

H10884

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No. F

Registry No. H-10884

LOCALITY

State Alaska

General Locality Cook Inlet

Sublocality Southern Approach to Port Nikiski

1999

CHIEF OF PARTY

Robert Kohut

LIBRARY & ARCHIVES

DATE NOV 8 2000

HYDROGRAPHIC TITLE SHEET

H-10884

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.

F

State Alaska

General locality Cook Inlet

Locality Southern Approach to Port Nikiski

Scale 1:10,000 Date of survey June 12 - August 5, 1999

Instructions dated November 28, 1997 Project No. OPR-P385-KR
Change #5 March 22, 1999

Vessel Sea Ducer (AK Reg. "AK0601P")

Chief of party Robert Kohut

Surveyed by Terra Surveys, LLC

Soundings taken by echo sounder, hand lead, pole Reson 8101

Graphic record scaled by N/A

Graphic record checked by N/A

Evaluation by: L. Deodato Automated plot by HP Design Jet 750C

Verification by G. Nelson, D. Hill, L. Deodato

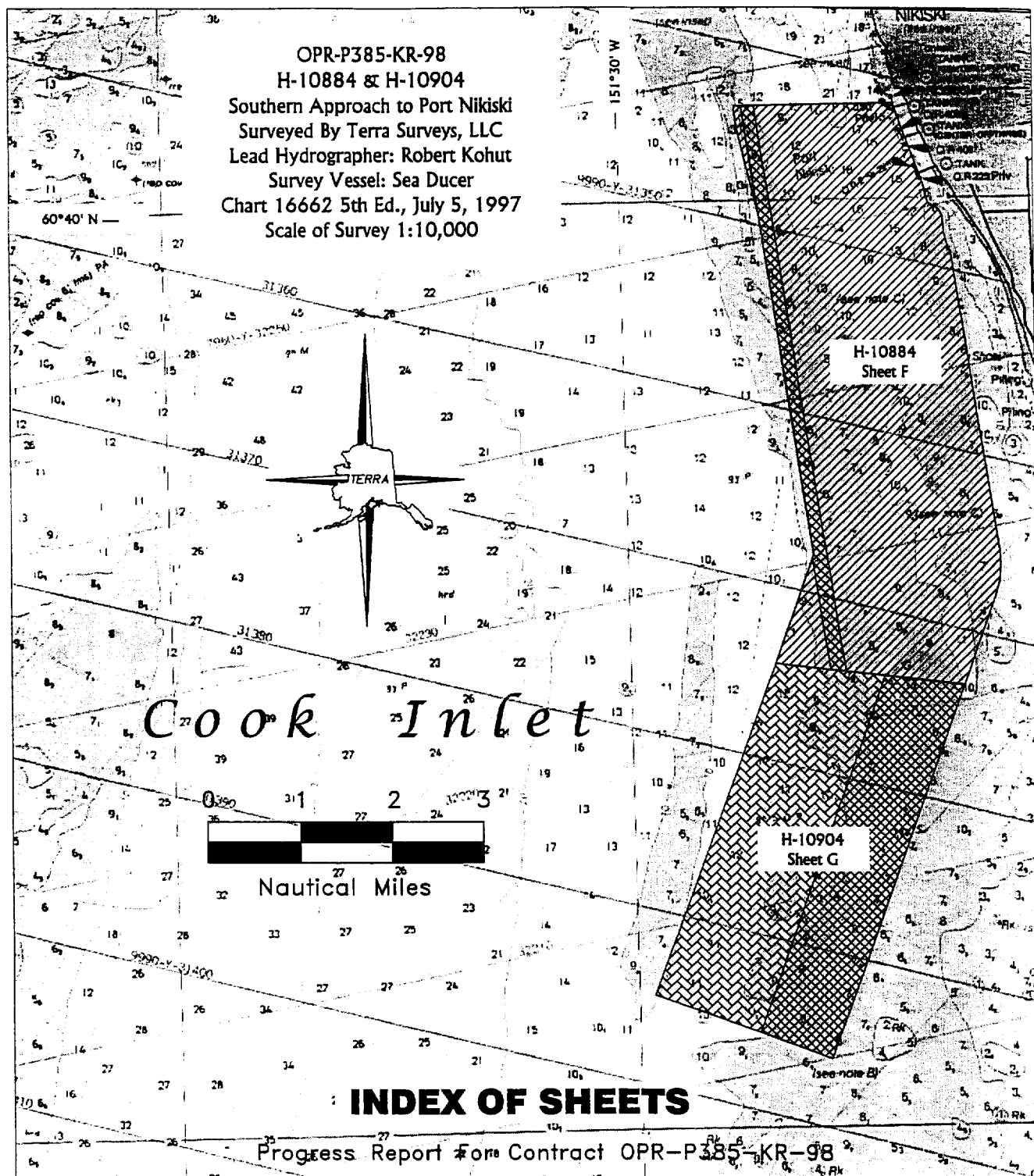
Soundings in fathoms ~~xxx~~ at ~~MLLW~~ MLLW

REMARKS: Time in UTC. Revisions and marginal notes in black were generated at the Pacific Hydrographic Branch during review of the survey.

Contractor Name: Terra Surveys, LLC
1930 South Whiting Circle
Palmer, AK 99645
907-745-7215

AWOIS ✓ & SURFV 10-23-00 BY MIBH

OPR-P385-KR-98
 H-10884 & H-10904
 Southern Approach to Port Nikiski
 Surveyed By Terra Surveys, LLC
 Lead Hydrographer: Robert Kohut
 Survey Vessel: Sea Ducer
 Chart 16662 5th Ed., July 5, 1997
 Scale of Survey 1:10,000



Progress Report for Contract OPR-P385-KR-98

Sheet F				Sheet G			
Registry #	Started(GMT)	Completed(GMT)		Registry #	Started(GMT)	Completed(GMT)	
H-10884	June 12, 1999	Aug 5, 1999		H-10904	July 19, 1999	August 14, 1999	
	June	July	August		June	July	August
Area -main scheme-				Area -main scheme-			
LNM Hydro -all lines-	815.74	102.21	5.5	LNM Hydro -all lines-	0	262.81	294.82
LNM SSS	0	0	0	LNM SSS	0	0	0
Sq NM	11.3	0.9	0	Sq NM	0	3.5	4.6
Items Investigated	0	0	0	Items Investigated	0	0	0
Sound Velocity Profile Casts	48	4	0	Sound Velocity Profile Casts	0	41	25
WX Days Lost	2	0	0	WX Days Lost	0	2	1

Descriptive Report to Accompany Hydrographic Survey H-10884

Sheet F

Scale 1:10,000

June-August 1999

Terra Surveys, LLC

Chief of Party: Robert Kohut, P.L.S. and Certified Hydrographer

A. PROJECT ✓

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-P385-KR, on the southern approach to Port Nikiski, Cook Inlet, Alaska, dated ~~May 12, 1999~~ ^{November 28, 1997}; amended on ~~May 26, 1999~~ ^{March 22}.

The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of this area. Numerous obstructions and shoaling have been reported in this area. The area is adjacent to the KPL dock which is a petroleum dock, a liquid natural gas (LNG) dock and a loading dock for a fertilizer manufacturing plant. The area is transited by oil tankers, liquid natural gas tankers, oilfield support vessels, commercial fishing boats and tenders, tug and barge contractors and oil spill response vessels.

The project area encompasses approximately 12.2 square nautical miles located near Nikiski in upper Cook Inlet. The survey primarily covers deep water channels on the southern approach to Port Nikiski.

A shallow water, multibeam sonar system was used to locate and determine the least depth over the obstructions and shoals as well as to determine the least depths over the entire project area. Every effort was made to ensure that the survey product could be traced to and reconstructed from the raw data.

B. AREA SURVEYED ✓

The area surveyed (Sheet F) for H-10884 covers approximately 12.2 square nautical miles to the southern approach to the Port of Nikiski, Alaska. The following NAD 83 latitudes and longitudes are the hydrographic survey limits:

<u>Degrees Latitude (N)</u>	<u>Degrees Longitude (W)</u>
60.579283	151.377894
60.595045	151.36538
60.596277	151.364645
60.597508	151.363859
60.597668	151.363817
60.597822	151.363725
60.599096	151.363439
60.600378	151.363099
60.60054	151.363114
60.600699	151.363079
60.601977	151.363247
60.603269	151.363367
60.652478	151.376749
60.656225	151.377768
60.658388	151.379383
60.660183	151.380244
60.662979	151.380531
60.664298	151.381964
60.665459	151.385727
60.666567	151.386372
60.668835	151.387233
60.683445	151.397663
60.68355	151.45615
60.682753	151.456202
60.679891	151.455437
60.663288	151.447946
60.603119	151.431581
60.583693	151.447008
60.579387	151.378561
60.579283	151.377894

The Index of Sheets shows the area surveyed for H-10884.

C. SURVEY VESSELS ✓

The *Sea Ducer*, a 31-foot Uscola Offshore Pilot with aluminum hull, was used for all data acquisition.

The Sea Ducer	AK ID # 0691
1997 Uscola Offshore Pilot	Hull ID # UCN0317M997
Manufacturer	Uscola Boat Works Palmer , AK
L.O.A.	31 ft.
Beam	10 ft.
Draft	1.5-2.0 ft.
Power Plant	Twin 188hp AD41/DP Volvo-Penta turbo diesels with stern drives.
Data collection power source	24vdc, 12vdc from mains 110vac from 2.4 kW Trace Inverter 110vac from 5kw Northern Lights Genset
Cruise Speed	35 knots
Fuel Cap	204 gallons
Fuel consumption	13 gal/hr @ cruise
Gross tonnage	5 short tons displacement

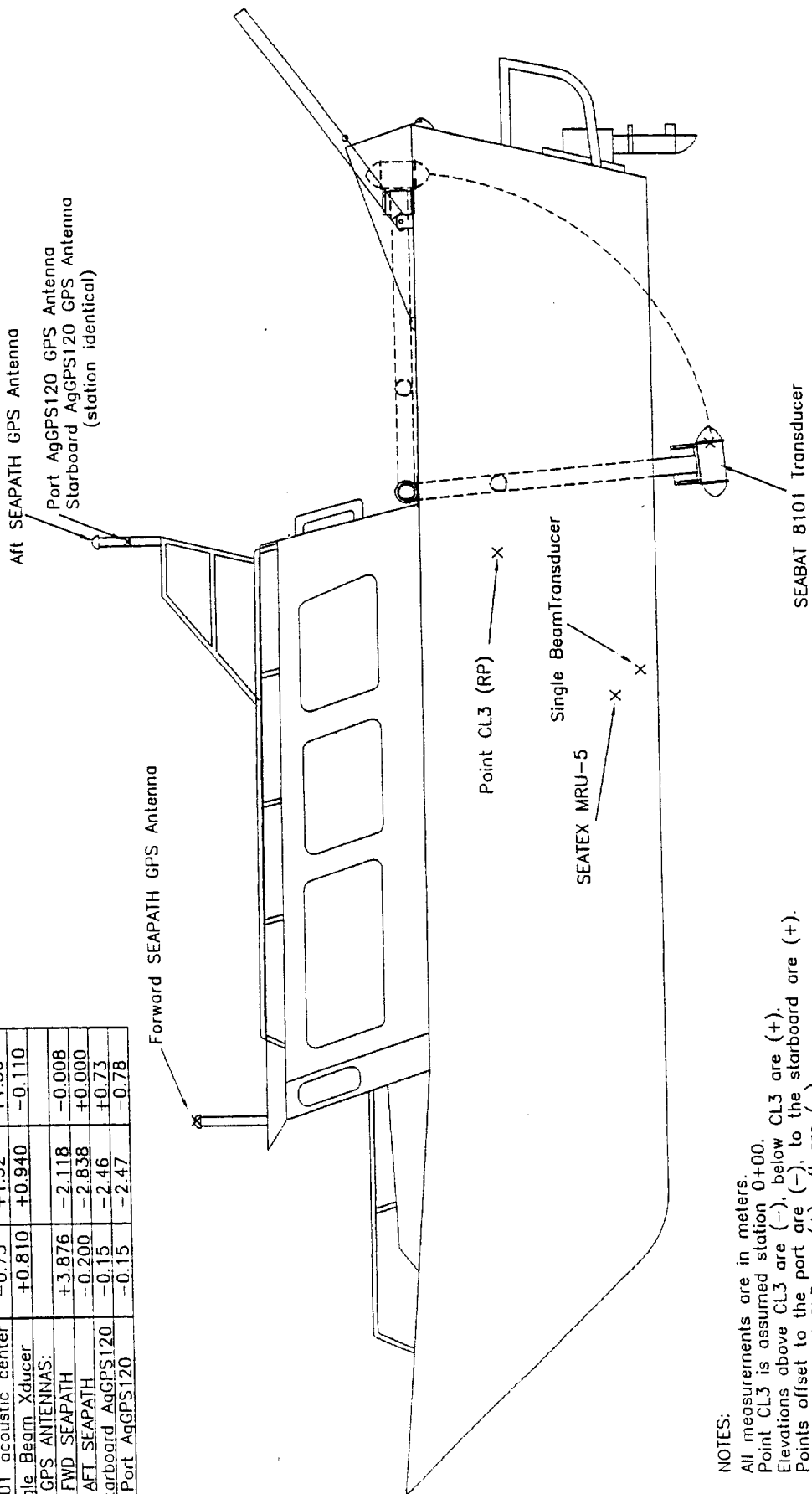


The Sea Ducer

The *Sea Ducer* was configured as shown on the *Sea Ducer* Instrument Locations Port, Top and Stern view drawings on the following pages.

