H10654

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Mutilbeam/Side Scan

Field No. G

Registry No. H-10654

LOCALITY

State Massachusetts

General Locality Vineyard Sound

Sublocality Lucas Shoal to Nashawena Island

1995

CHIEF OF PARTY
Walter Simmons (SAIC)

LIBRARY & ARCHIVES

DATE August 15, 1997

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NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NO. H-10654
	HYDROGRAPHIC TITLE SHEET	
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. G

State MASSACHUSETTS

General locality VINEYARD SOUND

Locality LUCAS SHOAL TO NASHAWENA ISLAND

Scale 1:10,000 Date of survey 3-6 Oct 1995; 18-20 Oct 1995; 23-26Oct 1995

Instructions dated September 30, 1994 as amended Project No. OPR-B389-CN

Vessel M/V ATLANTIC SURVEYOR (ID # D582365)

Chief of party WALTER SIMMONS

Surveyed by J. Miller, S. Ferguson, A. Gagnon, D. Allen, J. Kiernan, P. Selvitelli, R. Watson, L. Gates, E. DeAngelo; J. Case; A. Maddock; S. Cook; R. Franchuck; T. Hamel

Soundings taken by (echo sounder) hand lead, pole MULTIBEAM RESON SEABAT 9002

Graphic record scaled by Survey Personnel

Graphic record checked by Survey Personnel

Evaluation ~~Protracted~~ by J. A. Ferguson Automated plot by HP 650C ~~J. Kiernan, J. Case~~

Verification by D. Reifsteck

Soundings in fathoms (meters) feet at MLW (MLLW) and decimeters

REMARKS: * Contract # 50-DGNC-4-00035
Contractor Name: Science Applications International Corp.;
221 Third Street; Newport, R. I. 02840;
Subcontractor Name: Ocean Surveys Inc.;
91 Shefield Street; Old Saybrook; Ct 06475

Smooth Sheet Production Date/Time 08/06/96 13:25

Time Reference: UTC

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

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* Marginal notes and revisions to the Descriptive Report were generated at the Pacific Hydrographic Branch during review of the Contractor's survey work.

SUPPLEMENTAL REPORTS ARCHIVED WITH SURVEY DATA (SEE SECT. T OF DR)

8/13/96

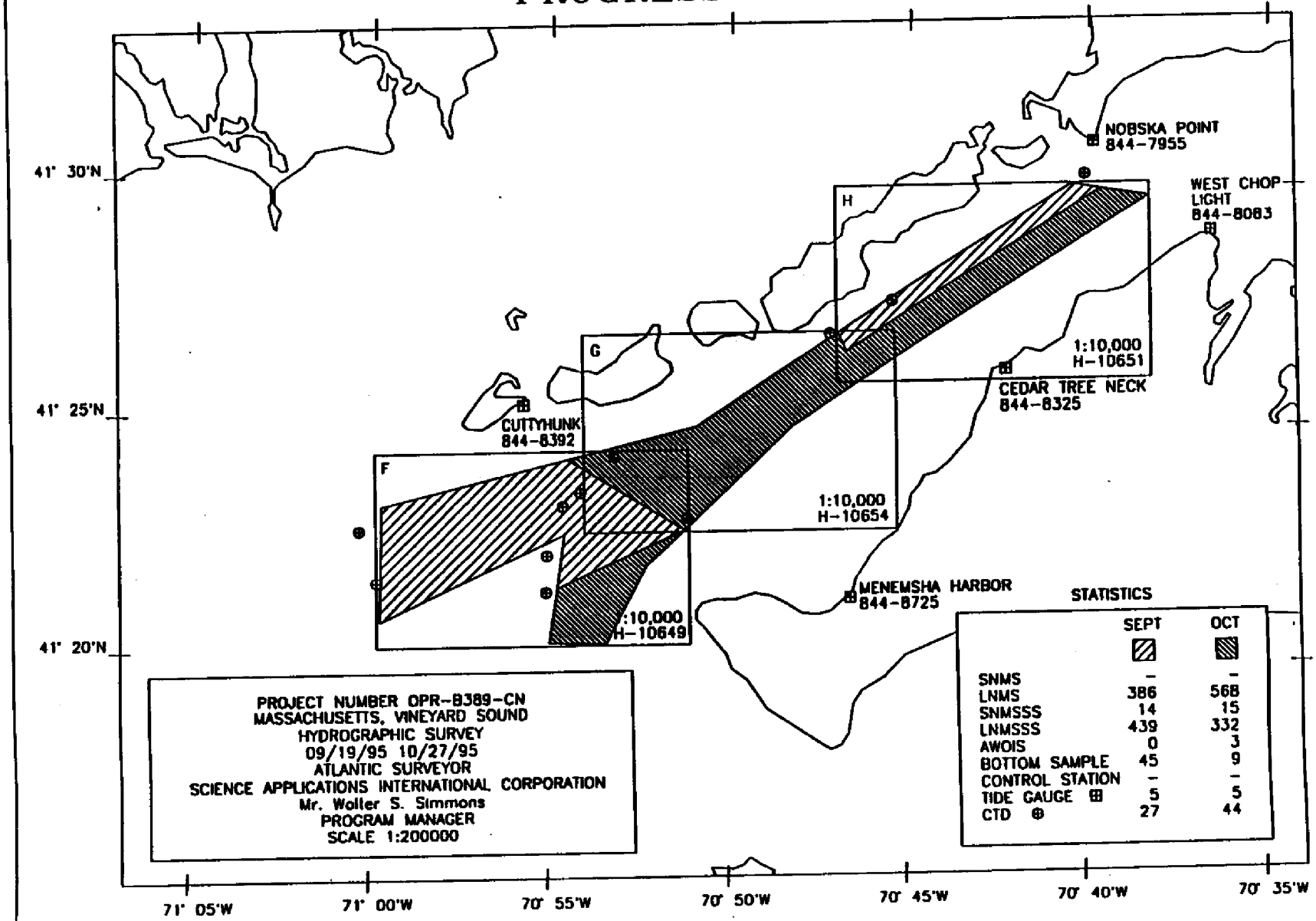
AWOIS/SARF 7/12/97 SJV

INDEX OF SHEETS

The Progress Sketch on the following page indicates:

1. Smooth Sheet Layout
2. Surveys and Registry Numbers
3. Tide Gauge Locations
4. CTD (Sound Velocity) Stations
5. Work Accomplished by Month

PROGRESS SKETCH



Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract 50-DGNC-4-00035 reflect the state of the sea floor in existence on the day and at the time the survey was conducted.

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Descriptive Report to Accompany
Hydrographic Survey H-10654

A. PROJECT ✓

Project number: OPR-B389-CN

Dates of instructions:		
	30 September 1994	**Original 50-DGNC-4-00035**
	21 March 1995	**Modification #1**
	03 April 1995	**Modification #2**
	06 June 1995	**Modification #3**
	23 June 1995	**Project limit definition, Execution Rocks**
	10 July 1995	**Modification #4**
	07 September 1995	**Modification #5**

Sheet letter: G
Registry number: H-10654
Purpose: Obtain 100% multibeam sonar coverage and 200% side scan sonar coverage within the survey area limits

B. AREA SURVEYED ✓ See Eval Rpt., Section B

The area surveyed is bounded approximately by the following coordinates:

Lat.	Long.
41° 26.86'N	070° 46.47'W
41° 25.86'N	070° 45.76'W
41° 24.90'N	070° 47.80'W
41° 22.70'N	070° 50.73'W
41° 24.28'N	070° 53.53'W
41° 24.90'N	070° 50.45'W

Dates of data acquisition:

10/03/95 - 10/06/95	JD 276 - 279
10/18/95 - 10/20/95	JD 291 - 293
10/23/95 - 10/26/95	JD 296 - 299

C. SURVEY VESSELS ✓

M/V ATLANTIC SURVEYOR (ID# D582365) was the platform for all multibeam sonar, side scan sonar, sound velocity and bottom sampling operations. Data acquisition and post processing systems were mounted in CONEX containers which were welded in place on the aft deck. The gyro compass was mounted in the pilot house, and the TSS335B motion sensor was mounted on the aft end of the deck house just above the main deck.

Multibeam sounder transducers were mounted back to back on a plate at the bottom of a stainless steel pipe at the starboard waist. Bearing plates were welded to the main deck, and a stabilizing alignment bracket was welded to the side of the boat. The primary GPS navigation antenna was mounted directly above the transducer pole and the reference GPS antenna was mounted just inboard on the same mount.

The side scan sonar tow position was located at the "A" frame aft center. An armored cable on a hydraulic winch, remotely controlled at the side scan operator's station, was used for this configuration.

The vessel layout is depicted in Figures C-1 and C-2, the coordinate systems in use are shown in Figure C-3, and the vessel offsets are shown in Table C-1. The Reference Point for the entire system is located on the transducer pole at the water line. For surveys conducted September through November 1995, the transducer draft was recorded as 2.30, therefore the pole was marked with the reference point at 2.30 meters. Lead line comparisons confirmed 2.30 meters as the correct draft.

Table C-1. Antenna and Transducer Locations Relative to Vessel Reference Point Oct. 3 - Nov. 13, 1995

Sensor	Offset in IHSS	IHSS Coordinate	Offset in RESON 6042	Reson Coordinate
Multibeam	x	0	x(port)	-0.07
	y	0	y(port)	+0.11
	z	0	z(port)	-2.30
			x(stbd)	+0.07
			y(stbd)	-0.02
			z(stbd)	-2.30
Trimble 4000DS	x	0		
	y	0		
	z	-6.82		
TSS335B	x			-3.020
	y			+3.320
	z			+1.300
Sidescan Tow PT	x	-15.90		
"A" frame aft	y	-2.46		
	z	-5.18		

Note that offsets relative to depth measurement are input to the RESON, while those for navigation are input to the IHSS.

As discussed in the Phase IIB Summary Report, the SAIC Integrated Hydrographic Survey System (IHSS), the RESON SeaBat multibeam system and the TSS-335B vertical reference, all have different coordinate systems, and therefore care must be taken when inputting correctors

