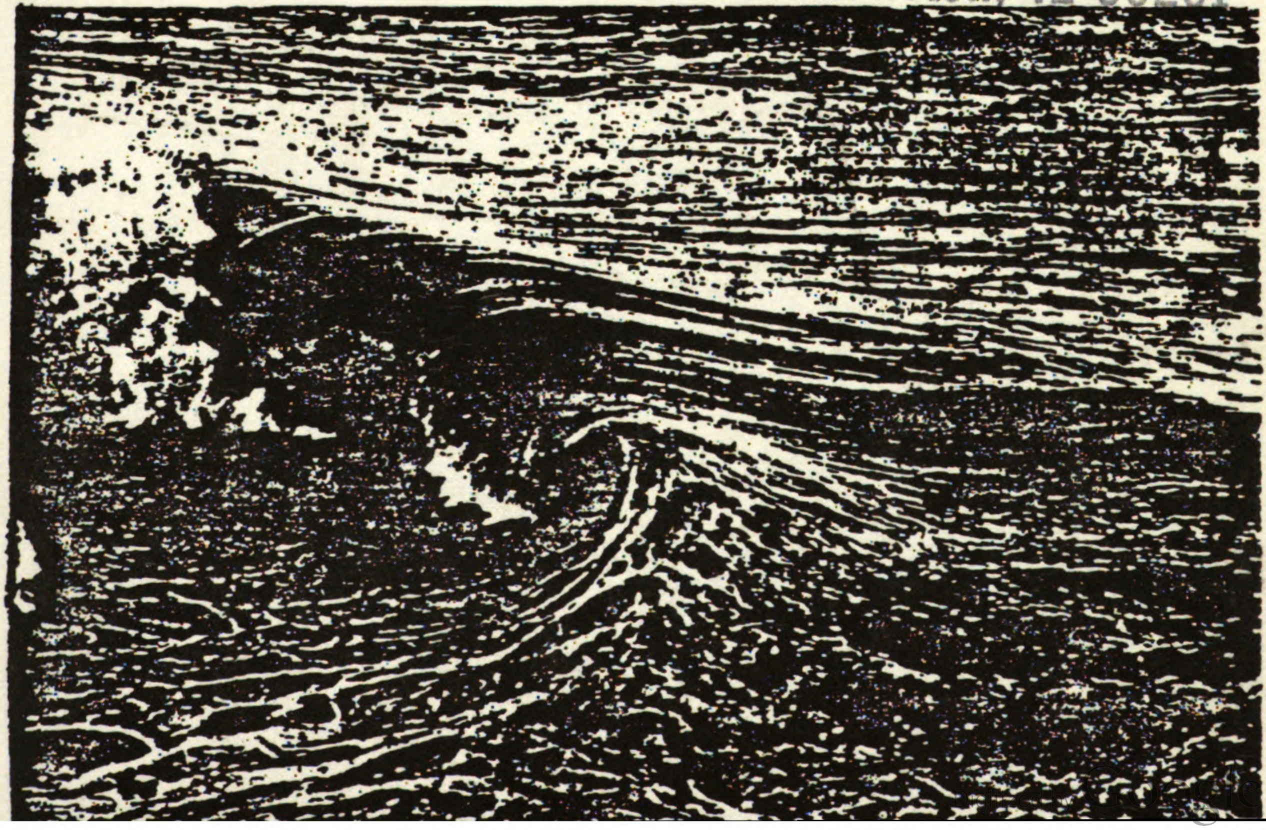
United States
Environmental Protection
Agency

EPA, Region II
Water Management Division
Marine and Wetlands
Protection Branch
New York, NY 10278

May 1988

Water

EPA Final Environmental Impact Statement for the Designation of Ocean Dredged Material Disposal Sites for Long Island, New York and New Jersey



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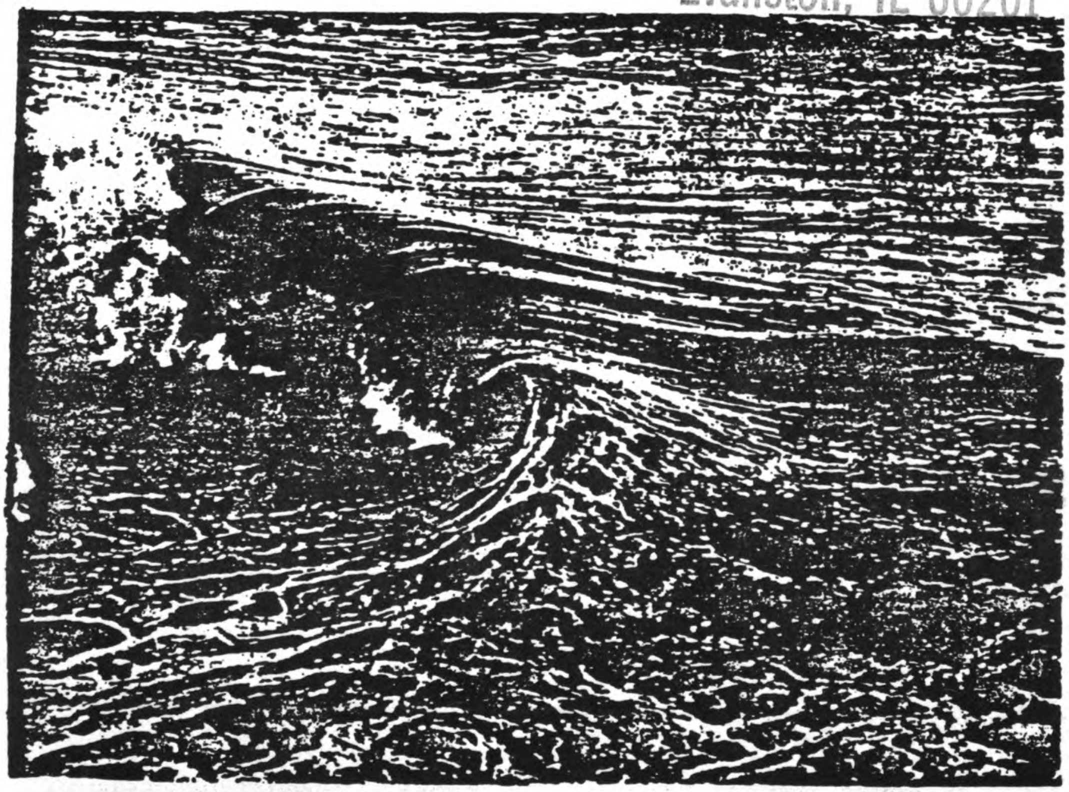

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

MAY 1 9 1988

To All Interested Government Agencies and Public Groups:

This is to inform you that the Final Environmental Impact Statement (EIS) for the Designation of Ocean Dredged Material Disposal Sites for Long Island, New York and New Jersey will be available for public review at the following locations:

U.S. Environmental Protection Agency
Marine and Wetlands Protection Branch
26 Federal Plaza, Room 837
New York, New York

U.S. Environmental Protection Agency
Environmental Impacts Branch
26 Federal Plaza, Room 702
New York, New York

U.S. Environmental Protection Agency
Public Information Reference Unit
Room 2904 (Rear)
401 M Street, S.W.
Washington, D.C.

U.S. Army Corps of Engineers
New York District Office
26 Federal Plaza
New York, New York

U.S. Army Corps of Engineers
Philadelphia District Office
Customs House
2nd and Chestnut Streets
Philadelphia, Pennsylvania

This final environmental impact statement (FEIS) was prepared by the U.S. Environmental Protection Agency (EPA) - Region II, with the assistance of Interstate Electronic Corporation. This document has been prepared in accordance with the regulations for implementation of the National Environmental Policy Act (NEPA), and in accordance with EPA's procedures for voluntary preparation of EISs on significant regulatory actions (39 FR 37119).

An EIS is a decision-making document. This FEIS was prepared for the purpose of evaluating the environmental impacts associated with the designation of sites for ocean disposal of dredged material from the inlets of Long Island, New York and New Jersey.

This document includes the following: an executive summary, chapters on the purpose and need for the action, alternatives, selection of alternate sites, proposed actions, characteristics of the affected environment, and environmental consequences resulting from disposal operations.

Comments concerning the content of this FEIS may be submitted to the EPA for consideration. All comments must be received within 45 days after the date of publication of the Notice of Availability for this FEIS in the Federal Register. Please address all comments to Mr. Mario Del Vicario, Chief, Marine and Wetlands Protection Branch, Room 837, U.S. Environmental Protection Agency, 26 Federal Plaza, New York, New York 10278.

Sincerely,

Christopher J. Daggett
Regional Administrator - Region II

ABSTRACT

The proposed action addressed in this Final Environmental Impact Statement (FEIS) is the designation of eight permanent dredged material disposal sites located off of Long Island, New York and New Jersey for the disposal of inlet maintenance dredged material. The dredged material disposal sites are: Rockaway, East Rockaway, Jones, and Fire Island New York, Shark River, Manasquan, Absecon, and Cold Spring New Jersey. Although these disposal sites are located close to the shore, this FEIS will demonstrate that the proposed action will have a negligible impact on the surrounding environment due to the inert nature of the dredged material combined with the relatively small size of the disposal areas.

The Environmental Protection Agency (EPA) recommends that all disposal operations be performed during the period from September to January. Disposal operations during this time period would minimize effects to the marine and human environments.

The eight interim sites are suitable for designation as each site satisfies all criteria of the Ocean Dumping Regulations. Dredged material from the inlets is similar in composition to the sediment at the proposed disposal sites. No adverse effects should occur to living resources, mineral resources, or socioeconomic or cultural resources of the environment from the continuing use of these sites. There have been no problems encountered during surveillance or monitoring activities at these sites.

FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR THE DESIGNATION OF DREDGED MATERIAL
DISPOSAL SITES FOR EIGHT
LONG ISLAND AND NEW JERSEY INLETS

APRIL 1988

U.S. Environmental Protection Agency
Region II
Marine and Wetlands Protection Branch
26 Federal Plaza
New York, New York 10278

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The proposed action addressed by this final environmental impact statement (FEIS) is the designation of eight environmentally acceptable ocean dumping sites for the inlets of Rockaway, East Rockaway, Jones, and Fire Island, New York, and Shark River, Manasquan, Absecon, and Cold Spring Harbor, New Jersey. These sites will be possible disposal sites for dredged material resulting from maintenance dredging projects. The draft EIS (DEIS) for this action was published by the U.S. Environmental Protection Agency (EPA) on November 18, 1983.

BACKGROUND

Ocean dumping has been regulated by EPA since the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) authorized EPA to establish and apply criteria for reviewing and evaluating permit applications for the dumping of waste material into ocean waters and to designate sites where such dumping may occur. In addition, Section 102(c) of the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4321 et seq., requires that Federal agencies prepare EISs on proposals for major Federal actions significantly affecting the quality of the human environment. The objective of NEPA is to build into the EPA decision-making process careful consideration of all environmental aspects of proposed actions. Although EPA activities under MPRSA are statutorily exempt from compliance with NEPA, EPA has voluntarily made a commitment to prepare EISs in connection with ocean disposal site designations (39 FR 16186; May 7, 1974).

SUMMARY OF ANALYSES

The purpose of this FEIS is to identify and select for designation eight environmentally acceptable ocean disposal sites for dredged material from eight inlets located in New York and New Jersey. The designation of an ocean disposal site for dredged material must be based on an evaluation of possible sites using the Criteria (40 CFR 228.5 - 228.6) of the Ocean Dumping Regulations (ODR). All candidate sites are evaluated for compliance with the criteria. Of the sites that are acceptable under the criteria, the site nearest the point of dredging is selected unless there are significant environmental advantages in designation of a more distant site. If no site is found that satisfies the criteria, no site is designated.

The eight interim sites are suitable for designation. Each site meets all criteria of the ODR. Dredged material from the inlets is similar in composition to the sediment at the proposed disposal sites. No adverse effects should occur on living resources, mineral resources, socioeconomic resources or cultural resources from the continuing use of these sites. There have been no problems encountered during surveillance or monitoring activities at these sites.

LAND-BASED ALTERNATIVES

Although the evaluation of land-based disposal alternatives is the responsibility of the U.S. Army Corps of Engineers (CE) as a part of the dredged material disposal permitting process, the EIS development process requires the consideration of a range of alternatives to the proposed action. Land-based disposal methods considered in the DEIS included placement of dredged material as beach nourishment, use of dredged material as capping material for contaminated dredged spoil, and use of dredged material as upland fill.

RESPONSIVENESS SUMMARY

The National Oceanic and Atmospheric Administration (NOAA) and the U.S. Department of the Interior (DOI), Office of the Secretary, Mid-Atlantic Region, expressed their concern that if these sites were designated, beach nourishment would not occur. However, the designation of the eight sites would only provide a disposal option; it does not preclude other disposal alternatives. Whenever feasible, beach nourishment is the preferred alternative.

Both NOAA and DOI also provided information updating the threatened and endangered species listings in the areas of the proposed sites. These agencies both stated that some of the proposed dredged material disposal sites are within surf clam population zones. However, no adverse impacts on shellfish populations are expected due to the nature of the dredged material (primarily sand) and the seasonal constraints placed on both the dredging and the disposal operations.

New Jersey Department of Environmental Protection commented that site designation was subject to the Coastal Zone Management Act (CZMA) and the FEIS should include a section assessing the consistency of the proposed action with New Jersey's Coastal Management Plan (CMP). EPA reviewed this comment and determined that site designation is not subject to the CZMA. In Chemical Waste Management v. U.S. Department of Commerce, et al., Civil Action No. 86-624, (United States District Court For The District Of Columbia, 1986). The court determined that neither the Coastal Zone Management Act (CZMA) nor the National Oceanic and Atmospheric Administration (NOAA) regulations implementing the CZMA authorize a State to impose conditions unilaterally on EPA as part of the consistency certification. Section 102 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) authorizes the Administrator to designate sites and times for dumping (33 U.S.C. Section 1412(c)). The State of New Jersey is pre-empted from exercising authority over ocean dumping, including site designation (Section 106 (d) of MPRSA).

CONCLUSIONS

As a result of the analyses conducted pursuant to the preparation for this EIS, EPA proposes to designate eight dredged material disposal sites located offshore of East Rockaway, Rockaway, Jones, and Fire Island Inlets, New York, and Shark River, Manasquan, Absecon, and Cold Spring Inlets, New Jersey for the disposal of dredged material removed from the East Rockaway, Rockaway, Jones, Fire Island, Shark River, Manasquan, Absecon, and Cold Spring Inlets, respectively. This action is necessary to provide acceptable ocean dumping sites for the current and future disposal of this material.

The analyses conducted for this EIS indicate that the eight interim sites should be designated as the disposal sites. These proposed site designations are for an indefinite period of time, and the sites will be subject to continuing monitoring and site management by EPA to ensure that unacceptable adverse environmental impacts do not occur.

It should be emphasized that the designation of a site for ocean dumping of dredged material does not preclude alternate methods of disposal. Decisions on the acceptability of ocean dumping are made on a case-by-case basis during permitting or review of Federal projects. During the permitting process, land-based alternatives are considered as disposal alternatives. Ocean dumping is selected only when the applicant can demonstrate that no practicable alternatives exist that would cause less adverse impact or potential risk to the total environment.

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1. PURPOSE OF AND NEED FOR ACTION

Chapter 1

Purpose of and Need For Action

1-1 Purpose of and Need For Action

The proposed action in this Final Environmental Impact Statement (FEIS) is the final designation for continuing use of the Long Island, New York (Rockaway, East Rockaway, Jones, and Fire Island), and New Jersey (Shark River, Manasquan, Absecon, and Cold Spring) Inlet Dredged Material Disposal Sites (IDMDSs). The purpose of the proposed action is to provide feasible and environmentally acceptable ocean locations for the disposal of inlet dredged materials. The FEIS presents the information utilized in the evaluation of the suitability of ocean disposal areas for permanent designation. The environmental studies and final designation processes are being conducted in accordance with the requirements of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA) (86 Stat. 1052), as amended (33 U.S.C.A. Section 1401, et seq.); the U.S. Environmental Protection Agency's (EPA) Ocean Dumping Regulations and Criteria (40 CFR Section 220-229); and other applicable Federal environmental legislation.

Based upon an evaluation of all reasonable alternatives, the proposed action in this FEIS is to designate the existing interim Long Island and New Jersey IDMDSs. The sites may be used for the disposal of dredged material only after evaluation of each Federal project or permit application has established the need for ocean disposal. In addition, the volumes of material to be disposed of at the proposed sites must be within site capacities and in compliance with the criteria and requirements of EPA and U.S. Army Corps of Engineers (CE) regulations.

Permit issuance for disposal operations at the IDMDSs is under the jurisdiction of two CE districts: New York (Rockaway Inlet, East Rockaway Inlet, Jones Inlet, Fire Island Inlet and Shark River Inlet), and Philadelphia (Manasquan Inlet, Absecon Inlet, and Cold Spring Inlet). EPA Region II is responsible for site monitoring and management activities. The inlets are located along the south shore of Long Island, New York and the coast of New Jersey (Figure 1).

1-1.1 New York Sites

Rockaway IDMDS is located approximately 2 nmi southeast of Rockaway Inlet (Figure 2). The entrance channel to Rockaway Inlet provides passage into Jamaica Bay, an important port of Long Island. Dredging to maintain channel depth has required the removal of approximately 200,000 cubic yards (cy) material over a fifty year period. The inlet is dredged every two years and was last dredged in December 1987. The interim IDMDS was last used in 1979; dredged material was first dumped in the vicinity of the interim IDMDS in 1929.

East Rockaway IDMDS is located approximately 1.3 nmi southwest of East Rockaway Inlet (Figure 3). The interim IDMDS was used last in 1979. Dredged material was first dumped in the vicinity of the IDMDs in 1938. Because of shoaling, yearly maintenance dredging of the inlet has been required for the last 20 years. Approximately 200,000 cy of material is dredged from the inlet every two years.

Jones IDMDS is located approximately 1.5 nmi southwest of Jones Inlet (Figure 4). The inlet provides passage for small vessels. The interim IDMDS has been used since 1959, and was last used in 1978. Approximately 300,000 cy of material dredged from Jones Inlet every two years. The Inlet was last dredged in July 1987.

Fire Island IDMDS is located approximately 1.7 nmi southwest Fire Island Inlet (Figure 5). The interim IDMDS has been used for dredged material disposal since the mid-1940's. The inlet requires annual maintenance (approximately 250,000 cy) dredging because of rapid shoaling; however, disposal of dredged sediments has been been on adjacent beaches. The CE plans to coordinate future inlet dredging with their beach erosion control program and to continue to use inlet sediments for the beach nourishment if suitable. Fire Island Inlet is the primary waterway between the Atlantic Ocean and Great South Bay. The inlet is used extensively by both commercial and pleasure craft.

1-1.2 New Jersey Sites

Shark River IDMDS is located approximately 0.4 nmi northeast of Shark River Inlet (Figure 6). The CE's dredging records indicate that from 1955 to 1958 inlet sediments were dumped in the vicinity of the IDMDS, but interim location of sites was established by EPA in 1977. Because of littoral drift, approximately 42,000 cy of material is dredged from the project area every 5 years. Disposal of dredged sediments has been primarily as beach nourishment on adjacent beaches, and is the CE preferred disposal alternative because of beach erosion concerns. Ocean disposal is a secondary consideration when beach disposal is not feasible or economical. Vessels using Shark River Inlet are primarily recreational.

Manasquan IDMDS is located approximately 0.3 nmi northeast of Manasquan Inlet (Figure 7). The CE's dredging records indicate that the interim IDMDS has been used since 1964 and that approximately 35,000 cy of material has been dredged from Manasquan Inlet annually. The site was last used in 1978. The EPA recommends that the dredged material be used as beach nourishment whenever feasible. The inlet is used primarily by recreational craft (CE, 1975b).

Absecon IDMDS is located approximately 0.5 nmi southeast of Absecon Inlet (Figure 8). The CE's dredging records indicate that the interim IDMDS has been used since 1964, and was last used in 1978. Previous to 1978, approximately 60,000 cy of material was dredged from the Inlet annually and dipsosed of at the Absecon IDMDS. Absecon, on the south side of the inlet, is a base for a large fleet of fishing vessels (CE, 1975b).

Cold Spring IDMDS is located approximately 1 nmi southwest of Cold Spring Inlet (Figure 9). The CE's dredging records indicate that the interim IDMDS has been used since 1964, and was last used in 1987. Approximately 11,000 cy of dredged material is removed from the Inlet annually and disposed of at the Cold Spring IDMDS. Cold Spring Inlet (Cape May Inlet) is used by fishing fleets, pleasure craft, and the Coast Guard (CE, 1975b).

1-2 Corps of Engineers Local Need

The CE has requested EPA to permanently designate ocean dumping sites for the disposal of dredged material from the Long Island and New Jersey Inlets. Continued use of these waterways depends on maintenance dredging of Federal and non-Federal navigational channels and berthing areas. In the event that these areas were not dredged, the sedimentation process would selectively seal off portions of the shallow bayside waters of coastal Long Island and New Jersey. Isolation of some coastal waters from tidal influences would reduce the total acreage of estuaries. In extreme cases the inlet may close having a profound effect on the circulation patterns, salinity differences and sedimentation rates within the bayside waters. Any alteration of these parameters would result in drastic changes of the aquatic, semiaquatic, and terrestrial communities adjacent to the bays.

Economically, there would be a reduction in the number of shore area visitors and a corresponding reduction in recreational services. Land values would tend to decrease.

Natural shoaling processes would preclude passage of modern deep-draft vessels in the absence of dredging. The closure of these inlets would require vessels to travel further to reach their destination, resulting in increased expenditures in time and money for recreational and commercial vessels. Dredged sediments have been primarily used for beach nourishment and this disposal option remains the CE preferred disposal alternative. EPA supports beach nourishment whenever feasible. Ocean disposal is a primary consideration when beach disposal or other land based alternatives are not not feasible or economical.

1-3 Environmental Protection Agency's Purpose and Need

As previously stated, the CE has indicated a need for the designation of environmentally acceptable ocean dredged material disposal sites to carry out its responsibilities under the MPRSA, Rivers and Harbors Act, and other Federal statutes. In response to the CE's stated need, EPA, working in cooperation with the CE, initiated the necessary studies pursuant to the requirements of 40 CFR 228.4(e) to select, evaluate, and possibly designate the most suitable sites for the ocean disposal of dredged material.

This document has been prepared to provide the public and decision-makers with relevant information to assess the impacts associated with the designation of the proposed Long Island and New Jersey Inlet Dredged Material Disposal Sites.

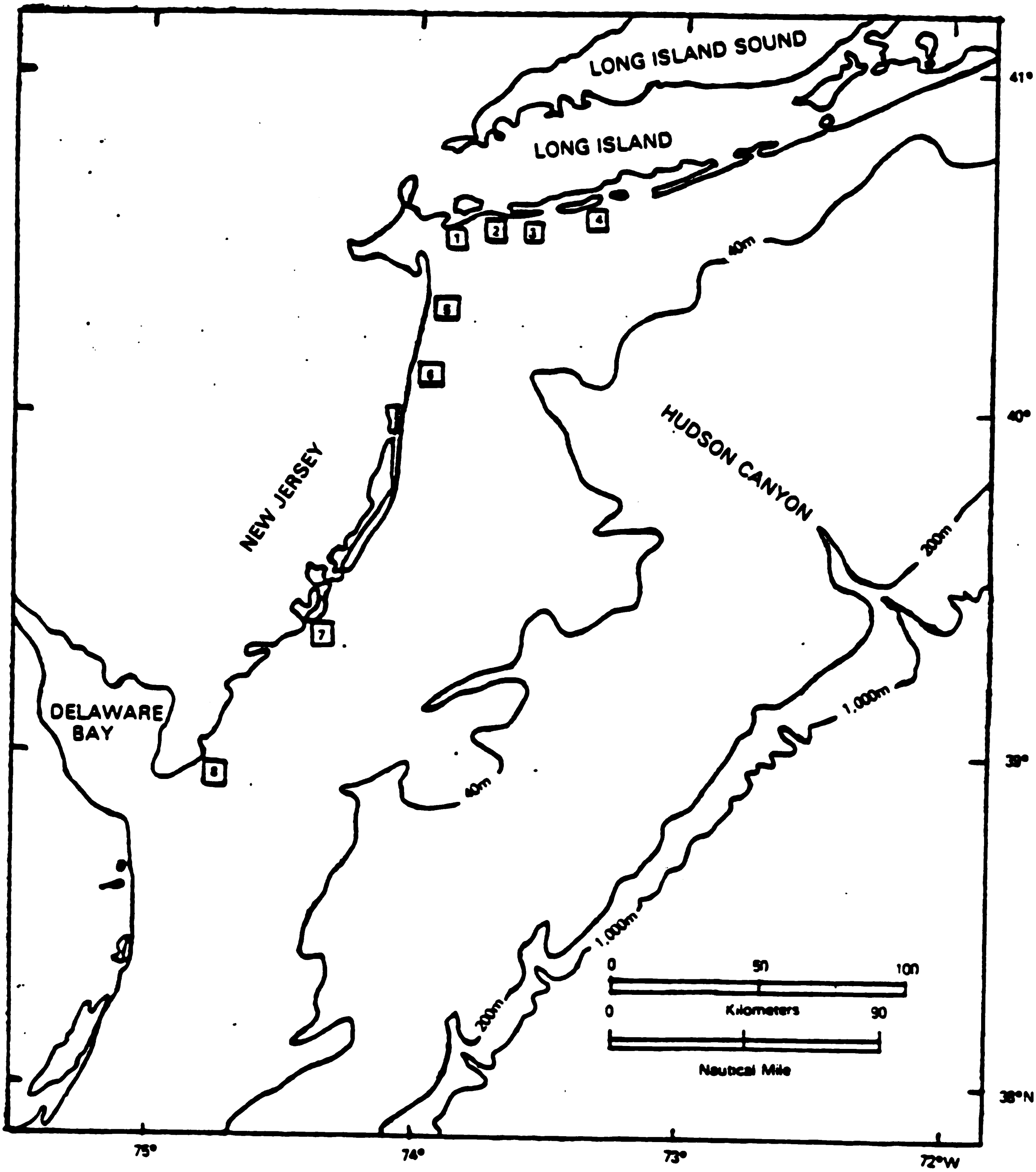
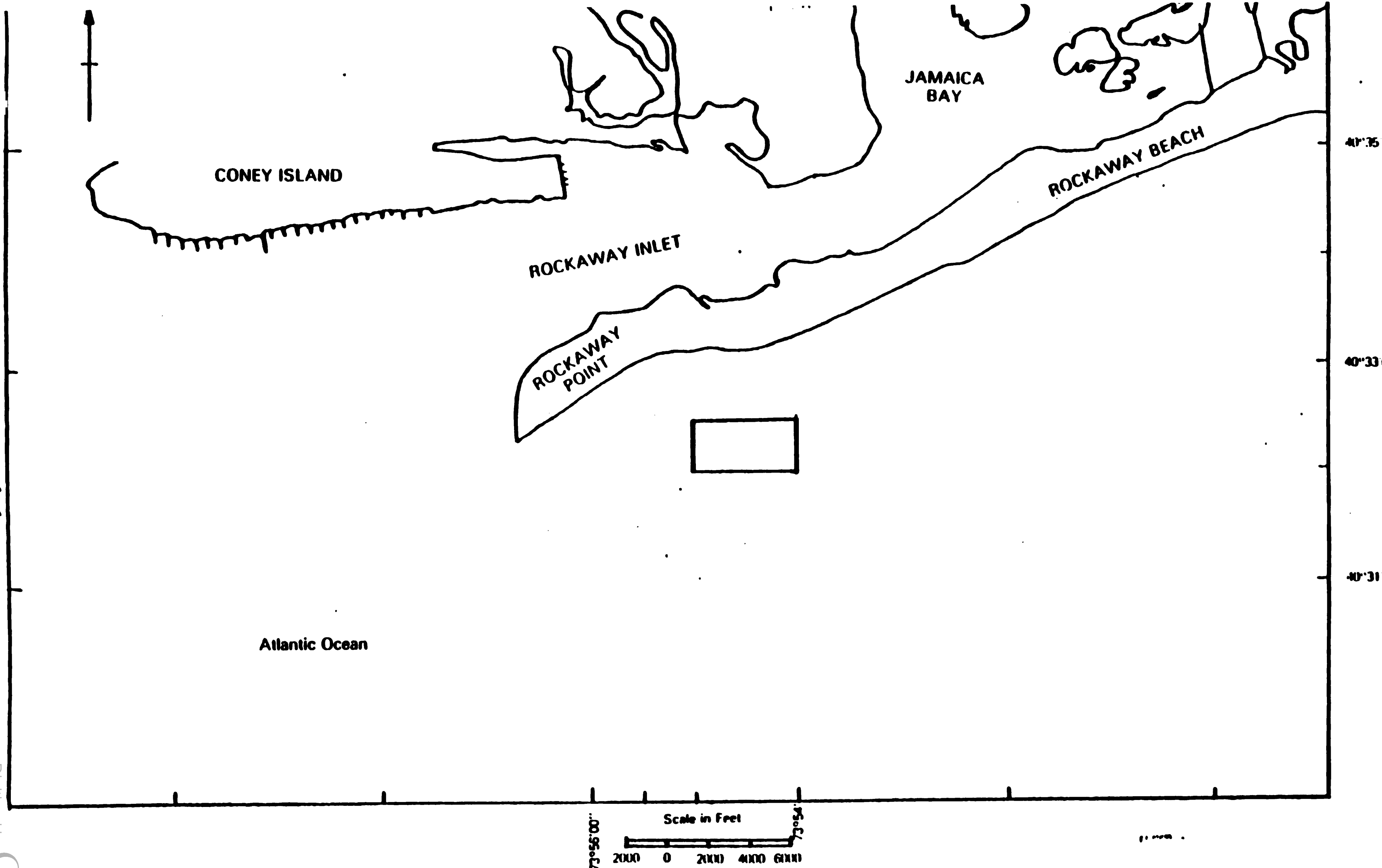


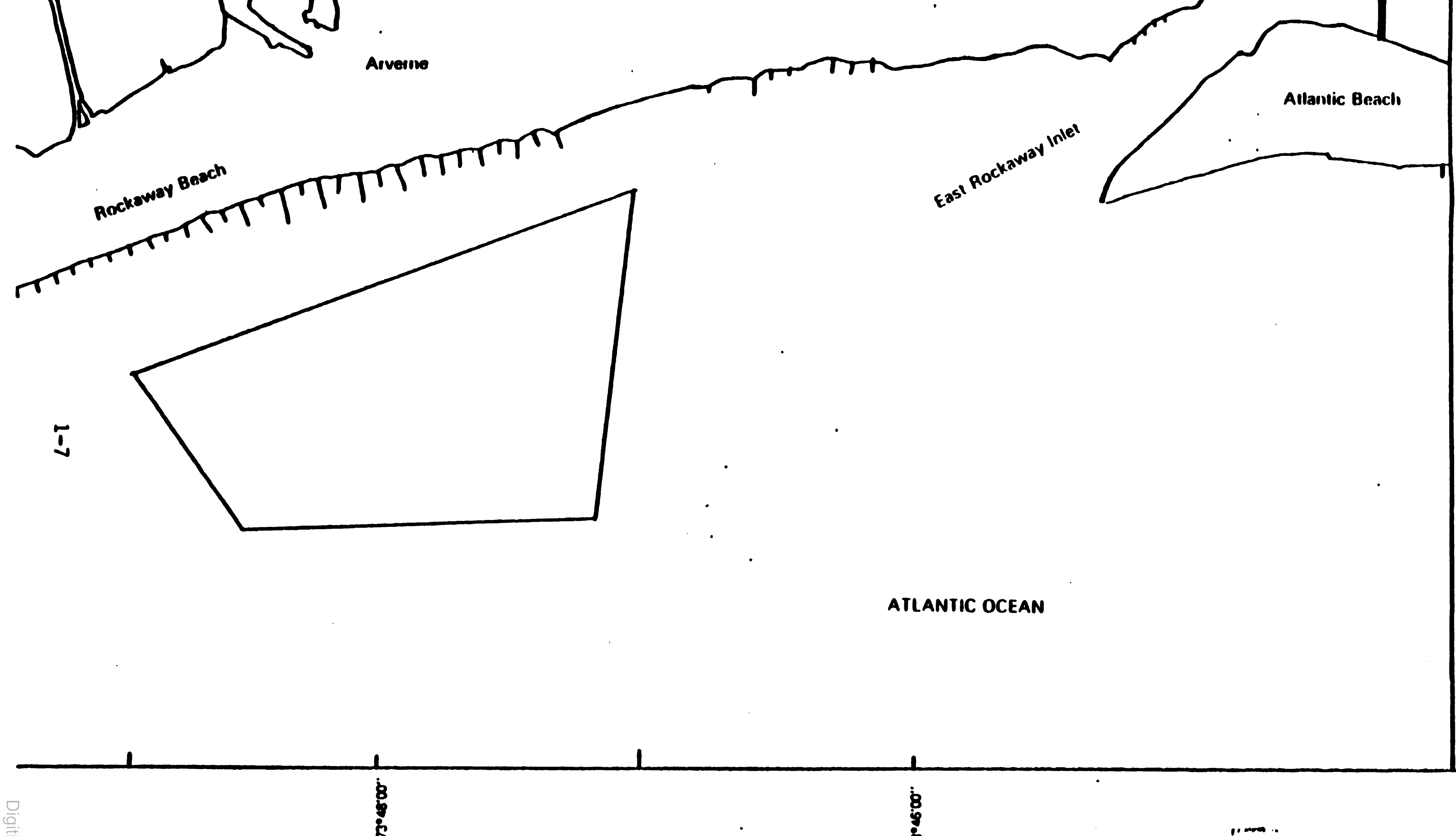
Figure 1. Location of Inlet Dredged Material Disposal Sites.

1. Rockaway Inlet
2. East Rockaway Inlet
3. Jones Inlet
4. Fire Island Inlet
5. Shark River Inlet
6. Manasquan Inlet
7. Absecon Inlet
8. Cold Spring Inlet



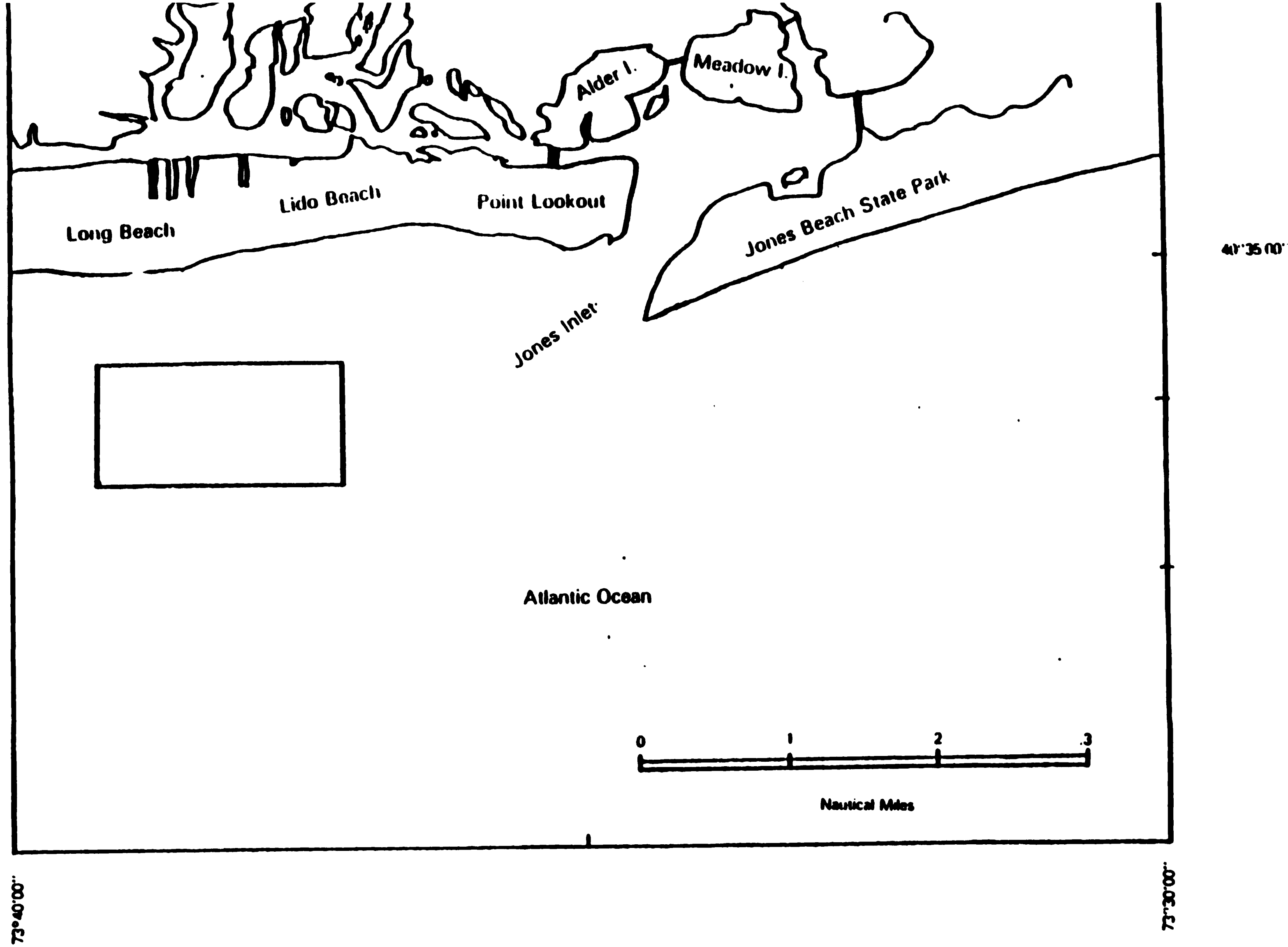
Boundary Coordinates	40°32'30"N, 73°55'00"W		Area	0.38 Square Nautical Miles
	40°32'30"N, 73°54'00"W		Water Depth	8-11 Meters
	40°32'00"N, 73°54'00"W		Distance Offshore	0.4 Nautical Miles
	40°32'00"N, 73°55'00"W		Material Type	Dredged Material
Center Coordinates	40°32'15"N, 73°54'30"W			

Figure 2. Rockaway Inlet DMDS



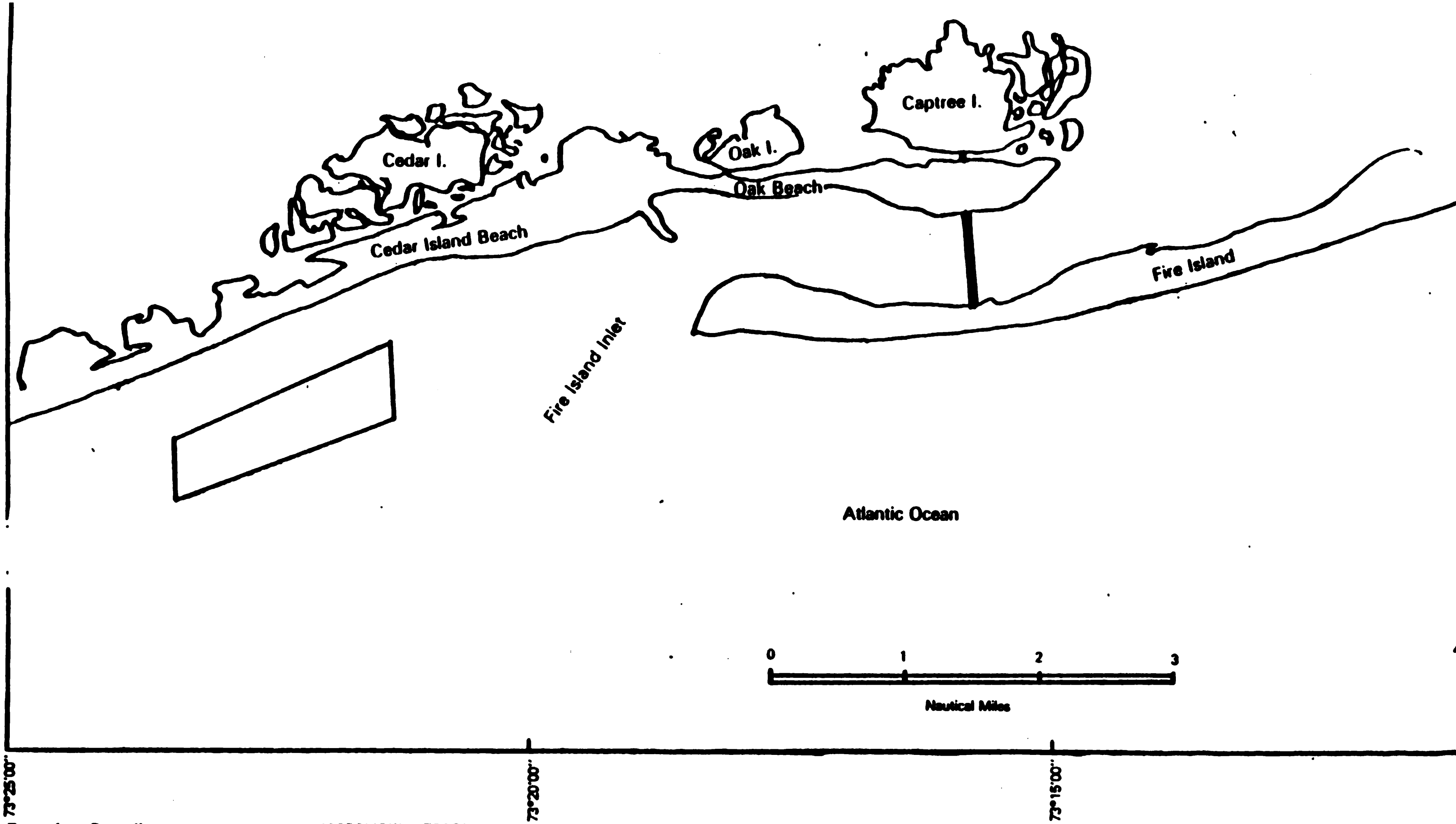
...dary Coordinates	40°34'36"N, 73°49'00"W	Area ...	0.38 Square Nautical Miles
	40°35'06"N, 73°47'06"W	Water Depth ...	6 9 Meters
	40°34'10"N, 73°48'36"W	Distance Offshore ...	0.4 Nautical Miles
	40°34'12"N, 73°47'17"W	Material Type ...	Dredged Material
...er Coordinates	40°34'38"N, 73°48'00"W		

Figure 3. East Rockaway Inlet DMDS



Boundary Coordinates	40°34'32"N, 73°39'14"W	Area	1.19 Square Nautical Miles
	40°34'32"N, 73°37'06"W	Water Depth	7-10 Meters
	40°33'48"N, 73°37'06"W	Distance Offshore	0.5 Nautical Miles
	40°33'48"N, 73°39'14"W	Material Type	Dredged Material
Center Coordinate	40°34'10"N, 73°38'10"W		

Figure 4. Jones Inlet DMDS

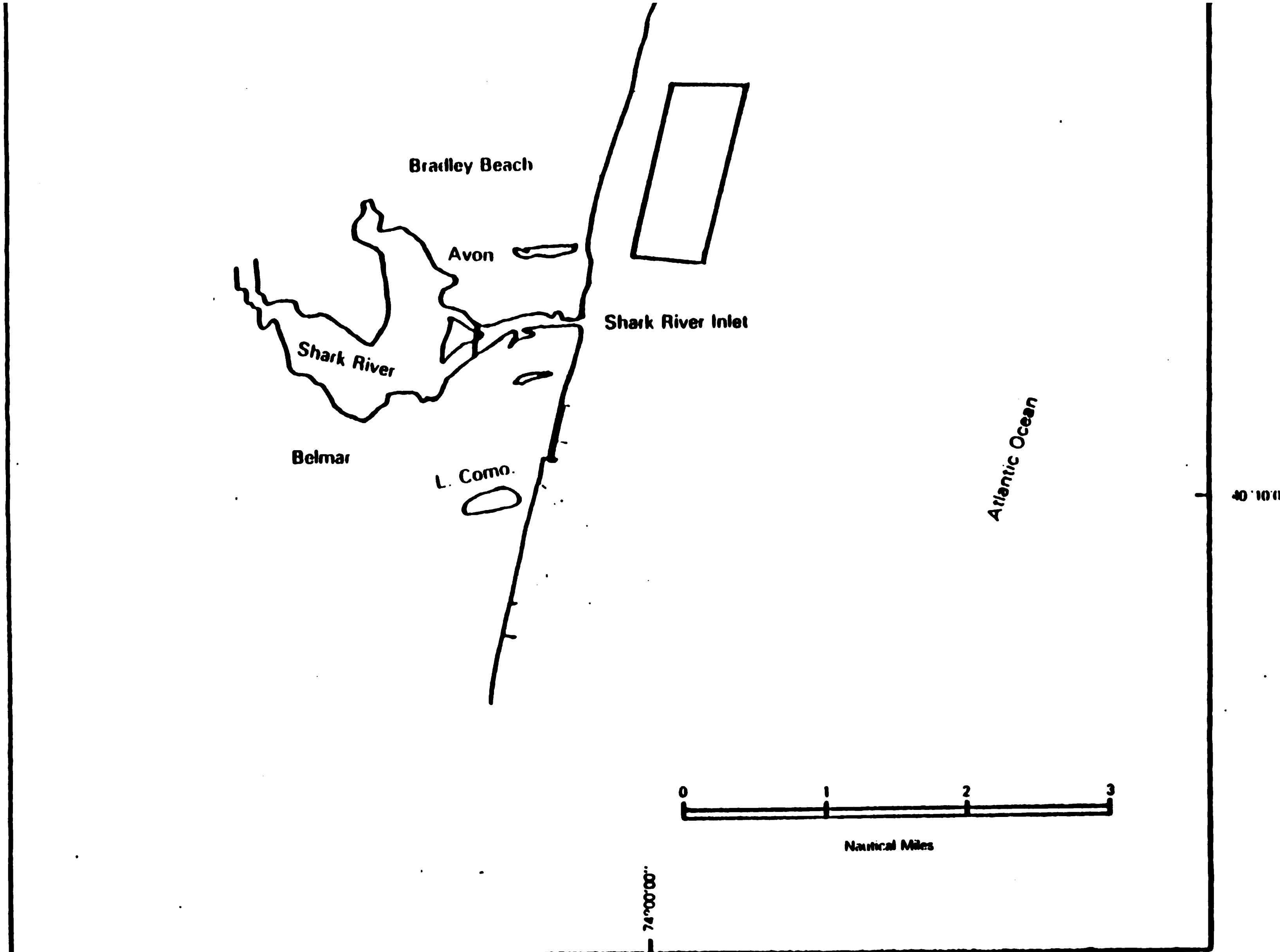


Boundary Coordinates .... 40°36'49"N, 73°23'50"W
40°37'12"N, 73°21'30"W
40°36'41"N, 73°21'20"W
40°36'10"N, 73°23'40"W

