UNITED STATES DEPARTMENT OF THE INTERIOR

FINAL ENVIRONMENTAL STATEMENT

PROPOSED FIVE-YEAR OCS OIL AND GAS LEASE SALE SCHEDULE

March 1980 - February 1985

Prepared by
The Bureau of Land Management

161

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Frank Gregg

Director

Bureau of Land Management

FINAL ENVIRONMENTAL IMPACT STATEMENT - PROPOSED FIVE-YEAR OCS OIL AND GAS LEASE SALE SCHEDULE MARCH 1980 - FEBRUARY 1985

Responsible agency: U.S. Department of the Interior, Bureau of Land Management

Abstract: The statement considers a proposed five-year schedule consisting of 30 oil and gas lease sales in 15 areas of the Outer Continental Shelf. Nine other alternatives are examined. Three primarily involve sale delays within the five-year timeframe--two to obtain additional environmental information in one Alaska sale area and in Central and Northern California, and the third to allow communities shoreward of three Alaska sale areas to conduct coastal zone management planning. Three alternatives primarily involve omissions of sales from the schedule; one to allow for longerterm environmental studies in one Alaska area, a second to allow technology for certain sea ice conditions to be developed in a non-frontier area, and a third to reduce oil production on the west coast, ameliorating transportation and refining requirements. Two alternatives involve a slower pace of leasing and would combine benefits of the other alternative schedules. These alternatives include 25 and 28 sales. A final schedule alternative includes 33 sales in 13 leasing areas. A no action and conservation alternative is also considered. Mean oil and gas resource estimates from the proposed schedule are 6.6 billion barrels of oil and 29 trillion cubic feet of gas. In excess of 33 oil spills are statistically probable as a result of activities conducted on lease sales included on the schedule. Impacts to marine and coastal populations will occur as a result of the proposal. Localized impacts to marine organisms in the vicinity of offshore structures will also occur. In addition, impacts to local economies, infrastructure, land use, and subsistence lifestyles (Alaska), and use conflicts on the OCS, are anticipated. Resources of particular concern which may be most vulnerable to adverse impacts from offshore oil development are identified in each leasing area. The relative sensitivity of various OCS areas to impacts on types of resources and resource uses is assessed. The statement also discusses the regulatory framework in which the sales and post-sale activities would be conducted. An environmental statement will also be prepared to consider each sale on the proposed schedule.

States where the proposed action is located: The proposed schedule includes sales offshore of the following States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, California and Alaska.

Comments: Comments concerning the final environmental statement must be received by February 25, 1980, and should be addressed to:

Director
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Department of the Interior
18th & C Streets, N.W.
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TABLE OF CONTENTS

PAGE

PAGE

PAGE

APPENDICES

SUMMARY

Alternatives

The proposed action (Alternative 1) consists of a schedule of 30 Outer Continental Shelf (OCS) oil and gas lease sales for consideration in the period between March 1980 and February 1985, (plus one contingency sale in the Gulf of Mexico). Sales are considered in the North Atlantic; Mid-Atlantic; South Atlantic, includig Blake Plateau; Southern California, including Santa Barbara Channel; Gulf of Alaska; Cook Inlet and the Beaufort Sea; all areas where previous oil and gas lease sales have been held or are proposed to be held prior to March 1980. Sales are also considered in Central and Northern California; Kodiak; Northern Aleutian Shelf; St. George Basin; Navarin Basin; Norton Basin; and the Chukchi Sea; all are areas where no previous OCS oil and gas lease sales have been held, or in the case of Central and Northern California, no recent sale has been held, and no development has taken place.

Alternatives considered include:

* An alternative schedule of 33 sales in the five-year period, omitting consideration of sales in Navarin Basin and Northern Aleutian Shelf, and decreasing by one the sales considered offshore California by not considering a second sale in central and northern California. This alternative schedule includes more sales than Alternative 1 by 14 Gulf of Mexico sales (an additional three) and 2 sales each in the Gulf of Alaska, Beaufort Sea and St. George Basin (Alternative 1 considers one in each of these areas). This alternative was developed from a schedule option submitted by the Department of Energy and is one which maximizes net economic value. (Alternative 2)

* Delay sales proposed for Norton Basin, St. George Basin and Northern Aleutian Shelf from dates proposed in Alternative 1 (September 1982; December 1982; and October 1983, respectively), in order to allow unorganized boroughs to undertake local coastal zone management planning. (Alternative 3)

* Hold the proposed St. George Basin Sale (#70) in 1983 (Alternative 1 schedules this sale in 1982) to allow additional time for further environmental data collection. (Alternative 4)

* Hold the proposed Central and Northern California Sale (#53) in 1983 (Alternative 1 scheduled this sale in 1981) to allow time for further environmental data collection. Additionally, omit the 1983 California sale included in Alternative 1 (#73), and designate the 1984 California sale (#80) as a Southern California sale. (Alternative 5)

* Omit Northern Aleutian Shelf from consideration for leasing in the five-year schedule, to allow additional time for long-term environmental data collection and environmental impact analysis. (Alternative 6)

* Omit the Chukchi Sea from consideration for leasing in the five-year schedule, and substitute a Beaufort Sea sale in the schedule in 1985, in order to develop technology for shear zone and pack ice conditions in an area of existing infrastructure and transportation network. (Alternative 7)

* Schedule 25 OCS lease sales, omitting Northern Aleutian Shelf, St. George Basin, Navarin Basin, Norton and Chukchi Sea from consideration for leasing in the five-year schedule, to reduce the amount of Alaskan oil and gas for which transportation will need to be developed and processing logistics resolved or facilities developed. This alternative would also incorporate advantages of alternatives 3, 4, 5 and 6. (Alternative 8)

* Schedule 28 OCS lease sales, omitting Northern Aleutian Shelf, St. George Basin and Chukchi Sea; add Hope Basin; and hold Kodiak and Norton Basin later than proposed in Alternative 1. Also, confine the Beaufort Sea sale to the landfast ice zone. This alternative would incorporate advantages of Alternatives 3, 4, 6, and 7, and to a lesser extent 8. (Alternative 9)

* No action and conservation (Alternative 10)

Alternative 1 would result in the consideration of offering about 32 million acres for leasing during the five-year period under consideration. The estimated mean resources resulting from this schedule are approximately 6.6 billion barrels of oil and 29 trillion cubic feet of gas. To develop these resources, an estimated total of 547 platforms would be required. In areas outside of offshore Alaska, transportation of oil by both tankers and pipelines will be required. Use of pipelines is expected in the Gulf of Mexico (largely existing trunk systems) and in Southern California. In other areas, the amount of resources actually discovered and their location, will determine which mode of transport would be used, since this decision is heavily influenced by economies of scale. However, some tankering in other areas may be expected. In Alaska, use of pipelines is projected for the Beaufort Sea, but pipeline to tanker or offshore loading of oil is likely for other areas of Alaska. Gas in Alaska, with the exception of that from the Beaufort Sea, and possibly southeastern Alaska would probably be transported to the lower 48 States (most likely to the West Coast) by liquified natural gas tankers, if produced. The Department of Energy believes that constraints posed by market conditions would result in reinjection of gas in all areas except the Beaufort Sea and Cook Inlet.

Due to the required mix of crude oil slates and the absolute available refining capacity on the West Coast, as well as the input of some North Slope crude to those refineries, much of the oil production from the Alaskan OCS would probably need to be transported to the Gulf of Mexico or east coast refineries. The receiving and vaporization of liquified natural gas from Alaska poses a constraint beyond the market constraint identified above, as adequate capacity does not now exist nor is it planned in the near future.

OCS development undertaken under Alternatives 1 through 9 would be undertaken in a regulatory framework which applies to both pre-lease sale and post-lease sale processes and activities. Consideration would be given to environmental effects and use conflicts at the pre-lease sale tract seletion stage, in the sale decision and stipulations development, and in the regulation of structure placement and drilling activities after each sale. As these decisions progress, they become more site-specific and mitigation measures can be better defined and tailored to site-specific resource protection.

Environmental Consequences

The environmental concerns raised most often in relation to the proposed schedule, as a result of the draft environmental statement comment procedure, involved marine resources and subsistence resources and lifestyle in Alaska; sensitive marine mammals and seabirds in Central and Northern California; air quality and recreation in California; the possible environmental effect of Arctic development due to the lack of existing technology to develop that area and possible consequences of oil spills in sea ice conditions; and cumulative impacts to endangered whale species, especially in the Pacific.

A major environmental impact producing factor inherent in the production of OCS oil and gas is oil spill risk. Based on volume of oil estimated and historical experience, in excess of 33 oil spills greater than 1,000 barrels are statistically probable as a result of development stemming from sales included in Alternatives 1, 3, and 4. A similar amount of total spills would result from Alternatives 5, 6, and 7. However, these alternatives would result in reduced risk of spills to specific regions (Alternative 5 would reduce spill probability for California by 1.3; Alternative 6 would reduce the probable number of spills in the southern Bering by .23; Alternative 7 would reduce the probable number of spills in the Arctic, and overall, by 3.77). Alternative 2 would result in a similar number of total spills being probable, but the distribution would vary (1.3 less probable spills in California 2.3 less in the Bering; .23 more in southern Alaska; and 3.59 more in the Arctic). Alternatives 8 and 9 would result in significantly less spills being probable--a total of 19.43 and 22.33, respectively--which would reduce spill likelihood in Alaska.

Oil spills pose a potential adverse impact to recreation, through fouling of beaches; to commercial fishing, through fouling of gear, area closures, tainting and possible effects to fish stocks; and to marine and coastal ecosystems. Fish larvae, benthic organisms, sea ducks and pelagic birds, and marine mammals are marine organisms particularly susceptible to adverse effects of oil spills.

All OCS leasing areas are judged to be at least moderately sensitive to oil spill impact to fisheries resources and the North Atlantic highly sensitive due to endemic stocks; however, the Gulf of Alaska, Kodiak, Northern Aleutian Shelf and Norton Basin have a markedly smaller risk of oil spills than other regions, due to relatively low projected amounts of oil. All OCS areas are also adjacent to waterfowl populations and have some populations of pelagic birds. However, based on levels of pelagic bird population and waterfowl breeding areas, the North Atlantic, offshore California, Gulf of Alaska, Kodiak, Northern Aleutian Shelf, St. George Basin, Navarin Basin, Norton Basin and the Chukchi and Beaufort Sea areas are believed to be the most sensitive to oil spill impacts to bird populations, based on available, but limited, data. Likewise, based on the presence of species which have been identified as being of concern relative to OCS development (through previous sale specific endangered species consultations), the North and Mid-Atlantic, Southern California and all Alaska areas are judged to be relatively high sensitivity areas for endangered species. Central and Northern California, and all Alaska areas except Cook Inlet and Navarin Basin are considered most sensitive to marine mammals due to the abundance of breeding populations.

Within the various OCS regions are also unique or unusual resources, habitats or assemblages of organisms which could be adversely affected by oil spills or other oil and gas development-related activities. These include coral reefs and hard bottom communities (South Atlantic, Gulf of Mexico, California), canyon heads (Mid- and North Atlantic), islands serving as discrete and prolific breeding grounds for pelagic birds and marine mammals, (offshore California, Aleutian Islands) major migration routes (Northern Aleutian Shelf) and others. These unique or especially productive areas are most well defined outside of Alaska where the data base is greater. In many cases, these resources are discrete and limited enough that tract selection and mitigating measures for particular lease sales can mitigate, though not eliminate, potential adverse environmental impacts to the resources involved.

In addition to large oil spills, development activities as a result of lease issued during the five-year schedule of OCS oil and gas leases will cause chronic oil pollution through routine discharges and accidental spillage; the release of toxic chemicals in drilling muds and formation waters; smothering effects of drill cuttings; and sedimentation and smothering due to pipeline burial. By and large, these impacts will occur in localized areas around drilling platforms and pipelines. These impacts are also amendable to some degree to mitigation through control of discharges and through selecting tracts and placing structures so as to avoid adverse effects to particularly sensitive resources or areas which are especially productive.

The level of these impacts cannot be assessed in any quantitative manner at this time. The lack of specific tract locations (available at the sale proposal state, which is also subject to an environmental statement) makes even qualitative analysis of impacts difficult, as proximity to resources of concern and oil spill trajectories cannot be determined at the program level of planning.

Multiple use conflicts are also difficult to assess in the absence of specific sale proposals. Recreation is principally affected by oil spills. All areas outside of Alaska are judged to be relatively highly sensitive to impacts from oil spills affecting recreation, although the type of sensitivity differs. Some areas, such as the Mid- and South Atlantic and Southern California, experience recreational use along their entire shoreline. The risk of affecting a recreational beach is high for oil spills which might impact the shore. In areas where beach use is more limited, as in Northern California and North Atlantic, a spill affecting a beach would have a high impact because of more restricted beach access, although the chance of impacting a beach may be considerably less.

Besides the potential for effects of oil spills and other pollution events to impact fish stocks, commercial fishery use of the OCS can be impacted by development resulting from sales in the five-year leasing schedule. The greatest conflict is expected to involve gear damage and loss. However, compensation is available. There will also be short-term and long-term removal of potential fishing grounds from use due to placement of structures and pipelines.

In areas other than northern Bering and Arctic regions, where commercial fishing is minimal, at least moderate conflicts are anticipated; conflicts may be higher in the North Atlantic, and the Santa Barbara Channel portion of Southern California, due to the density of harvesting activities, and in Kodiak, due to crab potting, which is particularly susceptible to losses and for which replacement may be problemmatic, at least in the short-term. Subsistence harvesting of fish and marine mammals in Alaska may also be impacted by the five-years of OCS oil and gas lease sales, through conflicts in resource use or from oil spills. Sales in the Northern Aleutian Shelf, Navarin Basin and Chukchi Sea areas may pose the highest relative risk to these resources and their harvesting.

The placement of structures on the OCS can also contribute to navigational conflicts, resulting in a higher potential for accidents, including those involving oil, LNG, and hydrocarbon product tankers. This potential impact can be ameliorated to some degree by control of structure placement and by navigation schemes. However, ship traffic is not always confined to navigation lanes and increased density of obstructions will result in increased potential for collisions. Due to the low density of traffic in Alaska, the risk posed by OCS structures is relatively low; the Mid-Atlantic, Gulf of Mexico and Southern California areas may pose the highest risk due to platform density and/or traffic density relative to potential leasing areas.

Impacts to local and regional economies, infrastructure, and land use, and other socio-economic impacts are expected to be generally low to moderate. Outside of Alaska, all coastal regions adjacent to OCS areas have some degree of industrialization, and the economic bases in the urban areas are diverse. Projected levels of OCS-related activities are not expected to produce major changes or growth in economic sectors or to regional employment or population. Depending upon the exact location of onshore facilities, some land use conflicts, and social and fiscal impacts on communities could be expected, however.

In Alaska, major commitments of land to new industrial uses and large influxes of workers, relative to the existing population, can be expected. Based on experience in the North Slope development, and in response to anticipated local and State desires and pressures, it is anticipated that facility development will be isolated from any nearby communities and interaction restricted through the establishment of enclaves. This should reduce potential impacts to infrastructure and social impacts to subsistence communities.

In summary, development activities stemming from Alternative 1 will result in increased conflicts with other uses of the OCS and the coastal zone these range from minor inconveniences to local, severe short-term use curtailments from oil spills, including those resulting from tanker collisions. Loss of lives from tanker collisions and other accidents may also result. The extent of these impacts will be largely determined by specific tract selections made at the sale decision stages, and can be mitigated to some degree through tract selection decisions and stipulations imposed in the sale decision, and by regulation in the post-sale stage.

Additionally, impacts to marine and coastal organisms, and possibly to ecosystems, can be expected as a result of these proposed OCS oil and gas lease sales. Oil spills, which are statistically probable, would have the greatest potential for severe impacts. Oil spills will result in mortality to individual organisms, and possibly reductions in population. Oil spills occurring in particularly sensitive areas--such as those entrained in an enclosed wetland or estuary--or affecting a small and particularly sensitive population--such as rafting pelagic birds, or bird or marine mammal breeding areas--could result in long-term population declines. Population declines have been observed in pelagic birds in the North Sea which have been attributed to oil spill events (through not confined to offshore oil development). Entrained fuel oil has resulted in closures of wetlands from harvesting molluscs and shellfish for several years (although no similar experience exists with crude oil). Adverse long-term impacts to populations are not apparent as a result of 30 years of Gulf of Mexico oil and gas development, the Santa Barbara oil spill, or even tanker spills of refined oil. However, the complexity of factors involved in population size and diversity and the absence of complete baseline data do not permit a definite conclusions that no such long-term impacts have or cannot result from oil spills.

Similarly, while discharge of drilling fluids and chronic pollution caused by OCS development can be expected to have some short-term and very localized impacts, experience in the Gulf of Mexico has not shown any apparent long-term adverse population effects; however, a conclusion that no such impacts will occur is not possible. Thus, long-term chronic pollution and its possible effects on the marine and coastal ecosystems and possibly upon some individual populations, is a risk of OCS development.

Impacts resulting from Alternatives 3, 4, and 5 involving delay of sales within the five-year schedule, are expected to be the same as, or very similar to those discussed for Alternative 1. Impacts resulting from Alternative 6, omission of the Northern Aleutian Shelf from consideration in the five year schedule, would be the same except in the Bering Sea region. There, the potential for oil-related individual mortality or population reductions to breeding sea ducks, to migrating marine mammals and fish, to breeding populations of seals and to the other components of the area's marine and coastal ecosystem would be reduced.

The overall level of impact from Alternatives 2 and 7 would be similar to those of Alternative 1, based on the similar level of facilities required and probable spills. However, the focus of impacts would differ. Both may somewhat reduce various onshore impacts in Alaska, including those to Native subsistence resources and lifestyles, as fewer areas would be developed.

Alternative 8, involving only 25 sales, none of which would be in the Bering Sea region or the Chukchi Sea, would result in elimination of all impacts in the Bering Sea and much reduced impacts in the Arctic region. An overall substantial decrease in effects on marine mammals and pelagic birds and watefowl would be anticipated, due to the importance of the Bering Sea both as breeding and migratory habitat, and the Chukchi Sea as a migratory bird-staging area. In addition, this alternative would markedly reduce the need to develop transportation facilities to carry production to available refining capacity, would decrease the need for LNG facilities for Alaskan gas.

Alternative 9, involving only 28 sales, would reduce impacts to the Bering Sea region (no sales would be held in the southern Bering), and would eliminate impacts in the Chukchi lease area, although it would add impacts to the southern Chukchi Sea--i.e., Hope Basin. This would result in impacts to marine mammals and avian populations in the area, and to Native populations including impact to their subsistence resources. This alternative would also result in additional time for planning for OCS-related facilities in the Bering Sea region and on Kodiak.

Alternative 10, no action and conservation, would eliminate the impacts resulting from the new OCS development. However, if energy supplies anticipated from the proposal were replaced with imported hydrocarbons or increased development of alternate energy forms, other environmental effects would result. Increased importation, should it occur, could pose greater risks of tanker accidents and major spills in coastal areas. Development of energy from coal or shale would increase the risk of greater air and water pollution for interior portions of the country. If no action is taken to continue OCS development and energy shortfalls result, the primary impacts would be economic.

I. PURPOSE AND BACKGROUND OF THE PROPOSED ACTION

A. Purpose and Need for Proposed Action

The proposed action consists of a five-year Outer Continental Shelf (OCS) oil and gas leasing schedule, described in Section II.A., prepared according to the requirements of Section 18 of the Outer Continental Shelf Lands Act, (hereafter "OCS Lands Act") as amended (92 Stat. 632). That section requires the Secretary of the Interior to prepare a leasing program to implement the policies of the Act. The leasing program is defined as consisting of:

> a schedule of proposed lease sales indicating, as precisely as possible, the size, and location of leasing activity which he determines will best meet national energy needs for the five-year period following its approval or reapproval.

Among the policies of the Act, as amended, are to make oil and gas resources available to meet the Nation's energy needs as rapidly as possible, and to balance orderly energy resource development with protection of the human, marine and coastal environments. In order to ensure correlation between Interior's energy leasing policy and overall national energy policy, a memorandum of understanding (MOU) was signed in September 1978, between the Department of the Interior and the Department of Energy (DOE) concerning the establishment and use of production goals for energy resources on Federal lands. Pursuant to that MOU, on May 17, 1979, the Department of Energy transmitted to Interior final OCS oil and gas production goals for 1985, 1990, and 1995. They are as follows:

	1985	1990	1995
Oil Production (Millions of Barrels)	284	581-597	532-581
Gas Production (Trillions of cubic feet)	3750	3309	1956

(The range in figures for oil production results from differences in prices assumed. The price differences assumed are not anticipated to affect gas production significantly. Prices used are: oil--$18.50 and $23.85/barrel; gas--$3.50 and $4.50/million cubic feet.)

Subtracting the anticipated production from existing OCS leases, production goals for the new five-year schedule, as well as 1979 OCS lease sales, are:

	1985	1990	1995
Oil Production (Millions of Barrels)	27	383-399	435-484
(Trillions of cubic feet)	207	945	770

The DOE production goals are based on its estimate of resources to be obtained from a schedule developed on the basis of maximized net economic values.

DOE finds that other energy forms, including solar, geothermal and nuclear fusion, will not significantly reduce dependence on foreign sources of energy before the end of the century. Therefore, the goal is to maximize OCS energy production as much as possible without sacrificing efficient production. To the extent that this reduces the increasing U.S. dependence on foreign energy sources, undesirable social and economic effects of that dependence can be lessened.

In addition to responding to national energy needs, Section 18(a)(2) of the OCS Lands Act, as amended, requires that the timing and location of sales be based on consideration of:

(A) existing information concerning geographical, geological, and ecological characteristics of such regions;
(B) an equitable sharing of development benefits and environmental risks among the various regions;
(C) the location of regions with respect to, and the relative needs of regional and national energy markets;
(D) the location of regions with respect to other uses of the sea and seabed, including fisheries, navigation, existing or proposed sealanes, potential sites of deepwater ports, and other anticipated uses of the resources and space of the outer Continental Shelf;
(E) the interest of potential oil and gas producers in the development of oil and gas resources as indicated by exploration or nomination;
(F) laws, goals, and policies of affected States which have been specifically identified by the Governors of such States as relevant matters for the Secretary's consideration;
(G) the relative environmental sensitivity and marine productivity of different areas of the outer Continental Shelf, and
(H) relevant environmental and predictive information for different areas of the outer Continental Shelf.

Finally, Section 18(a)(3) requires the Secretary, on the basis of the above information and to the maximum extent practicable, to select the timing and location of leasing so as to balance environmental risks, development benefits and adverse impacts on the coastal zone.

A discussion of how size, timing and location were considered in developing the proposal is attached as Appendix 1. The factors listed above were explicitly addressed in the material developed for Secretarial consideration (available upon request from the Office of OCS Program Coordination, U.S. Department of the Interior), prior to his tentative selection of a proposal for consideration in this environmental statement (and for submittal to Congress as required by Section 18 of the OCS Lands Act, as amended). Those factors bearing on environmental impacts are further analyzed and discussed in this statement. However, this document is only one tool used by the Secretary in carrying out his responsibility to balance to the maximum extent practicable environmental risks, development benefits and adverse impacts on the coastal zone as required by Section 18(a)(3).

Items (A) and (H), regarding environmental characteristics and information, are reflected in Section II, the Description of the Environment, and more specifically in Section IV.A.5, concerning availability of information. These are also addressed as appropriate under the alternatives in Sections IV.B.-J. Item (B), which calls for an equitable sharing of developmental benefits and risks, is interpreted to mean that all regions of the country are expected to contribute if economically recoverable deposits of hydrocarbons are located off their shore, and to share in the risk of development. The aspect of this item dealing with environmental risks, along with Item (G) regarding relative environmental sensitivity and marine productivity of different OCS areas, is addressed in Section II.A.4., which presents a summary of the environmental effects of the proposal by sale area, including a matrix analysis of varying sensitivities and in Section IV.

Item (C) calls for consideration of regional and national energy markets with respect to leasing regions. The Department of Energy has advised that the market will not constrain OCS production at the national or regional level. The issue of availability of transportation to bring supplies to market has also been addressed and is discussed under Section II.A.3.

The location of regions with respect to other uses of the OCS is addressed in the descriptive material (Section III, subsections A.4.; B.4; C.4; D.4; E.4; and F.4) and in the impact analysis of the proposal (Section IV.B.2.d. and e. and Section IV.B.3.). The relative potential regional use conflicts are presented in Section II.A.4.

Industry interest in various leasing regions, Item (E), is included as Appendix 2. Laws, goals, and policies of affected States, as specifically identified by the Governors, are to be considered (Item (F)). Appendix 3 summarizes comments received from the States as a result of a request for comments for consideration in the development of the program and resulting from an earlier draft proposed schedule (see Section I.B.1. below). A copy of a letter sent to the Governors explaining how their comments have been considered is also included in Appendix 3.

Section 18(b) of the OCS Lands Act, as amended, requires the Secretary to submit, as a part of the five-year leasing program, an estimate of appropriations and staff necessary to implement the program. These are included as Appendix 4.

B. Background of the Proposal

1. Administrative Events Leading to the Proposal

Section 18 requires a detailed review process in developing the leasing schedule. The review involves significant participation of affected States, Federal agencies, and the public, as well as submission of the program's schedule to the President and Congress.

As a first step in the development of a proposed lease sale schedule, the Secretary requested comments and information of the Governors of affected States, Federal agencies, and the public in October 1978. Specific information regarding environmental concerns and risks, and other uses of the OCS were requested, as well as information pertaining to industry interest, location of OCS regions with respect to energy markets, and laws, goals and policies of affected States. The information requested pertained to considerations, outlined in Section 18(a), upon which the proposed schedule must be based.

On March 9, 1979, after considering comments and information received as a result of his request, the Secretary submitted a draft proposed schedule to the Governors of affected coastal States, and made the draft proposal available for public comment.

Public meetings concerning the draft proposed schedule were held between March 21 and April 9, 1979, in seven coastal cities.

Comments received concerning the March 9 draft proposal, including those resulting from public meetings and the Notice of Intent to prepare an environmental statement, were considered by the Secretary in developing the proposed leasing program which was submitted to Congress, the Attorney General, and Governors of affected States on June 18, 1979. Submittal of a draft proposal by that date was required by Section 18(d)(2) of the OCS Lands Act, as amended.

The final leasing schedule must be finally submitted to the President and Congress at least sixty (60) days prior to Secretarial approval of that schedule.

A discussion of how mandated factors outlined in Section 18(a) were considered in developing the proposal and alternatives is included as Appendix 1.

2. Scoping

On April 27,1979, the Bureau of Land Management announced its intention to prepare an environmental statement on the proposed schedule. This notice, published in the Federal Register (Vol. 44, No. 83, page 24939), outlined the proposed scope of the draft proposal and alternatives anticipated, as well as tentatively identified significant issues considered appropriate as the focus of the environmental statement. Comments on the scope of the proposal and the statement were solicited, in order to aid in defining the scope of the statement and issues to be addressed.

Comments received as a result of the Notice of Intent and all other sources were analyzed and the more significant issues for consideration in the environmental statement identified. The major scope of the analysis in the draft statement was confined to the alternatives listed below:

1. The draft proposed five-year OCS leasing schedule submitted to Congress in June 1979 consisting of 30 lease sales in fifteen lease sale areas, including seven frontier areas.

2. An alternative schedule, based on one developed by the Department of Energy, consisting of 33 sales in 13 lease sale areas, including five frontier areas. This alternative would result in maximized net economic value.

3. An alternative schedule consisting of the same sales as Alternative 1, but involving alternative timing for three sales in the Bering Sea region of Alaska. This alternative would result in delays in these sales within the five-year timeframe in order to allow a longer period of time for onshore planning efforts, conducted under the aegis of the state coastal zone management programs in areas where little onshore planning and planning capability currently exists.

4. An alternative schedule consisting of the same sales in Alternative 1, but involving alternative timing for a sale in the St. George Basin, in order to allow an additional year to conduct environmental studies.

5. An alternative schedule consisting of the same sale as Alternative 1, with one exception. The proposed Northern Aleutian Shelf sale would be omitted from the five-year schedule, in order to allow for longer-term consideration of environmental consequences of offshore oil and gas development in that area.

6. An alternative schedule consisting of the same sales as Alternative 1, with two exceptions. The proposed Chukchi Sea sale would be omitted from the schedule and substituted with a Beaufort Sea sale, in order to allow development of technology for certain sea ice conditions in a developed leasing area, as opposed to a frontier area.

7. A five-year leasing schedule consisting of 25 lease sales in ten leasing areas. This alternative would omit from the five-year schedule five sales in the Bering Sea region and Chukchi Sea which are considered in Alternative 1. It would allow a slower paced development, resulting in reduced transportation and processing logistical problems, and reduced need for LNG facilities particularly as these relate to the West coast.

8. A no action alternative, resulting in no OCS oil and gas lease sales, but depending instead upon other energy sources, including conservation, to meet the nation's energy needs.

The environmental issues listed below were identified as significant issues to be analyzed in depth in the environmental statement, and were identified in accordance with the guidance provided in Section 1501.7 of the CEQ regulations. Additional issues are treated briefly where appropriate.

1. Impact on commercial fisheries.

2. Impact on habitats and resources of special concern within leasing regions.

3. Impact on endangered species.

4. Impact on air quality.

5. Impact on social and economic factors, including infrastructure and native subsistence in Alaska.

6. Impact on planning and management for other uses of the OCS and adjacent onshore areas, including the marine sanctuary program.

3. Consultation

The draft environmental statement was released on August 29, 1979. Public hearings were held during the week of October 1, 1979, in Anchorage, Alaska; Los Angeles, California; New Orleans, Louisiana; Washington, D.C.; and New York, New York. A total of 48 persons or groups presented testimony at these hearings. In addition, in excess of 75 written comments were received regarding the draft statement. Written comments were received from 12 Federal agencies (The Nuclear Regulatory Commission, the U.S. Geological Survey, the Bureau of Mines, the Heritage

Conservation and Recreation Service, the U.S. Department of Commerce, the Department of Energy, the U.S. Environmental Protection Agency, the Department of Army, the Department of the Air Force, the Federal Aviation Administration, the Federal Energy Regulatory Commission, and the U.S. Fish and Wildlife Service); 14 States (including Washington, California, Alaska, Mississippi, Louisiana, South Carolina, Georgia, Massachusetts, New Jersey, Maryland, Texas, Rhode Island, Florida and North Carolina) and 16 local jurisdictions or groups representing local jurisdictions. In addition, numerous environmental and other public interest groups, Alaskan Native groups, oil industry and others provided comments. Many of the comments were lengthy and detailed, and some represented several organizations or agencies.

Comments from State, Federal and local agencies are reproduced in Section V, along with representative comments representing public interest groups, industry and Alaskan Natives. Major issues raised by these comments and in the public hearings are also included in Section V. Some corrections and clarifications pointed out by commenters are not included in the issue summary, but the text has been revised to respond to the comments.

As a result of the comments received, two additional alternatives, to those discussed above, were added:

1. An alternative schedule consisting of the same sales as Alternative 1, except for three of the proposed California sales included in the Alternative 1 schedule. The proposed 1981 Central and Northern California sale (#53) would be delayed until 1983, replacing the 1983 California (sale #73) which would be omitted. Additionally, the 1984 California sale (Sale #80) would be designated as a Southern California sale.

2. An alternative schedule proposed by the State of Alaska consisting of 28 lease sales, which would differ from Alternative 1 in th_ Alaska sale areas considered. The Northern Aleutian Shelf, St. George Basin and Chukchi Sea would be omitted; the Beaufort Sea sale would not include pack ice and the shear zone; and the Kodiak and Norton sales would be held later than proposed in Alternative 1.

4. Regulatory and Administrative Framework--Department of the Interior

a. Pre-lease Sale

(1) Administrative Steps Leading to Sale Proposals

Subsequent to the approval of the five-year OCS leasing program, or lease schedule, leasing activities conducted by the Department of the Interior must be consistent with the approved schedule. However, inclusion of sales on the schedule does not represent a decision to lease. It represents the Department's intent to consider leasing in specific areas, and to proceed with leasing and development only upon determining that such activities are environmentally, technically, and economically acceptable. Therefore, each sale on the approved five-year schedule will be subject to similar administrative steps and assessment procedures to those which have been utilized in the past for sales included on tentative planning schedules. The OCS Lands Act, as amended, requires some additional procedures not previously required by law; however, many of these have already been implemented administratively for recent sales.

The first step in the leasing decision process is the Call for Nominations, usually between 26 and 34 months prior to a proposed sale date. The Call for Nominations solicits industry interest in specific tracts as well as comments from the States, other Federal agencies, and the public regarding tracts which should or should not be considered for leasing. Comments and nominations are analyzed by the Bureau of Land Management's OCS Office having jurisdiction in the sale area under consideration. The OCS Office also assembles environmental profiles and data on the area, including information from resource reports requested of other Federal agencies prior to issuance of the Call for Nominations. Finally, geologic, geohazard and resource information is assembled at this time by the appropriate regional office of the Geological Survey's Conservation Division. The BLM OCS Office and the Geological Survey's appropriate regional office, after presentation and consultation with affected States, make a preliminary joint tract recommendation to their headquarters offices. After further consideration, including coordination with Geological Survey, BLM forwards recommendations to the Secretary for a tentative selection of tracts to be subject to further analysis. This usually occurs 22 to 27 months prior to the proposed scheduled sale date.

The Bureau of Land Management prepares an environmental statement assessing the tentatively selected tracts and any alternatives developed through the scoping process, or resulting from the environmental analysis itself. During this environmental assessment process, special stipulations may be developed which are proposed to be attached to leases resulting from the sale. These are developed to aid in mitigating potential environmental impacts or multiple use conflicts. The preparation of an environmental statement normally takes 15 to 20 months.

Subsequent to the preparation and publication of an environmental statement, a Secretarial Issue Document is prepared and submitted to the Secretary for his use in making a preliminary decision. This document outlines environmental issues and impacts addressed in the environmental statement, and economic and other considerations, and presents options for the Secretary's decision. Included in the option package are the special stipulations, as appropriate.

If the Secretary's preliminary decision is to proceed with the sale proposal, a Proposed Notice of Sale is issued, indicating the tracts proposed for leasing, the stipulations to be made part of the leases, bidding systems proposed to be used, and any pertinent information to lessees deemed necessary for potential bidders. Governors of affected States are allowed up to 60 days to comment on the proposed lease sale, as required by Section 19(b) of the OCS Lands Act, as amended. The Secretary is required to consider the Governors' comments regarding the size, timing and location of the proposed lease sale, and he must indicate in writing his reasons for accepting or rejecting their recommendations. At least 30 days prior to the scheduled sale, a final Notice of Sale is published in the Federal Register. The entire pre-lease sale process normally requires 26 to 34 months.

(2) Geohazard Information

Prior to tract selection, preliminary analysis of geological and geophysical data collected on a regional basis are often available to identify the types of potential geohazards in an area. High-resolution geophysical data covering all tracts proposed to be offered in a sale are analyzed by the Conservation Division of the Geological Survey prior to the sale. These data are generally acquired under contract after tentative tract selection is announced, with the goal being to complete analysis in time for consideration by BLM in the impact statement. The data are used to assess possible geologic hazards and are used in making decisions to offer particular tracts and in designing any special stipulations which may be necessary to safeguard operations on particular tracts.

(3) Stipulation Development

During the environmental assessment process, conditions or resources may be identified which are believed to warrant special regulation. In this event, stipulations may be developed which are proposed to be attached to one or more leases in a sale area. These may be developed by the BLM OCS Office staff conducting the analysis, or by other Federal agencies, States or the public through the environmental statement comment process.

Recommendations for stipulations are normally first considered by the BLM OCS Office, in consultation with the regional offices of the Geological Survey's Conservation Division and Fish and Wildlife Service, and in some cases the National Park Service and Heritage Conservation and Recreation Service. This consultation procedure is carried out according to Secretarial Order (S.O.) 2974 detailing interdepartmental coordination procedures for OCS leasing activities. Prior to inclusion in the Secretarial Issue Document and Proposed Notice of Sale, S.O. 2974 consultation is usually undertaken at the headquarters level, as well. The final decisions on inclusion of stipulations and the specific requirements of stipulations are made by the Secretary in the Notice of Sale.

Stipulations may be developed to address a wide variety of situations and concerns. In the past, they have most often been used to protect cultural and biological resources and to mitigate against potential geologic hazards. They may be used to restrict operations to a specific portion of a tract, when some portions are considered geologically hazardous or contain a biological resource which could be adversely affected by operations. Stipulations may allow the Geological Survey to require that lessees conduct additional studies prior to operations on a tract or a portion of a tract, in order to demonstrate that operations may be safely conducted or may be conducted without adversely affecting a resource of concern. Finally, they may require that operations on all or a part of the tract be conducted in a specified manner in order to protect a resource of concern.

Examples of stipulations designed to protect biological resources are:

1) Stipulations in the East and West Flower Gardens and other hard bottom areas in the Gulf of Mexico, prohibiting operations on coral banks, and establishing a zone around banks where shunting of all drilling material to within 10 meters of the bottom is required, and an additional zone where shunting or monitoring or both is required.

2) Stipulations in the Mid-Atlantic allowing the Geological Survey's Oil and Gas Supervisor to require the lessee to perform environmental surveys in areas defined as biologically important, and to require the lessee to move or modify operations which might adversely affect these resources. The identification of areas as biologically important is made by an interagency committee made of Interior and non-Interior Federal agencies and States.

3) A stipulation in Cook Inlet restricting flights over a pelagic bird rookery during breeding seasons.

Examples of other past uses of stipulations are: to mitigate the effects of structure placement on archeological resources, through survey and other requirements; and to reduce potential socioeconomic impacts through requirements to train offshore personnel.

(4) Environmental Studies Program

The Bureau of Land Management designed the OCS Environmental Studies Program in 1974 to produce and analyze information needed for the prediction, assessment, and management of impacts on the human, marine, and coastal environments of the OCS and nearshore areas which could be affected by offshore oil and gas exploration and production activities. Information from the program is incorporated in environmental statements and other material provided to the Secretary of the Interior for the assessment of environmental impacts and the evaluation of the trade-offs between non-action and various development alternatives. Section 20 of the OCS Lands Act as amended has codified the requirement for the environmental studies program.

The procedures through which the Environmental Studies program provides information to the Secretary of the Interior were recently delineated by BLM (1978) in its program guidance entitled Study Design for Resource Management Decisions: OCS Oil and Gas Development and the Environment. Each OCS office, in coordination with appropriate Federal, State and local authorities, defines the critical environmental issues associated with each lease sale within its respective jurisdiction. A series of "decisionmaker's questions" are then directed to each issue to separate those components for which sufficient information exists to make a management decision from those components which require further study. The components which require further study are used to identify and design specific studies to provide the required information. Each OCS office submits a list of studies as part of its annual Regional Study Plan to the BLM headquarters office in Washington. The Washington Office has the responsibility for planning and budgeting the entire program. Both of the functions are related directly to the Secretary's five-year leasing schedule. The Washington Office ranks each of the studies in relation to its importance to a future lease sale and to national exploration and production priorities. Ranking is based primarily on the existence or absence of legal responsibility, timing of the sale, and regional concern about the issue involved. Through its funding responsibilities, the Bureau ensures that the highest priority projects are adequately supported and that program continuity is maintained. Studies which are funded through this process are resubmitted to the originating OCS Office for procurement.

b. Exploration and Development Operations

(1) Regulation Exploration Plans and Development and Production Plans:

No exploration, development or production may commence on any OCS lease until an appropriate plan has been approved by the Geological Survey. These plans must describe activities to be conducted on a lease related to exploration, or development and production. They must also be accompanied by environmental reports, except in the Gulf of Mexico offshore areas other than the Florida coast. However, even where this exemption is applicable, an environmental report is required if activities described in the plan would affect a State with an approved coastal zone management plan, and an environmental report or environmental information may be required by the Director, Geological Survey if necessary to the approval process.

The Secretary may not approve an exploration plan unless it is determined that "such exploration will not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure or object of historical or archaeological significance." (Section 11(g)(3)).

The Secretary may not approve a development/production plan "if the Secretary determines, because of exceptional geological conditions in the lease areas, exceptional resource values in the marine or coastal environment, or exceptional circumstances, that (i) implementation of the plan would cause serious harm or damage to life (including fish and other aquatic life), to any mineral deposit (in areas leased or not leased), to the national security or defense, or to the marine, coastal or human environments, (ii) the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable period of time, and (iii) the advantages of disapproving the plan outweigh the advantages of development and production." (Section 25(h)(1)(d)). Furthermore, development/production plans may not be approved if State concurrence with the consistency certification is not obtained or the Secretary of Commerce does not overrule a State objection. For development/production plans, a provision is made for comment by Governors of affected States and executives of affected local governments. At least once in each region, excluding the Gulf of Mexico, the Secretary must declare approval of a development/production plan to be a major Federal action and prepare an environmental statement.

These regulations appear at 30 CFR 250.34-1 and 250.34-2. They have been revised to conform with new or statutory provisions in Sections 5, 11, and 25 of the Act.

Once exploration or development and production plans are approved, drilling permits are also required; discussed under OCS Order No. 2 below.

Best Available and Safest Technologies: In accordance with Section 21(b) of the OCS Lands Act, as amended, all new drilling and production operations, and wherever practicable, existing operations, must use the best available and safest technologies which the Secretary determines to be economically feasible. This requirement is applicable to equipment which, if it failed, would have a significant effect on safety, health, or the environment, unless benefits clearly do not justify the costs.

Pooling and Unitization: A commonly used method of ensuring resource conservation, mandated by Section 5 of the OCS Lands Act, is pooling or unitization, which results in the joint development of oil or gas resources underlying separate tracts. Unitization procedures appear at 30 CFR 250.50 - 250.52.

Air Quality: The OCS Lands Act, as amended, provides that the Secretary shall prescribe regulations "for compliance with the national ambient air quality standards pursuant to the Clean Air Act" to the extent that

OCS oil and gas activities "significantly affect the air quality of any State." The regulations will apply to all OCS leases, but actual control of emissions will be required only where the emissions would significantly affect the ambient air quality of any onshore area of a State. Regulations implementing these provisions are currently being developed (see proposed 30 CFR 250.37 at 44 F.R. 27949, May 10, 1979).

Suspension of Operations and Cancellation of Leases: Regulations appearing at 30 CFR 250.12 provide for the suspension or temporary prohibition of an operation or activity 1) at the request of a lessee, in the national interest, to facilitate proper development of a lease, or to allow for construction or negotiation of transportation facilities, or 2) if there is a threat of serious, irreparable or immediate harm or damage to life (including fish or other aquatic life), to property, to any mineral deposits, or to the marine, coastal or human environments.

The Secretary may cancel a lease or permit if, after a hearing, he determines: 1) that continued activity would probably cause serious harm or damage to life, the environment, national security or defense, 2) that the threat will not disappear or decrease to an acceptable level within a reasonable time, and 3) the advantages of cancellation outweigh the advantages of continued activity. A lease may be cancelled only following suspension or temporary prohibition on a lease or permit continuously for a period of five years (or at the request of the lessee).

These regulations are being revised to comply with new statutory requirements.

Remedies and Penalties: Under 30 CFR 250.80, both civil and criminal penalties can be assessed for failure to comply with responsibilities under the law, regulations or a lease.

(2) OCS Orders

OCS Operating Order supplement regulations and detail requirements and specifications for oil and gas exploration and recovery operations. They outline permit requirements, engineering criteria, surveillance and testing procedures and information requirements. They are published and administered by the Geological Survey. Following is a description of the procedures covered by each order.

OCS Order No. 1: This order requires identification of the operator, block designation and well number on wells, platforms, structures, mobile drilling units and subsea structures. It also addresses navigation aid devices requirements for subsea objects and U.S. Coast Guard responsibilities for such requirements.

OCS Order No. 2: This is a highly technical order detailing drilling operation rules and permit requirements, including those for mobile drilling units (including fitness and ability to withstand oceanographic and meteorologic conditions, and survey requirements); well casing and cementing; blowout-preventer equipment (including criteria, maintenance and testing); mud program; supervision, surveillance and training; and for the establishment of field drilling rules.

OCS Order No. 3: This order establishes plugging and abandonment procedures which have general application to all wells drilled for oil and gas.

OCS Order No. 4: This order sets out criteria for demonstrating the capability of a well to produce paying quantities of oil or gas.

OCS Order No. 5: This order contains detailed procedures for the installation, design, testing, operation and removal of subsurface safety devices.

OCS Order No. 6: This order sets specifications for workover procedures, including testing, and wellhead fitting, valves and casing heads. It relates to production operations only.

OCS Order No. 7: This order prescribes pollution prevention measures and discharge requirements. It regulates the types and methods of discharge of muds, cuttings, sanitary waste and other types of discharges. It also indicates discharges subject to regulation by the Environmental Protection Agency.

OCS Order No. 8: This order establishes requirements applicable to platform and structure design and installation. It requires consideration of environmental conditions which may contribute to structure damage. This order applies to production operations.

OCS Order No. 10: An OCS Order No. 10 is in effect for the Gulf of Mexico and for the Pacific, addressing different topics. The title and content of a similarly numbered order in other regions is reserved. OCS Order No. 10 for the Gulf of Mexico details required procedures for sulphur drilling. OCS Order No. 10 for the Pacific prescribes procedures for drilling of twin core holes.

OCS Order No. 11: This order sets requirements for maximum efficient recovery rate for oil and gas from a lease, and establishes production rates. It also provides procedures to shut-in wells, due to over-production or storms, and for producibility tests. It applies to production only.

OCS Order No. 12: This order sets forth requirements for public inspection of records. It details what information which the lessee provides to the U. S. Geological Survey is considered public and how this information should be transmitted to the Survey in order for it to be made publically available.

OCS Order No. 13: This order sets forth requirements for accurate measurement of oil and gas production, stipulations for the commingling of production from several wells, and standards for metering of production. This order applies only to production.

OCS Order No. 14: This order establishes procedures for the diligent development of resources, including criteria for granting limited supension of operations. It applies to the production phase.

OCS Operating Orders Nos. 1, 2, 3, 4, 5, 7, 8 and 12 pertain to operations and activities included in the exploration and development phases. These orders are in effect for all areas where sales have been held (Gulf of Mexico, Pacific, Gulf of Alaska, including Cook Inlet, and Atlantic). These orders, except for No. 8, were recently revised, appearing in the Federal Register on May 18, 1979 (Vol. 44, No. 98), and will become effective on January 1, 1980. Operating Orders covering the same topics are under development for the Arctic region (covering the joint Federal/State Beaufort Sea sale scheduled for December 1979), and were published in draft form in the Federal Register on June 13, 1979 (Vol. 44, No. 115). Order No. 8 covering all operating areas, including the Arctic, is being revised and appeared in draft form in the Federal Register on July 2, 1979 (Vol. 44, No. 128).

In the Gulf of Mexico and Pacific regions, where production is occurring, the following additional operating orders (with their effective dates)are in place:

OCS Order No. 6 - Gulf of Mexico, 8-28-69; Pacific, 6-1-71
OCS Order No. 10 - Gulf of Mexico, 10-30-70; Pacific, 6-1-71
OCS Order No. 11 - Gulf of Mexico, 5-1-74; Pacific, 5-1-75
OCS Order No. 13 - Gulf of Mexico, 10-1-75
OCS Order No. 14 - Gulf of Mexico, 1-1-77

With the exception of OCS Order No. 10, the orders for different regions address the same operations and procedures. Where differences in operating conditions dictate, however, different criteria and requirements apply to different regions.

A more detailed descripton and analysis of OCS Orders may be found in the Federal Register volumes cited above, or by referring to recent environmental statements for the sales in the various regions.

For those regions for which no OCS Order have been published, OCS Orders will be developed similar to existing orders but taking into account regional requirements. Their development will follow established rulemaking procedures, allowing for public comment on draft orders.

(3) Structural Verification Program

A program is currently being established by the Geological Survey, which is designed to assure that offshore oil and gas structures are designed, constructed and installed using standardized procedures to prevent structural failures. Lessees will be required to submit detailed information on any proposed structure to be erected. The program will facilitate review of these structures. The program will utilize third party expertise and technical input in the verification process through the use of a Certified Verification Agent. The program is described in detailed in the Federal Register of July 2, 1979 (Vol. 44, No. 128).

(4) Inspections

Drilling and production compliance inspections are conducted before, during and after operations to assure that safety and pollution-prevention requirements of regulations and OCS Orders are met. Noncompliance with checklisted requirements for specific installations are followed by prescribed enforcement actions, consisting of written warnings or shut-ins of platforms, zones (well), equipment, or pipelines. The primary objective of initial inspections is to assure proper installation of mobile units or structures and associated equipment. After operations begin, additional, unannounced inspections are held.

Daily helicopter and aircraft surveillance, and general observations from platforms, are maintained by the Geological Survey.

The U.S. Geological Survey has an established Failure and Inventory Reporting System Program which is used in conjunction with its inspection program to enforce regulations and OCS Orders. A standardized compilation of items has been prepared by the USGS entitled "List of Potential Items of Non-Compliance and Enforcement Action," the "PINC" list, used as a guide for inspections. During an inspection of the drilling or production operations, a written warning or shut-in order may be issued.

(5) Stipulations

Stipulations developed prior to the sale (discussed under Section I.B.2.a. above) are administered by the Geological Survey and BLM (pipelines) to provide further special protection to resources of concern and to further mitigate any special operating conditions, such as geological hazards.

(6) Other Environmental and Safety Controls

Besides its regulations and operating orders and lease stipulations, the U.S. Geological Survey has two mechanisms which may be utilized to control or mitigate environmental or other problems which may arise. Notices to Lessees may be issued which define operational problems and necessary actions for solution. In addition, conditions may be applied to any permits or rights-of-use or easements, which may be necessry to provide environmental protection.

c. Pipelines

(1) Bureau of Land Management

The Bureau of Land Management grants rights-of-way for pipelines and accessory structures. Regulations contained at 43 CFR 3340 set out environmental and other requirements for rights-of-way grants. Best available and safest technologies, including those for pipeline burial, must be utilized (where determined economically feasible by the Secretary). Potential effects of a proposed pipeline on human, marine and coastal environments, life, property and mineral resources must be considered prior to granting of a right-of-way, and special stipulations may be attached to the grant to protect these values. Upon abandonment, relinquishment, revocation or termination of the right-of-way grant, the pipeline must be removed, or if abandonment in place can be demonstrated not to pose an unreasonable hazard to fishing, navigation or the marine environment, the pipeline must be purged and open ends plugged and buried.

Regulations concerning these grants (43 CFR 3340) were recently revised to comply with new statutory provisions (Federal Register, June 29, 1979, Vol. 44, 127).

(2) Geological Survey

The Geological Survey grants easements and right-of-use for pipelines. These grants do not apply to pipelines used for transporting oil, gas or other production after custody has transferred to a purchaser or carrier. Revised reguluations governing these grants appear at 30 CFR 250.18(c) and 250.68.

In addition, the Geological Survey's OCS Operating Order No. 9 currently in effect in the Gulf of Mexico (effective 10-30-70) and the Pacific (effective 6-1-71) provides approval procedures for pipelines. Applications must include purpose of each line, proposed route, burial depth, design specifications, and pressure control devices. Welding and laying pipelines must be monitored. A hydrostatic test is required upon completion of installation.

d. Other: Intergovernmental Planning Program for OCS Oil and Gas Leasing, Transportation and Related Facilities (IPP)

The Intergovernmental Planning Program for OCS Oil and Gas Leasing, Transportation and Related Facilities (IPP) has been implemented to provide a formal coordination and planning mechanism for three major elements administered by the Bureau of Land Management (BLM). These are (1) the leasing process, (2) the Environmental Studies Program, and (3) transportation planning for OCS oil and gas.

The program establishes, in each of six leasing regions, a Regional Technical Working Group Committee and, if a marketable discovery is made, a State Technical Working Group Subcommittee. The Regional Technical Working Group Committees form one of the three types of committees comprising the Outer Continental Shelf Advisory Board and will, through the accumulation and evaluation of information, provide guidance to the Bureau of Land Management and information to other Interior bureaus. The State Technical Working Group Subcommittees serve as a forum for information exchange for site-specific planning activities, the establishment of transportation corridors and the location of associated onshore facilities. Further information regarding this program can be obtained from the Bureau of Land Management publication entitled, "Intergovernmental Planning Program for OCS Oil and Gas Leasing, Transportation and Related Facilities," dated February 8, 1979.

5. Regulatory and Administrative Framework--Other Federal Agencies

a. Exploration and Development Operations

Navigation, Safety and National Defense Considerations: The Department of Transportation has jurisdiction over the establishment of shipping fairways. Within these fairways, vessel traffic enjoys the paramount right of navigation (33 U.S.C. 1223(c)(1)). The Department of Transportation, through the U.S. Coast Guard, also establishes traffic separation schemes for vessels operating in the territorial sea seaward of major ports. The Corps of Engineers has responsibility for permitting structures on the OCS. In cases involving construction of artificial islands and fixed structures on the OCS which affect minerals leased from BLM, the Corps' review is limited to the impact of the proposed work only on navigation and national security. Structure permits are issued for exploratory drilling vessels and for fixed and mobile platforms. In considering an application for a permit for a structure partially or wholly within shipping lanes, the Corps of Engineers receives recommendations from the U.S. Coast Guard. While no specific regulations are in force, the Corps generally does not allow structures to be placed within traffic lanes identified by the Coast Guard.

The Coast Guard administers regulations covering warning devices, safety equipment and other matters related to safety of life and property on fixed OCS platforms and drilling vessels. The Coast Guard must also implement the provision of the OCS Lands Act, as amended, requiring use of best available and safest technologies, discussed above (I.B.2.b.(1)).

Emissions: The National Pollution Discharge Elimination System (NPDES), created by the Federal Water Pollution Control Act Amendments of 1972, and administered by the Environmental Protection Agency, is applicable to fixed platforms and rigs engaged in OCS oil and gas activities. The permit requirements are based on EPA-published effluent limitations. The NPDES does not apply to 1) water, gas or other material injected into a well to facilitate production of oil or gas, or 2) water derived in association with oil or gas production and disposed of in a well.

b. Pipelines

Corps of Engineers responsibilities relating to structure placement, outlined above, also apply to pipelines. Upon receipt of an application for a permit, the Corps publishes a notice to obtain the views of all interested parties. In cases involving structures or work in State waters, the decision whether to issue a permit must be based on a full public interest review, including environmental, economic and conservation concerns. The Material Transportation Bureau of the Department of Transportation (DOT) is responsible for establishing and enforcing design, construction, operation and maintenance regulations for pipelines. Related jurisdictions of the Department of Transportation and the Geological Survey concerning these responsibilities are defined in a Memorandum of Understanding between DOT and the Department of the Interior.

The Federal Energy Regulatory Commission (FERC) has the authority, under the Natural Gas Act, to issue certificates of public convenience and necessity for proposed projects involving transportation or sale of interstate natural gas (includes OCS gas). FERC must investigate environmental effects, the potential reserves, the need for the gas and the availability of capital to develop the resource. The right of eminent domain may be exercised by pipeline companies in a court of law as necessary to acquire rights-of-way for FERC-approved projects. FERC also enforces the Natural Gas Policy Act of 1978 (92 Stat. 3350). As applies to the OCS, this Act provides new wellhead pricing controls for certain natural gas produced from the OCS.

c. Onshore Facilities

The National Pollution Discharge Elimination System (NPDES), created by the Federal Water Pollution Control Act Amendments of 1972, applies to water discharges at terminal and storage areas, gas processing facilities and other OCS-related facilities. Additionally, oil storage areas of specific capacities must have approved Spill Prevention Control and Countermeasure Plans.

Air emission provisions of the Clean Air Act also apply to storage tanks, gas processing facilities and other onshore OCS-related facilities involving point source emissions. In most cases, permitting authorities under both of these acts have been delegated to States, with oversight responsibility retained by EPA.

d. Other

Financial Liability for Oil Spills under the Clean Water Act

Under the Clean Water Act, 91 Stat. 1566 (1977), amending the Federal Water Pollution Control Act, lessees or operators on the OCS may be held financially liable for damage due to oil spills. Liability is for actual cost of oil removal or cleanup, to a maximum of $50 million, except where a discharge takes place without the fault of the owner or operator. The cost of removal includes replacement or restoration costs of natural resources destroyed or damaged by a spill, with the President empowered to act as trustee of the natural resources.

Offshore Oil Spill Pollution Fund: Title III of the OCS lands Act, as amended, provides procedures to be followed for cleanup costs and damages resulting from such an oil spill. It establishes a Fund in the Treasury, in an amount not to exceed $200 million, administered by the Department of Transportation and Treasury. The Fund is established through a fee on oil obtained from the OCS. The Fund covers spills from any offshore facilities on the OCS and any tanker, barge or other water craft operating in offshore waters carrying oil directly from an offshore facility. Except for willful misconduct or gross negligence, total liability is limited to $250,000 or $300 per gross ton for a vessel, and $35 million plus removal and cleanup costs for an offshore facility.

Fishermen's Contingency Fund: Title IV of the OCS Lands Act provides for establishment of a Fund not to exceed $1 million for purposes of compensating U.S. commercial fishermen for fishing gear damage or loss, and loss of profits resulting from activities related to oil and gas exploration, development, and production. Accounts are established on an area by area basis, and administered by the Secretary of Commerce. Lessees and holders of an exploration permit, easement or pipeline right-of-way, are assessed an amount to be credited to area accounts. Assessments are collected by the Geological Survey. Damages attributed to a financially responsible party may not be compensated from the Fund.

Also under Title II, the Geological Survey has issued regulations providing for marking, where practicable, of equipment, tools, containers and other items used on the OCS, with owners identification.

Additionally, survey charts of obstructions on the OCS are being developed for use by commercial fishermen by the National Ocean Survey, as required by Title II.

Oil and Hazardous Substances Pollution Contingency Plans: The National Contingency Plan, 40 CFR 1510, was developed by the Council on Environmental Quality in 1975, in accordance with the Federal Water Pollution Control Act Amendments of 1972. The plan provides for a coordinated Federal response to any discharge of oil or other hazardous substance that pose a threat to public health or welfare. It delineates the responsibilities of the Departments of Agriculture, Commerce, Defense, Transportation, and Interior and the Environmental Protection Agency. The plan applies to the navigable waters of the United States, the adjoining shorelines, and the waters of the continental shelf.

Besides establishing basic coordination procedures and responsibilities, the plan establishes a National Response Team and a National Strike Force to work with regional U.S. Coast Guard Strike Teams, and EPA's Environmental Response Team. It allows for participation of volunteers, industry, and academic and scientific groups, and outlines provisions for States to be reimbursed for certain expenses in removal operations.

Under the National Contingency Plan, regional response teams are established, based on regional plans prepared by EPA and the Coast Guard. These include State liaisons as well. In addition, various State subregional contingency plans are attached to the regional plans.

Oil Spill Containment and Clean-up Equipment: As required by U.S. Geological Survey Operating Orders and by 40 CFR 1510, both discussed above, oil spill equipment is maintained both by the government (U.S. Coast Guard Strike Teams) and by industry operating on the OCS.

To comply with USGS requirements, individual companies operating on the OCS have formed coorperatives to maintain spill equipment in the regions where OCS sales have been held. As additional sales are held in OCS areas, the Geological Survey will evaluate the adequancy of existing equipment maintained by companies in the area. The types and availability of these facilities by region is discussed in sale-specific environmental statements referenced at the beginning of Section II. The effectiveness of this equipment is limited however, by deployment time required, and principally by sea state. Containment booms operating on the high seas are effective only at wave heights of about 5 to 6 feet, and less in breaking wave conditions. It has been estimated that average recovery of oil spilled at sea is on the order of 20 percent (Biglane, 1975, as reported in FES, OCS Sale No. 58). However, equipment can be deployed so as to protect vulnerable resources. For example, booms were utilized to protect entrances to lagoons along the Texas coast from the Campeche oil spill. When deployed in quieter, nearshore waters, the effectiveness of containment and clean-up equipment is increased.

There is no experience with conventional containment and clean-up equipment in ice conditions, and much of the conventional equipment would not be applicable under ice conditions. Several ideas have been put forth regarding clean-up containment under ice conditions, including earthmoving equipment to gather solified oil which is spilled on top of ice as a result of a blowout, and ice containment barrier and skimmers to recover oil held in pockets under the ice. Those schemes and others were discussed in comments by the newly formed Alaska Beaufort Sea Oil Spill Response Body, commenting on the 1979 State/Federal Beaufort Sea sale draft environmental statement. However, none of those techniques have been tested.

5. Interrelationship with Other Projects and Proposals

a. Coastal Zone Management

The Coastal Zone Management (CZM) Act, 16 U.S.C. 4151-64, as amended, administered by the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, provides grant-in-aid to States for the development and implementation of management programs to control land and water uses in the coastal zone. In order to qualify for implementation funds, a State must develop its management program within four years from its initial participation. The policy which the Act established is aimed at balancing protection of the coastal environment with development and economic interests. The Act provides for consistency of Federal programs with approved State plans. Under the consistency provision of the Act, exploration plans and development and production plans of OCS oil and gas lessees are specifically indicated as items which must receive consistency review by affected coastal States with approved management plans. In addition, certain pre-leasing activities may require a consistency determination. The Act also established a 10-year Coastal Energy Impact Fund to offset impacts from offshore oil and gas development, providing up-front grants, loans, and other funds for planning, preparation, and mitigation of OCS-related onshore impacts.

The Act allows individual States much leeway in devising management plans and allocating responsibilities, both among State agencies and to regions and localities. However, responsibility for policy development and implementation rests with the States themselves. Therefore, the types of development permitted in the coastal zone, including any that might be associated with offshore oil and gas operations, can ultimately be broadly influenced and controlled by the State programs, with input from local governmental units.

b. Marine Sanctuaries

The purpose of the marine sanctuary program is to identify distinctive areas in the oceans and to preserve and restore such areas for their conservation, recreational, ecological or esthetic values by designating them as marine sanctuaries and providing appropriate regulation and management. Human activities such as oil and gas development will be allowed within sanctuaries to the extent that such activities do not have any significant adverse effect on the resource value of the sanctuary.

Since enactment of the Marine Protection, Research and Sanctuaries Act of 1972 and pursuant to the revised regulations, effective July 31, 1979, 68 sites have been placed on the List of Recommended Areas and seven sites are being considered as active candidates. The size of these sites has varied enormously, from a few square miles to several thousand. To this point in time, however, sites designated as actual marine sanctuaries have been quite small in area.

Depending upon the resource value designated to be protected by the sanctuary, control of oil and gas operations may range from no additional mitigating measures (beyond those now in force) to total exclusion of all oil and gas operations.

c. The Fisheries Conservation and Management Act of 1976 (FCMA)

The FCMA provides a method whereby the fishery resources of the United States can be managed in such manner as to conserve these valuable resources. While both the foreign and domestic fisheries will be managed, the practical effects will be to encourage the domestic fishery while reducing the foreign one. One of the principal tools used is a regional catch quota for each species, based on optimum yield. That portion of the optimum yield which domestic fisheries can harvest is allocated to U.S. fishermen. Any balance is allocated to foreign nations. Since the passage of the Act, the number of U.S. vessels engaged in commercial fisheries has increased significantly.

The passage of the Act and concomitant growth of the industry will increase the level of interaction between OCS oil and gas activities and the commercial fishing industry. This interaction may be most notable in competition for space. An increasing number of fishing vessels will a) increase probability of vessels colliding with rigs, platforms or service vessels; b) be denied fishing space, thus increasing competition elsewhere; and c) be affected by any losses sustained because of oil spills or drilling pollutants.

d. Deepwater Ports

The Deepwater Port Act of 1974 gives the Department of Transportation the authority to license deepwater ports. Only one such port is currently under construction--the Louisiana Offshore Oil port (LOOP) in the Gulf of Mexico. One other project in the Gulf of Mexico is in the application stage. It is proposed for a location offshore of Freeport, Texas.

The purpose of a deepwater port is to provide offshore terminal facilities for importation of oil in large or very large crude carriers, which could otherwise be constrained from offloading in an area due to required water depths and other constraints. For the LOOP project, the nominal safety zone has a radius of 14,650 feet and a fairway width of approximately two nautical miles. Some constraints to OCS oil and gas development could result from deepwater ports due to navigational consideration in placing structures in the vicinity of anchorage, fairways and safety zones. In addition, some seabottom area could be inaccessible to drilling.

e. Sealanes

The Port and Tanker Act of 1978 requires that the Coast Guard provide "safe access routes for the movement of vessel traffic proceeding to or from ports or places subject to the jurisdiction of the United States," by designating necessary fairways and traffic separation schemes for vessels operating offshore of such ports and places. "Such a designation shall recognize, within the designated area, the paramount right of navigation over all other uses." The Act further requires that the Coast Guard consult with Interior and "to extent practicable, reconcile the need for safe access routes with the needs of all other reasonable uses of the area involved." To this end, the Coast Guard has undertaken a study of the vessel traffic in U.S. coastal waters in order to determine which areas would be appropriate for the placement of port access routes.

Existing and proposed navigation schemes are likely to involve some tracts in most of the proposed sale areas in the lower 48 and the southern Alaska region, however, none of the existing or proposed schemes should involve entire sale areas.

f. Offshore Thermal Energy Conversion (OTEC)

Ocean thermal energy conversion is a process which utilizes the temperature difference between hot surface seawater and cold subsurface seawater to drive a heat engine to produce power. OTEC has been the subject of studies sponsored by the National Science Foundation, the Energy Research and Development Administration and the Department of Energy (DOE). These studies indicate that OTEC has the potential to become a viable energy source. The Department of Energy has awarded a $42.7 million contract to Global Marine Development Company to build the world's first large scale ocean thermal energy conversion plant at a site

18 miles northwest of Keahole Point on the Island of Hawaii. The site off Keahole Point is excellent because it provides the required temperature differences of 35 to 40 degrees between ocean water at the surface and a depth of 2,300 ft. needed to make OTEC work. The three-year testing and operation phase of this project is slated to begin sometime in 1980.

The absence of oil and gas exploration in Hawaiian waters precludes the presence of a conflict between OTEC and 5-year oil and gas leasing program. Furthermore, should OTEC project in the future expand into oil and gas rich OCS waters, OTEC platforms, which operate in water depths exceeding 2,000 feet, would present the potential for interference only with deepwater oil and gas operations.

g. Offshore Mining

The Secretary of the Interior is authorized under the OCS Lands Act to issue leases for minerals other than oil, gas and sulfur on the Outer Continental Shelf, and under the provisions of the Mining and Minerals Policy Act (P.L. 83-212) to foster and encourage private enterprise in mining or mineral activities.

A variety of hard mineral commodities occur as surficial or near surficial deposits on the OCS. Several of these are now, or have the potential to become, commercially exploitable. Offshore sand and gravel, covering large areas of the shelf in many OCS regions, is being looked at as an alternative source of construction aggregate for large metropolitan coastal areas. Marine phosphorite deposits off southern California and the southeastern U.S. could supplement the extensive but environmentally controversial onshore resource base. Gold and heavy mineral and deposits occur rather extensively in relict beaches, buried river channels and reworked Pleistocene gravels bordering northern California, Oregon, Washington and Alaska. Of additional interest are the extensive deposits of ferro-manganese nodules that occur on the Blake Plateau. Rising prices or future supply shortages could result in favorable economics for mining these OCS resources. Under present conditions, mining of offshore hard minerals, with the execption in some areas of sand and gravel, is not economic.

Assessment of the impact of the proposed oil and gas leasing program on future OCS mining is dependent upon many prerequisites, the most important of which are discovery and evaluation, followed by technological advances and a supportive economic climate. As offshore oil and gas developments become more prolific, concentrated biologic, geologic, geophysical, cultural, and hazard surveys cover a larger portion of the OCS in progressively greater detail. The positive impact of this expanding network of surveys relative to oil and gas development by both Federal agencies and private industry favors the discovery and evaluation of marine (hard) mineral deposits.

Marine mining subsystems for these minerals are not yet sufficiently advanced but are not among the key requirements in developing successful mining of continental shelf hard mineral resources. Currently, emphasis is being placed on the development of techniques for the delineation and exploitation of unconsolidated marine deposits and the only available systems are shallow-water systems similar to those in use on land, in bays, or in estuaries. At the current rate of technological advance of mining systems for continental shelf minerals, several years will elapse before oil and gas development could impact other mineral development. Primary impacts that might be expected relate to space use conflicts in offshore extraction and possibly for onshore processing and support activities as well. Since virtually no prior OCS hard mineral leasing activities has occurred, an extensive Federal regulatory framework for OCS mining has not yet been developed. Thus, once OCS mining becomes feasible, government will have a great deal of flexibility in planning and regulating this new activity to accommodate other resource values.

h. Ocean Dumping

All ocean dumping is regulated by the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA), as amended, on October 15, 1973 (see Federal Register 38 FR 28610 et seq.). A revised version of the reglations became effective on February 10, 1977 (see 43 FR 2462-2490). These regulations require an EPA issued permit for all ocean dumping of industrial wastes and municipal sludge materials. A November 1977 amendment to the MPRSA (P.L. 95-153) mandates the termination of ocean dumping of sewage sludge by December 31, 1981.

A permit is also required for ocean disposal of dredged (or cellar dirt) material. Permits for this type of disposal are issued by the U.S. Army Corps of Engineers.

40 CFR 228 lists the designated areas in which wastes may be disposed of in the ocean. Further, EPA publishes an annual report entitled "Ocean Dumping in the United States." This report includes information on permit holders, type of waste approved for disposal under the permit, and waste volumes disposed of, by year.

6. Trends in Alternative Energy Sources

Although the proposed OCS 5-year oil and gas leasing program is directly responsive to statutory and Administrative mandates to develop domestic energy resources to meet pressing national needs, it is conceivable that a change in this mandate could occur, resulting in de-emphasis on producing offshore oil and gas in favor of accelerating the development of other, perhaps environmentally preferable, domesteic sources of energy. The following energy sources either now help meet or have the potential to contribute to meeting the Nation's energy needs. The degree to which some mix of these might substitute for oil and gas resources developed th rough implementation of the proposed 5-year leasing program would depend on a number of variables. Many of these variables relate to evolving Federal policies toward encouraging energy conservation stimulating the development of other domestic energy resources, and promoting the research and development of non-conventional energy sources. International events will continue to provide a primary stimulus for this policy evolution.

A detailed description of Federal initiatives and planning objectives for research and development of the Nation's energy sources is contained in: A National Plan for Energy Research, Development and Demonstration, published in June 1977 by the U.S. Energy Research and Development Administration. Discussion of the role and prospects for various energy sources is found in National Energy Plan II, Department of Energy, 1979. Another extremely useful, though slightly dated discussion on the technologic, economic and environmental aspects developing various domestic energy sources can be found in Energy Alternatives - A Comparative Analysis, published in May 1975 through the Science and Public Policy Program of the University of Oklahoma.

Domestic Onshore Oil and Gas

Large quantities of oil and gas still remain in U.S. onshore deposits. The U.S. Geological Survey (1975) estimated quantities of measured crude oil reserves at 31 billion barrels, indicated reserves at 4.3 billion barrels and inferred reserves at 20.4 billion barrels. The amount of onshore undiscovered recoverable resources range from 37 billion barrels (95% probability) to 81 billion barrels (5% probability) of oil, with a mean value of 56 billion barrels.

Production of domestic crude oil has declined sharply from a historic peak in 1970. As a result of Alaskan North Slope production, this declining trend has reversed slightly. With anticipated further expansion of North Slope deliveries, the Energy Department projects a short term increase in domestic oil production. However, output from the North Slope is expected to peak around 1990. The National Energy Plan II (DOE, 1979) projects that total domestic production (onshore and offshore) in the year 2000 will be about 10 to 11 million barrels/day, a projection that is relatively insensitive to changes in the price of oil assumed, or changes in amount of domestic coal and nucelar energy assumed.

The U.S. Geolological Survey (1975) estimated that the remaining undiscovered recoverable onshore natural gas resource in the U.S. ranges from 264 TCF (95% probability) to 506 TCF (5% probability), with a mean value of 377 TCF. The proven reserves of natural gas have declined since the mid-1960's to an estimated 209 TCF (AGA, 198).

The pattern of domestic production of natural gas has closely followed that of crude oil. Natural gas output peaked in 1973 and has since declined. Unlike petroleum, natural gas imports amounted to only about five percent of total U.S. consumption in 1977 and have not make up for domestic production declines. The Natural Gas Policy of 1978 aims to stimulate greater production of domestic gas supplies by raising the regulated price and providing for deregulation by 1985. In the short term, the act's most significant consequences has been to abolish the price differential between interstate and intrastate gas, which has resulted in increased supplies of gas. The conversion of coal into synthetic gas is expected to have considerable importance at some future time (see synthetic fuels from coal discussion).

Coal

The total identified coal resources of the United States is estimated to be 1.7 trillion tons (DOI, 1978). Of this amount, only 438 billion tons have thus far been identified with enough certainty and economic prospectiveness to be placed in the reserve category. Fifty-four percent by weight of these reserves (forty-five percent by BTU) are located west of the Mississippi River. Until recently, western reserves played only a limited role as a source of the Nation's coal production, as heavy demand from eastern and midwestern population and industrial centers was satisfied with coal from historically productive mines in Appalachia and the Midwest. Approximately sixty percent of the Nation's western coal reserves is owned by the Federal government, and an additional twenty percent is dependent on the availability of complementary Federal coal for its production.

Domestic coal production has been on an upward trend during the last ten years, reaching an historic high of 689 million tons in 1977. Of this amount, approximately sixty-nine percent was used for electrical power generation, eleven percent for coking, nine percent for other industrial operations, and eight percent export. The 475,000 tons of coal used for generating electricity in 1977 contributed forty-seven percent of the Nation's electrical power needs for that year.

The Department of Energy (1978), using its Projection Series F energy forecast, projects increased annual U.S. coal production to 1.058 billion tons by 1985 and 1.348 billion tons by 1990, with the greatest growth shown in production frm the northern Great Plains. Domestic consumption of coal is forecast by DOE to grow at an annual rate of five percent through 1990 (DOE, 1978). This growth in consumption is expected to occur primarily in the electric utility sector and, to a lesser extent, in the industrial sector.

A more detailed discussion of coal and its contribution to U.S. energy needs, as well as the environmental impact of increased production of Federal coal, may be found in the Final Environmental Statement on the Federal Coal Management Program, released by the Bureau of Land Management in April 1979.

Synthetic fuel from coal--it has been projected that coal conversion technology may provide about 0.4 quadrillion BTU's by 1990, and 2 quadrillion BTU's per year by 1995 (U.S. Department of Energy, Energy Suply and Demand in the Midterm, April 1979). This compares to total national energy consumption during the 1990's in the approximate neighborhood of 100 quadrillion BTU's per year. In July of 1979 the Administration presented a major plan to reduce oil imports by a combination of energy conservation and increased domestic energy production. A cornerstone of this plan is the large scale production of synthetic fuel from U.S. coal resources. This development will create demand for coal and increase production above the level forecast in earlier projections. Environmental impacts, including comparisons of various residuals for different synthetic fuel processes and end uses with conventional oil and coal development and use, may be found in Comparative Analysis of Health and Environmental Effects of Coal Conversion Technology, L.D. Hamilton, et. al., 1978, prepared for the Assistant Secretary for Environment, U.S. Department of Energy. The comparison indicates that, on a BTU basis, offshore oil development generally yields less residuals than coal conversion technologies, or conventional coal, except for water pollution--specifically, hydrocarbon inputs.

Geothermal Energy

There are three types of geothermal energy: hydrothermal, geopressured, and hot dry rock. Hydrothermal is particularly promising in the western States, where many reservoirs have been identified. The geyser field in California is the most extensively developed source of hydrothermal energy in the United States. Its capcity has increased from 13 thousand kilowatts in 1960 to 559 megawatts in 1978; by 1985, normal expansion at the geysers is expected to yield a total capacity of 230 megawatts, followed by moderate expansion of that resource area and other economical geothermal resource areas (U.S. Department of Energy, Energy Information Administration, Annual Report to Congress, 1977 and 1978).

Geopressured resources are hot water aquifers containing dissolved methane, found along the Gulf of Mexico coast in sedimentary formation. Both the heat of the water and the methane content are sources of energy. There is presently a great deal of ncertainty about the cost of recovery and the size of the methane resource. Presently estimates range from 5,000 to 63,000 trillion cubic feet. Even the low end of that range represents an extremely large natural gas resource. It is clear that this resource holds the potential for a major contribution. However, the process is still largely experimental and is not expected to be developed commercially until the year 2000.

The table below presents the U.S. Department of Energy's estimates of the contribution expected from the three types of geothermal energy during this century (National Energy Plan II, 1979).

Estimated Geothermal Utilization
(Quads per Year)

Resource	Application	1985	2000
Hydrothermal	General electricity Provide direct heat	0.08-0.3	0.6-3.0
Geopressurized	General electricity and produce methane	0-0.02	2.4-4.0
Hot Dry Rock	Not estimated		

Environmental aspects of hydrothermal development are addressed in the Bureau of Land Management's Final Environmental Statement on the Geothermal Leasing Program, released in 1974.

Hydroelectric

Hydroelectric plants in 1977 accounted for 68,300 megawatts, or 12 percent of the total installed electrical generating capacity of the United States. This was about 25 percent less than in 1974, due primarily to drought conditions in many western States. In the 1930's and 1940's hydroelectric power provided as much as 30 percent of total domestic electricity needs (Department of Energy, 1977 Statistics and Trends of Energy Supply, Demands and Prices). Although hydroelectric power is relatively safe, nonpolluting, low in cost, and does not consume fuel, its expansion in recent years has been limited by the lack of good new sites and opposition on environmental and cost grounds. The possibilities for expanding capacity at existing dams and for developing hydroelectric facilities on smaller rivers and streams are being investigated (Department of Energy, Environmenal Readiness Document-Small Scale Low Head Hydro Commercialization Phase III Planning, 1978).

Imported Oil and Gas

In 1977, imports of crude oil averaged 6.6 million barrels per day, which was an increase of 25 percent over the level just one year earlier. By the last quarter of 1978, imports of crude oil to U.S. stood at 6.7 million barrels per day and provided 44 percent of all crude oil inputs to U.S. refineries. An additional 2 million barrels per day was imported in the form of refined products (U.S. Department of Energy, Energy Information Administration).

Some advantages of reliance on imported oil do exist, including conservation of domestic oil and gas for use by future generations and allocations of domestic capital and productive capabilities to types of economic activity in which the U.S. has a comparative advantage in international trade. However, the disadvantages of such heavy dependence on foreign crude oil include: the difficulties arising in international relations due to the interruptibility of imported supplies; the balance of payments problem which is aggravated by extensive oil imports; and the lack of a secure bargaining position from which to resist OPEC price increases. Because of these advantages, it is an Administration goal to reduce imports of foreign oil by 4.5 million barrels per day by 1990. The proposed leasing schedule could play an important role in achieving that goal, since combined peak production from all sale areas is expected to be on the order of two million barrels per day (exact production will vary depending on the development schedules, decline rates, and the size of discoveries). While reducing drilling-related and support facility related environmental impacts associated with domestically produced oil, oil spills from tankers importing oil present significant potential environmental impacts.

Historically, imports of liquified natural gas (LNG) have provided a relatively small portion of the Nation's energy needs. In 1978, LNG imports to the U.S. provided about 407 billion cubic feet (BCF) of gas. Based on the risked mean resource estimates, on the order of 3000 BCF a year gas could be provided at peak gas production from the OCS sales in the proposed leasing schedule. Thus, existing LNG facilities could not accommodate the tremendous expansion in LNG receiving capacity which would be needed to replace the gas from the proposed leasing schedule. (However, note that a major expansion of LNG receiving facilities might also be necessary if the gas is produced from all Alaska areas as a result of the proposed schedule, in order to handle LNG from the Alaska OCS; see Section IV.A.4). In addition to the receiving capacity limitation discussed above, increased LNG imports would involve problems of interruptibility and balance of payments deficits, as discussed under oil imports. While resulting in relatively minor environmental impacts (see discussion of LNG facilities under Section IV.A.4), these are significant safety concerns regarding LNG transport and facilities due to the volatile nature of liquified gas.

Nuclear Power

The Department of Energy (Statistical Data of the Uranium Industry, 1978) estimated that domestic uranium reserves (U_3O_8) at $30 or less per pound (forward costs) were 690,000 tons at of January 1, 1978; an additional 200,000 tons were estimated in the $30 - $50 per pound cost range. Potential resources, at $50 or less per pound were estimated to be 3.5 million tons. Uranium production (U_3O_8) in 1978 reached a record level of approximately 18.5 thousand short tons.

At year end, 71 nuclear power plants were operable in 26 States. Additionally, a total of 90 construction permits had been granted with another 45 nuclear facilities planned. Operationsl plants produced 276.4 billion kilowatts hours of electricity in 1978, which represented 21.5 percent of total domestic electric utility generation (Department of Energy, Annual Report to Congress, 1978).

Nuclear power plants are currently cost competitive with coal plant in most regions of the U.S. In recent years however, a number of concerns regarding cost and safety have reduced the expected rapid growth of nuclear energy. Pricing uncertainties have involved parity relationships with other fuels, future Government actions concerning enrichment services and spent fuel management, and anti-competitive forces in the foreign uranium market (Department of Energy Annual Report to Congress, 1978). Safety concerns involve questions of nuclear proliferation, radiation hazards, and the storage and disposal of radioactive wastes. Numerous environmental statements specific nuclear plant proposals have been prepared by the Nuclear Regulatory Commission.

Oil Shale

High grade deposits of oil shale, located primarily in Colorado, Utah, and Wyoming, may contain as much as 600 billion barrels of oil, and lower grade deposits may contain an additional 1.2 trillion barrels. Given favorable economic conditions, as much as 80 billion barrels (total) of shale oil could be extracted. A number of optimistic production forecasts were made in the 1973-74 period; it soon became evident, however, that production costs would be much higher than originally expected. Unless there are breakthroughs in technology, shale oil is not expected to be competitive with oil and gas until their prices rise considerably. Even then, shale oil is not expected to be competitive with oil and gas until their prices rise considerably. Even then, shale development might not be competitive because historically increases in prices have tended to lag behind increases in cost. (U.S. Department of the Interior, 1973, Final EIS for the Prototype Oil Shale Leasing Program; and U.S. Department of Energy, Statistics and Trends of Energy Supply, Demand, and Prices, 1977).

Solar

The basic solar energy categories are solar heating and cooling of buildings, agricultural and industrial process heat, wind energy conversion, photovoltaic conversion, solar thermal conversion, and biomass. Solar heating and cooling, agricultural and industrial process heat, wind energy, and biomass appear to have potential for significant uses between now and 1990. The most promising of these is biomass, which is expected to displace from 3.1 to 5.4 quads (quadrillion BTS's) per year of conventional energy by the year 2000--out of a total national annual energy consumption expected to be approximately 100 to 115 quads. Industrial and agricultural use of solar energy may displace from 1.0 to 2.6 quads, and residential/commercial uses may displace less than half a quad, but photovoltaics could displace up to one quad and wind energy may displace from 0.6 to 1.7 quads of conventional energy in the year 2000. These estimates would be higher if maximum technically feasible expansion of U.S. solar energy use were assumed. Solar energy is relatively clean and pollution-free compared to conventional fuels, and use of solar energy adds diversity and flexibility to the national energy supply (National Energy Plan II, May 1979).

Conservation

The conservation or efficient use of energy is a "source" of energy in a very real and highly important sense. In the National Energy Plan II, the Department of Energy has estimated that current trends in energy conservation could provide the equivalent of 11 million barrels of oil per day by the year 2000; further incentives for conservation could increase that amount. However, in the mid-term, even under conservative demand/consumption estimates for 1990 (about 21 million barrels/day - DOE Project Series F, Annual Report to Congress, April, 1978), and considering existing domestic production of about 8 million barrels/day, which will not be greatly offset by North Slope crude under development, conservation alone does not appear to be able to offset the demand for petroleum liquids.

The Report of the Energy Project at the Harvard Business School (Strobaugh and Yergin, 1978) indicates that energy conservation, together with solar energy, is the most realistic alternative available to continued high imports, which is available to the U.S. However, this study as well, recognizes the importance of offshore oil and gas development to increase domestic oil supplies, and favors the leasing of offshore properties "under strict environmental regulations and in a manner to promote rapid development."

Energy conservation has the advantage of little or no environmental impact. The principle disadvantages are economic, but planned conservation, as opposed to curtailments, would not necessarily result in excessive economic impacts. The extent of such impacts would depend on the enforcement, incentive and other implementation measures utilized. Those measures may include allowing the price of all oil and gas to rise to reflect market value; imposing a surtax on consumption of oil and gas related products, or allocating or rationing available petroleum products.

II. DESCRIPTION OF THE ALTERNATIVES

Table II-1 indicates the proposed timing and location of all alternatives. The alternatives are described separately below.

A. Alternative 1: The Proposal

1. Description of Alternative 1

The proposed action is a five-year schedule of oil and gas lease sales on the Outer Continental Shelf, consisting of 30 proposed sales and one contingency. The proposed timing and location of these sales is indicated in the proposed schedule. Maximum sale sizes are as follows:

Leasing Areas	Millions of Acres
North Atlantic	.8
Mid-Atlantic	.8
South Atlantic, Sale No. 56 (actual)	1.6
South Atlantic/Blake Plateau	.8
Gulf of Mexico, Sale No. A62 (actual)	1.099
Gulf of Mexico, Sale No. 62 (actual)	.419
Gulf of Mexico (all others)	1
Southern California	.8
Central and Northern California Sale No. 53 (actual)	1.338
Central and Northern California (all others)	.8
Gulf of Alaska (actual)	2
Kodiak (actual)	3.2
Cook Inlet	.865
Northern Aleutian Shelf	1
St. George Basin	1
Navarin Basin	1
Norton Basin	.6
Chukchi Sea	.6
Beaufort Sea	.6

Figures II-1 and II-2 define the boundaries of these lease sale areas. The Department is presently considering shifting some of these boundaries, principally affecting the Mid-Atlantic and South Atlantic boundary, and the Northern Aleutian Shelf and Navarin Basin areas. These changes are not expected to result in significant differences in environmental impacts. Figures II-3 and II-4 show general locations of geologic basins, where specific sales may be focused; however, sales would not necessarily be confined to the areas depicted.

Table-II-1

Leasing Schedule Alternatives

Alternative I

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

53 Central & Northern California
A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
57 Norton Basin
69 Gulf of Mexico
70 St. George Basin

1983

71 Beaufort Sea
72 Gulf of Mexico
73 California
74 Gulf of Mexico
75 North Aleutian Shelf
76 Mid-Atlantic
77 Gulf of Mexico*

1984

78 South Atlantic/Blake
79 Gulf of Mexico
80 California
81 Gulf of Mexico
82 North Atlantic
83 Navarin Basin

1985

84 Gulf of Mexico
85 Chukchi Sea

Alternative II

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

A66 Gulf of Mexico
53 Central & Northern California
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
69 Gulf of Mexico
Gulf of Mexico
52 North Atlantic
68 Southern California
71 Beaufort Sea
70 St. George Basin

1983

72 Gulf of Mexico
74 Gulf of Mexico
Gulf of Mexico
76 Mid-Atlantic
78 South Atlantic
Gulf of Alaska
57 Norton Basin

1984

79 Gulf of Mexico
81 Gulf of Mexico
Gulf of Mexico
82 North Atlantic
80 Southern California
Beaufort Sea
St. George Basin

1985

84 Gulf of Mexico
85 Chukchi Sea

Alternative III

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

53 Central & Northern California
A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
69 Gulf of Mexico

1983

71 Beaufort Sea
72 Gulf of Mexico
73 California
74 Gulf of Mexico
76 Mid-Atlantic
77 Gulf of Mexico*

1984

78 South Atlantic/Blake
79 Gulf of Mexico
80 California
81 Gulf of Mexico
82 North Atlantic
83 Navarin Basin
70 St. George
75 North Aleutian Shelf

1985

57 Norton
84 Gulf of Mexico
85 Chukchi Sea

Alternative IV

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

53 Central & Northern California
A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
57 Norton Basin
69 Gulf of Mexico
72 Gulf of Mexico

1983

71 Beaufort Sea
73 California
74 Gulf of Mexico
75 North Aleutian Shelf
76 Mid-Atlantic
77 Gulf of Mexico*
70 St. George Basin

1984

78 South Atlantic/Blake
79 Gulf of Mexico
80 California
81 Gulf of Mexico
82 North Atlantic
83 Navarin Basin

1985

84 Gulf of Mexico
85 Chukchi Sea

Alternative V

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
57 Norton Basin
69 Gulf of Mexico
70 St. George Basin

1983

53 Central & Northern California
71 Beaufort Sea
72 Gulf of Mexico
74 Gulf of Mexico
75 North Aleutian Shelf
76 Mid-Atlantic
77 Gulf of Mexico*

1984

78 South Atlantic/Blake
79 Gulf of Mexico
80 Southern California
81 Gulf of Mexico
82 North Atlantic
83 Navarin Basin

1985

84 Gulf of Mexico
85 Chukchi Sea

* Contingency Sale

Alternative VI

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

53 Central & Northern California
A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
57 Norton Basin
69 Gulf of Mexico
70 St. George Basin

1983

71 Beaufort Sea
72 Gulf of Mexico
73 California
74 Gulf of Mexico
76 Mid-Atlantic
77 Gulf of Mexico*

1984

78 South Atlantic/Blake
79 Gulf of Mexico
80 California
81 Gulf of Mexico
82 North Atlantic
83 Navarin Basin

1985

84 Gulf of Mexico
85 Chukchi Sea

Alternative VII

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

53 Central & Northern California
A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
57 Norton Basin
69 Gulf of Mexico
70 St. George Basin

1983

71 Beaufort Sea
72 Gulf of Mexico
73 California
74 Gulf of Mexico
75 North Aleutian Shelf
76 Mid-Atlantic
77 Gulf of Mexico*

1984

78 South Atlantic/Blake
79 Gulf of Mexico
80 California
81 Gulf of Mexico
82 North Atlantic
83 Navarin Basin

1985

84 Gulf of Mexico
85 Beaufort Sea

Alternative VIII

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico
46 Kodiak

1981

53 Central & Northern California
A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid-Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
69 Gulf of Mexico

1983

71 Beaufort Sea
72 Gulf of Mexico
73 California
74 Gulf of Mexico
76 Mid-Atlantic
77 Gulf of Mexico*

1984

78 South Atlantic/Blake
79 Gulf of Mexico
80 California
81 Gulf of Mexico
82 North Atlantic

1985

84 Gulf of Mexico

Alternative IX

1980

A62 Gulf of Mexico
55 Gulf of Alaska
62 Gulf of Mexico

1981

53 Central & Northern California
A66 Gulf of Mexico
56 South Atlantic
60 Cook Inlet
66 Gulf of Mexico
59 Mid Atlantic

1982

67 Gulf of Mexico
68 Southern California
52 North Atlantic
69 Gulf of Mexico

1983

46 Kodiak
71 Beaufort Sea (includes landfast ice areas only)
72 Gulf of Mexico
73 California
74 Gulf of Mexico
76 Mid-Atlantic
77 Gulf of Mexico*

1984

57 Norton Basin
78 South Atlantic/Blake
79 Gulf of Mexico
80 California
81 Gulf of Mexico
82 North Atlantic
83 Navarin Basin

1985

84 Gulf of Mexico
Hope

Alternative X

1980

No Action

1981

No Action

1982

No Action

1983

No Action

1984

No Action

1985

No Action

* Contingency Sale

PROPOSED OCS OIL AND GAS LEASE SALE SCHEDULE

JUNE 1979

1979[1]

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico									E		H	
55 Gulf of Alaska									E		H	
62 Gulf of Mexico									E		H	
46 Kodiak												E
53 Central N. Calif.												
A66 Gulf of Mexico						C		D		T		
56 South Atlantic			C		D		T					
60 Cook Inlet		D			T							
66 Gulf of Mexico						C		D		T		
59 Mid-Atlantic							C		D			T
67 Gulf of Mexico												
68 Southern California[2]												C
52 North Atlantic										C		D
57 Norton Basin				C							D	
69 Gulf of Mexico												
70 St. George Basin							C			D		
71 Beaufort Sea										C		D
72 Gulf of Mexico												
73 California												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake												
79 Gulf of Mexico												
80 California												
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin												
84 Gulf of Mexico												
85 Chukchi Sea												

1980

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico		F		P		SC	R	N	S			
55 Gulf of Alaska			F		P		SC	R	N	S		
62 Gulf of Mexico		F				P		SC	R	N	S	
46 Kodiak		H			F		P		SC	R	N	S
53 Central N. Calif.				E		H				F		P
A66 Gulf of Mexico							E		H			F
56 South Atlantic							E		H			
60 Cook Inlet								E		H		
66 Gulf of Mexico							E		H			F
59 Mid-Atlantic											E	
67 Gulf of Mexico	C		D		T							
68 Southern California[2]		D			T							
52 North Atlantic				T								
57 Norton Basin		T										
69 Gulf of Mexico								C		D		T
70 St. George Basin		T										
71 Beaufort Sea			T									
72 Gulf of Mexico												
73 California											C	
74 Gulf of Mexico												
75 No. Aleutian Shelf					C			D				T
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake												
79 Gulf of Mexico												
80 California												
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin												
84 Gulf of Mexico												
85 Chukchi Sea												

1981

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.		SC	R	N	S							
A66 Gulf of Mexico		P		SC	R	N	S					
56 South Atlantic	F		P		SC	R	N	S				
60 Cook Inlet		F		P		SC	R	N	S			
66 Gulf of Mexico					P		SC	R	N	S		
59 Mid-Atlantic	H				F		P		SC	R	N	S
67 Gulf of Mexico			E		H			F		P		SC
68 Southern California[2]					E		H				F	
52 North Atlantic							E		H			
57 Norton Basin						E				H		
69 Gulf of Mexico										E		H
70 St. George Basin										E		
71 Beaufort Sea												E
72 Gulf of Mexico	C		D		T							
73 California	D			T								
74 Gulf of Mexico							C		D		T	
75 No. Aleutian Shelf												
76 Mid-Atlantic					C		D			T		
77 Gulf of Mexico[3]										C		D
78 So. Atlantic/Blake			C			D				T		
79 Gulf of Mexico												
80 California										C		D
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin						C			D			
84 Gulf of Mexico												
85 Chukchi Sea							C			D		

1982

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico	R	N	S									
68 Southern California[2]	P		SC	R	N	S						
52 North Atlantic	F		P		SC	R	N	S				
57 Norton Basin		F		P		SC	R	N	S			
69 Gulf of Mexico			F		P		SC	R	N	S		
70 St. George Basin	H				F		P		SC	R	N	S
71 Beaufort Sea			H				F		P		SC	R
72 Gulf of Mexico			E		H			F		P		SC
73 California				E		H				F		P
74 Gulf of Mexico									E		H	
75 No. Aleutian Shelf								E			H	
76 Mid-Atlantic										E		H
77 Gulf of Mexico[3]		T										E
78 So. Atlantic/Blake											E	
79 Gulf of Mexico	C		D		T							
80 California			T									
81 Gulf of Mexico					C		D		T			
82 North Atlantic				C		D			T			
83 Navarin Basin	T											
84 Gulf of Mexico											C	
85 Chukchi Sea		T										

1983

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
68 Southern California[2]												
52 North Atlantic												
57 Norton Basin												
69 Gulf of Mexico												
70 St. George Basin												
71 Beaufort Sea	N	S										
72 Gulf of Mexico	R	N	S									
73 California		SC	R	N	S							
74 Gulf of Mexico		F		P		SC	R	N	S			
75 No. Aleutian Shelf			F		P		SC	R	N	S		
76 Mid-Atlantic				F		P		SC	R	N	S	
77 Gulf of Mexico[3]		H			F		P		SC	R	N	S
78 So. Atlantic/Blake		H				F		P			R	N
79 Gulf of Mexico			E		H			F		P		SC
80 California					E		H				F	
81 Gulf of Mexico							E		H			F
82 North Atlantic									E		H	
83 Navarin Basin										E		
84 Gulf of Mexico	D		T									
85 Chukchi Sea												E

1984

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
68 Southern California[2]												
52 North Atlantic												
57 Norton Basin												
69 Gulf of Mexico												
70 St. George Basin												
71 Beaufort Sea												
72 Gulf of Mexico												
73 California												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake	S											
79 Gulf of Mexico	R	N	S									
80 California	P		SC	R	N	S						
81 Gulf of Mexico		P		SC	R	N	S					
82 North Atlantic			F		P		SC	R	N	S		
83 Navarin Basin	H				F		P		SC	R	N	S
84 Gulf of Mexico	E		H			F		P		SC	R	N
85 Chukchi Sea			H				F		P		SC	R

1985

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
68 Southern California[2]												
52 North Atlantic												
57 Norton Basin												
69 Gulf of Mexico												
70 St. George Basin												
71 Beaufort Sea												
72 Gulf of Mexico												
73 California												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake												
79 Gulf of Mexico												
80 California												
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin												
84 Gulf of Mexico	S											
85 Chukchi Sea	N	S										

C - Call for Nominations
D - Nominations Due
T - Tentative Tract Selection
E - Draft Environmental Statement
H - Public Hearing

F - Final Environmental Statement
P - Proposed Notice of Sale
SC - State Comments Due
R - Energy Review
N - Notice of Sale

S - Sale

[1] The 1979 Column is included to indicate the pre-lease actions required for OCS lease sales scheduled for the period 3/80 - 2/85. Sales scheduled for dates in the latter half of 1979 include:
48 So. California June 1979 — [illegible] Nov. 1979
58 Gulf of Mexico July 1979 — Beaufort Sea Dec. 1979
42 North Atlantic Oct. 1979

[2] Includes Santa Barbara Channel.

[3] This sale has been included in this schedule in order that planning may be commenced. Subsequent events (e.g., deletion of another sale from this schedule) will determine whether this sale will be held as indicated, held at some other time during the 5-year period, deleted or postponed until after February 1985.

