NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey RECONNAISSANCE

Field No. RU-40-1-91

Registery No. D-111

LOCALITY

State RHODE ISLAND

General Locality RHODE ISLAND SOUND

Sublocality QUICKSAND POINT TO BLOCK ISLAND

1991

CHIEF OF PARTY
LCDR. N.E.PERUGINI

LIBRARY & ARCHIVES

DATE

☆U.S. GOV. PRINTING OFFICE: 1985—566-054

NOAA FORM 77-28 (11-72)

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

HYDROGRAPHIC TITLE SHEET

REGISTER NO. D-111

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-40-1-91

State: Rhode Island

General locality: Rhode Island Sound

Locality: Quicksand Point to Block Island

Scale: 1:40,000 Date of survey: Sept 24-Nov 14, 1991

Instructions dated: March 11, 1991 Project No.: OPR-B660-RU

Vessel: NOAA Ship RUDE (9040)

Chief of party: LCDR Nicholas E. Perugini

Surveyed by: N.E. Perugini, P.L. Schattgen, M.J. Oberlies, J.A. Illg, D.E. Williams

Soundings taken by echo sounder: ~~[illegible]~~ & side scan sonar

Graphic record scaled by: NEP, PLS, MJO, JAI, DEW

Graphic record checked by: NEP, PLS, MJO, JAI, DEW

Protracted by: NA Smooth Automated plot by: ~~NA~~ (AMC) Xynetics 1201 Plotter

~~Verification~~ Processing by: ~~NA~~ Atlantic Hydrographic Section (AMC)

Soundings in: meters at MLLW

REMARKS: All times recorded in UTC

AWOLS & SURF 10/15/92 mcR

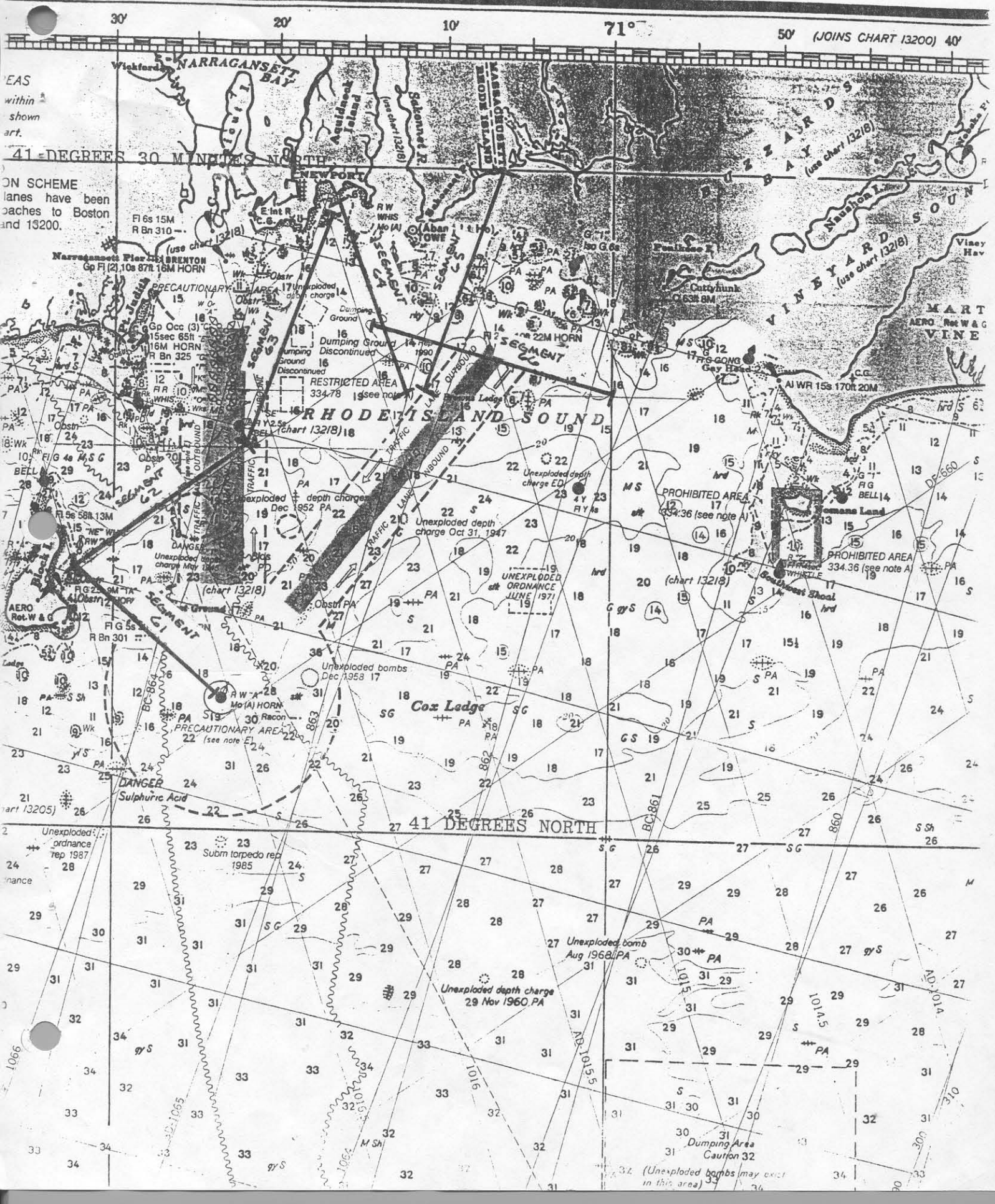
RWH

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

☆ U.S. G.P.O. 1972-769-565/519 REG. #6

OPR-B660-RU-91
RU-40-1-91
D-111

1:400,000 CHART 12300



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A. PROJECT

A.1 This survey was conducted in accordance with Hydrographic Project Instructions OPR-B660-RU, Southern New England Coast, Connecticut and New York.

