

Waste Disposal in the Oceans

Minimizing Impact,
Maximizing Benefits

Edited by

Dorothy F. Soule and Don Walsh



Waste Disposal in the Oceans

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Waste Disposal in the Oceans: Minimizing Impact, Maximizing Benefits

edited by Dorothy F. Soule and Don Walsh

After a decade of attempts to control pollution with broad, sweeping legislation on a national scale, recent efforts have recognized the need to evaluate waste disposal on a case-by-case or regional basis, incorporating new knowledge about the consequences of disposal. This book examines the major uses and effects of waste disposal in the ocean, paying particular attention to California's coastal waters. The contributors, representing public agencies, academe, and research institutions, take into account environmental concerns while they focus on developing management strategies of using the oceans for waste disposal. The book is a result of the 1982 symposium "Ocean Disposal in the 1980s," which was sponsored by the Southern California Academy of Sciences.

Dr. Dorothy F. Soule is director of Harbors Research Laboratory, senior research scientist at the Institute for Marine and Coastal Studies, and adjunct professor of environmental engineering at the University of Southern California, where Dr. Don Walsh is director of the Institute and professor of ocean engineering.

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Minimizing Impact,
Maximizing Benefits

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and Don Walsh

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Introduction

After a decade of massive effort to control pollution in land, water, and air media by means of sweeping environmental legislation, regulation enforcement, and the concomitant expenditure of billions of dollars, the 1980s have already seen a reexamination of the original premises and the methods selected to implement them. A number of realities have become apparent; that massive infusions of funds cannot automatically resolve all waste problems; that the medium-by-medium approach to waste disposal has at times led to a "no alternative" answer for management; that overgeneralization for the sake of legalistic "equality" may in fact have denied the innate biological, physical, chemical, and ecological differences in the very diverse environments of the United States; and that "solutions" have often been imposed without the proper basis of scientific research and information.

The historical view of the oceans as virtually limitless receptacles for societal wastes resulted in centuries of degradation of rivers and estuaries and ultimately of coastal inshore waters. Although in the United States pollution legislation dates back to the Rivers and Harbors Act of 1890 and the Federal Water Pollution Control Act (FWPCA) PL 80-845, of 1948, it was not until the signing of the National Environmental Policy Act of 1969 (PL 91-190) in January 1970 that important regulatory powers were implemented. The dominant purpose of the FWPCA and its subsequent major amendments in 1972 (PL 92-500) and 1977 (PL-217) was to restore the biological integrity of the Nation's waters. The 1972 Marine Protection Research and Sanctuaries Act ("The Ocean Dumping Act," PL 92-532) and the 1978 National Ocean Pollution Research, Development and Monitoring Planning Act (PL 95-273) have also had significant regulatory impact on marine water quality and regulation.

The efforts to mandate a complete cessation of the uses of the oceans of the United States were beneficial in some instances, but by 1977 it was belatedly recognized by Congress that some ocean uses were perhaps not harmful, some were perhaps even beneficial, and that some uses were necessary by virtue of prohibitive costs or the lack of better alternatives on land.

In the 1980s, opportunities exist to reevaluate ocean disposal on a case-by-case, or on a local or regional basis rather than a national one. Choices of best available alternatives for management will have to be made, based, it is hoped, on research rather than legalistic generalizations. The impossibility of invest-

ing an estimated \$500 billion to convert all primary-treated sewage systems to secondary-treated facilities, for example, is recognized; at the same time serious doubt has been cast upon secondary treatment as the best option for at least some marine ecosystems. As yet, impacts of deepsea oil drilling are not fully revealed, and methods of evaluating and predicting impacts are still in need of great improvement.

The Southern California Academy of Sciences Symposium, "Ocean Disposal in the 1980s" on April 30-May 1, 1982, was organized to examine some of the major usages and effects of ocean disposal, as well as methods presently available or being developed for evaluating the effects and efforts directed at developing management strategies. The inherent assumption was that some ocean disposal will of necessity continue; the urgency is to eliminate disposal of toxic wastes and to control by the best available management practices other types of disposal in order to minimize impacts and maximize benefits.

