

H10520

NOAA FORM 76-35A	
U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE	
DESCRIPTIVE REPORT	
Type of Survey	HYDROGRAPHIC/SIDE SCAN SONAR
Field No.	RU-10-1-94
Registry No.	H-10520
LOCALITY	
State	MASSACHUSETTS
General Locality	BUZZARDS BAY
Sublocality	3.5 NM SE OF MATTAPOISETT NECK
19 94	
CHIEF OF PARTY LCDR. D. R. HERLIHY, NOAA	
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DATE	JAN 22 1996

NOAA FORM 77-28
(11-72)

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

REGISTER NO.

HYDROGRAPHIC TITLE SHEET

H-10520

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.

RU-10-1-94

State Massachusetts

General locality Buzzards Bay

Locality 3.5 NM SE of Mattapoisett Neck

Scale 1:10,000

Date of survey 24 March - 10 June 1994

Instructions dated 23 February 1994

Project No. OPR-B616-RU-94

Vessel NOAA Ship RUDE

Chief of party LCDR D.R. Herlihy

Surveyed by LCDR D.R. Herlihy, LTJG R.T. Brennan, ENS T.A. Haupt, ST E.T. Hardison

Soundings taken by:(echo sounder, hand lead, pole) Raytheon DSF-6000N Echosounder

Graphic record scaled by DRH, RTB, TAH, & ETH

Graphic record checked by DRH, RTB, TAH, & ETH

Protracted by _____ Automated plot by ENCAD NOVAJET JIL

Verification by ATLANTIC HYDROGRAPHIC BRANCH PERSONNEL

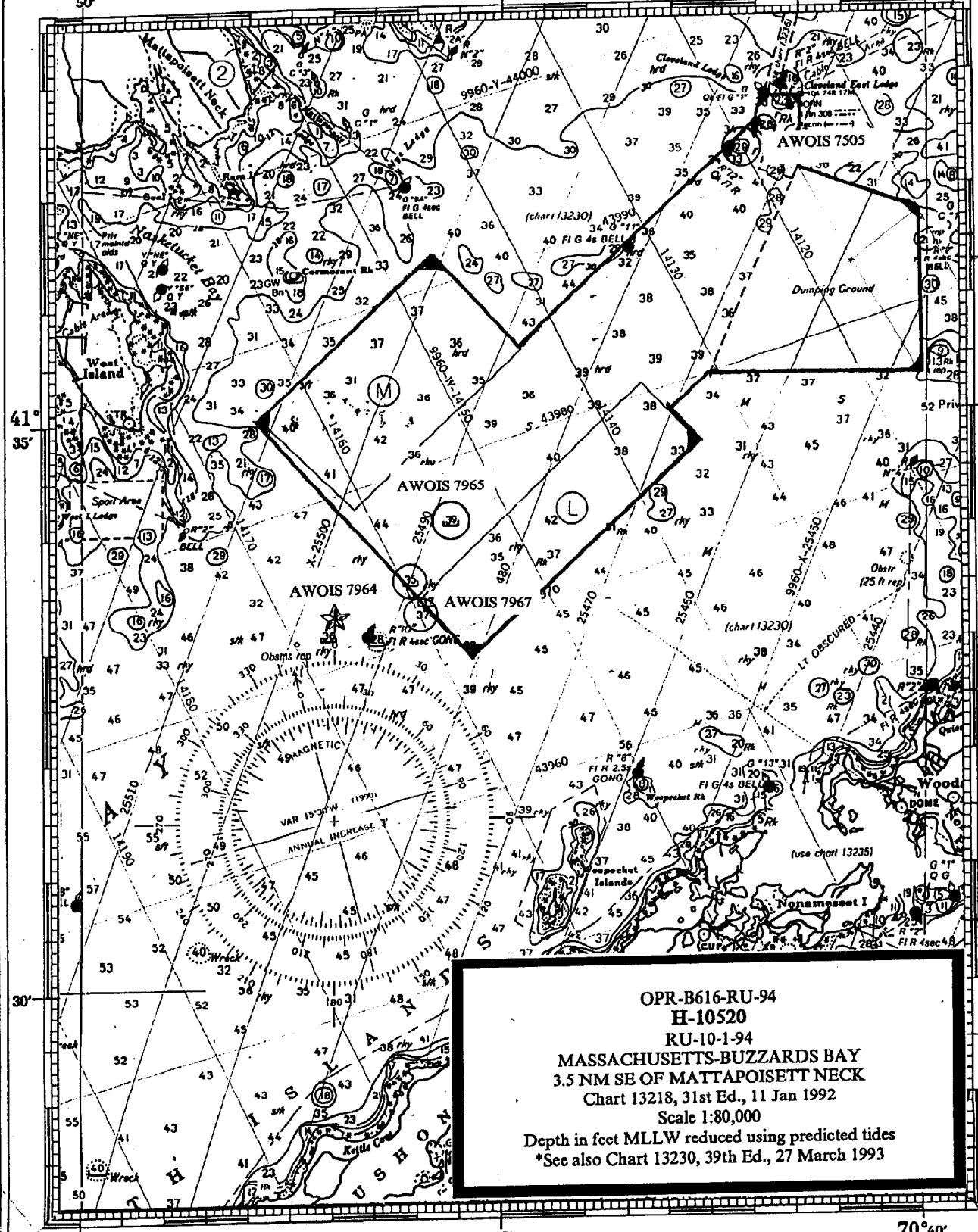
Soundings in (~~fathoms, feet, or meters~~ at ~~MLW~~ or MLLW) Feet meters-at MLLW

REMARKS: All times recorded in UTC.

The DSF-6000N was used as the primary sounding instrument, however,
as warranted, the SEABAT 9001 shallow-water multi-beam sonar system
was employed for distinct item investigations and is documented
as such.

NOTES IN THE DESCRIPTIVE REPORT WERE MADE IN RED
DURING OFFICE PROCESSING.

5/1-2-97 AW015 and SURF ✓ RWD 2/96



OPR-B616-RU-94
 H-10520
 RU-10-1-94
 MASSACHUSETTS-BUZZARDS BAY
 3.5 NM SE OF MATTAPOISETT NECK
 Chart 13218, 31st Ed., 11 Jan 1992
 Scale 1:80,000
 Depth in feet MLLW reduced using predicted tides
 *See also Chart 13230, 39th Ed., 27 March 1993

(JOINS CHART 13237)

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A. PROJECT

A.1 This survey was conducted in accordance with Hydrographic Project Instructions OPR-B616-RU, Buzzards Bay, Nantucket and Vineyard Sounds, Massachusetts.

A.2 The original date of the instructions is February 23, 1994.

A.3 There has been one change to these instructions:

- Change No. 1 dated March ⁹15, 1994

A.4 This Descriptive Report covers the navigable area survey conducted on sheet "B" of project B616-RU-94 in the Buzzards Bay navigation corridor, including anchorages L and M, as well as the dumping grounds centered around position 41°36'18"N and 070°41'00"W, as specified by the Project Instructions.

A.5 Project OPR-B616-RU responds to requests from the U.S. Coast Guard and the Coast and Geodetic Survey's Mapping and Charting Branch to investigate certain reported submerged wrecks and obstructions in Buzzards Bay, and to complete surveys of the four general anchorages in Buzzards Bay.

B. AREA SURVEYED

This survey encompasses an area in Buzzards Bay extending from the Cleveland East Ledge Light south to the R "10" buoy, and represents the third of four sheets proceeding north from the entrance of the Bay. The exact boundaries of the Navigable Area Survey (NAS) lie between the following coordinates, starting at the northernmost end and proceeding clockwise:

41°37'45"N	070°41'37"W
41°37'10"N	070°41'32"W
41°36'46"N	070°41'07"W
41°35'22"N	070°40'04"W
41°35'22"N	070°42'34"W
41°35'01"N	070°43'04"W
41°34'44"N	070°42'43"W

B. AREA SURVEYED (continued)

41°32'49"N	070°45'21"W
41°34'54"N	070°48'00"W
41°36'25"N	070°45'53"W
41°35'36"N	070°44'49"W
41°37'24"N	070°42'20"W
41°37'45"N	070°41'56"W

Data collection for this survey began on March 24, 1994 (DN 083) and concluded on June ~~8~~₁₀, 1994 (DN 161).

C. SURVEY VESSELS

C.1 The following vessels were used during this project:

Vessel	EDP Number	Primary Function
NOAA Ship RUDE (S590)	9040	Hydrography, Side Scan Operations and SEABAT Investigations
RUDE Launch (RU3)	1290	Diving Operations

C.2 During the ship's January 1994 dry-dock period, RUDE was outfitted with a pivoting armature to carry the transducers for the Reson SEABAT 9001 shallow-water multi-beam sonar system. This armature was mounted on the port side of the ship, approximately midway along the ship's length. The arm was designed to be detachable and ride in a cradle on the boat deck when not in use for extended periods. Since the transducers were not designed to be permanently deployed, the arm was typically installed only when the SEABAT system was to be used, and rotated into the down, or operating position, only during times of data acquisition.

D. AUTOMATED DATA ACQUISITION AND PROCESSING *SEE ALSO THE EVALUATION REPORT*

D.1 Survey data acquisition and processing were accomplished using the HDAPS system with the following software versions:

Program	Version	Dates Used
BACKUP	2.00	083-161
BLKEDIT	2.02	083-161
CARTO	2.11	083-102
	2.13	102-161
CLASSIFY	1.05	083-161
CONTACT	2.32	083-102
	2.34	102-161
DAS_SURV	6.63	083-102
	6.70	102-161
DP	2.14	083-161
EXCESS	4.21	083-161
FILESYS	3.21	083-102
	3.24	102-161
GRAFEDIT	1.06	083-161
LSTAWOIS	3.06	083-102
	3.07	102-161
MAN_DATA	2.01	083-161
NEWPOST	6.01	083-161
PLOTALL	2.25	083-102
	2.27	102-161
PREDICT	2.01	083-161
PRESURV	7.07	083-102
	7.08	102-161
QUICK	2.04	083-102
	2.05	102-161
RAMSAVER	1.02	083-161
REAPPLY	2.10	083-161
ZOOMEDIT	2.22	083-102
	2.24	102-161

D.2 Other software includes program **VELOCITY 2.10**, dated March 15, 1994, which generates sound velocity corrector tables, including the program's **REFRACTB** subroutine, which corrects SEABAT multiple slant ranges for both depth and position (cross track distance) due to refraction.

D.3 SEABAT multi-beam data were acquired exclusively on the SEABAT 9001 data acquisition 486 personal computer, using the Coastal Oceanographics HYPACK software package (Version 1.0, dated March 1, 1994), receiving gyro and predicted tide input from HDAPS and direct heave/roll/pitch data from the Datawell HRP sensor and positioning input from the Ashtech GPS receivers. SEABAT data was processed on one of two personal computers equipped with the LSTRUD (Version 2.0, dated May 18, 1994) post-processing software. A single least depth was generated for each SEABAT investigation and later entered into HDAPS via the **MANUAL DATA ENTRY** program.

E. SONAR EQUIPMENT

E.1 Side scan sonar operations were conducted using an EG&G Model 260 image-corrected side scan sonar recorder and a Model 272-T single frequency towfish. All side scan operations were conducted from the RUDE (vessel # 9040). The following list shows equipment serial numbers and corresponding dates used:

Equipment Type	Serial Number	Dates Used
Recorder	10884	083-089
	12104	089-095
	10884	095-161
Towfish	11901	083-094
	11904	094-094
	11901	094-104
	16630	104-105
	16696	105-161

E.2 The side scan sonar towfish was configured with a 20° beam depression, which is the normal setting and yields the best beam correction.

E.3 The 100 kHz frequency was used throughout this survey.

E.4 a. The 100-meter range scale was generally used for this survey. Given the average depth of water throughout the navigable area corridor, the 100-meter range scale was used to maximize area coverage and provide optimal contact resolution.

The area encompassed by the dumping grounds, at the northeast corner of this survey, contained depths shoaler than those found in the rest of the survey. The 75-meter range scale was utilized in this area to attain the proper side scan coverage. All side scan coverage was ultimately checked with a smooth plot to ensure proper overlap between adjoining lines.

The current Field Procedures Manual (FPM) specification was used to determine maximum line spacing with Differential GPS positioning:

$$LS_{\max} = 2RS - 2EPE_{\max}$$

where: RS = range scale (75 or 100 meters)

EPE = expected position error

For a 1:10,000-scale survey, a maximum EPE of 15 meters is permitted. Using this value in the above equation, a maximum line spacing of 170 meters for RS = 100 meters and 120 meters for RS = 75 meters is authorized. Data collected with an EPE of 15 or greater was either rejected or smoothed in the post processing phase of the survey, so the maximum line spacing was never exceeded. In addition, the actual line spacing for the side scan sonar coverage acquired with the 100-meter range scale during this survey was 160 meters. This line spacing was chosen to 1) give an added margin on coverage, and 2) to allow an even number of hydro lines to be run in between each mainscheme line (i.e. an even 7 lines can be run at 20 meter spacing between two mainscheme lines with RS = 100 meters).

Erroneous Expected Position Error (EPE) values in excess of 15 meters may be seen throughout the raw data printouts, most typically ranging between 408.2 and 409.2. These values were not considered in the line spacing calculations shown above due to their acceptable, corresponding Horizontal Dilution of Precision (HDOP) values. These excessive values were investigated in the HDAPS Graphic Sounding Edit program and consistently found to be erroneous when accompanied by an acceptable HDOP value. The high EPE values appear to be caused by an HDAPS software deficiency.

b. Confidence checks were obtained by noting recognizable bottom characteristics at the edges of the sonar range scale in use. Features such as sand waves, buoy anchors and trawl door scours were commonly used for this purpose.

c. Two hundred percent side scan sonar coverage was completed for this survey.

d. Large areas of the bottom within this survey consisted of soft silt and sand. Due to the inherent characteristics of this bottom composition and the lack of contacts found there, there are segments of data with large gaps between confidence checks. It is the opinion of the hydrographer that this data is acceptable due to confidence checks seen before and after these barren areas.

During the post-processing of the initial side scan data, it was noted that significantly less contacts were seen on the port channel than on the starboard. Due to the small amount of contacts logged during the first hundred percent of side scan coverage over the navigable corridor and anchorages L and M, this was viewed with little suspicion. It was not until beginning side scan coverage of the dumping grounds, an area dense with contacts, that this was noted as a serious problem, not just an occasional oddity.

On DN 104, a test was conducted on a known contact which provided an excellent return on the starboard channel. The line was then re-run in the opposite direction, placing the contact within view of the port channel. The image produced from the port channel was vague, with a dull, almost non-existent shadow. The ship's spare towfish was installed and the test run again. This time images of comparable quality were viewed on both channels. In lieu of the results of this test, all data collected before DN 104 were reviewed and areas showing contacts on the starboard channel with only dim contacts showing on the port were rejected and re-run.

Except as noted above, all side scan sonar records acquired during this survey were clear with excellent returns. There were several instances of the side scan sonar towfish becoming entangled in lobster trap buoy lines, temporarily whiting out the sonagram. On these occasions, the towfish was brought on board, inspected and serviced as necessary, with all affected data subsequently being rejected.

e. The towfish was deployed exclusively from the stern during this survey.

E.5 As authorized by the Project Instructions (6.15.1), a 400-meter grid was developed to overlay this survey. The most significant contacts within each of these 400-meter "cells" were investigated by intensive echo sounder investigation. Tight line spacing, routinely as close as five meters, was used to conduct these investigations. Contacts warranting more precise depth determination were investigated using the SEABAT 9001 multi-beam sonar system. The data for these investigations are summarized in the Development Abstract in Section N of this report.

