W00047

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey: **Navigable Area**

Registry Number: **W00047**

LOCALITY

State: Massachusetts

General Locality: Massachusetts Bay

Sub-locality: 8 NM East of Rockport Harbor

2003

CHIEF OF PARTY
Donald W. Haines, LCDR, NOAA

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DATE

NOAA FORM 77-28U.S. DEPARTMENT OF COMMERCE
(11-72)NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

W00047

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

State:	**Massachusetts**		
General Locality:	**Massachusetts Bay**		
Sub-Locality:	**8 NM NE of Rockport Harbor**		
Scale:	**1:20,000**	Date of Survey:	**04/05/1996 to 12/10/1996** **10/01/2003 to 10/01/2003**
Instructions Dated:	**07/17/03**	Project Number:	**OPR-A397-TJ-03**
Vessel:	**NOAA Ship THOMAS JEFFERSON, S-222**		
Chief of Party:	**LCDR Donald W. Haines, NOAA**		
Surveyed by:	**THOMAS JEFFERSON Personnel**		
Soundings by:	**Kongsberg Simrad EM1002 multibeam echosounder**		
Graphic record scaled by:	**N/A**		
Graphic record checked by:	**N/A**		
Protracted by:	**N/A**	Automated Plot:	**N/A**
Verification by:	**Atlantic Hydrographic Branch Personnel**		
Soundings in:	**Meters at MLLW**		

Remarks: ***Bold, Italic, Red notes in Descriptive Report were made during office processing. Charted depths in feet at MLLW.***

1) All Times are UTC.

2) This is a Navigable Area Hydrographic Survey.

3) Projection is UTM Zone 19.

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DESCRIPTIVE REPORT

to accompany

HYDROGRAPHIC SURVEY W00047

Scale of Survey: 1:20,000
Year of Survey: 2003
NOAA Ship THOMAS JEFFERSON
LCDR Donald W. Haines, Commanding

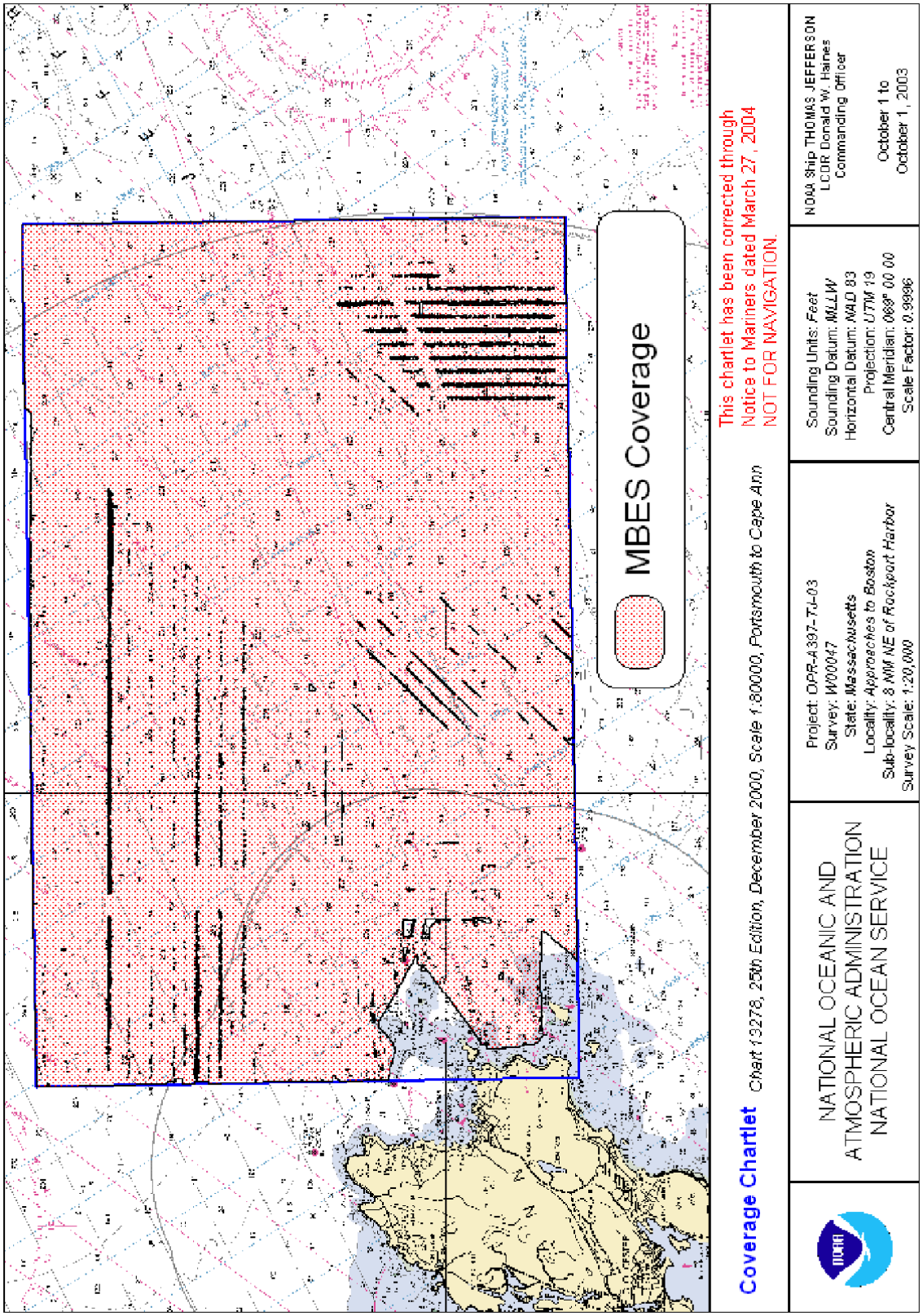
A. AREA SURVEYED

This hydrographic survey was conducted in accordance with Hydrographic Survey Letter Instructions* for project OPR-A397-TJ03, ~~Approaches to Boston~~ ***Massachusetts Bay***, Massachusetts. The original instructions* are dated July 17, 2003.
Data filed with original field records.

This Descriptive Report pertains to sheet "Q" of project OPR-A397-TJ-03. The assigned registry number for this sheet is W00047, as prescribed in the Letter Instructions*.

This project is being conducted to provide contemporary hydrography with full bottom multibeam coverage in the approaches to Boston Harbor. This project responds to requests from the Massachusetts Port Authority (MASSPORT), Boston Pilots, the First U.S. Coast Guard District, Massachusetts Coastal Zone Management (Boston, MA), and the U.S. Geological Survey (Woods Hole, MA).

This project will also contribute valuable bathymetric data to the Stellwagen Bank Marine Sanctuary program in conjunction with the U.S. Geological Survey (USGS), Woods Hole Oceanographic Institution (WHOI), and the Canadian Hydrographic Service (CHS). Multibeam tracklines will be run in order to validate Outside Source Data (OSD) from the USGS and the University of New Hampshire (UNH). For complete survey limits, see the chartlet on the following page.


MBES Coverage
Coverage Chartlet
Chart 13278, 25th Edition, December 2000, Scale 1:80000, Portsmouth to Cape Ann
This chartlet has been corrected through
Notice to Mariners dated March 27, 2004
NOT FOR NAVIGATION
NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE
Project: OPR-A397-TJ-03
Survey: W00047
State: Massachusetts
Locality: Approaches to Boston
Sub-locality: 8 NM NE of Rockport Harbor
Survey Scale: 1:20,000
Sounding Units: Feet
Sounding Datum: MLLW
Horizontal Datum: NAD 83
Projection: UTM 19
Central Meridian: 069° 00 00
Scale Factor: 0.9996
NOAA Ship THOMAS JEFFERSON
LCDR Donald W. Haines
Commanding Officer
October 1 to
October 1, 2003

B. DATA ACQUISITION AND PROCESSING *See Also Evaluation Report.*

EQUIPMENT

This survey took advantage of a vast data set acquired by U.S. Geological Survey (USGS). The USGS and their partnership with the Canadian Hydrographic Survey, acquired multibeam bathymetric data over a time span of ten years. The data for this sheet were acquired from April 5, 1996 to December 10, 1996. Data were delivered to NOAA in UNB swathed format. The data were assembled and converted to Caris HIPS format at University of New Hampshire's Joint Hydrographic Center as part of the preparation for the project. This Outside Source Data (OSD) was integrated into our quality control pipeline (see Quality Control section). The majority of this OSD was located in waters greater than 20 meters and not located in high priority navigation areas as depicted in the national survey plan.