Participants in the symposium were all scientists, some of whom are affiliated with agencies involved in ocean disposal, while others are involved in research on assessing impacts and protecting environmental quality. The academy audience and symposium speakers alike represent a common paramount desire to preserve and protect the oceans. It is, however, necessary to recognize that only by working together can the problems associated with societal usage of the seas be ameliorated. An important step is to provide a forum where the processes and problems can be discussed.

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May 1983

Preface

The topics addressed in this publication are especially relevant to the activities of the U.S. Army Corps of Engineers because they address the Corps' regulatory function, which is one of its most important and most difficult roles. Consequently, it is appropriate that the Corps participated in the symposium on which these papers were based.

In my opening remarks at the symposium, in describing aspects of the Corps of Engineers program that led to our involvement in this scientific symposium, I noted that the Corps of Engineers is a major command of the U.S. Army and a member of the Department of Defense. It has a twofold mission that is one part military and one part civilian. Our military role is to provide combat engineering support to the army and military construction of major facilities for both the army and the air force.

Our military role was established early, back when the Corps of Engineers was founded on June 16, 1775 as a component of the Continental Army. The roots of our Civil Works mission reach back nearly as far, to the early 1880s. But that side of our mission has evolved slowly. It began when we were charged in 1824 by Congress with clearing and snagging operations along the Ohio and Mississippi Rivers to facilitate safe navigation. Although this action was aimed primarily at insuring continued expansion of riverborne commerce, more importantly, it would turn out, this early civil works function would establish the Corps of Engineers as an important player in the future of water resources development in this country. That water resources development role has grown by leaps and bounds over the years.

Today it encompasses such activities as development of inland waterways, provision of coastal harbor navigation and ports development, projects to prevent beach erosion, associated recreational development, and, of course, the planning design and construction of projects to provide flood control.

Working hand in glove with water resources development is a Corps of Engineers program of water resources protection and preservation. This is accomplished through our regulatory function, or as it is sometimes called, our permit authority.

As far back as the turn of the century -- 1899 to be exact -- Congress enacted Rivers and Harbors legislation that commissioned the Corps of Engineers to regulate

against unauthorized fill or discharge of materials into the navigable waters of the United States. The term "navigable" was broadly defined and expanded to include tributary streams. The 1899 law remains an important underpinning of our regulatory function. Since the passage of NEPA legislation -- since 1969 -- additional laws have come to bear that augment our regulatory program. Section 404 of the Clean Water Act, as you may know, expanded our jurisdiction to include so-called "waters of the United States." Thus, not only navigable streams but isolated wetlands and intermittent streams which might flow only 5 cubic feet per second for half the year were brought under the umbrella of a Corps of Engineers program to regulate against their despoilation.

However, the legislative provision that is most operative with regard to ocean disposal is Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972.

Section 103 specifies that all proposed operations involving the transportation and dumping of dredged material into ocean water must be evaluated to determine the potential environmental impact of such activities. This is accomplished jointly by the Corps of Engineers and the Environmental Protection Agency. Both our agencies draw on the best technical expertise available to assist us in making these impact determinations.

Section 103 and the other laws I mentioned authorize us -- no, compel us -- to perform a role that is at once satisfying and at times very frustrating. It is satisfying because regulatory actions to protect vital water resources are extremely important and much needed. It is frustrating at times because the nature of the regulatory business is that we are constantly caught up in a balancing act trying to weigh and evaluate all sides of a proposed action. And always in the end we are left with a decision that would try the wisdom of a Solomon: Is the proposed action in the greater public interest? If it is, we grant the permit; if not, we deny it. Sounds simple, doesn't it? But you can imagine that Abe Lincoln's oft-recited parable about not being able to please all the people all the time is definitely in effect here. It's one of the reasons that I characterized our regulatory function at the outset as one of the more important and more difficult roles we in Corps of Engineers have to perform.

I once heard someone describe our regulatory role this way: "It provides us with the opportunity to alienate a whole new class of people than we might ordinarily have the chance to offend." Of course, that was said

tongue-in-cheek, I believe. The less cynical and more accurate version is that through our regulatory program we are able to gain the confidence of a number of divergent groups when we can convince them that the Corps of Engineers is willing to work as hard toward water resources development. And in that regard our regulatory program can at times make us a few new friends, where we might not ordinarily have had that opportunity.

So it's a challenging program without all issues resolved and all questions answered. The interest and information generated by technical and scientific symposia such as this can assist us immensely in our regulatory efforts.

