.6	122/52/51.0	"

With the transfer of the above notes and features to the present survey, H-10684 is adequate to supersede the prior surveys within the common area.

#### **N. ITEM INVESTIGATIONS**

AWOIS items are satisfactorily discussed in the hydrographer's report.

#### **O. COMPARISON WITH CHART**

Survey H-10684 was compared with the following charts.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>	<u>Datum</u>
18448	27th	October 30, 1993	1:80,000	NAD83
18456	18th	May 20, 1995	1:20,000	NAD83

##### **a. Hydrography**

The charted hydrography originating with the prior surveys mentioned in section M requires no further discussion. Charted information originating from miscellaneous sources was adequately investigated with the following exceptions.

The following offshore features and notes were not investigated by the hydrographer and should be retained as charted:

<u>Feature</u>	<u>Latitude N</u>	<u>Longitude W</u>
Mooring buoy	47/09/32	122/51/53
Mooring buoy	47/08/32	122/54/16

A pier, charted in the vicinity of latitude 47/08/27.9N, longitude 122/54/05.1W, is located outside the limits of hydrography. However, based on notes contained in the raw survey records which document an adequate visual investigation of the area at low water, the pier is considered disproved. It should be deleted from charts.

All charted rocks and piers in the common area not listed above should be retained as charted.

With the exceptions noted above, survey H-10684 is adequate to supersede charted hydrography within the common area. The area of supersession is graphically depicted on Attachment 1 and Attachment 2 to this report.

b. Dangers to navigation

The hydrographer reported no dangers to navigation during survey operations. No dangers were submitted during office processing.

**P. ADEQUACY OF SURVEY**

With the exception of the six-foot sounding transferred from H-6197 (1936) and the mooring buoys mentioned in the Evaluation Report, section O, Hydrography, survey H-10684 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, April 1994 Edition.

**Q. AIDS TO NAVIGATION**

Aids to navigation have been adequately discussed in the hydrographer's report and supplemented as follows:

Itsami Ledge Light 7 was positioned hydrographically during survey operations and is depicted on the smooth sheet.

**R. STATISTICS**

Statistics are itemized in the hydrographer's report.

## **S. MISCELLANEOUS**

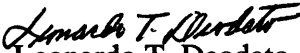
Miscellaneous information is discussed in the hydrographer's report. The geographic name Harstene Island on Charts 18456 and 18448 is now changed to Harstine Island by a recent decision of the Board of Geographic Names. See NOAA Form 76-155 attached.

## **T. RECOMMENDATIONS**

This is a good hydrographic survey. Additional work is recommended in the vicinity of the prior six foot sounding as discussed in the Evaluation Report, Section M.

## **U. REFERRAL TO REPORTS**

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

  
Leonardo T. Deodato  
Cartographer

APPROVAL SHEET  
H-10684

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: 7/9/97  
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.

Kathy Timmons Date: 8/1/97  
Kathy Timmons  
Commander, NOAA  
Chief, Pacific Hydrographic Branch

