COASTAL MANAGEMENT ASPECTS OF OCS OIL AND GAS DEVELOPMENTS

A TECHNICAL INFORMATION PAPER BY THE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION'S, OFFICE OF COASTAL ZONE MANAGEMENT.

EDWARD T. LAROE AND PAUL R. STANG, WITH KATHARINE H. CONROY, DAVID W. LAIST, TREVOR Q. O'NEILL, RICHARD N. RIGBY, LINDA A. SADLER, AND MICHELE M. TETLEY

JANUARY 1975

ROCKVILLE, MARYLAND

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PREFACE

This is one of a series of documents by the Office of Coastal Zone Management (OCZM) intended to provide technical support to coastal zone managers on major issues which they face.

Specifically, this paper provides a brief overview of OCS petroleum activities (Section 1) and a description of: Federal OCS responsibilities and roles (Section 2), offshore and onshore activities associated with OCS operations (Sections 3 and 4), socio-economic and environmental impacts deriving from those activities (Section 5 and 6) and suggestions for planning and management for OCS developments (Section 7). The Annotated Bibliography (Section 8) describes the OCS-related portions of the literature cited, much of which should be available in a state's coastal zone management office or regional library. The Appendix is a directory of agencies and organizations involved with OCS oil and gas related activities.

The recommended readings, arranged in priority order at the end of each section, were selected to direct the reader to specific portions of the most relevant articles, documents, and books related to the subject of each section. Numbers in the footnotes refer to the Annotated Bibliography.

This paper was written by a special task force within OCZM with contractual aid from Environmental Guidance Group, Washington. D.C. Several persons provided critical assistance, suggestions, and documents for this effort, for which we are grateful. Their assistance does not imply endorsement or acceptance of this paper. They include: Pamela Baldwin,

U.S. Senate National Ocean Policy Study; Frank Basile, Bureau of Land Management; Robert Bell, Shell; Max Blumer, Woods Hole Oceanographic Institution; Frank Broadhead, California Coastal Zone Conservation Commission; Robert Bybee, Exxon; Dan Kash, University of Oklahoma; Sheila Mulvihill, Council on Environmental Quality; Marshall Nichols, National Petroleum Council; Lyle St. Amant, Louisiana Wildlife and Fisheries; Hal Scott, Florida Audubon Society; and Dale Straughan, University of Southern California.

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COASTAL MANAGEMENT ASPECTS OF OCS OIL AND GAS DEVELOPMENTS

Section 1.

INTRODUCTION

1. INTRODUCTION

1.1 Objective

This paper is intended to provide an understanding of activities, impacts and management considerations related to Outer Continental Shelf (OCS) oil and gas operations, and to ensure their effective integration into a balanced, long-term coastal zone management program.

1.2 Overview

In response to President Nixon's directives of January 1974, the Bureau of Land Management (BLM) has developed an accelerated OCS leasing schedule designed to lease as much as 10 million acres of the federal OCS in 1975, more than doubling the total acreage leased since the inception of federal OCS leasing in 1953. The proposed schedule (Table 1) includes several frontier areas where there has been no previous experience with offshore oil and gas.

Several issues concerning the proposed OCS leasing have been identified. These include the magnitude and timing of the sale, the adequacy of long-term national energy plans and policies, the adequacy of environmental safeguards, the proper role of state and local governments in OCS decision-making, and state and local need for front-end monies for planning, management, and financing of needed government services and facilities. A comprehensive discussion of all of the issues raised by the expanded offshore leasing program is beyond the scope of this effort. The reader is directed to Section 1.3 for discussion of some of these issues. The

Table 1

Tentative Leasing Schedule

1975

January - South Texas
May - Central Gulf of Mexico
July - Southern California
August - Cook Inlet
November - Gulf of Alaska
December - Mid-Atlantic

1976

February - Gulf of Mexico (over 200 meter water depth)
May - North Atlantic
July - South Atlantic
September - Southern California
October - Bering Sea (St. George)
December - Gulf of Alaska (including Kodiak)

1977

February - Gulf of Mexico (deep)
May - Southern California (deep)
July - Mid-Atlantic (shallow and deep)
September - Beaufort Sea
October - Outer Bristol Basin
December - North Atlantic (shallow and deep)

1978

February - Southern California (deep)
May - South Atlantic (Blake Plateau)
July - Bering Sea (Norton Basin)
September - Gulf of Alaska (Aleutian Shelf)
October - Northern California, Washington, Oregon
December - Chukchi Sea (Hope Basin)

This November 1974 Department of Interior schedule is tentative. As of Jan. 22, 1975, the South Texas sale has slipped to February; the Southern California sale will take place sometime after July; the Cook Inlet sale cannot occur until after settlement of a state/federal dispute, and the Mid-Atlantic sale will not take place until 1976. For up-to-date information, call BLM headquarters at 202/343-8725 or 202/343-8547.

paper is directed toward the problem of how state coastal planners can begin to prepare and plan for the impacts placed on the state by OCS activities.

The greatest difficulty in preparing this paper has been to gather hard data on expected onshore activities and impacts. Full comprehension of these activities will be necessary for the incisive planning required if we are to provide for the progressive and wise use of our OCS oil and gas petroleum resources while maintaining the existing uses and benefits of the coastal zone.

1.3 Recommended Selected Readings

A. Morton, Rogers C.B. Remarks of Secretary of the Interior Rogers C.B. Morton Before the Coastal State Governors and their Representatives on Proposed Outer Continental Shelf Leasing Programs. November 1974. (Bibliographic Reference #20).

Pages 1-5.

This speech succinctly describes the position of the Department of the Interior on OCS leasing.

B. Council on Environmental Quality. OCS Oil and Gas - An Environmental Assessment. April 1974. (Bibliographic Reference #9).

Chapter 9.

Describes various mechanisms available to states for managing OCS developments.

C. National Petroleum Council. U. S. Energy Outlook, A Summary Report of the National Petroleum Council. December 1972. (Bibliographic Reference #21

Pages 35-46; 57-59.

NPC view of oil and gas outlook for the period from 1971 to 1985.

D. Noone, James A. Energy Report Parts 1 and 2. April 1974. (Bibliographic References #23 and #24).

Pages #23: 512-521; #24: 572-578.

Presents various views of the OCS oil and gas issues.

E. LaRoe, Edward T. Statement on Relation of Coastal Zone Management to Offshore Petroleum. April 1974. (Bibliographic Reference #17).

Pages 1-6.

Presents a brief review of CZM/OCS relationships.

F. White, Robert M. Remarks by Robert M. White, NOAA Administrator Before the Meeting of Coastal State Governors, Department of the Interior Auditorium Washington, D.C. November 1974. (Bibliographic Reference #35).

Pages 1-6

States NOAA's position on OCS activities.

G. Odum, H. T. "Energy, Ecology and Economics". 1973. (Bibliographic Reference #25).

Pages 220-227

Presents a theoretical analysis of the energy issue emphasizing the concept of net reserves.

Section 2.

FEDERAL RESPONSIBILITIES AND ROLES

2. FEDERAL RESPONSIBILITIES AND ROLES

There are a number of federal agencies with responsibilities in OCS resource development. This section gives a quick look at the major roles played by each. There may well be additional OCS functions performed by the listed agencies as well as other federal components not listed. A major reference source in this area is the U.S. Government Organization Manual, published bi-annually by the Government Printing Office, Washington, D.C.

The Outer Continental Shelf Lands Act of 1953 (43 U.S.C. 1331 et seq.),[1] provides the basic authority for managing and controlling the development of OCS oil and gas, and establishes different responsibilities in several agencies. Under the National Environmental Policy Act of 1969, (42 U.S.C. 4321-437), each affected Federal agency is required to review and comment on draft environmental statements.(See Federal Register Vol. 38, No. 147-Aug.1,1973) Other authorities also influence OCS development and are included.

2.1 Federal Agencies

Department of the Interior

The Secretary of the Interior is authorized by the Outer Continental Shelf Lands Act of 1953 to grant OCS oil and gas leases on submerged tracts not exceeding 5,760 acres (three miles by three miles) for a period of five years and for as long thereafter as production occurs. Interior is responsible for administering these leases, including prescribing the necessary rules for regulating development in a manner consistent with

[1] 32, pp. 95-105 (Contains a copy of the OCS Lands Act of 1953.)

existing public policy objectives. The Department is assisted by the OCS Research Management Advisory Board. The board gives advice on baseline environmental data gathering and environmental monitoring on the OCS. The National Petroleum Council, an industry advisory body, reports to the Secretary of the Interior.

Within Interior, the Bureau of Land Management (BLM) administers the leasing provisions of the OCS Lands Act. It:

1. receives nominations and selects tracts to be included in a lease sale;
2. prepares an environmental impact statement for each sale;
3. together with Interior's U.S. Geological Survey (USGS), makes an economic, engineering, and geologic evaluation of tracts to be sold;
4. receives the bids and determines whether or not to award leases to the highest bidders on individual tracts;
5. receives revenues from lease sale and
6. grants rights of way for pipelines to transport oil and gas from OCS leases to shore.[2]

U.S. Geological Survey (USGS) has the primary responsibility within the Department of Interior for overseeing the development of a tract once it has been leased. USGS:

1. through its area supervisors and in consultation with the petroleum industry, issues detailed regulations in the form of OCS orders and notices covering operational safety;
2. enforces OCS orders and notices;
3. issues geophysical and geological exploration permits;
4. approves post-lease exploration and development plans;

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[2] 14, p. 101

5. issues permits for both exploratory and development drilling;

6. approves pipelines as a part of field development and

7. collects royalties (which go to the general treasury).[3]

The U.S. Fish and Wildlife Service has a broad mandate to study, protect and manage fish and wildlife resources and promote maximum use and enjoyment of wildlife resources compatible with their perpetuity. Basic authority is contained in the Fish and Wildlife Act of 1956 (70 U.S.C. 1119).

Department of Defense

The OCS Lands Act and the 1899 Rivers and Harbors Act charge the Secretary of the Army with responsibility for preventing obstructions to navigation. The Corps of Engineers requires that a permit be obtained before an oil or gas structure may be placed on the OCS; this requirement has been applied to artificial islands and offshore platforms, for instance.

Department of Transportation

The Coast Guard, located within the Department of Transportation, has several OCS responsibilities including:

1. insuring that structures on the OCS are properly marked to protect navigation;

2. establishing and enforcing safety regulations for OCS structures;

3. inspecting and identifying floating drilling rigs;

4. maintaining surveillance for oil spilled or discharged into the

[3] 14, p. 101.

waters over or immediately adjacent to the OCS and

5. coordinating the National Oil and Hazardous Substance Pollution Contingency Plan. [4]

The Office of Pipeline Safety (OPS), also located in the Department of Transportation, has responsibility for the safety of pipelines, including establishing design criteria.

The Environmental Protection Agency (EPA)

EPA's major role in OCS activities is setting and enforcing discharge levels of pollutants, and in ocean dumping. It is the lead federal agency in NEPA reviews. EPA's air pollution controls could have a major impact on onshore facilities such as refineries. Authorities for EPA's activities include:

Executive Order 11752 EPA Federal Facilities Program (subjects all federal facilities to EPA monitoring of air and water discharge),

Federal Water Pollution Control Act of 1972, as amended, P.L. 92-500,

Clean Air Act, 42 U.S.C. 1857-1857f including Section 309 (EPA is lead federal agency for environmental input in NEPA reviews),

Marine Protection, Research and Sanctuaries Act of 1972, 33 U.S.C. 1401-1444 (ocean dumping) and

Solid Waste Management Act, 42 U.S.C. 3251-3259 (affecting onshore facilities).

Department of Commerce

The National Oceanic and Atmospheric Administration (NOAA) has several relevant OCS responsibilities.

[4] 14, P. 102.

The Coastal Zone Management Act of 1972 (16 U.S.C. 1451) authorizes the Secretary of Commerce to provide grants-in-aid to coastal states to encourage the establishment of management programs for uses of land and water in coastal areas, and to require consistency of federal programs with approved state plans. This is being administered by the Office of Coastal Zone Management (OCZM).

The Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1401-1444) authorizes the Secretary of Commerce, after consultation with the heads of other interested agencies and the approval of the President, to designate areas extending seaward as far as the outer edges of the Outer Continental Shelf as marine sanctuaries for preservation or restoration for their conservation, recreational, ecological or esthetic values. The marine sanctuary program is also administered by OCZM.

The National Marine Fisheries Service is concerned with all potential impacts on living marine resources and reviews draft and final environmental impact statements. Its responsibilities for commercial fisheries require a close interest in the impacts of OCS operations.

The Environmental Data Service has developed a NOAA-wide OCS Marine Environmental Assessment Data Management Plan which provides guidelines for data handling policy and documentation data. The plan also includes information on data flow, data exchange and data products archiving.

The National Ocean Survey studies tides, currents and other environmental features which affect location and design of offshore structures. Its geodetic work and navigation charts also have application to OCS operations.

