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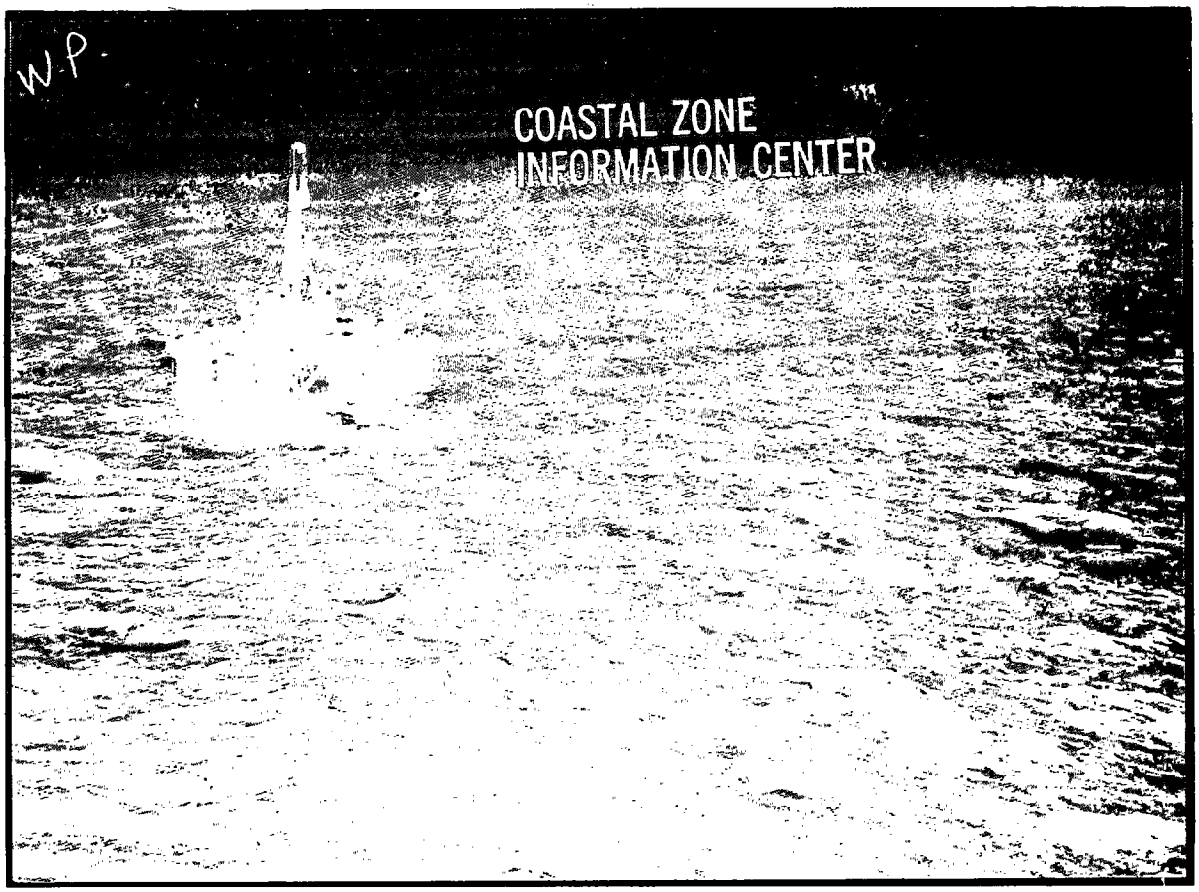
Maine and the Search for OCS Oil and Gas



Charles S. Colgan
Maine State Planning Office

Maine State Planning Office Coastal Program

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MAINE AND THE SEARCH FOR OCS OIL AND GAS

Charles S. Colgan
Economic Planning and Analysis Division
Maine State Planning Office

COASTAL ZONE
INFORMATION CENTER

January, 1978

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3.3	Offshore
3.4	Offshore
3.5	Offshore
3.6	Offshore
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3.9	Exxon
3.10	Offshore
3.11	Offshore
3.12	NERBC
3.13	NERBC
3.14	NERBC
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MAINE AND THE SEARCH FOR OCS OIL AND GAS

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. THE SEARCH FOR OCS OIL AND GAS	7
Federal Leasing and Regulation	11
Exploration	16
Development	24
Production	30
Shutdown	30
III. ONSHORE FACILITIES FOR OCS OIL AND GAS	31
General Siting Considerations	31
Services Bases	34
Platform Fabrication Yards	38
Repair and Maintenance Facilities	44
Pipe Coating Yards	45
Partial Processing Facilities	47
Pipelines and Marine Terminals	51
Gas Treatment and Processing Plants	56
Refineries	58
IV. ECONOMIC AND ENVIRONMENTAL EFFECTS OF OFFSHORE DEVELOPMENT	63
Economic Benefits	63
Economic Costs	74
Environmental Effects	78

Table of Contents (Cont'd)

	Page
Effects on the Fisheries	83
V. OCS POLICY DEVELOPMENT IN MAINE	87
VI. PLANNING FOR ONSHORE IMPACTS	95
Introduction	98
Planning for Effects on the Local Economy	105
Planning for Other Socioeconomic Impacts	109
Summary	109
Appendix A.....Glossary of OCS Terms	105
Appendix B.....Bibliography	131
Appendix C.....Maine Laws which would affect OCS Onshore Facilities	115
Appendix D.....Governor's Open Letter to the Offshore Industry	117

INTRODUCTION

As America's reserves of oil and natural gas have diminished in recent years, the need to search for new domestic sources of petroleum has become more urgent. The Arab oil embargo of 1973-1974 was evidence of America's shrinking domestic reserves, but in fact a significant change came in 1970 when known domestic reserves were less than projected demand for the first time. One major hope is that new sources of oil and gas in the United States are under the ocean, in the area called the Outer Continental Shelf (OCS).

The Continental Shelf is an area of subsea lands which extend into the ocean to a distance of about 200 miles off the coast of America. Oil and gas have been found under the Continental Shelf off the Gulf Coast states of Louisiana and Texas, but it is only in the past few years that the outer edges of the shelf have been explored, and that the search has moved to areas off the coast where exploration has not previously occurred. One of these "frontier areas" is the Georges Bank, an area off New England which is 160-200 miles southeast of Maine (Figure 1.1).

The Federal government, which owns the lands of the Continental Shelf, will sell leases on Georges Bank in January, 1978. A lease will allow an oil company to drill for oil and gas, and if any is found, to produce and sell the oil or gas. With the sale of these leases, the New England states face the possibility of becoming an oil and gas producing region for the first time.

It is not expected that New England could become self sufficient in oil from a find on Georges Bank; the most optimistic estimates are that Georges Bank could supply only about 2 years of New England's needs for oil and gas at 1976 rates of consumption. Nor is a find of oil or gas on Georges Bank likely to decrease the cost of petroleum products to New Englanders. The expense of extracting the oil or gas, transporting it ashore, processing it, and then distributing it will be great, and it is really only at relatively high prices that the investment which must be made will be attractive to the oil companies. For this reason, oil and gas discovered on the OCS is not price controlled by the Federal government.

Even a large find will be only a small addition to total domestic reserves. But what may be only a small addition to the national reserves may bring fairly large changes to areas of New England where the oil companies locate their operations.

Complex technologies and huge amounts of equipment are required to extract oil and gas from 15,000 feet beneath the ocean floor, and in an area such as New England, where no oil exploration has occurred previously, it will be necessary to import all of the equipment and many of the facilities needed for OCS development. This will mean an entirely new industry will locate in New England with large amounts of capital and the possibility of many new employment opportunities.

But since it is not known how much, if any, oil or gas is to be found under Georges Bank, it is impossible to predict how much investment and how many new jobs will be brought by OCS development. Nor is it known what facilities will be located in New England, or in what states or towns they will be located.

Until a find is made, the effects that will be felt in New England, and in Maine, can only be outlined in general fashion. OCS development is not expected to bring major changes to either New England or to Maine. At the height of development, there would be only about 10,000 jobs spread throughout Maine, New Hampshire, Massachusetts, and Rhode Island; the 10,000 total would only hold for 1 - 2 years. Region-or-state-wide, the effects on the economy and on the environment will not be noticed by the vast majority of citizens. However, there is a real possibility that major effects will be noticed in local areas, where onshore facilities locate, or where environmental changes could occur.

Some OCS onshore facilities are large scale industrial operations, which, because of a variety of technical siting requirements, may seek locations in relatively undeveloped sections of New England, where the needs of the facility and the accompanying population's need for new infrastructure may bring significant changes.

There is also the real possibility of environmental damage from oil spills and from the facilities themselves which may affect the Georges Bank fisheries and the coastlines of the New England states'. While the possibility of such damage can be minimized through strict regulation of operations, the use of the latest technologies, and through careful planning, there is an irreducible probability of accidents of some kind over the life of an oil field.

The role that Maine will play in the exploration of Georges Bank is unclear. As this report indicates, there are several possibilities. On the whole, it is not expected that Maine will become a center for OCS-related activity, but some onshore facilities could locate in Maine, and any damage to Georges Bank could affect Maine fishermen. Moreover, existing Maine business firms could find markets in the offshore industry even if facilities do not locate within the State.

There is no doubt that OCS development has some potentially important benefits and some equally important potential costs. The need for new domestic oil and gas reserves is such that the OCS cannot be ignored, and the potential economic benefits are attractive. It is possible to undertake OCS development in a manner which will assure that risks are kept to an absolute minimum. Governor Longley has, therefore, supported OCS development as long as it is undertaken in a manner which assures that potential damage to the environment is minimized.

The State Planning Office has been studying the potential implications of OCS development since 1975, under a grant from the U.S. Department of Commerce's Office of Coastal Zone Management. Much of what has been learned during this period is summarized in this report which presents an overview of the OCS development process, describes the onshore facilities associated with OCS development, outlines the general impacts both environmental and economic, and summarizes the development of State Executive policy on OCS development.

Two other technical memorandums have also been published by the State Planning Office. Services Bases for Offshore Oil provides a detailed description of characteristics and impacts of service bases, and the types of facility which, on balance, is the most likely to be located in Maine. An Annotated Bibliography of OCS Documents in Maine, contains a list of government documents, consultant reports, and other OCS publications which are available at various agencies in Augusta.

Through the OCS Planning Program, a part of Maine's Coastal Program, an attempt has been made to develop information about offshore petroleum development which will be useful to State and local government agencies, and to Maine citizens in general. The uncertainty about future events on Georges Bank as well as onshore activities is a limiting factor on planning, but it can be reduced substantially through an examination of similar experience in other parts of the world — a study of the characteristics of onshore facilities, and a review of the research on OCS development.

A brief summary of the expectations regarding OCS development, which are elaborated upon in other sections of the report, follows.

SUMMARY OF EXPECTATIONS REGARDING OCS OIL DEVELOPMENT ON GEORGES BANK

How much oil or gas might be there?

This is the biggest unknown. The United States Geological Survey, responsible for making estimates, has revised its figures several times. They currently estimate that there is about a 50-50 chance of finding between .15 and 1 billion barrels of oil and .75 to 6 trillion cubic feet of natural gas. This would add to our domestic resources, but would not be considered a major find by global standards.

What Onshore facilities will be located where?

Service and supply bases for boats which carry provisions and supplies to the drilling rigs are certain to come to New England. These are also the most likely of the onshore facilities to locate in Maine, although they are only likely to come as spillover from Davisville, Rhode Island.

If oil or gas is found, several other facilities may be placed somewhere in New England, including:

1. Pipeline construction facilities (coating yards and installation bases) if gas is found, or if oil is to be brought ashore by pipeline.

2. Gas processing plants, which will be located as close to the pipeline landfall as possible.

3. Tanker terminals, if oil is brought ashore by this method, and if a refinery is located in New England.

Refineries and platform construction yards may also locate in New England, but the location decisions for these facilities will depend on several factors other than the discovery of oil and gas on Georges Bank.

Of these facilities, platform construction yards may be located in Maine, although not for several years. Several proposals for refineries have already been made for Maine, and more may follow, with or without the discovery of oil on Georges Bank. Other facilities are not likely to be sited in Maine because of distance and other economic, and technical considerations.

What are the Impacts Likely To Be?

For the region as a whole, it is expected that a maximum of 10,000 people could be employed by the oil industry directly at the height of development activity, with perhaps 5,000 to 10,000 more employment opportunities generated as a secondary benefit. But this would be only for one to two years, and only if a large find is made. Smaller finds will produce fewer jobs. These jobs would be spread throughout New England, with most being in Rhode Island and Massachusetts. Maine would be a secondary location of OCS activities because it is relatively farther from the center of activity on Georges Bank.

On Local Economies?

There is no doubt that onshore facilities can have significant effects on the communities in which they are located, especially if they are located in rural and heretofore non-industrial areas. While most would be big boosts to local economies, large new populations could also strain local services and local businesses. Proper planning and Federal financial assistance could help alleviate some of the larger problems.

On Energy Supply and Price?

Any find will increase domestic reserves, and make supply more dependable. But there is not likely to be much effect on prices. The large investments needed to get to the oil or gas will mean that the products will be expensive, and current Federal regulations allow the pricing of newly discovered oil at the world market price, or what OPEC demands. This price will be charged by developers in order to maximize their economic return.

On the Environment?

Oil spills are the greatest hazard. They can occur offshore during the production of oil through well blowouts, or during transportation of the oil ashore through pipeline breaks or tanker accidents. Tanker accidents are the most likely cause of major oil spills, and small oil spills are associated with the transfer of oil into and out of tankers.

Potential effects of oil on marine life in the area of a spill, and on the Georges Bank ecosystem are still mostly unknown. Research on oil spill effects is complicated by the special circumstances of many spills, and the difficulty of monitoring the effects of large spills on hundreds of square miles of ocean, as in the case of the Argo Merchant. Scientists are observing that spill closely, but it will not provide conclusive answers.

The environmental effects from onshore facilities will be a function of the specific facility and the specific site. In Maine, existing environmental laws such as the Site Location Act and the Coastal Wetlands Act, as well as local zoning and land use controls will be relied upon to assure maintenance of environmental quality.

On Fisheries?

Oil spills do represent a threat to the fisheries of Georges Bank, but the magnitude of the threat is unknown. Current predictions are that the probability of a calamitous destruction of the fisheries is fairly remote. But there are too many gaps in current knowledge about the Georges Bank fisheries to be certain that nothing will happen.

A problem which is likely to occur is competition for physical space between fishing and oil equipment at sea, and competition for berthage and other port services in traditional fishing ports, such as New Bedford.

II THE SEARCH FOR OIL AND GAS ON THE CONTINENTAL SHELF

Oil and gas have historically been produced in the southern and western regions of the United States, but as these reserves have gotten progressively smaller the search has shifted to new areas. One of these areas has been the continental shelf off both the Atlantic and Pacific coasts, including an area off New England called Georges Bank.

The Continental Shelf (figure 2.1) is actually a geologic extension of the continental land mass, and has proved to bear deposits of oil and gas in the same way as the land. Oil and gas are known to occur in the Continental Shelf areas such as the Gulf of Mexico and the North Sea. Off the Atlantic Coast, there are four areas that show the possibility of bearing oil and gas as in the Gulf or North Sea. These areas are indicated in figure 2.2. Georges Bank Basin is depicted in figure 2.3.

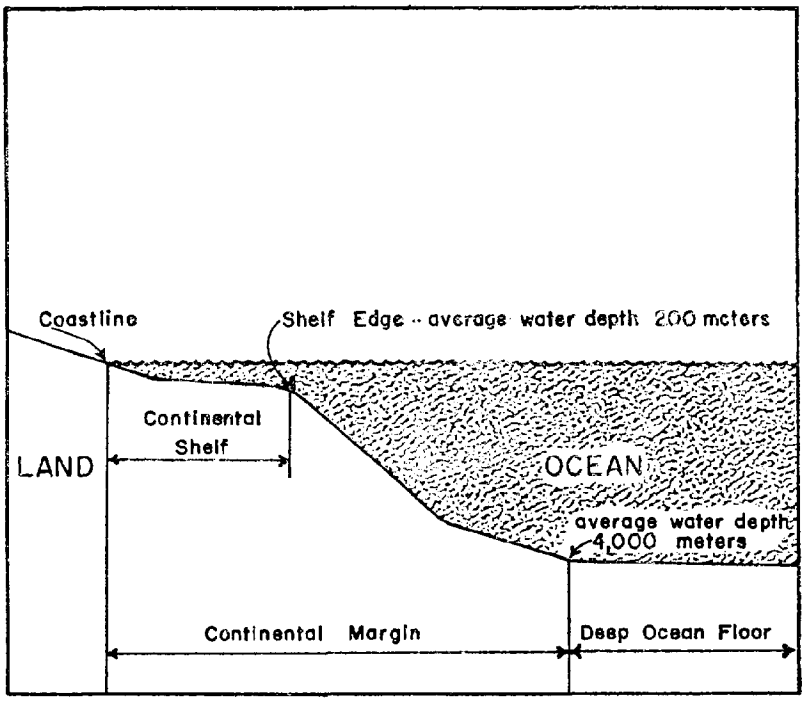

Figure 2.1
Schematic Cross Section of the Continental Shelf

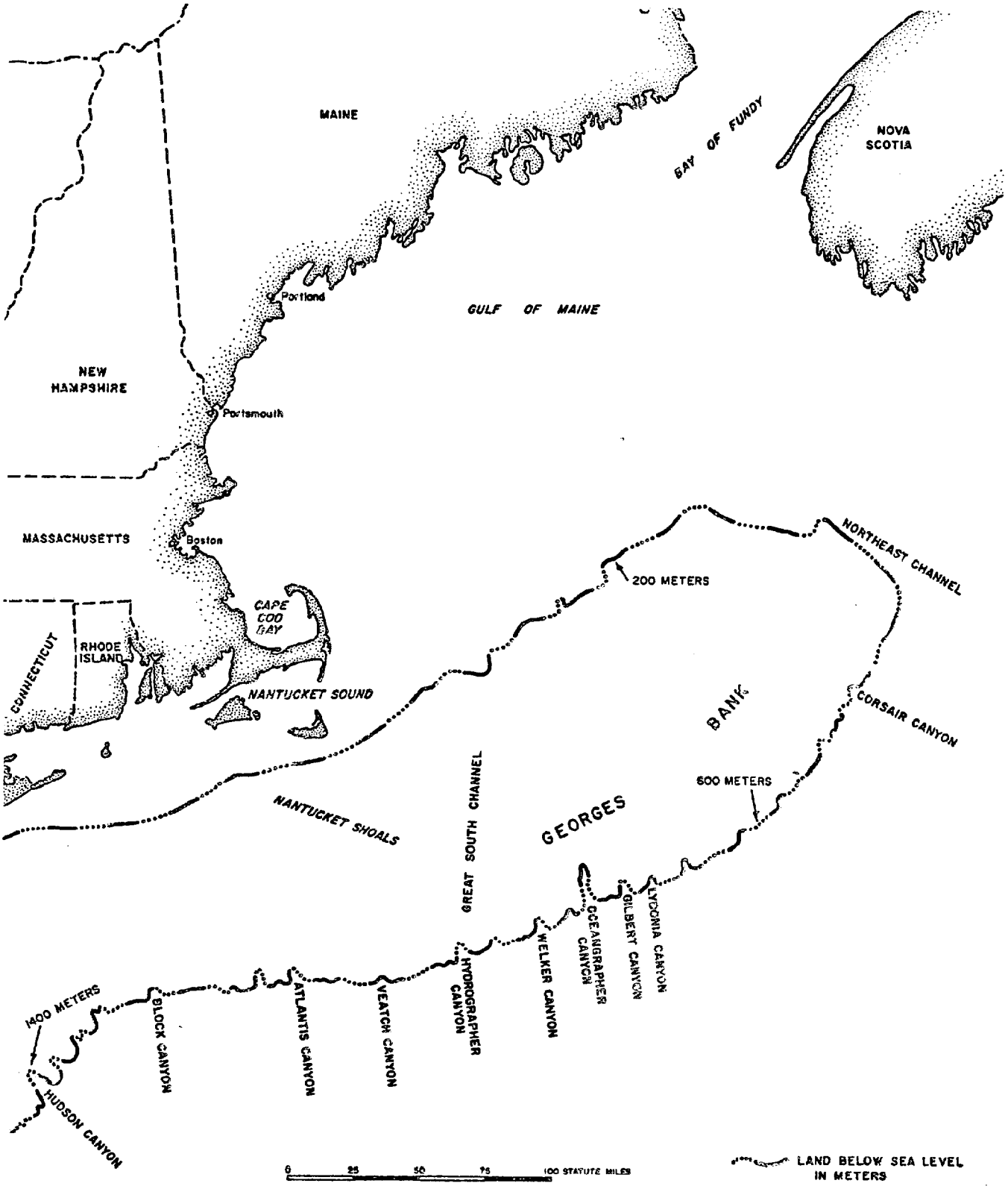

Figure 2.2
Georges Bank

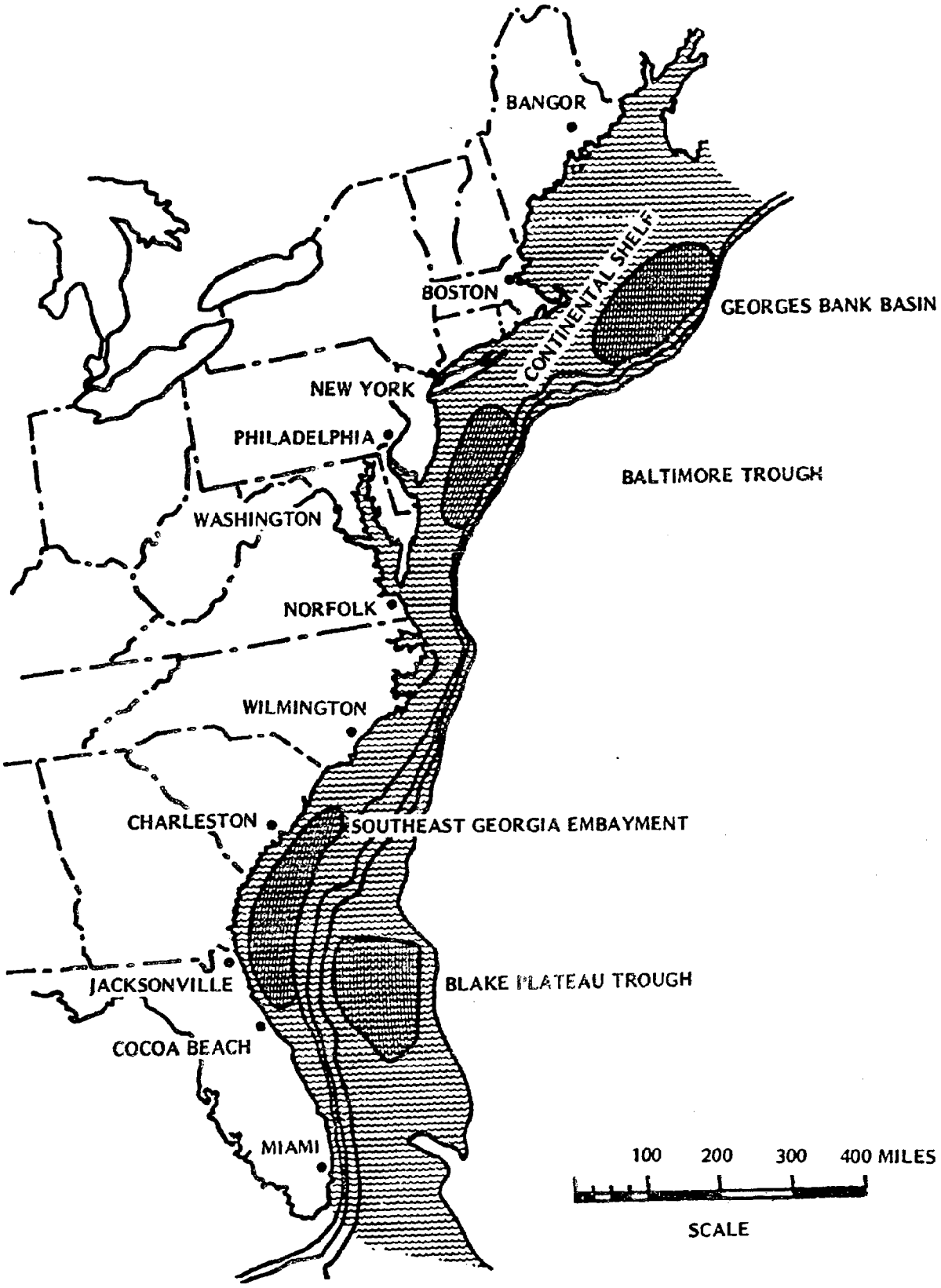

Figure 2.3
Areas of Interest to Oil Companies in Atlantic

The preparation for beginning the search for oil and gas on Georges Bank has been ongoing since 1970, when President Nixon ordered an increase in domestic production of oil because of dwindling reserves and escalating demands. The process was delayed for several years until the title to the Outer Continental Shelf was established by the Supreme Court (in the case of United States v. Maine, et.al.). The first sale of lease rights for exploration on Georges Bank is scheduled for January, 1978.

As Maine faces offshore oil development, it is important to remember that, while there are many uncertainties about what will happen, one uncertainty is paramount: Is there any oil or natural gas under Georges Bank? And if there is, how much? On the answers to these questions rest the answer to all other questions about the effect of Georges Bank oil development.

Table 2.1 indicates the current "best guess" estimates of the probability of finding oil, and the amount there is to be found. These represent, even by the most optimistic estimates, only a relatively small addition to the United States reserves. But, in the light of current known reserves, they would be an important addition.

MAXIMUM ESTIMATED FINDS (25% PROBABILITY)

SOURCE: U.S.G.S.

Atlantic Outer Continental Shelf		Georges Bank	
Oil	Gas	Oil	Gas
4 billion bbl.	14 trillion cubic feet	1 billion bbl.	6 trillion $ft.^3$

LIKELIEST SIZE FINDS (75% PROBABILITY)

Atlantic Outer Continental Shelf		Georges Bank	
Oil	Gas	Oil	Gas
2 billion bbl.	5 trillion $ft.^3$	.15 billion bbl.	2 trillion ft^3

Table 2.1

Offshore oil development begins with the decision of the federal government to lease lands on the Outer Continental Shelf for exploration, and proceeds through a complex series of steps to the lease sale, and then beyond into the operations phases when oil companies actually conduct the search. The following sections discuss the sequence of events associated with OCS development.

FEDERAL LEASING AND REGULATION

The Federal Government, as the owner of the oil and gas resources of the Continental Shelf, decides when the resources should be developed and allows the oil companies to do the actual development. The Government sells leases to the oil companies in an auction. Leases permit exploration for up to five years and grant the leasee the right to sell any oil or gas discoveries. A royalty on oil or gas production is also charged.

The leasing process involves a complex series of steps, which begin several years before a sale takes place. Table 2.2 presents the schedule for the two scheduled lease sales on Georges Bank. A third sale is contemplated, but will not likely be held until the result of exploration allowed under the first two sales has indicated the presence of oil or gas.

The leasing process begins with the Call for Nominations, in which the industry is invited by the Federal Government to identify areas it would like leased. The agency within the Federal Government which has responsibility for this, and all other phases of the leasing procedure, is the Bureau of Land Management (BLM), part of the Department of the Interior. The oil companies choose tracts on the basis of up to ten years of seismic surveying, conducted from vessels of the type depicted in figure 2.3. Such surveys indicate the geologic structures of the Continental Shelf from which petroleum geologists can identify likely petroleum bearing locations.

Once the oil companies indicate the areas of interest, the BLM divides these areas into tracts which are 3 nautical miles by 3 nautical miles, or just over 5,700 acres, (2304 hectares). This list is then published as the preliminary tract selection. States and other interested parties may then comment on the preliminary listing of tracts, and suggest withdrawal of some tracts from the forthcoming lease sale, for environmental or other reasons. Such comments are usually called 'negative nominations'. For Georges Bank, Massachusetts and Maine made several negative nominations for tracts which either were close to shore, or which were in productive fishing or breeding grounds.

A decision on this is not made until the notice of sale is announced, although the Department of Interior has indicated it is thinking of withdrawing most of the tracts that Massachusetts and Maine requested. (figure 2.4). In addition, the State Department recommended withdrawal of several tracts on the eastern end of Georges Bank where the boundary line with Canada has not been established. This was accepted by BLM, and the tracts were withdrawn from the first lease sale.

STEPS IN THE LEASING PROCESS FOR GEORGES BANK

STEP	LEASE SALE 42	LEASE SALE 52*
Call for Nominations	June, 1975	November, 1978
Nominations Due at BLM	August, 1975	January, 1979
Negative Nominations	June, 1976	April, 1979 - June, 1980**
COST Tests	May, 1976 - July, 1977	April, 1979 - June, 1980**
Draft Environmental Impact Statement released	October, 1976	December, 1979
Public Hearing on DEIS	December, 1976	February, 1980
Final Environmental Impact Statement	August, 1977	June, 1980
Proposed Notice of Sale	October, 1977	August, 1980
Sale	January, 1978	November, 1980

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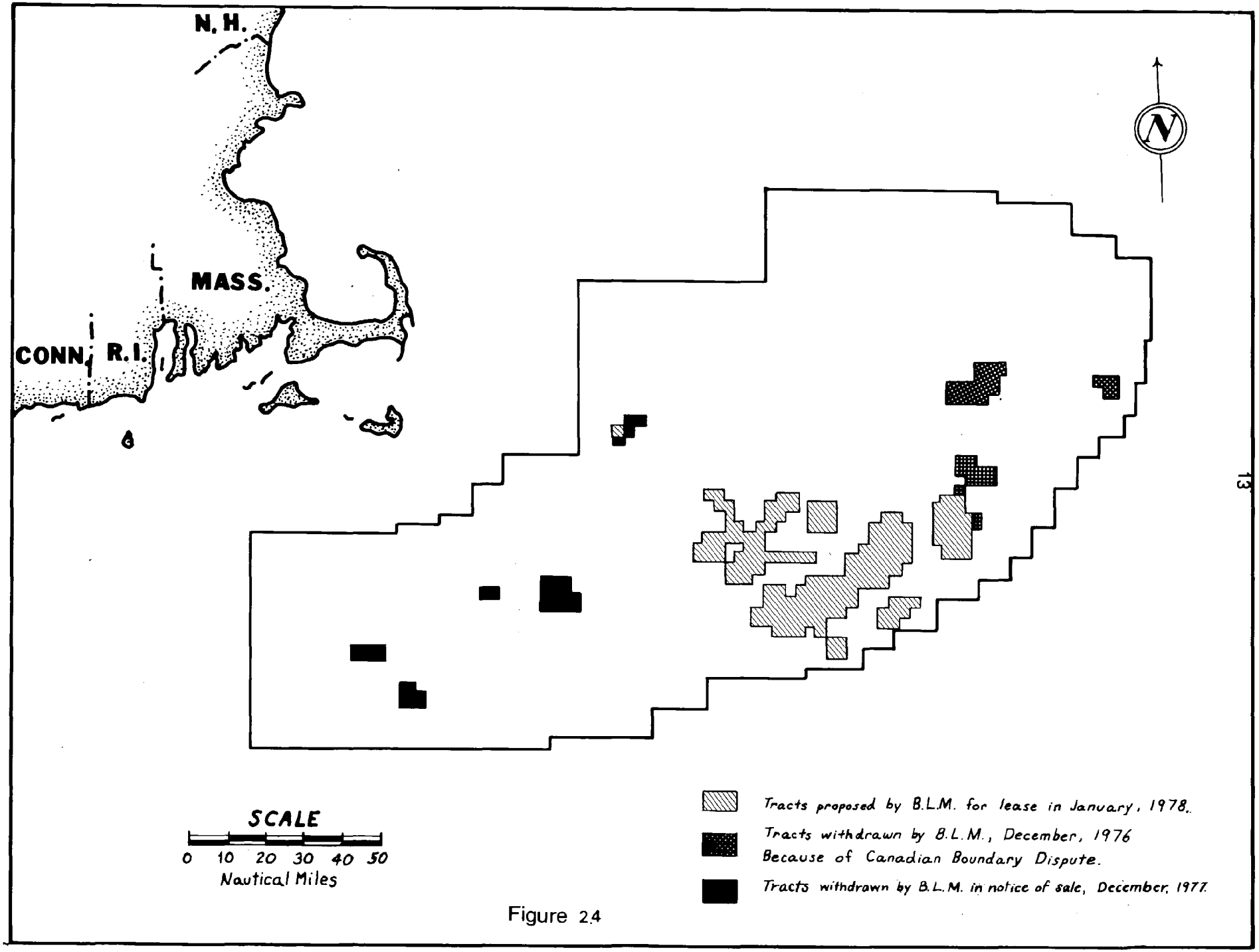
* Tentative schedule, announced by the Department of the Interior in August, 1977.

