F00416

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Navigable Area Survey

Field No. SHP-5-1-95

Registery No. FE-416

LOCALITY

State Alaska

General Locality Taiya Inlet

Sublocality Skagway Harbor

19 95

CHIEF OF PARTY
LT Guy T. Noll, NOAA

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NOAA FORM 77-28 (11-72) | U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION | REGISTER NO.

HYDROGRAPHIC TITLE SHEET

FE-416

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. SHP-5-1-95

State: Alaska

General locality: Taiya Inlet

Locality: Skagway Harbor

Scale: 1:5,000 Date of survey: May 9-12, 1995 DN129-132

Instructions dated: May 2, 1995 Project No.: S-0901-SHP

Vessel: "FUNZIE-ONE" Mr. R.A. Stephens, Operator/Owner (Private Vessel)

Chief of party: LT Guy T. Noll, NOAA

Surveyed by: LT G.Noll, LTJG H. Johnson, Dr. Roman Motyka, AK Geological Division

Soundings taken by echo sounder, ~~hand lead, pole~~: Side Scan Sonar EG&G Model 260, Innerspace 448, 208 Khz single-beam

Graphic record scaled by: LT Noll, LTJG Johnson

Graphic record checked by: LT Noll

Evaluation by: ~~Protracted by~~: Gordon E. Kay Automated plot by: HP Design Jet 550L

Verification by: Dennis J. Hill

Soundings in ~~fathoms~~ ~~feet~~ at ~~MLW~~ MLLW: Meters and Decimeters

REMARKS: Time in 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 ✓ 3/22/96 EBC

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537.

U.S. GOVERNMENT PRINTING OFFICE: 1986 - 652-C

Descriptive Report to Accompany Field Examination FE-416

Field Number SHP-5-1-95
Scale 1:5,000
1995

Suitcase Hydrographic Party
Chief of Party: LT Guy T. Noll

A. PROJECT ✓

In accordance with project instructions S-O901-SHP dated May 2, 1995, a field examination in Skagway Harbor, Taiya Inlet, Alaska was performed from May 9 to May 12, 1995.

Hydrography and Side Scan Sonar (SSS) coverage was completed in the vicinity of the major dock facilities per request of the City of Skagway and the State of Alaska after a submarine landslide, or mass-wasting event, occurred November 3, 1994. The goal of the project was to locate and characterize any obstructions or dangers to navigation before the beginning of the 1995 cruise ship season on or about May 23, 1995. Unfortunately, re-construction of the White Pass and Yukon Railroad (WP&YRR) dock facility, which was heavily damaged in the slide, was still underway at the time of the survey, so SSS operations were not possible in the immediate vicinity of the slide.

B. AREA SURVEYED See Eval Rpt, Section B

The area surveyed for FE-416 extends from latitude 59° 26′ 24" N, longitude 135° 19′ 20" W, north to latitude 59° 27′ 05" N, longitude 135° 20′ 10" W, and east to longitude 135° 19′ 15" W. HDAPS Field sheet 01 was skewed 315° with sheet dimensions measuring 16 cm by 22 cm. Hydrographic limits for FE-416 are within those required by the Hydrographic Manual (Section 1.2.3, pp. 1-6).

Hydrographic data acquisition occurred on May 9, 1995 (DN 129), May 11, 1995 (DN 131), and May 12, 1995 (DN 132).

C. SOUNDING VESSELS ✓

Private vessel "FUNZIE-ONE", operated by Mr. R.A. Stephens of Skagway, was used for all hydrography. There is no vessel identification number per HSG 52. The echosounder transducer and GPS antenna were co-located using a stock Innerspace transducer/antenna pole mounted vertically to the outboard starboard rail of the vessel. The face of the transducer was 1.6 meters below the water surface, and the GPS antenna

was 2.7 meters above the water surface. The SSS fish was deployed using about 40 meters of Kevlar cable through an 8" pinch reel hydraulic "pot-puller" commonly used in Alaska for shrimping and crabbing, mounted on the starboard quarter. The top point of the sheave was the measuring point for the amount of cable deployed, per HDAPS SSS fish positioning assumptions, and was located 1.7 meters above the water surface, 1.6 aft of and 0.3 meters to port relative to the transducer/antenna pole. For additional information concerning the logistics and setup of equipment aboard FUNZIE-ONE, see the attached Trip Report. *filed with the survey records.*

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Hydrographic data were acquired using HYPACK for Windows, version 5.2. Data were recorded in the "RAW" sensor format. The data were then converted to Hydrographic Data Acquisition and Processing System (HDAPS) format using HSB's conversion program, HYPCON, version 1.7. The HDAPS program FILESYS, version 3.40, was modified to convert the PC ASCII data file to HP binary format for processing. The HDAPS programs DSNEDIT and BLKEDIT were modified at the Hydrographic Section to change the SSS fish height and cable length, and the computed Course Made Good stored in the data records.

During this project, hydrographic data were e-mailed from Alaska to Silver Spring, Maryland, where they were converted to HDAPS format, then e-mailed to Seattle, Washington for processing of the depth edits scanned in Alaska. Sounding and track plots were made in Seattle, then forwarded by facsimile transmission to Skagway, where interpretation of resulting data by the hydrographer was made to determine necessary additional work. The e-mailed versions of the data were not used in the final processing, however, due to the modifications to the data translators mentioned above.

E. SONAR EQUIPMENT

Side scan sonar data were collected using an EG&G model 260 thermal-paper recorder and a model 272T dual frequency fish borrowed from the Atlantic Hydrographic Party and enroute after this project to RAINIER for an upcoming project. Only the 100KHz frequency was used, running along contours in the steep bathymetry offshore of the piers, and running parallel to the port facilities where possible. The smallest range scales possible were used, and confidence checks were accomplished by running near man-made features (dolphins, piles, riprap). Over 200% coverage was obtained near the ore and Broadway docks, and offshore of the ore, Broadway and ferry terminal facilities. 100% coverage was obtained into the small boat harbor. Substantial coverage of the shoreline south of the WP&YRR dock facility was accomplished, but the steepness of the bathymetry along shore reduces the effectiveness of SSS imagery for finding dangers to navigation, so actual coverage percentages are difficult to compute with confidence.

Large Range Scales were necessary for the deep water tracks collected due to the fish bottom tracking limitations. Near shore coverage was at 100 meter range scale or better, while offshore range scales increased to 300 meters. Speed over ground was never greater than 3 knots (approx. 1.5 meters/second). Up to forty (40) meters of kevlar SSS tow cable were deployed. There was no degradation of the sonargrams due to freshwater or thermoclines.

F. SOUNDING EQUIPMENT

An Innerspace Model 448 (IN-448) echosounder, serial number 258 was used on "Funzie-One". Soundings were recorded in meters with an assumed speed-of-sound through water of 1,500 meters per second. The transducer was pole-mounted coincident with the GPS antenna on the starboard rail amidships.

Digitized soundings displayed on line were compared in the field with the analog trace to ensure reasonable agreement. A comparison with the echogram during deep water operations confirmed the hydrographer's assumption that the digital depth was not equal to the echogram depth in water more than 100 meters deep (HSB has been notified). Sounding operations were therefore limited to water less than 100 meters deep; actual range of soundings is ~~2.4~~ 0.8 to ~~84.6~~ 80 meters.

G. CORRECTIONS TO SOUNDINGS

Velocity of Sound

A sound velocity cast was performed using AML s/n 3003 on DN 131 in 86 meters of water offshore of the ferry terminal. The AML SVP PC-based software did not function on the 80486-based PC, so PROCOMM was used to start the AML and download the data after the cast. The raw data were sent to the Nautical Charting Research and Development Lab (NCRDL) for processing using both the SVP software and the standard VELOCITY program ver. 2.11. Unfortunately, the latest NRCC calibration, which is necessary for VELOCITY correctors, was performed in 1991. These results were close to the SVP-derived results, however. All data are included in the Appendix. *Filed with the survey records.*

Static Draft

A metric Ashtech measurement stick 2.1 meters long was used for depth comparisons with the echosounder. SHP measured the depth below the transducer at low tide on DN 130 using a line and lead fishing weight, then measured the line with the same tension by folding it on an overhanging hook on the aft cabin overhead and comparing it to the pole, which is normally used for geodetic height measurements and is graduated in millimeters. Initial comparisons were off by 0.3 meters, which was later determined to the difference in heel when one person is at the starboard rail (doing the leadline measurement) and standing at the echosounder midships. Additionally, tape was placed on the transducer pole marking the water surface, and this mark was measured on the

dock after removing the pole on DN 132 as a check.

Dynamic Draft ✓
Settlement and squat measurements were not observed for "FUNZIE-ONE". Speed through the water was never above three knots, so these effects are assumed to be negligible. The transducer pole began to bend due to the drag of the water when speeds increased above two knots on DN 129. A C-clamp was affixed to the pole at the rail for DN 131 and less flexing was apparent. There does not appear to be a measurable change in the draft due to the pole flexing.

Tide Correctors ✓
Predicted tide correctors from the existing station at Skagway, 945-2400, were applied to soundings in field processing. Final correctors will be applied from data collected by this station. Opening levels were not performed, per project instructions. Final leveling will be accomplished in June, 1995 by Pacific Operations ~~Section~~ (N/OES214) as part of the relocation of this gage. Final leveling was accomplished. Approved Tide Note dated July 13, 1995 is attached.