Center Coordinate .... 40°36'41"N, 73°22'35"W

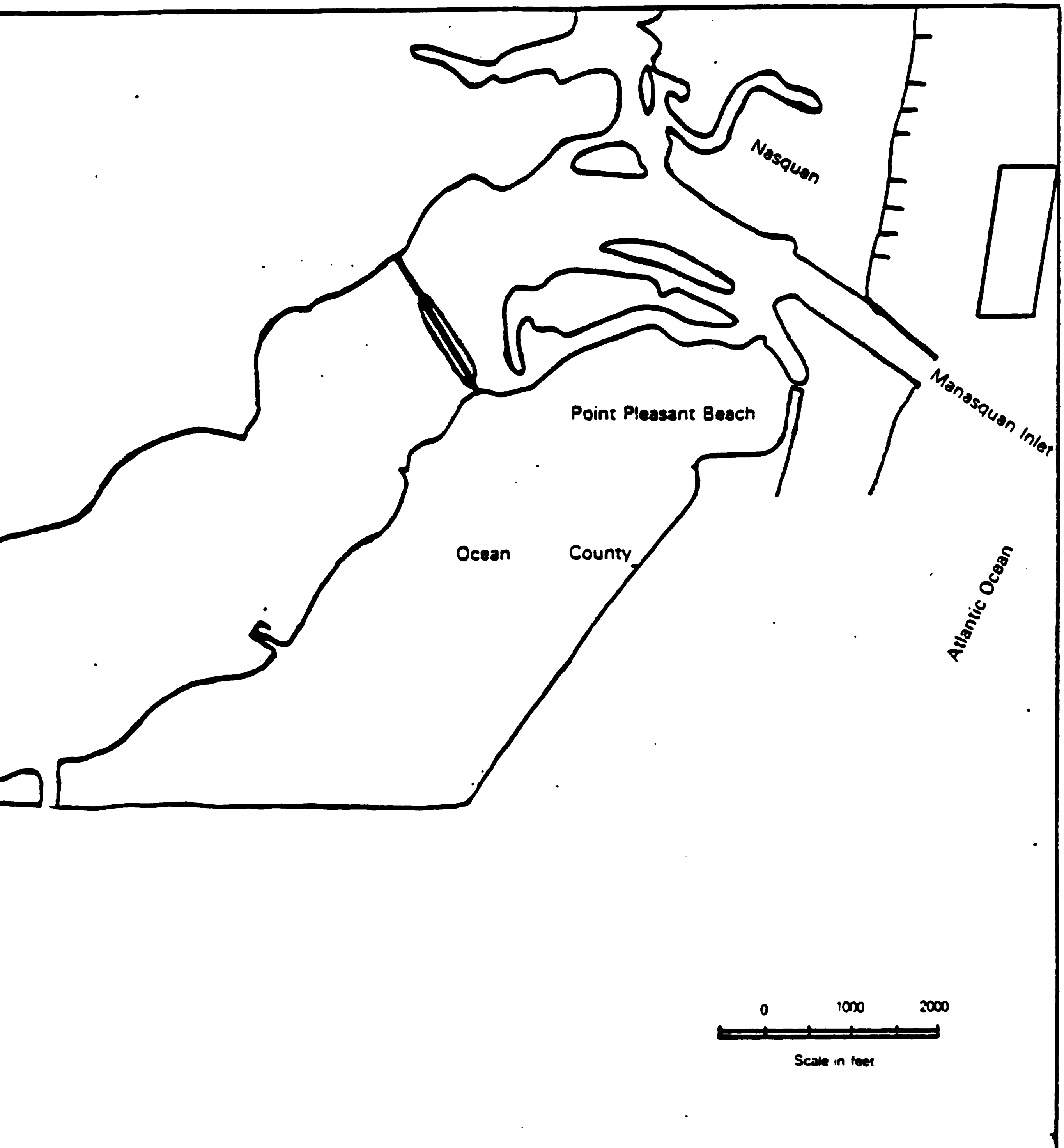
Area .... 1.09 Square Nautic
Water Depth .... 7-10 Meters
Distance Offshore .... 0.5 Nautical Miles
Material Type .... Dredged Material

Figure 5. Fire Island Inlet DMDS



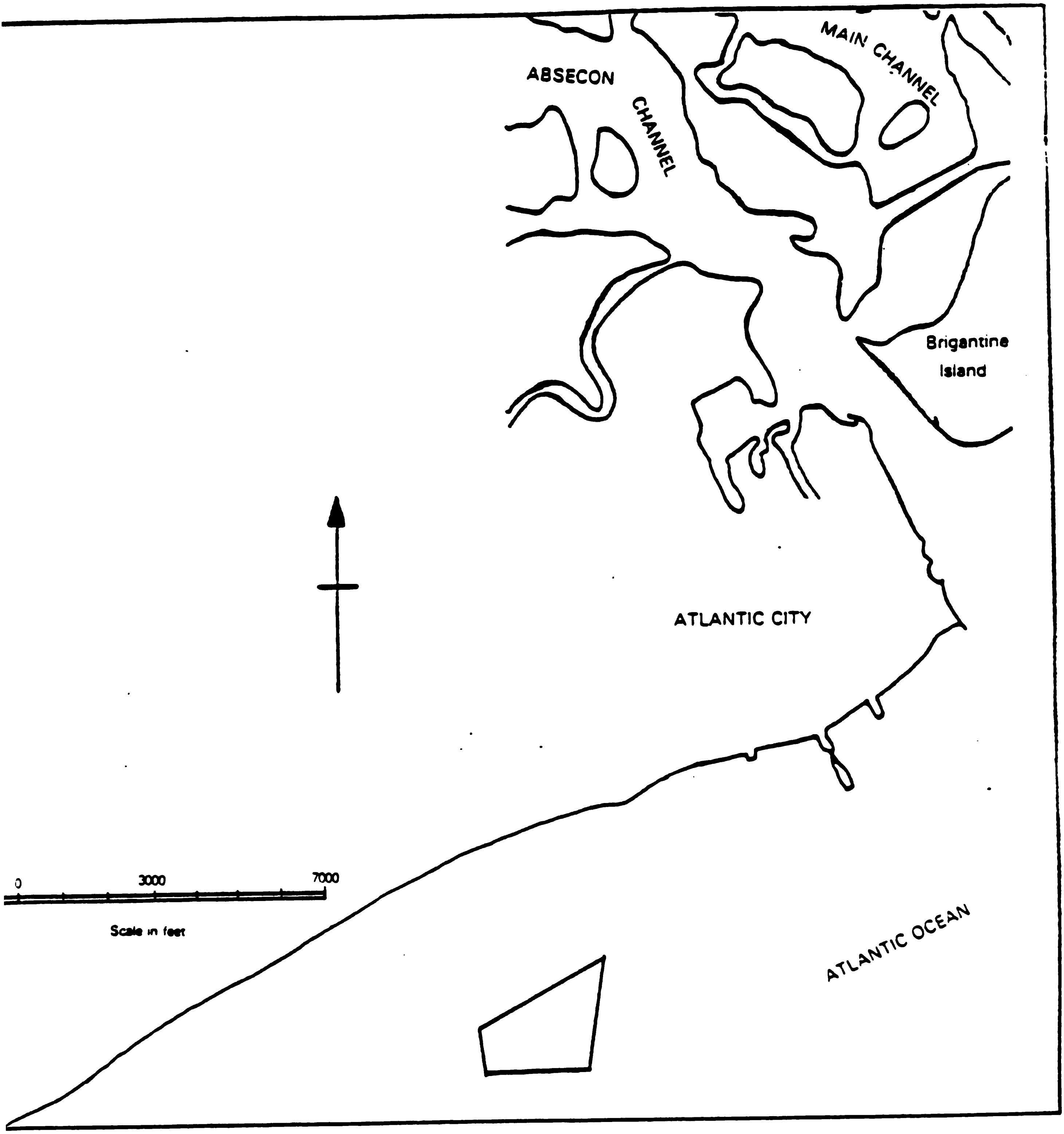
Boundary Coordinates	40°12'48"N, 73°59'45"W	Area	0.6 Square Nautical Miles
	40°12'44 N, 73°59'06"W	Water Depth	12 Meters
	40°11'36"N, 73°59'28"W	Distance Offshore	0.25 Nautical Miles
	40°11'42"N, 74°00'12"W	Material Type	Dredged Material
Center Coordinates	40°12'12"N, 73°59'39"W		

Figure 6. Shark River Inlet DMDS



...ary Coordinates	40°06'36"N, 74°01'34"W	Area	0.11 sq. nmi
	40°06'19"N, 74°01'39"W	Water Depth	18 meters
	40°06'18"N, 74°01'53"W	Distance Offshore	0.3 nmi
	40°06'41"N, 74°01'51"W	Material Type	Dredged Material
Coordinates	40°06'30"N, 74°01'33"W		

Figure 7. Manasquan Inlet DMDS



~~ary Coordinates	39°20'39"N, 74°18'43"W	Area	0.28 sq. nmi
	39°20'30"N, 74°18'25"W	Water Depth	7 meters
	39°20'03"N, 74°18'43"W	Distance Offshore	0.5 nmi
	39°20'12"N, 74°19'01"W	Material Type	Dredged Material
~ Coordinates	39°21'13"N, 74°23'47"W		

Figure 8. Absecon Inlet DMDS

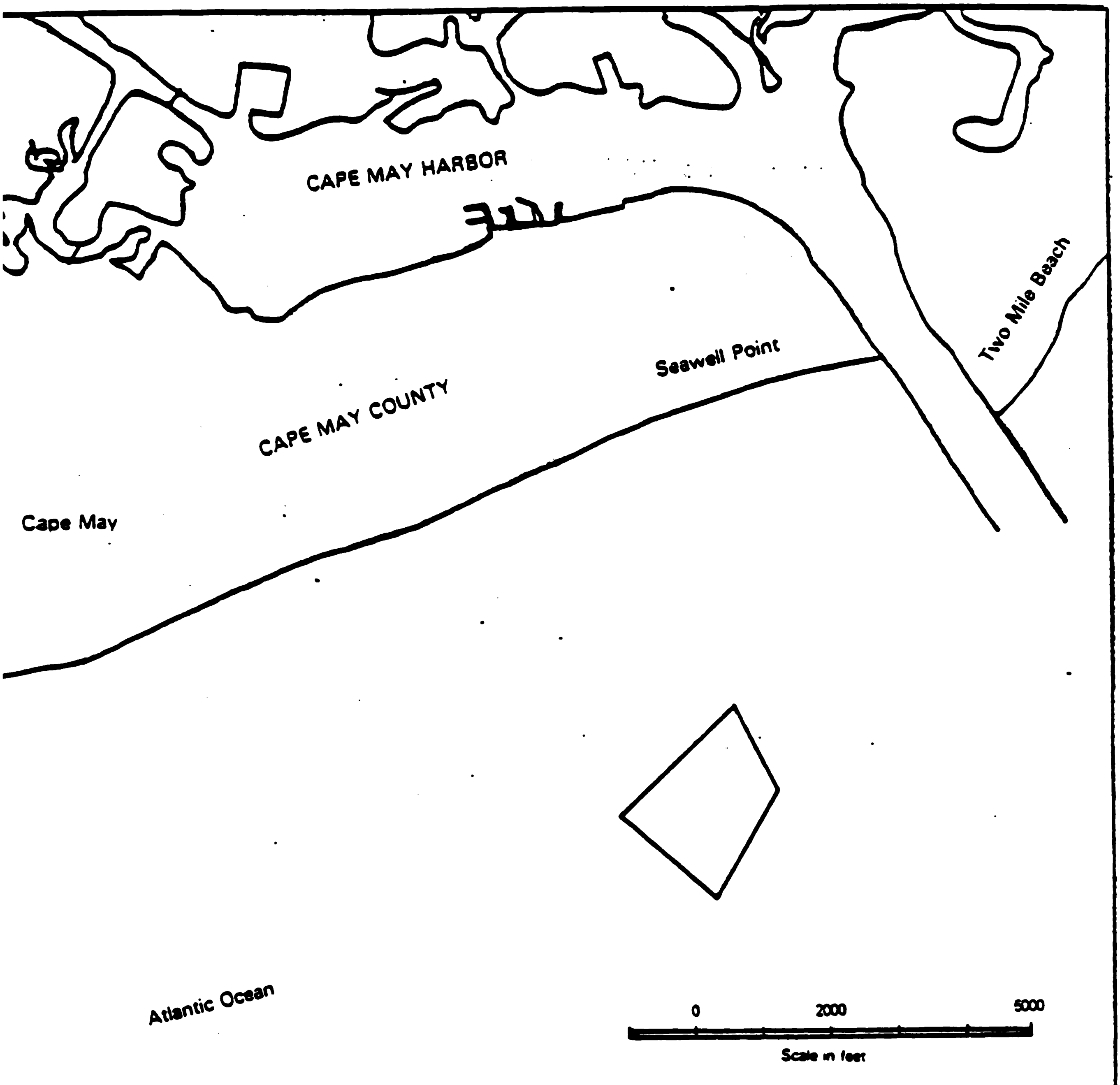


Figure 9. Cold Spring Inlet DMDS

Coordinates	38°55'52"N, 74°53'04"W	Area	0.13 sq. nmi
	38°55'37"N, 74°52'55"W	Water Depth	9 meters
	38°55'23"N, 74°53'27"W	Distance Offshore	1 nmi
	38°55'36"N, 74°53'36"W	Material Type	Dredged Material
ordinates	38°55'37"N, 74°53'14"W		

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Chapter 2

Alternatives Including The Proposed Action

2-1 Alternatives Including the Proposed Action

EPA proposes designation of the interim Long Island (East Rockaway, Rockaway, Jones, and Fire Island) IDMDSs and New Jersey (Shark River, Manasquan, Absecon, and Cold Spring) IDMDSs (Figure 2-1). Final site designation for the disposal infers only determination that the proposed sites are suitable for the disposal of dredged material only if land based alternatives are not feasible. Approval for use of the sites will be determined on a case by case basis to ensure that the proposed ocean disposal of dredged material is in compliance with the criteria and requirements of EPA and CE regulations. The alternatives considered were:

* No Action - the Long Island and New Jersey IDMDSs would retain their interim designations until their expiration on December 31, 1988, after which no nearshore EPA approved ocean disposal sites would be available for dredged material disposal.

* Proposed Action - designation of the existing Long Island and New Jersey IDMDSs.

* Alternative Action - designation of ocean sites other than the existing Long Island and New Jersey IDMDSs.

The environmental implications and effects of each alternative listed above have been analyzed from available data and are presented in this chapter.

2-2 No-Action Alternative

The No-Action alternative to the proposed action would be to refrain from designating ocean sites for the disposal of dredged material from the Long Island and New Jersey Inlets. The existing sites have interim status that are scheduled to expire on December 31, 1988.

Under the no action alternative, neither the present sites nor alternative ocean disposal site(s) would be designated. Consequently, the only ocean disposal site available to the CE would be the Mud Dump Site, the Regional dredged material disposal site in the New York Bight (Figure 2-1). The CE would be required to either: (1) select acceptable alternative disposal methods (i.e. land based), (2) develop information sufficient to designate acceptable alternate ocean sites, (3) ocean dispose of the dredged material at the Mud Dump Site, or (4) modify or cancel proposed dredging projects for which disposal of the dredged material at the inlet sites is the only feasible method of disposal. Based upon these factors, the No-Action Alternative is not considered to be an acceptable alternative to the proposed

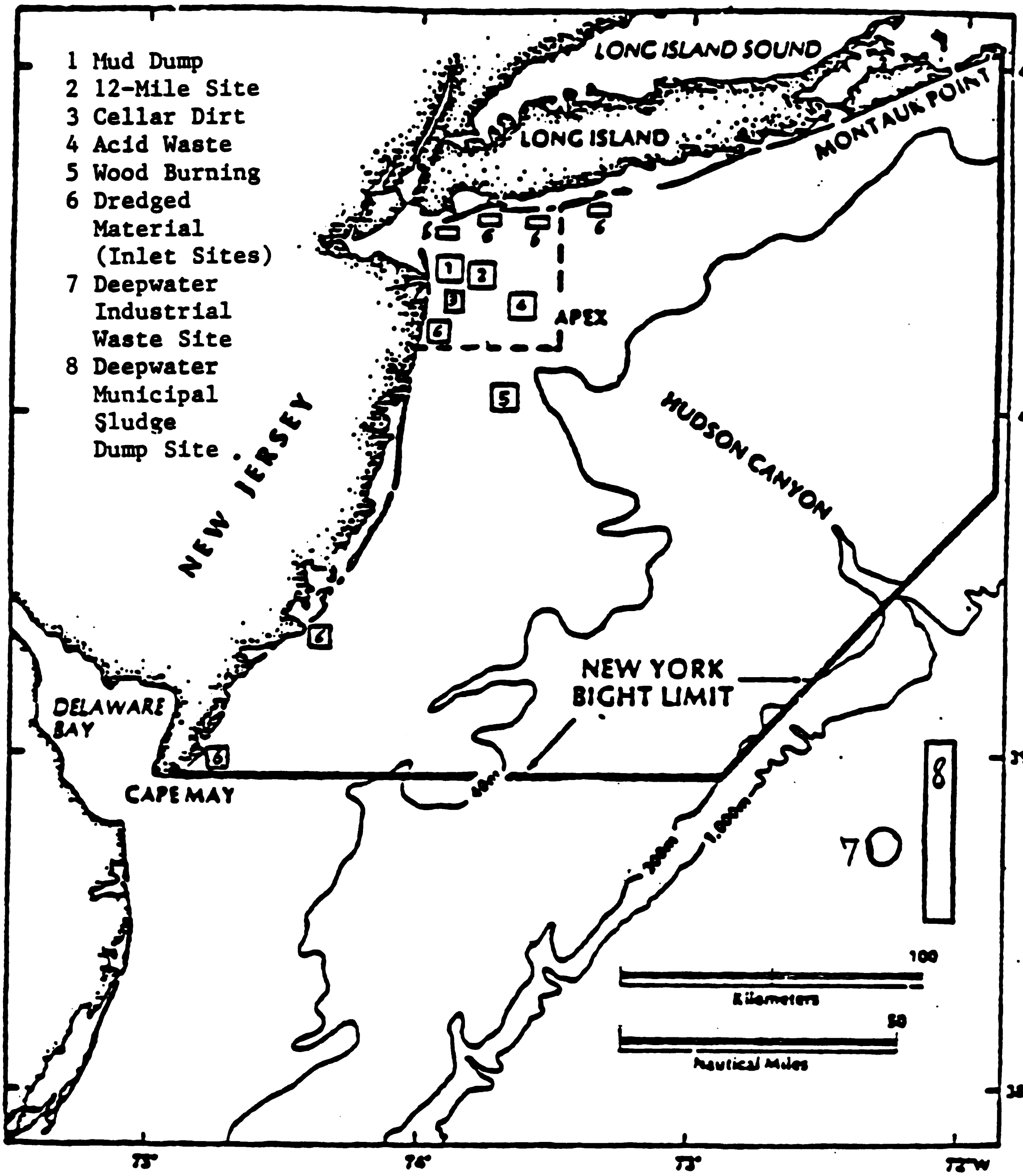


Figure 2-1. Ocean Disposal Sites in the New York Bight.

action.

2-3 Non-Ocean Disposal Alternatives

Non-ocean disposal alternatives are not evaluated or presented in this FEIS since the designation of an environmentally acceptable ocean disposal site is independent of individual project disposal requirements. Non-ocean disposal alternatives must be considered during the permitting process for non-Federal projects and during the EIS period for Federal projects. The need for and environmental acceptance of ocean disposal must be demonstrated on a case-by-case basis in order to receive an ocean disposal permit.

As part of the permitting process, land-based disposal alternatives must be evaluated by both the EPA Regional Office and the CE district, as specified in the Ocean Dumping Regulations (40 CFR Part 227). In addition, the CE, in conjunction with the EPA Regional Office, must evaluate the environmental effects associated with alternative disposal methods (i.e. ocean or land-based) for every project.

2-4 Selection of Alternative Sites

The Ocean Dumping Regulations (40 CFR 288.5) state the general criteria which must be considered in the selection of an ocean disposal site. The primary criteria are as follows:

* Dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment. Areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation will be particularly avoided.

* Locations and boundaries of disposal sites will be chosen so that temporary perturbations in water quality will be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

* Sizes of ocean disposal sites will be limited in order to localize any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse long range impacts.

* Wherever feasible, ocean dumping sites will be designated beyond the edge of the Continental Shelf.

Using these general criteria, three ocean environments off Long Island and New Jersey are considered as possible locations for ocean disposal sites: (1) nearshore (depths less than 12 m, distance up to approximately 1 nmi offshore); (2) mid-Shelf (depths between 15 m and 200 m, approximately 10 nmi to 100 nmi offshore); and (3) deepwater slope (depths greater than 200 m, approximately 100 nmi offshore).

(1) Nearshore: The nearshore existing sites are the most feasible and environmentally acceptable ocean locations for the disposal of dredged material from the Long Island and New Jersey Inlet areas. The inlet sites range 0.2 to 0.7 nmi offshore, and have been historically used for disposal of dredged material. The dredged materials are nearly identical to the natural sediments in the vicinities of the inlet sites. Only small volumes of material (less than 200,000 cy/year) are dumped at any of the sites.

The proposed IDMDSs are the most economical disposal alternatives because they are closer to the inlets than any other available ocean sites. Dumping in other areas would increase the travel time at sea.

There are no clear advantages to designating alternative nearshore disposal sites. Previous disposal of dredged material at the existing sites has not caused significant adverse impacts on human health, economics, safety, or aesthetics. In addition, disposal operations have not interfered with any long-term use of resources. After evaluating the alternatives, it is proposed that the existing sites within the nearshore environment be designated.

There are clear disadvantages to designating dredged material disposal sites in deepwater locations. One of the criteria in selecting a dredged material disposal site is its ability to contain the dredged material within the site's boundaries. Deepwater sites subjected to offshore currents that would transport the dredged material outside of the site boundaries are not as environmentally acceptable as nearshore sites that could contain the material.

(2) Mid-Shelf: In selecting a site(s) within the Bight for dredged material disposal, other activities in the area must be evaluated for possible use conflicts (mineral resources, oil and gas lease tracts, fisheries, etc.).

Adequate background environmental information on the area presently exists to provide for and to form bases for projecting possible disposal impacts. Several shelf locations in the New York Bight have been used for the disposal of wastes (i.e. dredged material, cellar dirt, sewage sludge, and industrial wastes and acids), which could be considered as potential locations for the disposal of inlet dredged material (Figure 2-1). These other locations were eliminated because of potential conflicts with site use, environmental acceptability, and high transportation costs.

The New York Bight Mud Dump Site is the most reasonable alternative location within the vicinity of New York Harbor. Many Federal projects, and virtually all private projects dispose of dredged material at the Mud Dump Site. Dumping has occurred at the Mud Dump Site since 1914. A large mound resulting from previous disposal is in the northwest quadrant of the site. The natural sediments at the site have been covered by the accumulation of dredged material. The Mud Dump Site can possibly provide an alternative site for Long Island and New Jersey dredged material. However, Section 211 of the Water Resources Development Act of 1986 mandates that the Mud Dump Site be closed to all but "acceptable dredged material" within three years of the passage of the Act (November 1989) and a new Mud Dump Site greater than 20 miles offshore must be designated.

(3) Deepwater Sites: The 106-Mile Site is an ocean disposal site in New York Harbor, beyond the Continental Shelf. Designation of a site for dredged material disposal in that area would require extensive predisposal and monitoring surveys, as well as substantially increase costs associated with disposal.

2-4.1 Detailed Basis For the Selection of the Sites

Part 228 of the Ocean Dumping Regulations describes general and specific criteria for the selection of ocean disposal sites. The general criteria state that site locations will be chosen "to minimize the interference of disposal activities with other activities in the marine environment" so that "temporary perturbations in water quality or other environmental conditions during initial mixing...can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effect before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery." In addition, ocean disposal site sizes "will be limited in order to localize for identification and control of any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts". Finally, whenever feasible, EPA will "designate ocean dumping sites beyond the edge of the Continental Shelf and other such sites that have been historically used".

This proposed designation is based on site evaluation using the 11 specific criteria listed in Section 228.6(a) of the Ocean Dumping Regulations. EPA established these 11 criteria to constitute "...an environmental assessment of the impact of the site for disposal" (Table 2-1). The criteria are used to make critical comparisons between the alternative sites, and using information found in Chapters 3 and 4 of this EIS, were the basis for final site selection. The interim sites and the Mud Dump Site were considered within the context of the 11 site selection

TABLE 2-1

SECTION 228.6 (a) OF THE OCEAN DUMPING REGULATIONS, 11 CRITERIA

1) Geological Position, Depth of Water, Bottom Topography and Distance from Coast.

2) Location in Relation to Breeding, Spawning, Nursery Feeding, or Passage Areas of Living Resources in Adult or Juvenile Phases.

3) Location in Relation to Beaches and Other Amenity Areas.

4) Types and Quanities of Wastes Proposed to be Disposed of, and Proposed Methods of Release Including Methods of Packing the Waste, if Any.

5) Feasibility of Surveillance and Monitoring.

6) Dispersal, Horizontal Transport and Vertical Mixing Characteristics of the Area Including Prevailing Current Direction and Velocity, if Any.

7) Existence and Effects of Current and Previous Discharges and Dumping in the Area (Including Cumulative Effects).

8) Interference with Shipping, Fishing, Recreation, Mineral Extraction, Desalination, Fish and Shellfish Culture, Areas of Special Scientific Importance and Other Legitimate Uses of the Ocean.

9) The Existing Water Quality and Ecology of the Site as Determined by Available Data or by Trend Assessment of Baseline Surveys.

10) Potential for the Development or Recruitment of Nuisance Species in the Disposal Site.

11) Existence at or in Close Proximity to the Site of any Significant Natural or Cultural Features of Historical Importance.

criteria.

2-5 Detailed Consideration of the Alternative Sites

2-5.1 Geographical Position, Depth of Water, Bottom Topography and Distance From Coast [40 CFR Section 228.6(a)(1)]

Table 2-2 summarizes the geographic and physical characteristics for the alternative existing sites and the Mud Dump Site. Bottom topography at the existing sites is dominated by sand ridges and swales. Accumulations of dredged material at the Mud Dump has altered the natural bottom topography.

TABLE 2-2

NEW YORK BIGHT DREDEGED MATERIAL DISPOSAL SITES

LONG ISLAND INLET DREDGED MATERIAL DISPOSAL SITES

Site	Boundary Coordinates and Area	Water Depth (m)	Distance Offshore (nmi)	Bottom Topography
Rockaway	40°32'30"N, 73°55'00"W 40°32'30"N, 73°54'00"W 40°32'00"N, 73°54'00"W 40°32'00"N, 73°55'00"W 0.81 nmi^2	8-11	0.4	Ridge & Swale
East Rockaway	40°34'36"N, 73°49'00"W 40°35'06"N, 73°47"06"W 40°34'10"N, 73°48'36"W 40°34'12"N, 73°47'17"W 0.81 nmi^2	6-9	0.4	Ridge & Swale
Jones	40°34'32"N, 73°39'14"W 40°34'32"N, 73°37'06"W 40°33'48"N, 73°37'06"W 40°33'48"N, 73°39'14"W 1.19 nmi^2	7-10	0.5	Ridge & Swale
Fire Island	40°36'49"N, 73°23'50"W 40°37'12"N, 73°21'30"W 40°36'41"N, 73°21'20"W 40°36'10"N, 73°23'40"W 1.09 nmi^2	7-10	0.5	Ridge & Swale

Table 2-2 (cont'd) NEW JERSEY INLET DREDGED MATERIAL DISPOSAL SITES

Site	Boundary Coordinates and Area	Water Depth (m)	Distance Offshore (nmi)	Bottom Topography
Shark River	40°12'48"N, 73°59'45"W 40°12'44"N, 73°59'06"W 40°11'36"N, 73°59'28"W 40°11'42"N, 74°00'12"W 0.6 nmi^2	12	0.25	Ridge & Swale
Manasquan	40°06'36"N, 74°01'34"W 40°06'19"N, 74°01'39"W 40°06'18"N, 74°01'53"W 40°06'41"N, 74°01'51"W 0.11 nmi^2	18	0.5	Ridge & Swale
Absecon	39°20'39"N, 74°18'43"W 39°20'30"N, 74°18'25"W 39°20'03"N, 74°18'43"W 39°20'12"N, 74°19'01"W 0.28 nmi^2	7	0.5	Ridge & Swale
Cold Spring	38°55'52"N, 74°53'04"W 38°55'37"N, 74°52'55"W 38°55'23"N, 74°53'27"W 38°55'36"N, 74°53'36"W 0.13 nmi^2	9	1.0	Ridge & Swale
	MID - SHELF ALTERNATIVE			
Mud Dump	40°23'48"N, 73°51'28"W 40°21'48"N, 73°50'00"W 40°21'48"N, 73°51'28"W 40°23'48"N, 73°50'00"W	16-29	5.3 (NJ) 9 6 (LI)	Accumulated Dredged Material

2-5.2 Location in Relation to Breeding, Spawning, Nursery, Feeding or Passage Areas of Living Resources in Adult or Juvenile Phases

All of the above activities occur throughout the coastal areas of the Bight. The existing sites are not known to be uniquely important for any species. The existing sites are located near inlets (<2 nmi) that serve as passageways for finfish which use the estuaries and bays for spawning and nursery grounds. The inland waters also provide resting and feeding areas for migratory birds. Shellfish are distributed along both the Long Island and New Jersey coastlines. However, Rockaway, East Rockaway, Shark River, Manasquan, and Cold Spring IDMDSs are all located within Federal and/or State shellfish closure areas (Figure 2-2). These closed areas still represent a valuable resource. Due to this and other resources in the vicinity of the dredging and disposal sites, seasonal constraints (dredging windows) will be placed on all projects through permit reviews. This condition will avoid disposal of dredged material during and immediately following spawning season. The survival of the spat will not be adversely affected by disposal operations. The adverse effects due to the disposal of dredged material would be low if the IDMDS were designated, due to the clean nature of the material and the placement of seasonal constraints on the dredging and disposal to prevent impacts on resources in the area.

The Mud Dump Site is not known to be uniquely important for any species in the adult or juvenile life stages. The Hudson Shelf Valley may be an important passage area for lobster and finfish entering the Apex from offshore, and the Mud Dump Site is located on the western edge of the Valley. The probability of adverse effects of dredged material disposal at the Mud Dump Site is low. The Mud Dump also is within the present shellfish closure zone.

2-5.3 Location in Relation to Beaches and Other Amenity Areas

All existing sites are located close to shore (<1 nmi). The inlets and nearby beaches provide important recreational areas and many tourists utilize these areas during the summer months. However, the disposal of dredged material at these sites should not adversely affect the shorelines, public health, or aesthetics. The material dredged from the inlet is similar in composition to the sediment at the disposal site, and the New York and Philadelphia CE Districts schedule their dredging projects during periods of low recreational activity (September to January) so as not to interfere with recreational activities.

The Mud Dump Site is located 5.3 nmi offshore New Jersey and 9.6 nmi offshore Long Island. Virtually all dredged material settles to the bottom near the release point and studies have indicated that any material released at the Mud Dump Site does not adversely affect beaches or other amenity areas (EPA, 1982).

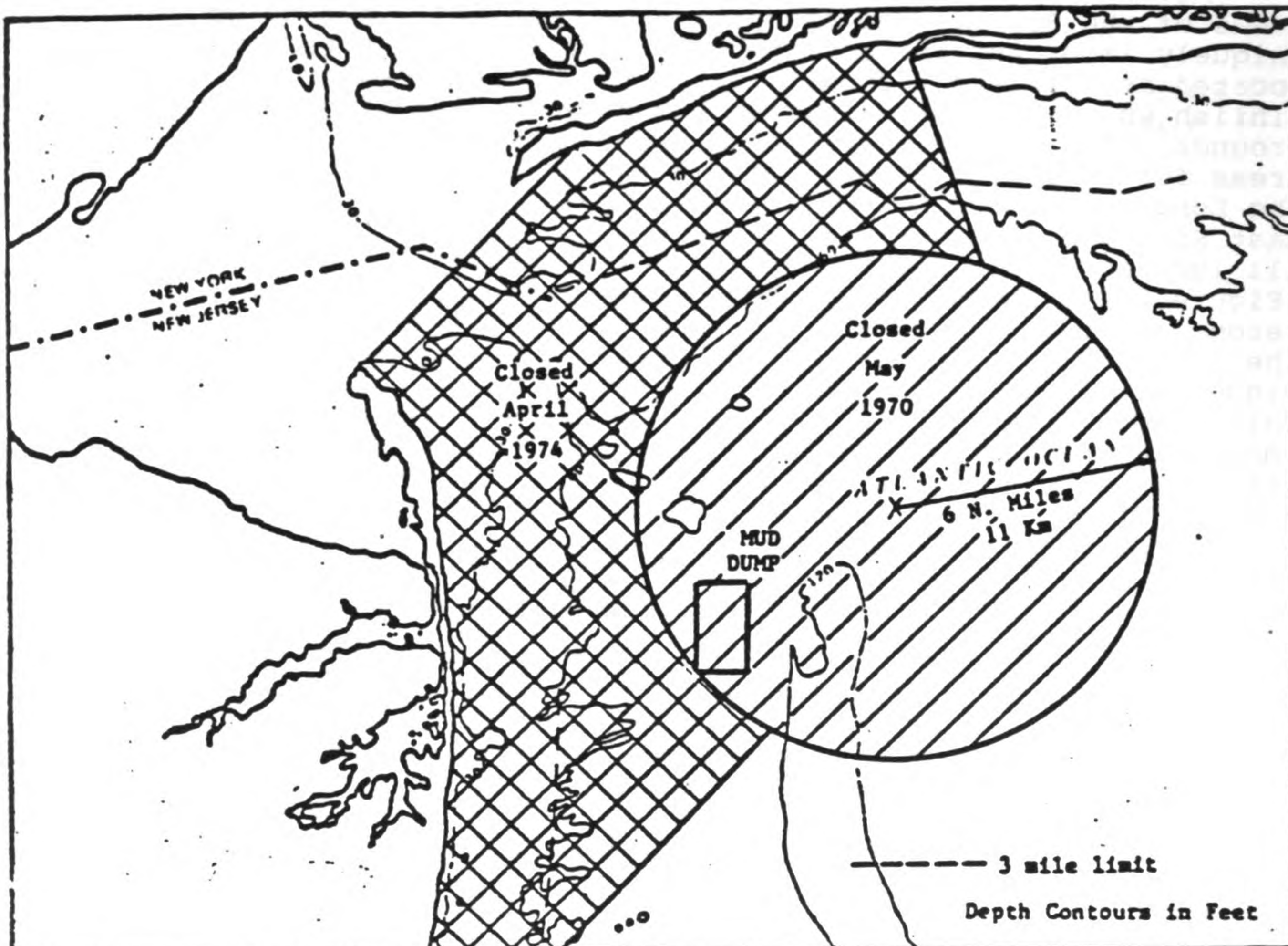


Figure 2-2. Commercial Shellfish Closure Zone

Source: Mitre, 1979

2-5.4 Types and Quantities of Wastes Proposed to be Disposed of, and Proposed Methods of Release, Including Methods of Packing the Waste, if Any

In the past, the interim sites have received variable quantities of dredged materials, ranging from 200,000 cy/50 years (Rockaway) to 200,000 cy/year (Absecon) (Table 2-3). Sediments dredged from the inlets are predominantly sand and there have been no indications of significant adverse effects resulting from dumping at any of the interim sites.

Dredging and disposal methods vary for the different inlets (Table 2-3). Dredging operations at the Rockaway and East Rockaway Inlets generally involve the use of a hopper dredge for inlet maintenance projects. Shark River and Fire Island Inlets are generally dredged via a hydraulic pipeline to dispose of sediments on the beach; however, if an ocean disposal site is used in the future, dredging and disposal would probably be conducted by a hopper dredge. Disposal methods for Jones, Manasquan, Absecon and Cold Spring Inlets vary because equipment used to dredge the inlets is determined by private contractor.

At the Mud Dump Site, all dredged material would be transported by dump scow or hopper dredge. Each load would be dumped over a period of a few minutes and none of the material would be containerized or packaged in any way.

If material is suitable for beach nourishment, EPA would recommend this alternative over ocean dumping at all eight of the sites. However, the dredged material must be relatively clean and coarse textured (generally greater than 80% sand).

2-5.5 Feasibility for Surveillance and Monitoring

Surveillance is feasible at each of the proposed sites because of their limited distance from shore. The Mud Dump Site is located 5.3 and 9.6 nmi offshore from New Jersey and Long Island respectively. The interim sites are located less than 1 nmi from the shorelines. Surveillance of all of the proposed and alternative sites can easily be accomplished by patrol boat, aircraft, shiprider, or by remote observation such as radar or satellite. The Coast Guard routinely conducts surveillance at the dredged material disposal sites while EPA, the CE, NOAA, and others have conducted extensive monitoring/research activities at and near the sites (CE, 1987).

2-5.6 Dispersal, Horizontal Transport, and Vertical Mixing Characteristics of the Area, Including Prevailing Currents, Direction and Velocity, if Any

Circulation patterns in the New York Bight are variable, and are the result of wind, geology, and the structure of the New York and New Jersey coastlines (CE, 1983). Generally, nearshore currents flow southwest and onshore. McClennen and Cramer (1976) reported that normal bottom tidal currents average 10 cm/s. Wind

Types and Quantities of Wastes Proposed

Site	Description of Dredged Material	Approximate Dredge Volumes (yd^3)	Frequency of Dredging	Method of Release*
Long Island Inlets				
Rockaway	96% sand	200,000	over a 50 year period	from hopper dredge
East Rockaway	98% sand	100,000	annual	from hopper dredge
Jones	99% sand	175,000	annual	variable **
Fire Island	99% sand	1.5 million	annual	pumped onto beach from hydraulic pipeline
New Jersey Inlets				
Shark River	88-96% sand	42,000	every 5 years	pumped onto beach from hydraulic pipeline
Manasquan	at least 80% sand	35,000	annual	variable **
Absecon	at least 80% sand	60,000	annual	variable **
Cold Spring	sand, percentage unknown	11,000	annual	variable **

* Usual method reported by CE; dredged material is not packed

** Equipment used for dredging is determined by contractor, therefore method of release may vary

Table 2-3

driven currents in the Bight indicate a net surface flow to the southwest at speeds averaging about 4 or 5 cm/s, but are subject to reversals, especially during the summer (Hansen, 1977).

At each of the alternative sites, long-term sediment transport would be episodic and dominated by storms. Butman et al., (1979) reported that currents associated with storm conditions (primarily in winter) resuspend and transport bottom sediments in a southwest direction on the mid-Atlantic Shelf. The NYD-CE has stated that disposal of dredged material at the interim sites, should aid in the control of beach erosion. The majority of the sediment should be transported inshore towards the beaches (CE, 1973 and 1974b). In general, transport of suspended solids from dredged material disposal should depend primarily upon the speed and direction of the wind and upon the direction of tidal currents.

2-5.7 Existence and Effects of Current and Previous Discharges and Dumping in the Area (Including Cumulative Effects)

The environmental effects of dredged material disposal are dependent upon the characteristics of the dredged material and the environmental conditions at the disposal sites. Short-term impacts include temporary increases in turbidity, burial of benthic organisms and the possible alteration of existing habitats (CE, 1983). At disposal sites studied in the Dredged Material Research Program (DMRP) between 1973 and 1978, it was demonstrated that the effects on physical, chemical, and biological variables in the water column as a result of disposal operations were negligible (Conner, W.G., Aurand, D., et al., 1979).

Other impacts may include depletion of dissolved oxygen, elevated ammonia concentrations, increases or decreases in phytoplankton productivity, and direct physical effects on fish (NJDEP, 1981). However, Wright (1978) stressed that the effects are site specific and that no evidence has been found to demonstrate significant impacts beyond the disposal areas, except in cases of movement of the dredged material by bottom currents.

Dredged material disposal has produced no significant adverse effects on water quality at the existing sites. EPA survey data, collected in 1979, did not indicate any trends attributable to previous or current disposal of dredged material. No major differences in finfish and shellfish species or numbers were found in EPA surveys within or adjacent to the existing sites (Appendix C).

Past use of the existing sites has created temporary disturbances of benthic infauna and demersal fish assemblages (Chapter 3, EPA survey). The natural variability of benthic communities within the nearshore region may obscure the identification of impacts due to past use of the existing sites. However, no adverse impacts from previous disposal operations have been identified.

The Mud Dump Site has been used for dredged material disposal operations since 1914. From June 1980 to August 1981 dumping was directed to the southeast quadrant (Experimental Mud Dump Site). All dredged material disposed of subsequent to 1981 has been in the northeast quadrant. The site itself is nearly devoid of benthic infauna, probably due to repeated dumping. Outside the site boundaries, the distribution of numerically dominant organisms is apparently unaffected by disposal activities. Seasonal data shows no trends associated with dumping, and sedimentary characteristics appear to be the dominant factor controlling the benthos.

2-5.8 Interference with Shipping, Fishing, Recreation, Mineral Extraction, Desalination, Fish and Shellfish Culture, Areas of Special Scientific Importance and Other Legitimate Uses of the Ocean

The eight inlets accomodate light shipping traffic. Because of the proximity of the existing sites to the inlets, some traffic undoubtedly passes through the sites. However, all of the existing sites are located inshore of the major shipping lanes, with the exception of Rockaway IDMDS and the Mud Dump Site which are located within a precautionary zone. Due to its location, disposal operations at the Mud Dump Site would have the highest probability of interferring with shipping traffic. However, barges have been traveling to the site for nearly 70 years without any reported navigational problems (EPA, 1982).

A number of important commercial or recreational fisheries exist in Long Island and New Jersey inshore waters. A total of about 125 species of finfish have been reported from the estuarine marine waters of Long Island and New Jersey. Many species utilize primarily offshore areas as adults but inshore waters when they are young. A number of species are important food sources. However, none of the disposal sites represent unique fishery areas. Past use of the nearshore existing sites for the disposal of dredged material has not resulted in known adverse impacts on fishing or shellfishing. Furthermore, the placement of seasonal constraints on the dredging and disposal operations should prevent the disposal operations from impacting the sites and surrounding areas during critical periods.

Many of the areas adjacent to the inlets are condemned for the taking of oysters, clams, and mussels because of bacterial contamination. Shellfishing is presently restricted at the following disposal sites: Rockaway, East Rockaway, Shark River, Manasquan, Cold Spring, and the Mud Dump disposal sites. Seasonal constraints placed on disposal at the proposed sites will reduce any impact of disposal on the shellfishery.

The creation of temporary turbidity within the disposal areas may have a short-term impact on local marine biota. Benthic organisms would be buried and community structure would be changed as their original habitat conditions were disturbed.

Recreational use of the New York Bight waters near the existing sites consists primarily of boating and sport fishing. The sport fishermen may discover a temporary absence of fish at the disposal area during disposal operations, but this would not be a permanent impact. Because of the high frequency of recreational use of the beaches and boating near the proposed sites, seasonal constraints (dredging windows) would be established for all of the sites.

Because the high sand content of the dredged material should minimize resuspension and turbidity, the public beaches should not be disrupted by the proximity of the disposal sites. No significant impact on aesthetics should occur. Although disposal operations might possibly increase the noise level to the surrounding areas, the proximity of residential communities and the time of operation are such that this disturbance should be minimal.

No mineral extraction, fish culture, shellfish culture, or desalination activities would be impacted by disposal operations at the sites.

Due to the small size of the disposal areas in relation to the New York Bight, there are no unique resources of special scientific importance in the disposal area

2-5.9 Existing Water Quality and Ecology of the Sites as Determined by Available Data or by Trend Assessment or Baseline Surveys

Environmental surveys conducted by EPA have indicated that the disposal of dredged material at the interim sites has not caused significant adverse effects on water quality (i.e. nutrients, trace metals, dissolved oxygen, or pH). Effects on plankton in the area are difficult to assess because of the high natural variability in their populations. Since no significant release of nutrients or trace metals accompanies the disposal of dredged material, no detectable effects upon phytoplankton are expected. Similarly, no adverse effects upon anadromous or pelagic finfish are expected. Water quality is similar to conditions reported in the literature for the New York Bight (EPA, 1982). Dredging windows placed on each project would ensure that disposal operations would not occur during periods of depressed water quality or during periods of finfish migration.

Some temporary changes in the water quality would occur as a result of disposal operations at the sites. Resuspension of sediment subsequent to the disturbance of bottom deposits would be inevitable; however, the resulting increase in turbidity and concomitant water discoloration would depend upon the nature of the suspended material and would be temporary.

EPA data indicate that the organisms present at the disposal areas are not unique to the disposal sites, but are found throughout the area. While macrobenthic losses are expected to occur within the sites, it is anticipated that a similar benthic community would re-establish itself. Benthic organisms would be affected by turbidity and sedimentation during disposal operations. As the sediments settle, benthic habitats could be blanketed, resulting in the temporary smothering of sessile, benthic organisms. Highly motile invertebrates would move to avoid these disturbances and return after the operations had ceased. Increase in turbidity may cause a decrease in the zone of light penetration, leading to a reduction in the primary productivity in the area. This reduction could affect the entire food web because less food is produced at the primary level. However, seasonal constraints on the disposal operations would avoid periods of high biological activity.

The Mud Dump Site has been extensively modified by previous disposal activities. Benthic density is low, probably resulting from repeated burial. Levels of some contaminants (e.g. metals) are higher than in the surrounding areas.

Differences of opinion exist regarding the sources of contaminants, and the extent of contaminant levels in the Hudson Raritan Estuary plume area. Although benthic areas are stressed, the fauna shows high spatial and temporal variability primarily controlled by natural processes (Pearce et al., 1976). For example, the 1976 oxygen depletion event did not result from ocean dumping but from natural physical and biological processes (Folkowski et al., 1980). However, others maintain that the levels of cadmium, PCBs, and aromatic hydrocarbons are approaching or exceeding safe levels (EPA, 1982).

2-5.10 Potential for the Development or Recruitment of Nuisance Species at the Disposal Site

There are no known components in the dredged material or consequences of its disposal which would attract or result in the recruitment of nuisance species to any of the alternative disposal sites. EPA surveys at the sites did not detect the development or recruitment of any nuisance species as a result of previous dredging operations.

2-5.11 Existence at or in Close Proximity to the Site of any Significant Natural or Cultural Features of Historical Importance

The areas to be utilized for the dredged material disposal sites range from 0.2 to 0.7 nmi from the shore line. The potential for the discovery of cultural resources in these locations must be considered in relation to two major time periods.

Prehistoric

Early man in eastern North America probably utilized the area of the now submerged Continental Shelf. The presence of land archaeological sites along the Atlantic coast, commencing approximately 12,000 years ago, and the broad utilization of marine and land species by the occupants, suggests that the lower sea levels of the early post-pleistocene period probably provided hospitable environments that are now submerged areas. The documentation of shell and peat deposits (BLM, 1976) along with the discovery of now extinct mammoth and remains suggests that food processing encampments would have existed in the project area. These could range from simple kill and butchering stations to major shellfish processing sites.

The difficulties in locating such occupation areas today are twofold. Initially, there is the question of their continued presence and integrity after exposure to rising sea levels and the resultant surf lines. The dynamic character of the near shore ocean bottom would tend to quickly scatter occupation remains, except perhaps in those areas subject to burial by rapid silting over from glacial melt runoff. This type of burial might act to preserve archaeological sites in the bottom sediments with some degree of integrity.

While researchers in offshore deposits (Pickman, 1982) agree that the potential for the discovery of intact resources does exist, they all identify the second major difficulty, namely locating of the specific sites. Closer to the present shoreline and in estuaries and wetlands, simple probes can be used (Pickman 1982) to locate shell midden deposits. Others consider that the remains of near shore archaeological deposits inaccessible until dredging operations expose them (Kopper, 1979).

A detailed study of the locating problem by Barder and Roberts (1980) also suggested the need to directly examine sediments as they are removed form the ocean bottom to determine the presence of prehistoric materials. Further consideration by Heritage Studies (1985) of the problem of locating dated sites along the New Jersey shoreline called for the production of detailed predictive models prior to the removal and examination of sediments. Again, the focus is on a form of monitoring during the removal of potential cultural resource-bearing material.

Present disposal operations could be considered to have a low potential for impact on prehistoric resources. The areas to be dredged have long since had their initial clearing of the channels. The disposal for the dredged material would not involve any sediment removal from the ocean bottom and would be a continuation of the utilization of existing areas. While it is possible to carry out a detailed predictive study of the prehistoric cultural resource potential for these areas, the end results would suggest that survivability would be low except for any areas that were initially deeply buried. The discovery of such cultural resources would be dependent upon sediment removal and as this is not an aspect of this site designation, the project can be considered to have no effect on identifiable prehistoric cultural resources.

Historic

As a result of rising sea levels following the retreat of the Wisconsin glacial ice, historic sites would exist only in the form of ship wrecks in the project area. These wrecks would include early wooden hulled vessels up through those equipped with cast iron engines and ferrous hulls. A variety of sources have been consulted that indicate the position of known wrecks (Lonsdale and Kaplan, 1964; Beramn, 1972; Marx, 1983; NOAA, 1981). None of these references specifically locate a known wreck within the limits of the project disposal areas. While this material represents what is known to date it does not, as with all archaeological site inventories, indicate actual presence or absence of wrecks within an unsurveyed area. Errors and inaccuracies in position reporting, ships lost in unknown locations, under reporting of smaller vessels, as well as ships lost prior to the time of extensive record keeping, reduce the usefulness of the inventory. A report by Heritage Studies (1985) suggests that under reporting ranges from 5:1 to 100:1, of total wrecks to identified wrecks.

