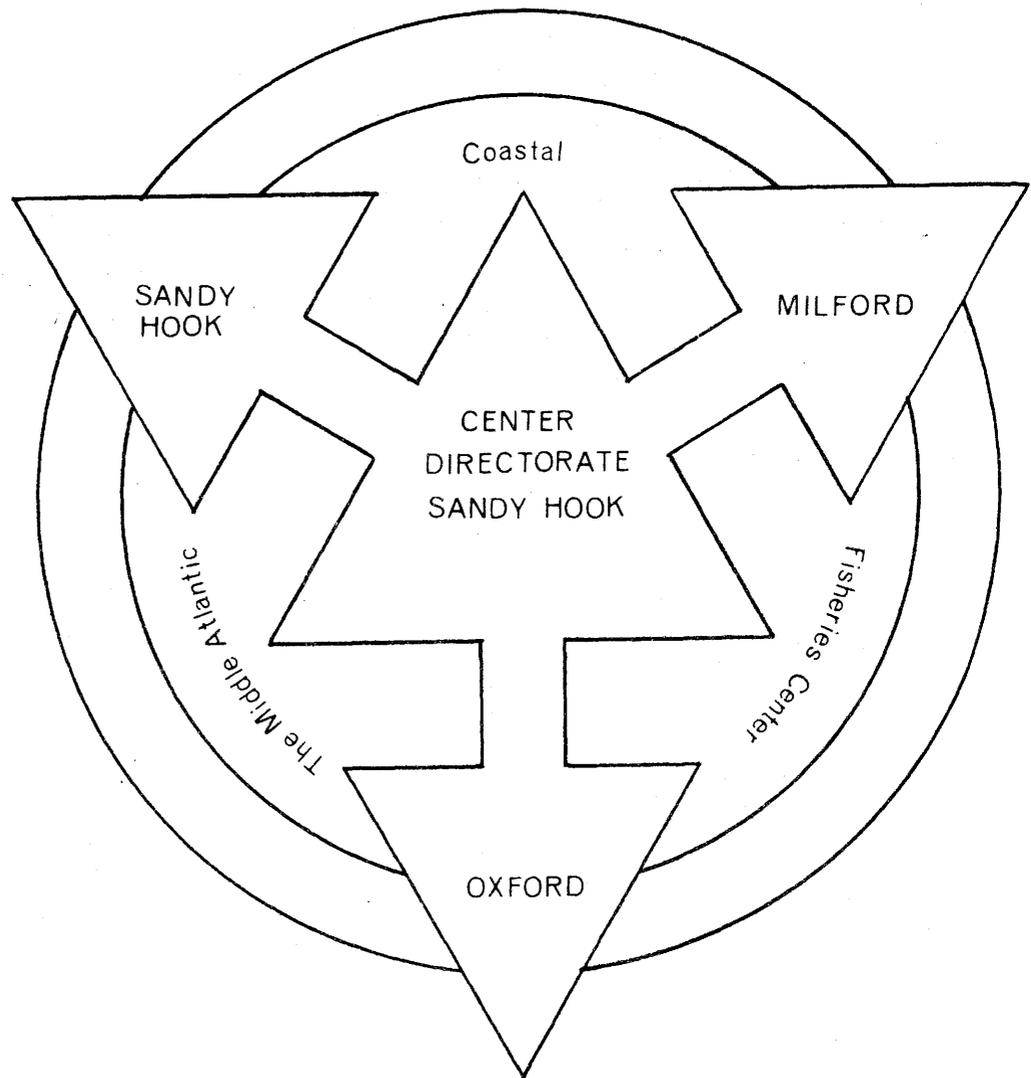


Distribution of Fecal Coliforms in Sediments and Water
from the Thames River and New London Dumpsite - Long
Island Sound



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region

MIDDLE ATLANTIC COASTAL FISHERIES CENTER



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NATIONAL MARINE FISHERIES SERVICE
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1st Quarterly Report

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Environmental Microbiology and Chemistry Investigation

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INTRODUCTION

The following report constitutes data obtained on the distribution of fecal coliform bacteria and total aerobic plate count in the top layer of sediments obtained from the Thames River and the New London, Connecticut, dredge spoil dumping area prior to the commencement of dredging operations in August, 1974. A limited number of water samples were examined for the presence of fecal coliforms. For the initial baseline studies, sampling was conducted in June, July and August of 1974.