** Negative nominations and COST drilling will take place during the periods indicated.

TABLE 2.2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SCALE
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Nautical Miles
Tracts proposed by B.L.M. for lease in January, 1978.
Tracts withdrawn by B.L.M., December, 1976
Because of Canadian Boundary Dispute.
Tracts withdrawn by B.L.M. in notice of sale, December, 1977.

Figure 2.4

The preliminary tract selection becomes the basis for the Draft Environmental Impact Statement. The purpose of this study is to examine potential impacts on both the physical and the socio-economic environments in the area. The study was prepared by BLM and submitted to the public and interested parties for review and comment.

The DEIS for Georges Bank was released in October, 1976, and Public Hearings were held in December in both Boston and Providence. Maine testified at the hearing in Boston, and later submitted detailed testimony in writing. In the testimony, Maine reiterated its basic policy in favor of oil development as long as it is accompanied by adequate environmental safeguards, and also reiterated requests for changes in the OCS management process at the federal level (See policy section). Regarding the document, Maine commented that it was far too vague in many sections, and that it did not adequately address the question of what the environmental impacts would be.

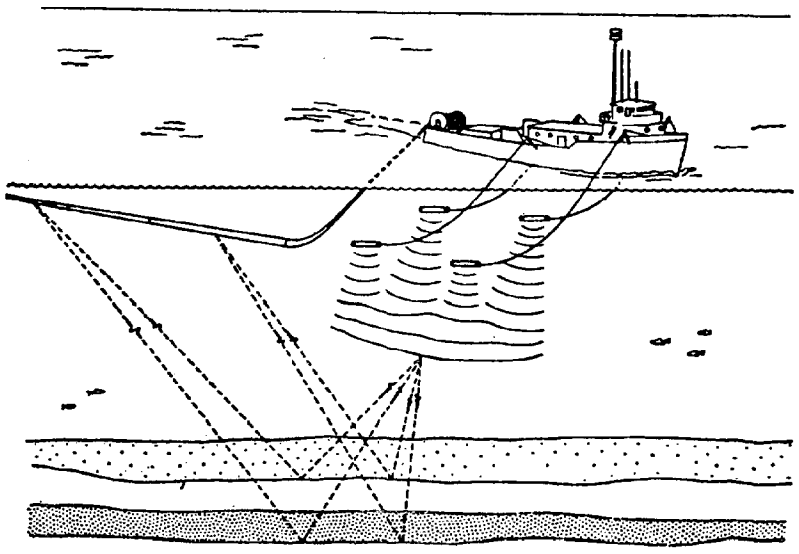


Figure 2.5
Seismic Surveying

Once all the comments have been received, a Final Environmental Impact Statement* is prepared. This Final Statement becomes part of the Program Decision Options Document (PDOD) which is used by the Secretary of the Interior to decide whether or not to hold the lease sale, and if so, what tracts to offer.

At the same time that the Environmental Impact Statement is being prepared, the United States Geological Survey, the agency which has primary regulatory authority for the operations authorized by the leases, prepares the regulations it will impose on operators. These regulations, known as Operating Orders, are prepared first in draft form, and then in final form after a period of review and comment. These Orders cover drilling procedures, waste disposal, marking of offshore structures, and a variety of other details. They also include requirements for disclosure of information to states and affected areas by lease holders.

In addition to the Operating Orders, there is also the possibility of regulation by Lease Stipulation. Conditions of operation are written into the leases by BLM and may cover any or all of the same areas as the Operating Orders. Violation of Lease Stipulations may result in cancellation of a lease.

Once the tract selections have been made, the federal government allows the oil companies to conduct test drilling in the region. These tests, called Cooperative Offshore Stratigraphic Tests (or COST holes), are used to get a better picture of the geology of a region. This information is shared among all companies participating (31 in the case of Georges Bank), the federal government, and the states in the area. It will be used by the oil companies to help decide how much they are willing to pay for the leases when the sale is opened. The federal government uses the same data to decide if the bids are realistic. Two COST holes were drilled on Georges Bank.

To measure environmental effects, BLM establishes an Environmental Studies Program which monitors the environment in a frontier area, both before and after exploration begins. The program involves extensive sampling and measurement of atmospheric and oceanographic conditions, pelagic, benthic, and planktonic populations, and water chemistry. The Program begins when the DEIS is being prepared and continues up to eight years.

Once the Secretary of the Interior has decided to hold the Lease Sale, a final list of tract offerings is prepared, and a date for the sale announced (The Notice of Sale). The actual sale is a sealed bid auction in which the companies submit a bid on either the bonus to be paid to the federal government for the lease, or on the royalty to be paid on all oil or gas discovered. The Department of Interior decides which bidding method will be used. These bids are opened and announced at a public meeting usually in a city near the Lease Sale. The bonuses can run to several million dollars. One tract in the Baltimore Canyon was sold in 1976 for a bonus of 108 million dollars.

* Many of the defects Maine pointed out were resolved in the Final EIS. Maine's and other states' comments, are included in Volume IV of the Final EIS.

The BLM can accept or reject any or all bids, and offer the tracts again in subsequent lease sales. This is not likely to happen with Georges Bank since the trend is recent sales has been towards increasingly higher bids. The 1976 Baltimore Canyon sale saw 401 bids submitted on 101 tracts, with bids totaling 3.5 billion dollars. High bids totaled 1.13 billion dollars. This was more than twice what the government expected to have bid.

PHASES OF DEVELOPMENT

The process of offshore oil development begins after the leases have been sold and continues until either no oil or gas has been discovered in commercially interesting quantities, or all the oil or gas is pumped out. If oil or gas is found, the development process will take between 25 and 30 years and will be divided into four phases:

Exploration

Development

Production and Workover

Shutdown

The timing for these phases will vary depending on when a find is made and how much is found. The figures for 'time required' in Table 2.3 are only the approximate ranges which can be expected. The timing applies to fields and not to an entire frontier area. Oil companies may have different start-up times for their leases, and the government will probably hold more than one lease sale. Thus the activities outlined in Table 2.3 may be repeated several times with different fields. This is important to remember, for while the development phase of one field is progressing, other fields may be being explored, and the production phase in one field may coincide with the development and exploration phase of other fields. The activity level in each phase is different with the development phase being the most active (figure 2.6) but since there may be several development phases, the overall effect onshore may be much different than the schedule would seem to indicate.

EXPLORATION

The exploration phase begins immediately after the leases have been awarded. The oil companies begin to acquire onshore space for service bases and to let contracts for drilling, rigs, boat services, and a variety of other service and material needs.

Before actually beginning operations, the oil companies must submit to the United States Geological Survey (the agency within the Department of Interior which assumes regulatory authority over the OCS once the lease sale has been held) an Exploration Plan and an Environmental Report. The Exploration Plan must list the type and sequence of activities the company will undertake during exploration, note the kinds of drilling structures and equipment to be used, the location of wells, and provide other data describing what will occur during the

PHASE	TIME REQUIRED	ACTIVITY		
		FEDERAL	INDUSTRY	STATE AND LOCAL
Preleased Lease	18 mos.- 2 years	Identify lease areas Call for Nominations Tract Selection Environmental Impact Statement Proposed Operating Orders Review all comments on EIS and operating orders Notice of Sale Sale	Preliminary Geophysical Surveys Nominations of Tracts Comments on: EIS, Proposed Operating Orders COST drilling Preliminary onshore site identification Submit bids	Preliminary Planning Comments on: EIS, Proposed Operating Orders Policy Development Negative Nominations Preliminary promotion (consistent with policy)
Exploration	1-3 years if discovery is made 5 years if no discovery	Review and approve Exploration Plans Review and Approve applications for permits for: drilling, pollution prevention, navigation, etc. Monitor and enforce permits and Review applications and provide assistance to communities and states.	Secure Government Drilling, Pollution, Navigation, etc. Choose sites and develop Temporary Service Bases Put drilling rigs on station if find is made, continue drilling to establish size and configuration of field	Review and Approve Exploration Plans Review and Approve permits for Temporary Service Bases Apply for Federal Assistance Plan for Development phase Continue promotional efforts (consistent with policy) Assist in business development and labor training.
Development	4-9 years	Review and Approve Development Plans - option to require EIS. Approve all permits for development drilling and construction of offshore and onshore facilities Monitor and enforce permits and regulations Provide assistance to states and localities	Permit applications for offshore and onshore facilities for: Production (Platforms, service bases) Transport (Pipelines, tankers, terminals) Processing (Partial Processing, Gas Processing, refineries) Construction of all facilities	Review and Approve Development Plans Review and approve permit applications for onshore facilities Detailed planning for onshore facilities Adjustments in Services necessitated by onshore Promotional efforts (consistent with policy) Business development and Labor training
Production	10-25 years	Monitor and enforce permits and regulations Permitting any new facilities as required	Pump oil and gas from wells, transport, process, and market Well maintenance and workover	Monitor and enforce permits Adjust delivery of public services as required Plan for shutdown
Shutdown	1-3 years	Monitor and enforce permits and regulations	Notify intent to shutdown field Dismantle offshore structures Shutdown onshore facilities that service field being shutdown	Monitor and Enforce Adjust public services as required Assure conversion of land and facilities to profitable uses

Table 2.3

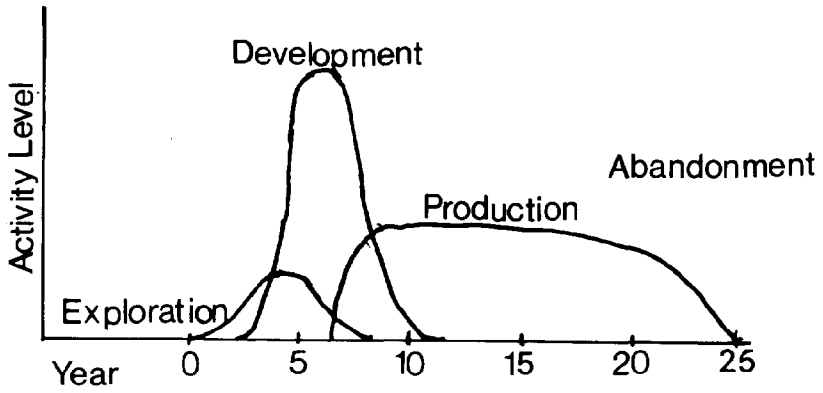


Figure 2.6
Activity Levels During the Phases of OCS Development

Exploration phase. In addition, the oil company must give a general indication of its plans and expectations regarding the development phase, and must certify to the U.S.G.S. that its operations under the Exploration plan are consistent with the approved Coastal Zone Management Plans of potentially affected states. States are also asked to concur with this certification of consistency and are given the opportunity to comment on the overall adequacy of the Exploration Plan.

The Environmental Report which must be submitted along with the Exploration Plan requires the company to describe the environmental characteristics of the areas in which it will be working, both onshore and offshore, identify areas of particular sensitivity, identify the onshore facilities which will be used, together with their characteristics and employment, and define the approximate routes which boats and aircraft will use in transmitting from onshore to offshore operations. Estimates of demand for major supplies of equipment, water, goods and services are also required.

Both the Exploration Plan and the Environmental Report must be accepted by the Geological Survey before permits to drill can be issued.

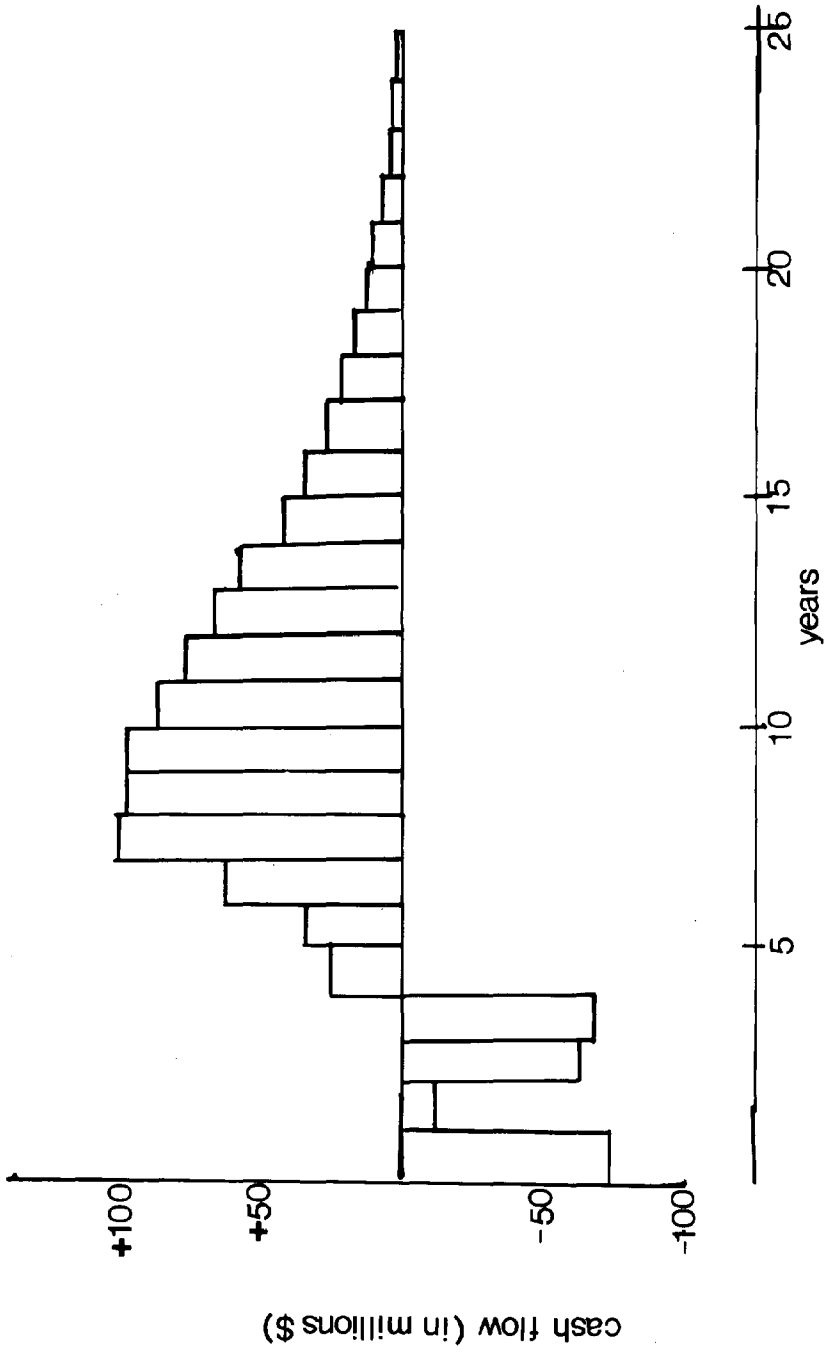


Figure 2.7
Cash Flow of an oil company
which invests in OCS Development

The leasing fees and bonuses that oil companies pay to the Federal government is just a small part of the investment which must be made in an offshore oil field. A field which produces 200 million barrels of oil a day will cost around 400 million dollars (1976 dollars) to develop and put into production. Moreover, as figure 2.5 makes clear, much of this money must be invested before the company can make any money off the field. Oil companies will attempt, therefore, to begin operations as soon as possible once their Exploration Plans are approved.

It should take six to eight months for an oil company to sign the necessary leases and contracts and get approval from Federal and State governments for facilities. It may take longer if approval of facilities and operations plans is delayed or other problems arise. But within six to eight months the exploration process should have begun.

Using the data from their seismic surveys, the companies place mobile drilling rigs in the areas most likely to contain oil or gas and begin drilling. The rigs are of three types: jack-up, semi-submersible, and drill ships. (Figures 2.8, 2.9, 2.10). They are used to drill wells for the purpose of finding out if any oil or gas is present. If either is found, the rigs will be used to drill 'delineation' wells, which attempt to establish the area of the oil or gas field and the depth where it is to be found; from this information the size of the find can be determined.

The drilling rigs in the exploratory phase are also used in the exploration process around the world, and so will probably be brought to Georges Bank from the Gulf of Mexico or perhaps the north Sea; there is great variation in the worldwide availability of rigs from month to month, but oil companies will probably have no difficulty in leasing the necessary equipment.

The rigs are supported by onshore facilities which are usually called Service Bases (sometimes Supply Bases). These bases are the storage area for all the materials needed for drilling, including drill pipe, drilling mud, fuel oil for the rig's electric generators, water, and supplies for the men who work on the rigs. Large boats (figure 2.11), approximately 150-220 feet in length, are used to transport the material to the rigs, with two or three boats assigned to one rig. The boats are in almost constant operation, loading material at the base, traveling to or from the rigs, or unloading the material at the rig.

Exploration is a period of relatively light activity once the rigs are on station and the service bases are operating. The greatest activity is associated with construction of service bases and initial outfitting of rigs. The exploration phase will last until oil or gas is found and the size of the find determined, or until the oil companies abandon the search and/or the lease expires (in five years).

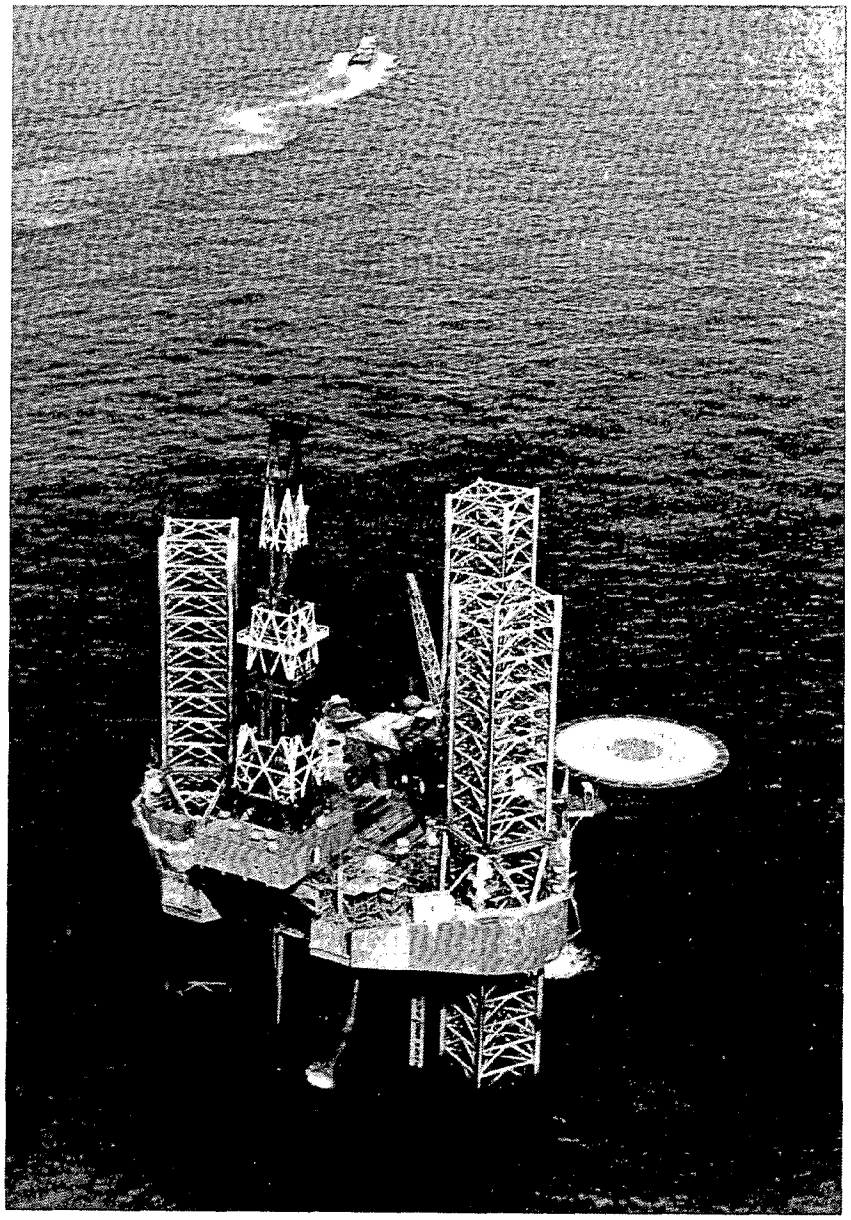


Figure 2.8
Jack-Up Rig

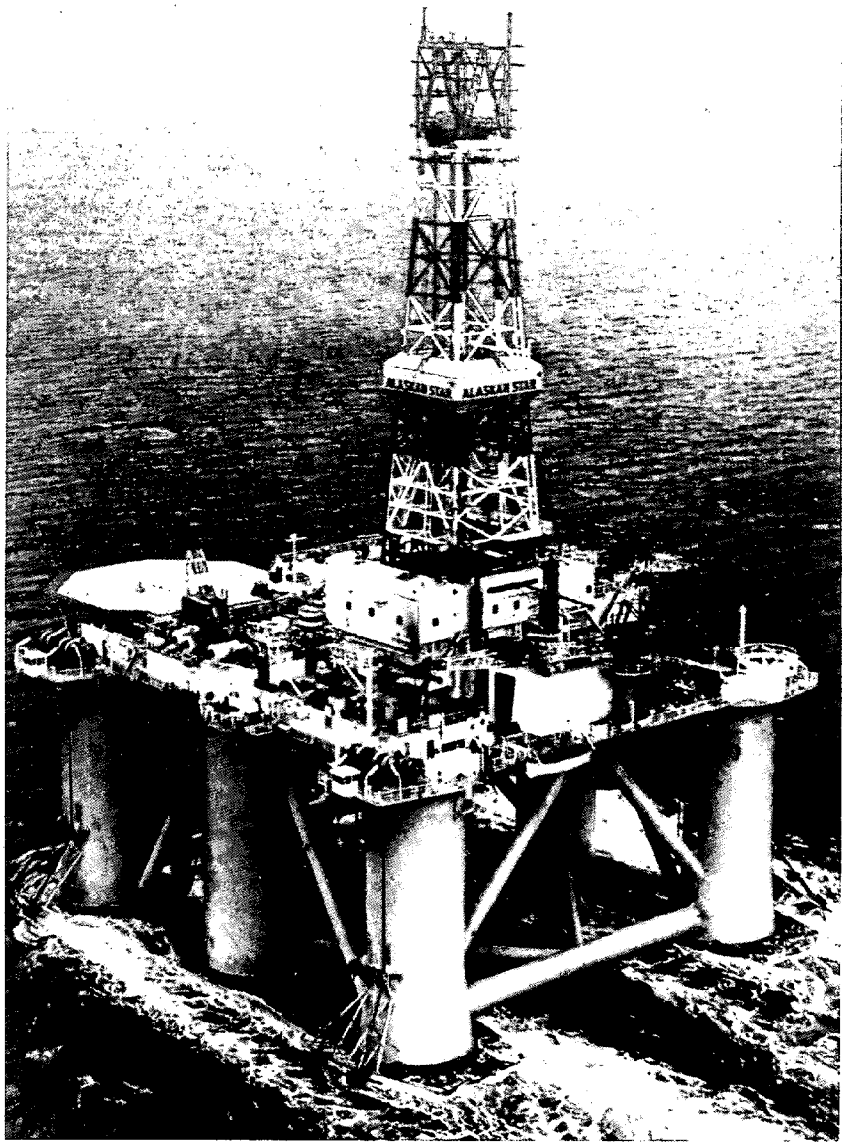


Figure 2.9
Semi-Submersible Rig
This is an example of the newer, self-propelled semi-submersible rigs

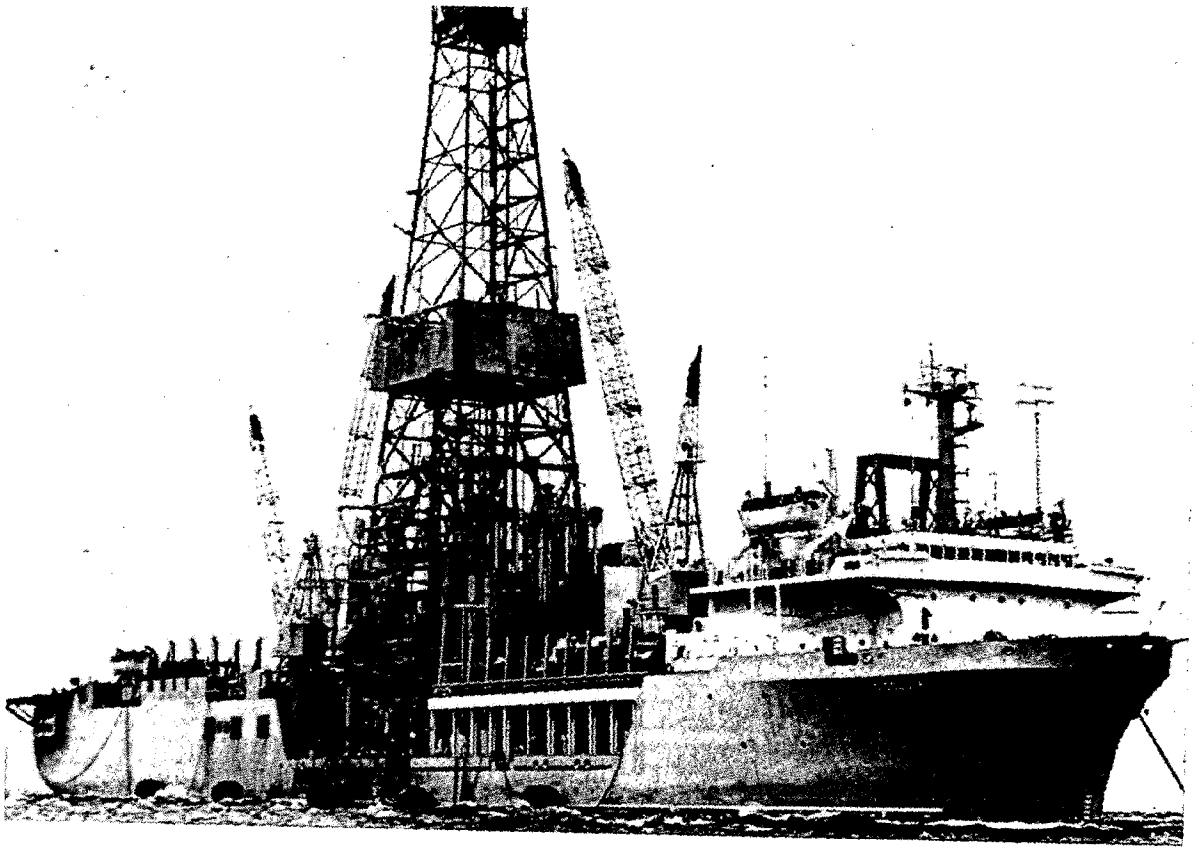


Figure 2.10
Drill Ship

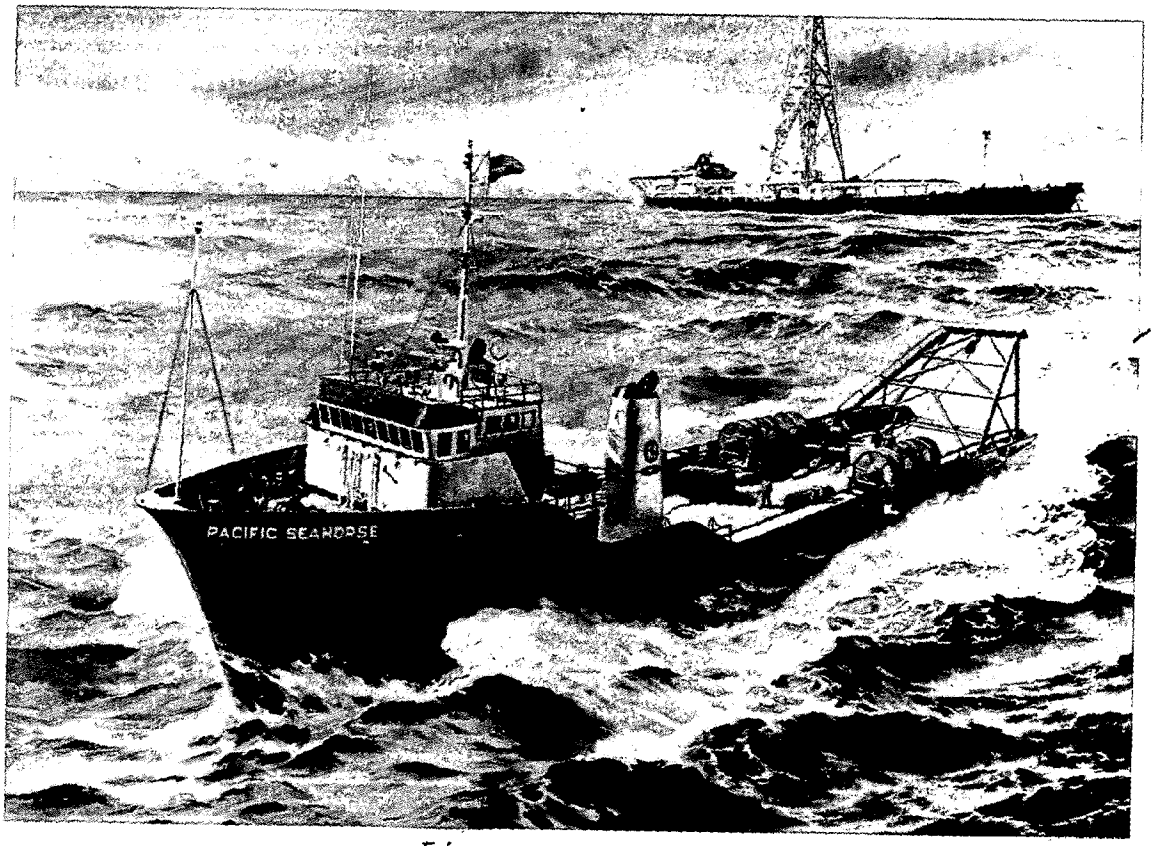


Figure 2.11
Supply Boat

DEVELOPMENT

If oil or gas is discovered, and if the find is sufficiently large to warrant the investment, field development will begin. In order to bring offshore reserves into the energy stream, the oil or gas must be pumped from under the sea, transported ashore, processed, and sold. Each operation comprises a distinct system, and there are numerous options available to oil companies with each system. The development phase consists of first deciding what facilities will be used in each system, and then constructing them. Only when all the systems are in place and operating does the development phase of a field end, and the production phase begin.

