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A Committee Presentation to a Consultant Panel to the

NATIONAL COUNCIL ON MARINE RESOURCES AND ENGINEERING DEVELOPMENT

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September 23, 24, and 25, 1968

Washington, D.C.

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EXECUTIVE OFFICE OF THE PRESIDENT
NATIONAL COUNCIL ON MARINE RESOURCES
AND ENGINEERING DEVELOPMENT

COMMITTEE ON MULTIPLE USE
OF THE COASTAL ZONE

SCHEDULE FOR PANEL HEARING on COASTAL ZONE PROGRAMS AND PLANS

September 23, 24, 25, 1968
Room 9104, New Executive Office Building (FOB #7)
Washington, D.C.

September 23

8:45	Organizational discussion	-- Panel and ICMUCZ Members
9:00	Overview of Committee Activities and Plans) Discussion of Hearing Procedure)	-- Mr. Pautzke *

TASK GROUPS AND COMMITTEE PANEL

9:15	Task Group on Interagency Coordination, Federal-State Relations and Legal Problems (COSREL)	-- Col. McGuinness
9:45	Discussion	
10:15	Great Lakes Panel	-- Mr. Lee
10:30	Discussion	
10:45	Task Group on Problems, Opportunities and Needs (IPON)	-- Capt. Jenkins
11:15	Discussion	
12:00	Luncheon break	

* Titles of persons making presentations are given on a list beginning with the third page following this one.

September 23

1:30	Task Group on Identification and Delineation of the Coastal Zone (IDCOZ)	-- Dr. O'Bryan
2:00	Discussion	
2:30	Task Group on Chesapeake Bay (CHESBA)	-- Col. Love
3:00	Discussion	
3:30	Task Group on Harbor and Port Studies	-- Gen. Noble
3:40	Discussion	
4:30	Adjourn	

September 24

PROGRAMS AND INITIATIVES

9:00	Background and Priority Proposals	-- Mr. McBroom
9:15	Oil Pollution Control Program	
	Coast Guard	-- Capt. Heyward
	Corps of Engineers	-- Gen. Noble
	Interior	-- Dr. Hirsch for Dr. Singer
10:00	Discussion	
10:30	Effects of Construction Activity in the Coastal Zone Development of Offshore Facilities New Techniques for Restoration of Coastal Shores and Beaches	-- Gen. Noble
11:00	Discussion	
11:30	Seaward Boundary Determination Circulatory Characteristics of Coastal Waters	-- Adm. Nygren
12:00	Luncheon break	

September 24

1:30	Discussion	
2:00	Offshore Ports and Systems for Bulk Cargoes	-- Mr. Marsden
2:15	Discussion	
2:30	Biomedical Research on Man in the Sea	-- Dr. Price
	Education in the Marine Sciences (Coastal Zone)	-- Dr. Lindquist
3:00	Discussion	
3:30	Physical Facts of the Estuarine Environment	-- Mr. Upson
3:45	Discussion	
4:00	Presentation of Remaining Committee Initiatives	-- Mr. Pautzke -- Mr. McBroom
4:30	Discussion	
5:00	Summary Discussion	-- Panel Mr. Pautzke Mr. McBroom
5:30	Adjourn	

September 25

9:00	Executive Session of Panel Mr. Pautzke, Mr. McBroom, and Committee members to be available on call to assist Panel	

PANEL FOR HEARING ON COASTAL ZONE PROGRAMS AND PLANS

Meeting
September 23-25, 1968

Room 9104
New Executive Office Building

Dr. Douglas Brooks, Chairman — 203-277-3301
Travelers Research Center
Hartford, Connecticut 06101

Admiral Edward C. Stephan — 525-2800
Ocean Systems, Inc.
1901 N. Fort Myer Drive
Arlington, Virginia 22209

Mr. Walter Boyer — 301-752-2118
Maryland Port Authority
Pier 2, Pratt Street
Baltimore, Maryland 21202

Dr. James Crutchfield — 206-543-5635
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University of Washington
Seattle, Washington 98105

Mr. Peter Andrews — 628-2906
Buffalo Courier Express
National Press Building (Room 1389)
Washington, D.C. 20004

Mr. Boyd Ladd — 424-9375
717 College Parkway
Rockville, Maryland 20850

MSC Representative: Dr. David A. Adams

Titles of Persons Making Presentations at Panel Hearing, Multiple Use of the Coastal Zone, September 23 and 24, 1968

Clarence F. Pautzke
Chairman, CMUCZ
and
Acting Assistant Secretary of the Interior
for Fish and Wildlife and Parks

Col. Wm. V. McGuinness, Jr.
Chairman, COSREL
and
Assistant Director of Civil Works
for Comprehensive Planning
Corps of Engineers, Office of the
Chief of Engineers

James A. Lee
Chairman, Great Lakes Panel
and
Assistant for Environmental Health to the
Assistant Secretary for Health and
Scientific Affairs
Health, Education and Welfare

Capt. Wm. A. Jenkins
Acting Chairman, IPON
and
Deputy Chief, Office of Operations
United States Coast Guard

Dr. Deric O'Bryan
Chairman, COSREL
and
Social Scientist, Ecological Hydrology
Water Resources Division, Geological Survey
Interior Department

Col. Wm. J. Love
Chairman, CHESBA
and
District Engineer, Baltimore
Corps of Engineers

Brig. Gen. Charles C. Noble
Director of Civil Works
Corps of Engineers

James T. McBroom
Executive Secretary
Committee on Multiple Use
of the Coastal Zone

Capt. Francis D. Heyward
Chief, Law Enforcement Division
Office of Operations
United States Coast Guard

Dr. Allan Hirsch
Assistant Commissioner, Program
Plans and Development
Federal Water Pollution Control
Administration
Department of the Interior

Dr. S. Fred Singer
Deputy Assistant Secretary
for Water Pollution Control
Department of the Interior

Rear Admiral Harley D. Nygren
Associate Administrator, ESSA
Department of Commerce

Howard J. Marsden
Chief, Division of Ports and Systems
Office of Maritime Promotion
Maritime Administration
Department of Commerce

Dr. Vincent E. Price
Special Assistant to Director
National Institute of General Medical Services
National Institutes of Health
Department of Health, Education and Welfare

Dr. Clarence B. Lindquist
Regional Coordinator
National Defense Graduate Fellowship Program
Division of Graduate Programs
Bureau of Higher Education
U.S. Office of Education
Department of Health, Education and Welfare

Joseph E. Upson
Deputy Assistant Chief for Research and
Technical Coordination, Water Resources
Division, Geological Survey
Department of the Interior

Opening Remarks by Chairman, Committee on Multiple Use of the Coastal Zone, National Council on Marine Resources and Engineering Development, at a Panel Hearing on September 23, 1968

The Coastal Zone and the Committee on Multiple Use of the Coastal Zone are both unique in the affairs of the Marine Sciences Council.

The Coastal Zone includes land areas as well as the adjacent seas and sea bottoms. It also includes the Great Lakes and their shorelines. The Coastal Zone is an extremely significant part of the marine environment.

Vice President Hubert H. Humphrey, the Chairman of the Council, put it this way in an address at Kingston, Rhode Island, last year:

> "When we think of our marine environment, we tend to visualize the Pacific Ocean, the Atlantic Ocean, the Gulf of Mexico, or the Indian Ocean, or the Caribbean Sea. Though we speak in these vast terms, the most useful and important portion of that environment -- both actual and potential -- is the cities with their harbors and estuaries, the beaches and boating facilities, the centers of shipbuilding and shipping, the waters to the edge of the continental shelf, the Great Lakes and the adjacent shoreline lands. We call this vast area the coastal zone, and it's where the people and the seas meet."

Nearly all of the Nation has a stake in the sound use of our Coastal Zone resources, yet there is no comprehensive system for assuring sound use. For the most part, the uses that man makes of the

Coastal Zone are carried out to serve single objectives. There is little comprehensive planning or adequate public control over what the Vice President has called, with concern, "irreversible changes."

The Coastal Zone Committee is unique because it includes consideration of an area of Nation rather than a scientific function or series of functions, like Research, Education and Facilities or Ocean Exploration and Environmental Services.

Our Committee was organized in September 1967. The Committee includes representatives of 19 agencies and has 36 members, alternates, and observers on the Committee list. This list is included as the last 12 pages of this book.

The Committee has organized a number of task groups to carry out its work.

One of them is the Task Group on Interagency Coordination, Federal-State Relations, and Legal Problems (COSREL). This Group has completed its report, which includes 58 recommendations. The report is now pending before the Committee. The other groups are: (1) The Great Lakes Panel, (2) The Task Group on Problems, Opportunities and Needs (IPON), (3) The Task Group on Identification and Delineation of the Coastal Zone (IDCOZ), (4) The Task Group on Chesapeake Bay (CHESBA),

and the Task Group on Harbor and Port Studies. The Chairmen of all of these groups will make reports at our hearings.

The Committee has also developed 37 new initiatives for fiscal year 1970. We plan to present these initiatives during this hearing. We are proud of every one of them and believe that each represents a worthy proposal from the agency which prepared it.

At the request of Council staff, a subcommittee of the Multiple Use Committee developed a proposed priority system for these 37 initiatives. This system is as follows:

Priority 1 -- Needed immediately -- may be costly and/or dangerous to wait an additional year.

Priority 2 -- Essential to orderly development of the Coastal Zone -- should be included in Fiscal Year 1970 program.

Priority 3 -- Sound -- desirable to have in Marine Resources program.

In Priority 1, the subcommittee included the pollution control program for massive oil spills submitted by the Coast Guard, the Corps of Engineers, and the Interior Department and also the initiative of the Corps of Engineers on the study of the Effects of Construction Activities on the Ecology of the Coastal Zone.

In Priority 2, the subcommittee placed all of the other initiatives in the Panel hearing schedule which will be presented by the agencies sponsoring them.

All the rest of the 37 initiatives were placed in Priority 3. We plan to discuss them with you tomorrow afternoon, following the presentation of the Priority 1 and Priority 2 initiatives.

All of the material we will present to you in the form of reports on task groups and initiatives represents a response to the Committee's plea for generation of new and innovative ideas for handling the problems of the Coastal Zone. This request was made in the atmosphere of generating these ideas without budgetary and policy constraints.

What we are offering to the Panel in this hearing is a body of ideas and proposals which have been developed by the Committee members and the Task Groups, but which are yet to be processed in the stills of policy and budgetary refineries.

We bring these ideas forward in this form in the conviction that this is the good way to reach the needed innovative solutions to the vexing problems of the marine environment in general and the Coastal Zone in particular.

INITIATIVES

National Council on Marine Resources
and Engineering Development

Committee on Multiple Use
of the Coastal Zone

Initiatives -- Fiscal Year 1970

Title	F.Y. 1970 (In Millions $)	Total Estimated Cost (In Millions $)
1. Smithsonian Institution		
A. Interoceanic Canal Studies	.5	20.0
B. Marine Preserves	.1	8.0
C. Submersibles	.2	20.0
D. Great Lakes Ecology	.2	.5
E. Marine Aquacultural Station	1.0	20.0
F. Underwater Archeology	.3	10.0
Subtotals	2.3	78.5
2. Corps of Engineers		
A. Development of Offshore Facilities	.15	1.40
B. New Techniques and Equipment for Restoration of Coastal Shores and Beaches	.3	1.20
C. Effects of Construction Activities on the Ecology of the Coastal Zone	.25	3.75
D. Combatting Oil Spills	1.0	
Subtotals	1.70	6.35
3. Commerce - Maritime Administration		
A. Seaport Control Tower	.15	.15
B. Offshore Ports and Systems for Bulk Cargoes	.5	1.0
Subtotals	.65	1.15
4. Commerce - Coast and Geodetic Survey		
A. Seaward Boundary Determination	2.94	5.56
B. Circulatory Characteristics of Coastal Waters	2.47	4.00
Subtotals	5.41	9.56

Title	F.Y. 1970	Total Estimated Cost
5. Transportation - Coast Guard		
A. Oil Pollution Program, Massive Oil Spill		
(1) Containment	.05	.05
(2) Source Control	.1	.1
(3) High Speed Pumps	.2	.2
(4) Tank Top Burner	.1	.1
(5) Pollution Recovery Equipment		
(a) Feasibility Study	.1	.1
(b) Barge	.25	.25
(c) Flotation devices	.25	.25
(6) Oil Bio-degradation Study	.1	.1
B. Port Advisory Services	.2	.2
C. Hazardous Cargo Information Ctr.	.25	.25
Subtotals	1.60	1.60
6. Interior		
A. Artificial Reefs as a Tool of Marine Sport Fishery Management - BSFW	.2	
B. Marine Underwater Observation and Interpretation - NPS	.5	
C. Physical Facts of the Estuarine Environment - GS	2.75	
D. Estuarine Research and Management - BCF	4.1	
E. Aquaculture - BCF	5.3	
F. I.O.D. - Mapping Resources of the Continental Shelf - BCF	4.0	
G. Combating Oil Spills - FWPCA	.5	
Subtotals	17.35	
7. Health, Education and Welfare		
A. Finfish Sanitation	.65	
B. Health Hazards Arising out of Toxic Chemicals Polluting the Coastal Zone Waters	.25	
C. An Innovative Initiative in Education for the Marine Sciences	.05	

Title	F.Y. 1970	Total Estimated Cost
D. Use of the Coastal Zone as a Source of Marine Forms for Biomedical Research	.1	
E. Biomedical Research on Man in the Sea	.1	
Subtotal	1.15	

8. Water Resources Council

A. Establishment of River Basin Commission in the Coastal Zone	1/	
B. National Assessment of Adequacy of Water and Related Land Resources	1/	

Recapitualtion --

Smithsonian	2.3		78.5	
Corps of Engineers	1.70		6.35	
Commerce - MARAD	.65		1.15	
Commerce - CGS	5.41		9.56	
Subtotal - Commerce		(6.16)		(10.71)
Transportation - Coast Guard	1.60		1.60	
Interior	17.35			
Health, Education and Welfare	1.15			
Water Resources Council		1/		1/
Grand Totals	30.16			

1/ No cost estimate provided

March 8, 1968

1. Base Line Studies in the Region of the Interamerican Isthmian Canal

The effects of some of the activities of modern man which can change the distributions of animals and plants and the geography of major regions of the world may be of the greatest scientific and economic (and therefore political) importance.

Many examples can be cited: The construction of a canal around Niagara Falls permitted the sea lamprey to invade the Great Lakes, and destroyed important lake trout and whitefish industries. The accidental introduction of a snail parasite on Japanese oysters contributed to an equally great reduction in the major ground fisheries of the Black Sea. The digging of the Suez Canal has allowed 137 species of marine organisms to pass from the Indian Ocean to the Mediterranean Sea, and at least one species to pass in the reverse direction. The ultimate repercussions of this exchange are not yet clear, but already the preliminary effects are being felt from Pakistan to Tunisia. Dams in inland waterways of the western United States have prevented the reproduction of salmon. On land, there are the famous examples of rats, starlings, and sparrows introduced into North America, and rabbits and cacti introduced into Australia. All these species have wrought basic changes in the ecologies of their new homes, and some have already cost many millions of dollars to control.

These examples indicated that the construction of a new sea level canal in Panama or Colombia should be accompanied by a wide range of biological studies. First of all, preliminary information must be obtained in order to predict the probable biological effects of the mixing of Atlantic and Pacific biotas. The subsequent changes in the biological and physical environments should be monitored and measured regularly, for a period of several years.

The information obtained would be of great scientific interest as well as practical value.

The Atlantic-Pacific Interoceanic Canal Study Commission is making radiobiological studies to determine the feasibility of canal construction. Following the Commission studies, a decision will be made as to whether to undertake construction. The Smithsonian Institution is an appropriate organization to direct or coordinate the long-term studies. The following proposal specifies the precise interests of the Institution, summarizes its resources and capabilities, and suggests a definite program to begin the necessary research as rapidly and economically as possible.

The studies which the Smithsonian proposes to undertake would complement and supplement the earlier work sponsored by the Atlantic-Pacific Interoceanic Canal Study Commission. The Smithsonian would extend the Commission's feasibility studies in space and in time to investigate

each major habitat type on each side of the canal over a period of time sufficient to achieve a biological understanding of the dynamics and ecology of the organisms and not just their occurrence.

It is proposed that the Smithsonian assure the development of an adequate program to permit the fullest possible understanding of: (1) the implications of new canal construction for the distribution and maintenance of marine life, (2) the extent of movement through the existing canal, and (3) the necessary background to evaluate any oceanographic changes which might occur after a sea level connection is made.

Extrapolating from the observed morphological diversity we can expect that, after the sea level canal is completed and the barrier to dispersal is removed, a wide range of changes may occur. The influx of new organisms would be expected to upset the balance of some populations. New interactions among species would change the nature of the selection to which the organisms are subjected. Instances of hybridization and intergradation can be predicted among those related groups from opposite sides of the Isthmus which have not accumulated sufficient genetic or behavioral isolating mechanisms. In some circumstances competition between newly mixed elements of the biota may cause rapid changes in population densities. Some species probably will become more abundant, while others may become extant. New species interrelationships will occur. The possible effect on harvestable marine species is uncertain.

An innate complexity exists in biological systems in the tropics resulting from three distinctive features: (1) tropical biota includes larger numbers and a greater diversity of species than the biotas of any other regions of the world; (2) the ecological and behavioral relations between species are more complex in the tropics than elsewhere; and (3) the tropics are believed to be the place of origin, and principal center of evolution, of most groups of organisms. New and major types of adaptation to "new ways of life" appear to be more likely to be evolved by tropical species than by species of other regions. Tropical species also seem to be more successful in invading other regions than are species of other regions in invading the tropics.

As clearly established during the Smithsonian Conference on Tropical Biology held in Panama City, November 10-12, 1966, our knowledge of tropical biology lags far behind parallel information in the temperate regions. Accumulation of these data for tropical regions is essential for the development of rational programs to harvest the sea and best utilize its resources. The major areas of protein deficiency for human populations are in the tropics. Detailed knowledge of the potential fisheries resources is but one of the side benefits to be anticipated from the proposed Isthmian program.

Total estimated cost -- $20 million
Estimate for f.y. 1970 -- $ 500,000

March 8, 1968

2. Marine Preserves

For many years various suggestions have been made that atolls be set aside for scientific work. The conservation of atolls now would provide that this unique environment will be available for study in a near natural condition as civilization moves into the oceans. Atolls with typical characteristics should be selected and maintained as international scientific preserves with guards to keep out unwanted visitors, and scientific laboratories and quarters for the implementation of projects in science. The world's atolls now belong to some nation or national protectorate. Within the next few years we must make our moves and secure the sites or perhaps lose the chance forever.

Coral atolls have been of general scientific interest since Darwin wrote his treatise on the subject in the last century. In addition to the geological puzzles atolls present, their fringing coral reefs provide a most varied and interesting biological community. In looking for Pacific atolls which were relatively undisturbed, we have been made painfully aware of the necessity of preserving one or more of the relatively few uninhabited atolls left. Fortunately for the feasibility of the project, the less populated and exploited an atoll, the greater the scientific interest since undisturbed ecology of the land and the reef is the goal. Conversely, the uninhabited atoll is uninhabited because it has thus far been of least interest to man.

In the case of such atolls removal from the coral reef of one or more species for commercial reasons may well upset the reef's delicate balance of nature, causing a readjustment in the original community. Achievement of the object of the preserve in this case thus requires that commercial fishing be prohibited from the reef areas, within a radius of perhaps five nautical miles. (This should not prove to be any commercial hardship in the foreseeable future, as the uninhabited status implies isolation and little local fishing, and deep sea commercial fishing presumably would want to keep boats and tackle free of the reefs.)

In the case of all such preserves the high seas areas would retain their character as such under international law, subject to specific limitations that may be agreed upon for inclusion in an international arrangement. It would be necessary that such an arrangement not inhibit unrestricted use of the areas in emergency circumstances should reason of national security require. (This objective might be accomplished in a variety of ways, and would not necessarily require an explicit treaty provision.) The results of scientific exploration, study or research would be required to be made openly available.

Approval of the first such preserve was given by President Johnson in May 1967, although this approval has not been announced. The procedures for the establishment of Rose Island as a preserve were proposed as a precedent to the designation of other preserves. Many Islands are held

by several nations in trust to the United Nations. When the permanent disposition of these Islands is agreed on, the United States should be prepared with proposals to designate appropriate Islands as permanent International Preserves.

Additionally, unique Islands exist in various parts of the world, for example, Aldabra. Recently saved from a proposal to use the Island as an air base, Aldabra and other such Islands should be considered by appropriate groups for designation as International Preserves.

Total estimated cost --	$8 million
Estimate for f.y. 1970 --	$100,000

//

March 8, 1968

3. Submersibles

Although modern experience and the impetus for utilization of underseas vehicles for research really began with the 1959 dive of TRIESTE to 35,700 feet depth in the Marianas Trench, biologists have attempted to observe organisms by surface supported diving in the sea at least since 1844. During the last several years the Smithsonian Institution has made a significant commitment of scientist time to such research. Many scientists have adopted SCUBA techniques, and that part of the ocean available to SCUBA is being continually studied for its biological and geological secrets.

The first research submersible vehicle was used by the Smithsonian Institution in 1964 and since that time 25 scientists have made more than 100 dives on nine underseas vehicles. These dives have established the fact that such vehicles are an essential part of research support for the Smithsonian. They open the door to solution of many baffling research problems in connection with the identity, behavior, and abundance of organisms. They provide a mechanism for study that will permit tests of otherwise speculative geological theories.

Submersibles are needed to study the distribution of Coraline algae. These reef-forming plants help to consolidate the sediments and stabilize the coastlines of the eastern United States in areas north of the coral reef communities. Coraline algae may be of great significance in the production of organic matter in the shallow water areas. Grazed by parrot fishes and other marine forms, there is no good estimate of the depth limitations to their occurrence to seaward and of their abundance. Although much has been learned by SCUBA, the limits to SCUBA diving are more restricted than that to algal distribution. Vehicles are required to extend our knowledge to seaward.