\*\*\*\*\*

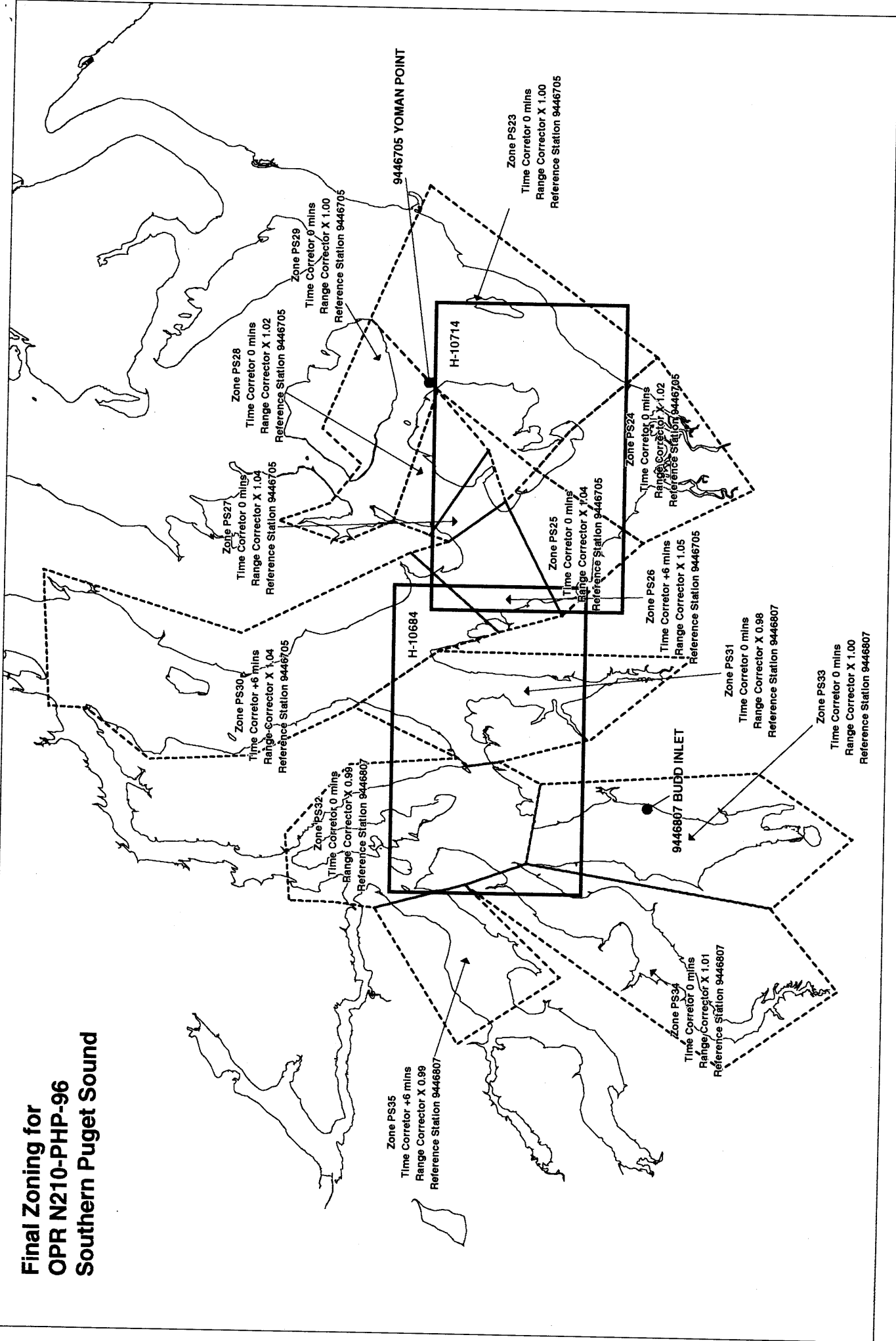
Final Approval

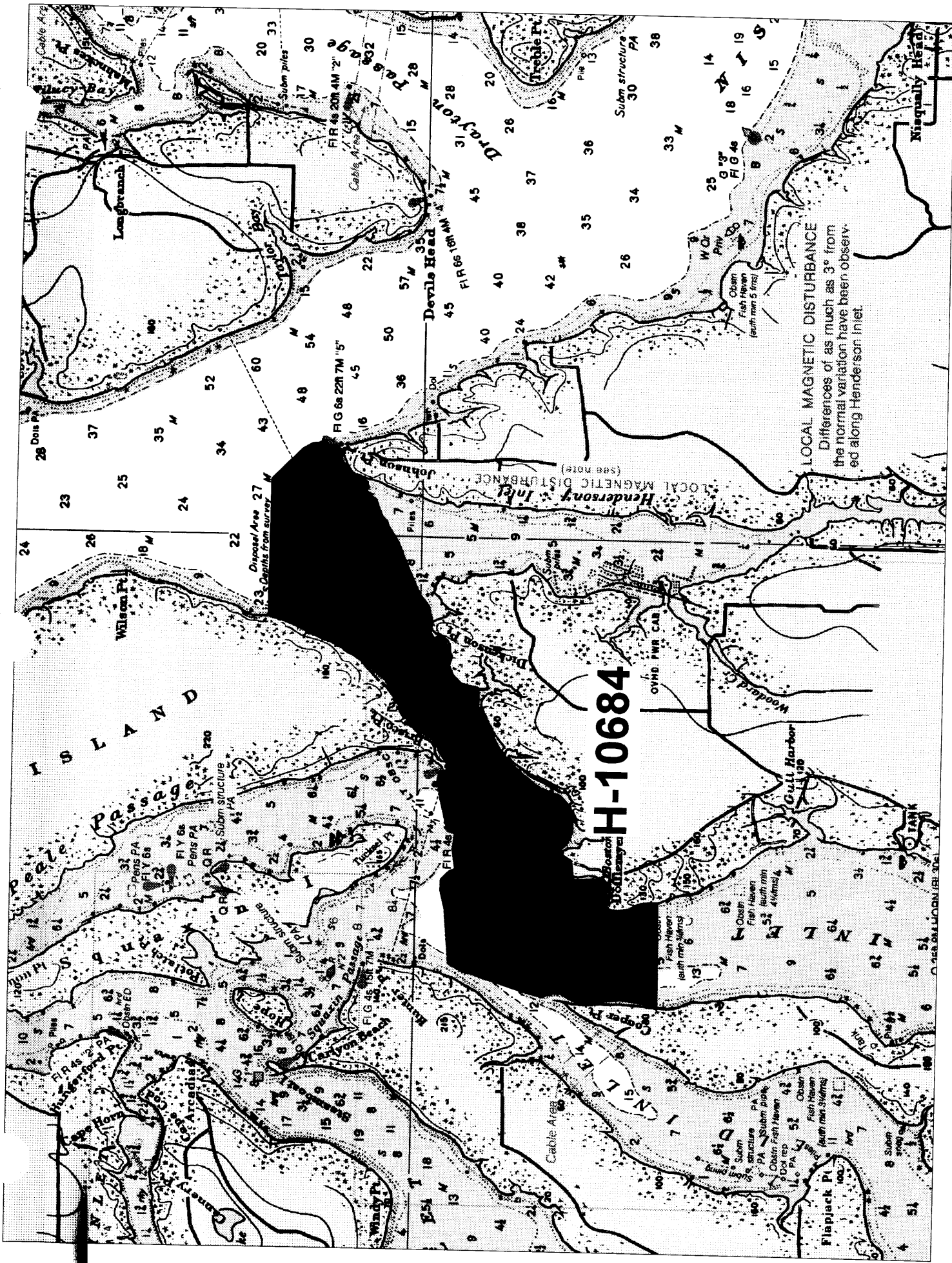
Approved:

Andrew A. Armstrong III Date: Oct 17, 1997  
Andrew A. Armstrong III  
Captain, NOAA  
Chief, Hydrographic Surveys Division



**Final Zoning for  
OPR N210-PHP-96  
Southern Puget Sound**





H-10684

LOCAL MAGNETIC DISTURBANCE  
Differences of as much as 3° from  
the normal variation have been observ-  
ed along Henderson Inlet.

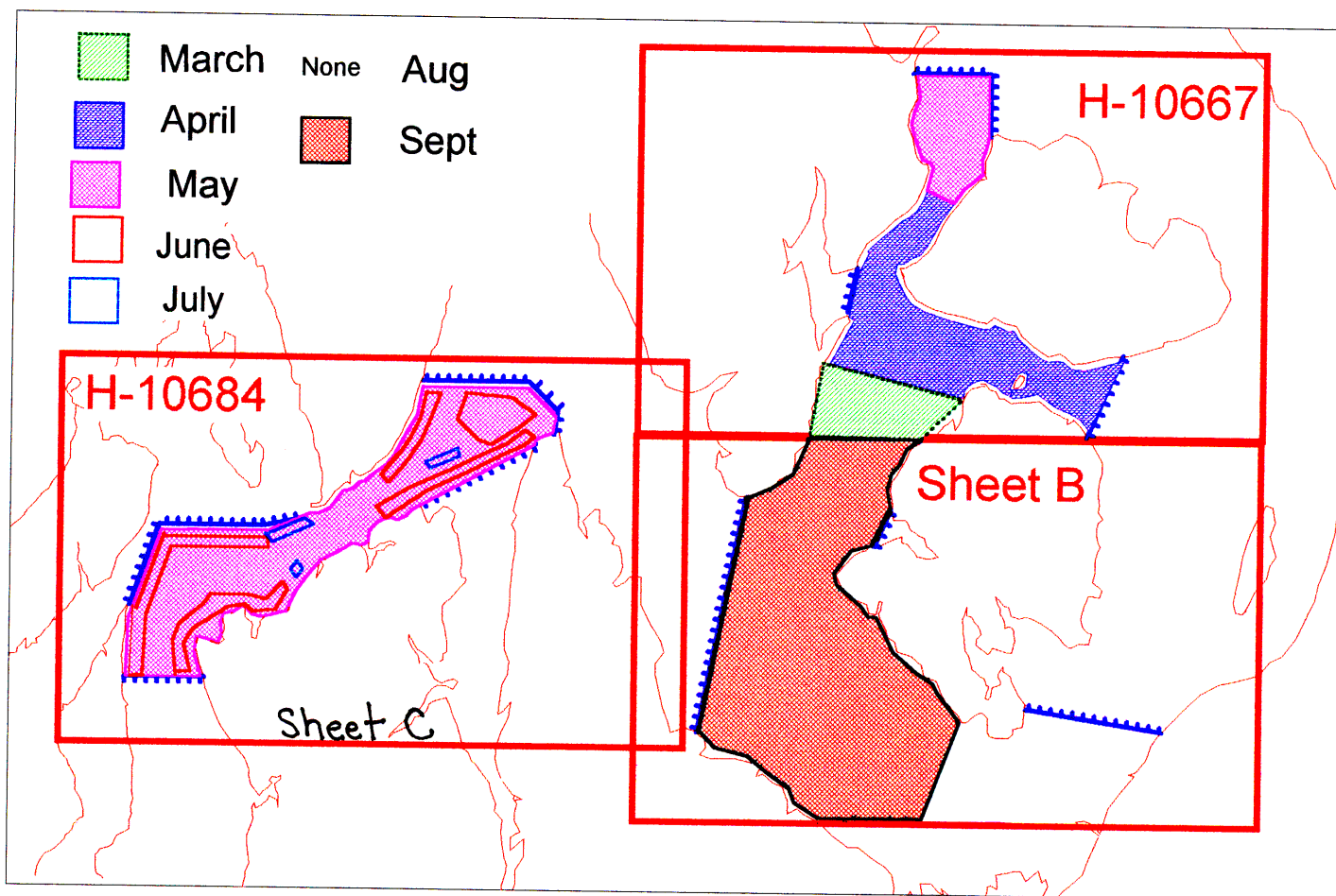
LOCAL MAGNETIC DISTURBANCE  
(see note)

LOCAL MAGNETIC DISTURBANCE  
Differences of as much as 3° from  
the normal variation have been observ-  
ed along Henderson Inlet.

# PACIFIC HYDROGRAPHIC PARTY

## Progress Sketch

Chief of Party  
LT Richard A. Fletcher



### STATISTICS

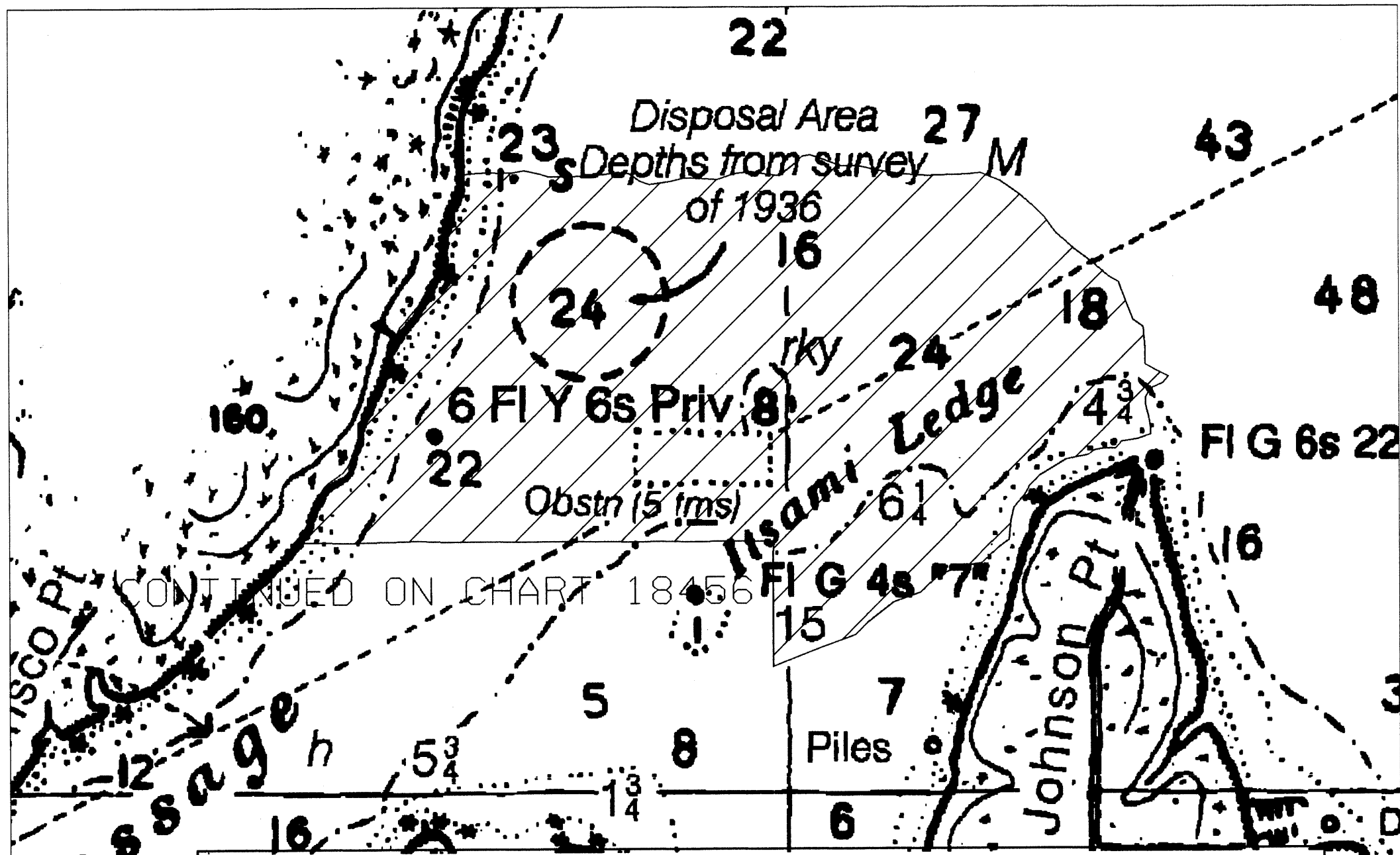
Type	March	April	May	June	July	Sept
LNM. Hydro	30.0	94.4	219.9	36.5	5.2	256.2
LNM. SSS	0.0	35.3	20.6	35.5	3.1	38.2
SQ. NM	1.0	3.1	6.4	2.1	0.1	8.9
D.P.	0.0	0.0	60.0	3.0	1.0	0.0
Dives	2.0	2.0	0.0	0.0	0.0	2.0
B.S.	0.0	0.0	19.0	0.0	36.0	0.0
AWOIS	0.0	0.0	0.0	0.0	0.0	0.0
Control Stations	4.0	0.0	0.0	0.0	0.0	0.0
SV Casts	1.0	2.0	2.0	2.0	1.0	2.0
Tide Gauge	1.0	1.0	0.0	0.0	0.0	0.0

### SCHEDULE

Registry #	Started	Est Completion	Completed	Submitted
H-10667	3/27/96	6/6/96	6/6/96	7/19/96
H-10684	5/14/96	8/15/96	8/15/96	9/30/96
H-10714	9/3/96	10/31/96		

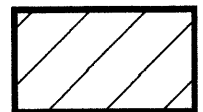
### DOWNTIME (days)

Days lost by	March	April	May	June	July	Sept
Weather	0	0	0	0	0	1
Mechanical	0	0	0	0	0	0
Electronic	1	0	0	3	0	0

