

FE 419

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey ... Field Examination
Field No. PHP-5-2-95
Registry No. FE-419

LOCALITY

State Washington
General Locality .. Puget Sound
Sublocality East Waterway

1995

CHIEF OF PARTY

LT Richard A. Fletcher, NOAA

LIBRARY & ARCHIVES

DATE APR 16 1996

HYDROGRAPHIC TITLE SHEET

FE-419

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-5-2-95

State Washington

General locality Puget Sound

Locality East Waterway

Scale 1:5000 Date of survey July 12, 1995

Instructions dated Not Applicable Project No. Not Applicable

Vessel SeaArk Launch 1102 (EDP #0652)

Chief of party LT Richard A. Fletcher, NOAA

Surveyed by LT R. A. Fletcher, LT(jg) E. W. Berkowitz

Soundings taken by echo sounder, ~~hand lead, etc~~ Innerspace Model 448

Graphic record scaled by LT G. T. Noll, LT J. Verlaque

Graphic record checked by LT G. T. Noll, LT J. Verlaque

Verified by J. Stringham, B. Olmstead Automated plot by HP Design Jet 650C

Evaluated by B. Olmstead
Verification by

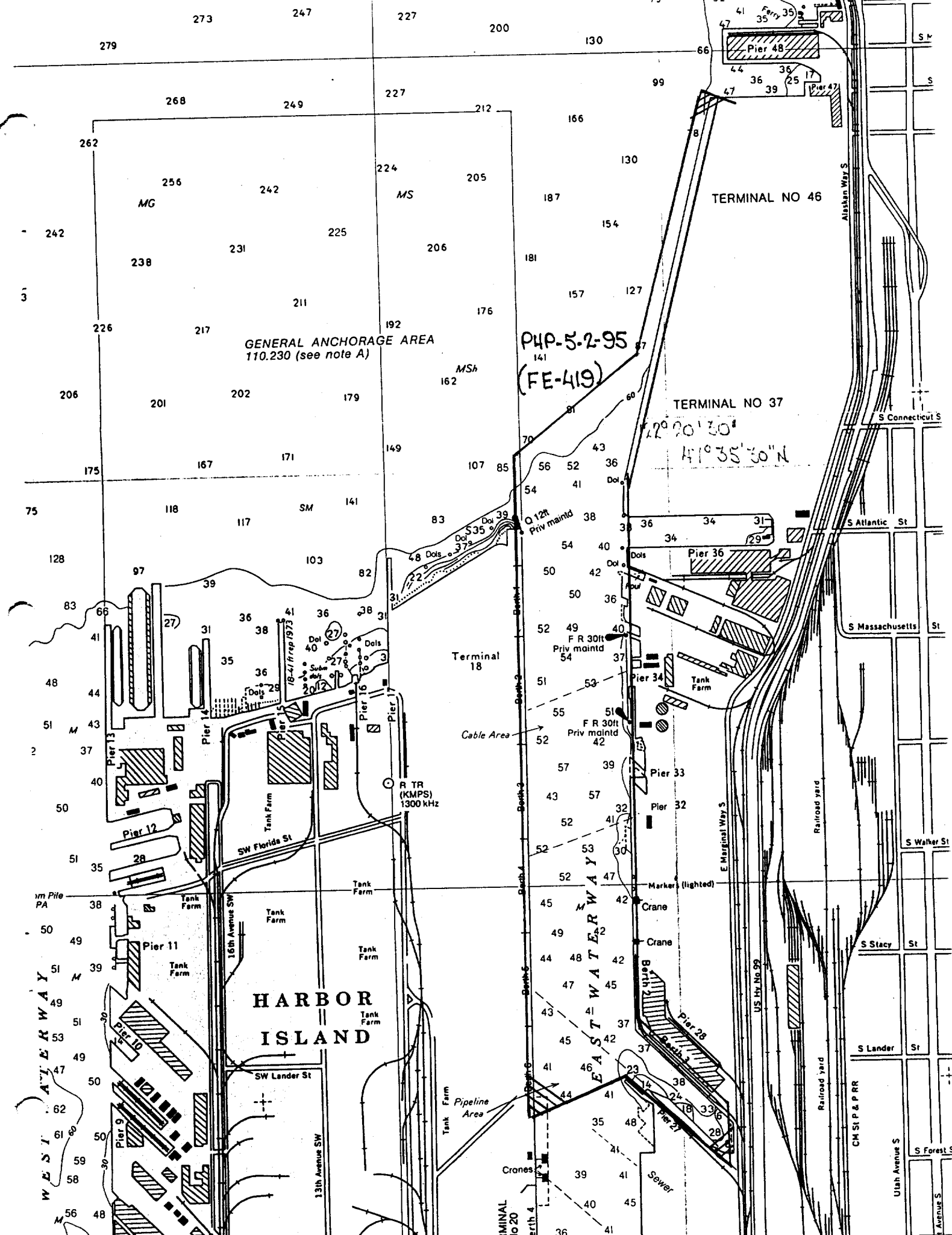
Soundings in ~~XXXXXX~~ feet at ~~MLLW~~ MLLW

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.

