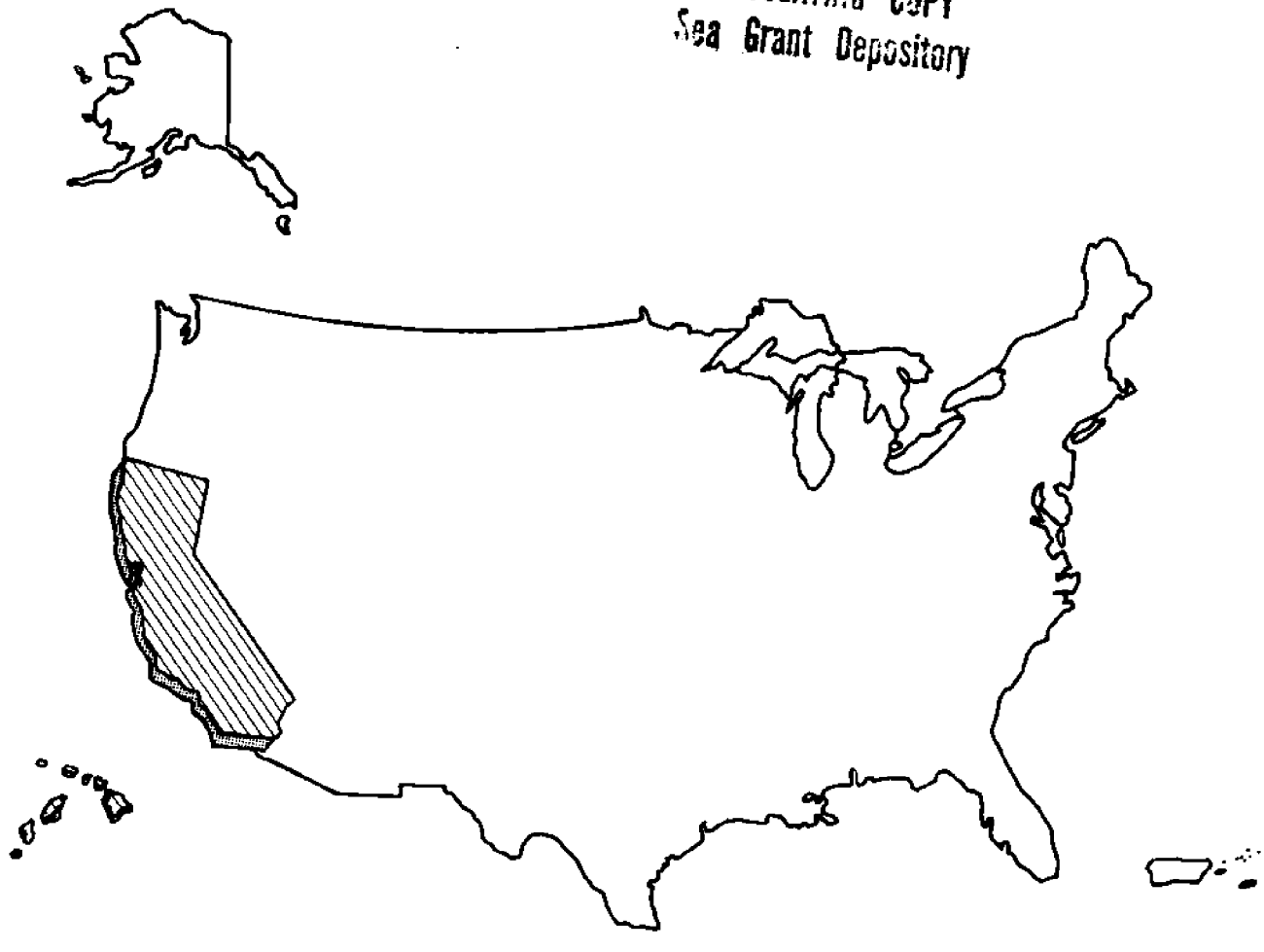
Report of Southwest Regional Workshop on Ocean Pollution Monitoring

Pasadena, November 18-20, 1980



June 1981

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June 1981

UNITED STATES DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Office of Marine Pollution Assessment
R.L. Swanson, Director

Executive Summary

This report summarizes the results of a joint NOAA and EPA conference on the status and requirements of marine pollution monitoring programs along the coasts of California and Hawaii. The meeting was hosted by the Office of Marine Pollution Assessment of NOAA and the Surveillance and Analysis Division of EPA Region IX on November 18 through 20, 1980, at Pasadena, Calif.

The purpose for the meeting and this report is to provide up-dated information on the status of marine pollution monitoring programs for the next Federal Plan for Ocean Pollution Research, Development, and Monitoring, mandated by Public Law 95-273, and to assist the host agencies to develop their long-range plans for marine pollution monitoring. The Pasadena meeting was one of six such assemblies held throughout the country during the fall and winter of 1980-'81.

Chapter 1 of this report contains a summary of the background information given at the meeting by NOAA representatives. It contains definitions and recommendations from the Interagency Monitoring Subcommittee report and from the Report of West Coast Region Conference on Marine Pollution Problems (conference was held in June, 1980, in Portland, Ore.).

Chapter II contains a summary of the key findings and recommendations of the meeting. These include the need to develop: (1) better coordination among the monitoring agencies; (2) a mechanism for standardization, intercalibration and quality control of data collection and analysis; (3) periodic reviews of compliance monitoring programs to update the programs and to expand the utility of their data; (4) a regional data and information dissemination and referral center; and (5) more reliable, cost-effective sampling and analysis technology.

Chapter III is the summary of the presentations of the local and municipal agency group, the industry group, the State of Hawaii, State of California and the Federal agencies. This section highlights, as examples, the larger monitoring programs of the region and briefly presents the major concerns of each group.

Chapter IV is the regional assessment: It contains the major needs and recommendations and their rationale (when given) under the headings of "institutional needs", "management needs", "scientific (research) needs", and "technology needs".

Chapter V contains the summary of three papers presented at the meeting about approaches toward a national monitoring program and the recommendations of the attendees about possible implementation strategies. The approaches of the Swanson-O'Connor and the Segar papers basically rely on the existing and future compliance monitoring programs as a major data source to be used for regional environmental and ecological effects monitoring purposes. The first paper, however, recommends a broad, national surveillance program using sentinel organisms in addition to compliance monitoring. The second paper recommends adding ecology and "ocean climatology" monitoring programs, along with pollutant concentration trend monitoring and selected ecosystems re-

search. The paper by Bascom suggests a departure from existing programs and recommends: (1) establishment of "normal" ecological conditions from the shoreline to 1,000 meters in depth; (2) pollutant source/input identification; (3) monitoring of boundaries of contaminated areas; and (4) establishing long-term time-series measurements of oceanographic characteristics. The paper maintains that such a program designed with the use of advanced technology (satellites, telemetry, etc.) would be more cost-efficient in the long run than the present programs, and would yield the desired results sooner.

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I

Introduction

NOAA and EPA Region IX hosted a regional conference to discuss marine pollution monitoring programs and recommendations for the states of California and Hawaii at Pasadena, Calif., on November 18 through 20, 1980. The meeting was one of six such assemblies held throughout the country during the fall of 1980 and winter, 1981.

Purpose of the conference was to evaluate the status of the marine pollution monitoring activities and to provide the input into the second Federal Plan for Ocean Pollution Research, Development and Monitoring, which is mandated by the National Ocean Pollution Planning Act of 1978, Public Law 95-273. The Federal Plan is intended to present policy guidance in planning and coordination efforts of federal activities related to pollution research, development and monitoring of U.S. Coastal and Great Lakes waters.

The meeting was also intended to provide a sample inventory of the region's monitoring activities and recommended actions. While the meeting made progress toward identifying regional requirements and the major programs, additional efforts will have to be made to obtain an inventory of all programs and program details.

The conference also served as a forum for dialogue between those who attended. Participating in the conference were 79 invitees who represented academia, industry, consulting science and engineering, and local, state and federal agencies.

Objectives of the conference were: (1) to identify the marine pollution monitoring programs of the region; (2) to determine the extent to which current monitoring programs address local and regional ocean pollution problems and information requirements; and (3) to assess the requirements for a region-wide ecosystem monitoring program and discuss options of strategy.

Speakers were asked to address the following topics:

1. What marine pollution monitoring activities are conducted in the region?
2. Who are the users of the monitoring data and how do they use it?
3. Are monitoring data effectively used in decision making?
4. What are the sources of funding for the programs?
5. What new monitoring activities are necessary to address local and regional marine pollution problems, needs and priorities?
6. Is there a need for a region-wide ecosystem monitoring program?
7. How can current monitoring activities be incorporated into a region-wide ecosystem monitoring program?
8. What is a reasonable cost-effective way of designing a rational region-wide ecosystem monitoring program?
9. What roles should NOAA, EPA and other federal, state and local agencies play in support of regional monitoring activities?

Format of the meeting was designed to allow providers and users of monitoring data to present a synopsis of their role in Region IX monitoring activities and to make recommendations. Each presentation was followed by open discussion of attendees. Program examples were outlined by representatives of local agencies, the states of California and Hawaii, industry and federal agencies. Recommendations were not given priorities nor were they intended to represent concensus opinion of conference participants.

The meeting opened with presentations from the first Federal Plan for Ocean Pollution Research, Development and Monitoring, Fiscal Years 1979-'83; specifically from the Interagency Monitoring Subcommittee report. The report identified five areas of monitoring: pollutant source monitoring; receiving water, local ecosystem monitoring; food resource/public health monitoring; hazardous substance spills monitoring; and regional ecosystem monitoring.

In order for attendees of the Southwest Region workshop to approach workshop goals from a joint perspective, a number of terms were also defined from the subcommittee report:

Monitoring was defined as the systematic time-series observations of predetermined pollutants or pertinent components of the marine ecosystem over a length of time that is sufficient to determine the (1) existing level, (2) trend, and (3) natural variations of the measured parameters in the water column, sediments or biota.

Research was defined as a search for fundamental understanding of the environment, its processes, and its chemical and biological interactions.

Recommendations of the monitoring subcommittee include:

1. There is a need for an inventory of private, local and state agency monitoring activities for more effective planning at the federal level.
2. Monitoring data should be shared and analyzed by users, perhaps through regional data banks.
3. Existing data should be converted to a form more useful for making management decisions.
4. A national monitoring program should be developed which is based on regional input.

Another presentation touched on aspects of the West Coast Region Conference report of marine pollution problems, held in June of 1980 in Portland, Ore. While the express purpose of the Portland conference was to identify the region's significant marine pollution problems, define information needs and recommend priorities for the Federal Plan, several recommendations relating to monitoring were issued:

The recommendations include:

1. Monitoring should be done with an ecosystem approach rather than with only a few parameters.

2. The effects of industrial waste should be monitored.
3. Techniques and methods of data collection should be standardized.
4. Existing data should be utilized whenever possible.
5. Regional libraries should be established where reports and data are stored.
6. Marine and coastal areas need continuous monitoring and assessment.
7. Current monitoring programs should be periodically reviewed and analyzed for effectiveness.
8. Monitoring studies should include the effects of freshwater runoff on marine environments.

The Southwest Region conference was organized through a joint effort of the Environmental Protection Agency Region IX Office and the Office of Marine Pollution Assessment of the National Oceanic and Atmospheric Administration, which also sponsored this report.

II

Consolidated Results

Throughout the three-day workshop, participants identified more than 75 individual needs related to marine pollution monitoring. The majority of those needs relate to specific monitoring programs or methodologies. Other, more generalized, needs regarding monitoring were also stated.

The stated needs were not given priorities nor did they, in most cases, represent concensus opinion of workshop participants.

Certain issues and recommendations, however, were given strong support by a large number of those present. That is to say, several statements of needs concerning marine pollution monitoring in general were voiced by more than one workshop participant. Those that appeared to have received strong endorsement are listed here. These recommendations could be considered the key findings of the workshop:

A coordinating body should be established to investigate methods, evaluate data, identify agency activities and evaluate new needs of monitoring. It should also assure productive, nonduplicating programs which will provide bases for sound management decisions.

Standardization, intercalibration and quality control of monitoring data collection and analyses procedures should be investigated. Participants made the point that an apparent weakness of monitoring programs is the lack of standardized methods or procedures.

Evaluation of the current compliance monitoring programs is needed to determine their responsiveness to current management needs. It was recommended that such reviews should be based on the utility of monitoring data. Participants believed that all concerned organizations would benefit from this periodic reassessment.

Ad hoc committees representing agencies and industry should be established to identify specific monitoring objectives and make recommendations to appropriate federal agencies.

An ad hoc committee, which would evaluate the need for improved, more cost-effective sampling, analysis, technology, etc., should be established.

A regional data and information center should be established that would archive and disseminate data and would serve also as a data and information referral center.

III

Monitoring Program Examples

The main body of the Southwest Region conference consisted of presentations followed with discussions by representatives of local agencies, industry, state and federal agencies. The following contains selected examples and summaries of these presentations; for details see Appendix D.

A. Local Agency Program Examples

In addition to the examples which follow, workshop presentations were made by representatives of the Aquatic Habitat Program in the San Francisco Bay area and the Southern California Coastal Water Research Project (SCCWRP).

1. Orange County Sanitation Districts

The Orange County Sanitation Districts have been monitoring the ocean to assess wastewater impacts for 20 years. Initial monitoring consisted of sampling near the outfall for coliform bacteria, suspended solids, surface grease and total sediment nitrogen. The program was expanded in 1969 to include benthic trawling and was further expanded in 1974.

The present marine monitoring program consists of water quality sampling, sediment sampling, benthic trawling and rig fishing.

When the field work is completed, the organisms identified and the samples analyzed, a quarterly report is prepared for the regulatory agencies. The districts also prepare an annual report which summarizes and interprets all data from the reporting period. This report is submitted to the Regional Board which reviews it and then meets with district's staff to evaluate the monitoring program and discuss modifications.

2. Los Angeles County Sanitation Districts

The Los Angeles County Sanitation Districts operate a large regional system providing sewage treatment for some four million people, as well as related industry and commerce. The district's control plant has a 385 million gallons per day (mgd) capacity advanced primary treatment facility that discharges advanced primary effluent and centrate from sludge into the Pacific Ocean through two submarine outfalls located two miles offshore. Discharge depths are between 160 and 200 feet. Five upstream sewage treatment plants also serve the regional system, providing over 100 mgd of tertiary treatment capacity.

The district's ocean monitoring program is twofold. The agency is one of the sponsors of the Southern California Coastal Water Resource Project (SCCWRP), which is intended to provide information on the impact of wastewater discharges into the Southern California Bight.

In addition, the districts have carried out an extensive and intensive compliance monitoring program over the past decade as specified in permits issued by the California Regional Water Quality Control Board, Los Angeles District. The district's efforts include chemical and bacteriological water quality monitoring, benthic biological and finfish trawls, scuba diving observations in shallow waters, and a variety of special programs of short or long term in oceanography, ecology, public health, recreational use and other areas potentially affected by wastewater discharge.

Monitoring Concerns

Local agency program participants identified several needs relating to marine pollution monitoring. Two items appeared to receive the endorsement of a large number of participants. First, a coordinated region-wide assessment is needed to investigate methods, evaluate data, monitor activities and evaluate needs of monitoring agencies. The assessment should be evaluated annually. Second, a regional data and information center should be established.

Other items of need are: (1) a coordinating body within the region to assure productive nonduplicating programs which will provide bases for sound management decisions; (2) ad hoc committees representing agencies and industries to identify specific monitoring objectives and make recommendations to appropriate federal agencies.

B. State of California Program Examples

In addition to those presentations summarized here, a representative of the California Department of Health Services outlined the department's responsibilities for the monitoring of shellfish bed bacteria levels.

1. State Water Resources Control Board and Regional Water Quality Control Boards

The State Water Resources Control Board and the Regional Water Quality Control Boards are the agencies with primary responsibility for water quality control in California. Two state-wide marine monitoring programs are currently in effect. They are the National Pollutant Discharge Elimination System (NPDES) discharger monitoring and the State Board's Marine Monitoring Program.

(1) The NPDES discharger monitoring is conducted as a regional activity by the regional boards. Although the individual discharger monitoring programs have many features in common based on state-wide policies, they are administered and enforced at the regional level.

(2) The State Board's Marine Monitoring Program was developed to meet state-wide monitoring needs related to the board's policies and plans, such as the Ocean Plan and the Bays and Estuaries Policy, as well as provisions of the Porter-Cologne Water Quality Control Act and the Federal Water Pollution Control Acts.

Objectives of the program are: (a) to provide the state with a system to document and assess long-term trends in selected indicators of the quality of coastal marine and estuarine waters, and (b) to inventory and evaluate past and present monitoring activity in marine/estuarine areas aimed at avoiding duplication of monitoring activity. This inventory was published in October, 1976.

The two-part program consists of the California Mussel Watch and Areas of Special Biological Significance (ASBS) reconnaissance surveys. The Department of Fish and Game conducts both projects as the prime contractor, but secures technical assistance from a number of specialists.

The ASBS surveys were begun to provide preliminary information about the relative ecological health of the 34 areas designated under provisions of the board's Ocean Plan. Nearly all of the 30 surveys completed to date were performed by marine scientists from academic marine institutions.

2. California State Mussel Watch

The California State Mussel Watch is directed by the State Water Resources Control Board and conducted by the Department of Fish and Game, in conjunction with consultants from Moss Landing Marine Laboratories and the Bodega Bay Institute of Pollution Ecology.

Mussels are particularly suitable pollutant indicators as they are sessile in nature as adults, and they accumulate contaminants in tissues to levels considerably higher than sea water.

The State Mussel Watch is modeled after the National Mussel Watch. Like the national program, the State Mussel Watch concentrates on high-quality data collection from the point of sample site selection and collection through handling, preparation, analyses and data interpretation.

The State Mussel Watch monitors the same pollutants as the National program with the exception of the radionuclides. The National Mussel Watch concentrates on areas of suspected water quality problems, while the state program is directed toward areas not directly affected by point source discharge. Emphasis for the past two years has been placed on the identification of point source discharge and their effects on marine biota.

Of the 28 principal problems and 27 information needs in marine waste disposal identified at the NOAA West Coast Region Conference on Marine Pollution Problems held in June of 1980, State Mussel Watch and related studies

will be addressing the following high priority issues:

a. diseases and health of fish and shellfish
b. marine food webs, toxic substances, biomagnification
c. regional differences in capacity to assimilate wastes
d. improve ecological monitoring techniques
e. hazardous materials storage and detection
f. petroleum impacts from oil spills or chronic discharge
g. effects of dredged spoils

Monitoring Concerns

State of California program representatives recommended that standardization and other methods of monitoring procedures should be investigated, and that monitoring data and reports should be placed in regional libraries. The need to use and analyze existing data in conducting marine pollution monitoring programs was also expressed. Participants also recommended that monitoring should be conducted with an ecosystem approach.

C. State of Hawaii Program Examples

Local agencies conducting monitoring research in the State of Hawaii are principally the University of Hawaii, Water Resources Research Center, Hawaii Institute of Marine Biology and other units of the University of Hawaii. In addition, the U.S. Navy conducts occasional investigations of its own.

During the past nine years, monitoring research in Hawaii has (1) evaluated some existing and identified new pollution indicators, (2) established some survey techniques, (3) surveyed and evaluated major pollution impact sources, and (4) identified and evaluated some important environmental factors.

1. Ocean outfall monitoring program--The City and County of Honolulu have monitored their ocean outfalls since 1972. The program has four basic objectives:

a. The conventional parameters, such as BOD, TSS, pH, bioassay, are monitored to determine compliance with the NPDES permit values.
b. The 129 priority pollutants and six pesticides identified by the EPA are measured and if any are present, the possible sources are investigated. Both industrial and nonindustrial (commercial and residential) areas are included in the surveys.
c. The physical, chemical and microbiological parameters are monitored at selected stations in the receiving waters to determine compliance with the federal zone of initial dilution (ZID) and state zone of mixing (ZM) conditions.
d. The benthic flora and fauna communities and phytoplankton, zooplankton and larval fish populations are surveyed to determine biostimulatory or inhibitory effects of the discharges.