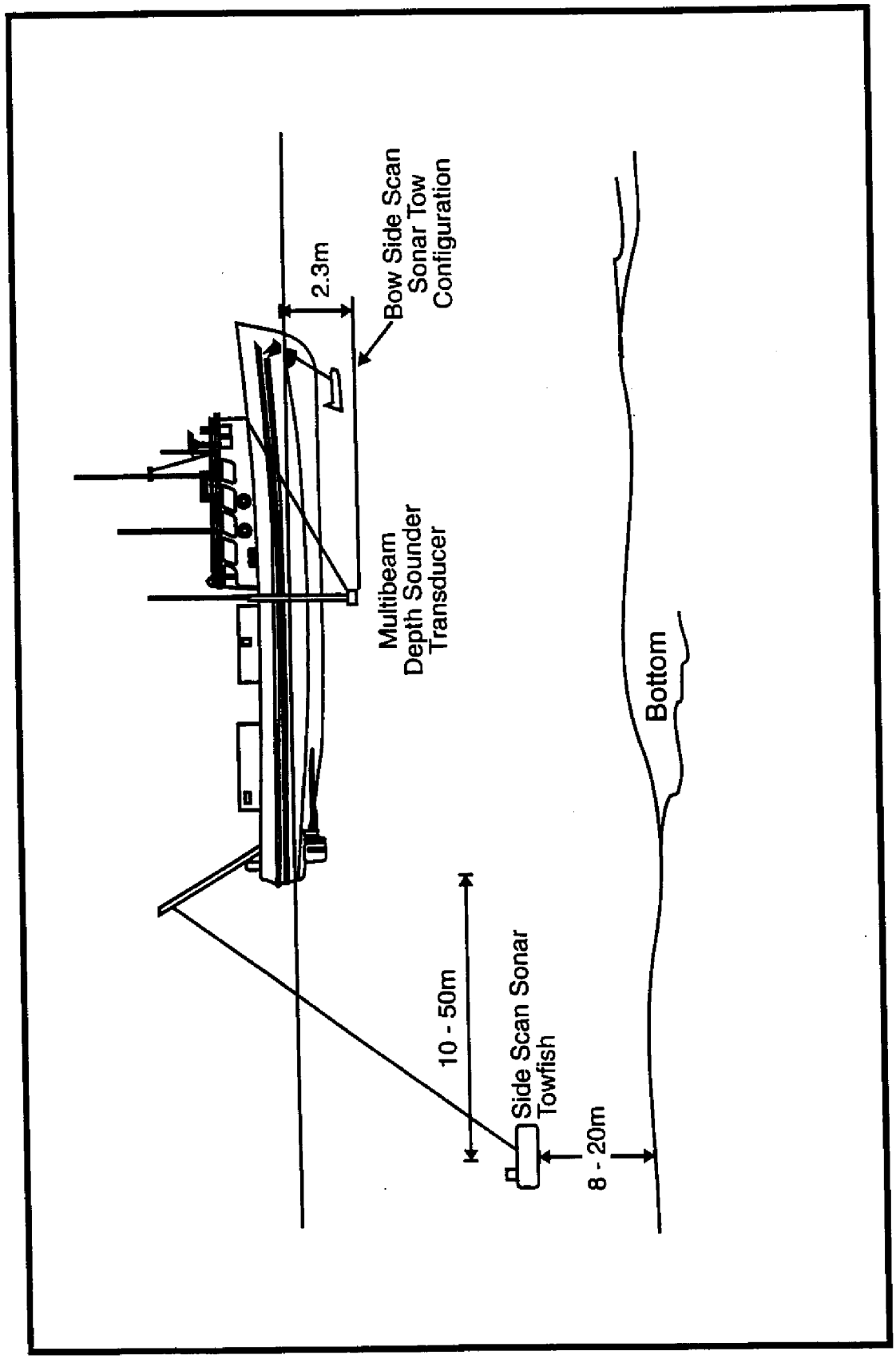


Figure C-1. Configuration of MV Atlantic Surveyor During Survey Operations

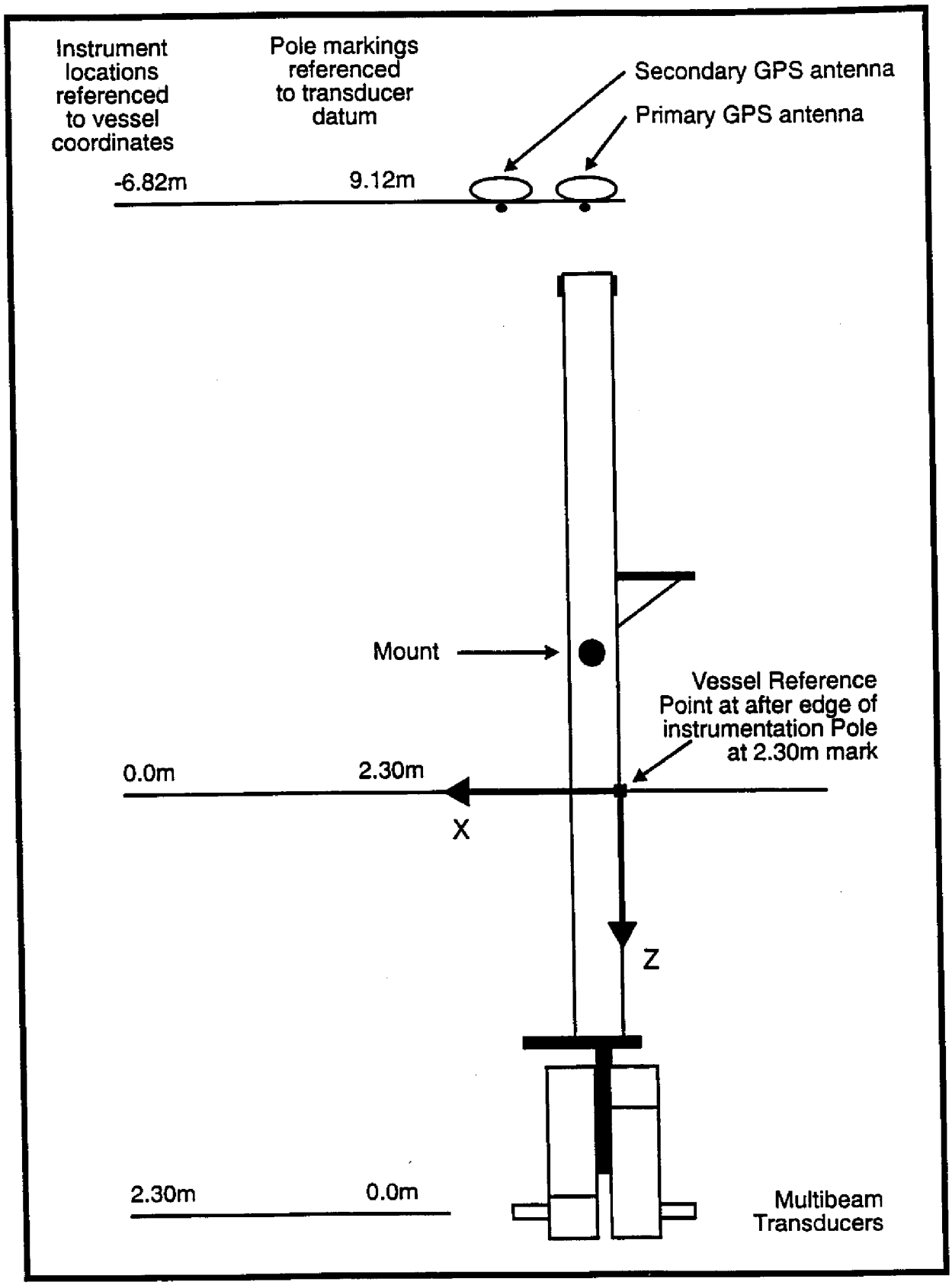


Figure C-2. Configuration of Multibeam Transducer Pole

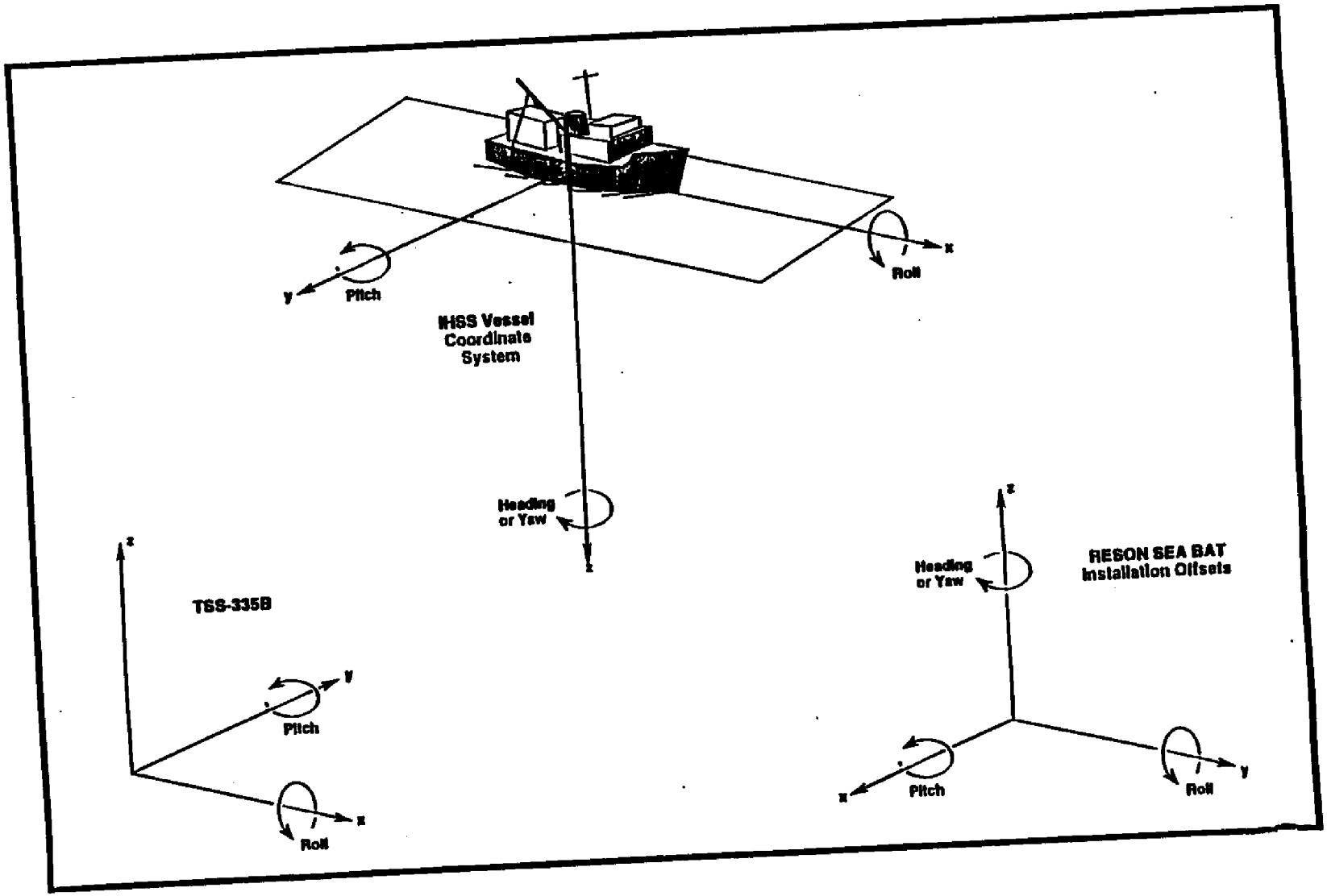


Figure C-3. Relevant IHSS Instrument Coordinate Systems

to the system. The IHSS considers "z" to be positive down, while both the RESON and TSS consider "z" positive up. Both the IHSS and TSS consider "x" positive forward, the RESON considers "x" as positive athwartships to starboard. IHSS considers "y" positive athwartships to starboard, the TSS considers "y" positive athwartships to port and the RESON considers "y" as positive forward.

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

The following SAIC IHSS software modules were used in the Real-Time acquisition of MULTIBEAM data.

Program	Modification Date
ap9	May 20, 1995
auto_archive	May 4, 1995
cbatdtc	May 15, 1995
cbatout	May 15, 1995
chutil	May 9, 1995
datamgr	May 4, 1995
dtc_data_display	May 4, 1995
eoscandtc	Sept. 23, 1995
filemgr	May 4, 1995
irig-b pdd	May 8, 1995
kfstub	May 5, 1995
klein595	May 23, 1995
mbmgr	May 18, 1995
mergeserve	May 27, 1995
messagemgr	May 4, 1995
mk32	Apr 26, 1995
navmgr	May 28, 1995
nms	May 9, 1995
ntimesrv	Apr 06, 1995
kflog	May 30, 1995
helm_display	May 28, 1995
rtkfst	Apr 29, 1995
seabird seasoft (4.210)	Feb. 23, 1995
setclock	Apr 22, 1995
sb_sssv	May 22, 1995
spmgr	May 05, 1995
stateb	May 04, 1995
strip	May 09, 1995
svpmon	May 04, 1995
swathplot	May 04, 1995
sync_os2	Apr 23, 1995
sync_ux	May 04, 1995
syscon	May 04, 1995
Teltx	May 04, 1995
telrx	May 04, 1995
timechk telrx	May 04, 1995
tr4000	May 16, 1995
tr4ref	May 16, 1995
tss335b	May 08, 1995
utilitymgr	May 04, 1995

The following Polaris Imaging and SAIC IHSS software modules were used in real-time acquisition of SIDESCAN Data

Program	Modification Date
eoscan.exe	May 15, 1995
sonar.bin	May 15, 1995
scan.cfg	May 15, 1995
sonar.bin/eoscan.exe	May 17, 1995
eoscan.cfg	May 18,1995
sonar.bin/eoscan.cfg	May 19, 1995
DSP Card (Hardware), eoscan.exe	May 21, 1995
eoscan.exe, eoscan.cfg	June 13 ,1995

The following SAIC software modules were used in the processing of all data.

Program	Modification Date
appcors	May 17, 1995
applydft	July 26, 1995
applysqt	July 26, 1995
chutil	May 05, 1995
corrtarg	Sept. 18, 1995
corrtarg	Oct. 17, 1995
datamgr	May 4, 1995
datasumm	Aug. 15, 1995
examgyro	Jun 22, 1995
exammb	May 19, 1995
gsf2hdcs	May 22, 1995
gsfedit	Sept. 4, 1995
gsfupdat	June 30, 1995
MBHAT>check_cover	Sept. 19, 1995
MBHAT>check_z	Nov. 21, 1995
MBHAT> contact_dxf	Nov. 8, 1995
MBHAT>cover_dxf	Nov. 16, 1995
MBHAT>feature_gsf	Nov. 16, 1995
MBHAT> get_contact	Nov. 8, 1995
MBHAT>init_sheet	July 19, 1995
MBHAT>junction	Oct. 23, 1995
MBHAT>main_x_diff	June 29, 1995
MBHAT>make_contours	Dec 22, 1995
MBHAT>make_final_contours	Nov. 3, 1995
MBHAT>makeacadpcx	July 20, 1995
MBHAT>new_select	Dec. 10, 1995
MBHAT>new_ss_cover	Nov. 28, 1995
MBHAT>noaagsf	Nov. 8, 1995
MBHAT>set_eoflag	Oct. 2, 1995
MBHAT>target_dxf	Oct. 31, 1995
MBHAT>track_dxf	July 20, 1995
MBHAT>update_contact	Nov. 6, 1995
MBHAT>view3d	July 21, 1995
MBHAT>ztogsf	Oct. 5, 1995
navup	Sept. 19, 1995
rangeflt	Sept. 4, 1995
rangeflt	Oct. 5, 1995
refdraft	Sept. 20, 1995
resetflg	Sept. 18, 1995
resonflt	May 05, 1995
setsound	July 25, 1995
swathmap	May 05, 1995
tid2hmps	May 17, 1995

Throughout this descriptive report wherever software is mentioned (in bold print) it is inferred that the most current version of the software available was used.

E. SONAR EQUIPMENT (Side scan sonar operations)

The following side scan sonar equipment was used for the entire Sheet G survey:

- Klein 595 Side Scan Sonar Recorder, Klein Associates, Serial Number 658.
- Klein 595 Dual Frequency Towfish, Klein Associates, Serial Number 700.
- Klein 595 Dual Frequency Towfish, Klein Associates, Serial Number 894.
- Eoscan Digital Side Scan Recording and Target Analysis, Polaris Imaging, Serial Number 10270A.

The vertical beam width of the Klein 595 side scan was: 40 degrees at 3dB. A depression angle of 20 degrees was used on the tow fish. The dual frequency fish had the 500 kHz frequency disabled, and the 100 kHz frequency was used at all times.

