

H10820

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic / Multibeam

Field No. RU-10-4-98

Registry No. H10820 (and Additional Work)

LOCALITY

State Maine

General Locality Approaches to Penobscot Bay

Locality Two Bush Channel

1998 - 99

CHIEF OF PARTY
LCDR D. A. Cole

LIBRARY & ARCHIVES

DATE JAN - 7 2000

REGISTRY NUMBER:

H10820

HYDROGRAPHIC TITLE SHEET

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

FIELD NUMBER:

RU-10-04-98

State: Maine

General locality: Approaches to Penobscot Bay

Locality: Two Bush Channel

Scale: 1: 10,000 Date of survey: June 22, 1998 - September 17, 1998

Instructions dated: June 22, 1998 Project Number: OPR-A366-RU-98

Vessel: NOAA Ship RUDE

Chief of Party: LCDR D. Cole

Surveyed by: LCDR D. Cole, LT E. Berkowitz, PS E. Owens, PS C. Parker, ST S. Rooney, ST K. Callahan

Soundings taken by echo sounder, hand lead-line, or pole: Reson SeaBat 9003 shallow-water sonar system, Raytheon DSF 6000N Echosounder

Graphic record scaled by: RUDE Personnel

Graphic record checked by: RUDE Personnel

Protracted by: N/A Automated plot by: HP 2500CP HP Design Set

Verification by: AHP Branch

Soundings in: Feet: Fathoms: 5 Meters: at MLW: MLLW: (*)

Remarks: All times recorded in UTC.

*Handwritten notes in the Descriptive Report were made during office processing.

Annals/SAOP ✓ 12/13/99 35 ✓

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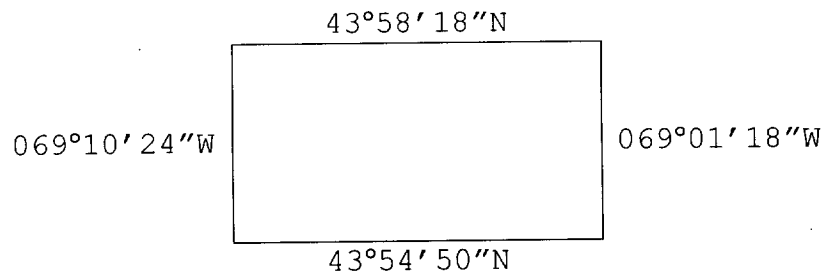
Data filed with field records

A. PROJECT

- A.1 This survey was conducted in accordance with Hydrographic Project Instructions OPR-A366-RU, Approaches to Penobscot Bay, Maine (Two Bush Channel).
- A.2 The original instructions are dated June 22, 1998.
- A.3 There are no amendments to the original instructions.
- A.4 This survey is designated registry number H10820.
- A.5 This survey responds to requests from the Down East Pilots and Penobscot Bay & River Pilots Association. The project area is traversed by petroleum tankers with 35 ft. drafts which make 200-250 transits per year through Two Bush Channel and with the amount of small boat traffic encountered in this area these deep draft vessels cannot deviate from the channel to any degree. There is also an anchorage area included in this project used by the pilots that is adjacent to Two Bush Channel.

B. AREA SURVEYED

- B.1 Survey H10820 covers an offshore area in Two Bush Channel, ten nautical miles south of Rockland, Maine.
- B.2 Survey H10820 is comprised of one sheet with the following approximate boundaries: Included are an anchorage area and AWOIS Item 10018 that are separated from the channel survey limits.



- B.3 Data acquisition for survey H10820 began on June 22, 1998 (DN 173) and ended on September 17, 1998 (DN 160).

Ztc

C. SURVEY VESSELS

- C.1 All hydrography and multibeam investigations were conducted from NOAA Ship RUDE, S-590, EDP# 9040. General functions include 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 arm mounted on the port side, approximately amidships. The multibeam transducer was rotated into the operating position only during times of data acquisition.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

- See also 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 evaluation process and completion of the field sheet. All software versions used for data processing are listed in Appendix H. *data filed with field records*
- D.1b Triton Corporation's ISIS software Versions 3.0 (01/08/98) was used to acquire SeaBat multibeam and digital multibeam imagery. 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 data (XTF Format) conversion in the CARIS-HIPS System utilized specific selections within the *Convert Triton Isis XTF* program in HDCS. 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.

- D.2b SeaBat depth data was 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 Section ~~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 was 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 an 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 2500CP DesignJet plotter. Data could also be overlaid on a raster image of the applicable chart.

D.2f The total number of multibeam soundings acquired and processed during field evaluation does not reflect the total number of multibeam soundings provided to N/CS33. For transfer to HPS, the sounding density has been reduced by selecting a grid size of 1.5mm at survey scale with no sounding suppression within HIPS. Additional sounding excessing will be conducted during the verification process using HPS.

E. SIDE SCAN SONAR EQUIPMENT

Side scan sonar data was not acquired for this survey. SeaBat imagery data was recorded digitally using the Triton ISIS software and archived in the Extended Triton Format (*.XTF) files.