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~~ (List of Horizontal Control Stations) attached along with the printouts and other supporting data for the Third Order Class I observations and computations for this project. Nominal one hour open traverse observations were conducted on May 7, 1995 from SGY BM T 187 1988 ("B"-order) to SGY B2 ("C"-order) through the new DGPS reference station positioned for this survey. A spur position from the DGPS reference station to the DGPS performance check station was performed on May 10, 1995. The accuracy of the DGPS reference station is 1:207,616 as computed by the ratio of the difference between the ellipsoidal positions of SGY B2 to the length of the two vectors. Vertical control of the GPS observations was obtained by fixing the position and elevation of SGY BM T 187 1988. Data supporting these positions are ~~located in Separate III~~, Position Control. filed with the survey records.

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

Differential GPS (DGPS) was used for hydrographic position control throughout this survey in accordance with GPS User's Manual version 3.0 and the FPM 3.4.6. The unique mobile equipment serial numbers are annotated on the data printouts.* The base station serial numbers may be found ~~in Appendix III.~~* The PC-based program INITGPS was used to initialize the Ashtech GPS sensor according to FPM 3.4.3.3. ✓

The total Expected Position Error (EPE) was 7.5 meters, which allows a maximum HDOP of 3.0 for this survey according to FPM 3.4.2. The MONITOR program ver. 3.0 was

* filed with the survey records.

used overnight (10 hours) to confirm the selected reference station site. Results are in Separate III. Availability was 98.6%, with 95% of the positions within 6 meters and an HDOP value of 1.9 or less. On-site analysis and review of results indicates a trend of mis-positioning along the fjord of Taiya Inlet, which could not be avoided, when five or fewer satellites were near zenith and no satellite was visible to the south or north. ✓

Per FPM, Section 3.4.4.1, DGPS performance checks were obtained during the survey using the site established at the Skagway Small Boat Harbor floating pier on May 10, 1995 (DN 130) using static GPS baseline measurement from the DGPS station previously positioned. Both performance checks were successful, as annotated on the echograms for DN 131 and DN 132. These checks, combined with the lack of positioning errors relative to shoreline items, even when comparing these positions to the 1:600 scale USACE blueprints, suggest that there were no systemic errors in hydrographic positioning.

J. SHORELINE ✓

Shoreline is shown on field sheets for orientation purposes only from USACE blueprints 153787, 153788 and 153789 per telephone conversation with Hydrographic Surveys Branch Operations Section May 16, 1995. Later shoreline for smooth sheet production will be obtained from the post-construction survey following completion of the new WP&YRR pier. The shoreline depicted on the smooth sheet in brown is from the USACE blueprints listed above. The post-construction survey was not available during office processing.

K. CROSSLINES ✓

Sounding lines which overlap, and data collected on separate days, indicate no systemic problem with positioning or sounding operations, with direct comparison of depths showing differences of less than a meter.

L. JUNCTIONS ✓

There are no contemporary surveys with which to junction. Concur

M. COMPARISON WITH PRIOR SURVEYS *SEE Evaluation Report, Section M.*

This survey was compared to FE-358, 1:5,000, 1990, and the USACE blueprints 153787, 153788 and 153789 (State Plane, NAD27, November 1994) enlarged to 1:5,000. In addition, a sounding plot in feet at 1:600 scale was created from this survey to compare directly to the USACE blueprints. Although on a different horizontal datum and projection, comparison by overlay, using Breakwater Light "2" and the breakwater as a control point, showed no significant changes between the blueprints and this survey, except as covered by the Item Investigation Reports.

N. ITEM INVESTIGATION REPORTS

The following items were assigned for this survey:

AWOIS Item	Depth	Description/Source and Location	Technique; Least Depth at Fix Number
52205	11.8 m	Shoal/USACE blueprint near ferry float	SSS; 12.7 m at fix 1014+0
52206	18.4 m	Shoal/USACE near ferry dolphin	SSS found broken piles; 18.0 at fix 746+1
52207	3.0 m	Shoal/USACE small boat harbor entrance	SSS; 3.3 m at fix 736+0
52208	6.8 m	Depth before dredging Broadway pier	SSS; 9.3 m at fix 500+0
165.2P	7.9 m	Debris Pile found at end of Ore Terminal pier	SSS; 7.9 m at fix 606+1

Item 52205 38.8 foot sounding, approx. 40 feet long, in 70-foot (21.3 m) depths
Source: BP 153788/1994 USACE contract survey (post-slide)
Position: 59°26'54.00"N, 135°19'31.00"W (NAD 83)
Investigation: 200% Side Scan Sonar, high frequency echosounder development

Results:
Least depth of ~~12.7~~ 11.6 meters (~~41~~ 38 feet, 6 3/4 ~~fathoms~~ 6.3) at fix 1014+0 at **59°26'54.81"N, 135°19'31.93"W (NAD 83)** was found on DN 132 (May 12, 1995) during drift search. Side Scan did not detect an obstruction of the reported extent, see fixes 323 to 325 and 447 to 450 on DN 131.

Recommendation: Hydrographer recommends charting least depth at the above position. Do not Concur
The 11.6 meter sounding plots next to ferry dock. Chart representative depths as shown on the smooth sheet.

Item 52206 60.5 foot sounding (18.4 meters) in 70-foot depths (21.3 m)
Source: BP 153788/1994 USACE contract survey (post-slide)
Position: 59°26'55.00"N, 135°19'35.00"W (NAD 83)
Investigation: 200% Side Scan Sonar, high frequency echosounder development

Results:
Least depth of 18.~~0~~4 meters (~~59~~ 60 feet, ~~9 3/4~~ 10.0 fathoms) at fix 746+1 at **59°26'54.25"N, 135°19'34.78"W (NAD 83)** was found on DN 131 (May 11, 1995) during drift search. Side Scan found broken/cut piles (conjecture) southeast of current dolphin marking end of Alaska Marine Highway dock structure. See sonargram for fixes 323 to 325 and 447 to 450 on DN 131, and fix 53 on DN 129.

Recommendation: Hydrographer recommends charting least depth at the above position. Do not Concur
The 18.4 meter sounding plots next to the catwalk attached to the Ferry landing. Chart representative depths as shown on the smooth sheet.

Item 52207 9.9 foot sounding (3.0 meters) in 13-foot depths (4.0 m)
Source: BP 153788/1994 USACE contract survey (post-slide)
Position: 59°26'56.00"N, 135°19'24.00"W (NAD 83)
Investigation: 100% Side Scan Sonar, high frequency echosounder development

Results:

Least depth of 3.~~3~~ meters (1~~1~~ feet, 1 ~~3/4~~ fathoms) at fix 736+0 at **59°26'56.09"N, 135°19'25.64"W (NAD 83)** was found on DN 131 (May 11, 1995) while investigating AWOIS 57705. See echosounder development from fix 715 to fix 738 on DN 131 for raw data and notes. Side Scan found no significant obstructions in entrance to small boat harbor; see 50 meter range scale sonargram for fixes 142 to 148 on DN 131. This 3.1 meter sounding was exceeded by a 21-foot depth. (Position No. 736)

Recommendation: Hydrographer recommends charting least depth at the above position. Entrance of harbor is prone to silt clouds and schools of fish, and AWOIS item may have been caused by one such phenomenon. CHART AREA AS SHOWN ON SMOOTH SHEET.

Item 52208 5 fathoms (9.1 m) post-dredging, 3 3/4 fathoms (6.8 m) charted
Source: CL73-1993 White Pass & Yukon Railroad, post-dredging
Position: 59°27'01.00"N, 135°19'31.00"W (NAD 83)
Investigation: 200% Side Scan Sonar, high frequency echosounder development

Results:

Least depth of 9.~~3~~ meters (3~~0~~ feet, 5 fathoms) at fix 500+0 at **59°27'02.59"N, 135°19'28.28"W (NAD 83)** was found on DN 131 (May 11, 1995) during pier lines along Broadway dock. Side Scan and echosounder found extensive signs of dredging, OR SLUMPING. See sonargram for fixes 167 to196 and 223 to 228 on DN 129.

Recommendation: Hydrographer recommends charting least depth at the above position. CHART AREA AS SHOWN ON SMOOTH SHEET.

Item SSS 165.2P Debris pile on sonargram near Ore Terminal dock
Source: This survey
Position: 59°26'56.8"N, 135°19'48.6"W (NAD 83)
Investigation: 200% Side Scan Sonar, high frequency echosounder development

Results:

Least depth of ~~7.9~~ meters (2~~6~~ feet, 4 ~~1/4~~ fathoms) at fix 606+1 at **59°26'56.80"N, 135°19'48.64"W (NAD 83)** was found on DN 131 (May 11, 1995) during drift search. Side Scan found debris pile south-southeast of current dolphin marking end of Ore Terminal dock structure.

Recommendation: Hydrographer recommends charting least depth at the above position. CONCUR

O. COMPARISON WITH THE CHART *SEE Evaluation Report, Section O.*

Sounding comparisons

Digital selected sounding data were extracted from the HDAPS file GRAPHDATA and imported into MapInfo for digital overlay of a scanned chart image of NOAA Chart 17317, 16th edition, April 1992. Sounding values in meters were translated into whole fathoms using the algorithm Fathoms=INTEGER((Meters*3.280833/6)+.22). A printout of this file and overlay is included in this report as a progress sketch. This chart comparison indicates no dangers to navigation. Shoaler depths are charted in the region near the old WP&YRR pier; obviously this survey is deeper due to the submarine slump of sediments which occurred in November 1994.

