DAMOS

DISPOSAL AREA MONITORING SYSTEM

ANNUAL DATA REPORT - 1978

SUPPLEMENT C

ISLE OF SHOALS DISPOSAL SITE

Naval Underwater Systems Center

Newport, Rhode Island

New England Division

Corps of Engineers

Waltham, Massachusetts

May 1979

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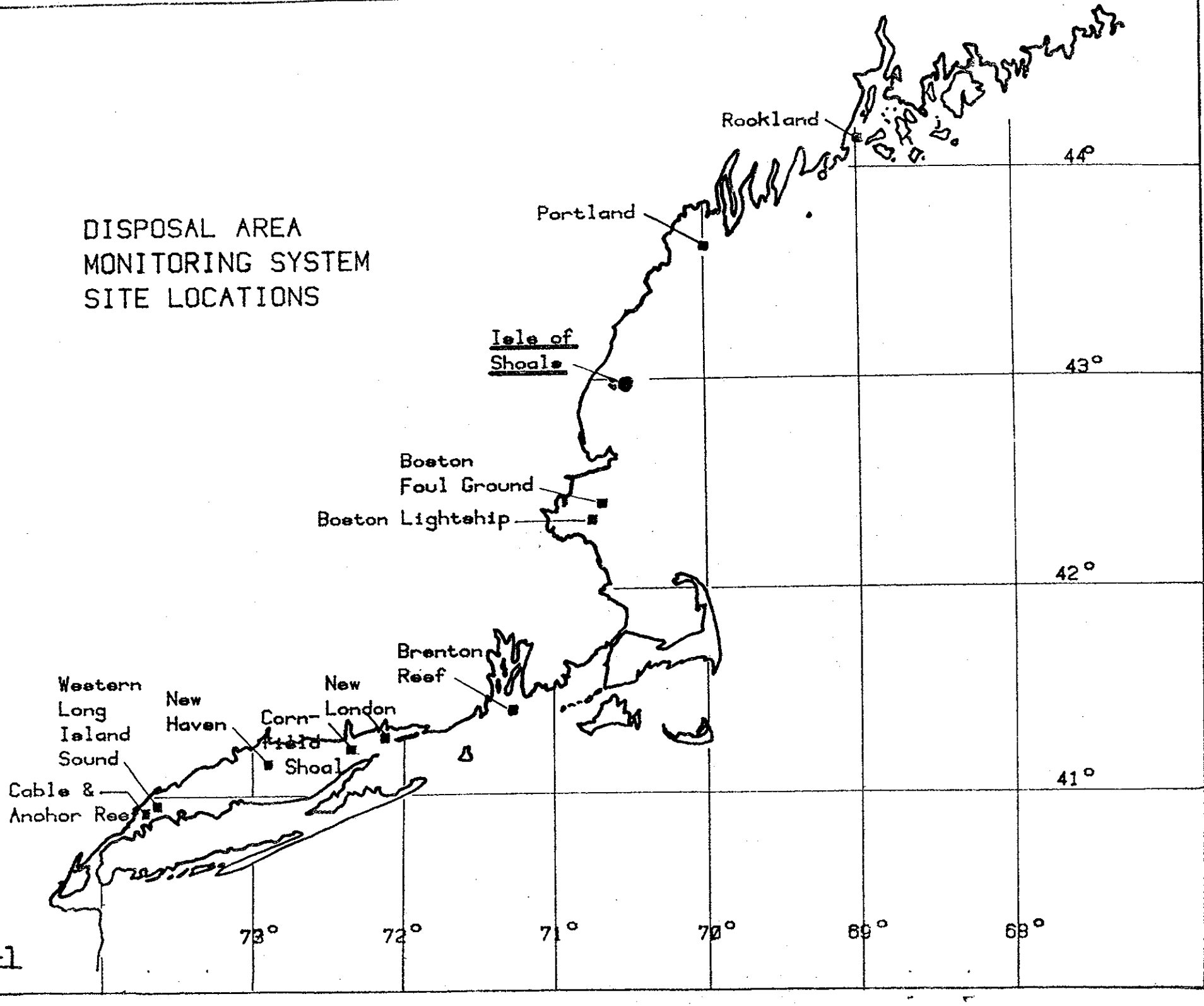

DISPOSAL AREA
MONITORING SYSTEM
SITE LOCATIONS
Rockland
Portland
Isle of Shoals
Boston Foul Ground
Boston Lightship
Brenton Reef
New London
Corn-field Shoal
New Haven
Western Long Island Sound
Cable & Anchor Reef
44°
43°
42°
41°
73°
72°
71°
70°
69°
68°

FIG.-1

DISPOSAL AREA MONITORING SYSTEM

This is one of a series of site specific data reports resulting from the DAMOS program, now two years in progress. DAMOS is the culmination of nearly a decade of prior study efforts, actually preceding NEPA, which have been directed towards the understanding of the effects of and the responsible management of the ocean disposal of dredged materials in New England waters as they fall under the authority of the New England Division of the Corps of Engineers. The individual site reports henceforth will be updated approximately on an annual bases as additional knowledge is gained, at least with respect to those sites where significant disposal activities will have occurred.

ISLES OF SHOALS

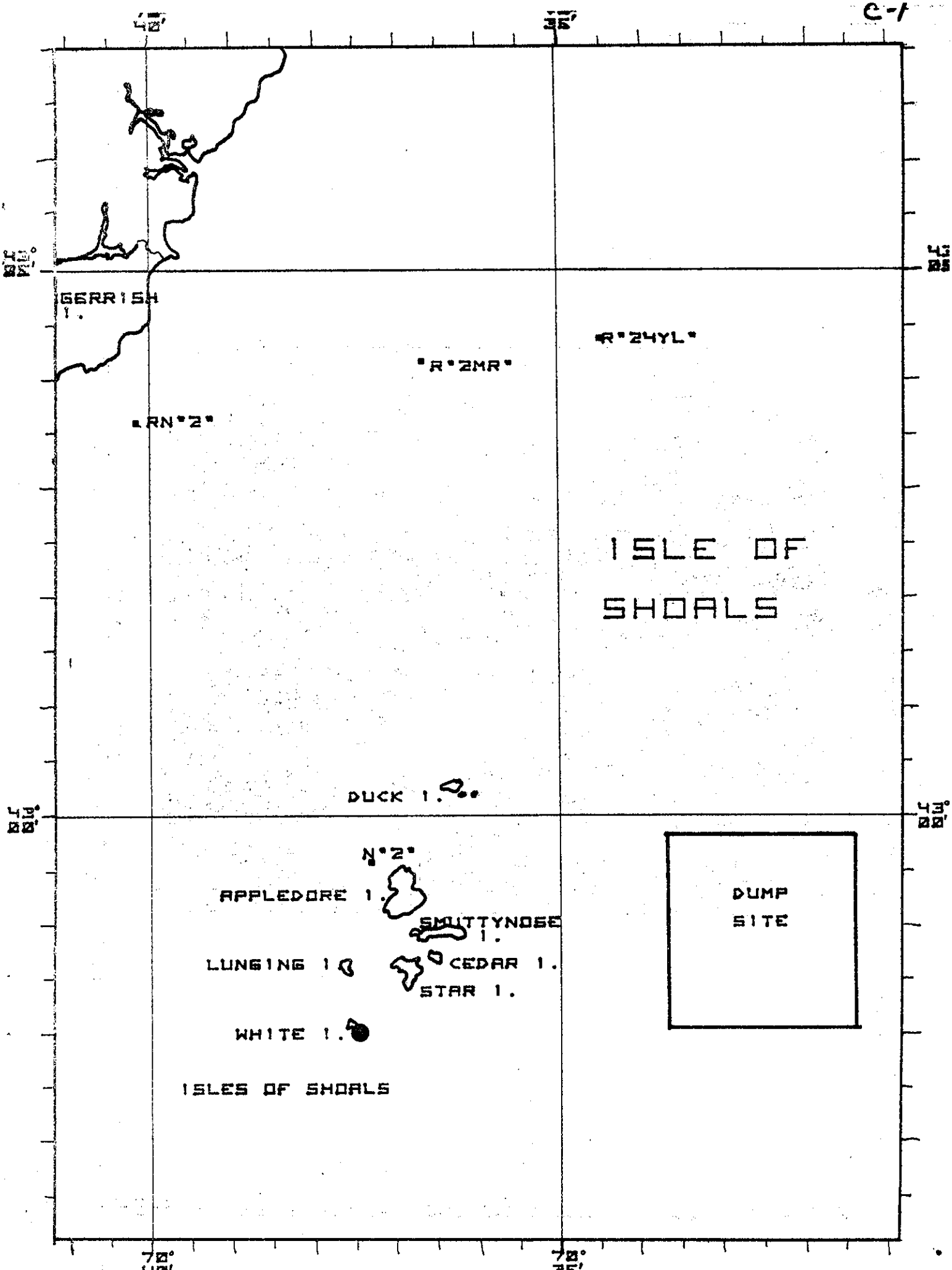
The actual location of the Isles of Shoals disposal site that could be used as a regional dumping ground has not been officially designated. A large dumping ground (Fig. C-1) between 1 and 3 miles east of the Isles of Shoals has been used in the past for a small amount of dredge spoil from the Portsmouth - Kittery area. The bottom is largely rocky but is penetrated by several valleys containing soft sediment. Previous dumping was not specific to areas within the site and the location of spoil is not known. No effects of spoil have been reported, however, there are many metal racks on the seafloor which have been jetisoned from aircraft using jet assisted takeoff (JATO) from Pease Air Force Base.