F. SOUNDING EQUIPMENT

F.1a Single-frequency (455 kHz) multibeam data was acquired with a Reson SeaBat 9003 (S/N 10496-447020) shallow-water sonar system.

F.1b SeaBat 9003 (455 kHz) multibeam data was continuously recorded during data acquisition and served as the primary source for hydrographic digital soundings. Sounding depths ranged from 26 to 220 feet of water, utilizing multibeam range scales of 25, 50, 100 and 200 meters.

F.2a Dual-frequency (24 and 100 kHz) vertical beam echo sounding data was acquired with Raytheon DSF-6000N Digital Survey Echosounders (S/N 116N; DN173-DN211) and (S/N A109N; DN258-DN260).

F.2b Both high (100 kHz) and low (24 kHz) frequency vertical beam DSF data was 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 **NOTE 1:** Only missed depths (9999.9) edits were made to the DSF data 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 depth edits.

NOTE 2: DSF data should not be included on the final field sheet; all final field soundings originate from multibeam data.

- F.3 There were no observed faults in sounding equipment that affected the accuracy or quality of the data.
- F.4 No diver investigations were performed for this survey.
- F.5 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 for one hundred percent multibeam sonar coverage between lines was determined in **MapInfo** by using the **HPS_MI** tool for drawing multibeam swath coverage. Multibeam swaths were based on DSF single beam sounding data and were extrapolated to a swath width assumption of 108°, inclusive of beam numbers three through thirty-eight. Due to the limitations of multibeam swath determination by this method, swath coverage over sloping features may be suspect to error due to a flat bottom assumption and not taking into account instantaneous heave, pitch and roll values. Utilizing this tool, full SWMB coverage mainscheme line spacing was adjusted to provide full coverage over the entire survey area except in holiday areas discussed in (**Section S.Recommendations**).

- F.6 Optimal vessel speed was determined by the multibeam range scale being utilized to produce the required pings per unit area of bottom. All multibeam data for H10820 was acquired using the appropriate optimal vessel speed to ensure 100% along track multibeam coverage.

G. CORRECTIONS TO SOUNDINGS

- G.1a Sound velocity correctors were computed from conductivity, temperature, and depth measurements acquired with SeaBird SBE19 SEACAT Profilers (serial numbers 1251, 2530, 284). 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 Appendix IV for data records. *Data used with field records

The following velocity casts were used for this survey:

VELOCITY CAST #	JULIAN DAY #
01	173
02,03	174
04	176
05	177
06,07,08	180
09,10	181
11,12	182
13	183
14,15	188
16,17	189
18,19	190

VELOCITY CAST #	JULIAN DAY #
20,21	197
22,23,24	201
25,26,27	202
28,29,30	203
31,32	204
33	205
34,35	208
36	211
37,38	258
39,40,41	259
42,43	260

Sound velocity effects were applied to the SeaBat data using CARIS-HIPS (incorporating the NOAA 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 conducted on 06/28/98 for H10820. Additional DSF-leadline direct comparisons were conducted during the 1998 field season. Records are provided with H10820 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 ~~Separate IV~~ for data records.
APPENDIX E

G.1d Vessel 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 was acquired with a Seatex Seapath Motion Reference Unit (MRU-5) (S/N 0544). Heave, pitch, and roll data was applied to SeaBat multibeam data. Heave data was applied to DSF vertical beam data during post processing.

G.1f Heading data was acquired with Seatex Seapath and applied to determine multibeam transducer azimuth.

G.1g 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). A 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. **Data filed with field 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 correctors were developed by applying predicted time corrections and range correctors to the unverified tides at Portland, Maine (Station 841-8150). Unverified tidal data was downloaded from the NOS OPSD web site (www.opsd.nos.noaa.gov) and was computed in CARIS-HIPS and HPS and applied to SeaBat and DSF data.

PORTLAND, MAINE HARMONIC TIDE GAUGE		
Zone	ME156	ME157
Reference #	841-8150	841-8150
Time Corrector	-12 minutes	-18 minutes
Range Corrector	X 1.02	X 1.00

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 was acquired at the Portland, Maine Tide Gauge Station(841-8150) by N/OES231. Verified tides were unavailable during field processing. A Request for Approved Tides / Water Levels was mailed on October 21, 1998. This data will replace the unverified tide data during verification by N/CS33.

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 must 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 - *Seatech 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 Seatech Seapath 200 and Starlink systems were used throughout this survey for positioning determination. DGPS Radio Beacon reception sites were automatically selected by the strongest signal available within the survey area at a given time. The following DGPS beacons were within range of the survey area, Brunswick, ME being nearest:

USCG DGPS Radio Beacon Broadcast Sites	Freq (KHz)	Rate (BPS)	Latitude N	Longitude W	Range (n.m.)	Beacon ID #
Brunswick, ME (primary)	316	100	43°53'42"	069°56'17"	115	800
Portsmouth, NH	288	100	43°04'15"	070°42'36"	70	801

- 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 #
SeaPath 200	0347
StarLink, antenna Model MBA2	4202
Magnavox DGPS Receiver MX50R	078

H.5 The GPS Horizontal Dilution of Precision (HDOP) was recorded during data acquisition. HDOP values were checked within the raw DGPS navigational information (PreProcess.XTF data) when navigational errors were detected in HDCS navigational cleaning in CARIS-HIPS. Data where the computed maximum allowable HDOP value of 3.6 was exceeded was rejected in HDCS and was then reacquired.