E.6 Overlap was checked on line using the real-time swath plot, with the edited swath plot used to identify holidays.

F. SOUNDING EQUIPMENT

F.1 All standard hydrographic soundings were acquired using a Raytheon 6000N Digital Survey Fathometer (DSF-6000N). Equipment serial numbers and corresponding dates used are as follows:

Equipment Type	Serial Number	Dates Used
DSF-6000N	A107	083 - 138
	B040N	138 - 144
	A107	144 - 161

F.2 When diver investigations were conducted, least depths were measured with a 3-D Instruments, Inc. precision direct drive depth gauge:

0 - 70 fsw (feet salt water) S/N 201637 12

This gauge was checked each day it was used by comparing it with a leadline. Depths recorded by the leadline varied with that recorded from the pneumatic depth gauge at times by more than the allowed 0.5 feet. This disparity can be attributed to wire angles in the leadline (approximately 10°), choppy sea states and significant currents on the day dive operations were conducted. Calibration and check documentation for this equipment is found in Separate IV. *DATA FILED WITH ORIGINAL FIELD RECORDS. DIVE REPORTS ARE APPENDED TO THIS REPORT.*

F.3 There were no faults in sounding equipment which affected the accuracy or quality of the data.

F.4 Both high (100 kHz) and low (24 kHz) frequency sounding data were recorded during data acquisition. Only high frequency soundings were plotted.

F.5 As authorized by the Project Instructions, the Reson SEABAT 9001 shallow-water multi-beam sonar system was used to determine precise least depths over significant contacts discovered during routine side scan sonar operations.

The Reson SEABAT 9001 produces sixty 1.5 degree beams per swath, yielding an included swath angle of 90 degrees and a swath width which is approximately twice the surrounding water depth. The system operates at a frequency of 455 kHz and updates at a rate of 7 times per second in 25 meters of water, thus acquiring 420 soundings per second. SEABAT slant ranges and quality factors for each of the 60 beams are acquired through the Coastal Oceanographics HYPACK data acquisition system on an IBM-compatible 486 personal computer.

Prior to beginning SEABAT data collection on this survey, a RUDE SEABAT-specific offset table/file was created to define the physical relationship between the various ~~components~~^{components} that comprise the system, including the SEABAT transducer head, Hippy sensor and GPS antenna. In addition, this offset file contains heave, roll and pitch biases which were determined during an initial "Patch Test" run in Chesapeake Bay prior to the beginning of project OPR-B616-94. A copy of the SEABAT offset table is contained in Separate III. DATA FILED WITH ORIGINAL FIELD RECORDS

During post-processing using the LSTRUD program developed by the Nautical Charting Research and Development Laboratory, SEABAT position and Hippy data are first viewed graphically and edited as necessary for data quality. Once this has been accomplished, the software attaches a position to each of the SEABAT data records. The various heading, Hippy and sound velocity refraction correctors are then applied to the SEABAT slant range values to create a data record for each individual SEABAT beam, 60 data records for each SEABAT swath. The subsequent 60 records contain computed positions and depths, cross track distances and beam quality codes. After this expanded file is created, the data are viewed graphically in three different perspectives to review the consistency of the sounding data, with the option of editing any erroneous or questionable soundings that may exist.

Once the sounding data has been reviewed and edited as necessary, the LSTRUD software selects a subset of the approximate 14,000 minimum depths contained within the total data set being processed, following which a file containing the 15 least depths found within the subset of 14,000 minimum depths is generated. It is from this file that the single least depth for each SEABAT investigation was obtained for manual data entry into HDAPS.

A summary of all SEABAT investigations conducted for this survey is appended to the Development Abstract in Section N. Copies of all 15 least depth listings associated with these investigations are included in Separate V. *DATA FILED WITH ORIGINAL FIELD RECORDS*

G. CORRECTIONS TO SOUNDINGS

G.1 a. The velocity of sound through water was determined using an Odom Digibar Sound Velocity Probe (S/N 169). A Data Quality Assurance Test was conducted before each velocity cast to ensure the meter was operating within tolerance. Generally, velocity casts were conducted weekly with few exceptions.

All data were processed using program **Velocity 2.10**. The computed velocity correctors were entered into the HDAPS sound velocity table and applied on line to both high and low frequency soundings. SEABAT refraction correctors were created using the **REFRACTB** subroutine and applied during post-processing. The sound velocity correctors applied to this survey are based on casts recorded on the following dates:

Cast Number	Date	Latitude	Longitude	HDAPS Table	Applied to Days
1	3/24/94	41°33'14"	070°47'22"	1	083-084
2	3/28/94	41°32'28"	070°47'24"	2	087-097
3	4/04/94	41°32'43"	070°47'14"	3	097-097
4	4/11/94	41°33'39"	070°46'53"	4	101-107
6	4/18/94	41°33'16"	070°46'34"	6	108-112 105-111
7	4/25/94	41°35'06"	070°40'30"	7	118-119 112-118
8	5/02/94	41°30'57"	070°50'11"	8	122-126 119-124
9	5/09/94	41°31'07"	070°50'19"	9	129-133 126-131
10	5/16/94	41°30'52"	070°50'12"	10	136-140 133-139
11	5/23/94	41°30'51"	070°50'12"	11	142-147
12	6/01/94	41°30'52"	070°50'15"	12	152-161

- b. There was no variation in the DSF-6000N instrument initial.
- c. No instrument correctors to the DSF-6000N were required.
- d. A dual leadline comparison with the DSF-6000N was conducted during special project S-B902 in Long Island Sound:

DN 160 at 41°00'25"N and 070°32'59"W (27 ft depths)

The greatest variation between leadline and DSF soundings was 0.1 meters. Considering the ship's motion and the wire angle in the leadline from current (approximately 5°), this is excellent agreement and provides an adequate check that the echo sounder was functioning properly. Data from these comparisons can be found in Separate IV. *DATA FILED WITH ORIGINAL FIELD RECORDS*

Two types of lead line were used during the leadline to DSF-6000N comparison. The starboard leadline was a steel surveyor's tape graduated in feet with a fixed 5 lb weight at its end. A leadline corrector of 0.0 was assumed for this leadline. The port leadline was a traditional leadline made of cotton tiller with a stainless steel cable core. This lead line had a corrector of 0.0 up to its 30-foot mark, yielding an average leadline corrector of 0.0 to be applied in the comparison with the DSF-6000N.

- e. All sounding correctors were applied to both the narrow (100 kHz) and wide (24 kHz) DSF-6000N beams.
- f. During the ship's winter 1994 dry-dock period, an exact vertical measurement was taken from the DSF transducer to a fixed point on the bridge wing. After the ship was re-floated, the height above the waterline was determined for this point. The ship's static draft was thereby calculated to be exactly 2.12 meters (7.0 feet). This draft corrector was applied to all sounding data via the HDAPS offset table.
- g. Settlement and squat correctors for the RUDE were determined on the Elizabeth River, Norfolk, Virginia on March 3, 1993. An observer, stationed with a level on a pier, measured changes in relative height by sighting to a staff held at the longitudinal position of the ship's transducer. The ship steamed directly toward and then away from the observer. The toward and away runs were averaged and applied to soundings through the HDAPS offset table.

h. Heave data were acquired by a Datawell heave, roll and pitch sensor (S/N 19128-C), and were applied to soundings in real time. Only the heave corrections were applied to the plotted soundings.

G.2 There were no unusual or unique methods or instruments used for correcting echo soundings.

G.3 Generally, sound velocity correctors resulting from weekly velocity casts were re-applied to the data acquired that entire week. Section G.1 a) gives the periods during which each set of velocity cast correctors were used.

G.4 The ship's two pneumatic depth gauges were calibrated by Instruments East, Inc., Norfolk, VA on February 2, 1994. Corrector data from the calibration was not applied to measured depths because it was less than 0.1 meters.

A system check was performed each day the pneumatic depth gauge was employed, as a means of ensuring the validity of the gauge's measurements. These system checks are included in Separate IV. Hydrographic Survey Guideline No. 55 mandates that agreement between the leadline and observed gauge values must not exceed 0.5 feet. However, there were occasions when observed readings did exceed this limit. On these occasions, the observed wire angle of the leadline and pneumatic depth gauge hose was unavoidably excessive and, therefore, the comparison values were viewed with suspicion. As a result, no correctors were applied to measured pneumatic depth gauge values.

G.5 Generally, sea conditions greater than one meter affected the graphic sounding record, creating a trace of constant peaks and deeps. Application of heave correctors to raw echo soundings appeared to accurately represent true depths.

G.6 a. The tidal datum for this project is Mean Lower Low Water. The operating tide station at Newport, Rhode Island (845-2660) served as direct control for datum determination. This station also served as the reference station for predicted tides. Data for predicted tides were provided on floppy disk before the start of the project.

b. Tidal data used during data acquisition were obtained from Table 2 of the East Coast of North and South America Tide Predictions, and applied to the digital tide data using HDAPS software. The subordinate station for predicted tides was:

NO.	PLACE	POSITION	TIME		HEIGHT	
			High Water	Low Water	High Water	Low Water
1127	Mattapoissett Harbor	41°39'N 70°49'W	+0 11	+0 20	*1.09	*1.00

Tidal correctors were applied on line using HDAPS predicted tide tables numbers 3, 4, 5, and 6. Tide table 3 was used for the month of March, 4 for April and so on. *Approved tides and zoning were applied during office processing.*

c. Zoning for this project is consistent with the project instructions.

A request for smooth tides was mailed on June 21, 1994.

H. CONTROL STATIONS *See also EVALUATION REPORT*

H.1 The horizontal datum for this project is the North American Datum of 1983 (NAD 83).

H.2 This survey was conducted exclusively using Differential GPS, which precluded the need for any shore based horizontal control stations.

H.3 No horizontal control stations were used or established for this survey.

H.4 No horizontal control stations were used or established for this survey.

H.5 Verification of horizontal control was not necessary since no land-based horizontal control stations were used.

H.6 There are no photogrammetric problems, positioning problems or unconventional survey methods pertinent to this survey.

I. HYDROGRAPHIC POSITION CONTROL

I.1 This survey was conducted exclusively using Differential GPS positioning.

I.2 Accuracy requirements were met as specified by the Hydrographic Manual and Field Procedures Manual (FPM). The Horizontal Dilution of Precision (HDOP) and Expected Position Error (EPE) specified by the FPM were monitored during on-line data collection. When these values exceeded the allowable limits (HDOP = 3.35, EPE = 15), survey operations were suspended until the Differential GPS improved. If the positioning degraded beyond the acceptable limits while on line, the data were either smoothed or rejected, depending upon the extent of the affected data.

I.3 Control Equipment:

Differential GPS:

<u>Unit A</u>	<u>Unit B</u>
Ashtech GPS Sensor	Ashtech GPS Sensor
s/n 700417B1083	s/n 700417B1003
Firmware Version 1E11D-P	Firmware Version 1E11D-P
Magnavox MX50R	Magnavox MX50R
DGPS Receiver s/n 078	DGPS Receiver s/n 160

Correctors were received from both the Montauk, New York and Portsmouth, New Hampshire radio beacons for the entire survey.

I.4 The Differential GPS system requires no calibrations to its equipment from outside sources. However, to check the position accuracy of the DGPS system, a daily performance check was conducted. The Shipboard Data Integrity Monitor (version 1.2), or "SHIPDIM", program was utilized to conduct these performance checks.

For a DGPS performance check, section 3.4.5 of the FPM states that a DGPS performance check may be conducted using "SHIPDIM" when "two independent reference beacons are receivable, and two remote receivers are available on the ship. Each remote receives correctors from a different reference, then the computed positions are compared." The computed inverse between the check receiver and the reference receiver must not exceed δP_{max} , where:

$$\text{delta } P_{\text{max}} = \text{SQRT} [(\text{EPE})^2 + (\text{ECR})^2]$$

delta P_{max} = Maximum allowable inverse distance
between the DGPS and check position

EPE = Expected Position Error of the DGPS position

ECR = Error Circle Radius of the check position

"SHIPDIM" compares four sample positions from both the check and reference receivers and compares them. Three of the four checks must be less than the delta P_{max} for a successful performance check.

I.5 No calibration data were required to be applied to the raw positioning data as DGPS was the primary positioning system.

I.6 a. There were no unusual methods used to calibrate or operate the electronic positioning equipment.

b. No shipboard DGPS malfunctions were experienced during the times of hydrography for this survey.

c. During times of heavy rains and/or thunderstorms, the ship would experience periods of intermittent service from either the Montauk, New York or the Portsmouth, New Hampshire radio beacons, or both, depending on the location of the degraded weather at the time. During such instances, control would be switched to the reference beacon sending the strongest, most interference-free signal. If both the Montauk and Portsmouth beacons were experiencing periods of degraded weather, the survey operations were suspended until such time as service from one or both beacons had resumed.

d. During the periods when local weather affected the DGPS radio beacons as described in section I.6.c, the on-line positioning would unexpectedly "drop out". These instantaneous outages were associated only with weather related beacon interference. During times of poor satellite coverage or geometry, there would be a steady deterioration of the HDOP which could be continuously monitored. Such weather-related outages could occur often, sometimes every few minutes, making it nearly impossible to begin or complete a survey line. The duration of these outages ranged from half an hour to several hours.

e. No systematic errors were detected which required adjustments.

f. Antenna positions were corrected for offset and layback, and referenced to the position of the DSF-6000N transducer. These correctors were located in the HDAPS offset table, and applied on line to the positioning algorithm. Refer to Separate III for a copy of the HDAPS offset table.*

g. Offset and layback distances for the A-frame (tow point) were located in the HDAPS offset table and applied on line. These offsets, along with the cable length, towfish height, and depth of water, were used by the HDAPS system to compute the position of the towfish. Refer to Separate III for a copy of the HDAPS offset table.*

J. SHORELINE

No shoreline is contained within the boundaries of this survey.

K. CROSSLINES

A total of 19.13 nautical miles of crosslines were obtained for this survey, which represents 10.6% of the first 100% mainscheme side scan coverage.

An un-excessed plot of mainscheme soundings with crosslines superimposed was used to conduct mainscheme to crossline comparisons. Soundings at intersections were compared to all other soundings within a 5 mm (50 meter) radius. Based on this procedure, agreement between mainscheme and crossline soundings was found to be excellent, especially in areas of flat or slightly sloping relief.

The correlation between mainscheme and crosslines on this survey is excellent. The majority of soundings compared fell within 1 foot of each other, with only an occasional difference of two feet noted. Most often these larger differences were observed in the dumping grounds which was characterized by an extremely irregular bottom consisting of large boulders and dump piles.

** DATA FILED WITH THE ORIGINAL FIELD DATA*

L. JUNCTIONS *See also the EVALUATION REPORT*

L.1 This survey junctions with survey H-10461, sheet "C", along its southwest boundary. Survey H-10461, scale 1:10,000, was completed by the RUDE during the 1993 field season.

L.2 Agreement at the junction of surveys H-10520 and H-10461 is excellent. Agreement between soundings were typically within one foot when compared to other soundings within a 30 to 40 meter radius, and only occasionally differing by two feet within a similar radius of investigation.

L.3 There are no significant discrepancies at junctions to be reconciled.

L.4 No recommendations for adjustments to soundings, features or depth curves are appropriate.

M. COMPARISON WITH PRIOR SURVEYS *SEE ALSO THE EVALUATION REPORT*

A comparison with prior surveys will be performed by the Atlantic Hydrographic ~~Section~~^{BRANCH} as part of the office verification process.