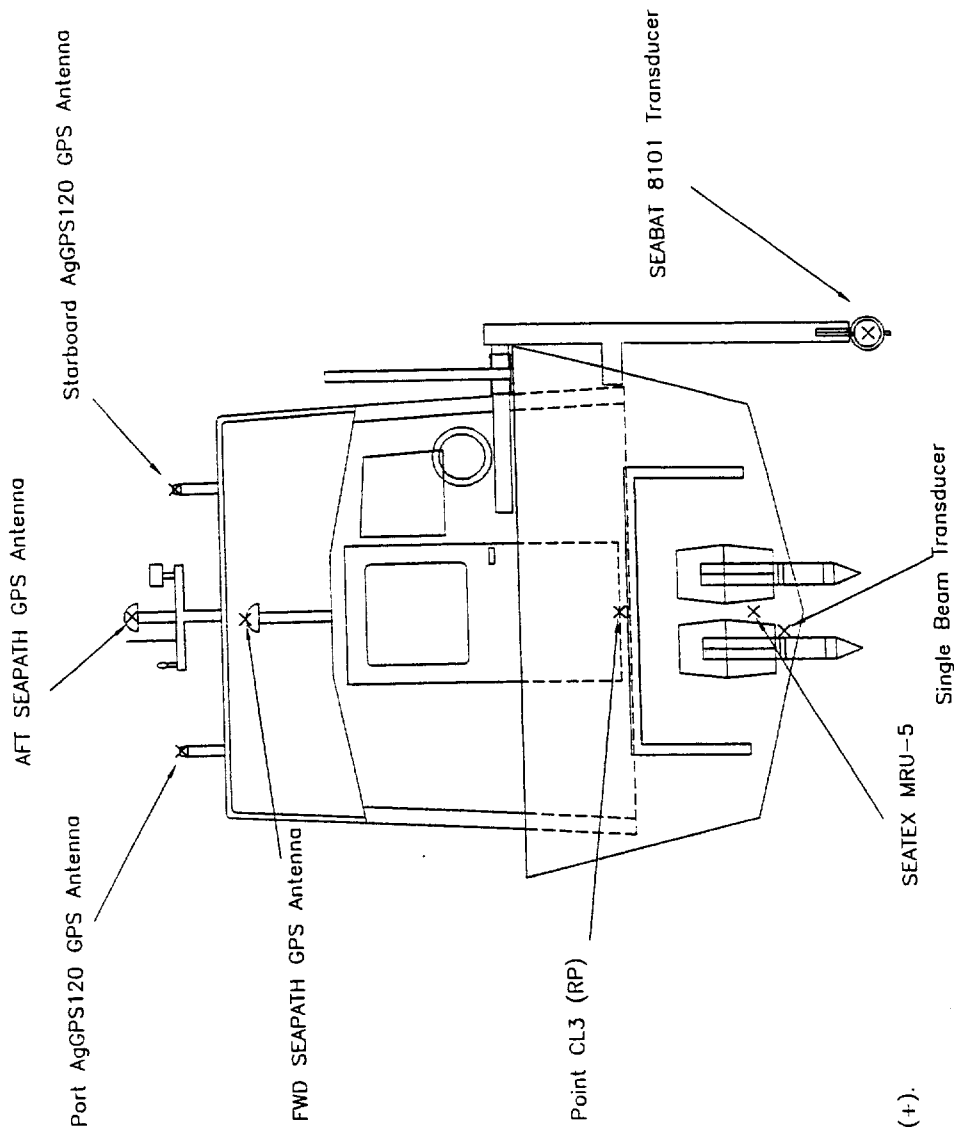
SEA DUCER INSTRUMENT LOCATIONS (PORT VIEW)

Desc.	Station (y)	Elev. (z)	Offset (x)
Point CL3 (RP)	0.000	0.000	0.000
Seatex MRU-5	0.988	0.778	0.000
8101 acoustic center	-0.73	+1.32	+1.56
Single Beam Xducer	+0.810	+0.940	-0.110
GPS ANTENNAS:			
FWD SEAPATH	+3.876	-2.118	-0.008
AFT SEAPATH	-0.200	-2.838	+0.000
Starboard AgGPS120	-0.15	-2.46	+0.73
Port AgGPS120	-0.15	-2.47	-0.78



NOTES:
 All measurements are in meters.
 Point CL3 is assumed station 0+00.
 Elevations above CL3 are (-), below CL3 are (+).
 Points offset to the port are (-), to the starboard are (+).
 Stations fore of CL3 are (+), aft are (-).

SEA DUCER INSTRUMENT LOCATIONS (STERN VIEW)



Desc.	Station (y)	Elev. (z)	Offset (x)
Point CL3 (RP)	0.000	0.000	0.000
Seatex MRU-5	0.988	0.778	0.000
8101 acoustic center	-0.73	+1.32	+1.56
Single Beam Xducer	+0.810	+0.940	-0.110
GPS ANTENNAS:			
FWD SEAPATH	+3.876	-2.118	-0.008
AFT SEAPATH	-0.200	-2.838	+0.000
Starboard AgGPS120	-0.15	-2.46	+0.73
Port AgGPS120	-0.15	-2.47	-0.78

NOTES:
 All measurements are in meters.
 Point CL3 is assumed station 0+00.
 Elevations above CL3 are (-), below CL3 are (+).
 Points offset to the port are (-), to the starboard are (+).
 Stations fore of CL3 are (+), aft are (-).

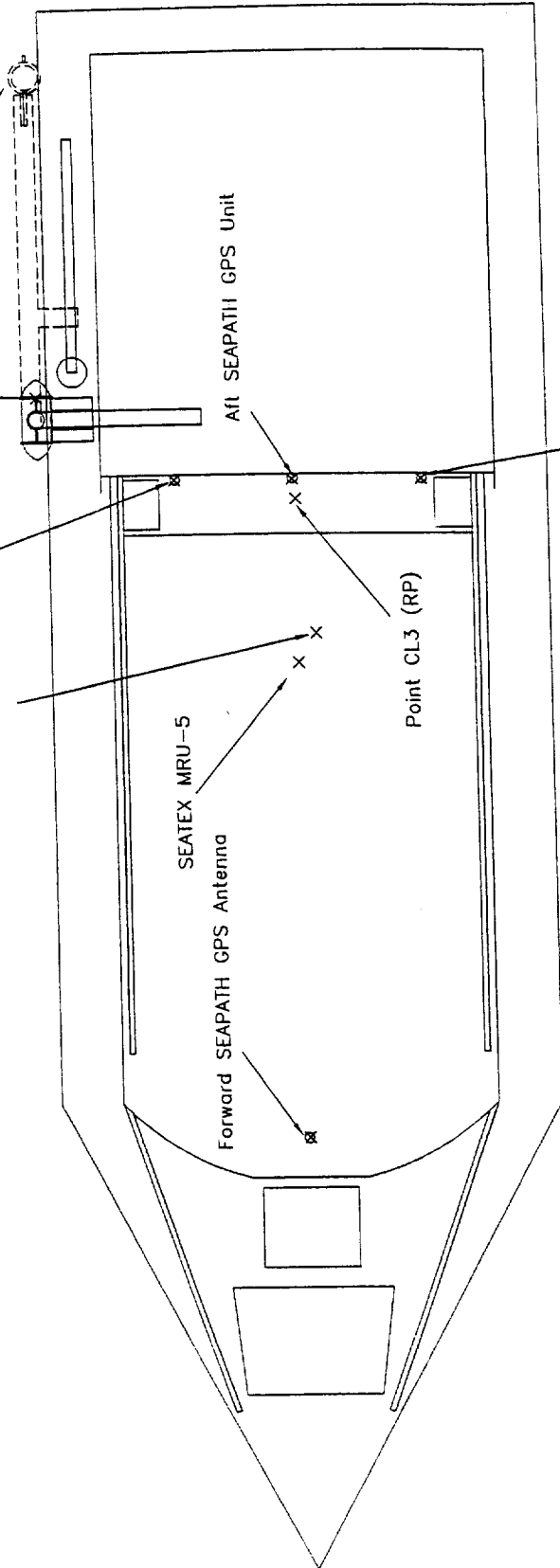
SEA DUCER INSTRUMENT LOCATIONS (TOP VIEW)

Desc.	Station (y)	Elev. (z)	Offset (x)
Point CL3 (RP)	0.000	0.000	0.000
Seatex MRU-5	0.988	0.778	0.000
8101 acoustic center	-0.73	+1.32	+1.56
Single Beam Xducer	+0.810	+0.940	-0.110
GPS ANTENNAS:			
FWD_SEAPATH	+3.876	-2.118	-0.008
AFT_SEAPATH	-0.200	-2.838	+0.000
Starboard AgGPS120	-0.15	-2.46	+0.73
Port AgGPS120	-0.15	-2.47	-0.78

SEABAT 8101 Transducer

Starboard AgGPS120 GPS Antenna

208 khz Transducer (3')



NOTES:

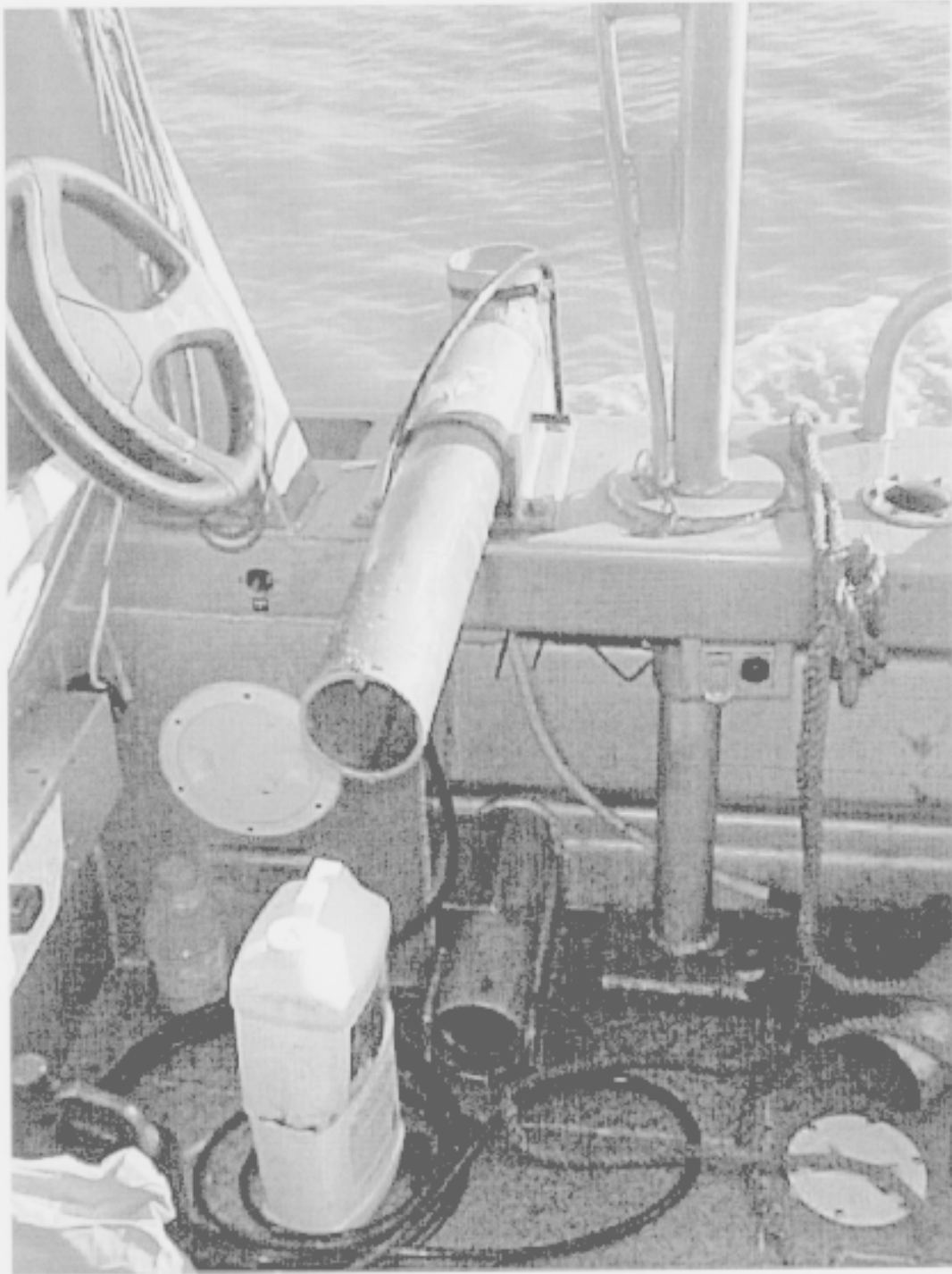
All measurements are in meters.
 Point CL3 is assumed station 0+00.
 Elevations above CL3 are (-), below CL3 are (+).
 Points offset to the port are (-), to the starboard are (+).
 Stations fore of CL3 are (+), aft are (-).



Sonar Head Pole Mount from bow while out of water



Sonar Head Pole Mount from stern while deployed



Sonar Head Pole Mount from deck while deployed



Sonar Head Pole Mount from bow while underway



Retrieving Sonar Head Pole Mount

Two Seapath 200 GPS antennas were mounted on centerline 4 meters apart over the cabin. Two AgGPS120 GPS antennas were mounted on the radar rack to port and starboard of the rear Seapath 200 antennae. The Seatex Motion Reference Unit (MRU-5) was mounted on centerline, forward of the rear cabin bulkhead and below the deck. The *Sea Ducer* also has three single beam transducers mounted in a sea chest amidships on centerline.

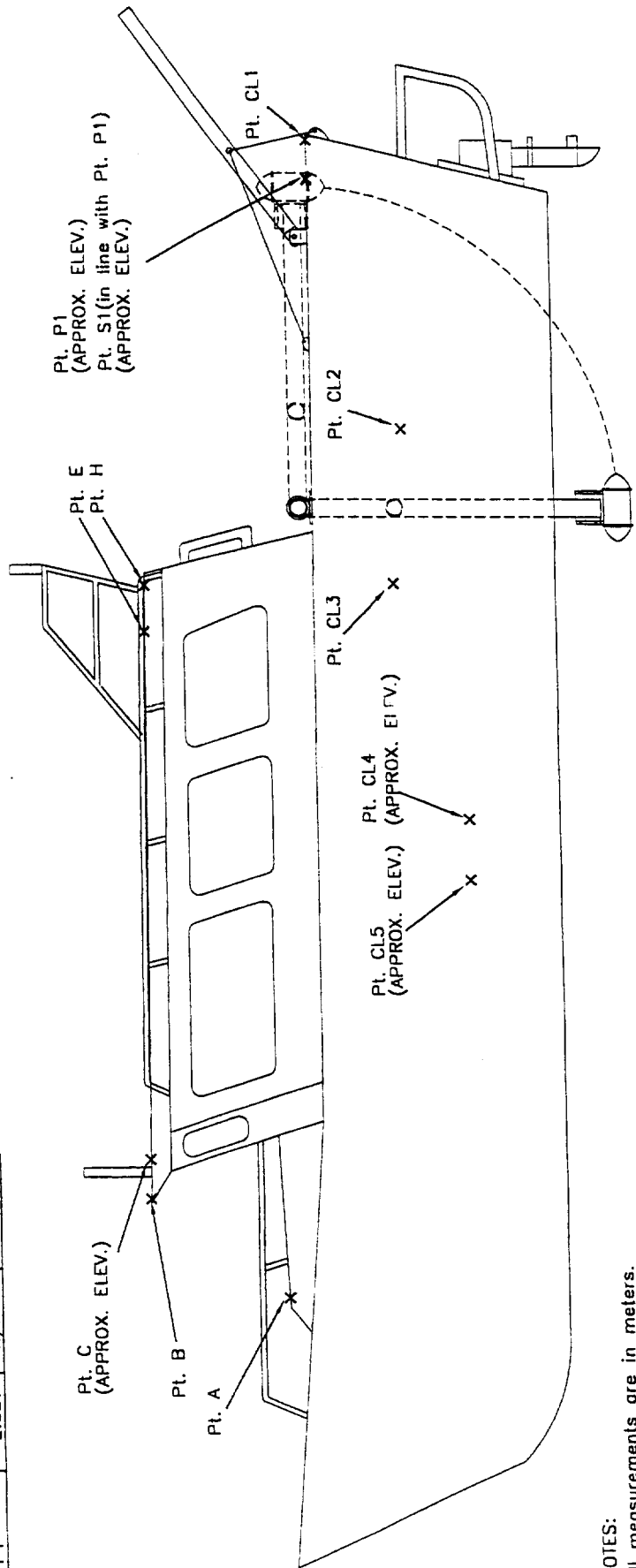
Control positions on the *Sea Ducer* are the result of surveys done both in Terra Surveys' shop using conventional surveying equipment and in the field using the survey points (punch marks) set during the original survey. The original survey involved leveling the boat on its trailer such that the apparent water line found on the hull was level. Elevation and location were then obtained using an automatic level, a digital total station, and steel chain. Punch marks were made and named for later use as equipment was mounted.

Metric adhesive rod face was adhered to the sides of the hull and also to the multibeam pole for daily readings of vessel draft.