Anomalous position data was either manually smoothed or flagged "rejected", depending on the extent of the affected data. Instantaneous vessel speed was automatically cleaned in CARIS with an event tolerance of 1.0 knot 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 is 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 data records.

Horizontal positions of the DSF vertical beam echo sounder data were corrected for GPS antenna offsets during field processing. Offsets in Hypack were acquired with multibeam transducer as the offset point ("batcentric"). *See Appendix E for data records.

H.7f 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 - *See also Evaluation Report*

No shoreline exists within the boundaries of survey H10820.

J. CROSSLINES

- J.1 A total of 18.83 nm of crosslines were acquired for this survey, equating to 5.3% of the 100% multibeam sonar coverage lines.
- J.2 Processed SeaBat crossline soundings gridded at 1 meter x 1 meter (see Section ~~F.4~~^{F.5}) were compared to a 1 meter x 1 meter gridded digital terrain model (DTM) surface in CARIS Workfile Processing. The DTM surface was built from processed SeaBat mainscheme soundings. Averaged across the statistics computed as a function of beam number (see Separate IV)*, the average mean difference between **SeaBat crossline and SeaBat mainscheme soundings** is approximately +0.135 meters (434,653 comparisons, a + symbol means the crossline soundings compared deeper, due to shoal-biased DTM surface). *See Separate IV for statistical report.

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 shallower areas. The bathymetry on survey H10820 is deep and extremely steep and rocky.

- 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 Evaluation Report

This survey does not junction with any contemporary surveys.

L. COMPARISON WITH PRIOR SURVEYS See also Evaluation Report

A comparison with prior surveys is not required for this survey, as stated in the Hydrographic Project Instructions for H10820. This comparison will be accomplished by N/CS33.

M. ITEM INVESTIGATION REPORTS

All significant or suspect multibeam contacts acquired during the one hundred percent mainscheme coverage were developed with additional near-nadir confidence swaths, ensuring that minimum depths in these areas were adequately defined. Fifty-six of these developments were considered verified or disproved by near-nadir multibeam development during this survey.

In addition, AWOIS Item Number 11018 was investigated with one hundred percent multibeam sonar coverage and development. Notable results from this development are summarized as follows:

M1.1 AWOIS NO: 10018

Item Description: OBSTRUCTION

Source: AWOIS Listing

AWOIS Position: Lat. 43°56'29.69" N Long. 069°01'56.94" W

Required Investigation: S2, SWMB, DI Radius: 250m

Charts Affected: 13302, 13303

INVESTIGATION

Date(s): July30 (DN211) and September 17, 1998 (DN260)

SWMB Depth Sounding Attributes: DN(211), Line 007_1505,
Time 15:07:51.049,
Profile # 1129, Beam # 6

Investigation Used: SWMB

Survey Position(s): Lat. 43°56'28.47"N Long. 069°01'59.61"W
30 57

Charted Position(s): Lat. 43°56'29.69"N Long. 069°01'56.94"W

Position Determined By: Differential GPS

Investigation Summary: AWOIS 10018 was covered with 100% SWMB coverage. Shoal soundings were investigated with additional SWMB coverage to obtain least depth soundings near nadir. A depth of 26 feet, was identified approximately 63.5 meters and 70° true from the center of the charted 27 feet by wire drag symbol on charts 13302 and 13303. **Note:** Chart 13302 has a danger curve surrounding the 27 foot by wire drag symbol, and chart 13303 has a 30 foot contour surrounding the same symbol at the same chart position.

CHARTING RECOMMENDATION

Recommendation: The hydrographer recommends the removal of the charted **27 feet by wire drag symbol** from charts 13302 and 13303. Replace with depth known to be **26 feet and surrounding danger curve** at the survey position. *(Repeat with clarification)*

*Chart 26 ft SWMB
Depth 27*

N. COMPARISON WITH THE CHART *See also Evaluation Report*

N.1 Three charts are affected by this survey:

CHART AFFECTED	EDITION	DATE	CHART SCALE
Chart 13301	20 th Ed.	01 March 1997	1 : 40,000
Chart 13302	19 th Ed.	20 June 1998	1 : 80,000
Chart 13303	11 th Ed.	06 July 1991	1 : 40,000

✓ N.2 Seven Dangers to Navigation were submitted on October 1, 1998 for survey H10820. Upon further data processing and review the 24 foot danger to navigation reported at latitude 43°56'50.41"N and longitude 069°04'56.27"W was rejected and a surveyed depth of 28 feet was consistent with the charted 28 foot depth. See Appendix ^A 1 for a copy of the report.