A city staff of 22 engineers, laboratory specialists and inspectors, along with numerous scientific consultants, are required to conduct the program at a cost of about $500,000 annually or 3 per cent of the total operating cost.

2. Ambient water monitoring program--Water quality monitoring performed by the Hawaii State Department of Health is part of the regulatory program supported by EPA grants to the state. The Department of Health has developed capabilities to meet the needs of National Pollutant Discharge Elimination System (NPDES) and ambient water monitoring program in compliance with state and federal laws.

The Department of Health maintains approximately sixty fixed monitoring stations located throughout most beaches, coastal shorelines and embayments of the state. The stations are continuously monitored throughout the year to reflect a well-defined history of water quality conditions.

The monitoring provides data and information on physical, chemical and biological properties of water quality. Water monitoring data are used to describe existing conditions, evaluate trends, review enforcement and control programs, and assess problems of nonpoint source pollution, including environmental impacts of land-based activities.

The overall objective for the program is to provide data and information necessary to maintain an understanding of water quality, including its causes and effects of such quality.

The monitoring covers water quality paramenters in the State Water Quality Standards. The paramenters currently monitored on a monthly or quarterly basis are microbiological and physicochemical. Biota are monitored annually at selected stations.

Special water quality investigations or intensive surveys are conducted as part of the water quality monitoring program.

The state's water monitoring program utilizes a computerized water data file referred to as STORET. Water quality violations, station location and indexing, station data and water quality inventory, and water quality statistics are some of the retrievals provided by the system.

The EPA and the Pollution Investigation and Enforcement Branch of the Department of Health are the main users of the water quality data generated from the monitoring programs. Water quality monitoring information is also made available to individuals, private consultants and other government agencies.

Monitoring Concerns

State of Hawaii program participants called for the establishment of a regional information and deposition center. Also of importance to the Hawaii

contingent was the establishment of marine water quality criteria which can be applied to the ecosystems of Hawaii and the Pacific Islands. Because their ecosystems differ substantially from the coastal environment of the continental shelf and because of the vastness of the area, Hawaii representatives recommended that the Hawaiian and Pacific Islands be designated a separate region or subregion.

D. Industry Program Examples

Industry program presentations, in addition to those outlined below, were made by representatives of the University of California's Hancock Foundation, Southern California Edison Company, the King Harbor Studies, Interstate Electronics and Dames and Moore.

1. Atlantic Richfield Company

Through continued operation, through growth and expansion of facilities, and by exploration and development of natural resources, the energy industries impact the environment in different ways. New technology brings new kinds of impacts to the environment, many of which were unknown a few years ago. Increases in the volume of goods and services, resulting from increased demand, expand the magnitude of environmental impacts.

The major environmental concerns within the petroleum refining industry cover all areas of the pollution impact problem, including air and water quality, land use, waste disposal, air emissions, waste disposal, effluent discharges, social and economic impacts and aesthetic considerations.

In response to federal, state and local regulations, ARCO's operations are monitored for change and impact. Biological and chemical monitoring programs are now in effect or have been completed at ARCO's refineries. Bioassay monitoring is done twice a year. A program to monitor effects of a large water intake and discharge facility in Alaska is being developed. Air quality is monitored at various ARCO facilities.

2. Kelco Division of Merck and Company

Since it depends upon kelp for the production of many of its products, Kelco is necessarily concerned about programs designed to monitor pollutants in the nearshore California waters where the company harvests. Presently, Kelco conducts a monitoring program in the Point Loma area which is designed to: (1) provide environmental information for its restoration program; (2) predict wet kelp supplies; and (3) detect long-term changes in kelp standing stocks.

Monitoring Concerns

Industry representatives stressed that both the regulator and the complier should agree on the objectives of a monitoring program, that monitoring regulations should take into account different ecologies, and that the regulator recognize and use the expertise within industry. Also pointed out was the need for a regional data bank which would make possible specific comparisons as well as linkages between some computer data base systems.

E. Federal Program Examples

Presentations other than those summarized below were mady by representatives of the National Park Service and the Food and Drug Administration.

1. Environmental Protection Agency

The Environmental Protection Agency (EPA) Region IX is presently involved in the following long-term, fixed-station monitoring of the marine environment:

a. Basic water monitoring program--The EPA conducts sampling of nine marine sites in Hawaii and three marine sites in Guam on a regular basis. Parametric coverage includes water temperature, turbidity, dissolved oxygen, pH, salinity, total residue, total nitrogen, total amonia, total coliform, fecal coliform and total phosphorus. Site selections are negotiated with the states and collection of samples is performed by the states. The program, funded by EPA, is a component of the federal network for assessing national water quality.

b. California Mussel Watch--This program is summarized in State of California Program Examples.

c. National Pollution Discharge Elimination System (NPDES) permit monitoring--Pursuant to specific discharge permits, individual point source dischargers must monitor and report to the agency delegated by the EPA to enforce permit requirements. This monitoring is the responsibility of the dischargers, such as waste water treatment plants, power plants and industry, etc. The EPA performs oversight compliance monitoring and inspections only.

d. Section 301(h) regulations--The EPA is now reviewing applications for modification of secondary treatment for discharges into marine waters. The regulations require:

(1) compliance with applicable water quality standards
(2) the protection of a balanced indigenous population
(3) establishment of a monitoring system by the discharger
(4) a toxics control program.

In addition to the preceding long-term monitoring, the EPA conducts short-term and/or reaction oriented monitoring. Examples of this are programs performed by the research ship Antelope and six surveys of radioactive waste dumping sites off the Farrallon Islands conducted from 1974 to 1978.

2. Bureau of Land Management

The Bureau of Land Management (BLM) is the federal agency within the Department of Interior responsible for managing and leasing marine minerals in the federal outer continental shelf (OCS).

The Pacific OCS Office presently has no monitoring program funded. But the office has proposed several offshore rig monitoring studies in the FY 1982 Environmental Studies Plan. The offshore meteorological buoys being placed off the California Coast are being funded by the Pacific OCS Office for a three-year period.

The Pacific OCS Office concerns about monitoring studies in this region relate to the effects of OCS oil and gas development on the marine and coastal environments. Potential impacts that could be investigated in a monitoring program include OCS platform discharges, physical and human disturbances from OCS development activities, and the long-term effects of chronic and accidental oil spills.

3. NOAA/National Ocean Survey

The National Ocean Survey (NOS), a component of NOAA, has several programs that provide information for marine monitoring.

Nautical Charting Program--The NOS is responsible for the production and up-to-date maintenance of nautical charts of the U.S. coastal waters. The basic purpose of these charts is for navigation of maritime commerce. The base data, however, is available for other uses. The shoreline has been mapped continuously since the mid-1800s, which provides information about shoreline changes over a long period of time.

National Tide and Water Level Observation Network--Operated and maintained by the NOS, this network consists of about 200 long-term, tide-water level stations, with about 50 of these stations in the Great Lakes. These stations record the water level on a continuous basis, and from this information tidal data is computed and referenced to tidal bench marks. Surface temperature and density are also recorded at these stations. Many of the stations have been in operation since the late 1800s. The information is also used to produce the tide prediction tables.

Tidal Current Surveys--The NOS is also responsible for conducting tidal current surveys. A primary use of the data is the production of tidal current charts for navigation and for the publication of the tidal current prediction tables. This information, however, has many other uses.

The NOS also scheduled for completion by the end of 1980 a comprehensive circulatory survey of San Francisco Bay.

4. U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers is involved in three aspects of monitoring the marine environment.

a. Regulatory--This aspect of COE monitoring relates to the issuance of permits.

b. Specific Projects of Studies--Examples of the COE's specific marine monitoring projects are:

(1) dredging
(2) San Francisco Bay Prototype Data Acquisition which is intended to lead to a better understanding of the Bay and model verification
(3) Humbolt Harbor and Bay Project which involves mapping and evaluation of the wetland
(4) Noyo River and Harbor Project which monitors entrance conditions.

c. Special Programs

(1) The California Data Collection Program involves the collection of wave data in cooperation with Scripps, the State of California and NOAA. Beach profiling and the LEO visual observation project are other components of the California Program.
(2) Remote Sensing Manual

Monitoring Concerns

Federal program participants echoed the need for a central depository of regionally developed marine pollution data. Monitoring programs should be designed with the involvement of regulatory decision makers to define the most appropriate objectives and questions to be answered. Participants also stressed that products and progress reports of any marine monitoring program should result in feedback in the proper form to appropriate decision makers and regulators. In addition, participants recommended the application of a region-wide ecosystem approach to monitoring.

IV

Regional Assessment

The Southwest Region workshop resulted in more than 75 recommendations relating to problems, needs and strategies for improvement of marine pollution monitoring programs and techniques. Those recommendations which addressed marine pollution monitoring in general are highlighted here. To relate the recommendations to specific elements of pollution monitoring, they are grouped below according to their institutional, managerial, scientific and technological aspects. For more detail, refer to Appendix D.

A. Institutional

The following recommendations relate to institutional elements of marine pollution monitoring programs.

A coordinating body should be established within the region to assure nonduplicating programs which will provide bases for sound management decisions. It should also provide region-wide assessments to investigate methods, evaluate data, maintain awareness of agency activities, and evaluate needs of monitoring agencies with an annual update.

Ad hoc committees representing agencies and industry should be established to identify specific monitoring objectives and make recommendations to appropriate federal agencies. It is important to the coordination of monitoring programs and to the quality of data collection and analysis that both the regulator and the complier agree to and understand specific monitoring objectives.

An ad hoc committee should be established to evaluate the need for improved sampling, analysis, technology, etc., which could be more cost-effective.

A regional data and information referal/dissemination center should be established. Participants recognized that a vast amount of monitoring information is spread throughout the region and is difficult to locate.

B. Management

Participants issued the following recommendations relating to management aspects of monitoring.

Standardization, intercalibration and quality control methods of monitoring procedures should be investigated. A stated weakness of local agency monitoring programs is the lack of procedure or method standardization. Presently it is difficult for those unfamiliar with agency programs to compare information.

Regulatory agencies need to recognize regional differences when setting regulations. Differing ecologies should preclude the writing and application of uniform regulations.

Participants also stated that the current compliance monitoring program should be evaluated to determine responsiveness to current management needs.

C. Science (Research)

Participants also made recommendations regarding the element of science in monitoring.

It was stated that marine water quality criteria should be established which is applicable to individual ecosystems. While there are possibly common transferrable concepts and technologies from one region to another, such data quality control, data and information storage and retrieval systems, there is no substitute for local in-site monitoring and monitoring research tailored to the ecosystems.

Monitoring would be more meaningful if conducted with an ecosystem approach rather than with the measurement of only a few parameters.

Another recommendation was that in any long-term monitoring program, sampling validity and data quality assurance are necessary if the results are to have lasting value.

D. Technology

In general, technology and engineering programs should focus at the present on the improvement of the reliability and care of operations of existing measurement, sampling and analysis systems.

When a national program of monitoring will become operational (that is the long-term technological needs of large agencies and programs of regional and national scope), technology requirements will increase in the areas of automated sampling, telemetry and remote sensing technology.

V

Regional Perspective Toward a National Ocean Pollution Monitoring Program

A major element of the Southwest Region workshop was the discussion of the need for a national ocean pollution monitoring program. Discussion of the need arose throughout the three-day event, and the final agenda item addressed the topic with presentations by advocates of a national program. The following are summaries of the presentations.

A. A Recommended Direction for a National Marine Pollution Monitoring Program--A summary of the paper by R. L. Swanson and Joel S. O'Connor, presented by R. L. Swanson

The presenter pointed out the need for developing a national monitoring philosophy or framework which will lead to a coordinated, effective and economically feasible program. The national program is needed since the country is experiencing an increasing number of socially and economically significant marine environmental problems. The increase points out the need for monitoring coastal waters and pollution sources more effectively and to anticipate such problems so that their adverse impacts might be mitigated.

Monitoring was defined and divided into four categories -- compliance, environmental, ecological and health. In order to identify the changes in the marine environment caused by pollution and the effects of this pollution on people, all categories of monitoring must be undertaken concurrently.

Some of the more important gaps in existing monitoring programs and agency responsibilities appear to be in the areas of environmental and ecological effects monitoring. In general, this void can be classified as marine ecosystem monitoring and this is what needs to be addressed on a national scale.

A national marine ecosystem monitoring program should be designed to: (1) anticipate marine pollution problems before they become acute; (2) assess the changing conditions of coastal marine ecosystems; and (3) predict responses of coastal marine ecosystems to anticipated changes in environmental variables.

The monitoring program should concentrate efforts in nearshore waters, including estuaries and the Great Lakes.

The presenter recommended that the monitoring program be implemented gradually over the coming decade. It will have a national scope with regional ecosystem emphases and specified uses will be identified. To meet the objectives efficiently, effectively and economically, a hierarchial framework is suggested that emphasizes centralized management. This would avoid excessive data collection, and assure useable measurements, intercalibration of equipment, quality assurance of data and uniform and reproducible analyses.

The following is a suggested framework for monitoring:

1. A national overview is obtained through a surveillance technique using sentinel organisms.

2. Regional pollution problems are addressed by "control areas" with compelling monitoring needs.

3. Data from appropriate federal, state and local monitoring programs are incorporated into the data base.

Sentinel techniques to obtain a national overview serve the purpose of identifying emerging problems and identifying potential areas for more intensified "control area" monitoring.

In the control area approach, effects must be tied to the sources. Also, transfer routes must be clearly understood if resource management and pollutant regulation are to be effective. This approach addresses changes in contaminant loading, through compliance monitoring and it should detect effects and concentrations of pollutants on the environment. Data collected by the program should be statistically sound and geographically limited.

B. Draft Considerations for a National Ocean Pollution Monitoring Approach
by Douglas Segar

A hierarchical national marine pollution monitoring program is proposed of which the basic strategy is to incorporate information from existing programs where possible and initiate new programs only where necessary and justifiable by the expected results.

The national program would consist of a number of separate and distinct regional programs designed around regional needs. The hierarchical program would not subsume existing programs or cause existing programs to be changed in major fashion or eliminated. The important functions of coordination and synthesis of information, however, would be facilitated through regional centers operated as cooperative entities with participation from state and local groups and concerned federal agencies organized through NOAA and its responsibilities under the National Ocean Pollution Planning Act.

The key subprograms of the proposed hierarchical approach are:

1. Existing and future compliance monitoring programs.
2. Pollutant concentration trend monitoring. A limited broad scan analysis program replaced eventually by a sentinel organism program, if and when that technique is perfected.
3. Ecosystem understanding development comprising existing programs of research on major marine ecosystems.
4. Marine ecology monitoring comprising existing resource and habitat surveys and compliance monitoring.
5. Region-wide ecosystem monitoring. A new program limited in scope to determinng major changes in ocean climatology (water mass structure, nutrient chemistry, and basic assessment of phytoplankton community structure) established on a regional basis over a period of 20 to 30 years.

This approach should satisfy the goal of providing sufficient information that the health of the ocean can be maintained through appropriate management of pollution. The program will require only limited additional expenditures of money and trained manpower. Cost savings through making greatest use of some existing programs, particularly compliance monitoring programs, can potentially more than offset such additional expenditures.

The program is aimed at the long-term problem, decades in the future. Undoubtedly, it will not and cannot satisfy all current management information needs. These current needs, however, probably cannot be totally satisfied with any reasonable level of effort. It must be stated that a critical underlying assumption of this program is that the new and largely untested system of environmental law and regulation (including but not limited to marine environmental law) established during the 1970s will, given time, reduce the inputs of pollutants to the oceans, reduce the potential for surprise pollutants and lead to much better knowledge of the inputs that remain. The proposed program is designed to continue to operate beyond the period when these gains will be made and to enable effective management of the ocean as an appropriate resource for the disposal of some of man's wastes.

C. Toward a National Marine Monitoring Program by Willard Bascom

The presenter postulated that a large part of present monitoring programs serves no useful purpose and represents an expensive way to verify that EPA and state standards are met. Moreover, the areas for which data has been obtained are a small part of U. S. coastal waters. And until recently, the methods of taking data/samples and analyzing them were not standardized. Therefore, most of the monitoring data taken to date is not of great value for the long run.

Because of this, the presenter suggests that a national program be addressed to the overall coastline, that it consider future problems, and that it make use of new technology.

The objective of monitoring should be: (1) to determine if human health and/or sea life is threatened by some manmade contaminant or activity, and (2) to develop a long-time data base that can be used for general scientific purposes.

The presenter issues the following recommendations related to implementing a national program:

1. Establish normal conditions and natural variations of animal and plant species, chemical backgrounds, oceanographic factors, etc. This includes variations with time and implies that the measurements continue long enough to include the 11 and 27-year cycles.

   An ecological charting of our coastal waters from high tide to a depth of 1,000 meters that defines the range of normal conditions would be a most

useful first step. This requires a grid of stations related to depth, man's presence, coastal shape, etc. Then, at appropriate intervals, monitoring (repeated checking) for ecological changes could be done.

2. Identify pollutants--The sources of pollutants are generally well known. They include outfalls of all kinds, river and harbor discharges, aerial fallout, etc. The possible pollutants reaching the sea should be identified and quantified in a systematic way. A continuing search for chemicals previously unknown in the environment must be made.

   Natural sources such as oil seeps and runoff from mining areas should be checked occasionally. Also to be checked is the runoff from large agricultural valleys where many chemicals are used to control pests and improve crops.

3. Establish boundaries of contaminants--In areas near presently known sources of contamination, such as outfalls, harbors, certain river discharges, etc., the bottom conditions should be mapped and the distance to background conditions in all directions should be determined. Future monitoring should then be concentrated along that boundary to determine if the contaminated area is shrinking or growing.

4. Some existing time series should be extended and some new time series measurements (which can be related to satelite scans) should be initiated. Examples of these measurements are water temperature, color and clarity, which would serve as a local confirmation of satellite measurements. The measurements should be simple and inexpensive so that they could be continued for scores or hundreds of years.

5. Animals living in areas where pollution is suspected should be measured directly, using modern biochemical methods to determine if they have been damaged. This has the advantage of going directly to the desired answer instead of trying to measure pollutant chemicals and determine their pathways and fates. Then polluted areas can be charted and the offending substances can be identified.

6. A national program must be designed to obtain data about large areas of our coastal waters. This should be done inexpensively using modern techniques of ecological surveying, or searching for new pollutants, of satellite observation and of biochemistry. If properly designed and organized, such a program will cost less than the old-fashioned methods now in general use and will continue for many years.

D. Recommendations Issued by Workshop Participants Relating to Establishment of a Regional Monitoring Program

Following the three presentations, the participants discussed various monitoring options and reached the following general concensus in regard to a regional approach toward a regional monitoring program:

A regional planning group should be formed to determine goals, objectives and usage of a regional monitoring program. The group should be limited to 12 members representing academia, state government science, state government management, Southern California Coastal Water Research Project (SCCWRP), a federal advisory group, municipal dischargers and industry.

Tasks of the group should be to:

1. Define the management of a regional program.
2. Create a data inventory to identify specific sources of existing data.
3. Identify specific users of existing data (a user inventory).
4. Identify an information management system.
5. Define a monitoring program based on California needs.
   a. establish standardization and quality control in:
      (1) sampling
      (2) taxonomy
      (3) chemistry
      (4) testing of personnel and procedures
      (5) preparation of a text of coastal monitoring procedures
      (6) preparation of a set of keys of coastal taxonomy
   b. evaluate critical monitoring needs based on 1980 West Coast Region Conference on Marine Pollution Problems
   c. identify a reasonable regional monitoring station grid, sampling schedule, etc.
   d. schedule future meetings
   e. define a mechanism for output and establish milestones.

Appendix A

Public Law 95-273

Public Law 95-273
95th Congress

An Act

May 8, 1978
[S. 1617]

To establish a program of ocean pollution research, development, and monitoring, and for other purposes.