The area between the Broadway and Ore Terminal docks was recently dredged, as can be seen from the sonargrams and echograms. The Sewer PA near the ferry terminal was not seen from the boat, but the outfall may be on the echogram between fixes 1213 and 1214 (offline) on DN 132. It was not possible to convince the vessel operator to navigate close enough to shore to fully develop this feature. *The charted "Sewer PA" should remain on the chart.*

P. ADEQUACY OF SURVEY ✓

This survey is complete and adequate to supersede prior surveyed least depths on the five specified investigation items, and to update the depth contours in the immediate vicinity. It is adequate to supplement the prior surveys, blueprints, and post-construction surveys in the supersession of charted soundings. Side Scan coverage of areas other than the vicinity of the WP&YRR pier is adequate for proof of absence of obstructions in these navigable waters. *Concur*

Q. AIDS TO NAVIGATION ✓

The characteristics of the lights at the end of the Broadway dock and small boat breakwater were not observed. The breakwater light "2" was located at the end of the breakwater, but was not positioned to hydrographic standards due to logistical constraints. The dolphin at the end of the Broadway dock was under construction at the time of the survey. The dolphin and the co-located red, privately maintained light, were positioned with fix 859 on DN 131 at latitude 59°26'58.284"N, longitude 135°19'34.703"W. *CHART priv aid, as shown on the smooth sheet, at the above position.*

R. STATISTICS ✓

Description	Quantities
Total Selected Soundings	993
Total Detached Positions	6
Total Bottom Samples	0
Total AWOIS Items	4
Total Side Scan miles	4.8
Total Nautical Miles Hydrography	10.3
Square Nautical Miles Hydrography	0.15
Velocity Casts	1
Days of Production	3

S. MISCELLANEOUS ✓

The fjord of Taiya Inlet has extremely steep bathymetry, especially on the southeast shore. No anomalous tidal or current conditions were apparent. ~~No~~ Bottom samples were ~~acquired.~~ Not required, as per Project Instructions 6.7.

T. RECOMMENDATIONS ✓

Side Scan Sonar coverage near the new WP&YRR pier was not accomplished due to continuing construction. Upon completion, the post-construction survey should verify that depths at the face of the pier are deeper than charted depths. Even if it had been possible, Side Scan coverage in this bathymetry would have been of poor quality. The hydrographer recommends the acquisition of full-coverage digital data using a multi-beam swath system for contour/modeling of the bathymetry for the State of Alaska Division of Geological and Geophysical Surveys. These data would allow better understanding of the geological processes which contributed to the submarine landslide precipitous to the old WP&YRR pier collapse.

U. REFERRAL TO REPORTS ✓

All supporting data and reports are in the Appendix and Separates. filed with the survey records.

Guy T. Noll, LT, NOAA
Chief of Party

CONTROL STATIONS as of 27 Jun 1995

No	Type	Easting	Northing	H Cart	Freq	Vel Code	MM/DD/YY	Station Name
001	G	991.0	1780.5	12 139	0.0	0.0	05/06/93	SGY BM T 187 1988 "B ORDER"
002	G	1857.3	2586.7	21 139	0.0	0.0	05/06/93	SGY B2 "C ORDER" NE RUNWAY
003	G	1381.5	1100.8	17 250	0.0	0.0	05/07/95	DGPS AT HRBR OFFICE "3rd"
004	G	1279.9	992.4	7 250	0.0	0.0	05/09/95	DGPS PIER CHECK STATION "3rd"
005		1134.0	979.8	15 139	0.0	0.0	03/01/92	BREAKWATER LT "2" (USACE)

CONTROL STATIONS as of 27 Jun 1995

No	Type	Latitude	Longitude	H Cart	Freq	Vel Code	MM/DD/YY	Station Name
001	G	059:27:21.539	135:19:30.571	12 139	0.0	0.0	05/06/93	SGY BM T 187 1988 "B ORDER"
002	G	059:27:47.587	135:18:35.568	21 139	0.0	0.0	05/06/93	SGY B2 "C ORDER" NE RUNWAY
003	G	059:26:59.574	135:19:05.789	17 250	0.0	0.0	05/07/95	DGPS AT HRBR OFFICE "3rd"
004	G	059:26:56.069	135:19:12.234	7 250	0.0	0.0	05/09/95	DGPS PIER CHECK STATION "3rd"
005		059:26:55.663	135:19:21.494	15 139	0.0	0.0	03/01/92	BREAKWATER LT "2" (USACE)

Special Report FE-416

INTRODUCTION

Hydrography and Side Scan Sonar (SSS) coverage was completed in the vicinity of the major dock facilities per request of the City of Skagway and the State of Alaska after a major submarine landslide occurred November 3, 1994. The goal of the project was to locate and characterize any obstructions or dangers to navigation before the beginning of the 1995 cruise ship season on or about May 23, 1995. Unfortunately, re-construction of the White Pass and Yukon Railroad (WP&YRR) dock facility, which was heavily damaged in the slide, was still underway at the time of the survey, so SSS operations were not possible in the immediate vicinity of the slide.

This project had good conditions for a full test of the "suitcase hydrographic" survey method which has been a goal for several years in NOS. The project site was far from office support which presented challenging obstacles such as data transmission, equipment shipment, personnel travel, availability of supplies, and encouraged resourcefulness. The availability of GPS and the proximity to a working tide gauge freed the hydrographers from time-consuming horizontal and vertical control. The city of Skagway was willing to supply a "vessel of opportunity" free of charge with a boat driver, and the state of Alaska Division of Geological and Geophysical Surveys supplied another knowledgeable worker for the survey. Finally, the advent of good IBM-compatible PC-based survey software allowed the data acquisition and processing of hydrographic and support data on one computer, so additional office space is no longer required.

Work in support of survey operations began in both the Operations and System Support sections approximately 2 months before the project. Equipment and survey logistics were not finalized until two weeks before the beginning of operations. Shipment of gear occurred in those two weeks, after some hardware testing at Pacific Marine Center. All data were processed by the end of May, and plots in MapInfo were created for significant personnel associated with the project, including Skagway, the State of Alaska, and the USACE.

CHRONOLOGY OF EVENTS

Saturday, May 6, 1995

- Arrive Skagway aboard 4-seater Piper from Juneau at 9 pm
- Explore town, harbor, piers

Sunday, May 7, 1995

- DGPS base station setup at Harbormaster's Office
- One hour observations at SGY B2 and Benchmark T 187 1988
- Downloaded Ashtech GPPS software from PHS BBS with D. Timmons aid since we could only connect at slow baud rates and our login time at Ashtech was restricted.
- Dr. Roman Motyka, Alaska Department of Geological Surveys arrived in evening
- Setup MONITOR at DGPS base station for overnight observations.

Monday, May 8, 1995

- Met Mr. R.A. Stephens and began boat setup on "FUNZIE-ONE"
- Completed boat setup with aid from Roman Motyka and Mr. R.A. Stephens.
- Completed computations of DGPS base station position
- Setup MONITOR program again at DGPS base station because of questionable output from previous night.

Tuesday, May 9, 1995

- MONITOR output acceptable, ready for hydro.
- Final communications testing between acquisition computer and sensors.
- Collected SSS data along depth contours
- Met with *Skaguay* news reporter, Mark Cardinal, during lunch and described the project (See article.)
- Ran out of Innerspace 448 paper in afternoon, arranged for shipment of paper from Seattle
- Met with MKB construction who is doing the work on the new pier. Unable to lower any mooring lines or move barges due to tight deadlines unless owner gave the go ahead.
- Met with Beryl Hosford, Director of Port Operations for White Pass and Yukon Railroad, and found that no further delays in completion date could be accommodated.
- Scanned echograms for depth edits and sonargrams for contacts. Data was sent to PHS and HSB for conversion along with the compiled list of depth edits.

Wednesday, May 10, 1995

- Innerspace paper arrived in late morning.
- Met with City Manager, Jim Filip, who reiterated that the city wished to get "as much as they can" from us for the port safety.
- Set up GPS for performance check station alongside FUNZIE-ONE

- Set up AML for a cast.
- Measured offsets on boat such as draft, SSS layback, and SSS offset.
- Worked on processing the AML test cast

Thursday, May 11, 1995

- Collected SSS data in morning, echo-sounder data in afternoon.
- Completed development of AWOIS items.
- Acquired detached positions on all ends of piers.
- Performed AML cast in 80 meters of water.
- Scanned echograms for depth edits and sonargrams for contacts. Data was sent to PHS and HSB for conversion along with the compiled list of depth edits.
- Continued pursuing HYPACK processing
- Worked on processing the AML cast.

Friday, May 12, 1995

- Continued processing and analyzing data in morning.
- Once PHS provided input of coverage, collected echo-sounder data in afternoon.
- Removed all equipment from "FUNZIE-ONE", packed it, and stored it in harbormaster's office overnight.

Saturday, May 13, 1995

- Arranged for shipment of SSS to Juneau to await RAINIER arrival and arranged for shipment of remaining gear to Juneau where FEDEX would pick it up.

Sunday, May 14, 1995

- Arrived in Seattle

Monday, May 15, 1995

- Worked on HYPACK to HDAPS conversion program with HSB

Tuesday, May 16, 1995

- Continued work on conversion program with HSB

Wednesday, May 17, 1995

- Completed revisions of conversion program, loaded all data onto HDAPS.
- Completed depth edits, reapplication of vertical correctors, and produced a draft sounding plot.