N.3a The overall agreement between charted soundings and survey depths ranges from good to poor. Most soundings compare within 0 to 5 feet, with occasional greater differences. One hundred percent coverage conducted during this survey identified several previously unknown features.

N.3b No shoaling or deepening trends were found in the survey area.

N.3c Survey data exhibits characteristics of complex geologic morphology. Rock escarpments, ledges, and other benthic features are indicative of glacial environments. These features were identified via sounding data and multibeam records throughout the survey area.

N.4 There was one submarine cable crossing area within the survey limits of H10820. This crossing~~s~~ was not visually identified by signs on the shoreline nor by benthic features portrayed within data records. Hydrographer recommends maintaining charted status of cable crossings.*
Appendix - See also Section 5.2 page 10

N.5a In some cases the charted depths over features were shoaler than survey depths. Additional sounding swaths were conducted over these features where survey data had not "beat the chart." These additional swaths generally confirmed the 100% multibeam data. The hydrographer believes these features may have shoal biased errors introduced by earlier and less accurate sounding technologies.

N.5b Due to limitations of swath coverage tools, the hydrographer lacks confidence that near-nadir beam soundings were acquired over all significant charted features. Additional multibeam swath coverage to cover holidays is recommended as discussed (Section S). Specifically, the hydrographer recommends maintaining conservative evaluation and retain charted soundings on the following features where the multibeam data did not beat the chart: *do not occur - chart soundings from the present survey*

Central positions of charted soundings from:	
Chart 13302 19 th Ed. 20 June 1998 1:80,000	
1 -	Charted 49 ft sounding 43°56'42.75"N 069°04'37.5"W
2 -	Charted 53 ft sounding 43°56'52.77"N 069°06'16.23"W
3 -	Charted 44 ft sounding 43°56'08.21"N 069°08'32.44"W

1 - Charted 36 ft Rock 43°55'23.80"N 069°08'42.10"W
2 - do not occur - charted 49 ft sounding - chart present survey depth
3 - do not occur - charted 53 ft sounding - chart present survey depth
4 - do not occur - charted 44 ft sounding - chart present survey depth
(3) do not occur - charted 36 ft - chart

O. ADEQUACY OF SURVEY

This survey is complete and fully adequate to supersede prior surveys in common areas with exceptions as mentioned in (Section N).

P. AIDS TO NAVIGATION

- P.1 Four detached positions were acquired on navigational aids during this survey.
- P.2 There were no submarine or overhead pipelines, tunnels, bridges, or ferry routes found in the survey area. A cable area is charted in the H10820 survey area approximately 1.3 kilometers due south of Two Bush Island.
- P.3 A comparison was made between the survey positions and the largest scale chart of the area. All aids are properly identified in the Light List. No aid was found to deviate from its charted position by more than a few meters. Each aid adequately serves the apparent purpose for which it was established.

Note: Used Charts 13301 20th Ed. March 01, 1997 (scale 1:40,000) and 13303 11th Ed. July 06, 1991 (scale 1:40,000) for comparison.

Q. STATISTICS

1.	a.	# of Multibeam (MB) Soundings Processed	42,562,000
	b.	# of MB Soundings Transferred to HPS	110,285
	c.	Lineal Nautical Miles of Sounding Lines	353.1 NM
2.	a.	Square Nautical Miles of Hydrography	7.2 SQNM
	b.	Days of Production	23
	d.	Detached Positions - Navigational Aids	4
	e.	Bottom Samples	27
	f.	Tide Stations	1
	g.	Velocity Casts	43
	j.	SeaBat Item Investigations	57

R. MISCELLANEOUS - See also Evaluation Report

- R.1 No evidence of silting, unusual submarine features, anomalous tide or tidal current conditions, or magnetic anomalies were detected during this survey.
- R.2 27 bottom samples were submitted to the Smithsonian Institution for this survey.

S. RECOMMENDATIONS

S.1 The following eleven positions centrally locate multibeam swath coverage holidays for survey H10820. It is recommended that further multibeam swath coverage be acquired over these holidays, especially item numbers one through four listed below, which reside in areas where a least depth determination will likely supercede charted soundings.

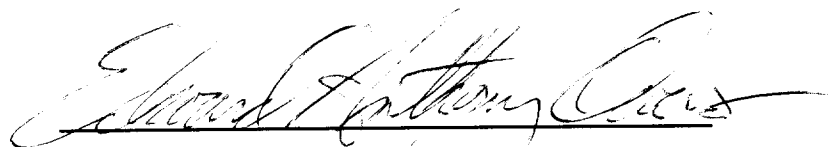
Multibeam Swath Coverage Holidays		
#	Central Latitude	Central Longitude
1	43°57'21.0" N	069°01'53.95" W
2	43°57'17.18" N	069°02'11.29" W
3	43°57'15.67" N	069°02'10.51" W
4	43°56'54.65" N	069°06'17.68" W
5	43°56'42.59" N	069°06'40.68" W
6	43°57'12.33" N	069°02'29.77" W
7	43°57'00.85" N	069°03'12.27" W
8	43°56'58.59" N	069°03'22.31" W
9	43°57'29.74" N	069°09'20.67" W
10	43°57'26.64" N	069°09'25.06" W
11	43°57'34.82" N	069°08'47.02" W

S.2 The charted cable area should be investigated for current relevance and possible removal. See also Section N.4 - page 13.