National Ocean Pollution Research and Development and Monitoring Planning Act of 1978.
33 USC 1701 note.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Ocean Pollution Research and Development and Monitoring Planning Act of 1978".

33 USC 1701.

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds and declares the following:

(1) Man's activities in the marine environment can have a profound short-term and long-term impact on such environment and greatly affect ocean and coastal resources therein.

(2) There is a need to establish a comprehensive Federal plan for ocean pollution research and development and monitoring, with particular attention being given to the inputs, fates, and effects of pollutants in the marine environment.

(3) Man will increasingly be forced to rely on ocean and coastal resources as other resources are depleted. Our ability to protect, preserve, develop, and utilize these ocean and coastal resources is directly related to our understanding of the effects which ocean pollution has upon such resources.

(4) Numerous departments, agencies, and instrumentalities of the Federal Government sponsor, support, or fund activities relating to ocean pollution research and development and monitoring. However, such activities are often uncoordinated and can result in unnecessary duplication.

(5) Better planning and more effective use of available funds, personnel, vessels, facilities, and equipment is the key to effective Federal action regarding ocean pollution research and development and monitoring.

(b) PURPOSES.—It is therefore the purpose of the Congress in this Act—

(1) to establish a comprehensive 5-year plan for Federal ocean pollution research and development and monitoring programs in order to provide planning for, coordination of, and dissemination of information with respect to such programs within the Federal Government;

(2) to develop the necessary base of information to support, and to provide for, the rational, efficient, and equitable utilization, conservation, and development of ocean and coastal resources; and

(3) to designate the National Oceanic and Atmospheric Administration as the lead Federal agency for preparing the plan referred to in paragraph (1) and to require the Administration to carry out a comprehensive program of ocean pollution research and development and monitoring under the plan.

33 USC 1702.

SEC. 3. DEFINITIONS.

As used in this Act, unless the context otherwise requires—

(1) The term "Administration" means the National Oceanic and Atmospheric Administration.

(2) The term "Administrator" means the Administrator of the Administration.

(3) The term "Director" means the Director of the Office of Science and Technology Policy in the Executive Office of the President.

(4) The term "marine environment" means the coastal zone (as defined in section 304(1) of the Coastal Zone Management Act of 1972 (16 U.S.C. 1453(1))); the seabed, subsoil, and waters of the territorial sea of the United States; the waters of any zone over which the United States asserts exclusive fishery management authority; the waters of the high seas; and the seabed and subsoil of and beyond the Outer Continental Shelf.

(5) The term "ocean and coastal resource" has the same meaning as is given such term in section 203(7) of the National Sea Grant Program Act (33 U.S.C. 1122(7)).

(6) The term "ocean pollution" means any short-term or long-term change in the marine environment.

SEC. 4. COMPREHENSIVE FEDERAL PLAN RELATING TO OCEAN POLLUTION.

33 USC 1703.

(a) LEAD AGENCY FOR PLAN.—The Administrator, in consultation with the Director and other appropriate Federal officials having authority over ocean pollution research and development and monitoring programs, shall prepare, in accordance with this section, a comprehensive 5-year plan (hereinafter in this Act referred to as the "Plan") for the overall Federal effort in ocean pollution research and development and monitoring. The Plan shall be prepared and submitted to Congress and the President on or before February 15, 1979, and a revision of the Plan shall be prepared and so submitted by February 15 of each odd-numbered year occurring after 1979.

Responsibility.

Submittal to President and Congress.

(b) CONTENT OF PLAN.—The Plan shall contain, but need not be limited to, the following elements:

(1) ASSESSMENT AND ORDERING OF NATIONAL NEEDS AND PROBLEMS.—The Plan shall—

National priorities.

(A) identify those national needs and problems, which relate to specific aspects of ocean pollution (including, but not limited to, the effects of ocean pollution on the economic, social, and environmental values of ocean and coastal resources), which exist and will arise during the Plan period;

(B) establish the priority, based upon the value and cost of information which can be obtained from specific ocean pollution research and development and monitoring programs and projects, in which such needs should be met, and such problems should be solved, during the Plan period; and

(C) contain, if pursuant to the preparation of any revision of the Plan required under subsection (a) it is determined that any national need or problem or priority set forth in the preceding version of the Plan should be changed, a detailed explanation of the reasons for the change.

(2) EXISTING FEDERAL CAPABILITY.—The Plan shall contain—

Existing Federal capability.

(A) a detailed listing of all existing Federal programs relating to ocean pollution research and development and monitoring (including, but not limited to, general research on marine ecosystems), which listing shall include, with respect to each such program—

(i) a catalogue of the Federal personnel, facilities, vessels and other equipment currently assigned to, or used for, the program, and

(ii) a detailed description of the existing goals and costs of the program, including, but not limited to, a categorical breakdown of the funds currently being expended, and planned to be expended, to conduct the program; and

(B) an analysis of the extent to which each such program, if continued on the basis and at the funding level described pursuant to subparagraph (A)(ii), will assist in meeting the priorities set forth pursuant to paragraph (1)(B) during the Plan period.

(3) POLICY RECOMMENDATIONS.—If it is determined, as a result of the analysis required to be made under paragraph (2)(B), that the priorities set forth pursuant to paragraph (1)(B) will not be adequately met during the Plan period using the existing Federal capability described pursuant to paragraph (2)(A), the Plan shall contain those recommendations for changes in the overall Federal effort in ocean pollution research and development and monitoring which would ensure that those priorities are adequately met during the Plan period. Such recommendations may include, but need not be limited to—

(A) changes in the goals to be achieved under various existing Federal ocean pollution research and development and monitoring programs;

(B) suggested increases and decreases in the funding for any such existing program consistent with the extent to which such program contributes to the meeting of such priorities;

(C) specific proposals for interagency cooperation in cases in which the pooling of the resources of two or more Federal departments, agencies, or instrumentalities under existing programs could further efforts to meet such priorities or would eliminate duplication of effort; and

(D) suggested legislation to establish new Federal programs considered to be necessary if such priorities are to be met.

Budget review.

(4) BUDGET REVIEW.—The Plan shall contain a description of actions taken by the Administrator and the Director to coordinate the budget review process for the purpose of ensuring interagency coordination and cooperation in (A) the carrying out of Federal ocean pollution research and development and monitoring programs; and (B) eliminating unnecessary duplication of effort among such programs.

"Plan Period."

(c) For purposes of this section, the term "Plan period" means—

(1) with respect to the Plan as required to be submitted on February 15, 1979, the period of 5 fiscal years beginning on October 1, 1978; and

(2) with respect to each revision of the Plan, the period of 5 fiscal years beginning on October 1 of the year before the year in which the revision is required to be prepared under subsection (a).

33 USC 1704.

SEC. 5. COMPREHENSIVE OCEAN POLLUTION PROGRAM IN THE ADMINISTRATION.

Establishment.

(a) ESTABLISHMENT OF PROGRAM.—The Administrator shall establish within the Administration a comprehensive, coordinated, and effective ocean pollution research and development and monitoring program. The Administrator shall carry out all projects and activities under the program in a manner consistent with the Plan.

(b) CONTENT OF THE PROGRAM.—The program required to be established under subsection (a) shall include, but not be limited to—

(1) all projects and activities relating to ocean pollution research and development and monitoring for which the Administrator has responsibility under provisions of law (including, but not limited to, title II of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1441-1444)) other than paragraph (2);

(2) such projects and activities addressed to the priorities set forth in the Plan pursuant to section 4(b)(1)(B) that can be appropriately conducted within the Administration; and

(3) the provision of financial assistance under section 6.

SEC. 6. FINANCIAL ASSISTANCE.

33 USC 1705.

(a) GRANTS AND CONTRACTS.—The Administrator may provide financial assistance in the form of grants or contracts for research and development and monitoring projects or activities which are needed to meet priorities set forth in the Plan pursuant to section 4(b)(1)(B), if such priorities are not being adequately addressed by any Federal department, agency, or instrumentality.

Grants and contracts.

(b) APPLICATIONS FOR ASSISTANCE.—Any person, including institutions of higher education and departments, agencies, and instrumentalities of the Federal Government or of any State or political subdivision thereof, may apply for financial assistance under this section for the conduct of projects and activities described in subsection (a), and, in addition, specific proposals may be invited. Each application for financial assistance shall be made in writing in such form and manner, and contain such information, as the Administrator may require. The Administrator may enter into contracts under this section without regard to section 3709 of the Revised Statutes of the United States (41 U.S.C. 5).

Contract authority.

(c) EXISTING PROGRAMS.—The projects and activities supported by grants or contracts made or entered into under this section shall, to the maximum extent practicable, be administered through existing Federal programs (including, but not limited to, the National Sea Grant Program) concerned with ocean pollution research and development and monitoring.

(d) ACTION BY ADMINISTRATOR.—The Administrator shall act upon each application for a grant or contract under this section within six months after the date on which all required information is received by the Administrator from the applicant. Each grant made or contract entered into under this section shall be subject to such terms and conditions as the Secretary deems necessary in order to protect the interests of the United States. The total amount paid pursuant to any such grant or contract may, in the discretion of the Administrator, be up to 100 percent of the total cost of the project or activity involved.

(e) RECORDS.—Each recipient of financial assistance under this section shall keep such records as the Administrator shall prescribe, including records which fully disclose the amount and disposition by such recipient of the proceeds of such assistance, the total cost of the project or activity in connection with which such assistance was given or used, the amount of that portion of the cost of the project or activity which was supplied by other sources, and such other records as will facilitate an effective audit. Such records shall be maintained for three years after the completion of such project or activity. The Administrator and the Comptroller General of the United States, or any of their duly authorized representatives, shall have access, for the purpose of audit and examination, to any books, documents, papers, and

Recordkeeping.

Accessibility.

records of receipts which, in the opinion of the Administrator or of the Comptroller General, may be related or pertinent to such financial assistance.

33 USC 1706.

SEC. 7. INTERAGENCY COOPERATION.

The head of each department, agency, or other instrumentality of the Federal Government which is engaged in or concerned with, or which has authority over, programs relating to ocean pollution research and development and monitoring—

(1) shall cooperate with the Administrator in carrying out the purposes of this Act;

(2) may, upon written request from the Administrator or Director, make available to the Administrator or Director, on a reimbursable basis or otherwise, such personnel (with their consent and without prejudice to their position and rating), services, or facilities as may be necessary to assist the Administrator or the Director to achieve the purposes of this Act; and

(3) shall, upon a written request from the Administrator or Director, furnish such data or other information as the Administrator or Director deems necessary to fulfill the purposes of this Act.

33 USC 1707.

SEC. 8. DISSEMINATION OF INFORMATION.

The Administrator shall ensure that the results, findings, and information regarding ocean pollution research and development and monitoring programs conducted or sponsored by the Federal Government be disseminated in a timely manner, and in useful forms, to relevant departments, agencies, and instrumentalities of the Federal Government, and to other persons having an interest in ocean pollution research and development and monitoring.

33 USC 1708.

SEC. 9. EFFECT ON OTHER LAWS.

Nothing in this Act shall be construed to amend, restrict, or otherwise alter the authority of any Federal department, agency, or instrumentality, under any law, to undertake research and development and monitoring relating to ocean pollution.

33 USC 1709.

SEC. 10. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the Administration for the purposes of carrying out this Act not to exceed $5,000,000 for the fiscal year ending September 30, 1979.

Approved May 8, 1978.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 95-626 pt. 1 (Comm. on Science and Technology) and 95-626 pt. 2 (Comm. on Merchant Marine and Fisheries).

CONGRESSIONAL RECORD:

Vol. 123 (1977): Aug. 3, considered and passed Senate.

Vol. 124 (1978): Feb. 28, considered and passed House, amended.
Apr. 24, Senate agreed to House amendment.

* U. S. GOVERNMENT PRINTING OFFICE : 1980 311-064/8

Appendix B

Workshop Agenda

OVERVIEW OF REGIONAL
MARINE POLLUTION MONITORING REQUIREMENTS
SOUTHWEST REGIONAL MEETING

Huntington-Sheraton Hotel
1401 South Oak Knoll
Pasadena, California 91109

November 18-20, 1980

AGENDA

Tuesday, November 18 — Morning Session

I. INTRODUCTION

8:30 - 9:00 a.m.	Registration
9:00 - 9:15	Welcome; ground rules; logistical details; introduction (Moore)
9:15 - 9:30	Overview of objectives; structure of meeting; products; schedule; follow-up; question/answer period (Peter - MacKenzie)

II. BACKGROUND

9:30 - 9:45	The National Ocean Pollution Planning Act of 1978 (P.L. 95-273); the Second Federal Plan; preparatory activities (Pijanowski)
9:45 - 10:00	Interagency Monitoring Subcommittee Report definitions; definition of monitoring; monitoring vs. research; categories of monitoring; Report recommendations (Peter)
10:00 - 10:30	Coffee Break
10:30 - 10:45	Summary of the Pacific Regional Ocean Pollution Conference (Reish)
10:45 - 11:45	Discussion Period
12:00 - 1:30 p.m.	Lunch Break

Afternoon Session

III. EXAMPLES OF MONITORING CONCERNS

Local Agency Programs
Coordinator and Moderator: A. Mearns

1:30 - 1:40 p.m.	Orange County	(Harper)
1:40 - 1:50	Los Angeles County	(Haydock)
1:50 - 2:00	Aquatic Regional Monitoring	(Sutton)
2:00 - 2:10	SCCWRP Interactions	(Kleppel)
2:10 - 3:00	Discussion Period	
3:00 - 3:30	Coffee Break	

Afternoon Session (Cont)

III. EXAMPLES OF MONITORING CONCERNS (cont)

State of Hawaii Programs
Coordinator and Moderator: L.S. Lau

3:30 - 3:40 p.m.	Local Programs	(Lau)
3:40 - 3:50	City and County of Honolulu	(Richardson)
3:50 - 4:00	State Programs	(Akazawa)
4:00 - 4:45	Discussion Period	
4:45 - 5:00	Summary of day's activities; announcements	(Peter - Moore)

6:00 - 7:00 p.m. No host cocktails
"Attitude Adjustment - Meet Friends"

Wednesday, November 19 Morning Session

III. EXAMPLES OF MONITORING CONCERNS (cont)

Industry Programs
Coordinator and Moderator: D. Soule

9:00 - 9:10 a.m.	USC/Hancock Foundation	(Soule)
9:10 - 9:20	Dames and Moore	(Young)
9:20 - 9:30	KELCO	(Baralotti)
9:30 - 9:40	Atlantic Richfield	(Chamberlin)
9:40 - 10:15	Coffee Break	
10:15 - 11:00	Discussion Period	
11:30 - 1:00	Lunch Break	

Afternoon Session

III. EXAMPLES OF MONITORING CONCERNS (cont)

State of California Programs
Coordinator and Moderator: J. Youngerman

1:00 - 1:10 p.m.	State Water Resources Control Board	(Ladd)
1:10 - 1:20	Department of Fish and Game	(Martin)
1:20 - 1:30	Department of Health Services	(Mahoney)
1:30 - 2:30	Discussion Period	
2:30 - 3:00	Coffee Break	

Afternoon Session (cont)

III. EXAMPLES OF MONITORING CONCERNS (cont)

Federal Agency Programs
Coordinator and Moderator: J. Lopp

3:00 - 3:10	Environmental Protection Agency	(Lopp)
3:10 - 3:20	Corps of Engineers	(Sustar)
3:20 - 3:40	Food and Drug Administration	(Alton)
3:40 - 3:50	National Park Service	(Kolipinski)
3:50 - 4:30	Discussion Period	
4:30 - 5:00	Summary of day's activities; organization of groups to assist in the preparation of summaries	(Peter - Moore)

8:00 - 10:00 p.m. Meeting of groups preparing summaries

Thursday, November 20 Morning Session

III EXAMPLES OF MONITORING CONCERNS (cont)

8:30 - 9:20 a.m.	Presentation of Summary reports	(Group coordinators)
9:20 - 9:45	Discussion Period	
9:45 - 10:00	Coffee Break	

IV. REGION-WIDE ECOSYSTEM MONITORING APPROACHES

Moderator: D. Segar

10:00 - 10:20 a.m.	An approach to a national monitoring program	(Swanson)
10:20 - 10:40	Experiences with marine pollution monitoring at SCCWRP	(Bascom)
10:40 - 12:00	Discussion Period	
12:00 - 12:30	Meeting Overview; action items; acknowledgements	(Peter - Moore)
12:30	Adjourn	

Appendix C

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Appendix D

Program Reports,
Letters

EXAMPLES OF MONITORING CONCERNS

Industry Programs

In a decade of environmental control, the programs mandated for marine monitoring that have been carried out by industry have varied widely in their scopes in time, space and in parameters selected.

Two general categories of required monitoring for compliance have been required:

1) Monitoring to obtain and maintain NPDES permits for effluents,
2) Monitoring for preparation of federal Environmental Impact Statements (EIR Reports in California),

A third category of monitoring may be considered as:

3) Episode-related monitoring.

The requirements for NPDES permits vary radically, even within a single EPA Region, since permits are issued at different times, to differing agencies and industries, with differing considerations of effluent quality, quantity and cost-benefit relations.

NPDES Permits

The principal characteristic of NPDES permits is that they represent technology-based standards for attaining a given set of values for specific parameters at the mouth of a pipe. Initially, a baseline survey of the presumed area of impact may be carried out, but the parameters measured may or may not be well selected to evaluate the living environment or ecosystem. Compliance monitoring to maintain a permit may be very limited in scope, or may be very extensive. Such studies for power plants, for example, may provide the only long-term monitoring in an extensive coastal area.

It is unfortunate that in the early years of NPDES permitting, monitoring criteria were sometimes selected that may have been appropriate to freshwater streams but were not appropriate to the marine environment. When obvious degradation of habitat occurred in spite of permit limitations, EPA turned to mandating increasing levels of in-plant technology without regard to the need for, nor the benefits of, the hardware in relation to the ecosystem of the receiving waters.

There will be a reassessment of this approach within the next five years, largely because of the escalating costs of technology which industry and the public are unable to bear. It is therefore important that necessary revisions in the approaches be made.

The EIS Process

Baseline surveys for obtaining EIS/EIR permits for construction in the coastal zone have produced studies of widely varying quality and scope. Some industries, and public agencies have made concerted efforts to monitor intensively and to take the ecosystems approach, while others have carried out studies that were incompetently done, trivial, or too limited in scope. Such studies could expand the data base for an area, if measurements and data were compatible with ongoing studies, and the quality of the work were verifiable.

Episode Monitoring

Some of the most expensive and least productive monitoring has been carried out on highly visible major oil spills such as the ARGO Merchant. There is usually no baseline at a spill site, and the emergency mobilization of funds, experts, equipment, and monitoring protocol does not lead to the best use of available resources. Industry is particularly constrained by liability considerations and corporate chains-of-command in getting studies of accident sites initiated quickly enough to determine immediate impacts. Contingency plans and systems of mobilization must be refined.

Conclusions

Baseline monitoring systems should be developed which would cover large areas on a regular basis at least seasonally.

The site-specific, long-term requirements for industry, associated with NPDES permits, could then be integrated into the baseline system, to cover smaller areas more intensively, as well as to monitor the particular components related to the individual effluents.

If these systems were in place, the assessing of impacts of episodes such as spills would have some meaning when evaluated against the baseline.

If such an approach were in place, costs would be borne in part by the integration of required monitoring programs for existing private industries and public agencies as well.

The further steps to the understanding of either ecosystems or public health impacts will require systems research, laboratory research, and field study with both basic and applied approaches.

A national data bank may not be cost effective, but compatibility of data recording would make possible specific comparisons as well as linkages between some computer data base systems.