Figure II-1

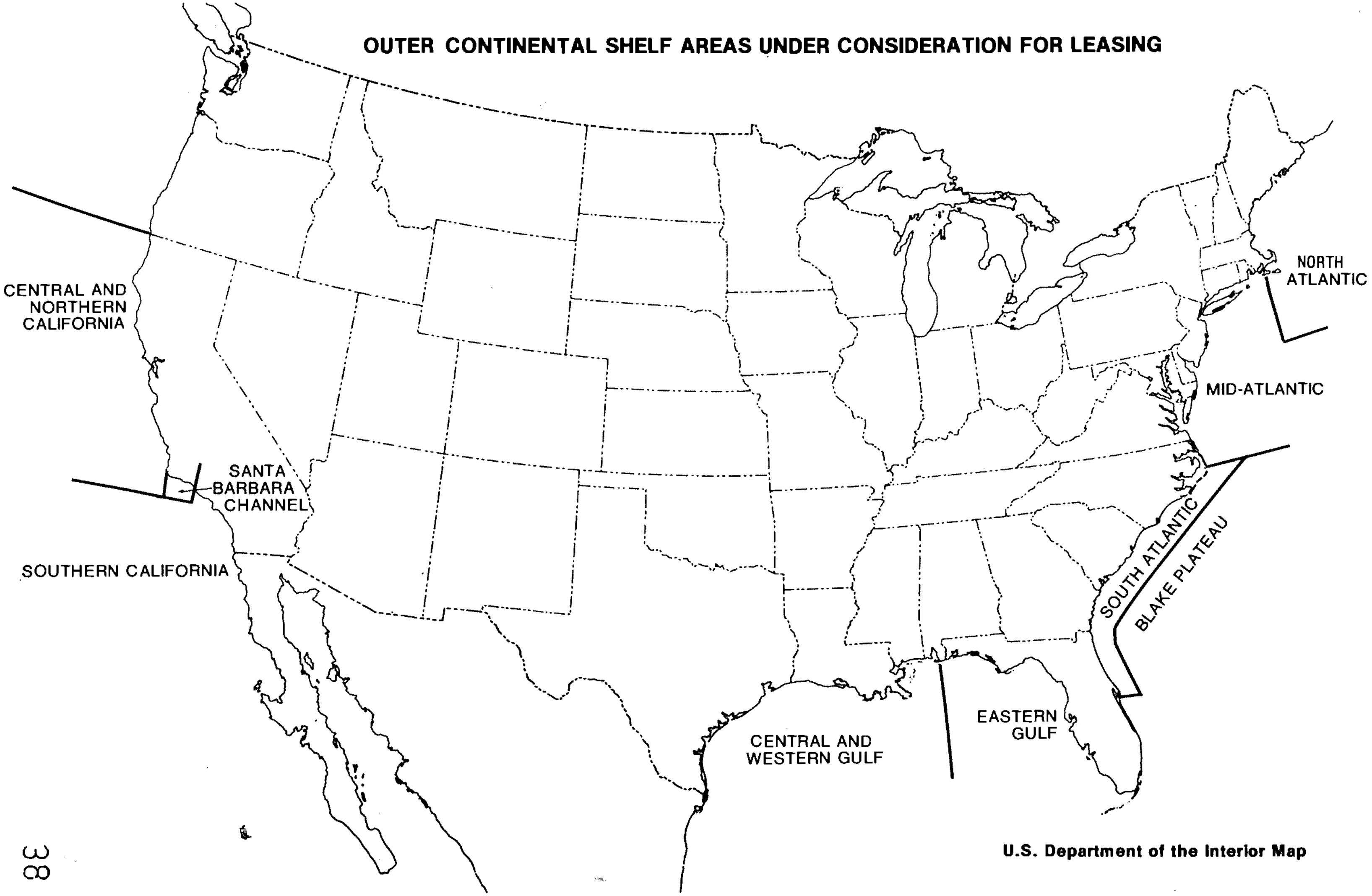
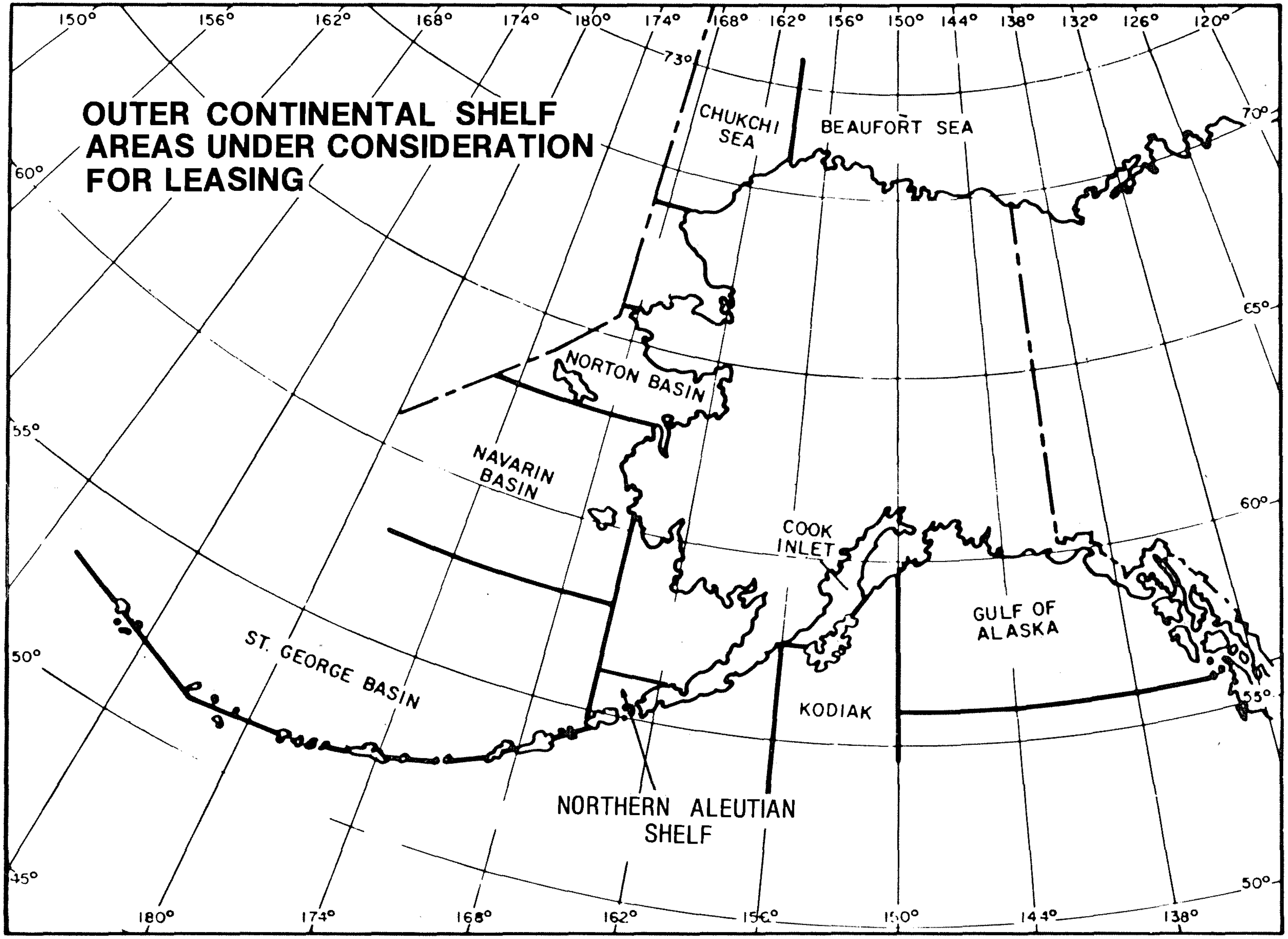
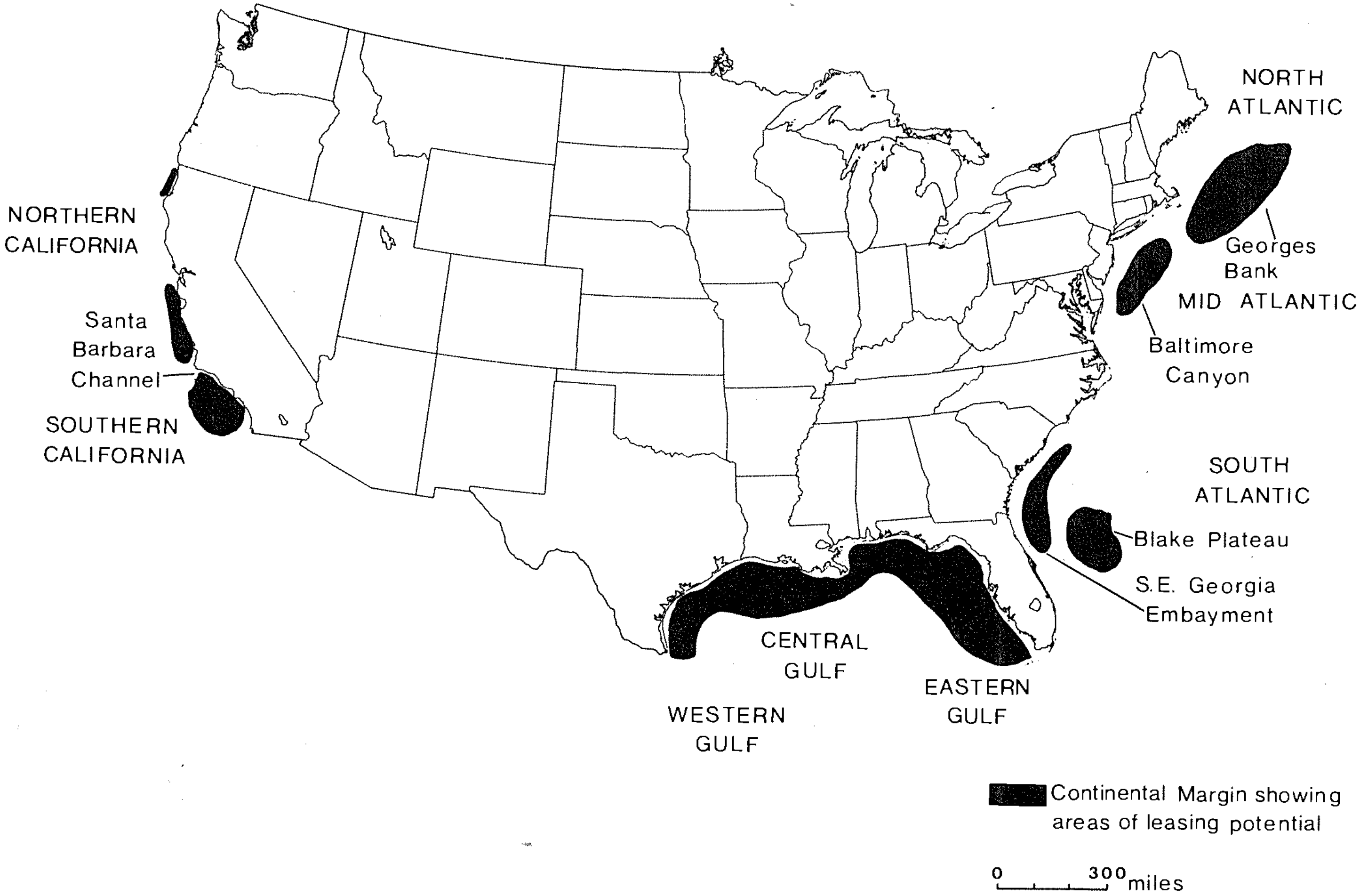

OUTER CONTINENTAL SHELF AREAS UNDER CONSIDERATION FOR LEASING
CENTRAL AND NORTHERN CALIFORNIA
SANTA BARBARA CHANNEL
SOUTHERN CALIFORNIA
NORTH ATLANTIC
MID-ATLANTIC
SOUTH ATLANTIC
BLAKE PLATEAU
EASTERN GULF
CENTRAL AND WESTERN GULF
U.S. Department of the Interior Map

Figure II-2



U.S. Department of the Interior Map

Figure II-3



OUTER CONTINENTAL SHELF LEASE AREAS, COTERMINOUS UNITED STATES

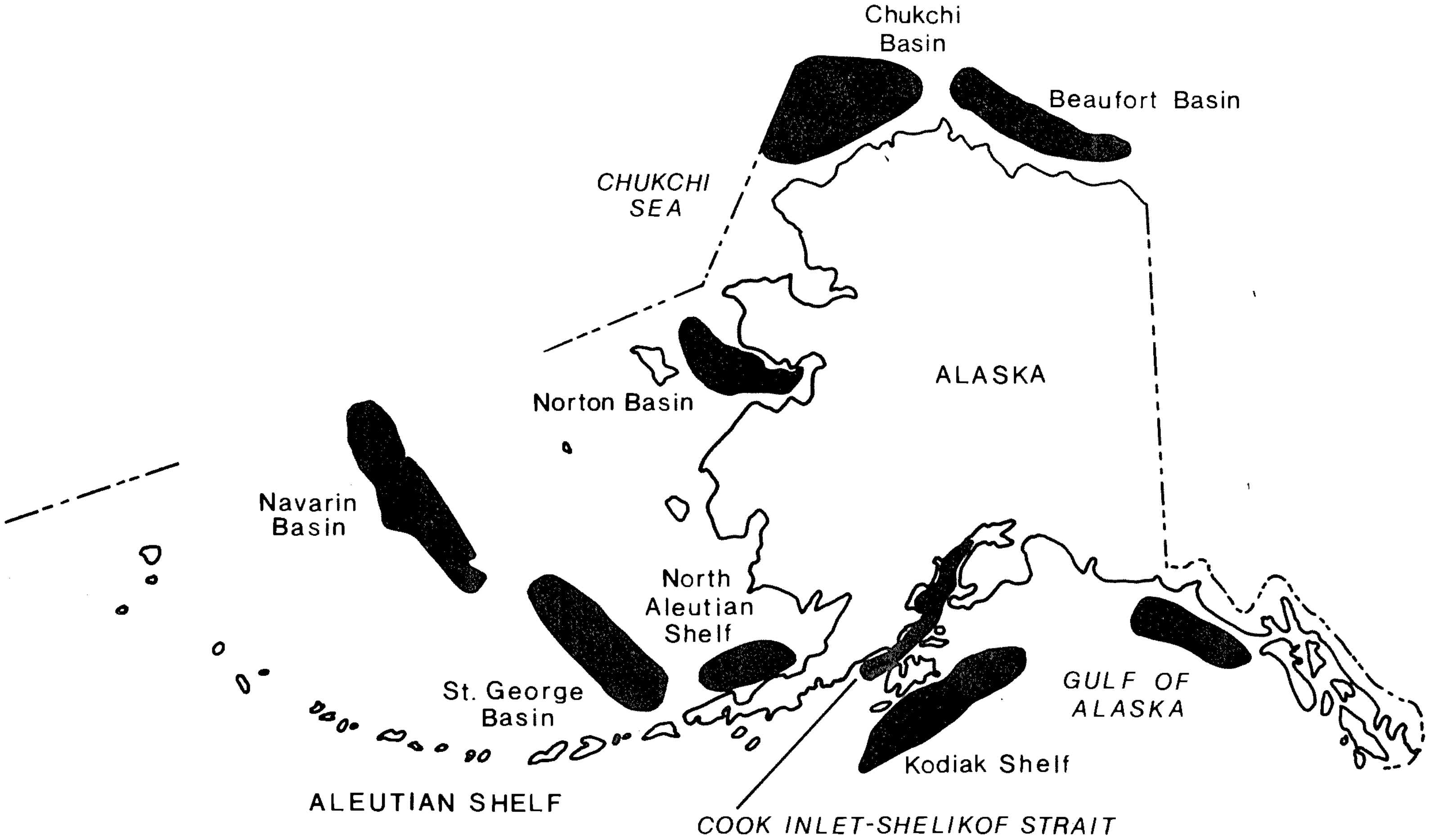


Figure II-4

Alaskan OCS areas of leasing potential

Source. U.S. Geological Survey
January 1980

Table II-2
Summary of Activities
Alternative 1

	North Atlantic	Mid-Atlantic	S. Atlantic & Blk/Plateau	Gulf of Mexico	So. Calif. & S. Bar. Chnl.	Cen. & Northern N. California
Total Oil (million barrels)	356	200	240	790	1180	288
Peak Oil production/yr. (million barrels/day)	.116/1992	.067/1992	.077/1991	.386/1987	.316/1991-93	.074/1991
Total Gas (trillion cubic feet)	1.78	1.64	.4	10.6	1.75	.37
Peak Gas production/yr. (billion cubic feet/day)	.56/1992	.53/1992	.14/1991	5.3/1987	.56/1991-1993	.11/1991
Maximum acreage offered/ number of sales (million acres)	1.6/2	1.6/2	2.4/2	10.3/11-12	2.4/1-3	2.938/1-3
Wells-exploratory/ development and production	40/320	122/108	28/162	1549/1955	156/1319	95/312
Platforms	60	54	44	300	52	14
Statistically Probable No. of Oil Spills>10^3 bbl.	2.04	1.15	1.38	3.29	4.92	1.65
Possible Oil Transportation T=Tanker P=Pipeline	T to Mid-Atlantic	T to Mid-Atlantic	T & P to Mid-Atlantic or Gulf of Mexico	P to Gulf of Mexico	P to So. California	T & P to Cen. & No. Calif.
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to No. Atlantic	P to Mid-Atlantic	P. to So. Atlantic	P to Gulf of Mexico	P to So. California	P to So. California
Possible onshore locations of new facilities (excluding expansions)	-	-	-	-	-	Humboldt Co. San Mateo Co. San Luis Obispo Co. (gas processing support)

Table II-2
Summary of Activities
Alternative 1

	Gulf of Alaska	Kodiak	Cook Inlet	Northern Aleutian Shelf	St. George	Navarin
Total Oil (million barrels)	40	46	160	40	320	760
Peak Oil production/yr. (million barrels/day)	.014/1989	.014/1989	.056/1990	.014/1991	.112/1991	.267/1993
Total Gas (trillion cubic feet)	.14	.138	.38	.16	1.24	2.84
Peak Gas production/yr. (billion cubic feet/day)	.04/1989	.04/1989	.11/1990	.04/1992	.32/1991	.7/1993
Maximum acreage offered/ number of sales (million acres)	2/1	3.2/1	.865/1	1/1	1/1	1/1
Wells-exploratory/ development and production	10/4	10/12	10/18	12/10	12/80	16/190
Platforms	1	1	1	1	2	4
Statistically Probable No. of Oil Spills>10^3 bbl.	.23	.26	.92	.23	1.84	4.36
Possible Oil Transportation T=Tanker P=Pipeline	P to T to Lower 48	P to T to Lower 48	P to T to Lower 48 & poss. P to Kenai	P to T to Lower 48	P to T to Lower 48	P to T to Lower 48
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to Gulf of Alaska	P to LNG facility, T to lower 48	P to LNG fac.; T to lower 48	P to LNG facility, T lower 48	P to LNG facility, T to lower 48	P to LNG facility, T lower 48
Possible onshore locations of new facilities (excluding expansions)	Yakutat (marine term.)	Old Harbor Afognak Is. Ugak Bay (marine term. LNG Support)		Unalaska (support) Cold Bay Vic. (marine term. LNG)	Unalaska (sup. LNG, marine terminal)	Unalaska (support)

Table II-2
Summary of Activities
Alternative 1

	Norton	Chukchi Sea	Beaufort Sea	Total
Total Oil (million barrels)	60	1280	860	6620
Peak Oil production/yr. (million barrels/day)	.021/1991	.449/1994	.302/1992	$<$ 2.285
Total Gas (trillion cubic feet)	.24	3.96	3.3	28.938
Peak Gas production/yr. (billion cubic feet/day)	.07/1991	.98/1994	.81/1992	$<$10.31
Maximum acreage offered/ number of sales (million acres)	.6/1	.6/1	.6/1	32.1/30
Wells-exploratory/ development and production	8/12	6/208	8/214	2082/4924
Platforms	1	6	6	547
Statistically Probable No. of Oil Spills>10^3 bbl.	.34	7.35	3.59	33.55
Possible Oil Transportation T=Tanker P=Pipeline	P to T to lower 48	P to T to lower 48	P to T to lower 48	
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to LNG facility, T to lower 48	P to LNG facility, T to lower 48	P to lower 48 (Alcan)	
Possible onshore locations of new facilities (excluding expansions)	St. Michael's Bay Golovin Bay Pastol Bay (support marine terminal)	Kotzebue Sound (marine terminal, LNG support)		

Table II-2 lists total maximum acreage offered and estimated resources to be recovered by sale area. The resource estimates used are "risked" estimates, that is, the probability that no oil may be found is factored into the estimates. If hydrocarbons are found as a result of an individual lease sale, it is likely that greater amounts could be produced--in some cases, substantially greater amounts. When environmental statements are prepared for individual sales included on the schedule, "conditional" estimates of resources (those that assume the area to be hydrocarbon productive), which are based upon the specific sale area, are used for impact assessment. Therefore, a better assessment of impact, should the sale occur and be hydrocarbon productive, will be performed. However, because it not probable that all areas and sales will be economically productive, risked estimates are believed to present a better total picture of likely results of the sale schedule. Table II-2 also indicates major development assumptions, including transportation and processing of resulting oil and gas, and new onshore facilities which may be required.

Additionally, Table II-2 includes the statistically probable number of oil spills which might occur, by sale area. An explanation of these figures and how they were derived is contained in Section IV.A.1.

The availability of transportation networks to bring supplies resulting from this proposal to market has been examined, particularly as it relates to Pacific and Alaska area sales. A brief discussion of possible transport modes and constraints is presented below. However, transportation and marketing cannot be addressed with certainty at this time. To some extent, prediction of and provision for transportation depends on a better understanding of 1) resource potential and expected schedules of actual oil and gas production, concerning specific sales and groups of sales, and 2) other oil and gas transportation projects, particularly on the West coast. As proposed sales are examined individually in the future, a better analysis can be made. At the present stage of definition of the likely action, greater specificity is not possible. Additionally, final resolution of transportation issues will not be possible until there is the incentive of potential production, because in many cases final solutions will involve heavy capital investments. This issue is one which will require a continued coordinated effort on the part of Federal agencies involved to insure that it is handled in an efficient and timely manner.

At present, the only OCS area with an extensive pipeline system, including a network of oil and gas gathering systems and trunk lines, is the Gulf of Mexico, specifically the central and western Gulf. It is anticipated that production in this area will continue to use pipelines, and in many cases, only new gathering lines would be required to connect new areas to existing trunk systems. Construction of new pipelines in the extreme western Gulf may be required, as well as for any production in the eastern Gulf, which has no current production. In the eastern Gulf, tankering of oil might be utilized if resources do not economically justify pipelines.

In the Atlantic, the choice of tankers vs. pipelines will also be made based on the amount of resources to be transported. It is likely that, due to distance from shore, any oil production would be tankered from the Blake Plateau. Likewise, due to distance from refineries and shore, it is considered likely that oil production from Georges Bank in the North Atlantic would also be tankered.

At present, pipelines are used to bring oil and gas ashore in Santa Barbara Channel, although tankers are often employed to transport landed oil to refineries. Pipelines are considered most desirable in California, due to air quality implications in use of tanker terminals. Pipeline transport is most likely in the Santa Barbara Channel and other portions of Southern California, due to the relative concentration of resources and existing refining infrastructure. This is also the area where air emissions are of greatest concern. Pipelines are also possible in central California in the Santa Maria area. However, tankering of oil may occur in northern California.

In the southern Alaska region, OCS oil and gas is likely to be shipped by oil tanker or LNG tanker to the west, Gulf or east coasts, requiring construction of new tanker facilities for the Gulf of Alaska and Kodiak area. Another possibility for gas in the eastern portion of southern Alaska is for a new pipeline connecting to the proposed Alcan line to the mid-west.

Bering Sea production would most likely be transported in oil and LNG tankers to the lower 48, as well. New construction of tanker facilities would also be necessary in this region. In some cases, offshore storage and loading could be utilized; in other cases pipelines to shore and transshipment would be required. Connecting pipelines to the TAPS and Alcan pipelines are also a possibility, but not considered as likely.

Projected transport of arctic oil and gas, at least in the Beaufort Sea, is through the TAPS-tanker route to the west, Gulf and east coasts for oil, and through the proposed Alcan line to the mid-west for gas. An alternative method of transporting arctic production, considered more likely for the Chukchi Sea, is oil and LNG tankering to the west and Gulf coasts.

In the Arctic, as well as Navarin and St. George, ice-breaking tankers would be required. At present, no marine vessels are capable of operating year-round in the Arctic. However, some analyses of their potential have been performed. There are existing proposals for their use in northern Canadian provinces; any use of such vessels would provide experience with their use during the 1980's.

Current West coast (PADD V) refineries process about 0.8 million B/D of imported oil. Sixty to seventy percent of total West coast capacity can process sour crude oil. Currently, about 1 million B/D are processed in West coast refineries from the Alaska North Slope, the rest being transported through the Panama Canal to eastern refineries. Production from the North Slope is anticipated to peak around 1990 at 2.5 million barrels per day--about one million barrels above existing levels. However, up to .93 million barrels per day of this increase may be transported to PADs II and IV through the proposed Northern Tier pipeline. Peak daily production figures from Southern California, (including Santa Barbara Channel) and Central and Northern California are expected to total .39 million barrels per day, but the three areas are not estimated to peak in the same year. The peak would be spread out between 1991 and 1993 and may, therefore, be slightly less than .39 million B/D. Peak daily production figures for Gulf of Alaska, Kodiak and Cook Inlet are expected to total .084 million barrels per day (between 1989 and 1990). Southern Alaskan crude is anticipated to be sweet, therefore not posing a constraint to PAD V refineries. Therefore, west coast refineries may be able to process at least the majority of the .474 million B/D of California and Southern Alaska OCS crude and the .07 or more million B/D of North Slope crude which cannot be transported to PAD's II and IV. In any case, ample refining capacity exists in PAD's I and III; including that which currently handles imports, to process any oil which cannot be processed in PAD V, even when other OCS production is considered.

Gulf of Mexico and east coast and mid-west refineries (PAD's I, II, III) currently process about 3.9 million B/D of imported oil--of these imports, about 2.1 million B/D is medium to high sulfur crude. The effective increase in refining of medium to high sulfur crude through 1982 is expected to be 1.1 million B/D, (and less than .2 million B/D for sweet crude). (See Appendix 7) If expected increases in capacity and imports are considered, these refineries would be expected to be able to process 3.2 million barrels of sour crude by the early 1980's.

Peak daily production figures for the Gulf of Mexico and the three Atlantic sale areas are expected to total .646 million B/D, but the peak for each area would be spread over five years (1987 to 1992), resulting in a lower total peak from these areas combined. Peak daily production figures for Alaskan sale areas in the Bering and arctic regions are expected to total 1.17 million B/D, with peaks for each area occurring between 1991 and 1994, resulting in a somewhat lower total combined peak production. In total, peak production from the Gulf of Mexico, Atlantic, and Northern Alaska, may be on the order of 1.8 million B/D in the late 1980's and early 1990's. Even if all of this production were to be sour, refining difficulties would not be expected. Transporting crude to available capacity however, will involve major transportation projects and require a concerted and coordinated Federal effort.

Concern has been expressed regarding how increased production onshore from specific areas may constrain the ability to refine OCS related production. Additionally, the analysis above does not explicitly take into account production which may result from recent OCS sales. However, onshore production outside of Alaska has been declining since about 1970. Increased production through advanced recovery techniques or from specific provinces is not expected to be able to greatly offset this decline. As indicated in the inset in Figure II-5, domestic production - considering both onshore and offshore, is expected to be about 10 million barrels per day in the 1980's, and according to the Department of Energy's National Energy Plan-II, will be between 10 and 11 million B/D in the year 2000.

The projection for domestic oil production shown in Figure II-5 is compatible with estimates regarding resources to be produced as a result of the proposed five-year leasing schedule. The projection assumes that 10 billion barrels of reserves from the OCS are added between 1977 and 1990. The total oil resource estimates for the schedule is on the order of 6.6 billion, and if it proves reasonably accurate, most of the 6.6 billion barrels would be added as reserves or inferred reserves by 1990. Additional reserves can be expected to be added from previous leasing. Therefore, even with increased efforts for domestic productions, DOE does not project enough production to pose any constraints to existing or planning domestic refining capacity.

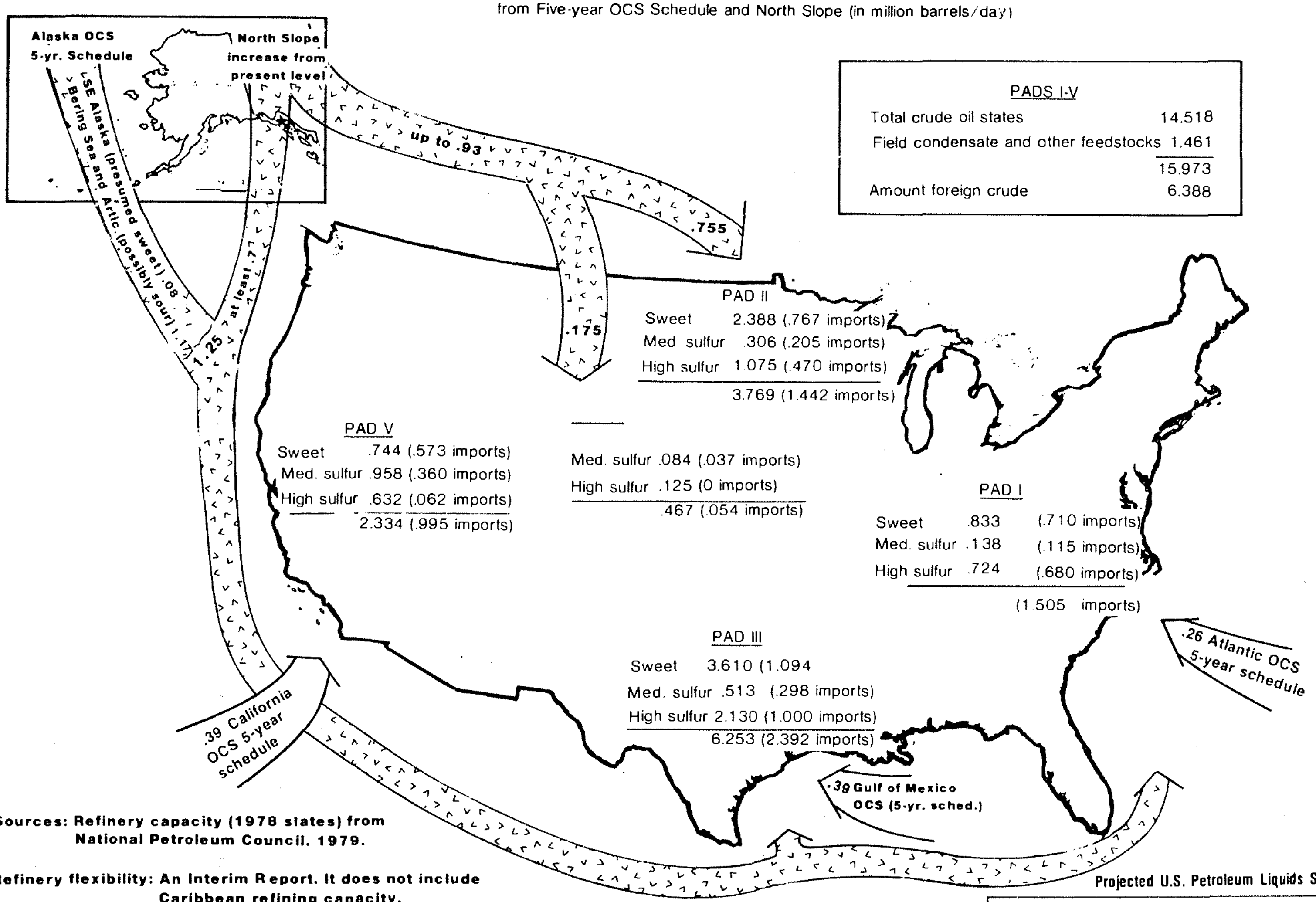
Figure II-5 also shows the distribution of 1978 refining runs by type, in relationship to anticipated OCS production from the proposal, and the substantial Northern Slope field.

This analysis is based on average anticipated peak production figures. It is not reasonable to assume that the high end of projected resource estimates would be realized in all areas. However, additional constraints could occur if higher levels of resources are produced in certain areas, such as offshore California or in the more productive areas of Alaska where, if high levels of resources are produced, a significant increase to total OCS production could occur. As previously mentioned, it is also assumed that total U.S. domestic production would remain constant (or decline) and does not explicitly take into account production from recent OCS sales or OCS sales scheduled prior to March 1980.

Given the lack of information on sulfur content of crude oil from various regions, and resource estimates and production schedules based on specific tracts (such as available in pre-sale analyses), a more definitive analysis of potential problems related to transporting oil to appropriate refineries cannot be made at this time.

Constraints to the transportation and procesing of gas outside of the lower 48 also exist. It should be noted that the Department of Energy does not believe that gas will be produced from any Alaskan OCS areas except Beaufort Sea and Cook Inlet. If this were the case, total gas expected as a result of the schedule would be reduced from 28.94 tcf to 20.22 tcf. Natural gas from the OCS areas of Alaska may be utilized in a variety of ways. Production from the Beaufort Sea area would probably be connected by a spur pipeline to the proposed Alaska natural gas pipeline terminals at Prudhoe Bay, and be transported by the pipeline to the lower 48 States. The remaining Alaska OCS gas production, expected to be about 2.2 billion cubic feet per day (BCFD) around 1990, could be reinjected during the early years of production from each field. Most of this gas could eventually be transported by LNG (Liquified Natural Gas) tankers, or by pipeline, to the lower 48 States. The preferred method of transport will depend on the exact location and size of the gas finds, as well as upon the future market, development of LNG receiving and regassification capacity of the west coast. At present there are no LNG receiving facilities on the west coast. An LNG facility of .9 to 1.2 BCFD has been proposed for the Point Conception, California area, and has been conditionally approved by the Federal Energy Regulatory Commission. An environmental report on this proposal, prepared by the California Public Utilities Commission in July 1978, is available.

Figure II-5 Refining capacity by Petroleum Administrative Defense Districts and Inputs from Five-year OCS Schedule and North Slope (in million barrels/day)



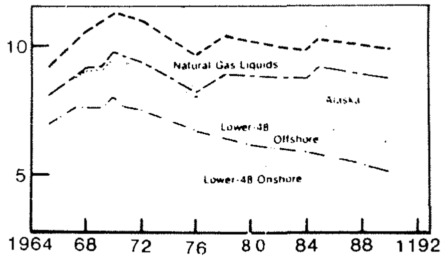
Sources: Refinery capacity (1978 states) from National Petroleum Council. 1979.

Refinery flexibility: An Interim Report. It does not include Caribbean refining capacity.

Amount of imports based on estimated import proportions for 1978 from Item 9, National Petroleum Refiners Assoc., Capability of U.S. Refineries to Process sweet/sour crude oil, March 15, 1978. Also see Appendix 7.

Note: Imports into PAD V have been further backed out by North Slope crude since 1978.

Projected U.S. Petroleum Liquids Supply



There are three existing LNG receiving terminals in the U.S., located in Massachusetts, Maryland and Georgia. An additional LNG plant has been proposed and approved for the Lake Charles area of Louisiana. Taken together, these four facilities have a capacity of less than two BCFD. This is similar to the amount of LNG which may be produced in the early 1990's from the Alaska OCS under the proposed leasing schedule. It is not likely to be feasible to tanker large volumes of LNG through the Panama Canal. Thus the shipment of Alaska OCS gas by LNG may require major construction of LNG receiving terminals on the west coast of the U.S., and/or construction of such facilities near the U.S. in Canada or Mexico. Another possibility is that some LNG from Alaska might be exported in exchange for hydrocarbon imports to other areas of the U.S.

LNG and/or pipeline are considered the likely modes of transport for the Alaska gas, but there are also other possibilities. For example, the natural gas could be converted to methanol and transported by tankers without requiring cryogenic refrigeration. This option, however, would probably require advances in the gas-to-methanol conversion technology in order to be economically competitive, since the current process is relatively efficient compared to the gas-to-LNG technology. Another possibility is that the gas could be transported by pipeline to shore and then processed into products such as fertilizer. In any case, however, it is not considered likely that the valuable natural gas would be simply flared off and wasted as a product of oil production.

Thus, at the present time it appears likely that natural gas produced on the Alaska OCS as a result of the proposed leasing schedule may be reinjected initially, at least until transportation were built. Following this, the gas could be transported by LNG tanker or by pipeline to the lower 48 States. The Department of Energy estimates at this time that only Beaufort Sea and Cook Inlet gas production will be produced and marketed. Changing market and economic conditions could change this projection in the future. Therefore, this environmental statement will address briefly the environmental impacts of transporting Alaskan gas. However, any transportation systems developed to transport and process Alaskan gas will likely be the subject of separate environmental statements.

2. Summary of Environmental Impacts of the Proposal

The relative environmental sensitivities of the various OCS leasing regions as a result of this alternative are summarized in Table II-3. A summary of impacts by area follows below. However, the summaries by region do not take into account the cumulative impact upon resources which may be experienced as a result of the proposal. Whales migratory through numerous sale areas offshore of California and Alaska, or the eastern United States, and waterfowl which breed in Alaska and migrate from Alaska through other areas of the country, wintering in more southerly climes are the prime examples of resource (populations) which could be exposed to impacts as a result of the proposed schedule. Additionally, resources may be exposed to cumulative adverse oil and gas related impacts as a result of sales in adjacent sale areas - either due to migration of species between areas or spills from one sale area entering another sale area.

Socioeconomic effects and adverse air quality impacts could also cumulatively affect onshore areas as a result of sales in nearby areas such as economic impacts to the State of Alaska. Additionally, oil tankers, and possibly LNG tankers, especially those from Alaska, could result in increased spills in other regions, beyond those which may result from production in a lease area (spill estimates included in this statement consider tankering of oil in most cases. Therefore, spill numbers given by lease area reflect spills which may actually occur outside the lease area).

Table II-3, in summarizing regional sensitivities to OCS related development, indicates high, low and moderate relative sensitivities of types of resources in each area to OCS related development. It is not meant to project high, low and moderate absolute impact. The ratings are the judgment of the analysts who performed the impact assessments. The discussions of impacts in Section IV.B.2 attempt to explain the basis of the ratings. No more sophisticated ranking or rating of impacts on regions was judged by the analysts to be meaningful at this stage for two reasons. First, the susceptibility of sensitive resources to OCS-related impacts cannot be assessed with any degree of certainty prior to tract selection when the specific location of OCS activity relative to sensitive resources can be judged, and oil spill trajectory analysis, air quality modeling and other analyses performed. These types of analyses are dependent upon specific environmental parameters of the tracts proposed for lease and adjacent areas. Secondly, comparison between regions results in comparisons between different types of resources and different impacts which cannot be easily or meaningfully compared for severity.

Resources and Uses and Primary Impact Factors 1/	Resources					Use Conflicts								
SALE AREAS	Birds - O	Non-Endangered Marine Mammals - O	Endangered Species - O	Fish & Shellfish - O, S	Air Quality - F	Navigation - S	Commercial Fishing - O, S	Subsistence Fishing - O	Recreation & Tourism (incl. sport fishing) - O	Marine Sanctuaries - O, S	Infrastructure & Economy - F	# High Sensitivity to Oil Spills / # Oil Spills	# High Sensitivity to Offshore Struc. / # Platforms	# High Sensitivity to Onshore Facil. / Impact-Producing Facil 2/
NO. ATLANTIC	H	M	H	H	M	M	H	-	H		M	5/ 1	2/14	0/-
MID-ATLANTIC	M	L	H	M	M	H	M	-	H		L	2/ 1	1/18	0/-
SO. ALTANTIC	M	L	L	M	L	L	M	-	H	L	L	1/ 1	0/10	0/-
GULF OF MEXICO	M	L	M	M	L	H	M	-	H	H	L	2/3+	2/300	0/-
SO. CALIFORNIA	H	H	H	M	H	H	M	-	H		L	4/4+	1/40	1/T, GP
CEN. & NO. CALIF.	H	M	M	M	H	L	M	-	H		M	2/4+	0/33	1/T, GP
GULF OF ALASKA	H	H	H	M	L	L	M	L	L		M	3/2+	0/6	0/-
KODIAK	H	H	H	M	L	L	H	L	L		M	4/21	1/1	0/-
COOK INLET	M	M	H	M	L	L	M	L	M		M	1/2+	0/6	0/-
N. ALEUTIAN SHELF	H	H	H	M	L	L	M	H	L		H	4/2+	0/2	1/MT, LNG, SS
ST. GEORGE	H	H	H	M	L	L	M	H	L		H	3/3+	0/4	1/MT, LNG, SS
NAVARIN	H	M	H	M	L	L	L	M	L		M	3/1+	0/1	0/-
NORTON	H	H	H	M	L	L	L	M	L		H	4/1+	0/1	1/MT, LNG, SS
CHUKCHI SEA	H	H	H	M	L	L	L	H	L		M	4/18+	0/10	0/-
BEAUFORT SEA	H	H	H	M	L	L	L	M	L		M	3/4+	0/2	0/-

1/ PRIMARY IMPACT FACTORS (Matrix assesses sensitivity to these factors, but does not take into account the number or likelihood of the factors occurring)

O - Oil Spills S - Offshore Structures F - Onshore Facilities

2/ TYPES OF ONSHORE FACILITIES EXPECTED WHICH MAY CAUSE IMPACT

GP - Gas Processing SS - Service Support LNG - Gas Liquifaction
T - Tankering (Receiving & Transshipment) MT - Marine Terminal

TABLE II-3 RELATIVE ENVIRONMENTAL SENSITIVITY OF OCS LEASING AREAS ALTERNATIVE 1

LEGEND

H - Relatively Highly Sensitive

M - Relatively Moderately Sensitive

L - Relatively Low in Sensitivity

North Atlantic

The major impacts on commercial fishing are expected to be gear and space conflicts on the Georges Bank area, largely due to the high density of fishing activity in the area. There may also be adverse impacts associated with flavor-tainting of fish products as a result of oil spillage, and some competition for shore facilities, labor, goods and services. There is concern that severe impacts could accrue to those fish stocks which are endemic to Georges Bank, as a result of impacts from oil spill affecting offshore spawning areas. At least two oil spills greater than 1,000 bbls. are probable. In view of the many variables involved, the likelihood of adverse impact is considered to be relatively low but could be severe and result in millions of dollars in lost catch.

Coral and associated benthic populations are found in North Atlantic slope areas from depths of 200 to 2000 meters. At this depth, the populations are not expected to be affected by oil spills. The greatest potential threat lies with cuttings, muds and other pollutants discharged in close proximity to canyon heads and perimeters. Coral populations may then be exposed to drilling contaminants, and may suffer mortality attributable to suffocation or to toxic materials. These impacts are amenable to mitigation.

Estuaries of New England are smaller and more limited than more southerly parts of the Atlantic. These systems are extremely important nursery grounds for finfish and shellfish. Population losses would be high for resident species as well as for those moving into feed and spawn, should they be impacted by an oil spill. The most serious loss would be to larval stages of resident shellfish, making replacement of these populations an exceedingly slow process if a large portion of spawning stock is lost. Contamination of an estuary by oil may lower phytoplankton productivity, thereby reducing food to zooplankton and ultimately, to higher trophic levels.

Waterfowl populations are particularly susceptible to oil spills during the spring and fall migration periods. The most susceptible bird populations are the sea ducks which migrate offshore on Georges Bank.

Contamination of pinniped breeding rookeries by oil can be severe during the pupping season. The harbor and population from Cape Cod north and the grey seal (Muskeget Isand, MA) are the most likely to suffer from an oil spill.

In the North Atlantic, the Gulf of Maine, Nantucket Shoals, Jeffrey's Ledge, and Stellwagen Bank are important whale habitats, particularly during the summer and fall. Six endangered species of whale may be found in the area, either engaged in feeding activities or passing through on migratory routes. Special concern has been raised regarding the Right and Humpback whales. Impacts to marine mammals could occur as a result of oil spills emanating from either rigs or platforms on the Bank or spills from tankers enroute to shore. Oil spills which locally decrease plankton and fish utilized by whales for food may also have the potential to preclude whales from portions of their total range in the North Atlantic, thereby shifting migration patterns. OCS development could also impact endangered and threatened turtles which frequent the North Atlantic.

Impacts to recreation could result from an oil spill impacting a beach area, foreclosing its use for recreational purposes for at least the duration of the oil's continuous beaching and any subsequent cleanup period. The size, seasonality and beaching location of a spill are other significant factors which influence the magnitude of the recreation opportunity that will be curtailed. The areas in the North Atlantic where an oil spill could result in the most significant impact to recreation include Cape Cod, Nantucket and Martha's Vineyard.

A number of areas have been recommended as marine sanctuary areas in the North Atlantic, ranging from coastal areas (Nantucket Shoals, Jeffrey's Ledge, Stellwagen Bank) to offshore areas as large as Georges Bank. Should they receive sanctuary status, regulation of oil and gas activities may run the gamut from no additional controls beyond those currently in effect to total prohibition of drilling activities. The extent of impact of oil and gas activities to any sanctuaries would depend on the type of regulation imposed, and to some extent, on the purpose for which a sanctuary was established.

Mid-Atlantic

The major impacts on commercial fisheries in the Mid-Atlantic are expected to be gear conflicts and some limited competition for shore facilities. There may be some revenues lost because of flavor-tainting of the catch but they are expected to be moderate to low. At least one oil spill greater than 1,000 bbls. is probable.

Coral and associated benthic populations are found in canyon heads in Mid-Atlantic slope from depths of 200 to 2000 meters. At this depth, the populations are not expected to be affected by oil spills. The greatest potential threat lies with cuttings, muds and other pollutants discharged in close proximity to canyon heads and perimeters. Coral populations may then be exposed to drilling contaminants, and may suffer mortality attributable to suffocation or to toxic materials. These impacts are amenable to mitigation.

Estuaries, including Chesapeake Bay, Delaware Bay, Great South Bay and the such are particularly susceptible to deleterious effects from petroleum contamination. These estuaries serve as nursery grounds for finfish and shellfish. Population losses as a result of oil spills would be high for resident species as well as for those moving into feed and spawn. The most serious loss would be to larval stages of resident shellfish, since these immature forms originate within the estuary and would not be replenished from without. Contamination of an estuary by oil may lower phytoplankton productivity, thereby reducing food to zooplankton and ultimately, to higher trophic levels. The risk of these impacts occurring is small.

Waterfowl populations in wetlands and estuaries of the Mid-Atlantic are also susceptible to oil spills, especially during the spring and fall migration periods. However, the potential for impact is small, due to the small probability of a spill both occurring and impacting shore.

In the Mid-Atlantic, important whale habitats are located coastally. Six endangered species of whales may be found in the area, either engaged in feeding activities or passing through on migratory routes. Special concern has been raised regarding the right whale. A spill could result in locally decreased plankton and fish utilized by whales for food, and may have the potential to preclude whales from portions of their total range in the Mid-Atlantic, thereby shifting migration patterns. OCS development could also impact endangered and threatened turtles which frequent the Mid-Atlantic. Transportation of oil spills from tankers enroute from oil fields to New York - New Jersey areas could impact turtles in shallow nearshore areas, particularly along the south shore of Long Island.

The major potential for impact to recreation in the Mid-Atlantic would be an oil spill impacting a beach area, and foreclosing its use for recreational purposes for at least the duration of the oil's continuous beaching and subsequent cleanup period. The size, seasonality and beaching location of a spill are significant factors which influence the magnitude of the recreation opportunities that will be curtailed. However, virtually the entire Mid-Atlantic coastline is utilized for recreation; therefore, if a spill were to reach shore, it would have a high likelihood of affecting recreation.

Recommended marine sanctuaries in the Mid-Atlantic range from coastal to the offshore Hudson Canyon area. Should a sanctuary or sanctuaries be designated, OCS oil and gas may be totally prohibited at one extreme, or receive no further limitations, should it be judged that present regulations provide adequate safeguards. Since the purposes for sanctuary proposals have not been fully defined, the extent of possible conflict with OCS development cannot be assessed. The extent of conflict or impact would also depend upon regulations imposed.

As a result of sales in the North and South Atlantic, and possibly in Alaska areas, transportation of additional OCS oil to Mid-Atlantic refineries may result. While this is expected to largely back out foreign tanker shipments, the potential spill impacts of these tankers could be considered as adding impacts to this region.

South Atlantic/Blake Plateau

Commercial fisheries in this area that will most likely be adversely impacted are site-specific fisheries such as reef-fish and sessile estuarine fisheries such as oysters. Gear conflicts, flavor-tainting of fish flesh and competition for shore facilities are expected to occur, but will be minor. Overall, the impact on commercial fishing in this area is expected to be moderate to low.

Drilling activities could adversely impact hard bottom communities and coral pinnacles, although these localized potential impacts are amenable to mitigation through stipulations and other operational constraints.

Should an oil spill occur, (at least one large spill is probable) it could severely affect estuarine areas which are located all along the South Atlantic coast. Contamination of estuaries could affect associated fisheries and the large waterfowl concentration found along the South Atlantic. The endangered brown pelican is particularly susceptible to adverse effets from oil contamination, and a major spill could potentially affect the population in the area. Leasing in the more distant Blake Plateau portion of this lease sale area would result in the lowest potential effects to estuarine associated species.

Associated with estuaries the length of the South Atlantic coast, are beaches which are highly utilized for recreation. These resources result in tourism being important to local and state economies. Any oil spill could also foreclose recreational opportunities.

Gulf of Mexico

Localized adverse impacts on estuarine fisheries may occur. Flavor-tainting of the harvest may occur resulting in lost revenues. Additionally, the likelihood of hangs and gear losses to shrimp trawlers will be increased; however, measures are available to mitigate resulting losses. Overall, the adverse impacts to commercial fisheries are expected to be moderate.

Oil spills could have an adverse impact to birds, especially the endangered brown pelican, and to the endangered Florida manatee. Over 3 spills greater than 1000 bbls. are probable as a result of the schedule.

Drilling activities have the potential to adversely affect clearwater bank communities, including the Flower Gardens, which is proposed as a marine sanctuary. However, stipulations used in the past are believed to effectively mitigate this potential.

The Gulf of Mexico may also receive increased employment and economic impacts as a result of sales in other areas. Skilled personnel from this area may be drawn to other regions of the country, and increases in manufacturing sectors could occur as a result of the proposal, leading to socioeconomic, land use and onshore environmental quality effects. Oil from other regions (e.g., Alaskan oil may be transported to the Gulf of Mexico for refining - which while backing out imports may nonetheless result in oil spills.

Southern California

Of primary concern in southern California is the impact that OCS oil and gas development will have on air quality. Most locations from Point Conception South to the Mexican Border experience violations of ozone standards, with other gaseous pollutants exceeding standards in the Los Angeles and San Diego urban areas. Prevailing winds in coastal southern California will generally transport any OCS air emissions onshore. Since most of this area already experiences severe air quality problems, emission controls and/or offsets from OCS related development will be critically important.

Other impacts would be experienced by the commercial fishing industry in southern California. These include loss of fishing space and damage to trawl fishing gear, especially in the Santa Barbara Channel, and the adverse impact of oil spills such as tainting. Competition for shore facilities are expected to be minimal.

Overall impacts on Southern California fisheries are expected to be moderate.

The impact of an oil spill on southern California estuaries and wetlands might be considered significant due to their rareness alone. Concentrated breeding, feeding, and nesting populations of birds, and pinnepeds would also be negatively impacted by an oil spill. It is probable that about 5 spills over 1000 bbls. will result from the proposal. However, oil tankered from Alaska may also result in spills in this region.

The light footed clapper rail the brown pelican, the sea otter and the migratory route of the California grey whale are endangered species which could be negatively impacted by pollution and oil spillage. Additionally, the Pacific right whale may be adversely impacted by offshore oil development in the area. Concern regarding this species was raised in regard to OCS Sale No. 48.

Central and Northern California

Some coastal locations in northern California experience violations of the ozone standards. Other gaseous pollutants are within standards except in the San Francisco Bay urban area. Prevailing winds in coastal northern California generally will transport any OCS air emissions directly into onshore areas. Since this area already experiences air quality problems, emission controls and/or offsets from OCS related development will be important.

Damage to trawl fishing gear and oil spillage are potential impacts on the commercial fishing industry in northern California. In addition, numerous welands and estuaries, which are spawning areas for sport and commercially fished fish and invertebrates, could be impacted by an oil spill. Between one and two spills over 1000 bbls. are probable as a result of the proposal. However, oil tankered from Alaska may also result in spills in the region.

Oil spillage and development related pollutants entering the food chain would adversely effect concentrated populations of birds and pinnepeds. The southern sea otter, the California clapper rail and the brown pelican are endangered species which occupy northern and central California coast and may be especially susceptible to impacts by oil spills. The Pacific right whale has also been identified as an endangered species of concern in California with regard to OCS development.

Relatively significant impacts on harbors, transportation facilities, infrastructure and regional economies could be expected in northern California owing to the "frontier" nature of this area.

Gulf of Alaska

The Gulf of Alaska can be characterized by extreme storm conditions (high winds and waves) and by deep water, both of which may cause impacts to oil and gas activities on the OCS.

Commercial fishing is prelevant, but by foreign and domestic fishermen, and fishing geal loss, competition for goods, space or labor, and flavor-tainting of fish are potential impacts to commercial fishing and related industries.

Oil contamination may reduce population of marine birds, shorebirds, marine mammals, and both predator and prey fish species along the coast or in Prince William Sound. The risk of a spill occurring, however, is relatively low. Wetlands, tidelands, pupping and hauling grounds, and river deltas in the area would be particularly sensitive to oil contamination. Impacts from construction and operation activities would be low to medium except in waterfowl areas. The impacts on recreation resources, air quality, socioeconomic systems, transportation, and on sport fishing would be low. The impacts on cultural resources, both terrestrial and submerged, could be higher.

Kodiak

The Kodiak sale area can be characterized by extreme storm conditions (high winds and waves) and by deep water.

Commercial fishing is prevalent, both by foreign and domestic fishermen, with crab, shrimp, and bottomfish being major species that could be highly impacted. Potential gear loss, competition for goods, space and labor, and flavor-tainting of fish also exist for commercial fishing and related industries.

Oil contamination may reduce populations of marine birds, shorebirds, marine mammals, and both predator and prey fish species along the each side of Kodiak Island, although the risk of oil spills is relatively low in this area. Kelp could also be moderately impacted. Wetlands, tidelands, pupping and hauling out grounds, bays and estuaries in the area would be particularly sensitive to oil contamination. The impacts of construction activity would be low to moderate and those of operations are variable depending on the activity. The impacts on recreation resources, air quality, socioeconomics systems, transportation, and sport fishing would be low. The impact on cultural resources would be moderate.

Cook Inlet

Cook Inlet has the potential for high winds and waves, seismicity, and active volcanoes. Floe ice is present during the winter months. The area is far more enclosed than any other on the Alaska OCS.

Kamishak and Kachemak Bays are the primary commercial fishing areas. Voluntary shipping lanes already in use will minimize gear loss, but dock space and goods and services are at a premium in some areas. Impacts on fisheries should be moderate, based on experience with offshore oil development in upper Cook Inlet, and because oil and gas development is prohibited from high intensity fishing areas by the State.

Oil contamination may reduce populations of marine and shorebirds, aquatic mammals and fish species. There is high probability of one large spill occurring as a result of the proposal. The area contains many highly sensitive wetlands, tidelands, and estuaries. Impacts from additional construction and operations will be slight because of the level of previous activity, except in Shelikof Strait, where no oil and gas activity has taken place.

The area is heavily used for recreation, sport fishing, and tourism, all of which could be impacted from an oil spill. The transportation and socioeconomic systems are well established, so additional impact there should be low. Air quality regionally is good. The potential impact to cultural resources is believed low to moderate.

Norton Basin

The Norton Basin is characterized by storm conditions equal to or exceeding the severity of those in the Gulf of Alaska. There are a variety of geophysical hazards, and loose floe ice is present a majority of the time.

Impacts to commercial fishing would be low, limited primarily to gear loss or damage. The estuaries and river deltas of this region are important and sensitive habitats. Impacts from construction and operations will be variable depending on the activity. Oil contamination may reduce populations of birds, marine mammals, and fish species, although the probability of a spill is relatively low. Endangered whales in the area could also be impacted by an oil spill.

Recreational activity and sport fishing is minimal in the area so the impacts to them would be low. Air quality regionally is excellent and the impacts on socioeconomic and transportation systems would be low, although possibly moderate on subsistence activities. Impacts on land use and cultural resources would be low to moderate.

St. George Basin

St. George Basin has storm conditions similar to the Norton Basin. There are few other potentially severe geophysical hazards, and ice rarely forms in this area.

Dutch Harbor was the top port in the U.S. in 1978 for value of catch landed, so commercial fishing plays a vital role in the economy of the area. Gear loss could have a moderate to high impact, but other impacts such as competition for goods, space, and labor should be low and relatively short-term.

The Aleutian Islands are a National Wildlife Refuge, because of the abundance and diversity of wildlife found there. The Pribilofs, important fur seal breeding grounds, could be severely impacted by an oil spill as could the bays and beaches of the Aleutians. Between one and two large oil spills are probable. The overall impact from oil and gas activities is expected to be moderate.

There is little recreation and sport fishing, so impacts to them would be low. The impacts on subsistence activities, cultural resources, and land use are expected to be low to moderate, with the impacts on socioeconomic and transportation systems expected to be low.

Beaufort Sea

The Beaufort Sea is overlain most of the year by landfast ice and pack ice, the latter being the type constantly in motion. There is also subsea permafrost, coastal erosion, and occasional high winds.

There is a small commercial fishery, mostly in the river deltas, that could be impacted by an oil spill if it entered these areas. The probable number of spills over 1,000 bbls. is more than three.

The area is vitally important and sensitive on a seasonal basis to millions of migratory birds and mammals including the endangered bowhead and grey whales. Barrier islands are important nesting grounds, and the lagoons are biologically productive in the summer months. Ice leads formed during break-up are also highly sensitive areas. Any or all of these could be highly impacted by an oil spill occurring on or under the ice, during the ice-free period. Impacts from construction and operations could be high on a local basis, depending again on the season.

There is little tourism, recreational activity, and sport fishing, so impacts to these activities would be low. Air quality is excellent.

Because of previous levels of oil and gas activities and the presence of facilities, additional impacts to socioeconomics, subsistence, land use, and transportation are expected to be low. Impacts to cultural resources will be moderate.

Northern Aleutian Shelf

Storm conditions here are similar to those in the Norton and St. George Basins. Possible geophysical hazards include seismic events, tsunamis, mass wasting, vulcanism, and occasional sea ice.

The area is on the edge of the Bristol Bay, perhaps the richest fishing grounds in the world. Impacts to salmon, crab, and bottomfish could be moderate to high from an oil spill. The probability of a large spill occurring is relatively low. Distance from the area of greatest harvesting should result in a low risk of spills impacting commercial fisheries.

The area encompasses and abuts on important wildlife habitat, with one of the world's largest concentrations of marine mammals and birds, which could be severely impacted by oil contamination, and to a lesser extent by air traffic, construction, and operation activities. Izembek Lagoon is a national wildlife range mid-shore in the sale area, and is used by the entire world's population of a handful of bird species. Unimak Pass is a migration route for endangered and other marine mammals alike.

There is little recreation or sport fishing in this area, so impacts on these activities would be low. Air quality is excellent. Impacts on transportation and socioeconomic systems are expected to be low. Impacts on subsistence activities, land use, and cultural resources are expected to be low to moderate. Impacts on subsistence activities could be moderate to high, as this area is one of the three most sensitive areas in terms of subsistence lifestyles.

Navarin Basin

Water depth and ice are the greatest physical hazards in this area, along with localized shallow faults, sandwave bedforms, and unstable bottom sediments.

Commercial fishing would be minimally affected by oil and gas activities, although oil contamination could reduce populations of important species.

Shoreward of the area are several national wildlife refuges, attributing to its importance as stopover habitat on the major flyways. The impacts from oil and gas activities could range from low to moderate, except for waterfowl and shore bird areas should they be impacted by an oil spill. Over four large spills are probable as a result of the proposal. However, the most important shorebird and waterfowl area in the region, the Yukon delta, is over 30 miles from the basin, resulting in a low risk of spills impacting these resources. Impacts on marine mammals, including endangered species, from oil contamination could be moderate to high.

The level of recreation and sport fishing is unknown, but is believed not to be great. Air quality is excellent. The impacts to socioeconomic and transportation systems are expected to be low. The impacts on subsistence and land use are expected to be low to moderate and the impacts on cultural resources moderate.

Chukchi Sea

The Chukchi Sea presents similar geophysical constraints to OCS development as does the Beaufort Sea. The ice is much more dynamic, however, and storm conditions are similar for both areas.

Commercial fishing is very limited in this area, but the area is highly productive and biologically active on a seasonal basis, which means the degree of impacts from oil spills, construction, and operations will vary depending on the time of year. The bowhead and grey whales are seasonally present, and the potential impacts to them are moderate to high, relative to other areas. Over seven large oil spills are probable as a result of the proposal, owing to the high level of estimated oil resources.

There is little recreation or sport fishing, so impacts to these activities would be minimal. Air quality is excellent, and the impacts to socioeconomic and transportation systems are expected to be low. Impacts on cultural resources will be moderate, while impacts on subsistence and land use are estimated to be low to moderate. Subsistence lifestyle could be moderately to highly affected, as this area is considerd to be the most sensitive in terms of subsistence activities and lifestyle.

B. Alternative 2: Substitution or Additions of Sales

1. Discussion

An alternative involving locational, and in some cases, timing considerations, is to offer additional or substitute sale areas. Sale areas could be added or substituted for one or more of the following rationales:

a) Additional contingency sales could be scheduled in order to provide options should sales currently included on the proposed schedule be delayed or not be held as a result of decisions later in the pre-sale process.

Additional contingency sales could be scheduled in the Gulf of Mexico in the event that proposed sales were deleted or delayed. The Gulf of Mexico has the advantage of being able to bring hydrocarbon supplies to market quickly at low cost and is an area where many of the preliminary environmental and geotechnical studies have been accomplished. The proposed schedule calls for two sales per year in the Gulf of Mexico at one million acres each. If there were three or more sales per year proposed in the Gulf, these sales would probably be smaller in size or include less prospective acreage than otherwise. This option would necessitate additional administrative burdens and would not necessarily result in offering more acreage or recovery of more resources in the Gulf than the proposed schedule (Alternative 1).

Additional contingency sales could also be scheduled outside the Gulf of Mexico in the event that proposed sales in other frontier areas were delayed or deleted. A major advantage of this option would be flexibility in the schedule provided by such sales. However, this would result in leasing at a faster rate than is considered optimum for areas outside of the Gulf of Mexico: one sale every three years for the first and second sale in an area and every two years for the second and third sales in an area. If it were to be determined that a faster pace of leasing is desirable, and feasible, energy goals would better be met by scheduling additional non-contingency sales.

It is also possible to label some frontier area sales, which are considered in Alternative 1 as firm, proposed sales, as contingency sales. However, such a category of contingency sales in frontier areas, where advanced planning requirements are the greatest both for the government and for potential bidders, introduces a level of uncertainty which may not be productive. All sales on the proposed schedule are contingent upon further environmental and geotechnical analyses and upon decisions to be made after planning is completed. The requirements of the National Environmental Policy Act as well as all environmental requirements of the OCS Lands Act, as amended, must be met prior to a final decision to hold a sale. If additional contingency sales were placed on the schedule, it would necessitate additional studies and commitment of additional manpower and funds. If some sales included as proposed sales in Alternative 1 were considered as contingency sales instead, they would be competing for pre-sale planning and studies funding with former sales. This option would indicate less commitment to sales designated as contingencies and could pose manpower and fiscal constraints on industry and government which could ultimately result in less effort in gathering and analyzing data to prepare for such sales.

b) Sale areas not proposed for leasing in Alternative 1 could be included to offer additional potential for oil and gas production, or in place of sales included in Alternative 1. Additional sales could also be added in lease sale areas which are included in Alternative 1, in order to increase potential oil and gas production or to replace sales in Alternative 1.

Sale areas not included in Alternative 1 are: Florida Straits, Oregon-Washington, Southern Aleutian Shelf, Bristol Basin northeast of Northern Aleutian Shelf, and Hope Basin. With the exception of Bristol Basin, the exclusion of these areas from Alternative 1 was influenced by low estimated resource potential and low industry interest. They are all frontier areas. The first three (Florida Straits, Oregon-Washington and Southern Aleutian Shelf) were ranked by industry and the U.S. Geological Survey as the lowest three of 22 areas in terms of resource potential, and among the lowest four by industry in terms of interest in exploration. Hope Basin was ranked among the lowest four for resource potential by the Geological Survey. While industry interest in exploration and evaluation of resource potential was somewhat higher (14 out of 22), it ranked below the other areas of the Arctic region (Beaufort Sea and Chukchi Sea) in estimation of resource potential.

Bristol Basin, originally included among the 22 lease sale areas, is demarcated by latitude 165° and extends shoreward (east) of that line (and north to approximately longitude 60°). Alternative 1 includes a part of this lease sale area, the Northern Aleutian Shelf, which represents the southwestern corner of the area (this area extends shoreward only to 162° and north to 56° 30'). The U.S. Geological Survey indicates that the highest resource potential in Bristol Basin is limited to the Northern Aleutian Shelf portion.

Because of the low resource potential of these areas, relative to those included in Alternative 1, the addition or substitution of most of these areas is not considered a viable alternative to the proposed schedule (Alternatve 1). However, inclusion of Hope Basin is considered in Alternative 9.

An alternative to increasing the number of sales included in the five-year schedule, without adding new sale areas, could be considered. This could be accomplished in part by holding additional sales in areas included in the proposed schedule. Several oil companies in commenting on the proposed schedule and the draft environmental statement, recommended a significantly increased pace of leasing in prospective Alaskan frontier areas. These recommendations would result in less than three years between sales in frontier areas--in some cases, annual sales in certain Aleutian areas were recommended--which the Department judges to be faster than is desirable (see Appendix 1). However, the Department of Energy has also recommended a schedule of leases which would result in increased leasing.

2. Description of Alternative 2 (Modified DOE 33-Sale Schedule)

The Department of Energy developed a proposed schedule (see Table II-4) which includes 33 sales (in contrast to the 30 sales in Alternative 1). This is accomplished in part by holding three more sales in the Gulf of Mexico, and one more sale each in the Gulf of Alaska, Beaufort Sea and St. George Basin, than are proposed in Alternative 1. (However, only three total additional sales result, as one less sale is included in California, Navarin Basin and Northern Aleutian Shelf, resulting in no sales in the last two areas.) The timing in this alternative has been modified slightly from that developed by the Department of Energy, in order to meet criteria developed by the Department of the Interior (see discussion under Alternative 3).

Table II-4. MODIFIED DEPARTMENT OF ENERGY OPTION
Alternative 2

1980	#A62	Gulf of Mexico
	#55	Gulf of Alaska
	#62	Gulf of Mexico — #46 Kodiak
1981	#A66	Gulf of Mexico
	#53	Central and Northern California
	#56	South Atlantic
	#60	Cook Inlet
	#66	Gulf of Mexico
	#59	Mid-Atlantic
1982	#67	Gulf of Mexico
	#69	Gulf of Mexico
		Gulf of Mexico
	#52	North Atlantic
	#68	Southern California
	#71	Beaufort Sea
	#70	St. George Basin (originally proposed by DOE for 1983)
1983	#72	Gulf of Mexico
	#74	Gulf of Mexico
		Gulf of Mexico
	#76	Mid-Atlantic
	#78	South Atlantic
		Gulf of Alaska (originally proposed by DOE for 1982)
	#57	Norton Basin
1984	#79	Gulf of Mexico
	#81	Gulf of Mexico
		Gulf of Mexico
	#82	North Atlantic
	#80	Southern California
		Beaufort Sea
		St. George Basin (originally proposed by DOE for 1985)
1985	#84	Gulf of Mexico
	#85	Chukchi Sea (originally proposed by DOE for 1984)

This schedule would result in a greater number of sales held in the one area where petroleum potential is most assured--the Gulf of Mexico--and in concentrating exploration and development efforts in fewer Alaska frontier areas. It would allow for 10 Alaskan sales, in seven different areas, instead of nine Alaskan sales in nine separate areas. It would also delete the Blake Plateau area from consideration, and central and northern Calfornia from consideration in the 1983 proposed California sale. This would allow the Department of the Interior to concentrate its resources in obtaining environmental and geophysical data gathering in fewer areas. It would also allow industry to concentrate its geophysical data gathering in fewer areas and perhaps require less onshore infrastructure investment. By doing so, however, it would prohibit determining resource potential in Navarin Basin, Northern Aleutian Shelf and Blake Plateau and place emphasis on two untested Alaskan areas--Beaufort Sea and St. George Basin. Additionally, the three sales per year proposed for the Gulf of Mexico would be drawn from the same pool of unleased potentially productive tracts, which could result in smaller individual sales (and same total sale area offered per year) or the necessity to offer less prospective tracts than otherwise.

This alternative, as developed by DOE, schedules sales within certain constraints to leasing (rig availability, transportation, facility siting, geohazards, etc.) so as to maximize net economic value of the schedule as a whole. It was developed by DOE in the process of establishing production goals. While the timing modifications may reduce somewhat the net economic value, this schedule may still be viewed as one which seeks to maximize economic value. DOE believes that gas production in particular is substantially affected by the optimized schedule.

An alternative to the proposed schedule which utilizes substitutions and a additions, then, is the modified DOE schedule. A substitution option is also considered under Alternative 5, which focuses mainly on sales which might be omitted from the five-year schedule.

Table II-5 indicates total acreage offered and estimated (average) resources to be recovered by sale areas, as well as major development assumptions and statistically probable number of oil spills, by sale area. The resource estimates are risked, as in Alternative 1. They differ from the Department of Energy's own estimate of recoverable resources resulting from this proposed schedule, due to a difference in methodology. This is discussed in reference to the Department of Energy's comments on the draft environmental statement in Section V, Consultation.

3. Summary of Environmental Impacts of Alternative 2

Impacts of Alternative 2 would be similar to those of Alternative 1 and would be largely the same to areas outside of Alaska. Alternative 1 includes California sales in 1983 and 1984, without specifying location in California, thereby allowing flexibility as to whether central and northern California or southern California would be considered for each of these sales. Since Alternative 2 includes only one central and northern California sale, potential impacts to this area may be less than those for Alternative 1. This would result in less impact to sensitive marine mammal pupping grounds and pelagic bird rookeries in the Farallon Island area and to marine and coastal resources of central and northern California in general. Potential air pollution problems posed by transfer oil would also be reduced. Less competition for onshore facilities with commercial fishermen may also result.

Impacts to Navarin Basin and Northern Aleutian Shelf discussed under Alternative 1 (see summary in II.A.2.) would be eliminated or substantially reduced. These would include, in particular, impacts to an important bird migration stopover, Izembek Lagoon, lessening potential impacts to the world population of black brandt, cackling Canada goose, Stellar's eider and speckled eider; the Unimak Pass marine mammal (especially grey whale) and fish (especially salmon) migration passage; substantial numbers of nesting and migrating waterfowl in the Navarin Basin area (including emperor and cackling Canada goose using the shoreward, but distant Yukon River delta); and commercial and subsistence fisheries resources. In addition, omission of the Northern Aleutian Shelf and the Navarin Basin would allow additional time to consider whether any marine sanctuaries should be designated in these areas. There are presently no active candidates for marine sanctuary designation in these areas.

Impacts to the Gulf of Alaska, St. George Basin and Beaufort Sea would be greater than those for Alternative 1, as additional sales would be considered in those areas. Increased risk of oil spills impacting significant bird nesting and staging areas in all three regions; endangered whale species and other marine mammals, as well as subsistence fishing resources, especially in the Beaufort Sea and St. George Basin areas, would result.

Table II-5
Summary of Activities
Alternative 2

	North Atlantic	Mid-Atlantic	S. Atlantic & Blk/Plateau	Gulf of Mexico	So. Calif. & S. Bar. Chnl.	Cen. & Northern N. California
Total Oil (million barrels)	356	200	240	790	930	222
Peak Oil production/yr. (million barrels/day)	.116/1992	.067/1992	.077/1991	.386/1987	.183/1991-1993	.057/1993
Total Gas (trillion cubic feet)	1.78	1.64	.4	10.6	1.35	.286
Peak Gas production/yr. (billion cubic feet/day)	.56/1992	.53/1992	.14/1991	5.3/1987	.345/1991-1993	.066/1993
Maximum acreage offered/ number of sales (million acres)	1.6/2	1.6/2	2.4/2	8.4/14	1.6/2	1.338/1
Wells-exploratory/ development and production	40/320	122/108	28/162	1263/1955	113/1025	64/240
Platforms	60	54	44	300	41	10
Statistically Probable No. of Oil Spills>10^3 bbl.	2.04	1.15	1.38	3.29	4.0	1.27
Possible Oil Transportation T=Tanker P=Pipeline	T to Mid-Atlantic	T to Mid-Atlantic	T & P to Mid-Atlantic or Gulf of Mexico	P to Gulf of Mexico	P to So. California	T & P to Cen. & No. Calif.
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to No. Atlantic	P to Mid-Atlantic	P. to So. Atlantic	P to Gulf of Mexico	P to So. California	P to So. California
Possible onshore locations of new facilities (excluding expansions)	-	-	-	-	-	Humboldt Co. San Mateo Co. San Luis Obispo Co. (gas processing support)

Table II-5 Con't.

	Gulf of Alaska	Kodiak	Cook Inlet	St. George
Total Oil (million barrels)	80	46	160	640
Peak Oil production/yr. (million barrels/day)	< .028/1991	.014/1989	.056/1990	< .224/1992
Total Gas (trillion cubic feet)	.28	.138	.38	2.48
Peak Gas production/yr. (billion cubic feet/day)	< .08/1991	.04/1989	.11/1990	< .64/1992
Maximum acreage offered/ number of sales (million acres)	3/2	3.2/1	.865/1	2/2
Wells-exploratory/ development and production	15/8	10/12	10/18	24/160
Platforms	2	1	1	4
Statistically Probable No. of Oil Spills>10^3 bbl.	.46	.26	.92	3.67
Possible Oil Transportation T=Tanker P=Pipeline	P to T to Lower 48	P to T to Lower 48	P to T to Lower 48 & poss. P to Kenai	P to T to Lower 48
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to Gulf of Alaska	P to LNG facility, T to lower 48	P to LNG fac.; T to lower 48	P to LNG facility, T to lower 48
Possible onshore locations of new facilities (excluding expansions)	Yakutat (marine term.)	Old Harbor Afognak Is. Ugak Bay (marine term. LNG Support)		Unalaska (sup. LNG, marine terminal)

Table II-5 Con't.

	Norton	Chukchi Sea	Beaufort Sea	Total
Total Oil (million barrels)	60	1280	1720	6744
Peak Oil production/yr. (million barrels/day)	.021/1992	.449/1994	∠ .604/1992	∠ 2.282
Total Gas (trillion cubic feet)	.24	3.96	6.6	30.134
Peak Gas production/yr. (billion cubic feet/day)	.07/1992	.98/1994	∠ 1.62/1992	∠ 10.48
Maximum acreage offered/ number of sales (million acres)	.6/1	.6/1	2/2	29.2/33
Wells-exploratory/ development and production	8/12	6/208	27/428	1730/4656
Platforms	1	6	12	546
Statistically Probable No. of Oil Spills>10^3 bbl.	.34	7.35	7.17	33.3
Possible Oil Transportation T=Tanker P=Pipeline	P to T to lower 48	P to T to lower 48	P to T to lower 48	
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to LNG facility, T to lower 48	P to LNG facility, T to lower 48	P to lower 48 (Alcan)	
Possible onshore locations of new facilities (excluding expansions)	St. Michael's Bay Golovin Bay Pastol Bay (support marine terminal)	Kotzebue Sound (marine terminal, LNG support)		

C. Alternatives 3, 4 and 5: Delay Sales Within the Five-Year Schedule

1. Discussion

Alternatives to the timing of sales in Alternative 1 exist. Holding sales earlier than proposed in Alternative 1 is not considered a viable option, since the current schedule was developed to allow holding sales as early as possible, taking into consideration the time required to obtain necessary environmental and geophysical data, and to prepare environmental analyses required by the National Environmental Policy Act. Reducing the time between sales in frontier or newly leased areas is also not viewed as a viable alternative. Optimum time between sales in areas outside the Gulf of Mexico is considered to be three years between first and second sales, and two years between subsequent sales. This timing permits the Department to benefit from exploratory results, especially important in frontier areas, and seeks to provide for a steady level of exploration activity, which avoids a boom-bust problem but keeps rigs occupied once in an area.

While holding sales earlier than proposed in Alternative 1 is not considered viable, sales could be scheduled later in the five-year period based on the following rationales:

a) Sales could be delayed to allow time to complete coastal zone management plans prior to a sale.

All States which are currently anticipated to receive approved Coastal Zone Management programs are anticipated to receive approval prior to the end of fiscal year 1980, and the first sale (Gulf of Mexico) on the proposed schedule is September 1980, the last month of FY 80. Therefore, these States should have have plans in place prior to proposed sales (with the possible exception of Mississippi and Texas, the two Gulf of Mexico States anticipated to receive approval during FY 1980). There is some question as to whether New York and Florida will receive approval within time limitations for Federal funding. Georgia has withdrawn from the program. In California and Alaska, local coastal zone management plans are also being prepared. The deadline for completion of California local plans is January 1981. Sale 53 is proposed for May 1981. In Alaska, 40 district plans are anticipated and 20 are anticipated to be completed by the beginning of 1981. The remaining 20 are anticipated to require up to an additional 7 years. In the absence of district plans, the State coastal zone management program, approved in July 1979, will be in effect and all oil and gas development activities applicable to the consistency provision must be consistent with the State plan.

Of particular concern in Alaska, however, is that large portions of the shoreline are unorganized, i.e., there is no local government and therefore no planning and zoning expertise. In organized boroughs which can initiate planning and zoning in the absence of a coastal zone management program, the lack of a district CZM plan is not viewed as crucial, given the fact that the State program will be applicable and local controls are available. However, in unorganized boroughs, coastal zone management funding offers the best incentive to prepare for possible onshore effects of OCS development. In order to be eligible to receive CZM funding, such areas must be organized into a coastal resource service area.

The area where the unorganized status of adjacent shoreland presents the greatest concern is the Bering Sea region and Norton Sound. Other areas contain unorganized boroughs, but localities expected to receive most onshore impacts resulting from sales on the proposed schedule are organized and in many cases have CZM planning efforts underway. In the Bering Sea region, only one coastal resource service area is known to have been formed--on the Yukon-Kuskokwim delta between Pastol Bay and Cape Pierce. That area is adjacent to the Navarin Basin sale area. As a Navarin Basin sale is not proposed until December 1984, sufficient time is probably available to complete a CZM plan prior to the proposed sale date for Navarin Basin.

b) Sales could be delayed to allow time for additional environmental information to be obtained.

Alternative 1 was designed to allow the earliest possible scheduling of Alaska frontier areas where resource potential is believed to be high, and other areas, consistent with the availability of environmental and geotechnical data believed to be necessary for a sale decision. The status of information availability for the proposed schedule (Alternative 1) is discussed in Section IV.B.5.

However, delay of sales within the five-year schedule would allow time to obtain additional information.

Based on the factors discussed above, the following are alternatives to the proposed action.

2. Alternative 3: Delay Sales in Norton Basin, St. George Basin and the Northern Aleutian Shelf

a. Description of Alternative 3

The area of Alaska where the unorganized status of adjacent shoreline results in greatest concern for coastal zone management plans is the Bering Sea region and Norton Sound. Areas adjacent to Norton Basin, St. George Basin and Northern Aleutian Shelf have not as yet initiated any efforts to become eligible for CZM funding. In the absence of a regional comprehensive plan or a CZM plan, no local control could be exercised in enclave siting decisions or over indirect land uses associated with these proposed sales, although provisions of the Alaska State Coastal Management Plan would apply.

These sales, Norton Basin, St. George Basin and Northern Aleutian Shelf, proposed under Alternative 1 for 1982 and 1983, could be delayed in order to allow for additional time for coastal resource service areas to be formed, CZM plans completed, approved and implemented. This alternative would delay a Norton Sale, until 1985. The Norton area is the least prepared to undertake coastal zone management planning at the present time. It would delay the other two sales until 1984. The location expected to be the focus of much of the onshore facilities which might result from these proposed sales-Unalaska- is a first class city and presently has the authority to implement zoning regulations.

b. Summary of Environmental Impacts of Alternative 3

The environmental impacts of this alternative would be the same as those for Alternative 1 in all regards except that land use impacts to the shorelands adjacent to Norton Basin, St. George Basin, and Northern Aleutian Shelf may be reduced.

Areas adjacent to Norton Basin where onshore facilties may be located are believed to be the St. Michael's Bay, Golovin Bay and Pastol Bay areas. These are presently unorganized. All are undeveloped areas. Should CZM planning be undertaken and in effect prior to siting decisions, development could be directed to a location and undertaken in a manner desired by local residents. The only infrastructure presently available in this region is in Nome.

The areas adjacent to the St. George Basin and Northern Aleutian Shelf where onshore facilities may be located are Unalaska and the Cold Cay vicinity. Unalaska is a first class city, where some comprehensive planning has been undertaken, but no coastal zone program is currently underway. The rest of the Aleutian chain is unorganized and has not yet formed a coastal resource service area. As discussed for Norton Basin, should CZM programs be developed and implemented, development of onshore facilities could be directed to a location and undertaken in a manner consistent with local desires. Additional time would also allow further consideration of whether these areas or portions of these areas should be given marine sanctuary status, although none are currently active candidates.

3. Alternative 4: Delay a Sale in St. George Basin for One Year

a. Description of Alternative 4

The St. George Basin sale, proposed for December 1982 in Alternative 1, could be delayed until late 1983. Studies are planned to be initiated in FY 1980. Trajectory modelling for the St. George Basin will need to be contracted for, as the model which is in use by the U.S. Geological Survey is not applicable to the area. It is certain that the over two years of pollution transport data planned for collection will not be available for use in a modelling effort for use in the draft environmental statement. It is conceivable, but not certain, that one year of date might be available and could be used in a trajectory analysis for the final environmental statement. If the sale were to be held in December, 1982, as proposed in Alternative 1, the modelling effort would need to rely on partial data collected from earlier studies and whatever data is available from the FY 1980 collection effort.

Should the sale be delayed, availability of oceanographic and meteorologic data would be assured for use in modelling of oil spills (at least three are estimated to result from the proposed sale). In addition, living resources studies would be complete. Under the schedule proposed in Alternative 1, only preliminary data for these studies would be available for the sale decision.

b. Summary of Environmental Impacts of Alternative 4

Impacts of this alternative would be almost identical to those of Alternative 1. However, delay of the proposed St. George Basin sale would allow an additional year in which to obtain and analyze environmental information. This might result in fewer impacts resulting from this particular sale if the additional information obtained results in tract selection and stipulation decisions which offer increased environmental protection and omission of particular tracts which present the greatest potential for environmental damage. It is nearly impossible to speculate on what that information and those decisions might be. Therefore, for all practical purposes delay will only marginally change the extent of impact, or may not change it at all. It is also conceivable that increased information might influence the decision as to whether or not to hold the sale. If it was decided not to hold a St. George Basin sale based on additional information, impacts resulting from the sale in that area, addressed under Alternative 1, would be eliminated.

4. Alternative 5: Delay the Proposed 1981 Central and Northern California Sale Until 1983, Delete 1983 California Sale, Designate 1984 California Sale as a Southern California Sale

a. Description of Alternative 5

Resources of particular concern in Central and Northern California include abundant coastal and pelagic birds and their rookeries, and coastal sea mammals. These organisms are known to be extremely sensitive to oil spill impacts. Studies sponsored by BLM are currently underway to develop more information regarding distribution and abundance of these resources. However, all studies will not be completed prior to the final environmental statement for this proposed sale under Alternative 1. This alternative would delay the sale for nearly two years, so that the studies would be fully completed and all information would be available in order to perform a risk analysis and for use in stipulation development in the environmental process.

As this area is considered as a frontier area, (it has a limited history of leasing, but no development), an additional sale in central and northern California prior to 1986 (three years from the first proposed sale on the schedule) may not be desirable. Therefore, sales designated as "California" proposed sales in Alternative 1 would need to be restricted to Southern California, under this Alternative. Since one specified southern California sale is also proposed for 1982, this alternative considers omitting the 1983 sale #73 in California proposed under Alternative 1. Therefore, this alternative would result in California sales as follows 1) a proposed Southern California sale in 1982, 2) a proposed central and northern California sale in 1983, and 3) a proposed southern California sale in 1984.

Table II-6 indicates the acreage offered, resource and facility estimates and statistically probable number of spills for the two California leasing areas, and for the schedule as a whole as a result of this alternative. All other activities and estimates (for other lease sale areas) would be the same as those included in Table II-2.

Table II-6
Summary of Activities
Alternative 5

Total Oil	Southern Calif. including Santa Barbara Channel	Central & Northern California	Total (5-Year Schedule)
(Million barrels)	930	222	6304
Peak Oil produc. (million barrels/day)	.183/1991-1993	.057/1993	<2.135
Total Gas (trillion cubic ft/day)	1.35	.286	28.454
Peak gas production (billion cubic ft.)	.345/1991-1993	.066/1993	<9.899
Max. Acreage Offered No. of sales (million acres)	1.6/2	1.338/1	28.7/29
Wells - exploratory/ dev. & production	113/1025	64/240	2008/4558
Platforms	41	10	532
Statistically Probable-No. of Spills>	4.0	1.27	32.05

b. Summary of Environmental Consequences of Alternative 5

Impacts of this alternative would be almost identical to those of Alternative 1. However, impacts to California leasing areas would be reduced, as a result of one less sale in those areas, and delay of a central and northern California sale would allow additional time to obtain and analyze environmental information. This would allow an improved risk analysis over that allowed in Alternative 1, and may provide better information earlier to develop mitigation measures and/or specific tract omission options to protect sea bird and pinniped concentration areas, including rookeries and pupping grounds. It is nearly impossible to speculate on what specific decisions may result or the amount of additional protection they may offer over those which may be developed as a result of Alternative 1. It is conceivable that increased information might influence the decision as to whether or not to hold the sale. If it was decided not hold a sale in central and northern California, impacts resulting from a sale in that area, addressed under Alternative 1, would be eliminated.

D. Alternatives 6, 7, and 8: Omit Sales from the Five-Year Schedule

1. Discussion

Alternatives involving locational considerations are those which would omit from the five-year schedule sale areas included in Alternative 1. Sales could be omitted based on the following rationales:

a) Areas which have unique or especially significant biological resources, where information concerning these resources and potential impacts to them are more limited than in other areas, might be omitted from the five-year schedule. This would allow additional information to be obtained and analyzed.

As discussed under II.C. above, Alternative 1 has been designed to schedule sales in prospective frontier areas as soon as possible, consistent with the availability of environmental and geotechnical information believed necessary for a sale decision (see Section IV.B.5.). However, additional time would allow more information to be obtained and analyzed.

b) Where development and production technology is not presently available to respond to operating conditions in an area, the area could be omitted from the five-year schedule in order to allow additional time for technological advancement.

One factor which is constrained under current technological capabilities is deep water operating. While exploration has currently taking place in water depths up to 1486 meters (4874 feet), and exploration and development technologies for depths up to 3000 meters (6560 feet) are in the prototype or design stage. The maximum depth at which a conventional platform production system have been installed is 312 meters (1023 feet) and subsea completion systems are currently designed for depths up to 600 meters (1968 feet) (see Appendix).

In most proposed OCS sale areas, deep water may be encountered in parts of the area, as leases are offered further from shore. The basin with the greatest prevalence of deepwater is Blake Plateau, where depths up to 2250 meters (7380) are encountered (although shallow depths--800 meters--also occur). However, in all proposed lease sales in Alternative 1, including the proposed 1984 South Atlantic/Blake Plateau sale (#78), alternatives to offering deepwater tracts exist. Therefore, omitting a proposed sale from the five-year schedule due to a presence of deep water is not considered an alternative.

Besides deep water, the major potential constraint presented by offshore operating conditions is ice. Technologies currently exist to explore and develop in the landfast ice zone. However, beyond the landfast zone, in the transitional shear zone and in pack ice, there is currently no operating experience. The only Arctic OCS sale involving ice conditions which was held prior to the beginning of the five-year schedule (March 1980) is the 1979 Beaufort Sea State/Federal sale. As in areas further offshore in Beaufort Sea (than were offered in 1979 sale), extensive shear zone and pack ice is present in the Chukchi Sea.

c) To reduce production on the west coast, thereby reducing oil to be transported and processed, and resulting in a slower paced scheduled.

As indicated under the discussion of Alternative 1, the proposal is expected to result in greater amounts of oil and gas than can currently be processed on the west coast. Beaufort Sea oil production is assumed to be transported via the TAPS pipeline and tankered to the west coast or eastern refineries, where current TAPS-carried production is being refined, and Beaufort Sea gas possibly transported through the proposed Alcan line. However, the transportation and processing of oil and gas from the Bering Sea region and the Chukchi Sea remain unresolved. As indicated under Alternative 1, the Department of Energy does not expect any gas production outside of Cook Inlet and the Beaufort Sea, due to market constraints.

2. Alternative 6: Omit the Northern Aleutian Shelf Area

a. Description of Alternative 6

The proposed Northern Aleutian Shelf sale area lies north of Unimak Island in the Aleutian Chain and at the seaward edge of Bristol Bay. As such, it is in close proximity to extremely important breeding habitat, migration routes and feeding areas for marine mammals, including endangered whales, and population of waterfowl and other birds.

Izembek Lagoon, a National Wildlife Refuge, is located shoreward of the proposed sale area. It is a major migratory stop for major portions of the world populations (or possibly the entire populations) of black brandts, cackling Canada geese, Stellar's eiders and speckled eiders. The area is also rich in other waterfowl and seabirds.

Unimak Pass is a major migratory route for fish and marine mammals, including the endangered grey whale. Additionally, the proposed sale area is at the southern edge of one of the largest bottomfish fisheries in Alaska. Shoreward in Bristol Bay are also important crab and salmon fisheries.

studies have been identified to obtain information concerning geologic conditions, circulation, commercial fisheries, endangered species, marine mammals, and birds and coastal ecosystems. This information should be available for consideration in an environmental statement.

However, because of the significance of this area to marine and coastal populations identified, omission of this sale from the five-year schedule in order to allow for long-term studies is an alternative. Long-term studies concerning the coastal ecosystems, importance of the region as a migration route, and potential impacts due to oil spills could be conducted, should the consideration of this sale be delayed beyond five years.

Table II-7 indicates acreage offered, resource and facility estimates and the statistically probable number of spills which would result for the schedule as a whole under this alternative. Estimates for all other lease sale areas (except Northern Aleutian Shelf) would be the same as included in Table II-2.

Table II-7
Summary of Activities
Alternative 6

	Five-Year Schedule
Total Oil (million barrels)	6580
Peak Oil Production (million barrels/day)	<2.271
Total Gas	28.778
Peak Gas Production (billion cubic feet)	<10.27
Maximum Acreage Offered No. of Sales (million acres)	28.7/29
Wells-Exploratory/ development & production	2070/4914
Platforms	546
Statistically Probable No. Oil spills> 10^3 bbl.	33.32

b. Summary of Environmental Impacts of Alternative 6

The environmental impacts of this alternative would be the same as those in Alternative 1, except that potential impacts to resources in the Northern Aleutian Shelf area would be substantially reduced. Due to the proximity of the St. George Basin to Northern Aleutian Shelf, and in the absence of oil spill trajectory analysis for St. George Basin, it is not possible to conclude that these impacts would be eliminated. Additionally, the individuals and populations of marine mammals and birds which could be impacted by a Northern Aleutian Shelf sale also spend portions of the year in other Alaska areas. However, it appears that the Northern Aleutian Shelf may be particularly important as a concentration point for many of these species, and therefore elimination of consideration of this sale area at this time would reduce impacts to these populations. Impacts to marine mammals and waterfowl and seabirds, and the endangered grey whale, would be lessened. Additionally, this alternative would allow more time in which to consider possible marine santuary status for the area, prior to its consideration for sale, should it be reconsidered for leasing after February 1985. Should sanctuary status be given to any portion of the area, any new leasing proposal could be constrained by regulations implementing the sanctuary. However, there are currently no active candidates for marine sanctuary designations in the Northern Aleutian area.

2. Alternative 7: Omit Chukchi Sea from Five-Year Schedule and Substitute a Beaufort Sea Sale

a. Description of Alternative 7

Leasing in the Beaufort Sea seaward of the 1979 Federal/ State Beaufort Sea sale area would involve tracts in the shear zone and pack ice. Substantial portions of the Federal OCS in Chukchi Sea would also involve those ice conditions. While currently there is not operating technology for these ice conditions, scheduling a sale beyond the landfast ice zone would provide incentive to develop this technology. Scheduling such a sale in the Beaufort Sea, as opposed to the Chukchi Sea, would offer several advantages. First, data gathering and studies could be concentrated in this area so as to have a greater data base, both environmental and geotechnical. Second, operating experience in the less problemmatic zone in the Beaufort Sea would exist. Finally, infrastructure, including transportation facilities, would be available, thereby offsetting the investment which would be required in order to develop offshore operating technology. Should the Chukchi Sea sale be held, not only would development of offshore technology be required, but new onshore service support would need to be established as well as transportation facilities. Transportation from the Chukchi Sea would involve either ice-breaking tankers (there are existing proposals for their use in northern Canadian provinces which may provide operating experience with their use by the time they would be required for a 1985 Chukchi Sea sale) or a connecting pipeline to the TAPS oil pipeline and proposed Alcan line.

Table II-8 indicates acreage offered, resource and facility estimates and the statistically probable number of oil spills, in the Beaufort Sea area, and for the 5-year schedule as a whole, as a result of this alternative. All other activities and estimates (for other lease sale areas) would be the same as indicated in Table II-2.

Table II-8
Summary of Activities
Alternative 7

	Beaufort Sea	Total (5-Yr. Schedule)
Total Oil (million barrels)	1720	6200
Peak Oil Production/yr (million barrels/day)	.604/1994	<2.138
Total Gas (trillion cubic feet)	6.6	28.278
Peak Gas Prod/yr. (billion cubic feet)	1.62/1994	<10.14
Max. Acreage Offered No. of sales (m.a.)	1.2/2	29.7/30
Wells-Exploratory/ dev. & prod.	16/428	2084/4930
Platforms	12	547
Statistically/probable No. of oil spills> 10^3 bbls.	7.17	29.78

The major disadvàntage of this alternative would be foregoing the resources estimated to result from the proposed Chukchi Sea sale--a net loss estimated at 420 million barrels of oil.

b. Summary of Environmental Impacts of Alternative 7

Environmental impacts of this alternative would be identical to those of Alternative 1 except in the Arctic region. Because less oil would be expected as a result of a second Beaufort Sea sale, less potential for impact to biologic resources of the Arctic region as a whole would result. Impacts to subsistence harvesting of fish and marine mammals would be somewhat reduced, as the Chukchi Sea is somewhat more important than Beaufort in this regard. Impacts to breeding waterfowl may also differ. While omission of a Chukchi Sea sale would significantly reduce the potential oil spill risk to waterfowl breeding on barrier islands and feeding in estuaries in that area, Beaufort Sea is more heavily utilized by waterfowl than is the Chukchi Sea shore area.

3. Alternative 8: Include 25 Lease Sales on the Proposed Schedule, Omitting St. George Basin, Northern Aleutian Shelf, Navarin Basin, Norton Basin and Chukchi Sea from the Five-Year Schedule

a. Description of Alternative 8

This alternative would reduce the projected oil resources anticipated for Alternative 1 by an estimated 2.46 billion barrels of oil. Reducing the amount of Alaskan oil which would need to be transported and refined. This would reduce the daily oil production by an amount somewhat less than .863 million B/D (which is the total of the estimated peak daily production figures from the sales omitted--however, these peaks are estimated to occur between 1991 and 1994 and are not additive). It would also reduce the projected gas resources by 8.4 trillion cubic feet, reducing the necessity for liquified natural gas facilities, should the gas be produced.

It should be noted that Department of Energy does not anticipate production of gas from these areas because of market constraints and the cost of conversion to LNG. Table II-9 indicates estimated resource, facility and other estimates for this alternative.

b. Summary of Environmental Impacts of Alternative 8

This alternative would result in only one frontier area in Alaska, Kodiak, being considered in the five-year schedule. All impacts discussed for the Bering Sea and the Chukchi Sea lease sales under Alternative 1 would be removed. Since the Bering Sea hosts an abundance of sea birds, breeding and migrating waterfowl, and breeding and migrating marine mammals, overall impacts of the schedule on these resources would be much reduced from Alternative 1. In addition, impacts to land use and coastal planning in Alaska, as discussed for Alternative 3, would be substantially reduced, since all areas which are considered least prepared for onshore infrastructure and land use impacts would be omitted from consideration for leasing at this time. In addition, technology for adverse ice conditions would be developed in the Beaufort Sea, rather than the Chukchi Sea, resulting in differing environmental and economic effects as discussed in Alternative 7.

This alternative would result in a slower paced schedule, allowing for concentration of manpower and funding resources in fewer geographic areas and fewer sales.

Table II-9

Summary of Alternatives

Alternative 8

	North Atlantic	Mid-Atlantic	S. Atlantic & Blk/Plateau	Gulf of Mexico	So. Calif. & S. Bar. Chnl.	Cen. & Northern N. California
Total Oil (million barrels)	356	200	240	790	1180	288
Peak Oil production/yr. (million barrels/day)	.116/1992	.067/1992	.077/1991	.386/1987	.316/1991-93	.074/1991
Total Gas (trillion cubic feet)	1.78	1.64	.4	10.6	1.75	.37
Peak Gas production/yr. (billion cubic feet/day)	.56/1992	.53/1992	.14/1991	5.3/1987	.56/1991-1993	.11/1991
Maximum acreage offered/ number of sales (million acres)	1.6/2	1.6/2	2.4/2	10.3/11-12	2.4/1-3	2.938/1-3
Wells-exploratory/ development and production	40/320	122/108	28/162	1549/1955	156/1319	95/312
Platforms	60	54	44	300	52	14
Statistically Probable No. of Oil Spills>10^3 bbl.	2.04	1.15	1.38	3.29	4.92	1.65
Possible Oil Transportation T=Tanker P=Pipeline	T to Mid-Atlantic	T to Mid-Atlantic	T & P to Mid-Atlantic or Gulf of Mexico	P to Gulf of Mexico	P to So. California	T & P to Cen. & No. Calif.
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to No. Atlantic	P to Mid-Atlantic	P. to So. Atlantic	P to Gulf of Mexico	P to So. California	P to So. California
Possible onshore locations of new facilities (excluding expansions)	-	-	-	-	-	Humboldt Co. San Mateo Co. San Luis Obispo Co. (gas processing support)

Table II-9

	Gulf of Alaska	Kodiak	Cook Inlet	Beaufort Sea	Total
Total Oil (million barrels)	40	46	160	860	4160
Peak Oil production/yr. (million barrels/day)	.014/1989	.014/1989	.056/1990	.302/1992	< 1.422
Total Gas (trillion cubic feet)	.14	.138	.38	3.3	20.498
Peak Gas production/yr. (billion cubic feet/day)	.04/1989	.04/1989	.11/1990	.81/1992	< 8.2
Maximum acreage offered/ number of sales (million acres)	2/1	3.2/1	.865/1	.6/1	27.9/25
Wells-exploratory/ development and production	10/4	10/12	10/18	8/214	2028/4424
Platforms	1	1	1	6	533
Statistically Probable No. of Oil Spills>10^3 bbl.	.23	.26	.92	3.59	19.43
Possible Oil Transportation T=Tanker P=Pipeline	P to T to Lower 48	P to T to Lower 48	P to T to Lower 48 & poss. P to Kenai	P to T to lower 48	
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to Gulf of Alaska	P to LNG facility, T to lower 48	P to LNG fac. T to lower 48	P to lower 48 (Alcan)	
Possible onshore locations of new facilities (excluding expansions)	Yakutat (marine term.)	Old Harbor Afognak Is. Ugak Bay (marine term. LNG Support)			

E. Alternative 9: Delay Sales Within the Five-Year Schedule and Omit Sales from the Five-Year Schedule, Based on Factors Considered in Alternatives 2, 3, 4, 6 and 7

1. Discussion

The State of Alaska (see State of Alaska comments in Section V) has made several recommendations regarding Alaskan sale areas. The State divided the sale areas according to the following categories: 1) sales that are appropriate for leasing in the 1980-1982 timeframe, 2) sales that are appropriate for leasing in the 1983-1985 timeframe, and 3) sales which could be delayed indefinitely. Sale areas are recommended for leasing in the 1983-1985 time period and for indefinite postponement based largely upon the same consideration discussed in Section II.B. and C. - the availability of environmental information, the availability of technology to develop hydrocarbon resources under Arctic conditions, and the status of coastal zone management planning. However, the State of Alaska's alternatives regarding specific sale areas differs in some cases from those resulting from the rationales discussed for Alternatives 3, 4, 6, and 7. Specifically, Alaska recommends delay of the Kodiak sale, not contemplated by any of the earlier alternatives, and indefinite postponement, rather than a one year delay, of a St. George Basin sale. The State also recommends indefinite postponement of shear zone and pack ice areas of the Beaufort Sea, not considered in Alternative 7. These last two recommendations, in particular, received substantial support in comments on the draft environmental statement. No rationale for delaying the Kodiak sale, specific to the sale area, was presented. However, other commenters on the draft statement recommended a delay in order to complete ongoing planning for OCS related facility development. The State also recommends Hope Basin as being appropriate for leasing in the 1983-1985 time period - which is not considered in Alternative 7.

Aside from the new elements discussed above, this alternative would combine elements of Alternatives 2, 3, 4, 6, and 7 and to some extent, Alternative 8. It would reduce total oil and gas resources anticipated to be recovered as a result of the five-year schedule, to an estimated 3924 million barrels of oil and 22.4 trillion cubic feet of gas. This estimate was derived by assuming that if a Beaufort Sea sale excluded shear and pack ice zones that only 50 percent of the resources which would otherwise be recovered could be produced. This estimate was made by the Bureau of Land Management, for purposes of analysis only and is not based on geologic information. It does not represent a Geological Survey estimate, and results in only hypothetical resource numbers, because geologic analyses have not been performed which might allow a more reasoned estimate.

Alternative 9: Hold 28 Lease Sales Omitting the Northern Aleutian Shelf, St. George Basin, and Chukchi Sea; Omit Portions of the Beaufort Sea; Delay Sales in Kodiak and Norton Basin; and Add a Sale in Hope Basin

a. Description of Alternative 9

This alternaive would differ from Alternative 1 in Alaska only (except for some minor timing changes in the Gulf of Mexico). It would omit from the 5-year schedule any consideration of leasing in the Southern Bering Sea, by omitting the Northern Aleutian Shelf and St. George Basin. It would remove from consideration of leasing beyond the landfast ice in the Arctic; however, it would add Hope Basin (in 1985), a transition area between the Bering Sea and the Arctic conditions of the Chukchi Sea area considered in Alternative 1. It would also delay the proposed Kodiak sale 2+ years (it is proposed under Alternative 1 for leasing in December 1980, and the State recommends 1983 as the earlier sale date), and the Norton Sale for 2 years (it is proposed for September 1982 in Alternative 1, and recommended by the State of Alaska for 1983-1985).

Table II-10 indicates estimated acreage offered, oil and gas resource and facility development assumptions, as well as the statistically probable number of oil spills which would result from this alternative.

b. Summary of Environmental Consequences of Alternative 9

This alternative would result in largely removing impacts to resources in the southern Bering Sea, in a manner similar to, but more completely than Alternative 5. This would reduce impacts to important breeding habitats, migration routes and feeding areas marine mammals, sea birds, shorebirds, and waterfowl. Impacts to the extensive bottomfisheries would be removed, as would any threat of impact to the more distant coastal salmon and crab fisheries.

Statistically probable oil spills in the Arctic would be reduced from 10.94 to 1.8, significantly reducing the threat of oil spills impacting large waterfowl populations and other resources of the Arctic. The potential threat (which uncertain) of spilled oil being widley dispersed by spring break up would be reduced.

Onshore planning in the Bering Sea region (discussed under Alternative 3), as well as Kodiak, would be more advanced prior to a sale in Norton Basin and Kodiak. This may enhance the ability of local governments and residents to direct the location and other elements of onshore facilities related to OCS development, and may allow increased mitigation of potential adverse effects of these facilities.

Table II-10

Summary of Activities

Alternative 9

	North Atlantic	Mid-Atlantic	S. Atlantic & Blk/Plateau	Gulf of Mexico	So. Calif. & S. Bar. Chnl.	Cen. & Norther N. California
Total Oil (million barrels)	356	200	240	790	1180	288
Peak Oil production/yr. (million barrels/day)	.116/1992	.067/1992	.077/1991	.386/1987	.316/1991-93	.074/1991
Total Gas (trillion cubic feet)	1.78	1.64	.4	10.6	1.75	.37
Peak Gas production/yr. (billion cubic feet/day)	.56/1992	.53/1992	.14/1991	5.3/1987	.56/1991-1993	.11/1991
Maximum acreage offered/ number of sales (million acres)	1.6/2	1.6/2	2.4/2	10.3/11-12	2.4/1-3	2.938/1-3
Wells-exploratory/ development and production	40/320	122/108	28/162	1549/1955	156/1319	95/312
Platforms	60	54	44	300	52	14
Statistically Probable No. of Oil Spills>10^3 bbl.	2.04	1.15	1.38	3.29	4.92	1.65
Possible Oil Transportation T=Tanker P=Pipeline	T to Mid-Atlantic	T to Mid-Atlantic	T & P to Mid-Atlantic or Gulf of Mexico	P to Gulf of Mexico	P to So. California	T & P to Cen. & No. Calif.
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to No. Atlantic	P to Mid-Atlantic	P. to So. Atlantic	P to Gulf of Mexico	P to So. California	P to So. California
Possible onshore locations of new facilities (excluding expansions)	-	-	-	-	-	Humboldt Co. San Mateo Co. San Luis Obispo Co. (gas processing support)

Table II-10

	Gulf of Alaska	Kodiak	Cook Inlet	Navarin
Total Oil (million barrels)	40	46	160	760
Peak Oil production/yr. (million barrels/day)	.014/1989	.014/1989	.056/1990	.267/1993
Total Gas (trillion cubic feet)	.14	.138	.38	2.84
Peak Gas production/yr. (billion cubic feet/day)	.04/1989	.04/1989	.11/1990	.7/1993
Maximum acreage offered/ number of sales (million acres)	2/1	3.2/1	.865/1	1/1
Wells-exploratory/ development and production	10/4	10/12	10/18	16/190
Platforms	1	1	1	4
Statistically Probable No. of Oil Spills>10^3 bbl.	.23	.26	.92	4.36
Possible Oil Transportation T=Tanker P=Pipeline	P to T to Lower 48	P to T to Lower 48	P to T to Lower 48 & poss. P to Kenai	P to T to Lower 48
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to Gulf of Alaska	P to LNG facility, T to lower 48	P to LNG fac.; T to lower 48	P to LNG facility, T lower 48
Possible onshore locations of new facilities (excluding expansions)	Yakutat (marine term.)	Old Harbor Afognak Is. Ugak Bay (marine term. LNG Support)		Unalaska (support)

Table II-10

	Norton	Hope Basin	Beaufort Sea	Total
Total Oil (million barrels)	60	26	430	4576
Peak Oil production/yr. (million barrels/day)	.021/1992+	.009/1994	.157/1994	<1568
Total Gas (trillion cubic feet)	.24	.17	1.65	22.098
Peak Gas production/yr. (billion cubic feet/day)	.07/1992+	.04/1994	.405/1994	< 8.605
Maximum acreage offered/ number of sales (million acres)	.6/1	.6/1	3/1	29.8/28
Wells-exploratory/ development and production	8/12	8/4	4/107	2056/4525
Platforms	1	1	3	536
Statistically Probable No. of Oil Spills>10^3 bbl.	.34	.15	1.8	22.48
Possible Oil Transportation T=Tanker P=Pipeline	P to T to lower 48	P to T to lower 48	P to T to lower 48	
Possible Gas Transportation P=pipeline LNG=liquified natural gas	P to LNG facility, T to lower 48	P to LNG facility, T to lower 48	P to lower 48 (Alcan)	
Possible onshore locations of new facilities (excluding expansions)	St. Michael's Bay Golovin Bay Pastol Bay (support marine terminal)			

This alternative would result in impacts to the Hope Basin area which would not result from Alternative 1 or other alternatives.