LOGISTICS

Shipment of Equipment

Time-critical shipment of equipment weighing less than the Federal Express US government contractual limit of 150 lbs (100 lbs in remote locations) is best handled by using pre-printed FedEx forms with account numbers for HSD/PHB/AHB. Most locations are served by one or two-day service. For larger shipments, or remote locations, such as Alaska or the territorial islands, Andy Michels (the shipping/warehouse manager at PMC) recommends FliteTime, a government contract service. He is willing to do the paperwork necessary for FliteTime usage for these kinds of projects. Basically, the field unit calls Andy and informs him that they would like to ship with a "convert to GBL at destination", he does the paperwork and tells them to call FliteTime at 1-800-992-2211. FliteTime arranges the accounting based on PMC's number and the field unit's accounting code, and needs only the number and weight of the pieces from the field unit and the Airbill number from the shipper. Although similar arrangements could be made with other shipping offices, Andy's experience will help ensure timely shipment of goods, and he is willing to handle the special work.

Testing of survey equipment

Another reason to have Andy handle the shipping is the need to "stage" the equipment and ensure it is in working order at PMC-EED. The experience of the Electronic Technicians at PMC helps to ensure that the necessary modifications to new equipment, mounting accessories, and supporting connection gear are made and tested in a timely manner, with due regard for possible field-mandated changes to the original design.

A major part of the testing is the setup and hands-on checkout of the software to be used for the survey. ALL software, including survey planning, acquisition, processing, and supporting programs should be reviewed one month prior to the project. This will allow testing of the software packages with the equipment at least two weeks prior to the project, and ensure that all software is present and in working condition before the project begins. Until several projects have been completed, it is highly likely that a new project will require changes to software and hardware packages unforeseen by the previous project managers. For example, one project may require Side Scan Sonar imaging, with daily images faxed or e-mailed to the home office, and the next project may require Sea Bat multi-beam images and near-real time contouring for comparison to prior survey data. The software for handling these two projects would consist of several different packages, many of which would not be needed during the other project.

Personnel

At least three survey-proficient personnel are required for a SSS survey and at least two survey-proficient personnel are required for a basic hydrographic survey. Field

personnel need to have experience in survey project setup (GPS, tides, sound velocity), data collection and processing, public relations (including communications with the public, contractors, politicians, and mass media), and most importantly, troubleshooting all of the above. Familiarity with computers, data communications protocols, and software macro programming is a requisite for at least one of the personnel assigned to the suitcase unit. Depending on the visibility of the project, public relations is a major portion of the work performed by the field unit, and could require a dedicated senior officer on-site (e.g. LCDR DeBow at Huntington Beach oil spill). Arduous working conditions, such as those found at Shemya Island, Alaska, require additional personnel to ensure project completion before complete burnout of the assigned unit. Assigned personnel should expect to work 12-hour days, and be required to work up to 16 hours per day, if necessary, to complete the project within cost. Sustained working hours greater than 12 per day will occur, but should be mitigated by a "standby" hydrographer if possible. Thus, use of civilian employees will incur greater costs, due to overtime, then that of commissioned personnel.

Public Relations

Basic public relations include the self-introduction of the survey project personnel to the people and agencies listed in the project instructions. Once on site, the project manager must make time to visit the primary survey requester to discuss project goals. Talking with local boaters may offer additional useful perspectives to the hydrographer's knowledge of the area. Contacts cultivated through the project planning process at Operations should be enhanced with background information and alternate contacts whenever possible.

A lunch with member(s) of the local mass media may be a time-efficient way of getting the suitcase hydrographic team's mission message to the public. Radio/Television interviews may also be useful, but common sense should be used in scheduling interviews if adversarial positions exist. Try not to implicate the survey in legal conflicts; the survey may end up in the courts, and survey team members should endeavor not to comment on such matters to which the data may pertain.

Prior preparation of presentation materials, such as MapInfo viewgraphs, will help show politicians and media the state of readiness of the team, if a formal debriefing of hydrography or the current mission is requested. MapInfo could also serve as a conduit through which information about the project, such as changes to the shoreline or area of hydrography, could be passed back to headquarters. Hydrographic data could be put into X,Y,Z format and imported into MapInfo, then sent via e-mail or fax back to the planning personnel for evaluation. Images could be scanned for additional background information. Finally, MapInfo or HYPACK could be used to provide .DXF-type files to local engineering/planning offices for near-real time non-navigational uses.

SURVEY

A 34' private vessel "FUNZIE-ONE", owned by Mr. R.A. Stephens of Skagway, was used for all hydrography. Four people were used during survey operations: Mr. R.A. Stephens operated the vessel during all survey operations, Dr. Roman Motyka, Alaska Department of Geological Surveys, operated the Innerspace 448 echo sounder, LT Guy Noll operated the EG&G 260 SSS and hydraulic pinch-block winch, and LTJG Heidi Johnson operated the acquisition computer. All data were collected at speeds less than three knots to avoid stressing the transducer/antenna pole mounted outboard. The echosounder and VHF DGPS systems worked well.

Line spacing and orientation were problematic. Standards written in the Hydrographic Manual were not feasible for a vessel of opportunity. Several factors affected our decision to switch from normal hydrographic lines. Even though a cross track error indicator was present on the HYPACK computer, it was difficult to discern due to the monochrome display and it was physically impossible to station the computer near the vessel operator. Beyond the physical limitations, we knew that it was not realistic to expect someone without prior experience to drive an electronic line and it was also not possible for one of us to drive his vessel. Unfortunately, Mr. R.A. Stephens' compass was also broken. Thus, sounding lines were run parallel to the piers at distance intervals and AWOIS items were investigated by drifting over an area or tight line spacing relative to fixed objects/ranges on shore. Since he did have a Echotec color VDU depth sounder, all SSS work was run along depth contours, the standard method in areas of steep bathymetry, and this worked as well as expected.

Detached positions were obtained on the offshore ends of the dolphins at the end of all piers in the harbor. Mr. Stephens performed this work well, and hopefully the next vessel's operator will be as courageous in this effort.

Survey depth comparisons between our data and the 1990 RAINIER survey data were very good, less than 0.5 meters, in areas which were not subject to change due to dredging or the slide. In the area of the slide all survey depths were 10-25 meters deeper. SSS bottom coverage was full 200% in areas of deep-draft significance to navigation and all contours looked reasonable. Refer to the Descriptive Report for detailed information regarding the survey.

EQUIPMENT

Private vessel "FUNZIE-ONE" was used for all hydrography. The steel-hulled vessel is 34 feet in length, 10 feet abeam, and has a draft of approximately 4 feet. Helm controls are stationed in the cabin, flying bridge, and on the aft cabin bulkhead on the port side fantail for easy dockside maneuvering. The vessel is powered by a Caterpillar 3106 diesel, with four hundred gallon fuel capacity. A sixty ampere 12 Volt alternator charged two banks of two six Volt batteries connected in parallel for 12 VDC. The batteries, which were new, were discharged during the day due to the slow boat speeds, and were recharged at lunch and during the evening using shore power.

Two **Ashtech ME-XII GPS** units were used to establish a position for the Differential GPS (DGPS) station at the harbormaster's office and one unit was used as a DGPS reference station for hydrography. The DGPS station was setup up in a small utility building where 120 VAC power was available. Long coaxial antenna cables allowed GPS and radio transmission antennas to be affixed to the roof of the building providing a clear sight to the survey area. Running the radio and GPS equipment from 120VAC simplified operations, including the MONITOR test, and eliminated the need to recharge 12V batteries each night.

Two **Maxon VHF radios** were utilized to transmit and receive differential GPS correctors. One radio was mounted alongside the Ashtech ME-XII GPS unit in the small utility shed to transmit correctors. We initially tried to use a magnetic mount whip antenna for transmission, but were unable to receive correctors so we switched to the standard Maxon pole antenna supplied by PMC which worked. The second radio was installed on the vessel to receive correctors. The magnetic mount whip antenna worked fine for receiving correctors and was mounted on the mast of the vessel. The cable ran through a lockable overhead hatch to the radio.

An **Ashtech GPS sensor** was used in the vessel to provide positioning information to HYPACK. The antenna was mounted on the top end of the transducer pole using a threaded bushing that had been fabricated at N/CG21 prior to departure. A piece of all-thread bolt would also have served as an antenna mount, hose-clamped to the transducer pole or another mast of at least one inch diameter. The antenna was mounted approximately 2.7 meters above the waterline which provided adequate service although it was still a couple of meters below the stack. The sensor was initialized using an in-house program, GPSINIT. The sensor did not save the initialization parameters, probably due to a faulty internal battery, so it was reset each time it was powered up for surveying.

An **Innerspace 448 single frequency echo sounder** was used to collect both analog and digital sounding data. The high frequency transducer (208 kHz, 8 degree beamwidth) tracked the bottom well, down to 80-100 meters. Similar to reports from PHP, 10 meter differences between the analog echogram and the digital data were noticed in deeper depths ($>$ 100 meters.) Several heavy metal tube sections were connected to form the transducer pole. The transducer was connected to one end of the pole with the power cable running up through the pole sections. The pole was attached to the boat using several

universal antenna clamps, a C-clamp, and lines leading fore and aft from the transducer to cleats on the boat. The pole was mounted vertically to the outboard starboard rail of the vessel with the transducer positioned 1.6 meters below the waterline which placed it approximately 1 foot below the keel of the vessel. We observed the pole bending aft at higher speeds, but ran most sounding operations at slow speeds (3 knots.)