T. REFERRAL TO REPORTS

Copies of the Coast Pilot Report, User Evaluation, Chart Inspection, and Report of Danger to Navigation are included in the Separates.

This report and the accompanying field sheets are respectfully submitted.

A handwritten signature in cursive script, reading "Edward Anthony Owens". The signature is written in black ink and is positioned above a horizontal line.

Edward Anthony Owens
Physical Scientist, NOAA
Atlantic Hydrographic Branch



U.S. 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

October 1, 1998

*FAXED
 10/9/98
 LOCAL NOTICE TO MARINERS
 (10/20/98) 42/98*

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 the approaches to Penobscot Bay, Maine:

Hydrographic Survey Registry No....H-10820
 State.....Maine
 General Locality.....Approaches to Penobscot Bay
 Sublocality.....Two Bush Channel
 Project Number.....OPR-A366-RU-98
 Surveyed by.....NOAA Ship RUDE

During the course of multibeam sonar operations, several bathymetric rocky features were discovered to have least depths shoaler than the depths currently shown on the charts of the area. This new depth information merits immediate publication in the Local Notice to Mariners. The updated depth affects the following charts:

Chart 13302, Penobscot Bay and Approaches, 19th ed, 20 Jun 1998
 Chart 13303, Approaches to Penobscot Bay, 11th ed, 06 Jul 1991

DEPTH*	LATITUDE (NAD 83)	LONGITUDE (NAD 83)	CHARTS AFFECTED
43 ft 44	43° 57' 38.40" N	069° 02' 07.81" W	13302, 13303
41 ft 42	43° 57' 25.29" N	069° 01' 57.14" W	13302, 13303
44 ft 45	43° 57' 16.17" N	069° 02' 17.43" W	13302, 13303
58 ft 59	43° 57' 00.04" N	069° 03' 09.01" W	13302, 13303
43 ft 44	43° 56' 44.53" N	069° 03' 26.17" W	13302, 13303
24 ft 26	43° 56' 50.41" N	069° 04' 56.27" W	13302, 13303
42 ft 41	43° 56' 08.16" N	069° 05' 21.02" W	13302, 13303

* Updated depths are reduced to feet at MLLW using predicted tides and should be viewed as preliminary information, subject to office review.

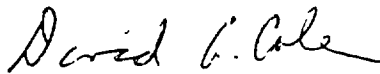


Contact either of the following personnel for further information:

Commanding Officer
NOAA Ship RUDE (207) 329-1966
439 West York Street
Norfolk, VA 23510

Chief, Atlantic Hydrographic Branch
Atlantic Marine Center (804) 441-6746
439 West York Street
Norfolk, VA 23510

Sincerely,



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

Attachment

cc: AHB
NIMA

APPENDIX K

APPROVAL SHEET

LETTER OF APPROVAL

REGISTRY NO. H10820

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 100% SWMB sonar coverage and is more than adequate to supersede all prior surveys in common areas with exceptions as noted in Sections N, O, and S. The survey is considered complete and adequate for nautical charting.



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

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

Addendum to H10820

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 NUMBER:

RU-10-08-99⁴

State: Maine

General locality: Approaches to Penobscot Bay

Locality: Two Bush Channel

Scale: 1: 10,000 Date of survey: June 1, 1999

Instructions dated: September 7, 1999 Project Number: OPR-A366-RU-98/99, CHANGE NO.-1

Vessel: NOAA Ship RUDE

Chief of Party: LCDR J. Verlaque, NOAA

Surveyed by: LCDR J. Verlaque, LT E. Berkowitz, ENS K. Slover, ST S. Rooney, AST M. Chandler

Soundings taken by echo sounder, hand lead-line, or pole: Reson SeaBat 9003 shallow-water sonar system, Odom-Echotrac Echosounder

Graphic record scaled by: RUDE Personnel

Graphic record checked by: RUDE Personnel

Protracted by: N/A Automated plot by: HP 2500CP

Verification by: AHB Branch Personnel

Soundings in: Feet: Fathoms: Meters: at MLW: MLLW: (*)

**Remarks: CHANGE NO.1 : Amendment to Hydrographic Survey Letter Instructions OPR-A366-RU-98.
All times recorded in UTC.**

Handwritten notes in the Addendum to the Descriptive Report were made during office processing.