Sampling Plan

The three sampling areas designated for the bacterial studies were as follows:

Spoils (Dumping) area - A circular area within a 1-mile radius from the point of dumping designated by the NL buoy in Long Island Sound.

Control area - The area outside the spoils area but within a circle of a 2-mile radius from the NL buoy.

River stations - Areas of the Thames River to be dredged.

Bottom sediments at forty stations located in both the spoils area and control area and five river stations were sampled during four day-cruises in June and July, 1974. These sediment samples were analyzed for total fecal coliforms and total aerobic bacteria. Three weeks later 18 stations within the control and spoils areas and one river station were resampled. Bottom water samples were collected at six stations. These samples were analyzed for total fecal coliforms. In August a spoils station at the

NL buoy (Station C6), three control (spoils interfaces) stations, located one mile from the NL buoy, and one river station were sampled for bottom water once each during flood and ebb tides. These samples were analyzed for total fecal coliform counts.

MATERIALS AND METHODS

Collections and Handling of Samples

Bottom sediments were obtained using a Smith-McIntyre grab. The top centimeter of the sediment surface was removed with a sterile tongue depressor and placed in a sterile 8-oz. French square bottle until full. The samples were then stored in refrigerated ice chests and examined within 24 hours at the laboratory. Each sample represents an approximate 100 cm² surface area of the sediment.

Water samples were taken in one-liter sterile plastic bags by means of a sterile polyethylene bag water sampler (Oceanics, Inc.). Water was aseptically transferred to sterile 8-oz. French square bottles and refrigerated for transport to the laboratory. All water samples were analyzed within 24 hours of collection.

Analysis for Fecal Coliform Bacteria

The procedure used for determining total fecal coliform MPN's follows Standard Methods for the Examination of Water and Wastewater (13th edition), modified for the dilution of sediment samples for inoculation of the culture tubes.

RESULTS

The data obtained on the several cruises are presented in Tables 1-4 and plotted on outline maps (Figs. 1-3). The plots on the maps also indicate the

stations sampled during this study. For the convenience of analysis the fecal coliform ranges are grouped in the three areas as follows:

River Stations

<u>No. of Stations</u>	<u>Fecal Coliform Range</u>
3	10,000 - 172,000
2	1,000 - 10,000
Total <u>5</u>	

Spoils Area

3	1,000 - 10,000
13	100 - 1,000
4	0 - 30
Total <u>20</u>	

Control Area

7	1,000 - 10,000
7	100 - 1,000
5	0 - 30
Total <u>19</u>	

The highest fecal coliform counts were obtained in the sediments from the river stations. Three samples had counts in the range of 10,000-172,000 fecal coliforms per 100 ml of sediment. Except for the count in sediment from Station R1, furthest up the river, all counts on the river samples exceeded those obtained from the dumpsite and adjacent areas.

Fecal coliform counts in the top sediments from the dumpsite and adjacent areas were elevated, but lower than those obtained from the river samples. They also exhibited a variance in counts, a factor which would normally be expected.

In examining the grouping of counts, i.e., within the spoils and control areas, no set pattern of distribution was observed. The range of fecal coliform counts in the sediments from each of these areas was quite similar.

Resampling and analyses of sediments from 18 selected stations in the dumpsite area and one river station were made three weeks after the initial survey. These samples yielded fecal coliform counts of which 9 of 19 correlated well, 3 of 19 were comparable and 7 of 19 differed greatly. Considering the difficulty in obtaining sediments from the exact spot at each station during resampling (and the variable distribution of bacteria in sediments) such results would be expected.

