IV ADCRSM

Cruise Report

R/V NEECHO

N87-1

Boston Harbor - Massachusetts Bay

6/16/87 - 7/21/87

by

Richard R. Rendigs

87024rpt

Ship:	R/V NEECHO
Cruise Number:	N87-1
Parent Project:	Pollution Transport and Accumulation in Coastal Embayments
Funding Agency:	USGS
Funding Amount:	$90,000
Contract Number:	04132
Start and end date:	FY 87
Area of operations:	Boston Harbor - Massachusetts Bay
Dates and ports:	start: 6/16/87 end: 7/21/87 Pt. Allerton, Hull, MA
Chief Scientist:	Rick Rendigs
Cruise data curator:	Rick Rendigs
Scientific Party:	USGS: Rick Rendigs, Dave Nichols, Tom O'Brien, Ken Parolski, Dave Lubinski, Dave Schneider, Bob Oldale, Barry Irwin. ~5 per day Boston University: Mike Hill
Ship's Captain:	Dave Mason and Joe Newell
Purpose of Cruise:	To conduct a high resolution seismic reflection (uniboom) and side scan survey of Boston Harbor and selected offshore areas.

Navigation Techniques: The megapulse accufix 500 navigation system was used to acquire Loran C radio navigation signals (TD's). This receiver was used in conjunction with a software package driven by an IBM-PC which allowed the captain to steer the ship along the track lines in Boston Harbor.

The navigator inputs the track line way points (beginning and end of line) in decimal minutes, along with the desired Loran C sampling and filter rates and additional secondary factor corrections (ASF) into the navigation format. A steering function is computed and displayed on a monitor which allows the ship's captain to maneuver along the track line.

As the ship steers along the line, the Loran C signal is updated, the new position recomputed and the data stored onto floppy disc. A hardcopy of the current position is also generated during this operation.

Loran C signals were also displayed on a Northstar 6000 receiver as a navigational cross check.

The side scan and high resolution seismic survey conducted in Massachusetts Bay used the actual Loran C time delay lines as track lines. The Northstar 6000 receiver was used to steer along these TD lines. This receiver also has a steering function which allows the ship's operator to accurately steer along the TD lines.

Scientific equipment:

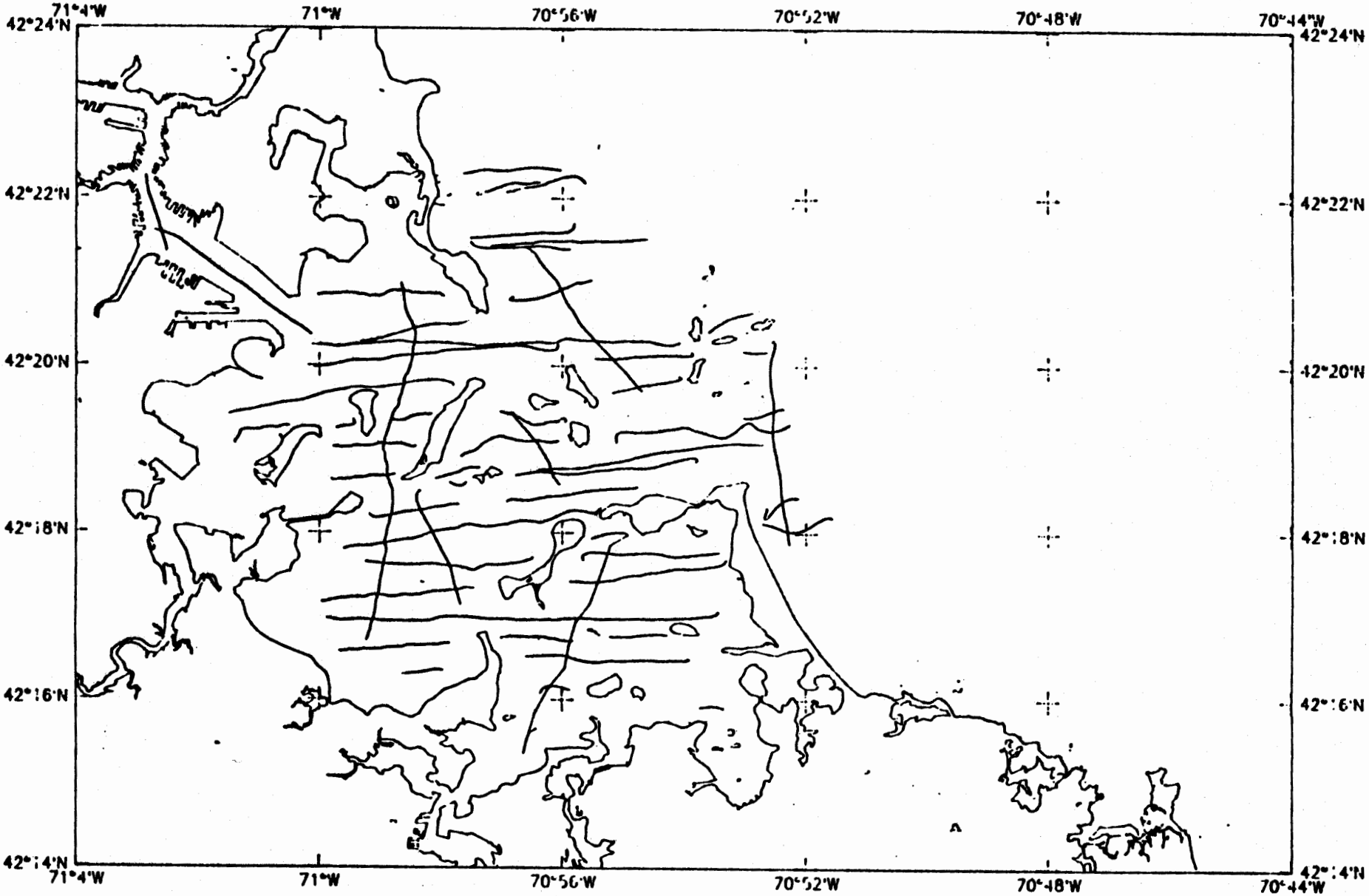
100 kHz Klein sidescan towfish and recorder
3.5 kHz towfish with recorder
0.5-5 kHz Datasonics Geopulse ~~(Uniboom)~~ system

Tabulated information:

a). 19 days at sea
b.) number of stations and kilometers of each type of continuous data:

	Stations	Uniboom	side scan	3.5 kHz
Boston Harbor	57	128.75	128.75	59.46
Massachusetts Bay	8	77.12	77.12	-0-
		205.87	205.87	

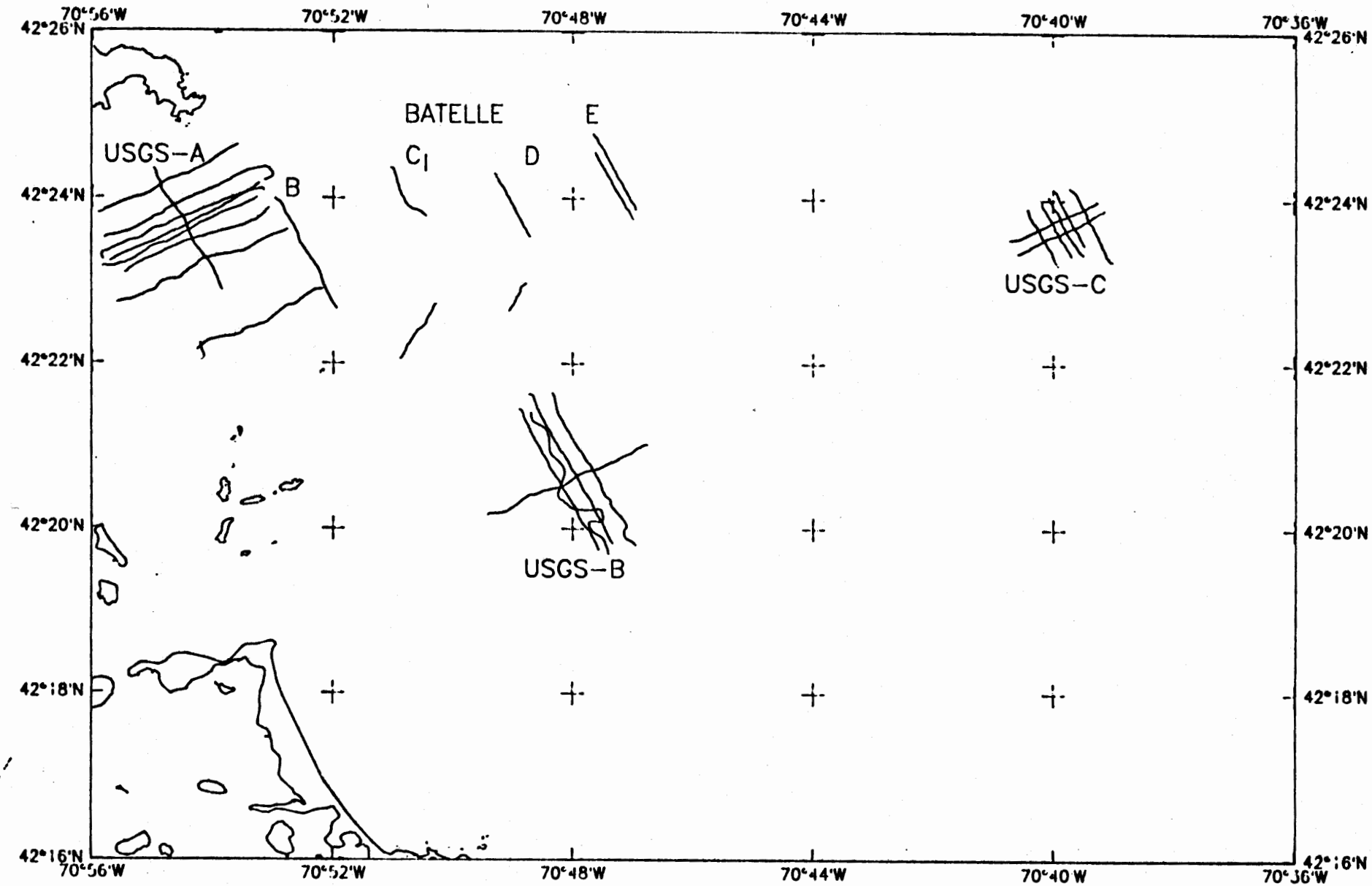
Boston Harbor



R/V Neecho – Seismic and Sidescan Sonar Survey

0 1 2 3 4 5 NAUTICAL MILES

Massachusetts Bay



R/V Neecho–Seismic and Sidescan Sonar Survey

0 1 2 3 4 5 NAUTICAL MILES

c. table of station information:

Survey Line No.	Date Surveyed	Latitude	Longitude	Water Depth (Ft.) Along Survey Line	Uniboom	3.5kHz	Sidescan	Distance Surveyed (km)
1	6/18/87	42 15.53 42 15.66	70 56.57 70 56.41	5-25	X	X	X	0.32
2	6/18/87	42 16.12 42 16.12	70 56.35 70 55.85	8-20	X	X	X	0.72
3	6/26/87	42 15.92 42 15.91	70 53.36 70 53.74	8	X	X	X	0.48
4	6/26/87	42 16.50 42 16.52	70 53.99 70 56.59	5-25	X	X	X	3.20
5	6/26/87	42 16.77 42 16.75	70 54.27 70 55.21	5-25	X	X	X	1.14
6	6/26/87	42 16.72 42 16.70	70 56.97 70 55.81	10-30	X	X	X	1.44
7	7/7/87	42 16.57 42 16.67	70 59.67 70 57.84	8	X		X	2.25
8	7/7/87	42 16.30 42 16.35	70 57.63 70 57.93	8	X		X	0.80
9	6/26/87	42 17.06 42 16.97	70 53.45 70 59.86	8-30	X	X	X	7.68
10	7/7/87	42 17.34 42 17.15	70 57.43 70 59.94	8-30	X		X	3.04
11	6/26/87	42 17.68 42 17.41	70 53.30 70 55.86	10-50	X	X	X	3.12
12	6/26/87	42 17.66 42 17.76	70 55.63 70 53.42	10-60	X	X	X	2.72
13	6/25/87	42 17.71 42 17.64	70 56.48 70 59.22	10-35	X	X	X	3.36
14	6/25/87	42 18.30 42 17.80	70 55.36 70 59.58	10-50	X	X	X	5.12
15	6/26/87	42 17.96 42 17.93	70 54.93 70 55.51	10-40	X		X	0.72

Survey Line No.	Date Surveyed	Latitude	Longitude	Water Depth (Ft.) Along Survey Line	Uniboom	3.5kHz	Sidescan	Distance Surveyed (km)
16	6/18/87	42 17.99 42 15.36	70 54.90 70 56.62	10-60	X	X	X	4.80
17	6/25/87	42 18.22 42 18.34	70 59.16 70 57.69	10-40	X		X	1.76
17A	6/25/87	42 18.37 42 18.55	70 56.91 70 54.75	25-50	X		X	2.56
18	6/25/87	42 18.86 42 18.68	70 53.80 70 56.75	10-50	X	X	X	3.60
18A	6/25/87	42 18.61 42 18.60	70 57.56 70 57.84	30	X		X	0.32
19	6/18/87	42 19.07 42 18.76	70 52.70 70 56.38	10-50	X		X	4.48
20	7/7/87	42 18.64 42 18.78	70 58.08 70 57.34	30	X		X	0.88
21	7/8/87	42 18.64 42 18.63	70 59.79 70 58.74	10	X		X	1.28
22	7/8/87	42 19.05 42 19.02	70 58.39 70 59.76	10-25	X		X	1.6
23	7/7/87	42 18.91 42 19.10	70 57.66 70 56.05	25	X		X	2.0
24	6/18/87	42 19.07 42 19.31	70 55.10 70 52.25	20-50	X		X	1.92
25	6/18/87	42 19.60 42 19.53	70 52.08 70 54.60	15-50	X		X	0.96
26	6/18/87	42 20.27 42 17.87	70 52.54 70 52.26	30-70	X		X	1.76
27	7/7/87	42 19.33 42 19.44	70 55.95 70 57.01	10-40	X		X	1.36
28	7/7/87	42 19.42 42 18.58	70 56.88 70 56.02	10-50	X		X	1.76
29	7/8/87	42 19.43 42 19.34	70 58.13 70 58.79	15 (4.58 m)	X		X	0.8

Survey Line No.	Date Surveyed	Latitude	Longitude	Water Depth (Ft.) Along Survey Line	Uniboom	3.5kHz	Sidescan	Distance Surveyed (km)
30	7/8/87	42 19.36 42 19.24	70 59.44 70 59.71	10	X		X	0.48
31	7/8/87	42 19.25 42 19.22	71 00.58 71 01.21	20	X		X	1.28
33	6/29/87	42 19.75 42 19.40	70 57.78 71 01.48	10-40	X	X	X	2.8
35	6/29/87	42 19.88 42 19.68	70 54.10 70 55.16	10-30	X	X	X	1.44
37	6/18/87	42 20.18 42 20.17	70 52.58 70 53.01	40-60	X		X	0.48
38	6/29/87	42 20.17 42 20.09	70 53.87 70 55.45	30-50	X	X	X	2.0
39	6/29/87	42 22.62 42 20.28	70 56.06 70 54.07	30-60	X	X	X	4.8
40	6/29/87	42 20.25 42 20.28	71 00.13 70 54.07	25-60	X	X	X	7.2
41	6/29/87	42 20.68 42 20.41	70 52.77 70 53.59	40-60	X	X	X	1.12
42	6/19/87	42 21.51 42 21.42	70 54.57 70 57.16	15-45	X		X	3.2
43	6/19/87	42 20.55 42 20.28	70 57.53 70 59.31	20-40	X		X	2.24
44	6/19/87	42 20.39 42 21.60	71 00.14 71 02.71	40-60	X		X	3.76
44A	6/19/87	42 21.35 42 22.25	71 02.54 71 02.86	40-60	X		X	1.52
45	7/8/87	42 20.83 42 20.83	70 57.91 71 00.02	10	X		X	2.56
45A	7/7/87	42 16.70 42 20.99	70 59.20 70 58.64	10-45	X		X	7.04

Survey Line No.	Date Surveyed	Latitude	Longitude	Water Depth (Ft.) Along Survey Line	Uniboom	3.5kHz	Sidescan	Distance Surveyed (km)
46	6/19/87	42 20.82 42 21.03	70 56.78 70 55.51	20-40	X		X	1.68
47	6/19/87	42 22.18 42 22.07	70 55.61 70 56.91	10-40	X		X	1.6
48	6/19/87	42 21.49 42 21.39	70 57.49 70 55.86	10-45	X		X	2.0
49	6/19/87	42 21.70 42 21.52	70 55.80 70 57.50	10-40	X		X	2.08
50	6/19/87	42 22.07 42 22.19	70 57.37 70 56.36	10-40	X		X	1.2
51	6/19/87	42 22.33 42 22.28	70 56.01 70 57.62	10-40	X		X	1.92
52	6/19/87	42 19.63 42 21.35	70 54.38 70 56.28	25-50	X		X	3.6
54	6/18/87	42 18.32 42 18.42	70 52.63 70 52.11	30	X		X	0.96
55	6/18/87	42 18.18 42 18.13	70 51.54 70 52.70	30	X		X	1.44
56	6/25/87	42 18.50 42 17.13	70 58.32 70 57.65	10-20	X	X	X	2.4
BATELLE SITE B								
13975.5	7/20/87	42 24.05 42 22.67	70 53.06 70 51.98	75	X		X	1.81
BATELLE SITE C_1								
13961.5	7/20/87	42 24.37 42 23.78	70 51.08 70 50.44	80	X		X	1.02
BATELLE SITE D								
13950.5	7/20/87	42 24.35 42 23.03	70 49.32 70 48.73	100	X		X	0.98

Survey Line No.	Date Surveyed	Latitude	Longitude	Water Depth (Ft.) Along Survey Line	Uniboom	3.5kHz	Sidescan	Distance Surveyed (km)
BATELLE SITE E								
13937.5	7/20/87	42 24.84 42 23.87	70 47.69 70 46.94	110	X		X	1.2
13938.5	7/20/87	42 23.70 42 24.55	70 46.92 70 47.62	110	X		X	0.48
USGS SITE A								
13987	7/21/87	42 24.35 42 22.88	70 54.99 70 53.84	40-80	X		X	3.68
13993	7/21/87	42 22.03 42 22.23	70 54.19 70 54.21	30-70	X		X	0.48
44286.5	7/21/87	42 22.91 42 22.15	70 52.19 70 54.27	30-70	X		X	3.84
44292	7/21/87	42 22.72 42 23.62	70 55.60 70 52.76	40-80	X		X	4.96
44294	7/21/87	42 23.88 42 23.09	70 53.08 70 55.46	40-80	X		X	4.32
44295	7/21/87	42 23.17 42 24.00	70 55.82 70 53.28	40-80	X		X	4.48
44295.5	7/21/87	42 24.08 42 23.23	70 73.87 70 55.71	40-80	X		X	4.48
44296	7/21/87	42 23.25 42 24.18	70 55.82 70 53.24	40-80	X		X	4.64
44297	7/21/87	42 24.21 42 23.51	70 53.15 70 55.80	40-80	X		X	4.8
44299	7/21/87	42 23.81 42 24.64	70 55.90 70 53.59	40-80	X		X	4.0

Survey Line No.	Date Surveyed	Latitude	Longitude	Water Depth (Ft.) Along Survey Line	Uniboom	3.5kHz	Sidescan	Distance Surveyed (km)
USGS SITE B								
13958	7/17/87	42 19.80 42 21.64	70 46.95 70 48.33	85	X		X	4.56
13960	7/17/87	42 21.62 42 19.82	70 48.72 70 47.33	85	X		X	4.48
13961	7/17/87	42 19.70 42 21.41	70 47.39 70 48.70	70-110	X		X	4.80
13962	7/17/87	42 21.44 42 19.74	70 48.89 70 47.59	100	X		X	4.48
44266	7/17/87	42 20.15 42 21.02	70 49.41 70 46.76	70-110	X		X	4.51
USGS SITE C								
13890	7/16/87	42 23.26 42 24.14	70 39.00 70 39.71	220	X		X	2.24
13892	7/16/87	42 24.02 42 23.46	70 40.00 70 39.48	220	X		X	1.6
13893	7/16/87	42 23.34 42 24.04	70 39.48 70 40.07	220	X		X	1.92
13894	7/17/87	42 24.01 42 23.34	70 40.21 70 39.68	180	X		X	1.6
13896	7/17/87	42 23.22 42 23.90	70 39.91 70 40.42	150	X		X	1.76
44268	7/16/87	42 23.88 42 23.35	70 39.15 70 40.58		X		X	1.1
44269	7/16/87	42 23.50 42 23.98	70 40.72 70 39.25		X		X	1.1

19. Commentary:

Navigation is the process of directing the movement of a craft from one point to another. This is usually a straightforward process in the open ocean.

However, with navigation in harbors, estuaries, and other nearshore areas, the Loran C signal tends to increase in velocity as it travels from the land to seawater. This in addition to local variations in topography, as well as the proximity of highly industrialized areas affects the magnitude and resolution of the TD signals. The net result may produce a significant difference between the readings from the receiver and the actual location of the TDs plotted on a navigation chart. Steering the ship into an island or shoal area is one consequence of such an undesireable situation.

This land effect, known as the additional secondary phase factor (ASF), can be measured and calculated and input as a correction factor into the navigation format.

A series of ASF measurements during July, 1987 were conducted throughout Boston Harbor by tying up to various fixed markers and bouys and monitoring the TD signals over a period of 10-15 minutes at each site. These readings were compared to the positions (LOP's) identified for these markers in the U.S. Coast Guard Light List. Subsequent calculations produced ASF corrections for the W (Caribou, ME) and X (Nantucket, MA) TD signals of 1.6 and 2.5, respectively. These values were then input into the megapulse navigation format prior to each days surveying.

The ASF correction values will vary on a seasonal basis and should be measured prior to any sampling or surveying program within restricted waterways of a harbor, estuary, or other nearshore areas.

20. Acknowledgements:

I would like to thank all personnel who participated in the cruise and especially members of the marine seismic operations group as well as the warehouse group and Barry Irwin of the navigation group for their expertise, patience, and insight in contributing to the successful completion of the project. (There were times we all thought it would never end).

I would also like to express my appreciation to the ships operators, Dave Mason and Joe Newell for their highly competent operation of the R/V NEECHO.

Finally , I wish to express my personal appreciation to members of the U.S. Coast Guard at Point Allerton in Hull, Massachusetts for their cooperation, professionalism, and use of their facilities leading to the culmination of this phase of the project.