As with prehistoric cultural resources, difficulties also lie with the ability to locate undocumented ship wrecks. An analysis by the Institute for Conservation Archaeology (1980) notes the inconclusiveness of magnetometer studies on wooden hulled vessels unless they are carried out under extraordinarily controlled conditions. A combination of remote sensing techniques would somewhat improve the chances of discovery (Heritage Studies, 1985). These techniques would include narrow interval magnetometry, metal detectors, side-scan sonar and sub-bottom profilers.

While the documentation concerning wreck locations in the disposal site areas does not indicate the presence of known wrecks, the possibility of unknown wrecks does exist. However, the combination of poor potential survivability, lack of documentation and the nature of the project activity in the disposal area results in a low probability for the discovery of, or impact to, historic cultural resources. Further, as no sediment removal is to occur, but rather continued additions are to be made to bottom deposits, even direct visual observation would be of little value.

Thus, based on factors of low potential for survivability, lack of documentation and unlikelihood of impact, it can be determined that the proposed disposal activity will have no effect on resources on or eligible for nomination to the National Register of Historic Places.

2-5.12 Conclusions

A summary of the 11 site-selection criteria for the alternative sites is presented in Table 2-4. All of the existing IDMDS are compatible with the criteria used for site evaluation. The following criteria are considered extremely relevant in the selection of the interim sites as the preferred locations for the disposal of dredged material.

* Historical disposal of dredged material at the interim sites has not produced significant adverse effects. Site specific investigations have detected only minor, temporary changes in the physical, chemical, and biological characteristics at the sites.

* Surveillance and monitoring of these sites are easier than at the deepwater sites because the existing sites are close to shore (<1 nmi) and within shallow-water depths (<12 m).

* Dredged material disposal at the interim sites is more cost effective than other disposal alternatives.

Although dredged material from the inlet sites could be disposed of at the Mud Dump Site, this alternative is not preferred.

* It has been estimated that based on current disposal rates, the life expectancy of this site is only an additional 6-8 years.

* Sedimentary characteristics at the Mud Dump Site differ from natural sediments of the inlet areas.

On the basis of historical use, the absence of significant adverse impacts, cost effectiveness, and the relative ease of which a monitoring and surveillance program can be implemented, the EPA proposes, in accordance with the Regulations, that the interim designated Long Island and New Jersey IDMDS receive final designation.

2-6 Use of the Sites

All future use of the Long Island and New Jersey IDMDS for ocean dumping must comply with the EPA Ocean Dumping Regulations and Criteria. Only dredged materials from the inlet areas satisfying the requirements of 40 CFR Section 227.13 will be disposed of at the IDMDS. The sites may be used for such disposal only after evaluation of each Federal project or permit application has established the need for ocean disposal and that the proposed disposal is in compliance with the criteria and requirements of EPA and CE regulations.

SUMMARY OF THE SITE SELECTION
CRITERIA AS APPLIED TO THE ALTERNATIVE SITES

Table 2-4

Criterion	Interim Sites	Mud Dump Site
1. Geographical position, depth of water, bottom topography, and distance from coast	Sites located close to shore (<1 nmi); depths <12 m; ridge and swale topography	Located >6 nmi water depths 16-29m; mounding from previous disposal activities
2. Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases	Living resources breed and spawn in and near inlet areas; the nearshore regions are important fish and invertebrate passage areas	All activities occur throughout the Bight; located on western edge of Hudson Shelf Valley, which may be an important passage area
3. Location in relation to beaches and other amenity areas	All sites within 1 nmi from beaches; and recreational areas with the exception of Absecon (5.5 nmi)	No beaches in immediate vicinity; some recreational fishing near the site
4. Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packing, if any	Sites receive 0-200,000 cy annually; 60-98% sand composition; disposal methods vary; beach nourishment recommended	Site receives 6-8 million cy annually
5. Feasibility of surveillance and monitoring	Surveillance by shore-based observers on day-use boats possible; monitoring is feasible	Surveillance by shipriders or aircraft possible; radar; monitoring feasible
6. Disposal, horizontal transport and vertical mixing characteristics of the area including prevailing currents direction and velocity if any	Rapid settling; no persistent turbidity plume; potential for beach nourishment; transport dependent upon wind speed, direction and tidal currents	Short-term movement of material is minimal; long-term movement dominated by storms; net movement is westward

Table 2-4 (cont'd)

Criterion	Existing Sites	Mud Dump Site
7. Existence and effects of current and previous discharges and dumping in the area (including cumulative effects	Adverse effects including temporary mounding, smothering of some benthic organisms; no significant impacts	The site has received dredged material for over 70 years: adverse effects include reduction of bottom-dwelling organisms, and a mound in the NW area of the site
8. Interference with shipping, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean	Mineral extraction, desalination, fish and shellfish culture does not occur; minimal interference with commercial/ recreational shipping; previous disposal operations have not interfered with other legitimate uses of the ocean	Minimal interference with shipping. Next to highly populated sport fishing area. No interference with other criteria.
9. The existing water quality and ecology as determined by available data by trend assessment or by baseline studies	Water quality and ecology of the site have not been adversely affected by disposal; benthic organisms will be most directly affected Little effect on resources in the area due to seasonal seasonal constraints placed on the disposal operation.	Disposal has only transient effects on water quality. Extreme mounding at NW corner. Low biota density due to repeated disposal.
10. Potentiality for the development or re-cruitment of nuisance species in the disposal site	Dredged material has no components which would favor the development or recruitment of nuisance species	Same as for the existing sites
11. Existence at or in close proximity to the site of any significant natural or cultural features of historical importance	No features of historical importance at or near the sites	Same as for the existing sites

2-7 Permissible Material Loadings

Historically, dredged material disposal volumes have ranged from 25,000 cy to 200,000 cy annually at the eight sites. These disposal operations have caused localized mounding, slight changes in sediment texture, and minor effects to the benthic fauna. Continuation of these rates of disposal would be acceptable. Accelerated disposal rates may also be acceptable, however, if monitoring programs indicate that unacceptable adverse effects are resulting from the accelerated disposal, disposal operations would be altered or curtailed in accordance with the Ocean Dumping Regulations (40 CFR Section 228.11).

2-8 Disposal Methods

Present disposal methods practiced by the CE at the existing sites would be acceptable for future dumping. The materials are dredged, transported by either hopper dredge, barge or scow combination, and discharged from underwater ports while the vessel is within the boundaries of the disposal sites.

Material dredged from Fire Island and Shark River Inlets in the past has been deposited onto the nearby beaches using hydraulic pipelines. The EPA recommends that the use of dredged material for beach nourishment be implemented wherever possible. Pending further study, it also may be the preferred use for other inlet dredged materials. Beach erosion is a major environmental problem in Long Island and New Jersey. Beach nourishment is an effective management program to help control erosion and offers significant beneficial effects.

2-9 Disposal Schedules

EPA recommends that disposal operations be performed during the period from September to January. Disposal operations during this period would minimize impacting peak seasons of recreational use, as well as protecting spawning and other critical phases of important fishery and shellfishery resources in the vicinity of the dredging and disposal sites.

2-10 Monitoring the Disposal Sites

Section 228.9 of the Ocean Dumping Regulations requires impacts resulting from dumping activities at a disposal site and surrounding marine environment to be evaluated periodically. This information is often gathered via monitoring surveys. If deemed necessary, the CE District Engineer (DE) and the EPA Region II Administrator (RA) may establish a monitoring plan by determining the appropriate monitoring parameters, the frequency of sampling, and the areal extent of the survey. The factors considered in making determinations include the frequency and volumes of disposal, the physical and chemical nature of the dredged material, the dynamics of the site's physical processes, and the life histories of the species monitored.

The primary purpose of the monitoring program is to determine whether disposal at the site is significantly affecting areas outside of the sites and to detect long-term adverse effects. Consequently, the monitoring study must survey the sites and surrounding areas, including control sites and areas likely to be affected, as indicated by environmental factors (i.e., prevailing currents and sediment transport). The results of an adequate survey provide early indication of potential adverse effects radiating from the sites. Knowledge of density and concentration gradients facilitates prediction of future impacts on areas surrounding the disposal sites, and provides direction for management of future disposal activities.

2-11 Guidelines for the Monitoring Plan

Historically, no significant adverse effects from previous disposal activities have been observed. Monitoring requirements for the sites are minimized by the nature of the dredged material (sand) and its similarity to sediments at the disposal sites and surrounding area. Many physical parameters would not be significantly affected by disposal such as temperature and salinity. Physical parameters such as turbidity, which illustrate variation during disposal quickly return to ambient levels due to the high-energy environment and the nature of the dredged material. The DE and RA may choose to monitor selected parameters occasionally experiencing a wide natural variability (i.e., sediment characteristics during exceptionally high run-off) in order to separate natural environmental fluctuations from those caused by dredged material disposal.

3. AFFECTED ENVIRONMENT

Chapter 3

Affected Environment

3-1 Affected Environment

All of the sites are within the New York Bight. Physical processes of the Bight operate over broad areas and cause variations in the chemical and biological characteristics of the water over the entire region. The sediments and associated biota in the Apex and near each of the sites are typical of sand-bottom communities occurring throughout the mid-Atlantic Bight.

3-2 Climate

Climate parameters of interest at the interim sites include air temperature, rainfall, wind patterns, and the occurrences of storms and fog. Air temperature interacts with surface waters and may influence the vertical stability of the water during warm periods. Rainfall increases freshwater run-off, thereby decreasing surface salinity and intensifying the vertical stratification of the water. Coastal run-off contributes suspended sediment and various chemical contaminants to the water column. Winds and storms generate waves and currents which can resuspend and transport dredged material. A high incidence of fog during particular seasons might affect navigational safety and limit disposal operations.

3-2.1 Air Temperature

Average normal temperatures are similar for the New York and New Jersey coasts, with New Jersey temperatures slightly higher. Mean temperatures range from the minimum of $2^{o}C$ in February to a maximum of $22^{o}C$ in August for New York. Annual average temperatures range from 11^{o}-$12^{o}C$ along coastal New York and New Jersey.

During extreme winters the interior bay waters are completely closed to navigation by ice. In ordinary winters, some of the channels, especially near the Long Island and New Jersey inlets, remain open most of the time though ice always forms on the flats. The inlets are rarely closed but passage is often difficult because of running ice. All of the principal inlets and adjacent channels are used in the winter by local fishing boats (NOAA, 1972).

3-2.2 Precipitation/Fog

The Bight coastal region averages 18 to 24 thunderstorms a year, most of which occur from June through August. Precipitation occurs throughout the year, and August generally has been the month of heaviest precipitation (11-12 cm).

Visibility at the existing sites is sometimes reduced by fog, smoke, and haze. Thick fog occurs, but not frequently enough to significantly restrict travel to and from the sites. Visibility reduced by fog to less than 1 nmi occurs with greatest frequency in May and June (11 and 8 days/month, respectively). When necessary, disposal operations could be performed safely under conditions of reduced visibility.

3-2.3 Winds

Surface winds are one of the most important driving forces for current flow variations over the Continental Shelf in the Bight (Beardsley et al., 1976). The distribution of surface wind speeds and directions has a pronounced seasonal variation but little spatial variation (Lettau et al., 1976), suggesting that surface winds over the Bight are governed by broad circulation systems rather than small, local systems. Westerly and northwesterly surface winds generally predominate in winter, while southerly and southwesterly winds generally prevail in summer (Lettau et al., 1976).

Wind speeds over Bight coastal areas are usually moderate. During winter, winds are primarily offshore with average velocities of 4.5 to 5.8 m/s (100 to 15 mph). Summer winds are predominantly onshore, with average speeds of 2.7 to 4.0 m/s (6 to 10 mph; Lettau et al., 1976). The highest recorded wind velocities for the Bight (50 m/s [113 mph]) are due to tropical storms (Hurricane Hazel, recorded at the Battery in 1954; Lettau et al., 1976).

3-2.5 Storms

Seasonal storms are characteristic of the Bight. Extratropical (north easterly) storms are common from November until April (Pore et al., 1974); tropical storms (hurricanes) are rare but generally occur in late summer or early autumn (Pore and Barrientos, 1976). Storms may restrict a particular disposal operation, but frequencies or severities are not sufficiently common to restrict disposal operations for extended periods.

3-3 Physical Conditions

Clear seasonal patterns of temperature, salinity, density structure, isolation, and river run-off occur in the Bight. The physical conditions at all of the existing sites are similar.

3-3.1 Temperature

Annual minimum water temperatures (often less than 2^{o}C) and well-mixed, unstratified waters occur in January (Bowman and Wunderlich, 1976). Thermal stratification begins in May when surface temperatures reach 9^{o}C to 11^{o}C, and bottom (below 30m) temperatures remain near 4^{o}C. The thermocline continues to intensify through the summer. Maximum surface temperatures (up to 26^{o} C) occur in August. Bottom waters retain their characteristics with little modification until storms and cooling trends break the thermocline in late autumn. By the end of

October, surface temperatures are 16°C to 18°C over most of the Apex. As winter progresses, vertical mixing continues and the temperatures decline towards the winter minimum.

3-3.2 Salinity

Surface salinity distribution indicates winter maxima and summer minima (Bowman and Wunderlich, 1976). Salinity generally increases with increasing depth over the Shelf, although in some areas the water is homogeneous with depth. Salinity steadily increases seaward from less than 32°/oo along the coast to between 32 and 34°/oo over the central shelf, reaching approximately 35°/oo at the Shelf Break (mean values).

3-3.3 Water Masses

Hollman (1971) has identified three water types in Bight Shelf Waters: (1) Hudson River Plume Water; (Bowman and Wunderlich, 1977); (2) Surface Shelf Water; and (3) Bottom Shelf Water.

3-3.4 Hudson River Plume Water

The combined discharges from the Hudson and Raritan Rivers flow from the Lower Bay into the northwest corner of the Apex as a low-salinity plume. Discharge volumes are maximal in April and minimal in August. Approximately one-half of the annual discharge occurs during March, April, and May (Bowman and Wunderlich, 1976). Although the plume persists throughout the year, the extent and depth are highly dependent on local winds and flow rates from the Hudson and Raritan Rivers (McLaughlin et al., 1975). Generally, the plume flows southward between the New Jersey coastline and the axis of the Hudson Shelf Valley. During the winter, however, the plume may flow eastward between the southern coast of Long Island and the axis of the Hudson Shelf Valley, or, in some instances, the plume may split and flow both eastward and southward.

3-3.5 Surface Shelf Water

With the onset of heavy river discharge in the spring, surface salinities in the Bight decrease and a moderate salinity-maintained stratification occurs, separating Surface Shelf Water from Bottom Shelf Water. Decreasing winds and increasing insulation cause a stronger thermocline to develop (Charnell and Hansen, 1974). The two-layer system reaches its maximum strength during August. Summer Surface Shelf Water is characterized by moderate salinity (25 to 27 parts per thousand) and high temperatures (26°C; Bowman and Wunderlich, 1976).

3-3.6 Bottom Shelf Water

During winter, water characteristics are essentially homogeneous over the Bight Shelf. With rapid formation of a thermocline and separation of Surface Shelf Water in spring, bottom waters become isolated until the next winter. Bigelow (1933) reported that this "cold pool" (temperatures of 6^{o} to $8^{o}C$), which extends from the south shore of Long Island to the opening of the Chesapeake Bay is surrounded by warmer water on all sides. The cool temperatures of the bottom water persist even after the surface layers have reached the summer maximum. The upper layer of the Bottom Shelf Water is usually between 30m and 100m depth during summer (Bowman and Wunderlich, 1977).

3-3.7 Tidal Currents

Tides along the Long Island and New Jersey coasts are semi-diurnal with two flood and two ebb tides a 24.48 hour period. The mean tidal range within the Long Island and New Jersey inlets varies between four and five feet. In inland waters, the tides are affected by the winds. In general, westerly winds produce lower than normal water levels and easterly winds produce higher than normal water levels. Strong winds of long duration may cause as much as three feet of variations in water level in portions of the waterways which normally experience a tidal range of only 0.05 feet.

3-3.8 Waves

Waves normally come from the east with a slight shift to the northwest during the winter and southwest during the summer. The median wave height is approximately 4 feet during the winter and 2 feet during the summer (Bumpus et al., Swanason, 1976).

Waves have little influence on the initial dispersal of dredged material at the IDMDSs because most of the material settles quickly to the bottom. Both storm-induced surface waves and tidal-influenced internal waves can contribute to sediment resuspension, and must be considered in evaluation bottom sediment transport at the interim sites.

3-3.9 Circulation

The major feature of Bight surface circulation is a flow towards the southwest paralleling the coastline (Figure 3-1). Surface speeds average 3.7 cm/s (Conner et al., 1979) and an anticyclonic (clockwise) bottom gyre is present. This gyre is one component of a northward-flowing bottom current which splits when it reaches shallower water near the coast (McLaughlin et., 1975).

Exchange circulation characterized by seaward surface flow of estuarine waters and landward flow of denser bottom water occurs throughout the Sandy Hook/Rockaway Point Transect. These features can be displaced due to tidal oscillations, masked by stronger, variable wind-driven currents, and drastically altered for periods of several weeks. Alterations are more common during the summer, when sustained periods of strong and persistent southerly winds influence circulation patterns (Hansen, 1977).

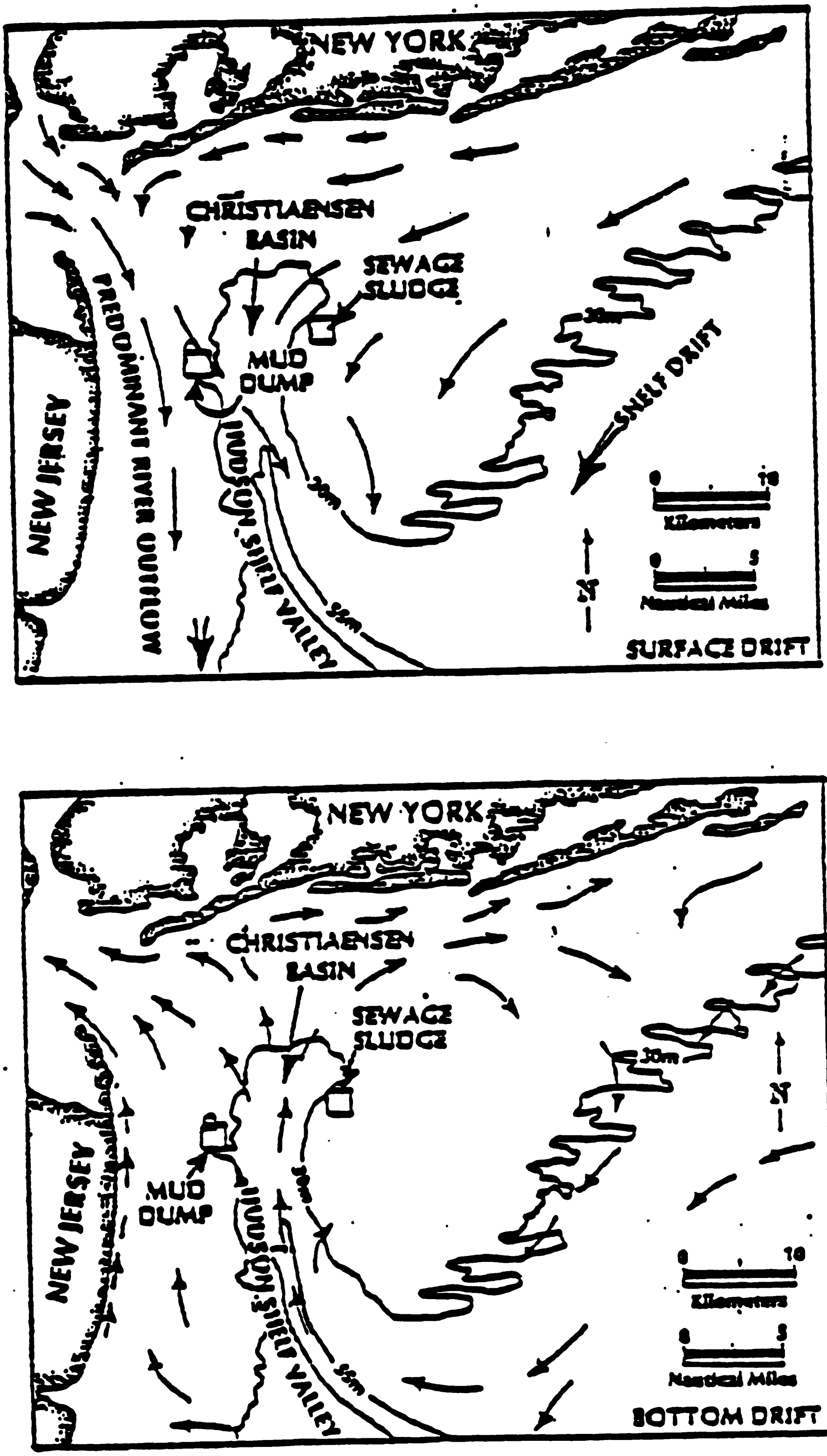


Figure 3-1. Surface and Bottom Circulation in the Apex (Late Autumn)
Source: McLaughlin et al., 1975

3-4 Geological Conditions

The New York Bight Continental Shelf is a sloping plain resulting from glaciation and sea level changes over the past several million years (Freeland and Swift, 1978). The Apex of the Bight is the result of a post glacial rise in sea levels which partially submerged the lower valleys of the Hudson and Raritan Rivers (O'Conner et al., 1977).

The landward boundary of the New York Bight is formed by barrier islands with numerous tidal inlets (O'Conner et al., 1977). These inlets are areas where coarse and medium grained sediments are deposited by littoral forces (Gross, 1976). These tidal forces also result in the entrainment and accumulation of sediment in the vicinity of the Long Island and New Jersey Inlets.

The inner Shelf is dominated by ridge and swale topography (Figure 3-2). Ridge spacing is generally about 1 nmi with an amplitude of 2 to 10 m; alignment is mostly east to northeast at 20^{o} to 30^{o} angles to the shoreline.

Sedimentation in the inlet area is affected by waves, currents, and the depth of the channel. The general characteristics of the dredged material varies with the hydrodynamic environment at the Long Island and New Jersey inlets.

3-4.1 Sediment Composition

Shelf sediments are predominantly sand with scattered patches of gravel. The exceptions are the Hudson Shelf Valley, the Christiaensen Basin and the immediate vicinities of the tidal inlets (Swifts et al., 1979). where the sediments are composed primarily of quartz and feldspar and range from coarse to medium sand. The inlet sediments generally consist of well-sorted medium to fine quartz sand with minor contributions of silt and clay. The fine grained silt and mud components are primarily the result of natural forces (Bearsley et al., 1976).

3-5 Chemical Conditions

The New York metropolitan area contributes a major source of contaminants entering the Bight (Table 3-1). Atmospheric dust and washout by rainfall, freshwater runoff from land, urban and industrial effluents, and barged material (e.g., dredged material, acid wastes, and sewage sludge) dumped into the ocean cause high levels of trace metals in the water and bottom sediments of the Apex (Ecological Analysis and SEAMOcean, 1983). Dissolved-metal concentrations in the waters of the Apex are higher than on the open Shelf.

Outflow from the Hudson and Raritan Rivers is a major source of dissolved nutrients to the New York Bight, extending as a plume of enriched water southward along the New Jersey Coast (CE,

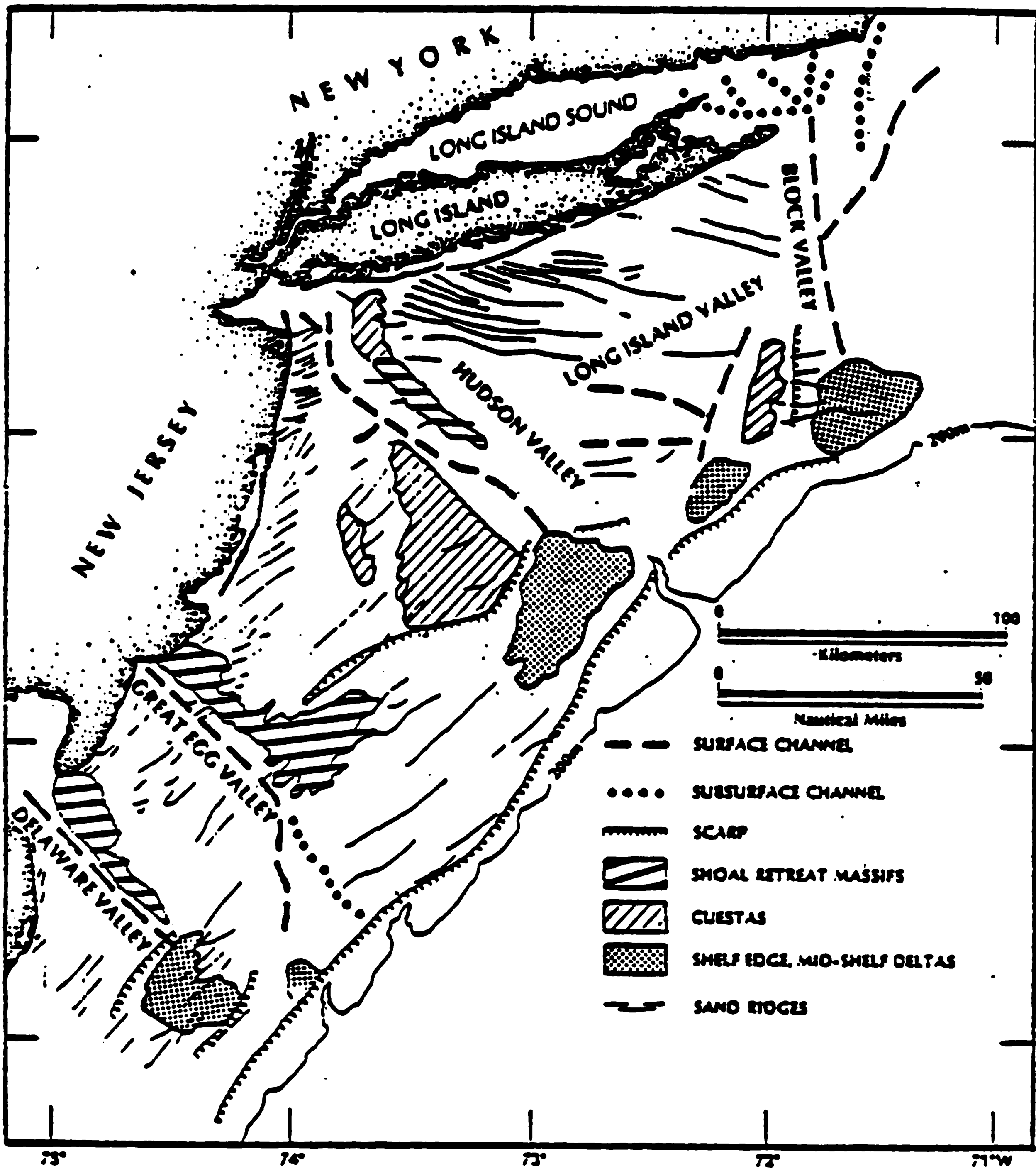


Figure 3-2. Topography of the New York and New Jersey Shelf
Source: Modified from Swift et al., 1972

Table 3-1. Estimated Contaminant Input, in Percentage Contribution Except as Noted, to the New York Bight Apex (After Ecological Analysts and SEAMOcean, 1983)

	Hudson Estuary	Dredged Material Dumping	Other Dumping	Atmospheric Input	Coastal Discharges	Annual Load (tons/yr)
Total Solids	25.6	65.5	5.3	—	0.8	7.03×10^6
Oil and Grease	62.1	15.4	>0.1	—	14.4	206,300
Arsenic	54.7	43.1	—	0.1	—	133.5
Cadmium	55.0	31.4	0.3	0.3	4.7	105.5
Chromium	45.3	39.4	0.9	>0.1	5.0	1,636.5
Copper	41.3	45.6	0.2	—	1.8	3,002.2
Lead	48.0	40.0	0.1	1.2	1.5	2,125.9
Mercury	53.3	30.7	>0.1	—	13.0	52.5
Zinc	50.1	38.6	0.4	0.5	2.2	6,841.2

1983). Elevated levels of dissolved inorganic forms of nitrogen and phosphorus have been attributed to sewage inputs from the Hudson estuary. Transport to the Bight is largely controlled by river flow (Garside et al., 1976). Seasonal patterns of winter maxima and summer minima for concentrations of nitrate and phosphate are generally observed throughout the Bight (O'Conner et al., 1977).

3-5.1 Dissolved Oxygen

Levels of dissolved oxygen at the interim sites are dependent upon several factors including temperature, salinity, rate of re-aeration, photosynthetic production, and use by biological respiration processes and chemical oxidation (CE, 1983). Dissolved oxygen concentrations in the water of the Apex are near saturation in January and are at a minimum in August. In the summer, a stable thermocline exists and dissolved oxygen concentrations in the lower layer may drop to 10% of saturation (Segar and Berberian, 1976). Concentrations may decrease to 30% of saturation in the vicinity of the Mud Dump Site (O'Conner et al., 1977a).

3-5.2 Heavy Metals, Trace Elements and Other Anthropogenic Inputs

Heavy metals both in the water column and sediments of the inner Apex of the New York Bight are elevated above levels detected on the outer Shelf or other unpolluted marine systems. Identified sources of increased heavy metals include ocean dumping of dredged materials, sewage sludge, acid waste, and cellar dirt, as well as terrestrial runoff, waste water, and atmospheric inputs (Mueller et al., 1976). The degree of enrichment of numerous heavy metals, (lead, copper, silver, mercury, cadmium, iron and manganese) in dredged material is several orders of magnitude greater than other coastal deposits (Dayal et al., 1981). Surface waters in the vicinity of the existing sites are not affected by heavy metal contamination beyond that attributable to the Hudson River plume (Segar and Cantillo, 1976); this is probably a consequence of the rapid sequestering of these metals by particles and organic matter and relatively rapid removal from the water column by sedimentation.

The data indicates that dredged material is the single largest source of metals loading to the Bight. Dredged material in the New York Bight Apex is reported to contribute up to 80 percent of the heavy metal loadings. This does not include mercury, which comes primarily from municipal wastewater discharges (EPA, 1980).

Elevated levels of PCBs in the sediments of the Bight are largely a result of the dumping of sewage sludge (EPA, 1982). The highest concentrations of PCBs in the Bight are in the black muds of the Christiaensen Basin, although levels above background are also found at the Mud Dump (O'Conner et al., 1980; EPA, 1982). Table 3-2 indicates PCB sediment concentrations in various locations in the Bight.

3-6 Biological Conditions

The interim sites are part of a nearshore marine environment. The major biotic units of interests are plankton, benthos and fisheries.

3-6.1 Plankton

The pattern of phytoplankton production and seasonal succession in the Bight is typical of coastal, temperate waters (Malone, 1976; Walsh et al.; and Yentsch, 1977). Major environmental factors affecting the plankton are temperature, light levels, vertical stability of the water column, and nutrient supply. Seasonal variation in productivity is associated with summer and winter, with the highest levels occurring during the summer and lowest levels occurring during the winter.

Maximum production in the New York Bight is associated with the nutrient-rich plume of the Hudson estuary water (CE, 1983). The spring is dominated by blooms of diatom species. Later in the spring and summer a diverse range of phytoplankton populations are present such as diatoms, dinoflagellates, and chlorophytes.

In the summers of 1983 and 1984, phytoplankton blooms occurred along nearshore New Jersey waters. The water turned bright green and many beach closures resulted. A green tide bloom also occurred in the summer of 1987 near Ocean City.

Red tides have occurred annually in the Lower New York Bay estuarine system. The tides usually begin in mid-June and extend to adjacent New Jersey coastal waters. However, these red and green tides have not been the acutely toxic varieties such as those which contaminate shellfish, causing paralytic shellfish poisoning or fishkills.

An EPA <u>Green Tide Environmental Inventory 1986</u> suggested that water quality problems, such as the algal blooms in the nearshore region, are related to biological and chemical reaction rates in relation to poor water column flushing rates. The seasonal constraints placed on the dredging and disposal operations at these inlets and sites would avoid periods of high biological activity, high stress, and hypoxic events.

Zooplankton populations in the Bight are usually dominated by copepods. Zooplankton population densities generally reflect the seasonality of algal production and the food web appears to be well balanced with a large part of the production being consumed in the water column (Walsh et al., 1976; and Yentsch, 1977).

TABLE 3-2

Total PCB Concentrations in Sediments

From the New York Region

(ug/g [ppm] dry weight)

Location	Total PCBs
Hudson	60.0
Km 240	6.0
New York Harbor	2.0
Gowanus Canal	0.4
Newton Creek	0.2
Raritan Bay	0.0009
Sandy Hook Transient	0.7
Christiaensen Basin	0.4
Mud Dump	0.03
Sludge Site 1	0.2
Sludge Site 2	0.2
Arthur Kill	0.81

Source: CE, 1983

3-6.2 Benthos

The nearshore benthic fauna of the Bight is dominated by organisms characteristic of high energy coastal marine environments. The benthic communities at the interim sites are usually characterized by mollusks, crustaceans and worms living on or in the sediments.

Several benthic communities are present within the Apex. Pratt (1973) recognized three bottom faunal groups widespread on the mid-Atlantic Continental Shelf associated with sand, silty-sand, and silt-clay substrates (Figure 3-3). Apex sediments range from sand gravel to mud (Freeland et al., 1976), and elements of all three biotic communities occur within the Bight. The sand faunal group is the dominant community in the Apex and is represented by suspension feeders. The more seaward silty-sand faunal areas contain higher organic content and are typified by amphipods and mollusks. Silty-clay habitats develop where the fine sediments accumulate and are found in the Bight in estuaries, bays and the head of the Hudson Canyon. These areas are characterized by echinoderms, polychaetes and bivalves.

3-6.3 Fisheries

Many finfish of commercial and recreational importance occur in the area of the existing sites. The diversity and abundance are due to the geographical location of the Bight, which is the northern limit of temperate and subtropical migrants and the southern limit of boreal migrants. Some species occur inshore, others offshore, and some migrate from inshore to offshore. Significant numbers of adults, planktonic eggs, and larvae can be found over the entire mid-Atlantic Shelf throughout the year.

Over 300 species of finfish are known to occur, and approximately 80 are of commercial importance (McHugh and Ginter, 1978; Mitre, 1981). The most productive commercial fisheries include menhaden, whiting, scup, flounder, red hake, tilefish and butterfish (McHugh, 1977) and the greatest catches by weight by sport fisherman have been bluefish, Atlantic Mackerel and striped bass (Mitre, 1979). A fishing moratorium has been placed on striped bass. Commercial catches are prohibited and the recreational fishery has been limited to striped bass above 33 inches in limited quantities. Most of the migratory species either spawn in coastal waters of the Bight or the larvae use nearshore areas as nurseries, indicating that the estuaries around the New York Bight are important in the maintenance of fish populations.

Benthic invertebrate species in the Bight with greatest commercial value include surf clams, softclams, scallops, lobsters and blue crabs. Much of the Apex is closed to shellfishing because of high total and fecal coliform bacteria levels (Figure 3-4). The closure applies only to those species in which the whole animal is consumed (e.g., surf clam), and not to species where only part of the animal is consumed (e.g.,

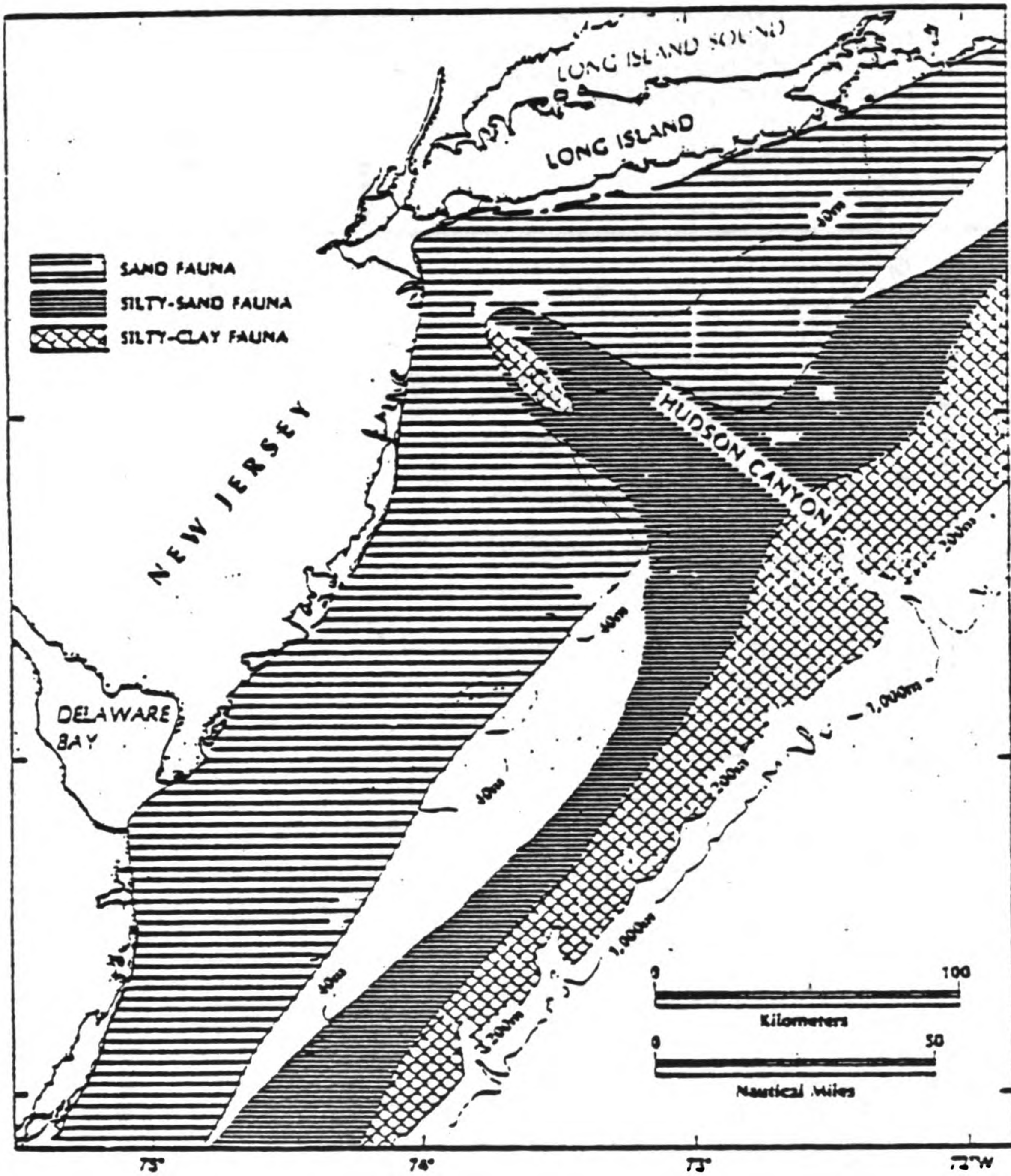


Figure 3-3. Benthic Faunal Types in the Mid-Atlantic Bight
Source: Adapted from Pratt, 1973

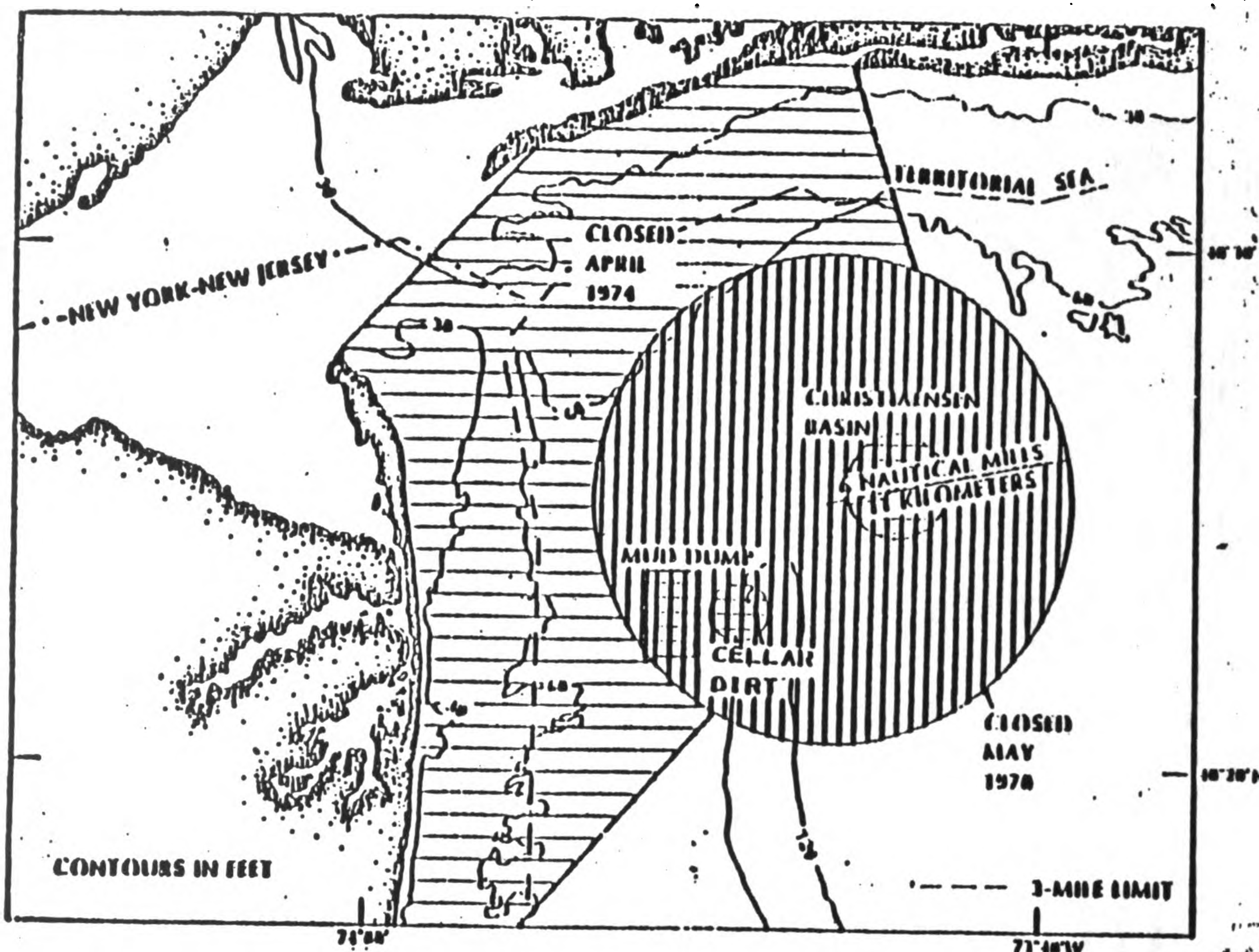


Figure 3-4. Commercial Shellifishig Closure Areas

Source: Verber, 1976

lobsters).

Although commercial shellfish species are found in the vicinity of all of the interim sites, the Rockaway, East Rockaway, Shark River, Manasquan and Cold Spring sites are all within the existing shellfish closure area and the shellfish are unharvestable. The yield of the shellfishery has increased since 1942, (McHugh and Ginter, 1978). The increase in shellfish landings is attributable to the growth of the surf clam industry. Surfclams are common throughout the sandy areas of the Bight, but the most productive areas are along the outer shores of Long Island and off Barnegat Bay and Little Egg Harbor in New Jersey (CE, 1983). To prevent dredged material disposal operations from interfering with the surf clam industry, the disposal of dredged material is prohibited during the spawning period which occurs from May through July. In addition to the surf clam industry, significant commercial harvesting of hard clams, soft clams, bay scallops, sea scallops, and lobsters exists throughout large areas of the Bight (Mitre, 1979).

3-6.4 Threatened and Endangered Species

Five endangered species of whales may be found in waters of the mid-Atlantic Bight (Gusey, 1976): blue whale (Balaenopter muscules), finback whale (B. physalus), sei whale (B. borealis), humpback whale (Megaptera noveangliae), and the right whale (Eubalaena glacialis). However, presence of these whales in the Apex would be unusual, and no critical habitats for these species occur in or near the existing sites.

Four species of endangered birds are found within the marine and coastal regions of the Bight (Howe et al., 1978): bald eagle (Haliaeetus leucocephalus), brown pelican (Pelecanus occidentalis), Eskimo curlew (Numenius borealis), and the American Peregrine Falcon (Falco peregrinus anatum). These birds are not expected to be adversely affected by the disposal of dredged material at any of the proposed sites. The Mid-Atlantic Region, U.S. Department of the Interior indicates that the American Peregrine Falcon (Falco peregrinus anatum) should be added to the list of threatened and endangered species found in the Bight.

Three species of threatened turtles are found in the New York Bight: the loggerhead (Caretta caretta), leatherback (Dermochelys coriacea), and Kemps Ridley (Lepidochelys kempi). These turtles are not expected to be adversely affected by the disposal of dredged material at any of the proposed sites because the species are not common in the area of the sites. Therefore, the sites are not critical areas for these species.

3-7 Activities in the Site Vicinities

3-7.1 Commercial Fisheries

New Jersey and New York together accounted for 4% of the total U.S. commercial fisheries landings in 1975. The stocks of many important commercial species of both shellfish and finfish show indications of overfishing, and landings have remained fairly stable due largely to the industry's ability to shift emphasis to different species (McHugh, 1977; McHugh and Ginter, 1978). Commercially important species include finfish such as scup, whiting and tilefish. Shellfish such as the surf clam, lobster and quahog are important species.

In the Apex, commercial fishing areas change seasonally. The target species for the fisherman depend upon the abundance of the stock and the price. The Fishery Conservation and Management Act (FCMA) of 1976 created an economic resource zone known as the "200-mile limit" contiguous to the territorial sea. The fishery conservation zone has been divided and authority given to Fishery Management Councils to regulate the resources within their regions by means of Fishery Management Plans.

3-7.2 Recreational Fisheries

Most recreational fishing in the Bight is confined to the inner Shelf. Recreationally important species include weakfish, bluefish and mackerel. Recreational species fished further offshore include bluefin tuna, marlin and swordfish. The sport catch often equals or surpasses the commercial landings of certain species.

Figure 3-5 shows the major recreational fishing grounds in the Apex. Many of the areas support seasonal fisheries. For example, the Mud Hole is a popular whiting area in the winter and tuna area in the summer; Shrewsbury Rocks are rarely used in the winter but supports a popular bluefish area in the summer. The more important fishing areas are the 17-Fathom Bank, Mud Hole, Shrewsbury Rocks, the Farms and Klondike Bank (Christensen, personal communication*).

3-7.3 Shipping

The major trade routes serving the New York-New Jersey area coincide with the three traffic lanes into New York Harbor: the Nantucket, Hudson Canyon, and Barnegat Traffic Lanes (Figure 3-6). The trade routes which lie within Navigational Lanes are usually the safest routes for shipping traffic.

Hopper dredges and barges spend little time at the disposal site because each dump takes only 3 to 5 minutes. It is suggested that hazards to navigation occur primarily as a result of transit to and from the site, increasing somewhat as distance offshore increases. Adherence to the International Regulations Preventing Collisions at Sea, 1972 (USGG, 1977) would prevent accidents.