Grouping the total aerobic counts in the top sediments from the various stations, as follows, showed no pattern of distribution:

<u>Count Range x 10⁵</u>	<u>Number of Stations</u>		
	<u>River</u>	<u>Control</u>	<u>Spoils</u>
1.5 - 6.0	-	4	2
6.1 - 24.0	-	12	13
24.1 - 96.0	-	3	3
93.0 - 650.0	5	-	-

Counts in the river sediments were significantly higher than those obtained from the dumpsite and adjacent areas. Comparison of total counts with the fecal coliform counts did not have a high degree of correlation.

In general, the data would indicate that the fecal coliform and bacterial densities in near-shore sediments were significantly higher than those from the southern section near the center of the dumpsite. This would indicate that significant contamination pressure was exerted by the river outflow.

In the initial survey, sediments were selected for bacterial and coliform analyses. To determine the dispersion of bacteria by dredging operations and the deposition of the spoils into surrounding waters, sediments and their overlying waters were simultaneously collected and analyzed for fecal coliforms.

Although limited, the data in Table 3 show that no uniform ratios or correlating densities could be established between sediments and the overlaying waters.

To establish any variability in coliform densities in bottom water due to tidal flow, samples were collected from five stations at ebb and flood tides and analyzed for fecal coliforms. The data in Table 4 indicated that higher coliform densities were present in bottom water during ebb rather than flood tide, except at Station R4, the river station. This observation indicated that contamination pressure was exerted by the Thames River to the inshore areas in regard to increased bacterial and fecal coliform densities.

FUTURE STUDIES

Sediments from 7 stations, represented by triangles in Figure 4, will be sampled quarterly to monitor for any increases in fecal coliform and total bacterial densities in the spoils and control areas.

Bottom water and sediment samples will be collected simultaneously at five stations and analyzed to establish any correlation between coliform densities in the sediment and water. The bottom water will be sampled at ebb and flood tides during the spring, summer and winter quarters.

During July sediment samples from all stations in the spoils and control areas, as outlined in Figure 4, will be analyzed for fecal coliforms and total bacterial densities as done in the initial survey.

Table 1. Distribution of total bacterial counts and fecal coliforms in sediments from Thames River-New London Dumpsite- June 26 - July 8, 1974.

Station	Initial Survey	
	Total Plate Count X 10 ⁴	Fecal Coliforms /100 ml
A1	69	1,300
A2	110	1,720
A3	140	11
A4	140	490
A5	70	240
A6	100	221
A7	72	790
A8	85	460
A9	160	1,410
B1	33	17
B2	26	14
B3	36	2
B4	26	11
B5	15	14
C1	130	172
C2	170	700
C3	160	4,900
C4	150	2,200
C5	95	3,300
C6	17	220
C7	95	330
C8	120	490
C9	93	490
D2	37	221
D3	72	172
D4	91	221
D5	37	130
E1	970	7,900
E2	260	2,400
E3	290	2,210
E4	160	1,090
E5	250	490
E7	310	26
E8	150	109
E9	130	22
F3	140	790
F4	200	460
F5	890	490
F7	170	26
F8	110	172
F9	37	172
R1	2,650	1,300
R2	2,200	4,900
R3	1,080	172,000
R4	6,500	22,100
R5	930	24,000

Table 2. Comparison of Fecal Coliforms in Sediments at Selected Stations before Dredging and Dumping

Initial Survey

Station	Fecal Coliforms/100 ml	
	June 26 - July 8, 1974	July 30, 1974
A2	1,720	330
A3	11	5
A4	490	33
A5	240	330
B2	14	490
B3	2	170
B4	11	49
B5	14	70
C2	700	490
C3	4,900	240
C4	2,200	70
C5	3,300	49
C6	220	79
C7	330	130
C8	490	23
E7	26	0
E8	109	172
F7	26	17
R4	22,100	17,200

Table 3. Distribution of fecal coliforms in sediments and bottom water - from New London Dumpsite - July 29, 1974.

