H11022

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic
Side Scan Sonar/Multibeam

Field No.

Registry No. H11022

LOCALITY

State Delaware and New Jersey

General Locality Delaware Bay and River

Locality Miah Maull Shoal to Ben Davis Point

2001

CHIEF OF PARTY
Walter S. Simmons

LIBRARY & ARCHIVES

DATE

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

REGISTRY NO. **H11022**

FIELD NO. **B**

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.

State Delaware –New Jersey

General locality Delaware Bay and River

Locality Miah Maull Shoal to Ben Davis Point

Scale 1:20,000 Date of survey 3 April 2001 – ~~18~~ ***19*** November 2001

Instructions Dated 27 October 2000 Project No. OPR-D307-KR-00/01

Vessel *R/V OceanExplorer* US905425

Chief of Party *WALTER S. SIMMONS*

Surveyed by Walter Simmons, Steven Lemke, Tim Hillier, Paul Donaldson, Pam Clark, Gary Davis, George Ghiorse, Rebecca DeKeyzer

Soundings taken by **echo sounder**, hand lead, pole MULTIBEAM RESON SEABAT 8101

Graphic record scaled by survey personnel

Graphic record checked by survey personnel

Protracted by Automated plot by HP1055CM ***(Field)***
Hewlett Packard Design Jet 2500CP (office)

Verification by ***Atlantic Hydrographic Branch personnel***

Soundings in fathoms, **feet,** meters at MLW, **MLLW**

REMARKS: **Contract #** 50-DGNC-0-90015
Contractor: Science Applications International Corp., 221 Third Street; Newport, RI 02840
Subcontractor: McKim & Creed, 860 Greenbrier Circle, Suite 202, Chesapeake, VA 23320
Subcontractor: LCMF, 139 East 51st Ave., Anchorage, AK 99503
Times: All times are recorded in UTC
Purpose: To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.
Bold italic red notes in the descriptive report were made during office processing
UTM 18

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537. ☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—665-661/1222 REGION NO. 6

Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract 50-DGNC-0-90015 reflects the state of the sea floor in existence on the day and at the time the survey was conducted.

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Descriptive Report to Accompany
Hydrographic Survey H11022
Scale 1:20,000, Surveyed 2001
R/V OceanExplorer
Science Applications International Corporation (SAIC)
Walter S. Simmons, Hydrographer

Project Number: OPR-D307-KR-00/01
Dates of Instructions: 27 October 2000 **Original:** 50-DGNC-0-90015
12 July 2001 **Task Order #4**: 56-DGNC-1-33004

Dates of Supplemental Instructions: None
Sheet Letter: B
Registry Number: H11022
Purpose: To provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area.

A. AREA SURVEYED

Description:
The area surveyed was a section of the Delaware River and Bay extending between Miah Maull Shoal and Ben Davis Point. Included were the northern end of Brandywine Range, Miah Maull Range and Shoal, Cross Ledge and Cross Ledge Range, the southern end of Liston Range, Ben Davis Point Shoal, Blake Channel and Joe Flogger Shoal.

Dates of multibeam data acquisition (UTC):

04/03/2001 – 04/05/2001	093 - 095
04/09/2001 – 04/10/2001	099 - 100
04/20/2001 – 05/07/2001	110 - 127
05/09/2001 – 05/12/2001	129 - 132
05/14/2001 – 05/16/2001	134 - 136
05/19/2001 – 05/20/2001	139 - 140
05/24/2001	144
05/26/2001 – 06/04/2001	146 – 155
06/06/2001 – 06/12/2001	157 - 163
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08/15/2001 – 08/22/2001	227 - 234
08/24/2001 – 08/28/2001	236 - 240
11/17/2001 – 11/19/2001	321 - 323

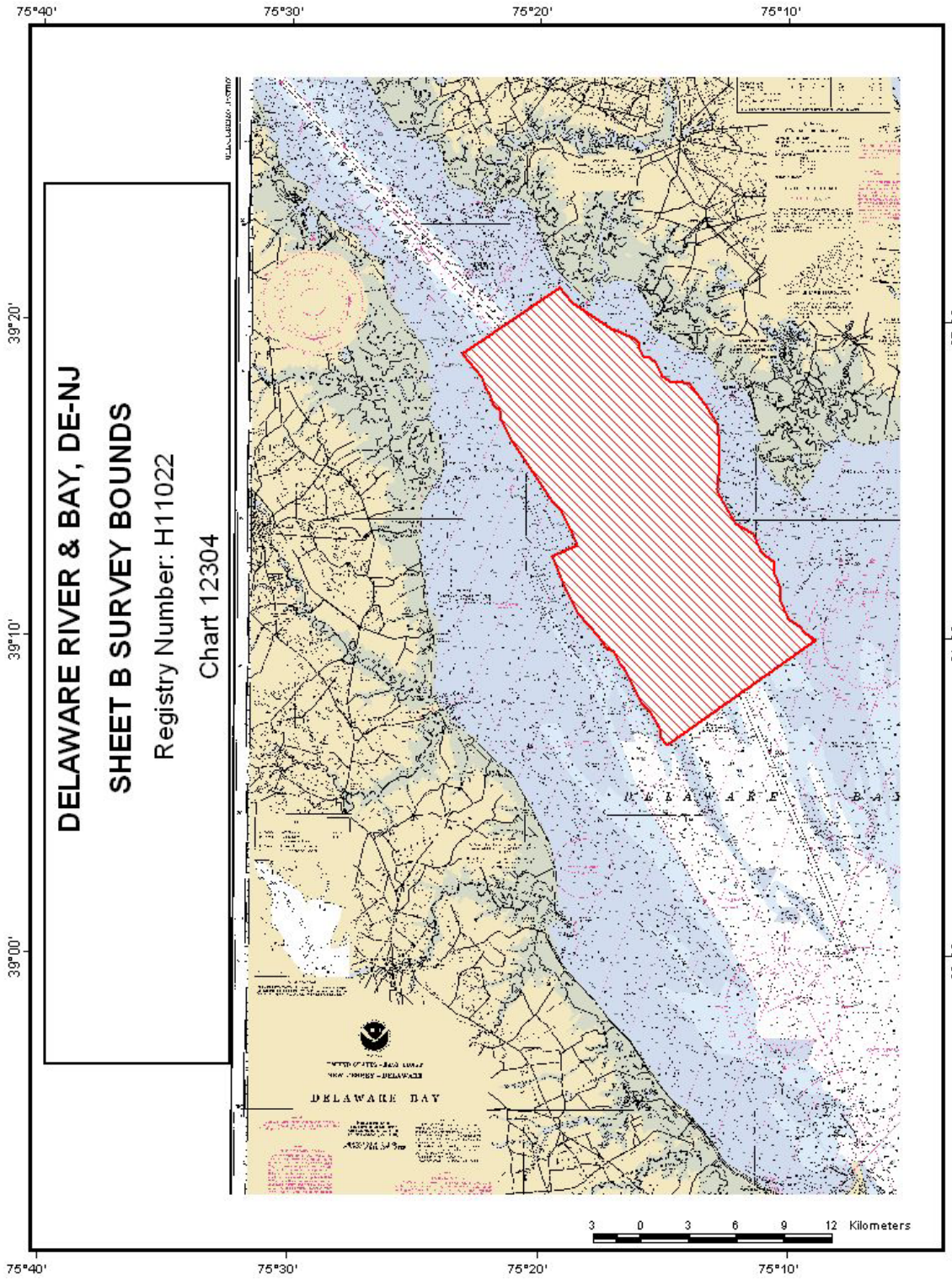

Figure A-1. H11022 Survey Bounds

B. DATA ACQUISITION AND PROCESSING *See also the Evaluation report*

B1. EQUIPMENT

A detailed description of the systems used to acquire and process these data has been included in the separate Data Acquisition and Processing Report for OPR-D307-KR-00/01. There were no variations from the configuration described therein. The information below summarizes the larger report.

Table B-1. Major Systems by Manufacturer and Model Number

	Manufacturer / Model Number	Subsystem
Multibeam Sonar	RESON SeaBat 8101	Transducer 8101 Processor R6042 Controller Processing Unit
Side Scan Sonar	Klein 2000 Towfish	K-Wing Depressor, Transceiver/Processing Unit (TPU),
Vessel Attitude System	TSS POS/MV Inertial Navigation System	
Positioning System	TSS POS/MV,	
	Trimble 7400 GPS Receiver	
	Trimble Probeacon Differential Beacon Receiver,	
	Leica MX41R Differential Beacon Receiver	
Sound Velocity System	Brooke Ocean Technology Ltd., Moving Vessel Profiler-30 with	Applied Microsystems Ltd. Smart SV and Pressure Sensor

Survey Vessel

The *R/V OceanExplorer* was the platform for multibeam sonar, side scan sonar and sound velocity data collection. The main cabin of the vessel was used as the data collection center. All data were shipped to the Data Processing Center in the SAIC Newport, RI office for data processing. The POS/MV IMU was mounted on the vessel, centerline just forward and above the RESON 8101 transducer, below the main deck. The multibeam sounder transducer was mounted on the keel. Table B-2 is a list of vessel characteristics for the *R/V OceanExplorer*.

Table B-2. Survey Vessel Characteristics

Vessel Name	LOA (Ft)	Beam (Ft)	Draft (Ft)	Max Speed	Gross Tonnage	Power (Hp)	Registration Number
R/V OceanExplorer	60’	16’4”	6’	17 kn	56	1100	US905425

Major Systems

SAIC used their Integrated Survey System (**iss2000**) to acquire and process these survey data. Mission planning was conducted on UNIX and Linux platforms, while data acquisition and survey control were accomplished in a WindowsNT environment. Multibeam processing was performed on UNIX and Linux systems. Side scan data were reviewed on a WindowsNT platform using Triton-Elics' Isis software, while they were mosaiced in **iss2000** on a UNIX or Linux platform.

B2. QUALITY CONTROL

There were 155 linear nautical miles of cross lines surveyed and 2646 linear nautical miles of main scheme lines surveyed resulting in approximately 5.8 percent coverage by cross lines. The following histograms represent the distribution of selected soundings by beam number. Figure B-1 illustrates the number of selected soundings versus beam number while Figure B-2 illustrates the percentage of selected soundings versus beam number.

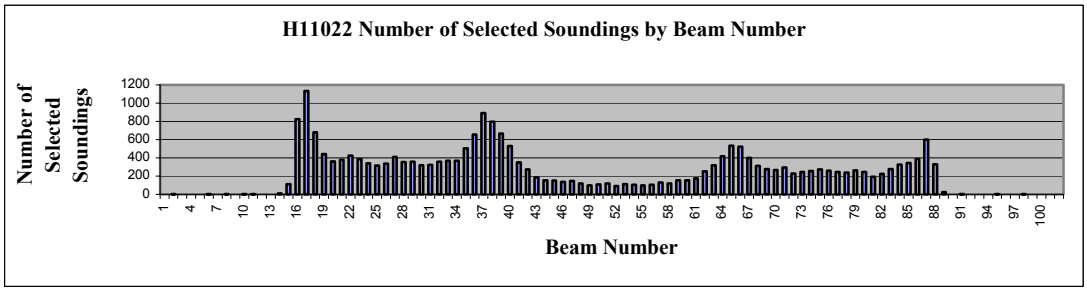

Figure B-1. Histogram of Selected Soundings by Beam Number – H11022

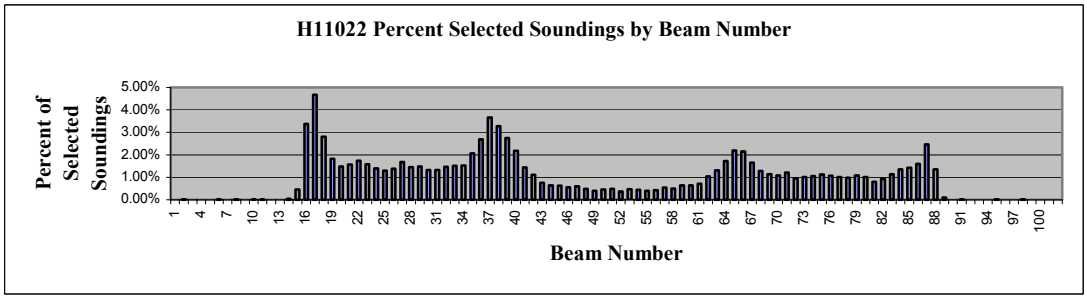

Figure B-2. Histogram of Percentage of Selected Soundings by Beam Number - H11022

Comparisons of all crossing data in H11022 show that 95.9% of comparisons are within 30 centimeters, 98.5% of comparisons are within 40 centimeters and 99.4% of comparisons are within 50 centimeters. The comparisons greater than 50 centimeters are accounted for by the normal small DGPS position scatter in areas of steep slope, sand waves and features. All comparison differences greater than 180 centimeters are at Feature #1 where depths change from 14.1 meters to 7.7 meters over a horizontal distance of 10 meters.

Table B-3. Junction Analysis All Main Scheme vs. Cross Lines, H11022

Depth Difference		All		Positive		Negative		Zero
		Count	Percent	Count	Percent	Count	Percent	Count
0 to	5cm	42054	33.23	19497	28.19	18299	34.44	4258
5 to	10cm	28301	55.59	14152	48.65	14149	61.07	
10 to	15cm	22938	73.72	13574	68.28	9364	78.7	
15 to	20cm	13954	84.75	9332	81.77	4622	87.4	
20 to	25cm	8712	91.63	5552	89.8	3160	93.35	
25 to	30cm	5471	95.95	3698	95.14	1773	96.68	
30 to	35cm	2026	97.55	1267	96.98	759	98.11	
35 to	40cm	1273	98.56	912	98.29	361	98.79	
40 to	45cm	706	99.12	506	99.03	200	99.17	
45 to	50cm	390	99.43	255	99.39	135	99.42	
50 to	60cm	440	99.77	270	99.78	170	99.74	
60 to	70cm	135	99.88	82	99.9	53	99.84	
70 to	80cm	64	99.93	29	99.95	35	99.91	
80 to	90cm	33	99.96	11	99.96	22	99.95	
90 to	100cm	19	99.97	10	99.98	9	99.97	
100 to	110cm	11	99.98	3	99.98	8	99.98	
110 to	120cm	7	99.99	5	99.99	2	99.98	
120 to	130cm	4	99.99	3	99.99	1	99.99	
130 to	140cm	2	99.99	2	99.99	0	99.99	
140 to	150cm	0	99.99	0	99.99	0	99.99	
150 to	160cm	2	99.99	0	99.99	2	99.99	
160 to	170cm	2	99.99	1	100	1	99.99	
170 to	180cm	2	100	2	100	0	99.99	
180 to	190cm	3	100	0	100	3	100	
190 to	200cm	0	100	0	100	0	100	
200 to	220cm	1	100	0	100	1	100	
220cm to	230cm	1	100	1	100	0	100	
	Totals	126551	100.00%	69164	54.65%	53129	41.98%	4258
								3.36%

Detail of comparisons at selected crossings in different areas of H11022, comprising approximately 1% of the crossings in the survey, are listed in the Separates to this report. These comparisons were made over relatively flat bottom, and reflect mainscheme and crossline soundings taken on several different days, and in different area throughout the survey.

The H11022 survey junctions with surveys H11070 and H11081. ***See also the Evaluation Report***. Table B-4 lists the Junction Analysis using all comparisons in the common area between H11022 and H11070. These comparisons show 98.6% were within 50 centimeters. The normal small DGPS position scatter in areas of steep slope, sand waves and features accounts for differences exceeding 50 centimeters. Table B-5 compared to Table B-6 illustrates the difference between analysis over relatively flat bottom and the channel, which has steep slopes, large sandwaves and was being actively dredged during both surveys.