Impacts to other lease sale areas would be the same as those discussed under Alternative 1. However, some cumulative impacts to resources in the Bering Strait area may occur as a result of lease sales in both the Norton Sound and Hope Basin.

In Hope Basin, resources of concern which are especially sensitive to OCS development include marine mammals. Several species of seals, walrus, sea lions, porpoises, several whale species and the polar bear, all utilize this area. In addition to being an important calving and pupping ground for some of these species, the Bering Strait is the relatively narrow migratory route for many of these cetacean and pinniped species, including endangered whale populations. While the probability of large oil spills is relatively low, migration of these species could also be impacted by structure placement.

Hope Basin is also a prime avian habitat--both an important migratory route for waterfowl and shorebirds, and a breeding area for seabirds. These are very sensitive to oil spill impacts and could also be affected by onshore development.

The economy and lifestyle of the Hope Basin/Kotzebue Sound area is very traditionaly oriented, with high subsistence use of marine and terrestrial mammals, fish and birds. However, there has been some experience in the area with mining exploration and development onshore. Potential socioeconomic impacts are similar to other frontier areas of Alaska. However, Kotzebue is developing a tourism industry based on its appeal as a traditional Eskimo village, where native lifestyle and crafts are displayed. Any significant alteration to the village lifestyle as a result of facility siting in or near the village could adversely impact the tourism potential. Enclave development and sensitive facility siting should mitigate this impact.

F. Alternative 10: No Action and Conservation

1. Description of Alternative 10

An alternative to the proposed schedule is to cease leasing Federal OCS areas for oil and gas development, beginning in March 1980, and to emphasize the conservation of available energy resources. This alternative would result in the need to meet national energy needs through other sources, or to reduce energy consumption, or most likely, a combination of both. One directly substitutable source of OCS oil and gas is imported oil and gas; however, the Administration is committed to the reduction of oil imports, due to the adverse economic and political repercussions of dependence on foreign sources of oil. Additional production of onshore oil and gas represent another source of direct substitutes for OCS resources. In lieu of adequate onshore sources of oil and gas, or importation, energy requirements could be met using alternate energy sources, such as coal, solar energy, nuclear power and conservation measures, or a combination of these alternatives. Trends in alternative sources of energy to OCS production, including conservation are discussed in Section I.B.7.

2. Summary of Environmental Impacts of Alternatives 8

The impacts associated with Alternative 1 would be eliminated or largely eliminated should this alternative be adopted. Some impacts to marine and coastal ecosystems would result should importation of oil be increased. These impacts would accrue largely to the lower 48 States where refining centers and oil product import ports exist. The extent of these impacts would be directly related to the reduction in energy consumption effective by energy conservation. Socioeconomic impacts related to Alternative 1 would be eliminated, but could be replaced with similar infrastructure, employment and population impacts associated with the development of additional coal extraction and processing, oil shale processing, nuclear plant and LNG plant construction, and other facilities associated with alternative energy production.

Adverse environmental effects to onshore ecosystems could also be expected; the nature and extent would depend upon the type, level and location of such alternative energy production. It is likely that the western portion of the United States would receive the bulk of such impact, with the exception of nuclear plant construction due to the location of a substantial amount of alternative energy sources in the Rocky Mountain States.

Depending upon the extent of conservation and/or shortfall of energy, economic dislocation, such as a higher rate of unemployment could also occur.

III. DESCRIPTION OF THE ENVIRONMENT

The descriptions below present a brief overview of the OCS regions in which lease sales are being considered. Additional material on these regions is contained in the environmental statement concerning the Proposed Increase in Oil and Gas Leasing on the Outer Continental Shelf, issued by the Bureau of Land Management in 1975. Additionally, more specific information regarding many of these areas is contained in sale-related environmental statements prepared by the Bureau of Land Management. Most recent statements concerning proposed OCS oil and gas lease sales in the various sale areas are:

Area	Sale Covered by Final Environmental Statement
North Atlantic	#42
Mid-Atlantic	#49
South Atlantic	#43
Gulf of Mexico (Eastern Gulf)	#65
Gulf of Mexico (Central & Western Gulf)	#58A
Southern California	#48
Gulf of Alaska	#39
Kodiak	#46 (DES only)
Cook Inlet	CI
Beaufort Sea	Federal/State Sale

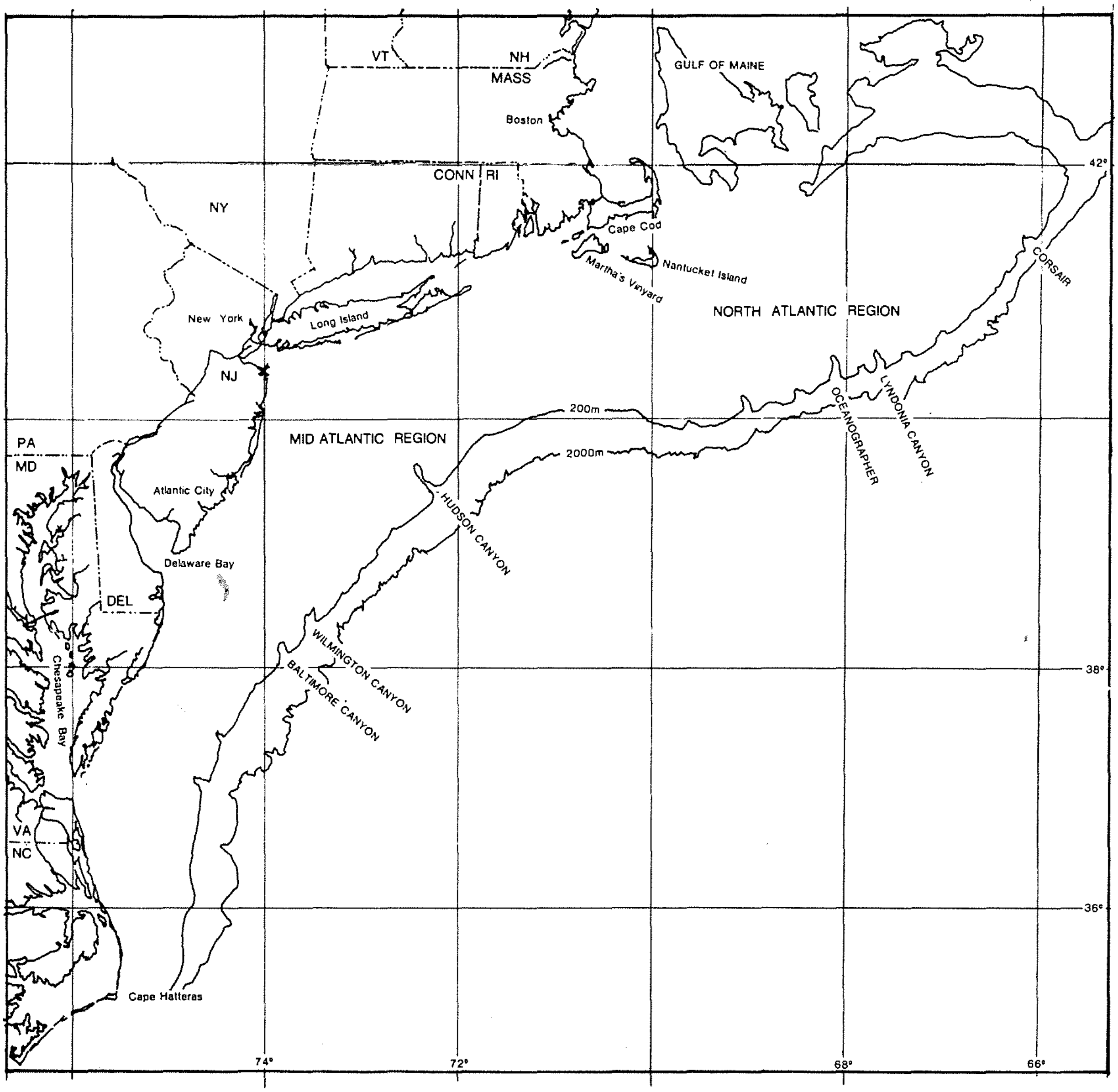
Appendix 5 indicates the BLM OCS Office responsible for those statements, and their addresses. Statements may be examined in or obtained from these offices. A list of libraries within the region which have been provided copies of the statements is also available through the OCS Offices.

A. Atlantic Region

1. Geology

In the frontier North Atlantic area, extensive geophysical evidence indicates that the Georges Bank Basin, a northeast-trending downwarped continental basin, is a site of probable traps, reservoirs and seals adequate for trapping oil and gas. However, drilling in the nearest exploration province, the Scotian Shelf of Canada, has not demonstrated commercial quantities of oil and gas. Based upon seismic data, 25,000 feet of Jurassic (and probably Triassic) through Quaternary sediments are present. Operations on Georges Bank will encounter large migratory sand waves and strong tidal and storm currents, exposing all structures to bottom scouring and foundational instability. Upper slope or canyon head operations will expose structures to unstable, steep slopes with potential for mass sediment movement.

Figure III-1
Atlantic Region
(Mid- and North Atlantic Portions)



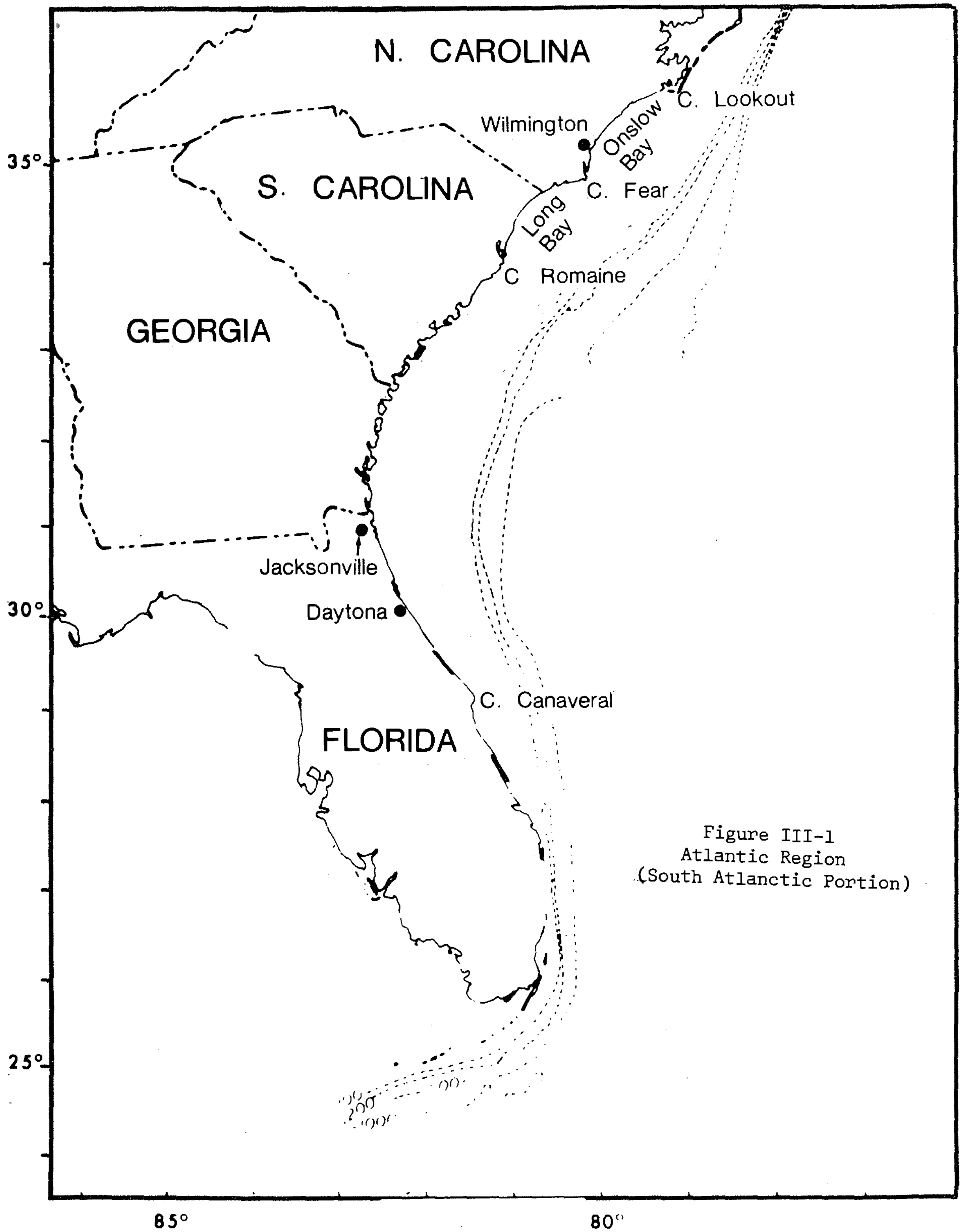


Figure III-1
Atlantic Region
(South Atlanctic Portion)

The Mid-Atlantic (Baltimore Canyon Trough) region has demonstrated hydrocarbon shows in three exploratory wells and in one of two COST wells drilled. There have been five gas shows reported in the three exploratory wells, with one of these showing traces of both gas and oil. Commercially producible quantities have not as yet been proven as a result of Sales #40 and 49 exploration drilling. Large domal structures have been tested as dry by several wells; however, other structural and possible stratigraphic traps are being tested. Geologic hazards in the Mid-Atlantic predominate on the Upper Slope and at canyon heads, where potentially unstable slopes and seafloor slumping have been reported seaward of the entire length of the shelf edge.

In the South Atlantic, the COST No. GE-1 well is the first deep stratigraphic test to be drilled. The well was drilled within the Southeast Georgia Embayment to a total depth of 13,254 feet. Data from this well shows potential hydrocarbon reservoir units are present within the carbonates in the uppermost section, as well as in sandstone beds. While the carbonate section overall appears to be thermally immature, the upper half penetrated in the well shows the greatest potential. Sandstones are believed to be potential to a depth of at least 10,000 feet.

No production has been established for this region. However, exploratory drilling as a result of Sale #43 has began.

The Blake Plateau area offers the potential of a thicker marine section than is present in the South Atlantic area. The basement is covered by marine sedimentary rocks of Jurassic to Cenozoic age. The sediments above economic basement form a seaward thickening wedge terminated by a reef off the southern Blake Plateau and exceeding 14km in the thickness beneath the southern Blake Plateau Trough. Stratigraphic traps formed by pinchouts, barrier islands, channel sands, etc., might be anticipated beneath the Inner Blake Plateau. Some carbonate banks have been interpreted beneath the Outer Blake Plateau; these, too, might act as hydrocarbon traps.

Geologic hazards include potential slumping and mass movement of sediments, particularly in areas of steep slopes associated with the upper slope and submarine canyons. Shallow gas deposits and active faults are other geologic features that exist in localized areas.

2. Physical Oceanography and Meteorology

The physical environment adjacent to the Atlantic coast is not a particularly harsh one. The relatively benign set of average conditions is occasionally punctuated, however, with extremes which may be considered limiting to offshore operations.

Surface winds play a critical role in determining the movement of spilled oil and other pollutants in the marine environment. Additionally, wind driven waves may be the most serious weather induced problem affecting shipping and offshore development. The prevailing surface winds over the region are from the west. Throughout the area there is a general shift to the northwest during winter and the southwest during the summer. Winds from the northeast usually present the greatest threat of severe weather to the offshore region. Foul weather is most common during the winter season (November to April).

Nor'easters (extratropical cyclones) are more frequent and intense between October and April. Formation usually occurs between 30 and 40 N and within 100 miles of the coast, with maximum severity occurring between New England and Canada. Winds of gale or hurricane force can occasionally occur. The maximum sustained 100-year wind is 102 knots.

The northeastern United States is rarely affected by the passage of hurricanes. The South Atlantic coastal region has generally experienced tropical cyclones of one type or another (tropical storms, tropical depressions or hurricanes) as early as May 28 and as late as December 3. Portions of the region near Miami, Charleston and Cape Hatteras are the most likely to experience a hurricane in any one year.

Present frequency of periods of limited visibility is variable throughout the region. At Nantucket Shoals, July is commonly the month with the greatest percent frequency of fog that limits visibility to less than one mile (47.5%). Frequency of occurrence of fog is much lower in the southern portions of the region.

The waters of the Atlantic coastal region may be characterized as having a complex and seasonally dependent pattern of circulation. Seasonally varying winds and irregularities in the coastline result in the formation of a complex system of local eddies and gyres. Currents tend to be strongest during the peak river discharge period in late spring and during periods of highest winds in the winter. In late summer when winds are light and estuarine discharge is minimal, currents tend to be sluggish, and the water column is generally stratified.

In general, waters of the east coast exhibit a westerly to southwesterly drift gradually becoming more southerly trending close to the Virginia Cape. This drift becomes transient off North Carolina, South Carolina and Georgia. Major factors influencing circulation along the southern portion of the coast are density gradients caused by salinity differences, the prevailing wind pattern, and the Gulf Stream. The Gulf Stream forms northwest of Little Bahama Bank and flows northward paralleling, to some degree, the continental margin. However, in the vicinity of Cape Hatteras it swings eastward away from the continental margin.

During the winter months, waves greater than 20 feet occur nearshore less than 2% of the time, and up to 5% of the time farther offshore. The median significant wave height (the 50th percentile) is approximately 4 feet during winter and 2 feet during summer. These relatively low wave heights do not eliminate the possibility of exceptionally high waves occurring from time to time. For example, in the Mid-Atlantic region, once every five years a maximum wave height of 17.5 meters can be expected, while once every one hundred years one of 26.2 meters can be expected. In the South Atlantic region, estimated maximum wave heights are somewhat lower than a 16 meter maximum expected every 25 years and a 20 meter maximum expected every 100 years.

3. Marine Habitats and Resources

a. General Description: Productivity in the Atlantic is highest nearshore where nutrient input from the continent is concentrated. Levels of productivity decrease seaward across the shelf and then peak again at the shelf edge where deep ocean currents bring in nutrient rich water.

Generally, there are three faunal zones along the Atlantic coast which are characterized by different faunal assemblages although considerable overlap does occur. North of Cape Cod is a cold water or boreal assemblage characterized by Gadids such as cod and haddock. The area from Cape Cod to Cape Hatteras, the Mid-Atlantic area, is a transitional zone mixing the cold water assemblages to the north with the warm temperate assemblages from south of Cape Hatteras and is characterized by Penaeid shrimps, Sciaenids, such as seatrouts, and snappers, groupers, and porgies.

Within in each zone seasonal onshore-offshore movements are typical for mobile organisms. Coastwise seasonal migrations are typical in each of the zones also. Migrations of anadromous fish such as striped bass and shads occur in both the North and Mid-Atlantic areas, bluefish migrations occur in the Mid- and South Atlantic, and king and spanish mackerel migrations are typical of the South Atlantic. Oceanic pelagics such as billfish and tunas migrate through all three zones. Whales also migrate through the area.

The benthic assemblages can be classified by substrate type roughly, soft and hard. The soft substrates, such as sand and muds are really the predominant type, especially in the Mid- and South Atlantic. Hard bottom substrates such as rocky outcrops, favor the accumulation and concentration of attached epibenthos, such as corals, seafans, sea whips, and algae and associated pelagic organisms. Marine turtles are known to occur around livebottoms in the South Atlantic. Habitat availability is probably the major limiting factor to the overall production of the organisms associated with hard/live bottom communities.

The soft substrate are inhabited by creeping and burrowing benthos and generally, but not always, support less biomass per unit area than hardbottom communities.

b. Habitats and Resources of Special Concern: The fish fauna of the western Atlantic represents a resource of particular concern. Fisheries resources and migration are discussed above. Many species of fish have planktonic eggs and most have planktonic larvae. Spawning is concentrated nearshore in shallow, inshore areas of estuaries and embayments and offshore on relatively shallow coast and bank areas. Several important species, yellowtail flounder, American plaice, silver hake, Atlantic mackerel and red hake among them, spawn over long periods of time in large areas of the western Atlantic. For some species, spawning results in an aggregation of fish in small, well-defined areas. Anadromous species are a good example.

Most fish in the western Atlantic spawn from late winter to midsummer, often beginning in the more southern reaches of the area and proceeding northward. For fish spawning over wide areas, as much as several months may be involved to complete spawning from the southern to the northern extremes. The planktonic period (through the egg and larvae stages) may last as long as 5 months, depending in part upon water temperature. For most species, specific geographic sites are not selected consistently every year for spawning. Rather, the location of most intense spawning and the areal extent of spawning varies annually.

Perhaps 34 species of pelagic birds are found in the Mid-Atlantic and New England areas, with as many as 30 of these species common to both. The largest concentration of pelagic birds are found in upwelling areas and areas of high productivity. These areas may also have high commercial fishing value, such as Georges Bank. Several species of pelagic birds breed in the North Atlantic area, including razorbill, common puffin, black guillemot, Leach's petrel, arctic tern, great black-backed gull an herring gull. The major nesting colonies are concentrated along the offshore islands off the coast of Maine.

There are 7 endangered species of marine mammals occurring in the Atlantic: the blue whale (not in South Atlantic), the fin whale (not in South Atlantic), the humpback whale, the right whale, the sei whale, the sperm whale and West Indian manatee (South Atlantic only). Endangered turtles are: the hawksbill, which is rare in the Mid- and North Atlantic; the leatherback, the Kemp's Atlantic ridley, the green turtle, and the loggerhead turtle. Coastal endangered species include the bald eagle and peregrine falcon, and in the South Atlantic only, the brown pelican and everglades kite.

At least 190 canyons dissect the slopes between Labrador and Cape Hatteras and their distribution conforms closely to the proximity of the Wisconsin ice sheet. Biologically, the canyons appear to be especially productive, both from a viewpoint of the pelagic and benthic habitats. They act as channels between the upper shelf and the ocean floor, and as such may act as a potential pathway for flow of materials, including nutrients and pollutants.

Canyons tend to be more diverse biologically in terms of trophic types of the organisms present. Various species have discrete depth ranges, while others are not so narrowly confined. In general, there is a pattern of gradual species replacement with increasing depth. Corals, both alcyonarians and scleractinians, can be found in many of the canyons as well as in deep slope areas. Those populations in canyons, however, tend to be denser and more diverse. Certain species of coral are found only in canyons because of their requirement for a firm substrate. Some of the canyons located in the more northern portions of the Atlantic contain "pueblo" communities. These communities consist of terrain on slope areas marked by burrows and excavations, and occupied by lobsters, eels, red crab and tilefish. The pueblo communities may act as nursery grounds for the offshore lobster populations.

In addition to corals occurring in more northerly submarine canyons, substantial coral resources are located in the South Atlantic region. These include: Onslow Bay coral patches, the corals of the low-relief hard bottoms in the Southeast Georgia Embayment, the deepwater coral banks on the Blake Plateau and the Florida Keys Reef Tract. The coral patches in Onslow Bay are of immense scientific interest and importance because both hermatypic and ahermatypic corals exist where winter bottom temperature are as low as 10.6°C. These temperatures are significantly lower than previously assumed minimum temperatures for the survival of tropical reef corals.

Coral banks have been identified from the northern end of the Blake Plateau and probably exist throughout this area. The mapped area of about 1200 to 1500 square miles contains approximately 200 features which range from 30 to 500 feet in relief from a depth of 400 fathoms.

The coral reefs offshore Florida form a discontinuous arc, 195 miles long from Dry Tortugas to Fowey Rock (near Key Biscayne). These coral reefs represent the only such ecosystem bordering continental North America. Although isolated coral heads are found throughout the area (approximately 800 sq. miles), true living coral reefs are concentrated on the Outer Continental Shelf. The coral reefs occur as linear ridges along the western boundary of the Florida Current, or as patch reefs located landward of the barrier reefs.

4. Other Uses of the OCS

a. General Description: Oil and gas operations in the Atlantic OCS have been competing and will continue to compete with many other uses of the marine environment. On the open shelf areas competition will exist with shipping, for which designated traffic lanes have been proposed by the Coast Guard for ships approaching the heavily trafficked ports; with commercial fishing, with which space use and fishing gear damage are at issue, as well as loss of catch due to oil spills, especially in the extensively fished Georges Bank region; with recreation along the many heavily utilized sandy beaches from New England to the east coast of Florida; with facility siting at small coastal ports and in the heavily populated Mid-Atlantic upland regions, with effects on air and water quality; and with military and NASA operations conducted over the shelves. In addition to these uses, interim ocean dumping sites are also in use along the Atlantic coast.

b. Uses of Particular Concern: Traffic Separation Schemes (TSS) have been implemented by the Coast Guard and recognized by the Intergovernmental Maritime Consultative Organization (IMCO) to aid in the prevention of collisions in the vicinity of major harbors. An additional vessel control scheme has been proposed by the Coast Guard and is under consideration by the Army Corps of Engineers. Termed Port Access Routes (PAR's), these navigation lanes would extend seaward from the present termination of the traffic separation lanes of the TSS system out to the 1000 fathom contour. The concept would consist of four parallel lanes, two of which would be used for traffic (one for inbound and one for outbound vessels) for a period of two years. The area crossed by the other two lanes of the system would be available for OCS development including the siting of exploratory rigs during the period. At the end of the two years the lanes would reverse allowing exploration activity in the lanes previously restricted to ship traffic. Public hearings were conducted in late November 1978 on the PAR concept but no final decision on implementation has been taken.

The commercial fisheries of the Mid-Atlantic Bight nearly parallel those of the New England area in terms of value and exceed New England volumes by a considerable extent, when Chesapeake Bay is included. In 1978, landings for the Mid-Atlantic States (including the Chesapeake area) were almost 800 million pounds worth 172 million dollars. Several species are extremely valuable to the Mid-Atlantic fishery, including menhaden, Atlantic mackerel, surf clam, hard clam, blue crab, whiting, red hake, sea scallop, oyster, butterfish and scup. The average value for shellfish is about 25 percent greater than that of finfish while being 80 percent less in volume. Almost all species have increased in value during the last few years, while volume of some important species such as surf clam has declined precipitously. The menhaden fishery is extremely important to the Mid-Atlantic, and also to the U.S. fishery as a whole.

Important Mid-Atlantic fishing ports in terms of quantity of fish and shellfish landed are (in order of decreasing volume) Beaufort-Morehead City, N.C.; Cape May-Wildwood, N.J.; Hampton-Norfolk, Va.; Wanchese, N.C.; Point Pleasant, N.J.; Ocean City, Md., and Cape Charles-Oyster, Va.

The Northwest Atlantic area is one of the most productive fishing areas in the world. In 1978, almost 661 million pounds were landed, worth about 257 million dollars. This is an increase in volume above that recorded for 1977 (581 million pounds) as well as in value (203 million dollars in value in 1977). Important New England species include haddock, cod, whiting, yellowtail flounder, Atlantic herring, red hake, American lobster, sea scallop, pollock, ocean perch, soft clam, Atlantic mackerel, grey sole and American plaice. The average annual value of shellfish is almost 50 percent greater than for finfish (for the year 1970-76).

Important New England ports in terms of quantity of fish and shellfish landed are (in order of decreasing volume) Gloucester, MA; New Bedford, MA; Pt. Judith, R.I.; Portland, ME; Rockland, ME; Boston, MA; Provincetown, MA, and Newport, R.I.

U.S. commercial fisheries landings for the southeastern Atlantic States amounted for 398 million pounds in 1978 (valued at $96 million). Shrimp, accounting for 7% (in 1975) of the U.S. total shrimp catch, is the region's most value commercial fishery resource. Blue crab, menhaden, flounder, oyster and king mackerel follow in order of value of catch.

In the Atlantic during 1970 (the most recent survey), about 5 million recreational fishermen caught 918 million pounds of finfish. Species which dominate the catch in the South Atlantic (which constitutes the largest recreational fishery in the Atlantic) include bluefish, dolphins, groupers, grunts, jacks, king mackerel, porgies, weakfish and yellowtail snappers. In the Middle Atlantic, the following species prevail: bluefish, Atlantic mackerel, spot and striped bass. In the North Atlantic principal species are bluefish, cod, winter flounder, Atlantic mackerel and striped bass.

The South Atlantic marine environment is of particular recreational interest to sports fishermen and a small but growing number of scuba divers. Most recreational fishing and scuba diving in the South Atlantic is focused around the natural and artificial reefs in the nearshore and offshore areas. All the South Atlantic States are actively involved in the development of artificial reefs to facilitate and enhance recreational pursuits in the marine environment.

Recreational boating also takes place in the Mid- and North Atlantic offshore regions. However, areas of petroleum potential in those regions are located 50 or more miles from shore. Only a small portion of recreational craft range this far offshore.

Since publication of the Marine Protection Research and Sanctuaries Act in 1974, two sanctuaries, the Civil War ironclad vessel USS Monitor located southeast of Cape Hatteras Light, and the Key Largo Coral Marine Sanctuary, have been approved in the Atlantic region. Currently, there are at least 25 recommended marine sanctuary sites in the Atlantic, occurring in both territorial and Federal waters. The size of these sites varies greatly from a few to several thousand square miles.

A substantial portion of the water and air space of the Mid-Atlantic and South Atlantic (and to a lesser degree the North Atlantic) continental shelves and adjacent shorelines are used for various military operations. These operations include training and testing activities such as submarine operations, gunnery practice, sea trials, radar tracking, vessel maneuvers, and general operations. Specific operations areas and type of activity permitted within each are delineated in maps published by the Defense Mapping Agency, the Coast Pilot publications, and the CINCLANTFLT Instruction Title 3120.26, Atlantic Fleet Operation Areas.

5. Coastal Habitats and Resources

a. General Description: The major portion of the Atlantic coastline is used for recreational purposes. Coastal-related activities include beach use, swimming, boating, picnicking, fishing, hunting of waterfowl, and nature interpretation. Coastal wetlands that exist along estuaries and embayments are critical and vulnerable environments that provide nutrients and habitats for a wide variety of coastal and marine organisms. Migratory and breeding habitat for waterfowl and shorebirds is in the north. The greatest concentration of waterfowl occurs in the Chesapeake Bay area--the nation's largest estuary.

Evidence of prehistoric occupation of the coastal area of the Atlantic region from the earliest Paleo-Indian period through the Archaic and into the Woodland periods (which lasted until contact with the first European settlers) is found throughout the area from the tidal zone landward. Rudimentary sites from early cultures and larger habitation sites and burial complexes from the later periods are also located in considerable numbers.

The coastal areas of the Atlantic States have been prominent in American history from earliest colonial times. The region contains many buildings, structures, and sites that are important to the preservation of American history, architecture, and culture. The majority of these are located inland from the surf/tidal zone and would be unaffected by any OCS-related activity. Coastal fortifications and lighthouses typify historical sites found within the surf/tidal zone, and are often protected by various means such as bulwarks or other barriers.

b. Habitats and Resources of Special Concern: There are approximately one million acres of coastal wetlands in the Mid- and North Atlantic. Chesapeake Bay, the extensive wetlands landward of the barrier island chain from Long Island south, and Delaware Bay, provide spawning and nursery habitat for many species. Numerous coastal embayments in the North Atlantic also provide extensive wetland habitat; seventy percent of the commercially important fish and shellfish species in the North Atlantic are estimated to use these systems for spawning, nursery or feeding. The 2,650 miles of nearly continuous estuary/beach systems in the South Atlantic also provide valuable habitat. Wetlands in the South Atlantic provide habitat for the greatest numbers of migratory waterfowl and breeding shorebirds on the Atlantic coast.

The coastal zone of the Atlantic region lies within the Atlantic Flyway. The largest wintering populations are scaup, black duck, mallard, canvasback, and the snow goose. Marsh areas of most bays are important waterfowl habitats. Particularly important are Raritan Bay, Chesapeake Bay and Currituck-Albemarle-Pamlico Sound. Important nearshore areas are the Nantucket Sound-Nantucket Shoals area, off eastern Long Island, off the Virginia Capes, and off the Outer Banks of North Carolina. In addition to waterfowl, coastal areas support waders and shorebirds.

During 1977, all of the States within the Mid- and North Atlantic region had areas that were classified non-attainment for one or more air pollutants. The air quality of the South Atlantic States is generally good, but, major urban centers and their environs experience high pollution concentrations. Photochemical oxidants (ozone), suspended particulates, and carbon monoxide were the pollutants most often occurring in violation of standard levels.

6. Socioeconomic Factors

a. General Description: The northeastern United States has been characterized as a megalopolis with intensively developed urban and industrial uses running virtually continuously from Boston to Washington, D.C., at the same time, much of the coast along the North and Mid-Atlantic is rather sparsely populated, not only in the more rural States such as Maine and New Hampshire, but also in the more urban States from Massachusetts down through Virginia. The South Atlantic region, like the South as a whole, has been transformed from an agriculturally based economy into a manufacturing economy and has reversed a trend of out-migration.

Major ports are located along the Atlantic coast, with the majority of commerce in most ports consisting of shipments of petroleum products and crude oil. Total vessel traffic decreased substantially for most coastal ports between 1973 and 1976, probably due to increased use of container shipping facilities.

Natural gas, crude oil and petroleum product pipelines are found in the North and Mid-Atlantic areas. The Portland-Montreal Pipeline System originates in coastal Maine and carries crude oil to Montreal. No major crude oil pipeline exists in the Mid-Atlantic or South Atlantic. The natural gas transmission system traverse the entire coastal region. In the South Atlantic, petroleum products are brought into the area by pipeline or tanker, largely from Texas and Louisiana. New England, as a region, incurs above average costs for petroleum products.

There are 14 operating refineries along the Atlantic coast with a capacity of 1,615,300 barrels per calendar day (b/cd) (Oil and Gas Journal, Annual Refining Survey, 1979). The majority of this is refined in the Mid-Atlantic region. Petroleum refining in the North and South Atlantic is minor.

b. <u>Factors of Particular Concern</u>: The Davisville/Quonset, Rhode Island port complex is located along the west passage of Narragansett Bay approximately twenty miles south of Providence. This complex has served as the supply base for OCS exploration activities in the Baltimore Canyon, and is situated so that it could serve the same function for exploration activities on Georges Bank.

Service vessels require ports with water depths of 15 to 20 feet and dockside space of 100 to 200 feet per vessel, with ancillary services available. While these types of facilities are normally not available in ports serving primarily pleasure boats, they are found in ports which berth commercial fishing vessels.

There is little offshore petroleum extraction infrastructure developed in the South Atlantic. Exploration activities resulting from Sale 43 have not resulted in large established supply bases as yet.

Severe winters in the North Atlantic States, result in a beach use season which is quite short, primarily limited to July and August for most recreational activities. Mid-Atlantic States have a somewhat longer season. However short the season, coastal-related tourism is a significant factor in the economies of these States. On Long Island, New York (Nassau and Suffolk Counties), it was estimated that $257 million is spent annually on beach-related recreation. (Long Island State Park and

Recreation Commission, 1977. Assessment of Impacts of Proposed OCS Activities on Long Island's Shoreline Recreation Industry.) On Cape Cod, Massachusetts, during 1977, 9,153,740 visitor days for the purposes of Recreation/Sightseeing/Entertainment resulted in expenditures of $234,069,000. Of this, 54.8% of the visitor days and 53.0% of the dollar total spent occurred during July and August. Tourism is also an important economic factor in the South Atlantic coast. In Florida, tourism is the number one industry, accommodating over 25 million visitors annually.

B. Gulf of Mexico

1. Geology

The continental shelf margin of the eastern Gulf of Mexico is dominated by the Florida Platform consisting of a massive sequence of carbonate and evaporite deposits of Mesozoic and Cenozoic age. The major structural features of the region are DeSoto Canyon, the Southwest Georgia Embayment, the Ocala Uplift, the Peninsular Arch, and the South Florida Basin.

The results of drilling to date in the eastern Gulf are discouraging. Major potential exploration targets in the area are stratigraphic pinchouts, shelf margin reef facies, and structural traps associated wth salt tectonics, growth faults, and anticlines.

The northwestern Gulf shelf and slope overlie the Gulf Coast Geosyncline. This geosyncline is an extremely thick terrigenous clastic (interbedded sand, silt, and clay) sequence that extends from northeastern Mexico to southeastern Louisiana. The locus of maximum deposition has migrated northeastward from south Texas beginning in the Eocene to southeast Louisiana at the present. As a result of the overall pattern of marine regression the axis of this thick clastic sequence has shifted steadily gulfward. Consequently, the resulting deposits form a pattern in which succesively younger rock units occur progressively farther seaward than the underlying older units.

Five major structural elements referred to as the Rio Grande Embayment, the San Marcos Arch, the East Texas or Houston Embayment, the Sabine Arch, and the Mississippi Embayment are aligned transverse to the axis of the Gulf Coast Geosyncline.

Hydrocarbon potential on the Federal OCS has been established in sediments ranging from Miocene to Pleistocene, in structural traps such as anticlines, growth faults, and salt and shale diapir associated traps, as well as in a myriad of stratigraphic traps. There were approximately 358 fields on the Federal OCS of the Gulf of Mexico as of December 1978. Of these 238 primarily produce gas and 89 primarily produce oil. In the remaining 31, production or productivity has not yet been determined. Production depths range from about 300 m to 5550 m, with most production occurring between 2600 and 3900 m. USGS records show that 4.9 billion barrels of oil and condensate and 39.2 trillion cf of gas have been produced from Federal OCS lands as of December 1978.

Unstable bottom sediments, and shallow gas deposits, are primary geologic hazards which exist in the Gulf of Mexico. Mudflows and slumps are common near the Mississippi Delta. Karst topography is also present on the west Florida Platform.

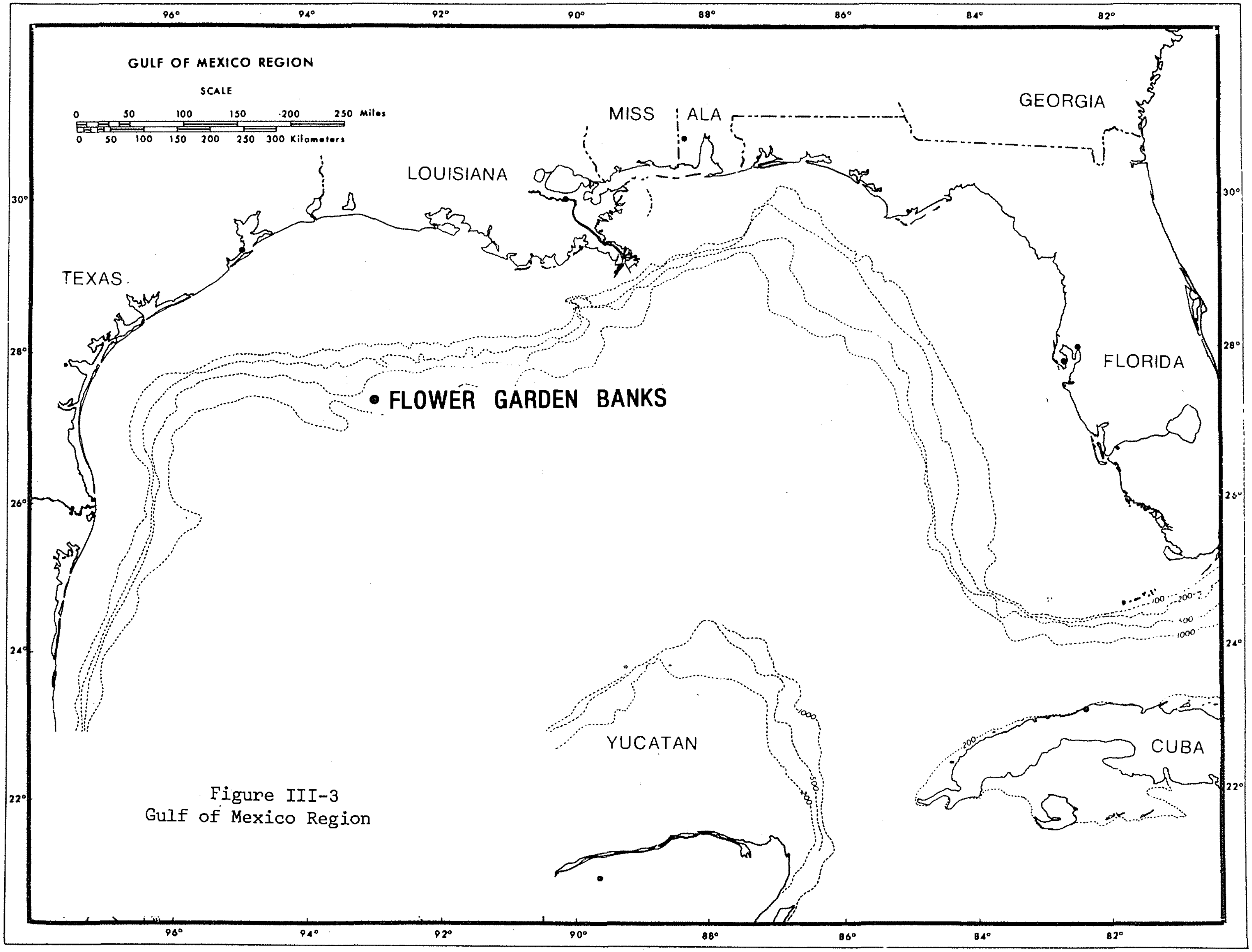


Figure III-3
Gulf of Mexico Region

2. Physical Oceanography and Meteorology

In general, the large scale circulation in the Gulf of Mexico is attributable to four major factors: Yucatan Currents, tides, winds, and river discharges. The Loop Current is a major feature of the Central and Eastern Gulf. It is a continuation of the Yucatan Current that enters the Gulf of Mexico through the Yucatan Straits. Although the current shows great annual and seasonal variability in magnitude and course, in general, it penetrates some distance into the Gulf, turns clockwise and exits through the Florida Straits. Large eddies frequently separate from the main current and drift into the western Gulf; these spin-offs decay over a period of three to six months. No significant permanent or semi-permanent shelf currents exists in the western Gulf as a result of the Loop Current.

Along the continental shelf in the Gulf of Mexico there is a general westward movement of currents. The nearshore regime in this area is influenced by several factors, among them winds, tides, offshore current flow and fresh water discharge from coastal rivers. In most areas significant winds are the major control of surface currents.

Surface currents in the western Gulf of Mexico shift seasonally and, in general, reflect the prevailing winds over the area. Currents from September through February are southwesterly with indications of an alongshore or offshore movement in November and December. A period of transition occurs in March-May when currents shift to west then to the northwest. Surface current flows north and east alongshore in June and July. Finally, in August, currents are westerly before resuming the September regime.

Easterly waves and tropical storms appear in the Gulf during late summer and early fall. The principal paths of tropical storms into the Gulf are through the Yucatan Channel and Straits of Forida. Over half of these tropical storms become hurricanes during this season.

The largest and most destructive storms affecting the Gulf of Mexico and adjacent coastal zones are tropical cyclones. These have their origin over the warm tropical waters of the central Atlantic Ocean, Caribbean Sea or southeastern Gulf of Mexico. They occur most frequently between June and late October and there is a relatively high probability that tropical cyclones will cause damage in the Gulf of Mexico each year.

Warm, moist Gulf air blowing slowly over chilled land or water surfaces brings about the formation of the fog. The period from November through April has the highest frequencies of low visibilities. Generally, coastal fogs last three or four hours although particularly dense sea fogs may persist for several days.

3. Marine Habitats and Resources

a. General Description: The benthic habitats can be divided by faunal assemblages into the white shrimp grounds or inner shelf (327 m), the brown shrimp grounds or midshelf (2290 m), the shelf break (90182 m), and deeper, the slope. The inner shelf area is dominated by estuarine associated fauna. The midshelf area is composed of a fauna which is largely estuarine independent, and for demersal fishes, supports a greater biomass and richer fauna than the inner shelf area. The Central and Western Gulf have a nepheloid layer near the bottom throughout much of the area. Because of this, macroalgae are not abundant.

Based on an inventory of known and existing coastal archaeological sites and the suspected sea level transgressions, PaleoIndians could have potentially inhabited what is now the continental shelf as long as 50,000 years ago. Direct evidence of specific inundated marine sites has not been documented to date with the exception of a few shallow water, nearshore sites bordering the existing shoreline.

Documented evidence of approximately 2,000 potentially significant historic shipwrecks are known in the Gulf of Mexico between 1520 and 1945. Seventy percent of these wrecks are from the 19th and 20th centuries and any remains from approximately two-thirds of these shipwreck losses are expected to be within 1.5 kilometers of the existing shore line, particularly in the vicinity of historic port locations and inland passage ways. The U.S.S. Hatteras off Galveston, and the U.S.S. Tecumseh near Mobile Bay, and the San Jose in southern Florida are the only known shipwrecks in the Gulf of Mexico currently in the National Register of Historic Places.

b. Habitats and Resources of Particular Concern: Scattered throughout the OCS of the eastern Gulf of Mexico are areas of varying extent with little or no sediment cover and/or with hard rocky outcrops several meters or more in height. These areas may support a flora and fauna much more diverse and rich than nearby areas; if so, these aras are known as live bottom areas.

These areas are patchy or localized in character which makes accurate areal description, based on existing data, impossible. However through BLM funded studies as well as site specific surveys required of the industry by DOI regulations and lease stipulations, new information is beginning to become available.

In the central and western Gulf, live bottom areas of low relief are not found to any great degree; instead high relief banks, rising tens of meters from deep water (100-200 m) are found along the shelf breaks.

These banks provide a hard substrate, and at depths of less than 85 m a rich and diverse flora and fauna result, including corals. The most luxurious of these banks, the East and West Flower Gardens, are the northern most extensions of the Carribbean coral reef flora and fauna.

In the geographical area of the Outer Contintal Shelf from the Dry Tortugas to Brownsville, Texas there are several accumulations of reef building corals. The Texas Louisiana Outer Continental Shelf bears a series of topograhical prominences, two of which, the East Flower Garden and the West Flower Garden, are capped by tropical Atlantic coral reefs of the submerged variety. In the eastern Gulf of Mexico (west Florida Shelf) coral communities (organic banks and bioherms) are sparsely distributed in depths of 10 to 60 m over a wide area. While individual coral colonies are found as far north as Panama City, the northernmost reported coral bank assemblages are the Florida Middle Grounds.

The Florida Middle Ground is approximately 1600 km of irregular submarine terrain located on the outer West Florida Shelf. The region is characterized by steep profile limestone escarpments and knolls rising 1015 m from the surrounding sand, sandshell substrate. Depths vary from 1426 fathoms.

The Middle Ground relief is probably due to underlying Pleistocene reefs which flourished during the last interglacial period. Many ahermatypic corals now occupy the Middle Ground, but the massive reef-building genera Acropora, Diploria, and Montastrea characteristic of Carribbean West Indian reefs are absent.

Florida Middle Ground reefs are dominated by the hydrocoral Millepora and the scleractinians Porites and Oculina in deeper areas; Millepora, the alcyconarian Muricea, and the scleractinian Dichocoenia domiate shallower reef crests.

Charter boats bring recreational fishermen to the Middle Grounds to fish for snapper and grouper and some commercial fishing has taken place recently.

The West and East Flower Garden Reefs are located south southwest of Galveston, Texas, on the outer edge of the continental shelf. They represent what are currently considered to be the northernmost tropical coral reefs in the Gulf of Mexico and they contain a representative Caribbean flora and fauna. Structurally the Flower Garden coral reefs are composed of large, closely spaced coral heads up to 10 feet or more in diameter and height. The topography is therefore quite rough, with as much or more vertical and inclined surface as horizontal. Between the coral heads, sand areas are frequently encountered. The coral fauna, 17 varieties of scleractinians and one milleporid, appears less diverse than that of many Caribbean reefs and it appears that the distance from these sources, rather than unstable environmental conditions, limits the diversity of the Flower Garden fauna. Among the reef-building corals, Montastrea annularis is most important, followed by Diploria strigosa, Montastrea cavernosa, Colpophyllia natans and Porties asteroides. The fire coral, Millepora alcicornis, encrusts reefrock throughout coral zone as do various species and other epifauna.

Currently, oil and gas development activities are being carried out in the vicinity of these reefs, but development is prohibited immediately adjacent to and within the living reef complex. These areas are valuable as research sites for such subjects as marine zoogeography, biological zonation, and trophic interactions in an impoverished Caribbean ecosystem. In addition, carter boat operators offer recreational SCUBA diving charters to these reefs.

Sanctuary.

4. Other Uses of the OCS

a. General Description: Twenty-one principal ports are located in the region. The Port of New Orleans and the Port of Houston are the second and third largest ports, respectively, in the United States. Deepwater offshore oil terminals and liquid natural gas terminals have been proposed and are being considered for construction on both the Texas and Louisiana coasts.

There are two approved interim dumping sites and one approved ocean dumping site in the Gulf. The Gulf of Mexico is used rather extensively by the U.S. Navy and Air Force for conducting military training, testing and research activities. Most of these activities take place in large tracts designated as military operating areas in the western, central and eastern Gulf.

b. Uses of Particular Concern: Commercial fisheries is an important economic use of the OCS of this region. By far the most productive fishery region of the Gulf of Mexico in terms of pounds caught is located off Atchafalaya Bay, Louisiana. The Gulf fishery is dominated by the shell fisheries: shrimp, crabs, and oysters, usually worth three or four times more than the much greater volume of finfish.

The Gulf of Mexico coastal zone is one of the major recreational areas of the nation, particularly in connection with saltwater fishing, scuba diving and snorkeling.

At the time of this writing, the Office of Coastal Zone Management (OCZM), a part of the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, has under consideration a proposal to designate the East and West Flower Garden Banks, located about 90 miles south of Sabine Pass, as a marine sanctuary. The DEIS on the proposal was made available on April 12, 1979, and the proposed regulations that would apply if designation were to occur were published in the Federal Register (44 FR 22081-22088) on April 13, 1979. The proposal as it stands at this time would apply more restrictions to a larger area than are currently applied by DOI regulations and lease stipulations. A key feature would be a 5-year moratorium on all oil and gas activities on blocks leased after sanctuary designation.

5. Coastal Habitats and Uses

a. General Description: The coastal area of the Gulf of Mexico is characterized by a natural pattern of wetlands (swamp and marsh), barrier islands, bays and estuaries. Interspersed within, and in some locations superimposed on, this natural pattern of undeveloped open space is the man-made, altered and controlled environment. Undeveloped open space, both protected and unprotected, is the predominant land/water use of the Gulf coast region. However, there are significant metropolitan and urban concentrations occupying long stretches of the coast, e.g., Tampa-St. Petersburg-Sarasota, Pensacola, Mobile, Mississippi Gulf coast area, Houston-Galveston, and Corpus Christi. Most residential, commercial, manufacturing, and public and semi-public uses are located within or close to the region's urban areas and small towns. However, considerable business and non-farm residential development is found scattered along the region's roads and highways.

The estuaries, channels, embayments, swamps and marshes which are located along most of the Gulf coast shoreline are extremely valuable in terms of biological productivity. The Mississippi River Delta and its associated seven million acres of marsh and estuaries supports the third largest shrimp production and second largest oyster production in the country. East of the Mississippi Delta the proportion of estuaries in the coastal zone diminishes and high energy sand beach becomes the most common feature. The associated wetlands of the eastern Gulf are also extremely valuable in terms of biological production. Along the northwest Gulf, the marshlands diminish rapidly to a narrow coastal band, and are nearly absent in the semi-arid regions of south Texas. A significant portion of the coastal zone, however, is composed of a vast system of bays and lagoons which are engendered for the most part by the extensive system of barrier islands.

The northern Gulf of Mexico coastal zone is one of the major recreational areas of the U.S., particularly shorefront activities such as saltwater fishing (surf and pier) and beach related activities. The coastal areas from southwest Texas to southern Florida display a diversity of natural landscapes and seascapes. Barrier islands, sandy beaches, bays, sounds, river deltas and marshes along with a subtropical climate provide an ideal setting for outdoor recreation and tourism. Publicly-owned and developed areas like state parks, national seashores and wildlife refuges; privately developed areas such as resorts, amusement parks and marinas and specially designated preservation areas such as historic and natural sites and landmarks, wilderness areas and scenic rivers attract millions of residents and non-residents annually to the Gulf of Mexico coastal zone.

Tourism based on coastal recreational resources, amenities and support services is a vital part of the economy of many coastal communities and resorts along the Gulf coast.

b. Habitats and Resources of Special Concern: The Gulf coast has a wide variety of outdoor recreation opportunities which are primarily focused on (or oriented to) the region's coastal wetlands and barrier islands. About 20% of the Gulf coast shoreline is used for recreation activities (7% public and 13% private). The three national parks, over 32 state parks and numerous county and city recreation sites provide an abundance and wide variety of recreational opportunities such as swimming, boating, fishing, picnicking, sightseeing and people watching, nature study and camping.

The Gulf coast wetlands are of special concern from both an environmental and economic standpoint because they are vital not only to reproduction and breeding grounds, flood plain protection, erosion control and wildlife habitat, but also for aesthetic and recreational purposes. Numerous Federal and State conservation-wildlife management areas and preserves have already been established that serve to protect large areas of the Gulf coastal zone from intense development pressures. In Florida, a statewide system of aquatic preserves has been established to set aside certain exceptionally valuable areas for perpetual public enjoyment, and to preserve important natural ecological systems.

The beaches and coastal marshes of the Gulf have numerous species of birds. The coastal zone of the northern Gulf of Mexico provides some of the best waterfowl wintering habitat in North America. Of all these areas the coastal marshes and rice fields of Louisiana constitute one of the largest general waterfowl wintering area within the United States. Waterfowl also overwinter in the Mobile Bay, Apalachicola and Suwanee rivers area, and the coast area between Apalachicola and Tarpon Springs. Seabird rookeries occur in numerous locations along the coast.

Several endangered wildlife species occur in the region including: the eastern brown pelican, the bald eagle, five species of turtles, the West Indian (Florida) manatee, the Mississippi sandhill crane, the red wolf, American alligator, Houston toad, Attwaters prairie chicken, the whooping crane, and the Arctic peregrine falcon. Critical marine habitat areas have been designated in the State of Florida by the Fish and Wildlife Service for the endangered Florida manatee.

The Texas coastal region has a high potential for the occurrence of air pollution problems in those locations with high population and industrial concentrations such as the Houston-Galveston area. These locations have frequent air pollution episodes which endanger the health and well-being of the public. Air quality over most of the Gulf coastal zone is good with pollution problems generally confined to a few areas around heavy industrial complexes.

Water quality and pollution problems in the Gulf coast are primarily the result of inadequately treated municipal sanitary sewage and industrial wastes, urban and agricultural surface runoff, dredging operations and/or shipping. Major pollution problem locations include: the Houston-Galveston area, Lake Ponchartrain, the Calcasieu and Mississippi Rivers, the Pascagoula-Escatampa and Biloxi-Gulfport areas, Mobile Bay, the Tampa Bay area and many of the other estuarine areas of the Florida Gulf coast.

6. Socioeconomic Factors

a. General Description: The Gulf Coast should properly be divided into an eastern and western area because the regions have such great differences. Both areas have shifted from agriculture into other industries, however, east of Mobile Bay industrial development has generally been light. The western Gulf has seen an enormous amount of industrial activity, largely connected with petroleum. East of Mobile Bay the Gulf Coast contains very few pipelines and only one small (5,000 b/d) refinery at St. Marks, while the western Gulf has the largest petroleum complex in the western hemisphere. The western Gulf also has the largest commercial fishing industry in the U.S. The eastern Gulf fishing industry is largely connected with recreation and tourism.

Western Gulf ports include Houston and New Orleans, two of the largest ports in the U.S. The eastern Gulf contains Mobile. Smaller ports in Texas and Louisiana are geared to commercial fishing, oil imports and exports, and offshore petroleum related services. Similar eastern Gulf ports are oriented towards recreational boating and fishing and commercial fishing.

b. Factors of Particular Concern: The western Gulf has the most developed OCS-related infrastructure in the world. The exploration rig and platform construction yards, diving companies, etc., service OCS activities all over the world. The capacity of these facilities is expanding and linked to worldwide OCS activity. The eastern Gulf has adequate facilities to support the present level of petroleum exploration activity which has been ongoing since 1959. The bases in Alabama and Florida are small, but should oil be found, expansion would have to take place.

Tourism is an increasingly important part of the economies of the Gulf states. Much of the tourism and recreational activity is oriented around the beach and ocean. For both the eastern and western Gulf, the tourist and recreational industries are much more important to the eastern Gulf than to Texas and Louisiana.

The northern Gulf of Mexico is our Nation's most popular sports fishing marine environment. In 1975 the Gulf of Mexico was responsible for 35 percent of the total national economic activity related to saltwater fishing. There is a large tourist as well as resident demand for deepsea recreational fishing in the Gulf of Mexico and over 200 boat-for-hire businesses are accomodating this need for the towns and resort communities bordering the Gulf of Mexico shoreline. Most of the marine recreational fishing and scuba diving are focused around the natural and artificial reefs known to exist in the Gulf of Mexico. Natural and several hundred artificial reefs constructed specifically to attract fish are the prime recreational destination areas in the eastern Gulf, whereas the more than 3,000 oil and gas structures mainly off Louisiana, and a few artificial reef specifically developed to attract fish are the focus of recreational fishing interest and scuba diving in the central and western Gulf of Mexico.

Port uses in the western Gulf are merely adapted to OCS activity but the small ports of the eastern Gulf might have some problems in accomodating fishing, pleasure craft and supply boats.

C. Pacific Region

1. Geology

As of January 1, 1978, there were 13 fields in the federally controlled portion of the Pacific OCS recognized as producing or capable of producing. All of the fields are located in southern California, 12 in the Santa Barbara Channel, and a single field in the San Pedro Basin. Seven of the fields are oil fields and six are a combination of oil and gas. As of January 1, 1978, none of the fields in the southern Californa OCS were fully developed. Of the 13 recognized fields in Federal waters, only two, Dos Cuadras Offshore and Carpinteria Offshore, have platforms installed and are now producing.

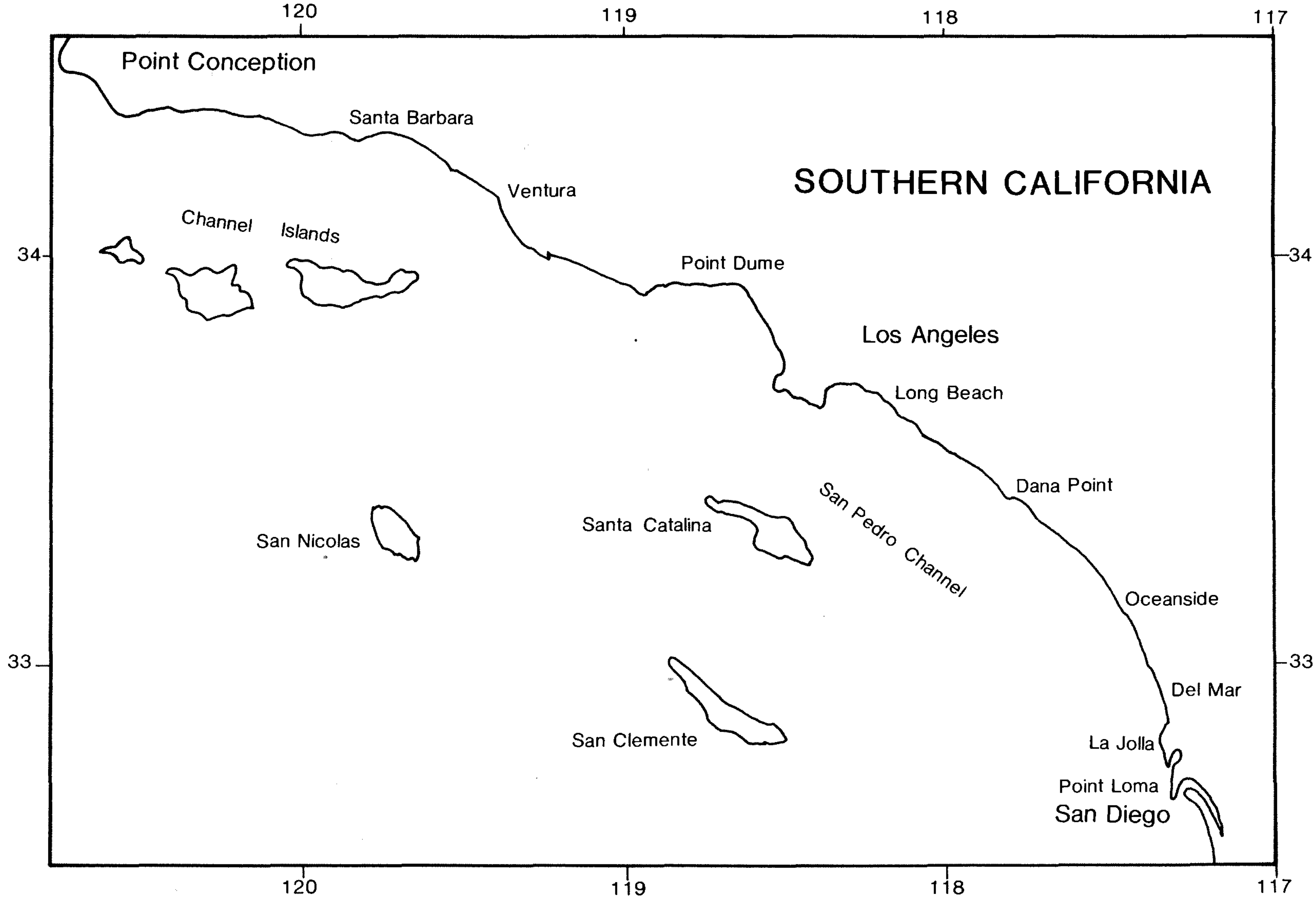


Figure III-4
Southern California Region

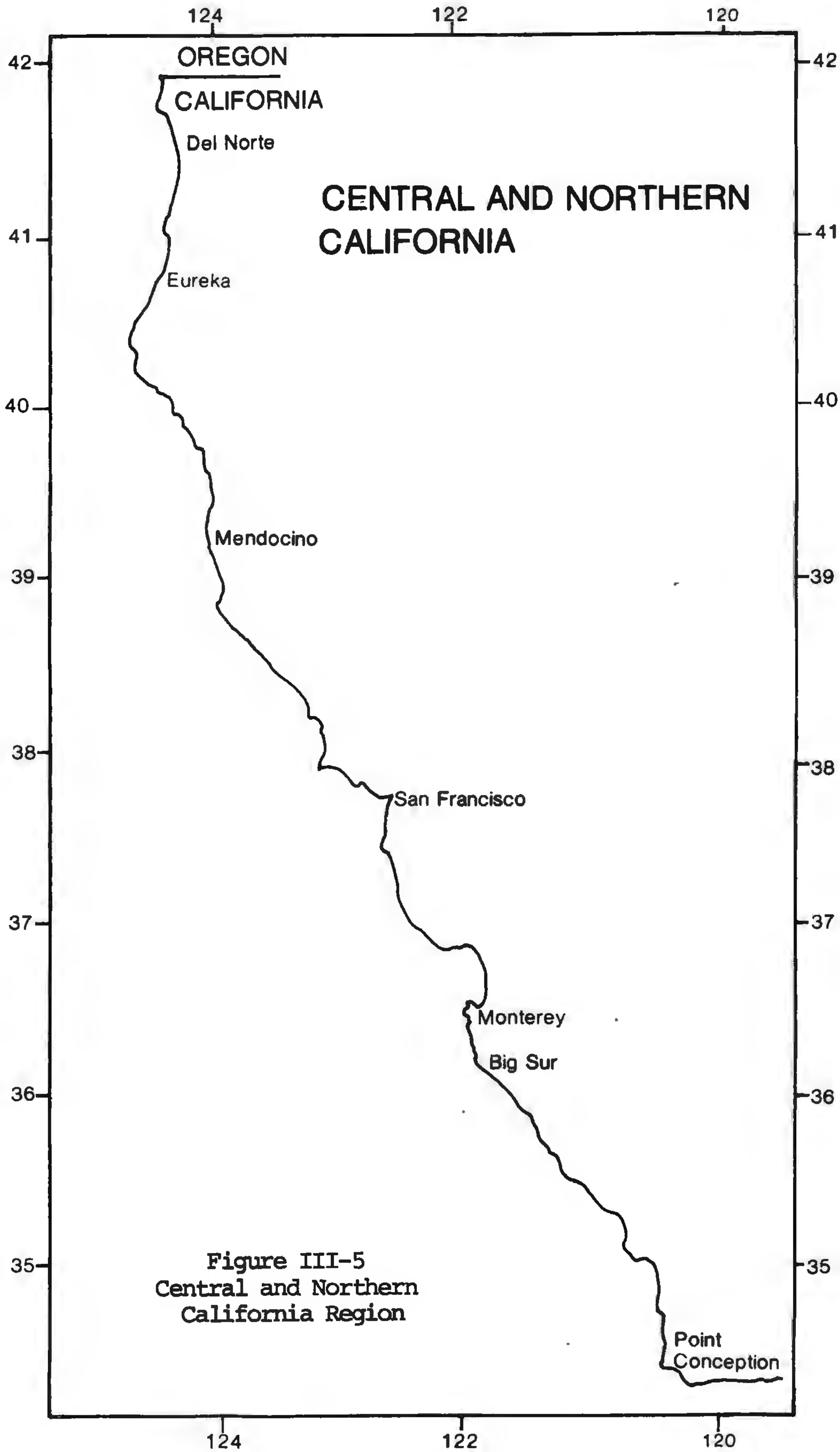


Figure III-5
Central and Northern
California Region

A platform is set on a third field, Hondo Offshore, and developmnent drilling began in 1977.

Potential petroleum offshore of southern California is extrapolated largely on the basis of development of analogous onshore regions. Further information comes from such geologic parameters as thickness of Neogene sediments, burial and thermal history, limited exploratory drillings, and structural characteristics and tends to substantiate low estimates of petroleum potential, at least for the outer basins. The continuation of favorable onshore stratigraphic and structural trends has been confirmed in the Santa Barbara Channel. Fractured marine shales and numerous potential structural traps have been identified, along with thick sandstone sections that offer good reservoir capabilities.

The portion of offshore central and northern California that is considered for the proposed OCS Lease Sale 53 includes parts of five separate provinces of the Pacific Coast offshore region. These provinces are, from north to south, Eel River, Point Arena, Bodega, Outer Santa Cruz, and Santa Maria Basins. Offshore oil and gas development has not occurred, to date, in these basins. Hydrocarbons encountered in offshore exploratory drilling were not deemed economic under prevailing economic conditions at the time. Most targets have been structural rather than stratigraphic traps. Four of the offshore areas in this region (Santa Cruz, Santa Maria, Bodega, and Eel River) lie adjacent to onshore basins. Petroleum production from all of these onshore basins has been relatively small.

The Southern California Borderland, Transverse Range Province, and North Central California Coast are cut by numerous faults many of which are identified as active because they either cut the seafloor, cut young sediment (<11,000 yrs. old) or can be correlated with historic seismic events. Much of the faulting in northern California is related to motion along the San Andreas and associated fault zones. At least one basin (the Eel River) overlies an active plate subduction zone capable of generating large magnitude earthquakes.

In the Transverse Range Province, at least six earthquakes of magnitude 6 (Richter scale) or larger have occurred within the last 60 years in the Santa Barbara Channel or adjacent structural provinces. Similarly, the Borderland Province is cut by numerous active faults and major historic seimsic events.

Evidence for seafloor instability in the form of slumps and slides are found in many of the California offshore basins, though, generally, there are insufficient data to establish the presence or absence of such activity. In addition, hydrocarbon seeps characterize many of the basins, and while not inherently hazardous themselves, may provide clue clues to the location of fractured reservoir rocks and shallow over-pressured gas pockets that can pose a danger to drilling operations.

2. Physical Oceanography and Meteorology

The prevailing winds along the California coast are generally from the northwest averaging between 10 and 20 mph. In those locations where the coastline is orientated east to west, the winds shift to a west-southwest direction. In the summertime, the winds become slightly more onshore. This pattern combined with a persistent temperature inversion tends to trap any surface generated emissions within the marine air layer and transports them onshore. In the urbanized coastal areas, these meteorological conditions favor high air pollution concentrations. The most severe air pollutant is photochemical oxidants or "smog" which results from the reaction of nitrogent oxides and hydrocarbons in the atmosphere.

A current, the outer limit of which extends offshore more than 300 miles, flows approximately parallel to the Pacific coast of the United States from 50° to 30° north latitude. The direction of the current is generally southward throughout the year except as noted below. Its velocity, which averages about 0.2 knot, is greatly influenced by prevailing winds. North of latitude 45° the set is usually northward from November through February. Along the coast, during certain periods, there is a weak northerly flow which is evident between San Diego and Point Conception from July through February, and between Point Conception and Cape Flattery from November through February.

Although the coast of California is not generally subject to waves of the magnitude which strike the Hawaiian Islands and other Pacific areas, widespread damage to shipping and to waterfront areas occasionally occurs, as as a result of tsumanis. Extensive wave height has been estimated to be 13.7 meters.

3. Marine Habitats and Resources

a. General Description: The most significant characteristic of Pacific coast plankton ecology is upwelling, which occurs during the spring (April or May) in southern California and later in the summer on the rest of the coast. The subsurface water is cold (10°C) and rich in the nutrients to the coastal waters during periods of upwelling. The combination of abundant nutrients and adequate sunlight allows prolific phytoplankton growth (up to several million cells per liter during blooms) in the upper 50 meters of water. Although diatoms are the most numerous group, red tide blooms are typically caused by dinoflagellates. Some red tide dinoflagellates emit toxins that can kill marine organisms or concentrate in filter feeders consuming the dinoflagellates. An example is the mussel poisoning species Gonyaulax catenella which is restricted to the waters north of Point Conception, California on the Pacific coast. Zooplankton abundance is closely related to that biomass of phytoplankton, as the latter serves as the primary food source for zooplankton. Therefore, zooplankton abundances follow phytoplankton abundances, although with a characteristic lag of several weeks, representing an exploitation and utilization phase of the plants by zooplankton.

In northern California to Point Conception, the continental shelf gradually slopes in a typical fashion, although occasionally cut by submarine canyons. As the depth increases, sediment tends to become more fine, contributing to a greater proportion of filter feeders (strain plankton out of the water) near shore and relatively more detrital (feed on or in the bottom) feeders near the outer portions of the shelf. Little work has been done in central and northern California, but Carey (1972) reported that in central Oregon the epifauna changes from a sparse molluscan assemblage to one dominated by numerous echinoderms and arthropods. The infauna demonstrate a seaward variation in species composition; arthropods are dominant close to shore; and polychaetes are dominant offshore. Abundance increases seaward; the largest numbers and greatest biomass of both epifauna and infauna were found at the outer edge of the continental shelf. In southern California, the topography and the bottom community is more complex. Species composition tends to change with depth. Assemblages of marine canyons show some isolation, as do the basins to an even greater extent. Throughout the Pacific coast, there are scattered hard bottoms containing assemblages limited to the bottom surface. These assemblages are believed to be more sensitive to oil operations.

The Pacific continental shelf nekton are strongly associated with the California Current and the coastal upwelling of nutrient rich waters. Presently, the most numerous epipelagic fish of the California Current throughout California is the northern anchovy, although the Pacific herring is abundant in the Pacific Northwest. The midwater fauna off southern California is especially complex because it contains species from three converging water masses (Pacific Subarctic, North Pacific Central, Pacific Equatorial) as well as species endemic to the California Current system. Specific groups of species are associated with each of these water masses.

Five hundred and fifty-four species of coastal marine fishes have been identified as occurring in California. The number of species decreases in a south to north direction.

b. Habitats and Resources of Special Concern: The majority of habitats of special concern are associated with the onshore or shallow area. However, scattered along the Pacific continental shelf, usually near its outer edge, are shallow, rocky banks rich in attached organisms and associated fish. In central and northern California, areas possibly fitting this category are St. George Reef, near Crescent City, Tolo Bank, south of the Mendocino Penninsula, Cordell Bank, off Point Reyes, and areas around the Farallon Islands off San Francisco. In southern California, shallow banks include the offshore Tanner and Cortes Banks, Osborn Bank, and Farnsworth Bank, although the latter is very close to shore. All of these southern California banks are notable for their populations of "purple coral", Allopora californica. Although these populations of Allopora occur in the Monterey Canyon, its distribution in Central California is not well known.

Coastal California is the transition area of southern subtropic waters and northern temperate waters. In this area, many southern and northern marine mammal and seabird species come within close proximity of each other. This results in a highly diverse population of marine animals throughout coastal California. No where else in the world is the pinniped (seals and sea lions) species diversity so great as off the coast of California where six different species may be found. Of the more than 80 species of cetaceans (whales, dolphins, porpoises) in the world, 27 are found in California coastal waters. The California sea otter, a marine mammal, has come back from near extinction and now numbers about 2000 animals and continues to expand its range off California's central coast. Significant pinniped rookeries exist in the Northern Channel Islands, Ano Nuevo Island the Farallon Islands and Castle Island. The offshore rocks, cliffs and islands of California provide nesting and resting habitats for many species of seabirds. Nineteen seabird species nest in the California coastal area. Over 50 percent of the seabird breeding population of the State breeds on the Farollon Islands and Castle Island.

The Pacific coast outer continental shelf has seven endangered whale species, four endangered species of turtles, the brown pelican and the southern sea otter occurring on it, although only the gray whale, during its yearly migrations, occurs with any real abundance.

4. Other Uses of the OCS

a. General Description: Some of the major activities which compete with the petroleum industry for the use of the outer continental shelf are shipping, commercial fisheries, and sports fisheries. Other important activities which compete for the use of the outer continental shelf include kelp harvesting, mariculture operations, marine sanctuaries, deepwater ports and coastal parks.

The extent of the shipping is difficult to document; however, most coastal traffic is likely to be within 30 miles of the coast. Relatively high traffic areas occur in the Santa Barbara Channel and near large ports such as Los Angeles, and San Francisco. Commercial and sport fisheries use virtually all of the waters of the continental shelf.

b. Uses of Particular Concern: Shipping is a competing activity of the outer continental shelf. However in the future, if proposed coastal traffic separation schemes are adopted and accepted, shipping conflicts will be reduced. Deep water ports have been proposed for very large tankers at Port Angeles, Washington, and Long Beach, California, although no applications for such ports are pending with the Department of Transportation; a liquified natural gas port is also proposed for Point Conception.

Commercial and sport fisheries are also an important competing outer continental shelf activity. In 1978, landings for the California (including shellfish) of 722 million pounds valued at $228 million were reported for marine waters within 200 miles of the coast. A much greater value may be placed on these fisheries if the total landings figures include those catches made outside the United State's 200-mile Economic Zone. In 1978, one-sixth of the landings of all 50 States were reported from California. The value of the sport fisheries is difficult to determine; however, its importance should probably be considered on a par with commercial fisheries since the indirect economic value must be considered in addition to the value of the actual landings.

In California waters, there are 34 Areas of Special Biological Significance (California State Water Resources Control Board, 1976), 7 extensive coastal oil and gas sanctuaries (extending 3 miles offshore), and several island oil and gas sanctuaries. (Oil and gas sanctuaries are areas where oil and gas developmemt is prohibited.) There are also more than 120 State parks, National parks, or National forests along the west coast between Canada and Mexico. The most significant aspect of marine parks and sanctuaries with respect to OCS oil and gas development, however, is the proposed designation of five marine sancturies. Areas around Point Reyes, Monterey, and the entire Santa Barbara Channel are being considered for marine sanctuary status. The San Diego and Tanner-Cortes Banks regions have also been considered for study as marine sanctuaries.

4. Coastal Habitats and Resources

a. General Description: The Pacific Californa Coast can be viewed in three (3) regions--southern, central and northern California. The 1,072 miles of mainland coastline, excluding the San Francisco Bay, and its 300 or so miles of offshore channel island coastline is subject to the jurisdiction of 15 counties, 45 cites, 42

State and 70 Federal agencies. Urban development is primarily concentrated in southern California, and the San Francisco Bay area. The major population centers being San Diego 1,585,000; Los Angeles 10,350,000; and San Francisco 4,592,000 (1977).

The remaining coastal development of the State is sparsely distributed. Natural restrictions to development, such as rocky promontories and precipitous cliffs, have allowed much of the shoreline to be used for recreation. Occasional pocket beaches, areas of sandy beaches backed by marine terraces and rugged seacliffs, shoreline with steep mountains reaches, rocky beach areas, wide river valleys and deltas, and lagoons and bays all constitute the undeveloped areas of the Pacific coast. In the autumn and spring, large numbers of seabirds, waterfowl, phalaropes, loons, grebes, gulls, shorebirds and other types of birds migrate along the "coastal flyway" of California utilizing the bays, estuaries, lagoons and other remaining wetlands of California.

Air quality in the coastal sections adjacent to major California urban areas is frequently poor. Air pollution by photochemical oxidants is particularly severe along the coast between Santa Barbara and San Diego, and near San Francisco. Except near major industrial sources, air quality in non-urban areas along the California meets Federal and State standards.

The cultural heritage of the Pacific coastal region is lengthy and diverse. Although there is some lack of agreement among anthropologists regarding the date of Early Man's entry into North America, human remains have yielded a variety of dates provide evidence of human occupation as early as 40-50,000 years ago, and perhaps earlier. From these early inhabitants a population known as the Paleo-Indians developed about 10,000 years ago and were the ancestors of historic and present-day Native American populations. The first European contacts were made by Spain and England during the sixteenth century; formal Spanish rule ended in 1846. Russian immigration began in 1812 with the establishment of Fort Ross. The influx of peoples from many areas of the world has continued and there remains a large number of both Native American and immigrant groups that continues to maintain distinctive ethnic identities, making this region rich in cultural diversity. As a result of the very long period of occupation, the entire Pacific coastal area is rich in prehistoric and historic cultural resources both on land and on the ocean floor. Much of what was left by Early man has probably not been preserved because of great rises in sea level during the last few thousand years. However, a great many artifacts have been recovered in southern California during extremely low tides and by divers. It is probable that the ocean floor ocean floor contains some Paleo-Indian remains yet to be discovered. The Pacific Ocean also contains thousands of documented shipwrecks off the California coast. Terrestrial archaeological sites are especially numerous, representing different periods of occupation in some areas. Historic sites are also numerous, many of which are designated as state landmarks or as Federal Register historic sites.

b. Habitats and Resources of Special Concern: Of particular concern in the California coastal region are wetlands. The decline in quality and number of wetlands in California increases their value and need for protection from further degradation.

In addition, coastal archeological sites are particularly well documented in San Luis Obispo, Santa Barbara, and San Diego counties.

6. Socioeconomic Factors

a. General Description: The Pacific region contains areas that have experienced some significant past and present OCS development activities and a large frontier area where no OCS development has taken place. The southern California area, including the Santa Barbara Channel, has had some relatively significant offshore development, while the rest of the region, which includes central and northern California, has experienced no OCS development. Much of the onshore development in the Pacific region has also been in the southern California, including Santa Maria and Santa Barbara. Because of this, the existing oil and gas infrastructure is to a significant extent concentrated in the southern California region.

Because of their moderate year-round temperatures and other resource attributes, the coastal counties of California contain a significant concentration of the State's population and economic base. The State's large population centers are in the coastal area--the San Francisco Bay area in northern California and the greater Los Angeles area in southern California, which regionally extends to Santa Barbara as a northern limit and southward down to San Diego. All of the large population/commercial centers in California have broad-based economies with light and heavy industries and comprehensive service sectors. There are extensive coastal areas where local or regional industries predominate, such as commercial fishing, lumbering, or tourist/recreation facilities. These smaller regional economies are often centered around a smaller port area in the region, (e.g., Eureka, Bodega Bay, Monterey, Morro Bay).

b. Factors of Particular Concern: The extent of existing petroleum-related industries varies widely throughout the region. There are a significant number of oil and gas processing facilities in the greater Los Angeles basin, extending up into the onshore area off the Santa Barbara Channel. Facilities for platform fabrication exist in several areas of the region, the most important being the San Francisco Bay area, but also including the Puget Sound, Portland, and the Los Angeles Long Beach areas. The bulk of the regions' petroleum refineries are in California. California has crude capacity of about 2,455,000 B/cd with about 62% of the capacity in southern California and the remaining 38% in central and northern California (1979).

Certain lands and landmarks along the Pacific coast including those with plants and animals traditionally gathered for ceremonial purposes, have religious significane for Native Americans. Areas of special concern to Native Americans include Point Conception, Diablo Canyon, Westport, Point Arena, Trinidad, Patrick's Point, Big Lagoon, Eel River, and the Klamath River.

Additionally, public access to the coast, recreation, and development needs (especially for coastally dependent land uses) are of special concern in the region.

D. Southern Alaska Region

1. Geology

The Alaskan Pacific-margin Tertiary basin is a 900-mile-long structural feature that roughly parallels the southern Alaska coast between Cross Sound and Chirkof Island. The basin covers approximately 103,600 sq. km (40,000 sq. mi.), mostly offshore, and is subdivided into two petroleum provinces, the Gulf of Alaska Tertiary province to the east and the Kodiak Tertiary province to the west. The Pacific-margin basin is bordered to the north and partially underlayed by pre-Tertiary rocks that form an effective basement for Tertiary strata. Scientists believe that the potential for finding hydrocarbon in commercial quantities on the Outer Continental Shelf (OCS) off southeastern Alaska is poor. Available information on hydrocarbon source rock potential in the Sale 39 (Northern Gulf of Alaska) area suggests that commercial quantities of hydrocarbons may not have been formed, which appears to be supported by the current lack of discovery of hydrocarbons through exploratory drilling. However, a major structure on the Yakuatat shelf remains to be tested. According to USGS oil and gas resource estimates, both the eastern and western Gulf of Alaska shelf areas, as well as the Kodiak shelf, are believed to be gas-prone rather than oil-prone. Cook Inlet basin represents the southern part of the 38,850 sq. km (15,000 sq. mi.) Cook Inlet petroleum subprovince. Promising stratigraphic structures are present in the inlet, and the erractic distribution of non-marine Tertiary strata within the sedimentary sequence suggests that stratigraphic traps may also exist throughout the basin.

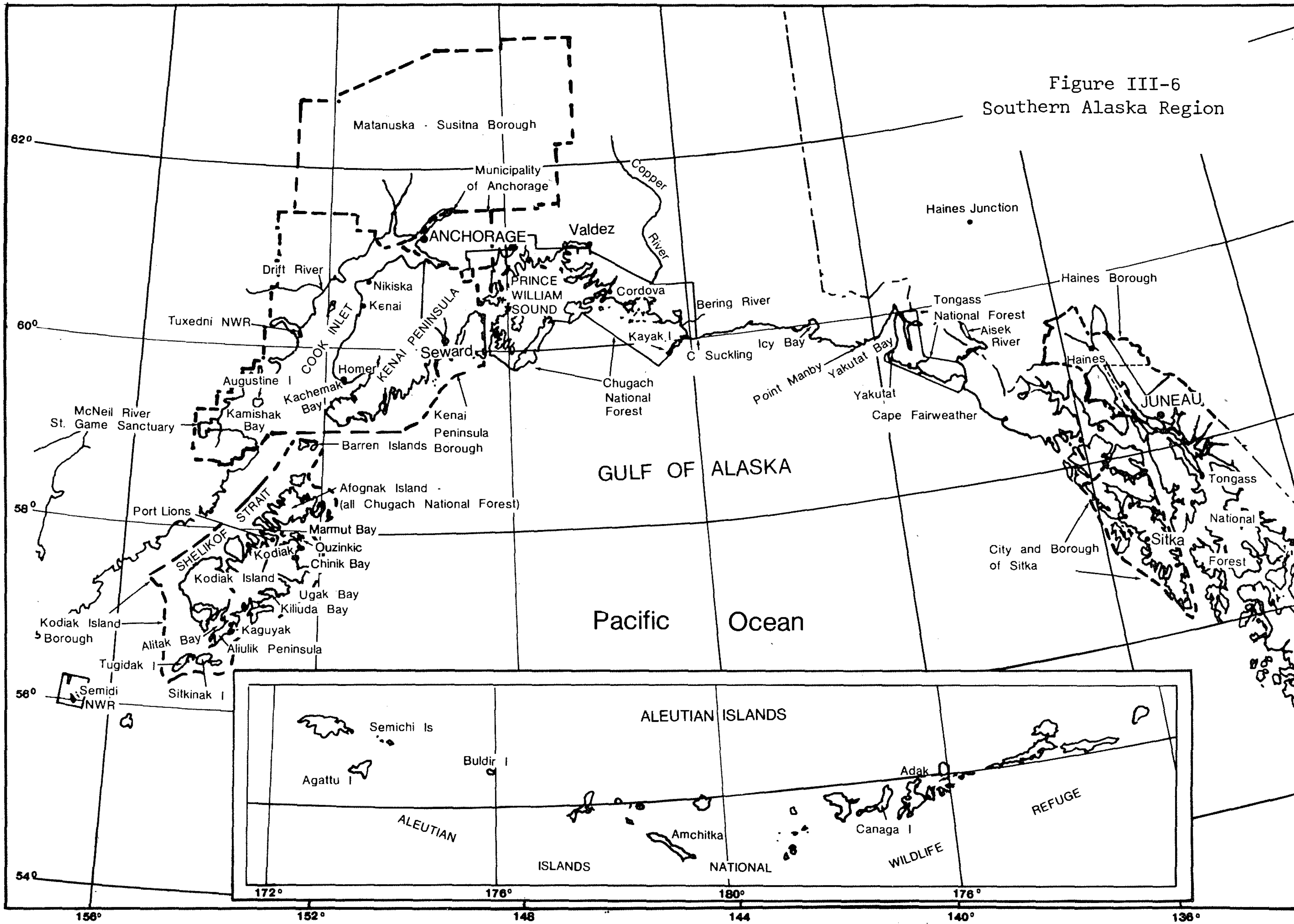


Figure III-6
Southern Alaska Region
Matanuska - Susitna Borough
Municipality of Anchorage
ANCHORAGE
Valdez
Copper River
Haines Junction
Drift River
Nikiska
Kenai
PRINCE WILLIAM SOUND
Cordova
Bering River
Haines Borough
Tongass National Forest
Aisek River
Tuxedni NWR
COOK INLET
KENAI PENINSULA
Seward
Kayak I
C Suckling
Icy Bay
Point Manby
Yakutat Bay
Yakutat
Haines
JUNEAU
Augustine I
Homer
Kachemak Bay
Chugach National Forest
Cape Fairweather
McNeil River St. Game Sanctuary
Kamishak Bay
Kenai Peninsula Borough
Barren Islands
GULF OF ALASKA
Tongass
National
Forest
Afognak Island - (all Chugach National Forest)
SHELIKOF STRAIT
Port Lions
Marmut Bay
Kodiak
Ouzinkie
Chinik Bay
Kodiak Island
Sitka
City and Borough of Sitka
Ugak Bay
Kiliuda Bay
Kodiak Island Borough
Kaguyak
Alitak Bay
Aliulik Peninsula
Pacific Ocean
Tugidak I
Sitkinak I
Semidi NWR
ALEUTIAN ISLANDS
Semichi Is
Buldir I
Agattu I
Adak
Amchitka
Canaga I
ALEUTIAN ISLANDS NATIONAL WILDLIFE REFUGE
62°
60°
58°
56°
54°
156°
152°
148
144
140°
136°
172°
176°
180°
176°

Potential for gas discoveries in lower Cook Inlet should be good. However, presently no significant commercial discoveries have been made in Sale CI leases.

The Southern Alaska OCS Region is characterized by a great variety of potential onshore and offshore geologic hazards. Offshore, these hazards include the probable occurrence of large magnitude earthquakes, associated mass seabed movements, slumping, faulting, displacements of the seafloor, dynamic bedforms such as sand waves and scattered shallow gas-charged sediments. The onshore area is extremely rugged and characterized by extensive glaciation, with many of the ice flows extending to the shoreline. In Cook Inlet, major hazards also result from seismic activity, mudslides, landslides, and ground movements. There are also five volcanoes located in the vicinity of western Cook Inlet, three of which have erupted in the last 21 years causing local damage from ash falls, sea waves, and flooding.

2. Physical Oceanography and Meteorology

There are several oceanographic and climatic factors which may influence the type of industrial technology which can be used on the OCS. The climatic factors which are perhaps of greatest concern, are the extreme storm conditions, the wind speed, and the wave height, including tsunami waves generated by earthquakes. Wind speed and wave height calculations are based on a 25-year projection, which is the approximate life of an individual oil field.

In the southern Alaska region, the predicted maximum sustained wind speed equals 90 knots (100 mph) and the extreme wave height equals 30 m (100 ft). An example is the 30-m tidal wave at Dutch Harbor generated by the April 1, 1946 earthquake.

The directions in which currents flow and the winds blow are important partly because they influence the likelihood of an oil slick drifting to shore, where the spilled oil may persist for a long time and lead to major ecological impacts. Swift currents are experienced only in the proximity of bays, such as 6-knot tidal currents in Cook Inlet. Tidal flux is the main driving force for surface waters in both Cook Inlet and Shelikof Straits. Tides in Cook Inlet produce a complex system of eddies and counter currents. Current systems within Shelikof Straits yield a net drift to the southwest. Winter net drift rates are 30 cm/sec but decrease in the summer to about 10-15 cm/sec. Chronic low volume spills and major spills originating in Cook Inlet would be transported southwest through Shelikof Straits. Synoptic meteorological conditions are similar in both Cook Inlet Inlet and the Shelikof Straits. However, differences in topography may occur in these areas which would produce localized differences in both wind intensity and direction. Another oceanographic factor which influences industrial technology is sea ice cover. The southern Alaska region remains ice-free all year except in Cook Inlet, where loose pack ice is present for about one-third of the year. Icing of ships' superstructures due to freezing sea spray is a serious problem in some specific localities, such as Shelikof Strait.

Water depth also influences the type of industrial technology that can be used. The proposed lease areas in the Southern Alaska Region have water depths which range from 30 m to more than 6000 m (4 miles). Cook Inlet and Shelikof Strait waters are less than 300 m deep.

3. Marine Habitats and Resources

General Description: In the Alaskan gulf, total primary production may be two to four times greater on the Continental Shelf than in the open ocean. Diatoms are probably the dominant species of phytoplankton in the gulf region. Phytoplankton tend to show a patchy distribution both horizontally and vertically in the gulf.

In high biologically productive areas, such as Prince William Sound, a large phytoplankton bloom occurs in the spring and drops off during the summer.

Zooplankton have similar distribution as phytoplankton, but zooplankton production peaks a month or two following peak phytoplankton production. Zooplankton, such as euphausiids and copepods, are the major food source for species such as whales, salmon, codfish, and herring.

Polychaetes, echinoderms, mollusks, and crustaceans are reported as major constituents of the benthos between 2600 m and 6000 m deep in the gulf region. A total of 209 species of benthos fauna have been identified for areas extending from depths inshore of 43 m to a maximum depth of 200 m, with polychaete annelids and mollusks most prominent.

More than 100 sea bird colonies are in the gulf region. One colony on Aghiyuk Island of the Semidi Islands contains more than 1 million birds (see Section III.D.4 below).

Habitats and Resources of Special Concern: The Gulf of Alaska, including Prince William Sound, Cook Inlet, and Shelikof Strait supports major groups of finfish and shellfish resources. Five species of Pacific salmon (chinook, coho, pink, chum, and sockeye) spawn in rivers and intertidal zones and spend their adult lives in the open ocean. King, tanner, and dungeness crab are major fisheries resources that spend the winter months in deeper water and the summer months in shallow water where spawning takes place. Shrimp, halibut, sole, flounder, sablefish, pollock, mackerel, and Pacific ocean perch are other important finfish species. Clams and scallops are also important shellfish species. Other species present are herring and capelin, which are important as food species, and various trouts, whitefish, and chars, which are anadromous (along with the salmon), and support sport fisheries. The primary differences between the lower Cook Inlet and Shelikof Straits commercial fisheries is that there appears to be a greater potential for a bottom fishery (primarily pollock) in the Shelikof area and the lack of a halibut fishery in the Cook Inlet. Otherwise, both areas support, crab (3 species); shrimp (5 species); salmon (3 primary species) fisheries.

The most abundant year-round marine mammals in the northern gulf are sea lions, harbor seals, sea otters, Dall's and harbor porpoises, and beluga whales. Fourteen species of whale, 2 porpoise species, and 2 dolphin species occur in the northern gulf. The number of marine mammals either residing in or annually migrating through the region is estimated to be from 90,000 to 100,000. Endangered marine mammals in the Alaskan gulf region are as follows: sperm whale, gray whale, blue whale, fin whale, sei whale, humpback whale, and right whale.

The following areas have significant concentrations of marine mammals and are critical habitat for marine wildlife. Coastal areas of Kodiak Island and nearby islands are critical and productive habitat for benthic organisms, such as crab and shrimp, and are important habitat for seals and sea lions. Bays and river deltas from Cape Spencer to Yakutat Bay, such as the Cooper and Bering river deltas, have significant seasonal concentrations of harbor seals. Winter and spring fur seal concentrations are on the Fairweather Grounds in northcentral and the eastern gulf coast and on Portlock Bank northeast of Kodiak Island. The Barren Islands have large concentrations of sea lions. Significant populations of whales including many endangered whale species seasonally occur in the Alaskan northern gulf. The distribution of kelp beds, where sea otters generally feed on associated animals, extends from Cook Inlet to Unalaska Island in the Aleutian Chain.

Islands and bays of Prince William Sound have large populations of sea otter, and four large historic sea lion rookeries are located within the approaches to the sound. The estuaries of Prince William Sound are very productive areas for many marine species of fish, birds, and mammals.

Soft corals are found extensively throughout the southern regions. They range from southeastern Alaska to the Aleutians.

The following discussion will demonstrate the presence of cultural resources (historic and archaeologic sites, structures, and objects) on the coastal areas of Alaska immediately adjacent to the areas of concern as well as the probability for the occurrence of archaeologic sites on the OCS. Based on a study conducted for the Alaska OCS office, the distribution of approximately 4,000 Holocene-age archeological sites in relation to Alaska's major ecosystems indicates that a relatively high number of sites occur within the coastal area. The coastal area, therefore, becomes significant sites for the study of past cultures.

The probability of archeologic site occurrence on the OCS has been documented by several studies conducted for the Alaska OCS Office. These investigations are based on the widely accepted theory that a worldwide lowering of sea level occurred because of an increase in glaciation during the Pleistocene, which resulted in the exposure of vast areas of the OCS. These exposed lands are believed to have been used by prehistoric cultures during the Pleistocene for subsistence activities and possibly as migration routes.

The distribution of known onshore cultural resources is relatively high, particularly in Prince William Sound, Cook Inlet, and on Kodiak

Island. Sites of particular interest are located along the coast. Areas of high probability for the occurrence of archeologic sites have been identified on the OCS adjacent to Kodiak and Afognak Islands and the southside of the Aleutians. Studies on cultural resources in lower Cook Inlet and the western Gulf of Alaska are underway so no specific information is currently available. The Gulf of Alaska east of Kayak Island has not been investigated, and such information will not be available in the foreseeable future.

4. Other Uses of the OCS

a. General Description: There are other uses of the outer continental shelf that may be affected by OCS oil and gas activities in the Southern Alaska Region. The most significant of these are the commercial fisheries, but others include transportation considerations, and marine sanctuary proposals.

b. Uses of Particular Concern: Of the three general areas in Alaska under discussion in this statement, the Gulf of Alaska supports the most diversified and productive commercial fisheries. Commercial efforts for individual species are greater in other areas, but the overall fishery in the gulf is the greatest. Over the last 10 years, Kodiak has always been one of the top 10 U.S. fish ports.

Salmon are fished for by U.S. fishermen using seines, set, and float gill nets; hand and power trollers; and hooks and lines. Most of the fishing occurs within 3 miles of land. In 1978, about 60 million salmon averaging 7 pounds per fish were caught in the Gulf of Alaska. Salmon averaged about 78 cents per pound to the fisherman.

American fishermen use pots for crab and primarily trawls for shrimp although some pot fishing for shrimp is also done. In 1978, about 31 million pounds of king crab, 5 million pounds of tanner crab, 4.6 million pounds of dungeness crab, and 64.4 million pounds of shrimp were caught and processed from the Gulf of Alaska. Prices ranged from 18 cents per pound for the shrimp, to 43 cents per pound for tanner crab, to $1.21 per pound for king crab, and to 50 cents per pound for dungeness crab.

The foreign (Japan, Russia) trawl-longline for flat and round bottom-dwelling fish species averages about 100,000 mt per year. In 1978, these fish were worth about 8 cents per pound to the fishermen. About 17 million pounds of halibut were caught in 1978 in the Gulf of Alaska by U.S. and Canadian fishermen using longlines. The fishermen were paid $1.28 per pound for halibut. There was no scallop fishing in the gulf in 1978.

The total wholesale value of the Southern Alaskan fish and shellfish production is over half a billion dollars per year. This value does not include the 100 thousand metric tons of bottomfish caught by foreigners, which is now potentially an exclusive U.S. resource to harvest.

The area fringing the Gulf of Alaska contains the most highly developed water transportation system in Alaska. All major and larger secondary population centers are served by either deep water freight or large carriers. Deep water ports and ports which show potential for development into deep water facilities are common. The most sophisticated and intensely used of the deep water ports is that of Anchorage. Anchorage is the transport hub of the State. Its port is ice free (except in unusually severe winters) and can accommodate larger containerzed cargo shipments.

Other deep water ports of note are Valdez (the pipeline terminal), Seward, Kenai, Cordova, Haines, and Skagway. In addition, there are places such as Yakutat and Kodiak which have the natural attributes for a deep water facility, but so far have not acquired the capital for development.

Deep water vessel traffic in the gulf has not reached the density which would warrant the establishment of extensive regulated shipping lanes. Two areas of regulated water lanes, however, do exist. In the southeast portion of the Cook Inlet a voluntary traffic lane for commercial freighters has been established. This action was brought about because of repeated incidents of damage by passing freighters on commercial fishing gear. The second controlled sea traffic area is a required oil tanker lane which extends from Valdez to Cape Hinchinbrook. Beyond the cape the tankers can proceed without any course restrictions.

The Department of Commerce has mentioned Prince William Sound, the Kodiak Shelf, and lower Cook Inlet as areas they may study for future consideration as marine sancturaries. There has, however, been no commitment on the part of Commerce.

5. Coastal Habitats and Resources

a. General Description: The gulf coastal plain is extremely irregular reflecting tectonic and glacial influences with coastal mountain ranges and extensive ice fields. The coastal plain is marked by long beaches and dune ridges backed by high marine terraces. Short meltwater streams and river deltas empty into the gulf. Dynamic interactions of a moist climate, rugged topography, discontinuous permafrost, varied soils, drainage and exposure have resulted in a complex vegetative pattern and varied ecosystems.

The major habitats are as follows: Hemlock-Sitka spruce covering most forested areas; wet tundra areas of low relief dominated by grasses and sedges, with few dwarf shrubs and herbaceous plants; and alpine tundra, open areas above tree line composed of white mountain avens, and low growing herbs, lichens, grasses, and sedges.

Five species of North American Pacific salmon, Dolly Varden char, rainbow and cutthroat trouts, arctic grayling, lake trout, whitefish, and turbot are important freshwater fish found in inland waters.

There are 219 species of birds with 111 of these being seabirds and shorebirds. Approximately 101 species are considered year-round residents in the northern Gulf. Many of the birds that breed and migrate across the gulf coast originate from transpacific or transequatorial regions.

Thirty-three species of terrestrial mammals occur along the northern gulf coast. Both the brown (grizzly) and black bear depend on beach fringe areas and river deltas for feeding. Beaches are important winter ranges for the Sitka blacktail deer. Moose are located throughout the region with major concentrations along the coastal areas. The number of furbearers that have a major dependence on the beach is small, with mink and river otter probably using the intertidal area most frequently.

b. Habitats and Resources of Special Concern: There are three species of birds on the official endangered list that are found on the northern gulf coast. Short-tailed albatross (a seasonal entrant); Aleutian Canada goose (a suspected seasonal entrant); and American peregrine falcon (a suspected resident). There are also four threatened plant species and one threatened mammal subspecies.

The northern gulf coast has extensive and complex estuarine systems such as Prince William Sound, which are highly productive of fish, birds, and marine mammals. Some other important wildlife nesting and breeding areas include the Cooper River Delta, Kenai Peninsula, lower Cook Inlet, and the Kodiak and Afognak Island coasts. The coastal areas of the northern gulf support moderate populations of bald eagles and peregrine falcons.

Environmental quality of the northern gulf is good to excellent with air quality presently within air standards for the entire area. Most air quality problems in the gulf coastal area are in Anchorage and Kodiak Island. Seasonal severe dust problems exist in Anchorage, and there are solid waste discharges from seafood processors in Kodiak. Water quality is good, although man-induced stresses, such as domestic sewage, industrial and commercial wastes, forestry waste, and waste or spillage from ships and small boats, are potential problems in developed harbors and settlements.

Cultural resources of the coastal area are addressed under Section III.D.3., Marine Habitats and Resources - Southern Alaska Region.

6. Socioeconomic Factors

The economy of southern Alaska consists of the metropolitan Anchorage and the southcentral Gulf of Alaska and Cook Inlet communities of Valdez, Yakutat, Cordova, Seward, Kenai-Soldotna, Homer, and Kodiak. Anchorage is the major port, service distribution center for the oil and gas industry, n population center of the State. Anchorage, which has about half the population and personal income of the State, has grown rapidly, based on alternating growth in the State's major basic activities: agriculture, forestry, fisheries, mining, construction (petroleum), and Federal, State, and local government.

The most prominent growth industries in Anchorage have been service industries to the basic industries, including transportation, communications, public utilities, trade, finance, insurance, real estate, residential construction, and services. For a variety of reasons, including continued development of Prudhoe Bay and expansion of in-State services, the Anchorage economy has continued to grow during the post-TAPS period.

The southcentral region of Alaska, excluding Anchorage, and consisting of Kodiak, the Gulf of Alaska, and the Kenai Peninsula, has a population of around 60,000 and has grown rapidly in recent years. Major basic industries in the region include mining (petroleum) and petrochemical activities, and construction in the Cook Inlet area. Also, growth areas have included, until recently, the TAPS terminal construction at Valdez. In addition, a major southcentral industry in Homer, Kodiak, Seward, Cordova, and Yakutat is fishing and fish processing. In 1975, the southcentral region accounted for 47 percent of the value of fish caught in the State. OCS exploration took place in the northern Gulf in 1977-78, but no resources were found. Currently, exploration is occurring in lower Cook Inlet.