Station	Fecal coliforms/100 ml	
	Sediment	Bottom Water
A2	330	33
C6(N1)	79	0
B3	170	8
C2	490	17
E8	172	0

Table 4. Distribution of Fecal Coliforms in Bottom Water at Ebb Tide and Flood Tide Before Dredging and Dumping

Station	Fecal Coliforms/100 ml	
	Ebb Tide 8/12/74	Flood Tide 8/19/74
A3	8	2
C3	49	5
E3	79	0
C6	2	0
R4	630	790

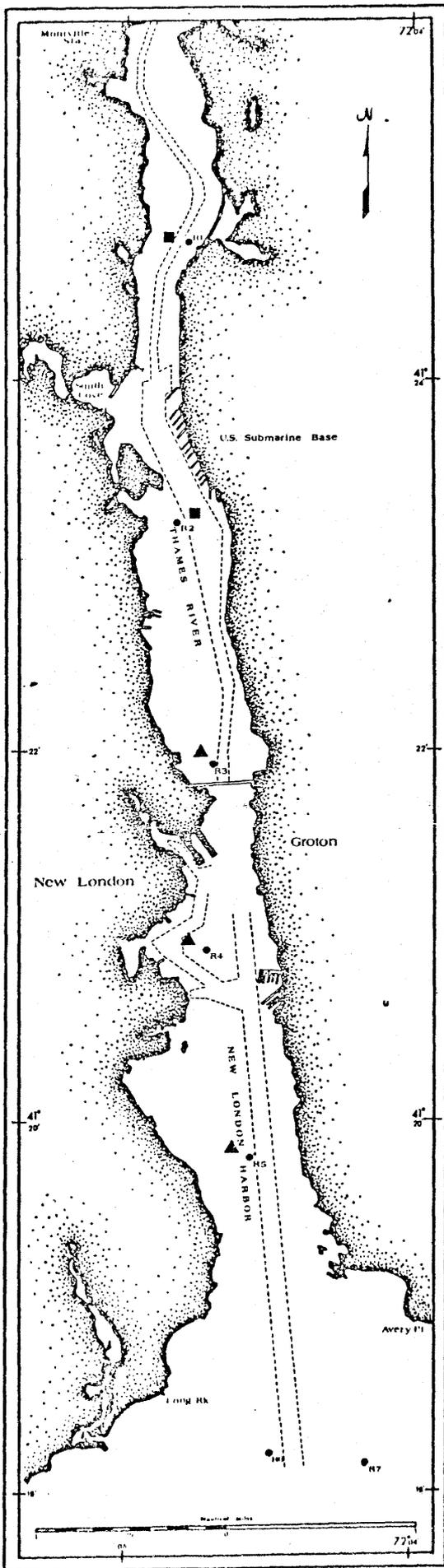
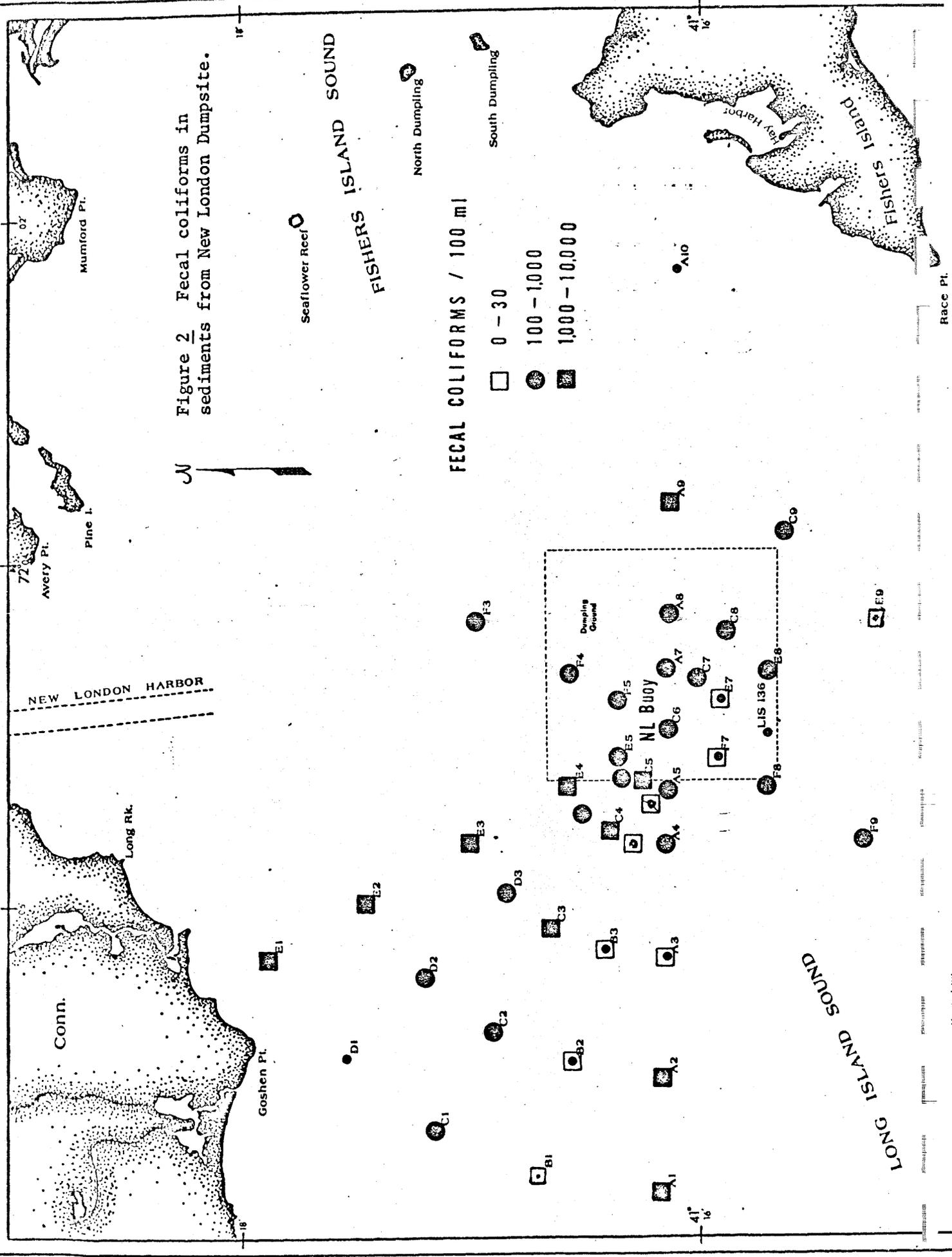