The *Sea Ducer's* survey power was provided by a 12/24vdc alternator on each of the mains connected to a bank of batteries for dc power and a 2.4 kW Trace inverter for 110ac. A back up, 5 kW diesel generator was also available but not typically used.

SEA DUCER SURVEY POINTS (PORT VIEW)

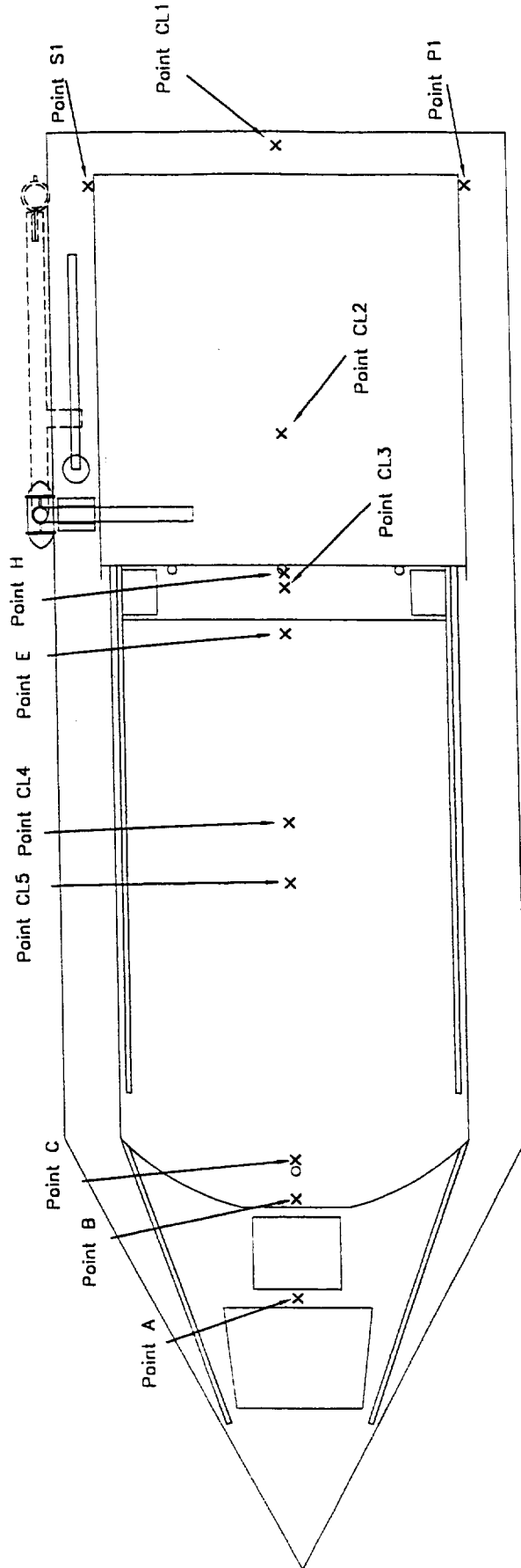
Pt.	Station	Elev.	Keel
CL1	-2.89	-0.518	+0.003
CL2	-1.015	+0.073	0.000
CL3 (RP)	0.000	0.000	+0.003
CL4	+1.561	N/A	0.000
CL5	+1.963	N/A	0.000
A	+4.720	-0.936	0.000
B	+4.066	-1.680	0.000
C	+3.805	N/A	0.000
E	+0.306	-1.649	0.000
H	-0.098	-1.643	0.000
S1	-2.630	N/A	+1.247
P1	-2.637	N/A	-1.244



NOTES:
 All measurements are in meters.
 Point CL3 is assumed station 0+00.
 Elevations above CL3 are (-), below CL3 are (+).
 Points offset to the port are (-), to the starboard are (+).
 Stations fore of CL3 are (+), aft are (-).

SEA DUCER SURVEY POINTS (TOP VIEW)

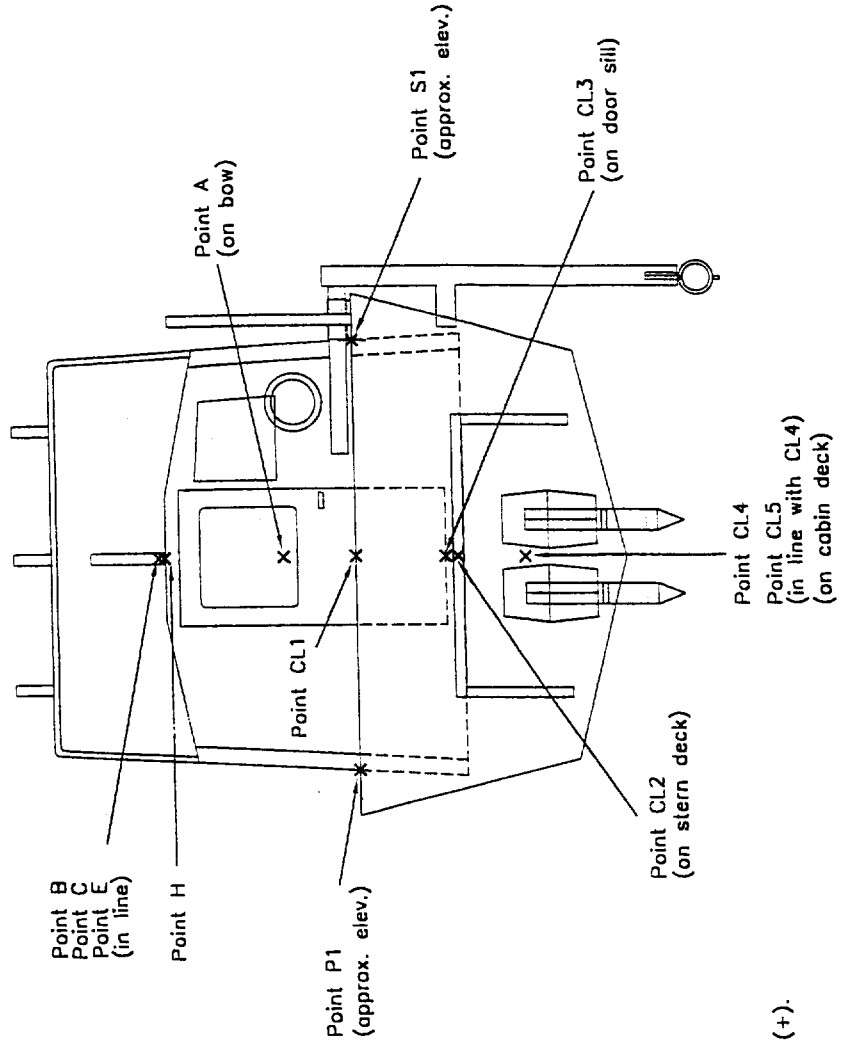
Pt.	Station	Elev.	Keel
CL1	-2.890	-0.518	+0.003
CL2	-1.015	+0.073	0.000
CL3 (RP)	0.000	0.000	+0.003
CL4	+1.561	N/A	0.000
CL5	+1.963	N/A	0.000
A	+4.720	-0.936	0.000
B	+4.066	-1.680	0.000
C	+3.805	N/A	0.000
E	+0.306	-1.649	0.000
H	-0.098	-1.643	0.000
S1	-2.630	N/A	+1.247
P1	-2.637	N/A	-1.244



NOTES:
 All measurements are in meters.
 Point CL3 is assumed station 0+00.
 Elevations above CL3 are (-), below CL3 are (+).
 Points offset to the port are (-), to the starboard are (+).
 Stations fore of CL3 are (+), aft are (-).

SEA DUCER SURVEY POINTS (STERN VIEW)

Pl.	Station	Elev.	Keel
CL1	-2.890	-0.518	+0.003
CL2	-1.015	+0.073	0.000
CL3 (RP)	0.000	0.000	+0.003
CL4	+1.561	N/A	0.000
CL5	+1.963	N/A	0.000
A	+4.720	-0.936	0.000
B	+4.066	-1.680	0.000
C	+3.805	N/A	0.000
E	+0.306	-1.649	0.000
H	-0.098	-1.643	0.000
S1	-2.630	N/A	+1.247
P1	-2.637	N/A	-1.244



NOTES:
 All measurements are in meters.
 Point CL3 is assumed station 0+00.
 Elevations above CL3 are (-), below CL3 are (+).
 Points offset to the port are (-), to the starboard are (+).
 Stations fore of CL3 are (+), aft are (-).

D. Automated Data Acquisition and Processing ✓

Data Collection

Multibeam data collection was performed on an Intel Pentium II PC running Reson's 6042NT Multibeam Data Collection software under Windows NT 4.0. The data collection PC received Reson 8101 bathymetry via a serial interface and Reson 8101 sonar imagery via an Ethernet interface. It received motion and attitude information (heave, pitch, roll and heading) via serial interface from the Seatex Seapath 200 system. It received position information from a Trimble Ag120 DGPS receiver that was operating on correctors received from a Trimble DSM GPS receiver set at 'Unocal' for this project. The Seapath 200 received differential correctors from another Ag120 GPS receiver tuned to the U.S. Coast Guard Beacon Kenai and its position was used as a check position.

The Reson 8101 received motion information from the Seapath 200 to aid in filtering. The motion information allowed the Reson to apply filters based on minimum and maximum depths while the vessel was experiencing roll.

Coastal Oceanographics' Hypack software was utilized for navigation and line tracking as well as for the collection of quality control statistics. The Hypack software ran on an Intel Pentium II computer under Windows NT 4.0. It obtained positioning information from an Ag120 GPS receiver receiving corrections from the DGPS base installed for this project. It received motion and position data (heave, pitch, roll, heading, latitude and longitude) from the Seapath 200. The Seapath 200 received correctors from the USCG beacon at Kenai (310Khz) and was used to confirm the local base position.

Processing Overview

The Reson 6042NT software collects multibeam data in its native format, a binary file with a 'SVY' extension. The first step in processing the data was to convert the 'SVY' file to a 'XTF', Extended Triton Format, for compatibility with CARIS HIPS. This was done using the Reson 6042NT software while offline. The data was then transferred with Hypack raw navigation data files off the vessel via 2.6-gigabyte Magneto-Optical (MO) disks.

The MOs were transferred daily from the vessel to the project office for processing. The data was copied to the server for storage and archived on 4mm DAT tapes. The XTF files were converted to HIPS files using HIPS' refoXTF program. All the field sheet information was entered into the project database to be used for quality control and delta draft computations. Preliminary tides were downloaded from the NOS Internet site and a tide file was prepared for use in Caris at this time.

Once converted, the lines were reviewed in HIPS 'Line' mode for defects in positioning, motion sensor data or sounding data. The positioning data was examined for jumps in position and if necessary data was rejected without interpolation. The various sensors, including azimuth, heave, pitch, roll and tide, were also checked. If necessary, data was rejected without interpolation or in the case of small isolated spikes, rejected with

interpolation. Typically no rejection was required for either the positioning or for the various sensors. The soundings were then reviewed in the Hydrographic Data Cleaning System (HDCS) editor where the user could filter or manually reject outliers. Filters used were beam quality and a roll value or angle from nadir filters. Beams of only the highest quality were accepted. If a question arose about a possible bottom feature then beams of lesser quality were reviewed. The angle filter was used and soundings outside a 140 degree sector about nadir were rejected. Line spacing was adjusted with water depth in the field to ensure three-beam overlap on adjacent lines with a 90° swath. This underestimation of swath width ensured sufficient overlap. When reviewing the soundings, the sidescan imagery obtained from the Reson 8101 was viewed in a window on the edit screen. This allowed the hydrographer to make decisions about the veracity of questionable features with the sidescan imagery to aid them.

Following adjustment for the sound velocity profile and delta draft measured in the field, the data was beam edited in HIPS 'Line' mode. Preliminary tides for the National Ocean Service (NOS) gage at Nikiski (945-5760) were applied with the zoning scheme outlined in Section G. The next step in HIPS was to 'merge' the data. In the merge step the various sensors for motion and position of the vessel were used to compute the final position and depth of the sounding.

Following merging, the data was reviewed in the HIPS 'Subset' editor for outliers. Soundings for a geographic area from multiple lines can be viewed from several directions and flagged as 'Rejected' if deemed an outlier or as 'Outstanding' if it is a feature the user desires to track. The soundings 'Rejected' in subset mode were typically single outliers. Soundings marked as 'Outstanding' are features which rose ten percent of the water depth. In the absence of sidescan information or reports of obstructions, these features are assumed to be rocks. The status of the 'Outstanding' flag is accessible from this point to the final AutoCAD drawing.

Following the 'Subset' editor, the data was exported to a binary file format developed by Terra Surveys. The data was then sorted into one meter square cells. Each cell collected information on the number of soundings in that cell, the average depth for the cell and the shoalest sounding for each cell with it's corresponding sounding ID number for later retrieval. The average depth for each square meter is exported to an ASCII file which can be read into the Caris Editor, a Geographic Information System (GIS) and inspected for coverage. In the Caris Editor, the soundings are displayed and a DTM constructed to show holes in the data. Areas requiring additional coverage were outlined and fill in lines were chosen, data collected and edited as described.

Once coverage was complete for the project, the data was exported from the Caris HIPS files to a database. During the export, the tide zone for each profile was determined, the angle from nadir that the sounding was taken at was determined and the athwartships footprint size was calculated. This information with all the flags from Caris HIPS are maintained in the database. After transfer to the database the soundings were tide adjusted using the zoning scheme provided and the Final Verified tides from the NOS gage at Nikiski (945-5760). These tides were down loaded from the NOS Internet site. The tide was applied equally to all soundings within each profile. Following the tide

adjustment, soundings were flagged as rejected if the footprint was deemed to large for the required shoal detection or the angle at which the sounding was taken was outside of the acceptable swath. The athwartships footprint was maintained at 2 meters or less down to 30 meters (MLLW) and at 10% of water depth or less (tide reduced) below 30 meters. The angle from nadir was maintained at less than 60° for most of this survey. Crossline statistics indicated that the allowable angle could be raised to 69° in water depths less than 30 meters (MLLW) and to 66° in water depths greater than 30 meters (MLLW). These wider nadir angles were used to reaccept a limited number of soundings in a small area devoid of soundings. The accepted soundings were within expected accuracy standards and footprint size.

An average of the acceptable soundings within each square meter was then exported to the Caris Editor as a tide adjusted final data set. The cleaned cross lines were exported to the Caris Editor in their entirety. The combined data was used for cross line analysis, tide zone analysis and coverage plots.

All accepted soundings were checked for overplot removal. Deeper soundings that would overplot the shoalest soundings were then suppressed. The unsuppressed soundings were then exported to AutoCAD. The unsuppressed soundings, which had been flagged by the operators as 'Outstanding', were placed on a separate layer in AutoCAD for identification on the drawing as rocks. All of the plotted soundings in AutoCAD contain an identification number, as well as it's beam number, profile number and line name; which allows tracing the sounding back to the database and thus back through all steps to collection. A histogram of unsuppressed soundings was generated from the database. The data was also exported to AutoCAD for trackline plots, which depict the track of the sonar head.

Quality Control

The raw navigation files from Hypack were used for quality assurance. The files were processed using Terra Survey's Multibeam Suite to summarize the start and end times of lines, distance traveled, average vessel speed, minimum number of satellites and maximum HDOP encountered. The lines were then checked for the several conditions that could cause disqualification. Disqualification could be due to going to fast for the appropriate range scale causing insufficient sounding density or inadequate GPS caused by less than 4 satellites or when the Horizontal Dilution of Precision (HDOP) was greater than 2.5.