A.2 The original date of the instructions is March 11, 1991.

A.3 The following changes to the original instructions are relevant to this survey:

Change # 1	August 8, 1991
Change # 2	September 3, 1991
Change # 3	October ~~11~~ 12, 1991

Supplemental instructions were received through telephone conversations with LCDR Kenny regarding reconnaissance hydrography in Narragansett Bay. The RUDE was instructed not to complete the hydrography in the bay (delineated on the presurvey review chart).

A.4 A sheet letter was not specified in the project instructions.

A.5 This survey responds to requests from the U.S. Navy, as well as state and local governments for updated bathymetric and hydrographic survey data of this area for use in proposed studies and in the construction of new charts. As a reconnaissance hydrography survey, soundings acquired during this survey will aid in the determination of the adequacy of charted depths.

B. AREA SURVEYED

B.1 This survey consists of six reconnaissance hydrography lines (each 10 nautical miles long), between Block Island, RI and Martha's Vineyard, MA. The six lines were numbered 61 through 66, and are shown on the chartlet in the front of this report. Refer to section N.1 for geographic positions of the lines.

The primary traffic in the area is tug-and-barge transports, which transit between Long Island Sound and points to the East (Buzzard's Bay and Boston), and deep draft vessels heading into or out of Narragansett Bay.

B.2 The lines are delineated on the pre-survey review chart, extending from latitude 41° 06.0' to 41° 29.5' North and from longitude 070° 57.9' to 071° 32.1' West.

B.3 Data acquisition began on September 24, 1991 (doy 267) and concluded on November 14, 1991 (DOY 318).

C. SURVEY VESSELS

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

VESSELS	ELECTRONIC DATA PROCESSING NUMBER	PRIMARY FUNCTION
NOAA Ship RUDE (S590)	9040	Hydrography/ Side Scan Operations
RUDE Launch (RU3)	1290	Diving Operations

Note: No diver investigations were conducted during this survey.

C.2 No unusual vessel configurations or problems were encountered.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

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

Program	Version	Dates Used
SURVEY	6.03	Sept 24 - Nov 14
DAS_SURV	6.04	Sept 24 - Nov 14
POSTSUR	5.14	Sept 24 - Nov 14

D.2 Other software includes VELOCITY 1.11 dated March 9, 1990 used to generate sound velocity corrector tables, and MTEN (dated between 1985 and 1986) for horizontal control verification and establishment.

D.3 The following are nonstandard acquisition and processing methods used during this survey:

1) On DOY 282, data from two different sheets (63 & 64) were downloaded onto the same floppy disk. The ship finished the segment on sheet 63, "broke line" and began the segment on sheet 64 after resetting the sheet number, fix number, and the plotter. So data acquired on sheet 63 were not downloaded after the line was "broken"; rather, data from both sheets were downloaded onto one floppy disk.

This problem was resolved by loading the one raw data floppy disk twice, and creating two different data files (one for DOY 282 on the sheet 63 directory, and one for DOY 282 on the sheet 64 directory). The extraneous data from the respective data files was then rejected:

(for DOY 282)
Fix # 401-410 rejected from sheet 63 data file
Fix # 166-189 rejected from sheet 64 data file.

2) On DOY 309, while running on line number 64, a large contact was discovered with the side scan sonar equipment. A separate sheet was drawn, and the feature was developed with side scan sonar, echosounder, and diver investigation. All data regarding this development has been transferred to survey FE-368SS.

E. SONAR EQUIPMENT

E.1 Side scan sonar operations were conducted using an EG&G Model 260 slant range 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	0012105	Sept. 24 - Oct. 7
	0011443	Oct. 7 - Nov. 14
Towfish	0011908 (Single Freq)	Entire Survey

E.2 The side scan sonar towfish was configured with a 20° beam depression, which is the normal setting and which 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 used for all side scan coverage. The depth of water encountered throughout the survey usually exceeded 20 meters, allowing excellent imagery on the 100 meter range scale.

b) Daily confidence checks were obtained by noting recognizable bottom characteristics at the edges of the sonar record.

c) Since the purpose of this survey was depth comparison for chart evaluation, side scan sonar coverage was not considered critical. The side scan sonar was towed for the entire survey, however there are breaks in the record at times when the recorder was shut down for paper changes, etc.

d) No other factors affected side scan sonar operations.

e) The towfish was deployed from the stern during the entire survey.

E.5 No contacts were examined more extensively than the initial computation of size, based upon side scan sonar trace. Refer to section E.6 for an explanation of contact selection and processing procedures.

E.6 The RUDE gained much experience (prior to this survey) with the number and type of features common in the area, as found during the basic survey H-10378. Confidence in the ability to identify dangerous features, solely from the side scan sonar trace, led to the following procedure for contact investigation.

Many "significant" contacts were <u>not</u> developed because of their small size relative to the depth of water in which they were located. Therefore, only one contact discovered during this survey justified development. It will be submitted with survey FE-368SS.