Data were also acquired by NOAA Ship THOMAS JEFFERSON on October 1, 2003 to help verify the OSD. NOAA Ship THOMAS JEFFERSON acquired multibeam echosounder (MBES) data using a Simrad 1002 multibeam system. All positioning and attitude were determined with a TSS POS/MV 320 (version 3) GPS-aided inertial navigation system. Sound velocity casts were conducted with a Sea Bird 19 profiler.

Due to a roll calibration error affecting outer beams at more than 50° off nadir, all data acquired by NOAA Ship THOMAS JEFFERSON were filtered to 45° from nadir on each side. Refer to the Data Acquisition and Processing Report (DAPR)***** for detailed equipment and vessel configuration information, MBES system calibrations, data acquisition, and data processing.
****Data filed with original field records.***

QUALITY CONTROL

Multibeam Quality Control

Mainscheme MBES data is defined to be the Outside Source Data (OSD). There were no known faults with the MBES system which affected data integrity. ***Concur.***

All outside source data were analyzed using Caris HIPS and SIPS 5.4, taking advantage of the new statistical analysis and error tracking capabilities. The data were used in the creation of **HIPS** BASE (Bathymetry Associated with Statistical Error) surfaces and analyzed using the standard deviation, density, and uncertainty layers. No systematic problems with the outside source data were found. ***Concur.***

Crosslines

On DN 274, data from five MBES crosslines were acquired by NOAA Ship THOMAS JEFFERSON. Mainscheme and crossline data were analyzed in a **HIPS** BASE surface (see project DAPR*).Based on ten randomly chosen sample points per crossline, the crosslines averaged 0.6 meters deeper than the mainscheme data. Several potential causes of this discrepancy were tested (See USGS Stellwagen Bank Data Memorandum in Appendix V). There was no single cause that could adequately explain the difference, but it is likely due to a combination of draft measurement errors on both CREED and THOMAS JEFFERSON, and tidal epoch change. The OSD shows excellent agreement with charted soundings and is valid for superceding the chart in those places where there is disagreement. ***Concur. See Also Evaluation Report.***

Junctions

Hydrographic survey W00045, Sheet O, and W00046, Sheet P, adjoin the southern edge of W00047. Survey W00048, Sheet R, adjoins the eastern edge of W00047. Survey W00050, Sheet T, adjoins the northern edge of W00047. All four surveys are part of project OPR-A397-TJ-03, and are validations of the same outside source data. As such, the data used for the survey overlaps were identical. ***Concur. See Also Evaluation Report.***

CORRECTIONS TO ECHO SOUNDING

All methods or instruments used were as described in the project DAPR*. A table detailing all sound velocity casts is located in Separate III*. ***Concur.***
Data filed with original field records.

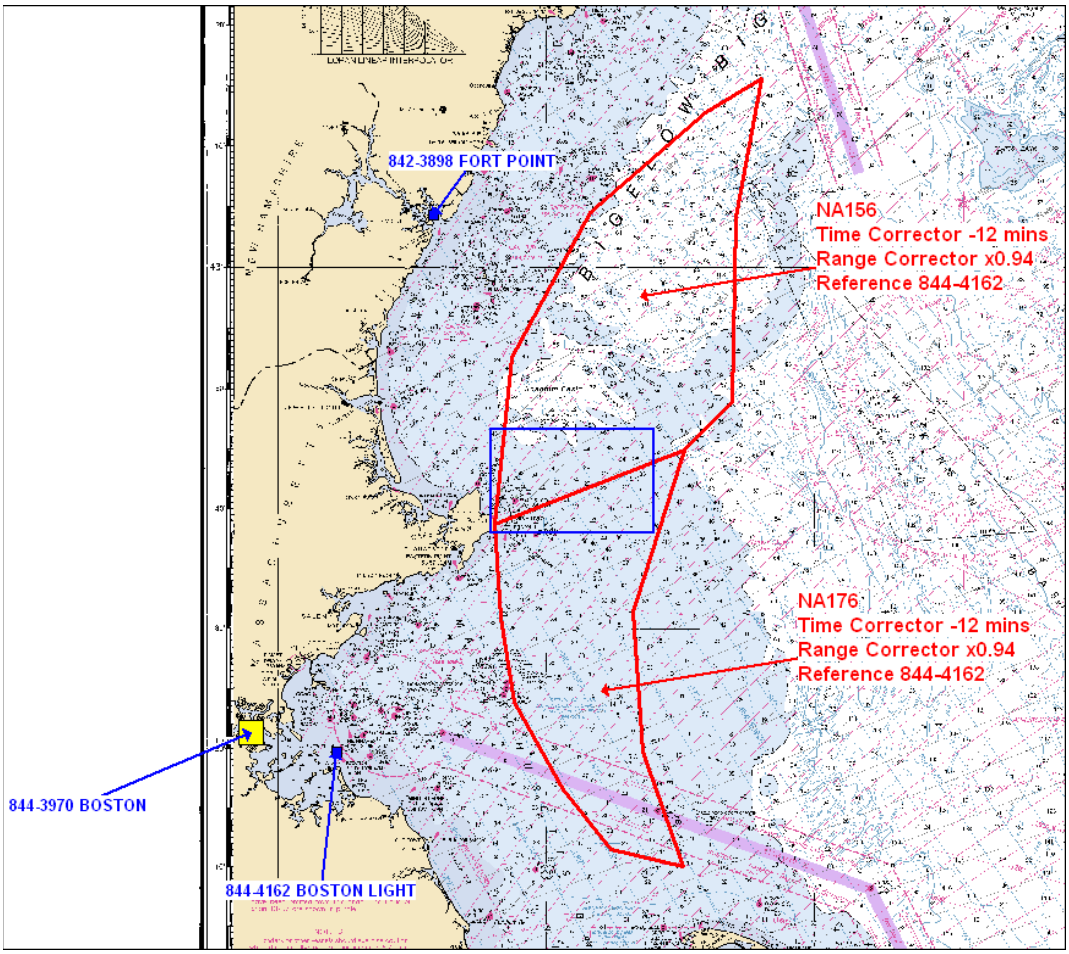
C. VERTICAL AND HORIZONTAL CONTROL

VERTICAL CONTROL

The tidal datum for this project is Mean Lower Low Water (MLLW). The operating tide stations at Boston, MA (844-3970) and Portland, ME (841-8150) served as control for datum determination. Tertiary gauges at Boston Light (844-4162) and Fort Point, NH (842-3898) provided ancillary tide data. ***Concur.***

Tidal zoning for this survey is consistent with the Letter Instructions*. The zones used for this survey are as follows:

ZONE NAME	CORRECTOR (min)	RATIO	REFERENCE
NA156	-12	x0.94	844-4162
NA176	-12	x0.94	844-4162



A Request for Approved Tides letter was sent to N/OPS1 on October 15, 2003 (Appendix IV*). Verified tides from the N/OPS1 CO-OPS website were applied to THOMAS JEFFERSON data on February 20, 2004. Preliminary zoning and verified water levels downloaded from the CO-OPS web site were used for the OSD data within the limits of this sheet. ***Concur. There were no differences in the preliminary and final zoning for this survey sheet.***

HORIZONTAL CONTROL ***See also Evaluation Report.***

The horizontal datum used for this survey is the North American Datum of 1983 (NAD 83), projected using UTM zone 19.

Sounding positional control was determined using the Global Positioning System (GPS) corrected by U.S. Coast Guard differential GPS (DGPS) beacon stations. The primary and only DGPS beacon used for this survey was Portsmouth, New Hampshire (Beacon #771). No horizontal control stations were established for this survey.

Horizontal dilution of precision (HDOP) was monitored during data acquisition. That value did not exceeded 2.50, and the survey was conducted during times of adequate satellite coverage.

**** Data filed with original field records.***

D. RESULTS AND RECOMMENDATIONS *See also Evaluation Report.*

CHART COMPARISON

There are seven charts affected by this survey:

13279, 30th edition, March, 2003, scale 1:20000
13274, 25th edition, September, 2003, scale 1:40000
13278, 25th edition, December, 2000, scale 1:80000
13260, 39th edition, June, 2003, scale 1:378838
13200, 33rd edition, January 19, 2002, scale 1:400000
13009, 30th edition, August 1, 2002, scale 1:500000
13006, 31st edition, June, 2003, scale 1:675000
13003, 47th edition, June, 2003, scale 1:1200000

General Agreement with Charted soundings

The sounding data acquired during this survey agree well with the charted depths. The charted depths are from partial bottom NOS surveys conducted before 1970. The MBES data acquired for this survey are adequate to supercede the charted depths. ***Concur. See also Evaluation Report.***

AWOIS Items and Significant Contacts

There are ~~five~~ ***three*** AWOIS items within the survey limits. These are addressed in the Item Investigation section found in Appendix I. ***Concur.***

Dangers to Navigation

There were no Dangers to Navigation (DtoN) reported by the Hydrographer for this project. ***Concur.***

Charted Features

There are ~~three~~ ***four*** charted features addressed in the Item Investigation section found in Appendix I. ***Concur. See also Evaluation Report, Chart Comparison, Additional Results, Charted AWOIS Item***

Uncharted Features

There are ~~three~~ ***no*** uncharted features addressed in the Item Investigations section in Appendix I. ***Concur.***

Charting Recommendations

Display survey soundings and redraw contour lines to represent the soundings acquired. ***Concur.***

BASE SURFACE PRODUCTS

The data for survey W00047 are submitted as two finalized BASE surfaces. One surface's threshold covers the depth range from 0 to 40 meters; the second covers the range from 30 to 200 meters. ***Concur. See also Evaluation Report.***

ADDITIONAL RESULTS

Aids to Navigation and Other Detached Positions

There are ~~six~~ ***two*** Aids to Navigation within the survey limits. However, no detached positions were taken and the hydrographer recommends they remain as charted. ***Concur.***

Bridges and Overhead Cables

There are no bridges or overhead cables within the survey limits. ***Concur.***

Ferry Routes

There are no ferry routes that pass through the survey limits. ***Concur.***

Submarine Cables and Pipelines

There are no charted submarine cables or pipelines within the survey limits, nor were any found during the survey. ***Do not concur. See also Evaluation Report.***

APPENDIX I

ITEM INVESTIGATIONS AND CHARTED FEATURES

Registry Number: W00047

State: Massachusetts

Locality: Approaches to Boston

Sub-locality: 8 NM NE of Rockport Harbor

Project Number: OPR-A397-TJ-03

Survey Dates: 12/10/1996 - 07/01/2004

Charts Affected

Number	Version	Date	Scale
13279	30th Ed.	03/01/2003	1:20000
13274	25th Ed.	09/01/2003	1:40000
13278	25th Ed.	12/09/2000	1:80000
13260	39th Ed.	06/01/2003	1:378838
13200	33rd Ed.	01/19/2002	1:400000
13009	30th Ed.	08/01/2002	1:500000
13006	31st Ed.	06/01/2003	1:675000
13003	47th Ed.	06/01/2003	1:1200000

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Charted 25 Foot shoal	Shoal	6.83 m	42° 39' 22.880" N	070° 35' 10.440" W	---
2.1	Charted wreck cleared to 20 (CHELSEA)	Wreck	[None]	42° 38' 48.943" N	070° 34' 10.481" W	---
3.1	UNKNOWN	AWOIS	[no data]	[no data]	[no data]	---
3.2	ALDEN	AWOIS	[no data]	[no data]	[no data]	---
3.3	AWOIS #7841 Chelsea	Sounding	23.25 m	42° 38' 57.671" N	070° 34' 10.188" W	7841

1.1) Charted 25 Foot shoal

Survey Summary

Survey Position: 42° 39' 22.880" N, 070° 35' 10.440" W

Least Depth: 6.83 m

Timestamp: 1996-345.15:08:52.150 (12/10/1996)

Survey Line: stellwagen / creed / 1996_345 / stell_345_0981

Profile/Beam: 1742/16

Charts Affected: 13279_1, 13274_5, 13278_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

Feature is the least depth over a charted shoal. The least depth is three feet shoaler and 33 meters NE of the charted shoal.

Feature Correlation

Address	Feature	Range	Azimuth	Status
stellwagen/creed/1996_345/stell_345_0981	1742/16	0.00	000.0	Primary
ChartGPs - Digitized	12	33.86	026.4	Secondary

Hydrographer Recommendations

Chart per digital data.

Cartographically-Rounded Depth (Affected Charts):

22ft (13279_1, 13274_5, 13278_1)

3 ¾fm (13260_1, 13009_1, 13006_1, 13003_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)

Attributes: EXPSOU - 2:shoaler than range of depth of the surrounding depth area

INFORM - Feature is the least depth over a charted shoal. The least depth is three feet shoaler and 33 meters NE of the charted shoal.

QUASOU - 6:least depth known

TECSOU - 3:found by multi-beam

Office Notes

Feature is represented on ENC US4MA04M as an Underwater/awash rock (S-57 feature UWTROC) and as a 25ft sounding on Raster charts. For ENC remove UWTROC feature 7.6m at location 42-39-22.954N, 070-35-14.096W and place UWTROC feature 6.7m at location 42-39-22.878N, 070-35-10.554W. On Chart 13279 this is charted as a 25' sounding with charted "rky." Recommend charting a 21' sounding and retaining rky as charted.

2.1) Charted wreck cleared to 20 (CHELSEA)

Survey Summary

Survey Position: 42° 38' 48.943" N, 070° 34' 10.481" W

Least Depth: [None]

Timestamp: 2004-183.04:52:25 (07/01/2004)

GP Dataset: ChartGPs - Digitized

GP No.: 2

Charts Affected: 13279_1, 13274_5, 13278_1, 13260_1, 13200_1, 13009_1, 13006_1, 13003_1

Remarks:

The charted wreck, corresponding to AWOIS item 7841, is from NOS surveys conducted prior to 1970. The charted wreck was not definitively found amongst the rocky bottom in the area. The Simrad EM 1000 used for the Outside Source data would likely have found a navigationally significant wreck in this depth of water.

Feature Correlation

Address	Feature	Range	Azimuth	Status
ChartGPs - Digitized	2	0.00	000.0	Primary

Hydrographer Recommendations

Delete dangerous obstruction from chart. Chart per digital data.

S-57 Data

[None]

Office Notes

Delete Wk depth 20ft swept by wire drag symbol located at 42°38'48.203"N, 070°34'09.585"W. Chart least depth soundings from current survey.

3.1) AWOIS #2142 - UNKNOWN

No Primary Survey Feature for this AWOIS Item

Search Position: 42° 39' 54.340" N, 070° 28' 16.140" W

Historical Depth: [None]

Search Radius: 0

Search Technique: [unknown]

Technique Notes: [unknown]

History Notes:

[unknown]

Survey Summary

Charts Affected: 13278_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

AWOIS 2142 was not found. Based on coverage, sounding density, and nature of AWOIS item, detection with the EM 1000 MBES used for this survey would not have been likely.

Feature Correlation

Address	Feature	Range	Azimuth	Status
A397_03_TJ	AWOIS # 2142	0.00	000.0	Primary
stellwagen/creed/1996_113/stell_113_0698	1515/7	50.08	195.8	Secondary (grouped)

Hydrographer Recommendations

Retain as charted.

S-57 Data

[None]

Office Notes

Concur with clarification. Defer to MCD for charting status - this item appears on charts 13260 and 13009 only.

3.2) AWOIS #2145 - ALDEN

No Primary Survey Feature for this AWOIS Item

Search Position: 42° 41' 30.340" N, 070° 19' 22.130" W

Historical Depth: [None]

Search Radius: 0

Search Technique: [unknown]

Technique Notes: [unknown]

History Notes:

[unknown]

Survey Summary

Charts Affected: 13278_1, 13260_1, 13009_1, 13006_1, 13003_1

Remarks:

AWOIS 2145 was not found. Based on sounding density in vicinity of AWOIS 2145, detection with EM 1000 MBES would have been unlikely.

Feature Correlation

Address	Feature	Range	Azimuth	Status
A397_03_TJ	AWOIS # 2145	0.00	000.0	Primary
stellwagen/creed/1996_106/stell_106_0566	3107/57	51.48	147.1	Secondary (grouped)

Hydrographer Recommendations

Retain as charted.

S-57 Data

[None]

Office Notes

Concur with clarification. Defer to MCD for charting status - this item appears on chart 13009 only.

3.3) AWOIS #7841 Chelsea

Primary Feature for AWOIS Item #7841

Search Position: 42° 38' 54.000" N, 070° 34' 05.700" W

Historical Depth: [None]

Search Radius: 0

Search Technique: [unknown]

Technique Notes: [unknown]

History Notes:

[unknown]

Survey Summary

Survey Position: 42° 38' 57.671" N, 070° 34' 10.188" W

Least Depth: 23.25 m

Timestamp: 1996-345.20:41:39.530 (12/10/1996)

Survey Line: stellwagen / creed / 1996_345 / stell_345_1022

Profile/Beam: 1350/52

Charts Affected: 13279_1, 13274_5, 13278_1, 13260_1, 13200_1, 13009_1, 13006_1, 13003_1

Remarks:

[None]

Feature Correlation

Address	Feature	Range	Azimuth	Status
stellwagen/creed/1996_345/stell_345_1022	1350/52	0.00	000.0	Primary
A397_03_TJ	AWOIS # 7841	152.28	318.2	Secondary (grouped)

Hydrographer Recommendations

[None]

Cartographically-Rounded Depth (Affected Charts):

76ft (13279_1, 13274_5, 13278_1)

12fm (13260_1, 13200_1, 13009_1, 13006_1, 13003_1)

S-57 Data

[None]

Office Notes

Feature corresponds to AWOIS item #7841 Chelsea, as described by the Massachusetts Board of Underwater Archaeological Resources (see attached web page document). Least depth on feature from office evaluation of HIPS data. Recommend charting a non-dangerous wreck at position 42°38'57.671"N, 070°34'10.188W".

Feature Images

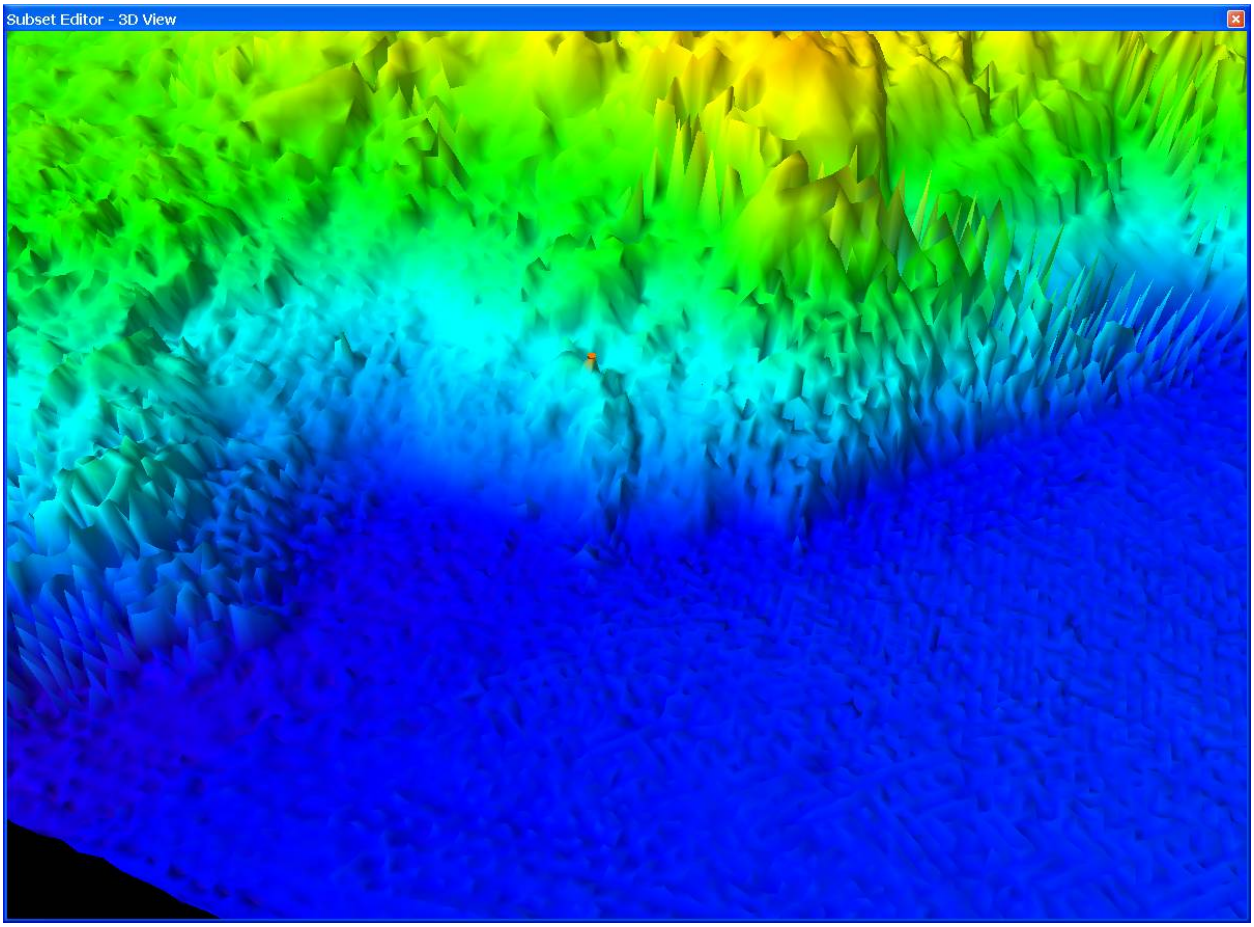


Figure 3.3.1

Description: **Coastal Tanker; Steel**
Dimensions: *length* - **169.7 ft.** *width* - **30.1 ft.** *depth* - **12.4 ft.**
Tonnage: *gross* - **556**, *other* - **Dead Weight - 402**
Propulsion: **Motor Vessel, single propeller**
Machinery: **(1930) Fairbanks, Morse & Co., 5 cylinder Oil Engine, 14" cylinder diameters, 17" stroke, 400 Brake Horse Power**
Cargo: **6000 barrels of number 2 fuel oil**

The Shipwreck

Date Sunk: **February 10, 1957**
Cause: **Foundered**
Location: **Cape Ann, off Loblolly Cove, ½ mile northeast of Thatcher Island.**
Coordinates: *Latitude,* **42° - 38' - 52"N** *Longitude,***70° - 34' - 11"W**
Loran:

At 8:30 Sunday morning, after loading fuel oil for delivery to Newington, New Hampshire, the coastal tanker *Chelsea* left Boston. Visibility was good, but a 35-mph northwesterly wind was whipping up seas off shore. Captain Keith Beale hoped to avoid the rough water by hugging the shorline, taking advantage of the protection it offered. Around 11:30 Beale turned command over to his Chief Mate, and went below. About 1 hour later *Chelsea* ground to a halt. The Chief had attempted a shortcut, popular with the Gloucester fishermen, between Straitsmouth Island and the Dry Salvages. He cut in to close to the submerged section of the Sandy Bay Breakwater, on the outgoing tide, and the tanker came to ground. The force of the impact opened a gash in her bow.

Chelsea was hard aground and the crew's attempts to free her were in vain. At last a **Coast Guard** 36-foot motor lifeboat came to remove all but skipper Beale.

The **Coast Guard** already had their hands full when *Chelsea* happened onto the breakwater. Late Saturday evening, the tanker *Franco Lisi* grounded on Little Misery Island off Boston. Although the vessel freed itself shortly after noon, Sunday, no cutter was available to render immediate assistance to the *Chelsea*. About 6 hours after running aground, the **Coast Guard** cutter *Evergreen* was standing by the helpless tanker. Pounding seas had opened the gash in her bow to near amidship, a length of 80 feet. In the hours before *Evergreen* arrived it was decided to attempt to patch the hole while the ship was still aground. Her crew was returned but before work could commence and just as the **Coast Guard** motor lifeboat was attempting to ferry a towline to the *Evergreen*, the rising tide floated *Chelsea* off the breakwater.

Water was now pouring into the tanker through the gash in her hull. Immediately, the motor lifeboat removed two of *Chelsea*'s crew as strong winds pushed the tanker in a Southerly direction. When roughly off Loblolly Cove, *Chelsea* began to settle fast. With little time for rescue remaining, the **Coast Guard** lifeboat edged in close to the tanker. Captain Beale and the remaining crew jumped for their lives, *Chelsea*, literally, sinking from beneath their feet. A crewman on the lifeboat quickly took an axe to the towline, to prevent his own vessel from being dragged under.

Chelsea settled into 60 feet of water.

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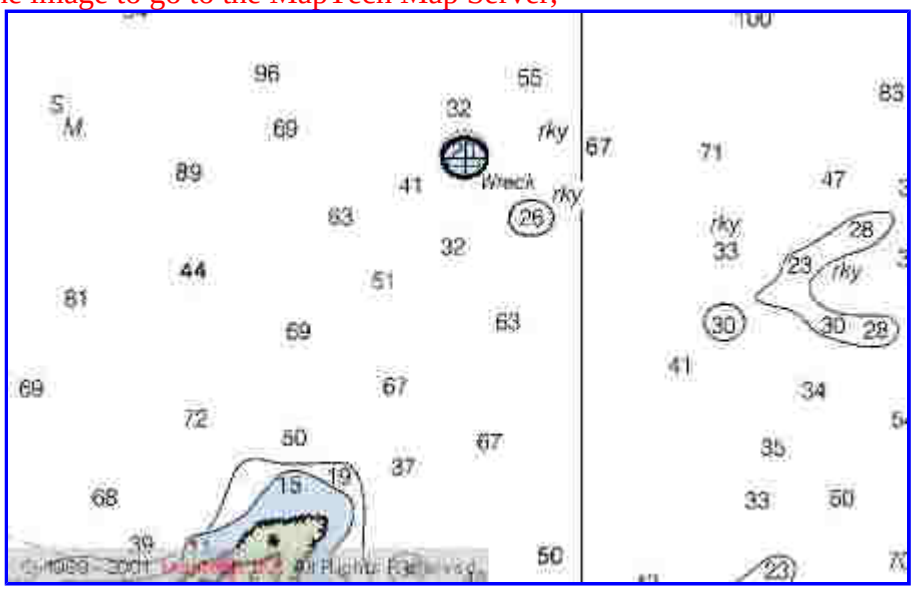
Dive Site Conditions

Depth in feet: *maximum* - **60**; *minimum* - **45**
Visibility in feet: *average* -

Chelsea settled with her bow on a ledge and her stern buried in the mud with no support amidship. This position broke the ship in two. The bow came to rest alongside, the ledge wall it was once atop, protecting the bow from storm damage. The bow gunnels are level with the top of the ledge. Over the years tidal action separated the two pieces. The stern is scattered and broken up on the bottom. The bow, until recently was known as a "Hollywood" wreck. It looked like a ship and was very photogenic, not a broken and twisted pile of scrap characterized by so many of New England's shipwrecks. It's best to dive the wreck at slack water because of strong tidal currents.

Click on the image to go to the MapTech Map Server,

for additional navigation information.



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Historical Background

Constructed: *year* - **1919**; *where* - **Bath, Maine**.
builder - **Texas S.S. Company**.
Construction details: **Machinary placed aft; 1 Deck plus a 39 ft. Poop Deck; 8 Bulkheads**.
Crew: **5** ; *Master:* **Keith Beale**
Owners: **Peerless #1 Corporation, New Jersey**
Home or Hailing Port: **Boston, Massachusetts**
Former Name(s) and date(s): **Texaco #145 (1919)**
Official number: **218001** Country: **U.S.A.**.
Other Comments: Hull #27 of the Texas S.S. Co.
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Salvage

The **Coast Guard** was more worried about *Chelsea* as a menace to navigation than the potential for an oil spill. Her cargo was a light fuel oil and would be dispersed by wind and wave action.
Before salvage operations could commence, the tanker's precarious position atop the ledge, broke her in two. The cargo quickly spilled but was carried offshore by prevailing winds.
After the tanker's mast and radar antennae were removed, it was no longer considered a hazard to navigation.
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Sources:

MapTech Mapserver
Merchant Vessels of the United States; 1957
Merchant Vessels of the United States, Vessels Lost Chapter; 1958
New England's Legacy of Shipwrecks; Keatts, 1988
New England Shipwrecks; Luther, 1967
The Fisherman magazine; October 13, 1988
The Record, "American Lloyds", American Bureau of Shipping; 1957
Underwater USA; Cathie Cush, May 1989
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These files are under construction. Any information, specifically dive site related, would be greatfully appreciated.

Send comments to: ***Chris Hugo***

APPENDIX V

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCES

The hydrographer reviewed the Coast Pilot report for the survey limits. There was no new additional information to be added to the Coast Pilot. ***Concur.***

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
NOAA Ship Thomas Jefferson S-222
439 W. York Street
Norfolk, VA 23510-1114

October 5, 2004

MEMORANDUM FOR: LCDR Tod Schattgen, NOAA
Chief, Atlantic Hydrographic Branch

THROUGH: CDR Emily B. Christman, NOAA
Commanding Officer, NOAA Ship THOMAS JEFFERSON

FROM: LT Shepard M. Smith, NOAA
Executive Officer, NOAA Ship THOMAS JEFFERSON

SUBJECT: USGS Stellwagen Bank Data

This memorandum serves to document the background, approach, and processing steps employed to incorporate the USGS Stellwagen Bank and Massachussets Bay multibeam data into the NOAA charting system.

Background

During the planning of OPR A397, I became aware that the survey areas assigned to WHITING, then LITTLEHALES, then THOMAS JEFFERSON overlapped significantly with the multibeam data acquired by USGS during the mid 1990s. This project was funded by USGS, with technical assistance from the Ocean Mapping Group at the University of New Brunswick and surveyed using the Canadian Hydrographic Service vessel *Frederick Creed*. It was also a cooperative project with NOAA, and several NOAA Corps hydrographers sailed aboard for portions of the project.

The data was collected under the guidance of some of the worldwide experts in multibeam surveying at the time. While it was NOAA's intention at the time to chart this data, we did not have the capability to process this large a dataset, and the data that NOAA did get languished in a collection of shoeboxes in Silver Spring.

In March 2003, after discussing the possibility with LT Jon Swallow at HSD operations, I contacted USGS in Woods Hole through Dr. Larry Mayer to inquire about the status of the data. I told them that we would be surveying the area on the NOAA Ship THOMAS JEFFERSON, and that we wanted to reduce duplication of effort. Dr. Bill Danforth replied enthusiastically that they would make the data available to us in whatever form we needed.

In addition, UNH's Center for Coastal and Ocean Mapping (CCOM) had contracted with SAIC to conduct a multibeam survey of Jeffrey's Ledge, an area just to the north of the

USGS Stellwagen Bank data set. During a break in their hydrographic survey work for NOAA, the SAIC team went up to Jeffreys Ledge and conducted the survey in the winter of 2002-2003. The data was sent to UNH in lightly edited form and turned over to graduate student Mashkoor Malik to work on. The CCOM leadership team offered the data to NOAA for charting. Because of the plans to incorporate the USGS data into NOAA's pipeline aboard the THOMAS JEFFERSON, I offered to add this SAIC data to the USGS data and work with it all together.

I then contacted HSD operations again to plan our approach to the project.

The Approach

This was an unusual opportunity to incorporate a large amount of Outside Source Data into the charting process. The most unusual aspect was that we had a ship available to junction and check the data. We came up with the following premises:

1) We would convert the data to a form where it could be manipulated as if it were our own data. This necessitated a new convertor to get the data into Caris HIPS format.
2) The tides applied to the data were inconsistent. We would plan to reapply all tides using historic NOAA station data and modern zoning.
3) We would use a Navigation Surface approach to process the data for charting. We would estimate the sensor errors for the Creed data and compute TPE as appropriate.
4) The data was edited to some extent by the Creed in the one case and CCOM in the other. We would further clean data only as necessary to produce a clean Navigation Surface.
5) The grids provided by the USGS were at a coarse resolution of 10m. For parts of the survey area, this is insufficient to capture all the seafloor detail in the data.
6) Various techniques were used by the CHS and USGS hydrographers to correct for sound velocity. The Simrad 1000 multibeam sonar system was corrected for sound velocity at the head and in the water column in real time. In order to compensate for head velocity errors and the difference between the last cast and the water column at their location, the hydrographers made extensive use of head velocity offsets and the interactive refraction editor. We would not second-guess the hydrographer's judgement on this, but merely reapply the values as they intended.
7) In general, we would compare *their results* to *our results*. We would not compare their *processes* to our *processes*. Because of the difference in the purpose of the survey and the changes in technology, it would not be useful to spend a lot of time worrying about processing techniques.
8) We would run crosslines with the TJ or her launches to check the accuracy of the data. We could also fill holidays or develop shoals at our discretion.
9) The TJ data would be combined with the OSD data to create a single survey with a "W" designation. TJ would write DRs and submit the surveys to AHB in a form

similar to that used for our own surveys. This should ease its inclusion in our workflow.

This approach was discussed with LT Jon Swallow Mike Riddle and Steve Verry, HSD Operations, and CDR Emily B. Christman at AHB, and is consistent with the project instructions issued for the project.

Preliminary Processing

Because I would be going out to the THOMAS JEFFERSON as Operations Officer and would oversee the project, I volunteered to be the focal point for data conversion and preliminary troubleshooting.

The data from USGS had all arrived by May 2003, and I was able to restore it all from CDs. The Swathed files were converted using a Swathed→Caris HIPS convertor written by Caris for this purpose. The first draft of the convertor assumed that the data had been fully merged with all refraction editing applied. This was not the case and a second version of the convertor was written which converted Swathed's three-parameter refraction editor files and converted them to a new HIPS format. In addition, the merge function in HIPS was modified to be able to perform a head velocity change in addition to changes at depth, to be consistent with the Swathed technology. After those changes, the data looked pretty good.

I contacted Cary Wong through HSD Operations and explained the project. Cary was able to find tide files going back to 1994. However, the files for 1994 were archived on a type of media that is no longer readable, so that year is only hourly data, which was interpolated by HIPS.

The Survey

THOMAS JEFFERSON arrived on scene in Massachusetts Bay in August 2003. In making up the cross line files for the survey, we estimated the total level of effort we wanted to spend on the project, then determined the number of crosslines that would be possible to run in that time frame. It came out to about three lines per sheet, run lengthwise east-west. In addition, in some areas, we ran some holiday lines and a few item investigations. On sheets D and F, we junctioned NOAA launch and ship data with the USGS data to form a complete survey.

Comparison of Data

In general, we found that the USGS data was consistently shoaler than the TJ ship multibeam data by 0.5m to 0.8m. In order to try to determine which was right, we tested several hypotheses.

1) Tidal Epoch-the tidal epoch changed in April 2003. The change is in the "right" direction to explain the difference, but the maximum magnitude in the survey area is 0.05m, not enough to explain the difference on its own.

2) Changing seafloor-The difference is too consistent
3) USGS use of the refraction editor-This could explain some differences in the outer beams, but the difference is consistent across the swath.
4) TJ draft error-We sought to test this hypothesis by doublechecking our draft and by conducting a leadline check. We conducted numerous tests and checked as many static measurements as possible. In addition, we installed a tube in the sonar void to be able to measure the waterline-reference mark directly. We were able to correct the difference by about 15 cm after adjusting our draft based on the new measurements. However, even after all the checking, we were unable to make the leadline test close with the Simrad processed soundings. The difference was about 0.4m, and the leadline measurements would be in general agreement with the USGS data.
5) The launches data was also compared to the USGS data and the TJ ship data. In general, the launch data was also shoaler than the ship data by 0.2-0.3m, placing it between the ship data and the USGS data.
6) Creed draft/loading error-*Creed* is a SWATH vessel with active stablization and controllable draft to optimize seakeeping abilities. It is possible that the draft was poorly measured or controlled. If it were poorly controlled, however, we would expect that there would be considerable inconsistency within the USGS data set. A draft measurement error would be consistent with a constant offset.

Conclusions

1) We were not able to find a single cause for the difference between the USGS data and TJ data, but believe it to be a combination of TJ draft measurement, Creed draft measurement, and tidal epoch change.
2) The data collected for these surveys by USGS and TJ were collected under circumstances other than an NOS-specified hydrographic survey for charting, and need to be treated differently than other surveys.
    a. The current version of NOS Specifications and Deliverables is inapplicable to these surveys.
    b. The results of the surveys should be examined, with far less emphasis on the processes employed during acquisition and processing.
    c. These surveys were not intended to find and characterize small features such as rocks, wrecks, and obstructions. In the few cases where these features were in fact visible in the data, they will be noted in the DR. In other cases, the items should remain as charted.
    d. Most of the survey area was in deep water (>30m) and there was continuous coverage in these areas. In shoaler areas, the line spacing was frequently too wide to achieve continuous coverage. As a result, there are a few shoals on some sheets that TJ has recommended be retained as charted because the least depth was not determined by these surveys. It was beyond the scope of this project to investigate every shoal and fill every holiday.

3) This procedure of running a few crosslines over OSD data was very successful and has resulted in a set of surveys that NOAA can stand behind for charting purposes. However, I do not think it should generally be necessary for ship's personnel take the lead on the project. I recommend that future similar efforts should be encouraged, with shoreside processing personnel taking the lead on the project from start to finish. This includes:

   a. Discussing the form of data transfer from the supplying organization to NOAA in manner conducive to continued cooperation and collaboration.
   b. Ensuring that the data is rigorously converted to our processing software (HIPS), paying special attention to the application of ancillary data such as tides, sound velocity, and draft. Conversion should also be made in such a way as to preserve any edits that the original hydrographers made to the data.
   c. Well before any planned field work, the data should be analyzed for holidays, searched for rocks, wrecks, obstructions and compared to the chart. With this information, the hydrographers can develop a survey plan that optimizes the use of the ship.
   d. Survey work should include regularly spaced crosslines sufficient to check most of the OSD survey lines. It should include holiday lines and item investigation lines as necessary to minimize unresolved items and unaddressed charted features.
   e. Preliminary processing can occur on the ship, but a shoreside team should write up the DR and do the final analysis and processing.

Subject: [Fwd: status of stellwagen data]
Date: Mon, 10 Apr 2006 15:17:54 -0400
From: Shepard Smith <Shep.Smith@noaa.gov>
To: Daniel Wright <Daniel.Wright@noaa.gov>

-------- Original Message --------
Subject: status of stellwagen data
Date: Wed, 10 Sep 2003 17:41:25 GMT
From: Kim Sampadian <kim.sampadian.atsea@noaa.gov>
To: shep.smith@noaa.gov
CC: matthew.ringel@noaa.gov,peter.lewit@noaa.gov

Status of applying zoned verified tides to the Stellwagen Data as of 9/10/03

Contents of Tide file (8443970.tid)-
1994 verified tide is hourly with coverage from 10/01/1994 to 2/31/1994; Dates of acquisition are 11/11/1994 to 12/04/1994

1995 verified tide is hourly with coverage from 3/01/1995 to 5/31/1995; Dates of acquisition are 3/29/1995 to 4/26/1995

1996 verified tide is six-minute with coverage from 3/01/1996 to 5/31/1996 and 11/01/1996 to 12/31/1996; Dates of acquisition are 4/2/1996 to 4/26/1996 and 12/4/1996 to 12/13/1996

1997 verified tide is six-minute with coverage from 11/01/1997 to 12/31/1997; Dates of acquistion are 11/20/1997 to 12/01/1997

1998 verified tide is six-minute with coverage from 01/01/1998 to 01/31/1998 (not needed for the data but left them in anyway) and hourly from 11/10/1998 to 11/30/1998; Dates of acquisition are 11/22/1998 to 11/23/1998

All data has preliminary zoned verified tides applied off the primary Boston gauge(H:\tide\2003\Boston\844-3970\AppBostonCORP.zdf) with the exception of the following lines that only have the verified tide applied directly(H:\tide\2003\Boston\844-3970\8443970.tid-- 7 out of 1748 lines isn't bad):

1996_116
stell_116_0732 (cross zones from NA156 to NA176 and back to NA156)

1996_342
stell_342_0892 (cross zones from NA169 to NA156 and back to NA169)

1996_344
stell_344_0919 (cross zones from NA156 to NA176 and back to NA156)

stell_344_0943 (cross zones from NA169 to NA156 and back to NA169)
stell_344_0950 " "
stell_344_0962 " "

1996_345
stell_345_1034 (cross zones from NA156 to NA176 back to NA156 and then back to NA176)

These lines crash Caris when trying to apply zoned tides but work fine when applying the tide file directly. I verified that there isn't any gaps or overlaps in these zones and tried rejecting the parts of the

lines that cross between zones (reaccepted the data once I tested this theory). I also tried deleting the ProcessedDepths.lsf file for a couple of the lines and then trying to reapply and still no luck. Hopefully the Caris Hotfix will take care of these remaining lines. I've created a session "stellwagen_tide.hsf" for these lines.

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: January 7, 2004

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-A397-TJ-2003
HYDROGRAPHIC SHEET: W00047

LOCALITY: Approaches to Boston, MA
TIME PERIOD: October 1, 2003

TIDE STATION USED: 844-4162 Boston Light, MA
Lat. 42° 19.7'N Lon. 70° 53.5'W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.858 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: NA156, NA176

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 on the **new 1983-2001 National Tidal Datum Epoch (NTDE).**

Thomas V. Mero 1/9/04

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR W00047 (1995,2003)

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.

B. DATA ACQUISITION AND PROCESSING

B.1 EQUIPMENT

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

MapInfo, version 8.5, Release Build 32
PYDRO, version 7.3 (R2110)
CARIS HIPS/SIPS version 6.1
CARIS BASE Editor 2.1
CARIS HOM ENC Version 3.3 SP3
dKART INSPECTOR, version 5.0 SP1

B.2 PROCESSING

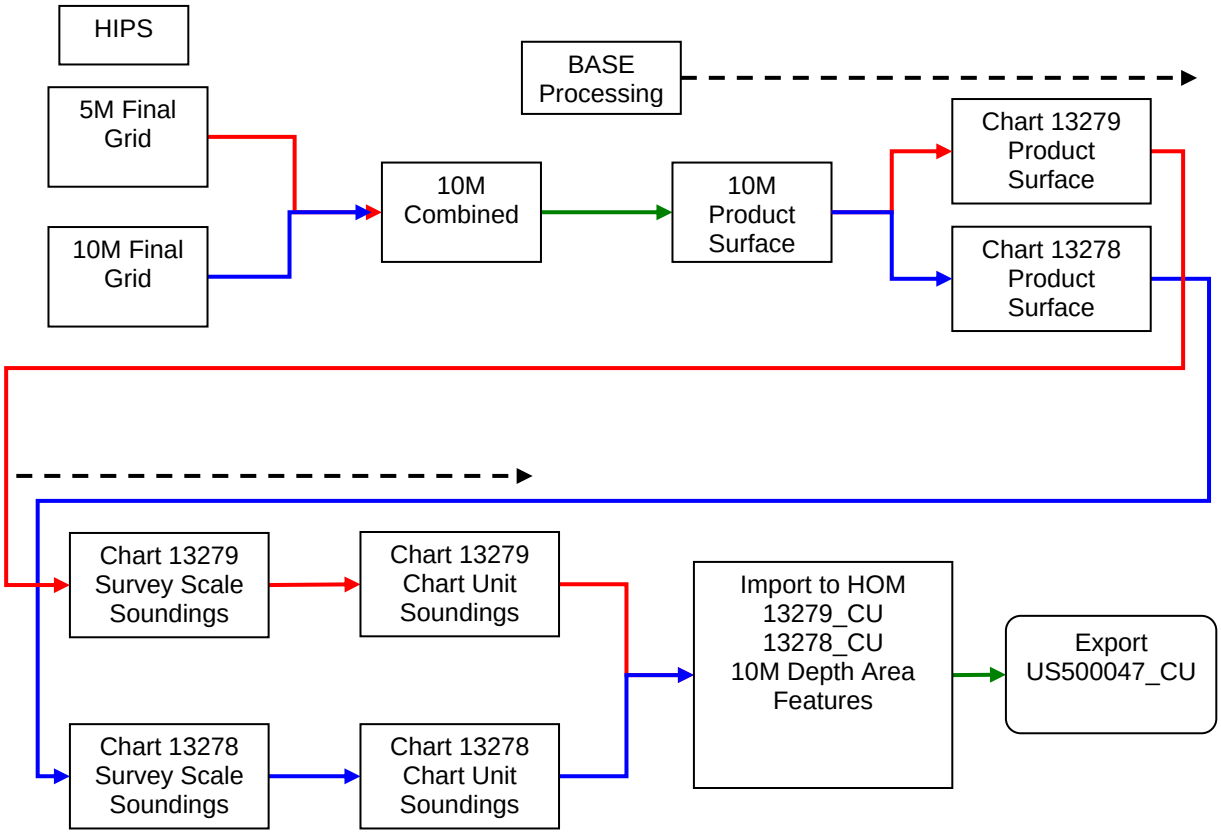
H-CELL

Office processing entailed the use of CARIS HIPS to generate two finalized Combined Uncertainty and Bathymetry Estimator(CUBE)surfaces, AHB_W00047_5m_Final.hns and AHB_W00047_10m_Final.hns. These surfaces were computed at 5 and 10 meter resolutions respectively, using the “Density & Locale” disambiguation parameter and the deep CUBE parmeter. The finalized surface was computed using the greater of standard deviation or uncertainty with designated soundings applied. Depth thresholds were applied at 0-30 meters for the 5m resolution surface and 29-200 meters for the 10 meter resolution surface. The CUBE surfaces are the bathymetric and feature presentation source for soundings incorporated within the submitted Electronic Navigational Chart Base Cell file.

Final CUBE surfaces were used as the source data for the nautical chart update products. During office processing, it was determined to exclude the Thomas Jefferson crossline data due to an undetermined inconsistency between the two data sources. Creed data was selected as the source for CUBE surfaces and nautical chart products.

CARIS Bathy DataBASE processing included the creation of a combined surface, AHB_W00047_Comb_10m.hns, from the 5 and 10 meter finalized surfaces. A generalized product surface, AHB_W00047_PS_10m.hns, was extracted from the combined surface at 10 meter resolution with designated soundings reapplied.