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Implications of the National Advisory Committee on Oceans and Atmosphere (NACOA) Report, "The Role of the Oceans in Waste Management Strategy"

Don Walsh¹

The National Advisory Committee on Oceans and Atmosphere (NACOA) was created by Congress in 1971. By law, NACOA is required to report to the President and Congress its recommendations and findings on national ocean and atmosphere issues. The Committee has 18 members, appointed by the President, who serve for terms of three years. Members represent a wide diversity of backgrounds and geographic distribution.

Issues studied by NACOA are generated in two ways: direct request from the Administration or Congress, and expressed interest of the members. The usual procedure is to have a discussion of the topic, invite presentations by appropriate experts (both within and outside government) and, then, decide whether or not we wish to undertake a formal study in the area. If a study effort is approved by the full membership of NACOA, then a panel is formed, typically consisting of 3-5 members assisted by NACOA staff members.

It was this procedure that led to NACOA's agreeing to study the question of ocean disposal of wastes in mid-1979. In this case, the study was a result of a request made by Congressman Gerry Studds of Massachusetts. NACOA's initial concern was that the use of the oceans for waste disposal might increase with few safeguards to insure minimum adverse impact. We also believed that the Environmental Protection Agency (EPA) was not facing the problem of waste disposal in an integrated way. Options such as land disposal, burning, and ocean disposal were being foreclosed by lack of internal agency coordination. The closer we looked, the more confused the situation seemed to be.

For example, we found that ocean dumping of wastes within the three-mile territorial sea was less severely regulated through the Clean Water Act than was dumping beyond the three-mile limit which was governed by the more recent Ocean Dumping Act. We also found that EPA believed they could not make any sort of major corrections, because most ocean dumping would be terminated by the end of 1981. The EPA said that Congress had mandated such action and that EPA did not have the option to modify this termination.

EPA's medium-by-medium approach to waste disposal tended to move the problem around rather than determine the best, lowest risk option. EPA was not happy about finding itself in the corner; Congress was unhappy about dealing with the problem piecemeal over a period of years, and the municipal authorities with the disposal burden were unhappy about facing costly (and in some cases, impossible conditions of compliance) in the time frame given to them by the federal government.

How did we get into such a situation when we simply started out to insure that society's impact on the environment should be as minimal as possible? It is a classical case of "pendulum swinging" excesses in government policymaking.

In the late 1960s, we began to realize that many of society's activities were having damaging and, perhaps, irreversible impact on our environment. It was clear that various kinds of pollution, discharged into various media, were injurious to man and his ecosystem. Furthermore, such activities had real adverse economic effects. There was a compelling need to clean up our environment.

The principal event that set most of the present environmental regulatory activities in motion was the National Environmental Policy Act (NEPA) which was signed into law on 1 January 1970. NEPA set the basic policy of the United States in the following words from the "Declaration of Purpose" in the act:

To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the nation.

With the basic policy established by NEPA, five substantive laws, which were concerned with waste disposal, were passed by Congress and signed by the President:

- ° Federal Water Pollution Control Act ("Clean Water Act"). First passed in 1948, it was amended four times after 1970 as a result of NEPA.
- ° Marine Protection, Research and Sanctuaries Act (MPRSA, "Ocean Dumping Act").
- ° Safe Drinking Water Act (SDWA).
- ° Resource Conservation and Recovery Act (RCRA).
- ° The Clean Air Act.

Since these acts were not all passed at the same time, their inter-relationships, coordination and harmonization tended to be minimal, at best. This is perhaps reflective more of the dispersed way in which Congress considers and passes laws rather than any lack of coherence. As these acts were brought into operation, they tended to force the society waste disposal problem to the medium which was least regulated at that time. We were moving to the ultimate point where incineration was discouraged (it polluted the air and was energy intensive); burying on land was extremely difficult (it could contaminate freshwater supplies and required a great deal of energy to move), and dumping in the ocean was fast approaching the point of being totally foreclosed as an option.