Lines were also disqualified by the Caris HIPS operators if they were excessively noisy or had missing data due to improper filtering in the collection process.

Software Summary

SeaBat 6042 Software produced by Reson was used for all multibeam data acquisition. Coastal Oceanographics Hypack was used for navigation and quality control. Caris Hips, a processing program developed by Universal System Ltd., was used for multibeam post processing and quality assurance. Terra Surveys in house programs were used for quality

control, generating 'delta draft' files, tide adjustments, sounding suppression and data export.

The following table lists software used for data supporting this survey:

Program Name	Version	Date	Usage and Dates Used
Reson/SeaBat 6042 NT	5.20 L	5/19/99	6/12/99 through completion. Multibeam data collection software
Coastal Oceanographics, Inc/Hypack	8.9	4/16/96 5/19/98	Navigation and collection of quality control and statistical data.
Tides and Currents	2.2	11/26/96	Predicted Tides
Caris Hips	4.32b	4/16/99	Multibeam Data Processing.
Caris Editor	4.31	8/26/98	Data Visualization, manipulation
Caris Tools	4.31	9/3/98	Data Manipulation, Contouring
Corpscon	5.11.01	2/2/99	Coordinate Conversion
Trimble/DSMCHAT	3.2	94-96	Configure AgGPS120 GPS receiver
Seapath	1.02.04	10/05/99	Seapath 200 Firmware
Winzip	6.0	91-95	Compressing and transferring large data files
Trimble/Probeacon		9/12/94	PC interface for AgGPS 120
Power Desk Utilities 98	3.032	6/26/98	File management
ACAD MAP 3	3	7/14/98	Drafting
Quicksurf	5.1	6/26/97	Surface modeling, contouring
Corpscon	5.11	6/10/98	Coordinate Conversion
Wizard	5.07RF	3/4/98	Tide data down load, programming and calibration for the MicroTide tide gage
Terra Surveys HPTools		5/98 – 10/99	Inhouse program for generation of line and gps quality statistics
Microsoft SQL Server	6.5	8/19/97	Database server for storage and manipulation of sounding data.
Terra Surveys Multibeam Suite		6/98 – 11/99	Suite of programs for transfer of data from Caris HIPS to SQL Server and tide adjustment, determination of acceptable data, sounding suppression, trackline generation and export to Caris Editor.
Seatex MRC	2.53	12/3/98	PC Interface to Seatex MRU-5
Seapath Control Center	1.01.01		PC Interface to Seatex Seapath 200
Microsoft Access	97		Database Management
Microsoft Excel	97		Spreadsheet Program
Microsoft Word	97		Word Processing Software
Microsoft Visual Basic	6.0		Programming Language & Tools
Windows NT Server	Server 4.0		Operating System

Service Pack	4		Operating System
MS-DOS	6.22		Operating System
TEXTPAD32	V3.2.2		Text Viewing & Editing
RCMCONF	V1.33	1997	Radio Modem Config Program
SVP Process	1.00	5/24/99	SVP Program/Data Collection
Windows NT Workstation	4.0		Operating System

E. SONAR EQUIPMENT (Towed sidescan) ✓

No SONAR equipment (towed sidescan) was used on this survey. *CONCUR*

F. SOUNDING EQUIPMENT ✓

The survey vessel, *Sea Ducer* was equipped with a Reson SeaBat 8101 multibeam echo sounder system. The system's two main components consist of a surface processor (serial 16118) and transducer head (serial 089604).

Soundings were recorded in meters and corrected for the speed of sound through water from multiple daily measurements of the water column profile (see Section G). Depths encountered in the survey range from 7.4 meters/ 4.0 fathoms (Latitude 60.676204° N, Longitude 151.394822° W), to 43.1 meters/ 23.6^{*} fathoms (Latitude 60.681597° N, Longitude 151.419277° W), at MLLW based on verified tide data from the Nikiski Gage (945-5760).

Metric leadlines were used for depth comparison with the depth sounder. Leadlines were constructed from metric fiberglass survey tapes with 24 or 36 ounce lead balls attached such that the bottom of the ball was at the zero mark. Leadline comparisons were conducted a minimum of once weekly by simultaneously reading the draft marks on the sonar head pole, the leadline depth (typically 3-6 meters) and the depth from the 8101. The comparison was made with the formula:

$$\text{Error} = \text{Leadline Depth} - \text{Draft} - 8101 \text{ Depth}$$

* exceeded.

G.

Corrections to Soundings ✓

The following methods were used to determine, evaluate and apply corrections to soundings.

Speed of sound through water

The velocity of sound through water was determined by a minimum of two casts per day with the following two instruments.

Velocimeter (sound velocity, temperature and depth profiler)	<i>SVPlus</i> (standard instrument with 50 dBar pressure sensor and 350 ms temperature sensor)
Manufacturer	Applied Microsystems Ltd. Sydney, British Columbia, Canada
Serial number	3279
Pressure Calibration	4/01/99 by Applied Microsystems Ltd.
Temperature Calibration	4/01/99 by Applied Microsystems Ltd.
Distilled Water Sound Calibration	4/01/99 by Applied Microsystems Ltd.
Voltage Calibration	4/01/99 by Applied Microsystems Ltd.

Velocimeter (sound velocity, temperature and depth profiler)	<i>SVPlus</i> (standard instrument with 50 dBar pressure sensor and 350 ms temperature sensor)
Manufacturer	Applied Microsystems Ltd. Sydney, British Columbia, Canada
Serial number	3259
Pressure Calibration	3/24/99 by Applied Microsystems Ltd.
Temperature Calibration	3/24/99 by Applied Microsystems Ltd.
Distilled Water Sound Calibration	3/24/99 by Applied Microsystems Ltd.
Battery Calibration	3/24/99 by Applied Microsystems Ltd.

The following instrument was operated at the surface.

Velocimeter (sound velocity, temperature and depth profiler)	<i>Smart SV&P</i> (standard instrument with 50 dBar pressure sensor)
Manufacturer	Applied Microsystems Ltd. Sydney, British Columbia, Canada
Serial number	4177
Certificate of Authenticity	6/12/98 by Applied Microsystems Ltd.

Copies of the manufacturer's calibration reports are included in Appendix G.*

The velocimeters were programmed for a sample rate of 1 sample per second during casts, and 1 sample per minute for the continuous monitoring of the work area. Terra Surveys' SVP programs and downloads the velocimeters for each cast and provided graphs and statistics on cast comparisons both on the vessel and also in the office. Dual casts were done a minimum of once a day for comparison between velocimeters and typically three times a day. During survey operations, the *Smart SV&P* measured the sound velocity once per minute and Terra Surveys' SVP program alerted the user if the sound velocity varied more than a user selected amount indicating that another cast should be taken. The casts were taken as deep as possible and geographically distributed to satisfy the 95% anticipated water depth and represent local and diurnal variability.

Processing Procedures

The velocimeter raw pressure data was converted to depths in meters in a data base using Foronoff and Saunder's formula as provided by Applied Microsystems Ltd. The formula is as follows:

P=pressure in decibars

$x = \sin(\text{latitude}/57.29578)$

$X = x^2$

$Gr = 9.780318 * (1 + (0.0052788 + 0.0000236 * X) * X + 0.000001029 * X^2)$

$D = (((-0.000000000000000182 * P + 0.0000000002279) * P + 9.72659) * P)$

Depth = D/Gr

The data was thinned to one velocity per meter of depth and converted to a CARIS format where the profile corrections were applied to the soundings. CARIS applies the most recent velocity cast in the file so the newest correctors were always being used. The following Sound Velocity Profile Summary shows the casts, their positions and the maximum depths of each cast. See Appendix J* for listings of each cast.

* Filed with the hydrographic data.

Instrument Corrections

No special instrument corrections were made.

Corrections determined from bar checks and vertical casts.

Metric lead lines were used for depth comparison with the depth sounder. Lead lines were constructed from metric fiberglass survey tapes with 24 or 36-ounce lead balls attached such that the bottom of the ball was at the zero mark. Lead line comparisons were conducted a minimum of once weekly by simultaneously reading the draft marks on the sonar head pole, the lead line depth (typically 3-6 meters) and the depth from the 8101. The comparison was made with the formula:

$$\textit{Error} = \textit{Lead line Depth} - \textit{Draft} - \textit{8101 Depth}$$

The lead lines are summarized in the table on the following page.

NADIR BEAM CHECKS

Project	Date	check done	Port Static Draft	Lead line	Reson 8101	Star static draft	Delta Error
WO5	6/12/99	No	0	0	0	0	0
WO5	6/13/99	No	0	0	0	0	0
WO5	6/13/99	No	0	0	0	0	0
WO5	6/14/99	No	0	0	0	0	0
WO5	6/15/99	Yes	1.05	7.84	6.8	0	0.01
WO5	6/16/99	No	0	0	0	0	0
WO5	6/17/99	No	0	0	0	0	0
WO5	6/18/99	No	0	0	0	0	0
WO5	6/19/99	No	0	0	0	0	0
WO5	6/21/99	Yes	1.06	3.85	2.87	1.1	0.1
WO5	6/22/99	No	0	0	0	0	0
WO5	6/23/99	No	0	0	0	0	0
WO5	6/24/99	No	0	0	0	0	0
WO5	6/26/99	No	0	0	0	0	0
WO5	6/27/99	No	0	0	0	0	0
WO5	6/28/99	No	0	0	0	0	0
WO5	6/29/99	No	0	0	0	0	0
WO5	6/30/99	No	0	0	0	0	0
WO5	7/1/99	Yes	1.07	6.75	5.45	1.15	-0.19
WO5	7/18/99	Yes	1.08	5.51	4.41	1.1	0
WO5	7/19/99	No	0	0	0	0	0
WO5	7/22/99	No	0	0	0	0	0
WO5	7/24/99	No	0	0	0	0	0

Static Draft

A metric adhesive rod face was adhered to the sides of the hull and the multibeam pole for daily readings of the vessel draft. The tapes were calibrated to read the depth of the sonar head. The draft was recorded twice daily. The draft readings were incorporated into a database, which included the date and time, line name, and engine RPM. From the database and the measured offsets for the boat, the distance from the boat's reference point to the water line was computed for every line, this was then adjusted by the expected settlement computed using the logged engine RPM and compiled into a delta draft file used by CARIS.

Settlement

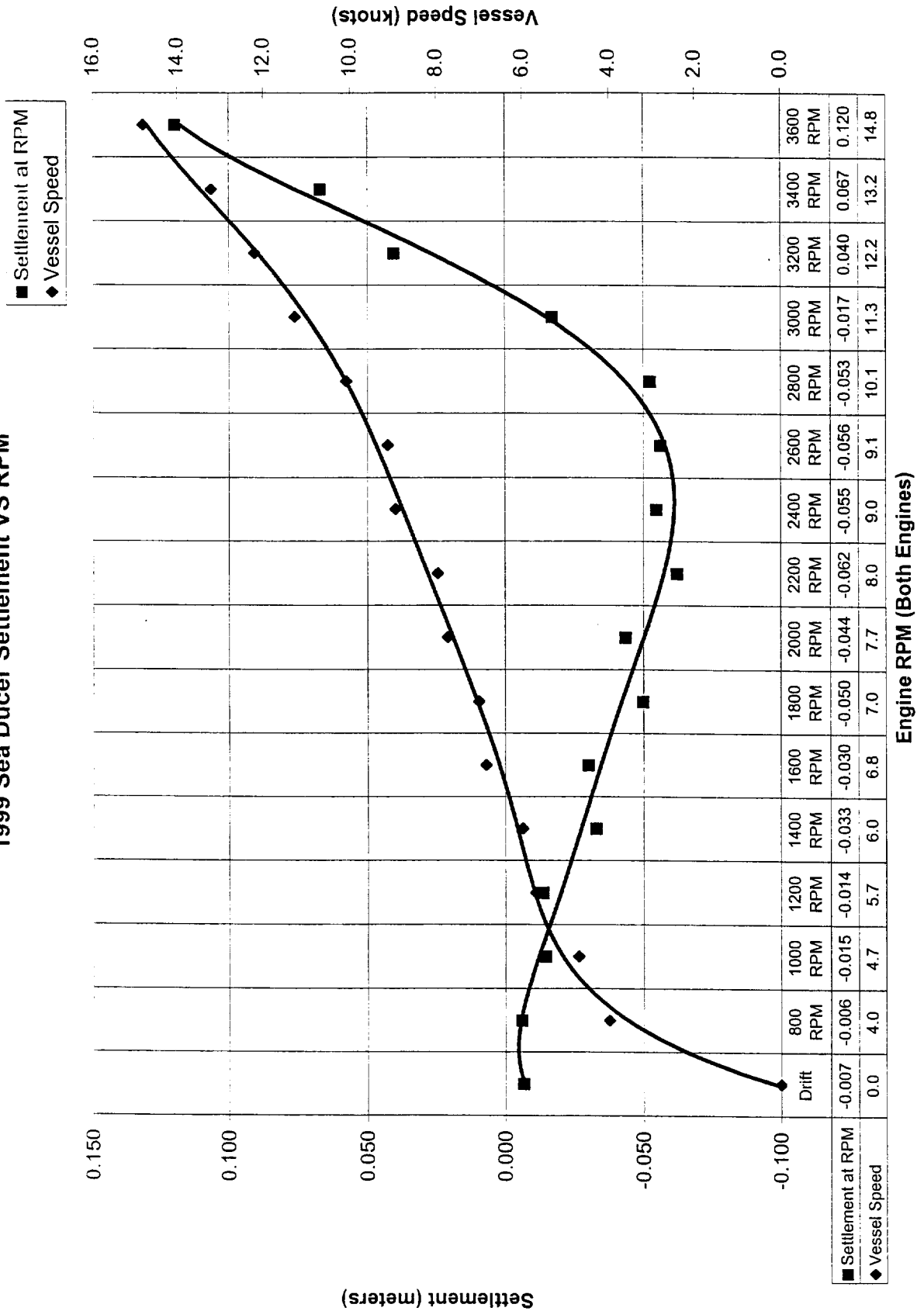
Measurements for the Squat and Settlement were conducted near Salamatof in the work area, using On The Fly Real Time Kinematic (OTF-RTK) GPS survey procedures. The measurements were conducted with two Trimble 7400MSi's on the *Sea Ducer* and a Trimble 4000SSi as a base station. Pacific Crest Radio modems were used to transmit the correctors to the vessel.

Two Trimble 7400MSi antennas were installed on the *Sea Ducer*. One antenna was installed near the bow and one on the aft swim deck, both on the centerline of the vessel. The relationship of these antennas to the vessel baseline was surveyed and recorded.

Three files were collected during each test; one ASCII file was recorded for each of the two Kinematic GPS Receivers. These files contained the National Marine Electronics Association (NMEA) "GGK" string, a GPS output string which contains the time, position, ellipsoid height, HDOP and mode. The third file was collected using Coastal Hypack which logged the attitude information from the Seapath 200. The *Sea Ducer's* attitude and elevations were recorded at rest and at various RPM settings to determine vessel dynamics. The static data for the vessel at rest was observed as a baseline and used to correct for tide changes with a starting and ending tide. The results of the measurements were compiled in a spreadsheet. A graph depicting vessel settlement and speed at various RPM settings is shown on the following page. The vessel dynamics appear to react, as any small launch would be expected. At low RPMs (speed), the aft lowers, the bow rises, and the vessel settles into the water. As the RPM is increased the settlement increases to a point where the hull begins to plane. At the upper end of the useable survey speeds (3400 RPM) the vessels reference point is actually 6 cm above its elevation at rest.