To accommodate a MCD request for two different sounding densities within the H-Cell, product surface AHB_W00047_13279_PS_10m.hns was extracted from the 10 meter generalized surface to reflect the coverage area of chart 13279. From this surface the sounding set W00047_13279_SNDG_SS.hob was generated at 1:10,000 scale which was used for selection of the chart unit sounding set W00047_13279_SNDG_CU.hob. A second file, AHB_W00047_13278_PS_10m.hns was extracted from the 10 meter generalized surface to reflect the coverage area of chart 13278. From this surface the sounding set W00047_13278_SNDG_SS.hob was generated at 1:20,000 scale which was used for selection of the chart unit sounding set W00047_13278_SNDG_CU.hob. Chart Unit sounding selection was based on existing sounding distribution in raster charts 13279 and 13278. Although H-Cell specifications call for automated sounding selection using a table of radii, due to the complex nature of the bathymetry a manual selection yielded a more representative selection. A single depth area was generated from the 10 meter resolution product surface at the intervals 0.229 and 183.109 meters. The diagram below illustrates the processing steps used to achieve the MCD request for multiple sounding densities.



HOM processing was done with the CARIS GIS Environmental Variable set to a metric scale (-1,-1,t) in order to accommodate millimeter precision of the sounding value(CARIS default rounding regime with truncation) during H-Cell processing and export of Base Cell file. This environmental variable was reset to NOAA standard values (0,0,N) when converting the metric exchange file to chart depth units after the Base Cell File export.

The following files were imported into HOM to create the chart unit file W00047_01.des from which the Base Cell final product US500047_CU.000 was produced:

W00047_13279_SNDG_CU.hob
W00047_13278_SNDG_CU.hob
W00047_DEPARE_10m.hob
W00047_Features.hob

The following files were imported into HOM to create the survey scale file W00047_02.des from which the Base Cell final product US500047_SS.000 was produced:

W00047_13279_SNDG_SS.hob
W00047_13278_SNDG_SS.hob
W00047_DEPARE_10m.hob

H-cell layers in CARIS HOM are organized as follows:

Layer 100 Soundings
Layer 200 Skin of the Earth(SOTE)
Layer 300 Features
Layer 500 Line & Meta data

BASE CELL TESTING

The base cell file US500047_CU.000 was examined using dKart Inspector. Warnings received were all inconsequential. The DSPM.HUNI and DSPM.DUNI were reported to have illegal values, but these errors were expected as originating during ENC conversion to NOAA chart values, so they also can be ignored. All other errors refer to ENC features being retained where QUASOU and TECSOU are attributed as unknown.

CROSS LINES

Office processing determined the field unit acquired less than the required 5% (approximately 4.0%) of cross line data for quality assurances and system assessment as specified in the *NOS Hydrographic Surveys Specifications and Deliverables* (*NOS HHSSD*), 2003 Edition. The cross line analyses conducted at AHB were consistent with the field analysis. Despite the insufficient cross line data, W00047 has been deemed as acceptable for charting purposes.

The vertical depth variance at crossline junctions were on the average 0.6m. This discrepancy falls within the IHO Order 1 depth accuracy vertical error budget which ranges between 0.50m to 3.75m for the survey's depth range. This method does not technically meet the conventional standards set forth in the *NOS HHSSD*. However, Hydrographic Surveys Technical Directive 2004-03, dated 01/08/05, has given approval that NOAA field units may vary from the established procedures and documentation with respect to CARIS HIPS BASE Surface processing methods.

JUNCTIONS

Hydrographic survey W00045, Sheet O, adjoins the south western edge of W00047 and overlaps the sheet area. The overlapping H-Cell area from W00045 was excluded from H-cell W00047. Likewise, hydrographic survey W00046, Sheet P, adjoins the South eastern edge of W00047 and overlaps the sheet area. The overlapping H-Cell area from W00046 was excluded from H-cell W00047.

C. HORIZONTAL CONTROL

Office ENC processing of this survey required translating the datum to meet S-57 ENC requirements. During CARIS HOM processing the horizontal geodetic datum was translated to Latitude and Longitude (LLDG) World Geodetic System-84 (WGS-84). The S-57 ENC format serves as the exchange file submitted to Marine Chart Division.

D.1 CHART COMPARISON

13279 (32nd Edition, February,2007)
Corrected through NM Feb 24/07
Corrected through LNM Feb 20/07

13274 (26th Edition, April,2005)
Corrected through NM Apr 23/05
Corrected through LNM Apr 19/05

13278 (26th Edition, June,2005)
Corrected through NM Jun 11/05
Corrected through LNM May 31/05

13260 (40th Edition, May,2007)
Corrected through NM May 26/07
Corrected through LNM May 15/07

13200 (35th Edition, May,2007)
Corrected through NM May 26/07
Corrected through LNM May 15/07

13009 (33rd Edition, May,2007)
Corrected through NM May 26/07
Corrected through LNM May 15/07

13006 (34th Edition, May,2007)
Corrected through NM May 26/07
Corrected through LNM May 15/07

13003 (49th Edition, April,2007)
Corrected through NM Apr 7/07
Corrected through LNM Apr 3/07

ENC Comparison **US4MA04M (Edition 9 2007-02-08)**

The charted hydrography originates with prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in the Descriptive Report. The MBES data acquired for this survey are adequate to supersede the charted hydrography.

ADDITIONAL RESULTS

General Agreement with Charted soundings

The charted depths are from partial bottom NOS surveys before 1970. The MBES data acquired for this survey are adequate to supercede the charted soundings.

Charted Bottom Characteristics

The field unit did not acquire bottom samples during survey operations. It is therefore recommended to retain the present charted bottom characteristics.

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.

Submarine Cables and Pipelines

Submarine cables exist in the H-Cell area, and are represented on Raster charts 13003, 13006, 13009, 13200 and 13260 only. It is unlikely theses features could have been detected in the MBES data. Defer to MCD for final charting status.

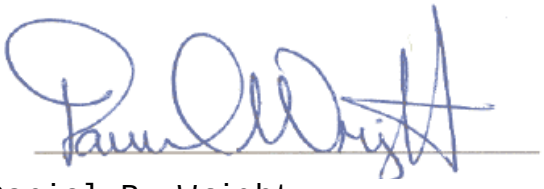
ADEQUACY OF SURVEY

The OSD were acquired prior to the formulation of NOAA standards for MBES coverage. As such, the data do not generally meet the sounding density and coverage requirements. The data are, however, sufficient to supercede the charted hydrography where survey depths are shoaler than charted depths. Full seafloor coverage was not achieved and uncharted features hazardous to surface navigation are not expected but may exist.

MISCELLANEOUS

ENC products were created by Atlantic Hydrographic Branch personnel, Norfolk, Virginia, using CARIS HOM v3.3. ENC products and electronic data will be forwarded to Marine Chart Division, Silver Spring, Maryland.

For charted features the field unit used positions sourced from the raster chart. These positions appear in the item investigation forms and vary slightly form the positions of corresponding features in the H-Cell. The positions of the charted features in the H-Cell are from the last version of the ENC at the time of processing.



Daniel B. Wright
Physical Scientist
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
W00047

The completed surveys have been inspected with regard to survey coverage, delineation of depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered in the digital data for these surveys. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Daniel Wright
2007.12.20 08:32:04 -05'00'

Daniel Wright
Physical Scientist,
Atlantic Hydrographic Branch

All final products have undergone a comprehensive review as per the Atlantic Hydrographic Branch Processing Manual and are verified to be accurate and complete except where noted in the Evaluation Report.

Helen Stewart
Atlantic Hydrographic Branch, Norfolk, Virginia
2007.12.20 08:45:21 -05'00'

Reviewed:_____
Helen Stewart,
Physical Scientist,
Atlantic Hydrographic Branch

I have reviewed the Base Cell files, accompanying data, and reports. This survey and accompanying Marine Chart Division deliverables meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Evaluation Report.

Shepard Smith
I am approving this document
2007.12.20 11:19:51 -05'00'

Approved:_____
Commander Shepard M. Smith, NOAA
Chief, Atlantic Hydrographic Branch

Jeremy McHugh
Digitally signed by Jeremy McHugh
DN: cn=Jeremy McHugh, c=US
Date: 2008.01.02 11:35:20 -05'00'