The fastest growing local economies (census divisions) in the region were the Kenai Peninsula (population 16,753) and Valdez (population 13,000). Less rapid growing economies were Cordova (population 2,353), Seward (population 3,395), Kodiak (population 9,366), and Yakutat (population 550). Major ports in the region consist of Seward and Whittier on the Alaska railroad, and Valdez on the TAPS tanker transfer point.

Presently, the Anchorage and southcentral economies have just adjusted to the end of the TAPS construction. Future growth is expected to be slower than in the past. One of the most important future industries is mining, in addition to further Prudhoe Bay development, LNG, and OCS development. Also, expansion of the bottom fishing industry may be a potential growth area. In the near future, southcentral construction growth will likely be dependent on government projects such as the Pacific LNG plant, the ALCAN gasline, and the Alpetco petrochemical plant, which could boost the ports of the region to a rapid growth condition.

Excluding Anchorage, the smaller towns villages in the southern OCS region depend on subsistence fishing, subsistence hunting, and food gathering to supplement cash incomes and to maintain family and cultural traditions; but not to the extent experienced in the Bering Sea and Arctic regions. For those families where cash economy rather than direct resource dependency is the dominant economic source of livelihood, subsistency pursuits take the form of traditional practices and the means of supplementing an urban food supply. In such a varied region, however, the smaller villages and town approach patterns of subsistence lifestyle and resource dependency similar to other rural Alaska environments. As shown by the 1974 study of Federal Programs and Alaska Natives, more than one-third of the Native families in the region derive at least half their food supply from subsistence resources. Within the region, such dependency ranged from 24 percent of the families living in the vicinity of Cook Inlet to 56 percent of the families in Prince William Sound and surroundings. In the region a total of some 65,000 salmon are caught for subsistency purposes, an amount representing an average annual catch for the years 1972-77 as reported by the North Pacific Commission. This subsistence catch represents 8 percent of the State total and may underestimate the total regional subsistence catch due to the customary practice of assigning a small portion of commercial catch to personal use.

The major landowner in the region is the Federal government, with land in wildlife refuges (Kodiak, Semidi, Simeonof, Tuxedni, and the proposed Becharof, Alaska Peninsula, Iliamna, Kenai, and Copper River NWR's, the Iliamna area, and the Kenai Moose Range addition); in the national park system (Katmai, Aniakchak, Lake Clark, Kenai Fiord, and Wrangell-St. Elias), and in the Chugach National Forest. The State of Alaska and the Chugach, Cook Inlet and Sealaska Regional Native Corporation also own land in this region. With the exception of Kodiak, the Kenai Peninsula, the Anchorage area, Cordova, and small communities and Native villages, the coastal area in the region is essentially undeveloped. However, land use ranges from intermittent to intensive, with uses including subsistence hunting and fishing, recreation, rural settlement, commercial fishing, and some agriculture and oil and gas operations.

E. Bering Sea Region

1. Geology

There have been no lease sales on the the OCS in this region. Petroleum prospects in the Bering Sea OCS region include: (1) the thick sections (basins) of Cenozoic and, in some areas, Cretaceous strata underlying broad areas of the Continental Shelf. (2) deformed Mesozoic rocks which underlie many of these basins, (3) domical and diapiric structures associated with the more deeply submerged (2000 m) Umnak Plateau area, and (4) thick masses of late Tertiary beds in summit basins along the crestal region of the Aleutian Ridge. Many of the outer-shelf basins are underlain by folded Cretaceous and Jurassic strata which are not only propsective in themselves, but may have supplied hydrocarbons to overlying Cenozoic structures. The most promising prospects are the thick accumulations of early Tertiary through Holocene beds that occur in the larger inner-shelf basins which underlie the shelf's major bays and gulfs (Norton and Bristol Basins). An estimated 1-2 million acres in the Bristol Bay area may have petroleum potential, although little information exists on the nature of hydrocarbon sources.

Potential hazards in the Bristol Bay region are primarily shallow faulting, seismicity, and permafrost. Sporadic volcanic activity in the Aleutian Chain may cause problems on a local basis. Little information exists about the nature and distribution of permafrost in the area.

In the St. George and Navarin Basins of the southern Bering OCS, the principal potential hazards are shallow faults, gas-charged sediments, slumping near the shelf edge and dynamic bottom sediments. Seismicity is relatively low. In Norton Sound, potential hazards consist of offshore subsea permafrost, sea ice hazards, gas charged sediments, shallow faulting, and dynamic sediment transport, including ice gouging and sand wave bedforms. Seismicity is usually low (below magnitude 6.5).

2. Physical Oceanography and Meteorology

In the Bering Sea region, the predicted maximum sustained wind speed equals 90 knots (100 mph) and the maximum significant wave height equals about 32 m (105 ft).

The ice cover lasts about half the year and averages 60 to 70 percent of complete coverage during the coldest times. The ice cover is most dense in the northeast part of the Bering Sea, near Norton Sound, and is least dense in the southwest part over the St. George Basin.

The water depths are shallow (30 to 100 m) over the Bristol and Norton Basins, but range down to 3750 m (2.3 miles) over both the St. George and Navarin Basins.

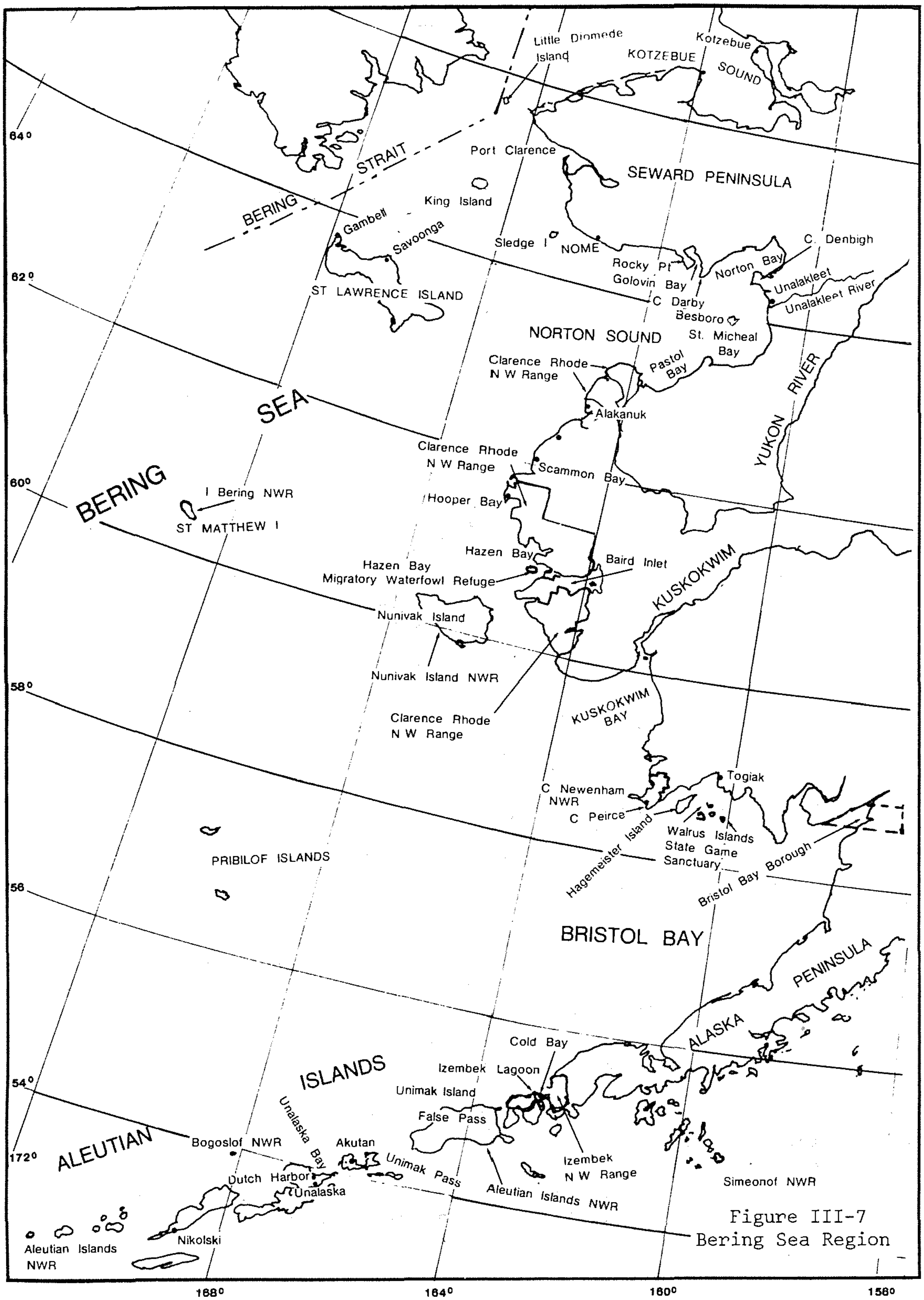


Figure III-7
Bering Sea Region

3. Marine Habitats and Resources

a. General Description: Phytoplankton are especially abundant in the Bering Sea and Bristol Bay. Plankton blooms occur in late spring and often again in early fall.

Zooplankton biomass varies, decreasing in silty waters of bays or lagoons and becoming higher in clear waters over the OCS. High concentrations of plankton provide seasonally abundant food for baleen whales along the edge of the pack ice and where the Continental Shelf drops off. Abundant larger marine invertebrates, crabs, shrimp, clams, squid, and fish are consumed by toothed whales, walrus, seals, and sea lions.

In the nearshore, intertidal benthic fauna, such as starfish, sea urchins, and limpets, are common along the Aleutians. Other benthos, such as clams, are abundant in Bristol Bay, as well as the Aleutians.

The Bering Sea is one of the most productive areas for seabirds in the western Hemisphere. The standing stock is estimated at 27 million.

b. Habitats and Resources of Special Concern: Many of the species described for the Gulf of Alaska occur in the Bering Sea. The same five species of salmon are present with sockeye by far the most abundant. King and tanner crab, shrimp, the demersal species such as halibut, sole, pollock, sablefish, Atka mackerel, and Pacific ocean perch are also present.

Major species not present include dungeness crab, scallops, and razor clams. In addition to the trout and Dolly Vardin char present in the gulf, the Bering Sea also has sheefish and arctic char.

Twenty-five species of marine mammals are found in the Bering Sea. Important populations of walrus, northern fur seal, stellar sea lion, and sea otter are present in the region. Several different species of seal and eight species of whale occur in the region, with the beluga whale the most common.

Endangered mammals found in the Bering Sea are as follows: bowhead, sei, gray, sperm, fin and humpback whales. The following areas are critical to specific marine mammals. The Aleutian Islands are the most productive sea otter habitat in the world; the Pribilof Islands are the center for thousands of fur seals to mate and raise their young.

The biological heart of the Bering Sea region is undoubtedly Bristol Bay (see section III.E.5 below). The bay is one of the most biologically productive marine areas in the world. Bristol Bay estuary and the associated Continental Shelf possess the greatest concentration of birds, fish, and marine mammals found anywhere on the North American Continent.

Reports of coral have been limited to nearshore Akutan Island in the Aleutian Islands.

Cultural resources in general are discussed in this section under the Southern Alaska Region. The distribution of known onshore cultural resources is relatively high, particularly on Nunivak Island and the area surrounding Norton Sound. Sites of particular interest are located along the coast. Areas of high probability for the occur rence of archeologic sites have been identified on the OCS adjacent to Nunivak, Pribilof, and St. Matthew Islands, Kuskokwim Bay, and the Bering Strait.

4. Other Uses of the OCS

a. General Description: There are several additional resources and constraints that will affect both onshore and offshore OCS activities in the Bering Sea Region. The most important of these resources is the commercial fisheries, but others include transportation considerations, marine sanctuary proposals, onshore land use, cultural resources, and coastal zone management.

b. Uses of Particular Concern: The Bering Sea is a vast commercial fishing area. The salmon runs in Bristol Bay are legendary. In 1978, the king crab catch in the western Bering Sea near the Aleutian Peninsula made Dutch Harbor/Unalaska the top dollar value center for fish landed in the United States. The salmon catch in 1978 was about 40 million fish. Prices and weights are the same as for the Gulf of Alaska.

In 1978, 102.8 million pounds of king crab, 70.4 million pounds of tanner crab, 18,000 pounds of dungeness crab, and 6.5 million pounds of shrimp were caught in the Bering Sea.

Halibut catches from the Bering Sea area have averaged about 200 metric tons in previous years. Canadian and U.S. fishermen use the area, however, the bulk of the fish are caught by U.S. fishermen.

The total wholesale value of the Bering Sea fish and shellfish production was over 300 million dollars in 1978. This value does not include the harvest of bottomfish, or groundfish.

Nationals from five other foreign countries have conducted groundfish operations (except halibut) in the Bering Sea. These are Japan, the U.S.S.R., Korea, the Republic of China (Taiwan), and Poland. These nations fish for pollock, Pacific cod, rockfish, sablefish, halibut, flounder, Atka mackerel, and others (sole, turbot, etc.) The catch of these species during the 10-year period, 1968-1977, averaged 1.7 million metric tons.

The groundfish allocations to foreign nations for 1979 is 1.4 million mt, worth about 300 million dollars, all of which is potentially an exclusive U.S. resource to harvest.

The Bering Sea ia an area of light water traffic. The adjacent coast is without a viable deep water facility. The only deep water port is on the southern side of the Aleutian Islands at Dutch Harbor. Nome, Dillingham, and Kotzebue are the largest towns located on the Bering Sea; they are served by lighter and/or barge vessels. The Bering Sea is ice free and open to commercial water traffic for a period ranging from 6 months in the southern areas to less than 100 days in the far north. During winter, all traffic in this area moves by air. Land connections between the Bering Sea and other regions do not exist.

The Department of Commerce has done preliminary work on a report for a Bristol Bay marine sanctuary, an area from Cape Newenham to the Pribilofs to Unimak Pass. Further study, consultation and public hearings would be needed before sanctuary designation.

Almost all of the coastal area in this region is undeveloped, with the exception of small communities and villages. The dominant uses are subsistence-oriented.

5. Coastal Habitats and Resources

a. General Description: The coastline of the Bering Sea is varied; in the north, coast is largely low gravel banks behind pebble beaches with little or no vegetation. The banks slope upward to Mid-region, the vast Yukon-Kuskokwin delta is an area of estuarine tidelands and saltwater marshes, with an indefinite boundary. The coast along the Aleutian Islands is generally rocky coastal bluffs.

The major habitats are wet or moist tundra with some coastal high-bush and spruce-hardwood communities in the Norton Sound area. The region supports a wide diversity of birdlife, mostly in the lowland, marshy areas and along rocky coastal bluffs. The area is abundant in waterfowl, seabirds and shorebirds, and has bald and golden eagles, and peregrine and gyra falcons.

Important mammals found in the major habitats are shrews, arctic ground squirrel, lemmings, voles, gray and arctic fox, grizzly bear, ermines, wolveriness, and caribou. Moose and muskox are present in some areas. Muskrat, mink, river otter, and harbor seal are important in the marshes and tidelands.

b. Habitats and Resources of Special Concern: Bristol Bay and the continental shelf area of the southeastern Bering Sea encompass one of the great bird concentrations in the world. The region is a crossroads for waterfowl along transoceanic and transcontinental flyways. In addition, large numbers of these birds mate and nest in the Bering Sea area. Estimates of waterfowl that use this area exceed several million annually. Even greater numbers of sea birds and shorebirds nest along the coast and the islands of Bristol Bay.

The Aleutian Islands are an important ecotone linking Asiatic and North American biotic communities and have members of both continental populations, as well genetically indigenous species, making the islands of extreme scientific and biological importance.

The Yukon Delta is the largest and most productive of western Alaska waterfowl habitats. The entire Pacific flyway of white-fronted geese and whistling swans nest on the delta.

The Bering Strait is the flyway for birds migrating between the old and new worlds during spring and fall migration.

Endangered species of the Bering coast include the short-tailed albatross, Aleutian Canada goose, and American peregrine falcon.

Cultural resources of the coastal area discussed under Section III.C.5. Marine Habitats and Resources - Bering Sea Region.

6. Socioeconomic Factors

The Bering Sea OCS region can be divided into the Norton Sound portion with economic activity centered in Nome (population 7,000), the Bristol Bay portion centered in Bethel (population 20,000) and Dillingham (population 3,200), and the Aleutian portion centered in Unalaska/Dutch Harbor (population 2,000) and Adak (population 4,000). (These figures reflect the population of local governments and the surrounding area.) These three regions of the Bering Sea OCS correspond to Native regional corporation areas--the Bering Straits, the Calista and Bristol Bay, and the Aleut Corporation, respectively.

The economy of the northern Norton Sound area is centered in Nome which is the transportation and commerce center for northwest Alaska. The major employer in Nome is government, with large service, utilities, and trade employment. Nome has scheduled air service, lightering for large vessels, and local truck highways extending into the surrounding area. A substantial skilled/unskilled labor force is available in the Nome area if needed, and the surrounding area includes partially subsistence subsistence villages and the Alaska reindeer industry. Indications are that the areas has rich mineral potential.

The two main economic centers in the Bristol Bay area are Bethel and Dillingham. Bethel is the transportation hub for the villages in the Yukon-Kuskokwim Delta. The main employer is government (Federal, State, and local), along with transportation and trade. Bethel has scheduled air service and a port with dock and warehouse. No truck and rail service exist. Dillingham is the other major economic center in the Bristol Bay section, and it is the center for the large Bristol Bay salmon fishery and fish processing industry. Major employment is in fishing, fish processing, government, and trade/transport. The city has regular air and barge service.

The southern most economic area in the Bering OCS region is the Aleutian area. The main economic centers in this area are Unalaska/Dutch Harbor, Adak, and Cold Bay. Cold Bay is a communication center, whereas Unalaska is the center of the huge Bering Sea fishering industry. Most employment in Unalaska is in fishing and fish processing and most labor is transient with little local impact. Unalaska/Dutch Harbor is served by scheduled air and water carriers and its permanent labor force is quite small compared with its seasonal peak labor force.

Another major center of economic activity in the Aleutian area is Adak, a military community with government, construction, and crabbing employment. Adak has scheduled air and water carrier service.

The important regional industrial sectors include government, trade, transportation, services, subsistence and fishing. Subsistence is quite important to residents throughout the region even though there seems a trend toward less dependence on subsistence. Commercial fishing in this area is also very important to the immediate area and the State, since the area is one of the world's richest fishing grounds with considerable growth potential.

The main fish harvested in these western Alaskan waters are salmon, king crab, tanner crab, and halibut. Until recently, foreign fishermen dominated the area, but the 200 mile limit has set off a rapid U.S. industry expansion. In 1977, the western area produced better than half the State's shellfish catch, and in 1975, 35 percent of the State salmon catch. Bristol Bay is the number one fishing area in dollar value in the United States.

Tourism and animal husbandry are presently quite small, but both have good potential. No petroleum development has occurred on the OCS, but several Native corporations favor continued onshore exploration.

The Bering Sea region contains the largest number (119) of villages in Alaska, sites which represent consistently high and varied dependency on subsistence resources. Excluding military enclaves, these settlements are distributed as follows: Aleutian Islands 14; Alaska Peninsula and Bristol Bay 30; Kuskokwim and lower Yukon River, deltas and intervening coastline and tundra 56; and Norton Sound and Seward Peninsula 19. On the average, more than two-thirds (71 percent) of the Native families in the region derive at least half their food supply from subsistence resources, according to the 1974 study of Federal Programs and Alaska Natives. This dependency ranges within the region from 56 percent of the families in the Aleutian Islands to 84 percent of the families in the area of the Kuskokwim and lower Yukon Rivers.

The variety of fish and wildlife resources available in the vicinity of the customary subsistence harvest sites dictate the resources used, which vary by village in the region. For example, a survey by Nunam Kitlutsisti in 1976 of village subsistence harvest among 47 villages in the area of the Yukon-Kuskokwim Delta showed the following average resource harvest: 77 percent fish, 7 percent land animals, 6 percent sea mammals, 6 percent vegetation, and 4 percent birds. Wide variation existed among villages in these resources categories: fish harvest ranged from 38 to 86 percent of family dependency, land mammals from 2 to 45 percent, and sea mammals from 0 percent (where not available) to 15 percent. All percentages were computed on the basis of resource weight, with the total subsistence harvest averaging 9,281 pounds per family.

No description of single species harvest does justice to relative dependencies in the mix of resources used or in the total availability of resources among resource cycles. Single species harvests are instructive, however, in pointing to primary resource dependencies within the State, such as the heavily demanded resources of whale, walrus, salmon, caribou and moose. For example, three villages accounted for 86 percent of the total subsistence harvest of adult walrus in 1977, these being the three island villages closest to the migration route of the species: Gambell, Savoonga and Diomede. The Bering Sea region as a whole accounts for 90 percent of all subsistence caught salmon species in the State, based on statistics provided by the North Pacific Commission and averaged for the yerar 1972-77. This average annual regional catch of some 720,000 salmon was distributed as follows: the Bering Sea region north of Cape Newenham (including the entire Yukon and Kuskokwim Rivers) 78 percent of the regional harvest, and Bristol Bay and the north side of the Alaska Peninsula 22 percent. The subsistence salmon catch in the Aleutian Islands was negligible, pointing less to a lack of dependency as to limited reporting and the use of a variety of other fish, shell fish and marine mammal resources.

The major landowners in the region are the Federal Government and the Alaska Natives, with federal land in wildlife refuges (Clarence Rhode, Hazen Bay, Aleutian Islands, Cape Newenham, Nunivak, and the proposed Kanuti, Togiak, Yukon Delta, and Alaska Marine Resources NWR's), and Native selections, including St. Lawrence Island, the north and east sides of Norton Sound, scattered sections along the rest of the region's shoreline, and some of the Aleutian Islands.

Almost all of the coastal area in this region is undeveloped, with the exception of small communities and villages. The dominant uses are subsistence-oriented.

F. Arctic Region

1. Geology

Results of exploratory drilling on State of Alaska leases along the Beaufort Sea coast both in the vicinity of Prudhoe Bay and Point Thomson suggest that recoverable hydrocarbons probably exist in the proposed joint Federal/State lease area. Additionally, considerable hydrocarbons (mostly gas) have already been discovered in the Canadian Arctic (Melville Island area, Dome Petroleum's Beaufort Sea offshore area, and MacKenzie Delta region). These arctic discoveries at least offer a reasonable promise of commercial discovery in the U.S. Beaufort Sea.

The northern Chukchi Sea is underlain by some of the same geological features that were found in the oil and gas field at Prudhoe Bay and in several smaller oil and gas fields in and near Naval Petroleum Reserve-Alaska. Sedimentary deposits north of the Barrow Arch may well attain thicknesses of 20,000 feet or more. The possibility that they may represent a late Cretaceous and Tertiary delta, combined with the presence of diapiric structures, makes the area attractive for petroleum exploration.

The presence of a regional arch, many smaller folds, and numerous fault surfaces at the base of the younger sequence offer good oil and/or gas trapping potential within the Hope Basin. The Cretaceous rocks beneath

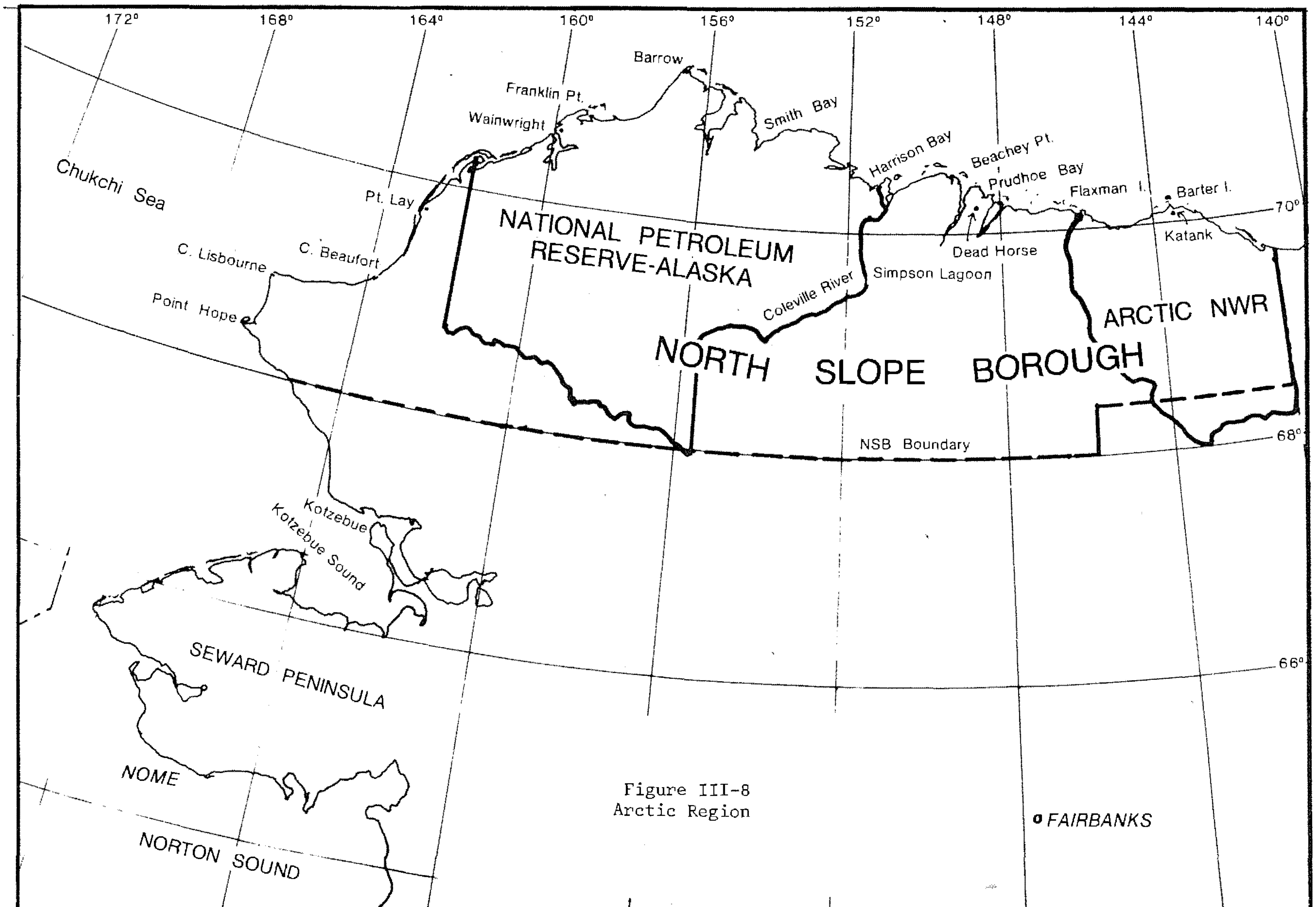


Figure III-8
Arctic Region

the Beaufort Sea probably contain organic-rich shales at their base, as they do onshore. In addition, sands higher in the section contain both oil and gas deposits near the coast onshore. The possibility also exists that some of the pre-Cretaceous rocks which contain oil at Prudhoe Bay may locally extend across the Barrow Arch and underlie the Beaufort shelf. Although the Cretaceous and Tertiary rocks are of southern provenance and thicken seaward, the pre-Cretaceous rocks occur in general within shoreline facies along the Barrow Arch and thicken southward. Thus, a conservative projection of onshore data suggests that if the prospective pre-Cretaceous rocks are present on the Beaufort shelf, they are limited.

The natural hazards of the arctic region are many and severe, and include offshore subsea permafrost, sea ice, ice gouging of the seabed, gas-charged sediments at various depths, coastal erosion, and sediment transport. The Beaufort Sea also has shallow faults, slumping near the shelf edge, and erosion and migration of barrier islands and shoals. The Chukchi Sea is virtually aseismic and offers no volcanic hazards.

2. Physical Oceanography and Meteorology

In the arctic region, the predicted maximum sustained wind speed equals 80 knots (90 mph). Extreme storm waves in the arctic region are not likely to be as high as in the Southern Alaska and Bering Sea Regions, partly because the pack ice reduces the likelihood of their generation, and in any case would reduce their range.

The offshore pack ice lasts all year and can unexpectedly be blown inshore even in midsummer. When it is blown inshore, the deep (20 m) ice keels on the bottom of the ice sometimes gouge deeply (5 m) into the sea bottom.

The coastal waters are usually ice-covered for three-quarters of the year; the coastal ice cover is solid most of that time. The water depth in the proposed lease areas is less than 75 m.

The summer and winter climates conditions are extremely different--whether measured by ice cover, light level, or temperature. The biological activity is condensed into a brief but very active summer, as is explained in the section on habitats and resources.

3. Marine Habitats and Resources

a. General Description: Phytoplankton and benthic primary production in the arctic is greatest nearshore within the shallow coastal lagoons. The annual productivity is far less than that of the southern Alaska coastal region, reflecting the short growing season in the Arctic. Greatest production of invertebrates and fish likewise occur in the lagoons, with arctic cod being a key species in the food web.

The environmental quality of the marine arctic region is nearly pristine. There have been no major water pollution incidents in the American Beaufort Sea so effects are somewhat speculative. With few automobiles and no widespread major industry, air quality is excellent.

b. Habitats and Resources of Special Concern: The Beaufort-Chukchi Sea region has the least fish species diversity and population of the three OCS regions in Alaska. Commercial species of crab, shrimp, salmon (except occasional pink and chum salmon runs), scallop, herring, and demersal flatfish and roundfish species do not occur in this region. Sheefish, Dolly Varden char, steelhead, and rainbow trout also do not occur. The primary species in the region are whitefish, cisco, grayling, arctic char, arctic cod, flounder and sculpin, all of which support subsistence fishing by local residents.

Although there are many marine mammals occurring in the arctic seasonally, there are relatively few species. The beluga, bowhead, humpback, fin, sperm, right, sei and gray whales appear during the spring-summer season, and three species of pinnipeds (ringed, bearded, and spotted seals) are also present. The bowhead whale and the gray whale are the only endangered marine species found in the arctic coastal region; others are offshore species.

The productive barrier islands and lagoon areas are critical feeding areas for migratory birds and mammals.

While no coral has been found in the Chukchi Sea, there is soft coral in the boulder areas within the proposed Joint Federal/State Beaufort lease area. This boulder field is a unique habitat similar to a "live bottom" in southern areas.

Cultural resources in general are described in this section under the Southern Alaska Region. The distribution of recent onshore cultural resources is relatively high along the Chukchi and Beaufort Sea coasts. The occurrence of sites of greater antiquity is, however, relatively low. The scarcity of Holocene sites is postulated to be caused by persistent beach erosion. Areas of high probability for the occurrence of archeologic sites have been identified on the OCS adjacent to Point Barrow and Humphrey Point.

4. Other Uses of the OCS

a. General Description: There are several other uses of the outer continental shelf that may be affected by OCS oil and gas activities in the Arctic Region. Other than the hazards previously discussed, these include some commercial fisheries, transportation considerations and marine sanctuary proposals.

b. Uses of Particular Concern: This is the least productive commercial marine fishing area in Alaska. In 1978, about 72,000 salmon were harvested around the Kotzebue area. There is also a small, commercial fishery for whitefish and cisco at the mouth of the Colville River. The catch averages about 74,000 pounds annually.

More freight is shipped by air than water to the arctic coast. No deep water ports exist along the Arctic Ocean. Cargo ships must anchor far offshore, and lighters are used to bring the freight to land. At Barrow, the largest town of the region, water depth reaches 1 fathom at a point 335 meters from shore. The arctic coast is ice free only during August and September. Marine freight deliveries are restricted to these months.

The Department of Commerce is working on several options for marine sanctuaries in the Beaufort Sea area. The areas vary in size and location. There has not been any commitment on the part of Commerce.

5. Coastal Resources and Habitats of Special Concerns

a. General Description: The arctic coast is composed of a series of lagoons and barrier pebble beaches with earth banks behind. The major habitat is tundra or arctic grassland composed of lichens, grasses, sedges, and dwarf woody plants such as cranberry, heath shrub, birch, willow, and bearberry.

Two distinct seasons are winter with ice and snow cover and little biotic activity, and spring/summer, a short growing season of rapid vegetative and fauna growth and reproduction.

The arctic cod is considered a key species in the food web of arctic streams. Other important anadromous fish are ciscoes, whitefish, and char.

There are millions of birds that migrate into the Arctic region. Migratory birds begin to appear in April or May with geese, ducks, cranes, swans, shorebirds, and seabirds being the predominant forms. Their activity ends with fall migration in September.

Mammals such as the arctic lemming and arctic hare are predominant primary consumers. Caribou are of seasonal importance, with moose and muskox of lesser importance. Predominant secondary consumers (predators) are the arctic fox and the polar bear. The wolf, wolverine, and brown bear are of seasonal importance during the spring and summer season. The ringed and bearded seals are marine mammals of permanent residency along the coast and on the barrier islands.

b. Habitats and Resources of Special Concern: The only endangered species reported for the arctic region is the arctic peregrine falcon which is reportedly in the area during migration, but does not breed here since suitable habitat is not available.

Approximately 171 bird species use the Alaskan north coast during the short arctic summer. Fifty of these species can be found along the Beaufort Sea. Offshore areas are used for feeding while estuaries and nearshore uplands are used for reproduction. Estuaries, river deltas, and other drainage areas are also important habitat for other wildlife of the region. Barrier islands are important as denning sites for polar bears.

The environmental quality is very good. The water is nearly pristine and the air quality is about the best in the Nation. There are essentially no man-induced environmental stresses such as sewage and industrial wastes.

Cultural resources of the coastal areas and discussed under Section III.F.3., Marine Habitats and Resources - Arctic Region.

6. Socioeconomic Factors

The arctic region economy is dominated by three activities. First, the non-Native enclave economy is dominated by massive construction and mining operations at Prudhoe Bay and Deadhorse, population 5,531. Second, the developed economy dominated by the local and regional government and Native corporation employment, supplemented by mining employment, is centered mainly in Barrow. These activities are financed in part by indirect revenues from Prudhoe Bay and Native land distributions. Finally, a Native traditional and subsistence economy supplemented by mining and government employment exists in part in the distribution centers at Barrow (population 2,800), and Kotzebue (population 2,500), but represents the major source of traditional and customary livelihood in the 18 other villages situated in the region.

The largest economic activity in the arctic region is the oil and gas activity and its related construction employment. This activity is presently concentrated at Prudhoe Bay on the Beaufort Sea coast where a giant 10-billion-barrel, 26-trillion-cubic-feet field is in production. A second area of relatively large exploration activity is the National Petroleum Reserve located to the west of Prudhoe Bay. Finally, light exploration is occurring on Native corporation lands, which extend throughout much of the arctic area.

Typically, oil and gas development is of the enclave type, with small direct effects on the traditional communities. Federal, borough, and local government employment are important in Barrow, with the Prudhoe Bay property taxes financing much of the borough activity. Local and borough governments are the main activity in the smaller villages outside subsistence. Other major or potential industries of the arctic region are tourism, which is small but growing, and the activities of the NANA and Arctic Slope Regional Corporations, and the other Native corporations with large land and financial holdings and a desire to promote the economic well being of the area. Kotzebue and Barrow receive a substantial number of 1 to 2 day visits by tourists during June, July, and August.

The people of the Arctic region rely heavily on a subsistence lifestyle. According to the 1974 study of Federal Programs and Alaska Natives, more than 75 percent of the Native families in the region derive at least half their food supply from subsistence activities. Largely a meat harvest, the variety of fish and wildlife resources available in the vicinity of the customary subsistence harvest sites dictate the resources used, which vary among the 20 villages in the region. For example, the region surrounding Kotzebue is characterized as having three types of subsistence economies represented; a sea mammal dominated economy in three villages, an inland caribou dominated economy in three other interior villages, and a mixed land mammal and fish subsistence economy in five other villages, including the service center of Kotzebue, where sea mammals are also significant subsistence resources. Sea mammals harvested for subsistence purposes include bearded seal, beluga whale, hair seal, and a small number of walrus. Caribou and moose head the list of land mammals harvested, with trout, smelt, salmon, whitefish, sheefish and arctic char comprising the major fish species used. Similar but distinctive patterns likewise exist within the territory of the North Slope Borough, where the hunting of the Bowhead whale is of overriding socio-cultural and economic value.

The major landowner in the region is the Federal Government, with about three-fourths of the coastal area in wildlife refuges (Arctic NWR and the proposed Selawik and Alaska Marine Resources NWR) in the national park system, (Cape Krusenstern and Bering Land Bridge) and in the National Petroleum Reserve-Alaska. The State owns most of the land around Prudhoe Bay, and the Natives have selected land at Kaktovik, Barrow, Wainwright, and along the Chukchi Sea. With the exception of Barrow, the Deadhorse/Prudhoe Bay complex, and small Native villages, the coastal area is essentially undeveloped. The dominant uses are subsistence-oriented.

IV. ENVIRONMENTAL CONSEQUENCES

A. Generic Impact Producing Factors

1. Oil Spills

Introduction: Petroleum hydrocarbons are introduced to the marine environment by deliberate, accidental and natural means. Sources of deliberate discharge of petroleum hydrocarbons include: tanker washing (during normal operations and preceeding dry dock periods), river and urban runoff, coastal municipal and industrial wastes and atmospheric rainout. Accidental discharges occur from tanker mishaps, pipeline ruptures and production and storage spills. Oil seeps represent the natural source of petroleum hydrocarbons to the marine environment. The total volume of petroleum hydrocarbons introduced to the world's ocean is estimated to be nearly two billion gallons per year. A breakdown by contributors is presented below.

TABLE 1

Contributions to the Introduction of Petroleum Hydrocarbons to the World's Ocean*

Contributor	Percentage of Total (Approximate)	Billions of Gallons Per Year
Marine Transportation	34	.656
River Runoff	26	.493
Atmospheric Rainout	10	.185
Municipalities	10	.185
Natural Seeps	10	.185
Industrial Wastes	8	.154
Offshore Production	2	.025
		1.883

The discussion presented here deals only with the accidental discharge of petroleum hydrocarbons from the production and transportation to shore of crude oil produced on America's OCS. These accidental discharges stem largely from human errors and equipment failures. Spill sources are collected according with production sites, tanker transportation and pipeline transportation. Furthermore, this discussion does not consider the use of spill containment and clean-up equipment. A brief discussion of containment and clean up is included in Section I.B.4.d.

*Taken From: Boyd, B. Dianne, Charles C. Bates and John R. Harrald, 1976, The Statistical Picture Regarding Discharges of Petroleum Hydrocarbons In and Around United States Waters. Proceedings of the Symposium on Sources, Effects and Sinks of Hydrocarbons in the Aquatic Environment, American Institute of Biological Sciences, Washington, D.C., pages 38-51.

Spill Risk: There are six components to an analysis of oil spill risk. In order of occurance these components are: (a) spill likelihood; (b) nature of the spill; (c) transport and behavior of the spilled oil; (d) location and sensitivity of impactable resources; (e) likelihood of con- between the spilled oil and vulnerable resources; and (f) estimation of damage to the resources. Each of these components or topics are discussed below.

a. Spill Likelihood: Spill likelihood is a probabalistic matter. Oil spills occur for a variety of reasons at a variety of locations and at a variety of times. One of the chief causes of oil spills is human error. It is established practice in oil spill risk analysis to attempt to assign probabilities of spill occurrence which are based upon analysis of recorded spill incidence. It is implicit with such procedure that past experience foretell future events. This may be an incorrect assumption in that past experiences have occurred only in specific areas and no provision is made for the possibility that improved technology and stricter enforcement of updated regulations will change the probabilities of spill occurrence. Further, while intuitively one might assume that spill likelihood is higher in areas of more severe meteorologic, oceanographic or geohazard conditions, the fact of the matter is that there is no evidence (statistical, or otherwise) to support this assumption. Offshore structures are carefully engineered and safety factored in order to enable structures to withstand conditions present in specific areas. Additionally, even in the event of a structure failure, other system controls are likely to prevail, thereby further reducing the likelihood of a spill. That is to say, failure of a structure as a result of environmental or other factors does not necessarily result in failure of spill control equipment. In short, there is no apparent relationship between severity of physical conditions and the likelihood of oil spills.

Analyses of oil spill statistics have utilized a variety of exposure variables. Exposure variables are those parameters judged by the analysists to be indicators of spill likelihood. Example exposure variables are volume of oil handled, age of tankers, number of tanker port calls and miles of pipeline. The variety and analysis of exposure variables utilized in various studies are limited by the existing data bases, which are sparse. Oil spill risk analyses performed by the Department of the Interior for assessment of environmental impact on the outer continental shelf have utilized volume of oil produced as the exposure variable. The reader is referred to the Final Environmental Impact Statement for OCS Sale #48 (Southern California) or #49 (Mid-Atlantic) for an example of this OCS oil spill risk analysis.

Application of the spill incidence rates used in the Department of the Interior oil spill risk analysis work yield values as shown in the following table. The values in the table represent the anticipated number of oil spills for each of the outer continental shelf regions based upon drilling activities use of the indicated mode of transportation (P for pipelines and T for tankers). These spills would occur over a twenty-five to thirty year period. The expected volumes of oil to be produced and transported in each of the regions (the exposure variables) are included in the table. The values presented in the table represent resource volumes for acreage to be offered according to the proposed five-year schedule. It is assumed that all of the estimated volumes of oil will be produced and transported to shore. There is no accounting in the table for spills originating from existing leases or from oil imports. There are uncertainties in the volume estimates presented in the table. For example, there is a 95% chance that the volume to be produced and transported from the North Atlantic region will exceed 39 million barrels and a 5% chance that it will exceed 155 million barrels. The corresponding numbers of large spills (greater than 1000 barrels) for this range of volumes are .22 and .89, respectively.

SPILL FREQUENCY ESTIMATES FOR OCS REGIONS
Alternative 1

Area	Produced Volume ($x10^6$)	Trans. Mode	No. of Spills > 1000 bbls.
North Atlantic	356	T	2.04
Mid-Atlantic	200	T	1.15
South Atlantic/Blake Plat.	240	P/T	1.38
Gulf of Mexico	790	P	3.29
Southern California	1180	P	4.92
Santa Barbara Channel			
Central & No. Calif.	288	T	1.65
Gulf of Alaska	40	T	0.23
Kodiak	46	T	0.26
Cook Inlet	160	T	0.92
Northern Aleutian Shelf	40	T	0.23
St. George	320	T	1.84
Navarin	760	T	4.36
Norton	160	T	0.34
Chukchi	1280	T	7.35
Beaufort	860	P	3.59
Total			33.55

b. Nature of the Spills: The nature of a spill includes the location and type of spill and the spill duration. The consequences of an oil spill are very much dependent upon how and where the spill occurs.

If an oil spill occurs as a blowout into the atmosphere, as was the case in the North Sea Ekofisk incident in 1977, there will be opportunity for considerable evaporation. Evaporation is enhanced by the formation of increased surface area due to presence of oil particles in the atmosphere. If the oil spill were to occur beneath the sea surface, from a pipeline rupture for example, much of the oil could be taken into the water column. The processes by which oil is taken into the water column is referred to as accommodation. Evaporation and accommodation are especially pertinent to to the lighter weight components of crude oil. A third type of oil spill is created by the release of oil on or near the sea surface by such manner as a tanker hull rupture or grounding accident. Examples of the latter include the Amoco Cadiz and Argo Merchant incidents.

Spill duration and discharge rate are important factors determining the fate and effects of an oil spill. Consider for example the contrasting consequences of a near instantaneous release of a small quantity of oil provided by accidental spillage of a barrel of oil versus a platform blowout which lasts for the several weeks or months requiring drilling of a relief well. The latter circumstance was experienced in the Gulf of Mexico Campeche oil spill. Spill duration and discharge rate are also important factors relating to spill containment and cleanup.

c. Transport and Behavior: The transport of oil within the ocean is a function of currents and local winds. The relative importance of each is a function of their magnitudes and the depth of the oil in the water column. Most attention has been paid to the movement of oil on the water's surface where winds and surface currents predominate. Significant progress has been made in the study of surface transport although considerable work is yet required to determine the thickness and concentration distributions of oil on and near the ocean surface.

As with spill incidence, the projection of oil spill movement is a probablistic matter which is limited by wind and water velocity observations. Prediction of the movement of a hypothetical spill is based upon existing observations and an understanding (observed and theoretical) of the variations in wind and water velocities which might reasonably be expected to occur.

The behavior of oil during its transport includes spreading over the water's surface, evaporation, entrainment and accommodation within the water column, biological and chemical degradation and interaction with sediments, all of which are complex phenomena of which little is known.

Crude oil is a mixture of petroleum hydrocarbons which span a wide range of molecular weights and possess a wide variety of physical and chemical properties. The make up of crude oil varies with geographic location of the oil wells and with production depth within individual wells. Until the oil has been recovered and analyzed its makeup is not known. The physical and chemical properties of this mixture undergo considerable change as various components are removed from the mixture. Removal of various components is brought about by processes of evaporation, accommodation and interaction of sediments. Thus there are varying behaviors of an oil spill which might result from both the nature and location of an oil spill. Spill location is pertinent through the influences of differing water volumes, relevant dynamical processes acting on the spilled oil and water, and the presence or absence of sea ice.

Little is known about oil spill behavior and clean-up on or under ice. However, it is believed that fast ice conditions should ease rather than hinder clean-up operations. Any oil spilled would have a higher viscosity in winter temperatures and would tend to be semi-solidified by the snow on the ice surface. Additionally, oil would tend to accumulate in the voids and spaces in the uneven under ice surface if released beneath the ice (Lewis, 1978). Further, it is believed that sluggish currents, high salinities, and low temperatures beneath the ice will retard dispersion, inhibit microbial degradation and allow prolonged contact and dissolution of the more toxic, aromatic fractions (NOAA/OCSEAP 1979). If however, a spill occurs in late winter and clean-up is not possible prior to spring breakup, drifting ice could disperse oil over a large area. (See Appendix 9 for discussion of Arctic Technology).

d. <u>Location and Sensitivity of Impactable Resources</u>: Impactable resources include the shorelines, regions utilized by sea birds, spawning areas, larvae and fish migration routes, commercial and sports fishing areas and a host of others. The existence of these and other resources of course depends upon geographic location. The sensitivities of the various impactable resources are time dependent. An oil spill cannot directly impact whales along their migration routes if the spill occurs when the whales are absent. However, the oil spill may impact whales through indirect pathways such as the food web. Although a recreational beach is always sensitive to oil spills the impact may be more adverse if it occurs during the height of the recreation season. Degrees of sensitivity are generally functions of such factors as the life stages of organisms and social and economic factors.

It is important, for assessing the impact of oil spills on various resources, to maintain an accounting of both the location and time sensitivity of the resources. Analyses, taking these factors into account, have been and will continue to be presented in sale specific environmental impact statements prepared by the Bureau of Land Management.

e. Likelihood of Oil Spills Contacting Vulnerable Resources: The likelihood of an oil spill contacting a potentially vulnerable resource is a function of the locations of the spill and the resource and the oil spill trajectory. Damage to the vulnerable resources are of course dependent upon the condition and quantity of the oil at the time of impact.

The locations and temporal sensitivities of potentially vulnerable resources have been and are being documented through extensive studies. The locations are not necessarily fixed in time or space but vary with circumstances peculiar to the organisms. For example, spawning may occur when the water reaches a particular temperature; non-stemming larvae will be found where currents carry them; etc.

Spills are apt to occur in a variety of places. Tanker spills are considered most apt to occur along tanker routes and at positions of loading and unloading. While this is perhaps correct (and is presumed in pre-lease sale environmental assessments) it is recognized that ships become lost at sea and go aground outside accepted transit routes. We can be more confident in assigning potential spill sites to the locations of pipelines and production platforms.

f. Damage to Resources: The final (and perhaps most important) aspect of a thorough oil spill risk analysis deals with damage assessment. The hypothetical spill has occurred, the oil has undergone some alterations in its physical-chemical properties while being transported on and beneath the sea surface and has contacted one (more likely more than one) sensitive resource. What now are the consequences to the natural and human environments? This aspect of the analysis is difficult because of the chain of uncertainties and assumptions which necessarily have preceeded the oil's coming in contact with the resources and because of the paucity of information available from valid in situ observations of effects.

A further complication arises from the fact that oil spills occur in a wide variety of sizes. The smaller spills are those which are barely observed or apt to be conscientiously reported (one to a few barrels) while the largest spills have exceeded a million barrels.

Most accidental oil spills are small in volume; however, the greatest volume of accidentally spilled oil is released during the very few but very large spills. Given these circumstances, there is little significance in discussing an average sized oil spill. The final impact analysis therefore must be largely a judgmental one.

2. Water Effluents

a. Offshore

The significant offshore effluents which result from OCS leasing and development include formation waters, drilling fluids and cuttings, deck drainage and sanitary wastes.

Formation waters are essentially relict sea water which was geologically trapped along with petroleum resources and, when produced with petroleum, must be removed and disposed of. In some wells water is encountered in the early stages of production. In others, water is not encountered until the producing formation has been significantly depleted, and in some cases water is never produced. Constituents of these waters which may adversely affect marine water quality include petroleum hydrocarbons and radionuclides.

Petroleum hydrocarbons are present in disposed formation waters at an average concentration of 200 mg/l. However, concentrations vary widely with geographic region, production stage of the formation, and the treatment technology applied. See Section I.B. for pertinent regulatory requirements. Radionuclides have been detected in produced formation waters in activity levels ranging from 4 to over 1,000 picoCuries per liter. Ambient radioactivity levels in continental shelf waters are approximately 1-2 picoCuries per liter.

Drilling fluids are complex chemical mixtures which are circulated through a well bore during drilling. Drill cuttings are those rock particules displaced during the drilling of a well. The cuttings are separated from the circulating drilling fluid and discharged. This discharge contains appreciable quantities of drilling fluids which adhere to the cuttings. In addition, drilling fluids are occasionally discharged during drilling and at the completion of a well. The weight of the major drilling fluid components discharged from a typical 15,000 ft. well are indicated in the table below. Toxicity bioassays have indicated that most drilling fluid components are relatively non-toxic; however, some minor constituents are toxic and persistent. Effects of drilling muds and fluids on the marine environment are discussed in Section IV.B.2..

MUD COMPONENTS USED IN SEAWATER - LIGNOSULFONATE SYSTEMS TO 15,000 FEET. WEIGHT IN THOUSAND POUNDS 1/

	Interval 0-900 Ft.	Interval 900-3500 Ft.	Sub-total 3500 Ft.	Interval 3500-10,000 Ft.	Sub-total 10,000 Ft.	Interval 10-15,000 Ft.	TOTAL 15,000 Ft.
Barium Sulfate (Barite)	3	3	6	529	535	625	1,160
Bentonitic Clay	10	10	20	36	56	9	65
Attapulgite Clay	5	5	10	-	10	-	10
Caustic	.5	.5	1	20	21	23	44
Aromatic Detergent		1	1	2	3	-	3
Organic Polymers		1	1	3	4	-	4
Ferrochrome Lignosulfonate				26	26	69	95
Sodium Chromate						2	2
TOTALS	18.5	20.5	39	616	655	728	1,383 (691.5 tons)

1/ These are "typical" values and quantities may vary by as much as 50 percent from well to well.

Deck drainage includes all effluents resulting from platform washings, deck washings, and run-off from curbs, gutters, and drains including drip pans and work areas. The constituents of concern in this effluent are oil and grease. No quantitative information on concentration ranges is available; however, these discharges are strictly controlled. See Section I.B. for pertinent regulatory requirements.

The sanitary wastes from offshore oil and gas facilities are composed of human body waste and domestic waste such as kitchen and general house-keeping wastes. Variables which affect the volume and concentration of these wastes include time, space, occupancy, platform characteristics, and operational situation. Floating solids are of great concern from this effluent due to the adverse aesthetic effects created thereby.

b. Onshore

The significant onshore water effluents which could result from OCS development would be those associated with the construction of new onshore facilities and the operation of those new gas processing facilities, and marine terminals constructed as a result of the proposal.

The significant alterations to onshore water quality accompanying construction activities include temporary increases in suspended sediment and nutrient load to water bodies which receive runoff from construction sites. Important variables include size of area disturbed, topographic relief, soil type, precipitation, time under construction, and environmental engineering considerations such as catch basins and turbidity dams. However, these pollutants are typical of older plants. State-of-the-art gas plants utilizing a physical solvent closed 100p process usually emit only exhaust gas wastes.

Gas processing plants generate 85 percent of their wastewater output from cooling water and 10 percent from boiler feed. Water consumption is assumed to be 1.5 gallons per day per thousand cubic feet of gas processed. The approximate waste water constituents are presented in the table below. These, however, represent effluents of older plants. State-of-the-art plants emit only waste gas effluents.

GAS PROCESSING PLANT WASTEWATER POLLUTANTS

USE	POLLUTANT	CONCENTRATION (LBS/1000 GAL)
Cooling	Chromate	0.25
	Zinc	0.025
	Chlorine	0.0012
Boilerfeed	Phosphates	0.34
	Sulfite	0.17
	Sludge conditions	0.17
	Oil and grease	0.08

Marine terminals discharge waste water as a result of deballasting tankers. Important variables controlling the constituents of ballast water include the type of product previously transported, and the degree of treatment applied to the ballast water prior to discharge. The approximate constituents of the effluent from a ballast water treatment facility are given in the table below.

MARINE TERMINAL BALLAST WATER POLLUTANTS

POLLUTANTS	POUNDS PER MILLION GALLONS
Biochemical Oyxgen Demand	88
Total Suspended Solids	84
Chemical Oxygen Demand	320
Oil and Grease	18

Petroleum refineries produce process waste water which contains concentrations of contaminants such as oil and grease, suspended solids, phenols, chromium and sulfides and exerts great biological and chemical oxygen demand on receiving water. This raw effluent is normally treated to reduce these constituents prior to discharge. New refinery construction is not anticipated as a direct result of the proposed action.

3. Air Emissions

a. Offshore

National ambient air quality standards have been established for the major types of pollutants that endanger human health and welfare. Of these, carbon monoxide, particulates, sulfur dioxide, hydrocarbons, and nitrogen dioxide may be associated with OCS development activities.

In addition, some States have established standards for hydrogen sulfur, which may also be emitted from the OCS. The various air quality standards define the maximum pollutant concentrations that can occur without impacting human health and welfare.

The term (NO_x) is used to describe oxides of nitrogen, including NO_2 and NO. NO_2 is a pungent gas which causes nose and eye irritation and pulmonary discomfort. NO is converted to NO_2 by atmospheric chemical reaction. Both NO and NO_2 participate in photochemical reactions leading to smog.

Sulfur dioxide is a colorless and pungent gas which causes irritation to the respiratory tract and eyes and causes bronchoconstriction at high concentrations.

Hydrocarbons react with NO_x and sunlight to form photochemical oxidants or "smog". Health effects include irritation of the eye, nose, and throat. Extended periods of high levels of oxidants produce headaches and cause difficulty in breathing in patients suffering from emphysema.

Suspended particulates cause irritation to the respiratory tract. Absorption of gases on small particles increases the effect, particularly if the particles penetrate to deeper portions of the lungs.

Details regarding the potential effects of pollutant levels in excess of the standards can be found in studies developed by the U.S. Environmental Protection Agency, used to develop air quality standards (See Appendix _).

The USGS is in the process of developing regulations which address the problem of potential onshore air quality degradation as a result of OCS activities.

Significant air pollutant emissions sources resulting from the proposal are discussed below. A more detailed analysis of impacts from specific sales will be possible at the sale-specific environmental impact statement stage; however, anticipated air quality impacts by area are addressed generally in Section IV.B.3.e.,

A major oil spill would release significant amounts of hydrocarbons. A major natural gas release could emit locally toxic amounts of hydrogen sulfide (H_2S) and significant amounts of hydrocarbons into the offshore atmosphere. These emissions would probably be diffused rapidly in the offshore air mass.

Pollutant emissions during exploration occur largely from ship engines, drilling and routine supply operations. Total emissions from these sources are expected to be minimal. Emissions of all pollutants increased during pipeline and platform installation largely owing to the transport of materials from major supply centers to the lease areas. Major pollutants from this source (i.e. tug boats, barges, etc.) include nitrogen oxide, carbon monoxide, hydrocarbons and particulate matter. A combination of platform installation and high production levels normally results in a peak emission year occurring shortly after production begins. Offshore emissions decrease abruptly following completion of platforms installation and continue to gradually decrease thereafter as production levels decline.

The major offshore pollutants associated with production are sulfur oxides and nitrogen oxides from power generation, hydrocarbons from evaporative losses, and sulfur oxides, hydrocarbons, and hydrogen sulfide from gas processing. Power generation may account for up to 20 percent of the total OCS development related emissions of nitrogen and sulfur oxides. Production emissions associated with pipelines include exhaust emissions from pumps to clean the recovered oil and gas to shore and evaporative hydrocarbon emissions from pipeline valves, flanges and seals. Tanker related emissions include 1) hydrocarbon losses during the loading operations 2) exhaust emissions from tanker engines and 3) hydrocarbon losses from tanker cargo breathing. Hydrocarbon losses during the loading are typically the largest single emission source associated with OCS development. In general, use of pipelines rather than tankers significantly reduces hydrocarbon emissions.

A major oil spill would release significant amounts of hydrocarbons and hydrogen sulfur. Depending upon prevailing meteorological conditions, these emissions could have a temporary adverse impact on onshore air quality.

b. Onshore

Onshore supportive activities would be needed during all phases of OCS activities. The number of employees and volume of supplies required during the production phase would be drastically lower than during exploration and development. Major onshore emisisons sources include port facilities, fabrication yards, employee vehicles, gas processing plants, tanker unloading, partial oil processing and storage tanks. Generally, about 80 percent of the total onshore hydrocarbon emissions and lesser amounts of sulfur dioxide and hydrogen sulfide emissions are associated with ample processing processing plants. The major source for sulfur dioxide emissions is the combustion of coal, oil and other commercial and industrial fuels containing sulfur.

The emission sources described above could result in some onshore air quality degredation. The magnitude of that impact in comparison with the air quality standards can only be predicted where the extent of OCS development is known. The USGS is in the process of developing regulations which address the problem of onshore air quality degredation as a result of OCS activities.

4. Onshore Facilities

a. Sale-Induced Facilities

A variety of facilities are required in order to support offshore oil and gas leasing operations. Most of these facilities would be required for each sale or sale area considered in the proposed five-year leasing schedule; the likelihood of each is addressed under each facility description.

More detailed information regarding each of these facilities may be found in the NERBC-RALI publication, Onshore Facilities Related to Offshore Oil and Gas Development: Factbook (available from the New England River Basin Commission, 55 Court Street, Boston, Massachusetts 02108). The material is presented in such a manner that once more specific information is known regarding sale location, offshore facility requirements, and capacities of earlier established facilities, the size and amount of required new onshore facilities can be projected along with related requirements and impacts.

The discussion below focuses upon the operation of facilities. For some large facilities, the economic and social impacts of construction may exceed the impacts of operation. For the larger facilities, a construction force of 500 to 1,000 persons working over a period of one to three years could be required. The environmental effects would depend on the site characteristics, but could involve vegetation and soil removal with resulting habitat destruction, runoff, dust and other impacts associated with similar industrial developments.

Service or Support Bases: Service bases are essentially port facilities, with dockside space, warehousing, open air storage space, and a small amount of office space required. A helicopter pad may also be located in conjunction with a service base. However, companies may seek helicopter sites closer to the offshore operating areas. Any given port area may service more than one operator, either with separate facilities for each operator, or common facilities provided by a service company. Where available, leasing or acquisition of areas with existing port facilities would be most attractive for service bases, with the possibility of renovation or the construction of new facilities. Use of existing facilities, either OCS service bases from adjacent operating areas (as in moving from the Central Gulf of Mexico to the eastern Gulf, or to nearby areas offshore of California), or other commercial facilities, is especially desirable and likely during the initial exploratory phase, before it is determined whether and where long-term facilities will be required. In most areas of Alaska other than Cook Inlet, enclave type development is expected, concentrating not only service bases, but transporting and processing facilities as well. In most cases, these would be placed at a distance from existing towns and villages.

Service bases serve primarily as storage and staging areas for supply vessels. Because of the size, draft and servicing requirements of these vessels, they are often likely to be easily accommodated in ports serving fishing vessels, causing a potential for space competition and other use conflicts. Ports utilized solely by pleasure craft are not likely to have appropriate services (repairs, supplies, etc.) or drafts (15 to 20 feet); ports serving large cargo ships and tankers engaged in international trade, on the other hand, may not be prepared to service smaller supply vessels. Space requirements depend on the amount of offshore facilities being served, since the space required is determined primarily by the amount of drill pipe, muds and other supplies being stored, and by berthing space for the vessels required to supply the offshore rigs or platforms. If only two or three exploratory wells are being drilled at any one time, less than 25 acres may be required. For a base supporting more operations, anywhere from 50 to 100 acres per base could be required.

The number of vessels operating out of the base varies with the number of platforms serviced and the distance out to the platforms, but in general one supply vessel is needed for every two or three producing platforms. During drilling activity the need for supply boats is higher; two or three supply boats needed for each exploratory or development drilling rig. For these platforms, located over 150 miles from their support base, four supply boats may be required during development drilling. Additional supply boats and tugboats are required during platform and pipeline installation. Each supply boat employs a total of about 11 people, working in shifts. Platform crews are transported either by helicopter or by crew boats. Crew boats employ about six persons and are used where the platforms are close to shore or where severe weather conditions prohibit use of helicopters. A helicopter employs about three people and can service up to five producing platforms.

Potential environmental impacts from operating onshore service bases, besides land use conflicts discussed above, would stem mostly from hydrocarbon emissions from storage and transfer of fuel for service vessels and offshore operations; combustion from machinery and vehicles; accidental spillage or leakage of fuel; water supply requirements (potable water for offshore workers and nonpotable for drilling operations); and runoff. Greater impacts would be incurred in the construction stage, should significant new construction be required, including dredging for bulkheads.

Many of the OCS lease sales on the proposed schedule represent at least the second or third sales in the area and the areas already have (or may in the future already have) service bases established. Should bases be developed as a result of the first frontier area sales, additional sales may require only expansion of existing service bases--depending upon the distance of subsequent sales from original support facilities. No new bases would be expected in the Gulf of Mexico. Additional sales would serve to offset declining drilling activity of recent years and help keep existing support operations at current levels. In Alaska, in all areas except perhaps Cook Inlet, new support bases would be required; most would be expected to be concentrated facilities of the enclave-type, as previously discussed.

Pipelines, Pipeline Coating, and Pipeline Terminals: Installation and operation of pipeline would require several facilities. Prior to the laying of pipe offshore, it must be coated with a concrete and asphalt sealant for underwater use. A new pipecoating facility may or may not be required in a given area, as similar pipecoating techniques are sometimes utilized for other uses of pipeline (e.g., sewage outfalls), so that pipecoating capacity may already be available in developed areas. While pipecoating facilities would probably need to be available within each region, they would not necessarily be established in each lease sale area. The size of a yard would depend upon demand, but would normally be 100 acres or more of industrially zoned land with water frontage, ocean access, 15 feet or deeper channel depths, and good road or rail access. Most of the site would be utilized for open storage of pipe.

Seasonal, unskilled labor accounts for the greatest part of the 100-200 workers required. Potential environmental effects stem from dust and other particulates, internal engine combustion, water pollution from runoff, water supply requirements, and effects of site preparation required.

During pipeline installation, support facilities for pipelaying vessels are required. These facilities would be similar in nature and impact to service bases supporting drilling and production operations and may be sited in conjunction with the service bases.

Once the pipe is coated and installed, permanent pumping and storage terminals may be required for oil, if it is to be piped to a refinery in the region. The storage capacity would be about two days of pipeline transmission capacity. A forty acre site could be required, utilized mostly by the storage tanks. Pumping stations for gas pipelines, if required, would require little land besides the right-of-way. Air pollution emissions from oil storage tanks present a potential for environmental impacts.

Pipeline rights-of-way themselves are normally 50 to 100 feet wide. Of this, 30 to 40 feet of soil and vegetation may be removed, and a total of 50 to 60 feet may be disturbed by pipelaying equipment. If placed in well-drained areas without excessive slope, effects of burial would be temporary. If layed in wetlands or other less suitable areas, careful planning and design would be required to mitigate potential environmental effects and prevent exposure of the line.

Marine Terminals: A tanker or barge terminal may be utilized to transship oil piped to shore for subsequent shipping to other regions. If separation has not taken place offshore, a partial processing facility could be located in conjunction with the terminal. Such a terminal facility would be anticipated where severe weather conditions and heavy seas would interfere with offshore loading of tankers. For example, construction of marine terminals is expected as a result of Alaska sales, except Beaufort Sea, the Gulf of Alaska, and possibly Cook Inlet (Beaufort production could be shipped through the TAPS pipeline, and terminal facilities exist in the Gulf of Alaska and Cook Inlet which may be adequate or could be expanded). A waterfront site, preferably industrial, would be required, with a water depth of 35 feet. While the site could occupy 200 or 300 acres, less than 100 acres would probably be intensely utilized; most of this would be for storage tanks. Employment requirements would depend upon the size and specific type of operation but would probably be well under 100 persons. The most significant environmental impact would be due to hydrocarbon emissions from storage and transfer of oil, from dredging (if required), and from site preparation. Other potential effects would be air emissions from combustion, any pollutants from partial separation and partial processing, dust, and runoff.

Gas Processing Plants: Gas processing plants are built to remove hydrogen sulfide impurities (if any) and to strip commercially valuable ethanes, propanes and butanes from the gas stream. They are constructed along the pipeline route between the landfall and an existing gas transmission line. A large plant processing one billion cubic feet per day would require about a 75-acre site. About 500 persons would be employed in building the plant, and about 50 persons would be employed in operating it.

The greatest potential for environmental impacts is sulfur dioxide emissions from gas processing. The extent of the emissions would depend on the amount of hydrogen sulfide in the gas and the amount of gas processed. Other pollutants include emissions from combustion, particulates, runoff and any effects of site preparation.

New or expanded gas processing facilities would be anticipated as a result of sales in the Atlantic lease sale areas, the eastern Gulf of Mexico and California lease sale areas.

Gas Liquifaction and Vaporization: In those Alaska areas where shipping is feasible at least most of the year and large volumes of natural gas are discovered, it may be economical to liquify the gas and ship it in Liquified Natural Gas (LNG) tankers. This processing and shipping is considerably more expensive that pipeline transportation of gas and would not be used in other areas, where existing transmission lines to market could absorb any new supply.

An LNG plant, with storage and docking facilities would require 25 to 100 acres of waterfront land, adjacent to deep water, with additional acreage for dredge disposal, expansion and buffer zone. The proposed facility for Cook Inlet gas would occupy a 50 acre tract. Potential air emissions include heat, nitrogen oxides (processing and tankering) and some sulfur oxides (tankering). In general, potential environmental impacts would be similar to those of other medium to large industrial plants, except that dredging might also be involved in site preparation. The chief problem in transport and storage of LNG is not environmental concerns but safety concerns due to the potential for fire or explosions.

A vaporization plant and receiving facility could require up to 1000 acres for a one billion cf/d plant. The proposed Pt. Conception proposal includes 209 acres, with 30 to 35 acres of subtidal lands for the marine terminal. Besides site preparation, including possibly dredging, environmental impacts of plant operation are low. Only minor air emissions are involved--the principle constitutant being nitrogen oxides. Again, the greatest risk is the safety factor. Such plants could be required on the west coast and would involve extensive environmental analysis and permitting requirements. (see Section II.A.1.)

Ancillary Facilities: Several small service or support companies may be established in a region to support OCS development. Some of these may be more likely to be established as a result of a second or third sale, when a long-term market for products and services seems assured. Examples of specialized companies include wireline companies, mud suppliers, and special tool companies. Other less specialized services may be provided by companies already in an area, perhaps through expansion. Examples of these are trucking firms, caterers, and welding shops. None of these require more than 5 acres and most less; only mud suppliers and cementing companies require water docksite and ocean access; most are small employers; and most would be expected to locate or expand in existing industrial and commercial sites. No significant increase in environmental impacts would be expected to occur as a result of these facilities.

b. Non-Sale Specific

Refineries are usually built to satisfy the demand for refined products in a particular area because it is less expensive to transport crude oil than it is to transport refined products. Therefore, to the extent that OCS-produced oil can feed refineries (existing or future) built to satisfy demand for refined products, no new refineries would be required as a result of the proposed action. Between 1960 and 1977 the percentage of the demand for refined products met by domestic refiners (excluding Puerto Rico) has fluctuated between 83 and 92 percent There may be some economic advantage to increasing that percent, and projected increases in demand also make increases in domestic refinery capacity likely, regardless of crude oil source. Therefore, the proposed action is not expected to cause expansion of domestic refinery capacity. However, the location of any new domestic capacity may be affected by OCS production.

In some cases regional refining capacity may not be able to be utilized for refining production from adjacent OCS regions. By and large, all Alaska production will be refined in the lower 48 where the market exists. This production can be shipped to Pacific coast refineries in the lower 48 or to Gulf of Mexico refineries (or to the Midwest, if pipeline transportation is developed). Refining of California OCS production, especially in combination with crude from Alaska, is constrained by the inability of California refineries to handle "sour" (high sulfur) crude. Predominantly sweet crude from southern Alaska provinces and any sweet crude from the California OCS can be substituted for some of the imported crude currently being processed in Petroleum Administration District V (including California). Expansion of California refining capacity to handle additional sour crude is limited by National Ambient Air Quality Standards. It is expected that any Alaskan crude which cannot be processed in PAD V will be transported to the Gulf of Mexico or Mid-Atlantic.

Should any new domestic refinery be located so as to process OCS-produced crude oil, an environmental impact statement would be required in order to obtain necessary air and water emission and effluent permits.

A new refinery of substantial size (100,000 to 250,000 B/D or larger)--smaller refineries are not as economic, but may be encouraged if they are built to handle foreign crude, since the entitlement program is designed not to discriminate against small, independent refiners)--requires 1000 to 1500 acres, although only about half of this is intensively used, the rest being utilized as a buffer zone. Some dockside acreage is required for a marine terminal if oil is received or sent out by tanker or barge instead of by pipeline. Refineries are major water users, but the amount required depends upon the capacity, product mix, cooling system and water quality; it is estimated that 5 to 15 million gallons per day could be used. Use of 100,000 kilowatts of electric power could be required as well. Air emissions would depend on the input, product mix and control technology. Major emissions include particulates, carbon monoxide, sulfur oxides, and hydrocarbons. Some water effluents, including hydrocarbons, phenols, chromium, sulfides, and suspended particles are also produced. Employment at refineries is significant, and could be on the order of 500 persons.

Significant construction impacts--both social and economic--arise from a large construction force of up to 3,000 persons. Environmental impacts due to site preparation and dredging may also occur.

Platform fabrication is considered a program induced facility, since any new platform fabrication facility would be built in response to increased domestic or world demand for platforms, but not necessarily in response to demand within one sale area or region. Platform fabrication yards are currently located in the Gulf of Mexico and California; they provide platforms for operating areas around the world.

Steel platform fabrication yards are large facilities with ocean access (and horizontal and vertical clearance requirements) requiring 400 to 800 acres, with dockside depths of 15 to 30 feet. If steel rolling takes place on site, there may be substantial water demand. Combustion emissions, particulates and emissions from antifouling painting are major air pollutants. Water effluents may also contain dissolved anti-fouling chemicals and dissolved metals.

Major environmental concerns are similar to those from other large scale industrial projects, involving significant site preparation impacts, including habitat destruction runoff, and potential requirements for substantial dredging. Large scale employment requirements (about 500 to 1,000 workers) would also occur.

5. Offshore Facilities

a. Exploratory Operations

(1) Drilling Rigs

Offshore exploratory drilling operations take place from three basic types of mobil rigs: jackup, semisubmersible, and drillship. The jackup structure is composed of a buoyant drilling deck with several attached legs. The rig is floated to location where the legs are lowered to the seafloor by some mechanical means, and the operating platform is raised to a level above the largest anticipated wave height. Jackup rigs are used out to water depths of about 350 feet and can survive 125 MPH wind and 90 foot wave conditions. Semisubmersible rigs are large selfpropelled floating platforms that are ballasted to a predetermined draft for drilling operations and maintained over the drill site by either a wire rope/chain mooring system or a dynamic positioning system. Water depth capability of the semisubmersible is dependent basically on the economics of deploying and recovering the anchored mooring system. They are designed to operate in severe weather conditions such as found in the North Sea. Very deep water exploratory drilling is accomplished from drillships positioned by dynamic positioning systems. Due to their shipshape they are susceptible to sea induced motions but "turret" designs help keep the vessels on the most favorable heading for operations. Current drillships are capable of drilling in over 5000 feet of water. About 90 persons would be employed on each exploratory rig.

(2) Positioning System

All floating exploratory platforms require some means of maintaining the rig over the drill site within certain limits. A spread mooring system employs heavy wire rope and/or chain terminating in anchors at the seafloor. The system is deployed with the help of support vessels and position is maintained by tensioning the lines with winches. The operational water depth of the spread mooring system is limited by the time and expense required to deploy and retrieve the system.

Dynamic positioning (DP) systems are used on semisubmersibles, drillships, and pipe lay vessels. These systems (which can be analog or digital) maintain vessel location by sensing platform deviation from a known position. Nonacoustic DP systems (such as the taut wire and marine riser systems) measure deviation of the element from the vertical while short and long baseline acoustic systems use arrays of hydrophones to measure horizontal displacement by accurately measuring travel times of acoustic pulses. Other vessel motions such as pitch and heave are measured by accelerometers. The sensors feed the resultant data into computers that manipulate the data and activate thrusters to provide proper force on specific vectors to counter disruptive environmental forces. Regardless of the type positioning system used, there is at least one completely redundant backup system which is activated in the event of primary system malfunction.

(3) Offshore Drilling Equipment

Much of the equipment used for offshore floating drilling operations is similar to that employed ashore. However, vessel motion and distance from the hull to the wellhead requires some unique equipment.

Blowout preventers (BOP's) are designed to control a well under unusual fluid or gas pressures by closing rams around (or at time cutting through) the drill string at the wellhead. In offshore drilling, they are generally modular units weighing up to 400,000 pounds (containing annular, pipe, and blind rams) mated to the wellhead collar at the seafloor. Control of the BOP rams was originally from the surface via discrete hydraulic lines. However, as operational water depth increased, unacceptable delays in ram closure times occurred. Current BOP control is by electrohydraulic methods whereby electric signals sent from the control panel at the surface activate the rams using bottom located hydraulic fluid accumulators, reducing BOP ram closure times to acceptable limits regardless of water depth. As with the positioning systems, primary BOP control equipment is backedup by at lease one completely redundant system.

The marine riser connects the drill platform to the BOP stack. It contains the drill string and provides a return conduit for drilling muds. The weight of the riser and muds increases dramatically as water depth increases, which, in early offshore drilling, restricted water depth capability. Development of syntactic buoyancy material (encasing the exterior of the riser joints), making the riser nearly neutrally buoyant, permits drilling in several thousand feet of water.

Vessel motion about the drill site is compensated for by various devices. Heave and pitch effecting the marine riser and drill string weight is compensated for by the marine riser tensioning system and drill string compensating gear.

These systems employ a series of hydraulic ram/cylinder and wire rope/sheave components to absorb up to about 50 feet of vertical vessel motion. Horizontal vessel displacement of up to a few degrees is allowed by flex (or ball) joints located at both the lower and upper end of the marine riser.

If emergency vessel disconnect from the wellhead becomes necessary, the upper BOP separates, allowing the platform to move offsite until conditions permit resumption of operations. Initial positioning of equipment (or reentry after a disconnect) is accomplished using guidelines (taut 3/4 inch wire rope stretching from the wellhead to the ocean surface), or acoustic locating devices. Manned intervention via divers and submersibles and/or remote television monitoring are also used for the operation.

b. Development and Production

(1) Platforms

Traditionally offshore oil/gas activity has involved exploratory drilling (including delineation of fields) from mobil rigs, followed by the design, fabrication, and installation of permanent bottomfounded platforms. Each producing platform employs approximately 16 persons. The structures currently utilized are of the steeljacket and concrete types. Concrete platforms are essentially structures with sufficient mass and crosssection to resist shifting due to environmental loads. In addition to supporting drilling and production facilities, they can be designed to provide void spaces for the storage of up to 1 million barrels of oil. They have been sited in 500 foot water depths in several areas of the North Sea.

Steel-jacket platforms are the dominant type of development and production units found on the United States OCS. They are fabricated ashore and floated to the well site, up-ended by controlled flooding, and placed on bottom with the help of crane barges and work boats. The units are anchored to the bottom by a series of piles driven into the seafloor. One piece steel platforms have been placed in over 500 foot water depths while sectionalized structures such as the Cognac platform in the Gulf of Mexico have been sited in water up to 1000 feet deep.

Economic factors may dictate innovative platform designs for development and production activity in water depths beyond 1000 feet. Two current concepts are the Guyed Tower and Tension-Leg designs. The guyed tower is maintained on-site by a series of radiating guy-wires terminating in clump-weights and anchors, while the tension-leg platform is anchored to a pile founded base by risers or cables held in tension by the positive buoyancy of the platform. The Exxon Guyed Tower is intended for at least 2000 foot depths while the Amoco concept was designed for 750 to 3000 foot depths.

Regardless of the design of the platform, they are all configured for multiwell production--some of the larger ones have slots for more than 40 wells. The platforms produce the fields by directional drilling techniques where the wells are deviated by predetermined values from the vertical in specific directions designed to efficiently exploit a field from a minimum number of platforms.

(2) Early Production Methods

Rig fabrication costs and lead time, escalating development and production expenses, and the desire to develop marginal fields has led to the evolution of the early production system concept. Production wells may be drilled through subsea templates from floating rigs which can complete and cap the wells and move on. A conventional structure (that was being fabricated during drilling operations) may then be positioned over the template for production or the wells may be completed via subsea completions with the product transferred to a floating production/storage facility.

(3) Subsea Completions

'Wet' subsea completion systems (where the wellhead components are exposed to the environment) and 'dry' systems (components encapsulated in 1 atmosphere chambers) are utilized for early production designs and for application in deep water production beyond current diver intervention limits where field geometry and yield would not permit structure employment. Wells may be individual producers to a floating facility or satellite wells tiedback to a central point via feeder lines as in the Garoupas field off Brazil.

(4) Floating Production Systems

Floating production/storage facilities can range from converted floating platforms or tankers to purpose-built facilities. A variety of systems have been designed to transfer the produce from the subsea wellhead or production center to the surface for transfer to shore facilities. Single Point Mooring (SPM) systems basically employ a riser from the seafloor wellhead to the surface, and an articulated buoy/boom system (which allows the surface facility to move in response to environmental forces) connected to the production/storage facility. Some semi-submersible floating producton platforms have the riser from the seafloor template attached directly to the platform. Tankers or pipelines transfer the produce to shore facilities for further refining and distribution.

(5) Pipelines

Under certain conditions pipelines are used to transport the oil/gas to onshore facilities or from satellite wells to subsea production centers or gathering points. Pipe is usually laid from a lay-barge, lay ship, or semi-submersible platform positioned by a spread mooring or dynamic positioning system but may also be laid by the bottom pull or floating method. The 40 to 80 foot steel pipe sections (pre-coated with concrete ashore) are welded together, x-rayed, and lowered to the bottom from a "stinger" at the rear of the platform. The vessel is slowly advanced by selectively tensioning mooring lines. Current lay vessels are capable of laying large diameter pipe in relatively deep (1000 foot plus) water under severe sea/wind conditions. Reel pipe lay ships recently put into operation carry the pipe in a continuous string on a large reel from which it is fed to the stinger to be laid. Tensioning systems aboard the lay vessels maintain constant tension on the pipe string as it is laid. Burial of the pipeline for protection is required by many permitting authorities. This is accomplished by devices that plow a trench prior to the lay, or bury the line after installation by creating trenches with air or water jets, augers, or other gear into which the pipe settles by gravity. A lay barge, together with its accompanying "jet" barge for burying the pipeline, will employ about 235 persons and install from 50 to over 200 miles of large diameter offshore pipeline in a year, depending on the size of the pipe and weather conditions during installation.

c. Current and Projected Technology

Continuous advances in the state-of-the-art in exploratory drilling equipment such as blowout preventers, marine riser buoyancy modules, new coupling designs, and motion compensation gear, along with refined positioning and subsea control systems hardware and software, make it possible to routinely drill in water depths exceeding 400 feet in wave heights to over 50 feet. Some of the current generation of drillships carry in excess of 6000 feet of marine riser and enough drill pipe (in 18 to 45 foot sections) to sink a 20,000 foot well in that water depth.

Development and production technology is not yet capable of operating in these depths. Production is currently occurring from the steel Cognac platform in over 1000 feet of water in the Gulf of Mexico and plans are underway to utilize a guyed-tower to produce a field in the same area at about 1500 feet. Tension leg designs have been extensively evaluated for depths to about 3000 feet. Subsea completions (both 'wet' and 'dry') are being made routinely in 500 to 600 foot depths in the North Sea environment, and some systems such as the Exxon SPS (which has been tested under simulated deepwater conditions) are designed to be deployed in up to 2000 feet of water. Increased emphasis is being put on early production techniques to offset cost factors and exploit marginal fields. Subsea template, satellite well, and similar diverless completions are being contemplated for 2000 feet and more, and new floating production designs to handle the production are available.

Pipeline technology has made rapid advances in recent years. Third generation semi-submersible lay barges with variable angle 'stingers', advanced abandonment and recovery systems, and enhanced vessel stability enables the laying of large diameter pipe in over 1000 feet of water and smaller pipe at deeper depths. A 36" line has been laid in over 500 feet of water while a 20" line has been laid in 1100 foot depths and plans are underway for the laying of another 20" line in 2000 feet of water in the Sicilian Channel. Pipeline burial technology has kept pace a new system employing a rotating cutter head which is positioned by contact with the previously laid pipeline is capable of operating in over 1000 feet of water.

Recent technological advances in production and development phases of off-shore oil/gas operations have been considerable. Exploration of potential deepwater areas around the world could lead to discoveries which in turn would prompt the industry to further accelerate development of deepwater production technology.

B. Environmental Consequences of Alternative 1

1. Impacts of the Physical Environment

Constraints to OCS oil and gas development activities considered in the following sections are geologic, oceanographic and meteorological.

Meteorologic conditions may severely impact OCS development. Fog, rapid weather changes, severe winter storms, hurricanes and extratropical and tropical cyclones with attendant high sea state, strong winds and storm currents frequent portions of the OCS. Freezing and thawing of offshore subsea permafrost, the presence of land fast, shear and pack ice, and icing on ship and platform superstructures can cause special engineering problems for OCS activities in northern areas.

Oceanographic parameters which may impact OCS operations include extreme wave heights, water depth exceeding the present extent of proven oil production technology (300 meters) and high velocity surface and subsurface currents.

Instability of the seafloor, whether from seismic activity or sedimentary processes, is a major geologic hazard to emplacement of platforms and pipelines in the marine environment. Hazards related directly to seismic activity include ground shaking, fault rupture, generation of tsunamis, and earthquake-induced ground failures such as liquefaction and slumping. Faults showing displacement of either the seafloor or young (less than 11,000 years) sediments as well as those associated with historical earthquakes are considered active, and therefore, potentially hazardous to development. Instability of the seafloor can also result from dynamic (e.g., wave surge) and static (e.g., gravity) forces acting independently of seismic activity. Some areas of the seafloor are prone to mass movement (e.g., slumps, slides) or other forms of sediment transport (flows, creep, or current scour). Sand wave migration may be prevalent in shallower waters resulting in scouring, differential loading on structures and exposure of buried pipelines.

Gas charges sediments, high pressure gas zones and gas saturated sediments are significant potential hazards. The presence of high pressure gas is a not uncommon cause of blowouts during drilling and if gas is present above saturation (bubble phase), it reduces the expected depth-dependency increase in sediment shear strengths.

Volcanic eruptions may create locally hazardous conditions in the form of lava and ash flows, fire, toxic gases, corrosive rains, flash floods and local tsunamis.

Hazards, as discussed above, pose a danger to pipelines (onshore and offshore), platforms, refineries and other oil and gas development support facilities.

Many of the dynamic processes noted involve forces so great that the only means of limiting damage to man-made structures is to avoid areas with extreme geologic, meteorologic or oceanographic conditions. Detailed maps derived from site specific high resolution seismic surveys can be used to identify areas of potential instability (e.g., faults, slumps, slides) as well as apparent geopressured zones. Adjacent well control is also used to detect shallow gas zones to be avoided.

Alternatively, structures may be designed to accommodate expected conditions. Building criteria will establish the necessary guidelines to erect structures capable of withstanding maximum ground accelerations from earthquakes, forces related to wave and wind impact and other dynamic processes. These criteria will be established within a Platform Vertification Program administered by USGS. "The design, fabrication and installation of all new fixed or bottom founded platforms or other structures shall be designed, fabricated and installed in accordance with the applicable provisions of the document "Requirements for verifying the structural integrity of OCS platforms" (see Federal Register V. 44 #128, 1979 July).

Drilling structures will be engineered for a maximum force times a safety factor. Structures can be made more sturdy in unstable areas by increases piling thickness reducing the area of drag by drilling through the platform legs and increasing the depth of pilings in soft bottoms. In areas of current scour, the base of structures and pipelines will need to be shielded to prevent damage. Surface casings may be set at shallower depths in regions of shallow faulting.

There are a sampling of the types of problems and mitigating measures which may be considered in the Platform Verification Program. Each structure or pipeline will need to be considered on a case basis to adequately assess the potential hazard and the appropriate solution particular to each situation.

North Atlantic

The principal environmental conditions contributing to constraints on engineering of structures and conduct of operations in the North Atlantic region are severe weather and high seas coupled to the relative shallowness of Georges Bank and the abundant mobile sediments on the surface of the Bank.

Rapid weather changes, winter storms, and hurricanes drive strong winds and currents in the region.

The surficial sediments of Georges Bank are in almost constant motion under average tidal currents and wave conditions. Sediment scour is likely at the base of any structure or pipeline placed on the Georges Bank seafloor. These will have to be properly shielded to prevent damage. Large areas of active sand waves are present. The sand waves, ranging 10-20 m. high and hundreds of meters long, are predominant in waters shallower than 60 m. Scouring, differential loading on structures, and exposure of buried pipelines could result from sand wave migration.

Shelf-edge (about 200m depth) and upper continental slope mass sediment movement and/or slope foundation instability is probable. Creeping, slumping, or weak sediments may exist to sediment depths of a few hundred meters and initiation of sediment motion may be related to oceanographic conditions. Proper site selection and structural design will be required.

While the primary leasing sites will be located on the Bank, and not the slope, exploration potential may extend to continental slope water depths to 2000 meters. Seafloor stability characteristics are relatively unknown at these depths.

In conclusion, offshore structures in the North Atlantic will need to be designed to withstand severe winds and wave impact during winter storms and late summer to autumn hurricanes.

The predominately sand sized sediments on Georges Bank are susceptible to scour and transport which becomes especially severe during storms. Fields of large active sand waves will also need to be considered an engineering constraint.

Mid-Atlantic

Potential impacts by the physical environment in the Mid-Atlantic region are moderate to severe meteorologic and oceanographic conditions, unstable slopes and sediments movements.

Hurricane and tropical storm conditions will generate high winds and excessive wave heights. Mean bottom current flows range from 5-30 cm/s, sufficient to erode Mid-Atlantic shelf sediments, thus exposing structures to the risks of sediment scouring.

Foundation instability on the shelf area will be influenced by the presence of buried channels, shallow lenses of low strength sediments, and by gas-charged shallow sediments. Sand waves located in the Mid-Atlantic are not believed to be active, or to pose threats to operations. Likewise, shallow recent faulting is not seen as a major concern. To date, the location of exploratory operations in the region has relied upon avoidance of potentially hazardous sites, following geophysical and geotechnical examinations.

Shelf-edge (about 200m) and upper continental slope areas in the eastern portions of the Mid-Atlantic region are characterized by sediment, creep, slump deposits, and the potential for small- and large-scale slumping, or mass movement of sediment. The potential hazard posed by these features to exploratory and/or development facilities may be great.

Mass sediment movement may be triggered by seismic events. The Mid-Atlantic region is, however, an area of relatively low seismic risk.

Exploration potential for the near future in the Mid-Atlantic may be the greatest on the upper continental slope and may extend to water depths of 2,000 meters, encompassing a broad zone beyond the shelfbreak. Little is known about bottom conditions, as related to engineering considerations, at such depths.

In conclusion, the capacity to withstand severe wind and wave conditions accompanying extratropical cyclones and hurricanes need to be considered in the design and construction of offshore structures. Slumps and offshore gas charged sediments also represent potential engineering constraints in the Mid-Atlantic region.

South Atlantic/Blake Plateau

Excessive water depths, high speed winds and large waves generated by tropical storms, sediment scour and instability and high velocity surface and subsurface currents are principal engineering constraints on OCS development in the South Atlantic/Blake Plateau.

The major meteorological condition likely to impact operations in the South Atlantic/Blake Plateau area is the tropical cyclone (including tropical storms, tropical depressions and hurricanes).

The major impact-causing oceanographic condition results also from hurricanes in the form of waves. Besides the physical damage caused by wave impact, wave energy acting on the bottom sediments underneath and around a bottom-supported structure may result in scour and/or sediment instability, which in turn can result in partial or total failure of the structure.

Gulf stream currents (which may reach speeds of 180 cm/s) in combination with deep water represent potential constraints on the oil industry efforts off the South Atlantic coast. The industry, however, has recently drilled off the South American coast in deep water and had to content with up to 3 knots of currents. With special engineering, the well was successfully drilled.

Much of the Blake Plateau/South Alantic waters lie in depths which approach the limits of oil industry production technology. Drilling for and producing oil or gas in deepwater present some special problems and requires special equipment and procedures. For more detail on industry deep wate capabilities see Appendix 6.

Numerous faults have been recognized on the Florida-Hatteras Shelf, an adjacent continental slope and inner Blake Plateau. Most faults are believed to be related to compaction. Five slump faults have been located on the slope. The faults appear to be buried and inactive at the present time. No active sand waves or slump masses have located on the shelf or slope.

In conclusion, the high probability of damage related to storm generated winds and waves, as well as sediment scour and instability in the South Atlantic/Blake Plateau necessitates detailed sediment engineering surveys and the design of a structure capable of withstanding a hundred year storm in the area.

The presence of excessive water depths over much of the South Atlantic/Blake Plateau coupled with velocity currents will require expanding the limits of oil production and exploration technology through special equipment and procedures.

Gulf of Mexico

Winds and waves generated by tropical cyclones, faulting, sediment scour and instability and high pressure gas zones are the principal engineering constraints to OCS development in the Gulf of Mexico.

The major meteorological condition likely to impact operations in the Gulf of Mexico is the tropical cyclone (including tropical storms, tropical depressions and hurricanes). The probability of damage resulting from a tropical cyclone is high.

The major impact-causing oceanographic condition results also from hurricanes in the form of waves. Besides the physical damage caused by wave impact, wave energy acting on the bottom sediments underneath and around a bottom-supported structure may result in scour and/or sediment instability, which in turn can result in partial or total failure of the structure.

Two dynamic geologic conditions prevail which may be hazardous to petroleum exploration and development 1) salt movement resulting in domes, faults, steep slopes, gas seepage and sediment slumping; 2) rapid sedimentation in deltaic areas that result in under consolidated fine grained, often gas-charged sediments which can flow and slump on very low slope gradients.

These conditions occur most frequently around the Mississippi Delta, the outer continental shelf, the upper continental slope and the ancient Rio Grande Delta off south Texas.

Karst topography is found in portions of the eastern Gulf and may pose operational problems.

Of lesser importance in the Gulf of Mexico is the risk from earthquakes. No known damage has been recorded from earthquakes to an offshore oil platform or installation in the Gulf of Mexico.

Active faults, gas seep areas, and seep mounds pose dangers to offshore seabottom operations; however, these hazards are detectable to geophysical surveys. Due to this recognizability, active faults displacements, gas seeps, and seep mounds are generally considered an order of magnitude less readily detectable.

Hydrogen sulfide gas has been a problem on shore in the Mississippi-Alabama-Florida area and may be expected to be hazardous to those people working on the drilling rigs offshore.

In conclusion, considering the high probability of damage resulting from tropical cyclones in the Gulf of Mexico, structures need to be designed to withstand a hundred year storm in the area. Gas charged sediments and high pressure gas zones are another significant potential hazard and need to be avoided. Active fault displacements and gas seeps are considered an order of magnitude less hazardous. Sediment instabilities (slump and slides) are also prevalent in the Gulf; however, enough is known about the dynamics of sediment movement so that structures can be designed to withstand the lateral force of seafloor movement.

Although numerous hazards from the physical environment impact OCS activities in the Gulf of Mexico, over 30 years of exploration and development experience has resulted in a technical expertise capable of mitigating most of the difficulties. The present of 2200 successfully operating offshore structures in the area attests to this.

Southern California

Earthquakes, faul movement, submarine slumps and slides are the principal hazards to emplacement of platforms and pipelines in Southern California. Normal physical oceanographic conditions are not a constraint on OCS development activities in this region, though the generation of tsunamis by seismic activity is a probability.

Twenty-four earthquakes of local magnitude 6 (Richter scale) or larger have occurred in souther California during the past 60 years. The seismic activity implies contemporary fault movement at depth. The Santa Barbara Channel region shows geologic evidence of Holocene fault movement at depth. The Santa Barbara Channel region also show geologic evidence of Holocene fault displacement and geodetic evidence of contemporary differential vertical movement. Submarine landslides have also been mapped within the Santa Barbara Channel slopes.

Natural hydrocarbon seeps are common in the Santa Barbara Channel region, as well, and although not inherently hazardous, they may provide clues to potentially hazardous conditions associated with fractured reservoir rock.

South of the Santa Barbara Channel Islands, within the Southern California Borderland, exist four major fault zones identified as active and considered environmentally hazardous. Areas known to be prone to submarine sliding occur along the mainland shelf and slope.

Known hydrocarbon seeps in the borderland are located on the Santa Monica and San Pedro shelf areas. The presence of hydrocarbons in sediments samples south of San Pedro and the large number of faults in these areas suggest that surface seeps and subsurface gas-charged sediments may be present here as well.

Normal phycial oceanographic and meteorologic conditions do not present any unusually difficult or significant constraints on Southern California OCS development. Intense hurricanes of the type occasionally observed along the Gulf and East coasts, do not occur along the Pacific coast. Gale force winds (>33 knots) blow infrequently (1% of the time). The stronger winds may affect navigation, particularly for small craft. Navigation may also be seriously hampered by fog which is common in California waters during both summer and winter seasons, though less frequently in southern California.

Both remote source and locally generated seismic sea waves (tsunamis), which could reach 20 to 30 feet at the shoreline, are a possibility off the California coast. While tsunamis waves do not reach greater heights until they reach shore, the shallow areas of the Tanner and Cortes banks may cause some higher waves to form. Also, pipelines going ashore could be affected.

In conclusion, southern California Basins considered in the 5-year OCS Oil and Gas Leasing Schedule are transected by numerous active fault zones. Prospects for seismic activity within the life of oil and gas development operations is relatively high. The risks incurred from seismic-related ground shaking, horizontal and vertical displacement, and secondary geologic mass movements triggered by a seismic event may be suitably mitigated by avoiding areas along traces of active faulting or through construction of facilities designed to withstand potential displacement. Physical oceanographic and meteorologic conditions in southern California generally will not constrain oil and gas development, though the generation of a seismic sea wave by a local or distant earthquake source could pose a danger to shallow water platforms and onshore facilities.

Central and Northern California

Active faulting, earthquake shaking, deep and shallow rock and sediment failures and diapirism are the primary constraints on OCS activity in northern California. Gale force winds and fog may hamper navigation of support vessels. Normal oceanographic conditions do not pose a serious threat to OCS development, though seismically induced tsunamic waves may endanger activities.

Active faulting as indicated by offset seafloor deposits and/or historic seismicity characterize portions of the Santa Maria, Bodega, Santa Cruz, Eel River, and Port Areana Basins.

Deep seated lateral displacements of rock masses and shallow slumps and slides which appear to be active are found as well. Shale flowage and diapirism described on the Oregon and Washington Continental Shelf may also exist in Northern Basins.

The presence of hydrocarbon seeps in north-central California offshore basins have not been reported in literature to date. Inferred trapped shallow gas pockets have been observed in acoustic profiles across the northern-central California margin. Over pressured gas pockets such as these may pose a potential blowout hazard to drilling operations.

The major weather features off the northern California coast that may affect OCS operations are wind and fog. Fog, which may seriously hamper navigation of vessels, is common along the coast north of San Francisco with Point Arena and Point Reyes generally considered to be the foggiest locations on the Pacific coast. Fog is less frequent off the central California coast.

Extratropical storms give rise to severe wind and wave conditions along the central-northern California coast. However, the winds associated with these storms seldom attain hurricane force over much of an area.

In conclusion, Central and Northern California Basins considered in the 5-year OCS Oil and Gas Leasing Schedule are transected by numerous active fault zones. Prospects for seismic activity within the life of oil and gas development operations is relatively high. The risks incurred from seismic-related ground shaking, horizontal and vertical displacement, and secondary geologic mass movements triggered by a seismic event may be suitably mitigated by avoiding areas along traces of active faulting or though construction of facilities designed to withstand potential displacement. Physical oceanographic conditions in northern California, will not constrain oil and gas development, though the generation of a seismic sea wave by a local or distant earthquake source could pose a danger to shallow water platforms and onshore facilities. Gale force winds and fog which periodically frequent northern California coastal waters could also hamper navigation of support vessels serving offshore facilities.

Gulf of Alaska

Two of the main engineering constraints in the northeastern portion of the Gulf are the extreme storm conditions and the water depth. The maximum wind speeds are about 90 knots (100 mph) and the extreme wave height equals 30m (100 ft.). While these storm conditions are severe, semi-submersibles in sale 39 and Lower Cook Inlet have been successfully used in such conditions for both exploration and production.

The water depths in two-thirds of the Gulf range well below 300 m, which is the present extent of proven oil production technology.

Potential natural hazards in the Gulf of Alaska consist of some areas of potential slumping and unstable bottom sediments; various geotechnical effects of large magnitude earthquakes; scattered shallow offshore faults; and scattered occurrences of gas-charged sediments. Coastal erosion and/or areas of sediment accumulation may be encountered along the coastline.

In conclusion, geohazard or other operational constraints in the Gulfof Alaska are those which have been encountered in other sale or operating areas. Exploration experience in the northern Gulf of Alaska (sale #39), and exploration and development experience in areas with comparably severe oceanographic and meteorologic conditions, including Cook Inlet, the North Sea, and the northern Atlantic, demonstrate the potential for operations in this types of environment. Available mitigating measures are expected to be adequate to respond to these conditions. Geohazard and other data will be available for use in specific tract offering decisions, and in designing any special stipulations required to meet localized conditions, as well as to regulate structure placement and design, and operating methods.

Kodiak

The constraints of industry in the Kodiak portion of the Gulf are similar to those that are described for the Gulf of Alaska. The extreme storm conditions and deep water in two-thirds of the area may require specially designed equipment from the industry.

Potential natural hazards in the Kodiak lease sale area consist of faulting, seismicity, landsliding, submarine slumping, liquefaction flows, coastal and offshore erosion and deposition, volcanism, and tectonism. Tsunamis may also occur in the Kodiak area.

In conclusion, available mitigating measures are expected to be adequate to respond to conditions in the Kodiak sale area, where oil and gas operations are already taking place. For further discussion, refer to the assessment of geohazard and other operational constraints in the Gulf of Alaska.

Cook Inlet

Some of the constraints on industry are similar to those that are described for the Gulf of Alaska. Extreme storm predictions are the same (90 knot winds and 30 m waves).

Flow ice is present during a short part of the winter, but it has not been a constraint on past operations. Platforms in upper Cook Inlet were designed for operations in ice and have operated without problem since 1965. In the Shelikof Strait portion of the area, superstructure icing on ships can be a serious hazard.

Potential natural hazards in Cook Inlet include a limited number of shallow near surface faults, and the potential for a variety of geotechnical effects of large magnitude earthquakes. There are no known occurrences of gas seeps on the Cook Inlet OCS or known potential slump areas in the Cook Inlet OCS. Lower Cook Inlet is, however, extensively covered with a static field of large sand waves with heights ranging up to 12 m and wavelengths of about 1-2 km.

Active volcanoes on the western side of Cook Inlet may subject oil and gas activities to hot ash and acid rainfall deposits, possible hot glowing ash cloud in close proximity to a volcano, and in the worst case to large blocks of debris in the event of a Mt. Krakotoa type of volcanic explosion. Tsunamis may be generated due to volcanic and/or large magnitude earthquake activity.

In conclusion, available mitigating measures are expected to be adequate to respond to conditions in the Cook Inlet, where oil and gas operations are already taking place. For further discussion, refer to the assessment of geohazard and other operational constraints in the Gulf of Alaska.

Norton Basin

Extreme storm conditions in this part of the Bering Sea can be worse than those in the Gulf of Alaska. For Nortin Basin the predicted maximum sustained wind speed equals 90 knots (100 mph) and the extreme wave height equals 32 m (105 ft).

Loose flow ice is present about two-thirds of the year with a maximum density of usually 60 to 70 percent of complete coverage.

There is often poor visibility near the Bering Straits along the northern edge of Norton Basin. For example, there is about a 30 percent chance that the cloud ceiling will be below 300 ft.

Potential natural hazards in this area consist of surface and near surface faults, thermogenic gas seeps, gas-charged sediments, seafloor biogenic gas craters, low to high densities of ice gouges in the Norton Sound Bight scouring depression ripple bedforms, and areas of storm affected sand lavers. Earthquake activity is generally of low magnitude and should be a minimal hazard for appropriately designed structures. Volcanic hazards are negligible. Permafrost is present onshore and if present offshore, as in the proposed joint Beaufort Sea lease area, then offshore subsea permafrost and ice may be a potential natural hazard.

In conclusion, many geohazard or other operational constraints in the Norton Basin are encountered in other U.S. OCS operating areas and can be responded to using available mitigating measures. Geohazard and other data will be available for use in specific tract offering decisions, in designing special stipulations required to meet localized conditions, and in regulating structure placement and design, and operating methods.

While looseflow ice is present a majority of the time, there is also operating experience in arctic and sub-arctic climated and offshore sea ice conditions in areas such as the high Canadian Arctic, the Canadian Beaufort Sea, McKenzie Delta, Prudhoe Bay, Harrison Bay (ice island drilling), Sagvanirktok River (artificial island construction and drilling), and near-shore in the Alaska Beaufort Sea (exploratory drilling on barrier islands). Onshore support and transportation experience in such projects as the Trans-Alaska pipeline and Prudhoe Bay oil and gas development has provided experience in arctic and sub-arctic climate and permafrost conditions. The existing regulatory framework should also allow appropriate controls and mitigating measures to be developed and implemented to respond to these conditions.