JP 05/05/99 12/13/99 SSV

ADDENDUM to DESCRIPTIVE REPORT TO ACCOMPANY
HYDROGRAPHIC SURVEY, H10820
OPR-A366-RU-98
FIELD NUMBER: RU-10-04-98
SCALE: 1:10,000
NOAA SHIP RUDE
Commanding Officer
LCDR James S. Verlaque, NOAA

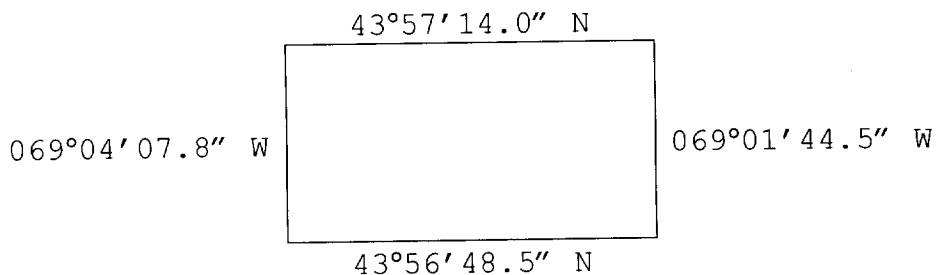
A. PROJECT

This survey was conducted in accordance with Hydrographic Project Instructions OPR-A366-RU, Approaches to Penobscot Bay, Maine (Two Bush Channel), dated June 22, 1998, and Change No.1 dated September 7, 1999. The 1998 survey was conducted from NOAA Ship RUDE under the command of LCDR David A. Cole, NOAA.

The purpose of addendum to H10820 is to provide additional SEABAT shallow water multibeam swath coverage over holidays discussed in section S. Recommendations from H10820 Descriptive Report.

B. AREA SURVEYED

Additional fieldwork was conducted for survey H10820 in an offshore area in Two Bush Channel, ten nautical miles south of Rockland, Maine with the following approximate boundaries:



Additional fieldwork for survey H10820 was conducted on June 01, 1998 (DN 152).

C. SURVEY VESSELS

All hydrography and multibeam investigations were conducted from NOAA Ship RUDE, S-590, EDP# 9040. General functions included multibeam sounding operations and velocity of sound determinations.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

- 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 8.9.7 (02/02/99) 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 5.0 (08/18/98) was utilized for data display during the evaluation process and completion of the field sheet. All software versions used for data processing are listed in **Appendix H. *Data filed with Field records.*
- D.1b Triton Corporation's ISIS software Version 4.32 was used to acquire SeaBat multibeam and digital side scan imagery. 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 VELOCWIN Version 4.01 was used to process the acquired data and calculate velocity corrections.

No additional changes were made to this section. Refer to H10820 Descriptive Report.

F. SOUNDING EQUIPMENT

- F.2a High frequency (100 kHz) vertical beam echo sounding data was acquired with an ODOM-Echotrac Echosounder (S/N 9643). Echograms were monitored on-line and anomalous echogram traces were immediately cross-referenced to the ISIS multibeam acquisition display online aboard NOAA Ship RUDE S-590. **Single-beam Data should NOT be included on the final field sheet; all final field soundings originate from multibeam data.**

No additional changes were made to this section. Refer to H10820 Descriptive Report.

G. CORRECTIONS TO SOUNDINGS

- G.1a Sound velocity correctors were computed from conductivity, temperature, and depth measurements acquired with SeaBird SBE19 SEACAT Profilers (s/n 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 cast was used:

VELOCITY CAST #	JULIAN DAY #
44	152

Sound velocity effects were applied to the SeaBat data using CARIS-HIPS (incorporating the NOAA Nautical Charting Development Lab REFRACT algorithm). Sound velocity correctors for the vertical beam soundings were computed using VELOCITY and applied to the single beam ODOM data using HPS.

- G.1b ODOM-leadline direct comparisons were conducted during the 1999 field season (See Appendix E). Continuous comparisons between ODOM and Seabat multibeam depths were monitored during field acquisition. Sounding comparisons are discussed in Section J.
- G.1d Vessel dynamic draft was measured for NOAA Ship RUDE vessel number 9040 on March 5, 1999 using the real time kinematic on the fly GPS method. Dynamic draft correctors were stored in the CARIS-HIPS Vessel Configuration File and HPS Offset Tables for use in data processing (See *APPENDIX E for data records).
- G.1g Multibeam heave, pitch, roll, and heading sensor data was adjusted using biases as determined during a patch test conducted on March 05, 1999 (DN064). See the CARIS-HIPS Vessel Configuration File in *Separate I for data records.
- G.6b Tide data was acquired at Portland, Maine (Station 841-8150) by N/OES231. A request for approved tides was mailed on June 28, 1999. This data will be compared to the verified tide data during verification by N/CS33 (see Section G.6d).
- G.6d **DO NOT REAPPLY ANY CORRECTORS in HPS, including verified smooth tides. Note that verified tide values have been applied to the entire multibeam data set in CARIS-HIPS prior to conversion to HPS.**

Upon receipt of approved tides, a comparison should be conducted by the Atlantic Hydrographic Branch (N/CS33) to determine whether tidal reference station(s), tide correction values, or zoning correctors differ from the applied OPSD verified tides. If tide station(s) and/or tidal data reducers do not differ, no reapplication of approved tides should be conducted in CARIS-HIPS. If tide station(s) and/or tidal data reducers do differ, approved

tidal data will supercede these correctors and needs to be applied to the entire multibeam data set in CARIS-HIPS. If necessary, all vertical correctors and horizontal offsets should be reapplied to multibeam data using CARIS software only.