Smithsonian scientists are concerned with the study of mid-water organisms in the upper waters of the deep ocean. These populations are of interest as potentially exploitable fisheries. They scatter acoustic transmissions of the Navy. Their specific identities are controversial. They are variously reported to be fishes, squid, jellyfishes, shrimp, siphonophores, and other organisms. Scientists are eager to use the capability of underseas vehicles to study the kinds, distributions, and populations of mid-water organisms.

Geological theories of the origin of continents and their changing faces with time are deeply involved in shore processes. Smithsonian geologists use SCUBA to study the formation of underseas canyons. Drastically limited by diving techniques, these scientists urgently need vehicle time to follow the underseas contours, observe the physical features, and sample in specific locations. Rocks dredged from the ridge on the floor of the middle Atlantic Ocean indicate that some enlightening information on the structure and movement of the Earth's crust could be gathered by deep diving vehicles. With chartered underseas vehicles, the Smithsonian plans to make detailed studies of this poorly studied but promising geological area.

Archeological interest is high in the use of submersible vehicles to examine sunken ships and to probe areas suspected of hiding submerged ancient cities. Smithsonian scientists using such vehicles could greatly enhance their observational capability and add substantive information to the accounts of prehistoric man's activities.

Three program areas of particular interest would employ research submersibles, the first two of which would use vehicles with lock-out capabilities. With the development of saturation diving techniques and submarines which may be equalized to ambient pressure in the shallow ocean, it has become possible for scientists to work exposed to the ocean environment for extended periods at depths up to at least 150 meters. Man himself is the most versatile scientific tool, and this ability to work in the hostile oceanic milieu is an important step forward in the efforts to explore and to understand the sea.

The first program area involving lock-out vehicles combines detailed observation of the distribution and abundance of the ocean biota with in situ experiments. Work has already been performed in evaluating the influence of light on animal behavior and new observations have been made on the mating of cephalopods in a natural environment. The experimental work should be extended to examine various frequencies and intensities of light and also into other areas of research. Our knowledge of oceanic animals is sufficiently sparse so that practically any observation which is made represents a significant extension.

As a second program the use of lock-out vehicles also provides a major new tool for extending archeological knowledge. The recent field of submarine archeology has already provided new insight into the past. With the use of submersibles the reality of the lost city of "Atlantis" may very well be demonstrated. A conference on underwater archeology will be held at the Smithsonian in FY 1968 to select potential sites for exploration. Implementation of this program will open an exciting new door for discovery.

In association with each of the submersible programs is a plan to develop field guides to the plants and animals apt to be seen during field studies. Especially when the crew members of research submarines and the accompanying observers are not trained biologists, field guides may be used to encourage the taking of valuable observations.

Total estimated cost -- $20 million
Estimate for f.y. 1970 -- $200,000

March 8, 1968

4. Great Lakes Ecology

The Smithsonian Institution wishes to make a fundamental examination of the U.S. and Canadian aquatic research activities and plans with reference to the Great Lakes in order to provide basic information to be utilized in developing new programs. The resources of the Smithsonian can be drawn upon to discover all such data. Knowledge of the physical and chemical components of the Great Lakes systems, the biological components of these systems, the regulatory systems that maintain relative stability in the system and the modifying influences of contaminants must be understood if well planned projects are to be undertaken.

The Smithsonian proposes to undertake a program designed to develop and open lines of communication between scientists and others concerned with the Great Lakes environment and man's accidental or premeditated manipulations of this environment, to organize an outline of basic research studies which may be undertaken in developing desired data on the ecology of the Great Lakes, and to suggest studies to provide needed information.

A program is proposed during which panels of experts and consultants will be organized to identify the problems to be encountered and to identify the most productive methods of accomplishing the proposed research. Special attention would be given to the advancement of knowledge of the effects of pollution on natural systems with the long-range objectives of developing management practices to control eutrophication, thermal wastes and to further man's proper utilization of the Lakes.

In accordance with the recommendations of such panels, the Great Lakes would be studied as a whole with respect to their:

1. living and nonliving components,
2. structure,
3. functions and processes,
4. spatial distribution,
5. past history and future changes,
6. relationships to larger systems in which they are component parts, and
7. classification in relation to other ecological systems.

Consideration of these factors is essential to understanding the effect of pollutants on the functioning of the systems. During the study period, comparisons between the Great Lakes and other foreign large lakes will be started to provide a common basis for measuring changes through space and time. However, the main concentration of effort will be on the Great Lakes.

Emphasis will be placed on basic descriptions of the ecological systems with regard to their structure (distribution and numerical relationships among populations of different kinds of organisms; description of the physical components of the environments).

The combined objective of the study would be to establish a baseline of understanding of the total environment for continuing reference as desired. A maximum number of competent scientists will be utilized in the panels, in organization of bibliographies and in locating other existing data at cooperating institutions.

Total estimated cost -- $500,000
Estimate for f.y. 1970 - $200,000

March 8, 1968

5. Marine Aquicultural Experiment Station

It is proposed that a portion of the swampland in the Canal Zone be set aside as an Aquicultural Experiment Station. Levees should be built and provision made for adequate pumping of water into and out of the resulting ponds. The land should be given planned treatment to provide a variety of marine habitats and the facility should be maintained as a marine research station on an equivalent basis with U.S. Agricultural Experiment Stations.

If located on the Atlantic side of the Isthmus of Panama, the normal tide is only about two feet and maximum tide is four feet. There are no hurricanes and seldom are there any storms. The area lies in the tropics where most of the underfed people in the world reside and the land is not now being utilized.

The resulting facility would be expected to run experiments in animal breeding, in fertilization of marine waters, in marine plant culture, in marine animal culture, in marine genetics, in methods of harvesting marine organisms, and in selection of new species of marine organisms for utilization by man.

Total estimated cost -- $20 million
Estimate for f.y. 1970 - $ 1 million

March 8, 1968

6. Underwater Archeology

New equipment for locating underwater objects and for occupying the ocean offer both an opportunity and a responsibility for proper descriptions of archeological findings. The responsibility for wise use and non-destructive studies is exceptionally important in order that man will continue to have available these evidences of prehistoric civilizations and satisfy his need to know about the past.

Using magnetometers and simple sonar equipment, wrecks and sites are being discovered in abundance. Surveying, marking and scientific recovery are important to the U.S. and the world. It is, therefore, proposed that a concerted effort be made to develop a national capability in this field and to conserve and utilize properly the information available in the artifacts discovered.

It is believed that 15,000 years ago, sea level was more than 100 meters below the present sea level. This means that the Maritime Paleolithic, i.e., the specialized Old Stone Age cultures which existed along the shores is now submerged. In research along the coast of Malta and Gibralter many caves have been seen fronting on what was once natural ocean front terraces, but which are now submerged at depths of up to 350 feet. Such caves have been explored at depths to 70 feet and evidence was found of human habitation. Absolutely nothing is known about maritime cultural specialization in the Paleolithic, so that work in such caves can be expected to yield stones, bones, and other important information regarding man's early adaptation to a coastal environment. Geologists have located artifacts off both the western and eastern coasts of the U.S.

Town sites, which include harbor installations as well as submerged buildings of various types, are unlikely to be found at depths greater than 50 feet, and in fact most of them rest in shallower waters with depths of less than 20 feet. Neolithic sites may also be found in fresh water lakes but here also at depths less than 30-40 feet. The harbor itself should be examined and the deep water approaches to the harbor, where wrecks may be found, would shed considerable light on the trade patterns of the sites on the shore. Sand covered structures may offer special problems of detection. Sonars can now look about 3 feet into sand.

Wrecks may be found at any depth. The wrecks at considerable depths may be well preserved, because they lie at depths below the primary level of destructive sea life, such as the Teredo worm. The number of wrecks of all time periods must be exceptionally great. It has been noted that at the present time, when the world is at peace, three-tenths of one percent of the world's merchant shipping is being deposited on the ocean floor each year. Some of these wrecks should be left as a future resource. A sweep of the Florida Channel in about 600 feet of water should reveal many wrecks, which are known from historical sources.

The foregoing grouping of sites indicates that underwater archeology has interests in exploration and excavation at depths ranging from the surface to 1,000 feet or more. For sites in shallow water, i.e., depths less than 20 feet, use has been recommended of a plastic tent filled with air, which could rest on the ocean floor with a water seal at the bottom. In such a tent where the working environment approaches that of land, an archeologist could excavate the ocean floor within the tent as he would on land. A plexiglass bubble, which derives its air from the surface, is said to be safe in depths up to 50 feet. Deep submersibles may be useful for both survey and excavation work at considerable depth. The small submarine, ASHERAH, has been helpful in conducting survey work. Presumably a vehicle such as DEEP DIVER might provide a means of getting divers to the work area on the ocean floor and at the same time enable the pilot and an observer in the forward compartment to conduct limited surveys of the area.

Total estimated cost -- $10 million
Estimate for f.y. 1970 -- $300,000

CORPS OF ENGINEERS, U. S. ARMY

DEVELOPMENT OF OFFSHORE FACILITIES

A Proposed New Initiative for FY 1970 to National Council on Marine Resources and Engineering Development.

Problem. Man's increasing activities in the coastal areas are contributing to the congestion of coastal and lakeshore cities, leading to expansion into offshore areas. Biscayne Bay, Florida and San Diego, California are examples. This expansion includes the construction of such facilities as offshore barriers, islands, causeways, airfields, power and desalinization plants, harbors, floating breakwaters, terminal platforms, and access tunnels. Research is required to develop engineering design criteria and construction techniques for these facilities and to determine the effects of their construction on the littoral processes of adjacent coastal areas.

Proposed Research. Analytical, laboratory, prototype, and possibly pilot oceanographic and underwater soil mechanics studies would be conducted on:

a. The littoral regime in the vicinity of offshore facilities, including the effects of interruption of alongshore sand transport and methods of transferring accretion to downdrift areas.

b. The current circulation patterns in the vicinity of offshore facilities, with a view to providing proper flushing between offshore structures and the shore.

c. The effects of wave action on pore pressures and bearing capacity of offshore permeable soils.

d. The effect of wave-induced fluctuations of mud on the use of ocean bottom for structure foundations.

e. The effects of alteration of wave refraction and energy distribution by offshore structures on adjacent shores.

Program for Accomplishment. While this new initiative would be of multi-agency interest, it would be primarily engineering and construction oriented. Therefore, it is proposed that the research be assigned to the Corps' Coastal Engineering Research Center, for accomplishment under its expanding research and development program. This assignment would not require new legislation. The Research Center would coordinate this research program with other interested Federal agencies, including the Departments of Transportation, Commerce, Interior, and Housing and Urban Development. Funds in the amount of $150,000 would be required in FY 70[1/] to prepare a comprehensive plan of study and to initiate the research. Thereafter, funds in the amount of $250,000 per year for five years are estimated to be necessary for completion of the program studies.

1/ Subject to budgetary constraints.

REVISED: 12 Sept. 1968

CORPS OF ENGINEERS, U. S. ARMY

NEW TECHNIQUES AND EQUIPMENT FOR RESTORATION OF COASTAL SHORES & BEACHES

A Proposed New Initiative For FY 1970 to the National Council on Marine Resources and Engineering Development

Problem. The combined forces of nature are continuously eroding and, at some locations, building up the beaches along the seacoasts of the United States. The most critical areas which require restoration or nourishment include the entire Atlantic shoreline of New Jersey, the coastline of Florida between Cape Kennedy and Miami, the Gulf of Mexico shoreline in the vicinity of Galveston, the California shoreline from Santa Barbara to San Diego, and the south shoreline of Lake Erie.

The most effective dissipator of wave energy is a wide sandy beach, which not only serves as an energy absorber to resist erosion and to protect structures located on the backshore, but also provides actual or potential recreational benefits. Thus, the most desirable solution to a shore erosion problem is the restoration of a shoreline to desired dimensions with suitable material, and the periodic placement of additional sand to maintain the necessary strand width and foreshore slope.

Presently, 108 beach erosion control projects have been authorized by Congress, of which 98 involve the placement of suitable fill material for beach restoration and periodic nourishment. It is estimated that beach restoration on these 98 projects will require about 200 million cubic yards, and the nourishment of these projects during their projected life will require about a billion cubic yards of suitable material. For example, the authorized beach erosion control projects along the Atlantic coastline of Florida will require about 25 million c.y. for restoration and 50 million c.y. for continuing nourishment.

For many years, the source of sand for beach restoration and nourishment has been from lagoonal and inland deposits. However, in recent years it has become increasingly difficult to obtain suitable sand from these sources in sufficient quantity and at economical costs for beach fill purposes. This is due primarily to the increased value of marginal and inland lands, including developments by public and private interests, and the added costs of transporting sand from remote inland areas. Material composing the bottom and sub-bottom of estuaries, lagoons, and bays in many instances is not suitable for long-term stabilization purposes. Regardless of material suitability, there is also an increasing restraint on the use of any materials in tideland areas, as evidenced by the many laws and ordinances prohibiting such use, due to the recognition of potential ecological imbalances that may result.

REVISED: 12 SEPT. 1968

The problem of the scarcity of suitable material for beach fill operations led the Corps of Engineers to initiate a program in FY 1965 to determine whether large deposits of suitable fill material exist in the offshore zone. The program involves the accumulation of data on the characteristics of material composing the bottom and sub-bottom between the 15' and 100' depth contours. Since FY 1965, sand inventory surveys have been completed along the New Jersey and Florida coastlines. Preliminary analysis of data collected indicates there are many large deposits of suitable material in the offshore zone. For example, there are about 600 million cubic yards of suitable material off the Florida coastline and about 1.5 billion cubic yards along the New Jersey shoreline, at distances ranging from one to six miles offshore. Data are presently being collected along the New England coastline and the area from Cape Charles, Virginia, to the North Carolina line. The remainder of the Atlantic and the Gulf, Pacific, and Great Lakes offshore sand deposits will be surveyed in future years, as required. The present problem is the development of the best method of placing these offshore deposits on the eroded beaches and, additionally, to afford a better means of creating artificial islands and providing or maintaining harbor channels.

Proposal. It is proposed to develop new techniques and equipment to excavate material from offshore deposits and deliver this material in a practicable and economical manner to beaches requiring restoration or nourishment. The Corps of Engineers intends to pursue the following primary goals to achieve this objective:

a. Investigate improved methods of beach nourishment, using existing hopper dredge direct pump-out and pipeline dredge equipment.

b. Investigate and develop new concepts of beach nourishment equipment and procedures, considering such items as submarine dredges and elevated platform units which could result in more efficient and lower cost systems.

c. Investigate and develop equipment to better withstand the action of littoral forces (wind, waves, and currents) on transferring pipelines or conveyor systems.

d. Investigate cheaper methods of transfer of littoral drift deposits at ocean inlets.

The impact of the above techniques on fish, wildlife, and other estuarine and environmental values would be investigated, in cooperation with other agencies, under the Corps' initiative, "Effects of Construction Activities on the Ecology of the Coastal Zone."

Program for Accomplishment. It is estimated that the annual funding required for FY 1970 1/ and subsequent years through FY 1973 will be $300,000. This

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1/ Subject to budgetary constraints.

level of funding will provide for: the purchase and installation of instrumentation in the offshore zone to acquire qualitative and quantitative data on littoral forces; model tests and small-scale prototype tests of mechanical components, such as pipeline transferal systems; and engineering studies and evaluation of data collected and of new concepts developed for the excavation and utilization of offshore deposits for beach restoration and nourishment purposes. The views and advice of university people, representatives of the dredging industry, and experts in the coastal engineering field will be solicited in connection with these studies and evaluations. An important objective of this program is to obtain the cooperation and active participation of plant and equipment manufacturers and the dredging contractors.

New legislation will not be required to proceed with this type of program, since existing authorities are adequate. Appropriation of annual funds in the above amount will permit this program to proceed on an optimum schedule.

This initiative comprises only a part of an over-all research program directed at improving marine construction plant, which will be pursued as funds can be made available. This initiative covers the most urgent facet of that program, which is within the purview of the Committee on Multiple Use of the Coastal Zone.

CORPS OF ENGINEERS, U. S. ARMY

EFFECTS OF CONSTRUCTION ACTIVITIES ON THE ECOLOGY OF THE COASTAL ZONE

A Proposed New Initiative for FY 1970 to the National Council on Marine Resources and Engineering Development

Problem. Construction activities are increasing rapidly in the coastal zone, as population pressure mounts and economic development continues to expand. The impact on the coastal environment and ecology is evident, as works associated with modern technology alter the tidal regimen and degrade or enhance shore and water areas of substantial values. Land fill and dredging, harbor and channel construction, jetties and breakwaters, causeways, hurricane barriers, salinity control structures, and artificial beaches may generate important ecological changes. In the present state of knowledge, many of the effects are obscure and a better understanding of these relationships is urgently needed. Systematic studies of preventive or corrective action and a full evaluation of the side-effects of construction are necessary to realize the potential, and to prevent destruction of our invaluable coastal resources.

Proposal. A research program should be undertaken promptly to assess the nature and extent of the effects of construction activities on the environment of the coastal zone, and to suggest practical measures, related to such construction, for improving the management of our estuarine and coastal waters and adjacent lands. With proper knowledge, guidance, and control as necessary, prudent modifications of existing or contemplated engineering works or industrial activities can be effected, in order to reduce the impact on eco-systems and established economic activities. This research is expected to result in long-range savings in cost and help to provide a rational basis for decisions and trade-offs on the development and preservation of our shores.

Program for Accomplishment.

1. Interagency Joint Effort. The formulation and execution of this research program would be carried out by the several Federal agencies concerned with various facets of these problems, with the Corps of Engineers as the lead agency.

a. The Corps has extensive involvement in the coastal zone, including planning, design, construction, operation, and maintenance of coastal works, such as channel improvements, harbors, canals (land cuts), protective structures, beaches, and major drainage of swamps and marshes. Also, systems of upstream channel improvements and reservoir impoundments affect the estuarine and coastal environment. Further, the Corps has a nationwide mission in control of noxious aquatic plants, including infestations in the coastal zone.

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b. Many of the other Federal, State, municipal, and private activities, such as industrial dredging and spoil disposal, dumping, installation and operation of shore and offshore structures, including the intakes and outfalls of industrial and power plants generating chemical, biological, radiological, or thermal pollution effects in the coastal zone, are subject to Corps permits and inspections.

c. The Corps has extensive experience and capability in construction technology, one of the main factors in man's activities affecting the coastal zone, and one which offers great potential for ameliorative measures.

d. With its Coastal Engineering Research Center, Great Lakes Research Center, Waterways Experiment Station, San Francisco Bay Model, and the projected Chesapeake Bay Study and Model, the Corps has an array of research facilities and capability that provides a solid base already in being for scientific and engineering research in this area. Present moderate capability in the biological, environmental, and socioeconomic disciplines is being strengthened. Existing Corps authorities in water and related land resources development, including the Coastal Engineering and Great Lakes Research Programs, are adequate for the Corps to undertake this program.

e. Many of the individual research projects would be accomplished jointly by two or more agencies and, in some cases, cooperatively with State or other non-Federal agencies, and with industrial trade associations or professional organizations.

2. Multi-disciplinary, Multi-agency, Systems-Oriented, Case Study Approaches. Because of the immensity and complexity of the problem, and the broad spectrum of causes and effects, a wide variety of disciplines and expertise of many agencies will be brought to bear. Conceiving of coastal biological and physiographic processes as a dynamic system, interacting with the inputs of man's intrusion upon it to produce changing beneficial or adverse outputs, the requisite research on this system and process must itself be systems-oriented. Part of the program would be structured in the form of pilot projects. Before-and-after case studies would be made in detail of the effects (favorable or adverse) of Corps projects and project-systems (including reservoirs and upstream channel improvements) on the coastal environment.

3. Extramural Participation. A considerable portion of this research would be performed extramurally, and it is envisaged that universities, academic institutions, and Sea Grant Colleges would participate with other Federal agencies in this program.

4. Cost and Schedule. Substantive research, which would be started under this initiative in FY 1970, is to be preceded in FY 1969 with a preliminary study to survey the existing state-of-the-art, to scope the program with relation to the nature and magnitude of the problems to be investigated, and to develop the detailed research plan, including priorities. An advisory group, including outstanding expertise from the major

relevant disciplines, within and outside of Government, is being established to assist in program formulation and implementation. The entire program would be coordinated with other agencies having missions and continuing programs related to these studies. The Department of the Interior and other agencies with special capabilities in the field would be major contributors to the studies, and the Corps would transfer funds to such agencies for this purpose.

FY 1970	$ 250,000 1/
FY 1971	500,000
FY 1972-74	1,000,000/year

1/ Subject to budgetary constraints.

CORPS OF ENGINEERS, U. S. ARMY

COMBATING OIL SPILLS

A Proposed New Initiative for FY 1970 to National Council on Marine Resources and Engineering Development

Problem. The "Torrey Canyon" oil spill disaster off the coasts of England and France in March 1967 was the stimulus which awakened the world community to the fact that, despite the advanced state of our technology, we were severely deficient in knowledge or experience on how to cope with a major oil spill. Many of the measures taken in connection with the Torrey Canyon spill were of an emergency nature, with much doubt that they would be timely, practicable, and effective. In fact, the defensive measures taken approached being a vast experiment by which it was hoped that the damage to aquatic life could be minimized and the coastal areas protected or restored. At the same time, this incident provided useful basic data for future use in developing definitive programs and techniques for prevention, control, and restoration measures in the event of a major oil spill. A review of the actions taken as a result of the Torrey Canyon incident demonstrates clearly that knowledge in this field is sparse and that extensive investigations coupled with selective research programs are urgently required, so that an assured capability and technique could be developed to combat a major oil spill and accomplish satisfactory restoration operations on the beach.