St. George Basin

Extreme storm conditions in this area are similar to those that are described for Norton Basin. In addition, about half of the St. George Basin is over 300 m deep.

Ice rarely forms in this southeastern portion of the Bering Sea, in contrast to the areas near the Norton and Navarin Basins.

Potential natural hazards in this area consist of numerous shallow faults, possible shallow gas-charged sediments, possible slump areas near the shelf edge, coastal erosion, and depositional processes. Earthquake potential is generally low, both in magnitude and frequency. Except for the Alaska Peninsula and Aleutians, volcanic hazards are negligible.

In conclusion, available mitigating measures are expected to be adequate to respond to conditions in St. George Basin, where conditions are similar to those in the southern Alaska region. For further discussion, refer to the assessment of geohazard and other operational constraints in the Gulf of Alaska.

Beaufort Sea

In the Beaufort Sea there are two types of ice: landfast ice which does not move much; and thick, multiyear pack ice which is always in motion. The extent of the pack ice, including the shear zone, varies along the coast and by season; however, during the winter it generally is present beyond 20 to 70 miles offshore. During the summer, the pack ice edge may drift further inshore. Existing production operations have been limited to date to the landfast ice further inshore. A detailed discussion of ice conditions, distribution of ice zones, and technology for development in the landfast ice zone is included in the Beaufort Sea Environmental Statement for the Federal/State oil and gas lease sale.

Water circulation under the ice in winter is negligible. This means that spilled oil may not be dispersed and can be easily collected, but the weak circulation also means that toxic formation waters and drilling fluids may not be dispersed, so cannot be safely discharged into the environment.

The summer and winter climatic conditions are very different. In the past this has restricted industry, because some activities (such as resupplying, construction, drilling, etc.) were possible during only part of the year, due to voluntary restriction or government regulations.

In the Beaufort Sea, storm conditions often generate high winds (80 knots), but large tsunami waves are unlikely because of the ice sheet.

Potential natural hazards consist of shallow near surface faults, subsea permafrost and ice, possible areas of slumping near the shelf break and slope, possible shallow gas-charged sediments, and possible subsurface high abnormal pressured water sands or hydrocarbon-bearing strata. Coastal erosion and depositional processes pose some nearshore items of consideration. Earthquake magnitudes, both historically and potentially do not represent a significant hazard.

In conclusion, many geohazard and other environmental constraints in the Beaufort have been encountered in other U.S. OCS sale or operating areas. As discussed in the assessment of geohazard and other operational constraints in Norton Sound, some experience has also been gained in operating in Arctic ice conditions in the landfast zone. Furthermore, further exploration experience and data concerning the Beaufort Sea should be available as a result of the Federal/State Beaufort sale. Available regulatory requirements, including special stipulation, are expected to be able to respond to these conditions in the landfast zone.

The regulatory framework provides mechanisms to develop appropriate controls for shear and pack ice zone, but production systems for these zones are only in the design stage.

The final Environmental Impact Statement for the proposed 1979 oil and gas lease sale in the Beaufort Sea contains a more detailed discussion of the impacts of the physical environment on operations in this area.

Northern Aleutian Shelf

Storm conditions in this part of the Bering Sea are similar to the conditions near the Norton Basin and St. George Basin.

Maintenance of high water quality is critical in this area, because of the enormous catch of fish from nearby Bristol Bay. The pattern of water circulation will not necessarily alleviate any potential water quality problems; water currents are not sluggish, but the currents tend to be tidally generated, which just moves parcels of water back and forth with little net replacement.

Potential natural hazards in this area include high probability of seismic events, mass wasting, subsidence, shoreline erosion, volcanism, storm driven waves, possible tsunamis in coastal areas, and occasional sea ice effects.

In conclusion, available mitigating measures are expected to be adequate to respond to conditions in the Northern Aleutian Shelf, where conditions are similar to those in the southern Alaska region. For further discussion, refer to the assessment of geohazard and other environmental constraints in the Gulf of Alaska.

Navarin Basin

Storm conditions in this area are similar to those in other parts of the Bering Sea. Ice is present for about two-thirds of the year, and at midwinter averages 60 to 70 percent of complete coverage.

About 80 percent of the area is over 300m deep, which exceeds the depth of proven technology.

Potential natural hazards include shallow faults, possible unstable bottom sediments, storm effects on bottom sediments, and sandwave bedforms. Seismic and volcanic hazards are negligible.

In conclusion, available mitigating measures are expected to be adequate to respond to conditions in the Navarin Basin, where most conditions are similar to those in the southern Alaska region. For further discussion, refer to the assessment of geohazard and other environmental constraints in the Gulf of Alaska. While some ice may be encountered in the Navarin Basin, the existing regulatory framework should allow appropriate controls to be designed and implemented to respond to such conditions.

Chukchi Sea

During the spring and winter, Chukchi ice is much more dynamic than Beaufort Sea ice. While the Beaufort Sea exhibits a vast area of fast ice with an occasional much larger area attached, there is an extremely active flow lead along the Chukchi Coast, with new ice being formed, detached, piled, and transported almost continually. The OCS has very little landfast ice for which there is existing operating experience.

The problems of water quality, seasonality, and storm conditions that were described for the Beaufort Sea also apply to the Chukchi Sea.

Potential natural hazards in this area include shallow near surface faults, possible shallow gas-charged sediments, ice gouges and storm affected bottom sediments, bedforms and scours, coastal erosion and depositional processes, and possible subsea and onshore permafrost similar to the Beaufort Sea coastal areas on and offshore. Earthquake magnitude is low and does not represent a serious potential hazard. There are no active volcanoes in this area.

In conclusion, the Chukchi Sea is expected to present similar geohazard and other environmental conditions as the Beaufort Sea and the Norton Basin, except that in the OCS, the ice is largely not the landfast ice present in the 1979 Federal/State Beaufort sale, but shear and pack ice for which production systems are only in the design stage.

2. General Impacts

a. Impacts of Hydrocarbons and Drilling Fluids on the Marine Environment

Petroleum Hydrocarbons

Very little is known concerning the more subtle or synergistic effects to marine organisms which may result from the introduction of hydrocarbons and heavy metals, or increased levels of these substances. The following is a summary of Appendix 8, influence of hydrocarbons and heavy metals on marine food webs. References are found in the text and the literature citations of Appendix 8.

Introduction: Hydrocarbons, organic compounds containing only carbon and hydrogen, are universal components of the marine environment. Marine hydrocarbons orginate from a variety of sources, including biogenic decay and metabolism, natural seepage of petroleum, and petroleum pollution from accidents in transportation, drilling, and production of fossil fuels. Hydrocarbons can be divided into biogenic (hydrocarbons native to organisms), and petrogenic, (hydrocarbons found in fossil fuels). Characteristics distinquishing petroleum hydrocarbons from biogenic hydrocarbons include the following: 1) a much greater range of molecular structures and weights of the more complex mixture of hydrocarbons, 2) approximate unity ratio for even- and odd-numbered homologous series, such as alkanes, 3) more kinds of cycloalkanes and aromatic hydrocarbons, and 4) numerous naphthenoaromatic and sulfonated (e.g. the dibenzothiphenes) hydrocarbons in petroleum that have not been reported in organisms.

Uptake, Metabolism and Discharge: Petroleum hydrocarbons are available to marine organisms in various physical and chemical forms, and the resultant uptake by organisms is dependent on the available form and the degree of the exposure, including the amount and duration. Petroleum, from its initial fluid condition through to its final residual form, undergoes a complex modification, including dispersion by physical forces, and chemical modification by oxidative and biological processes. As the petroleum is dispersed and modified, it is presented to pelagic organisms in dissolved, dispersed, or suspended forms, and to benethic organisms in dissolved, dispersed, suspended, or sedimented forms.

Petroleum hydrocarbons (PHC) may enter the food web by two methods. The first involves the active uptake of dissolved or dispersed petroleum, mainly via the gills and possibly through the soft body surface of marine worms. The other method involves the passage of PHC into the gut from the water column and/or the water surface while drinking or gulping wataer, and from ingestion of PHC absorbed on particles including living and dead matter. The relative importance of the methods is still largely unknown and probably will vary according to the species, the method of feeding and respiration of the organism, the type of habitat, the sea state, and the physical and chemical form of the petroleum. Preliminary evidence indicates that the majority of hydrocarbons enter molluscs, crustaceans, and fish via gill membranes. However, recent work with copepods suggests that dietary uptake is the major route, and that ingested hydrocarbons are retained longer.

Upon entering the organisms, PHC can be either passed through the organism as feces or can become incorporated into the body tissues. A significant amount of PHC is taken up and accumulated, at least temporarily, within the body tissues of most fish and invertebrates as a result of an oil spill. Though the relative amount of accumulation varies greatly with the organisms involved and with the concentration and composition of the hydrocarbons, the actual amount accumulated, on a dry weight basis, can be quite substantial.

Hydrocarbons are usually concentrated or stored in association with biogenic lipids. Specific sites of hydrocarbons storage in some marine animals include muscle tissue, gall bladder, brain and other neural tissues, and liver of fish; gills and digestive gland, or hepatopancreas of shrimp, adductor muscles of oysters; mantle, digestive tract, adductors muscle, and gonads of scallops and mussels; and muscle tissue and digestive tract of periwinkles, sea urchins, and other intertidal benthos.

Recent investigations have increased the scant information available on the metabolic pathways of hydrocarbon degradation in marine organisms. Degradation of aromatic and paraffinic hydrocarbons has been reported in marine fish and some marine invertebrates. Phytoplankton and marine invertebrates, including some zooplankton and molluscs, are unable to oxidize either paraffinic or aromatic hydrocarbons. The liver, or the liver-like organ in some invertebrates, the hepatopancreas, is assumed to be the site of hydrocarbon degradation. In these organs, the unaltered hydrocarbons undergo hydroxylation and other detoxification processes. In those invertebrates where degradation does not occur, some of the detoxifying microsomal oxidases in the hepatopancreas may be missing. Resultant metabolic products may be retained in tissues long after the parent hydrocarbons have been depurated and some of these products may be mutagenic, teratogenic or carcinogenic.

The ability of organisms to depurate accumulated hydrocarbons is a controversial issue. Copepods, barnacle larvae, and other plankton have been found to discharge oil in fecal pellets, passing the oil apparently unchanged into fecal matter. In bivalve molluscs, two forms of hydrocarbon accumulation and discharge have been reported: 1) a short-term form where PHC are taken up rapidly and depurated completely or to background levels within a range of several weeks to two months. 2) A long-term hydrocarbon burden accumulated in tissues that is not completely discharged. Fish and shrimp, both of which can possibly degrade hydrocarbons, completely depurated accumulated hydrocarbons to background levels, after a short exposure to petroleum.

The avenues of depuration of accumulated hydrocarbons vary. In molluscs and some zooplankton which can not degrade hydrocarbons, bile salts or some natural detergents are able to emulsify hydrocarbons and allow passage through the gut, and into the feces. In fish, the water soluble, hydroxylated products of hydrocarbon metabolism are discharged, probably in the urine, via the gall bladder and kidney. In marine mammals, the metabolites from hydrocarbon degradation are passed through the bile and into the feces and urine. The determined rates of PHC metabolism and depuration are, at present, only speculative.

The microbial degradation of fossil hydrocarbons and derivatives in the marine environment has been widely reported. However, the rates vary with the chemical complexity of the crude, the microbial populations, and many of the environmental conditions, such as temperature, oxygen levels, and microbial predators. The process of "seeding and/or fertilization" of oil spills to facilitate biodegradation has been suggested as a clean-up method, but the possibilities have not been fully explored. A multiseed stock would probably be necessary, and, at present, is not technically feasible on open waters or beaches.

Carcinogenicity and Synergistic Effects: Some doubt remains as to the direct carcinogenicity of crude oil and crude oil residues. Polynuclear aromatic (PNA) hydrocarbons, some of which are known carcinogens, such as 3,4-benzpyrene, phenanthrene, and chrysene, have been reported in petroleum and petroleum products, but concentration levels of PNA from crude oil or concentration levels in the water column after an oil spill are unknown. Benzene, the most abundant aromatic compound in crude oil, has been proven mutagenic to fish eggs. Conclusions regarding the effects of oil and carcinogens in the marine environment are based on limited information. Recent work has implicated crude oil as a carcinogen, but further research is needed in the field of carcinogens and man's exposure to them.

Synergistic effects of oil and other pollutants are not well understood. Immersion studies of seals in oil have shown that non-stressed seals, immersed in crude oil, exhibited only transient eye problems and minor kidney and possibly liver lesions; no permanent damage was observed. However, seals, stressed by captivity, died within 71 minutes after immersion in oil. PCBs and phenols are known to alter the lipophile metabolizing enzyme system in mammals. It is unclear how genetic factors, sex and size affects this enzyme system. The synergistic interaction of petroleum hydrocarbons with these and other undefined factors may result in severe, adverse effects on marine populations. However, this is an area that needs more research.

Food Web Magnification: The possibility exists of some selective hydrocarbon buildup in the food web, especially by molluscs, which retain a portion of the toxic aromatic hydrocarbons. However, evidence suggests that classical food web magnification (an increasing concentration of hydrocarbons per weight of tissue or lipid at successively higher trophic levels) of petroleum hydrocarbons does not occur. The lower trophic levels, including phytoplankton and zooplankton, can accumulate hydrocarbons. The higher trophic levels, such as fish and mammals, have been found to depurate accumulated hydrocarbons. Therefore food web magnification may more likely be a function of the ability of different species to accumulate and depurate hydrocarbons from the water and food rather than a function of their position in the food web. Food web magnification may occur in birds, since chlorinated hydrocarbon pesticides have been found to accumulate in birds on land. This accumulation of petroleum hydrocarbons could pose a threat to bird populations.

Public Health Effects: Crude oil and crude oil residues have been implicated as possible carcinogens. Oil contamination could pose problems to human health, if contaminated seafood were consumed. According to the National Academy of Sciences (NAS, 1975) workshop on petroleum in the marine environment, tentative conclusions are:

> Although our information is limited, the effect of oil contamination on human health appears not to be a cause for alarm. From our calculations, we estimate that the carcinogen benzopyrene concentration on a dry weight basis arising from a high level of contamination by petroleum is comparable with that of common terrestrial foods. We, of course, do not recommend eating contaminated seafood, but in most cases, because of the taste factor, not many will be tempted to do so. It is clear that this is an area in which our knowledge is grossly inadequate and that the contamination of seafood by oil is clearly undesirable.

However, recent work by Yevich and Barszcz (1977) has further implicated petroleum as a carcinogen. During two oil spills involving a No. 2 fuel oil and a No. 5 diesel oil, they found two types of cancer formed in soft shell clams. One type forms in gonadal tissue and quickly spreads to other organs; while the other is a blood cell form equivalent to leukemia. Additional research is needed on this subject to evaluate the potential risk to the marine and human environment.

Heavy Metals and Drilling Fluids

Heavy metals occur naturally in sea water in relatively low concentrations. In the coastal zone, especially in estuaries, near river mouths or municipal discharges, concentrations may be much greater than natural background levels. Fourteen trace metals are known to be essential for animal life. They serve as components of enzymes, enzyme system, activators, components of vitamins, hormones and respiratory pigments.

In offshore operations, petroleum, formation waters and drilling muds may contribute heavy metals and other trace elements. Concentrations in crude oil vary greatly. Nickel and vandium are generally the most abundant metallic elements in crude oil, although cobalt, mercury, iron, and zinc can be abundant. Nickel and vanadium are known to occur in several colloidal materials covering broad molecular-weight and polarity ranges.

Drilling muds contain barite (barium sulfate) and ferrochrome lignosulfonate. Though chromium is known to be toxic in certain elemental states, when bound in chemical compounds, it is less toxic. It has been shown that in ferrochrome lignosulfonate, the chromium is firmly chelated and is not likely to be removed from the complex even by strong ion-exchange resins.

The International Decade of Oceanographic Exploration Workshop concluded that with the possible exception of lead, current levels of heavy metals in marine ecosystem are derived primarily from natural sources. (Natural sources include river water, windblown material from weathered rock and tectonically active ridges where heavy metals are emitted in heavy brine.) In the Gulf of Mexico, the Gulf Universities Research Consortium concluded that all heavy metals observed in the water column were within ranges reported for oceanic waters, with the possible exception of barium. Similarly, no evidence of bioaccumulation has been reported in the Buccaneer Oil Field study (EPA/NOAA) or the Central Gulf of Mexico platform monitoring study (BLM). Once in the marine environment, concentrations of heavy metals are lowered by dilution and removed from sea water by precipitation, absorption and adsorption. Accumulation in marine organisms can occur by uptake and adsorption from sea water through gills, body surface or gut wall. The amount adsorbed depends on many physical characteristics, as well as biological characteristics of the adsorbing organism. Accumulation can also occur through ingestion of food containing heavy metals. Food sources for accumulation of heavy metals include those adsorbed onto suspended particles or plankton, heavy metal compounds that have precipitated into sediments and been ingested by deposit feeders, and heavy metals concentrated by organisms, which are then preyed upon by other organisms in higher levels of the food chain.

Concentration factors in marine organisms (measured against that available directly from the organism's environment) range up to more than one million for the heavy metals.

The relative importance of uptake from water compared to uptake from food is still being studied and is by no means resolved for marine organisms. It probably varies because of factors mentioned above, for different elements and organisms as well as various relative concentrations.

Heavy metals are usually used in enzyme systems or stored in a particular body tissue, sometimes only temporarily. The storage location depends on the type of metal, form of the metal complex, method of uptake, species of organism and other factors. Storage sites for most organisms include digestive glands, muscle tissues, skeletal tissue and gills. Most metals of concern from the standpoint of possible contributions from oil and gas operations are a part of the biological catalyst system and include iron, copper, zinc, manganese, and cobalt (nickel, chromium, cadmium, and silver may follow these elements).

There have been few studies to date on the release or depuration of heavy metals from marine organisms to the marine environment. Although data on retention times are scanty, there are indications that metals concentrated in animal tissues are retained at significant concentrations from several days to several months. Discharge of heavy metals from marine organisms can take place by ion exchange across cell membranes of gill and body surfaces, loss of molting exoskeltons that have concentrated heavy metals, excretion of heavy metals into the gut and loss by feces and excretion in the urine. All of these processes help an organism to regulate the concentration of heavy metals and other substances accumulated from sea water or food, but the extent and rate of their release is poorly known for heavy metals.

Many variables are involved in the uptake, storage, metabolism and release of heavy metals, and very little is known of their transport through the marine ecosystem.

There is ample evidence to indicate that heavy metals accumulate in the marine food web in a variety of organisms at various trophic levels and through a variety of paths of uptake. Most of the characteristics of heavy metals in the marine environment favor their magnification in the food web. They are relatively resistant to chemical and biological degradation. However, classical food web magnification is complicated, not only by the various uptake methods, but by the ability of some organisms to release heavy metals back to the marine environment.

There is evidence that heavy metal concentration in petroleum, formation waters and drilling fluids can range from 10 to 10^5 times the natural background levels of the open ocean. Therefore, events such as accidental massive or chronic oil spills, accidental loss of drilling fluids and the discharge of formation waters can introduce higher loads of heavy metals into the ocean. The introduced metals are then diluted by sea water, precipitated out, adsorbed on particles or other organisms and absorbed by some marine organisms, occurring around drilling platforms for the most part.

Therefore, there could be some uptake of metals, especially by the sessile organisms around the platforms. It is not known to what extent this occurs and to what levels the heavy metals would concentrate in the water column, sediments or marine organisms as a result of petroleum operations. Investigations of the uptake of oil-associated trace metals in experimentally oiled sediments suggested that the detritovores *Phascolosoma agassizii* and *Macoma inquinata* were not exhibiting uptake of trace metals from the oiled substrate. Early investigations conducted concerning effects of heavy metals from offshore petroleum operations indicated that concentrations of heavy metals in the water column were within the ranges for the metals in the water column were within the ranges for the metals in the ocean water, except for barium where the date were inconclusive, and a zinc gradient around the platforms probably due to the decomposition of the sacrificial covering of the platform legs. Recent work in the Buccaneer Oil Field has indicated significantly higher concentrations of barium, lead and zinc in the surficial sediments within 180 meters of two of the platforms studied relative to the average trace metal concentrations recorded in the BLM baseline study. BLM rig monitoring studies in the Gulf of Mexico have also reported elevated levels of cadmium in addition to barium, lead and zinc in benthic sediments near drilling sites.

The fate and effect of drilling fluids and trace metal components has been the subject of increased research in the last few years. Most effects have dealt with dilution, dispersion and transport of mud contaminants. The available literature demonstrates that continuous low level discharges of drilling fluids (10-20 bbl/hr) will dilute by factors of 10^4 or 10^5 within 200-300 meters of the discharge source. Background concentrations for suspended solids are generally reached within 300 meters of the source.

The majority of experimental effects data in the published literature at this time indicates that whole muds and mud components, with the exception of bactericides, are relatively non-toxic. The use of chlorinated hydrocarbons in bactericides has recently been banned by USGS. Little or no work has been done on sub-lethal effects. LD50's for whole muds have been reported in the range of 10,000 to greater than 100,000 ppm. The work to date indicates that adult cold water organisms are generally not more sensitive than temperate ones.

Recent toxicity studies carried out on corals have indicated that downhole circulated or whole muds are more toxic than laboratory aged muds. It is thought that extreme temperatures and pressures may have modified certain components of the drilling fluid such as the lignosulfonates. Recent studies have also indicated that burial in drilling muds can cause mortality sooner than similar burial in carbonate sands.

b. Impact on Coastal Ecosystems

Coastal ecosystems potentially affected by the proposed lease sales, regardless of the leasing schedule adopted, include saltwater and freshwater marshes; sand/dune beaches and rocky shore; river deltas; coastal tundra; barrier islands; and bays, lagoons, and estuaries.

Adverse impacts to coastal areas could occur as a result of the construction of pipelines and onshore facilities, or crude oil spills from exploration, production, transportation or storage. Trenching and burying pipeline nearshore and onshore up to the supratidal zone would disturb the sea bottom and resuspend sediments. In marshes and estuaries, trenching or dredging may alter circulation patterns, tidal flow and salinity gradients. Erosion of pipeline canals in marshes can cause significant losses of this habitat type.

In beach and barrier island areas, pipeline burial in the surf zone would disrup and rework sand and mud, resuspend sediments, temporarily change the beach profile, and remove indigenous submerged vegetation in a zone of about 20 meters width. Pipeline rights of way would also be cleared above the high tide line. If pipelines are installed in areas containing dunes, the dunes may take from a few to many years to recover, depending upon their size and the recovery measures employed.

In coastal tundra areas containing permafrost--the Beaufort and Chukchi Sea areas--pipeline installation and burial could cause soil subsidence or collapse if the sediment is not thaw stable. The resultant loss of vegetation would reduce wildlife habitat.

As discussed in Section IV.A.2.f. below, and Section IV.B.3.b., significant changes in land uses will be required in Alaska as a result of the proposed action. Enclaves incorporating several OCS-related facilities are anticipated, which could require several hundred to a few thousand acres each. Such a development presently exists to support North Slope oil production. This development will result in significant habitat destruction, adversely impacting local wildlife populations, possibly including those which are utilized as susistence resources by Alaskan Natives. The full nature and extent of impacts cannot be determined until the site selection process. However, if unique or critical habitats can be avoided, this habitat destruction, while probably resulting in losses of wildlife, would not necessarily be expected to adversely affect total wildlife populations, given the extent of undeveloped area in Alaska.

The effects of crude oil spills on coastal ecosystems has received considerable attention. Important variables include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a coastal ecosystem, the ecosystem type or types contaminated by the crude (i.e., marsh, beach, estuary, mangrove, tundra, etc.), the climate and weather of the spill site, the water depth and suspended sediment load, the cleanup method attempted and previous exposure to oil spills.

The above variables will determine the degree of damage and the recovery time for a particular coastal spill.

If oil from a spill reached sandy beaches or barrier islands, it could catch in nearshore vegetation (for instance, the extensive kelp beds off some portions of the California coast), mix with the waves, and despoil sand and mud flats to the high tide line. If the wave action is vigorous against the shore, the oil could be quickly mixed with nearshore and onshore bottom sediments, where rates of biodegratation could be slow and where the oil may be periodically re-exposed by wave action or currents. The appearance of the beach would be marred by the crude or weathered oil before the oil penetrated the sand to sufficient depth to obscure its.

On rocky shores, oil would coat and discolor rocks and offshore structures, such as piers or jetties. Cleanup activities usually involve steam cleaning rocks. The steam kills the organisms on the rocks not already killed by direct contact with the petroleum fractions or by smothering. Loss of the encrusting organisms reduces food available to beach-dwelling fauna.

Oil reaching estuaries or marshes may have its most serious biological effects there. Because estuaries tend to act as nutrient traps, estuarine organisms can be exposed to long periods of contamination. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. Spartina spp. of the East and Gulf coast salt marshes have been shown to withstand moderate single doses of hydrocarbons but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plant species would probably be most affected by a spill during growing season, when the oil could influence flowering, vegetative reproduction, and seed development.

Spills would be most likely to affect coastal tundra during the ice-free summer season. Damage to biota may be very great and recovery time long because of the low level of biological activity resulting from the low temperatures of the air and soil. In arctic areas, dead moss seems to insulate the soil. If the moss is disturbed or removed, as would be possible during cleanup efforts after an onshore pipeline%ill, soil erosion could be significant.

In all coastal environments, oil spilled from onshore transportation or treatment activities may contaminate soil, vegetation, or shoreline. These spills may enter storm sewers and finally reach marine waters, where their deleterious effects have been previously described.

Conclusion: The major potential impacts to coastal areas from oil and gas activities occur during construction of pipelines and onshore support, treatment, and processing facilities and during accidents resulting in spills. Such activities or accidents can alter coastal ecosystems usually in a temporary manner if appropriate mitigative measures are employed. Massive crude oil spills in arctic environs or when allowed to enter enclosed bays may cause long term contamination of the system.

c. Impact on Water Quality and Supply

1) Onshore Water Quality and Supply

Changes in population and industrial activity as a result of the possible discovery of oil and gas resources in the proposed lease sale areas will induce changes n onshore water quality, and will place demands on local freshwater supply systems. During the construction of onshore facilities such as gas processing plants and operations bases, temporary water pollution from non-point sources would occur due to runoff from the construction sites. The operation of a gas plant produces some water pollutant effluents (Section IV.A.2.b.), but the technology exists to reduce the water quality impacts of a gas processing plant to acceptable levels as determined by permitting requirements.

In many onshore areas the principal source of OCS-induced growth in water requirements would be the population increase caused by the growth in employment opportunities. The importance of this impact will vary with local conditions, but it is not expected to be severe since population changes in most areas will be only a small percentage of the existing population. Additional water requirements will be created at the OCS-related facilities themselves. Operations bases will require about one million gallons of fresh water (largely non-potable) for each exploratory or development well which is drilled. This water is transported to the platforms by supply boats and is used for mixing with drilling muds. Gas processing plant water requirements vary widely depending on the volume of gas processed and the type of cooling system used. Once-through cooling systems use large amounts of water (fresh or brackish) and would not be used where water supply is a problem. Cooling towers use about .0015 gallons per cubic feet of gas processed, and closed cooling systems consume no significant amount of water. The type of cooling system used would depend upon feasibility in light of local water supply conditions. In general, however, it is expected that properly designed and sited OCS-related facilities would cause only a minimal to moderate water supply impact. However, in areas of existing water supply shortages, such as Northern California, any increased water demand would aggreviate existing supply problems.

Conclusion: Onshore water pollution impacts are estimated to be small and localized as a result of the proposal. State and Federal water pollution control regulations will mitigate potential adverse impacts. Water supply requirements will be increased by only a small amount as a result of population increases; however, localized impacts to water supply may occur as a result of onshore facility siting. The extent of impacts to both water quality and supply will depend to some extent on specific facility locations.

2) Offshore Water Pollution

Drilling fluids, drill cuttings, deck drainage, and sanitary wastes will be discharged into the marine environment during development of the areas to be leased under the proposed schedule. The impact of these discharges on the offshore marine environment is expected to be minimal, since the quantities involved are small in comparison to the massive volume of sea water in the area of discharge which will dilute the pollutants. Pipeline burial will result in a temporary impact on the water quality if toxic metals, pesticides, and other organic and inorganic compounds are resuspended. The effects of open ocean oil spills will probable be temporary. Pipeline ruptures or breaks could result in nearshore spills. Nearshore spills affecting estuaries or semi-enclosed bays could have severe impacts on the water quality. Chronic spills from platforms and the discharge of formation waters will result in increases of the hydrocarbon levels, and possibly trace metal concentrations in the water column. Impacts to biotic communities as a result of this water quality degradation are discussed under IV.B.2.a. and b. above, and in Section IV.B.3.

Conclusion: Overall, the effect of sales included in the proposal will be moderate to severe degradation of water quality in localized areas around platforms and rigs and in areas, particularly those nearshore, that are affected by oil spills.

d. Impact on Shipping and Navigation

The major impacts to shipping and navigation that can be expected to occur as a result of OCS oil and gas activities would stem from the construction of offshore structures on the OCS during the development and production phases. Navigation or operational errors in the vicinity of these structures could result in collisions. Impacts which could result from any such collisions include injury, loss of life, spillage or oil and release of debris, including all or part of a rig, platform, or ship. The release of a ship's cargo could present a serious threat to the environment if the cargo were a toxic chemical, crude oil, or refined oil product.

It is expected that during the first phases of oil and gas exploration there will be a slight negative impact on ship traffic which will be short term in nature. Some conflicts may arise with vessel movements in the vicinity of major traffic areas caused by the additional number of vessels which will not be traveling in customary directions, rather, they will be moving in crisscrossing patterns. This pattern of vessel movement will almost certainly increase the probability of collision in areas withn existing high number of vessel movements.

Many of these impacts would still be present and disruptive during development well drilling operations. Service vessels traveling between the coast and offshore sites during normal supply and work crew transport would result in an increase in ship traffic in the area's harbors, traffic lanes and the offshore region. Slow moving vessels engaged in trenching and pipe laying activities would also be operating in the area during the development phase. Pipeline construction operations, which would involve a large barge, one to three tugboats and several pipe supply vessels, would terminate once the lines are completed. Impacts would be limited to the time required to lay the pipeline, and prior knowledge of the precise location of the pipeline laying operations at a given time would enable each vessel to avoid this ongoing work. Trips by service vessels will continue throughout all phases of OCS operations; however, as exploratory and development related activities decline, their associated material transport and service trips will also decline. The remaining production related trips--worker transport, supply and service--will become normalized. These trips will be primarily directed between onshore operations bases and offshore production areas.

Floating trash accidentialy lost off platforms will also constitute a hazard to boats. Damaging collisions can result between small boats and floating drums, cans, and wood. The screws of all sizes of vessels can be fouled on floating plastic sheeting or plastic nylon ropes. The possible frequency and subsequent significance of this problem cannot be determined.

Since there is such a limited data base concerning OCS related shipping and navigation accidents in the Atlantic, California and Alaska area, we must use the Gulf of Mexico experience in order to examine the incidence of vessel collisions with OCS structures. It is recognized that these statistics are not necessarily directly transferable to other operating areas. However, given the large number of structures (over 2200) and the large number of vessel movements, existing Gulf of Mexico activities may represent the maximum impact case.

From 1963 to 1977, there were 12 major collisions with OCS structures, eight of these occurred at night. Only one incident involved casualties. This was the Gloptik Sun/Chevron Platform collision, where six tanker crewmen died. At least six of the accidents involved foreign flag vessels. The Hunt Oil Company's Platform "A", located at Eugene Island, Block 63, was involved in two accidents in a period of 16 months. This platform is located near an existing high traffic area, and illustrates the problem with drilling near shipping lanes.

While the number of offshore structures in the Gulf of Mexico has increased steadily since 1964, the number of accidents involving these structures and ships has decreased. The OCS Lands Act authorizes the Coast Guard to promulgate and enforce marking requirements for rigs and platforms, and OCS Operating Order No. 1 requires identification marking of structures or abandoned subsea objects.

It is not possible to predict with any confidence the probability of collisions with OCS related structures and vessels in frontier areas. In those areas where no structures presently exist and little exploratory vessel activity has taken place, as is the case of the North Atlantic and Alaska (with the exception of Cook Inlet and the Gulf of Alaska), the mere introduction of OCS activities certainly increases the probability of conflicts and collisions. Further, it is likely that this probability is even higher in areas with existing high levels of vessel traffic, like the Mid-Atlantic and Southern California, and an increase in OCS related activities in these areas is likely to increase vessel/platform and vessel/vessel conflicts.

Various types of traffic separation schemes are in place at the entrances to most large ports in order to facilitate the safe passage of vessels to and from them. The U.S. Army Corps of Engineers is the agency responsible for the issuance of permits for the erection of structures on the OCS. With the exception of those schemes that have been formally designated as fairways, there is no legal basis for the restriction of rigs and platforms from recommended traffic separation schemes on their extensions, although permits may be denied based upon Coast Guard request on recommendation.

Conclusion: The placement of structures on the OCS is presently regulated in all existing and proposed OCS operating areas, and navigation of OCS and non-OCS vessels is regulated to some extent particularly seaward of major port areas. With proper enforcement of existing regulations and, in some instances, the development of sale specific lease stipulations, potential conflicts can be effectively minimized, and overall impacts will be low in most areas. Greater potential for adverse impacts would result in the North Atlantic and Southern California, due to the existing high density of shipping in the general vicinity of potential lease sale areas.

e. Impact on Other Uses of the OCS

Potential impacts to commercial fishing and to recreational use of the OCS, as well as conflicts with other management plans for the OCS, are discussed in Sections IV.B. 3 and 4.

1) Military Uses

A substantial portion of the water and air space off the east and west coast of the United States is used for various military operations. High density operations are conducted on a daily basis in some sectors--particularly in the Southern California Fleet Operating Area Off-shore. There and elsewhere the activities would include live weapons firing from ships and aircraft, sea trials, warship maneuvers, aircraft tests and operations, and submarine and ASW operations. Appropriate OPAREA manuals and instructions delineate the major areas and type of activity permitted within each. The military operating areas are also detailed in the U.S. Coast Pilot series and maps published by the National Ocean Survey (NOS). Weekly "Notice to Mariners" delineate the projected use of the areas.

There are four missile launch and test centers that conduct operations that could effect portions of the OCS. These are NASA Wallops Station, The eastern, western and Gulf coast ranges which lie to the east and south of Cape Canaveral, Florida, to the west and south of Vandenberg AFB, California and to the south of Eglin, AFB, respectively. Large portions of the OCS adjacent to these facilities are designated restricted or danger zones and are under control of the appropriate range authorities. Activities within these areas would include missile launch and recovery, jet powered target flights, and similar operations. Other unrelated activity may be approved and conducted on a not to interfere basis.

Conclusion: Some potential for conflict with military operations exists, particularly on the east and west costs. These can be mitigated to some degree by operational restrictions on both military and oil and gas activities and by tract selections.

2) Ocean Dumping

Although ocean dumping has been curtailed to some degree in recent years, it remains an accepted means for disposal of waste material generated by the seaboard states. Dumping is regulated by the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), as amended on October 15, 1973 (38 FR 28610 et. seq.). The Environmental Protection Agency (EPA) published the final revisions of the regulations, which took effect February 10, 1977, in the Federal Register of January 11, 1977, Part VI. 220-229. These new regulations prohibit ocean dumping except by permit in the territorial sea out to 22 km (12 nautical miles) from shore. Ocean dumping permits are issued by the Regional Administrator, EPA, except for permits for dredged material disposal, which are issued by the District Engineers, U.S. Army Corps of Engineers.

The regulations provide for several types of permits, including General, Special, Interim, Emergency, Research, and Dredged Material Permits. The dumping of materials into the ocean will be permitted only at sites selected to minimize the interference of disposal activities with other marine activities. Materials dumped into the designated sites off the east and west coast include industrial chemicals, petroleum refinery wastes, acids, obsolete or unserviceable military munitions, nuclear industry and laboratory radioactive wastes, and sewage sludge. Dredge materials are deposited, as well as vessels sunk under general permit to the U.S. Navy. The EPA publishes an annual report, "Ocean Dumping in the United States," that provides information related to disposal of wastes in the ocean, such as permit holders, and type and volumes of waste disposed of.

The U.S. Congress has passed a bill prohibiting all ocean dumping of municipal sludge after 1981. The Environmental Protection Agency has indicated that it will strictly enforce this legislation. Industrial waste dumping is not specifically prohibited by the legislation. However, there are few currently active permits and no new ones are being issued.

Conclusion: Because of past ocean dumping activities, potential for disturbance of toxic and other waste material will exist on the OCS, particular offshore of intensively developed areas. Known dumping sites can be avoided in most cases through exercising siting controls over structure placement.

3) Cables

Communications cables cross the Ocs from several shore terminals along both the east and west coasts of the U.S. These cables, laid at various times in past years, are shown on National Ocean Survey (NOS) charts at the best known locations. During installation, certain portions of the cables were buried and other sections were given a special wire armor covering for protection. Subsequent to installation, occasionally cable breaks necessitated repairs resulting in areas where the cable may lay on the bottom in "S" shaped routes. Though the cable is buried and/or armored it is still relatively fragile and easily damaged by fishing gear. It woud also be susceptible to damage from platform anchoring systems or offshore construction activity.

Conclusion: Some potential for disruption of cables exists, particularly on the east and west coasts. Interference can be mitigated through exercising siting controls over structure placement.

f. Impact on Land Use

Primary impacts on land use will result from demand for land for facilities necessary for the exploration, development and production and transportation phases of OCS oil and gas activity. In addition, there will be secondary land use impacts caused by the physical demands for land of the additional population. This results in an increase in the demand for facilities such as housing, schools, and recreation sites. The primary impacts could be lessened if OCS facilities were located in industrially zoned areas or were placed in enclaves, as planned for Alaska. Secondary impacts could be critical at the local level, particularly in rural areas and areas without infrastructure, but would be less noticeable in more developed areas.

A discussion of the characteristics of onshore facilities in terms of their operation and work force requirements and a summary of their potential environmental impacts appears in Section IV.A.4. The land use impacts of these same facilities are discussed here.

For some large facilities, the economic and social impacts of construction may exceed the impacts of operation. For the large facilities, a construction force of 500 to 1,000 persons woeking over a period of one to three years could be required. The environmental effects would depend on the site characteristics, but could involve vegetation and soil removal with restulting habitat destruction, runoff, dust and other impacts associated with similar industrial developments.

Service or Support Bases: The extent of which adverse impacts could be associated with placement of facilities will be dependent on the degree of regulation and enforcement and implementation of land use goals and plans. The only facilities which will be required at commencement of exploratory activity will be service bases. Even so, these will probably be temporary, requiring initially a short-term lease on available facilities until exploratory activity determines whether establishment of permanent facilities is justified. However, temporary facilities may determine the location of permanent facilities.

Service bases serve primarily as storage and staging areas for supply vessels. Because of the size, draft and servicing requirements of these vessels, they are often likely to be easily accommodated in ports serving fishing vessels, causing a potential for space competition and other use conflicts. Space requirements depend o the amount of offshore facilities being served, since the space required is determined primarily by the amount of drill pipe, muds and other supplies being stored, and by berthing space for the vessels required to supply the offshore rigs of platforms. If only two or three exploratory wells are being drilled at any one time, less than 25 ares may be required. For a base supporting more operations, anywhere from 50 to 100 acres per base could be required.

PIpelines, Pipeline Coating, and Pipeline Terminals: Prior to the installation of pipelines, pipes must be coated with concrete and asphalt sealant for underwater use. Pipecoating facilities would probably be needed in each region but not in each lease sale area. The size of a yard would depend upon demand, but would normally be 100 acres or more of industrially zoned land with water frontage, ocean access, 15 feet or deeper channel depths, and good road or rail access. Most of the site would be utilized for open storage of pipe. During pipeline installation, support facilities for pipelaying vessels are required. These facilities would be similar in nature and impact to service bases supporting drilling and production operations and may be sited in conjunction with the service bases. Pipeline rights-of-way themselves are normally 50 to 100 feet wide. Of this, 30 to 40 feet of soil and vegetation may be removed, and a total of 50 to 60 feet may be disturbed by pipelaying equipment. When parallel pipelines are constructed at different time intervals, they can be spaced as closely as 10 feet apart. Thus, the timing of pipeline construction is crucial in minimizing necessary right-of-way takings and the resulting effects on land use.

Land use impacts of pipelaying operations are dependent upon whether the pipe must cross marshes, barrier beaches, open fields, or urban areas. If pipelines are located in a marsh area, or areas subject to erosion or thos with high water tables and poor drainage, the natural processes would be disrupted and the pipelines could be exposed. A beach crossing would affect the recreational use of the land during the construction period, if the construction occurred during the prime use season. Pipelines that cross open fields cause only a temporary disruption, and if the site is returned to its original condition, no long-term land use impacts will result. Should the pipeline cross through an urban area, there would be a disruption of traffic flow, and possibly the loss of certain buildings that would have to be acquired for the right-of-way. Once the pipe is coated and installed, permanent pumping and storage terminals may be required for oil, if it is to be piped to a refinery in the region. The storage capacity would be about wo days of pipeline transmission capacity. A forty-acre site could be required, utilized mostly by the storage tanks. Pumping stations for gas pipelines, if required, would require little land besides the right-of-way.

Pipeline landfalls will determine the general locations of terminals and gas processing facilities. A mechanism for State involvement in the siting of pipelines exists in the Federal consistency provision of the Coastal Zone Management Act. This would apply in States with approved coastal zone management plans.

Marine Terminals: A tanker or barge terminal may be utilized to transship oil piped to shore for subsequent shipping to other regions. If separation has not taken place offshore, a partial processing facility could be located in conjunction with the terminal. A waterfront site, preferably industrial, would be required, with a water depth of 35 feet. While the site could occupy 200 or 300 acres, less than 100 acres would probably be intensely utilized; most of this would be for storage tanks. Marine terminals would be required as a result of this proposal principally in Alaska and would probably be constructed in association with other OCS facilities in an enclave development.

Gas Processing Plants: A gas processing plant would be constructed along the pipeline route between the landfall and an existing transmission line. A large plant processing one billion cubic feet per day would require about a 75-acre site. If the plant was located in an industrial area near a population center, incoming and outgoing gas lines may have to be odorized, and screening techniques may have to be utilized to minimize these conflicts.

Gas Liquification: A liquified natural gas plant with storage and docking facilities would require 100 to 150 acres of waterfront land adjacent to deep water. In general, potential environmental impacts would be similar to those of other medium to large industrial plants, except that dredging might also be involved in site preparation. The facilities would only be required in Alaska, and would probably be constructed in an enclave development in association with other OCS-related facilities.

Ancillary Facilities: There are many ancillary industries that are associated with OCS development. These generally consist of firms that supply the many goods and services that are needed by the oil industry. Examples include mud and cement companies, special tool companies, trucking firms, caterers, and welding shops. Individually, the land and labor requirements of each of these industries is small. However, due to similar locational requirements, many of these industries are likely to cluster, and can produce localized impacts. Some of these industries, such as mud suppliers and cement companies, require waterfront land, and this demand acts to escalate land values and cause increased competition for specific sites. Most of these firms, however, would be expected to locate or expand in existing industrial and commercial locations.

Platform Fabrication Yards: Steel platform fabrication yards are large facilities with ocean access (and horizontal and vertical clearance requirements) requiring 400 to 800 acres, with dockside depths of 15 to 30 feet. Major environmental concerns are similar to those for other large scale industrial projects, involving significant site preparation impacts, including habitat destruction, runoff, and potential requirements for substantial dredging. Large scale employment requirements (about 500 to 1,000 workers) would also occur.

As indicated in Section II.A.1, facility construction resulting from this proposal would be limited in most areas where an OCS sale or sales have previously been held. In these lease sale areas, previously constructed facilities will probably be utilized, with expansions as necessary, although some new siting may result. Whether new facilities would be built would depend, in part, on the specific location of new lease sales, relative to earlier sales (not known at this time) and in some cases, whether the same companies are involved. At most, a few hundred acres in each region would be required for OCS-related facilities. An indeterminate, but probably small additional amount could be required for induced activities and population.

In established OCS regions, the impacts of specific facilities would depend upon where facilities are located and the compatibility of these new uses with surrounding land uses. By and large, these areas are anticipated to have adequate, suitably zoned land available. However, some siting conflicts could be expected, as with any type of industrial facility. Land use impacts can be mitigated through zoning controls and other siting controls such as the coastal zone management consistency provisions.

In the lower 48 States, the Central and Northern California area could be expected to receive the greatest land use impacts, as there is no existing OCS oil and gas infrastructure and little petroleum-related infrastructure. However, planning and zoning controls should act to mitigate adverse impacts in this area as well.

The greatest land use impact will occur in Alaska, outside of Beaufort Sea and the southeastern Alaska area. Enclave development--coterminous siting of OCS-related facilities in isolation from any nearby communities--is expected to occur in these areas. This type of development was constructed for the Prudhoe Bay oil field development. While enclaves will reduce impacts to surrounding communities, a drastic change in land use will nonetheless occur. Such enclaves will result in major industrial land uses being introduced into pristine areas. Connecting transportation routes may also need to be constructed, resulting in further land disturbances. The enclaves themselves would require several hundred to a few thousand acres, depending on the facilities accommodated and the amount of activity supported. Associated with this permanent land use shift--from wilderness or near wilderness to a developed use--habitat destruction, runoff, air and water emissions, and other impacts would occur. Therefore, land use impacts in Alaska, would be the permanent commitment of thousands of acres from a natural state to intensely developed land uses.

These areas are also largely unorganized, meaning that there is little or no zoning. Of particular concern in this regard are the Bering Sea region and Norton Sound areas. While a State coastal zone program has been approved and will apply to these areas, most of the communities in these areas have not organized themselves to initiate local CZM planning efforts. Therefore, control over siting decisions at the local level is non-existent along much of the western coast of Alaska.

The magnitude of the land use changes in Alaska is, however, offset by the fact that a very small percentage of Alaska's 365,000 square miles is developed. Even commitment of thousands of acres of OCS-related uses represent a miniscule percentage of available undeveloped land. Development needs and pressures, due to the remoteness of large population centers from coastal areas adjacent to most proposed OCS lease areas, are considerably less than in the lower 48 States. As in other areas, however, the extent of land use impact and conflict will depend upon specific site selections. Considering all of the above factors, land use impacts, even in Alaska, are expected to be low.

Conclusion: Land use impacts are expected to be minimal in the lower 48 states, with the possible exception of Central and Northern California, where no OCS petroleum-related infrastructure or general petroleum-related infrastructure exists. In Alaska, in frontier areas, large commitments of land to developed uses will be required, resulting in habitat destruction and degradation of the surrounding environment. However, conflict with other land use requirements will be minimal.

g. Impact on Historical Resources

1) Offshore Cultural Resources

Submerged cultural resources include both historic and prehistoric sites. Historic resources include shipwrecks, sunken aircrafts, and artifacts (e.g., anchors) not located in association with wrecks. Prehistoric resources include aboriginal artifacts (e.g., stone bowls, tools) which may occur singly or in clusters, and habitation sites submerged by rising sea level.

Preliminary exploration activities potentially impacting cultural r"sources include coring for sediment or stratigraphic samples, and dredging or trawling for rock or sediment samples. Impact from these sampling activities is generally slight because small areas of the ocean floor are involved, or because the techniques involved produce very shallow bottom disturbances. Most submerged cultural resources are protected to some extent from shallow disturbance by overlying sediment. Sampling can have a positive effect if the samples are analyzed for archeological information.

Explosives may be used in deep seismic work during this phase, but the potential for negative impact on aboriginal remains is not high because explosives are seldom used in areas shallow enough to contain high concentrations of these resources. There is a high risk involved for shipwrecks in deep water.

Exploratory drilling brings a higher risk to all cultural resources. The exploration phase may last a period of weeks or months. Direct impact also occurs from drilling, although the risk is less because the actual drillsite is small. As the number of drillsites increases, so does the potential impact risk. Any anchoring activities produce a very high risk because they result in disturbance of large areas of seafloor. The diameter of the affected area may be as high as 12 times the water depth, and the diamater increases with each change in anchor location. Weight and drag of anchor, chain, and cable continually gouge the bottom area. Anchor recovery, either by drag or tag line and buoy, also results in bottom disturbance.

Another source of potential impact is the use of divers, who may be employed for maintenance, to explore for hazards, or to recover lost equipment. Divers may collect artifacts for themselves or others or they may disclose the location of submerged resources to others who might salvage or plunder them.

Indirect impact can result from the accumulation of debris on the bottom from work crews. Debris may include those tools and supplies lost overboard; it may also include illegally jettisoned waste or surplus supplies (e.g., pipe, cable). This debris can result in magnetic anomalies that will interfere with remote sensing operations in future cultural resource surveys. Another hazard to surveys is caused by the operation of motors, winches, pumps, and various other equipment on the drillship or rig that creates a spectrum of sound and electromagnetic frequencies and magnetic fields. This noise could show up on the records of remote sensing surveys in nearby areas, interfering with the identification of significant resources.

The initial source of potential impact during the development/operation phase is the construction of platforms and the drilling of wellsites. Platform construction results in a great deal of bottom disturbance because of the large area of seafloor covered and the numerous pilings sunk to secure the base. Debris accumulation continues around the platforms and may be accelerated with increased traffic in the area. Large magnetic gradients extending for great distances are created by the platforms and surrounding debris, and acoustic frequencies are created that may cause noise in sonar records. Anchoring activities continue to disturb the bottom as tankers, work boats, and supply boats service the platform. Wellsites may be drilled directly below the platform or at some distance away and be connected by pipelines to the platform. Magnetic fields influencing large areas are created as pipelines and cables are laid between wells and platforms, adjacent platforms, and platforms and shore. Pipeline laying creates additional bottom disturbance due to anchoring activities of lay barges and to the dredging required to bury pipeline in shallow areas. Depending on the size of the pipe and the type of bottom sediment, a large area of bottom may be disturbed. Debris accumulates along the pipeline route as the pipe is laid.

Noise continues from the platform, as with the exploratory rigs, from equipment operations that could influence remote sensing records compiled in nearby areas. Rigs, helicopters, and boats are sometimes lost. As these lie on the bottom they produce anomalies, potentially masking the identification of cultural resources.

Oil spill is always a source of potential impact on cultural resources, although there is a relatively low risk for submerged material. Most submerged cultural resources are protected from direct contamination by overlying sediment. In addition, it is only the most viscous oil that is likely to reach the bottom; most spilled oil would probably remain mobilized until it had left the area and reached a lower energy environment. The most likely spill impacts would be contamination that could interfere with radiometric dating and tarry oil coating that could alter the appearance and, hence, identification of small artifacts.

The risk from diver-induced impact continues during this phase.

When production ceases, the top of the steel well casing is blown off with explosives a few meters below the mudline after the well has been plugged for abandonment. The explosives used in this procedure could possibly damage the nearby cultural resources, although this is relatively unlikely. The rest of the casing, which may be several meters long, remains in the well, creating a large magnetic anomaly which may affect the accuracy of future remote sensing surveys. Removal of the platform and seafloor obstructions, due to wells and wellheads, may result in considerable bottom disturbance. Dragging the bottom to salvage debris also results in bottom disturbance. There may be unrecovered metallic debris that could continue to affect future remote sensing surveys. Salvage and sport divers may be attracted to debris areas.

Conclusion: The potential for destruction of artifacts in localized areas as a result of structure placement and drilling exists in most OCS areas. This impact can be partially mitigated through the use of stipulations requiring surveys, but cannot be entirely removed.

2) Onshore Cultural Resources

Most types of historic sites located along the coast are not directly at sea level or are protected by bulkheads or other artificial barriers. They thus would not be directly affected by an oil spill impinging on the shoreline but the aesthetic value of a resource could be temporarily degraded until cleanup operations were completed. Prehistoric sites (both known and unknown) located within or adjacent to low lying areas that are tidally influenced could be permanently impacted by an oil spill that reached shore, contaminating the site with oil, and coating artifacts.

Historic buildings, sites, bridges, and districts, as well as prehistoric locales could be impacted by pipeline landfalls and routing operations between the shore and processing facilities. Historic resources could be temporarily affected during trenching, and pipe and pipe laying operations, if operations occurred nearby. But once the constructon phase is completed, revegetation and other natural processes would soon return the area to normal. Known and unknown prehistoric sites, on the other hand, could suffer irreparable damage or destruction during trench excavation and subsequent pipeline activity. A pipeline oil leak, resulting in oil seeping through the soil could further damage artifacts by coating them.

Onshore processing and storage facilities construction could cause long-term impacts to the environment adjacent to historic and prehistoric cultural resources. However, the probability of this occurring is very remote, as state environmental and regulatory agencies have opportunities to review plans for onshore development related to offshore oil and gas activity.

Onshore cultural resources are further protected by the Advisory Council on Historic Preservation. This Council (established by the National Historic Preservation Act of 1966) has the power to comment on any federally licensed or sanctioned activity which could impinge on sites listed or eligible for inclusion in the National Register of Historic

Places. The Council would in turn seek the advice and comments of the appropriate state agency responsible for cultural preservation. Most coastal onshore sites already listed in the National Register are lighthouses.

Contemporary onshore cultural resources include certain tidal areas used for religious gatherings by Native Americans. An example of this is Point Conception, California. While these areas could receive similar impacts as the historic cultural resources, review procedures can mitigate these impacts.

Conclusion: There is little likely impact to onshore cultural resources as a result of the proposed sales, because 1) the location of most known structural historic resources is above mean high tide, 2) the probable siting of OCS facilities will be in industrially zoned areas or in enclaves, and 3) studies will be performed prior to pipeline siting. However, environmental reports required for exploration and development plans will insure opportunities to make more site-specific evaluations.

3. Impacts of Special Regional Concern

a. Impact on Commercial Fishing Activities

OCS Oil and gas activities may impact commercial fishing two primary ways: 1) effects on the resources and 2) effects on fishing activities. Effects upon the resources are biological effects which are manifested by alterations in abundance, distribution, and composition and are covered in Section IV.B.2.a., b., and d., and IV.B.3.b. The discussion in this section focuses mainly on effects on fishing activities.

Fishing activities involve the harvesting and marketing of the resource. The ability to harvest the resource can be impacted by competition for shore facilities, labor and goods; and at sea, space competition, such as gear conflicts, and associated losses, and area closures, and removal of fishing space.

The ability to market the resource may be adversely impacted by tainting of the flesh of the marine produce either real or perceived. Tainting would probably be most pronounced if oil comes in contact with shellfish populations, especially molluscs. Although molluscs are known to depurate, the area contacted will probably be closed to harvesting for at least one fishing season, and perhaps for many years.

Of the various types of fishing gear in use in the OCS areas, towed bottom gear such as trawls and dredges, as well as pots, have the greatest chance for operational conflicts with oil and gas activities.

Trawls and dredges are dragged over large areas of the seafloor, and can encounter and become fouled on natural or man-made bottom obstructions. Submerged oil field obstructions include pipelines, subsea completions, and debris that is lost overboard from platforms, rigs, or workboats. Rigs and platforms are emergent and can be detected and avoided by fishermen. The cost to a fisherman can be substantial from a fouled trawl or dredge. The losses can range from a small time loss required to free the gear to considereable losses of downtime for repairs, replacement of gear, and missed catch.

In addition to normal legal routes, special mitigation is available for fishermen who suffer gear and associated losses on the OCS. The Fishermen's Contingency Fund, Title IV of the OCS Lands Act of 1978, provides for establishment of a fund to compensate fishermen for losses sustained on the OCS because of oil and gas activities. This Act applies to losses that cannot be attributed to a financially responsible party. Under the Act, the Department of Commerce is charged with mapping both man-made and natural obstructions on the OCS and making the information available to fishermen. Final regulations concerning the implementation have not yet been promulgated.

In view of the mitigation available, the increased gear conflict and associated losses should be largely compensated.

North Atlantic

Georges Bank and the Gulf of Maine sustain the most fishing pressure and density in the North Atlantic area. In 1978, the catch in New England was 660 million pounds of fish and shellfish valued at $257 million (ex-vessel). This accounted for nearly 14% of the value and 11% of the weight of the U.S. national catch. The most valuable fishery is the American lobster which was valued at $48 million to fishermen in 1975. Eighty-three percent of that catch was caught in pots within 12 miles of shore. Bottom trawl fisheries for cod, haddock, gray, sole, yellowtail flounder, and silver hake, are significant as is the purse seine fishery for herring. A substantial fishery using dredges for sea scallops also exists.

The trawl and dredge fisheries can be expected to sustain losses through gear hangs as a result of this proposal. As previously discussed, these losses should be amelierated by the mitigatory measures available. The heavy trawl gear used in the North Atlantic may increase the probability of pipeline breaks and spills. However, tankering is the projected mode of transportation for oil. Additional safety measures may be developed during the leasing process to alleviate this problem, if needed.

Loss of fishing space may be caused by installation of unburied pipelines, rigs, platforms or by other OCS-related structures. The greatest amount of spatial exclusion would come about from the avoidance of unburied pipeline by fishing vessels employing otter trawls, hydraulic clam dredges or scallop dredges. It is expected that commercial fishermen may avoid unburied pipeline, fishing to within a distance of 500 meters to one nautical mile. Since, in the North Atlantic, the expected mode of transportation is tankering of oil products, the amount of spatial losses due to pipelines can be expected to be small to moderate.

A self-imposed safety zone is expected to be about 500 meters around rigs and platforms since their location is more easily ascertained than unburied pipeline. Rigs would remove more space than platforms because of the arrangement of their anchoring systems, but the rigs are in place for much shorter periods of time so that the total impact is less than for platforms. The estimates for the number of platforms in this area is 60. Assuming all of these would be placed on Georges Bank an estimated 5000 hectares could be removed from fishing by towed gear. Although substantial, this is a small fraction of the total area available for fishing on Georges Bank. However, impacts may nonetheless occur, depending on the locations of the platforms, since fishermen may be required to modify their tows.

As indicated in Section IV.B.3.b. spawning in the North Atlantic can take place in small, discrete areas, although the areas vary from year-to-year. An oil spill offshore affecting such a spawning area could adversely impact a year class of fish.

The statistically probable number of spills greater than 1,000 bbls. resulting from offshore structures and tankers in projected to be 2.04 for the North Atlantic. If an oil spill should occur and contact Buzzards Bay, Narragansett Bay or Long Island Sound, harvesting of the resources in the area or a portion of the area will probably be restricted for at least one fishing season and perhaps much longer, as a result of tainting. Losses of soft clam, bay scallops, and oyster harvests will adversely affect the industry that fishes that particular locality. The loss would probably be localized and would not be expected to substantially affect the North Atlantic fishery for a particular species.

If an oil spill occurred in the offshore area, the area of the spill will in effect be closed to harvesting until the spill is gone. If the oil should reach the bottom, shellfish harvesting in the area will be restricted, by choice or mandate, until impacted species have depurated. Loss of harvest as a result of an offshore spill would probably not exceed one season, because bottom concentrations of hydrocarbons would be expected to be low as a result of a surface spill in deeper waters. Tainting, perceived or real, could render the marine produce unmarketable and cause substantial losses to the fishermen. Area closures will probably result in displacement of fishing effort to other areas, and because this is already a high density fishery, decreased fishing efficiency could result. This adverse impact would probably be short-term.

There may be some localized severe competition for shore facilities, but it is expected to be short-term. Use of Davisville, R.I. for support services for existing oil and gas activities in the Mid-and North Atlantic has avoided competition thus far.

The impacts of the two sales proposed in the five-year schedule will be in addition to those anticipated as a result of proposed OCS Sale #42 in the North Atlantic, increasing the potential for interference with offshore fisheries through space loss and gear loss, and impacts resulting from oil spills.

In conclusion, gear conflicts and associated losses, and offshore spatial conflicts will inevitably occur as a result of proposed oil and gas activities. However, competition for dock space, labor, goods and services is expected to be minimal. Should a spill or spills occur as is probable, and then impact a limited spawning area, it is conceivable that losses to the Georges Bank fisheries could be very severe and millions of dollars could be lost to the economy. The North Atlantic is considered to be relatively highly sensitive to potential use conflicts as a result of OCS development.

Mid-Atlantic

The Mid-Atlantic is an area of mixed fisheries. Major fisheries in the area are trawl fisheries for flounders, scup, hakes, and butterfish; dredging for surf, soft and hard clams, and ocean quahog; purse seining for menhaden and Atlantic mackerel; and pot fishing for lobster and black sea bass. The bays and estuaries, especially Chesapeake Bay, support substantial fisheries for blue crab, oyster and anadromous fishes, such as striped bass and American shad. In 1978, the Mid-Atlantic catch was 200 million pounds, valued at $79 million, accounting for 3% by weight and 4% by value of the U.S. national catch. The Chesapeake Bay catch for 1978 was nearly 10% of the weight and 5% of the value of the U.S. national catch.

In the Mid-Atlantic area, as in most OCS area, gear conflicts with oil and gas associated bottom obstructions is expected to occur, but should be ameliorated by the mitigatory measures available.

The statistically probable number of oil spills greater than 1,000 bbls. is 1.15. An oil spill that reaches shore will probably cause closure of harvesting areas. The mollusc (clam) fisheries would probably be the most severely impacted, and could be lost to the fishery from months to years. This loss of harvest may cause substantial losses to those fishermen who depend upon that particular area. Clam fisheries were valued at approximately $22 million in the Mid-Atlantic States in 1978.

An oil spill in the offshore area will probably result in short-term area closures and loss of revenues to the fishermen because of unmarketability of the catch due to tainting of the flesh (either real or perceived). Area closures may displace fishing efforts to other locations, but this is not expected to be a major concern.

As indicated in Section IV.B.3.b., substantial adverse impacts to fish populations are not anticipated as a result of effects on offshore spawning, due to the broad area over which spawning occurs. However, an oil spill affecting the estuaries of the Mid-Atlantic could have a severe impact in shellfish and on finfish utilizing these areas as nursery grounds. Such an impact might occur from a tanker spill occurring in or near an estuary. However, OCS production is expected to replace tankering of imports and probably will not result in increased risk of spills over present conditions.

It is projected that 54 platforms will be installed as a result of this proposal. This would remove approximately 4,500 hectares from potentially trawalable space. In view of the size of the Mid-Atlantic and the density of trawling activities, no adverse impacts are expected from this space conflict. Competition for shore facilities and labor, goods and services is expected to be minor.

The impacts of the two proposed Mid-Atlantic sales included in the five-year schedule with be in addition to the introduction of OCS-realted impacts stemming from OCS sales #40 and #49.

In conclusion some adverse impacts on commercial fishing will inevitably occur, but the losses to the fishery as a whole are expected to be low to moderate.

South Atlantic

The fisheries catch in this region was 399 million pounds valued at $96 million in 1978, accounting for 7% of the weight and 5% of the value of the U.S. national catch. Shrimp is the major cash crop in this area and harvesting is largely confined to nearshore (less than ten miles from the coast) and inshore waters. The shrimp stocks are subject to extreme fluctuations in abundance, largely related to the severity of winters when the young shrimp are in the estuarine nursery areas. Other estuarine fisheries such as oysters, blue crab, flounders, and seatrouts, are important in this region also.

In recent years the fishery for reef fishes has expanded considerably and many shrimp fishermen have turned to this fishery to supplement their incomes during the off-season or in poor years. The reef fishes, primarily black sea bass, snappers, groupers, and porgies, are exploited with traps, trawls, and handlines from livebottoms scattered over the shelf. Dredging for calico scallops is also a major fishery but harvesting locations vary because the distribution and abundance of the resource varies widely.

Larger commercial vessels will range widely throught this area, and even harvest shrimp in the Gulf of Mexico. As in other areas, trawl and dredge gear conflicts with oil and gas activities can be expected to occur. Several avenues for mitigation are available to the fishermen.

Oil spills that reach the estuarine areas can be expected to have adverse impacts on shellfisheries such as oysters. This would be a localized severe effect. The statistically probable number of oil spills greater than 1,000 bbls. as a result of this proposal is 1.38. Offshore oil spills could render some produce, such as calico shrimp, unmarketable for fear of tainting, and in effect cause an area closure. If this occurs, the closure would probably be short-term.

Loss of fishing space due to rig and platform emplacement would adversely impact the reef-fishermen. The loss of space associated with this proposal would be approximately 3650 hectares, half of which would be in the Blake Plateau. There are expected to be minor impacts associated with competition for labor, dock space, and other goods and services.

In conclusion, little adverse impact on commercial fisheries in the South Atlantic can be expected to occur as a result of the proposal. The most apparent adverse impact would be an oyster and other mollusc fisheries, if any oil spill should reach shore. The likelihood of this happening is believed to be quite low. There may be some localized competition for dock space at selected areas, but the adverse effects are expected to be short-term. These impacts will be in addition to these resulting from OCS Sale #43.

Gulf of Mexico

The fisheries catch in this region was 2.2 billion pounds valued at $473 million in 1978. This accounted for 38% by weight and 26 % of the value of the total U.S. catch. Shrimp is the largest cash crop in the Gulf of Mexico. Shrimping is carried out throughout the Gulf and the major shrimp grounds are the Tortugas (off SW Florida) for pink shrimp, and offshore Lousiana (browns and whites) and Texas (browns). Menhaden is a valuable fishery and purse seining for this nearshore fishery is concentrated to the east and west of the Mississippi River delta offshore Louisiana and Mississippi. Occasionally, menhaden are harvested off the Apalachicola area in northwest Florida.

Snapper and grouper (reef fish) fisheries are valuable to West Florida and Pascagoula, Mississippi ports. The fleet ranges over large areas of the Gulf, including the deeper shelf, but the major fishing areas are the West Florida shelf and oil platforms offshore Louisiana and the northern part of Texas. This fishery many suffer impacts from rig and platform emplacement, but mitigatory measures have been applied in the past and probably will be used in the future.

In the Eastern Gulf there may be some competition for dock space but the adverse impacts are expected to be short-lived.

Conflicts between trawls and oil and gas activities have occurred in the past and a similar level of conflict probably will occur in the future. The losses to the fishermen should be alleviated by the mitigatory measures available.

Oil spills that contact the nearshore area, coastal marshes, bays and estuaries, have the greatest potential for damage. The large majority of Gulf fisheies are estuarine dependent, that is, the estuary is a critical habitat in some stage of their life cycle, usually a larval or juvenile stage. Shrimp are good examples. The adults spawn in small aggregations offshore and the larvae migrate to estuaries where they spend their juvenile stages. Potentially, oil spills could seriously impact these resources, although there is no evidence of such impact from 30 years of development. Oil spills could impact sessile resources such as oysters, but this has not been considered a major problem in the past. Oyster production and shrimp species composition has changed in Louisiana over the years. This has been attributed to changes in the salinity regime in the wetlands, caused by wetland development, alterations in fresh water flows, and unplugged oil and gas pipeline canals. Current practice is to plug the canals.

As a result of this proposal, the number of spills greater than 1,000 bbls. is estimated at over three. Should a major spill occur, areas closures could result along with concomitant losses to the fishermen. In the past this has not been a problem.

While it is too early to verify any long-term impacts, there do not appear to have been major short-term impacts on the Gulf of Mexico fisheries as a result of the Mexico Campeche oil spill in the summer of 1979. Potentially most severe impact of the Campeche spill is to the shrimp fishery, the bay fishery and on redfish stocks.

Oil containment booms were deployed across the mouths of passes and cuts into the bays of South Texas, thereby protecting the bay fisheries from the oil. The booms did cause some slowdown of vessel traffic into and out of the ports.

Terry Leitzell, NOAA Assistant Administrator for Fisheries, is quoted in Fish Boat (24(11):31) as stating :

> Although there appears to have been little impact on commercial and recreational fishing, we intend to study the effects of the oil on eggs, larvae, and juvenile fish and shellfish to develop a data base that will be useful in assessing the damage caused by this spill and in providing information for future spills.

However, National Fishermen (60(8):12) reports that shrimpers along the North Texas coast have filed a lawsuit against Pemex and other interests in the spill. Further, the article quotes the president of the Texas Shrimp Association as stating " There is bad publicity about us being hurt (by the spill) and it is false." Shrimping is off this year but it has been related to decreased salinity in the estuaries caused by heavy spring rains, not by the oil spill. South Texas shrimping has continued in spite of the oil, and Texas and Federal health inspectors have found no contamination of catches due to the spill. (Patsy Lochbaum in Corpus Christi Times, 10/28/79; Leitzell, op. cit.)

This year's shrimp fishery is based on last years crop. Effects on the spawning stock and/or recruits to next year's crop will not be testable until next year. Of particular concern is the great potential for adverse effects on redfish stocks. Redfish spawn on the surface in the late summer and fall on the Gulf side of mouths of inlets and passes. These floating eggs and larvae could be greatly affected by the oil. Again, effects on redfish recruitment will not become apparent until at least next year.

In conclusion, the short-term effects on the Campeche spill on Texas fisheries have been negligible. No mass mortalities of fishes have been reported, no displacement of fishing effort to other areas, and no loss of catch due to contamination. There was inconvenience to vessel traffic. The shrimp catch in Texas is down this year, but this has been related to environmental conditions in the nursery, rather than to effects of the oil. For perspective, Louisiana shrimp catch is down this year also. The longer-term effects on fisheries will not come become apparent before next year. At that time more definite impact evaluations should be available. Also, perhaps information on the effects in Mexican waters will be available.

In conclusion, gear conflicts and associated losses will inevitably continue to occur, but with mitigation available, losses to fishermen should be reduced. While past experience has not proven any adverse effects of OCS development on Gulf of Mexico fisheries, they are potentially sensitive to oil and gas activities due to estuarine-dependent affinities. Therefore, this is considered to be moderately sensitive to impacts to commercial fisheries harvesting, compared to other regions.

Southern California

The major fisheries in the Southern California area include the purse seine fisheries for northern anchovies, jack mackerel, Pacific bonita, and albacore. Trawl fisheries for white seabass, white croaker, squid and halibut, are also important, especially the halibut fisheries from Point Mugu to Point Conception. Other important fisheries are sea urchins and abalones which are harvested by divers, and spiny lobsters and rock crabs which are harvested by traps. The Southern California fisheries are far more valuable than the Northern California fisheries. The halibut fishery alone is valued at more than a quarter of a million dollars per year in the Santa Barbara area.

As in other areas, implementation of this proposal will increase the incidents of gear conflict especially with trawls. The losses could be high if they were unmitigated; however, mitigation is available.

The Santa Barbara Channel is a heavily fished area and space conflicts with the platforms could occur. In the Santa Barbara Channel area 15 platforms may be installed as a consequence of this proposal. This could remove approximately 1,200 hectares of seafloor from trawling. This may cause some displacement of effort and fishing inefficiency in this densely fished area. Further, drift gill and trammel netting is widespread in the Santa Barbara area. Increased numbers of structures could adversely impact this type of harvesting method, depending on the locations of the platforms. Loss of fishing space due to rig and platform emplacement in the remainder of the Southern California lease area is expected to be insignificant.

The projected number of spills greater than 1,000 bbls. in this area is approximately five. Should an oil spill contact the coastal area losses could be locally severe. The greatest potential for damage would occur in the shallow inertidal zone where bottom dwelling organisms could be contaminated by oil. Important commercial species most likely to be affected would be above ($3 million annual ex-vessel), spiny lobster, sea urchin and rock crab. Area closures would most likely result, and harvests of shellfish may be locally substantially reduced from several months to several years. Should a spill occur in the offshore area, area closures will probably result, but will most likely be short-term.

In the Santa Barbara Channel, seafloor space conflicts may be a problem. There may be some competition for shore facilities such as dock space, labor, goods and services, but this problem is expected to be mnor.

Impacts as a result of sales included in the proposed schedule will be in addition to OCS-related impacts resulting from OCS sales #35 and #48. Cumulative impacts on Southern California fisheries would be increased, including spatial conflict in the Santa Barbara Channel.

In conclusion, adverse impacts will be experienced by the commercial fishing industry. Overall, the impacts will be moderate.

Central and Northern California

The major finfisheries in the Central and Northern California area are for the northern anchovy longlining for, sablefish, trawling for flatfish and squid, and trawling and gill netting for rockfish and lingcod. Trawling for albacore and king and silver salmon are also important and have an ex-vessel value of about $17 million. Pacific shrimp, spot prawn, dungeness crab, and abalone are important shellfish resources.

Gear conflicts and losses to the fishermen can be expected to increase as a result of this proposal. However, most of these losses should be mitigable. The number of platforms projected to be installed as a result of this proposal is 14. This could remove approximately 1,166 hectares of the seafloor from trawl fishing, which is less than 1% of the area available. Thus, the impacts from space removal will be low.

The projected number of oil spills greater that 1,000 bbls. for this are is 1.65. Should an oil spill reach a coastal area, localized severe losses to the fishing industry could result. The greatest potential for damage would occur in the shallow intertidal area where bottom dwelling organisms could be contaminated by oil. Important species most likely to be affected would be dungeness crab ($10 million ex-vessel value) oysters and octopus. Area closures could result in harvests being substantially locally reduced from several months to serveral years. Offshore spills may also result in area closures and unmarketability of catch, but will most likely be small and short-term.

Port facilities are in short supply in northern California and conflicts for shore facilities may be anticipated. The potential extent of this problem cannot be quantified at this time, but may be a continuing problem.

In conclusion, adverse impact will be experienced by the commercial fishing industry because conflicts for shore facilities are likely to be intense and fairly long-term. However, offshore space conflicts should be minimal. In total the magnitude of impacts to Central and Northern California fisheries should be moderate.

Gulf of Alaska

In the part of the Gulf of Alaska under analysis for this proposal, pot fishing for crab species, seining and trolling for salmon, trawling for bottomfish species, and longlining for halibut are the major fisheries. These are carried out by Alaskan, other U.S. based, Canadian, and other foreign (the largest being Japanese) fishermen. Crab catch has averaged 1. 46 million pounds, salmon 1.3 million pounds, bottomfish species 34.5 metrictons, and halibut 2.4 million pounds over the five-year period between 1973 and 1976.

Competition for space (dock, ocean area, cargo, transportation), labor, and goods may have an intense but short-term impact on the fishing industry. Boat harbors are small, and fuel and other goods and labor in many cases are in short supply. Until the drilling and service companies get new or expanded and dedicated facilities built (requiring at least one year's time), this competition could reduce fishing time and profits. Because of the short-term nature of these impacts and better planning efforts of both the small ports to be used and the oil companies, this impact would be low.

Fishing gear loss, as in other OCS areas, could be a real problem when the fishing and oil production occur in the same area. If the large crab pots used in this area are lost, the fishermen could lose the whole fishing season because of the difficulty in obtaining replacements. Not all the fishermen from one port would be affected, but an individual fisherman could lose a great deal, and several could suffer partial losses. Overall impacts would be low, considering the total number of fishermen in the area, and the mitigation available.

Flavor-tainting of fish, such as salmon caught in nets along the shore of the Gulf of Alaska, thereby making them impossible to sell after capture, is possible, but based on Alaskan experience, not very probable. Additionally, the probability of a large oil spill occurring in the Gulf of Alaska is relatively low (the statistically probable number of spills over 1,000 bbls. is .23.

As indicated in Section IV.B.3.b., there is a potential for intertidal pink salmon spawning areas to be impacted as a result of an oil spill, possibly resulting in an adverse impact to a year class. This could reduce the pink catch, perhaps by 10 to 15 percent, for one to three years. Pink salmon catches have averaged about 160,000 pounds over the five-year period between 1973 and 1976.

In summary, there will be an adverse impact on the commercial fishing of the Gulf of Alaska area because of the proposed lease sale. Fish population reductions will not cause as great an impact as physical factors, largely gear loss. However, effective mitigation is available.

In conclusion, overall adverse impact is estimated to be moderate in comparision with other regions, and could result in a year or two years loss of profits for individual crab or salmon fisherman.

Kodiak

Impacts on the commercial fisheries based in Kodiak will occur for the same reasons and from the same activities as discussed for the Gulf of Alaska. As in the Gulf of Alaska, spill liklihood is fairly low (.26 being the statistically probable number of spills over 1,000 bbls.). In addition to crabs and other species also fished in the Gulf of Alaska, Kodiak fisheries include shrimp and a burgeoning domestic groundfish (bottomfish) fishery. Salmon catch on the east side of Kodiak has averaged almost 20 million pounds ($9.8 million), the halibut catch 9.7 million pounds ($12.5 million), the bottomfish catch 212 pounds ($17 million), crab catch 26 million pounds ($23 million) and shrimp 50 million pounds ($9 million).

Impact from shoreside competition and gear loss will again be similar to that in the Gulf of Alaska, however, the probability of impacting more fishermen is greater, due to the magnitude of fishery in this area in increase in shipping and susceptibility of the dominant crabbing industry to gear conflicts. In addition, at least in the short-term, replacement of any lost crab pots will be a problem due to lost fishing time.

In conclusion, impacts on the Kodiak based commercial fisheries (crab, shrimp, salmon, bottomfish) will come primarily from shore based competition and gear loss (especially pots, for which there may be a replacement problem) and could be of moderate to relatively high magnitude. Impacts from fish species population alterations is estimated to be slight. However, it is estimated that pink salmon catches (over 16 million pounds) could be reduced by up to about one-third for 1 to 3 years depending upon the location and timing of spills coming ashore. Until a support and supply base is selected and constructed, competition impact in the immediate Kodiak area could be moderate to high. Overall, impacts to the fishing industry in Kodiak as a result of the proposal may be the highest of the Alaska areas.

Cook Inlet

Commercial fisheries in Cook Inlet are similar but of lesser magnitude than those based around Kodiak. Most of the fishing is located in or in close proximity of Kamishak and Kachemak Bays. Salmon, king and tanner crab, shrimp, halibut, and herring are the major species. Some bottomfish species and dungness crab are also harvested. Because Cook Inlet is the most commercially developed of the proposed Alaska areas, competition for supplies, labor, and transportation facilities will be minimal. Competition for dock space will cause as great an impact as in any other port in Alaska gear loss impacts should be low because of the presence of voluntary shipping lanes and because the highest intensity fishing is located in fish sanctuaries where oil and gas development is prohibited (by the State), thereby reducing the potential for interference and for adverse biological impacts. Some of this impact may be experienced in Kodiak if a commercial find is made in the Shelikof Straits.

The proposed leasing area (tract selection has already taken place) is west and south of the tracts leased in the first Cook Inlet OCS sale, and further from the most productive spawning area (Kachimak Bay). Stocks are also recruited from outside the Inlet. In addition, oil spills in the Inlet will be dispersed and broken up through turbidity and flushing action, and circulation patterns in the bay systems would tend to restrict movement of oil into spawning areas. Therefore, impacts from oil spills affecting spawning or tainting of adults are expected to be moderate. However, some cumulative impacts as a result of the first Cook Inlet sale and the proposed sale could result. It is likely that, as a result of the proposal, one large spill would occur, as the statistically probable number of spills greater than 1,000 bbls. is nearly one (.92).

In conclusion, impacts from the proposed lease sale on Cook Inlet commercial fisheries is estimated to be moderate. Competition for dock space and some gear loss will be the most prominent impacts.

Norton Basin

The primary fishery in this proposed area is gillnetting for chum and pink salmon by local fishermen. Average catches are about 1.2 million pounds ($720,000) for the combined species salmon catch. There is a small fishery for herring using gill nets, and there is a test fishery for crab. There are no major ports or developed areas adjacent to the proposed sale area and, therefore, no space conflicts will occur. The salmon fishery could be impacted primarily by gear loss, damage from oil support and supply boats, or from pollution events fouling the nets. Incidence of this type of impact would be low, because all the fishing takes place in the nearshore areas that are removed from Federal waters. Additionally, the probability of a large spill occurring is relatively low, as the statistically probable number of spills greater than 1,000 bbls. is .34.

There is a substantial subsistence fishery (about 250,000 pounds) for the same two species of salmon and hearring. This could be impacted in the same manner as the commercial fishery, but again incidence would be low.

In conclusion, impacts on the limited commercial fishery of Norton Basin would be low and limited primarily to gear damage or loss.

St. George Basin

This area supports a large and growing crab fishery using pots, and a large foreign trawl fishery for bottomfish. In 1977, the following fish catches were made in the proposed St. George leasing area: king crab, 9.1 thousand metrictons ($11.3 million); bottomfish 450 thousand metric tons ($58.9 million); and herring, 379 metric tons ($134,000). Halibut catch averaged about 130 metric tons ($330,000) between 1974 and 1978. There is also a small longline halibut fishery. Dutch Harbor/Unalaska was the top port in value of catch landed during 1978 in the U.S. It is also the only established port and harbor facility in association with this proposed sale area.

Competition for space, material, and labor will be high, at least until the exploration/development companies can construct their own facilities. This impact is estimated to last one to two years. Gear loss could be a moderate to high impact. Again this will probably be a short-lived (two to three years) problem, but is expected to be intense.

The statistically probable number of oil spills greater than 1,000 bbls. is nearly two (1.84). However, offshore surface spills are not anticipated to result in major population effects on the commercial fishery, as these are largely bottom fisheries. Bottom concentrations of hydrocarbons could be expected to be low enough not to result in mortalities of adult bottomfish. Spills which reach nearshore spawning areas could have a greater effect on the crab fishery and spawning. However, in the absence of trajectory analysis of specific tracts proposed for leasing, the potential for this impact is difficult to assess. In conclusion, impacts because of fish population reductions attributable to this proposal will be low in the St. George Basin. Impacts from competition between the fish and oil industries for space, goods, and services could be high but short-lived (2-3 years), resulting in an overall moderate impact and relative sensitivity to impact.

Beaufort Sea

There is a small (70,000 lbs. annually) commercial fishery in the Colville River delta for whitefish and cisco species using gillnets. There would be little if any impacts from activities associated with this proposal. However, any impacts would be in addition to those which would result from the proposed Federal/State (1979) Beaufort Sea sale, and three to four spills (3.59) greater than 1,000 barrels are statistically probable as a result of the proposal.

Northern Aleutian Shelf

The Northern Aleutian Shelf (western Bristol Bay) area is the immigration route of the majority of the sockeye salmon (10-50 million fish) that support the largest salmon fishery in the world. Average catch between 1969 and 1975 was about 21,000 metric tons ($12 million) for the combined salmon species. Commercial salmon fishing with floating gillnet is carried out in the area, but the bulk of the fishing is east of this area. There is a crab fishery based in Dutch Harbor/Unalaska that is expanding into the area although it is too early to know if this area will support a crab fishery. This is also the southern end of the foreign bottomfishing area. While nearshore Bristol Bay supports the most important salmon fishery in Alaska, as well as valuable crab fisheries, these fisheries take place largely in the coastal nearshore portion of Bristol Bay, which is over 200 miles from the boundary of the proposed leasing area.

There are no ports or fishing villages on the landward boundary of this area; all facilities would need to be built. There would, however, be no conflicts for port facilities, goods, or labor as in the Gulf of Alaska or Kodiak areas.

There may be some competition for sea space between the exploration and development companies and fishermen, but it is not estimated to be more than a minor problem. Gear loss could be a major factor to the fishermen involved at some time during the life of the proposal. However, the number of fishermen is not as large in this area as farther east and the overall impact would be minor.

It is estimated that there would be little or no impact on the growing crab or established bottomfish fisheries because of their distance from the proposed sale area. Additionally, the liklihood of a large oil spill is relatively low (the statistically probable number is .23).

In conclusion, of the three fisheries involved (salmon, crab, bottomfish) the salmon fishing is most vulnerable to impacts from development associated with the Northern Aleutian Shelf. The impacts would be moderate but could affect a large number of fishermen in any one year.

Navarin Basin

The major fishery in the Navarin Basin is the foreign (Japanese, Russian, Korean, etc.) fishery for bottomfish. Some halibut are fished, and the expanding crab fishery from the St. George Basin may reach this area. Additionally, there are small commercial/subsistence salmon and herring fisheries associated with the coast areas. There are no major or minor fishing ports or supply areas. All facilities would need to be built.

The bottomfish, crab, and halibut fisheries would be minimally effected by activities associated with this proposal.

Fisheries most susceptible to adverse effects from offshore oil development are the salmon and herring fisheries that are carried out within the 3-mile limit, for the most part. Impacts could range from gear fouling and loss to reduction of salmon and herring populations from pollution events. However, the Navarin Basin is over 300 miles from shore; the potential for impact to these fisheries is low, although over four large oil spills (4.36) are statistically probable. Competition between the oil and fishing industries would not be a significant factor.

In conclusion, the major fisheries in the Navarin Basin would be minimally affected by this proposal.

Chukchi Sea

Commercial fishing may be carried out by only a few Native villages for salmon, or whitefish. However, impacts to the limited fishery could be severe, as it is probable that over seven oil spills could occur as a result of a sale in the Chukchi Sea, and their probability of reaching shore may be high, as leasing is expected to take place relatively close to shore.

b. Impact on Sensitive Areas

North Atlantic

Canyonhead fauna are well represented in the North Atlantic. Coral are diverse, particularly in Corsair, Lydonia, and Oceanographer Canyons. Lobster populations abound in "pueblo" communities. These populations may act as nursery stock for the offshore lobster population. Significant red crab populations are also present in the canyons.

These canyonhead communities may be particularly susceptible to contamination from oil spills and from drilling activities. Oil may sink because of adherence to sediments and impact the canyon walls and bottom. Discharge of drilling muds and cuttings may result in down slope movement of these substances. The areal extent of such movement is unknown as is the effect on the biological community of any toxicants contained in or adhering to muds or cuttings. However, potential impacts of drilling discharges can be mitigated through restrictions on structure placement and by requiring shunting of drilling fluids. Risk of impacts of oil spills can be mitigated to some degree through tract selections.

Estuaries are important ecosystems along the North Atlantic coast because of their role as nursery areas, waterfowl habitat and sites of high productivity. As such, they are particularly susceptible to deleterious effects from petroleum contamination (see Section IV.B.2.b.). Long Island Sound in particular is a critical habitat to several species of finfish and shellfish which require estuaries for completion of their life cycle. Species which could be particularly affected by spills or other adverse impacts to estuaries in the North Atlantic include winter and summer flounder, soft clam and lobster.

Waterfowl populations are particularly susceptible to oil spills during the spring and fall migration periods. Contamination of estuaries could result in high mortality of waterfowl, which often concentrate in the estuaries in feeding populations. Even large losses would not be considered significant to the entire coastal population, since many bays with large waterfowl populations would remain unaffected.

Offshore oil spills and release of drilling contaminants may affect fish populations through mortality of eggs and larvae and through interference with chemical clues such as initiators of mating behavior. Nearshore spills may affect adult populations of shellfish as well. Habitats may be made unacceptable for spawning and feeding activities. North Atlantic species such as cod, haddock, yellowtail, winter flounder, sea herring, scallops, lobster, American plaice, ocean perch, soft clam, grey sole, and squid, among others, could be affected.

Offshore fish spawning areas in the North Atlantic are often poorly defined spacially and may vary from year to year depending upon patterns of temperature, water quality and other factors perhaps not well established. While areas where spawning has occurred historically may be quite large, in any given year, that portion of the area actually utilized by a spawning population may be quite limited. During those spawning seasons when extremely small areas are heavily occupied by breeding fish, an oil spill covering the area could have serious consequences, with the loss of an entire year class possible, or losses exceeding a year class if contamination of the bottom occurs. This is thought to be a fairly unlikely event in deeper, offshore water with the probability of it occurring increasing in the shallow, coastal waters. Should bottom contamination occur in offshore waters, spawning grounds may be altered unfavorably from 6 months to 3 years, depending upon substrate type. Most notable examples of bottom spawning habitats which could be affected offshore are those for winter flounder and sea herring. Nearshore or in coastal waters where small sediment particle size and organic content are optimal for oil retention, contamination may last as long as 5-7 years, affecting soft clam, bay scallop, and oysters.

The most susceptible avian populations are the sea ducks which migrate offshore along the coast. Historically, losses of these ducks to oil spills have numbered in the tens of thousands, a significant loss to the population. Pelagic birds are common in such areas as Georges Bank, Nantucket Shoals, Stellwagen Bank and Jeffrey's Ledge. The most susceptible species may be alcids which spend much of their time on the water.

Contamination of pinniped breeding rookeries can be severe during the pupping season. Young seals may also ingest oil accidentally while nursing if the mother has become oiled. Abandonment of a pupping area because of oil contamination is also possible. Oiled pups also gain weight at a slower rate than unoiled, and may not survive the winter. The harbor and gray seal populations from Cape Cod north are the most likely to suffer from an oil spill.

Conclusion: Canyon heads represent biologically productive habitats which are particularly sensitive to adverse impacts from drilling activities; however, because of their discrete nature, they can be protected through mitigating measures. The North Atlantic is considered relatively highly sensitive to oil spill effects on offshore spawning and on pelagic bird populations. The region is considered moderately sensitive to oil spill effects on marine mammals. At least two oil spills greater than 1000 bbls. are probable as a result of the proposal.

Mid-Atlantic

As in the North Atlantic, the Mid-Atlantic OCS is cut by canyons. To some extent, a faunal shift occurs in the canyonheads of the Mid-Atlantic. Pueblo communities are not as pronounced, and eels, hake and tilefish predominate. While coral populations are also present in this area, they are far less diverse and common. It may be that Mid-Atlantic canyon faunal assemblages are less susceptible to effects from an oil spill or release of drilling discharges on the basis of density alone. Types of impacts and potential for mitigation are similar to those discussed for the North Atlantic.

Estuaries are important ecosystems along the Mid-Atlantic because of their role as nursery areas, waterfowl habitat and sites of high productivity. As such, they are particularly susceptible to deleterious effects from petroleum contamination. Another property of Mid-Atlantic coast estuaries which increasingly influences the ecosystems within is the slow degradation of water quality from point and non-point industrial sources. Against this chemical background, the additive effect of petroleum may act in synergism, causing a more pronounced effect than that which would occur if acting alone.

The estuaries of the Mid-Atlantic are extremely large and play a very important role in the development of a number of important finfish and shellfish. Chesapeake Bay, which is largely protected from spills in the existing lease area by the Delmarva Peninsula, is dominant among the estuaries but other estuaries of importance include Delaware Bay, Great Egg Harbor, Barnegat Bay, Hudson Estuary and Great South Bay. Principal species which could be affected by an oil spill in one of these major estuaries include bluefish, striped bass, summer flounder, hard clam, oysters, blue crabs, weakfish and menhaden. The most serious loss would be to larval stages of resident shellfish, since these immature forms originate within the estuary and would not be replenished from without. Adult populations of shellfish may suffer great mortality. Replacement of these populations is primarily dependent upon internal populations, and would be an exceedingly slow process if a large portion of the spawning stock were lost.

Offshore oil spills and the release of drilling contaminants may affect fish populations through mortality of eggs and larvae and through interference with chemical cues, such as those involving migratory behavior and initiation of mating behavior. Nearshore spills may affect adult shellfish populations as well. Important Mid-Atlantic species which could be impacted by an oil spill include summer flounder, scup, menhaden, weakfish, Atlantic mackerel, hard clam, oyster, surf clam, quahog, red hake and whiting.

Spawning areas for fish in the Mid-Atlantic are quite general in area, with many species spawning over large areas, often in response to the northward movement of temperature in spring and early summer. Other factors such as water quality may also be instrumental in determining temporal and spatial patterns of spawning.

In contrast to the North Atlantic, estuaries in the Mid-Atlantic are extremely valuable as nursery grounds for both shellfish and finfish. Based on analyses performed for OCS sales 40 and 49, offshore oil spills resulting from this proposal would have a low probability of reaching these areas, if future leasing does not occur substantially shoreward of existing leased areas. While a tanker spill could impact an estuary if it occurred in the vicinity of the estuary, most Mid-Atlantic estuaries are protected and they have a net outflow, decreasing the risk of spill entry. Additionally, the net risk to estuaries as a result of the spill is not expected to increase substantially, as OCS production is anticipated to replace existing tankered imports. However, should such a spill occur and impact nearshore areas, where small sediment particle size and organic content are optimal for oil retention, and contamination may last as long as 5-7 years. Impacts to hard clam, oyster, summer flounder, by scallop and species of finfish dependent on estuaries during part of their life cycle.

Oil spills are expected to have potentially significant effects on waterfowl in the Mid-Atlantic, with less noticeable impacts anticipated for coastal shorebirds and pelagic birds. The estuaries of the Mid-Atlantic are important not only for migration, but as wintering areas. Coating or ingestion of oil could result in large mortalities, but would not be expected to be of long-term significance to coastal populations as a whole. The severity of impact on pelagic birds is dependent upon unknown factors such as bird population size and distribution, chronic spillage rate, time, and location of spill. Shorebirds are not as susceptible to an oil spill since oil coming into contact with their legs would be subsequently washed off when they moved to a cleaner beach to feed. The most susceptible waterfowl are the sea ducks which migrate and winter off the coast. Large mortalities of these birds have been observed due to oil spills. If a spill were to contact a winter area when ducks were present, a significant decrease in sea duck populations could be noticed, depending upon how dispersed the ducks were.

Conclusion: Canyonheads represent biologically productive habitats which are particularly sensitive to adverse impacts firm drilling activities; however, because of their discrete nature, they can be protected with mitigating measures. The Mid-Atlantic is considered to be relatively moderately sensitive to oil effects to fish, including offshore and nearshore spawning habitats. The region is also rated as moderately sensitive to oil spill impacts to bird populations, due to the lesser numbers of pelagic birds (than the North Atlantic). At least one large spill is probable.

South Atlantic/Blake Plateau

Biologically sensitive areas on the South Atlantic OCS are hard bottom areas, where water conditions and depth permit the growth of rich biological communities. Live bottoms are defined as those areas which contain diverse epifaunal assemblages living upon naturally occurring rocky formations. Little specific information is available about these areas, but it is known that these areas are scattered throughout the shelf in a sparse seemingly random manner, except for a trend of reefs of relatively high relief along the shelf break. Even less is known of the Blake Plateau, although there is evidence that deep water coral communities are present.

Protection of such areas could be provided by stipulations appended to the lease of any block on or near enough to an area of biological significance that there might be a deleterious effect on the biota of that area due to oil and gas exploration and development. Such stipulations have been developed during the past five years in live bottom areas in the Gulf of Mexico in consultation with the USFWS and USGS; in addition, advice has been received from other agencies such as EPA and NMFS as well as from the industry and other interested groups. Finally, in designing these stipulations, extensive use is made of BLM funded studies in the area.

Since these areas of important biological resources are not well known at this time, a stipulation could require the lessee to provide a bathymetric map of the area in which drilling is desired and require the lessee to make an interpretation of survey data for the possible presence of live bottom areas. If the data indicate that live bottoms might exist in the area, the lessee could be required to submit photo or other documentation to substantiate that such areas are not present, or to take measures designed to protect the live bottom, which may include (but not be limited to) shunting, monitoring, or the transporting of all drilling effluents away from the live bottom areas.

Estuarine areas are important due to their role as nursery grounds for many species of commercially important fish and shellfish and as waterfowl habitat. The major impact of concern from the proposal is the potential for oil pollution. Crude oil contamination can render shellfish inedible, cause high mortalities to waterfowl and contaminate bottom sediments. Recovery can take from months to years. The possibility of an estuary suffering a crude oil spill in this area as a result of this proposal is believed to be low.

Conclusion: Hardbottoms in the South Atlantic represent biologically productive habitats which are particurlarly susceptible to adverse impacts from offshore oil and gas development activities; however, due to their discrete nature, they can be protected through the use of mitigating measures. The South Atlantic is considered to be relatively moderately sensitive to oil spill impacts to estuarine environments and associated fish spawning and waterfowl resources. At least one large spill is probable.

Gulf of Mexico

Biologically sensitive areas in the Gulf of Mexico include live bottom areas similar to those described above. The available evidence indicates that these areas are sparsely scattered throughout the shelf of the eastern Gulf in small patches. The Florida Middle Grounds are probably the best known and most biologically developed of these areas, with extensive inhabitation by hermatypic corals and related communities. These areas would be protected from the potentially adverse impacts from oil and gas activities by stipulation similar to that described for the South Atlantic, and presently in effect in other areas of the Gulf of Mexico.

In the region of the shelf break the central Gulf is characterized by a series of "topographic highs", geologic features rising out of 100-200 m to various depths and trending east-west along the break. Many of these are the surface expression of salt domes, and nearly all are hard, rocky outcrops. Many are drowned coral reefs. The hard, more or less vertical surfaces provide habitat and food for a wide variety of organisms, and it has been found, largely through BLM-funded studies, that, at similar depths, all of these banks contain similar biological communities. The East and West Flower Garden Banks off Texas and Louisiana rise closer to the water's surface than the others and are the only two which contain living hermatypic (reef-building) corals.

Stipulations have been developed to protect these valuable and unique biological resources from the impacts of oil and gas activities. It is believed that application of these restrictions, described below, will reduce such potential impacts to an insignificant level.

Stipulations in the area of the East and West Flower Garden Banks are the most stringent because of the unique and sensitive nature of these coral reefs. These stipulations:

a. Prohibit any activity, including the placement of pipelines, within the 85 m isobath of the banks.
b. Require the shunting of all drill fluids and cuttings to within 10 m of the bottom for activities within 3 nautical miles (nmi) of the 85 m isobath; and
c. Require a monitoring program to assess the impacts of the activities on the biota of the Banks to be carried out for activities within 1 nmi of the 85 m isobath.

Stipulations for existing leases on or near banks near the shelf break of the central and western Gulf which rise out of deep water to at least within 85 m of the surface of the water are somewhat less stringent but still serve to protect the biota of the bank. Again, all activities within the 85 m isobath is prohibited (for those few banks in water shallower than 85 m, a closing isobath would be selected so that protection of the bank biota would be maintained); within 1 nmi of the 85 m isobath shunting is required; and between 1 nmi and 3 nmi of the 85 m isobath either shunting or monitoring would be required, and if monitoring showed that shunting is not harming the biota of the bank shunting could be imposed.

There are several banks, particularly off the South Texas coast which have less relief and rise out of shallower water than those mentioned above, and which are subjected to a much higher level of turbidity and sedimentation. These banks currently receive adequate protection by stipulations no existing leases prohibiting any activity within the boundary of the bank itself which will usually be the deepest closing isobath of the bank.

The Gulf of Mexico also possesses highly productive estuarine ecoystems which are a source of planktonic food supply of menhaden, shrimp and other fisheries, spawning habitat for fisheries resources, including shrimp, and as migratory, wintering and nesting habitat for bird populations. The resources are all sensitive to adverse impacts from oil contamination; however, field observations in the Gulf of Mexico has not indicated any overall decrease of productivity as a result of past oil and gas development. Nonetheless, it is possible that spills reaching these areas could have some adverse effect on estuarine resources.

Conclusion: Live bottom areas, including coral reefs, are biologically productive habitats in the Gulf of Mexico which are particularly sensitive to adverse effects from offshore oil and gas development. However, because of their discrete nature, they can be protecting using mitigating measures which have been applied in the past. This region is considered to be moderately sensitive to oil spill effects upon bird populations and spawning and other fisheries habitats and resources. It is estimated that the proposal will result in about three large oil spills in the Gulf of Mexico.

Southern California

Tanner, Cortez and Farnsworth Banks are important habitats for benthic communities which contain the hydrocoral allopora californica as well as sponges and bryozoans. These areas also favor the accumulation of recreationally and commercially important shellfish and finfish. These communities could be adversely affected by oil and gas operations through physical disruption such as anchoring; pipeline, rig and platform placement; or by the effluents (drilling fluids, formation waters, etc) associated with these activities and by oil spills. Effective mitigating measures would include pre-activity surveys to establish spatial relationships and operational controls such as rig siting or effluent limitations which can be required by lease stipulation.

The estuaries of Mugu Lagoon, Upper Newport Bay and Tijuana Lagoon are relatively unaltered and stand the risk of contamination by an oil spill as a result of this proposal. If contaminated by an oil spill reaching shore and impacting them, these estuaries would undergo significant population changes and may not return to their natural state for years.

The Southern California coast contains isolated rocky shores which if coated by a crude oil spill as a result of this proposal may not rapidly be repopulated due to the distance over which colonizing life forms would have to be recruited. Sandy beaches in this area are of great recrea tional importance and would tend to trap spilled oil for long periods and experience erosion as a result of the oil contamination.

Large nesting colonies of birds occur on the following islands of the Southern California Bight: San Miguel, Santa Rosa, Santa Cruz, Anacapa, San Nicholas, and Islas los Cononados, Mexico. Also, the coastal wetlands of Southern California and many offshore areas of the Southern California Bight experience seasonal population increases. These concentrations of birds are especially vulnerable to massive oil mortalities which can affect entire populations. The only effective mitigating measure is to prevent oil from contacting these areas at those times when birds are present in great numbers.

Seasonal concentrations of pinnipeds occur on San Miquel, San Nicolas, Santa Barbara, San Clemente and Coronados Islands. Large numbers of pinnipeds could be injured or killed if an oil spill strikes these areas while pinnipeds are congested there.

Conclusion: The Southern California area contains several types of resources that are sensitive to adverse impacts from offshore oil and gas development. Coral banks represented biologically sensitive areas which are particularly susceptible to impacts from drilling activities. This impacts can be mitigated through restrictions and tract selections, applied to these discrete areas. The region is considered to be relatively highly sensitive to adverse impacts from oil spills affecting bird populations, due to the island nesing colonies, and marine mammals. It is considered relatively moderately sensitive to adverse impacts from oil spills affecting other biological resources. It is estimated that approximately five oil spills over 1000 bbls. will occur in Southern California as a result of the proposal.

Northern and Central California

In the Monterey-Carmel offshore area dense communities containing the hydrocoral Allopora californica, sponges, bryozoans and fish occur on hard bottom habitats. These communities could be adversely affected by oil and gas operations as described above for hard bottoms in southern California.

The important estuaries of northern California include the Smith River, Humboldt Bay, Eel River Delta, Klamath River, Drakes Bay, Bolinas Lagoon, Bodega Bay, Elkhorn Slough, and the Morro Bay/Los Osos estuary. These areas are important as spawning areas for fish and invertebrates, many of which are commercially important. If contaminated by oil, these areas would undergo changes which could conceivably impair their role as nursery areas. Protection of estuaries from spills in this area would be more difficult than in southern California due to the wider openings to the sea and the greater tidal range.

Oil spills which contact the high energy rocky shores prevalent in this area could kill most of the intertidal organisms through smothering and toxicity. Recovery and repopulation could take from months to years depending upon the severity of the contamination.

Large seasonal concentrations of nesting seabirds occur on the Farallon Islands and Castle Rock. These areas account for over half of all breeding seabirds occurring in California. Other areas experience seasonal population increases; these are: Eel River Canyon, Mendocino Ridge-Gorda Escarpment, Gulf of the Farallones, Monterey Canyon and coastal wetlands. These concentrations of birds are especially vulnerable to massive oil mortalities which can affect entire populations.

In this area, St. Georges Reef, Farallon Islands and Ano Nuevo Island are important seasonal habitats for pinnipeds. The potential exists for large numbers of these marine mammals to be injured or killed if oil is allowed to contaminate these areas.