An **AML sound velocity probe** was used to acquire a sound velocity profile down to a depth of 100 meters. The plan was to use AML's SOFT-16.SVP software to initialize the probe and process the probe data using calibration coefficients unique to this software. Attempts to use the software to initialize the probe failed and we used PROCOMM to communicate directly with the probe. Commands to clear the memory, reset the time, and to start the logging sequence were issued. It is believed that the 486 computer we were using was too fast to use with this software. The documentation of the software had the following to say, "It should be noted that problems may arise if SOFT-16.SVP is run on one of the new 'super-fast' AT or 386 IBM compatible computers. Timing problems can occur and the communication link lost when the serial port is accessed too quickly." After the cast was performed, the data was downloaded to hard disk using PROCOMM. We were unable to use the SOFT-16.SVP software to process the cast because it was in an incompatible format. Since we did not have the NRCC calibration coefficients we were also unable to process the cast using the standard procedures. Instead, the DQA was manually compared against a hard copy of acceptable limits and the cast sent to N/CG21 for further analysis. They were later able to process the cast using the SOFT-16.SVP software with a slower machine although they admitted that the SOFT-16.SVP software was not as robust as desired.

An **EG&G 260 side scan sonar** was used to acquire sonar imagery of the harbor area. Side scan sonar data were collected using a thermal-paper recorder and a model 272T dual frequency fish borrowed from the Atlantic Hydrographic Party and enroute after this project to RAINIER. Only the 100KHz frequency was used, running along contours in the steep bathymetry offshore of the piers, and running parallel to the port facilities where possible. Note that communication with the boat's driver is crucial for safe SSS operations, and that reference to physical landmarks such as piers, dolphins, and rip rap is easier for the layman to understand then the "normal" hydrographer's lingo of SSS Range Scale overlaps, Cross Track Errors, and SSS towcable lengths. The smallest range scales possible were used, and confidence checks were accomplished by running near man-made features (dolphins, piles, riprap). Over 200% coverage was obtained near the ore and Broadway docks, and offshore of the ore, Broadway and ferry terminal facilities. 100% coverage was obtained into the small boat harbor. Substantial coverage of the shoreline south of the WP&YRR dock facility was accomplished, but the steepness of the bathymetry along shore reduces the effectiveness of SSS imagery for finding dangers to navigation, so actual coverage percentages for navigational clearance purposes are difficult to compute with confidence.

Large range scales were necessary for the deep water tracks collected due to the fish bottom tracking limitations. Near shore coverage was at 100 meter range scale or

better, while offshore range scales increased to 300 meters. Speed over ground was never greater than three knots (approx. 1.5 meters/second). The SSS fish was deployed using about 40 meters of Kevlar cable through an 8" pinch reel hydraulic "pot-puller" commonly used in Alaska for shrimping and crabbing, mounted on the starboard quarter. There appears to be no damage resulting from the pinch block usage. There was no degradation of the sonargrams due to freshwater or thermoclines, though freshwater was present in the northern limit of the survey, and air temperatures were well above normal.

A **486-33Mhz "luggable" computer** with 4 MB RAM and a 520 MB hard disk was used for data acquisition, data processing, sensor initialization, horizontal control processing, sound velocity processing, data transmission, and e-mail. The computer was outfitted with an internal modem and a 4-port serial card which allowed for a total of 6 serial ports. Serial ports were utilized by the mouse, GPS sensor, Innerspace 448, and EG&G SSS. After determining the correct communication protocol for each sensor, there were no problems with serial communication. The modem was used to communicate through e-mail host computers, to download program updates, and to transmit data to the processing center. The modem provided invaluable service as we would not have been able to work through the conversion problems without sending sample data. Although the hard disk size was adequate, we frequently ran out of memory when accessing large datasets. The computer, although touted as "portable", weighs in at a heavy 22 lbs which makes it moderately cumbersome when travelling, moving it from acquisition platform to processing space, and basically carrying it with you wherever you go.

Coastal Oceanographics's **HYPACK acquisition and processing software** was used to collect data and do preliminary processing. See the Processing section for further details regarding the processing capabilities. There were no problems with HYPACK in regards to acquisition. HYPACK interfaced with the Ashtech GPS sensor, Innerspace 448 echo sounder, and EG&G 260 side scan sonar. Both the Innerspace 448 and EG&G SSS were annotated with an event mark, event number, and time. Event marks on the EG&G 260 were sporadic and unpredictable. This appears to be an inherent problem with the EG&G 260 as HDAPS and PC-DAS have the same problem with 2-way communication. Data was logged based on distance and saved to the hard drive at the end of a line. Requests for modification to HYPACK categorized by Coastal Oceanographics' response follow:

Modifications Completed by Coastal Oceanographics (5/26/95)

1) Change the Side Scan Sonar (SSS) raw sensor message tag from "EC2" to something else such as "SSS" or "EGG" because the SSS message looks exactly like the raw sensor message from the DSF-6000N, our dual echo sounder.
2) Modify acquisition program so that when logging is ended, HYPACK waits for next positioning record before closing the file.
3) Add option in DESIGN to turn off fix numbers when doing a trackplot on screen.
4) Add HDOP and # of satellites to the data display window.

5) Correct the format of raw lat/lon in position record.

Modifications Coastal Oceanographics in Process of Completing

1) An easier way to input the initial draft offset. Dynamic draft would also be ideal.
2) Add ability in DESIGN to rotate soundings plotted on screen.

Modifications Coastal Oceanographics in Design Stage

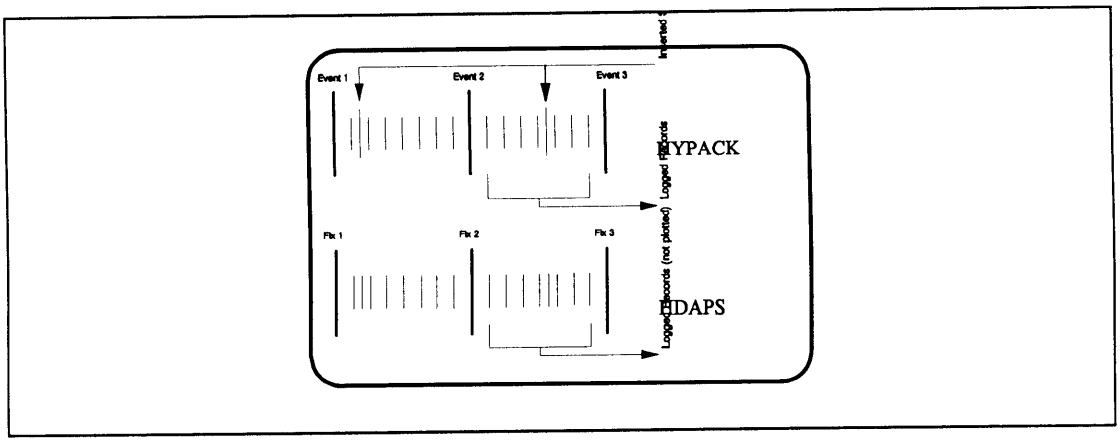
1) Tide files for entire month or at least greater spreads than 1 file per day.
2) Dynamic on-line tide correctors.
3) Addition of a batch file to apply tides to several files.

All boat equipment (EG&G, Innerspace 448, Ashtech GPS, computer, radio, etc.) was powered by 120VAC power provided by a **2.5kW Inverter**, borrowed from MILLER FREEMAN, which was hooked up to the boat batteries. Although the inverter capacity was well above what was needed, it put a considerable drain on the boat batteries. By charging the batteries during lunch and at the end of the day, we had plenty of power to run a full day of operations. A power strip was plugged into the inverter and devices plugged into the strip. PMC EED provided a **Power/data comm conversion box** in which the radio and Ashtech sensor could be connected for DC power, which was powered by a Maxon radio AC power supply with a 12VDC jury-rigged output connector. Power options for both 12 VDC and 120 AC were available for most of the equipment which provided flexibility for potential power problems, such as blown power supplies.

PROCESSING

Originally, the plan was to perform preliminary depth and position edits in the field using HYPACK processing functions and then to transfer the data to PHS for further processing and sounding, track, and swath plots. HYPACK would be used in the field for visualizing contours and coverage, aided by PHS plots faxed to Skagway to show SSS coverage and to aid in identification of areas for further development.

Efforts in the field to utilize HYPACK's editing routine revealed distinct differences in processing philosophy. HYPACK's editing routine is highly inefficient for handling a multitude of depth edits. For example, each survey line is shown visually with the event marks in bold. To edit the event mark depth, you must use the mouse to click on the mark. Most of the time you are unable to get exactly on the mark and must then use the "next record" key to get to the event. Since we did not have an on-line printout, this was the only method available to us for comparisons between the scanned echogram depths and the digital data. This technique was not possible for long lines of data, and may reflect the USACE-based design of HYPACK. Another difference in philosophy is a depth insert. A depth insert in HDAPS means to make one of the un-selected records a selected record so that the significant depth will be represented on plots because only selected soundings are plotted. In HYPACK an insert is a true insert, similar to HYDROPLOT, whereby a brand new record with an interpolated position is inserted between original recorded records. However, when the HYPACK inserts transfer to HDAPS they are just another recorded record, and do not become inserted/selected records which defeats the purpose of inserting it in the first place.



HYPACK's philosophy is not flawed in this case, just different. Instead of randomly choosing the significant soundings by time or distance and ignoring the others, they use all recorded soundings in their processing routines. The reason that we "insert" a sounding, which in our case is merely upgrading a recorded sounding to a selected sounding, is because our plotting, sorting, and other processing routines only look at selected soundings. Although we were unable to perform depth edits in the field, we were able to utilize HYPACK's sorting routine to create preliminary screen plots. The screen plots were fairly accurate since the digitization by the Innerspace 448 is highly reliable which eliminated the need for depth changes and also because HYPACK's sort routine uses all the recorded data to create an "excess" plot which made inserts unnecessary.