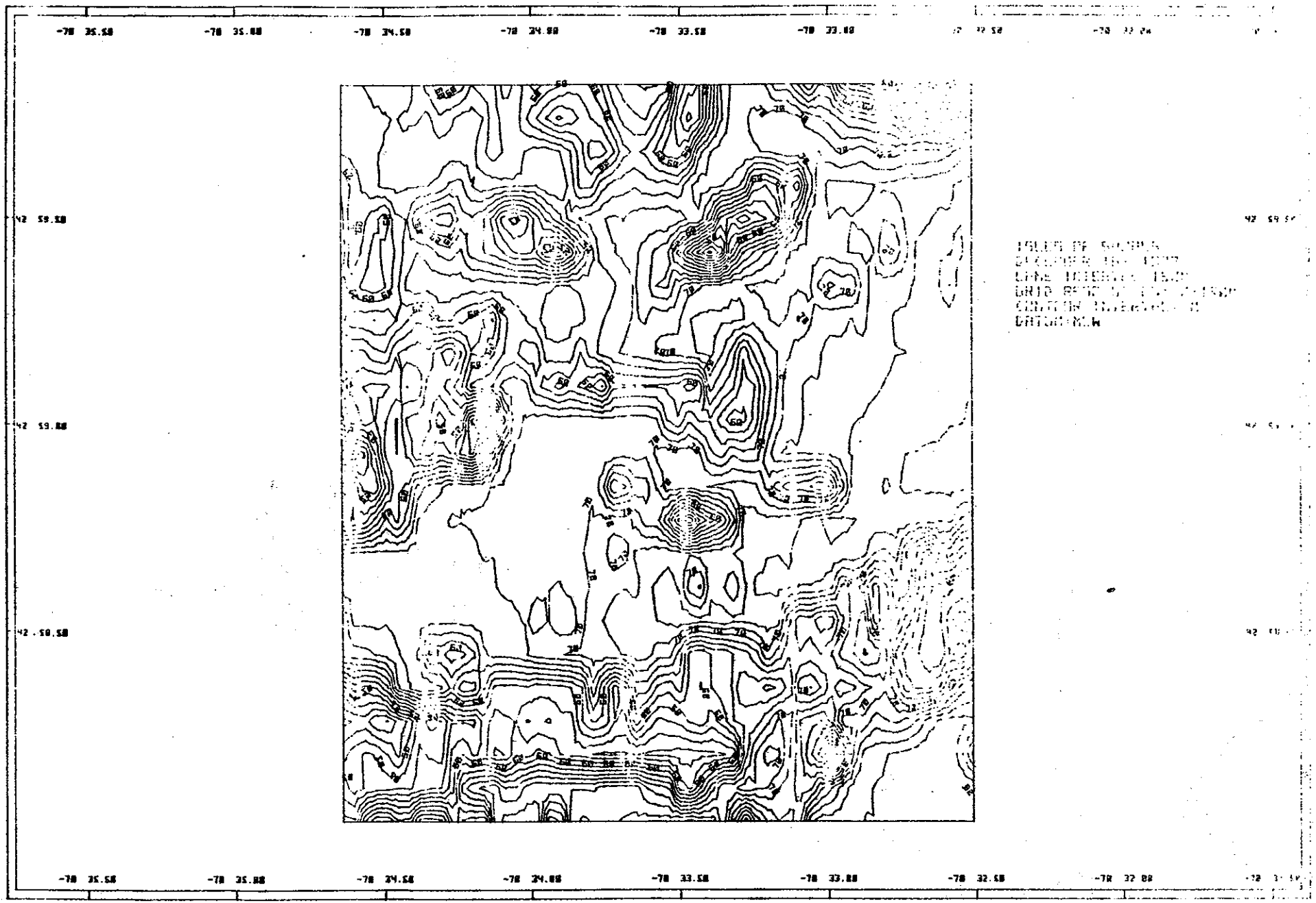
Selection of a disposal point within this historical site has been undertaken by the DAMOS program to provide baseline data should dredging in the Piscataqua River be required in the future. The actual space needed for "point dumping" of spoil is probably ¼ x ¼ mile but a 1 x 1 mile site will be established. The site chosen for study of currents and fisheries is a valley on the east side of the large dumping ground.

Bathymetry

Navigation for surveys in the Isle of Shoals area was provided by trisponder stations at a surveyed site in York, Maine and at Newburyport Light. Side scan and subbottom data indicate that the disposal area is composed of outcrops of basement rock, and flat areas covered by a soft acoustically transparent mud.

The first bathymetric survey of the site in December, 1977 (Fig. C-2(a-g)) indicated a flat, soft area would be present on the eastern edge of the disposal


GERRISH I.
"R"24YL"
"R"2MR"
"RN"2"
ISLE OF SHOALS
DUCK I.
N"2"
APPLEDORE I.
SMUTTYNOSE I.
LUNGING I.
CEDAR I.
STAR I.
WHITE I.
ISLES OF SHOALS
DUMP SITE


-78 35.58
-78 35.08
-78 34.58
-78 34.08
-78 33.58
-78 33.08
-78 32.58
-78 32.08
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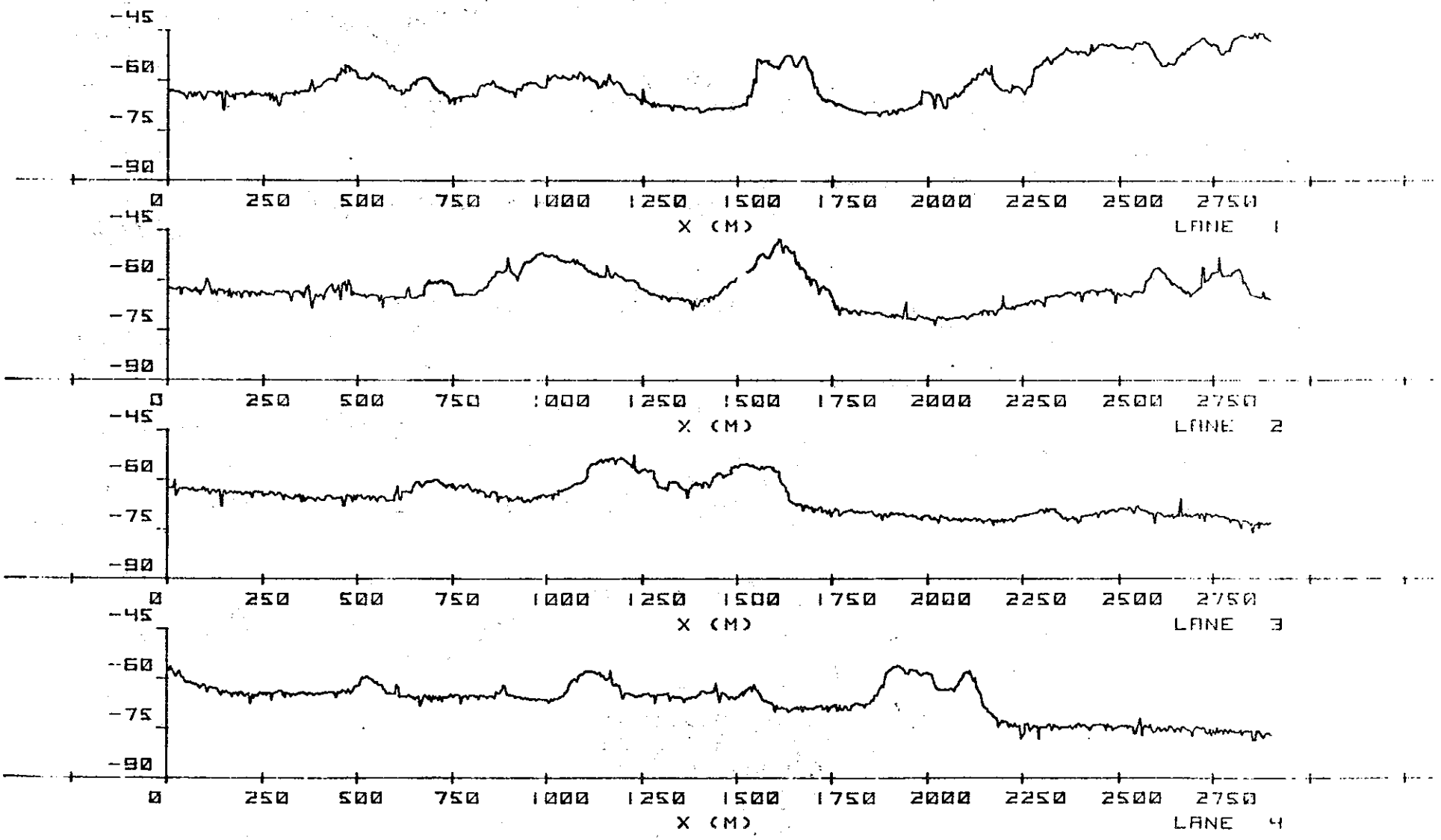
42 59.08
42 58.58
-78 35.58
-78 35.08
-78 34.58
-78 34.08
-78 33.58
-78 33.08
-78 32.58
-78 32.08

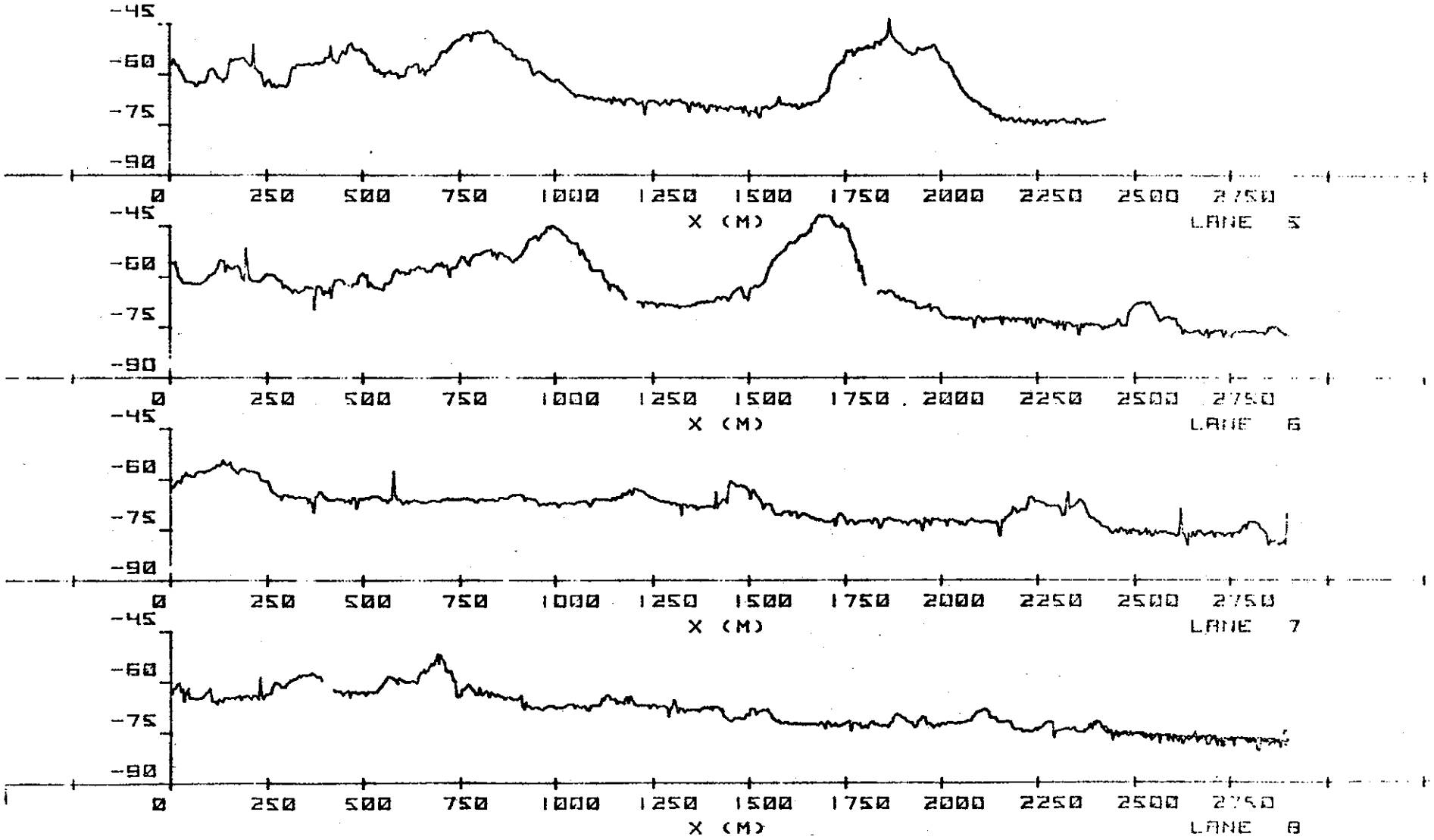
C-2a

ISLE OF SHOALS
DECEMBER 16, 1977
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 8.33X