Figure 1 Distribution of fecal coliforms in sediments - Thames River.

FECAL COLIFORMS / 100 ml

- - 1,000 - 10,000
- ▲ - 10,000 - 200,000

Figure 2 Fecal coliforms in sediments from New London Dumpsite.



Nautical Miles

Scale: 1:50,000

Vertical text on the right edge of the map frame.

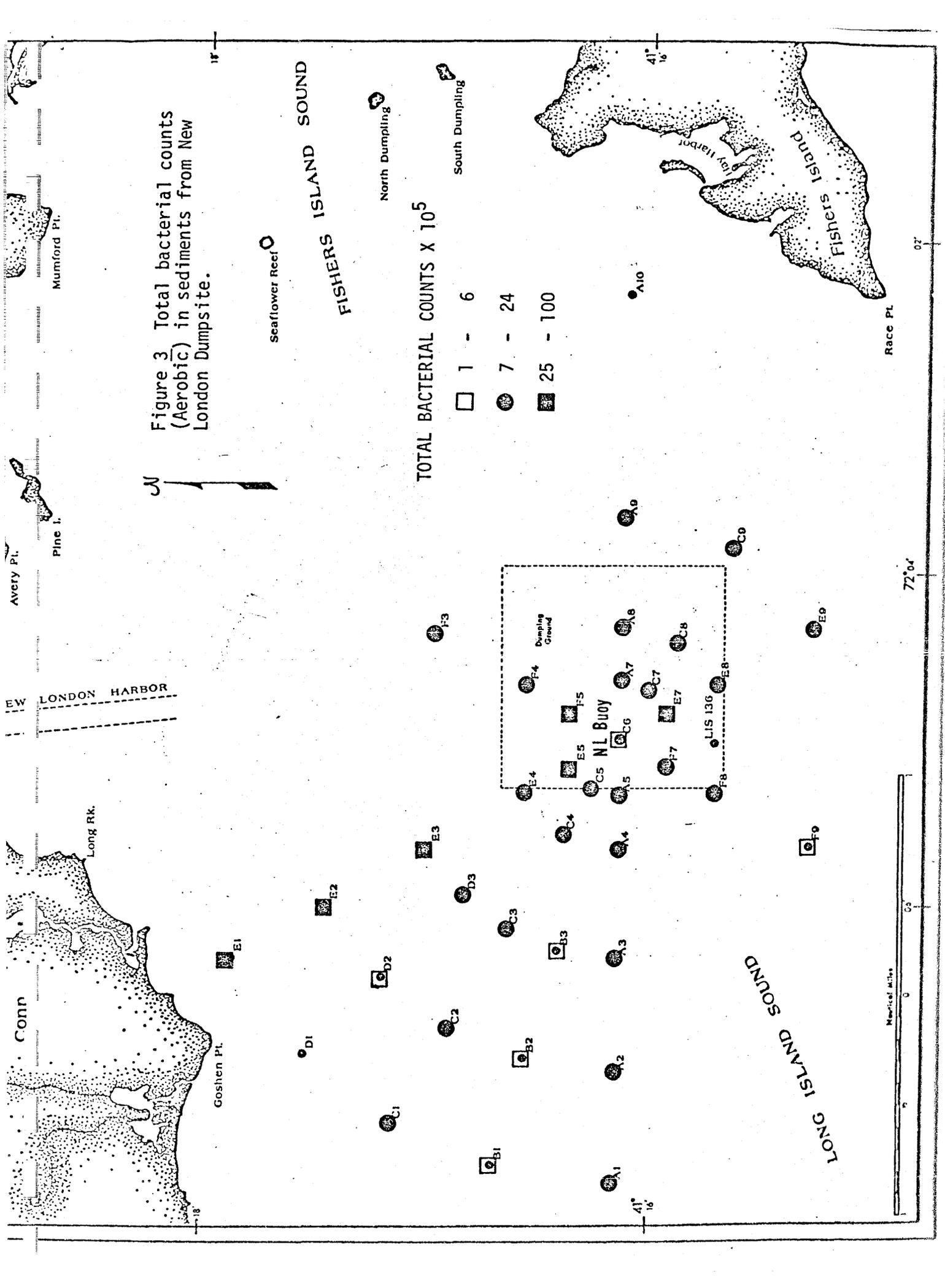


Figure 3 Total bacterial counts (Aerobic) in sediments from New London Dumpsite.

TOTAL BACTERIAL COUNTS X 10⁵

- 1 - 6
- 7 - 24
- 25 - 100

EW LONDON HARBOR

Long Rk.

Conn

Goshen Pt.

E1

D1

E2

C2

C1

E3

D3

C3

B2

B3

A3

A2

A1

F3

F4

C4

A4

E5

A5

A6

A9

E4

F5

A7

A8

A10

C5

A6

A7

C7

E7

C9

F7

E7

E8

F8

LIS 136

E9

F9

FISHERS ISLAND SOUND

North Dumping

South Dumping

Seaflower Reef

Mumford Pt.

Pine I.

Avery Pt.

FISHERS ISLAND

Race Pt.