Marine resource development activities are conducted through an extensive cooperative program with major universities operated by the National Sea Grant Program.

The Environmental Research Laboratory manages a multi-million dollar interagency research program to assess the primary marine environmental impacts of petroleum development on the Outer Continental Shelf of Alaska. Funded by BLM, the program includes participation from most of the Universities of the Pacific Northwest, the USGS, the Army COE, the Fish and Wildlife Service of DOI and EPA. Work is currently underway in the N.E. Gulf of Alaska. In April 1975, work will begin relative to the Beaufort Sea and Bering Sea. In FY1976, efforts will also include a study in the Gulf of Alaska, Chukchi Sea and Norton Sound.

The National Weather Service provides historic storm data, weather forecasts, and hurricane warnings.

Department of Labor and Department of Health, Education and Welfare

Both departments have responsibilities under the Occupational Safety and Health Act of 1970. HEW makes evaluations of working conditions and provides technical assistance to employers. The Department of Labor is responsible for enforcing the rules established to provide employees with a safe working environment.

Federal Power Commission

The Federal Power Commission (FPC) has jurisdiction over common carrier pipelines. It has broad discretionary powers over the approval, design, and economics of common carrier gas pipelines, and it sets the wellhead price of OCS gas. It also issues certificates of public convenience and necessity required for gas pipeline construction.

Federal Maritime Commission

The Federal Water Pollution Control Act Amendments of 1972 requires the

Federal Maritime Commission to determine the financial responsibility of oil shippers operating in the oceans adjacent to the U.S. Although most oil produced on the OCS is brought ashore by pipeline, this provision would apply to oil or gas brought ashore by barge or tanker.

Federal Energy Administration (FEA)

The Federal Energy Administration established in 1974 has been given the directive to insure that the supply of energy will be sufficient to meet demands. In energy shortages, FEA will establish priority needs. Among its functions is the development of a strategy for self-sufficiency in energy supplies. Its Office of Energy Resource Development is responsible for energy facility siting, construction and licensing.

2.2 Recommended Selected Readings

A. Waitsman, Irvin. New England River Basins Commission Summary of Federal Responsibilities in Oil and Gas Leasing on the Outer Continental Shelf. December 1974 (Bibliographic reference #34)

Pages 1-8

Explains clearly and in greater detail how the various Federal agencies carry out their roles in the OCS leasing system and OCS development.

B. Federal Energy Regulation Study Team. Federal Energy Regulation: An Organizational Study. April 1974. (Bibliographic reference #11)

Pages F1-F13 (Appendix F - Federal Regulation: An Agency by Agency Description).

This is broader than OCS but includes Federal agency's responsibilities in the OCS area. Should also prove to be a useful reference for questions involving energy facility siting and the national interest.

C. New England Center For Continuing Education. Proceedings of the 4th New England Coastal Zone Management Conference. Perspectives on Oil Refineries and Offshore Unloading. May 1974 (Bibliographic Reference #22)

Pages 74-80
A description of a local approach to decision making
Pages 86-89
A description of responsibilities in decision making related to the role of the private citizen, private industry, public interest groups, states and local governments.

D. Kash, Don E., et al. Energy Under the Oceans. 1973. (Bibliographic reference #14)

Pages 25-90

Traces the roles of federal agencies during the development to OCS oil and gas resources. The roles are interspersed with much technical data which shows the relationship between the activities and the agencies.

E. U.S. Department of Interior, Bureau of Land Management. Draft Environmental Statement. Vol. 1 of 2. 1974. (Bibliographic reference #29)

Pages 119-123.

Contains management and supervisory authorities related to OCS activities and state coastal management legislation prior to 1972.

Pages 126-141.

Describes completed and on-going environmental data gathering programs.

Section 3.

OFFSHORE ACTIVITIES

3. OFFSHORE ACTIVITIES

3.1 Introduction

Generally speaking, OCS oil and gas resources in federal waters are developed by private interests under the supervision and regulation of the federal government. The timing and sequence of events up to and including the lease sale (see Table 2) are controlled by federal procedures and regulations, and are thus relatively predictable. However, the time lag between a lease sale and the peak production of a field varies considerably, from less than five years to more than ten or fifteen years, depending upon the location and nature of the field, capital and equipment requirements, market conditions, and many other variables. A simplified flow chart of the activities after the lease sale in a hypothetical field is attached (Table 3), which assumes one year of exploration, three years of development, and oil production beginning four years after the lease sale.

The pre-lease sale procedures are administered primarily by the Bureau of Land Management, Department of the Interior. However, once a lease sale has been held, the detailed requirements for most phases of OCS oil and gas development are set forth in the U.S. Geological Survey's OCS Orders for each USGS area. As mentioned earlier, the Corps of Engineers, Coast Guard, Environmental Protection Agency, and Occupational Safety and Health Administration have important roles. For a discussion of the federal

Table 2. Department of the Interior pre-Lease Sale Procedures

Step 1: Technical resource reports on the proposed leasing area are obtained from interested Federal agencies.

Step 2: A call for nominations by the oil and gas industry of tracts it believes hold the greatest promise for oil and gas is published in the Federal Register, followed by a notice requesting comments on the area under consideration from private citizens, utilities, academic and scientific groups, and state and local governments.

Step 3: A tentative selection of tracts which may be included in the possible lease sale is made, based upon the nominations and data and comments received. The tracts are announced to the public.

Step 4: A more detailed analysis of data on a tract by tract basis is undertaken, using data collected from all government agencies (Federal, state, and local), institutions, groups, and individuals.

Step 5: A site-specific draft environmental impact statement (DEIS) is prepared, based on these data and analyses.

Step 6: A public hearing on the DEIS is held.

Step 7: A final environmental impact statement (FEIS) is prepared, using all data and testimony (written and oral) collected at the public hearing. This FEIS is submitted to the Council on Environmental Quality and is made available to the public.

Step 8: Concurrently with the preparation of the FEIS, a decision document highlighting the major issues in identifying the alternative courses of action is developed for eventual use by the Secretary.

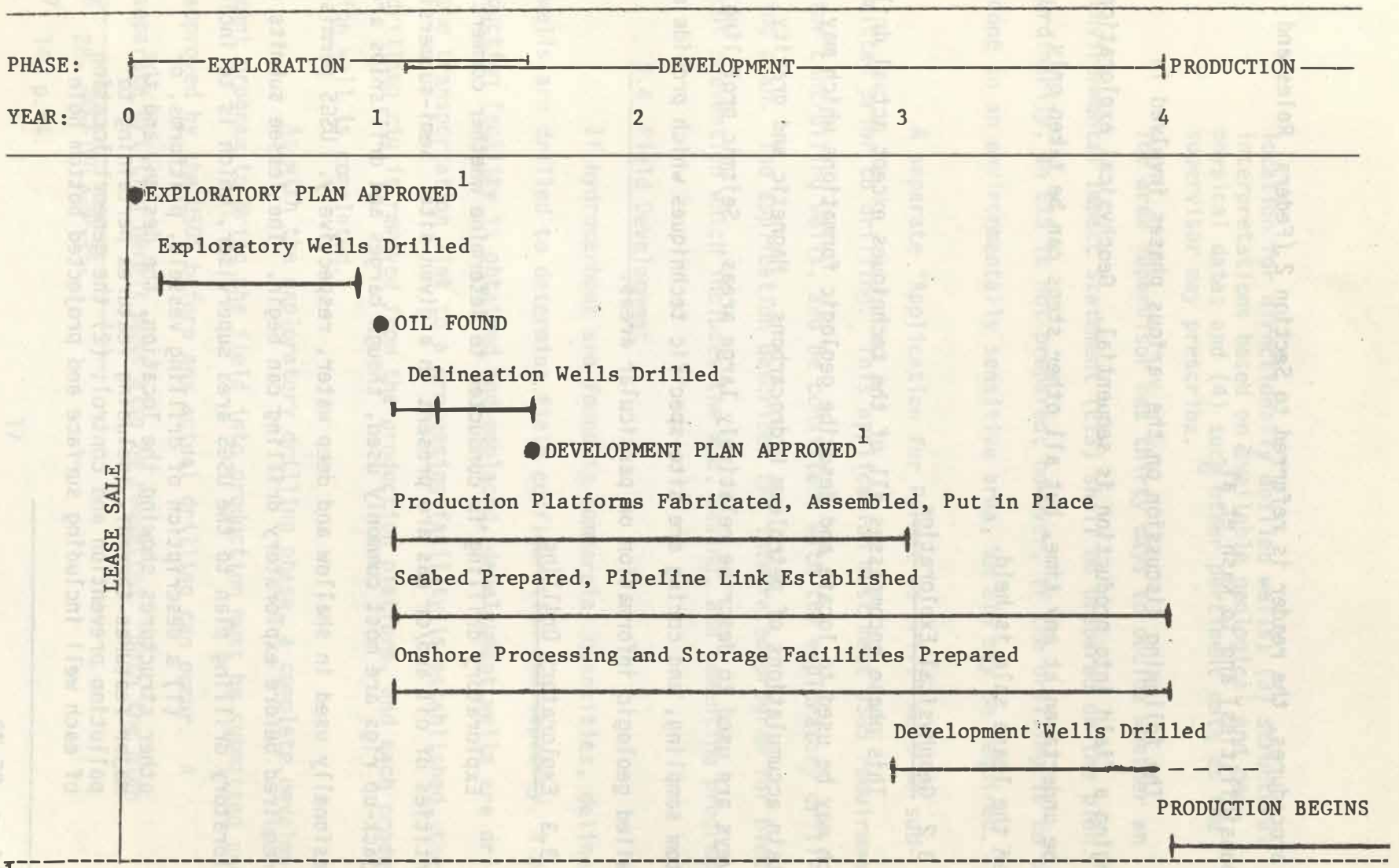
Step 9: After waiting at least thirty days from the submission of the FEIS to CEQ, a decision is made, based upon the FEIS and the decision document, as to whether or not the sale will be held. If it is determined to hold the sale, final tract selection is made, lease stipulations determined, and a notice of sale published in the Federal Register.

Step 10: At the lease sale, sealed industry bids for individual tracts are opened and read.

Step 11: After assessing the bids against the Department's evaluation of the tracts offered, leases may be issued to bidders.

Table 3

Hypothetical OCS Development Schedule After Lease Sale is Held



[1] Environmental Impact Statement may be required, at USGS option

Note: This flow chart depicts the time sequence involved in the development of a hypothetical OCS oil field. For purposes of clarity, we have simplified an admittedly complex and variable series of events with the following assumptions: (1) in this case, commercial quantities of oil are found 1 year after the lease sale; (2) capital and equipment are readily available; (3) Production begins 4 years after the lease sale.

OCS procedures, the reader is referred to Section 2 (Federal Roles and Responsibilities) and to Kash et al.[5]

The following discussion on the various phases involved in bringing a field into production is sequential. Geophysical exploration can be undertaken at any time, but all other steps can be taken only after the lease sale is held.

3.2 Geophysical Exploration

This phase encompasses all of the techniques except actual drilling which may be used to locate and describe geologic formations which may contain accumulations of petroleum hydrocarbons. Magnetic and gravity surveys are used to describe relatively large areas. Seismic profiling, bottom sampling, and coring are site-specific techniques which provide more detailed geologic information on particular areas.

3.3 Exploratory Drilling

Exploratory drilling is conducted to determine whether commercial quantities of oil and/or gas are present in a given site. Semi-submersible or jack-up rigs are most commonly used, though barges and drillships are occasionally used in shallow and deep water, respectively. USGS permission is required before exploratory drilling can begin. The lessee submits an exploratory drilling plan to the USGS area supervisor, which is to include:

> (1) a description of drilling vessels, platforms, or other structures showing the location, the design, and the major features thereof, including features pertaining to pollution prevention and control; (2) the general location of each well including surface and projected bottom hole

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[5] 14, p. 25-70.

location for directionally drilled wells; (3) structural interpretations based on available geological and geophysical data; and (4) such other pertinent data as the supervisor may prescribe.[6]

The area supervisor has thirty days to decide whether an Environmental Impact Statement (EIS) shall be prepared on the plan. Ordinarily, an EIS is not prepared; however, if the drilling is to be done in an environmentally sensitive area, an EIS may be required.[7]

A separate "Application for Permit to Drill" must be submitted prior to drilling. This application must meet USGS requirements for controlling wells, and be consistent with the exploratory drilling plan. The application describes the integrated program for blowout prevention which includes the mud, casing, and cementing programs.

3.4 Field Development

If hydrocarbons are found in commercial quantities, delineation wells are drilled to determine field configuration and capacity. A production facility is obtained and emplaced, development wells are drilled, the transportation link to a processing facility is established, the drilling rig is removed from the production platform, and each production well is completed.

As with the exploratory drilling phase, a complete development program to bring the field into production must be submitted and approved by the USGS before any actual drilling can occur. A separate drilling permit must also be requested. Both the plan

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6 28, Section 250.34.

7 14, p.44.

and the permit are subject to the Interior rule which provides thirty days for determination of whether approval of the request would constitute a major federal action which might significantly affect the quality of the human environment, and thus require an EIS.[8]

As each production well is completed, well casing is installed, down-hole safety devices are put in place, and various techniques are used to facilitate the flow of hydrocarbons through the producing strata and into the well.

3.5 Production

In the production phase, oil is separated, metered, and pumped either ashore by pipeline, to offshore storage tanks, or directly to tankers. Gas, if not flared, (burned off at the well head) is separated, dehydrated (if necessary), pressurized, metered, and pumped ashore by pipeline. Alternatively, gas may be reinjected into the field for future extraction. The majority of producing wells produce both oil and gas, though usually not in similar quantities.

At least ten years of production is normally needed to recoup initial capital investments, and most fields can be expected to remain in production for twenty years or more.[9] During the lifetime of the field, hydrocarbons are extracted at or below the Maximum Efficiency Rate (MER), an upper limit on the production rate set by agreement between the

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[8] 14, p. 50.

[9] Kash, Donald E., personal communication.

leasee and the regulatory agency. The average percentage of hydrocarbons extracted--of the amount known to be in place--for all U.S. onshore and offshore production over a ten-year period has been estimated at 31 percent.[10] Industry is developing what are called secondary and tertiary recovery methods in an attempt to increase the percentage of hydrocarbons extracted. Even a small increase in the percentage recovery rate would result in significant domestic production increases.

When a well is to be abandoned, either because it was a dry well or because the economically recoverably hydrocarbons have been extracted, all casing is required to be removed to a depth of fifteen feet below the ocean floor. Before such procedures were required, drilling and production equipment left behind had occasionally interfered with fishing and navigation activities. Current procedures for OCS well abandonment are contained in the USGS OCS Order #3. (in OCS Orders 1-12 Governing Oil, Gas, and Sulphur Leases in the Outer Continental Shelf Gulf of Mexico Areas by the USGS, Reston, Va.)

3.6 Transportation

Hydrocarbons may be transported to onshore processing facilities by pipeline, tanker, or barge. All natural gas and almost all oil from the OCS is brought ashore by pipeline. Tankers may be used if the field is far offshore or otherwise remote from an established and producing field, or in order to bring the field into production at an earlier data.

Pipelines. Historically, pipeline was laid directly onto the ocean floor. Current regulations require that pipeline be buried at least three feet if laid in less than 200 feet of water. There are different

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[10] 14, p. 60

methods for laying pipeline, depending on the diameter of the pipeline, its length, and other factors.[11]

Tankers, Barges. These are commonly used when the producing area is remote from the processing or consumption area.[12]

Offshore Storage. This method may be used if the field is far offshore, or when severe weather conditions prohibit the extended mooring of tankers. Three systems are currently available.[13] These are:

Elevated: these are the smallest systems because they must be above waves during severe storms. In the Gulf of Mexico, not more than 10,000 barrels can be stored on any given platform.

Floating: a 1,000,000-barrel capacity barge system is in use in the Persian Gulf, with a single point mooring (SPM) system to enable the barge to withstand storms, etc.

Ocean Floor: these can be either submerged or extending above the water surface. They can be used in up to several hundred feet of water, and are either dome- or cone-shaped. Systems of up to 1,000,000 barrels capacity are currently available.

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[11] 18, p. 2.1-2.7.

[12] 9, p. 4.20.

[13] 9, p. 4.21-4.22.

3.7 Recommended Selected Readings

A. Kash, Donald E., et al. Energy Under the Oceans: A Technology Assessment of Outer Continental Shelf Oil and Gas Operations. 1973. (Bibliographic reference #14)

Pages 25-70.

An excellent summary of the steps by which OCS oil and gas resources are developed. Includes detailed discussion of technology used in each phase, and government procedures applicable to each stage. More generally, very useful on all aspects of OCS oil and gas development.

B. Council on Environmental Quality. OCS Oil and Gas - An Environmental Assessment. April 1974. (Bibliographic reference #9)

Pages 4-1 - 4-22.

Useful summary of the technology and steps involved in development of OCS oil and gas. More general, less detailed than Energy Under the Oceans which it used as a source.

Section 4.

ONSHORE ACTIVITIES

4. ONSHORE ACTIVITIES

4.1 Introduction

Discussed here are the types of onshore activities and facilities that will usually be needed in association with the expansion of OCS exploration and production operations. In general, onshore activity is the most poorly documented aspect of oil and gas operations, and the following discussion is hindered by a lack of specific data. The Congressional Office of Technology Assessment expects to release in August 1975 a comprehensive analysis of the onshore impacts of OCS oil and gas activity, deepwater ports, and offshore nuclear power plants on New Jersey and Delaware. It may partially fill this gap.

For convenience onshore OCS operations can arbitrarily be subdivided into primary and secondary activities. The former includes any and all activities that are necessary for the development and production of petroleum reserves. Included in this category would be such operations as production platform fabrication, laying and operation of pipelines, construction and operation of refineries and gas processing plants, and transport of necessary supplies and equipment to rigs, platforms and refineries. Secondary activities, using our working definition, include the steps taken to provide necessary public services (schools, hospitals, roads, etc.) and housing to accommodate the influx of people drawn by expanding employment opportunities. Also included is development resulting from the establishment of other industry, such as petrochemical plants, commercial enterprises and other manufacturers attracted to the area by the oil development.

Onshore development patterns will vary region to region depending on various factors. To a large degree activity will be determined by the extent of existing facilities as well as the physical and biological conditions present at the involved locations. Additional variables include the size of the petroleum discoveries, the speed at which it is to be developed, whether the reserves are primarily oil or gas, and the proximity of the markets for the products.[14]

4.2 Facilities and Activities

Onshore activities related to OCS pre-exploration and exploration phases will be relatively minor. They will primarily be limited to the port servicing requirements for research vessels and their associated supply ships.

Harbor activity would revolve around the transfer to ships of drilling equipment, pipes, chemicals, food provisions, and other supplies. During the several months necessary to drill exploratory wells in Scotland, some 3,000 tons of material had to be transferred to each drill rig.[15] In areas where adequate facilities permit, major repairs to damaged drill ships and semi-submersible rigs may take place. In some cases, especially in areas with no history of offshore operations, development of some supporting industry may be initiated even prior to exploratory drilling. For example, the recent proposal of Brown and Root to locate a platform fabrication plant in rural Northhampton County, Virginia predates any exploratory drilling in the Atlantic OCS.[16]

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[14] 1, Chapter 1.

[15] 10, p. 5.

[16] 15, pp. 1-3.

For the most part, significant onshore activity will not occur until the exact location and extent of resource reserves has been defined. If exploratory drilling demonstrates the presence of economically recoverable quantities of hydrocarbons, there will be a rapid increase in construction activity. Platform fabrication will be a major coastal activity near the oil field, employing 1,000 or more persons per platform. Due to the uniqueness of the structures which are built for the specific conditions of the area (water depths, etc.), they are generally built near their actual drilling location. Refineries may be constructed if there are no such existing facilities or if those present are inadequate and the need for refined products exists. Although they could be placed near the shoreline, they may also be located in inland areas and supplied with crude oil via pipeline. Such placement could also situate them closer to major markets.

Pipeline construction onshore will be required as well as port facilities to service ships laying pipeline offshore. Large field mobilization areas or supply depots will be required for storage of drill pipe concrete, drilling muds, transportation pipelines, and other equipment.[17] Pipe coating installations will also be required.

Preparatory steps, possibly including such activities as harbor dredging and wharf construction, will be necessary to insure adequate harbor facilities to service the support vessels needed for construction, maintenance and supply purposes. Storage facilities will have to be constructed in association with refineries.[18] If refineries are absent, both tank farms

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[17] 10, p. 11.
[18] 10, p. 5.

and tanker terminals may be required for service as a distribution center for further sea transport. Gas processing plants will also need to be constructed on the coast. Additional steps may be needed to upgrade or construct new transportation arteries such as railroads, highways, and airports to provide needed access routes for equipment and supplies.

Extensive onshore construction activity will also result from the demand for more governmental services and facilities such as schools, housing, hospitals, roads, parks, etc. New or upgraded utilities such as water supplies and sewage treatment plants will also be required. Some of these required development steps may even necessitate extension beyond the limits of the coastal zone such as construction of transportation arteries or providing an ample water supply from inland areas.

During the transition period from the development phase to the production phase, heavy construction activity will decline and be replaced by maintenance and operation activities. While some of this slack will taken up by construction for secondary industry moving into the area, such as petrochemical plants, assorted manufacturers and smaller commercial businesses, there will be a distinct decrease in building projects. Supply ships, typically about two per platform, will continue to use port facilities for loading, transfer of personnel, food, and other necessities. Airport activity, particularly helicopter traffic, will continue to be heavy as personnel are shuttled back and forth to offshore installations.

Consequently, it is clear that a very significant increase in onshore activity will result from OCS oil and gas activity. The period of greatest onshore development will occur following the actual discovery of

hydrocarbon reserves by exploratory drilling and will come in the form of increased construction operations to provide the necessary equipment and facilities for production. Additional construction activity during this development stage will result from secondary requirements to accommodate the inevitable population increase. As the development phase gives way to the production phase, activity will remain much higher than during the period prior to OCS development but also lower than during the rapid construction period.

4.3 Recommended Selected Readings

A. Baldwin, Pamela and Baldwin, Malcolm. Onshore Planning for Offshore Oil; Lessons from Scotland. February 1975. (Bibliographic reference #1)

Chapter I.

Briefly outlines the activities and impacts that occurred onshore in Scotland in conjunction with OCS oil and gas discovery and production.

B. Fasham, D.R. A Review of Oil Related Developments in the U.K. Following the North Sea Discoveries with Particular Reference to the Scottish Highlands and Islands. January 1974. (Bibliographic reference #10)

Pages 7-12.

Describes some onshore OCS oil related activities.

C. Council on Environmental Quality. OCS Oil and Gas - An Environmental Assessment. April 1974. (Bibliographic reference #9)

Pages 7-1 - 7-16.

Presents a brief review of some expected onshore impacts.

D. Knecht, Robert W. Outcome of Informal Visit to Chairman of the County Board of Supervisors. Northampton County, Eastville, Virginia, on November 2, 1974. November 1974. (Bibliographic reference #15)

Pages 1-3.

Describes the response of a local board of supervisors to a proposal to build a platform fabrication complex.

Section 5.

SOCIO-ECONOMIC IMPACTS

5. SOCIO-ECONOMIC IMPACTS OF OCS OIL AND GAS

5.1 Introduction

For the purposes of this paper, socio-economic impacts are confined to those associated with offshore oil and gas development. These impacts have both positive and negative aspects. Positive aspects might include increased employment, additional income, immigration of skilled labor, and increased diversification of the economic base. Even with careful planning and management, OCS development can also cause problems such as increased unemployment in certain sectors, uneven distribution of income, labor shortages in non-oil industries, severe stress on community infrastructure, development into a single-industry area, and the need for local revenue to finance governmental services and facilities before tax producing industries are in operation.

Some socio-economic impacts are unique to oil and gas development, such as the need for skilled workers for refineries. However, others, for example very rapid increase in the need for housing and community services, come with any rapid, large-scale industrial development.

The following editorial from the Fairbanks All American Weekly, is but one example of socio-economic impacts caused by growth activities resulting from the Trans-Alaska Pipeline in Fairbanks.

TOWN MAY REGRET PIPELINE PRAISE

Reprinted from a recent editorial in the FAIRBANKS (Alaska) ALL-AMERICAN WEEKLY.

In the past few years we have written so many editorials supporting the trans-Alaska pipeline project and urging that we get on with it, that now that the project is beginning, we feel a bit hypocritical in writing an editorial complaining about its impact.

Nonetheless, we feel compelled to point out that thus far the project is having very little positive impact on the average citizen, that in reality it is having a negative impact on most of us.

One of the biggest impacts has been the project's impacts on the price structure, forcing us into a whirlwind of inflation, the likes of which we have never seen before.

The cost of real estate has skyrocketed and landlords have started raising their rents to almost unbelievable figures. And various groups of tenants are having to band together in associations to fight what they call unconscionable rent increases, evictions, etc.

The demand for building lots with utilities available is particularly great, and it appears that before long the vacant lots in the city will disappear. The population of the city will go up, of course, but it's a cinch that it will not be as comfortable living in a crowded city with little breathing space.

Construction will probably boom outside the city in the borough (county), but there again there is apt to be environmental impact. The impact could be serious on the public health since a study not too long ago showed that at least one third of area wells were polluted.

Then there is the impact on traffic. Once we had a few snarls at eight in the morning and at noon and traffic jams at the five o'clock rush. Now the traffic is running heavy all day, and it is becoming increasingly difficult to get around anytime during the day from eight to five.

The cash registers of the businessmen are beginning to jingle. And those who are fortunate to be employed on the pipeline construction are in a good position. That green stuff will allow them to overcome their problems.

But by and large the average citizen is being hit, and hit hard. The easy-going slow-paced Fairbanks is losing its personality and is becoming another old, crowded, stilted, impersonal fast-paced city.

And what does all this add up to for the average citizen? A great deterioration of the quality of life.

5.2 Factors Involved in Determining Impacts

A difficulty with identifying socio-economic impacts is that they differ with respect to locality, segments of the population and duration. In order to determine impacts it is necessary to carefully define the parameters of the geographic area being impacted. Even all local communities in the area may not benefit equally, as the location where services are needed may not match the location where revenues are generated.

Socio-economic impacts are directly related to the build-up of onshore processing facilities. The impact of construction and operation of platform fabrication facilities, pipelines, refineries, gas processing facilities and petrochemical complexes, for example, is substantially greater than that of a pipeline coming ashore and its connection to an existing pipeline or tank farm.

The degree to which an area is urbanized and economically diverse influences the extent to which impacts are felt. The more developed the area the more likely that housing and services will be available or can be easily expanded. In addition, a diversified economy is more likely to insure that oil and gas does not become the single base of support.

If adequate natural gaslines, navigation channels, highways, airports, railroads, transmission lines, and highway interchanges are in place prior to an onshore build-up, new impacts will be minimized. The existence of processing facilities in certain regions of California, the Gulf Coast, and the Mid-Atlantic region is likely to reduce the severity of some onshore impacts in comparison to

frontier areas in Alaska and Georgia, for example.

It might be expected that areas of high unemployment might benefit most by OCS development, but this depends on the characteristics of the local unemployed or underemployed work force. Frequently large scale industrialization attracts more workers from outside the area than can be employed. In these cases unemployment may even increase.

When determining impacts it is necessary to differentiate between stages in the OCS development process. Periods of construction, development, and operation will have uneven employment requirements.

If a platform fabrication plant is built, a large number of construction workers (up to 2000 workers)may be involved for perhaps two years.[19] This may happen concurrently with the engagement of a relatively small number of employees in offshore exploratory drilling operations. As the fabrication plant goes into operation the employee requirement changes from a large number of construction workers to a smaller number of steel workers (up to 1200 workers per platform [19]). When the platforms are completed and in place, work can begin offshore in the in the production phase.

Simultaneous with platform fabrication, pipeline coating and laying operations may take place in anticipation of the production phase. Pipeline coating is labor intensive, but depending on the number of well locations, and their distance from shore, relatively short-lived. Pipeline laying itself is less labor intensive but is also short-lived.

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19 1, p. 4.5.

In addition, refineries, gas processing plants, and petrochemical plants may be built. This will depend on such factors as the amount of oil and gas expected, support facilities available, ease in acquiring land, zoning, and proximity to markets. The construction phase of these facilities will also be labor intensive with a subsequent reduction in the numbers of workers needed in the operation phase. For example, an oil refinery may require approximately 2,000 workers for construction but only 300 to 500 for operation.

In summary, these oil-related developments are likely to require large numbers of construction workers for four to six years. After this, onshore activity will subside, causing a substantial decrease in the demand for labor.

Facilities (housing, schools, roads, etc.) and services (fire, police) will be needed immediately for the large group of people who are likely to have jobs in the area for only a relatively short period of time.

The smaller number of employees needed for routine operations are likely to come more slowly into an area and stay for the duration of the oil and gas activity, about 10 to 30 years. They too will need housing and services but on a smaller scale at a less rapid pace.

The ability of a given community or region to cope with rapid expansion depends largely on its existing capability to plan and control growth, and the flexibility of its financial structure. This is the essence of a sound comprehensive coastal zone management program.

5.3 Selected Examples of Socio-Economic Impacts

Although much has recently been written about the impact of OCS development,[20] there is not much agreement as to impacts. This section presents information from a variety of sources in order to give an idea of the scale of impacts OCS activities might have onshore.

Magnitude of Impacts

It is difficult to quantify the total impacts of OCS activity. While it is known that there will be an increase in employment, estimates of the employment multiplier vary. A study in Louisiana estimates that each offshore job produces 1.7 jobs in oil and gas-related onshore activities (i.e., construction, refinery workers), and that each of these jobs generate 2.1 jobs in service jobs (i.e., retail facilities).[21] The U. S. Chamber of Commerce estimates that a net increase of 100 manufacturing workers (including oil and gas development workers) results in an increase of 68 jobs in service employment.[22]

Additionally, the Chamber of Commerce[23] estimates that a net increase of 100 manufacturing workers (including oil and gas development workers) results in the average net increase of:

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[20] For examples of impacts of high and low intensity OCS development in various regions see Bibliographic Reference #9. Also, A Study of the Socio-Economic Factors Relating to the Outer Continental Shelf of the Mid-Atlantic Coast, Vol. 1-8, Mary Jenny and Joel Goodman, University of Delaware for BLM, DOI.

[21] 12, p.55.

[22] 38, p. 140

[23] 38, p. 140.

Population: 351

Families: 97

School Enrollment: 70

Retail Establishment: 1

Retail Sales: $565,000

Governmental Costs

Government service needs are difficult to generalize, but, as an example, Virginia is using the following ratios to describe increased public service demands attributable to population growth and industrial development.[24]

School enrollment	262.5 students/1,000 population increase
Hospital beds	3.64 beds/1,000 population increase
Police	1.54 police/1,000 population increase
Government employees	30 public servants/1,000 population
Water demand-domestic	100,000 gallons/1,000 population increase/day
Water demand-refinery	40 gallons/barrel of oil processed
Sewage-domestic	100,000 gallons/1,000 population increase/day
Solid waste	3 tons/1,000 population increase/day

Public expenditures to finance services and facilities increase substantially faster than revenues during the build up phase of OCS activity. This potentially increases the tax burden on the resident population, due to local revenue shortfall caused by the need to

[24] 31, pp. 66-67.

accommodate growth before the tax base expands. Typically, the advantages of oil and gas development accrue mainly to the larger region involved whereas the disadvantages tend to be localized in the immediate vicinity of the development.

Potential for Social Conflict

Oil and gas development has caused a number of problems particularly in the North Sea and in Alaska by attracting large numbers of outsiders to small closely knit rural communities as well as to larger cities. The problems of growth and rapid urbanization which results from intensive oil and gas activity include high wages for those in the oil and gas industry and rising prices for the community, changes from rural to urban work patterns,[25] inability to attract other industries due to high petroleum wages, housing shortages, labor shortages, overloads on recreational facilities, tension among residents and newcomers, and in general, the pressures of a sudden increase in population density.

Impacts on Other Industries

Much concern has been evidenced regarding permanent or partial disruption to other industries. Particular concern has been expressed for fishing, recreation, and tourism which depend on availability of the attractive and healthy coastal lands and waters.

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[25] 1, Chapters 2 and 3.

As indicated above, in small communities oil activities frequently pay considerably higher wages than other industries can afford. As a result, other industries may not be able to compete for manpower. To counteract this effect, the Shetland Islanders of Scotland are taking particular care to ensure that their traditional industries of knitwear and fishing are maintained in a viable state during the oil activity.

Post Oil and Gas Considerations

Unless careful planning and management of oil and gas activities has occurred, the abandonment of oil and gas wells may leave boom communities and their governments severely in debt and with a substantial supply of unneeded capital facilities.

5.4 Recommended Selected Readings

A. U.S. Committee on Commerce. Outer Continental Shelf Oil and Gas Development and the Coastal Zone. November 1974. (Bibliographic reference #32)

Pages 37-48

Summarizes socio-economic impacts in the coastal zone.

B. Council on Environmental Quality. Outer Continental Shelf Oil and Gas - An Environmental Assessment. December 1974. (Bibliographic reference #34)

Page 322

This study is based on Resource Planning Associates study Potential Onshore Effects of Oil and Gas Production on the Atlantic and Gulf of Alaska OCS. The BLM EIS was in partial based on the CEQ study. Chapter 7 contains a number of charts of various regions with economic impact under high and low intensity OCS development.

C. Baldwin, Pamela, and Malcolm Baldwin. Onshore Planning for Offshore Oil: Lessons from Scotland. February 1974. (Bibliographic reference #1)

Chapters I, II, III and X.

An excellent report on socio-economic impacts. Chapters mentioned are most important although much good impact information is scattered throughout the report.

D. Wilcox, Susan and Walter J. Mead. The Impact of Offshore Oil Production on Santa Barbara County, California. February 1973. (Bibliographic reference #36)

Pages 1-16.

Includes actual employment figures and labor costs for each phase of oil and gas activities in Santa Barbara as well as amounts of taxes generated by offshore oil.

E. Gulf South Research Institute. Offshore Revenue Sharing: An Analysis of Offshore Operations on Coastal States. December 1974. (Bibliographic reference #12)

Pages 27-51.

Presents economic Impacts in Louisiana.

Pages 52-57.

Shows how other states could use assumptions and statistics to determine impacts.

Appendix B1-B6.

Provides additional information on employment and governmental expenditures associated with OCS petroleum production.

F. Virginia Institute of Marine Sciences. Virginia and the Outer Continental Shelf: Problems, Possibilities and Posture. 1974. (Bibliographic reference #33)

Pages 64-67.

Gives breakdown of numbers of employees needed per refinery and government services required per 1000 population.

Section 6.

ENVIRONMENTAL IMPACTS

6. ENVIRONMENTAL IMPACTS

A variety of adverse environmental impacts can be expected in the course of OCS oil and gas development activities. While some of these activities would have minor or short-term impacts, others, such as the dredging and filling of wetlands, air and water pollution from refinery operations, and chronic oil pollution can be expected to cause serious environmental damage over extended periods of time.

6.1 Sources

Geophysical Exploration: In the past, the use of explosive charges to run seismic surveys has resulted in local environmental disruptions. The recent introduction of air guns and electronic devices has diminished the environmental disturbances to be expected from this source.

Exploratory Drilling: The greatest environmental threat during this phase is the possibility of a blowout of oil, gas, or other drilling fluids, which may occur when the pressure within the producing formation exceeds that of the column of drilling mud.

Field Development: Blowouts may also occur during this phase as wells are drilled to determine the capacity and configuration of the producing field. Some pollution may result from the unregulated disposal of drilling mud and cuttings. In addition, the laying of pipeline to establish a transportation link between the producing field and onshore processing facilities usually involves the dredging and filling of wetlands, which

can have serious impacts on the productivity of coastal ecosystems. Processing and support facilities (if not already in existence) must be located and constructed; if not undertaken in the context of regional planning, these activities have serious impacts on pre-existing and future land and water uses in the coastal zone.

Production: Separation and treatment of oil and gas on the production platform usually involves the disposal of large quantities of "brine water" containing small concentrations of hydrocarbons before transportation and processing. Accidental blowouts or other platform accidents can occur at any time.

Transportation: Hydrocarbons are discharged into the environment at all points of the transportation and distribution system from wellhead to ultimate destination on land. The distribution system can be characterized as fast but potentially messy; small volume spillage occurs routinely, particularly at transfer points between different components of the system (e.g., terminal-tanker, refinery-pipeline, etc.). Moreover, accidents, human errors, and equipment failures can cause large spills at any time.

Processing: The air and water pollutants generated as byproducts of petroleum refining operations are the major source of direct adverse environmental impacts during the processing phase. There are, as well, potential long-term aesthetic and land and water use impacts. Storm water runoff from such facilities may pose problems.

6.2 Selected Potential Major Impacts

Oil Pollution

Most oil spilled into water will initially float at the water surface. Wind and water forces effectively distribute spilled petroleum hydrocarbons into all components of the marine and coastal environment, including the water column, sediments, atmosphere, and the organisms present in the marine and coastal ecosystems.

Petroleum hydrocarbons are toxic to most or all marine organisms. Blumer[26] has listed eight ways in which oil can damage marine organisms:

1. Direct kill of organisms through coating and asphyxiation.
2. Direct kill through contact poisoning of organisms.
3. Direct kill through exposure to the water soluble toxic components at some distance in space or time from the accident.
4. Destruction of the generally more sensitive juvenile forms of organisms.
5. Destruction of the food sources of higher species.
6. Incorporation of sublethal amounts of oil and oil products into organisms resulting in reduced resistance to infection and other stresses (the principal cause of death in birds surviving the immediate exposure to oil).
7. Incorporation of carcinogenic and potentially mutagenic chemicals into marine organisms.
8. Low level effects that may interrupt any of the numerous events necessary for the propagation of marine species and for the survival of those species which stand higher in the marine food web.

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[26] 2, p. 64 ff.

The impact of any particular oil spill varies considerably, depending upon the nature and volume of the oil discharged, the location of the spill (distance offshore, sensitivity of the local environment), the time of year, prevailing environmental conditions, clean up techniques used (if any), and other factors.[27] Moreover, there is some evidence that chronic discharge of relatively small quantities of oil may result in more serious and longer term environmental damage than a single, relatively large volume spill.

Refineries

In the course of normal operations, refineries can be expected to have substantial impacts on air and water quality. Table 4 presents potential sources of refinery emissions.[28]

The most significant air pollutants from a refinery are likely to be hydrocarbons, sulfur oxides, and particulates. As well, odors from normal refinery operations can pose public health and aesthetic problems up to several miles away from the refinery itself. Four potential sources of refinery odor emissions are storage tanks, hydrocarbon-contaminated waste water, piping system leaks, and leaks of liquids and gasses.[29] Waste gases, released as a product of the refinery process, can also cause a substantial health or odor impact.

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[27] 3, p. 36 ff.

[28] For quantitative data on air and water pollutants to be expected from refineries, see 19, p. 154, 156, 158, 159, 161, and 162.

[29] 7, p. 30.

Table 4

POTENTIAL SOURCES OF SPECIFIC EMISSIONS FROM OIL REFINERIES[30]

Emission	Potential Sources
Sulfur Compounds	Boilers, process heaters, catalytic-cracking unit regenerators, treating units, H_2S flares, decoking operations
Hydrocarbons	Loading facilities, turnarounds, sampling, storage tanks, waste water separators, blowdown systems, catalyst regenerators, pumps, valves, blind changing, cooling towers, vacuum jets, barometric condensers, air-blowing, high-pressure equipment handling volatile hydrocarbons, process heaters, boilers, compressor engines
Oxides of Nitrogen	Process heaters, boilers, compressor engines, catalyst regenerators, flares
Particulate Matter	Catalyst regenerators, oilers, process heaters, decoking operations, incinerators
Aldehydes	Catalyst regenerators
Ammonia	Catalyst regenerators
Odors	Treating units (air-blowing, steam-blowing), drains, tank vents, barometric condenser sumps, waste water separators
Carbon Monoxide	Catalyst regeneration, decoking, compressor engines, incinerators

[30] 19, p. 153.

Refineries require large quantities of water for both cooling and processing purposes.[31] Cooling water is used to reduce the heat generated during refinery operations--it does not come into direct contact with the petroleum and is not thereby contaminated. However, it does present potentially significant thermal pollution problems for the receiving waters, and may directly kill organisms by entrapment. Water used directly in the refining processes is heavily polluted by the compounds picked in the process. This process water must be carefully treated before release into the marine or coastal environment.

Dredge and Fill Operations

Dredging and/or filling of coastal wetlands is frequently conducted during the construction of pipelines and other facilities for the production, transportation, and processing of OCS oil and gas. These activities can have devastating impacts on coastal ecosystems. In addition to the direct destruction of coastal wetlands and submerged bottoms by removal or burial of basic habitat, dredge and fill activities can have severe impacts on adjacent areas. The natural water flow and circulation patterns, which control the structure and composition of coastal ecosystems, can be altered radically by such activities, with corresponding impacts on the basic health and productivity of the ecosystem affected. In addition, the increases in turbidity, sedimentation rates, and the release of pollutants previously trapped in sediments, all contribute to the degradation of the coastal and marine environment.[32, 33]

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[31] 7, p. vi to vii.

[32] 18, p. 3.1-3.27.

[33] 37, p. 134-144.

6.3 Recommended Selected Readings

A. Blumer, Max. The Scientific Aspects of Oil Pollution. 1971. (Bibliographic reference #2)

Pages 54-73.

Discusses the extent of marine oil pollution. It is an excellent summary of the effects of oil pollution on marine ecology, including the effect on commercial shellfish valves, the risk to human use of marine resources, etc.

B. State of Connecticut, Department of Environmental Protection. Potential Environmental Effects of an Oil Refinery in Connecticut. Draft Report to the Governor's Fact Finding Task Force on Refineries. November 1974. (Bibliographic reference #7)

Pages ii-viii

Excellent summary of the impacts on air and water quality, land use, etc. to be expected if an oil refinery is built in the study area.

Pages 25-32.

Discusses air quality impacts.

Pages 49-50.

Discusses water quality impacts.

Page 54.

Discusses refinery siting limitations.

C. Boesch, Donald F., Hershner, Carl H., and Milgram, Jerome H. Oil Spills and the Marine Environment. 1974. (Bibliographic reference #3)

Pages 1-114.

Summarizes the biological and ecological impacts of oil spilled in the marine and coastal environment. It also presents a discussion and evaluation of available systems for preventing or cleaning up oil pollution incidents. Overall, the book is a valuable summary of the information available at this time.

D. McGinnis, John T. et alia. Environmental Aspects of Gas Pipeline Operations in the Louisiana Coastal Marshes to Offshore Pipeline Committee. December 1972. (Bibliographic reference #18)

Pages 3.1-3.32.

A good summary of the environmental, ecological, and cultural effects of constructing pipelines (with specific reference to gas but also generally useful for oil) in coastal marshes and wetlands.

Section 7.

PLANNING AND MANAGING

7. PLANNING AND MANAGING

7.1 Experiences from Other Areas

As has been shown, onshore impacts stemming from offshore oil and gas operations can be extensive. It is the theme of this paper that proper preparation can mitigate adverse effects. Although the impacts which have resulted from OCS activities in other areas--such as Texas, Louisiana, and California--might be instructive as to what to plan for, they provide little guidance about how to plan, for until recently planning was more by default than by design.

It is only recently--in California, Florida, and the North Sea--that planning prior to OCS activities has actually occurred, and in these cases it is too early to judge the efficacy of these actions. A review of operations in established areas, such as in Louisiana, Texas and California, shows a variety of impacts that might be expected. The most troublesome impacts appear to be: those relating to the conflict between the petroleum industry and traditional coastal users; problems created by growth induced by oil and gas operations, including conflict of the industry with a small-town atmosphere; the impact of the oil industry on local industry, especially attracting employees from existing industry because of higher wages; the problems associated with the departure of the oil industry when a field is abandoned; and the economic burdens placed on local and state governments because of revenue shortfalls during the early stages of oil operations. For example, in the early stages of operations in the Gulf of Mexico conflicts arose between traditional coastal users, especially fishing interests, and the offshore

industry. Offshore operations in Louisiana and Texas led to the loss of some traditional fishing and trawling grounds.

Even prior to the Santa Barbara blow-out, residents of that community were disturbed by the changes the offshore industry had brought. The small town resort atmosphere was altered by the industry operations; the contrast of ways was especially visible at the waterfront and city boat docks, where oil company crew boats and storage areas contrasted sharply with the traditional fishing boats and pleasure vessels.

The Department of the Interior has generally indicated the onshore impact from offshore operations will be slight or non-existent.[34] Interior states, for example, that no new refineries will be needed, for new oil fields will only replace declining onshore capacity or displace foreign imports. Interior has indicated, too, that most development will take place in already existing industrialized areas, so that growth-induced impacts, while perhaps large, will not be significant in terms of overall activity. The priority that they place on this problem is perhaps indicated by the fact that only 30 out of 1,200 pages of the recent BLM Environmental Impact Statement for the accelerated leasing program directly addresses land-use and socio-economic onshore impacts.

Already, however, activities have or are occurring which indicate that the impacts will be large. In preparation for the anticipated Atlantic offshore activity, Brown and Root, a major fabricator of offshore

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[34] Frank Basile and Darius Gaskins, DOI, personal communication.

equipment, has recently purchased a 2,000-acre parcel on the rural eastern shore of Virginia.[35] Planned for this tract--located near Cape Charles, Virginia-- is a platform construction operation. Such facilities in other locations employ over 1,000 persons.

7.2 Applicability of Experiences

There is great difficulty in attempting to generalize from experience in one area and applying these to another area, for there are great differences between the areas and the operations. In Louisiana, where the great majority of OCS activities in the U.S. have occurred, the development of the offshore industry was a slow, evolutionary process. From the first tentative drilling efforts in bays and coastal waters, the industry slowly progressed over a more than 30-year period to the level which exists today. Onshore support facilities grew at a related pace.

In the frontier areas, however, it is now proposed that several tens of million acres of offshore land will be leased in a matter of perhaps three years. The proposed leases for 1975 alone, although not all in frontier areas, exceed the total leased under the federal program in the 20 years since its inception. The size of the sales, and the great speed with which they will occur, will impose far larger and more swift impacts, and the growth-associated impacts will be far more obvious and significant because of these time and size factors.

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[35] 15, pp. 1-3.

This problem is exacerbated by still another difference--in the areas of existing offshore production, the first offshore areas leased for oil were in state rather than federal waters. Because the states collected revenues from this production, they were at least partially compensated for the costs of necessary governmental services and facilities. This provided the basis for later expansion of operations into federal waters. However, in the Atlantic, where there is no history of offshore operation and little likelihood of oil in state waters, these same impacts will be realized without the benefit of state-derived, oil related revenues.

The socio-economic conditions also differ between the earlier, older areas and the frontier areas where offshore operations are now being planned. The Atlantic coast today is not only more densely populated than the Gulf Coast of 30 years ago, but the coastal resources are more heavily used. For this reason conflicts between competing users such as the petroleum industry and the fishing tourist, residential, and recreational interests will be more intense.

Finally, the physical environment also differs. Wave heights and characteristics are far more severe in the Atlantic and Alaskan waters than in the Gulf of Mexico, even though the latter is subject to more frequent hurricane activity. Cold temperatures and even, in the Alaskan area, ice flow, add additional stress on men and machines. Seismic activity off California and Alaska is still another problem not existing in the Gulf of Mexico.

In many respects--scale and timing of activity, severity of environment, and to a lesser extent the socio-economic environment--the

frontier areas, and especially the Atlantic region, are more similar to the North Sea experience than that in the western Gulf of Mexico.

7.3 Suggestions for Planning and Management

Given the past experience and the potential impact of the anticipated activities, it is clear that planning must occur as conscious forethought prior to the initiation of offshore oil and gas operations rather than as has largely happened in the past, by neglect or default. Development of energy plans must occur in the broader context of a balanced comprehensive management program such as one developed under the federal Coastal Zone Management Act of 1972. Such planning will greatly mitigate adverse impacts, but will also require many components.

Under a balanced program the state should analyze its coastal resources and the variety of uses placed on them. At the same time it should seek to identify the demands which will be placed on the coastal lands and resources in the future; offshore oil and gas operations would be one of these, to be considered along with recreational needs, ecological values, residential requirements, areas of aesthetic and cultural interest, and other industrial requirements, for example. With respect to oil and gas, the state should try to determine what kinds of onshore facilities will be needed, their requirements, and their likely impacts. The planning dimension should be broad enough to include all parts of the problem. In planning for OCS oil and gas, state planners should consider the requirements beyond coastal lands into the near-shore waters for pipeline placement, or inland if necessary, for transportation pipelines and refineries. After

identifying existing valuable or vulnerable areas, the planners should determine where the new activities--including oil and gas operations--should or should not be located.

Finally, appropriate methods of control must be developed to implement the programs and achieve the desired goals. Three specific steps might be identified in this process: state administrative organization, information collection, and implementation.

Administrative Organization

A state might begin by establishing an appropriate administrative structure to deal with the offshore oil and gas operations and problems. This structure should be established in the context of and with full concern for the broader coastal planning and management issues, such as socio-economic and environmental concerns as well as other aspects of the energy problem. Clear lines of authority should be established for planning, management, permitting, tax and fee collections, surveillance, and enforcement activities. Several agencies may well be involved in these activities, but their interrelationship should be clearly understood. A central coastal zone management authority would be of critical importance. The geographic boundaries of the areas of concern for each function should be clearly defined. For example, the operational definition of the coastal zone might be redefined to include various aspects of anticipated oil and gas operations.

A single central agency might be designated as responsible for the state response to oil spills. This agency would be given the ability

to requisition and deploy manpower and materials from and to provide for the coordination of other state agencies as needed in emergencies.

Although both are really untried by major spills, the oil spill contingency plans developed by California and the Coast Guard might be examined for ideas and suggestions.

Information Requirements

At the same time, the state should begin to collect the data and information which will be needed for sound planning and management. These will require both a knowledge of what (kind and intensity) offshore activities and onshore support facilities are planned, as well as an understanding of the existing socio-economic and environmental conditions which might be affected.

State officials should open lines of communication among themselves and the offshore actors including the USGS, BLM, the American Petroleum Institute, the oil companies themselves, and satellite industries. The state might seek--in fact require--all information available from such sources regarding the activities that can be anticipated. For a broad array of activities and facilities, such as OCS operations themselves, onshore fabrication plants, storage yards, crew bases, pipelines and landfalls, tank farms, refineries, and associated industries, information such as the location, size, time of construction, life of the facility, manpower requirements, demand on public services (water, roads, sewage, etc.) and special pollutants or problems, should be determined far enough in advance to allow adequate and responsible state planning.

It is difficult to say at what point in offshore development such information can be expected. Certainly a base for planning should be developed prior to the lease sale; however, not all information can be reliably supplied until after exploratory drilling. The state might consider a requirement that following either the lease sale or exploratory drilling (or after both, for that matter), all successful bidders must submit detailed plans for an appropriate time period (perhaps five years) for all OCS activities--offshore and onshore construction, drilling, production, and abandonment--to the state coastal zone planners for coordination with their planning efforts. Probably the most critical time for decision-making will occur after exploration, when a discovery has been made and plans are prepared for developing the field. At this point again, the state should seek access to the data and direct input on preparing the plan, for this development plan will largely determine the direction and location of subsequent activities. If appropriate the states should request that an environmental impact statement be prepared prior to approval of the plan by USGS.

Also prior to the lease sale, in fact before the Environmental Impact Statement, the state should begin to develop a sound understanding of its resource base. Offshore in state waters, a baseline monitoring program should measure and determine, for example, relevant information and patterns of currents and waves, background chemistry conditions, including the pre-oil operation hydrocarbon levels, and biological conditions. Such studies should be coordinated with the federal OCS baseline studies conducted under contract to BLM. Straughan[36] provides some suggestions for

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[36] 26, pp. 1-4.

what the offshore program should include, and Jones[37] lists some problems encountered by Florida, which developed the first attempt to establish sound baseline conditions prior to offshore oil and gas activity.

Such baseline studies and inventories should include the coastal and onshore areas as well as the state waters. Here, baseline socio-economic studies, including existing or potential coastal resource use and economic conditions, should be added to the biologic-environmental studies. In all cases, baseline inventories should be designed to clearly establish existing (pre-oil) social, economic, and environmental conditions; to develop an understanding how the systems work; to determine important or critical areas; and to detect changes created by oil and gas activities when they occur.

Management and Implementation

After establishing the existing or background conditions, and after determining the kinds of impacts to be expected, general plans and policies can be formulated. These should not simply be single purpose plans, but should be developed as part of a broader management program, such as a coastal zone management program where other values and benefits are considered in planning. For example, based on the earlier inventories, geographic areas of particular concern, such as traditional fishing grounds, productive estuarine ecosystems, areas of high recreational use or potential, and critical water or shore use areas might be identified and defined. Natural hazards such as flood-prone areas, must also be considered, as must state and federal air and water quality needs.

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[37] 13, pp. 1-12.

Having identified various resources and the hazards and impacts associated with the offshore operations, the state can make a judgment about where OCS developments and activities are acceptable or where other resources are too valuable. An effort might be made to devise a framework which would assess coastal resources and their values, and the possible impacts oil and support operations have on them. Such a framework would permit the state to rank coastal areas according to their compatibility with offshore oil production. This would enable the state to establish a set of priorities--these resources are expendable, develop here first; these are more valuable, develop here later; and never develop here.

In this fashion the planners could determine critical areas which should be preserved and protected as well as areas more suitable for development. Sites can be chosen for pipeline corridors in state lands and waters for landfalls and for siting of onshore facilities.

In addition to planning and management for siting and provisions for environmental protection, planning should also include measures designed to mitigate the social-economic impacts. Early planning can reduce the strain placed on municipal services and facilities caused by the oil induced growth. State and local governments should analyze and evaluate various methods of front-end financing available to them and consider new legislation to increase the flexibility and effectiveness of the financing capabilities. Planning should also consider the effects of the social impacts and economic dislocations which might be caused as oil-related activities commence and again as they are phased out. A carefully planned transition can help avoid the "boom and bust" economy which might

occur with unregulated development.

Quite likely there will be legislative changes necessary to implement the proposed management programs. For example, financial help will certainly be needed not only to accomplish the necessary planning, but also to provide the services and facilities necessary to receive the oil-induced growth. In part this might be achieved through federal grants and revenue sharing if this were adopted. In large part, however, it could also be accomplished through the creation of state severance taxes, "growth" taxes, or by permit fees. The state might also wish to require performance bonds and to establish an oil spill liability fund, financed by oil industry taxes, to cope with accidents and spills. Strict liability requirements would seem to act as a strong deterrent to careless operations.

In addition to facility siting legislation as a part of an overall coastal zone management program, the state might wish to consider stronger methods of control of site placement and use. Following the Scottish example, it could consider acquiring ownership in a few carefully selected areas and requiring that all oil-related activities be confined to these areas. As landlord, the state would gain additional control of the manner and placement of operations.

At a minimum, the state should consider requiring unitization of onshore facilities. In offshore operations the industry frequently practices unitization (where several companies holding leases in separate tracts manage a filed jointly under one company's leadership. This provides greater efficiency in operation and production). However, unitization

practices have not occurred onshore. Each company constructs its own pipelines, terminals, storage farms, support bases, etc. Legislation requiring the unitization of these facilities and operations would avoid wasteful duplication and reduce the adverse impacts.

The Energy Element of the California CZM program[38] provides one state's approach to the problems of offshore operations and refinery siting. Moseley[39] also provides general guidance for planning.

All of these management efforts would be greatly diminished without a complete interaction of all concerned parties. In resource evaluation, in planning, and in implementation the problems, attitudes and assistance of local governments, the public at large, the federal government, and industry must all be considered and included. Certainly, for example, the growth-induced impacts will most seriously affect the local levels of government. On the other hand, some of the management objectives might best be implemented by including them as stipulations on the federal lease sale contracts. Too, the states should consider the national and local interest in their management plans. The industry itself will be in a better position to develop its programs, and plan for its costs, if it clearly understands the state objectives and program at the beginning of its planning. States should not overlook interstate coordination, too. This is especially important in planning for onshore impacts, such as those created by refineries, support facilities, and fabrication sites. While

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[38] 5, pp. 195-246; pp. 283-308.

[39] 22, pp. 81-89.

it would be unrealistic to assume that every state can avoid refineries, it would be equally unrealistic to assume that each state must have them. Instead, a regional view is necessary.

Finally, public acceptance and support for the program and decisions can only be achieved by thoroughly involving the public in an open and substantive way in all steps of the planning and management process. This must include careful coordination by all parties, coordination that will only result from deliberate state efforts.

7.4 Recommended Selected Readings

A. Baldwin, Pamela L. and Malcolm F. Baldwin. Onshore Planning for Offshore Oil: Lessons From Scotland. February 1975. (Bibliographic reference #1)

The best description and analysis of the activities and impacts of Scottish-North Sea oil and gas experience. Although instructive and relevant to the Atlantic and Alaskan situation, it is impossible to select specific page references; this book should be read at leisure when there is time to absorb its impact.

B. California Coastal Zone Conservation Commission. The Energy Element. November 1974. (Bibliographic reference #5)

Pages 195-246; 283-308.

A thoughtful approach by a state which is both experienced in the offshore woil and gas arena, and comparatively well developed in its coastal zone management program. This document may offer some suggestions for consideration. Its importance lies as much in the problem it attempts to address as in the solutions it provides.

C. Jones, James I., Ph.D., Florida Division of State Planning. Florida, Its Outer Continental Shelf and Project Independence: Is the Price Worth the Gamble? September 1974. Bibliographic reference #13).

Pages 1-12.

Discusses the issues and problems Florida has faced as a result of the Federal OCS leasing which occurred in the Eastern Gulf of Mexico late in 1973. Presents the Florida experience as a prototype for the other frontier areas expected to be developed under the accelerated OCS leasing schedule.

D. Moseley, Joe C. "State Approach to Decision Making" in Proceedings the 4th New England Coastal Zone Management Conference. May 1974. (Bibliographic reference #22).

Pages 81-89.

Succinct comments and suggestions, relating to the overall issue of refinery and deepwater siting. The comments apply in general to the overall OCS problem as well.

E. Knecht, R. W. The Shetlander Accept the Challenge. July 1974. (Bibliographic reference #16)

Pages 1-6.

Relevant comments on planning for the Shetland-North Sea oil and gas development. Discusses a sound approach to planning.

F. Straughan, Dale, Ph.D. Basic Outline to Conduct Environmental Studies in the Proposed Southern California Borderland Sale. 1974. (Bibliographic reference #26)

Pages 1-4.

G. U.S. Senate, NOPS. North Sea Oil and Gas: Impact of Development on the Coastal Zone. November 1974. (Bibliographic reference #30)

177 pages.

A good detailed view of the North Sea oil and gas experience, including some discussion of planning approaches. Again, it is difficult to select specific page references.

H. California State Department of Conservation. Oil Spill Contingency Plan. August 1972. (Bibliographic reference #4)

Pages 1-43.

Developed in large part as a result of the Santa Barbara blow-out, this presents a detailed plan which might suggest problems and solutions to other states.

Section 8.

ANNOTATED BIBLIOGRAPHY

8. ANNOTATED BIBLIOGRAPHY

1. Baldwin, Pamela L. and Malcolm F. Baldwin. Onshore Planning For Offshore Oil: Lessons from Scotland. Conservation Foundation. February 1975. Washington, D. C. Multi pp.

   Examines Scotland's experience with offshore oil and gas development to provide planners with information on what to expect on shore when oil and gas are discovered offshore. Emphasizes the nature, characteristics and problems of onshore impacts and Scotland's planning efforts to deal with these impacts. Highlights lessons to be learned from Scotland's experience, and makes recommendations for U.S. policy.

2. Blumer, Max. Scientific Aspects of the Oil Spill Problem. Environmental Affairs. Volume I, Number 1. April 1971. pp. 54-73.

   Describes the extent and sources of oil pollution, the various environmental effects of oil pollution on the marine environment and the use of marine resources, and the different types of countermeasure techniques used to minimize the impacts of oil pollution. Assesses shortcomings in knowledge, techniques and procedures related to oil pollution and makes recommendations for their improvement.

3. Boesch, Donald F.,et. al. Energy Policy Proj. of the Ford Found. Oil Spills and the Marine Environment. Ballinger Publishing Co. 1974. Cambridge, Massachusetts. 114 p. Price $7.00.

   Provides an overview of current knowledge on the effects of oil spills and the efficiency of preventive safeguards. Contains two papers - one on the ecological, and the other on the technological aspects of oil pollution. Identifies the current base of scientific and technical knowledge on the causes, effects and prevention of oil pollution. Recommendations are made to improve that information base.

4. California State Department of Conservation, Department of Fish and Game, Department of Emergency Services. Oil Spills Contingency Plan. State of California. August 1972. 43 p. Illus. maps.

   California's plan to respond to oil pollution incidents within the boundaries of the state. Describes organizational structure, operational responsibilities, alerting procedures, operations, agency contacts, critical water use and waste disposal areas.

5. California Coastal Zone Conservation Commission. Revised Draft of Sixth Plan Element, Energy. State of California. January 1975. San Francisco, California. 335 p.

Examines the demand for oil, gas, and electricity; energy conservation; alternative energy sources; power plant siting, petroleum exploration and production, tanker terminals, refinery siting and liquified natural gas. In each of these sections the Commission's findings are followed by recommendations as to policy positions that should be taken.

6. California State and Regional Commission of California. Energy Volume VI: Tanker Terminals, Refineries, LNG Facilities. Preliminary Draft. State of California. July 1974. 174 p.

One of a series of background reports for planning the future of the California coast. Identifies current port capacities and refinery capacities in California and assesses the need for expanding these capacities. Examines types of ports, factors effecting port demand, factors effecting port development decisions and alternatives to port development. Examines proposed plans for refinery construction, factors affecting refinery siting, regulatory social and environmental considerations in siting refineries and economic impact of refineries.

7. Connecticut State Department of Environmental Protection. Potential Environmental Effects of an Oil Refinery in Connecticut. State of Connecticut. November 1974. Hartford, Connecticut. 55 p. illus. and maps.

Evaluates environmental impacts associated with construction and operation of an oil refinery in Connecticut. Areas of study emphasized include air quality, water pollution and the effects of transshipment of and unloading of crude oil in Long Island Sound.

8. Conservation Foundation. Offshore Oil Heats Up As Energy Issue in Conservation Foundation Letter. Conservation Foundation. November 1974. Washington, D. C.

Presents a detailed summary of Pamela and Malcolm Baldwin's book Onshore Planning for Offshore Oil: Lessons from Scotland, concerningn oil and gas development offshore and its impacts onshore.

9. Council on Environmental Quality. OCS Oil and Gas - An Environmental Assessment. Council on Environmental Quality. Washington, D.C.. April 1974. multi p.

   Examines the potential impact of OCS oil and gas development. Focuses on several hypothetical drilling sites in high potential areas and establishes a relative ranking of environmental risks associated with their development. Analyses offshore and onshore impacts, OCS technology, and institutional and legal mechanisms for managing OCS development. Recommends specific action for improvement of OCS technology, regulation and enforcement, and coordination between the states and Federal Government and among Federal agencies.

10. Fasham, Douglas R. A Review of Oil Related Developments in the UK Following the North Sea Discoveries: With Particular Reference to the Scottish Highlands and Islands. Highlands and Islands Development Board. January 1974. Multi p. maps.

    Describes the exploration and development phases of offshore oil production in the North Sea including offshore facility requirements, costs and economic impacts and onshore related activities such as fabrication, supply, storage and other support facilities. Describes the oil related development areas in Scotland.

11. Federal Energy Regulation Study Team. Federal Energy Regulation: An Organizational Study. G.P.O. #5210-00386. Washington, D.C. April, 1974. Multi pp. Price $2.80.

    Examines the organizational structure of Federal energy regulation, the interrelationships among the involved departments, agencies and bureaus, and their interaction with state energy regulation. Identifies deficiencies in the energy regulatory system. Recommendations are aimed at improving the structure of Federal energy regulation, not at reforming internal agency policy and procedures.

12. Gulf South Research Institute. Offshore Revenue Sharing: An Analysis of Offshore Operations on Coastal States. Governor's Offshore Revenue Sharing Committee. State of Louisiana. December 1974. 64 p. Appendices illus.

Presents an evaluation of the economic, costs and benefits resulting from OCS oil and gas development on state and local governments in contiguous coastal states. The increase in employment opportunities resulting in OCS activities will increase the population thus increasing the demand for governmentally funded public services. As much of the industrial activity is outside the state and local taxation jurisdiction, necessary governmental expenditures increase whereas governmental revenues do not. The case of Louisiana is cited as an example.

13. Jones, James I. "Florida, Its Outer Continental Shelf and Project Independence: Is the Prize Worth the Gamble?" Division of Florida State Planning. September 1974.

Discusses the issues and problems Florida has faced as a result of the Federal OCS leasing which occurred in the Eastern Gulf of Mexico late in 1973. Present the Florida experience as a prototype for the other frontier areas expected to be developed under the accelerated OCS leasing program.

14. Kash, Don E. and Irvine L. White et.al. Energy Under the Oceans A Technology Assessment of Outer Continental Shelf Oil and Gas Operations. University of Oklahoma Press. 1973. Norman Oklahoma. 378 p. illus. Price $4.50.

Presents a thorough introduction to potential environmental, legal/political, and social impacts associated with Outer Continental Shelf oil exploration, development, and production. A basic review of development methods is followed by an examination of specific policy issues including the adequacy of OCS technologies, available information and data, environmental quality government management, and jurisdiction. The study identifies weaknesses within the present management system and presents recommendations. A series of appendices on environmental pollution and public opinion; oil pollution and accidents; offshore petroleum reserves, resources and production; biological effects of oil pollution; and leasing procedures concludes the book.

15. Knecht, Robert W. Outcome of Informal Visit to Chairman of the County Board of Supervisors, Northampton County, Eastville, Virginia on November 2, 1974. Unpublished. November 1974. 2 p.

Recounts a visit to county officials to determine local attitudes and governmental policies toward the Brown and Root Proposal to construct a platform fabrication complex in this rural area.

16. Knecht, Robert W. The Shetlanders Accept the Challenge. Unpublished. July 1974. 6 p.

Examines the governmental actions at a local level in the Shetland Islands to plan and manage onshore impacts resulting from OCS petroleum development. The success of their planning process is based on the early adoption of a policy toward control of onshore development, a comprehensive independent study of likely onshore industry requirements and impacts, an effective public information program, and adoption of necessary planning and management powers through new legislation.

17. LaRoe, Edward T. Statement of Relation of Coastal Zone Management to Offshore Petroleum, Unpublished. April 1974. 6 p.

Presents a call for bold planning and management objectives by coordinated Federal, state, and local governmental action to minimize adverse environmental impacts and uncontrolled development patterns that will arise from the proposed increase in OCS oil and gas development.

18. McGinnis, John T.: Ewing, R.A. et al. Environmental Aspects of Gas Pipeline Operations in the Louisiana Coastal Marshes. Battelle. Columbus Laboratories. Columbus, Ohio. December 1972. 120 p.

Provides an overview of the environmental concerns associated with pipeline operations in marshland. Documents existing knowledge on the environmental, socio-economic, cultural and aesthetic effects of gas pipelines in marshlands, identifies gaps in existing data required to predict the consequences of additional pipeline operations and defines research programs to fill data gaps. Includes a summary of current research efforts.

19. Mitre Corporation. Program Plan for Environmental Effects of Energy. NTIS PB-235 115. Washington, D. C. July 1974 multi p.

Presents the operating plan for the National Science Foundation's Five Year Program for the Environmental Effects of Energy. The plan sets forth an agenda, schedule and budget for a research program to examine the principal environmental and socio-economic concerns associated with alternative energy sources - coal, oil and gas, oil shale, geothermal and solar energy.

20. Morton, Rogers C. B. Remarks of Secretary of the Interior Rogers C. B. Morton Before the Coastal States Governors and their Representatives on Proposed Outer Continental Shelf Leasing Programs. U. S. Department of the Interior. November 1974. Washington, D. C.

Summarizes the position of the Department of the Interior toward the need for OCS oil and gas development and their proposed leasing program. An outline of the areas being considered as well as resource, environmental and technological factors weighed in the decision are presented.

21. National Petroleum Council. U. S. Energy Outlook, A Summary Report of the National Petroleum Council. Washington, D. C. December 1972. Washington, D. C. 134 p. Illus. and maps.

22. New England Center for Continuing Education. Proceedings the Fourth New England Coastal Zone Management Conference "Perspectives on Oil Refineries and Offshore Unloading Facilities" The New England Center For Continuing Education. May 1974. Durham, New Hampshire. 145 p. illus.

Addresses public policy issues raised by refinery and deep-water port siting. Suggests steps to facilitate decision making and summarizes the responsibilities of private citizens, public interest groups, industry and all levels of government in decision-making related to deep water ports and refineries.

Gives a broad overview of present U.S. energy situation (including all forms of energy) with chapters on supply and demand; domestic supplies; availability of foreign oil and gas; financial effects, energy trends beyond 1985, and recommendations on a U.S. energy policy. It is estimated that twice the oil and three times the amount of natural gas produced in the U.S. through 1970 remain to be discovered. However, decreased accessibility of these resources will make recovery more costly. Between 10.4 and 15.5 millions of barrels of oil/day will be available in 1985 as compared to the 11.3 million barrels/day available in 1970.

23. Noone, James A. Energy Report/Environmentalist, Others Criticize Offshore Leasing Expansion. National Journal Reports. April 6, 1974. pp. 512-521.

Reports on the Federal Government's plan to expand leasing of the Outer Continental Shelf for oil and gas exploration. Provides a profile of the OCS controversy, including general background material, chronology of events, views of various actors involved in the controversy, and analysis of environmental aspects of the expansion program.

24. Noone, James A. Energy Report/Industry Response Seen Pacing Offshore Leasing Expansion. National Journal Reports. April 20, 1974. pp 592-578.

Reports conflicts over aspects of the OCS leasing program including the government's management practices, resource evaluation manpower and equipment estimates, bidding systems, and jurisdiction. Presents the industry response to the expanded leasing program.

25. Odum, H. T. Energy, Ecology and Economics. in AMBIO. Volume 2, Number 6. Royal Swedish Academy of Science. 1973. Stockholm, Sweden. p. 220-227 illus.

Examines the need for considering energy, ecology and economics as a single unified system. Outlines major factors to consider in determining net available reserves. Net available reserves of oil and gas should be estimated on the basis of gross reserves less the cost in energy and the cost of disruption of the ecology.

26. Straughan, Dale. Basic Outline to Conduct Environment Studies in the Proposed Southern California Borderland Sale. (Comments). University of California. Allan Hancock Foundation. December 17, 1974. 4 p.

Presents technical suggestions for planning a baseline and monitoring program for OCS.

27. Texas Office of the Governor Management Science Division. Benefits and Costs to State and Local Governments in Texas Resulting From Offshore Petroleum Leases on Federal Lands. Report 0025-1174-NR. State of Texas. November 1974. Austin, Texas. 8 p.

Estimates the benefits and costs to local and state governments in Texas resulting from offshore production on the proposed Federal leases. Based on the current tax structure and level of public service expenditures. Concludes that the revenues generated by OCS oil and gas development would not cover the state and local government costs to provide public services for the estimated 69,000 employees related to offshore production.

28. U. S. Department of the Interior. Regulations Pertaining to Mineral Leasing, Operations and Pipelines on the Outer Continental Shelf. U. S. Department of the Interior. May 1973. Washington, D.C. 103 p.

Contains regulations governing the conduct of mineral operations and development in the Outer Continental Shelf, the disposal of OCS royalty oil, the granting of rights-of-way for pipelines on the OCS and the leasing of mineral deposits in the OCS. Also contains delegations of authority, copies of pertinent public laws and lease forms.

29. U. S. Department of the Interior, Bureau of Land Management. Draft Environmental Statement: Proposed Increase in Acreage to be Offered for Oil and Gas Leasing on the Outer Continental Shelf. Volumes 1 and 2. DES 74-90. U. S. Department of Interior. October 1974. Vol. 792 pp. Vol. II 466 and attach. Illus., maps.

The Federal Government's environmental impact statement on a proposal to increase the acreage for OCS oil and gas exploration and development so that 10 million acres are leased in 1975. Provides a geological, climatic and biological description of the proposed impacted regions. Examines possible impacts of the expanded OCS leasing program, such as impacts on the onshore and offshore environment, on air and water quality and on commercial fisheries. The statement also examines alternatives to the proposed expanded leasing program.

30. U. S. Senate Committee on Commerce. National Ocean Policy Study. North Sea Oil and Gas: Impact of Development On the Coastal Zone. U. S. 93rd Congress 2nd Session. October 1974. Washington, D.C. 177 p. G.P.O. 5270-02622. Illus. Price $1.90.

Examines the experience with oil and gas development in the North Sea. Presents the findings from an on-site investigation conducted by an administrative-legislative branch staff delegation. Examines the problems associated with oil and gas development in the North Sea and the problem-solving mechanisms used by the United Kingdom in dealing with rapid development. Makes no recommendations for legislation but draws conclusions with implications for U. S. policy for OCS activities.

31. U. S. Senate Committee on Commerce, National Ocean Policy Study. Oil and Gas Development and Coastal Zone Management Hearings Before the National Ocean Policy Study. Serial No. 93-99. U.S. 93d Congress 2d Session. May 1974. Washington, D.C. 450 p. G.P.O. Illus. and maps.

Presents testimony and statements of various congressmen, agencies, and organizations concerning the environmental, social and economic impacts of OCS oil and gas developments on the coastal zone. The testimony indicates that there is a large gap in our understanding of the OCS development.

32. U. S. Senate Committee on Commerce National Ocean Policy Study. Outer Continental Shelf Oil and Gas Development and the Coastal Zone. U. S. 93rd Congress 2nd Session. November 1974. Washington, D.C. 206 p. G.P.O. Illus. Price $2.15.

Investigates major issues associated with OCS oil and gas development and recommends improvements in current OCS procedures and practices. Issues addressed include OCS information needs, environmental impact on the coastal zone, environmental impact on ocean resources, Federal management and leasing policies, OCS production and transportation technology, manpower and materials, state jurisdiction, revenue-sharing and financial aid to state, and coastal zone management.

33. Virginia Institute of Marine Sciences for the Office of the Governor. Virginia and the Outer Continental Shelf: Problems, Possibilities and Posture. Commonwealth of Virginia. November 1974. Richmond, Virginia. 93 p. and appendix.

Evaluates the ecologic impacts that could result from the discovery and development of OCS oil and gas in three zones- offshore, interface (from 3 mile limit to the upper margin of the wetlands) and onshore. Makes recommendations for the states' OCS policy position.

34. Waitsman, Irvin W. New England River Basins Commission Staff Report: Summary of Federal Responsibilities in Oil and Gas Leasing on the Outer Continental Shelf. New England River Basins Commission. December 1974. 8 p.

Explains the legal authorities for Federal responsibilities in OCS leasing, the leasing system, and the regulations guiding development of OCS resources.

35. White, Robert M. Remarks by Robert M. White, NOAA Administrator, Before the Meeting of Coastal State Governors, Department of the Interior Auditorium, Washington, D. C. November 1974.

Discusses the role of NOAA's National Marine Fisheries Service in protecting fish and shellfish populations from OCS oil and gas development. Briefly examines the meaning to states of the recent Coastal Zone Management Act which established the Office of Coastal Zone Management within NOAA.

36. Wilcox, Susan M. and Mead, Walter J. The Impact of Offshore Oil Production on Santa Barbara County California. February 1973. Washington, D. C. 23 p.

Presents the socio-economic onshore impacts that have resulted from oil and gas development on state offshore submerged lands. Described is the employment generated from such development as well as the sources of taxes contributed to governmental funds. Due to Santa Barbara's offshore oil and gas development, actual figures can be given as to the employment figures, governmental expenditures and tax revenues.

37. LaRoe, Edward T. "Effects of Dredging, Filling, and Channelization on Estuaries" Proceedings Fish and Wildlife Values of the Estuarine Habitat: A Seminar for the Petroleum Industry. U. S. Department of the Interior. June 13-14, 1973.

Examines the environmental impacts of dredge, fill and channel activity on estuaries. Places these impacts in perspective by discussing them within the context of an estuarine system. Describes short and long term primary, secondary and tertiary impacts. Suggests several ways to alleviate adverse impacts.

Appendix

DIRECTORY OF AGENCIES AND ORGANIZATIONS

APPENDIX

Directory of Agencies and Organizations

The following list of national and regional offices of Federal agencies and other organizations involved with OCS oil and gas, are starting points for obtaining information on that particular organization's role and activities.

As a rule, regional offices should be the first point of contact by a state program.

Included are:

A. Executive Offices

1. Office of Management and Budget (OMB)

a) Federal Regional Councils

Regional Offices:

David W. Hayes
Region 1
c/o FRC Secretariet
JFK Building, Rm. E431
Boston, Massachusetts 02203
617/223-5421

S. William Green
Region II,
Regional Administrator, HUD
26 Federal Plaza, Rm. 3451
New York, New York 10007
212/264-8068

Daniel J. Snyder, III
Region III
Regional Director, EPA
Federal Buidling, Rm. 4950
600 Arch Street
Philadelphia, Pa. 19106
215/597-9815

Jack Raven
Region IV
Regional Administrator, EPA
1371 Peachtree St.,N.E.
Suite 510
Atlanta, Georgia 30309
404/526-2287

Governor Norman Erbe
Region V,
Regional Representative of the
Secretary of Transportation
300 S. Wacker Drive
Chicago, Illinois 60606
312/353-4000

Ed Forman
Region VI
Regional Representative of the
Secretary of Transportation
1100 Commerce Street
Room 9C28
Dallas, Texas 75202
214/749-1431

Webster Otis
Region IX,
Special Assistant to the Secretary
Department of the Interior
450 Golden Gate Avenue
San Francisco, California 94102
415/556-8200

Bernard Kelly
Region X
Regional Director, HEW
Arcade Plaza Building
1321 Second Avenue
Seattle, Washington 98101
206/442-0420

B. Federal Departments

1. Department of Commerce

a) Economic Development Administration

National Office:

George T. Karras, Director
Office of Public Works
Economic Development Administration
Department of Commerce
Washington, D.C. 20230
202/967-5265

or

Joseph G. Hamrick
Dep. Assistant Secretary
for Planning

202/967-3121

Regional Offices:

Atlantic EDA
600 Arch Street
Philadelphia, Penna. 19106
215/597-4603

Southeastern EDA
1401 Peachtree Street, N.E.
Atlanta, Georgia 30309
404/526-6401

Mid-Western EDA
32 W. Randolph Street
Chicago, Ill. 60601
312/353-7706

Southwestern EDA
702 Colorado Street
Austin, Texas 78701
512/397-5461

Western EDA
1700 Westlake Avenue, North
Seattle, Washington 98109
206/442-0596

b) National Oceanic and Atmospheric Administration

1) Environmental Research Laboratories

National Office:

John Robinson
Environmental Research Laboratories
3100 Marine Avenue
Boulder, Colorado 80302
303/499-6212

Regional Offices:

Atlantic Oceanographic
and Meterorological Labs
15 Rickenbacker Causeway
Virginia Key
Miami, Florida 33149
305/361-3360

Pacific Marine Environmental
Laboratory
c/o University of Washington
WB-10
Seattle, Washington 98105
206/442-0199

1) Environmental Research Laboratories (Continued)

Regional Offices:

Gulf of Alaska, Bering Sea
Project Office
Federal Office Building
Juneau, Alaska 99802
907/586-7438

Arctic Project Office
University of Alaska
Fairbanks, Alaska
907/479-7393

2) National Marine Fisheries Service

National Office:

Dale R. Evans
Chief of Environmental Assessment
National Marine Fisheries Services
3300 Whitehaven Street, N.W.
Washington, D. C. 20035
202/634-7490

Regional Offices:

National Marine Fisheries
Service
U. S. Department of Commerce
1700 Westlake Avenue, N.
Seattle, Washington 98109
206/442-7575

National Marine Fisheries
Service
U. S. Department of Commerce
Federal Building, 709 W. 9th Street
Juneau, Alaska 99801
907/586-7221

National Marine Fisheries
Service
U. S. Department of Commerce
Duval Bldg. 9450 Gandy Blvd.
St. Petersburg, Fla. 33702
813/893-3141

National Marine Fisheries
Service
U.S. Department of Commerce
300 South Ferry St., Room 2016
Terminal Island, Calif. 90731
213/548-2575

National Marine Fisheries
Service
U. S. Department of Commerce
Federal Building, 14 Elm Street
Gloucester, Mass. 01930
617/281-0642

3) National Ocean Survey

National Office:

Commander Archibald Patrick
National Ocean Survey
Marine Mapping and Charting
6001 Executive Boulevard
Rockville, Maryland 20852
301/496-8255

Regional Offices:

Atlantic Marine Center
439 W. York Street
Norfolk, Virginia 23510
703/441-6201

Pacific Marine Center
1801 Fairview Avenue E.
Seattle, Washington 98102
206/442-7656

4) Office of Coastal Zone Management

National Office:

Paul Stang
Office of Coastal Zone Management
National Oceanic and Atmospheric Administration
11400 Rockville Pike
Rockville, Maryland 20852
301/496-8896

5) Office of Sea Grant

National Office:

Dr. Richard Kolf
Sea Grant
425 13th Street, N.W.
Penn Building, Suite 620
Washington, D.C. 20004
202/967-4562

State Offices can be contacted locally.

2. Department of Defense

a) U. S. Army Corps of Engineers

National Office:

Major General J. W. Morris
Director, Civil Works
Office, Chief of Engineers
Washington, D. C. 20314
202/693-7154

Division Offices:

U. S. Army Engineer Div.,
South Atlantic
510 Title Building
30 Pryor Street, S. W.
Atlanta, Georgia 30303
404/526-6711

U. S. Army Engineer Div.,
North Atlantic
90 Church Street
New York, New York 10007
212/264-7101

U. S. Army Engineer Div.,
North Central
536 South Clark Street
Chicago, Illinois 60605
312/353-6310

U. S. Army Engineer Div.,
North Pacific
220 N.W. 8th Avenue
Portland, Oregon
503/221-3700

U. S. Army Engineer Division,
Ohio River
550 Main Street
P. O. Box 1159
Cincinnati, Ohio 45201
513/684-3002

U. S. Army Engineer Div.,
Lower Mississippi Valley
Walnut and Crawford Streets
P. O. Box 80
Vicksburg, Mississippi 39180
601/636-1311

U. S. Army Engineer Div.,
Southwestern
1114 Commerce Street
Dallas, Texas 75202
214/749-3336

U. S. Army Engineer Div.,
South Pacific
630 Sansome Street, Room 1216
San Francisco, California 94111
415/556-0914

U. S. Army Engineer Div.,
New England
424 Trepelo Road
Walthan, Mass. 02154
617/894-2400

3. Department of Interior

a) Bureau of Land Management

National Office:

Gene Herrin
National Resources Specialist
Bureau of Land Management
19th and E Streets, N.W.
Washington, D. C. 20240
202/343-8537

Regional Offices:

Alaska OCS
Bureau of Land Management
121 W. Fireweed Lane
Anchorage, Alaska 99510
206/442-0150

Gulf of Mexico OCS
Bureau of Land Management
1001 Howard Avenue
New Orleans, La. 70113
504/527-6541

Atlantic OCS
Bureau of Land Management
90 Church Street
New York, New York 10007
212/264-7254

Pacific OCS
Bureau of Land Management
300 N. Los Angeles Street
Los Angeles, California 90012
213/688-7234

b) United States Geological Survey

National Office:

Dr. Vincent McKelvey
Director
U. S. Geological Survey
National Center
Reston, Virginia 22092
703/860-7411

or

Russell G. Wayland
Chief Conservation Director

703/860-7524

Regional Offices:

U. S. Geological Survey
1825 K Street, N. W.
Suite 316
Washington, D. C. 20006
202/343-4685

U. S. Geological Survey
Emperial Office Bldg. Rm 336
3301 North Causeway Blvd.
Metairie, La., 70011
504/837-4720

U. S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025
415/323-8111

4. Department of Transportation

a) United States Coast Guard

National Office:

Robert Bergstrom, Commandant (GLRA/81) (Regulation Activity)
400 Seventh Street, S. W.
Washington, D. C. 20590
202/426-1534

LCDR Kenneth Bishop, Commandant (GMVI/83) (Oil Spills)
Merchant Marine Vessel Inspection Division
400 Seventh Street, S. W.
Washington, D. C. 20590
202/426-2190

Regional Offices:

First Coast Guard District
150 Causeway Street
Boston, Massachusetts 02114
617/223-3603

Second Coast Guard District
Federal Building
1520 Market Street
St. Louis, Missouri 63103
314/MA 2-4600

Third Coast Guard District
c/o Coast Guard Base
Governors Island
New York, New York, 10004
212/364-8734

Fifth Coast Guard District
Federal Bldg.
431 Crawford Street
Portsmouth, Virginia 23705
804/393-9611

Seventh Coast Guard District
1203 Federal Building
51 S. W. First Avenue
Miami, Florida 33130
305/350-5011

Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199
216/522-3950

Eleventh Coast Guard District
Heartwell Building
19 Pine Avenue
Long Beach, California 90802
213/590-2311

Twelfth Coast Guard District
630 Sansome Street
San Francisco, California 94126
415/556-9000

Thirteenth Coast Guard District
618 Second Street
Seattle, Washington 98104
206/624-2902

Fourteenth Coast Guard District
677 Ala Moana Boulevard
Honolulu, Hawaii 96813
HO. 5-8831

a) United States Coast Guard (Continued)

Regional Offices:

Eight Coast Guard District
Customhouse
New Orleans, Louisiana 70130
504/527-2611

Seventeenth Coast Guard District
P.O. Box 3-5000
Juneau, Alaska 99801
907/827-1121

C. Federal Agencies

1. Environmental Protection Agency

National Office:

P. A. Wastler
Chief, Marine Protection
Environmental Protection Agency
4th and M Streets, S. W.
Washington, D. C 20460
202/245-3051

or

Henry Van Cleve
Chief, Spill Prevention and Control Board

202/245-3045

Regional Offices:

Region I, EPA
2303 John F. Kennedy Federal Bldg.
Boston, Mass. 02203
617/223-7210

Region II, EPA
26 Federal Plaza, Rm 847
New York, New York 10007
212/264-2525

Region III, EPA
6th and Walnut Streets
Philadelphia, Penna. 19906
215/597-9814

Region IV, EPA
Suite 300
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309
404/526-5727

Region V., EPA
230 S. Dearborn Street
Chicago, Illinois 60604
312/353-5250

Region VI, EPA
1600 Patterson, Suite 1100
Dallas, Texas 75201
214/749-1962

Region IX, EPA
100 California Street
San Francisco, California 94111
415/556-2320

Region X, EPA
1200 Sixth Avenue
Seattle, Washington 98101
206/442-1220

2. Federal Energy Administration

National Office:

Federal Energy Administration
12th and Pennsylvania Avenue, N. W.
Washington, D. C. 20461
202/961-6216

Regional Offices:

Region I
150 Causeway Street
Boston, Mass. 02114
617/223-3703

Region II
26 Federal Plaza
New York, New York 10007
212/264-1021

Region III
1421 Cherry Street
Philadelphia, Penna. 19102
215/597-3890

Region IV
1655 Peachtree St., N.E.
Atlanta, Ga. 30309
404/526-4884

Region V.
175 W. Jackson Blvd.
Chicago, Illinois 60604
312/353-8431

Region VI
212 N. St. Paul Street
Dallas, Texas 75201
214/749-7345

Region IX
111 Pine Street
San Francisco, California 94111
415/556-7216

Region X
909 First Avenue
Seattle, Washington 98104
206/442-7280

3. Federal Power Commission

National Office:

Dr. Marquis Seidel
Office of Energy Systems
Federal Power Commission
825 North Capitol Street, N. W.
Washington, D. C. 20426
202/386-6525

Regional Offices:

Federal Power Commission
Room 500
730 Peachtree Building
Atlanta, Georgia 30308
404/526-5134

Federal Power Commission
U. S. Customhouse
555 Battery Street
San Francisco, California 94111
415/556-3581

3. Federal Power Commission (Continued)

Regional Offices:

Federal Power Commission
Room 2207
26 Federal Plaza
New York, New York 10007
212/264-3687

Federal Power Commission
819 Taylor Street
Fort Worth, Texas 76102
817/334-2631

Federal Power Commission
31st Floor, Federal Building
230 South Dearborn Street
Chicago, Illionois 60604
312/535-6171

D. Legislative Committees

1. National Ocean Policy Study

John Hussey
National Ocean Policy Study
5202 Dirksen Senate Office Building
Washington, D. C. 20510
202/224-9345

E. Private Associations

1. American Petroleum Institute

Dr. Wilson M. Laird
1801 K Street, N.W
Washington, D. C. 20006
202/833-5722

2. National Petroleum Council

Kenneth Belieu, or Marshall W. Nichols
Executive Director
1625 K Street, N. W.
Washington, D. C. 20006
202/393-6100