N. ITEM INVESTIGATION REPORTS

N.1.1 Area of Investigation

AWOIS 7505

Buzzards Bay

Reported Position:

41°37'21.38"N

070°42'17.11"W

Datum: NAD27

Reported Depths: Charted 29 foot sounding is the most recent depth on this item as determined by the COE survey BP72649/1967.

Feature: Sounding

N.2.1 Description and Source of Item

AWOIS 7505 was first encountered on survey H3391WD/1912-14, with a cleared wire drag depth of 31 feet, and again on survey H6831WD/1942. A year later in 1943, the SS Pan Florida hit a rock in this area. A 1943 COE investigation reported a rock shoal in this same area to be covered by 30 feet of water at MLW. The current sounding of 29 feet comes from COE survey BP72649/1967. This area was later investigated in survey H9661/1976-77, with a 31-foot depth found, however the 29-foot sounding remained due to insufficient development.

N.3.1 Survey Requirements

This item required 200% side scan coverage, echo sounder development and diver investigation

N.4.1 Method of Investigation

Two hundred percent side scan coverage was achieved over the entire AWOIS 7505 search radius. One side scan contact (319.01S) was found within the search radius and was the subject of echosounder development 3T2. This contact was also investigated using the SEABAT 9001 multi-beam sonar system.

N.5.1 Results of Investigation

AWOIS 7505 was logged once on side scan sonar as contact 319.01S and was found during development 3T2 to be a small rock outcropping. This item was investigated both with echosounder (twice) and SEABAT (twice). The first echosounder investigation yielded an 8.6⁴-meter (~~27.6~~^{28.2} feet) corrected depth (fix 5184.2). This contact was then investigated with SEABAT, and a corrected depth of 9.0⁰ meters (29.8⁸ feet) was acquired (fix 13017). Since the correlation between the DSF-6000N and SEABAT had typically been closer, a second echosounder investigation on DN 161 was conducted, yielding a 9.2²-meter (29.8⁸ feet) corrected depth (fix 6675.2). This echosounder investigation was immediately followed by another SEABAT investigation, which yielded a 9.2²-meter (~~30.0~~^{30.8} feet) corrected depth (fix 13027). Since the position of the four depths acquired are all within five meters of each other (thus the same feature), it is the hydrographer's opinion that there is possibly a disparity between predicted and the real tides, which accounts for these depth differences. This question should be addressed upon application of smooth tides during the office verification stage.

N.6.1 Comparison with Prior Surveys

A comparison with prior surveys will be performed by the Atlantic Hydrographic Section as part of the office verification process.

N.7.1 Comparison with Chart and Charting Recommendations

Largest scale chart of this portion of the survey area:

Chart 13230
"Buzzards Bay"
39th ed. March 27, 1993
Scale: 1:40,000

AWOIS 7505, a ^(8.8m) 29-foot sounding charted in position 41°37'21.38"N and 070°42'17.11"W was located and found to have a least depth by echosounder of 8.4 meters (~~27.6~~^{28.2} feet) in position 41°37'20.310"N and 070°42'17.367"W.

It is the opinion of the hydrographer that the 29-foot sounding be retained pending the application of smooth tides to the survey depth mentioned above. If smooth tides do not significantly alter this depth, it is recommended that the 29-foot sounding be changed to 28 feet and charted in position 41°37'20.310"N and 070°42'17.367"W (fix 5184.2). *Concur*

CHART 28 ft. (8.6m) depth = 28RK

N.1.2 Area of Investigation

AWOIS 7964

Buzzards Bay

Reported Position:

41°33'30.38"N

070°46'07.11"W

Datum: NAD27

Reported Depths: Charted 35-foot sounding. Wire drag hang at 38 feet, 43-47 foot depths exist in the vicinity.

Feature: Sounding

N.2.2 Description and Source of Item

AWOIS 7964 was originally a 36-foot depth from survey H3391/1912-14WD and was later cleared during survey FE161WD/1957 to 37 feet. A 38-foot hang with a cleared depth

of 35 feet was also discovered approximately 100 meters northwest during FE161WD. This area was investigated again during survey H9615/1976, but was not adequately developed.

N.3.2 Survey Requirements

This item required 200% side scan coverage, echo sounder development and diver investigation

N.4.2 Method of Investigation

Two hundred percent side scan coverage was achieved over the entire AWOIS 7964 search radius. Several contacts were logged within this search radius and fall under developments 20G1 and 21G2. This item was investigated with echosounder and the SEABAT 9001 multi-beam sonar system, as well as by diver investigation.

N.5.2 Results of Investigation

AWOIS 7964 was logged on side scan sonar as contact 574.43P (See also 574.44P and 3937.17S) and was found by divers to be a group of boulders with the largest measuring approximately 10ft high by 18ft long by 10ft wide. The pneumatic depth gauge reading taken by divers and corrected with ~~predicted~~ *Approved* tides was 10.~~8~~⁹ meters (35.~~7~~⁴ feet) in position 41°33'30.525"N and 070°46'05.899"W.

N.6.2 Comparison with Prior Surveys

A comparison with prior surveys will be performed by the Atlantic Hydrographic Section as part of the office verification process.

N.7.2 Comparison with Chart and Charting Recommendations

Largest scale chart of this portion of the survey area:

Chart 13230
"Buzzards Bay"
39th ed. March 27, 1993
Scale: 1:40,000

AWOIS 7964, a 35-foot sounding charted in position 41°33'30.38"N and 070°46'07.11"W was located and found to have a least depth by pneumatic depth gauge of 10.~~8~~⁹ meters (35.~~7~~⁴ feet) in position 41°33'30.525"N and 070°46'05.899"W

It is the opinion of the hydrographer that the 35-foot sounding be retained and the geographic position be updated with the position acquired during this survey (fix 12010).

*CONCEPT
DELETE CHARTED HANG WITH A 35 FT
CLEARANCE DEPTH AND CHART A 35 FT
SOUNDING ON A ROCK (35RK) IN
LAT 41°33'30.525"N LON 70°46'05.899"W
AS SHOWN ON THE PRESENT SURVEY.*

N.1.3 Area of Investigation

AWOIS 7965

Buzzards Bay

Reported Position:

41°34'05.18"N

070°45'38.31"W

Datum: NAD27

Reported Depths: Charted 39 foot sounding. Wire drag hang at 41 feet, 44-45 foot depths exist in the vicinity.

Feature: Sounding

N.2.3 Description and Source of Item

AWOIS 7965 was a 41-foot wire drag hang, with a cleared depth of 39 feet found during survey FE161WD/1957 in position 41°34'04.8"N and 070°45'40.2"W. This area was again surveyed during H9615/1976, however was not sufficiently developed.

N.3.3 Survey Requirements

This item required 200% side scan coverage, echo sounder development and diver investigation

N.4.3 Method of Investigation

Two hundred percent side scan coverage was achieved over the entire AWOIS 7965 search radius. Only one side scan contact (500.58P) was found near the search radius for this item, and it was almost 200 meters from the geographic position given in the AWOIS listing. This item was consequently investigated with both the echosounder and SEABAT 9001 multi-beam sonar system.

N.5.3 Results of Investigation

AWOIS 7965 was logged once on side scan sonar as contact 500.58P and was subsequently found to be a small solitary boulder during development 18H1. This item was investigated both with echosounder and SEABAT. The echosounder

investigation yielded a 12.7 meter (41.7 feet) corrected depth. This contact was then investigated with SEABAT and a corrected depth of 12.6 meters (41.3 feet) was acquired. Due to the barely significant size and good returns on both echosounder and SEABAT, this item was not further developed by diver investigation.

N.6.3 Comparison with Prior Surveys

A comparison with prior surveys will be performed by the Atlantic Hydrographic Section as part of the office verification process.

N.7.3 Comparison with Chart and Charting Recommendations

Largest scale chart of this portion of the survey area:

Chart 13230
"Buzzards Bay"
39th ed. March 27, 1993
Scale: 1:40,000

AWOIS 7965, a 39-foot sounding charted in position 41°34'05.18"N and 070°45'38.31"W was located and found to have a least depth by SEABAT of 12.²~~4~~ meters (40.⁰~~7~~ feet) in position 41°34'08.⁴⁶⁵~~563~~"N and 070°45'43.⁵⁷²~~624~~"W.

It is the opinion of the hydrographer that the 39-foot ^{Wire drag} sounding be deleted and the ^(12.2m) ~~41~~-foot ^{clearance depth} survey sounding be charted in position 41°34'08.⁴⁶⁵~~563~~"N and 070°45'43.⁵⁷²~~624~~"W (fix 1302⁴~~6~~). *CONCUR*

N.1.4 Area of Investigation

AWOIS 7967

Buzzards Bay

Reported Position:

41°33'13.58"N

070°45'58.71"W

Datum: NAD27

Reported Depths: Charted 37-foot sounding. Wire drag hang at 39 feet, 46-foot depths exist in the vicinity.

Feature: Sounding

N.2.4 Description and Source of Item

AWOIS 7967 was first discovered during survey FE161WD/1957 as a 39-foot wire drag hang that was cleared to 37ft in position 41°33'13.58"N and 070°45'58.71"W. This area was later investigated during survey H9615/1976, however was not adequately developed.

N.3.4 Survey Requirements

This item required 200% side scan coverage, echo sounder development and diver investigation

N.4.4 Method of Investigation

Two hundred percent side scan coverage was achieved over the entire AWOIS 7967 search radius. Several contacts were logged which skirted the AWOIS 7967 boundary and were flagged as possible candidates for this item. These contacts were later investigated with the echosounder during developments 21G1, 22H1, and 22H2, the most significant of these also being investigated with the SEABAT 9001 multi-beam sonar system. After these developments were completed, contact 634.08S (Development 21G1) proved to be the most significant and was targeted for a diver investigation.

N.5.4 Results of Investigation

AWOIS 7967 was found to be side scan sonar contact 634.08S, and determined by divers to be a large boulder resting on a sandy bottom measuring approximately 10 feet high by 8 feet wide by 10 feet long. This contact does not fall within the search radius of AWOIS 7967, however when compared to contacts 4242.38S and 4242.39S, the only other possible candidates, contact 634.08S was the most likely of the three. The pneumatic depth gauge reading taken by divers and corrected for ^{appropriate} predicted tides was 10.1 meters (33.1 feet) in position 41°33'18.41"N and 070°46'01.57"W.

N.6.4 Comparison with Prior Surveys

A comparison with prior surveys will be performed by the Atlantic Hydrographic Section as part of the office verification process.

N.7.4 Comparison with Chart and Charting Recommendations

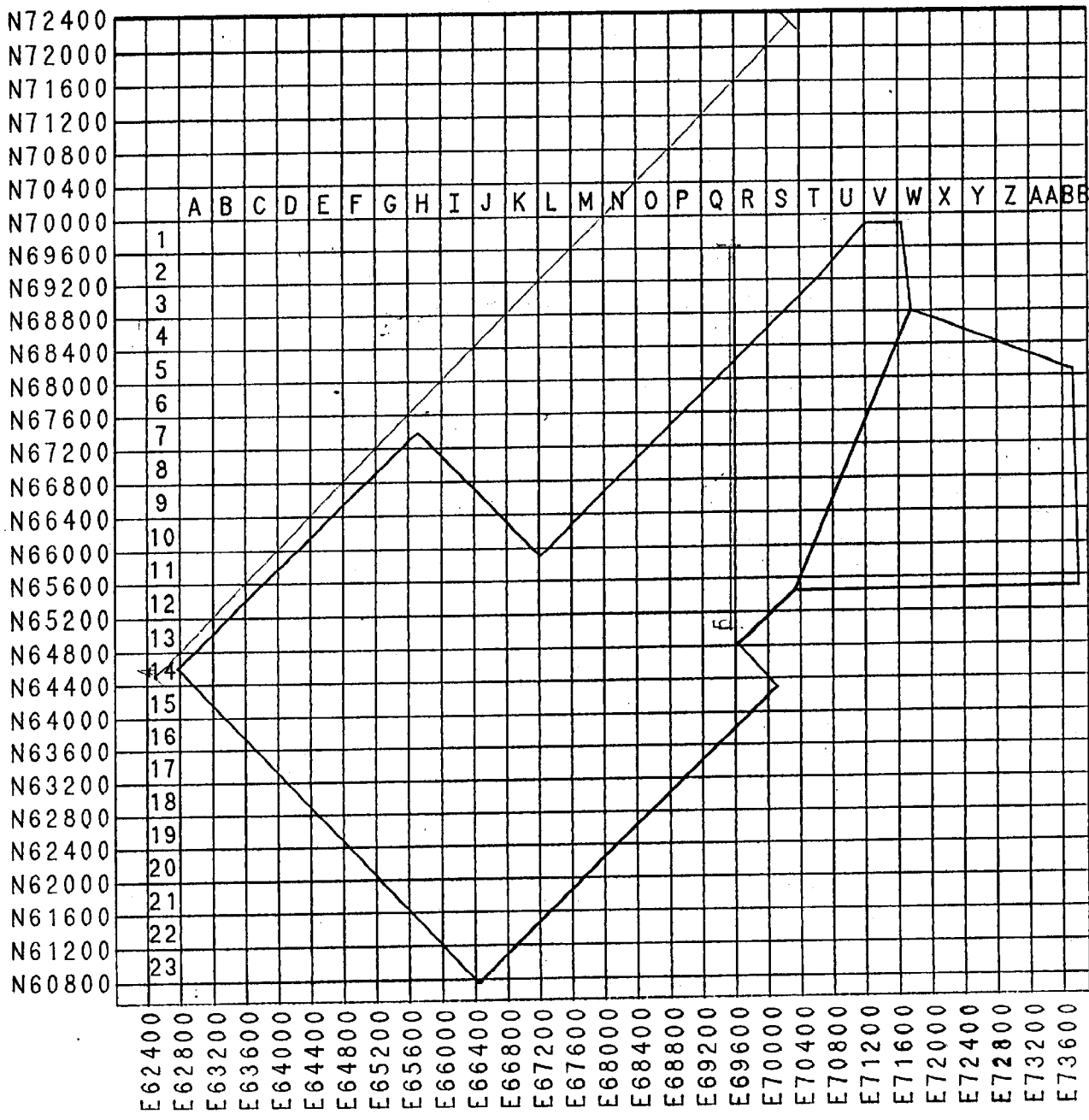
Largest scale chart of this portion of the survey area:

Chart 13230
"Buzzards Bay"
39th ed. March 27, 1993
Scale: 1:40,000

It is unclear whether contact 634.08S is the same boulder encountered in prior survey FE161WD, or if it could be either contact 4242.38S or 4242.39S. Regardless, contact 634.08S has proven to be the more significant and warrants being charted over the 37-foot sounding. This contact was found to have a least depth by pneumatic depth gauge of 10.1 meters (33.1 feet) in position 41°33'18.41"N and 070°46'01.57"W.