APR 16 1996 *Se*

Andrews & MBB



GENERAL ANCHORAGE AREA
110.230 (see note A)

P4P-5-2-95
(FE-419)

TERMINAL NO 46

TERMINAL NO 37

HARBOR
ISLAND

WEST WATERWAY

EAST WATERWAY

Railroad yard

CM ST & P RR

Utah Avenue S

Avenue S

S Forest St

S Lander St

S Stacy St

S Walker St

S Massachusetts St

S Atlantic St

S Connecticut St

Alaskan Way S

US Hwy No 56

E Marginal Way S

Terminal No 20

Im Pile PA

Cable Area

Terminal 18

R TR (KMPS)
1300 kHz

Dols

MSH

MS

MG

3

2

128

75

175

206

206

242

242

262

279

273

247

227

200

130

79

52

66

99

166

130

187

154

181

157

127

192

176

162

179

149

107

85

56

52

36

54

41

Dols

54

40

Dols

50

42

Dols

50

36

Dols

52

49

F R 30ft

54

Priv maintd

51

53

55

51

F R 30ft

52

42

Priv maintd

57

39

43

57

52

41

52

53

52

47

45

42

Markers (lighted)

49

42

Crane

44

48

Crane

44

42

47

45

43

41

45

42

41

37

44

41

44

41

35

48

39

41

40

45

36

41

12° 20' 30"
41° 35' 30"N

O 12ft
Priv maintd

Dols 39
Dols 35
Dols 37

48 Dols
22 Dols

31 Dols

38 Dols

31 Dols

31 Dols

31 Dols

31 Dols

31 Dols

31 Dols

31 Dols

31 Dols

31 Dols

31 Dols

31 Dols

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31 Dols

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31 Dols

31 Dols

31 Dols

Descriptive Report to Accompany Field Examination FE-419

Field Number PHP-5-2-95
Scale 1:5,000
1995

Pacific Hydrographic Party
Chief of Party: LT Richard A. Fletcher

A. PROJECT ✓

This Field Examination, registry number FE-419, was conducted to obtain modern data for the maintenance of existing nautical charts. The project responds to concerns expressed by the U.S. Navy which requested a reconnaissance survey, through contact with the Pacific Marine Center, of the East Waterway of Elliott Bay and a positive resolution of a shoal along pier 37.

The area is frequented by deep-draft container ships. The main concern is the charted shoal along pier 37 where the aircraft carrier Kitty Hawk was assigned to berth during the 1995 Seafair activities.

PHP-5-2-9⁵~~4~~ is the field number assigned to this survey.

B. AREA SURVEYED See Eval Rpt, section B

The area surveyed is the East Waterway of Elliott Bay and the face of terminal 46, from latitude 47°34'42"N to 47°36'00"N and from longitude 122°20'24"W to 122°20'4⁸"W. Plotter sheet 1 was skewed to 270° with overall sheet limits measuring 20 cm by 70 cm. The inshore hydrographic limit for FE-419 was the wharf faces. Depths ranged from 4.5⁵ meters to 26.8 meters. (18-89 Feet)

FE-419 was surveyed at 1:5,000 scale standards, but at 1:10,000 scale position control requirements

All hydrographic data acquisition was conducted on July 12, 1995, (DN 193). A sound velocity cast was conducted on July 13, 1995 (DN 194). Data processing was completed at the Pacific Hydrographic Branch (PHB) July 14, 1995 (DN 195).

C. SOUNDING VESSELS ✓

NOAA Launch 1102 (EDP No. 0652), a 21-foot SeaArk, was used for all hydrography, velocity casts, and developments. No changes to the standard vessel sounding configuration were necessary.

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

HYPACK for Windows version 5.2 was used for data acquisition throughout the project.

HYPCON program 2.16 was used for data conversion to HDAPS format and the raw data was submitted to the Pacific Hydrographic Branch for processing.