Side scan operations were conducted in water depths ranging from 9-33 meters. The side scan range was maintained at 100 meters for Sheet G and the side scan altitude off the bottom was maintained between 8 and 20 meters, except as noted in restricted range time periods indicated in the Sheet G Processing Report and the *gssl.p00* file. The amount of cable deployed was determined by using the 1-meter markings on the cable. As the cable length was adjusted to maintain the proper fish altitude, the operator would note the markings on the cable and enter the amount of cable deployed into the IHSS, which calculated layback and fish height, as described in the Phase IIB Summary Report.

To verify that the side scan signal reached the full extent of the slant range setting, records were checked for location of known objects at the far edge of the slant range. Sheet G analog records were of high quality and were rigorously analyzed by at least 2 operators/processors to reject suspect data.

Side-Scan Target and Feature Processing

For a full discussion of side scan processing, refer to the Phase IIB Summary Report, for complete side scan processing file listings, refer to Sheet G Processing Summary Report.

Sheet G side scan targets were collected with the **Eoscan_DTC**, September 23, 1995 version, which includes layback in the record output. All targets were read into an Excel spreadsheet, which calculated slant range. Using the output listing from the spreadsheet, two side-scan processors reviewed each graphic record and the associated target file. Additions, corrections and deletions of target ranges, shadows, and times were agreed upon and entered into the spreadsheet. The **corr_targ** program was then run to update target positions, ranges, and heights for all targets.

Targets were correlated with multibeam features using the **get_contact** program, which produces the *gfeature* file and modifies the *gtargets.ctv* file. There were 25 targets which were resolved into five features for Sheet G. Each feature was reevaluated with reference to its position and relation to soundings on the smoothsheet. *gfeature* and *gtargets.ctv* files were combined into the *gupdate.out* file using **update_contact** to provide a correlated features-to-targets listing. The *gfeatgsf.out* file was created using the **feature_gsf** program, which traces each feature to a multibeam file, ping and beam number. All 5 features in Sheet G were correlated to 1 x IHO multibeam depths.

Side Scan Coverage Analysis

The side scan lines in Sheet G were, in general, run with a line spacing of 90 meters and a side scan range setting of 100 m, providing the required 200 percent side scan coverage with a 10% overlap of lines, as shown on the side scan coverage plot. This coverage was calculated using the **new_ss_cover** program (see Phase IIB Summary Report for discussion of parameter settings) with settings of a=20, r=30, p=30, and b=10, with the *gss.p00* and *geos.lst* files as input.

F. SOUNDING EQUIPMENT

The following components were used for acquisition of multibeam bathymetric data:

- RESON SeaBat 9002 multibeam system consisting of:
  - Two SeaBat Transducers, Serial Numbers port 332217, starboard 214010.
  - Two SeaBat 9001 Processors, Serial Numbers 6597 and 5230
  - SeaBat 6042 Controller and Processing Unit, Serial Number 590 P0 794-387

A lead line made of Kevlar line with a 35-pound steel plate as a weight was used for checking the center beams of the multibeam echo sounder. The line was marked in feet and was calibrated against a steel tape.

G. CORRECTIONS TO SOUNDINGS

Speed of sound

The following systems were used to determine sound velocity profiles for corrections to multibeam sonar soundings.

- Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 1801, Calibration Date 08 March 1995, (CTW in file names).
- Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 565, Calibration Date 11 April 1995, (CTG in file names).

Speed of sound profiles were computed from casts taken with Sea-Bird Electronics, Inc. model 19 CTD's. The primary unit was SBE19 #1801. Daily confidence checks were obtained from simultaneous casts with the primary CTD and with SBE19 #565. All profiles were computed using **SBE Term19**. Computed profiles were copied to the **IHSS** for comparison on the screen. A selected profile was applied to the system, recorded, and sent to the RESON 6042 where a refraction lookup table was computed for application of depth, angle and range correctors to the multibeam sounding data. If sounding depths exceeded the cast depth, the 6042 used the bottom of the table to extend correctors below the table. Reference page 18 regarding depth and position error analysis.

Positions and dates of all casts are shown in Table G-1. Confidence check profiles from simultaneous casts were compared using the multibeam display program and were, in general, identical. If not satisfactory, at least one more profile was done.

Table G-1. CTD Files and Locations

CTD File Name	Confidence Check	Apply to Reson	Cast Depth (m)	Latitude	Longitude	
ctw27601.cnv		X	32	41 23.6	70 52.9	Plots outside survey limits
ctw27702.cnv		X	33	41 26.6	70 46.5	
ctw27703.cnv	X	X	32	41 24.0	70 52.4	
ctg27704.cnv	X		32	41 24.0	70 52.4	
ctw27801.cnv		X	33	41 26.6	70 46.5	
ctw27802.cnv	X		33	41 26.6	70 46.5	
ctg27803.cnv	X	X	33	41 26.6	70 46.5	
ctd29101.cnv		X	32	41 26.7	70 46.4	
ctw29102.cnv	X		33	41 22.8	70 50.3	Plots outside survey limits
ctg29103.cnv	X	X	33	41 22.8	70 50.3	
ctw29201.cnv		X	32	41 26.6	70 46.6	
ctw29202.cnv	X		33	41 23.6	70 52.8	Plots outside survey limits
ctg29203.cnv	X	X	33	41 23.6	70 52.8	
ctw29301.cnv		X	30	41 22.8	70 50.4	
ctw29501.cnv		X	28	41 30.0	70 39.1	
ctw29601.cnv		X	31	41 26.7	70 46.1	
ctw29801.cnv	X	X	30	41 23.9	70 52.9	
ctg29802.cnv	X		30	41 23.9	70 52.9	

Corrections determined from vertical casts

Leadline comparisons to multibeam center beam soundings were made weekly to verify the transducer draft and echo sounder instrument correctors. For each comparison, a CTD cast was taken and the sound velocity profile loaded into the **IHSS** and the RESON 6042. Ten leadline readings were recorded along with the UTC time of observation while the **IHSS** recorded the multibeam readings. **Exammb** was used to find the port and starboard center beam readings for the time of each leadline reading.

The results of these readings were entered into a spreadsheet along with the draft reading from the transducer pole and any squat corrector which may have been entered in the **IHSS**. The spreadsheet applied a calibration corrector to the leadline readings and converted the readings from feet to meters. It also applied correctors for the difference between the draft and 2.30 meter reference point and for any settlement and squat inadvertently left in the **IHSS** to the port and starboard multibeam readings.

Each corrected cast depth was compared to the simultaneous multibeam readings and correctors were calculated using a spreadsheet. The ten comparisons were averaged for each transducer and the standard deviations were computed. The mean of the results for six sets of comparisons resulted in a corrector of 0.006 meter for each transducer. Therefore, no instrument or draft corrector was applied to sounding for this survey. The leadline comparisons are included in the Phase IIB Summary Report.

Static draft

At a minimum, the static draft was observed on a daily basis by reading the markings on the transducer pole while the vessel was stationary. If the static draft value changed from the previously noted value, the new value was entered into the RESON system. The static draft value was recorded at the beginning of a GSF file or whenever values in the header were changed. All results are reported in the Processing and Multibeam Data Summary.

Settlement and squat

Measurements of settlement and squat were conducted at the breakwater north of Coddington Cove, Narragansett Bay, Rhode Island on May 5, 1995, in 14 meters of water.

The results were compiled into a lookup table of vessel's engine rpm vs settlement and squat. Rpm settings were entered into the Multibeam parameters by the real-time system operator, the computer applied settlement and squat correctors interpolated from the lookup table, and recorded it in the "Depth Corrector" field of the GSF data file for each ping.

All results are reported in the Phase IIB Summary Report - Settlement and Squat Test.

Roll, Pitch and Heading

The following sensors were used for acquisition of Heave, Roll, Pitch and Heading data:

- TSS 335B Vertical Reference Units, Serial Numbers 001615 and 593
- Sperry MK32 Gyrocompass, Serial Number 208

The TSS 335B Vertical Reference Units and their corresponding junction boxes, were used for heave, roll, and pitch. The accuracy of the sensor is 5 percent of 1 m or 5 cm for heave; ± 0.10° dynamic accuracy for roll and pitch, and ± 0.05° static accuracy for roll and pitch. The Sperry MK32 was used for heading. The dynamic heading accuracy of the unit at 3 sigma was 0.6° times the secant of latitude.

On Julian Day 297 (Oct. 24) TSS335B (001615) was replaced with TSS 335B (593). Alignment tests were run on this day and the new vertical reference was used for survey beginning on 298.

Occasional power fluctuations affected the Sperry Mk 32 gyrocompass for periods of approximately .01 seconds. These fluctuations were identified and corrected in processing using the program **examgyro**.

Heading, roll, and pitch biases were determined in a series of tests performed in Narragansett Bay prior to the start of the survey. These tests were repeated each time a transducer or Vertical Reference Unit was changed. Prior to conducting any of the tests, a CTD cast was taken to determine the sound velocity profile and entered into the RESON system. In the RESON the port and starboard roll biases were initially set to +30° and -30° respectively, heading biases were initially set to 0° and 180°, and pitch biases were set to 0. The roll bias test was run first in an area with relatively flat bottom. The range scale was set to 100 meters.

Three lines were run spaced 40 meters apart and each line run in both directions. The data from parallel lines in the same direction were used for roll bias calculations for each head separately; the ideal data set was positioned so that the depths from the center beams from a transducer were compared against the depths of the mid-swath beams. Tidal corrections were applied to all data before roll corrections were calculated using routines in the **MBHAT** software. All results are reported in the Phase IIB Summary Report.

After the roll biases were calculated and entered into the RESON system, the pitch bias test was conducted. The pitch test was conducted on multiple reciprocal runs of a single line perpendicular to a slope of approximately five degrees. The range scale of the RESON was set to 50 meters and ships speed was maintained approximately constant. Pitch biases were computed by comparing runs in opposite directions. Tidal corrections were applied to all data before pitch corrections were calculated using routines in the **MBHAT** software. All results are reported in the Phase IIB Summary Report.

After measurement, calculation, and entry of the pitch bias correctors, heading bias tests were conducted. For the heading bias test 5 parallel lines were run in opposing directions so that the inner beams from a transducer head overlay the intermediate or outer beams of the same head. The heading bias was then determined by measuring the distance between equal depths and calculating the angle subtended by that distance. Tidal corrections were applied to all data before heading corrections were calculated using routines in the **MBHAT** software. All results are reported in the Phase IIB Summary Report.

Roll, pitch, and heading biases applied in H-10654 are shown in Table G-2.

Table G-2. Roll, Pitch, and Heading Bias

	Days 276-297		Days 298-299	
	Port	Starboard	Port	Starboard
Roll	+30.146	-29.105	+29.668	-29.289
Pitch	-1.02	-1.02	-0.963	-0.363
Heading	+1.25	+1.25	+1.25	+1.25

Tide and water level correctors ✓ See eval. rpt., sect. G.

Tide data were acquired using the following gauges:

- Sea Data, Model TDR-3A, Serial Numbers 018, 221, 224 and 518

incorrect. App. E. lists proper gages.

Smooth sheet soundings were corrected for water level through application of observed data from the Cedar Tree Neck, MA (844-8325), and ~~Nobska Point, MA (844-7955)~~ stations. A staff MLLW datum was computed at each station by simultaneous comparison with Newport, RI (845-2660) and with Woods Hole, MA (844-7930) using the NOAA Form 248 method prescribed by Marmer (Tidal Datum Planes, Spec. Pub. 135, U.S. Dept. of Commerce.) The simultaneous comparison computations are included in the Phase IIB Summary Report - Tides.

The boundaries of tide zones used are listed in the Phase IIB Summary Report - Tides. Gage readings were recorded in relation to staff zero; therefore, the MLLW datum height was

subtracted from gage readings before applying the time and ratio correctors.

Full data for all project water level gages are in the Phase IIB Summary Report - Tides.

H. CONTROL STATIONS See eval. rpt., sect. H.

The horizontal datum used for the survey was the North American Datum (NAD) 1983.

Existing horizontal control stations were used to establish a DGPS reference station at Gay Head Light to provide primary navigation control for hydrographic positioning. Station 31435 (LW5817) was used to verify the DGPS performance of the Gay Head Light station. Horizontal control data are included in the Phase IIB Summary Reports.

I. HYDROGRAPHIC POSITION CONTROL See eval. rpt., sect. I.

The following equipment was used for positioning:

- Trimble 4000 GPS Receiver, Serial Number 3504A09516
- Magnavox MX50R Differential Beacon Receiver, Serial Number 154
- Trimble 4000 GPS Receiver, Serial Number 3430A07030
- Pacific Crest Differential Beacon Receiver various SN's
- DGPS shore station [OSI], Serial Number 3433A07356

The primary hydrographic positioning control equipment was a Trimble 4000 GPS using differential correctors from the contractor established station at Gay Head Light. HDOP, number of satellites, elevation of satellites, and age of correctors were monitored so that the resulting hydrographic positioning control meets the specifications.

Positioning confidence checks were established by recording a separate (reference) Trimble DGPS using correctors from the U.S. Coast Guard station at Montauk, NY. A real time monitor raised an alarm when the two DGPS positions differed by more than 10 meters horizontally. During all times when differential correctors were being received, positioning confidence checks were well within tolerance.

In daily post processing, the reference DGPS positioning was substituted for the primary DGPS positioning during those times when the reference met the specifications, but the primary did not.

J. SHORELINE ✓

Not Applicable

K. CROSSLINES ✓

Crosslines constituted approximately 5 percent of the mainscheme length. Comparisons of all crossing data in the 1xIHO swaths, using **MBHAT** software, show that more than 95 percent of comparisons are within 30 centimeters and 98.8 percent of comparisons are within 50 centimeters. These data include areas of sharp relief as well as relatively flat bottom. Over

relatively flat bottom more than 90 percent of comparisons are within 20 centimeters and more than 99.9 percent of comparisons are within 50 centimeters. In an area of primarily steep sand waves more than 90 percent of comparisons are within 30 centimeters and more than 96 percent of comparisons are within 50 centimeters. In all cases larger differences between main-scheme and crossline soundings correspond to areas of steep slope and rapid slope changes. Comparisons across all days of operation are uniform and do not reveal any problem with water level corrections.