Proposed Research. New and practical techniques should be developed which would be applicable to three principal areas of concern associated with an oil spill, namely: containment of oil at site; destruction or recovery of oil at site; and protection and restoration of the shore face. In each area, the following primary goals to achieve this objective should be pursued:

1. Containment of Oil at Site.

a. Investigate and develop improved methods, techniques, and hardware to contain an oil slick within a limited area: Different types of floating booms are in common use for the control of oil spills in sheltered waters. However, much is to be desired with respect to their effectiveness and capabilities. Various types of floating booms will be investigated and evaluated, and an effort made to develop an optimum system which is easily transportable and readily assembled and installed. Since no floating booms have been developed to withstand the forces in the ocean environment, a major effort should be directed to determining whether it would be feasible to develop a boom for this purpose.

b. Investigate and determine the feasibility of developing a bubble curtain barrier system adaptable to the ocean environment: Similar systems, for use in sheltered waters, have been developed and used successfully in port and harbor areas to contain an oil spill.

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2. Destruction or Recovery of Oil at Site.

a. Investigate the feasibility of developing a method, adaptable to the Corps of Engineers hopper dredge fleet, whereby chemically-treated sand would be sprayed over an oil slick, causing the oil to adhere to the sand particles and sink to the bottom: Extensive preliminary laboratory work has already been completed by the Royal Dutch Shell Company in Holland, with results indicating that this technique has possibilities and merits further research leading to a prototype test. The availability of sand along the coastal areas, and the capability of the Corps hopper dredges to dredge, treat, and deliver this sand to the location of an offshore oil spill, are factors which make research in this field highly desirable. The principal effort should be directed to (1) determining the modifications required to Corps hopper dredges and (2) developing a pumpout dispensing system to apply the chemically-treated sand to the oil slick. The possibility of adverse ecologic effects from use of this technique should be carefully evaluated by the FWPCA.

b. Investigate the feasibility of developing oil skimmer or collection-type equipment of much greater capacities than now exist: Special effort should be directed to the development of unique collection-type plant capable of operating in the ocean environment. Present equipment has limited capacity and is of such nature that it can operate only in sheltered waters on relatively minor oil spills.

3. Protection and Restoration of the Shore Face.

a. (1) Investigate the feasibility of utilizing an expedient of large sand-filled nylon bags to form a protective barrier dike around the more critical shorefront locations when an attack by an oil spill is imminent. (2) Also, investigate possibilities of developing a protective cover system and method of installation and anchoring of large rubber, plastic, or polyethelyne sheets of fabric similar to the plastic covers used at ball parks to protect the field during inclement weather: Rolls of these fabric sheets might be stockpiled at strategic locations and be readily transportable, so that installation can be made at vulnerable locations in a short period of time.

b. Investigate the feasibility of developing a highly sophisticated piece of heavy construction equipment, similar to a paving machine, which could move along the beach skimming and collecting a layer of the oil-contaminated beach sand, processing the mixture automatically by burning or chemical means, and then discharging the clean or processed sand back on the beach.

Program for Accomplishment. This initiative is of multi-agency interest and represents a segment of the comprehensive research program considered necessary to assure a Federal capability to cope successfully with massive oil spill incidents. It is intended that the agencies with primary responsibility for that part of the program covered by this initiative would be the FWPCA and the Coast Guard, as these agencies are well qualified and adequately equipped and staffed to undertake this mission. However, since the Corps of Engineers has expertise in the fields of coastal engineering and marine and heavy construction, particularly in the coastal and offshore areas, and has the resources, facilities, and

marine plant required, it could assist and participate in the program even though primary responsibility is vested in other Federal agencies. On this basis, the Corps would coordinate with the efforts of other agencies and private interests which may be engaged in research on complementary facets of the overall problem. The Corps participation in the program could be accomplished by utilizing the resources and facilities of the various District Offices, as required, as well as the Coastal Engineering Research Center, the Waterways Experiment Station, and the Marine Design Division of the Philadelphia District.

Corps assistance to the lead agencies in this program would be at their request and on a reimbursable basis. Accordingly, Corps funding of this program is not envisioned. Pending development of more refined figures by the lead agencies, the Corps estimates that this program would involve a funding requirement of about $1 million per year for four years.

U. S. Department of Commerce
Maritime Administration

Suggested FY1970 Initiative
for
Committee on Multiple Use of the Coastal Zone
National Council on Marine Resources and Engineering Development

Seaport Control Tower

Problem:

At the present time, there are some 24 Federal agencies whose functions affect the administration, operation or development of the ocean port. The existing multiplicity of these Federal organizations and their often dispersed, physical location within individual ports adversely affect the efficient servicing of ships, cargo and passengers and thus our international trade and commerce.

Objective:

The development of a port "Control Tower" would achieve: (1) the centralization of port activities and the reduction of the retardant effects of multiple, uncoordinated Federal agency activities, (2) the facilitation of the entrance and clearance of ships, cargo, and passengers, and (3) the implementation of the recommendations of the IMCO and OAS 1/ international waterborne transportation facilitation conventions, dealing with ports, which the United States has ratified.

Scope:

From the viewpoint of the Federal Government, the "Control Tower" designation would refer to the headquarters location of a so-called Federal "Port Controller". Enactment of new or amendment of existing legislation could give the Maritime Administration the authority to act in the capacity of "Federal Port Controller" and define its responsibilities with respect to coordinating all Federal port activities regarding the entrance and clearance of ships, passengers, and cargo. To this end, the local offices of the Federal inspection and clearance agencies, such as Customs, Immigration, Public Health, Agriculture, Coast Guard, etc. would function as staff to the Port Controller.

Several concepts should be examined to consider the provision of a central focal point of certain or all port activities. The determining factor as to concepts should be the scope and nature of the port activities taking place at specific ports.

Concept A (see chart 1), embodying the "Control Tower" approach, could consist of a separately located "Federal Port Activities Center" (also housing the "Federal Port Control Tower") administered by the Federal Government, which to the maximum degree possible, would house certain Federal agencies within one building in order to facilitate inter-agency coordination and communications.

1/ International Maritime Consultation Organization
Organization of American States

Organizationally, the tower would contain two groupings of resident organizations. The first would contain the aforesaid Federal inspection and clearance agencies under the coordinating head or "Port Controller". The second resident grouping would consist of those Federal port related agencies having a significant influence on the port, but not a direct daily bearing on cargo or passengers. A third grouping would be of the basically non-resident type consisting of Federal port-related agencies such as F.M.C., I.C.C., etc.. Space permitting, these agencies could also be housed in the building constituting the Federal Port Activities Center.

Concept B (see chart 2) consists of the type already in existence and rapidly being provided at many U.S. and foreign ports in the form of commercial "World Trade Centers". In effect, this is a Private Port Activities Center, administered by a port authority, maritime association, or a joint committee of local interests and consisting of a large building or buildings housing the non-Federal organizations and entities involved in international business and in the administrative processing of world trade. Under such centralized conditions, these interests could act more expeditiously in clearing passengers and commerce through the port. As detailed in chart 2, those organizations embodied would consist of resident and non-resident non-Federal agencies, private firms, and entities. Such a "World Trade Center" could continue to exist, or be established, as physically-separated from the Federal Tower concept.

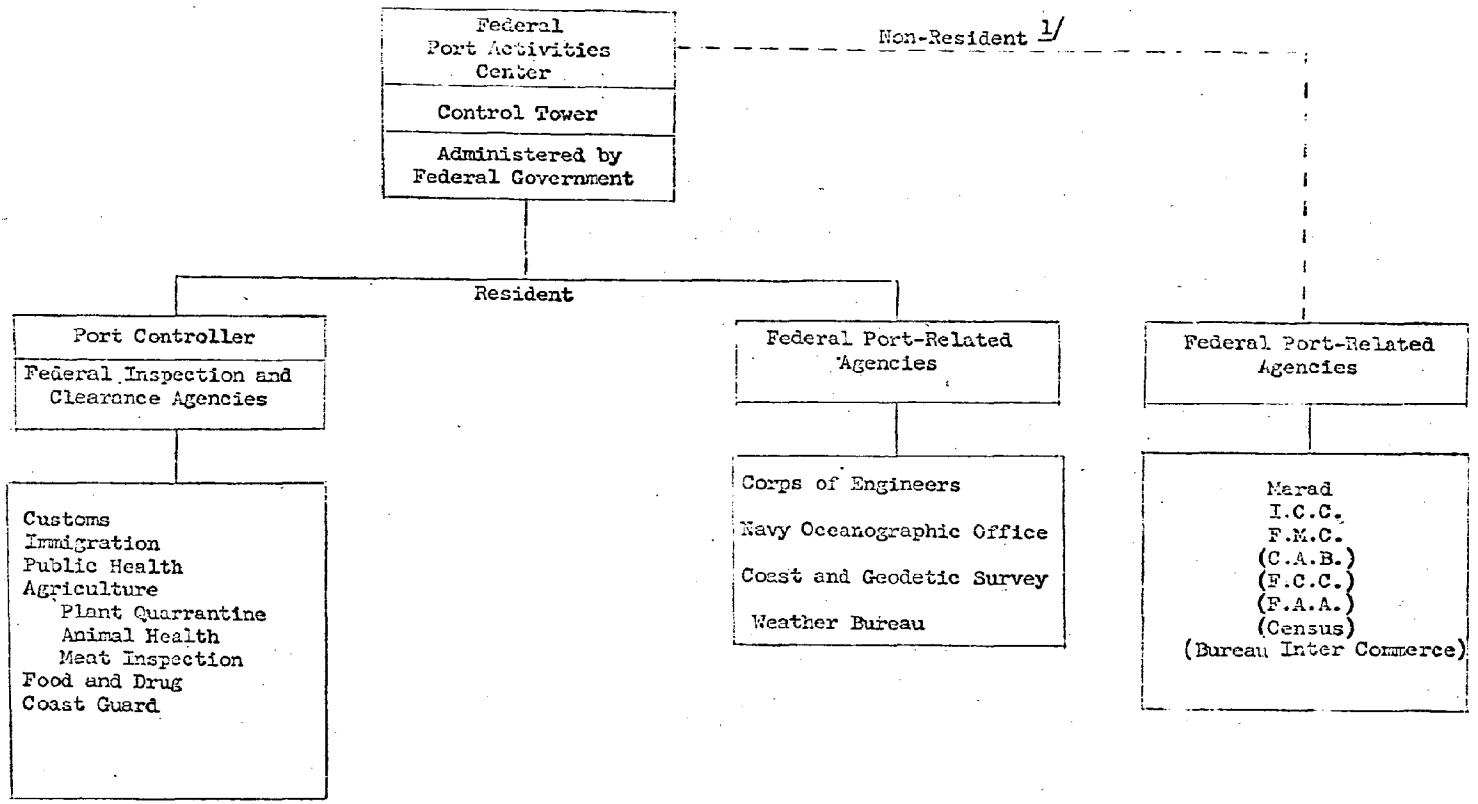
Concept C (see chart 3) can be considered the ultimate in centralization of port activities as it would encompass the principles of the two previously described concepts. As a "World Trade Center", administered by a port authority, maritime association, or a joint committee of local interests, it would contain a "Control Tower" for all Federal port activities, separately administered by the Federal Government and embodying, on a resident and non-resident basis, the same organizational structure of Federal agencies described in concept A. As a counterpart to the Federal activities area, there would also be contained in such a center, on both a resident and non-resident basis, the same organizational structure of non-Federal interests described in concept B. Thus, at a single physical location, ship officers, forwarders, shippers, and others could make all the necessary arrangements regarding the entrance and clearance of the ship, its crew, its passengers and the various elements of its cargo.

An additional significant benefit obtained by the Federal Government from the "Seaport Control Tower" concept would be that, in the event of a National emergency or war, there would be in existence a Federally operated port center capable of immediately exercising Federal control of the emergency utilization of the local port, as provided in the current plans of the Maritime Administration and contained in its "Manual for the Emergency Utilization and Control of United States Ports, dated October 31, 1963".

Plan of Action:

The Maritime Administration will proceed with the preparation of appropriate draft legislation to accomplish the purposes of this initiative, in close cooperation with the Committee on Multiple Use of the Coastal Zone and the Marine Sciences Council. Additional funds will not be required to develop this initiative unless it is determined that, initially, a study should be made to determine the ports to be included in such a program, the types of centers to be established, Federal costs for provision of office space, administrative costs of the local Federal Port Control organizations, etc.. In such event, costs of such a study are estimated at $150,000 with completion within one year from commencement.

CONCEPT A

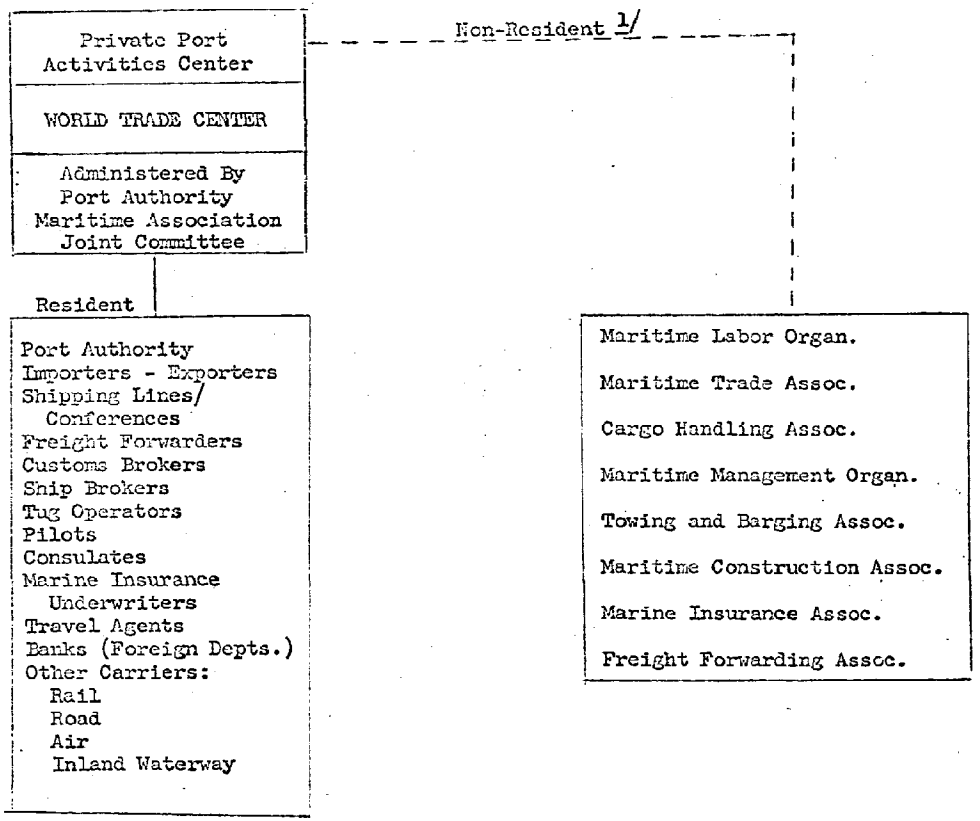


3/

1/ Unless space permits

CHART 1

CONCEPT B



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1/ Unless space permits

CHART 2

CONCEPT C

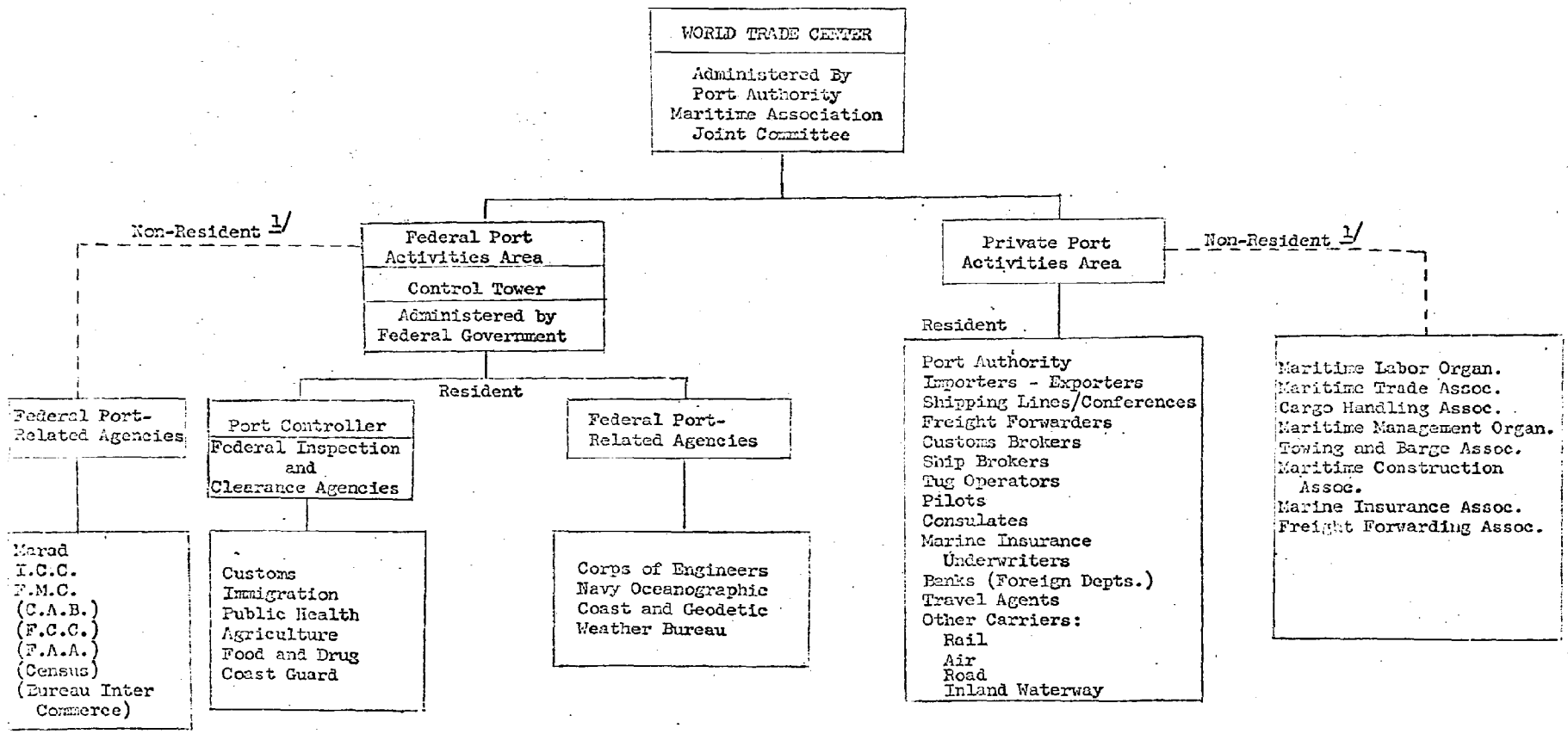

CHART 3

1/ Unless space permits

U. S. Department of Commerce
Maritime Administration

Suggested FY1970 Initiative
For
Committee on Multiple Use of the Coastal Zone
National Council on Marine Resources and Engineering Development

Offshore Ports and Systems for Bulk Cargoes

Problem:

A major share of our industrial base is dependent on liquid and dry bulk products entering via our ocean ports. Under existing conditions, the operation of bulk-petroleum carriers presents the constant risk of oil pollution to land and sea areas adjacent to a point of ship collision or grounding. Exclusive of safety and pollution hazards the technology of present and future bulk ship construction is outstripping and will continue to outstrip the capacity of existing ports to provide adequate channel depths and shoreside berthing facilities to accommodate existing or planned super and "mammoth" size bulk carriers. A third consideration is that, under an all-out nuclear attack, it can be assumed that a great number of the existing in-port petroleum transfer facilities would be destroyed, thereby having an immediate detrimental effect on the industrial capacity of this nation. Under existing circumstances our ports and shipping channels are becoming congested and dangerous, presenting not only risks of collision, fire, destruction and financial loss, but also pollution of port and valuable recreational areas.

Objective:

The objective of this study is to investigate and develop those types of bulk cargo transfer facilities and locations which would (1) reduce ship traffic in congested port areas and ship channels, thereby reducing safety hazards and the risk of pollution to ports and adjacent areas; (2) provide water depths adequate to accommodate the larger bulk carrying ships now in existence and those planned for the future, and (3) to reduce the susceptibility of existing U.S. tanker terminal facilities to enemy attack.

Plan of Action:

A few of the possible solutions worthy of comprehensive evaluation are as follows:

(1) Offshore Ports and Artificial Islands - Engineering studies should be conducted to determine the feasibility of constructing offshore "ports", "islands", or facilities of a fixed or floating nature, sufficient in size and dimension to withstand the expected forces of nature, and at the same time provide relatively adequate shelter to vessels transferring cargo. Some of the required technology for this type of structure is already in existence as exemplified by the "Texas Towers". In order to minimize the risk of damage from adverse weather and sea conditions and, at the same time, increase ship turnaround time, it may be possible to develop high capacity conveying, pumping and pipeline equipment presently not in existence. For liquid products, the transfer from ship to shore via the "port" or "island", would be by the use of submarine pipelines. In the case of dry bulk products, as appropriate

offshore transfer could be accomplished via pipelines in slurry form or by other innovative systems to shore terminals from the point of discharge. These offshore installations and facilities would be constructed and staffed to function as self-contained entities capable of coping with any emergency situation that may arise. Designs for this and other types of suggested solutions would include the best techniques for improved containment control, treatment of spills, and recovering of pollutants. For example, they could be equipped with oil separation equipment in the event of spillage, to include perhaps a standby tanker at each major installation provided with such equipment - the tanker(s) to be provided by the American petroleum/tanker industries. Detergents and other oil-removal materials could also be stockpiled.

(2) Isolated Area Locations - Coastal area investigations should be made in order to determine suitable locations away from populated areas which lend themselves to development of specialized ports, and shelter for all sizes of bulk ships. While it is an accepted fact that any site chosen would probably require extensive initial and maintenance dredging, this method may be the most economical in the long run. The risk of pollution from accidents in the approaches to such isolated locations, while perhaps minimized, would not be completely eliminated, however, spillage within such areas could be controlled and corrected quickly through proper advance planning, installation design and oil control techniques.