Pacific Regional Ocean Pollution Conference
Summary Discussion

Donald J. Reish
Dept. of Biology, California State University, Long Beach
Long Beach, California

Workshops were held in Portland, Oregon, in 1978 and 1980 as mandated by the National Ocean Pollution Research and Development Act of 1978. Representatives from various levels of government, academia, and industry came from California, Hawaii, Oregon, and Washington to discuss marine environmental problems of these geographical regions. The work party was charged with identifying the significant marine pollution problems, defining informational needs, and recommending priorities including the rationale for such recommendations. The work party was divided into groups on the basis of geographical region and type of environmental problem. Thus, a particular problem could be considered by the group concerned with a specific environmental problem as well as by one or more of the geographical groups.

It was obvious that with such a wide variety of environments represented from the rain-forested areas of the Northwest to dry, heavily populated Southern California to the insular, tropical climates of Hawaii and the Pacific Islands that many environmental problems were discussed. The focus of this meeting was the environmental problems of California, Hawaii and the Pacific Islands. In Southern California the major concern was on particular pollutants, that is, petroleum activities, municipal waste discharges, dredging and disposing activities, ocean dump sites, habitat modification, and non-biodegradable industrial wastes. The major concern of groups representing Hawaii and the Pacific Islands were by-in-large centered around applying and modifying Mainland techniques and standards to the insular environments as well as the need for greater understanding of unique environmental conditions such as water movement characteristics and coral reef protection.

While the meeting in Portland was not concerned with monitoring, many problems relating to monitoring were discussed. Specific items discussed include the following:

(1) Monitoring should use an ecosystem approach rather than be concerned with only a few parameters.
(2) The marine and coastal environment should be subjected to continual monitoring and accessment. The methods employed in collecting the data should be examined and evaluated periodically to determine whether or not they are providing the necessary data.
(3) Standardization of methods and techniques of gathering the data should be accomplished whenever possible.

(4) Existing data should be utilized whenever possible.
(5) Monitoring studies should include the effects of fresh water run-off and industrial washes on the marine environment.
(6) Regional libraries should be established where reports and data are stored.

General discussions of the entire working party demonstrated that these diverse geographical areas do have environmental problems in common, but perhaps more important was the realization that each area has unique situations. These discussions also demonstrated the importance of regional input in studying a national problem. Any attempt to set national policy with regards to marine environmental matters must have representatives from all geographical areas because no one individual nor small committee has the expertise or experience to make these decisions on a nation-wide basis.

REGIONAL POLLUTION MONITORING IN THE SAN FRANCISCO BAY AREA

James E. Sutton, Assistant Project Director, Management,
Aquatic Habitat Program, 1839 Ninth Street, Alameda, CA 94501

Pollution monitoring in the San Francisco Bay area has developed through several stages, from an original position of totally ignoring the problem to the present watershed-wide concern. Along the way, dischargers have at first been concerned with only the small world at the end of their pipes, and self-monitoring was begun about 1956. Many of the smaller plants and outfalls have subsequently been combined, but monitoring was still limited to specific portions of the bay, even though the receiving waters overlapped these separate districts. Today the entire Bay is recognized as a hydrographic and ecological unit, and there is some movement to a true estuarine approach: recognizing the interdependence of the Bay, the Sacramento-San Joaquin Delta, and the whole Central Valley watershed.

Most regional monitoring is still performed by the dischargers, of which there are about 80 major dischargers in the Bay, plus many smaller dischargers. The data collected are used primarily for determination of compliance to standards, and then are filed away. Thus the monitoring is still primarily on a district, rather than a Bay-wide basis.

The Aquatic Habitat Program was developed by the combined efforts of the State Water Resources Control Board, the San Francisco Regional Water Quality Control Board, and the Association of Bay Area Governments in order to study and monitor the Bay as a whole, over a long term, in a co-ordinated and consistent manner. The scientific studies are being undertaken by the Sanitary Engineering Research Laboratory of the University of California, Berkeley, while the management portion has been awarded to Jefferson Associates, Inc. of San Francisco and to myself.

The program has several goals, including some which have been mentioned several times at the workshop. These included: examination of biological processes in the Bay; standardization of techniques; and since standard techniques are only as good as the person performing them, a quality assurance program. The overall goal of the program is to develop a Master Plan for monitoring of the entire Bay, including the following aspects:

1) identification of pollution sources;
2) development of a monitoring program to assess the Bay habitat, including present and potential problems;
3) establishment of research priorities and the economic feasibility to accomplish these priorities;
4) development of long-term funding.

The key to the program is long-term funding. Because the Bay is the only major estuary on the west coast, and because it is subject to such extremes of conditions compared to non-estuarine situations, the baseline must be developed and monitored over a comparatively long period of time. A federal grant-type commitment to the Program is most appropriate to assure an adequate development of the program and the ecological and hydrographic data base required.

San Francisco Bay has several attributes which make it particularly suitable for a regional monitoring program. The Bay is enclosed and relatively protected, making survey work possible in weather unsuitable to offshore surveys, and smaller vessels can be employed, significantly reducing ship costs. The presence of the U. S. Army Corps of Engineers physical model at Sausalito provides a unique testing and reference facility. The extensive invertebrate collections at the California Academy of Sciences provide an important faunal record of Bay fauna going back beyond the year of the U.S.S. Albatross (1912-1913).

Monitoring of San Francisco Bay on a regional basis takes on added importance with the planned construction of the Peripheral Canal around the Delta, and resultant further diversions of water from the Delta and Bay. The Aquatic Habitat Program will be a leading agency in the development of region-wide monitoring for the Bay.

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27 January 1981

Dr. Harvey L. Moore
Marine Pollution Monitoring Workshop
Extension Hall 307
Oregon State University
Corvallis, Oregon 97331

Dear Dr. Moore:

Allan Mearns urged me to contact you regarding the Marine Pollution Monitoring Workshop and my potential (belated) contribution.

Enclosed is a brief description of a 26-month ichthyoplankton survey conducted in the nearshore California bight by USC.

I hope this information is useful.

Sincerely,

Gary D. Brewer, Ph.D.

Ichthyoplankton Coastal and Harbor Studies Program

The Institute for Marine and Coastal Studies of the University of Southern California began a survey in June 1978 designed to assess the species occurrence, abundance, and the spatial and temporal distribution of fish eggs and larvae (ichthyoplankton) in the nearshore southern California bight. A primary goal of the project is to determine the significance of shallow coastal habitats between Pt. Conception and San Diego as spawning and nursery grounds for marine fishes.

The project, entitled Ichthyoplankton Coastal and Harbor Studies (ICHS), was designed as a cooperative effort among federal, state, university, and industrial interests to uncover details of the early life history of fishes. Such inforamtion is essential for fishery management, but we have also emphasized the importance of the data for impact analyses associated with thermal and chemical waste discharge and coastal zone construction, as well as overall plankton ecosystem analyses.

We have been convinced since the project's inception that unique environmental conditions are found in the nearshore waters. We have also recognized the need to link the nearshore phenomena with broad-scale oceanographic features if we hope to understand the dynamics of nearshore plankton. Hence, our collection techniques were designed to complement and supplement the offshore California Cooperative Oceanic Fisheries Investigajtions (CalCOFI) surveys. We plan to compare and contrast nearshore data on ichthyoplankton with data colected offshore by CalCOFI.

The initial phases of the ICHS program were funded by Southern California Edison and the NOAA Sea Grant Program (includes state funds). These efforts included 26 consecutive monthly sampling periods (June 1978-July 1980) when over 3500 plankton samples were collected along isobaths of 8, 15, 22, and 36-m along transects off southern California (Figure 1). In addition to the planton sampling, which included both oblique tows from the bottom to the surface and discrete neuston, middepth, and epibenthic tows, a variety of other oceanographic data were recorded (Figure 2).

Three dimensional graphics, principal components and factor analyses, and standard parametric and non-parametric statistics will be used to assess temporal and spatial patterns in the biological data and abiotic correlations.

As of January 1981, only a portion of the collection has been sorted and identified for ichthyoplankton; data reporting has been preliminary (Brewer et al. 1978, 1979ab, 1980). We are seeking additional funds to complete the 26-month ichthyoplankton data base according to the priorities indicated (Tables 1A,1B). Completion of priorities 1 and 2 would enable the ICHS project to acheive our overall groal of assessing the importance of developed and undeveloped nearshore habitats in southern California as resources for the larvae of coastal marine fishes.

The fish eggs and larvae generally comprise only a small portion of the zooplankton captured by our nets. We have not had the resources to identify and enumerate the non-fish components, despite the importance of these organisms in the dynamics of the ecosystem. A secondary goal of the ICHS program is to analyze the zooplankton in the nearshore southern California bight; funds are being sought for these efforts.

The broad temporal and geographical extent of our nearshore data and the proximity of some ICHS stations to outfalls and various disturbed and undisturbed habitats should stimulate some additional interest from those responsible for assessing, monitoring, and managing marine pollution and marine resources.

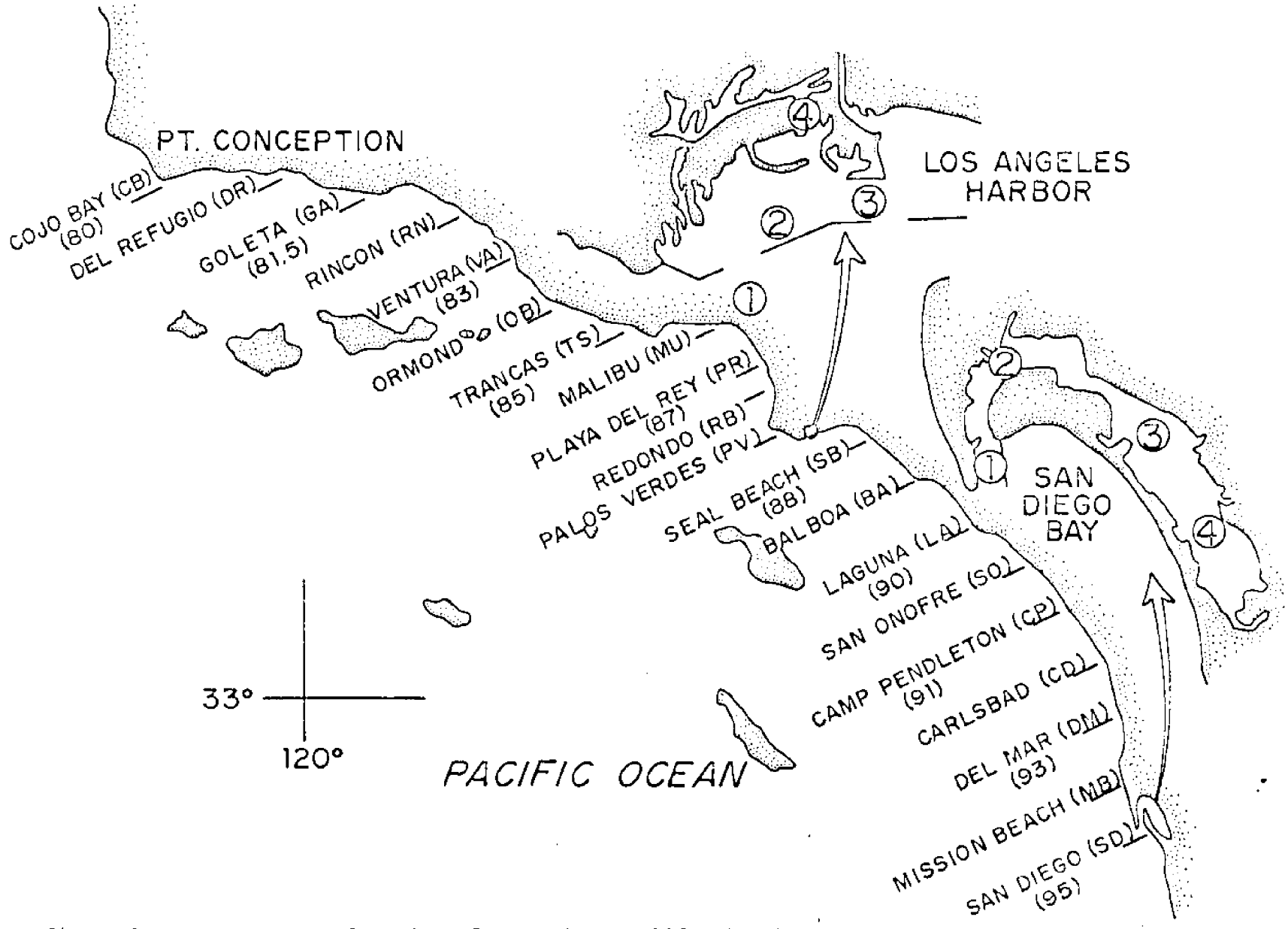

Figure 1. ICHS transect locations for southern California bight survey. Between June 1978 and July 1979 the 10 numerically designated transects were sampled, as were Los Angeles Harbor and San Diego Bay. Between August 1979 and July 1980 all 20 outer coast transects were sampled. See accompanying table for isobaths and depths sampled during each period.

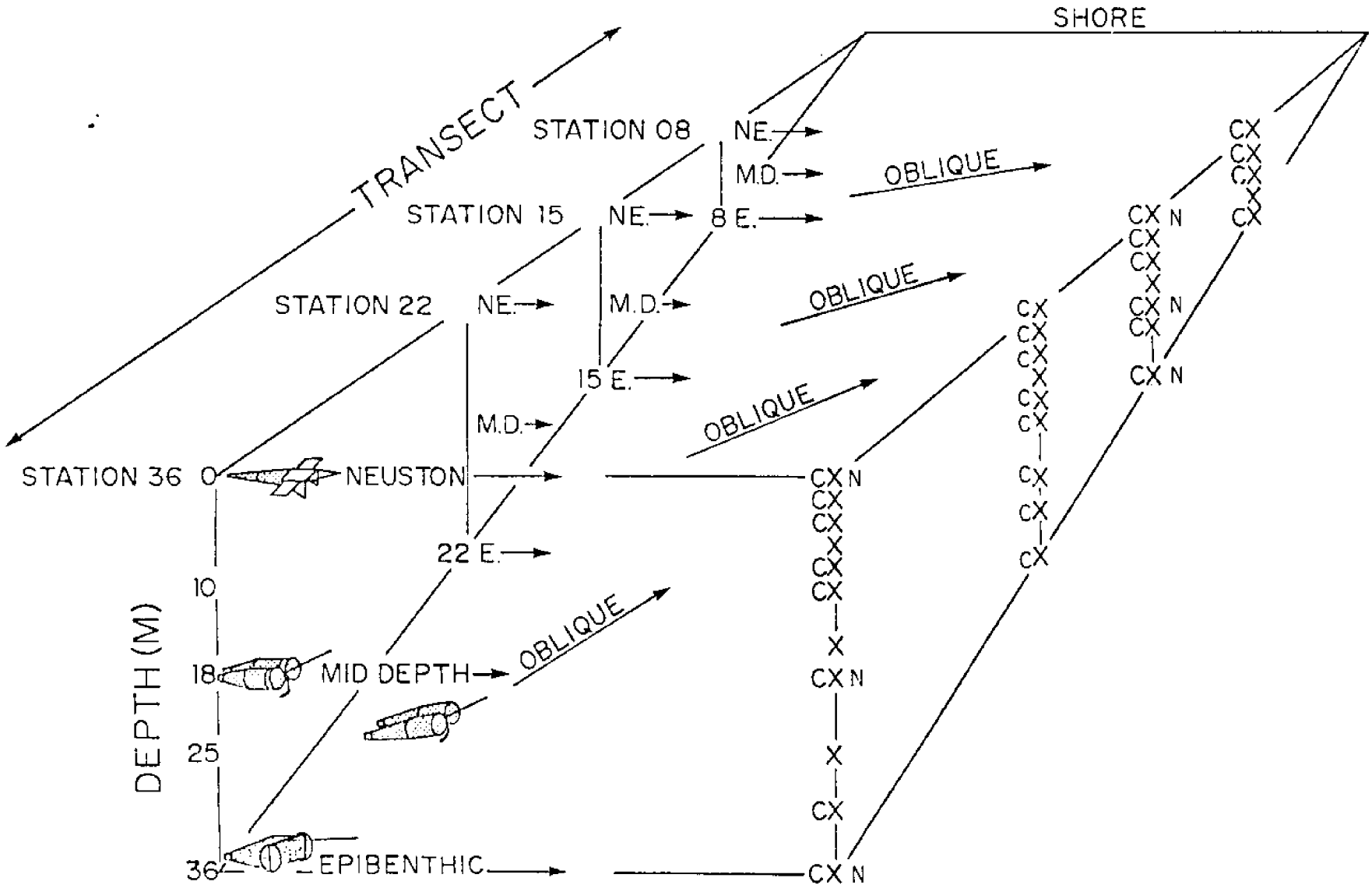

Figure 2. ICHS sampling scheme. NE = neuston, M.D. = middepth, E. = epibenthic plankton samples; X = temperature, salinity, dissolved oxygen, pH record; C = chlorophyll a sample; N = nitrate + nitrite sample. See accompanying figure and table for the isobaths sampled during periods between June 1978-July 1979 and August 1979-July 1980.

Table 1A. ICHS field and laboratory activities from June 1978-July1979; including proposed laboratory processing for unsorted samples.

Samples Collected-Phase I Field	1978							1979						
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
"Oblique Tows"														
10 Outer Coast Transects with 4 Stations/Transect (8,15,22,& 36-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4 Stations in Los Angeles-Long Beach Harbor	X	X	X	X	X	X	X	X	X	X	X	X	X	ns
4 Stations in San Diego Bay	X	X	X	X	X	X	X	X	X	X	X	X	X	ns
"Discrete Depth Tows"														
Neuston--10 Outer Coast Transects with 4 Stations/Transect (8,15,22,&36-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X	X	ns
Middepth--10 Outer Coast Transects with 4 Stations/Transect (8,15,22,& 36-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X	X	ns
Epibenthic--10 Outer Coast Transects with 4 Stations/Transect (8,15,22,& 36-m isobath)	ns	ns	ns	ns	X	X	X	X	X	X	X	X	X	ns

ns= not sampled

Samples Processed-Phase I Laboratory														
"Oblique Tows"	X	X	–	X	X	–	X	X	–	X	X	–	–	–
"Discrete Depth Tows"	–	–	–	–	X	–	–	–	–	–	–	–	–	

Proposed Laboratory Processing (future)														
"Oblique Tows" for ichthyoplankton			X[1]			X[1]			X[1]			X[1]	X[1]	X[1]
"Discrete Depth Tows" for ichthyoplankton								X[2]			X[2]		X[2]	

1= 1st priority
2= 2nd priority

Table 1B. ICHS field and laboratory activities from August 1979-July 1980.

	1979					1980						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Samples Collected-Phase II Field												
"Oblique Tows"												
20 Outer Coast Transects with 2 Stations/Transect along 17 Transects (8 & 22-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X
with 4 Stations/Transect along 3 Transects (8,15,22, & 36-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X
"Discrete Depth Tows"												
Neuston--3 Outer Coast Transects with 4 Stations/Transect (8,15,22, & 36-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X
Middepth--3 Outer Coast Transects with 4 Stations/Transect (8,15,22, & 36-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X
Epibenthic--3 Outer Coast Transects with 4 Stations/Transect (8,15,22, & 36-m isobath)	X	X	X	X	X	X	X	X	X	X	X	X
Samples Processed-Phase II Laboratory												
"Oblique Tows"	X	X	X	X	X	X	X	X	X	X	X	X
"Discrete Depth Tows"	X	X	X	X	X	X	X	X	X	X	X	X

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DEC 3 - 1980

Mr. George Peter, Chairman
Southwest Regional Marine Pollution
Monitoring Meeting
U.S. Department of Commerce
National Oceanic & Atmospheric Admin.
Office of Marine Pollution Assessment
Rockville, MD 20852

Dear Mr. Peter:

COMMENTS NOAA/EPA REVIEW OF MARINE POLLUTION MONITORING REQUIREMENTS

In your letter dated November 14, 1980, you requested that we submit to you our comments concerning three items of particular interest to NOAA and EPA in the Southwest Regional Marine Pollution Monitoring Meeting held in Pasadena, California on November 18 through 21, 1980. Unfortunately my participation was abbreviated because of a work action by employees under my supervision, so I was unable to bring up for discussion observations of our personnel based upon intensive marine monitoring activities dating from 1955. I will therefore try to briefly outline in the following paragraphs the points we believe to be the most important for your study.