Oil companies are required before actually beginning development to submit a Development Plan and Environmental Report similar to those required prior to commencing operations on the Exploration phase. These reports are somewhat more extensive, presenting data on timing of activities, and more extensive ideas of the activities the oil companies will undertake. Again, State government and others will have the opportunity for comment on the adequacy and accuracy of these reports.

In addition to these reports, the Department of Interior may require an Environmental Impact Statement to be written at the time of the application for approval of the Development plans. The Geological Survey will conduct an independent analysis of the potential effects of a development plan, and will decide whether enough information is already available in any previous environmental impact statements to adequately ascertain the environmental effects of development plans. If the Geological Survey concludes that enough information is not available, and this will certainly be the case in frontier areas such as Georges Bank, then a new Environmental Impact Statement will be written. The Statement will of course be submitted for review and comment at public hearings as all such Statements are. The Interior Department also has the option of doing a single areawide Development EIS or separate ones for different parts of an area.

The decisions which oil companies must make are based on a complex set of factors, with each oil field and each oil company requiring different approaches. The factors involved in the decision-making are discussed in detail in Chapter III. The decisions are highly interrelated, but a brief look at the systems in isolation will indicate the wide variety of options available to perform the three basic functions.

Production

Wells must be drilled into the seabed from which the oil and/or gas is to be pumped. This is accomplished from platforms permanently placed on the ocean floor, in contrast to the mobile drilling rigs used during exploration which can be removed after a find is made. The production platforms are constructed onshore of steel or concrete and then towed out to the drill site where they are sunk and permanently anchored to the ocean floor. The superstructure, containing living quarters and drilling machinery is then placed on top, and drilling begun. One platform may serve a wide area, with several wells drilled at angles.

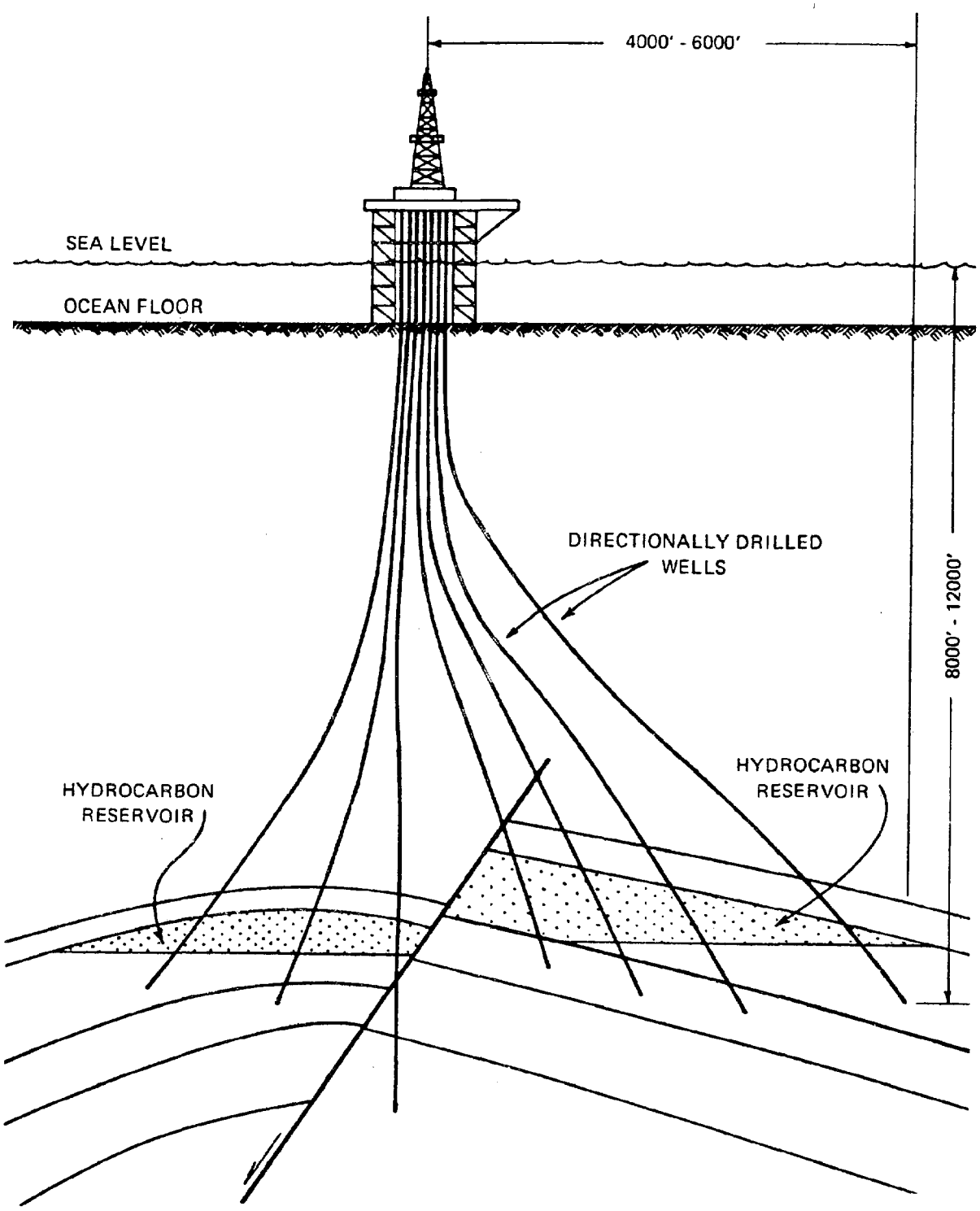


Figure 2.12
Directional Drilling

Most production platforms used around the world are steel platforms, but oil development in the North Sea, where waters are deeper and weather conditions are more severe than in the Gulf of Mexico, has lead to the development of concrete platforms. These are more expensive, but they may be superior where weather conditions are extreme, or bottom conditions are unsuitable for the piles which have to be driven to anchor steel platforms. An additional consideration is the ability of concrete platforms to have storage tanks built into the base for oil; this may be an advantage if tankers are used to bring oil ashore.

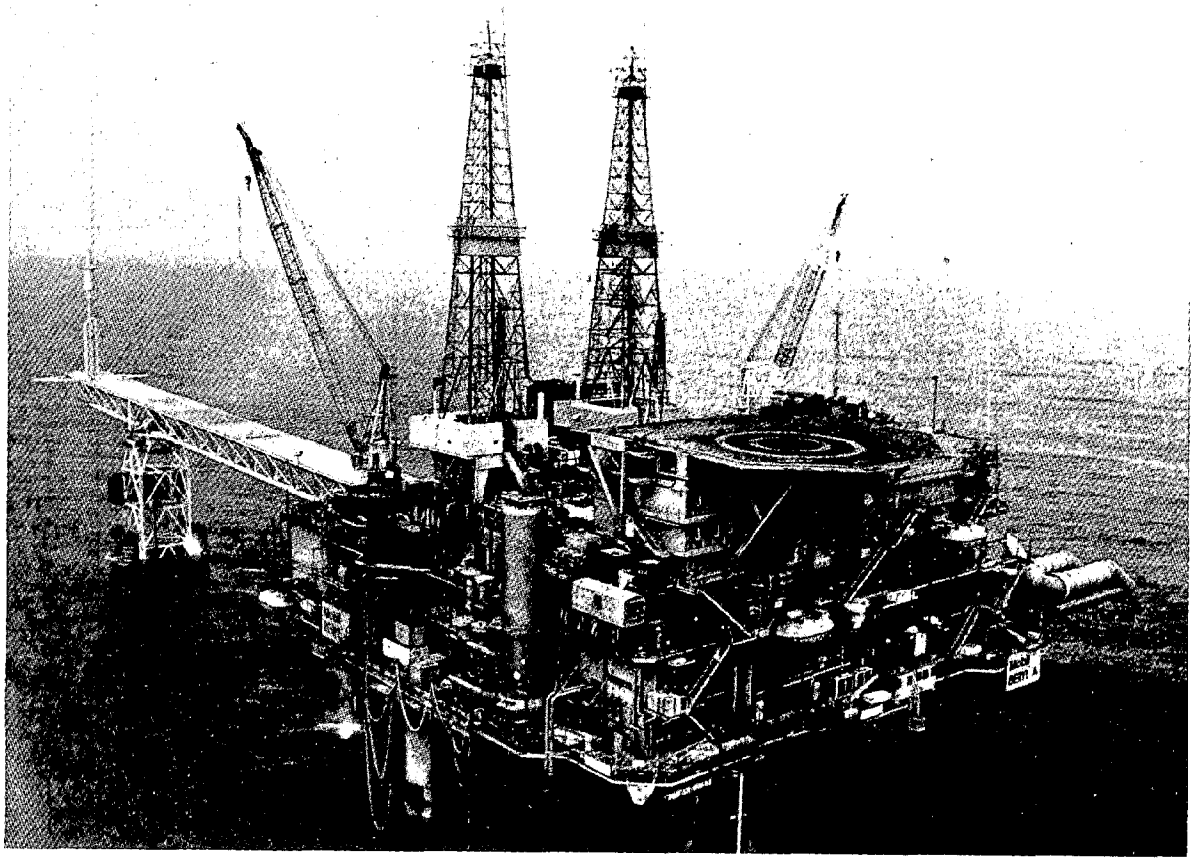


Figure 2.13
Drilling Rig in the North Sea
The Deck section of a drilling rig is illustrated in this figure, showing the crew quarters, helipad, and other gear. The extension to the left is to flare (burn) off unwanted natural gas.

Transport

Once the oil or gas is pumped out of the seabed, it must be transported ashore for processing and selling. For transporting oil, there are two basic options: tanker or pipeline. For transporting gas, there is only the possibility of pipelines, since liquification of gas (for tanker transport) at sea is currently not feasible. But the choice involved in decisions on transport is very complex. The principle factors in the decision are:

The size of the find (is it big enough to pay for pipelines which cost two million dollars a mile, and are thus far more expensive than tankers).

Distance (tankers have lower costs per mile and can take oil to places other than the nearest landfall).

Meterology (tankers are somewhat more likely to cause oil spills loading and unloading in bad weather).

Ocean bottom structure (if there are too many high peaks and low valleys in the ocean floor, pipelines are very difficult to build).

Location of existing onshore facilities (if terminals or refineries are already nearby, these may be used).

Gas find (if gas is found and a pipeline has to be built for it, it is possible the same pipeline will be used for oil).

There are four possible basic transport strategies which are likely to be used. The first would be pipelines only, from offshore well directly to onshore processing. This is the strategy which must be used for gas pipelines, and could be used for oil pipelines, depending on the factors noted above. It is also possible to pipeline the oil ashore, and then transfer the oil to tankers for trans-shipment to a refinery. Tankers could be used to carry the oil directly to refineries or to a terminal where it would be pipelined overland to refineries. In the United States, the oil has been brought ashore almost exclusively by pipeline. In the North Sea, a combination of pipelines and tanker strategies is used.

The choice of transport strategies will dictate the types of onshore facilities which will be required. If tankers are used, the only onshore facility required is a terminal, where the oil is unloaded and then stored in tanks awaiting transfer to the refinery. Such a terminal is essentially the same as those which receive oil brought by tanker now, such as those in Portland or Searsport.

Because oil loading into tankers offshore is a delicate procedure which can be prone to oil spills, if tankers are used there may be a necessity to store the oil offshore during periods of harsh weather. This storage is accomplished either with tanks which form part of the base of concrete drilling platforms, or with concrete storage tanks specifically designed and installed on the seabed for this purpose. These storage tanks are used currently in the North Sea, but their use is not anticipated on Georges Bank.

Pipelines, whether for oil or gas, require a number of different onshore and offshore facilities. Offshore, pipeline laying operations require barges where the sections of pipe are welded together and then layed onto the bottom. A barge which digs a grench in which the pipe lays is also needed. There are also support vessels for the barges, including boats to bring the lengths of pipe to the "lay barge".

Onshore, there must be bases for the support vessels, and a place for the pipeline to come ashore (the landfall). The major onshore facility is the pipe coating yard, where each length of pipe is coated with an anticorrosive compound and then with concrete to add weight. The pipe is fabricated in steel mills and transported to these yards which are located shoreside, and from which the pipe is taken out to the lay barges.

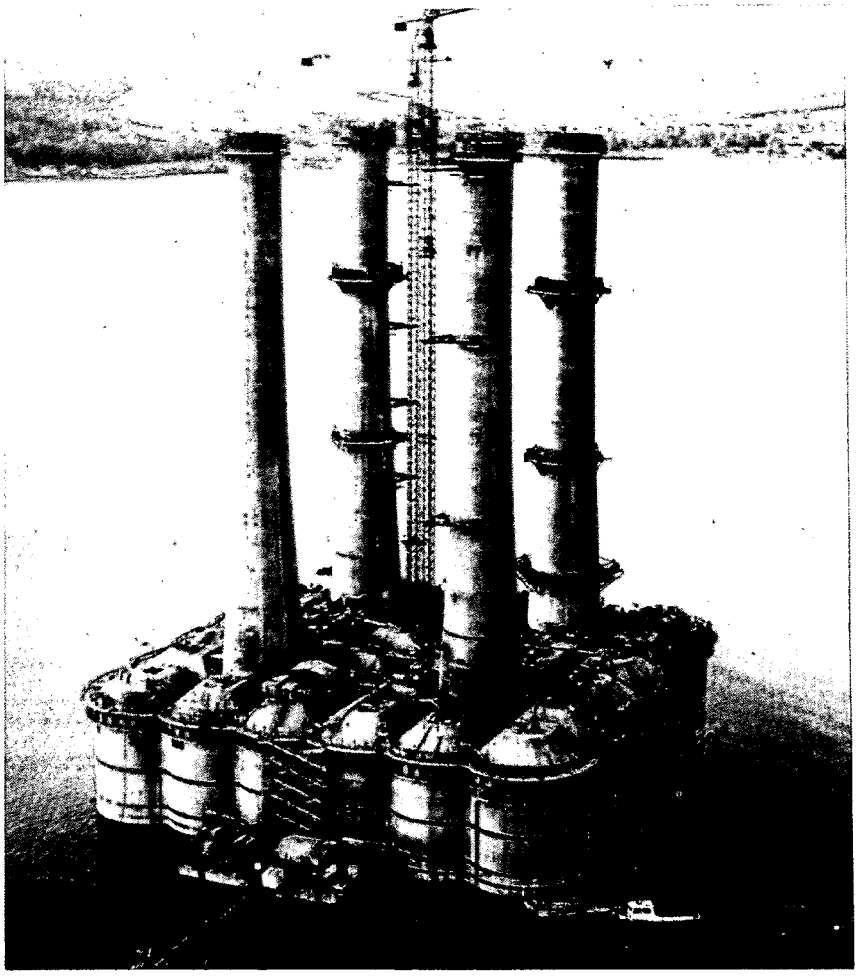


Figure 2.14
Concrete Platform Under Construction
This Concrete Drilling platform is under construction in Norway. The cells at the base hold ballast water and may be used to store oil. The deck sections are yet to be installed.

Processing

Three kinds of processing must be done on the crude oil and gas which is pumped out of wells. In the first stage, water that is trapped in sediment with oil or gas (formation water) must be separated out, since it is not desirable to ship it ashore. This is accomplished on the production platform. The second stage is 'partial processing' in which gas is removed from oil, if they are found together and transported ashore together. In addition a variety of impurities, mostly water and suspended solids are removed from the crude oil. This second stage may be accomplished onshore, or offshore, depending on distance to shore, the size of the pipe to be used, the amount of impurities in the oil stream and the relative cost factors involved in land purchases, etc.

The final processing stage separates the usable products from the crude oil or natural gas. With natural gas, the usable components of ethane, propane, butane, and natural gasoline are separated out in a processing plant which is built between the landfall and the nearest transmission line. Since natural gas is sold by oil companies to gas companies at the wellhead, the processing plant will be situated in such a way as to feed the gas into an existing transmission line owned by the company which buys the gas.

Oil is separated into gasoline, industrial and heating residual fuels, and naptha at refineries. Refineries are the largest and most complex of all onshore OCS facilities, and the most expensive to build. They are not constructed to process the oil from just one source, such as an OCS find; they must be built to process oil from a variety of sources, although one source may predominate for a period of time. Thus the decisions on refinery construction are made with a view toward long term demand and marketing considerations, as well as supply factors. There is no assurance that even with a sizable find a refinery will be built in the area of an OCS development.

Marketing is the final stage in the OCS development process, but this will usually consist of only feeding the new sources of supply into existing distribution systems. There are some circumstances where owners of leases may not be involved in marketing in the area where the oil is found. If that company wished, it could set up a marketing network, or more likely, trade oil or gas with one of the companies that does business in the area.

The development phase will consist of developing and integrating all these systems until the time comes for production to begin. Even if one field is fully developed and producing, however, the facilities for pipe laying and platform construction may be kept busy developing other fields in the frontier area.

PRODUCTION

The activity level in the production phase is significantly lower than in the development phase, since construction of facilities and equipment has been mostly completed. The only major change is the requirement for well workover which occurs every five to ten years. This involves redrilling a well in a manner similar to development drilling, and requires a support activity similar to that phase. Each well will be drilled again, and will require tubular goods (drill stem) and drilling mud. This will increase activity primarily at the service bases.

SHUTDOWN

When an oil field is played out, that is to say, when all the oil or gas that can be retrieved has been, the field is shutdown. This involves the removal of the deck sections from production platforms, and their marking as subsurface obstructions with buoys, and the closing down of onshore support bases. Some onshore facilities, such as platform construction yards and refineries may continue operating in an area long after the field has played out, but facilities that are set up just to deal with one field, such as pipelines, service bases, gas processing plants, etc., are shutdown.

III ONSHORE FACILITIES FOR OFFSHORE OIL

Siting Considerations

The effects of offshore oil development on a region are very much a result of the locations in which the onshore facilities are sited. There are both general and specific considerations in siting decisions, and it is important to gain an understanding of these factors to predict possible patterns of onshore development and to plan for them.

Each facility has specific requirements which are detailed in the sections below, but there are fairly general criteria which guide oil comapnies and the specialized suppliers in making siting decisions.

Above all, the cost is the primary consideration: the investment in capital and manpower required to build and install all the equipment needed to produce, transport, and process the oil or gas found under the sea is enormous. Technology has allowed drilling and production in deeper and deeper waters, but the technology is extremely expensive. Table 3.1 gives an estimate of the costs to develop a 200 million barrel oil field, approximately the smallest size field that is commercially interesting.

To these costs are added the bonus costs which must be paid to the Federal government before any activity can begin, as well as the royalties on any field. There is a great deal of 'up front' money which oil companies have to pay out before they begin to get any return at all on their investment. There is thus an understandable desire on the part of the oil companies to keep costs to a minimum wherever possible. The criteria which follow are applied primarily with the need for cost minimization in mind.

There are three characteristics of the find itself which set many of the parameters within which oil companies must operate:

Size of the Find

The amount of oil or gas actually found is a major constraint since it determines how much return an oil company can expect for its investments. This will, in turn, determine the total amount that can be invested in a field, and will determine to a great extent whether pipelines can be used, and how much site development can be borne for each facility.

Area of Find

Where the find is in relation to the shore, and in relation to other finds affects decisions on what kinds of facilities will be used for transport, and how many platforms will be required to drill the needed wells.

Content of Find

The proportions of oil and gas that are found, and the precise chemical composition of the oil and gas will affect the decisions on where partial processing facilities can be located, whether existing refineries can process the oil

BREAKDOWN OF INVESTMENT FOR A 200 MILLION BARREL OIL FIELD

	$ million	% of Total Cost
Exploration and Delineation Wells	24.0	6
Development Wells	166.0	42
Platforms	95.0	24
Production Equipment and Quarters	60.0	15
Emergency Flares	6.0	2
Storage	24.0	6
Moorings and Lines	10.0	2
Pipelines	9.0	2
Mobilization and Demobilization	3.0	1
TOTALS:	397.0	100

TABLE 3.1

SOURCE: CONOCO

without modification, (and is the size and configuration of gas processing plants). Of course, if gas is found, it will require a pipeline to transport it ashore.

The other general criteria apply to the potential sites onshore. Oil companies will obviously have a preference for pre-existing facilities that are either already functioning, or could be put into operation with minimal investment. There are not many such locations in an area such as New England of course. Though there are some, most of the facilities will have to be placed in areas which require extensive site development. Sites should generally have the following characteristics:

Access to the Sea:

In order to service the offshore operation, onshore facilities must have good access to the sea which includes having a good harbor usable all year round with safe access in any weather and a deep channel as uncrowded with other shipping as possible

Land:

The amount of land needed will depend entirely on what facility is being considered and whether it is expected to be permanent or temporary. In general, however, land must be available in large sections, be geologically suitable for the use to which it will be put, and be zoned (or sonable) for heavy industrial uses.

Transport:

For any of the supply or construction facilities, rail, or at least excellent road transportation as close to the water as possible is essential because of the large amounts of material to be carried. Air transport nearby is also helpful.

Labor:

Oil drilling and production goes on around the clock, 365 days a year, in all but the most extreme weather. The associated onshore facilities (with only one or two exceptions) must operate on the same basis, and so there is a necessity for operations to continue without delays caused by labor problems. Cooperative labor is absolutely necessary, and the oil companies are generally willing to pay to promote it.

Environmental Impact:

Onshore facilities will be placed where the environmental damage will be as little as possible, as much to avoid delays caused by permitting procedures as any other reason.

Distance:

A variety of distances will be taken into account. Most important will be the distance from the onshore operations to the offshore operations. Also to be considered are: the distance from the suppliers of needed materials for drilling and

production, the distance to an oil company's major markets, and the distance to the nearest processing facilities.

State and Local Support:

The oil companies (and their subcontractors) will not go where they are not wanted. Given any alternatives, they will choose to locate where there is local support for their arrival; such support would have to manifest itself in the form of active expressions of approval from state and local government officials. Again, the time and money spent fighting local opposition would generally be too great.

Figure 3.1 gives a schematic representation of the kinds of facilities which are used in offshore oil development, and the relationship between onshore and offshore operations. This diagram is intended only to convey a general sense of the facilities. In actual cases, not all of these facilities would be needed since choices as to pipelines, tankers, the location of partial processing, and the siting of refineries and petrochemical plants are all highly variable. The diagram should not be interpreted to mean that all the facilities will be built as a consequence of an oil or gas find on Georges Bank.

The onshore facilities for offshore oil development are responsible for the major effects that most people will actually notice. The facilities are industrial operations, and as such are generally more compatible with areas of existing industrial activity. But the siting requirements do not always permit this, and it is possible for major onshore facilities to be sited in areas that have not had previous industrial development.

While it is impossible to predict with any certainty the exact number and types of facilities required, or where they might be located in New England, or the effects they will have, it is necessary to have some idea of the kinds of facilities which might come, their characteristics, and the specific siting requirements of each. This section examines the onshore facilities in detail.

Service and Supply Bases *

The bases are (Table 3.2 - Services Bases) the logistical link between onshore and offshore drilling, transferring materials and possibly workers to the drilling rigs. They may be either temporary or permanent. Temporary bases are set up during the exploration phase, and are utilized until oil or gas are discovered. They may then become permanent (meaning for the life of the oil field), or a permanent base may be established on its own.

The service base consists essentially of dock space for large material-hauling boats that are specially designed for the offshore oil industry; warehouse and open storage areas for tubular goods, cement, drilling mud, and other material; a storage tank for the diesel fuel which is used both by the boats, and to power machinery on the rigs; and administrative offices. It is also possible to have a helipad for helicopters which ferry the crews to the rigs, but there is no requirement that heliports be located with supply bases. The size of base depends on how many rigs it is set up to serve, with permanent bases being larger than temporary.

* A complete description of Service Bases is contained in Service Bases for Offshore Oil, (1977) published by the Maine State Planning Office.

SERVICE BASES

SUMMARY OF REQUIREMENTS AND IMPACTS

	Temporary Bases *	Permanent Bases
Land:	5-10 acres on an all-weather harbor	50-75 acres on an all-weather harbor
Waterfront:	200 feet of wharf 15-20 feet water depth	400 feet of wharf 15-20 feet water depth
Fresh Water:	5,200,000 gal/rig/year during drilling	8,200,000 gal/platform/year during drilling
Fuel:	26,000 bbls/rig/year during drilling	54,000 bbls/platform/year during drilling 19,200 bbls/platform/year during production
Labor:	45 jobs/rig	50-60 jobs/platform during drilling
Wages:	approximately $734,000 per year	approximately 51,000,000 per year
Capital Investment:	$150,000 to $250,000	$1,000,000 to $3,000,000
Air Emissions:	hydrocarbons from fuel storage tanks and transfer operations; carbon monoxide and nitrogen oxides from machinery and vehicle exhaust	
Wastewater Contaminants:	hydrocarbons and heavy metals from bilge and ballast water discharged by boats	
Noise	up to 85 decibels on a 24-hour basis	
Solid Wastes:	up to 6 tons per day during drilling operations, including hazardous, oil-contaminated wastes	

Requirements and impacts of bases supporting platform and pipeline installations are similar to those of temporary service bases.

TABLE 3.2

SOURCE: NERBC

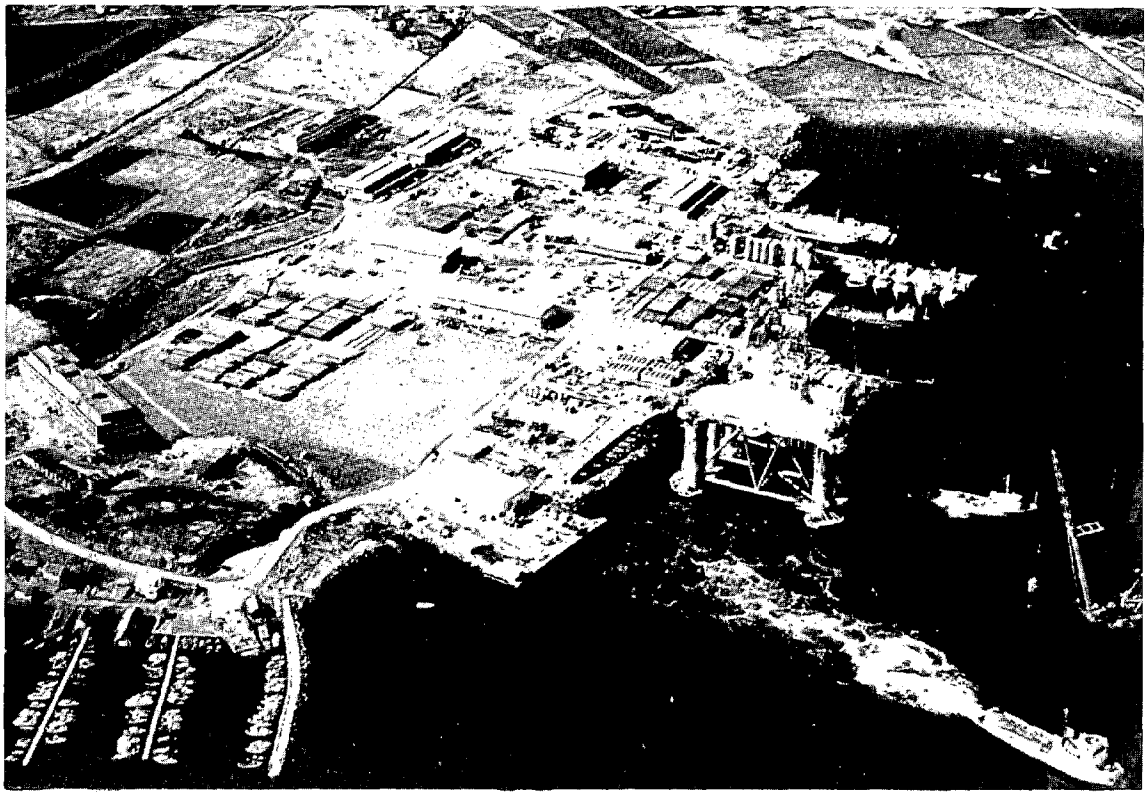


Figure 3.2
Service Base, Scotland
This is one of the largest Service Bases in Scotland, with room for several Service Boats and a Semi-Submersible rig awaiting repairs.

The base will operate 24 hours a day, 365 days a year, since that is the way the rigs operate. Two or three boats usually service one rig, with one boat loading, one traveling, and one unloading at all times. When the base or the boats cannot deliver supplies, and hence the rig is not operating, the minimization of 'down time' is attempted to the maximum extent possible.

In addition to the bases which supply material for drilling rigs, there are also service bases for pipelaying operations and for platform installation operations. These bases are essentially similar to supply and service bases for drilling rigs in both appearance and operation. Bases for pipelaying operation will usually be located at or near a pipecoating yard and serve primarily to transport the sections of pipe out to the lay barge. Platform installation bases are home to the ocean going tugboats which pull the platforms onto the station and then supply the installation process.

Service bases for drilling are either owned by the oil companies, or leased from specialized subcontractors; these subcontractors may set up just to run service bases, or they may be large boat companies. Oil companies will sometime prefer to own the base if long term commitments are desirable, such as in permanent service bases, or if a base will be serving a large area.

Siting

The siting requirements for temporary and permanent service bases are, except for size, basically the same. Temporary service bases are more likely to be on leased land (with purchase options if possible), and are more likely to be established in existing harbors where possible. Temporary service bases should, of course, be expandable if a find is made.

The specific requirements are indicated in Table 3.2

Service base sites for Georges Bank exploration have already been established at Davisville, Rhode Island, the site of the former Navy base at Quonset Point. The drilling rigs for the COST tests were supplied from this site which had almost all the requirements of a service base already met. In addition, it is located so as to be able to serve Georges Bank and Baltimore Canyon development.