See section 1.b. of the Evaluation Report.

F. SOUNDING EQUIPMENT

F.1 All hydrographic soundings were acquired using a Raytheon 6000N digital survey fathometer (DSF). One DSF 6000N was used during the entire survey: S/N A106N.

F.2 No other sounding equipment was used for this survey.

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

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

G. CORRECTIONS TO SOUNDINGS

G.1 a) The velocity of sound through water was determined using a Digibar Sound Velocity Probe (S/N 169), made by Odom. A Data Quality Assurance Test was conducted before each velocity cast to ensure the meter was within tolerance.

All data were processed using Velocity 1.11 software. The computed velocity correctors were entered into the HDAPS sound velocity tables and applied "on-line" to both high and low frequency soundings. Sound velocity correctors applied to this survey were obtained on the following dates:

Cast Number	Date	Latitude	Longitude	HDAPS Table #	Applied to Days
14	9-24-91	41° 10.1' N	71° 18.2' W	14	267-269
15	10-03-91	41° 23.4' N	71° 23.6' W	15	282
18	11-04-91	41° 22.4' N	71° 19.9' W	18	309-318

b) There were no variations in the DSF-6000N instrument initial.

c) No instrument correctors to the DSF-6000N were required.

d) Two dual lead line comparisons with the DSF-6000N were made:

April 25, 1991 at 41° 35.6'N 71° 21.3'W (25 ft depths)
July 22, 1991 at 41° 20.9'N 71° 29.1'W (35 ft depths)

The greatest variation between leadline and DSF soundings was less than 0.2 meters for both comparisons. Considering the ship's motion and the scope in the leadline from current, this is excellent agreement and provides an adequate check that the echosounder was functioning properly. Data from these comparisons are found in SEPARATE IV.

e) All sounding correctors were applied to both the narrow (100 kHz) and wide (24 kHz) beams.

f) During the winter 1988 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 2.26 meters (7.4 feet). This draft value was applied to the 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 13, 1991. 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. Both runs were averaged and applied to soundings through the HDAPS offset table.

However, the actual corrector values derived from these data were computed incorrectly and consequently used for this survey. This problem was resolved by using the HDAPS program "REAPPLY". See section G.2 for a detailed explanation of this situation.

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.

See SEPARATE IV for all data records concerning corrections to soundings.

G.2 The HDAPS program "REAPPLY" was used for the first time this season to reapply corrector tables to soundings. An evaluation of the most appropriate tables for each day's data was made, and compared to the tables actually used. New tables were then applied to those days which differed.

As stated in section G.1.g) settlement and squat values were computed incorrectly and used in all HDAPS offset tables for the season. The "REAPPLY" program was used to correct this problem. Offset table #3 was changed to show the adjusted settlement and squat correctors, and then the table was reapplied to all soundings acquired during this survey.

G.3 As stated in paragraph G.2, corrector tables were reapplied to soundings during processing, so that the most relevant correctors were applied to plotted soundings. The corrected offset table #3 was reapplied to all soundings.

G.4 Pneumatic depth gauges were not used during this survey.

G.5 Generally, sea conditions greater than one meter affected the fathogram, creating a trace of constant peaks and deeps. But the 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 Newport tides were provided on floppy magnetic disk before the start of the project.

b) The height and time correctors listed below were taken from Table 2 of the East Coast of North and South America Tide Predictions, and applied to the digital tide data using the HDAPS software:

NO.	PLACE	TIME		HEIGHT	
		High water	Low water	High water	Low water
1195	Block Island (Old Harbor)	-17 min	+12 min	* 0.83	* 0.86
1157	Newport	0	0	* 1.00	* 1.00

Tidal correctors were applied on-line using the HDAPS predicted tide tables 9, 10, and 11. Table 9 utilized Block Island for correctors to the Newport gauge, and tables 10 and 11 applied no correctors to the Newport gauge.

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

A request for smooth tides was mailed on December 6, 1991.

Smooth Tides were applied during office processing at AHS.

H. CONTROL STATIONS

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

H.2 The list of Horizontal Control Stations is located in Appendix III.

H.3 Newly established horizontal control stations were surveyed using standard NGS approved surveying techniques; primarily the Geodetic Direct and Resection procedures. These data were then entered into the NGS software "MTEN", which computed the Latitude and Longitude of the new station using the NAD 83 ellipsoid.

Existing stations were verified by comparing observed horizontal angles and distances (to known stations) with angles and distances provided by inverse computations using "MTEN".

All horizontal control stations used during this survey are Third-order.

H.4 All horizontal control work was conducted within the "Providence" NGS Quadrant.

H.5 Refer to the Horizontal Control Report (submitted to N/CG 233 under separate cover) for specific procedures and sites surveyed by the RUDE.

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

I. HYDROGRAPHIC POSITION CONTROL

I.1 Two different systems were used for vessel positioning during the survey; Falcon Mini-Ranger and the Differential Global Positioning System (DGPS). A detailed discussion of DGPS navigation is contained in Section I.4.

I.2 Accuracy requirements were met when either positioning system was primary, as specified by the Hydrographic Manual, Field Procedures Manual (FPM), and change # 2 to the project instructions regarding DGPS.

I.3 Control Equipment:

Mini-Ranger:
Falcon 484 by Motorola Inc.
Serial Numbers:

RPU	F-0246	
R/T	F-3409	
R/S:	E-2969	F-3244
	F-3241	F-3297
	E-2907	F-3242
	E-2926	F-3217

GPS:
Both by Magnovox: MX 4200D Differential GPS Receiver
S/N 199
MX 50R DGPS Receiver (correctors)
S/N 036

I.4 Calibration descriptions for each of the two positioning systems follow:

Falcon:

As stated in section 3.1.3.3 of the Field Procedures Manual for Hydrographic Surveying, a continuous critical system check is obtained "when data are acquired with three or more LOP's and ECR and maximum residual criteria are being met as required in section 3.1.3.1" (of the same manual). RUDE routinely conducted survey operations using at least three LOP's (when Falcon was primary), and all other positioning criteria were met as required (see section I.2).

A pre-project baseline calibration of the Mini-Ranger system was conducted at the Atlantic Marine Center on March 6, 1991. Two baseline calibrations were conducted in Bristol, RI on June 2 and July 14, 1991 and one in Newport, RI on October 19, 1991. See the Electronic Control Report submitted under separate cover for data records of the calibrations.

GPS

As stated in section 6.2 of the Project Instructions (change No. 2 dated 3 September 1991), "Differential GPS ... can be used for this project as the Primary positioning system" with the following 1:10,000-scale accuracy requirements:

1. As a DGPS system check, at least one Falcon range is to be recorded twice daily in a static mode, and must agree within 5 meters of the DGPS position.
2. During data acquisition, at least one Falcon range must be recorded and the computed residual must be less than 10 meters.
3. Survey operations may not be conducted when the HDOP exceeds 3.0.
4. Four satellites must be used for the DGPS position computation.

As DGPS was still new (during this survey) as the primary positioning system, extreme care was taken by the RUDE to insure the above requirements were met. The following are some points on the acquisition procedures and actual performance of the DGPS system:

1. The HDAPS survey acquisition program (DAS_SURV) was modified by LCDR Perugini so that the HDOP was recorded with every selected sounding. Also, an extra line was added to the header information preceding each survey line, stating that DGPS is the primary positioning system. This information is found on the raw data printout.

2. One to three Falcon ranges were recorded simultaneously with all data collected when DGPS was the primary positioning system. The maximum residual of these ranges was recorded on the raw data printout (as well as electronically), and scanned off-line for residuals greater than 10 meters. Normally, the maximum residual was below 5 meters and never consistently exceeded 10 meters, so the 5-meter static agreement check was accomplished during data collection.

3. Survey operations were suspended when the HDOP value exceeded 3.0. Generally, whenever this value exceeded 2.5, the position would begin to deteriorate. High HDOP value was not a significant problem, as the duration was relatively short (several seconds) and the condition would correct itself.

4. Whenever less than four satellites were being tracked by the DGPS unit, the HDOP would normally rise above 3.0, the residuals would climb, and the position would generally degrade. Normally, 5 to 6 satellites were visible and the same number were used in the position solution. Too few satellites never caused a substantial problem.

5. Overall, it was obvious when the DGPS position was in error, because any (usually several) of the following conditions would occur: the position would jump, the HDOP would climb, the residuals would climb, the number of satellites would drop below four, or the DGPS system would switch from "NAV" (navigating) to "TRK" (tracking). However, these conditions were not overly common, and rarely did a positioning problem with this system cause substantial "downtime". Whenever poor DGPS positioning was persistent, the Falcon system was selected as primary or operations were suspended until the DGPS system was operational.

See SEPARATE III for all positioning calibration data.

I.5 Only the Falcon system required calibration data to be applied to raw ranges. The range corrector and minimum acceptable signal strength (MASS) for each Mini-Ranger Reference Station was entered into the HDAPS system using the Pre-Survey Corrector-Offset (C-O) table. These tables provided the mechanism by which HDAPS automatically applies the proper range corrector and removes from the position computation those LOP's with signal strengths below MASS.

Problems were encountered in the application of correctors to the Falcon ranges when the C-O table was not updated. The following table illustrates the problem data:

HDAPS Sheet #	DOY	Codes with Incorrect Correctors	Primary Navigation System	Remarks
61	267	2,8	DGPS	no effect on positioning
62	269	4	DGPS	no effect on positioning
63	269	4	DGPS	no effect on positioning
64	309	2,4,6,8	Falcon	positioning in error (minor - not recomputed)
	310	4,6,8	Falcon	positioning in error (minor - not recomputed)
65	311	4,6,8	DGPS	no effect on positioning
	318	4,6,8	DGPS	no effect on positioning
66	311	4,6,8	DGPS	no effect on positioning

Days on which DGPS was the primary navigation system, positioning was unaffected by erroneous correctors, since only the comparative residuals were in error. Therefore, days on which Falcon was primary (DOY's 309 & 310) are the only days that vessel positioning was affected by incorrect C-O values.

To determine the magnitude of positioning error on these two days, the HDAPS utility "PREDICT ECR'S" was utilized. Six positions were entered separately using the "Go to a Point" function key, and the difference between range corrector values was entered using the "Select Bias" function key. The program then computed a second position using the bias values, and displayed the differences between actual and biased positions. The following table shows the positions used, bias values, and differences in positions for the six positions tested:

Fix Number	DOY	Bias Values * Sta 120	Sta 121	Sta 125	Delta Position (m)
422	309	+1	+2	-5	4.8
426	309	+1	+2	-5	4.6
427	309	+1	+2	-5	4.6
458	309	+1	+2	-5	2.8
				Average Position Error on DOY 309 =	**4.2**
461	310	+1	+2	0	2.8
464	310	+1	+2	0	1.7
				Average Position Error on Doy 310 =	**2.3**

* Bias values were determined by computing the difference between the applied corrector value and the real corrector value (that should have been applied), ie.: station 121

-3.9 (applied) -2.00 (real) = +2 bias

As shown above, the position error caused by bad corrector values is less than 5 meters. Since the survey scale is 1:40,000, this error is considered to be within positioning accuracy requirements. Therefore, position recomputations for these days is unnecessary.

I.6 a) See section I.4 for DGPS operating procedures and adequacy standards.

b) There were no occurrences of equipment malfunctions or substandard operation.

c) There were no occurrences of unusual atmospheric conditions that may have affected data quality.

d) There were no occurrences of weak signals or poor geometric configurations of a duration to significantly compromise data quality.

e) Refer to section I.5 for an explanation of problems encountered due to incorrect C-O table values.

f) Antenna positions were corrected for offset and layback, and referenced to the position of the DSF 6000N transducer. These correctors were entered in the HDAPS Offset table, and applied on-line to the positioning algorithm. Refer to SEPARATE III for a copy of offset table 3, which was the only table used during this survey.

g) Offset and layback distances for the A-frame (tow point) were entered 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 offset table number 3.

J. SHORELINE

No field sheets encompassed any shoreline.

K. CROSSLINES

No crosslines were required for this survey.

L. JUNCTIONS

This survey does not junction with any current surveys.

M. COMPARISON WITH PRIOR SURVEYS

A comparison with prior surveys is not required for a reconnaissance hydrography survey. Refer to Section N for a comparison with charted depths in the area.

N. COMPARISON WITH THE CHART

N.1 Although a comparison with charted depths was not required for this survey, a 1:80,000 scale sounding plot was generated as an overlay for chart 13218, for basic comparison and general trend evaluation. Comparison was required - see section 6.4. of the Project Instructions.

The reconnaissance lines (delineated on the pre-survey review chart) were scaled from the pre-survey review chart and numbered 61 through 66. The following list shows the GP's of the start and end of each line; refer to the chartlet in the front of this report for orientation of the lines.

Geographic Pos.-**Line 61-** 41°06'12" N 71°23'36" W (start)
41°12'00" N 71°32'06" W (end)

Line 62- 41°12'00" N 71°32'06" W (start)
41°17'54" N 71°21'30" W (end)

Line 63- 41°17'54" N 71°21'30" W (start)
41°28'12" N 71°16'30" W (end)

Line 64- 41°28'12" N 71°16'30" W (start)
41°19'42" N 71°12'12" W (end)

Line 65- 41°19'42" N 71°11'30" W (start)
41°29'12" N 71°06'36" W (end)

Line 66- 41°22'30" N 71°11'18' W (start)
41°20'00" N 70°57'48" W (end)

N.2 No AWOIS Items were investigated during this survey.

N.3 No danger to navigation reports were filed during this survey.

N.4 a) The quality of agreement between soundings acquired during this survey and depths currently charted was very good, usually within 0.5 meters offshore, but increasing to 1 meter closer to shore.

b) With the exception of the Northern 1/3 of line 65, all soundings acquired during this survey were deeper than depths currently charted. Soundings from this section of line 65 are approximately 0.3 meters shoaler than charted depths in the area. The differences generally increased as the lines approached landmasses, with an approximate maximum difference of 1 meter.

The application of approved tides may reconcile some of this discrepancy, however survey soundings should remain deeper than charted depths. These differences are not considered significant.

c) Given the limited number of soundings acquired during

See the Evaluation Report - Section 7.a.

this survey, individual depths from the chart should not be superseded by survey depths.

d) No significant shoals or features were investigated during this survey. The one significant feature which was discovered with side scan sonar will be submitted with survey FE-368SS.

e) No special shoal investigations were conducted during this survey.

f) No hydrographic findings were encountered during this survey.

g) No maintained channels are located within this survey area.

h) All soundings acquired over the Narragansett Bay and Buzzards Bay traffic lanes differed little from the charted depths. As stated previously, the "offshore" soundings were in closer agreement to the charted depths, and intersections with these traffic lanes fall into this description.

N.5 A comparison of non-sounding features is not included.

N.6 No changes to the current chart are recommended after this preliminary comparison.

See the Evaluation Report, section 7.a.

O. ADEQUACY OF SURVEY

O.1 This survey is complete and adequate for use in comparing current soundings of the area to prior surveys and charted depths.

O.2 There are no parts of the survey that are considered incomplete or substandard.

P. AIDS TO NAVIGATION

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

P.2 No aids to navigation were investigated for positioning during this survey.

P.3 No ~~other~~ aids were located during the survey.

P.4 No bridges, overhead cables or overhead pipelines are located within the survey area.

P.5 No submarine cables, pipelines or ferry routes are located within the survey area.

P.6 No ferry terminals are located within the survey area.

Q. STATISTICS

Q.1	a) Number of positions	746
	b) Lineal nautical miles of sounding lines	55
Q.2	a) square nautical miles of hydrography	N/A
	b) days of production	12
	c) detached positions	0
	d) bottom samples	0
	e) tide stations	1
	f) current stations	0
	g) velocity casts	3
	h) magnetic stations	0
	i) XBT drops	0

R. MISCELLANEOUS

R.1 There is no other information of scientific or practical value resulting from this survey that has not been covered in previous sections.

R.2 Bottom samples were not required for this project.

S. RECOMMENDATIONS

S.1 No survey inadequacies have been noted.

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

S.3 Provided that the application of approved tides will not substantially alter survey data, no further investigation of the survey area is recommended. The existing charted depths adequately represent current soundings (see section N), and a basic survey of any of the area covered is not recommended.

Do not concur - See the Evaluation Report, section 7.a.

T. REFERRAL TO REPORTS

RUDE Electronic Control Report - 1991 Field Season
(submitted to N/CG244 concurrent with this survey)

Horizonal Control Report - 1991 Field Season
(submitted by N/CG23322)

APPENDIX I. DANGER TO NAVIGATION REPORTS

No danger to navigation reports were submitted in conjunction with this survey.

CONTROL STATIONS as of 4 Feb 1992

HEIGHT OF ANTENNA

No	Type	Latitude	Longitude	H	Cart	Freq	Vel	Code	MM/DD/YY	Station Name
113	F	041:21:39.621	071:28:53.024	20	250	0.0	0.0	8	07/15/91	PT JUDITH LIGHT OFFSET 2, 1992
114	F	041:13:39.514	071:34:33.030	25	250	0.0	0.0	6	07/15/91	BLOCK ISLAND N LIGHT OFFSET, 1992
118	F	041:09:09.918	071:33:06.592	61	250	0.0	0.0	5	08/08/91	BLOCK ISLAND SE LIGHT OFFSET 2, 1992
119	F	041:04:15.499	071:51:25.373	9	250	0.0	0.0	2	08/12/91	MONTAUK POINT LIGHT OFFSET, 1992
120	F	041:21:39.717	071:28:52.946	20	250	0.0	0.0	8	09/23/91	PT JUDITH LIGHT OFFSET 3, 1992
121	F	041:26:57.712	071:23:57.797	20	250	0.0	0.0	4	09/26/91	BEAVER TAIL OFFSET 1, 1992
122	F	041:27:43.708	071:21:46.539	12	250	0.0	0.0	6	10/09/91	CASTLE HILL LIGHT OFFSET, 1992
125	F	041:27:42.566	071:10:22.144	12	250	0.0	0.0	2	10/21/91	WARREN OFFSET, 1992

- ALL STATIONS WERE FIELD POSITIONS

- ALL STATIONS WERE INLAND OF THE HIGH WATER LINE

APPENDIX VII. APPROVAL SHEET

LETTER OF APPROVAL

REGISTRY NO. D-111

Field operations contributing to the accomplishment of this survey were conducted under my 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 charting.

Nicholas E. Perugini

Nicholas E. Perugini, LCDR NOAA
Commanding Officer
NOAA Ship RUDE

NOAA FORM 61-29
(12-71)

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

REFERENCE NO.
N/CG244-68-92

LETTER TRANSMITTING DATA

DATA AS LISTED BELOW WERE FORWARDED TO YOU BY *(Check)*:

☐ ORDINARY MAIL ☐ AIR MAIL

☐ REGISTERED MAIL ☐ EXPRESS

☐ GBL *(Give number)* _____

TO:

NOAA/NATIONAL OCEAN SERVICE
Chief, Data Control Section, N/CG243
Bldg. WSC-2, Room 151
6015 Executive Blvd.
Rockville, MD 20852

DATE FORWARDED
15 September 1992

NUMBER OF PACKAGES
Two (2)

NOTE: A separate transmittal letter is to be used for each type of data, as tidal data, seismology, geomagnetism, etc. State the number of packages and include an executed copy of the transmittal letter in each package. In addition the original and one copy of the letter should be sent under separate cover. The copy will be returned as a receipt. This form should not be used for correspondence or transmitting accounting documents.

D-111 (RU-40-1-91)
OPR-B660-RU, RHODE ISLAND, RHODE ISLAND SOUND
QUICKSAND POINT TO BLOCK ISLAND

Pkg. 1: (Tube)
1 Original Descriptive Report.
1 Smooth Sheet.
1 Smooth Position Overlay.
2 Smooth Excess Sounding Overlays.
4 Final Field Sheets.

Pkg. 2: (Box)
1 Accordian folder containing raw field data (echograms, sonargrams, and printouts) for Year Days 267, 269, 282, 309, 310, 311, and 318.
1 Notebook containing the Separates to accompany the Descriptive Report.
1 Envelope containing data removed from the Descriptive Report.
1 Envelope containing sounding corrector data (TRA, Velocity, and Smooth Tides).
1 Cahier of Final Printouts.
1 Envelope containing Horizontal Control Data.

FROM: *(Signature)* Maurice B. Hickson, III
Maurice B. Hickson, III

RECEIVED THE ABOVE
(Name, Division, Date)

Return receipted copy to:

Chief, Atlantic Hydrographic Section,
N/CG244
Atlantic Marine Center
439 West York Street
Norfolk, VA 23510-1114

09/15/92

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: D-111

NUMBER OF CONTROL STATIONS	8
NUMBER OF POSITIONS	352
NUMBER OF SOUNDINGS	1532

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	53	03/17/92
VERIFICATION OF FIELD DATA	47	05/20/92
ELECTRONIC DATA PROCESSING	24	
QUALITY CONTROL CHECKS	33	
EVALUATION AND ANALYSIS	37	09/01/92
FINAL INSPECTION	4	08/28/92
TOTAL TIME	198	

ATLANTIC HYDROGRAPHIC SECTION APPROVAL 09/01/92

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

D-111

Name on Survey	A ON CHART NO. 13218	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	
BLOCK ISLAND	X									1
QUICKSAND POINT (title)	X									2
RHODE ISLAND (title)	X									3
RHODE ISLAND SOUND	X									4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
					Approved:					15
										16
					Charles E. Harrington					17
					Chief Geographer - N/CG2x5					18
					AUG 18 1992					19
										20
										21
										22
										23
										24
										25

NOAA FORM 76-155 SUPERSEDES C&GS 197

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: March 14, 1992

MARINE CENTER: Atlantic

OPR: B660-RU-91

HYDROGRAPHIC SHEET: D-111

LOCALITY: Rhode Island, Rhode Island Sound, Quicksand Point to Block Island

TIME PERIOD: September 24 - November 14, 1991

TIDE STATION USED: 845-2660 Newport, Rhode Island
Lat. 41° 30.3'N Lon. 71° 19.6'W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 1.67 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.7 ft.

REMARKS: RECOMMENDED ZONING

1. East of 71° 23.0'N Longitude, west of 71° 0.0'W Longitude, south of 41° 30.0'N Latitude and north of 41° 18.0'W Latitude, apply a -6 minute time correction and a x0.85 height ratio to Newport, Rhode Island (845-2660).

2. East of 71° 34.0'N Longitude, west of 71° 20.0'W Longitude, south of 41° 18.0'N Latitude and north of 41° 5.0'W Latitude, times are direct and apply a x0.82 height ratio to Newport, Rhode Island (845-2660).

Note: Times are tabulated in Eastern Standard Time.

CHIEF, DATUMS SECTION

COAST AND GEODETIC SURVEY
ATLANTIC HYDROGRAPHIC SECTION
EVALUATION REPORT

SURVEY NO.: D-111 FIELD NO.: RU-40-1-91

Rhode Island, Rhode Island Sound, Quicksand Point to Block Island

SURVEYED: September 24 through November 14, 1991

SCALE: 1:40,000 PROJECT NO.: OPR-B660-RU

SOUNDINGS: RAYTHEON DSF 6000N Fathometer and EG&G Model 260 Side Scan Sonar

CONTROL: Motorola MiniRanger Falcon 484 (Multiple LOP) and Magnovox Differential Global Positioning System (DGPS)

Chief of Party.....N. E. Perugini

Surveyed by.....P. L. Schattgen
.....M. J. Oberlies
.....J. A. Illg
.....D. E. Williams

1. INTRODUCTION

a. This survey is a reconnaissance survey and is only suitable to supplement existing data within the common area.

b. Only the most significant side scan sonar contacts are shown on the smooth sheet. Many other side scan sonar contacts evident in the rocky areas common to this survey are significant based upon the project definition of significance (section 6.13.1. of the Project Instructions). These lesser significant contacts were not inserted into the contact files by the hydrographer or the preprocessing examination personnel based upon the reasoning stated by the Hydrographer in section E.6. of the Hydrographer's Report. Considering the reasoning by the Hydrographer, the depths within the common areas, the reconnaissance nature of this survey, and the recommendation to obtain complete coverage (section 7.a. of this report), it is not considered of reasonable value to insert and smooth plot these lesser contacts. Additionally, no contacts which appear less than 10 meters from the towfish were selected as significant contacts because:

1) The computation of contact height from side scan sonar imagery of contacts close to the towfish is not reliable.

2) Considering the depths within the common areas, the DSF-6000N fathometer would have detected any significant features that would have been within 10 meters of the towfish. The DSF-6000N fathometer was operated with both narrow and wide beam data being recorded throught the survey area.

c. Notes in the hydrographer's report were made in red during office processing.

2. CONTROL AND SHORELINE

a. Horizontal control for the present survey is discussed in sections H. and I. of the hydrographer's report.

Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD 83). Office processing of this survey is based on these values. The smooth sheet of this survey has been annotated with ticks showing the computed mean shift between the present survey datum, NAD 83, and NAD 27. To place this survey on the NAD 1927, move

the projection lines 0.383 seconds (11.8 meters or 0.29 mm at the scale of the survey) north in latitude and 1.835 seconds (42.7 meters or 1.07 mm at the scale of the survey) east in longitude.

b. There is no shoreline within the area of this survey.

3. HYDROGRAPHY

a. This survey is a reconnaissance survey and only six lines of hydrography were run. In the one crossing that exists on this survey, there is good agreement where these two reconnaissance lines cross.

b. Because this is a reconnaissance survey, depth curves could not be adequately drawn and are not shown on the present survey smooth sheet.

c. Development of the bottom configuration is not a requirement because the present survey is a reconnaissance survey. There were no indications of significant shoal features requiring investigation for least depth except the feature noted in section N.4.d) of the hydrographer's report which was addressed in survey FE-368SS (1991).

4. CONDITION OF SURVEY

The smooth sheet and accompanying overlays, hydrographic records, and reports adequately conform to the applicable requirements.

5. JUNCTIONS

There are no junctional requirements.

6. COMPARISON WITH SURVEYS

Comparison with prior surveys is not required for reconnaissance surveys. Refer to section 6.4 of the Project Instructions.