Yet, our society will produce waste and the volume will increase at a rate of roughly 2 percent a year. The United States is the greatest waste-producing nation in the world, a fact to be faced by the municipalities that have to deal with it. By the year 2000, it is estimated that the various fractions of our society's wastes will be as follows:

- ° Dredged Materials - 30 percent
- ° Industrial Wastes (wet and solid) - 28 percent
- ° New Sources (coal, shale, synthetic fuels, etc.) - 17 percent
- ° Sewage Sludge (wet - 16 percent
- ° Municipal Wastes (dry) - 9 percent

The total weight for all these wastes requiring disposal in the year 2000 is estimated to be 2,489 million metric tons per year. By comparison, the present volume is about 1,500 million tons a year.

Probably the gradual movement towards almost complete restriction of ocean waste disposal came from a report done by the Council on Environmental Quality (CEQ) in 1970: "Ocean Dumping - A National Policy." The report documented an alarming rise in the amount of materials being disposed of in the oceans together with the fact that little of this activity was under any sort of regulatory control. It further cited their belief that our scientific knowledge of the ocean's ability to receive wastes was too limited to fully understand the environmental impacts. The passage of NEPA in January of 1970 and the release of the CEQ report in October, 1970, thus provided a powerful stimulus to develop statutory frameworks to greatly restrict the use of the oceans for any waste disposal.

The situation, left alone, would have reached an unsatisfactory conclusion by 31 December 1981, when, essentially, all dumping of sewage sludge in the ocean would have been banned by EPA. This resulted from a 1977 amendment to the Ocean Dumping Act by Congress which was interpreted by EPA to have this result.

The advent of NEPA and the succession of laws that carried out its intent, as well as the CEQ report on ocean dumping, all were positive factors in arresting a fundamentally bad situation where little thought had been given to consequences of ocean dumping. But moving towards a total ban was not the optimum solution. Over the past 12 years, improved knowledge of the oceans and better means of waste disposal technique have been developed. But, the forces set in motion by mandated environmental actions tended to sum together in unfortunate ways even as the problems of ever increasing volumes of wastes got worse.

By May, 1979, a few members of Congress, as well as NACOA, became concerned that the EPA medium-by-medium approach to waste disposal was beginning to create major problems for those local government agencies that had to deal with actual disposal. By not taking a holistic approach, considering that the ocean might be the preferred option, several things happened. EPA was not able to make a sufficiently documented and forceful case with Congress to avoid the move towards virtual banning of ocean dumping. And because most ocean dumping was to be stopped by the end of 1981, EPA invested less and less

resources in studying the impact of ocean waste disposal. This, of course, reduced the data base on which to make good management decisions. It was a unhealthy spiral tending to transfer the entire waste disposal problem to the land disposal or incineration options.

The NACOA Panel on Waste Management was established in May, 1979 to study this question with special emphasis on ocean disposal. With assistance from NACOA staff, outside consultants and reviewers, the five-member NACOA panel spent nearly two years listening to presentations, reviewing documents and making field trips to visit waste disposal organizations. Basically, the panel considered three categories of wastes that could be disposed of in the oceans if they met certain degrees of treatment: dredged materials, sewage sludge, and industrial wastes. We exempted the complex question of nuclear wastes in this study.

The panel's report, approved by the full NACOA in January, 1981, was entitled, "The Role of the Ocean in a Waste Management Strategy."

Our panel summarized the situation as follows:

1. Dredged materials from maintenance dredging of ports and channels must be disposed of somewhere unless the Nation is prepared to cause significant economic dislocation in its shipping and transportation industries.
2. Sewage sludge and municipal waste will continue to be produced no matter how successful we are in recycling or advancing the state of the art in waste treatment.
3. Industrial wastes cannot always be totally recycled. Therefore, we will always have to find ways to dispose of the residuals in an economic and safe manner or else drastically change our lifestyle.

The result of our work and the sense of NACOA on this subject is best expressed by simply quoting our final recommendations:

1. NACOA RECOMMENDS THAT THE FEDERAL GOVERNMENT ESTABLISH AS A PRIORITY GOAL THE REUSE AND RECYCLING OF WASTES, AND INCREASE INCENTIVES TO REDUCE THE AMOUNT OF TOXIC MATERIALS THAT MUST BE DISPOSED OF BY STATES, MUNICIPALITIES, AND PRIVATE INDUSTRY.

NACOA believes that we must manage wastes, not media, and that the medium-by-medium approach of the 1970s is no longer adequate.