It is the opinion of the hydrographer that the 37-foot ^{wire drag clearance} sounding charted in position 41°33'13.58"N and 070°45'58.71"W ^{depth} be deleted, and the ^(10.1m) 33-foot depth found during this survey be charted in position 41°33'18.41"N and 070°46'01.57"W (fix 12009). *Concur Chart as a 33RK*

Development Abstract



H-10520
 HDAPS Sheets 4 and 5
 400-Meter Development Grid

DEV	Side Scan Contact Number (s)	Hydro Dev Positions	Least Depth (m)	* LD Pos	Geographic Position	Remarks
1V1	4234.09P	5076-5085	8.1 7.7	5078. 4 5	41°37'42.840"N 70°41'43.560"W	
1V2	324.31S	5086-5083	9.4 8.9	5090.2	41°37'38.489"N 70°41'45.185"W	
1V3	CHARTED DEPTH 33ft	6473-6496	11.4 11.1	6485.2	41°37'44.915"N 70°41'52.153"W	
1W1	3277.38P	5094-5103	8.0 7.4	5100.3	41°37'47.273"N 70°41'37.510"W	
2T1	287.09P	5128-5135	8.6 10.4	5134. 2 2.3	41°37'30.059"N 70°42'16.635"W	<i>.421</i> <i>15.938</i>
2T2	3280.09S	5136-5143	11.0 10.6	5136. 1 5138.2	41°37'31.435"N 70°42'15.673"W	<i>41°37'30.992</i> <i>70°42'16.443</i>
2U1	3274.49P	5190-5203	10.2	5196.3	41°37'32.382"N 70°41'56.291"W	
2U2	325.33S	5204-5211	10.3 9.9	5206.1	41°37'31.295"N 70°41'55.438"W	
2U3	CHARTED DEPTH 28ft	6513-6528	10.2	6523.2	41°37'32.956"N 70°41'59.262"W	
2V1	3269.49S	5120-5127	10.62 10.2	5124.3	41°37'28.237"N 70°41'53.833"W	
2V2	CHARTED DEPTH 28ft	6497-6500	10.3 10.1	6499. 3 4	41°37'32.175"N 70°41'56.123"W	
2V3	3269.53P	6501-6512				CONTACT NOT FOUND
2W1	3725.25S	5104-5111	8.73 8.7	5106.2	41°37'32.830"N 70°41'31.977"W	
2W2	473.23S	5112-5117	8.8 8.7	5114.0	41°37'26.300"N 70°41'28.276"W	
3S1 3W1	543.29S	5144-5151	9.1 8.8	5144.2	41°37'13.300"N 70°41'26.759"W	
3S2 3W2	3796.52S	5152-5161	10.70 10.1	5154.2	41°37'21.734"N 70°41'31.630"W	
3T1	285.42S	5170-5181	10.1	5176.2	41°37'19.948"N 70°42'27.523"W	
3T2	319.01S	5182-5189 6673-6676	8.6	5184.2	41°37'20.310"N 70°42'17.367"W	See Seabat fix 13017 13027

* LD corrected for Approved Tides

DEV	Side Scan Contact Number (s)	Hydro Dev Positions	Least Depth (m)	*LD Pos	Geographic Position	Remarks
4V1	RE-INVEST FIX 3266.3	6609-6614	8.84	6611.4	41°37'05.215"N 70°41'44.383"W	
4X1	3117.35P	4353-4364	9.1 8.9	4355.2	41°36'59.018"N 70°41'18.678"W	
5U1	478.54S	5162-5169	11.85	5164.3	41°36'53.363"N 70°42'08.017"W	
5W1	3141.47P	4658-4665	9.82	4660.2	41°36'53.697"N 70°41'29.622"W	
5W2	1665.52S	4666-4671	9.0 8.7	4666.2	41°36'55.377"N 70°41'25.463"W	
5X1	2005.47P	4365-4372	8.83	4365.3	41°36'55.848"N 70°41'21.303"W	See Seabat fix 13005
5X2	1670.55S	5050-5057	8.40	5052.2	41°36'49.978"N 70°41'21.385"W	
5Y1	1287.58S	4304-4314	6.75	4311.1	41°36'45.825"N 70°40'57.349"W	
5Y2	3066.04S	4373-4384	6.81	4397.2 79	41°36'47.330"N 70°41'01.147"W	See Seabat fix 13006
5Y3	1587.78S	5058-5067	7.4 6.5	5060.3 5062.4	41°36'46.248"N 70°40'59.154"W	See Seabat fix 13016
5Y4	RE-INVEST. FIX 4379.2	6669-6672	7.6	6671.4	41°36'47.437"N 70°41'01.065"W	
5Z1	2830.28S	4385-4394	7.85	4393.3	41°36'52.832"N 70°40'39.991"W	
5Z2	1212.53S	5044-5049	10.82	5046.2	41°36'50.952"N 70°40'33.055"W	
5AA1	2979.08P	4395-4404	8.0 7.7	4403.3	41°36'50.702"N 70°40'20.871"W	See Seabat fix 13007
5AA2	2874.08P	4405-4412	6.73	4405.4	41°36'51.421"N 70°40'13.906"W	
5BB1	1080.15S	4413-4414	6.83	4413.2	41°36'46.689"N 70°40'04.904"W	
6W1	1663.37P	4443-4450	8.0	4443.3	41°36'31.272"N 70°41'26.432"W	
6W2	2004.09P	5022-5029	10.1 9.1	5022.2 5028.0	41°36'53.697"N 70°41'29.622"W	41°36'42.732" 70°41'22.502"

* L.D. corrected for Approved tides

DEV	Side Scan Contact Number(s)	Hydro Dev Positions	Least Depth (m)	* LD Pos	Geographic Position	Remarks
6X1	3137.46S	4327-4334	8.76	4327.2 4333.5	41°36'35.014"N 70°41'17.328"W	38.087 17.200
6X2	3121.33S	5030-5035	9.81	5032.1	41°36'33.905"N 70°41'17.154"W	
6X3	3087.40P	5036-5043	10.1 9.6	5038.4	41°36'35.118"N 70°41'06.850"W	
6Y1	1722.05P	4315-4326	8.75	4323.86	41°36'31.182"N 70°40'59.090"W	
6Y2	2807.38P	4431-4442	10.83	4431.2	41°36'32.547"N 70°40'49.304"W	
6Z1	2831.45S	4288-4297	8.6	4294.3	41°36'39.581"N 70°40'39.954"W	
6Z2	2832.06P	4298-4303	8.53	4302.4	41°36'35.303"N 70°40'38.016"W	See Seabat fix 13003
6Z3	RE-INVEST. FIX 4298.4	6663-6668	7.7	6665.2	41°36'35.319"N 70°40'38.051"W	
6AA1	1799.36S	4415-4422	9.30	4421.4	41°36'37.502"N 70°40'26.941"W	
6AA2	2975.33S	4423-4430	9.1 8.8	4423.2	41°36'31.771"N 70°40'15.022"W	
6BB1	2907.00S	5068-5075	9.80	5072.2	41°36'40.258"N 70°40'11.805"W	See Seabat fix 13015
7P1	311.175S	5212-5219	10.73	5214.0	41°36'21.702"N 70°43'33.320"W	
7V1	3173.09S	4451-4458	8.84	4451.2	41°36'23.841"N 70°41'46.103"W	
7V2	1401.01S	5006-5015	9.42	5010.1	41°36'20.645"N 70°41'43.670"W	
7V3	NO NAME	5016-5021	9.73	5018.1	41°36'17.543"N 70°41'43.249"W	
7W1	1348.26S	4988-4995	9.73	4988.2	41°36'20.718"N 70°41'23.942"W	
7W2	1663.15S	4996-4999	9.1 8.8	4996.3	41°36'26.004"N 70°41'25.394"W	
7W3	NO NAME	5000-5005	8.80	5002.4	41°36'30.512"N 70°41'24.836"W	CONTACT WAS FOUND DURING 7W2 INVEST.

* L.D corrected for Approved tides

DEVELOPMENT ABSTRACT
H-10520

NOAA Ship RUDE
OPR-B616-94

DEV	Side Scan Contact Number(s)	Hydro Dev Positions	Least Depth (m)	/ LD Pos	Geographic Position	Remarks
7X1	3137.08P	4335-4344	9.3	4337.2	41°36'30.206"N 70°41'19.058"W	
7X2	2031.46S	4459-4468	9.3	4459.1	41°36'17.722"N 70°41'09.956"W	
7Y1	1738.34S	4469-4474	8.70	4469.2	41°36'26.447"N 70°40'54.557"W	
7Y2	1723.02S	4974-4979	9.6	4974.3	41°36'24.841"N 70°41'00.771"W	LARGER CONTACT FOUND, BEGIN 7Y3 INVESTIGATION.
7Y3	NO NAME	4980-4987	9.86	4974.3	41°36'24.841"N 70°41'00.771"W	
7Z1	1216.42P	4258-4267	10.80	4264.6	41°36'23.379"N 70°40'31.472"W	
7Z2	2833.27	4268-4277	9.83	4268.2	41°36'21.126"N 70°40'38.867"W	See Seabat fix 13001
7AA1	1104.38P	4278-4287	9.70	4286.2	41°36'30.587"N 70°40'17.189"W	See Seabat fix 13002
7AA2	2856.23P	4964-4973	10.70	4968.2	41°36'19.095"N 70°40'18.375"W	
7BB1	1097.27S	4475-4482	11.81	4477.2	41°36'24.729"N 70°40'09.516"W	
7BB2	1082.05S	4954-4963	9.70	4960.2	41°36'27.374"N 70°40'05.316"W	
8G1	3300.14S	6311-6322	9.72	6317.3	41°36'14.740"N 70°46'05.440"W	
8G2	CHARTED DEPTH 31ft (13.54S)	6617-6626	10.70	6619.2	41°36'17.907"N 70°46'05.325"W	
8Q1 8S-1	462.52S 3842.6	5220-5225 6603-6608	11.40	5222.0	41°36'13.101"N 70°43'07.902"W	
8V1	1620.32P	4483-4490	8.81	4483.1	41°36'11.995"N 70°41'41.520"W	
8V2	1444.57S	4906-4915	8.80	4910.3	41°36'12.888"N 70°41'49.024"W	
8W1	3125.47P	4345-4352	7.74	4345.2	41°36'06.924"N 70°41'22.565"W	See Seabat fix 13004

L.D. corrected for approved video

DEV	Side Scan Contact Number (s)	Hydro Dev Positions	Least Depth (m)	* LD Pos	Geographic Position	Remarks
8W2	1648.05S	4916-4923	7.42	4922.24	41°36'19.629"N 70°41'31.826"W	LARGER CONTACT FOUND, BEGIN 8W3 INVESTIGATION.
8W3	NO NAME	4922-4927	7.72	4924.2	41°36'17.535"N 70°41'31.761"W	
8W4	RE-INVEST. FIX 4345.2	6655-6662	7.45	6655.3	41°36'06.973"N 70°41'22.560"W	
8X1	3112.52S	4618-4623	8.3 7.9	4618.2	41°36'15.012"N 70°41'17.680"W	
8X2	3089.51P	4624-4631	7.95	4630.2	41°36'15.132"N 70°41'07.436"W	
8X3	RE-INVEST. FIX 2043.2	6649-6654	7.6	6651.3	41°36'12.915"N 70°41'05.139"W	
8Y1	2809.33P	4632-4639	8.85	4634.23	41°36'11.581"N 70°40'49.077"W	
8Y2	2054.47S	4928-4937	9.20	4930.3	41°36'09.614"N 70°40'59.049"W	See Seabat fix 13009
8Z1	2824.02P	4640-4645	9.21	4642.23	41°36'09.927"N 70°40'45.769"W	
8Z2	1218.31P	4938-4945	12.1 11.8	4938.1	41°36'06.783"N 70°40'31.206"W	
8AA1	1106.48P	4246-4257	10.2 9.8	4254.2	41°36'12.289"N 70°40'17.028"W	See Seabat fix 13000
8AA2	2973.44S	4646-4651	10.81	4646.2	41°36'13.610"N 70°40'15.608"W	
8AA3	2973.46S	4652-4657	9.93	4652.2	41°36'13.952"N 70°40'14.540"W	See Seabat fix 13010
8BB1	2900.28S	4946-4953	11.23	4948.2	41°36'11.733"N 70°40'04.121"W	
9G1	45.04S	6297-6304	11.3 10.7	6297.2	41°35'57.045"N 70°46'15.239"W	NOTHING FOUND
9H1	RE-INVEST. FIX 3396.6	6561-6566				
9K1	RE-INVEST. FIX 3264.1	6575-6576	10.9	6575.2	41°33'49.553"N 70°45'02.251"W	
9V1	1582.35S	4880-4887	9.0 8.6	4882.2 4880.1	41°35'59.927"N 70°41'43.895"W	.113 .634

* LD corrected for APPROVED TIDES

DEV	Side Scan Contact Number (s)	Hydro Dev Positions	Least Depth (m)	LD Pos	Geographic Position	Remarks
9V2	1550.07S	4888-4905	9.2 8.7	4892.2	41°36'01.299"N 70°41'50.482"W	
9W1	3136.02S	4606-4617	9.81	4610.1	41°36'03.006"N 70°41'27.907"W	
9W2	1632.06S	4598-4605	9.83	4600.24	41°35'56.338"N 70°41'35.862"W	
9W3	1632.45S	4672-4681	8.82	4680.3 4676.3	41°36'00.672"N 70°41'35.781"W	.12/ .707
9X1	1307.11S	4860-4869	8.84	4860.23	41°36'01.744"N 70°41'06.585"W	See Seabat fix 13012
9X2	1675.39S	4870-4879	9.81	4874.3	41°36'00.694"N 70°41'21.784"W	
9Y1	2793.07S	4586-4597	11.2 10.7	4594.2	41°35'56.338"N 70°41'35.862"W	54.257" 54.870"
9Y2	1726.31S	4852-4859	11.73	4854.3	41°35'54.785"N 70°41'01.696"W	
9Z1	3075.24P	4834-4841	11.0 10.6	4834.2	41°35'59.828"N 70°40'46.540"W	.510
9Z2	1785.25P	4842-4851	12.3 11.9	4844.2	41°35'59.564"N 70°40'33.590"W	
9BB1	2881.27S	4818-4825	11.2 10.7	4824.1	41°36'04.353"N 70°40'09.305"W	
9BB2	2899.24P	4826-4833	11.51	4826.2	41°36'01.595"N 70°40'07.032"W	
10F1	RE-INVEST. FIX 3329.2	6555-6560	11.6	6556.0	41°35'53.004"N 70°46'18.102"W	
10G1	3319.19P	6291-6296	11.3 10.7	6291.2	41°35'51.668"N 70°46'10.775"W	
10W1	1659.29S	4568-4577	9.81	4572.3 4574.2	41°35'51.315"N 70°41'26.106"W	.302 .067
10W2	1385.14S	4788-4799	8.81	4796.2	41°35'41.618"N 70°41'37.548"W	.339 .596
10X1	1676.58S	4800-4809	9.73	4802.3	41°35'47.216"N 70°41'21.533"W	
10X2	1998.52S	4810-4817	9.72	4814.2	41°35'50.070"N 70°41'20.849"W	

L.D. corrected for approved tide

DEV	Side Scan Contact Number (s)	Hydro Dev Positions	Least Depth (m)	* LD Pos	Geographic Position	Remarks
10Y1	1600.14S	4550-4561	11.8 ⁷	4560.1	41°35'47.641"N 70°41'02.066"W	
10Y2	3198.03P	4562-4567	10.0	4566.3	41°35'44.410"N 70°40'54.884"W	
11F1	77.47S	6285-6290	9.1 ⁵	6287.2	41°35'28.312"N 70°46'32.585"W	See seabat fix 13025
11I1	RE-INVEST. FIX 3465.3	6567-6574				Nothing found
11V1	1625.08S	4772-4779	11.8 ⁷	4774.2	41°35'27.806"N 70°41'42.630"W	
11V2	1950.51S	4780-4787	10.8 ⁷	4782.2	41°35'30.154"N 70°41'43.277"W	
11W1	3155.56S	4750-4759	9.8 ²	4754.3	41°35'35.090"N 70°41'35.015"W	
11W2	1992.22P	4760-4771	10.2 ⁰	4766.3	41°35'38.419"N 70°41'24.899"W	
11X1	1709.17S	4736-4743	10.2 ^{9.8}	4742.3 4740.3	41°35'29.366"N 70°41'04.660"W	.175 .118
11X2	1705.11S	4744-4749	10.0 ^{9.6}	4744.2	41°35'31.201"N 70°41'11.919"W	
11Y1	1299.21S	4542-4549	6.9	4544.3	41°35'37.607"N 70°41'03.065"W	
11Y2	3055.51P	4728-4735	7.8 ⁰	4728.1	41°35'39.787"N 70°40'56.519"W	
11Y3	RE-INVEST. FIX 4544.3	6643-6648	7.3 ^{6.3}	6643.3	41°35'37.442"N 70°41'03.230"W	
11AA1	1603.31S	4578-4585	11.1 ^{10.6}	4580.2	41°35'27.152"N 70°40'30.050"W	See Seabat fix 13008
11AA2	2986.31P	4722-4727	15.0 ^{14.8}	4722.5	41°35'29.771"N 70°40'20.644"W	
12E1	3356.39P	6277-6284	10.8 ⁰	6281.2	41°35'20.181"N 70°46'48.183"W	
12S1	240.33S	6305-6310	N/A	N/A	N/A	CONTACT NOT FOUND
12V1	1626.09S	4491-4502	12.8 ^{13.1}	4501.2	41°35'18.534"N 70°41'41.527"W	