The inlets along New Jersey and Long Island serve as entrance ports for light commercial and recreational ship

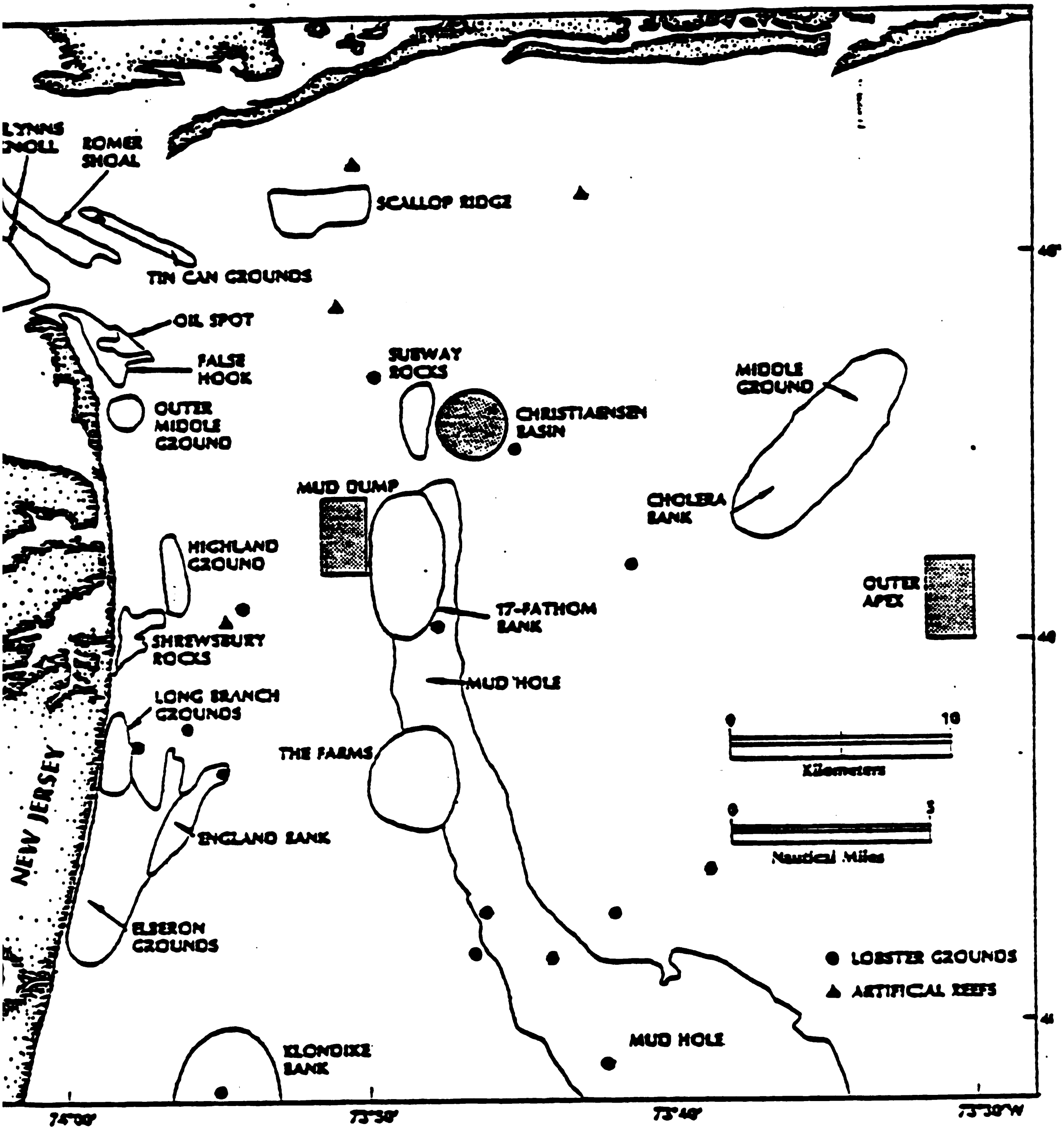


Figure 3-5. Important Recreational Fishing Grounds in the New York Bight Apex
Source: Schmidt, 1980, unpublished

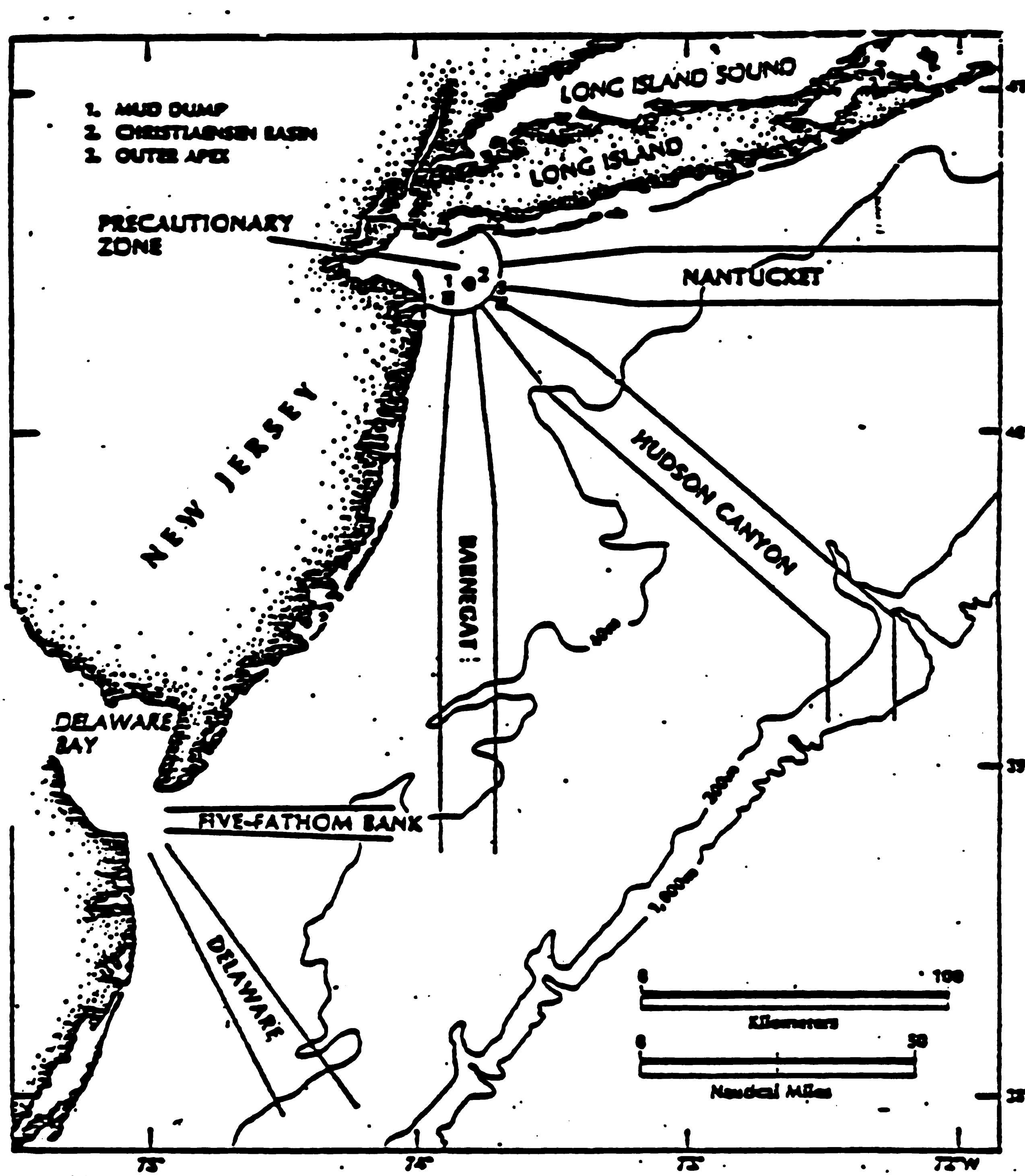


Figure 3-6. Traffic Lanes in the Mid-Atlantic Area

* D. Christensen, NOAA-NMFS, Sandy Hook Laboratory, Highland, New Jersey

traffic. None of the interim site locations pose unacceptable navigational hazards that preclude their use.

3-7.4 Recreational Activities

The New York Bight offers an indefinite number of recreational activities. Nearly one half of the shoreline of the Bight is currently devoted to public recreation (Carls, 1978) and there are numerous state, county and national parks which serve the area's population. In addition to these public lands, there are substantial numbers of private facilities such as marinas, beaches and campgrounds.

The most popular forms of recreational activity include swimming, boating, sunbathing and fishing (Carls, 1978). An upward trend in all recreational activities is expected to continue, resulting in an intensification of the demand for coastal and marine recreational resources (CE, 1983).

3-7.5 Oil and Gas Exploration

The U.S. Department of the Interior, Bureau of Land Management (BLM), completed the first sale of oil and gas leases in the mid-Atlantic (Baltimore Canyon Trough; Outer Continental Shelf (OCS) Sale no. 40) in August 1976. Exploratory drilling at 6 of the 93 tracts leased in OCS Sale no. 40 began in the spring and summer of 1978. In May 1978, BLM published a draft EIS on OCS Sale no. 49, which was held in February 1979. No existing or planned oil and gas lease tracts are located in any interim or designated ocean disposal sites in the Bight. Currently there are 85 active leases in the mid Atlantic Area. In July of 1982, a re-offering sale was held (RS-2) whereby 155 tracts offered in Sale No. 59 were offered again.

3-7.6 Other Uses

In addition to the previous uses, the New York Bight is utilized for a variety of other activities. Among those are:

- Scientific Research - represented by the National Oceanic and Atmospheric Administration's (NOAA) intensive Marine Eco-System's Analysis (MESA) program. This program is aimed at increasing knowledge about the Bight and man's impact upon it.

- Outer Continental Shelf (OCS) Energy Development Activities - the Bight is located at the junction of the BLM's North and Mid-Atlantic Lease areas and has been subject to lease and exploratory drilling.

- Sand and Gravel Mining - although experiencing a lull presently, sand and gravel mining in the Bight has been a commercially important activity. Since 1973, Lower N.Y. and

Raritan Bays have been the only areas mined.

- Military Uses - the Bight is contained within the Narragansett Bay Operating Area and is subject to occasional military activity such as submarine operations, gunnery practice, sea trials, radar tracking and general operations.

3-8 Ocean Waste Disposal

As of 1980, EPA and CE have permitted the disposal of municipal and industrial wastes at various locations in the Bight (Figure 3-7). This section briefly describes activities at the sites, excluding the Long Island and New Jersey IDMDSs. Designation of the IDMDS for the disposal of dredged material will not interfere with the use of these other sites.

3-8.1 Mud Dump

The Mud Dump Site (Figure 3-7, #1) has been moved frequently since dredged material was first dumped in 1888. The site has occupied its present location since 1915. The Mud Dump Site received an approximate annual average of 7 million cy of dredged material between 1970 and 1987. Future annual volumes are projected to be approximately 5.5 to 6 million cy. Section 211 of the Water Resources Development Act of 1986 mandates closure of the Mud Dump Site to all but "acceptable dredged material" and the designation of a new Mud Dump Site at least 20 miles offshore. These projected volumes may change as a result of this legislation.

3-8.2 Cellar Dirt Site

The Cellar Dirt Site (Figure 3-7, #3) was designated by the EPA on May 6, 1983, for the disposal of excavation dirt and rock. New York City dumped approximately 50,000 cy of material in 1985. Currently, there is one permittee authorized to use the site.

3-8.3 Sewage Sludge Site

Sewage sludge consists of water and residual municipal sewage solids from primary and secondary treatment plants. The 12-Mile Site (Figure 3-7, #2) was established in 1924 for the disposal of municipal sludge. However, on April 1, 1986, EPA denied petitions to redesignate the 12-Mile Site. As of January 1, 1988, all municipal sludge dumping has occurred at the Deepwater Municipal Sludge Dump Site (formerly known as the 106-Mile Site) (Figure 3-7, #8). Nine permittees currently ocean dump municipal sludge at this site under court order. In 1986 approximately 8 million wet tons of municipal sludge was ocean dumped.

3-8.4 Acid Waste Site

The Acid Waste Site (Figure 3-7, #4) was established in 1948 for the disposal of aqueous wastes. One permittee, Allied

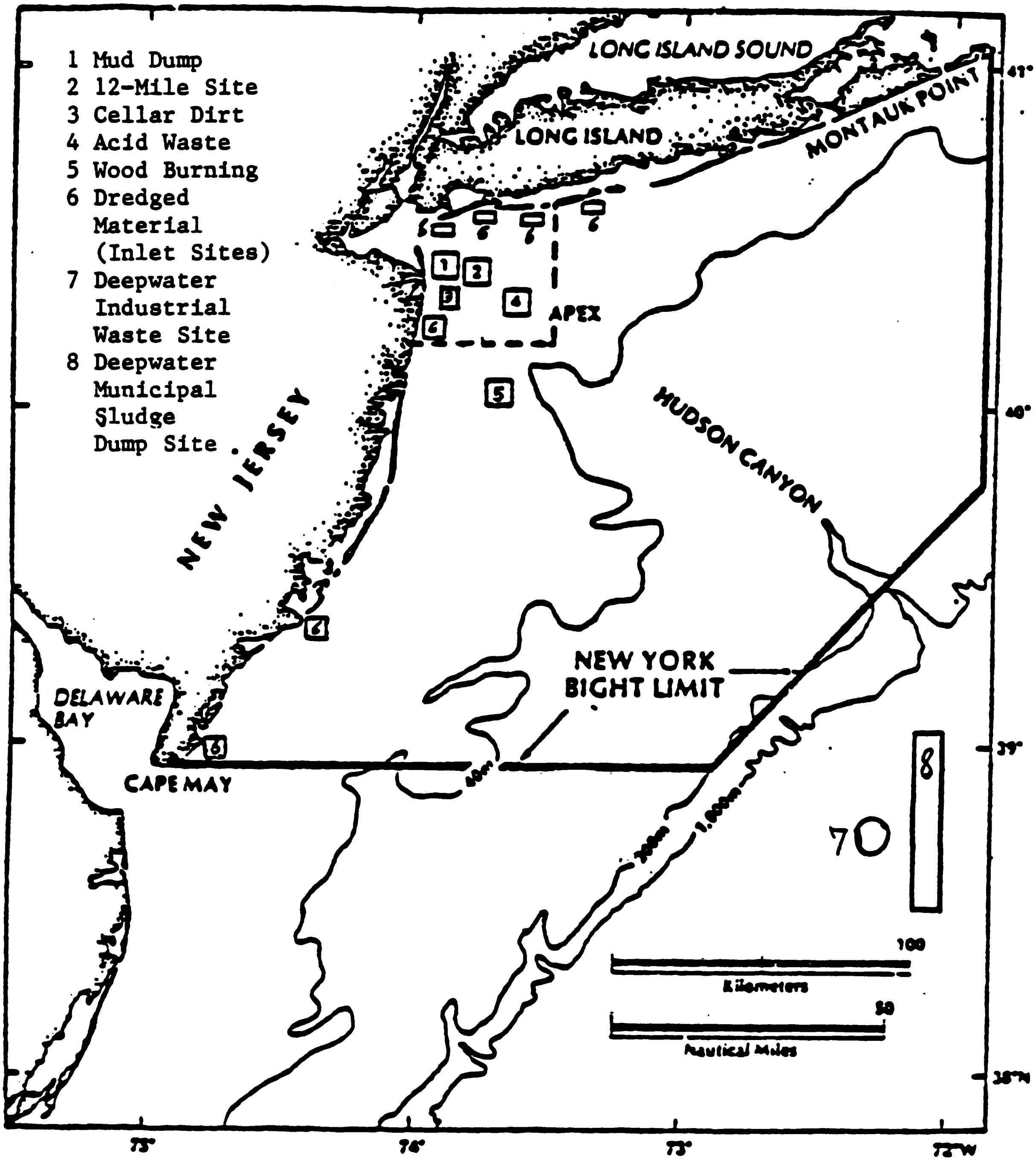


Figure 3-7. Ocean Disposal Sites in the New York Bight.

Chemical Corporation, presently utilizes the site. In 1982, Allied Corporation disposed of 30,000 wet tons of hydrochloric acid.

3-8.5 Woodburning Site

The Woodburning Site (Figure 3-7, #5) was established for the burning of scrap wood from harbor debris, pier pilings and waterfront construction sites. The site is used as needed and only the combustion products (e.g., particulates) reach the ocean; the remaining ash is landfilled.

3-8.6 Deepwater Industrial Waste Site

The Deepwater Industrial Waste Site (Figure 3-7, #7) was established for the disposal of aqueous industrial waste. The site was designated in 1984, with no expiration date. One permitee, E.I. Du Pont De Nemours Co., presently utilizes the site. In 1984 18,677 wet tons were dumped, no dumping ocurred in 1985, 140,133 wet tons were dumped in 1986, and 27,980 wet tons were dumped in 1987.

4. ENVIRONMENTAL CONSEQUENCES

Chapter 4

Environmental Consequences

4-1 Environmental Consequences

This chapter examines available scientific and analytical data to determine the environmental consequences of dredged material disposal at the interim sites evaluated in Chapter 2. The environmental effects include:

- o Environmental changes directly affecting public health (specifically, through impacts to commercial or recreational fisheries) and safety (navigational hazards);
- o Effect of disposal operations on aesthetics;
- o Environmental consequences of dredged material disposal on biota, water chemistry, and sediments.
- o Unavoidable adverse environmental effects and mitigating measures;
- o Relationships between short-term use and long-term productivity; and
- o Irreversible or irretrievable commitment of resources which would occur if the proposed action is implemented.

4-2 Effects on Public Health and Safety

Evaluation of potential adverse effects on humans caused by the disposal of dredged material in the ocean is a fundamental concern. The nature of the disposal operation and type of material to be dumped may have direct or subtle effects upon public health and safety. Many health hazards may not be obvious; the potential for bioaccumulation of toxic chemicals from dredged material by organisms that may be consumed by the public is of primary concern. Similarly, dredged material harboring pathogenic bacteria and viruses may limit recreational water-sport activities and human consumption of fish and shellfish taken from the disposal site vicinity. Navigational hazards may develop from excessive shoaling of dredged material at the sites and from movement of disposal vessels to and from the site.

4-2.1 Introduction of Potentially Harmful Toxics

Potential effects on human health, resulting from the consumption of marine organisms, can be evaluated from bioassay and bioaccumulation tests performed on marine organisms. Toxic levels of trace metals for most marine organisms have not been established, partially due to extreme variabilities in the sensitivities exhibited by organisms during their different life stages. The form of chemical contaminants is difficult to determine in the natural environment, but is important in determining toxicity. Trace metals present in dredged materials may follow many pathways when introduced at the site; for instance, the trace metals can: (1) be released into the water while the dredged material is settling or after deposition on the sea floor, (2) remain adsorbed to site sediments, and/or (3) be ingested, primarily by benthic organisms.

Laboratory and field tests on dredged material indicate that, under certain conditions (e.g., oxidizing or reducing environments), some trace metals are released from dredged material into seawater in concentrations well above background levels (Lee et al., 1975). Manganese was released in the greatest quantities under both oxidizing and reducing conditions. Under reducing conditions, substantial amounts of iron and lead were released. Zinc was taken up from water under both oxidizing and reducing conditions, while copper, lead, and cadmium were neither released nor taken up under oxidizing conditions. Actual increases over background values were insignificant (parts per billion or less), so that considerable analytical difficulties are encountered in even detecting the contaminants. Furthermore, there is little evidence to indicate that such low levels would cause adverse effects on marine organisms during the extremely short time before the concentrations were diluted to the original background levels (Pequegnat et al., 1978b).

Some organisms have accumulated PCBs or DDT from dredged material. The source of PCBs in benthic feeders is probably recently deposited sediment layers and recent discharges. PCBs are no longer manufactured and PCB inputs are resuspended sediments, industrial and sewage treatment plant discharges, and runoff from the Hudson-Raritan Estuary (New York Academy of Sciences, 1987). The designation of these sites would have no adverse effect through the introduction of toxics.

4-2.2 Interference with Navigation

Navigational safety should not be adversely affected by disposal operations at the existing sites. Although there is some risk of collision when the hopper dredges are operating or in transit to the sites, the probability is negligible considering the short-term and intermittent schedule of disposal operations. No incidences of such problems have been reported during previous use of the sites.

4-3 Effects on Aesthetics

Aesthetics of nearshore waters and beaches should not be affected by dredged material disposal activities. Nearshore waters are naturally turbid and the disposal of dredged material at the existing sites should not produce a permanent surface plume. The CE has stated that dumping at these nearshore sites would aid in the control of beach erosion since the dredged material should be transported inshore towards the beaches.

4-4 Effects on the Ecosystem

The effect of dredged material disposal on the marine ecosystem is of considerable public concern. Whereas some effects are large-scale and immediately apparent, others are subtle; it is frequently difficult to differentiate between changes due to natural fluctuations and those resulting from human perturbations. The consequences of dredged material disposal may be difficult to interpret in light of incomplete knowledge of biological pathways, ecology of organisms, and community dynamics.

The long term impacts associated with aquatic disposal are changes in sediment type and sedimentation rates, and possible long-term release of chemical contaminants and subsequent uptake of contaminants by organisms (CE, 1983). Furthermore, studies have demonstrated that in some cases benthic organisms bioaccumulate contaminants in concentrations that are higher than background levels. However, the dredged material from the inlets consist primarily of sand are similar in composition to the sediments at the IDMDSs. This would minimize the overall change in sediment type and sedimentation rates occurring in the disposal site. For each dredging project, the material to be disposed of would be analyzed no contaminated sediment would be permitted to be disposed of at the sites.

The effects of dredging operations on the ecosystem depend upon several factors: physical and chemical characteristics of the dredged sediment, degree of similarity between dredged sediments and those of the site, amount of material to be dumped, frequency of disposal, nutrients associated with dredged material, and turbidity associated with disposal operations. The physical and biological characteristics of the receiving environment are equally important. Effects of dredged material disposal may be lessened by locating disposal sites in areas where sediments are rarely disturbed.

4-4.1 Air Quality

Air quality would be influenced directly by disposal operations. The exhaust from the ships transporting the dredged material would cause a temporary decrease in air quality. No indirect impacts on air quality would occur as a result of the use of these sites.

4-5 Effects on Water Quality

4-5.1 Turbidity

Dredged material disposal causes an immediate increase in turbidity in the receiving waters. Duration of the turbidity plume formed depends upon particle size, currents and turbulent mixing (Wright, 1978). Sediment suspensions are unavoidable but short-term.

Changes in turbidity may be both beneficial and adverse to the environment. Beneficial effects may include the release of nutrients and the adsorption of undesirable chemical contaminants by the turbidity plume (Stern and Stickle, 1978).

Adverse effects of turbidity include temporary and local decreases in light penetration (possibly reducing photosynthesis), mechanical abrasion of the filter-feeding and respiratory structures of animals, and adsorption of essential nutrients from the water (Cairns, 1968). However, numerous studies have concluded that the suspended loads are unlikely to cause any long term adverse effects. Most organisms are not seriously affected by suspended sediments in the water (Hirsch et al., 1978). The exceptions are those systems sensitive to water clarity, such as coral reefs, kelp beds, and larval forms of oysters and clams (Hirsch et al., 1978; Stern and Stickle, 1978). Seasonal constraints during periods of high biological activity, would reduce the adverse impacts of turbidity on dissolved oxygen levels and prevent burial of organisms during the active period.

Disposal of dredged material at the interim sites should not cause adverse environmental impacts. The inlet sediments are predominantly sand and should sink rapidly minimizing re-suspension.

4-5.2 Dissolved Oxygen

Dredged sediments may exert a slight oxygen demand as they descend through the water column. The initial oxygen decrease depends partly on the type of material dumped; for example clean sand and gravel exert the lowest demands and anoxic and organically rich sediments exert the highest demands (Baram et al., 1978). Unless dissolved oxygen levels are depressed prior to dumping, disposal operations are unlikely to produce harmful effects on fish or other organisms. Because waters at the interim sites are well oxygenated, no adverse effects are anticipated. Seasonal disposal constraints would also avoid disposal during periods of low dissolved oxygen.

4-5.3 Nutrients

Deposition of dredged material may release nutrients in the water column. Although, nutrient release may stimulate phytoplankton growth, in high concentrations nutrients (such as ammonia) could become toxic to some organisms (Pequegnat et al., 1978). The potential occurrence of either effect is dependent upon the concentrations of constituents released, environmental factors (including dissolved oxygen levels), and mixing and dilution rates. Seasonal constraints placed on the disposal operations will avoid further increasing nutrient concentration during periods of high biological activity.

4-5.4 Trace Elements and Chlorinated Hydrocarbons

Disposal of dredged material in the ocean should not increase concentrations of trace metals in the water column. Unlike trace metals and nutrients, chlorinated hydrocarbons (CHC's) do not naturally occur in dredged sediments and the presence of these substances is due to anthropogenic (human) contamination (Brannon, 1978). Natural processes may concentrate CHC's in bottom sediments (Burks and Engler, 1978); CHC's are relatively insoluble and are rapidly sorbed (adsorbed and absorbed) to sediments, and only limited quantities are released to interstitial water, (Burks and Engler, 1978). The designation of these sights would not increase concentrations of trace metals and chlorinated hydrocarbons in the water column.

4-5.5 Effects on Sediment Quality

Disposal at any of the sites should not produce significant adverse effects on sediment quality. Contaminants in dredged material generally remain associated with the solid fraction of the material (Brannon, 1978).

4-6 Effects on Biological Conditions

4-6.1 Plankton

Dredged material disposal would cause a short-term increase in turbidity, resulting in a temporary decrease in light penetration with a concomitant reduction of photosynthetic activity (Stern and Stickle, 1978). No long-term changes in dissolved nutrients, trace metal concentrations, or phytoplankton primary productivity have been attributed to the disposal of dredged material (Wright, 1978; Hirsch et al., 1978). No short- or long-term adverse effects on plankton are expected at the sites.

4-6.2 Nekton

Transient turbidity plumes associated with the disposal of dredged material does not pose a significant threat to fish. Suspended particles can cause gill damage and reduce fish respiratory surface area (Ritchie, 1970), but this type of gill damage has not been positively identified as harmful to fish in terms of overall survival. Turbidity plumes associated with dredged material disposal are so brief that these changes probably would not not occur to any significant degree.

During periods of high turbidity, pelagic fish probably swim to more favorable areas. More sedentary fish (e.g., flatfishes) usually have higher tolerance levels to suspended particles, thereby minimizing the effects of suspended solids on their respiration (O'Connor et al., 1977).

After dumping, fish may be attracted to disposal sites by the exposure of food items in the dredged material and by the mound formed by dumping (Oliver et al., 1977). Adverse effects should not occur because disposal has only short-term, transient effects on water-column parameters and foraging activity by fish is not restricted to the mound. In addition, the placement of seasonal restrictions on both the dredging and disposal operations would further reduce the effects on water column parameters and foraging activities during periods of increased biological activities.

4-6.3 Benthos

Benthic communities are usually characterized by macroinvertebrates such as mollusks, crustaceans, and worms living on and within the sediments, the characteristics of which determine the nature and species composition of the resident fauna. The most significant adverse impacts of dredged material disposal have been observed in the benthos (Wright, 1978). The benthos are affected by burial and smothering, which temporarily reduce abundances of benthic species. The intensity of this effect varies with the type of dredged material, thickness of the overburden resulting from dumping, frequency of dumping, the benthic organisms involved, and the physical processes occurring in the receiving environment. Seasonal restrictions would allow for an extended recovery/recolonization period.

Recolonization by benthic organisms has been reported to occur fairly rapidly (within a few months) when dredged sediments are similar to the disposal site sediments. Presumably, the benthic communities have adapted to this type of perturbation.

One potential conflict with disposal at the nearshore interim sites is the occurrence of shellfish within the region. However, seasonal restrictions would prohibit disposal operations during spawning and larval growout seasons.

4-6.4 Threatened and Endangered Species

Threatened and endangered species in the areas off Long Island and New Jersey are highly mobile and could avoid any area in which dumping was occurring. The feeding ranges of such species are sufficiently large so that the infrequent dumping activities should not significantly affect their feeding activities. In addition, the area of the disposal sites are small compared to the total feeding area available to such species. Seasonal restrictions on dredging and disposal would avoid critical migratory periods of any of these species. Thus, it is unlikely that threatened and endangered species would be adversely affected by the disposal of dredged material at the existing sites.

4-7 Effects on Economics

4-7.1 Fisheries

Although fishery resources occur in and around all existing sites, all of the sites are located away from rocky outcrops and other identified productive fishing grounds in the Bight. Past use of the interim sites for the disposal of dredged material has not resulted in any known adverse impacts on fishing or shellfishing.

4-7.2 Commercial Shipping

Use of the existing sites should not conflict with normal commercial shipping traffic, provided routine navigational precautions are observed. The presence of hopper dredges or bottom dump scow barges at the existing sites may represent an obstacle to vessels approaching the inlets entrance; however, this is considered a minor problem because no conflicts have been recorded by the CE from previous site use.

Navigational hazards resulting from movement of the barges to and from the sites are minimal. Because dumping is completed within a short period of time and lengthy maneuvering within the sites during release is not required, disposal operations should not cause unacceptable navigational hazards

4-7.3 Military Activities

No conflict to military activities should arise with the use of any of the existing sites.

4-7.4 Recreation

Adverse effects on Long Island and New Jersey beaches are not expected because no impacts have been reported during past disposal activities. Furthermore, seasonal restrictions are placed on dredging and disposal operations to minimize impacts during periods of high recreational activity.

Recreational fishing and boating occurs around the interim sites and may be disturbed temporarily as a result of disposal operations. Any adverse impacts on sportfishing and diving activities are expected to be minimal and short-term. The infrequent and transitory nature of disposal operations are not expected to produce significant adverse impacts.

4-7.5 Mining and Oil and Gas Exploration

Sand resources occur almost continuously along the inner mid-Shelf. However, no mining or mineral extraction is known to occur at any of the interim sites.

Oil and gas exploration in the New York Bight indicates that the Continental Shelf may contain sufficient quantities of oil and gas for exploitation. All of the nearshore existing sites are outside the oil and gas lease sale tract areas.

4-7.6 Transportation of Dredged Material to the Site

Minor disruptions of harbor channel traffic may occur as a result of transportation and disposal of dredged material. Most of these disturbances are associated with the dredging operations and subsequent transport of the dredged material out of the inlets, where shipping and recreational boat traffic may cause congestion. Such inconveniences would occur regardless of the location of a disposal site.

Transportation costs for hauling dredged material from the dredging area to an ocean disposal site may represent a large part of the cost of a dredging operation. Expenses for fuel, labor and equipment rental are directly related to the distance between the dredging site and the disposal area.

4-8 Unavoidable Adverse Environmental Effects and Mitigating Measures

Potential unavoidable adverse effects that may occur within the interim sites include:

- o Accumulation of dredged material on the ocean floor;
- o Generation of a turbidity plume which would temporarily degrade water quality, interfere with filter feeding, decrease light availability, reduce primary productivity;
- o Smothering of less mobile benthic biota by burial under dredged material; and
- o Further alteration of sediment composition that would affect organism abundance, diversity, and possibly community structure at a site.

Some of the unavoidable adverse effects, are of short duration and of limited impact due to the rapid dilution of the material after release. Other impacts pose little environmental consequence because of the limited size of the site. Seasonal restrictions would further decrease the adverse effects by allowing dredging and disposal operations during periods of low biological activity. However, it should be stressed that some changes within a site may be acceptable as long as areas outside the site are not affected.

A monitoring program would detect any unacceptable adverse effects that might occur outside of the general boundaries of the site. The monitoring plan would concentrate on the benthic environment to determine possible long-term adverse effects on the benthic community and to determine dredged material distribution on the bottom of the site.

4-9 Relationship Between Short-Term Uses and Long-Term Productivity

Disposal operations should not interfere with the long-term use of any resources at the interim sites. Commercial fishing and sportfishing at and near the existing sites should not be significantly affected because the sites constitute only a small portion of the New York Bight inhabited by commercially important species. It is not anticipated that short-term impacts at the existing sites would significantly affect the long-term productivity of the area. Any short-term losses would be offset by the benefit to commerce from the dredging of the Long Island and New Jersey Inlet areas.

4-10 Irreversible or Irretrievable Commitments of Resources

Several resources would be irreversibly or irretrievably committed by the proposed action. These include the

- o loss of energy in the form of fuel required to power the disposal vessels to and from the disposal sites, and the
- o loss of some benthic organisms at the sites which are buried during disposal operations.

These losses are insignificant when compared to the benefits resulting from the dredging of the inlets. Without the availability of the nearshore disposal sites, many of the inlets may not be dredged.

5. RESPONSIVENESS SUMMARY

Chapter 5

Reponsiveness Summary

5-1 Introduction

The purpose of this section is to address comments received in response to the draft environmental impact statement (DEIS). The DEIS was made available for public review on November 18, 1983, and the comment period was open for a period of 60 days.

5-2 Comments and Responses

Letters were received from various federal, state, and local organizations. Complete copies of these letters are presented in Appendix B.

Substantive comments for which responses have been prepared are presented in the following listing, and the relevant paragraph(s) in each of these letters are marked and numbered in Appendix B to identify the source of each comment. The individual and/or organization making the particular comment is identified in this section.

EPA appreciates the comments provided to us by the State of New Jersey Department of Environmental Protection, Department of the Army, CE, Philadelphia District, National Science Foundation, National Oceanic and Atmospheric Administration, and the U.S. Department of the Interior.

5-2.1 Barbara Patala
Acting Chairman, Committee on Environmental Matters
National Science Foundation
Washington, D.C.
(November, 17 1983)

Comment 1-1: The National Science Foundation has no comments regarding the draft "Environmental Impact Statement (EIS) for the New Jersey/Long Island Inlets Dredged Material Disposal Site Designation."

5-2.2 John R. Weingart, Acting Director
Division of Coastal Resources
State of New Jersey
Department of Environmental Protection
Trenton, New Jersey
(December 20, 1983)

Comment 2-1: The designation of the sites is subject to the consistency provisions of the Federal Coastal Zone Management Act.

Response 2-1: New Jersey Department of Environmental Protection commented that site designation was subject to the Coastal Zone Management Act (CZMA) and the FEIS should include a section assessing the consistency of the proposed action with New Jersey's Coastal Management Plan (CMP). EPA reviewed this comment and determined that site designation is not subject to the CZMA. In Chemical Waste Management v. U.S. Department of Commerce, et al., Civil Action No. 86-624, (United States District Court For The District Of Columbia, 1986). The court determined that neither the Coastal Zone Management Act (CZMA) nor the National Oceanic and Atmospheric Administration (NOAA) regulations implementing the CZMA authorize a State to impose conditions unilaterally on EPA as part of the consistency certification. Section 102 of the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) authorizes the Administrator to designate sites and times for dumping (33 U.S.C. Section 1412(c)). The State of New Jersey is pre-empted from exercising authority over ocean dumping, including site designation (Section 106 (d) of MPRSA).

Comment 2-2: Both the site designation and the dumping of dredged material are subject to the consistency requirements of the CZMA.

Response 2-2: As stated in 2-1, a consistency determination is not required for site designations.

Comment 2-3: The Department of Environmental Protection could issue a negative determination on EPA's designation and later invoke consistency with regard to the issuance of the permit by the Corps.

Response 2-3: It is agreed that the sequence of events as presented in this comment could occur. Once the sites were designated, the New Jersey Department of Environmental Protection could issue a negative determination. However, in the past, the dredging that has occurred at the existing sites has been determined to be consistent with the Coastal Zone Management Act of New Jersey. It is not likely that any major change in the types of projects would occur which could lead to a negative consistency determination.

The designation of ocean dredged material disposal sites is based on a determination that the sites are environmentally acceptable for the disposal of dredged material. Once designated, the ocean disposal site provides one alternative for the disposal of dredged material. However, its use is regulated by the issuance of ocean disposal permits. Permit decisions and conditions are based on the results of evaluations in connection with proposed dredged material disposal projects. It is possible that these evaluations may determine that the dredged material is not suitable for ocean disposal, that the quantity of dredged material is beyond the capacity of the site, or that there are land-based disposal alternatives that are preferable to ocean disposal. Consequently, a non-ocean alternative may be selected for disposal of dredged material even though an environmentally acceptable ocean disposal site exists. Designation of an ocean disposal site does not imply that the site is available to all who wish to use it. All permit applications would continue to be reviewed on a case-by-case basis, and permits would only be issued after the need for ocean disposal has been documented.

Comment 2-4: The final EIS should include a section assessing the consitency of the proposed action with New Jersey's Coastal Management Program and should demonstrate that it is not feasible to use the dredged material for beach nourishment and should include an analysis of heavy metals and other possible contaminants in the dredged material from Absecon and Manasquan Inlets.

Reponse 2-4: A demonstration that beach nourishment is not feasible has not been included in the final EIS. Section 145 of P.L. 94-587 states that the Secretary of the Army, acting through the Chief of Engineers, is authorized upon request of the State, to place on the beaches of such State, beach quality sand which has been dredged in constructing and maintaining navigation inlets and channels adjacent to such beaches, if the Secretary deems such action to be in the public interest and upon payment of the increased cost thereof above the cost required for alternative methods of disposing of such sand. The feasibility of use of the dredged material for beach nourishment is determined in connection with each proposed dredging project. At that time, the quality and composition of the dredged material is determined, public interest aspects are evaluated, and the additional costs, are estimated and financial arrangements made. Beach nourishment is the preferred dredged material disposal method.

An analysis of heavy metals at the Absecon and Manasquan Inlets has not been included in the EIS. This analysis would be more appropriate during the permit processing period. The results would be examined on a case-by-case basis to ensure the suitability of the material being disposed of at that time. Material which would "degrade the waters of the United States" would not be permitted to be ocean disposed at any site.

5-2.3 Nicholas J. Barbieri, P.E.
Chief, Planning/Engineering Division
Department of the Army
Philadelphia District, Corps of Engineers
(December 27, 1983)

Comment 3-2: The center coordinates shown for the Absecon inlet Site do not fall within the boundary coordinates.

Response 3-2: The center coordinates of the Absecon Inlet Site have been corrected on page 1-13.

5-2.4 Joyce M. Wood, Chief
Ecology and Conservation Division
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Washington, D.C.
(December 30, 1983)

Comment 4-4: Beach nourishment should be the preferred disposal method for the Jones Inlet dredging.

Response 4-4: It should be noted from paragraph 4, page 2-11 that beach nourishment is recommended wherever needed and economically feasible. Use of the dredged material for beach nourishment at Jones Inlet is not precluded by the designation of an ocean disposal site. The suitability of the sediment for beach nourishment is determined on a case-by-case basis by the percentage of sand contained in the proposed dredged sediment and the quality of the sediment. The statement "...beach nourishment should be the preferred use for dredged material from both Absecon, Cold Springs, and Manasquan Inlets" was based on the Rutgers (1981) study for all dredging projects, the feasibility of beach nourishment must be examined and is not a given based on the area being dredged. Wherever practical, beach nourishment is preferable to ocean disposal.

Comment 4-5: As mandated by the Clean Water Act, water quality is expected to improve in the vicinity of shellfish closure zones. In addition, shellfish living in areas listed as "condemned" still provide a brood stock.

Response 4-5: Paragraph 4, page 2-14 regarding present restrictions is correct as stated. Improvement of water quality in these areas is a common goal.

EPA concurrs that shellfish living in "condemned" areas contribute to the broodstock, however, shellfish living in the areas to be dredged and the disposal areas do not comprise the majority of the brood stock for these areas. Furthermore, seasonal restrictions prohibit disposal during spawning and larval growout season.

Comment 4-6: Of the five endangered whale species mentioned, only the fin whale is regularly found in the Apex. Another common summer inhabitant of the Apex and the existing IDMDS's is the loggerhead sea turtle.

Response 4-6: The EPA appreciates receiving the additional information. The text has been altered accordingly.

Comment 4-7: Background scientific literature exists to compose a cursory summary of the expected long-term biological effects of site designation.

Response 4-7: As stated in this lead-in paragraph (paragraph 2, page 4-3), long term effects are the most difficult to assess and enough has been written in the scientific literature to offer at least a general summary. This section has been altered to incorporate this comment.

Comment 4-8: Young clams and oysters are also sensitive to turbidity.

Response 4-8: Paragraph 2, page 4-4 reflects this comment.

Comment 4-9: Generally, the more opportunistic benthic species recolonize first.

Response 4-9: It is agreed that more opportunistic species probably recolonize first. However, other species tend to recolonize over time. If conditions do not change the previous communities would rapidly recolonize due to the abundance of similar groups surrounding the disposal area.

Comment 4-12: The National Ocean Service contacted the New Department of Environmental Protection to assure that the State was aware of the DEIS in the context of its CZM program.

Response 4-12: The State of New Jersey is aware of the proposed site designations. See comment letter from the Department of Environmental Protection.

5-2.5 Anita J. Miller
Regional Environmental Officer
U.S. Department of the Interior

Office of the Secretary
Mid-Atlantic Region
Philadelphia
(January 13, 1984)

Comment 5-2: The subject document provides a basically adequate description of the proposed action and the affected environment. However, we are concerned that the permanent designation of Long Island, New York and New Jersey Inlet Dredged Material Disposal Sites (IDMDSs) might preclude the consideration of more productive uses of inlet dredged material, such as beach nourishment. In addition, permanently designated disposal sites might encourage more frequent dredging of the inlets, resulting in more frequent disturbance of benthic communities.

Response 5-2: The designation of an ocean dumping site does not preclude "...consideration of more productive uses of inlet dredged material...". Consideration of these uses is included in the evaluation of each permit application and Federal project. See response concerning beach nourishment. In view of the costs of dredging channels, it is doubtful that permanently designated disposal sites would encourage more frequent dredging of the inlets.

Comment 5-3: The creation of dredged material mounds so close to the barrier islands could redirect littoral currents toward the barrier islands, further aggravating shoreline erosion problems. These mounds could also affect fish migration and the distribution of planktonic stages of fish, invertebrates, and shellfish into unsuitable environments through the alteration of currents.

Response 5-3: Creation of mounds at the Inlet Sites is not expected. The high energy nature of the sites should lead to redistribution of the disposed dredged material over the area of the sites. Furthermore, no mounds have been formed as a result of the past use the the IDMDSs.

Comment 5-4: In light of the dynamic nature of the south shore of Long Island and the eastern shore of New Jersey, it appears that as long as the dredged material is clean, beach nourishment would be a highly practicable and environmentally preferable method of inlet dredged material disposal.

Response 5-4: See response 2-4.

Comment 5-5: The permanent designation of the IDMDSs is not in the best interest of resource conservation. We therefore recommend against the permanent designation of the Long Island, New York, and New Jersey Inlets Dredged Material Disposal Sites.

Response 5-5: The EPA does not agree with the comment. An ocean disposal site provides one alternative for the disposal of dredged material. An ocean disposal site does not preclude use of any other disposal alternative. It is believed that full consideration of this alternative along with other alternatives for disposal of dredged material would be in the best interest of resource conservation. Each dredging project is evaluated on a case-by-case basis. Beach nourishment is the preferred disposal alternative. However, if the dredged material does not meet the criteria for beach nourishment, other alternatives must be considered. Therefore, it is necessary to designate ocean disposal sites.

Comment 5-6: Page 1-2: the DEIS indicates that Rockaway Inlet provides passage into Jamaica Bay, and incorrectly states that this is "an important port of Long Island." The Rockaway Inlet, which is part of Gateway National Recreation Area (NRA), supports only transient commercial operations within the south channel of the Bay. The nature of Rockaway Inlet is considerably different from any of the other inlets covered in the DEIS. The terminal jetty off Breezy Point reduces the normal quantities of sediment loads into Rockaway Inlet, thus allowing tidal flows to maintain access to the Jamaica Bay Wildlife Refuge, which is highly important to the support of the Hudson-Raritan estuarine ecosystem and coastal fisheries resources. The refuge supports over 320 migratory and resident bird species dependent upon this coastal estuarine embayment.

Response 5-6: It is understood that the commercial use of Rockaway Inlet is less than the other inlets Table 2-2 states that the Rockaway Inlet requires the least amount of dredging (200,000 cy over a 50 year period). Because this Inlet is an important factor in the maintenance of the Hudson-Raritan Estuarine ecosystem, the designation of a dredged material disposal site for material removed from the inlet is vital to maintaining the quality of the environment.

Comment 5-7: Figure 2 notes the Rockaway DMDS site. This area appears to be within a major commercial surf clam population zone. In addition, contributions of any dredged materials containing organics, sediments, trace metals, or other material that potentially could reduce the quality or aesthetics of bathing beach water near Rockaway Beach (Riis Park) within Gateway NRA would be of major concern to the National Park Service.

Response 5-7: It is understood the area within which the Rockaway Inlet Site is located is presently closed to commercial clam harvesting. The quality of the dredged material is considered in the evaluation of permit applications and Federal projects for each project. Material which would "degrade the waters of the United States" would not be permitted by be ocean disposed at any of the dredged material disposal sites.

Comment 5-8: Page 3-18: The list of threatened and endangered species should include the American peregrine falcon (*Falco peregrinus anatum*) in the final EIS. It nests in the vicinity of the overall project area and is probably a transient species at the interim IDMDSs. No impacts are anticipated to this species, so no Biological Assessment or further Section 7 consultation under the Endangered Species Act (87 Sta. 884, as amended; 16 U.S.C. 1531 et seq.) is required with the U.S. Fish and Wildlife Service. Should project plans change or if additional information on listed or proposed species becomes available, this determination might be reconsidered.

Response 5-8: As suggested, the American peregrine falcon has been added to the list on page 3-16.

Comment 5-9: Due to the potential negative impacts of dredged material at the proposed Long Island, New York, and New Jersey Inlets Dredged Material Disposal Sites, and the viable option of disposing of clean material through beach nourishment, we recommend against the proposed permanent designation of the disposal sites.

Response 5-9: The recommendation has been noted, See responses 2-4 and 5-5 for discussion of beach nourishment.

Comment 5-10: Our most probable position on any permit application to dispose of inlet dredged material would be an objection to ocean disposal, and recommendation for beach nourishment.

Response 5-10: The Mid-Atlantic Region's most probable position has been noted.

5-2.6 Larry Schmidt
Acting Director, Planning Group

State of New Jersey
Department of Environmental Protection
Trenton, New Jersey
(February 8, 1984)

Comment 6-1: The Department of Environmental Protection has completed its review of the above noted draft EIS. As a result of this review we do not anticipate any major adverse environmental impacts provided that the designated dredged material disposal sites are found consistent under New Jersey's Coastal Zone Program. The DEP recommmends that the inlet dredged material be used for beach nourishment whenever possible. This method of disposal will minimize water quality and biota impacts while maximizing the recreational value of the beaches.

Response 6-1: The EPA appreciates the State of New Jersey, Department of Environmental Protection's review of the Draft EIS. For responses to the attached letter, see responses 2-1 through 2-5.

6. COORDINATION

Chapter 6

COORDINATION

Preparers of the Final EIS

The final EIS was issued by the U.S. Environmental Protection Agency, Region II. This document was based on a Draft EIS which was issued November 18, 1983. Review and revisions were prepared by Region II's Marine and Wetlands Protection Branch. Additional reviews and support were provided by the Office of Regional Council and Environmental Impacts Branch.

Copies of the Draft EIS were sent out for comment to:

Federal Agencies and Offices

Council on Environmental Quality
Department of Commerce
National Oceanic and Atmoshperic Administration
Department of Defense
Army Corps of Engineers
Department of the Navy
Department of Health and Human Services
Department of the Interior
Bureau of Land Management
Bureau of Outdoor Recreation
Fish and Wildlife Service
Geological Survey
Department of State
Department of Transportation
United States Coast Guard
National Science Foundation

State and Municipalities

State of New Jersey
State of New York
City of New York
Atlantic County
Cape May County
Monmouth County
Nassau County
Ocean County
Suffolk County

Private Organizations

American Littoral Society
Environmental Defense Fund, Inc.
National Academy of Sciences
National Wildlife Federation
New Jersey Marine Sciences Consortium
New York Testing Laboratories, Inc.
Port of New York and New Jersey

Resources for the Future

Sierra Club
Water Pollution Control Federation

Academic/Research Institutions

Rutgers University
State University of New York
University of Rhode Island

Comments were received from:

Barbara Patala
Acting Chairman, Commitee on Environmental Matters
National Science Foundation
Washington, D.C.
(November, 17 1983)

John R. Weingart, Acting Director
Division of Coastal Resources
State of New Jersey
Department of Environmental Conservation
Trenton, New Jersey
(December 20, 1983)

Nicholas J. Barbieri, P.E.
Chief, Planning/Engineering Division
Department of the Army
Philadelphia District, Corps of Engineers
(December 27, 1983)

Joyce M. Wood, Chief
Ecology and Conservation Division
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Washington, D.C.
(December 30, 1983)

Anita J. Miller
Regional Environmental Officer
U.S. Department of the Interior
Office of the Secretary
Mid-Atlantic Region
Philadelphia
(January 13, 1984)

Lawrence Schmidt
Acting Director, Planning Group
State of New Jersey
Department of Environmental Protection
Trenton, New Jersey
(February 8, 1984)

APPENDIX A

Appendix A

REPORT OF FIELD SURVEYS

NEW JERSEY AND LONG ISLAND ODMDSs

PREFACE

Interstate Electronics Corporation (IEC), under contract to the EPA (Contract No. 68-01-4610), conducted field surveys at four ODMDSs along the New Jersey coast, and four along the south shore of Long Island. The purpose of these surveys was to further characterize the marine environments in the area of the ODMDSs and to determine, if possible, any effects on the surrounding environment caused by disposal activities.