LONG ISLAND SOUND

Nautical Miles

72°04'

07'

41° 16'

41° 16'

18'

18'

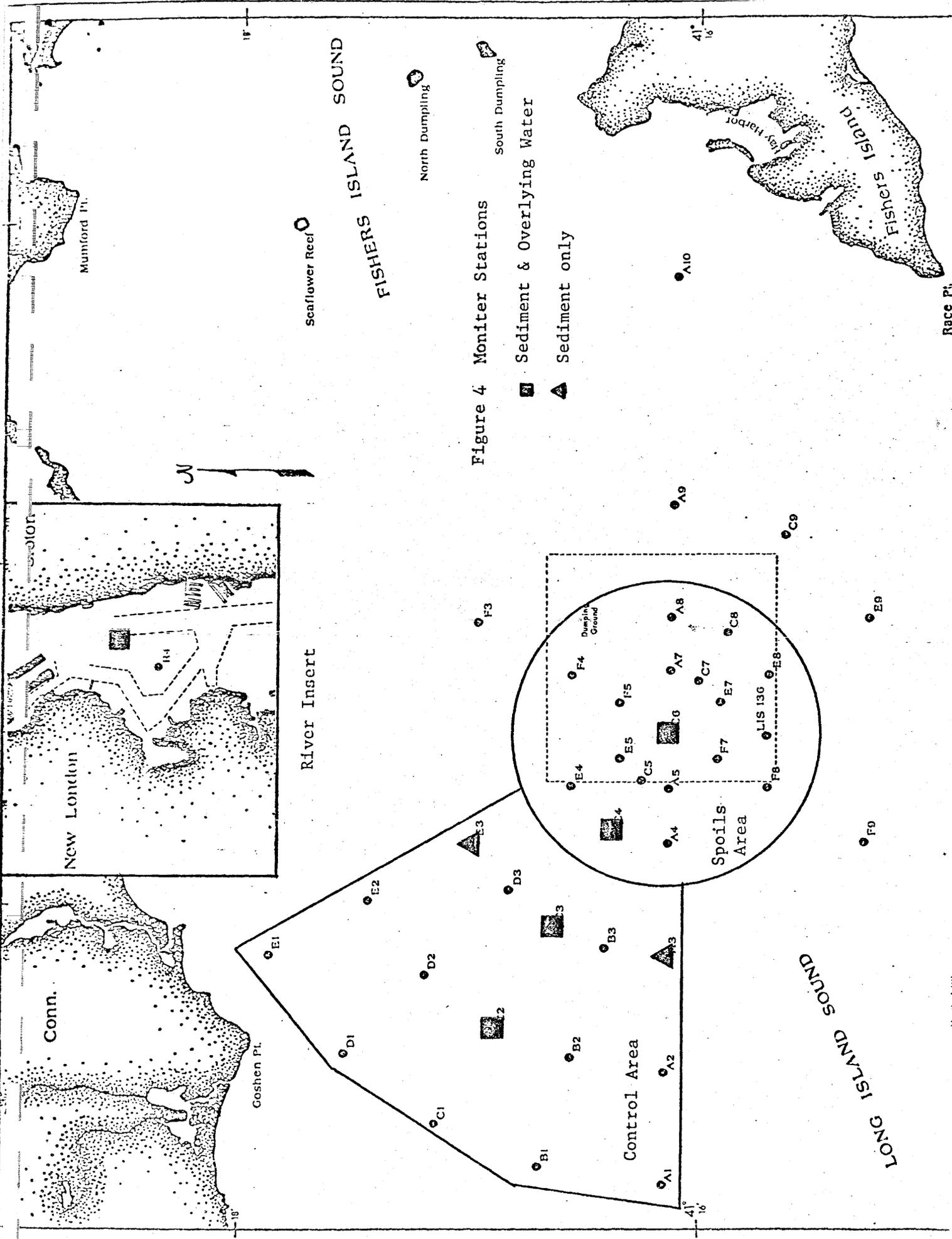


Figure 4 Monitor Stations

- Sediment & Overlying Water
- ▲ Sediment only