* LD corrected for approved tides

DEV	Side Scan Contact Number (s)	Hydro Dev Positions	Least Depth (m)	LD Pos	Geographic Position	Remarks
12W1	1996.22P	4526-4541	10.84	4536.1 4526.2	41°35'23.868"N 70°41'21.982"W	.487 .575
12Y1	3034.08P	4714-4721	9.75	4718.2 3	41°35'22.457"N 70°40'53.083"W	
12Z1	1789.54S	4696-4703	9.6	4700.2	41°35'19.105"N 70°40'36.110"W	
12Z2	1251.38S	4704-4713	9.0 8.9	4704.3	41°35'21.659"N 70°40'43.258"W	
12AA1	2842.03P	4682-4687	9.9	4682.3	41°35'19.758"N 70°40'25.116"W	See Seabat fix 13011
12AA2	1791.31S	4688-4695	11.9	4688.2	41°35'25.236"N 70°40'27.901"W	
14A1	4212.43P	5820-5829	9.60	5824.2	41°34'56.739"N 70°47'55.792"W	
14A2	3287.28S	5830-5835	10.0 9.5	5830.2	41°34'53.843"N 70°47'53.872"W	
14N1	RE-INVEST. FIX 3920.2	6583-6590				Nothing found
14P1	708.515S	5226-5231	N/A	N/A	N/A	CONTACT NOT FOUND
14Q1	776.485S	5232-5237	N/A	N/A	N/A	CONTACT NOT FOUND
14Q2	RE-INVEST. FIX 4095.2	6597-6602				Nothing found
15A1	3224.53P	5836-5851	9.5 8.9	5848.3	41°34'44.809"N 70°47'51.261"W	See Seabat fix 13023
15E1	RE-INVEST. FIX 3491.6	6545-6554				Nothing found
15G1	259.43S	5870-5879	10.83	5876.2	41°34'36.384"N 70°46'05.902"W	
15G2	296.31P	5880-5887	11.84	5884.2	41°34'34.689"N 70°46'01.846"W	
15G3	3587.16S	5888-5897	12.2 11.7	5894.1	41°34'35.403"N 70°46'03.252"W	
15N1	651.33S	5256-5263	11.2 10.9	5260.2	41°34'41.079"N 70°44'09.675"W	
15P1	RE-INVEST. FIX 4079.1	6591-6596				Nothing found

L.D. corrected for Approved Tides

DEV	Side Scan Contact Number (s)	Hydro Dev Positions	Least Depth (m)	* LD Pos	Geographic Position	Remarks
15R1	1070.46S	5238-5243	10.85	5238.3	41°34'38.626"N 70°42'57.078"W	
15R2	824.29S	5244-5255	10.73	5248.1	41°34'44.468"N 70°43'01.678"W	
16G1	3587.03P	5898-5909	13.0 12.5	5900.2	41°34'34.203"N 70°46'07.126"W	CONTACT NOT FOUND
16G2	296.24S	6266-6276	N/A	N/A	N/A	
17G1	3685.38P	5852-5859	13.3 12.7	5854.2	41°34'19.589"N 70°46'04.796"W	
16L1	RE-INVEST. FIX 622.3	6577-6582				Nothing found
17O1	4163.46S	5529-5534	11.81	5529.2	41°34'12.596"N 70°43'42.917"W	
17P1	1067.12	5272-5281	10.83	5274.2	41°34'11.718"N 70°43'32.430"W	
17Q1	4197.04S	5264-5271	N/A	N/A	N/A	CONTACT NOT FOUND
18H1	500.58P	5860-5869	12.83	5866.2	41°34'08.598"N 70°45'43.671"W	See Seabat fix 13024 13026
18I1	CHARTED DEPTH 39ft	6529-6544	13.5	6529.2	41°34'07.514"N 70°45'36.468"W	
18O1	4165.05S	5535-5542	12.1 11.6	5537.2	41°34'02.750"N 70°43'54.630"W	
18O2	4191.11P	5543-5550	11.1 10.6	5547.1	41°34'02.451"N 70°43'46.520"W	See Seabat fix 13018
18O3	CHARTED DEPTH 31ft (852.31S)	6633-6642	11.76	6641.2	41°34'01.231"N 70°43'45.107"W	
18P1	1044.49P	5523-5528	10.84	5523.2	41°34'07.903"N 70°43'39.921"W	
19H1	3867.16P	5687-5692	N/A	N/A	N/A	CONTACT NOT FOUND
19J1	3264.30S	5591-5596	11.83	5591.2	41°33'47.132"N 70°45'06.867"W	
19K1	4070.16P	5551-5558	10.83	5553.2	41°33'44.832"N 70°44'59.986"W	
19K2	NO NAME	5559-5570	11.0 10.5	5559.3	41°33'42.598"N 70°45'03.688"W	

* (L.D) corrected for approved notes

DEVELOPMENT ABSTRACT
H-10520

NOAA Ship RUDE
OPR-B616-94

DEV	Side Scan Contact Number(s)	Hydro Dev Positions	Least Depth (m)	* LD Pos	Geographic Position	Remarks
19M1	833.29S	5571-5582	11.84	5573.2	41°33'42.553"N 70°44'26.076"W	
19M2	4170.01P	5583-5590	12.3 11.9	5583.3	41°33'41.891"N 70°44'17.441"W	
19O1	291.09S	5681-5686	13.4 12.9	5681.1	41°33'54.094"N 70°46'52.984"W	
20F1	572.51S	5675-5680	N/A	N/A	N/A	CONTACT NOT FOUND
20G1	574.43P	5665-5666	11.44	5665.2	41°33'30.538"N 70°46'05.847"W	See Seabat fix 13021
20G2	574.44P	5667-5674	12.2 11.9	5667.3	41°33'31.283"N 70°46'06.364"W	See Seabat fix 13022
20K1	817.33P	5597-5602	11.5	5599.1	41°33'32.843"N 70°44'47.987"W	
20K2	4069.18S	5603-5612	12.86	5609.3	41°33'35.154"N 70°45'05.700"W	
21G1	634.08S	5647-5654	10.85	5649.2	41°33'18.373"N 70°46'01.691"W	See Seabat fix 13020
21G2	574.10P	5655-5664	12.8	5661.4	41°33'27.847"N 70°46'10.968"W	
21L1	846.55S	5619-5624	11.7	5619.0	41°33'22.975"N 70°44'34.070"W	
21M1	879.355P	5613-5618	13.6	5615.0	41°33'29.994"N 70°44'23.315"W	
22H1	4242.38S	5631-5640	11.84	5632.0	41°33'18.133"N 70°45'55.917"W	See Seabat fix 13019
22H2	4242.39S	5641-5646	N/A	N/A	N/A	CONTACT NOT FOUND
23I1	RE-INVEST FIX 784.3	6627-6632				Nothing found
23J1	843.44S	5625-5630	N/A	N/A	N/A	CONTACT NOT FOUND

* LD. corrected for Approved tides

SEABAT 9001 DEVELOPMENT ADDENDUM
H-10520

NOAA SHIP RUDE
OPR-B616-RU-94

SHEET	CONTACT	FILE	VELOC	DEV.	FIX #	DN	GMT	RAW DEPTH	TIDE CORR.	LEAST DEPTH	LATITUDE	LONGITUDE
5	1106.48P	1305061M	94129125	8AA1	13000	130	141639	10.7	-0.6	10.1	41°36'12.322"N	070°40'16.954"W
5	2833.27P	1305705M	94129125	7Z2	13001	130	155956	9.4	-0.2	9.2	41°36'12.136"N	070°40'38.742"W
5	1104.38P	1306148M	94129125	7AA1	13002	130	170518	9.2	+0.0	9.2	41°36'30.595"N	070°40'16.995"W
5	2832.06P	1306779M	94129125	6Z2	13003	130	185925	7.5	-0.2	7.3	41°36'35.355"N	070°40'37.841"W
5	3125.47P	1308010M	94129125	8W1	13004	130	222531	8.4	-1.0	7.4	41°36'07.018"N	070°41'22.504"W
5	2005.47P	1314816M	94129125	5X1	13005	131	132319	9.4	-1.1	8.3	41°36'55.840"N	070°41'21.346"W
5	3066.04S	1315025M	94129125	5Y2	13006	131	140324	7.3	-0.9	6.4	41°36'47.217"N	070°41'01.078"W
5	2979.08P	1315582M	94129125	5AA1	13007	131	153506	8.4	-0.5	7.9	41°36'50.630"N	070°40'20.746"W
5	1603.31S	1365870M	94136130	11AA	13008	136	161844	11.9	-0.9	11.0	41°35'27.113"N	070°40'29.891"W
5	2824.02P	1367509M	94136130	8Z1	13009	136	205211	9.7	-0.1	9.6	41°36'10.147"N	070°40'45.828"W
5	2973.46S	1367873M	94136130	8AA3	13010	136	220120	9.6	-0.1	9.5	41°36'14.052"N	070°40'14.445"W
5	2842.03P	1375022M	94136130	12AA	13011	137	141107	10.6	-0.6	10.0	41°35'19.845"N	070°40'24.946"W
5	1307.11S	13877008	94136130	9X1	13012	138	212410	9.2	-0.4	8.8	41°36'01.688"N	070°41'06.512"W
5	n/a	1394988M	94136130	8W3	13013	139	135149	7.5	-0.2	7.3	41°36'17.629"N	070°41'31.653"W
5	n/a	1396449M	94136130	7W3	13014	139	175539	9.8	-1.0	8.8	41°36'30.588"N	070°41'24.844"W
5	2907.00S	13981195	94136130	6BB1	13015	139	223341	10.0	-0.4	9.6	41°36'40.378"N	070°40'11.577"W
5	1587.78S	1397810M	94136130	5Y3	13016	139	215954	7.4	-0.6	6.8	41°36'45.942"N	070°40'58.468"W
4	319.01S	1406381M	94136130	3T2	13017	140	174400	9.9	-0.9	9.9 /	41°37'20.339"N	070°42'17.522"W
4	4191.11P	1445276M	94143132	1802	13018	144	143927	11.4	-0.3	11.1	41°34'02.345"N	070°43'46.343"W
4	4242.38P	1447313M	94143132	22H1	13019	144	202254	12.4	-0.7	11.7	41°33'16.548"N	070°45'58.304"W
4	634.08S	14476961	94143132	21G1	13020	144	221317	11.5	-1.0	10.5	41°33'18.268"N	070°46'01.668"W
4	574.43P	14480053	94143132	20G1	13021	144	221437	12.6	-1.3	11.3	41°33'30.427"N	070°46'06.013"W
4	574.44P	14482251	94143132	20G2	13022	144	225107	13.6	-1.4	12.2	41°33'31.889"N	070°46'06.393"W
4	3224.53P	1455096M	94143132	15A1	13023	145	141000	10.1	-0.3	9.8	41°34'44.666"N	070°47'51.356"W
4	500.58P	14555686	94143132	18H1	13024	145	152837	12.9	-0.7	12.2	41°34'08.465"N	070°45'43.572"W
4	77.47S	1464908M	94143132	11F1	13025	146	140606	11.0	-1.1	9.9	41°35'28.422"N	070°46'32.578"W
4	500.58P	15469863	94152141	18H1	13026	154	192506	13.4	-1.0	12.4	41°34'08.562"N	070°45'43.944"W
4	319.01S	1615057M	94152141	3T2	13027	161	274400	10.1	-0.9	9.9 /	41°37'20.117"N	070°42'17.265"W

NOTE: ALL DEPTHS ARE IN METERS.

* Excess level 0 depths corrected for appeared tides (only)

O. COMPARISON WITH THE CHART *See also the Evaluation Report*

O.1 Charts affected by this survey are:

Chart 13229 SC

"South Coast of Cape Cod and Buzzards Bay"

25th ed. March 27, 1993

Scale: 1:40,000

Chart 13230

"Buzzards Bay"

39th ed. March 27, 1993

Scale: 1:40,000

Chart 13218

"Block Island to Martha's Vineyard"

32st ed. June 26, 1993

Scale: 1:80,000

O.2 On July 22, 1994, a Danger to Navigation Report was sent to the Commander, First Coast Guard District, outlining charting discrepancies found during this survey, as well as representative shoal depths discovered in the previously un-surveyed dumping grounds south of Cleveland Ledge East Light.

See*Appendix I for a complete copy of the Danger to Navigation Report, the details of which are summarized below:

** Appended to this Report*

REPORT OF DANGER TO NAVIGATION

* THESE UPDATED DEPTHS AFFECT THE FOLLOWING CHARTS:

Chart 13229 (25th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13230 (39th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13218 (31st ed. 11 January 92)
Chart Scale 1:80,000

**DEPTH (MLLW)	LATITUDE	LONGITUDE	Chart UPDATE LETTERS	REFERENCE LETTERS
33 ft	41°-33'-18.4"N	070°-46'-01.6"W	D	AWOS 7967
33 35 ft	41°-35'-24.9"N	070°-46'-48.6"W	E	
35 34 ft	41°-33'-49.5"N	070°-45'-02.2"W	F	
38 ft	41°-33'-18.1"N	070°-45'-24.3"W	W	(Chart 13230 only)
29 ft	41°-37'-09.4"N	070°-41'-36.4"W	G	
26 ft	41°-36'-50.4"N	070°-41'-43.1"W	H	
26 27 ft	41°-36'-50.8"N	070°-41'-21.4"W	I	
20 21 ft	41°-36'-47.1"N	070°-40'-56.4"W	J	
20 22 ft	41°-36'-46.7"N	070°-40'-04.9"W	K	
28 ft	41°-36'-44.0"N	070°-41'-20.4"W	W	CHART NO CHANGE ON 13230 CHARTS 13229 + 13218
24 26 ft	41°-36'-35.3"N	070°-40'-38.0"W	L	
26 27 ft	41°-36'-12.9"N	070°-41'-49.0"W	M	
24 ft	41°-36'-07.0"N	070°-41'-22.6"W	X	CHART NO CHANGE ON 13230 CHARTS 13229 + 13218
30 31 ft	41°-36'-09.9"N	070°-40'-45.8"W	N	
30 32 ft	41°-36'-14.0"N	070°-40'-14.5"W	P	
35 34 ft	41°-35'-44.9"N	070°-42'-20.7"W	Q	
26 28 ft	41°-35'-41.3"N	070°-41'-37.6"W	R	
20 21 ft	41°-35'-43.6"N	070°-41'-00.3"W	S	
35 34 ft	41°-35'-27.2"N	070°-42'-26.0"W	T	
37 ft	41°-35'-36.9"N	070°-42'-10.2"W	Y	CHART NO CHANGE ON 13230 CHARTS 13229 + 13218
29 30 ft	41°-35'-28.0"N	070°-41'-05.3"W	U	
35 36 ft	41°-35'-27.2"N	070°-40'-30.0"W	V	

* Updated depths should be viewed as preliminary information, subject to office review.