The following computer programs were used for supporting data:

<u>Program Name</u>	<u>Version</u>	<u>Date</u>
VELOCITY	2.10	1994
MONITOR	3.0	1995
GEOID93	1.00	1990

E. SONAR EQUIPMENT ✓

No side scan sonar was used on this project. *Concur*

F. SOUNDING EQUIPMENT ✓

The Innerspace Model 448 (IN-448) echosounder, s/n 239 was used on VN 0652.

The IN-448 had extreme difficulty tracking and correctly digitizing in the turbid water of the Duwamish River. Soundings were recorded in meters with a speed-of-sound through water of 1500 m/sec. Depths encountered in the survey area range from 4.8 meters to 26.8 meters.

No on-line calibration adjustments were required for the IN-448.

G. CORRECTIONS TO SOUNDINGS ✓

Velocity of Sound

Corrections for the speed of sound through the water column were computed from data obtained with an Applied Microsystems Laboratories (AML) sound velocity profiler (S/N 03042). The VELOCITY program was used to determine the speed of sound correctors.

The following cast was used to determine the velocity correctors:

HDAPS Table	DN	Depth*	DN Range	Cast Position ✓ Latitude	Longitude
1	194	52.3	193	47°35'36"N	122°21'32"W

*Extrapolated depth.

Separate IV* contains copies of all velocity cast data and HDAPS Velocity Corrector Tables. Note that there were some depths deeper than the sound velocity cast, but not of navigational significance, offshore of the northern piers. *Cast position falls outside the survey limits.*

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

Static Draft ✓

Static draft for VN 1102 was determined on April 12, 1994 (DN 102). First, the depth of the transducer face from a reference mark on the hull was measured. Next, with the launch in the water (fuel tanks half full and two personnel aboard) the depth from this reference mark to the launch's waterline was measured. Combining the two measurements, a static draft of 0.4 meters was calculated.

Dynamic Draft

Settlement and squat measurements for VN 1102 were conducted on April 5, 1994, (DN 095) in Guemes Channel, Washington. Field records are included in Separate IV.*

Offset* table 2 corresponds to VN 1102. Settlement and squat correctors were reapplied during office processing using the REAPPLY program in HDAPS.

Corrections to Echosoundings ✓

Digitized soundings displayed on line were compared in real time with the analog trace to ensure reasonable agreement. As mentioned in section F, Sounding Equipment, digitizing the depths in the turbid water was difficult and significant manual editing of depths were necessary. All sounding edits were scanned and check-scanned at Pacific Hydrographic Branch during processing.

Tide Correctors ✓ See Eval Rpt, section 6

Tide correctors were not applied in the field but real tides were applied during office processing from the Elliott Bay tide station data downloaded from headquarters. The operating tide station at

* Filed with the survey data

Seattle Washington (944-7130), is located less than 1 NM north of the East Waterway and serves as control for datum determination.

Straight line interpolation of the six-minute tide correctors (based on Mean Lower Low Water) was accomplished using the HDAPS program REAPPLY. Times and heights are direct on the datum station. No anomalous data are apparent, and the printout of the data is included in Appendix V.*

H. CONTROL STATIONS *See Eval Rpt, section H*

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). A copy of the HDAPS Control Station Table is included in ~~Appendix III~~ ^{this report} (List of Horizontal Control Stations). A separate Horizontal Control Report for OPR-N228-PHP, Eagle Harbor, was submitted to N/CG245 on July 25, 1995.

I. HYDROGRAPHIC POSITION CONTROL *See Eval Rpt, section I*

Differential GPS (DGPS) was used for position control throughout this survey. Position accuracy requirements for a 1:10,000 scale survey were met as specified in the section 3.4 of the Field Procedures Manual.

The USCG DGPS beacon at Robinson Point was used throughout this project: *Station plots outside the survey limits.*

<u>Reference Station</u>	<u>Latitude</u>	<u>Longitude</u>	<u>El. Ht</u>
Robinson Point	47°23'18.953"N	122°22'26.745"W	-6.031m

Reference sites were confirmed using program MONITOR per FPM section 3.4.6.3. Copies of scatter plots and outlier.sum files are included in Separate III*(Horizontal Position Control and Corrections to Position Data).

DGPS fixed point performance checks were obtained per FPM, Section 3.4.4.1 prior to and after data collection using a pile at the end of a pier at the Ferry Repair Facility in Eagle Harbor. The mark was positioned to Third Order, Class I standards (see Horizontal Control Report). All DGPS performance checks were successful; check forms are located in Separate III.*

* Filed with the survey data.