The lack of an on-line printout prevented us from easily comparing the analog trace with the digital data for depth changes. Unfortunately due to the time consuming nature of HYPACK's editing routine, comparisons were not made in the field and we relied heavily upon the reliability of the Innerspace 448's digitization capabilities.

Predicted tide tables were created and applied to the data along with a static draft corrector. Sound velocity correctors were not applied in the field although the capability was available.

A compiled list of depth and position edits was sent to PHS along with the day's data for further processing and plots. Due to the unfamiliarity of the data and strict time constraints, the processed data from PHS was still unavailable at the end of the survey, although we did receive input from PHS regarding additional development areas and coverage. In the future, the field should have the capability to process the data and display it without having to rely on office support.

CONCLUSIONS

In its current configuration, a suitcase large enough to carry everything needed for a hydrographic survey would be a small van. Transportation of gear from the staging area to the boat and from the boat to the shipper could have been a real problem. We had great support from Ken Russo, harbormaster, and later Dr. Roman Motyka, AK geologist, with vehicular transport. If it had rained, we would have been drowned rats putting up gear and getting setup, so weather was one thing about which we cannot complain.

Most private boats do not have the requisite equipment for towing a side scan, mounting a transducer pole, or deploying a sound velocity cast. Luckily, Mr. Stephens provided a good bit of support, tools, and supplies that allowed us to keep on schedule. His local knowledge was another important asset as most vessel operators in unfamiliar waters would not have felt comfortable with going inshore and getting close for detached positions. His pinch wheel, hydraulic winch, and line holder were more than adequate for both the side scan fish and sound velocity cast deployments. His battery banks, though depleted daily by idling and producing 120 VAC through our inverter, were ample enough for daily operations. His cabin had a table large enough for both the SSS and the Innerspace units, and he had a hatch through which all cables could be easily passed without pinching. There was plenty of room for GPS gear, radio, computer, and other miscellaneous supplies without making the cabin crowded. Also, his boat was rigged from the beginning as a "work" boat, used for fishing and recreation, and was not primarily a "luxury" cabin cruiser. It is likely that the attitude of the owner will have as much impact on the final survey product as the survey personnel, due to his/her importance in getting the equipment setup, driving to just the "right" spot, and preventing accidents with on-board gear. The owner/driver of a "work" boat is closer in attitude to the hydrographer than the luxury boat owner.

Skagway was small enough for everyone who had an interest in the project to easily find us, inform us of background information, and discuss the project. Though the reporter wrote that we "slipped into town", we were anything buy sly in getting set up, meeting people, and otherwise being visible. In a large town or city, this project would not have elicited much interest and, although supplies would be easier to obtain, logistical personnel support may have been more difficult to find. Certainly, security would have been more of an issue.

Most of the time the computer was tied up either running the MONITOR program, acquiring data, transmitting data, processing data or downloading software and we were unable to do any further processing or report-writing until it was free. If presentation products are desired before leaving a project area, such as importing and displaying data in MapInfo, such work must be coordinated with the computers' availability. A color monitor or LCD would be useful as HYPACK's screen plotting programs show the soundings in color according to contour interval. Other advantages to a color display include identifying sensor problems by red warning signals on screen, and MapInfo presentation of data on the chart-like scanned image. A second computer would have greatly increased productivity and prevented burn out that was a result of many long nights.

Once the HYPACK to HDAPS conversion program, HYPCON, is finished, it should be modified to convert HYPACK to HPS format and utilize the PC-based HPS suite of software for preliminary processing in the field. Ideally, a program such as the HDAPS program QUICKEDIT, which permits quick batch editing, should be finalized in the HPS suite of software. Finally, careful consideration must be taken in choosing suitcase hydro team members. Members must complement each other in practical knowledge, field skills, and personality. With the decrease in hydrographic field operations and loss of acquisition platforms, these basic skills will become scarcer and scarcer. The cohesive force amongst the team members is very important when working 16 hour days in a remote location. Importance must also be placed on the dedication of a specific individual at the processing section to respond to the field party's processing needs during the project.

In conclusion this project provided important navigational information to the City of Skagway and also demonstrated that the suitcase hydro concept is viable. In the future, action on recommendations given by team members could streamline and optimize this process even farther.

RECOMMENDATIONS

* Three team members for a typical SSS survey and 2 team members for a typical hydrographic survey.
* One laptop computer per person.
* PC-based HPS suite of software for field processing.
* Develop batch editing program in HPS similar to HDAPS program QUICK.
* Faster, more portable computer with 16 MB RAM, 520 MB hard disk, color screen.
* Acquire more tools such as vice grips, screwdrivers, hex tools, etc. (see equipment list)
* Arrange boat usage far enough in advance to settle on power layout, equipment positioning, and setup of transducer pole.
* Ship equipment early to ensure arrival and save in rush shipping costs
* Optimize power and weight aspects by using "black box" technology such as digital side scan sonar and digital echosounder. This would be great platform for testing of new technologies.
* Borrow SeaCat probe for sound velocity cast.
* Use vessel operator with local knowledge.

APPENDIX A: BREAKDOWN OF EXPENSES

Travel (2 people)	$2,091.00
M&IE (2 people)	$1,570.00
Lodging (2 people)	$1,085.00
Equipment Shipping (800 lbs)	$2,360.00
Misc. Supplies	$390.00
Telephone	$200.00
TOTAL	$7,696.00

APPENDIX B: EQUIPMENT LIST

ITEMS IN BOLD ARE ITEMS THAT WERE ADDED TO LIST AFTER COMPLETION OF PROJECT AND SHOULD BE ACQUIRED FOR NEXT PROJECT.

Boat:

Boat with cabin space, shallow draft, 12V- 60+ Peak AMP alternator-charging battery pack with 300Ahr min capacity (100A 12VDC or 50A 24VDC alternator preferred)
Boat owner/driver with local knowledge
SSS tow rigging (cable area, winch/hauler, fish stowage)
Battery charger from shore power (each night)
Inverter 1.5Kw (PMC-EED) for boat electronics; could also use generator
DC power cabling to connect inverter to battery bank
12VDC connections, wire (0-20ga), tabs, splices, crimpers
Multi-tester, with AC/DC operation and beeping short-circuit mode (for continuity tests)

Echo Sounder:

Innerspace 448 echosounder, AC/DC power cables, serial data cable, paper (HSD)
Transducer, transducer cable, pole sections (HSD)
Qtips, rubbing alcohol
Several universal antenna clamps (5-10)
Leadline

GPS:

2x Maxon radios, whip antenna (boat), pole antenna (base station), cables for power/data (HSD)
2x Ashtech ME-XII GPS in pelican cases; batteries and 120VAC power supplies (HSD/PHP)
2x Tripods (PHP)
2x Tribrachs
Ashtech sensor, cables, antenna (HSD)
Boat power distribution (fused) box (PMC-EED)
Plumb bob (PHP)
Power cables for sensor, radios, ME-XII (HSD)
Masts for attaching radios/antennas to fixed objects (HSD)
Current Firmware for sensor, radios, and ME-XII (HSD)

SSS:

EG&G 260 SSS, fish, cables, paper, power (110V AC or 24VDC) (Field Unit)
Cable markings with permanent marker
Spare boards box
RS-232 communications board (9600, E,7,2)

Sound Velocity:

AML, I/O converter box (blue), serial cable, plugs (HSD) OR SeaCat with cables (Field Unit)
Current calibration parameters and software (NCRDL)
Thermometer
Line

Acquisition/Processing Computer:

Laptop with color screen, serial cables, fax/modem, modem connection cables (acquisition)
Laptop with color screen, hand scanner, big hard disk, **16Mb RAM**, fax/modem (processing)
Portable printer, parallel cable, paper, power supply/cord (HSD)
HYPACK hard-key for software lock (HSD)
Break-out box for RS-232 communications tests (cables, data, and sensors) (HSD)

Software:

WP 6.0, Procomm, Spreadsheet, HPS (Dbase V), HYPACK, Monitor, Velocity, Ashtech: GPPS, Fillnet, and Mission Planner, Tide/Current Predictions, ATERM (BANYAN), Reachout (HSD) **MAPINFO**

Miscellaneous:

Various hose clamps
Various plastic ties
Duct tape, strapping tape, colored electrical tape
Pocket knife and utility knife
Parachute cord, and non-stretchy line, too
Various gender changers, null modems, serial cables (HSD)
Compass
Manuals for DGPS, SV, HYPACK, Ashtech M-XII, Modem stuff (HSD)
Fax machine availability
Modem connection availability

Federal phone card (HSD)
FEDEX forms (HSD)
Cash, AMEX, Impac VISA, and personal credit cards
Camera
List of phone numbers for support people (work and home)
Business cards for "Suitcase Hydro" with blank name/phone fields
Pelican cases to carry small and delicate items
Hex, torx, and socket set, Vice grips, screwdrivers
Various nuts/bolts
Calculator
Tape measure (metric)
Small digitizing tablet
Cell phones (2x, one for boat, one for shore)
Third person for set up, acquisition, PR, and processing work

APPENDIX C: POWER REQUIREMENTS

EQUIPMENT	V dc	Power (V-amp)	V ac	Power (watt)
Computer			120	200 (estimate)
Maxon Radio	12	10 (receive)	120	
Ashtech Sensor	12	18	120	
Innerspace 448	12	84	120	300
EG&G Side Scan	22-30	100	120	100

Note: Side scan power input not an option setting - determined by unit used.