** Depths reduced to MLLW using ^{approved} predicted tides.

~~***~~ See also Evaluation Report, Section C. + Memorandum + Chartlets

THESE DEPTHS ARE TO BE DELETED
FROM THE FOLLOWING CHARTS:

Chart 13229 (²⁵24th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13230 (39th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13218 (31st ed. 11 January 92)
Chart Scale 1:80,000

DEPTH (MLLW)	LATITUDE	LONGITUDE
28 ft	41°-36'-46.0"N	070°-46'-05.0"W
37 ft	41°-33'-13.6"N	070°-45'-58.7"W

*
Chart Update
Reference Letters

NOT FOUND ON
CHARTS

X Chart 13230
Z Chart 13218
13229

0.3 The overall correlation between charted depths and survey soundings is excellent, with average differences of approximately one foot in flat and slightly sloping areas, and no more than two to three feet in areas of irregular bottom topography. *concur*

0.4 The correlation between charted shoal areas and corresponding soundings from this survey is also excellent. See sections 0.2 and 0.3 for discrepancies and additions to the chart. *concur*

0.5 Chart 13230, 39th ed. March 27, 1992, and Chart 13228, 9th ed. June 13, 1992, are the main operating charts used by mariners in this area. Since the primary navigation system in the bay is still LORAN-C, it would be beneficial to have the LORAN-C time delay grid overlaid on these charts. In addition, the latitude and longitude scales in their present format are cumbersome to use, since they are only broken down into whole minutes, rather than tenths of minutes.

P. ADEQUACY OF SURVEY *See also the Evaluation Report*

P.1 All items investigated during this survey have been addressed.

* *See also the Evaluation Report, Section 0. and Memorandum*

P.2 This survey is complete and contains no substandard data. AWOIS investigations were limited to the confines of the navigable area corridor.

Q. AIDS TO NAVIGATION

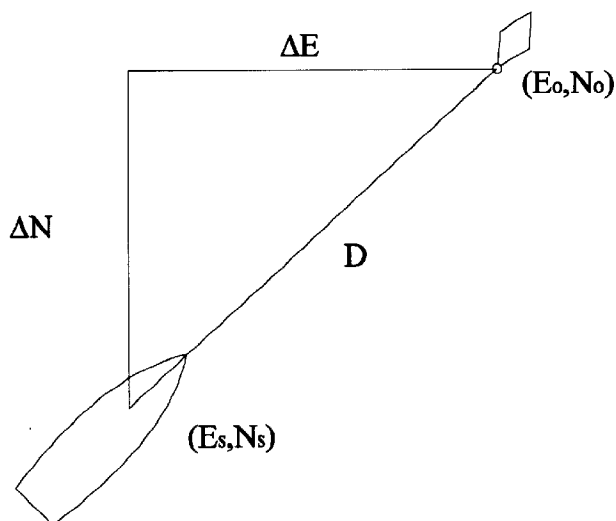
Q.1 The RUDE conducted no correspondence with the U.S. Coast Guard regarding floating aids to navigation.

Q.2 There are five floating aids to navigation within this survey. In U.S. Coast Guard Light List Volume 1, Atlantic Coast, they are identified as the following:

Light No.	Name	Published Position	Surveyed Position	
16085	*Cleveland East Ledge Light	41°37.9'N 070°41.7'W	41°37'51.56"N 070°41'39.00"W	.466" .044"
16070	Buzzards Bay Lighted Bell Buoy 11	41°36.5'N 070°43.6'W	41°36.45'N 070°43.54'W	27.446" 32.403"
16075	Buzzards Bay Obstruction Lighted Buoy 12	41°37.4'N 070°42.4'W	41°37.38'N 070°42.32'W	22.896" 19.824"
16080	Buzzards Bay Shoal Lighted Buoy 14	41°37.6'N 070°42.0'W	41°37.58'N 070°42.00'W	35.005" 00.766"
16105	Lighted Buoy 1	41°37.8'N 070°41.9'W	41°37.84'N 070°41.94'W	50.518" 56.690"
16110	Lighted Bell Buoy 2 West of Shoal	41°37.9'N 070°41.8'W	41°37.90'N 070°41.73'W	54.266" 43.803"

The observed characteristics of these buoys agreed with their published characteristics. As for their position verification, detached positions were obtained for all of the buoys. This was completed by maneuvering RUDE as close as possible to the buoy and then taking several detached positions. At the same time the distance and bearing of the ship's bow was estimated to the aid. This distance was corrected for the position of the transducer and applied to the detached position to compute the "true" position, as illustrated in the following diagram:

* FINAL POSITION USED WAS NGS POSITION: 41° 37' 51.46867" N
ON SURVEY 70° 41' 39.04278" W



ΔE = The difference between the easting of the ship and the easting of the object.

ΔN = The difference between the northing of the ship and the northing of the object.

D = The distance from the bow of the ship to the object plus 10.13 M (10.13 M is the distance from the GPS antennae to the bow.)

(E_s, N_s) = The easting and northing of the ship.

(E_o, N_o) = The easting and northing of the object

Θ = The angle measured from the ship's position (North or South, $0^\circ - 90^\circ$) to the position of the object.

$$\begin{aligned} E_o &= \Delta E + E_s \\ &= D \sin \Theta + E_s \end{aligned}$$

$$\begin{aligned} N_o &= \Delta N + N_s \\ &= D \cos \Theta + N_s \end{aligned}$$

As can be seen in the table above, positions computed in this manner agree well with their published positions. *THESE AIDS APPEAR ADEQUATE TO SERVE THEIR INTENDED PURPOSES.*

Q.2.1 There was one non-floating aid to navigation, Cleveland East Ledge Light House, found within this survey. Since the water immediately surrounding the light house was sufficiently deep, RUDE took detached positions on the light house in a manner similar to that for buoys. Four detached positions were recorded for this item, one was taken on the south side of the light house with the ship's head in the north direction another on the north side facing south and so on at each of the major axis of the compass. Two were recorded on DN 091 using the Montauk, New York Differential GPS radio beacon and two were taken on DN 102 using the Portsmouth, New Hampshire Differential GPS radio beacon. The four detached positions were corrected for the estimated range and recorded azimuth, and all four averaged to arrive at a corrected position for this light house. For the position comparison see the table in section Q.2 above.

Q.3 There were no aids to navigation other than those listed in the Light List found within the boundaries of this survey. *CONCUR*

Q.4 No bridges, overhead cables or overhead pipelines are located within the survey area. *CONCUR*

Q.5 No pipelines or designated ferry routes are located within the survey area. *CONCUR*

Q.6 No ferry terminals are located within the survey area. *CONCUR*

R. STATISTICS

R.1 a. Number of Position	6826
b. Lineal Nautical Miles of Sounding Lines:	
Nautical Miles of Survey With the Use of Side Scan Sonar	361.17
Nautical Miles of Survey Without the Use of Side Scan Sonar	338.80
R.2 a. Square Nautical Miles of Hydrography per 100% of Coverage	15.60
b. Days of Production	49
c. Detached Positions	111
- 2 for diver investigations	
- 5 for floating aids to navigation	
- 4 for non-floating aids to navigation	
- 100 for bottom samples	
d. Bottom Samples	100
e. Tide Stations	1
f. Current Stations	0
g. Velocity Casts	11
h. Magnetic Stations	0
i. XBT Drops	0

S. MISCELLANEOUS *See also the Evaluation Report*

S.1 a. No evidence of silting was found during this survey.

b. No evidence of unusual submarine features was found during this survey.

c. On DN 145, RUDE was conducting mainscheme hydro splits on HDAPS Sheet 4 during a full moon. The full moon coupled with severe thunderstorms produced "fingers" in our smooth depth plots reflecting the anomalous tides experienced on this day, as well as on DN 143 and 144 preceding the full moon.

d. No observations of unusual currents were recorded during this survey.

e. No evidence of magnetic anomalies was found during this survey.

S.2 One hundred bottom samples were obtained during this survey. As directed in the project instructions they were inspected, recorded and not submitted to the Smithsonian Institution.

T. RECOMMENDATIONS

T.1 See section 0.2 for dangers to navigation noted during this survey.

T.2 RUDE is aware of no construction or dredging that will affect results of this survey.

T.3 No further investigation of the survey area is recommended, except those items noted in section 0.2.

U. REFERRAL TO REPORTS

No reports have been published which are not contained within this Descriptive Report.

APPENDIX III

LIST OF HORIZONTAL CONTROL STATIONS

No horizontal control stations were needed for this survey as Differential GPS was employed exclusively for all positioning control. The geographic positions for the two Differential GPS radio beacons used during this survey are as follows:

Montauk Point, NY (MPRB)

41° 04' 02.04711" N
~~41° 01' 02.05" N~~
071° 51' 38.27" W

Portsmouth, NH

15.064
43° 04' ~~12.00~~" N
070° 42' ~~30.00~~" W
36.805

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

NOAA FORM 76-40 (8-74)
SUPERSEDES NOAA FORM 76-40 (2-71) WHICH IS OBSOLETE, AND EXISTING STOCK SHOULD BE DESTROYED UPON RECEIPT OF REVISION.

* THESE UPDATED DEPTHS AFFECT THE FOLLOWING CHARTS:

Chart 13229 (25th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13230 (39th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13218 (³¹~~39~~st ed. 11 January 92)
Chart Scale 1:80,000

** DEPTH (MLLW)	LATITUDE	LONGITUDE
33 34 ft	41°-33'-18.8"N	070°-46'-01.7"W
33 35 ft	41°-35'-24.9"N	070°-46'-48.6"W
35 34 ft	41°-33'-49.5"N	070°-45'-02.2"W
38 ft	41°-33'-18.1"N	070°-45'-24.3"W
29 ft	41°-37'-09.4"N	070°-41'-36.4"W
26 ft	41°-36'-50.4"N	070°-41'-43.1"W
26 27 ft	41°-36'-50.0"N	070°-41'-21.4"W
20 21 ft	41°-36'-47.1"N	070°-40'-56.4"W
30 22 ft	41°-36'-46.7"N	070°-40'-04.9"W
28 ft	41°-36'-44.0"N	070°-41'-20.4"W
24 26 ft	41°-36'-35.3"N	070°-40'-38.0"W
26 27 ft	41°-36'-12.9"N	070°-41'-49.0"W
24 ft	41°-36'-07.0"N	070°-41'-22.6"W
30 31 ft	41°-36'-09.9"N	070°-40'-45.8"W
30 32 ft	41°-36'-14.0"N	070°-40'-14.5"W
35 34 ft	41°-35'-44.9"N	070°-42'-20.7"W
26 28 ft	41°-35'-41.3"N	070°-41'-37.6"W
20 21 ft	41°-35'-43.6"N	070°-41'-00.3"W
35 34 ft	41°-35'-27.2"N	070°-42'-26.0"W
37 ft	41°-35'-36.9"N	070°-42'-10.2"W
29 30 ft	41°-35'-28.0"N	070°-41'-05.3"W
35 36 ft	41°-35'-27.2"N	070°-40'-30.0"W

* Updated depths should be viewed as preliminary information, subject to office review.

** Depths reduced to MLLW using ^{approved}~~predicted~~ tides.

DEPTHS TO BE DELETED FROM THE FOLLOWING CHARTS:

Chart 13229 (25th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13230 (39th ed. 27 March 93)
Chart Scale 1:40,000

Chart 13218 (~~3rd~~^{2nd} ed. 11 January 92)
Chart Scale 1:80,000

DEPTH (MLLW)	LATITUDE	LONGITUDE
28 ft	41°-36'-46.0"N	070°-46'-05.0"W
37 ft	41°-33'-13.6"N	070°-45'-58.7"W

NOT ON CHART AT
THIS POSITION

Please contact either of the following personnel for further information:

Commanding Officer
NOAA Ship RUDE
16 Sconticut Neck. Rd
#244
Fairhaven, MA. 02719
508-979-0600

Chief, Atlantic Hydrographic Section
Atlantic Marine Center
439 W. York St
Norfolk, VA. 23510
804-441-6746

Sincerely,

Daniel R. Herlihy

Daniel R. Herlihy
Lieutenant Commander, NOAA
Commanding Officer, NOAA Ship RUDE

OPR-B616-RU-94

H-10520

RU-10-1-94

MASSACHUSETTS-BUZZARDS BAY

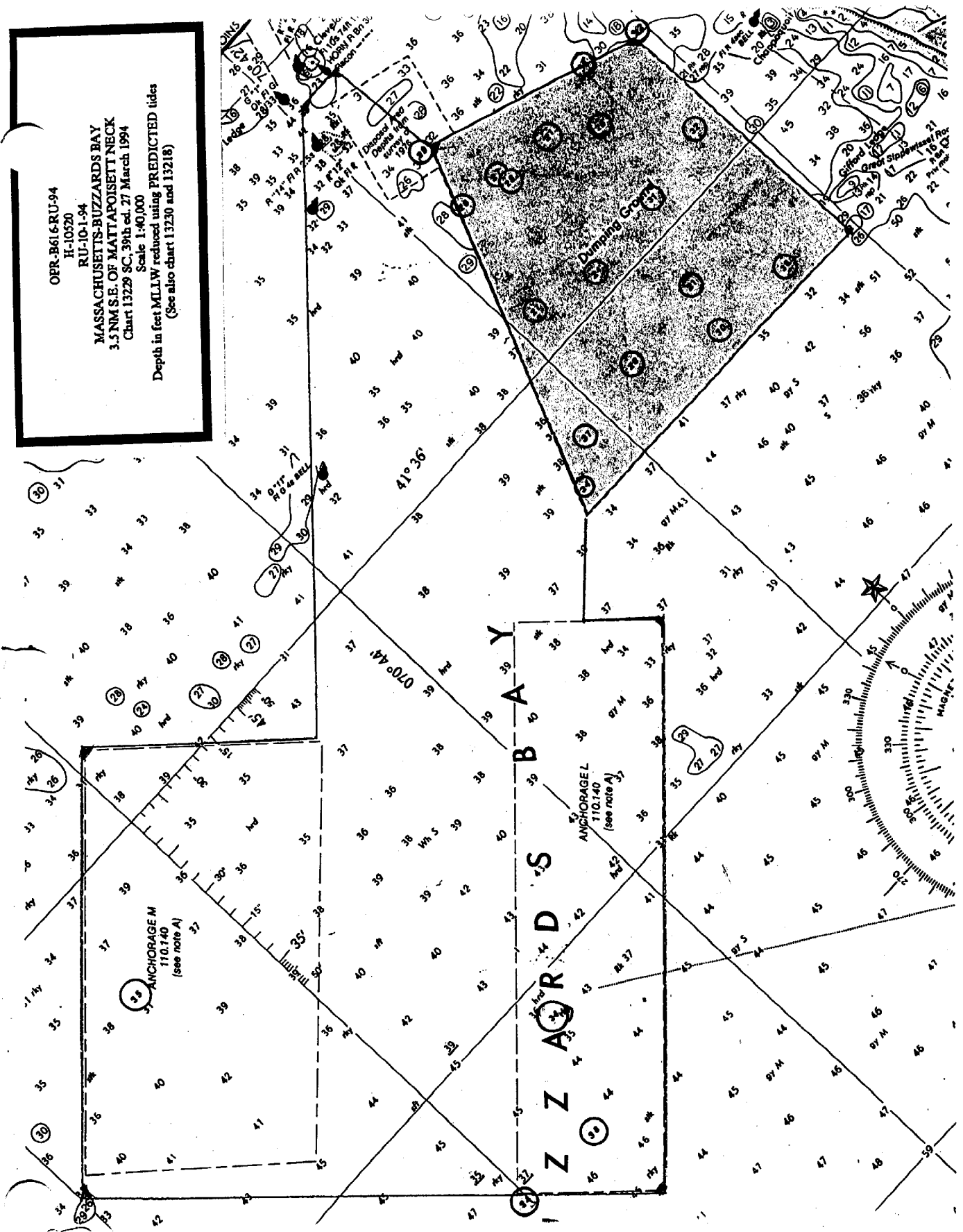
3.5 NM S.E. OF MATTAPOISETT NECK

Chart 13229 SC, 39th ed. 27 March 1994

Scale 1:40,000

Depth in feet MLLW reduced using PREDICTED tides

(See also chart 13230 and 13218)



B616-RU-94
H-10520
DIVE INVESTIGATION REPORT
AWOIS 7967 37' SOUNDING
DIVE 154/1

DATE: June 3, 1994 DN: 154

DIVEMASTER/TENDER - ST HARDISON

DIVERS - LCDR HERLIHY

COXSAIN/TENDER - SS BRAWLEY

- ENS HAUPT

VISIBILITY: 10 FEET

CURRENT: 0.0 KTS

MAXIMUM DEPTH: 46 FEET

BOTTOM TIME: 12 MIN.