The following GPS equipment was used:

<u>Equipment Location</u>	<u>Type of Receiver/Antenna</u>	<u>Receiver Serial No.</u>	<u>Antenna Serial No.</u>
VN 1102	Ashtech (v.1E08D)	700417B1043	700378B0402
VN 1102	CSI Beacon Rcvr. (MDL MBX1)	X-1212	M-2253

Offset and layback correctors for the GPS antenna are included in offset table 2.

J. SHORELINE See Eval Rpt, section J.

No shoreline verification was conducted in the field, as no source was available.

K. CROSSLINES See Eval Rpt, section K.

Two lines were run diagonally at 45° to the mainscheme hydrography. No comparison was conducted in the field.

L. JUNCTIONS ✓

There are no junctions. Concur

M. COMPARISON WITH PRIOR SURVEYS See Eval Rpt, section M.

No prior surveys were on hand for comparison.

N. ITEM INVESTIGATION REPORTS ✓

There are no AWOIS items. Concur

O. COMPARISON WITH THE CHART See Eval Rpt, section O.

PHP conducted online comparisons between the digitized soundings and chart 18450, 12th Edition, Jan 26, 1991 to ensure reasonable agreement. A more rigorous comparison will be performed by Pacific Hydrographic Branch, N/CS34 after application of smooth tides.

No indication of the charted shoal along pier 37 was found. Delete shoal charted at latitude 47°35'03"N Longitude 122°20'36"W and replace with depths from this survey. Concur Depths of 40-41 feet were found in the vicinity of the charted 30 foot sounding.

A ~~bar~~^{ridge} was found centered at Latitude 47°35'08"N Longitude 122°20'20"W with a least depth of 43 feet. It appears this may be an area that was missed during the last dredging operations of the East Waterway. Concur Chart this area based on the present survey information.

Danger to Navigation See Eval Rpt, Section O.

No dangers to navigation were found. Further review after smooth tides are applied may indicate dangerous depths within developments.

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

This survey is complete and adequate to supersede all prior surveyed depths, and to update the depth contours in the immediate vicinity. Concur

Q. AIDS TO NAVIGATION See Eval Rpt, Section Q.

All aids to navigation seaward of the 5-meter curve were positioned. All positions showed good agreement with the charted positions. An uncharted light was positioned at the northwest corner of the USCG pier 36. The light is privately maintained by the Port of Seattle. Mr. Jim Boyd of the Port of Seattle, (206)728-3135, was contacted to verify the position but he could not find a recorded position for the light. Although the light was only positioned using Hydrographic standards, DGPS, PHP recommends charting the light, see NF 76-40. See addendum to Section Q dated 2/21/96 (attached).

R. STATISTICS ✓

<u>Description</u>	<u>Quantities</u>
Total Positions (selected soundings)	1483
Total Detached Positions	4
Total Nautical Miles Hydrography	20.2
Square Nautical Miles Hydrography	0.12
Velocity Casts	1
Days of Production	1
Bottom Samples	0
Tide Stations established	0

S. MISCELLANEOUS ✓

Bottom samples were not acquired.

February 21, 1996

Q. AIDS TO NAVIGATION

Some doubt appears in this paragraph about the red light positioned on the NW corner of pier 36. The official name of the light was not shown in the DR or on NOAA FORM 76-40. I contacted Mr. Jim Boyd of the Port of Seattle (728-3135) and he confirmed the Descriptive Report. The Port does not maintain that light. He suggested I contact the Coast Guard Aids to Navigation Branch here in Seattle.

I contacted the Aids to Navigation/Waterways Management Branch phone number 220-7270 and spoke with a Lt. Matthew. I gave Lt. Matthew our position of the light and he searched for the light and finally confirmed the light was not an Aid to Navigation. He believes the light is a red pier light to help vessels in seeing the pier when mooring at 36. Lt. Matthew also, advised me that the two lights on Pier 34 were both discontinued on December 15, 1995 because of new construction.

The Light List Names of the two lights are:

Pier 34 North Dock Light LLNR 16865
Pier 34 South Dock Light LLNR 16870

These lights have been shown on the field examination as they were in existence at time of survey operations.



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

February 20, 1996

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

Dear Sir:

Five dangers to navigation have been identified by Pacific Hydrographic Branch within the survey limits of field examination FE-419 (Pacific Hydrographic Party, July 12, 1995). These dangers affect the following charts:

<u>Chart</u>	<u>Edition/Date</u>	<u>Scale</u>	<u>Datum</u>
18450	13th Ed./Aug 22, 1992	1:10,000	NAD83
18449	15th Ed./Oct 29, 1994	1:25,000	NAD83

The attached information is provided for publication in the Local Notice to Mariners. A copy of chart 18450 showing the area in which the dangers exist is also attached.