Item 1 - An overview of the existing marine pollution monitoring activities.

The City of Los Angeles has been performing legally required monitoring of the effluents from its treatment facilities and of the receiving waters of Santa Monica Bay and the Los Angeles Harbor since 1955. It also performed what may have been the first comprehensive EIR/EIS study of receiving waters at about the same period. This was to determine the most environmentally responsible treatment and disposal procedure wastewaters and wastewater solids from the major Hyperion Treatment Plant. The studies leading to this first EIR/EIS report were made by the Hancock Foundation of the University of Southern California and the scientific validity of the report and of the recommendations it contained have never been scientifically challenged. Accordingly, it is important to make an initial distinction when referring to monitoring. That is, there are perhaps two types:

1. Monitoring to satisfy legal-political requirements.

2. Monitoring based upon scientific studies directed at understanding the environmental-ecological effects of waste discharge and the environmentally responsible methods of handling wastewater treatment and disposal.

   (I am excluding here a third type of monitoring which is chiefly in-plant. This is process control testing which is used to control sewage treatment plant operations)

In a case concerning a City of Los Angeles Outfall, the Federal District Court for Central California did not find that the law requires the best environmental answer or even that an EIS must be prepared. Rather, it simply requires technological based standards applied uniformly nationwide.

The District Court finding was upheld by the U.S. Supreme Court.

From the above, it follows that the basic thrust of the monitoring in the Southern California area is not necessarily towards the determination of scientific information which would eventually result in the determination of responsible environmental methods for the treatment and disposal of wastewaters and wastewater solids; but rather toward determining whether technologically based standards are uniformly applied to all facilities in the nation. That is, the work is directed towards legal-political rather than scientific-environmental requirements. The amount of emphasis upon the legal-political monitoring work can best be judged by the level of expenditure now required. For the City of Los Angeles, approximately one million dollars per year are expended for legal-political monitoring. For scientific-environmental work about $250,000 per year is spent, chiefly through the Southern California Coastal Water Research Project.

In our opinion all monitoring work is adversely affected by the strictly adversary position assumed by the Federal and State Control agencies. Agencies may sometimes be reluctant to discuss scientific work or possible findings with these agencies because the information may be used both as a prosecution tool and to expand the non-scientific monitoring requirements.

Item 2 - How can the utility of the monitoring information from your area be improved?

This answer must also be subject to the fact that the bulk of the work now done is for legal-political rather than scientific-environmental reasons. Determination of the most environmentally responsible procedures for treatment and dispoal of wastewaters and wastewater solids is not the principal goal of monitoring. The monitoring work now done for scientific-environmental reasons is most usually contested by the control agencies or the information is obtained and used by them in a speculative manner to justify administratively based decisions. This condition is apparently

a fault of the basic law which locks the agencies into the uniform application of technologically based standards rather than achievement of responsible environmental answers for each point of treatment and discharge.

Our answer to the question would be that the scientific specialists from the local agencies, the Southern California Coastal Water Research Project, the EPA, the State Water Resources Control Board and NOAA meet and review the present legal-political monitoring in terms of restructuring the present program. That is, to change the sampling grid and the testing now required so that the scientific purpose of determining what the environmental impact of various types of treatment and methods of discharge can be better served. This does not mean simply adding "interesting" scientific studies to the present almost useless (scientifically) legal-political monitoring now required; but a complete change in monitoring tasks towards a goal of making the work usable for ecosystem health studies. Presently, the bulk of the approximately one million dollar per year monitoring work is virtually unusable (or at least unused) from a scientific point of view. It does lead to filling in required report forms, and the determination of whether standards are met; but it adds little to an understanding of ecosystem health. There should perhaps be a "sunset rule" on all monitoring programs with a complete review by a scientific committee at regular intervals. For example, a simple change of sampling points from a rayed pattern at fixed distances from a discharge to a grid based upon bottom depth would add greatly to the value of work now done. After such reviews, all future additions or deletions to the monitoring program should be approved by the suggested scientific committee and not simply arise because of factors such as the media finding a new pollutant of the week.

Item 3 - The need for region-wide ecosystem health monitoring and the roles of the various concerned participating groups.

We believe that insurance of region-wide ecosystem health maintenance is perhaps the major goal to be worked toward. We further believe, as outlined above, that neither the present law nor the current monitoring programs are such that progress towards this goal can be evaluated. Insofar as we can determine, the work of the Southern California Coastal Water Research Project is the only consistent effort toward the evaluation of factors involved in the treatment and discharge of wastewaters and wastewater solids which would affect ecosystem health. This represents perhaps 15-25% of the "monitoring" effort of the agencies in Southern California. The remaining 75-85% of the work is almost useless in terms of the stated goal.

The role of the various concerned participating groups in the control of monitoring versus the goal of insuring ecosystem health is a more difficult question given the present law and the way the participation of public and private groups is mandated. That is the whole approach is adversarial with some nominated to wear "black hats" and some nominated to wear "white hats". We believe that a cooperative scientifically based approach to the question of monitoring in terms of the goal of insuring ecosystem health is necessary or the monitoring program will continue to be almost useless. All agencies must to a degree submerge assumed administrative and legal needs to the scientific needs if the current enormous monitoring effort is to be of value in the national effort toward environmental improvement.

In conclusion, we would add one caveat. To a degree the monitoring program by the agencies receiving, treating and disposing of treated wastewaters and wastewater solids must respond to the need to determine whether certain valid standards are being met. However, we believe the overall structure of the monitoring work can be such that certain scientific goals can also be accommodated. We do not believe that such monitoring should have applied as an overlay esoteric scientific studies which might arise from the research interest of one or two specialists in the world. A group such as the Southern California Coastal Water Research Project should exist to evaluate the cost-benefit of such added work and to approve the funding and to carry them out if the scientific review committee believes them to be of value.

Very truly yours,

Jack M. Betz

JACK M. BETZ, Director
Bureau of Sanitation

cc: Alan J. Mearns
NOAA Pacific Office
7600 Sand Point Way NE
Seattle, WA 98115
(Supplements my comments noted in your letter of November 24, 1980)

LOS ANGELES COUNTY SANITATION DISTRICTS

IRWIN HAYDOCK, PH.D.
SUPERVISOR, OCEAN MONITORING AND RESEARCH PROGRAM

The County Sanitation Districts of Los Angeles County (LACSD) operate a large regional system providing sewage treatment for some four million people, as well as related industry and commerce, in Los Angeles County. The Districts' Joint Water Pollution Control Plant (JWPCP) serves as the backbone of the system, with a 385 mgd capacity advanced primary treatment facility that discharges advanced primary effluent and centrate from sludge dewatering into the Pacific Ocean through two submarine outfalls located approximately two miles offshore of Palos Verdes Peninsula. Discharge depths are between 160 and 200 feet.

Five upstream sewage treatment plants also serve the regional system, providing over 100 mgd of tertiary treatment capacity. Effluent from the upstream plant is considered suitable for reuse; that portion for which no market exists is discharged to the San Gabriel River system. Sludges are returned to the sewer system for eventual separation and central solids processing at JWPCP.

The ongoing JWPCP construction program includes a total of 200 mgd capacity biological treatment units, additional digesters, and improvements to the existing dewatering system. A long term solution to the problem of ultimate sludge disposal is under consideration. The Sanitation Districts recently applied for a modification of secondary treatment requirements at JWPCP within an EPA program developed pursuant to Section 301(h) of the 1977 Clean Water Act. If the Districts' application is favorably reviewed, additional biological treatment capacity (beyond 200 mgd) will not be constructed.

The Districts' ocean monitoring program has taken two paths. This agency is one of the sponsors of the Southern California Coastal Water Research Project (SCCWRP), whose purpose since its inception in 1969 has been to provide information on the impact of wastewater discharges into the Southern California Bight Region of the Pacific Ocean.

In addition, the Districts have carried out an extensive and intensive monitoring program over the past decade as specified in permits issued by the California Regional Water Quality Control Board, Los Angeles District. The Districts' efforts include chemical and bacteriological water quality monitoring, benthic biological grabs and finfish trawls, scuba diving observations in shallow waters, and a variety of special programs of short or long term nature in oceanography, ecology, public health, recreational use, and other areas potentially affected by wastewater discharge.

The Districts' marine research has focused on predictive methodologies. A real-time monitoring system which consists of telemetering buoy system sensors will be combined with computerized models representing initial and subsequent dispersion of wastewater in order to minimize chlorine addition at JWPCP while meeting bacteriological standards in local waters. In addition, considerable emphasis has been placed on development of causal relationships between effluent quality and local benthic ecology, on the local productivity of algae ranging from phytoplankton to kelp, and on disease and abnormalities and bioaccumulation of potential toxins

in fish and shellfish. Many of these studies have been carried out in conjunction with similar bight-wide investigations of SCCWRP scientists.

Despite a long history of marine waste disposal, with gradually improving techniques and methods of wastewater treatment, there is relatively little scientific knowledge about the influence of treated waste discharges on the fundamental ecological systems of nearshore marine waters. The reason for this is apparent; limited resources have dictated an emphasis on monitoring programs rather than comprehensive studies aimed at elucidation of fundamental principles. Probably no monitoring program, no matter how extensive, can achieve the ultimate goal of fully understanding the effect of effluent on the marine ecosystem. Realizing this limitation, it is encumbent on authorities conducting monitoring operations to select programs that, in addition to their immediate objective, will contribute the most to basic knowledge in this area of inquiry. In addition, long term monitoring in the Southern California Bight should produce reference data which can be used in balancing either (1) environmental and economic needs or (2) conflicting environmental objectives. That is, agencies responsible for environmental regulations should make a stronger effort to balance objectives within all areas which are potentially affected by man's activities. Recognizing that availability of resources are to some degree binding, such agencies must find ways to achieve the greatest return, in terms of environmental protection, from expenditures in this area. Long term monitoring programs should provide the kinds of data necessary for rational evaluation of alternative treatment and disposal strategies.

Speaking less generally, the Districts' ocean monitoring experience has led us to several additional conclusions.

1. Development and application of appropriate techniques for rapid, synoptic measurement of phenomena related to pollutant disposal is of pressing importance. Fixed in situ sensors with telemetry and/or towed instruments equipped with near real-time data acqusition and evaluation systems will greatly facilitate oceanographic studies. Simplified measures of biological response, such as fluorimetry for phytoplankton, particle counters for plankton and suspended solids, and acoustic measurement of fish abundance represent areas of recent advancement which are not yet routinely available within ocean monitoring programs.

2. In any long term monitoring program sampling validity and data quality assurance are necessary if the results are to have lasting value. Reference material needs to be maintained to provide historical perspective and to recognize real changes due to nature or man's effects in the face of changing methods and personnel. As a routine matter, new methods should overlap for a period with old prior implementation to any program. Regular instrument calibration and routine sample standardization should go hand-in-hand with all field and laboratory work and the results should be consistently recorded as a part of monitoring data sets. Standard methods for marine work should be adopted wherever possible in routine monitoring programs, but there should remain a flexibility of choice in adopting other or developing new methods where parallel studies define appropriate intercalibration factors. One must not be lulled into complacency

because the instruments used for sampling are the same; differences in ships and personnel, as well as time and space, may override considerations of "standardization"; extensive documentation appears to be a better approach, allowing other subsequent users to judge the data-base on its own merits.

3. Finally, data management and subsequent analysis,evaluation, and usage are by no means simple, but are necessary attributes of any long-term monitoring effort. Some monitoring will be goal oriented to determining compliance with effluent or receiving water standards, for example; other data will be more general in nature, and probably less likely to have immediate use, such as seasonal oceanographic and biological characteristics, but these data can lead to a longer term goal of understanding the natural system variability and the interactions of pollutants and natural factors on the biota and the human users of the environment. Approved standard methods and analytical techniques should be validated and published by the Federal Government; this is being done in EPA's recent Ecological Research Series, but NOAA should provide a similar series for oceanography.

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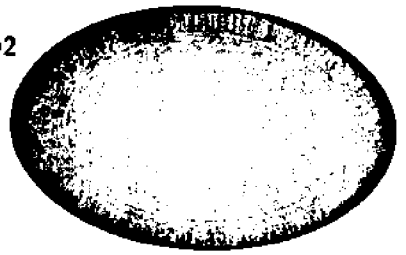
Oceanic
Engineering

Serial No. 8300-592
January 14, 1981



Dr. George Peter
National Oceanic and
Atmospheric Administration
Office of Marine Pollution
Assessment
Rockville, Md. 20852

Dear Dr. Peter:

Thank you for your memorandum giving an up-date on the Marine Pollution Monitoring Workshop held in Pasadena. When a draft report on the workshop is available, I would be most anxious to review it.

Concerning your outline of the five major issues identified at the meetings, I am interested in the third and fourth, specifically in the utilization of monitoring data to improve the monitoring strategy and in the necessity for monitoring data to assist the decision maker. I would like to participate in follow-on activities related to these subjects.

Thanks again for your memo. The workshop was informative and an excellent exchange of views occurred between representatives of federal, state, local, and industrial organizations. I would like to participate in further workshops or activities dealing with marine pollution monitoring.

Sincerely,

INTERSTATE ELECTRONICS CORPORATION
Oceanic Engineering Operations

Marshall Holstrom

Marshall V. Holstrom
Oceanographer

MVH/rs

Appendix E

Papers Relating to a
National Marine Pollution
Monitoring Program

A RECOMMENDED DIRECTION

FOR A

NATIONAL MARINE POLLUTION MONITORING PROGRAM

A Summary of the Paper

By

R. L. Swanson and Joel S. O'Connor

The country is experiencing an increasing number of socially and economically significant marine environmental problems, such as anoxia, beach closings, and toxic poisoning of fishery resources. This increase points out the need for monitoring coastal waters and pollution sources and more effectively, to anticipate such problems so that their adverse impacts might be mitigated. The time is appropriate to review strategies and methodologies necessary for an effective monitoring program, and to recommend logical directions that we as a nation might take. This paper may be a first step toward developing a national monitoring philosophy or framework which will lead to a coordinated, effective, and economically feasible program.

The five-year Federal Plan defines monitoring as "the systematic, time-series observations of predetermined pollutants or pertinent components of the marine ecosystem over a length of time that is sufficient to determine the: (1) existing level, (2) trend, and (3) natural variations of the measured parameters in the water column, sediments, or biota.

In general, monitoring is divided into four categories:

1. Compliance--monitoring to establish whether a pollutant source is meeting the requirements of a permit or regulation, or whether water quality objectives established by law, regulation, or international agreement are being met;
2. Environmental--monitoring those environmental variables which will assist in the assessment of contaminants in the ecosystem and/or their pathways (e.g., beach water quality and pollutant pathways to edible fishes);
3. Ecological--monitoring the biological responses to the pollutant as it passes through the ecosystem (including people) to detect the ecological consequences of pollutant stress;
4. Health--monitoring pathogenic or indicator microorganisms and toxic materials in water, fish, and shellfish to determine impact on human health.

In order to identify the changes in the marine environment caused by pollution and the effects of this pollution on people, all categories of monitoring must be undertaken concurrently. Because environmental changes and effects must be traceable back to the sources for the purposes of control, this comprehensive approach to monitoring is necessary to provide realistic guidance to management authorities.

In reviewing existing monitoring programs and agency responsibilities, some of the most important gaps seem to be in the areas of environmental and ecological effects monitoring, which would link the sources to their effects on people and natural ecosystems. In general, this void can be classified as marine ecosystem monitoring, and this is what needs to be addressed on a national scale. This national marine ecosystem monitoring program should be designed to: (]) anticipate marine pollution problems before they become acute, (2) assess the changing conditions of coastal marine ecosystems, and (3) predict responses of coastal marine ecosystems to anticipated changes in environmental variables. The monitoring program should concentrate its effort in nearshore waters, including estuaries and the Great Lakes. This decision is mandated by a realistic appraisal of fiscal and personnel resources, which precludes the development of a more extensive monitoring program covering the entire U.S. continental shelf. In addition technology development has not yet adequately replaced the need for sea-going survey vessels, and the escalating ship operating costs dictate selective vessel useage. Thus, a cost-effective program must concentrate on the nearshore, which in fact, is the most heavily impacted area by anthropogenic pollution, and contains the majority of marine resources of value to mankind.

We recommend that this monitoring program be implemented gradually over the coming decade. It will have a national scope with regional ecosystem emphases and specified uses will be identified. To meet this challenge efficiently, effectively, and economically, a hierarchical framework is suggested that emphasizes centralized management. This will avoid excessive data collection, and assure useable measurements, intercalibration of equipment, quality assurance of data, and uniform and reproducible analyses. This framework can be implemented conservatively, while insuring a mechanism to check benefits versus investments.

The hierarchical approach to monitoring, which incorporates the four types of monitoring mentioned earlier, would consist of the following levels:

1. National and international overview is obtained through a surveillance technique, such as Mussel Watch. This serves to give advance warnings of unanticipated problems, and provides national perspective so that "level 2" areas can be defined and priorities can be set.
2. Control areas and/or ecosystems will be monitored based on regional requirements. These efforts would concentrate on monitoring those parameters which relate sources to ecosystem effects, and will require an understanding of ecological processes. Also, these areas should be critically selected for merit and as representives of larger geographic areas so that results and observations can be extrapolated.
3. Appropriate local monitoring again will be conducted on the basis of needs, but there will be efforts to selectively incorporated incorporate some of the results into the national data base. In addition, these programs will and aid in the filling of information gaps, will help to identify problems before these actually become critical, and will establish new monitoring requirements.

As a first step in establishing the program, the users and objectives for all levels must be clearly defined. Primary users may include the regulatory agencies, and public and private institutions who will implement the controls and remedial measures. The control area phase of the program should have the greatest impact on management decisions affecting coastal resources, but the national (and even international) overview (level 1) is essential in relating the control areas to each other, and in understanding the overall pollution problem. Local monitoring, level 3, is conducted in response to local needs; the national program emphasis at this level will be on assuring calibration and quality control. This is necessary so that the national program can benefit from these efforts.

After a level 1 program, such as Mussel Watch is established, the regional programs would begin with a thorough examination of local marine pollution issues and problems. It will be necessary to identify the real needs for monitoring, the sources of contaminants, the ongoing monitoring efforts, and whether current regional ecosystem processes are well enough known for the new monitoring program to be beneficial. In order to keep monitoring costs reasonable and operations effective and efficient, criteria upon which decisions are to be based must be specified in advance. Data collection efforts can then lead to timely analyses, interpretations, and development of recommendations that are transmitted back to policy and management officials. Decisions, such as the adoption of alternative disposal practices, or the changing of legal, scientific, or managerial requirements, necessitate continuous cost benefit analyses and evaluations of the effectiveness of the monitoring effort. The objectives and experimental design can then change to meet evolving needs.

The general approach in developing the monitoring design should be similar for all the control areas. In the end, effects should be tied to sources, and the transfer routes should be clearly understood in order that resource management practices and pollutant regulations be more effective. Although linkages between sources and effects will seldom be as rigorously documented as desired, this must be the ultimate aim. Thus, it is desirable to implement a monitoring effort in the control areas that incorporates the principles of both the mass-balance and critical pathways approaches, as described by E.D. Goldberg.

Mass-balance requires quantification of the sources, reservoirs, sinks and fluxes of material into and out of the system as identified by previous or on-going research. The critical pathway approach involves establishing an acceptable risk or effect in the marine ecosystem or in man. Knowledge of the input of the pollutant and concentrations throughout the critical path can be used to estimate the likelihood of exceeding the acceptable risk. Risk or managerially acceptable effects data are largely related to public health and biotic effects, and are available

through regulatory agencies such as EPA, FDA, NMFS, and State agencies. Other areas of risk, associated more with socio-economic considerations, should be considered, and research into these areas is now being undertaken.