Table K-1. Junction Analysis Mainscheme - Crosslines

Category	Count	Percent	Total Percent
to 10 cm	810502	62.31	62.31
to 20 cm	338851	26.05	88.36
to 30 cm	96813	7.44	95.80
to 40 cm	29398	2.26	98.06
to 50 cm	10781	0.83	98.89
to 60 cm	5226	0.40	99.29
to 70 cm	2984	0.23	99.52
to 80 cm	1984	0.15	99.67
to 90 cm	1349	0.10	99.77
to 100 cm	872	0.07	99.84
> 100 cm	2049	0.16	100.00
Total Counts =	1300809		

L. JUNCTIONS See eval. rpt., sect. L.

The junction between surveys H-10654 (Sheet G) and H-10651 (Sheet H) includes steep as well as relatively flat terrain. In the relatively flat area, more than 91 percent of comparisons were within 30 centimeters, more than 96 percent were within 40 centimeters, and more than 98 percent were within 50 centimeters. In the area of steep terrain, more than 88 percent of comparisons were within 50 centimeters. In all cases, the larger differences between surveys occurred in areas of steep or rapidly changing slope. Table L-1 includes all comparisons between the two surveys. Refer to Section L of Evaluators Report for discussion with junctional survey H-10563.

Table L-1. Junction Analysis Sheet G - Sheet H

Category	Count	Percent	Total Percent
to 10 cm	65247	52.57	52.57
to 20 cm	36085	29.08	81.65
to 30 cm	12834	10.34	91.99
to 40 cm	5214	4.20	96.19
to 50 cm	2466	1.99	98.18
to 60 cm	844	0.68	98.86
to 70 cm	425	0.34	99.20
to 80 cm	279	0.22	99.42
to 90 cm	209	0.17	99.59
to 100 cm	124	0.10	99.69
>100 cm	383	0.31	100.00
Total Counts =	124110		

M. COMPARISON WITH PRIOR SURVEYS see eval. rpt., sect. M.

H-10654 was compared to H-8905 (1966), scale 1:20,000. In general the multibeam soundings and ~~charted~~ Prior Survey depths agree well. In water depths greater than 18 m (60 ft) soundings differed by less than 1 m (3 ft). The greater density of multibeam soundings highlighted bottom features such as the sand waves along the south side of the survey. The 18 m (60 ft) MB curve in this area displays this well and indicates a generally south-west migration of the sand-waves compared to the 1966 survey data. Concur

Another large scale difference between the 1995 multibeam data and the 1966 depths is in the southern portion of the shoal area near the Nashawena Lighted Whistle Buoy. Comparison of the 18 m (60 ft) curve in this area suggested a general southward migration of the shoal area by approximately 100 m. Concur

The 1995 data show two wave-form features extending from the southern tip of the Shoals marked by the Nashawena Lighted Whistle Buoy near 41° 23.85'N, 70° 50.25'W. The southern feature runs in a NW-SE direction (NW = 41° 24.00'N, 70° 50.5W, SE = 41° 23.85'N, 70° 50.3W) with the 1995 18 m (60 ft) curve extending approximately 500m beyond the 1966 18 m (60 ft) curve. Water depths along this feature were as much as 6.5 m shoaler in 1995 (i.e., 1966 = 21.6 m, 1995 = 15.2 m). Concur

The northern feature extends from north to south (north = 41° 24.27'N, 70° 50.23'W, south = 41° 23.90'N, 70° 50.25'W) approximately 200 m south and 100 m east of the 1966 18 m (60 ft) contour. Shoaling along this feature ranges from 1 to 7 m. Concur

Other smaller scale differences associated with the migration of the shoals near the Nashawena Lighted Whistle Buoy include:

- In a 100 m radius circle centered on 41° 24.20'N, 70° 51.0'W, the multibeam selected sounding data are 1-3 m shoaler than the previous survey.

- In a 300 m radius circle centered on 41° 24.45'N, 70° 50.65'W, the multibeam selected sounding data are 1-3 m shoaler than the previous survey.

- In a 300 m radius circle centered on 41° 23.95'N, 70° 50.30'W, the multibeam selected sounding data are 1-3 m shoaler than the previous survey.

- In a swath 100 m wide centered on the line from 41° 25.00'N, 70° 49.70'W to 41 25.16 N, 70 49.85 W, the multibeam selected soundings are 1-3 m shoaler than the previous survey.

- At 41° 25.21'N, 70° 49.57'W, a 20.4 m (67 ft) sounding occurs where the multibeam sounding is 15.2 m (50 ft); approximately a 5 m difference.

- In a 100 m radius circle centered on 41° 25.37'N, 70° 49.39'W, the multibeam selected sounding data are 1-3 m shoaler than the previous survey. Concur

Along these shoals there are several north-south ridges with depths as shoal as 8.8 m (28ft) in the multibeam soundings. These shoals and others were reported in the Danger to Navigation Reports dated October 21, 1995 and December 30, 1995 which are included in Appendix A of this report. Appendix A is empty! NAN Report added to Eval. Report. Only 8 soundings reported to USCG. No items from Dec. report were ~~added~~ forwarded to USCG.
Surveys H-10563, 1994, and FE-411, 1995, were not made available for comparison. Survey H-10563 is a Junctional Survey.
AWOIS # 7883, identified as a wreck, called for a search radius of 700 m centered at 41° 24.20'N, 70° 53.06'W. This position and part of the search area were within this survey. No wreck was found in the 100% multibeam and 200% side scan coverage on this survey. However, a wreck was found on H-10649 and is discussed in that report. Reference Survey H-10649 for discussion of AWOIS 7883 and charting disposition.

N. COMPARISON WITH THE CHART

H-10654 was compared to Chart 13230, 40th ed., April 29, 1995, scale 1:40,000.

In deeper water, this survey and the chart agree quite well. The 18 m (60 ft) depth curve is more complex than charted and in general shows littoral drift to the south west. Comparisons with charted soundings shoaler than 18 m (60 ft) also indicate drift to the south. Agree

The 13.8 m (45 ft) sounding charted at 41° 25.38'N, 070° 48.41'W has moved south about 100 meters. The 18 m (60 ft) curve surrounding this sounding has also shifted southward and almost joins the 18 m (60 ft) curve to the south. Concur

This survey shows the depth curves to have characteristics of a sand and gravel wave structure. The 18 m (60 ft) curve along the south side of the survey shows wave type structure and migration to the southwest. The 18 m (60 ft) curve surrounding Nashawena Lighted Whistle Buoy "NA" also shows wave characteristics and growth southward to 41° 23.8'N, 070° 50.3'W. Buoy "NA" marks the 10.1 m (33 ft) high point of a curving ridge which runs NNW and SE from the buoy. Eastward of the buoy and inside the 18 m (60 ft) curve are several north-south ridges with depths as shoal as 8.8 m (28 ft). These shoals and others were reported in the Danger to Navigation Reports dated October 21, 1995, and December 30, 1995. These reports are included in Appendix A of this report. Concur
See note above.

O. ADEQUACY OF SURVEY

Survey H-10654 is complete and adequate to supersede all prior surveys. Agree.

Data for all tracks shown on the track plot are included in the accepted survey data. The decision was made to retain these data to provide more 1xIHO coverage. In many cases, the extra lines were run to fill in side scan gaps and the multibeam data were recorded simultaneously.

Soundings corresponding to wrecks, rocks, and obstructions are shown in bold print so that they may be easily related to the corresponding text label. The density of soundings on this survey, while necessary to fairly depict the bottom, made it difficult to place text within the sheet. For that reason, text for features (wrecks, rocks, and obstructions), for floating aids to navigation, and for bottom characteristics are shown in reduced height bold characters. This makes them stand out from the soundings and eases their placement. Even so, it was often necessary to deviate from the traditionally preferred placement of text.

No plot on mylar or paper can fully represent the tremendous amount of data which are available in this survey. Manipulation of and viewing of the data with a computer is much more satisfactory for many applications. In particular, the ***mbmz*** layer viewed with the **MBHAT** software gives an excellent picture of the shape and character of the bottom.

The following discussion provides guidance for evaluation of this survey against the specifications.

Multibeam

There are no gaps in multibeam coverage for this survey. Concur

Sound Velocity Corrections

For one period of time during the survey, an incorrect sound velocity profile was applied to the multibeam data and used for depth determination. This occurred due to a design defect in the real-time software that caused it to incorrectly record the name of the current sound velocity profile. At 277 15:04:38, the profile CTW27601.CNV was downloaded instead of CTW27702.CNV. This affects data recorded between 277 15:55:00 and 277 22:25:36. During that time, fourteen lines were run in the western corner of the sheet. The resultant depth and position errors (Table O-1) were estimated by comparing the depths determined by the two Sound Velocity Profiles (SVP) in the SAIC Error Model. The model indicates that 1xIHO data recorded during this time were shoal biased between 0.02 and 0.08 m and have horizontal errors as great as 0.12 m. Since these errors were extremely small, they were not removed from the data.

→ table next pg. says deep biased.
regardless, error is small, within specs.

Table O-1. Depth and Position Errors Due to Incorrect Sound Velocity Profile (Julian Day 277)

Beam Angle, deg.	Depth Error, m	Position Error, crosstrack distance, m
0	0.02 too deep	0.0
45	0.08 too deep	0.12 too close to nadir

In some cases the sound velocity profile applied did not extend to 95% of the maximum depth observed in the data set. In those cases the RESON SeaBat used the bottom of the sound velocity table to extend corrections to the observed depths greater than the cast depth. To check the validity of this vertical extrapolation, the hydrographer made extrapolations to the bottom using the trend of the bottom of the sound velocity profile. The x, y, z coordinates of maximum soundings in the file were computed at nadir and at 45° off nadir. The following list shows the errors resulting from using the RESON extrapolation method compared to the trend extrapolation.

Table O-2. Depth and Position Errors Due to Sounding Depth Exceeding Sound Velocity Profile Depth

Dataset	Cast #	Cast Z	Data Z	Delta Z	Beam Angle	Error in Meters		
						X	Y	Z
mba95276.d01	ctw27601.cnv	31.29	35.80	4.51	0	0.000	0.000	0.000
					45			
mba95276.d02	ctw27601.cnv	31.29	37.13	5.84	0	0.000	0.000	0.000
					45			
mba95278.d01	ctw27703.cnv	29.28	36.80	7.52	0	0.000	0.000	0.000
					45			
mba95278.d02	ctw27703.cnv	29.28	33.10	3.82	0	0.000	0.000	0.000
					45			
mba95296.d04	ctw29601.cnv	31.00	34.39	3.39	0	0.000	0.000	0.000
					45			

The results of these comparisons show that there were no depth and position errors from extending the bottom of the sound velocity table. Concur

Side Scan

At 41° 24.55'N, 70° 51.20'W there is a gap at JD 277-23:33 near the trackline where only 100 percent side scan coverage is shown. In this area, a 45-second period was deleted from side scan coverage due to a speed of 4.6 knots. The rejected side scan record and multibeam data were consulted to determine if there were any significant targets or features in the area. There were none. Thus the side scan coverage is judged to be adequate for that time period. Concur

At 41° 25.35'N, 70° 49.30'W there is a gap at JD 278-01:32:45 near the trackline where only 100 percent side scan coverage is shown. This gap exists because digital side scan data were not available; however, the analog side scan record does exist. This record was examined and the analog record is excellent. No targets are present in this record and full 1xIHO multibeam coverage is available. Thus the side can coverage is judged to be adequate for the time period. Concur

At 41° 23.95'N, 70° 52.82'W near the trackline at JD 277 17:21:30, there is a gap with only 100 percent side scan coverage due to course deviations in the flanking tracklines at JD 277 - 17:11:40 and JD 277-18:08:00. In this area complete 1xIHO multibeam coverage is available. No features exist in this area. Thus the side scan coverage is judged to be adequate for the time period. Concur

At the southwestern survey boundary, all 100 percent coverage areas shown in the side scan coverage plot are completely overlapping with the Sheet F survey data. Thus at least 200 percent coverage is available. Concur

The designation of wreck, rock, or obstruction was assigned to features based on examination of the side scan images and the multibeam data. If a feature could not be clearly judged a wreck or a rock it was designated an obstruction. Two or more side scan processors agreed upon the designation. The hydrographer and the Government Contracting Officer's Technical Representative reviewed and approved the designations.

Contours ✓

One meter contours were generated from 1 x IHO data gridded to select the shoalest sounding in a 15 meter true cell size. This method has the potential for a small horizontal offset of contours if the shoal sounding occurs in the corner of the cell. However, it does generate contours corresponding to least depths for the survey. Smooth sheet contours were compared to the selected soundings plotted on the smooth sheet, and were modified as necessary for a clear and safe hydrographic presentation. Shoal curves were enlarged when necessary to make them visible around the shoal sounding. Curves were also modified toward deeper water to ensure inclusion of soundings equal to the curve depth. Small deep curves were removed for clarity, but deep curves were sometimes retained on the smooth sheet even though the density of soundings precluded placing a deep sounding within them. The hydrographer felt that the shape of the bottom was more adequately defined by making use of these contours derived from the data too dense for depiction on the smooth sheet in numeric form. Agree!