It is entirely possible that service base activities will locate in Maine. Several sites in Maine, including Portland, South Portland, Bath, Rockland, and three towns on Penobscot Bay, (Belfast, Searsport, and Stockton Springs), have sites that are potentially useful as temporary or permanent service bases. Moreover, these sites would be as close to many of the tracts on Georges Bank as would Davisville, as figure 3.4 shows. Governments in these towns have already expressed a willingness to seek service bases for their towns, and prepared site evaluations with funding from the State Planning Office.

There are other possibilities for service bases in New England, including Boston and New Bedford, Massachusetts, and Providence or Newport in Rhode Island. Maine ports will be competing with these and other potential sites for service base activity which does not locate in Davisville. If a large number of companies win leases on Georges Bank, or if oil is found fairly quickly, then it is likely that there will be enough demand for service bases that Maine would be seriously considered. Maine is perhaps most likely to become a service base site when the second Georges Bank Lease Sale takes place. It is expected that tracts on the eastern 1/3 of Georges Bank, which would be closer to Maine, will then be sold.

Impacts

The impacts from a service base can be expected to be relatively less than that of the larger onshore facilities. Service bases require a small operating workforce, although there may be a large influx of people during construction (or expansion) of a base. The exact number of people would depend on the amount of construction required; if an existing facility can be converted to a service base the construction impacts will be considerably less than if a facility is to be built from scratch.

It should also be noted that service bases come in a variety of sizes, depending on the operations offshore that they will support. Bases may be quite small, if they are only serving three or four drilling rigs. But they may be much larger if they serve several drilling rigs, and pipeline and platform installation operations. Impacts will be consonant with the size of the base.

1

The environmental impacts from service bases are expected to be relatively minimal. Oil and other materials handled at the base may be spilled, but the quantities are likely to be much less than those handled at existing oil ports. Noise from 24 hour operations may be a problem, as would the lights from the facility; this would depend on how close the facility was to residential areas. Air quality may be affected by emissions from oil storage tanks or from the dry chemicals (mud and cement) which are stored with the facility. Since all solid waste from offshore operations must be brought ashore, the service base must have access to disposal means. A special problem may be the disposal of oil contaminated drilling mud; federal regulations forbid the disposal of this material in the oceans, so it must be transported ashore. It must then be taken to a facility which is capable of recovering the oil from the mud. This is not expected to be a serious problem, however, since new technologies have by and large eliminated the oil contamination of muds.

PLATFORM FABRICATION YARDS

If oil or gas is found, the resources are pumped out of the seabed from platforms which are permanently emplaced on the seabed. The platforms support drilling equipment and living quarters similar to those rigs which did the exploratory drilling. There are two kinds of platforms: steel and concrete. Steel platforms (Figure 3.3) are by far the most common, used in all waters off the United States. They are built on their side, and then towed to the station on barges; there they are up-ended and sunk to the seafloor by flooding the bases (Figure 3.4). Next piles are driven through the legs to anchor the platform to the seafloor. Drilling equipment and other quarters are then placed on top.

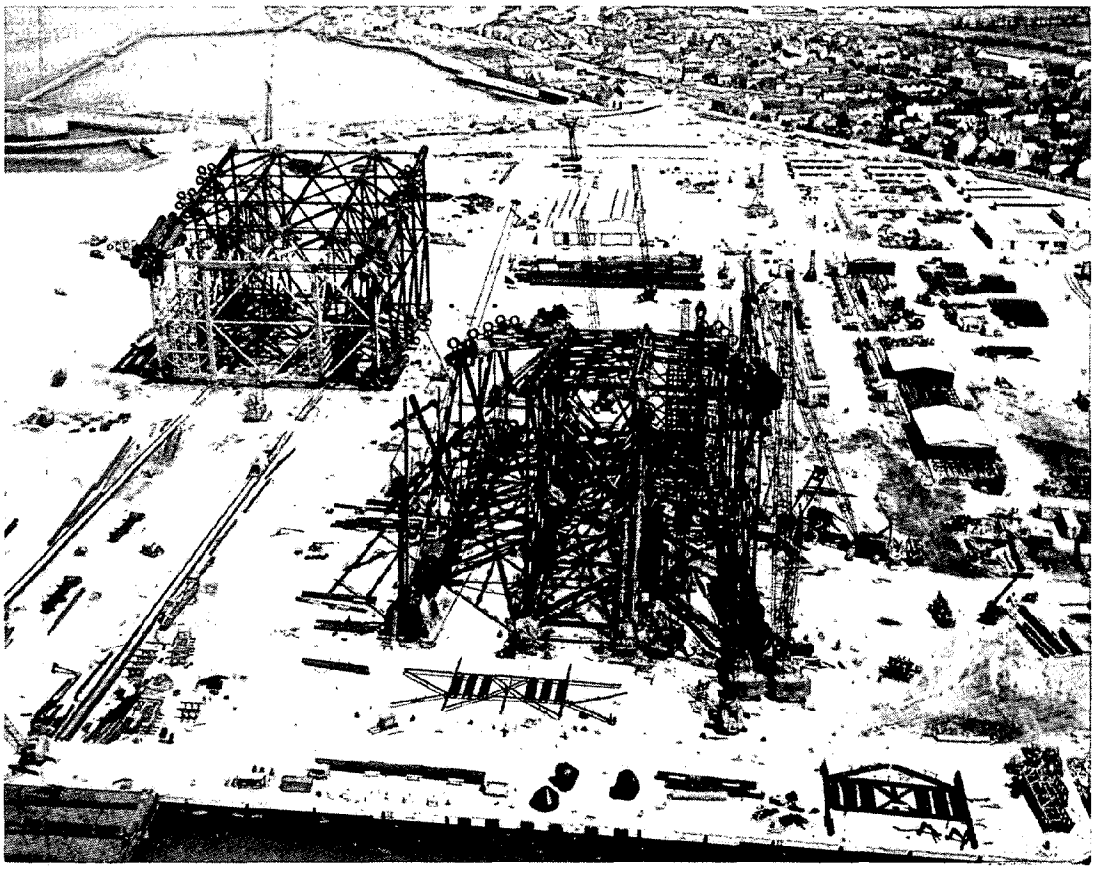


Figure 3.3
Steel Platform Fabrication Yard

Concrete platforms are a more recent development and are used primarily where weather, ocean, and seabed conditions require greater stability and higher endurance. Thus, concrete platforms have primarily been used in the North Sea. Concrete platforms rest on the seabed by virtue of its tremendous weight, which is a function of both the concrete and the cells in the base of the platform which hold water for ballast. These cells can also be used to store oil that has been pumped out of the seabed; this is a useful feature when tankers are used for it allows the oil to be stored during periods when tanker loading at sea is impossible because of weather. Concrete platforms are built in a different manner from steel platforms (Figure 3.5), being built upright in several stages nearshore and then towed out to the station. It takes longer to build a concrete platform, but they are easier to install.

Siting

The construction of the two types of platforms is basically different, but the construction yards are not really dissimilar. Both require large amounts of open, flat, well-drained land, at the waters edge. A large amount of waterfront is required for the loading of platforms on to barges (or drydocks) and for the arrival of material, which may also be by barge.

Figure 3.4
Launching A Steel Platform
This platform is being launched from a barge. The lower ends of the legs will be flooded to sink the platform to the sea floor.

CONCRETE PLATFORM FABRICATION YARD

SUMMARY OF REQUIREMENTS AND IMPACTS

Land:	20-50 acres per platform
Depth at Wharf:	20 - 40 feet minimum; 35-50 feet preferred
Sea Access Clearances:	over 400 feet (vertical)
Water	40,000 gal/day at a one-platform concrete yard (165,000 gal/day at peak activity)
Energy:	3 megawatts at a one-platform concrete yard; 45,000 gal diesel fuel stocked at a one-platform concrete yard; 11 tons gas stocked at a one-platform concrete yard
Labor:	350-450 average; peak 600-1200
Wages:	$8.8 million total per year (l platform), average wage $19,550
Air Emissions:	sand and metal dust from sandblasting, dust from cement storage silos and concrete mixer plant; hydrocarbons and other organic compounds from paint evaporation; carbon monoxide, sulfoxides, hydro carbons, and nitrogen oxide from vehicles
Wastewater Contaminents:	heavy metals, particulates, anti-fouling chemicals
Noise:	80-100 decibels on 24-hour basis
Solid Waste	packaging materials, metal scraps, contaminated debris

TABLE 3.4

SOURCE: NERBC

STEEL PLATFORM FABRICATION YARDS

SUMMARY OF REQUIREMENTS AND IMPACTS

Land:	400-800 acres
Depth at Wharf:	15-30 feet
Sea Access Clearances:	210-350 feet (horizontal and vertical)
Water:	100,000 gal/day at a steel platform yard, employing 1, 500 workers
Energy:	not available
Labor:	250-550 per steel platform (average)
Wages:	$30 million total per year at a steel yard (2-4 platforms/ year): average wage $19,000
Air Emissions:	sand and metal dust from sand blasting hydrocarbons and other organic compounds from paint evaporation: carbon monoxide, sulfoxides, hydrocarbons, and nitrogen oxides from vehicles:
Wastewater Contaminants:	heavy metals: particulates, anti-fouling chemicals.
Noise:	80-100 decibels on a 24-hour basis
Solid Wastes:	Packaging materials, metal scraps, contaminated debris

TABLE 3.5

SOURCE: NERBC

The site is usually open for the most part, with large areas devoted to materials storage. Machine shops, administration buildings, and other sheds are also present. Large sheds for the building of deck sections may be at the same site or the deck sections may be built separately (Figure 3.6). Yards may contain their own rail transport system for materials handling, and for the mobile cranes which are required for building.

The biggest difference between the yards for concrete and for steel platforms is in the waterfront requirements. Concrete yards are built first in drydocks in which the cells are constructed, and then floated out to deeper water where the tower is constructed. The construction of concrete platforms thus requires deeper water right up to the construction site than is required for steel fabrication. In addition, the vertical construction of concrete platforms requires that there be no overhead obstructions (such as bridges or transmission lines) on the route from the yard to the open sea.

A find of oil or gas in a frontier area does not necessarily mean that a platform fabrication yard will be built in the area. The platform, whether steel or concrete, can be towed long distances from the construction site to the drilling location. For example, platforms for drilling off Brazil have been built in Scotland. There is a need for a fabrication yard in a frontier area only if demand will be high enough so that the cost of building a yard will be less than the cost of towing the platforms from the nearest facility. The platform fabrication business is also a highly competitive one, and so the market situation at the time a find is announced may be a major factor. Platform construction companies will usually not decide on the building of a fabrication yard, therefore, until after a find is made, and its size estimated. Companies may, however, take options on potential sites before a find is made.

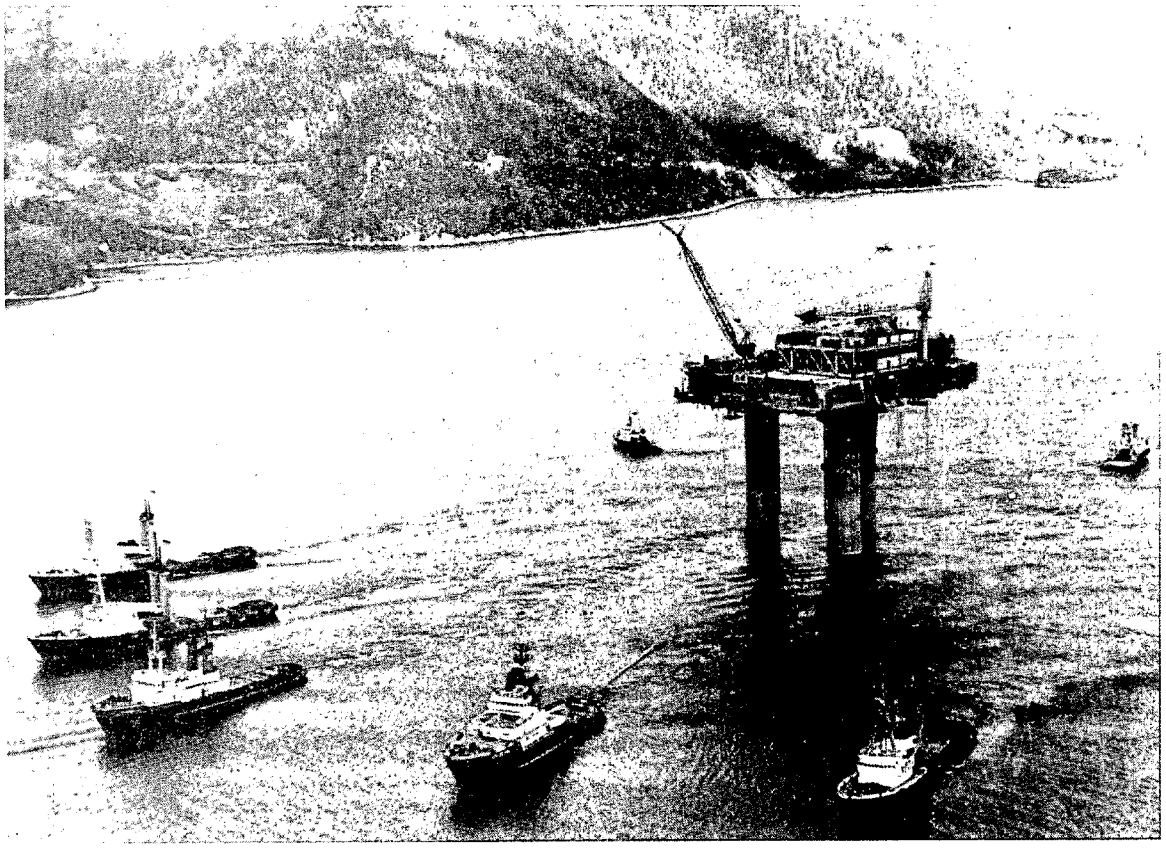


Figure 3.5
Concrete Platform being towed onto station in the North Sea

For Georges Bank, the decision to build a platform fabrication yard (either steel or concrete) will rest almost entirely on the size of any find that is made. If it is a large find, there is a good possibility for a platform fabrication company to seek sites in New England. If not, then platforms could be constructed in the Gulf of Mexico or at a site in Cape Charles, Virginia where Brown and Root, one of the larger platform fabricating companies, has options on a site to serve all the frontier areas of the Atlantic.

A steel platform yard could be built at several sites in New England, including several in Maine. Most estimates at this time are that only steel platforms will be used on Georges Bank. However, concrete platforms could be used for several reasons: weather conditions on Georges Bank are acknowledged to be as bad or worse than that in the North Sea; a find that is not large enough to justify a pipeline and thus requires tankers to bring the crude oil ashore might make concrete platforms, with their built-in storage capability, attractive; and competition between steel and concrete fabricators may induce a concrete fabricating firm to put a yard in a frontier area such as New England. If a concrete platform yard is to be constructed in New England it is likely to be built in Maine, the only location on the East Coast with water deep enough to accomodate such a facility. This possibility remains highly problematic, however, and will not occur for several years.

Impacts

The impacts, both socio-economic and environmental, of platform fabrication yards stem primarily from the fact that this is the largest of the onshore facilities in terms of operating employment and materials handled. The large population influx may cause major dislocations in almost any area where a yard is located, and may have a tremendous impact in a rural, non-industrial area. Permanent changes in an area will be the likely result of a platform fabrication yard's location.

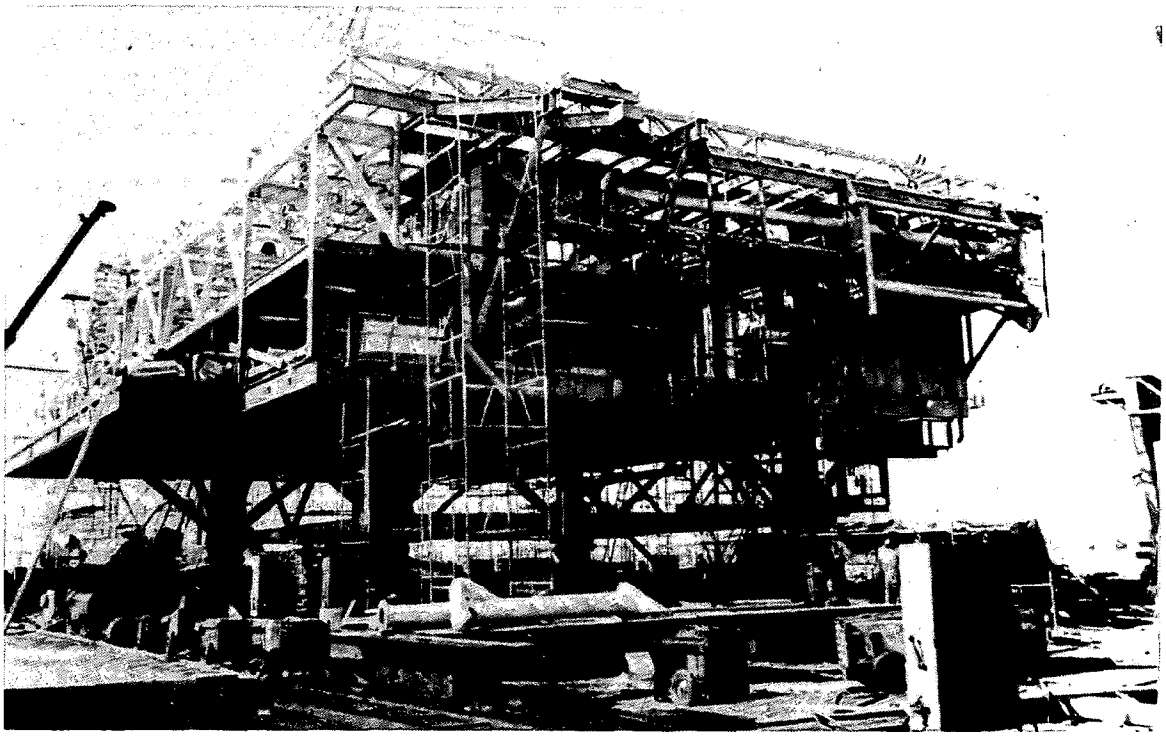


Figure 3.6
Deck Section under construction

The environmental impacts are primarily noise, dust, and large amounts of solid waste in the form of metal scraps and other materials. The change in land use and visual impacts are also major considerations.

REPAIR AND MAINTENANCE FACILITIES

Description

The immense amount of equipment and the complex technologies required to develop offshore oil reserves call for repair and maintenance facilities to be nearby and available at all times. Of paramount necessity is the minimization of 'down time', which means that oil companies and their subcontractors will look for local firms capable of providing repairs and regular maintenance whenever required. This makes repair and maintenance one of the easiest ways to capitalize on OCS development. Repair and maintenance requires the second highest expenditure in operating expenses for developers.

The most important areas in which local firms can provide services would be in vessel repairs for the service boats, and repairs to the various operating machinery on the boats and on the drilling rigs, including electronic gear and diesel engines. Repairs are conducted both onshore and offshore, and personnel should be available on a 'call out' basis to go to rigs to work at any time. A drydock for boat maintenance is also necessary for both regular and emergency work.

Depending on the availability of local facilities, most of the offshore operator's repair needs can probably be met with local services. There is a possibility that local firms may wish to expand to attract offshore oil business, especially since the oil industry will pay premium prices for the kind of services it requires. However, firms should remember that the oil industry may be gone in a few years if no finds are made, and expansion planning should be made accordingly.

The one area in the repair and maintenance field that is not likely to come primarily from local firms is diving and subsea repair. This is an industry which has developed greatly in recent years, as deeper water has required more complicated drilling, transport, and storage technology, which in turn has necessitated more complex techniques for repair and inspection underwater. The diving industry can be expected to locate onshore facilities in an OCS region, with several firms establishing headquarters to compete for business.

Siting

Since local firms are used whenever possible, siting of new facilities is not generally a problem. Expansion of existing facilities will of course depend on an individual firm's situation. Diving firms, or any other firm that might choose to expand into New England, will try to locate in ports, especially near service bases.

New England has a fairly large marine service industry that will benefit substantially from offshore oil development. Maine's contribution is assured if service bases are located in Maine. Maine firms could compete with other New England firms if they offered specialized services or some other advantage. In addition, the facilities and personnel of the Bath Iron Works could provide much of the needed service boats activity based in Maine, and could perhaps provide services for the industry under other conditions.

Impacts

Since repair and maintenance yards are by and large already located in an area, and may only be expanded to meet the demands of OCS industry, both economic and environmental impacts can be expected to be minimal.

PIPE COATING YARDS

Description

If a pipeline is used to bring either oil or gas ashore, the pipe must be treated with anticorrosive and concrete coatings before it can be laid. This is accomplished at a pipe coating yard, a large, open facility where approximately 95% of the land is used to store pipe, and the remainder is used for the pipe coating sheds.

The pipe is fabricated at steel mills in 40 foot sections, and then delivered to the pipe coating yard either by rail or by barge. The coatings are a mastic or asphalt-like anti-corrosive compound applied hot to the outside of the pipe first, and then concrete is put on to give the pipe weight so that it will sit on the bottom without moving. Each 40 foot section weighs about 40 tons when the coating process is completed.

The large amount of land required is primarily for pipe storage, for uncoated pipe, for mastic-coated pipe that is cooling, and concrete-coated pipe that cannot be stacked until the concrete has completely set. The sheds where the actual coating is done are relatively small one-story buildings, divided into concrete and mastic sections, or with one separate building for each operation.

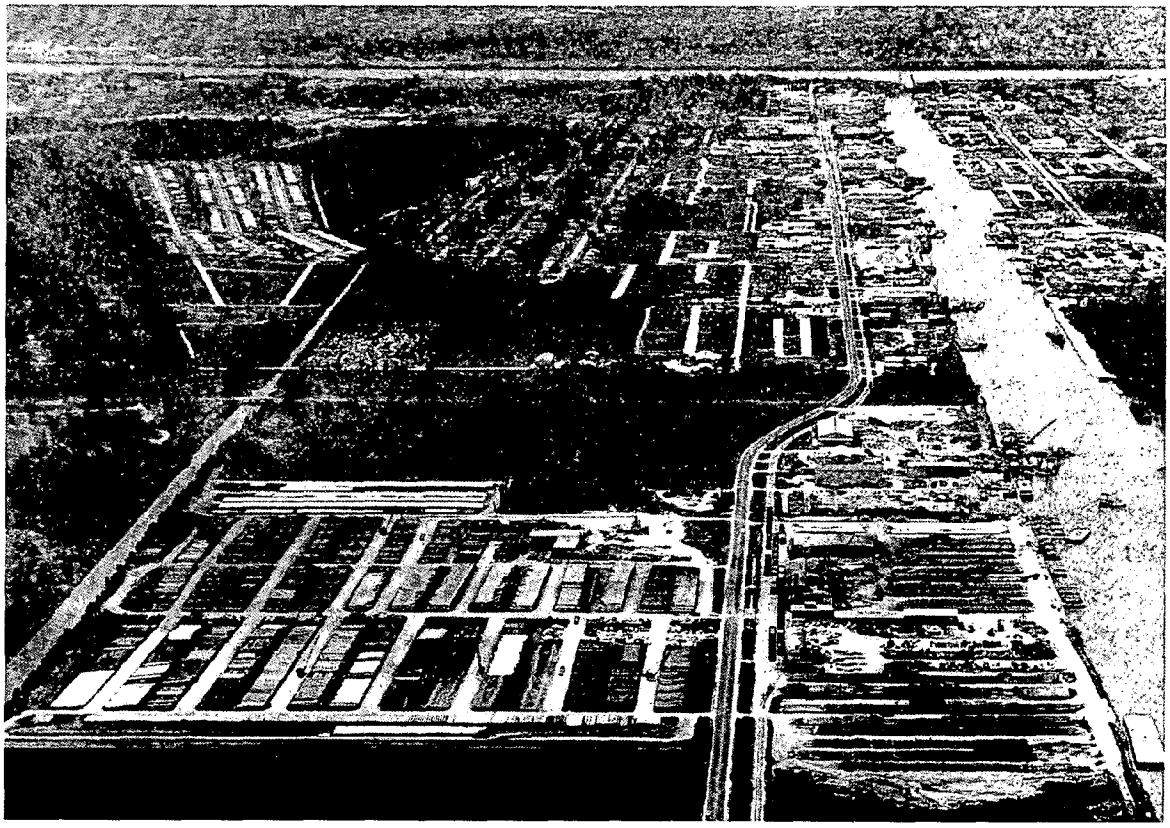


Figure 3.7
Pipe Coating Yard, Louisiana

PIPE COATING YARDS

	SUMMARY OF REQUIREMENTS AND IMPACTS
Land:	100-150 acres (30 for a portable plant)
Marginal Wharf:	750 feet
Depth at Wharf:	at least 10 feet, preferable 20 to 30 feet
Water:	15,000 gallons per day
Energy:	1 million KWH; 12-13 million cu ft/yr natural gas
Labor:	100-200 people during production season (usually March-September)
Wages:	$2 million per year at a yard employing 175 people average wage $11,500
Capital Investment:	$8-10 million ($1 million for a portable plant)
Air Emissions:	particulate better, nitrogen oxides, sulfur oxides, carbon monoxide, hydrocarbons
Wastewater Contaminants:	hydrocarbons, alkaline substances, particulates, metal fragments
Noise:	90-100 decibels (uncontrolled)
Solid Wastes:	packaging materials, concrete, metal scraps, contaminated debris.

TABLE 3.6

The cooling operation for the mastic and the setting process for concrete require that the work only be performed in relatively temperate periods of the year. This means the yard can only operate from roughly April to November. The yard is probably the only onshore facility to operate on a regular schedule, 8 hours a day, five or six days a week.

In addition to the coating facilities, testing of each section of pipe is done to see that there are no leaks or flaws in the coating.

Siting

There are two kinds of pipe coating yards: permanent and portable. A portable yard is set up to work usually for just one season, and is established at a railhead in or near a port where boats can pick up the pipe. A permanent yard will be established when there is demand for more than one season's work; it will be much larger than the portable yard.

If possible, a permanent yard will be sited near a service base, but this is not essential. The yard may be the site of the service base for the pipe laying operations. The principal considerations will be land available in an area close to the pipelaying operations to minimize time between the pipecoating yard and the actual laying.

Because pipecoating yards are sited as near the laying operations as possible, it is most likely that they would be located in Massachusetts or Rhode Island, not Maine. Pipelines, if they are used, are virtually certain to come ashore in Massachusetts or Rhode Island because of the distances involved, consequently it is far more likely that pipecoating yards would be located nearby. It is conceivable, but not probable, that if a pipeline came ashore on Cape Ann, a pipe coating yard somewhere in southern York County could perhaps serve it.

Impacts

Pipecoating is seasonal work, requiring a large influx of workers during the season. There is also a need for large peak workforce during construction of the yard. And pipecoating yards are temporary operations, working only as long as pipelines are being constructed. Even "permanent" yards may last only three to five years. Thus planning for the socio-economic impacts of pipe coating yards is somewhat more complicated because of this time factor. It will be necessary to approach the planning for these facilities on the same basis as the planning for construction phases, with a minimum permanent modification to municipal services, or to supply businesses.

Environmental impacts from pipecoating yards are limited primarily to dust, contaminated wastewater, and noise. Solid waste can also be significant, as can visual impacts.

PARTIAL PROCESSING FACILITIES

Description

Partial processing refers to the separation of gas, water and suspended solids from the crude oil that is pumped out of a well. Natural gas must be removed and processed separately while water which is often pumped up with oil must be removed before refining can begin. The suspended solids will include sand and other minerals which also must be removed before refining.

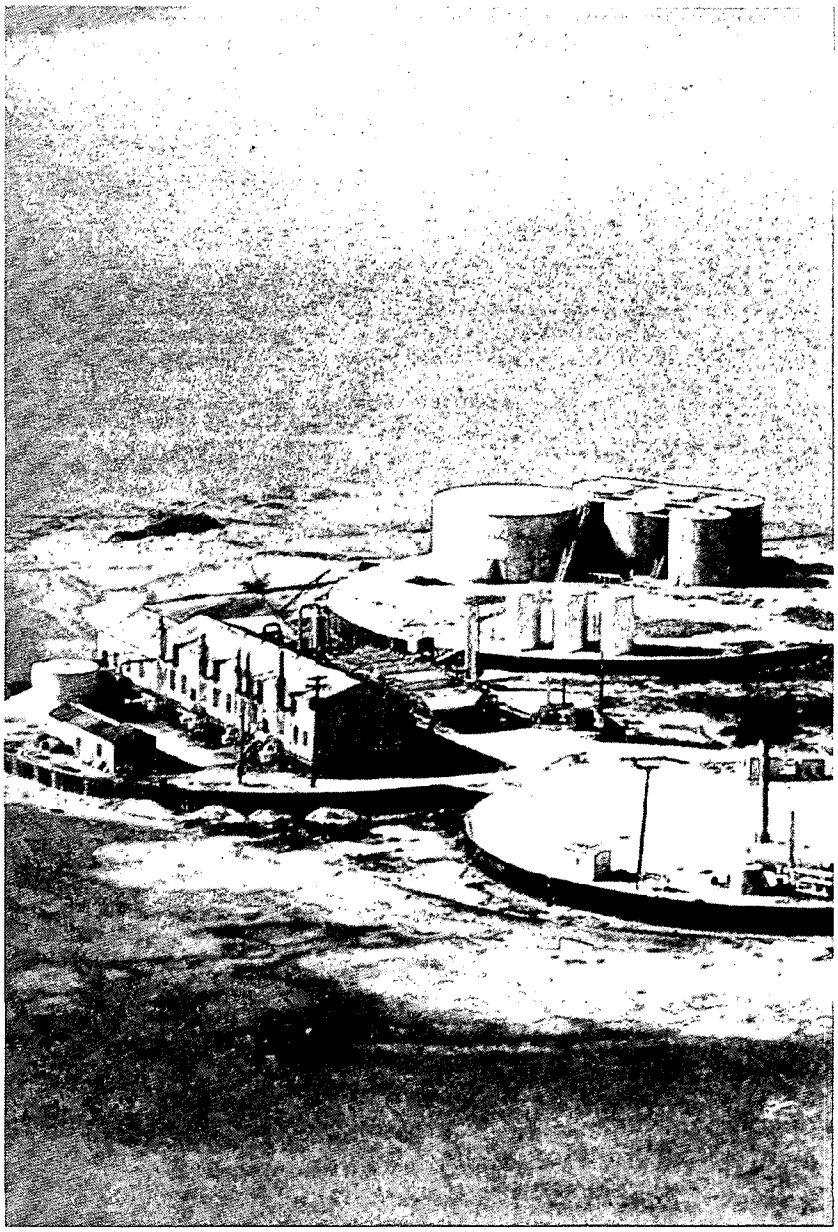


Figure 3.8
Partial Processing Facility

Partial processing can be done either onshore or offshore, and the decision on where to do it is integrally involved with decisions on production, transportation and processing.

Siting

There are several basic criteria involved in the decision on where to locate a partial processing facility, including:

Distance to shore. The further from shore a find is made, the more likely that partial processing will occur offshore. The greater costs incurred in transporting crude oil long distances can be offset by reducing the volume of fluid to be transported.