Table B-4. Junction Analysis, H11070 vs. H11022 (all comparisons)

Difference Range		All		Positive		Negative		Zero
		Count	Percent	Count	Percent	Count	Percent	Count
0cm to	5cm	3343	23.08	1356	33.32	1630	16.2	357
5cm to	10cm	2752	42.07	814	53.32	1938	35.47	
10cm to	15cm	2605	60.05	766	72.14	1839	53.75	
15cm to	20cm	1786	72.38	491	84.2	1295	66.62	
20cm to	25cm	1438	82.31	279	91.06	1159	78.14	
25cm to	30cm	1100	89.9	164	95.09	936	87.45	
30cm to	35cm	531	93.57	52	96.36	479	92.21	
35cm to	40cm	375	96.16	37	97.27	338	95.57	
40cm to	45cm	211	97.61	27	97.94	184	97.4	
45cm to	50cm	145	98.61	24	98.53	121	98.6	
50cm to	60cm	108	99.36	32	99.31	76	99.35	
60cm to	70cm	42	99.65	12	99.61	30	99.65	
70cm to	80cm	32	99.87	6	99.75	26	99.91	
80cm to	90cm	11	99.94	4	99.85	7	99.98	
90cm to	100cm	5	99.98	3	99.93	2	100	
100cm to	110cm	1	99.99	1	99.95	0	100	
110cm to	120cm	1	99.99	1	99.98	0	100	
120cm to	130cm	1	100	1	100	0	100	
130cm to	140cm	0	100	0	100	0	100	
	Totals	14487	100.00%	4070	28.09%	10060	69.44%	357
								2.46%

Table B-5. Junction Analysis, H11070 vs. H11022 (flat bottom)

Difference Range		All		Positive		Negative		Zero
		Count	Percent	Count	Percent	Count	Percent	Count
0cm to	5cm	419	28.68	209	25.71	162	27	48
5cm to	10cm	329	51.2	175	47.23	154	52.67	
10cm to	15cm	338	74.33	219	74.17	119	72.5	
15cm to	20cm	211	88.77	140	91.39	71	84.33	
20cm to	25cm	105	95.96	46	97.05	59	94.17	
25cm to	30cm	37	98.49	14	98.77	23	98	
30cm to	35cm	11	99.25	4	99.26	7	99.17	
35cm to	40cm	9	99.86	4	99.75	5	100	
40cm to	45cm	1	99.93	1	99.88	0	100	
45cm to	50cm	0	99.93	0	99.88	0	100	
50cm to	60cm	0	99.93	0	99.88	0	100	
60cm to	70cm	1	100	1	100	0	100	
70cm to	80cm	0	100	0	100	0	100	
	Totals	1461	100.00%	813	55.65%	600	41.07%	48
								3.29%

Table B-6. Junction Analysis, H11070 vs. H11022 (Channel)

Difference Range		All		Positive		Negative		Zero
		Count	Percent	Count	Percent	Count	Percent	Count
0cm to	5cm	698	22.12	282	26.5	342	16.96	74
5cm to	10cm	561	39.9	165	42.01	396	36.59	
10cm to	15cm	564	57.78	153	56.39	411	56.97	
15cm to	20cm	372	69.57	121	67.76	251	69.41	
20cm to	25cm	365	81.14	120	79.04	245	81.56	
25cm to	30cm	264	89.51	95	87.97	169	89.94	
30cm to	35cm	106	92.87	31	90.88	75	93.65	
35cm to	40cm	67	94.99	21	92.86	46	95.93	
40cm to	45cm	50	96.58	20	94.74	30	97.42	
45cm to	50cm	36	97.72	15	96.15	21	98.46	
50cm to	60cm	38	98.92	24	98.4	14	99.16	
60cm to	70cm	9	99.21	4	98.78	5	99.41	
70cm to	80cm	10	99.52	5	99.25	5	99.65	
80cm to	90cm	9	99.81	4	99.62	5	99.9	
90cm to	100cm	5	99.97	3	99.91	2	100	
100cm to	110cm	1	100	1	100	0	100	
110cm to	120cm	0	100	0	100	0	100	
	Totals	3155	100.00%	1064	33.72%	2017	63.93%	74
								2.35%

Table B-7 depicts the junction analysis using all comparisons in the common area between H11022 and H11081. These comparisons show 98.2% were within 35 centimeters and 99.3% were within 40 centimeters. The normal small DGPS position scatter in areas of features, steep slopes along the channel, and sand waves accounts for differences exceeding 50 centimeters. Table B-8 depicts an area of relatively flat bottom. The table illustrates that 100 % of the soundings are within 45 centimeters.

Table B-7. Junction Analysis, H11022 vs. H11081 (all comparisons)

Difference Range		All		Positive		Negative		Zero
		Count	Percent	Count	Percent	Count	Percent	Count
0cm to	5cm	7130	30.1	3513	24.17	2951	34.77	666
5cm to	10cm	5086	51.58	2928	44.32	2158	60.2	
10cm to	15cm	4445	70.34	3125	65.83	1320	75.75	
15cm to	20cm	2875	82.48	2217	81.08	658	83.5	
20cm to	25cm	1955	90.74	1380	90.58	575	90.28	
25cm to	30cm	1296	96.21	894	96.73	402	95.02	
30cm to	35cm	472	98.2	253	98.47	219	97.6	
35cm to	40cm	259	99.29	141	99.44	118	98.99	
40cm to	45cm	92	99.68	49	99.78	43	99.49	
45cm to	50cm	41	99.86	17	99.9	24	99.78	
50cm to	60cm	24	99.96	11	99.97	13	99.93	
60cm to	70cm	7	99.99	2	99.99	5	99.99	
70cm to	80cm	3	100	2	100	1	100	
	Totals	23685	100.00%	14532	61.36%	8487	35.83%	666
								2.81%

Table B-8. Junction Analysis, H11022 vs. H11081 (flat bottom)

Difference Range		All		Positive		Negative		Zero
		Count	Percent	Count	Percent	Count	Percent	Count
0cm to	5cm	970	27.6	560	20.9	320	42.9	90
5cm to	10cm	750	48.93	587	42.81	163	64.75	
10cm to	15cm	642	67.2	548	63.27	94	77.35	
15cm to	20cm	478	80.8	423	79.06	55	84.72	
20cm to	25cm	330	90.18	257	88.65	73	94.5	
25cm to	30cm	235	96.87	207	96.38	28	98.26	
30cm to	35cm	72	98.92	60	98.62	12	99.87	
35cm to	40cm	34	99.89	33	99.85	1	100	
40cm to	45cm	4	100	4	100	0	100	
	Totals	3515	100.00%	2679	76.22%	746	21.22%	90
								2.56%

In some of the shallow areas of H11022 the complete 200% side scan coverage was not obtained. Because of weather conditions at the time of the survey it was exceedingly difficult to obtain full coverage. Therefore, in accordance with the Evans to Sipos memo, 7-27-2001, Appendix ***V*** ~~5~~ ***appended to this report***, the following criteria were applied to gaps in the side scan data:

- In areas of less than 6 feet water depth, coverage was evaluated for quality, and a judgment made whether it was possible to safely obtain better data.
- In areas between 15 and 6 feet water depth, the 100% coverage was evaluated for quality, and a judgment made whether it was possible to safely obtain the second 100% coverage.
- In areas of water depth greater than 15 feet, 200% coverage was required.

Areas deeper than 15 feet have complete 200% coverage.

Comparison between the two side scan coverage mosaics showed that none of the shallow water gaps overlap. Therefore, there is at least 100% coverage in all of the survey area. The only significant side scan contacts in the areas with 100% coverage were contacts #1956 and #2456 correlated to multibeam feature #91, identified as buoy RN"8" at 39° 17' 22.26"N 075° 18' 42.26"W, NAD83, and contact #2555 correlated to multibeam feature #90, identified as an obstruction* covered 11 feet at 39° 17' 31.15"N 075° 19' 10.08"W, NAD83. There were no additional multibeam features within the shallow side scan gap areas.

****Chart representative survey soundings***

B3. CORRECTIONS TO ECHO SOUNDINGS

Please refer to the Data Acquisition and Processing Report for a description of all corrections applied to echo soundings. There were no deviations from the corrections described therein.

C. VERTICAL AND HORIZONTAL CONTROL *See also the Evaluation report*

NOAA tide stations 8551910 Reedy Point, and 8557380 Lewes, Delaware were the source of verified water level heights for determining correctors to soundings. In addition SAIC operated tide stations at 8554399 Mahon River entrance and 8537363 Bayside Stow Creek during this survey. A station was also established and operated at Elbow of Cross ~~Ridge~~ ***Ledge*** Light for zoning purposes. Datums at these stations were compared to the results of applying NOAA zoning parameters to the appropriate NOAA station. Crossline and sheet-to-sheet comparisons indicated that the NOAA zoning was adequate. The NOAA parameters were used to develop the water level correctors for soundings on this survey.

These survey data were collected in horizontal datum NAD-83, using the UTM-18 projection. The following equipment was used for positioning on the *R/V OceanExplorer*:

- TSS POS/MV, Serial Number 314
- Trimble 7400 DSi GPS Receiver, Serial Number 3815A22469

Differential correctors were from the U.S. Coast Guard Stations at Cape Henlopen, Delaware and Reedy Point, Delaware. Daily position confidence checks were established using a Trimble DGPS. A real-time monitor raised an alarm when the two DGPS positions differed by more than 10 meters horizontally. Positioning confidence checks were well within the allowable inverse distance of less than 5 meters.

Please refer to the Vertical and Horizontal Control Report for detailed descriptions of the procedures and systems used to attain hydrographic positioning. There were no variations from the procedures described therein.

D. RESULTS AND RECOMMENDATIONS *See also the Evaluation report*

D1. CHART COMPARISON

H11022 was compared to Chart 12304, 41st Edition, 22 April 2000, at a scale 1:80,000 corrected through U.S. Coast Guard Fifth District Local Notice to Mariners #51/01 (NTM_12_19_01).

Recommend reconstruction of the listed chart using data from this survey.

Charted Depths

The following discrepancies were noted during chart comparisons (Chartlets are in the Separates* to ~~be Included with the Survey Data Binder~~):

In the vicinity of a charted 17 feet in position 39° 16' 21.95"N 075° 17' 26.25"W, NAD83, is depth of 13 feet in H11022 (*See Chartlet 1). ***Concur***

In the vicinity of a charted 19 feet in position 39° 16' 37.06"N 075° 17' 33.54"W, NAD83, is depth of 13 feet in H11022 (*See Chartlet 1). ***Concur***

In the vicinity of a charted 12 feet in position 39° 16' 38.03"N 075° 17' 17.09"W, NAD83, is depth of 18 feet in H11022 (*See Chartlet 1). ***Concur***

In the vicinity of a charted 21 feet in position 39° 16' 09.97"N 075° 16' 54.89"W, NAD83 is depth of 14 feet in H11022 (*See Chartlet 1). ***Concur***

In the vicinity of a charted 14 feet in position 39° 16' 23.64"N 075° 16' 36.00"W, NAD83, is depth of 21 feet in H11022 (*See Chartlet 1). ***Concur***

In the vicinity of a charted 15 feet in position 39° 13' 27.74"N 075° 20' 26.92"W, NAD83, is depth of 9 feet in H11022 (*See Chartlet 8). ***Concur***

In the vicinity of a charted 14 feet in position 39° 13' 27.28"N 075° 21' 01.57"W, NAD83, is depth of 10 feet in H11022 (*See Chartlet 8). ***Concur***

In the vicinity of a charted 18 feet in position 39° 13' 00.36"N 075° 19' 27.27"W, NAD83, is depth of 22 feet in H11022 (*See Chartlet 8). ***Concur***

In the vicinity of a charted 16 feet in position 39° 13' 25.70"N 075° 19' 03.76"W, NAD83, is depth of 9 feet in H11022 (*See Chartlet 8). ***Concur***

In the vicinity of a charted 8 feet in position 39° 08' 58.19"N 075° 15' 54.75"W, NAD83, is depth of 16 feet in H11022 (*See Chartlet 13). The shoal has shifted eastward. ***Concur***

In the vicinity of a charted 24 feet in position 39° 08' 05.35"N 075° 15' 36.28"W, NAD83, is depth of 30 feet in H11022 (*See Chartlet 13). The shoal has shifted eastward. ***Concur***

In the vicinity of a charted 27 feet in position 39° 07' 36.63"N 075° 15' 53.28"W, NAD83, is depth of 17 feet in H11022 (*See Chartlet 13). Depths in this area have shifted eastward. ***Concur***

Data is filed with original field records

In the vicinity of a charted 46 feet in position 39° 07' 53.68"N 075° 13' 14.37"W, NAD83, is depth of 39 feet in H11022 (*See Chartlet 13). ***Concur***

In the vicinity of a charted 13 feet in position 39° 07' 47.11"N 075° 17' 09.09"W, NAD83, is depth of 9 feet in H11022 (*See Chartlet 14). ***Concur***

In the vicinity of a charted 21 feet in position 39° 06' 08.54"N 075° 15' 24.48"W, NAD83 is depth of 17 feet in H11022 (*See Chartlet 15). ***Concur***

In the vicinity of a charted 21 feet in position 39° 05' 48.23"N 075° 15' 18.06"W, NAD83, is depth of 17 feet in H11022 (*See Chartlet 15). The shoal on the west side of Blake Channel has extended southeast. ***Concur***

In the vicinity of a charted 22 feet in position 39° 05' 29.95"N 075° 15' 10.13"W, NAD83, is depth of 17 feet in H11022 (*See Chartlet 15). ***Concur***

In the vicinity of a charted 27 feet in position 39° 04' 51.68"N 075° 14' 36.02"W, NAD83, is depth of 20 feet in H11022 (*See Chartlet 15). ***Concur***

In the vicinity of a charted 27 feet in position 39° 05' 15.57"N 075° 14' 47.98"W, NAD83, is depth of ~~20~~ ***19*** feet in H11022 (*See Chartlet 15). ***Concur***

In the vicinity of a charted 11 feet in position 39° 05' 30.35"N 075° 13' 30.28"W, NAD83, is depth of 14 feet in H11022 (*See Chartlet 16). The shoal has become deeper and shifted to the east. ***Concur***

In the vicinity of a charted 12 feet in position 39° 05' 07.94"N 075° 13' 16.74"W, NAD83, is depth of 15 feet in H11022 (*See Chartlet 16). ***Concur***

In the vicinity of a charted 14 feet in position 39° 04' 46.70"N 075° 12' 56.87"W, NAD83, is depth of 17 feet in H11022 (*See Chartlet 16). ***Concur***

In the vicinity of a charted 21 feet in position 39° 06' 03.47"N 075° 12' 42.12"W, NAD83, is depth of 26 feet in H11022 (*See Chartlet 16). ***Concur***

In the vicinity of a charted 42 feet in position 39° 03' 33.20"N 075° 13' 12.56"W, NAD83, is depth of 36 feet in H11022 (*See Chartlets 18 & 19). ***Concur***

Numerous other depth comparison discrepancies occur throughout the survey because of the full coverage by H11022 compared to the partial coverage of previous surveys and the apparent displacement of charted depths because of the steepness of the terrain, and migration of shoals. ***Concur***

****Data is filed with original field records***

Depth Curves

It is recommended that all depth curves be reconstructed using the results of this survey. Specifically the curves around Joe Flogger Shoal and Blake Channel need to be reconstructed due to the migration of the shoal to the East since the previous surveys. ***Concur***

The circular 12-foot curve near 39° 16' 38.14"N 075° 17' 17.07"W, NAD83, should be removed as no depths less than 12 feet were found in this area (*See Chartlet 1). ***Concur***

The 12-foot curve near 39° 17' 19.02"N 075° 18' 26.62"W, NAD83, should be moved to the Southwest (*See Chartlet 1). ***Concur***

The small circular area above the MLLW datum (as depicted by a MLLW line and light green shading) at 39° 17' 40.33"N 075° 18' 54.60"W, NAD83, should be removed (*See Chartlet 2). ***Concur. Delete low water curve and tinting***

The triangular 30-foot curve near 39° 14' 10.72"N 075° 20' 25.89"W, NAD83, should be removed as no depths greater than 30 feet were found in this area (*See Chartlet 3). ***Concur with clarification. A 31 foot depth was found insignificant for charting.***

The circular 12-foot curve near 39° 14' 03.03"N 075° 19' 58.65"W, NAD83, should be removed as no depths less than 12 feet were found in this area (*See Chartlet 3). ***Concur***

The circular 18-foot curve near 39° 13' 00.36"N 075° 19' 27.27"W, NAD83, should be removed as no depths less than 18 feet were found in this area (*See Chartlet 8). ***Concur***

Ranges

*Brandywine Range (*Chartlets 16 and 18)*

There were no soundings found within Brandywine Range with a least depth less than what is reported in the controlling depths table.
Do not concur. See the Evaluation Report, section D1., Controlling Depths.