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

Sincerely,

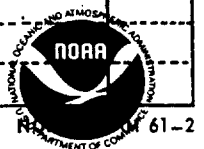
Kathryn Timmons
 Commander, NOAA
 Chief, Pacific Hydrographic Branch

Enclosures

cc: DMAHTC
 N/CS261
 PMC

FILE COPY

CODE	SURNAME	DATE	CODE	SURNAME	DATE
N/CS341	Haines <i>th</i>	<i>2/20/96</i>			
N/CS341	Hill <i>OK</i>	<i>2/20/96</i>			
N/CS34	Timmons <i>KT</i>	<i>2/20/96</i>			



Field Examination Registry Number: FE-419

Survey Title: State: Washington
Locality: Puget Sound
Sublocality: East Waterway of Elliott Bay

Project Number: N/A

Survey Date: July 12, 1995

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

Charts Affected: 18450 13th Edition/August 22, 1992 1:10,000 NAD83
18449 15th Edition/October 29, 1994 1:25,000 NAD83

<u>ITEM</u>	<u>DANGER</u>	<u>DEPTH</u>	<u>LATITUDE (N)</u>	<u>LONGITUDE (W)</u>	<u>POSITION</u>
A.	Shoal	43 feet	47°35'56.46"	122°20'24.64"	No. 100 ✓
B.	Shoal	47 feet	47°35'53.99"	122°20'26.33"	No. 177
C.	Shoal	39 feet	47°35'13.03"	122°20'37.51"	No. 863.01
D.	Shoal	38 feet	47°35'08.44"	122°20'37.43"	No. 527
E.	Shoal	42 feet	47°35'07.59"	122°20'38.92"	No. 991.01

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

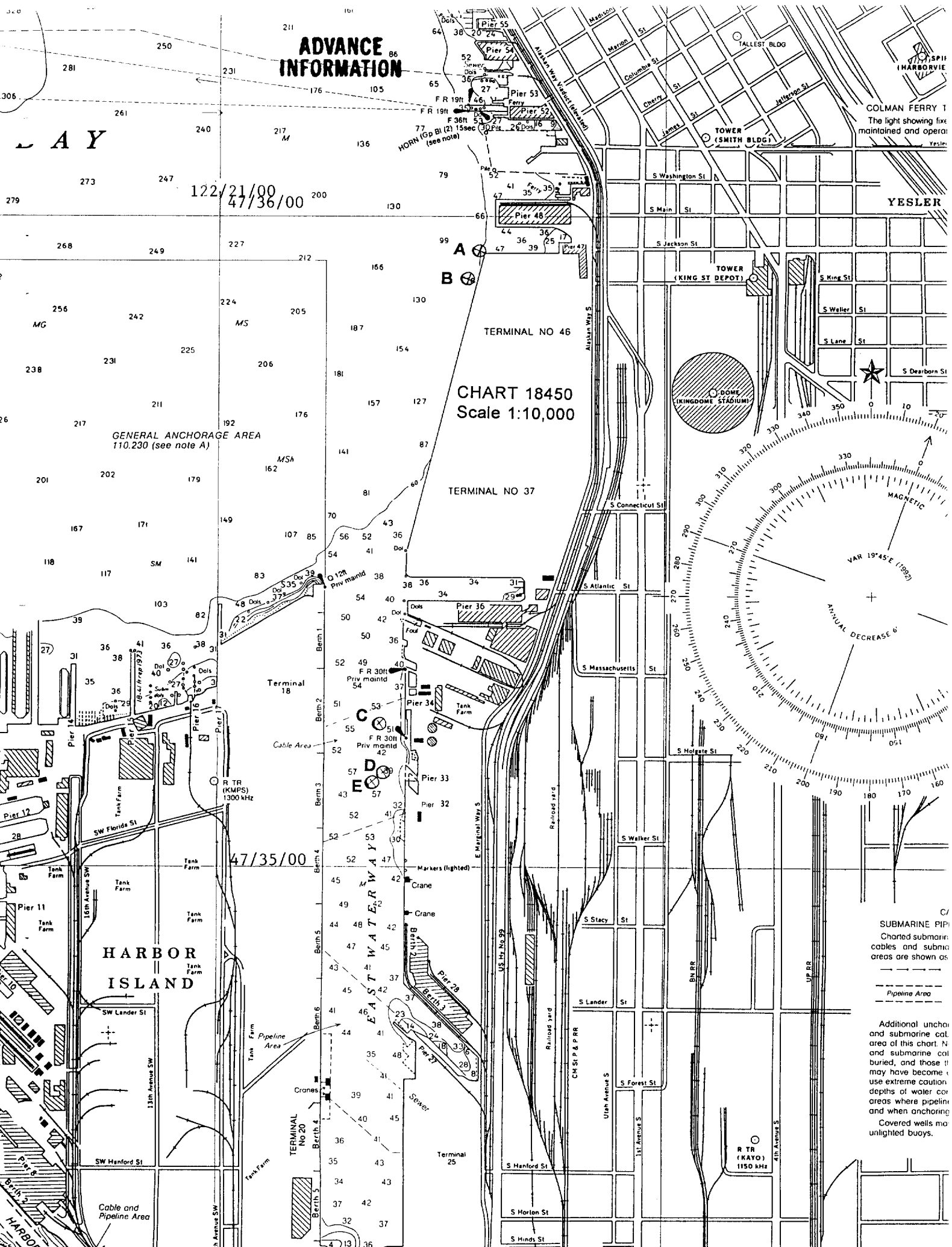
ADVANCE INFORMATION

LAY

122/21/00
47/36/00

GENERAL ANCHORAGE AREA
110.230 (see note A)

CHART 18450
Scale 1:10,000



C/ SUBMARINE PIPE
Charted submarine cables and submarine areas are shown as

Pipeline Area

Additional uncharted and submarine cables in this chart. Note and submarine cables buried, and those that may have become covered with mud or silt. Use extreme caution in depths of water where pipeline and when anchoring. Covered wells marked with unlighted buoys.

RESPONSIBLE PERSONNEL	
TYPE OF ACTION	NAME
OBJECTS INSPECTED FROM SEAWARD	LT Rick Fletcher, NOAA
POSITIONS DETERMINED AND/OR VERIFIED	
FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES	
<p align="center">INSTRUCTIONS FOR ENTRIES UNDER 'METHOD AND DATE OF LOCATION' (Consult Photogrammetric Instructions No. 64.)</p>	
<p>OFFICE</p> <p>I. OFFICE IDENTIFIED AND LOCATED OBJECTS Enter the number and date (including month, day, and year) of the photograph used to identify and locate the object. EXAMPLE: 75E(C)6042 8-12-75</p> <p>FIELD</p> <p>I. NEW POSITION DETERMINED OR VERIFIED Enter the applicable data by symbols as follows: F - Field L - Located V - Verified 1 - Triangulation 2 - Traverse 3 - Intersection 4 - Resection</p> <p>A. Field positions* require entry of method of location and date of field work. EXAMPLE: F-2-6-L 8-12-75</p> <p>*FIELD POSITIONS are determined by field observations based entirely upon ground survey methods.</p>	<p>FIELD (Cont'd)</p> <p>B. Photogrammetric field positions** require entry of method of location or verification, date of field work and number of the photograph used to locate or identify the object. EXAMPLE: P-8-V 8-12-75 74L(C)2982</p> <p>II. TRIANGULATION STATION RECOVERED When a landmark or aid which is also a triangulation station is recovered, enter 'Triang. Rec.' with date of recovery. EXAMPLE: Triang. Rec. 8-12-75</p> <p>III. POSITION VERIFIED VISUALLY ON PHOTOGRAPH Enter 'V-Vis.' and date. EXAMPLE: V-Vis. 8-12-75</p> <p>**PHOTOGRAMMETRIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods.</p>
<p>ORIGINATOR</p> <p><input type="checkbox"/> PHOTO FIELD PARTY</p> <p><input checked="" type="checkbox"/> HYDROGRAPHIC PARTY</p> <p><input type="checkbox"/> GEODETIC PARTY</p> <p><input type="checkbox"/> OTHER (Specify)</p> <p>FIELD ACTIVITY REPRESENTATIVE</p> <p>OFFICE ACTIVITY REPRESENTATIVE</p> <p><input type="checkbox"/> REVIEWER</p> <p><input type="checkbox"/> QUALITY CONTROL AND REVIEW GROUP REPRESENTATIVE</p>	

T. RECOMMENDATIONS ✓

none

U. REFERRAL TO REPORTS ✓

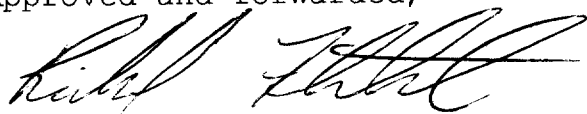
Title

Date

Horizontal Control Report
OPR-N228-PHP
Eagle Harbor, WA

30 May, 1995

Approved and forwarded,



Richard A. Fletcher
Lieutenant, NOAA
Chief of Party

APPROVAL SHEET

for

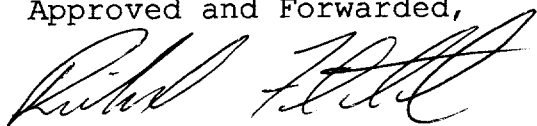
SURVEY FE-419

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 1995. 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,