∴ small deviations in contours may not be supported by a selected sounding. A Correction overlay has been generated to revise contours based only on plotted data. See Final Rpt. Section B.

P. AIDS TO NAVIGATION ✓

Nashawena Lighted Whistle Buoy "NA" was on station at 41° 24.296'N, 070° 51.163'W with characteristics Mo(A) W and a red and white striped structure. This is in agreement with Charts 13230 and 13233 and with Light List, volume 1, Atlantic Coast, 1994. Buoy "NA" adequately serves its purpose. Agree.

Nashon Lighted Bell Buoy "28" was on station at 41° 26.5'N, 070° 46.9'W with characteristics F1 R 4s and a red structure. This is in agreement with Charts 13230 and 13233 and with Light List, volume 1, Atlantic Coast, 1994. Buoy 28 adequately serves its purpose. Agree.

Q. STATISTICS ✓

Survey statistics are as follows:

804 km	Lineal kilometers of sounding lines
25.77 km^2	Square kilometers of hydrography

9	Days of production
2	Days of weather downtime
1	Days of mechanical, electronic or operational downtime
2	Number of tide stations
18	Number of velocity casts
0	Number of XBT drops

R. MISCELLANEOUS

The area covered by H-10654 is a glacial area characterized by sand and gravel waves which tend to migrate under the influence of strong currents and storms. Concur

S. RECOMMENDATIONS

Recommend the entire common area of charts 13218. 13230 and 13233 be reconstructed with data from this survey. Concur.

T. REFERRAL TO REPORTS *

- Phase I - NOAA Acquisition of Sounding Data in Western Long Island Sound, Phase I Test Results, December 3, 1994. Submitted to NOAA COTR aboard M/V Beavertail.
- Phase IIA - Phase IIA Accuracy and Alignment Tests - submitted to NOAA COTR aboard M/V Atlantic Surveyor, May 14, 1995.
- Phase IIB - Survey Report - Calibration, Horizontal Control, Real-Time and Processing Procedures, submitted January 5, 1996 to Chief, Pacific, Hydrographic Section; National Ocean Service, NOAA.
- Phase IIB - Summary Report - Tides (Tide Zoning and Tide Station Reports), submitted January 5, 1996.
- Processing and Multibeam Data Summary
- Sheet G Real Time Log Notebook
- Sheet G Sound Velocity Notebook
- Sheet G Processing Notebook
- Sheet G Digital Data Listing Notebook
- Sheet G Digital Data
- Sheet G Side Scan Sonar Analog Records
- Sheet G Plots

* PROJECT SPECIFIC REPORTS ARCHIVED WITH SURVEY H-10649.
SURVEY SPECIFIC REPORTS ARCHIVED WITH SURVEY DATA.

APPENDIX A:

DANGER TO NAVIGATION REPORTS

ADDED DURING EVALUATION
Reference letter dated 12/30/95 for final corrected depths.

Science Applications International Corporation
An Employee-Owned Company

October 21, 1995

Rec'd 10/21/95
Hydrographic Surveys Br.
Nautical Charting Div.

Lieutenant Commander David A. Cole, NOAA
Field Manager, Contract Hydrographic Surveys
Office of Coast Survey, N/CG24x3
National Ocean Service
1315 East West Highway, SSMC3, Station 6856
Silver Spring, MD 20910

Subject: NOAA Contract 50-DGNC-4-00035: Danger to Navigation Report

Dear Lieutenant Commander Cole:

Science Applications International Corporation (SAIC) has discovered dangers to navigation on Charts 13218, 13230, and 13233 during surveys in Vineyard Sound, MA, under the subject contract.

Many features appear to have migrated to the south and west. Much of the area consists of large sand waves which are subject to change from the action of high curents and storms.. Shoal soundings were found while surveying H-10649 and H-10654 as follows:

Feet	Latitude	Longitude
42	41 28.50 N	070 40.83 W
49	41 24.70 N	070 51.24 W
42	41 24.54 N	070 50.68 W
48	41 24.48 N	070 50.66 W
49	41 24.48 N	070 50.48 W
43	41 24.16 N	070 50.28 W
50	41 24.63 N	070 49.65 W
35	41 24.70 N	070 50.34 W
29	41 24.79 N	070 50.36 W
30	41 24.84 N	070 50.37 W
36	41 24.93 N	070 50.39 W
37	41 24.89 N	070 50.18 W
47	41 25.32 N	070 49.38 W
43	41 25.36 N	070 49.36 W
32	41 25.46 N	070 49.32 W
45	41 25.30 N	070 48.40 W
31	41 25.15 N	070 47.28 W

Plots on H-10651

Admiral's Gate, 221 Third Street, Newport, Rhode Island 02840 Office: (401) 847-4210 FAX: (401) 849-1585

Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson

Feet	Latitude	Longitude
43	41 25.35 N	070 48.12 W
44	41 25.31 N	070 48.07 W
48	41 25.25 N	070 48.05 W
37	41 25.08 N	070 48.04 W
33	41 25.01 N	070 48.03 W
35	41 25.09 N	070 47.61 W
34	41 25.14 N	070 47.52 W
37	41 25.23 N	070 47.42 W

The listed positions are NAD 1983 and the depths are MLLW corrected using Newport, RI, observed water levels with zoning as stated in the subject contract. Depths are subject to change after post processing with local observed water levels.

In view of the above dangers, SAIC recommends removal of the following soundings charted in Chart 13230:

Feet	Latitude	Longitude
47	41 24.95 N	070 50.08 W
54	41 25.38 N	070 49.34 W
45	41 25.37 N	070 48.40 W

Copies of sections of chart 13230 are enclosed.

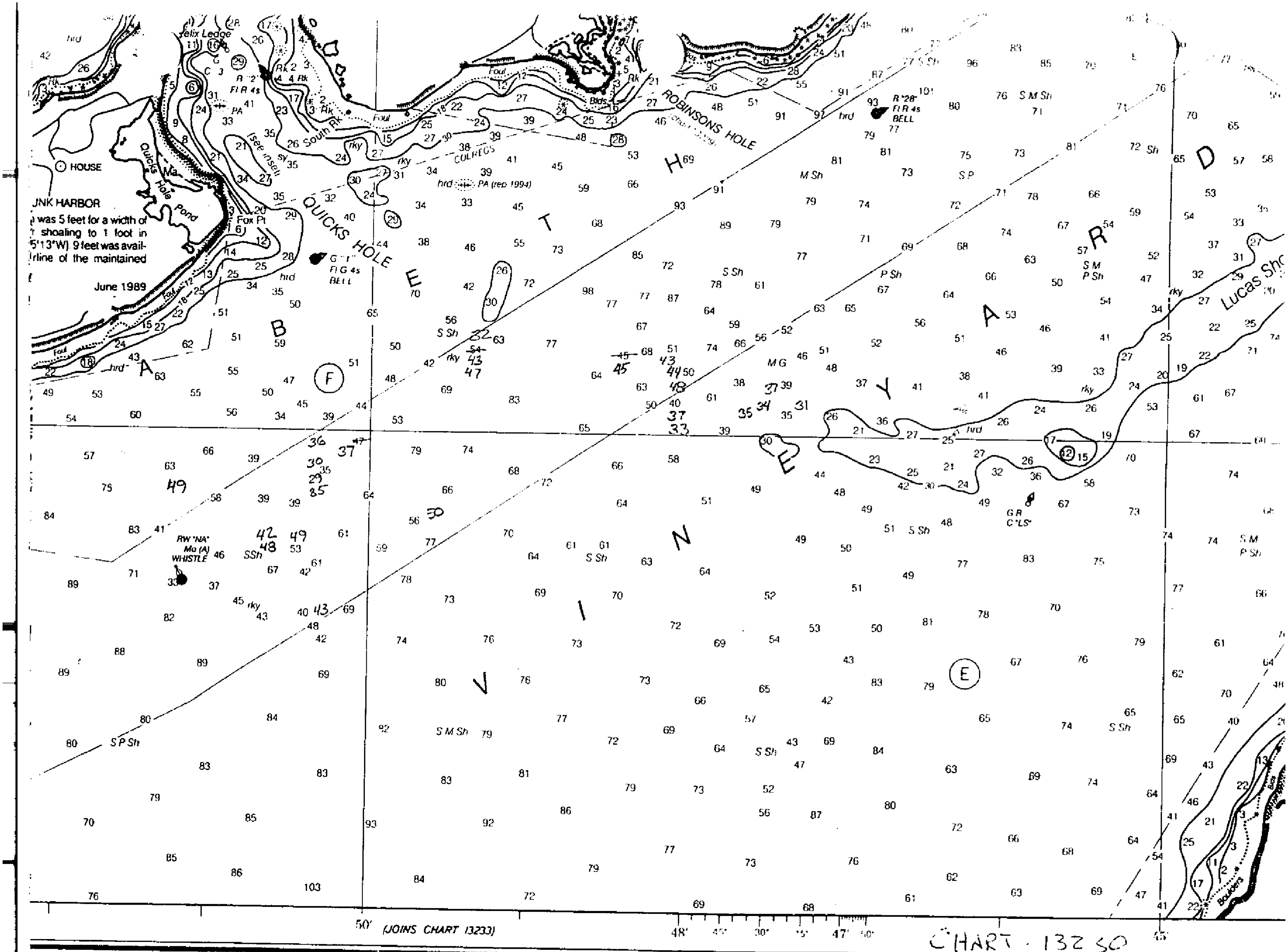
Sincerely,
Science Applications International Corporation

Walter S. Simmons
Program Manager

Enclosures

Admiral's Gate, 221 Third Street, Newport, Rhode Island 02840 Office: (401) 847-4210 FAX: (401) 849-1585

Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson


VINEYARD SOUND
QUICKS HOLE
ROBINSONS HOLE
Lucas Shoal
Quicks Hole Pond
Felix Ledge
HOUSE
South Rk
Fox Pt
JNK HARBOR
was 5 feet for a width of
shoaling to 1 foot in
5'13"W). 9 feet was avail-
rline of the maintained
June 1989
R "28" Fl R 4s BELL
G "1" Fl G 4s BELL
RW "NA" Mo (A) WHISTLE
R "2" Fl R 4s
PA (rep 1994)
COLREGS
(JOINS CHART 13233)
CHART · 13230

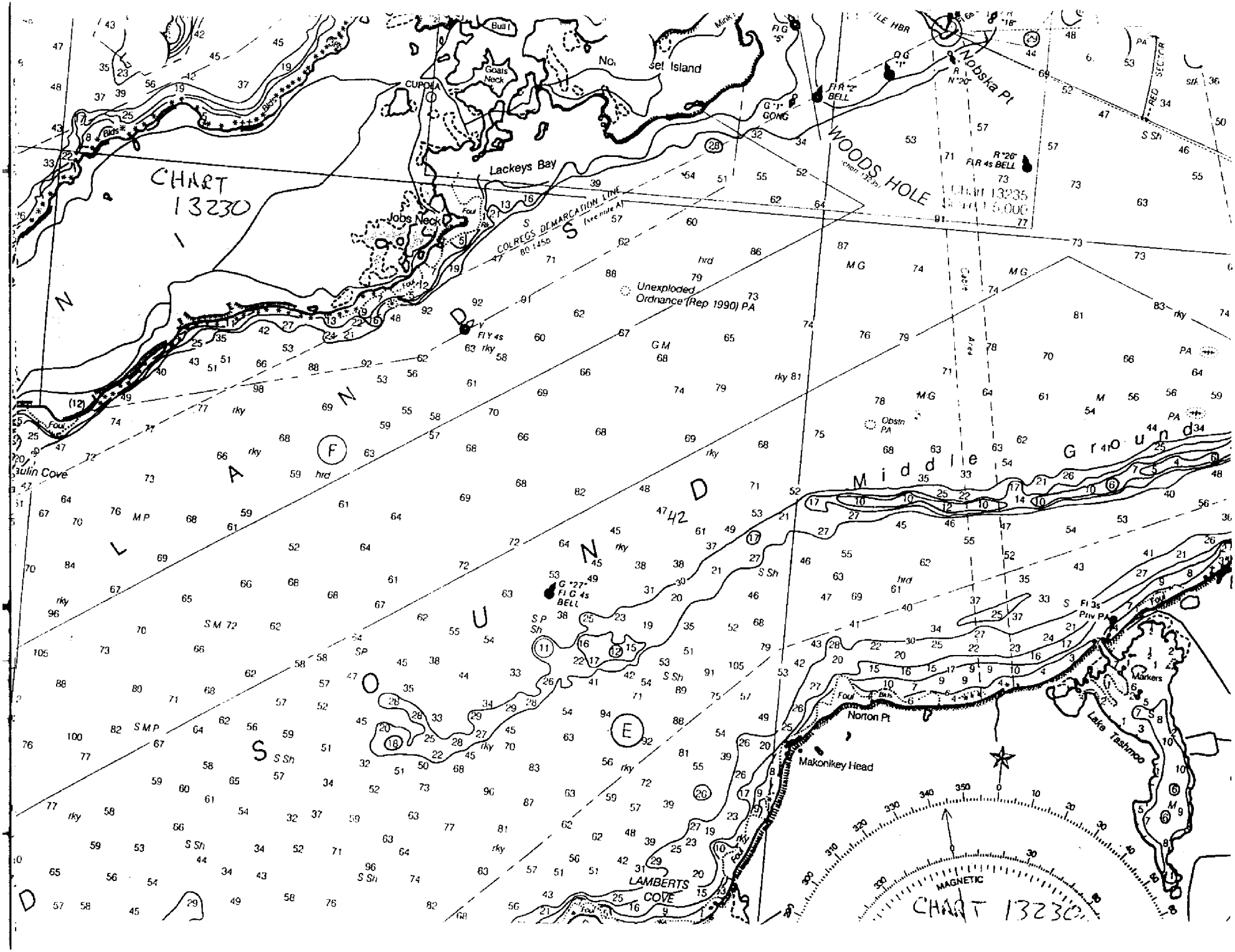


CHART 13230
Bull I
Goats Neck
CUPOLA
Lackeys Bay
Jobs Neck
COLREGS DEMARCATION LINE
Unexploded Ordnance (Rep 1990) PA
Nobska Pt
WOODS HOLE
Chart 13235
Obstn PA
Middle Ground
Norton Pt
Makonikey Head
LAMBERTS COVE
Lake Tashmoo
Markers
MAGNETIC
CHART 13230

ADDED DURING EVALUATION

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Coast Survey
Silver Spring, Maryland 20910-3282

Reference letter dated 12/30/95 for Final corrected depths.