2. NACOA RECOMMENDS THAT CONGRESS AND THE EXECUTIVE BRANCH ADOPT AN INTEGRATED APPROACH TO WASTE MANAGEMENT. THIS REQUIRES THAT THE ENVIRONMENTAL PROTECTION AGENCY MODIFY ITS EXISTING MEDIUM-BY-MEDIUM APPROACH TO WASTE DISPOSAL. WASTES SHOULD BE DISPOSED OF IN THE MANNER AND MEDIUM THAT MINIMIZES THE RISK TO HUMAN HEALTH AND THE ENVIRONMENT, AND AT A PRICE THAT THIS NATION IS PREPARED TO PAY.

As part of the process of establishing an integrated waste management policy, NACOA recommends two specific actions:

- A. The EPA policy that no ocean dumping permit will be issued when any land-based alternative exists should be reversed.
- B. The 97th Congress should amend Section (h) of the Federal Water Pollution Control Act.

The requirement of a "balanced, indigenous population" around a sewage effluent outfall is so rigid as to undo what the 95th Congress tried to do when it passed the 301 (h) waiver provision.

NACOA is convinced that part of the present problem is the medium-by-medium approach that follows from the statutory regime enacted by Congress and the conflicting goals of many of the existing laws.

3. NACOA RECOMMENDS THAT CONGRESS HOLD HEARINGS WITH A VIEW TOWARD ELIMINATING THE CONFLICTS RESULTING FROM THE IMPLEMENTATION OF THE PRESENT WASTE MANAGEMENT LEGISLATION, AS PART OF THE PROCESS OF DEVELOPING AND IMPLEMENTING A NATIONAL WASTE MANAGEMENT STRATEGY.

Each region of this country has its own unique set of oceanographic, hydrologic, geological, and atmospheric properties, and the "right" disposal method for one location is not necessarily right for another.

4. NACOA RECOMMENDS THAT THE ENVIRONMENTAL PROTECTION AGENCY ESTABLISH BROADLY REPRESENTATIVE REGIONAL CITIZEN ADVISORY COMMITTEES TO ADVISE THE REGIONAL ADMINISTRATORS IN THE SELECTION OF APPROPRIATE WASTE MANAGEMENT OPTIONS.

The laws governing dredged-material disposal in the ocean and in internal waters do not require, nor does scientific evidence call for, stricter regulation of ocean disposal than of internal water disposal of dredged materials.

5. NACOA RECOMMENDS THAT THE ENVIRONMENTAL PROTECTION AGENCY AMEND ITS REGULATIONS FOR DISPOSING OF DREDGED MATERIALS IN THE OPEN OCEAN TO BE CONSISTENT WITH THOSE FOR DUMPING UNDER THE CLEAN WATER ACT. REGULATIONS FOR DUMPING IN THE OPEN OCEAN SHOULD NOT BE MORE STRINGENT THAN THOSE FOR DUMPING IN INTERNAL WATERS. THE IMPACT OF THE DISPOSITION OF DREDGED MATERIALS ON THE SPECIFIC DISPOSAL SITE SHOULD BE THE PRIMARY CONSIDERATION OF THE REGULATION.

The scientific information available to date does not support a ban on ocean disposal of either all sewage sludge after December 31, 1981, or of all industrial wastes.

6. NACOA RECOMMENDS THAT OCEAN DISPOSAL OF SEWAGE SLUDGE EITHER BY BARGE OR THROUGH PROPERLY DESIGNED OUTFALLS SHOULD CONTINUE TO BE A DISPOSAL OPTION UNDER APPROPRIATE MANAGEMENT CONDITIONS AND WITH ADEQUATE MONITORING SAFEGUARDS IN THOSE AREAS WHERE NO UNREASONABLE DEGRADATION OF THE ENVIRONMENT RESULTS FROM SLUDGE DISPOSAL.
7. NACOA RECOMMENDS THAT OCEAN DISPOSAL OF INDUSTRIAL WASTES SHOULD CONTINUE AT SITES WHERE EVIDENCE INDICATES NO UNREASONABLE ENVIRONMENTAL DEGRADATION AND WHEN HUMAN HEALTH, ENVIRONMENTAL, AND ECONOMIC CONSIDERATIONS INDICATE THIS IS THE PREFERABLE OPTION.

Finally, NACOA believes that it is a mistake to give research on ocean-waste disposal a low priority because of a belief that it will soon "go away." Ocean disposal must remain a viable option.