No additional changes were made to this section. Refer to H10820 Descriptive Report.

Q. STATISTICS

1.	a.	No. of MB Soundings Transferred to HPS	503
	b.	Lineal Nautical Miles of Sounding Lines	2.7 NM
2.	a.	Square Nautical Miles of Hydrography	0.1 SQNM
	b.	Days of Production	1
	c.	Velocity Casts	1

S. RECOMMENDATIONS

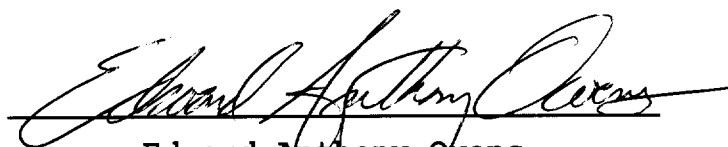
Additional SEABAT shallow water multibeam was acquired over fourteen significant multibeam coverage gaps. These confidence swaths were acquired to ensure that minimum depths in these areas were adequately defined. Least depth determinations in these development areas did not vary significantly from depths determined from survey H10820.

The following fourteen positions centrally locate multibeam swath coverage holidays run on June 01, 1998 (DN: 152).

Multibeam Swath Coverage Holidays	
Central Latitude	Central Longitude
43-57-21.33 N	069-01-53.65 W
43-57-17.13 N	069-02-11.45 W
43-57-15.66 N	069-02-10.54 W
43-57-12.34 N	069-02-29.86 W
43-56-59.47 N	069-02-45.41 W
43-56-59.77 N	069-03-17.51 W
43-56-56.48 N	069-03-43.92 W
43-57-12.57 N	069-04-06.05 W
43-57-35.27 N	069-03-36.10 W
43-57-37.63 N	069-03-35.10 W
43-57-01.12 N	069-05-33.87 W
43-56-54.73 N	069-06-17.36 W
43-56-51.71 N	069-06-26.45 W
43-56-50.20 N	069-06-27.49 W

No additional field work is required.

This report and the accompanying field sheets are respectfully submitted.

A handwritten signature in cursive script, reading "Edward Anthony Owens", written over a horizontal line.

Edward Anthony Owens
Physical Scientist, NOAA
Atlantic Hydrographic Branch

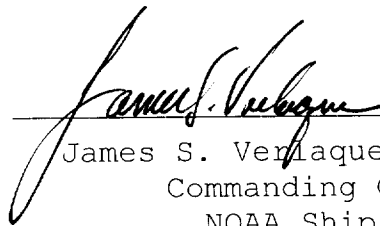
APPENDIX K

APPROVAL SHEET

LETTER OF APPROVAL
FOR
ADDENDUM to DESCRIPTIVE REPORT TO ACCOMPANY
HYDROGRAPHIC SURVEY, H10820
OPR-A366-RU-98
FIELD NUMBER: RU-10-04-98
SCALE: 1:10,000
NOAA SHIP RUDE
Commanding Officer
LCDR James S. Verlaque, NOAA

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 addendum is more than adequate to support survey H10820 data in common areas. This survey is considered complete and adequate for nautical charting.



James S. Verlaque, LCDR, NOAA
Commanding Officer
NOAA Ship RUDE



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: April 12, 1999

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-A366-RU-98

HYDROGRAPHIC SHEET: H-10820

LOCALITY: Approaches to Penobscot Bay, ME (Two Bush Channel)

TIME PERIOD: June 22 - September 17, 1998

TIDE STATION USED: 841-8150 Portland, ME
Lat. $43^{\circ} 39.4'N$ Lon. $70^{\circ} 14.8'W$

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

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.880 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: ME156 & ME157

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.

Thomas V. Mero 4/12/99

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION





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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: August 24, 1999

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-A366-RU-98

HYDROGRAPHIC SHEET: H-10820

LOCALITY: Approaches to Penobscot Bay, ME (Two Bush Channel)

TIME PERIOD: June 1, 1999

TIDE STATION USED: 841-8150 Portland, ME

Lat. 43° 39.4'N Lon. 70° 14.8'W

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

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.880 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: ME156 & ME157

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.

Thomas V. Mero 8/24/99

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

GEOGRAPHIC NAMES

H-10820

Name on Survey	ON CHART NO. 13307 13303		ON PREVIOUS SURVEY		ON U.S. QUADRANGLE MAPS		FROM LOCAL INFORMATION		ON LOCAL MAPS		P.O. GUIDE OR MAP ATLAS		U.S. LIGHT LIST	
	A	B	C	D	E	F	G	H	K					
PENOBSCOT BAY (title)	X		X											1
MAINE (title)	X		X											2
TWO BUSH CHANNEL	X		X											3
														4
														5
														6
														7
														8
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														21
														22
														23
														24
														25

Approved:

Dennis J. Ransburg
Chief Geographer
MAY 5 1999

N/CS33-85-99

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

DEC 8, 1999

NUMBER OF PACKAGES

ONE TUBE

TO:

CHIEF, DATA CONTROL GROUP, N/CS3x1
NOAA/NATIONAL OCEAN SERVICE
STATION 6815, SSMC3
1315 EAST-WEST HIGHWAY
SILVER SPRING, MARYLAND 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.