Survey designs were prepared by IEC and delivered to EPA on 31 May 1979. T.A. Wastler (Chief, Marine Protection Branch, EPA) approved the design for Long Island on 10 June 1979, and New Jersey on 15 July 1979.

The designs for the second surveys were revised by IEC and approved by EPA during 22-29 October 1979 for Long Island and 30 October to 3 November 1979 for New Jersey. Fewer stations were sampled at the Shark River Inlet (New Jersey) and the Jones Inlet (Long Island) ODMDSs during the second surveys, and additional stations were sampled between the ODMDSs along both coasts. In general, the revised plans allowed a wider spread of stations along both coasts to better characterize the marine habitats. Details of the sampling program are given in Section A-2 of this Appendix.

CONTENTS

CONTENTS (continued)

ILLUSTRATIONS

TABLES

CONTENTS (continued)

CONTENTS (continued)

A.1 INTRODUCTION

Interstate Electronics Corporation (IEC) conducted field surveys at four ODMDSs along the New Jersey coast (Shark River, Manasquan, Absecon, and Cold Spring Inlets) and four along the south shore of Long Island, New York (Rockaway, East Rockaway, Jones, and Fire Island Inlets). The surveys were performed during summer (June-July) and fall (October-November) of 1979. The purpose of the surveys was to collect biological, chemical, geological, and physical oceanographic data to assess the effects of dredged material disposal on the marine environment, and to augment historical information for the area. Major consideration of survey design was to determine whether any adverse effects measured within an ODMDS were detectable outside of the site boundaries.

Methods of data collection, results, and interpretations of the survey data are presented in the following sections. The data are briefly compared with historical information; however, more comprehensive treatment is given in Chapter 3 of this EIS.

A.2 METHODS

All survey operations were conducted using the Ocean Survey Vessel (OSV) ANTELOPE. Loran-C or radar range and bearing positioning were used for navigation, providing accuracy within 0.25 nmi (see Appendix B for Loran-C positions or range and bearing of all sampling casts).

During the July survey of the New Jersey Sites, Stations 1 to 15 were located in the area of the ODMDSs (Figure A-1). With the exception of Shark River Inlet ODMDS, a single station was located within each disposal site, and a single control station was positioned away from the site. For Shark River, three stations were sampled inside (1,3,4) and four immediately outside (2,5,7,9) the ODMDS due to its greater area. During the October-November survey, only Station 1 was re-sampled in the immediate area of the Shark River ODMDS; six additional control stations (Stations 16 through 21) were located between the disposal sites to further characterize the region.

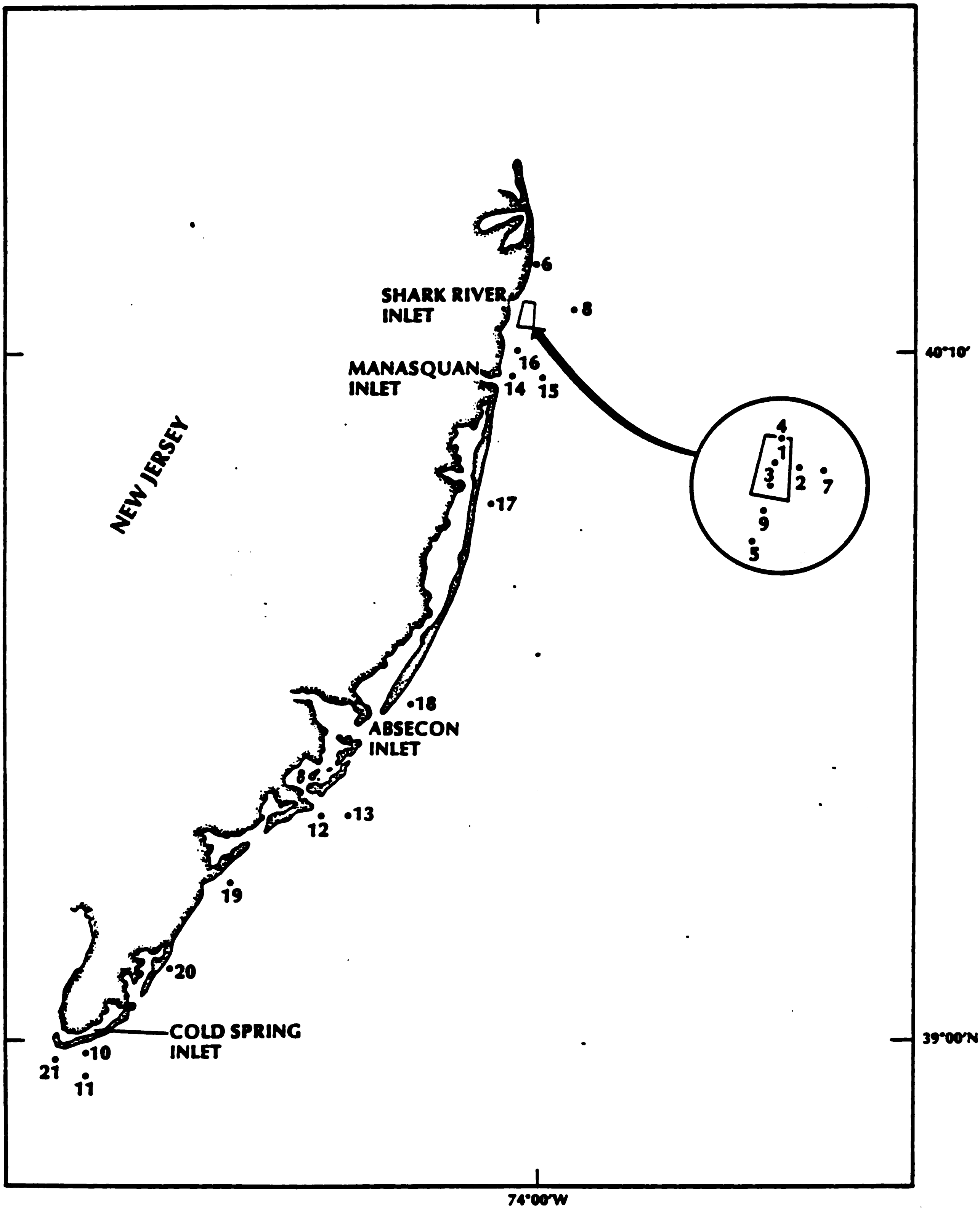


Figure A-1. New Jersey Inlet ODMDSs--Sampling Station Locations for July and October-November 1979 (inset shows July stations at the Shark River ODMDS, Stations 16-21 not sampled during July Stations 2-5, 7 and 9 not sampled during October-November)

Sampling design along the Long Island coast and station substitutions during the second survey were similar to those for New Jersey (Figure A-2). In general, a single station within the ODMDS and an outside control were located at each of the disposal sites. The exception was the Jones Inlet Site where, during June three stations were positioned inside (1,3,5) and three outside (2,4,7) the ODMDS. Stations 2,3,5, and 7 were omitted during the October survey, and stations 16 through 21 were added to improve regional coverage. The water depth, longitude, and latitude for all stations is presented in Table A-1.

Microbiological analyses of sediments and tissues, and several chemical (dissolved oxygen, pH) physical oceanographic (salinity temperature, turbidity) measurements were performed aboard the OSV ANTELOPE; all other detailed chemical, geological, and biological analyses were performed at shore-based laboratories listed in Table A-2.

Sampling equipment, procedures, and preservation methods were in accordance with the "Oceanographic Sampling and Analytical Procedures Manual" (IEC, 1980). A summary of these methods is presented in the following sections.

A.2.1 WATER COLUMN MEASUREMENTS

Shipboard Procedures

Conductivity and temperatures profiles were measured with a Plessey CTD, and data were stored on 9-track computer disks. A rosette sampler equipped with 30-liter Go-Flo bottles was used to collect surface and near-bottom water samples for suspended solids and dissolved oxygen, and for salinity and temperature calibration samples; mid-depth samples were collected for analysis of dissolved and particulate trace metals and chlorinated hydrocarbons (CHCs). Salinity samples were analyzed with a Beckman salinometer. Surface and bottom water temperatures were measured using reversing or bucket thermometers. Turbidity was measured with a Hach laboratory turbidimeter, dissolved oxygen using the modified Winkler method (Strickland and Parsons, 1968), and pH with a Beckman pH meter.

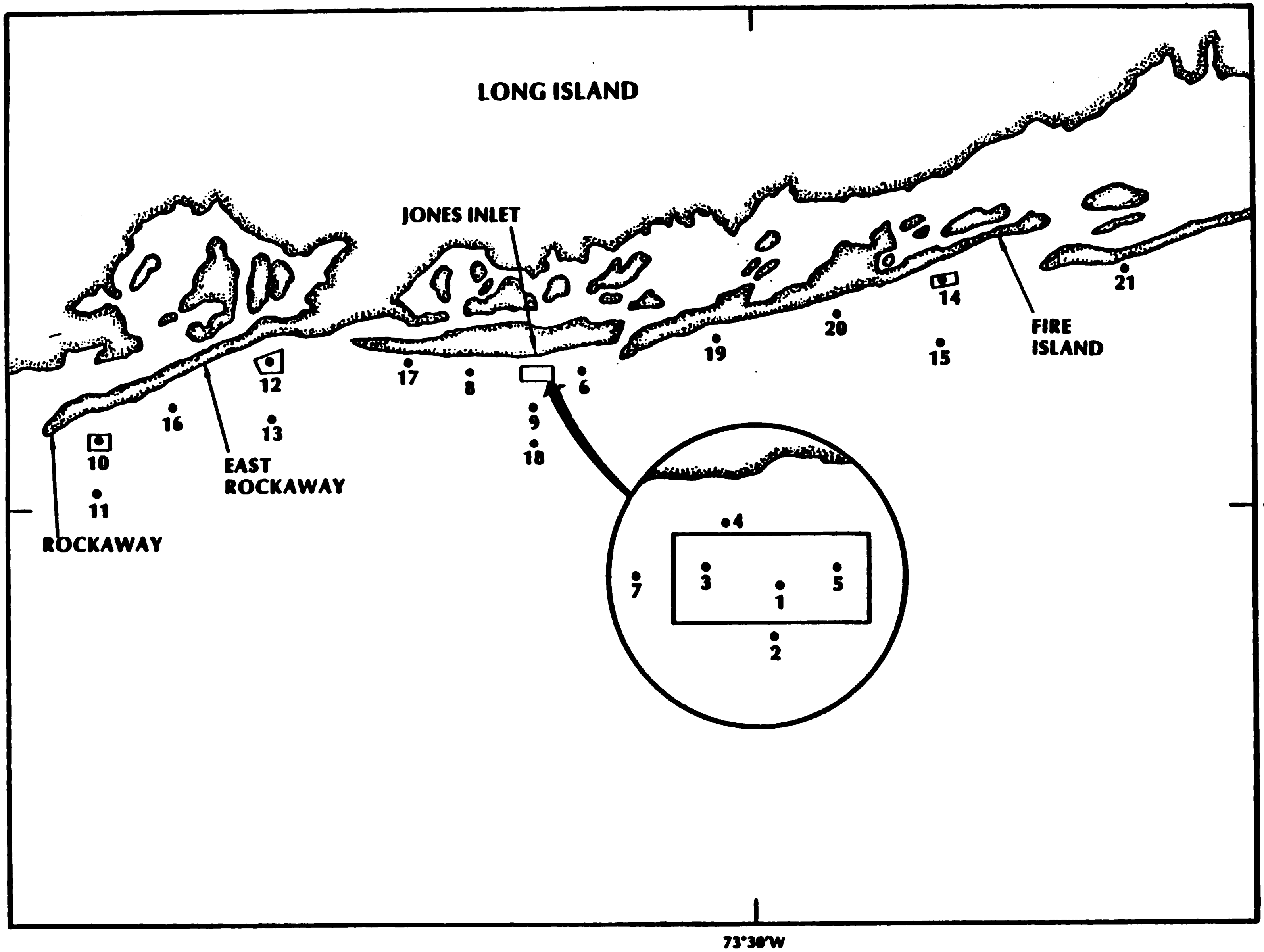


Figure A-2. Long Island Inlet ODMDSs--Sampling Station Locations
for June and October 1979
(inset shows June stations at the Jones Inlet ODMDS,
Stations 16-21 not sampled during June
Stations 2,3,5 and 7 not sampled during October).

TABLE A-1

WATER DEPTH, LATITUDE AND LONGITUDE OF STATIONS* SAMPLED ALONG THE NEW JERSEY AND LONG ISLAND COASTS, JUNE-JULY AND OCTOBER-NOVEMBER 1979

Station	Depth (m)	Latitude	Longitude	Station	Depth (m)	Latitude (N)	Longitude (W)
New Jersey:							
1	12	40°12.2'	73°59.6'	12	8	39°21.3'	74°23.8'
2	16	40°12.1'	73°59.6'	13	15	39°21.3'	74°21.5'
3	13	40°11.1'	73°59.0	14	7	40°06.5'	74°00.7'
4	12	40°12.7'	73°59.6'	15	14	40°05.5'	73°58.7'
5	14	40°10.8'	74°00.1'	16	10	40°09.0	74°00.8'
6	13	40 13.2	73 59.2	17	11	39°44.3'	74°06.4'
7	16	40°12.0'	73°58.3'	18	12	39°31.5'	74°15.4'
8	17	40°11.9'	73°57.6'	19	9	39°12.7'	74°37.9'
9	15	40°11.3'	74°00.0'	20	10	39°05.2'	74°42.3'
10	9	38°55.6'	74°53.2'	21	10	38°58.3'	74°55.8'
11	10	38°53.8'	74°53.2'				
Long Island:							
1	9	40°34.1'	73°38.1'	12	8	40°34.6'	73°48.0'
2	10	40°33.6'	73°38.3'	13	12	40°32.6'	73°48.0'
3	10	40°34.1'	73°38.8'	14	7	40°36.2'	73°22.6'
4	5	40°34.7'	73°38.6'	15	17	40°35.5'	73°22.2'
5	7	40°34.1'	73°37.4'	16	9	40°33.3'	73°51.3'
6	8	40°34.1'	73°36.2'	17	8	40°34.3'	73°42.7'
7	9	40°34.1'	73°39.5'	18	12	40°32.1'	73°38.1'
8	8	40°34.1'	73°40.2'	19	10	40°34.7'	73°31.1'
9	10	40°33.1'	73°38.1'	20	8	40°35.7'	73°26.5'
10	10	40°32.2'	73°54.5'	21	8	40°36.7'	73°15.5'
11	12	40°30.2'	73°54.5'				

*See Text for stations sampled during individual surveys.

TABLE A-2
LABORATORIES PERFORMING ANALYSIS OF SAMPLES
FROM NEW JERSEY AND LONG ISLAND ODMDSs AND VICINITY

Biology	Chemistry and Geology
Taxon, Inc., Salem, Massachusetts	ERCO, Cambridge, Massachusetts
*Dr. D.J. Reish, California State University Long Beach, California	*LFE Environmental, Richmond, California

* Denotes Quality Control Laboratory

Water samples for total suspended solids and trace metals (particulate and dissolved) analyses were transferred from Go-Flo bottles to 2-liter pressure filtration bottles, then filtered through Nucleopore filters. The filtrate was collected for dissolved trace metals analyses in precleaned bottles acidified with Ultrex nitric acid. Measured water volumes were pressure-fed directly from Go-Flo bottles through an Amberlite XAD resin column for extraction of dissolved CHCs (Osterroht, 1977). Both the filters for suspended solids and particulate metals and resin columns for dissolved CHCs were processed in a positive pressure clean hood and frozen prior to extraction and analysis.

Laboratory Methods

Total suspended solids were determined gravimetrically on an electrobalance (Meade et al., 1975). Filters containing particulate trace metal samples were leached for 2 hours with 1N Ultrex nitric acid. Leachates were analyzed for cadmium (Cd) and lead (Pb) by graphite furnace atomic absorption spectrophotometry (AAS), and for mercury (Hg) by cold-vapor AAS (EPA, 1979).

Dissolved Hg was analyzed by cold vapor AAS following an acid-permanganate digestion and reduction with hydroxylamine and stannous sulfates (EPA, 1979). Dissolved Cd and Pb were concentrated using a chelation-solvent extraction method (Sturgeon et al., 1980), and analyzed by graphite furnace AAS.

CHCs were eluted from resin columns with acetonitrile. The eluate was extracted three times with hexane, evaporated to near dryness, fractionated on florisil columns, and analyzed by electron capture gas chromatography (Osterroht, 1977). The chromatogram was scanned for presence of polychlorinated biphenyls (PCBs; Arochlors 1016, 1221, 1232, 1242, 1248, 1254, 1260 and 1262), and various pesticides and derivatives (aldrin, dieldrin, endrin, heptachlor, β-BHC, DDT, DDD, DDE, and heptachlor epoxide).

A.2.2 GEOCHEMISTRY AND GRAIN SIZE ANALYSES

Shipboard Procedures

Fifty grams of sediment were removed from each of seven 0.065 m^2 box cores per station, and frozen for grain-size analysis. Sediment samples for geochemical analyses (trace metals, oil and grease, total organic carbon [TOC], and CHCs) were collected from the surface 2 cm of two cores per station, stored in acid-cleaned Teflon jars, and frozen.

Laboratory Methods

Sediment grain size was determined by washing sediment samples through 2,000 and 62 um mesh sieves to separate gravel, sand, and silt/clay fractions following a procedure described by Folk (1978). Sand/gravel fractions were separated with 10 Ø interval sieves, dried, and weighed. The silt/clay fractions were analyzed using a pipette method (Rittenhouse, 1933).

Trace metals (Cd and Pb) were leached from 5 to 10g of sediments for 2 hours with 25 ml of 1N nitric acid, and analyzed by graphite furnace AAS. Mercury was leached from 5 to 10g of sediments at 95° with aqua regia and potassium permanganate, reduced using hydroxylamine sulfate and stannous sulfate, and analyzed by cold-vapor AAS (EPA, 1979).

Oil and grease were extracted from 100g sediment samples with an acetone-hexane mixture, dried and quantified gravimetrically according to the method of APHA (1975). Total organic carbon in sediments was measured with a Perkin-Elmer Model 240 Elemental Analyzer (Gibbs 1977).

CHCs were soxhlet extracted from sediment samples using a 1:1 acetone-hexane solvent. The extract was evaporated, cleaned on a florisil column, fractionated on a silicic acid column, and analyzed by electron capture gas chromatography (EPA, 1974). An additional acid cleanup step was required for analysis of PCBs.

Elutriate tests were performed in accordance with the specifications of EPA/CE (1977). Sediments and unfiltered disposal site water were mixed at a 1:4 ratio and mechanically and air-agitated for 30 minutes. After a one hour settling period, test water was filtered, acidified with ultrex hydrochloric acid, and analyzed for trace metals using techniques described above.

A.2.3 BIOLOGICAL MEASUREMENTS

Shipboard Procedures

Five macrofaunal samples were collected at each station using a 0.06 m^2 box core and washed through a 0.5 mm screen. Organisms were preserved in 10% formalin in seawater and stored until analysis. Two 3.5 cm diameter subcores were taken from one box core at each station for the July survey only and preserved for enumeration of meiofauna.

Two trawls, one inside and one outside of the site, were conducted using a 7.6m Otter trawl to collect epifauna for analysis of tissue concentrations of CHCs, trace metals, and total and fecal coliforms. In addition, information from the catch was used to further characterize the benthic and nektonic communities.

Epifauna from trawls were sorted in stainless steel trays and enumerated. Tissue was combined from at least three individuals of each of the commercially important species captured for fecal and total coliform analyses. The tissue was aseptically homogenized in a blender, and cultured and analyzed within 6 hours using a modified most probable number (MPN) technique (APHA, 1975; IEC, 1980). Other specimens were transferred from the trays to acid-rinsed plastic buckets, and then into clean plastic bags and frozen for trace metal analyses. Additional specimens were transferred to stainless steel buckets with stainless steel forceps, wrapped in aluminum foil, placed in polyethylene bags, and frozen for CHC analysis.

Total and fecal coliforms in sediments were determined from two box core samples at several stations. Approximately 30g of sediment from the surface 1 cm of each sample was collected aseptically; analysis was initiated within 6 hours after collection. Coliforms were determined using a modified MPN technique (APHA, 1975).

Laboratory Methods

For each coastal area, several dominant macrofaunal species were selected by Interstate biologists for enumeration in all samples. Selection of species was based on the inspection of initial laboratory data (species abundance among stations), feeding type, and known association with environmental conditions, particularly substrates. Each of the six dominant species were enumerated in all five station replicates, and mean species abundances were calculated for each station.

Analysis of cadmium and lead concentrations in tissues followed techniques described by EPA (1977). Approximately 5g to 10g of homogenized tissue were digested with nitric acid and hydrogen peroxide while heated. The digests were then evaporated, diluted to volume with deionized water, and analyzed with flame or flameless AAS. Analyses of Hg concentrations in tissue required digestion of an 8g to 10g sample with concentrated nitric and sulfuric acids and potassium permanganate, reduction of the ionized mercury with hydroxylamine and stannous sulfate, and analysis with cold-vapor AAS (EPA, 1979).

Tissue analyses for CHCs required homogenization of 50g of tissue with sodium sulfate, extraction with hexane, cleanup, fractionation, and analysis with electron capture gas chromatography (EPA, 1974).

A.2.4 COMPUTER DATA ENTRY AND ANALYSES

All data were entered into the Interstate computerized Oceanic Data and Environmental Evaluation Program data base (ODEEP). Statistical analyses included calculation of means and standard deviations; correlations were run between parameter values measured for individual sediment samples (casts). For certain data sets, nonparametric statistical tests were performed; these methods are described below in the appropriate sections.

A.3 RESULTS AND DISCUSSION

A.3.1 NEW JERSEY SURVEYS

A.3.1.1 Water Column

Temperature and salinity of the water column off New Jersey exhibited distinct differences between surveys and were consistent with previous seasonal observations in the area (Bowman, 1977). Temperature of coastal surface water during the July survey was approaching its annual maximum (22°C; Bowman, 1977). A slight warming trend in a southerly direction was observed; values ranged from 19.1°C at Shark River Inlet to 22.3°C at Absecon Inlet (Table A-3). July surface temperatures were warmer than those near the bottom; vertical differences of up to 8.9°C were recorded at offshore Stations 7,8 and 15, indicating the presence of a thermocline. Surface to bottom changes at inshore stations were generally less than 3°C. The overall temperature range during July was 12.6 to 22.3°C (Table A-3). July salinities (Table A-3) ranged from 29.0 to 31.9 °/oo reflecting fresh water inputs to the area (Bowman, 1977), and were relatively constant with depth. Both the minimum salinity (29.0 °/oo, surface) and the maximum vertical difference occurred at Station 1, near Shark River Inlet. During the fall (October-November) cruise, water temperatures were colder, exhibiting small vertical and spatial variations (range 12.4 to 14.8°C; Table A-4). Salinity variations were similarly small (30.4 to 32.7 °/oo; Table A-4). Lowest salinities were again found near the surface in the vicinity of Shark River Inlet, and may have reflected fresh water inputs from the Shark River and/or the Hudson Estuary.

WATER COLUMN PARAMETERS IN THE AREA OF THE NEW JERSEY ODMDSs, JULY 1979

Station	Depth (m)	Temperature (°C)	Salinity (°/oo)	Turbidity (NTU)	Total Suspended Solids (mg/l)	Dissolved Oxygen (ml/l)	Dissolved Oxygen (% Sat'n)	pH
1	2	19.5	28.980	0.75	2.90	6.16	114	8.2
	6	—	—	0.50	—	—	—	—
	11	16.9	30.711	1.00	2.53	4.97	88	8.0
6	2	19.4	30.063	0.72	0,41	7.36	136	8.2
	7	—	—	0.32	—	—	—	—
	12	16.1	30.955	0.83	1.23	4.07	71	8.0
7	2	19.9	30.076	0.57	0.87	6.56	123	8.2
	8	—	—	0.39	0.88	—	—	—
	15	12.0	31.519	0.65	0.50	3.85	62	7.8
8	2	19.1	30.715	0.73	0.96	8.19	151	7.9
	15	11.5	31.596	0.75	0.98	4.07	65	8.2
9	2	19.6	30.016	1.51	0.59	6.15	115	8.2
	14	17.0	30.878	0.59	5.08	5.19	93	—
	15	—	—	—	1.74	—	—	8.0
10	2	21.8	30.711	0.49	0.83	5.31	103	8.1
	4	—	—	0.48	—	—	—	—
	6	21.6	30.751	1.01	2.21	5.08	99	8.1
11	2	20.2	31.011	1.10	2.39	4.91	93	8.0
	3	—	—	2.85	—	—	—	—
	5	20.2	31.026	1.25	4.45	5.06	96	8.0
12	2	22.3	30.854	2.90	5.02	4.15	82	7.7
	4	—	—	2.70	—	—	—	—
	6	20.7	30.965	3.00	5.12	4.05	78	7.6
13	2	21.2	30.902	1.55	3.29	5.27	102	8.1
	4	—	—	1.60	—	—	—	—
	7	19.0	31.055	1.50	3.04	4.17	77	8.0
14	2	20.1	29.978	0.76	1.40	6.40	121	8.2
	7	—	—	1.25	—	—	—	—
	12	16.1	30.858	1.55	2.70	4.42	78	8.0
15	2	19.6	30.861	0.43	0.69	5.46	102	8.2
	9	—	—	3.00	—	—	—	—
	16	10.6	31.918	1.00	1.02	4.56	72	7.9

— = Not determined

TABLE A-4
WATER COLUMN PARAMETERS IN THE AREA OF THE NEW JERSEY ODMDSs, OCTOBER-NOVEMBER 1979

Station	Depth (m)	Temperature (°C)	Salinity (°/oo)	Turbidity (NTU)	Total Suspended Solids (mg/l)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (% Sat'n)	pH
1	2	13.1	30.938	0.39	0.51	6.68	113	7.9
	7	—	31.497	0.08	0.94	—	—	7.9
	13	13.1	31.922	0.95	1.60	5.15	85	7.9
6	2	12.4	31.116	0.54	0.56	6.57	107	7.9
	5	—	31.864	0.53	0.59	—	—	7.9
	9	13.5	32.121	0.66	0.90	5.99	100	7.8
8	2	13.1	31.572	0.45	0.70	6.68	108	7.8
	15	13.5	32.722	0.96	1.93	2.66	45	7.6
10	2	14.4	31.809	3.80	5.52	6.59	113	7.9
	4	14.1	31.814	4.35	6.60	6.60	112	8.0
11	2	14.5	32.157	1.00	1.81	6.47	111	8.0
	3	—	32.170	1.00	2.48	—	—	8.0
	7	14.8	32.190	1.20	3.49	6.21	107	8.1
12	2	12.9	31.618	3.20	5.35	6.70	111	7.8
	3	—	31.122	2.90	5.47	—	—	7.8
	6	12.9	31.182	3.00	5.94	6.63	109	7.8
13	2	13.5	31.819	1.25	1.55	6.48	108	7.8
	5	—	31.867	1.20	1.57	—	—	7.8
	7	13.7	31.930	1.15	2.22	6.41	108	7.8
14	2	13.0	31.192	0.55	0.57	6.63	109	7.9
	7	—	31.385	0.63	0.60	—	—	7.9
	14	12.9	31.528	0.52	0.69	6.38	105	7.9
15	2	14.0	32.347	0.27	0.41	6.06	103	7.9
	10	—	32.366	0.52	0.44	—	—	7.9
	20	13.9	32.366	0.33	0.38	6.01	102	7.9
16	2	12.7	30.394	0.47	0.56	6.70	109	7.8
	11	12.6	31.083	0.62	0.79	6.73	110	7.9
17	2	14.1	31.815	2.50	3.06	6.23	106	7.8
	8	14.1	31.959	2.30	3.35	6.34	107	7.8
18	2	14.0	32.091	1.90	3.56	7.06	119	7.9
	8	13.8	32.079	1.80	3.83	6.90	116	7.9
19	2	13.6	31.146	1.40	3.15	7.55	126	7.9
	10	14.0	31.627	1.60	3.81	7.21	122	7.9
20	2	14.1	31.909	1.30	2.02	6.97	118	8.0
	6	14.0	31.933	2.00	4.55	6.76	114	8.0
21	2	14.3	31.986	3.40	4.96	6.47	110	8.0
	10	14.1	32.073	2.90	4.41	6.10	103	8.0

— = Not determined

Dissolved oxygen concentrations (Tables A-4 and A-5) were sometimes slightly higher, but followed trends similar to those reported by Segar and Berberian (1976) for nearshore New Jersey waters. Both the present survey data and the latter study indicated considerable spatial and vertical variation in dissolved oxygen levels. During July, surface water was well-saturated (82 to 150% saturation); bottom water was generally less oxygenated (62 to 99% saturation). Probably as a result of storm mixing and weakening of water column stratification, dissolved oxygen levels at most staions during the fall (October-November) survey were near or above saturation at surface and bottom. The exception, Station 8 off Shark River Inlet, exhibited a near bottom concentration of 2.7 ml/l (45% saturation). Such concentrations occur frequently along the New Jersey coast during summer (Sharp, 1976) and have been observed during October and November by Segar and Berberian (1976).

Seawater pH generally decreased slightly with depth in July and was uniform with depth during October-November (Tables A-3, A-4). All pH values ranged from 7.6 to 8.2, within the normal range for seawater (Horne, 1969).

Levels of turbidity and concentrations of total suspended solids (TSS) showed considerable spatial and some vertical variability (Tables A-3 and A-4), probably reflecting various sources of suspended matter (estuarine runoff and tidal exchange, bottom scouring, and plankton productivity). Levels of these parameters were similar for the two surveys and consistent with measurements for TSS reported by Callaway, et al. (1976) and Freeland et al. (1976) for the nearshore New York Bight. Turbidity ranged from 0.32 to 4.35 NTU with a mean of 1.8 NTU; TSS averaged 2.0 mg/l and ranged from 0.4 mg/l to 5.9 mg/l. Highest values of both parameters were observed during the fall survey near Cold Spring and Absecon Inlets (Stations 10 and 12). No clear horizontal or vertical trends were evident from the data.

Dissolved and particulate trace metal concentrations were generally low (<0.5 ug/l) during both surveys (Tables A-5, A-6). With the exception of one dissolved mercury measurement (0.1 ug/l; Station 14, July) near Manasquan Inlet, all mercury and cadmium levels were well below EPA quality criteria for marine waters (0.1 ug/l Hg and 5 ug/l Cd; EPA, 1976). Dissolved and

TABLE A-5
PARTICULATE AND DISSOLVED TRACE METALS, AND DISSOLVED CHCs AT MID-DEPTH IN THE WATER COLUMN IN THE AREA OF NEW JERSEY ODMDSs, JULY 1979

	Station 1	Station 6	Station 10	Station 11	Station 12	Station 13	Station 14	Station 15
Particulate Trace Metals ($\mu g/l$)								
Hg	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.001
Cd	0.050	0.078	0.060	0.049	0.180	0.048	0.061	0.042
Pb	0.049	0.035	0.089	0.220	0.430	0.130	0.160	0.100
Dissolved Trace Metals ($\mu g/l$)								
Hg	0.030	0.030	--	0.040	0.040	0.040	0.100	0.040
Cd	0.073	0.076	--	0.040	0.050	0.051	0.110	0.059
Pb	0.130	0.080	--	0.080	0.260	0.140	0.160	0.120
CHCs* (ng/l)								
PP'DDD	ND	ND	ND	ND	0.90	ND	ND	ND
PP'DDE	ND	ND	ND	ND	1.00	ND	ND	ND
dieldrin	ND	ND	ND	ND	13.00	ND	ND	ND

* No other CHCs detected
-- = Not analyzed, sample lost
ND = None detected
Values represent single analyses

TABLE A-6
PARTICULATE AND DISSOLVED TRACE METALS, AND DISSOLVED CHCs AT MID-DEPTH IN THE WATER COLUMN IN THE AREA OF THE NEW JERSEY ODMDSs, OCTOBER-NOVEMBER 1979

	Station 1	Station 6	Station 10	Station 11	Station 12	Station 13	Station 14	Station 15
Particulate Trace Metals (μg/1)								
Hg	0.006	0.003	0.005	0.001	0.006	0.004	0.003	0.004
Cd	0.012	0.008	0.032	0.005	0.009	0.003	0.003	0.010
Pb	0.100	0.062	0.024	0.075	0.220	0.075	0.079	0.004
Dissolved Trace Metals (μg/1)								
Hg	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070
Cd	0.097	0.251	0.221	0.330	0.133	0.258	0.114	0.063
Pb	0.034	0.087	0.082	0.214	0.026	0.229	0.027	0.028
CHCS* (ng/1)								
Arochlor 1016	13.5	14.8	23.2	6.1	3.7	3.6	2.2	ND
pp'DDD	1.5	1.7	3.9	ND	ND	ND	ND	ND
pp'DDE	ND	ND	ND	ND	ND	ND	ND	ND

* No other CHCS detected
ND = None detected
Values represent single analyses

particulate cadmium concentrations were within or below the range reported for New York Bight waters by Segar and Cantillo (1976). Lead levels were variable; concentrations in the dissolved and particulate phases ranged from 0.028 to 0.260 ug/l and from 0.004 to 0.430 ug/l, respectively. No historical lead data from the area were available for comparison; however concentrations were within ranges reported for unpolluted coastal waters elsewhere (Abdullah et al., 1972).

One PCB mixture (Arochlor 1016), one pesticide (dieldrin), and two pesticide derivatives (pp'DDD, pp'DDE) were detected in water column samples during the surveys (Tables A-5 and A-6). All levels were extremely low (25 ng/l); PCB concentrations were similar to those reported previously for the area (Harvey and Steinhauer, 1976).

A.3.1.2 Sediment Characteristics

Sediments off the New Jersey coast have been reported to be predominantly fine to coarse sands with patches of gravelly and muddy sands (Freeland and Swift, 1978; Freeland et al., 1976; 1979). Results of EPA/IEC surveys in 1979 generally agreed. Sediment sand content ranged from about 67 to 99% with no apparent seasonal or depth-related trends (Tables A-7, A-8). Poor sediment sorting at some stations during July (e.g., Stations 1,3, and 4 near Shark River Inlet) was indicated by co-occurrence of relatively high percentages of both gravel and fines (silt and clay); this situation was less evident during the October-November survey (e.g., Stations 1,6, and 21). Silt and clay content over both surveys ranged from near zero to approximately 28%; the heterogeneity of sediment texture was further demonstrated by the large standard deviations for replicate casts at the same station. Stations near Shark River Inlet (e.g., Stations 1,3,5,6) generally yielded higher percentages of fines than other areas sampled off New Jersey; however sediments did not exhibit greater proportions within the ODMDS relative to outside. No effects of dredged material disposal at the ODMDSs could be identified from the grain size distribution.

Levels of all measured sediment chemical constituents correlated positively ($p < 0.05$) with silt and clay content. Sediments off the Shark River Inlet,

TABLE A-7
SEDIMENT COMPOSITION IN THE AREA OF THE
NEW JERSEY ODMDSs, JULY 1979

Station	Mean Depth Among Casts (m)	% Composition*		
		Gravel	Sand	Silt and Clay
1	14	14.2 (15)	71.3 (22.3)	14.5 (10.8)
2	15	0.7 (0.9)	97.5 (1.1)	1.8 (0.5)
3	14	11.3 (24.2)	60.9 (43.3)	27.7 (44.3)
4	15	0.9 (2.1)	94.9 (7.6)	4.1 (5.5)
5	15	22.4 (26.5)	53.0 (20.1)	24.6 (26.0)
6	16	0.7 (1.2)	88.6 (21.5)	10.5 (20.2)
7	16	0.8 (1.0)	97.7 (1.2)	1.5 (0.7)
8	17	7.0 (17.5)	91.4 (18.0)	1.6 (1.0)
9	13	0.8 (1.5)	97.5 (1.6)	1.7 (0.5)
10	8	0.8 (0.9)	96.5 (3.3)	2.7 (3.3)
11	8	1.9 (3.3)	97.2 (3.7)	1.0 (0.6)
12	7	0.1 (0.1)	98.8 (0.4)	0.2 (0.3)
13	9	0.1 (0.1)	99.0 (0.5)	0.9 (0.4)
14	11	0.5 (0.6)	89.9 (19.4)	8.5 (18.5)
15	20	0.6 (0.8)	95.6 (6.6)	3.9 (5.9)

*Values are means (n=7) with standard deviations in parentheses for seven replicate box cores at each station.

which generally contained the highest levels of silt and clay, also contained the highest levels of cadmium, mercury, lead, oil and grease, total organic carbon (TOC) and chlorinated hydrocarbons (CHCs). Data at the Shark River ODMDS were insufficient to determine whether the elevated levels of sediment parameters was the result of previous dumping; areas north and south of this ODMDS also contained elevated levels of fine materials and/or sediment chemical constituents. Further, dredged material disposal at the Shark River Site has not occurred since 1958. Sediment samples from Cold Spring and Absecon Inlet ODMDS, and from control Stations 17, 18, 19, and 20 generally contained low levels of fines and trace contaminants.

TABLE A-8
SEDIMENT COMPOSITION IN THE AREA OF THE NEW JERSEY
ODMDSs, OCTOBER-NOVEMBER 1979

Station	Mean Depth Among Casts (m)	% Composition		
		Gravel	Sand	Silt and Clay
1	15	1.3 (1.9)	83.7 (30.1)	15.1 (30.6)
6	14	1.4 (2.3)	70.8 (35.8)	27.7 (36.1)
8	18	1.6 (4.0)	90.2 (12.0)	8.1 (9.0)
10	8	4.3 (1.8)	91.4 (3.4)	4.3 (2.3)
11	10	1.3 (1.2)	96.0 (1.2)	2.6 (1.9)
12	7	0.0 (0.1)	97.5 (0.7)	2.3 (1.0)
13	10	1.0 (2.3)	95.1 (2.1)	3.9 (0.8)
14	15	0.4 (0.4)	97.5 (1.0)	2.0 (1.1)
15	22	0.4 (0.8)	96.5 (0.7)	3.1 (1.1)
16	11	0.3 (0.5)	93.5 (1.9)	6.2 (2.0)
17	8	0.1 (0.1)	91.5 (1.4)	8.4 (1.4)
18	8	0.1 (0.1)	92.8 (1.4)	7.0 (1.3)
19	8	2.0 (5.7)	84.7 (4.9)	13.2 (7.0)
20	9	0.0 (0.0)	91.3 (1.7)	8.7 (1.7)
21	10	27.9 (8.4)	66.6 (10.4)	5.1 (3.5)

*Values are means (n=7) with standard deviations in parentheses for seven replicate box cores at each station.

Sediment cadmium concentrations ranged from 0.01 to 0.92 ug/g; mercury from 0.01 to 2.03 ug/g; and lead from 1.3 to 130 ug/g over both surveys (Tables A-9 and A-10). The highest concentrations of all three metals were recorded for sediments from Station 3 during July, and from Stations 6 and, to a lesser degree, 8 during the October-November survey. Station 3 is located within, and Stations 6 and 8 north and east of the Shark River Inlet ODMDS. Secondary maxima occurred at other stations in the vicinity of this site (e.g., Station 15). Since high metal levels were found both within and outside the Shark River ODMDS, previous dredged material disposal at this site may not be the causative agent. This possibility cannot be excluded, however, as it is

TABLE A-9
TRACE METALS, TOTAL ORGANIC CARBON (TOC), AND OIL AND GREASE
IN SEDIMENTS, IN THE AREA OF THE NEW JERSEY ODMDSs, JULY 1979*

Station	Hg (ug/g)	Cd (ug/g)	Pb (ug/g)	TOC (mg/g)	Oil and Grease (mg/g)
1	0.54, 0.23	0.20, 0.05	24.0, 5.5	11.4, 1.0	0.66, 0.07
2	0.32, 0.12	0.03, 0.01	12.0, 13.0	2.8, 1.0	0.12, 0.18
3	0.73, 0.81	0.05, 0.80	64.0, 130	43.9, 42.5	1.98, 3.21
4	0.29, 0.41	0.13, 0.05	35.0, 29.0	4.4, 1.3	0.18, 0.00
5	0.24, 0.18	0.15, 0.18	17.0, 14.0	2.7, 5.9	0.15, 0.32
6	0.11, 0.14	0.01, 0.01	12.0, 9.6	0.8, 1.2	0.04, 0.03
7	0.10, 0.06	0.01, 0.01	8.2, 3.6	0.7, 0.8	0.03, 0.03
8	0.05, 0.18	0.01, 0.01	7.0, 15.0	0.8, 0.8	0.02, 0.01
9	0.88, 0.54	0.02, 0.03	9.7, 22.0	2.5, 10.4	0.19, 0.01
10	0.01, 0.02	0.01, 0.02	2.3, 2.0	0.6, 0.4	0.01, 0.03
11	0.01, 1.10	0.01, 0.05	1.3, 8.9	0.5, 0.4	0.03, 0.01
12	0.04, 0.08	0.01, 0.01	1.9, 2.1	0.7, 0.9	0.02, 0.02
13	0.08, 0.02	0.01, 0.01	3.0, 2.7	0.7, 0.5	0.03, 0.03
14	0.02, 0.08	0.01, 0.01	2.5, 3.5	0.6, 0.6	0.05, 0.03
15	0.44, 0.19	0.01, 0.01	49.0, 12.0	15.5, 1.1	0.51, 0.06

*Values represent single determinations from duplicate box cores.

possible dumped sediments could have been transported and deposited outside the site boundaries since they were last dumped in 1958 (see Chapters 1 and 3). Other possible sources of contamination in sediments of this area include: (1) deposition of contaminated suspended sediments discharged from the New York Harbor system or Shark River Inlet, (2) offshore ocean dumping of sewage sludge and dredged material, or (3) transport from contaminated offshore sedimentary deposits. Trace metal concentrations comparable to those measured in the Shark River Inlet area have been reported for the New York Mud Dump dredged material deposit (located approximately 8 km offshore); concentrations measured elsewhere during the present study were similar to or less than those in "natural" sediments in the New York Bight (Dayal et al., 1981; also see EPA, in preparation). Lead levels measured off the Absecon

TABLE A-10
TRACE METALS, TOTAL ORGANIC CARBON (TOC), AND OIL AND GREASE IN SEDIMENTS IN THE AREA OF THE NEW JERSEY ODMDSs, OCTOBER-NOVEMBER, 1979*

Station	Hg (ug/g)	Cd (ug/g)	Pb (ug/g)	TOC (mg/g)	Oil and Grease (mg/g)
1	0.02, 0.01	0.02, 0.02	19.0, 6.5	0.9, 0.7	0.04, 0.01
6	2.03, 0.03	0.86, 0.03	120, 3.2	38.6, 4.1	3.18, 0.12
8	0.09, 0.02	0.92, 0.02	15.8, 17.0	18.1, 0.8	0.30, 0.02
10	0.01, 0.01	0.03, 0.03	3.6, 3.2	1.4, 1.1	0.01, 0.08
11	0.01, 0.01	0.01, 0.01	1.6, 1.4	0.2, 0.2	0.01, 0.01
12	0.01, 0.01	0.03, 0.02	2.0, 1.9	0.5, 0.6	0.06, 0.02
13	0.03, 0.01	0.04, 0.01	5.0, 2.8	1.3, 0.6	0.18, 0.02
14	0.01, 0.01	0.01, 0.01	5.0, 4.6	0.5, 0.2	0.02, 0.01
15	0.05, 0.02	0.04, 0.01	12.4, 7.4	1.3, 0.7	0.09, 0.06
16	0.03, 0.04	0.02, 0.07	6.4, 12.6	1.0, 2.8	0.09, 0.09
17	0.02, 0.02	0.03, 0.03	6.6, 6.2	0.9, 0.7	0.06, 0.02
18	0.02, 0.02	0.03, 0.08	5.2, 4.9	1.2, 0.9	0.07, 0.04
19	0.01, 0.01	0.03, 0.03	5.6, 5.2	1.2, 1.3	0.06, 0.06
20	0.01, 0.01	0.03, 0.03	3.8, 5.0	0.9, 1.9	0.05, 0.04
21	0.01, 0.01	0.03, 0.02	3.6, 3.2	1.5, 0.6	0.12, 0.06

*Values represent single determinations from duplicate box cores

Inlet were comparable to those measured in the same area by Burreson et al. (1979). Metal levels differed considerably between casts at some stations (e.g., Station 6, July survey) reflecting patchy sediment distributions over relatively small areas.

Inlet were comparable to those measured in the same area by Burreson et al. (1979). Metal levels differed considerably between casts at some stations (e.g., Station 6, July survey) reflecting patchy sediment distributions over relatively small areas.

Concentrations of TOC (Tables A-9 and A-10) ranged from 0.2 mg/g in sandy sediments at Stations 11 and 14 in the fall, to 43.9 mg/g in relatively fine-grained sediments at Station 3 in July. Highest TOC levels were found in the same samples as the metal maxima and were similarly patchy in distribution, particularly near Shark River Inlet. MMeasurements in 90% of the samples fell within the range 0.4 to 18.1 mg/g (0.04 to 1.8%). TOC levels were similar to those measured previously in the New York Bight (Gross, 1976).

Oil and grease content in sediments ranged from 0.01 to 3.1 mg/g (Tables A-9 and A-10) and, again, levels were clearly related to sedimantary silt and clay content. As with other trace contaminants, oil and grease content did not exhibit any clear seasonal trends or relationship to dredged material disposal.

Three PCB mixtures (Arochlor 1016, 1254, and 1262), one pesticide (dieldrin) and three pesticide derivatives (pp'DDE, opDDE, and pp'DDD) were identified in sediments off the New Jersey coast (Table A-11). Other PCB mixtures or pesticides analyzed either were not present, or present at levels below analytical detection limits. Total PCB concentrations ranged from 0.9 ng/g at Station 11 in July to 109 ng/g at Station 6 in the fall. Again, levels were positively correlated, (p 0.05) to percentages of silt and clay. No statistical (Mann-Whitney U-Test) difference between PCB levels in site versus control sediments was observed. Concentrations of PCBs showed no consistent seasonal trends and were generally comparable to those found by Harvey et al. (1973) and West and Hatcher (1980) in coastal areas of the New York Bight. Levels of pesticides and pesticide derivatives were in sediments all below 5 ng/g. Levels generally paralleled PCB concentrations suggesting that the distribution was a result of association with fine grained materials, and not necessarily related to dredged material disposal at the ODMDSs.

A.3.1.3 <u>Contaminants in Organisms</u>

Concentrations of trace metals and CHCs in edible tissues of four species collected from the survey area are presented in Table A-12. Levels of most contaminants varied over a relatively wide range; however sporadic catches of specimenns for analysis prevented any meaningful spatial or seasonal comparisons.