Power Source Options

EQUIPMENT	Voltage	Power	Computer Vac adapter	Vac Power (watt)
Carry-on project batteries	12 Vdc	500 AHr for 8 hr [1]	fused "automobile" 12v adapter	150
Boat alternator [3]	12 Vdc	230 amp	fused "automobile" 12v adapter	150
Boat generator (Recommended)	120 Vac	1000 watt	buffer [2]	200

[1] Four 80AHr batteries support laptop system on RA-9. Additional two battery capacity (15 amp @12 Vdc, plus reserve) estimated for "suitcase" computer, one battery for side scan.

[2] Isolate computer and sounder from generator with 40 amp charger to two or four project batteries strapped/run parallel to "float 24 Vdc", and then from batteries to 120 Vac inverter. Conversion efficiency factor estimated 75%. PMC can supply charger and inverter. Operational Caution: Depending on peak loads, this

configuration tended to discharge the batteries during the day. Batteries shall be un-strapped and charged separately at night. Attempting to charge strapped batteries will overload and damage the charger.

3 Use of alternator, 80 amp @12 Vdc or 40 amp @24 Vdc, a possible option to feed project batteries, and using inverter noted above for supplying 120 Vac. Requires charger for night recharge. Requires appropriate heavy-gage cable from alternator (AWG#1/0 for 24 Vdc used on RAINIER Jensens). 12 Vdc alternator not an option if 24 Vdc side scan used.

4 Have contract vessel provide appropriate Vac or Vdc circuit breaker on cable to project batteries, or at distribution panel if equipment powered directly with "clean" power.

APPENDIX D: WEIGHT OF EQUIPMENT

EG&G 260 Recorder	180 lbs.
EG&G 272T Fish	110 lbs.
Innerspace 448 Sounder	90 lbs.
Ashtech MX-II GPS (2)	50 lbs.
2.5kw Inverter	48 lbs.
AML Probe	31 lbs.
Tripods	30 lbs.
Transducer/Pole Sections	22 lbs.
Computer	22 lbs.
Miscellaneous	150 lbs.
TOTAL	**783 lbs.**

APPROVAL SHEET

for hydrographic survey

FE-416

Surveying and processing procedures were based on the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; the HYPACK software documentation; and the Field Procedures Manual, as updated for 1994. The data were reviewed by me both in acquisition and processing phases.

The digital data and supporting records are considered complete and adequate for charting purposes. Final review and processing will occur at N/CG245, Pacific Hydrographic Section.

Approved and Forwarded,

DATE: June 27, 1995

Guy T. Noll
Lieutenant, NOAA
Chief, Suitcase Hydrographic Party

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

ORIGINAL

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: July 13, 1995

HYDROGRAPHIC BRANCH: Pacific

HYDROGRAPHIC PROJECT: OPR-0901-SHP

HYDROGRAPHIC SHEET: FE-416

LOCALITY: Alaska, Taiya Inlet, Skagway Harbor

TIME PERIOD: May 9 - 12, 1995

TIDE STATION USED: 945-2400 Skagway, Ak.
Lat. 59° 27.0′N Lon. 135° 19.5′W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 4.87 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 15.6 ft.

REMARKS: RECOMMENDED ZONING

Times and heights are direct on Skagway, Ak. (945-2400).

Caution: Bracketing levels have not been received at the time this tide note was processed. Until these levels are received verifying vertical stability, these data are preliminary.*

for _____
CHIEF, DATUMS SECTION

*Message received from Datums Section, Approving the final levels. This tide note is now considered the final one. 10/95

NOAA FORM 76-155
(11-72)

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

SURVEY NUMBER

FE-416

GEOGRAPHIC NAMES

Name on Survey	A ON CHART NO. 17317	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	
ALASKA (title)	X		X							1
SKAGWAY	X		X							2
TAIYA INLET	X									3
										4
										5
										6
										7
										8
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										25

Approved:

Chief Geographer

OCT 18 1995

NOAA FORM 76-155 SUPERSEDES C&GS 197

NOAA FORM 77-27(H)
(9-83)

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER: FE-416

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

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	SMOOTH OVERLAYS: POS., ARC, EXCESS	
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES	1					
ENVELOPES						
VOLUMES						
CAHIERS						
BOXES						

SHORELINE DATA

SHORELINE MAPS (List):	None
PHOTOBATHYMETRIC MAPS (List):	NA
NOTES TO THE HYDROGRAPHER (List):	NA
SPECIAL REPORTS (List):	None
NAUTICAL CHARTS (List):	17317 16th Ed., April 18, 1982

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			993
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			

	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS	15		15
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET	30		30
COMPARISON WITH PRIOR SURVEYS AND CHARTS			
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		21	21
GEOGRAPHIC NAMES			
OTHER*			
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS	45	21	66

Pre-processing Examination by LT G. Noll	*Beginning Date* 5/5/95	*Ending Date* 5/5/95
Verification of Field Data by D. Hill	*Time (Hours)* 15	*Ending Date* 9/5/95
Verification Check by B. Olmstead	*Time (Hours)* 4	*Ending Date* 10/5/95
Evaluation and Analysis by G.E.Kay	*Time (Hours)* 21	*Ending Date* 10/23/95
Inspection by B. Olmstead	*Time (Hours)* 16	*Ending Date* 11/27/95

EVALUATION REPORT
FE-416

A. PROJECT

Refer to the hydrographer's report.

B. AREA SURVEYED

Survey FE-416 is a Navigable Area Survey (NAS) located in Skagway Harbor, Taiya Inlet, Alaska. Skagway is situated at the northern terminus of the Inside Passage to Alaska, and is essentially a transfer point between water and rail shipping routes. Skagway is also a popular port of call for numerous cruise ships that sail the inside passage. The major docking facilitates include the White Pass and Yukon Corporation Wharf, Skagway Terminal Company Pier, Broadway Pier and the Skagway Ferry Terminal Pier. A small boat basin is protected by a breakwater that exists just north of the White Pass and Yukon Route Railway Wharf. Bottom samples were not required. Depths range from 0.8 to 80 meters. The shoalest depths are generally found to the north near the shoreline.

C. SURVEY VESSELS

A vessel of opportunity was used. Refer to the hydrographer's report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Survey data were processed by the hydrographer, using the HYPACK and MapInfo software. Office processing used 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 data, was created with a dbf (extension) and enhanced using the AutoCad system, are filed both in the AutoCad drawing format, dwg (extension); and in transfer format, dxf (extension). Copies of these files will be retained at PHB until transfer protocols are developed.

The drawing files necessarily contain information that 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 smooth

sheet. Data is plotted using a Modified Transverse Mercator (MTM) projection and are depicted on a single sheet. An accompanying computer printout contains the parameters and the correctors.

E. SONAR EQUIPMENT

Side scan sonar was used. Refer to the hydrographer's report.

F. SOUNDING EQUIPMENT

Refer to 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. Actual tide reduction is derived from Skagway, Alaska, gage 945-2400. The approved tide note is attached.

H. CONTROL STATIONS

Control stations are discussed in the hydrographer's report and separates. A list of control stations used on survey FE-416 is attached to this report.

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 year of establishment of control stations originates with the hydrographer's signal list.

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 of precision (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 soundings located by these fixes are consistent with the surrounding information. These fixes are considered acceptable.

J. SHORELINE

Refer to the hydrographer's report.

K. CROSSLINES

Refer to the hydrographer's report.

L. JUNCTIONS

Junctions were not required as per Project Instructions 6.9.

M. COMPARISON WITH PRIOR SURVEYS

Survey FE-416 was compared with the following prior surveys.

H-6945 (1943), 1:2,000

Survey H-6945 has been superseded by FE-358 within the common area and requires no further discussion. However, several charted soundings were not investigated by the present survey and should be retained as charted. These soundings are all in excess of fifty fathoms and are located south of latitude 59/26/45N, and west of longitude 135/20/00W. Comparison with depths south of latitude 59/26/38N, and east of longitude 135/20/00W reveal general differences of 2 to 10 meters (1.0 to 5.5 fathoms). The present survey data reflects a consistently shoaler bottom. Data acquisition techniques and the mass wasting event that took occurred November 4, 1994 account for these differences.

Except as noted above, FE-416 is adequate to supersede the prior survey within the common area.

FE-358 (1990), 1:5,000

Comparison with FE-358 reveals depth agreement within one meter (0.5 fathoms) in the areas north of latitude 59/26/51N, and west of longitude 135/19/38W. Good agreement is generally found also at the entrance to the small boat basin and in the areas of the Skagway Ferry Terminal and Ship basin containing the Skagway Terminal Company Pier and Broadway Dock. However, it appears that dredging activity has taken place along the Skagway Terminal Company Pier and Broadway Dock as present depths are 1 to 3 meters deeper in comparison to the 1990 survey work. The greatest changes in depths have occurred in the areas south of latitude 59/26/51N and east of longitude 135/19/38W as approaching the old White Pass and Yukon Railroad Dock. The present survey depths are consistently deeper in these areas from 10 to 15 meters (5.5 to 8.0 fathoms). These differences are directly attributed to the mass wasting event that occurred November 4, 1994. The present survey data does not readily identify where the material from this underwater landslide was deposited.

The following features were not investigated and the prior survey should remain as the charted source.

Feature	Latitude North	Longitude West
dol	59/26/59.0	135/19/43.4
dol	59/26/58.1	135/19/44.0
pile	59/26/56.9	135/19/47.3

With the exception of the mean high water line, attached cultural features, and the items listed above, FE-416 is adequate to supersede the 1990 survey data in the areas of common coverage.

Project Instructions, section 6.10., includes the following non-standard statement. "In areas known or believed to be affected by the submarine landslide, compare data with surveys accomplished since that event by the US Army Corps of Engineers and /or private contractors." The following should be considered as miscellaneous source data during the next production cycle for chart 17317.

BP153787 (1994), 1:600
BP153788 (1994), 1:600
BP153789 (1994), 1:600

Blueprint's BP153787, BP153788, and BP153789 are project condition surveys performed by a USACOE contractor and completed after the initial landslide. These surveys are far superior in detail and closer inshore coverage than our present survey. Present survey soundings compare well with slight differences.

Skagway Instability Investigation (1995), scale 1:1:2,400

"Skagway Instability Investigation" performed by Peratrovich, Nottingham & Drage, Inc., of Anchorage, Alaska. This survey contains depth curves in feet marked in 20-foot increments and no soundings. When depth curves are converted from feet to meters the resulting meter curves are in relative agreement with the present survey data.

N. ITEM INVESTIGATIONS

AWOIS items 52205, 52206, 52207, and 52208 were assigned for investigation. The dispositions of these items are contained in the item investigation reports found in the hydrographer's report and requires no further discussion.

O. COMPARISON WITH CHART

Survey FE-416 was compared with the following chart.

Chart	Edition	Date	Scale	Datum
17317	16th	April 18, 1992	1:77,812	NAD 83

a. Hydrography

Charted hydrography originates with the previously discussed prior. The prior surveys are discussed in section M and require no further discussion.

Survey FE-416 is adequate to supersede charted hydrography within the area of common coverage.

b. Dangers to Navigation

No dangers to navigation were reported by the hydrographer. No dangers were noted during office processing.

P. ADEQUACY OF SURVEY

Hydrography contained on survey FE-416 is adequate to:

1. delineate the bottom configuration, determine least depths, and draw the required depth curves;

2 reveal there are no significant discrepancies or anomalies requiring further investigation; and

3. show the survey was properly controlled and soundings are correctly plotted.

Except as noted below, 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 1995 Edition.

Q. AIDS TO NAVIGATION

There are two fixed aids to navigation located within the survey limits. Breakwater Light 2 is located on the breakwater that protects the small boat basin and was visually verified during survey operations. This light should remain as charted. A private aid, Skagway Terminal 2 Dock Light, was positioned at latitude 59/26/58.282N, longitude 135/19/34.703W and marks the end of the Broadway Dock. This feature should be charted at the surveyed position. The private aid currently charted at latitude 59/26/58N, longitude 135/19/35W should be removed. There are no floating aids to navigation within the survey limits.

R. STATISTICS

Refer to the hydrographer's report.

S. MISCELLANEOUS

Refer to the hydrographer's report for miscellaneous information.

T. RECOMMENDATIONS

This is a good hydrographic survey. Refer to section T of the hydrographer's report regarding additional work.

U. REFERRAL TO REPORTS

Refer to the hydrographer's report.

Bruce A. Olmstead
for Gordon E. Kay
Cartographer

APPROVAL SHEET
FE-416

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 processings have been entered in the magnetic tape record for this survey. Final control, position, and sounding printouts have been made and are included with the survey records. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Bruce A. Olmstead Date: 11/27/95
Bruce A. Olmstead
Senior Cartographer, Cartographic Section
Pacific Hydrographic Branch

I have reviewed the smooth sounding plot, 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 A. Timmons Date: 12/11/95
Kathy A. Timmons
Commander, NOAA
Chief, Pacific Hydrographic Branch

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Final Approval

Approved:

Andrew A. Armstrong III Date: 3-21-96
Andrew A. Armstrong III
Captain, NOAA
Chief, Hydrographic Surveys Division

135°20'15" 135°20'00" 135°19'45" 135°19'30" 135°19'15" 135°19'00"

59°27'00" 59°26'45" 59°26'30"

SKAGWAY

TAIYA INLET

Skagway Terminal 2
Dock Light (priv)

APPROXIMATE END OF
REMAINING PIER

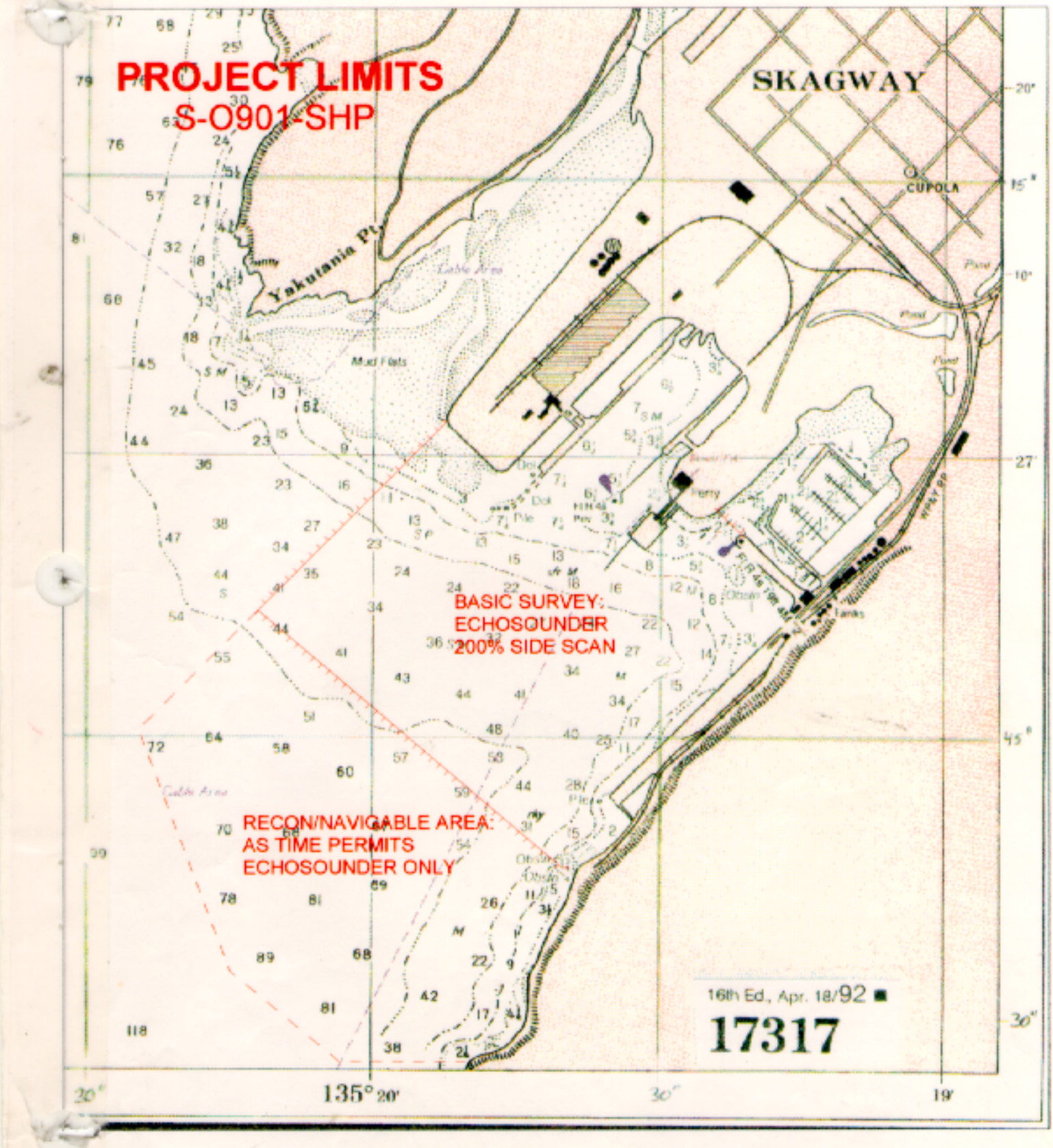
PIER DESTROYED NOVEMBER 3, 1994

SHORELINE IN BROWN ORIGINATES WITH THE
FOLLOWING DOCUMENTS:
BP153787, BP153788, BP153789

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY

FE-416

ALASKA
TAIYA INLET
SKAGWAY HARBOR
FIELD SHEET: SHP-5-1-95
DATE OF SURVEY: MAY 1995
SOUNDINGS IN METERS AND DECIMETERS
DATUM: NAD 83
PROJECTION: MTM
CONTROLLING LATITUDE: 59°26'24"N
CENTRAL MERIDIAN: 135°19'30"W
FALSE EASTING: 1000


PROJECT LIMITS
S-0901-SHP
SKAGWAY
CUPOLA
Yakutania Pt.
Cable Area
Mud Flats
Ferry
Tanks
BASIC SURVEY:
ECHOSOUNDER
200% SIDE SCAN
RECON/NAVIGABLE AREA:
AS TIME PERMITS
ECHOSOUNDER ONLY
16th Ed., Apr. 18/92
17317
135° 20'
20°
30'
19'

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. FE-416

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
17317	3/17/96	Bruce A. Olmstead	Full ~~Part~~ ~~Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings from field examination.
17300	8-24-98	David [illegible]	Full Part Before After Marine Center Approval Signed Via
			Drawing No. Examined, N.C. scale
			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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			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.