H10820

MAINE, APPROACHES TO PENOBSCOT BAY, TWO BUSH CHANNEL

(ONE) TUBE CONTAINING THE FOLLOWING:

- SMOOTH SHEET FOR SURVEY H10820
- ORIGINAL DESCRIPTIVE REPORT
- 2 DRAWING HISTORY FORMS (NOAA FORM #76-71) FOR NOS CHARTS 13301 AND 13303
- 1 RECORD OF APPLICATION TO CHART FORM (NOAA FORM #75-96) FOR SURVEY H10820
- 2 H-DRAWINGS FOR NOS CHARTS 13301 AND 13303
- 2 COMPOSITE DRAWINGS FOR NOS CHARTS 13301 AND 13303

FROM: (Signature)

DEBORAH A. BLAND

RECEIVED THE ABOVE

(Name, Division, Date)

Return receipted copy to:

ATLANTIC HYDROGRAPHIC BRANCH
N/CS33
439 WEST YORK STREET
NORFOLK, VA 23510-1114

12/08/99

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10820

NUMBER OF CONTROL STATIONS		2
NUMBER OF POSITIONS		110285
NUMBER OF SOUNDINGS		110285
	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	6.0	04/07/99
VERIFICATION OF FIELD DATA	73.0	10/18/99
QUALITY CONTROL CHECKS	64.0	
EVALUATION AND ANALYSIS	8.0	
FINAL INSPECTION	4.0	10/19/99
COMPILATION	54.0	12/01/99
TOTAL TIME	209.0	
ATLANTIC HYDROGRAPHIC BRANCH APPROVAL		10/21/99

**ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10820 (1998)**

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

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 0.297 seconds (9.178 meters or 0.92 mm at the scale of the survey) north in latitude, and 1.850 seconds (41.248 meters or 4.12 mm at the scale of the survey) east in longitude.

I. SHORELINE

There is no shoreline within the bounds of this survey.

K. JUNCTIONS

There are no junctional surveys to the north, south, east or to the west of this survey. Present survey depths are in harmony with the charted hydrography to the north, south, east and 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 13301 (20th EDITION, Mar 1/97)
13302 (19th EDITION, Jun 20/98)
13303 (11th EDITION, Jul 6/91)

Hydrography

The charted hydrography originates with the prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in Sections M. and N. of the Descriptive Report. Attention is directed to the following:

1) A charted rock with a depth of 36 feet (10³m), in Latitude 43°55'23.80"N, Longitude 69°08'42.10"W originates with an unknown source. This item was investigated and a 39 foot (11⁸m) depth on a rock was located in Latitude 43°55'22.148"N, Longitude 69°08'42.188"W. It is recommended that the 36 foot rock be removed from all affected charts and that a dangerous 39 foot rock be charted as shown on the present survey.

2) A charted rock with a depth of 44 feet (13⁴m), in Latitude 43°56'08.00"N, Longitude 69°08'33.00"W, originates with an unknown source. This item was investigated and disproved by the present survey. It is recommended that the 44 foot rock be removed from all affected charts.

3) An uncharted submerged rock with a least depth of 47 feet (14³m) was located during office processing in Latitude 43°56'03.622"N, Longitude 69°08'38.526"W. It is recommended that a dangerous 47 foot rock be charted as shown on the present survey.

4) A charted rock with a depth of 45 feet (13⁷m), in Latitude 43°57'38.10"N, Longitude 69°02'20.70"W, originates with an unknown source. This item was investigated and a 46 foot (14m) depth on a rock was located in Latitude 43°57'36.888"N, Longitude 69°02'21.823"W. It is recommended that the 45 foot rock be removed from all affected charts and that a dangerous 46 foot rock be charted as shown on the present survey.

Except as noted above, the present survey is adequate to supersede the charted hydrography within the common area.

O. ADEQUACY OF SURVEY

This is an adequate hydrographic/multi-beam 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 the Marine Chart Division, Silver Spring, Maryland.

The following NOS Charts were used for compilation of the present survey:

13301	1:40,000	(20th Edition, Mar. 1/97)
13303	1:40,000	(11th Edition, Jul. 6/91)

H10820

Robert Snow

Robert Snow

Cartographic Technician
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H10820

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 disproval 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 W. Blevins Date: 10/31/79
Richard W. Blevins
Cartographer
Atlantic Hydrographic Branch

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

Andrew L. Beaver Date: 10/21/79
Andrew L. Beaver
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch

Final Approval:

Approved: Samuel P. DeBow, Jr. Date: Jan. 7, 2008
Samuel P. DeBow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