8. NACOA RECOMMENDS THAT THE INTERAGENCY COMMITTEE ON OCEAN POLLUTION RESEARCH, DEVELOPMENT AND MONITORING, ESTABLISHED BY PUBLIC LAW 95-273, RECOGNIZE THAT THERE IS A HIGH PROBABILITY THAT LAND, DEEP WELL, AND ATMOSPHERIC WASTE DISPOSAL ACTIVITIES WILL BE REDUCED DURING THE 1980s IN FAVOR OF OCEAN WASTE DISPOSAL. THE FEDERAL PROGRAM OCEAN POLLUTION RESEARCH, DEVELOPMENT, AND MONITORING MUST EMPHASIZE RESEARCH AND MON-

ITORING RELEVANT TO THE DISPOSAL OF WASTES OF
ALL KINDS IN VARIOUS OCEANIC ENVIRONMENTS.

Lack of complete information on the consequences of waste disposal is only one element of risk to be considered when selecting a waste disposal option. More knowledge concerning the effects of waste disposal will not eliminate the risk, but will continue to reduce that portion of the risk associated with uncertainty, thus sharpening our ability to choose the safest disposal option, whether it be ocean, land, deep well, or air.

Since advisory committees do just that, their advice can only be offered to their sponsors (in this case the President and the Congress). It has no force for compliance, so whether or not such counsel is used is another question.

How did we do? It would appear that we did better than expected.

The City of New York could not meet the total ban on ocean dumping of sewage sludge by the 31st of December, 1982. They sued the EPA (i.e., the Federal Government) in federal court and won the case. Federal Judge Sofaer cited the NACOA report in ruling that EPA ocean dumping regulations cannot presume that all sludge dumping "unreasonably degrades the environment." Furthermore, he stated that EPA must evaluate all permits using the criteria in the Ocean Dumping Act (section 102) including the need to dump and the impact of using land-based alternatives.

EPA decided not to appeal the ruling, and with the change of administration from President Carter to President Reagan, this agency was put under new management. By late 1981, it was clear that EPA was, in fact, going to change their rules to permit increased ocean waste disposal. Our NACOA report was cited as one of the sources for their ideas in rethinking the whole problem.

Meanwhile, certain members of Congress and the public were unhappy with both EPA and NACOA. By December, 1981, Congressman D'Amours of New Hampshire indicated that he would promote legislation to ban all sludge dumping and Congress passed amendments to the Clean Water Act which included a one-year ban on the discharge of sewage sludge through outfall pipes into marine waters.

A new phase of the battle had begun.

It has been 24 months since NACOA released its report. Has there been anything that we might now change in our eight recommendations? The answer is, essentially, no. However, we are concerned with certain other events that were essentially part of our conditions under which the ocean option made sense. These are largely in the area of waste disposal monitoring and management, together with the needed scientific research to understand the receiving environments.

We were pleased that the executive branch, through EPA, was willing to consider and use the ocean as a waste disposal option. But we were also quite concerned that funding support for the necessary scientific background studies was being cut back over 50 percent (FY '83). NACOA considers it absolutely essential that the use of the oceans as a waste disposal medium be coupled with scientific studies and site monitoring after the fact of dumping. We find that both EPA and the National Oceanic and Atmospheric Administration (NOAA) are cutting back on these environmental scientific studies. The proposed administration budget cuts have not been fully implemented since there has not been an approved Federal Budget by Congress for fiscal year 1982 and 1983. Under the continuing resolution procedure, these programs continue at a funding level of the last approved budget (fiscal year 1981).

At the same time, we are now seeing an increasing number of coastal municipalities beginning to apply for permits to use the ocean waste disposal option. As of March, 1982, the number was about 20. It would appear that the "pendulum" may begin to swing back towards the situation prior to NEPA if we do not treat ocean waste disposal as an integrated system of permitting, regulation and management together with careful scientific studies of the sites and post-dumping monitoring. These last two conditions seem to be dropping out of the system due to budget cutbacks.

It would seem that an ideal solution would be to charge user fees for ocean dump site use by approved disposal agencies. These fees could provide the needed funding to maintain the science and the monitoring efforts at each site. This seems to be under active consideration by the Congress and the Administration.