*Miah Maull Range (*Chartlets 10, 13, and 16)*

The following areas of Miah Maull Range were found to have depths less than the Reported depths in the Channel Tabulation:

Data is filed with original field records

- Right Inside Quarter from 39° 05’ 22.35”N 075° 11’ 22.62”W, NAD83, to 39° 06’ 13.00”N 075° 12’ 08.12”W, NAD83, depths are less than the reported ~~42.4~~ ***41.3*** feet (*See Chartlet 16). ***Concur with clarification. See the Evaluation Report, section D1., Controlling Depths.***

- Left and Right Inside Quarters from 39° 06’ 51.95”N 075° 12’ 43.05”W, NAD83, to 39° 07’ 16.43”N 075° 13’ 06.12”W, NAD83, depths are less than the reported ~~42.4~~ ***41.3 - 41.0*** feet (*See Chartlet 13). ***Concur with clarification. See the Evaluation Report, section D1., Controlling Depths.***

- Left and Right Inside Quarters from 39° 08’ 14.42”N 075° 13’ 58.02”W, NAD83, to 39° 09’ 16.43”N 075° 14’ 53.85”W, NAD83, depths are less than the reported ~~42.4~~ ***41.3 - 41.0*** feet (*See Chartlets #10 and 13). ***Concur with clarification. See the Evaluation Report, section D1., Controlling Depths.***

*Cross Ledge Range (*Chartlets 4, 7, 9, and 10)*

There were no soundings found with in Cross Ledge Range with a least depth less than what is reported in the controlling depths table. ***Do not concur. See also the Evaluation report section D1., Controlling Depths.***

*Liston Range (Below Ship John Light) (*Chartlets 2, 3, and 4)*

There were no soundings found with in Liston Range (below Ship John Light) with a least depth less than what is reported in the controlling depths table. ***Concur***

Navigational Aids

All aids to navigation shown on chart 12304 that fall within the survey boundaries of H11022 were sufficient for their intended purpose. ***Concur***

AWOIS Items, Wrecks and Obstructions ***See also the Evaluation report***

2719

A 150-meter search radius of AWOIS Item 2719 was surveyed with 200% side scan coverage and partial multibeam coverage in H11022. A least depth of 34.7 feet was located at 39° 12’ 57.41”N, 075° 17’ 43.22”W, NAD83. Recommend removal of charted 31 Wk at 39° 12’ 57.01”N, 075° 17’ 43.87”W, NAD83, and charting surveyed sounding and symbol “Wk” (*See Chartlet 7, see Correlator Sheet for Feature #108). ***Concur. Delete 31 Wk. Add 34 dangerous Wk at survey position stated above.***

Data is filed with original field record.

2720

Approximately 75% of the 2000-meter search radius of AWOIS Item 2720 was surveyed in H11022. The area covered from 600 meters west to 1870 meters east and 2000 meters north and south of the reported position with 200% side scan coverage and partial multibeam coverage. The Item was not located within the area covered by H11022.
Recommend removal of the charted dangerous submerged wreck PD at 39° 12′ 07.40″ N 075° 19′ 39.69″ W, NAD83 (*See Chartlet 8). ***Do not concur. Item was not fully investigated. Retain as charted.***

2721

A 2000-meter search radius of AWOIS Item 2721 was surveyed with 200% side scan coverage and partial multibeam coverage in H11022. The item was located and is and identified as Feature #86 at 39° 13' 59.18"N 075° 14' 38.92"W, NAD83, 410 meters 092° from the charted position (*See Correlator Sheet for Feature 86). It is two wrecks in close proximity. Recommend charting surveyed sounding with symbol "Wks" (*See Chartlets 4 and 5). Recommend removal of charted dangerous wreck PA at 39° 14' 00.41"N, 075° 14' 58.68"W, NAD83.
Concur. Delete dangerous sunken Wk symbol and PA notation. Add 12 Wks with danger curve at survey position stated above.

2723 and 2724

A 150-meter search radius of AWOIS Items 2723 and 2724 was surveyed with 200% side scan coverage and partial multibeam coverage in H11022. The items were located and identified as Feature #38 at 39° 12' 38.35"N 075° 15' 14.71"W, NAD83, with a least depth of 17.36 feet and Feature #39 at 39° 12' 37.20"N 075° 15' 13.57"W, NAD83, with a least depth of 17.26 feet (*See Correlator Sheets for Features 38 and 39). Recommend removal of *charted ~~15~~ ***16*** Wks at 39° 12' 37.~~90~~ ***.86*** "N, 075° 15' 14.~~10~~***.99***"W, NAD83, and charting with surveyed sounding and symbol "Wks" (*See Chartlet 7).
Concur with clarification. AWOIS 2723 - delete 16 Wks with danger curve. Add 17 Wks with danger curve in latitude 39°12' 38.35"N, longitude 075°15' 14.71"W.
See the Evaluation report section D1a. for AWOIS 2724.

2946

A 2000-meter search radius of AWOIS Item 2946 was surveyed with 200% side scan coverage and partial multibeam coverage in H11022. The item was located, 580 meters 199° from the charted position, and is identified as Feature #82 at 39° 08' 28.06"N 075° 15' 37.07"W, NAD83, with a least depth of 14.17 feet (See Correlator Sheet for Feature 82). Recommend removal of charted submerged dangerous wreck at 39° 08′ 47.40″N 075° 15′ 30.~~63~~ ***68***″W, NAD83, and charting surveyed sounding with symbol "Wk" (*See Chartlet 13).
Concur. Delete dangerous sunken wreck symbol, add 14 Wk with danger curve.

Data is filed with original field record.

3247

A 1000-meter search radius of AWOIS Item 3247 was surveyed with 200% side scan coverage and partial multibeam coverage in H11022. The item was located, 728 meters 108° from the charted position, and is identified as Feature #104 at 39° 16' 31.24"N 075° 18' 04.65"W, NAD83, with a least depth of 9.91 feet (See Correlator Sheet for Feature 104). Recommend removal of charted rock at covered low water at 39° 16′ 38.40″N 075° 18′ 33.69″W, NAD83, and charting surveyed sounding with symbol "Obstn" (*See Chartlet 1). ***Concur. Delete rock awash symbol, add 10 Obstn with danger curve.***

7461

A 150-meter search radius of AWOIS Item 7461 was surveyed with 200% side scan coverage and partial multibeam coverage in H11022. An obstruction was located, 53 meters 186° from the charted position, and is identified as Feature #98 at 39° 14' 50.96"N 075° 15' 39.00"W, NAD83, with a least depth of 11.16 feet (*See Correlator Sheet for Feature 98). Recommend charting sounding with symbol "Obstn." ***Do not concur, chart scale limitation***. At the charted position of 7461, 39° 14' 52.70"N 075° 15' 38.81"W, NAD83, is a mound with a least depth of 10.40 feet, ***latitude 39° 14' 52.65"N, longitude 075° 15' 38.75"W.*** Recommend removal of the charted 6 foot obstruction with danger curve, and charting of this sounding (*See Chartlets 4 & 5). ***Concur with clarification. Delete charted 6 Obstn, add 10 Obstns with danger curve in latitude 39°14' 52.65"N, longitude 075°15' 38.75 "W.***

10731

H11022 covered the approximately 75% of the southern part of AWOIS Item 10731, ***latitude 39° 15' 58"N, longitude 075° 21' 32"W,*** with 200% side scan and partial multibeam. All soundings and obstructions located within the charted Fish Haven are deeper than the authorized minimum depth of 15 feet MLLW. It is recommended that the soundings and obstructions from H11022 be charted in the Fish Haven with the note "Obstn Fish Haven (auth min 15 ft) depths from survey of 2001."
Do not concur. Retain as charted.

10732

H11022 covered AWOIS Item 10732, ***latitude 39°11' 06"N, longitude 075°18' 28"W,*** with 200% side scan and partial multibeam. Depths along west side are less than the authorized 15 feet (MLLW) with minimum of 9 feet in northwest corner of the Fish Haven ***to 14 feet in the southwest corner.*** It is recommended that the soundings and obstructions from H11022 be charted in the Fish Haven with the note "Obstn Fish Haven (auth min 15 ft) depths from survey of 2001." ***Concur with clarification. Retain notation Obstn Fish Haven (auth min 15 ft). Chart representative shoal depths.***

10734

A 1500-meter search radius of AWOIS Item 10734, ***latitude 39° 13' 06"N, longitude 075°13' 42"W,*** was surveyed with 200% side scan coverage and partial multibeam

Data is filed with original field records

coverage in H11022. The reported visible wreck was not located visually, nor was a wreck identified in the side scan and multibeam data collected in the AWOIS search area. Recommend removal of visible wreck charted at 39° 13′ 06.00″N, 075° 13′ 42.00″W, NAD83 (*see Chartlet 6). ***Concur.***

The Wreck and danger circle with a least depth of 14 feet near 39° 12’ 52.82”N, 075° 15’ 17.16”W, NAD83, was confirmed and located as Feature #107 with a minimum depth of 14.17. Recommend no changes to the charted feature (*see Chartlet 7).
Concur with clarification. See Evaluation Report section D1a., AWOIS #2724.

Danger to Navigation Reports

Three Dangers to Navigation Reports were filed for H11022 that affected chart 12304. All three dangers were shown on Chart 12304 used for the chart comparison:

- Report 1 was submitted on or about 6 July 2001, and reported a 5.7 foot (1.75 meters) high obstruction with a minimum depth of 35 feet (10.67 meters) in 41 feet (12.42 meters) of water, at 39° 12’ 11.92”N 075° 17’ 18.60”W, NAD83, (*See Correlator Sheet for Feature #42) (*See Chartlet 7). This obstruction is nearest the channel of a group of obstructions. Recommend changing the charted Obstn label to Obstns. ***Concur with clarification. Delete charted 35 Obstn, add 27 Obstns with danger curve in latitude 39°12'13.3"N, longitude 75°17'24.0"W. See also the Evaluation Report section D1b.***

- Report 2 was submitted on 12 July 2001, and reported a 10.7 foot (3.27 meters) high obstruction with a minimum depth of 24 feet (7.54 meters) in 35 feet (10.81 meters) of water, at 39° 15’ 54.22”N, 075° 20’ 50.58”W, NAD83, (*See Correlator Sheet for Feature #1) (*See Chartlet 2). Further investigation revealed this to be a wreck. Recommend changing the charted Obstn to Wk. ***Concur with clarification. Revise 24 Obstn to 24 Wk with danger curve as shown on present survey.***

- Report 3 was submitted on or about 17 July 2001, and reported an 18 foot (4.29 meters) high obstruction with a minimum depth of 14 feet in (4.29 meters) in 25 feet (7.62 meters) of water, at 39° 08’ 51.02”N 075° 16’ 02.22”W, NAD83, (*See Correlator Sheet for Feature #100) (*See Chartlet 13). Recommend maintaining the charted 14 Obstn and danger circle. ***Concur.***

Uncharted Wrecks and Obstructions ***See also the Evaluation report***

The following table lists the uncharted wrecks and obstructions located in H11022 along with charting recommendations. See feature correlator sheets, found Section II of the Separates Binder*, for images.

Data is filed with original field records

Table D-1. Uncharted Wrecks and Obstructions on H11022

Feature No.	Feature Position (NAD83)		Least Depth	Recommendations
	Latitude (N)	Longitude (W)		
9	39° 05’ 50.39”	075° 12’ 45.62”	19.62	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 16) ***Concur - add 19 Obstn with danger curve***
25	39° 11’ 13.24”	075° 16’ 08.66”	21.16	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 10, see Feature 24) ***Do not concur*** **
27	39° 14’ 20.80”	075° 18’ 08.23”	17.85	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 4) ***Do not concur*** **
28	39° 11’ 56.37”	075° 16’ 21.70”	22.34	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 7) ***Do not concur*** **
29	39° 12’ 19.76”	075° 16’ 39.44”	25.00	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 7) ***Do not concur*** **
34	39° 14’ 07.63”	075° 16’ 34.48”	17.32	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 4) ***Do not concur*** **
35	39° 13’ 23.42”	075° 16’ 18.58”	14.31	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 7) ***Concur - add 14 Obstn with danger curve***
36	39° 16’ 40.03”	075° 19’ 45.21”	15.78	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 2) ***Do not concur*** **
41	39° 15’ 59.41”	075° 17’ 18.42”	10.30	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 1) ***Concur - add 10 Obstn with danger curve***
49	39° 16’ 06.08”	075° 19’ 42.21”	16.04	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 2) ***Do not concur*** **
63	39° 09’ 15.13”	075° 17’ 09.07”	17.65	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 9) ***Do not concur*** **
66	39° 04’ 51.71”	075° 13’ 06.19”	15.09	Wreck - Chart sounding and symbol “Wk” (*See Chartlet 16, see Feature 67) ***Concur - add 15 Wk with danger curve***
70	39° 11’ 49.26”	075° 18’ 50.00”	21.20	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 8) ***Do not concur*** **
72	39° 09’ 40.85”	075° 17’ 48.08”	17.68	Obstruction - Chart sounding and symbol “Obstn” (*See Chartlet 9) ***Do not concur*** **
78	39° 10’ 34.47”	075° 17’ 45.53”	16.70	Obstructions - Chart sounding and symbol “Obstns” (*See Chartlet 9) ***Concur - add 16 Obstns with danger curve***
80	39° 11’ 31.43”	075° 18’ 04.91”	25.07	Obstruction - Chart sounding and symbol “Obstns” (*See Chartlet 7, see Feature 79) ***Do not concur*** **
81	39° 11’ 01.94”	075° 18’ 03.85”	16.31	Obstructions - Chart sounding and symbol “Obstns” (*See Chartlet 9) ***Do not concur*** **
88	39° 15’ 29.69”	075° 20’ 41.65”	25.99	Obstructions - Chart sounding and symbol “Obstns” (*See Chartlet 3, see Feature 87) ***Do not concur*** **
92	39° 15’ 56.04”	075° 21’ 09.70”	29.53	Obstructions - Chart sounding and symbol “Obstns” (*See Chartlet 2) ***Do not concur*** **

Feature No.	Feature Position (NAD83)		Least Depth	Recommendations
	Latitude (N)	Longitude (W)		
93	39° 14' 12.96"	075° 19' 21.65"	20.80	Obstruction - Chart sounding and symbol "Obstn" (*See Chartlet 3) ***Do not concur*** **
96	39° 02' 32.71"	075° 13' 29.68"	15.81	Wreck - Chart sounding and symbol "Wk" (*See Chartlets 18, 19, and 20) ***Concur - add 16 Wk with danger curve***
106 ***73***	39° 05' 40.82" ***39° 05' 44.21"***	075° 13' 38.56" ***075° 13' 31.38"***	11.55 ***14.11***	Wreck - Chart sounding and symbol "Wk" (*See Chartlet 16, see Features 73 and 74) ***Concur with clarification - add 11 & 14 Wks with danger curve***

***** During office processing, these features were deemed insignificant, chart survey soundings.***

Charted Shoals

*Ben Davis Point Shoal (*Chartlets 1 and 4)*

The charted boundary for Ben Davis Point Shoal is valid and has remained stable. Recommend redrawing the depth curves around Ben Davis Point Shoal based on the results of H11022. ***Concur***

*Miah Maull Shoal (*Chartlets 13 and 16)*

The charted boundary for Miah Maull Shoal is valid and has remained stable. Recommend redrawing the depth curves around Miah Maull Shoal based on the results of H11022. ***Concur***

*Cross Ledge (*Chartlet 10)*

The charted boundary for Cross Ledge is valid. The north and west sides of the shoal ***were shoaler on H11022 than the charted depths*** ~~have remained stable~~. The ***southern sides of the shoal remained stable.*** ~~south and west sides are deeper. in H11022 than charted soundings~~. Recommend redrawing the depth curves around Cross Ledge based on the results of H11022 (*See Chartlet 10). ***Concur***

*Joe Flogger Shoal (*Chartlets 7, 8, 9, 13, and 16)*

The north and west sides of Joe Flogger Shoal have remained stable. The 12 and 18-foot curves on the east side have moved eastward. In the middle of the shoal depths were greater in H11022 than the charted depths. Charted 6 and 8-foot soundings were surveyed to 13 and 16 feet in H11022 (*See Chartlet 10). The south end and southwest sides are deeper in H11022 than charted soundings (*See Chartlet 16). Recommend redrawing the depth curves around Joe Flogger Shoal based on the results of H11022. ***Concur***

Data is filed with original field records

Cable Areas

Unburied submarine cables were detected in the side scan imagery in the cable area running southwest from 39° 13' 40.00" 075° 11' 54.38"W, NAD83, to the Elbow of Cross Ledge Light at 39° 10' 54.88" 075° 16' 04.34"W, NAD83, (*Charts 6, 7, and 10). ***Concur, retain cable area as charted.***

Unburied submarine cables were detected in the side scan imagery in the cable area running southeast from the Elbow of Cross Ledge Light 39° 10' 54.88" 075° 16' 04.34"W, NAD83, to the Miah Maull Shoal Light at 39° 07' 35.73" 075° 12' 30.84"W, NAD83, (*Charts 10 and 13). ***Concur, retain cable area as charted.***

Bottom Composition

There were 17 bottom samples taken to verify the bottom types charted for H11022. Table D-2 compares information for each sample collected to the charted bottom type.