The daily draft readings and engine RPM values were recorded on the written line notes. These values were then entered into the Project Control Data base on a daily basis and used to generate the delta draft file for 'CARIS'.

1999 Sea Ducer Settlement VS RPM



Heave, Roll and Pitch

The Seatex Seapath 200 sensor system was used to determine heave, roll and pitch as well as azimuth and position.

Manufacturer :	Seatex
Model :	Seapath 200 m320-00
Seapath Serial number:	0299
Motion Reference Unit:	MRU-5
MRU Serial number:	299cus
Manufacturers stated accuracy:	
Heading:	0.05° 1 σ (4 meter baseline)
Roll and Pitch:	0.05° 1 σ
Heave:	0.05 meters 1 σ
Position Accuracy:	2 meters 2 σ

Tide Correctors

In accordance with section 6.1 of the statement of work, the NOS tide station at Nikiski, Alaska (945-5760) was used as the source for the MLLW datum for this project. No supplemental gauges were installed. The unverified (preliminary) 6-minute data was downloaded from NOS database via the Internet and applied during the CARIS post processing routine. A height corrector was applied to the preliminary data to reference tides to MLLW rather than station datum, as the data was provided. NOAA provided zoning was not applied to the preliminary data.

Verified 6-minute tides were acquired from NOS after the survey was completed. The verified tide data was downloaded from the Ocean Products and Services Division (OPSD) World Wide Web site (<http://www.opsd.nos.noaa.gov>). The time and height tidal zoning correctors listed in Appendix E* were applied both in CARIS and during transfer of the soundings from CARIS to the sounding database. After determining the tidal zone for each profile, the associated soundings were adjusted for the final tide.

** Filed with the hydrographic*

H. Control Stations ✓

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). All software, comparisons of junctions and prior surveys referenced NAD 83.

All data provided in NAD 27 was translated to NAD 83. The National Ocean Service Automated Wreck and Obstruction Information System (AWOIS) data was converted from NAD 27 to NAD 83 with Corpscon coordinate conversion program.

See ER, sect N for discussion of AWOIS

A control survey was performed to establish coordinates for a station set named UNOCAL. This station was used to send differential correctors to the *Sea Ducer* survey vessel during their survey of Sheets of F and G. Along with UNOCAL the United States Coast Guard (USCG) DGPS Beacon at Kenai was used during hydrographic operations for horizontal positions and confidence checks.

The NGS second order station NIK was used as a DGPS performance check site. NAD 83 Geographic Coordinates for these horizontal control stations are found in Appendix C. *
A summary of the control survey follows.

GPS Processing for control station UNOCAL

Purpose: The purpose of this survey and processing was to establish a coordinate for the station named UNOCAL set by Terra Surveys, LLC. This station was used to send differential correctors to the *Sea Ducer* survey vessel during their survey of Sheets of F and G.

Procedure: The survey was performed on May 27, 1999 and involved the observation of four different points. Two of the stations (NIKI USCG A and T 81 RESET) observed are first order NGS control monuments. Station NIK is a second order monument and was observed as a check. Data sheets for these control points can be found in Appendix C* of this report or on the worldwide web at the following URL www.ngs.noaa.gov. UNOCAL was the fourth station observed.

Processing: Processing and adjustment of the data was performed using Trimble's GPSurvey version 2.35a. All data acquired in the survey was loaded and processed with the exception of NIKIA-3.dat. The NIKIA-3.dat file represents an observation of only 20 minutes and the surveyor specifies not use it in his notes.

** Filed with the hydrographic data.*

Adjustment: The adjustment was performed in two stages. The first stage was a minimally constrained adjustment of NIKI USCG A, T81 RESET, and UNOCAL. The published coordinate of NIKI USCG A was held fixed, and the adjustment was performed in order to obtain an adjusted coordinate on T 81 RESET. A fully constrained adjustment using all four stations was performed next. NIKI USCG A's published coordinate and T 81 RESET's adjusted value were held fixed. This process returned a final coordinate value for UNOCAL. Results are displayed in the following table.

COORDINATE ADJUSTMENT SUMMARY

NETWORK = Nikiski_Bas

TIME = Thu Sep 23 15:58:39 1999

Datum = NAD-83

Coordinate System = Geographic

Zone = Global

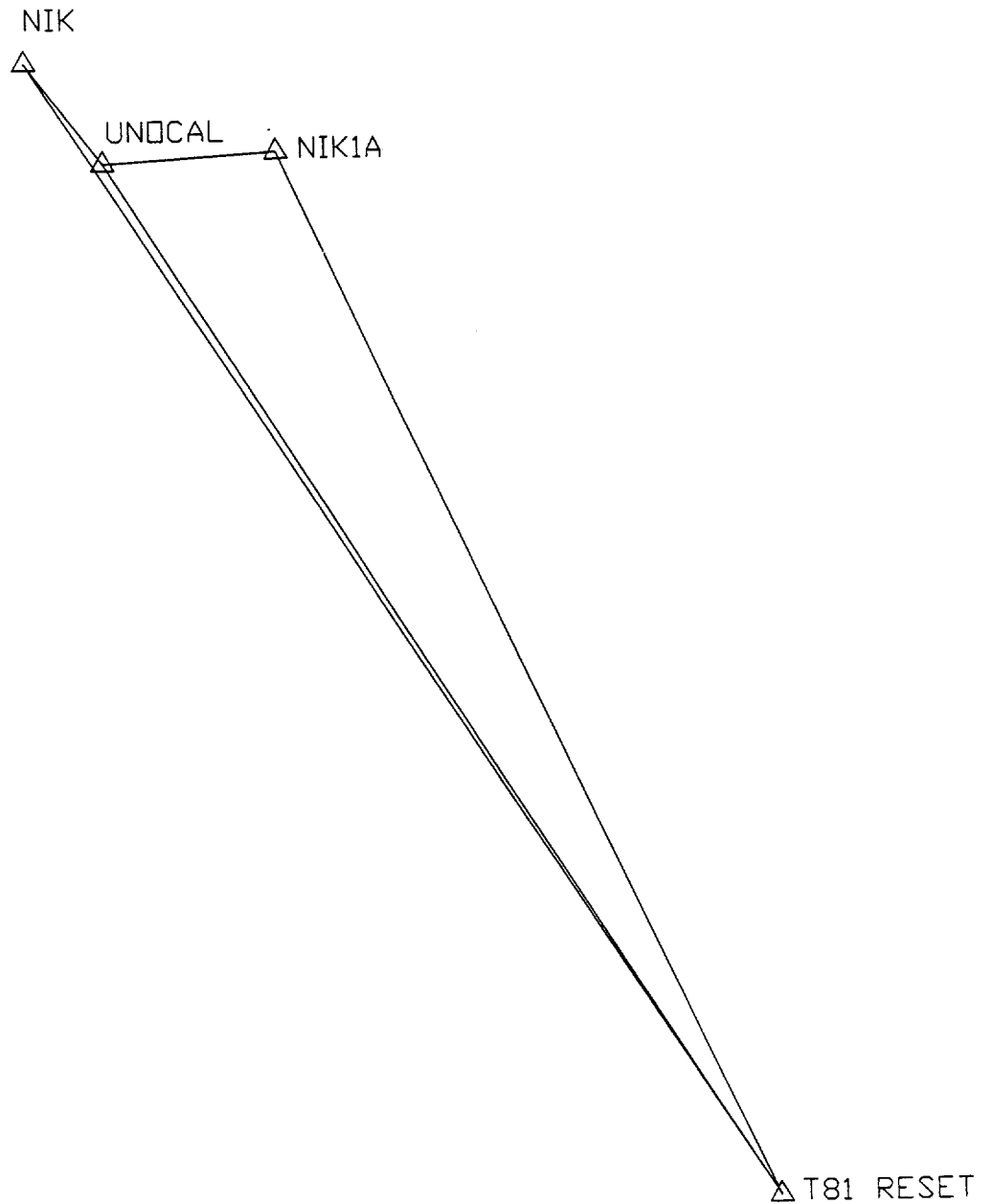
Network Adjustment Constraints:

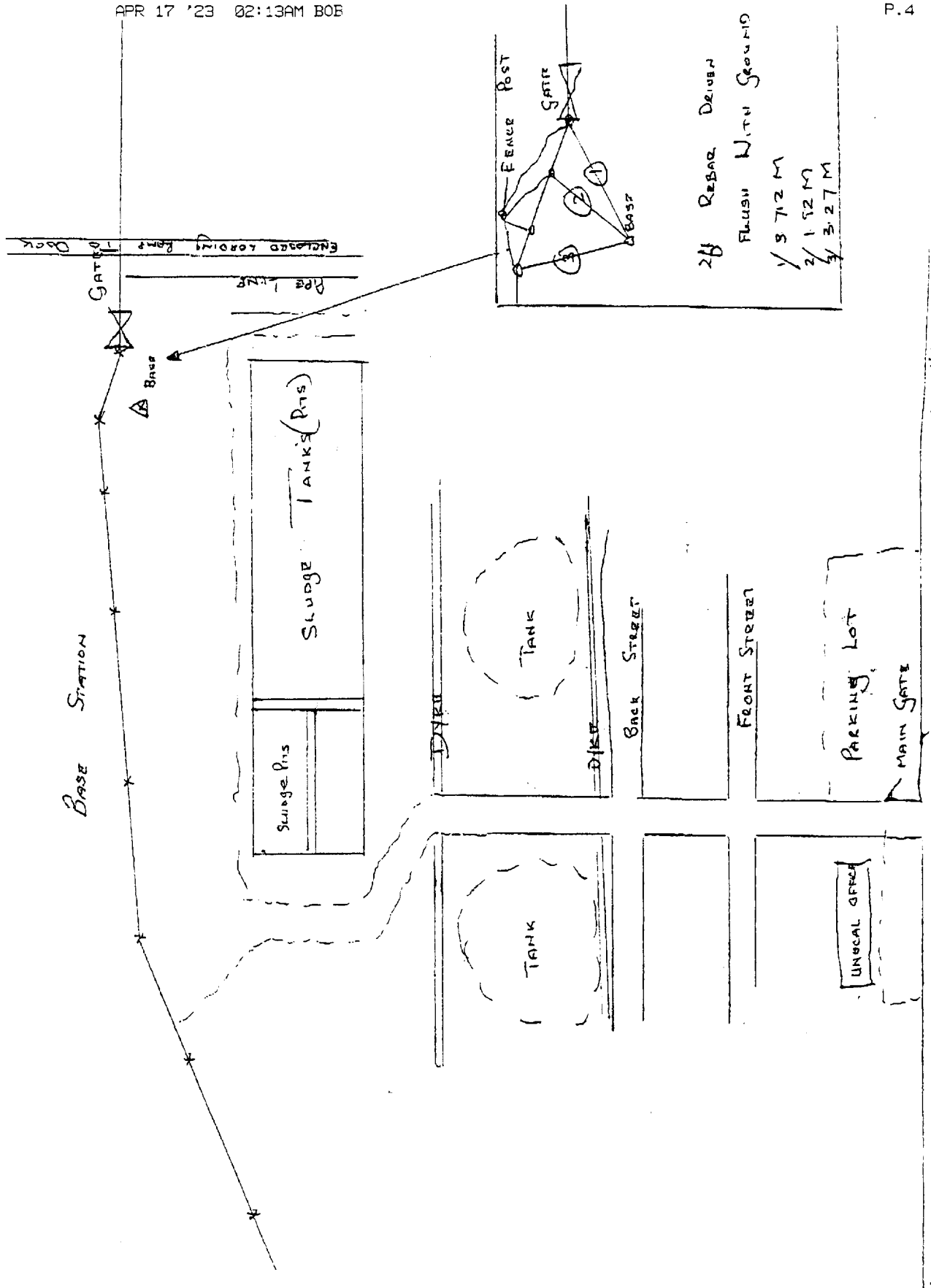
2 fixed coordinates in y

2 fixed coordinates in x

Name	Latitude	Longitude	Status
UNOCAL	60° 40' 22.350756"	151° 23' 01.069064"	Float
NIK	60° 40' 58.634420"	151° 23' 57.232039"	Float
NIKI USCGS A	60° 40' 26.187010"	151° 20' 53.609190"	Fixed
T81RESET	60° 34' 05.601845"	151° 15' 00.152199"	Fixed

NETWORK MAP: HORIZONTAL CONTROL FOR STATION UNOCAL





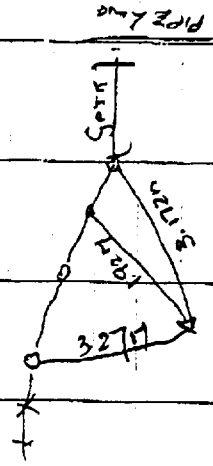
Niki 1a-1 High 1:547 M
 Niki 1a-2 1:550 M
 Niki 1a-3 1:414 M

SEM FOUND IN GOOD CONDITION
 AS PER 1986 DESCRIPTION
 GREEN PLASTIC MACKER NOW
 BAKKEN IN HOLE

Base Amt Height: 1:415 M

FROM INTERSECTION OF MAIN STREET
 AND KENIA SQ. ALONG SO NORTH
 ON SQ. ALONG APPROX 8.9 MILE
 TO ENTRANCE OF UNICAL PLANT
 (PERMISSION MUST BE OBTAINED
 BEFORE ENTRY PERMITTED)
 FOLLOW SOUTH STREET TURN RIGHT
 0.2 MILE TO PASS STORAGE TANKS
 TO OPEN AREA WEST OF
 SLUDGE PITS.
 FOLLOW FENCE NORTH 0.17
 TO GATE AND PIPE LINE

Station is Approx 3 M SSE
 From Gate.



Niki 1951 LAIS 11

SM Found in Jeep Condition
As per Recovery Notes
To get permission to
enter property go to
Helen Galt on West Side of

NICKEL & KONTA RT

At gate # 1 HERE IS TELEPHONE

DRIVE # 343 DOCK

549 REFINERY (125000)

TSB1 RESER 128511

SM Found As per Simon Description
Dated 1995, Mercedes Witness
Post Has Now Been Replaced

I. Hydrographic Position Control ✓

Position Accuracy

Differential Global Positioning System (DGPS) provided the basis of hydrographic positions throughout the survey. The total horizontal positional error falls within 10 meters at the 95% confidence level for all features in this project. A fixed-point DGPS Performance Check was performed to confirm this accuracy standard and a graphical analysis of the check is included in Appendix H.*

In addition to the accuracy of the DGPS system, the accuracy of the sounding position depends on the following:

- Characteristics of the multibeam system
- Depth of water
- Accuracy of heave, pitch, roll, and heading measurements
- Accuracy that latencies are accounted for and applied
- Accuracy and reliability of the of Sound Velocity Profile (SVP)

Position Control

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The following stations were used for project control:

Reference station	NGSPID	CORS ID	USCG DGPS Beacon Frequency	Horizontal Order
UNOCAL	-	-	-	-
Kenai 1 CORS L1 Phase Center	AB6390	Kenai_19960131	310 kHz	CORS
NIK	TT0543	-	-	SECOND

A local Differential Global Positioning System (DGPS) station named UNOCAL was established and used as primary horizontal positioning. Along with UNOCAL the United States Coast Guard (USCG) DGPS Beacon at Kenai was used during hydrographic operations for horizontal positions and confidence checks. Control station "NIK" was used as a DGPS performance check site.