The Chairman of NACOA, Dr. John Knauss, testified before Congressman D'Amours House Subcommittee on Oceanography on the 18th of March, 1982. He essentially made the following points as the current NACOA position on this issue:

- "1. There has been no significant change in scientific knowledge that would cause us to change our 1981 recommendations.
2. We believe that ocean disposal, properly managed and monitored, should continue to be a waste disposal option.
3. It is imperative, however, to avoid indiscriminate dumping.
4. Because ocean disposal may well be a politically and economically easy choice in the face of growing land disposal problems, there must be strong and viable management and assessment programs to provide adequate safeguards.
5. We are alarmed at the lack of resources available to EPA and NOAA for these purposes in the face of plans for greatly increased ocean dumping; some funding mechanism for these activities must be found.
6. In summary, we believe strongly that the 1981 NACOA recommendations stand as a set. We cannot recommend continued ocean disposal without adequate controls and assessment of the effects.
7. Because adequate increases in Federal appropriations will be difficult to get, alternative funding mechanisms should be explored -- such as user fees, or increased (and better designed) compliance monitoring funded by the permittees."

In September, 1982, the House of Representatives passed H.R. 6113 which reauthorized Title I of the Marine Protection, Research and Sanctuaries Protection Act of 1972 (commonly known as the "Ocean Dumping Act"). The bill provided for permitting authority by the EPA and the U.S. Army Corps of Engineers for ocean waste disposal of dredge and non-dredge materials. EPA would designate disposal sites after careful study of potential locations and was required to provide monitoring after dumping activities had begun. A fee system was developed to charge for the permits. The bill also stipulated a two year moratorium on the dumping of low level radioactive wastes. Of course, high level waste is already banned by existing legislation.

Unfortunately this bill was not passed by the Senate before the end of the last Congress and it will have to be reintroduced in the present Congress.

Of note, however, is the fact that the radioactive waste moratorium provision did pass the Congress. It was a rider on the bill that mandated the five cent a gallon federal tax increase on motor fuel for highway improvements!

There will be more hearings as this bill, or a similar measure, is reintroduced in Congress. The initiative will probably be in the House again and it is hoped that 1983 will find such legislation signed into law. The Administration did not support H.R. 6113 in 1982 and there may be some difficult negotiations before it is a reality in 1983.

It is a useful negotiation and should help to focus attention not only on ocean waste disposal, but the general balance of how our nation will be organized to dispose of its wastes now and in the future.

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Ocean Disposal and Monitoring

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ABSTRACT

Oceanic responses to waste disposal should be monitored to confirm that they are as expected or, if the responses are more severe than expected, to design a revised disposal strategy. Monitoring programs should be coordinated and designed so that they satisfy the management needs of a large number of organizations, such as industries, municipal dischargers, certain local, state, and federal agencies, public and environmental organizations, and the U. S. Congress.

A review of this nation's ocean pollution monitoring programs found that these are fragmented, uncoordinated, often duplicative, and are without national or regional focus. This paper provides the results of the review and discusses the efforts that are underway to correct ocean monitoring activities through changes in the monitoring strategies, agency approaches, legislation, and disposal technology.

INTRODUCTION

There are fundamental disagreements about marine pollution monitoring which make it one of the most controversial topics in ocean pollution policy. The disagreements involve questions such as:

- what is the definition of monitoring;
- what is the separation between research and monitoring;
- is there a real need to monitor;
- exactly what parameters should be the monitored;

- is there adequate knowledge to decide what to monitor;
- are monitoring data and results useful;
- are monitoring data being used effectively;
- is monitoring the best investment of limited funds; and
- who should monitor?

In our view, monitoring is one of the most important tools available to assess the conditions of the oceans in order to manage activities that could alter those conditions.

To assess the adequacy of marine pollution monitoring programs in the United States from the managers' and users' point of view, NOAA and EPA jointly held five regional workshops between September 1980 and February 1981 (Seeger 1981). A sixth workshop on the Great Lakes was cosponsored by NOAA and the U.S./Canadian International Joint Commission. The workshops were part of a series of regional meetings to develop information for the preparation of the Second Federal Plan for Ocean Pollution Research, Development, and Monitoring, mandated by the National Ocean Pollution Planning Act of 1978 (P.L. 95-273). Participants were selected with the aim of achieving a balance among federal, state, and local governments, local organizations, industry, environmental groups, and between managers and technical experts. The intent of the workshops was to develop guidelines, strategies, and approaches for monitoring programs in order to improve their overall effectiveness and minimize their costs.