TABLE 3.8

PARTIAL PROCESSING FACILITIES

	SUMMARY OF REQUIREMENTS AND IMPACTS
Land:	15 acres per 100,000 barrles of oil and associated gas to be processed
Water:	10,000 gallons per month
Energy:	1.5 million SCFD/month gas 400,000 kwh/month
Labor:	150 construction field jobs (oil and gas facilities); approximately ten jobs during operation
Wages:	$14,400/year (operation)
Capital Investment:	$13 million (110,000 BPD capacity)
Construction Period:	15 months
Air Emissions:	hydrocarbons, hydrogen sulfide, sulfur oxides, nitrogen oxides
Major Wastewater Contaminants:	suspended solids, oil and grease, heavy metals, pheonls, halogens, chromium
Noise:	80-90 decibels from pumps; 81-96 decibels from flare stacks; 81-96 decibels from treating vessels.

Well Stream Characteristics. A high water content or emulsified water will both encourage offshore processing.

For onshore partial processing facilities, siting decisions will be made to integrate the facility with transportation facilities. Thus, if oil comes ashore by pipeline, the partial processing must be done somewhere between the landfall and the refinery. If tankers are involved in transporting the oil (either to trans-ship oil brought ashore by pipeline, or to bring the oil ashore directly from the platform), a partial processing facility may be built at the terminal site or nearby. The location of the facility in this case, or in the case of one sited along a pipeline route, the availability of land with suitable waste disposal features is the principal factor in determining location.

Impacts

Partial processing facilities require relatively little in the way of labor either during the construction or operating periods. However, since the facility is usually located near other facilities such as refineries, pipeline landfalls, or marine terminals, the total effect on the economy must be considered as the sum of all such co-located facilities.

The environmental impacts consist chiefly of sand and water that are removed from the well stream, hydrocarbon emissions from storage tanks, and site alteration impacts.

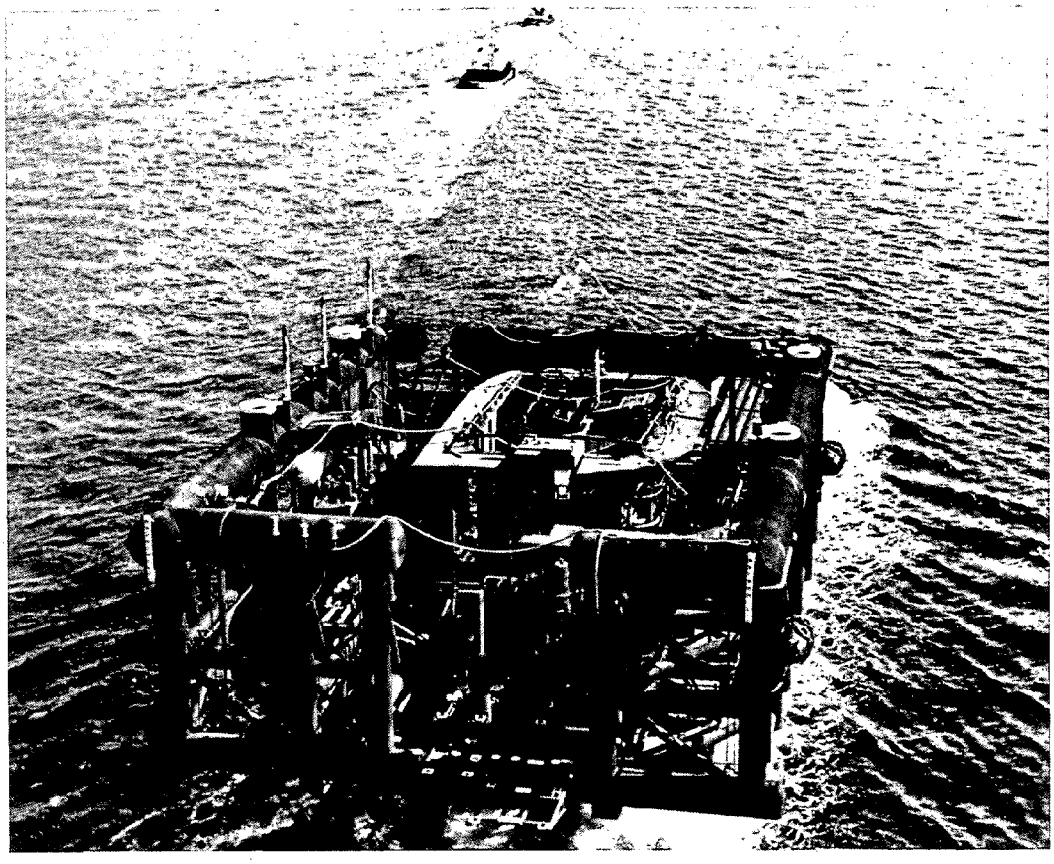


Figure 3.9
Sub-Sea Completion System being towed to a drilling rig

PIPELINES AND MARINE TERMINALS

Description

The method used to get oil or gas ashore once it has been pumped out of the well depends on a great many factors. The choice is basically between tankers (or barges or pipelines to transport oil, and between pipelines and flaring (disposing by burning) of the gas. The criteria which are involved in making these choices include:

Size of Find. This is by far the most important factor. Pipelines are enormously expensive, costing around two million dollars (1976 dollars) a mile. The first consideration therefore is: "is there enough of a find to justify this size investment?"

Distance to Shore. The distance to shore determines the total cost of the pipeline. Tankers have lower operating costs the further the find is from shore, while pipelines are more economical closer in.

Climate. In bad weather, loading tankers and barges offshore can be impossible, and it may be necessary to store oil for long periods if bad weather continues. A pipeline is not sensitive to weather and can transport oil and gas year round.

Ocean bottom conditions. The seabed is not flat, but rather contains hills and valleys, many of which are very steep. Placing pipeline across widely varying terrain is much more difficult.

Location of Existing Onshore Facilities. If refineries or tanker terminals already exist in an area, then oil may be carried to them by the cheapest and quickest means possible, tankers or pipelines depending on location of the facilities.

Composition of the Find. If natural gas is found it must be transported ashore by pipeline since the technology does not currently exist to liquify natural gas offshore so that it could be transported ashore by tanker. Thus if gas is found in sufficient quantities to justify a pipeline, then one will be built. Such a pipeline could carry oil, if the oil and gas are found together.

The decision on transportation strategy must take all these factors into account, and so it is all but impossible to predict with any certainty whether pipelines or tankers will be used. The size of the finds which are expected on Georges Bank (See Table 2.1) would suggest the use of tankers. There is also the possibility that a combination of tankers and pipelines can be used for oil. The oil can be brought ashore by pipeline and loaded into a tanker for trans-shipment to a refinery in another region, or brought ashore by tanker, and then piped to a refinery overland, where pipeline construction costs are less than those of marine pipelines.

In the United States, almost all offshore oil, and all offshore gas, is brought ashore by pipeline. In the North Sea a combination of various strategies is employed, including the construction of huge offshore concrete storage tanks which hold oil for tankers.

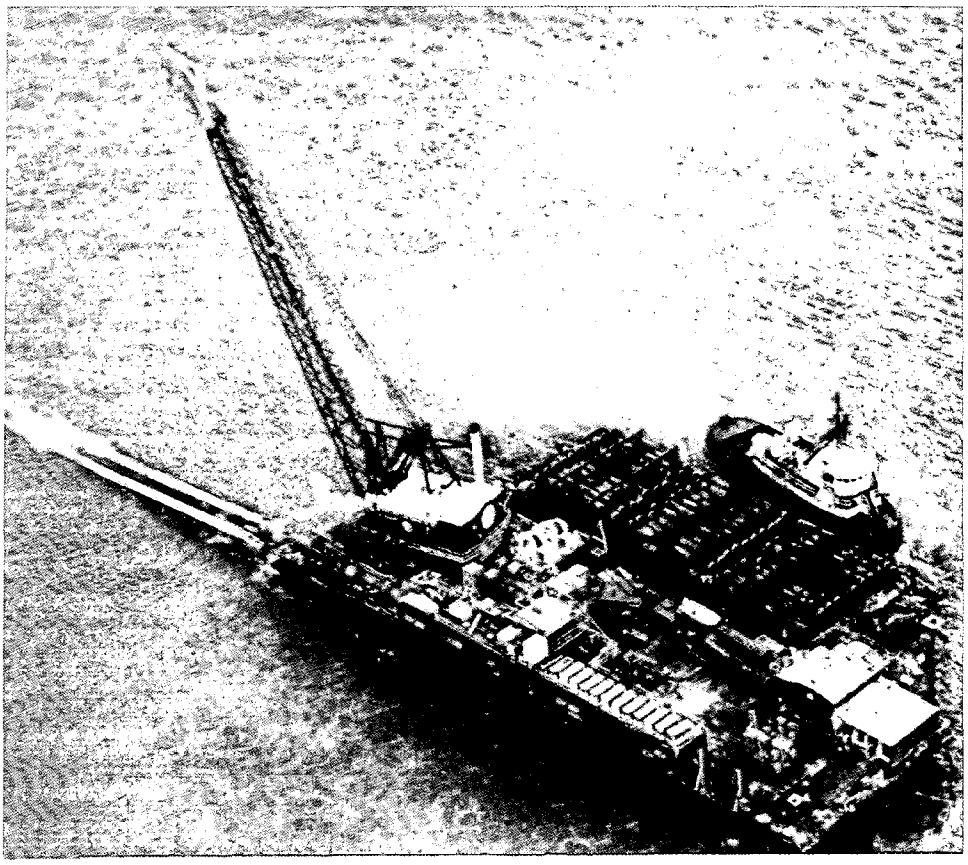


Figure 3.10
Pipe Lay Barge in operation

Pipelines do not require large onshore facilities, even though they are one of the most expensive facilities. Pipecoating yards are the major onshore operations connected with pipelines. The site where the pipeline comes ashore, the landfall, is usually all but undistinguishable from the surrounding landscape once construction is completed. The other onshore operation is the service base for the boats which supplies materials and crew to the pipelaying operation. This base will usually be located at or near the pipecoating yard or existing service bases.

The major activity involved in pipe laying occurs offshore, where barges and offshore tugs comprise the pipe laying "spread". This consists of a barge to hold sections of pipe and another where the sections are welded together called lay barges. As each section of the coated pipe is welded, the barge is moved forward. The pipe goes onto a long "tail" called a stinger which relieves tension on the pipe as it is lowered to the seabed. Another barge, called a jet barge, usually precedes the lay barge and blasts a trench into the seabed using compressed air or water; the pipe is then placed into this trench.

There is another method of pipelaying, using large reels of pipe which are laid by unreeling as the barge moves forward. This method is only usable with pipe that has not been coated with concrete, which is usually the smaller diameter pipe used to connect several platforms with one another and to the large diameter pipeline leading from the fields ashore.

The pipelaying operations require mild weather and can only take place in fairly limited periods each year. There is thus a great deal of time pressure in the operation when a "weather window" is reached. Since pipelaying may take a great deal of time, it may not be finished until after development drilling. The first oil may then be brought ashore by tanker.

Pipelines may be owned by oil companies or by gas transmission companies. Gas is often sold by oil companies at the well head, and it is the responsibility of the gas company to get the product ashore. If only gas is carried in the pipeline, it will be constructed by the gas transmission company; if oil is carried it would probably be a joint venture.

Because of the expenses and the time involved in building a pipeline, oil may be brought ashore by tankers, usually in the 30,000 - 50,000 dwt range. The onshore facility involved is a marine oil terminal, which consists of berthage and loading/unloading equipment on a pier, storage tanks, safety systems, and often some harbor navigational aids. Marine terminals may be shoreside piers, by far the most common, or they may be offshore moorings (Single Point Moorings, or Monobuoys).

Shoreside terminals may serve one or more tankers, with piers extending out into a channel at which two tankers can tie up and load or offload simultaneously. (Figure 3.11). Single Point Moorings are used primarily where very large tankers (Supertankers, those above 200,000 deadweight tons) which require deep water anchorages. SPM's (Figure 3.12) are used primarily where deepwater is not available up to the shore.

If marine terminals are used for trans-shipment of oil that comes ashore by pipeline, a partial processing facility may be located at the site. Pipelines to refineries, which may be located at the same site or some distance away, may also be a feature of marine terminals.

Siting

The siting of the pipeline landfall is one of the relatively simpler siting decisions for onshore facilities. The pipeline will be routed to landfall at the point which provides the shortest route possible. The costs of pipeline construction mandate short distance, and the land fall will be placed more or less at the nearest shoreline to the oil field. The only major constraint would be the bottom conditions on which the pipe will be laid.

Because of the distance criterion, it is all but impossible for a pipeline to be located anywhere in Maine. The distances are too great from any point on Georges Bank to any point in Maine. This means that Maine will not be the location of pipeline dependent facilities such as gas processing plants, nor is Maine likely to be the location of such pipeline related facilities as pipecoating yards. These facilities, and the pipeline landfall, are most likely to be in Massachusetts or Rhode Island.

The landfall site itself consists only of a 10 foot wide right-of-way, with the pipeline buried. The only permanently visible signs of the landfall are usually a fence or a sign.

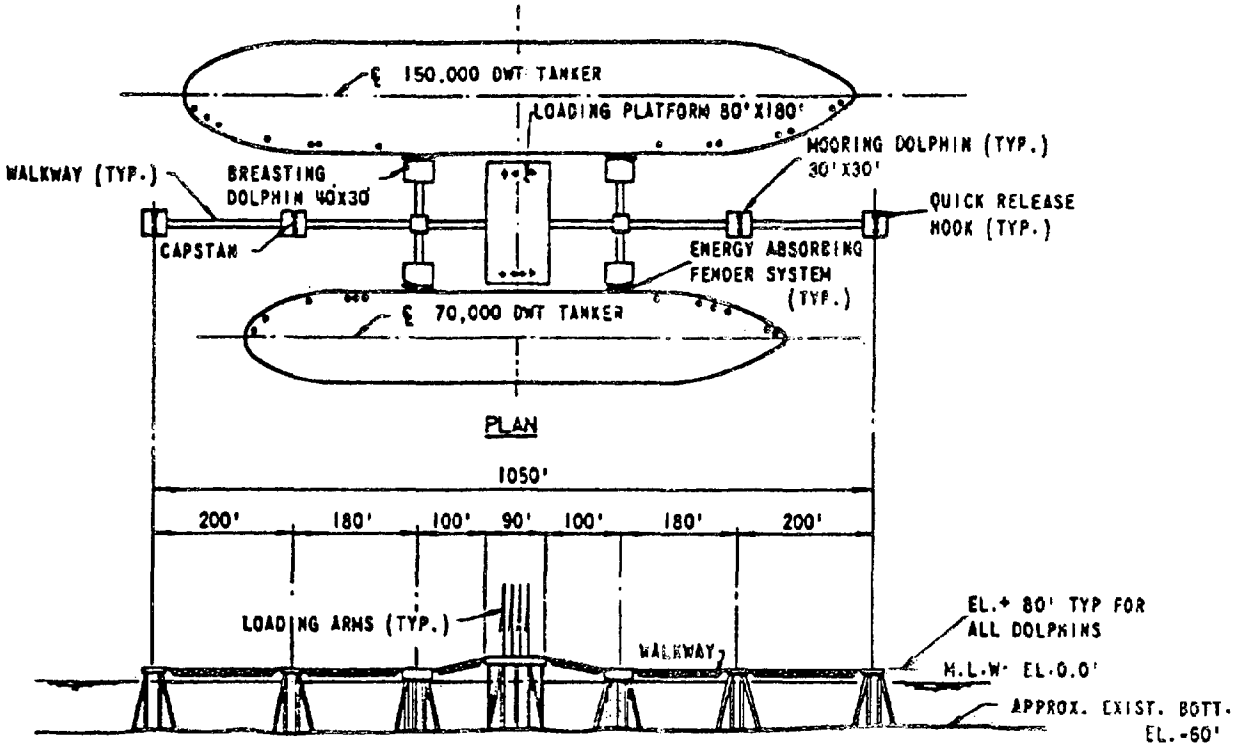
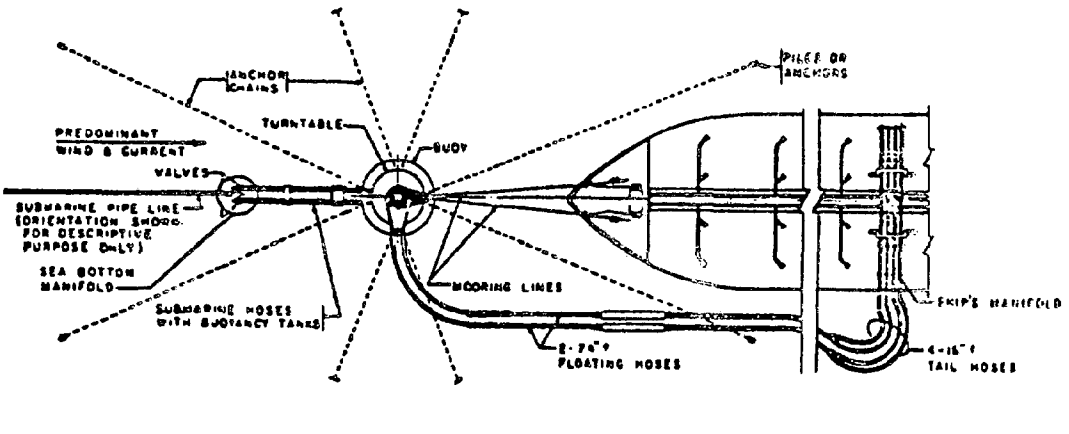


Figure 3.11
Typical Layout of a Mid-Depth Sea Island Terminal



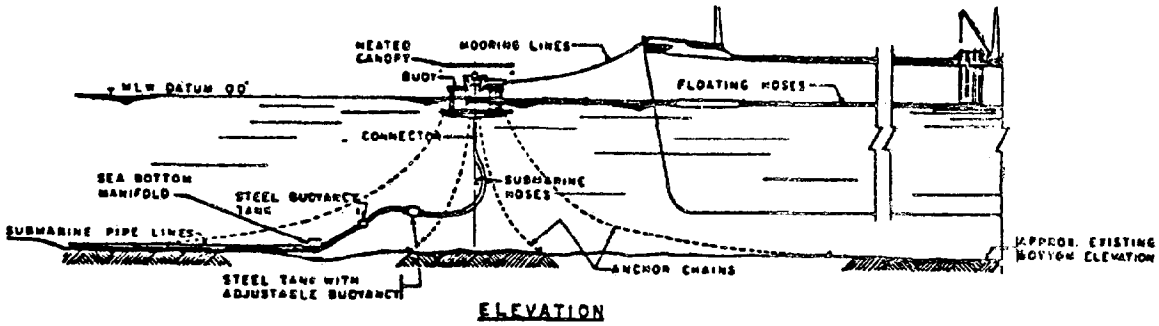


Figure 3.12
Catenary Anchor Leg Mooring (CALM)
One of Several Types of Single Point Moorings (SPM's)

The location of marine terminals depends to a great extent on the function the terminal will have in the transportation system. If the oil is to be carried directly to a refinery, the terminal will be sited as near to the refinery as possible, often at the same location as the refinery. The terminal may also be located at some distance from the refinery, with a pipeline overland between the two; this is most likely if there is no suitable site at the refinery for a terminal. If the terminal is to be a trans-shipment point, it will be located at the pipeline landfall site, or very near to it.

The terminal requires a large amount of land for storage tanks, administrative offices, and other equipment. The waterfront may be used for tanker berthage, in which case there should be water depth sufficient for the size tankers that will be used, a good navigational approach, and a sheltered harbor. If Single Point Moorings are used, they will be placed some distance offshore, and there will be a pipeline from the mooring to storage onshore.

Marine oil terminals are already common facilities in Maine and New England. The largest such facility is at Portland, which is the terminal for the pipeline to Montreal and much of the oil used in Maine. Portland is the third most active oil port on the East Coast. Searsport is also an active oil port. Whether or not any of the Georges Bank oil is brought to existing Maine oil ports, or to other sites in Maine that could become oil ports, depends on where the oil will be refined. If the oil is refined in New Jersey or Pennsylvania (the closest existing refineries), then oil will be tankered directly to terminals at those refineries, or brought ashore by pipeline to Massachusetts or Rhode Island and then transshipped by pipeline or tanker from the landfall.

However, if a refinery is located in Maine, such as the currently proposed refinery at Eastport or the refinery once proposed at Sanford, oil could be brought to Maine. The facilities and experience which exist in Portland are undoubtedly an attraction to the industry, and if other conditions make a refinery possible in Maine, Portland could be used.

Impacts

The impacts from pipeline construction facilities have been covered in other sections. The impacts from the pipeline landfall, both economic and environmental, are relatively minimal. Only during the construction of the landfall is there any activity or disruption of the environment, and both are, by and large, short-lived.

The impacts from oil terminals are more substantial. The effects of the construction period resemble the impacts of other facilities, such as pipecoating yards or gas processing plants. During the operation phase, the employment is relatively small, but the potential environmental impact from large scale oil handling can be great. However, modern oil spill clean up equipment and procedures in addition to strict requirements for spill liability under Maine law, have made oil terminals much less of an environmental hazard than was previously the case. The oil handling at Maine ports which has been going on for years is evidence that oil terminals need not be major environmental problems. However, there are risks of oil spills both large and small in any oil loading operation, and these must be taken into account.

GAS TREATMENT AND PROCESSING PLANTS

Description

Most of the impurities in a natural gas stream are removed in partial processing plants, but some of the impurities remain. These must be removed, and gas broken down into its liquifiable hydrocarbon components which are then sold. These components include ethane, propane, butane, and natural gasoline.

Each plant is designed specifically for the composition of the gas that it will process, and so there is no standard design for these facilities. They are usually quite a bit smaller than refineries, though they may resemble them in shape and appearance. They may also emit the same odors as refineries.

Siting

Gas processing plants are always sited somewhere between the pipeline land-fall and the distribution lines to market. While the facility need not be on the coast, it is very often near the coast. The location of onshore partial processing plants may have some bearing on siting as well. Availability of land, with a water source nearby for cooling, is the other determinant of location.

Because a gas processing plant's location is dependent on the location of the pipeline landfall, it is virtually certain that no gas processing plants would be built in Maine. The distances involved in building a pipeline are simply too great.

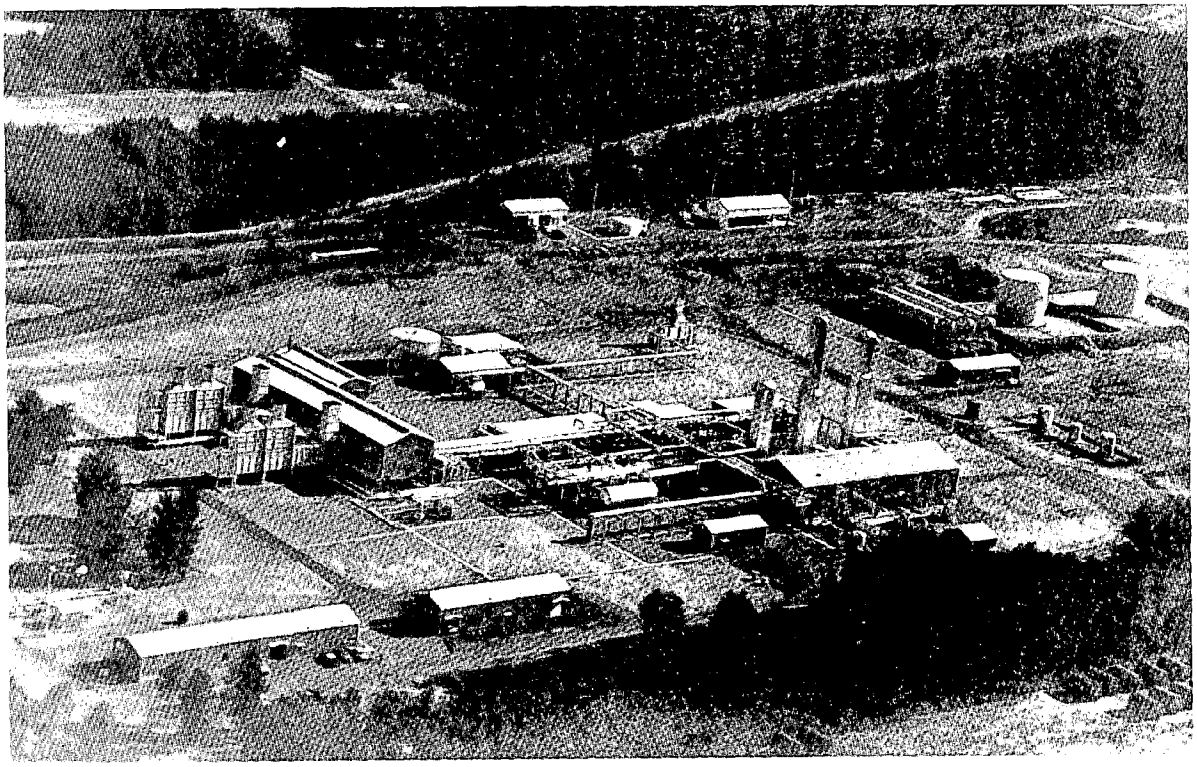


Figure 3.13
Gas Processing Plant

GAS PROCESSING AND TREATMENT PLANTS

SUMMARY OF REQUIREMENTS AND IMPACTS

Unless otherwise noted, statistics are for a billion cu.ft/day plant

Land:	50 to 75 acres
Water:	200,000 gallons per day average
Energy:	5,400,000 kilowatt hours/month 360,000,000 cubic ft/month of natural gas from plant
Labor:	550 construction jobs (peak figure) 45-55 operation and maintenance jobs
Wages:	approximately $750,000 per year (operation and maintenance)
Capital Investment:	$85 million (one million cu./ft./day plant) $26 million (300 million cu./ft./day plant)
Construction Period:	1.5 years

Air Emissions:

major	minor
hydrogen sulfide	particulates
sulfur oxides	carbon monoxide
hydrocarbons	nitrogen oxides

Wastewater Contaminants:

in cooling water:	sulfuric acid	
	chromium	30 ppm
	zinc	3 ppm
	chlorine	0.2 ppm
in boiler water:	phosphates	20-60 ppm
	bases	
	sulfite	20 ppm
general:	dissolved hydrocarbons	

Noise: 80 - 100 decibels from boilers, compressors, and flarestacks on a 24-hour basis

Solid Wastes: Scale and Sludge from boiler and cooling tower cleanouts; tank cleaning sludge; spent dessicants, filtration media and oil absorbants.

TABLE 3.7
SOURCE: NERBC

Impacts

Gas processing plants resemble refineries in appearance, but are usually much smaller. This also applies to their impacts, with smaller construction and operating workforces, and consequently smaller socio-economic impacts, especially over the long term where a very small workforce is required.

Environmental impacts are similar to a refinery in many ways in terms of effluents, although again on a somewhat smaller scale. Modern gas processing plants are able to control effluents effectively to meet standards, and have been fairly successful in reducing the noxious odors which have been associated with these facilities.

REFINERIES

Description

Refineries are the final processing stage for oil (Figure 3.14). Crude oil is separated into the fractions, or components, that are used as energy sources: gasoline, home heating oil, and industrial fuel oils. A by-product of refining is naptha which is used as a raw material ('feedstock') for petrochemical manufacturing.

Refinery design is contingent upon the chemical composition of the crude oil that will be processed (particulary sulfur content) and on the product mix, that is the proportion of gasoline, heating oil, etc, that will be turned out. Refineries may be either very large, processing 500,000 barrels a day, or very small, processing 5000 barrels a day. At present, it is estimated that if a refinery is built, it would be around 250,000 barrels-a-day capacity for Georges Bank oil, although smaller refineries could be proposed.

The two major components of a refinery include: processing units, the tall towers which make up the core of the refinery, and in which the crude oil is separated into products; and, a large number of storage tanks, for crude oil waiting to be refined and for storage of the various products waiting to be shipped out. There are also treatment plants for water used as coolant, administration offices, machine shops, electrical station, firehouse and other safety installations, and pipelines leading into and throughout the complex. Facilities to send the oil out, including tank trucks and railroad cars, as well as pipelines, will also be present. A refinery usually has a complete road network and communications system of its own. There may be a large open space surrounding the complex, serving as a buffer zone.

Siting

A refinery will not necessarily be located in New England even if a large find of oil is made. Because refineries are the most complex and the most expensive onshore facilities to build, the decision to build refineries is made on the basis of a number of factors which do not enter into decisions on other (on shore) facilities. The availability of markets for a firm's products and the capacity of existing nearby refineries are the major factors. Availability of crude sources other than the OCS find may also play a large part in the decision.

SUMMARY OF REQUIREMENTS AND IMPACTS FOR A RANGE OF REFINERY AND TYPE

	250,000 bbls/day		500,000 bbls/day	
Fuel Mix **	Low	High	Low	High
Operation Phase				
Land Area (acres)	1000	1000	1750	1750
Water (million gal/day)				
withdrawn	13.2	10.5	26.4	22.1
consumed	5.4	4.5	10.7	9.3
Power				
Electric (kwh/day	1,818,000	1,446,000	3,636,000	2,982,000
Fuel Oil (bbls/day)	24,330	19,790	48,660	40,380
Employment				
Total Direct	435	410	620	590
Local Labor Pool	374	353	533	507
Employment by Type (%)				
Administrative	18.4	19.4	15.3	16.1
Operative & Maintenance	70.1	68.3	72.6	71.2
Other (Laboratory;Safety; etc.)	11.5	12.2	12.1	12.7
Wages				
Total Direct ($ thousand)	6,705	6,345	9,503	9,070
Total Local ($ thousand)	5,766	5,457	8,174	7,800
Average/man (dollars)	15,250	15,250	15,250	15,250
Average Adminis.	18,750 - 19,250	18,750 - 19,250	18,750 19,250	18,750 19,250
Average Opr. & Main.	14,500	14,500	14,500	14,500
Average Other	15,500	15,500	15,500	15,500
Capital Investment ($ million)	815	690	1,515	1,285
Annual Operating Costs ($ million)	68.5	58.3	125.2	107.1
Local Taxes ($ million)	7.0	5.8	12.9	10.7

Transportation Operation)				
Auto Round Trips/Day)	218	205	310	295
Truck				
Rail	Information unavailable at printing.			
Waterway				
Construction Phase				
Total Time	4	4	4	4
Actual Construction Time	3	3	3	3
Costs ($ million)	700	580	1,285	1,065
Employment				
Total Direct	2,180	1,800	1,285	1,065
Local Labor Pool	1,526	1,260	2,793	2,268
Total Wages ($ million) per year	46,135	38,500	84,425	69,300
Local Wages ($ million)	32,295	26,950	59,098	48,510
Average	21,160	21,390	21,160	21,390
Power				
Electric				
Fuel Oil	NA	NA	NA	NA
Water	NA	NA	NA	NA
Transportation				
Auto	The UNH study predicts a total of 62,700 shipments to refinery over construction period. It cannot be determined if all shipments would be by truck or if some would be by rail or water.			
Truck				
Rail				
Waterway				

* Unless otherwise noted, data derived from "Effects on New England of Petroleum Related Industrial Development," Arthur D. Little, Volumes 3 and 4.

** The Little study uses two fuel mixes to identify various cost differences based on complexity - A High Fuel mix is 33% gasoline, 4% kerosene/jet fuel, 27% distillate fuel oil, and 36% residual oil. A Low Fuel mix is 43% gasoline, 5% kerosene/jet fuel, 36% distillate fuel oil, and 16% residual oil.

TABLE 3.3

SOURCE: NERBC

Current estimates are that any oil found on Georges Bank would be refined at refineries in New Jersey and Pennsylvania, where ther is currently excess capacity, but a large find of oil in the Baltimore Canyon could change this situation.

Refineries have been a major topic of concern in Maine for the past ten years. There have been three serious proposals for refineries in the State (Machiasport, Sanford, and the most recent one in Eastport), and there have been at least as many other proposals that were never taken past the talking stage. Whether or not a refinery would be constructed in Maine, if one is built to serve an OCS find, is unclear. Certainly the other refinery proposals indicate the view that Maine is considered by the industry to be a good place to locate a refinery.

The site of a refinery built to process Georges Bank oil would depend in part on how the oil is brought ashore. If it is brought ashore by tanker, it could be brought to an existing terminal such as Portland, and refined somewhere in Southern Maine, similar to the Sanford proposals (which was to land the oil in Portland and pipeline it to Sanford). If it is brought ashore in Massachusetts or Rhode Island by pipeline (or by tanker), it could be shipped to a refinery in Maine or elsewhere in New England or the North Atlantic states, either by pipeline or tanker. It is thus impossible to say at this time whether a refinery will be built, and if so, whether it will be built in Maine.

It should be noted, in addition, that a refinery proposal need not be contingent on Georges Bank finds. Pittston Company's application for its refinery in Eastport is still active, and a number of changes in the supply and demand of refining capacity in the Eastern United States could prompt additional proposals. Refineries should be viewed, therefore, as a separate, but linked, question from OCS development.

The specific requirements of a site revolve primarily around land and water. A refinery needs both in abundance, land to site the processing towers, pipelines, and especially for the tank farms and a buffer zone around the complex, and water to provide cooling for the processing equipment which must operate at a very high temperature. The ability of a refinery to meet federal and state air and water quality standards at a site will have an important bearing on selection as well. Location near a terminal or landfall is not critical, but is desirable.

Impacts

Refineries are likely to be the largest onshore facility associated with OCS development. The impacts, both economic and environmental, are consequently also likely to be the greatest. Refineries will require a relatively small operating workforce but a very large construction workforce. The construction period will also be the longest of any facility. It should be added that since a refinery may be constructed at the same site as, or very near to, either a tanker terminal, partial processing facility, or both, the construction and operation impacts of these facilities may have to be taken into account.

The environmental impacts of a refinery are numerous and complex. Air quality will be affected by the emissions from the refining process, from hydrocarbon emmissions from storage tanks, and from numerous other sources. Water is used for cooling and for some of the processes in the refinery, and contains a variety of toxic chemicals which must be removed before it can be discharged. Noise levels are not extreme, except at irregular intervals when gases are flared. And solid waste, much of which is oil contaminated, must be disposed of; a secondary problem in this regard is the sludge caused by the extensive wastewater treatment.
Much of the facility is in fact taken up with pollution control equipment, including wastewater treatment plants and settling pools.

Although a refinery cannot be considered a "clean" industry, pollution control technologies do allow refineries to be built and to operate within existing environmental protection regulations.

Figure 3.14
Refinery at Joliet Illinois

IV. ECONOMIC AND ENVIRONMENTAL EFFECTS OF OFFSHORE DEVELOPMENT

A. Economic Benefits

The potential effects on the economy are of two major types. The effects on jobs, wages, and overall business activity in a region can be substantial. The tremendous investments in capital and the number of people needed to construct and operate the facilities, both onshore and offshore, are always an addition to the economy in a region.

Tables 4.1 through 4.7 indicate the employment, wages, land use, and capital investment that might be expected under three different scenarios of development as postulated by the New England River Basins Commission. The high find scenario (2.4 billion barrels of oil, 12.4 trillion cubic feet of gas) is the estimate which represents the largest amount of oil and gas that is likely to be found on Georges Bank, but which only has a 1 in 20 chance of actually being found. The medium find scenario (900 million barrels of oil, 4.2 trillion cubic feet of gas) represents the most likely size find. The no find scenario represents only the activity associated with approximately five years of exploration which ultimately yields no commercial size finds. The figures on employment, etc., are for New England as a whole. Since at this point it is difficult, if not impossible to say what facilities will be located where, and so estimates have been made for the entire region.

These tables illustrate the complexity of trying to estimate the employment and wage effects that OCS development can have. Not only must estimates be given for three different scenarios, but estimates must also be given for construction and operating phases for each facility, and for annual averages and peak employment periods. There is also a great deal of variability in employment in OCS related facilities which must be kept in mind.

In addition, the tables also indicate effects on employment and wages, and generally indicate the secondary effects. It is impossible to accurately estimate at this time the multipliers which would indicate the secondary effects because there are too many unknowns. Multipliers will vary greatly from facility to facility, from site to site, and over time as infrastructure is developed. A rough guess is that OCS facilities will have multipliers ranging from 1.2 to 2.0, meaning that any facility could generate between 20% more jobs than the facility itself and 100% more jobs.

It is possible, however, to identify some of the areas in which secondary employment will be generated. This will primarily be in business opportunities for local business firms which are capable of supplying goods and services to the oil industry, and to the various subcontractors that are hired by the oil industry to build platforms, run service bases, construct pipelines, etc.

There are a variety of businesses in addition to the oil firms which locate in an area where offshore operations are underway. These firms provide a variety of goods and services which the oil companies contract for. These "ancillary industries" fall into two major groups:

TABLE 4.1

TYPES OF FACILITIES TO BE EXPECTED
IN NEW ENGLAND

Activity	High Find	Medium Find	No Find
	2.4 billion bbls. oil 12.4 trillion cub. feet gas	900 million bbls. 4.2 trillion cub. feet	
Service and Supply Bases	10–20 Permanent	6–12 Permanent	4–5 Temporary
Platform Fabrication Yards	1		
Platform Installation Service Base	11	1	
Pipelines	2 for oil 4 for gas	2 for gas	
Pipeline Installation Service Base	1	1	
Pipecoating Yards	2	1	
Gas Processing Plants	6	2	
Marine Oil Terminal	1		
Refinery	1		

TABLE 4.2

LAND USE (In Acres)

Activity	High Find	Medium Find	No Find
Service and Supply Bases	500	300	75
Platform Fabrication Yards	200		
Platform Installation Service Base	30	20	
Pipelines	6	2	
Pipeline Installation Service Base	40	30	
Pipe Coating Yards	200	100	
Gas Processing Plants	345	120	
Marine Terminals	100		
Refinery	1000		
TOTAL	2400	580	75

TABLE 4.3

CAPITAL INVESTMENT
(In Millions $)

Activity	High Find	Medium Find	No Find
Supply and Service Bases	24	15	1
Platform Fabrication Yards	50		
Platform Installation Service Base	1	1	
Pipelines	2400	1362	
Pipeline Installation Service Base	1	1	
Pipe Coating Yards	20	10	
Gas Processing Plants	266	90	
Marine Terminal	50		
Refinery	690		
TOTAL	3500	1500	

TABLE 4.4

EMPLOYMENT

Activity		High Find Local Hire	High Find Total	High Find % Local	Medium Find Local	Medium Find Total	Medium Find % Local	No Find Local Hire	No Find Total
Service and Supply Bases	(Ann. Avg.)	582	797	73	384	575	67	70	133
	(Peak)	1285	1736	72	753	1076	70	119	237
Platform Fabrication Yards	(Ann. Avg.)	1620	2025	80					
	(Peak)	2400	3000	80					
Platform Installation (including service base)	(Ann. Avg.)	320	1129	28	182	642	28		
	(Peak)	425	1478	29	379	1382	27		
Pipelines (Including Landfall Construction)	(Ann. Avg.)	148	580	26	59	235	25		
	(Peak)	225	973	23	101	507	20		
Pipeline Installation	(Ann. Avg.)	5	36	70	19	28	67		
	(Peak)	40	61	65	26	38	68		
Pipe Coating Yards	(Ann. Avg.)	129	143	90	79	88	90		
	(Peak)	217	241	90	109	121	90		
Gas Processing Plants Construction	(Ann. Avg.	160	320	50	113	225	50		
	(Peak)	200	400	50	130	300	43		
Gas Processing Plants Operation	(Ann. Avg.)	50	84	59	20	34	59		
	(Peak)	89	149	59	31	52	59		
Marine Terminals Construction	(Ann. Avg.)	113	565	20					
	(Peak)	113	565	20					
Marine Terminals Operation	(Ann. Avg.)	25	35	71					
Refinery Construction	(Ann. Avg.)	1600	2000	80					
	(Peak)	1600	2000	80					
Refinery Operation	(Ann. Avg.)	287	410	70					
	(Peak)	287	410	70					

TABLE 4.5

ANNUAL AVERAGE WAGE (ALL NEW ENGLAND)
(in millions of $)

Activity	High Find			Medium Find			No Find		
	Local Hire	Total	% Local	Local	Total	% Local	Local	Total	% Local
Service and Supply Bases	9.9	13.5	73	6.5	9.8	66	1.2-2	2.3-4	57-60
Platform Fabrication Yards	30.8	38.5	80						
Platform Installation	5.7	20.3	28	3.2	11.5	28			
Pipelines (including landfall construction)	.85	4.	21	.36	1.8	20			
Pipeline Installation Service Base	.4	.6	66	.12		70			
Pipe Coating Yards	2.3	2.6	88	1.5	1.7	88			
Gas Processing Plants: Construction	2.7	5.3	51	2.25	4.5	50			
Operation	8.	1.3	62	.31	.52	59			
Marine Terminals: Construction	2.3	11.3	20						
Operation	.4	.6	66						
Refinery: Construction	28.	40.	70						
Operation	4.3	6.2	69						

TABLE 4.6

AVERAGE ANNUAL DIRECT, INDIRECT AND TOTAL EMPLOYMENT

Activity		High Find			Medium Find			No Find		
		Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Service and Supply Bases		793	638*	1435	575	460	1035	133	67	200
Platform Fabrication Yards		2025	1620*	3645						
Platform Installation (including service base)		1129	934	2663	642	481	1123			
Pipelines		590	295**	885	235	176	411			
Pipeline Installation Service Base		36	18**	54	28	21	49			
Pipe Coating Yards		143	114*	257	88	88	176			
Gas Processing Plants:	Construction	320	240**	560	225	169	394			
	Operation	84	67*	151	34	34	68			
Marine Terminals	Construction	565	283**	848						
	Operation	35	28*	63						
Refinery	Construction	2000	1000**	3000						
	Operation	410	328*	738						

* Long Term Multiplier of 1.8 Used
** Short Term Multiplier of 1.5 Used

TABLE 4-7

AVERAGE ANNUAL DIRECT, INDIRECT, AND TOTAL WAGES
(in millions of $)

Activity		High Find			Medium Find			No Find		
		Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Service and Supply Bases		13.5	13.5*	27.	9.8	8.05	17.2	2.3	2.0**	4.3
Platform Fabrication Yard		38.5	38.5**	77.						
Platform Installation (Incl. serv. base)		20.3	15.2	35.5	11.5	11.5	23.			
Pipelines		4.	3.**	7	1.8	1.35	3.15			
Pipeline Installation Service Base		.6	.5**	1.1	.16	.12	.28			
Pipe Coating Yards		2.6	2.6*	5.2	1.7	1.7	34			
Gas Processing Plants:	Construction	5.3	4.0**	9.3	4.5	3.4	7.9			
	Operation	1.3	1.3*	2.6	.52	.52	1.04			
Marine Terminals	Construction	11.3	8.5**	19.8						
	Operation	.6	.6*	1.2						
Refinery	Construction	40.0	30.0**	70.0						
	Operation	5.2	6.2*	12.4						

* Long term multiplier of 2.0 used
** Short term multiplier of 1.75 used

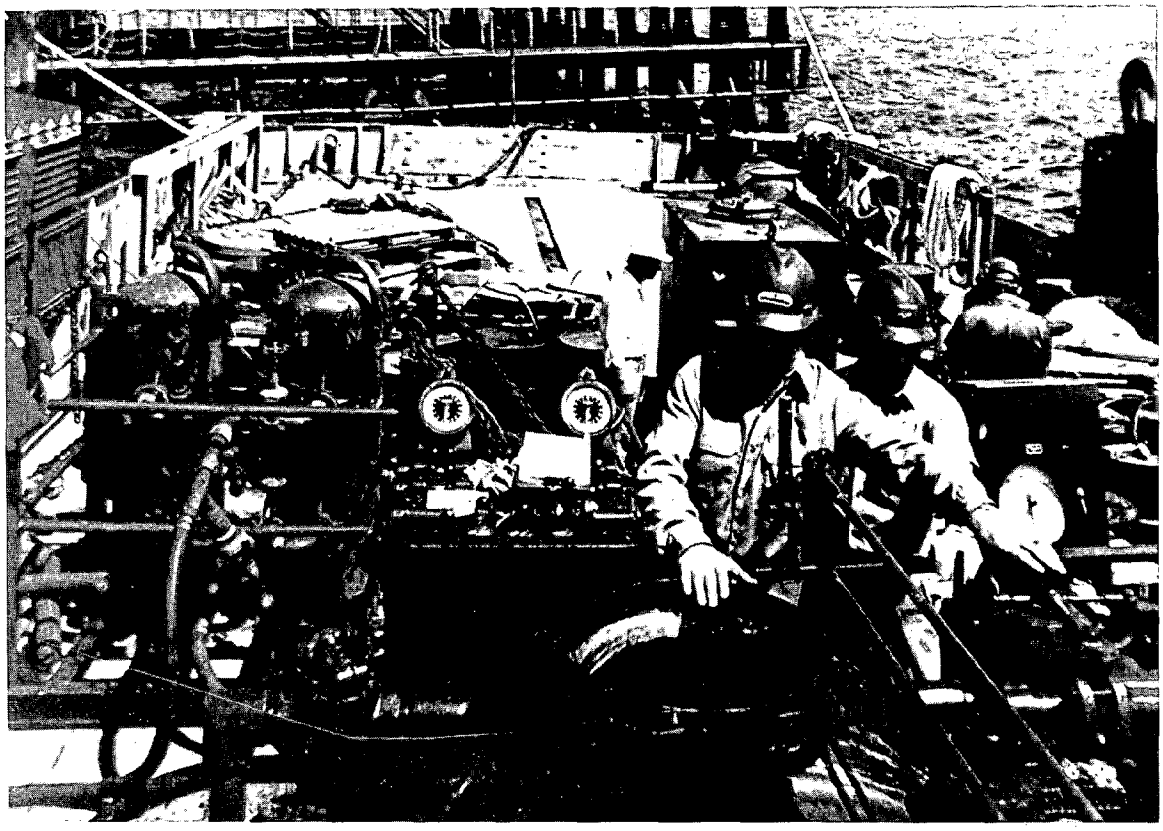


Figure 4.1
A Sandstone Acidizing System operated on a rig by Halliburton Services Company, one of the largest companies providing a variety of services to the Offshore Industry.

1. Businesses directly related to oil and gas development:

These businesses are not likely to be found anywhere in New England and thus will locate offices here once operations are underway. They will often locate near, or on, a service base. During the exploration phase, the operations may be fairly small. The firms would then expand during development. These firms' impact on the local economy will be in employment (principally clerical and other jobs that can be filled from the local work force). The firms may need office space, and/or warehouse space, and other services, but unless there is a real shortage of such services, this should not present a problem.

Firms in this category include:

Mud Companies - (which supply drilling "mud", a fluid used during drilling to lubricate and cool the drill stem, to transport drill cuttings to the surface and maintain pressure).

Cement Companies - (which provide a very specialized cement used in sealing drill casings).

Drilling Equipment Companies - (drill bits, reamers, pipe joints, pump parts, etc. These firms both supply and repair this kind of equipment).

Wellhead Equipment Companies - (suppliers and repairers of blowout preventers, mud manifold systems and similar equipment).

Fishing and Rental Tool Companies - (providers of specialized pipe equipment and equipment for fishing or retrieving equipment in the well).

Logging and Perforating Companies - (provides equipment and staff to monitor the well drilling and to "perforate" the casing to allow oil to flow into the well hole).

Helicopter Companies - (provide helicopters for transport of crews, and sometimes materials to offshore operations).

Catering Companies - (provides food and housekeeping services to offshore operations).

Diving Service Companies - (provide divers and equipment for underwater work, including installation and repair).

Completion and Production Service Companies - (provide equipment and personnel to control the flow of fluids from oil or gas reservoir to the surface).

Inspection and Testing Companies - (monitor equipment and operations to assure conformance to specifications).

2. Businesses which are not exclusively related to the oil industry:

These firms are likely to be located in a frontier area, and the oil industry and its subcontractors will contract for services from these companies as required. In addition to repair and maintenance facilities (discussed above in Chapter 3) the following services are required:

Trucking and Stocking Companies - (provide transportation and warehousing of tubular goods).

Supplies Firms - (a wide variety of miscellaneous equipment)

Metal Fabrication and Welding - Machine Shop Services.

Labor Contractors - (provides skilled and unskilled labor, usually in irregular and variable-length activities such as vacation replacements, well workover, and emergency repairs)

Oil Spill Recovery Services - (provides containment booms, and other clean-up equipment for use when conditions permit).

In addition, office supplies, fuels, cranes and lifts, communications equipment and other miscellaneous supplies will be required.

The variability in employment which is reflected in Tables 4.1 through 4.7 is also reflected in the timing of facilities. Assuming that the first lease sale for Georges Bank is held in January of 1978, and that a second lease sale is held sometime in 1980, the facilities for the high find scenario might operate on a scale roughly indicated by Table 4.8. This reflects a total time for the offshore industry to operate in New England of about 30 years. A comparable estimate for the medium find is about 20 years.

Pipeline Installation and Operation:		
	Installation:	1984 - 1992
	Operation:	1986 - 2007
Pipeline Installation Service Base:		1984 - 1992
Pipe Coating Yard:		1984 - 1992
Gas Processing Plants:		
	Construction:	1987 (others in 1989, 1990, 1992, 1993, 1994)
	Operation:	1986 - 2005
		1987 - 2006
Marine Terminals:		1991 - 2005
		1992 - 2006
Refinery:		
	Construction:	1981 - 1984
	Operation:	1984
Service and Supply Bases:		
	Temporary:	1978 - 1981
	Permanent:	1980 - 2009
Platform Fabrication Yards:		1981 - 1991 (This might continue to work to supply other offshore areas after 1990. Otherwise it would shut down)
Platform Installation Service Base:		1982 - 1990
		1983 - 1991

TABLE 4.8

B. Economic Costs

The other major types of economic impact are the costs associated with a large influx of people, capital, and business activity into an area. If finds are made, the decisions on technologies, facilities, and locations and the beginning of the development phase come very rapidly, with a large concentration of activity in a relatively short period of time. The demands on a community where a permanent service base, a refinery, or a platform fabrication yard will be located can be quite severe as up to several thousand people come into a community to build or operate these facilities.

The large population growths which accompany such facilities will be the principal factor in the impacts. Figure 4.4 which shows employment associated with the various onshore facilities, gives only a rough picture of the total population increase that is possible. Employees will come from the local work force, from a surrounding region, and from out of state. Some will bring families of varying sizes. In addition, the secondary employment generated by the facility will also generate population growth.

It is possible to estimate the total employment of any type of OCS facility but more difficult to estimate the impact on local population. Exactly how many employees will come from the local population (Figure 4.4 gives only very rough estimates), how many will bring families, what the ages of children will be, how many people will come from out of state to look for work and stay until they can find it, are all very uncertain quantities.

Such increase in population will have a variety of effects, including impacts on:

Public Services: The offshore oil industry will increase employment and will act as any new industry in an area to increase the tax base for both state and local government for all taxes. But while there will be more to tax for government, there will also be increased demands for services. Employees of onshore facilities will move into an area and require housing, schools, police and fire protection, medical facilities, recreation, water and sewer facilities, and all the other services provided by government. And they may demand these services in a very short time; 2000 workers moving in to build an oil refinery will need all these, but they will not stay around for long. But 1000 men working at a platform fabrication yard would demand these services permanently. The taxes may or may not be paid to the towns, (when the facility is in one town, but the population increases primarily in surrounding towns where the impacts actually occur). And current, or even planned services in these areas may be inadequate to meet the demand.

Labor and Local Business. The oil industry is sensitive to delays, and is willing to pay top dollar for what it needs. As a result, it may drive local customers of a business away, either because the oil industry can drive up the price of goods or services or because it can utilize the full capacity of a business to the exclusion of local customers. The same problem may occur in the local labor market, where the demand for such skills as ship captains, deck hands, and high tensile steel welders may be such that workers are drawn away from current employment and to the oil industry jobs.

SUMMARY OF POTENTIAL SOCIO-ECONOMIC IMPACTS FROM ONSHORE OCS FACILITIES

Housing	Increased Prices Shortages Mobile Home Parks, possibly very large ones Possibly more homes built
Land	Inflation in value Increase in property tax base Pressure for development of reviewing open space Cumulative Growth Possible loss of visual resources Competition for port uses
Public Sector	Increased demands for: Schools Public Safety (Fire, Police, Ambulance, etc.) Environmental Services (Water, Sewer, etc.) Hospital and other health care services Recreation Transportation (Roads) Increased property, income, and sales taxes Time lag between demands for services and taxes to pay for them Possible distribution of demand away from the facility
Private Sector	Increased business opportunities for local businesses capable of supplying industry needs competitively Increased employment opportunities Possible drains in supply of some services or goods Labor shortages in some skills

TABLE 4.9

The extent of this kind of impact will depend on the kinds and sizes of local business and the size of the labor pool in the special skills demanded, as well as such things as prevailing prices, wage rates, and the extent to which a business is currently being used or to which unemployment existed in the skill categories.

Housing and Land Values: The people who come to build and operate the onshore facilities will require housing. The effect on the housing stock in the community and surrounding area will amost certainly be to drive the price of housing up, and if there is little housing available to begin with, or if the facility is a very large one such as a platform fabrication yard, a severe shortage may result.

The facility, accompanying rises in economic activity directly tied to the facility, and secondary growth caused by increases in personal income in a region may, added together, comprise a more substantial change in a region than might be expected just from the facility alone. This cumulative growth, which may be accelerated in growth is already underway before an OCS facility locates in a community, is very difficult to predict accurately, and thus to plan for. It is, of course, more likely to occur with large facilities in relatively undeveloped areas. Since it is largely unpredictable, the only strategy which may have any success is to be aware of the possibilities and consider each stage of growth brought about by the facility, the suppliers, and by others within the context of the sum total of all growth occuring within the community. By keeping a "running total" on growth, communities may more easily address the questions involved with each separate growth opportunity.

Somewhat related to the potential land-use problems are port use impacts of a facility. Most of the OCS facilities require waterfront land, and most make use of that land as a port. For existing ports, this means that the OCS facility may have effects on landside use of the ports (piers, roads, etc.) and on oceanside uses (channels, mooring areas, docks, etc.). Competition for port facilities among the OCS facility, fishermen, recreational boaters, and other port users will be a prime concern for planners; potential conflicts must be identified and strategies for minimizing problems developed. The Maine Department of Transportation's Port Planning and Development Program (in the Bureau of Transportation Services) can assist in this planning with technical information on ports and through the inventory of facilities in all Maine ports which was completed in 1977.

If an OCS facility is located in an area which is not used as a port, some port facilities may be constructed at the site. These new port facilities may be usable for other purposes (fishing or recreational boating) after the OCS operations have shut down. In a very few cases the new port facilities might be available for other uses during the lifetime of the operations, but this would be subject to the builder's (the OCS facility's owner) willingness to make them available.

Boom and Bust: Onshore OCS facilities, like offshore operations, are relatively short term developments. Eventually, twenty to thirty years after operations begin, the oil and/or gas will run out, and after capping wells and dismantiling offshore platforms, the industry will leave a frontier area. Most associated onshore facilities will then shut down, although a few such as refineries and platform construction yards may keep operating. Moreover, within the time period for activity in a frontier area there may be wide variations in activity at a facility due to competition and other conditions within the industry.

This will make planning difficult, especially for businessmen who seek to offer goods and services to the industry, and to local people who may wish to train for jobs in the industry. Once the industry leaves, or during periods of slack activity, businessmen who have invested in expansion to meet the offshore industry's needs may find they cannot replace that business easily. And workers trained in skills for the offshore industry may find no market for their skills in the area. Those who will do business with the offshore industry, or seek employment in it, should be made aware of these potential problems.

The eventual departure of the offshore industry also means that onshore facilities will have to find new uses, or be reconverted to existing uses after final shut down. Communities will want to be sure that the future uses of the site are taken into account in planning, and that suitable provision is made for either conversion to a new use or reconversion to an existing use.

If a shortage is likely to result, mobile homes or some other form of temporary housing will be required. In Scotland an old passenger ship was used to house workers. Such measures would not likely be necessary in Maine, but large mobile home parks may be required during the construction of facilities such as a refinery or platform construction yard, and may be used for workers on a permanent basis. Southern Louisiana, where the offshore oil industry has been operating for over thirty years, still has numerous large trailer parks for workers at platform fabrication yards, and other facilities.

Because of the demand for land for the facility itself, and for housing, land values in the area may also increase substantially. While this will of course add to the property tax base, it may also put further pressure on open land for development and may make the purchase of land for other purposes more difficult for residents.

"Quality of Life"

Another impact which may affect local communities is on what may be called, for want of a better term, the "quality of life". While incomes, employment opportunities, and the tax base will increase with the location of an onshore facility in a community, the inflation in land values, lost open space, increased traffic and congestion, and possible loss of aesthetic attractions which may accompany the development may cause changes which residents of the community may not find desirable. Such effects will depend on the size of the facility and the size of the community, and how they are dealt with will depend on how the community views these effects. Planning by communities can greatly assist in reducing some of the undesirable effects, but it is possible for some facilities to permanently change the area in which they are located. Platform construction yards would probably have this effect if they were located in a community which had not had any other industrial operations. Service and supply bases, if they were located in Searsport or Portland, would not be likely to cause any fundamental changes unless they evolved into major service centers such as Morgan City, Louisiana or Aberdeen, Scotland. Given the relatively small estimates of oil and gas for Georges Bank this seems unlikely to happen.

C. ENVIRONMENTAL IMPACTS

If OCS development occurs, there are many possibilities for major, long term alterations in the coastal and marine environment. Such alterations could occur as a result of oil spills, or as a result of onshore facilities. While changes from both causes can be substantial, a major difference between the two is in the capability to project and manage possible impacts. The environmental impacts from onshore facilities are by and large predictable based on past experience. Oil spills are, on the other hand, both difficult to predict, and past experience has not yet provided reliable guides to effects.

Oil Spills

Concern for the damage which oil spills may cause to the fisheries resources of Georges Bank and to the coastline of New England has been the focal point of much of the discussion of offshore oil development on Georges Bank. Since the blowout in a platform in the Santa Channel in 1969, oil spills have often been associated in people's minds with OCS development. This association has been reinforced by the recent blowout in the Ekofisk field in the North Sea, and concern has also been increased greatly by the Argo Merchant disaster in December, 1976.

The concern for the potential effects of oil spills is not matched, unfortunately, by an ability to predict the possibilities of oil spills, or their effects.

Data on the sources of oil pollution in the ocean indicates (table 4.8) that offshore drilling is, overall, not a major source of oil pollution. And data (Table 4.9) indicates that over a period of time (8 years, or almost one third to one fourth the life of a field on Georges Bank) the amount spilled in the Gulf of Mexico, where there is considerably more activity than there would be on Georges Bank, is relatively small.

TABLE 4. 8

SOURCES OF OIL POLLUTION IN THE SEA

Automobile crankcase oil disposal	29.4%
Tankers	28.4%
Oil carrying barges	1.4%
Other vessels	17.3%
Industrial Machinery Waste Oil	15.3%
Refinery/ Petroleum Plant disposal	6.5%
Offshore drilling	2.1%

(Source: Goodman, Decisions for Delaware, 1975 Univ. of Delaware)

On the other hand, the possibility of a blowout where 5,000 barrels or more oil can escape per day is always present as the Santa Barbara and Ekofisk incidents demonstrate. Regulations require that the blowout preventers (Figure 4.2), which are valves capable of shutting down the well if pressure builds beyond tolerable levels. But these devices are manually operated, and thus subject to error. And the devices must be removed from time to time for maintenance, which leaves the possibility of a blowout at that time. The Ekofisk blowout occurred during such a period.

The probabilities of very large oil spills from blowouts are relatively small. Of equal risk, and with higher probabilities are tanker accidents and chronic spillage from loading and un-loading operations. Note in Table 4.8 that tanker and barge transport combined makeup the single greatest source of oil pollution in the oceans. Thus there would be a greater risk of oil spills if tankers or barges are used to bring oil ashore. The actual risk will depend on the extent to which oil from the OCS replaces oil brought from abroad. If the OCS oil exactly replaces oil that is now brought from abroad, then the risk to the East Coast as a whole does not change, although the risk in any one area may change because of the destination of oil (for instance to a possible New England refinery). The risk of oil spills may decrease if pipelines are used to bring the oil ashore, and that oil replaces oil from abroad. Conversely, the risk may be greater if the OCS oil does not replace foreign oil.

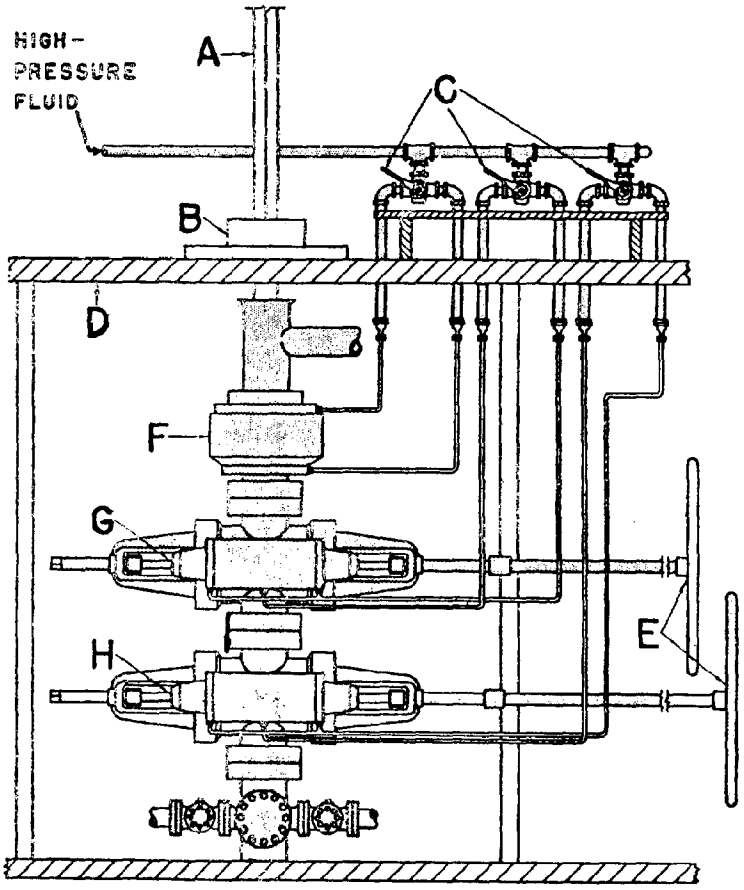
Major oil spills of the type that occur with a blowout or a tanker accident are not the only danger. Whenever oil is handled by tankers, small spills are all but inevitable. Such small spills are usually dispersed. However, such dispersion may simply redistribute the spill into areas where the effects are impossible to discern.