METHOD OF POSITION DETERMINATION: DETACHED POSITION

HDAPS POSITION: DSF FIX - 12003 PNEUMATIC DEPTH GAUGE FIX - 12010

EASTING: 65525.2

NORTHING: 61651.6

LATITUDE: 41°33'18.415"N

LONGITUDE: 070°46'01.570"

AVERAGE LEAST DEPTH BY PNEUMATIC DEPTH GAUGE: 10.4

TIME OF READING: 1505 UTC

PNEUMATIC DEPTH GAUGE CORRECTOR:

0.0

approx
~~PREDICTED~~ TIDAL ZONE CORRECTOR:

-0.3

LEAST DEPTH DETERMINED AT MLLW

10.1

(33 ft)

NARRATIVE REPORT: The object of this dive was AWOIS 7967, which was discovered originally during a wire drag investigation (FE161WD) in 1957 and determined to be an obstruction at a depth of 39 feet. This obstruction was investigated again in 1976 during basic survey H-9615 but not developed adequately.

The dive buoy was dropped in position E = 65522.4 and N = 61650.3. A large rock was found approximately 2 meters north of the buoy anchor. The rock had a large base, approximately 3.5 meters in diameter, and a pinnacle at the top. A least depth by pneumatic depth gauge of 10.4 meters was taken at the pinnacle, and a detached position was later obtained by the ship. The visibility at the time of the dive was 8-12 feet. The surrounding bottom in this area was covered with pebbles and sand, with an average depth of 46 feet by diver's depth gauge

B616-RU-94
H-10520
DIVE INVESTIGATION REPORT
AWOIS 7964 35' SOUNDING
DIVE 154/2

DATE: June 3, 1994 DN: 154

DIVEMASTER/TENDER - CB PRINGLE

DIVERS - LCDR HERLIHY

COXSAIN/TENDER - SS BRAWLEY

- ENS HAUPT

VISIBILITY: 10 FEET

CURRENT: 0.5 KTS

MAXIMUM DEPTH: 49 FEET

BOTTOM TIME: 7 MIN.

METHOD OF POSITION DETERMINATION: DETACHED POSITION

HDAPS POSITION: DSF FIX - 12007 PNEUMATIC DEPTH GAUGE FIX - 12011

EASTING: 65424.6

NORTHING: 62025.1

LATITUDE: 41°33'30.525"N LONGITUDE: 070°46'05.899"

AVERAGE LEAST DEPTH BY PNEUMATIC DEPTH GAUGE: 11.2

TIME OF READING: 1534 UTC

PNEUMATIC DEPTH GAUGE CORRECTOR:

0.0

Approved
~~PREDICTED~~ TIDAL ZONE CORRECTOR:

-0.4 -0.3

LEAST DEPTH DETERMINED AT MLLW

10.8

NARRATIVE REPORT: The object of this dive was AWOIS 7964, which was discovered originally during a basic survey (H-3391) in 1912 and determined to be an obstruction at a depth of 36 feet. This obstruction was investigated again in 1957 and in 1976 but the area was not adequately developed.

The dive buoy was dropped in position *41°33'30.528"N 070°46'05.847"W* E = 65425.8 and N = 62025.5. An extremely large rock was found where the buoy anchor came to rest. The rock had a large base, approximately 9 meters in diameter, and a pinnacle at the top. A least depth by pneumatic depth gauge of 11.2 meters was taken at the pinnacle, and a detached position was later obtained by the ship. The visibility at the time of the dive was 8-12 feet. The surrounding bottom in this area was covered with smaller rocks and sand, with an average depth of 49 feet by diver's depth gauge

APPENDIX VII

APPROVAL SHEET

LETTER OF APPROVAL

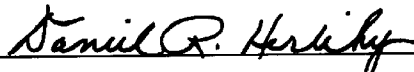
REGISTRY NO. H-10496

This report and the accompanying field sheets are respectfully submitted.



Richard T. Brennan, LT(jg), NOAA
Field Operations Officer
NOAA Ship RUDE

Field operations contributing to the accomplishment of this survey were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and field sheets have been closely reviewed and are considered complete and adequate for nautical charting.



Daniel R. Herlihy, LCDR, NOAA
Commanding Officer
NOAA Ship RUDE



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: November 9, 1994

MARINE CENTER: Atlantic

HYDROGRAPHIC PROJECT: OPR-B616

HYDROGRAPHIC SHEET: H-10520

LOCALITY: Massachusetts, Buzzards Bay 3.5 Nautical Miles Southeast
of Mattapoisett Neck

TIME PERIOD: March 24 - June 10, 1994

TIDE STATION USED: 844-7531 Mattapoisett, Ma.
Lat. $41^{\circ} 39.6'N$ Lon. $70^{\circ} 48.8'W$


PLANE OF REFERENCE (MEAN LOWER LOW WATER): 8.66 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 4.1 ft.

REMARKS: RECOMMENDED ZONING

Times and heights are direct on Mattapoisett, Ma. (844-7531).

Note: Times are tabulated in Greenwich Mean Time.


CHIEF, DATUMS SECTION



GEOGRAPHIC NAMES

H-10520

Name on Survey	A ON CHART NO. 13230 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											
	BUZZARDS BAY (title)	X										
CLEVELAND EAST LEDGE	X											2
CLEVELAND LEDGE	X											3
MASSACHUSETTS (title)	X											4
MATTAPOISETT NECK (title)	X											5
												6
												7
												8
												9
												10
												11
												12
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												23
												24
												25

Approved:

Charles E. Harrington
Chief Geographer - N/C62x3

NOV - 2 1994

01/10/96

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H-10520

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	6826
NUMBER OF SOUNDINGS	35836

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	277	11/01/94
VERIFICATION OF FIELD DATA	231.50	08/15/95
QUALITY CONTROL CHECKS	0	
EVALUATION AND ANALYSIS	152.50	
FINAL INSPECTION	18	09/14/95
COMPILATION	64	01/02/96
TOTAL TIME	743	
ATLANTIC HYDROGRAPHIC BRANCH APPROVAL		09/29/95

**ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H-10520 (1994)**

This Evaluation Report has been written to supplement and/or clarify the original Descriptive Report. Sections in this report refer to the corresponding sections of the Descriptive Report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

Hydrographic Processing System (HPS)
AUTOCAD Release 12
NADCON, version 2.10

The smooth sheet was plotted using an ENCAD NovaJet III plotter.

H. CONTROL STATIONS

Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD 83). The smooth sheet has been annotated with ticks showing the computed mean shift between the North American Datum of 1983 (NAD 83) and the North American Datum of 1927 (NAD 27).

To place the smooth plots on the NAD 27 datum, move the projection lines 0.385 seconds (11.868 meters or 1.19 mm at the scale of the survey) north in latitude and 1.884 seconds (43.643 meters or 4.36 mm at the scale of the survey) east in longitude.

L. JUNCTIONS

H-10461 (1993) 1:10,000 to the southwest

An standard junction was effected between the present survey and survey H-10461 (1993). There are no junctional surveys to the southeast, northeast and northwest. Present survey depths are in harmony with the charted hydrography to the southeast, northeast and northwest.

M. COMPARISON WITH PRIOR SURVEYS

A comparison with prior surveys was not performed. This is in accordance with section 4. of the memorandum titled,

"Changes to Hydrographic Survey Processing", dated May 24, 1995.

- O. COMPARISON WITH CHARTS 13218 (32nd Edition, Jun 26/93)
13230 (39th Edition, Mar 27/93)
13232 (2nd Edition, May 15/93)
13229 (25th Edition, Mar 27/93)

The charted hydrography originates with prior surveys and miscellaneous sources. An adequate comparison with charted depths is made in sections O.3 and O.4, page 40, of the Descriptive Report and needs no further discussion.

Attention is directed to the following:

Information pertaining to numerous charted and uncharted items within the present survey area was forwarded to Nautical Chart Division for application to NOS chart 13230 prior to approval of the present survey. A copy of the memorandum titled, "Updates for Charts 13218, 13230, and 13229", dated July 19, 1995, and the list of items to be updated is appended to this report.

After completion of office processing of this survey, the evaluator concurs with the charting recommendations made in memorandum referenced in the preceding paragraph.

P. ADEQUACY OF SURVEY

This is an adequate hydrographic/side scan sonar survey; no additional work is recommended.

S. MISCELLANEOUS

Chart compilation using the present survey data was done by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compiled data will be forwarded to Hydrographic Surveys Division, Silver Springs, Maryland upon completion of the project.

A supplemental 36 foot curve was drawn to show additional bottom relief within the navigable area. A brown 40 foot depth curve was drawn to further delineate the bottom relief in the area of AWOIS item 7965.

RUDE Processing Team

Richard W. Blevins
Richard W. Blevins
Cartographic Technician
Verification of Field Data

Maxine Fetterly
Maxine Fetterly
Cartographic Technician
Evaluation and Analysis



July 19, 1995

MEMORANDUM FOR: Captain Andrew A. Armstrong, III
Chief, Hydrographic Surveys Division

FROM: *Nicholas E. Perugini*
Commander Nicholas E. Perugini, NOAA
Chief, Atlantic Hydrographic Branch

SUBJECT: Updates for Charts 13218, 13230, and 13229

The Atlantic Hydrographic Branch has recently forwarded several smooth sheets and H-drawings that affect soon-to-be printed charts in Buzzards Bay. Three other surveys have not yet been fully processed; H-10575, H-10520, and H-10548.

Attached are significant data extracted from these surveys which can be applied to the subject charts. While these surveys have not been fully processed, we have identified many changes, deletions, and additions that will be made to the chart. There are several categories of features:

1. **Deletions** - Hydrographer has disproved the existence of a charted feature.
2. **Changes** - The hydrographer has located a particular feature and has determined an accurate least depth. On surveys H-10520 and H-10548, approved tides have been applied to the data so the charting depiction will be accurate.
3. **Notice to Mariners Features** - The RUDE submitted a Dangers to Navigation Report on July 22, 1994. This report affected H-10520. The ship also submitted a second report on September 19, 1994. This report affected survey H-10548. Both of these reports detailed many additions and deletions of depths to the chart. Some of those depths have already appeared on the new edition of chart 13230. We have since applied approved tides to the data and those depths have changed slightly. The updated depths are included with this package.

Please contact me if there are any questions concerning this data.



NOS CHART 13218 UPDATE
Corrections to Chart 13218, 32nd Ed., June 26, 1993
July 19, 1995

FROM SURVEY H-10520 (1994)

CHANGE the following charted items:

DUMPING GROUND LABEL SHOULD BE CHANGED TO DUMPING GROUND (DISCONTINUED), ADD (DEPTHS FROM SURVEY OF 1994) *Do not concur. See NCM Section 4.14.5 RWD 2/96*

- A.** CHANGE THE 29-FOOT CHARTED SOUNDING AT LAT 41°37'21.38"N, LON 70°42'17.11"W, TO A 28-FOOT SOUNDING FROM PRESENT SURVEY AT LAT 41°37'20.310"N, LON 70°42'17.367"W - **AWOIS ITEM 7505**
- B.** REMOVE THE CHARTED HANG WITH A 35-FOOT CLEARANCE DEPTH AT LAT 41°33'30.38"N, LON 70°46'07.11"W, CHART A 35-FOOT SOUNDING ON A ROCK FROM PRESENT SURVEY AT LAT 41°33'30.525"N, LON 70°46'05.899"W - **AWOIS ITEM 7964**
- C.** REMOVE THE CHARTED HANG WITH A 39-FOOT CLEARANCE DEPTH AT LAT 41°34'05.18"N, LON 70°45'38.31"W, CHART A 40-FOOT SOUNDING FROM PRESENT SURVEY AT LAT 41°34'08.465"N, LON 70°45'43.572"W - **AWOIS ITEM 7965**

Items D. through Y. originated with a Danger to Navigation report submitted by NOAA Ship RUDE on July 22, 1994.