Ecosystem monitoring also should be attentive to changing contaminant loadings. This information can be derived from the compliance monitoring of the regulatory agencies and the permit process (level 3), and from the detection of effects and/or concentrations of pollutants in the reservoirs and sinks. The data collection program should be statistically sound, concentrating on the limited geographic control areas (tens to hundreds of square kilometers), where applications of mass-balance and critical pathway techniques can be usefully applied.

It is expected that Mussel Watch, or a similar approach, will pinpoint a few areas in particular need of regional study, and these can be designated as control areas. Such areas might include New York Bight Apex and the Southern California Bight. Discussions with anticipated users of this regional monitoring information will provide essential input to the monitoring program planning so that the program will be designed foremost to address regionally identified needs. The remaining parts of the program will be to cement the effort into a cohesive unit which will address the ecological functioning of the area. It is hoped that such efforts will provide us with much more useful monitoring results that can be instrumental in wise management decisions.

DRAFT CONSIDERATIONS

FOR A

NATIONAL OCEAN POLLUTION MONITORING APPROACH

BY DOUGLAS A. SEGAR

A Possible Hierarchical Marine Pollution Monitoring Approach

A POSSIBLE HIERARCHICAL MARINE POLLUTION MONITORING APPROACH

Introduction

In a paper entitled, "A Recommended Direction for a National Marine Pollution Monitoring Program," Swanson and O'Connor have suggested that the broad goal of a proposed national marine pollution monitoring program should be to assess the health of the ocean. They have suggested a hierarchical approach to such a program that would consist of three separate lab-related efforts; first the use of the sentinel organism approach (see below) in a nationwide network, second intensive monitoring of control areas and/or ecosystems (which would be identified as critical impact areas based on the sentinel organism monitoring or other information), and third the incorporation of appropriate local (mostly compliance) monitoring results into the data base.

In this paper, we will present an alternative hierarchical strategy which, although it does not differ markedly from Swanson and O'Connor's approach, we feel may better answer ocean pollution management needs. Our proposed strategy is based upon the same major considerations of technical and economic feasibility that were the basis for Swanson and O'Connor's strategy. Because of their importance, we will reiterate these constraints here with some restatement and clarification.

1. Many agencies at Federal, state and local levels have specific and widely varied responsibilities for monitoring pollution in the ocean. The majority of such responsibilities involve compliance monitoring. In this paper we define compliance monitoring to be all monitoring which is performed to meet the requirements of a permit or regulation. This definition includes "health effects monitoring" of pathogenic or indicator microrganisms in water and shellfish, and toxic materials in fish and shellfish for the purpose of protecting human health. A national marine pollution monitoring program cannot and should not replace or subsume compliance monitoring programs, but may well incorporate their results.

2. The cost and manpower requirements of monitoring contaminant concentrations and effects throughout the coastal oceans of the United States (the "measure everything everywhere syndrome") is prohibitive. The major costs associated with such efforts are the large expenditures of money and highly trained manpower required to measure trace contaminant concentrations in environmental samples and to perform biological surveys and biochemical analyses aimed at identifying ecological effects. To some extent, high costs are dictated by technology limitations which are inherent in sampling and working in the marine environment. Improvements in our at-sea sampling and analysis technology can be made which would substantially reduce the costs of monitoring contaminants and their effects in the ocean. However, such improvements will take many years to develop before costs for determination of trace contaminant distributions and identification of subtle ecological effects are reduced to levels affordable for use in intensive, continuing monitoring programs that adequately cover the large areas of impacted or potentially impacted coastal ocean.

3. There is considerable concern that the results of marine monitoring programs aimed at identifying pollution-induced ecological changes are not now and may not be in future interpretable since the natural variability of ocean ecosystems is very poorly understood. Only in a very limited number of instances have we been able to conclude that an observed adverse change in the marine ecosystem structure could not have been caused by natural variability. Therefore, even though in many instances we have observed ecological changes which appear to parallel changes in contaminant inputs, we have rarely been able to satisfactorily demonstrate a cause and effect relationship. Those instances where we have been able to satisfactorily demonstrate such a relationship are almost exclusively related to effects occurring in very small areas of the benthic ecosystem adjacent to a site of contaminant input. While pollution-caused ecological changes in limited areas of benthic marine ecosystems are important, and in many instances may be justifiable costs to society of ocean use, ecological changes on a broader scale either in benthic or non-benthic communities have much more import to society. Our current monitoring programs major failure is to provide the knowledge required to distinguish between natural variability and pollutant-induced changes on a regionwide scale.

Objectives of Proposed Hierarchical Monitoring Program

The general objective of a marine monitoring program should be to provide information useful to ocean pollution management decisions. However, such decisions range from global policy concerning the production and use of synthetic organic chemicals to decisions such as choosing the location of a pipe draining storm discharge from a small piece of property such as a golf course. No single monitoring system could directly address this entire range of management needs. Therefore, the objectives of even a hierarchical monitoring program need to be focused on limited objectives. We propose the following.

1. Management and control of local impacts of waste discharges and other polluting activities and protection of public health from contaminated seafood or local bathing waters should continue to be addressed through compliance monitoring.

2. Contaminant concentrations in the marine ecosystem should be monitored in the smallest possible number of samples, sampling locations and time, to ensure that significant long-term trends within marine ecosystems will be identified.

3. We should reduce the possibility of contaminants other than those currently identified as being of concern from entering the marine ecosystem in large quantities without detection. This need should be addressed by compliance monitoring and research programs only.

4. We should develop an understanding of the nature of marine ecosystems and monitor the needed parameters such that we are able, with adequate certainty, to identify major changes in the structure of coastal ecosystems and to determine whether such changes are caused by natural variability. In determining whether major ecological changes occur, maximum utilization of available information from ocean users and other ocean management monitoring activities should be aimed at.

5. We should design marine pollution monitoring programs in such a manner that the information generated has the maximum utility for ocean management other than marine pollution management consistent with satisfaction of other than marine pollution management objectives.

These objectives have not been established in isolation from considerations of and constraints on the practical aspects marine pollution monitoring. Therefore, the rationale for their establishment becomes clear only after the practical design of the proposed hierarchical marine pollution monitoring program is considered.

Components of a Proposed Hierarchical Marine Pollution Monitoring Program

Our proposed hierarchical marine pollution monitoring program comprises five key subprograms. These are

1. Compliance monitoring
2. Pollutant concentration trend monitoring
3. Ecosystem understanding development
4. Marine ecology monitoring
5. Regionwide ecosystem monitoring.

All except the last of these five are addressed to a large degree by ongoing activities. We will briefly discuss each one in turn with a more detailed discussion of the proposed regionwide ecosystem monitoring. However, it should be clearly stated that we only emphasize the regionwide ecosystem monitoring component because it is the only component not addressed by current activities. A viable, successful monitoring program depends upon the conduct and coordination of all five key subprograms and, although we suggest some modifications both in the short and long term in each subprogram, we intend and assume that each subprogram will continue to be conducted substantially as it is now. Nevertheless, mechanisms are needed to bring together the information generated by these subprograms especially as the subprograms are conducted by a diversity of Federal, state, local and private organizations. In line with its responsibilities under the Ocean Pollution Planning Act, NOAA should provide such mechanisms and conduct, in addition, only those activities essential to fill critical information gaps.

1. Compliance Monitoring

Compliance monitoring, including human health protection monitoring, serves the specific purpose of establishing that the monitored activity is taking place in compliance with the standards applicable to the particular activity monitored. Such standards can be simple such as a not-to-exceed number for a certain parameter as in fecal coliform monitoring of bathing waters, or mercury monitoring in fish and shellfish. Standards can also be extremely complex such as "unreasonable degradation of the marine environment" in the Ocean Dumping Act and maintenance of a "balanced indigenous population" in the Clean Water Act. Compliance monitoring programs are consequently themselves diverse, ranging from simple chemical testing to detailed ecological structure characterization performed on a continuing basis.

A National Monitoring Program cannot and should not replace or subsume compliance monitoring programs. However, compliance monitoring data should be incorporated in a regional marine monitoring data base, access to the data base by compliance monitorers should be facilitiated and encouraged such that maximum use is made of available data. The cost and complexity of compliance monitoring should, over time, be reduced as our understanding of marine ecosystems improves and we make simplifying amendments to our statutes and regulations to reflect such improved understanding. Our ultimate aim should be to reduce complicance monitoring to reliable input characterization, and occasional spot checks of near-field ecosystem structure in discharge or impact zones. With sufficient understanding of ecosystem function, we would from such information be able to predict impacts (or their absence) with acceptable accuracy.

Such ecosystem understanding and simplified compliance monitoring is many years distant. However, our proposed hierarchical marine monitoring program can do much to reduce the cost and complexity of compliance monitoring in the nearer term. Typically compliance monitoring schemes are a compromise between on the one hand cost and capability constraints and the need to intensively characterize the near-field impact zone, and on the other hand the need to make far-field measurements to establish "background" or natural variations. The compromises reached usually preclude attainment of a satisfactory resolution of the natural variability while the effectiveness of the near-field studies is also reduced. This leads to a situation where most compliance monitoring fails to establish with any certainty the nature and extent of environmental impacts of the monitored activity. All too often ecological structure changes or anomalies are observed in the area monitored but it is impossible to determine that they could not have been caused by natural variations. One of the principle objectives of our hierarchical monitoring program is, therefore, to determine whether observed major ecological changes are caused by natural variability. This objective is addressed primarily by the proposed regionwide marine ecosystem monitoring program as described below.

2. Pollutant Concentration Trend Monitoring

Long-term trends of pollutant concentrations in marine ecosystems must be established. In establishing such trends, it should be recognized that the simplest and perhaps least expensive means by which this may be done in the long term is by prediction, based upon an understanding of pollutant pathways in marine ecosystems and detailed knowledge of the pollutant input routes and rates. Improvements in the compliance monitoring schemes are, therefore, needed to enable better estimates of pollutant inputs to be made. However, improvements in input information and understanding of pollutant pathways will come slowly and there will always be a need for an inexpensive independent trend assessment.

The most promising techniques for this independent assessment is the sentinel organism methods, of which the mussel watch program is a crude prototype. Research should be continued to perfect this technique and a national program should be instituted if and when the technique is proven. In

the interim, a period that will almost certainly exceed five years, reliance should be placed on results of compliance monitoring, research programs, and knowledge of inputs. In addition, we should perform broad scan analysis of a minimal (less than 200 or 300 per year nationwide) number of sediment and biological samples to detect any drastic changes in pollutant concentration. Such samples should be taken from carefully selected areas with a high potential for impact. Sampling should include composite samples and need only be done annually since the changes being looked for by this program are those of large magnitude compared to natural variability. Smaller changes, if they occur, should in any event be observed by compliance monitoring programs.

The unknown pollutant or surprise factor such as occurred with PCB's and kepone cannot be ignored. However, the surprise factor also cannot be totally eliminated, as the monitoring program needed to do so is both beyond any possible rational cost and beyond our current or any reasonably projected technology. However, it should be recognized that (a) the minimal broad scan analysis program followed by the sentinel organism program described above will provide for a significant reduction in the possibility of surprise pollutants, and (b) that the developing regulations governing the manufacture and use of chemicals, such as those pursuant to the Toxic Substance Control Act, the Federal Insecticide, Fungicide and Rodenticide Act and the Resource Conservation and Recovery Act will, given time, lead to drastic reduction in the potential for surprise pollutants in the environment including the oceans.

3. Ecosystem Understanding Development

Major multiyear ecosystem investigations aimed at understanding specific marine ecosystem functioning should continue to be performed. The MESA New York Bight study, the SCCWRP study off Southern California, and the EPA Chesapeake Bay Program are examples of such ecosystem investigations. We do not have the available expertise to adequately perform more than two or three such studies concurrently. Therefore, careful choices must be made of areas to be subjected to such studies and the temptation to continue a program beyond the stage when a working understanding of the ecosystem under study is obtained must be avoided. The definition of what constitutes a working understanding is, of course, a difficult subjective decision, but one that must be made if we are to develop better understanding of all of our coastal marine ecosystems.

4. Marine Ecology Monitoring

Impacts and potential impacts of marine pollution fall generally into two categories, human health impacts and ecological impacts. Compliance monitoring provides the information reuqired to identify any major near-field ecological change. However, compliance monitoring does not often adequately address the potential for long-term, regionwide ecological changes. Although desirable, a monitoring program that would identify long-term subtle changes in the marine ecology which take place anywhere within the United States coastal marine ecosystem would be impossibly expensive and would require more trained manpower than could possibly exist. This is especially true since

natural variability of marine biological is poorly understood, but known to be large at least in some instances.

Our objective within a marine monitoring program must, therefore, be restricted to identifying major ecological changes and establishing with adequate certainty whether such changes were or may have been caused by natural variability. The first part of this objective identifying major ecological changes can be substantially achieved through the use of existing programs, including fisheries and shellfisheries surveys, catch statistics, kelp bed resource surveys, habitat surveys, etc., with inputs from compliance monitoring and ecosystem research studies. It may be necessary to initiate limited additional monitoring surveys in key areas of critical habitat such as kelp beds, coral reefs, and coastal marshes. Where they are necessary, such additional surveys should be set up through the various Federal, state, local and private resource management programs although the results of all resource monitoring programs should be incorporated as an input to the hierarchical marine monitoring program.

5. Regionwide Ecosystem Monitoring

Most if not all major natural changes in marine ecosystem structure are driven by "climatic" variations. In the ocean this means water mass movement, which affects physical and chemical control of primary production, which in turn affects upper levels of the food chain. The time scales on which such changes occur and have major ecological impacts are season to season and over periods of years in concord with climatology. The major possible exception to this rule is disease which is known to be responsible for major ecological changes, but which is probably also mediated by physical and chemical changes in the environment.

Regionwide ecosystem monitoring should be initiated with the aim of detecting "climatically" controlled changes in the ocean environment which may be responsible for ecological changes. This element of the hierarchical monitoring approach is the newest and least defined and, therefore, requires more detailed explanation. Whenever an ecological change or crisis is observed in the ocean environment, the question is always raised whether or not that change or crisis could have been or was caused by natural events. Only in the rarest of instances are we able to answer yes or no to this question. In the case of the 1976 anoxia in the New York Bight we have been able to tentatively answer yes to this question, but the answer came long after the event and too late to influence management decisions made on the basis of a presumption that the event was not naturally caused. Therefore, there exists a need for rapid hindcasting of information to decide whether or not natural variability or changes in the ecosystem were or could have been responsible for marine ecological changes or crises. It should be remembered that such hindcasting is the basis for forecasting in the long term. For example, meteorologists routinely forecast weather changes by hindcasting to find similar situations in the past, albeit through complex dynamic models which have the ability to extrapolate from a hindcast.

A regional ecosystem monitoring program continued over a long period of time will lead to an ability to predict natural changes. Almost all such changes (on a large scale) are caused by climatic changes which alter the water mass physical and chemical characteristics within a given region. If we could develop our marine ecosystem understanding sufficiently to understand how such changes in physical and chemical water mass characteristics may affect biological populations, then theoretically the basic information needed to predict naturally induced biological change could be reduced to that knowledge together with measurements of water mass structure changes. In the ultimate projection of this logic if we understood the ocean-atmosphere coupling sufficiently well, we could predict most naturally induced ocean biological change based solely on meteorological data. However, if it is achievable at all, such understanding is generations away and so we must develop a monitoring system which will measure ocean water mass "climate" data directly.

On the simplest level this implies measuring salinity, temperature, and possibly turbidity data in sufficient detail to detect major water mass shifts. However, because our water mass chemistry varies somewhat independently of these basic physical variables and because this chemistry controls primary production and perhaps exerts some limited direct control on other biological levels, we can improve our predictability by chemically characterizing the water masses and any changes in such chemistry that may occur. Although we know that certain trace metals and trace organic constituents can exert some control over the primary production step, cost considerations dictate that we consider only those chemical parameters known to be the major biological controlling factors, i.e., nitrogen species phosphorous species, silicates, and oxygen. Changes in these parameters according to our best estimates are probably responsible for most of the natural variation of primary production (qualitative and quantitative) within any regional ecosystem.

From an understanding of the natural changes in physical water mass characteristics and the basic chemical characteristics listed above, and based on our current knowledge of marine ecosystems (particularly those that have been well studied), we can probably hindcast with considerable accuracy and determine whether observed biological changes could have been caused naturally or not. Uncertainties would, of course, remain, particularly those concerned with the effects of changes in minor constituent chemistry of the water masses. However, these could be further reduced at relatively low cost by obtaining information from one step farther along the causality chain, the phytoplankton. Simple measurements of phytoplankton biomass, chlorophyll and species composition (classified as to dominant species and genera of minor species only) would provide a somewhat independent assessment of natural variation.

A regional ecosystem monitoring program such as that described would have a number of desirable characteristics including:

a. Simplicity Sampling and analysis could be carried out without major commitments of high technology resources or highly trained manpower.

b. Relative ease of interpretation and data handling due to limited number of parameters measured.

c. Ability to perform from moving vessels and/or aircraft. Reduced shiptime required. Minimal vessel capabilities needed.

d. Ease of standardization of techniques and intercalibration. Ease of intercomparability and merging of data with data from other monitoring and research programs.

All of the benefits translate into major cost savings over more "comprehensive" programs. In addition, and more important, the proposed regional ecosystem monitoring program would provide basic information needed for a number of other areas of ocean management other than marine pollution, particularly fisheries management, but also including marine meteorology, beach restoration and preservation, marine transportation planning, and marine energy production planning. As our use of the ocean environment expands, the breadth of application would expand much as has the basic weather information expanded its utility as our society has advanced. Thus we are proposing a Regionwide Marine Monitoring Program which is much more than just a pollution monitoring program.

The question of benthic ecosystem monitoring and monitoring of coastal macroalgae-based communities is not addressed directly by our proposed Regionwide Marine Monitoring Program. However, the information generated about ocean climatology changes will certainly be relevant and useful in addressing such questions, and it is felt that such monitoring will be best performed through other programs including ongoing fish and shellfish management surveys, compliance monitoring, specific monitoring programs related to ocean uses (e.g., kelp farming), regional ecosystem investigations, and special studies of highly impacted areas, as described above.

Implementation of a Regionwide Marine Monitoring Program would be gradual, taking place region by region. It is estimated that perhaps 20-30 years would be needed to establish such programs throughout the United States coastal marine areas. During this time and subsequently, the program would undergo continuous evaluation and modification based on experience gained much as our meteorological network has grown.

Coordination and Synthesis

Information generated by each of the five subprograms each with its own many component pieces must be integrated and the programs themselves coordinated. It is proposed to do this on a regional basis through Regional Marine Pollution Centers. An outline of the possible structure and functions of such centers and suggestions as to how they can be established in a stepwise fashion over a period of years are contained in a separate paper (see attached). The establishment of such integration and coordination capabilities is an essential and integral component of our proposed hierarchical monitoring program.

Summary

A hierarchical National Marine Pollution Monitoring Program is proposed whose basic strategy is to incorporate information from existing programs where possible and initiate new programs only where necessary and justifiable by the expected results. The National Program would consist of a number of separate and distinct regional programs designed around regional needs. The hierarchical program would not subsume existing programs or cause existing programs to be changed in major fashion or eliminated. However, the important functions of coordination and synthesis of information would be facilitated through regional centers operated as cooperative entities with participation from state and local groups and concerned Federal agencies organized through NOAA and its responsibilities under the National Ocean Pollution Planning Act.

The key subprograms of the proposed hierarchical approach are:

1. Existing and future compliance monitoring programs.

2. Pollutant concentration trend monitoring. A limited broad scan analysis program replaced eventually by a sentinel organism program, if and when that technique is perfected.

3. Ecosystem understanding development comprising existing programs of research on major marine ecosystems.

4. Marine ecology monitoring comprising existing resource and habitat surveys and compliance monitoring.

5. Regionwide ecosystem monitoring. A new program limited in scope to determinng major changes in ocean climatology (water mass structure, nutrient chemistry, and basic assessment of phytoplankton community structure) established on a regional basis over a period of 20-30 years.