The technology to clean up oil spills has been developed greatly in recent years, but the technology is not usuable under all conditions. Under United States Geological Survey regulations, companies with drilling leases on the OCS must have a contingency plan prepared and approved for dealing with any oil spills which may occur offshore and must stockpile equipment for a response in case of a spill. But oil spill clean-up technology is not very effective in high winds and turbulent seas, any clean-up technology is most effective in relatively calm waters. Thus, it is not likely that even the best technology, promptly and properly applied, can guarantee that damage from an oil spill will not occur.

If an oil spill occurs, the question of where the oil will go arises. Aside from the obvious point that this will, in part, depend on the origin of the spill, not much is known. Several computer models have been developed to predict the movement of oil spills on Georges Bank. These models use data on tides, winds, and ocean currents, as well as bottles set adrift on Georges Bank, to get an idea of where an oil slick might drift. The first model, developed at M.I.T. in 1973, concluded that an oil spill is most likely to drift ashore during the spring. Such a spill would affect the Massachusetts coast, especially Nantucket, Martha's Vineyard, and Cape Cod. During the rest of the year a spill would probably be carried easterly or northeasterly out into the Mid Atlantic. This was the case with the Argo Merchant spill, which occurred during the winter.

Figure 4.2
Blowout Preventer

A = *Kelly*
B = *Rotary Table*
C = *Hydraulic Controls on derrick floor*
D = *Derrick floor*
E = *Manually Operated controls on side of substructure*
F = *Top preventer, which contains a large rubber element capable of sealing around any tool protruding through casing head*
G = *Pipe rams which close off hole, providing drill string is removed*



Because of the distance and the prevailing winds and currents, it is unlikely that a spill from drilling operations could reach Maine shores. However, tanker accidents near Maine shores could cause spills that would affect Maine. This will depend on whether Maine ports are used.

It would seem, therefore, that some oil spills are going to happen if OCS development takes place. The question then, is what the effects will be. A great deal of research about the effects of oil spills has yielded few definitive results which would allow the damage caused by any one spill to be predicted with accuracy. There are two difficulties in research and oil spills; first is the great complexity of the marine ecosystem. It is very difficult in most cases to separate the effects of oil from other changes in the environment; the second is the large areas of ocean in which spills occur. When the area of ocean covered by a spill is multiplied by the volume of ocean through which a spill passes, the problem ot determining the effects becomes apparent.

Some things about the life span of oil spills are well known. Oil starts out as a slick, but over the course of two or three days the slick disperses and degenerates into tarry lumps, or pancake particles of oil. This occurs because the lighter fractions of the crude oil evaporate and leave only the heaviest parts. The tarry lumps will then be carried by the ocean currents; if they do not reach shore in one to two weeks, they will usually sink, covering the bottom.

The toxic nature of oil to living organisms is well established. The lighter fractions are immediately toxic to fish, but since there fractions evaporate relatively quickly, it is only during the first one or two days that the oil is directly toxic. The oil which remains after evaporation is toxic to sea birds, if the birds land in it and get it on their feathers. It is also toxic to beach organisms if the oil washes ashore. The tarry lumps will sink into beach sand and cause disruption in the intertidal ecosystem, and they may be carcinogenic to organisms that absorb it after it sinks. This may happen with shellfish which seem to absorb the oil relatively easily. Shelfish taste is also definitely affected by oil, making tainted fish commercially valueless.

The effects on the fish stocks of Georges Bank (herring, cod, hake, etc.,) from oil spills are again unpredictable. It is known that oil spilled in the water does not usually affect adult fish, even when the oil contains its most toxic elements. Adult fish can simply swim out of the way of oil slicks and avoid them. At the larval stage, however, fish can be killed in large numbers by an oil spill. The M.I.T. Georges Bank study estimates that as much as 1% of a yearly class of fish could be killed by an oil spill in a spawning ground at the right time of year. This is not large, and would not threaten the existence of a species. However, a large larval kill could affect the commercial viability of some species, especially in those species that have been severely overfished in recent years. This would not be permanent damage; the stock would recover. But it would mean reduced fishing, and a longer time for recovery of depleted stocks.

Temporary disruption of fishing operations is also an affect of oil spills. It is not possible to trawl a net through an oil slick, where gear and catch are fouled by the oil. The area of a spill is thus closed to fishing for the duration of the spill.

Research has been able to identify the short term effects of oil spills, but has been largely unable to identify long term effects. In 1969, a barge went aground in Buzzards Bay, Massachusetts carrying No. 2 fuel oil, a relatively light oil. Large scale destruction of the shellfish resources in Buzzards Bay was attributed to the spill, and recovery of the fishery is still not complete. Oil continues to pollute the area, having become locked in the sediments whence it is released continually and keeps recovery from being complete. This spill, intensively studied by scientists at Woods Hole Oceanographic Institute, demonstrates that the long term effects of a spill can be devastating. But the Buzzards Bay spill had several features which make it impossible to generalize the results to all spills. For one thing, the oil spilled was more toxic than crude, and the spill took place in an area where the oil was not dispersed, but rather concentrated. This case can really only demonstrate the effects of a light fraction of oil spilled in a confined area, and does not tell much about crude oil spilled on the open ocean.

TABLE 4.9

TRENDS IN GULF OF MEXICO
OIL SPILLS

Year	Number Incidents	Total Production (bbls)	Total Spilled (bbls)	% of Production Spilled
1964	5	122,500,126	14,928	0.0122
1965	2	144,986,615	2,188	0.0015
1966	0	188,714,070	0	0
1967	2	121,861,614	160,704	0.072
1968	2	266,936,001	6,085	0.0023
1969	8	302,919,143	10,924	0.0036
1970	7	335,658,540	84,323	0.0251
1971	11	387,445,398	1,285	0.0003
1972	2	389,323,680	150	0.00004

(Source: Decisions for Delaware)

In the Gulf of Mexico, where offshore drilling has been going on for over thirty years, there have been no definitive studies showing that marine resources have been substantially destroyed by the oil development. Because the platforms become the home for organisms at the low end of the food chain, some forms of fishery such as shrimp have actually increased. On the other hand there have been changes in the distribution and composition of fish stocks over the years, and the oyster industry has suffered from the tainting of the oysters with oily taste.

The largest amount of oil spilled into the ocean in a relatively short time has not come from tanker accidents or blowouts but from the sinking of tankers by U-boats in World War II. A recent study of tanker sinkings along the coast of the United States by a team at M.I.T. reveals that there is no evidence that over the thirty years since the war the oil spill did damage to fisheries, but this study again does not demonstrate anything conclusive because of the lack of baseline data.

In order to deal with oil spills, every effort must be made to minimize the probability of their occurring. Federal regulations require blowout preventers and other safety measures. But the most important measure that could be taken would probably be oil transport by pipeline. This eliminates the need for tanker and barge operations, the greatest risk of oil spills. But pipelines are extremely expensive, and pipelines are also prone to oil spills, though less so than tankers, and would not be used if there is not a sufficient find to pay for it. Maine has joined with Massachusetts to urge the federal government to require pipelines if at all feasible, which the Department of Interior has agreed to. Decisions on the exact transportation made will not be made, of course, until there is more known about the size of the find and the oil companies' development plans.

EFFECTS ON FISHERIES

The principal source of concern for the effects of oil on the fishery resources of Georges Bank is fear for the effects of oil spills. As the previous section indicates, there is ground for concern, but it is not likely that the fisheries resource would be destroyed by oil development. However, oil spills and petroleum development operations definitely have the potential for short and long term damage to the fishing industry. Fishing operations can be forced out of an area where an oil spill has taken place, and some larvae may be destroyed lessening the available catch in subsequent years. While an entire species would not be eliminated as a result of an oil spill, a spill could seriously endanger the commercial viability of a stock for some time; this might be especially serious in stocks which are currently depleted due to overfishing in recent years. Moreover, the oil industry represents a new demand on the Georges Bank area and on the ports of New England, and there are areas where the demands of the oil industry may conflict with those of the fishing industry. These conflicting demands will primarily take the form of competition for space, both at sea and onshore.

Offshore, the emplacement of drilling rigs, pipelines, partial processing facilities, and possibly storage tanks on and under the ocean will take away space that is now completely open to fishermen. How much space will be taken out of fishing activity is uncertain, but estimates have been made by the Woods Hole Oceanographic Institution. While fishing on Georges Bank takes place at all times of the year, and in all sections of the bank, the pattern of fishing on the Bank tends to be along the northern and western edge, while the tracts that will be leased tend to be along the southern and eastern edge. By dividing the Bank up according to areas of fishing and by areas of oil company interest (tract nominations) the Woods Hole study found that 84% of the tracts nominated by the oil companies coincide with the least productive 60% of the fishing grounds. This area accounts for only 18% of the historical fish catch. Only 8% of the nominated tracts are in an area which accounts for 37% of the historical catch.

Within those areas of overlap some ground will be taken out, but probably not much. The Woods Hole estimate is less than .2% of the area that could be taken out by the platforms required to develop the highest estimated quantity of oil and gas reserves. The exact area depends on the extent to which the area between platforms is open. If the platforms are too close together to allow a fishing boat trawling a net to pass between them, or if the platforms are tied together by pipelines which would snag bottom draggin equipment, then the area would be closed. The .2% estimate applies to the case where all the space between the platforms is unavailable to fishing.

While these estimates indicate the actual physical area to be removed from fishing is probably very small, they underestimate the potential effect that the emplacement of oil drilling structures could have. Fishing is a dynamic operation in which the boats must go where the fish are. A fishing boat, especially a side trawler, is not very maneuverable when the net has been set, and so the fishing boats will be forced to give oil related operations a wider berth than is implied by the actual size of the oil equipment. It is impossible to guess how much of a berth will be necessary, since this will depend on the boat, the captain, the wind, etc. It should not, however, be a great deal more, and fishing operations will have to only be altered somewhat rather than stopped.

Another potential source of conflict might be between fishing boats and service boats and other vessels. This should not present major problems, however, since the oil industry vessels tend to operate on more or less regular schedules and courses, and as long as the fishermen are made aware of these schedules, there would probably be no great problem.

The greatest fear of fishermen is the amount of debris that will be added to the ocean bottom by oil operations. Federal regulations prohibit the dumping of debris from boats or rigs, but the regulations are difficult to enforce, and dumping does occur. The debris presents a real threat to fishing gear, since trawl doors and nets can become ensnared in the debris and destroyed causing gear loss that may cost a fisherman thousands of dollars. Fishermen have recommended strict enforcement of the anti-dumping regulations, a position supported by Maine and Massachusetts. And, as with other areas of potential conflict between oil and fishing operations, difficulties can be minimized by close communication between the industries. In this case, the oil industry operations must be made to appreciate the seriousness of dumping debris.

The same kind of problem can occur with pipelines, where the pipe, valves and pumping stations along the way can also damage fishing gear. Pipelines are normally layed in trenches that are blasted using water or air pressure to dig a trench in the bottom sediment. The normal shifting of the sediment is usually sufficient to cover the pipeline, but this is not likely to be the case on Georges Bank where bottom conditions are not conducive to this. Recommendations have been made to require burial of the pipeline, and marking and covering of all other associated equipment to assure that the dangers are minimized.

An important means of helping fishermen whose gear is damaged by oil operations is a Fisherman's Compensation Fund which would pay fishermen for lost gear. Such a fund has been proposed in Congress.

The possible conflicts onshore will be greatest if fishing boats and service boats compete for space in crowded harbors. Dock space, traffic lanes, and port services would be in demand by both. While service bases are not usually set up in crowded harbors, and the intense competition that might occur in a port like Gloucester is not likely, competition is still a potential problem in any port, especially since the oil industry can usually pay higher prices for needed services. Fishermen may find that repair yards that they have used, o. .her services that have been readily available, are taken up servicing service boats or other oil equipment. This problem may be most acute during the exploration phase, when businesses are not likely to expand to meet new demands until a find has been made and they know that future business levels will justify expansion.

Competition for labor, especially experienced crews, may also present difficulties for fishermen. Again, the higher wages paid by the oil industry will lure men away from fishing. However, officers or service boats must be Coast Guard licensed, which is not required of fishing captains.

These problems of competition for services and labor can be predicted only at a very general level. The exact extent to which this might occur will not become known until the exploration phase begins and service bases are established.

The conflicts between the fishing and oil industries may occur, but most can be dealt with by planning and cooperation between them.

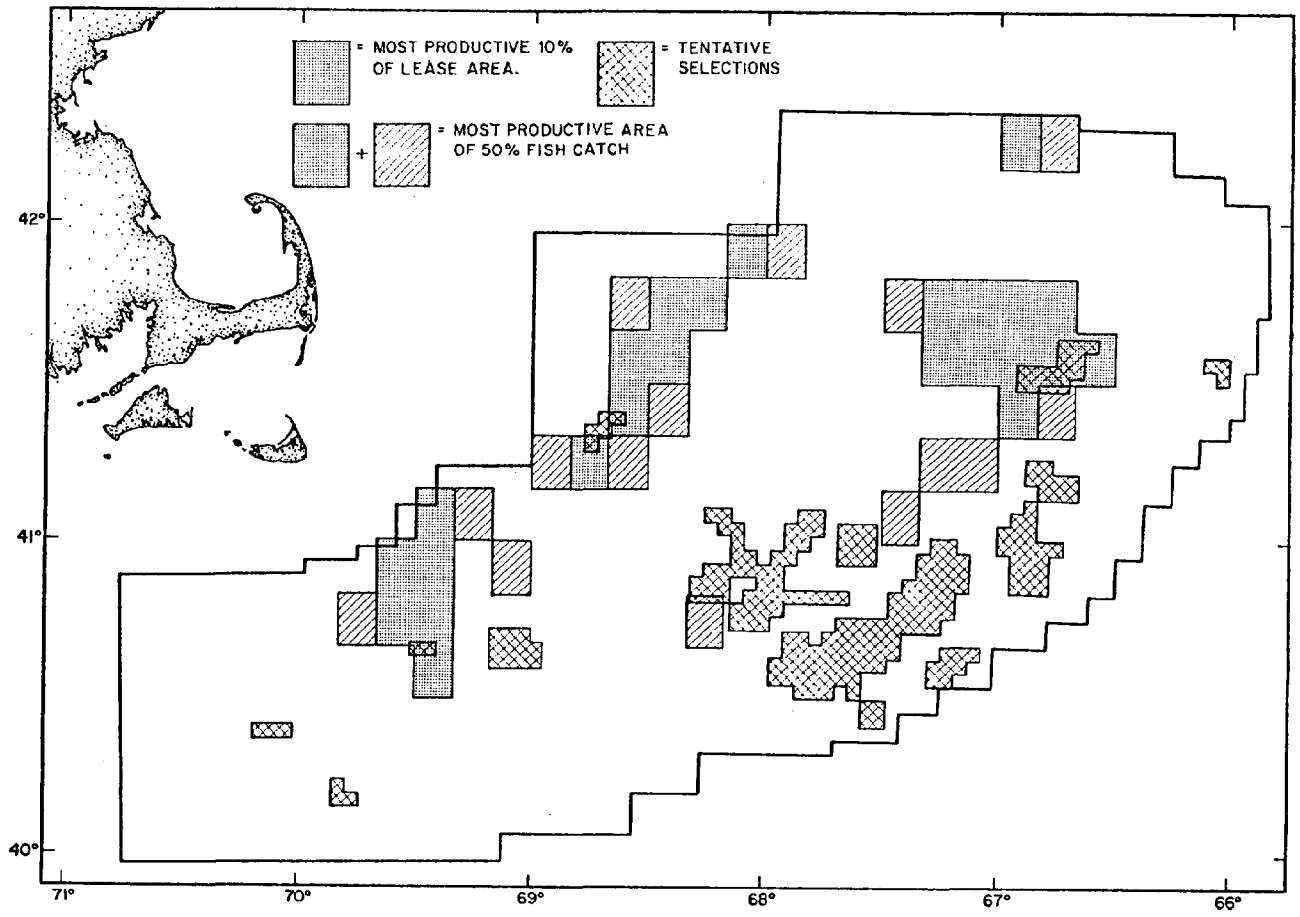


Figure 4.3
Comparison of most Heavily Fished Areas on Georges Bank with original tract selections

ONSHORE FACILITIES

The environmental impacts of onshore facilities are summarized in the sections on each facility in Chapter III. These impacts range from the relatively minor disruptions of the beach when a pipeline landfall is constructed to the major changes in land use, and air and water quality implied by a refinery. The environmental impacts from these facilities are essentially those of any heavy industrial operations. As such they would come within the purview of state and federal laws which require minimal additions to pollution. Since judgments about the acceptability of environmental alterations from such facilities can only be made, the specific site of a facility is taken into account, decisions about onshore facilities should only be made when specific proposals are put forward. The local planning process and state and federal laws should insure that such damage as may occur is minimized.

V. OCS POLICY DEVELOPMENT IN MAINE

Maine's policies concerning Georges Bank oil development have been shaped primarily by the fact that the Federal government and oil company's have primary responsibility for the timing, scale, and management of OCS exploration and development. Within this overall context set by the oil companies and the Federal government, State and Local governments will have to deal with the effects of OCS onshore and offshore operations as they may impact the economy, the environment and the way of life of New England citizens. In Maine, it is anticipated that the existing framework of land use and environmental laws will be able to provide sufficient legal authority to manage any adverse impacts, although some improvements to the basic environmental and land use laws are currently being considered by the Governor's Advisory Committee on Coastal Development and Conservation. It is also anticipated that the existing pattern of planning responsibilities will not have to be altered to deal with OCS development.

Maine's policy has been developed through the efforts of the Governor and his Advisory Committee on Coastal Development and Conservation. The major components of Maine's policy were established in September, 1975 when the Governor testified before a special hearing of the United States House of Representatives' Ad Hoc Select Committee on the Outer Continental Shelf. In that testimony Governor Longley said,

> "It is clear that Maine and the other New England states need reliable sources of petroleum and, assuming the presence of significant quantities of hydrocarbon resources, that the development of Georges Bank would satisfy this need. It is equally clear that the cultural and natural impacts of poorly thought out offshore oil and gas development could be immense. If Georges Bank development occurs, we need to be exceptionally careful to prevent inadvertent loss of things we treasure in this state and New England in the pursuit of transient gains. Fortunately, since the exploration and development of a new oil and gas field takes several years, there is no reason to rush ahead in panic. The time is available to do the job right. In view of our undeniable energy needs, the carefully controlled development of Georges Bank appears to be a sensible policy. Therefore I support, in principle, the orderly development of Georges Bank oil and gas resources."

The original announcement of leasing plans on Georges Bank was made in June, 1975, and the Lease Sale was set for August, 1976. Much of the State's early efforts were directed towards persuading the Federal government of the need to assure maximum economic benefit by protecting the marine environment and minimizing adverse onshore impacts. Particular attention was directed to revising the OCS Lands Act, the Federal law which authorizes the leasing of lands on the Outer Continental Shelf and establishes the management principles for offshore petroleum development.

As of December, 1977, the Congress has yet to pass needed amendments to the OCS Lands Act, but some of the changes that Maine has been requesting since 1975 have been adopted by administrative action of the Department of the Interior and other federal agencies. In the meantime, the Maine State Planning Office has been conducting an extensive analysis of all OCS issues. Maine's policy positions on OCS matters are summarized in the following sections, which describe the basic Executive Branch position on each major issue and discuss the current status of events related to that issue.

1. Actions to Take Advantage of Economic Development Opportunities Which May Result from OCS Development:

> "Where significant new business opportunities are identified which, on balance, would produce more gains than losses, the State will seek to work in partnership with oil and gas development interests, coastal area communities, and the Federal government to bring those opportunities to reality." Governor Longley, statement to the House OCS Subcommittee, 1975.

In December, 1975, Governor Longley sent a letter to a number of leaders of the offshore oil industry in which he wrote that a basic objective of Maine's policy on OCS development is "to help private industry implement beneficial development proposals which would at the same time serve conservation goals and meet established environmental standards.

Since Service Bases are both the most likely of the onshore facilities to locate in Maine, and the facilities which are most compatible with current uses of the coast, the Governor has supported promotional efforts on behalf of Maine communities which have determined for themselves that they would like to be considered as sites for Service Bases. These communities include Portland, South Portland, Bath, Rockland, Searsport, Belfast, and Stockton Springs. In June, 1977, the Governor sent an open letter to the Offshore oil industry (appendix D) in which the sites and facilities available in these communities were described.

Other industrial development efforts are being undertaken by the towns. As Georges Bank development occurs, and the possibilities of other economic development opportunities in Maine become apparent, the State will have to consider how to structure these opportunities so as to be beneficial to Maine, and what development activities will be appropriate.

2. Protection of the Offshore and Coastal Environment:

> "The realization that Georges Bank oil and gas development, if it occurs at all, will be a memory in 50 years will be a guiding factor in Maine's approach to OCS development. Careful attention must be given to insuring a high degree of environmental protection." Governor Longley, Statement to House OCS Subcommittee, 1975.

Protection of the marine environment beyond the three mile limit is the responsibility of the Federal government. Several agencies, including the United States Geological Survey, The Bureau of Land Management, and the Coast Guard have responsibilities for regulating the operation of drilling rigs, the use of various technologies, the emplacement of pipelines, and navigation. It is imperative that the regulations promulgated by these agencies take into account the unique conditions and uses of Georges Bank, require the use of technologies which assure maximum environmental safeguards, and ensure that the regulations be strictly enforced.

In the original selections of tracts to be leased, several tracts along the northern and western edge of Georges Bank were nominated. In comments made in December, 1976, on the *Draft Environmental Impact Statement*, Horace Hildreth, speaking for Governor Longley, urged that these tracts be withdrawn from the first Lease Sale since they were the closest tracts to shore. In October, 1977, Secretary of the Interior Andrus accepted this suggestion, which had also been made by the Commonwealth of Massachusetts.

An important part of any environmental protection effort is a knowledge of baseline conditions. In order to assess changes in the environment, it is important to understand the current state of the environment. This is the purpose of the OCS Environmental Studies Program which is undertaken by the Federal government. The Governor has urged the Federal Government to begin the Environmental Studies Program prior to the actual commencement of drilling operations, and this is now Federal policy. While these studies are expected to continue for several years, it will now be possible to have baseline data on the state of the environment prior to oil beginning.

While the Environmental Impact Statement (EIS) has become an important tool for environmental policy, in many instances such as OCS development there are too many unknowns at the time the EIS is prepared (prior to the Lease Sale) to make accurate projections of environmental impact. Maine has urged the Department of Interior to prepare two Environmental Impact Statements: one at the time of a Lease Sale, and the other after oil or gas is found but before development phase activity begins. This will provide a clearer view of potential effects during the development period (the time when activity and the impacts are greatest) since the location and extend of petroleum resources will then be known. The Department of Interior has now agreed to prepare a Development Phase EIS.

Since oil spills are the greatest single threat to the environment likely to result from OCS development, it is imperative that the Federal government enact a strict liability law which will compensate those damaged by oil spills and which will pay for immediate clean up of a spill without resorting to litigation. The Maine Coastal Conveyance of Petroleum Law should be a model for such legislation. An oil spill liability law was included in the OCS Lands Act amendments which were defeated in the Congress in 1977. Maine will continue to press Congress for such a law, as it is essential to responsible development.

A major consideration of any environmental protection plan for OCS development on Georges Bank must be the protection of the fishery resources in this area. This is especially critical since overfishing of stocks in recent years has depleted many species to the point where substantial damage to a stock could result in eliminating that stock from commercial viability for many years. The new Federal Fisheries Management Program (the 200 mile limit) must be given the opportunity to rebuild stocks without the added burden of major environmental damage from the oil industry.

The tracts along the northern edge of the bank (figure 2.7) were withdrawn at Maine's request, with the exception of one tract. As that tract continues to lie in a major spawning and migratory area, Governor Longley has requested that it too be withdrawn from Lease Sale #42.

The potential conflicts between fishing and oil operations can only be dealt with through strict enforcement of anti-dumping regulations and through cooperation between the fishing and oil industries. A compensation fund for fishermen whose gear is damaged or whose time is lost due to oil operations is also a necessity. While the Department of the Interior has proposed stricter regulations on dumping, a Fishermen's Liability Program has not yet been established.

3. Participation of the States in OCS Leasing and Management:

> Maine supports changes in the way oil and gas development decisions are made so that affected states and communities can become partners with the Federal government and the petroleum industry in making decisions about the pace and location of development, both onshore and offshore. From Governor Longley's Statement to the House OCS Subcommittee, 1975.

The Federal government, as the owner of the Outer Continental Shelf land and its resources has the authority to decide when and under what conditions these resources will be developed. But it is the coastal states' communities and individual citizens residing in those states who are directly affected by OCS development. There is thus a critical need for the Federal government to view the development of OCS resources as a cooperative undertaking of all levels of government.

The principal means of such cooperation must be the involvement of state (and local governments, when appropriate) in the decision-making process of the Federal government. The vehicles for such involvement must be expanded information programs, so that state and local governments are kept informed of events related to OCS development, and frequent, meaningful opportunities for review and comment of potential federal decisions.

Several opportunities for such review and comment have recently become available, as have new programs to provide expanded information about OCS Development. The Department of the Interior has proposed a joint state-federal transportation management program to deal with all aspects of planning for oil and gas pipelines and for tankering of oil. The Department is now requiring that oil companies submit separate Exploration and Development Plans before drilling can begin in either the Exploration or Development Phase. This is in addition to the new requirements for a Development Phase Environmental Impact Statement. These latter changes reflect procedures which Maine has been advocating for several years to clearly separate the Exploration and Development Phase in the management process.

The Bureau of Land Management and the United States Geological Survey have also proposed new information plans to keep states up to date on the latest events, findings, experience, and other matters pertaining to OCS development during the pre-lease (BLM) and post-lease (USGS) periods.

It should be noted, however, that these changes, desirable as they may be, are only administrative changes instituted at the direction of the present Secretary of the Interior. Cecil Andrus. Thus, they are subject to administrative change in the future. The OCS Lands Act amendments which were tabled in November, 1977, would have codified similar requirements into law as advocated by the State of Maine. Therefore, it remains important for Congress to act in the near future in order to assure continued cooperation between Federal and other levels of government.

Another essential aspect of the Federal-State-Local cooperation on OCS matters is funding for adverse impacts on communities which result from either onshore or offshore operations. The addition of oil or gas reserves from Georges Bank to domestic reserves is a benefit to the nation as a whole, and it should be a national responsibility to compensate those who may suffer damage as a consequence of OCS development.

The Coastal Energy Impact Program established in 1976, should provide such assistance, as long as adequate funds are appropriated by Congress.

4. Other Aspects of OCS Management:

New bidding systems should be tried in order to maximize the return from OCS petroleum resources to the American taxpayer.

Under the prevailing system, an oil company bids on the bonus to be paid to the Federal government at the time the lease is sold, and then agrees to pay a fixed royalty (usually 16-2/3%) on all oil or gas which is produced from the leased area. Alternate bidding systems could increase the return to the taxpayer on the sale and subsequent production. The first Georges Bank Lease Sale will also be one in which an alternate bidding system will be tried. Certain tracts will be sold on the basis of bids on the percentage of oil and gas sales to be returned to the Federal government as royalties, and a fixed bonus will be required. But this is the result of an Administrative Process directed by the Secretary of the Interior, Andrus, and has not been codified into law.

5. The Need for a National Energy Policy:

The development of a national energy policy and plan which examines the desirability of accelerating offshore oil and gas production within an overall framework of energy supply, conservation, and use, and which establishes the rationale for accelerating offshore oil and gas production is essential for sensible development of offshore petroleum resources. From Governor Longley's Statement to the House OCS Subcommittee, 1975.

It has been evident for some time that new domestic petroleum reserves should be searched for, but the energy question is far too complex and too basic to all aspects of American life to allow quick and easy solutions. Only when OCS development is placed within the context of all the options available to deal with the energy problem can a reasonable approach be taken in making decisions. The Carter Administration's National Energy Plan is the first attempt at considering OCS within the entire energy context, and the changes which have been made in OCS regulatory procedures reflect the view of the Plan that, while the Outer Continental Shelf is an important potential source of new energy resources, there is also a need to take adequate precautions during the development process.

6. Boundaries:

> Any outstanding boundary issues, including those between the United States and Canada, and between adjacent states, should be settled as quickly as possible in order to clarify the situation regarding future lease sales, inshore management responsibilities, and distribution of related Federal grants and loans. From Governor Longley's Statement to the House OCS Subcommittee, 1975.

There is currently no agreed-upon boundary between the United States or Canada on Georges Bank. Both nations have claims, based on differing interpretations of the international law regarding boundaries, to the eastern 1/3 of the Bank. As a result of this dispute, tracts which were nominated but lie to the east of the Canadian-claimed line, were withdrawn from those to be auctioned in Lease Sale #42.

Negotiations between special representatives of the United States and Canada have been underway since August, 1977, and it is expected that a settlement will be proposed by the end of 1977.

The Coastal Energy Impact Program (described in chapter 6) requires that an extension be made of the lateral seaward boundary between states in order to determine eligibility for funds under one of the grant sections of the Program. Maine has taken the position in negotiations with New Hampshire and Massachusetts that the extension of the boundary should be only for the purposes of the CEIP and that an extension of the boundary between Portsmouth and Isles of Shoals recently fixed by the Supreme Court would meet the requirement of the Law.

As of November, 1977, agreements among the three states involved has not proved possible, and it is anticipated that the issue will be submitted to the Department of Commerce for resolution of the dispute.

7. State and Local Planning:

> "The State will take the lead in helping coastal communities and coastal area citizens prepare for the onshore activities which could accompany offshore oil and gas development. The objective of this assistance will be to pinpoint new business opportunities for Maine, to evaluate the likelihood of Maine coastal communities being asked to host specific types of oil related development and to develop an understanding of the needs and consequences of oil related development." Governor Longley's Statement to the House OCS Subcommittee, 1975.

Just as the OCS management process must be a cooperative venture among Federal, State, and Local governments, so too should planning for industrial development and possible impacts be a cooperative undertaking between State and Local governments.