NOV 16, 1995

Commander (OAN)
First Coast Guard District
408 Atlantic Avenue
Boston, Massachusetts 02110-3350

Dear Sir:

While conducting hydrographic survey operations in Vineyard Sound, Masschusetts, our contractor discovered several areas of shoaling. Attached are Danger to Navigation Reports indicating the positions of these dangers.

Differential GPS, side scan sonar, and multibeam sonar were used to determine the positions and depths. These data are preliminary and subject to office review.

Sincerely,

Jack L. Wallace ACTG for AAA
Andrew A. Armstrong, III
Captain, NOAA
Chief, Hydrographic Surveys Division

Enclosures

cc: OA312 - G. Smith
N/CS26 - D. Romesberg
N/CS3X3 - D. Cole
N/CS34 - K. Timmons
DMAHTC

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H-10654

State: Massachusetts

General Locality: Vineyard Sound

Sublocality: Lucas Shoal to Nashawena Island

Project Number: OPR-B389-CN

The following items were found during hydrographic survey operations:

Object Discovered: Shoaling

Depths in feet corrected to Mean Lower Low Water using observed tide correctors.

Affected nautical charts:

Chart Number	Edition		Reported Depth	Charted Horiz. Datum	Geographic Position	
	No	Date			Latitude	Longitude
13230	40	04/29/95	47 ft	NAD 83	41°25'19"N	070°49'23"W
13233	14	11/28/92	32 ft		41°25'28"N	070°49'19"W
13229	25	03/27/93	34 ft		41°25'14"N	070°47'25"W
13218	32	06/26/93	49 ft		41°24'42"N	070°51'14"W
			29 ft		41°24'47"N	070°50'22"W
			43 ft		41°25'21"N	070°48'07"W
			33 ft		41°25'01"N	070°48'02"W
			50 ft		41°24'38"N	070°49'39"W

ADDED DURING EVALUATION

Science Applications International Corporation
An Employee-Owned Company

December 30, 1995

Lieutenant Commander David A. Cole, NOAA
Field Manager, Contract Hydrographic Surveys
Office of Coast Survey, N/CG24x3
National Ocean Service
1315 East West Highway, SSMC3, Station 6856
Silver Spring, MD 20910

Subject: NOAA Contract 50-DGNC-4-00035: Danger to Navigation Report
Reference: 1) Danger to Navigation Report dated October 21, 1995
2) Danger to Navigation Report dated December 15, 1995

Dear Lieutenant Commander Cole:

Science Applications International Corporation (SAIC) reported dangers to navigation on Charts 13218, 13230, and 13233 discovered during conduct of surveys in Vineyard Sound, MA, via Reference 1), and Reference 2).

Having post processed the survey data using local observed water levels, SAIC is pleased to present an update to Reference 1), and requests NOAA destroy Reference 2).

Many features appear to have migrated to the south and west. Much of the area consists of large sand waves which are subject to change from the action of high currents and storms. Shoal soundings were found while surveying H-10651 and H-10654 as follows:

Post Processing Depth and Position			Reference 1) Reported Depth and Position			
Feet	Latitude	Longitude	Feet	Latitude	Longitude	
42	41 28.50 N	070 40.83 W	42	41 28.50 N	070 40.83 W	Plots on H-10651
48	41 24.69 N	070 51.24 W	49	41 24.70 N	070 51.24 W	
39	41 24.78 N	070 50.68 W				
38	41 24.68 N	070 50.65 W				
41	41 24.54 N	070 50.68 W	42	41 24.54 N	070 50.68 W	
49	41 24.48 N	070 50.66 W	48	41 24.48 N	070 50.66 W	
44	41 24.37 N	070 50.45 W				
43	41 24.30 N	070 50.36 W				
42	41 24.07 N	070 50.25 W				
44	41 24.00 N	070 50.27 W				
49	41 24.48 N	070 50.48 W	49	41 24.48 N	070 50.48 W	

Admiral's Gate, 221 Third Street, Newport, Rhode Island 02840 Office: (401) 847-4210 FAX: (401) 849-1585
Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson

Post Processing Depth and Position

Feet	Latitude	Longitude
49	41 24.64 N	070 49.65 W
34	41 24.70 N	070 50.34 W
32	41 24.89 N	070 50.38 W
28	41 24.77 N	070 50.35 W
29	41 24.83 N	070 50.37 W
35	41 24.93 N	070 50.39 W
36	41 24.90 N	070 50.18 W
48	41 25.32 N	070 49.38 W
43	41 25.36 N	070 49.36 W
33	41 25.44 N	070 49.33 W
45	41 25.31 N	070 48.41 W
30	41 25.15 N	070 47.28 W
43	41 25.35 N	070 48.12 W
44	41 25.31 N	070 48.08 W
47	41 25.26 N	070 48.05 W
36	41 25.08 N	070 48.04 W
32	41 25.01 N	070 48.03 W
35	41 25.09 N	070 47.61 W
34	41 25.14 N	070 47.52 W
37	41 25.23 N	070 47.42 W
28	41 25.00 N	070 47.57 W

Reference 1) Reported Depth and Position

Feet	Latitude	Longitude
50	41 24.63 N	070 49.65 W
35	41 24.70 N	070 50.34 W
29	41 24.79 N	070 50.36 W
30	41 24.84 N	070 50.37 W
36	41 24.93 N	070 50.39 W
37	41 24.89 N	070 50.18 W
47	41 25.32 N	070 49.38 W
43	41 25.36 N	070 49.36 W
32	41 25.46 N	070 49.32 W
45	41 25.30 N	070 48.40 W
31	41 25.15 N	070 47.28 W
43	41 25.35 N	070 48.12 W
44	41 25.31 N	070 48.07 W
48	41 25.25 N	070 48.05 W
37	41 25.08 N	070 48.04 W
33	41 25.01 N	070 48.03 W
35	41 25.09 N	070 47.61 W
34	41 25.14 N	070 47.52 W
37	41 25.23 N	070 47.42 W

The listed positions are NAD 1983 and the depths are MLLW corrected using Nobska Point, MA, Cedar Tree Point, MA, and Cuttyhunk, MA, observed water levels with MLLW datum and zoning as determined by SAIC.

Sincerely,
Science Applications International Corporation

Walter S. Simmons

Walter S. Simmons
Program Manager

Admiral's Gate, 221 Third Street, Newport, Rhode Island 02840 Office: (401) 847-4210 FAX: (401) 849-1585

Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson

APPENDIX B:

LANDMARKS AND NON-FLOATING AIDS TO NAVIGATION LISTS

NOT APPLICABLE

APPENDIX C:

LIST OF HORIZONTAL CONTROL STATIONS

NAME	LATITUDE	LONGITUDE	ANTENNA ELEVATION	SOURCE	DATES & TIMES (UTC) OCCUPIED
Gay Head Light (OSI offset)	41° 20 54.38790'N	070° 50 05.92574'W	52.0m	051 Survey	06 September 1995, 2232 UTC 07 September 1995, 2239 UTC
31435 (LW5817)	41° 30 55.09542'N	070° 39 20.17711'W	9.6m	Published	17 September 1995, 1358 UTC 17 September 1995, 1415 UTC
B8/9 S 819 (LW0048)	41° 20 50.27680'N	070° 50 13.19474'W	45.0m	Published	15 September 1995, 2225 UTC 15 September 1995, 2245 UTC

APPENDIX D:

LIST OF GEOGRAPHIC NAMES

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

H-10654

Name on Survey	A ON CHART NO.	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	
Vineyard Sound	13233									1
Lucas Shoal	13233									2
										3
										4
										5
										6
										7
										8
										9
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										11
										12
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										14
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										18
										19
										20
										21
										22
										23
										24
										25

NAMES HAVE NOT BEEN SUBMITTED TO, OR APPROVED BY CHIEF GEOGRAPHER.

APPENDIX E:

TIDE NOTES

ADDED TO DR BY EVALUATER.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Ocean and Earth Sciences
Rockville, Maryland 20852

September 17,1996

MEMORANDUM FOR: LTCDR David A. Cole
Hydrographic Surveys Division

FROM: Stephen K. Gill
Chief, Tidal Analysis Branch

Michael C. O'Hargan
Chief, Sea and Estuarine Section

SUBJECT: Final Evaluation of Contract Deliverables, Project OPR-B389-

The Ocean and Lake Levels Division (OLLD), as requested, has reviewed information received from; the contractor in teleconference between the contractor, yourself, and Michael O'Hargan and Stephen Gill on July 24, 1996; and, the subsequent written submission from the contractor regarding project-wide compliance issues to you dated August 16, 1996.

The additional information received during the teleconference and the written submission completes the requests for detailed information from OLLD. Major errors noted have been corrected, and missing information has been provided. OLLD now has an acceptable understanding of the contractor's procedures related to the water level field collection, data reduction, data processing, and tidal datum determination.

Based on the review of the recent information in the context of the previous evaluation of the contractor's work on tides, OLLD has estimated a worst-case uncertainty in the tide-reducers applied to the soundings for the contract of 1.0 ft. This estimate includes datum recovery of MLLW datum on the bench marks (a bias error), and uncertainties in the raw tide gauge measurements, the staff-to-gauge settings applied to the data, and the tidal zoning correctors. It is our understanding that this maximum estimated error is within the 1.6 foot (0.50 meter) specified in the contract.

OLLD will provide details of the evaluation in a subsequent in-house program evaluation document. OLLD has determined, based on the evaluation, that the tide data collected for this survey are "single purpose data" for use as tide reducer only. Accepted tidal datums, bench mark elevations, and published bench mark sheets will not be updated or produced as result of the contractor data. This limitation does not affect acceptance of the contract deliverables.

cc:

Richard Barazotto
Philip Morris
Jim Hubbard
Mike Gibson

SHEET G ✓
TIDE NOTES

SITE	LOCATION	PERIOD
Cedar Tree Neck, MA	41° 26.1'N	16 September 1995
8448325	70° 41.8'W	31 October 1995
Cuttyhunk, MA	41° 25.3'N	15 September 1995
8448392	70° 55.3'W	01 November 1995

Cedar Tree Neck, MA
Two Sea Data TDR-3A, tide gages (S/N 018 and 221) were installed on 16 September 1995. The staff was installed and leveled on 16 September 1995. Pipes and gages were removed on 31 October 1995.

Cuttyhunk, MA
Two Sea Data TDR-3A, tide gages (S/N 224 and 518) were installed on 15 September 1995. The staff was installed and leveled on 15 September 1995. Pipes and gages were removed on 01 November 1995.

The reference stations for H-10654 were Newport, RI (845-2660) and Woods Hole, MA (844-7930).

Soundings for field sheets were corrected daily in post processing using observed water level data from NOAA station Newport, RI (845-2660). Data were acquired by cellular phone modem using the NOAA REALDATA software. Zoning correctors applied to Newport data were:

+ 24 minute time correction and a x.82 range ratio east of 71° 00.0' W and west of 70° 50.0' W
+ 42 minute time correction and a x.74 range ratio east of 70° 50.0' W and west of 70° 46.0' W
+ 54 minute time correction and a x.65 range ratio east of 70° 46.0' W and west of 70° 42.0' W

Smooth sheet soundings were corrected for water level through application of observed data from the Cedar Tree Neck, MA (844-8325), and Cuttyhunk, MA (844-8392) stations. A staff MLLW datum was computed at each station by simultaneous comparison with Newport, RI (845-2660) and with Woods Hole, MA (844-7930) using the NOAA Form 248 method prescribed by Marmer (Tidal Datum Planes, Spec. Pub. 135, U.S. Dept. of Commerce.) The simultaneous comparison computations are included in the Phase IIB Summary Report - Tides.

The boundaries of tide zones used are listed in the Phase IIB Summary Report - Tides. Gage readings were recorded in relation to staff zero; therefore, the MLLW datum height was subtracted from gage readings before applying the time and ratio correctors.

Zoning correctors applied to the observed gage values were:

Station	Zone	Correctors			Staff MLLW Datum
		Time (h min)	Ratio	Height	
Cuttyhunk	B6	00 00	*1.00	1.151	1.151
Cuttyhunk	B7	+00 06	*1.00	1.151	1.151
Cuttyhunk	B8	+00 12	*0.94	1.151	1.151
Cuttyhunk	B9	+00 18	*0.88	1.151	1.151
Cedar Tree Neck	B10	-00 12	*1.20	0.611	0.611
Cedar Tree Neck	B11	00 00	*1.00	0.611	0.611

All data for all project water level gages are reported in the Phase IIB Summary Report - Tides.

The on-line times for acquisition of valid hydrographic data are presented in Table E-1.