It is believed that this approach can satisfy the goal of providing sufficient information that the health of the ocean can be maintained through appropriate management of pollution. The program will require only limited additional expenditures of money and trained manpower. Cost savings through optimization of some existing programs, particularly compliance monitoring programs, can potentially more than offset such additional expenditures.

The program is aimed at the long-term problem, decades in the future. Undoubtedly, it will not and cannot satisfy all our current management information needs. However, these current needs probably cannot be totally satisfied with any reasonable level of effort. It must be stated that a critical underlying assumption of this program is that our new and largely untested system of environmental law and regulation (including but not limited to marine environmental law) established during the 1970's will, given time, reduce the inputs of pollutants to the oceans, reduce the potential for surprise pollutants, and lead to much better knowledge of the inputs that do remain. Our proposed program is designed to continue to operate beyond the period when these gains will be made, and to enable effective management of the ocean as an appropriate resource for the disposal of some of man's wastes.

Notes on a National Marine Monitoring Program

Willard Bascom

I speak as a scientist who has spent considerable time doing research related to monitoring. I have observed that large parts of the present monitoring programs serve no useful purpose, and are an inordinately expensive way to verify that EPA and State standards have been met. In any event, the areas for which data has been obtained are a very small part of our coastal waters. Moreover, until the last few years the methods of taking data/samples, and analyzing them was not standardized. Therefore, in my opinion most of the monitoring data taken to date is not of great value for the long run.

I suggest that a national program be addressed to our overall coastline, that it consider possible future problems, and that it make use of new technology.

The objective of monitoring should be (1) to determine if human health and/or that of sea life is threatened by some man-made contaminant or activity and (2) to develop a long-time data base that can be used for general scientific purposes.

In order to make sure that our thinking is clear certain key words must be defined:

Monitoring is repeated checking to determine if events of ecological or oceanographic significance have occurred. (This implies that there is a range of normal conditions within which there can be non-significant occurrences which do not damage sea life.)

Pollution is a damaging excess of one or more contaminants.

Contamination is an increase in some substance above its natural range.

Note: Change does not equate with damage.

Damage to an animal occurs when its natural detoxifying capacity has been exceeded. This means that atypical levels of metals or foreign hydrocarbons are bound to its macromolecules (such as DNA, RNA, or enzymes).

Whether or not this detoxifying capacity has been exceeded can be determined by a variety of procedures including gel chromatography (for metals) HPLC (high pressure liquid chromatography) for foreign hydrocarbons, and cytochemistry (of lysosomes) for both metals and hydrocarbons. Where multiple contaminants are present it should be possible to determine which ones are at the sites of toxic action and therefore are responsible for the damage.

Important items in a national coastal marine monitoring program

1. Establish normal conditions and natural variations--of animal and plant species, chemical backgrounds, oceanographic factors, etc. This includes variations with time and implies that the measurements go on long enough to include the 11 and 27 year cycles.

   An ecological chart of our coastal waters from high tide to a depth of 1000 meters that defines the range of normal conditions would be a most useful first step. This requires a grid of stations related to depth, man's presence, coastal

shape, etc. Then, at appropriate intervals of time, monitoring (repeated checking) for ecological changes could be done.

2. The sources of pollutants are generally well known. They include outfalls of all kinds, river and harbor discharges, aerial fallout, etc. The possible pollutants reaching the sea should be identified and quantified in a systematic way. A continuing search for chemicals, previously unknown in the environment, must be made.

   Natural sources such as oil seeps and runoff from mining areas should be checked occasionally. So should the run-off from large agricultural valleys where many chemicals are used to control pests and improve crops.

3. In areas near presently known sources of contamination such as outfalls, harbors, certain river discharges, etc., the bottom conditions should be mapped and the distance to background conditions (in all directions) determined. Future monitoring should then be concentrated along that boundary to determine if the contaminated area is shrinking or growing.

4. Some existing time series should be extended and some new time series measurements (which can be related to satellite scans) should be begun. These might be of water temperature, color, clarity to serve as a local confirmation of satellite measurements. These should be simple and inexpensive so that they can be continued for scores or hundreds of years.

5. Animals who live in areas where pollution is suspected should be measured directly, using modern biochemical methods to determine if they have suffered damage. (This has the advantage of going directly to the desired answer instead of trying to measure pollutant chemicals and determine their pathways and fates.) Then polluted areas can be charted and the offending substances can be identified. (See top of page 2 for concept and techniques.)

A national program must be designed to obtain data on large areas of our coastal waters in an inexpensive way using modern techniques of ecological surveying, of searching for new pollutants, of satellite observation and of biochemistry. If properly designed and organized such a program will cost less than the old fashioned methods now in general use and will continue for many years.

Appendix F

References

References

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Appendix G

Local, State and Federal Agency Programs

I Orange County Sanitation Districts

A. Programs

The Orange County Sanitation Districts have been monitoring the ocean to assess wastewater impacts for 20 years. Initial monitoring consisted of sampling near the outfall for coliform bacteria, suspended solids, surface grease and total sediment nitrogen. The program was expanded in 1969 to include benthic trawling and was further expanded in 1974.

The present marine monitoring program consists of water quality sampling, sediment sampling, benthic trawling and rig fishing.

When the field work is completed, the organisms identified and the samples analyzed, a quarterly report is prepared for the regulatory agencies. The districts also prepare an annual report which summarizes and interprets all data from the reporting period. This report is submitted to the Regional Board which reviews it and then meets with District's staff to evaluate the monitoring program and discuss modifications.

B. Recommendation

A coordinated region-wide inventory is needed to investigate methods, evaluate data, monitor activities and evaluate needs of the discharging agencies. This inventory should be part of a regional program that makes recommendations to ensure that data and information are effectively used in decision making. Local agencies should do the field work and participate in the inventory. The regional program should not be limited to current monitoring, but should include future research, such as sludge disposal through a deep-water ocean outfall.

The most apparent weakness with the districts' program and other similar programs is the lack of procedure or method standardization. Presently it is difficult for anyone who is unfamiliar with the programs of the monitoring agencies to compare information.

II Los Angeles County Sanitation Districts

A. Programs

The agency is a sponsor of the Southern California Coastal Water Research Project (SCCWRP), which is intended to provide information on the impact of wastewater discharges into the Southern California Bight.

In addition, the districts have carried out an extensive and intensive monitoring program over the past decade as specified in permits issued by the California Regional Water Quality Control Board, Los Angeles District. The districts' efforts include chemical and bacteriological water quality monitoring,

benthic biological grabs and finfish trawls, scuba diving observations in shallow waters, and a variety of special programs of short or long term in oceanography, ecology, public health, recreational use and other areas potentially affected by wastewater discharge.

B. Recommendations

1. Comprehensive monitoring programs--Authorities conducting monitoring operations should select programs which, in addition to their immediate objective, will contribute the most to basic knowledge in the area of inquiry.

In addition, long-term monitoring in the Bight should produce reference data which can be used in balancing either (a) environmental and economic needs or (b) conflicting environmental objectives. That is, agencies responsible for environmental regulations should make a stronger effort to balance objectives within all areas which are potentially affected by man's activities. Long-term monitoring programs should provide the kinds of data necessary for rational evaluation of alternative treatment and disposal strategies.

Despite a long history of marine waste disposal, with gradually improving techniques and methods of wastewater treatment, there is relatively little scientific knowledge about the influence of treated waste discharges on the fundamental ecological systems of nearshore marine waters. The reason for this is apparent: limited resources have dictated an emphasis on monitoring programs rather than comprehensive studies aimed at elucidation of fundamental principles. Probably no monitoring program, no matter how extensive, can achieve the ultimate goal of fully understanding the effect of effluent on the marine ecosystem.

2. Appropriate measurement techniques--Development and application of appropriate techniques for rapid, synoptic measurement of phenomena related to pollutant disposal is of pressing importance. Fixed-in situ-sensors with telemetry and/or towed instruments equipped with near real-time data acquisition and evaluation systems will greatly facilitate oceanographic studies. Simplified measures of biological response, such as flourimetry for phytoplankton, particle counters for plankton and suspended solids, and accoustic measurement of fish abundance represent areas of recent advancement which are not yet routinely available within ocean monitoring programs.

3. Sampling validity and data quality assurance--In any long-term monitoring program sampling validity and data quality assurance are necessary if the results are to have lasting value. Reference material needs to be maintained to provide historical perspective and to recognize real changes due to nature or man's effects in the face of changing methods and personnel. As a routine matter, new methods should overlap with old for a period prior to implementation of any program. Regular instrument calibration and routine sample standardization should go hand-in-hand with all field and laboratory work, and the results should be consistently recorded as part of monitoring data sets. Standard methods for marine work should be adopted wherever possible in routine monitoring programs, but there should remain a flexibility of choice in adopting other or developing new methods where parallel studies define appropriate intercalibration factors.

4. Data management and subsequent analysis, evaluation and usage are by no means simple, but are necessary attributes of any long-term monitoring effort. Some monitoring will be goal oriented to determining compliance with effluent or receiving water standards, for example. Other data will be more general in nature and probably less likely to have immediate use, such as seasonal oceanographic and biological characteristics. But these data can lead to a longer term goal of understanding the natural system variability and the interactions of pollutants and natural factors on the biota and the human users of the environment. Approved standard methods and analytical techniques should be validated and published by the federal government. This is being done in the EPA's Ecological Research Series, but NOAA should provide a similar series for oceanography.

5. Restructuring the compliance monitoring program--The use of monitoring information could be improved by a restructuring of the compliance monitoring program by local agencies, the Southern California Coastal Water Research Project, the EPA, the State Water Resources Control Board and NOAA. That is, there should be a change of the sampling grid and the testing now required, in order to better serve the scientific purpose of determining the environmental impact of various types of treatment and methods of discharge.

6. "Sunset rule" on monitoring programs--There should be a "sunset rule" on all monitoring programs with a complete review by a scientific committee at regular intervals. After such reviews, all future additions or deletions to the monitoring program should be approved by the suggested scientific committee.

III San Francisco Bay/Delta Region

A. Program

The Aquatic Habitat Program was developed through combined efforts of the State Water Resources Control Board, the San Francisco Regional Water Quality Control Board and the Association of Bay Area Governments. The program is intended to study and monitor the Bay as a whole, over a long term and in a coordinated and consistent manner.

Program goals include examination biological processes in the Bay, standardization of techniques and quality assurrance. The overall goal is to develop a master plan for monitoring the entire Bay. The master plan would include:

1. identification of pollution sources
2. development of a monitoring program to assess the Bay habitat
3. establishment of research priorities and the economic feasibility to accomplish the priorities, and
4. development of long-term funding.

B. Recommendations

1. Cooperation--For the Aquatic Habitat Program to succeed, the cooperation is needed among the dischargers, scientists and engineers. Involvement of federal agencies such as the EPA, USCE, USFWS, NOAA, and NMFS is also needed.

2. Funding--Inasmuch as NOAA has funds available for the development of regional monitoring programs and since such a program is actually being developed for the San Francisco Bay, NOAA financial support would appear appropriate and cost effective. Effective monitoring programs require long-term stable commitment of funds; NOAA and other such government agencies are in the best position to provide this type of support.

3. Long-term data sets--The current philosophy calling for instant data must be replaced by a recognition of the need for long-term data sets.

4. The competitive nature of funding needs to be replaced by a system that will promote coordination.

5. Regional differences--Regulatory agencies need to recognize the regional differences that exist in the country when setting regulations.

6. Incentives--There should be incentives, both economic and institutional, for local dischargers to participate in monitoring.

7. Coordinating agency--There is a need for a coordinating agency in each regional area that understands the local system.

IV Recommendations Related to Local Agency Programs

1. Identify the critical monitoring needs addressed by the West Coast Region Conference on Marine Pollution Problems, Portland, OR., June 17-19, 1980.

2. Initiate and publish an annual compendium of marine pollution research and monitoring activities in (a) California, (b) Oregon, and (c) Hawaii and the Pacific Trust Territories. Utilize expertise in each state to produce the compendium and model it after the Oceanographic Institute of Washington's Annual Compendium.

3. Conduct a series of small regional meetings, each of which will result in identification of specific monitoring objectives and identification of specific regional data sets. This will result in a specific proposal to NOAA for setting up and operating a regionally responsive data center and library. The proposal will include costs and resource needs.

4. San Francisco Bay should be designated a sixth area by NOAA for consideration in the next West Coast Region Conference on Marine Pollution Problems. Because it is an estuarine system and because of the extensive human use of that system, San Francisco Bay has many unique characteristics and problems not common to the open coast.

5. Utilize existing data--More effort should be made to use the vast amount of data already accumulated.

6. The Southwest Region should receive more funding than the present 1 per cent of federal funds earmarked for ocean pollution research, development and monitoring.

7. Local municipalities have neither the capacity nor talent for more sophisticated monitoring techniques and programs.

8. There are more useful purposes of monitoring than solely for compliance. Additional purposes and goals of monitoring programs should be defined and emphasized (or even recognized).

9. There is a need to emphasize quality control of monitoring methods.

10. Duplication of work should be avoided.

11. A regional library-data deposition center should be established.

Session Speakers

Local Agency Programs

Alan Mearns, Coordinator/Moderator

Mike Heinz

Irwin Haydock

James Sutton

Gary Kleppel

I State Water Resources Control Board and Regional Water Quality Control Boards

A. Programs

The State Water Resources Control Board and the Regional Water Quality Control Boards are the agencies with primary responsibility for water quality control in California. Two statewide marine monitoring programs are currently in effect. They are the National Pollutant Discharge Elimination System (NPDES) discharger monitoring and the State Board's Marine Monitoring Program.

1. The NPDES discharger monitoring is conducted as a regional activity by the regional boards. Although the individual discharger monitoring programs have many features in common based on state-wide policies, they are administered and enforced at the regional level.

2. The State Board's Marine Monitoring Program was developed to meet state-wide monitoring needs related to the Board's policies and plans, such as the Ocean Plan and the Bays and Estuaries Policy, as well as provisions of the Porter-Cologne Water Quality Control Act and the Federal Water Pollution Control Acts.

Objectives of the program are:

a. to provide the state with a system to document and assess long-term trends in selected indicators of the quality of coastal marine and estuarine waters.
b. to inventory and evaluate past and present monitoring activity in marine/estuarine areas aimed at avoiding duplication of monitoring activity. This inventory was published in October 1976.

The overall goal of the Marine Program has been to provide the state with a system to document and assess long-term trends in selected indicators of the quality of coastal marine and esturarine waters.

The two-part program consists of the California Mussel Watch and Areas of Special Biological Significance (ASBS) Reconnaissance Surveys. The Department of Fish and Game conducts both projects as the prime contractor, but secures technical assistance from a number of specialists.

The ASBS surveys were begun to provide preliminary information about the relative ecological health of the 34 areas designated under provisions of the Board's Ocean Plan. Nearly all of the 30 surveys completed to date were performed by marine scientists from academic marine institutions.

B. Recommendation

State and regional boards should improve storage and utilization of the data collection programs of discharger monitoring.

II California State Mussel Watch

A. Program

The California State Mussel Watch is directed by the State Water Resources Control Board and conducted by the Department of Fish and Game, in conjunction with consultants from Moss Landing Marine Laboratories, and the Bodega Bay Institute of Pollution Ecology.

Mussels are particularly suitable pollutant indicators as they are sessile in nature as adults, and they accumulate contaminants in tissues to levels considerably higher than sea water.

The State Mussel Watch is modeled after the National Mussel Watch. Like the national program, the State Mussel Watch concentrates on high-quality data collection from the point of sample site selection and collection through handling, preparation, analyses and data interpretation.

The State Mussel Watch monitors the same pollutants as the national program with the exception of the radionuclides. The National Mussel Watch concentrates on areas of suspected water quality problems, while the state program is directed toward areas not directly affected by point source discharge. Emphasis for the past two years has been placed on the identification of point source discharge and their effects on marine biota.

Of the 28 principal problems and 27 information needs in marine waste disposal identified at the NOAA West Coast Region Conference on Marine Pollution Problems held in June of 1980, State Mussel Watch and related studies will be addressing the following high priority issues:

1. Diseases and health of fish and shellfish
2. Marine food webs, toxic substances, biomagnification
3. Regional differences in capacity to assimilate wastes
4. Improve ecological monitoring techniques
5. Hazardous materials storage and detection
6. Petroleum impacts from oil spills or chronic discharge
7. Effects of dredged spoils

III Recommendations Related to State of California Programs

1. Monitoring should be conducted with an ecosystem approach rather than by the studies of only a few parameters.

2. Existing data should be utilized and analyzed.

3. Monitoring methods should be standardized when possible.

4. Effects should be measured of freshwater land drainage and industrial wastes on marine water quality.

5. The marine environment should be subjected to continual monitoring and assessment. The results should be examined and evaluated periodically to determine significance of the data.

6. Data and reports should be deposited in regional libraries where the data can be readily available.

7. Contaminants that have highest monitoring informational needs include synthetic organics and trace elements.

Session Speakers

State of California Programs

John Youngerman, Coordinator/Moderator

John Ladd

Michael Martin

A. Programs

The local agencies conducting monitoring research in the State of Hawaii are principally the University of Hawaii Water Resources Research Center, Hawaii Institute of Marine Biology and other units of the University of Hawaii. In addition, the U. S. Navy conducts occasional investigations of its own. Research sponsoring agencies are principally the Sea Grant College Program, University of Hawaii; City and County of Honolulu; and the three state agencies of the Marine Affairs Coordinator, Department of Health, and Department of Planning and Economic Development.

The past nine years of monitoring research have (1) evaluated some existing and identified new pollution indicators, (2) established some survey techniques, (3) surveyed and evaluated major pollution impact sources, and (4) identified and evaluated some important environmental factors.

1. Ocean outfall monitoring program--The City and County of Honolulu have monitored their ocean outfalls since 1972. The program has four basic objectives:
   a. The conventional parameters, such as BOD, TSS, pH, bioassay, are monitored to determine compliance with the NPDES permit values.
   b. The 129 priority pollutants and six pesticides identified by the EPA are measured and if any are present, the possible sources are investigated. Both industrial and nonindustrial (commercial and residential) areas are included in the surveys.
   c. The physical, chemical and microbiological parameters are monitored at selected stations in the receiving waters to determine compliance with the Federal Zone of Initial Dilution (ZID) and State Zone of Mixing (ZM) conditions.
   d. The benthic flora and fauna communities and phytoplankton, zooplankton and larval fish populations are surveyed to determine biostiulatory or inhibitory effects of the discharges.

A city staff of 22 engineers, laboratory specialists and inspectors, along with numerous scientific consultants, are required to conduct the program at a cost of about $500,000 annually or 3 per cent of the total operating cost.

2. Ambient water monitoring program--Water quality monitoring performed by the Hawaii State Department of Health is part of the regulatory program supported by EPA grants to the state. The Department of Health has developed capabilities to meet the needs of National Pollutant Discharge Elimination System (NPDES) and abmient water monitoring program in compliance with state and federal laws.

The Department of Health maintains approximately sixty fixed monitoring stations located throughout most beaches, coastal shorelines and embayments of the state. The stations are continuously monitored throughout the year to reflect a well-defined history of water quality conditions.

The monitoring provides data and information on physical, chemical and biological properties of water quality. Water monitoring data are used to describe existing conditions, evaluate trends, review enforcement and control

programs, and assess problems of nonpoint source pollution, including environmental impacts of land-based activities.

The overall objective for the program is to provide data and information necessary to maintain an understanding of water quality, including its causes and effects of such quality.

The monitoring covers water quality parameters in the State Water Quality Standards. The parameters currently monitored on a monthly or quarterly basis are microbiological and physicochemical. Biota are monitored annually at selected stations.

Special water quality investigations or intensive surveys are conducted as part of the water quality monitoring program.

The state's water monitoring program utilizes computerized water data file referred to as STORET. Water quality violations, station location and indexing, station data and water quality inventory, and water quality statistics are some of the retrievals provided by the system.