** Filed with the hydrographic data.*

Refer to diagrams included in Section C (Vessels) for the instrument locations on the *Sea Ducer*.

HDOP spikes due to atmospheric conditions or satellite constellation configurations were rare. Spikes that did occur were caught either in the field and no further data was collected or by the quality control procedures in the office using the recorded data. There were no unusual atmospheric conditions that affected data quality. The only malfunctions involving positioning equipment were the result of power outages. Surveying would continue when power was restored.

Systematic errors were resolved during pre-survey testing with configuration modifications to the AgGPS120, Reson, and Seatex Seapath 200 systems until results proved reasonable. Detailed configuration settings are listed in Appendix G. *

Prior to field season, all sensor locations were established and a precise conventional survey of the vessel was performed utilizing a Theodolite / EDM and steel chain. From this, sensor offsets, stationing and elevations were determined and applied to the appropriate sensor or processing stage. The origin point (RP) of the vessel was called CL3 and the position of the multibeam sonar transducer was called Seabat 8101.

** Filed with the hydrographic data.*

DGPS Performance Check

The National Geodetic Service (NGS) station "NIK" was used as a fixed-point DGPS performance check site during a 24 hour observation period. The local station UNOCAL was checked against the fixed position of "NIK". A Trimble Ag120 DGPS receiver, capable of receiving local correctors in the Radio Technical Commission Marine (RTCM) format was placed on control station "NIK". It computed a differentially corrected position at a rate of one per second and output a National Marine Electronics Association (NMEA 0183) "GGA" message once per second to a logging computer. The computed position was compared to the control point's published position. A graphical analysis of this data is found in Appendix H. *

The local DGPS station UNOCAL along with Kenai USCG differential navigation beacon were used for horizontal survey positions and confidence checks during hydrographic operations. A confidence check was performed by simultaneously receiving positions on the vessel from the two different stations. When UNOCAL correctors were used for primary positioning, Kenai was used as a confidence check. Data supporting the confidence checks and the positioning criteria can be found in Appendix H. *

Positioning Equipment

The following GPS equipment was used:

Equipment Location	Type of Receiver/Antenna	Receiver serial No.	Antenna serial No.
DSM Base	Ag120/Trimble	0220062265	0220061904
Aft	SEATEX/Trimble	Seapath-0361	0220125667
Kenai	Ag120/Trimble	0220058481	0220061841
Forward	SEATEX/Trimble	Seapath-0361	0220157019
UNOCAL	Base Station/Trimble	0220053609	0220050446

* Filed with the hydrographic data.

J. SHORELINE ✓

Not applicable *concur*

K. Crosslines ✓

Following reduction of the sounding data a DTM was created in the Caris Editor. First the soundings within the database that had not been rejected either in editing or in the database due to footprint size, angle or beam number were gridded on a 1 meter interval. Gridding involved extracting and averaging soundings within each 1 meter by 1 meter area and averaging the depths. A record was then output with the average depth and the coordinates for the center of the cell. This set of records comprised 42,835,962 points and was imported to the Caris Editor. A regular DTM was created using a 2 meter cell size and a radius of 3 meters. Each cell within the regular DTM was a weighted average of the soundings within a 3 meter radius of the cell center. Weighting within the radius was based on the distance from the center of the cell with closer soundings given higher weights. After a DTM was made each crossline was compared to the DTM two ways. The accepted soundings (not rejected in editing) were compared by beam number and by angle.

An artifact in the swath was found in parts of the data where the swath appeared to be "cupped". When this appeared the outer beams of the swath were lower than the center. The source of the "cupping" was not determined although it could be related to either bottom material type or power and gain settings of the Reson 8101 sounder. The "cupping" did not degrade the data used for coverage and the smooth sheet to the degree that the data became unacceptable. *Loheur*.

The accuracy required for this survey was that 90% of the soundings used have an error of 0.3 meters or 1% of water depth whichever is greater. An equivalent error budget is allowed for water level corrections for a total error budget of 0.6 meters or 2%, whichever is greater. The table below summarizes the crossline statistics. The columns labeled 90% are either the largest angle or outboard beam numbers which had 90% or greater compliance with the required accuracy. The statistics are summarized on the next page.

Refer to the report "Crosslines" for the statistics found in this process. The file naming indicates whether the data was accepted by angle or beam, followed by the line name.

Examples are:

ana164053 This file name is for line 164053 and uses data accepted by angle.

bma164053 This file name is for line 164053 and uses data accepted by beam number

For data organized by angle, user number 1 contains soundings with an angle between 0° and 1°, user number 2 has soundings with an angle between 1° and 2° and so on.

For data organized by beam, the user number equals the Reson 8101 beam number.

Crossline Analysis

Line	Number of Soundings		Min Depth(mtrs)		Max Depth(mtrs)		Std Dev Center	Port		Star		Angle From Nadir	Port		Star		Angle From Nadir
164053	711,946	8.28	43.05	0.11	6	96	69	7	95	67							
164054	506,308	8.95	41.87	0.11	6	96	69	8	95	65							
164055	287,824	1.51	41.43	0.15	6	95	68	12	95	64							
165000	223,173	10.37	26.77	0.13	4	95	68	N/A	N/A	N/A							
165001	574,460	9.90	38.58	0.11	5	96	69	7	97	65							
165002	509,864	11.31	35.65	0.11	4	95	69	7	93	66							
165003	641,679	8.76	34.93	0.11	4	97	70	7	96	66							
165004	566,250	9.29	34.06	0.11	4	95	69	6	96	68							
165005	616,020	9.72	32.64	0.10	5	97	70	6	93	66							
165006	631,690	10.90	28.72	0.10	4	97	71	N/A	N/A	N/A							
165007	694,262	10.97	27.19	0.09	4	97	70	N/A	N/A	N/A							
165008	614,806	9.43	25.79	0.09	4	97	70	N/A	N/A	N/A							
165009	648,119	10.42	23.86	0.11	3	98	72	N/A	N/A	N/A							
165010	339,484	12.06	19.53	0.14	2	99	73	N/A	N/A	N/A							
165011	551,861	13.29	22.62	0.11	2	99	73	N/A	N/A	N/A							
165012	821,491	12.50	21.21	0.12	2	100	75	N/A	N/A	N/A							
165013	784,123	13.10	21.84	0.10	2	100	76	N/A	N/A	N/A							
165014	793,502	12.66	26.40	0.10	2	100	76	N/A	N/A	N/A							
165015	770,878	12.99	24.01	0.12	2	100	76	N/A	N/A	N/A							
165016	779,972	12.90	24.72	0.13	2	100	76	N/A	N/A	N/A							
165021	821,486	13.11	23.35	0.12	6	95	68	N/A	N/A	N/A							
165022	194,266	13.47	18.31	0.11	4	97	71	N/A	N/A	N/A							
166001	487,767	12.60	24.03	0.13	14	89	56	N/A	N/A	N/A							
166002	750,035	12.71	24.37	0.13	7	89	62	N/A	N/A	N/A							
166003	750,476	13.06	23.94	0.12	8	92	64	N/A	N/A	N/A							
166004	760,636	11.40	22.20	0.11	7	88	61	N/A	N/A	N/A							
166005	442,289	13.74	19.92	0.18	5	93	67	N/A	N/A	N/A							
166006	333,216	11.58	21.80	0.16	4	88	63	N/A	N/A	N/A							
166007	736,852	11.80	24.42	0.17	4	92	66	N/A	N/A	N/A							
166008	736,528	11.68	24.82	0.15	7	91	64	N/A	N/A	N/A							
166009	723,897	12.98	24.34	0.15	4	88	64	N/A	N/A	N/A							
166010	543,985	14.75	22.12	0.16	7	92	65	N/A	N/A	N/A							
166022	185,776	0.81	22.09	1.23	6	96	68	N/A	N/A	N/A							
Summary	19,534,921	0.81	43.05	0.16	4.6	95.2	69	7.2	95.0	66							

L. Junctions ✓ *See Eval Rpt., section L.*

Survey H-10844 was compared with survey H-10802, a 1:10,000 scale survey covering the area immediately to the north, and with survey H-10904, a 1:10,000 scale survey covering the area immediately to the south. Agreement between the surveys was very good with the majority of the soundings agreeing within 0.2 fathoms. No adjustment or reconciliation is necessary.

M. Comparison with Prior Surveys ✓ *See Eval Rpt., section M.*

Comparison with prior surveys was not required under this contract. ^{*Concur*} See Section N for comparison to the nautical chart. _^

N. Comparison with the Chart ✓ *See Eval Rpt., section O.*

This survey was compared in Autocad Map to the following charts:

Chart	Scale	Edition	Date
16662	1:100,000	4 th	August 31, 1996

General agreement between the chart and this survey was good although some changes in the edges of the shoal areas were detected. This survey also found a number of rocks not noted on the chart. This is probably the result of the high sounding density of this survey. As a result the soundings found tended to both match the chart and contain higher and lower values within the same area of the chart.

H-10884 Fathoms	Latitude				Longitude				Comment On Agreement With Chart
	°	'	"		°	'	"		
14.2	60°	40'	54.162"	N	151°	26'	23.154"	W	9 fathoms 2 feet on chart
14.3	60°	39'	38.939"	N	151°	23'	54.977"	W	15 fathoms on chart
10.0	60°	38'	06.928"	N	151°	24'	24.913"	W	well into shallow side of 10 fathom curve
9.7	60°	37'	52.559"	N	151°	23'	40.452"	W	well into 10 fathom curve
10.2 ³	60°	36'	30.260"	N	151°	23'	54.644"	W	Well into shallow side of 10 fathom curve
10.2	60°	36'	09.511"	N	151°	22'	53.481"	W	Well into shallow side of 10 fathom curve

P. Aids to Navigation ✓ *See Eval Rpt., section Q.*

There were no Aids to Navigation found in this survey. *Concur.*

Q. Statistics ✓

The following list of statistics applies to surveying performed from the *Sea Ducer*, the only vessel used on this survey.

Lineal Nautical Miles of Sounding Lines (Shallow Water Multibeam)	934.94
Lineal Nautical Miles of Side Scan Sonar	0
Square Nautical Miles (100% Shallow Water Multibeam Coverage)	12.2
Days of data acquisition	23
Total number of soundings	205,122,617
Number of selected soundings on preliminary smooth sheet	18,264
Number of detached positions	0
Number of bottom samples	36
Number of velocity casts	52
Number of Horizontal Control Stations Occupied / Established	3/1
Number of tide stations installed	0

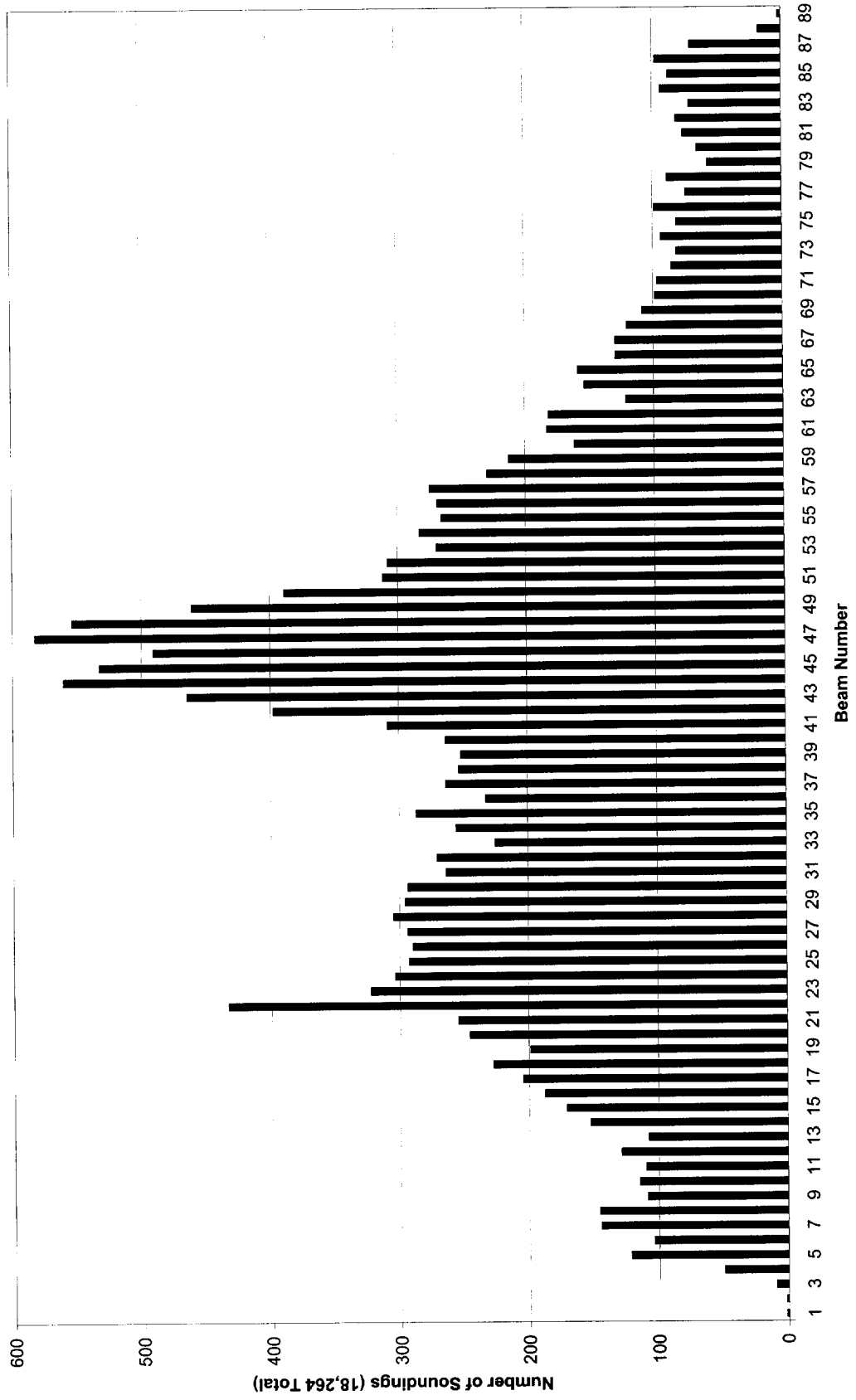
R. Miscellaneous ✓

This survey found the general location and depths over the shoal to be very similar to the chart. The smooth sheet soundings were analyzed for the number of soundings representing each beam on the Reson 8101 and are included on the following page.

Reson 8101
Beam # v.s. # of soundings on smooth sheet

<u>Beam</u>	<u>Count</u>	<u>Beam</u>	<u>Count</u>
6	1	50	532
7	1	51	490
8	9	52	582
9	49	53	553
10	121	54	460
11	103	55	388
12	144	56	311
13	145	57	307
14	108	58	269
15	114	59	282
16	109	60	265
17	128	61	268
18	107	62	274
19	152	63	229
20	170	64	212
21	187	65	161
22	204	66	182
23	227	67	181
24	198	68	121
25	245	69	153
26	254	70	158
27	433	71	129
28	322	72	129
29	303	73	120
30	292	74	108
31	289	75	98
32	293	76	96
33	304	77	85
34	295	78	81
35	293	79	93
36	263	80	81
37	270	81	98
38	225	82	74
39	255	83	88
40	286	84	57
41	232	85	65
42	263	86	76
43	253	87	81
44	251	88	71
45	263	89	93
46	308	90	87
47	397	91	97
48	464	92	70
49	560	93	17
		94	2
			<hr/> 18264

WO 5 Smooth Sheet Soundings



S. Recommendations ✓

We are unaware of any planned activities involving construction or dredging within or adjacent to this area.