(3) Ship-to-Barge Transfer - Of lesser significance, this method is currently in use and consists of transferring bulk products in deep water between larger ships, whose drafts prevent the use of available channels, harbors and shoreside terminal facilities, and harbor barges. While this method does not eliminate the risk of pollution and is uneconomical from the standpoint of time, it may prove to be the most practical solution, in some cases, to the costly improvement of port channels in that it does permit the use of large point-to-point ocean carriers while reducing the size of unit oil loads actually entering the port.

(4) Ocean Barge Systems - Ocean barges are currently being designed in sizes up to 24,000 Dwt, including ocean push-towing features. Study considerations should therefore include possible offshore handling of large non-self propelled ocean tanker barges used in transporting petroleum, chemicals and other liquid cargoes.

(5) Submarine Tankers - While some studies have been conducted on this exotic form of petroleum transportation, the resultant projected high costs have prevented its development up to the present time. Under existing circumstances, however, a restudy may be warranted. Use of a submarine tanker in conjunction with submerged pipelines extending offshore on the sea bottom would permit rapid cargo transfer to take place completely underwater and obviate the need for costly above water terminal and mooring facilities at the seaward end and the inherent risks from inclement weather.

(6) Sea Tower Terminal - Studies should be undertaken to determine the feasibility of designing and constructing offshore, deep water, fixed towers or some modified structure which could house pipeline and hose handling equipment that could load and unload super-size tankers from an overhead position similar to the way a gantry crane is employed in handling containers. Such a concept could be designed, for example, on the basis of the conventional, multiple buoy system and could eliminate the slower method of lifting a hose-marker buoy containing the offshore end of the

pipeline hose on board to be connected to the ship's manifold. There have been cases where the pipeline hose has broken away from the hose-marker buoy causing considerable problems and delays in discharging. At those sites where no shelter exists and sea conditions are extreme, a sea tower terminal may not be as suitable as some of the aforementioned methods.

(7) Other - The possibility of other innovative offshore or outport facilities, other than those mentioned herein, should be investigated.

With any of the above listed approaches that prove technically possible, a complete systems analysis should be made in order that all substantive factors receive equal attention. In this regard, in addition to appropriate consideration of the economic factors involved, i.e., location of producing areas, consuming areas and refineries; system, operation and commodity movement costs; environmental studies covering weather, hydrography, topography, geology, ocean currents, etc., must ultimately be carried out in order to arrive at the best possible solutions, with consideration being given to possible establishment of defined sea routes for petroleum carriers. The analysis must also include consideration of the movement of bulk commodities between shore terminal points and storage, refining, and consumption locations via overland pipelines, conveyors, conventional carriers, etc..

Ultimately, the deciding factor will be the matter of economics and economic feasibility, taking into consideration any possible Federal Government participation in the costs of the changeover and a transitional period. For this reason all data relative to all possible solutions must be assembled and compared against the data applicable to each possible concept.

Initially, an investigation should be made of the existing national system of the oceanborne movement of bulk cargoes with major and priority emphasis upon petroleum products and other hazardous liquid commodities, including existing loading and discharging ports and facilities, ocean carriers - present and planned, commodity movements including origin and destination, shipper requirements, etc.. Concurrently therewith, engineering investigations of various possible alternative offshore and outport transfer facilities should be undertaken and complete conceptual designs accomplished for the most promising. Thereafter, a minimum of one complete systems analysis should be made for a selected major petroleum shipping route, say a Texas port or ports to the port of New York and its area. Costs for this study program are estimated at $1,000,000 with time for completion scheduled for a two year period. F.Y. 1970 fund requirements would be $500,000. In view of its statutory, national responsibilities for the development of ocean shipping and ports and port facilities, the Maritime Administration would be the logical agency to undertake this program.

Initiative: Seaward Boundary Determination

Introduction

The generalized interest of the thirty Coastal and Great Lakes States in "marine environment activities" (using that term to include any use, or potential use, of the oceans, the Great Lakes and their contiguous waters and shore) is well known. Many states have established ocean resource commissions or advisory groups to plan, develop and guide their programs.

It appears that the intensity of state interest in marine environment activities increases in direct ratio to the existence of an economic catalyst such as the potential of exploitable resources or the need for coastal engineering structures. In states presently having oil and gas benefits (California, Louisiana and Texas) interest in marine environment activities is already intense. Such resource motivated interest is rapidly spreading to other states as well as increasing in intensity at an accelerating rate as knowledge of potential resources increases. The extractive industries, especially oil, are now exploring, or have manifested an interest in exploration off Alaska, Washington, Oregon, Florida, the Carolinas, New Jersey, Massachusetts and Maine.

An increased interest in political boundaries goes hand-in-hand with mining and engineering development in the coastal region. Coastal boundaries

are delimited on the basis of the delimitation of the legal coastline or baseline. Determination of the location and form of the baseline involves two fundamental surveying procedures: (1) establishment of the appropriate tidal datum plane by tide gages in place for at least one year of continuous observations at each location and (2) aerial photomapping of the horizontal delineation of the line formed by the intersection of the shore and the appropriate tidal datum plane.

The foregoing surveying procedures have been carried out as regular functions of the Coast and Geodetic Survey but primarily for the purpose of producing navigational charts, tidal information and tidal datum planes. During the past few weeks, the Coast and Geodetic Survey has been approached by four states (California, Louisiana, Texas and Massachusetts) seeking technical advice regarding the locating of the baseline of their Federal-State offshore boundary. As mining and engineering development in the coastal region accelerates, it seems clear there will be an increasingly acute demand on the Coast and Geodetic Survey to accelerate its traditional shore and sea survey program specifically for boundary purposes. However, before such technical field work is done, there must first be made certain preliminary planning decisions as well as legal interpretations and policy decisions which are beyond the authority of the Coast and Geodetic Survey. Analytical examination must also be made of existing tidal and survey information in the C&GS archives to determine exactly where new field work is required.

Decisions Preliminary to Boundary Determination

Preliminary planning decisions, legal interpretations and policy decisions which must be made include the following:

(1) Normal baseline

The normal baseline, whether on the mainland, structures, islands or rocks awash, is in reality delimited by relevant points on the low water line. In practice, it will not be necessary to locate the low water line everywhere. But it will be necessary to locate the low water line (1) at salient points from which arcs are to be swung to delimit the outer Federal-State boundary and (2) at headlands of bays and (3) in the boundary area between adjacent states and between the United States and Canada and the United States and Mexico, in order to construct the lateral boundary.

(2) Juridical bays

It will be necessary to determine what coastal indentations are bays by applying the semicircle test and the maximum 24 mile closing line rule.

(3) Historic bays

It will be necessary to determine what coastal indentations are areas over which the United States has traditionally asserted dominion with the acquiescence of foreign nations.

(4) Straight baseline systems

It is to be expected that states with rugged coastlines, fringed with islands (e. g. Alaska and Maine) will push for the adoption of a system of

straight baselines along such coasts, as this will increase the states' offshore territory.

Recommendations

To meet an accelerated demand for offshore boundary determination, preparation should be made now. The following steps are recommended:

(1) Executive Branch task force

There should be created as soon as possible a small inter-agency task force (a) to work with the interested states and (b) to decide the federal position upon the decisions necessarily preliminary to locating the Federal-State, or international boundary.

The task force should probably include Justice (Lands Division), chairman; State (Legal Adviser and Geographer); Interior (General Counsel and Bureau of Land Management); and Commerce (Coast and Geodetic Survey).

(2) Executive Branch Monitoring Group

Establish an inter-agency group to analyze existing data and new survey data, establish priorities for additional field work, monitor the work of fixing final baselines and Federal-State offshore boundaries, and serve as a Federal point of contact in working with state organizations.

It is estimated that 7 individuals will be required; one from Land Management, one from Justice, and two tidal specialists and three cartographers from the Coast and Geodetic Survey.

Costs would approximate $110,000 per year beginning in FY 1970.

3. Initial Federal Equipment Investment

In FY 1970, procure tide measuring equipment and a specially outfitted aircraft as a step preliminary to field operations.

Costs would approximate $2,550,000.

4. Federal-State Matching Funds Program

States interested in determining their outer (Federal) boundary should share the cost. This could be done by a Federal-State matching funds program. Such a program could also be utilized to establish priority of boundary determination, since it would be impossible to demarcate every state's boundary at once. In other words, each state's boundary would be worked on in the order in which the states allocated their matching funds. Costs to the Government are estimated as follows:

Fiscal Year	1970	1971	1972	1973 And Beyond
Federal Funds (in thousands)	280	545	855	895

SUMMARY OF TOTAL COSTS

Fiscal Year	1970	1971	1972	1973 And Beyond
Federal	2,940	655	965	1,005
State	280	545	855	895
Total	3,220	1,200	1,820	1,900

Coast and Geodetic Survey, ESSA

CIRCULATORY CHARACTERISTICS OF COASTAL WATERS

Initiative:

An accelerated and comprehensive program to determine the circulatory characteristics of nearshore waters is considered necessary for the proper development of the resources of the coastal zone. Detailed surveys of the circulation patterns of the various gulfs, bights, sounds, bays, estuaries, and inner shelf are required. The benefits derived from the determinations will be interdisciplinary in nature and will cover virtually every facet of coastal development activity: fisheries (both sport and commercial), pollution, beach erosion, recreation, real-estate development (both residential and industrial), pleasure boating, oil exploration and drilling, shipping, underwater constructions, and mining. In addition, as a by-product, the program will provide the descriptive basis upon which predictions of oceanographic variables can be made.

The surveys would employ current meters, drogues, dye, radioactive tracers, STD sensors, and stereoscopic photogrammetric techniques. As such, ships, airplanes, and buoys will be required. The specific techniques used would be dictated by the nature of the particular body of water being investigated. In all cases, however, the surveys would include the entire water column.

The synoptic presentations resulting from the surveys would be augmented by the use of monitoring stations (probably buoys) at various "key" locations in each area for the purpose of determining the variability of the patterns with time.

The proposed plan would double and improve the present capability of the Coast and Geodetic Survey in the field of circulatory surveys within a 3-year period and maintain this capability for an indefinite period. Results to be obtained are in direct linear proportion to effort expended. Given the additional resources outlined in the attached table, 4 major estuarine areas of a size comparable to Narragansett Bay could be covered each year beginning with FY 1972. On the inner shelf, larger areas could be covered. Beginning with FY 1972, the annual program cost would level off at $776,000/FY.

CIRCULATORY SURVEYS IN COASTAL WATERS

Additional Costs In Thousands

Fiscal Year	1970	1971	1972 & Beyond
New Vessel & Buoy Survey System	2,000	---	---
Vessel & Buoy Operating Costs	50	200	200
Reduction & Analysis of Data	---	20	40
Shore Support	---	20	20
Photogrammetric Support	---	100	100
TOTALS	2,050	340	360
TOTAL PROGRAM	2,466	756	776

OIE
9 April 1968

Department of Transportation
United States Coast Guard

Suggested * FY 1970 Initiatives

for

Committee on Multiple Use of the Coastal Zone
National Council on Marine Resources and Engineering Development

Summary

1.	Oil Pollution Program, Massive Oil Spill	
	a. Containment	$ 50,000
	b. Source Control	400,000
	c. Pollutant Recovery Equipment	1,600,000
	d. Oil Bio-degradation Study	100,000
2.	Port Advisory Services	200,000
3.	Hazardous Cargo Information Center	250,000
		$2,600,000

* For discussion purposes only

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OIE
9 April 1968

Department of Transportation
United States Coast Guard

Suggested * FY 1970 Initiatives

for

Committee on Multiple Use of the Coastal Zone
National Council on Marine Resources and Engineering Development

(* For Discussion Purposes Only)

1. Oil Pollution Program

A. Massive Oil Spill

The accidental discharge of massive quantities of oil as a result of the TORREY CANYON casualty provided the motivation for a great effort by government and industry to prevent, control and cleanup oil spills. However, although a start has been made in FY '68, and continued in FY '69, additional work must be continued into 1970 and beyond if we as a nation are going to be prepared to cope with this problem. At the present time we are not prepared to combat or cope with a massive oil spill anywhere in the U. S. or on the open sea coastal waters. The OCEAN EAGLE grounding is testimony to this. Deficiencies exist in the legal and institutional, training and education of personnel, equipment, and knowledge.

The following Coast Guard programs are therefore recommended for FY '70 to continue the work begun in FY '68.

1.) Continuation and Intensification of Research

Noting with concern the limited extent of present

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knowledge with respect to the rapid, safe and efficient disposal of oil in the case of major spillages especially in the open sea, as a matter of urgency research and development in the following areas is indicated:

a. Containment. Suitable materials to contain an oil spill must readily be available in all inland and coastal areas. Booms presently available for containment are reasonably effective in quiet water areas, but they are not generally available or suitable for a gross spill containment. Also, present containment methods for use on the oceans and in rough water areas are inadequate and should be improved through development, test and evaluation.

Design criteria should allow for air transport, quick assembly, rigging and placement.

Training and indoctrination of operational personnel must also be accomplished. The Federal Government should take the lead in this effort, assisted by private industry in research, technology and development of concepts.

Estimated cost of development $50,000.

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b. Source Containment and Control.

Mechanisms for containment and control of oil cargo at the source are also inadequate, particularly in the case of vessels which experience difficulty at sea and may discharge their cargoes as a result. The PEGASUS is an example of this type situation. Techniques for containing cargo and fuel oil or withdrawing the cargo from troubled vessels should be developed.

Development of light-weight, air transportable, high capacity pumps is in order. Cooperation with the U. S. Navy, Supervisor of Salvage would be desirable for mutual benefits to be derived.

Burning should not be ignored as a means of oil disposal at the source. Although the method employed to burn the oil in the TORREY CANYON failed, and it appears that failure of that particular procedure should have been predictable, it is considered possible to dispose of the oil within a wreck by burning. It is possible to design and develop burners, to be installed on tank tops, that will burn oil at a very high rate. Such burners can be made self-sustaining, or independent of external power sources, once they have been started by means of a battery or air charge. Remote and simultaneous starting of a large number of installed tank top burners is desired. Provisions would include prevention of softening and collapse of the tanker hull from heat, although it might not be practicable to protect the superstructure. Such burners would be designed to be air transportable, and readily adaptable to tanker hulls of different depths. Although such a burner would not be a primary salvage tool, its development for special applications is considered justifiable.

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Cost of these projects:

Source containment	$100,000
High speed pumps	$200,000
Tank top burner	$100,000
Total	$400,000

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c. Pollution Recovery Equipment.

Cleanup of Massive Oil Spills on the Ocean

Recent events of the past year show that the probability of a massive oil spill off the coasts of the United States cannot be ignored. The probability of major damage is slowly increasing with time. Accidents will never be eliminated, nor will the effects of heavy weather, or malfunctioning equipment or mistakes of human beings. The average size of tankers is slowly increasing as is the tanker traffic in the coastal zone. The effects of an oil spill are also increasing with the increasing size of the tankers, and the increasing use and development of our coastal land, estuarine and water areas. The experience of the TORREY CANYON saw an outlay of $30,000,000 for cleanup caused by the lost oil cargo. Many studies and experience have pointed to the deficiency of coping with gross leakage at sea.

The nation can ill afford to ignore the threat and to accept as the only course of action preventative measures. Removal of the oil from the water before it befouls the coastline or creates a major fire or safety hazard in our port areas is a possibility that should be pursued.

Possibilities are to collect the oil from the surface of the ocean, in shore and shoal waters, separate the oil from the water and store the oil in the holds of a tanker barge or other flotation devices.

If tankers are to be used, the possibility of T-2 tankers

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from the Reserve Fleet is a possibility. If their use proves feasible, consideration should be given to possibility of two such vessels on each of our coasts including the Great Lakes. Size limitations of T-2 tankers (15,000 tons) should be considered since 20,000 tons of oil was released from the TORREY CANYON in the first 24 hours.

Our technology is capable of developing the pumps, fittings and accessories for such a project. However, operation of such a concept on the size required would require an ocean-going vessel, such as a tanker, barge or floating containers. Floatation devices with appropriate pipelines and floating containers also would have to be developed.

Rough computations and preliminary study indicate that pumping equipment and containment booms effective under moderate open sea conditions, can be developed to be air transportable and capable of being handled at the scene by relatively small vessels and helicopters.

Alternatives to be considered are barges and tankers for chartering for use in certain areas for use as containment vessels.

Another alternative is the purchase, design and construction of collapsible and air transportable sausage-shape containment devices made of fiber reinforced plastic or rubber. A few C-130 aircraft loads of such devices would provide receiving and temporary stowage capacity for a larger amount of oil.

The primary responsibility for dealing with a massive oil spill rests with the Federal Government and specifically with the Coast Guard.

This initiative calls for a feasibility study and development of prototype hardware and procedures for removal of massive amounts of oil from the ocean surface.

The project would be to follow-on the FY '69 work with a program to develop in FY '70 concept means, hardward and organizational arrangements to remove massive oil spill from the ocean. It would be appropriate to solicit the talent and cooperation of the petroleum industry in the development of such a system, since the industry has a significant concern in anti-pollution efforts.

Cost of a feasibility study	$100,000
Cost of a development of equipment and modification of T-2 tanker	$1,000,000
Barge	$ 250,000
Flotation Devices	$ 250,000
Total	$1,600,000

NOTE - The Coast Guard withdrew the item for the T-2 tanker ($1 million), above, at a CMUCZ meeting on April 9, 1968.

d. Oil Bio-degradation Study

Basic research of oil action, dissipation and degradation in the ocean environment. Although there has been some early research in this field, such findings have not been related to the national development of regulations, standards or criteria. Such questions as to the validity of the criteria of 100 ppm of oil allowed to be discharged in the sea prohibited zones, under certain conditions, should be examined from the rational scientific standpoint. Further, the examination of the prohibited zones should also be made to determine if sufficient "buffer zone" exists with the increasing use of importance of the "coastal zone area." With due regard to the tanker lanes, size and volume of tankers using these lanes, this initiative relates to the Oil Pollution Act of 1961, which stemmed from the Oil Pollution Convention of 1954 (Convention For the Prevention of Pollution of the Seas By Oil 1954).

With the increasing interest of the Continental Shelf, the various programs that are being mounted in this sea area, the adequacy of present preventative safeguards should be reviewed.

The DOT/U. S. Coast Guard as the administrator of the Oil Pollution Act of 1961, Executive Secretary of the U. S. Delegation of the Intergovernmental Consultative Organization (I.M.C.O), under whose international cognizance these proposals would fall, is the appropriate federal agency to sponsor such studies.

Cost of Oil Bio-degradation Study $100,000

2. Port Advisory Services

The I.M.C.O. Subcommittee on Safety of Navigation considers that port advisory services can make a valuable contribution to safety in harbor approaches, and concluded that member governments should be recommended to consider setting up appropriate services in ports that warrant it by the importance and nature of their traffic, particularly in oil terminals and other ports where noxious or hazardous cargoes are loaded and unloaded.

This service would be provided by the U. S. Coast Guard working in cooperation with local authorities and industry. The Coast Guard Captains of the Port offices would plan to initiate this service in FY '70 at the following major ports:

Portland, Me.
New York, N. Y.
Philadelphia, Pa.
Baltimore, Md.
Norfolk, Va.
Charleston, W. Va.
St. Louis, Mo.
Houston, Texas
New Orleans, La.
LA/LB, Calif.
San Francisco, Calif.
Portland, Ore.
Seattle, Wash.

However, on a voluntary basis of participating companies and local authorities the service would go into effect without delay at Captain of the Port, Houston, Texas i. e. by 1 January 1969 on a trial basis, as an extension of the Channel Industries Mutual Aid Plan. The service would supplement present notice to mariners and would include the radio-broadcast at scheduled and other times as appropriate and upon request. of navigational information, marine traffic information, emergency incidents in the harbor, channel or approaches. Also telephone information and daily printed bulletins would be provided. Based upon a

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year's trial operation, information for the feasibility of extending the service to the above listed.

The problem of operations in pilot waters with the U. S. position calling for "bridge to bridge" communications would have to be fully explored, since the imposition of a second VHF, or other communications requirement, on the merchant marine would have to be explored very carefully. The views of the Navigational Planning Staff, who are developing the U. S. National Maritime Navigation Plan would be solicited.

Cost of this prototype P.A.S. in the Houston Ship Channel would be $200,000.

3. Hazardous Cargo Information Center

With the increasing volume of hazardous cargoes, port congestion, marine traffic, population densities in our port areas, anti-pollution efforts and safety, there is a need for the Coast Guard to develop a modern technical data bank containing pertinent information on hazardous cargoes moving in water transportation, their properties, effects if accidentally released and protective measures to be taken by own forces and the port area in the event of an accidental release. Capability of the Center would also include quick retrieval and transmission to selected distant field units of pertinent information for use by operating and technical personnel. Captain of the Port, Houston now maintains a modest information center of chemical cargo characteristics. This initiative would up-date this Center and expand the service to include all the Galveston-Houston Ship Channel. Implementation would be in phased steps after 1970 for all U. S. navigable waters and could be extended to include chemicals in other modes of transportation.

It should be noted that the basic problem is local, not overwhelmingly federal, or by uncontrollable circumstances inter-state. Thus federal control would not prevail necessarily, although in certain areas the Coast Guard now controls traffic in the St. Mary's River, and in emergency situations. However, the basic concept here should be local government and industry with an input and coordination in the public interest by the Federal Government. The U. S. Coast Guard is the logical agency to sponsor this project. This program would support and be compatible with the national water pollution program.

Estimated cost for implementation of this Center would be $250,000.

ARTIFICIAL REEFS AS A TOOL OF MARINE SPORT FISHERY MANAGEMENT

We have known for a long time that rocky coasts, reefs, and banks are more attractive to fish than smooth sandy or muddy bottoms, but it wasn't until the early 1950's that serious attempts were made in the United States to provide artificial reefs specifically for fish attractants. Various materials have been used -- automobile bodies, quarry rock, rubble, concrete pipe, etc.

Observations show that standing crops of fish and food organisms are greater on the artificial reefs than on the surrounding substrate -- in some cases more than 10-fold. Reefs can attract fish to an area that would be normally devoid of significant numbers and actually create fishing where none existed before. Used judiciously with research-based knowledge, they will be able to reduce some of the recreational fishing deficit predicted for the future.