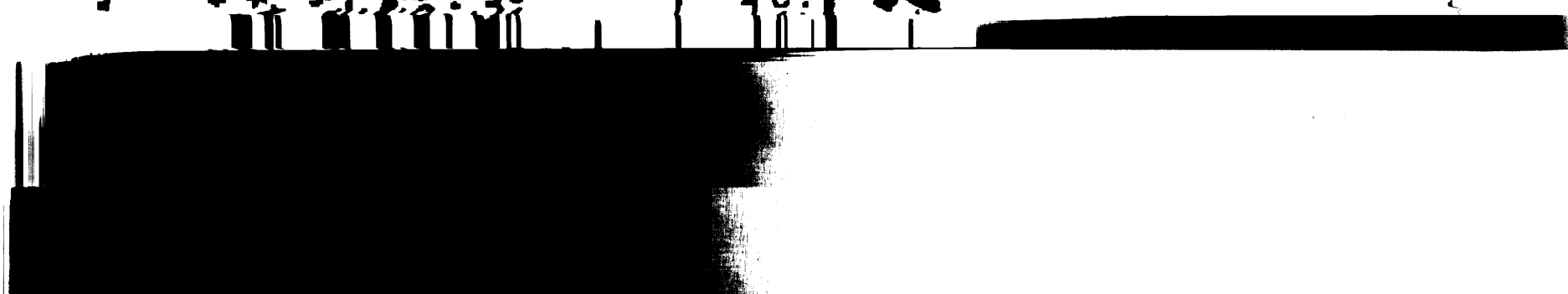


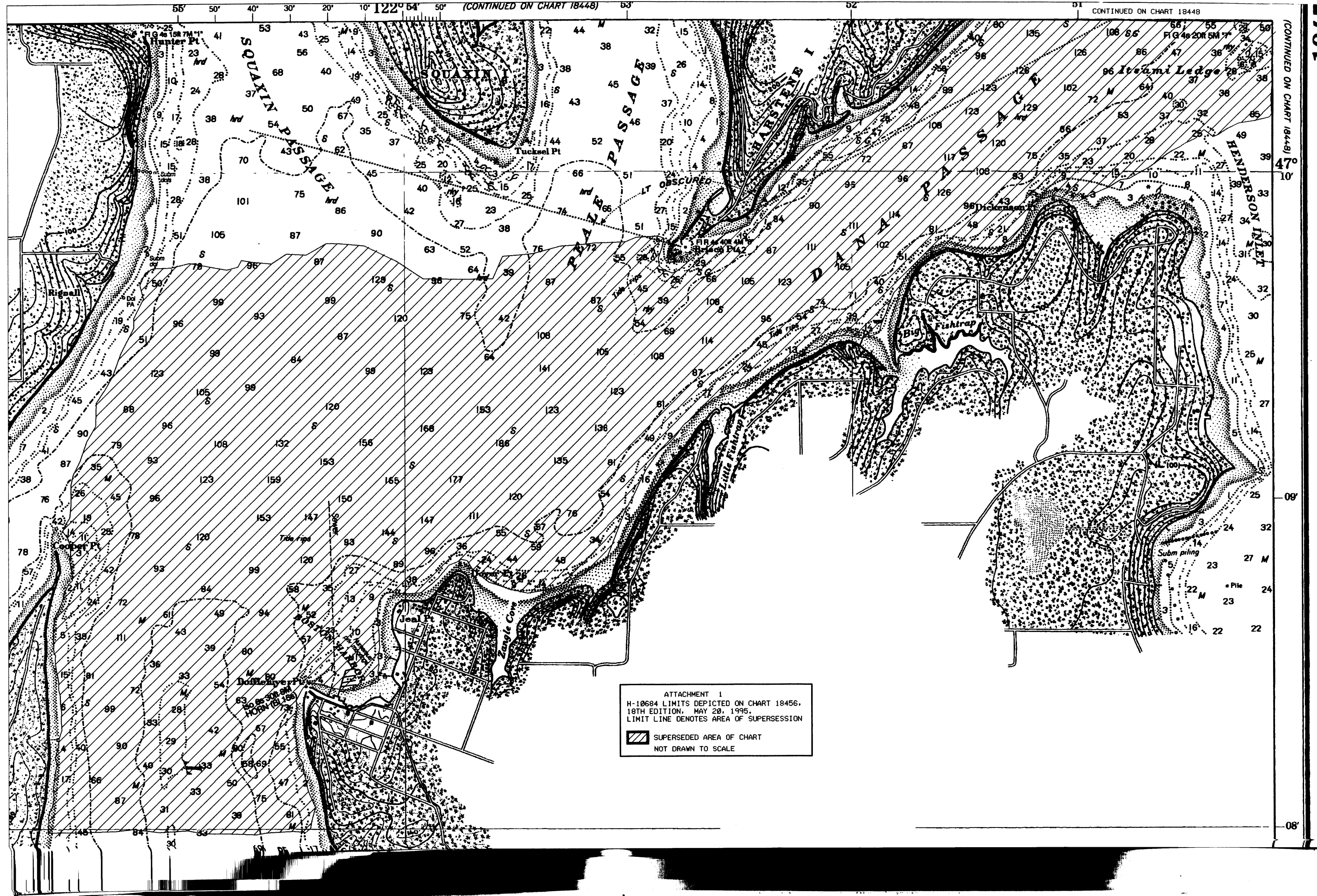
CONTINUED ON CHART 18456

ATTACHMENT 2  
 H-10684 LIMITS DEPICTED ON CHART 18448  
 28TH EDITION, JUNE 29, 1996.  
 LIMIT LINE DENOTES AREA OF SUPERSESSSION



SUPERSEDED AREA OF CHART  
 NOT TO SCALE





CONTINUED ON CHART 18448  
 47° 10'  
 08'  
 08'