The workshops highlighted some of the previously listed disagreements and revealed:

- fragmentation and lack of coordination among programs due to diverse and often overlapping responsibilities of the various organizations and agencies involved;
- lack of awareness, within a given region of what organizations are involved in monitoring and what types of data they collect;
- lack of standardization in data collection, processing, and quality assurance procedures; - lack of documentation adequate to allow comparisons of results;
- absence of regional efforts to synthesize results, or to use the monitoring information for the assessment of regional ecosystem conditions; and
- frustrations with the validity and/or usefulness of the mandated (required)

monitoring tasks, especially compliance monitoring data, for the assessment of the status of the conditions of the regional ecosystem.

Although disagreements about monitoring and problems identified in the existing programs still exist, some of the developments that occurred since the workshops have potential positive influence on the practices of waste disposal and monitoring in the future. In this paper we shall highlight these developments and the relationships among monitoring, research, and management. The principle message of the paper, however, is the presentation of some of the requirements that are needed for the establishment of reasonable regional and national monitoring programs. All other topics are interwoven with the discussion of these requirements. These are: (1) achievable, useful program objectives; (2) management and scientific support; (3) legislative support; and (4) cooperation and and coordination among the agencies involved.

MONITORING, RESEARCH, MANAGEMENT: THE QUEST FOR ACHIEVABLE AND USEFUL MONITORING OBJECTIVES

According to our thesis, for the successful design and establishment of regional and national monitoring frameworks, it is absolutely essential that monitoring is recognized as a management tool. Management, at the local, state, federal, and congressional levels must, first, identify in each region the ecological and environmental resources that are of special concern and which may be altered by some ocean use activity and, second, define the level of changes in these resources which are safe or tolerable. Only those parameters should be selected for monitoring that will detect these changes and will relate them to man's activities, so these could be modified if necessary. The relationship between key polluting activities and major human health and resource concerns in a region should form the basis of the monitoring program. Management decisions are required to focus regional monitoring activities on specific and useful objectives.

One may also think of monitoring as hypothesis testing. Based on the understanding of what the important resources and concerns are, what kind and how wastes will be released into the ocean, and what dominant processes will act upon them, hypotheses can be made on waste distribution, concentration, and effects. Decisions to proceed with an ocean disposal plan should be based on these hypothesized effects, that can be tested by the regional monitoring programs. When deemed necessary, operations

can be modified or some other prudent actions could be taken based on the monitoring information.

In light of the pressing problems to dispose our wastes safely, we no longer can afford the "know-nothing, do-nothing" philosophy, which uses the argument of "imperfect scientific understanding" to reject the idea of ocean waste disposal out of hand, and to veto monitoring programs as futile. Also we cannot afford to "monitor everything, everywhere," so that we could be absolutely sure to cover all, even yet unforeseen contingencies. In addition to the institutional complexities and the lack of defensible objectives and benefits, these attitudes have contributed significantly to the lack of success of the establishment of major regional or national monitoring programs to date.

There is a rather simplified ocean-use management model, which portrays conceptually the relationships among ocean use, management, research, and monitoring (Fig. 1). In this model, man's activities are linked with environmental and ecological consequences, and both are coupled with the decision process. This model specifically emphasizes the "judgmental process," which involves not only the scientific understanding of the consequences of man's activities, but also the economic and social realities which, in fact, play a key role in decision processes. The model recognizes the importance of directing our scientific endeavors toward the understanding of ecological and environmental processes, which play a major role in influencing the consequences of man's activities in the ocean. When we know, or can reasonably hypothesize specific consequences of a given ocean-use activity, we have the fundamental information at hand to control that activity effectively, assuring that its impacts are acceptable.

Monitoring, in the context of this model, is the assessment of selected consequences that tell us whether our assumptions were correct or not. Monitoring, if designed properly, is the key activity that will allow us to enter ecological and environmental facts into the decision-making process. These facts, in combination with other inputs, form the basis of recommendations for management decisions.

Judging the relative importance between research and monitoring within the framework of the ocean use model is unnecessary. If the two are defined within the same frame of reference, then research is development of new knowledge and monitoring is the application of existing knowledge. We do not accept the argument that available know-