Sand waves occur in several areas of H11022, which are depicted on the smooth sheet. These areas include all four ranges: Liston Range, Cross Ledge Range, Miah Maull Range and Brandywine Range; the northern tip of the survey area, an area southwest of Joe Flogger Shoal, and the southeastern corner of the survey area.

Data is filed with original field records

Table D-2. H11022 Bottom Sample Characteristics

Bottom Sample Number	Bottom Sample Position (NAD83)		Depth of Bottom Sample	Observed Bottom Type	Charted Bottom Type
	Latitude (N)	Longitude (W)			
BS-1	39° 16' 46.24"	075° 18' 34.05"	13	M	h
BS-2	39° 15' 47.16"	075° 19' 26.99"	21	Sh	M
BS-3	39° 10' 28.03"	075° 17' 30.10"	35	S Sh	S Sh
BS-4	39° 08' 14.68"	075° 14' 37.83"	25	S Sh	M Sh
BS-5	39° 12' 15.26"	075° 12' 40.03"	16	f*ne* S Cy	M
BS-6	39° 07' 10.52"	075° 16' 22.35"	17	Si M	Cy
BS-7	39° 08' 22.67"	075° 17' 09.82"	17	Si Sh	S Cy
BS-8	39° 06' 20.99"	075° 14' 58.57"	32	Si M Sh	S Sh
BS-9	39° 03' 56.06"	075° 13' 26.43"	39	Si M	S M Cy
BS-10	39° 05' 03.46"	075° 14' 50.86"	19	Si	S Cy
BS-11	39° 05' 04.70"	075° 09' 14.03"	24	Si Sh	S Cy Sh
BS-12	39° 08' 05.59"	075° 09' 25.92"	19	Sh ~~Si~~	S Sh
BS-13	39° 08' 04 12"	075° 13' 28.24"	42	S	h

Bottom Sample Number	Bottom Sample Position (NAD83)		Depth of Bottom Sample	Observed Bottom Type	Charted Bottom Type
	Latitude (N)	Longitude (W)			
BS-14	39° 09’ 25.53”	075° 13’ 39.83”	25	~~F~~ *fne* S	S Sh
BS-15	39° 09’ 18.46”	075° 10’ 41.48”	18	Sh Si	S Oys
BS-16	39° 11’ 29.40”	075° 13’ 10.76”	21	Sh	S Sh
BS-17	39° 13’ 08.58”	075° 16’ 16.96”	16	Si Sh	S

It is recommended that the bottom type charted be updated where necessary based on the information collected during this survey. ***Concur***

D2. ADDITIONAL RESULTS

Shoreline verification was not required for this survey. ***Concur***. Comparison with prior surveys was not required under this contract. ***Concur, see also the Evaluation Report section D2***. See Section **D1. CHART COMPARISON** for comparison to the nautical chart.

Aids to Navigation

U.S. Coast Guard aids to navigation were found on station as charted. These aids adequately serve their intended purpose. ***Concur***

Dredging

USACE was actively dredging the channel in Liston Range, Cross Ledge Range, Miah Maull Range and Brandywine Range during and after this survey.
Defer to MCD Update Service Branch.
See also the Evaluation Report section D1, Controlling Depths.

APPENDIX 1. DANGER TO NAVIGATION REPORTS

Danger to Navigation Report *# 1*

Hydrographic Survey Registry Number: H11022

State: Delaware-New Jersey

Locality: Delaware Bay

Sub-Locality: Miah Maull Shoal to Ben Davis Point

Project Number: OPR-D307-KR-2000

Depths are reduced to Mean Lower Low Water using verified tides based on preliminary zoning. Positions are based on NAD-83. The multibeam view below depicts the object in the invalid data outside the NOAA standards beam cutoff angle. These data show a height of 1.75 meters and a minimum depth of 10.67 meters / 35 feet. Position was obtained using DGPS from a US Coast Guard Station.

Charts affected: 12304 Delaware Bay 1:80,000

The following item was found during hydrographic survey operations:

FEATURE	DEPTH (FT)	LATITUDE (N)	LONGITUDE (W)
1. Obstr	35	39 12 11.92	075 17 18.60

The above item has been applied to chart 12304, updated through March 29, 2003. See page 16 of the Descriptive Report and section D1b. of the Evaluation Report for revisions made during office processing.