The EPA and the pollution Investigation and Enforcement Branch of the Department of Health are the main users of the water quality data generated from the monitoring programs. Water quality monitoring information is also made available to individuals, private consultants and other government agencies.

B. Needs

The following were identified as high priority information needs at the West Coast Region Conference on Marine Pollution Problems, June 1980:

1. Applicability of marine water quality criteria to Hawaii and Pacific Islands--The existing marine water quality criteria are not appropriate to the Pacific Basin. The region should be allowed to modify the criteria using baseline data from completed field studies in control and ocean discharge areas.

2. Selection of indicator organisms for the fish, mollusk and crustacean categories for the purpose of toxicity bioassays--Selection of the appropriate organisms in Hawaii and the subsequent experimental work for bioassays requires time and focused research effort.

3. Natural versus induced changes of a balanced indigenous population (community) within the zone of initial dilution--In order to determine whether observed changes of a community are due to effluent discharge, preliminary studies of the ecosystem must be conducted prior to discharge and construction of an outfall to determine the amplitude and duration of natural periodic fluctuations in the marine community. If control sites well removed from the discharge site, but containing essentially the same indigenous biological community structure, are monitored coincidentally with that in the zone of initial dilution, changes in important indicator species can be compared.

4. Toxic substances and their biological effects--Experimental studies on biomagnification of toxic substances in food chains in Hawaii are essential for the establishment of baseline information on the distribution and role of toxic substances in indigenous marine organisms.

5. Improve ecological monitoring techniques--Using existing data and experience, biological indices should be developed that quantitatively document changing, degrading or recovering marine ecosystems. These indices should not be costly. They should be generated from relatively simple sampling methods that can be frequently undertaken and can be reported in a timely fashion.

6. Microbiological and viral research needs--There is a need to develop relatively simple, inexpensive and highly efficient methods for assessing health hazards of viral pollution. Microbiological standards reflecting human fecal contamination should be reassessed. Rapid detection methods for viruses in marine food sources should be developed. Viruses in sediment should be evaluated.

7. Coral protection from silt by coastal land zoning--Methods should be developed for delimiting an effective coastal land buffer zone. A method should also be developed for determining and monitoring delivery ratio of sediment.

8. Pollution transport model for oceanic islands--There is a need to develop a data base on currents, temperature, density, gradient necessary for modeling.

9. Ocean management planning--There is a need to develop monitoring methodologies necessary for planning which parts of the ocean surrounding an oceanic island can optimally accommodate potentially competing developments of marine resources, e.g., fishing, mariculture, recreation, waste disposal, ocean thermal energy conversion installations, and U. S. Navy and shipping activities.

C. Recommendations

1. Applicable criteria for marine water quality--Since the warmwater, oceanic, coral ecosystem setting of Hawaii and the Pacific Islands are substantially different from the continental shelf coastal environment, special criteria should be established for this vast region extending some 5,000 miles in the Central and Western Pacific Ocean. While there are possibly common transferrable concepts and technologies from one region to another, such as data quality control, data and information storage and retrieval systems, there is no substitute for local in-site monitoring and monitoring research tailored to the coral ecosystem, insular environment and ocean resources development.

2. Adequate funding--The Hawaiian and Pacific Islands should be considered as a region or a subregion, and their monitoring efforts should be supported by more adequate funding than at the current level of less than 1 per cent of federal funding.

3. Ecosystem approach to monitoring--The State of Hawaii offers to the region and to the nation the state's experience now being gained in utilizing the ecosystem approach to water quality management. Much more monitoring and monitoring research is needed to fully establish the water quality criteria based on the ecosystem approach.

4. Nonpoint land pollution sources such as sediment, and ocean resources development sources such as ocean thermal energy conversion (OTEC) should be given special attention in deciding overall monitoring strategies.

5. There is a need for a regional information and deposition center.

Session Speakers

State of Hawaii Programs

L. Stephen Lau, Coordinator/Moderator

George C. Richardson

Eugene Akazawa

I Overview

In a decade of environmental control, the programs mandated for marine monitoring that have been carried out by industry have varied widely in their scopes in time, space and in parameters selected.

Two general categories of required monitoring for compliance have been:
1. monitoring to obtain and maintain NPDES permits for effluents
2. monitoring for preparation of federal Environmental Impact Statements (EIR reports in California)

A third category of monitoring may be considered as:
3. episode-related monitoring.

NPDES Permits--The principal characteristic of NPDES permits is that they represent technology-based standards for attaining a given set of values for specific parameters at the outset of monitoring. Initially, a baseline survey of the presumed area of impact may be carried out, but the parameters measured may or may not be well selected to evaluate the living environment or ecosystem. Compliance monitoring to maintain a permit may be very limited in scope or may be very extensive. Such studies for power plants, for example, may provide the only long-term monitoring in an extensive coastal area.

In the early years of NPDES permitting, monitoring criteria were sometimes selected that may have been appropriate to fresh-water streams, but were not appropriate to the marine environment. When obvious degradation of habitat occurred in spite of permit limitation the EPA turned to mandating increasing levels of in-plant technology without regard to the need for, nor the benefits of, the hardware in relation to the ecosystem of the receiving waters.

This approach will be reassessed within the next five years, largely because of the escalating costs of technology which industry and the public are unable to bear. It is, therefore, important that necessary revisions in the approaches be made.

The EIS Process--Baseline surveys for obtaining EIS/EIR permits for construction in the coastal zone have produced studies of widely varying quality and scope. Some industries and public agencies have made concerted efforts to monitor intensively and to take the ecosystems approach, while others have carried out studies that were incompetently done, trivial, or too limited in scope. Such studies could expand the data base for an area if measurements and data were compatible with ongoing studies and the quality of the work were verifiable.

Episode Monitoring--Some of the most expensive and least productive monitoring has been carried out on highly visible major oil spills, such as the Argo Merchant spill. There is usually no baseline at a spill site, and the emergency mobilization of funds, experts, equipment and monitoring protocol does not lead to the best use of available resources. Industry is particularly constrained by liability considerations and corporate chains-of-command in getting studies of accident sites initiated quickly enough to determine immediate impacts. Contingency plans and systems of mobilization must be refined.

II Kelco Division of Merck and Co.

A. Program

Because it depends upon kelp (macrocystis) for the production of many of its products, Kelco is necessarily concerned about programs designed to monitor pollutants in the nearshore California waters where the company harvests. Presently, Kelco conducts a monitoring program in the Point Loma area designed to:

1. provide environmental information for its restoration program
2. predict wet kelp supplies
3. detect long-term changes in kelp standing stocks.

B. Recommendations

1. Monitor changes in kelp beds--When monitoring programs are undertaken in areas where kelp beds occur, these beds should be monitored for distribution and abundance changes that relate to water quality changes. Macrocystis is an important organism to monitor for the following reasons:
    1. It holds ecological importance as a primary producer and is a structural element that provides settling space and shelter for animals.
    2. Kelp is of economic importance both directly to the kelp industry and indirectly to other fisheries of organisms dependent upon kelp.
    3. Kelp's overall biology is relatively well known.
    4. Kelp's sensitivity to pollutants has in the past provided reason to suspect pollution problems that might otherwise have gone unnoticed.
    5. The distribution and abundance of kelp is easily measured and recorded using aerial photography.

2. Studies of kelp should be conducted over a sufficiently large area to insure that changes associated with large-scale pollution sources can be measured in relation to an unaffected "control" area.

3. Regional studies should be conducted to provide a measure of episodic, oceanographic events, such as El Nino warm-water periods.

4. Changes in distribution and abundance of kelp observed from aerial surveys should be confirmed for cause using diving surveys.

5. Kelco's expertise related to harvesting of kelp should be used in designing nearshore monitoring programs for California waters.

III Atlantic Richfield Company

A. Programs

Through continued operation, through growth and expansion of facilities, and by exploration and development of natural resources, the energy industries

impact the environment in different ways. New technology brings new kinds of impacts to the environment, many of which were unknown a few years ago.

Increases in the volume of goods and services, resulting from increased demand, expand the magnitude of environmental impacts.

The major environmental concerns within the industry cover all areas of the pollution impact problem, including air and water quality, land use, waste disposal, air emissions, waste disposal, effluent discharges, social and economic impacts and aesthetic considerations.

In response to federal, state and local regulations ARCO's operations are monitored for change and impact.

Biological and chemical monitoring programs are now in effect or have been completed at ARCO's refineries. A program to monitor effects of a large water intake and discharge facility in Alaska is being developed. Air quality is monitored at various ARCO facilities.

B. Recommednations

1. Agree on program objectives--Both the regulator and the regulated should agree on the objectives of a monitoring program. One of the industry's problems has been not knowing what government wants.

2. Keep things simple--Industry is not yet in the position to do "research-type" monitoring, since it does not have the expertise.

3. Monitoring regulations should take into account different ecology. That is, one uniform regulation should not be applied to the industry overall.

4. Data sources within industry should not be ignored. It is important that the regulator recognize and use the expertise within industry.

5. While realizing that physical and chemical monitoring are necessary, ARCO would like to concentrate on biological monitoring. ARCO would like monitoring to become more purposeful and only a means to an end rather than an end in itself. Monitoring programs should be dynamic; as more information is obtained, monitoring programs should be flexible enough to change in magnitude when the information warrants it.

6. Regulations should more quickly reflect advances in science.

7. If regional monitoring programs are developed, industry should at least have a consulting participation in their management.

8. Industry must move beyond a position of reaction into a position of leadership, and ARCO would like to do this in the area of Monitoring marine pollution.

9. Incentive for self monitoring--More self monitoring might be done by the petroleum industry if government would provide incentives for industrial energy and government research projects and for joint research projects by industry and academia. Tax relief is one example of incentive.

IV Recommendations Related to Industry Programs

1. Scope and methods of required monitoring should be appropriate and currently available.

2. Monitoring requirements should consider receiving water objectives as well as effluent quality.

3. The data base of any regional monitoring program should be assessible to all users.

4. Baseline monitoring systems should be developed which would cover large areas on a regular basis at least seasonally. The site-specific, long-term requirements for industry associated with NPDES permits could then be integrated into the baseline system to cover smaller areas more intensively, as well as to monitor the particular components related to the individual effluents. If these systems were in place, costs would be borne in part by the integration of required monitoring programs for existing private industries and public agencies as well.

5. The further steps to the understanding of either ecosystems or public health impacts will require systems research, laboratory research and field study with both basic and applied approaches.

6. A national data bank may not be cost effective, but compatibility of data recording would make possible specific comparisons as well as linkages between some computer data base systems.

7. Standardization of gear and equipment used in monitoring programs would be too inhibiting. Taxonomic standardization, however, would be useful.

8. A guideline manual of sampling monitoring techniques should be developed.

9. An ongoing regional monitoring program should be established that is tailored to the region, as long as (1) existing data sources are used as much as possible, (2) concomitant research is carried on, (3) a data base is available from which data could be retrieved, and (4) there are feedback loops to regulations.

Session Speakers

Industry Programs

Dorothy Soule, Coordinator/Moderator

David Young

Craig Barilotti

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I Environmental Protection Agency

A. Programs

The Environmental Protection Agency (EPA) Region IX is presently involved in the following long-term, fixed-station monitoring of the marine environment:

1. Basic water monitoring program--The EPA conducts sampling of nine marine sites is Hawaii and three marine sites in Guam on a regular basis. Parametric coverage includes water temperature, turbidity, dissolved oxygen, pH, salinity, total residue, total nitrogen, total ammonia, total coliform, fecal coliform and total phosphorus. Site selections are negotiated with the states and collection of samples is performed by the states. The program, funded by EPA, is a component of the federal network for assessing national water quality.

2. California Mussel Watch--This program is summarized in Section IV.

3. National Pollution Discharge Elimination System (NPDES) permit monitoring--Pursuant to specific discharge permits, individual point source dischargers must monitor and report to the agency delegated by the EPA to enforce permit requirements. This monitoring is the responsibility of the discharger, such as waste water treatment plants, power plants and industry, etc. The EPA performs oversight compliance monitoring and inspections only.

4. Section 301(n) regulations--The EPA is now reviewing applications for modification of secondary treatment for discharges into marine waters. The regulations require:
   a. compliance with applicable water quality standards (dissolved oxygen, turbidity, pH, etc.)
   b. the protection of a balanced indigenous population
   c. establishment of a monitoring system by the discharger
   d. a toxics control program.

In addition to the preceding long-term monitoring, the EPA conducts short-term and/or reaction oriented monitoring. Examples of this are programs performed by the research ship Antelope and six surveys of radioactive waste dumping sites off the Farrallon Islands conducted from 1974 to 1978.

B. Recommendation

Central depository--The EPA STORET (Storage and Retrieval) data system should be investigated as a way to fill the need for a central depository of regionally developed marine pollution data.

II National Park Service

A. Programs

The National Park Service (NPS) is conducting no marine pollution monitoring programs, as defined at this conference, in the Western Region. Throughout

the NPS System, past and current monitoring programs in the marine environment are rare. The NPS's research budget, about $2 million per year in the Western Region, is directed at mission oriented studies and must solve management problems over resources within parks. One example of NPS-funded marine pollution monitoring involves evaluation of thermal discharges from a power plant on the ecosystem in Biscayne Bay National Monument.

The NPS, however, has recently partially funded a baseline pseudo-monitoring program involving intertidal resources at San Miguel and Santa Barbara Islands. As part of the Bureau of Land Management's outer continental shelf program, Drs. Mark Littler and Dale Straughan have established permanent intertidal stations on these two California coastal islands. Detailed quantitative information in rocky and sandy intertidal areas is now available. This data covers seasonal variations in community composition and includes data on environmental parameters. If a catastrophic oil spill or other subtle pollution were to alter this ecosystem, man will have some information about the nature of community occurring there under natural conditions.

B. Recommendation

Data center--A central data repository or data center should be formed. A tremendous amount of data are available but are scattered about the region.

III Bureau of Land Management

A. Programs

The Bureau of Land Management (BLM) is the federal agency within the Department of Interior responsible for managing and leasing marine minerals in the federal continental shelf (OCS)

The Environmental Studies Program of BLM's Pacific OCS Office began on the West Coast in 1974 as part of BLM's national program of gathering baseline data for making OCS oil and gas leasing and development decisions. BLM held open public meetings to recommend baseline studies in the area, contracted for summaries of existing marine and coastal environmental information on the West Coast, and awarded several large baseline contracts between 1975 and 1977. The contracts were awarded to local universities, private industry consulting firms and other federal agencies to perform the work.

As a result of the Southern California baseline program funded by BLM between 1975 and 1978, several reports are available on the distribution and abundance of intertidal and benthic organisms in the Southern California Bight, as well as offshore marine bird and mammal distributions, abundances and breeding areas.

Also studied were concentrations of hydrocarbons and trace metals in marine organisms, the water column and coastal and offshore sediments. Several geological hazard surveys were also funded along with a sediment transport study in the San Pedro Shelf area.

BLM in 1978 reevaluated and redirected the Environmental Studies Program from the baseline study concept towards funding studies to answer specific questions and concerns about OCS oil and gas leasing and development that would provide answers to decision makers regarding management questions. The program's current goal is to establish information needed for predicting assessment and management of impacts on the human, marine and coastal environments of the OCS and nearshore areas which may be affected by oil and gas activities. As a result the Pacific OCS Office now funds a range of marine and coastal studies directed at answering questions relating to the prediction and assessment of OCS oil and gas development impacts.

The Pacific OCS Office presently has no monitoring program funded. But the office has proposed several offshore rig monitoring studies in the FY 1982 Environmental Studies Plan. The offshore meteorological buoys being placed off the California Coast are being funded by the Pacific OCS Office for a three-year period. The three years accumulation of baseline data in the Southern California Bight is available to users for monitoring purposes.

The Pacific OCS Office concerns about monitoring studies in this region relate to the effects of OCS oil and gas development on the marine and coastal environments. Potential impacts that could be investigated in a monitoring program include OCS platform discharges, physical and human disturbances from OCS development activities, and the long-term effects of chronic and accidental oil spills.

B. Recommendations

1. Region-wide ecosystem approach--Any monitoring program should consider and evaluate the region-wide controlling and forcing factors in the marine environment in program design. This could avoid the problem of gathering site-specific data that cannot be interpreted properly due to limited boundary conditions.

2. Information use and application--The program should be designed with the involvement of regulatory decision makers to define the most appropriate objectives and questions to be answered. Monitoring programs should be designed and carried out to provide useful information to make regulatory or management decisions concerning marine resources.

3. Regional information storage and retrieval system--The most valuable contribution that NOAA could make at this time concerning marine pollution monitoring and studies in this region would be to fund and set up a regional environmental information storage and retrieval system. The system could expand an existing network or use existing facilities for storing and distributing information about the large number of federal, state and local governmental marine programs in the area as well as private and industrial programs. A good first step would be to set up a system describing all ongoing marine and coastal monitoring and research programs in the area.

4. Feedback to decision makers and regulators--Products and progress reports of any marine monitoring program should result in feedback in the proper form to appropriate decision makers and regulators. A critical task in this process is to translate the technical and scientific data gathered in the program synthesis products and summary products that can be understood by nontechnical regulators and decision makers.

IV National Ocean Survey

The National Ocean Survey (NOS), a component of NOAA, has several programs that provide information on marine monitoring.

Nautical Charting Program--The NOS is responsible for the production and up-to-date maintenance of nautical charts of the U. S. coastal waters. The basic purpose of these charts is for navigation of maritime commerce. The base data, however, is available for other uses. The shoreline has been mapped continuously since the mid-1800s, which provides information about shoreline changes over a long period of time.

National Tide and Water Level Observation Network--Operated and maintained by the NOS, this network consists of about 200 long-term, tide-water level stations, with about 50 of these stations in the Great Lakes. These stations record the water level on a continuous basis, and from this information tidal data is computed and referenced to tidal beach marks. Surface temperature and density are also recorded at these stations. Many of the stations have been in operation since the late 1800s. The information is also used to produce the tide prediction tables.

Tidal current surveys--The NOS is also responsible for conducting tidal current surveys. A primary use of the data is the production of tidal current charts for navigation and for the publication of the tidal current prediction tables.

This information, however, has many other uses.

The NOS also scheduled for completion by the end of 1980 a comprehensive survey of San Francisco Bay.

V U.S. Army Corps of Engineers

A. Programs

The U.S. Army Corps of Engineers is involved in three aspects of monitoring the marine environment.

1. Regulatory--This aspect of COE monitoring relates to the issuance of permits.

2. Specific Projects of Studies--Examples of the COE's specific marine monitoring projects are:
   a. Dredging
   b. San Francisco Bay Prototype Data Acquisition which is intended to lead to a better understanding of the Bay and model verification
   c. Humboldt Harbor and Bay Project which involves mapping and evaluation of the wetland
   d. Noyo River and Harbor Project which monitors entrance conditions

3. Special Programs
   a. The California Data Collection Program involves the collection of wave data in cooperation with Scripps, the State of California and NOAA. Beach profiling and the DEO visual observation project are other components of the California Program.
   b. Remote Sensing Manual

B. Conclusions and Recommendations

1. General monitoring does not necessarily help identify cause and effect.

2. Stability and variability of data must be evaluated.

3. Short-term studies should compliment more limited long-term projects.

4. A better understanding of the ecosystem is needed.

5. Totally standardized methods would be difficult and impractical to develop since each agency has specific needs.

6. Quality of data depends on the objective of gathering the data.

VI Recommendation Related to Federal Programs

Input from operating scientists is desired. The technological needs of ocean pollution monitoring programs are being assessed by NOAA's Ocean Technology and Engineering Services (OTES), and input is required to answer the following questions:

1. What scientific work cannot be accomplished because of equipment/ methodology shortfalls?
2. What improvements are necessary in present equipment and methodologies?
3. What field recommendations for equipment and methodology advancements in technology are available now? Who should be contacted?
4. Are funding estimates available for the preceding?
5. Is there potential for cooperative agreements with federal, state and local centers for technology developments?

Session Speakers

Federal Programs

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