- D.** CHANGE THE 37-FOOT SOUNDING CHARTED AT LAT 41°33'14"N, LON 70°45'56"W, TO A 33-FOOT SOUNDING ON A ROCK AT LAT 41°33'18.415"N, LON 70°46'01.570"W
- E.** CHANGE THE 31-FOOT SOUNDING CHARTED AT LAT 41°35'21"N, LON 70°46'47"W, TO A 33-FOOT SOUNDING AT LAT 41°35'20.181"N, LON 70°46'48.183"W
- F.** CHANGE THE 35-FOOT SOUNDING CHARTED AT LAT 41°33'44"N, LON 70°45'04"W, TO A 34-FOOT SOUNDING ON A ROCK AT LAT 41°33'44.832"N, LON 70°44'59.986"W
- H.** CHANGE THE 28-FOOT SOUNDING CHARTED AT LAT 41°36'52"N, LON 70°41'47"W, TO A 26-FOOT SOUNDING AT LAT 41°36'51.496"N, LON 70°41'43.164"W

CHART the following new items:

- G.** 29-FOOT SOUNDING AT LAT 41°37'08.377"N, LON 70°41'35.231"W
- I.** 26-FOOT SOUNDING AT LAT 41°36'49.978"N, LON 70°41'21.385"W
- J.** 20-FOOT SOUNDING AT LAT 41°36'47.330"N, LON 70°41'01.147"W
- K.** 20-FOOT SOUNDING AT LAT 41°36'46.689"N, LON 70°40'04.904"W

- L. 23-FOOT SOUNDING AT LAT 41°36'35.277"N, LON 70°40'37.818"W
- M. 26-FOOT SOUNDING AT LAT 41°36'12.888"N, LON 70°41'49.024"W
- N. 28-FOOT SOUNDING AT LAT 41°36'11.581"N, LON 70°40'49.077"W
- P. 30-FOOT SOUNDING AT LAT 41°36'13.952"N, LON 70°40'14.540"W
- Q. 35-FOOT SOUNDING AT LAT 41°35'44.906"N, LON 70°42'20.661"W
- R. 26-FOOT SOUNDING AT LAT 41°35'41.339"N, LON 70°41'37.596"W
- S. 20-FOOT SOUNDING AT LAT 41°35'43.565"N, LON 70°41'00.349"W
- T. 35-FOOT SOUNDING AT LAT 41°35'27.191"N, LON 70°42'25.985"W
- U. 29-FOOT SOUNDING AT LAT 41°35'26.710"N, LON 70°41'03.026"W
- V. 35-FOOT SOUNDING AT LAT 41°35'27.152"N, LON 70°40'30.050"W
- W. 28-FOOT SOUNDING AT LAT 41°36'44.039"N, LON 70°41'20.396"W
- X. 24-FOOT SOUNDING AT LAT 41°36'06.924"N, LON 70°41'22.565"W
- Y. 37-FOOT SOUNDING AT LAT 41°35'36.878"N, LON 70°42'10.223"W
- AA. 24-FOOT SOUNDING AT LAT 41°36'52.832"N, LON 70°40'39.991"W
- BB. 25-FOOT SOUNDING AT LAT 41°36'31.421"N, LON 70°41'26.592"W
- CC. 23-FOOT SOUNDING ON A ROCK AT LAT 41°36'17.629"N,
LON 70°41'31.826"W
- DD. 22-FOOT SOUNDING AT LAT 41°35'33.156"N, LON 70°40'05.830"W
- EE. 29-FOOT SOUNDING AT LAT 41°35'21.659"N, LON 70°40'43.258"W
- FF. 29-FOOT SOUNDING AT LAT 41°35'28.312"N, LON 70°46'32.585"W
- GG. 27-FOOT SOUNDING AT LAT 41°35'54.043"N, LON 70°45'47.428"W

DELETE the following charted items:

- Z. CHARTED HANG CLEARED TO 37-FEET AT LAT 41°33'13.58"N,
LON 70°45'58.71"W - **AWOIS ITEM 7967**

NOS CHART 13230 UPDATE
Corrections to Chart 13230, 40th Ed., April 29, 1995
July 19, 1995

FROM SURVEY H-10520 (1994)

CHANGE the following charted items:

DUMPING GROUND NOTE SHOULD BE CHANGED TO READ:
(DEPTHS FROM SURVEY OF 1994)

*Do not concur. See NCM
Section 4.14.5 RWD 2/96*

- A. CHANGE THE 29-FOOT CHARTED SOUNDING AT LAT 41°37'21.38"N, LON 70°42'17.11"W, TO A 28-FOOT SOUNDING FROM PRESENT SURVEY AT LAT 41°37'20.310"N, LON 70°42'17.367"W - **AWOIS ITEM 7505**
- B. REMOVE THE CHARTED HANG WITH A 35-FOOT CLEARANCE DEPTH AT LAT 41°33'30.38"N, LON 70°46'07.11"W, CHART A 35-FOOT SOUNDING ON A ROCK FROM PRESENT SURVEY AT LAT 41°33'30.525"N, LON 70°46'05.899"W - **AWOIS ITEM 7964**
- C. REMOVE THE CHARTED HANG WITH A 39-FOOT CLEARANCE DEPTH AT LAT 41°34'05.18"N, LON 70°45'38.31"W, CHART A 40-FOOT SOUNDING FROM PRESENT SURVEY AT LAT 41°34'08.465"N, LON 70°45'43.572"W - **AWOIS ITEM 7965**

Items D. through W. originated with a Danger to Navigation report submitted by NOAA Ship RUDE on July 22, 1994.

- D. CHANGE 34-FOOT CHARTED SOUNDING AT LAT 41°33'18.4"N, LON 70°46'01.6"W TO A 33-FOOT SOUNDING ON A ROCK FROM PRESENT SURVEY AT LAT 41°33'18.415"N, LON 70°46'01.570"W
- E. CHANGE 31-FOOT SOUNDING AT LAT 41°35'24.9"N, LON 70°46'48.6"W TO A 33-FOOT SOUNDING AT LAT 41°35'20.181"N, LON 70°46'48.183"W
- F. CHANGE 34-FOOT SOUNDING AT LAT 41°33'49.5"N, LON 70°45'02.2"W TO A 34-FOOT SOUNDING ON A ROCK AT LAT 41°33'44.832"N, LON 70°44'59.986"W
- G. CHANGE 29-FOOT SOUNDING AT LAT 41°37'09.4"N, LON 70°41'36.4"W, TO A 29-FOOT SOUNDING AT 41°37'08.377"N, LON 70°41'35.231"W
- H. CHANGE 26-FOOT SOUNDING AT LAT 41°36'50.4"N, LON 70°41'43.1"W, TO A 26-FOOT SOUNDING AT LAT 41°36'51.496"N, LON 70°41'43.164"W
- I. CHANGE 27-FOOT SOUNDING AT LAT 41°36'50.0"N, LON 70°41'21.4"W, TO A 26-FOOT SOUNDING AT LAT 41°36'49.978"N, LON 70°41'21.385"W

- J. CHANGE 21-FOOT SOUNDING AT LAT 41°36'47.1"N, LON 70°40'56.4"W, TO A 20-FOOT SOUNDING AT LAT 41°36'47.330"N, LON 70°41'01.147"W
- K. CHANGE 22-FOOT SOUNDING AT LAT 41°36'46.7"N, LON 70°40'04.9"W, TO A 20-FOOT SOUNDING AT LAT 41°36'46.689"N, LON 70°40'04.904"W
- L. CHANGE 26-FOOT SOUNDING AT LAT 41°36'35.3"N, LON 70°40'38.0"W, TO A 23-FOOT SOUNDING AT LAT 41°36'35.277"N, LON 70°40'37.818"W
- M. CHANGE 27-FOOT SOUNDING AT LAT 41°36'12.9"N, LON 70°41'49.0"W, TO A 26-FOOT SOUNDING AT LAT 41°36'12.888"N, LON 70°41'49.024"W
- N. CHANGE 31-FOOT SOUNDING AT LAT 41°36'09.9"N, LON 70°40'45.8"W, TO A 28-FOOT SOUNDING AT LAT 41°36'11.581"N, LON 70°40'49.077"W
- P. CHANGE 32-FOOT SOUNDING AT LAT 41°36'14.0"N, LON 70°40'14.5"W, TO A 30-FOOT SOUNDING AT LAT 41°36'13.952"N, LON 70°40'14.540"W
- Q. CHANGE 34-FOOT SOUNDING AT LAT 41°35'44.9"N, LON 70°42'20.7"W, TO A 35-FOOT SOUNDING AT LAT 41°35'44.906"N, LON 70°42'20.661"W
- R. CHANGE 28-FOOT SOUNDING AT LAT 41°35'41.3"N, LON 70°41'37.6"W, TO A 26-FOOT SOUNDING AT LAT 41°35'41.339"N, LON 70°41'37.596"W
- S. CHANGE 21-FOOT SOUNDING AT LAT 41°35'43.6"N, LON 70°41'00.3"W, TO A 20-FOOT SOUNDING AT LAT 41°35'43.565"N, LON 70°41'00.349"W
- T. CHANGE 34-FOOT SOUNDING AT LAT 41°35'27.2"N, LON 70°42'26.0"W, TO A 35-FOOT SOUNDING AT LAT 41°35'27.191"N, LON 70°42'25.985"W
- U. CHANGE 30-FOOT SOUNDING AT LAT 41°35'28.0"N, LON 70°41'05.3"W, TO A 29-FOOT SOUNDING AT LAT 41°35'26.710"N, LON 70°41'03.026"W
- V. CHANGE 36-FOOT SOUNDING AT LAT 41°35'27.2"N, LON 70°40'30.0"W, TO A 35-FOOT SOUNDING AT LAT 41°35'27.152"N, LON 70°40'30.050"W

DELETE the following charted items:

- W.** 38-FOOT SOUNDING AT LAT 41°33'18.1"N, LON 70°45'24.3"W
- X.** HANG CLEARED TO 37-FEET AT LAT 41°33'13.58"N,
LON 70°45'58.71"W - **AWOIS ITEM 7967**

CHART THE FOLLOWING NEW ITEMS:

- AA.** 24-FOOT SOUNDING AT LAT 41°36'52.832"N LON 70°40'39.991"W
- BB.** 25-FOOT SOUNDING AT LAT 41°36'31.421"N LON 70°41'26.592"W
- CC.** 23-FOOT SOUNDING ON A ROCK AT LAT 41°36'17.629"N,
LON 70°41'31.826"W
- DD.** 22-FOOT SOUNDING AT LAT 41°35'33.156"N LON 70°40'05.830"W
- EE.** 29-FOOT SOUNDING AT LAT 41°35'21.659"N LON 70°40'43.258"W
- FF.** 29-FOOT SOUNDING AT LAT 41°35'28.312"N LON 70°46'32.585"W
- GG.** 27-FOOT SOUNDING AT LAT 41°35'54.043"N LON 70°45'47.428"W

NOS CHART 13229 UPDATE
Corrections to Chart 13229, 25th Ed., March 27, 1993
July 19, 1995

FROM SURVEY H-10520 (1994)

CHANGE the following charted items:

DUMPING GROUND LABEL SHOULD BE CHANGED TO **DUMPING GROUND**
(DISCONTINUED), ADD (DEPTHS FROM SURVEY OF 1994) *Do not concur. See NCM
Section 4.14.5 RWD 2/96*

- A. CHANGE THE 29-FOOT CHARTED SOUNDING AT LAT 41°37'21.38"N,
LON 70°42'17.11"W, TO A 28-FOOT SOUNDING FROM PRESENT SURVEY
AT LAT 41°37'20.310"N, LON 70°42'17.367"W - **AWOIS ITEM 7505**
- B. REMOVE THE CHARTED HANG WITH A 35-FOOT CLEARANCE DEPTH AT
LAT 41°33'30.38"N, LON 70°46'07.11"W, CHART A 35-FOOT
SOUNDING ON A ROCK FROM PRESENT SURVEY AT LAT
41°33'30.525"N, LON 70°46'05.899"W - **AWOIS ITEM 7964**
- C. REMOVE THE CHARTED HANG WITH A 39-FOOT CLEARANCE DEPTH AT
LAT 41°34'05.18"N, LON 70°45'38.31"W, CHART A 40-FOOT
SOUNDING FROM PRESENT SURVEY AT LAT 41°34'08.465"N,
LON 70°45'43.572"W - **AWOIS ITEM 7965**
- E. CHANGE THE 31-FOOT SOUNDING CHARTED AT LAT 41°35'20"N,
LON 70°46'48"W, TO A 33-FOOT SOUNDING AT LAT 41°35'20.181"N,
LON 70°46'48.183"W
- K. CHANGE THE 28-FOOT SOUNDING CHARTED AT LAT 41°36'45"N,
LON 70°40'04"W, TO A 20-FOOT SOUNDING AT LAT 41°36'46.689"N,
LON 70°40'04.904"W

*Items D. through Y. originated with a Danger to Navigation report
submitted by NOAA Ship RUDE on July 22, 1994.*

CHART the following new items:

- D. 33-FOOT SOUNDING ON A ROCK AT LAT 41°33'18.415"N
LON 70°46'01.570"W
- F. 34-FOOT SOUNDING ON A ROCK AT LAT 41°33'44.832"N
LON 70°44'59.986"W
- G. 29-FOOT SOUNDING AT LAT 41°37'08.377"N, LON 70°41'35.231"W
- H. 26-FOOT SOUNDING AT LAT 41°36'51.496"N, LON 70°41'43.164"W
- I. 26-FOOT SOUNDING AT LAT 41°36'49.978"N, LON 70°41'21.385"W
- J. 20-FOOT SOUNDING AT LAT 41°36'47.330"N, LON 70°41'01.147"W

- L. 23-FOOT SOUNDING AT LAT 41°36'35.277"N, LON 70°40'37.818"W
- M. 26-FOOT SOUNDING AT LAT 41°36'12.888"N, LON 70°41'49.024"W
- N. 28-FOOT SOUNDING AT LAT 41°36'11.581"N, LON 70°40'49.077"W
- P. 30-FOOT SOUNDING AT LAT 41°36'13.952"N, LON 70°40'14.540"W
- Q. 35-FOOT SOUNDING AT LAT 41°35'44.906"N, LON 70°42'20.661"W
- R. 26-FOOT SOUNDING AT LAT 41°35'41.339"N, LON 70°41'37.596"W
- S. 20-FOOT SOUNDING AT LAT 41°35'43.565"N, LON 70°41'00.349"W
- T. 35-FOOT SOUNDING AT LAT 41°35'27.191"N, LON 70°42'25.985"W
- U. 29-FOOT SOUNDING AT LAT 41°35'26.710"N, LON 70°41'03.026"W
- V. 35-FOOT SOUNDING AT LAT 41°35'27.152"N, LON 70°40'30.050"W
- W. 28-FOOT SOUNDING AT LAT 41°36'44.039"N, LON 70°41'20.396"W
- X. 24-FOOT SOUNDING AT LAT 41°36'06.924"N, LON 70°41'22.565"W
- Y. 37-FOOT SOUNDING AT LAT 41°35'36.878"N, LON 70°42'10.223"W
- AA. 24-FOOT SOUNDING AT LAT 41°36'52.832"N, LON 70°40'39.991"W
- BB. 25-FOOT SOUNDING AT LAT 41°36'31.421"N, LON 70°41'26.592"W
- CC. 23-FOOT SOUNDING ON A ROCK AT LAT 41°36'17.629"N,
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- EE. 29-FOOT SOUNDING AT LAT 41°35'21.659"N, LON 70°40'43.258"W
- FF. 29-FOOT SOUNDING AT LAT 41°35'28.312"N, LON 70°46'32.585"W
- GG. 27-FOOT SOUNDING AT LAT 41°35'54.043"N, LON 70°45'47.428"W

DELETE the following charted items:

- Z. CHARTED HANG CLEARED TO 37-FEET AT LAT 41°33'13.58"N,
LON 70°45'58.71"W - **AWOIS ITEM 7967**

APPROVAL SHEET
H-10520

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth curves, development of critical depths, cartographic symbolization, and verification or disapproval of charted data. The digital data have been completed and all revisions and additions made to the smooth sheet during survey processing have been entered in the magnetic tape record for this survey. A final sounding printout of the survey has been made. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Richard H. Whitfield
Richard H. Whitfield
Cartographer
Atlantic Hydrographic Branch

Date: 9-29-95

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.

Nicholas E. Perugini
Nicholas E. Perugini, CDR, NOAA
Chief, Atlantic Hydrographic Branch

Date: 9-29-95

Final Approval:

Approved: *Andrew A. Armstrong* Date: 1-22-96
Andrew A. Armstrong, III
Captain, NOAA
Chief, Hydrographic Surveys Division

MARINE CHART BRANCH
RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. 17-10520

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
13232	12/18/95	Robert Hill	Full Part Before After Marine Center Approval Signed Via Drawing No.
13230	1/4/95	Robert Hill	Full Part Before After Marine Center Approval Signed Via Drawing No.
13229	1/8/96	Robert Hill	Full Part Before After Marine Center Approval Signed Via Drawing No.
13218	1/10/96	Robert Hill	Full Part Before After Marine Center Approval Signed Via Drawing No.
13232	2/8/96	Dan Hesketh	Full Part Before After Marine Center Approval Signed Via Drawing No. 4
13229F	2/8/96	Dan Hesketh	Full Part Before After Marine Center Approval Signed Via Drawing No. 26 PLY THRU 13232
13218	2/8/96	Dan Hesketh	Full Part Before After Marine Center Approval Signed Via Drawing No. 70 THRU 13229F
13230	3/9/96	Dan Hesketh	Full Part Before After Marine Center Approval Signed Via Drawing No. 52 THRU 13229F
			Full Part Before After Marine Center Approval Signed Via Drawing No.
			Full Part Before After Marine Center Approval Signed Via Drawing No.