DATE: September 19, 1995



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

GEOGRAPHIC NAMES

FE-419

Name on Survey	A ON CHART NO. 18450, 18449 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										
	EAST WATERWAY	X		X							
ELLIOTT BAY	X		X								2
HARBOR ISLAND	X		X								3
WASHINGTON (title)	X		X								4
											5
											6
											7
											8
											9
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											25

Approved

Christie Coley
Chief Geographer

FEB 27 1996

HYDROGRAPHIC SURVEY STATISTICS

FE-419

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

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION			AMOUNT
SMOOTH SHEET		1	SMOOTH OVERLAYS: POS., ARC, EXCESS			0
DESCRIPTIVE REPORT		1	FIELD SHEETS AND OTHER OVERLAYS			0
DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS	
ACCORDION FILES						
ENVELOPES						
VOLUMES						
CAHIERS	1					
BOXES						

SHORELINE DATA

SHORELINE MAPS (List):	NA
PHOTOBATHYMETRIC MAPS (List):	
NOTES TO THE HYDROGRAPHER (List):	
SPECIAL REPORTS (List):	
NAUTICAL CHARTS (List):	Chart 18450 13th ED

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			1483	
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	17		17	
COMPARISON WITH PRIOR SURVEYS AND CHARTS		3	3	
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		11	11	
GEOGRAPHIC NAMES				
OTHER*				
*USE OTHER SIDE OF FORM FOR REMARKS				
	TOTALS	17	14	31

Pre-processing Examination by LT Pamela Haines	Beginning Date 7/12/95	Ending Date 9/20/95
Verification of Field Data by J. Stringham, B. Olmstead	Time (Hours) 17	Ending Date 2/20/96
Verification Check by B. Olmstead	Time (Hours) 2	Ending Date 3/25/96
Evaluation and Analysis by B. Olmstead	Time (Hours) 14	Ending Date 3/27/96
Inspection by D. Hill	Time (Hours) 2	Ending Date 3/29/96

EVALUATION REPORT

FE-419

A. PROJECT

Project information is discussed in the hydrographer's report.

B. AREA SURVEYED

The purpose of this survey was to provide contemporary hydrographic data in the East Waterway, Elliott Bay, Washington, which supports considerable deep-draft traffic for the container and cargo handling facilities. Additional information and the survey limits are discussed in the hydrographer's report. Generally, depths range from 5.5 to 27.1 meters (18-89 FT). However, depths in the federal project area which supports the major shipping activity range from 36-60 feet.

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) and AutoCad, Version 12.

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 with the dbf extension. In addition, the sounding plot was created with a dbf (extension) and enhanced using the AutoCad system, are filed both in the AutoCad drawing format, dwg (extension); and in the more universally recognized graphics transfer format, dxf (extension). Copies of these files will be retained at PHB until transfer protocols are developed and improved.

The drawing files necessarily contain information which is not part of the HPS data set such as geographic name's 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. 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

Sonar equipment information is found in the hydrographer's report.

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. The reducers include corrections for actual tide data, dynamic draft, and sound velocity. The reducers have been reviewed and are consistent with NOS specifications. Actual tide reduction is derived from the Puget Sound, Elliott Bay tide gage (944-7130).

H. CONTROL STATIONS

Sections H and I of the hydrographer's report contain adequate discussions of horizontal control and hydrographic positioning.

The USCG DGPS beacon at Robinson Point was used for position control and is a published value based on NAD 83. The geographic positions of all survey data are also based on NAD 83. The field examination 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: -0.544 seconds (-16.791 meters)
Longitude: 4.283 seconds (89.488 meters)

I. HYDROGRAPHIC POSITION CONTROL

Differential GPS (DGPS) was used to control this survey. 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 (HDOP). These positions are isolated and occur randomly throughout the survey area. A review of the data, however, indicates that none of these fixes are used to position dangers to navigation. The features and or soundings located by these fixes are consistent with the surrounding information. These fixes are considered acceptable. System checks were performed by fixed point method to confirm the DGPS was operating properly.

J. SHORELINE

There were no contemporary shoreline manuscripts to support this survey. Although the hydrographer did not perform shoreline verification, a comparison with Chart 18450 13th ED August 1992 reveals that hydrography appears consistent with the charted shoreline.