Table E-1. Abstract of Times of Hydrography

1995/276 01:22:04.38 to 1995/276 01:37:00.31
1995/276 01:44:59.56 to 1995/276 02:10:01.02
1995/276 02:17:45.46 to 1995/276 02:39:53.91
1995/276 02:48:54.48 to 1995/276 03:07:44.74
1995/276 03:15:54.36 to 1995/276 03:32:18.57
1995/276 03:39:59.53 to 1995/276 03:55:22.94
1995/276 04:01:10.06 to 1995/276 04:17:00.20
1995/276 04:24:03.47 to 1995/276 04:37:30.52
1995/276 04:44:36.23 to 1995/276 04:56:49.73
1995/276 05:03:09.15 to 1995/276 05:15:53.25
1995/276 05:22:55.03 to 1995/276 05:35:14.54
1995/276 05:41:40.48 to 1995/276 05:54:20.42
1995/276 06:00:56.21 to 1995/276 06:13:15.64
1995/276 06:28:20.61 to 1995/276 07:28:18.72
1995/276 07:33:33.26 to 1995/276 08:31:36.48
1995/276 08:37:44.05 to 1995/276 09:37:27.48
1995/276 09:42:50.69 to 1995/276 10:43:29.96
1995/276 10:47:54.65 to 1995/276 11:01:22.29
1995/277 15:34:59.36 to 1995/277 15:34:59.95
1995/277 15:55:00.05 to 1995/277 16:06:08.98
1995/277 16:15:19.11 to 1995/277 16:40:35.85
1995/277 16:47:13.93 to 1995/277 17:00:29.95
1995/277 17:19:58.05 to 1995/277 17:41:25.91
1995/277 18:15:54.83 to 1995/277 18:33:29.84
1995/277 20:17:50.07 to 1995/277 20:17:51.92
1995/277 20:25:09.70 to 1995/277 20:39:12.89
1995/277 20:50:46.33 to 1995/277 21:01:48.82
1995/277 21:23:08.23 to 1995/277 21:32:20.51
1995/277 21:43:32.62 to 1995/277 21:50:55.88
1995/277 22:01:33.04 to 1995/277 22:07:09.06
1995/277 22:14:28.32 to 1995/277 22:18:19.47

Table E-1. Abstract of Times of Hydrography (Continued)

1995/277 22:23:38.15 to 1995/277 22:25:35.54
1995/277 23:14:01.06 to 1995/277 23:59:56.75
1995/277 23:59:56.83 to 1995/278 00:33:26.87
1995/278 00:55:57.68 to 1995/278 02:15:35.04
1995/278 02:22:17.86 to 1995/278 03:43:42.76
1995/278 03:55:54.42 to 1995/278 04:51:59.86
1995/278 05:01:00.14 to 1995/278 05:15:22.30
1995/278 05:26:24.71 to 1995/278 06:43:39.79
1995/278 07:36:03.20 to 1995/278 08:33:59.96
1995/278 08:44:00.16 to 1995/278 08:56:06.04
1995/278 09:13:20.16 to 1995/278 10:22:11.41
1995/278 10:29:27.11 to 1995/278 11:34:08.93
1995/278 11:34:16.26 to 1995/278 11:47:11.62
1995/278 12:01:07.85 to 1995/278 13:17:44.79
1995/278 13:49:25.74 to 1995/278 15:05:30.39
1995/278 15:13:18.76 to 1995/278 16:32:17.53
1995/278 16:37:35.04 to 1995/278 17:01:59.98
1995/278 17:16:00.14 to 1995/278 17:53:34.36
1995/278 18:54:00.05 to 1995/278 19:39:26.79
1995/278 19:48:03.07 to 1995/278 21:05:10.53
1995/278 21:53:30.13 to 1995/278 22:37:00.07
1995/278 23:13:06.60 to 1995/278 23:59:56.43
1995/278 23:59:56.51 to 1995/279 00:27:59.49
1995/279 01:01:09.31 to 1995/279 02:23:38.19
1995/279 03:16:32.41 to 1995/279 04:11:10.76
1995/279 04:56:00.02 to 1995/279 05:11:59.93
1995/279 05:18:00.10 to 1995/279 05:44:54.42
1995/279 06:12:12.00 to 1995/279 07:08:34.04
1995/279 07:26:45.04 to 1995/279 08:39:53.43
1995/279 08:58:16.58 to 1995/279 10:15:19.89
1995/279 10:31:05.14 to 1995/279 11:25:14.16
1995/279 11:48:31.19 to 1995/279 12:42:34.75
1995/279 12:44:30.50 to 1995/279 13:30:52.93
1995/279 13:36:57.84 to 1995/279 14:30:17.83
1995/279 14:32:37.89 to 1995/279 15:17:38.30
1995/291 07:48:59.67 to 1995/291 09:02:11.61
1995/291 09:09:17.54 to 1995/291 10:21:06.53
1995/291 10:29:40.15 to 1995/291 11:42:37.58
1995/291 11:52:13.41 to 1995/291 13:06:32.30
1995/291 13:32:43.82 to 1995/291 14:24:23.53
1995/291 15:07:17.25 to 1995/291 15:49:59.57
1995/291 16:01:11.38 to 1995/291 16:11:59.94
1995/291 16:29:00.15 to 1995/291 16:47:42.11
1995/291 17:01:57.30 to 1995/291 17:37:05.39
1995/291 18:23:36.64 to 1995/291 19:00:40.34
1995/291 19:10:02.84 to 1995/291 19:37:12.87
1995/291 19:49:42.30 to 1995/291 20:17:11.29
1995/291 20:27:05.78 to 1995/291 20:58:19.62

Table E-1. Abstract of Times of Hydrography (Continued)

1995/291 21:08:31.59 to 1995/291 21:41:39.19
1995/291 22:31:06.63 to 1995/291 22:55:28.38
1995/291 23:10:44.61 to 1995/291 23:37:37.15
1995/291 23:44:28.86 to 1995/291 23:59:56.49
1995/291 23:59:56.71 to 1995/292 00:05:51.39
1995/292 00:17:51.20 to 1995/292 00:39:16.39
1995/292 00:46:59.35 to 1995/292 01:05:03.99
1995/292 01:12:41.91 to 1995/292 01:30:41.51
1995/292 01:36:49.08 to 1995/292 01:50:48.42
1995/292 01:58:20.72 to 1995/292 02:11:33.25
1995/292 02:18:48.66 to 1995/292 02:29:09.97
1995/292 02:37:32.33 to 1995/292 02:48:28.30
1995/292 02:54:41.79 to 1995/292 03:01:45.50
1995/292 03:08:48.46 to 1995/292 03:14:12.04
1995/292 03:22:15.15 to 1995/292 03:24:32.38
1995/292 04:12:50.20 to 1995/292 04:42:01.09
1995/292 04:52:09.81 to 1995/292 05:34:31.69
1995/292 05:42:33.61 to 1995/292 05:43:50.93
1995/292 05:43:51.00 to 1995/292 06:16:44.30
1995/292 06:53:00.17 to 1995/292 08:05:17.30
1995/292 08:13:02.63 to 1995/292 09:10:04.95
1995/292 09:18:26.13 to 1995/292 10:17:15.99
1995/292 10:21:08.18 to 1995/292 11:19:36.11
1995/292 11:25:50.79 to 1995/292 12:24:41.54
1995/292 12:29:18.16 to 1995/292 13:31:39.25
1995/292 13:36:24.46 to 1995/292 14:36:28.38
1995/292 14:40:41.90 to 1995/292 15:45:25.77
1995/292 16:25:23.23 to 1995/292 17:25:05.52
1995/292 17:32:47.00 to 1995/292 18:29:57.32
1995/292 18:36:01.04 to 1995/292 19:27:52.60
1995/292 19:41:39.35 to 1995/292 19:52:29.39
1995/292 20:01:16.64 to 1995/292 20:21:58.21
1995/292 20:28:13.56 to 1995/292 20:47:37.29
1995/292 21:23:43.97 to 1995/292 21:41:35.28
1995/292 21:47:14.11 to 1995/292 22:03:58.46
1995/292 22:07:38.80 to 1995/292 22:22:47.46
1995/292 22:27:43.41 to 1995/292 22:42:26.23
1995/292 22:46:30.56 to 1995/292 22:59:20.58
1995/292 23:04:30.67 to 1995/292 23:16:48.11
1995/292 23:20:43.55 to 1995/292 23:31:04.56
1995/292 23:35:44.44 to 1995/292 23:44:50.79
1995/292 23:48:38.24 to 1995/292 23:56:11.27
1995/293 00:00:39.97 to 1995/293 00:06:52.87
1995/293 00:22:08.87 to 1995/293 00:27:19.71
1995/293 00:51:19.99 to 1995/293 00:55:00.47
1995/293 00:59:30.35 to 1995/293 01:01:41.29
1995/293 01:06:37.46 to 1995/293 01:07:30.27
1995/293 01:14:34.42 to 1995/293 01:42:27.03

Table E-1. Abstract of Times of Hydrography (Continued)

1995/293 01:50:57.17 to 1995/293 02:04:02.30
1995/293 02:08:48.11 to 1995/293 02:35:53.69
1995/293 02:39:49.73 to 1995/293 03:01:15.81
1995/293 03:06:33.90 to 1995/293 03:31:42.47
1995/293 03:35:50.06 to 1995/293 03:57:43.99
1995/293 04:04:19.11 to 1995/293 04:18:22.89
1995/293 04:22:36.41 to 1995/293 04:35:43.31
1995/293 04:42:47.47 to 1995/293 04:57:06.66
1995/293 05:02:06.39 to 1995/293 05:14:54.33
1995/293 05:21:27.68 to 1995/293 05:34:24.17
1995/293 05:44:16.60 to 1995/293 05:50:11.28
1995/293 05:56:35.14 to 1995/293 06:02:19.75
1995/293 06:06:23.26 to 1995/293 06:12:19.65
1995/293 06:17:19.68 to 1995/293 06:23:08.73
1995/293 06:27:41.20 to 1995/293 06:33:26.11
1995/293 06:38:39.76 to 1995/293 06:44:21.41
1995/293 06:48:37.59 to 1995/293 06:54:34.34
1995/293 06:59:04.15 to 1995/293 07:04:42.24
1995/293 07:07:51.47 to 1995/293 07:13:57.11
1995/293 07:19:17.58 to 1995/293 07:25:03.67
1995/293 07:29:26.37 to 1995/293 07:35:20.46
1995/293 07:40:11.89 to 1995/293 07:45:49.98
1995/293 08:01:58.64 to 1995/293 08:13:13.56
1995/293 08:18:46.77 to 1995/293 08:30:41.98
1995/293 08:35:23.64 to 1995/293 08:46:32.93
1995/293 08:52:07.32 to 1995/293 09:04:12.24
1995/293 09:16:29.08 to 1995/293 09:28:02.89
1995/293 09:33:21.88 to 1995/293 09:45:32.20
1995/293 09:50:20.08 to 1995/293 10:01:48.34
1995/293 10:06:45.18 to 1995/293 10:19:36.90
1995/293 10:23:44.79 to 1995/293 10:35:15.12
1995/293 10:40:07.14 to 1995/293 10:52:55.98
1995/293 10:57:05.05 to 1995/293 11:08:28.57
1995/293 11:13:51.71 to 1995/293 11:25:56.16
1995/293 11:29:46.20 to 1995/293 11:41:23.46
1995/293 11:45:34.63 to 1995/293 11:57:12.35
1995/293 12:13:00.09 to 1995/293 12:57:08.62
1995/293 13:30:29.40 to 1995/293 13:46:36.72
1995/293 13:56:31.51 to 1995/293 14:26:48.76
1995/293 14:42:18.61 to 1995/293 14:45:36.50
1995/293 14:49:01.51 to 1995/293 14:53:07.76
1995/293 14:57:14.17 to 1995/293 15:00:43.39
1995/293 15:21:27.26 to 1995/293 15:39:08.49
1995/293 15:43:52.52 to 1995/293 16:04:18.98
1995/293 16:15:22.87 to 1995/293 16:28:20.30
1995/293 16:34:58.97 to 1995/293 16:47:21.44
1995/296 13:51:06.99 to 1995/296 13:56:39.97
1995/296 14:01:57.18 to 1995/296 14:05:04.19

Table E-1. Abstract of Times of Hydrography (Continued)