TABLE A-11

CHLORINATED HYDROCARBONS (CHCs)* DETECTED IN SEDIMENTS IN THE AREA OF THE NEW JERSEY ODMDSs, JULY AND OCTOBER-NOVEMBER 1979

	PCB Arochlor 1016 (ng/g)		PCB Arochlor 1254 (ng/g)		PCB Arochlor 1262 (ng/g)		Dieldrin (ng/g)		Pesticides and Derivatives op'DDE (ng/g)		Pesticides and Derivatives pp'DDE (ng/g)		Pesticides and Derivatives pp'DDD (ng/g)	
Station	July	Oct-Nov	July	Oct-Nov	July	Oct-Nov	July	Oct-Nov	July	Oct-Nov	July	Oct-Nov	July	Oct-Nov
1	11.0	0.9,1.4	15.0	1.1,0.6	-	-,-	-	-,-	1.0	-,-	0.8	-,-	1.4	0.1,-
2	4.0	-,-	5.0	-,-	-	-,-	-	-,-	-	-,-	-	-,-	0.4	-,-
4	6.0	-,-	12.0	-,-	-	-,-	-	-,-	0.6	-,-	-	-,-	0.5	-,-
6	9.0,2.0	37.9,1.7	15.0,2.0	43.5,0.9	-,-	27.7,-	-	-,-	-,-	-,-	0.6,-	0.7,-	1.3,0.4	3.6,-
10	1.0	1.4,0.9	1.0	2.1,1.0	-	-,-	-	-,-	-	-,-	0.1	0.1,-	0.2	0.1,-
11	0.8	0.2,1.6	0.1	2.2,-	-	1.6,-	-	-,-	-	-,-	-	-,-	-	-,-
12	3.0	0.7,0.8	-	1.0,0.5	-	-,-	-	-,-	-	-,-	-	-,-	-	-,-
13	1.0	1.7,-	2.0	1.5,-	-	0.6,-	-	-,-	-	-,-	-	-,-	-	-,-
14	1.0	0.7,1.3	1.0	0.8,1.7	-	1.2,-	-	-,-	-	-,-	-	-,-	-	-,-
15	23.0	2.7,1.6	37.0	4.2,1.7	-	5.5,0.3	2.4	-,-	-	-,-	1.4	-,-	-	0.2,-

* No other CHCs detected

\- = None detected

Values represent single determinations from individual box cores

TABLE A-12
CONCENTRATIONS OF TRACE METALS AND CHLORINATED HYDROCARBONS (CHCs) IN ORGANISMS COLLECTED FROM THE VICINITY OF NEW JERSEY ODMDSs, JULY AND OCTOBER 1979*

Species (common name)	Trace Metals (ug/g)				CHCs (ng/g)**					
						PCBs		Pesticides and Derivatives		
	Station	Hg	Cd	Pb	Arochlor 1016	Arochlor 1254	Arochlor 1262	pp'DDE	pp'DDD	pp'DDT
July										
<u>Scophthalmus aquosus</u> (Windowpane flounder)	3	0.15	0.08	2.4	32.0	73.0	—	9.7	3.2	6.5
<u>Scophthalmus aquosus</u>	6	0.08	0.09	2.6	65.0	84.0	—	20.3	16.6	8.6
October-November										
<u>Cancer irroratus</u> (rock crab)	1	0.65	0.55	0.6	38.5	32.0	12.9	3.3	23.6	—
<u>Cancer irroratus</u>	6	0.39	0.24	0.5	185	43.8	62.8	1.3	24.2	—
<u>Callinectes sapidus</u> (Blue crab)	6	1.23	0.99	1.5	NA	NA	NA	NA	NA	NA
<u>Spisula solidissima</u> (Surf clam)	13	0.08	0.08	0.7	NA	NA	NA	NA	NA	NA
<u>Spisula solidissima</u>	17	0.07	0.13	0.7	40.2	21.5	—	3.5	2.3	—

* Data represent single analyses of pooled tissue samples (edible portions)
** No other CHCs detected
— = Not detected
NA = Not analyzed

Ranges of trace metal concentrations for all species captured were 0.07 to 1.23 ug/g Hg (mercury), 0.08 to 0.99 ug/g Cd (cadmium), and 0.5 to 2.6 ug/g Pb (lead). One mercury value in crabs collected near the Shark River ODMDS (1.23 ug/g in *Callinectes sapidus* at Station 6 was above the FDA Action Level of 1.0 ug/g for edible fish and shellfish tissue (21 CFR Part 109). No data or standards for lead or cadmium were available for comparison.

Concentrations of DDT derivatives (pp'DDE, pp'DDD, pp'DDT) ranged from undetectable to 24.2 ng/g; total PCB (sum of individual arochlors) levels ranged from 62 to 292 ng/g. All PCB values were far below the FDA Tolerance Level of 5 ug/g (5,000 ng/g; 21 CFR Part 109) and were well within ranges for *Scophthalmus aquosus*, *Cancer irroratus*, and *Spisula solidissima* as reported by Pierce (1980) for the New York Bight.

A.3.1.4 Elutriate Tests

Elutriate tests performed on sediments from the vicinity of Shark River Inlet indicated small releases of cadmium and lead to test waters; mercury showed little or no release (Table A-13). Cadmium and lead releases were greater for sediments collected outside (Station 6) relative to inside (Station 1) the ODMDS. No dumping of dredged materials has occurred at this site since 1958; thus, no conclusions can be reached regarding effects of dredged material disposal.

TABLE A-13
RESULTS OF ELUTRIATE TESTS FOR SEDIMENTS INSIDE AND OUTSIDE THE SHARK RIVER ODMDS; SEDIMENT AND WATER COLLECTED DURING JULY 1979*

	Concentration in Test Water (ug/g)			Pre-Test Concentration** (ug/g)		
Station	Hg	Cd	Pb	Hg	Cd	Pb
1 (Inside)	0.050	0.056	0.42	0.030	0.073	0.130
		0.050	0.150	0.23		
	0.055	0.140	1.60			
6 (Outside)	0.050	0.130	0.86	0.030	0.076	0.080
		0.050	0.150	6.10		
	0.055	0.270	6.50			

* Three replicate tests performed on each sediment sample, all concentrations are ug/l in dissolved phase.
** Seawater collected at mid-depth at indicated station.

A.3.1.5 Macrofauna

Eighty-four species of macrofauna were common at stations sampled along the New Jersey coast in July and October-November 1979 (Table A-14). Polychaetous annelid worms comprised 57% of the macrofaunal species, and were best represented by species of *Nephtys*, *Prionospio*, *Amastigos* and archiannelids. The latter group was one of the most abundant taxa during both surveys; densities of the anchiannelid *Protodrilus symbioticus* reached nearly 28,000 individuals/m^2 at Station 15 (a control site at the Manasquan Inlet ODMDS) during the October-November survey. Crustaceans were also numerous (23% of total species) due to the presence of many species of amphipods including species of *Acanthohaustorius* and *Unciola*. Molluscs were common and comprised 14% of the macrofauna; bivalves were the most numerous taxa, especially *Modiolus modiolus*, *Spisula solidissima* and *Tellina agilis*.

Figure A-3 is a diagramatic representation of several of the abundant macrofauna collected from the study area, and indicates where they occur in the sediment. Most of these species, such as *Acanthohaustorius* or *P. symbioticus*, are small bodied organisms (< 5 cm) characteristic of sandy marine environments of the Middle Atlantic Bight (see Maurer et al., 1976). The surf clam *S. solidissima*, however, can grow to 17 cm in length (Stanley, 1970), and is a valuable commercial resource along the New Jersey coast (Serchuk and Murawski, 1980; see Chapter 3). However, at all stations, the surf clams collected were less than 20 mm in length, (Mr. D. McGrath, Taxon, personal communication) and therefore, less than one year in age (Ropes, 1980).

Comparison of the benthic community of a disposal area with surrounding undisturbed (by disposal) benthic communities may aid in the detection of effects caused by the disposal of dredged material. These areas can be compared by examining the structure of the community and abundances of representative species.

One method to describe community structure is to define the trophic or feeding interrelationships of the resident organisms. Determination of feeding modes has been used here to characterize the trophic structure of macrofauna at each station. Each of the species in Table A-14 was placed into the following feeding categories basad on Barnes (1968); Bloom et al. (1972); Santos and Simon (1974); Fauchald and Jumars (1979); Maurer et al. (1979); and Dauer (1980):

- surface deposit feeders, both tubicolous and non-tubicolous, that ingest sediment and detritus at the sediment-water interface;
- burrowing deposit feeders that feed in the upper layers of the sediment column;
- suspension feeders that filter food particles from the water column;
- carnivores that feed on live animal tissue; and
- omnivores that feed on a wide range of plant, animal, and detrital particles.

Mean abundances of the common species in Table A-14 were summed for each trophic category by station, and percentages were calculated (Figure A-4). In this study, omnivores and carnivores have been combined into a single group because many of the organisms, such as glycerid polychaetes (Fauchald and Jumars, 1979), cannot be accurately assigned to either feeding mode.

The majority (57%) of macrofauna at the ODMDSs and control areas were surface and burrowing deposit feeders characteristic of fine sand habitats common in shallow-water areas of the Middle Atlantic Bight (Day et al., 1971; Maurer et al., 1976; Maurer et al., 1979). Burrowing deposit feeders were represented mainly by the small capitellid polychaete Amastigos sp..

High abundances of surface deposit feeders at several stations were related to the great density of the archiannelid P. symbioticus. Both Amastigos sp. and P. symbioticus probably are capable of rapid population expansion, and could be considered opportunistic. Maurer et al. (1979) suggest that the

TABLE A-14

A LIST OF COMMON SPECIES OF MACROFAUNA COLLECTED AT STATIONS ALONG THE COAST OF NEW JERSEY, JULY AND OCTOBER-NOVEMBER 1979

Species listed represented 70% of macrofauna at each station.
(SDF = surface deposit feeder, BDF = burrowing deposit feeder, SF = suspension feeder, C/O = carnivore, and/or omnivore)

Species	Feeding Type	Survey (1979)	
		July	October-November
Cnidaria:			
Anthozoa:			
Cerianthidae	C/O	X	
Nemertea:			
Cerebratulus lacteus	C/O	X	X
Annelida:			
Polychaeta:			
Phyllodoce mucosa	C/O	X	
Eulalia sanguinea	C/O		X
Brania wellfleetensis	BDF		X
Exogone hebes	BDF		X
Streptosyllis arenae	C/O	X	
S. varians	C/O	X	
Syllidae	C/O	X	
Syllides longocirrata	C/O	X	
Aglaophamus circinata	C/O	X	
Nephtys bucera	C/O	X	X
N. picta	C/O	X	X
Glycera capitata	BDF	X	
G. dibranchiata	BDF	X	
G. oxycephala	C/O		X
Hemipodus roseus	C/O		X
Goniadella gracilis	C/O	X	X
Lumbrineris acutus	C/O	X	
L. brevipes	C/O	X	
L. fragilis	C/O	X	X
Onuphis eremita	C/O		X
Stauronereis caecus	C/O	X	
Dispio uncinata	SDF	X	X

TABLE A-14 (Continued)

Species	Feeding Type	Survey (1979)	
		July	October-November
Nerinides unidentata	SDF		X
Polydora caulleryi	SDF		X
Prionospio dayi	SDF		X
P. ligni	SDF	X	
Scolelepis squamata	SDF	X	
Scolecolepides viridis	SDF	X	
Spiophanes bombyx	SDF	X	X
Magelona rosea	SDF	X	X
M. papillicornis	SDF		X
Caulleriella killariensis	SDF	X	X
Tharyx acutus	SDF	X	X
T. annulosus	SDF	X	X
Scoloplos fragilis	SDF		X
Aricidea jeffreysii	SDF	X	X
A. wassi	SDF	X	
Paraonis pygoenigmatica	SDF	X	
Ophelina aulogaster	BDF	X	
Amastigos sp.	BDF	X	X
Mediomastus ambiseta	BDF	X	X
Capitellidae		X	
Pherusa affinis	SDF	X	
Asabellides oculata	SDF	X	X
Polycirrus eximus	SDF		X
Sabellaria vulgaris	SF		
Archiannelida sp. B	SDF	X	
Protodrilus symbioticus	SDF	X	X
Oligochaeta:			
Peloscolex sp.	BDF	X	
Oligochaeta	BDF	X	X

TABLE A-14 (Continued)

Species	Feeding Type	Survey (1979)	
		July	October-November
Mollusca:			
Gastropoda:			
Mitrella lunata	C/O		X
Nassarius trivittatus	C/O		X
Sayella fusca	C/O	X	X
Pelecypoda:			
Donax fossor	SF		X
Lyonsia hyalina	SF		X
Modiolus modiolus	SF	X	X
Mulinia lateralis	SF	X	X
Nucula delphinodonta	SDF	X	
N. proxima	SDF	X	
Petricola pholadiformis	SF	X	X
Spisula solidissima	SF	X	X
Tellina agilis	SDF	X	X
Arthropoda:			
Ostracoda:			
Cytheridae americana	SDF	X	
Ostracoda	SDF	X	
Pseudocytheretta edwardsi	SDF	X	X
Mysidacea:			
Mysidopsis bigelowi	SF		X
Neomysis americana	SF	X	X
Cumacea:			
Pseudoleptocuma minor	SDF	X	
Tanaidacea:			
Leptochelia savignyi	SDF	X	X
Isopoda:			
Edotea triloba	C/O	X	X

TABLE A-14 (Continued)

Species	Feeding Type	Survey (1979)	
		July	October-November
Amphipoda:			
Acanthohaustorius millsi	SF	X	X
A. shoemakeri	SF		X
Corophium tuberculatum	SDF		X
Gammarus lawrencianus	?SDF	X	X
Photis macrocoxa	SDF	X	X
Protohaustorius deichmanne	SDF	X	X
P. wigleyi	SDF	X	X
Pseudunciola obliquua	SDF	X	X
Synchelidium americanum	?SDF	X	
Unciola irrorata	SDF	X	
Decapoda:			
Cancer irroratus	C/O	X	
Echinodermata:			
Echinoidea:			
Echinarachnius parma	SDF		X

shifting nature of sands caused by water movement could cause enough disturbance to limit the abundance of species belonging to other feeding types, such as suspension feeders.

Carnivores and omnivores constituted only a small percentage (28% overall) of the trophic composition at the majority of the stations. Species of Nephtys, Lumbrineris and Goniadella gracilis generally were the dominant taxa of this trophic group. However, at Cold Springs Inlet (Station 21), the syllid polychaetes Streptosyllis arenae, S. varians, and Syllides longocirrata became abundant.

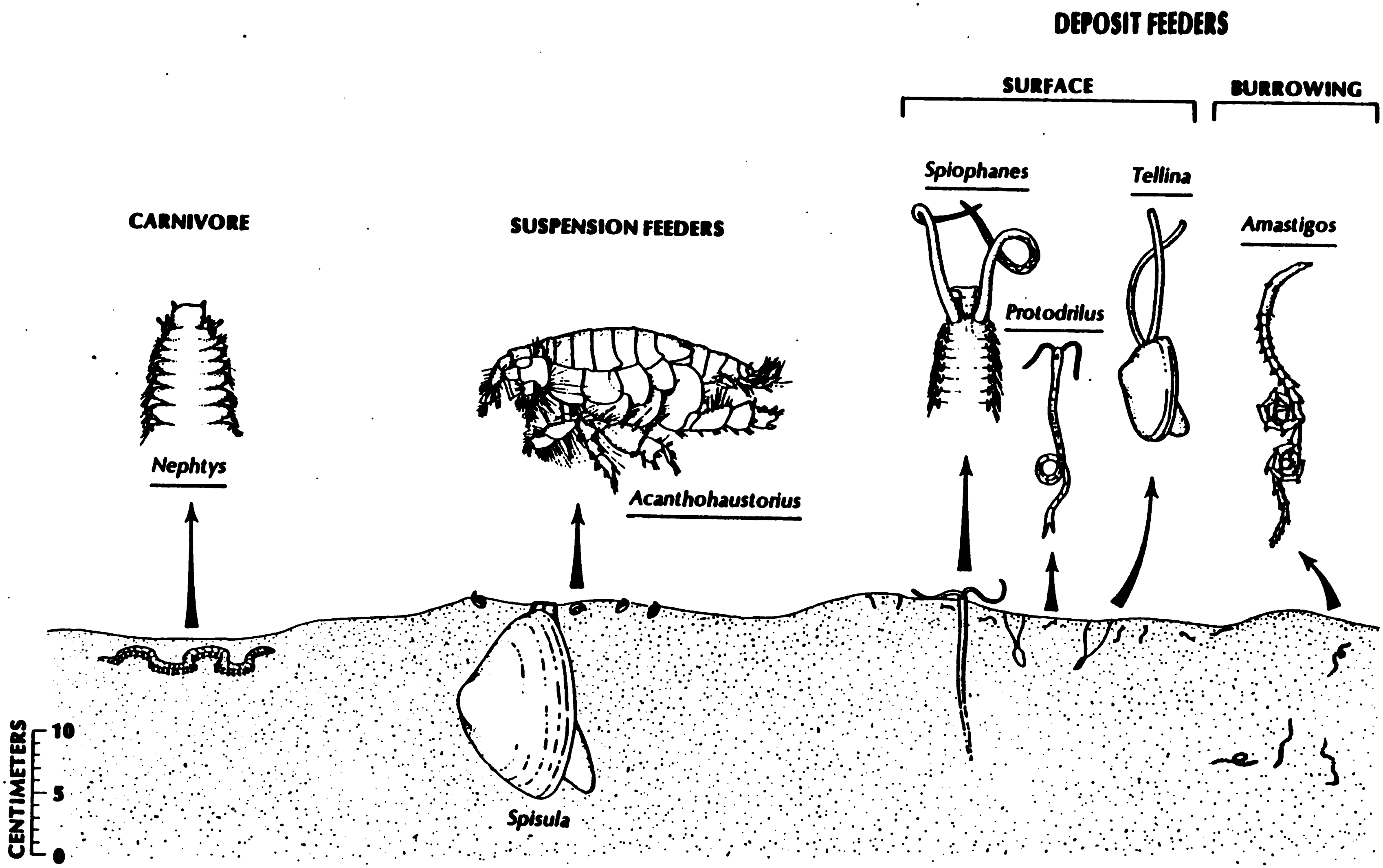


Figure A-3. Some of the Common Macrofauna Found in Sandy Sediments Offshore of the New Jersey Coast, July and October–November 1979. Organisms Illustrated in the Sediment drawn to the Same Scale.

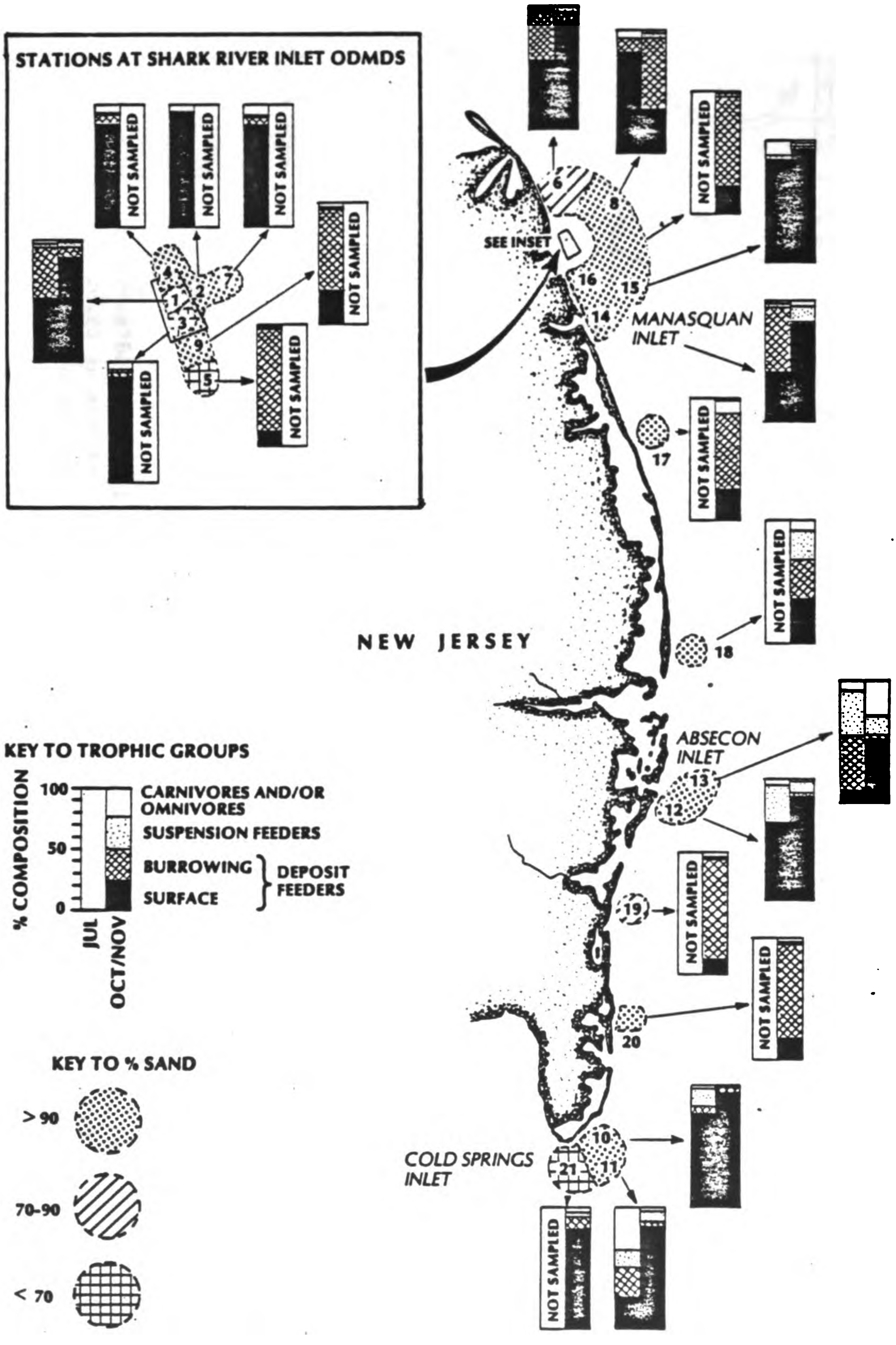


Figure A-4. Trophic Composition of Macrofauna at Stations Along the New Jersey Coast, July and October-November, 1979

The percentage of sand in the sediments also is shown in Figure A-4. At stations around the ODMDS at the Shark River Inlet, the occurrence of silt and clay increased, and fewer suspension feeders were found. Large quantities of silts and clays resuspended into the water column by water currents and/or feeding activities of deposit feeders (Rhoads and Young, 1970) tend to clog the filtering structures of suspension feeders (Peterson and Peterson, 1979) and therefore limit their populations.

Six species, which were common to abundant during both surveys and represented a variety of trophic groups were selected for further analysis. These species included Nephtys picta, Spiophanes bombyx, Amastigos sp., Spisula solidissima, Tellina agilis, and Acanthohaustorius millsi. Numerical data for these organisms are presented in Tables A-15 and A-16. These species were ubiquitous throughout the study area, but very patchily distributed. As an indication of this patchiness, the Index of Dispersion (I) [ratio of variance to mean $(S^2/\bar{x})$] was calculated for each dominant species at each station; low values of I (<1.0) indicate a regular or uniform distribution, whereas high values (>1.0) suggest a clustered distribution of individuals (Elliott, 1977). Mean values of I (Table A-17) for all dominant species were greater than one indicating that all were somewhat clustered in distribution. However, species like N. picta and S. solidissima were more uniformly distributed compared with the opportunistic species Amastigos sp., which had very high values of I.

Distributions of two of the six species (Amastigos and S. solidissima) are presented graphically in Figures A-5 and A-6. Amastigos sp. exhibited high spatial and temporal variability characteristic of an opportunistic species(Figure A-5). Fluctuations in density were best seen at Station 16 near the Shark River Inlet where densities ranged from 0 to 10,022 individuals/m^2 between surveys.

The distribution of S. solidissima was selected for graphic presentation (Figure A-6) because of its high abundance and commercial value. Surf clams were found throughout the entire study area with observed densities of up to 863 individuals/m^2 (Station 12, July 1979). Where stations were sampled during both surveys, surf clams were more plentiful during the first survey

TABLE A-15
ABUNDANCES OF SIX SELECTED* SPECIES OF
MACROFAUNA COLLECTED ALONG THE NEW JERSEY COAST, JULY 1979
(Values are mean number per replicate ± one standard deviation)

Station	*Nephtys picta*	*Spiophanes bombyx*	*Amastigos* sp.	*Spisula solidissima*	*Tellina agilis*	*Acanthohaustorius millsi*
1	1.2 ± 1.8	14.0 ± 16.7	156.4 ± 216.9	2.2 ± 2.3	117.8 ± 151.5	0.0 ± 0.0
2	3.4 ± 2.7	227.8 ± 42.1	0.0 ± 0.0	0.6 ± 0.9	25.8 ± 17.5	0.0 ± 0.0
3	1.8 ± 3.5	48.0 ± 66.5	0.0 ± 0.0	0.0 ± 0.0	15.4 ± 14.3	0.0 ± 0.0
4	4.0 ± 4.2	122.4 ± 171.0	14.0 ± 28.1	0.6 ± 0.9	46.2 ± 14.4	0.0 ± 0.0
5	0.0 ± 0.0	2.2 ± 4.9	596.6 ± 602.3	3.2 ± 6.1	92.0 ± 79.3	0.0 ± 0.0
6	6.0 ± 4.6	25.2 ± 56.3	115.0 ± 177.1	2.4 ± 3.9	29.2 ± 25.6	0.0 ± 0.0
7	4.0 ± 0.7	0.4 ± 0.9	0.0 ± 0.0	0.4 ± 0.5	13.0 ± 13.7	0.0 ± 0.0
8	9.6 ± 10.7	0.0 ± 0.0	0.0 ± 0.0	2.4 ± 4.3	14.6 ± 11.9	0.0 ± 0.0
9	3.2 ± 3.4	42.0 ± 52.1	243.8 ± 544.0	3.2 ± 4.5	46.8 ± 27.6	0.2 ± 0.4
10	2.6 ± 2.1	12.2 ± 11.4	8.6 ± 11.8	24.4 ± 15.9	11.2 ± 10.8	2.4 ± 3.9
11	0.6 ± 1.3	4.0 ± 8.4	0.0 ± 0.0	5.6 ± 10.9	2.4 ± 4.3	3.6 ± 3.5
12	2.0 ± 1.9	0.0 ± 0.0	2.0 ± 2.0	51.8 ± 11.7	5.0 ± 4.0	10.8 ± 15.4
13	5.8 ± 3.6	1.4 ± 1.7	29.6 ± 32.2	20.0 ± 11.9	2.0 ± 2.4	0.0 ± 0.0
14	3.4 ± 4.7	2.4 ± 5.4	238.6 ± 341.6	10.4 ± 12.3	23.0 ± 17.5	0.0 ± 0.0
15	10.8 ± 13.0	6.6 ± 6.5	0.2 ± 0.4	1.4 ± 0.9	20.6 ± 13.9	0.6 ± 0.9

* See text for explanation, abundances are individuals/0.06m^2 box core

TABLE A-16
ABUNDANCES OF SIX SELECTED* SPECIES OF MACROFAUNA COLLECTED ALONG THE NEW JERSEY COAST, OCTOBER-NOVEMBER 1979
(Values are mean number per replicate ± one standard deviation unit)

Station	*Nephtys picta*	*Spiophanes bombyx*	*Amastigos* sp.	*Spisula solidissima*	*Tellina agilis*	*Acanthohaustorius millsi*
1	3.4 ± 2.9	0.4 ± 0.9	9.2 ± 14.5	28.6 ± 19.9	21.6 ± 21.8	0.0 ± 0.0
6	8.5 ± 5.9	1.0 ± 1.5	7.2 ± 11.5	20.0 ± 18.7	20.8 ± 19.6	0.0 ± 0.0
8	13.2 ± 6.1	2.0 ± 2.8	561.2 ± 1251.5	23.0 ± 17.6	104.8 ± 196.4	0.0 ± 0.0
10	4.4 ± 2.9	69.2 ± 25.4	19.0 ± 20.6	1.8 ± 1.6	61.8 ± 39.8	0.0 ± 0.0
11	1.2 ± 0.6	3.6 ± 4.5	0.8 ± 1.3	1.8 ± 0.4	10.8 ± 17.4	8.0 ± 10.4
12	3.2 ± 1.3	84.8 ± 50.1	6.6 ± 7.4	9.6 ± 6.5	6.2 ± 4.1	21.8 ± 15.3
13	7.8 ± 5.6	4.0 ± 3.4	2.4 ± 3.8	2.8 ± 0.8	0.4 ± 0.5	0.0 ± 0.0
14	6.6 ± 1.9	0.2 ± 0.4	2.0 ± 2.3	20.8 ± 1.7	11.0 ± 7.7	0.0 ± 0.0
15	12.2 ± 6.7	19.4 ± 20.7	0.0 ± 0.0	15.6 ± 3.6	15.8 ± 8.3	0.0 ± 0.0
16	4.0 ± 2.6	5.3 ± 7.6	601 ± 497.2	10.0 ± 9.6	5.3 ± 6.4	0.0 ± 0.0
17	4.2 ± 4.0	3.6 ± 4.0	101.4 ± 122.7	14.4 ± 8.0	2.8 ± 0.8	0.0 ± 0.0
18	16.6 ± 11.6	12.8 ± 7.9	64.4 ± 131.0	37.6 ± 13.8	11.4 ± 14.1	6.8 ± 14.7
19	23.7 ± 6.9	94.2 ± 28.6	1524.5 ± 536.4	14.3 ± 4.6	31.2 ± 9.2	0.0 ± 0.0
20	20.2 ± 3.3	98.8 ± 40.3	431.0 ± 255.2	8.8 ± 6.4	5.6 ± 5.2	0.0 ± 0.0
21	0.4 ± 0.5	46.9 ± 19.0	4.8 ± 4.7	1.2 ± 1.1	13.2 ± 7.0	0.0 ± 0.0

* See text for explanations, abundances are individuals/0.06 m^2 box core

TABLE A-17
THE INDEX OF DISPERSION (I) FOR EACH SELECTED SPECIES AT EACH STATION ALONG THE NEW JERSEY COAST, JULY AND OCTOBER-NOVEMBER 1979
(Distributions are random when I = 1.0,
Regular when I <1.0, and Contagious Clumped) when I >1.0)

Station	Nephtys picta	Spiophanes bombyx	Amastigos sp.	Spisula solidissima	Tellina agilis	Acanthohaustorius millsi
July:						
1	2.7	19.9	300.8	2.1	194.8	—
2	2.1	7.8	—	1.4	13.3	—
3	6.8	92.1	—	—	4.5	—
4	4.4	238.9	56.4	1.4	4.5	—
5	—	10.9	608.1	11.6	68.4	—
6	3.5	125.8	272.7	6.3	22.4	—
7	0.1	2.0	—	0.6	14.4	—
8	11.9	—	—	7.7	9.7	—
9	3.0	64.6	1,213.8	6.3	16.3	0.8
10	1.7	10.7	16.2	10.4	10.4	6.3
11	2.8	17.6	—	21.2	7.7	3.4
12	2.1	—	2.0	2.6	3.2	22.0
13	2.2	2.1	35.0	7.1	2.9	—
14	2.5	12.2	489.1	14.5	13.3	—
15	15.6	6.4	0.8	0.6	9.4	1.4
Mean dispersion ($\bar{X} \pm SD$)	4.4 ± 4.3	47.0 ± 69.5	299.5 ± 388.0	6.7 ± 6.1	26.8 ± 49.0	6.8 ± 8.8
October - November:						
1	2.5	2.0	22.2	13.8	22.0	—
6	4.1	2.3	18.4	17.5	18.5	—
8	2.8	3.9	2,790.9	13.5	368.1	—
10	1.9	9.3	22.3	1.4	25.6	—
11	0.5	5.6	2.1	0.1	28.0	13.5
12	0.5	29.6	8.3	4.4	2.7	10.7
13	4.0	2.9	6.0	0.2	0.6	—
14	0.5	0.8	2.6	0.1	5.4	—
15	3.7	22.1	—	0.8	4.4	—
16	1.7	10.9	411.1	9.2	7.7	—
17	3.8	4.4	148.5	4.4	0.2	—
18	8.1	4.9	266.5	5.1	14.0	31.8
19	2.0	0.7	188.7	1.5	2.7	—
20	0.5	14.4	151.1	4.7	4.8	—
21	0.6	7.7	4.6	1.0	3.7	—
Mean dispersion ($\bar{X} \pm SD$)	2.5 ± 2.1	8.6 ± 8.0	288.8 ± 730.8	5.4 ± 5.8	33.9 ± 92.9	18.7 ± 11.5

— = no individuals collected at the station.
* Index of dispersion = ratio of variance to mean abundance (after Elliot, 1977)

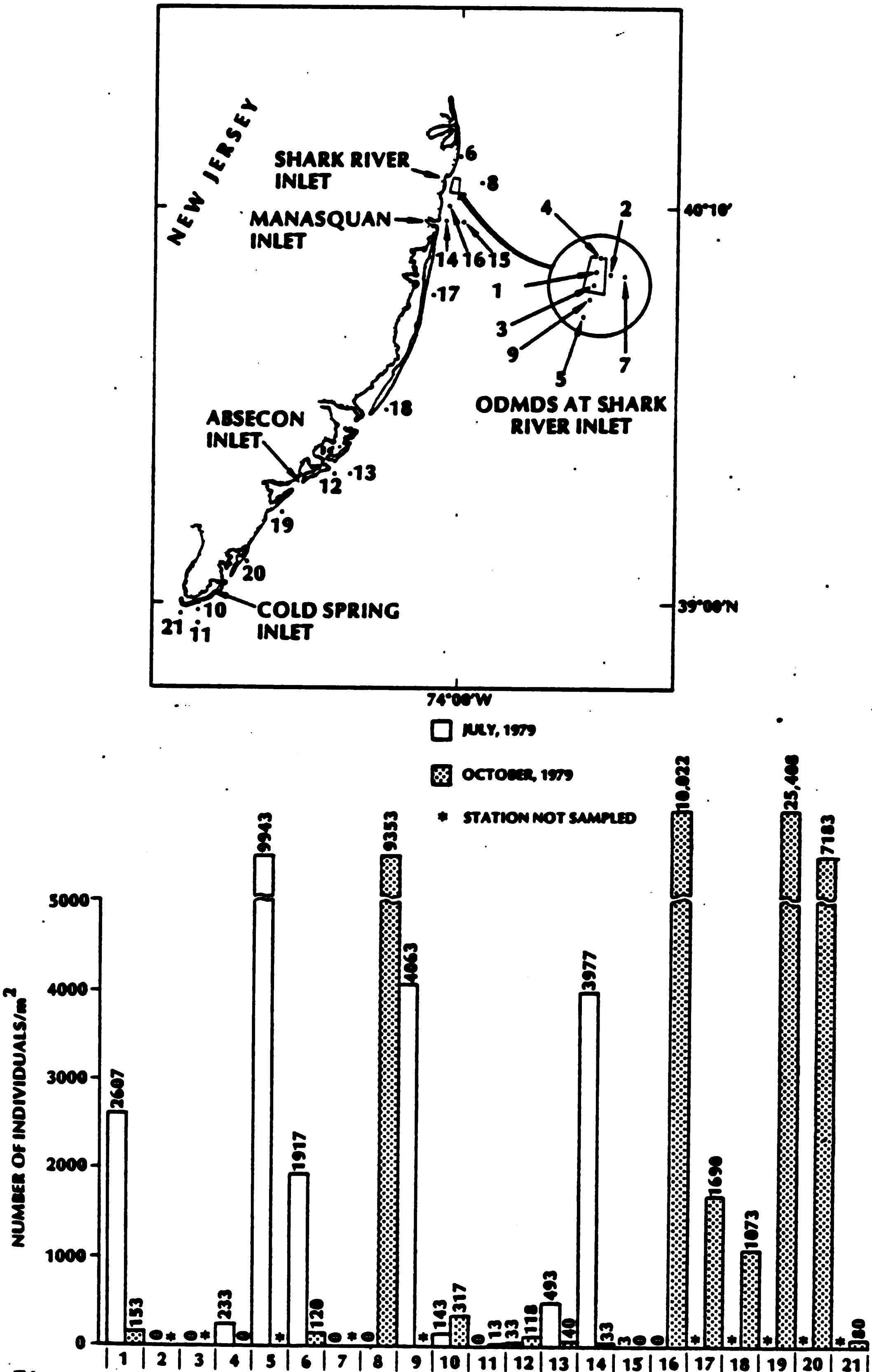
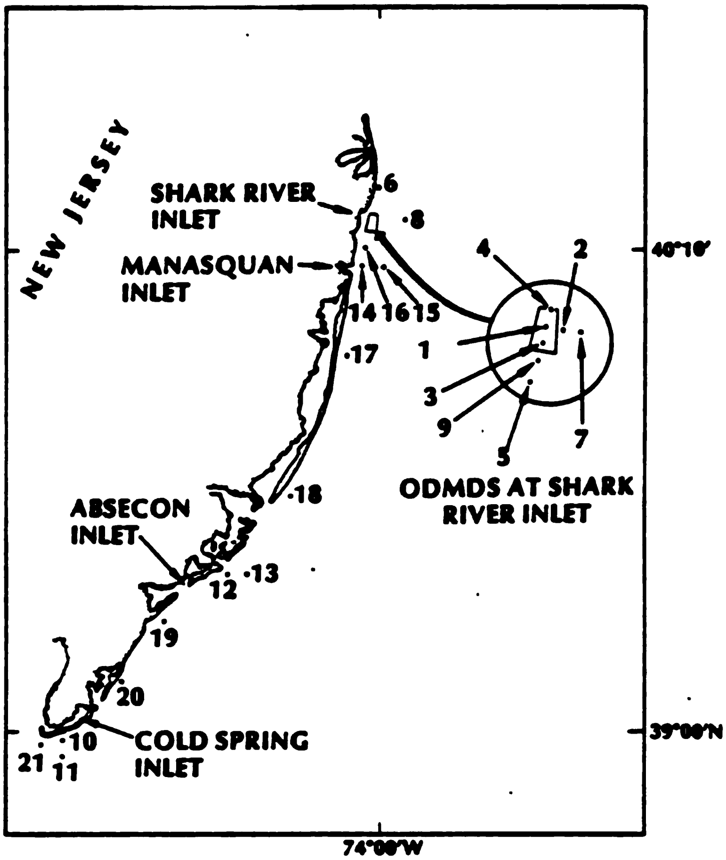


Figure A-5. Distribution of Amastigos sp. at Stations Along the New Jersey Coast, July and October-November 1979. Values were Calculated from the Mean Number of Individuals Among Five 0.06 m^2 Replicates at Each Station.



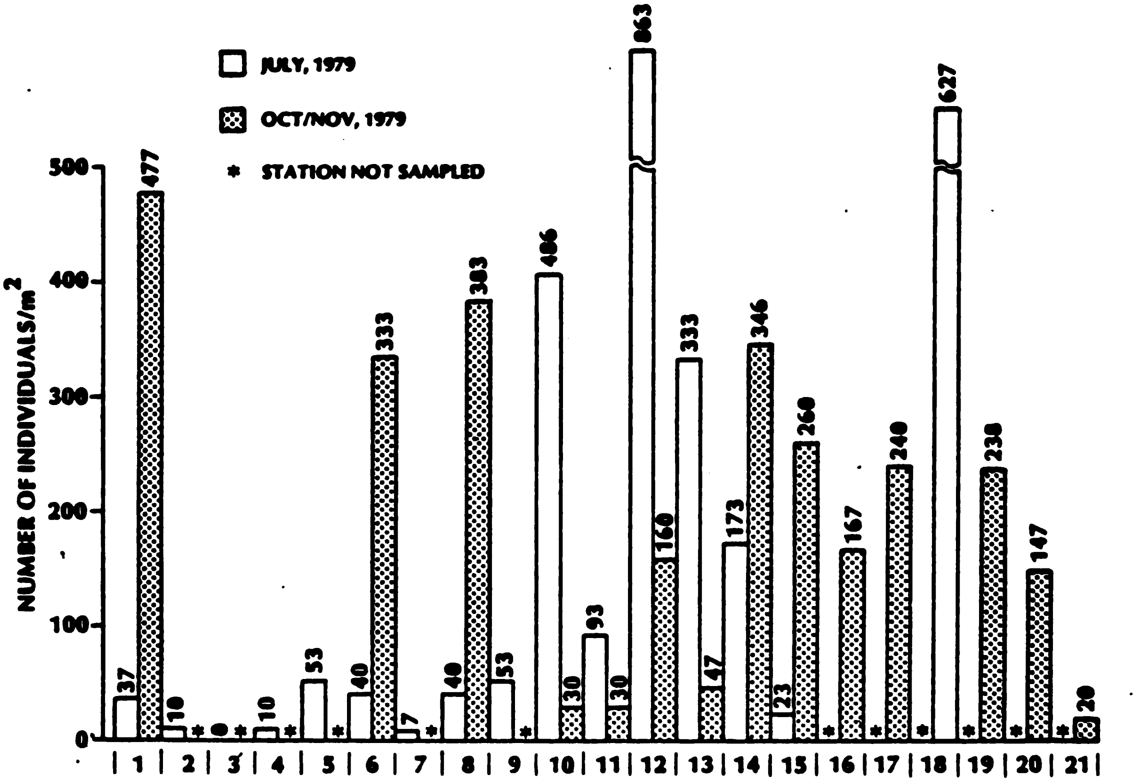


Figure A-6. Distribution of Spisula solidissima at Stations Along the New Jersey Coast, July and October-November 1979. Values were Calculated from the Mean Number of Individuals Among Five 0.06 m^2 Replicates at Each Station.

(July, 1979) in the southern portion of the study area; in the northern half they were more abundant during the second survey (October-November, 1979). Different hydrological conditions (which may disperse or concentrate larvae), and different rates of predation by snails, sandstars and fish could account for the variability in the distribution and density of these young clams.

As discussed above, a number of stations were located in the area of the ODMDS at Shark River Inlet during the July survey. Differences in the densities of dominant species between the ODMDS and control stations during July were examined as follows: (1) stations along a similar isobeth were separated into a control group (Stations 2, 5, 6, and 9) outside the boundaries of the dump site, and an ODMDS group (Stations 1, 3, and 4)within the boundaries of the site; (2) for each dominant species, all density information from the replicates was pooled for each group of stations; and (3) differences between groups for each species were tested using a Mann-Whitney U-test (Sokal and Rohlf, 1969). For all but one species, no significant difference ($p < 0.05$) could be detected between the control and DMDS groups. The exception was that significantly greater numbers of N. picta occurred at the ODMDS (U=224.5, p 0.01). Densities of this polychaete may be regulated by small-scale differences in sediment composition among stations, but specific reasons for the distribuiton are not known.

In general, the majority of the macrofaunal species reported here displayed highly variable and patchy distribution. Any effects of dredged material disposal on their distributions may have been masked by natural variations in abundances of these organisms.

A.3.1.6 Epifauna

Two otter trawls were conducted during the first survey at the Shark River Inlet ODMDS (at Stations 3 within the ODMDS, and 6 outside the ODMDS). Twenty-four species of invertebrates and fish were collected from these stations (Table A-18); crustaceans and fish were the most common organisms. Crustaceans were best represented by sand shrimps Crangon spp., hermit crabs Pagurus acadianus, and various species of crab. Hake Urophycis spp. were the most common fish although many windowpane flounder Scophthalmus aquosus were common at Station 3.

TABLE A-18
SPECIES OF INVERTEBRATES AND FISH COLLECTED IN
OTTER TRAWLS IN THE AREA OF THE SHARK RIVER ODMDS, JULY 1979
(Values are total number of individuals per tow)

Species	Common Name	Station 3 (Inside ODMDS)	Station 6 (Outside ODMDS)
INVERTEBRATES			
Cnidaria:			
Scyphozoa	Jellyfish	1	1
Annelida:			
Polychaeta	Polychaete	3	-
Arthropoda:			
Crangon septemspinosus	Sand shrimp	20	-
Crangon sp.	Sand shrimp	-	10
Homarus americanus	Lobster	2	4
Pagurus acadianus	Acadian hermit crab	15	-
Brachyura	Crab	1	-
Cancer borealis	Jonah crab	-	10
C. irroratus	Rock crab	7	4
Libinia emarginata	Spider crab	-	1
Ovalipes ocellatus	Lady crab	4	-
Mollusca:			
Lunalia heros	Northern moon snail	-	2
Nudibranchia	Sea slug	-	7
Echinodermata:			
Asterias forbesii	Sea star	3	20
Echinarachnius parma	Sanddollar	1	3
FISH			
Rajidae:			
Raja erinacea	Little skate	-	1
Engraulidae:			
Anchoa mitchelli	Bay anchovy	4	-

TABLE A-18 (Continued)

Species	Common Name	Station 3	Station 6
Gadidae:			
Merluccius bilinearis	Silver hake	-	3
Urophycis sp.	Hake	7	-
U. chuss	Red hake	-	8
U. regius	Spotted hake	25	30
Sparidae:			
Stenotomus chrysops	Scup	-	1
Triglidae:			
Prionotus carolinus	Northern searobin	7	-
Bothidae:			
Citharichthys arctifrons	Gulf stream flounder	1	1
Scophthalmus aquosus	Windowpane flounder	1	13

During the second survey, a rocking-chair dredge was substituted for the otter trawl in order to sample macrofauna, such as Spisula solidissima, which live buried in the sediment. The dredge mainly collected crabs (Table A-19) including Cancer irroratus and Libinia emarginata from Station 6, located north of the Shark River Inlet ODMDS. Although not designed to capture fish, the dredge did collect two species of flatfish and a skate.

The species reported here are characteristic of organisms observed in other dredge and trawl studies (e.g., Ichthyological Associates, 1975) conducted on sand habitats off New Jersey. More information would be needed to determine if dredged material disposal at various ODMDSs had affected populations of these larger organisms.

These epifaunal data provide additional information regarding the trophic structure of the sand community. The majority of the epibenthic species, such as the crabs, moon snails, seastars and fish are carnivorous or omnivorous and may have a large impact on distributional patterns of many species of

TABLE A-19
SPECIES OF INVERTEBRATES AND FISH COLLECTED IN THE
ROCKING-CHAIR DREDGE IN THE AREA OF THE SHARK RIVER INLET
ODMDS (STATIONS 1 AND 6) AND ABSECON INLET ODMDS (STATIONS 12 AND 13)
(Values are total number of individuals per tow)

Species	Common Name	Stations			
		1	6	12	13
INVERTEBRATES					
Arthropoda:					
<u>Limulus polyphemus</u>	Horseshoe crab	-	3	-	-
<u>Pagurus pollicaris</u>	Hermit crab	-	1	-	-
<u>Callinectes sapidus</u>	Blue crab	1	1	-	-
<u>Cancer irroratus</u>	Rock crab	2	60	9	19
<u>Libinia emarginata</u>	Spider crab	1	20	-	-
<u>Ovalipes ocellatus</u>	Lady crab	-	6	-	11
Mollusca:					
<u>Crepidula plana</u>	Slipper shell	-	1	-	-
<u>Spisula solidissima</u>	Surf clam	-	-	4	-
FISH					
Rajidae:					
<u>Raja erinacea</u>	Little skate	-	1	-	-
Bothidae:					
<u>Paralichthys dentatus</u>	Summer flounder	-	-	-	1
<u>Scophthalmus aquasus</u>	Windowpane flounder	-	-	-	1

macrofaunal prey. For example, Ropes (1980) has suggested that these kinds of predators are responsible for much of the juvenile mortality of the surf clam <u>Spisula solidissima</u>. Information on rates of predation on this clam does not exist.

A.3.1.7 Microbiology

Results of limited analyses for coliforms in sediments and tissues indicated positive counts in most samples examined. Sampling stations and total and fecal coliform counts are presented in Table A-20.

In July, total coliform counts in lobster tissue from Shark River Inlet, and in clam tissue from Absecon Inlet, were higher inside the ODMDSs (Stations 3 and 12, respectively) than in control areas (Stations 6 and 13, respectively). The maximum total coliform level, 160,000 MPN/100g, was found in lobster from within the Shark River ODMDS (Station 3). Fecal coliforms were detected in lobster from within the Shark River ODMDS and in clams from within the Absecon Inlet ODMDS; samples were not analyzed at the control stations. In contrast, total and fecal coliform levels in October-November were substantially lower and only slight differences were observed between levels in tissues collected inside versus outside the ODMDS.

Samples for analysis of total coliforms in sediments were collected only during July and only in the Shark River Inlet area. Higher total coliform counts were found outside (Station 6, 2,300 MPN/100g) relative to inside (Station 1, 200 MPN/100g) the ODMDS.

With the exception of the maximum value in lobster (Station 3, June), coliform levels in sediments and tissues were within ranges reported previously for the shellfish collected from the Inner New York Bight. The nearshore area along New Jersey is known to be contaminated with coliform bacteria from various sources. As described by Verber (1976), a series of studies on coliform contamination in water, sediment, and organisms led to the FDA's closure of shellfishing from Manasquan Inlet, New Jersey to East Rockaway Inlet, New York. Influx of coliforms is derived from ocean dumping of sewage sludge and waste water effluents from the New York Metropolitan area (Verber, 1976) and several outlets along the New Jersey coast (DOI, 1967). Because of the area-wide presence of coliforms, any microbial contamination from dredged material disposal at the New Jersey ODMDSs could not be differentiated from other sources.