T. Referral to Reports ✓

NOAA PROJECT OPR-P385-KR

H-10884

Terra Surveys, LLC

- **CROSSLINE REPORTS, 1999**
- **LINE LOGS AND LINE STATISTICS, JD 163-175, 1999**
- **LINE LOGS AND LINE STATISTICS, JD 176-217, 1999**
- **SOUND VELOCITY PROFILE DATA**

To: "Brian Greenawalt" <Brian.Greenawalt@noaa.gov>, Gary Nelson
From: "Thomas S. Newman" <tom@terra-surveys.com>
Subject: Questions for Sheet F
Cc: bob
Bcc:
Attached:

Brian,

We have a question Gary Nelson was not able to answer regarding Task Order #5. The limits at the northeast portion of the project appear to reach behind the docks along the shoreline. Do you want survey data behind the docks?

Thanks,

Tom Newman

From: "Brian Greenawalt" <Brian.Greenawalt@noaa.gov>
To: <tom@terra-surveys.com>
Cc: "Maurice Hickson" <Maurice.Hickson@noaa.gov>,
"Gary Nelson" <gnelson@pachydro.noaa.gov>
Subject: Re: Questions for Sheet F
Date: Mon, 7 Jun 1999 07:51:10 -0400
X-Mailer: Microsoft Internet Mail 4.70.1155

Tom,

The survey limits should have been across the face of the piers, not behind them.

File a copy of this message in the "Supplemental Correspondence" appendix of the DR for Sheet F.

Regards,
C. Brian Greenawalt
Program/Management Analyst
NOAA – Hydrographic Surveys Division
Voice: (301) 713-2698 x114
Fax: (301) 713-4533



LETTER OF APPROVAL

REGISTRY NO. H-10884

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of survey H-10884 were conducted under my direct supervision with frequent checks of progress and adequacy. This report and smooth sheets have been closely reviewed and are considered complete and adequate as per the Statement of Work.

A handwritten signature in black ink, appearing to read "T. Newman", is written over a horizontal line.

Thomas S. Newman
Hydrographer
Terra Surveys, LLC
July 17th, 2000

GEOGRAPHIC NAMES

H-10884

Name on Survey	<div style="display: flex; justify-content: space-between;"> A ON CHART NO. 16662 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 </div>											
	ALASKA (title)	X		X								
COOK INLET	X		X									2
PORT NIKISKI	X		X									3
												4
												5
												6
												7
												8
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												24
												25

Dennis J. Koresching
SEP 18 2000

HYDROGRAPHIC SURVEY STATISTICS

H-10884

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

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

SHORELINE DATA

SHORELINE MAPS (List):	NA
PHOTOBATHYMETRIC MAPS (List):	NA
NOTES TO THE HYDROGRAPHER (List):	NA
SPECIAL REPORTS (List):	NA
NAUTICAL CHARTS (List):	16662 5th Ed., July 5, 1997

OFFICE PROCESSING ACTIVITIES

The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS			
	VERIFICATION	EVALUATION	TOTALS	
POSITIONS ON SHEET				
POSITIONS REVISED				
SOUNDINGS REVISED				
CONTROL STATIONS REVISED				
	TIME-HOURS			
	VERIFICATION	EVALUATION	TOTALS	
PRE-PROCESSING EXAMINATION				
VERIFICATION OF CONTROL				
VERIFICATION OF POSITIONS				
VERIFICATION OF SOUNDINGS	47		47	
VERIFICATION OF JUNCTIONS				
APPLICATION OF PHOTOBATHYMETRY				
SHORELINE APPLICATION/VERIFICATION				
COMPILATION OF SMOOTH SHEET	75	14	89	
COMPARISON WITH PRIOR SURVEYS AND CHARTS				
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		12	12	
GEOGRAPHIC NAMES				
OTHER* (Chart Compilation)		44	44	
*USE OTHER SIDE OF FORM FOR REMARKS	TOTALS	122	70	192

Pre-processing Examination by G. Nelson	Beginning Date 5/1/2000	Ending Date 5/25/2000
Verification of Field Data by G. Nelson, L. Deodato	Time (Hours) 122	Ending Date 7/7/2000
Verification Check by D. Hill	Time (Hours) 20	Ending Date 9-15-00
Evaluation and Analysis by L. Deodato	Time (Hours) 26	Ending Date 7/12/2000
Inspection by D. Hill	Time (Hours) 29	Ending Date 9-15-00

**EVALUATION REPORT
H-10884**

A. PROJECT

Survey H10884 was conducted under contract 50-DGCN-8-90021 awarded on April 10, 1998.. A Statement of Work (SOW), dated November 28, 1997 contains specific requirements. The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data with which to update the existing nautical charts of the area

This survey was conducted by Terra Surveys, LLC. of Palmer, Alaska, which is hereafter referred to as the hydrographer. Specific information pertaining to this contractor may be obtained from NOS Hydrographic Survey Division (N/CS35)

B. AREA SURVEYED

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

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

Bottom sampling was not required for this contract. Depths range from 4 to 23 fathoms.

C. SURVEY VESSELS

The hydrographer's report contains adequate information relating to the vessel used during this survey.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Hydrographic data were acquired using a Reson SEABAT 8101 shallow water multibeam system. Data acquisition and processing procedures employed in the field have been adequately documented in the hydrographer's report, section D.

Office review of survey data and the preliminary smooth sheet was accomplished at the Pacific Hydrographic Branch. The final smooth sheet was compiled with MicroStation 95.

The smooth sheet drawing is filed in the MicroStation format, i.e., dgn extension. A copy of this file has been forwarded to the Hydrographic Surveys Division and a backup copy retained at PHB.

The drawing files necessarily contain information that is not part of the sounding and position data set such as geographic names text, line-type data, and minor symbolization. Cartographic codes used to describe the digital data are those authorized by the NOS Hydrographic Surveys Specifications and Deliverables.

The data are plotted using a Universal Transverse Mercator (UTM) projection and are depicted on a single sheet.

E. SONAR EQUIPMENT

Towed side scan sonar was not utilized during this survey.

F. SOUNDING EQUIPMENT

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

G. CORRECTIONS TO SOUNDINGS

Soundings have been reduced to Mean Lower Low Water (MLLW), with verified tide data obtained from the Ocean Products and Services Division (OPSD) Home Page "Hydro Hot List". The approved tide correctors are zoned from Nikiski, Alaska, gage 945-5760. Further information concerning tides can be found in section G of the hydrographer's report.

Other sounding reducers include corrections for static draft, dynamic draft, sound velocity, heave, roll and pitch. These reducers have been reviewed and are consistent with NOS specifications.

H. CONTROL STATIONS

The positions of horizontal control stations used during hydrographic operations are established by Terra Surveys, LLC based on NAD 83.

The smooth sheet is annotated with an NAD27 adjustment tick based on values determined with the NGS program NADCON. Geographic positions based on NAD27 may be plotted on the smooth sheet utilizing the NAD 83 projection by applying the following corrections.

Latitude: -2.045 seconds (-63.281 meters)
Longitude: 8.052 seconds (122.429 meters)

I. HYDROGRAPHIC POSITION CONTROL

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

J. SHORELINE

Investigation of shoreline was not required under this contract. However, the smooth sheet has been re-compiled to depict shoreline as it appears on nautical chart 16662, 5th Edition, July 5, 1997. This shoreline depiction is for reference purposes only.

K. CROSSLINES

Crosslines are adequately discussed in the hydrographer's report.

L. JUNCTIONS

Survey H10884 junctions with the following surveys:

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H10802	1998	1:10,000	North
H10904	1999	1:10,000	South

The junctions with surveys H10802 and H10904 are complete.. A "Joins" note has been added to the smooth sheet where applicable.

M. COMPARISON WITH PRIOR SURVEYS

Comparison with prior surveys was not required under this contract. However, comparison with the following prior survey was accomplished as part of the standard office processing procedure.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>
H10610	1995	1:10,000
H10615	1995	1:10,000

Surveys H10610 and H10615 cover the entire area of the present survey. In depths less than 20 fathoms, the soundings agree within 0.0 to 0.3 fathom and 0 to 1 fathom at greater depths with the present survey soundings being shoaler.

A sounding, 10 fathoms, was transferred from H10615 to the present survey.

With the transfer of the above sounding to the smooth sheet, survey H10884 is adequate to supersede the above prior surveys within the area of common coverage.

N. ITEM INVESTIGATION:

No AWOIS items were specifically assigned for this survey. However, during office processing the following AWOIS items were evaluated: 52190-52192, ~~52194~~, 52327-52329. Updated dispositions

were determined for each and the results compiled to the AWOIS database. A copy of this updated database was transmitted to N/CS34.

*AWOIS information
attached.
GKM
10/31/00*

O. COMPARISON WITH CHART

Survey H10884 was compared with the following chart.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>
16662	5	July 5, 1997	1:100,000
16662 (inset)	5	July 5, 1997	1:50,000

a. Hydrography

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

Three charted bottom characteristics, hrd, which originates from previously superseded prior surveys were retained as charted.

With the exception of the above, survey H10884 is adequate to supersede charted hydrography within the area of coverage.

b. Dangers to navigation

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

P. ADEQUACY OF SURVEY

The hydrography contained on survey H10884 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.

With the exception of the following the hydrographic records and reports received for processing are adequate and conform to the requirements of the NOS Hydrographic Surveys Specifications and Deliverables, dated April 1999 and the Statement of Work, dated November 28, 1997.

The descriptive report format does not follow the section labeling scheme specified in the Specs and Deliverables, section 8.1.3. This includes the identification of appendices.

Q. AIDS TO NAVIGATION

There are no aids to navigation within the boundaries of the surveyed area. The lights charted on the corners of the piers adjoining the northeast boundary of the survey are considered to be outside the project area. No investigation of these aids was conducted.

R. STATISTICS

Statistics are adequately itemized in the hydrographer's report.

S. MISCELLANEOUS

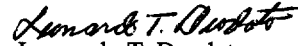
Miscellaneous information is adequately discussed in the hydrographer's report.

T. RECOMMENDATIONS

Survey H10884 is an adequate hydrographic survey. No additional work is recommended.

U. REFERRAL TO REPORTS

The hydrographer's report contains no reference to additional survey information in section T, Referral to Reports. However, several appendices included in the original descriptive report have been detached and filed with the rest of the hydrographic field records. These documents contain important information concerning the type of vessel used, system characteristics, system checks, instrument calibrations and data processing procedures.



Leonardo T. Deodato

Cartographer

RECRD 52190 VESSLTERMS SOUNDING CHART 16662 AREA P
 CARTOCODE 0130 SNDINGCODE 130 DEPTH 6.9

NATIVLAT	60/36/49.0	NATIVLON	151/25/34.6	<input type="button" value="convert"/>	NATVDATUM	31
LAT83	60/36/49.00	LONG83	151/25/34.6	<input type="button" value="Update GP"/>	GPQUALITY	High
	60 36 49		151 25 34.6		GPSOURCE	Direct
LATDEC	60.613611111111	LONDEC	151.4262777778			

PROJECT OPR-P385 ITEMSTATUS Completed SEARCHTYPE None
 RADIUS INIT ASSIGNED
 TECNIQ ##

Techniqnote

History

AWOIS ITEM 52190

SURVEY REQUIREMENTS COMMENT
 ITEM FOR INFORMATION ONLY. NO SURVEY REQUIREMENTS.

HISTORY
 H8617WD/61-- CLEARED 38FT; HUNG 38FT; (CHARTED AS SHOAL CLEARED 1 6 FM 2 FT). POSITION GIVEN IN LAT 60-36-54N, LONG 151-25-26W(NAD27).
 H9619/76-- 6.5 FM DEPTH CARRIED FORWARD IN SURROUNDING DEPTHS 1 OF 7.6 FMS (1964 EARTHQUAKE SUBSIDENCE OF .2 FM APPLIED). (ENTERED 2/95 RWD)
 H10615/95-- SOUNDING (6.6FMS AT MLLW) WAS VERIFIED IN LAT 60-36-49.0N, 1 LONG 151-25-35.6W (NAD83). (UPDATED 8/96 RWD)
 H10884/99--THE EVALUATORS COMMENTS/FINDINGS ARE NOTED IN THE FIELDNOTE SECTION OF THIS RECORD. (UPDATED 10/00 BY MBH)

Fieldnote

INVESTIGATION 52190

DATE(S): 08/05/99 (DN:N/A)

VN:AK0601P TIME:N/A

INVESTIGATION METHODS USED: (IE DI, 200% SIDE SCAN SONAR, ECHO SOUNDER)
 Echosounder(SWMB)

OBSERVED POSITION: LAT.60/36/49.0 LON.151/25/34.6

POSITION DETERMINED BY: DIFFERENTIAL GPS

INVESTIGATION SUMMARY: 6.9 fathom depth found in same proximate location as prior 6.6fm depth; SWMB technology.

CHARTING RECOMMENDATION (HYDROGRAPHER): N/A

EVALUATOR COMMENTS: 6.9fm depth found at UTM Zone 5 coordinates E586142.61, N6720781.33. Prior depth of 6.6fms considered disproved. Date of investigation approximate.

Proprietar

YEARSUNK NIMANUM SYSTEMNUM 10309

RECRD 52191 VESSLTERMS SOUNDING CHART 16662 AREA P
CARTOCODE 0130 SENDINGCODE 130 DEPTH 6.9

NATIVLAT	60/37/34.20	NATIVLON	151/26/04.50	<input type="button" value="convert"/>	NATVDATUM	31
LAT83	60/37/34.20	LONG83	151/26/04.50	<input type="button" value="Update GP"/>	GPQUALITY	High
	60 37 34.2		151 26 4.5		GPSOURCE	Direct
LATDEC	60.62616666667	LONDEC	151.43458333333			

PROJECT OPR-P385 ITEMSTATUS Completed SEARCHTYPE None
RADIUS INIT ASSIGNED
TECNIQ ##

Techniqnote

History

AWOIS ITEM 52191

SURVEY REQUIREMENTS COMMENT
ITEM FOR INFORMATION ONLY. NO SURVEY REQUIREMENTS.

HISTORY

H8617WD/61-- CLEARED 35 FT; HUNG 37 FT; (CHARTED AS SHOAL CLEARED 15 FM 5 FT). POSITION GIVEN IN LAT 60-37-33N, LONG 151-26-07W(NAD27).

H9619/76-- 6.3 FM DEPTH CARRIED FORWARD IN DEPTHS OF 7.8-8.6 FMS (1964 EARTHQUAKE SUBSIDENCE OF .2 FM APPLIED). (ENTERED 2/95 RWD)

H10610/95-- 37 FOOT HANG DEPTH DISPROVED WITH S2 AND 5-10M ECHOSOUNDER IN DEVELOPMENT. A 6.6FM DEPTH WAS LOCATED AT 60-37-33.8N, LONG 151-26-04.4W (NAD83). (UPDATED 8/96 RWD)

H10884/99--THE EVALUATORS COMMENTS/FINDINGS ARE NOTED IN THE FIELDNOTE SECTION OF THIS RECORD. (UPDATED 10/00 BY MBH)

Fieldnote

INVESTIGATION 52191

DATE(S): 08/05/99 (DN:N/A)

VN:AK0601P TIME:N/A

INVESTIGATION METHODS USED: (IE DI, 200% SIDE SCAN SONAR, ECHO SOUNDER)
Echosounder(SWMB)

OBSERVED POSITION: LAT.60/37/34.2 LON.151/26/04.5

POSITION DETERMINED BY: DIFFERENTIAL GPS

INVESTIGATION SUMMARY: 6.9 fathom depth found in same proximate location as prior 6.6fm depth; SWMB technology.

CHARTING RECOMMENDATION (HYDROGRAPHER): N/A

EVALUATOR COMMENTS: 6.9fm depth found at UTM Zone 5 coordinates E585655.15, N6722169.41. Prior depth of 6.6fms considered disproved. Date of investigation approximate.

Proprietar

YEARSUNK NIMANUM SYSTEMNUM 10310

RECRD 52192 VESSLTERMS SOUNDING CHART 16662 AREA P
 CARTOCODE 0130 SENDINGCODE 130 DEPTH 5.8

NATIVLAT	60/38/18.50	NATIVLON	151/22/35.30	<input type="button" value="convert"/>	NATIVDATUM	31
LAT83	60/38/18.50	LONG83	151/22/35.30	<input type="button" value="Update GP"/>	GPQUALITY	High
	60 38 18.5		151 22 35.3		GPSOURCE	Direct
LATDEC	60.63847222222	LONDEC	151.3764722222			

PROJECT OPR-P385 ITEMSTATUS Completed SEARCHTYPE None
 RADIUS INIT ASSIGNED
 TECNIQ ##

Techniqnote

History

AWOIS ITEM 52192
 SURVEY REQUIREMENTS COMMENT
 ITEM FOR INFORMATION ONLY. NO SURVEY REQUIREMENTS.
 HISTORY
 H8617WD/61-- CLEARED 29 FT; HUNG 38 FT; (5 FM SHOAL CHARTED IN I VICINITY). POSITION GIVEN IN LAT 60-38-22.2N, LONG 151-22-34.8W (NAD27).
 H9619/76-- 6.5 FM DEPTH CARRIED FORWARD IN DEPTHS OF 6.9-9.8 FMS. I (1964 EARTHQUAKE SUBSIDENCE OF .2 FM APPLIED). (ENTERED 2/95 RWD)
 H10610/95-- SOUNDING 6.2FMS AT MLLW WAS VERIFIED AT LAT I 60-38-20.6N, LONG 151-22-34.90W(NAD83). (UPDATED 8/96 RWD)
 H10884/99--THE EVALUATORS COMMENTS/FINDINGS ARE NOTED IN THE FIELDNOTE SECTION OF THIS RECORD. (UPDATED 10/00 BY MBH)

Fieldnote

INVESTIGATION 52192
 DATE(S): 08/05/99 (DN:N/A)
 VN:AK0601P TIME:N/A
 INVESTIGATION METHODS USED: (IE DI, 200% SIDE SCAN SONAR, ECHO SOUNDER)
 Echosounder(SWMB)
 OBSERVED POSITION: LAT.60/38/18.5 LON.151/22/35.3
 POSITION DETERMINED BY: DIFFERENTIAL GPS
 INVESTIGATION SUMMARY: 5.8 fathom depth found 63 meters bearing 184degrees with 100% bottom coverage using SWMB
 CHARTING RECOMMENDATION (HYDROGRAPHER): N/A
 EVALUATOR COMMENTS: 5.8fm depth found at UTM Zone 5 coordinates E588800.41, N6723617.64. Prior depth of 6.2fms considered disproved. Date of investigation approximate.

Proprietar

YEARSUNK NIMANUM SYSTEMNUM 10311

RECRD
 VESSLTERMS
 CHART
 AREA

 CARTOCODE
 SENDINGCODE
 DEPTH

NATIVLAT	<input type="text" value="60/39/14.00"/>	NATIVLON	<input type="text" value="151/24/49.00"/>	<input type="button" value="convert"/>	NATVDATUM	<input type="text" value="31"/>
LAT83	<input type="text" value="60/39/14.00"/>	LONG83	<input type="text" value="151/24/49.00"/>	<input type="button" value="Update GP"/>	GPQUALITY	<input type="text" value="High"/>
	<input type="text" value="60"/> <input type="text" value="39"/> <input type="text" value="14"/>		<input type="text" value="151"/> <input type="text" value="24"/> <input type="text" value="49"/>		GPSOURCE	<input type="text" value="Direct"/>
LATDEC	<input type="text" value="60.653888888889"/>	LONDEC	<input type="text" value="151.4136111111"/>			

PROJECT
 ITEMSTATUS
 SEARCHTYPE

 RADIUS
 INIT
 ASSIGNED

 TECNIQ

Techniqnote

History

 HISTORY

 H10610/95-- AN UNDEVELOPED, UNIDENTIFIED SSS CONTACT WITH AN ESTIMATED DEPTH OF 10.2FMS AT MLLW AND POSITIONED IN LAT 60-39-14N, LONG 151-24-49W IS SHOWN ON THE PRESENT SURVEY. (ENTERED 8/96 RWD)

 H10884/99--THE EVALUATORS COMMENTS/FINDINGS ARE NOTED IN THE FIELDNOTE SECTION OF THIS RECORD. (UPDATED 10/00 BY MBH)

Fieldnote

 DATE(S): 08/05/99 (DN:N/A)

 VN:AK0601P TIME:N/A

 INVESTIGATION METHODS USED: (IE DI, 200% SIDE SCAN SONAR, ECHO SOUNDER)

 Echosounder(SWMB)

 OBSERVED POSITION: LAT.N/A LON.N/A

 POSITION DETERMINED BY: DIFFERENTIAL GPS

 INVESTIGATION SUMMARY: 100% bottom coverage with SWMB

 CHARTING RECOMMENDATION (HYDROGRAPHER): N/A

 EVALUATOR COMMENTS: Depth disproved. Date of investigation approximate.

Proprietar

YEARSUNK
 NIMANUM
 SYSTEMNUM

RECRD 52328 VESSLTERMS SOUNDING CHART 16662 AREA P
CARTOCODE 130 SENDINGCODE 130 DEPTH 10.8

NATIVLAT	60/37/11.10	NATIVLON	151/24/15.1	<input type="button" value="convert"/>	NATVDATUM	31
LAT83	60/37/11.10	LONG83	151/24/15.1	<input type="button" value="Update GP"/>	GPQUALITY	High
	60 37 11.1		151 24 15.1		GPSOURCE	Direct
LATDEC	60.61975	LONDEC	151.4041944444			

PROJECT OPR-P385 ITEMSTATUS Completed SEARCHTYPE None
RADIUS 100 INIT RWD ASSIGNED 8/14/1996
TECNIQ MB,ES,S2,DI

Techniqnote

History

AWOIS ITEM 52328

HISTORY

H10615/95-- AN UNIDENTIFIED, UNDEVELOPED SSS CONTACT WITH AN ESTIMATED DEPTH OF 9.6FMS AT MLLW AND POSITIONED IN 1 LAT 60-37-11N, LONG 151-24-21W IS SHOWN ON THE PRESENT SURVEY. 1 (ENTERED 8/96 RWD)
H10884/99--THE EVALUATORS COMMENTS/FINDINGS ARE NOTED IN THE FIELDNOTE SECTION OF THIS RECORD.
(UPDATED 10/00 BY MBH)

Fieldnote

INVESTIGATION 52238

DATE(S): 08/05/99 (DN:N/A)

VN:AK0601P TIME:N/A

INVESTIGATION METHODS USED: (IE DI, 200% SIDE SCAN SONAR, ECHO SOUNDER)
Echosounder(SWMB)

OBSERVED POSITION: LAT.60/37/11.1 LON.151/24/15.1

POSITION DETERMINED BY: DIFFERENTIAL GPS

INVESTIGATION SUMMARY: 10.8 fathom depth found 90.2m, 85.8 degrees from prior 9.6fm depth; SWMB technology.

CHARTING RECOMMENDATION (HYDROGRAPHER): N/A

EVALUATOR COMMENTS: 10.8fm depth found at UTM Zone 5 coordinates E587334.8, N6721495.8. Prior depth of 9.6fm considered disproved. Date of investigation approximate.

Proprietar

YEARSUNK

NIMANUM

SYSTEMNUM 10421

RECRD 52329 VESSLTERMS SOUNDING CHART 16662 AREA P
 CARTOCODE 104 SENDINGCODE 130 DEPTH 5.6

NATIVLAT	60/35/27.4	NATIVLON	151/22/15.3	<input type="button" value="convert"/>	NATVDATUM	31
LAT83	60/35/27.4	LONG83	151/22/15.3	<input type="button" value="Update GP"/>	GPQUALITY	High
	60 35 27.4		151 22 15.3		GPSOURCE	Direct
LATDEC	60.5909444444	LONDEC	151.3709166667			

PROJECT OPR-P385 ITEMSTATUS Completed SEARCHTYPE None
 RADIUS 100 INIT RWD ASSIGNED 8/14/1996
 TECNIQ MB,ES,S2,DI

Techniqnote


History
 AWOIS ITEM 52329
 HISTORY
 H10615/95-- AN UNDEVELOPED, UNIDENTIFIED SSS CONTACT WITH AN I ESTIMATED DEPTH OF 4.6FMS AT MLLW AND POSITIONED IN LAT I 60-35-31N, LONG 151-22-15W IS SHOWN ON THE PRESENT SURVEY. I (ENTERED 8/96 RWD)
 H10884/99--THE EVALUATORS COMMENTS/FINDINGS ARE NOTED IN THE FIELDNOTE SECTION OF THIS RECORD.
 (UPDATED 10/00 BY MBH)

Fieldnote
 INVESTIGATION 52239
 DATE(S): 08/05/99 (DN:N/A)
 VN:AK0601P TIME:N/A
 INVESTIGATION METHODS USED: (IE DI, 200% SIDE SCAN SONAR, ECHO SOUNDER)
 Echosounder(SWMB)
 OBSERVED POSITION: LAT.60/35/27.4 LON.151/22/15.3
 POSITION DETERMINED BY: DIFFERENTIAL GPS
 INVESTIGATION SUMMARY: 5.6 fathom rock found 111.2m, 181.1 degrees from prior 4.6fm depth; SWMB technology.
 CHARTING RECOMMENDATION (HYDROGRAPHER): N/A
 EVALUATOR COMMENTS: 5.6fm depth found at UTM Zone 5 coordinates E589234.4, N6718331.7. Prior depth of 4.6fm considered disproved. Date of investigation approximate.


Proprietar

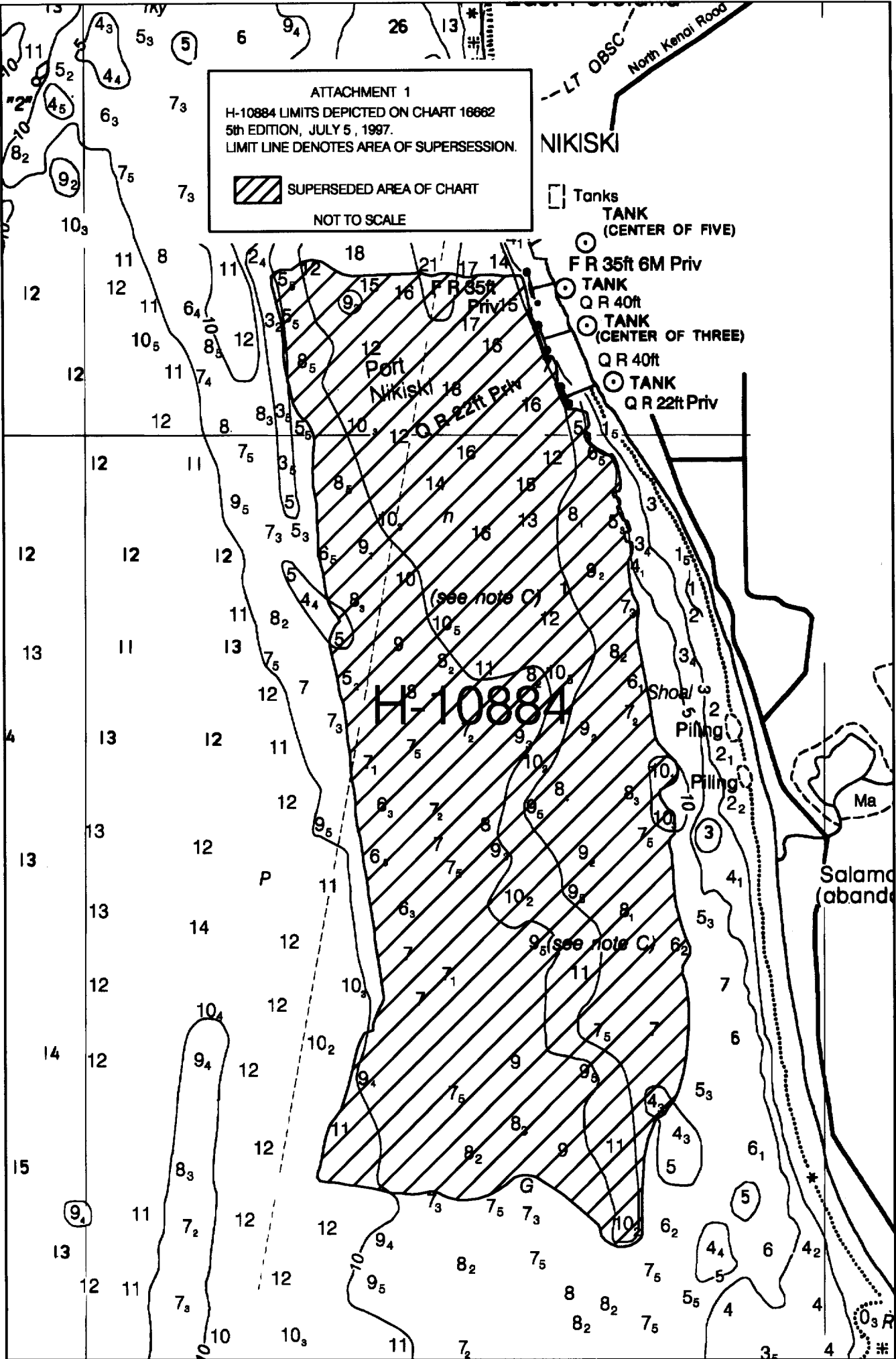
YEARSUNK NIMANUM SYSTEMNUM 10422

ATTACHMENT 1
 H-10884 LIMITS DEPICTED ON CHART 16662
 5th EDITION, JULY 5, 1997.
 LIMIT LINE DENOTES AREA OF SUPERSESSION.

 SUPERSEDED AREA OF CHART

NOT TO SCALE

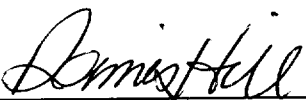
-  Tanks
- TANK (CENTER OF FIVE)
- F R 35ft 6M Priv
- TANK Q R 40ft
- TANK (CENTER OF THREE)
- Q R 40ft
- TANK Q R 22ft Priv



APPROVAL SHEET
H10884

Initial Approvals:

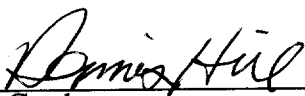
The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.



Dennis Hill
Chief, Cartographic Team
Pacific Hydrographic Branch

Date: 9-15-00

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




James C. Gardner
Commander, NOAA
Chief, Pacific Hydrographic Branch

Date: 9-29-00

Final Approval

Approved:



Samuel P. De Bow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

Date: 11/8/00