Conclusions: Due to the high use of the OCS in Central and Northern California for concentrations of seabirds, including nesting colonies, this area is considered to be relatively highly sensitive to impacts from OCS-related development affecting bird populations. The area is considered to be moderately sensitive to oil spill and other impacts to marine mammels and to fisheries resources. Approximately two oil spills greater than 1000 bbls are estimated to result from the proposal which could impact these resources.

Gulf of Alaska

The proposed Gulf of Alaska oil and gas lease area encompasses many critical breeding and feeding areas for fish, birds and marine mammals, as well as unique and highly-productive areas for other marine life.

Prince William Sound is such an area. Millions of sea birds nest in colonies along the Sound's coast, on adjacent Hinchinbrook and Hawkins Islands and Middleton Island further offshore, and also feed in marine waters offshore. Large seal and sea lion rookeries and pupping grounds are present within the approaches to the Sound, and the Middleton Island area. Also large numbers of sea otter, fur seals, dolphins, and whales occur seasonally in the sound. Oil contamination in the Sound could have adverse impacts on many species and great numbers of wildlife. Oil and gas activities such as air traffic in the general area could also have adverse affects. However, the Sound is considerably west of the sale area.

Coastal wetlands such as the Copper and Bering River deltas are critical breeding and feeding habitat for millions of ducks, geese, swans, shorebirds, and large concentrations of seals and other wildlife species that could be adversely impacted by oil and gas development in the area.

Waterfowl (ducks, geese, swans) would be particularly vulnerable to oil pollution in or near their wetlands. Other important critical areas for birds and marine mammals include the Yakutat Bay area and Icy Bay. The major Pacific flyway for millions of migratory birds and seven endangered whale species transects the proposed Gulf of Alaska oil and gas lease area. Oil pollution and air traffic support activities could directly impact these important populations.

Crab, salmon and halibut are similar in that shallow (less than 20 m) nearshore waters are critical to their larval and juvenile forms. These forms spend from three months to several years in these protected waters and are more susceptible to adverse impacts during the larval stage, than after assuming adult but immature forms and moving to deeper waters. These areas are continuous along the Gulf of Alaska, but concentrated from Kayak Island west. The Alaska current moving from east to west along this shore could carry pollutants along the coast west of the pollution site.

It is conceivable that one or several pink salmon intertidal spawning areas could be affected for at least one year by a spill and that some outmigrating sockeye, coho and chinook would be affected. Severity of impact is unquantifiable, but is estimated to be in the low to medium range. Crab and halibut larvae could also be affected by a pollutant event, but because of the less concentrated nature of their habitat, (such as spawning areas) impacts on these populations would probably be low.

Impacts on bottom fish species would be low because of the widespread area that juvenile and larvae forms are found and their position in the water column (20 to 90 m) which is generally below a pollutant's effective impact range.

Conclusion: Because of the abundance of breeding pinnipeds and birds, the Gulf of Alaska is considered to be relatively highly sensitive to oil spill and other impacts on these resources. While intertidal areas are abundent and are critical spawning habitat, the area is considered to be moderately sensitive to oil spill impacts affecting estuarine systems and fisheries resources, because of their disbursed nature. It is estimated that there is a low probability that an oil spill will occur in the Gulf of Alaska as a result of this proposal.

Kodiak

The Kodiak Island lease area encompasses significant concentrations of nesting and feeding birds and marine mammals such as sea otters, seals, and sea lions. These significant concentrations occur in the following areas: the coastal areas of Afognak Island; Ugak Bay; Marmot Bay; Chiak Bay; Aliulik Peninsula; and Sitkalidak, Tugidak, and Sitkinak Islands. These populations could be adversely impacted from oil contamination of marine waters and contamination of food organisms around these sites, and air traffic noise from oil and gas activities in the area.

A large portion of Kodiak Island is designated as a National Wildlife Refuge protecting the Kodiak brown bear. Adverse impacts on the Kodiak bear would come from destruction or contamination of food source if the salmon fisheries were adversely impacted from oil pollution.

Impact to fisheries resources in the Kodiak areas would be of a similar nature to those discussed under the Gulf of Alaska. There may be less potential for impact to crab because of the protected locations in estuaries. Shrimps spend a portion of their lives in quiet inshore waters where they migrate up and down in the water column night and day. Because of this behavior, a spill affecting inshore waters could result in multiple exposure during a very vulnerable part of their life. Shrimp populations could therefore be reduced; however there is so much natural variation of population, the impact cannot be predicted. Impacts to bottom fisheries would in general be low, as in the Gulf of Alaska. However, species (halibut) whose eggs and/or larvae float in the upper layers of water could experience some population reduction from a spill. Total impact is estimated to be low. The most sensitive areas for fish in the Kodiak lease area are Marmot, Chiniak, Ugak, Kiliuda, Sitkalidak, and Alitak Bays.

Conclusion: Because of the abundance of breeding populations of birds and marine mammals, the Kodiak are considered to be relatively highly sensitive to oil spill and other impacts from OCS development affecting these resources. While impacts to shrimp populations as a result of the proposal may be an exception, other resources in this area are considered to be moderately sensitive to oil spill and other impacts. It is estimated that no more than one spill would occur in the Gulf of Alaska as a result of the proposal.

Cook Inlet

Oil and gas development in the proposed lower Cook Inlet OCS lease area could have adverse impacts on significant populations of seabirds and waterfowl. Critical feeding and nesting areas for large numbers of ducks, geese, and trumpeter swans lie in the Kenai lowlands. Swans are particularly affected by noise disturbances.

Important marine and shorebird nesting and feeding areas occur in the following areas: Tuxedni Bay; Kamishak Bay; Kachemak Bay; the Barren Islands; Chugach Islands, Augustine Island; and Tuxedni National Wildlife Refuge on the west side of the inlet.

Adverse impacts to fisheries resources in Cook Inlet are estimated to be moderate. Highly productive areas (e.g. Kachemak Bay) have been designated by the state as fish sanctuaries where oil and gas development is prohibited. Tract selection for the proposed Cook Inlet sale has already taken place. Tracts adjacent to Kachemak Bay, which would have the greatest potential for spill effects, were not among those tentatively selected. Adverse effects of oil spilled as a result of a spill in the Inlet will be reduced because oil will be broken up and dispersed as a result of turbidity and flushing, reducing the potential for smothering and other biological impacts resulting from slicks and patches of oil.

Conclusion: While breeding population of marine mammals and waterfowl and well as pelogic birds use, is less abundant then in many other areas of Alaska, Cook Inlet nonetheless provides important habitat for these resources. It is considered to be moderately sensitive to oil spill and other adverse impacts resulting from OCS-related development. It is estimated that about one oil spill greater than 1000 bbls. will occur in Cook Inlet as a result of the proposal.

Norton Basin

The proposed Norton basin sale area encompasses important habitat for migratory birds and marine mammals that could be adversely impacted. The estuaries and river deltas of this region are important waterfowl habitats, especially that portion of the Yukon River delta included in the proposed sale area. Important seabird colonies and the adjacent ocean feeding areas include: St. Lawrence Island, Little Diomede Island, Fairway Rock, King Island, Sledge Island, Egg Island, Besboro Island, Cape Denbigh, Rocky Point, and Cape Darby. North of the Norton Basin is the Bering Strait, which serves as a narrow migration pathway from the Bering Sea to the Arctic. Several species of seals; walrus; harbor porpoise and several whales, including the endangered gray and bowhead whales, utilized the Strait. Oil spills, as well as structures placement, have the potential to directly impact these organisms and to interfer with migration and feeding. (Additional discussion of potential impacts to the Bering Strait is included in Section IV.1. under Environmental Consequences of Alternative 9.)

For impacts on sensitive fish areas, see discussions under Gulf of Alaska. The Yukon River Delta, Norton Bay, and Port Clarence are the major fish habitats in this area.

Conclusion: As other Bering Sea areas, the Norton Basin provides important breeding habitat for waterfowl and pelagic birds and for marine mammals, as well as being important for migration. It is considered to be relatively highly sensitive to oil spill and other OCS-related impacts affecting these resources. The probability of one oil spill greater than 1000 bbl. occurring as a result of the proposal, is estimated to be relatively low.

St. George Basin

OCS development in the proposed St. George Basin lease area could have serious adverse impacts on highly important marine mammal and marine bird populations, and general marine wildlife habitats. The Aleutian Islands have been designated as a National Wildlife Refuge because of the abundance and diversity of wildlife found there. The Pribilof Islands have the most important northern fur seal concentration in Alaska, and could be adversely impacted from oil spills in the lease area. The Pribilof Islands and the Bogoslof National Wildlife Reserve also have enormous seabird colonies numbering in the millions, that could be severely impacted by oil pollution, air traffic, construction, and other oil and gas activities. The Aleutian Islands adjacent to the proposed sale area and within the proposed Northern Aleutian Shelf sale area represent the most productive sea otter habitat in the world. Sea otters can be severely impacted by oil pollution. Unimak Pass, located between the St. George and Northern Aleutian Shelf sale areas, is an important marine mammal migration route. Seals, sea lions, and cetaceans could be adversely impacted by the oil spill or oil and gas activities in the pass.

For impacts on sensitive fish areas, see discussion under Gulf of Alaska. The intertidal areas of the Pribilof and Aleutian Islands are the major nearshore fisheries habitats in this proposed area.

Conclusion: Because of the abundance of breeding marine mammals in the St. George Basin vicinity, including the fur seals of the Pribilofs, and sea otters of the Aleutians, St. George Basin is considered to be relatively highly sensitive to potential adverse effects of OCS development impacting marine mammals. It is also considered highly sensitive for sea birds. In addition, it is estimated that about two oil spills greater then 1,000 barrels will occur as a result of a St. George Basin sale.

Beaufort Sea

The proposed Beaufort Sea sale area encompasses many coastal shallows, such as lagoons (Simpson Lagoon as an example), bays, and river deltas. These have seasonal high concentrations of migratory birds (11 million estimated), mammals, and other wildlife that could be seriously affected by oil pollution and other disturbances from oil and gas development in the vicinity during the spring and summer months.

Barrier islands, which played a primary role in the formation and protection of the biologically productive lagoons and bays, are important habitat for several bird species and important denning sites for polar bears. Oil contamination and other human disturbance of these areas could cause abandonment of this critical habitat by these species.

During spring breakup, ice leads are the greatest centers of biological activity and productivity. The plankton and fish concentrations that occur there represent a significant part of the food source of all of the marine animals in the area at that time. Large concentrations of migratory birds and seals depend on the ice leads for feeding and foraging. Large oil spills occurring near these areas or under the ice during the winter could have a very severe impact on these populations. In the northeast corner of Alaska fronting the Beaufort Sea is the Arctic National Wildlife Refuge. It is important for mammals, migratory waterfowl and shorebirds which could be adversely affected by oil and gas activities.

For information on sensitive fish areas, see discussion under Gulf of Alaska. Smith and Harrison Bays and the lagoon systems near Barrow, Beachy Point, Flaxman and Barter Islands are the major habitats in this area. While the number and diversity of fish in the Beaufort Sea is much less than in more southerly areas, the fisheries resources are important subsistence resources to the Native population.

Conclusion: The Beaufort Sea is particularly sensitive to adverse impacts from oil spills resulting from the proposed schedule in spring and summer. During these periods, marine mammals and migratory birds could be adversely impacted by about four oil spills greater than 1,000 bbls. estimated to result from the proposal.

Northern Aleutian Shelf

The proposed Northern Aleutian Shelf lease area encompasses important wildlife habitat for marine mammals and birds with some of the world's largest concentrations of seabirds and waterfowl. Large oil spills, chronic oil pollution of food sources, air traffic, construction, drilling, and other support activities could have a severe impact on this biologically sensitive area.

Izembek Lagoon which is located mid-shore in the proposed lease area has been designated as a National Wildlife Range. Izembek Lagoon is used by several million waterfowl, seabirds, and shorebirds for feeding in the spring and fall with many of these birds remaining in the area throughout the summer. A major portion, or perhaps the world's entire population of black brants, cackling Canada geese, Stellar's eiders, and speckled eiders feed in this bay during spring and fall migration. A large oil spill in or near Izembek Lagoon during migration periods could have a severe impact on the bird populations and possibly eliminate most members of the four species mentioned above. Other biological resources would also be adversely affected.

The Northern Aleutian Shelf area is the in-migration route of the majority of sockeye salmon that constitute the largest salmon stock in the world. The greatest potential impacts to salmon populations would be on their in-migration. Adult salmon are less susceptible to adverse effects of oil-related pollution events but it is thought that their homing and feeding chemo-receptors can be upset by water-soluble fractions of oil. Should this occur and a run be delayed from reaching its "home" streams, population levels could be reduced. It appears that juvenile sockeye salmon use the north side of Bristol Bay for their migration. However, it is thought that large numbers go through False and Unimak Passes just to the west of the proposed sale area. Pollutant effects from increased shipping resulting from this proposal and oil spills could affect these out-migrants.

Conclusion: The Northern Aleutian Shelf area is rated as relatively highly sensitive to oil spills impacting bird and marine mammal resources--due to its importance both as a breeding area and as a migratory pathway. It is estimated that the probability of an oil spill over 1,000 bbls. occurring as a result of the proposal is relatively low.

Navarin Basin

The Navarin Basin proposed sale area is offshore of large areas of sensitive wildlife habitat that may be adversely impacted by oil and gas development. The Yukon River delta is the largest and most productive of western Alaskan waterfowl habitats. Nearly the entire population of emperor and cackling geese nest on the delta, as do most of the Pacific Flyway whistling swans. A portion of the primary coastal habitat for those species is in the Clarence Rhode National Wildlife Refuge. Other designated wildlife refuges and ranges in the proposed lease area include Cape Newenham and the Walrus Islands, Nunivak Island, Hazen Bay, and the Bering Sea National Wildlife Refuge. The Yukon River delta and other coastal areas, however, are in the order of 300 miles shoreward of the prospective geologic structures in the Navarin area. The probability of impacts from oil spills is believed to be low.

The species present in the Navarin are a continum of species present in St. George and Norton Basins. The area is probably the wintering ground for many of marine mammals from the Norton, Chukchi and Beaufort areas. The bird species present are numerous and are present throughout the year. Species lists are similar to those from the St. George and Norton Basin areas. The ice free area of the Navarin Basin is used as an over wintering area for many birds.

For impacts on sensitive fish areas, see discussion under Gulf of Alaska. The Yukon River Delta is the major nearshore habitat closest this region. The continental shelf break (200 meters) is the major fisheries habitat in the lease sale area.

Conclusion: The Navarin Basin is over 300 miles from the Alaska mainland and sensitive resources (especially breeding waterfowl) of the Yukon delta. It is important as a migratory route for marine mammals. While there is wildlife use of St. Lawrence Island, the concentration, magnitude and proximity of most birds and fisheries resources is less than in other Alaska areas, with the exception of pelagic birds. In this reason, Navarin Basin is considered to be relatively highly sensitive to OCS-related impacts to pelagic birds and marine mammals, but is considered relateively moderately sensitive for other resources. Four or more oil spill greater than 1000 bbls. are estimated to result from the proposal and could adversely impact these resources.

Chukchi Sea

The proposed Chukchi Sea lease area encompasses the same type of biologically sensitive areas as the proposed Beaufort Sea lease area, including waterfowl populations, biologically productive lagoons and bays, and during spring breakup, ice beds which are the center of biologically activity and productivity. The impacts from oil and gas development would be similar.

Should support or transportation facilities for a Chukchi Sea sale be developed in Kotzebue Sound, important spawning and waterfowl and shorebird migration areas, as well as possibly marine mammals, could be impacted in the Hope Basin area. These impacts are further discussed under Section IV.J. under Environmental Consequences of Alternative 9.

For impacts on sensitive fish areas, see discussion under Gulf of Alaska. The lagoon system from Cape Beaufort to Wainwright are the major habitats here. The fish of the Chukchi Sea are lesser in number and diversity than in more southerly areas. However, the fisheries resource is important for subsistence purposes to the Native populations.

Conclusion: The Chukchi Sea is particularly sensitive to adverse impacts from oil spills in the spring and summer resulting from the proposal. During these periods, marine mammals and birds could be adversely impacted by seven or more oil spills greater than 1,000 bbls. estimated to result from the proposal.

c. Impact on Endangered Species

Potential impacts to endangered species are assessed on a sale by sale basis (except in the Gulf of Mexico where a regional assessment has been made) according to the requirements of the Endangered Species Act. The National Marine Fisheries Service (in NOAA) and the U.S. Fish and Wildlife Service develop biological opinions regarding the jeopardy to endangered species populations which could result from a proposed action. This assessment process and resulting opinion is required prior to a sale decision. Prior to the selection of specific tracts, and oil spill trajectory analysis, no definitive analysis of potential impacts to these populations is possible.

Endangered species of greatest concern, which may be impacted by the proposed five-year leasing schedule, are endangered whales. One cause for this concern is that whales can be cumulatively impacted as they migrate through and spend portions of the year in several OCS areas. For example, the gray whale winters in the northern Pacific, and migrates through the Bering Sea to the Arctic, and some migrate through the Gulf of Alaska and Kodiak leasing area as well. Therefore, they could be subject to impacts in up to eight separate leasing areas. While at least one oil spill is probable in each of these areas, oil spills would occur over the approximately twenty year period from exploration through production. It is impossible to predict whether individual whales or whale populations might be subjected to multiple, simultaneous spill incidents. However, these species would certainly be subjected to noise impacts from exploration, and from development and production where it occurs, in each of the various regions. However, the cumulative impact of such exposure cannot be assessed, especially in view of the lack of understanding of the extent to which noise impacts whales. Because of these factors, as well as the general lack of information regarding various impacts to whales and on whale distribution, and differences in behavior between species, impacts to whale population, especially in the cumulative sense, cannot be assessed in any definitive manner at a program level.

As the same populations of whales occur in many of the OCS areas proposed for leasing, generic impacts to whales will be discussed below, prior to the endangered species impact discussions by leasing area.

Generic Impacts on Whales

Noise Effects: Although Geraci and St.Aubin (1979) show that high frequency sounds cause permanent ear damage in laboratory animals and could adversely affect marine mammals, the low frequency sounds that are likely to emanate from protroleum exploration and prodution are significantly less destructive. Physical adverse effects from low frequency sounds on cetaceans are unknown, however, noise does have nonauditory physical effects on birds and mammals (Fletcher, 1971). These effects appear to cause physiological stress involving hormone responses leading to lowering of disease resistence, increased vulnerability to environmental stress, and hormone imbalances which may adversely affect reproduction. Such stress-involved effects may apply to cetaceans.

Because cetaceans rely on their well developed auditory (hearing) senses for communication and respond abruptly to certain signals even to their own detriment (Tomlin, 1955), they could experience acoustical confusion, a theoretical cause of mass strandings (Dudok van Heel, 1966). Because cetaceans and other marine mammals use sound as a form of communication or navigation, background noise from oil and gas activities in the marine environment could interfere with these communications sounds causing social disruption and echo-confusion (Geraci and St. Aubin, 1979). Whether these effects occur or not is unknown.

Noise from boat and air traffic, and from drilling and pipeline activities could affect cetaceans that are moving through or feeding in OCS oil and gas exploration or production areas.

Air and boat traffic cause at least temporary displacement and other disturbance reactions in cetaceans. Fraker (1978) observed both aircraft and boat disturbances of beluga whales while Calkins and Curatolo (1979) report that humpback whales, killer whales, and Dall porpoises are disturbed by boat traffic in Glacier Bay. However, the fact that familiar species such as gray and humpback whales, dolphins, and elephant seals along the developed California coast seem to co-exist well with human activities Geraci and St. Aubin (1979) suggest that cetaceans adjust to small boat and limited air traffic noise. Drill platforms are not expected to interfere with whale migration.

Direct Oil Effects: There is no evidence that cetaceans may or may not be able to detect hydrocarbon pollution, and if so, avoid it. Accounts from past oil spills show that other marine mammals such as seals and sea lions in some cases do not avoid oil, however, there has yet to be found a confirmed case of a whale, dolphin, or porpoise found coated or fouled with oil (Geraci and St. Aubin, 1979). Cetacean skin is smooth and unlikely to accumulate oil; however, unlike pinnipeds which come ashore with obvious evidence of oil, and oil-fouled cetacean may go unnoticed. Although oiled cetaceans have not been observed, the nature of their skin suggests that they may be particularly vulnerable to noxious effects of surface contact with hydrocarbons such as gas condensates (Geraci and St. Aubin, 1979). The epidermis is not keratinized, but composed of viable (live) cells (Sokolov, 1960, Geraci and St. Aubin, 1979).

In conclusion, to the review of investigative research on the physiological nature of cetacean skin, Geraci and St. Aubin (1979) report that cetacean epidermis is virtually unshielded from the environment, and it may react to noxious substances, such as oil, in a manner similar to sensitive mucous membranes. Gray whales, which frequent shallow nearshore habitats, may be the most likely endangered cetacean to be fouled in cases of oilspills accumulating in nearshore areas.

Cetacean vulnerability to oil ingestion varies with species and type of oil and nature of the oilspill. Baleen whales such as blue, fin, and humpback whales could accidentally engulf large quantities of oil while catching food concentrations that may be present in an oilspill area. In this case, most of the oil engulfed would probably be forced out of the mouth during the feeding process, however, oil coating or fouling of the baleen plates could occur. Studies in progress have demonstrated that oil causes matting of the baleen fringes which reduces filtering efficiency (Braithwaite, personal communication). Other baleen whales, such as right and sei whales, which skim the water surface covering relatively large areas while feeding may be the most vulnerable to baleen fouling and oil ingestion in the case of surface oil pollution. The effects of oil ingestion on whales is unknown.

The bottom-feeding gray whale is unlikely to ingest surface oils but could be prone to ingestion of hydrocarbons in the sediments of nearshore areas contaminated by acute or chronic oil pollution. Tomilin (1955) reports that cetaceans, especially benthic feeders, have a poorly developed sense of taste, and the presence of foreign bodies in cetacean stomachs attest to this. Thus, evidence indicates that whales may not be able to differentiate between hydrocarbon contaminated and uncontaminated food.

Inhalation of oil or oil clogging in the cetacean blowhole is unlikely as the typical breathing cycle of cetaceans involves an "explosive" exhalation followed by an immediate inspiration and an abrupt closure of the blowhole (Geraci and St. Aubin, 1979; Tomilin, 1960). This process prevents inhalation of water and should be as discriminatory of oil, however, toxic hydrocarbon gas could be inhaled. The effectiveness of the inhalation process to avoid the uptake of oil would depend on the quantity and chemical properties of the oil.

Indirect Oil Effects: The greatest potential indirect impacts from oil and gas activities on cetaceans would be the possible destruction or contamination of critical food sources from acute or chronic oil pollution.

In the discussion of the endangered baleen whales' food sources, it was pointed out that most of these migratory whales (blue, fin, gray, and humpback whales) are probably seasonal feeders. These species rely almost entirely on the abundant food sources of the Gulf of Alaska, Bering Sea, and Arctic Sea for nourishment and live off the stored blubber reserves while migrating and while in their winter range (Wolman, 1972; Rice and Wolman, 1971; Gilmore, 1959).

Euphasiid and copepod crustaceans are important food of fin, blue, sei, and right whales (especially blue and right whales), while benthic amphipods are an important food of gray whales. The destruction or contamination of these food resources from hydrocarbon pollution would adversely affect the associated whale species forcing them to enter their wintering areas during the following season in a lean and possible stressed condition. Such a condition could cause significant reproductive failure and increased mortality. An oil spill would add stress to an endangered or badly depleted whale population. The blue whale and right whale are among the most endangered whale species . These species are also "restricted feeders" preying on only a few species of plankton. Thus, the blue and right whales probably have the lowest tolerance to increased stress and mortality. The loss of only a few additional whales may reduce these species populations below the level of environmental tolerance.

In summary, although noise can be damaging to marine mammals the low frequency sounds emanated by oil and gas activities have not been proven to adversely affect cetaceans. Boat and air traffic will temporarily disturb cetaceans but the coexistance of whales, dolphins, and other marine mammals with human activities suggest that at least some species of cetaceans are able to adjust to such disturbance.

Direct oiling is unlikely to be a problem with cetaceans, because their smooth skin surface should not allow oil to accumulate; however, their skin is sensitive and perhaps permeable to toxic hydrocarbons.

Oil ingestion and baleen fouling is a potential problem for all baleen whales with surface pollution most likely to affect skimmer feeders such as sei and right whales and with bottom sediment hydrocarbons most likely to affect gray whales.

The reduction or contamination of critical food sources due to oil pollution is the major potential indirect effect on cetaceans. The significant reduction of plankton populations in the gulf as a whole from an oil spill is highly unlikely. However, the localized and temporary loss or contamination of food sources in important feeding areas could contribute to adverse environmental stress on badly depleted whale populations.

North Atlantic

There are six endangered species of whales which occur seasonally in this area including the fin, sei, sperm, blue, humpback and right whales. Possible impacts from oil and gas development are similar for all marine mammals. As detailed below, oil and gas operations could adversely affect marine mammals through increase high frequency noise levels, by direct contact with crude oil, and collisions with boats; and indirectly by the contamination of their food. Although no cetacean deaths have been reported as the direct effect of oil pollution, some adverse effects could include: irritation of skin and eyes, clogging or inflammation of respiratory tracts, fouling of baleen plates and ingestion which could cause internal disorders. Underwater obstructions such as ground tackle could create hazards for whales in the immediate area of operations. Of major concern is the effect OCS operations may have on the reproductive capacity of whales as interference with breeding, calving, or the survival of juveniles would reduce the chances for survival of these species.

In the North Atlantic areas the summer and fall seasons are the times of greatest whale abundance, so the risk of ship collision is enhanced during this time. The right whale, a surface feeder, would be particularly susceptible. Winter crude oil spills south of Cape Cod would particularly affect the fin, sei and sperm whales which congregate there at the time.

Endangered species which occur onshore in this area include the bald eagle, peregrine falcon and Eskimo curlew. The most likely mode of impact to these species would be through the ingestion of oil contaminated food.

The short nose sturgeon is an endangered fish species in this area. The most serious effect on the short nose sturgeon would be the contamination of spawning fish and their eggs during April, and the possible reduction in eggs and fry as result of sedimentation from onshore construction activities. The likelihood of an oil spill occurring and impacting one of the rivers in which this sturgeon is found is remote.

Five species of sea turtles occur in this area during the summer, including the endangered Atlantic Ridley, leatherneck and hawksbill and the threatened green and loggerhead turtles. These turtles could be adversely affected by contacting spilled oil or oil contamination of their food. Particular areas of concern are Vineyard Sound, Buzzards Bay, Nantucket Sound and the south shore of Long Island.

The most serious potential impacts to these endangered species in the North Atlantic major oil spills and chronic oil pollution. An endangered species consultion with Fish and Wildlife Service and National Marine Fiseries Service pertaining to proposed North Atlantic OCS Sale No. 42. In the biological opinion of these agencies, with stated conditions, there would be no jeopardy to the continued existence of the endangered and threatened species considered, and no destruction or modification of their critical habitats or habitats likely to be determined as critical in the future, resulting from the first proposed OCS sale in the region, with two exception. The National Marine Fisheries Service believes that not enough information exists to determine whether an adverse impact to the right and humpback whales would result from proposed Sale #42. Impacts as result of the proposed schedule will be in addition to these from proposed Sale #42.

Conclusion: Except for possible impact to the right and humpback whales, impact to endangered species are difficult to project at this level, but based upon the analysis for the first proposed North Atlantic sale, is not expected to result in jeopardy for individual species. Because a question remains regarding to two whale species, this area is rated as relatively highly sensitive for impacts to endangered species.

Mid-Atlantic

The species of concern in this area are the same as those discussed above for the North Atlantic with the addition of the brown pelican in the extreme southern end of the region.

General impacts on whales were discussed previously; since this area is thought to contain the calving grounds for the fin whale, development in this area has the potential to interfere with this activity. Other potential impacts on whales in this area would be similar to those in the North Atlantic.

The brown pelican is susceptible to oil spills as it dives into or alights on the water while feeding or resting. Pelicans could be adversely affected directly by contact with oil or indirectly by the contamination of food or loss of habitat. However, the existing area of leasing (Sales #40 and 49) is considerably northern of the brown pelican range.

The other endangered species of concern in this area (birds, fish and turtles) are the same as those in the North Atlantic area and the potential for impact would be identical. The Pamlico Sound area is a shallow nearshore area important to turtles.

An endangered species consultation was held with Fish and Wildlife Service and National Marine Fisheries Service pertaining to Mid-Atlantic OCS Sale No. 49. In the biological opinion of these agencies, with stated conditions, there would be no jeopardy to the continued existence of the endangered and threatened species considered, and no destruction or modification of their critical habitats or habitats likely to be determined as critical in the future, resulting from the second OCS sale held in the region, with one exception. National Marine Fisheries Service indicated that any impact to the right whale would be significant. Impacts to all endangered species as a result of the proposal will be in addition to those resulting from OCS sales #40 and #49.

Conclusion: Except for possible impact to the endangered right whale, the proposal is not expected to result in jeopardy to endangered species in the Mid-Atlantic. While level of impact is difficult to assess at the program level, this conclusion is based on analysis for earlier OCS sales in the Mid-Atlantic. Because a question remains regarding the right whale, this area is considered to be relatively highly sensitive for impacts to endangered species.

South Atlantic/Blake Plateau

The endangered bird species which occur in this region are: brown pelican, bald eagle, peregrine falcon, Bachman's warbler, and the dusky seaside sparrow. These bird species inhabit the coastal area and could be affected by coastal construction and/or oilspills. As discussed in previous sections, most of the coastal construction will be confined to small areas (i.e., pipeline and storage facilities) and little of the habitat utilized by these species is expected to be lost as a result of OCS oil/gas operations. Impacts to the brown pelican are discussed under Mid-Atlantic; however, the potential for impact to this species would be greater, as its range extends shoreward of the entire lease area.

The endangered marine mammal species which occur in this region are: right, fin, humpback, sperm and sei whales; and the manatee. A discussion of the general impacts on whales is found at the beginning of this subsection. Manatees are especially susceptible to collisions with boats in shallow coastal waters, because of their slow moving habits and the confining nature of the coastal harbors, rivers, and channels they normally inhabit. Jacksonville Harbor is of concern in this respect. Oil spills could contaminate aquatic vegetation consumed by manatees.

The endangered and protected marine reptiles which occur in this region are: Kemp's ridley, leatherback, hawksbill, loggerhead and green turtles and the alligator. These species could be affected by oil spills or on-shore construction. Oilspills could affect turtle eggs and hatchlings if a spill coated a turtle nesting beach during incubation (April-July) or when hatchling turtles were leaving the nests (July-August).

Coastal construction (pipelines/storage facilities) could disrupt turtle and alligator nesting habitat if constructed during the nesting season.

An endangered species consultation was held with Fish and Wildlife Service and National Marine Fisheries Service (February, 1978) pertaining to South Atlantic OCS Sale No. 43. In the biological opinion of these agencies, with stated conditions, there would be no jeopardy to the continued existence of the endangered and threatened species considered, and no destruction or modification of their critical habitats or habitats likely to be determined as critical in the future, resulting from the first OCS sale in the region.

Conclusion: While impacts from the proposed schedule will be in addition to those from OCS sale #43, and while impacts are difficult to project prior to a specific sale proposal, the proposed schedule is not expected to result in jeopardy to individual endangered species. Therefore, this area is considered to be relatively low in sensitivity for impacts to endangered species resulting from OCS development.

Gulf of Mexico

Three major groups of endangered and protected species occur in the Gulf of Mexico Region: birds, marine mammals and marine reptiles.

The endangered bird species which occur in this region are: brown pelican, whooping crane, Mississippi sandhill crane, bald eagle, and peregrine falcon. These bird species inhabit the coastal area and could be affected by coastal construction and/or oil spills. As described in previous sections, most of the coastal construction will be confined to small areas (i.e., pipelines and storage facilities) and little of the habitat utilized by these species is expected to be lost as a result of OCS oil/gas operations.

Of the species listed above, the brown pelican is the most susceptible to oil spills as discussed under Mid-Atlantic.

The endangered and protected marine mammal species which occur in this region are: blue, fin, right, sei, and sperm whales, and the manatee. Manatees are especially susceptible to collisions as discussed under South Atlantic. Crystal River and Charlotte Harbor are of concern in this respect.

The endangered and protected marine reptiles which occur in this region are: Kemp's ridley, hawksbill, leatherback, green and loggerhead turtles; and the alligator. The impacts to these species are discussed under South Atlantic.

An endangered species consultation was held with Fish and Wildlife Service and National Marine Fisheries Service (January 1979) pertaining to endangered species in the Gulf of Mexico region. In the biological opinion of these agencies, with certain reservations pertaining to manatees, leasing and exploration activities are not likely to jeopardize the continued existence of the endangered and threatened species considered, or result in destruction or adverse modification of the critical habitats with the exception of the maatee.

Conclusion: Base on past development and on endangered species consultations concerning several OCS sales, the proposal is not expected to result in jeopardy to endangered species. One area of concern is the critical habitat for the Florida manatee. However, the area of concern is well defined. Based upon this critical habitat, the Gulf of Mexico is rated as moderately sensitive for OCS-related impacts to endangered species as a result of the proposal.

Southern California

The light-footed clapper rail is an endangered species which could be impacted by crude oil spills resulting from this proposal. Clapper rails live in salt marshes and spend most of their lives in close contact with the water. If an OCS related oil spill were to enter or occur in a salt marsh, the possibility of this species being adversely affected is great. This rail has been sighted in salt marshes from Goleta to Baja.

Development in Southern California resulting from this proposal will probably not have an adverse impact on the endangered and threatened whales and sea turtles found in this area. This is due in part to their mitigatory nature and the fact that they tend not to congregate in this area, hence limiting the prob- ability of major impact on populations as a whole. Generic impacts to whales has been discussed previously.

The southern sea otter has been infrequently sighted in this area and could be harmed by contacting spilled crude oil as discussed below under Northern California.

As in other OCS areas where sales have been held, a Section 7 consultation has taken place (for OCS sale #48). In the opinion of the Fish and Wildlife Service and the National Marine Fisheries Services, with stated conditions, that sale is not considered to jeopardize the continued existence of the species of concern, with possible exception of the Pacific right whale, should it come in contact with an oil spill. This exception is based on the extremely low population level of the Pacific right whale.

Conclusion: While impacts to endangered species from the proposed schedule will be in addition to those from previous sales, the proposed schedule is not expected to result in jeopardy to endangered species, with the possible exception of the Pacific right whale. This conclusion is tentative, as an analpsis prior to specific sale proposals is difficult, but the conclusion is based upon previous analyses. Because a question remains regarding impact to the Pacific right whale, Southern California is considered to be relatively highly sensitive for impacts to endangered spacies resulting from OCS-related development.

Central and Northern California

California clapper rail habitat in this area extends from Tomales Bay to Elhorn Slough in Monterey Bay. The impacts of this proposal to this species would be similar to that described above for the light- footed clapper rail.

Southern sea otters have been observed in this area primarily between Pt. Lobos and Morro Bay. If a sea otter's fur were to become contaminated by crude oil it would probably die from exposure due to loss of insulation. This combined with the limited range of the sea otter makes it very susceptible to adverse effects to the entire population of this species from crude oil spills. Alteration of the nearshore marine environment as a result of onshore oil and gas development activities would almost certainly affect sea otter populations.

The impacts on whales migrating through this area would be the same as discussed above for Southern California, except that it is not certain that the Pacific right whale ranges into this region.

Conclusion: While impacts to endangered species are difficult to assess at this pre-sale proposed stage, the proposal is not expected to result in jeopardy to endangered species, based on the assessment for similar species in southern California. Because a question remains regarding the range of the Pacific right whale, this area is considered to be moderately highly sensitive to impacts on endangered species from OCS development, based on concern for the Pacific right whale in southern California.

Gulf of Alaska

Endangered mammalian species found seasonally in the Gulf of Alaska proposed oil and gas lease area are the sperm whale, the gray whale, the blue whale, the fin whale, the sei whale, the humpback whale, and the right whale. In order to avoid repetition the discussion of the distribution and abundance of these whales is expanded in this section and referred to, where appropriate, in other sections. A general discussion of OCS operation related impacts on whales is included in the earlier portion of this subsection.

The sperm whale is distributed in the Pacific from the Equator north to the Cape Navarin region in the Bering Sea. In the Gulf of Alaska, the greatest number of sperm whales regularly occurs off Kodiak Island to the west along the Aleutian Chain as far as the Commander Islands, south of Kodiak Island, and just east of Portlock Bank. The regions of highest concentrations of sperm whales are generally associated with a sharp increase in water depth such as the underwater slopes of the Aleutian Islands (Berzin and Rovnin, 1966).

Migration of sperm whales north to Alaskan waters begins in March and continues through May along several migration routes. Mature males migrate to more northern latitudes, but females and young males seldom migrate above 50°N latitude. Fall migration begins in September with most whales leaving the Gulf of Alaska by the end of November. The breeding season and location of breeding and calving are unknown.

As with other whales, the distribution of sperm whales is dependent on the location of food sources. The primary food source of sperm whales is several species of squid and fish (Okutai, and Nemoto, 1964; Berzin and Rovnin, 1966). The exact feeding method is unknown; however, evidence indicates that this species may feed off the ocean bottom.

The North Pacific population of sperm whales has been estimated at about 90,000 animals (Fiscus, et.al., 1976). The total population of both sexes combined is believed to be about 150,000 animals. An estimate for the Gulf of Alaska has not been reported.

The gray whale occurs only in the North Pacific and adjacent waters of the Arctic Ocean. The primarily summer range of this species is the Bering Sea, the Chukchi Sea and the western Beaufort Sea. The east Pacific stock of gray whales migrate through the Gulf of Alaska and Kodiak area during April, May, and June and again during the fall migration in November and December (Berzin and Rovnin, 1966; Rice and Wolman, 1971).

Gray whales swim within a few kilometers of shore when passing points, headlands, and sectors of coastline where the continental shelf is narrow and there are no off-lying inslands. Nemoto (1964) suggests that gray whales migrate through narrow straits between islands and the mainland. When migrating through the Kodiak area, this species apparently follows the east coast of the Kenai Peninsula and then turns southwest at the Barren Islands and moves along the east coast of Afognak and Kodiak Islands (Cunningham, 1979). Like the humpback whale, some grays may overwinter in the southern portion of their summer range and possibly in the Gulf of Alaska. Some gray whales stop short of the Arctic on northern migrations and a few whales spend the summer feeding season in southern Alaska waters.

The gray whale, like the humpback, blue and fin whales is apparently a summer feeder, building up blubber layers from the abundance of food in the north and migrating to warm calvin and breeding ground in the south during the winter and living on stored body fat reserves until they return to the summer range. Breeding and calving occurs off Baja, California during the winter season.

Unlike other Baleen whales the gray whale is a bottom feeder with benthic amphidods its preferred food. Schooling fish may also be eaten. The gray whale feeds by stirring or engulfing bottom sediments and other skimming or filtering the food items.

Population estimates of gray whales vary significantly. Rice and Wolman, (1971) estimate the gray whale population at 11,000 animals.

In the north Pacific, the blue whale is distributed from Baja California north to the Bering Sea. In its summer range the blue whale occurs in relative abundance in an area just south of the Aleutian Islands between 160°W and 175°W longitude. The blue whale is also distributed from an area north of 50°N. latitude extending southeast of Kodiak across the Gulf of Alaska and southeastern Alaska to as far south as Vancouver Island (Berzin and Rovnin, 1966; Ridgeway, et al., 1972; Nishiwaki, 1972).

The blue whale spring migration begins in April/May as whales travel north along the American shore of the Pacific. Rice (1974) reported that all blue whales seen off California were less than 80 kms from shore and some only 3kms with many in shallow water between 50 and 200 meters deep. Whaling records indicate a peak occurrence of blue whales in the Aleutians in June and in the Gulf of Alaska in July.

Fall migration of the blue whale begins in September moving south in the reverse direction of the spring migration to wintering areas off Baja, California and south to the Equator. The breeding season is unknown.

The principal food of blue whales in their summer range are small Euphausid shrimp. Food is obtained by engulfment rather than by skimming as some Baleen whales do, so they require large swarms of plankton (Nemoto, 1975; Pivorunas, 1979).

The blue whale population in the north Pacific has been reduced from an estimated pre-whaling population of 6,000 to 1,600 animals. Although blue whales have been protected since 1966, no significant recovery has been detected (Fiscus et al, 1976).

The right whale is probably the most rare of the endangered whale species. Three separate populations of the right whale are recognized by most investigators: the north Atlantic, the north Pacific, and the Southern Hemisphere populations (Pivorunas, 1979). The north Pacific population is distributed on the western side of the Pacific from California north as far as the Bering Straits according to early whaling records, however, the northern extent of there range is considered to be the southeastern Bering Sea (Berzin and Rovnin, 1966; Rice, 1974). The entire Gulf of Alaska from Vancouver Island-Alexander Archipelago to the eastern Aleutians is within the right whales summer range and historically encompasses the "best" whaling grounds in the nineteenth century for this species (Rice, 1974; Fiscus, et al., 1976). The area of greatest accumulation of right whales is in the northern Gulf of Alaska between 145° to 151°W longitude south to about 50°N latitude (Berzin and Rovnin, 1966).

The route and timing of right whale migration is unknown. According to Berzin and Rovnin (1966) the Pacific right whale does not follow a definite migration route, but moves north along a broad front. Whaling records indicate this species should be present in the Gulf of Alaska and Kodiak area from May to September (Fiscus, et al., 1976). There are no records of recent confirmed sighting in the Gulf of Alaska. Three right whales were taken by Japan on Albatross Bank near Kodiak in 1961 for research (Fiscus, et al., 1976). A confirmed sighting of the Pacific right whale off Hawaii occurring in March 1979 (Rice, personal communications, 1979). The breeding season of the right whale is unknown.

The primary food source of Pacific right whales is small copepod crustaceans (Calanus) and small euphausiid crustaceans (Omura, et al., 1969; Watkins and Schevill, 1976; Pivorunas, 1979). Unlike most baleen whales, the right whale feeds exclusively on plankton (Nemoto, 1959) by skimming the water surface over discrete patches of plankton on the surface and subsurface concentrations of plankton within 10 meters depth (Nemoto, 1959; Watkins and Schevill, 1976; Pivorunas, 1979).

Although right whales have been protected from commercial whaling since 1937, this species still remains critically endangered. The population for the entire north Pacific is estimated at about 150 to 200 animals (Wada, 1973, 1975; as cited by Fiscus, et al., 1976). This estimate is probably over optimistic. Rice (1979) suggests that the species may be on the verge of extinction.

As mentioned previously, both the blue and right whales are restricted feeders, probably, therefore, having an especially low tolerance to stress mortality of blue or right whale individuals, may therefore, have a high potential for population impact.

The Fin Whale is widely distributed in the northeastern Pacific with the Gulf of Alaska representing a significant portion of its summer feeding range. Significant numbers occur between May and August from 144°W to 150°W longitude and 56°N to 59°N latitude to include part of Portlock Bank and from an area near the Shumagin Islands to the Trinity Islands south of Kodiak. During spring migration Fin whales first occur in southeast Alaskan waters in March and peak in April. Peak occurrences in the Kodiak Northern Gulf of Alaska area begin in May (Berzin and Rovnin, 1966; Fiscus, et al., 1976).

Although the fall migration of fin whales begins in September in the Bering Sea this species will remain in the Aleutian and Gulf of Alaska waters until November with the possibility of some fin whales wintering in southeastern Aleutian and Gulf of Alaska area. Breeding apparently occurs from September through March.

The food sources of fin whales in the north Pacific include Euphausid Crustaceans (krill) as well as many small fish. Fin whales, like blue whales, feed by engulfment of large swarms or schools of their prey (Pivorunas, 1979).

The population of fin whales in the eastern north Pacific has been estimated at 9,000 animals (Rice, 1974). Other estimates of the north Pacific stock range up to 16,000 animals (Fiscus et al., 1976).

The sei whale occurs in the Pacific, Atlantic and Antarctic Oceans (Ridgeway, et al., 1972). In the Gulf of Alaska, the summer distribution of the sei whale is similar to that of the fin whale (Rice, 1974).

A large concentration of this species occurs near and just east of Portlock Bank in the Gulf of Alaska. The largest known concentration occurs during May and June southeast of the Aleutian Island (Nishiwaki, 1966; Berzin and Rovnin, 1966). Migration periods and routes are similar to that of the fin whale.

The sei whale population within the north Pacific is estimated to be about 8,600 animals (Tillman, 1976, as cited by Fiscus, etal., 1976). Pre-whaling estimates of sei whales in the north Pacific range from 40,000 to 42,000 animals as reviewed by Fiscus et al., (1976).

In the north Pacific, the Humpback whale is distributed from the Equator, north to 70°N latitude in the Chukchi Sea (Ridgeway et al., 1972; Rice, 1974).

Fall migration may begin as early as September (Brezin and Rovnin, 1966; Ridgeway, et al., 1972) from northern waters in the Bering but southward migration out of the Gulf of Alaska and Kodiak area usually starts in December to wintering grounds off Mexico and the Hawaiian Archipelago (Fiscus, et al., 1976). Berzin and Rovnin (1966) and Hall and Tillman (1977) suggest that some humpbacks may remain in the Gulf of Alaska during mild winters as indicated by occasional winter sightings. The northward migration of this species occurs in early March (Wolman, 1972; Fiscus, et al., 1976). Fetal growth curves indicate breeding occurs from October through April.

The humpback whale feeds on euphausiids (krill) and sometimes small fish such as herring and cod (Nemoto, 1959; Nemoto and Toshio, 1965; Wolman, 1978). According to Wolman (1972) evidence indicates that humpback whales, like gray, blue and fin whales, are seasonal feeders, obtaining food in the northern or summer range and living on body fat reserves in the calving and winter range.

The North Pacific population of humpback whales has been protected from commercial whaling since 1966. Evidence indicates that this population is increasing. The estimated population is about 1,400 animals (Wada, 1975; as cited by Fiscus, et al., 1976).

The short tailed albatross has been observed at two locations in the Gulf of Alaska region; off the coast of the Bering Glacier, and off the coast near Glacier Bay National Monument.

The Aleutian Canada goose and the American peregrine falcon are suspected residents of the Gulf of Alaska area. Impacts on these bird species are essentially unknown.

Conclusions: The endangered species consultation for sales in the Gulf of Alaska region has not been completed, however, a consultation regarding the Federal/State Beaufort Sea sale indicated that insufficient information exists to determine impacts to the gray whale. Since the gray whale also uses this area, the Gulf of Alaska is considered at this time to be relatively highly sensitive to OCS-related impacts to endangered species. In addition, right and blue whales, which feed in the area, may be especially sensitive to oil spill impacts on their food supply.

Kodiak

Endangered mammalian species found seasonally in the Kodiak proposed oil and gas lease area are the sperm whale, the gray whale, the blue whale, the fin whale, the sei whale, the humpback whale, and the right whale. Potential impacts from oil and gas development on these cetaceans are similar for all the whales and are discussed at the beginning of this subsection. Their distribution and abundance has been discussed under the Gulf of Alaska section.

The Aleutian Canada goose is a suspected seasonal entrant in the Kodiak area. Potential impacts on this species are unknown.

Conclusion: The endangered species consultation for sales in the Kodiak area has not been completed however, a consultation regarding the Federal/State Beaufort Sea sale indicated that insufficient information exists to determine impacts to the gray whale. Since the gray whale also uses this area, the Kodiak is considered at this time to be relatively highly sensitive to OCS-related impacts to endangered species.

Cook Inlet

Endangered mammalian species that are known seasonal entrants in the Shelikof Strait portion of the Cook Inlet proposed lease area are the sperm whale, the gray whale, the blue whale, the fin whale, the sei whale, the humpback whale, and the right whale. The occurrence of these whales in the northern portion of the proposed lease area is possible. Possible impacts from oil and gas development on the endangered whales are similar for all the whales and are discussed at the beginning of this subsection and under Gulf of Alaska.

Conclusion: No endangered species consultation has taken place for sales in the Cook Inlet. However, a consultation regarding the Federal/State Beaufort Sea sale indicated that insufficient information exists to determine impacts to the gray whale. Since the gray whale also uses this area, the Cook Inlet is considered at this time to be relatively highly sensitive to OCS-related impacts to endangered species. Impacts to right and blue whales may be of special concern as well.

Norton Basin

Endangered mammalian species found seasonally in the Norton Basin proposed lease area are the bowhead whale, the gray whale, the fin whale, the sei whale, and the humpback whale. Possible impacts from oil and gas development on these cetaceans would be of the same type for all the whales. These potential impacts are discussed at the beginning of this subsection.

North of the basin is the Bering Strait which serves as a migration route from the Bering Sea to the Chukchi Sea. It is relatively narrow, and many species, including the endangered gray and bowhead whales depend on ice distribution to carry out their migration. Structures placement or gravel island development which altered ice land formation could have an impact on migration. Additionally, the waters between the Bering Strait and St. Lawrence Island are a feeding and concentration area for gray whales in the summer. Therefore, the potential for adverse impacts may be greater in this area than in more open areas.

Conclusion: No endangered species consultation has taken place for sales in the Norton Basin. However, a consultation regarding the Beaufort Sea Federal/State Sale resulted in an opinion from the National Marine Fisheries Service that insufficient information exists to determine impacts to the bowhead and gray whales. Since these whales are also found in this area, the Norton Basin is considered at this time to be relatively highly sensitive to OCS-related impacts to endangered species. The importance of this area as a migration route also contributes to this rating.

St. George Basin

Endangered mammalian species found seasonally in the St. Georges Basin proposed oil and gas lease area are the bowhead whale, the gray whale, the sei whale, the fin whale, the right whale, the humpback whale, and the sperm whale. Possible impacts from oil and gas development on the endangered cetaceans are similar for all the whales and the impacts are discussed under North Atlantic.

An area of special concern for endangered whales, is Unimak Pass, located between the St. Georges and the Northern Aleutian Shelf proposed lease areas. Oil spills and oil and gas activities within or near this constricted waterway during migration periods could seriously affect the endangered whales.

Gray whales occur in the Beaufort Sea during the short ice free periods of July and August where they feed in coastal waters. An oil spill would have similar direct and indirect adverse affects on the gray whale as with the bowhead whale. Gravel islands could block them out of important areas.

A threshold examination for Section 7 consultation for the first Beaufort Sea Sale has been held. The National Marine Fisheries Service indicated that insufficient information was available to determine impacts to the bowhead and gray whales. Studies are currently underway to obtain additional information.

The Arctic peregrine falcon, is reported in the Beaufort lease area, but does not breed there.

Conclusion: While it is difficult to assess impacts to endangered species prior to specific sale proposals, and impacts resulting from the proposed schedule will be in addition to those from the proposed Federal/State 1979 Beaufort Sea Sale, the proposal is not expected to result in jeopardy to endangered species with the possible exception of the bowhead and gray whales. Because insufficient information exists for the National Marine Fisheries Service to make a determination regarding possible impact to these species, the Beaufort Sea is considered at this time to be relatively high sensitive to impacts on endangered species as a result of OCS-related activities.

The peregrine falcon, nests and breeds in the Aleutian Islands, with the largest population on Amchitka Island. This peregrine may be _Falco peregrinus pealei_, which is not regarded to be endangered. The short-tailed albatross has been sighted in the vicinity of the western Aleutians. The endangered Aleutian Canada goose breeds primarily on Buldir Island within the St. Georges Basin area. Other populations have been introduced on Amchitka and Agattu Islands, and introductions are planned for the Semidi Islands and Canada Island. Potential impacts from oil and gas development on these species are unknown.

Conclusion: No endangered species consultation has taken place for sales in the St. George. However, a consultation regarding the Beaufort Sea proposed Federal/State sale resulted in an opinion from the National Marine Fisheries Service that insufficient information exists to determine impacts to the bowhead and gray whales. Since these whales are also found in this area, the St. George is considered at this time to be relatively highly sensitive to OCS-related impacts to endangered species Its importance as a migration route also contributes to this rating. In addition, as indicated in the Gulf of Alaska discussion, the right whale, which occurs in this area, may be especially sensitive to oil spill impacts to their food supply.

Beaufort Sea

The bowhead whale, and the gray whale, are endangered marine mammals found seasonally in the Beaufort Sea.

The bowhead migrates from the Bering Sea into the Chukchi and the Beaufort Seas from March through June. An oil spill during the migration period could have a direct adverse impact on the bowhead whale. On and offshore oil and gas development and related activities near the migration route could have adverse impacts on the bowhead whales. The bowheads follow extensive leads in the ice that are oriented in southwest to northeast direction. Alteration of ice lead formation due to construction of gravel islands could obstruct bowhead migration in the spring. Bowheads do not appear to feed during the spring migration. Mysids, phytoplankton, amphipods, small fish, mud-dwelling tunicates and vegetation have been found in Bowheads' stomachs at other times. Some authors have concluded that bowheads do little feeding while migrating. This observation is at variance with some Eskimos who observed whales feeding just off Barrow. Either way, it must be assumed that the destruction or reduction of prey food species from an oilspill or a reduction of productivity because of siltation in the water from artificial island construction are potential indirect impacts on the bowhead.

During that part of the fall when the bowhead whales may be present in the proposed lease area, their migration patterns, feeding behavior, breeding, and possibly parturition could be altered by oil and gas activities. In October through November when the whales move out of the Beaufort Sea they migrate close to shore and may be most susceptible to impacts from oil and gas activities.

d. Impact on Recreation and Sports Fisheries

Introduction: Water dependent recreation activities are susceptible to severe impacts from marine pollution induced by oil and gas activities. Parks, wildlife refuges and management areas, specially designated areas such as national natural landmarks, National Register sites, beaches and barrier islands and other shoreline recreation resources that front on the ocean or on bays and estuaries can incur impacts from the construction of pipelines which come ashore, from oil spills and from the placement of onshore facilities (such as terminals or transfer facilities) should they be located near a recreational area. Additionally, oil and gas activities offshore can visually impact on shoreline resources or contribute non-petroleum floating debris to ocean waters that eventually washes ashore impacting recreation resources and water enhanced recreation activities.

By far the most unpredictable and severe negative impact can result from oil which is released into the marine environment and which finds its way into popular recreation waters or reaches shore, soiling shoreline recreation resources. Oil spills most likely to affect recreation resources and activities could originate from drill site blowouts, near shore or onshore pipeline breaks or leaks, and crude oil transport vessel accidents, or a combination of these causes. The greatest number of recreationists would be affected should an oil slick come ashore on a national seashore or a popular recreation beach where the focus of public use is at the water's edge.

The blowout of a Mexican well in the Bay of Campeche released oil which began washing ashore on Texas barrier island beaches on August 14th. Visitation statistics for Padre Island National Seashore give an indication of the impact of an oil spill on recreation. For an area which received annual visitation of 867,000 in 1978, visitation was down 25.5% in August 1979 over August 1978, and 23.8% in September.

An oil spill impacting a beach area would foreclose its use for recreational purposes for at least the duration of the oil's continuous beaching and any subsequent cleanup period. If a beach area is relatively accessible, cleanup can be accomplished in a matter of days through the mechanical removal of oil soaked sand. Depending on the pre-existing condition of the beach (i.e., degree of erosion), efforts might have to be made to replenish the sand that had been removed by cleanup operations. This could take an extended period of time (possibly months) depending on the availability of sand and/or the requirement to obtain a permit to remove sand from submerged lands for replenishment purposes. The timeframe of curtailed uses could be extended beyond the period necessary for cleanup and replenishment by the adverse publicity associated with the beaching. The size, seasonality and beaching location of a spill are other significant factors which influence the magnitude of the recreation opportunities that will be curtailed. Cleanup costs will be mitigated by monies provided by the Oil Spill Contingency Fund (unless liability can be fixed).

Trash (floating and non-organic) improperly disposed of offshore, or debris from accidents offshore can eventually impact the aesthetics of shoreline recreation resources and cause increased maintenance to resource area administrators. Although a minor and intermittent problem, such impacts can be expected.

More predictable and controllable impacts can result from onshore facility requirements such as pipeline alignment, support facility sitings and the aesthetic effects of these type facilities upon people recreating within perceivable distance from these facilities. Careful siting can mitigate these impacts.

Recreation and tourism are very interrelated. Many local coastal economies are heavily dependent on the quality and attractiveness of ocean and bayfront recreation resources. Should recreation areas be impacted to the point of discouraging public use as a result of this proposed sale, a corresponding impact would be noted in the economies of coastal towns and villages. The extent of economic harm which may result fron an oil spill affecting recreation resources would be impossible to predict with any degree of specificity because of the importance of the interplay of factors such as spill size, duration, seasonality, locality, etc. However, as an example of the magnatiude, it was estimated that the value of recreation foregone by Santa Barbara residents as a result of the 1969 spill there was over $13 million, although diversions to other areas resulted in a negligible overall economic impact to tourism (Mead and Sorensen, 1971).

In summary, given possible oil pollution events, the potential exists for (1) short-term disturbances or loss of water-related, near shore recreational activities, (2) soiling of beaches and recreation areas; (3) short term decreases in tourism based economies; and (4) aesthetic disturbances to a certain segment of the population.

The most pervasive adverse impacts on boating and sport fishing stemming from hydrocarbon development would probably involve pollution to the marine environment. The most damaging cause of marine pollution would likely result from chronic or dramatic spillage of oil. Boaters and fishermen would not want to soil their boats by entering a contaminated area for the duration of a spill incident. There were a esimated 14,050,000 recreational boats operating during 1978 according to the U.S. Coast Guard. A study done for the National Marine Fisheries Service by Centaur Management Consultants, published in 1977, on Economic Activity Associated with Marine Recreational Fishing, estimated that 1840 million worth of retail goods and services associated with marine recreational fishing were purchased in 1975.

A major oil spill could have a longer term impact on sport fishing if the larvae or basic components of the sport fish food chain were diminished as a result of a spill. Even in the case of major oil spills, long term toxic environments would not be maintained and fish populations would be expected to migrate back into affected areas once the oil slick has been removed (by wave action, containment, and cleanup or dispersion). Repopulation of an area could be anticipated to be well underway by the end of the succeeding spawning cycle.

In addition, pipeline landfalls, dredging and filling activities and increased runoff resulting from onshore support facilities could have noticeable short-term impacts on larval populations and boating aesthetics, but the overall impacts on sport fishing and boating would be negligible.

North Atlantic

Coastally-oriented recreational activities popular in the North Atlantic include swimming, boating, fishing, hunting of waterfowl, and bird watching, and whale watching. Participation in all of these activities is high, and the peak season for each activity is short due to climatic conditions. July and August comprise the peak season for swimming and beach use, whereas the spring and fall would be peak times for birdwatching and whale watching during migration periods.

The importance of recreation-based tourist economies to the coastal communities and to the North Atlantic States as a whole means that the impact of an oil spill during certain months could be great. Also, beach use is concentrated in fewer locations than in more southerly parts of the Atlantic, due to limited beaches, and in some areas, limited public access to beaches. Therefore, a spill affecting a beach could have a high impact on recreation due to the relative scarcity of alternate areas in some parts of the region. While much of the northeast coast is used for water-based recreation, particular areas which could receive severe impacts due to potential oil pollution are Cape Cod, Nantucket Island and Martha's Vineyard in Massachusetts. In 1977, Cape Cod received over 9 million visits for recreation related purposes, Nantucket received 506,000 and Martha's Vineyard 670,000. These visits directly contributed to the spending of $234.9 million on Cape Cod, $16.3 million on Martha's Vineyard, and $13.6 million on Nantucket. Since more than half of the visits and expenditures in these areas occur during July and August, the impact of an oil spill reaching a beach during these two months would be more severe than during the rest of the year.

Onshore facility induced impacts that could result from the competition for land between recreation and OCS-related onshore facilities and the degradation of the aesthetic environment conducive to recreation could come from the new or expanded gas processing and operations support facilities that would be required and the new tanker terminals that may be required in the North Atlantic as a result of these proposed sales.

There is little impact envisioned on sport fisheries as a consequence of the proposed oil and gas developmental activities. The principal areas fished appear to be coastal, as opposed to the open ocean, because of the great distance and time it takes to reach open waters, and the fact that most recreational boats are not designed for fishing offshore waters.

The magnitude of the impacts of a spill to sport fisheries in the North Atlantic would be dependent upon the time of year in which the spill occurred in addition to the location and extent of the spill, since different species are sought at different times. In general, most sport fishing occurs between April and December. Therefore, a spill during these months would have a greater impact on sport fishing than a spill during January, February, or March.

An oil spill impacting an estuary could be very detrimental to sport fishing for anadromous fish such as striped bass, shad, smelt and Atlantic salmon. If a spill were to occur during a run, the sport fishing for the duration of the spill would be interrupted. Since most runs are relatively short, a spill would probably preclude any fishing for that year. If a spill were to occur during the time when young fish are migrating to the sea, they could suffer high mortality rates and thus affect sport fishing during a later year when they would normally return to spawn. Impacts on sport fishing will generally be more severe on shore fishermen than on boat fishermen, should a spill reach shore.

Conclusion: Because of the limited availability of beach access in most of the North Atlantic region, and its high value economically, as well as to individuals, the North Atlantic region is relatively highly sensitive to impacts from oil spills. At least two large oil spills are probable, but the risk of the spills reaching shore is not known.

<u>Mid-Atlantic</u>

Popular recreational activities in the Mid-Atlantic are similar to those in the North Atlantic, however, recreational beaches extend along the entire region. Important recreation/tourist centers are located from the south shore of Long Island to Cape Hatteras, North Carolina. The Mid-Atlantic region contains 18 major Federal recreation or wildlife areas, as well as numerous State and local sites of exceptional recreational importance or which have ecological value such as the Pine Barrens in New Jersey. Such areas could receive impacts similar to those in the North Atlantic, except that the season is somewhat longer in the Mid-Atlantic, and alternatives more available. Thus impact to recreation uses might not be as severe as in the North Atlantic, although effects to individual businesses or local economies would be similar.

Annual beach visitation for the south shore of Long Island (Nassau and Suffolk Counties) is about 38 million, of which 29 million visits occur from mid- May to mid-September. The economic impact of a hypothetical oil spill near Long Island has been analyzed in a 1977 report prepared by the Long Island State Park and Recreation Commission. The study found that the impact of an oil spill on Long Island beaches could result in losses to the regional economy of between $423,000 and $13.3 million per week, depending on the size of the spill, the season in which it occurs, and the beaching location. This loss assumes that 100% of beach-related revenues and 10 to 30% of boating and sports fishing revenues would be lost each week while cleanup operations proceeded.

Sport fishing impacts are generally comparable to the North Atlantic. Sport fishing activities and species sought are also comparable except that a very limited amount of fishing alongside of rigs by sport fishermen may occur in the Mid-Atlantic. Charter boats do run offshore from New Jersey to fish for tilefish.

Conclusion: Because of the prevalance of recreational beaches and their high use and importance to local economies, the Mid-Atlantic region is considered to be relatively highly sensitive to oil spills, should one reach shore. At least one major (over 1000 bbls.) is probable, but the risk of spills reaching shore is not known.

<u>South Atlantic/Blake Plateau</u>

Popular water dependent recreation activities in this region include swimming, fishing, waterfowl hunting, snorkling, skiing, and sailing. All are susceptible to severe impacts from marine pollution induced by oil and gas activities especially in shallow water, nearshore areas available for recreation use.

Of the approximately 1200 miles of beachfront potentially affected by the proposed lease sales in the next five years, major dedicated ocean front recreation sites are located in areas where spills could potentially beach, specifically, Cape Hatteras and Cape Lookout National Seashores in North Carolina and Cape Canaveral National Seashore in Florida. In 1978, Cape Hatteras National Seashore received more than 2 million visits, Cape Lookout received 54,300 and Cape Canaveral 882,600. State recreation areas to the south are located in high potential beaching sites according to former spill trajectory predictions in the South Atlantic for OCS Sale No. 43. A spill would affect large numbers of users and could also impact coastal tourism economies; at least one large spill is probable.

There is an extensive fishing and boating interest which utilizes the sounds and nearshore areas along the South Atlantic seaboard. Sport fishermen pursue such species as mackerel, bluefish, cobia, flounder and sea trout. Additionally, North Carolina, South Carolina, Georgia and Florida all support charter and party boat fleets which range throughout the Outer Continental Shelf engaging in sport fishing activities. Therefore, while the risk of a spill is low, this area is relatively susceptible to adverse impacts to sports fishing, should a spill occur.

Access to recreational waters by boaters and fishermen will not be noticeably affected as a result of these proposed sales. Oil spills could adversely affect sport fisheries in ways similar to those discussed for the North Atlantic.

Conclusion: Because of the prevalence of recreation areas and their high use and importance to local economies, as well as sport fishing use of the OCS, the South Atlantic is considered to be relatively highly sensitive to oil spills. At least one large spill is probable.

Gulf of Mexico

A large portion of the shoreline and associated land and water of the Gulf of Mexico is composed of designated recreation areas and routinely supports water-oriented and water-enhanced recreation activities. Parks, wildlife refuges and management areas, aquatic preserves, wilderness areas, natural landmarks, scenic rivers, beaches, and barrier islands are places in which people swim, snorkel, boat, fish, picnic, and participate in many other activities associated directly or indirectly with the shore.

Because 11 proposed Gulf of Mexico sales would likely be accommodated by already existing storage and supply bases, staging areas, fabrication and refinery facilities in the coastal areas of Mississippi, Louisiana annd Texas, little competition with recreation is anticipated. Some existing facilities will likely be expanded, updated and replaced depending on the nature and extent of oil and gas finds which may result from continued development of petroleum resources in the Gulf of Mexico. However, none of these projected occurrences are likely to have dramatic impacts on coastal recreation resources and activities in the Gulf.

Thirty years of U.S. offshore development in the central and western Gulf of Mexico has had no documented major long term adverse effects on shoreline recreation stemming from major or acute oil spills. However, as indicated previously, Texas beaches suffered decreased visitation of about 25% in two months in the summer of 1979 over 1978 levels, due to the Campeche spill. Although tar balls have been a chronic nuisance to shoreline or beach aesthetics and use, there is no evidence which would indicate offshore petroleum development is a major contributor to that problem.

Visual obstructions are currently existing in the nearshore waters in many areas along the central and western Gulf shoreline. These may be a source of visual pollution to the sensitivities of some individuals. Visual pollution is more likely to be a sensitive issue should nearshore areas be considered for leasing in the eastern Gulf or within sight of components of the national wilderness system.

The major recreational activity which commonly extends out into the Gulf of Mexico where OCS leasing occurs is recreational fishing. Some scuba diving also takes place offshore, especially in the central Gulf where underwater visibility in the nearshore marine environment is poor. Experience has shown, especially in the central Gulf off Louisiana, that oil and gas development offshore significantly enhances deep sea recreational fishing and scuba diving. Major semi-permanent installations such as easy to locate, multi-well platforms placed in proposed lease tracts would attract and concentrate sport fish and inevitably sport fishermen. The literature is replete with documentation on the reefal effects of artificial structures placed in the marine environment, although it is inconclusive on the contribution of artificial structures to productivity or total biomass. The degree to which offshore oil and gas development will affect recreational fishing is believed to be related to such factors as the number and size of structures erected, the length of time they are in place, and the distance they are from shore. Water depth, oceanic conditions, and bottom conditions around an offshore platform might also affect the recreational fishing associated with oil and gas structures offshore.

With almost 3,000 emergent artificial structures currently existing in the Gulf of Mexico, the projected addition of an average of 300 platforms will be a small increment and is more likely to replace offshore structures which are being removed from terminated leases. The most dramatic impact on sports fishing would likely occur if new leases in the eastern Gulf led to platform development within 40 miles of shore.

Conclusion: Because of the prevalence and high use of recreation areas in the Gulf of Mexico, and their importance to local economies, the Gulf of Mexico is considered to be relatively highly sensitive to oil spills. However, past experience in the Gulf of Mexico has resulted in very little disruption of shoreline recreation.

Southern California

Southern California (Point Conception to the Mexican border) accounts for about 75 percent of California's coastal recreation. For this reason, the area would be very sensitive to oil spills occurring as a result of the proposal. Waterborne recreational activities which would be adversely affected by oil spills in this region, include boat cruising, water skiing, racing, sailing, swimming, diving, and fishing for finfish and shellfish. Seashore-related recreation activities such as beachcombing, shell collecting, painting, shoreline nature study, camping and sunbathing would also be adversely affected by an oil spill. Boat traffic might also be restricted if harbors were closed due to the installation of booms.

A loss of beach usage and boating opportunities due to an oil spill could have a significant impact to the coastal recreation economy. Tourism is the third largest industry in California, directly affecting more than one million jobs.

The Santa Barbara oil spill in 1969 affected 30 miles of beaches. A study done by Mead and Sorensen on the Economic Cost of the Santa Barbara Oil Spill concluded that the spill diverted tourists to other areas so that losses to motels and restaurants in the impacted area were offset by gains to those in other areas. Because of this diversion, they concluded that the overall loss to tourism was negligible, although there were individual localized losses in the impacted area. As part of this study, a survey was conducted to determine the loss of recreation opportunities to residents of the Santa Barbara area. This loss was projected to be 744,000 beach visits. The value of the recreation opportunities lost was projected to be $13,150,000 direct spending on recreaton by the area residents.

Sport fishing from partyboats from the major portion of this activity in Southern California. There is also some private boat, shoreline, jetty and pier fishing, as well as skin diving, all of which could be impacted by oil spills. Species caught by sport fishermen in Southern California include California barracuda, Pacific bonito, kelp and sand bass, rockfish, white croaker, Pacific mackerel, sablefish and California halibut.

Offshore structures have both beneficial and adverse effects on recreation and sport fishing. A concentration of offshore structures could inhibit view quality, sailing, and boat racing; however, the structures also serve as good navigation marks. Offshore structures are valuable navigation aids since they are often the only references available to the recreational boater, who often has little sophisticated navigation equipment.

Sport fisheries are often enhanced by offshore structures due to the artificial reef effect. These structures provde food and cover in areas that otherwise are largely devoid of these essentials. The actual value of the increased sport fishery potential in the vicinity of an offshore structure in California is limited, however, since tying up to structures is prohibited, and anchoring or drifting within 200 feet is discouraged.

Conclusion: Because of the prevalence of beaches, their high use and economic value, Southern California is considered to be relatively highly sensitive to impacts from oil spills. Four spill are estimated to result from the proposed sale. Therefore, some disruption to recreation can be expected to occur, should any of these spills reach shore, possibly resulting in millions of dollars lost.

Central and Northern California

While the mainstay of the tourist/recreation industry exists in Southern California, it should be noted that places in central and Northern California such as Morro Bay, Monterey Bay, Bodega Bay and Humboldt Bay are also important tourist/recreation centers. Golden Gate National Recreation Area had nearly 9 million visits in 1978 and Point Reyes National Seashore had nearly 2 million visits.

Impacts on recreation in Central and Northern California would be similar to those in Southern California, except that because recreation use is less predominant, the likelihood of a recreation resource being affected may be less.

Sport fishing in Central and Northern California consists of shore, pier, partyboat, skin diving, and surf netting. Since shore and pier fishing comprise 80% of the total, sport fishing in this region would receive greater impacts from an oil spill reaching shore than from OCS offshore activity. Major species sought by sport fishermen in this region include: blue rockfish, ling, cod, striped bass, king and silver salmon, white croaker, jack smelt, surfperch and rockfish. The greatest amount of sports fishing occurs in the Monterey-San Francisco area.

Conclusion: Because of the limited opportunities for beach use, (the most intense recreational use of the shoreline), limited alternatives in the event of displacement, as well as high localized use and importance to local economies, central and northern California is considered to be highly sensitive to impacts from oil spills. One to two large spills are estimated to occur as a result of the proposal. Therefore, some disruption, and very possibly foreclosure, of recreational opportunities can be expected to occur as a result of this proposal. However, because of their limited nature, the probability of a spill reaching shore at a beach may be somewhat low.

Gulf of Alaska

OCS development impacts on recreation will be greatest if they impact known recreation areas in proximity to the lease sale area. Yakutat is the principal recreation area. Secondary recreation areas include coastal regions from Point Manby on Yakutat Bay to Cape Suckling and from Dry Bay southeast to Cape Spencer. Oil spill trajectory projections for the northern Gulf of Alaska indicate that the probability of oil spills reaching and damaging the shoreline area is greatest during the summer tourist season.

Coastal wetlands habitat for migratory waterfowl provide enjoyment for photographers and other recreational visitors in the Yakutat area, Stikine Flats, and other locations. Effective OCS development, especially the possibility of an oil spill, could significantly impact the wildlife population and/or habitat area and thus impair the associated recreational experiences.

Onshore support facilities for OCS development are presumed to be located in separate enclaves. Hence, impacts from OCS support activities upon local recreational facilities and activities should be minimal.

OCS impacts on visual resources and wilderness values are interrelated. Offshore OCS platforms may constitute a significant adverse impact if viewed within a short distance, i.e., 0-5 miles. The degree of impact depends upon conditions of visibility, the observation point of the viewer, the scenic and aesthetic characteristics of the viewshed as evaluated by the viewer, and the distance to the object viewed.

Other lands with potential recreational value are on or near the coastline facing the lease sale area and are vulnerable to possible impacts from OCS development. These include: Wrangell-St. Elias National Monument, which was created by Presidential Proclamation, with the legislative intention of creating a national park; Glacier Bay National Monument; and the portion of the Tongass National Forest between Yakutat and Dry Bay.

Sport fishing in the Gulf of Alaska is minor, concentrating primarily in freshwater streams and on salmon species. Because of the distance from even the shorebased facilities, impacts on sport fishing would be low. However, an increase of fishermen because of the proposal could require a change in creel limits and a lessening of the aesthetic enjoyment of solitary fishing.

There should be little or no impact from population reduction because of hydrocarbon pollution. Population reduction because of overfishing, while possible, has a very minor probability. Because of the nature of facility construction (intense, but short-term), this impact, if it happens, would be similar.

Conclusion: Because of the low and dispersed recreational use in the Gulf of Alaska, it is considered to be relatively low in sensitivity to oil spills and other impacts of OCS development affecting recreation.

Kodiak

The type of OCS development impacts on recreation, tourism, visual resources, and wilderness values will be generally comparable to those of the Gulf of Alaska: some interference with and possible damages to the natural setting and habitat requirements of sport and other fauna, which impacts recreational use values; some interference with local infrastructure which is used primarily for tourism, recreation, and commercial fisheries; impact upon the visual setting and wilderness quality of the coastal zone; and oil spills which impair and disrupt recreational activity. However, the risk of oil spills occurring in the Kodiak area, based on resource projections is much less than in the Gulf of Alaska. Based on oil spill risk estimates alone, a sale in Kodiak presents the least potential for impacts to recreation of Alaska sale areas.

Some of the existing coastal communities on Kodiak Island would not be significantly affected by the visual impact of offshore platforms, either because of the orientation of the community on the coastline in context of the lease sale area and/or the distance of the nearest lease block to the community. These conditions hold for the communities of Kodiak, Old Harbor, Port Lyons, Ouzinkie, Kaguyak, and a number of smaller villages.

Most of Kodiak and Afognak Islands are presently Federal lands, with national interest and recreational potential. Kodiak Island, with the exception of the established native communities, is a national wildlife refuge, and Afognak Island is part of the Chugach National Forest.

Sport fishing is of low intensity and concentrated on a few streams on Kodiak Island. Competition for fish and fishing areas will be the major impacts which could lead to reduced catch limits or closed fishing areas. Impacts to sport fishing from population reduction based on pollution events or other proposed activities would be slight.

Conclusion: Because of the low use for recreation in the Kodiak area, it is considered to be relatively low in sensitivity to oil spills and other impacts associated with OCS development affecting recreation.

Cook Inlet/Shelikof Strait

The impact of OCS development on recreation, tourism, visual resources, and wilderness values will be of the same type as that in other lease sale areas in Southern Alaska.

Because recreation and tourism are present to a greater degree in the Kenai Peninsula than in other sale areas, the impact of OCS operations on these activities may be greater. However, use of existing support facilities or possible expansion are anticipated; therefore competition for resources should be low. OCS development in the Shelikof Straits should not adversely impact recreational resources, because the onshore area is essentially unpopulated and subject to a low level of recreational use.

Other coastal lands with potential recreational value which face the lease sale area and are vulnerable to possible impacts from OCS development are: Katmai National Monument along the Alaska Peninsula; the McNeil River State Game Sanctuary facing Kamishak Bay; Kodiak National Wildlife Refuge on Kodiak Island; and Chugach National Forest Lands on Afognak Island.

This area has the most intense sport fishing in Alaska. Salmon, halibut, crab, Dolly Varden char, razor and butter clams, sand and rockfish are caught in the oceans, from the beaches, and in the freshwater streams that enter Cook Inlet. Competition for the fish and fishing areas has already reduced catch limits and fishing times in order to protect the resource. Increased numbers of fishermen from this proposal will further erode this resource.

Conclusion: Cook Inlet, especially the Kenai Peninsula, receives the most intense recreational use of the Alaska sale areas. It is considered to be moderately sensitive to oil spills. At least one spill is expected to occur and could reach shore. Some discruption of recreation may be expected as a result of a spill. The greatest potential for impact, however, may be in competition for fishing in already crowded areas as a result of population increases.

Norton Basin

Types of OCS development impacts on recreation, tourism, visual resources, and wilderness values will be generally comparable to other Alaska sale areas.

Existing recreational and tourist activity areas which are prone to OCS development impacts include: sport fishing activity along the coastline near Nome, in the Unalakleet River drainage, and in the Pilgrim River drainage in the Port Clarence district; and tourism, which is attracted to the gold rush history of Nome.

Other coastal lands with potential recreational value which face the proposed sale area and are vulnerable to possible impacts fom OCS development are: a portion of the Clarence Rhode National Wildlife Refuge located west of Pastol Bay and comprising part of the delta drainage of the Yukon River; a portion of the Yukon delta area from Cape Stephens westward to Alakanuk (or, the western boundary of the Norton Basin lease sale) which was withdrawn for consideration as a refuge by Presidential proclamation; and several island sanctuaries for marine resources in the Norton Sound area, which were also withdrawn by Presidential proclamation.

Because recreational activity in the inaccessible portions of the coastline of the Norton Basin is presently low, the impacts of OCS development upon this activity should be low. However, the adverse effects of OCS development may damage the quality of the coastal lands and renewable resources, and thus impair or irreparably damage their recreational potential.

There is little sport fishing in the Norton Basin. Unless there is a massive reduction of salmon populations because of activities associated with this proposal, which is not very probable, there should be no impact on sport fishing.

Conclusion: Because of the low use for recreation, the Norton Basin area is considered to be relatively low in sensitivity to oil spills and other impacts from OCS development affecting recreation.

St. George Basin

Types of OCS development impacts on recreation, tourism, visual resources, and wilderness values will be generally comparable to those in the other Alaska sale areas.

The level of existing recreational and tourism activity is unknown. Existing settlement areas which are presumed to be the focus of recreational activity include Akutan, Dutch Harbor, Unalaska, Nikolski, and Adak Station.

Most of the islands on the Aleutian Chain are part of the Aleutian Islands National Wildlife Refuge. Hence, they are presumed to have recreational and wilderness use potential, and can be considered vulnerable to potential impacts of OCS development. Several marine resource areas have been withdrawn by Presidential proclamation, with a legislative recommendation for creation of a national wildlife refuge.

Sport fishing impacts are similar to those in the Norton Basin.

Conclusion: Because of the low use for recreation, the St. George Basin area is considered to be relatively low in sensitivity to oil spills and other impacts from OCS development affecting recreation.

Beaufort Sea

The lack of access to this sale area limits the level of recreational and tourist activity, and hence the possibility for impacts on recreation and tourism. Impacts from OCS development may be significant, depending upon the extent of OCS operations, interference with mammalian and fishery habitat, and damages attributable to oil spills, etc. The State of Alaska may enact restrictions on sport fishing activity in the sale area in order to avoid hazards and conflicts; this may be considered an adverse impact on the sport fishery areas available.

OCS development impacts on visual resources are comparable to those in the Gulf of Alaska.

Wilderness values could be impacted by OCS development where the wilderness resources are in close proximity to the sale area. The Arctic National Wildlife Refuge includes the eastern Beaufort Sea coastline. The U.S. Fish and Wildlife Service considers wilderness recreation to be compatible with management of the Arctic National Wildlife Refuge.

Other resources of potential recreational value on or near the coastline of the Beaufort Sea, that are vulnerable to possible impacts from OCS development include: seven natural landmarks proposed by the Heritage Conservation and Recreation Service; various historical and archaeological sites identified or suspected along the coastline; and proposed wild and scenic river designation for the lower reaches of the Colville River. These resource areas are considered to have potential for recreation, tourism, wilderness values, and visual resource uses.

Conclusion: Because of the low recreation use, the Beaufort Sea is considered to be relatively low in sensitivity to oil spills and other impacts from OCS development affecting recreation.

Northern Aleutian Shelf

Types of OCS development impacts on recreation, tourism, visual resources, and wilderness values will be generally comparable to those in other Alaska sale areas.

Existing recreation and tourist activity areas which are prone to OCS development impacts include; sport hunting in the Yukon and Kuskokwim Deltas; and sport fisheries throughout the Bristol Bay subregion. Aside from existing recreation use areas, the coastline, wetlands, and intertidal reaches are rich with high density waterfowl range, salmon running and habitat, and marine mammal habitat. These areas have a high potential for recreational and wilderness use.

Other coastal lands with potential recreational value facing the lease sale area that are vulnerable to possible impacts from OCS development are: the Cape Newenham National Wildlife Refuge comprising some 45 miles of shoreline; withdrawal of the Yukon Delta and Togiak areas on the north sides of Bristol and Kuskokwim Bays by Presidential proclamation, with a legislative recommendation for the creation of a national wildlife refuge; the withdrawal of the Hagemeister Island as part of the Alaska Marine Resources National Wildlife Refuge; the Walrus Island State Game Sanctuary; the Izembek National Wildlife Refuge located on the lower reaches of the Alaska Peninsula; and Unimak Island.

Sport fishing impacts are similar to those in the Norton Basin. Impacts on recreational resources and sport fishing in this area should be low, given the levels of activity.

Conclusion: Because of the low recreational use, the Northern Aleutian Shelf is considered to be relatively low in sensitivity to oil spill and other OCS-related impacts to recreation.

Navarin Basin

Types of OCS development impacts on recreation, tourism, visual resources, and wilderness values will be generally comparable to other Alaska sale areas.

The level of existing recreational and tourism activity is unknown. Existing settlement areas which are presumed to be the focus of recreational activity include Alakanuk, Hooper Bay, Scammon Bay, and Chevak.

Approximately all of the mainland and island coastline in the sale area is presently included in or recommended to be included in a national wildlife refuge. With recreational and wilderness use potential, the shoreline is vulnerable to possible impacts from OCS development. Included in this area are: the Clarence Rhode National Wildlife Refuge; and the balance of the shoreline, which was withdrawn by Presidential proclamation, with the legislative intention of creating the Yukon National Wildlife Refuge. The two major islands in the lease sale area--Nunivak and St. Matthew Islands--are also National Wildlife Refuges.

Sport fishing impacts are similar to those in the Norton Basin. Impacts on recreational resources and sport fishing in this area should be low, given the level of activity.

Conclusion: Because of the low recreational use, the Navarin Basin is considered to be relatively low in sensitivity to oil spill and other OCS-related impacts to recreation.

Chukchi Sea

OCS development impacts on recreation, tourism, visual resources, and wilderness values will be generally comparable to other Alaska sale areas.

The existing level of recreational and tourism activity in the lease sale areas is unknown and considered to be nominal because of inaccessibility. Any recreation and/or tourism as well as visual resource values, are presumed to be in close proximity to existing settlement areas, which include Wainwright and Point Lay. Any adverse impacts would be greater if occurring in context of these settlement areas.

The Cape Lisbourne area has been withdrawn by Presidential proclamation, with a legislative recommendation for creation of a national wildlife refuge. This coastal resource has a recreational potential, fronts on the sale area, and is vulnerable to possible impacts from OCS development.

Sport fishing impacts are similar to those in the Norton Basin. Impacts on recreational resources and sport fishing in this area should be low, given the level of activity.

Conclusion: Because of the low recreational use, the Chukchi Sea is considered to be relatively low in sensitivity to oil spill and other OCS-related impacts to recreation.

e. Impact on Air Quality

The air emissions from OCS development and related activities as a result of this proposal were described in Section IV.A.3. The important variables affecting air quality impact associated with development in the different OCS regions include number of production facilities, number and type of treatment facilities, throughput of petroleum products, prevailing meteorological conditions, and the existing air quality in an area.

Ambient air quality standards designed to protect the public health and welfare have been established by Federal, State, and local governments. The Federal standards, called the national primary and secondary ambient air quality standards, are promulgated by EPA pursuant to the Clean Air Act. The Clean Air Act also requires States to prepare State Implementation Plans and allows States to promulgate more stringent standards than those national standards set by EPA. Some local governments have also enacted standards which apply within their own jurisdiction. The EPA, State, and local standards which apply within their own jurisdiction. They are not, however, applicable to emission sources located on the OCS. Instead, under the OCSLA Amendments, the Secretary of the Interior has exclusive jurisdiction to prescribe regulations with provisions for compliance with the national ambient air quality standards pursuant to the Clean Air Act to the extent that activities authorizied under the OCSLA significantly affect the air quality of any State.

In response to its statutory mandate under Section 5(a)(8) of the OCSLA Amendments, the Department is in the process of promulgating regulations. On May 10, 1979, proposed regulations setting out a regulatory scheme for the control air emissions from OCS operations were published (44 F.R. 27449). The proposed regulations would establish information requirements and criteria to be used to determine whether the impact from emissions would "significantly effect" air quality in any onshore area. Lessees would be required to model emissions to determine their effect on onshore ambient air concentrations. The resulting ambient air concentration would be compared to very conservative significance levels established by the U.S. Environmental Protection Agency. If the significance levels would be exceeded, the provisions of the regulations requiring control or offset of emissions would apply. The proposed regulations were designed to prevent the significant deterioration of onshore air quality as well as to achieve and maintain the air quality standards. Decisions concerning the potential impacts of offshore emissions on onshore air quality and the necessity for control or offset of those emissions would be made as part of the approval process for exploration plans and development and production plans.

The comment period on the proposed regulations closed in July, 1979. As a result of the many comments, data, and studies received, the Department is analyzing and reassessing the provisions of the proposed regulations. The final regulations will be in place before any sales described in the EIS take place.

The air quality status of coastal locations which may be affected by OCS related development varies from site to site. Some areas, especially on the West Coast, experience daily violations of the air quality standards and have developed stringent regulatory programs to improve the air quality. Other areas vary from almost pristine air quality (e.g., Alaska), to moderate air quality where the States are striving not only to avoid violations of the standards but also to prevent the significant deterioration of air that is cleaner than the standards require. According to the preamble to the proposed regulations, the Department believes that the approach described in the regulations would not prevent the attainment of the national primary and secondary standards or any more stringent State standard that might be incorporated into the State Implementation Plan. Furthermore, because of the very stringent "significance levels" which are proposed for incorporation into the regulation and the fact that emissions sources are widely dispersed on the OCS, the Department of the Interior believes that the approach adopted in the proposed regulations will insure an adequate margin of safety which would minimize any cumulative impacts from offshore oil and gas development. Also, because the proposed regulations would contain requirements for the prevention of significant deterioration of attainment areas, States' efforts to maintain clean air areas would not be jeopardized.

Project specific impacts can only be defined by preparation of any emissions inventory and through appropriate diffusion modeling. However, the special air quality impact considerations for each sale area are given below.

North Atlantic

Because of prevailing northwesterly, and southwesterly winds in this area, some air pollutants resulting from offshore activities would be borne away from land and diluted in the large mass over the ocean. However there are some easterly wind patterns in the North Atlantic area which could carry OCS emissions onshore. To the extent that such emissions significantly effect any onshore area of any State, they will be regulated by the Department of the Interior as required by Section 5(a)(8) of the OCS, as amended.

Onshore, the most significant new sources of air pollutants would be the gas processing plants and possible expansion of refineries. Gas processing plants predominantly contribute sulfur oxides, which could significantly deteriorate existing air quality unless adequate pollution control technology (a tail gas and "claus" plant) is installed. The potential general vicinity sites for gas processing plants in this area include the Narragansett, R.I., Providence, R.I., and Boston, Massachusetts areas. These air quality control regions are within attainment areas for SO_2. With proper treatment technology air quality impacts will be negligible. However, due to widespread non-attainment of standards in the northeastern United States, offshore air emissions which could significantly affect onshore air quality would be controlled. In the North Atlantic sale area it appears that increases in hydrocarbon emissions associated with tank farms and pumping stations would not be very much above the level expected without these proposed sales. The effect of these changes upon onshore ambient air quality cannot be quantified at this time.

Conclusion: It is possible that exploration and development activities occurring on the OCS may, at times, affect the onshore air quality. However, in those instances where a significant effect results, the lessee will be required by Interior to control the emissions and, in certain instances, to provide offsets.

Mid-Atlantic

Because of the prevailing northwesterly, westerly, and southwesterly winds in this area, it is expected that most air pollutants resulting from offshore activities would be borne away from land and diluted in the large air mass over the ocean. However, to the extent that emissions from OCS operations significantly affect any onshore area of any State, they will be regulated by the Department of the Interior as required by Section 5(a)(8) of the OCSLA Amendments.

Onshore, the most signfiicant new sources of air pollutants would be the gas processing plants and possible expansion of refineries. The potential sites for gas processing plants in this area include Burlington and Middlesex Counties in New Jersey, both of which are within attainment areas for SO_2. With proper treatment, these potential air emissions should be inconsequential.

If refinery expansion were to occur, increases in hydrocarbon and sulfur oxide emissions could occur. Air pollution increases from sale-related activity (other than gas processing and oil refining) would not be significant in any year and all emissions in non-attainment areas would be mitigated or offset.

Conclusion: See conclusion under North Atlantic section.

South Atlantic/Blake Plateau

The onshore effect of emissions from OCS development in this area is not known. However, to the extent that emissions from OCS operations significantly affect any onshore area of any State, they will be regulated by the Department of the Interior as required by Section 5(a)(8) of the OCSLA Amendments.

Onshore emissions may be significant if major finds are encountered which would necessitate the construction of onshore terminals or treatment facilities. If this development were to occur in metropolitan or industrialized areas then offsets may be required especially in Charleston, South Carolina; Savannah, Georgia; and Jacksonville, Florida. If development occurs in more rural areas, greater percentage increases in air pollutants will occur but air standards would not be exceeded.

Conclusion: See conclusion under North Atlantic section.

Gulf of Mexico

Offshore emissions from this proposal will replace existing emissions in the central and western Gulf but will probably be located farther offshore following the trend of new discoveries. The onshore treatment and processing infrastructure is well established and no increase in onshore emissions is expected as a result of this proposal. Offsets may be required in a few instances where new developments occur in non-attainment areas.

Offshore development in the easternGulf of Mexico could, in some instance, effect onshore air quality. Photochemical oxidants from onshore development may have to be offset in areas such as Mobile and Tampa if such developments as gas processing plants or tank farms were to be constructed in these localities.

Conclusion: See conclusion under North Atlantic section.

Southern California

Most coastal locations in this area experience violations of the ozone standard especially from Point Conception south to the Mexican border. Other gaseous pollutants are within the standards except in the major urban areas of Los Angeles and San Diego. In these areas, exhaust emissions create a critical problem. For example, Los Angeles and Orange Counties account for about 42 percent of California motor vehicles and in 1972, residents consumed an estimated 42.9 million liters of gasoline per day.

The human health effects of eye and respiratory tract irritation, aggravation of respiratory disorders, headaches and nausea which result from the severe air pollution in this area are well known. Agricultural crops and other plant life in this area also suffer air pollution related damage such as leaf tissue collapse.

As indicated in Section III.B., the prevailing winds in coastal southern California could transport OCS air emissions into onshore areas. Since most of this area already experiences severe air quality problems, emission cointrols and/or offsets from OCS-related development will be critically important. The proposed USGS regulations mentioned above will require controls or mitigation measures where determined to be necessary to prevent significant effects to any onshore area.

Conclusion: See conclusion under North Atlantic section.

Central and Northern California

Some coastal locations in this area experience violations of the ozone standard. Other gaseous pollutants are within the standards except in the major urbanized area in the vicinity of San Francisco Bay. In this area, exhaust emissions and industrial sources create air pollution problems.

As indicated in Section III.B., the prevailing winds in coastal northern California could transport OCS air emissions into onshore areas. Since this area already experiences air quality problems, emission controls and/or offsets for OCS-related development will be important. The proposed USGS regulations mentioned above will require such controls and other mitigation measures where determined to be necessary to prevent significant effects to other onshore areas.

Conclusion: See conclusion under North Atlantic section.

Gulf of Alaska

In the Gulf of Alaska sale area, present concentrations of emissions are verylow and well within ambient standards for the general area. Any additional industrial activity such as oil and gas development would degrade the existing air quallity to some extent on a local basis. For example, Valdez on occasion exceeds primary ambient standards for SO_2 emissions while oil tankers are in port but does not exceed alert levels at any time. The prime point sources where emission concentrations would most likely occur would be in the vicinity of an oil terminal--possibly in Yakutat.

Conclusion: The impact of oil and gas development on the air quality of the Gulf of Alaska could decrease air quality to a certain extent, especially near onshore oil and gas facilities; however, to the extent that such emissions significantly effect any onshore area of the State, they will be regulated by the Department as required by Section 5(a)(8) of the OCSLA Amendments.

Kodiak

The Kodiak sale area has relatively clean air year round with some degradation because of waste disposal near fish processing plants, and dust from construction, volcanic activity, or particulate matter raised by high winds. Any additional industrial activity such as oil and gas development, especially a crude oil terminal and/or an LNG plant, would degrade the existing air quality to some extent. These facilities could be located in Old Harbor, Afognak Island, or Ugak Bay. Offshore degradation would generally be minimal. Onshore oil and gas facilities could have cumulative effects with existing development. However, enforcement of State standards and Federal regulations would keep these levels below State requirements.

Conclusion: See conclusion under North Atlantic section.

Cook Inlet

In the Cook Inlet/Shelikof sale area, air emissions are well within the ambient air quality standards with the exception of particulate emissions from fugitive dust. It appears that present oil and gas activity has not had a significant effect on air quality, but combined with additional oil and gas activities, some adverse effect on the existing air quality could be expected. This impact would be around existing onshore oil and gas facilities on the Kenai Peninsula, which are expected to be utilized as a result of this proposed sale. It should also be noted that the Tuxedni National Wilderness Area on the west side of lower Cook Inlet has a mandatory prevention of significant deterioration (PSD) Class I designation which allows no degradation of air quality.

Conclusion: See conclusion under North Atlantic section.

Norton Basin

In the proposed Norton Basin sale area, concentration of air emissions are presumably very low and well within ambient air quality standards although there is no current monitoring data for this area, according to the EPA. Impacts from oil and gas development will decrease air quality to a certain extent, especially near onshore gas and oil facilities. A crude oil terminal and LNG plan could be located at St. Michael Bay or Golovin Bay.

Conclusion: See conclusion under North Atlantic section.

St. George Basin

In the proposed St. George Basin sale area, concentrations of air emissions are presumably very low and well within ambient air quality standards, although there is not current monitoring data for this area, according to EPA. Impacts from oil and gas development from a crude oil terminal and the LNG plant will decrease air quality to a certain extent especially near onshore oil and gas facilities possibly in Unalaska Bay or Dutch Harbor.

Conclusion: See conclusion under North Atlantic section.

Beaufort Sea

In the proposed Beaufort Sea sale area concentrations of emissions are low and well within ambient air quality standards as reported by the air-monitoring station of Prudhoe Bay. Impacts from a second oil and gas lease sale they combine with those from the first Beaufort Sea sale decrease air quality to a certain extent, especially near onshore oil and gas facilities. However, air impacts in the Beaufort Sea will be minimized by use of the existing tanker terminal at Valdez. No LNG plant or gas processing is anticipated.

Conclusion: See conclusion under North Atlantic section.

Northern Aleutian Shelf

In the proposed Northern Aleutian Shelf sale area, concentrations of air emissions are presumably very low and well within ambient air quality standards, although there is no current monitoring data for this area, according to the EPA. Impacts from oil and gas development will decrease air quality to a certain extent, especially near a new crude oil terminal or LNG plant--possibly located in the vicinity of Cold Bay.

Conclusion: See conclusion under North Atlantic section.

Navarin Basin

In the proposed Navarin Basin sale area, concentrations of air emissions are presumably very low and well within ambient air quality standards, although there is no current monitoring data for this area according to the EPA. Impacts from oil and gas development will decrease air quality to a certain extent, especially near oil and gas facilities; offshore loading of oil is anticipated, and possibly an offshore LNG facility. It should be noted that the Bering Sea National Wilderness Area located along the Yukon Delta coast has a mandatory PSD designation.

Conclusion: See conclusion under North Atlantic section.

Chukchi Sea

In the proposed Chukchi Sea sale area, concentrations of air emissions are presumably very low and well within ambient air quality standards, although there is no current monitoring data for this area according to the EPA. Impacts from oil and gas development will decrease air quality to a certain extent, especially near a crude oil terminal or LNG plant (possibly at Point Hope).

Conclusion: See conclusion under North Atlantic section.

f. Impact on Socioeconomic Systems

North Atlantic

The risked mean estimates of the resources to be recovered from the North Atlantic region as a result of the proposed leasing schedule are 356 million barrels of oil and 1.78 trillion cubic feet of gas. Based upon modelling results for proposed OCS Sale No 42 (Georges Bank), it is believed that North Atlantic sales included in the proposed schedule will generate a regional total of about 5,400 jobs during peak activity; approximately 1,900 of these jobs would be directly related to the OCS activity. A population increase of about 18,600 persons could occur in the region as a result of the employment increase.

The social and physical infrastructure of an area may be affected in numerous ways by onshore development and OCS-induced growth, but rapid population increases would have the greatest effect. Rapid population growth in an area would have an ensuing impact upon housing availability, schools, water supply, sewage treatment, solid waste disposal, medical facilities and other necessary public services.

Although population growth associated with this proposed action is expected to cause minimal regional impacts, these impacts may not be uniformly insignificant for all localities. The significance of the population impacts will be related to existing infrastructure capacity. If the proposed North Atlantic sales are in the vicinity of proposed Sale No. 42, it is expected that onshore facility development would take place in the southeastern New England/Narangansett Bay area. The Davisville, R.I., area may also receive additional activity, as a result of Mid-Atlantic OCS activity, if exploration activity in the Baltimore Canyon continues to be serviced from Davisville.

The size of the proposed sales in terms of potential oil and gas recovery is probably not great enough to stimulate major new industrial activity in the North Atlantic area. Since many skills found in other industries are easily adaptable to the offshore petroleum industry, unemployment may be reduced in parts of the region. Workers could also be displaced from other sectors of the economy, creating openings in unrelated industries.

Some onshore facilities which could serve for the proposed North Atlantic sales are expected to be constructed for proposed OCS Sale No. 42. In addition to these, it is possible that new facilities will be needed for gas processing plants and new or expanded facilities for operations support.

Factors mitigating a larger potential impact of new OCS activity on the North Atlantic region include: 1) the high level and variety of industrial development already existing within the regions; 2) the fact that portions of rig crews and operations support personnel will commute on a bi-weekly or monthly basis from areas such as the Gulf of Mexico where offshore activity is already well developed, and 3) fabrication of required equipment such as platforms and rigs most likely will be provided by established facilities outside of the region.

Mid-Atlantic

The risked mean estimates of the resources to be recovered from the Mid-Atlantic region as a result of the proposed five-year leasing schedule are 200 million barrels of oil and 1.64 trillion cubic feet of gas. Based upon modelling results for the most recent sale in the area (OCS Sale No. 49), it is expected that Mid-Atlantic sales on the proposed five-year schedule would generate a regional total of about 5,700 jobs during peak activity; approximately 1,000 of these jobs would be directly related to the OCS activity. A population increase of about 20,100 persons could occur in the region as a result of the employment increase.

The social and physical infrastructure of an area may be affected in numerous ways by onshore development and OCS-induced growth, but rapid population increases would have the greatest effect. Rapid population growth in an area would have an ensuing impact upon housing availability, schools, water supply, sewage treatment, solid waste disposal, medical facilities and other necessary public services.

Although the population growth associated with this proposed action is expected to cause minimal regional impacts, these impacts may not be uniformly insignificant for all localities. The significance of the population impacts will be related to existing infrastructure capacity. If additional lease sales are in the vicinity of Sales 40 and 49, onshore facility development may take place in the northern New Jersey region, as well as outside of the region in Davisville, R.I. Based on the resource estimates, population gain can be expected to be minimal on a regional percentage basis, so that no significant alterations in the population characteristics of the Mid-Atlantic region as a whole are expected.

The size of the proposed sales in terms of potential oil and gas recovery is probably not great enough to stimulate major new industrial activity in the Mid-Atlantic area. Since many skills found in other industries are easily adaptable to the offshore petroleum industry, unemployment may be reduced in parts of the region. Workers could also be displaced from other sectors of the economy, creating openings in unrelated industries.

Most of the major onshore facilities required for the proposed Mid-Atlantic sales will have been constructed as a result of OCS Sales 40 and 49. Due to the low level of the resource estimates for the two pro posed sales in the Mid-Atlantic, no significant amount of new facilities except for new or expanded operations support and gas processing capacity are to be expected. Fabrication of platforms will most likely be provided by established facilities outside the region. Some platforms may be fabricated at a proposed Brown and Root facility in Cape Charles, Virginia but this project has encountered major delays and faces an uncertain future due to significant local opposition.

Portions of the crews on platforms and rigs would commute on a bi-weekly or monthly basis from areas where offshore activity is already well developed. Due to the high level and variety of industrial development already existing within the Mid-Atlantic region, the socioeconomic impact of the OCS development is expected to be minimal.

South Atlantic/Blake Plateau

The risked mean estimates of the resources recoverable from the South Atlantic and Blake Plateau regions as a result of the proposed leasing schedule are 240 million barrels oil and .40 trillion cubic feet of gas. Based upon results of economic modelling for the most recent sale in the area (OCS Sale No. 43), peak direct employment due to South Atlantic (and Blake Plateau) sales on the proposed leasing schedule is expected to be about 360 persons, and peak total employment (including indirect and induced jobs) is expected to be about 1,065 persons. Population in the region may increase by about 2,340 as persons move into the area to take advantage of employment opportunities.

Significant discoveries from Sale #43 (held in 1978) could dampen the impact of subsequent sales. Most of the drilling crews used in exploration and development will reside outside the South Atlantic coastal region and should not create infrastructural stresses. The remaining crew, usually at lower skill levels, could be local residents. This, together with hiring at onshore facilities, should reduce total unemployment and outmigration of the unemployed and underemployed to some degree. The relatively small expected population increase should not create significant infrastructure stresses. Exploratory drilling on Sale #43 leases was begun in June 1979 and resulted in temporary service bases established in Savannah and Brunswick, Georgia. If successful, the current exploratory activity could result in onshore facilities that would be perpetuated by the proposed sales. If exploratory activities generated by Sale #43 are unsuccessful, the proposed sales could generate new onshore oil and gas infrastructure development.

Employment and population resulting from the proposed lease schedule could impact areas such as: Savannah and Brunswick, Georgia; Jacksonville, Florida; Charleston, South Carolina; and Wilmington and Morehead City, North Carolina. Counties within commuting distance of these centers could receive some impacts from the sales, but the impacts would be minimal. The low reserve estimates make it unlikely that refinery capacity would be constructed. Gas processing plants seem marginal for the area, and would not be large long term employers even if they were necessary. Offshore activity and onshore operations support facilities would provide the principal OCS-related employment.

Gulf of Mexico

The risked mean estimates of the resources to be recovered from the Gulf of Mexico region as a result of the proposed five-year leasing schedule are 790 million barrels and oil and 10.6 trillion cubic feet of gas. Based upon results of previous economic modelling for the Gulf of Mexico area, it is expected that the proposed leasing schedule would generate between 13,000 and 28,000 direct OCS-related jobs during peak activity. Most of these jobs would simply replace employment which would otherwise be lost to the region due to declining activity at other Gulf of Mexico offshore production sites. If 80 percent of the required direct employment is absorbed by this shift, then the corresponding range for new employment is about 2,600 to 5,600 for directly OCS-related jobs. Total employment growth, including indirect and induced employment, would range from 4,500 to 9,700 jobs, while population growth would be about 13,000 to 20,000 persons.

In contrast to other OCS areas, the Gulf of Mexico has an established offshore and onshore support industry that services the world. This infrastructure is located primarily in Texas and Louisiana, where Federal OCS sale production accounted for almost 7 percent of domestic petroleum production and 19 percent of domestic natural gas production in 1978.

Existing employment in the Gulf of Mexico area in petroleum related industries would continue with some expansion if the proposed sales are held. A substantial number of existing employees would shift from completed or declining offshore activities to work on the proposed sales' activities.

In addition, some experienced workers in the Gulf region will find employment in OCS operations in other parts of the country. If about 37 percent of the cumulative peak direct employment in other regions consists of bi-weekly commuters from the Gulf of Mexico region (a percentage consistent with the actual experience in the Mid-Atlantic frontier area) then as many as 6,240 workers from the Gulf area might find employment in other OCS regions as a result of this five-year schedule. These long distance commuters would bring additional income into the Gulf region's economy, although their frequent absences from home could create family and social stresses.

Population growth induced by new employment would occur over a six to ten year period and should not significantly stress public facilities. Most of the growth will occur in established areas in Texas and Louisiana. Onshore impacts could occur in Florida, Mississippi, Alabama, and southern Texas if significant discoveries are found in their OCS waters. Overall, the socioeconomic impact of the proposed lease schedule will be a continuation of current trends, with a minimal increase expected.

Southern California and Santa Barbara

The risked mean estimates of the resources to be recovered from the southern California and Santa Barbara Channel area as a result of the proposed leasing schedule are 1,180 million barrels of oil and 1.75 trillion cubic feet of gas. Based upon economic projections from OCS Sale No. 48 (Southern California, 1979), it is estimated that a peak of about 18,900 jobs may be created by the proposed leasing schedule. About 4,800 of these peak year jobs would be directly related to the OCS activity. A peak year population increase of approximately 37,500 persons could result from the employment increase. To the extent that employment is absorbed by previous residents of the region, the induced population and any stress on existing public and private facilities would be reduced. A portion of the new employment will be absorbed by residents who are shifting from declining activity in the previous State and Federal offshore leasing areas.

Previous sales have taken place in the Southern California and Santa Barbara Channel areas, and there is presently existing, though limited, offshore oil and gas infrastructure. Development of leases in the Southern California and Santa Barbara Channel areas would be likely to have some impact on existing harbors, transportation facilities and certain sectors of the regional economy in forthcoming years. Adjustments in the economy would be made as new capacity was built to accommodate increased OCS development.

The comprehensive and diverse economic base found in the Southern California area makes it unlikely that OCS development would have much of an incremental impact on the existing economy. This is somewhat less true in the Santa Barbara Channel area. Further development in the Santa Barbara Channel might result in some significant socioeconomic impacts, but the extent of onshore development and the existing infrastructure in the region tends to lessen the impact. Considering the extent of the existing economic base in the Southern California and Santa Barbara Channel areas, the population and employment effects should be relatively minor.

Central and Northern California

The risked mean estimates of the oil and gas resources to be recovered from the Central and Northern California area as a result of the proposed leasing schedule are 288 million barrels of oil and .27 trillion cubic feet of gas. Based upon results of previous economic modelling, it is expected that development and production of these amounts of oil and gas could create about 1,200 jobs directly related to the OCS production during peak activity. In addition, about 3,600 jobs would be created by the need for indirect support of the OCS activity and its employees. A population increase of up to 14,400 persons during peak OCS activity could result, although this figure would be reduced to the extent that employment is absorbed by previously unemployed residents of the region.

In Central and Northern California, there has been no OCS development. The coastal economies in the area are oriented toward commercial fishing, lumbering, and/or recreational-tourist activities. If leasing occurs, exploration activity will affect public harbors, transportation facilities, and possibly housing in the coastal area for approximately five years, even if no significant hydrocarbon resource finds are made. If commercial development is limited, some impacts can be expected in the regional economy, but onshore investment and induced employment would be minimal and would result in few socioeconomic dislocations. If major commercial development takes place, pipelines to shore and onshore processing facilities may be expected. Support facilities may compete with other uses in the regional economy (e.g., commercial fishing), and there could be more pronounced socioeconomic dislocations as the region's employment and regional product shifts toward oil and gas development activities.

Relatively significant impacts can be expected in central and northern California, particularly on public harbors, as a result of the proposed schedule--but the level of socioeconomic impacts is totally a function of the extent of commercial oil and gas resources found there. The present resource estimates suggest a low to moderate impact to the regional economy in the area.

State of Alaska

In this section the socioeconomic impacts of the proposed leasing program upon Alaska are examined from two perspectives. First the impact upon the state economy as a whole is discussed, and then the specific impacts within each of the nine proposed leasing areas offshore Alaska are examined.

The proposed lease sales, taken individually, will probably have only limited effects on the State's economy. However, viewed as a whole, the proposed leasing program may well have significant effects on employment, population, personal income, the State's fiscal position, and the structure of the Alaskan economy.

Any forecast concerning the magnitude of these impacts must, however, remain an informed judgement at best. This is because economic impact must be defined as change from a pattern of economic growth which would have occurred without OCS development. Governmental and private sector decisions and events will determine these future patterns. For example, the State of Alaska has proposed an oil and gas leasing schedule of its own. Any resulting energy related development will influence this pattern of economic activity. The disposition of Alaskan lands is not yet final, introducing uncertainty regarding several development projects. Relocation of the State capitol would influence local economies which are also expected to be affected by OCS development (e.g., Anchorage). State policy decisions concerning expenditures and the Permanent Fund will affect future patterns of economic activity. In short, there are many significant uncertainties which will strongly influence Alaska's economic growth, without considering OCS development. The significance of impacts of OCS development must be viewed and assessed in this context.

The Bureau of Land Management, through the Alaska OCS Office Socioeconomic Studies Program, has sponsored research of the cumulative effects of OCS development on the Alaskan economy. The study analyzes the cumulative effects of assumed OCS development in the Western and Northern Gulf of Alaska, Beaufort Sea and Lower Cook Inlet compared to a "no OCS development" base case. (The reader is referred to this study for specifics of the development assumptions and base case. See L. Huskey, "Forecast and Analysis of the Cumulative Mean Case, Western Gulf of Alaska Impact Analysis," University of Alaska, 1979.) Though the scale of assumed development differs from the proposal analyzed here, the major trends identified in the study may reasonably be applied to the proposal.

OCS development is expected to reinforce the major structural changes observed in the Alaskan economy in the recent past (1975-1976) and those expected to occur in the future without OCS development. Several major structural changes are evident. As the size of the economy increases, more goods and services are produced locally. The importance, or relative share, of the support sector also increases. The population ages and the labor force participation rate increases through time, leading to an increase in the proportion of the population which is employed. (This does not mean that the unemployment rate would decrease; in fact, there is some evidence to suggest that it may increase slightly.) State expenditures increase faster than revenues after the major petroleum revenues from Prudhoe Bay peak. This revenue/expenditure pattern would necessitate drawing down the general fund.

Implementing the proposal, given the stated assumptions, would probably cause a significant change in the magnitude of growth. Oil production from the proposed leasing areas in Alaska would peak in the early 1990's at approximately 1.9 million barrels per day (depending on the production decline functions assumed). The economic activity associated with this level of development and production would increase employment, population, and personal income by the turn of the century. The intensity of these effects in any given time period will be determined primarily by the rate of development and the extent to which the Alaskan economy (or local economies) are relied upon to supply goods and services for the offshore development and its employees.

If historical trends continue, Anchorage's position as the financial, service, and distribution center for the state would be enhanced. Similarily, the population of the Southcentral region would continue to grow faster than the state as a whole. The Southcentral region would be expected to receive the bulk of development and production effects. Effects on individual communities will be determined in some degree by local government policy choice. The provisions of the Coastal Zone Management Act and local planning and zoning authorities provide control mechanisms. This is not to imply that unwanted impacts cannot occur. The construction of the transAlaska pipeline provides ample evidence that temporary commodity shortages, price inflation, housing shortages, stress on utility systems, and a variety of social stresses may occur. These effects may be mitigated to the extent that development activities are isolated and local communities are not relied upon for the provision of goods and services.

Overall, the discovery and production of the assumed resources would cause a measurable increase in the magnitude of economic activity and population growth in the State.

In the discussions below, the socioeconomic impacts within each of the nine proposed Alaska leasing areas are described.

Other changes and specific impacts of the proposed leasing program are linked to the predominant subsistence lifestyle in rural Alaska. A short description of characteristics of a traditional subsistence economy may aid this and subsequent discussions:

- Subsistence for each member is guaranteed
- Unemployment is not a threat, but uncertainties of the physical environment are
- There are no full-time specialists; every adult knows most all that needs to be known for survival
- Work arrangements are constrained and directed by the physical environment and social structure, not by the market or labor price, indeed, market dependency is absent
- Kinship dependency dominates
- Productive units are embedded in the social organization; there are no separate economic institutions
- Disposition of produce is controlled through social obligations and reciprocity
- Goods are distributed through feasts, gifts and some limited internal and external trade.

Changes in this additional pattern of shared hunting, fishing and gathering activities have already occurred and are continuing to occur. Date by ANCSA Region tabulated in the 1974 study of Federal Programs and Alaska Natives indicate considerable variation in extent of subsistence activity and dependence in Alaska, ranging from a high dependence and number of months devoted to subsistence pursuits in the Arctic Slope, Calista, Bristol Bay and Bering Straits Regions (Bering and Arctic OCS regions) to lesser dependence along the southern OCS in the Sealaska, Cook Inlet, Koniag, and Chugach Regions. Ahtna, Aleut, NANA and Doyon regiions fall between these two extremes. Regions with a predonderance of small homogeneous Native villages are most dependent upon subsistence while regions with a preponderance of non-Native places and more urban conditions are least dependent.

Subsistence in Alaska is grounded in the village and is its reason to exist. The more than 200 villages in Alaska serve as convenient staging areas for families to directly appropriate resources for subsistence purposes. With few exceptions, villages in Alaska occupy coastal or river bank sites, which are convenient locations for a variety of reasons, but most importantly for hunting and fishing. As the arctic environment dictates human activity in subsistence living, so the biotic food web is inexorably linked with the web of socio-cultural relationships at the village level.

Because of the interlinking of individual, family, cultural and community characteristics associated with a predominantely subsistence lifestyle, change in one characteristic can be expected to cause change in others. The impact of oil and gas development along the Alaska OCS would cause the least change related to subsistence lifestyles on the following sociocultural elements:

- The family will continue to be one of the most resilient aspects of Native culture. Those norms of the family having to do with subsistence including the functions of hunter, fisherman, food gatherer, collector of wood, and berry picker will survive.

- A strong sence of village identity will continue--the sense of belonging to village of birth continues throughout the life of most Native persons, regardless of where they may be living or working.

- Seasonality of yearly subsistence activities will also continue. That is, there will continue to be times for fishing, hunting, jobs in the village, picnics, clamming, and times for local ceremonies.

- Villagers are likely to continue established patterns of diverse subsistence activities throughout the year.

The following sociocultural elements will be most susceptible to change:

- Modern technology and conveniences may be used to supplement or replace traditional modes and methods.

- The physical mobility of people in and out of villages is likely to increase.

- The diversity and complexity of human relationships involved in rural lifestyles will increase as the social world of rural villagers expands.

- Larger political and economic structures will interact with the villages at more points, especially on the Native regional level, and through Native Corporations and Associations.

- Increased conflict is likely, although this may be mitigated somewhat by successful enclave settlement patterns.

- The relationship of cash-generated and subsistence-generated activities will continue to fluctuate depending on resource availability, seasonality of cash employment and other factors.

- With increased contact, social and individual stress may be expected to increase.

The use of enclaves to isolate oil develoment activities from traditional villages or towns should mitigate many of the impacts on social systems. Depending on the effectiveness of the boundary maintenance capabilities of oil enclaves and surrounding villages or towns, the impacts on rural Alaska lifestyles will vary from mild to moderate. The degree of disruption to local and regional social systems will depend upon the ability of local communities and regions to maintain social and cultural integrity in the face of increased industrial activity. Despite the potential for mitigation, it is clear that OCS development, in concert with other developmental pressures and changes currently taking place in Alaska, will affect rural, traditional lifestyles of Native Alaskans. While specific villages will be impacted by specific sales, some cumulative effects wil be felt as well. Some villages, especially in the Bering Sea region, may be impacted by development activities resulting from more than one sale. Additionally, the proposed action may be considered to cumulatively impact Alaskan Native culture in general. Numerous and widespread developmental activities will increase the contact and interaction of Native individuals and organizations with technology and non-traditional governmental and social systems. This will contribute to changes and pressures to change Native lifestyles and social and economic patterns. This could also contribute to the reduction of truly traditionally-oriented social and economic systems in Alaska.

Gulf of Alaska

The risked mean oil and gas resource estimates for the eastern gulf sale area are 40 million barrels and .14 trillion cubic feet, respectively. By interpolating from the high, low, and mean resource/employment relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

First, longterm direct employment would be around 50, with peak employment (excluding the LNG plant) around 100 and with early employment (third-year exploration) of 30. If, as is possible, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enclaves and would have little effect on long term employment levels or population impacts. The resident long- term employment figures would be 40 (long-term), 50 (peak), and 15 (third-year exploration). These direct resident employment figures imply an increase in State or local property taxes around $6.2 million, increased long-term State direct and indirect employment of 190, and increased long-term state population of 420.

From these estimates the following economic impact can probably be expected. First, the increase in State employment, population and economic activity would be mild and positive. Second, the local effects are controlled by expected use of an enclave-type approach to eastern gulf development which will isolate the local community (Yakutat, pop. 500) from the potential petroleum employment population impact of 100 at peak levels, plus dependents. With enclave development, which was used successfully on the North Slope and at the Drift River facility, the impact of forecast construction and workers on Yakutat is avoided and only a mild quickening in the local economy might result. Only mild positive impacts from a controlled transfer of some local residents to high-paying, steady petroleum employment, and a moderate increase in taxable local property should be expected. Thus, no major net employment or population impact is forecast with this enclave development mode, used to avoid upsetting the local economy and lifestyle.

For a general discussion of subsistence lifestyles, see State of Alaska discussion. The population of this area is 21 percent Native (about 1740 people) many of whom rely moderately on the subsistence harvest. Commercial fishing and subsistence hunting, fishing and food gathering are predominant activities. Residents of this area are familiar with oil development in recent years at Valdez and in previous exploration in the Gulf of Alaska. These are susceptible to accidents involving the transportation system (pipeline and tankers) for both oil and gas development. The on-land subsistence harvest consisting of moose, brown bear, black bear, deer, goat, berries and wood is susceptible both to adverse environmental effects of transportation systems, crude oil terminals, LNG facilities, and operations support/supply bases. Enclave development should reduce the risk of environmental impact to the above systems. Based on the type of subsistence harvest and the population of the villages in this area, the sensitivity of the harvest to oil and gas development may be ranked approximately eighth of nine Alaska areas (1=most sensitive, 9=least sensitive).

Kodiak

The risked mean oil and gas resource estimates for the Kodiak sale area are 46 million barrels and .138 trillion cubic feet, respectively. By interpolating from the high, low, and mean resource/employment relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

First, long-term direct employment would be around 100, with peak employment (exluding the LNG plant) of 310 and with early employment (third-year exploration) of 80. If, as is likely, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enclaves and would have little effect on long-term employment levels or population impacts. The resident long-term employment figures would be 100 (long-term), 100 (peak), and 100 (exploration). These direct resident employment figures imply an increase in local property taxes, increased long-term State direct and indirect employment of 1200, and increased long-term state population of 1100.

From these estimates the following economic impacts can probably be expected. First, the increase in State employment, population, and economic activity would be mild and positive. Second, the impacts of peak employment on the local community (Kodiak, pop. 9366) can be controlled by enclave development, of the type described for the Gulf of Alaska. A slight quickening in the local Kodiak economy is likely. This mild and beneficial local impact would come from controlled transfer of some local residents from fishing to steady high-paying petroleum employment, and a relatively large increase in local taxable property implicit in development. Thus, no significant net employment and population impact is forecast.

For a general discussion of possible impacts to subsistence lifestyle, see the State of Alaska discussion. The population in this area is 19% native (about 1,729 people), the majority of whom live in nine certified villages on Kodiak Island. A smaller proportion live in Kodiak city or in other village sites along the Island. The people of Kodiak Island are moderately dependent upon subsistence and are substantially involved in commercial fishing.

Salmon, shellfish, crabs, bottom fish, shrimp, clams, seals, ducks, geese, muskrat, and beaver are the water-based subsistence sources in the Kodiak area. These are susceptible to accidents involving the transportation system for both oil and gas. The on-land subsistence harvest consisting of bear, deer, elk, rabbit, berries, and wood is susceptible to accidents involving crude oil terminals, LNG facilities, and support/supply bases. Enclave development should reduce the potential impact to the above systems. Based on the type of subsistence harvest and the population of the villages in this area, the sensitivity of the harvest to oil and gas development may be ranked approximately seventh of nine areas. (1=most sensitive, 9=least sensitive).

Cook Inlet/Shelikof

The risked mean oil and gas resource estimates for the lower Cook/Shelikof sale area are 160 million barrels and 0.38 trillion cubic feet, respectively. By interpolating from the high, low, and mean resource/employment relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

First, long-term direct employment would be around 150, with peak employment (excluding the LNG plant) around 325, and with exploration employment of 110 (third-year). If as is likely, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enlaves and would have little effect on long-term employment levels or population impacts. The resident long-term employment figures would be 130, with peak resident employment 165, and third-year exploration employment at 45. These direct resident employment figures imply increased State or local property taxes of around $5.4 million, increased long-term State direct and indirect employment of 1920, and increased long-term state population of 1,500.

From these estimates the following economic impact can probably be expected. The increase in State employment, population, and economic activity will be mild and positive. The local impacts of this development are also likely to be minor, because the assumed resoures and activity associated with this schedule will probably be a small addition to the resource assumed discovered in sale CI. Also extensive population and infrastructure exists to absorb the economic impact. The local impacts on the Shelikof area, where a majority of the resources are likely to be found, would probably be small, because petroleum employment wold be constrained to enclave status (as discussed for Gulf of Alaska) with small, managed impacts on the Kodiak Borough. Severe short and long-term impacts are avoided, so that only a mild increase in economic activity in either the Kodiak or Kenai Boroughs is likely. This mild and beneficial local impact would come from controlled hiring of some local residents, local purchases of services, and from the relatively large increase in local taxable property. Thus, a low nondisruptive employment population is forecast in Kodiak and Kenai.

For a general discussion of possible impacts to subsistence lifestyle, see the Gulf of Alaska discussion. The population of this area is seven percent native (about 1,218 people). The Indian, Aleut and Eskimo peoples in this area reside in 3 large villages (Seldovia, Tyonek and Ninilchik) and a number of smaller villages along the east coast of Kodiak Island and on both sides of Cook Inlet. They are relatively familar with oil development and with the onshore operation of such development. This tends to lighten the future impact on their lifestyle. Area native populations rely moderately on the subsistence harvest.

The water-based subsistence sources of the Lower Cook Inlet are humpback salmon, dog salmon, silver salmon, red salmon, king salmon, herring, catfish, candlefish, codfish, clams, crab, hair seal, beluga whale, ducks, and geese. These sources are susceptible to impacts involving the transportation system for oil and gas development. The on-land subsistence harvest consisting of bear, deer, moose, rabbits, berries, and wood is susceptible to adverse environmental effects from crude oil terminals, LNG facilities, and support/supply bases. However, enclave development should reduce the potential for impacts to the above systems. Based on the type of subsistence harvest and the population of the villages in this area, the sensitivity of the harvest to oil and gas development is the least sensitive of the nine Alaska Sale areas.

Norton Basin

The risked mean oil and gas resource estimates for the Norton sale area #57 are 60 million barrels and 0.24 trillion cubic feet, respectively. By interpolating from the high, low, and mean resource/employment relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

First, long-term direct employment would be around 100, with peak employment (excluding the LNG plant) of 250, and with early employment (third- year exploration) of 75. If, as is likely, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enclaves and would have little effect on long term employment levels or population impacts. The resident long term employment figures would be 90 (long-term), 110 (peak), and 30 (exploration). These direct resident employment figures imply an increase in State or local property taxes of $6 million, increased long-term State direct and indirect employment of 450, and increased long-term state population of 1020.

From these estimates the following economic impact can probably be expected. First, the increase in state employment, population and economic activity would be limited and positive. Second, the local impacts of peak employment on the local communities such as Nome (pop. 7000) and others, is expected to be controlled or eliminated by enclave development, perhaps at St. Michael. As on the North Slope, Drift River and as proposed for Yakutat and discussed for Gulf of Alaska, these managed petroleum employee enclaves are isolated from the local community. Massive short and long-term community impacts are avoided, with a small increase in the local (Nome, etc.) economic activity being likely. This mild and beneficial local impact would come from controlled transfer of some local residents from fishing to steady high-paying petroleum employment and from the relatively large increase in local taxable property implicit in development. Thus, little net, employment, population, and social impact is forecast from development, although some changes are possible.

For a general discussion of possible impacts to subsistence lifestyles, see the State of Alaska discussion. The population of this area is 78 percent native (about 5,226 people) residing in over 20 villages on Norton Sound, south of Kotzebue Sound and on St. Lawrence Island. Contact with technical innovation has been primarily associated with Nome's history of gold development. Village residents rely heavily on subsistence harvests of sea mammals and fish.

The water-based subsistence resources of the Norton area are salmon, tomcod, flounder, herring, smelt, wild fowl, seal, walrus and whale. These sources are susceptible to adverse environmental impacts from transportation system (pipe and tankers) for both oil and gas development. The on-land subsistence harvest and comprising bear, moose, reindeer, squirrel, rabbit, ptarmigan, berries, and some wood is also susceptible to impacts from involving the crude oil terminals, LNG facilities, and support/supply bases. However, enclave development should make any accidents involving the above systems of milder impact. Based on the type of subsistence harvest and the population of the villages in this area, the sensitivity of the harvest to oil and gas development may be ranked approximately fourth of nine areas.

St. George Basin

The risked mean oil and gas resource estimates for the St. George sale area are 320 million barrels and 1.24 trillion cubic feet, respectively. By interpolating from the high, low, and mean resource/employment relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

Long-term direct employment would be around 290, with peak employment (excluding the LNG plant) of 570, and with early employment (third-year exploration) of 200. If, as is likely, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enclaves and would have little effect on long term employment levels or population impacts. The resident long-term employment figures would be 250 (long-term), 310 (peak), and 80 (exploration). These direct resident employment figures imply an increase in State or local property taxes of $9 million, increased long-term State direct and indirect employment of 1300, and increased long-term State population of 2800.

From these estimates the following economic impact can probably be expected. The increase in State employment, population and economic activity would be mild and positive. The local impacts of this 570 peak employment on local communities of Unalaska (pop. 2000), and nearby villages are expected to be controlled and eliminated to a large extent by enclave-type development (discussed under Gulf of Alaska) at Dutch Harbor. This mild local impact would come from controlled transfer of some local residents from fishing to steady high-paying petroleum employment and from the relatively large increase in local taxable property implicit in development. Thus, little net local employment, population, and social impact is forecast from petroleum development, although mild changes are possible.

For a general discussion of potential impacts to subsistence lifestyles, see the State of Alaska discussion. The population of this area is 26 percent native (about 1976 people). These primarily Aleut and Eskimo people reside in villages located on islands in the Aleutian Chain and on the Pribilof Islands. Commercial fishing and fur seal harvesting supplement subsistence hunting, fishing, and food gathering activities. They are unfamiliar with oil and gas development.

The water subsistence sources of the St. George Basin are comprised of crab, halibut, codfish, shellfish, seal, sea lions, and whales, which are susceptible to impacts from the transportation system (pipe and tankers) for both oil and gas development. The on-land subsistence harvest comprising rabbits and berries is susceptible to accidents involving the crude oil terminals, LNG facilities and support/supply bases directly. However, enclave development should reduce the likelihood of adverse impacts to the above systems. Based on the type of subsistence harvest and the population of the villages and the fact that development already exists in this area, the sensitivity of the harvest to oil and gas development may be ranked approximately third of nine areas.

Northern Aleutian Shelf

The risked mean oil and gas resource estimates for the North Aleutian Shelf sale area are 40 million barrels and 0.16 trillion cubic feet respectively. In interpolating from the high, low, and mean resource/employment relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

First, long-term direct employment would be around 50, with peak employment (excluding an LNG plant) of 120, and with early employment (third-year exploration) of 40. If, as is likely, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enclaves and would have little effect on long-term employment levels or population impacts. The resident long-term employment figures would be 45 (long-term), 55 (peak), and 20 (exploration). These direct resident employment figures imply an increase in State or local property taxes of $2 million, increased long-term State direct and indirect employment of 232, and increased long-term State population of 514.

From these estimates the following economic impact can probably be expected. First, the increase in State employment, population and economic activity would be limited and positive. Second, the local impacts of peak employment on local communities such as Cold Bay (pop. 300) are expected to be controlled and eliminated to a large extent by enclave-type development, perhaps joint use of the St. George enclave, or one in the Cold Bay area. Enclaves development is discussed under Gulf of Alaska. Only a small mild and beneficial local impact would be expected, as a result of controlled transfer of a limited number of local residents from fishing to steady high-paying petroleum employment and from the relatively large increase in local taxable property implicit in development. Thus, little net local employment, population, and social impact is forecast from petroleum development; however, changes would be expected.

For a general discussion of potential impacts on subsistence lifestyles, see the State of Alaska discussion. The population in this area is estimated to be about 26 percent Native (about 1,000 people), most of them rely moderately on subsistence. These Eskimo, Indian and Aleut people reside in villages on the Alaskan Peninsula and along Bristol Bay, a prime salmon fishing area. Residents are rather unfamiliar with oil and gas development.

Waterfowl, seal, sea lions, whales, shellfish, crabs, and a variety of fish are the water subsistence sources of the North Aleutian area. These are susceptible to environmental impacts from the transportation system (pipe and tankers) for both oil and gas. The on-land subsistence harvest consisting of brown bear, deer, moose and ptarmigan, is susceptible indirectly to accidents involving the transportation system and directly to accidents involving the crude oil terminals, LNG facilities, and support/supply bases. Enclave development should make any accidents involving the above systems of milder impact. Based on the type of subsistence harvest and the population of the villages in this area, the sensitivity of the harvest to oil and gas development may be ranked approximately second of nine area. (1=most sensitive, 9=least sensitive)

Beaufort Sea

The risked mean oil and gas resource estimates for the Beaufort Sea sale area are 860 million barrels and 3.3 trillion cubic feet, respectively. By interpolating from the high, low, and mean resource/development relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

First, long-term direct employment would be around 670, with peak employment of 1180, and with early employment (third-year exploration) of 470. The corresponding resident long-term employment figures would be 590 (long-term), 690 (peak), and 170 (exploration). These direct resident employment figures imply an increase in State or local property taxes of $20 million, increased long-term State direct and indirect employment of 2900 and increased long-term State population of 6000.

From these estimates the following economic impact can probably be expected. The increase in state employment, population and economic activity would be mild and positive. The local impacts of the 1180 peak employment on the communities of Barrow (pop. 2800) and Kaktovik (pop. 136) are expected to be controlled and eliminated to a large extent by enclave-type development (discussed under Gulf of Alaska) at Prudhoe Bay/Deadhorse. In this event local North Slope economies are likely to experience only a low increase in activity. This mild local impact would come from controlled transfer of some local residents from fishing to steady high-paying petroleum employment and from the relatively large increase in local taxable property implicit development. Thus, little net local employment, population, and social impact is forecast from petroleum development, although mild changes are possible.

For a general discussion of potential impacts to subsistence lifestyles, see the State of Alaska discussion. The population of this area is 87 percent native (about 3,480 people), many of whom rely heavily on subsistence. The Inupiat Eskimo people are familiar with oil development at Prudhoe Bay and with exploration on the National Petroleum Reserve. Residents of villages are dependent on village-wide whaling activity as a foundation of their socio-cultural system.

The water subsistence resources of the Beaufort Sea comprise seal, ugruk, walrus, bowhead whale, fish, ducks, and geese, which are susceptible to impacts from the transportation system (pipe and tankers) for both oil and gas development. The on-land subsistence harvest comprising grizzly and polar bear, caribou, moose, sheep, ptarmigan, fur bearers, bird's eggs, and berries is susceptible to accidents involving the crude oil terminals, and support/supply bases directly. However, enclave development should reduce the likelihood of adverse impacts to the above systems. Based on the type of subsistence harvest and the population of the villages and the fact that development already exists in this area, the sensitivity of the harvest to oil and gas development may be ranked approximately sixth of nine areas. (1=most sensitive, 9=least sensitive)

Navarin Basin

The risked mean oil and gas resources estimates for the Navarin sale area are 760 million barrels of oil and 2.84 trillion cubic feet of gas. By interpolating resource/employment relations generated for Sale #55 EIS scenarios, the following economic impacts can be estimated.

First, long-term direct employment would be around 1355, with peak employment (excluding an LNG plant) of 3775, and with early employment (third-year exploration) of 1040. If, as is likely, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enclaves and would have little effect on long-term employment levels or population impacts. The resident long-term employment figures would be 1330 (long-term), 1500 (peak), and 508 (exploration). These direct resident employment figures imply an increase in State or local property taxes of $5 million, increased long-term State direct and indirect employment of 6390, and increased long-term state population of 14,500.

From these estimates the following economic impact can probably be expected. First, the increase in State employment, population and economic activity would be moderate. Second, the local impacts to be controlled and eliminated to a large extent by offshore loading and enclave-type development including perhaps joint use of the St. George enclave, or one in the Cold Bay area. These types of enclaves are discussed under State of Alaska.

Massive short or long-term impacts are avoided, but a moderate quickening in the local economy is likely. This impact would come from controlled transfer of a limited number of local residents from fishing to steady high-paying petroleum employment and from the relatively large increase in local taxable property implicit in development. Thus, moderate employment, population, and social impact is forecast from petroleum development.

For a general discussion of potential impacts to subsistence lifestyles, see the State of Alaska discussion. The population in this area is 89% native (about 8,366 people). Most of them rely quite heavily on the subsistence harvest. They are unfamiliar with oil development.

The Navarin Basin water subsistence resources consist of tomcod and blackfish in the fall; blackfish, needlefish, ling cod, and smelt in the winter; herring and clams in the spring; and whitefish, seal, and walrus in the summer. Wild fowl and their eggs are also harvested. These sources are susceptible to accidents involving the transportation system (pipe and tankers) for both oil and gas development. The on-land subsistence harvest consisting of mink, rabbit, muskrat, berries, and some wood is susceptible to accidents involving the crude oil terminals, LNG facilities, and support/supply bases directly. Enclave development should make any accidents involving the above systems of milder impact.

Based on the type of subsistence harvest and the population of the villages in this area, the sensitivity of the harvest to oil and gas development may be ranked approximately fifth of nine areas. (1=most sensitive, 9=least sensitive)

Chukchi Sea

The risked mean oil and gas resource estimates for the Chukchi Sea sale area are 1280 million barrels and 3.96 trillion cubic feet, respectively. By interpolating from the high, low, and mean resource/employment relations generated for the sale #55 EIS scenarios the following economic impacts can be estimated.

First, long-term direct employment would be around 680 with peak employment (excluding an LNG plant) of 970, and with early employment (third-year exploration) of 480. If, as is likely, the natural gas is converted to LNG and transported by tanker, then construction of the LNG facility would roughly double the peak direct employment figure shown above. However, the direct employment in LNG facility construction would be a temporary change confined to enclaves and would have little effect on long term employment levels or population impacts. The resident long-term employment figures would be 620 (long-term), 690 (peak), and 140 (exploration). These direct resident employment figures imply an increase in State or local property taxes of $38 million, increased long-term State direct and indirect employment of 6800, and increased long-term state population of 5800.

From these estimates the following economic impact can probably be expected. First, the increase in state employment, population and economic activity would be small and positive. Second, the local impacts of peak employment on local communities including Kotzebue (pop. 4900) are expected to be controlled and eliminated to a large extent by enclave-type development, as previously discussed for other Alaska areas. A mild increase in the local village enconomies is likely. This local impact would come from controlled transfer of a limited number of local residents from fishing to steady high-paying petroleum employment and from the relatively large increase in local taxable property implicit in development. Thus, little net employment, population, and social impact is forecast from Chukchi Sea petroleum development, although mild changes are possible.

For a general discussion of potential impacts to subsistence lifestyles, see the Gulf of Alaska discussion. About 87% of the population in this area is Native. Most of these people (about 1,500 persons) rely heavily on the subsistence harvest. Whaling is an important activity. The people are not familiar with oil development.

Salmon, tomcod, flounder, whales, and waterfowl are the water subsistence sources of the Chukchi Sea area. These sources are susceptible to oil spills, including those involving the transportation system for both oil and gas development. The on-land subsistence harvest consisting of polar bear, caribou, and ptarmigan is susceptible indirectly to adverse environmental impacts as a result of crude oil terminals, LNG facilities, and support/supply bases. Enclave development should help to mitigate potential impacts to the above systems. Based on the type of subsistence harvest and the population of the villages in this area, the sensitivity of the harvest to oil and gas development may be ranked the most sensitive of the nine Alaska areas.

4. Impact on Other Management Plans

Coastal Zone Management: States with approved CZM (306) programs will review OCS exploration and development plans as well as certain pre-lease activities to ascertain whether federally licensed or permitted activities covered in the plans, and affecting land and water uses in the coastal zone, are consistent with their respective CZM programs. Should a State object to a plan, the Department of the Interior is prohibited from issuing any license or permit for any of the activities described in the plan. The Secretary of Commerce can, however, override the State's objection through a finding that the activity described in the plan is consistent with the objectives of the Coastal Zone Managaement Act of 1972 (as amended) or is otherwise necessary in the interest of national security.

State CZM plans may restrict the placement of pipelines, refineries or other support facilities in areas of particular environmental concern, and may set standards for their placement elsewhere. However, some provision for their appropriate location is required by the CZM Act, as amended.

In addition to the procedural requirements for coordination and consistency, the Fèderal CZMA established the Coastal Energy Impact Program (CEIP) to help coastal states and local communities better cope with the potential and actual impacts of OCS and other energy development activities. The CEIP includes: grants for planning for social, economic and environmental consequences of expected energy development; financial assistance for new or improved public facilities and services; and grants to ameliorate damage to recreational or other environmental resources when the responsible party cannot be found or charged with damage.

Marine Sanctuaries: Any person may recommend a site for a marine sanctuary. Within three months of receiving a recommendation, NOAA must analyze it and decide whether to place the site on the List of Recommended Areas (LRA). Active Candidates are selected from the sites on the LRA based on criteria found in the regulations. Within six months after selection as an Active Candidate, public workshops are held. Within 90 days after the workshops, a decision is made regarding whether or not the site will remain an Active Candidate. If not, a notice in the Federal Register specifying the reasons is published. If so, a DES is prepared containing a draft designation document and draft regulations. The process continues with public review and consultation both before and after revision of the DES, before the decisions on whether or not to designate the site as a marine sanctuary and what regulations will apply are made.

Revised regulations implementing the Marine Sanctuary program took effect July 31, 1979. Two sanctuaries have been designated to date, both in 1975. Seven sites are presently considered Active Candidates and these are discussed under the leasing region in which each is located. The initial LRA contained 68 sites. If any site should receive sanctuary status, regulations of oil and gas activities may be totally prohibited at one extreme or there may be no additional controls beyond those currently in effect.

North Atlantic

Coastal Zone Management: Presently, Maine, Massachusetts, and Rhode Island have approved Coastal Zone Management Programs. It is anticipated that by the end of 1980, New Hampshire and Connecticut will also receive approval.

Maine generally supports oil and gas exploration and development on Georges Bank due to the positive stimulus that such development would have on certain sectors of the economy of New England and Maine, provided that drilling takes place with maximum safeguards for the environment and other resources of the area. Maine will seek these environmental safeguards through applying the consistency criteria embodied within its approved CZM Plan. Proposed activities are consistent if they can meet the standards and conditions of the eleven core laws which make up the Maine Program. These laws regulate land use in the coastal zone, air and water quality, the coastal conveyance of petroleum, and marine resource management.

OCS development is seen by the Commonwealth of Massachusetts as a possible means of providing resources of oil and gas to New England. The Massachusetts CZM Program will allow this development if special care is exercised to avoid harm to the beneficial resources of the coast. The most important of these are the fishery resources of coastal waters (including known spawning areas and traditional fishing grounds); the quality of coastal waters which serves to maintain the health and harvestability of coastal fisheries and which provides recreational benefits; wildlife wintering, nesting, and migratory stopover areas; and the recreational resources of the coast, particularly bathing beaches. The program places a heavy emphasis on the promulgation of regulations for several separate regulatory programs. These regulations involve: energy facility siting, coastal wetlands licenses, water quality certification for dredging and disposal, and ocean sanctuaries.

The Rhode Island program encourages the development of OCS oil and gas resources provided that certain policies discussed in the approved program, and elaborataed upon in the State Energy Amendments, are adhered to. These policies regulate the siting, construction, alteration and/or operation of petroleum processing, transfer or storage facilities and power generating facilities within the State which require a permit from the Council. An application for one of these facilities must provide reliable and probative evidence that the proposal will not: 1) conflict with any Council plan or program; 2) make any area unsuitable for any uses or 3) significantly damage the environment of the coastal region. The program document includes a section on the development of a facilities plan for the Davisville-Quonset Point Area, which is presently being used as a support base for Mid-Atlantic OCS operations.

Marine Sanctuaries: Eleven sites in the North Atlantic have been placed on the List of Recommended Areas. These sites range from coastal areas (Nantucket Shoals, Jeffrey's Ledge, Stellwagen Bank) to offshore areas as large as Georges Bank. Georges Bank has received consideration as an Active Candidate. An issue paper was distributed on the proposal in July 1979 and public workshops were held in August. In September, NOAA, EPA and the Interior Department agreed on a variety of safeguards to increase the protection of the rich biological resources of the Bank and their habitats. Consequently, a decision was made to withdraw Georges Bank from the list of Active Candidates because NOAA determined that these safeguards and existing regulatory mechanisms were sufficient to fully protect the values of the area.

Fishery Management Plans: Fishery management plans have been adopted for such surf clam and ocean quahog, groundfish including cod, haddock and yellowtail flounder and Atlantic herring. The squid, Atlantic mackerel and butterfish plans are in the final stages of review and lobster, bluefish, and shark plans are being written. There should be no increased interaction between foreign commercial fishermen and OCS oil and gas activities in the North Atlantic. The foreign fishery is restricted to a small portion of the southern edge of Georges Bank. A change may occur as a result of a proposed fishing agreement between the United States and Canada. Much of the Northeast fishery would be open to the Canadians, and on Georges Bank, they would fish primarily for scallops. Any loss of scallop grounds because of space removal would then affect both the U.S. and Canada.

Navigation Schemes: Designated port access routes do not as yet exist for the North Atlantic OCS area. Existing traffic separation schemes, which a established as a means of routing vessels to assure safe navigation, exten through areas which may be considered for leasing. When studies of vessel traffic density and the need for safe access routes are completed by the U.S. Coast Guard, proposed access routes or other ship routing measures ma be promulgated. Such measures may impose restrictions on the exploration and development of specific lease areas. However, it is anticipated that the navigation schemes in these areas can be adjusted to accommodate the needs of oil and gas operations and reduce conflicts between navigation an industry.

Mid-Atlantic

Coastal Zone Management: Presently, New Jersey (Bay and Ocean Shore Segment), Delaware and Maryland have approved Coastal Zone Management Programs. It is anticipated that by the end of 1980, New York, New Jersey, (balance of coastal zone), and Pennsylvania will also be approved. Virginia was unable to get its coastal legislation passed, and due to other program shortcomings, OCZM terminated its funding of Virginia's program on March 31, 1979.

New Jersey's program generally encourages OCS development as long as all related onshore activities do not conflict with existing land uses and are conducted in accordance with the policies of the program. Onshore activities for development and production of offshore hydrocarbons must be carried out according to specific energy facility policies which relate to the need for and acceptability of all proposed new or expanded coastal energy facilities. The Bay and Ocean Shore segment of the program has stated that while pipelines, pumping and compressor stations would be permitted within the actual segment areas, oil and gas facilities should ideally be located outside the segment on sites such as those adjacent to Raritan Bay.

The Delaware program has developed several specific policies with regard to OCS oil and gas development. While the coastal management program is generally supportive of OCS development and the potential need for the construction of related facilities in the State of Delaware, key policies regulate: 1) the location of new petroleum refineries, prohibiting them in the coastal strip, but allowing them inland; 2) the case-by-case consideration of OCS oil and gas exploration in Delaware waters to ensure that there is adherence to strict environmental safeguards; and 3) the siting of oil and gas pipelines with a prohibition of their terminating in the coastal strip. The State is also encouraging the development of existing port areas, such as Wilmington and Lewes, for OCS support base activities.

The location of oil, natural gas, and OCS-related facilities in Maryland's coastal counties is regulated by the Coastal Facilities Review Act and is administered by the Tidewater Administration in conjunction with other State agencies and local units of government. Facilities covered under this act include natural gas facilities, pipelines, intermediate oil production terminals or refineries, oil and gas storage facilities, operation bases, and fabrication yards. These facilities must receive certification from the Maryland Department of Natural Resources before construction may begin. While no OCS facilities have been specifically prohibited under the Maryland program, certification for construction will not be granted unless specific standards are met. These standards include conformity with air, water, noise and solid waste laws, local land use planning regulations, and the assurance that the facility would not overburden the surrounding infrastructure and environmental setting.

Marine Sanctuaries: Fifteen sites in the Mid-Atlantic have been placed on the List of Recommended Areas for marine sanctuary designation, although there are presently no Active Candidates in this region. Recommended sites include the Assateague Island Seashore and the offshore underwater canyons: Hudson, Wilmington, Baltimore, Washington, and Norfolk.

Fishery Management Plans: Management plans are currently in effect for Atlantic groundfish (including yellowtail flounder, haddock and cod), Atlantic herring, and the surf clam and ocean quahog fisheries. Plans for mackerel and squid fisheries are imminent. In the Mid-Atlantic, conflict will be particularly intense between foreign fishermen and the oil and gas industry in restricted areas where foreign fishermen must conduct all of their fishing activities. Because of language barriers, these conflicts may be particularly serious, resulting in increased danger not only for the fishermen but also for rigs and platforms.

Navigation Schemes: Designated port access routes do not as yet exist for the Mid-Atlantic OCS area. Existing traffic separation schemes, which are established as a means of routing vessels to assure safe navigation, extend through areas which may be considered for leasing. When studies of vessel traffic density and the need for the safe access routes are completed by the U.S. Coast Guard, proposed access routes or other ship measures may be promulgated. While such measures may impose restrictions on the exploration and development of specific lease areas, it is also anticipated that the navigation schemes in these areas can be adjusted to accommodate the needs of oil and gas operations and reduce conflicts between navigation and industry.

<u>South Atlantic/Blake Plateau</u>

Coastal Zone Management: Both North and South Carolina's programs have been approved; Georgia formally withdrew from the program in June 1979; Florida hopes to receive approval of its program by the end of 1980.

North Carolina has developed five management policies regarding OCS oil and gas development. These are: 1) to support an approach to offshore oil and gas exploration which will provide an adequate supply of energy while protecting the public environmental, social and economic interests in coastal and offshore areas; 2) that the State will take an active role in the OCS decision process in the review and comment on all OCS lease stipulations and operating orders prior to their approval; 3) that it is State policy to protect the public interest in natural oil and/or gas by establishing regulations to prohibit waste, compel ratable production, and protect the environment; 4) that the Department of Natural Resources and Community Develoment must be contacted and a permit issued before any oil or gas well drilling may proceed within the three mile State jurisdiction, and; 5) that discharges of oil upon any waters, tidal flats, beaches or lands, or other waters that drain into State waters is prohibited.

South Carolina has a series of energy resource policies by which the Coastal Council will evaluate proposed energy and energy-related facilities, including those associated with OCS exploration and development, to ensure consistency with the coastal management program. These policies include the fact that non-water dependent energy and energy-related facilities are prohibited from locating along the shorefront unless no feasible alternative is available or an overriding public interest can be demonstrated, and any substantial environmental impact can be minimized. The expansion of existing energy facilities is preferred to the development of new sites; and all pipelines through the coastal zone will be laid in pipeline corridors to be developed in coordination with the Coastal Council.

Marine Sanctuaries: Two marine sanctuaries have been designated, both in 1975. One contains resting place of the U.S.S. Monitor, a Civil War iron-clad vessel which sank in 1862 off Cape Hatteras, North Carolina. Management emphasis is on preservation of the Monitor. After a comprehensive diving expedition in August 1979, it was determined that the wreck is too fragile to be raised. The other marine sanctuary is off Key Largo, Florida, where management emphasis is on enforcement for the protection of a 100-square mile coral reef area.

Gray's Reef (off Georgia) has been placed on the list of Active Candidates. If approved, the management emphasis is expected to be on coordination of research, protection of habitats and coral reefs, and promotion of recreational use.

Fisheries Management Plans: There are no fisheries management plans in effect in the South Atlantic. However, plans are currently being developed for the following species: snapper-grouper, callico scallop, billfish, and swordfish (with Gulf of Mexico Council).

Gulf of Mexico

Coastal Zone Management: Alabama's program received approval in 1979. Mississippi, Louisiana, and Texas all expect to receive program approval in 1980, although Mississippi's 305(d) grant was temporarily suspended, effective December 15, 1979.

Alabama, in its Coastal Area Management Program, has considered the national interest in energy and has incorporated provisions to assure that in development of the coastal area, adequate consideration is given to such uses as the establishment of harbor facilities for the receiving of oil, gas and other commodities from ships and tankers, and pipelines from such ports. Two coastal resource use policies deal directly with energy-related activities in the coastal area. One, on coastal development, states that the Coastal Area Board will encourage and support the continued development of the economic resources of the coastal area, including the port, industrial, energy and recreational resources; the other encourages the extraction of mineral resources in coastal Alabama. Proposals to site energy facilities in the coastal area will be reviewed based on a project's impacts on coastal resources and its compliance with all relevant operational rules and regulations adopted by the Coastal Area Board.

Marine Sanctuaries: The East and West Flower Garden Banks located 90 miles south of Sabane pass are now being considered as an Active Candidate for designation as a marine sanctuary with management emphasis on the preservation of the coral banks community. The proposal as it now stands would apply more restrictions to a larger area than are currently applied by OCS regulations and stipulations. A key feature would be a 5-year moratorium on all oil and gas activities on blocks leased after sanctuary designation. OCS oil and gas development activities adjacent to the sanctuary are not expected to have a significant adverse impact on the living resources of the Flower Garden Banks. Existing leases in the Flower Garden Banks vicinity carry strict stipulations controlling the location of drilling and structure placement, and discharge of drilling material, as well as requiring monitoring.

Another Active Candidate is Looe Key, Florida, which is located between Big Pine Key and Key West. If approved, the management emphasis is expected to be on recreation and preservation of the coral reef, habitats, and natural values.

Fisheries Management Plans: The only fisheries management plan in effect in the Gulf is for the Stone Crab, and it is confined to the eastern Gulf. No conflict between the management plan and the leasing schedule is anticipated. Currently, fisheries management plans are being developed for shrimp and coral (with South Atlantic Council), reeffish, groundfish, shark, spiny lobster and coastal herrings.

Deepwater Ports: OCS oil and gas activities resulting from the five-year leasing plan are not expected to adversely impact deepwater ports planned or under construction in the Gulf of Mexico. Structures may be erected adjacent to fairways, anchorages, or safety zones associated with deepwater ports, however, such locations will be in accordance with applicable regulations and accepted safety standards. The amount of seabed removed from potential oil and gas development by deepwater ports is not considered significant.

Southern, Central and Northern California

Coastal Zone Management: Both the Federal Coastal Zone Management Act of 1972 and the California Coastal Zone Act of 1976 have the same goal: establishing a sound management program for the coastline utilizing the coordinated efforts of all appropriate government agencies, with the management program based on a comprehensive coastal plan evolved through a process employing maximum public participation. On November 7, 1977, the California Coastal Zone Management Program (CCZMP) was approved by the Office of Coastal Zone Management. The consistency portion of the CCZMP was contested in Federal Court and finally resolved in August 1978.

The 1976 (State) Coastal Act, which was based on coastal plan recommendations, provides for the conservation and development of California's 1,100-mile coastline. It establishes a State/local partnership, seeking to assure that public concerns of statewide importance are reflected in local decisions about coastal development. The Coastal Act implements State policies covering such matters as public access to the coast, coastal recreation, the marine environment, coastal land resources, and coastal development, including industrial development. The siting criteria for outer continental shelf oil and gas related development is contained within standards for energy facility siting. Each local government along the coast (15 counties and 54 cities) will use these policies in developing its own local coastal program. These local coastal programs entail developing land use plans, zoning maps and other actions which, when combined, are intended to implement the provisions of the Coastal Act. Local governments must submit their local coastal programs to the Coastal Commission for certification prior to January 1, 1981, the date by which all local coastal program must be certified.

The California program addresses the siting and development of tankers terminals, oil and gas production facilities, refineries, petrochemical plants, and LNG terminals. The set of policies related to energy facilities siting stress that energy-related industries should be located adjacent to similar existing industries and as far inland as possible to protect coastal resources and coastal access. If it is not possible for a coastally-dependent industrial use to locate or expand within existing industrial sites, the tradeoff between sites and relative environmental damage must be evaluated.

Marine Sanctuaries: Three sites off the California coast are Active Candidates for marine sanctuary status. They are: Northern Channel Islands and Santa Barbara Island, west of Los Angeles; Point Reyes/ Farallon Island, north of San Francisco Bay; and Monterey, south of San Francisco Bay. Management emphasis for the Northern Channel and Santa Barbara Islands proposal is geared to preservation of unique assemblages of marine flora and fauna with special emphasis on marine mammals. For the Point Reyes/Farallon Islands site, management emphasis would be on preservation of marine mammals and fisheries resources, complementing already protected land areas, and for the Monterey area, management emphasis would be on recreation and preservation of marine mammal habitats and ecosystems for education purposes. At issue is the proposed restriction of OCS oil and gas activities. Options under consideration range from prohibiting new leasing within designated sanctuaries to allowing development with stricter controls or with the existing controls. Decisions by NOAA on whether to seek sanctuary designations for these areas expected by the end of 1980 or shortly thereafter--prior to sales included in the proposed schedule.

The State of California has established a State program under which areas are designated specifically for removal and/or protection from man-induced activities. These include marine parks and oil and gas sanctuaries. In oil and gas sanctuaries, oil and gas development is prohibited, while other activities are not regulated. Potential impacts to these State areas would be of a similar nature to those which might occur to Federal marine sanctuaries.

The introduction of possible impacts from OCS development to existing and proposed sanctuaries could infringe on the basic justification for the sanctuary or park designation, in addition to impacts to the value of the areas in purely ecological terms. The types of activities that could affect these managed areas include oil spills and pipelines. The most significant impact to these areas from OCS development is likely to be from oil spills which may physically and/or chemically damage biota a shoreline. The construction and operation of offshore and onshore facilities can usually be located outside of these sanctuaries. If large Federal marine sanctuaries are established, such as the one proposed for Santa Barbara Channel, multiple use conflicts involving oil and gas development, fishing and boating, could occur, if traditional uses of the area are excluded or tightly regulated.

Fishery Management Plans: Fishery Management Plans (FMP) have been written for nine species, or species groups, which occur off the California coast. Eight of the plans were prepared by the Pacific Fishery Management Council, headquarters in Portland, Oregon and one (Billfish FMP) is being jointly prepared with the Western Pacific Fishery Management Council in Honolulu, Hawaii. The Salmon FMP and Anchovy FMP have both been approved and are in effect. The plans for other species are in varying draft stages. No conflict between these FMPs and the proposed leasing schedule are anticipated.

Ports: Ports to handle large tankers (up to 165,000 dead weight tons) in place of small tankers (27,000-40,000 dwt.) would reduce the traffic created by the small tankers. Presently, the Port of Long Beach is considering expansion of the port to handle larger oil tankers. Port expansion would reduce the supertankers lightering off San Clemente Island and shuttle tanks between the supertankers and the port. Reduction in ship traffic would decrease the probability of tanker-platform related accidents.

A proposed liquified natural gas (LNG) facility at Point Conception could create, in the immediate vicinity of the LNG facility, the possibility of accidents between th LNG tankers and the oil related activities. Any such accident would result in a significant safety hazard, due to the volatile nature of LNG.

Other deepwater Southern California port sites that have been suggested, include: offshore Port Huenehe, offshore Encina, and expansion of Los Angeles Harbor. The deepwater port sites and marine terminals that have been suggested to handle central and northern California OCS development activities are Richmond, Central San Francisco Bay, offshore Golden State and offshore Moss Landing.

Navigation Schemes: Traffic separation schemes (TSS) improve safety by separating opposing streams of ship traffic and organizing ship traffic through hazardous areas. TSS consists of opposing traffic lanes, separation zone between these lanes, and precautionary areas at entrances to main ports. Collisions between ship and oil and gas exploration and development vessels could result in loss of human lives, environmental damages, and air pollution from an oil spill, and economic losses. Placement of exploratory drilling vessels are not presently limited on a within the separation zone. However, placement of vessels and structures could be limited within the TSS in the future.

In the southern California area, there are two established TSS; these are: Point Conception to Point Fermin, about 120 nautical miles (nm); and Gulf of Santa Catalina; about 19 nm long. These TSS would effect oil and gas development on approximately 247,000 acres within the traffic lanes, and about 247,000 acres within the separation zone.

In central and northern California there is a proposed TSS, which extends about 500 nm from Point Conception to the California-Oregon border with entrances to Humboldt Bay, San Francisco Bay, and Estero Bay. This TSS could effect about 849,000 acres within the traffic lanes, and approximately 849,000 acres within the separation zone. It is outside the Sale #53 area.

Ocean Thermal Energy Conversion (OTEC): The Ocean Thermal Energy Conversion (OTEC) Program (see Section I.B.5.f.) is presently limited to pilot studies in Hawaiian offshore wataers, which would not be impacted by the 5-year OCS leasing schedule. Should OTEC projects expand into the Pacific OCS region, it has the potential for interference only in the deepwater (greater than 2,000 ft.) areas.

Deepsea Mining: Impacts that oil and gas development have on deep ocean mining include the positive impact of expanding oil and gas development related surveys by both Federal agencies and private industry which favor the discovery and evaluation of marine hard mineral deposits. The negative impacts are related to space use conflicts in offshore extraction and possibly for onshore processing and support facilities. Potential hard mineral recovery sites which might be impacted by development in conjunction with the 5-year oil and gas leasing schedule include: gold and heavy mineral sand deposits bordering northern California, sand and gravel recovery sites in San Pedro Bay and offshore San Diego, phosphorite mining in the area of Tanner and 40-mile banks.

Alaska

Coastal Zone Management: The State of Alaska, as a consequence of the July 1979 approval of its coastal management program (ACMP), has a set of standards regulating land and water uses in the State's coastal zone. These standards were developed in response to a requirement of the Alaska Coastal Zone Management Act (ACMA), which also mandated local planning by coastal communities with planning and zoning authorities.

A provision of the ACMA allows the Alaska Coastal Policy Council to direct the Lieutenant Governor to hold local elections to decide on the formation of a coastal resource service area in an area where it appears that major economic development activity will occur. The coastal resource service area would be formed in the unorganized borough only for the purposes of coastal planning. Major economic development activity is defined in part as including a Call for Nominations by the Secretary of the Interior for leasing of tracts in waters of the outer continental shelf adjacent to the coastal resource service area.

The Alaska Coastal Management Act recognizes the importance of the national interest in Alaska's coastal zone by including uses and facilities that are of national significance in its definition of "uses of State concern." Uses of State concern cannot be unreasonably or arbitrarily restricted in or excluded from the coastal zone. Included in this definition are resources and facilities that contribute to meeting national energy needs. Oil and gas development therefore must be accommodated in the ACMP and by local governments in the preparation of their respective district programs.

If, as a result of leasing and exploration, commercially producible quantities of oil and gas are found, and a decision is made to bring them onshore, then there will be direct impacts on Alaska's coastal zone, since in all proposed sales except Cook Inlet and Beaufort Sea, new facilities for support, transportation, and in some cases, processing, would be required. There are 16 specific standards relating to the siting of energy facilities which include the requirements that these be consolidated and be on sites which have sufficient acreage for expansion, as well as requirements to minimize environmental problems and conflicts with transportation and shipping. The districts and the States are obligated to identify suitable sites for energy facilities, with the actual decision to build left to the private sector.

In addition to the energy facilities section, the ACMP has sections on habitat protection and on subsistence, the latter of which states that districts may designate subsistence zones in which subsistence uses and activities have priority over all non-subsistence uses and activities.

Marine Sanctuaries: While 13 sites in Alaska have been placed on the List of Recommended Areas, none is being considered as an Active Candidate. The proposals range from broad areas such as the Beaufort Sea to discrete areas containing unique habitats and/or resources.

Fishery Management Plans: Fishery management plans have been written or are under consideration for troll salmon, king, tanner and dungeness crab, clams, shrimp, halibut, comprehensive salmon and scallops. These plans will apply to all Alaska offshore regions. No conflict is anticipated between these fishery management plans and the proposed leasing schedule.

Gulf of Alaska

Coastal Zone Management: While the ACMP covers the coastal zone statewide, there will be no regional Gulf of Alaska plans and possibly only one district program (Yakutat) near the sale area in place at the time of the Gulf of Alaska sale. Yakutat is anticipated to receive most of the onshore impact from the sale and expects to have a district coastal completed prior to the sale, to be able to control and direct any impacts resulting from it. However, with the exception of Yakutat, the adjacent shorelands are in the unorganized borough, i.e., where there is no local government, and consequently no local planning and zoning expertise. Local planning carried out under the CZM program would provide a planning framework in these areas.

Fishery Management Plans: In addition to the statewide plans mentioned above, a Gulf of Alaska plan has been written for all groundfish species.

Kodiak

Coastal Zone Management: The two jurisdictions that would be impacted by this sale are the Kodiak Island Borough and the Kenai Peninsula Borough. The tracts to be offered for sale are in close proximity to Kodiak and Afognak Islands.

The Kenai Borough has a local coastal program underway, whereas the Kodiak Borough does not. The Kenai Borough has generally been receptive to oil and gas activities and facilities, and the Kodiak Borough has the OCS Advisory Council looking at impacts and the ramifications of holding the sale. In any case, the regulatory provisions of the ACMP, which require accommodation of oil and gas facilities, apply.

Cook Inlet

Coastal Zone Management: The jurisdiction that would be impacted by this sale are the Kodiak Island, Kenai Peninsula, Matanuska-Susitna and Anchorage Boroughs. The tracts to be offered for sale are in lower Cook Inlet and the northern portion of Shelikof Strait.

With the exception of the Kodiak Borough, all of the above mentioned have local coastal programs in progress. Anchorage will probably have a completed program in 1979, the Mat-Su Borough in 1980 and the Kenai Borough in 1981. It is not known whether the latter two will be through the approval process by the time of the sale. The regulatory provisions of the ACMP, which require accommodation of oil and gas facilities, apply in any case.

Norton Basin

Coastal Zone Management: With the exception of Nome (a first class city), and several native villages (ineligible to be funded) the entire shoreline adjacent to the Bering-Norton Sound sale area, including St. Lawrence Island, is in the unorganized borough. There has been some interest shown in the Bering Strait region to form a coastal resource service area, which, under the provision of the ACMP, would allow the area to develop its own coastal plan.

An overall development strategy for the region is in the formulation stages, and both Nome and Teller have in the past submitted applications for coastal energy impact program funding. However, to date, no action has been taken by communities in this area to become eligible to apply for OCS planning funds. The region would be ill-equipped to deal with oil and gas activities locally in the absence of a regional comprehensive land use or CZM plan. The provisions of the ACMP will apply, however.

St. George Basin

Coastal Zone Management: With the exception of Unalaska (a first class city), and several native villages, the Aleutian Islands which form the southern edge of the St. George Basin, are in an unorganized borough. There has been some interest in organizing a coastal resource service area that would include the chain and the Alaska Peninsula west of 160°W (the latter area bordering the Northern Aleutian Shelf), but so far no action has been taken to become eligible for CZM planning funds. The Aleutian Islands are mostly national wildlife refuge lands now, but there are native land claims on them. The extent to which the region would be ready to deal with oil and gas activities in the absence of a regional comprehensive land use or CZM plan is uncertain. The provisions of the ACMP will apply, however.

Beaufort Sea

Coastal Zone Management: The North Slope Borough is presently nearing completion of a coastal program for its Prudhoe Bay segment and will extend its planning effort to cover the Arctic National Wildlife Refuge and the National Petroleum Reserve-Alaska in that order. The present proposed plan is geared toward the strictest preservation of the environment, while attempting to provide for the national interest in energy facilities. The next two segments will undoubtedly follow suit in terms of borough policy.

The North Slope will be ready to deal with onshore oil and gas facilities, but to what extent they will be permitted is unknown.

Northern Aleutian Shelf

Coastal Zone Management: As discussed for the St. George Basin there are no plans presently for any coastal management planning in the Aleutians or on the Alaska Peninsula. Unimak Island east to the 160°W line on the Alaska Peninsula marks the southern boundary of the Northern Aleutian Shelf.

There are no first class cities on th Bristol Bay side, and King Cove is the only such city in the immediate area. It is possible that the region could be ready to deal with onshore impacts of oil and gas activity through a coastal resource service area planning program, if such a program were initiated fairly soon.

Fishery Management Plans: In addition to the statewide plans mentioned above, a plan has been written for all groundfish in the Bering Sea and Northern Aleutian Shelf region.

Navarin Basin

Coastal Zone Management: This area only borders the shoreline west of 165°W on the Yukon-Kuskokwim delta, and includes Nunivak Island.

A coastal resource service area has been formed on the Yukon-Kuskokwim delta, between Pastol Bay and Cape Peirce. This area is eligible to receive coastal planning funds and will begin its planning effort once a service area board has been elected to oversee the planning effort. Because of considerable interest in this area in coastal zone management, a local CZM plan should be ready at the time of this sale.

Chukchi Sea

Coastal Zone Management: The coastal zone adjacent to the Chukchi Sea sale area includes the area from Cape Lisburne to Franklin Point. There are no first class cities in this area, and only a few native villages, but the area is included in the North Slope Borough. Phase IV (the last phase) of the borough's CZM planning will address this area. It is not known when this planning will commence; however, the proposed sale in the Chukchi is not scheduled until 1985. The present North Slope CZM plan for the Prudhoe Bay area is geared toward strict environmental preservation and to what extent this philosophy will be carried over, or oil and gas facilities would be permitted, is unknown.

Fishery Mangement Plans: In addition to the statewide plans mentioned above, a plan has been written for herring in the Bering-Chukchi region.

5. Availability of Information

As discussed in Section I.B.2.a(4), the Bureau of Land Management initiated an Environmental Studies Program in 1974. Within this program, studies are designed and implemented to provide information for various steps in the pre-leasing and post-leasing decisionmaking process. Following is a summary of the status of information availability, by leasing area, resulting from the studies program. Detailed information concerning identification of information needs, decisions which these needs are related to, and timing of identified studies, are included in Regional Studies Plans available from BLM's OCS offices (see Appendix 5 for locations).

North Atlantic

In order to obtain data and information for proposed OCS Sale #42, held in December, 1979 and anticipated future sales, environmental studies for the North Atlantic have been funded since 1974. Initial study efforts were designed to provide a broad overview of existing geological, biological and physical and oceanographic parameters and biological resources. Later studies have been and are planned to focus on site-specific resources, on establishing effects of petroleum development on specific resources, and on developing appropriate mitigating measures for offshore oil and gas operations. Information needs include a better understanding of engineering constraints posed by geologic conditions, information concerning the distribution, and composition of endangered species habitats, and canyon and slope fauna, and processes.

It is anticipated that the results from studies designed to obtain this information will be available for use in decisions for Sales #52 and #82 and in most cases will be available for inclusion in environmental statements.

Mid-Atlantic

The Mid-Atlantic Environmental Studies Program was also initiated in 1974. Since then, two OCS oil and gas lease sales have been held. The status of the studies program and information availability is similar to that of the North Atlantic. While some information related to post-sale transportation decisions is not expected to be available prior to proposed Sales #59 and #76, other information needs identified are expected to be satisfied prior to these sales. In most cases, the information will be available for use in environmental statement analyses.

South Atlantic/Blake Plateau

In the South Atlantic, one OCS Sale (#43) has been held. Initial study efforts in this area have provided a broad overview of geologic and oceanographic conditions, and biological and other resources. The significant information needs for this area include the location of hard bottom habitat, endangered species abundance and distribution, the identification of engineering constraints, the acquisition of physical oceanographic data for trajectory model input for the Blake Plateau portion of the area, and the likelihood of affecting archaeological resources.

These information needs are addressed in the FY 1980-81 Regional Studies Plan and in ongoing studies, and focus mainly on defining mitigating measures needed to allow development with minimal adverse environmental consequences.

Information will be available on endangered species and geological hazards prior to the final environmental statement for Sale #56 and prior to the initiation of actions on Sale #78. Sufficient information is available for trajectory modelling for the South Atlantic area, and planned FY 1980-81 studies should provide such data for the Blake Plateau area in time for use in a trajectory model for the environmental statement; other information will be incorporated into the decisionmaking process as it becomes available.

Concern has been expressed regarding the lack of physical-meteorological information for the Blake Plateau, especially as proposed Sale 56 tentative tract selection resulted in some tracts on the Blake Plateau being selected. The Fiscal Year 1980 Regional Studies Plan for the area includes the third year of the South Atlantic Physical Oceanography Field Study, which includes a summer 1980 hydrographic cruise over the Blake Plateau. Recently, the 1980 Regional Studies Plan was modified to include a Blake Plateau bottom and mid-water current study. This modification was made in response to concerns raised by the South Atlantic States (the bottom and mid-water current study was originally planned for FY 1981). This second study will now coincide with the summer 1980 hydrographic sampling. Information from both of these studies will be available prior to the Notice of Sale for proposed Sale 56. Planned continuation of physical oceanographic and meteorologic data collection on Blake Plateau after FY 1980 will allow for three full years of data collection and analysis for the Blake Plateau prior to the proposed South Atlantic/Blake Plateau (Sale No. 78) Notice of Sale.

Gulf of Mexico

The Gulf of Mexico has a long history of oil and gas development and now contains very intensively developed areas such as the Texas-Louisiana Shelf as well as relatively undeveloped areas such as the West Florida Shelf. Information is needed to establish the effects of intensive development and to prepare sufficient mitigating measures to prevent or offset any potential adverse impacts.

Significant information needs include a circulation model, and certain data for the model; the distribution of endangered species and birds; chemical, biological and archaeological characterizations of developed and undeveloped areas; the interrelationships between OCS development and commercial fishing stocks and activities, and recreational activities; and a better understanding of the engineering constraints in various high risk areas.

These needs are addressed in the FY 1980-81 Regional Studies Plan as well as through ongoing studies. These studies will allow for interpretation of the seriousness of previous impacts as well as the planning for mitigation of potential future impacts.

Southern California

Offshore southern California, especially the Santa Barbara Channel and State tidelands, has a history of petroleum development. Two OCS sales have taken place since the environmental studies program was initiated. As in other non-frontier areas, initial studies have provided an overview of the marine environment and ecosystems, and studies currently underway or planned focus on site-specific resources. Information needs identified include biological and geologic aspects of coral banks, geologic surveys of offshore ridges, and distribution and numbers of marine mammals and seabirds. These information needs are addressed in studies underway and will be available for pre-sale analysis and use for proposed California sales.

Central and Northern California

Central and northern California does not have an extensive history of Federal OCS oil and gas leasing. However, proposed Sale #53 has been in the planning stages for two years and environmental study efforts were initiated in 1976. Needs identified include information on physical oceanography and meteorology, coastal ecosystems, seabird distribution, and nesting, marine mammal distribution geologic hazards and air pollution transport. These information needs are addressed in studies underway and most of these studies will be completed and available for use in pre-sale analyses and decisions. However, final reports will not be completed for a seabird nesting and seasonal use survey, and a marine mammal and seabird study. Field work for the first study is completed and a map of nesting sties are available for use in the draft environmental statement for proposed Sale #53. A draft final report will also be available. For the second study, a six month report will be available for use in the Sale 53 final environmental statement, but the final report is not expected until after the sale date proposed in Alternative 1.

Gulf of Alaska

In the Gulf of Alaska, there is an ongoing studies program. Study efforts began in FY 1975 concentrating in the Northeastern Gulf of Alaska study area, including those addressing background hydrocarbon and tract metal levels, geohazards and oceanographic and meteorologic conditions (climatic atlas). There has been one OCS sale in this area, and planning for proposed Sale #55 began in 1978. Significant information needs include certain data on seismic risks, oceanographic hazards, oil spill trajectories, commercial fisheries, birds, endangered species, coastal ecosystems and pollution effects. Geohazard information collected and analyzed by the Geological Survey will be available for use in the sale decision. Initial BLM-funded geohazard surveys will be completed and analyzed in early 1981 and will be available for use in post-sale decision regarding structure placement and design.

Information concerning numbers, distribution, and habitat of endangered whales, useful to assessment of potential impacts, is limited. Section 7 consultation required by the Endangered Species Act is being initiated currently and the biological opinion concerning potential jeopardy to the whales is not yet available. Planned studies on these marine mammals will be initiated in FY 80 and are anticipated to require at least a two year effort.

Other studies addressing information needed are expected to be completed by the proposed sale decisions or are primarily oriented toward post-sale decisions.

Kodiak

Information needed includes certain data on seismicity, tsunami risk, oil spill trajectories, endangered whales, the distribution of pelagic birds and demersal fisheries, plankton distributions, and pollution effects.

Proposed Sale #46 has been in the planning stage since 1978. Studies are ongoing to address data needs and most have been completed or will be completed prior to the sale decision. Studies addressing topics including sediment hydrocarbon analysis, geohazards and ocenaographic and meteorologic conditions (climatic atlas) were begun in FY 1975-FY 1976. While data will be available, BLM-funded geohazard studies will not be fully reported prior to the proposed sale. Fully analyzed geohazard information will be available for use for postsale decisions regarding structure placement or design. Additionally, geohazard information and evaluation performed by the Geological Survey will be available prior to the sale decision. Studies concerning endan gered whale species, to be initiated in FY 80, will not be completed prior to the sale, although preliminary information may be available.

Endangered species consultation required by Section 7 of the Endangered Species Act has been initiated only recently, and the biological opinion concerning potential jeopardy to the whales is not yet available.

Cook Inlet

One Federal OCS Sale has been held in Cook Inlet, and proposed Sale #60 is currently in the planning stage. Significant information needs include information on faults, vulcanism, seismicity, tsunamis, coastal currents and winds, oil spill trajectories, commercial fisheries, endangered species, coastal ecosystems, and pollution effects. Studies addressing these needs should be completed and available for inclusion in the final environmental statement.

Norton Basin

Information needed in the Norton Basin includes data on seismicity, seabed erosion, geotechnical properties of sediments, distributions of permafrost, ice gouging, ice forces, coastal winds, and currents, oil spill trajectories, endangered whales, fisheries, marine mammals, pollutant effects, and recreation and lifestyle. Studies to obtain this information are currently in operation. Some reconnaissance studies were completed through FY 1976, and detailed studies began in FY 1977. Adequate information should be available by the end of FY 81 on which to base sale decisions for a proposed 1982 sale. Additional information obtained through these studies will be utilized in postsale decisions, as it becomes available.

St. George Basin

Some reconnaissance level studies and data synthesis, as well as seismic studies covering the St. George Basin have already been accomplished. Information required in the St. George Basin includes certain data on faults, coastal winds and currents, oil spill trajectories, endangered species, commercial fisheries, marine mammals, and birds.

Studies to address these information needs are being initiated and most should be completed prior to the proposed sale decision. BLM geohazard studies may not be completed and evaluated prior to completion of the final environmental statement. Geological Survey geohazard information should be available at that decision and both sets of data should be available for post-sale decisions.

Wind and other meteorologic and oceanographic data is planned to be collected. Collection and analysis would require two plus years (beginning in FY 1980) and may not, therefore, be completed in time for use in trajectory modelling for consideration in the development of an environmental statement. The living resources studies will be completed in 1983, but preliminary data will be available in 1982 for sale decisions and Section 7 consultation.

Beaufort Sea

Information needs include, for that portion outside the first lease (1979 Sale) area, data on the distribution of gas-charged sediments, sea ice hazards, coastal winds and currents, oil spill trajectories, endangered species, subsistence resources, exploration impacts, the effects of pollution, and socioeconomic impacts. Some of these studies will take three years to complete. It is anticipated that adequate information will be available in order to make sale decisions in 1982.

Northern Aleutian Shelf

As a result of previous scheduling of a Bristol Bay sale (June 1975 planning schedule) some reconnaissance level and data synthesis studies covering this area have been completed. Significant information needs include certain data on seismicity, faults, coastal circulation, commercial fisheries, endangered species, marine mammals and birds, socioeconomic conditions and trends and coastal ecosystems. The schedule prognosis is that the information required can be obtained prior to the decision for the sale proposed for October 1983.

Navarin Basin

Information needed in the Navarin Basin has been identified as including the distribution of contaminants, seismicity, faults, ice gouging, sea ice hazards, extreme oceanographic hazards, currents and winds, oil spill trajectories, endangered whales, commercial fisheries, socioeconomic trends and conditions and marine mammals and birds. The schedule prognosis is that the information needed could be acquired in time for the sale decision.

Chukchi Sea

In the Chukchi Sea, few detailed studies have been conducted. The area is covered by a climatic atlas and large scale ice hazard maps, and a chemistry effort was initiated in FY 77. Tentative permafrost investigations have also been undertaken. Significant needs are certain data on seismicity, faults, the distribution and engineering properties of permafrost, ice gouging, ice dynamics, extreme oceanographic events, storm surges, coastal currents and winds, oil spill trajectories, endangered species, sea birds and mammals, socioeconomic conditions and fisheries. Adequate time is available to obtain needed information for sale decisions for the proposed 1985 sale.

6. Unavoidable Adverse Impacts

a. Marine Habitats and Resources

In all proposed lease sale areas, minor decreases in primary productivity due to the mortality or functional impairment of plankton, benthic organisms, seagrasses and algae will occur in localized areas of high turbidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations. The possibility exists that toxic materials used in mud mixtures may adversely affect some marine organisms in localized areas when the drilling fluids and cuttings are discharged.

Disruption will occur if fresh oil spills reach sensitive biological features in all OCS leasing areas. Localized severe mortalities, probably selective, and functional impairment would probably occur, thereby altering the community structure for an unknown period of time.

Adverse impacts could occur to endangered and threatened species of marine mammals and birds. The most serious potential impacts would occur from major oil spills and chronic oil pollution. In leasing areas which have previously had endangered species consultations, concern for impacts to the right whale have been identified in the North and Mid-Atlantic and California regions, and for the manatee in the Gulf of Mexico.

b. Commercial Fisheries

Of the various types of fishing gear in use in the OCS areas, towed bottom gear such as trawls and dredges, as well as pots, have the greatest chance for operational conflicts with oil and gas activities. These conflicts are unavoidable in all OCS areas, as these fishing methods are common to all areas. However, losses can be compensated. Trawling operations suffer interference and inconvenience from oil and gas operations in several ways. Trawl nets can become snagged on underwater stubs, causing damage or loss of the nets. Pots can also be lost in this manner. In addition, it is conceivable that snags could damage underwater production equipment or pipelines, causing a spill of oil and gas. Because safety equipment is installed which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges and platforms are caught by fishing gear resulting in damage to the gear and/or its catch of fish; however, frequency of occurrence of this type of incident is low.

Commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species, rendering them unmarketable. This would be another adverse effect to commercial fishing.

Other adverse impacts include loss of fishing space caused by installation of unburied pipelines, rigs, platforms or by other OCS-related structures. There may be some localized severe competition for shore facilities.

Title IV of the OCS Lands Act of 1978 provides for the establishment of a Fishermen's Contingency Fund to compensate fishermen for losses sustained on the OCS because of oil and gas activities, if the losses cannot be attributed to a financially responsible party.

Leasing areas with comparatively high use conflicts with commercial fishing are the North Atlantic and Kodiak. Norton Basin, Chukchi Sea and Beaufort Sea all have low level conflicts. All other areas will have a moderate level of interaction between OCS activities and commercial fishing.

c. Coastal Habitats and Resources

Beaches, barrier islands, wetlands and other coastal ecosystems are located throughout the areas encompassed by the proposed sales. If any of these coastal areas are contaminated by oil, an undetermined amount of fish and wildlife habitat (primarily birds) will be damaged. It is possible that a large number of deaths, particularly to birds, fish larvae and shellfish, would occur should a large spill reach shore.

The unavoidable short-term impacts associated with trenching and backfilling for pipeline construction include the uprooting of all plants and non-motile animals in the path of the pipeline, thereby leaving a barren strip 9 to 12 meters wide. Some unavoidable damage may also be rendered to vegetation in adjacent areas by machinery used in the operation. The long-term impacts could include saltwater intrusion, changes in floral and faunal components and a possible increase in marsh erosion if a canal is not backfilled.

In the event of an onshore oil pipeline leak or spillage at onshore facilities, it is inevitable that the vegetation would be affected to an extent that would be dependent upon the severity of the spill. While a small leak may do little damage, a severe leak may contaminate the substrate and kill the vegetation that comes into direct contact with the oil and several years may be required for recovery. Small animals in contact with the oil would probably be killed.

In Alaska, up to ten thousand acres (assuming five major enclave development, with a high estimate of 2000 acres required for each) will be required for onshore OCS-related facilities. It is likely that enclaves located away from existing communities would be established. This would result in the unavoidable destruction of a significant amount of wildlife habitat, probably resulting in local population reductions, including those of subsistence resources.

d. Socioeconomic Systems

The migration of labor, capital, and materials to primary impacted areas during the early years of oil and gas operations, and the subsequent out-migration of some of these people and resources during the later years cannot be avoided should the sales take place and if commercially recoverable amounts of oil and gas are found.

When a given area is unable to absorb needed infrastructure expenditure, and economic activity cannot be shifted elsewhere, shortages of supply and dislocations in local economies may result. Problems with allocating the production of goods and services may occur, and consumers within the locality may be affected adversely. Consumption patterns and production patterns would eventually shift so as to remove excess demand, but this adjustment is not immediate and dislocations may be experienced as the local economy works its way to equilibrium. Areas with low population densities and limited industrial bases would be the most likely to experience such adverse impacts--such as Alaskan areas, and possibly portions of Central and Northern California.

A condition of uncertainty will also create unavoidable adverse impacts. To the degree that decisions are based on predictions or estimates that prove to be in error over time, adverse impacts will occur to commercial ventures that do not cover their costs. It is not likely that uncertainty could be completely removed from the decisionmaking process. Uncertainty with regard to the level of recoverable resources in the leasing areas, the actions of others, and the economic climate is bound to remain. Private industry and government, while basing their decisions on as much information as possible, will be unable to avoid the adverse impacts caused by uncertainty. Inefficient use of resources could also result from a lack of coordination between the private and public sectors and the improper sequencing of decisions on all levels.

Impacts on subsistence cultures in Alaska will occur, but should be mitigated by the use of enclave development for OCS facilities. Use conflicts with subsistence fishing will be high in the Chukchi Sea, Navarin Basin, and Northern Aleutian Shelf sale areas; medium in the St. George Basin and Beaufort Sea areas, and low in the other Alaska leasing areas.

e. Recreation

The adverse impacts on recreation that could be encountered if the proposed sales proceed are: the temporary disruption of recreation areas caused by pipeline burial, the competition for land between recreation and OCS-related onshore facilities, the degradation of the aesthetic environment conducive to recreation, and the damage to recreational sites caused by an oil spill. The first three impacts could largely be mitigated through careful site selection and by timing the construction of OCS facilities for the non-peak season. When an oil spill occurs, the extent of the recreation impact is dependent upon the location and size of the spill, the time of year in which the spill occurs, and the degree of success of cleanup.

A major spill would largely preclude any recreational activity in the affected area. Should oil impact a beach, the recreational use of that beach will be eliminated or dislocated until cleanup procedures have been completed and the beach restored to a desirable, usable state. The use which the impacted beach would normally receive could be temporarily transferred to surrounding beaches (if available), which might cause crowding and ultimate denial of beach areas to some people. Oil spills could temporarily close marinas and boat launching facilities. This would deny many boaters the opportunity to participate in the activity. Waterfowl areas could be closed for a fairly long duration (up to several years). The spill could result in bird mortality which would preclude hunting activities.

Use conflicts and impacts to recreation are expected to be high in all leasing areas except for those in Alaska where they are generally low. This is due to the limited recreational use of all Alaska areas except for Cook Inlet in which mid-level impacts to recreation are expected.

f. Air Quality

The air quality near offshore production sites will be affected should proposed sales included in the five-year schedule proceed. Offshore operations generate a small but significant amount of air pollutants resulting from stationary combustion or from venting produced gas. In most cases, the emissions will be local in nature and be quickly dissipated by climate conditions, and there would not be an increase in air quality degradation onshore.

If a natural gas leak or blowout were to occur, air quality degradation would be minimal. Oil leaks and oil spills which would not be accompanied by a fire would introduce highly volatile, low molecular weight hydrocarbons such as benzene and toluene into the atmosphere. These lighter fractions of crude oil would undergo some unknown degree of degradation, possibly resulting in photochemical smog. If a spill were to result in a fire, large amounts of particulate carbon and oxides of carbon, along with smaller but unknowm amounts of sulfur oxides, evaporate crude oil liquids and partially oxidized compounds would enter the air. Local air quality would be severely degraded during the duration of the fire. The extent of degradation cannot be determined but it is unlikely that it would be high enough to effect land resources or human health.

Air quality is major concern for the California leasing areas. The prevailing winds off of the California coast would generally transport any OCS air emissions directly onshore. Due to the existing poor onshore air quality, additions from OCS-related development activities, though small, would need to be offset or otherwise mitigated.

Air quality will also be unavoidably degraded in the vicinity of onshore transshipment and processing facilities. Through air quality standards and permitting, locations of emissions from these facilities would be tightly regulated. Therefore, adverse impacts are expected to be minor. However, even slight degradation of ambient air quality in California could be considered adverse.

g. Navigation and Shipping

A certain amount of interference between offshore structures and vessel traffic will occur as a result of the proposed sales. This could lead to an increase in accidents involving OCS vessels. Some areas which may criss-cross the offshore leasing areas have traditionally been used by oceangoing vessels but have not been officially established as traffic lanes. There is a higher probability of accidents occurring in heavy traffic areas. The U.S. Coast Guard's proposed Port Access Routes (PAR's) offer one technique through which the incidence of these accidents could be reduced.

Very little navigational interference can be expected between ships utilizing established fairways. However, at night, and especially during rough water, fog and heavy seas, ships which are not navigating the fairways could collide with fixed structures resulting from these proposed sales. Also, fishing boats engaged in trawling will be inconvenienced by having to navigate around fixed structures located on fishing grounds. Based on U.S. Geological Survey estimates, 957 new platforms could result from these proposed sales. This number represents a range of a minimum of 1 to a maximum of 60 platforms per leasing area, except for the Gulf of Mexico for which 300 platforms are projected. Since many of these will replace some of the more than 2200 structures already existing in the Gulf of Mexico, the incremented increase there would probably be as small. Yet, all platforms represent a potential increase in possible interference with ship navigation, and an unavoidable potential for increased accidents, including resulting spills.

h. Water Quality

Normal offshore operations would have unavoidable effects varying degrees on the quality of the surrounding water if the proposed sales are implemented. Drilling, construction and pipelaying would cause an increase in the turbidity of the affected waters for the duration of the activity periods, and, in the case of pipelines, could disturb settled pollutants. A turbidity plume, several hundred yards in length, could also be created by the discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect waters in the immediate vicinity of the rigs. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increases of the hydrocarbon levels and possibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms.

In the case of an accidental spill, unavoidable deleterious effects to offshore water quality would result. Spilled oil that is not recovered would release hydrocarbons and trace metals into the environment. The quality of the surface, near surface, and to a lesser extent, deeper waters would therefore be lowered for the duration of the spill. If oil is entrapped in bottom or shoreline sediments this degradation would continue over weeks or months while the oil was slowly reintroduced into the system. There is a statistical probability that a total of 48.51 spills greater than 1000 bbls. will occur as a result of holding the sales on the proposed five-year leasing schedule. The probability varies greatly by leasing area, from a low of .23 expected spills in the Gulf of Alaska and Northern Aleutian Shelf to a high of 7.35 in the Chukchi Sea.

Unavoidable impacts to onshore water quality will also occur caused by runoff from construction and sewage from the increases in population resulting from OCS activities.

i. Historical Resources

There is a small possibility that unknown archeological and/or historic artifacts and sites exist within the proposed lease sale areas. Cultural resource surveys may not detect with certainty all such sites or artifacts. Those materials within undetected sites could be damaged or destroyed by subsequent oil and gas activity such as structure siting and anchoring.

Other damage to archeological resources could come from oil contamination. Historical and archeological materials soiled by an accidental oil spill may not survive subsequent cleaning and restoration efforts. Porous materials could be rendered unsuitable for carbon dating techniques. The probability of such a polluting event occurring and interacting with artifacts is considered low and the potential for significant resource destruction appears small.

7. Relationship Between Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

This section considers the relationship between short-term use of the environment and the long-term productivity of the environment. The principal short-term use of the leased areas, should it be decided to hold sales included in the proposed schedule, would be for the production of an estimated 6.6 billion barrels of oil and 32 trillion cubic feet of gas, which are nonrenewable resources. During the oil and gas production period, there may be some limited interference with the longer term uses of the environment, such as commercial and sport fishing and recreation. Temporary impacts to marine communities would result from the proposed leasing schedule, due to construction and normal operation of offshore facilities. In addition, an estimated 33 plus oil spills would affect marine populations. Short-term losses would include the reduction in biological productivity, changes in marine habitats, reduction in populations of plankton, nekton, fish, benthos, birds, mammals, and modification of the food web. Long-term losses, if any, as a result of these oil spills, are uncertain.

The proposed leasing schedule may also result in onshore development and population increases, which may cause short-term adverse impacts to communities. A strain on existing economic and population infrastructures is to be expected if new OCS-related facilities are located in areas of low population and minimal existing industrial infrastructure. However, in the long-term, a return to equilibrium can be expected as population changes and industrial development are absorbed in the expanded communities.

After the completion of oil and gas production, oil spills and their impacts will not occur, and the marine environment is generally expected to remain at or return to its normal long-term productivity levels. It has been recognized that continuous, low-level pollution from toxic chemicals, including oil, may adversely affect long-term productivity. However, to date there has been no discernable decrease in long-term marine productivity in OCS areas where oil and gas has been produced for many years. Areas such as the Atlantic coast, which experienced repeated incidents of oil pollution as a result of tanker groundings during World War II, show no apparent long-term productivity losses, although baseline data do not exist to verify this. In other areas which have experienced apparent increases in oil pollution, such as the North Sea, some long term effects appear to have taken place. Populations of pelagic birds have decreased markedly in the North Sea in recent years--prior to the beginning of North Sea oil production. Until more reliable data becomes available, the long-term effects of the chronic and major spillage of hydrocarbons and other drilling related discharges cannot be accurately projected. In the absence of such data, it must be concluded that the possibility of decreased long-term productivity exists as a result of the proposed action.

In summary, short-term environmental and socioeconomic impacts would result from the proposed leasing schedule, including possible short-term losses in productivity as a result of oil spills. Oil and gas reserves would be lowered. Few long-term productivity or environmental gains are expected as a result of the proposed schedule; the benefits of the leasing schedule are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas. While no reliable data exists to indicate long-term productivity losses as a result of OCS development such as losses are possible. However, to the extent that OCS development would replace imports of oil which would otherwise be required, such losses as a result of tanker-related oil spill may occur in the absence of the proposal; however if this were the case, they would probably be confined to refining centers in the Gulf of Mexico and the Mid-Atlantic, rather than possible occurring in fifteen separate leasing areas including nine in Alaska. In addition to oil spill and discharge related long-term impacts, habitat removal, especially in Alaska where several thousand acres may be removed from wildlife habitat, productivity of disturbed habitat will be lost, as well, and this loss would probably be long-term if not permanent.

8. Irreversible and Irretrievable Commitments of Resources

a) Mineral Resources

The proposed sales are estimated to result in the production of 6.6+ billion barrels of oil and 30 trillion cubic feet of gas. This constitutes an irreversible commitment of these resources. Their development and production for energy and other uses in the short and mid-term will foreclose their availability in the future. Long-term alternate sources for energy are currently being developed, which would provide for sources of energy in the future. Other significant uses of hydrocarbons include manufacture of plastics, synthetic fibers and other synthetic materials, fertilizers and drugs. Use for manufacture of petroleum products in the future would also be foreclosed by production of these hydrocarbon resources in the 1980's and 1990's.

b. Biotic Resources

An irreversible and irretrievable commitment of biotic resources would occur in areas subjected to intensive development. Oil spills and chronic low level pollution can injure and kill organisms at virtually all trophic levels. Mortality of individual organisms can be expected to occur, and possibly reduction or even elimination of a few small or isolated populations. The magnitude of these effects are nearly impossible to predict; Section IV.A. and IV.B.2. through 4. identify the types of impacts which can occur and the resources which are particularly sensitive to adverse impacts resulting from the proposal. An irreversible comment of wildlife habitat will be required, principally in Alaska. Up to 10,000 acreas of habitat could be developed or affected by development of OCS-related facilities in Alaska. More specific analysis of the flora and fauna which may be impacted, their population levels and dynamics, and potential adverse impacts will be possible in site-specific analyses in sale-related environmental statements.

c. Human Resources

Human casualties can be expected to occur as the result of the OCS lease sales under consideration in the proposed five-year leasing schedule. Between 1970 and 1976, there were 102 deaths and 162 injuries directly related to OCS-related drilling activities. Accidents on rigs and platforms, including blowouts, helicopter crashes and boat accidents can be expected to occur and result in an irretrievable commitment of human resources, or as a result of accidents or human errors, despite mitigating measures to improve the safety of OCS operations.

d. Land Resources

An irretrievable commitment of land resources will result from the proposal, most significantly in Alaska. Existing wilderness and near-wilderness areas will be developed to support OCS activities in Alaska. Up to 2000 acres or more in five or six locations may be required. In other regions of the country, the use of sites where development exists can reduce or eliminate this commitment of resources.

e. Economic Resources

Decisions to proceed with sales on the proposed schedule will result in production of goods and services, including investment in required facilities. To the extent that these resources are drawn away from other uses, production of goods and services in alternate locations or of other types may be foregone. Steel products, specialized manpower and capital constitute required resources which may be scarcest.

f. Historical Resources

Any damage to archeological or historical sites and artifacts, either known or undiscovered, would result in an irretrievable commitment of nonrenewable resources. Their usefulness and value would be expand or lost as a result of oil spills or construction damage.

C. Environmental Consequences of Alternative 2: Substitutions or Additional Sales (Modified Department of Energy 33 Sale Schedule)

Impacts of Alternative 2 would be similar to those of Alternative 1 and would be largely the same to areas outside of Alaska. Alternative 1 includes California sales in 1983 and 1984, without specifying location in California, thereby allowing flexibility as to whether central and northern California or southern California would be considered for each of these sales. Since Alternative 2 includes only one central and northern California sale, potential impacts to this area may be less than those for Alternative 1.

Impact on California

Under Alternative 1, it is estimated that 66 platforms and 1631 development/production wells would be required, as well as 251 exploratory wells. It is also estimated under Alternative 1 that six to seven oil spills greater than 1,000 bbls. may result. These estimates are based on the assumption that California sales #73 and #80 would result in 200,000 acres offered in central and northern California. Omission of these acres would result in less facility development and somewhat less oil spill risk. For Alternative 2, it is estimated that a total of 51 platforms, 1265 development/production wells and 177 exploratory wells would be required, and than five or more large oil spill would occur.

This possible decrease in oil and gas activity in central and northern California would result in less impact to sensitive marine mammal pupping grounds and pelagic bird rookeries in the Falleron Island area and to marine and coastal resources of central and northern California in general. Potential air pollution problems posed by transfer of tankered oil would also be reduced. Less competition for onshore facilities with commercial fishermen may also result. Additionally, 43 less platforms are estimated to be required in Southern California. This could reduce somewhat the space use conflict which would occur between fishermen and oil and gas activities in Alternative 1, due to the constricted area available for fishing in Santa Barbara Channel.

Impact on Alaska

Impacts to Navarin Basin and Northern Aleutian Shelf discussed under Alternative 1 would be eliminated or substantially reduced. Oil spill risks estimated for Alternative 1 would be removed (from four to five spills greater than 1,000 bbls. are estimated to be statistically probable for Navarin, while the probability of one such spill in the Northern Aleutian Shelf area is estimated to be low). The potential impacts reduced or eliminated under Alternative 2 would include, in particular, potential impacts to an important bird migration stopover, Izembek Lagoon, reducing potential adverse effects to the world population of black brandt, cackling Canada goose, Stellar's eider and speckled eider; the Unimak Pass marine mammal and fish (especially salmon) migration passage; substantial numbers of nesting and migrating waterfowl in the Navarin Basin area (including emperor and cackling Canada goose using the shoreward, but distant Yukon River Delta); and commercial and subsistence fisheries resources.

Impacts to the Gulf of Alaska, St. George Basin and Beaufort Sea would be greater than those for Alternative 1, as additional sales would be considered in those areas. Increased risk (about double) of oil spills impacting significant bird nesting and staging areas in all three regions; endangered whale species and other marine mammals, as well as subsistence fishing resources, especially in the Beaufort Sea and St. George Basin areas, would result.

Under Alternative 1, the statistically probable number of large spills predicted are: Gulf of Alaska--a low probability of one spill, St. George Basin--about two, and Beaufort Sea--between three and four. These probabilities would be doubled, under this alternative. Substantially increased risks of oil spills in the St. George Basin may offset reduced impacts resulting from omitting a Northern Aleutian Shelf sale, as both areas are in close proximity to the Aleutian Islands. However, in the absence of spill trajectories for both areas, the extent to which these sales may both affect the same resources cannot be predicted.

D. Environmental Consequences of Alternative 3: Delay of Sales in Norton Basin, St. George Basin and the Northern Aleutian Shelf

The environmental impacts of this alternative would be the same as those for Alternative 1 in all regards except that land use impacts to the shorelands adjacent to Norton Basin, St. George Basin, and Northern Aleutian Shelf may be reduced.

Impact on Bering Sea Region

Areas adjacent to Norton Basin where onshore facilities may be located are believed to be the St. Michael's Bay, Golovin Bay and Pastol Bay areas. These are presently unorganized. All are undeveloped areas. Should CZM planning be undertaken and be in effect prior to siting decisions, development of large enclave type support and processing facilities, consisting of hundreds of acres to approximately 2000 acres, could be directed to a location and undertaken in a manner desired by local residents. The only infrastructure presently available in this region is in Nome.

The areas adjacent to the St. George Basin and Northern Aleutian Shelf where onshore facilities may be located are Unalaska and the Cold Cay vicinity. Unalaska is a first class city, where some comprehensive planning has been undertaken, but no coastal zone program is currently underway. The rest of the Aleutian chain is unorganized and has not yet formed a coastal resource service area. As discussed for Norton Basin, should CZM programs be developed and implemented, development of onshore facilities could be directed to a location and undertaken in a manner consistent with local desires.

E. Environmental Consequences of Alternative 4: Delay of a Sale in St. George Basin For One Year

Impacts of this alternative would be identical to those of Alternative 1, except in the St. George Basin area.

Impact on St. George Basin

Delay of the proposed St. George Basin sale would allow an additional year in which to obtain and analyze environmental information. This might result in fewer impacts resulting from this particular sale if the additional information obtained results in final tract selection and stipulation decisions which offer increased environmental protection and omission of particular tracts which present the greatest potential for environmental damage. In particular, the probability of impacting the biological resources of the Aleutian Shelf and Pribilof Islands may be better assessed through a more refined oil spill trajectory analysis.

Resources of concern in these areas include endangered marine animals, seals harvested for subsistence, waterfowl migration and breeding habitat, and commercial fisheries resources. It is also conceivable that increased information might influence the decision as to whether or not to hold the sale. If it was decided not to hold a St. George Basin Sale based on additional information, impacts resulting from the sale addressed under Alternative 1, (Section IV.B.) would be eliminated.

In addition, delay of this sale would allow additional time for conducting coastal zone planning in the region. The Aleutian Islands and the Bering Sea region in general are among the least prepared for onshore OCS-related development in that the shorelands are largely unorganized and without zoning control, and have not initiated efforts to become eligible for CZM funding (see discussion under Alternative 3 in IV.D. above). Less land use conflict may arise if additional time allows for a CZM program to be implemented and local control exercised.

F. Environmental Consequences of Alternative 5: Delay the Proposed 1981 Central and Northern California Sale Until 1983, Delete 1983 California Sale, and Designate 1985 California Sale as a Southern California Sale

Impacts of this alternative would be identical to those of Alternative 1, discussed in Section IV.B., except in California.

Impacts on California

Delay of the proposed Central and Northern California sale until 1983 would allow an additional two years in which to obtain and analyze environmental information, particularly that relating to pelagic birds and marine mammals. This might result in fewer impacts resulting from this particular sale if the additional information obtained results in final tract selection or stipulation decision which offer increased environmental protection. It is conceivable that increased information might influence the decision as to whether or not to hold the sale. If it was decided to not hold a Central and Northern California sale based on additional information, impacts resulting from the sale, addressed under Alternative 1, Section IV.B., would be eliminated.

This alternative would also result in one less sale in California as a whole, and reduction in impacts would be the same as discussed for California in Section IV.C.

G. Environmental Consequences of Alternative 6: Omission of a Sale in Northern Aleutian Shelf from Five-Year Schedule

The environmental impacts of this alternative would be the same as those for Alternative 1, except in the Northern Aleutian Shelf area.

Impact on Northern Aleutian Shelf

Potential impacts to resources in the Northern Aleutian Shelf area, discussed under IV.B. above, would be substantially reduced. Due to the proximity of the St. Georges Basin to the Northern Aleutian Shelf, and in the absence of oil spill trajectory analysis for St. George Basin, it is not possible to conclude that these impacts would be eliminated. Additionally, many individuals and populations of marine mammals and birds which could be impacted by a Northern Aleutian Shelf sale also spend portions of the year in other Alaska areas and could be impacted by other sales. However, it appears that the Northern Aleutian Shelf may be particularly important as a concentration point for many of these species, and therefore elimination of consideration of this sale area at this time would reduce impacts to these populations.

The relatively small risk of one oil spill occurring in this sale are under Alternative 1, would be eliminated, as would the need for an estimated 1 platform, 10 development/production wells, and 12 exploratory wells, and their resulting discharges and emissions. Impacts to marine mammals and waterfowl and seabirds, including what may be the world's population of four species and subspecies of waterfowl, and the endangered grey whale, would be lessened. Any reduction in risk of spills impacting Unimak Pass and the bays and lagoons along the Aleutian Chain would result in lowered potential adverse effects on these resources. Additionally, risk of impacts to the important commercial fisheries of Bristol Bay, northeast of the sale area, while considered low for Alternative 1, would be reduced under this alternative.

H. Environmental Consequences of Alternative 7: Omission of a Sale in Chukchi Sea From Five-Year Schedule and Substitution with a Beaufort Sea Sale

Environmental impacts of this alternative would be the same as those for Alternative 1 except in the Arctic region.

Impact on the Arctic Region

The high resource estimates for the Chukchi Sea result in between seven and eight large oil spills being statistically probable. If a second Beaufort Sea sale is added to the five-year schedule, the number of additional oil spills likely as a result of such a sale is estimated to be about 7. Therefore, omission of a Chukchi Sale and substitution with an additional Beaufort Sale should result in three or four less oil spills in the Arctic region as Alternative 1. This would significantly reduce the potential of impacts to Arctic subsistence harvesting--rated as most sensitive in Alaska--and to waterfowl breeding on barrier islands and feeding estuaries. This reduction in oil spill risk to waterfowl resources is somewhat offset, however, by the fact that the Beaufort Sea coastal area is more heavily utilized by waterfowl than is the Chukchi Sea.

I. Environmental Consequences of Alternative 8: 25 Lease Sales on the Five-Year Schedule, (Omitting St. George Basin, Northern Aleutian Shelf, Navarin Basin, Norton and Chukchi Sea from the Five-Year Schedule.)

This alternative would result in only one frontier area in Alaska, Kodiak, being considered in the five-year schedule. Impact outside of Alaska would be the same as in Alternative 1, addressed in Section IV.B., except for those associated with processing and transporting of Alaskan oil and gas to the lower 48 States.

Impacts on the Bering Sea Region

All impacts discussed in Section IV.B.3, for St. George Basin, Northern Aleutian Shelf, Navarin Basin, Norton Basin (all in the Bering Sea region) would not occur, under this alternative. The removal of Bering Sea sales from consideration at this time would mean that the approximately seven oil spills estimated to be statistically probable should these sales take place, would not occur.