TABLE A-20
TOTAL AND FECAL COLIFORM COUNTS, IN SEDIMENTS AND TISSUES FOR NEW JERSEY SURVEYS, JULY AND OCTOBER-NOVEMBER 1979

- SEDIMENTS -			- SHELLFISH -		
Date/ Station No.	Total Coliforms (MPN/100 g)	Fecal Coliforms (MPN/100 g)	Species	Total Coliforms (MPN/100 g)	Fecal Coliforms (MPN/100 g)
July 1979					
1+	200	ND	NC		
3*	NC	NC	Lobster (<u>Homarus americanus</u>)	160,000	3,700
6*	2300	ND	Lobster (<u>Homarus americanus</u>)	780	ND
12+	NC	NC	Clam (not identified)	2,700	1,400
13+	NC	NC	Clam (not identified	680	ND
October-November 1979					
1*	NC	NC	Rock crab (<u>Cancer irroratus</u>)	700	200
6*	NC	NC	Rock crab (<u>Cancer irroratus</u>)	600	154
			Lady crab (<u>Ovalipes ocellatus</u>)	563	250
12*	NC	NC	Surf clam (<u>Spisula solidissima</u>)	300	133
			Rock crab (<u>Cancer irroratus</u>)	200	400
13*	NC	NC	Surf clam (<u>Spisula solidissima</u>)	111	111
			Rock crab (<u>Cancer irroratus</u>)	200	200
			Lady crab (<u>Ovalipes ocellatus</u>)	200	200
17+	NC	NC	Surf clam (<u>Spisula solidissima</u>)	67	33

NC = Not collected
ND = Not determined
+ = Tissue sample collected from box core
* = Tissue sample collected in trawl

A.3.2 LONG ISLAND SURVEYS

A.3.2.1 <u>Water Column</u>

Temperature and salinity observations during the June and October surveys (Table A-21 and A-22) were consistent with those of Bowman (1977). Temperatures decreased and salinities increased from summer to fall: changes

TABLE A-21

WATER COLUMN PARAMETERS IN THE AREA OF THE LONG ISLAND ODMDs JUNE 1979

Station	Depth (m)	Temperature (°C)	Salinity (°/oo)	Turbidity (NTU)	Total Suspended Solids (mg/1)	Dissolved Oxygen (ml/1)	Dissolved Oxygen (% Sat'n)	pH
1	2	20.0	31.166	1.5	1.50	6.32	119	8.2
	8	18.0	31.312	1.6	3.70	5.61	102	8.1
6	3	18.6	31.192	1.0	1.48	6.27	115	8.3
	8	16.8	31.392	1.7	1.54	4.65	83	8.1
7	2	19.0	28.995	0.5	0.30	5.98	110	8.2
	7	18.7	29.453	0.8	1.09	5.80	106	8.1
8	2	18.7	32.827	0.9	0.43	6.12	114	8.1
	8	18.2	32.471	1.3	0.72	5.71	105	8.1
9	2	18.5	32.862	0.5	0.82	6.69	124	8.4
	12	13.6	29.436	1.3	1.95	5.38	89	8.0
10	2	17.9	30.142	1.2	3.04	7.24	131	8.3
	8	16.4	31.058	1.6	5.55	4.62	81	8.0
11	2	18.1	28.170	1.3	1.44	7.77	142	8.3
	9	15.0	30.022	2.0	1.83	4.97	85	8.1
12	2	19.2	28.235	1.0	2.50	7.05	132	8.4
	5	19.3	27.762	1.1	2.15	6.03	113	8.3
13	2	19.0	27.845	1.0	1.27	7.48	140	8.4
	11	16.5	26.823	1.0	1.96	4.76	82	8.0
14	2	17.8	31.403	0.4	0.51	5.86	106	8.2
	10	17.2	31.491	1.4	2.42	5.86	105	8.2
15	2	14.9	30.187	0.3	0.52	6.06	103	8.3
	15	11.2	32.286	1.7	2.38	5.54	88	8.1

TABLE A-22
WATER COLUMN PARAMETERS IN THE AREA
OF THE LONG ISLAND ODMDSs, OCTOBER 1979

Station	Depth (m)	Temperature (°C)	Salinity (°/oo)	Turbidity (NTU)	Total Suspended Solids (mg/l)	Dissolved Oxygen (ml/l)	Dissolved Oxygen (% Sat'n)	pH
1	2	15.2	31.615	1.6	2.62	6.21	108	8.1
	4	—	31.719	2.0	3.37	—	—	8.1
	7	14.9	31.987	2.0	3.42	5.36	92	8.0
4	2	14.3	31.977	1.2	2.29	6.01	102	8.1
	8	14.1	32.026	1.1	1.54	5.96	101	8.1
6	2	14.3	31.866	3.8	5.49	6.20	106	8.0
	5	—	31.893	2.5	6.97	—	—	8.0
	10	14.6	31.877	3.5	6.22	5.62	96	8.0
8	2	15.0	32.148	9.9	3.92	5.94	103	8.1
	7	14.8	32.153	9.3	1.04	5.99	103	8.1
9	2	16.2	30.788	0.9	1.58	8.24	145	8.3
	10	15.3	31.743	1.0	2.28	6.18	107	8.1
10	2	11.6	32.281	0.8	1.58	5.12	82	7.9
	4	—	32.904	1.0	1.29	—	—	7.8
	6	11.4	32.888	1.2	1.33	3.51	68	7.8
12	2	12.7	32.322	1.0	0.97	5.15	85	7.9
	5	—	33.035	1.6	3.29	—	—	7.8
	7	12.0	33.017	1.6	2.34	3.89	63	7.8
13	2	13.6	31.238	0.8	1.46	6.50	108	8.1
	6	—	32.323	0.8	1.76	—	—	8.0
	13	12.4	32.804	0.7	1.24	4.09	67	7.9
14	2	13.4	32.205	0.9	1.32	5.22	87	7.9
	5	—	32.310	1.0	1.12	—	—	7.9
	11	13.1	32.476	1.0	0.88	4.15	69	7.8
16	2	11.8	32.730	0.7	1.16	4.44	72	7.9
	9	11.5	32.893	0.8	1.34	4.04	65	7.9
17	2	14.7	31.970	1.8	3.10	5.97	102	8.1
	5	—	31.982	1.8	2.25	—	—	8.1
	7	14.1	31.986	1.8	2.54	5.94	101	8.1
18	2	16.3	30.643	0.8	0.90	8.76	154	8.3
	14	15.0	32.035	0.7	1.46	4.00	69	8.0
19	2	14.2	32.092	1.2	2.58	6.13	104	8.0
	5	14.3	32.172	1.3	4.31	5.53	94	8.1
20	2	14.4	32.187	0.7	0.84	5.51	94	7.9
	7	14.0	32.283	1.2	6.82	4.82	82	7.9
21	2	12.9	32.523	0.8	0.70	4.58	76	7.9
	5	—	32.516	0.7	0.90	—	—	7.9
	11	12.8	32.555	0.7	0.92	4.33	72	7.9

— = Not determined

were most pronounced for surface waters. Spatial variations were generally greater than vertical differences for both surveys. Weak thermal stratification of the water column was observed during June, particularly at deeper offshore stations (Table A-21). Surface water temperatures (range 14.9 to 20.0°C) were usually slightly warmer than those near the bottom (range 11.2 to 19.3°C); greatest vertical differences, up to 5.1°C, occurred at Stations 9, 11, 13 and 15, located farthest from shore. Salinity data collected during June showed small and inconsistent vertical changes. Although spatial variations exceeded those with depth in the water column (Table A-21), no clear areal trends were observed. Overall range for salinities in June was approximately 26.8 to 32.9^{o}/oo. As a result of cooling of surface waters and vertical mixing from increasing storm activity, the water column was relatively homogeneous with depth during October. Vertical temperature and salinity differences were less than 1.5°C and 1.6^{o}/oo, respectively. October temperatures ranged from 11.4 to 16.3°C, and salinities from 30.6 to about 33^{o}/oo over the survey area. In general, spatial variability and inconsistent vertical trends for salinity and temperature were probably related to the proximity of sampling stations to the various inlets along the coast and oscillatory tidal exchange with inland bay waters.

Seawater pH levels ranged from 7.8 to 8.4 during both surveys (Tables A-21, and A-22). Levels were within the normal range for seawater (Horne, 1969).

Dissolved oxygen concentrations exhibited a decrease with depth during both surveys and were generally lower during October than in June (Tables A-21 and A-22). Surface waters at most stations were super-saturated (100%) with oxygen during both surveys; minimum saturation levels (72 to 87%) were generally observed close to inlets (Stations 10, 12, 14, 16, 21), and may reflect surface outflow from coastal bays. Bottom water saturation levels were lower, ranging from 81 to 113% and from 63 to 107% for June and October, respectively. Vertical and temporal trends, the variable and saturation levels observed during the surveys were similar to those reported by Segar and Berberian (1976).

Turbidity and total suspended solids (TSS) levels appeared to reflect both seasonal and coastal influences (Tables A-21 and A-22). During June, when some thermal stratification was observed, turbidity and TSS generally increased with depth. Levels of both parameters exhibited higher maxima in October and showed no clear vertical trends; possibly reflecting greater turbulent mixing from fall storms. Spatial variations exceeded vertical differences during both surveys, however no inshore-offshore gradients were apparent. Turbidity and TSS levels, particularly at nearshore stations, are probably strongly affected by tidal exchange of coastal bay and offshore waters through the various inlets. Overall ranges for turbidity and TSS were 0.4 to 9.9 NTU and 0.4 to 7.0 mg/l, respectively. TSS concentrations were within previously reported ranges for the nearshore New York Bight (e.g., Freeland et al., 1976; Callaway et al., 1976).

Concentrations of dissolved and particulate trace metals were uniformly low during both surveys Tables A-23, and A-24). Cadmium levels were generally lower than reported for New York Bight waters (Segar and Cantillo, 1976) and well below the EPA (1976) marine water quality criterion of 5 ug/l. Mercury concentrations were also below the EPA (1976) criterion of 0.1 ug/l, with the exception of two samples. Station 14 during June had a dissolved mercury level of 0.19 ug/l, and Station 17 during October, a level of 1.70 ug/l. The latter measurement is suspect since it is well outside the range otherwise observed during the surveys; however, no historical data is available for comparison. Lead concentrations were all less than 1 ug/l and within ranges reported for uncontaminated coastal waters in other areas (e.g., Abdullah et al., 1972).

Dissolved chlorinated hydrocarbons (CHCs) were consistently observed at higher concentrations during the October survey relative to June (Tables A-23, and A-24). Levels (7 to 44 ng/l) of PCB (Arochlor 1016) in October were similar to levels found in Atlantic coastal waters of the general region (Harvey et al., 1973; 1976). Because PCBs are generally present in waters of the New York Bight, the absence in June is unexplained, and may have been due to analytical error. Pesticides and derivatives (dieldrin, endrin, DDD, DDE) were present at lower levels than PCBs (20 ng/l).

TABLE A-23
PARTICULATE AND DISSOLVED TRACE METALS, AND DISSOLVED CHCS AT MID-DEPTH
IN THE WATER COLUMN IN THE AREA OF LONG ISLAND ODMDSs, JUNE 1979

	Station 1	Station 6	Station 10	Station 11	Station 12	Station 13	Station 14	Station 15
Particulate Trace Metals (ug/l)								
Hg	0.001	0.003	0.006	0.002	0.001	0.003	0.002	0.012
Cd	0.026	0.085	0.022	0.044	0.013	0.075	0.017	0.022
Pb	0.280	0.190	0.090	0.190	0.140	0.060	0.120	0.100
Dissolved Trace Metals (ug/l)								
Hg	0.030	0.030	0.030	0.030	0.070	0.053	0.190	0.067
Cd	0.091	0.096	0.140	0.064	0.090	0.110	0.100	0.120
Pb	0.320	0.540	0.320	0.320	0.120	0.250	0.350	0.220
CHCs* (ng/l)								
dieldrin	16.0	18.0	ND	ND	ND	ND	ND	13.0
pp'DDE	ND	ND	ND	3.0	ND	ND	ND	ND
pp'DDD	ND	ND	ND	0.7	ND	ND	ND	ND
endrin	ND	ND	ND	ND	ND	ND	ND	14.0

* No other CHCs detected
ND = None detected
Values represent single analyses

TABLE A-24
PARTICULATE AND DISSOLVED TRACE METALS, AND DISSOLVED CHCS AT MID-DEPTH IN THE WATER COLUMN IN THE AREA OF LONG ISLAND ODMDSs, OCTOBER 1979

	Station 1	Station 6	Station 10	Station 12	Station 13	Station 14	Station 17	Station 21
Particulate Trace Metals (ug/l)								
Hg	0.016	0.012	0.006	0.010	0.005	0.007	0.014	0.007
Cd	0.060	0.012	0.064	0.072	0.082	0.094	0.131	0.045
Pb	0.016	0.023	0.054	0.022	0.080	0.026	0.035	0.016
Dissolved Trace Metals (ug/l)								
Hg	0.070	0.070	0.070	0.070	0.070	0.070	1.700	0.070
Cd	0.029	0.059	0.004	0.011	0.010	0.007	0.062	0.013
Pb	0.430	0.690	0.240	0.028	0.200	0.150	0.430	0.160
CHCs* (ng/l)								
pp'DDE	ND	ND	ND	2.42	ND	ND	ND	ND
pp'DDD	3.05	3.95	1.13	5.03	1.65	ND	ND	0.93
Arochlor 1016	25.90	21.30	14.60	44.10	15.10	ND	6.7	10.20

* No other CHCs detected
ND = None detected
Values represent single analyses

A.3.2.2 Sediment Characteristics

Previous studies of sediments along the south shore of Long Island indicate that the predominant sediment type is fine- and coarse-grained sand. Gravel and, particularly, silt/clay contents, however, are highly variable both spatially and temporally (Freeland et al., 1976; 1979; Freeland and Swift, 1978; Harris, 1976). Results of EPA/IEC surveys did not show the same degree of variability for these coarse and fine fractions, but did indicate a heterogeneous sediment surface (Tables A-25 and A-26). Mean percentages of gravel and silt/clay ranged from 0.0 to 25.1% and from 1.1 to 22.8%, respectively over both surveys and often exhibited large standard deviations for individual stations. Sand content ranged from 71.3 to 97.8%. No consistent seasonal (June-October) trends were apparent from the data; however, proportions of gravel and silt/clay were not always consistent at a given station between surveys. For example, greatest proportions of silt and clay (8.8 to 22.8%) were found at Stations 1 and 3 (within Jones Inlet ODMDS) during June, and at Stations 1, 14 (within ODMDS, at Jones and Fire Island Inlets, respectively) and 17 (near East Rockaway Inlet, outside ODMDS) during October. Thus, relatively high percentages of silt and clay were observed at Station 1 during both surveys (22.8%, 10.1%); this was not the case at Station 14 (3.6%, 11.6%); Stations 3 and 17 were sampled during only one survey. A similar situation exists for surficial gravel data. The lack of any clear trends may be the result of several influences or a combination of effects. Variations in sediment texture are known to occur over small areas in this region (Freeland et al., 1979; Harris, 1976), and minor navigational errors may cause sampling of different textural types. Based on the large standard deviations at each station, this probably occurred within and between surveys. A temporally changing sediment surface due to variations in sediment deposition, transport and/or burial (e.g., Harris, 1976) would cause differences between surveys. Dredged material disposal also could cause temporal and spatial variability to be observed (e.g., Dayal et al., 1981); however, it is not possible to differentiate the possible effects of disposal from other factors with the present data.

Levels of sediment chemical constituents were low at most stations sampled (Tables A-27 and A-28). With the exception of mercury, sedimentary trace

TABLE A-25
SEDIMENT COMPOSITION IN THE AREA OF
THE LONG ISLAND ODMDSs, JUNE 1979

Station	Mean Depth Among Casts (m)	% Composition* Gravel	Sand	Silt	Clay
1	11	0.3 (0.3)	76.6 (28.5)	13.7 (18.7)	9.1 (10.8)
2	11	22.5 (25.1)	90.6 (14.5)	0.4 (0.3)	1.8 (1.1)
3	10	0.8 (0.8)	85.3 (14.0)	5.6 (7.7)	3.2 (10.6)
4	8	5.7 (10.6)	91.0 (10.9)	0.7 (0.7)	2.5 (1.5)
5	10	0.1 (0.1)	93.3 (2.5)	3.1 (2.3)	3.4 (2.1)
6	9	0.3 (0.4)	96.2 (1.6)	1.3 (1.1)	2.2 (1.4)
7	9	3.6 (5.8)	93.2 (6.0)	0.7 (0.7)	2.4 (1.1)
8	10	2.6 (3.6)	94.8 (3.6)	0.8 (0.5)	1.7 (0.8)
9	10	18.2 (14.2)	80.0 (14.0)	0.6 (0.5)	1.2 (0.5)
10	11	2.3 (2.7)	94.7 (3.9)	1.0 (2.0)	2.2 (1.3)
11	10	1.7 (1.3)	95.1 (3.0)	0.3 (0.7)	2.8 (2.6)
12	8	0.5 (0.6)	95.0 (1.8)	1.2 (0.9)	3.2 (2.3)
13	14	4.9 (2.6)	93.9 (2.8)	0.4 (0.1)	0.7 (0.1)
14	9	0.4 (0.6)	96.0 (1.5)	0.7 (0.9)	2.9 (1.8)
15	17	0.1 (0.1)	97.8 (0.9)	0.2 (0.2)	1.9 (1.0)

* Values are means (N=7) with standard deviations in parentheses for seven replicate box cores at each station

metals, total organic carbon (TOC), and oil and grease were correlated positively ($p < 0.05$) with silt and clay content. Some indications of elevated levels of sedimentary chemical constituents were found for the Rockaway and Jones Inlet ODMDSs.

With the exception of one mercury level, mercury and cadmium concentrations were similar to those reported for "natural" sediments in the New York Bight (Dayal et al., 1981). A maximum value of 1.40 ug/g mercury was determined in sediments from Station 10 (June), within the Rockaway Inlet ODMDS. This high level was not accompanied by increased proportions of silt/clay or TOC. Other mercury concentrations ranged between 0.01 and 0.48 ug/g and were slightly higher in June relative to October. Cadmium concentrations ranged from undetectable to 0.10 ug/g with no temporal trends.

A few lead concentrations were above levels previously reported for coastal and/or "natural" sediments in the area (Carmody et al., 1973; Dayal et al., 1981). The highest level, approximately 56 ug/g occurred at Station 1, within the Jones Inlet ODMDS in June, and was accompanied by relatively high levels

TABLE A-26
SEDIMENT COMPOSITON IN THE AREA OF
THE LONG ISLAND ODMDSs, OCTOBER 1979

Station	Mean Depth Among Casts (m)	% Composition*			
		Gravel	Sand	Silt	Clay
1	10	0.1 (0.1)	89.8 (4.4)	5.8 (3.3)	4.3 (1.4)
4	8	5.7 (7.5)	91.1 (8.1)	0.4 (0.4)	2.6 (2.0)
6	10	0.5 (0.8)	95.9 (1.7)	0.6 (0.4)	2.8 (1.9)
8	9	13.8 (7.5)	84.2 (7.1)	0.3 (0.2)	1.7 (1.2)
9	13	23.0 (23.1)	74.9 (23.0)	0.1 (0.2)	1.7 (1.2)
10	9	1.6 (3.1)	93.5 (3.6)	1.1 (0.9)	3.6 (2.5)
12	8	0.5 (0.3)	96.1 (1.0)	1.4 (0.8)	1.6 (1.1)
13	14	4.5 (4.8)	87.2 (8.2)	0.8 (0.7)	6.3 (4.6)
14	12	0.4 (0.4)	88.1 (9.3)	5.5 (5.4)	6.1 (4.1)
16	9	1.9 (2.0)	94.7 (2.7)	0.4 (0.4)	2.3 (1.6)
17	11	0.2 (0.3)	89.3 (5.0)	5.0 (4.4)	5.5 (1.1)
18	15	25.1 (16.4)	71.3 (17.1)	0.3 (0.2)	3.1 (2.0)
19	10	0.6 (0.3)	95.6 (2.1)	1.0 (0.6)	2.8 (1.9)
20	10	2.1 (4.9)	90.6 (6.7)	3.8 (4.4)	3.5 (2.7)
21	11	0.0 (0.0)	95.6 (3.7)	0.9 (1.7)	2.8 (2.7)

* Values are means (N=7) with standard deviations in parentheses for seven replicate box cores at each station

of silt/clay, TOC and oil and grease. A secondary lead maximum of 35 ug/g was determined for the same survey in sediments at Station 10, within the Rockaway Inlet ODMDS. With the exception of mercury, levels of other sediment constituents at Station 10 were relatively low. Overall, lead concentrations ranged from 2.40 to 55.8 ug/g and, excluding the June maxima, exhibited little change between surveys. During October, concentrations of lead, and several other sediment constituents, were highest at Station 17, off East Rockaway; these maxima were substantially lower than those for June. The relatively high mercury and lead concentrations at the Rockaway and Jones Inlet ODMDSs during June could have resulted from dredged material disposal and/or inputs from coastal bays. Data are insufficient to confirm either possibility.

TABLE A-27
TRACE METALS, TOTAL ORGANIC CARBON, AND OIL AND GREASE IN SEDIMENTS FROM THE AREA OF LONG ISLAND ODMDSs, JUNE 1979*

Station	Hg (ug/g)	Cd (ug/g)	Pb (ug/g)	TOC (mg/g)	Oil and Grease (mg/g)
1	0.06, 0.44	0.04, 0.05	10.35, 55.72	3.10, 18.90	0.21, 1.43
2	0.03, 0.01	0.01, 0.01	3.49, 5.98	1.00, 0.90	0.03, 0.03
3	0.27, 0.01	0.05, 0.01	22.00, 6.97	25.10, 0.80	1.34, 0.06
4	0.02, 0.08	0.01, 0.03	3.60, 10.80	1.00, 1.90	0.06, 0.15
5	0.05, 0.06	0.03, 0.04	10.00, 13.63	1.50, 2.00	0.14, 0.19
6	0.02, 0.01	0.02, 0.01	7.55, 3.83	1.20, 0.80	0.06, 0.02
7	0.02, 0.02	0.01, 0.01	5.00, 4.80	1.50, 0.70	0.37, 0.04
8	0.02, 0.02	0.01, 0.02	6.96, 5.98	0.00, 1.40	0.03, 0.14
9	0.03, 0.02	0.02, 0.01	4.30, 4.50	1.10, 1.30	0.07, 0.08
10	1.40, 0.48	0.03, 0.08	35.00, 8.00	1.40, 1.20	0.04, 0.08
11	-, 0.40	-, 0.03	-, 24.00	1.00, 1.60	0.07, 0.13
12	0.04, 0.03	0.02, 0.03	10.27, 12.20	1.70, 2.20	0.12, 0.10
13	0.03, 0.03	0.01, 0.01	8.66, 1.59	1.20, 1.40	0.12. 0.11
14	0.01, 0.03	0.02, 0.01	4.90, 4.89	1.00, 0.90	0.02, 0.13
15	0.02, 0.01	0.01, 0.01	5.58, 4.99	1.10, 1.00	0.06, 0.07

* Values represent single determinations from duplicate box cores at each station
\- = Not analyzed due to partial loss of sediment sample in laboratory

TABLE A-28
TRACE METALS, TOTAL ORGANIC CARBON, AND OIL AND GREASE IN SEDIMENTS FROM THE AREA OF LONG ISLAND ODMDSs, OCTOBER 1979*

Station	Hg (ug/g)	Cd (ug/g)	Pb (ug/g)	TOC (mg/g)	Oil and Grease (mg/g)
1	0.03, 0.08	0.04, 0.04	7.70, 12.70	1.41, 2.62	0.08, 0.17
4	0.01, 0.02	0.01. 0.01	2.40, 3.80	0.31, 0.66	0.01, 0.03
6	0.01, 0.01	0.01, 0.01	4.20, 3.90	0.53, 0.52	0.02, 0.02
8	0.01, 0.01	0.01, 0.01	4.30, 4.50	0.43, 0.24	0.02, 0.01
9	0.01, 0.01	0.01, 0.01	4.20, 2.70	0.48, 0.35	0.02, 0.01
10	0.05, 0.06	0.04, 0.02	9.10, 9.70	1.54, 1.55	0.10, 0.11
12	0.02, 0.09	0.01, 0.04	4.50, 16.80	0.56, 3.01	0.03, 0.02
13	0.03, 0.03	0.02, 0.02	11.20, 10.60	1.24, 1.19	0.10, 0.10
14	0.06, 0.02	0.03, 0.03	13.10, 6.50	13.20, 1.32	0.23, 0.08
16	0.03, 0.03	0.04, 0.04	6.40, 5.90	1.39, 1.40	0.05, 0.06
17	0.12, 0.20	0.06, 0.10	16.60, 24.90	3.94, 7.66	0.24, 0.70
18	0.01, 0.03	0.01, 0.02	4.10, 7.90	0.43, 1.06	0.01, 0.06
19	0.09, 0.02	0.02, 0.02	3.30, 3.90	0.41, 0.55	0.03, 0.02
20	0.01, 0.02	0.02, 0.01	6.10, 2.20	0.51, 0.56	0.02, 0.02
21	0.02, 0.01	0.02, 0.01	2.70, 3.00	1.03, 0.44	0.01, 0.02

* Values represent single determinations from duplicate box cores at each station

Concentrations of TOC ranged from 0.C to 25.1 mg/g and correlated positively with percent fines. Relatively high, but patchy concentrations of TOC were measured within the Jones Inlet ODMDS (Stations 1 and 3) in June (Table A-25). High levels were not found elsewhere at or near the site during June or October. There was no consistent difference in TOC levels between surveys. TOC levels were within previously reported ranges for the general area (Gross, 1976).

Two oil and grease concentrations measured in sediments during June were relatively high: 1.43 mg/g at Station 1 and 1.34 mg/g at Station 3. Both sediment samples were retrieved from within the Jones Inlet ODMDS and contained relatively high proportions of TOC and silt/clay. Other concentrations in the survey area were low (<0.4 mg/g).

CHCs most commonly measured in survey sediments were PCBs, identified in both June and October as Arochlors 1016 and 1254, and in October only as Arochlor 1221 and 1262 (Table A-29). CHCs appeared to be associated with the silt and clay content of sediments. For example, the highest total PCB concentration (108.7 ng/g) was found in sediments containing the greatest amounts of silt and clay (i.e., Station 1, within Jones Inlet ODMDS during June survey), and ranged as low as 1.6 ng/g in clean sands at station 15 (June). CHC levels were similar to those measured during EPA/IEC surveys of the New Jersey coast (section A.3.1.2, this appendix), and by Harvey et al. (1973) and West and Hatcher (1980) in coastal areas of the New York Bight. Members of the DDT family (pp'DDT, plus derivatives pp'DDE and pp'DDD) were detected at much lower levels. No other pesticides were found in the sediment samples. No consistent variations between surveys were observed indicated by data.

A.3.2.3 Contaminants in Organisms

Concentrations of trace metals and CHCs in edible tissues of organisms collected from the survey area are presented in Table A-30. Levels of most contaminants varied over a relatively wide range, especially those for PCBs. Sporadic catches of individual species prevented any meaningful spatial or seasonal comparisons.

TABLE A-29
CHLORINATED HYDROCARBONS (CHCs) DETECTED IN SEDIMENTS FROM THE AREA OF THE LONG ISLAND ODMDSs, JUNE AND OCTOBER 1979

	PCBs								Pesticides and Derivatives					
	Arochlor 1016 (ng/g)		Arochlor 1221 (ng/g)		Arochlor 1254 (ng/g)		Arochlor 1262 (ng/g)		pp'DDE (ng/g)		pp'DDD (ng/g)		pp'DDT (ng/g)	
Station	June	October	June	October	June	October	June	October	June	October	June	October	June	October
1	3.4,14.7	7.2,8.7	-,-	2.9,2.5	15.2,94.0	9.6,9.0	-,-	-,2.3	0.1,0.7	-,-	1.2,7.8	1.9,1.3	-,-	-,-
6	0.5,0.8	1.0,4.4	-,-	2.9,2.8	4.4,1.5	-,2.0	-,-	-,-	-,-	-,-	-,-	0.8,0.9	-,-	-,-
10	-	12.7,1.6	-	6.5,4.2	5.0	3.9,4.0	-	3.8,3.8	-	0.0,0.2	-	0.8,1.0	-	-
11	1.0	NA	-	NA	2.0	NA	-	NA	-	NA	-	NA	-	NA
12	1.5,1.2	5.1,6.3	-,-	3.8,4.8	5.8,3.6	1.9,11.2	-,-	0.3,1.7	1.0,-	0.1,0.4	0.4,0.2	1.1,1.9	-,-	-,0.3
13	1.3,0.9	4.0,2.1	-,-	4.5,4.5	4.0,10.8	3.8,2.4	-,-	3.6,0.8	-,0.1	-,-	0.3,0.6	0.9,0.7	-,-	-,-
14	0.6,1.4	9.8,3.7	-,-	3.1,3.7	0.3,3.8	7.4,4.8	-,-	2.4,4.0	-,-	0.1,0.1	-,0.2	1.8,1.3	-,-	-,-
15	0.9,0.8	NA	-,-	NA	3.8,0.8	NA	-,-	NA	-,-	NA	-,0.2	NA	-,-	NA
17	NA	8.2,31.0	NA	4.7,4.7	NA	7.2,26.6	NA	3.5,22.7	NA	0.3,-	NA	1.4,6.6	NA	-,1.3
21	NA	6.1,1.7	NA	0.6,4.0	NA	-,-	NA	-,-	NA	-,-	NA	0.9,1.8	NA	-,-

* No other CHCs detected

- = Not detected

NA = Not analyzed

Values represent single determinations for individual box cores

TABLE A-30
CONCENTRATIONS OF TRACE METALS AND CHLORINATED HYDROCARBONS (CHCs) IN ORGANISMS COLLECTED FROM VICINITY OF LONG ISLAND ODMDSs, JUNE AND OCTOBER 1979*

Species (Common Name)	Station	Trace Metal (ug/g)			CHCs**				
		Hg	Cd	Pb	PCB (Arochlor 1016)	PCB (Arochlor 1254)	pp'DDD	pp'DDE	Dieldrin
JUNE									
Ovalipies ocullatus (lady crab)	2	0.09	0.74	1.0	324	5,840	134	193	—
Scophthalmus aanosus (windowpane flounder)	2	0.03	0.02	0.6	30.0	353	22.9	10.5	16.9
Ovalipies quadulpensis (swimming crab)	6	0.14	1.5	1.8	246	7,310	75.8	199	—
OCTOBER									
Cancer irroratus (rock crab)	1	0.44	0.51	1.0	NA	NA	NA	NA	NA
Spisula solidissima (surf clam)	10	0.14	0.09	1.5	14.7	246	47.4	6.2	—
Spisula solidissima	16	0.09	0.27	1.0	16.4	8.2	2.3	9.1	—
Cancer irroratus	17	0.19	0.47	0.3	NA	NA	NA	NA	NA

* Data represent single analyses of pooled tissue samples
** No other CHCs detected
— = Not detected
NA = Not analyzed due to insufficient sample

Trace metal concentration for all species ranged from 0.03 to 0.44 ug/g Hg (mercury), 0.02 to 1.5 ug/g Cd (cadmium), and 0.3 to 1.8 ug/g Pb (lead). All mercury levels were below the FDA Action Level for edible fish and shellfish tissue of 1.0 ug/g (21 CFR Part 109). No such standards exist for cadmium or lead.

Concentrations of CHCs were generally high. Two crab samples contained total PCB (sum of individual Arochlors) levels which exceeded the FDA Tolerance Level of 5 ug/g (5,000 ng/g) for edible fish and shellfish tissue (21 CFR Part 109). These crabs, Ovelipies ocellatus (6,160 ng/g, Station 2) and Ovalipies quadulpensis (7,560 ng/g, Station 6) were collected from the vicinity of Jones Inlet. PCB concentrations were lower in other organisms captured; excluding the crabs discussed above, the range determined was approximataly 25 to 383 ng/g total PCB. PCB concentrations determined in window pane flounder (Scophthalmus aquosus) and surf clam (Spisula solidissime) exceeded previously reported ranges for these species. Pierce (1980) reported a total PCB range of 20 to 70 ng/g for Spisula solidissima in the New York Bight; concentrations in this species measured during the present study in the vicinity of Rockaway Inlet ranged from about 25 to 261 ng/g. Similarly, Pierce's (1980) range for Scophthalmus aquosus was 60 to 320 ng/g; whereas a maximum level of 383 ng/g was determined for an individual of this species near Jones Inlet during the present surveys. Pesticide (dieldrin) and pesticide derivative (pp'DDD, pp'DDE) levels ranged from undetectable to 199 ng/g for all species captured. For species captured along both coasts (Spisula solidissima, Scophthamus aguosus) CHC concentrations were generally higher for the Long Island surveys relative to those for New Jersey. No explanation can be given for above observations.

A.3.2.4 Elutriate Tests

Elutriate tests performed on sediments from the vicinity of Jones Inlet indicated releases of cadmium and lead to test waters; mercury was apparently bound to the sediment (Table A-31). Cadmium and lead releases were substantially greater from sediments collected outside (Station 6) relative to inside (Station 1) the ODMDS. In contrast to the elutriate test results,

TABLE A-31
RESULTS OF ELUTRIATE TESTS FOR SEDIMENTS INSIDE AND OUTSIDE THE JONES INLET ODMDS; SEDIMENT AND WATER COLLECTED DURING JUNE 1979*

Station	Concentration in Test Water			Pre-Test Concentration**		
	Hg	Cd	Pb	Hg	Cd	Pb
1	0.055	0.320	1.90	0.070	0.029	0.430
	0.050	0.330	1.60			
	0.050	0.270	1.40			
6	0.050	3.40	3.0	0.070	0.09	0.690
	0.070	2.10	50.0			
	0.050	2.40	117			

* Three replicate tests performed on each sediment sample; all concentrations are ug/l in dissolved phase

** Seawater collected at mid-depth at indicated station.

lead and cadmium concentrations determined by acid leaching of sediments were greater at Station 1 (Tables A-27, A-28). Further, since Station 6 is located between the dredging area and the ODMDS, the possibility of short dumping and/or post-depositional transport of dredged material to Station 6 cannot be eliminated. Therefore, no conclusions can be reachad regarding deleterious effects of dredged material disposal at the ODMDS.

A.3.2.5 Macrofauna

Seventy-nine species of macrofauna were common at stations along the Long Island coast in June and October 1979 (Table A-32). Polychaetes, crustaceans, and pelecypods were the dominant taxa comprising 50.6, 27.8 and 10.1 percent of the macrofaunal species, respectively.

Forty-nine percent of the 79 species also were collected at study sites off the New Jersey coast (Section A.3.1.2, this Appendix). Many of the same dominant species, such as the polychaetes Amastigos sp. and Spiophanes bombyx, the archiannelid Protodrilus symbioticus, and the bivalves Tellina agilis and Spisula solidissima, were observed along both the New Jersey and Long Island coasts, and are typical of sand communities in this region (e.g., Maurer et al., 1976). Similar to the results for New Jersey, P. symbioticus was the most abundant organism collected offshore Long Island; for example, densities reached 23,883 individuals/m^2 at Station 18 (seaward of the Jones Inlet ODMDS) during the October survey.

TABLE A-32
COMMON SPECIES COLLECTED AT STATIONS ALONG THE COAST OF LONG ISLAND DURING SURVEYS, JULY AND OCTOBER 1979
(SDF = Surface deposit feeder, BDF = Burrowing deposit feeder, SF = Suspension feeder, C/O = Carnivore, and/or Omnivore)

Species	Feeding Type	Survey June	Survey October
Nemertea:			
Amphiporus bioculatus	C/O	X	X
Cerebratulus lacteus	C/O	X	
C. leidyi	C/O	X	
Lineus socialis	C/O	X	
Nemertea, unidentified	C/O	X	X
Annalida:			
Polychaeta:			
Pholoe minuta	C/O		X
Sthenelais limicola	C/O		X
Paranaitis kosteriensis	C/O	X	
Brania clavata	BDF		X
Exogone hebes	BDF		X
E. nr. *dispar*	BDF		X
Aglaophamus circinata	C/O	X	
Nephtys bucera	C/O	X	X
N. incisa	BDF	X	
N. picta	C/O	X	X
Glycera americana	BDF		X
G. capitata	BDF	X	X
G. dibranchiata	BDF	X	
Hemipodus roseus	C/O		X
Goniadella gracilis	C/O	X	X
Drilonereis longa	C/O	X	
Polydora caulleryi	SDF		X
Scolelepis squamata	SDF	X	
Spio setosa	SDF	X	
Spiophanes bombyx	SDF	X	X
Magelona papillicornis	SDF		X
M. physillae	SDF	X	
M. rosea	SDF	X	
Caulleriella killariensis	SDF		X
Dodecaceria sp.	SDF	X	
Tharyx acutus	SDF	X	X
T. annulosus	SDF		X
Orbinia swani	BDF	X	
Scoloplosacutus sp.	BDF	X	
Aricidea jeffreysii	SDF	X	X
A. wassi	SDF	X	X
Paranois fulgens	SDF	X	X
P. gracilis	SDF	X	X

TABLE A-32 (Continued)

Species	Trophic Group	Survey June	Survey October
P. lyra	SDF	X	X
Ophelia bicornis	BDF	X	
Travisia carnea	BDF	X	
T. parva	BDF	X	
Amastigos sp.	BDF	X	X
Capitella capitata	BDF	X	
Mediomastus ambiseta	BDF		X
Asabellides oculatus	SDF	X	X
Protodrilus symbioticus	SDF	X	X
Oligochaeta:	BDF	X	X
Lumbricillus codensis	BDF		X
Peloscolex gabriellae	BDF	X	X
Mollusca:			
Gastropoda:			
Gemma gemma	SF	X	
Modiolus modiolus	SF	X	X
Mulinia lateralis	SF		X
Nucula delphinodonta	SDF	X	
Petricola phoadiformis	SF		X
Spisula solidissima	SF	X	X
Tellina agilis	SDF	X	X
Thracia septentrionalis	SF		X
Arthropoda:			
Amphipoda:			
Acanthohaustorius intermedius	SF	X	X
A. millsi	SF	X	X
Gammarus lawrencianus	SDF	X	X
Jassa falcata	SDF	X	
Monoculodes sp.	SDF	X	
Parahaustorius longimerus	SDF	X	
Protohaustorius deichmanne	SDF	X	X
P. wigleyi	SDF	X	
Pseudunciola obliquua	SDF	X	X
Trichophoxus epistomus	SDF	X	
Unciola irrorata	SDF		X
Isopoda:			
Edotea triloba	C/O	X	
Cirolana concharum	C/O	X	

TABLE A-32 (Continued)

Species	Trophic Group	Survey June	Survey October
Tanaidacea:			
Leptochelia savignyi	SDF	X	X
Decapoda:			
Brachyura larvae	C/O	X	
Cancer irroratus	C/O	X	
Crangon septemspinosus	C/O	X	
Ovalipes ocellatus	C/O	X	
Pagurus longicarpus	C/O		X
Mysidacea:			
Heteromysis formosa	SF		X
Neomysis americana	SF	X	X
Cumacea:			
Oxyurostylis smithi	SF	X	

Several other species were abundant only along Long Island; these included the polychaetes *Tharyx acutus* and *Asabellides oculata*, the bivalve *Modiolus modiolus*, and the amphipod *Pseudunciola obliquua*. Several of these species are illustrated in Figure A-7.

The trophic structure of macrofauna at all stations was determined in the same manner as for New Jersey; the results are presented in Figure A-8. The majority of organisms were surface and burrowing deposit feeders. Surface deposit feeders included high densities of the archiannelid *P. symbioticus*, the polychaetes *A. oculata*, *T. acutus* and *S. bombyx*, and the bivave *T. agilis*. Other species were not individually abundant, but collectively they added to the overall abundance of this feeding group; examples included paraonid polychaetes and amphipod crustaceans. The polychaete *Amastigos* sp. was the most common burrowing species.

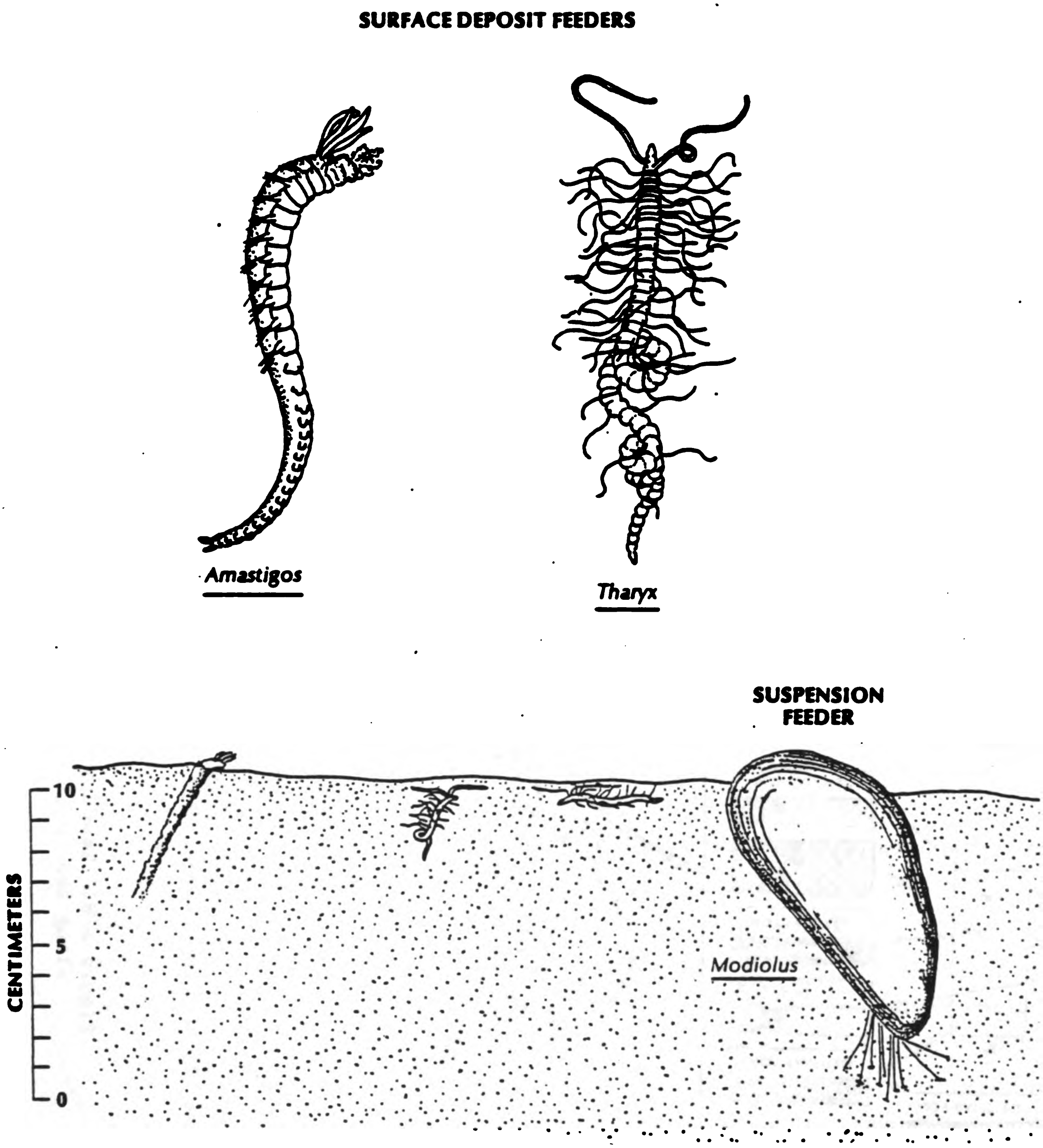


Figure A-7. Some of the Common Macrofauna found in the Sandy Sediments Offshore of the Long Island Coast, July and October 1979. Organisms Illustrated in the Sediment are Drawn to Scale.

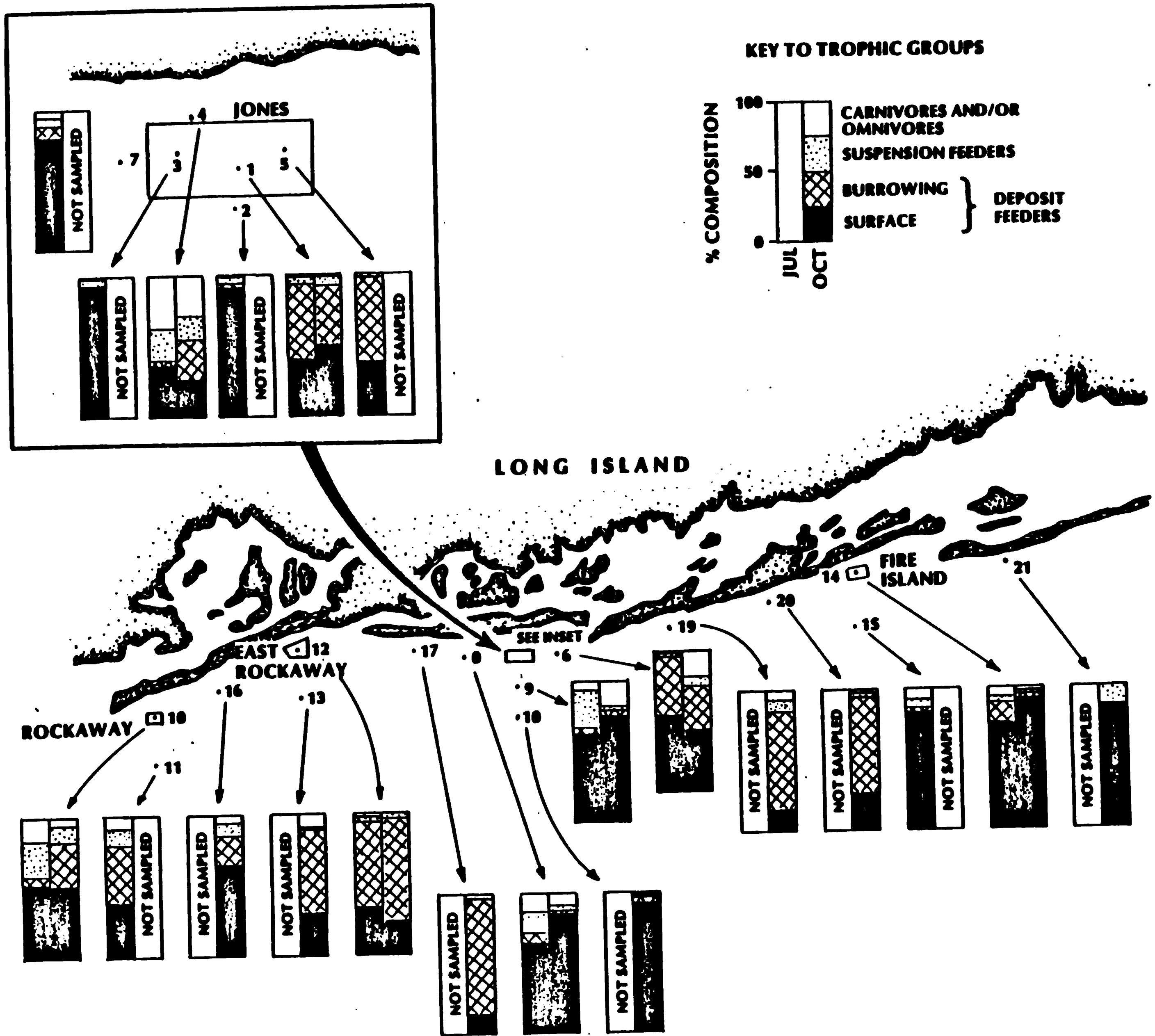


Figure A-8. Trophic Composition of Macrofauna at Stations Along the Long Island Coast, July and October 1979

Suspension feeders were not nearly as abundant as deposit feeders, but did occur throughout the entire study area. Bivalves comprised the greatest numbers, especially S. solidissima and M. modiolus.

Omnivores and carnivores were present at most stations but formed only a small percentage of the infaunal assemblage. This trophic group was best represented by nemertine worms, and nephtyid, glycerid and lumbrinerid polychaetes. These results are similar to those from the New Jersey analysis in that all trophic groups were represented at most stations deposit feeders were usually the predominant feeding type. As previously discussed (section A.3.2.3, this appendix), this macrofaunal assemblage is typical of other shallow-water sandy sediments along the Middle Atlantic Bight.

The seven most abundant species were selected for further analyses: Asabellides oculatus, Tharyx acutus, Amastigos sp., Spiophanes bombyx, Pseudoniciola obliquua, Tellina agilis, and Spisula solidissima. Numerical data for these species at each station from the two Long Island surveys are presented in Tables A-33 and A-34.