1995/296 14:11:31.31 to 1995/296 14:16:54.59
1995/296 14:35:06.78 to 1995/296 14:44:37.13
1995/296 16:11:47.60 to 1995/296 16:18:46.27
1995/296 21:24:16.79 to 1995/296 21:33:47.44
1995/296 23:14:53.62 to 1995/296 23:34:28.32
1995/297 00:11:42.24 to 1995/297 00:33:34.10
1995/298 17:48:58.43 to 1995/298 18:24:47.48
1995/298 18:28:48.85 to 1995/298 18:38:36.35
1995/298 18:50:09.79 to 1995/298 19:00:29.17
1995/298 19:05:13.50 to 1995/298 19:13:46.30
1995/298 19:19:51.50 to 1995/298 19:24:00.71
1995/298 19:34:09.43 to 1995/298 19:48:14.10
1995/298 19:56:36.17 to 1995/298 20:05:23.79
1995/298 20:12:07.57 to 1995/298 20:32:03.00
1995/298 20:39:20.86 to 1995/298 20:54:46.33
1995/298 21:00:41.76 to 1995/298 21:14:54.13
1995/298 21:20:00.75 to 1995/298 21:32:37.36
1995/298 21:39:43.89 to 1995/298 21:49:22.83
1995/298 22:09:36.48 to 1995/298 22:16:28.63
1995/298 22:18:14.32 to 1995/298 22:27:41.11
1995/298 22:30:55.84 to 1995/298 22:38:24.82
1995/298 22:42:01.68 to 1995/298 22:45:12.53
1995/298 22:50:42.06 to 1995/298 22:55:18.93
1995/298 23:08:15.99 to 1995/298 23:12:57.72
1995/298 23:31:09.91 to 1995/298 23:44:58.29
1995/299 00:19:24.25 to 1995/299 00:23:15.10
1995/299 00:33:15.81 to 1995/299 00:39:59.97
1995/299 00:51:24.52 to 1995/299 00:55:22.78
1995/299 01:11:33.51 to 1995/299 01:17:11.01
1995/299 01:26:34.69 to 1995/299 01:31:34.57
1995/299 01:42:12.91 to 1995/299 01:55:25.44
1995/299 02:09:23.15 to 1995/299 02:11:54.08
1995/299 02:35:31.74 to 1995/299 02:39:25.55
1995/299 02:45:23.05 to 1995/299 02:48:54.94
1995/299 02:57:40.29 to 1995/299 03:09:28.13
1995/299 03:14:21.64 to 1995/299 03:17:57.08
1995/299 03:22:06.15 to 1995/299 03:26:16.56
1995/299 03:35:40.24 to 1995/299 03:39:05.91
1995/299 03:47:21.76 to 1995/299 03:50:38.24
1995/299 03:55:41.23 to 1995/299 03:56:39.96
1995/299 04:06:06.90 to 1995/299 04:10:16.42
1995/299 04:22:14.45 to 1995/299 04:32:04.40
1995/299 04:37:24.40 to 1995/299 04:43:32.71
1995/299 04:54:27.04 to 1995/299 05:14:14.34
1995/299 05:22:03.82 to 1995/299 05:54:24.90
1995/299 06:06:26.49 to 1995/299 06:11:47.40
1995/299 06:22:47.66 to 1995/299 06:27:12.58
1995/299 06:33:47.70 to 1995/299 06:36:36.93

1995/299 06:49:10.51 to 1995/299 06:52:13.07

G Features Correlated with Multibeam Source Data

DEPTHS ARE IN METERS

Feat. #	Latitude	Longitude	Feature Least Depth	Feature Type	1 or 2 x IHO	Multibeam File Name	Ping Number	Beam Number	MB Depth
1	41 26.23021N	070 47.33442W	24.3	ROCK	1	mba95276.d02	109287	51	24.3
2	41 24.28403N	070 51.16917W	10.09	OBSTR	1	mba95293.d01	119044	50	10.09
3	41 24.46155N	070 50.74861W	14.88	OBSTR	1	mba95299.d01	109425	22	14.88
4	41 26.52387N	070 46.30893W	22.94	OBSTR	1	mba95278.d02	67533	38	22.94
5	41 24.22228N	070 51.04395W	11.74	OBSTR	1	mba95292.d04	97352	24	11.74

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

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER: H-10654

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

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

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

SHORELINE DATA

SHORELINE MAPS (List): NA

PHOTOBATHYMETRIC MAPS (List): NA

NOTES TO THE HYDROGRAPHER (List): NA

SPECIAL REPORTS (List): NA

NAUTICAL CHARTS (List): 13230 40th Ed., April 29, 1995

OFFICE PROCESSING ACTIVITIES

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

PROCESSING ACTIVITY	AMOUNTS		
	VERIFICATION	*EVALUATION*	*TOTALS*
POSITIONS ON SHEET			
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS			
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET			
COMPARISON WITH PRIOR SURVEYS AND CHARTS		40	40
EVALUATION OF SIDE SCAN SONAR RECORDS		80	80
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		24	24
GEOGRAPHIC NAMES			
OTHER*			
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS		144	144

Pre-processing Examination by J. Ferguson	*Beginning Date* 6/3/96	*Ending Date* 6/7/96
Verification of Field Data by J. Ferguson	*Time (Hours)* 120	*Ending Date* 10/10/96
Verification Check by B. Olmstead	*Time (Hours)* 18	*Ending Date* 1/14/97
Evaluation and Analysis by J. Ferguson	*Time (Hours)* 24	*Ending Date* 4/4/97
Inspection by B. Olmstead	*Time (Hours)* 14	*Ending Date* 6/5/97

EVALUATION REPORT
H-10654
Sheet G

A. PROJECT

The hydrographer's report contains a complete discussion of the project information.

B. AREA SURVEYED

The hydrographer's report lists the geographic coordinates outlining the survey area and lists the dates of data acquisition. The survey was conducted in Vineyard Sound, Massachusetts. Depths range from 8.7 meters (28 feet) to 33 meters (108 feet). The bottom consists primarily of course sand and shell, and sand waves cover the majority of the survey area.

C. SURVEY VESSELS

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

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Due to contractor proprietary data format, final data processing and verification was accomplished using contractor supplied software and a contractor supplied HP workstation. The software, used for processing is discussed in the hydrographer's report. The final smooth sheet is an AutoCAD (version 12) drawing file submitted by the contractor. Data is plotted using a UTM projection and are depicted on a single sheet. A revision overlay was created at PHB during office processing. The overlay includes corrected contour lines, the addition of selected supplemental contours, junctional notes and revised bottom sample notations. These revisions were made in order to conform to existing smooth sheet specifications.

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 SAIC's Generic Sensor Format (GSF) for multibeam survey data. In addition, the sounding plot is filed both in the AutoCAD drawing format, i.e., .dwg (extension); and in the more universally recognized graphics transfer format, i.e., .dxf (extension). Copies of these files will be retained at PHB until data transfer protocols are developed and approved.

E. SONAR EQUIPMENT

Side scan sonar was used on survey H-10654. The side scan sonar equipment, the method of operation, and disposition of significant sonar contacts are adequately discussed in the hydrographer's report.

F. SOUNDING EQUIPMENT

Sounding equipment is discussed in the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

The sounding data have been reduced to Mean Lower Low Water (MLLW). The reducers include corrections for an actual tide, dynamic draft, and sound velocity. Soundings were corrected for heave, roll, pitch, and heading during data acquisition.

Several velocity casts did not meet the depth requirement. When sounding depths exceeded the cast depth, the RESON used the bottom of the table to extend correctors below the table. The hydrographer's report describes (Pg 18) how an error analysis was conducted comparing the vertical extrapolation to an extrapolation using the trend of the bottom of the velocity profile. The error analysis determined that errors are minimal.

The Hydrographer's Report (Pg 12) mentions that soundings were corrected using tidal data from Cedar Tree Neck and Nobska Point, this is incorrect. Tidal correctors were from Cedar Tree Neck (844-8325) and Cuttyhunk (844-8392). Tide notes in Appendix E, list the proper tide gages.

H. CONTROL STATIONS

Sections H and I of the hydrographer's report contain adequate discussions of horizontal control and hydrographic positioning. The positions of horizontal control stations used during hydrographic operations are published and field values based on NAD83. The geographic positions of all survey data are based on NAD83.

A DGPS reference station was established at Gay Head Light. The station was properly established and the DGPS reference station was properly verified. Results are included in the Phase IIB Summary Report.

Data based on NAD27 may be referenced to this survey by applying the following corrections:

Latitude:	0.394 seconds	(12.15 meters)
Longitude:	-1.885 seconds	(-43.78 meters)

I. HYDROGRAPHIC POSITION CONTROL

Differential GPS (DGPS) was used to control this survey. A maximum allowable horizontal dilution of precision (HDOP) limit of 2.5 was used for this survey. The hydrographer's report adequately describes the methods used to insure all positions were within specifications.

J. SHORELINE

Shoreline verification was not required.

K. CROSSLINES

Crosslines are adequately discussed in the hydrographer's report.

L. JUNCTIONS

Survey H-10654 junctions with the following surveys.

Survey	Year	Scale	Area
H-10563	1994	1:10,000	SE edge
H-10649	1995	1:10,000	West edge
H-10651	1995	1:10,000	East edge

The hydrographer's report properly discusses the junction with survey H-10651, but does not mention the other surveys. The junctions with H-10651 and H-10649 are complete. Soundings are in good agreement within the common area.

The junction with H-10563 was not formally completed since the survey was previously processed and forwarded for charting. Depths on the present survey are generally 0.3 to 0.6 meters shoaler than the survey data collected in 1994, especially along the west end of the junction area at the 60 foot contour. Due to the flat bottom in this area, the 60 foot contour may be offset by several hundred meters. Survey data from H-10654 should supersede those portions of junctional survey H-10563 within the common area. An "Adjoins" note has been added to the smooth sheet overlay. Dashed lines have been placed on survey H-10563 to indicate the areas which have been superseded. The common area is defined by the area enclosed by the following points:

Latitude (N)	Longitude (W)
41/24.4'	070/48.4'
41/24.65'	070/48.6
41/25.0'	070/48.1'
41/25.6'	070/46.9'
41/25.05'	070/46.8'
41/26.0'	070/45.9'
41/25.8'	070/45.75'
41/24.8'	070/47.9'

M. COMPARISON WITH PRIOR SURVEYS

Survey H-10654 was compared to the following prior surveys.

Survey	Year	Scale
H-8905	1966	1:20,000
H-8903	1966	1:10,000

In general, in water depths greater than 60 feet, the multibeam soundings and prior survey depths agreed well. The present survey is generally 1-3 feet shoaler throughout the survey area. However, a few larger differences (3-15 feet) are readily evident in the vicinity of the Nashawena Lighted Whistle Buoy "NA" and a second area located approximately 2.5 nautical miles to the northeast of this floating aid. These larger differences are mostly accounted for by the existence and migration of sand waves activity. Additional discussion with the prior survey can be found in the hydrographer's report, section M.

Survey H-10654 is adequate to supersede the prior surveys within the common area.

N. ITEM INVESTIGATIONS

One AWOIS item (7883) was investigated within the survey area. Discussion and disposition of the item has been adequately addressed in the descriptive report for survey H-10649.

O. COMPARISON WITH CHART

Survey H-10654 was compared with the following charts:

Chart	Edition	Date	Scale	Datum
13230	40th	April 29, 1995	1:40,000	NAD83
13233	14th	November 28, 1992	1:40,000	NAD83

a. Hydrography

Prior surveys H-8905 and H-8903 conducted in 1966 are the source for most of the currently charted data. The prior survey has been adequately discussed in section M of the hydrographer's report and supplemented by additional comments in the evaluation report.

Survey H-10654 is adequate to supersede charted hydrography in the common area.

b. Dangers to Navigation

Several migrating shoals and ridges were discovered as mentioned in Section M. The most serious were reported in a memo to the COTR dated October 21, 1995. On November 16, 1995, the COTR forwarded eight of the items to the United States Coast Guard in an official Hazard to Navigation Report. After further processing and application of smooth tides, updated information

on the hazards was reported by the contractor in a memo dated December 30, 1995. The changes in final least depths were not great enough to warrant an additional report to the Coast Guard. These memos have been added to Appendix A of the hydrographer's report.

The eight items reported to the Coast Guard are listed below:

Reported Depth	Reported Position	Final Depth
47	41/25.32 N 070/49.38 W	48
32	41/25.47 N 070/49.32 W	33
34	41/25.23 N 070/47.42 W	36
49	41/24.70 N 070/51.23 W	48
29	41/24.78 N 070/50.37 W	28
43	41/25.35 N 070/48.12 W	43
33	41/25.02 N 070/48.03 W	32
50	41/24.63 N 070/49.65 W	49

There were no additional dangers to navigation found during office processing.

P. ADEQUACY OF SURVEY

Hydrography on survey H-10654 is adequate to:

a. Delineate the bottom configuration, determine least depths, and draw the standard depth curves.

b. Reveal there are no significant discrepancies or anomalies requiring further investigation.

c. Show the survey was properly controlled and soundings are correctly plotted.

The hydrographic records and reports received for processing are adequate and conform to the contract specifications.

Survey H-10654 adequately complies with the project instructions.

Q. AIDS TO NAVIGATION

There are two floating aids within the survey limits. They are properly positioned and plotted and serve their intended purpose.

R. STATISTICS

Statistics are itemized in the hydrographer's report.

S. MISCELLANEOUS

Miscellaneous information is discussed in the hydrographer's report. No additional miscellaneous items were noted during office processing.

T. RECOMMENDATIONS

This is a good hydrographic survey, no additional work is required.

U. REFERRAL TO REPORTS

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

Lieutenant Commander Jeffrey A. Ferguson, NOAA
Multibeam Processing Officer

APPROVAL SHEET
H-10654

Initial Approvals:

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

Bruce A. Olmstead Date: 6/5/97
Bruce A. Olmstead
Senior Cartographer, Cartographic Section
Pacific Hydrographic Branch

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

Kathy A. Timmons Date: 6/30/97
Kathy A. Timmons
Commander, NOAA
Chief, Pacific Hydrographic Branch

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Final Approval:

Approved:

Andrew A. Armstrong III Date: Jul 31, 1997
Andrew A. Armstrong III
Captain, NOAA
Chief, Hydrographic Surveys Division

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. H-10634

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
13233	4/21/97	Jeffrey Fang	~~Full Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings from smooth sheet
13230	4/21/97	Jeffrey Fang	~~Full Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings from smooth sheet
13229 SC	4/21/97	Jeffrey Fang	~~Full Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings from smooth sheet
13218	4/21/97	Jeffrey Fang	~~Full Part Before~~ After Marine Center Approval Signed Via
			Drawing No. Full application of soundings thru charts 13233, 13230
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED