

H10817

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-10-3-98

Registry No. H10817

LOCALITY

State MASSACHUSETTS

General Locality NANTUCKET SOUND

Locality CROSS RIP CHANNEL

1998

CHIEF OF PARTY
LCDR D. A. COLE, NOAA

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HYDROGRAPHIC TITLE SHEET

H10817

INSTRUCTIONS - The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the
O f f i c e

FIELD NO.

RU -10-3-98

State MassachusettsGeneral
localityNantucket SoundLocalit
yCross Rip ShoalScale 1: 10,000Date of
surveyMay 26 - June 16, 1998Instructions
dated6-22-98Project
No.OPR-B318-RU-98Vessel NOAA Ship RUDE, S-590, EDP 9040Chief of party LCDR David A. ColeSurveyed
byLCDR D.Cole; LT E.Berkowitz; RPS C.Parker; RPS E.Owens; SST K.Callahan; AST S.RooneySoundings taken by echo sounder, hand lead,
poleRaytheon DSF-6000N echo sounder, Seabat 9003Graphic record scaled
byLCDR D.Cole; LT E.Berkowitz; RPS C.Parker; RPS E.Owens; SST K.Callahan; AST S.RooneyGraphic record checked
byLCDR D.Cole; LT E.Berkowitz; RPS C.Parker; RPS E.Owens; SST K.Callahan; AST S.RooneyProtracted
byAutomated plot
byHP DESIGNER 1500 CP
PLOTTER (AHL)

Verification by

ATLANTIC HYDROGRAPHIC PERSONNEL

Soundings in

fathoms

(feet)

at

MLW

MLLW

Meters at MLLW (FIELD)

REMARKS

All times recorded in UTC.HAND WRITTEN NOTES IN THE DESCRIPTIVE REPORT
WERE MADE DURING OFFICE PROCESSINGAWOIS/SURF 11/19/99 MCR

NOAA Ship RUDE : 1998 Data Flowchart

Sensors Data Acquisition Data Processing Data Archival

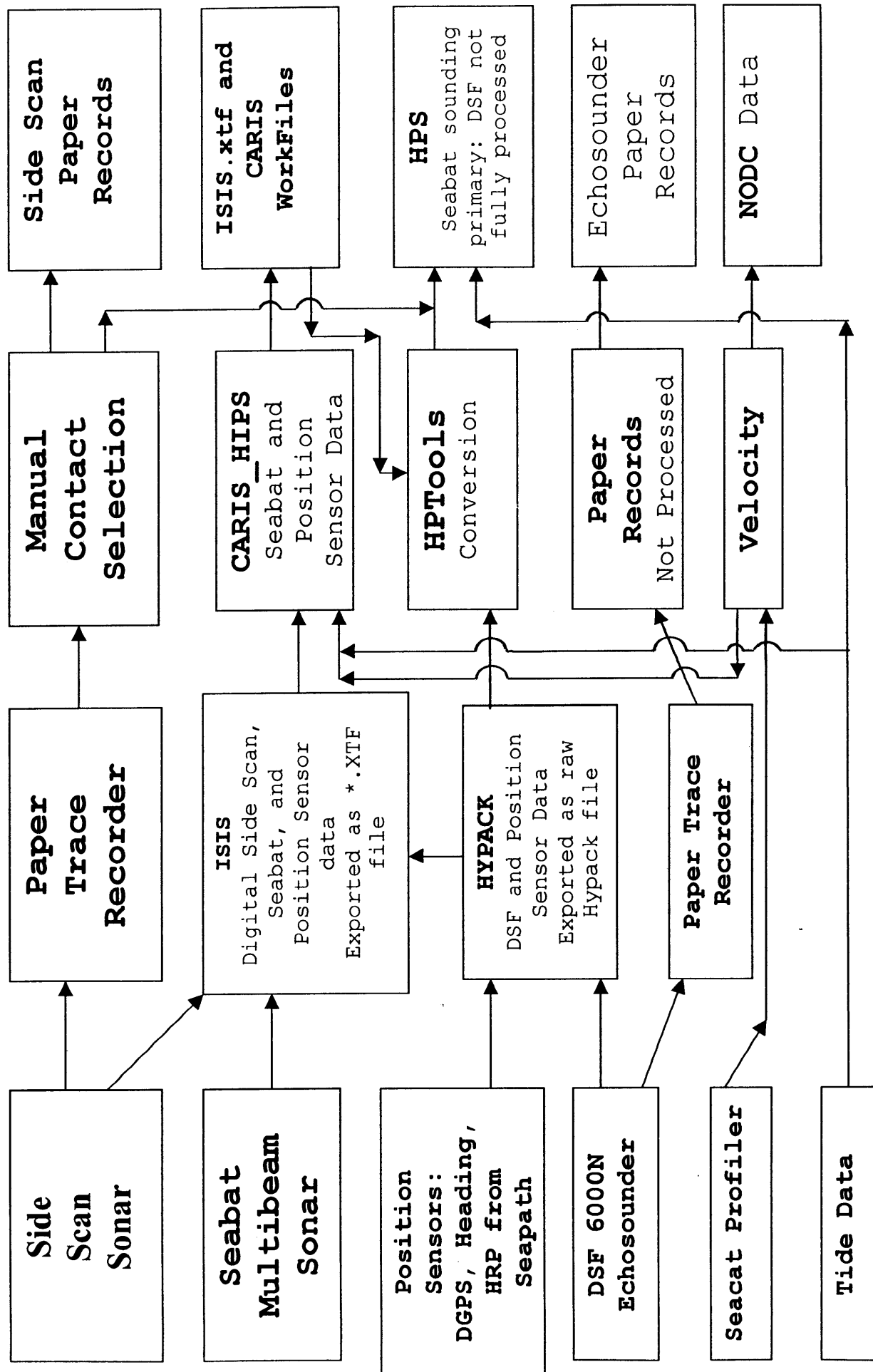


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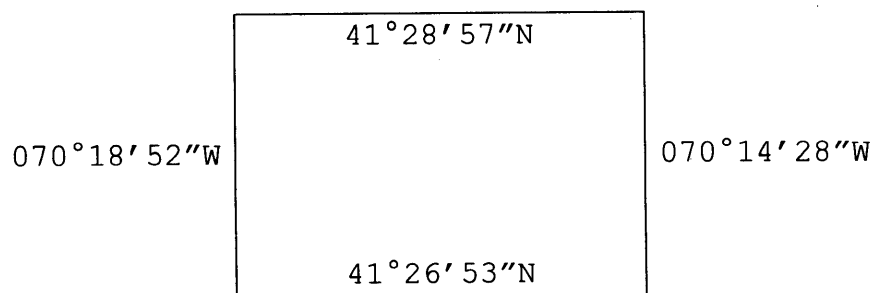
SEPARATES

A. PROJECT

- A.1 This survey was conducted in accordance with Hydrographic Project Instructions OPR-A318-RU, Cross Rip Shoal, Massachusetts.
- A.2 The original instructions are dated June 22, 1998.
- A.3 There are no amendments to the instructions.
- A.4 This survey is designated registry number H10817.
- A.5 The purpose of this project is to obtain full bottom coverage using a combination of multibeam and side scan sonar hydrography in Cross Rip Channel, adjacent to Cross Rip Shoal, Massachusetts. This survey responds to requests from the Northeast Pilots Association and supports their proposal for narrow passage transit by cruise ships. The pilots propose that the project area will be traversed by cruise ships with a draft of 27 feet. The area was last surveyed in 1956 and 1964 by single beam echo-sounder hydrography.

B. AREA SURVEYED

- B.1 Survey H10817 is located approximately 2.7 nm north of Tuckernuck Shoal, and includes the northern limits of Cross Rip Shoal, southern limits of Horseshoe Shoal, and southern limits of Halfmoon Shoal. Survey area covers approximately 5.39 square nautical miles.
- B.2 The survey is comprised of one sheet with the following survey boundaries (approximate and not to scale):



- B.3 Data acquisition for this survey began on May 26 1998 (DN 146) and ended on June 15, 1998 (DN 166).

Over 54.462 million multibeam soundings were processed during the survey.

C. SURVEY VESSELS

- C.1 All H10817 hydrography, side scan, and multibeam investigations were conducted from NOAA Ship RUDE, S-590, EDP #9040. General functions include side scan sonar and multibeam sounding operations, velocity of sound determinations, bottom sampling, and navigational aid positioning.
- C.2 The transducer for the multibeam sonar was deployed on a pivoting pole mounted on the port side, approximately amidships. The multibeam transducer was rotated into the water only during times of data acquisition.

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

- D.1a Coastal Oceanographics' HYPACK for Windows Version 7.1a (12/02/97) was used for data acquisition on this survey. Post processing included the use of HPTools Version 1.6.0 (03/04/98) for all Hypack data conversion data. Data processing was conducted using Hydrographic Processing System (HPS) Version 8.2 (03/02/98) supplied by Atlantic Hydrographic Branch Computer Support Group. Mapinfo Version 4.5 (11/11/97) was utilized for data display during the valuation process and completion of the field sheet. All software versions used for data processing are listed in Appendix H. *FILED WITH THE ORIGINAL FIELD DATA*
- D.1b Triton Corporation's ISIS software Versions 3.0 (01/08/98) was used to acquire SeaBat multibeam and digital side scan sonar data. SeaBat data was processed on the CARIS-HIPS System Version 4.2.7 (01/17/97).
- D.1c The SEABIRD SBE-19 sound velocity profiler unit was utilized with SEASOFT 3.3M (11/27/89) and SEACAT 3.1 (02/25/98) software. The program VELOCITY Version 3.1 (03/03/98) was used to process the acquired data and calculate velocity corrections.
- D.2a Multibeam and side scan sonar data (XTF Format) conversion within the CARIS-HIPS System entailed specific conversion selections. Conversion selection for origin of sensor information differs between the two types of data. Multibeam data conversion utilized the standard or default selections. Default selections with CARIS software

included "Ship Nav" from Sensor; "Ship Gyro" from Ship; "Fish Nav" from Sensor; "Fish Gyro" from Ship. Data decimation and image correction was not selected during conversion.

Side scan sonar data conversion entailed selecting "Ship Nav" from Sensor; "Ship Gyro" from Ship; "Fish Nav" from Ship; "Fish Gyro" from Ship. Data decimation and image correction was not selected during conversion.

- D.2b SeaBat depth data were monitored using ISIS during acquisition and processed utilizing CARIS-HIPS multibeam data cleaning programs. Digital multibeam depth profiles were visually reviewed and fliers were identified and manually flagged as "rejected"; no SeaBat quality flags were used to automatically "reject" data. Vessel navigation data from DGPS and attitude data from heave, pitch, roll, and gyro sensors were displayed and manually cleaned (see Sections G and I). Motion reference data was cleaned using the program "cleanGHPR" supplied by System Support Branch (SSB) N/CS32.
- D.2c After reviewing and cleaning, the depth, navigation, and attitude data were merged with sound velocity, tide, and vessel configuration data to compute the true depth and position of each sonar beam footprint. Work file processing included importing the multibeam depths (selecting "extended no key" and "group by beam number"). Processed depths were thinned by shoal bias selection with 2 m X 2 m sounding grid. Soundings were suppressed with a level of 2.0 constant term; this binning level yields data points approximately every 20 meters (2mm X 2mm at 1:10,000 scale). These excessed field sheet soundings were used in CARIS Workfile Processing for cross-data comparisons (see Section J.2). Finally, the CARIS Workfile Processing soundings were transferred into HPS (using HPTools) and MapInfo databases.
- D.2d Sounding evaluation included the use of a text file (.txt) created during the multi-beam sounding export process. This text file was used to display the soundings within MapInfo. The dat file (.dat) created during sounding export process was later converted into HPS via HPTools, generating a HPS multibeam only data file for each day of acquisition. Final field sheet selected soundings originate from these HPS multibeam only data files.

The conversion software translating HYPACK data and the suppressed multibeam soundings into HPS compatible format

was supplied by NOAA's Atlantic Hydrographic Branch Computer Support Group. The HPTools Version 1.7.1 was used for data conversion and management.

- D.2e Final plots were created in MapInfo, a PC-based GIS package, with assistance from HPS-MI MapInfo tools supplied by Hydrographic Survey Division (HSD). These tools produced depth, track and swath plots from HPS data and allowed plotting on a HP750C and 2500CP DesignJet plotter. Data could also be overlaid on a raster image of the applicable chart.
- D.2f The total number of multibeam soundings used and processed during post processing evaluation does not reflect the total number of multibeam soundings provided to N/CS33. Verification sounding grid size of 1.5mm at survey scale was selected with no sounding suppression within HIPS. Sounding excessing will be conducted during the verification process using HPS.

E. SONAR EQUIPMENT

- E.1 All side scan sonar data were acquired with an Edgetech (EG&G) model 272 towfish (S/N 11902) and an Edgetech Model 260-TH slant-range correcting side scan sonar recorder (S/N 16670). Additionally, all side scan sonar data were recorded digitally using the Triton ISIS software and archived in the Extended Triton Format (*.XTF) files.
- E.2 The side scan towfish used a 50° vertical beam width tilted down 20° from horizontal.
- E.3 The 100 kHz frequency was used throughout the survey.
- E.4a The 75-meter range scale was used at a line spacing of 60 meters to obtain 200% side scan sonar coverage.
- E.4b Confidence checks were conducted by means of verifying identifiable benthic features. Survey H10817 contains numerous areas with sand waves and ripples. These features were identified from inner to outer limits of the range scale. Graphic record annotations indicate the confidence checks. The hydrographer's confidence in side scan sonar area coverage was continuously verified.
- E.4c Two hundred percent side scan sonar coverage was completed for this survey. Holiday coverage was run to fill in any gaps. All coverage was checked with on-screen zoomable

coverage displays in MapInfo, to ensure proper overlap between lines.

- E.4d The towfish was deployed exclusively from the stern. An electronic cable counter (M/D Totco) was employed to determine the amount of side scan cable deployed.
- E.4f The towfish transducers appeared unbalanced; the starboard transducer image appeared weaker than the port channel. It was noted that the majority of contacts were sighted in the port channel. Transducer imbalance suggests evidence for this phenomenon.
- E.5 Sonar records were monitored on-line and reviewed by two persons during processing to identify contacts. Contact offsets and shadow heights were measured on sonar paper records, checked, and entered into the HPS Contact Table to compute contact heights and positions.
- E.6 All side scan contacts with computed heights greater than 10% of water depth, or greater than 1.0 meter off the bottom in depths shoaler than 20 meters, and all contacts which appeared man-made were deemed significant. All significant contacts were developed with multibeam sonar coverage. All coverage was checked with on-screen zoomable coverage displays in MapInfo, to ensure proper overlap between lines.

F. SOUNDING EQUIPMENT

- F.1a Single-frequency (455 kHz) multibeam data were acquired with a Reson SeaBat 9003 (S/N 10496-447020) shallow-water sonar system. The 9003's combined transmit and receive beams yield forty (40) soundings per ping, each formed from a 3° crosstrack x 1.5° alongtrack bottom footprint. During multibeam data processing, the outermost two beams on each side of the swath (beam numbers 1, 2, 39, and 40) were not processed, reducing the effective swath width to 108° (3° x 36 beams). Proper overlap between multibeam sonar coverage lines was verified using a conservative swath width assumption of 100°.
- F.1b SeaBat 9003 (455 kHz) multibeam data were continuously recorded during data acquisition and served as the primary source for hydrographic digital soundings. Sounding depths ranged from 21 to 87 feet of water, utilizing multibeam range scales of 25, 50, and 100 meters. 200% side scan sonar coverage was based upon 60 meter line

spacing. Multibeam development line spacing was adjusted yielding 100% multibeam coverage over the shoal which transects the survey area. Item investigation line spacing were based upon contact positions for nadir beam development.

- F.1c Vessel speed during the mainschmeme sounding collection consisted of maintaining standards for side scan operations. Multibeam development included vessel speeds between 4 and 7 knots; item and contact investigation speeds were generally slower (3 to 5 kts); slower speeds increase the data density along track over the feature. Line orientation was parallel to the channel axis.
- F.2a Dual-frequency (24 and 100 kHz) vertical beam echo sounding data were acquired with a Raytheon DSF-6000N Digital Survey Echosounder. DSF Echosounder S/N B046N was replaced with S/N 116N on May 29, 1998 (DN 149) and continued operational through survey completion.
- F.2b Both high (100 kHz) and low (24 kHz) frequency vertical beam DSF data were recorded during data acquisition. DSF echograms were monitored on-line. Anomalous DSF echogram traces were immediately cross-referenced to the ISIS multibeam acquisition display online.
- F.2c Manual edits were made to the DSF data; only missed depths (9999.9) were edited during field processing. DSF vertical correctors were applied to the raw DSF digital soundings (see Section G). The archived HPS fixes of DSF soundings do not represent the entire character of the seafloor because shoal bias inserts were not selected; graphic records were not scanned for depths edits. **DSF data should not be included on the final field sheet; all final field soundings originate from multibeam data.**
- F.3 Full multibeam coverage was conducted over the shoal ridge bisecting Cross Rip Channel. The shoal ridge extends ENE from the northern limit of Cross Rip Shoal toward the southwestern limit of Halfmoon Shoal.
- F.4 No diver investigations were performed for this survey.
- F.5 There were no observed faults in sounding equipment that affected the accuracy or quality of the data.

G. CORRECTIONS TO SOUNDINGS

G.1a Sound velocity correctors were computed from a SeaBird SBE19 SEACAT Profiler (S/N 196723-1251). Data quality assurance tests using the CAT program were performed for each cast. The profiler is calibrated at the beginning and end of each field season. See Separate IV* for data records.

The following velocity casts were used for this survey:

CAST #	DAY NUMBER
1	146
2, 3, 4	147
5, 6, 7	148
8	149
9, 10	152
11, 12, 13	153
14	155
15, 16	159
17, 18, 19	160
20, 21, 22	161
23, 24	162
25, 26	166

Sound velocities were applied to the SeaBat data in HIPS (incorporating the Nautical Charting Development Lab REFRACT algorithm). Sound velocity correctors for the vertical beam soundings were computed using VELOCITY and applied to the DSF data using HPS.

G.1b A DSF-leadline direct comparison was not conducted during survey H10817. Direct comparison was conducted during the 1998 field season and provided with H10817 documentation listed in Appendix E.*

Continuous comparison between DSF and Seabat multibeam depths were monitored during field acquisition. Sounding comparisons are discussed in Section J.

G.1c Sensor offsets and transducer static drafts were measured during the December 1996 dry-dock period. Sensor offsets were stored in the CARIS-HIPS Vessel Configuration File and HPS Offset Table for use in data processing. See

** FILED WITH THE ORIGINAL FIELD RECORDS*

Separate IV for data records.*

- G.1d Transducer dynamic draft was measured on March 4, 1998. Dynamic draft correctors were stored in the CARIS-HIPS Vessel Configuration File and HPS Offset Table for use in data processing. See Separate IV for data records.*
- G.1e Heave, pitch, and roll data were acquired with a Seatex Seapath Motion Reference Unit (MRU-5) (S/N 0544). Heave, pitch, and roll data were applied to SeaBat multibeam data. Heave data were applied to DSF vertical beam data during post processing.
- G.1f Heading data were acquired with Seatex Seapath and applied to determine both multibeam transducer and side scan towfish azimuth and position.

Multibeam heave, pitch, roll, and heading sensor data were adjusted using biases as determined during a patch test completed on March 4, 1998 (DN 064). Closing patch test was conducted on November 12, 1998 (DN316). Closing calibrations confirm offsets determined in opening patch test. See the CARIS-HIPS Vessel Configuration File in Appendix E* for data records.

- G.2 No unusual or unique methods or instruments were used to correct sounding data.
- G.3 Tide zoning for this survey is consistent with the Project Instructions. Tide zone NAN1 correctors were developed by applying a time correction of -42 minute time and a x0.92 range ratio to the unverified tides at Nantucket, Massachusetts (Station 844-9130). Unverified tidal data was downloaded from the NOS OPSD web site (www.opsd.nos.noaa.gov) and were computed in CARIS-HIPS and HPS for re-application to SeaBat and DSF data.
- G.4 The diver least depth gage was not used for this survey.
- G.5 No significant systematic errors were detected.
- G.6a The vertical reference surface for this survey is Mean Lower Low Water (MLLW).
- G.6b Tide data were acquired at Nantucket, Massachusetts (Station 844-9130) by N/OES231. Verified tides were unavailable during field processing. A request for verified tides was mailed on July 13, 1998. These data will replace the verified tide data during verification by N/CS33. APPROVED TIDES AND ZONING WERE APPLIED DURING OFFICE PROCESSING

G.6c Note that multibeam data processing was accomplished using predicted tide values during acquisition and preliminary unverified tide values during post processing. Shoal soundings selected through CARIS could change upon the re-application of verified smooth tides. Small differences between preliminary unverified and verified tides may require reapplication of verified tides to the entire CARIS-HIPS data set to ensure correct selection of least depths for transfer to HPS.

G.6d **In HPS, only tide reapplication processing is permissible on multibeam data. If necessary, all other vertical correctors and horizontal offsets should be reapplied to multibeam data using CARIS software. However, if tide reapplication is necessary, it should be done to the entire CARIS multibeam data set to ensure the correct least depths are identified for transfer to HPS.**

H. HYDROGRAPHIC POSITION CONTROL

SEE ALSO THE EVALUATION REPORT

H.1 The horizontal reference surface for this survey is the North American Datum of 1983 (NAD 83). No horizontal control stations were established for this survey.

H.2 Positioning for this survey was obtained from the NAVSTAR Global Positioning System (GPS) augmented with the U.S. Coast Guard Differential GPS (DGPS) service. The following USCG reference station beacons were used:

USCG DGPS RadioBeacon Broadcast Site	Freq kHz	Rate BPS	Latitude N	Longitude W	Range nm	Beacon ID #
Montauk Pt., NY	293	100	41°04'03"	071°52'38"	130	803
Chatham, MA	304	200	41°40'17"	069°57'02"	95	802

H.3 Accuracy requirements were met as specified by the Hydrographic Manual, sections 1.3 and 3.1, and Field Procedures Manual, section 3.4.

H.4 GPS and DGPS signals were acquired with the following hardware equipment:

GPS and DGPS Hardware	SERIAL #
Seatex SeaPath 200	0347
MRU-5	0544
StarLink, antenna Model MBA2	4202

H.5 The GPS Horizontal Dilution of Precision (HDOP) was recorded during survey operations and manually checked via the Detailed Data Abstract in HPS, raw data printout, and queried within MapInfo. The calculated maximum allowable HDOP value of 2.4 was rarely exceeded. Anomalous position data were either manually smoothed or flagged "rejected", depending on the extent of the affected data. Instantaneous vessel speed was checked with a 2.0 knot speed jump detector in CARIS-HIPS to aid in the manual cleaning of multibeam navigation data.

DGPS performance checks were not conducted. The necessity for control checks is eliminated when using the Seatex Seapath 200; quality positioning is supported by the continuous calibration routine inherent of SeaPath.

DGPS monitor and scatter plots for USCG beacons are not required as per guidelines mentioned in FPM 3.2.2.1

H.6 Calibration data are not required for differential GPS.

H.7a There were no unusual methods used to operate the positioning equipment.

H.7b There were no positioning equipment malfunctions.

H.7c There were no unusual atmospheric conditions noted which might have affected data quality.

H.7d No significant systematic errors were detected.

H.7e Offsets for the GPS antenna were applied from the CARIS-HIPS Vessel Configuration File (VCF) to compute the position of the SeaBat transducer. See Appendix E* for CARIS VCF and HPS DSF offset data records. *FILED WITH THE ORIGINAL FIELD RECORDS*

H.7g A-frame position (tow point), cable length, towfish height, and depth of water were applied to navigation data to compute the position of the towfish. This correction is applied in HPS via offset table and Reapply Sounding Corrections.

I. SHORELINE

No shoreline is contained within the boundaries of this survey.

J. CROSS COMPARISONS

- J.1 A total of 7.85 nm of crosslines were acquired for this survey, equating to over 7.8% of the mainscheme 100% side scan sonar coverage lines and approximately 5.9% of the mainscheme 100% multibeam sonar coverage lines. Although the total linear nm of crosslines is less than 6% of the total linear nm of mainscheme multibeam lines, over 766,054 soundings were compared.
- J.2 Processed SeaBat crossline soundings excessed at 2 meters x 2 meters (see Section F.4) were compared to a 2 meter x 2 meter binned digital terrain model (DTM) surface in CARIS Workfile Processing. The DTM surface was built from processed SeaBat mainscheme soundings (excessed at 2 meters x 2 meters). Averaged across the statistics computed as a function of beam number (see Appendix E), the mean difference between **SeaBat crossline and SeaBat mainscheme soundings** is approximately +0.1825 meters (766,054 comparisons, "+" means crossline soundings compared deeper--due to shoal-biased DTM surface).
** FILED WITH THE ORIGINAL FIELD RECORDS.*

Processed multibeam soundings converted in HPS were compared to the non-edited single beam DSF soundings. Sounding variance between **SeaBat mainscheme and DSF crossline soundings** was between 0-2 feet except where the bottom is sloping or irregular. In areas of sloping or irregular bottom the variance is greater than 2 feet and generally less than 4 feet. Because of the horizontal uncertainty in the positions of DSF soundings relative to SeaBat soundings, as well as a wide DSF beam footprint, DSF-to-SeaBat comparisons are more favorable in flatter and/or shoaler areas. The bathymetry on survey H10817 is extremely uneven and undulating due to numerous sand waves.

- J.3 No anomalous crossline comparisons were noted.
- J.4 The mainscheme and crossline data were collected with the same suite of survey equipment.

K. JUNCTIONS *SEE ALSO THE EVALUATION REPORT*

Survey H10817 contains no junctions.

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

A comparison with prior surveys will be performed by N/CS33.

M. ITEM INVESTIGATION REPORTS

M.1 Survey H10817 was covered utilizing 200% side scan sonar with multibeam development. Additional multibeam coverage lines were conducted over AWOIS items and side scan contacts to obtain least-depth soundings near nadir. The following SeaBat 9003 least depths were submitted as Dangers to Navigation (see Appendix I for report): *APPENDED TO THIS REPORT*

Fix #	Depth ft)	Latitude(N)	Longitude(W)
73,421	31 ft (9.2m)	41°27'01.2"	070°15'20.5"

M.2

AWOIS NO:6857

Item Description: Barge

Source: H8172/545-56; NM48/65; NM48/66

AWOIS Position: Lat - 41°26'42.42" N Lon - 070°12'10.06" W

Required Investigation: SD,S2,MB, DI -- 500m radius

Charts Affected: 13237, 13241

INVESTIGATION

Date(s)/DN(s): 06/10/98 (DN:161)

06/15/98 (DN:166)

Position Numbers: FX 9072-9094; 9522-9545;

89,897

Vessel Number: 9040

Investigation Used: S2, MB

Water Visibility: 5m+

Position Determined By: DGPS

Investigation Summary: Side scan sonar investigation identified three contacts within the search radius; 2267.1p, 5791.0s, and 6414.0s. Mainscheme and multibeam development sounding investigation indicated a corrected multibeam sounding with a least depth of 32 ft (9.9 m), located at the geographic position of 41°26'41.692"N 070°12'10.348"W. The following information pertains to the multibeam least depth: DN 166; HPS Fix Number = 89,897; Time = 18:46:15.149 UTC; Beam # = 10; Profile # = 213; Reference Line = 902_1845. The least depth is located 23.7 meters and an azimuth of 196.8° from the AWOIS target center.

CHARTING RECOMMENDATION

The hydrographer recommends removing blue tinted submerged wreck "(26 ft rep)." Chart a submerged wreck (32 wk) at the position listed below. *CONCUR*

Recommended Position: Lat 41°26'41"⁶⁹.7N Lon 070°12'10.³⁴W

Recommended Least Depth: 32 feet

COMPILATION NOTES

*DELETE (H) (26 ft rep)**ADD (32) WK*

M.3

AWOIS NO: 6858

Item Description: Seneca (barge)

Source: H8824/63-64; NM26/65

AWOIS Position: Lat - 41°27'06.5"N Lon - 070°17'55.6"W

Required Investigation: SD,S2,MB,DI -- 500m radius

Charts Affected: 13237, 13241

INVESTIGATIONDate(s)/DN(s): 05/27/98 (DN:147); 06/02/98 (DN:153);
06/11/98 (DN:162)Position Numbers: FX 2491-2492; 5957-5958;
9256-9302; 89,021

Vessel Number: 9040

Investigation Used: S2,MB

Water Visibility: 5m+

Position Determined By: DGPS

Investigation Summary: Side scan sonar investigation identified two correlating contacts within the search radius; 2491.8s and 5957.3p. Least depth derived from mainscheme and multibeam development sounding investigation indicated a corrected multibeam sounding with a least depth of 60 ft (18.5m), located at the geographic position of 41°27'08.179"N 070°18'05.564"W. The following information pertains to the multibeam least depth: DN 162; HPS Fix Number 89,021; Time = 15:38:07.039 UTC; Beam # = 6; Profile # = 181; Reference Line = 906_1534. The least depth is located 239.6 meters and an azimuth of 282° from the AWOIS target center, and 43.1 meters and an azimuth of 294° from contacts 2491.8s and 5957.3p.

CHARTING RECOMMENDATION

The hydrographer recommends removing submerged wreck "PA."
Chart a submerged wreck at the position listed below. *Concur*

Recommended Position: Lat 41°27'08.¹⁸2"N Lon 070°18'05.⁵⁶0"W

Recommended Least Depth: 60 feet

COMPILATION NOTES

DELETE (H) PA
ADD (LO) WA

M.4

AWOIS NO: 10024

Item Description: Pelican (PA rep 1994)

Source: LNM29/94

AWOIS Position: Lat - 41°27'48.0"N Lon - 070°11'03.0"W

Required Investigation: S2,MB,ES,DI,SD -- 350m radius

Charts Affected: 13237 (Not positioned on Chart 13241)

INVESTIGATION

Date(s)/DN(s): 06/09/98 (DN:160)

06/15/98 (DN:166)

Position Numbers: DN 160: FX 7748-8212 Vessel Number: 9040

DN 166: FX 9449-9491

Investigation Used: S2, MB

Water Visibility: 5m+

Position Determined By: DGPS

Investigation Summary: 200% side scan investigation identified three contacts in the immediate search radius. Contact heights were computed to be 0.2 to 0.3 meters and determined to be insignificant. Contact 7924.1s, 7985.9p, and 8020.4p were investigated by means of multibeam development over the contact location. No significant features were found during contact development; digital side scan records and multibeam soundings during contact development support negative results of wreck location.

CHARTING RECOMMENDATION

The hydrographer recommends that the charted submerged wreck (PA) be deleted from the survey area of the chart. *CONCUR*

Recommended Position: Lat Lon

Recommended Least Depth:

COMPILATION NOTES*DELETE (HIT) PA (REP 1994)*

N. COMPARISON WITH THE CHART *SEE ALSO THE EVALUATION REPORT¹⁷*

N.1 Two charts are affected by this survey:

- Chart 13237, 36th Ed., 13 July 1996 1:80,000 scale
- Chart 13241, 14th Ed., 06 July 1992 1:40,000 scale

N.2 One Danger to Navigation report containing one depth change was submitted for this survey. See Section N for a brief summary listing of the soundings and Appendix I for a copy of each report. *APPENDED TO THIS REPORT*

N.3a Seventy-seven charted soundings from Chart #13241 were contained within the H10817 survey limits. Approximately 75% of the charted soundings were in agreement with survey depths with differences between one to two feet. Approximately 25% charted soundings have wider variance of agreement within two to four feet of survey depths. Most of the survey depths with discrepancies are deeper than the charted soundings.

Twenty-four charted soundings from Chart #13237 were contained within the H10817 survey limits. Approximately 80% of the charted soundings were in agreement with survey depths with differences between one to two feet. Remaining 20% charted soundings have wider variance within two to four feet of survey depths. Most of the survey depths with discrepancies are deeper than the charted soundings.

N.3b Survey data indicates sand waves throughout the survey area. Graphic records indicate sand wave amplitude between one and four meters in specific areas, usually near the shoal areas. Small sounding discrepancies may be related to sediment shifting caused by tidal flow. The large discrepancies may be due to inaccurate chart soundings obtained from prior surveys, where horizontal positioning and depth determination were subject to errors.

N.3c The 24 and 30 foot contour located near the southern edge of Halfmoon Shoal in the general vicinity of 41°27'12"N 070°14'55"W extending WSW requires revision. Survey data yields a sufficient number of data points to delineate the 24 and 30 foot curve.

N.3d The 30 foot contour located ENE of Cross Rip Shoal in the general vicinity of 41°26'49"N 070°16'04"W requires revision. Survey data yields a sufficient number of data points to delineate the 30 foot curve.

N.4 All soundings from survey H10817 should supercede charted soundings.

O. ADEQUACY OF SURVEY *SEE ALSO THE EVALUATION REPORT*

Survey H10817 was completed using 200% side scan sonar with multibeam developments and should supersede ALL prior surveys in common areas.

P. AIDS TO NAVIGATION

P.1 Detached position (FX 9353 DN 166) was taken on one floating aid to navigation (R #20, LL# 13690) located near the boundaries of this survey.

P.2 A comparison was made between the detached positions and the largest scale chart of the area. Three of the four navigational aids were compared by means of locating the navigational aid via side scan sonar contacts. No floating aid was found to deviate from its charted position by greater than 50 meters. Each aid adequately serves the apparent purpose for which it was established.

P.3 All aids located during the survey were tabulated in the Light List, Vol. 1, 1998.

Nav Aid	Light List #	Light List Geographic Position	
G #17 Fl G 6s Gong	13665	41°26.6'N	070°11.2'W
R #18 Fl R 4s Bell	13675	41°27.2'N	070°14.1'W
R #20 Fl R 4s	13690	41°27.5'N	070°16.9'W
G #21 Fl 2.5s Gong	13685	41°26.9'N	070°17.5'W

P.4 There were no submarine or overhead pipelines, cables,

tunnels, bridges, or ferry routes found in the survey area. The charted "Cable Area" notations should be investigated for current relevance and possible removal.

Q. STATISTICS

Q.1a No. of Processed Multibeam Soundings	54,462,000
Q.1b No. of Multibeam Soundings Transferred to HPS...	20,127
Q.1c Lineal Nautical Miles of Sounding Lines.	222.74
Q.2a Square Nautical Miles of Hydrography	5.489
Q.2b Days of Production	14
Q.2d Bottom Samples	N/A
Q.2e Tide Stations.1
Q.2f Velocity Casts	26
Q.2g SEABAT Item Investigations3

R. MISCELLANEOUS *SEE ALSO THE EVALUATION REPORT.*

- R.1 No evidence of silting, unusual submarine features, or magnetic anomalies were detected during this survey.
- R.2 Survey area exhibited influences of strong tidal flows indicated by areas of high amplitude sand waves.
- R.3 Bottom samples were not required as per project instructions.

S. RECOMMENDATIONS

- S.1 Additional fieldwork is suggested for sounding verification. Multibeam sounding located at the geographic position of 41°27'11.11"N 070°12'12.43"W requires confirmation. Data observed in HIPS Swath Editor indicated an anomalous unsupported sounding which has been

rejected. Data can be located in CARIS_HIPS on Day Number 159; Reference Line "220_2213"; Time 222930 (UTC); PR# 10392; Beam #13; HPS Fix #78000. A confidence swath acquired over the target location would validate current edited status.

T. REFERRAL TO REPORTS

A copy of the Coast Pilot Report will be included in the Separates.

This report and the accompanying field sheets are respectfully submitted.

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

Castle Eugene Parker
Physical Scientist
NOAA Ship RUDE

APPENDIX K

APPROVAL SHEET

LETTER OF APPROVAL

REGISTRY NO. H10817

Field operations contributing to the accomplishment of this Navigable Area survey were conducted under my direct supervision with frequent personal checks of progress and adequacy. All field sheets and reports were reviewed in their entirety and all supporting records were checked as well.

This survey was completed with 200% side scan sonar coverage and is more than adequate to supersede all prior surveys in common areas. The survey is considered complete and adequate for nautical charting.



David A. Cole, LCDR, NOAA
Commanding Officer
NOAA Ship RUDE

APPENDIX A

DANGER TO NAVIGATION REPORTS

One Danger to Navigation reports was submitted for this survey.
See Section N for detailed investigation reports.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of NOAA Corps Operations
NOAA Ship RUDE S-590
439 W. York Street
Norfolk, VA 23510-1114

December 7, 1998

*FAXED TO FIRST C.G. DISTRICT
12/7/98*

Commander
First Coast Guard District
Aids to Navigation Office
408 Atlantic Avenue
Boston, Massachusetts 02110-3350

REPORT OF DANGER TO NAVIGATION

Dear Sir:

The NOAA Ship RUDE has recently completed a hydrographic survey of Cross Rip Shoal, Massachusetts:

Registry No.	H-10817
State	Massachusetts
General Locality	Nantucket Sound
Sublocality	Cross Rip Shoal
Project Number	OPR-B318-RU-98

During the course of multibeam sonar operations, one danger to navigation was discovered. This new depth information merits immediate publication in the Local Notice to Mariners. The updated depth affects the following charts:

Chart 13237	Nantucket Sound and Approaches	36th ed, July 13, 1996
Chart 13241	Nantucket Island	14th ed, Jun 6, 1992

Depth*	Latitude (NAD83)	Longitude (NAD 83)	Charts Affected
31 feet	41° 27' 01.2" N	070° 15' 20.5" W	13237, 13241

Updated depths are reduced to feet at MLLW using unverified tides and should be viewed as preliminary information, subject to office review. All soundings were obtained using differential GPS.

Contact either of the following personnel for further information:

Commanding Officer
NOAA Ship RUDE (757) 441-6386
439 West York Street
Norfolk, VA 23510-1145

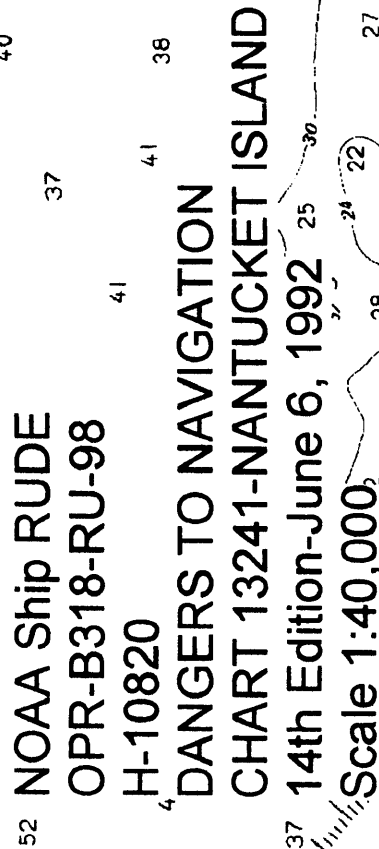
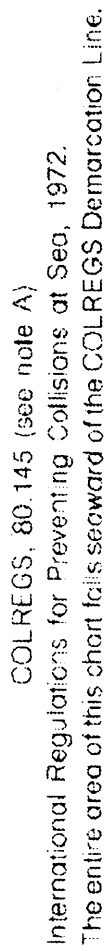
Chief, Atlantic Hydrographic Branch
Atlantic Marine Center (757) 441-6746
439 West York Street
Norfolk, VA 23510-115

Sincerely,

Lieutenant Commander David A. Cole, NOAA
Commanding Officer, NOAA Ship RUDE

Attachment
cc: AHB, NIMA







UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: October 21, 1998

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-B318-RU

HYDROGRAPHIC SHEET: H-10817

LOCALITY: Cross Rip Shoal, MA

TIME PERIOD: May 26 - June 15, 1998

TIDE STATION USED: 844-9130 Nantucket, MA

Lat. $41^{\circ} 17.1' N$ Lon. $70^{\circ} 05.8' W$

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.994 meters

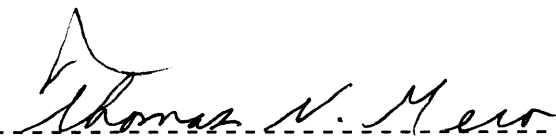
REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: NAN1.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time.

Note 2: Use tide data from the appropriate station for each zone according to the order in which they are listed in the Tidezone corrector files. For example, tide station one (TS1) would be the first choice for an applicable zone followed by TS2, etc. when data are not available. All zones within a survey sheet may not have the same order of applicable tide stations.

 10/22/98

CHIEF, REQUIREMENTS AND ENGINEERING BRANCH



Final tide zone node point locations for OPR B318-RU-98,
Sheet H-10817.

