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Waste Disposal in the Waters of the New York Bight: The Genesis of a Dead Sea

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WASTE DISPOSAL IN THE WATERS OF THE NEW YORK BIGHT: THE GENESIS OF A DEAD SEA

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CHAPTER I - INTRODUCTION

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In 1924 a sewer sludge dumping ground was established in the New York Bight off Ambrose Light about equidistant (twelve miles from the New Jersey and Long Island shorelines. In accordance with the Refuse Act of 1899 (33U.S.C. 407) authority was given the Army Corps of Engineers to issue permits for waste disposal in this area.[1] Subsequently the number separate waste disposal grounds in the Bight increased to five, one each for sewer sludge, dredge spoil, cellar dirt, acid waste, and toxic chemicals.

Little attention was focused on these ocean cesspools until the recent general concern with environmental quality. Not until 1967 did the Chief Engineer, Army Corps of Engineers direct its subsidiary agency, the Coastal Engineering Research Center (CERC) to undertake an ecological study of the Bight disposal areas. All recent concern and research has sprung from the findings of that investigation.[2]

This paper is composed of four chapters. Chapter I will seek to delineate the scope of the paper and acquaint the reader with recent activity concerning pollution in the Bight. Chapter II will focus exclusively on scientific data gathered to date, about

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[1]See Figure I, Horme, R.A., Mahler, A.J. and Rosello, R.C. Unpublished Manuscript, The Marine Disposal of Sewage Sludge and Dredge Spoil in the Waters of the New York Bight Woods Hole Oceanographic Institution Woods Hole, Mass. (1971) hereafter cited as Woods Hole Study (1971).

[2]See Table I Woods Hole Study (1971) for a chronology of the problem.

the effects of pollution on marine ecosystems. A definitive study authorized by the federal government and prepared by the Sandy Hook Marine Laboratory was scheduled for publication in 1971 but at this writing has not been made available. Therefore of necessity all scientific information has been gathered from thorough but interim reports. Chapter III will consider legal aspects of the problem, including relevant legislation, standing and other remedies which would be available to individuals or groups seeking to ultimately halt all ocean dumping in the area. Chapter IV will consist of conclusions to be drawn from this study.

History

From its inception (1924) the Bight dumping grounds have been the subject of multiple if not muted controversies. Substantial concern was voiced in 1931 when New York City disposed of garbage and other flotable refuse in the Bight. Beaches at resort areas down the coast to Sea Girt, N.J. were rendered unusable. Trash dumped without regard to current changes would find its way into bathing waters and onto beaches. New Jersey brought suit before the U.S. Supreme Court praying for an injunction against this means of garbage disposal.

Arguments raised defendant were that the dumping was done outside U.S. territorial waters (then three miles) and was therefore beyond the jurisdiction of the court. Also raised was the

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[3]New Jersey v. New York City 283 U.S. 473(1931).

fact the dumping was legally accomplished by a Corps of Engineers permit. The court however was impressed by the magnitude of the nuisance and per curium granted the injunction thereby forcing New York to incinerate the garbage.

The court recognized that the act of dumping took place outside U.S. jurisdiction on the high seas but said it was sufficient the effects were traceable to defendant and felt by the plaintiff in the U.S. waters. Dumping by permit was simply no defense in view of the court.

The garbage threat abated but the establishment of four other dumping grounds was accomplished with relatively little opposition, save for that raised by commercial and sport fishermen. Toxic chemicals and other wastes were pretty much for thirty years out of sight - out of mind. Until the late 1960's little if any concern was voiced over the increasing dependency by shore community sewer authorities and industry on the ocean as a resposnitory for their most noxious and nefarious wastes. Part of the reason may have been the release of a study on 1962 by a British investigator on the effects of sewage sludge on the marine environment. This study examined the waters off the Hyperion Plant near Los Angelos and found little damage to the environment. Further studies revealed the "reports" of human desease contracted by swimming in polluted sea water was rare.[4]

In 1966 a preliminary study by the U.S.Public Health Service

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[4]Woods Hole Study (1971)

showed high coliform levels in sludge samples destined to be barged to the Bight. This report directly precipitated the CERC study. The Corps of Engineers is directly concerned with maintaining the navigability of the Bight waters and its responsibilities for protecting the environment remain legally ill defined. The Bight problem received massive publicity in 1970 principally through the efforts of then U.S. Congressman Richard Ottinger (N.Y.).

A U.S. Senate post was being sought by Ottinger and he made the environment a pivotal issue in his unsuccessful campaign. It was Ottinger through his press releases who characterized the waters of the Bight as a biological "dead sea".[5] Picking up the publicity thread as well as cries of alarm from constituents Congressman James Howard (N.J.) conducted a probing and exhaustive public hearing on the Bight at Sandy Hook Marine Laboratory. Howard had introduced a bill in the House to amend the Act of 1888 (33 U.S.C. 443) by revoking all Army permits for dumping in the Bight and prohibiting all dumping within a twenty-five mile radius of the Ambrose Lighthouse.[6]

This hearing is worthy of examination as it received testimony from the Corps of Engineers and Dr. Jack Pearce author of

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[5]See Chronology.

[6]Hearing Before the SubCommittee on Rivers and Harbors of the Committee on Public Works, House of Representatives on H.R. 15915, Feb. 23, 1970 at Sandy Hook, New Jersey Washington: U.S. Government Printing Office 1970 hereafter cited as H.R. 15915.

the Sandy Hook Interim Report on the effects of dumping on the Bight.

The first group to testify were Col. James W. Barnett, District Engineer of New York, Army Corps of Engineers and Joseph Caldwell, Technical Director of the Caostal Engineering Research Center. Barnett's testimony illuminated the source of his authority for issuing dumping pemmits. Under the Act of 1888 the District Engineer of New York was also to serve as supervisor of the New York Harbor. The supervisor's office was established to

> "prevent obstructive and injurious deposits within the harbor and adjacent waters of New York City, by dumping or otherwise, and to punish and prevent such offenses."[7]

Action by disposal contractors directly precipitated this act. Quick turnarounds by scows which were not dumping at sea resulted in the pile up of debris at the harbor entrance. In addition vessels entering and exiting the port would frequently throw ballast overboard into the navigable channel.

Congressman Howard questioned the Army Representatives concerning the quantity of tidal water in the Bight and if it had a sufficient neutralizing effect of bacteria contained in the sewer sludge. The Army's answer was circumspect. Caldwell insisted the anount of sea water was sufficient to neutralize any bacteria (a threat to N.J. bathing beaches). Howard persisted in knowing why if there was no concern the Corps had

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[7]33 U.S.C. 443 (H.R. 15915) p.6).

initiated the CERC study.[8] Caldwell responded,

> "I think that the Corps has recognized for some time that there was a considerable but unevaluated effect from this dumping on the bottom itself in the vicinity of the dumping area. Therefore we were making the study to find out to what extent this bottom activity was taking place or in what sense it was being polluted and over that area."[9]

A secondary purpose of the Sandy Hook Hearings was to discuss the feasibility of moving the dump areas further out to sea, at least twenty-five miles or dumping off the edge of the continental shelf. An obvious question concerning the sites was why transfer them if no measurable damage had yet been calculated? Howard was pushing for an immediate transfer of the sites for health reasons. It had already been established that the high coliform levels existed in sludge dumped in the Bight. Colonel Barnett refused to be pinned down as to his responsibilities for health under the Refuse Act of 1899 (33 U.S.C. 407).[10] However Barnett did allude to a health problem in the Bight waters when questioned by Howard.[11]

The Corps of Engineers was somewhat reluctant to take a stand on damage caused by dumping. A partial explanation of this action was the then undelivered testimony of Dr .Jack Pearce of the Sandy Hook Marine Laboratory. When questioned Dr. Pearce provided illuminating testimony on the feasibility of dumping further out or in the alteraative land disposal. Sludge was

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[8] See Appendix A this chapter.

[9] HR 15915 p.11.

[10] Ibid., p. 13.

[11] Ibid., P. 17.

according to Pearce an inescapable consequence of modern living; even with tertiary treatment there would be sludge even though water processed in this manner would be potable.[12] Sewage sludge with this treatment can be dehydrated and put through a process of vacuum filtration and thus be disposed of in land fills, used as fertilizers, or in some cases cattle food. Tertiary treatment however is far in the future as most facilities in New York City alone only provide secondary treatment.

Astronomical sums are involved when tertiary treatment is the goal. For example, the 137th Street waste treatment plant which will serve several million people along the upper West Side of Manhattan will cost with feeder lines, 100 million. Congress for fiscal year 1970 appropriated four times what the Nixon Administration had asked for the entire nation (800 million). New York State got only 70 million of that total.[13] In the summer of 1971 the unfinished World Trade Center on lower Manhattan was still pumping RAW sewage into the Hudson and ultiately into the Bight.

When questioned on the advisability of moving the sites thus allowing dumping to continue Dr. Pearce responded,

"The present dumping site is one of the more produc-

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[12] Ibid., p. 110. Tertiary treatment is additional treatment following secondary treatment to produce a high quality product water by removing physical and chemical means, most of the remaining organic contaminants.

[13] Ibid., p. 52.

tive areas in the New York Bight."[14]

The implication of Pearce's statement is not clear, but he did not specifically rule out transfer.

Contrary scientific opinion regarding new ocean disposal areas is available. Dr. William Aron head of a team of oceanographers from the Smithsonian Institution which evaluated the interim Sandy Hook report has stressed,

> "that efforts should be directed to finding out what to do with the sludge rather that just putting it further away...dumping sludge further out to sea would only create further problems..."[15]

Indeed the opinion of Maurice Feldman, former N.Y. City Commissioner of Water Resources is to keep it concentrated where it can be studied.[16] Congressman Howard managed to elicit an unofficial position from the Corps of Engineers,

> "It is estimated that the disposal of sewage sludge twenty-five miles from Ambrose Light would cost communities involved about two million dollars per year in transportation costs alone. It is estimated that the cost to dispose of dredged material further out would increase the present cost of disposal by 50 to 100 per cent. Any change in location of ocean dumping might create another area duplicating the present effect without attendant benefits...
>
> It appears that the Federal Government and local communities as well as private industry that are now dependant upon the use of the ares should not be saddled with greatly increased operating cost until a proper solution to the disposal problem based on facts and the best of scientific advice can be found... This position is supported by the evidence that damage to the ecology is not limited to an area where it is controlled. This in no way detracts from the need

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[14] Ibid., p. 13.

[15] N.Y. Times February 21, 1970 p. 33.

[16] Ibid.

for an early resolution of the problems."[17]

Although conflict of authority exists as to the amount of damage done by dumping, virtually all parties agrees it is an unsavory practice but are viable alternatives available? Cost seems to be the principal consideration in implementing alternatives to ocean dumping, Yet costs at least for sewer sludge vacuum filtration may not be as high as the Corps would have people believe. A Monmouth County, N.J. sewage engineer has quoted the cost of $1.83 per hookup per year to provide vacuum treatment.[18] State and Federal officials seem all too willing to let the cost factor dominate the issue. Typical is a statement by Thomas Glenn, Director and Chief Engineer for the Interstate Sanitation Commission of N.Y., N.J. and Conn.

> "There are only a limited number of alternatives for dealing with sludge or industrial wastes that cannot be treated: 1. disposal on land, 2. disposal in underground wells, 3. disposal at sea on the continental shelf..."[19]

Glenn states that metropolitan areas cannot afford the space and cost of filtration and vacuum beds. Lost revenue from commercial and sport fisheries and recreational waters should be balanced against taxing industrial giants or muncipal sewer authorities. Underground wells do pose a severe threat to potable water sheds.

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[17] Ibid., H.R. 15915 p. 51.

[18] Ibid., p. 90.

[19] Ibid., p. 105.

Most officials simply do not understand the gravity of the problem. The Bight has been used continuously for thirty years as a cesspool. The wastes were out of sight, out of mind. Industry and private taxpayers through their sewer authorities have become fiscally comfortable with the ocean as a dump. Until 1969 even the most rudimentary evidence on the perhaps irreparable harm done to the Bight had been lacking.

Congressman Howard's hearing hardly resolved the issues but it did serve to focus public attention on the problem and did introduce some evidence of harm caused by dumping.[20] The fate of H.R. 15915 will be discussed in Chapter III with other legislation. With an overview of the problem at hand a meaningful discussion of scientific evidence gathered to date, can be presented.

The New York Harbor complex is the largest grossly polluted area in the United States if not the world.[21] Ocean dumping in the Bight is far from a local problem, the environmental effects of the ocean dumping of sludge, dredge spoil and other wastes is a matter of the gravest national concern for it is abundantly clear that burgeoning coastal populations will increasingly resort to ocean disposal for getting refuse out of sight - out of mind. The New York Bight is but the worst and first of emerging "dead seas" unless suitable legal and technological safeguards are applied.

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[20] See Appendix B this chapter for photographs of sea life exposed to wastes.

[21] Woods Hole Study (1971).

APPENDIX A

Source: H.R. 15915 and Woods Hole Study (1971).

Table 1

Chronology of the Major Events Related to the New York Bight Pollution Problem

1888	- The office of the Supervisor of the New York Harbor was established by the Act of 1888 - the original authority for the Corps of Engineers to control the dumping of wastes in the New York Bight.
1899	- The Refuse Act was passed which generally prohibited dumping of solid wastes in navigable waters. It also provided the authority to establish the permit system for the controlled dumping of solid wastes in designated areas.
1924	- The sewage sludge dumping ground was established in the New York Bight.
April 1967	- A "memorandum of understanding" between the Corps of Engineers and the Department of Interior was issued to facilitate the evaluation of the environmental impact of waste disposal activities.
Fall 1967	- The Chief of Engineers (Army Corps of Engineers) directed the Corps' Coastal Engineering Research Center (CERC) to undertake an ecological study of the New York Bight disposal areas.
March 1968	- A working committee of invited scientists, Corps staff members, and Smithsonian Institution representatives defined the problem areas and recommended a basic 2-year research program.
August 1968	- Sandy Hook Marine Laboratory was awarded a $280,000 contract to conduct the study of the New York Bight.
August 1969	- Dr. M.G. Gross (State University of New York) initiated a study of the chemical composition of sewage sludges dumped in the New York Bight.

Dec. 3, 1969 - The Sandy Hook Marine Laboratory completed the interim report on the New York Bight problem and submitted it to CERC.

Dec. 17-18,1969- The Scientific Advisory Committee selected by the Smithsonian Institution visited the laboratories at Sandy Hook and Stony Brook to review the work in progress.

Feb. 7, 1970 - Representative R.L. Ottinger alerted the public to the ecological problem in the New York Bight and released the Sandy Hook interim report.

Feb. 10, 1970 - Representative R.L. Ottinger (New York) introduced the first bill (H.R. 15828) in response to the New York Bight problem. It would prohibit all dumping of wastes within a 25-mile radius of Ambrose Light.

Feb. 14, 1970 - Gov. W.T. Cahill of New Jersey announced that he would ask the Corps to require all sewage sludge from New Jersey to be barged a minimum distance of 100 miles offshore.

Feb. 16, 1970 - Representative J.J. Howard (New Jersey) introduced a bill (H.R. 15915) which also banned dumping within a 25-mile radius of the Ambrose Light.

Feb. 19, 1970 - Senator Gaylord Nelson introduced a bill (S.3484) which would halt all dumping of solid wastes into the ocean and Great Lakes by 1975, except where there was no technically feasible alternative.

Feb. 23, 1970 - A public hearing on H.R. 15915 was conducted by the Subcommittee on Rivers and Harbors (House Committee on Public Works) at Sandy Hook, New Jersey.

Mar. 2, 1970 - Representative H. Fish Jr. (New York) introduced a bill (H.R. 16225) to increase the fines of the 1899 Refuse Act from $2500.00 to $10,000.00 per violation.

Mar. 5, 1970 - A public hearing was held by the Subcommittee on Air and Water Pollution (Senate Committee on Public Works) to investigate the cause, extent, and remedy of the New York Bight pollution problem.

April 15, 1970 - President Nixon stated in a message to Congress on waste disposal that he had directed Mr. R.E. Train (Chairman of the Council on Environmental Quality) to conduct a study on the dumping of solid wastes into the ocean.

May 13, 1970 - Representative J.M. Murphy (New York) introduced a bill (H.R. 17603) which would grant the Secretary of Interior authority to designate disposal areas and establish standards for waste discharge in these areas.

Sept. 1, 1970 - Target date for completion of the Train report to President Nixon.

Early 1971 - Target date for release of the final Sandy Hook report after review by the Scientific Advisory Committee.

Spring, 1973 - Hearings in New York City on the renewal of present dumping permits and action on applications for new dumping permits. Hearings held before the Environmental Protection Agency

July, 1973 - Start of Marine Ecosystems Analysis Program New York Bight Project

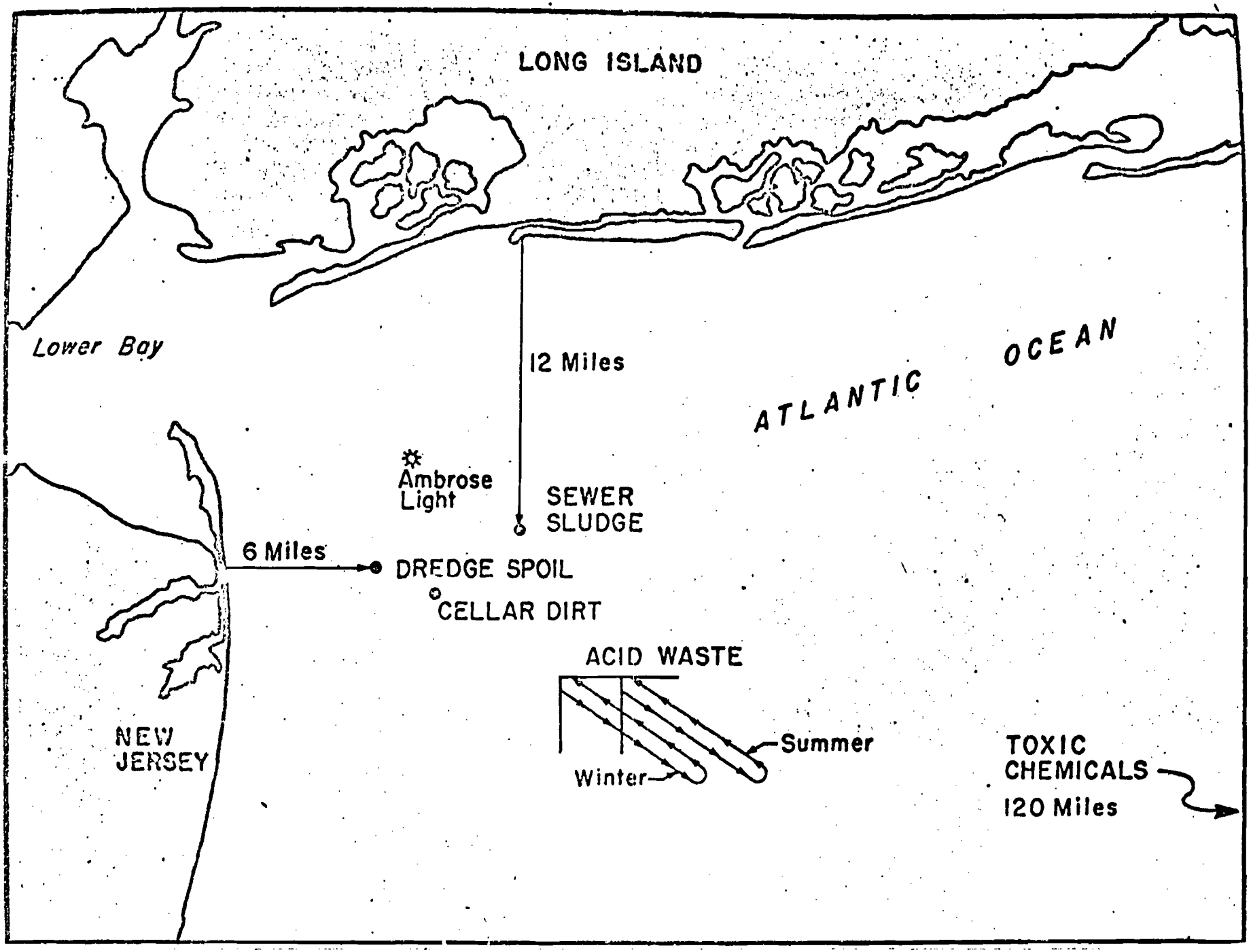
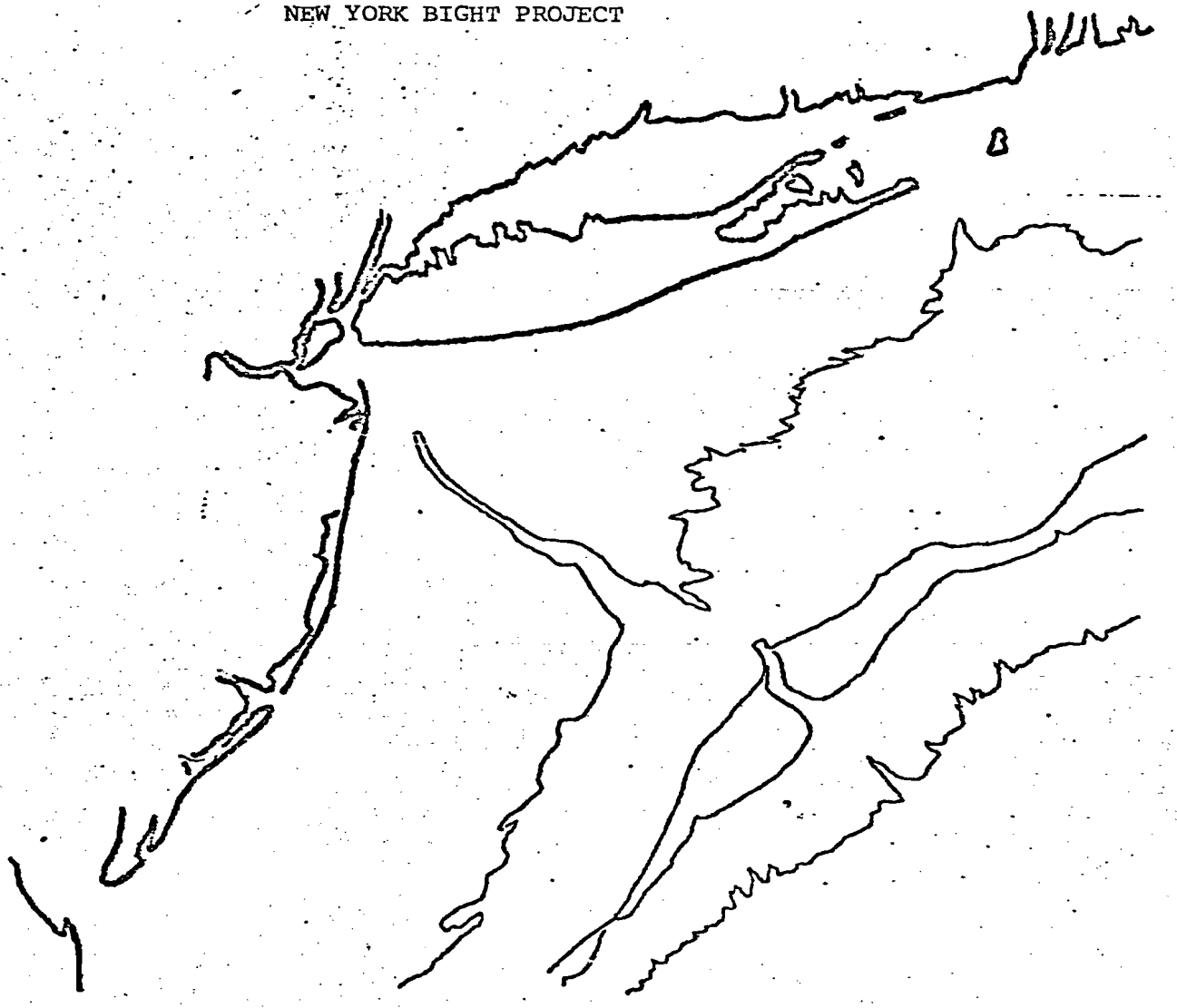


Figure 1. The location of various waste disposal sites in the New York Bight (Ketchum, 1970)

MARINE
ECOSYSTEMS
ANALYSIS
PROGRAM

THE MESA CONCEPT AND THE NEW YORK BIGHT PROJECT



R. L. Swanson

Acting Project Manager
New York Bight MESA Project

The coastal areas of the United States and its possessions are one of our most valuable resources. Identification of their value is certainly not new as a review of our history clearly indicates our economic and social development evolved in the coastal regions. However, it has recently become apparent that there is a limit to the stress that can be placed upon the delicate ecological balance that exists in the coastal environment.

The National Oceanic and Atmospheric Administration (NOAA) has within its organizational structure a considerable experience and expertise encompassing research, engineering, monitoring, prediction and resource assessment related to the coastal zone. These capabilities are located for the most part within NOAA's major line components (MLCs) which consist of the National Weather Service (NWS), National Ocean Survey (NOS), National Marine Fisheries Service (NMFS), Environmental Research Laboratories (ERL), National Environmental Satellite Service (NESS), and the Environmental Data Service (EDS). It has been through the various programs of the MLCs that many of the critical issues related to the estuarine and coastal environment have been addressed in the past and will continue to be so in the future. However, due to the complexity of the issues related to natural processes, man's impact and management policy has become

such that any one of these discrete programs cannot fully meet the requirement to describe the processes and eventually predict the responses of the coastal environment as a living dynamic system.

NOAA, in recognition of the above, has developed the Marine Ecosystems Analysis Program (MESA). It is the function of this program, for selected geographic areas, to integrate NOAA's existing capabilities in estuarine and coastal research into a cohesive and objectively oriented scope of investigation and research. This is to be accomplished through a redirection of the existing NOAA programs in the specific areas and supplemented by resources not now existing in the MLC programs. Further, provisions exist within the MESA effort to issue grants and contracts outside the NOAA framework to supplement NOAA's in-house capabilities and to constantly provide a mechanism by which new concepts, expertise and research can be introduced into MESA.

Where appropriate, MESA is to serve as a focus for cooperative efforts from other Federal agencies, State and local governments, universities, industries and other interests and capabilities to help resolve specific problems.

The objectives of MESA are consistent with NOAA's designated role in the marine environment. While they are not the exclusive responsibility of NOAA, they do serve to provide a framework for the MESA plan. These objectives are to:

1. Describe, understand, and monitor the physical, chemical, and biological processes of discrete marine environmental systems.

2. Provide information and expertise required for effective management of marine areas and the rational use of their associated resources.

3. Analyze impact of natural phenomena or man-made alterations on the marine environment.

MESA resides in the Office of Coastal Environment within NOAA. A number of discrete regional projects which will be independently managed but coordinated through the Office of Coastal Environment are planned to constitute the MESA Program. Each project is to be selected on the basis of a critical need for marine environmental research essential for understanding processes, man's impact and coastal zone management. The initial MESA effort has been identified as:

New York Bight - due to extremely heavy impact of man's activities, specifically ocean dumping.

Possible future projects are:

Puget Sound-Prince William Sound - due to the environmental impact of the transport of oil from Alaska through these regions.

Southeast Coast of Florida - due to the impact of expanding population on coastal waters which are dynamically affected by the Gulf Stream.

The New York Bight, the boundaries of which have been defined for MESA purposes in Figure 1, is adjacent to one of the most populated and industrialized regions in the world. As such, mankind has had an unprecedented effect on the marine environment. The Bight and its related shore has served as a playground, dump, sewer, transportation route, fishery, mineral resource and doubtless many other purposes. Recent reconnaissance assessments have raised the possibility that this marine region has in many respects been strained beyond the capacity of the system to revitalize itself under its present loading conditions. It is because of this issue that the New York Bight has been selected as the first and perhaps the most important MESA Project. It is essential that we are cognizant of the present state of the Bight and the related consequences, and the ultimate capacity of the Bight to withstand man's

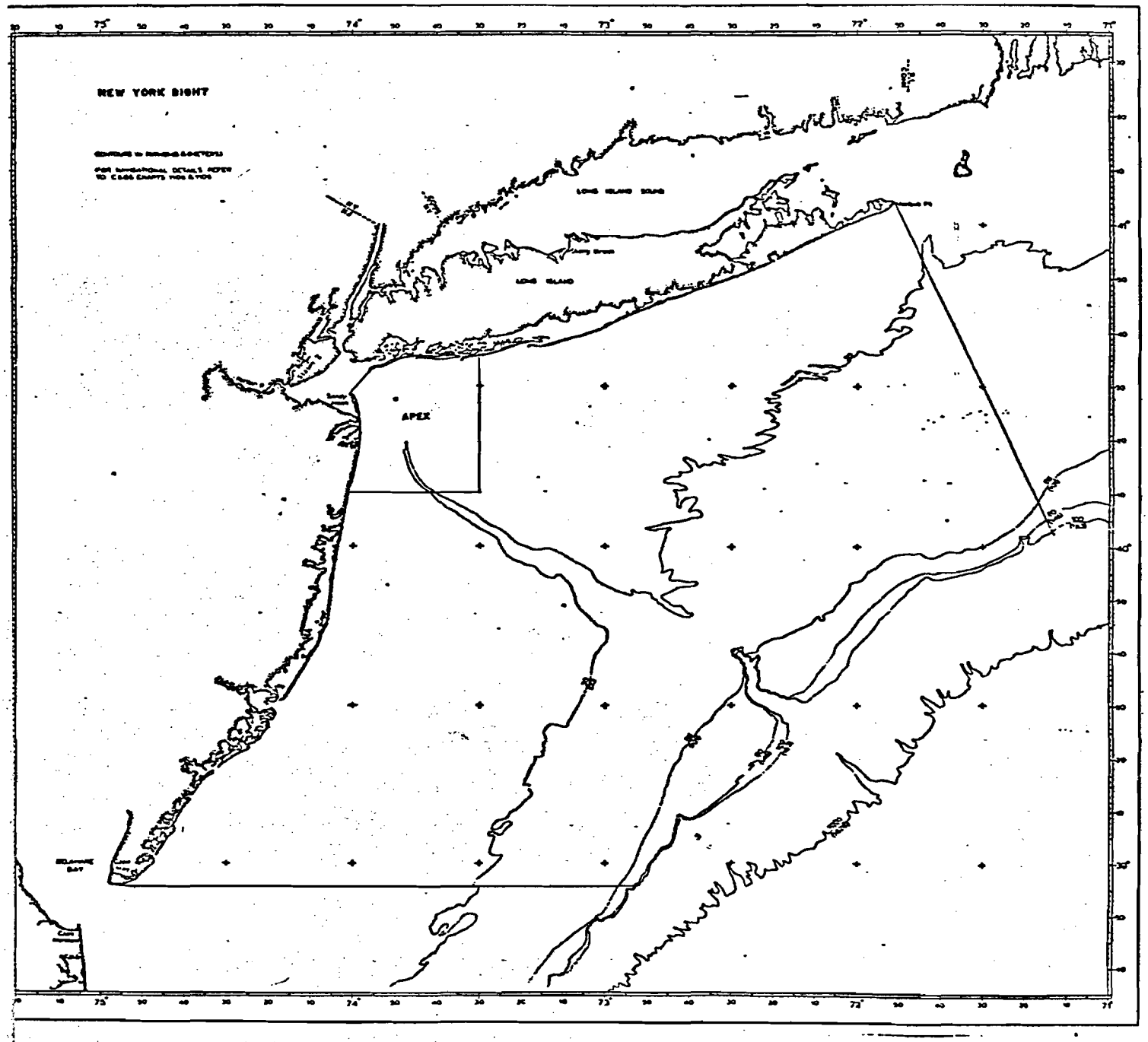


Figure 1

degradation. This can only be accomplished by understanding the dynamic processes of the marine ecosystem comprising the Bight.

Hopefully, through this knowledge, those of us who are responsible for establishing management guidelines will be able to regulate our activities such that we will enable the population to live in harmony with the system.

The New York Bight MESA Project is a five-year effort designed to addressed itself to the problems previously mentioned through integrated studies of the physical, chemical, geological, and biologic characteristics of the marine environment. As a logical approach to the Project, MESA will first examine the relevant existing knowledge concerning the Bight, then summarize it is a useful publicly-available form and use it to refine the New York Bight Project design.

The ultimate goals will be to provide users (e.g., policy makers and planners) with information and criteria for making decisions, and to establish a means of insuring that they will continue to have at their disposal such information during and upon completion of the Project.

In order to accomplish the latter aim, the Project must accomplish interim goals which are:

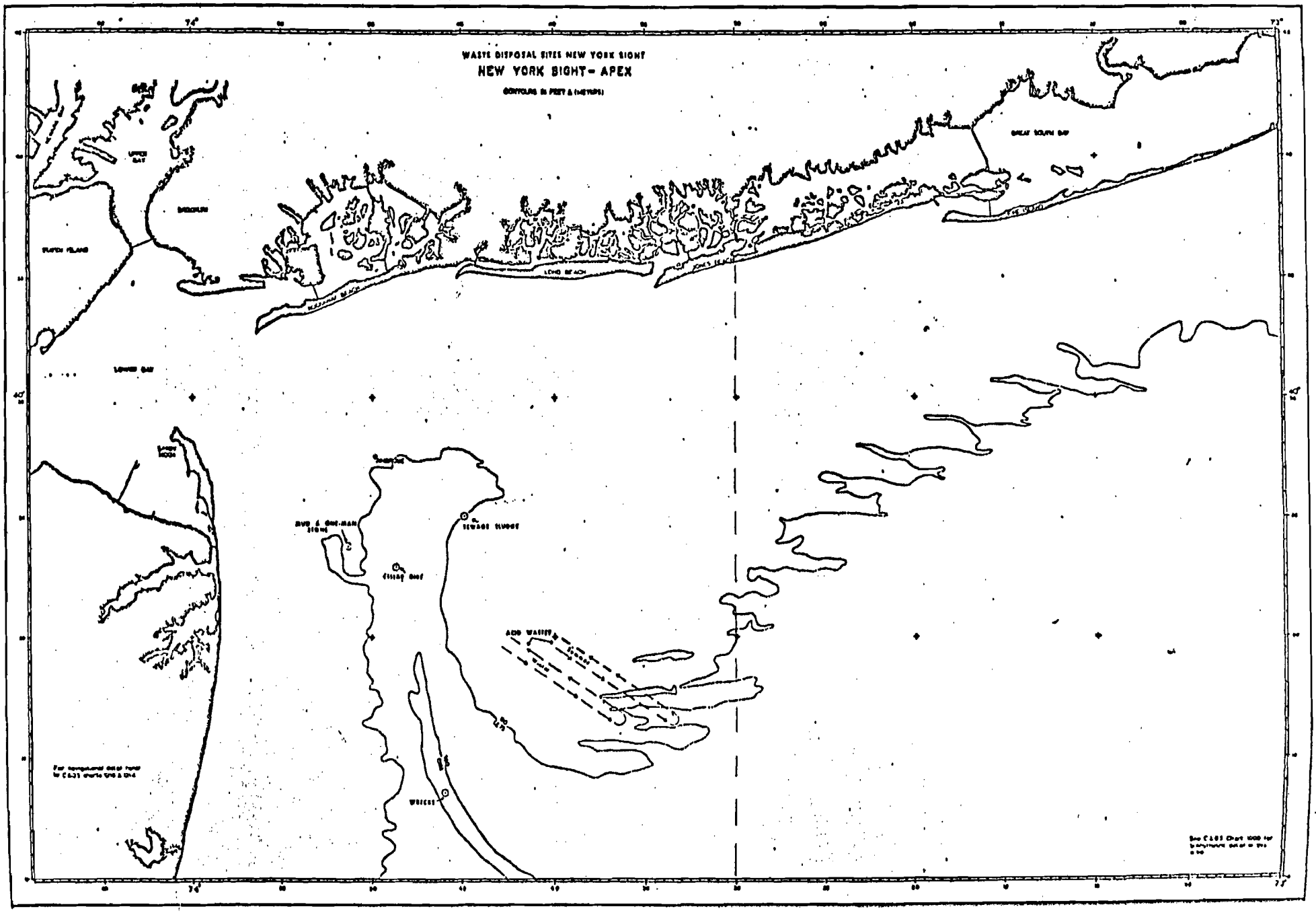
- To identify and describe major subsystems, processes and their driving forces within the New York Bight (subsystems and processes such as circulation, biological cycles and sediment transport).
- To identify and assess the significance of unusual natural (e.g., hurricane) and man-induced (e.g., dumping of sewage sludge) forces on the New York Bight.
- To refine temporal and spatial sampling scales for research and monitoring of the New York Bight.
- To utilize modeling techniques to predict, where necessary and practical, natural and man-induced impacts upon the New York Bight.

As the New York Bight Project has been in the developmental stages several tasks have been undertaken and are well on their way towards completion. These include, under the auspices of EDS, the development of an annotated bibliography key worded to the abstract level and a catalog of ongoing research. In addition, through management by the New York State Sea Grant Program, an

environmental altas of the Bight based on available information is being prepared. The atlas will be formated to allow pertinent new information to be inserted throughout the Project.

Paralleling this initial effort is the design of a conceptual model of the New York Bight ecosystem. The model which is being prepared under contract will serve to guide development and design of the project particularly as the project expands beyond the first field season into the entire Bight area. The model will also aid in the assessment and prediction of the impact of man's activities on the Bight ecosystem.

The first year's field activities, beginning in July 1973, have been designed to address the general New York Bight objectives and specifically the problem of research on ocean dumping (by authority given to NOAA in Public Law 92-532, the Marine Protection, Research and Sanctuaries Act of 1972). Most of this work will be within the apex (Figure 2) of the Bight. As indicated in the Figure, there are several distinct types of dump sites in the apex, consequently, NOAA will be able to respond to Public Law 92-532 as an integral part of the New York Bight MESA Project. Some of the problems with respect to ocean dumping that will be considered specifically during the first year but which will have to be continuously addressed during the entire Project are to determine:


WASTE DISPOSAL SITES NEW YORK BIGHT
NEW YORK BIGHT - APEX
(CONTOURS IN FEET & (METERS))
BROOKLYN
LONG BEACH
SEWAGE SLUDGE
DUMP & ONE-MAN DRUMS
ACID WASTE
WRECKS

- Types of material disposed of at individual dumping sites:
  a. Volumes
  b. Chemical composition
  c. Microbia/contamination

- Dimensions of the dump sites
  a. Horizontal and vertical extent
  b. Possible overlapping of different dump sites

- Seasonal changes, transport mechanisms, and rates of dispersal, decomposition, and accumulation of wastes as affected by physical and biological processes.

- Biological or community changes compared with historical baselines.

- Change in geological and geochemical factors as compared with historical baselines.

- Pathological effects on fish and shellfish.

- Needs for continued monitoring in vicinity of dumping sites and design of monitoring programs.

- Long-term growth rates of dump sites.

- Whether adverse conditions at the sites are cumulative and whether neutralizing processes are taking place.

- What is sacrificed or gained by using the present sites (food supply, aesthetics, spread of disease)?
- Better dump site locations along with criteria for assessing possible sites.
- How to recover impoverished areas.

Management of the Project will be accomplished through the MESA New York Bight Project Office, located at the Marine Sciences Research Center on the campus of the State University of New York at Stony Brook, Long Island, New York. The Project Manager and a team of approximately six scientific/managerial personnel will provide the overall project guidance. This responsibility will include:

1. Providing broad scientific direction;
2. Accomplishing technical integration and monitoring scientific progress;
3. Maintaining a user-directed issue orientation within the basic plan;
4. Eliciting and maintaining participation by the many organizations who have valuable contributions;

5. Controlling the actual project activities;

6. Eliciting adequate feedback from specific users and beneficiaries of the Project results.

In order to assist in successfully meeting the objectives and responsibilities of the New York Bight Project, a committee with three advisory panels will be established. Two of the panels will consist of members from the Federal, State, local governments, and the academic community. The role of these panels is to examine and suggest changes or improvements in the scientific and technical design in one case and to assure that the Project is meeting the user needs in the other. The third panel will be made up of citizen's groups and industry in order to provide a greater interface with a broader spectrum of the population.

The Naval Air Station (Floyd Bennett Field) on Jamacia Bay at Rockaway Inlet has been designated as a base of operations for the various research activities to be undertaken as part of the MESA New York Bight Project. Here the principal investigators will rendezvous for logistic support and services. Mobile facilities will be established from which the Engineering Development Laboratory and the National Oceanic Instrumentation Center, both of NOS, will provide engineering design, field support, calibration and limited maintenance facilities. This service alone is expected

serve as a model for future NOAA programs. Strict guidelines with respect to engineering, calibration and maintenance have been established for the project which will provide a data credibility for the scientific output. This credibility has been lacking in many previous marine endeavors.

Scientists from the MLCs are serving as the principal investigators, often with contractual investigations being carried out by universities, private institutions and other Federal agencies. ERL, through its Atlantic Oceanographic and Meteorological Laboratory in Miami, is serving as the lead for geological investigations during the initial stages of the Project. Emphasis will be placed during the first 18 months on the flux of sediment and its relationship to man-induced influences in the Bight apex. Mapping of the dump sites will entail evaluation of side scan sonar, seismic profiling, and bathymetric data. Ground truth will be obtained from gravity cores which will also be used to investigate processes at the sediment water interface. Wave refraction studies and bottom current speed and direction information will also be utilized by the geologists for analysis of the sediment transport mechanisms. The current measuring program is part of the physical oceanographic effort spearheaded by AOML and NOS. Taut wire, moored current meter arrays will be strategically placed in order to analyze the advective fluxes through the apex of the Bight and over the dump site locations.

A current meter system designed to move vertically in the water column will be utilized to investigate the influence of vertical stratification on the hydrodynamics of the Bight. With simultaneous observations of temperature and salinity at depth quantification of the driving mechanisms such as tidal and thermohaline induced circulation will be possible. By continuing the Project throughout the year, the seasonal fluctuations and hopefully the hypothesized extreme importance of storm generated circulation can be evaluated.

Dependent upon the investigations of these scientists are those of the Sandy Hook Laboratory of NMFS. Benthic studies designed on a sound statistical basis will be carried out in order to correlate the presence of living organisms and even their respiration rates as a function of numerous environmental parameters such as sediment type, water movement, chemical composition of both water and sediment including heavy metals, hydrocarbons and other man-induced materials.

Trawling for fish in conjunction with ongoing research at NMFS will not only help to determine species and abundance but will give further data for analysis and understanding of the cause, effect and impact of man on such fish diseases as tumors and fin rot.

Synoptic coverage often unavailable in traditional oceanographic studies will be available through remote sensing investigations in the NESS. Satellite oceanographic investigations are also being undertaken in the Bight through analysis of ERTS imagery and Skylab data.

Throughout the next 18 months, a variety of NOAA platforms will be seen in the apex of the Bight, along with non-NOAA vessels which will be participating in a variety of ways toward the MESA effort. The NOAA ship FERREL (Figure 3) and her predecessor the MARMER have already been carrying on extensive observations in New York Harbor and Long Island Sound since the late 1950s. The FERREL will have her oceanographic capabilities further expanded to enable her to undertake much of the burden of the multidiscipline MESA Project during the initial phases of the program. Her shallow draft and maneuverability give her added advantages for working in the inshore coastal waters of the Bight.

Finally, the responsibility for data management and for dissemination of data, information and the analysis of data performed by the principal investigators will lie with EDS. The importance of this function must be emphasized, for without proper data management and dissemination the Project holds little purpose.

Thus, each MLC and their respective participants play an integral part toward a total NOAA Project. The science is of little value without proper engineering, maintenance of equipment, etc., and neither is worth the effort without exchange of data and information. To succeed, the MESA New York Bight Project must be a team effort.

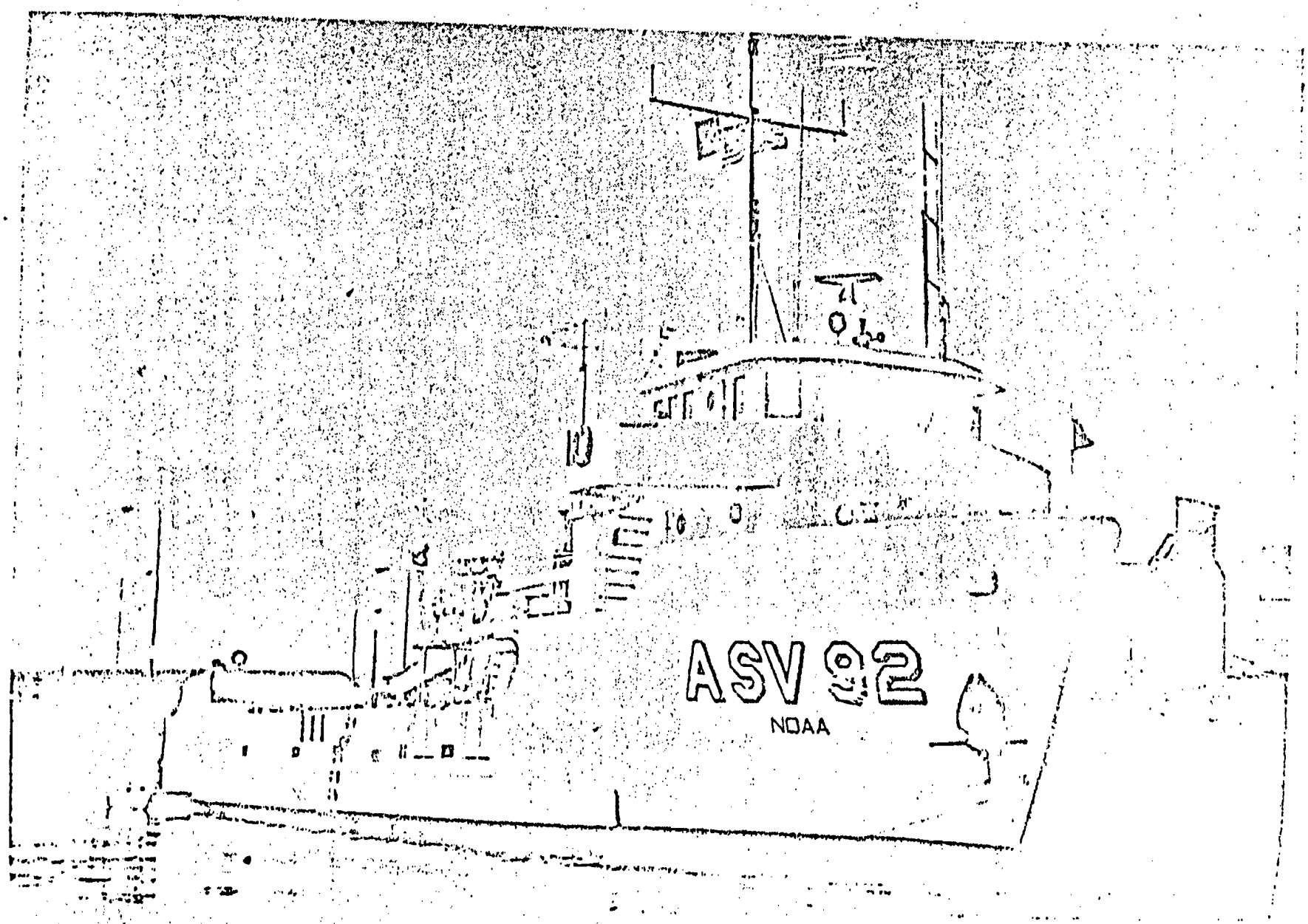
It is hoped that the MESA New York Bight Project will prove to be in many ways a prototype not only of future NOAA regional environmental studies but of major federal environmental studies as a whole. Resources are not available to permit programs to continue to develop independently of other similar programs. Cooperation and integration of efforts must exist across all governmental lines in order to meet the needs of the citizens of the United States in the most effective manner.

For more information concerning the MESA New York Bight Project, write to:

Project Manager
MESA New York Bight Project
Marine Sciences Research Center
SUNY
Stony Brook, New York 11790

Figure 3

NOAA Ship FERREL



CHAPTER II

THE WATERS OF THE NEW YORK BIGHT

Chapter II - The Waters of the New York Bight

Topography

The topography of the New York Bight is shown in Figure 3. The water depth in the sludge dump is approximately 70 feet, in the spoil dump about 60 feet. The topography is typical of the Continental Shelf and the most prominent feature of the area is the head of the Hudson Canyon. Because of its ecological importance fears have been expressed that polution may spill over to the canyon. However, conclusive evidence is lacking as to the harm done to benthic life in the canyon.

Uncontaminated sediments in the New York Bight area consist of sand with organic content less than 5% of the dry weight of the sediment.[1] Sediments along the New Jersey coast in waters up to 60 feet in depth are moderately coarse sands and in some instances gravels. These coarse sands grade into medium sands in waters 60 to 90 feet deep and into fine sands in waters 90 feet or deeper.[2] Little river-borne sediment finds its way to the North Atlantic at

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[1]The scientific information in this chapter is derived from studies, (a)Horme, R.A., Mahler, A.J. and Rossello, R.C. Unpublished Manuscript - The Marine Disposal of Sewage Sludge and Dredge Spoil in the Waters of the New York Bight Woods Hole Oceanographic Institution, Woods Hole, Mass. January 29, 1971 hereafter cited Woods Hole Study (1971)
(1)Gross, G.M., Black, J.A., Kalin, R.J., Schramel J.R. and Smith, R.N., Survey of Marine Waste Deposits, New York Metropolitan Region Marine Sciences Research Center, State University of New York, Stony Brook, N.Y. April 1971 thereafter cited Stony Brook Study (1971)
(c)Pearce, J. Interim Report on New York Bight Sandy Hook Marine Laboratory, Sandy Hook, N.J. December, 1969 hereafter cited as Sandy Hook Study (1969).

[2]Sandy Hook Study (1969).

the present time and most of that transported to the North East coast of the United States is retained by estuaries unless removed by dredging. Thus despite the high turbidity of the waters, in the New York Bight there is little natural sedimentation to dilute or bury waste solids.

Currents

The single most important factor determining the environmental effects of marine dumping is the currents-system in the dump and adjacent areas. The currents together with the oxygen content of the waters (which is largely determined by currents and mixing) fix the maximum load or capacity of the dump area.

Currents in the New York Bight are strong. The waters of the poluted Hudson River rarely exceed 1% of the total water since strong horozonal ocean circulation flushes the 500 square miles of the Bight every 6-10 days. However the circulation pattern is complex and reflects strong seasonal changes in the ebb tides and the direction of the currents is frequently onshore. The strength of the currents has its negative effects by bringing polluting material towards shore giving it less chance to decompose in addition to spreading the polluted area.

Figures 7-11 (Woods Hole Study) reflect the complex system of currents in the Bight.[3] Surface Drifters (bottles) released in the month of February in the dump areas[4] were not recovered indicating that in the winter months prevailing north-west winds produce off-

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[3] Sandy Hook Study (1969).

[4] Figure 2 Stony Brook Study (1971).

shore currents.[5] However in the summer a southwest current develops with a northerly current along the Long Island Coast. The surface current tendency is then onshore and drift bottles released in the dumping area return along the Long Island and to a lesser extent New Jersey shores.[6]

More relevant to the problems of the dump areas as sources of pollution are the bottom currents. These are generally and northerly at all times and bottom drifters released in the sludge dump in time end up along the beaches of Long Island.[7] Sandy Hook Laboratory is measuring current velocities but no data has yet been released.

The Woods Hole Study has concluded that the location of the sewage sludge dump in the New York Bight is one of the worst along the coastal area. The currents are largely onshore and 40% of the sea-bed drifter devices released in the contaminated area return to shore.[8]

Physical-Chemical Properties of the Waters

Both temperature and salinity of the Bight waters vary on a seasonal basis. In the winter the waters are characterized by a vertical homogeneity. The coldest and least saline water is close to the shore, with warmer and more saline water offshore. A tongue of this warmer ocean water is found along the Hudson Canyon. The

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[5] Ibid. Sandy Hook.

[6] Figure 9 (Woods Hole Study).

[7] Figures 10 & 11 (Woods Hole Study).

[8] Woods Hole Study (1971).

temperature reaches a low around 0°C onshore and 5°C offshore. The salinity varies from 31 parts per million (ppm) to 34 ppm offshore with lower salinities near the mouth of the Hudson River. In the spring, large quantities of warmer fresh water enter the Bight from the Hudson River. This water tends to stay on the surface and sets up a vertical inhomogeneity and the beginning of a thermocline.[9] The difference between bottom and surface temperatures at this time is about 4°C. The surface temperature in April varies from under 7°C to over 8°C. The salinities vary from 20 ppm - 25 ppm at the Hudson River mouth to 32 ppm offshore.

The summer is characterized by the establishment of a thermocline. The surface temperatures vary around 22-25°C and the bottom temperature varies from lows under 10°C in the Hudson Canyon to 20°C. The difference between surface and bottom temperatures varies from 5-6°C at the river mouth to over 10°C offshore and over the Hudson Canyon. The surface salinity varies from 25-32 ppm with the lowest readings at the river mouth. The bottom salinity varies from 28 ppm to 32 ppm offshore. The differences range from 3 ppm at the river mouth to quite small differences well offshore.

Autumn finds the reestablishment of the winter pattern. Water temperature drops and salinity increases as river flow decreases. The coldest water is again found onshore. The salinities vary from 27 ppm to 33 ppm and the temperatures from 10°C - 15°C. The surface temperature has a low in March, a peak in June or July followed

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[9]The region of the thermocline indicates mixing of deeper water with surface water through eddy diffusion and convection. Turekian, Karl Oceans Englewood Cliffs, N.J. Prentice Hall 1968 p. 89.

by a sharp drop in July - August and rises to another high in September-October. During the summer, the Bight is touched by the edge of an enormous cold cell that can cause rapid changes in bottom temperature.[10]

Resource Value

The Bight as a natural resource has inumerable uses as a recreation area, but for the purposes of this study only two resource values will be considered, Fisheries and the Gateway National Recreation Area.

The damage suffered by U.S. Fisheries is enormous. Of an estimated 1969 potential shellfish catch of $320,000,000 it is estimated that 1/5 of $63,000,000 is lost due to pollution.[11]

The pollution of the New York Bight also poses a potential threat to the proposed Gateway National Recreation Area - a new major conservation effort. This project is designed to improve the life of the urban poor, however a 1968 Federal survey suggests no casual link between ocean disposal and proposed park locations. It does state that beaches are and will be closed to swimming because of pollution from other sources.

Sources of Bight Pollution: Sewage Sludge and Dredge Spoil

Five major sources of pollution have been identified in the New York Bight:

1. Vessal discharge of trash, dredge wastes, and sewage.
2. Ocean disposal of sewage sludge, construction materials.
3. Sewer outfalls.
4. River discharge and land runoff.

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[10] Sandy Hook Study (1969).

[11] Woods Hole Study (1971) see Table 2 and Table 25.

5. Accidental spills on land and sea.[12]

The outlook in the case of dredge spoil may not be so grim.[13] A decline in shipping activities would tend to alleviate some of the harbor's pollution problems, although this may be offset by the growth of pleasure craft which are more difficult to police and probably more careless in their operation. The most troublesome constituent of the material dredged from the bottom of the port appears to be petro-chemicals.

The quantities of solid wastes being disposed of in the coastal waters of the U.S. are enormous and increasing. In 1968 about 48 million tons of waste were dumped at sea.[14]

The dumps in the Bight area carry the largest load. Between 1944 and 1968, 9,600,000 tons per year were dumped into the waters of the New York Bight. In the fiscal year 1968 the dumped materials amounted to 17 million cubic yards.[15] The Stony Brook Study has made some interesting comparisons to illustrate the magnitude of these quantities. It points out that 9,600,000 tons/year of solid wastes corresponds to 1 ton/year or 6 lbs/person/day and that except for the Gulf of Mexico, the wastes from the New York metropolitan area are the largest source of sediment discharging directly into the North Atlantic Ocean from the North American continent.

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[12]Woods Hole Study (1971).

[13]Physical properties of sewage sludge and dredge spoil will be discussed later.

[14]See Table 3, 4 and 11 (Woods Hole Study 1971).

[15]Woods Hole Study (1971).

The normal sediment load of the Hudson River was estimated to be 400,000 tons/year around 1900, but in 1960 it was estimated to be more than double this value at 830,000 tons/year. Between 1964-68 about 700,00 tons/year of wastes were dumped into the river which may have reached the harbor and where they were subsequently dredged up and barged to the waters of the Bight. The waste materials exceed river sediment discharge per unit area in the New York Bight by some 3 to 30 tons/year. It must be remembered that these wastes were dumped into waters already grossly polluted.

Over 1 billion gallons/day of sewage is discharged directly into waters entering the New York Bight from both New York and New Jersey. Only about half this is subjected to secondary sewage treatment and the treatment plants are so overloaded that the treatment is really not fully effective. All the entrances leading to the Bight are polluted. The Hudson River is already burdened with 10 times more pollution than it can accomodate by natural biological decomposition. By natural processes the Hudson River can recover from the sewage contamination of 1,200,000 people but in the metropolitan area the sewage effluents of a population 10 times greater are being discharged into a river already polluted by municipalities upstream.

Presently there is some degree of secondary treatment for about 75% of the 1300 million gallons treated, but about 325 million gallons/day of raw sewage continue to be discharged into the Hudson, mainly from the Northwest side of Manhattan, in addition 350 million gallons/day of raw sewage are poured into the Hudson

and East Rivers which eventually finds its way to the Bight.

Based on conservative estimate of 8 lbs solid waste/ person/ day the generation rate in 1980 will be over 150,000,000 tons/ year. If 10 lbs/person/day are generated total wastes in the coastal area will be three times the present level. The pressure to use the ocean for waste disposal will increase. These projections are disturbing because the pollution tolerating capacity of the Bight dumping areas appears to have been exceeded a few years ago.[16]

Physical-Chemical Properties of the Wastes

Sewage sludge is semi-liquid waste. The percentage of solids of sewage after primary sedimentation is 2.5 and after the secondary treatment trickling process 0.5. New York activated sludge is thickened in circular gravity thickeners to yield a relatively thick sludge of approximately 5-6% total solids; this represents a 0.0025 fraction of the original volume.[17]

Many nutrient materials are soluable, thus compared to the original sewage the nutrient content of the sludge is small therefore sludge has little nutrient value on the waters in which it is dumped.

In terms of pollution, the most troublesome components of sewage sludge are the organic content and apparently the toxic heavy metal content.[18] Sewer sludge from plants in New York City and New

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[16]Woods Hole Study (1971).

[17]Ibid.

[18]See Figures 3-2 to 3-5 (Stony Brook Study) for distributions.

Jersey are rich in organic matter, the total loss on ignition ranging from 46 to 80% of the dry weight of the material and the oxidizable carbon content of the samples ranged from 18 to 26%.[19] The remaining non-organic fraction of the sludge is largely composed of aluminosilicate materials chemically similar to shale. As for the nature of the organic material, sewage itself contains both volatile and non-volatile acids. Among the soluable, non-volatile acids found are glutaric, glycotic, latic, citric, benzoic, and phenyllactic. Among the soluable sugars found are glucose, sucrose and lactose.

Sewer sludge contains relatively high concentrations of lead, chromium, and copper. Sewer sludge is also believed to contain some petroleum materials although far less than dredge spoil. In the case of dredge spoil, the recent studies seem to be pointing in the direction that from a pollution standpoint, the most dangerous constituents in this material are petro-chemicals and again heavy metals.

The ocean floor in the sludge dumping area is also scattered with refuse and human artifacts. The physical appearance of the bottom is evidently exactly that of what the bight has become, a dump. Although in terms of quantities involved dredge spoil makes by far the greatest contribution to the solid wastes disposed of in the Bight, it should be noted that it is composed for the most

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[19]See Figures 2-3, through 2-6 and Figure 3-1 for distributions of carbon in the Bight.

part of inert mineral substances and would not constitute a pollution problem in itself were it not contaminated with petro-chemicals, heavy metals and pesticides.[20]

Waste Transport, Dispersal and Physical Effects

Little research has been done on barge dumping. Four studies conducted at various places throughout the world give only an approximate picture of settling and dispersion patterns and rates. The largest portion of dumped material sinks to the bottom within a few minutes. However a study conducted in an Oslo fjord in 1955 noted that a large cloud of very fine particles remained at or near the surface for periods up to four hours. This cloud could be carried three or four kilometers under the influence of wind and current. Saila, has studied the Newport Bight off Rhode Island and traced the settling pattern of dredging spoils by using turbidity measurements. He estimates that up to 25% of the dumped material remains suspended in the water column. He found that two slicks tended to form within an hour of dumping. One forms at the surface and one roughly mid-depth which probably was due to the density gradient at the thermocline. He theorizes that these slicks are composed of oils and organic matter with positive buoyancy which coagulate at the bottom anf then rise. He found that these slicks break up after four to five hours, which agrees with most estimates from outfall studies.

The general pattern of what will happen to sewage sludge or

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[20]Sandy Hook Study (1969).

dredging spoils dumped in the Bight can be predicted on the basis of the above studies. Over 75% of the material can be expected to settle rapidly within the dumping area. The remaining portion will travel with the current for a period of several hours while slowly settling. This direction is generally onshore in the summer and offshore in the winter. The Sandy Hook Laboratory has reported large quantities of suspended material near the dumping area. A very small portion will be buoyant and will disperse either at the surface or along a density gradient. Theoretical works predict this dispersion will be largely lateral with only a small vertical component. Storms however in the Bight have been found to mix the water column vertically, but also to move the contaminated sediments around. As a consequence cores taken in the area show alternating clean and polluted layers.[21]

Screening can be used to remove floatable material. In addition to the surface slicks and debris patches which are frequently observed to the east of the dump areas and which presumably result from the actual dumping operation, the material which does settle to the bottom can periodically gasify and then float contamination to the surface.[22]

In the waters of the New York Bight the bottom sediments in the disposal area are characterized by an organic content greatly in excess of the normal value (less than 5%) and currents spread

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[21] Sandy Hook Study (1969).

[22] Ibid.

this organic content zone northeast towards the Long Island coast. East of the disposal area is a region of abnormally high organic content (5-10%) of mysterious origin. It is not associated with the dumping area and may be the result of natural processes. The heavy metal content of the sediments leads to the same conclusion, namely the sludge contaminated area is spreading in a general water movement to the northeast and east. In contrast to the sludge, the dredge spoil tends to remain where it was dumped.[23]

Another factor in the spread of the contaminated areas is the failure to dump in designated areas. Despite patrolling, surveillance of the dump areas is not adequate and short dumping is known to occur. Also there is a lack of buoys and other navigational guides at the dumping site.

More information is needed on the depth of contamination of bottom sediments in and near the dump site. One core indicated that contamination penetrates to a depth of three feet.[24] If this is the case the Sandy Hook Report concludes that the rate of decomposition in the marine environment is very slow and raises a danger signal that we may have already exceeded safe limits of disposal.

Chemical Effects

Dredge spoil has been exposed to a brackish or marine environment for extended periods prior to dredging and dumping, similarly sewage sludge has been formed in an aqueous medium, consequently

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[23] Ibid.

[24] Ibid.

there is little nonbiological chemistry to occur immediately upon the dumping of these materials in the sea although there may be some aggregation and some subsequent precipitation of colloidal material due to the high ionic strength of sea water.

The most damaging pollutants of the dredge spoil are petrochemicals and heavy metals; of the sewer sludge, carbonaceous material and heavy metals. Petroleum contamination in New York Harbor is very extensive. The petroleum coats solid particulate material and is carried to the bottom. The water-oil emulsion formed results in sediments with the consistency of mayonnaise. The pesticide content of the contaminated sediments runs between 0.013 - 0.019 ppm DDE, 0.039 - 0.81 ppm DDD, and 0.013 - 0.126 ppm DDT.[25]

As a result of the highly publicized oil spills research on the chemical fate of hydrocarbons in the marine environment has been accelerated. After some initial degradation near the surface by the action of sunlight, aliphatic, olefinic and naphthenic components of the sinking oil are subjected to microbial attack by a number of widely distributed organisms such as Corysebaterium, Nocardia, Streptomyces, Penicillium, Candida and Mycobacterium.

However the biodegradation of petroleum material requires molecular oxygen or oxygenated anions, such as sulfate and it is very doubtful that most of such processes can occur in oxygen de-

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[25] Ibid.

pleted waters such as encountered in the contaminated waters of the New York Bight, and even if some available oxygen does remain in the waters it will soon be depleted by the polluted bottom material. Hydrocarbons spread in the bottom sediments thus enlarging the original area of contamination,

Natural water systems are capable of cleansing themselves of enormous influxes of hydrocarbons. Although the site of very dirty drilling operations for more than 20 years, surface sediments cores from the bottom of Lake Marcaibo, Venezuela, are clean of hydrocarbons, probably because its waters are rich in petroleum eating organisms. However these microbes need oxygen to survive and if the supply is depleted as is now the situation in the New York Bight, their hydrocarbons-removal capacity can be destroyed.

A comparitive study of New York Harbor and the Thames Estuary by Torpey in 1967 showed the following sequence of events marking successively severe conditions resulting from oxygen removal by carbonaceous pollutants.

1. When pollution loading increases to a rate requiring 20 lbs O_2/day/acre instability develops, O_2 level drops, fish migrate.
2. At a pollution loading level of 20 to 132 lbs O_2/day/acre the dissolved O_2 remains substantially constant at between 25 to 50% of saturation. This plateau is homostatic because symbiotic algae and bacteria are able to maintain this O_2 level.
3. At loading rates exceeding 132 lbs O_2/day/acre the O_2 was exhausted and anaerobic conditions prevailed.

The waters in the sludge disposal area in the Bight have now reached the last of these phases.[26]

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[26] Ibid.

Generally there is a 2 to 13 ppm difference in O_2 concentration between surface and bottom levels. There differences diminish with the breakdown of the thermocline in October-November. Water in the dump area contained 2-3 ppm less dissolved O_2 than water outside the dump area at the same depth. In late July to mid-October the dissolved O_2 level in the bottom waters over the sewage sludge is frequently less than 2 ppm extending over a distance insufficient to support life.

It is clear from measurements that oxidation of the organic component of the waste consumes the dissolved oxygen, thus reducing the oxygen content of the near bottom waters in both the spoil and sludge dumping areas.[27] Under normal conditions the concentration of dissolved oxygen varies with temperature, salinity, normal biological processes and is strongly dependent on local mixing processes. The seasonal variations in the oxygen content of the surface and bottom waters at a location in the center of the sludge disposal area is shown by Figure 29. In the sludge area in August-September the oxygen content of the water 3 feet off the bottom falls below the value required for survival of many marine organisms. As a consequence of this oxygen depletion, sediment samples collected in the sludge area are black and stink of H_2S - characteristic of an environment devoid of oxygen and high reducing capacity.

The deep waters of the Dead Sea (Israel-Jordan) are 5-10%

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[27] Figures 27 and 28 Sandy Hook Study (1969).

saturated with dissolved oxygen which is roughly the same level the Bight is approaching. In 1948-49 measurements revealed that the oxygen content of the near bottom waters in the dredge and sludge areas were 61% and 50% of saturation respectively. Measurements in July 1964 about half way between the two disposal areas revealed an oxygen minimum of about 59% or normal, but in September 1969 a research vessel from Woods Hole found that oxygen content in the sludge area had fallen to 27% saturation.[28] It can be concluded that sometime between 1949-69 dumping activities exceeded the critical level and that the waters were no longer capable of cleansing itself. The ability of these areas to regenerate into sustaining waters is questionable. The damage may be irreversible.

The sediments in the sewage sludge disposal area exhibit very large concentrations of lead, chromium and other toxic heavy metals. Comparison with uncontaminated sediments collected 8 miles eastward indicates that Chromium, lead and copper are about 150,300 and 2000 times more contaminated than normal. The amounts of these elements extractable from the sediment increases with concentration of extracting acid, suggesting that the metals are chelated in-

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[28]Woods Hole Study (1971). It should be noted that there is no evidence either in measurements made in the dump area in 1969 or by subsequent cruises of Woods Hole ships that the oxygen depletion extends into the water column for more than 5 m off the bottom. Also the Hudson River is a source of oxygen depleted water. Even in the outer Harbor can be as low as 1.8 to 2.0 ppm (Woods Hole Oceanographic Institute rej. no. 70-15.)

to organo metallic complexes. These substances would then extract into a petroleum phase and find their way into spoil dump sediments. Heavy metals thus extracted can slowly back into the overlaying water column or be taken up by organisms and thus be fed into the food chain.

Biological Effects

The physical and chemical effects of waste dumping into the waters of the Bight are relatively easy to assess - the biological effects will never be completely known. Preliminary studies conducted by the Sandy Hook Marine Laboratory have shown that the ecological effects of dredge spoil were similar to those of sewage sludge, but no direct effects were noted in the areas for the disposal of cellar dirt and rubble and acid wastes.

Fish and even plankton are mobile and can move in and out of the polluted area so the possible effects of waste disposal on them is more difficult to evaluate. The dredge spoil and sewage sludge areas which are depleted of dissolved oxygen in the summer months are devoid of any benthic populations. At each sludge site the area devoid of life appears to be a circular area of about two miles which suggests that the area affected is about six square miles. Nematodes, a small marine worm widely distributed in marine sediments are very tolerant of pollution, yet in the disposal areas even they cannot survive. Areas peripheral to the sludge dumping ground were either severly impoverished or often dominated by large numbers of Cerianthus a

pollution resitant sea anemone. Gammarid amphipods, an important food source for finfish, are highly sensitive to the pollution and their numbers were greatly dimished even in the marginally polluted areas. These tube-forming organisms, it might be noted help stabilize bottom sediments. Benthic communities east of the sludge dump are less productive than to the north, west and southwest. But there is no evidence that increased amounts of organic matter above normal background levels has any fertilizing effect on benthic communities.[29]

A number of laboratory tests have been conducted to reveal the response of various animals to the waste contaminated sediments. The mud snail, Nassarius obsoletus, which is highly tolerant and often occurs in polluted waters, avoided sludge sediment. Similarly hermit crabs avoided the contaminated sediment. Lobsters placed in unaerated aquaria containing sludge and spoil were dead at the end of ninty-six hours. In aerated aquaria they remained alive but developed pathological conditions. Crabs showed similar behavior with death occuring in forty-eight hours if the O_2 level was allowed to fall below 2ppm.

Lobsters, crabs, and horeshoe crabs kept for six weeks in well aerated aquaria containing sewage sludge but developed the following pathological anomalies.

1. Severe erosion of the exoskeleton
2. Erosion of chela and pereiopods
3. Infection of the eyes of horseshoe crabs with necrotic tissue
4. Fouling of branchial chambers and gills by organic debris, silt and oil
5. Covering of exposed surface of animals by a layer

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[29]Sandy Hook Study (1969).

> which could provide an initial residence for the innoculations of infective microorganisms.

Lobsters while mobile are fairly stationary residents of the benthic community. They do not make long migrations, but tend to stay in a limited area.[30]

Plankton are of extreme importance because of their most strategic position in the chain of life in the oceans, and unfortunately the effects of the dumping operations on plankton are unclear. A preliminary study by Sandy Hook found that filtered bottom water collected from the sewage sludge dump area completely inhibited phytophankton cell growth and photosynthesis. The natural productivity of these waters is about 12,000 metric tons of carbon per year, yet disposal operations are putting about 100,000 metric tons of carbon per year in the waters. Therefore the oxygen content of the waters is insufficient to enable them to cope with this additional burden of oxidizable carbon.

The effect of dumping operations on finfish is yet unclear. The most tangible evidence unearthed to date appears to be a high incidence of fin rot originating in or near the contaminated areas. If the disease is directly associated with the sewage sludge disposal operation and carried to other areas by migrating fish the effects of sludge may be more widespread than previously thought.

Fine suspended solid matter adversely effects sometimes le-

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[30] Ibid.

thally, the gill epithelium of fish and similar deleterious effects are expected for invertebrates especially filter feeders. Acid concentration greater than 1:600 (acid to sea water) was fatal to the white mullet. Incineration residues did not effect the fatty acid content of samples taken from winter flounder.[31]

A preliminary check on New York fishery landings indicates some adverse effects. In 1969 compared with the previous year there was a 32% reduction in quantity and 2% decline in the value of New York Landings.[32] It would be completely premature to attribute the decline in fish catch exclusively to pollution. Soviet fish factory ships may be responsible in great part for the decline.

Petrochemicals effect marine organisms by their inherent toxicity and their ability to contentrate pesticides and toxic metals. However the concentration of pesticides in dredge spoil by oil may have some beneficial use since it tends to scavange pesticides from the upper part of the water column where they can seriously interfere with photosynthesis.

Toxic metals show no beneficial effects. Copper is present in great concentrations in the New York Bight. Laboratory experiments have shown that Cu concentrations of 0.1 mg/1 part sea water kill soft clams in ten to twelve days. Cu concentration of 0.1 mg/1 inhibits photosynthesis in kelp 70% in nine days. Sublethal doses of copper reduced growth rates and reproduction in fishes.[33]

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[31] Woods Hole Study (1971).

[32] See Table 2 and 25 Woods Hole Study (1971).

[33] Woods Hole Study (1971).

The effects of incineration ash residue on selected marine species have been studied. Residue concentrations up to 5% by weight gave a significant mortality in winter flounder. First and second stage lobster larvae and the common prawn were easily able to withstand residue concentrations of 1%. Of all species tested sea scallops showed the highest sensitivity.[34] The toxicity of these metals may do considerable damage by reducing the normal rate of waste decomposition by inhibiting microbiological processes.

Clams harvested in the Bight for sale contain coliform bacteria levels 50 to 80 times greater than FDA standards. Even in the marginally polluted areas five miles from the center of the disposal area, more than 80% of the surf clams examined had excessive coliform levels.[35]

A summary of the effects of sewer sludge (SS) and dredge spoil (DS) disposal on the New York Bight ecosystem in the dump areas shows:

Environment

1. Greatly reduced levels of dissolved oxygen in the bottom waters (SS & DS)
2. Abnormally high concentrations of heavy metals (lead, chromium, and coppoer) in the sediments (SS & DS)
3. Drastic changes in the physical properties of the sediments (e.g. particle size and cohesiveness SS & DS)
4. Unusually high percentage of hydrophotic materials in the sediments (DS)
5. Greatly increased concentration of organic matter in the sediments (SS & DS)

Biota

1. Complete absense of benthic macrofauna in center

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[34]Sandy Hook Study (1969).

[35]Ibid.

of areas (SS & DS)
2. Characteristic communities of resi tant benthic macrofauna in the marginally polluted areas.

The material presented by the previous pages does not offer conclusive proof as to measurable harm created by ocean dumping in the Bight. The final Sandy Hook Laboratory report was scheduled for release in 1971 after review by the Scientific Advisory Committee of the Smithsonian Institution. Warning signs as to environmental damage are clearly evident from these preliminary studies. At the time of this writing the final Sandy Hook Report has not been published.

The following chapter will examine legal aspects of the problem, past, present, and pending legislation, and other state and federal remedies.

APPENDIX A

Source: Woods Hole Study (1971).

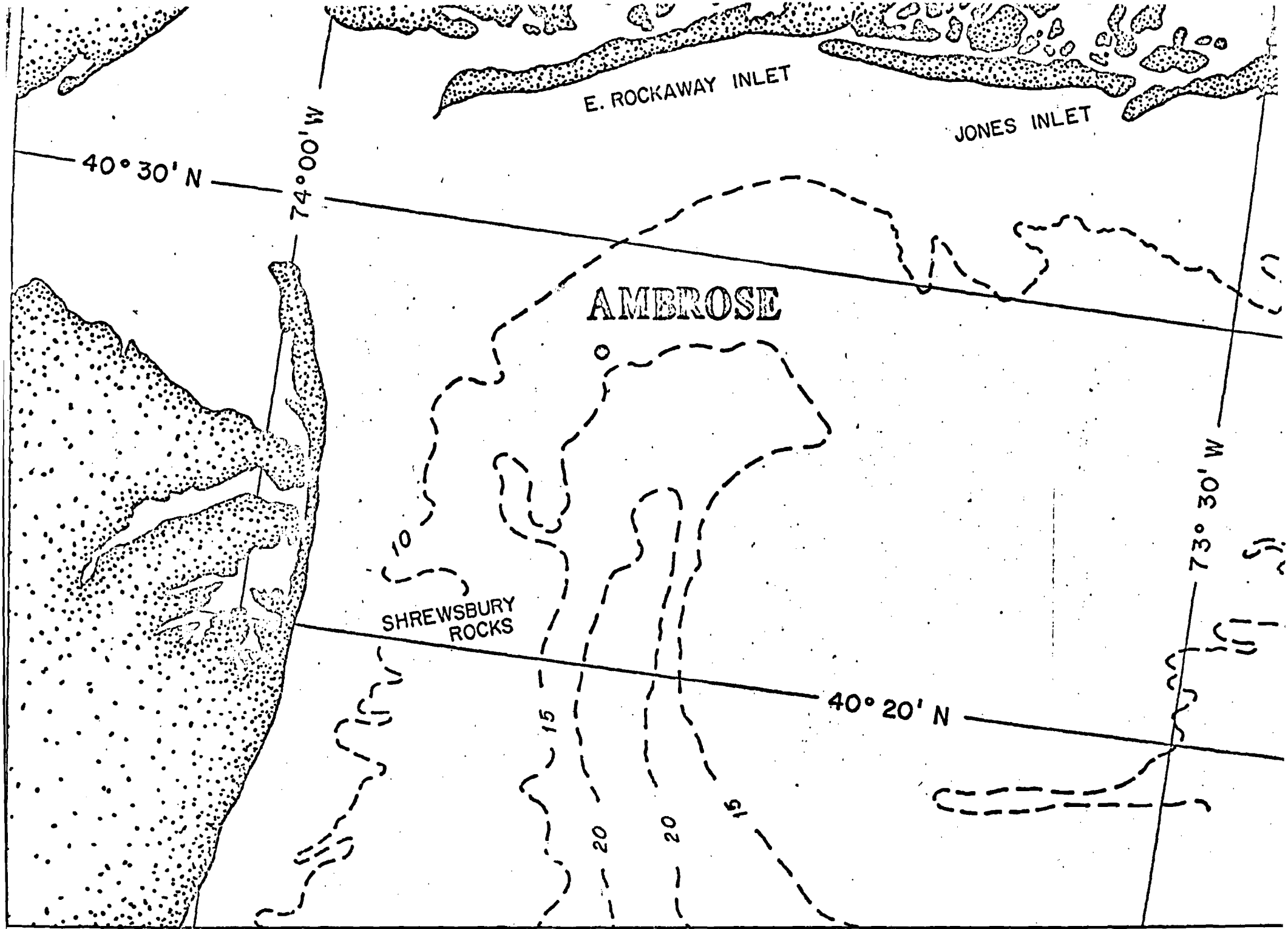


Figure 3. Bottom Topography of the New York Bight

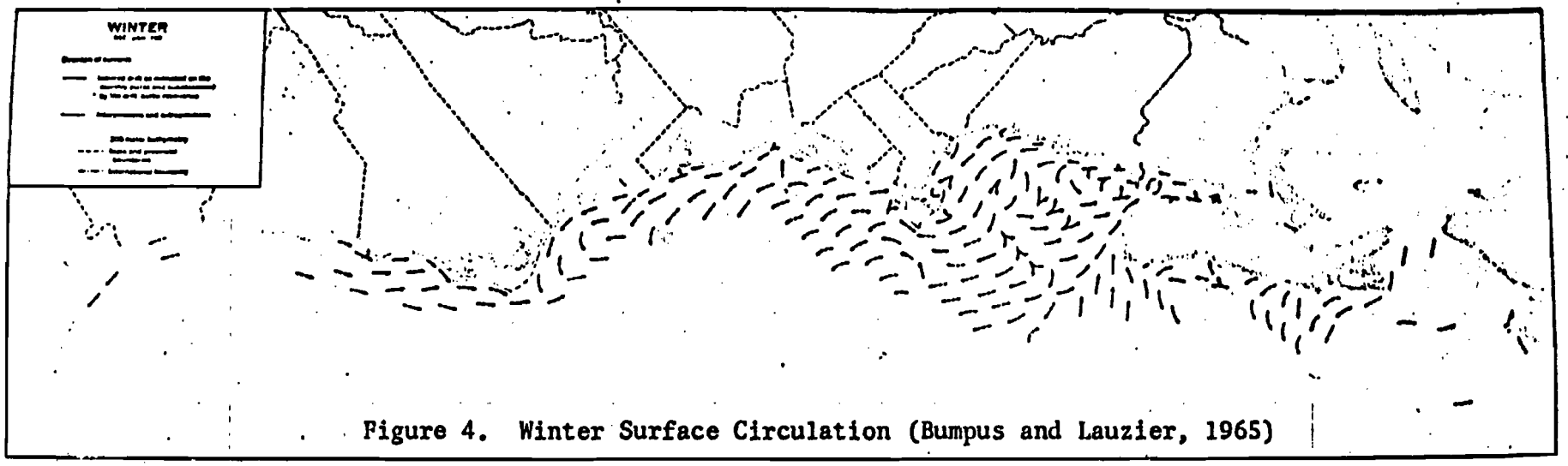


Figure 4. Winter Surface Circulation (Bumpus and Lauzier, 1965)

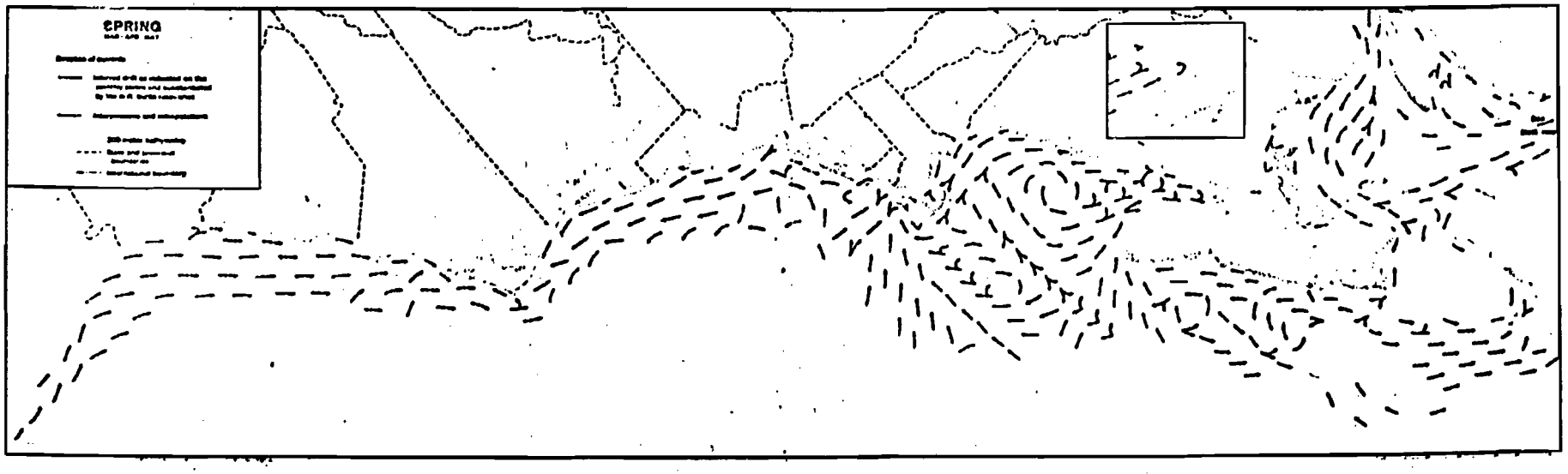


Figure 5. Spring Surface Circulation (Bumpus and Lauzier, 1965)

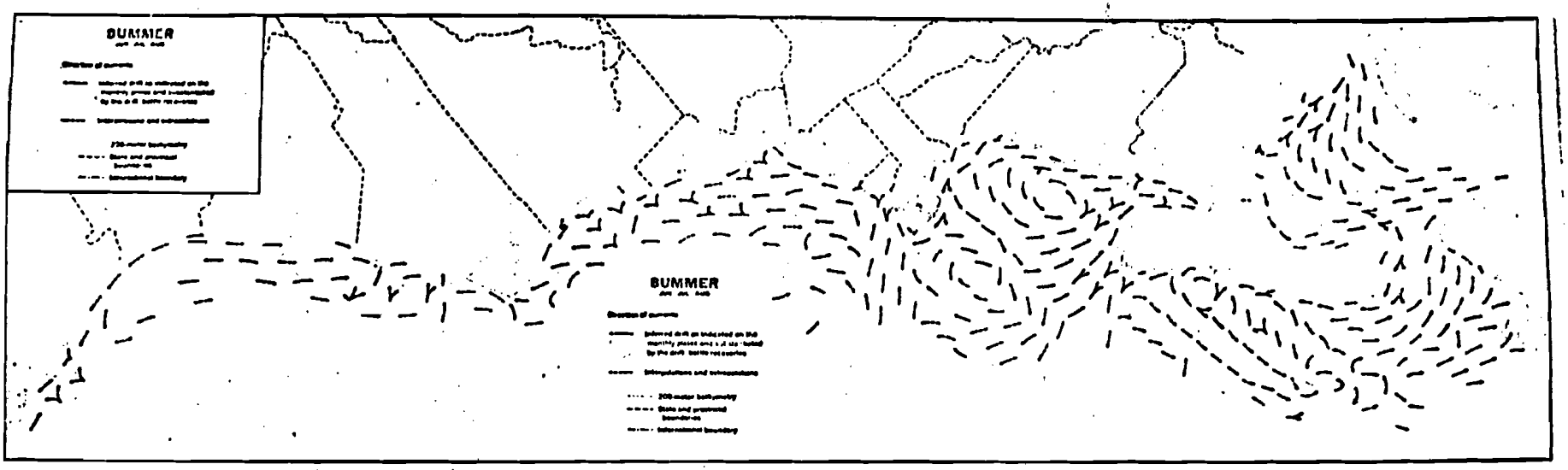


Figure 6. Summer Surface Circulation (Bumpus and Lauzier, 1965)

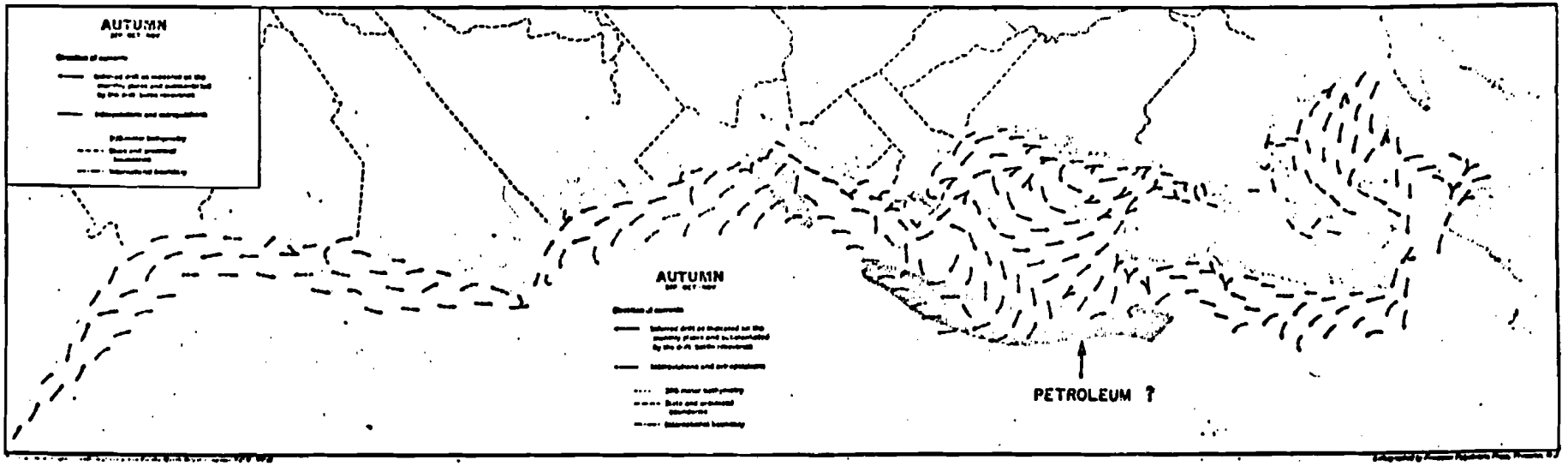


Figure 7. Autumn Surface Circulation (Bumpus and Lauzier, 1965)

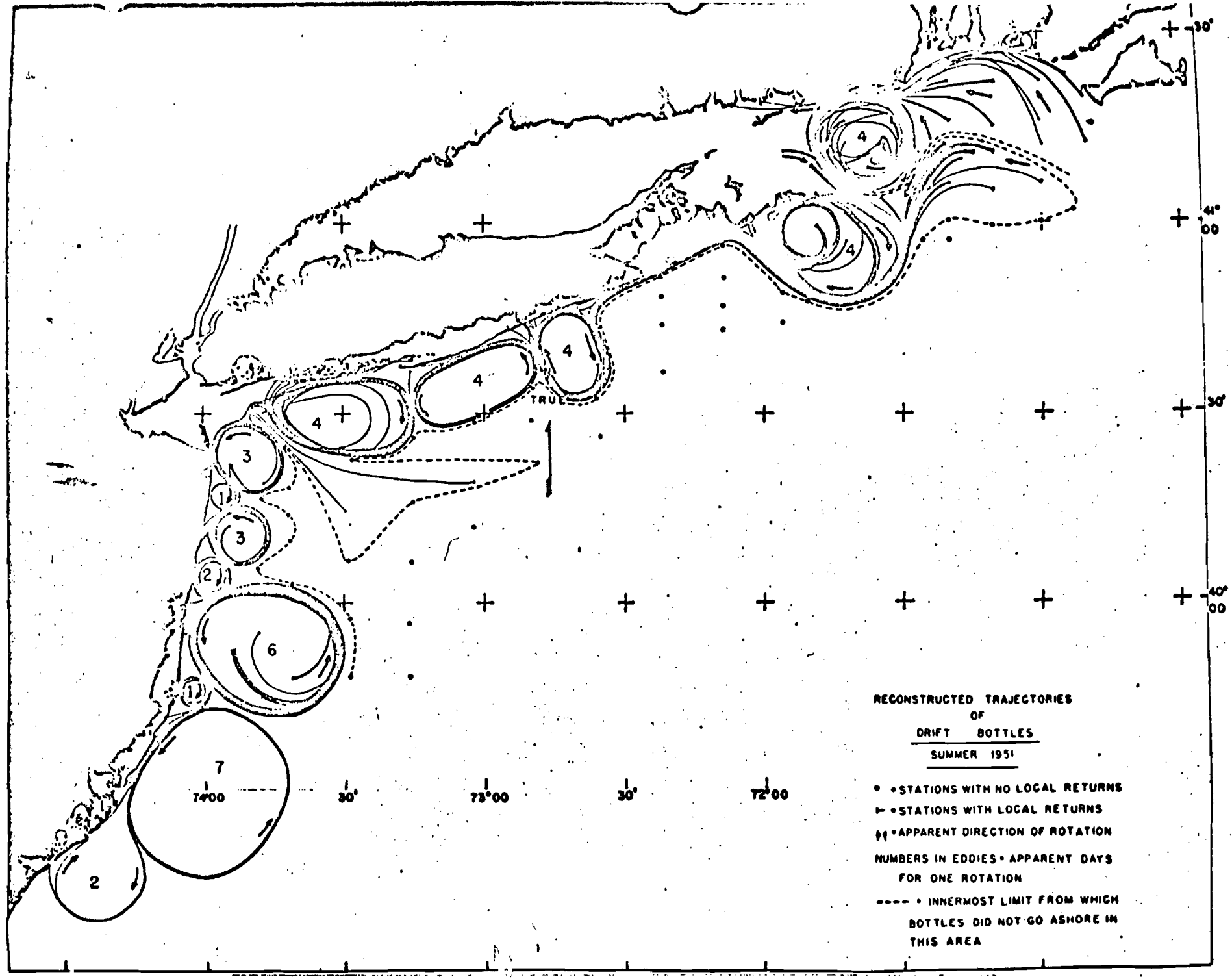


Figure 8. Reconstructed Trajectories of Drift Bottles - Summer, 1951 (Powers, 1953)

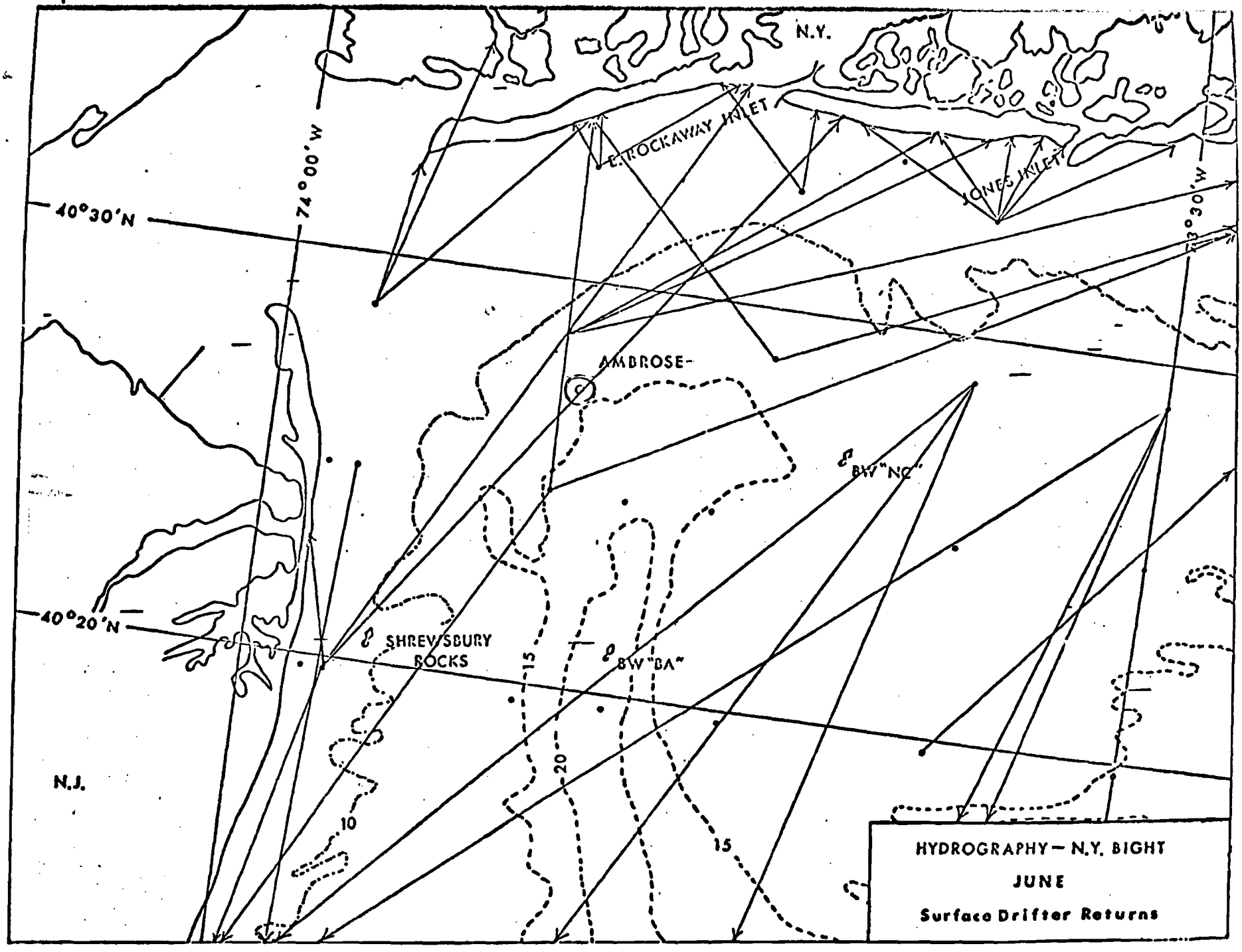


Figure 9. Surface Drifter Returns, June (Pearce, 1969)

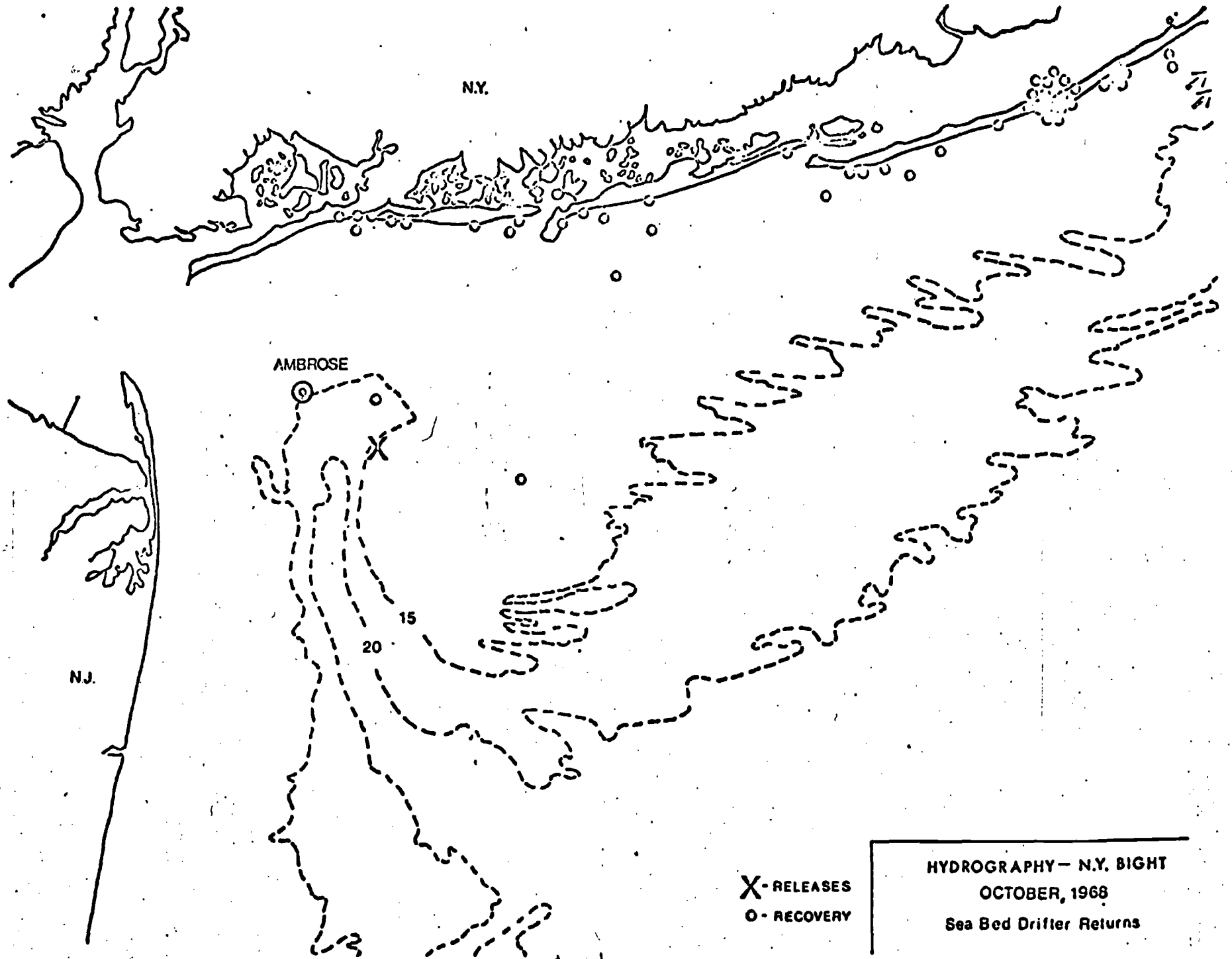


Figure 10. Sea Bed Drifter Returns, October (Pearce, 1969)

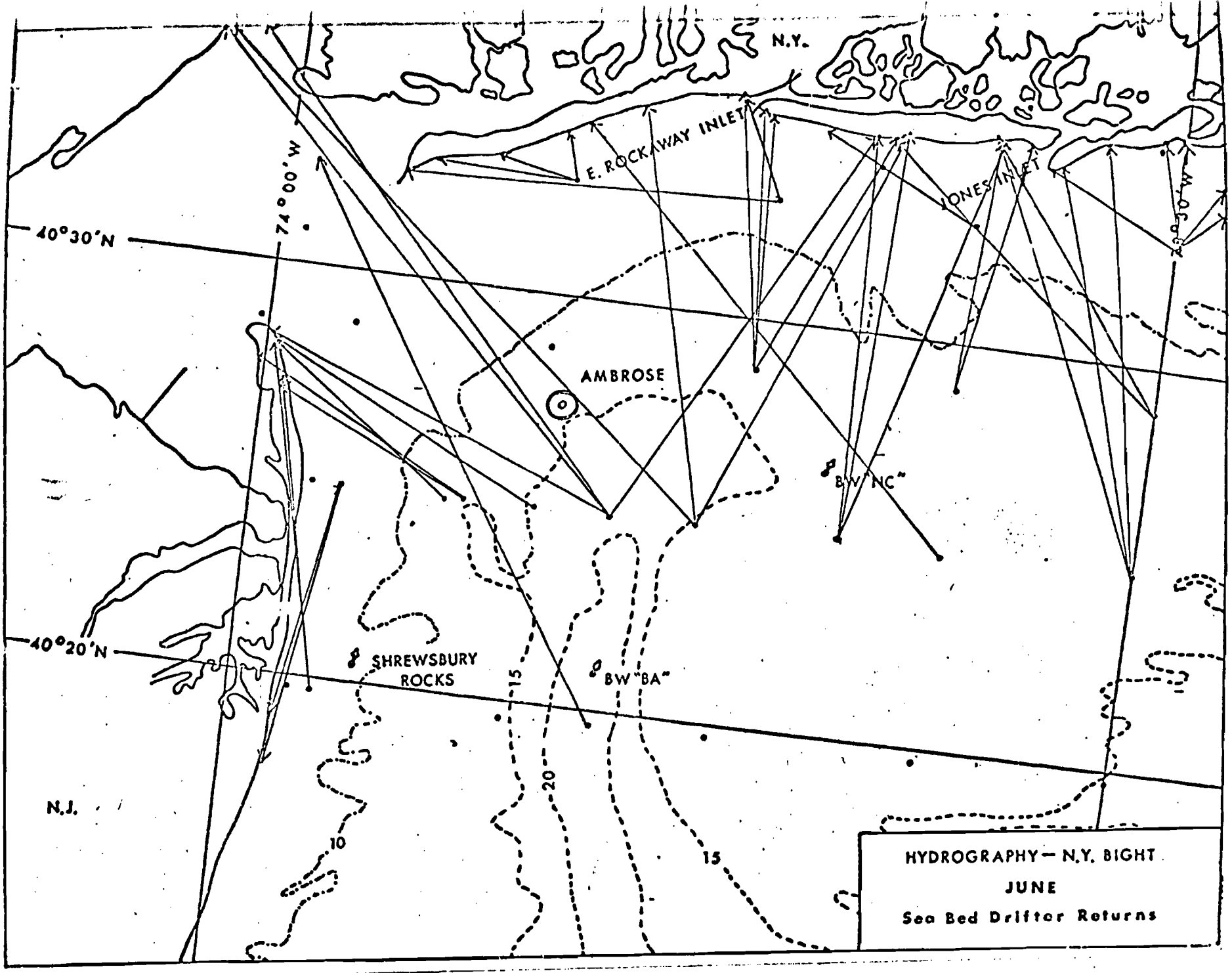


Figure 11. HYDROGRAPHY - N. Y. BIGHT, JUNE Sea Bed Drifter Returns (Pearce, 1969)

TABLE 2

SPECIES	TOTAL			
	1969		1968	
FISH	POUNDS	VALUE	POUNDS	VALUE
ANGLERFISH	25,400	$1,212	22,025	$909
BLUEFISH	1,119,432	131,950	576,287	116,767
BONITO	18,465	1,108	25,962	1,582
BUTTERFISH	763,376	110,132	974,018	150,574
COD	448,996	61,785	364,344	46,131
EELS: COMMON	168,188	39,306	140,428	31,677
CONGER	200	24	100	4
FLOUNDERS:				
GRAY SOLE	15,502	1,640	15,214	1,545
LEMON SOLE	700	73	4,900	720
BLACKBACK	1,616,927	97,477	1,825,533	106,507
YELLOWTAIL	4,698,659	376,251	5,614,991	413,083
FLUKE	573,420	200,261	1,215,742	396,534
HADDOCK	20,050	2,712	14,445	1,739
HAKE: RED (LING)	253,109	14,873	349,055	20,518
WHITE	4,850	485	2,600	260
HERRING, SEA	132,870	8,652	96,924	8,874
KING WHITING (KINGFISH)	12,483	2,157	20,018	2,343
MACKEREL	491,771	32,519	810,323	50,116
MENHADEN	9,762,457	229,940	17,784,755	193,784
POLLOCK	2,980	197	6,600	386
SCUP OR PORGY	1,637,374	352,490	2,800,635	629,734
SEA BASS	69,098	23,498	66,869	23,808
SEA ROBIN	65,220	2,975	56,025	2,637
SEA TROUT (WEAKFISH)	116,349	19,736	63,370	10,225
SHAD	13,680	1,893	12,636	2,062
SHARKS:				
GRAYFISH (DOGFISH)	144,420	12,643	136,214	9,574
UNCLASSIFIED	1,117	83	5,300	380
SKATES (RAJAFISH)	8,211	431	10,237	511
SPEARING (SILVERSIDES)	67,120	11,945	123,350	20,360
STRIPED BASS	1,457,775	356,624	1,489,775	338,074
STURGEON	11,493	1,623	10,896	1,784
SWELLFISH (BLOWFISH)	260,571	13,999	224,418	16,897
SWORDFISH	2,460	910	56,448	26,828
TAUTOG (BLACKFISH)	41,825	1,943	87,145	3,486
TILEFISH	9,600	1,263	6,192	958
TUNA: BLUEFIN	11,911	1,187	27,892	4,116
LITTLE (ALBACORE)	14,669	881	11,794	819
WHITE BAIT	5,400	810	-	-
WHITING	2,091,689	134,221	3,311,464	199,784
WHITE PERCH	64,618	13,165	86,100	17,899
UNCLASSIFIED:				
FOR FOOD	227,538	22,755	259,219	25,920
FOR BAIT, REDUCTION, AND ANIMAL FOOD	-	-	6,184,960	54,118
TOTAL FISH	26,451,963	2,287,829	44,895,203	2,934,017
SHELLFISH				
LOBSTERS, NORTHERN	1,416,225	1,456,141	1,166,876	1,181,679
CLAM MEATS: HARD	7,516,260	8,178,905	6,986,028	7,260,040
SOFT	190,672	76,176	201,552	81,879
SURF	3,431,416	389,614	3,007,895	295,249
CONCH MEATS	38,025	7,191	48,405	10,399
MUSSEL MEATS, SEA	209,850	63,012	206,590	63,348
OYSTER MEATS	212,956	473,057	175,405	377,717
SCALLOP MEATS, EDIBLE:				
BAY	248,635	376,541	201,484	350,174
SEA	596,946	642,244	1,480,253	1,665,432
SQUID	529,506	54,883	973,270	68,426
TOTAL SHELLFISH	14,390,571	11,717,764	14,447,861	11,362,343
GRAND TOTAL	40,842,534	14,005,593	59,343,064	14,296,360

New York Landings for Specified Period, 1969 and 1968

Anon, New York Landings, Dec. 1969

TABLE 25
New York Landings by Area, December, 1968
(Preliminary)

Species	Area 1 Ocean, New Jersey Boundary To East Rockaway	Area 2 Ocean, East Rockaway Inlet To Jones Inlet	Area 3 Ocean, Jones Inlet To Moriches Inlet	Area 4 Great South Bay	Area 5 Ocean, Moriches Inlet To Shinnecock Inlet
Fish	Pounds	Pounds	Pounds	Pounds	Pounds
ıglerfish	-	-	-	-	1,400
ıtterfish	495	-	1,174	-	-
)d	2,625	15,900	5,670	-	8,000
ɛls, Common	3,000	-	-	2,400	-
Flounders, Blackback	6,887	2,900	3,400	400	6,000
Yellowtail	5,250	16,500	53,725	-	44,700
Fluke	-	-	-	-	1,600
Hake, Red (Ling)	19,575	47,825	2,485	-	2,975
Herring, Sea	425	-	-	-	-
Mackerel	1,800	1,400	-	-	-
Scup or Porgy	-	-	-	-	1,475
Sharks, Grayfish (Dogfish)	600	500	-	-	1,900
Skates (Rajafish)	-	-	564	-	-
Striped Bass	-	-	-	-	[illegible]00
Whiting	238,040	98,625	12,286	-	24,600
White Perch	-	-	-	-	-
Unclassified, for food	7,250	2,450	1,220	-	3,500
Total Fish	285,947	186,100	80,524	2,800	96,650
Shellfish					
Lobsters, Northern	2,000	2,000	-	-	-
Clam Meats: Hard	-	-	-	311,952	-
Soft	-	-	-	256	-
Surf	18,989	38,250	219,351	-	-
Oyster Meats	-	-	-	1,425	-
Scallop Meats, Edible, Bay	-	-	-	6,000	-
Squid	-	-	-	-	4,000
Total Shellfish	20,989	40,250	219,351	319,633	4,000
Grand Total	306,936	226,350	299,875	322,433	100,650

TABLE 3

Ocean Dumping: Types and Amounts, 1968

(In tons)

	Atlantic	Gulf	Pacific	Total	
Dredge Spoils	15,808,000	15,300,000	7,320,000	38,428,000	80
Industrial Wastes	3,013,200	696,000	981,300	4,690,500	10
Sewage Sludge	4,477,000	0	0	4,477,000	9
Construction and Demolition Debris	574,000	0	0	574,000	<1
Solid Waste	0	0	26,000	26,000	<1
Explosives	15,200	0	0	15,200	<1
Total	23,887,400	15,966,000	8,327,300	48,210,700	100

(From Train, Cahn, and MacDonald, 1970)

TABLE 4

Estimated Polluted Dredge Spoils

Coastal Area	Total Spoils (in tons)	Estimated % of total polluted spoils*	Total polluted spoils (in tons)
Atlantic Coast	15,808,000	45	7,120,000
Gulf Coast	15,300,000	31	4,740,000
Pacific Coast	7,320,000	19	1,390,000
Total	38,428,000	34	13,250,000

* Estimates of polluted dredge spoils consider chlorine demand; BOD; COD; volatile solids; oil and grease; concentrations of phosphorus nitrogen, and iron; silica content; and color and odor of the spoils.

(From Train, Cahn, and MacDonald, 1970)

TABLE 11

Ocean Dumping: Historical Trends, 1949-1968[1] (66)

astal Area	1949-1953		1954-1958		1959-1963		1964-1968	
	Total	Avg./Yr.	Total	Avg./Yr.	Total	Avg./Yr.	Total	Avg./Yr.
lantic Coast	8,000,000	1,600,000	[2]16,000,000	3,200,000	27,270,000	5,454,000	31,100,000	6,200,000
lf Coast	[3]40,000	8,000	283,000	56,000	860,000	172,000	2,600,000	520,000
ific Coast	487,000	97,000	850,000	170,000	940,000	188,000	3,410,000	682,000
Total	8,527,000	1,705,000	17,133,000	3,426,000	29,070,000	5,814,000	37,110,000	7,422,000

1 Figures do not include dredge spoils, radioactive wastes, and military explosives.

2 Estimated by fitting a linear trend line between data for preceding period and data for succeeding period.

3 Disposal operations in the Gulf of Mexico began in 1952.

(Train, Cahn and MacDonald, 1970)

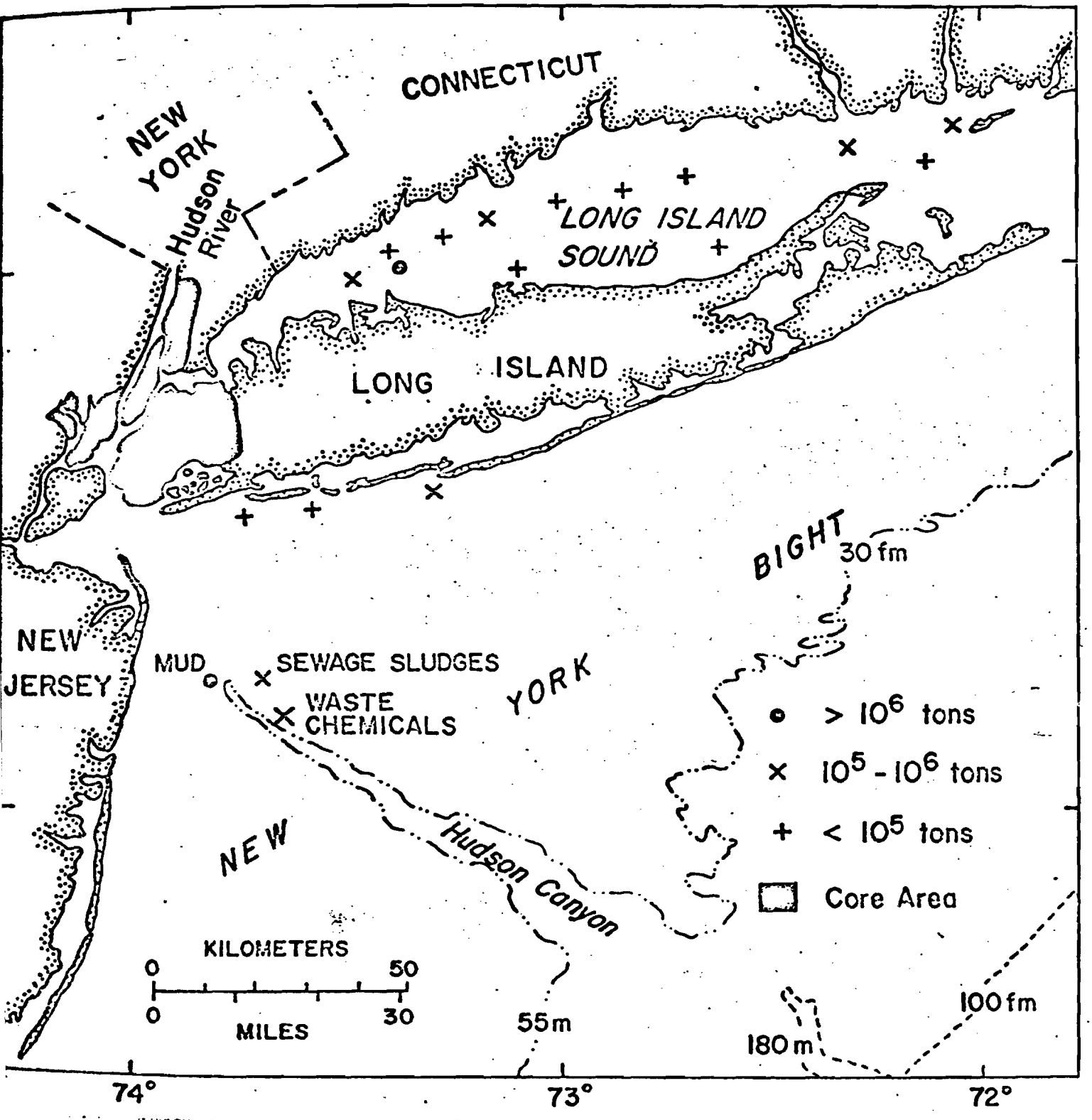


Figure 2. Location of disposal sites used for wastes coming from the New York Metropolitan Region (Gross 1970b)

APPENDIX B

Source: HR 15915.

APPENDIX B

Source: Stony Brook Study (1971).

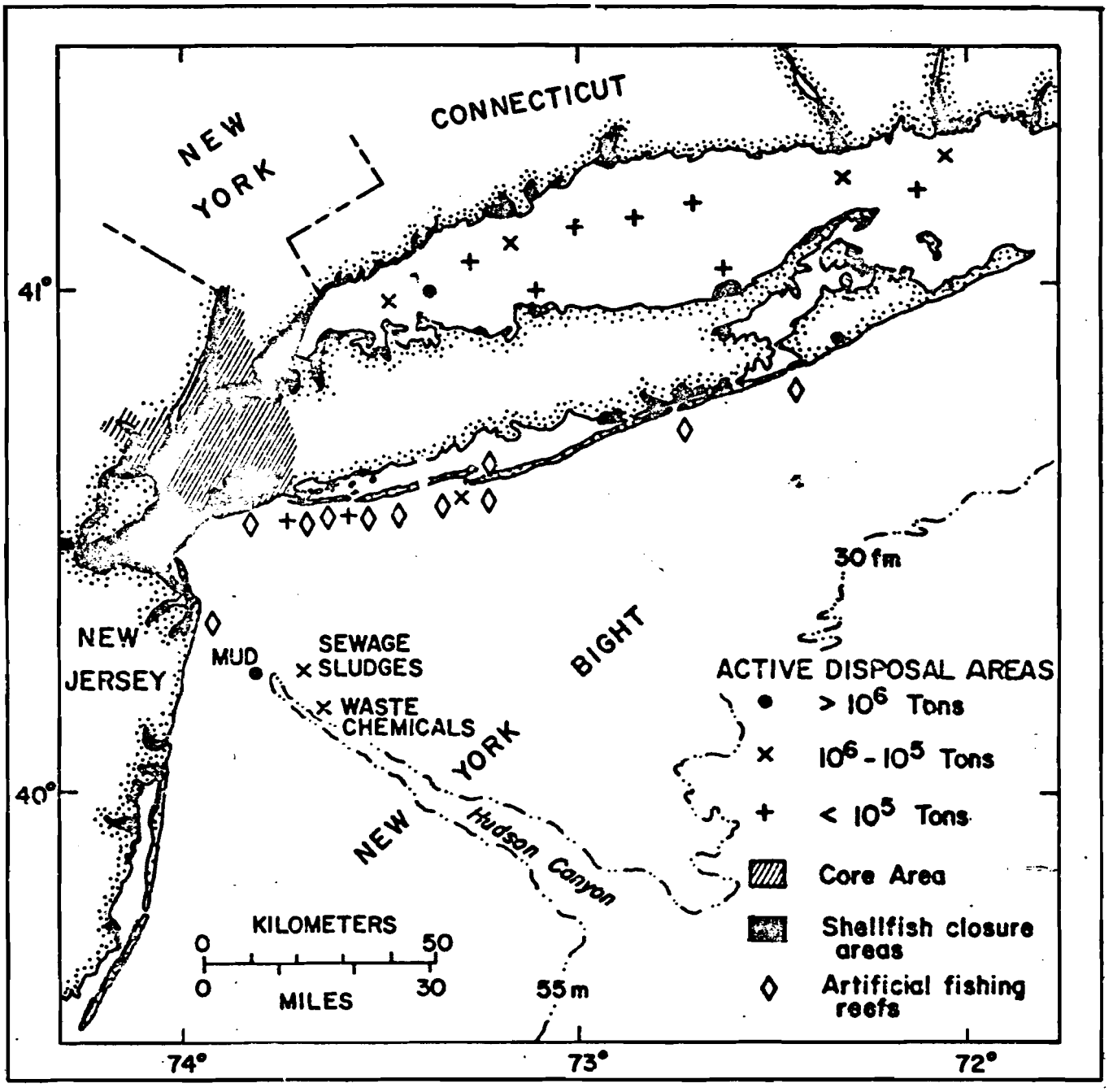


Fig. 1-1. The New York Metropolitan area included in this study and the waste disposal sites actively used in the region. The most densely populated portion of the region (core area) is indicated. Major waste disposal sites in New York Bight, Long Island Sound, and along the south shore of Long Island are shown. Artificial fishing reefs in the area have also been built of various types of wastes, including tires, hulls of barges and ships. Areas closed to the commercial production of shellfish are indicated from data supplied by appropriate agencies in New Jersey, New York and Connecticut.

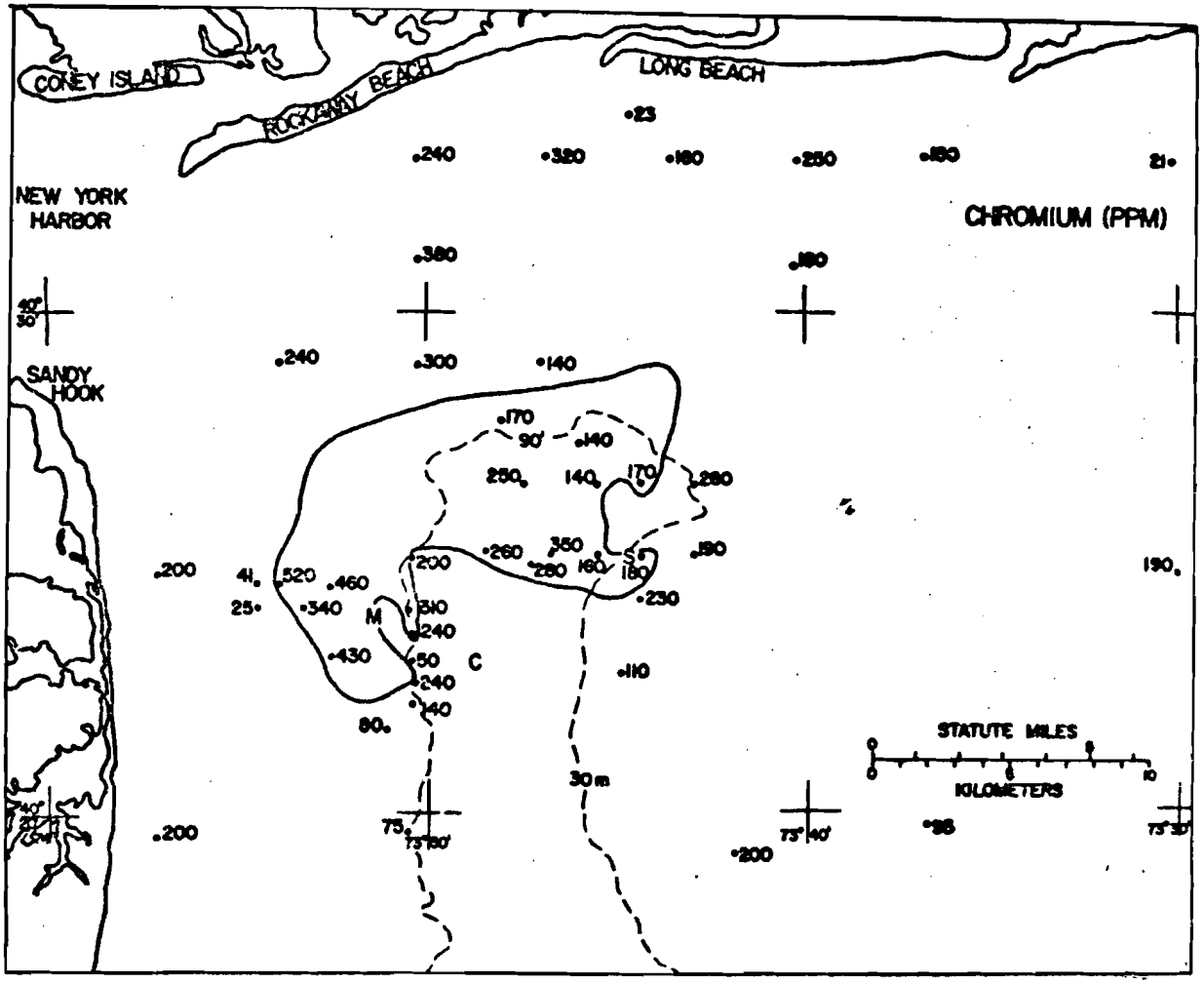
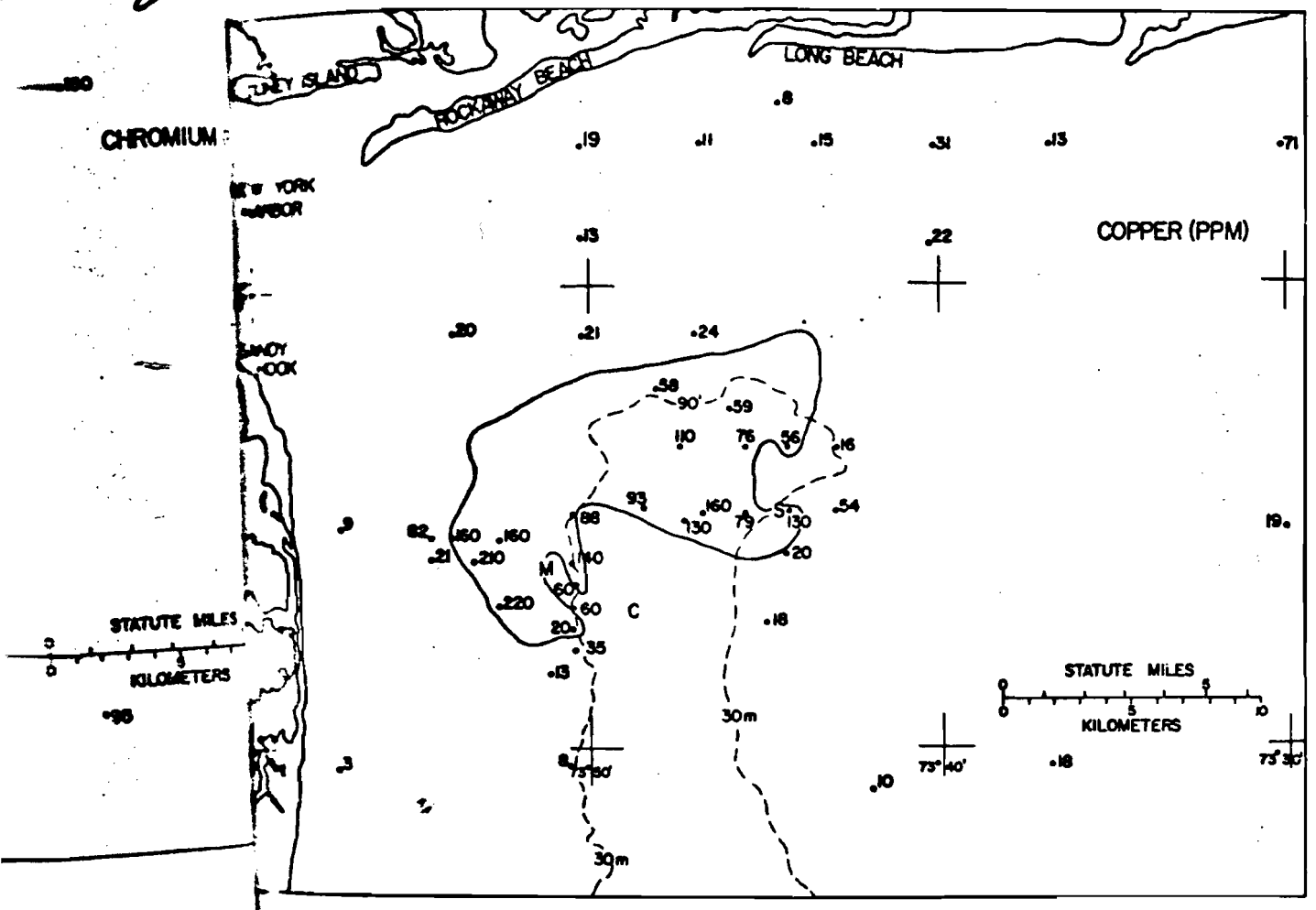


Fig. 3-2. Distribution of total chromium concentrations in surficial sediment waste deposits in New York Bight. Approximate location of disposal areas are indicated as follows: S-sewage sludge, M-"mud" disposal area, C-"cellar dirt" disposal site. The heavy contour outlines the area containing deposits with more than one percent total carbon.



...s in surficial ... Distribution of total copper concentrations in surficial sediment and ... of disposal ...its in the New York Bight. Approximate location of disposal areas and ...l area. C-"cel...e of contour indicated in Fig. 3-2.
...taining deposi...

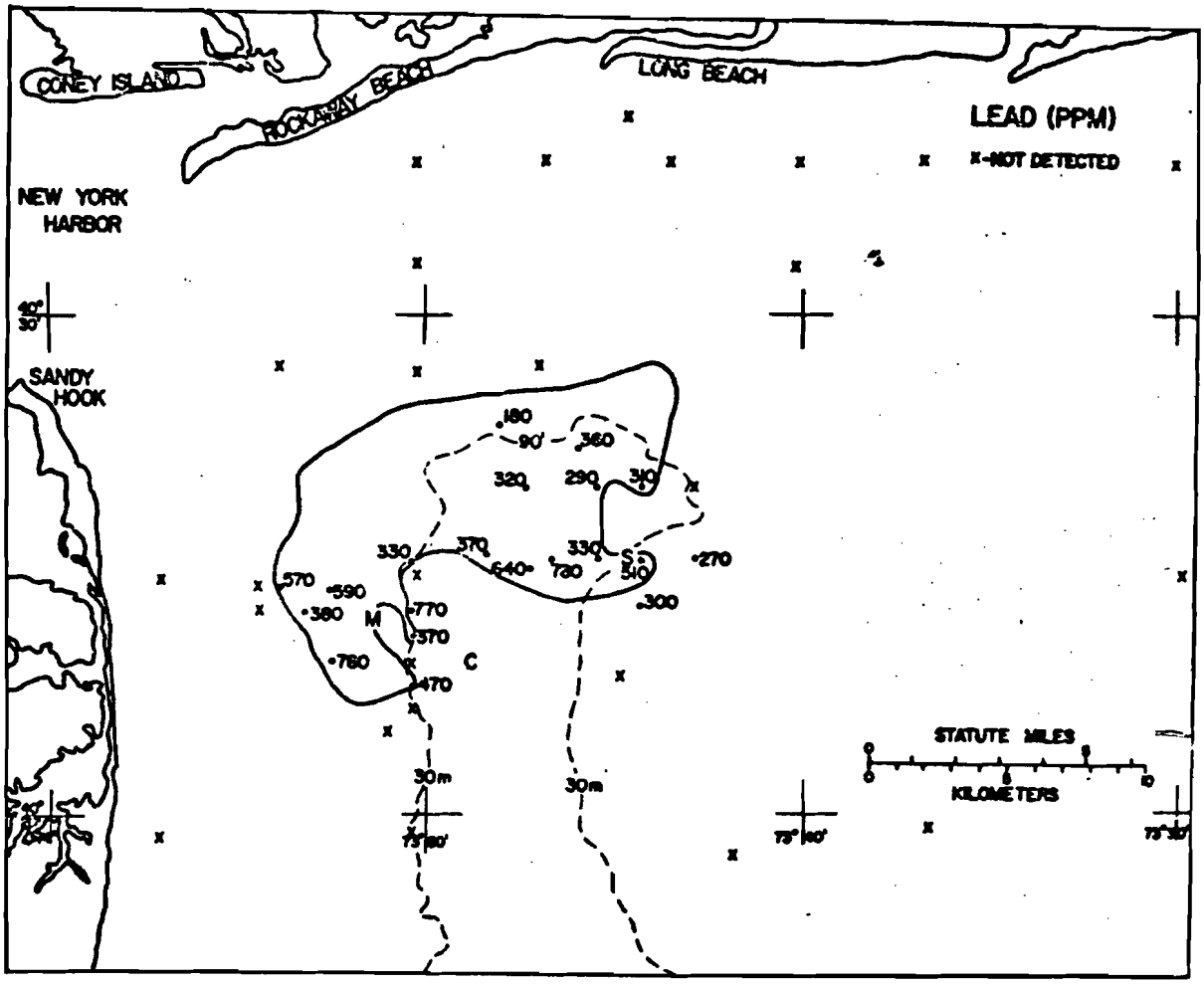


Fig. 3-4. Distribution of total lead concentrations in surficial sediment and waste deposits in the New York Bight. Approximate location of disposal areas and significance of contour indicated in Fig. 3-2.

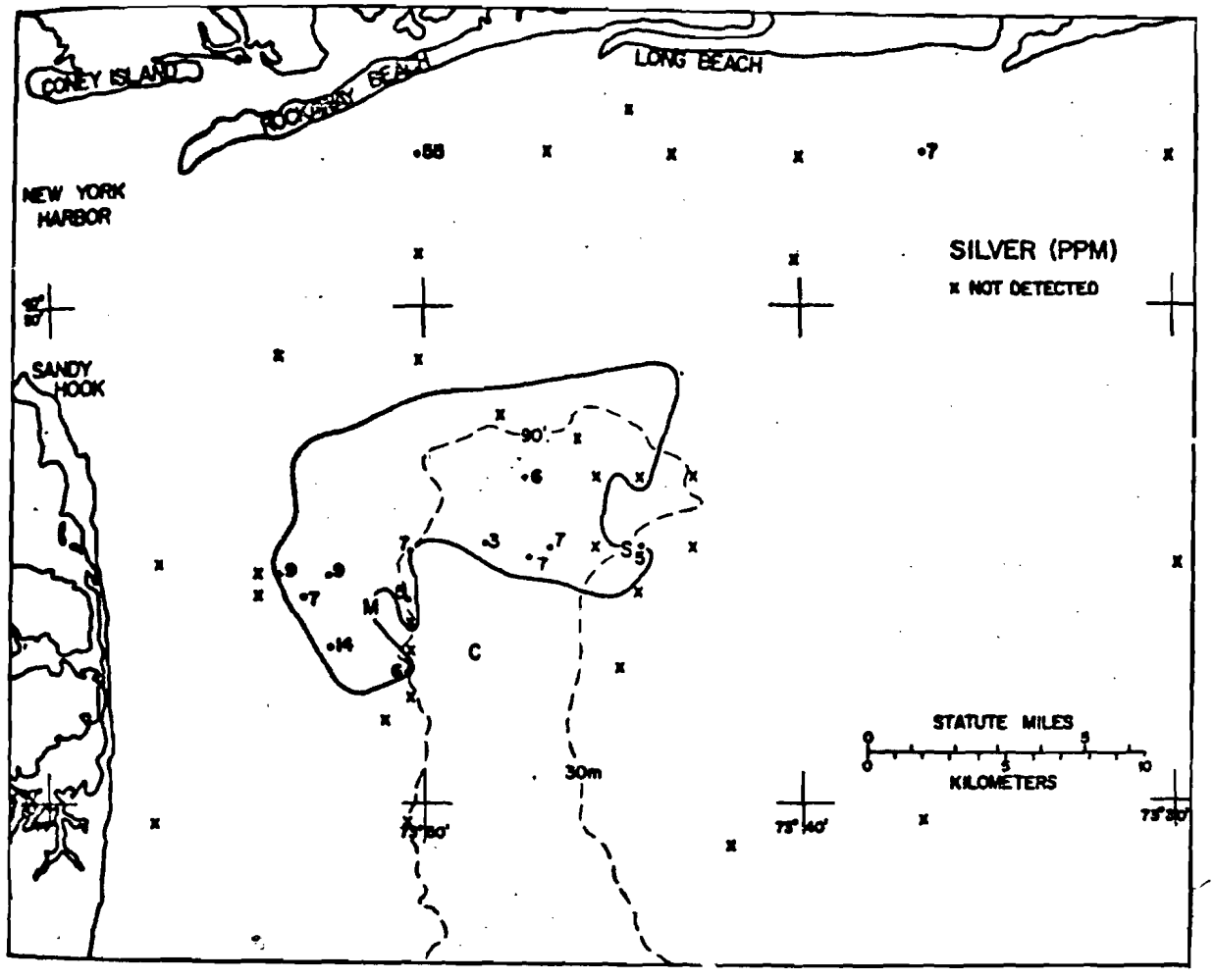
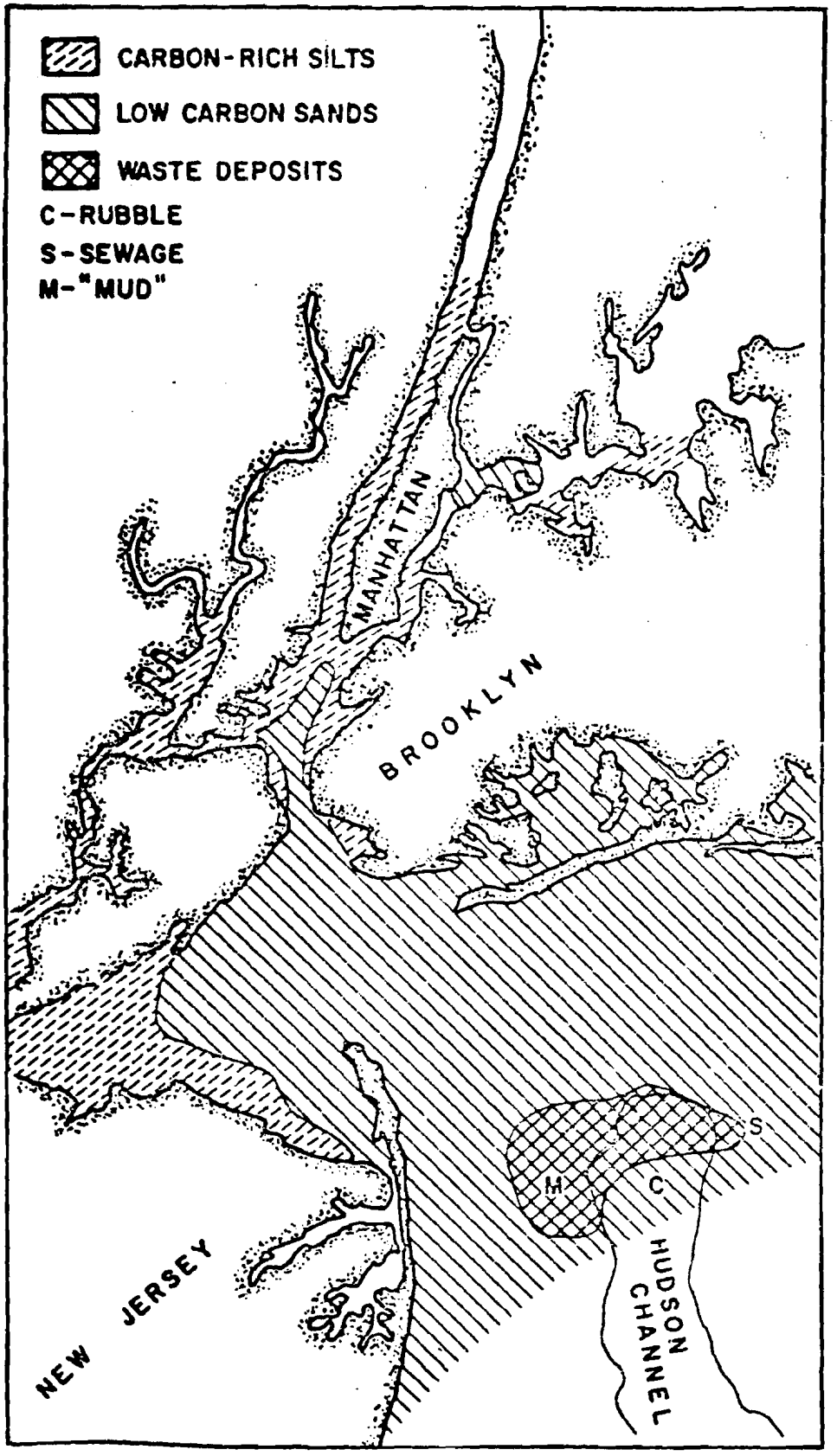


Fig. 3-5. Distribution of total silver concentrations in surficial sediment and waste deposits in the New York Bight. Approximate location of disposal sites and significance of contour discussed in Fig. 3-2.



2-6. Distribution of carbon-rich deposits in New York Harbor and carbon-rich deposits on the continental shelf near the harbor.

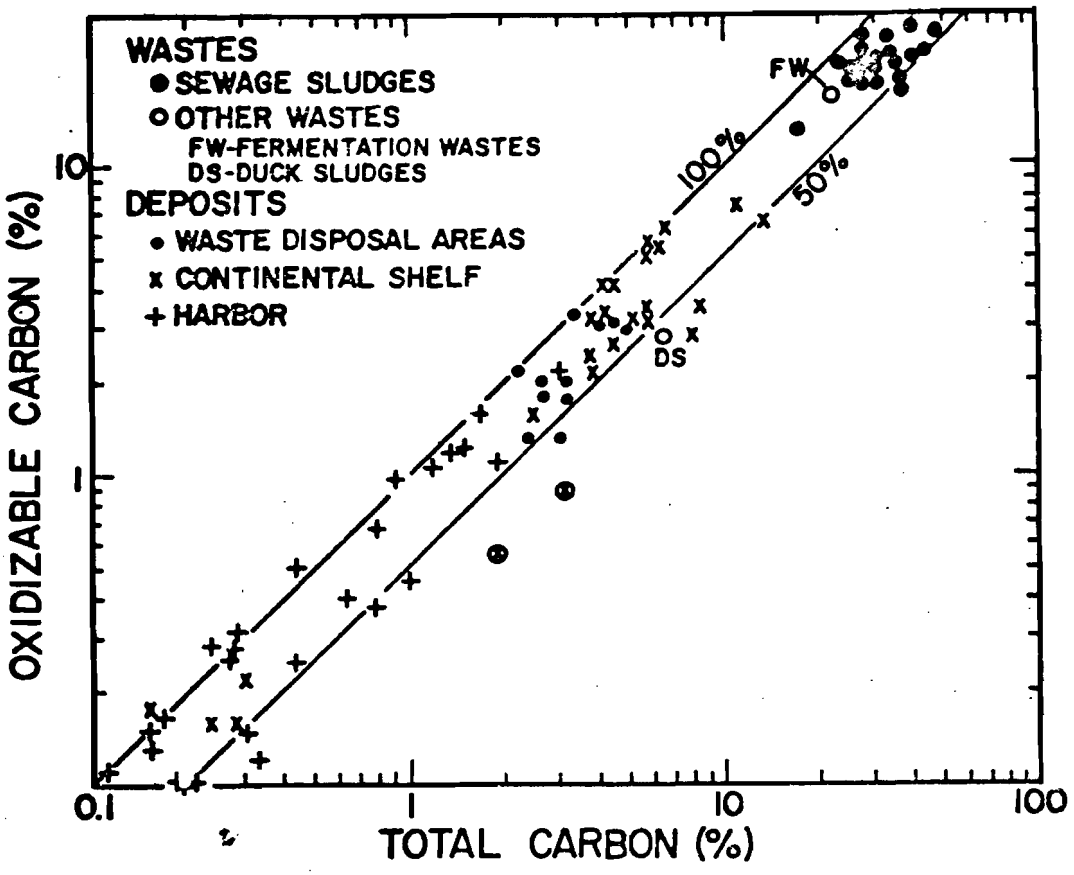


Fig. 2-5. Comparison of total-carbon and oxidizable-carbon concentrations in samples from New York Harbor and New York Bight. The two diagonal lines indicate the relationship expected if 100 percent or 50 percent of the total carbon content was oxidizable by the analytical technique used in this study.

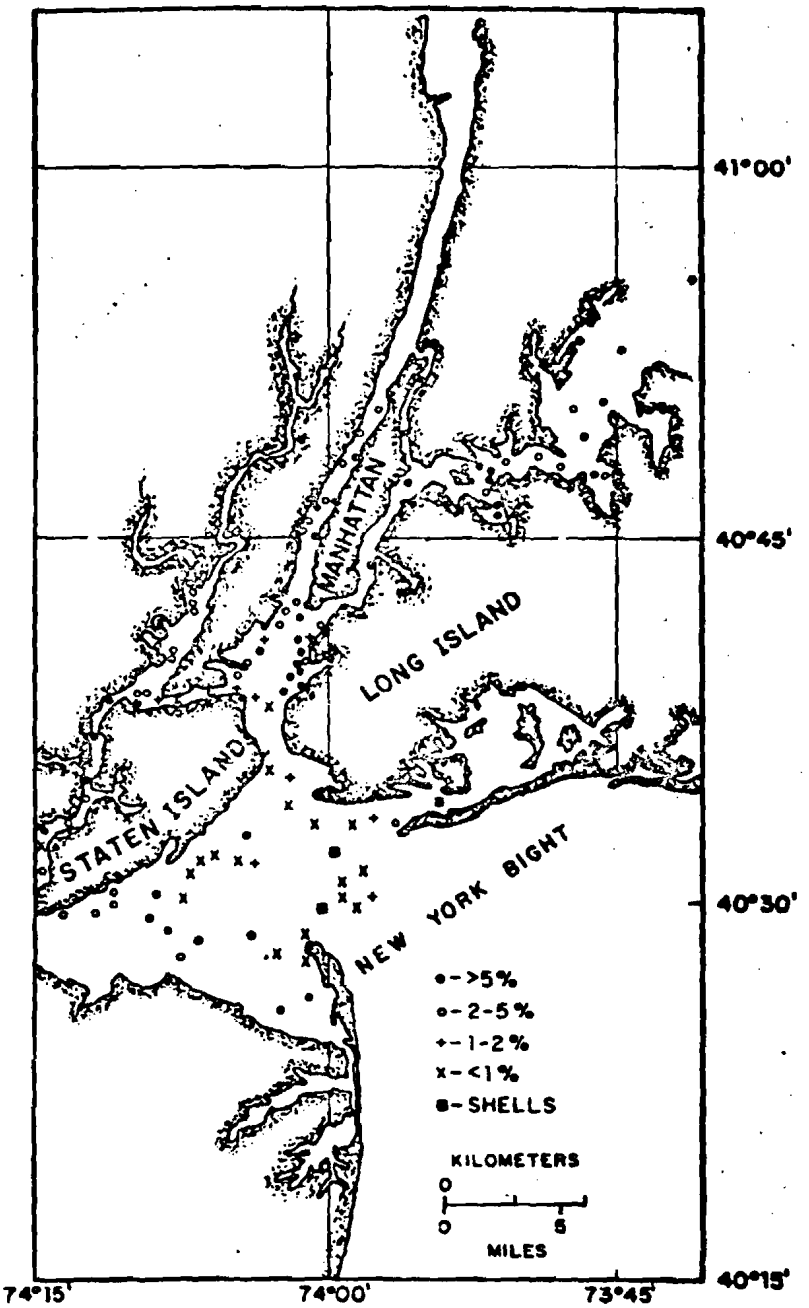


Fig. 2-4. Distribution of total carbon in surficial deposits in New York Ha
and adjacent waters.

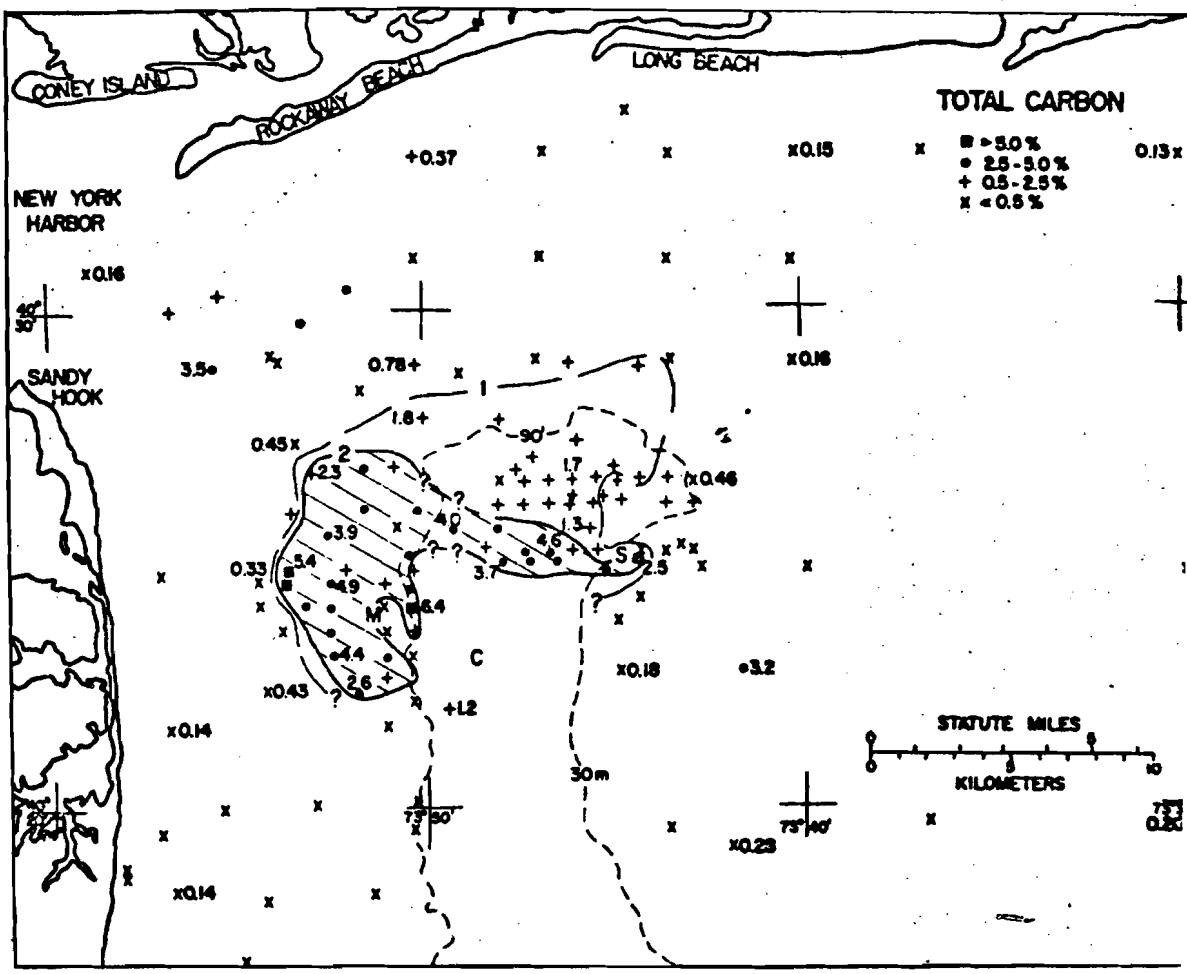


Fig. 2-3. Total carbon concentrations in deposits from New York Bigh

APPENDIX C

Source: Sandy Hook Study (1969).

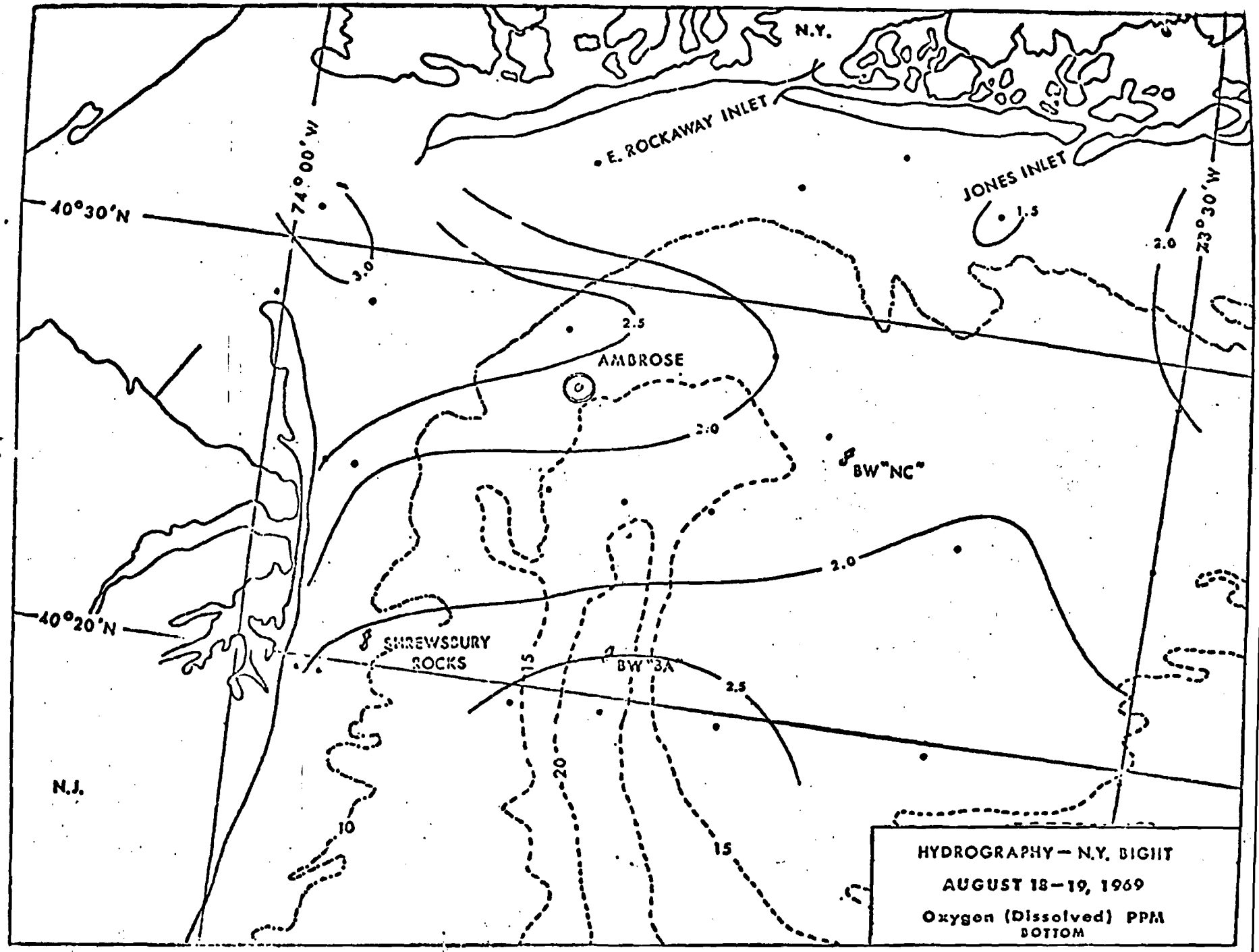


Figure 27. Oxygen (Dissolved) PPM Bottom, August, 1969. (Pearce, 1969)

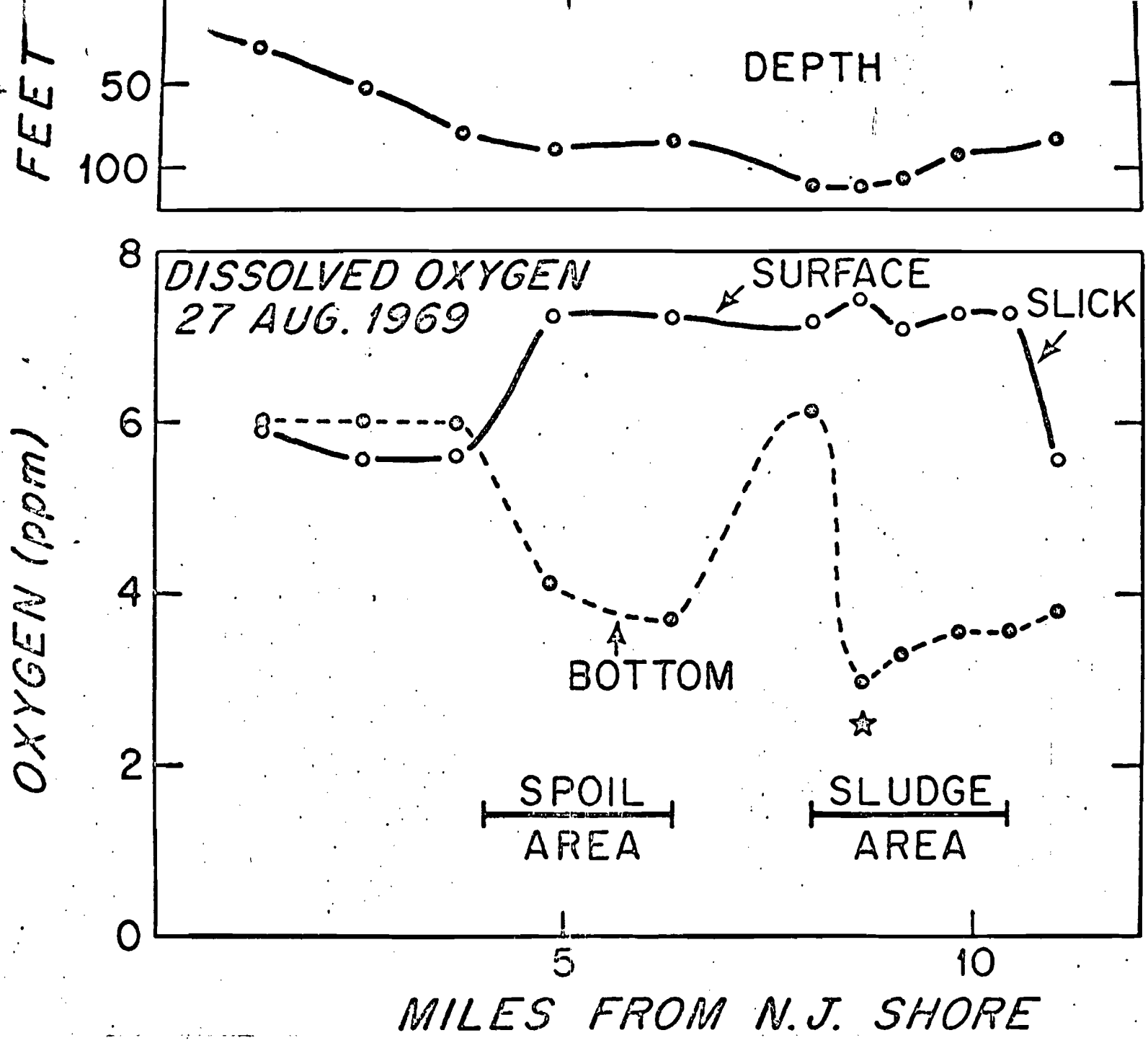


Figure 28. The water depth and the oexygen content of surface water and water three feet off the bottom in a section extending seaward from the coast of New Jersey. The surface slick indicated may reflect a recent disposal. (Ketchum, 1970)

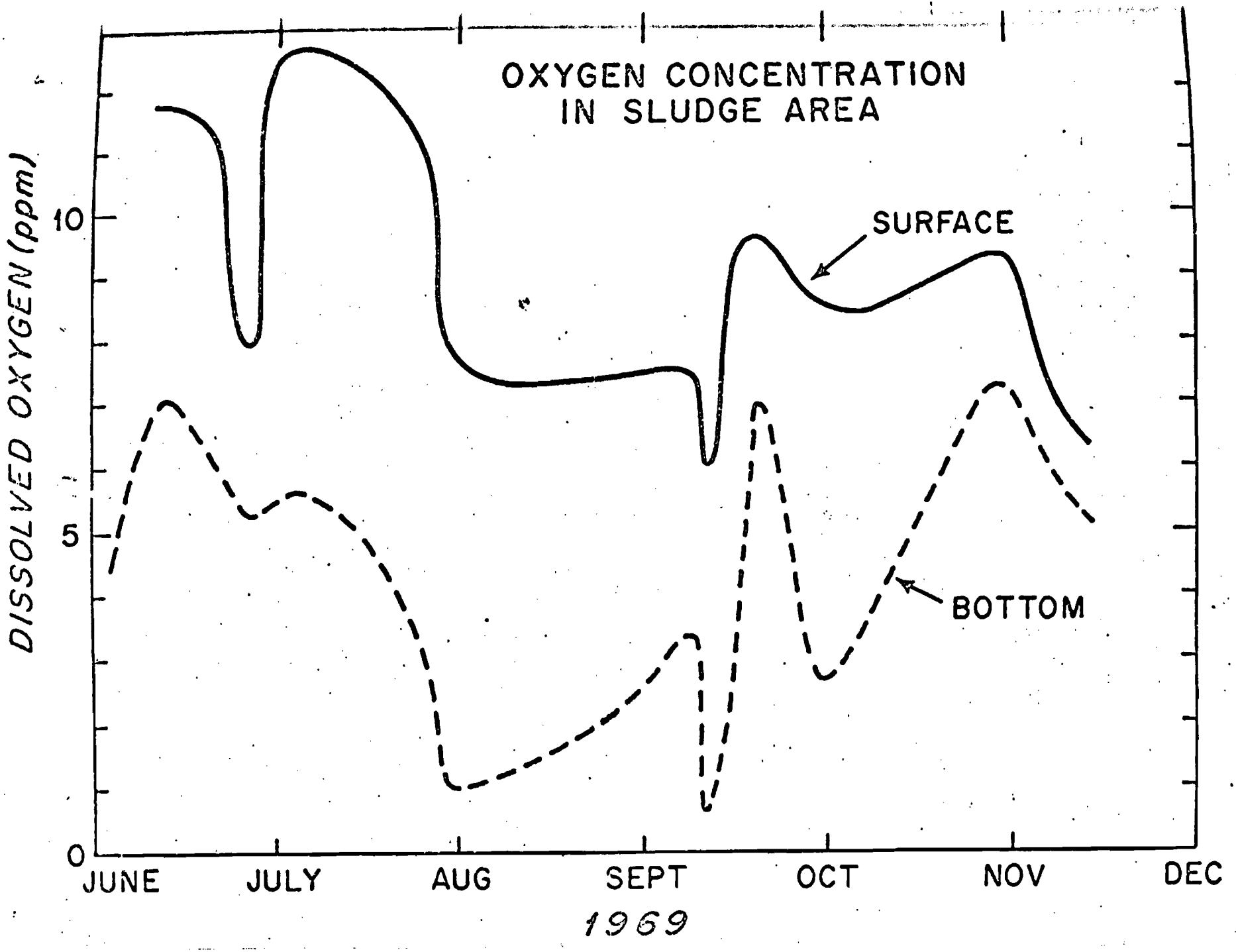


Figure 29. The variation with time of oxygen in the surface water and water three feet off the bottom at a station located in the center of the sewer sludge disposal site. The location is indicated by a star in Figure 28. (Pearce, 1970).

TABLE 24

A List of the Common Taxa Characteristic of the Cerianthus Community Surrounding the Periphery of the Sewage Sludge and Dredge Spoil Disposal Areas (Pearce, 1969)

CNIDARIA

ANTHOZOA:

Cerianthus americanus

RHYNCHOCOELA

NEMATODA

ANNELIDA:

POLYCHAETA:

AMPHARETIDAE

CIRRATULIDAE

COSSURIDAE

FLABELLIGERIDAE

GLYCERIDAE

GONIADAE

LUMBRINERIDAE

MALDANIDAE

NEPHTYIDAE:

Nephtys incisa

NEREIDAE:

Nereis pelagica

Nereis succinea

PARAONIDAE:

Aricidea jeffreysii

Paraonis fulgens

SABELLIDAE

SPIONIDAE:

Dispio uncinota

Prionospio malmgreni

Spiophanes bombyx

TEREBELLIDAE

MOLLUSCA:

GASTROPODA:

Nassarius vibex

BIVALVIA:

Nucula proxima

Yoldia limatula

any provision of this act or any rule, regulation or order promulgated pursuant to this act, he may affix to such pesticide a tag or other appropriate marking giving notice that such pesticide has been detained or embargoed, and warning all persons not to remove, dispose, or use such pesticide until permission is given by the department or the court. It shall be a violation of this act for any person to remove, dispose, or use any detained or embargoed pesticide without such permission.

12.
The powers, duties and functions vested in the State Department of Environmental Protection under the provisions of this act shall not be construed to limit in any manner the functions, powers and duties vested in the State Department of Environmental Protection under any other provisions of law.

13.
No ordinances of any governing body of a municipality or county or board of health more stringent than this act or any rules or regulations promulgated pursuant thereto shall be superseded by this act. Nothing in this act or in any rules or regulations promulgated pursuant thereto shall preclude the right of any governing body of a municipality or county or board of health, subject to the approval of the department, to adopt ordinances or regulations more stringent than this act or any rules or regulations promulgated pursuant thereto.

14.
This act shall be liberally construed to effectuate the purpose and intent thereof.

15.
This act shall take effect immediately.
Approved and effective June 1, 1971.

CLEAN OCEAN ACT

CHAPTER 177 [43]

ASSEMBLY NO. 2417

An Act to control and prevent the threat to the quality of the waters of the State caused by the dumping of waste materials in waters adjacent to the State, and to empower the Commissioner of the Department of Environmental Protection to adopt rules and regulations concerning the loading and the handling of materials within the State which are to be disposed of at sea.

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1.
This act shall be known and may be cited as the "Clean Ocean Act."

2.
The Legislature finds and determines that the ocean off the coast of the State is being used increasingly for the disposal of wastes, including sewage sludge, industrial wastes and dredged spoils; that ocean-dumped wastes contain materials which may have adverse effects on the public health, safety, and welfare; that many of these materials are toxic to human and marine

43. N.J.S.A. 58:10-23.25 to 58:10-23.33.

...and are damaging to the fish population and the food chain supporting ...e including man, as well as to other valuable natural and economic re...es; and that therefore the State must regulate and control this prac...and encourage the development and utilization of advanced methods of ... disposal which do not utilize the ocean as the repository for harmful ...rials.

... the purposes of this act unless the context clearly indicates another ...ing:

"Commissioner" means the Commissioner of Environmental Protection;

"Department" means the Department of Environmental Protection;

"Vessel" means every description of watercraft or any other artificial ...rivance used, or capable of being used, as a means of transportation on or ... water;

"Person" means and shall include corporations, companies, associations, ...ties, firms, partnerships and joint stock companies as well as individuals. ... shall also include all political subdivisions of this State, and any other ..., or any agencies or instrumentalities thereof.

... commissioner shall have the power to formulate and promulgate, ...nd and repeal rules and regulations preventing, conditioning and con...ing the loading of a vessel within the State with materials of any com...tion whatsoever and the handling of such materials which if disposed of ...ea cause, or may tend to cause, adverse effects on the waters of the ...e.

The commissioner may by rule or regulation require that the person ...onsible for the loading of a vessel or the handling of materials of any ...position whatsoever which are to be disposed of at sea first obtain a ...it.

...e department may, in accordance with a fee schedule adopted as a rule ...regulation, establish and charge fees for any of the services it perform in ...nection with this act, including the issuance of permits, which fees shall ...annual or periodical as the department shall deem. The fees charged by ... department pursuant to this section shall not be less than $100.00 nor ...e than $1,500.00 based on criteria contained in the fee schedule.

The permit required by this section may be conditioned upon compliance ...n all rules and regulations adopted pursuant to this act.

...f any person violates any of the provisions of this act, or any rule or ...ulation promulgated pursuant to the provisions of this act, the depart...nt may institute an action in a court of competent jurisdiction for in...nctive relief to prohibit and prevent such violation or violations and the ...d court may proceed in the action in a summary manner. Any person ... violates any of the provisions of this act, or any rule or regulation ...omulgated pursuant to this act shall be liable to a penalty of not more than ...000.00 for each offense to be collected in a summary proceeding under the ...nalty Enforcement Law (N.J.S. 2A:58-1 et seq.), and in any case before a ...urt of competent jurisdiction wherein injunctive relief has been requested. ...e Superior Court, County Court and county district court shall have juris...ction to enforce said Penalty Enforcement Law. If the violation is of a ...ntinuing nature, each day during which it continues shall constitute an ...ditional, separate and distinct offense. The department is hereby au...orized and empowered to compromise and settle any claim for a penalty ...der this section in such amount in the discretion of the department as may ...pear appropriate and equitable under all of the circumstances.

...estions by ~~strikeouts~~

7.
The powers, duties and functions vested in the department under the provisions of this act shall not be construed to limit in any manner the powers, duties and functions vested therein or in any person under any other provisions of law or any civil or criminal remedies now or hereafter available.

8.
If any provision of this act or the application thereof to any person or circumstances is held invalid, the remainder of the act and the application of such provision to persons or circumstances other than those to which it is held invalid, shall not be affected thereby.

9.
This act shall be liberally construed to effectuate the purpose and intent thereof.

10.
This act shall take effect immediately.
Approved and effective June 1, 1971.

Introductory Statement

More than 75% of the wastes which are disposed of at sea on the east coast are dumped off the coast of the State of New Jersey, most within 12 miles of the coast line. These wastes include sewage sludge and chemical waste whose components have the potential of adversely affecting the water quality of New Jersey's coastal waters. While the State recognizes that reasonable lead time is necessary to find alternatives to the current wasteful and potentially dangerous practice, the police of the State must be in outright opposition to ocean dumping. If it is found to be ecologically sound, wastes should be disposed of farther from shore, possibly off the continental shelf as an interim solution until such time as the entire practice can be abandoned.

This law enables the Commissioner of Environmental Protection to adopt rules and regulations governing the loading and handling within the State of New Jersey of materials which are to be disposed of at sea. These regulations are intended to establish a method by which the Department of Environmental Protection can protect the New Jersey shore, and at the same time encourage the development of alternatives to the ecologically unsound practice of dumping harmful materials at sea.

STATE PUBLIC SANITARY SEWERAGE FACILITIES ASSISTANCE—APPROPRIATION

CHAPTER 178

ASSEMBLY NO. 2457

An Act appropriating certain funds from the Water Conservation Fund for loans and grants for the planning and construction of sewerage treatment facilities by local governmental units and authorizing offers of grants from such fund subject to future appropriation upon ascertainment of construction costs.

Approved June 1, 1971.

CURRENT PERMITS FOR DISPOSAL OF WASTE, ATLANTIC OCEAN

Name of disposal area, description (sludge, acid, etc.) and U.S.C. & G. S. Chart No.	Name of permittee	Length of term	For whom dumped
Sewer sludge dumping ground; Chart No. 1215.	McAllister Bros., Inc	3 months	South Kearny Sewerage Authority.
Do	do	do	Westchester County.
Do	do	do	Linden-Roselle Sewerage Authority.
Do	do	do	Passaic Valley Sewerage Authority.
Do	do	do	City of Glen Cove
Do	do	do	Bergen County Sewerage Authority.
Do	do	do	Middlesex County Sewerage Authority.
Do	New York City Department of Water Resources (Rockaway).	do	Permittee.
Do	(Wards Island)	do	Do.
Do	(Owls Head)	do	Do.
Do	(Coney Island Ave. 2)	do	Do.
Do	(Hunts Pt.)	do	Do.
Do	(Port Richmond)	do	Do.
Do	(Jamaica Bay 26th Ward)	do	Do.
Do	(Tallmans Island College Pt.)	do	Do.
Do	(Jamaica Water)	do	Do.
Do	(Newtown Cr.)	do	Do.
Do	(Bowery Bay Astoria)	do	Do.
Do	Moran Towing & Transporting.	do	Bergen County Sewerage Authority.
Do	do	do	Linden Roselle Sewerage Authority.
Do	do	do	Middlesex County Sewerage Authority.
Do	do	do	Passaic Valley Sewerage Commission.
Do	do	do	City of Glen Cove.
Do	do	do	Joint Meeting Elizabeth, N.J.
Do	General Marine Transportation.	do	Rockaway (Pearsalls-Hassock).
Do	do	do	Bayonne.
Do	do	do	City of Long Beach.
Cellar dirt dumping ground; Chart No. 1215.	Moran Towing & Transporting.	do	Permittee.
Do	Great Lakes Dredging & Dock Co.	do	A. J. Pegno Co.
Do	Dunbar & Sullivan Dredging Co.	do	New York City Transit Authority.
Mud and 1-man stone dumping ground; Chart No. 1215.	Great Lakes Dredging & Dock Co.	do	Seatrain Lines.
Do	do	do	Do.
Do	do	do	American Export.
Do	do	do	International Terminal.
Do	Weeks Dredging Contracting, Inc.	do	Filtered Petroleum Corp.
Do	do	do	Grow Construction Co.
Do	Dunbar & Sullivan Dredging Co.	do	New York City Transit Authority.
Do	do	do	Do.
Do	Moran Towing & Transporting Co.	do	Transit Mix.
Do	do	do	Consolidated Edison Co.
Do	do	do	Do.
Waste acid (winter) dumping ground; Chart No. 1215.	do	do	Permittee.
Do	do	do	National Lead.
Do	do	do	Brooklyn Union Gas Co.
Do	Spentonbush Transportation Service.	do	E. I. du Pont.
Do	McAlister Bros	do	Permittee.
Do	Allied Chemical Corp	do	Do.
Do	General Marine Transportation.	do	Do.
Do	do	do	Do.
Waste acid (summer) dumping grade; chart No. 1215.	No permits issued		
Wreck dumping ground; chart No. 1215	do		
Chemical waste dump; chart No. 1000	Spentonbush Transportation	3 months	American Cyanamid.
Do	do	do	Tappan Tanker Terminal.
Do	do	do	Humble Oil Co.
Do	do	do	Chevron Oil Co.
Do	Moran Towing & Transporting	do	Dow Industrial Service.
Do	General Marine Transportation.	do	Pratt & Whitney.

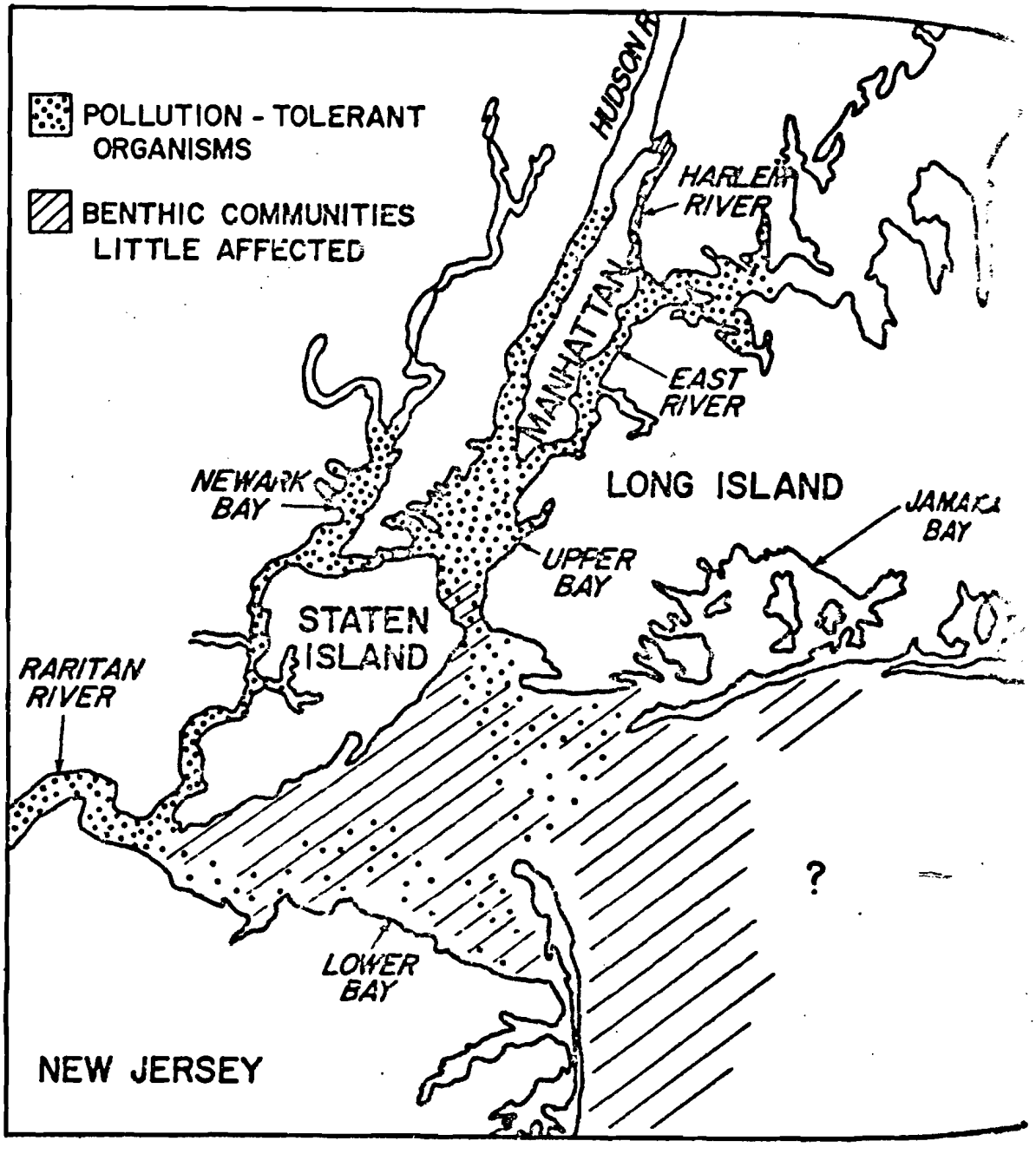


Fig. 5-6. Distribution of affect on the benthic animal life in the New York Harbor and New York Bight.

(The following was received for the record:)

(The following letter application from the Humble Oil & Refining Company typifies the toxic wastes resulting from industrial processes that are deposited in the Waste Chemical Dumping Grounds.)

HUMBLE OIL & REFINING CO.,
Linden, N.J., May 26, 1965.

DUMPING OF REFINERY SPENT CAUSTIC SODA AT SEA

SUPERINTENDENT OF NEW YORK HARBOR,
New York, N.Y.

DEAR SIR: We are requesting permission to dump, either at ten, thirteen, or hundred mile limit, spent caustic soda in 8,000 to 10,000 barrel barge lots on a 5-to-7 day basis.

A typical analysis of Refinery spent caustic consists of the following components:

Component:	*Percent*
Sodium Carbonate	5
Sodium Hydroxide	58
Sodium Sulphide	20
Sodium Naphthanate	2
Sodium Phenolate	3
Sodium Sulphate-Sulfite	2
Sodium Mercaptide	10
	100

PH 12–14
Concentration: 5°–20° Baumé
By Weight: %Water—97–86
%Sodium Salts—3–14
Color: Pale yellow to light green—clear

The dumping of Refinery spent caustic soda at sea will continue for an indefinite period of time. However, alternate methods of disposal are in the process of being developed, but these are of a long range nature.

If any other information is required for this type of operation, please do not hesitate to contact us.

Very truly yours,

T. J. INNER.

MATERIALS DUMPED AT THE CHEMICAL WASTE DUMPING GROUND IN FISCAL YEAR 1968

Name of permittee	Type of material	Work performed for	Total amount (cubic yards)
Spentonbush Transport Service	Spent caustic	Humble Oil Co	21,664
Do	do	Chevron Oil Co	3,000
Do	Nepera waste	Tappan Tanker Terminal	9,388

Mr. HOWARD. Continue.

Colonel BARNETT. This has resulted in increased activity and interest in disposing of these wastes at sea. With this increased activity and the rising concern of the Nation over water quality and pollution, the Corps of Engineers decided that it should determine accurately the environmental impact of the dumping operations.

Accordingly, the Chief of Engineers directed that a study be made of various dumping grounds, to do three things:

First, determine the effects of such dumping;

Source: Effects of Waste Disposal in the New York Bight
Summary Final Report(Sandy Hook Study)
U.S. Department of Commerce
April, 1972

Figure 7

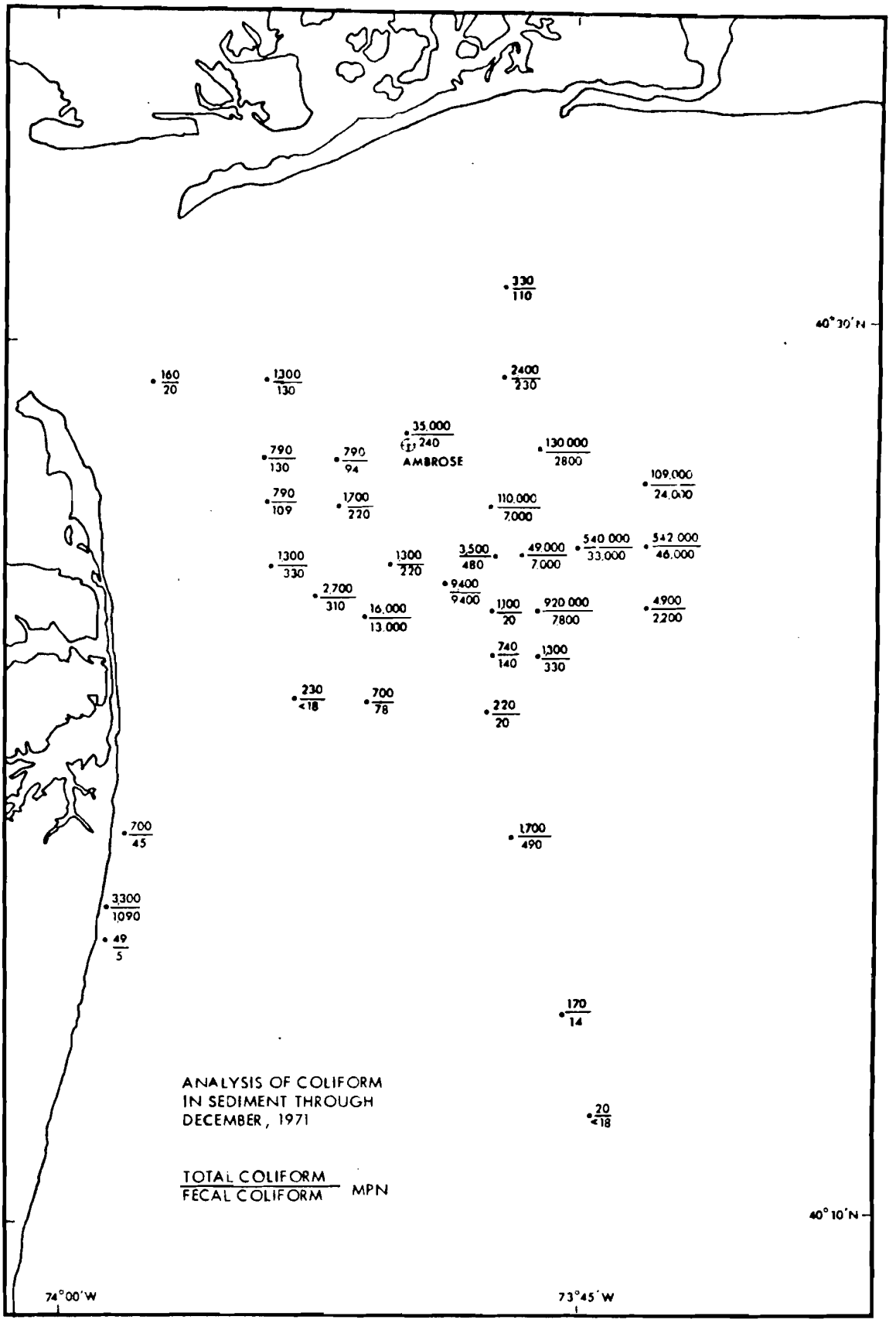

330/110
40°30'N
160/20
1300/130
2400/230
35,000/240
AMBROSE
790/130
790/94
130 000/2800
109,000/24,000
790/109
1700/220
110,000/7,000
1300/330
1300/220
3,500/480
49,000/7,000
540 000/33,000
542 000/46,000
9400/9400
2,700/310
16,000/13,000
1100/20
920 000/7800
4900/2200
740/140
1300/330
230/<18
700/78
220/20
700/45
1700/490
3300/1090
49/5
170/14
20/<18
ANALYSIS OF COLIFORM
IN SEDIMENT THROUGH
DECEMBER, 1971
TOTAL COLIFORM / FECAL COLIFORM MPN
40°10'N
74°00'W
73°45'W

Figure 4

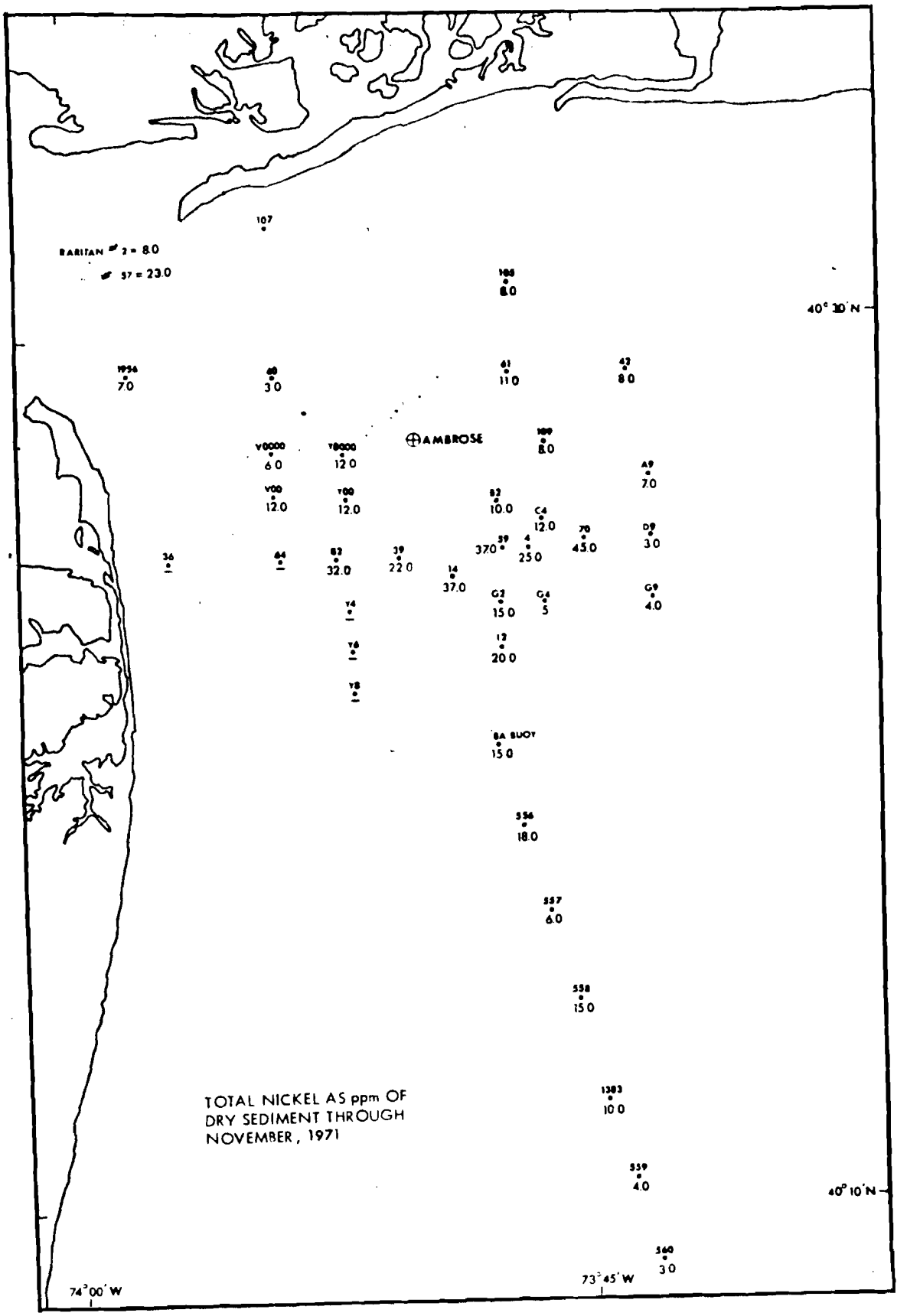

107
RARITAN 2 = 8.0
37 = 23.0
108
8.0
40° 30' N
1956
7.0
60
3.0
61
11.0
62
8.0
AMBROSE
109
8.0
A9
7.0
V0000
6.0
V8000
12.0
V00
12.0
V00
12.0
B3
10.0
C4
12.0
70
45.0
D9
3.0
36
64
B2
32.0
39
22.0
14
37.0
39
370
4
25.0
G2
15.0
G4
5
G9
4.0
Y4
Y6
Y8
12
20.0
BA BUOY
15.0
556
18.0
557
6.0
558
15.0
1383
10.0
559
4.0
40° 10' N
560
3.0
74°00' W
73°45' W
TOTAL NICKEL AS ppm OF
DRY SEDIMENT THROUGH
NOVEMBER, 1971

Figure 3

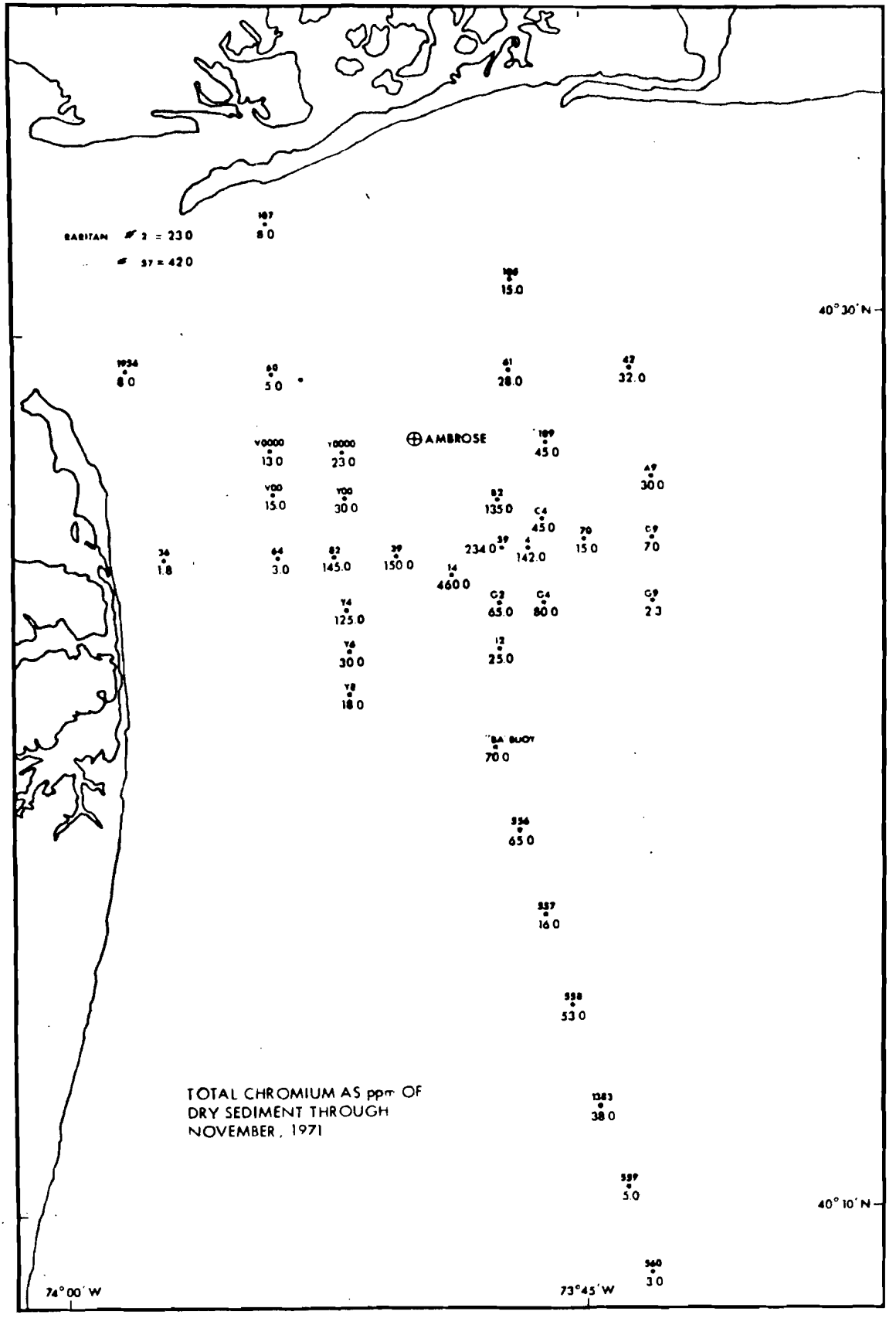
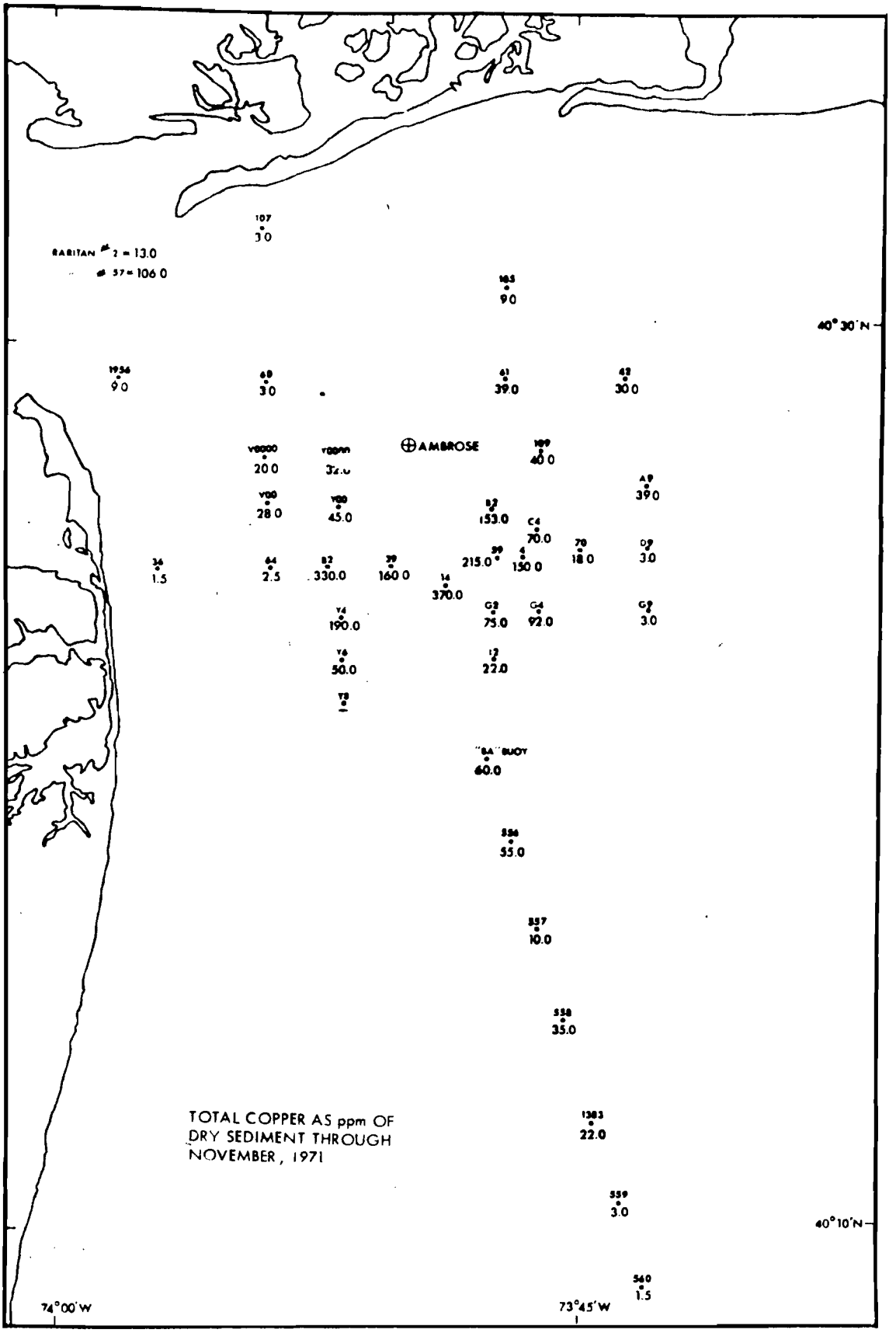

RARITAN 2 = 23.0
37 = 42.0
AMBROSE
40°30'N
40°10'N
74°00'W
73°45'W
TOTAL CHROMIUM AS ppm OF
DRY SEDIMENT THROUGH
NOVEMBER, 1971

Figure 2


RARITAN 2 = 13.0
37 = 106.0
AMBROSE
"A" BUOY
60.0
40°30'N
40°10'N
74°00'W
73°45'W
TOTAL COPPER AS ppm OF
DRY SEDIMENT THROUGH
NOVEMBER, 1971

CHAPTER III - THE LEGAL PROBLEM

Chapter III - The Legal Problem

Legal aspects of pollution in New York Harbor are numerous and complex. Several approaches for presentation of this material are available but perhaps the most useful would be to examine the issues from the perspective of a local fisherman's cooperative association. This hypothetical association with limited financial funding is seeking to abate all dumping of toxic chemicals and require all sewage to undergo advance treatment before discharge into the Bight.

Standing to sue is one of the major issues to be discussed but initially one must first examine the federal and state administrative remedies available to such a group. With the special nature of the Bight problem, these remedies will have limited if no value to the cooperative in its suit. A more imaginative approach is needed and this chapter will concentrate on the employment of a public trust doctrine applied to the submerged lands and waters of the New York Bight. The public trust doctrine is the moxt flexible of all approaches and has enjoyed continual recognition by the courts.

A look at legislative measures both federal and state reveals few devices sufficient to cope with the problem. Action on Senator Nelson's S. 3484 and Representative Howard's H.R. 15915 has been stalled pending the outcome of studies

funded by the federal government.[1] In the instance of H.R. 15915, delay in publication of the final Sandy Hook Report has stopped consideration of the bill.[2] The same fate is shared by former Representative Ottinger's H.R. 15828. The New Jersey Clean Ocean Act has stated the danger from the ocean dumping to the public interest but has not to date formulated the necessary administrative regulations.[3] The federal Act of 1888 which gave original authority to the Corps of Engineers to supervise New York Harbor does not primarily concern itself with the health aspects of dumping. The Refuse Act of 1899 has been a successful approach in many recent pollution suits; however, its application to abating pollution in the Bight would be limited in the following situation.

If our hypothetical fishing cooperative wishes to enjoin dumping, the proper recourse would be to petition the Attorney-General of New Jersey to file suit against the United States to abate a public nuisance. For anyone familiar with the vast industrial complexes in New Jersey which make use of the Bight for disposal, it is understandable that

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[1]See Chronology, Appendix A, Chapter I.

[2]Publication of the final Sandy Hook Report was effected in April, 1972; it substantially incorporated the findings of the interim Report. Source: Effects of Waste Disposal in the New York Bight, Summary, Final Report--National Marine Fisheries Service, Middle Atlantic Coastal Fisheries Center, Sandy Hook Laboratory, Highlands, N.J.

[3]See Appendix A this chapter.

this suit would be prosecuted with less than zealous vigor.[4] Recent cases have shown that prosecution of such suits is largely at the discretion of the Attorney-General. Language of the court in Boomer v. Atlantic Cement Co. is not atypical.

> The ground for the denial of injunction, not withstanding the finding that there is a nuisance and that plaintiffs have been damaged substantially is the large disparity in economic consequences of the nuisance and of the injunction.[5]

Such discretion in the hands of the Attorney General will not yield satisfactory results. Substantial damage to the shellfish industry and lobstering has already been caused by the dumping. The effects of the nektoral or free swimming fish has yet to be determined.

The usefulness of the Refuse Act of 1899 could be further restricted by a recent federal district court decision in Bass Anglers Sportsman Society v. U.S. Steel et al.[6] The court dismissed the action by the conservation group for an injunction and fines under the act.

> Equally important is the firmly established principle that criminal statues be enforced by proper authorities of the United States Government and a private party has no right to enforce these sanctions . . . . It has been repeatedly held that the Executive Branch through the Justice Department and U.S. Attorneys is charged with the enforcement of federal criminal law and in this area has broad

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[4]See Current Permits for Ocean Dumping, Appendix A, Chapter I.

[5]257 N.E. 2d 870, 309 N.Y.S. 2d 312 (1970).

[6]324 F. Supp. 414 (1971), 3 ERC 1065.

> discretion in determining whether or not to prosecute. In the exercise of such discretion U.S. Attorneys are immune from control or interference through mandamus or otherwise by private citizens or by courts.[7]

Thus, the fisherman's cooperative may run into standing problems if it tries to sue under the Refuse Act. The purpose of the previous discussion has not been to become entangled in a discussion of standing or eruditely distinguish cases. Its function has been to illuminate the difficulties in bringing suit under existing administrative provisions of federal or state law.

The implementation of the Public Trust Doctrine becomes expedient when considered in the light of two recent decisions which have drastically altered the standing of environmental groups before federal courts.[8] Prior to the Sierra Case, a landmark decision in Scenic Hudson Preservation Conference v. Federal Power Commission[9] had allowed conservation groups standing to sue in the federal system without alleging particular harm to themselves. Thus, as a result of this case any conservation group could sue as an interested party in maintaining the general quality of the environments.

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[7] Ibid., at 415.

[8] Sierra Club v. Morton, 405 U.S. 727 (1972), Zahn v. International Paper Co., 42 U.S. Law Week 4087 (Dec. 13, 1973).

[9] 354 F 2d 608 (2d Cir, 1965).

However, under the Sierra decision the U.S. Supreme Court has muddled the question of whether environmental groups have standing for judicial review under the Administrative Procedure Act. A conservation group must now show that it has suffered damage to itself in order to obtain judicial review of a federal agency decision.[10] Justice Douglas was prompted to a vigorous dissent in this case. He suggested that the problem of standing to sue could be simplified and sharply focused if a federal rule was fashioned to allow environmental issues to be litigated before federal courts and agencies in the name of inanimate objects about to be despoiled. The advocacy of such a position indicates the difficulty Douglas foresees for environmental groups maintaining standing. He further notes that federal agencies often have industrial pressure groups buried in their structure in an almost symbiotic relationship.[11]

It is, however, a complete exaggeration to view the Sierra decision as a death knell to further vigorous advocacy of environmental issues before the courts.

> Since we have not yet approached the point of Justice Douglas' dissent and confined standing on the inanimate objects about to be destroyed, environmental groups or concerned citizens will have to work within the liberally interpreted confines of the more traditional notions of standing.[12]

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[10]Edward Linky, Ocean Waste Disposal: A Violation of the Public Trust Doctrine, 7 Underwater Naturalist 30 (1972).

[11]Ibid., at 32.

[12]22 DePaul L. Review 460, 451 (1972).

The more recent decision of Zahn v. International Paper is going to have a far more restrictive effect on the ability of environmental groups or concerned citizens to sue in federal courts. In the Zahn Case, the plaintiffs are owners of property fronting on Lake Champlain and brought the action in federal district court on behalf of a class of themselves and lessees around the lake. They claimed discharges of pulp and other waste was lessening the utility of their property.

The court in the majority opinion written by Mr. Justice White said that multiple plaintiffs with separate and distinct claims must each satisfy the jurisdictional amounts for suits in federal courts, and in this diversity class action under FRCP 236(3) by owners of lakeshore property charging respondent with polluting Lake Champlain where only the named plaintiffs could show damages in the jurisdictional amount, a class action is not maintainable. Each plaintiff in a Rule 236 (3) must satisfy the jurisdictional amount and any plaintiff who does not must be dismissed from the case.[13]

Justice White further noted that the court had ample opportunity to overrule the above stated principle in Synder v. Harris[14] and chose not to do so. The matter in his

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[13]42 U.S. Law Week 4087.

[14]394 U.S. 332.

opinion is now one of legislative concern and the courts will await Congressional action, since jurisdictional amounts and other standing issues are statutory problems.[15]

One is prompted to inquire if the diversity or amount requirements cannot be met, could such a class action be maintained under the guise of a federal question? Justice White feels the result would be the same as a class action under a federal question, must still meet the same jurisdictional amount with respect to plaintiffs having separate and distinct claims even if a cause under federal law could be found. However, Congress has exempted major areas of federal question jurisdiction from any jurisdictional amount.[16]

Thus, as a result of these two recent decisions, environmental groups must allege particular harm to one or several of their members to maintain standing; and in a class action of separate and distinct claims, each claim must independently fill the jurisdictional amount of $10,000 or more. The effect of these cases will severely restrict the number of environmental suits and makes the facile Public Trust Doctrine an even more attractive cause of action.

Although little case law exists in the public trust area directly parallel to the situation in the Bight, the

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[15]28 USC 1331.

[16]28 USC 1333-34, 1336-40, 1343-45, 1347-58, 1361-62.

doctrine still enjoys substantial judicial recognition. Before applying the doctrine to the situation in the Bight, some background concerning the nature of public trust would be appropriate.

The concept of public trust had its origin in England. Certain interests such as fishing and navigation were considered so essential to the public well being that property for these purposes could not be alienated by the sovereign, to private interests. Professor Sax of the University of Michigan finds of the doctrine in American law,

> Of all the concepts known to American law, only the public trust doctrine seems to have the breath and substantive content which might make it useful as a tool of general application for citizens seeking to develop comprehensive legal approach to resource management problems.[17]

The polestar case in American public trust law is Illinois Central Railroad v. Illinois.[18] The Illinois legislature had conveyed in fee simple all the land under Lake Michigan for one mile along the shoreline and one mile out from shore of the business district of Chicago. The state later wanted the grant rescinded. The U.S. Supreme Court ultimately recognized the special character of title to the navigable waters of Lake Michigan.

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[17]Joseph Sax, The Public Trust Doctrine in Natural Law: Effective Judicial Intervention, 68 Mich. L. Review 472 (1970).

[18]146 U.S. 387 (1892).

> It is a title held in trust for the people of the state that they may enjoy the navigation of the waters, carry on commerce over them and have liberty of fishing therein freed from the destruction or inferences of private parties.[19]

The public trust mechanism is by no means a panacea for abatement of all environmental problems. Professor Sax while enthusiastic about the possibilities of the doctrine also tempers his ardor, for there are many courts which persistently state the judiciary is not the proper forum to examine issues concerning administrative decisions with public trust lands. Most of these courts follow the lead of Rogers v. City of Mobile[20] where suits to enjoin dredging of seed oysters from a public reef were dismissed on the grounds that the discretion of the Conservation Department is unchallengable absent a showing of bad faith in issuing the dredging permit.

Professor Sax to counter this approach prefers to see a litigation theory adopted which combines a sophisticated concept of public trust principles and setting out of reasonable alternatives for the achievement of a reasonable development of trust lands with minimal infringement of public uses. This approach is likely to obtain a far more sympathetic response from the bench than is one which takes

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[19] Ibid., at 452.

[20] 169 S 2d 282 (1962).

a rigorous legal principle and squeezes it to death.[21]

The fulcrum of this discussion is to examine the applicability of public trust concept to the pollution problem in the New York Bight. Several threshold issues must first be considered. Where exactly in the Bight are the effects of the dumping felt: surface water or subsoil? Which strata of government has jurisdiction over the waters of the Bight: state or federal? From the aforementioned studies (Woods Hole et al.) some authority exists to prove that ecological harm is being felt in more than the aqueous components of the Bight. Moreover, all the components of the marine eco-system are intricately related. Research into the Bight eco-system is still in its infancy.

Professor Orlando Delogu has divided marine environment into four sectors for zoning purposes. These sectors are useful in designating adversely effected areas of the Bight.[22] The first sector is surface water, which commercial navigation and recreational boating utilize. The second area between the surface and bed is used by finfish and scuba enthusiasts. The seabed areas are the environment of lobsters and other shellfish. Finally the subsoil, which is utilized

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[21] Ibid., 68 Mich. L. Review at 553.

[22] O. Delogu, Land Use Controls Principles Applied to Offshore Coastal Waters, 59 Kentucky L. Journal 609 (1971).

by oil and gas interests. All elements of the marine ecosystem are related, however, and the subsoil plays a vital role in maintaining other sectors. The subsoil in the Bight contains microorganisms and elementary varieties of worms (Nematodes) which play a major yet little understood role in maintaining the ecology. Gamarid amphipods are an important food source for finfish and also aid in stabilizing bottom sediments. Both varieties of organisms normally prolific in a healthy marine environment are greatly diminished in and near the dump sites in the Bight.[23]

From the facts above it is readily apparent that three out of four zoning areas are effected by dumping. Surface navigation and recreational boating except for olfactory sensibilities have yet to be effected. Circumstantial proof exists as to the effects on finfish; the harm done to the shellfish industry has already been mentioned and the effect on the subsoil has also been examined.

With strong preliminary evidence existing as to traceable harm the next issue is to determine jurisdiction over the polluted waters. The leading case concerning jurisdiction of offshore lands is United States v. California.[24] Mineral leases in that case had been executed by California pursuant

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[23]Sandy Hook Study (1969).

[24]332 U.S. 19 (1947).

to state statute, ignoring federal authority. California asserted a claim stating that the thirteen original colonies had jurisdiction to their offshore lands from the crown and further that the federal government had never asserted a claim to these lands and thus laches applied. California being admitted to the union as the equal of the original thirteen colonies was entitled to jurisdiction. The United States appeared as a member of the family of nations and asserted that lack of control over the submerged areas would compromise its sovereign character. The Supreme Court struck down the original colonies' argument as Justice Black wrote,

> Those who settled this country were interested in lands upon which to live, and waters upon which to fish and sail. There is no substantial support in history for the idea that they wanted and claimed a right to block off the oceans bottom for private ownership . . . in the extraction of its wealth.[25]

Justice Black was also unimpressed by the laches argument,

> . . . And even assuming that Government agencies have been negligent in failing to recognize or assert the claims of the Government at an earlier date, the great interest of the Government in this ocean area are not to be forfeited as a result. The Government, which holds its interests here as elsewhere in trust for all the people, is not to be deprived of those interests by the ordinary court rules designed primarily for private disputes . . . .[26]

The holding of U.S. v. California which has remained unaltered,

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[25]Ibid., at 32.

[26]Ibid., at 39-40.

is that the federal government has exclusive control over submerged lands including the lands reaching out to the three mile territorial limit. The conclusion of the Supreme Court is of immense importance for determining jurisdiction over the submerged lands of the Bight. Although the trust language is vaguely used in the opinion it can be argued that the U.S. through its Corps of Engineers is sacrificing valuable resources (shell and finfish) for the benefit of private industry through issuing permits for dumping in the Bight.

Looking directly at the factual situation in the Bight, one finds that the four principle dump sites are located twelve miles from both the New Jersey and Long Island shorelines. Are these dump sites beyond the territorial limit and thus beyond the jurisdiction of the court to enforce the public trust doctrine? The United States Code clearly shows these waters are within the jurisdiction of the United States. Recently the United States has expanded its territorial water limit beyond three miles to include a nine mile contiguous zone for fishing, and control over the submerged lands is also provided.[27]

> Nothing in sections 1091-1094 of this title shall be construed as extending the jurisdiction of the States to the natural resources beneath and in the waters within the fisheries zone established by such sections . . . .[28]

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[27]16 U.S.C.A., 1091.

[28]16 U.S.C.A., 1094.

Thus the United States is to have full sovereignty over the lands by the new zone. With jurisdiction resolved and evidence of harm to lands under the jurisdiction it remains to examine precedent for submerged lands held in public trust.

Historical precedent exists in the holding of Martin v. Waddell.[29] The controversy in that early case revolved around the interpretation of patents from the English crown to the Duke of York, of submerged lands under the Raritan River in New Jersey. Subsequently the Duke granted leases in these lands and petitioners sought to challenge the original grant from the King.

Heretofore in this discussion the types of interests protected by the public trust have not been clearly defined. There is no precise definition; however, these interests usually are so essential to the public good that alienation will result in irreparable harm. There are two such interests, however, that have always been deemed within the public trust; these are navigation and fishing. Professor Sax has perhaps overstated their value--"certain interests are so intrinsically important to every citizen that free availability tends to mark the society as one of citizens than of serfs."[30] Chief Justice Taney writing the opinion in Waddell found a

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[29]41 U.S. 367 (1842).

[30]Ibid., 68 Mich. L. Review at 474.

violation of public trust, but stated it in milder terms.

> . . . from the time of settlement to the present day, the previous habits and usages of the colonists have been respected and they have been accustomed to enjoy in common the benefits and advantages of the navigable waters for the same purposes and to the same extent that they had been used and enjoyed for centuries . . . for the men who just formed the English settlements could not have been expected to encounter the many hardships that unavoidably attended their emigration to the new world and to people the banks of its bays and rivers of the land under the water at their very doors was liable to immediate appropriation by another as private property and the settler upon the fast land thereby excluded from enjoyment, from the bottom . . . without becoming a trespasser upon the rights of another . . . .[31]

The above precedent applies to public interests conveyed to private interests but would the result be different if the land was appropriated for a public use? A series of Wisconsin cases may serve as a springboard for expanded federal applications of the public trust. The Wisconsin cases directly or inferentially are concerned if a resource is being utilized for its natural purposes, "a lake as a lake," rather than as a cesspool. In City of Madison v. State[32] the city sought to fill in six acres of submerged land to build a civic center and auditorium. The project would not interfere with boating on the lake; nevertheless the court recognized that simply to approve a project

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[31] 41 U.S. at 412.

[32] 83 N.W. 2d 674 (1957).

is to deny the states' special obligation with respect to the property.[33] Other decisions, In Re Crawford County Levee and Drainage District #1[34] and the City of Milwaukee v. State[35] public projects were held to be in violation of the public trust where it appeared a considerable area of the waterways lose its original character. A more recent case in this vein, State v. Public Service Commission[36] specifically stated that not one of the public uses of the "lake as a lake" could be destroyed or impaired. Based upon prior discussion and the above line of cases there is a substantial argument that the essential character of the Bight is being altered.

Federal courts through two important cases--Martin v. Waddell and U.S. v. California--have recognized that fishing and navigation are important public interests not to be compromised and that submerged lands resources are held in trust for "all the people."[37] Although the "lake as a lake" concept has been applied through state courts there is nothing to indicate this concept would not be persuasive in

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[33] Ibid.

[34] 264 U.S. 598 (1924).

[35] 214 N.W. 820 (1927).

[36] 81 N.W. 2d 71 (1957).

[37] U.S. v. California, 322 U.S., at 39-40.

a federal district court. The economic loss of the shellfish industry in Raritan Bay and the suspected migration of finfish away from the Bight serve as indicators of the changing character of the Bight. Fishing has always been recognized as essential to the character of the Bight waters and the lands beneath them. Alternative means of disposal are available for wastes flushed into the Bight; is an alternative livelihood available to the fishermen whose vested rights are preemptorily taken by a violation of this public trust?

A fisherman's cooperative association should have standing in a federal district court. The issue in controversy is persuasively federal in nature and damages are in excess of $10,000.[38] An injunction against all ocean dumping except for sewage undergoing tertiary treatment is desired. In addition, the court should unequivocally recognize the submerged lands and waters of the Bight as held in a public trust. Declaration of fertile fishery areas is but the logical extension of national parks and national shorelines where land is already protected by a public trust approach.

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[38] 28 U.S.C. 1331.
Note--Standing of the coop would be permitted even in view of the Sierra Club and Zahn Decisions.

CHAPTER IV - CONCLUSIONS

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The scope of this study has necessarily been broad. The pollution of the New York Bight has only recently drawn attention from a scientific and legal perspective and this sweeping scope will acquaint the reader with many aspects of the problem. One general inference to be drawn is that as with all ecosystems the marine environment is delicately balanced. The vast area of the oceans will not insure its ability to cleanse itself. Thor Heirdahyl in his "Ra" expedition of 1970 noted large clumps of oil in the Atlantic several hundred miles from the coast. Apparently even the cleansing mechanisms of the open sea is failing.

The success of any law suit concerning pollution in the Bight will depend upon the results of the final Sandy Hook Report. The preliminary studies have shown that these waters may be irreparably damaged. The shellfish industry already can show measurable harm resulting from polluted water of the Hudson River flowing into the Bight. Tertiary treatment of sewage will relieve most of this damage eventually, but the dump areas and contiguous zones are completely devoid of marine life or close to such a state.

If these waters are incapable of supporting life why the struggle to have the areas declared a public trust? These "dead sea" dumps are not stationary but are moving toward the shoreline at a measurable yearly rate.[1] Thus it is not enought

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[1]56% of fish caught off the coast of the United States are

to zone these areas as dumps and put them out of sight, out of mind.

The public trust doctrine has been sustained in American law from the early nineteenth century to the present. The United States has jurisdiction over submerged lands and waters in the Bight and the courts should declare such areas to be held in trust for the public good. Authority for such a view rests on Martin V. Waddell. In 1824, the shellfish resources of the Raritan River were deemed essential to the well being of the existing society. The importance economically and socially of the Bight fishery and recreational uses has not diminished.

The illogical squandering of the New York Bight's resources are simply untenable. The Bight is but the first and presently the worst of many possible "dead seas," it should become the last!

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caught within a breath of three miles. Opening statement - Geneva Law of the Sea Conference, March 11, 1958, Arthur Dean cited in Bishop, William W., International Law, Boston: Little Brown, 1971, p. 596.

CORRESPONDENCE

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
JOHN FITCH PLAZA, P.O. BOX 1390, TRENTON, N.J. 08625

April 4, 1972

Mr. Edward J. Linky
Duquesne University
Box 716 S.M.C.
1345 Vickroy Street
Pittsburgh, Pennsylvania 15219

Dear Mr. Linky:

In accordance with your request, we are enclosing a copy of so-called Clean Ocean Act (CH-177, P.L. 1971). We are presently in the process of preparing the necessary administrative regulations as provided in the statutes.

Very truly yours,

Ernest R. Segesser
Assistant Director for Water Quality

Enc.
6E5:G10

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, N. Y. 10007

REPLY TO
ATTENTION OF:

NANOP

18 September 1973

Mr. Edward J. Linky
900 Boston Neck Road
#2
Narragensett, R. I. 02882

Dear Mr. Linky:

I am in receipt of your letter of 11 September 1973 concerning hearings in New York City on renewal of past dumping permits in the Atlantic Ocean.

Last fall, the Senate and House of Representatives of the United States passed the "Marine Protection, Research, and Sanctuaries Act of 1972." Under this act, the U. S. Environmental Protection Agency was given prime responsibility for the regulation of dumping of waste materials in the ocean. The hearings you mentioned in your letter concern permit applications within the jurisdiction of the Environmental Protection Agency. I would therefore suggest that you contact Mr. James Sellar of the U. S. Environmental Protection Agency, 26 Federal Plaza, New York, N. Y. 10007, for further information concerning the specifics of the hearings.

Thank you for your interest.

Sincerely yours,

LOUIS W. PINATA
Acting Chief, Operations Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
EDISON, NEW JERSEY 08817

October 4, 1973

Mr. Edward J. Linky
900 Boston Neck Road #2
Narragansett, R. I. 02882

Dear Mr. Linky:

I'm sorry Mr. Linky, but copies of the minutes of the hearings on ocean dumping are not available. If you would like to visit our laboratory in Edison, we would be happy to show you the permits issued to the various dumpers.

Sincerely yours,

Richard T. Dewling
Director
Surveillance & Analysis Division

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