K. CROSSLINES

Crosslines were run diagonally to the mainscheme hydrography. There was good agreement between the mainscheme and crossline hydrography.

L. JUNCTIONS

Junction information is discussed in the hydrographer's report.

M. COMPARISON WITH PRIOR SURVEYS

H-9169 (1970) 1:5,000

Survey H-9169 covers the entire area of the present survey. However, it appears that the only charted data which originates from this prior work are the soundings and piling in ruins located between Pier 27 and Berth 3 and the two dolphins located on the southern end of Terminal 37 and Pier 36. This is likely attributed to the fact that the East Waterway is a federal project area subject to periodic dredging and continual depth changes.

A comparison with the present survey generally reveals 1-3 foot differences throughout the East Waterway with no clear pattern as to shoaling or being consistently deeper. However, differences of 10-12 feet (deeper) are readily noticeable along many of the berthing areas and is directly attributable to contemporary dredging activities to support deeper draft vessels. The greatest shoreline changes have occurred between Berth 2 and Pier 32 and the southern end of Terminal 37. These shoreline changes are the result of fill to enlarge the container and cargo handling facilities.

With the exception of the following, Field Examination FE-419 is adequate to supersede the prior survey within the common area.

<u>Feature</u>	<u>Location</u>
6-foot depth	Pier 27/Berth 3
8-foot depth	Pier 27/Berth
14-foot depth	Pier 27/Berth 3
Piling in ruins	Pier 27/Berth 3
Dolphins (2)	Pier 36/ Terminal 37

N. ITEM INVESTIGATION REPORTS

There were no AWOIS Items assigned to this survey.

O. COMPARISON WITH CHART

Chart 18450, 13th edition, dated August 22, 1992; scale 1:50,000

a. Hydrography

Charted hydrography originates with the previously mentioned prior survey and miscellaneous sources. The prior survey has been adequately addressed in section M and requires no further discussion. Charted miscellaneous soundings generally reflect the same differences with the present survey data as discussed in section M although charted pier face soundings currently reflect the deeper dredging that has taken place since 1970. Of note, the present survey found depths of 38-47 feet where the present chart shows 52-57 feet. This area is centered at latitude 47/35/09N, longitude 122/20/40W and extends approximately 125 meters west of Pier 33. This ridge-like feature rising above the bottom is likely an area missed during the last dredging operation.

FE-419 is adequate to supersede charted hydrography within the common area with the following exceptions:

<u>Feature</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>
Dol	47/35/29	122/20/34.5
Dol	47/35/23	122/20/35
Foul area	47/35/22.5	122/20/33
Pier ruins	47/35/20	122/20/35
Pier ruins	47/35/11	122/20/34
Pier ruins	47/35/04	122/20/36
Markers	47/35/00	122/20/35
Subm Cable Area	47/35/06	122/20/39

b. Dangers to Navigation

There were no dangers to navigation reported during survey operations. A total of five dangers to navigation were reported during office processing. A copy of this report is attached.

P. ADEQUACY OF SURVEY

Hydrography contained on FE-419 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

There are three fixed aids to navigation located within the survey limits. These features were adequately located and serve their intended purpose. An additional light, Pier 36 Pier Light, is a privately maintained light red light marking the northwest corner of the pier and is currently not charted. This light was adequately located and serves its intended purpose.

There are no charted landmarks within the survey area.

R. STATISTICS

Statistics are itemized in the hydrographer's report.

S. MISCELLANEOUS

Miscellaneous information is discussed in the hydrographer's report.

T. RECOMMENDATIONS

This is a good field examination. No additional work is recommended.

U. REFERRAL TO REPORTS

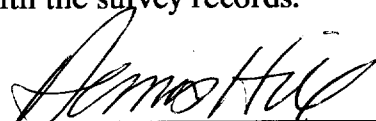
Referral to reports is discussed in the hydrographer's report.

Bruce A. Olmstead
Bruce A. Olmstead
Senior Cartographer


APPROVAL SHEET
FE-419

Initial Approvals:

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

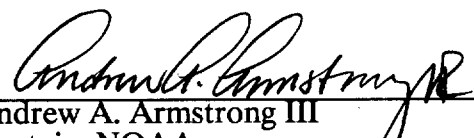

_____ Date: 4/5/96
Dennis Hill
Chief, Cartographic Section
Pacific Hydrographic Branch

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.


_____ Date: 4/9/96
Kathy Timmons
Commander, NOAA
Chief, Pacific Hydrographic Branch

Final Approval

Approved:


_____ Date: 4-15-96
Andrew A. Armstrong III
Captain, NOAA
Chief, Hydrographic Surveys Division