Format: Longitude in decimal degrees (negative value denotes
Longitude West),
Latitude in decimal degrees
Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction

	Tide Station Order	AVG Time Correction	Range Correction
Zone NAN1			
-70.315659 41.482586	844-9130	-42	0.92
-70.315241 41.413028			
-70.167681 41.413489			
-70.167891 41.482896			
-70.315659 41.482586			

Final Zoning for OPR B318-RU-98

Cross Rip Shoal, MA

BUZZARDS BAY

MARATHA VINEYARD

NANTUCKET

Sheet H-10817

NANTUCKET
Time Corrector -42 mins
Range Corrector x0.92
Reference 8449130

8449130 NANTUCKET

GEOGRAPHIC NAMES

H-10817

Name on Survey	A ON CHART NO. 13237, 13241 ON PREVIOUS SURVEY No.	B	C ON U.S. QUADRANGLE MAPS	D FROM LOCAL INFORMATION	E ON LOCAL MAPS	F	G P.O. GUIDE OR MAP GRAND MCNALLY ATLAS	H	I U.S. LIGHT LIST	K
CROSS RIP CHANNEL	X		X							1
CROSS RIP SHOAL	X		X							2
HALFMOON SHOAL	X		X							3
HORSESHOE SHOAL	X		X							4
MAIN CHANNEL	X		X							5
MASSACHUSETTS (title)	X		X							6
NANTUCKET SOUND	X		X							7
										8
										9
										10
										11
										12
										13
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										23
										24
										25

Chief Geographer

APR 12 1999

11/02/99

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10817

NUMBER OF CONTROL STATIONS		2
NUMBER OF POSITIONS		71314
NUMBER OF SOUNDINGS		71314
	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	2.0	03/22/99
VERIFICATION OF FIELD DATA	173.0	06/01/99
QUALITY CONTROL CHECKS	0.0	
EVALUATION AND ANALYSIS	15.0	
FINAL INSPECTION	24.0	10/22/99
COMPILATION	23.0	11/01/99
TOTAL TIME	237.0	
ATLANTIC HYDROGRAPHIC BRANCH APPROVAL		10/22/99

N/CS33-84-99

LETTER TRANSMITTING DATA

DATA AS LISTED BELOW WERE FORWARDED TO YOU
BY (Check):☐ ORDINARY MAIL☐ AIR MAIL☐ REGISTERED MAIL☒ EXPRESS☐ GBL (Give number) _____

DATE FORWARDED

November 4, 1999

NUMBER OF PACKAGES

1 Box, 1 Tube

TO:

NOAA/National Ocean Service
Chief, Data Control Group, N/CS3x1
SSMC3, Station 6815
1315 East-West Highway
Silver Spring, MD 20910-3282

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.

H10817

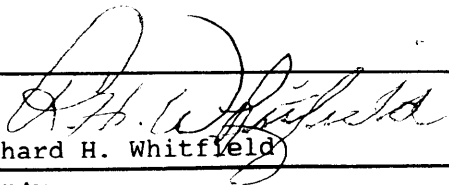
Massachusetts, Nantucket Sound, Cross Rip Channel1 Box Containing:

- 1 Original Descriptive Report for H10817
- 1 HISTORY OF CARTOGRAPHIC WORK for H10817 for chart 13241

1 Tube Containing:

- 1 Original Smooth Sheet for H10817
- 1 Paper Composite plot of survey H10817 for chart 13241
- 1 Mylar H-Drawing of H10817 for chart 13241

FROM: (Signature)


Richard H. WhitfieldRECEIVED THE ABOVE
(Name, Division, Date)

Return receipted copy to:

Atlantic Hydrographic Branch N/CS331
439 W. York Street
Norfolk, VA 23510-1114

**ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10817 (1998)**

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
NADCON, version 2.10
MicroStation 95, version 5.05
SiteWorks, version 2.01
I/RAS B, version 5.01

The smooth sheet was plotted using an Hewlett Packard DesignJet 2500CP plotter.

H. CONTROL STATIONS

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 has been annotated with ticks showing the computed mean shift between the NAD 83 and the North American Datum of 1927 (NAD 27).

To place this survey on the NAD 27, move the projection lines 0.421 seconds (12.992 meters or 1.29 mm at the scale of the survey) north in latitude, and 1.931 seconds (44.820 meters or 4.48 mm at the scale of the survey) east in longitude.

K. JUNCTIONS

There are no junctional surveys to the north, south, east or to the west. Present survey depths are in harmony with the charted hydrography to the north, south, east and to the west.

L. COMPARISON WITH PRIOR SURVEYS

A comparison with prior surveys was not done during office processing in accordance with section 4. of the memorandum titled "Changes to Hydrographic Survey Processing", dated May 24, 1995.

**N. COMPARISON WITH CHART 13241 (14th Edition, Jun 6/92)
 13237 (37th Edition, Oct 3/98)**

Hydrography

The charted hydrography originates with the prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section N. of the Descriptive Report.

N.2. One Danger to Navigation Report was submitted to the Commander (oan) First Coast Guard District, Boston, Massachusetts for inclusion in the Local Notice to Mariners, and to the Marine Chart Division, Silver Spring, Maryland. A copy of the report is appended to the Descriptive Report.

The danger to navigation submitted is a depth of 31 feet in Latitude 41°27'01.2"N, Longitude 70°15'20.5"W. The depth of 31 feet was computed with predicted tides. During office processing, approved tides were applied to the present survey. A shoaler depth of 30-ft is shown on the present survey in Latitude 41°27'01.975"N, Longitude 70°15'20.229"W. It is recommended that the 30-ft be charted as shown on the present survey.

The present survey is adequate to supersede the charted hydrography within the common area.

O. ADEQUACY OF SURVEY

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

R. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland.

The following NOS Chart was used for compilation of the present survey: 13241 (14th Edition, Jun 6/92)

H10817

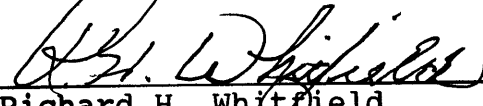
Frank Saunders

Frank Saunders
Cartographic Technician
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H10817


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 disproof 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 digital data for this survey. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.


Richard H. Whitfield
Cartographer
Atlantic Hydrographic Branch

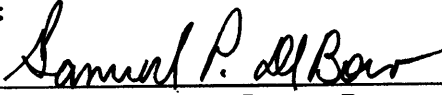
Date: 10/22/99

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.


Andrew L. Beaver, LCDR, NOAA
Chief, Atlantic Hydrographic Branch

Date: 10/22/99

Final Approval:

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

Date: November 29, 1999

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO.

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.

SUPERSEDES C.G.S. FORM 8352 WHICH MAY BE USED