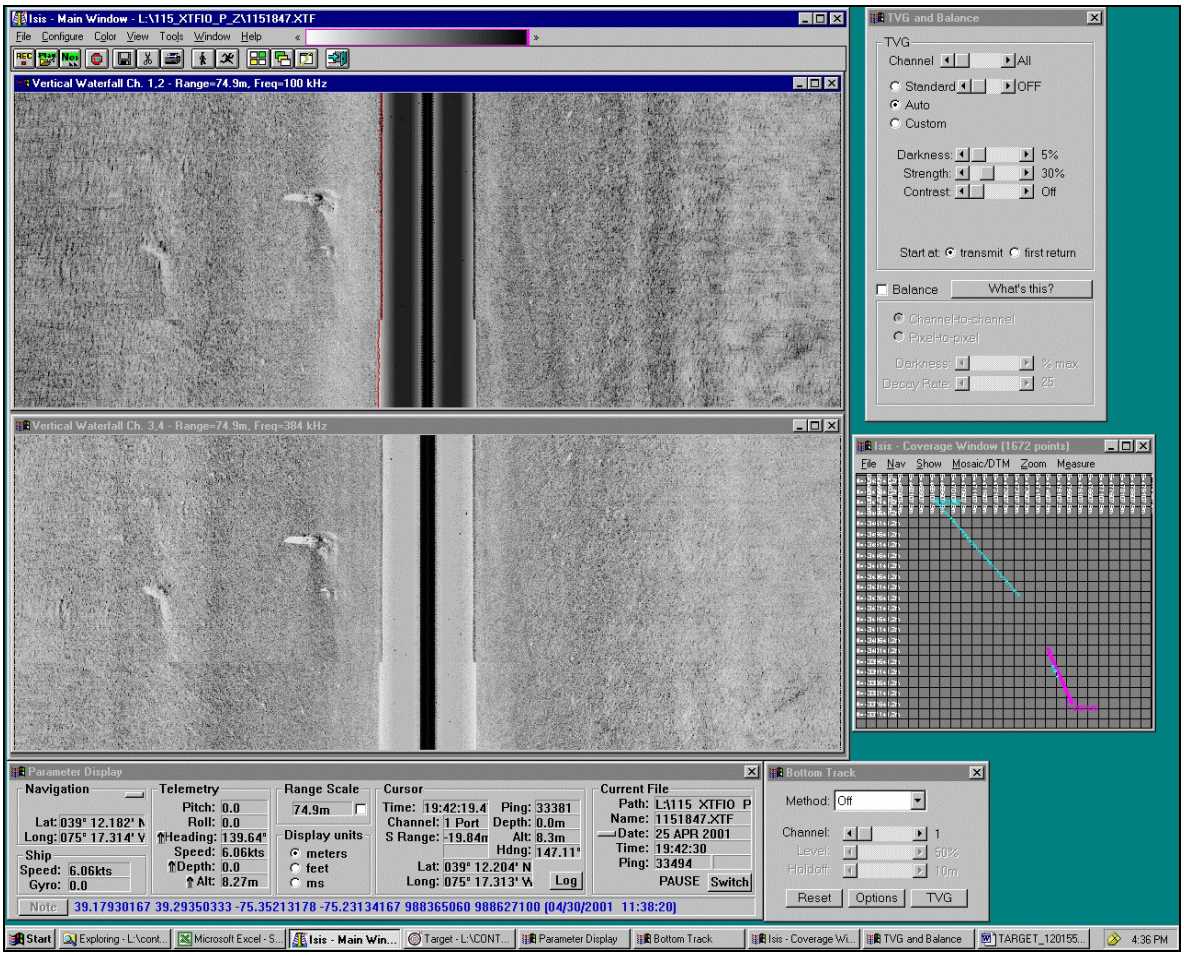

Figure App. 0-1. Side Scan View #1

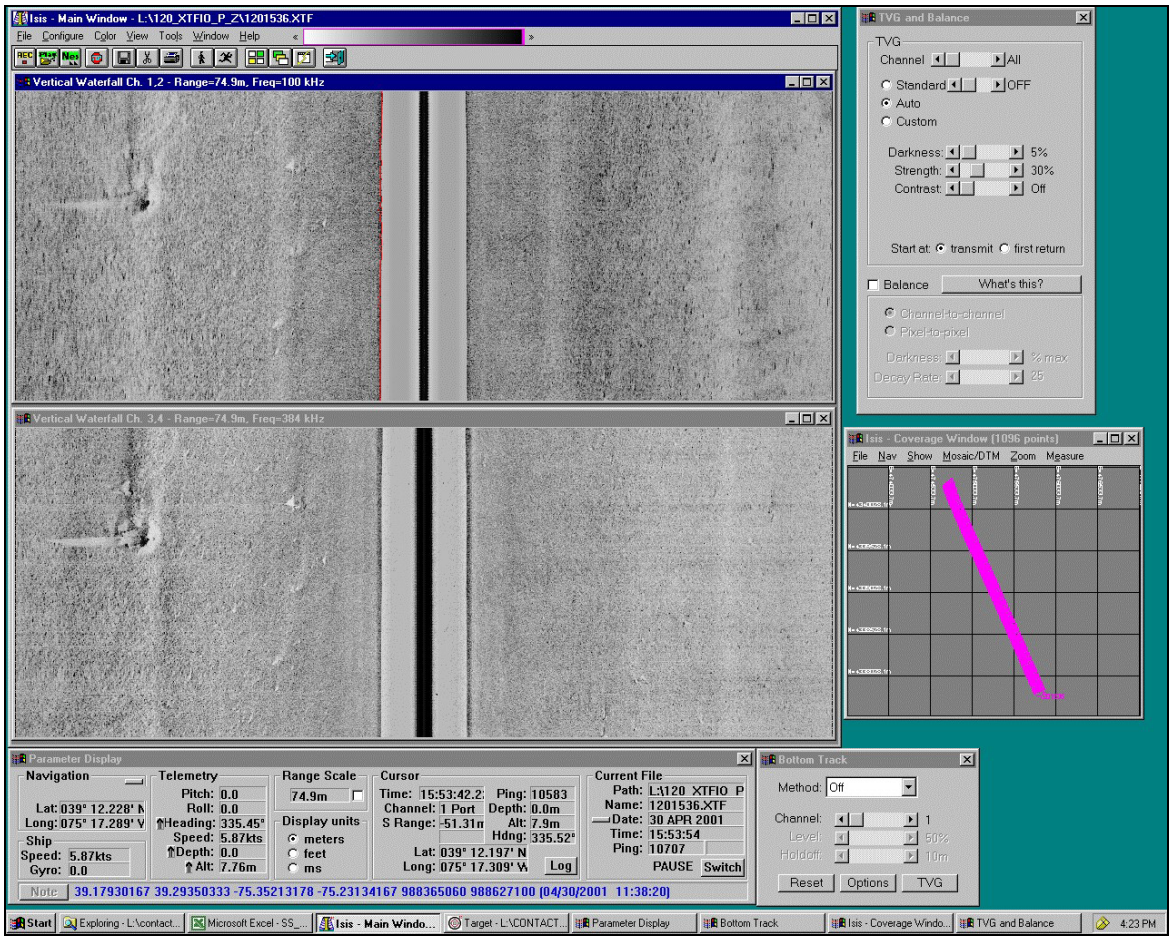

Figure App. 0-2. Side Scan View #2

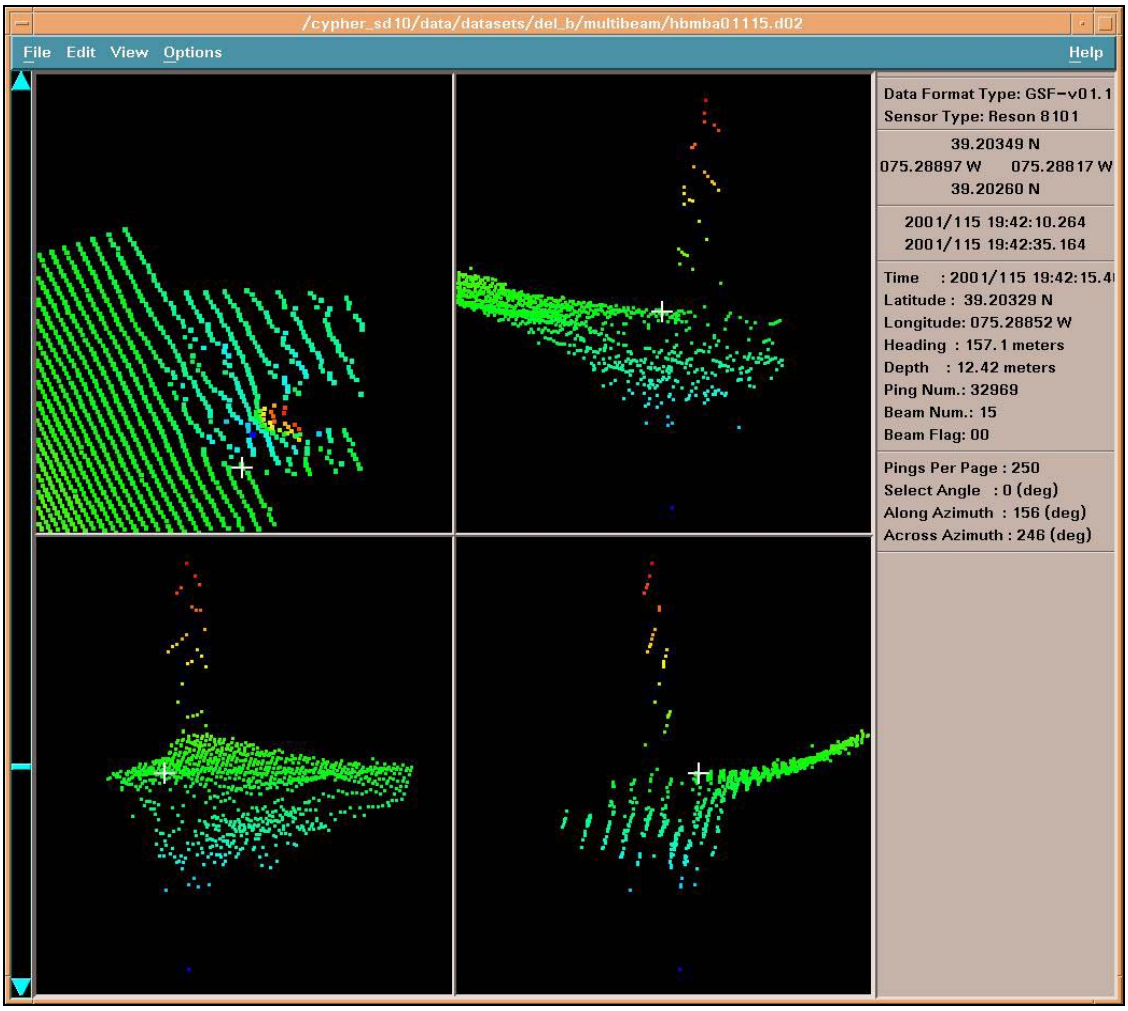

Figure App. 0-3. Obstruction with Cursor at Surrounding Depths

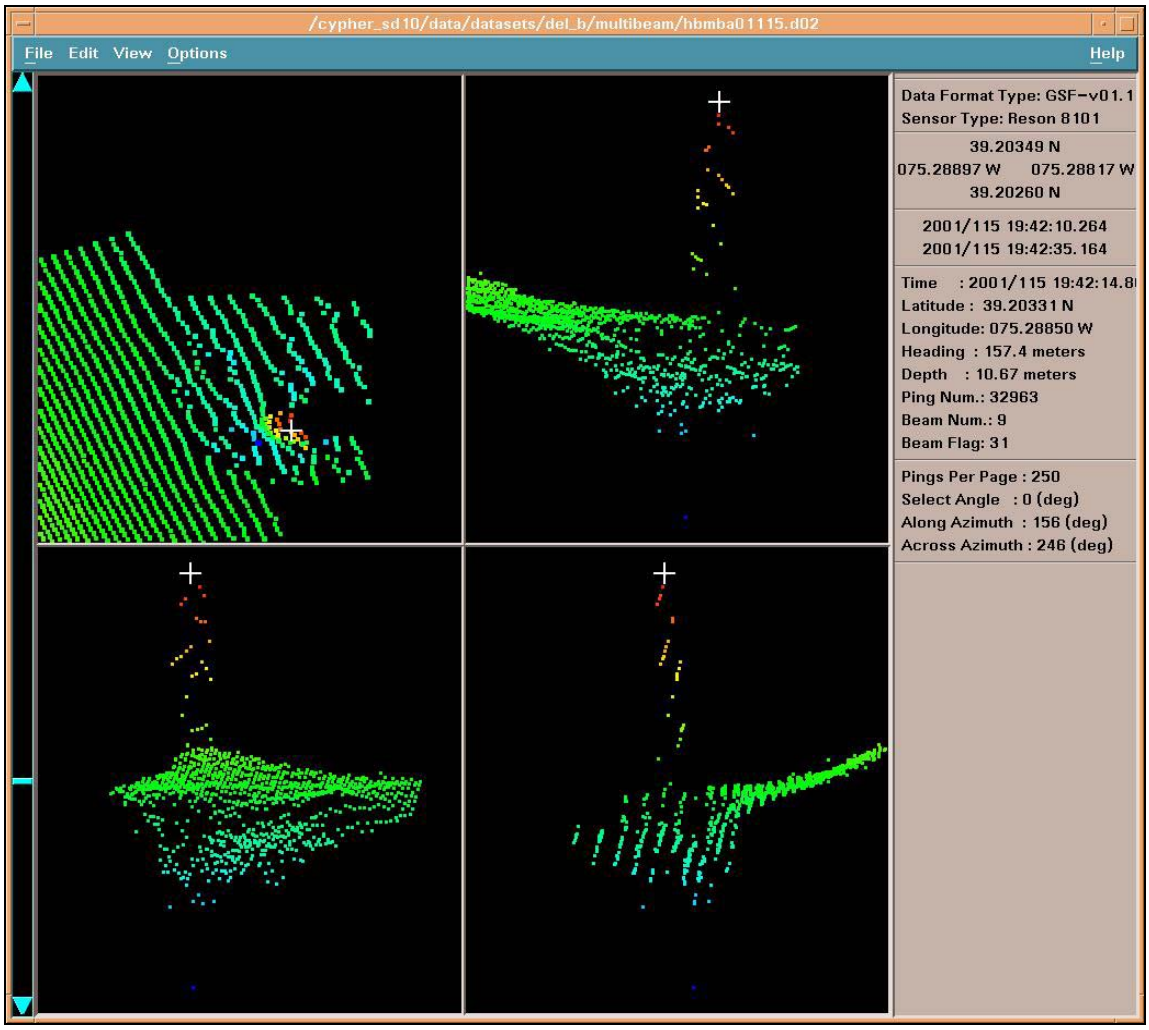

Figure App. 0-4. Obstruction with Cursor at Top Beam

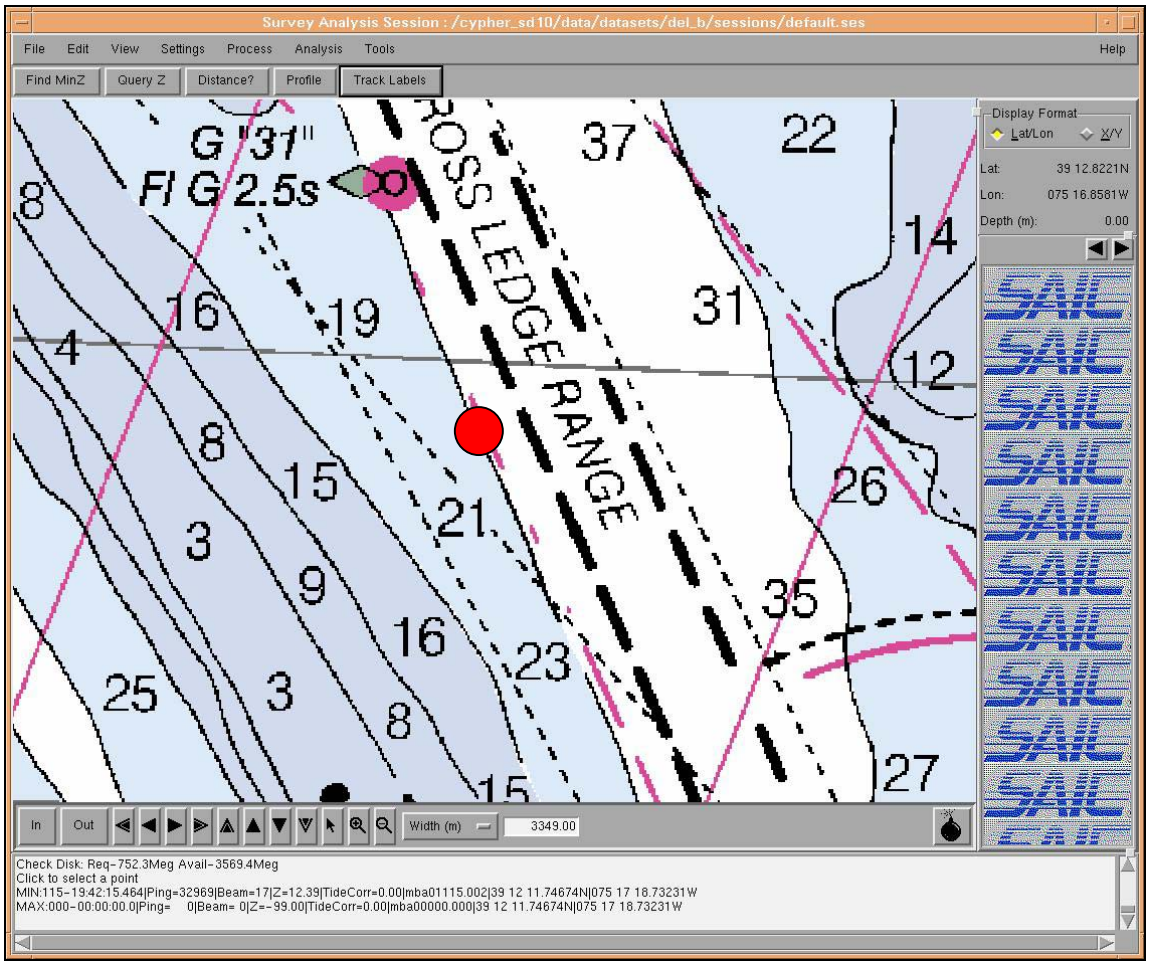

Figure App. 0-5. Obstruction Position on Chart (Red Circle)

Danger to Navigation Report *# 2*

Hydrographic Survey Registry Number: H11022

State: Delaware-New Jersey

Locality: Delaware Bay

Sub-Locality: Miah Maull Shoal to Ben Davis Point

Project Number: OPR-D307-KR-2000

Depths are reduced to Mean Lower Low Water using verified tides based on preliminary zoning. Positions are based on NAD-83. These data show a height of 3.27 meters and a minimum depth of 7.54 meters / 24 feet. Position was obtained using DGPS from a US Coast Guard Station.

Charts affected: 12304 Delaware Bay 1:80,000

The following item was found during hydrographic survey operations:

FEATURE	DEPTH (FT)	LATITUDE (N)	LONGITUDE (W)
1. Obstr	24	39 15 54.22	075 20 50.58

The above item has been applied to chart 12304, updated through March 29, 2003. See page 16 of the Descriptive Report for revisions made during present office processing.

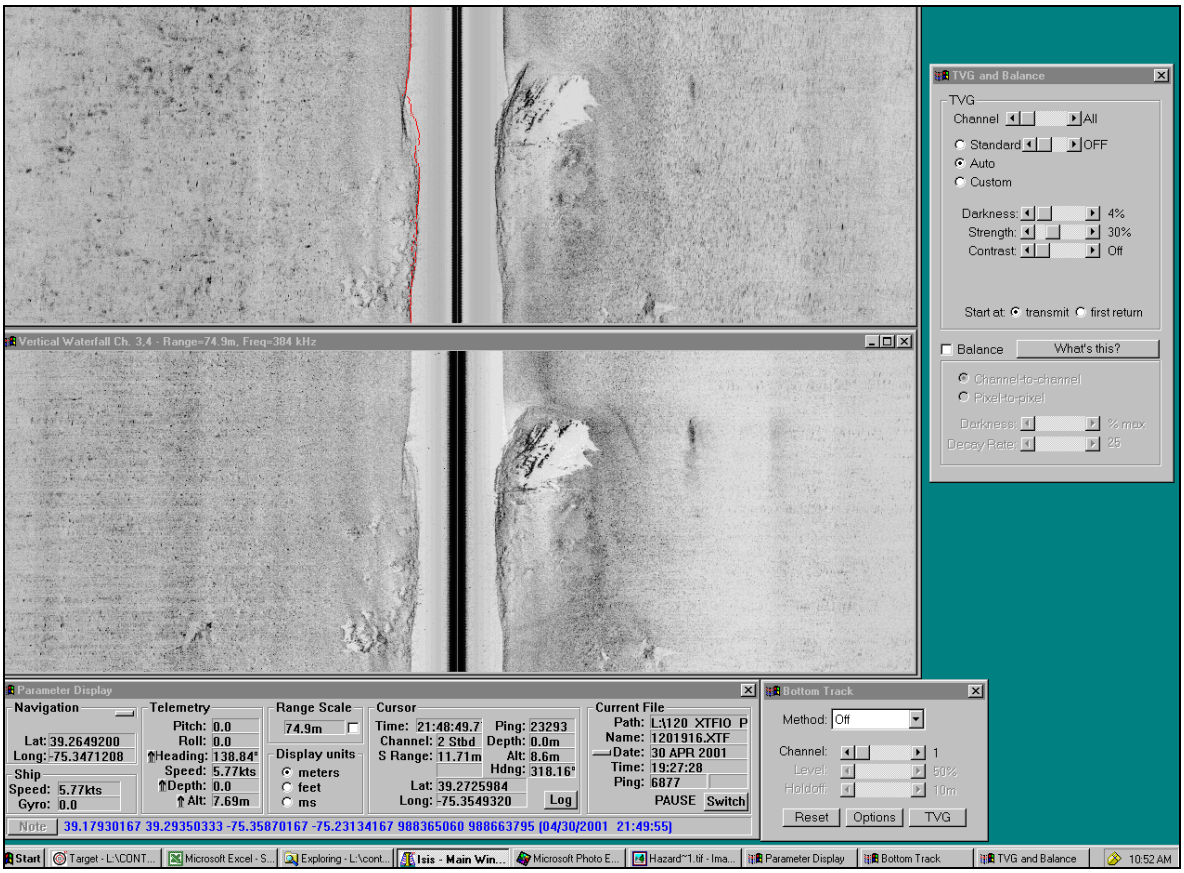

Figure App. 0-6. Side Scan View #1

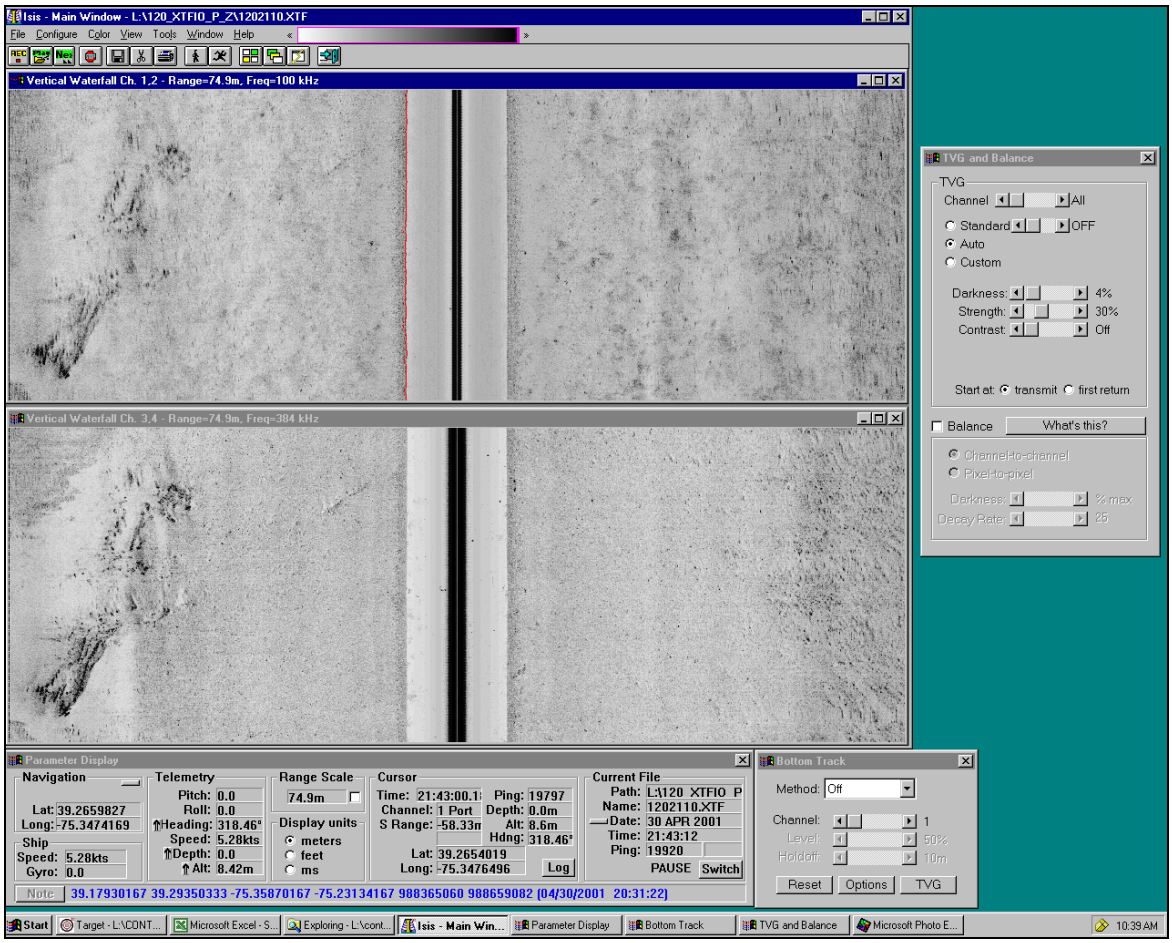

Figure App. 0-7. Side Scan View #2

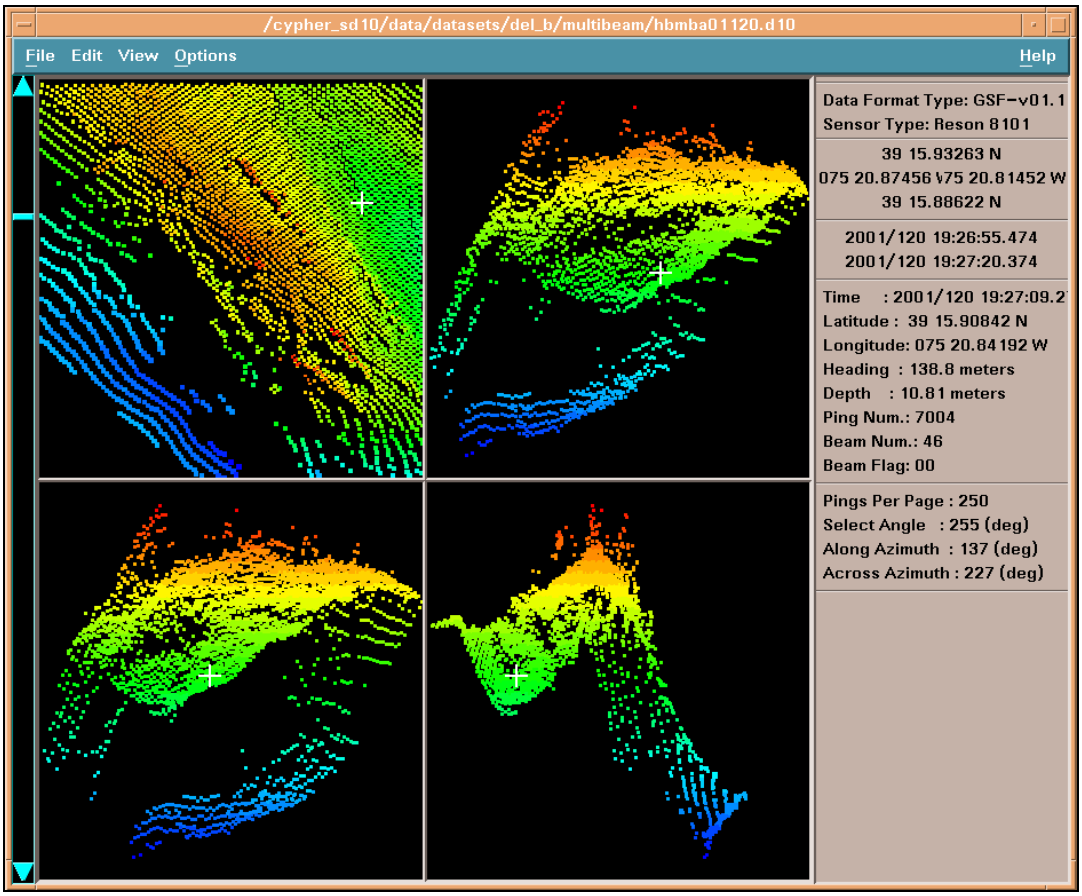

Figure App. 0-8. Obstruction with Cursor at Surrounding Depths

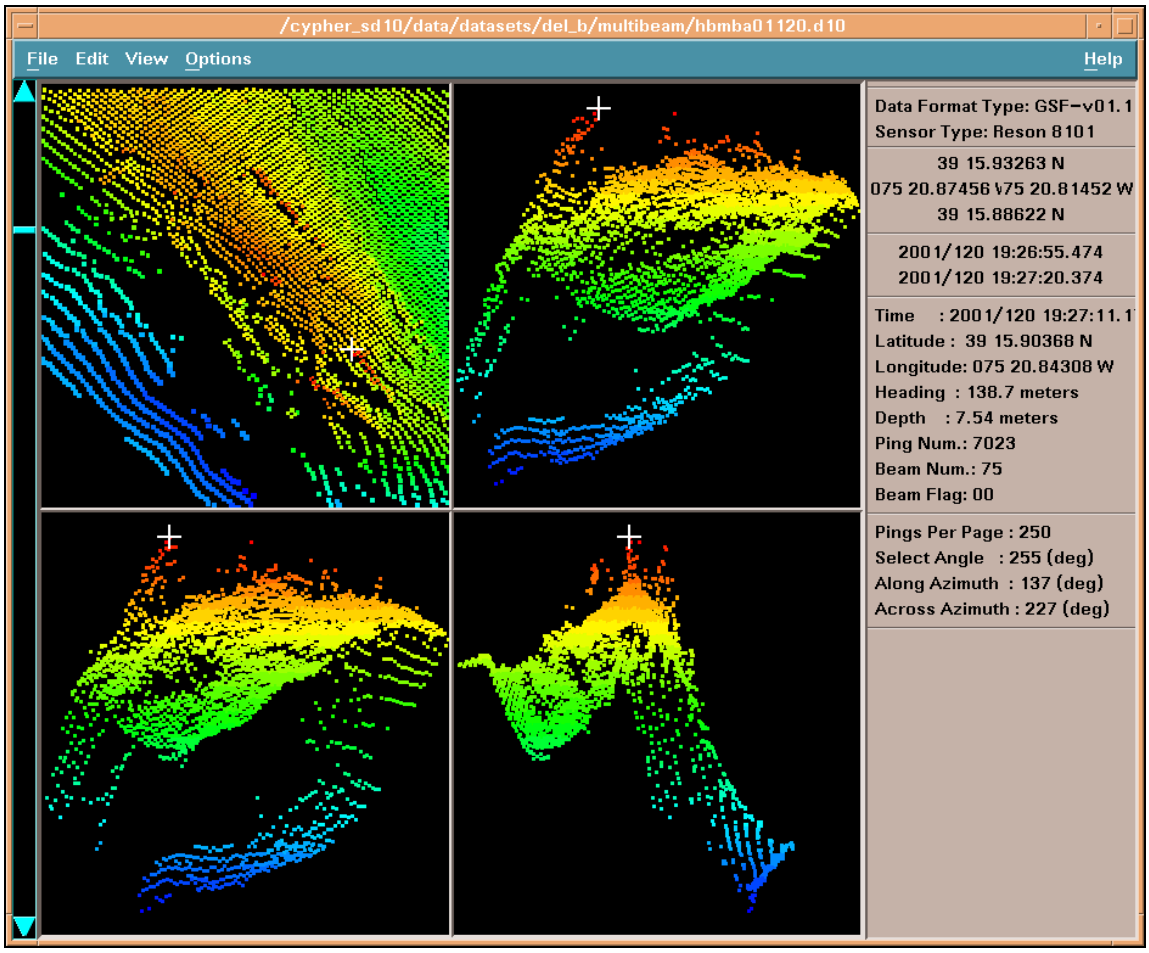

Figure App. 0-9. Obstruction with Cursor at Top Beam

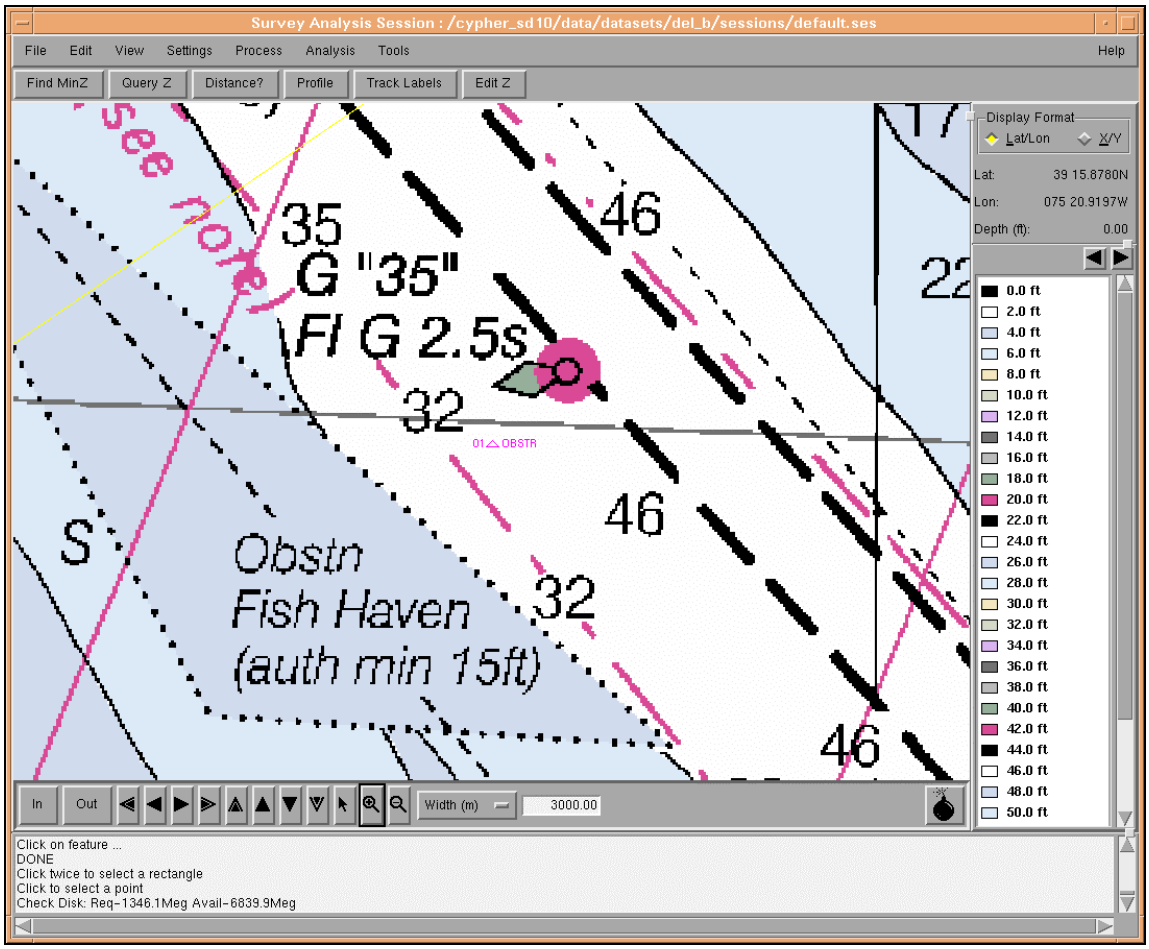

Figure App. 0-10. Obstruction Position on Chart

Danger to Navigation Report *# 3*

Hydrographic Survey Registry Number: H11022
State: Delaware-New Jersey
Locality: Delaware Bay
Sub-Locality: Miah Maull Shoal to Ben Davis Point
Project Number: OPR-D307-KR-2000

Depths are reduced to Mean Lower Low Water using verified tides based on preliminary zoning. Positions are based on NAD-83. These data show a height of 18 feet and a minimum depth of 14 feet / 4.29 meters, in charted 25 feet. Position was obtained using DGPS from a US Coast Guard Station.

Charts affected: 12304 Delaware Bay 1:80,000
The following item was found during hydrographic survey operations:

FEATURE	DEPTH (FT)	LATITUDE (N)	LONGITUDE (W)
1. Obstr	14	39 08 51.02	075 16 02.22

The above item has been applied to chart 12304, updated through March 29, 2003.
See page 16 of the Descriptive Report.

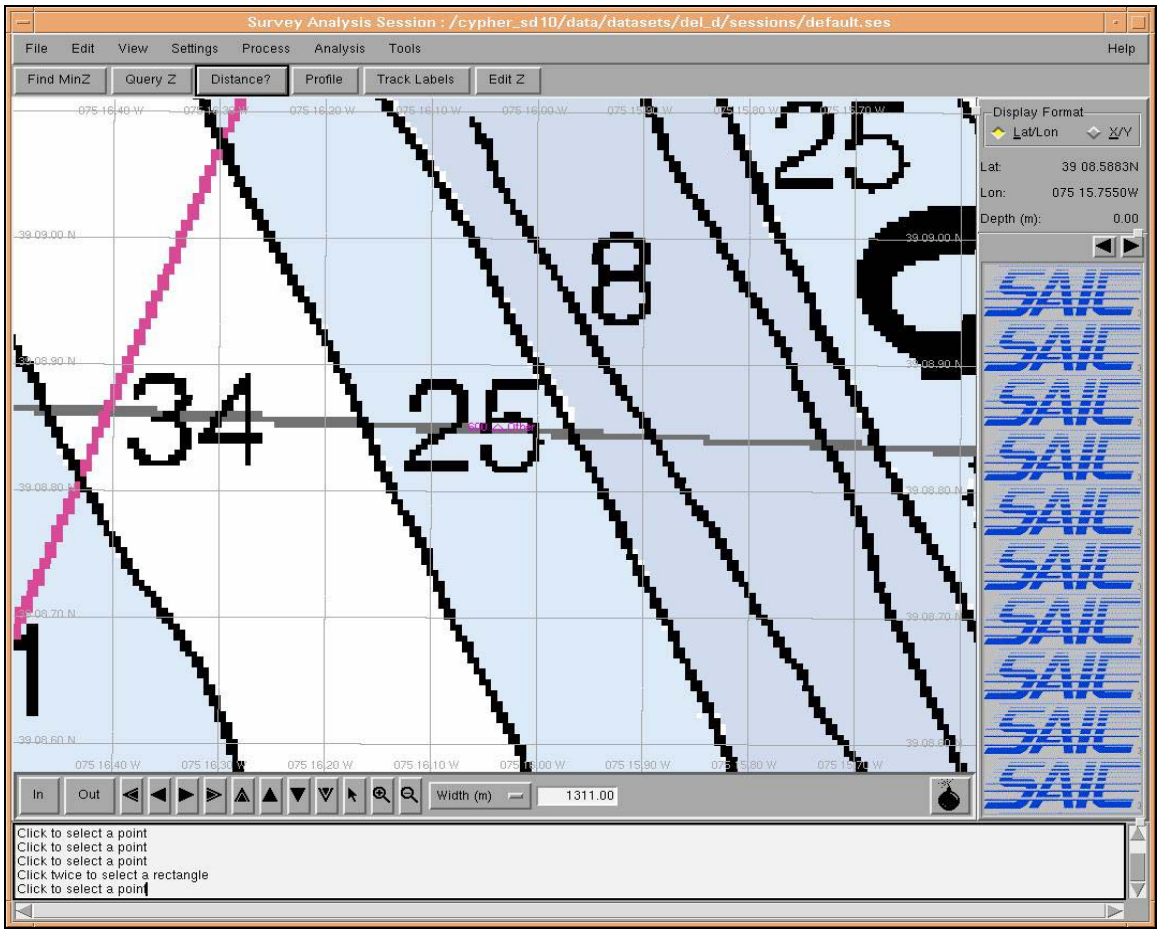

Figure App. 0-11. Chart 12304, 14 ft Sounding Under Charted 25 ft

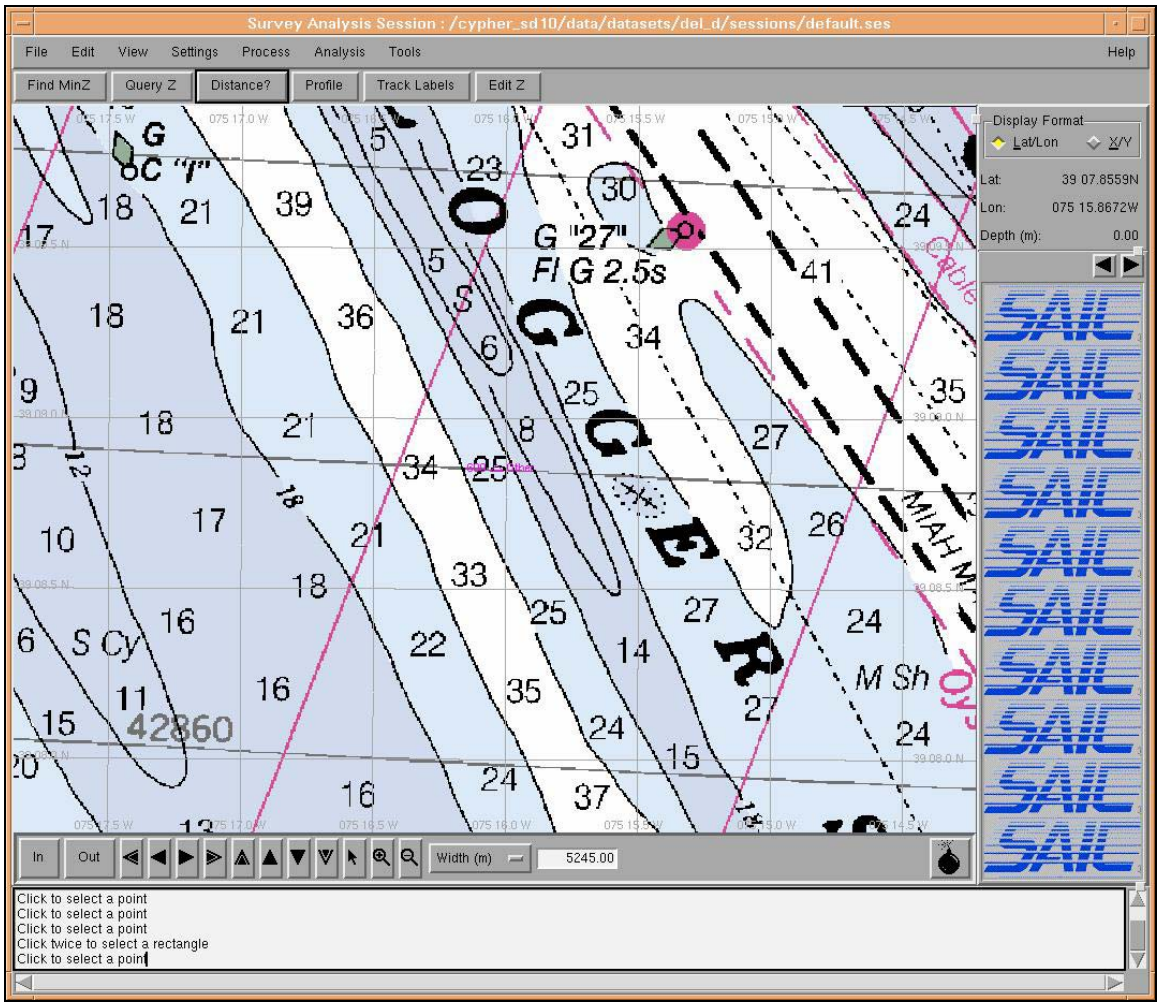

Figure App. 0-12. Chart 12304, 14 ft Sounding Under Charted 25 ft

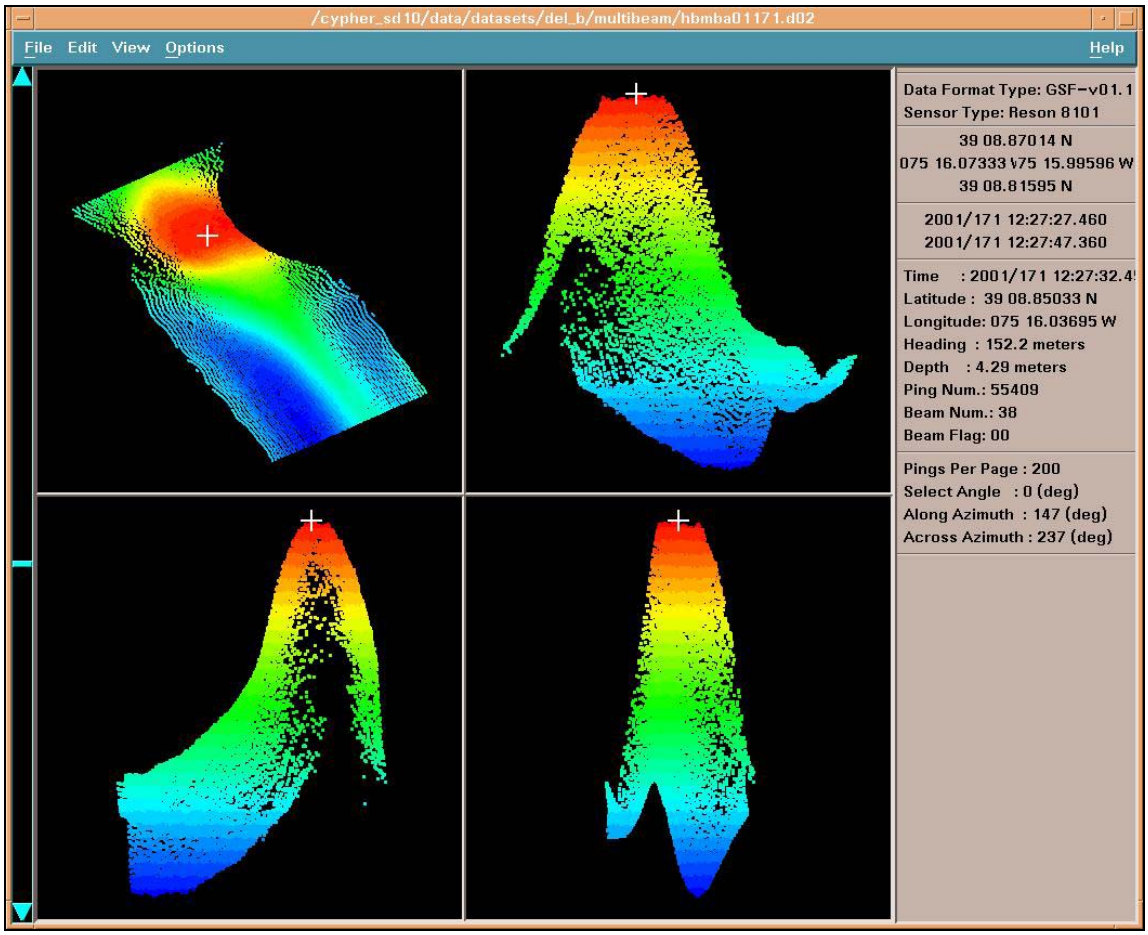

Figure App. 0-13. Multibeam Swath with Cursor at Least Depth, 4.29 meters = 14.07 feet

Figure App. 0-14. Klein 2000 Side Scan 100 and 500 Directly Over Feature

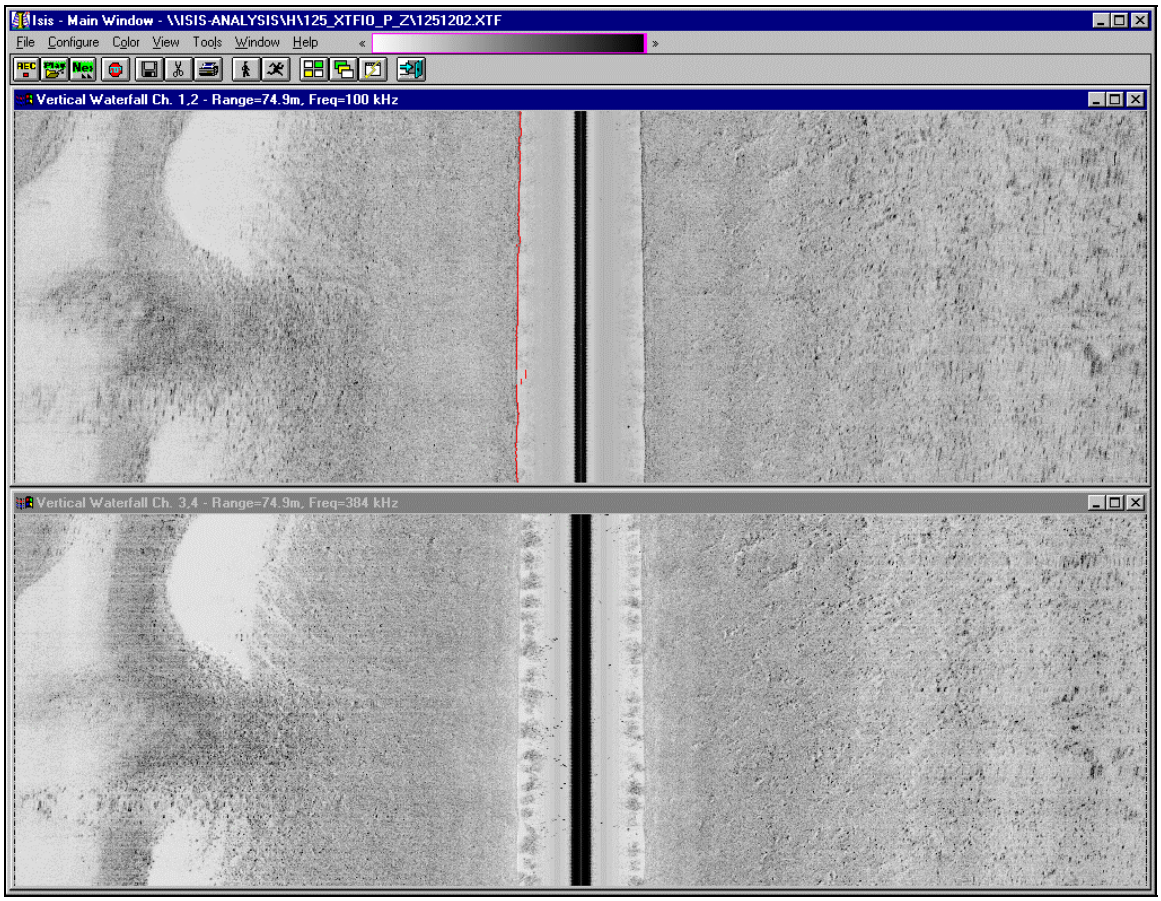

Figure App. 0-15. Klein 2000 Side Scan 100 and 500; Hump shadow goes off screen followed by scour shadow.

APPENDIX V. SUPPLEMENTAL SURVEY RECORDS & ORRESPONDENCE

This appendix contains two email memos from Dr. Evans, SAIC, to Eric Sipos, NOAA COTR, included below.

Sipos to Evans e-mail, 1-29-2001

From: Eric Sipos [mailto:Eric.Sipos@noaa.gov]
Sent: Monday, January 29,2001 10:22 AM
To: Rod Evans
Cc: Jeffrey Ferguson; Brian Greenawalt
Subject: Re: Delaware task order

I recall the same thing being said about a lead line being sufficient. I have no objections about using a daily lead line check in lieu of a single beam echosounder. We will add a requirement for side scan mosaics when we issue the task order ...the requirement should have been included in the October 27, 2000 SOW. We will require a separate mosaic for each 100% coverage.
Thank you for your questions. Please do not hesitate to contact us if other questions arise.
Eric
Rod Evans wrote:
Eric,
I am in the process of refining and finalizing the Delaware task order proposal for delivery to you on 8 February2001. I have only two questions so far that I would like guidance on.
1. In the June 2000 specification section 5.4.1 it states that for multibeam echo sounders a daily nadir comparison should be made with a single beam system. I recall in a meeting at NOAA late last year, that there was a comment made that a lead line would suffice. Is my memory correct? Removal of the single beam echo sounder from the R/V Ocean Explorer will reduce cost.
2. In the same specification section 8.4.1.1. (Side Scan Sonar Mosaic), states that a mosaic is required if specified in the SoW. I cannot see this requirement called out in the October 27, 2000. Am I correct to assume that only proof of sidescan sonar coverage is required as defined in 8.4.1?

Please advise me on these questions.
Thanks, RE.
Rod Evans Ph.D.,
Assistant Vice President,
Marine Survey Manager,
SAIC Marine Survey and Systems,
221 Third Street,
Newport RI 02840
USA.
Tel (401)848.4783.
http://www.saic.com

Evans to Sipos memo, 7-27-2001

SAIC Side Scan Coverage: Sheet B and D: Delaware Bay

To determine whether side scan coverage is adequate in shallow water areas where the fish altitude (above the bottom) is below the NOAA standard of 8% of the range scale in use, SAIC has performed some tests and evaluations in Delaware Bay.

During the RTK data experiment, a closely spaced grid of multibeam lines was run over a fish haven site that included numerous bottom features. Near the end of the day, four side scan lines were run to obtain imagery of the site with the side scan at 2 meter and 4 meter flying heights. One line at each altitude was run to look into the features from the east side, and one line at each altitude looked into the area from the west side (lines nominally north/south).

The features were clearly visible to the outer edge of the side scan image in all four passes. These side scan images were correlated to features in the high-resolution multibeam grid. Distances from the navigation track were measured to the most distant correlated features in ISS2000. Side scan range scale used for this test was 75 meters, the same as used on the main scheme survey lines In H11022 and H11023. The distances reached with the side scan at 2 meter and 4 meter altitude were measured to be 72 meters.

Based on this test, SAIC determined that it is possible to detect contacts, and cover the bottom to at least 72 meters cross track, even at fish altitude of 2 meters. Mosaics are being built using a 70-meter range cut-off for evaluation of coverage.

Areas with no coverage will be filled by running additional lines. Areas that have coverage will be evaluated to determine the quality of the imagery at the outer swath limits. In areas where the imagery at the outer swath limits is considered of too poor quality, additional lines will be run.

In areas of less than 6 feet water depth, we are evaluating the quality of the side scan sonar data that already exists, and judging if we believe it is possible to safely obtain better data where quality may be marginal.

In areas between 15 and 6 feet water depth, we are looking closely at the experience from the first 100% pass, and determining: (1) sonar data quality and (2) the feasibility of the survey vessel safely acquiring a second pass.

In areas of water depth greater than 15 feet, it is a more straightforward practice of planning to fill any data gaps or re-shoot any marginal quality data. Our methodology will be fully discussed in the Descriptive Report.

Fish in the water column do not in themselves create data gaps, because it is not likely that the same bottom area will be obscured in the data from adjacent survey lines. One of the purposes of 200% side scan bottom coverage is provide coverage in areas that may be obscured by fish schools in the water column.

The following examples are from the H11022 north 100% side scan mosaic made with a 70 meter range cut-off applied to the 75 meter range scale data.

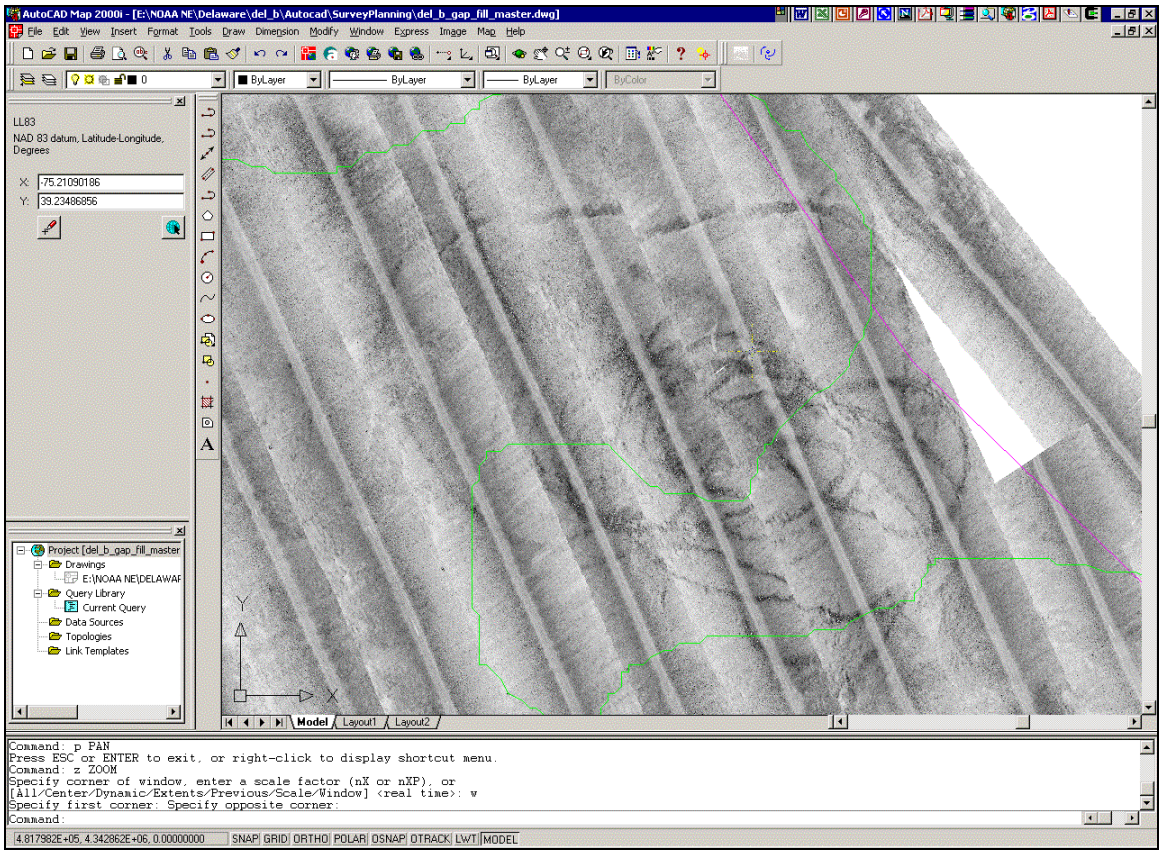

Figure App. 0-1. Example 1, North 100% coverage @ 70m range, showing green 15ft contour

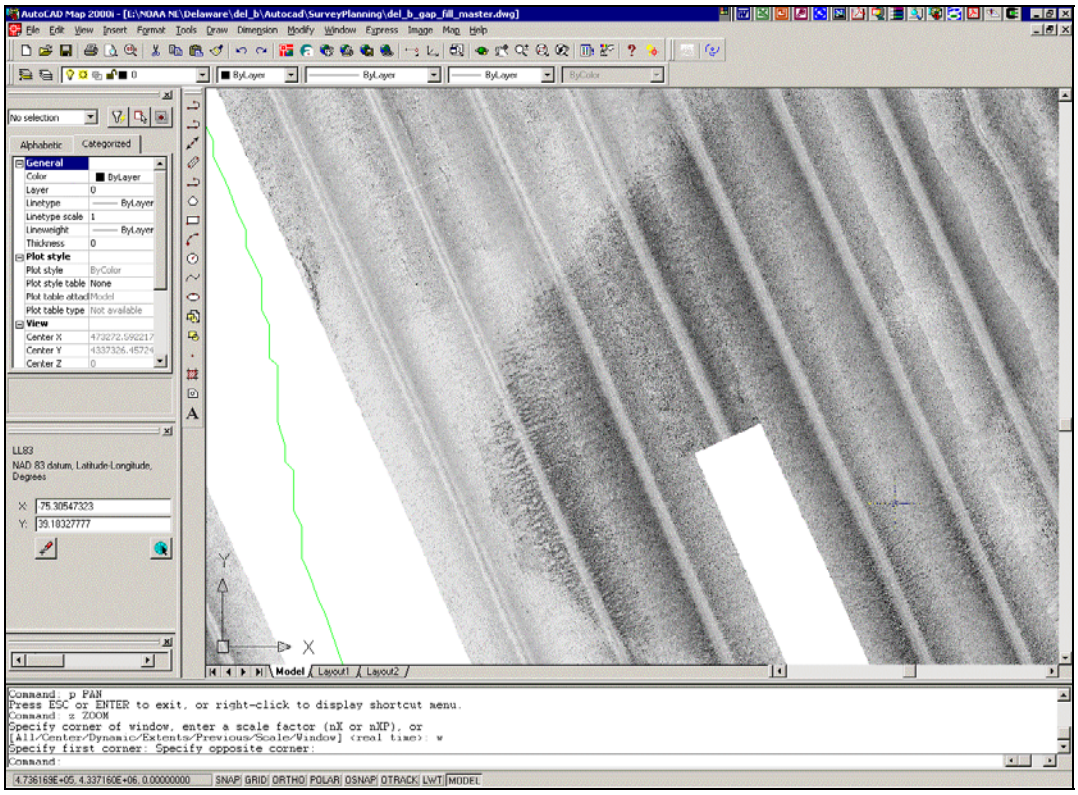

Figure App. 0-2. Example 2, North 100% coverage @ 70m range, showing green 15ft contour

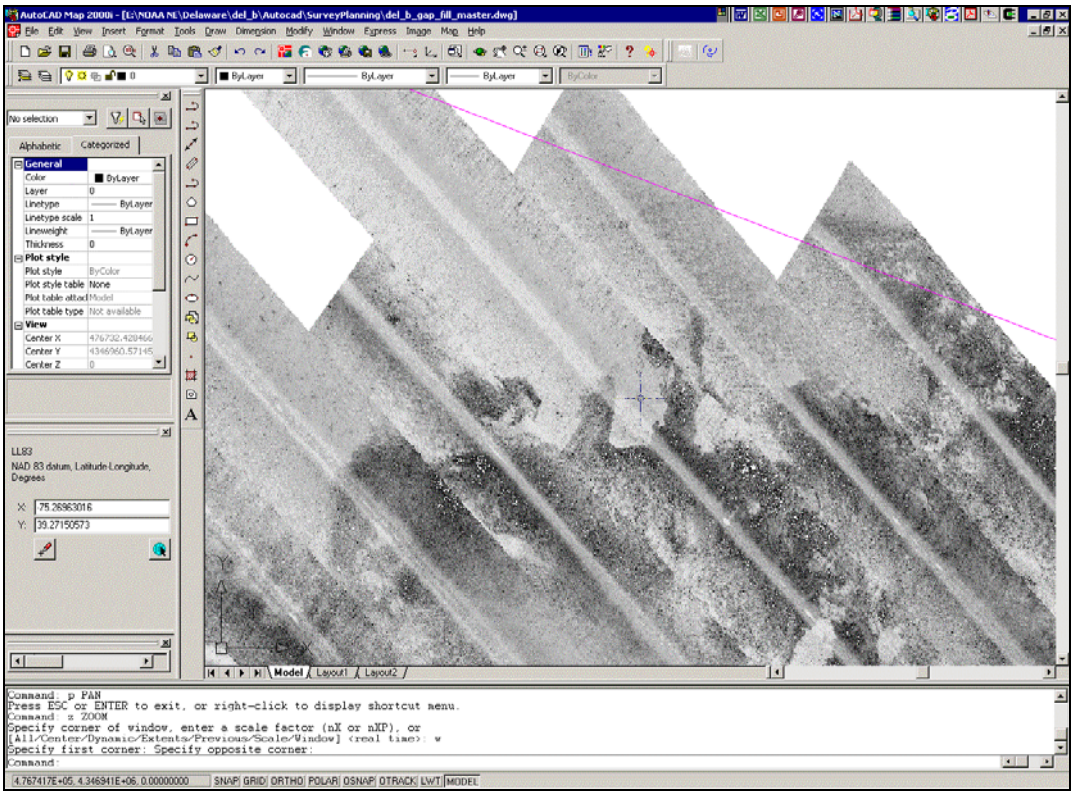

Figure App. 0-3. Example 3, North 100% coverage @ 70m range, showing green 15ft contour

E. APPROVAL SHEET

March 22, 2002

LETTER OF APPROVAL

REGISTRY NUMBER H11022

This report and the accompanying smooth sheet and digital data are respectfully submitted.

Field operations contributing to the accomplishment of survey H11022 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and smooth sheet have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Reports previously submitted to NOAA for this project include:

Report	Submission Date
Data Acquisition and Processing Report	02/08/2002
Vertical and Horizontal Control Report	03/02/2002
Tides and Water Levels Package	01/03/2002

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Science Applications International Corp.
Walter S. Simmons
Hydrographer
Friday, March 22, 2002

NOAA FORM 61-29
(12-71)

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

LETTER TRANSMITTING DATA

REFERENCE NO.
N/CS 33- 08 -04

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

☐ ORDINARY MAIL ☐ AIR MAIL
☐ REGISTERED MAIL ☒ EXPRESS
☐ GBL (Give number)_____

DATE FORWARDED
03/05/2004

NUMBER OF PACKAGES
1

TO:

NOAA / National Ocean Service
Chief, Data Control Group, N/CS 3x1
SSMC3, Station 6815
1315 East-West Hwy.
Silver Spring, MD 20910-3282

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

H11022
Delaware and Jersey
Delaware Bay and River

Descriptive Report
Evaluation Report
Record of Application to charts for Nos charts 12304

1 Smooth Sheet

1 H-Drawing for NOS chart 12304

ATTN: Chief, Data Control Group, N/CS 3x1

FROM: (Signature) Maxine Fetterly

RECEIVED THE ABOVE
(Name, Division, Date)

Return receipted copy to:

Maxine Fetterly
Atlantic Hydrographic Branch
439 W. York St.
Norfolk, VA 23510

NOAA FORM 61-29 SUPERCEDES FORM C AND GS 413 WHICH MAY BE USED.

• U.S. GOVERNMENT PRINTING OFFICE: 1988 - 554-006-61309

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H11022 (2001)

This Evaluation Report has been written to supplement and/or clarify the original Descriptive Report and required revisions on the Contractor (KR) Preliminary Smooth Sheet (PSS). Sections in this report refer to the corresponding sections of the Descriptive Report.

B. DATA ACQUISITION AND PROCESSING

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

MicroStation J, version 07.01.04.16
I/RAS B, version 07.01.000.18
MapInfo, version 6.5
CARIS HIPS/SIPS 2000 version 5.3

The Preliminary Smooth Sheet was plotted by the contractor and accepted as final by AHB.

JUNCTIONS

H11070 (2001) to the north
H11081 (2001) to the south

A standard junction could not be effected between the present survey and H11070 (2001) and H11081(2001). The junctional surveys are archived at NOS headquarters, Silver Spring, Maryland. Any adjustments to the depth curves in the junctional areas will have to be made on the chart during compilation at the Marine Chart Division (MCD).

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

C. HORIZONTAL CONTROL

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.

D1. COMPARISON WITH CHART 12304 (43rd Edition, March/03)

Corrected through NM March 29, 2003
Corrected through LNM March 18, 2003

Controlling Depths

Conflicts exist between the charted controlling depths and the present survey depths. The hydrographer noted on pages 5 and 20 of the Descriptive Report, that channels were being actively dredged during this survey in 2001. The latest chart tabulations reflect US Army Corps of Engineers report from September 2002. Attention is directed to the following:

Brandywine Range channel, in latitude 39˚04'29.6"N, longitude 75˚10'49.6"W, the shoalest present survey depth is 40 feet. The tabulation shows a controlling depth of 41 feet left inside quarter.

Miah Maull Range channel, in latitude 39˚05'05.0"N, longitude 75˚11'17.0"W, the shoalest present survey depth is 39 feet. The tabulation shows a controlling depth of 41.1 feet for the left outside quarter.

Miah Maull Range channel, in latitude 39˚05'34.0"N, longitude 75˚11'35.0"W, the shoalest present survey depth is 40 feet. The tabulation shows a controlling depth of 41 feet for the right inside quarter.

Cross Ledge Range, from latitude 39˚10'53"N, longitude 75˚16'15"W to latitude 39˚11'21"N, longitude 75˚16'30"W, the shoalest present survey depths in the channel are from 40-44 feet. The tabulation show controlling depths from 43 to 44.1 feet.

Cross Ledge Range, from latitude 39˚12'42"N, longitude 75˚17'21"W to latitude 39˚13'03"N, longitude 75˚17'34"W, the shoalest present survey depths are 43 feet. The tabulation shows a controlling depth 44.1 feet for the right inside quarter.

It is recommended the Marine Chart Division (MCD), Update Service Branch use the latest information available to determine if conflicts exist in the areas discussed in the Descriptive Report and this report.

Hydrography

The charted hydrography originates with the prior surveys and requires no further consideration. The hydrographer makes

adequate chart comparisons in section D. of the Descriptive Report. Attention is directed to the following:

a. Automated Wreck and Obstruction Information System (AWOIS) Item #2724, a charted wreck with a depth of 14 feet, in latitude 39˚12'53.40"N, longitude 75˚15'17.04"W, originates with Notice to Mariners 27 of 1967 (NM27/67). This feature was located by the field unit with a depth of 14 feet (4^3 m)in latitude 39˚12'53.33"N, longitude 75˚15'17.11"W. It is recommended that this feature be charted as shown on the present survey.

b. A charted obstruction with a depth of 35 feet, in latitude 39˚12'11.92"N, longitude 75˚17'18.60"W, originates with Danger to Navigation (DtoN) #1 submitted by the hydrographer. Two uncharted obstructions also located by the hydrographer are listed below:

Depth ft/m	Latitude(N)	Longitude(W)
27/ 8^2	39˚12'13.3"	75˚17'24.0"
33/10^2	39˚12'20.0"	75˚17'24.8"

It is recommended that the charted feature be deleted, and the obstruction with a depth of 27 feet (8^2 m) be charted as shown on the present survey.

c. An uncharted obstruction with a depth of 14 feet (4^3 m), in latitude 39˚09'40.10"N, longitude 75˚17'28.05"W, was located, but not addressed by the hydrographer. It is recommended that this feature be charted as shown on present survey.

d. The following uncharted features were located by the hydrographer but not addressed in the Descriptive Report. These features are shown as obstructions on the smooth sheet:

Depth ft/m	Latitude(N)	Longitude(W)
39/ 9^6	39˚04'41.3"	75˚11'02.9"
30/ 9^1	39˚03'36.2"	75˚11'32.9"
46/14^1	39˚06'39.6"	75˚12'45.7"
31/ 9^6	39˚09'39.9"	75˚15'48.9"
15/ 4^6	39˚11'03.2"	75˚11'54.5"
22/ 6^6	39˚10'47.2"	75˚15'55.9"
30/ 9^3	39˚10'41.8"	75˚17'37.8"
27/ 8^2	39˚11'18.8"	75˚16'54.0"
25/ 7^4	39˚11'34.9"	75˚16'21.8"

35/10[9]	39°11'32.3"	75°16'31.1"
36/11[2]	39°11'46.6"	75°16'39.7"
17/ 5[2]	39°12'53.1"	75°15'41.3"
39/12	39°12'22.5"	75°17'22.7"
30/ 9[2]	39°12'41.8"	75°17'37.0"
15/ 4[7]	39°12'51.2"	75°18'20.6"
15/ 4[7]	39°14'12.4"	75°17'32.9"
40/11[9]	39°14'00.8"	75°18'01.7"
21/ 6[4]	39°14'48.1"	75°18'48.5"
19/ 5[8]	39°15'33.4"	75°15'34.4"
16/ 4[8]	39°15'36.1"	75°15'37.1"
15/ 4[8]	39°16'44.0"	75°16'55.2"
45/13[8]	39°16'01.4"	75°20'38.2"

The features were determined not to be significant for charting during office processing. It is recommended that representative survey soundings be charted as shown on present survey.

e. An uncharted wreck with a least depth of 28 feet (8[6] m), in latitude 39°15'57.5"N, longitude 75°21'23.3"W, was located by the hydrographer. During office processing, the side scan sonar data were examined. The images did not appear to be a wreck. This feature is located within a charted Fish Haven and has a least depth deeper than the authorized minimum depth. This feature is not recommended for charting.

D2. 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.

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

ADEQUACY OF SURVEY

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

MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be

forwarded to Marine Chart Division, Silver Spring, Maryland. The following NOS chart was used for compilation of the present survey:

12304, 43rd Edition, March 2003
(updated through March 29, 2003)

APPROVAL SHEET
H11022

The completed survey has been inspected with regard to survey coverage, delineation of depth curves, development of critical depths, cartographic symbolization, and verification or disapproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Maxine Fetterly — Date: 1/26/04

Maxine Fetterly
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.

E. B. Christman — Date: 2/27/04

Emily B. Christman
Commander, NOAA
Chief, Atlantic Hydrographic Branch

AWOIS ✓ & SURF ✓ by MBH on 3/12/04

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H11022

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.
1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
12304	2/9/04	Marjorie Fetterly	Full ~~Part Before~~ After Marine Center Approval Signed Via FULL APPLICATIONS
			Drawing No. OF SOUNDINGS AND CURVES FROM
			SMOOTH SHEET
12304	6/23/04	EJ Van Dyke	Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
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SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.