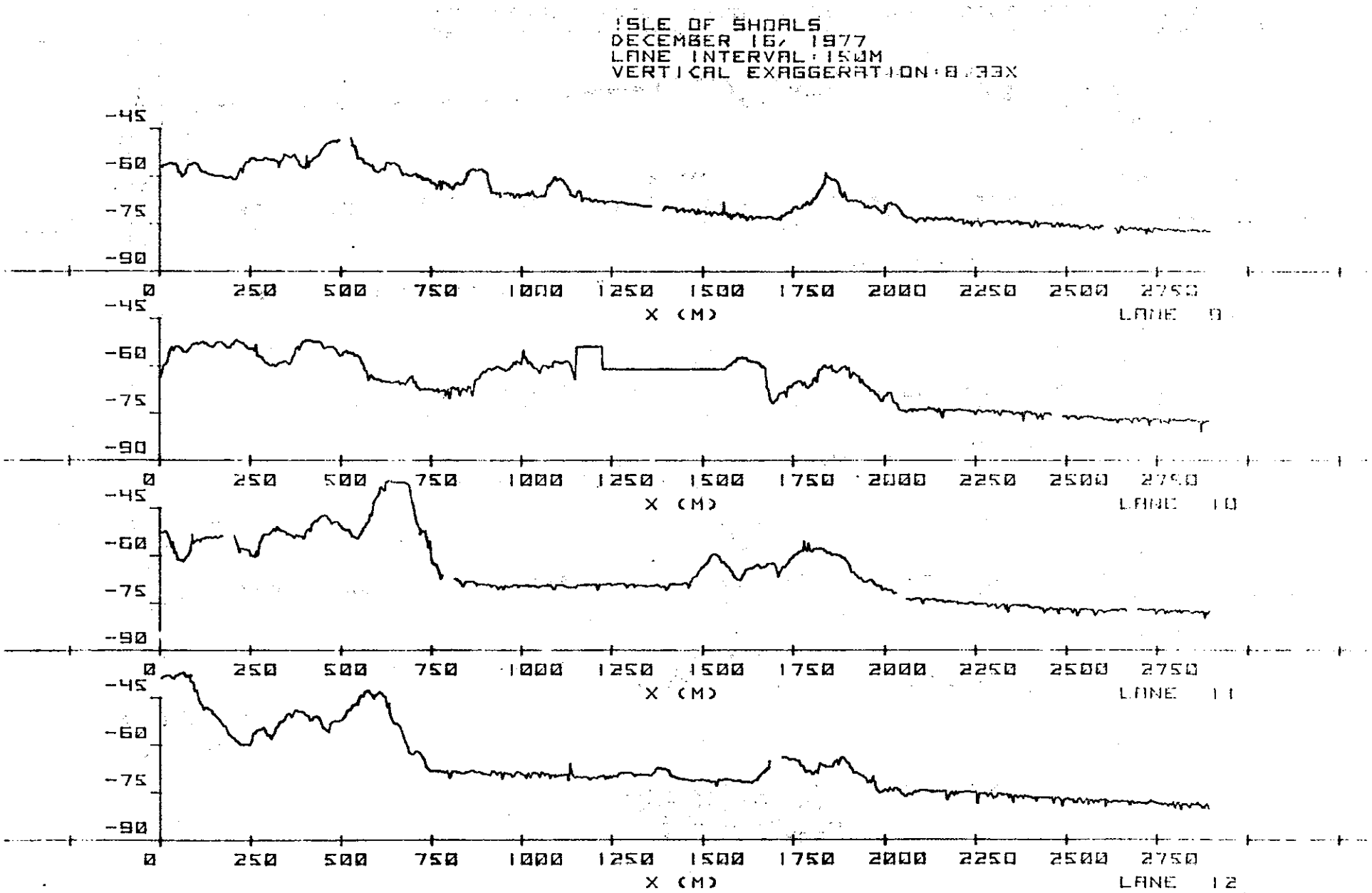


C-2b

ISLE OF SHOALS
DECEMBER 16, 1977
LANE INTERVAL: 150M
VERTICAL EXAGGERATION

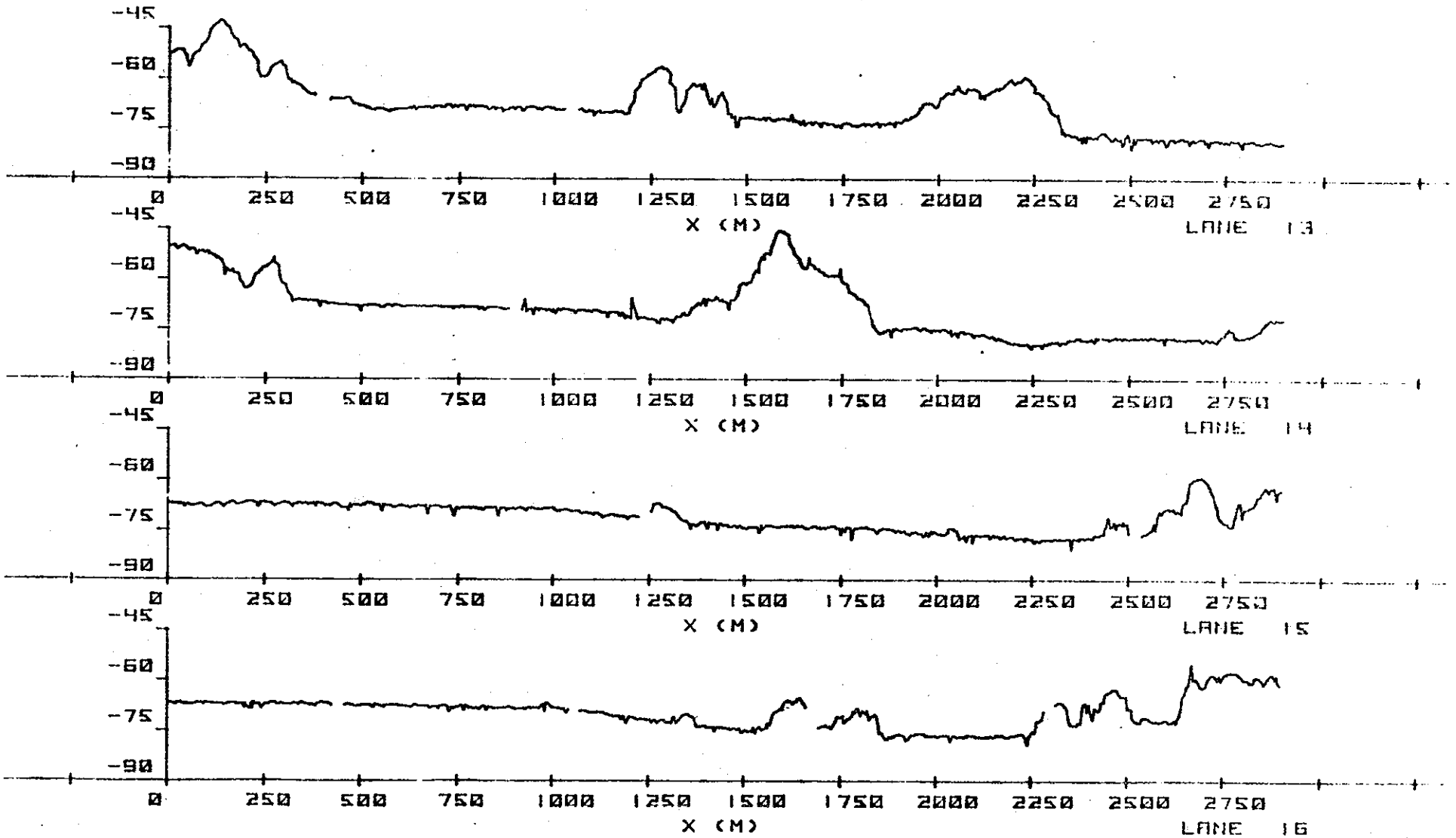


C-2c


ISLE OF SHOALS
DECEMBER 16, 1977
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 8.33X
-45
-60
-75
-90
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
X (M)
LANE 9
LANE 10
LANE 11
LANE 12

C-2d

ISLE OF SHOALS
DECEMBER 16, 1977
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 0.33X



C-2e

ISLE OF SHOALS
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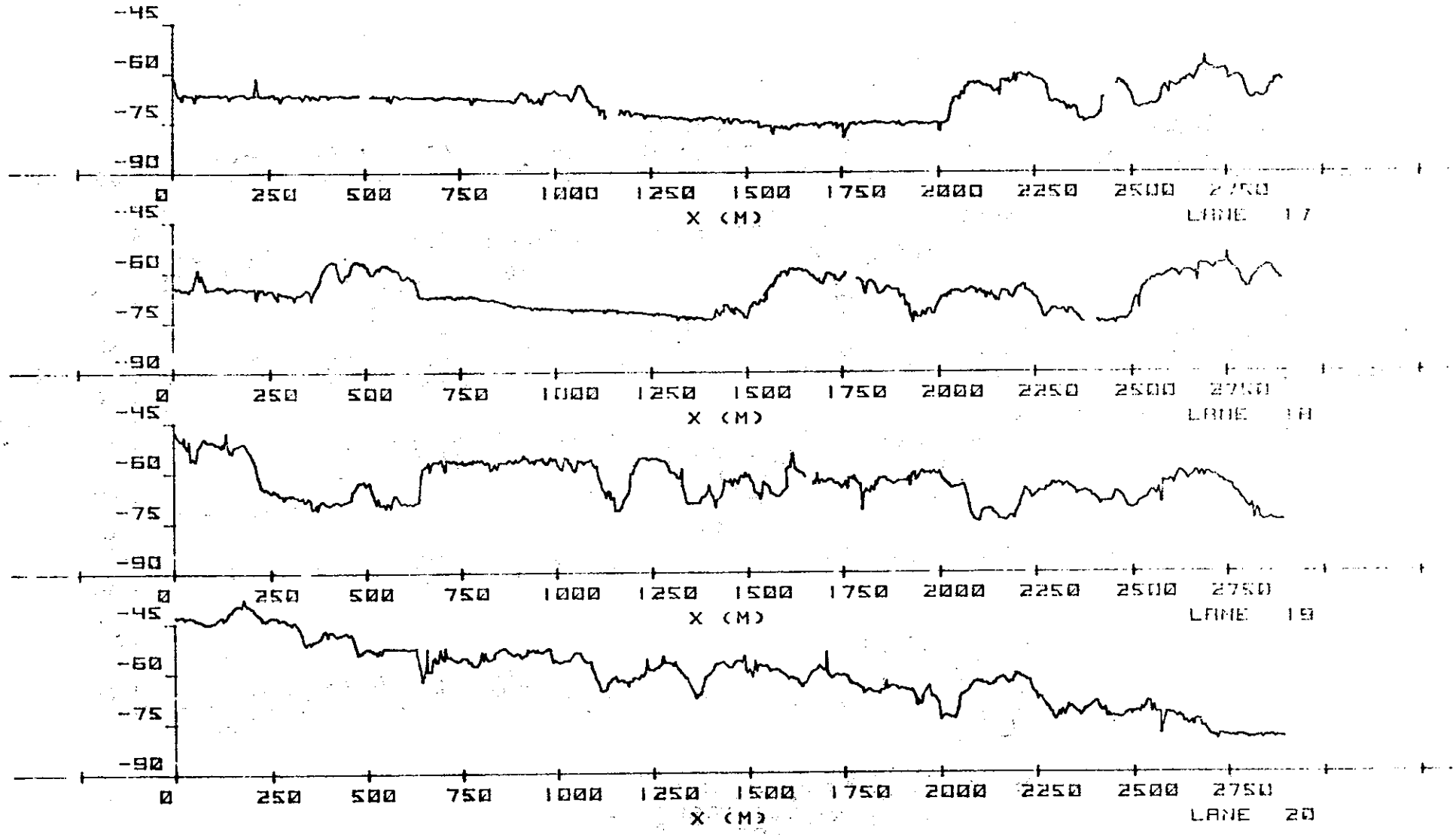
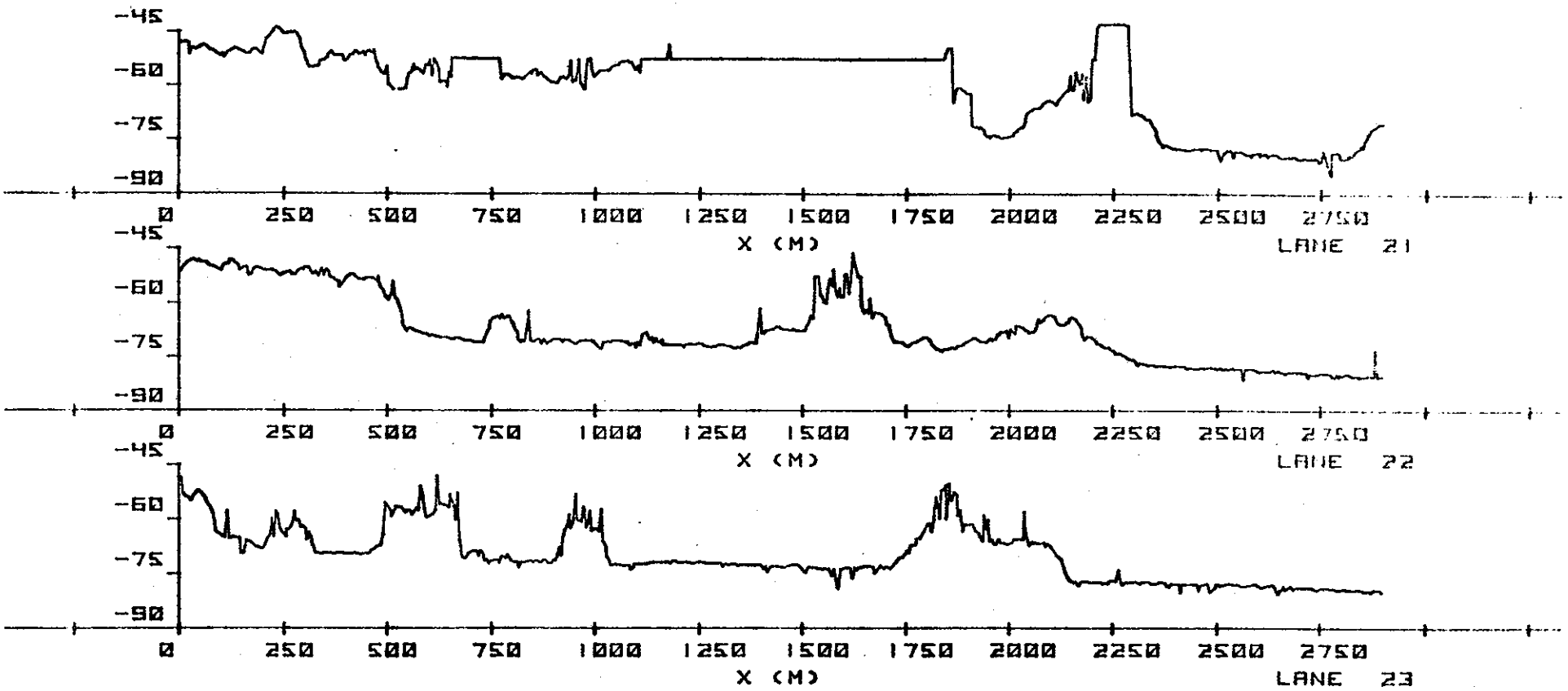
VERTICAL EXAGGERATION: 8.33X

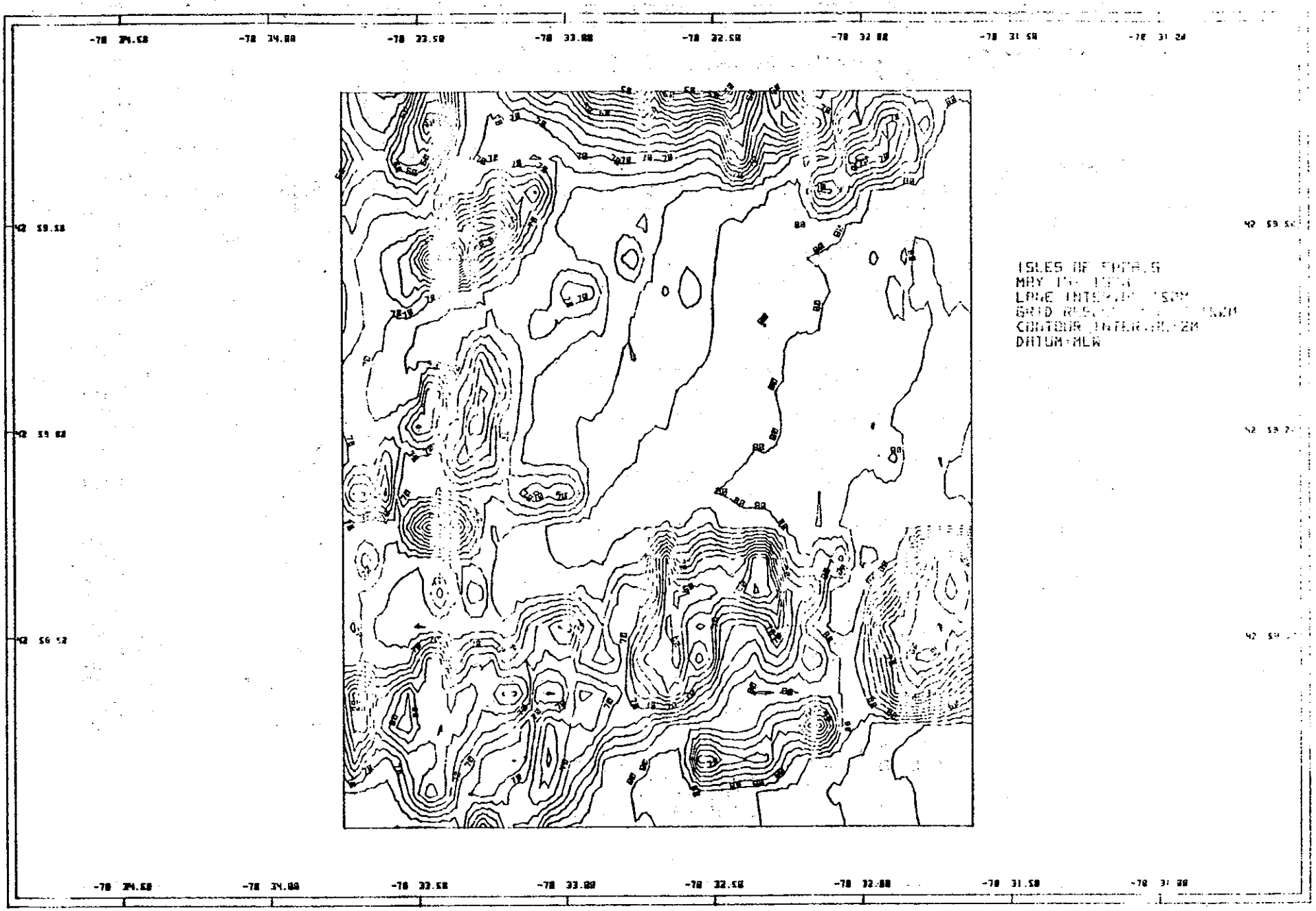


C-2f

ISLE OF SHOALS
DECEMBER 16, 1977
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 0.33X



C-2g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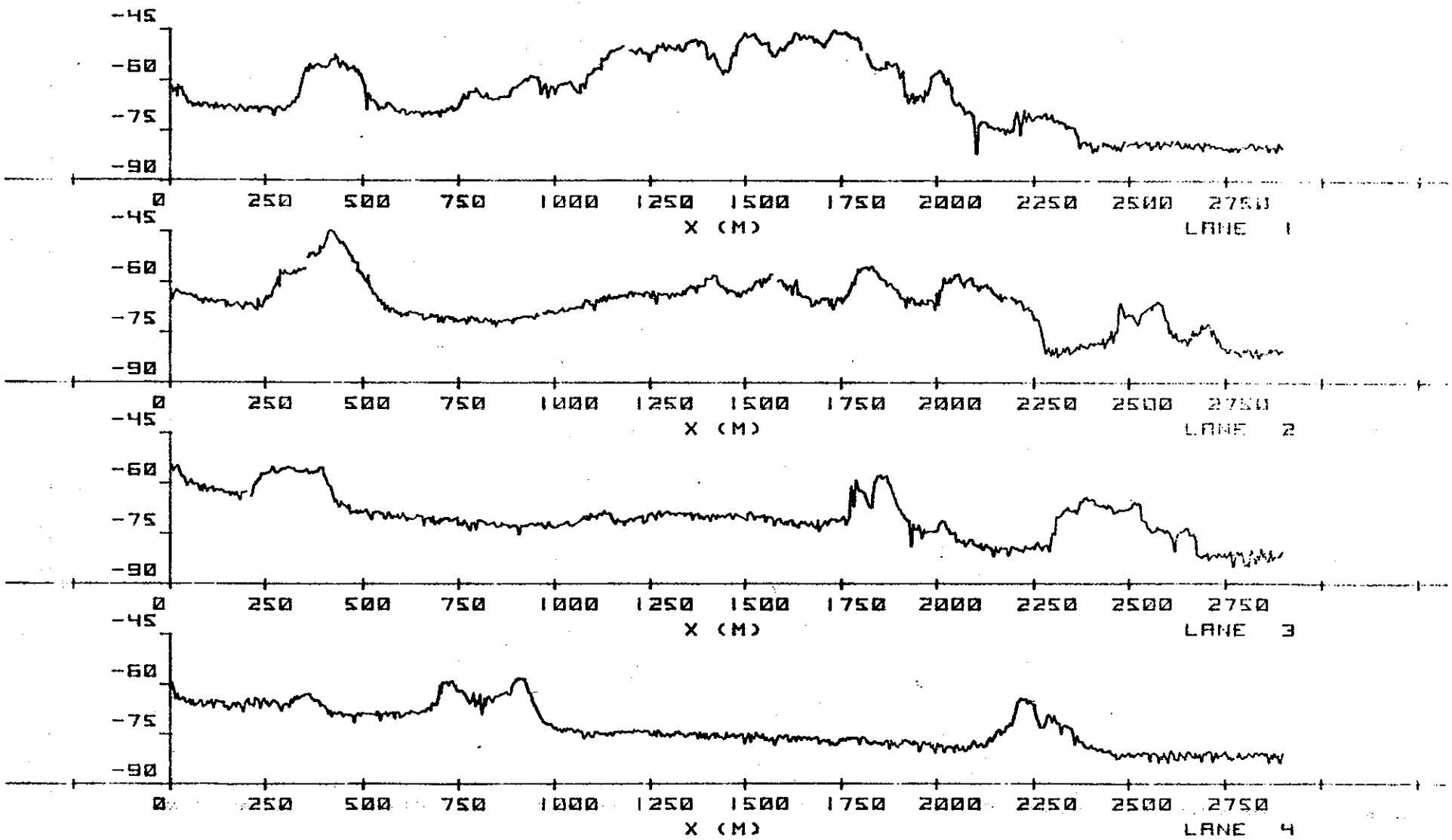
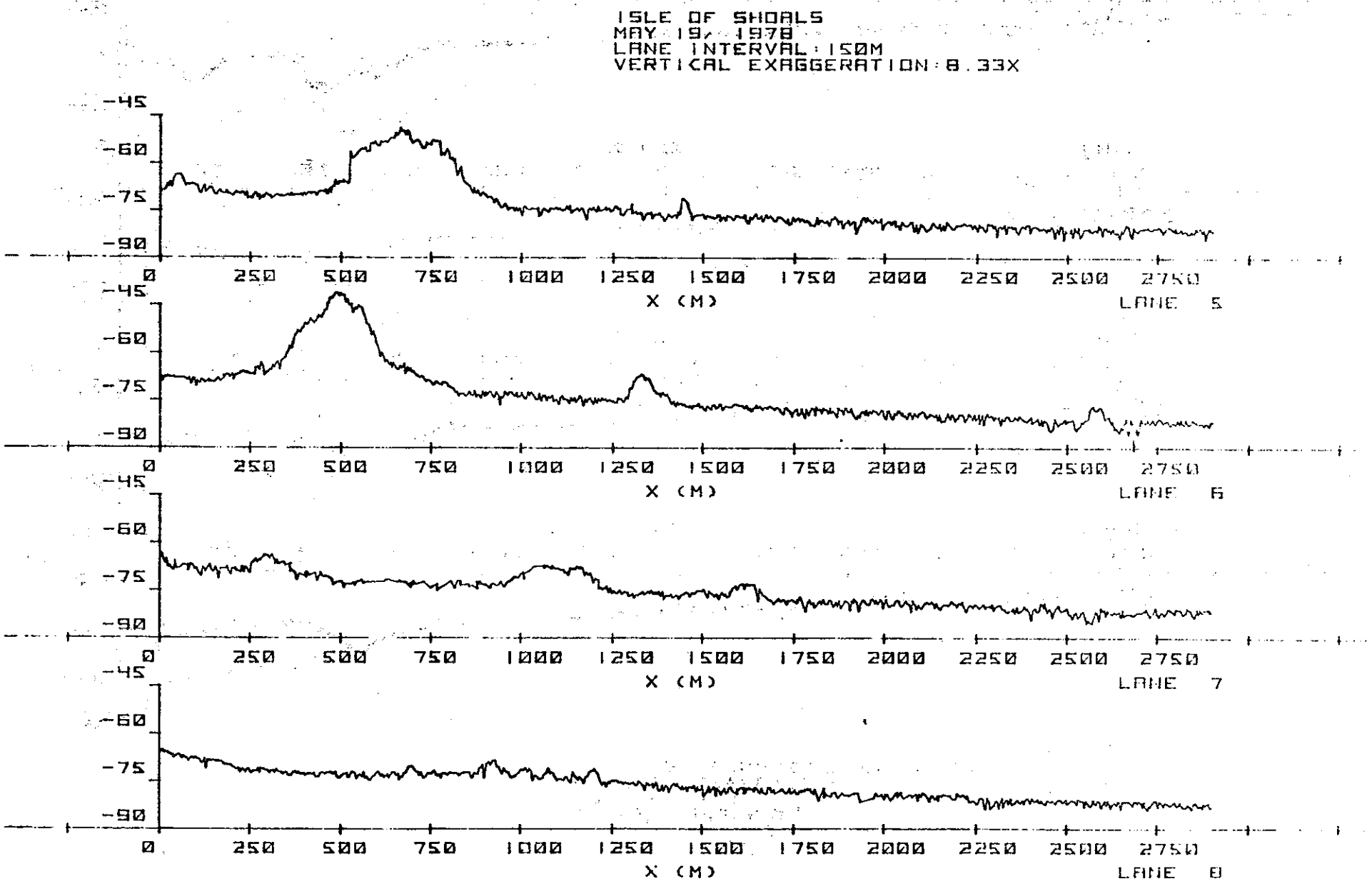
-70 34.00
-70 33.50
-70 33.00
-70 32.50
-70 32.00
-70 31.50
-70 31.00
42 59.50
42 59.00
42 56.50
ISLES OF
MAY
LANE
GRID
CONTOUR
DATUM:MLW

C-3a

ISLE OF SHOALS
MAY 19, 1978
LANE INTERVAL, 150M
VERTICAL EXAGGERATION: 8.33X

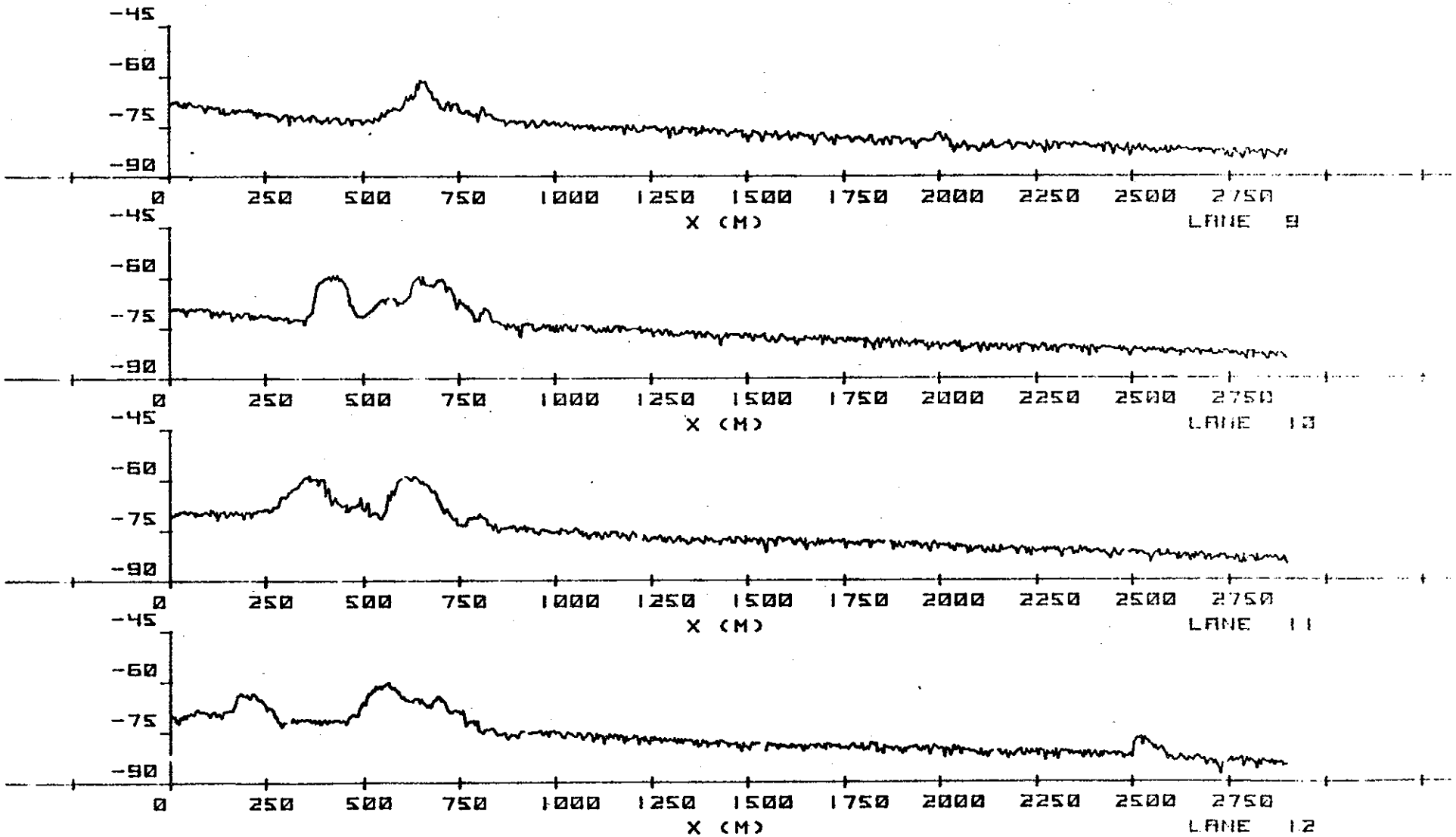


C-3b


ISLE OF SHOALS
MAY 19, 1978
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 8.33X
-45
-60
-75
-90
0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750
X (M)
LANE 5
LANE 6
LANE 7
LANE 8

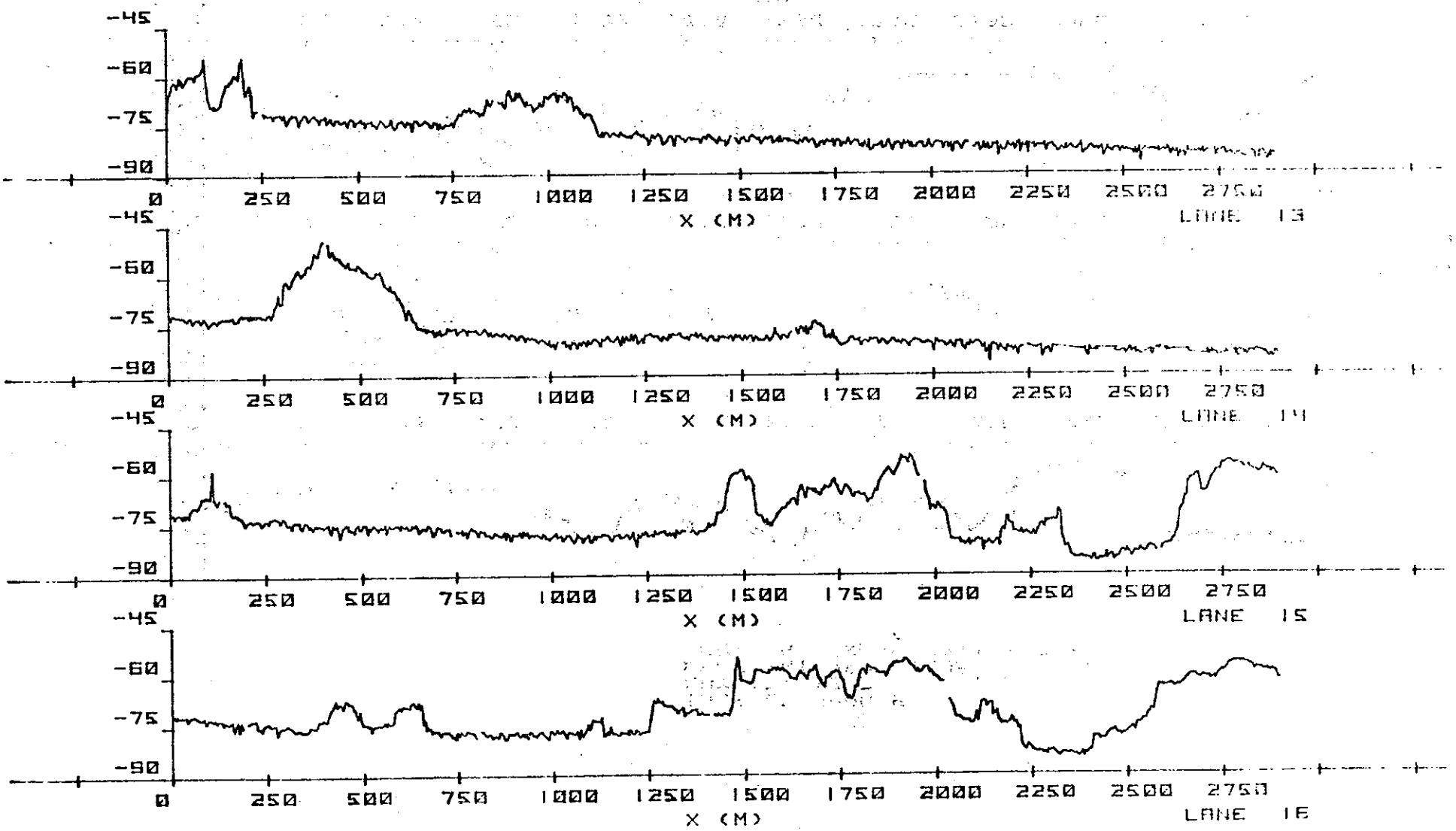
C-3c

ISLE OF SHOALS
MAY 19, 1978
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 8.33X



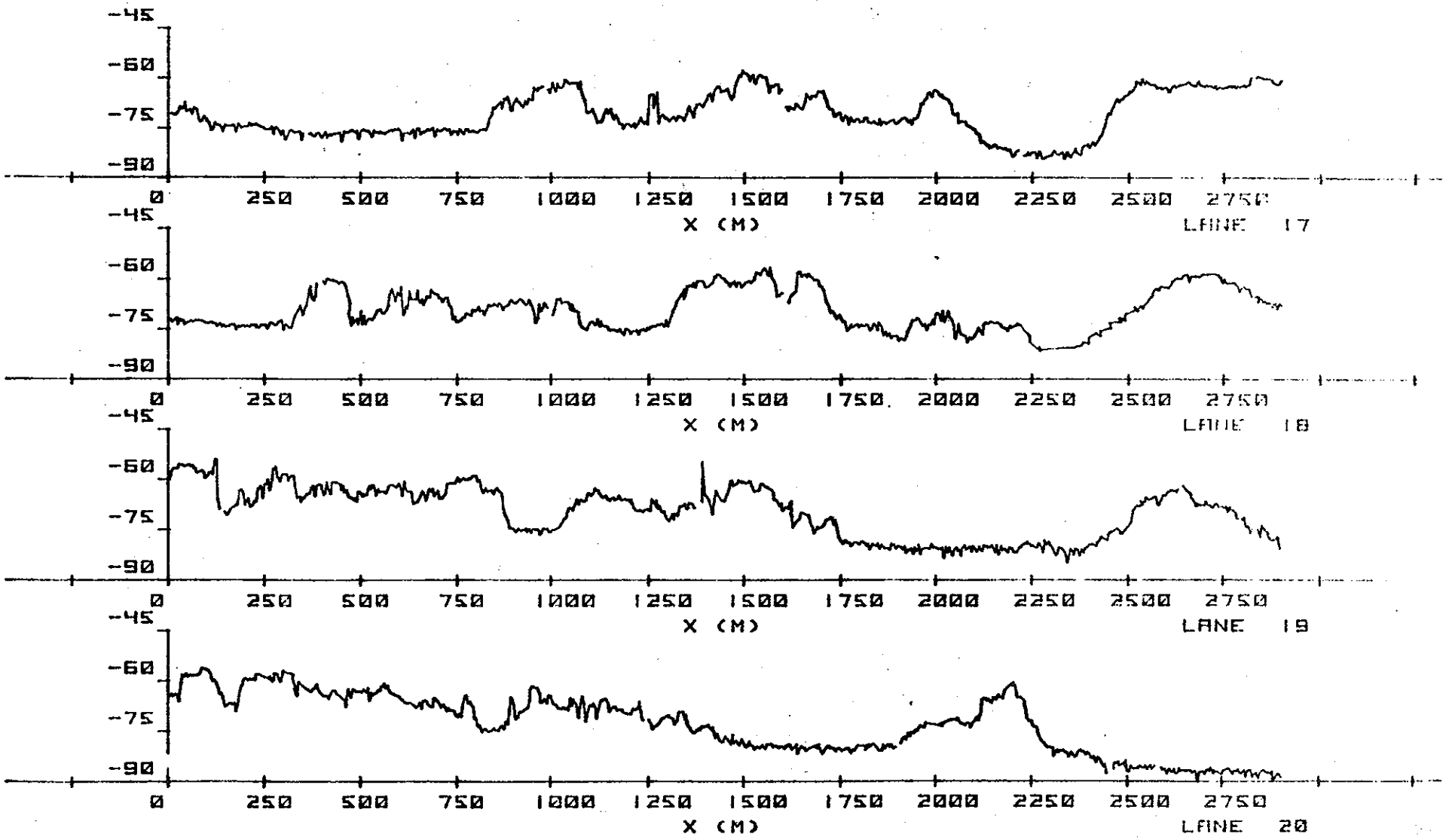
C-3d

ISLE OF SHOALS
MAY 19, 1978
LANE INTERVAL:150M
VERTICAL EXAGGERATION:8.33X



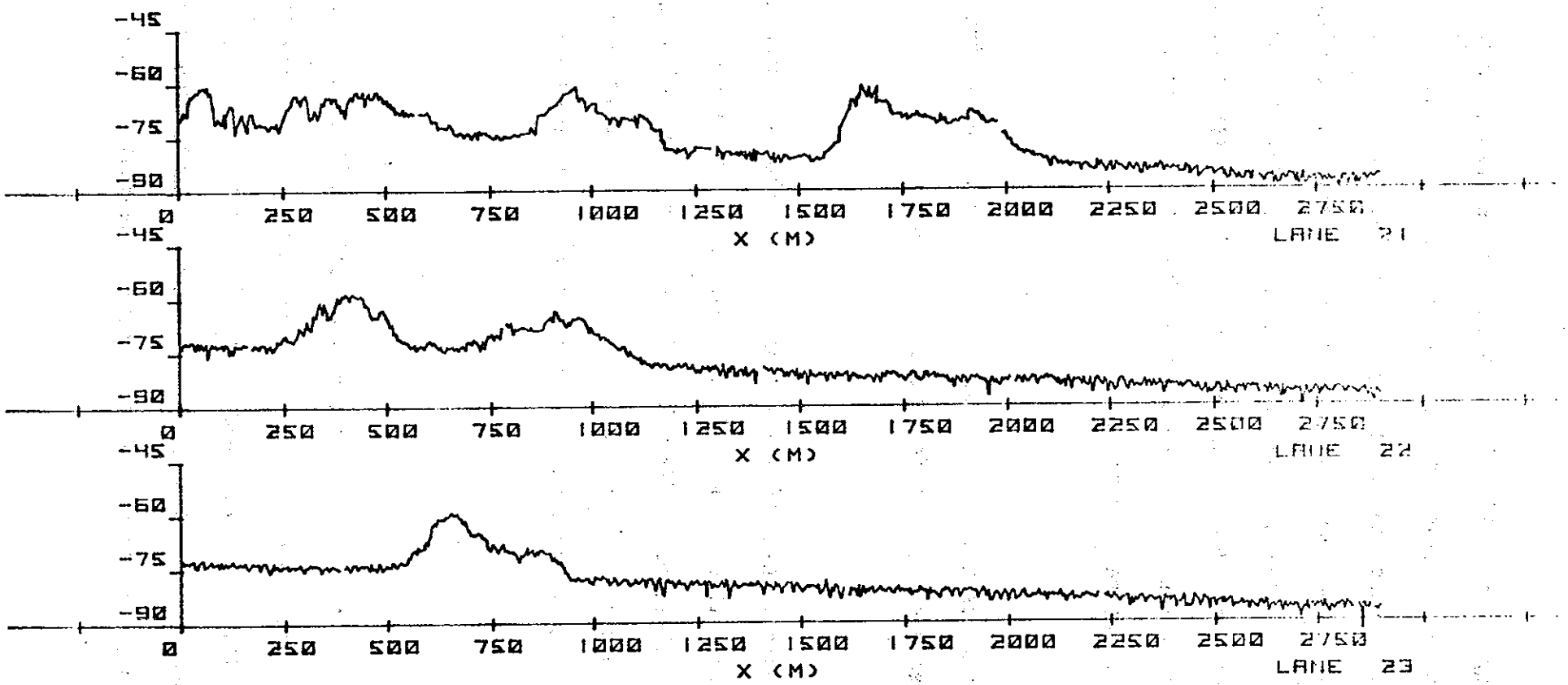
C-3e

ISLE OF SHOALS
MAY 19, 1978
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 8.33X



C-3f

ISLE OF SHOALS
MAY 19, 1978
LANE INTERVAL: 150M
VERTICAL EXAGGERATION: 8.33X



C-3g

site. The second survey in May, 1978 (Fig.C-3(a-g) was relocated eastward to examinethis location and it was found that the area would be an excellent location for a disposal site as the lithology would be similar to spoils dredged from the Portsmouth harbor. The most likely location for a disposal point would be in a small valley between two outcrops at a depth of 78 m. The presence of the outcrops would discourage dragging and the criteria of similar lithologies would be satisfied. Further work to define this disposal site will be accomplished in the near future.

Currents

No current measurements have been made at the Isles of Shoals site since the actual disposal area has not been defined.

Sediments

Heavy metal analysis of sediments from the Isles of Shoals site and the Pescataqua River are presented in Table C-1. These data fit the iron/metal model reasonably well. The samples from the disposal site are typical of unspoiled areas while those from the river are enriched in metals relative to iron. Such a situation would contribute to the monitoring of spoils should disposal occur.

Biochemical Studies

A mussel cage has not been placed in the disposal area because no specific site has yet been determined, however, a reference station was established on the eastern side of Smuttynose Island and was sampled beginning on August 21, 1977. *M. modiolus* from this station appear to show the greatest quantitative changes compared to baseline data of all the northern New England sites. As

TABLE C-1

SURFACE SEDIMENT ANALYSIS

ISLES OF SHOALS & PISCATAQUA RIVER

SAMPLING	Cd	Co	Cr	Cu	Fe*	Hg	Ni	Pb	Zn	Vol/Sol	Oil/Grease
				All metals ppm						(%)	(ppm) x 10^3
MAY 1978											
IS 1	.43	7.4	36	6.6	1.2	.060	20	15	37	5.2	.2
IS 2	.59	8.7	40	7.6	1.6	.037	25	13	44	5.1	.1
IS 3	.31	8.3	43	8.3	1.5	.050	25	18	47	7.4	.2
PRB5-B6 base	.45	6.6	60	80	1.1	.43	26	150	272	4.4	nil
PR -LB5	1.0	6.2	19	8.4	.58	.30	17	34	40	10.6	nil
PRDB	.36	8.6	40	450	1.8	.20	27	133	55	8.1	nil
PRNB-12 base	.45	5.8	61	26	.95	.33	21	47	94	8.8	nil
ERROR %	25	9	5	7	3	14	5	13	15	5	15

*All Fe values multiply by 10^4

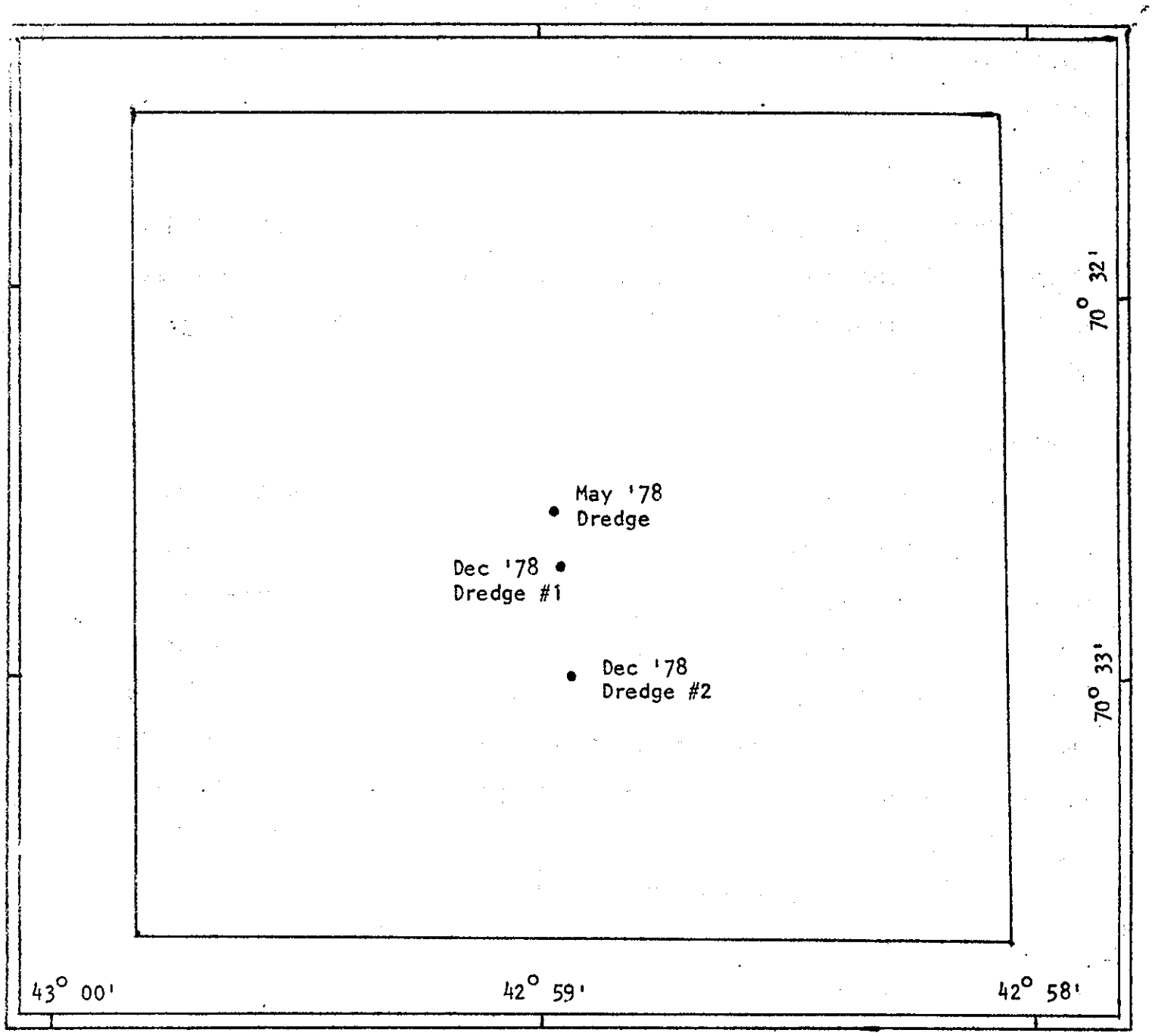
TABLE C-1a

SAMPLE LOCATIONS

SITE: Isle of Shoals, N.H.

DATE	DISPOSAL SITE: CURRENT METER	MUSSELS	BENTHIC SAMPLES DREDGES	BENTHIC SAMPLES GRABS	REFERENCE SITE MUSSELS	BENTHIC SAMPLES DREDGES	BENTHIC SAMPLES GRABS
1/May/1978			42°59'27.9" 70°32'35.2"		42°59'00" 70°36'00"		Portsmouth Harbor
1Aug/1978	NO CURRENT METER INSTALLED				Smuttynose		
1Dec/1978			42°58'50.0" 70°32'45.0"				
1Dec/1977			?				
Dec/1978			42°58'40.0" 70°33'00.0"				

Isle of Shoals



● Benthic Samples

can be seen from Table C-2 and Figure C-4 the concentrations of Cd, Cu, Hg, Zn, and Fe lie conspicuously outside the upper 95% conficence limit of the baseline data. Only the concentration of Cd remains within the 95% confidence limits. The location of this reference site may be subject to change unless a viable explanation for the significant changes in metal concentration can be explained.

Benthic Macrofauna

Table C-3 presents the numeric density data for the major species obtained at the Isles of Shoals disposal area during December, 1977. A fairly diverse population with 14 major species comprising 77% of the total number of individuals was found in this area.

Fisheries

There are a number of regulations which effect the pattern of fisheries in this area. The marine boundries of Maine and New Hampshire have not been established beyond the Isles of Shoals. Two possible borders are shown on Fig. C-5: a median line between Cedar Island Ledge and Anderson Ledge, and a line due east of the ledges. The study site is 1½ and 1 miles from these lines and in Maine water. The definition of these borders is important because Maine and New Hampshire waters can be used for lobstering only by residents of each state. Dragging can be done in non-home states with a licence, but dragging can not be done within 2 miles of New Hampshire. In addition to these regulations, there is a tradition of only Isles of Shoals - connected fishermen lobstering with 2 miles of the Maine islands.

TABLE C-2. HEAVY METAL CONCENTRATIONS (PPM) IN *MODIOLUS MODIOLUS* FROM ISLES OF SHOALS (NORTHERN NEW ENGLAND).

DATE	LOCATION		CD	CR	CU	HG	PB	ZN	FE
8-21-77	ISLES OF SHOALS	$\bar{x}$	8.88	1.85	32.27	0.262	14.89	214	98
		S.D.	3.60	0.74	8.68	0.059	2.53	46	7
5-19-78		$\bar{x}$	12.64	2.63	53.93	0.325	19.72	544	200
		S.D.	3.20	0.13	12.85	0.084	6.34	159	48
8-5-78		$\bar{x}$	30.63	1.94	57.33	0.405	19.22	461	114
		S.D.	10.37	0.04	6.27	0.007	1.13	104	2

TABLE C-3

DAMOS BENTHOS - TABLE OF NUMERIC DENSITY DATA

STATION ISLE OF SHOALS, NEW HAMPSHIRE DATE 17 DECEMBER 1977

PREDOMINANT SPECIES	DREDGE NUMBER 1	2	3	4	TOTAL	MEAN	STD DEVIATION	COEFF. OF DISPERSION	95 PERCENT CONF. LIMITS OF MEAN	NUMERIC RANK	% OF STN TOTAL	CUMUL. % OF TOTAL
1. Sternaspis scutata	18	13	28	96	155	38.8	38.7	38.6	0-100.4	1	19.0	19.0
2. Ampharete acutifroms	12	6	44	44	106	26.5	20.4	15.7	0- 59.0	2	13.0	32.0
3. Praxillella gracilis	9	10	10	41	70	17.5	15.7	14.1	0- 42.5	3	8.6	40.6
4. Myriochela heeri	7	3	5	54	69	17.3	24.6	35.0	0- 56.4	4	8.4	49.0
5. Edwardsia (elegaus)	4	6	9	14	33	8.3	4.3	2.2	1.5-15.1	5	4.0	53.0
6. Ctenodiscus crispatus	5	0	8	14	27	6.8	5.9	5.1	0- 16.2	6	3.3	56.3
7. Praxillella praetermissa	0	1	14	11	26	6.5	7.0	7.5	0- 17.6	7	3.2	59.5
8. Ninoe nigrippes	4	2	9	11	26	6.5	4.2	2.7	0- 13.2	8	3.2	62.7
9. Maldane sarsi	1	5	16	2	24	6.0	6.9	7.9	0- 17.0	9	2.9	65.6
10. Melinna crislata	1	1	16	6	24	6.0	7.1	8.4	0- 17.3	10	2.9	68.5
11. Ophiura sarsi	4	0	8	8	20	5.0	3.8	2.9	0- 11.1	10	2.4	70.9
12. Goniada maculata	5	2	2	9	18	4.5	3.3	2.4	0- 9.8	11	2.2	73.1
13. Spio filicornis	1	0	4	13	18	4.5	5.9	7.7	0- 13.9		2.2	75.3
14. Nephthys incisa	1	3	7	5	16	4.0	2.6	1.7	0- 8.1		2.0	77.3
15.												
16.												
17.												
18.												
TOTAL	72	52	180	328	632	158.0	126.5	101.3	0-359.3			
TOTAL NO. OF SPP. PER DREDGE	35	21	51	48	78	38.8	13.7		17.0-60.6			
SPECIES DIVERSITY (H')	3.10	2.68	3.16	8.94	2.98	0.26						
EQUITABILITY (J')	0.87	0.88	0.80	0.74	2.49	0.08						

TOTAL NO. OF INDIVIDUALS THIS STN = 817

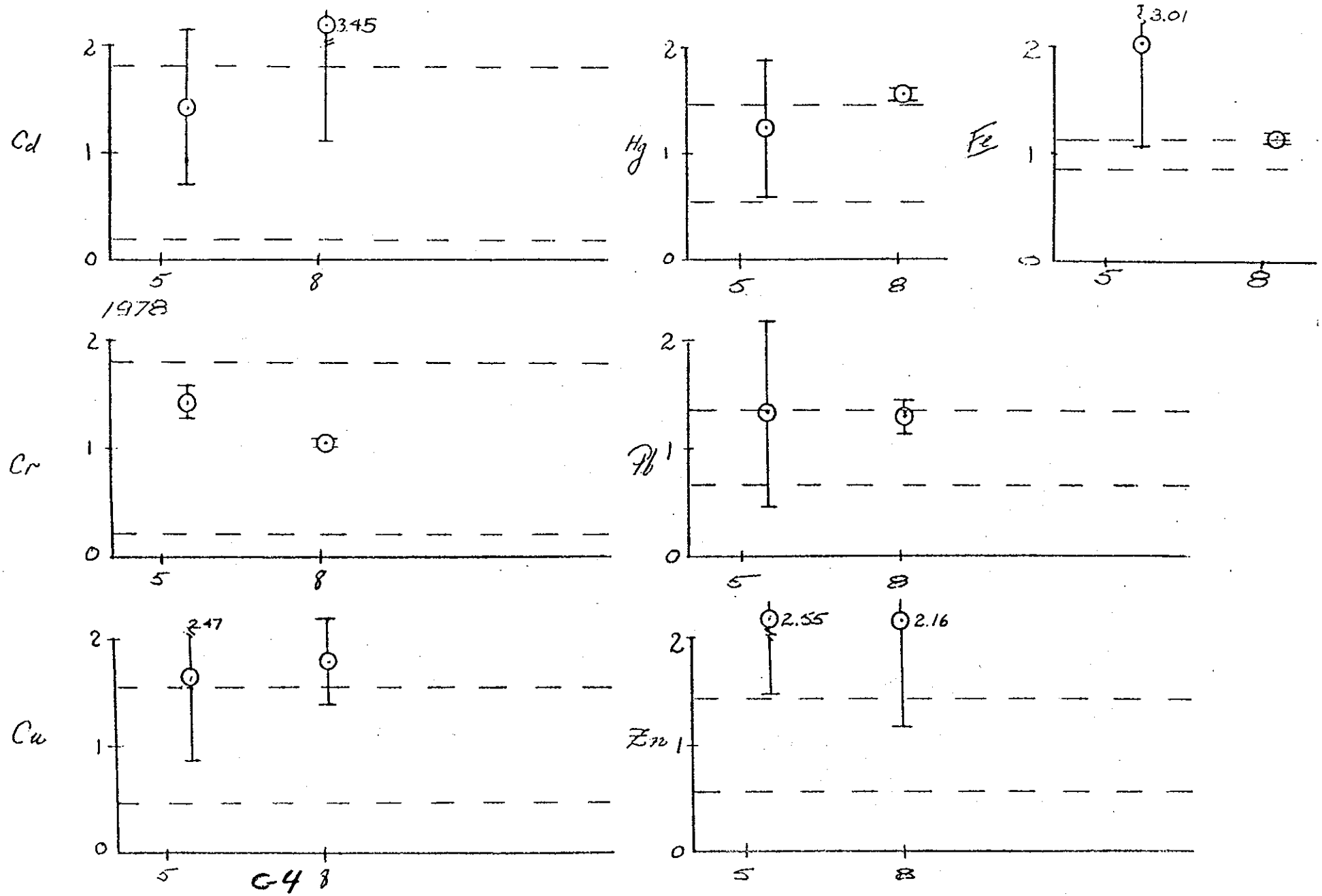
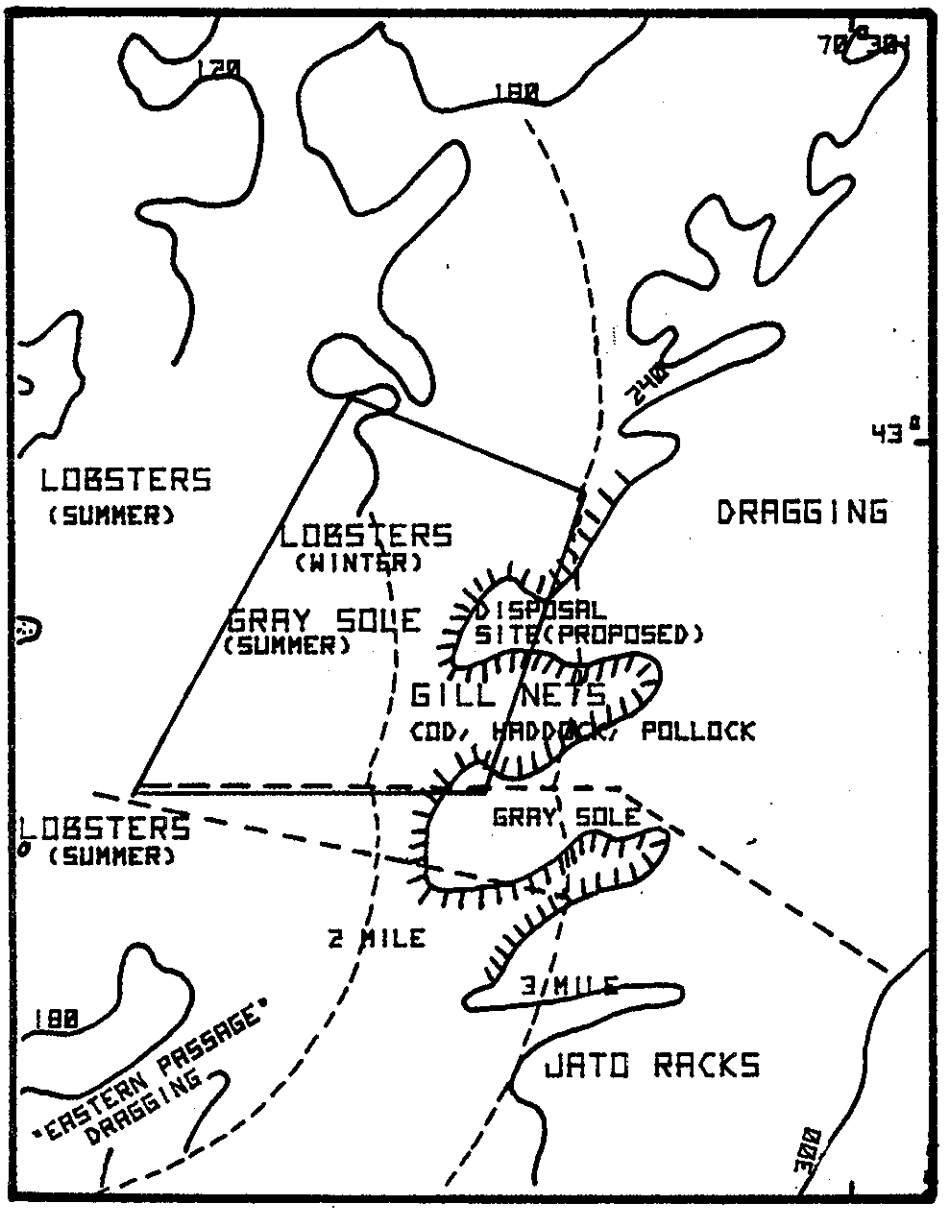


Figure 4. Temporal variation in the ratios of heavy metals in Modiolus modiolus from Isles of Shoals (O). Broken lines depict the 95% confidence limits of the baseline data.

Fig-5



FISHERIES IN THE VICINITY OF
ISLES OF SHOALS DISPOSAL SITE

The area surrounding Appledore Island (the site of the Isles of Shoals Marine Laboratory) has been nominated as a federal marine sanctuary. This is mainly to protect intertidal areas which have been studied over a long time period and should not effect fisheries or disposal at the study site.

In preparing this report, interviews were conducted with 2 lobstermen (Kittery) 4 inshore draggermen (Portsmouth, Glouchester) and 1 gill netter (Portsmouth). Most individuals have been contacted more than once.

Lobster. Lobsters are caught close to the Isles of Shoals and its ledges during the summer. In the winter and spring, the fishery extends into depths of around 60 m. Catch per effort within Maine waters is very high because the area is not overfished to the degree that many other New England areas are. Lobsters within the dump site tend to be large (1½-3 lbs.). Catches vary from very large to very small. Many clawless lobsters are caught (lobsters lose claws when run over by fish dragging gear or when as shorts they catch their claws between laths.

Much of the winter fishery in this general area is carried out by New Hampshire vessels. It was reported that winter lobstering was extended into deeper water east of the dump site in 1977. Catches were good, but there was some conflict with draggers.

The lobster fishermen interviewed so far are not very concerned about the potential effects of spoil disposal because of the small volumes which will be dumped and because earlier dumping had no detectable effects.

Finfish. Small draggers from York, Kittery, Portsmouth, and Glouchester, fish in this area. There is considerable variation in tow routes and techniques in the area so that it has not been possible to map fisheries in great detail.

Cod and haddock are caught during March to May in tows 2 miles east of the dump site and along northeast-southwest ridges several miles south of the site ("eastern passage", "pipe clay tows"). Whiting (silver hake) are caught in these areas in the fall and pollock are caught in November and December.

Gray sole are caught on patches of level bottom surrounded by rocks in the summer and early fall. Dab and cusk are incidental catches in these areas. Gray sole fishing commands a high price but requires detailed knowledge of the bottom. One fisherman has fished for gray sole in the valley on the southeast corner of the large dump site. It was reported that many JATO rocks were removed from here. Another fisherman has fished small but productive areas on the inner edge of the large dumpsite for many years. Neither of these fishermen considered the valley which is proposed as a dump site to be valuable fishing ground.

Gill nets are fished within the large dumping ground and south of it along the 80 meter contour. An "edge" is defined in the dumping ground but not south of it. New Hampshire vessels fish in the dumping ground area and Maine vessels fish north of it.

Cod and haddock are caught from March to May. Cod remain in the area during the summer but the presence of dogfish sharks ends the gill net fishery. Pollack are caught in November and December.

The area between the Isles of Shoals and Cape Ann is an important spawning ground for pollock (Nov. - Feb.) and cod (March - April). Spawned out cod ("slunk") are sometimes caught on the southern edge of the large dumping ground. Both of these fish have floating eggs.

Herring spawning grounds are located both inshore and offshore of the Isles

of Shoals. The inshore area is much less important than the offshore grounds on Jeffreys Ledge (Boyer et al, 1973). In 1972 there were two concentrations of herring eggs on Jeffreys Ledge, 20 and 22 miles from the proposed disposal site (Boyar et al, 1973). It was hypothesized that these areas were a major source of larvae for the western Gulf of Maine.