To exploit this management technique, a five-phased study is proposed to:

1. Conduct an ecological, hydrographic and geological investigation of potential reef sites from New England to Florida by periodic underwater observations at each area selected for construction. Observations will be made on the existing fish fauna and benthic organisms using standard sampling methods, i.e., swimmer transects, timed observation periods, and random quadrants. Faunal collections for identification and bottom samples for sediment analysis will be taken at each locality.

2. Design and install artificial fishing reefs of junk cars, concrete materials and scrap tires on approved reef sites. Arrange these to provide comparative data on the design and type of materials used in relation to the effectiveness and longevity of fishing reefs. Make periodic underwater observations on condition of materials, encrusting organisms and populations of fish attracted to reefs. Conduct laboratory tests on reef models of the action of currents, tides and other environmental factors.

3. Determine species composition, relative abundance, and temporal distribution of fish on artificial reefs in comparison with fish populations occupying natural reefs and areas devoid of reef habitat.

4. Measure the rate of larval settlement, colonization and succession of invertebrate epifauna and flora on various surfaces of artificial and natural reefs and the effects of the reef communities on bottom-dwelling infaunal organisms and finfish.

5. Measure selected parameters of the physical environment surrounding the reef materials to determine how these factors relate to the distribution of fish on the reef site.

Funding requirements in FY 1970 will be $200,000.

MARINE UNDERWATER OBSERVATION AND INTERPRETATION

With the greatly increased public interest in the marine environment and the growing attendance at seashore and estuarine areas in the National Park System, an unparalleled opportunity exists to satisfy public curiosity about the sea, its natural processes and its inhabitants.

In order to provide an underwater experience for park visitors that does not require swimming, scuba diving or viewing from glass bottom boats, National Park Service proposes to undertake a program of underwater observation facilities combined with interpretation services.

Methods and devices that are now being used for underwater observation by large numbers of people are now being studied to determine their design features, costs, and operational characteristics. Park Service proposes to study intensively the opportunities for marine observation and interpretation in five areas in the System. One or more locations would be selected for full-scale detailed examination. This site selection will be based on the inherent interest and natural significance of the marine features to be observed and interpreted and the suitability of physical and topographical characteristics to easy underwater public access. Program design and cost estimates will be prepared and an interpretive program begun.

Funding requirements in Fiscal Year 1970 will be $500,000.

U.S. GEOLOGICAL SURVEY

Suggested FY 1970 Initiative
for

Committee on Multiple Use of the Coastal Zone,
National Council on Marine Resources and Engineering Development

The Geological Survey proposes an investigational and data-collection program in estuaries and other coastal water bodies, to be entitled "Physical facts of the estuarine environment."

The estuarine resource is being recognized as one of the critical parts of the Nation's water resources. The water bodies themselves constitute some 50,000 square miles; some 25 percent of the Nation's population lives along or near them. They are used for shipping, cooling, recreation, potentially a source of water supply, and an essential part of the life cycle and habitat for food fish. Because of the large cities and other development of land uses bordering estuaries, pollution (including sediment load) is a major and growing problem. The need to manage estuaries in the foreseeable future requires the best possible understanding of the physical framework of the water bodies and how the hydrologic system works within it. The program in part involves the extension of going activities, but also includes a sizeable effort that is new in concept and scope in that it envisages a coordinated attack from geologic, hydrologic, and topographic points of view. In general, it involves a substantial increase in basic data collection, investigations of related water bodies considered to be typical, and a sharp step-up in hydraulic research. The program comprises activities in seven major scientific areas.

1. Information on the natural trend of development of estuaries through late geologic time and the nature of the enclosing rocks and deposits.
2. Studies of the source, transport, and deposition of sediments in coastal water bodies, including the relation between animal and plant life and bottom muds.
3. Documentation of the interrelation between estuarine waters and the enclosing hydrologic systems.
4. Hydraulic investigations into the mechanics of circulation patterns, fresh-salt water interaction, and dispersion of heat and other pollutants. Some of this would be studied by means of mathematical and physical models.
5. Data collection and research into the geochemistry of coastal waters and bottom sediments.
6. Investigations into the application of remote-sensing techniques for observing water-quality, hydraulic, and sedimentational features.
7. Field studies of the effects of natural disasters on man's use of coastal waters.

The investigational parts of the program would consist of comprehensive field studies of a few selected estuaries including topographic, geologic, and hydrologic mapping, accompanied by laboratory studies of water quality, sediment analysis, and paleontologic analysis. These would be supplemented by laboratory and office hydraulic research, special remote-sensing surveys, and case studies of the aftermaths of extreme events.

To the extent possible, the work would be coordinated with biologic surveys and research into marine life related to the geologic and hydrologic parameters that may be carried on by the Bureau of Commercial Fisheries and by Sport Fisheries and Wildlife.

There would be some intensification of topographic mapping in areas of special need.

The basic data aspects of water quality, streamflow measurements, and determination of ground-water conditions and discharge to estuaries are part of the Geological Survey's responsibilities in the development and operation of a national water data network under Bureau of the Budget Circular A-67 (see also attachment to memorandum from the Director, U.S. Geological Survey, dated March 5, 1968, subject, Implementation of Bureau of the Budget Circular A-67--coordination of Federal activities in the acquisition of certain water data).

Many activities of this kind are being carried on now by the Geological Survey, but they are being done in a piecemeal fashion. This program envisages a concerted and comprehensive investigation into the natural framework of one of the Nation's least known resources.

The 1970 fiscal year cost estimate is $2,750,000. Depending on actual appropriations, investigational work would be done in from one to five estuarine areas.

Addendum

The following additional comments illustrate the more detailed objectives and purposes of work in each of the numbered categories above:

(1) Work on item 1 would be mainly geologic mapping and special field studies. The results would bear on such questions as whether a particular estuary is now enlarging or is in the process of disappearance, the erodability of formations lining the shores, and the distribution of water-bearing deposits nearby and beneath.

(2) Studies of sedimentation would relate to the natural regimens of scour and fill, the effect of manmade changes thereon, the role of organisms in nutrient cycles, and many similar processes.

(3) Work in this item would again constitute field studies, some probably carried on in cooperation with local agencies, placing the estuaries studied within their real hydrologic environment. The work would relate the variations in time and space of fresh-water inflow (both surface water and ground water) and of salt-water inflow to water quality, circulation patterns, flushing rates, and nature and distribution of animal and plant life. It would include studies of salt-water encroachment potential of adjoining and subjacent aquifers.

(4) The goal of the hydraulic investigations would be to develop an understanding of the physics of various interactions as a

basis for predicting the effects of natural or man-induced changes. The estuaries selected would be typical; and research activities would be such as to establish basic principles useful anywhere.

(5) The geochemical activity would include systematic monitoring of the natural chemical and physical composition of the waters, and research into the chemical interactions of both organic and inorganic substances. These would bear on the presence of trace element concentrations as possible sources of metals, problems of fixation or other changes in introduced constituents, and would establish "base line" data on water quality. Such a base would be fundamental to programs of surveillance of pollutants and checking on water-quality improvements as carried on by any Governmental agency.

(6) If successful, remote-sensing techniques could be used to detect directions of pollutional transport, obtain synoptic pictures of circulation patterns for analysis, and observe sedimentational processes. This is really a tool to be used in the work outlined in the other items, but is sufficiently little understood and expensive that it is here listed separately.

(7) Although closely related to the first five items, studies of natural disasters, too, are considered separately as they deal with isolated extreme events rather than with the normally expected processes. The focus is on their effects on usability

of the resource. This work would include studies of the effects of actual or potential earthquakes, hurricanes and other unusual storms, and tidal waves. Such events are well known as destroyers of life and property, and contaminators of water supplies.

Initiative - Estuarine Research and Management

The Bureau of Commercial Fisheries proposes a 4.1 million dollar estuarine research program in FY 1970.

Estuaries provide essential habitat for some 70 species of fish and shellfish that contribute about 3 billion pounds or two-thirds of the total U.S. commercial fisheries harvest. Seven of the 10 species most in demand, including shrimp, our most valuable fishery, and menhaden, our largest volume fishery, are estuarine-dependent. Our estuaries are being altered and destroyed at such an alarming rate that many of our most valuable fishery resources are threatened.

The Bureau of Commercial Fisheries recognizes the importance of estuaries and now conducts research on estuary-dependent species or studies estuarine problems at 15 of its 20 biological laboratories. This work presently is funded at $3.1 million and will continue at the same level in FY 1969.

Bureau of Commercial Fisheries scientists have developed considerable expertise in dealing with fishery resource problems and have studied several estuaries intensively. Because of the diversity among estuaries and the complexity of estuarine problems we still are not able to (1) provide precise environmental data for policy decisions on fishery resources in multiple-use estuaries, (2) adequately assess the impact on fishery resources of environmental change wrought by estuarine modification, and (3) establish practical criteria for rehabilitating damaged estuarine habitats.

The Bureau of Commercial Fisheries has developed a plan to overcome these deficiencies to ensure that fishery resources receive adequate consideration when developing and managing the coastal zone. This plan would be activated in FY 1970 at an increased cost of $1.0 million and will be coordinated with work of other agencies including studies proposed by the U.S. Geological Survey.

The proposed new research for FY 1970 relates directly to estuary-dependent fishery resources and includes studies of estuarine productivity and nutrient cycling, determining the effects of changing environmental factors and heated effluents, classifying estuarine habitats, developing methods for rehabilitating damaged habitats, determining estuarine requirements for inflow of fresh water, developing criteria for assessing effects of construction projects that would alter estuaries, and participate in the multiple agency study of Chesapeake Bay. Staff capabilities also would be improved for revieving proposed estuarine construction projects.

This plan is consistent with and will contribute to the multi-agency effort of the Federal Government for multiple uses of our coastal zone.

Bureau of Commercial Fisheries

Initiative - Aquaculture

The Bureau of Commercial Fisheries proposes a 5.3 million dollar aquaculture program in FY 1970. More rapid development of aquaculture is needed because of increased foreign pressures on the declining potentials in waters fished by U. S. fishermen and because of continued loss of fishery habitat through increasing encroachments on the estuaries by urban and industrial developments.

The Bureau has already carried out considerable fundamental work on genetics, fish diseases, environmental requirements, hatchery culture and other aspects of aquaculture which would serve as a sound base for a much expanded and high priority program. Bureau expenditures in FY 1969 on aquaculture related projects will be about $2.8 million dollars.

The Marine Sciences Council in its 1967 report made the following statement concerning aquaculture based on a detailed study made recently under contract:

> "The United States, by virtue of its accomplishments in fields such as ecology, genetics, chemistry, and engineering, can contribute to the development of new and improved techniques in aquaculture. Aquaculture and particularly broader development of pond culture, can make a very significant contribution to the War on Hunger. The domestic economy might also benefit from aquaculture through increasing production of high quality food items now considered luxury items because of limited supplies."

The proposed initiative includes three major areas of aquaculture

(1) freshwater pond culture - channel catfish

(2) shellfish culture in coastal areas - oysters, clams, shrimp, northern lobster and blue crab

(3) artificial propagation of marine finfish - salmon, pompano and other selected species.

Freshwater pond culture of channel catfish is not dependant on favorable habitat in the coastal zone and estuaries. Success in the shellfish culture and artificial propagation of marine finfish programs will depend in part on the degree to which favorable estuarine and coastal zone habitat is preserved.

Projected effort related to the foregoing areas would be directed toward the following:

1. Improve and control the environment for reproduction and survival of the selected species.

2. Develop knowledge of the genetics, food requirements, conditioning factors, and diseases of species concerned.

3. Devise and apply engineering techniques to improve rearing facilities, harvest methods, and processing technology.

4. Conduct demand, production, and cost studies to isolate those areas in aquaculture that will provide the greatest payoff.

5. Demonstrate to associated agencies and the fishing industry how knowledge gained from environmental and husbandry research can be applied to efficient production of fish and shellfish.

Bureau of Commercial Fisheries

Initiative - International Ocean Decade - Mapping Resources of the U. S. Continental Shelf

The International Decade of Exploration and Assessment of the Seas calls for all nations to undertake the exploration and assessment of their own Continental Shelves and places highest priority on assessing living resources and their dynamics. As a contribution toward the long range goal of the International Decade the Bureau proposes a $4.0 million program in FY 1970 to commence systematic surveys and mapping of resources of Continental Shelf waters.

The resource mapping will require repetitive surveys to determine the seasonal availability and distribution of commercially important species. Though considerable work has been carried out in the past on resource mapping, the work has been fragmentary and a mere fraction of what is needed to carry out a properly designed study to cover all our Continental Shelves. The proposed program is three to four times that now being conducted and thus is presented as a new initiative. A major part of the program will be carried out by Bureau vessels using conventional sampling gear, but the program will include also research to determine the usefulness of new and developing technology, such as bioacoustics and remote sensing from space, as a means of resource assessment.

The program obviously is not restricted to the coastal zone. However, since many estuarine and coastal zone living resources migrate to and from the outer Continental Shelf waters seasonally and at different stages in their life history the entire BCF proposed Ocean Decade program on the Continental Shelf is submitted as an initiative. It might be possible to determine what part of the Ocean Decade program is to be physically carried out in the coastal zone. Since it is the living resource, however, which is the main object of research, it seems best to include the entire area through which it migrates and not restrict the proposal to the coastal zone only.

DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

COMBATING OIL SPILLS

A proposed new initiative for FY 1970 to National Marine Council's Committee on Multiple Uses of the Coastal Zone.

PROBLEM

Although oil spills of disaster proportions such as the Torrey Canyon and the Ocean Eagle have been the most widely publicized, sizeable oil spills are almost common occurrences, and the threat of major accidents is ever present. The more than 2,000 oil spills estimated to have occurred within the waters of the United States in 1966 may be a conservative figure for annual spill projections when accidents involving all types of hazardous materials are included.

To reduce this Nation's vulnerability to sizeable or major spills, the Secretary of the Interior, at the direction of the President, has assumed responsibility for completing interagency contingency plans for Federal response to pollution emergencies involving spills of oil or other hazardous materials. The National Contingency Plan has been completed, providing for a coordinated and integrated Federal response program at the National level and providing guidelines for response programs in each region of the country. Signatories to the plan are the Departments of Interior; Defense; Transportation; Health, Education and Welfare; and the Office of Emergency Planning. The Department of the Interior is also responsible for developing and revising the contingency plans for each region. The development of these plans is being carried out through the Federal Water Pollution Control Administration in close coordination with the other agencies concerned. This contingency planning represents a major step forward in protecting water resources from the effects of oil and other hazardous materials.

Although the National Contingency Plan is designed to make the best use of available Federal resources whenever an emergency requires Federal action, technological factors must be considered in increasing the effectiveness of the necessary action. At present, techniques for handling spills from vessels and land-based sources are varied and many are not fully developed. Research from both the public and private sector must play a major role in solving the problems caused by spilled pollutants.

Protection of the living resources of the sea is a particularly important objective in abating oil pollution. Because of this, the FWPCA has a "Policy Concerning the Use of Chemicals to Treat Floating Oils." This policy is designed to minimize damage to aquatic life, and is incorporated in the technical annex to the National Contingency Plan. A copy is attached.

FWPCA is also in the process of compiling an inventory of estuaries and estuarine zones as a part of its National Estuary Study, mandated by the Clean Water Restoration Act of 1916. This inventory will contain information concerning the ecology and resources of the nation's estuaries, and will provide an important source of guidance as to resources requiring special protection when combating oil spills.

We are certain that sizeable spills of oil and other hazardous substances will continue to occur in our coastal and inland waterways. Awareness of this problem, and activity to combat it has increased at the National, State and local levels of government. The rapid implementation of the National Contingency Plan will undoubtedly be of great help in mitigating the effects of spilled contaminants. Adjustment in the National Plan and the several regional plans is anticipated after they are implemented and their performance evaluated. The effectiveness of our efforts under the National Plan will also depend in part on research which must provide us with more and better techniques for handling spilled pollutants.

PROPOSAL

It is proposed to develop a more efficient and effective program to combat spills of oil and hazardous materials. The Department of the Interior through the Federal Water Pollution Control Administration intends to work toward the accomplishment of this objective through: 1) Implementation of the National Contingency Plan, with necessary revisions to be made upon evaluation of its effectiveness in providing an efficient and coordinated response to pollution emergencies; 2) contracting for research to improve and increase techniques for combating the effects of spilled pollutants; and, 3) application, by 1970, of the positive results of researches presently underway.

1. Implementation of the National Contingency Plan

Overall policy guidance in carrying out the provisions of the National Contingency Plan will be provided by the National Interagency Committee, established by the plan. The Committee is composed of representatives of the five signatory agencies and the DOI representative is Chairman of the Committee.

The National Plan will make it possible to mobilize available equipment and manpower and have them on the scene of an emergency as expeditiously as possible. As provided by the Plan, the Department of the Interior is responsible for administering, developing and revising the National Multi-Agency Plan for Oil and Hazardous Materials Pollution, and for developing and revising the regional plans. In this activity, the DOI will give full consideration to the recommendations of NIC concerning the interpretation, revision and application of the Plan. We expect that by 1970 sufficient experience will have been gained to permit effective evaluation and improvement of the National Plan, and the several regional plans.

2. Research

a. In April 1968, the FWPCA made a public request for research proposals for oil spill handling techniques. Fifty-eight responses were received to this Request for Proposals, covering a broad spectrum of suggested research areas including proposals relative to collection containment, chemical treatment, and shoreface restoration. In addition, FWPCA has several grants that will demonstrate various mechanical and pneumatic containment devices under various conditions, and will develop and demonstrate skimming devices and instrumentation. A listing of the subjects covered by these proposals and grants is attached.

These research efforts have been initiated prior to the establishment of the National Contingency Plan. As the Plan becomes fully implemented, it is anticipated that new and continuing efforts would be coordinated through the National Interagency Committee to ensure a maximum of productive effort and minimum of duplication and overlap among the several agencies concerned.

The FY 1969 funding level for oil pollution control research contracts is now estimated at $840,000. Research grants made in FY 1968 totaled $1,221,000 and $1,195,000 is projected for FY 1969. Presuming funds are made available, these levels will increase respectively to $2,000,000 and $3,450,000 for 1972.

3. Feasibility and Research Studies on Tagging and Identification of Oil

b. Research is planned in the area of tagging and identification of oil spilled in water. Because of the importance of positive identification of the discharger where cleanup cost recovery is concerned, this area of effort is singled out for added discussion.

In FY 1969, it is planned to complete a feasibility study of tagging and identification techniques with the strong and weak points and research needs relative to each system clearly set forth. Needed research and field evaluation would be undertaken next with initial field applications possible in late FY 1970 or in FY 1971 depending on the positive response from feasibility and research efforts.

The feasibility study is included in the research funding level for FY 1969. FY 1970 funding should be at the additional level of $400,000 to $600,000 for optimum development and at the level of $1,000,000 annually for the next four years.

DEPARTMENT OF THE INTERIOR

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

POLICY ON THE USE OF CHEMICALS TO TREAT FLOATING OILS

1. Chemicals should not be used to emulsify, disperse, solubilize, or precipitate oil whenever the protection or preservation of (a) fresh water supply sources, (b) major shellfish or fin fish nurseries, harvesting grounds or passage areas, or (c) beaches is a prime concern.

   Such chemicals should only be used in those surface water areas and under those circumstances where preservation and protection of water related natural resources is judged not to be the highest priority or where a choice as to resource preservation may make the use of such materials a necessary alternative.

2. Examples of areas and circumstances where the use of such chemicals might be acceptable are:

   a. where fire or safety hazards are presented by the spill of a petroleum product;

   b. where large numbers of waterfowl may perish because of the proximity of floating oil;

   c. under certain conditions, as a "polishing" or final clean-up of light slicks of oil following mechanical removal of floating oils.

3. Chemicals that emulsify, disperse, solubilize or precipitate oil should be used only under the immediate supervision of the Federal Water Pollution Control Administration except where it is judged that fire or safety hazards require the immediate application of such chemicals.

4. When chemical compounds are used in connection with oil clean-up, only those compounds exhibiting minimum toxicity toward the aquatic flora and fauna should be used. The Federal Water Pollution Control Administration is now developing and will soon issue a standard procedure for determining the toxicity of such chemicals.

5. Materials which aid in the collection of floating oils such as sorbents, gellants and viscosity control additives are considered to be generally acceptable providing that these materials do not in themselves or in combination with the oil increase the pollution hazard.

6. Research and development to improve chemicals which emulsify, disperse, solubilize or precipitate oil is encouraged. Whenever it is demonstrated to the complete satisfaction of the Federal Water Pollution Control Administration, that such a chemical, by itself and in combination with oil is non-toxic its use may be approved in the areas where the protection or preservation of a) fresh water supply sources, or b) major shellfish or fin fish nurseries, harvesting grounds or passage areas is a prime concern.

July 5, 1968

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FINFISH SANITATION

Oysters, clams and mussels are tasty, nourishing foods. But because they are grown in waters that may become contaminated, and because they are frequently eaten raw, unusual care must be exercised to assure that such shellfish are safe to eat. Seafoods such as oysters and clams grow best in protected bays where fresh water runs off the land and mixes with salt water. Such bays have an abundance of microscopic plants and animals (plankton) on which shellfish feed. Many bays are polluted by sewage from coastal cities, and the plankton may include harmful organisms. Hence, shellfish harvesting is prohibited in contaminated areas. To enforce this prohibition, these areas are patrolled by State health or fishery agencies.

Public health problems associated with the shellfish industry in this country are fairly well understood. The Public Health Service has, for the past 40 years, participated with the states and industry in programs designed to assure the sanitary quality of shellfish shipped in interstate commerce. The status of sanitation in other fisheries is not as well developed although in many respects public health hazards of significant magnitude exist. An outstanding example is the devastating outbreak of minamata disease in Japan caused by the discharge of organic mercury compounds in an estuary. Increased industrialization

of the coastal zones brings with it the threat of the effect of many toxic agents not only on the productivity of the estuary but also because many species of fish and shellfish have the ability to accumulate these noxious products, thereby imparting a potential toxicity to man. The biological impact of pollution on the ability of the estuary to produce food products should not be dismissed as of public health concern. On the overall, any reduction in the production of food both from the land or from the water has an effect on man's dwindling resources in the face of an ever increasing demand.

Estimated F.Y. '70 budget - $650,000.

HEALTH HAZARDS ARISING OUT OF TOXIC CHEMICALS POLLUTING THE COASTAL ZONE WATERS

New processes and products are contributing to the pollution of coastal zone waters. New classes of contaminants are taking their place beside the microbiological forms which for so long have threatened the health of man. A thriving technology supported by vigorous research is giving rise to pollutants whose effects on man and his marine resources are not well known. The estuarine waters, long the dumping grounds for man's wastes, are the recipients of an ever increasing array of materials that are the by-products and unwanted effluents of technological progress. While often present in only trace amounts, their role in bringing about illness and disability is too often only speculated upon. The rate at which new organics and synthetics are being developed has outstripped the ability of the health sciences to research their effects on man. The problems associated with detecting such materials in the coastal waters are formidable. Studies aimed at uncovering their role in contributing to chronic diseases are, of necessity, of long term and difficult to pursue. Nevertheless, the magnitude and rate of pollution by such a myriad of

chemicals calls for increased efforts in detection and health related research. Natural products of the coastal waters find their way into nearly every home in the country. The role of these products in the uptake and concentration of potentially harmful chemicals is poorly understood.

New programs and facilities focused on health effects of water-borne contaminants are needed. Even such simple problems as the human systemic effects of detergents in fish and other seafoods resulting from the cleanup of oil spillages needs to quickly be studied.

The existing facilities and resources of the several Federal agencies engaged in the marine health sciences offer a nucleus for an expanded effort.

Estimated F.Y. '70 budget - $250,000.

AN INNOVATIVE INITIATIVE IN EDUCATION FOR THE MARINE SCIENCES

It is only natural that, with exciting developments occurring today in marine science, there is a burgeoning interest on the part of youngsters in elementary and secondary schools. This interest is reflected in the number of requests received for information and assistance on this subject. Various agencies of the Federal Government have thus far made small contributions to meeting this demand. For example, the Naval Oceanographic Office has prepared both students' and teachers' kits on oceanography. The Interagency Committee on Marine Research, Education, and Facilities has prepared a pamphlet on university curricula in the marine sciences. The U.S. Office of Education has published articles on education in the marine sciences. The National Science Foundation has been sponsoring a small number of institutes with the specific purpose of enhancing teachers' knowledge of oceanography.

The Interagency Committee on Marine Research, Education, and Facilities has responsibility for cognizance and coordination

of Federal marine science education activities. But its activity in this regard is limited by availability of funds and size of staff, and out of necessity it has concentrated on manpower problems and higher education. More needs to be done in respect to elementary and secondary education. What is needed is an organizational unit (such as NASA has) that is specifically responsible for this sector of education. Most appropriately, this unit should be located in the new oceanographic agency, if such is formed in the near future as a result of the Commission's deliberations and recommendations to Congress. This unit should perform the following functions:

1. Serve as the central coordinating point for Federal activity in education in the marine sciences. Know what is going on and what materials are available in all Federal agencies.
2. Prepare and distribute up-to-date bibliographies on reading materials suitable for students in elementary and secondary schools.
3. Prepare and distribute career information.

4. Be knowledgeable about what marine science education activities are going on around the country. Publicize these (articles in professional journals, talks, etc.) so that interested persons may investigate them further, if they wish, with a view that similar activity may suitably be undertaken in their school districts.

5. Provide consultative services to State Departments of Education, school districts, professional organizations, etc., upon request, through correspondence, site-visits, etc. This would include making known to teachers, available teaching aids, teacher institutes, curriculum materials, etc.

6. Advise on need and amount of Federal support of education in the marine sciences. For example, if deemed necessary, a recommendation might be made that more teacher institutes were needed; or that marine mobiles, similar to the space mobiles, are desirable in order that ocean science can be brought to the students in the schools across the land.

7. Where gaps exist, contracts could be let for teaching materials (books, paperbacks, films, equipment, etc.) to be produced. NSF and NASA have successfully done this.

8. See that marine science education is appropriately represented at education meetings (science education, school administrators, etc.) in order that its cause may be suitably advanced among these groups.

9. Assist in the orderly advancement of marine science education in every way possible. This could include teacher and/or administrator conferences on what the problems are and what, if anything, needs to be done. An example of this was the New England Conference on Ocean Science Education in Elementary and Secondary Schools held at Woods Hole, Mass., on May 20-21, 1966.

The hearings of the Subcommittee on Oceanography of the House Committee on Merchant Marine and Fisheries during

December 1967 indicated that some members of the Subcommittee strongly felt that much more Federal support of marine science education in elementary and secondary schools is necessary.

Estimated FY '70 budget - $50,000.

Use of the coastal zone as a source of marine forms for biomedical research.

In terms of its legally defined role, the Public Health Service does not have a primary interest in the support of major programs in cataloging and describing the geographic distribution and movement of living forms throughout the sea. It is the interest of biomedical scientists, however, to ask fundamental questions of vital importance to human biology and to seek the answers wherever they may be found. Basic biological phenomena frequently prevail among many, or even all, living things. Some of these phenomena can be studied more readily in the simpler structures of marine invertebrates than in the complex structures of mammals commonly used as experimental animals.

Life was initially formed in the sea, which has remained a natural protective environment for a host of primitive forms which could not survive on land or in the air. Other biological groups are known to have evolved onto land and subsequently returned to the sea. The majority of animal phyla are in fact found primarily in the sea. For these reasons the oceans provide a rich and diversified resource which cannot be ignored in man's pursuit of biological knowledge.

It is clear that, in terms of biomedical science, marine biology is not of itself a discipline, but that the use of marine forms contributes to research in many of the biomedical disciplines, such as physiology, biochemistry, genetics, microbiology, developmental biology, and the behavioral sciences. In the evolution of the biomedical sciences, it is not the purpose of the PHS to develop marine biology per se, but rather to afford opportunities for biomedical scientists to become aware of the unique features of marine organisms and to provide them

access to those forms best suited to their research programs. The facilities for such access are an important concern.

Program Needs in the Area of Marine Biology

1. Many scientists in fundamental biomedical research are currently using marine forms. These scientists are supported on research grants, which provide an appropriate mechanism for the evaluation and support of these programs on the basis of their scientific merit and pertinence to the program needs of the various supporting agencies. It is not envisioned that this pattern of support should be changed in the immediate future.

2. The Federal Government currently has a very limited amount of graduate training in environments readily accessible to marine forms. Since biological scientists will increasingly be dependent upon these forms to help answer many of the questions which they must face, appropriate emphasis might be given to the further development of high-quality training programs having access to a marine environment and organisms therefrom.

3. The key problem in the approach of biomedical scientists to this area is that of access; for if scientists and their graduate students have access to marine forms, they will use them to pursue biological questions that cannot readily be pursued in the rat or in man. Therefore primary emphasis should be given to the problems of providing scientists greater access to marine forms. This problem can be approached at various levels, which will be discussed briefly below:

   a. Where at all possible, the use of marine forms in the scientist's own laboratory should be encouraged. The current availability

of seawater systems for small and large laboratory aquariums and the availability of rapid air transportation make it feasible for many scientists to use marine forms in their own laboratories. This approach has great merit, but in many instances is limited by the lack of a suitable source of the required marine organisms. If this is to be encouraged, more adequate mechanisms of supplying needed forms will have to be developed.

b. There are certain institutions, such as the University of Washington, Stanford University, the University of California, San Diego - Scripps Institution of Oceanography, Duke University, the University of Miami, and the University of Hawaii, which have their own marine laboratories that provide excellent access to the sea. Particular attention might be given to the further development of these facilities for sophisticated biomedical research. Other locations, such as the Gulf Coast, the Virgin Islands and Puerto Rico, also have access to a rich variety of marine forms. The support of these areas would involve not only equipment and facilities, but the development of staff highly competent in the biomedical and marine sciences.

c. The increasing demand for marine forms by scientists inland as well as by the sea makes it imperative that facilities be made available to scientists from inland laboratories. However, excellent scientists in many of the existing marine laboratories are so engrossed in their own research that they have little time to plan and manage facilities for visiting scientists from other laboratories. Furthermore, some institutions have a highly

protective attitude toward their marine flora and fauna and are concerned that the supply might be exhausted by others. Woods Hole, Friday Harbor, and other laboratories, operating largely on a summer basis, have long played an important role in providing inland scientists access to the sea. They will continue to do so, and their efforts should be enhanced.

d. There is urgent need, however, for biomedical research facilities by the sea where sophisticated research programs can be conducted over an extended period, on a year-round basis. It is suggested that a long-range program might consider the development of such facilities, providing space to selected groups of scientists and their institutions, on the condition that the facilities will be used continuously the year round.

It is important that such a facility be as close to large academic centers as is possible. Careful attention would have to be given as to the immediate availability of a wide variety of marine forms to the laboratory. It seems likely, however, that in the course of time scientists will not be willing to conduct highly sophisticated research programs on organisms randomly picked from a given rock or crevice within the sea or along its shores. It can be predicted that in the future valuable marine forms will be cultivated in a highly controlled environment, as are mice and rats today.

The selection and preparation of a site or sites for such facilities would be very important and would require the advice of people highly skilled in marine biology on the one hand and modern biological and medical research on the other.

4. The technique is rapidly developing by which man will be able to live within the sea for extended periods; the sea is indeed a new frontier for man to explore. As man moves into this environment, questions regarding his health, and the physiology and behavior of man in a deep-sea habitat, will become important. Moreover, the opportunities for extending our laboratories down into the sea to study the behavior, life cycles, and nature of biological forms at close range within their natural environment will become increasingly significant.

In many ways, biological and medical scientists will be in a position to supplement and complement the normal functions of governmental agencies participating in this effort. It is important to maintain liaison between the National Council on Marine Resources and Engineering Development, and the Navy Department, the National Science Foundation, the National Institutes of Health, the Atomic Energy Commission, and other governmental agencies having a concern in this area so as to provide effective support to the overall national program.

[illegible] budget (planning) - $100,000

Biomedical Research on Man in the Sea

The Marine Resources and Development Act of 1966 declared it to be the policy of the United States to develop, encourage, and maintain a coordinated, comprehensive, and long-range program in marine science for the benefit of mankind. The Continental Shelf is now within reach of man in the sea. When we gain the capability to explore and exploit it safely, we will have added nearly one-third to the territory of the United States.

The National Need for Biomedical Research

1. The Defense Need

The Navy has traditionally and historically been involved in and under the sea for a long time. Its interests include the rescue of men from diving submarines; the locating and recovery of small objects lost at sea (e.g., the H-bomb lost off Spain at a depth of 3,000 feet); deep salvage capability, such as that needed in the Thresher catastrophe; and in the Sealab series, of which the third is now under way. It is anticipated that in the future the Navy's operations will have a much broader range.

At present the Navy spends $3 million annually for biomedical studies relating to undersea problems. The Navy's efforts, and funds to support them, should be at least double what they are now. Under present funding, the Navy's direct research efforts of necessity have rather short-term, immediate goals, which need to be complemented by a fundamental research program seeking information that will be needed in the '70's and '80's. It is envisioned that ONR and other governmental agencies such as the NIH might work together to define

and develop an extramural program that will provide the fundamental knowledge needed for both Naval and industrial efforts.

2. The Industrial Need

The Continental Shelf contains a wealth of mineral, petroleum, and natural gas reserves. Undersea oil is now a multibillion dollar business, and this is expected to multiply many-fold. The total United States industrial investment is approximately $7.5 billion in oil leases, wells, and equipment. This is projected to rise to $37.5 billion in 10 years. Current sales of oil from undersea marine sources is $5 billion per year. Primary sites are the Gulf of Mexico, the California Coast, and the Southern Coast of Alaska, near Anchorage. Of present oil lands being leased by the U. S. Government, 13 on the Gulf Coast are deeper than 600 feet. Of 500,000 acres currently being leased on the California Coast, 50 percent are deeper than 600 feet and 15 percent deeper than 1500 feet. Present limits of safe diving capability are 400 feet.

It is estimated that within a year or two as many as 100 new oil fields will be built per year off-shore -- each requiring five man-years of diver time to bring into production and for continuous maintenance over five years of production. Other men will be needed for the laying of pipelines, salvage, and clean-up. It is estimated that 20,000 miles of pipeline are now lying on the floor of the Gulf Coast, carrying oil -- and rusting. If leaks occur there may be a serious pollution hazard. Repair or removal will require divers. In addition, 3,000 oil towers are now in the Gulf, many wrecked and a hazard to shipping; removal will require divers and be hazardous.

The oil business alone constitutes about half of total diving operations.

It is estimated that the sea contains vast resources of gold, silver, and other ores. On land, prospecting for oil and minerals has traditionally been done by individuals looking for outcroppings, or following down slopes from known sources of oil or minerals. Man will have to be directly involved in undersea prospecting. There are also many archeological treasures to be found under the sea.

The sea remains one of the world's greatest relatively untapped food resources. Utilization of the sea awaits "aquaculture," in which man systematically goes about the business of cultivating the sea. Man's delay in this effort has resulted, in part, from the difficulty of getting into the sea to observe, to work, and to learn the problems that are involved. As the world's food needs expand, the sea is bound to become a major resource for the future.

3. The Recreational Need

Few recreational sports have enjoyed as phenomenal a growth in the United States as that of underwater diving. It is estimated that this activity now has several million participants, and that within 25 years the number will reach 30 million, with an annual expenditure of $10 billion for recreational diving equipment, including small one- or two-man submarines. The need for more and better instruction in diving and for safer equipment and better controls is self evident. It seems probable that in a few years skin divers may need to be licensed, after appropriate examination, as airplane pilots are today. Approximately 100 Americans lost their lives in diving

accidents in 1965. In the past, the Navy has played a significant role in assisting with injuries incurred by the diving public.

4. Long-Range Needs -- 25 Years

Within 25 years, new industries, and the societies which they support, will become dependent upon the ocean. It is predicted that many political problems will arise, including the problems of ownership of land under the ocean. Exploitation of sea resources may well lead to a shift in the balance of world power. It may be necessary that scientific and industrial planning of the utilization of the oceans' resources be conducted on an international basis. Although only two countries, the United States and Russia, are heavily involved in space exploration, a number of other countries, including England, France, Italy, Canada, Norway, Sweden, Denmark, and Japan, have the capability to do extensive underwater exploration.

The Need for Biomedical Research

Most divers work for small companies that operate on a shoestring, with little knowledge of the biomedical problems involved. They operate on the basis of guts, ruggedness, and calculated risks. Industrial requirements for divers far outstrip the number available, many of whom are not fully qualified. Current oil operations are beyond the safe limits of knowledge and experience; currently divers are working at depths well beyond the limits of well-tested diving tables. Compared with the efforts that are being taken to protect men going into outer space, relatively little is being done to protect those who must go into the sea. In order to obtain oil and other natural resources from the

depths of the oceans, we are committing men to severe environmental stresses that we do not know and do not understand.

Pressure under the sea can become very great at relatively modest depths (i.e., 20 atmospheres at 650 feet, a common depth for the Continental Shelf). At such depths, decompression becomes long, arduous, and expensive. Thus, although a man may descend rapidly to 650 feet, it takes a number of days for ascent. Highly imaginative approaches are needed to seek ways of circumventing this long decompression period.

Nitrogen has narcotic effects on the diver at high pressures, so that at 400 feet, some workers will be sober and able, whereas others are virtually unconscious. It appears that a number of drugs have an effect on nitrogen narcosis; their mechanism of action needs to be examined. In recent years considerable research has been done on the binding of inert gases, such as xenon to hemoglobin. Such approaches must be extended to nitrogen and helium, to elucidate the precise mechanisms of their binding to other components of living tissues. At high pressures in a closed environment the concentration of active gases, such as O_2 and CO_2, must be kept under close control. Even small gaseous contaminants, which are readily tolerated at normal pressures, may have a devastating effect at 10 to 20 atmospheres.

Heat loss as the result of the thermal conductivity of water is 25 times that of air; the heat capacity of water is 1,000-fold greater than air. The ocean thus serves as an enormous "heat sink," tending to bring the diver's temperature rapidly to that of the environment. The use of helium in breathing mixtures accentuates the problems, as this gas has a thermal conductivity of six times that of nitrogen. The

problem of temperature control is critical -- one of the most difficult that divers currently face.

Problems of communication are very difficult under the sea. Visibility is poor; hearing is altered; voice communications through the helium atmosphere are very difficult, and hazards caused by "confusion of cues" may lead to accidents if the wrong signals are sent, so that at present much of the communication is still by the time-old method of jerking on a rope. New methods of communication are urgently needed.

Accidental hazards are common. In many places where divers work, the seabed is rough and hazardous, particularly around wrecks and objects to be salvaged. Objects being raised and lowered, as in the placement of a well-head or during salvage, may suddently shift and seriously injure or crush the diver. Currents of three to four knots an hour make work almost impossible.

Injury from marine organisms is another problem. Sharks and other biting fish may cause severe injury. A wide array of marine organisms use toxic substances as a means of defense, which may kill or seriously injure a diver. This is an area that appears to be particularly valuable for NIH research because of the likely spin-off of valuable drugs for medical use.

Problems of the handling of medical emergencies are made difficult by the fact that an injured diver cannot be rapidly evacuated to a medical facility where prompt and appropriate care can be given. A doctor must either go down to treat the patient under the sea, or the patient must be brought to the surface in a pressurized chamber. It is envisioned that

eventually such chambers will be evacuated by helicopter to hyperbaric medical centers, and that centers similar to those now being developed by hyperbaric surgeons may become important in the treatment of people working under the sea.

Other problems of biomedical significance remain to be examined. Included among these are (1) the effect of pressure per se on the structure of proteins and on the rate of enzymatic reactions, and how such changes affect biochemical reactions within the body; (2) problems of weightlessness, which cause redistribution of blood flow and changes in the physiology of various organs, such as the kidney; (3) the possible use of liquid breathing or artificial gills; (4) the magnification of human performance at depth through assisted respiration and the use of exo-skeletans.

Existing Biomedical Research Capability

The Navy has a number of different units participating in biomedical research related to under-the-sea activities. These units include the Naval Medical Research Institute of the National Naval Medical Center in Bethesda, Maryland, where studies on thermal protection, human behavior in prolonged isolation, and effects of drugs on animals under pressure are being carried out. The Experimental Diving Unit in Washington, D. C., does much of the training of divers and working out of decompression schedules. The Submarine Center at Groton, Connecticut, has a pulmonary physiology laboratory, and is carrying on research pertinent to undersea exploration. The Office of Naval Research has a contract research program, making funds available to outside groups interested in biomedical problems

of the sea. These studies are related to urgent needs of ongoing projects of the Navy.

The National Aeronautics and Space Administration has an input into deep sea technology through its space programs, where a great deal of research on stress physiology, telemetric systems, regeneration of gases and removal of toxic contaminants in closed systems has been conducted. Recently they have developed suits with constant volume joints which give no resistance to movement, and have potential application to underwater systems.

The National Institutes of Health has no research program directly concerned with man in the sea, but it does have a large amount of research in related areas that would have significance for man-in-the-sea operations. These would include the National Heart Institute's centers on hyperbaric medicine; the support of fundamental research on high and low altitude physiology; research on anesthesiology, thermoregulation, physiology of marine mammals, etc. The National Institutes of Health could well serve as a resource of fundamental information through the numerous scientists and consultants who cooperate in its programs. Many of the studies being conducted for purposes of man in the sea would also have a spin-off in other areas (i.e., hyperbaric medicine, anesthesiology, etc.).

If man is to go into the sea, we need experience with the biomedical hazards and problems that may arise. With several thousand men in the sea, as can be expected during the coming decade, many medical problems can be expected. Urgently needed are clinical research centers on the Gulf and California Coasts, where active oil operations are providing many opportunities for biomedical research on the problems that arise in man-in-the-sea operations.

Immediate Goals

A. The development of clinical research centers for research on men who are injured or have other medical problems as the result of man-in-the-sea activities.

B. The expansion and provision of funds for maximal utilization of basic research capabilities at existing centers and new centers that may be developed.

C. The stimulation of interest of biomedical scientists already skilled in adjacent scientific disciplines that can contribute to the problems of survival under the sea.

D. The training of young biomedical scientists with an interest in undersea problems.

Estimated FY '70 budget (planning) - $100,000

April 8, 1968

Initiatives Suggested by the Water Resources Council for Fiscal Year 1970 for the Committee on Multiple Use of the Coastal Zone, National Council on Marine Resources and Engineering Development

Initiative No. 1 - Establishment of River Basin Commissions under Title II of the Water Resources Planning Act for States that have Coastal Zones.

Discussion

One of the stated provisions of the Water Resources Planning Act is to provide for the optimum development of the Nation's natural resources by means of coordinated planning of water and related land resources through the establishment of river basin commissions. The President is authorized to establish these commissions on a request therefor by the Water Resources Council. The request by the Council or the State among other items defines the area for which the commission is requested and is concurred in by the Council and by not less than one-half of the States within which portions of the basin or basins concerned are located. Each such commission shall:

(1) Serve as the principal agency for the coordination of Federal, State, Interstate, local and nongovernmental plans for the development of water and related land resources in its area.

(2) Prepare and keep up to date to the extent practicable a comprehensive coordinated joint plan for Federal, State, Interstate, local and nongovernmental development of water and related land resources.

(3) Recommend long range schedules of priorities for the collection and analysis of basic data and for investigation, planning, and construction of projects.

(4) Foster and undertake such studies of water and related land resources problems in its area.

On November 29, 1967, the Water Resources Council adopted a statement which clarified that coastal, lake and river shorelines and islands are integral parts of the planning activities of the Council, river basin commissions, and other field organizations and State programs under Title III

of the Water Resources Planning Act. Mr. Frank Gregg, Chairman of the New England River Basins Commission, has responded to this policy statement as follows: "The Commission is giving careful consideration to a study applying the techniques of comprehensive river basin planning to analysis of the New England coastline, including estuaries and islands. Such a study would consider all demands on these resources--industrial, commercial, residential, recreational, etc.--and to recommend plans and programs for securing maximum benefits. Recommendations would apply to securing sound land use for all purposes, involving zoning, acquisition, etc.; water quality control; flood protection; beach erosion control; management of fish and wildlife resources."

The river basin commissions that have been established under Title II and which have coastal zones of interest to the Committee on Multiple Use of the Coastal Zone are the Pacific Northwest, the Great Lakes, and the New England. In each commission a chairman has been appointed by the President and a small staff has or is being organized to work for the commission and assist in carrying out the responsibilities as delineated in the foregoing paragraphs.

The established commissions include 16 of the 28 States that have coastal zones and also include 17,400 miles of coastline of the total of 58,500 miles in the coterminous United States. It is further noted that a river basin commission under Title II is being considered by some of the States within the area of the Southeast Basins Inter-Agency Committee. This includes the States of South Carolina, Georgia, Florida, Alabama, and Mississippi. Should this commission be established, it would mean that 21 of the 28 States having coastal zones would be in river basin commissions and 32,000 miles of coastline would be involved. The remaining seven States could come under river basin commissions for the Pacific Southwest which would include California, the Texas Gulf which would include Texas and Louisiana, and the North Atlantic which would include parts of New York and the States of New Jersey, Maryland, Virginia and North Carolina, and the District of Columbia.

Recommendation

In view of the fact that more than one-half of the States having interest in coastal zones are already within Title II river basin commissions and a number of the remaining States are considering such commissions, and the responsibility of these commissions involve the coastal zones including

the effect the upland river basin drainage area has on these coastal zones, it is recommended that the Committee on Multiple Use of the Coastal Zone work with the Water Resources Council toward early establishment of Title II commissions where this type of an institution is needed in these remaining areas. Furthermore, that the Committee on Multiple Use of the Coastal Zone review the plans of report prepared by the river basin commissions now in existence and those to be established to assure that the planning requirements of the coastal zones are receiving adequate consideration.

Initiative No. 2 - National Assessment of the Adequacy of Water and Related Land Resources

Discussion

In section 102 of the Water Resources Planning Act, the Water Resources Council is directed:

> Sec. 102. The Council shall--
>
> (a) maintain a continuing study and prepare an assessment biennially, or at such less frequent intervals as the Council may determine, of the adequacy of supplies of water necessary to meet the water requirements in each water resource region in the United States and the national interest therein; and
>
> (b) maintain a continuing study of the relation of regional or river basin plans and programs to the requirements of larger regions of the Nation and of the adequacy of administrative and statutory means for the coordination of the water and related land resources policies and programs of the several Federal agencies; it shall appraise the adequacy of existing and proposed policies and programs to meet such requirements; and it shall make recommendations to the President with respect to Federal policies and programs.

The purpose of a periodic assessment of the water supply-demand outlook of each of the water resources regions of the United States is to keep the Executive Branch, the Congress, and the public informed of current and projected regional and national water and related land resource needs and of current and prospective public action necessary to meet those needs.

The National Assessment will provide a means of summarizing information arising from project operation and regulation to national and regional planning projections. It will utilize much of the data made available by

the comprehensive planning studies, and, in turn, provide those studies with up-to-date national, regional, and basin projections of demographic, economic, and land use activity. Moreover, it is expected that the Assessment will be able to keep significant portions of completed regional framework studies valid by means of continuous updating.

The National Assessment will also complement the Planning-Programming-Budgeting System (PPBS) of the Federal Government. Whereas the PPBS operates within a limited time horizon of 5 to 10 years to allocate the efforts of the Federal Government, the National Assessment will be based on a time horizon of about 50 years in order to better illuminate emerging problems in water resources development. Population and economic growth and related requirements for water and related land will be considered. The Assessment will provide information for those who are concerned with the broader implications of national policy, planning, and research for water and related land resources.

The Council is approaching the National Assessment in three phases:

Phase I - An initial assessment of the adequacy of the national water supply based on readily available data.

Phase II - A more fundamental analytical framework for the assessment and more detailed measures of adequacy requiring substantial data inputs.

Phase III - A continuing refinement of phase II exploring the relationship of the water supply assessment and the measures of adequacy to economic factors, differences in productivity, institutional constraints, and other factors.

The First National Assessment report is in final stages of review by the Council. This report includes projections of water withdrawals and consumptive use and a description of problems for 20 water resource regions. In addition, the report has chapters on each major water use and on major water management problems.

For the next national assessment report much greater geographic detail is planned. A map showing region and subregions has been prepared for use of the National Assessment and the PPBS. This map is now being reviewed by Washington and field personnel of member agencies. With consideration of smaller subregions in the next report more consideration can be given to relation of projected requirements in coastal areas and to the relation of upstream uses to estuarial areas.

Recommendation

The National Assessment should include river basin-coastal area relationships. Any special analysis needed for the coastal areas should be included as part of the projected economic activity and requirements included in the National Assessment.

AGENCY PROGRAMS IN THE COASTAL ZONE

COASTAL ZONE PROGRAMS

The Marine Resources and Engineering Development Act of 1966 calls for an annual review of all marine activities conducted by departments and agencies of the United States.

Accordingly, each member agency of the Committee on Multiple Use of the Coastal Zone was asked to furnish for this Panel hearing a brief statement on its Coastal Zone programs. The statements furnished follow this page.

The two days scheduled for the Panel hearing did not permit the scheduling of time for review of these programs if the task group activities and the initiatives are to be presented.

However, the Committee Chairman, the Executive Secretary and, possibly, Committee members as requested, can be available on September 25 to discuss these programs with the Panel. It is suggested that the Executive Secretary be notified as soon as possible (see his telephone number on Committee list in the last 12 pages of this book) if Panel members desire to discuss these program statements.

No program statement was received from the National Science Foundation, the State Department, or the Water Resources Council. The National Aeronautics and Space Administration and the Navy Oceanographic Office reported that they have no Coastal Zone programs.

12 Sept. 1968

Coastal Zone Activities of the Corps of Engineers

The Corps of Engineers involvement in the coastal zone and Great Lakes goes back to the earliest days of the Republic, starting with coastal fortification, construction of piers and seawalls, removal of obstructions to navigation, protection of islands and beaches, and deepening and maintaining harbors and tidal watercourses. Over the years, Congress has charged the Corps with an ever-widening spectrum of responsibilities in the coastal zone, until today the Corps program of coastal engineering constitutes the largest, most varied, and most widespread combination of activities in this field of vital national interest.

By "coastal engineering" we mean the planning, design, construction, operation, and maintenance of engineering works in the coastal and tidal waters and in the Great Lakes, and research and data collection/analysis in support of these activities. Of the current annual level of about $1¼ billion dollars for the entire Civil Works program, the coastal/Great Lakes component represents roughly one-sixth, or about $200 million. By far the largest segment of these activities comprises the design, construction, operation, and maintenance of deep-draft commercial and fishing harbors, with their appurtenant channels to the sea (or connecting channels in the case of the Great Lakes), shallow-draft recreational harbors including harbors of refuge, and intracoastal shallow-draft channels for commercial and recreational craft. This channel and harbor work, in addition to deepening, widening, and straightening by means of several types of dredging (including maintenance of silted channels to authorized dimensions), also includes construction of breakwaters or other protective works, locks on Great Lakes and intracoastal channels and canals, and railroad and highway bridge relocations. In the interest of navigation, but also more recently in response to concerns for ecological, aesthetic, and other aspects of environmental quality, the Corps is responsible for removal of wrecks and other obstructions, for issuing permits for construction or other activities involving emplacement of temporary or permanent structures or release of industrial and other waste products in navigable waters, and for certain other regulatory activities.

The Corps, in conjunction with the AEC and other agencies, executes the engineering and scientific studies for the Atlantic-Pacific Interoceanic Canal Studies Commission, in the fields of topography, geology, hydraulics, hydrology, meteorology, acoustics, ecology, and health and sanitation. Another major functional area is the provision and maintenance of beaches, and the protection of developed shore facilities and undeveloped shore lands from erosion by waves and currents, including hurricane protection, through such means as placing and replenishment of sand, and construction of groins, jetties, seawalls, and other protective works.

The Corps is also concerned with aquatic plant control, salinity intrusion control, and major drainage of coastal marshes and swamps. It also compiles and disseminates information on waterborne commerce and on ports and port facilities, and Great Lakes hydrographic, hydrologic, and other physical data.

In support of these design, construction, and operational activities, the Corps is actively engaged in: comprehensive and preauthorization planning;

collection and analysis of scientific, technical, and economic data; research; and special studies and investigations (such as the Chesapeake Bay Model and the problem of dredge spoil disposal in the Great Lakes and estuaries). Of the Corps' $200 million annual coastal activity, the attached tabulation breaks out the $9-10 million attributable to research and other related scientific activities. There is, of course, a considerable fallout of benefit from these activities to the entire national community of interest in marine science and engineering. These activities programmed for FY 1970 include the following Initiatives:

Initiative	CMUCZ Priority
Combating Oil Spills	1
Effects of Construction Activities on the Ecology of the Coastal Zone	1
Development of Offshore Facilities	2
New Techniques for Restoration of Coastal Shores and Beaches	2

12 September 1968

CORPS OF ENGINEERS COASTAL ZONE PROGRAM, WITH SUPPORTING RESEARCH AND OTHER SCIENTIFIC ACTIVITIES

Program Allocation	New Obligation Authority, in Millions of Dollars		
	FY 1968 Actual	FY 1969 Estimate	FY 1970 Budg.Recom.
Total Civil Works Program	1,304	1,218	1,294
Coastal Zone Component 1/	196	183	194
a. Planning, Design, Construction (incl. Real Estate), Operation, and Maintenance, excluding portion allocated to b. below 2/	187.1	173.8	184.3
b. Research and other Scientific Activities 1/	8.9	9.2	9.7
Suballocation of Research and other Scientific Activities to Major Purpose 3/			
Transportation			
Channel and harbor development and protection	2.919	2.7	3.2
Development and Conservation of the Coastal Zone			
Shore stabilization and protection			
Beach erosion control and hurricane storm surge protection	1.496	1.5	1.7
Marine pollution management			
Pollution and flushing of bays, estuaries, and the Great Lakes	1.659	2.2	1.8
Recreation and conservation			
Recreation beaches and small-craft harbors	1.480	1.5	1.6
Education 4/	(.022)	(0.03)	(0.04)
Environmental Observation and Prediction Services	.313	0.3	0.3
Ocean Exploration, Mapping, Charting, and Geodesy	.838	0.8	0.9
National Data Centers			
National Oceanographic Data Center	.024	0.03	0.03
Great Lakes Data Center	.164	0.2	0.2
Subtotal	8.893	9.2	9.7

Notes

1/ Includes engineering and scientific studies for the Atlantic-Pacific Interoceanic Canal Study Commission, amounting to $3.4 million for FY 1968, $3.0 million for FY 1969, and $0.6 million for FY 1970.

2/ Navigation improvements, hurricane protection, major drainage, beach erosion control, regulatory activities.

3/ This classification and subitemization scheme follows that shown in table A-1, "Total Federal Marine Science Program by Major Purpose and Organization," on pp. 171-175 of "Marine Science Affairs - A Year of Plans and Progress" (the second annual report of the President to the Congress, on Marine Resources and Engineering Development, March 1968).

4/ Funds for education/training, which are non-additive, are distributed among other applicable activities.

ATOMIC ENERGY COMMISSION

The AEC supports a number of coastal zone research projects concerned with the use and impact of nuclear energy. General areas of effort are: environmental science, development of instrumentation based on nuclear techniques and nuclear power applications. Several divisions of AEC are involved according to their specific objectives.

Environmental Science

The environmental science program includes studies of the processes controlling the cycling of natural and artificial radioactivity in estuarine and coastal systems and possible effects of radiation on organisms. Biological uptake, concentration and elimination of radionuclides and food-chain relationships are emphasized. Chemical and physical processes acting to concentrate or to disperse radionuclides are also investigated. Basic knowledge in all aspects of oceanography is derived through use of environmental radioactivity for tracing and chronology. The present funding level for these projects is about $1 million per year.

Research on the effects of heated effluents on coastal biota was begun this year with one project funded at about $64,000. Much basic information is required in this area before possible harmful effects and potential for beneficial use can be assessed.

Instrument Development

Instrumentation and experimental methods based on nuclear techniques are being developed. Included are isotopic current meters and littoral transport studies utilizing radioisotope-tagged sand. Funding in 1969 is about $230,000.

Nuclear Power Applications

Radioisotopic and reactor power sources for use in marine vehicles and at fixed sites are being developed. Current efforts in oceanographic applications are about $5.7 million per year.

While 1970 budget figures are not yet available it is expected that overall effort will not change significantly. As funds become available through routine terminations or from other sources, the effects of thermal alteration in the coastal zone will receive increased emphasis.

ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION

Coast and Geodetic Survey Environmental Research Laboratories
Weather Bureau

September 13, 1968

ESSA has responsibilities for marine mapping and charting; the observation and prediction of tides, tidal currents, storms and storm endused sea surges; mission-related research on land-sea-air interaction processes; and for the Tsunami Warning System. These programs directly relate to the coastal zone, in whole or in part.

The principal marine program is nautical charting. Its output includes conventional charts, small-craft charts, and Coast Pilots, products whose common purpose is to permit safe and efficient navigation for commercial shipping and recreational boating. In addition, the continental shelf mapping program provides accurate descriptions of the physiography of the shelves in the form of maps depicting bottom configuration, geophysical anomalies, and sediment type and distribution. This will provide the Federal and State Governments and private enterprise with the basic information required for the intelligent management and exploitation of shelf resources.

The meteorological, tide and tidal current programs provide predictions essential for safe and efficient coastal transportation, and for fisheries, pollution control, recreation and construction.

The aim of the land-sea interaction program is to increase knowledge of shore processes affecting the prediction of the transport of pollutants, the erosion and deposition of sediments and related engineering applications.

Appropriations shown below have been extracted from other program categories to reflect the level of ESSA activities in the Coastal Zone.

	FY 68	FY 69	FY 70
Surveys and observations, processing analysis compilation and printing	9.6	9.6	10.3
Research and development	0.5	0.5	0.5
Facilities, equipment and construction	0.7	0.5	0.8
	10.8	10.6	11.6 *
Additional funding required to implement 1970 initiatives			5.0

*ESSA budget estimates - before Department of Commerce action.

MARITIME ADMINISTRATION
U.S. Department of Commerce
September 17, 1968

The Maritime Administration promotes the development of an American flag fleet, aiming at a position as a carrier commensurate with the Nation's position as the world's leading participant in foreign commerce. Programs have been developed to make shippers and the public in general aware of the importance of developing a fleet which is capable of carrying a substantial portion of our commercial exports and imports. Other programs are designed to obtain commercial cargoes for the U.S. flag fleet, since cargo is the life-blood of the merchant marine, and the development of sufficient carryings on our ships would assure the development of an adequate fleet.

Under the various laws which it administers, principally the Merchant Marine Act, 1936, as amended, the Maritime Administration is responsible for many activities. Generally, they may be classed in five groups or programs: (1) financial assistance, which includes operating and construction subsidies, ship replacement, vessel mortgage insurance, and cargo preference; (2) maritime operations, including reserve fleet maintenance, ship exchange, charters, and transfers; (3) maritime promotion, which involves cargo promotion and port development; (4) maritime training, which includes operation of the U.S. Merchant Marine Academy and responsibilities for the five state maritime academies; and (5) research and development, which is devoted to new systems development and to cost reduction projects.

The responsibility of the Maritime Administration for promoting the development of U.S. ports and related transportation facilities in connection with water commerce includes advising and assisting communities on port improvements, and initiating and coordinating programs for the continued operation and Federal control of ports under national emergency conditions. The agency's active ports and systems development program focuses attention on increasing port operating efficiency and reducing vessel turnaround time in port through improvement of cargo handling methods and operating practices, development of new marine terminal systems, promotion of adequate port capacity, and initiation and coordination of research and development projects related to port administration and operation. The ports and systems program includes 10 priority port research and development projects and 12 additional in-house and special services type projects. Fundings are as follows: FY 1967-$350,000; FY 1968-$475,000; and FY 1969-$1,700,000.

The funds obligated for all five major programs administered by the Maritime Administration are as follows:

	FY 1967 (mil.$)	FY 1968 (mil.$)	FY 1969 (Est.) (mil.$)
General Funds (appropriated)	247.1	384.6	417.6
Other Funds (not appropriated)	264.8	51.2	228.9
Total	511.9	435.8	646.5

The coordination and integration of all modes of transportation are key factors in the industrial, agricultural, and trade development of our country. The Maritime Administration's ports and systems program is directly related to the implementation of a fully coordinated and integrated transportation system to serve the Nation's ports and to promote the movement of hundreds of millions of tons of waterborne commerce through these ports in international trade. This commerce moves along, into and through the coastal zones.

ECONOMIC DEVELOPMENT ADMINISTRATION

The EDA program is a system of grants and loans to help the economic development of cities and towns and country areas where unemployment is high and income is low. The legislation authorizing this effort, the Public Works and Economic Development Act of 1965, was signed into law on August 26, 1965. EDA can also give assistance to areas threatened by an unusual and abrupt rise in unemployment. This might occur, for example, when a major factory shuts down or a military base closes. A recent example of this is the Brooklyn Navy Yard area which is now being assisted in planning for its redevelopment.

There are about 900 qualified areas, including Alaska, Puerto Rico, American Samoa, Guam, Hawaii and the Virgin Islands. The business of EDA is conducted through 7 EDA Area Offices.

Four main types of assistance are offered through EDA:

1. One is grants to communities for public works and development facilities. These grants are generally available on a 50-50 matching basis, but EDA can go as high as 80 percent in Federal grant funds for a project, if an area's situation is so bad that it cannot supply its 50 percent. These grant projects must be directly or indirectly related to creating permanent jobs.

2. A second major kind of assistance is long-term loans. These loans may be made to help build the same kind of projects as provided for in the grants.

   In cases of Public Works loans designed to improve industrial expansion possibilities, EDA may lend up to 100 percent of the project cost. Such loans may run for as long as 40 years at a current interest rate of 4-3/4 percent.

   EDA has approved over 1200 projects. Of these, about 800 were for water and sewer systems at about $400,000,000. Waste water treatment was next, with about 300 projects for more than $75,000,000. There were 30 reservoir and dam projects for $20,000,000, and 50 ports and harbors projects for $60,000,000.

   This assistance includes studies for the economic development of the areas such as harbor planning, manpower studies, studies for the fishing industry, market studies, industrial studies, tourism studies, and studies on water problems.

   Since economic development is the principal purpose of this program, certain types of projects are, by their very nature, more likely to be eligible for assistance than others. They include among them water and sewer projects serving principally industrial and commercial users, water pollution control projects aimed at the treatment of industrial wastes, general site improvements (including utilities

and access roads) for industrial parks, public tourism complexes, harbor facilities, flood control projects, airports, roads which are not on the Federal Aid Highway System, and vocational schools.

3. A third major kind of help under the EDA program is Technical Assistance and Research to help find the answers to economic problems.

   Here the range is wide.

   Technical assistance may help decide if a proposed industrial complex is economically feasible. It may solve some of the engineering and marketing problems connected with such a project.

4. A fourth tool to help combat unemployment in the economically hard-hit areas is found in a special section of the Manpower Development and Training Act. Under this section jobless workers in EDA areas are eligible for training and subsistence allowances while undergoing training.

ECHannum
9-18-68

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
September 13, 1968

Principal activities of this Department which relate to the coastal zone, particularly the health aspects of water quality, are those concerned with insuring the healthfulness of shellfish and other fish for human consumption, use of the coastal zone for occupational and recreational purposes, use of marine organisms for biomedical research, and use as a disposal site for solid wastes and toxic materials. These activities include (a) conducting and supporting research, development, field investigations, demonstrations and pilot operations, (b) providing technical and financial assistance to State and local efforts, (c) manpower training, (d) monitoring of coastal waters for pollutants injurious to health, and (e) use of marine life forms for biomedical research purposes. Particular emphasis is given to assisting States in developing their shellfish sanitation programs.

Marine health science facilities are now operating in Alabama, Rhode Island and Washington. Additional construction is planned in the latter two States.

Funding of the Department's activities in the coastal zone is as follows:

	Actual FY 1968	Estimate FY 1969	Estimate FY 1970
Use of Marine life in biomedical research . . .	2.40	2.65	2.95
Health problems related to marine pollution . . .	.90	.90	.90
Nutritional and health aspects of marine foods . . .	1.10	1.25	1.25
	4.40	4.80	5.10

The rapidly expanding occupational and recreational uses of the coastal zone is responsible for increasing numbers of individuals being exposed to biomedical hazards and problems. Many medical and health related problems can be expected to develop in the near future. This Department is hopeful that research interests and facilities can be developed and additional scientists and clinicians trained which collectively can contribute to the Nation's man in the sea efforts.

One-page summary of Agency program in Coastal Zone
Geological Survey - includes all Divisions

The Geological Survey's program in the Coastal Zone consists both of activities in and pertaining to the coastal waters themselves, and of activities on land areas adjacent thereto, and hence that relate indirectly to the waters. The program is divided into activities classed as (1) research and investigations, and (2) basic data collection. Also, for fiscal year 1970 a new program, Coastal Hydrology, is proposed that contains items of both types.

With respect to the water itself, research and investigations include projects on estuarine hydraulics, thermal loading, salt-water intrusion, quality of bottom water, offshore springs, sediment movement, development of remote-sensing techniques, and special geologic studies. These range from pure research to delineations of circumstances at particular places. There is some data collection on tidal flow and salinity intrusion. The Conservation Division evaluates mineral resources of the shelf beyond State jurisdiction, and exercises management functions to insure orderly development.

With respect to water-related land studies, the program includes geologic mapping, both terrestrial and submarine, of coastal areas, the Atlantic shelf program of bottom and subbottom geologic exploration, many investigations of ground-water conditions in coastal areas (both Coop. and Federally supported), and non-systematic remapping, revision, and updating of older topographic maps. Basic data collection includes measurement of streamflow at head of tide, observations of water quality at stations on streams entering coastal waters, and a few scattered tide stations.

The Coastal Hydrology program, proposed to begin in FY 1970, includes enlargement of basic data collection especially in the coastal waters themselves, comprehensive scientific studies in selected estuaries, and step-up of hydraulic and hydraulic-related research. The funding of this program as proposed is probably substantially greater than can be approved for immediate implementation.

Table 1.--Geol. Survey effort in Coastal Zone (Thousands of Dollars).

Types of Work (Great Lakes not included)	Fiscal years		
	1968	1969	1970
Geologic & Water Resources Div'ns.			
Research & investigations	3,789	3,601	3,728
Basic Data Collection	87 1/	77 1/	82 1/
Coastal Hydrol. Program	0	0	2,750
Conservation Division			
Resource Evaluation & Mgmt.	854	1,200	1,600
Topographic Division	(2)	(2)	(2)

1. Coastal Zone streamflow and water-quality measurements are included in nationwide "land" program, and not shown here.

2. Amounts for general geologic and topographic mapping, though substantial, are not readily separated out from nationwide programs.

NATIONAL PARK SERVICE

September 5, 1968

The National Park Service has responsibility for administration of the National Park System which includes twenty areas with significant marine resources. Eleven are national parks and monuments where resource protection is the major management objective, and nine are national seashores and lakeshores where outdoor recreation is the primary management consideration. Fourteen additional marine areas have been proposed for inclusion within the System or are under study.

To reflect the need for protection of outstanding stretches of shorelines, particularly near heavily populated urban areas, national seashores and national lakeshores have recently been added to the National Park System. Cape Hatteras National Seashore, authorized in 1937, was established in 1953. Cape Cod National Seashore was authorized in 1961, and more recently Padre Island, Point Reyes, Fire Island, Assateague Island, and Cape Lookout National Seashores were authorized. In 1966, the initial National Lakeshores, Indiana Dunes and Pictured Rocks, were authorized.

Prior to 1961, national parks and monuments were created on public domain lands or on lands donated to the Federal Government. The authorization of Cape Cod provided that parklands could be acquired with appropriated funds.

Appropriations for planning, development, conservation, and acquisition for the marine-related units under the management of the National Park Service are as follows:

	FY 1968	FY 1969	FY 1970
Planning	.1	.1	.1
Development	6.9	5.8	8.8
Conservation	1.2	1.9	1.0
Total	8.2	7.8	9.9
(Acquisition (BOR)	11.1	13.2	15.0)

National Seashores and Lakeshores provide opportunities for outdoor pursuits such as swimming, fishing, boating, hunting, hiking, picnicking, camping, photography, and nature study. Interpretive programs explain the natural and historical features to the visitors.

A variety of interpretive methods including self-guiding underwater nature trail at Buck Island Reef National Monument and Virgin Islands National Park, and Fort Jefferson National Monument; museum exhibits; and conducted tours and beach walks. The National Park Service is investigating additional means of increasing opportunities for underwater observation and interpretation.

National Council on Marine Resources & Engineering Development
PANEL ON COASTAL ZONE
Bureau of Mines
U.S. Department of the Interior

The Bureau of Mines has two activities in or related to the Coastal Zone, one is in Mineral Resource Evaluation Studies; the other is in development of technology in marine mineral mining.

The following tabulation expresses the resource evaluation work:

	1968	1969	1970
Input of Offshore Oil Developments	$91,000	$ 94,000	
Input of Estuarine Mining (Gulf Coast)		30,000	
Economic Analysis of Gulf Coast Mineral Imports and Exports		40,000	
Potential for Mineral Industry-Development in the Anchorage-Cook Inlet Areas		50,000	
Total	$91,000	$214,000	$220,000 1/

1/ A breakdown by projects has not yet been made.

Research in the immediate offshore zone, which is close to land processing facilities, is being stressed. Work is directed toward (1) deposit delineation and characterization, and (2) mining systems. Special emphasis will be placed on matters of compatibility of marine mining with marine ecology. A joint study has been initiated with BCF in this connection.

	1968	1969 (Est'd.)	1970 (proposed)
Funding:	$1,445,000	$1,478,000	$1,478,000

National Council on Marine Resources & Engineering Development
PANEL ON COASTAL ZONE

Activities of the Office of Water Resources Research
U.S. Department of the Interior

The OWRR supports research entirely by out-house allotments, grants, and contracts. Most of its activity is in non-coastally oriented water resource problems, but it does support a number of projects that are in the coastal zone. These currently are in three of the FCST categories having to do with general hydrology, water pollution, and resources planning.

FCST Category	1968 FY No. of Projects	1968 FY $ in Thous.	1969 FY No. of projects	1969 FY $ in Thous.
II Water cycle	8 1/	180	6 1/	158
V Water quality mgmt. & protection	9 2/	205	10 2/	107
VI Water Resources planning	4	48	7	184
Total	21	434	23	449

1. 5 and 3, respectively, in Estuarine problems.
2. 6 and 7, respectively, in Effects of pollution.

The following table gives the expenditures by type of support:

Support	1968 FY $ in Thousands	1969 FY $ in Thousands
Allotment to Res'ch. Inst's.	173,963	170,470
Matching Grants	153,040	79,664
Title II	106,785	198,675
Totals	$433,788	$448,809

The OWRR has not projected any estimates for FY 1970, although priority consideration will be given to proposals for research in estuaries and the Great Lakes. The level will probably not greatly exceed that for 1968 and 1969.

OFFICE OF SALINE WATER ACTIVITIES RELATED TO COASTAL ZONE PROGRAMS

The Office of Saline Water (OSW) is authorized by Congress to conduct research and development programs leading to the economic production, from seawater and other saline sources, of water suitable for agricultural, industrial and municipal uses. The OSW program is conducted by means of research and development grants and contracts awarded to individuals, universities, private research organizations and industrial firms, and other Government agencies. As desalted processes are discovered, or improved upon, they are advanced by means of pilot plants and test beds finally leading to module, test bed, or prototype plant construction and operations. In this connection, OSW operates two major facilities in the coastal zone area namely: the Wrightsville Beach Test Facility in North Carolina and the San Diego Test Facility in California.

Their location on the coast is for accessability to seawater. No funding pertinent to coastal zone programs is indicated for the above two facilities.

With the advent of large scale desalting developments in the coastal area OSW has undertaken studies on the impact of brine disposal from large size desalting plants on the marine environments of the Gulf of California and other coastal areas and a series of studies pertaining to the recovery of minerals. This latter program has the objective to integrate an economic mineral recovery from saline water conversion that is a system of pretreatment of incoming seawater or treatment of concentrated brine effluents to recover by-products.

The actual funding for Fiscal Year 1968 and estimates for Fiscal Years 1969 and 1970 for the above two items are as follows:

	Fiscal Year 1968	Fiscal Year 1969	Fiscal Year 1970
Brine Disposal Studies	$155,000	$200,000	$200,000
Recovery of Minerals from Seawater	219,000	105,000	130,000
	$374,000	$305,000	$330,000

OSW - 10/9/68

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Bureau of Land Management

The Bureau of Land Management has the responsibility for the administration of the public domain lands, including the mineral resources on the ocean floor of the Outer Continental Shelf. The Bureau conducts a very remunerative program of oil and gas leasing on the Outer Continental Shelf. However, the Bureau does not consider the Outer Continental Shelf to be within the "coastal zone" to be covered by the Marine Council's report because, under the terms of the Submerged Lands Act of May 22, 1953 (43 U.S.C. 1301) the Outer Continental Shelf starts three miles from the coastline. The area within three miles of the coastline belongs to the coastal States.

There are some public domain lands which have a shoreline, most in Alaska, with some scattered lands among the other States. However, these are administered under the general programs of the Bureau of Land Management and are not singled out for individual or special programming. The Bureau does not maintain a list of these lands and they cannot at this time be more specifically identified. However, all public lands are administered by the Bureau of Land Management for their multiple use values. Where present, marine resources are an important element of these values. All programs of the Bureau of Land Management are based on proper use, development and protection of all resources, with recognition of scenic, recreation, natural, ecologic, historic, public and other values, all in a manner to assure protection of the public interest.

We are unable to identify those portions of our program which specifically relate to coastal zones, and therefore, cannot furnish financial data relating to that aspect of our program alone.

BUREAU OF SPORT FISHERIES AND WILDLIFE

September 13, 1968

The Bureau of Sport Fisheries and Wildlife is substantially involved in the conservation of estuarine fish and wildlife resources and the preservation of estuarine habitat.

Activities cover research on fish and wildlife species; the acquisition, development and management of coastal refuges for waterfowl, migratory birds, endangered species, and for recreation; investigations, planning, and coordination concerning the preservation and development of fish and wildlife resources in connection with water development and navigation projects; surveys to determine waterfowl population statistics and enforcement of regulations pertaining to waterfowl; through the cooperative Federal Aid programs with the States the acquisition of wetlands, research on fish and wildlife, and access and development of facilities for fishing and hunting; through the cooperative fish and wildlife units at universities the training of professional biologists, dissemination of technical advice, promotion of conservation education and research; and pesticides surveillance and monitoring.

Two of the more significant activities are those concerned with coastal refuges and marine game fish research.

Of the 312 units in the National Wildlife Refuge system, 78 are coastal. Together these coastal refuges have a shoreline of more than 500 miles and an area of more than 18 million acres, of which 682,000 are identified as estuarine. As administrator of these areas, the Bureau of Sport Fisheries and Wildlife is a potent factor in the conservation of estuarine resources and, incidentally, in recreation activities associated with these resources.

The marine game fish research program is important because it is the only Bureau program exclusively concerned with the marine and coastal environments. It takes an added significance from two circumstances. Because of the migratory nature of many marine game fishes, localized research is not effective and States' efforts are minimal.

The appropriations for carrying out the Bureaus programs in the coastal zone are as follows:

	(Thousand dollars)		
	FY 1968	FY 1969	FY 1970 1/
Research and development	1816	1855	1995
Investment	3010	3121	2040
Operations	4618	4794	5179
Total	7814	9770	9214

1/ Estimate

Bureau of Commercial Fisheries
September 13, 1968

The Bureau of Commercial Fisheries has responsibility in the coastal zone to (1) ensure an adequate, dependable, diverse supply of fish and shellfish products of good quality; (2) encourage optimum use of estuarine living resources; and (3) contribute to man's understanding and control of estuarine living resources and their environment. To achieve these objectives in the coastal or estuarine zone, the Bureau conducts research on estuaries, estuarine problems, or estuarine-dependent species of fish and shellfish at 12 of its 20 biological laboratories. The Bureau also assists other Federal agencies and the States to assess proposed estuarine alterations for the purpose of preventing damage to fishery resources. Also, through Federal Aid programs, the Bureau provides assistance to the States for research and development on estuaries and related fishery resources.

Bureau research programs include life history studies and/or studies for determining the maximum sustainable yield of shrimp, blue crabs, menhaden, salmon, surf clams, lobsters, and thread herring; aquaculture research on oysters, clams, shrimp, and pompano; investigations to determine effects of pesticides and radio-active materials on estuarine organisms; studies on nutrient cycling and primary productivity of estuarine ecosystems; assessment of proposed estuarine alterations; surveys of estuarine fishery resources; and classification of different types of estuarine habitat in relation to their value for fishery resources.

The value of estuaries for fishery resources cannot be overemphasized. Estuaries now provide essential habitat for some 70 species of fish and shellfish that contribute about 3 billion pounds or two-thirds of the total U.S. commercial fisheries harvest. Seven of the 10 species most in demand, including shrimp, our most valuable fishery, and menhaden, our largest volume fishery, are likewise estuarine-dependent. Unfortunately our estuaries are being altered and destroyed at such an alarming rate that many of our most valuable fishery resources are threatened. Considerable additional effort must be devoted to the study of these valuable ecosystems and the resources they harbor. This Bureau's present and proposed activities in the coastal zone have substantial side benefits for water-oriented recreation, including sport fishing and hunting, for management of fishery resources, and for contributing toward the long-range planning for estuarine utilization and development.

Funding for Bureau of Commercial Fisheries work related to estuaries is, as follows:

	Thousands of Dollars		
	FY 1968	FY 1969	FY 1970 [1/]
Research on estuaries and related problems	1,223	1,223	1,613
Coordination	25	25	175
Species research	1,202	1,216	1,266
Construction	0	0	350
Federal Aid (P.L. 88-309)	686	686	700
Propagation research	4,570	4,777	7,237
	7,706	7,927	11,341

[1/] Increases for FY 1970 includes initiatives for Aquaculture and Estuarine Research and Management.

BUREAU OF OUTDOOR RECREATION

September 10, 1968

The Bureau of Outdoor Recreation has a central role in promoting Federal-State cooperation and coordination in planning the acquisition and development of both existing and proposed new areas in the Coastal Zone devoted to public recreational use.

The Bureau will submit a Nationwide Recreation plan to the President and to Congress. In the final stages of preparation, the Plan will provide a framework for Federal, State, local and private outdoor recreation programs, including those directed to outdoor recreation.

The Bureau has conducted a special survey of the recreation potential of islands off the coastline and on inland waterways of the country, and recommends principles and guidelines for the conservation of these significant resources. This completed study is being printed, and will soon be available for distribution.

The Bureau administers the Land and Water Conservation Fund Act of 1965. This Act provides grants to the States for the planning, acquisition, and development of outdoor recreation areas and facilities and to certain Federal agencies for the acquisition of recreational areas. Over 2,000 projects have been financed under this Act. Many of these projects supply marine-related recreation and preserve significant coastal areas. The estimated expenditures by the States and Federal agencies from Fund sources for marine-related recreation in FY 1968-70 are as follows (in millions of dollars):

	STATE		FEDERAL 1/	
	Acquisition	Development	Acquisition	Total
FY				
1968	8.0	5.0	14.1	27.1
1969	4.4	2.2	18.5	25.1
1970	15.5	7.8	25.0	48.3
Total	27.9	15.0	57.6	100.5

1/ Includes National Park Service, Forest Service, and Bureau of Sport Fisheries and Wildlife. Expenditures are also included as part of total program submittal of these agencies.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
Washington, D.C. 20242

September 17, 1968

The Federal Water Pollution Control Administration has the responsibility for the administration of the Federal Water Pollution Control Act, as amended.

To accomplish this in regard to marine resources it conducts a series of major programs in the estuaries and coastal zones. Briefly these programs are:

Comprehensive river basin planning for all aspects of water quality studies, management, and systems analysis. Studies in two additional basins in 1969. Fund estimates based on percentage of total planning funds.

Technical services and assistance to Federal, State, and local interests to conduct special authorized projects on effects of pollution on beneficial use in estuarine zones and on pollution surveillance. Fund estimates based on budgets for Charleston Harbor, Hillsborough Bay, and the National Estuarine Pollution Study.

Surveillance and special technical studies to support enforcement of pollution abatement actions. Funds for estuarine activities based on percentage of funds for unspecified studies and all of funds for studies such as Raritan Bay, Merrimack, and other smaller estuarine areas.

Intramural research and grants for research, fellowships, training, and demonstration projects in technology of advanced waste treatment and water quality control operations.

The funds related to these programs and services are as follows:

	(Millions of Dollars)		
	FY '68	FY '69	FY '70
Comprehensive Planning	1.0	1.4	2.1
Services and Surveillance	1.4	1.6	1.7
Research and Training	1.1	1.6	1.0
	3.5	4.6	4.8

All funds directly related to marine resources are estimated.

Important studies completed or in process relating to marine resources are: The National Estuarine Pollution Study, The Oil Pollution Report to the President, and the Watercraft Pollution Study. The National Multi-Agency Oil and Hazardous Materials Pollution Contingency Plan has been completed and is awaiting approval.

MULTIPLE USE OF THE COASTAL ZONE
SMITHSONIAN INSTITUTION
CURRENT PROGRAM
September 17, 1968

The Chesapeake Bay Center for Field Biology is operated by the Smithsonian Institution about 7 miles South of Annapolis, Maryland. This Bureau serves primarily as a natural area on land, however, access to the Bay is an obvious characteristic along 11 miles of shoreline. Marine activities at the Center are aimed at understanding the ecology of the Bay and are primarily of a research nature. The information gained is applicable to the multiple uses concept in the Bay.

The Smithsonian Tropical Research Institute in the Panama Canal is concerned with the ecology of the Coastal Zone, especially as the existing canal and the proposed new sea level canal may modify the environment. Feeling an urgent requirement to establish baselines anticipatory to the construction of a sea level canal, the Smithsonian seeks funds for greatly expanding its own activities and for support of related activities in the Caribbean Sea and the Gulf of Panama and adjacent waters. The accessibility of large shallow swamplands in the Canal Zone also lead to a suggestion by the Smithsonian that there be emphasis on aquaculture in the tropics where the vast majority of the undernourished may be found.

Members of the scientific staff of the Museum of Natural History and the other Bureaus are engaged in research on the biology of the Coastal Zone, gathering information that is necessary to evaluate the effects of pollution on the environment, to assess the ways that engineering construction may change the environment, to develop information necessary to increase the production of food from the sea, to determine the populations of noxious organisms in the Coastal Zone, and to understand the biology of the Coastal Zone.

1968	1969	1970*
$175,000	$190,000	$200,000

* No initiatives were given high enough priority by the Committee to justify their inclusion in the Smithsonian budget during this tight budget year.

COAST GUARD PROGRAMS IN THE COASTAL ZONE

Coast Guard programs in the Coastal Zone are divided into the following areas of activity.

Casualty Prevention:

Merchant Marine Safety

Regulates in various ways the construction, operation and manning of U.S. Merchant Marine vessels of many types to insure a high degree of safety.

	F.Y. 1968	F.Y. 1969	F.Y. 1970*
Total program expenditure	$7,600,000	$8,700,000	$9,100,000

Recreational Boating Safety

Enhances recreational boating safety by regulating certain equipment requirements of boats, educating the boating public, the enforcement of safety regulations and maintaining liaison with various governmental and public safety organizations.

Total program expenditures	$4,500,000	$5,500,000	$8,000,000

Aids to Navigation

Provides audio, visual and electronic aids for use by the general public in navigating the Coastal Zone by air or sea. Regulates the marking of obstructions and bridges in navigable waters to insure safe utilization of these waters. Regulates the construction and alterations of bridges to insure that they are not an unreasonable impediment to marine navigation.

Total program expenditures	$77,200,000	$76,300,000	$86,200,000

Port Safety

Provides resources and personnel to insure the safe operations of port facilities by regulations, inspections and detailed supervision of selected critical operations.

Total program expenditures	$12,400,000	$13,300,000	$18,400,000

National Search and Rescue

Provides search and rescue service on and over the areas of the Coastal Zone with aircraft, cutters and boats; and by coordinating non-Coast Guard facilities through extensive communication facilities. Provides ice breaking service.

Total program expenditures	$119,000,000	$112,900,000	$129,300,000

Marine Law Enforcement

Provides resources and personnel for enforcement of Federal laws and international treaties enacted to insure the best use of the natural resources of the Coastal Zone.

	F.Y. 1968	F.Y. 1969	F.Y. 1970*
Total program expenditure	$6,100,000	$6,100,000	$6,000,000

Water Pollution Control

Provides resources and personnel for the enforcement of the Oil Pollution Acts of 1924 and 1961 and the Refuse Act of 1899; and for the cooperation with other Federal agencies and local interests in the containment, abatement and disposition of spills of oil and other hazardous material into the waters of the Coastal Zone.

Total program expenditure	$800,000	$2,300,000	$4,100,000

Coastal Oceanography

Provides weather, wave, tide and surf condition information to users of the Coastal Zone and develops scientific data as to the potential use of the Coastal Zone through physical, chemical, geographical, biological and geophysical studies. Coast Guard aircraft, cutters, and selected automated off-shore towers carry out this service.

Total program expenditure	$1,244,000	$600,000	$1,000,000

Amalgamated Coastal Zone Program Expenditure

$287,844,000	$272,500,000	$323,900,000

These figures are rounded off from those contained in program proposals for F.Y. 1970.

* Reflects figures in the F.Y. 1970 budget request which is in the forecast stage, but departmental levels for the Bureau of the Budget stage have not been set.

LIST OF MEMBERS, ALTERNATES AND OBSERVERS OF THE COMMITTEE ON MULTIPLE USE OF THE COASTAL ZONE

EXECUTIVE OFFICE OF THE PRESIDENT
NATIONAL COUNCIL ON MARINE RESOURCES
AND ENGINEERING DEVELOPMENT

September 6, 1968

COMMITTEE ON MULTIPLE USE
OF THE COASTAL ZONE

MEMBERS, ALTERNATES, AND OBSERVERS

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McBROOM, James T.	183 5504
Army	
M CASSIDY, William F., Lt. Gen.	11 52052
A NOBLE, Charles C., Brig. Gen.	11 72923
A MEANOR, James B., Jr., Col.	11 74623
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Bureau of the Budget	
O KRAMER, Samuel	103 4750

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Commission on Marine Science, Engineering and Resources		
O	DINSMORE, Robertson P., Capt., USCG	103 3476
Council of Economic Advisers		
M	NOLL, Roger G.	103 5100
Health, Education and Welfare		
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M	PAUL, Robert M.	138 55977
A	KARAS, George	128 5001
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A	RYAN, John F.	13 36994
National Council on Marine Resources and Engineering Development		
	ADAMS, David A., Dr.	103 4626
National Science Foundation		
M	QUAM, Louis O., Dr.	183 6505
A	DOHERTY, Josephine K., Mrs.	183 7888
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A	JENKINS, William A., Captain	184 5656
Water Resources Council		
M	JOHNSON, Reuben	128 4783

EXECUTIVE OFFICE OF THE PRESIDENT
NATIONAL COUNCIL ON MARINE RESOURCES
AND ENGINEERING DEVELOPMENT

September 6, 1968

COMMITTEE ON MULTIPLE USE
OF THE COASTAL ZONE

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