For stations sampled during both surveys, A. oculatus was more abundant in July; densities of T. agilis were about the same between surveys, and all other dominant species were more numerous in October. These results suggest that these latter species reproduce and settle during late summer and early fall.

All species were found throughout the entire study area but were very patchy in their spatial distributions. The Index of Dispersion (I) was calculated for each species (described in Section A.3.2.3) to give an indication of the patchiness at each station (Table A-35). Values of I for Amastigos sp., A. oculatus, and P. obliquua were highly variable; mean I values for each survey were over one hundred, reflecting the highly patchy nature of these species. These results are typical of relatively opportunisitc macrofauna which have a high reproductive potential and can quickly colonize an area (Grassle and Grassle, 1974; Gray, 1979). Species such as S. solidissmia or S. bombyx generally had lower I ratios, and hence were less aggregated, or patchy.

TABLE A-33

ABUNDANCES OF SEVEN SELECTED* SPECIES OF MACROFAUNA COLLECTED ALONG THE LONG ISLAND COAST, JULY 1979.
(Values are mean number per replicate ± one standard deviation unit)

Station	*Asabellides oculatus*	*Tharyx acutus*	*Amastigos* sp.	*Spiophanes bombyx*	*Pseudunciola obliquua*	*Tellina agilis*	*Spisula solidissima*
1	80.2 ± 111.7	2.6 ± 3.4	145.0 ± 279.4	0.0 ± 0.0	0.0 ± 0.0	15.4 ± 15.4	0.0 ± 0.0
2	3.4 ± 3.0	0.4 ± 0.5	0.4 ± 0.5	0.2 ± 0.4	86.8 ± 86.1	3.0 ± 3.9	0.2 ± 0.4
3	71.4 ± 84.2	0.0 ± 0.0	0.2 ± 0.4	0.0 ± 0.0	1.6 ± 3.6	6.3 ± 11.1	0.2 ± 0.4
4	2.4 ± 2.1	0.6 ± 0.9	1.2 ± 1.3	0.4 ± 0.9	2.8 ± 5.2	4.4 ± 3.5	3.4 ± 3.8
5	409.2 ± 399.1	115.8 ± 124.2	936.6 ± 529.5	9.4 ± 5.3	0.09 ± 0.0	67.6 ± 55.2	17.4 ± 21.7
6	379.4 ± 617.6	6.2 ± 7.8	258.4 ± 356.9	6.6 ± 8.7	0.6 ± 0.9	38.2 ± 30.4	16.2 ± 19.2
7	1.4 ± 2.0	1.6 ± 2.6	0.0 ± 0.0	0.0 ± 0.0	78.6 ± 85.2	3.2 ± 5.2	0.0 ± 0.0
8	2.2 ± 1.8	0.4 ± 0.9	0.0 ± 0.0	0.2 ± 0.4	93.4 ± 168.0	1.6 ± 2.1	0.2 ± 0.4
9	0.4 ± 0.9	3.2 ± 6.6	0.0 ± 0.0	0.0 ± 0.0	2.6 ± 3.6	0.4 ± 0.5	0.4 ± 0.5
10	1.0 ± 1.0	0.0 ± 0.0	0.2 ± 0.4	0.0 ± 0.0	0.0 ± 0.0	11.4 ± 9.2	4.6 ± 2.1
11	1.2 ± 1.6	2.2 ± 3.8	48.6 ± 73.6	2.4 ± 2.9	0.0 ± 0.0	25.8 ± 12.0	15.6 ± 21.2
12	53.8 ± 34.8	35.0 ± 56.9	228.8 ± 234.5	2.6 ± 5.3	0.0 ± 0.0	33.8 ± 42.9	11.4 ± 14.4
14	28.4 ± 59.0	0.8 ± 0.8	8.2 ± 17.2	0.2 ± 0.4	0.0 ± 0.0	0.2 ± 0.4	0.2 ± 0.4
15	3.4 ± 4.7	1.4 ± 1.1	0.0 ± 0.0	1.2 ± 2.2	8.2 ± 6.0	14.8 ± 5.9	3.2 ± 4.6

* See text for explanation, abundances are individuals/0.06m^2 box core

TABLE A-34

ABUNDANCES OF SEVEN SELECTED SPECIES OF MACROFAUNA COLLECTED ALONG THE LONG ISLAND COAST IN OCTOBER 1979. (Values are mean number per replicate ± one standard deviation unit)

Station	*Asabellides oculatus*	*Tharyx acutus*	*Amastigos* sp.	*Spiophanes bombyx*	*Pseudunciola obliquua*	*Tellina agilis*	*Spisula solidissima*
1	69.2 ± 97.7	97.8 ± 52.6	199.2 ± 112.0	6.4 ± 2.9	0.4 ± 0.5	63.6 ± 27.6	9.4 ± 5.0
4	0.4 ± 0.5	0.2 ± 0.4	0.2 ± 0.4	0.0 ± 0.0	0.2 ± 0.4	1.2 ± 2.7	5.4 ± 3.8
6	1.2 ± 2.2	0.8 ± 0.8	57.8 ± 108.3	18.6 ± 26.2	0.6 ± 0.5	20.2 ± 14.4	16.4 ± 5.9
8	0.8 ± 0.8	3.0 ± 2.4	0.8 ± 1.5	3.0 ± 3.7	138.6 ± 299.4	3.4 ± 3.3	5.4 ± 3.6
9	0.2 ± 0.4	6.8 ± 7.0	0.2 ± 0.4	5.6 ± 10.0	98.2 ± 192.7	2.8 ± 4.1	2.0 ± 2.1
10	1.6 ± 2.3	1.4 ± 1.5	46.4 ± 30.7	2.0 ± 1.9	0.2 ± 0.4	3.8 ± 3.9	4.0 ± 2.9
12	30.6 ± 32.5	161.0 ± 77.5	878.6 ± 726.8	37.2 ± 26.1	0.8 ± 0.8	16.2 ± 26.2	25.0 ± 16.4
13	12.8 ± 11.6	1.9 ± 2.2	124.8 ± 120.5	11.4 ± 5.5	1.1 ± 2.6	7.0 ± 5.1	1.9 ± 0.9
14	446.2 ± 685.0	2.6 ± 2.3	24.2 ± 2.3	3.2 ± 3.7	0.0 ± 0.0	6.4 ± 6.6	2.4 ± 2.5
16	0.2 ± 0.4	0.2 ± 0.4	20.2 ± 4.5	0.4 ± 0.5	0.0 ± 0.0	1.4 ± 0.9	14.8 ± 8.0
17	152.2 ± 209.6	9.6 ± 7.0	1,184.8 ± 708.2	15.0 ± 14.2	0.8 ± 1.8	34.8 ± 31.5	4.6 ± 4.6
18	1.8 ± 3.4	13.2 ± 8.6	32.0 ± 58.0	1.8 ± 3.4	0.2 ± 0.4	15.0 ± 28.6	1.2 ± 2.2
19	0.2 ± 0.4	0.2 ± 0.4	259.2 ± 228.9	18.2 ± 19.1	0.8 ± 1.8	5.2 ± 2.8	17.0 ± 11.8
20	331.6 ± 724.8	20.4 ± 30.1	1,005.6 ± 2,212.4	4.4 ± 8.2	5.0 ± 7.3	10.0 ± 18.1	4.2 ± 3.9
21	1.4 ± 1.7	1.6 ± 1.9	0.0 ± 0.0	4.6 ± 3.1	235.4 ± 246.9	0.8 ± 0.8	44.6 ± 41.0

* See text for explanation, abundances are individuals/0.06m^2 box core

TABLE A-35
THE INDEX OF DISPERSION (I) FOR SELECTED SPECIES AT
EACH STATION ALONG THE LONG ISLAND COAST, JULY AND OCTOBER, 1979.
Distributions are random when I = 1.0,
Regular when I <1.0, and Contagious (Clumped) when I >1.0

Station	*Asabellides oculatus*	*Tharyx acutus*	*Amastigos* sp.	*Spiophanes bombyx*	*Pseudounciola obliquua*	*Tellina agilis*	*Spisula solidissima*
July:							
1	155.6	4.4	538.4	--	--	15.4	--
2	2.6	0.6	0.6	0.8	89.4	5.1	0.8
3	99.3	--	0.8	--	8.1	19.6	0.8
4	1.8	1.4	1.4	2.0	9.7	2.8	4.2
5	389.2	133.2	299.3	3.0	--	45.1	27.1
6	1,005.3	9.8	492.9	11.5	1.4	24.2	22.8
7	2.9	4.2	--	--	92.4	8.5	--
8	1.5	2.0	--	0.8	302.2	2.8	0.8
9	2.0	13.6	--	--	5.0	0.6	0.6
10	1.0	--	0.8	--	--	7.4	1.0
11	2.1	6.6	111.5	3.5	--	5.6	28.8
12	22.5	92.5	239.3	10.8	--	54.5	18.2
14	122.6	0.8	36.1	0.8	--	0.8	0.8
15	6.5	0.9	--	4.0	4.4	2.4	6.6
X±SD	129.6 ± 274.1	22.5 ± 43.3	172.1 ± 210.1	4.1 ± 4.2	64.1 ± 163.7	13.9 ± 16.9	9.4 ± 11.4
October:							
1	137.9	28.3	63.0	1.3	0.6	12.0	2.7
4	0.6	0.8	0.8	--	0.8	6.1	2.7
6	4.0	0.8	202.9	36.9	0.4	10.3	2.1
8	0.8	1.9	2.1	4.6	646.8	3.2	2.4
9	0.8	7.2	0.8	17.9	378.1	6.0	2.2
10	3.3	1.2	20.3	1.8	0.8	4.1	2.1
12	34.5	37.3	601.2	18.3	0.8	42.4	10.8
13	10.5	2.5	116.0	2.5	6.1	3.7	0.4
14	1,051.6	2.0	25.4	4.3	--	6.8	2.6
16	0.8	0.8	1.0	0.6	--	0.6	4.3
17	288.6	5.1	423.3	13.4	4.1	28.5	4.6
18	6.4	5.6	105.1	6.4	0.8	54.5	4.0
19	0.8	0.8	202.1	10.1	4.1	1.5	8.2
20	1,584.2	44.4	4,867.5	15.3	10.7	32.8	3.6
21	2.1	2.3	--	2.1	259.0	0.8	37.7
X ± SD	208.5 ± 468.1	9.4 ± 14.6	473 ± 1,277.1	9.7 ± 10.1	101.0 ± 203.3	14.2 ± 17.0	6.0 ± 9.1

-- = No individuals collected at the station.
* Index of dispersion = ratio of variance to mean abundance (after Elliot, 1977)

The abundances (individuals/m^2) of the opportunistic polychaete Amastigos sp. and the surf clam Spisula solidissima at each station along the Long Island coast are presented in Figures A-9 and A-10. Amastigos sp. was patchily distributed with no apparent spatial patterns. Greatest numbers occurred at Station 17 in October where nearly 20,000 individuals/m^2 were measured. Densities tended to be greater in October. Overall, this species was more abundant along this coast than the New Jersey coast.

Spisula solidissima was also patchily distributed along the Long Island coast (Figure A-10). All individuals collected were juveniles. Greater densities were found in the second survey which suggested a late fall recruitment into the populations along this coast. Overall, fewer surf clams were found along the coast of Long Island than along New Jersey, but patchiness and sizes of clams were similar.

Comparisons of dominant species between ODMDS and control stations were not done because of the great variation in density of these organisms among replicates. In this area, where natural populations are so variable, the detection of an altered community caused by the disposal of dredged material could only be accomplished through detailed monitoring of the biota.

A.3.2.6 Epifauna

Several species of crabs and the sand shrimp Crangon septemspinosa were the most abundant invertebrates collected in otter trawls (Table A-36). Fish were best represented by various species of hake and the windowpane flounder Scophthalmus aquosus. Many herring (35) were captured at Station 2; these individuals school in the water column, and thus were most likely caught when the trawl was lowered or retrieved from the bottom.

During the second survey in October, a rocking-chair dredge was substituted in place of the otter trawl to sample commercial species such as clams and crabs. Three species of crab were collected; most individuals were Cancer irroratus (Table A-37).

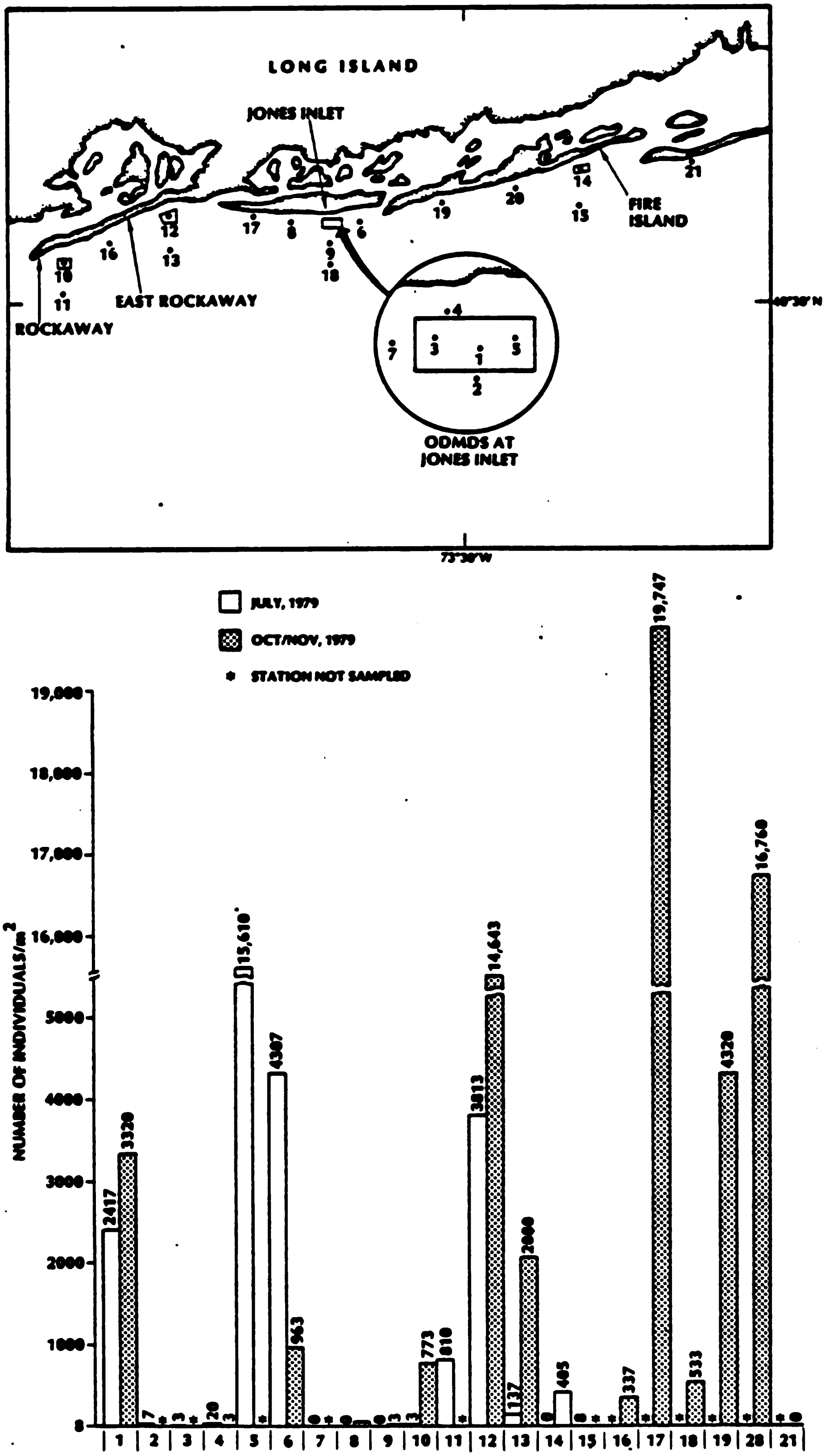
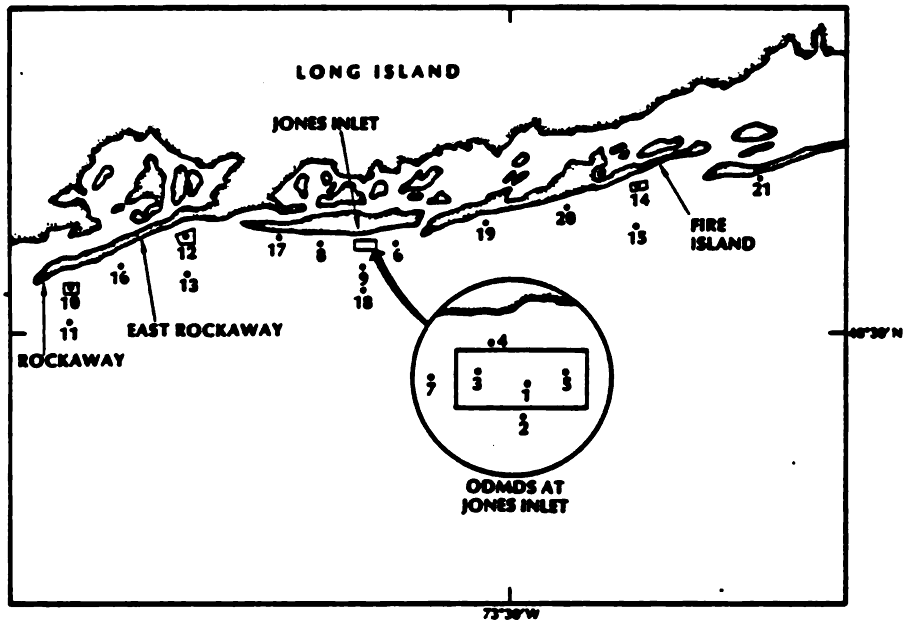


Figure A-9. Distribution of <u>Amastigos</u> sp. at Stations Along the Long Island Coast, July and October 1979. Values were Calculated from the Mean Number of Individuals Among Five Replicates at Each Station



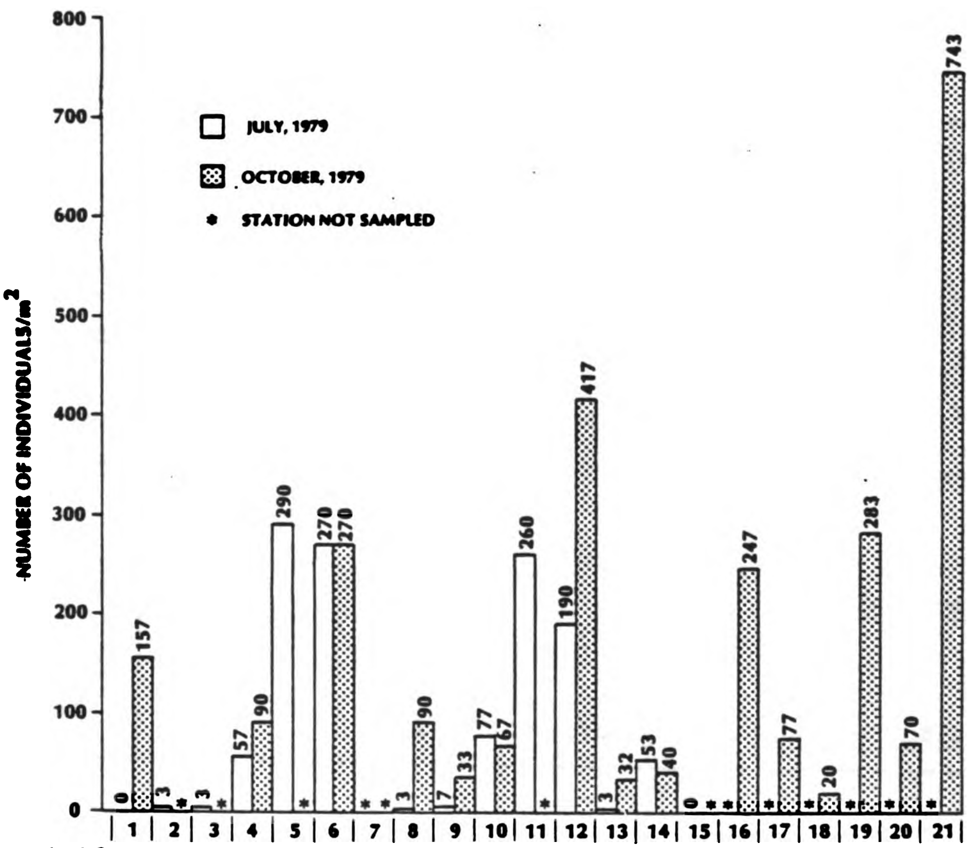


Figure A-10. Distribution of Spisula solidissima at Stations along the Long Island Coast, July and October 1979. Values were calculated from the Mean Number of Individuals Among Five Replicates at each Station

TABLE A-36
SPECIES OF INVERTEBRATES AND FISH CAPTURED IN OTTER TRAWLS
IN THE AREA OF THE JONES INLET ODMDS IN JUNE 1979.
VALUES ARE TOTAL NUMBER OF INDIVIDUALS PER TOW

Species	Common Name	Stations	
		2	6
INVERTEBRATES			
Arthropoda:			
Anomuran	Hermit crab	4	-
Cancer irroratus	Rock crab	13	-
Crangon septemspinosa	Sand shrimp	100	50
Ovalipes quadulpensis	Crab	55	26
Mollusca:			
Loligo pealei	Long-finned squid	Present	33
Echinodermata:			
Asteroidea	Sea star	6	-
Clypeateroida	Sand dollar	4	-
FISH			
Clupeidae	Herring	35	-
Engraulidae:			
Anchoa mitchelli	Bay anchovy	-	7
Gadidae:			
Merluccius bilinearis	Silver Hake	1	-
Urophycis chuss	Red Hake	6	7
U. regis	Spotted hake	-	8
Carangidae			
Trachusus trachurus	Scad	1	-
Sparidae:			
Stenotomus chrysops	Scup	4	-
Bothidae:			
Scophthalmus aquosus	Windowpane flounder	15	-

TABLE A-37
SPECIES OF INVERTEBRATES CAPTURED IN ROCKING-CHAIR DREDGE IN THE AREA OF THE JONES INLET ODMDS IN OCTOBER 1979. VALUES ARE TOTAL NUMBER OF INDIVIDUALS PER TOW

Species	Common Name	Station 1	Station 17
Scyphozoa	Jellyfish	-	1
Arthropoda:			
<u>Limulus polyphemus</u>	Horseshoe crab	3	-
<u>Cancer irroratus</u>	Rock Crab	51	15
<u>Ovalipes ocellatus</u>	Lady crab	16	8

- = None collected

Animals collected by both the otter trawl and rocking-chair dredge represent carnivores and omnivores characteristic of nearshore sand habitats in the New York Bight (e.g., Ichthyological Associates, 1975). As discussed for the results from New Jersey (section A.3.1.4), members of this trophic group can have a significant effect on a soft sediment community by controlling prey density and diversity (Reise, 1977; Virnstein, 1977).

A.3.2.7 <u>Microbiology</u>

Coliforms, both total and fecal, were identified in most sediment and tissue samples analyzed for the surveys. Results and sampling locations are summarized in Table A-38.

In June, total coliform levels in clam tissue were higher outside relative to inside the Rockaway Inlet ODMDS (7,000 mpn/100g at Station 11 versus 600 mpn/100g at Station 11 versus 600 mpn/100g at Station 10); fecal coliforms were not analyzed. In October total and fecal coliform levels in clam tissue were much higher inside the Rockaway Site (Station 10) than at control station 16; total and fecal levels inside the site were both 80,000 mpn/100g as compared to 7,000 and 850 mpn/100g, respectively, outside the site. Total coliform levels in crab tissue (<u>Cancer irrovatus</u>) from the Jones Inlet ODMDS (Station 1) were higher but not substantially different from levels detected in this species from Control Station 7; fecal levels for both samples were indeterminate (< 200 mpn/1006).

TABLE A-38
TOTAL AND FECAL COLIFORM COUNTS IN SEDIMENTS AND TISSUE
FOR LONG ISLAND SURVEYS, JUNE AND OCTOBER 1979

Date/ Station No.	- SEDIMENTS -		Species	- SHELLFISH -	
	Total Coliforms (MPN/100 g)	Fecal Coliforms (MPN/100 g)		Total Coliforms (MPN/100 g)	Fecal Coliforms (MPN/100 g)
June					
1+	4,000	200	NC		
6+	1,200	200	NC		
10+	NC	NC	Clam (not identified)	600	ND
11+	NC	NC	Clam (not identified)	7,000	ND
October					
1*	NC	NC	Rock crab _Cancer irroratus_	2,300	200
10+	NC	NC	Surf clam _Spisula solidissima_	80,000	80,000
16+	NC	NC	Surf clam _Spisula solidissima_	7,000	850
17*	NC	NC	Rock crab _Cancer irroratus_	1,300	200

NC = Not collected

ND = Not determined

+ = Tissue sample collected from box core

* = Tissue sample netted in trawl

Total coliforms in sediments at Jones Inlet were higher inside 4,000 mpn/100g at Station 1) relative to outside thte ODMDS (1.200 mpn/100g at Station 6); fecal coliform counts were indeterminate (< 200 mpn/100g).

Coliform counts determined for the present study were similar to values reported by Verber (1976) for sediments and shellfish in the Inner New York Bight. As described earlier for the New Jersey surveys, the Inner New York Bight is subject to several sources of sewage-derived bacterial contamination (Verber, 1976). It is, therefore, not possible to differentiate a particular source from others, especially with the limited data described here.

A.4 SUMMARY

Measurements of the water column, sediments, and benthic community at stations along New Jersey were similar to those recorded from stations along the Long Island coast. Therefore, the following summary will be generic in that groups of parameters will be discussed collectively for both coasts.

A.4.1 WATER COLUMN

Temperature and salinity measurements of the water column displayed seasonal trends and values typical of shallow, nearshore areas in the New York Bight. Some vertical stratification was present during the June and July surveys, particularly at offshore stations. Surface temperatures ranged from about 15 to 22°C; the warmer temperatures occurred in the southern portion of the study area. During the fall, the thermocline had weakened and the water column became more homogeneous; surface temperatures were similar throughout the study area and ranged from about 12 to 16°C.

Surface waters were usually 80 to 100% saturated with dissolved oxygen during both surveys. Bottom water was less oxygenated but never fell below 45% saturation. These results generally agree with previous studies of coastal waters in the New York Bight.

Levels or turbidity and concentrations of total suspended solids were variable throughout the study areas, and probably reflected various sources of suspended matter (such as from coastal Bays, sediment resuspension or planktonic productivity).

Concentrations of various trace metals, PCBs, and other CHC contaminants were variable among the stations along both coasts but concentrations generally were low. Levels of mercury and cadmium were usually below EPA water quality criteria and concentrations of various PCBs were similar to previously reported values.

A.4.2 SEDIMENT CHARACTERISTICS

Sediments at all stations along both the New Jersey and Long Island coasts were predominantly sand and characteristic of shallow, nearshore marine areas subjected to temporally variable waves and currents. Sand content of the sediment was usually 80% or greater at stations along both coasts. Silt and clay generally comprised less than 10% of the sediment mass. Exceptions where greater levels of fines occurred included the Shark River Inlet area on the New Jersey coast, and the Jones and Fire Island Inlet ODMDSs along the coast of Long Island. Additional studies would be needed to determine if these fine-grained sediments originated from disposal activities or natural proceses.

Levels of total organic carbon, oil and grease, trace metals and various pesticides and PCBs in sediments were generally similar to or less than levels measured in other studies of the New York Bight. Some indications of elevated levels of sedimentary chemical constituents at and/or near the Shark River, Rockaway, and Jones Inlet ODMDSs were noted. These elevated levels, however, could not be conclusively attributed to dredged material disposal since several other possible contaminant sources exist in these areas.

A.4.3 CONTAMINANTS IN ORGANISMS

Concentrations of trace metals and, especially chlorinated hydrocarbons in edible tissues varied widely. Of the organisms sampled, crab species generally contained the highest levels of contaminants. Mercury concentrations in crabs (Callinectes sapidus) collected off New Jersey, exceeded the FDA Action Level of 1.0 ug/g for this metal. The crabs Ovalipies ocellatus and quadulpensis, captured along Long Island, contained total PCB levels exceeding the FDA Tolerance Level of 5 ug/g. Trace metal concentrations in tissues were slightly greater for the New Jersey area, whereas, chlorinated hydrocarbons were more prevalent off Long Island. Relative to previously reported PCB concentrations for specific species, samples from the Long Island survey area were often greater; levels for species collected for the New Jersey surveys were within reported ranges. Because of sporadic catches of organisms during the surveys, no effects of dredged material disposal could be discerned.

A.4.4 ELUTRIATE TESTS

Elutriate tests performed for sediments within and outside the Shark River and Jones Inlet ODMDSs generally indicated releases of cadmium and lead to test waters. Mercury was apparently bound to the sediments. Releases of cadimum and especially, lead were greater from sediments in the vicinity of Jones Inlet (off Long Island) than Shark River Inlet (off New Jersey). For both areas, however, releases were greater for sediments collected outside relative to inside the ODMDSs. No conclusions could be reached regarding adverse effects of dredged material disposal at the sites.

A.4.5 MACROFAUNA

Macrofauna at stations along the New Jersey and Long Island coast were represented by species of polychaetes (Nephtys picta, Spiophanes bombyx, Amastigos sp., and Tharyx acutus), crustaceans (Acanthohaustorius millsi and Pseuduniciola obliquua) and bivalves (Tellina agilis, Spisula solidissima, and Modiolus modiolis). The community was dominated by deposit-feeders largely due to the great abundance of several opportunistic species (e.g., Amastigos sp.). However, suspension feeders, carnivores and omnivores also were present. The observed species are generally characteristic of shallow-water areas along the Middle Atlantic Bight. Dominant species were ubiquitous throughout the study areas, but were very patchily distributed.

Because of the distributional variability of the dominant species, significant differences in their densities between ODMDS and control stations at Jones and Shark River Inlets could not be determined. The only exception occurred at the Shark River Inlet where more Nephtys picta were observed within the ODMDS than at control stations. This species is a typical inhabitant of fine grained sediments and may have responded to the slightly greater amount of silt and clay at this site.

A.4.6 EPIFAUNA

Catches of epifaunal invertebrates at Shark River, Absecon and Jones Inlets were dominated by several species of crab and shrimp. The rock crab Cancer irroratus and sand shrimp Crangon septemspinosa were particularly abundant. Fish at all sites were best represented by various species of hake (Urophycis spp.) and the windowpane flounder Scophthalmas aquosus. All the species are characteristic of nearshore sand habitats of the New York Bight. Most of the epifaunal organisms captured were carnivorous and/or omnivorous organisms.

A.4.7 MICROBIOLOGY

Sediments and/or tissues in the vicinity of several ODMDSs were analyzed during the surveys for total and fecal coliforms. Most samples analyzed yielded positive results; the highest count in tissue was determined in lobster from the Shark River Inlet ODMDS. A high count was also found for surf clam within the Rockaway Inlet ODMDS. Both samples were collected from within the FDA-PHS shellfishing closure area. The Inner New York Bight is known to be impacted by coliform contamination from various sources. Any effects of dredged material disposal at the ODMDSs could not be differentiated from other potential sources of bacterial contamination.

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APPENDIX B

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

November 17, 1983

OFFICE OF THE
ASSISTANT DIRECTOR
FOR ASTRONOMICAL,
ATMOSPHERIC, EARTH,
AND OCEAN SCIENCES

Mr. Frank G. Csulak
Criteria and Standards Division (WH-585)
Environmental Protection Agency
401 M Street, SE
Washington, DC 20460

Dear Mr. Csulak:

1-1 The National Science Foundation has no comments regarding the draft "Environmental Impact Statement (EIS) for the New Jersey/ Long Island Inlets Dredged Material Disposal Site Designation."

Sincerely,

Barbara Patala

Barbara Patala
Acting Chairman,
Commitee on Environmental
Matters

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
TRENTON

DIVISION OF COASTAL RESOURCES

PLEASE ADDRESS REPLY TO.
CN 401
TRENTON, N. J. 08625

December 20, 1983

Mr. Patrick Tobin, Director
Criteria and Standards Division
United States Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Tobin:

2-1 I have received your letter of November 9, 1983 concerning the Draft Environmental Impact Statement for the proposed final designation for continued use of dredge material disposal sites off shore. I have determined that EPA's designation of the sites is subject to the consistency provisions of the Federal Coastal Zone Management Act, as disposal of the spoil will occur in New Jersey's coastal waters and therefore will "directly affect" the coastal zone within the meaning of that Act.

2-2 You note in your letter that disposal cannot take place until the Corps of Engineers issues a permit or follows its regulatory procedures under Section 103 of the Marine Protection Research and Sanctuaries Act. However, designation of the disposal areas is a significant step in the process leading to possible dredge spoil disposal at these sites. While it is only the actual dumping of the dredge spoil that has a direct physical effect on the coastal zone, EPA designation of the sites and Corps issuance of a permit are the two necessary Federal actions which may set in motion the ultimate disposal process. Accordingly, both actions are subject to the federal consistency requirements of the Coastal Zone Management Act.

2-3 The Department of Environmental Protection could issue a negative determination on EPA's designation and later invoke consistency with regard to the issuance of the permit by the Corps. However, this would not be a very efficient procedure, since it could allow EPA to go through the designation procedure without comment, only to be told at a later date that the Corps could not issue a permit for disposal in the designated areas due to a conflict with New Jersey's Coastal Management Program. Therefore, New Jersey believes that it is appropriate to apply the federal consistency provisions of the CZMA to EPA's designation of the sites at this time, in addition to the Corp's issuance of the permit.

In order to satisfy this requirement, the Final EIS should include a section assessing the consistency of the proposed action with New Jersey's Coastal Management Program. This Division will then review the EIS and the draft designation pursuant to 15 CFR 930, and will make a finding that the proposal action is or is not consistent with that program. Based upon the DEIS, I expect to be able to make a positive determination. However, the final EIS should demonstrate that it is not feasible to use the dredge spoil for beach nourishment and should include an analysis of heavy metals and other possible contaminants in the dredged material from Absecon and Manasquan Inlets.

If you have any questions concerning this determination that designation of these disposal sites is subject to the consistency provisions of the Coastal Zone Management Act, please call Mr. Allan B. Campbell, Chief, Bureau of Coastal Planning and Development at (609) 292-9762.

Sincerely,

John R. Weingart
Acting Director

JRW/ABC/js

cc: Mr. Allan B. Campbell, DEP/BCPD
Ms. Deborah Walker, NOAA/OCRM
Ms. Kathryn Cousins, NOAA/OCRM
Mr. Lawrence Schmidt, DEP/Planning Group

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

DEC 27 1983

IN REPLY REFER TO
Environmental Resources Branch

Mr. Frank G. Csulak
Criteria and Standards Division (WH-585)
Environmental Protection Agency
401 M Street, South-West
Washington, D.C. 20460

Dear Mr. Csulak:

This letter is in regard to the Draft Environmental Impact Statement (DEIS) for the New Jersey/Long Island Inlets Dredged Material Disposal Site Designation.

The DEIS adequately discusses existing conditions and known or anticipated impacts. Our only specific comment at this time concerns Figure 8 on page 1-13. The center coordinates shown for the Absecon Inlet Site do not fall within the boundary coordinates and should therefore be adjusted.

Thank you for the opportunity to comment on this DEIS. If you have any questions please contact Mr. Roy E. Denmark, Jr., Acting Chief, Environmental Resources Branch at 215-597-4833.

Sincerely,

Nicholas J. Barbieri, P.E.
Chief, Planning/Engineering Division

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

OFFICE OF THE ADMINISTRATOR

December 30, 1983

Mr. Frank Csulak
Criteria and Standards Division (WH-585)
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Sir/Madam:

This is in reference to your draft environmental impact statement on the New Jersey/Long Island Inlets Dredged Material Disposal Site Designation. Enclosed are comments from the National Oceanic and Atmospheric Administration.

Thank you for giving us an opportunity to provide comments which we hope will be of assistance to you.

Sincerely,

Joyce M. Wood
Chief
Ecology and Conservation Division

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Services Division
Habitat Protection Branch
14 Elm Street
Gloucester, MA 01930

December 27, 1983

TO: PP2 - Joyce M. Wood

FROM: F/NER54 - Ruth Rehfus

SUBJECT: DEIS #8311.12 - New Jersey/Long Island Inlets Dredged Material Disposal Site Designation, Environmental Protection Agency

4-2 The draft environmental impact statement for New Jersey/Long Island Inlets Dredged Material Disposal Site Designation that accompanied your memorandum of November 10, 1983 has been received by the National Marine Fisheries Service for review and comment.

The statement has been reviewed and the attached comments are offered for your consideration.

Attachment

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Services Division
Habitat Protection Branch
14 Elm Street
Gloucester, MA 01930

December 27, 1983

Mr. Frank G. Csulak
Criteria and Standards Division (WH-585)
Environmental Protection Agency
401 "M" Street, SW
Washington, D.C. 20460

Dear Mr. Csulak:

The National Marine Fisheries Service has reviewed the draft environmental impact statement for Long Island and New Jersey Inlet Dredged Material Disposal Site Designation, dated October, 1983, and offer the following comments.

Chapter 2

Alternatives Including the Proposed Action

4. Types and Quantities of Wastes Proposed to be Disposed of, and Proposed Methods of Release, Including Methods of Packing the Waste if any

   p 2-12, para 2

   Why isn't beach nourishment the preferred disposal method for the Jones Inlet dredging?

8. Interference with Shipping, Fishing, Recreation, Mineral Extration, Desalination, Fish and Shellfish Culture, Areas of Special Scientific Importance and Other Legitimate Uses of the Ocean

   p 2-18, para 2

   It should be noted that, as mandated by the Clean Water Act, water quality is expected to improve. In addition, shellfish living in areas listed as "condemned" still provide a brood stock.

Chapter 3

Affected Environment

4-6 THREATENED AND ENDANGERED SPECIES

p 3-16

Of the five endangered whale species mentioned, only the fin whale is regularly found in the Apex. The fin whale should be considered a common inhabitant of the area, with small schooling fish such as sand lance (Ammodytes sp) as its major food source. Another common summer inhabitant of the Apex and the Existing IDMDS's is the threatened loggerhead sea turtle (Caretta caretta). It is commonly seen during the summer months feeding on bottom organisms (crabs, clams, mussels, etc.) along the coastal areas and in bays and estuaries.

Chapter 4

Environmental Consequences

4-7 EFFECTS ON THE ECOSYSTEM

p 4-4, para 1

We agree that long term biological effects are difficult to assess, but enough has been written in the scientific literature to offer at least a cursory summary.

4-8 EFFECTS ON WATER QUALITY

TURBIDITY

p 4-5, para 1

Young clams and oyster spat are also sensitive to turbidity.

4-9 EFFECTS ON BIOLOGICAL CONDITIONS BENTHOS

p 4-8, para 2

Generally, the more opportunistic species recolonize first.

Sincerely,

for Ruth Rehfus
Branch Chief

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

OFFICE OF THE ADMINISTRATOR

December 30, 1983

Mr. Frank G. Csulak
Criteria and Standards Division (WH-585)
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Sir/Madam:

This is in reference to your draft environmental impact statement on the New Jersey/Long Island Inlets Dredged Material Disposal Site Designation. Enclosed are comments from the National Oceanic and Atmospheric Administration.

Thank you for giving us an opportunity to provide comments which we hope will be of assistance to you. We would appreciate receiving four copies of the final environmental impact statement.

Sincerely,

Joyce M. Wood

Joyce M. Wood
Chief
Ecology and Conservation Division

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Washington, D.C. 20230

December 29, 1983

TO: PP2 - Joyce Wood

FROM: N - Paul M. Wolff

SUBJECT: DEIS 8311.12 - New Jersey/Long Island Inlets Dredged Material Disposal Site Designation

-11 The subject DEIS has been reviewed within the areas of the National Ocean Service's (NOS) responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

-12 The NOS Coastal Programs Division contacted Mr. Alan Campbell of New Jersey's Department of Environmental Protection to assure that the state was aware of the DEIS in the context of its CZM program. Mr. Campbell already had reviewed the DEIS and reported that he is currently preparing a response to EPA. We were advised that EPA does not think that the proposed project would affect New Jersey's coast; however, the state does not agree and will notify EPA of their disagreement.

United States Department of the Interior

OFFICE OF THE SECRETARY
MID-ATLANTIC REGION
Custom House, Room 502
Second and Chestnut Streets
Philadelphia, Pennsylvania 19106

January 13, 1984

ER 83/1466

Mr. Frank G. Csulak
Criteria & Standards Division (WH-585)
Environmental Protection Agency
401 M St., S.W.
Washington, D.C. 20460

Dear Mr. Csulak:

1 The Department of the Interior has reviewed the draft environmental statement for New Jersey/Long Island Inlets Dredged Material Disposal Site Designation, and we offer the following comments for your consideration.

<u>General Comments</u>

2 The subject document provides a basically adequate description of the proposed action and the affected environment. However, we are concerned that the permanent designation of Long Island, New York, and New Jersey Inlets Dredged Material Disposal Sites (IDMDSs) might preclude the consideration of more productive uses of inlet dredged material, such as beach nourishment, based solely on economics. All of the beaches along the south shore of Long Island and the eastern shore of New Jersey could use beach nourishment. In addition, permanently designated disposal sites might encourage more frequent dredging of the inlets, resulting in more frequent disturbance of benthic communities.

-3 The creation of dredged material mounds so close to the barrier islands could redirect littoral currents toward the barrier islands, further aggravating shoreline erosion problems. These mounds could also affect fish migration and the distribution of planktonic stages of fish, invertebrates, and shellfish into unsuitable environments through the alteration of currents.

-4 In light of the dynamic nature of the south shore of Long Island and the eastern shore of New Jersey, it appears that as long as the dredged material is clean, beach nourishment would be a highly practicable and environmentally preferable method of inlet dredged material disposal.

5-5 We consider the permanent designation of the IDMDSs not to be in the best interest of resource conservation, and we therefore recommend against the permanent designation of the Long Island, New York, and New Jersey Inlets Dredged Material Disposal Sites.

Specific Comments

6 Page 1-2: The DEIS indicates that Rockaway Inlet provides passage into Jamaica Bay, and incorrectly states that this is "an important port of Long Island." The Rockaway Inlet, which is part of Gateway National Recreation Area (NRA), supports only transient commercial operations within the south channel of the Bay. The nature of Rockaway Inlet is considerably different from any of the other inlets covered in the DEIS. The terminal jetty off Breezy Point reduces the normal quantities of sediment loads into Rockaway Inlet, thus allowing tidal flows to maintain a natural inlet. In addition, the Rockaway Inlet is the only channel access to the Jamaica Bay Wildlife Refuge, which is highly important to the support of the Hudson-Raritan estuarine ecosystem and coastal fisheries resources. The Refuge supports over 320 migratory and resident bird species dependent upon this coastal estuarine embayment.

Figure 2 notes the Rockaway DMDS site. This area appears to be within a
7 major commercial surf clam population zone. In addition, contributions of any dredged materials containing organics, sediments, trace metals, or other material that potentially could reduce the quality or aesthetics of bathing beach waters near Rockaway Beach (Riis Park) within Gateway NRA would be of major concern to the National Park Service.

8 Page 3-18: The list of threatened and endangered species should include the American peregrine falcon (Falco peregrinus anatum) in the final EIS. It nests in the vicinity of the overall project area and is probably a transient species at the interim IDMDSs. No impacts are anticipated to this species, so no Biological Assessment or further Section 7 consultation under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) is required with the U.S. Fish and Wildlife Service. Should project plans change or if additional information on listed or proposed species becomes available, this determination might be reconsidered.

Summary Comments

Due to the potential negative impacts of disposing of dredged material
9 at the proposed Long Island, New York, and New Jersey Inlets Dredged Material Disposal Sites, and the viable option of disposing of clean material through beach nourishment, we recommend against the proposed permanent designation of the disposal sites.

-10 Our most probable position on any permit application to dispose of inlet dredged material would be an objection to ocean disposal, and recommendation for beach nourishment.

Thank you for the opportunity to comment on this proposal.

Sincerely,

Anita J. Miller

Anita J. Miller
Regional Environmental Officer

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF THE COMMISSIONER
CN 402
TRENTON, N.J. 08625
609-292-2885

February 8, 1984

Mr. Frank G. Csulak
Criteria and Standards Division
Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Re: Draft Environmental Impact Statement - New Jersey/Long Island Inlets Dredged Material Disposal Site Designation

Dear Mr. Csulak:

The Department of Environmental Protection has completed its review of the above noted Draft EIS. As a result of this review we do not anticipate any major adverse environmental impacts provided that the designated dredged material disposal sites are found consistent under New Jersey's Coastal Zone Program. Please refer to the attached letter, dated December 20, 1983, to Mr. Patrick Tobin from John Weingart, Acting Director, Division of Coastal Resources.

In addition, the Department recommends that the inlet dredged material be used for beach nourishment whenever possible. This method of disposal will minimize water quality and biota impacts while maximizing the recreational value of the beaches.

Sincerely,

Lawrence Schmidt

Lawrence Schmidt
Acting Director
Planning Group

LS/DA/ss
Attachment

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
TRENTON

DIVISION OF COASTAL RESOURCES

PLEASE ADDRESS REPLY TO:
CN 401
TRENTON, N. J. 08625

December 20, 1983

Mr. Patrick :bin, Director
Criteria and Standards Division
United States Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Tobin:

I have received your letter of November 9, 1983 concerning the Draft Environmental Impact Statement for the proposed final designation for continued use of dredge material disposal sites off shore. I have determined that EPA's designation of the sites is subject to the consistency provisions of the Federal Coastal Zone Management Act, as disposal of the spoil will occur in New Jersey's coastal waters and therefore will "directly affect" the coastal zone within the meaning of that Act.

You note in your letter that disposal cannot take place until the Corps of Engineers issues a permit or follows its regulatory procedures under Section 103 of the Marine Protection Research and Sanctuaries Act. However, designation of the disposal areas is a significant step in the process leading to possible dredge spoil disposal at these sites. While it is only the actual dumping of the dredge spoil that has a direct physical effect on the coastal zone, EPA designation of the sites and Corps issuance of a permit are the two necessary Federal actions which may set in motion the ultimate disposal process. Accordingly, both actions are subject to the federal consistency requirements of the Coastal Zone Management Act.

The Department of Environmental Protection could issue a negative determination on EPA's designation and later invoke consistency with regard to the issuance of the permit by the Corps. However, this would not be a very efficient procedure, since it could allow EPA to go through the designation procedure without comment, only to be told at a later date that the Corps could not issue a permit for disposal in the designated areas due to a conflict with New Jersey's Coastal Management Program. Therefore, New Jersey believes that it is appropriate to apply the federal consistency provisions of the CZMA to EPA's designation of the sites at this time, in addition to the Corp's issuance of the permit.

In order to satisfy this requirement, the Final EIS should include a section assessing the consistency of the proposed action with New Jersey's Coastal Management Program. This Division will then review the EIS and the draft designation pursuant to 15 CFR 930, and will make a finding that the proposal action is or is not consistent with that program. Based upon the DEIS, I expect to be able to make a positive determination. However, the final EIS should demonstrate that it is not feasible to use the dredge spoil for beach nourishment and should include an analysis of heavy metals and other possible contaminants in the dredged material from Absecon and Manasquan Inlets.

If you have any questions concerning this determination that designation of these disposal sites is subject to the consistency provisions of the Coastal Zone Management Act, please call Mr. Allan B. Campbell, Chief, Bureau of Coastal Planning and Development at (609) 292-9762.

Sincerely,

John R. Weingart
Acting Director

JRW/ABC/js
cc: Mr. Allan B. Campbell, DEP/BCPD
Ms. Deborah Walker, NOAA/OCRM
Ms. Kathryn Cousins, NOAA/OCRM
Mr. Lawrence Schmidt, DEP/Planning Group

APPENDIX C

BIBLIOGRAPHY

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_____ 1976b. Demersal finfish catches in the New York Bight by station and species, R/V ATLANTIC TWIN, May 8-June 4, 1973. NOAA DR ERL MESA-12. 143 pp.

_____ 1976c. Demersal finfish catches in the New York Bight by station and species, R/V ATLANTIC TWIN, October 1-November 7, 1973. NOAA DR ERL MESA-13. 102 pp.

_____1976d. Demersal finfish catches in the New York Bight by station and species, R/V DELAWARE II and ATLANTIC TWIN, April 1-May 2, 1974. NOAA DR ERL MESA-14. 101 pp.

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