The State Planning Office, through the OCS Planning component of the Coastal Program, will assist communities by providing information on OCS development and the onshore facilities which may come to Maine. Because of the uncertainty surrounding OCS development, the best way to approach planning for OCS is to provide the maximum amount of information possible to those with responsibilities for dealing with any potential impacts, so that actions may be taken as quickly as possible.

The OCS Technical Memorandum series will serve as the primary vehicle for disseminating information in this area. The first two reports in the series, Service Bases for Offshore Oil and An Annotated Bibliography of OCS Documents in Maine, have been published in conjunction with this report.

Other areas where the State Planning Office will provide assistance are in the analysis and projections of socio-economic impacts which may result from the location in Maine of any of the onshore OCS facilities, through the Office's Regional Socio-economic Impact Model (RSIM), through the Coastal Inventory and, in providing data on the natural resource base of an area where a facility may locate.

The State Planning Office will also be the agency responsible for administering the Coastal Energy Impact Program for Maine. This Program, described in the following chapter and in the forthcoming pamphlet The Coastal Energy Impact Program in Maine will assist communities impacted by OCS development to plan for those impacts, and in many cases, to pay for new municipal services and facilities required, or to compensate communities for unavoidable environmental damage.

The Department of Environmental Protection and other State agencies have responsibilities for regulation of new facilities to assure that they meet existing environmental standards. The complex nature of impacts from heavy industrial development on the coast may necessitate a new look at current procedures for determining the desirability of a specific facility's proposal. Under Legislature and Gubernatorial direction, the Governor's Advisory Committee on Coastal Development and Conservation is considering the question of whether changes in existing policies on the siting of heavy industry facilities should be made; if changes are considered to be necessary, the Committee will make recommendations to the Governor which will enable the State to take a broader perspective on such development.

Local policy toward OCS facilities will depend, of course, on the facility and the community. Several communities have already decided to try to attract Service Base facilities and have begun the planning for them under grants from the State Planning Office; the communities of Portland, South Portland, Bath, Rockland, Belfast, Stockton Springs, and Searsport have identified sites for Services Bases, potential local suppliers to the industry, and improvements in municipal facilities and services which might be needed if a Service Base were to locate in the community.

Policy Development on OCS matters will continue over the next several years as operations get underway, effects become clearer, and the needs for action on the part of Federal, State and Local governments are identified. Policy development to date has been constrained by a lack of knowledge about the actual location and extent of any petroleum resources on Georges Bank. As a result, policy development has concentrated on assuring that programs, procedures, and actions are taken to assure that, so far as possible, OCS development can be undertaken with a minimum of risk and maximum of benefit for the people of Maine.

VI. PLANNING FOR EFFECTS OF ONSHORE FACILITIES

It is unknown whether any firms which operate onshore OCS facilities will seek locations for those facilities in Maine. Chapter 3 presents a discussion of onshore OCS facilities and the possibilities that some of these facilities might locate in Maine; Chapter 4 delineates the general effects which are a consequence of the construction and operation of the various onshore and offshore facilities. As Chapter 4 demonstrates, the effects of onshore facilities are largely local, and thus it will be necessary for both State and Local governments to prepare to take advantage of the beneficial effects of a facility and to mitigate any adverse effects.

The planning process for OCS facilities has two basic steps. First, the potential effects must be identified, and then actions and strategies formulated to deal with the anticipated effects. Much of the burden for undertaking planning and for coping with the effects of facilities will fall on local governments. Local governments will be the most instrumental in undertaking promotional activities to the industry, and will be in the best position to assist local businesses and citizens in taking advantage of the oil industry's employment and purchasing requirements. Local governments will also have the responsibility for managing most of the adverse socio-economic impacts and will have to deal with certain environmental effects not covered by State law, particularly through zoning.

Under existing law, including the Site Location Act, Coastal Wetlands and Air and Water Pollution Acts, the State has primary responsibility for assuring the maintenance of environmental quality; however, these laws do not take socio-economic considerations into account, and thus these are not considerations when permits are issued under the aforementioned laws. The State's role, other than in administering statewide environmental laws, will be limited to providing information to local planners, offering technical assistance in formulating plans, and serving as the administrator of federal impact assistance funds through the Coastal Energy Impact Program.

It will be upon the government of the town or city where a facility may be located that the primary burden for planning and action will fall. A community may find it necessary to join with surrounding communities if the effects are likely to be felt in a wider area. This is especially likely with some of the larger OCS facilities which will have large population growth associated with them, particularly during the construction phase. This population growth is very likely to spillover to a wide area.

The local governments may turn to Regional Planning Commissions and Development Districts for assistance in planning. State Planning Office and other agencies of State government will also provide assistance. Regional Planning Commissions and Development Districts may be particularly useful in providing technical staff to assist communities and in coordinating planning among several towns which may experience effects. State agencies will assist primarly by providing information about facilities and potential effects.

The first phase of planning is the gathering of information about the facility and its potential effects. This is a critical stage since the exact effects of a facility cannot be determined until a proposal for a specific facility is made at a specific site. There is a great deal of variability in facilities and local conditions which make it impossible to predict the effects of facilities with any precision. Much detailed analysis of the exact facility on the site on which it will be built is required. A wide variety of information must be collected for efficient planning. Information about the size, operational characteristics, construction and operation schedules, the number of employees, and any requirements of the facility for infrastructure (roads, sewer, water supply, etc.), should be acquired. The firm which will own or operate the facility can be expected to be the major source of information about the facility itself, through direct contact with local planners and through applications for State, Federal, and Local permits. The State Planning Office, will also provide as much detailed information about facilities as possible, through the OCS Technical Memorandum series (the first of which was published in December, 1977 on Service Bases) and through a document library which contains a variety of information about OCS-related matters. (See An Annotated Bibliography of OCS Documents in Maine, published by the State Planning Office).

The Federal Government also has two information programs which will assist local planners. The United States Geological Survey requires that oil companies provide information on all onshore facilities which they expect to build or utilize, including employment and other data, as a condition of approval for the Exploration and Development Plans. These plans must be approved before exploration can begin and, if a find is made, before field development can begin. This program is expected to provide a variety of useful and timely information to communities.

The Bureau of Land Management is also requiring an annual update of geological data, reserve estimates, and anticipated development activities. This information will be very useful in determining the possible future activity at an onshore facility, and hence the possible effects on the local government and economy.

Information about the site, and the community must also be gathered. The State Planning Office's Coastal Inventory can provide useful natural resource information about the site itself, including such information as soil characteristics, fish and wildlife resources, water resources, and land cover-vegetation. The Department of Transportation's Port Inventory may also be valuable if port uses are anticipated. Table 6.1 is a list of materials which will assist communities in gathering the required information. All are available from the State Planning Office or the authorized agency.

The Maine Coastal Inventory (1977)

1. Maps covering all areas of the Coast (Scale 1:48,000)

   Map Series Cover: Topography, Slopes, Watersheds and Water Classifications, General Soils, Fish and Wildlife Resources, Land Cover Types, Recreation Facilities and Activities, Suitability of soil for sewage disposal.

2. The Maine Coastal Inventory Handbook

   Contains Key information to all maps.

Maine State Planning Office, Maine's Coast: Special Considerations for the Municipal Planning Process (1977)

Maine State Planning Office, Guidelines for Local Planning Boards (1973)

Maine State Planning Office, Maine's Coastal Program: The 306 Application (1977)

Maine State Planning Office, Shoreland Zoning in Maine (1975)

Maine State Planning Office, RSIM, The Maine Regional Socio-economic Impact Model (1978)

Greater Portland Council of Governments, All Land Is Not Created Equal: A Handbook For The Protection Of Environmentally Sensitive Areas (1976)

Penobscot Valley Regional Planning Commission, Comprehensive Planning Guide For Local Planning Boards (1976)

New Hampshire Office of Comprehensive Planning, The Land Book (1977)

TABLE 6.1

It is also important to know what changes can be expected in a community without the OCS facility. Thus, if a community is experiencing growth in population to begin with, and is beginning to take action to serve new population, the OCS facility can be expected to make new actions required much sooner than otherwise would have been expected. Information about the level of municipal services required to serve current and future population without the OCS facility will thus provide a baseline from which to assess changes brought about by the facility.

The State Planning Office, with information about the facility and the community, can make initial projections of the effects the facility will have on the local economy and government, using the Regional Socio-economic Impact Model (RSIM). This computer simulation will be useful in providing a detailed outline of the kinds of effects which can be expected from a specific proposal, and should guide local governments in deciding what measures should be employed in dealing with the effects.

The culmination of the information gathering effort should be an outline of the problems that a community may expect to face and the opportunities which might be taken advantage of. It may be useful to consider checking the areas considered and problems identified against a list of possible impacts such as that in figure 4.9.

Once the problems are identified, attention should turn to consideration of potential remedial actions.

Actions should be considered which will assure maximum benefits to the local economy and mitigation of any adverse impacts. These types of action are considered separately in the following sections.

1. Planning for Effects on the Local Economy

Communities will have to choose for themselves whether or not to actively seek the location of an onshore facility, and once the decision is made, will have to decide how to either promote themselves to the industry, or how to disuade industry from seeking sites. It should be noted, as earlier sections of this report indicate, that aside from Service Bases, most OCS onshore facilities will not come until after a find, and no commitments will be made by industry until a find is made. Therefore, communities which wish to engage in promotional activity will have to consider which facilities it may be suited for, and then initially promote itself on the basis of its own assessment of industry needs.

If a proposal is made by a firm, the first consideration is likely to be the new jobs to be created. It will amost always be desirable for local governments to insist on a firm's hiring employees from the local population whenever possible. Not only will this improve the economy of an area, but it will also minimize the influx of people from outside, who will be the ones needing new services. It is important to know, however, what skill categories are required by a facility, whether they are currently available in the community, and whether or not local education programs might be able to contribute to providing required skills. Firms will usually try to hire from the area when possible, (Table 4.4 indicates the percent of employees usually hired from local area) and, local governments should be in a position to assist firms in identifying and hiring those with the required skills.

Local governments should also be aware of the purchasing needs of a facility. This may assist local businesses to take advantage of OCS business. Such local business expansion may over time prove the greater generator of economic benefit to an area, especially with the smaller or temporary facilities such as Service Bases or Pipe Coating Yards.

Several caveats regarding local business relationships with the Oil industry have already been made in this report, and local governments which assist local businesses should be prepared to make them aware of such potential problems as: A shortage of labor, the problems of potentially great variations in demand for goods and services and the inflation in wages and prices which may accompany the large demands of a facility.

One other caveat which has been made, regarding the potential of a community becoming a one industry economy as a result of an OCS facility should be considered by local governments. This potential problem is likely to be greater in small communities than large, but if it is identified as a potential problem it will reinforce the need for economic diversification as a overall development strategy.

A second implication for local governments will be the development of a strategy to reuse the facilities that the OCS operations develop after they are closed down. Consideration given to potential uses of facilities should be given early in the planning process. It may be possible to identify alternate uses for the facility at the time of planning and construction and take action to assure ease of conversion when necessary. It may also be desirable to engage the assistance of the oil industry firm in securing a conversion of the facility, and such assistance can often be secured at the time when the proposal is being considered.

A Provision for facility reuse will assure that the economy will suffer as little as possible when the OCS firm closes. However, some dislocations are inevitable, especially if local suppliers of oil needs are unable to supply the new user.

2. Planning for Other Socio-economic Impacts

There are two basic types of action which can be taken to mitigate adverse impacts. The first are those taken by the local governments include the granting of zoning, building, and other permits required by local ordinance, and the provision of new or expanded municipal services to accommodate the needs of the facility and its associated population. The second type of action is that which can be taken by the firm itself, including construction of roads or other infrastructure requirements so that the community does not have to provide services which benefit only the facility. Actions of the first type are required, in one form or another, by the siting of the facility in a town; actions of the second type may be used, depending on circumstances surrounding individual situations.

Communities will have various types of zoning and building permit requirements. One of the first steps local government should take after receiving a proposal is to review existing ordinances with an eye towards assuring that they are adequate to cover the type of facility under consideration and the site for that facility. If necessary, requirements for height of buildings, setback, buffer zones, etc., may be added to meet anticipated problems. Consideration of new measures could include representatives of the firm making the proposal, in an advisory role.

The provision of municipal services to the facility and to the population which will accompany both construction and operation will be a major source of concern for local governments. The State Planning Office's computer model (RSIM) will help to indicate what services may be required by the facility and new population, but it will be up to local governments to decide what services will be provided, at what cost, and over what time period.

The decisions are not automatic by any means. Local decision makers must keep in mind the variations which can occur with any OCS onshore facility. Expansion and construction of a facility is possible due to the stage of offshore operations underway (for example, the expansion of a temporary to a permanent service base), and also due to the highly competitive nature of the offshore oil industry and its ancillary industries. It is possible, for instance, that a platform fabrication yard may be established to serve one or two areas of offshore development, but after a period of operation greatly expand because it gets orders from other areas. Such was the case with a platform yard in Scotland, and it resulted in the necessity of bringing old passenger liners and mooring them in the harbor of Aberdeen to house the workers for the expanded operations.

Decisions about expanded services will also be affected by current trends and anticipated changes in trends which may occur even without the new facility. Decisions can really only be made when the effects of the new facility are added to ongoing trends to produce a complete picture of future needs.

It may be desirable to have the firm which wished to operate the facility assist the community in some ways. The surest way of securing the firm's assistance is to own the land on which the facility will be built. Then, through sale terms, or through stipulations attached to a lease, the community can be assured that the firm will take any necessary actions.

However, it is not likely that the local government will own the land. In this case, there will have to be negotiations with the firm. Oil industry firms will usually try to accomodate local needs whenever possible, to assure continued support of their operation and thus rapid development of the site. Experience in Scotland has shown that the relationship between oil companies and their suppliers and communities in which facilities are to be located is one of mutual need, and it is possible to deal with the firms so that impacts are minimized.

Particular attention should be paid to the possibility of securing the firms assistance in coordinating development of facilities which may be shared with a community. For example, a wastewater and sewage treatment plant could be shared by both the community and the firm. And some impacts such as housing shortfalls may be dealt with only through cooperation between the community and firm. This would be particularly true if any temporary housing were set up to handle the population during the construction or early operations phase.

While onshore facilities will significantly add to the property tax base in a community, there are likely to be several problems which communities will have to face with regard to taxes and municipal services. Including the lag between the arrival of a large construction force and the first payment of taxes; the fact that a facility located in one town may have serious effects on a number of surrounding towns, but these towns will receive no revenues from the facility; and tax payments by a facility may not be sufficient to cover all requirements for services. There is also the need to hire planning services to deal with the various issues raised in this chapter.

The Federal government provides assistance in these areas through the Coastal Energy Impact Program. Grants are made available to both state and local governments for planning which must be done in connection with any OCS related facility. In addition, there are loans made available to communities to pay for new services, and also loan and bond guarantees. Grants are available to reduce or ameliorate unavoidable losses of recreational or environmental resources. And repayment assistance, in the form of extended payment schedules, reduction of outstanding amounts, or even outright grants to repay the loan in its entirety is also part of the program. Such repayment assistance is offered in the event that an expected expansion of the population (and thus of demand for services) does not occur for some reason.

The CEIP is administered through the State Planning Office. The regulations and procedures covering each section of the Program are described in The Coastal Energy Impact Program in Maine, to be published in January, 1978 by the State Planning Office. The eligibility of projects for grants under the CEIP is somewhat complex. All OCS related facilities (and non-OCS related energy facilities which affect the coast) are eligible for planning grants, but only those which have a "technical requirement" that they be located on the coast are eligible for the loans and guarantees (and the associated repayment assistance). This means that refineries are excluded from eligibility under these portions of the program, since they may be sited both on and off the coast. The purpose of this exclusion is to avoid providing an incentive for the location of facilities on the coast which do not have to be located there.

The CEIP is designed to assist communities pay for new services and to reduce unavoidable environmental losses, but it is not going to be a panacea for impacts from OCS facilities. There will still have to be considerable expenditure of time and effort, and in the end, money to deal with a facility's negative consequences.

Moreover, the Coastal Energy Impact Program is designed to be limited to the effects of specific facilities. The broader questions of land and natural resource management which are an integral part of planning for OCS facilities and other issues facing coastal communities, cannot be addressed using CEIP money. This is primarily the case because there will not be enough time or money to address broad issues at the same time a community is attempting to plan for a facility. Maine's Coastal Program will, however, provide funding to local governments to do the kind of broad based planning necessary to address not only OCS but a wide range of concerns. Funding of comprehensive planning efforts will be through Maine's "306" Program, which is being submitted in late 1977 to the federal government for approval.

Conclusions

It is an obvious point, but one worth noting, that there is a real need for local governments to plan for onshore facilities to develop means of assuring public involvement throughout the process. Whether or not OCS facilities bring major changes in a community, citizens should be aware of the implications of an OCS facility for the local economy, land use, and municipal government.

And it is also important to remember that OCS planning is a process which is ongoing throughout the life of a facility. A single "plan" is likely to be outdated soon after its publication as offshore operations and worldwide conditions in the industry creates changes in the operations of onshore facilities.

Just as the State in its initial planning efforts has concentrated on gathering information, making sure that needed responses are identified, and assuring that no matter what the pattern of effects on Maine which finally emerges as OCS development proceeds, so too must local planning efforts adopt a similarly flexible approach. Only such an approach can provide a community with opportunity to take into account all the possible effects from OCS development, most of which will not appear and take concrete form until after construction has begun and the facility begins operations.

APPENDICES

APPENDIX A

Glossary of OCS-related terms

This glossary includes both terms found in the text of this report and terms that are frequently encountered in other works.

A.P.I. American Petroleum Institute. Industry organization which acts as spokesman for the petroleum industry, and sets voluntary standards for petroleum operations.

Associated Gas Natural gas associated with oil accumulations. The gas may be dissolved in the oil (solution gas), or may form a cap of free gas above the oil (gas cap gas).

Barrel Unit of measurement of oil. 1 Barrel (bbl) = 42 U.S. Gallons. 159 litres (approximately)

Barytes A mineral of high specific gravity which consists essentially of barium sulphate. It is mixed in powdered form in drilling muds to increase their density and prevent an oil or gas well from blowing out.

Bit The cutting part of the drilling equipment.

Blow Out An escape of oil or gas from a well during drilling.

Blow Out Preventer High pressure valve, operated hydraulically or manually, fitted to the top of the casing of a drilling well to prevent an accidental blow out of gas.

B.L.M. Bureau of Land Management. The agency within the Department of the Interior responsible for the sale of leases for drilling rights on the Continental Shelf. BLM has jurisdiction over all OCS matters up to the lease sale.

Burying Placing pipe in trenches on the ocean floor. The most common method is jetting in which a trench is blasted in the sea floor sediments with jets of air. The pipe may or may not be covered up again after the trench has been dug. In some areas, such as the Gulf of Mexico, natural silting eventually covers the pipe. In rock strata, a trench is either blasted or dredged, or the line may be anchored but not buried.

Call for Nominations BLM requests the oil companies to indicate the sections of a lease area which they are interested in bidding on. The nominations are refined by BLM into tracts.

Casing Steel lining used to prevent the caving of the sides of a well, to exclude unwanted fluids, to provide a means of control of well pressures and oil and gas production.

C.E.I.P. Coastal Energy Impact Program. Federal monies available in the form of grants, loans, and loan guarantees to assist states and towns to plan for and alleviate adverse impacts from OCS onshore facilities, and to plan for other types of energy facilities on the coast.

Christman Tree The set of valves placed on top of a well to prevent blow outs and control the rate of flow of oil and gas.

COST drilling A Cooperative Offshore Stratigraphic Test. Oil companies are permitted to make one (sometimes two) test drillings in an area about to be leased to investigate the geology more accurately than can be done with seismic methods. The drilling is paid for and results shared among the oil companies. The federal and state governments also get copies of the results.

Crude Oil Unrefined petroleum.

Derrick The steel structure used to support the drill pipe and other equipment which must be raised or lowered during drilling operations.

Directional drilling A method of drilling where a well is not drilled vertically. Used extensively in drilling production wells where a number of wells must be drilled from a single platform.

Drill Pipe Steel pipe used for carrying and rotating drilling tools in a well and for permitting circulation of the drilling mud.

Drill String The column of drill pipe and drilling collars screwed together with the drill bit screwed on the end.

Drilling Collar A length of extra-heavy pipe, several of which are placed above the drilling bit. They serve to concentrate part of the weight of the drill string near the bottom of the hole to exert extra pressure on the drilling bit, thereby preventing buckling of the string.

Drilling Mud Fluid, commonly consisting of clay suspended in water with barytes added, pumped down through the drill string to the bottom of the bore hole. From there it rises back up to the surface through the space between the drill string and the bore hole wall. It is used to keep pressure within the hole equal to the pressure on the outside.

Drilling Platform Structure used to support the drilling rig and to house workers and other equipment. Mobile platforms (also called rigs) are used for exploratory drilling, and are either semi-submersible, jack-up, or drill ships. Stationary platforms are used to drill production wells, and are either steel or concrete.

Drilling Rig The complete machinery and structures required for drilling a well. Also describes mobile platforms used for exploratory drilling.

Drilling Ship Ships with a drilling rig attached which are used for exploratory drilling. They are kept in position either by multiple anchors or by dynamic positioning.

Dry Hole An unsuccessful well.

Dynamic Positioning A method of maintaining a floating offshore drilling structure in position over a well by means of computer controlled thruster motors, which respond constantly to changes in the wind, current, waves, etc. The motors mean that multiple anchors need not be used, thus making it easy to change positions or to drill in depths too great for anchors to be used effectively.

E.I.S. Environmental Impact Statement. Comprehensive analysis of environmental impacts required for any "major federal action" by the National Environmental Policy Act. (NEPA). One statement is prepared and submitted to interested parties and the public for comment at a public hearing, and then revised into a final statement. The EIS's sole purpose is to project possible impacts, and the only legal challenges that can be made are on the adequacy with which the EIS does this.

Gas In this report, natural gas.

Gas Processing Plant A facility designed to recover liquid hydrocarbons from the raw gas stream which are not recovered by ordinary gas/water/oil separation processes, and to remove impurities from the gas.

Hydrocarbons Compounds consisting wholly of hydrogen and carbon which form the bulk of oil and natural gas.

Jack-up A drilling platform with retractable legs which can be lowered to the sea bed and then the body (hull) of the platform is raised to a safe distance above the water.

Kelly A hollow, 40 foot long, square of hexagonal pipe attached to the top of the drill string and turned by a rotary table during drilling. It is used to transmit torque from the rotary table to the drill string and thus the drill bit.

Lay Barge Specialized barge for laying submarine pipelines. Designed as a floating barge or on semisubmersible principle.

Lease Sale A sealed bid auction through which the Federal government sells the rights to drill for oil and gas, and produce and sell whatever is found. The drilling rights are granted for a period of five years, but if oil or gas is found, the lease is extended for the productive life of the find.

Negative Nominations States and other interested parties request that tracts that have been nominated for sale be withdrawn. Reasons may include the proximity of a tract to other resources, special environmental hazards associated with a tract, or a desire to withdraw a tract temporarily while studies are made.

NERBC New England River Basins Commission. Regional organization for resource management which is conducting extensive investigations of potential impacts of OCS development on New England, in cooperation with the USGS RALI program.

Operating Orders The regulations by which the U.S.G.S. supervises the conduct of all operations offshore.

OCS Outer Continental Shelf The shallow, submerged platform which marks the geologic edge of the continental land mass. The term "outer" refers to that portion of the continental shelf lying beyond the three mile limit which marks is the limit of State jurisdiction to the limits outer limit of National jurisdiction, which are defined by the 1958 treaty on the Continental Shelf as "the 200 meter isobath (a line, every point of which is 200 meters below the surface) or to where the depths of the superjacent waters admits of exploitation".

Pipecoating Coating a pipe with concrete and anticorrosives to make it sink, to protect it from impacts, and from corrosion.

Pipecoating Yard Onshore facility which coats pipe. The pipe is then transported to the lay barge.

Pipeline Installation Service Base Service Base for boats which supply a lay barge with pipe and other supplies. Usually located near pipecoating yard.

Platform Fabrication Yard Facility for construction of production platforms. Yards to construct steel platforms are largest, with a great deal of room devoted to storage of steel. Concrete platforms must be fabricated in a yard with access to very deep water because they are built vertically, instead of horizontally.

Platform Installation Service Base Base for boats which tow platforms to location where drilling will be done and assist in positioning the platform. Also applies to the base for boats which position anchors for mobile platforms.

Plugging a Well Sealing off a well with cement when it is abandoned either temporarily or permanently.

RALI Resource and Land Investigations. A program of the United States Geological Survey to develop methods for resource management and planning.

Refinery Processing plant which separates crude petroleum into its various fractions, or chemical components, which are usable as gasoline, kerosene, fuel oil, etc.

Rotary Table Chair or gear driven circular unit, mounted in the derrick floor, which rotates the drill pipe and bit.

Roustabout General laborer on the rig.

Seismic Surveys Survey of the geology of the substructure of the ocean floor done by generating shock waves under water and then measuring the speed and arrival times of the waves as they bound back. Depths, inclinations, and type of rock can be indicated by these surveys, indicating whether or not oil bearing formations are present.

Semi-Submersible Drilling Platforms (or lay barges) which have pontoons or floats beneath the water, and which are either anchored or dynamically positioned.

Service/Supply Base Base for boats which carry all drilling material and other supplies to the drilling rigs, both exploratory and production.

Sulphur Content The proportion of sulphur in crude oil. A high sulphur content is indicative of low quality crude because of the pollution problems associated with sulphur.

Tank Farm Facilities of storage tanks for the storage of oil or natural gas. The facility will be associated with a terminal or a processing plant.

Terminals Points where oil is brought ashore for storage and transshipment. The facility consists of a mooring point for tankers or barges and storage tanks.

Tract The area which the government leases. It is 3 nautical miles by 3 nautical miles, or 5720 acres.

U.S.G.S. United States Geological Survey. The agency within the Department of the Interior which is principally responsible for regulating the conduct of all OCS drilling and production operations. Also has responsibility for assuring that BLM has adequate information about Geology of lease sale areas when bids are being considered.

Workover Re-entry into a completed well for modification or repair work.

APPENDIX B

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APPENDIX C

SUMMARY OF MAINE LAWS AFFECTING OCS ONSHORE FACILITY SITING

Title 38, Sections 481-488 as amended

Site Location of Development Act

Requires Board of Environmental Protection approval of developments involving 20 or more acres, or buildings of 60,000 square feet or more. Developers must demonstrate: Financial capacity to carry out project, Provisions for solid waste disposal and traffic management, that the soil types are suitable for the project, and that there will be no adverse effects on the environment and natural resources.

Title 38 Sections 541-557

Coastal Conveyance of Petroleum

Establishes fund for prompt cleanup of oil spills, payed for by tax on petroleum brought into the state. Authorizes Department of Environmental Protection to seek recovery of cleanup costs if responsibility can be fixed.

Title 38, Section 560

Regulation of Vessels at Anchor

Authorizes Department of Environmental Protection to regulate or prohibit anchorage of any vessel carrying oil as a cargo in any coastal or estuarine waters.

Title 12 Section 4811-4514 as amended

Mandatory Shoreline Zoning

Requires municipalities to zone all land bordering the ocean, lakes and rivers within 250 feet of the high water mark. Land must be zoned residential, industrial, or resource protection. State may impose zoning if municipalities do not.

Title 12, Section 4701-4709

Wetlands Control Act

Prohibits alteration of wetlands without a permit from the Board of Environmental Protection.

Title 12 Section 4751 - 4758

Protection of Coastal Wetlands Act

Allows Board of Environmental Protection to regulate or prohibit alterations of any wetland.

Title 38 Sections 361-372, 411-421, 451-454 as amended

Waste Discharge Licenses

Authorizes the Department of Environmental Protection to issue water classifications and to issue permits for any facility which would affect water quality.

Title 38, Section 581-605 as amended

Protection and Improvement of Air

Authorizes the Department of Environmental Protection to set and enforce air quality standards.

Title 38 Sections 1301-1308

Solid Waste Management Act

Authorizes the Department of Environmental Protection to set and enforce regulations concerning the location, construction, and alteration of solid waste facilities.

Title 1, sections 2 and 3

Submerged Lands

The State's ownership of all submerged lands is asserted.

APPENDIX D

An Open Letter to the Offshore Oil Industry...

June, 1977

The first lease sale on Georges Bank is not far off. We wish to encourage you to think of Maine as a potential site for basing your onshore service activities.

In September, 1975, I stated my administration's basic policy on OCS development: "Where significant new business opportunities are identified which on balance would produce more gains than losses, the State will seek to work in partnership with oil and gas development interests and coastal communities to bring these opportunities to reality."

In December, 1975, I followed up that statement with a letter to leaders of the offshore industry encouraging them to consider Maine for locating OCS facilities and to cooperate with us in developing projects which will be profitable and which also will meet our environmental standards and help advance economic goals of the State.

I believe service and supply bases would be economically beneficial, compatible with the character of the Maine Coast and consistent with its seafaring traditions. Maine also has much to offer the offshore service industry:

Our many harbors are less congested than counterparts in Southern New England, and are actually closer to eastern tracts on Georges Banks.

There are privately owned facilities in these ports which would make excellent temporary bases and also numerous sites which could accommodate development of permanent installations.

Maine's shipbuilding and repair facilities, including the world famous Bath Iron Works, have a reputation for delivering high quality work, on time. I am sure these companies will develop services and schedules to respond to your needs for good fast work.

And most importantly, our coastal labor force has a depth of experience in the maritime industries. The graduates of the Maine Maritime Academy have an outstanding reputation for skill and job longevity. We can also point with pride to the recent example of the Searsport stevedores who responded quickly and efficiently to a tremendous increase in their workload caused by potato shipments to drought stricken Europe.

This administration has placed a high priority on improving the climate for business expansion in Maine and these efforts are succeeding. We have encouraged an affirmative partnership between government and industry and stand ready to help you in any way we can. In return we ask only that you observe the following public interest guidelines while developing plans to locate in Maine.

1) Inform local officials as early as possible of your intentions and what the impacts will be on their communities. Several Maine communities including Kittery, South Portland, Portland, Bath, Rockland, Belfast and Searsport have notified me of their desire to attract service and supply bases to their harbors. You will find material on these ports enclosed. These local initiatives have my full support.

2) Contact state and local officials, especially directors of the Vocational-Technical Institutes to design programs for training and hiring as much Maine labor as possible.

3) Communicate specifications of your material and service needs to suitable Maine companies either directly or through the State or municipal development offices.

4) Work with representatives of the fishing industry and the Department of Marine Resources to identify and resolve potential conflicts with our fishing fleet.

Hadley Atlass, the State Development Director, will furnish you with further information on Maine. Local contacts are also listed in the enclosed brochures describing some of Maine's port communities.

Welcome to our State.

Sincerely yours,

James B. Longley

James B. Longley
Governor

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