Contemporary and subsequent surveys FE-364SS (1991), FE-365SS (1991), FE-367SS (1991), FE-368SS (1991), FE-372SS (1992), FE-374SS (1992), H-10422 (1992), and H-10424 (1991) are investigations of AWOIS Items and areas common to or near the present survey's reconnaissance lines. The present survey found no indications of wrecks, obstructions, or unusual hydrographic features with the exception of the feature noted in section N.4.d) of the Hydrographer's Report which was addressed in survey FE-368SS (1991). The comparison of this reconnaissance survey with these contemporary and subsequent surveys will be accomplished in their respective Evaluation Reports.

The present survey is a reconnaissance survey which is suitable only to supplement prior hydrography.

7. COMPARISON WITH CHARTS

13215 (12th Ed., June 23, 1990)
13218 (30th Ed., July 7, 1990)
13221 (47th Ed., Mar. 23, 1991)

a. HYDROGRAPHY

The source of the common charted hydrography was not determined for this reconnaissance survey, however, the prior surveys common to these areas are surveys at scales from 1:10,000 to 1:50,000 conducted from 1914 to 1966.

The present survey findings are in excellent agreement (generally within $\pm 0^{3}$-0^{6} meters or ±1-2 feet) with the charted hydrography within the common areas. The present survey indicates only one area (vicinity of latitude 41°07′24", longitude 71°25′21") where some shoaling appears evident. The present survey has a 29^{9}-meter (98-foot) sounding near a charted 105-foot (32-meter) depth. This indication of shoaling is not considered significant.

Ten significant features were found by side scan sonar on the present survey. These features were evaluated to be rocks from the analysis of the sonargrams. These features have estimated heights above the bottom as much as 7^{5} meters (24.6 feet). Eight of these ten features are shoaler than the charted hydrography and are recommended to be charted. Also five other present soundings are notably shoaler than the charted hydrography and are recommended to be charted. These features and soundings are:

ITEM	SURVEY DEPTH	CHARTED DEPTH	LATITUDE (N)	LONGITUDE (W)
Rk (A)	23m./75′	85′	41°09′05.81"	71°27′49.65"
Rk (A)	28^{9}m./95′	111′	41°07′08.83"	71°24′58.29"
Rk (A)	14^{5}m./47′	60′	41°26′36.23"	71°15′42.09"
Rk (A)	12^{7}m./41′	51′	41°23′20.50"	71°09′36.30"
Rk (A)	13m./42′	57′	41°28′10.75"	71°07′08.57"
Rk (A)	18^{4}m./60′	80′	41°22′14.27"	71°09′55.74"
Rk (A)	23^{5}m./77′	100′	41°22′01.41"	71°08′40.32"
Rk (A)	17^{5}m./57′	69′	41°21′04.61"	71°03′31.60"
Sounding	24^{6}m./80′	85′	41°10′07.16"	71°29′20.82"
Sounding	27^{3}m./89′	92′	41°08′05.36"	71°26′22.09"
Sounding	29^{9}m./98′	105′	41°07′23.84"	71°25′20.94"
Sounding	11^{7}m./38′	42′	41°26′49.65"	71°15′50.96"
Sounding	12^{3}m./40′	50′	41°26′42.85"	71°15′47.42"

The present survey demonstrates that the charted hydrography remains valid. However, the submerged rocks found by this reconnaissance survey and the rocky nature of the bottom evident on the sonargrams indicate the strong possibility of uncharted dangerous submerged features existing in Rhode Island Sound (particularly the northern portion). Additional field work achieving complete bottom coverage of these areas is recommended at an opportune time; however, the 12^{7}m. (41-foot) *Rk (A)* found in latitude 41°23′20.50"N, longitude 71°09′36.30"W, which is 10 feet shoaler than the 51-foot rocky shoal charted in latitude 41°23′15"N, longitude 71°09′30"W should be investigated while this project is continuing in 1992. A 200-meter radius search and a direct measurement least depth is recommended.

The reconnaissance hydrography not specifically discussed is adequate to supplement the charted hydrography.

b. AIDS TO NAVIGATION

No fixed or floating aids to navigation were located by this survey.

8. COMPLIANCE WITH INSTRUCTIONS

This survey adequately complies with the Project Instructions.

9. ADDITIONAL FIELD WORK

As noted in the Descriptive Report, this is a reconnaissance survey. This survey is adequate only to supplement prior and charted hydrography. Additional field work is recommended as noted in section 7.a. of this report.

Reginald L. Keene
Cartographic Technician
Verification of Field Data

Maurice B. Hickson, III
Cartographer
Evaluation and Analysis

Robert H. Hill
Senior Cartographic
Technician
Verification Check

APPROVAL SHEET
D-111

Initial Approvals:

The completed reconnaissance hydrographic survey has been examined with regards to presentation of survey results. The survey complies with National Ocean Service requirements except as noted in the Evaluation Report or the Descriptive Report.

This survey is not to be considered basic hydrographic survey data and is not approved as such.

R. D. Sanocki Date: Sep. 1, 1992
R. D. Sanocki
Chief, Hydrographic Processing Unit
Atlantic Hydrographic Section

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.

Christopher B. Lawrence Date: 1 September 1992
Christopher B. Lawrence, CDR, NOAA
Chief, Atlantic Hydrographic Section

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Final Approval:

Approved: [signature] Date: 2 OCT 92
J. Austin Yeager
Rear Admiral, NOAA
~~Dof~~ Director, Coast and Geodetic Survey