The Bering Sea region in general is the most highly sensitive of all OCS areas to oil spills impacting biological resources on a yearround basis. The southern Bering Sea region is relatively shallow and adjacent to island and lagoon systems which support important breeding population of fur seals, sea otters and other marine mammals, as well as breeding pelagic birds. It is also important migratory route for marine mammals, fish and waterfowl. Removing these areas from consideration at this time would remove the risk of adverse OC-related impacts to these breeding populations, and substantially reduce potential impacts to migratory populations.

As discussed under Alternative 3, the St. George, Northern Aleutian Shelf and Norton sales pose the greatest potential for adverse impacts as a result of infrastructure development, as those areas are the least prepared, through governmental organization and planning, to prepare for land use and associated impacts. This alternative would remove potential adverse impacts of onshore support facility development. It would reduce the overall commitment of land required in Alaska for onshore support, perhaps by four to six thousand acres, thereby substantially reducing the unavoidable and probably irreversible commitment of wildlife habitat which would be required under Alternative 1.

Impact on the Arctic Region

This alternative would also reduce impacts to the Arctic region. The Chukchi Sea sale is estimated to result in approximately between seven and eight large oil spills, which would not occur should this alternative be adopted. This would result in a substantial reduction of potential impact to biological resource in the Arctic, including the productive ice floe-associated biological activity during spring and summer break up and significant waterfowl breeding and feeding habitat. It would eliminate the need for support and transportation facility development in the Arctic, reducing loss of wildlife habitat by up about 2,000 acres. A concommitment reduction is potential impacts to subsistence activities would result. The Chukchi Sea area is considered to be the most sensitive of all Alaska areas to adverse impacts on subsistence resources as a result of OCS development.

Impact on Transportation and Processing

By reducing the peak flow of oil from Alaska by an amount somewhat less than 850,000 barrels per day, this alternative would also reduce impacts associated with transporting and refining of OCS produced oil--impacts which are likely accrue to other regions of the country. These include potential tanker spills, land use and habitat destruction impacts from pipelines and impacts of refining, particularly air quality impacts. However, to the extent that the import of oil would be increased to make up for oil that would be produced as a result of Alternative 1, tanker spill and refinery related impacts to these regions would be still be expected.

Additionally, this alternative would reduce by more than half of peak daily amount of Alaskan gas estimated for Alternative 1 which would require LNG facilities. This would reduce land use requirements and habitat destruction associated with construction of these facilities would also reduce the safety hazard involved in the operation of these facilities.

J. Environmental Consequences of Alternative 9: Hold 28 Lease Sales, Omitting the Northern Aleutian Shelf, St. George Basin and Chukchi Sea; Omit Portions of the Beaufort Sea; Delay Sales in Kodiak and Norton Basin

Impacts of this alternative would be the same as those in Alternative 1, for areas outside of Alaska (discussed in Section IV.B.,) except for those related to transportation and processing of Alaskan oil and gas.

Impact on Kodiak

Impacts to the Kodiak area would be the same as those for Alternative 1, except that additional time to plan for OCS-related development would result. Such planning is underway at present, but additional time would allow its completion prior to the sale. This could result in allowing the local government and residents to better influence siting decisions and perhaps reduce and land use conflict with fishing industry related facilities.

Impacts to Bering Sea Region

This alternative, by not considering the Northern Aleutian Shelf and St. George Basin for leasing, would largely remove potential adverse impacts to the southern Bering Sea and would significantly reduce potenial impacts to the Bering Sea as a whole. It would result in the reduction of statistically probable oil spills in the Bering larger than 1,000 bbls. by about 2 spills (from about seven to about five). The southern Bering is situated north of the Aleutian Chain, where a bay and lagoon system and the shallowness of the sea itself, result in an extremely productive area. The area is also an important migration route, both for fish and marine mammals, and for waterfowl. Unimak Pass is a particularly significant migration route for marine mammals, and for salmon. Additionally, the area supports a large foreign bottomfishery.

Onshore impacts in this region would also be substantially reduced as a result of this alternative. Requirements for onshore support and transportation facilities would be reduced by one-third to one-half, perhaps resulting in two to four thousand acres of land which would not be irreversibly removed from use as wildlife habitat, and reducing environmental effects of construction of these facilities. Additionally, as this alternative would delay the proposed Norton Basin sale, as well as delete the two southern Bering sales from consideration, it would substantially decrease the stress to planning systems (which are now nearly non-existent), allowing more time for local communities to increase their planning cababilities in the Norton Sound area and eliminate the need, at least for the present, for onshore facility siting efforts in the Bristol Bay/Aleutian Chain area. In Norton Basin, this may allow local governments and residents to have a greater voice in siting decisions, allow a better information base with which to make siting decision, and allow increased mitigation of potential adverse effects of these facilities.

Impacts on the Arctic Region (Chukchi Sea and Beaufort Sea Portion):This alternative would reduce the statistically probable number of large oil spills in this area from about eleven to about two, significantly reducing the threat of oil impacting biological resources, including subsistence resources, of the Arctic. These resources include waterfowl population and endangered bowhead and grey whales. It would also largely eliminate the need for additional support and transportation-related facilities in the Arctic, with a commitment reduction in loss of wildlife habitat. This alternative would also reduce the necessity to move ahead with technology to develop oil and gas resources in shear zone and pack ice conditions and remove the necessity to utilize this technology for which there would be no lengthy operating experience.

Impacts to Hope Basin: Impacts to the Physical Environments: Hope Basin is situated in the southern Chukchi Sea and would present similar constraints as Beaufort Sea and Chukchi Sea in terms of ice conditions. Hope Basin is relatively shallow, and present technology would permit development within the Kotzebue Sound portion of the region. Site-specific ice structures studies will be necessary to determine the most feasible method for development structures. Potential geologic hazards include shallow, gas charged sediments and ice scour.

In conclusion, some experience has been gained in operating under Arctic ice conditions (as discussed for Norton Sound, Chukchi Sea and Beaufort Sea under Section IV.B.1). Additionally, further exploration experience and data should be available as a result of leasing in the Federal/State Beaufort Sea sale. Available regulatory requirements are expected to be able to respond to these conditions in the landfast ice zone. The regulatory framework provides mechanisms to develop appropriate controls for the shear and pack ice zones, but produciton systems for these conditions are only in the design stage.

General Impact:

Impacts to the Marine Environment: The general impacts to the marine environment, resulting from the introdution of drill cuttings and fluids, oil spills and other aspects of OCS development will be similar to those discussed for Alternative 1 in Section IV.B.2.a. Impacts to specific elements of the marine environment, identified as impacts of special concern, as addressed below.

Impacts to Coastal Environment: The general impacts to the coastal environment, resulting from OCS development, will be similar to those discussed for Alternative 1. Impacts to migratory birds, a coastal resources of special concern, is addressed below. The region is also a major overwintering area for caribou, Dall sheep and other wildlife species.

Impacts on Shipping and Navigation: Impacts on local shipping and subsistence fishery in Kotzebue Sound are expected to be relatively minor. Impacts would be similar to those discussed for Alternative 1, in Section IV.B.2.d.

Impacts on Land Use: Impacts on land use would be similar to those discussed for other Alaskan areas under Alternative 1, Section IV.B.2.e. Existing land use in the Hope Basin area is predominately related to subsistence uses.

Impacts to Historical Resources: Impacts to historical resources would be similar to those discussed for Alternative 1, in Section IV.B.2.f., but primarily related to archeological resources. The Bering-Chukchi Platform is an offshore region of considerable archeologic interest. It was emergent for several periods to Pleistocene glaciation and served as a landbridge for Asian nomad who crossed over to North America during the later stages the ice advance that occurred at least 12,000 years ago. As evidence of the archeological importance of the region, a new national monument--the Bering Sea Land Bridge National Monument--is slated for creation to preserve any artifacts associated with man's early arrival in North America.

Any archeological remains with a relatively high probability for human habitation were also a subject to significant geological effects of marine transgressions, surf zones, strong current action, storm effects and erosion and sedimentation. Therefore, the probability of encountering, during OCS-related activities, widely dispersed, non-magnetic prehistoric remains, is probably very small. Archeologic stipulations should aid in mitigating adverse impacts to any significant, large pre-historic sites buried beneath the sea bed.

In conclusion, this area was particularly significant in the pre-historic period because of its role as a land bridge for migration into North America. Potential for impact, however, is similar to that discussed for Alternative 1. The Bering Land Bridge is also situated on the northern boundary of Norton Sound.

Impacts of Special Concern:

Impact of Commercial Fishing: There will be little or no impact on commercial fishing in the Hope Basin as a result of this alternative, as very little and sporadic commercial fishing takes place in the Hope Basin area.

Impacts on Sensitive Areas: The Hope Basin area is traversed by major southward migration routes for waterfowl and an important semi-coastal migration route for shorebirds. Critical areas are river lowlands and Capes Krusenstern and Espenberg. Cape Thompson and Cape Lisbourne are especially important areas for seabirds, due to the high concentration of seabird colonies in these areas. These populations are all sensitive to impacts from oil spills, and also to habitat destruction and other impacts of onshore OCS-related development, although the extent of impact would depend upon the siting of facilities.

Salmon spawning occurs in several rivers of the areas and is also sensitive to oil spills impacts.

Critical areas for marine mammals are the shear zone areas of open ice south and southwest of Point Hope, as well as large areas of landfast ice. They are major overwintering aras and pupping sites for seal species. Additionally, Hope Basin and Kotzebue Sound are calving areas for beluga whales. The shear zone from Point Hope to Cape Prince of Wales is a major migration route for whales, walrus and seals, migration from the Bering Sea to the Arctic. The distribution of ringed, ribbon, largha and bearded seals; Walrus; harbon porpoise; and the narwhale, grey and bowhead whales which migrate through the area, is dependent on ice location and movement. The polar bear, also found in the area, is similarly dependent on ice movement.

Conclusion: Due to the importance of this area as a migration route, and the constricted nature of the Strait, the area and the resources dependent upon it, are relatively highly sensitive to impacts, especially due to oil spills. The probability of a spill, however, is relatively low (the statistically probable number of spills greater than 1,000 bbls. is .23).

Impacts on Endangered Species: Potential impacts to endangered species in the Hope Basin as a result of this alternative, would be similar to those discussed for Beaufort Sea and Chukchi sea under Alternative 1 (Section II.B.2.c). While the probability of a large spill is relatively low, the area is extremely important as a migration route, as discussed above (under Impact on Sensitive Areas). The potential for a spill, and interference with migration, feeding and behavior due to structure placement represent potential for adverse impacts to those animals. The presence of peregrine falcon is also documented in this area.

No endangered species consultation has taken place for sales in the Hope Basin. However, a consultation regarding the Beaufort Sea Federa/State sale resulted in an opinion from the National Marine Fisheries Service that insufficient information exists to determine impacts to the bowhead and gray whales. Since these whales are also found in this area, and because of the importance of the area to whale migration, the Hope Basin is considered at this time to be relatively highly sensitive to OCS-related impacts to endangered species.

Recreation: Recreational use of the area is presently low, limited largely to trophy hunting (caribou and polar bear). However, the town of Kotzebue, which has a museum focusing on the history and culture of the Eskimos, is currently encouraging the development of a tourism industry. It is possible that extensive OCS-related onshore development activities could adversely affect the tradition-oriented of the tour, which could reduce its attraction to tourism. However, OCS development could also increase access to the area. Should OCS-related onshore facilities be sited in an enclave development and isolated from the existing community, as is expected in other areas of Alaska, there should be little impact on existing or potential recreation and tourism.

Impact on Air Quality: No major impact on regional air quality is anticipated in Hope Basin as a result of this Alternative. Air quality impacts would be similar to those discussed for other Alaska areas for Alternative 1 (Section IV.B.2.e).

Socio-economic Impact: Socio-economic impacts of OCS development in Hope Basin would be similar to those discussed for other Alaska frontier areas for Alternative 1 (Section IV.B.2.f). If facilities for a Chukchi sale were developed in Kotzebue Sound, additional impact would occur as a result of a Hope Basin sale. The town of Kotzebue (population 3000) has had some experience with mining exploration and development, both onshore on the Seward Peninsula and in the western and of the Brooks Range. Coastal communities, including Kotzebueursue traditional life styles dependent on coastal and offshore subs'stence hunting, fishing and other food gathering activities. Based on projected employment impacts in other Alaska regions, long-term direct employment would be around 50 or less, with peak employment (excluding an LNG plant) of 100 or less. An LNG plant, if constructed, would roughly double the peak employment impact.

In conclusion, onshore development in the Hope Basin area as a result of this alternative could result in major socioeconomic impacts if it takes place in or in close proximity to small native coastal villages. This would result in population and employment impacts, changes in the local economy and lifestyles and potentially adverse effects on subsistence resources. However, if enclave development occurs and OCS-related facilities are isolated from existing communities, only minor employment, lifestyle and culture, and economic impacts would be anticipated.

Impacts on Other Management Plans: While there is no coastal zone planning currently underway in the Hope Basin region, th NANA native regional corporation has published a status report describing NANA's regional strategy and management framework which is expected to evolve over the next several years. This plan recognizes the potential for OCS development in the region. Thus, the framework exists to planning for OCS development so that conflicts do not occur. However, existing management strategies and plans are not far enough advanced to assess the degree of compatibility with the proposed alternative.

Availability of Information: The Western and Arctic Alaska Transportation Study (Alaska Department of Transportation and Public Facilities) provides an excellent data base for socio-economic information in the Hope Basin area. NANA's regional strategy progress report, recently available, also contains much useful information on potential environmental impacts in onshore areas. Information on air and water quality is almost non-existent.

The BLM studies program (NOAA/OCSEAP) has produced information on nearshore ice in Kotzebue Sound, Climatology, biological habitats in the littoral zone, an inventory of birds in the Cape Thompson area, a study of earthquake occurrence in Kotzebue Sound, and some physical oceanographic and sea ice studies in the greater Chukchi Sea - Hope Basin region.

K. Environmental Consequences of Alternative 10: No Action and Conservation

The impacts associated with Alternative 1 would be eliminated or largely eliminated should this alternative be adopted. Some impact to marine and coastal ecosystems would result should importation of oil be increased. These impacts would accrue largely to the lower 48 States where refining centers and oil product import ports exists. Socioeconomic impacts related to Alternative 1 would be eliminated, but could be replaced with infrastructure, employment and population impacts associated with the development of additional coal extraction and processing, oil shale processing, nuclear plant construction, and other facilities associated with alternative energy production.

Adverse environmental effects to onshore ecosystems could also be expected; the nature and extent would depend upon the type, level and location of such alternative energy production. It is likely that the western portion of the United States would receive the bulk of such impact, due to the location of a substantial amount of alternative energy sources in the Rocky Mountain States.

Depending upon the extent of conservation and/or shortfall of energy, and the manner in which decreased oil and/or gas consumption is brought about, economic impacts could also occur.

Additional quantitative or qualitative analysis of the impacts of this alternative is not possible as the results of a no action alternative are not predictable.

V. Consultation

Introduction

The draft environmental statement was released on August 24, 1979, and submitted to the U.S. Environmental Protection agency on August 28, 1979. The comment period for the draft, as established by EPA, was from September 9 to October 22, 1979.

The draft was submitted to the following Federal agencies and States for review:

Nuclear Regulatory Commission
U.S. Department of Energy
U.S. Department of Commerce
U.S. Department of Defense
U.S. Army Corps of Engineers (DOD)
U.S. Department of Transportation
U.S. Coast Guard (DOT)
Office Of Pipeline Safety, Material Transportation Bureau (DOT)
Marine Mammal Commission
Federal Energy Regulatory Commission
Department of State
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
Heritage Conservation and Recreation Service
U.S. Bureau of Mines
Commission of Indian Affairs

State of Maine
State of New Hampshire
Commonwealth of Massachusetts
State of Rhode Island
State of Connecticut
State of New York
State of New Jersey
Commnwealth of Pennsylvania
State of Delaware
State of Maryland
Commonwealth of Virginia
State of North Carolina
State of South Carolina
State of Georgia
State of Florida
State of Alabama
State of Mississippi
State of Louisiana

State of Texas
Sate of California
State of Alaska

Copies of the statement were also sent to numerous local governments, environmental groups, industry, and other interested parties.

Public Hearings were held during the week of October 1, 1979, in Anchorage, AK; Los Angeles, CA: New Orleans, LA; Washington, D.C.; and New York, NY. A total of 48 persons testified at three hearings. In addition, extensive written comments were received from over 75 individuals and groups. Following is a list of all commentors and testifiers.

Alaska

1.	Willie Tukrook	Point Lay, AK
2.	Amos Agnasagga	" " , AK
3.	Rossman Peetook	Wainwright, AK
4.	Homer Bodfish	" , AK
5.	Mike Jeffery	Alaska Legal Services
6.	Dale Bower Stotts	Alaska Eskimo Whaling Commission; Barrow, AK
7.	Ronald H. Bower	Inupiat Native Corp.
8.	Tom Wilkinson	Atlantic Richfield Co.
9.	Bob Worl	North Slope Borough
10.	Joan Bucholdt	" " "
11.	Raymond Neakok, Sr.	Alaska Legal Services
12.	Sharon Macklin	United Fishermen of Alaska
13.	Roger Herrera	Sohio BP
14.	Bouce H. Baker	Div. of Policy, Development and Planning State of Alaska
15.	Caleb Pungowiyi	Kawarek, Inc.
16.	Leonard Dargon	Amoco Production
17.	Billy Neakok	Borough of Barrow, AK
18.	Paul Lowe	Alaska Center for the Environment
19.	Don Nielson	Bristol Bay Native Corp.
20.	Harold Pomeroy	Private Citizen, Anchorage, AK
21.	Norman Cohen	Rural CAP, AK
22.	David Benton	Friends of the Earth
23.	Cliff Eames	Trustees for Alaska
24.	Wayne Marshall	Kodiak Area Community Development Corp.
25.	Bob Peterson	Kodiak Area Native Assoc.
26.	Tom Peterson	Kodiak OCS Advisory Committee
27.	Hank Pennington	" " " "
28.	Harry Milligan	Kodiak Island Borough
29.	Pete Filieb	Cordova District Fishermen's Union

30.	William H. Hopkins	Alaska Oil and Gas Assoc.
31.	Tony Vasca	Numan Kitlutsisti
32.	Edward Szafran	Inupiat Village Corp., Barrow

Los Angeles

33.	Marlene T. Roth	Director, Community Development, Laguna Beach, CA
34.	Ron DiCarli	San Luis Obizpo Co. Planning Dept. CA
35.	Jean Harris	League of Women Voters, Ventura, CA
36.	Major Stephen A. Warren	Vandenberg AFB, CA
37.	Al Reynolds	Santa Barbara Dept. of Environmental Resources, CA
38.	John English	Santa Barbara Air Pollution Control District
39.	Beth Bosworth	Greenpeace, Monterey Chapter
40.	Nelson Wolf	Assoc. Monterey Bay Area Gov'ts
41.	Donald W. Lewis	Chevron, USA
42.	Julia Bolt	Friends of the Coast

New York

43.	David N. Kinsey	State of New Jersey
44.	Robert H. Nanz	Shell Oil Co.
45.	Sarah Chasis	Natural Resources Defense Council
46.	Gregory H. Sovas	New York State Dept. of Environmental Conservation
47.	Phoebe Wray	Center for Action for Endangered Species

Washington, D.C.

48.	R. W. Bybee	Exxon Co. USA

(No testifiers in New Orleans)

The following is a list of individuals/organizations who submitted written comments.

Federal

Organization Represented		Name
1.	United States Nuclear Regulatory Commission	Wm. H. Regan, Jr.
2.	United States Department of the Interior, United States Geological Survey	H. William Menard
3.	United States Department of the Interior, Bureau of Mines	J. D. Morgan
4.	United States Department of the Interior, Heritage Conservation and Outdoor Recreation Service	Chris T. Delaporte
5.	United States Department of Commerce National Oceanic and Atmospheric Administration	Robert W. Knecht
6.	Department of Energy Oil, Natural Gas and Shale Resources	R. Dobic Langenkamp
7.	United States Environmental Protection Agency, Office of Environmental Review	William N. Hedeman, Jr.
8.	United States Department of the Interior, Fish and Wildlife Service	Associate Director
9.	Department of the Army Office of the Chief of Engineers	George F. Boone
10.	Department of the Air Force	Harry P. Rietman
11.	Department of Transportation Federal Aviation Administration	Frank Austin
12.	Federal Engery Regulatory Commission	Kenneth A. Williams
13.	Department of Transportation United States Coast Guard	K. G. Wiman

State

Organization Represented	Name
1. State of Washington Washington State Parks and Recreation Commission	David W. Heiser
2. State of California Office of Planning and Research	Deni Green
3. State of California Governor's Office	Edmund G. Brown
4. State of Alaska Governor	Jay S. Hammond
5. State of Mississippi Department of Wildlife Conservation	Richard L. Leard
6. State of Louisiana Office of Science, Technology and Environmental Policy	Tommy F. Hill
7. South Carolina Coastal Council	H. Wayne Beam
8. Commonwealth of Virginia Council on Environment	J. B. Jackson, Jr.
9. State of Georgia Office of Planning and Budget	Charles H. Badger
10. Commnwealth of Massachusetts Executive Office of Environmental Affairs	John A. Bewick
11. State of New Jersey Department of Environmental Protection	David N. Kinsey
12. State of New Jersey Department of Community Affairs	Richard A. Ginman
13. State of Maryland Department of State Planning	James W. McConnaughhay
14. State of Texas Department of Water Resources	Harvey Davis

State (Cont.)

Organization Represented	Name
15. State of Rhode Island Governor's Energy Office	Dante G. Ionata
16. State of North Carolina Department of Administration	Chrys Baggett
17. State of Florida Office of Planning and Budgeting Intergovernmental Coordination	Walter O. Kolb

Local

Organization Represented	Name
1. County of Santa Barbara, CA	David Yager
2. Kenai Peninsual Borough	Donald E. Gilman
3. South Coast Air Quality Management District	Brian W. Farris
4. County of San Luis Obispo, CA	Patricia Beck
5. North Central Florida Regional Planning Council	Charles L. Kiester
6. Alaska Legal Services Corporation	Michael I. Jeffrey
7. Comprehensive Planning Organization	Paul Graham
8. County of San Mateo, CA	David C. Hale
9. County of Ventura, CA	Victor R. Husbands
10. Associaton of Monterey Bay Area Governments, CA	Warren C. Freeman
11. Village Council of Point Lay	Walter Tukrook
12. County of Humboldt, CA	Harry Prichard

Local (Cont.)

Organization Represented	Name
13. City and County of San Francisco	Selina Bendix
14. Association of Bay Area Governments, CA	Charles Q. Forester
15. Counties of Marin and Sonoma, CA	Richard Retecki
16. Monterey Bay Unified APCD	Larry Odle
17. City of Point Hope	Mayor
18. City of San Diego	Pete Wilson

Private

Organization Represented	Name
1. Champlin Petroleum Company	R. G. Fortman
2. Ogle Petroleum Inc.	Ronald G. Heck
3. Atlantic Richfield Company	E. F. Livaudais, Jr.
4. Kawerak, Inc.	Caleb Pungowiyu
5. Southern Natural Gas Company	Shelia R. Tweed
6. League of Women Voters of Eureka	Melaine C. Smith
7. Tribal Council of Emmonak, AK	Janet Shantz
8. West Gulf Maritime Association	Ted Thorjussen
9. Geophysical Institute, AK	Ronald C. Metzner
10. Sierra Club; Denali Group	Page Else
11. Bristol Bay Native Association	Marilyn Nelson
12. League of Women Votes, Ventura County	Jeanne Harvey

Private (Cont.)

Organization Represented	Name
13. Kodiak Area Community Development Corporation, Inc.	Wayne E. Marshall
14. Energy Action Educational Foundation	Edwin Rothschild
15. Bering Straits Native Corporation	George A. Walters
16. Self	Congressman Lionel Van Deerlin
17. Resource Development Council	James G. Dye
18. The Oceanic Society	Michael J. Haez
19. League of Women Voters	Helen Carr

Comments received from Federal, State and local agencies are reproduced at the end of the section, with the exception of portions of State comments which are too lengthy to be included or where a State agency indicated that it did not wish to comment. Copies of all comments which are not reproduced here are available from the Bureau of Land Management (542), U.S. Department of the Interior, Washington, D.C. 20240, and from the OCS Offices, listed in Appendix 5.

Following is a list of agencies from whom comments were received but not published in the Final Statement.

Organization Represented	Name
1. State of California Air Resources Board	Jane V. Hall
2. California Coastal Commission	
3. Department of the Interior Bureau of Land Management	James F. Davis
4. State of California State Lands Commission	James F. Trout

Organization Represented (Cont.)		Name
5.	State of California Governor's Office of Planning and Research	Gregory Fox Allan Lind
6.	California Regional Water Quality Control Board - Los Angeles Region	Lewis A. Schinazi
7.	Self	Alan Cranston Phil Burton Henry Waxman John Burton Jerry Patterson George Miller
8.	Commonwealth of Virginia	Paul Pitts
9.	State of Texas Railroad Commissin of Texas	Murray Moffatt
10.	State of Texas Department of Highways and Public Transportation	Marcus L. Yancy, Jr.
11.	CNG Producing Company New Orleans, LA	F. Wilson Hood
12.	Friends of the Earth, CA	Connie Parrish David Benton
13.	Whale Center, CA	Michael Weber
14.	NRDC	Sarah Chasis
15.	County of San Luis Obispo	Beryl Reichenberg
16.	Sierra Club, CA	Michele Perrault
17.	Turstees for Alaska	H. Clifton Eames, Jr.
18.	Friends of the Coast, CA	Julia A. Bott
19.	Save our Shores, CA	Karen Delaney
20.	Friends of the Sea Otter	Betty S. Davis
21.	Marin Conservation League	Karin Urguhart

All comments received were reviewed and analyzed to determine whether changes in the draft environmental statement were necessary. Where minor, technical changes were required, they were made in the text, without acknowledgement. Following is a summary of the major issues raised by commentors and testifiers, and responses to those issues, including where appropriate, an indication of whether and where the issue raised resulted in changes in the environmental statement.

SUMMARY OF ISSUES

A. Alternatives--Recommendations for Delays or Deletions from the Five-Year Schedule

1. Several commenters suggested the deletion or indefinite delay of both the Northern Aleutian Shelf and St. George Basin, because of marine resource conflicts and the desire to see a better assessment of risks to these resources in the Bering Sea. Some commenters also pointed to the need for: completion of coastal zone management plans; decisions regarding marine sanctuary designations; development of strengthened regulations based on a comprehensive data base; for additional technological advances.

State of Alaska; National Oceanic and Atmospheric Administration; Natural Resources Defense Fund; Trustees for Alaska (for Alaska Center for the Environment, Fairbanks Environmental Council, Friends of the Earth, as well); Emmonak Council; Kawerak, Inc.; United Fishermen of Alaska;

Delay of these sales in order to allow additional time to undertake coastal zone Management planning is considered in Alternative 3. In addition, a new alternative, Alternative 9, has been developed to respond to these and other comments regarding lease sale areas for which delay or deletion at this time was recommended, based on several factors.

2. Several commenters believe that Chukchi Sea and/or Beaufort Sea sales, or in some cases, the shear zone and pack ice zone of these sale areas, should be indefinitely postponed, pending development of arctic ice capabilities. One commenter (Metzner) stated that if work began next summer on test structures, the earliest these sales should be scheduled is 1985. Metzner also included part of Norton Basin in the same category. Some commenters also indicated a need for comprehensive data base for development of strengthened regulations, for decisions on marine sanctuary designations, and for completion of coastal zone management plans. Alaskan native groups want these sales indefinitely postponed because of their potential effect on marine mammals and other wildlife, which they believe will deny them access to subsistence hunting. Subsistence hunting is basic to the culture of the native peoples of this area.

State of Alaska; Ronald C. Metzner; Emmonak Council; Natural Resources Defense Council; Trustees for Alaska (also commenting for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth); Villages of Pt. Lay, Wainwright, Kaktovik, Nuiksut, and Barrow, Alaska; North Slope Borough.

The concerns expressed by these commenters are partially responded to by Alternative 7, which would omit Chukchi Sea, but replace the 1985 sale by an additional Beaufort Sea sale, in order to develop technology for Arctic ice conditions in a developed area. In addition, Alternative 9, a new alternative, has been developed, which would delete the Chukchi Sea and the shear and pack ice zones of the Beaufort Sea.

Finally, the Department of the Interior is working on developing mechanisms to assure that no development would take place in these areas without adequate technology. Several tracts in areas believed to be under stress by pack ice were bid on at the December 1979 Beaufort Sea Sale. Operations on these tracts should provide useful insight on pack ice technology. The Department of Interior adopted a cautious approach to operations on these tracts by advising lessees in the final Notice of Sale that drilling from platforms or structures located beyond the Barrier Islands in water depths in excess of 13 meters will be prohibited until a test platform or structure of the same type to be drilled from has been in existence in the sale area at these depths for a period of two winter seasons. Verification of the test structures will be in accordance with the Geological Survey Platform Veri-ification program . This approach is designed to encourage the development of arctic ice capabilities while maintaining a high standard of environmental safety.

3. Several commenters supported Alternative 3, which consider delay of sales in Northern Aleutian Shelf, St. George Basin and Norton Basin, for the purpose of allowing additional time to undertake coastal zone management planning. In addition, one commenter (Bering Straits Native Corporation) indicated a need to understand the environmental and cultural structure of the area, which will be aided by such planning. The State of Alaska, while calling for an indefinite postponement of sales in the Northern Aleutian Shelf and St. George Basin (discussed elsewhere), also believes that Norton Basin is appropriate for leasing in the 1983-1985 timeframe, rather than earlier, as it is scheduled in the proposal.

Trustees for Alaska (also for Alaska Center for the Environment; Fairbanks Environmental Council; and the Friends of the Earth); Emmonak Council; Bering Straits Native Corporation; Kawerak, Inc.; State of Alaska; United Fishermen of Alaska.

In addition to being considered in Alternative 3, these concerns are also addressed in Alternative 9, a new alternative.

4. Delay the Navarin Basin sale and deepwater portion the Gulf of Alaska sale until adequate deepwater technology is developed.

Trustees for Alaska (also commenting for Alaska Center for the Environment; Fairbanks Environmental Council and Friends of the Earth)

While the Navarin Basin is over three hundred miles offshore, the Basin is situated largely shoreward of the 200 meter line. Sale #55, in the Gulf of Alaska, includes twenty tracts in water depths of 300 m or more, but the deepest water in this proposed sale in 400 m -- not deeper than many tracts leased in recent OCS sales in other regions. Section II.D. addresses the issue of leasing in deepwater and Appendix 6 discusses deepwater technologies.

5. Two recommendations regarding Kodiak were received. The State of Alaska considers Kodiak as appropriate for leasing in the 1983-85 portion of the schedule, assuming that advanced exploration and development drilling techniques, transportation methods and mitigating measures are sufficiently developed by the early 1980's and if district CZM plans are satisfactorily completed. The Kodiak Island Borough and others also request a delay of the Kodiak sale, in order to complete special planning efforts underway in Kodiak which relate specifically to OCS-related development. The Kodiak Area Community Development Council called for deletion of the sale in order to prevent potential damage to the lucrative Kodiak area fisheries. Some commenters suggested delay of the Cook Inlet sale for similar reasons.

State of Alaska; Kodiak Area Community Development Council; Kodiak Island Borough; Kodiak Area Native Association; United Fishermen of Alaska; Kodiak OCS Advisory Council.

Alternative 9, which has been added to the FES, considers delay of the proposed Kodiak sale. Section IV.B.3.a. considers impacts to commercial fishing. This section concludes that gear conflicts and shoreside competition will be a problem in the Kodiak area, and Kodiak is considered to be among the highest of all proposed leasing areas in sensitivity to impacts upon commercial fishing from OCS development. Compensation is available for any gear losses which may be sustained as a result of OCS-related development.

6. One commenter believed that sales in the Gulf of Alaska, Beaufort Sea (Sale #71 only) and Navarin Basin be should delayed so that critical environmental data would be available for tract selection and other pre-leasing activities.

National Oceanic and Atmospheric Administration

Availability of data is addressed in Section IV.B.4. and alternatives have been developed in some cases where the availability of data has been controversial. Our analysis does not indicate that data availability at key decision points is a problem in the areas NOAA suggested.

7. Several commenters stated that OCS areas are too broadly or improperly defined. Trustees for Alaska indicated that the areas are too broadly defined to meet requirements of the OCS Lands Act to specify as precisely as possible the size, timing and location of sales. NRDC had similar concerns for all areas—pointing out that all areas appeared to come all the way to shore. The State of Alaska believes that the Navarin Basin area is too large and thus fails to meet the requirements of the OCS Lands Act. The State of Alaska also suggests considering Hope Basin and Chukchi Sea as one area, in order to study both areas and make a decision at a later date as to which portion to include in a lease sale. The Kodiak Area Community Development Corporation believes that the Shelikof Straits portion of the Cook Inlet sale should be considered as a separate sale (and/or recatagorized to a "Catagory I" or frontier area sale with additional pre-sale planning sale).

Trustee for Alaska (commenting also for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth); State of Alaska; Natural Resources Defense Council; Kodiak Area Community Development Council; State of California

Inclusion of an area in the leasing program is only the beginning of a very detailed process leading to a sale decision. Further refinement of broad leasing areas is more appropriate as a result of information received in response to the call for nominations and comment and as result of the analysis included in the draft and final environmental impact statements. This permits the definition of precise areas to be offered for lease to occur at the point in the process when the greatest amount of specific information is available.

8. The State of California and others are concerned that no delay or omission alternatives, involving California lease sales, were included in the draft environmental statement. These commenters indicated that in the absence of any alternatives involving these sales, consideration has not been given to all reasonable alternatives, as required by the National Environmental Policy Act, nor to the appropriateness of leasing in particular locations, as required by the OCS Lands Act Amendments.

State of California; Marine Conservation League

A new alternative, Alternative 5, has been added which considers the delay of the Central and Northern California sale.

9. Several comments were received specific to Central and Northern California Sale #53. The State of California recommended delaying this sale and possibly expanding or adding sales in Southern California. Several commenters believe that inadequate information exists to hold the sale as scheduled. One commenter (Santa Barbara Co.) suggested that Sale #53 should be held only contingent upon prohibition of drilling in vessel routing systems or sensitive biological areas, enforcement of local air quality standards, availability of effective oil spill protection, and completion of comprehensive planning through the planning stages.

State of California; Santa Barbara County; San Luis Obispo County; Save Our Shores; Sierra Club; Friends of the Sea Otter; Friends of the Earth.

An alternative addressing some of these concerns have been added. Alternative 5 considers delay of Sale #53. However, the prohibition of drilling in specific areas is normally addressed during evaluation of a specific sale, through the environmental impact statement process, when specific mitigating measures, including stipulations are considered and developed to address tract-specific concerns. The issue of enforcement of local air quality standards is addressed, under issue 9, part D. in this section. Section II.B. discusses contingency sales, concluding that they do not represent an effective alternative to firmer scheduling of sales.

10. It has been recommended that California lease sale areas be based on sedimentary basins, rather than two broad lease sale areas. Commenters believe that this would more appropriately meet OCS Lands Act Amendments requirements to define sales and specifically as possible and by "physiographic regions."

State of California; San Luis Obispo County; Marine Conservation League; San Diego County; Friends of the Sea Otter

Tentative tract selection for proosed sale #53 has already taken place and resulted in the preliminary selection of 214 tracts. This proposed sale, off central and northern California, includes five separate basins. We believe that treatment of these basins as separate sale areas would place unnecessary administrative burdens on the Department and others and would result in unnecessary expenditures of public and private funds in terms of preparing for the sales. The time allotted to each sale preparation, including development of five individual environmental impact statements, could also result in delays in exploration and development. Further, the size of the proposed sale area, in aggregate, is consistent with those of previous sales held by the Department (e.g. Gulf of Mexico). We want to assure the State that the environmental assessment process will consider the impacts of OCS development in each of the five areas and the appropriateness of leasing in each area. While the resources of an individual basin included in this sale may be relatively low, the Department of the Interior believes that in the aggregate, a central and northern California sale can make a significant contribution to meeting the nation's energy requirements.

Southern California and Santa Barbara Channel are also considered as one leasing area for similar reasons and will be treated as described above.

11. Commenters recommended deletion of specific basins or other areas from California sales, including

-- nearshore tracts offshore of San Diego because of potential threat to tourism economy and low resource estimates.

-- Santa Barbara north coast

-- Santa Barbara Channel because it has already been leased twice and most leaseable tracts have been offered.

-- deepwater tracts offshore of California due to unproven technology

-- Santa Cruz and Santa Maria Basins due to potential jeopardy for endangered species (sea otter)

-- basins offshore of San Diego, San Mateo, Bodega Bay and Mendiceno

State of California; Santa Barbara County; Comprehensive Planning Organization (of San Diego); Carpentia Valley Association; Scenic Shoreline Preservation Council; Friends of the Sea Otter; City of San Diego; Congressman Lionel Van Deerlin;

These recommendations are tract specific and more appropriately considered at the sale stage--during tract selection and the sale evaluation process leading to the decision as to which tracts will be included in the Final Sale Notice.

12. One commenter indicated that Sales #68 (Southern California) and Sales #73 and #80 be included only as contingency sales, in view of the potential over supply of oil and LNG to the west coast.

Santa Barbara County.

The statement considers the possibility of transport and processing difficulties due to the limited west coast market, processing capabilities and existing transportation network. As required by the National Environmental Policy Act, this has been identified as an unresolved issue. An alternative which would respond to this issue is considered in the statement. Alternative 7 considers inclusion of only southwestern Alaska and Beaufort Sea sales which would substantially reduce the amount of oil and gas to be transported.

13. One commenter suggested deleting Sales #73 and #80 ("California" sales), and concentrating on only one Central and Northern California sale in the five-year period.

Humboldt County.

The scheduling of only one Central and Northern California sale is considered in a new alternative--Alternative 5.

14. One commenter suggested delaying North Atlantic Sales #52 and #82 until results of Sale #42 are available, in order to adequately assess the risk of additional sales.

National Oceanic and Atmospheric Administration.

Sales #52 and #82 are scheduled according to the Department of the Interior's policy of waiting three years between the first and second sales in a frontier area and two years between a second and third sale in such an area. The Department believes that this allows adequate time to gain information from the first sale, in order to obtain additional resource information on which to base subsequent sale decisions. This resource information, along with the environmental studies program, and other research information, provide data upon which to base additional and refined assessments of environmental risks.

15. Several comments indicated that a better evaluation of the no action alternatives is required, including alternative energy sources, conservation, the relationship between OCS energy development and national energy supply and the advantages of petroleum reserves.

National Oceanic and Atmospheric Administration; Santa Barbara County; League of Women Voters of Eureka; San Luis Obispo County; Clean Air Coalition; San Mateo County; Association of Monterey Bay Area Governments; Whale Center.

Section I.7 has been revised to provide more information regarding the anticipated and feasible roles of oil and gas and other energy sources, including conservation, in meeting national energy needs.

16. Some commenters supported Alternative 7 as the alternative presenting the least environmental impact and resulting in the least amount of oil to be transported from Alaska and refined in the lower 48 States.

Whale Center; Page Else.

This alternative has been retained in the final environmental statement.

17. Some commenters stated that, because of the need for additional oil and because the Alaskan OCS presentes the greatest potential for large, new discoveries, more sales in Alaska should be included in the proposed five-year schedule--principally in areas already proposed for leasing in Alternative 1.

Champlin Petroleum Company; ARCO.

As discussed in Section II.B. and Appendix 1, the Department does not believe that a faster pace of leasing in Alaskan frontier areas, than is already proposed under Alternative 1, is desirable.

18. South Atlantic sales should proceed (as scheduled in Alternative 1) only if studies will be completed prior to the Notice of Sale. Adequate time should be allowed between Sales #56 and #78.

State of Florida.

The Bureau of Land Management has met with representatives of the South Atlantic States regarding studies to be funded for FY 80. As a result, the decision has been made to shift planned studies so that a Blake Plateau bottom and mid-water study will be funded in FY 80, to coincide with scheduled summer 1980 Blake Plateau hydrographic studies. It is anticipated that physical oceanographic and meteorological data collection will be continued on the Blake Plateau after FY 80. Three full years of data collection and analysis of physical oceanographic information will be completed prior to the Notice of sale for proposed Sale #78.

The exact area to be considered for leasing in Sale #78 has not yet been defined. In addition to 2-1/2 years between Sales #56 and #78 in which to consider drilling results, results of Sale #43, for which exploratory drilling is already underway, will be available. The timing of these second and third sales in an area is consistent with the Department of the Interior's analysis of appropriate timing, reflected in Appendix 1.

19. Concern was expressed over the low correlation of the options considered by the Secretary in June and the alternatives in the draft environmental statement. In addition, the State of Alaska's proposed schedule was not included.

State of Alaska.

Many of the alternatives included in the DES reflected specific elements included in options which the Secretary considered in June 1979. The configuration differed womewhat because the alternatives in the DES were set forth in response to specific issues and concerns raised through the scoping process and other public comment on the schedule development.

The State of Alaska's proposed schedule was developed by grouping sales which 1) are appropriate for leasing early in the schedule, 2) are appropriate for leasing late in the schedule, and 3) should be indefinitely postponed. The placement of sales in these categories was based on consideration of the status of coastal zone management planning; availability of infrastructure, transportation methods and drilling techniques; availability of a comprehensive coastal environmental data base for developing regulatory mechanisms; resolution of major natural resource conflicts and decisions on protective status, such as marine sanctuary designations.

These types of considerations, in conjunction with comments received through the scoping process, were utilized to develop alternatives for the draft environmental statement. Many of the alternatives included in the DES reflected similar considerations as those recommended by the State of Alaska. However, no alternative in DES contained the complete configuration of Alaskan sales as was recommended by the State.

The State of Alaska's recommended schedule has been included in the FES as Alternative 9. It also reflects the concerns of several other commentors on the DES.

20. The timing of California sales does not take into account the Department of the Interior's own policies regarding timing of sales in frontier areas.

San Luis Obispo County.

As Central and Northern California has a history of OCS leasing, though limited, it is not, strictly speaking, a frontier area. More information is available regarding this area than in many other frontier areas. For for purposes of defining the pre-lease sale process, it has been classified as a frontier area, and a longer pre-lease sale planning period has been allotted for this area than for other non-frontier areas. Under Alternative 5, Central and Northern California is categorized as a frontier area in that no additional sale in that area is proposed in the three-year period following the sale. Alternative 5 is a new alternative.

B. Environmental Statement and Approach and Assumptions

1. The environmental statement fails to demonstrate how requirements of Section 18 of the OCS Lands Act Amendments have been met. There is no method or rationale for weighing the eight factors specified in Section 18 to obtain a balance between development benefits and environmental risks, or required by Section 18.(a)(3). There should be a comparison of risks and benefits.

National Oceanic and Atmospheric Administration; State of New York; State of California; Commonwealth of Massachusetts; San Luis Obispo, Humboldt, and Marin Counties; Natural Resources Defense Council; Friends of the Sea Otter.

The purpose of the environmental statement is to assess the environmental impacts of the proposed schedule and alternatives to the proposal. Those factors included in Section 18 which relate to environmental issues have been addressed in the statement. The statement has also indicated briefly how other factors have been considered in the development of the proposal--by way of background and to provide a better understanding of the proposal.

The environmental statement is not, however, the ONLY decisionmaking tool in which all appropriate factors and considerations are weighed, nor is its purpose to justify the proposed action or any alternatives. The statement is one part of the decision process. Its focus is environmental impact, rather than the other factors which must be considered and balanced, along in accordance with Section 18.

2. Several commenters disagreed with statements in the draft environmental statement to the effect that a more quantitative analysis of risks and benefits is not possible at the program level. A better comparative analysis of the various regions was called for. In this regard, some commenters called for a better explanation of the sensitivity ratings contained in Table II-3 (p. 41 of DES) stating that there was no methodology provided to substantiate the ratings. The Commonwealth of Massachusetts called especially for a quantitative assessment of relative productivity between regions and suggested several criteria which could be utilized. The State of California presented a methodology for a numerical, semi-qualitative ranking, which among other things, would take into account regional differences in propersity for oil spills.

State of California; Commonwealth of Massachusetts, Ventura, San Mat eo, Humboldt, Marin and Sonoma Counties; Trustees for Alaska (commenting also for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth).

Suggestions for better, more quantitative comparisons of regions were carefully evaluated. However, the Bureau of Land Management has concluded that no methodology or data are available to provide a true quantitative comparison of regions. For example, as a measure of productivity, fish catch or fish landings was suggested. These data are included in the statement. However, data on fish landings does not accurately reflect the location of catches. For example, some fish landed in the Mid-Atlantic are caught in the North Atlantic. Additionally, fisheries catch data, besides being reported for areas and regions which do not corrspond well to OCS leasing areas, do not take into account varying levels of effort or possible variances in marketability of fish stocks.

True measures of productivity must begin by assessing primary production, but meaningful comparisons of primary productivity would require that similar methodologies and specifications be used in studies in all areas. It would also require both extensive and comprehensive area coverage to assure that measurements reflected area-wide production, due to the extreme variation in productivity among specific locations as a result of water depth, temperature, oxygen availability and numerous other factors.

In order to measure total production, studies of each trophic level would be required. Even if this type of total production by region analysis were performed, it would not take into account the variation within regions, and their relationship to specific areas within regions which may be affected by oil and gas development. However, short of evaluating total marine production , production of higher trophic levels which are used by humans as significant food sources, can be evaluated. A good evaluation of this type can be performed using fisheries catch data in combination with level of effort information. Extensive data has been collected which would allow such an evaluation. However, this data is not compiled, synthesized and analyzed in a manner which would allow an evaluation of this aspect of marine production. It is estimated that it would take several years to work up existing data to make such an evaluation.

The environmental statement has attempted to consider and assess productivity in a broader and less quantitative sense--giving consideration to existing fisheries data, the existence and extent of especially biologically productive habitats, and the importance of various areas in the life cycles of different types of species. It has also tried to balance these factors with the sensitivity of these factors to impact from oil and gas development, to the extent possible at this program level.

The matrix suggested by the State of California was also seriously considered. The rating parameters themselves were found to be very rational categorizations of the factors suggested for evaluation. However, the Bureau of Land Management disagrees with a main assumption behind the matrix, and that the matrix would prove ultimately more useful than the existing sensitivity matrix in Table II-3. One assumption behind the matrix is that differences in geohazards and other hazards between regions would cause differences in propensity for spills between regions. While this seems intuitively correct, there is no data which would support this hypothesis. Without any data which would demonstrate such a correlation, or the degree of correlation, an assessment of the degree of oil spill risk presented by various hazard factors, even after subjecting them to the rating parameters suggested, would still be subjective. (Sections IV.A.1. and IV.B.1. have been supplemented to better explain the relationshp between hazards and oil spill risk.) In addition, a matrix which essentially describes and categorizes the existence of various factors in each region does not reflect the degree of sensitivity of the factors to impact by oil and gas development.

In the DES, there was no indication of how the sensitivity ratings were assessed. In order to make the matrix more useful and better understood, additional explanation and cross-referencing has been added. The matrix represents a summary of the conclusions of the impact analysis contained in Section IV.B.

3. A cost/benefit analysis, as addressed in 40 CFR 15002.23 (CEQ Regulations implementing NEPA), should be included.

State of California; Commonwealth of Massachusetts; San Luis Obispo County.

The CEQ regulations require that if a cost/benefit analysis is prepared, that it be incorporated by reference or appended to the environmental statement. No cost/benefit analysis has been approved concerning the schedule. The regulation also state:

> For purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations. In any event, an environmental impact statement should at least indicate those considerations, including factors not related to environmental quality, which are likely to be relevant and important to a decision.

The Bureau of Land Management believes that this requirement has been met, through discussions of Section 18 requirements and through referencing of material prepared for the Secretary's consideration relating to a decision on a five-year OCS leasing schedule.

4. The EIS should analyze the probable extent, impact and possible mitigating measures, as well as cost of mitigating measures, of a catastrophic oil spill for each region. This would allow an area to be removed from the schedule if the cost of mitigation were anticipated to be prohibitive. It is suggested that the most probable catastrophic oil spill be projected in each region to make this evaluation.

Environmental Protection Agency.

There is no methodology to project "the most probable catstrophic spill." The EIS has projected the probable number of large spills--defined as those over 1000 bbls. Monetary costs of mitigation for such spills will be borne, at least in part, on a programmatic basis. Therefore, it does not appear useful to project a "catastrophic" (which is undefined) spill for each region, without consideration of the risk of such a spill, and the cost of mitigating such a spill, at the programmatic level. The impact, and therefore the cost, would be dependent upon the location of tracts included in a sale, their relationship to specific resources, and the prevailing oceanographic and meteorologic conditons at the time of the spill. The costs and impacts of a spill will vary within each region, and also within a sale area. An analysis of the costs of mitigation is made for each sale decision.

Instead, the environmental statement has attempted to generally assess the extent and susceptiblity of resources within each region to varous types of OCS-related impacts, and whether and to what extent OCS development in a region would pose a significant threat of environmental impacts.

5. The EIS should evaluate new biddig systems, one of the values of which is to promote environmental safeguards. The statement should discuss these systems, as well as tract sizes and lease periods for their environmental consequences.

National Oceanic and Atmospheric Administration.

The environmental statement is addressing a schedule of OCS lease sales being prepared pursuant to Section 18 of the OCS Lands Act Amendments. Use of various bidding systems, while required elsewhere in the Amendments, is not a part of the schedule or schedule requirements under Section 18, and therefore not a part of the proposed action.

NOAA suggests that the bonus bidding system, whereby the government accepts large amounts of money in advance of production, makes it difficult to modify, suspend or cancel leases, and could lessen flexibility in reviewing development and production plans. The Secretary has the responsibility to protect the environment, and the authority to suspend or cancel leases if threat of harm or damages warrant, regardless of the bidding system which was used to award a lease.

While it is conceivable that different lease periods may promote environmental protection, neither lease terms or tract sizes are a part of the five-year schedule proposal. While these factors may be appropriate considerations in the background, regulatory framework, and possibly mitigation of lease sales included in the proposed action, the Bureau of Land Management does not believe that they would result in significant differences in environmental effects which could be assessed at the program level.

6. The Draft Environmental Statement fails to analyze energy requirements and conservation potential of the alternatives. The Commonwealth of Massachusetts commented in a similar vein that the net energy should be used to measure benefit--taking into account energy to extract and transport hydrocarbon resources.

Commonwealth of Massachusetts; State of California; League of Women Voters of Ventura County.

The proposed schedule will result n an estimated 6620 million barrels of oil and 29 trillion cubic feet of gas, and despite energy requirements to produce these resources, should result ina net gain in energy.

The use of net energy analysis is appropriate only in cases where BTU content is a better measure of the value of a resource than is market price. However, any energy source has a variety of properties in addition to its energy content, including such characteristics as entropy level, proximity to users; burning characteristics; solid vs. liquid vs. gaseous; compatibility with the institutional environment, the natural environment, and the existing capital stock of energy-using equipment; and other characteristics. Because net energy analysis de-emphasizes or even ignores the effect which such characteristics have on the true value of a resource, market value is considered in this document to provide better approximations of the value of resources.

In this context, it is clear that if the net market value of extracting and transporting hydrocarbons in an offshore area represent a net loss, then the area will not be bid upon in a lease sale. On the other hand, if the net energy value of developing an area represents a loss, one would still need to rely on market value to determine whether the area should be developed. To use an extreme case as an illustration, a project which used 1.1 BTU of coal to mine and process the steel needed to produce 1.0 BTU of offshore oil could still be, despite the net energy loss, a socially desirable (and profitable) project, because of the fluidity, possible cleaner burning characteristics, and the resulting higher market value of the oil. Except in cases where prices were greatly distorted by regulation, a net energy analysis would be much less likely to capture the true value of such a project than would market prices.

Although it is true that market prices "externalize" or ignore some factors--such as the environmental cost of legally allowable increments in pollutant emissions--it is probably also accurate to note that net energy analysis exogenizes even more factors. Therefore the best approach, and the one used in this program is to retain the market vale analysis, but to supplement it with an analysis of environmental costs, so as to avoid reliance on market prices alone in determining the true social value of OCS development. This type of analysis is performed for each sale.

Any conservation potential of the proposal and alternatives (except Alternative 10) would be in the development stage and cannot be evaluated at this time.

7. Two comments addressed resources estimates utilized in the environmental statement. It was pointed out that resources estimated provided by the U.S. Geological Survey were based on 1975 data, and that recent events may require updating of those estimates, especially recent announcements regarding the potential of a reefal structure in the Atlantic. In addition, the Department of Energy noted significant discrepencies between its production goals--i.e. its estimates of resources which could be obtained from Alternative 2, and resources estimates for Alternative 1. It pointed out that the Department had indicated that Alternative 1 would meet 90-95% of the DOE goals; however estimates for Alternative 1, contained in the environmental statement, are several times those projected by DOE for Alternative 2.

State of California; State of New York; Department of Energy.

The Department of the Interior's projection of meeting 90 to 95% of the DOE goals with Alternative 1 was made based on the Department of Energy's resource projection for each sale area. While DOE was provided data by USGS for making such estimates, the production estimates developed by DOE are based on its own assumptions relating to such factors as production life and percentage of basin resources recoverable per sale, and economic variables. These assumptions and methodologies differ from those utilized by the Geological Survey to provide estimates for the environmental statement. An important difference in assumptions, for example, relates to gas production. While the USGS estimates potential gas resources which could be extracted as a result of sales included on the schedule, the market for gas is not considered, or not considered a constraint. DOE assumes very limited gas production in Alaska as a result of market conditions. The possibility that all gas estimated to be produced as a result of the schedule may not in fact be produced was discussed in the environmental statement.

Because of the uncertainties involved in making estimates of production in frontier areas, the Geological Survey has not utilized as complex a methodology as has DOE. The Geological Survey estimates for for each area represent a judgment, based on basin estimates, as to how much of the total estimated resources might be produced as a result of a sale. The DOE methodology considers numerous economic and geologic parameters, also starting with the basin estimates. However, the parameters used also require exercise of judgment, and are built on several assumptions.

In light of DOE's comments, the Geological Survey has revised estimates, particularly the Alaska estimates. In addition, the most recent available basin estimates were utilized for these revisions. The revised basin estimates reflect data from recent drilling and survey activity.

8. The treatment of transportation and refining difficulties is inadequate. Leasing should be slowed down so that problems can be resolved before significant production occurs. Several commenters disagreed with figures regarding PADD V refining capability and supply.

State of California; Santa Barbara, San Luis Obispo, and San Mateo Counties; Clean Air Coalition; Trustees of Alaska (commenting also for Alaska Center for the Environment, Fairbanks Environmental Council, Friends of the Earth); Friends of the Sea Otter.

As required by the CEQ regulations (40 CFR 5202.12), the issues of transportation networks and of the refining of oil, including high sulfur oil, are identified as unresolved issues. In view of the constraints noted in the environmental statement regarding the ability to predict and analyze future refining requirements, supply and transportation networks, the Bureau of Land Management does not believe that substantial additional analysis is possible at this time.

The discussion of PADD V refining capacity and future supply has been examined in light of specific comments made regarding inaccuracies and omissions, and has been amended and clarified as appropriate.

9. The destination of Alaskan LNG should be more carefully studied. The environmental impact report for the Pt. Conception LNG plant should be summarized and appended.

Santa Barbara County; San Francisco.

The comment above (B.8) regarding refining of oil on the west coast also applies to LNG facilities. However, as pointed out in the draft environmental statement, the Department of Energy does not expect gas to be produced in most Alaskan areas. The Pt. Conception LNG plant environmentalreport has been referenced.

10. The discussion of probable transportation and location of pipelines is inadequate.

Trustees of Alaska (also commenting for Alaska Center for the Environment, Fairbanks Environmental Center and Friends of the Earth).

As discussed in Section II.A.1., further identification of transportation modes is not possible at this stage. Location of pipeline requires even greater definition of lease areas and of productive tracts.

11. Commenters objected to or disagreed with statement in the DES to the effect that inclusion of sales in the schedule does not represent a decision to lease, and that as a result the DES put off detailed evaluation of impacts until the sale stage when more specific information is developed.

State of California; Sierra Club; Friends of the Sea Otter.

By law and regulation, the Secretary is required to complete several steps prior to deciding to hold a lease sale, which tracts to include in that lease sale, and what special stipulations should be required for that lease sale. Among the most important of these are the requirements of the National Environmental Policy Act.

The environmental statement makes as detailed an assessment of the environmental impacts of sales included in the schedule as is possible at this level of sale definition. Additionally, it indicates which analyses will be refined at the sale-specific environmental assessment stage. Also see response to comments A.2.

12. There is inadequate citing of sources; for example, no methodology or source for oil spill projections is given.

State of California.

The oil spill risk analysis methodology is referenced in Section IV.A.1.a. A selected bibliography, including major primary sources of data and conclusions, has been added.

C. Impact Assessment

1. The number of possible spills for all alternatives should be provided.

San Francisco.

Statistically probable numbers of oil spills have been added for all alternatives.

2. The region-by-region approach does not take into account the cumulative employment and social impacts, or the resulting environmental impacts, on the Gulf of Mexico. The DES notes that skilled workers may be drawn from other areas of the country to frontier regions--on a temporary basis--resulting in impacts to families in the Gulf of Mexico region. Construction of OCS facilities in the Gulf for other areas of the country will increase manufacturing employment and output.

State of Louisiana.

The environmental statement has been revised to better reflect this cumulative impact on the Gulf of Mexico region.

3. There is no analysis of cumulative impacts of the schedule on Alaska. Such impacts as those on whales migrating through the area, should be addressed.

Trustees for Alaska (commenting also for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth).

The FES has been revised to provide a better recognition of cumulative impacts. Because of the uncertainties involved at the program level, and because of the numerous factors and their interrelationship involved in impact assessment, no quantitative analysis of cumulative impact is possible.

The cumulative socioeconomic effects on Alaska are specifically considered under a heading "State of Alaska" in Section IV.B.3.f. An attempt was made to recognize possible cumulative effects on species which might be affected in more than one OCS area by OCS development. This effort was expanded in the final statement.

4. There is no analysis of the cumulative air quality impact on California. Under the proposed USGS regulations, each project could result in a 2% increase in ambient air quality. This could reach a very significant percentage if several such projects are approved. Even small increases would be significant where standards are close to being exceeded. Ventura County stated that the cumulative air quality analysis should consider other projects, such as the Oxnard coal-powered generating plant and the Elk Hill's terminal.

   Several commenters pointed out inadequacies in the air quality impact analysis - stating that adverse effects on industrial expansion, emissions from tanker loading, and adverse impact on health, property and crops should be addressed or addressed in more detail.

State of California; Ventura County; San Luis Obispo County; Clean Air Coalition; League of Women Voters of San Luis Obispo County.

The commenters expressed concern about the possible cumulative effects of air emissions from OCS facilities. In drafting the proposed air quality regulations (44 F.R. 27449, May 10, 1979) the Department, in response to its legislative mandate, devised a regulatory scheme which would facilitate the conversion of emissions from OCS facilities, through the use of EPA approved models, into concentrations of pollutants in the onshore ambient air. The Department also adopted EPA's "significance levels" to determine whether the resulting onshore ambient air concentrations significantly affect the onshore area. This approach is analagous to the one applied by EPA for new sources locating in a "clean" portion of a non-attainment area (see Appendix S, II-D, 44 F.R. 3283). The proposed U.S.G.S. air quality regulations would establish a very stringent program. For example, the adopted EPA significance levels are approximately 2% of the national primary ambient air quality standards. This level is quite conservative. In fact, EPA has informed the Department that although it is possible to model emissions at these levels, it is difficult if not impossible to detect these concentrations on air quality monitors. In devising this scheme, the Department believed that the stringency of the proposed standards and the dispersed nature of OCS sources combined to insure an adequate margin of safety which would offset any possible cumulative impacts.

During the public hearings in California the Department specifically requested informaton on the cumulative effects questions. Both the State of California and the industry submitted studies on the cumulative impacts of OCS facilities.

These studies have provided useful information and data which the Department will use to comprehensively address this subject in the final air quality regulations.

While the Bureau recognizes that emissions from OCS-related facilities will be in addition to those of other major projects and proposals, the cumulative impacts of these emissions cannot be evaluated at this program level. Air quality modeling will be performed for each proposed sale offshore of California, at which time OCS-related air quality impacts can be better assessed, their relationship to other air emission sources evaluated, and the indirect impacts of any air quality impacts can be addressed. Recognition of tanker loading as a primary emission source has been included in Section IV.A.3. of the FES.

5. The discussion of differences in environmental consequences of the various alternatives is too general to evaluate.

State of California; San Francisco; Humboldt County.

Sections II.B.-J. (Description of Alternatives) have been revised to include tables summarizing expected activities, resource levels, etc. In addition, Section IV.C-K have also been revised to provide a more definitive discussion of differences in impacts between alternatives.

6. The DES fails to adequately assess the possible conflicts with State and local policies and programs. The State of California stated that the environmental statement should analyze how the California coastal zone management program protects the coast and how leasing of specific areas would be contrary to CZM plan policies. The statement should also discuss pre-lease sale CZM consistency.

State of California; State of New York; San Luis Obispo County; Association of Monterey Bay Area Governments.

The purpose of the environmental statement (ES) is to provide an analysis and discussion of the environmental impacts of the Department of the Interior's five-year offshore oil and gas program (Program). Conflicts which arise between the Program and State and local policies or programs involve questions of a political or legal nature. Such conflicts may occur; however, the ES is not the correct forum for resolution of conflicts between laws or questions of a political nature. Those questions should be directed specifically to the process Congress designed for that purpose - i.e., the section 18 development process for the Program (43 U.S.C. 1334).

This is not to deny the interrelationship between the development of the ES and the Program. In fact, the ES recognizes this interrelationship in discussing, for example, the Coastal Zone Management Act, 16 U.S.C. 4151 et seq., though not specifically the California coastal zone management program.

However, in recognizing the interrelationship, one should not lose sight of the ES's limited role in the entire process - identifying the environmental ramifications of the project. Section 18, meanwhile, requires the Department of the Interior, in conjunction with the States to identify inter alia political and legal conflicts. Then, all of the information is brought together and utilized in the section 18 decisionmaking process - not in the ES, which has a narrower focus.

Finally, as to conflicts between the California coastal zone management program and the leasing of specific tracts, those issues are best addressed in the OCS lease sale ES's after specific tracts have been selected for consideration for leasing.

7. The discussion of information availability is inadequate. The statement should summarize Regional Studies Plans and should include, for each area, information necessary for each step in the process, whether this information is currently available, and when additional studies will be initiated and completed. EPA also called for monitoring plans for sensitive areas in each region. The Whale Center questioned the adequacy of the timing of whale studies, with respect to their inclusion in the environmental statements and sale decision.

Trustees for Alaska (also commenting for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth); Center for Action on Endangered Species; U.S. Environmental Protection Agency; State of Georgia; The Whale Center.

The environmental statement has referenced Regional Studies Plans for further information on this topic, in keeping with the CEQ regulations. Trustees for Alaska objects to this approach because these documents are "voluminous and intimidating" and do not include initiation and completion dates. The documents are lengthy and complex because the process of identification of necessary studies and levels of detail required for each step of the process, as compared to existing information available, is a complex one. For this reason a very general summary has been included in the statement and the lengthy and detailed material incorporated by reference.

Regarding monitoring plans for sensitive areas, these can be adequately designed only when the specific resource and area to be monitored is identified. Specific sensitive areas and resources which might be affected by a sale can not be identified sufficiently to develop such plans until after tract selection.

8. The discussion of endangered species information and impacts is inadequate. A more thorough analysis of existing information is required, especially considering its importance to subsistence hunting in Alaska.

Trustees for Alaska (also commenting for Alaska Center for the Environment, Fairbanks Environmental Center and Friends of the Earth); Whale Center; Friends of the Sea Otter.

Section IV.B.3.c. has been revised to include more information on endangered species.

9. Several commenters identified inadequate discussion of socioeconomic impacts.

Trustees for Alaska believes the socioeconomic impacts analysis for Alaska is inadequate, as it does not for example, consider the boom-bust syndrome which accompanied the construction of the Alaska pipeline, nor does it address potential mitigating measures such as a local-hire provision. Page Else indicated that the population and cultural impact assessment was inadequate for the North Slope.

The analysis of socioeconomic impacts on California was also criticized. The League of Women Voters of Ventura disagreed with the characteristics a peak-year population increase in Southern California as relatively minor and believe that affordable housing may be a problem, as well as provision of services by local government, in view of Proposition 13. The Clean Air Coalition and League of Women Voters of San Luis Obispo County state that socioeconomic impacts could be greater than protrayed in the statement, due to the California Coastal Commission policy of concentrating development in areas along the coast where industrialization has already occurred. The Association of Monterey Bay Area Governents states that impacts the Monterey Bay area cannot be adequately assessed without knowing how much of the projected regional employment will be in that area.

Trustees for Alaska (also commenting for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth); Page Else; League of Women Voters of Ventura; Clean Air Coalition; League of Women Voters of San Luis Obispo County.

More detailed information on socioeconomic impacts can be provided at the sale stage when economic modelling is used to help in evaluating indirect impacts which are caused by primary population and employment increases and primary increases in specific manufacturing construction and other sectors. In Alaska, the initial evaluations is that a steady level of exploration and development activity and segregation of support activities should help to reduce any "boom/bust" problem. Section VI.B.3.f, under "State of Alaska" discusses this potential impact.

10. The conclusion regarding impacts on recreation in Central and Northern California is questioned, as far as Central California is concerned. The 20 mile stretch of beach at Santa Maria had 3.9 million visitors is 1976-77.

San Luis Obispo County

Section IV.B.3.d. has been revised to reflect the level of recreation in Central California.

11. Some commenters questioned the conclusion that physical oceangraphic and seismic activity will not hamper OCS development. The State of California is concerned that these factors have have been given inadequate attention - that despite engineering and design criteria requirements - recent experience in California proves that existing knowledge cannot make any structure 100% safe against earthquakes. Increased oil spill risks will result.

State of California; Marine and Sonoma Counties.

Section IV.A.1 has been revised to include a discussion of the relationship between environmental factors and oil spills. As indicated in that Section, there is no data to support a correlation between the two.

12. Multiple use conflicts are in sufficiently identified. They should be documented in more detail.

Marin and Sonoma Counties; U.S. Coast Guard

The extent and exact nature of the interaction between OCS development and other uses of the marine environmental is highly dependent on specific tract locations and specific types of uses within or in chose proximity to those tracts. For example, different methods of fish harvesting have different degrees of potential conflict with OCS-related structures and other activities. The extent of potential conflict between OCS development and navigation depends upon the relationship of tract, and to some extent structures located with a tract, and navigation schemes and anchorages. Many of these impacts may be substantially mitigated as a result of the application of standard regulatory measures, development of special stipulations, and other speical mitigating measures. For example, the impacts of gear loss by fishermen can be compensated through a special fund set up for that purpose. As another example, if safe access routes are designated under the 1978 Amendments to the Ports and Waterways Safety Act, all lease rights within the access routes would be subordinate to the paramount rights of navigation safety.

The environmental statement has attempted to analyze the types of such conflicts which may take place within each region and the probable extent of impacts, as well as which types are most likely to occur. A more detailed analysis is possible at the sale stage when tract selection has occurred.

13. Some commenters disagreed with sensitivity ratings included in Table II-3. South Carolina disagreed with the ratings given the South Atlantic coastal resources. The Bering Straits Native Corporation disagreed with the rating attached to subsistence activities in the Norton Sound area. The Kodiak Area Community Development Corporation objected to the assigning of ratings for subsistence activities, indicating that such a rating is too subjective as these is inadequate information on which to base such a rating.

State of South Carolina; Bering Straits Native Corporation; Kodiak Area Community Development Corporation.

The ratings included in Table II-3 are relative ratings and do not necessarily imply a high or low absolute impact. They are an attempt to assess differences in potential impacts among regions. This is a difficult task at best as often several factors must be weighed which are not easily comparable. The assessment of relative sensitivity to avian populations must consider, for example, waterfowl nesting, staging, mitigratory stopover and wintering areas, as well as pelagic bird rafting areas. While utilizing additional, more discrete categories would result in an easier rating tasks, it would not necessarily aid in the decisionmaker in judging the overall differences in potential impact.

The environmental consequences discussion under Section IV.B. indicate the rationales behind the relative ratings. The explanation of the Table II-3 has been expanded to help the reader better understand how the table was developed.

14. There is inadequate attention given to the effects of oil spills and their degradation in Arctic ice conditions.

Page ELse; Bering Straits Native Corporation.

Little information is available concerning the behavior of oil in Arctic ice conditions. Section IV.A.1. has been revised to reflect this, and includes an indication of current thinking about possible spill behavior.

D. Comments Concerning the Five-Year Leasing Program and Policy

1. The proposed OCS leasing schedule does not meet the Section 18(a)(3) requirement to balance the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone.

Natural Resources Defense Council; Save Our Shores; San Luis Obispo County; Trustees for Alaska (also commenting for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth); Sierra Club; State of California; San Mateo County; Assoc. of Monterey Bay Area Gov'ts.; Humboldt County

The Department of the Interior believes the proposed program will allow all regions of the country to contribute to energy supplies, if economically recoverable hydrocarbon deposits are found off their shores, and to share in both the developmental benefits and environmental risks. Section 18(a) (2) (B) of the OCS Lands Act, as amended, (OSCLA), requires the program be based on a consideration of an equitable sharing of developmental benefits and environmental risks among the regions. However, the Act also clearly requires that the timing and location of sales be selected in a manner which balances the potentials for environmental damage, oil and gas discovery and adverse impacts to the coastal zone (section 18(a) (3)). The proposed program provides for six sales in the Atlantic, 11 in the Gulf of Mexico, four off California and nine off Alaska. The environmental sensitivities of these four regions are addressed in the background material prepared for the Secretary (part B, tab 6) and are further analyzed in the draft and final environmental statements. In accord with the OCSLA, these factors are not considered in and of themselves, but rather, are integrated and balanced with the other requirements for program development as described in Section 18.

2. An alternative to allow only exploration in St. George Basin and the Northern Aleutian Shelf, prior to a decision on proceeding with development and production, should be considered.

National Oceanic and Atmospheric Administration

The OCS Lands Act, as amended, does not provide for a separation of exploration from development. Section 25 of the Act does, however, require that at least once in a frontier area the approval of a development and production plan would be declared a major federal action under NEPA and a draft and final environmental statement would be prepared. Moreover, Interior may require in a lessees development and production plan, stringent measures to protect resources in the area of the lease. Further, if exploration results in the identification of unacceptable environmental risks, then leases may be suspended, and if adequate mitigating measures are not available leases may be cancelled.

3. Prices used in the Department of Energy's production goals are not reflective of anticipated world prices.

State of California

The continued increase in the price of oil strongly underscores the need for an aggressively paced OCS leasing program. Forecasting future prices is very difficult, particularly when prices are set by a cartel rather than by market forces. The prices used in the DOE production goal model in early 1979 are the same ones used by DOE in preparing the second National Energy Plan and were used in part for consistency with that effort. While the annualized prices used for the medium-low price ($18.50/bbl.) and, medium-high price ($23.85/bbl.) assumptions now appear low in light of recent price increases, a sensitivity analysis showed that use of the high price assumption ($31.00/bbl.) brought forward substantially increased production, but that the regional distribution of lease sales, as optimized by DOE's model, remains virtually the same. The greatest sensitivity of the optimized sale schedules to prices occurs in moving from the medium-low price assumption to the medium-high price assumption. The proposed 5-year leasing program developed in response to DOE's OCS production goals is appropriate at current price expectations as well, but will result in more production. (It should also be noted that the DOE price assumptions were stated in 1978 dollars and thus should not be compared to market prices in current dollars.)

4. There is inadequate discussion of studies budget. Why does it decrease over time, despite teh need for information for post-sale decisionmaking utilizing this data? Also, NOAA commented that the DES does not reflect specific steps that the Department of the Interior is taking to assure availability of information.

National Oceanic and Atmospheric Administration; Natural Resources Defense ouncil; Trustees for Alaska (also commenting for Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth)

In general, the studies budget decreases over time because it includes only those studies relating to proposed sales scheduled during the five-year period, with emphasis on preparing for sales in frontier areas. The budget estimates in the Secretarial Issue Document reflect costs for pre-sale, monitoring, and post-sale studies for those sales. In any case, the budget figures included with the five-year program are preliminary and do not reflect final decisions regarding future studies. Both the studies program and the budget requirements will be reviewed on a regular basis and revised as appropriate.

Environmental studies program information is available to the public upon request from BLM's OCS Office responsible for studies related to specific sales in their OCS area of jurisdiction.

5. Future leasing in California should be tied to use of pipelines. If resources are not great enough to justify pipelines, areas should be eliminated.

State of California

There is no legislative or other basis for limiting the transportation of OCS oil to pipelines. A decision to permit the use of tankers would only be made if envornmental safeguards were adequate. Further, until drilling is permitted no one knows the extent of reserves, if any at all, in an area.

6. The environmental statement should discuss Section 21(b) requirements for joint study of the adequacy of safety and health regulations and technology and their relationship to the five-year program.

National Oceanic and Atmospheric Administration

The Geological Survey has contracted with the Marine Board of National Academy of Science for a study of the adequacy of safety and health regulations and technology. The Coast Guard is involved also and will be providing information. This study was initiated October 1, 1979, and will form the basis of the joint Interior/Coast Guard report which will be sent to the President in early 1981.

7. The ability of industry to undertake as aggressive a program as the proposal is questioned, in light of industry's request for a ten-year lease term.

State of Alaska

The rationale for industry's request for a 10-year lease term is based on several factors: (1) delays of up to 22 months in arctic areas for rigs since they must be specially built; (2) potential restrictions on exploratory operations tailored to site-and sale-specific conditions; (3) potential delays due to legal mandates; (4) harsh operating conditions in the arctic could lengthen engineering design and construction phases of operation; and (5) a federal 10-year lease term would be consistent with Alaska's lease term. The OCS Lands Act, as amended, provides for lease terms of up to 10 years where the Secretary finds that this time length is necessary to encourage exploration in areas of unusually deep water or other unusually adverse conditions. Industry has repeatedly assured us that they are capable of undertaking the aggressive schedule, and in fact, their comments on the proposed program reveal they would prefer a faster pace in the Alaskan frontier areas.

8. It is recommended that the prohibition of foreign sale of Alaskan crude oil be reexamined--to alleviate potential west coast surplus of oil.

State of Alaska

This issue is outside the scope of this environmental statement.

9. The Environmental Statement should state that local air quality standards will be enforced.

Santa Barbara County

Section 5(a)(8) of the Outer Continental Shelf Lands Act Amendments of 1978 directs the Secretary of the Interior to regulate emissions from OCS activities only when these emissions would significantly affect the air quality of any State. Any decision to require the control of offshore emissions must be based on the onshore impact of the emissions.

On May 10, 1979, the Department published proposed regulations setting out a regulatory scheme for the control of air emissions from OCS operations (44 F.R. 27449). Those regulations established information requirements and criteria to be used to determine whether the impact from emissions will "significantly affect" onshore air quality. If significant effects occur, the provisions of the regulations requiring control of emissions will apply. Decisions concerning the potential impacts on onshore air quality of offshore emissions and the necessity for control will be made as part of the approval process for exploration plans and development and production plans.

The preamble to the proposed regulations discussed the application of more stringent State air quality standards to OCS activities (see 44 F.R. 27450-27451). It indicated that the Department believes that the approach proposed in the regulations will not prevent the attainment of more stringent State standards and requested that persons commenting on the regulations provide specific information which supports or disapproves this position. Several commenters submitted information on this subject which is now being analyzed. The final regulations, which are scheduled to be published in early 1980, will address these comments.

10. It is recommended that sevearl areas offshore of Alaska be designated as study areas.

State of Alaska

The expenditure of public funds to study an area for potential OCS exploration and development must be carefully considered in program development, and we believe that designation of "study areas" could undermine the intent of the Act to establish a 5-year program, a planning tool which is responsive to the Nation's energy needs. We continue to conduct useful environmental studies in potential sale areas and use of that information in key decisions leading to a sale. The placement of an area on the 5-year program does not represent a decision to lease, but rather, to consider the area for leasing.

11. Exploration by the government is recommended.

Santa Barbara and San Luis Obispo Counties

Adoption of this recommendation is a policy issue outside the scope of this environmental statement.

12. National reserve status should be considered for frontier areas.

San Luis Obispo County; North Central Florida Regional Planning Council

Adoption of this recommendation is a policy issue outside the scope of this environmental statement.

13. The DES did not address the impact which drilling in federal OCS waters may have in state oil and gas sanctuaries--such drilling may drain state reserves.

San Luis Obispo County

Section (8)(g) of the OCS Lands Act Amendments provides a method by which a state may receive a fair and equitable share of Federal revenues resulting from drainage of state lands, if such drainage occurs.

14. One commenter disagreed with the Department of the Interior policy of placing areas on the schedule to provide incentive for the development of deepwater and ice condition technologies. If this is done and a leasing decision is made prior to the development and proving of adequate technology, regulations and the lease should contain a suspension and cancellation provision that would <u>require</u> the Secretary to cancel the lease if technology is not developed.

Trustees for Alaska (also commenting for the Alaska Center for the Environment, Fairbanks Environmental Council and Friends of the Earth)

The Department of the Interior does not believe this requirement is necessary since the suspension and cancellation provision is available to the Secretary at any stage in the OCS process. Further, OCS Operating Orders 2, 5, and 8 provide for the control of drilling and other downhole activities in all waters including those that are deep or are ice infested. Geological Survey does not believe a safety problem exists because exploration development and production plans must be reviewed and approved, and operators will need to demonstrate the adequacy of any new systems. The Geological Survey also determines the adequacy of drilling platforms or structures through its Platform Verification Program. Finally, at least once in a frontier area the approval of a development and production plan will be declared a major Federal action under NEPA and a draft and final environmental statement will be prepared in accord with section 25 of the OCSLA.

15. Several commenters recommended contingency sales for specific areas in Alaska and California.

Natural Resources Defense Council; California counties

One contingency sale (Gulf of Mexico, 1983) is included in the proposed schedule. The contingency sale concept has not been expanded because it caused considerable uncertainty as to whether or not affected states and industry should invest in the pre-sale planning and other activities prior to a sale. It is important to have a firm and cost-efficient planning schedule. The OCS Lands Act, as amended, provides the necessary tools to assure protection of our social and environmental resources during oil and gas activities, and to revise the program, if necessary.

16. One commenter stated that the schedule does not assure the receipt of fair market value.

Energy Action

The rate of leasing in the proposed program is not so substantial an increase over the rate in recent years that it will cause a glut on the market for leases. The proposed amount of area offered for leasing is about 6 million acres per year. In 1977, the Department of the Interior offered 1,385,576 million acres for lease and in 1978, 2,381,581 acres.

Neither the energy product goals or economic goals of the OCS program would be served by restricting the supply of leases in order to extract higher payment for those offered. To follow such a policy would be to exploit the government's monopoly power in the OCS leasing market. This is clearly not required to assure receipt of fair market value for the lands leased and would sacrifice the national benefits of the leasing program.

Competition is adequate to assure fair market value even when a substantial number of tracts receive zero or one bid so long as no bidder can acqure valuable tracts for less by knowing in advance that none of the other potential bidders will be submitting bids. There is no evidence that the rates of leasing being proposed will allow any bidder to systematically develop and exploit such knowledge.

The U.S. Geological Survey will be increasing the resources used in tract valuation, especially in frontier areas. However, it is not necessary to have superior information in order to assure receipt of fair market value. It is only necessary to have bidders know that the government is equally well informed as any bidder and that it will consider its own estimates of a tract's value in deciding whether or not to accept a bid. The rate of leasing does not affect this so long as the government continues to receive all pre-lease data collected by potential bidders and continues to employ a sound bid rejection procedure.

17. Several commenters expressed concern regarding the timing of the DES in the development of the currently proposed and final five-year leasing schedule. One commenter (State of California) indicated that one month (between publication of the FES and a decision of the proposed schedule) is insufficient time to achieve the proper balance between environmental risks and development benefits required by section 18 of OSCLA.

State of California; State of New York; Natural Resources Defense Council; Clean Air Coalition of San Luis Obispo County

In order to ensure that environmental analysis conducted under NEPA is given full consideration in the development of the leasing program, a decision on the final proposed program has been delayed until after the FES is complete. Since the development of the program has been ongoing since late 1978, the Department believes that the 30 day period between publication of the FES and a decision is an adequate timeframe to make a balanced decision.

COMMENTS FROM FEDERAL, STATE, AND LOCAL AGENCIES

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

August 29, 1979

Director (542)
Bureau of Land Management
Washington, D.C. 20240

Dear Sir:

This is in response to your request for comment on the Draft Environmental Statement concerning the proposed five-year Outer Continental Shelf oil and gas lease sale schedule.

We have reviewed the statement and determined that the proposed action has no significant radiological health and safety impact, nor will it adversely affect any activities subject to regulation by the Nuclear Regulatory Commission.

Since we made no substantive comments, you need not send us the Final Environmental Statement when issued.

Thank you for providing us with the opportunity to review this Draft Environmental Statement.

Sincerely,

Wm. H. Regan, Jr., Acting Assistant
Director for Environmental
Projects and Technology
Division of Site Safety and
Environmental Analysis
Office of Nuclear Reactor Regulation

cc: U. S. Environmental Protection
Agency (5)

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
Mail Stop 760

12 OCT 1979

Memorandum

To: Director (542), Bureau of Land Management

Through: Assistant Secretary--Energy and Minerals OCT 17 1979

From: Director, Geological Survey

Subject: Review of draft environmental statement for proposed five-year OCS oil and gas lease schedule.

Our review indicates that information should be added to the draft statement to properly account for the following items:

Better definition of USGS responsibilities

Special techniques for drilling in the arctic

Areas recommended as marine sanctuaries

Significant hydrocarbon shows in Mid-Atlantic exploratory wells.

These concerns and numerous specific suggestions for changes in the draft statement are discussed in the enclosure.

J. R. Balsley
For H. William Menard

Enclosure

ONE HUNDRED YEARS OF EARTH SCIENCE IN THE PUBLIC SERVICE

Mention should be made of offshore ice or gravel islands and prefabricated activity structures as exploratory drilling structures. There also should be a reference to seasonality and drilling outside the pressure ridges which delineate the "fast" ice. Advanced and present technology will probably provide for structures to withstand ice and open-water storms.

The following items should be included to define responsibilities and authorities in regulating Outer Continental Shelf (OCS) oil and gas activities by the U.S. Geological Survey (USGS).

Permit conditions which can be included as an environmental control measure.

USGS Failure and Inventory Reporting System Program as an environmental and safety control measure.

Notice to Lessees which can define operational problems and necessary actions for solution.

Reference to 30 CFR 250.51 for pooling and unitization requirements (p. 11).

Page i, paragraph 1. The USGS provided estimates for resources to be developed, production rates, and infrastructure based upon 31 lease sales. It is assumed that proposed OCS Sale 77, Gulf of Mexico, will occur as scheduled. Also, Central and Northern California had a lease sale in May 1963 and should be listed with the areas where sales have been held prior to 1980.

Page ii, paragraph 4. Sentence 3 is incorrect. It is not expected that tankering will be required as a result of lease sales in the central and western Gulf of Mexico and the Santa Barbara Channel. Also, ". . . outside of offshore Alaska . . ." should read ". . . offshore Alaska . . . ."

Page iii, paragraph 3. ". . . 48 oil spills greater than 1,000 barrels . . ." should read ". . . 48 oil spills greater than 10,000 barrels . . . ."

Page 4, paragraph 9. See comment for p. i.

Page 13, OCS Order No. 4. Delete ". . . provides for the extension of a lease beyond its primary term for as long as oil and gas may be produced from a lease. It . . . ."

Page 20, paragraph 1. Line 10 should read ". . . exploration plans and development and production plans . . . ."

Page 35, (map) and p. 33 (lease sale list). We suggest omission of the word "Basin" for large areas which may contain numerous geologic basins.

Page 36, table 11-2. The total gas (trillion cubic feet) for the Gulf of Mexico should be 10.6.

Page 38, paragraph 4, and page 39, paragraph 2. The estimates of daily production rates were derived by the Bureau of Land Management (BLM) from the USGS estimates of annual production rates.

Page 43, paragraph 2. The following areas have been specifically recommended as marine sanctuaries: Corsair Canyon, Hydrographer Canyon, Lydonia Canyon, Oceanographer Canyon, Nantucket Shoals, Stellwagen Bank, and Jeffrey's Ledge.

Page 53, paragraph 3. See comment on page i.

Page 54, last paragraph. The Department of Energy's proposal would necessitate offering more deep water tracts. Delete the rest of the sentence.

Page 65, last paragraph. The discussion for the North Atlantic contains only physiography and no geology. We suggest the following be substituted for the first sentence: "In the frontier North Atlantic area, extensive geophysical evidence indicates that the Georges Bank Basin, a northeast-trending downwarped continental basin, is a site of probable traps, reservoirs, and seals adequate for trapping oil and gas. Based upon seismic data, 25,000 feet of Jurassic (and possibly Triassic) through Quaternary sediments are present."

Page 68, paragraph 1. There have been significant hydrocarbon shows in two Mid-Atlantic exploratory wells in addition to the COST B-3 well.

Page 68, paragraph 2. Substitute the term "carbonates" for "chalks."

Page 79, paragraph 2. The drilling results to date are discouraging only in the eastern Gulf of Mexico.

Page 79, paragraph 5. The first sentence should be qualified to include only the Federal OCS. The figures quoted should be updated. As of December 1978, there were approximately 358 fields on the Federal OCS of the Gulf of Mexico. Of these, 238 primarily produce gas and 89 primarily produce oil. In the remaining 31, production or productivity has not yet been determined. Federal OCS production as of December 1978 was 4.9 billion barrels of oil and 39.2 trillion cubic feet of gas.

Page 79, paragraph 6. Rewrite as follows: "Unstable bottom sediments and shallow gas deposits are the primary geologic hazards . . . ."

Page 85, paragraph 2, line 9. New Orleans should be added or Mobile and Houston deleted, depending upon the definition of "coastal."

Page 107, paragraph 3, last sentence. Why are not timber, logging, and forest industries mentioned? Tree harvesting is taking place in Afognak and Kodiak Islands, the Kenai Peninsula, and possibly other locations.

Page 108, paragraph 3. The area labeled "St. George Basin" is characterized with the sentence "Seismicity is relatively low." We believe this is incorrect for the southern portion of that area.

Page 109. The map is confusing. Dutch Harbor is a settlement about a mile north of Unalaska village across a stretch of water. There are only two principal Pribilof Islands, not four, as appears on the map. Unalakleet village is north of the river, not south. Besboro island is northwest of Unalakleet village.

Page 110, paragraph 3, sentence 2. This should read "Other benthic fauna, such as clams . . . ."

Page 112, paragraph 2, line 2. "The only deep water port is on the southern side of the Aleutian islands at Dutch Harbor." Dutch Harbor/Unalaska is on the northern side. Cold Bay and Adak are also deep water ports. Cold Bay is on the peninsula next to the island chain.

Page 114, paragraph 2. We believe the reference to Icy Bay was intended to be Cold Bay.

Page 115, paragraph 6. "Naval Petroleum Reserve" is now "National Petroleum Reserve," as on the map on page 116.

Page 117, paragraph 2. There is reference to ". . . bottom sediment instability . . ." in Chukchi Sea. The Chukchi Sea bottom is relatively smooth and not subject to seismic or tectonic activity. Does any geohazards research work support the quoted phrase?

Page 119, paragraph 3. "Freight deliveries are restricted to these months." We believe the sentence should begin with the word "marine."

Page 137, paragraph 3. Dynamically positioned drillships maintain a favorable heading with their automatic station keeping systems. "Turret" design drillships utilize anchor/chain mooring systems. The mooring winches are mounted on a turret which permits the vessel to rotate (through the activation of thrusters) while it is anchored to the sea floor.

Page 141, paragraph 2. Depending on the range, drill pipe varies in length from 18 to 45 feet, with 30 feet being the most common length. Drill pipe does not come in 75-foot lengths. The authors may be confusing drill pipe length with riser length. Risers for such deepwater rigs as the Discoverer Seven Seas come in 75-foot sections.

Page 145, paragraph 1. Portions of the Mid-Atlantic region are characterized by sediment creep.

Pages 246-248. The first three paragraphs on page 246 refer to the Beaufort Sea, which is listed on page 247. The first three paragraphs of page 247 refer to the St. George Basin discussion, which begins on page 245. The Northern Aleutian Shelf discussion begins on page 246, but is continued on page 248. The order of the discussions should be St. George Basin, Beaufort Sea, and Northern Aleutian Shelf, followed by Navarin Basin.

Page 263, paragraph 1. Sale No. 42 is currently scheduled for October 1979.

Appendix 1, page 2 and attachment 3. Sale No. 56 has 1.6 million acres tentatively selected.

Appendix 6, page 14. There is reference to a planned production platform having ". . . a record 62 wells." This may not be a present record--<u>Offshore Magazine</u>, May 1978, page 419, states that Shell plans an 80-well platform in the San Pedro Bay oil field.

OFFICE OF THE DIRECTOR

United States Department of the Interior

BUREAU OF MINES
2401 E STREET, NW.
WASHINGTON, D.C. 20241

October 15, 1979

Memorandum

To: Director, Bureau of Land Management

From: Director, Bureau of Mines

Subject: Draft Environmental Statement - Proposed Five-Year OCS Oil and Gas Lease Schedule

As requested, the subject statement has been reviewed and we offer the following comments.

While a brief overview has been presented of non-oil and -gas OCS mineral resources as well as the current status of marine mineral mining, we feel that the discussion oversimplifies potential conflicts regarding the use of space that could occur between oil and gas activities and marine mining. As an example, jurisdictional disputes and perhaps operational problems could arise should non-fuel minerals dredging operations be carried out during the course of developing oil and gas deposits. This would be true especially if such activities were to be carried out concurrently. Furthermore, blowouts of oil or gas wells would impede mineral exploration and exploitation. While we realize that it is very difficult to assess accurately in advance areas of possible conflict, we believe in principle with the view that the conflicts can be mitigated with careful forethought and planning.

As a corollary, offshore exploration for oil and gas prospects undoubtedly will favor the discovery of non-fuel mineral deposits.

Acting J. W. Morgan
Assistant Director

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

United States Department of the Interior

HERITAGE CONSERVATION AND RECREATION SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO: 550

OCT 15 1979

Memorandum

To: Director, Bureau of Land Management

From: Director, Heritage Conservation and Recreation Service

Subject: Draft Environmental Statement on Proposed Five-Year OCS Leasing Schedule (DES-79/52)

We have reviewed the subject draft statement in accordance with your August 24, 1979, memorandum and find it to be adequate insofar as our programmatic interests are concerned.

Harold Green
for Chris Therral Delaporte

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377- 4335

October 22, 1979

Mr. Frank Gregg
Director, Bureau of Land Management
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Gregg:

This is in reference to your draft environmental impact statement entitled "Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, March 1980 - February 1985." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving twelve (12) copies of the final statement.

Sincerely,

Sidney R. Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure Memo from: Mr. Robert W. Knecht
Assistant Administrator
Office of Coastal Zone Management
National Oceanic and Atmospheric Administration

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
XXXXXXXXXXXXXXXX
Office of Coastal Zone Management
Washington, D.C. 20235

CZ4:CNE

OCT 19 1979

MEMORANDUM FOR SIDNEY R. GALLER

FROM: Robert W. Knecht RWKnecht
Assistant Administrator

SUBJECT: Comments on DEIS No. 7908.42 — Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, March 1980 - February 1985.

This memorandum outlines the position of the National Oceanic and Atmospheric Administration (NOAA) on the proposed five-year Outer Continental Shelf (OCS) oil and gas lease sale schedule, March 1980 to February 1985, set forth in the subject draft environmental impact statement (DEIS) and its supporting documentation. The Office of Ecology and Conservation has deferred to the Office of Coastal Zone Management to coordinate the NOAA response to this DEIS.

I. SUMMARY AND RECOMMENDATIONS

We recognize the difficulties inherent in developing a five-year lease program and attempting to balance the wide range of often conflicting factors that must be considered under the requirements of the Outer Continental Shelf Lands Act Amendments (OCSLAA). The DEIS is only one step in this complex process. We do, however, have serious concerns about individual lease sales within the proposed schedule and about certain inadequacies of the DEIS.

With respect to proposed lease sale areas, NOAA recommends delay of new lease sales in the nation's two richest fishing grounds -- the Georges Bank and adjacent waters in the North Atlantic and the Southeastern Bering Sea (including lease sales in the St. George Basin and Northern Aleutian Shelf) — until other OCS areas have been leased, the risk to living marine resources and the coastal environment better assessed, and the petroleum potential of these two areas better determined. According to present estimates these two areas represent only 11 percent of OCS oil and gas resources to be developed as a result of the leasing program (see attached Table 1).

Delaying these sales will provide additional time for further improvements of OCS oil and gas technology and to learn more about the risk to fisheries, endangered marine mammals, and other living marine resources. If oil and gas operations are undertaken in these two areas, they should proceed cautiously with limited exploratory drilling to define the oil and gas potential and provide additional information on environmental impacts before deciding whether to proceed with development and production. This will better assure a proper balance of the benefits of development and the risks to living marine resources and the environment.

NOAA is concerned that critical environmental data will not be available in time for tract selection and other preleasing decisions in certain Alaskan sales — 55 Gulf of Alaska, 71 Beaufort Sea, 83 Navarin Basin, and 85 Chuckchi Sea -- and recommends that these sales be delayed until the data is available and fully assessed. When sales are delayed to permit the completion of critical environmental studies, it is important that DOI ensure that funding will be available for the studies. Present funding priorities are apparently determined primarily by the immediacy of pending sales.

The DEIS does not, in NOAA's view, adequately reflect DOI's consideration of the requirement of Section 18 of the OCSLAA to develop a leasing program based on eight criteria specified in the Amendments.

The DEIS fails to specify what steps DOI is taking to assure that the development of critical environmental information required under Section 20 of the OCSLAA will coincide with the principal decision points in the five-year program.

The DEIS does not provide an adequate analysis of alternate energy sources and fails to consider the implications of energy conservation.

There should be a discussion of the relationship between the five-year program and the requirements of Section 21 of the OCSLAA to conduct a joint study of the adequacy of existing safety and health regulations and of the technology, equipment and techniques available for the exploration, development and production of the minerals of the OCS.

The DEIS does not discuss any of the requirements of the mandated use of new bidding systems or describe their environmental consequences.

II. COMMENTS ON PROPOSED LEASE SALE AREAS

The following comments on individual lease sale schedules reflect the general concerns expressed above:

A. Sales 52 and 82 North Atlantic

NOAA recommends that no further lease sales be scheduled in the North Atlantic until a thorough assessment of the results of exploratory drilling in Lease Sale 42 on Georges Bank -- including its oil and gas potential, impacts on fisheries, endangered marine mammals and other living marine resources and

their habitats and the effectiveness of mitigating measures -- has been undertaken so that the risks of proceeding with additional sales in the North Atlantic can be adequately evaluated. At that time we will be better able to recommend whether additional lease sales should be considered on the Bank and its adjacent waters, and if so, what areas should clearly be excluded from all future sales. We are particularly concerned about nearshore areas within the proposed sale area where, in addition to the risk to valuable fisheries, oil and gas operations may threaten the coastal resources on which New England's important recreation industry depends.

B. Sales 70 St. George Basin and 75 Northern Aleutian Shelf

NOAA opposes scheduling Sale 70 or 75 at this time. As the DEIS notes, the Southeastern Bering Sea covered by these two sales provides Alaska's -- and one of the world's — most valuable commercial fisheries. They straddle completely the onshore and offshore migration path of the Bristol Bay salmon runs that support the largest salmon fishery in the world. The data available on the impact of oil on salmon suggests it may adversely affect spawning. Also at risk are large numbers of marine mammals, including eight species of endangered whales and the internationally protected fur seal herds on the Pribilof Islands.

A total of at least five large oil spills is predicted for the two sales, and even this prediction, based on spill statistics from the Gulf of Mexico, which does not have the severe storm conditions or seismic hazards of the Southeastern Bering Sea, may prove too low. For these reasons, NOAA recommends that the St. George Basin and the Northern Aleutian Shelf not be considered for leasing until other Alaskan OCS areas have been leased and their petroleum potential determined.

C. Sale 55 Gulf of Alaska

Because of funding cuts, data to be developed from ongoing and planned FY 80 studies by the Outer Continental Shelf Environmental Assessment Program (OCSEAP) will not be available for sale decisions under the proposed lease schedule. NOAA therefore recommends that this sale be delayed for one year beyond the scheduled October 1980 date so that sale decisions will be based on complete and up-to-date environmental data.

D. Sale 60 Cook Inlet

The Shelikof Strait region receives only superficial treatment in the DEIS discussion of the Cook Inlet lease sale. Yet it is a large, important and virtually unknown area adjacent to a national monument and national forest. Important differences exist between the Shelikof Strait region and the rest of Lower Cook Inlet that should receive more comprehensive treatment in the final environmental impact statement (FEIS).

E. 71 Beaufort Sea, 83 Navarin Basin and 85 Chukchi Sea

Sale 71 in the Beaufort Sea and 83 in the Navarin Basin should be delayed unless sufficient funding can be assured and the sale areas delineated in ample time for the necessary environmental studies to be completed before the DEIS is prepared. Moreover, to protect endangered bowhead and gray whales and other living marine resources, leasing in both the Beaufort and Chukchi Seas should be restricted to shorefast ice areas until proven technology exists for safe oil and gas operations in deeper water with moving ice.

F. OCS Schedule Alternatives 2 and 6

We have not indicated a preference for any of the sale schedule alternatives proposed in the DEIS because none of them address NOAA's range of concerns. NOAA does, however, strongly oppose Alternatives 2 and 6. Alternative 2 would schedule two rather than one sale in the biologically rich St. George Basin. NOAA believes it unwise to schedule any sales in St. George Basin now. Alternative 2 would also schedule two sales within two years of each other in the Beaufort Sea, a proposal that would be contrary to the cautious and systematic approach that NOAA favors in arctic areas, with development moving from the shore seaward. Accelerated leasing under Alternative 2 would further abbreviate the period available for study and analysis of environmental risks.

Alternative 6 is environmentally unsound because it would schedule a sale in the shear zone and pack ice areas of the Beaufort Sea in 1985 in place of a sale in the Chukchi Sea. Moving ice presents hazards that have not yet been technically addressed in U.S. offshore waters. NOAA, in commenting on the December 1979 Beaufort Sea lease sale, has recommended that test platforms be placed in the moving ice zone for at least two years before drilling is undertaken in this area. There is no assurance that demonstratively safe technology will be available for the shear and pack ice zones by 1985. NOAA opposes sales in the moving ice zones in the Beaufort or Chukchi Seas until such technology is available.

III. INADEQUACIES OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Section 18 of the OCSLAA requires the Secretary of the Interior to prepare and periodically revise an oil and gas leasing program to implement the policies of the OCSLAA. The leasing program is to consist of a schedule of proposed lease sales indicating as precisely as possible the size, timing, and location of leasing activity that the Secretary determines will best meet national energy needs for the five-year period following its approval or reapproval. The development of the leasing program is to be based on a consideration of:

- Existing information concerning the geographic, geological, and ecological characteristics of such regions;

- An equitable sharing of developmental benefits and environmental risks among the various regions;
- The location of such regions with respect to, and the relative needs of, regional and national energy markets;
- The location of such regions with respect to other uses of the sea and seabed, including fisheries, navigation, existing or proposed sealanes, potential sites of deepwater ports, and other anticipated uses of the resources and space of the Outer Continental Shelf;
- The interest of potential oil and gas producers in the development of oil and gas resources as indicated by exploration or nomination;
- Laws, goals, and policies of affected States which have been specifically identified by the Governors of such States as relevant matters for the Secretary's consideration;
- The relative environmental sensitivity and marine productivity of different areas of the Outer Continental Shelf; and
- Relevant environmental and predictive information for different areas of the Outer Continental Shelf.

A. Need to Meet the Requirements of Section 18 of the OCSLAA

The DEIS fails to explain how the eight criteria listed above were taken into account in the preparation of the proposed five-year leasing schedule and the other seven alternatives. No method or rationale is described to weight the eight factors nor is any method described with which to "obtain a proper balance between the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone" (Section 18(a)(3)). No framework or quantitative information is presented through which to evaluate the "relative environmental sensitivity and marine productivity of different areas of the Outer Continental Shelf" (Section 18(a)(2)(G)). The relative sensitivity of OCS leasing areas under Alternative 1 is simplistically displayed in Table II-3 (DEIS, p. 41) with no supporting quantitative information, analysis, or interpretation. "Relevant environmental and predictive information for different areas of the Outer Continental Shelf" is either not presented or is discussed in very general terms (Section 18(a)(2)(H)). Extension of the previous lease schedule and industry evaluation of resource potential and industry interest appear to be the prevailing basis in the development of the schedule (DEIS, Appendices 1 and 2).

B. Better Evaluation of Alternative Energy Sources Needed

One objective of the five-year schedule is to meet national energy needs. These have been identified by the Department of Energy (DOE) and transmitted to DOI in the form of oil and gas production goals for 1985, 1990, and 1995. The goals are:

	Est. 1978	1985	1990	1995
Annual OCS Oil Production				
(millions of barrels)	292.0	284.0	581.0 - 597.0	532.0 - 581.0
(energy equivalent in quads)	1.7	1.6	3.4 - 3.5	3.1 - 3.4
Annual OCS Gas Production				
(billion cubic feet)	4385.0	3750.0	3309.0	1956.0
(energy equivalent in quads)	4.5	3.8	3.4	2.0

The DOE goals are based on its estimate of oil and gas resources obtainable from an OCS leasing schedule developed on the basis of maximized net economic value. In other words, the goal is to maximize OCS energy production as much as possible without sacrificing efficient production (DEIS, p.2).

Offshore oil and gas represents only a small fraction of current total U.S. energy supply (See attached Figure 1). For example, in 1976, offshore oil provided roughly 4 percent of total energy (3.2 quads of a total 78.3 quads); offshore gas production supplied roughly 6 percent (4.8 quads of a total 78.3 quads).

In order to assess the relative costs and benefits associated with oil and gas production in ecologically sensitive offshore areas, the full range of alternatives for satisfying future U.S. energy requirements should be considered. The DEIS attempts to do this on pages 25-31. However, no comparative summary analysis is provided and the use of different energy units in the DEIS makes comparison of alternative sources impossible. One important alternative energy source -- conservation -- is not even discussed.

The conservation alternative is particularly important since conservation measures are capable of saving quantities of energy comparable to those which might be extracted from offshore areas -- at much less risk of environmental damage. For example, if improvements in automotive technology continue beyond the current mileage requirements for 1985, energy consumption by automobiles in the year 2000 can be about 5 quads less than in 1976, even given a substantial growth in automobile use (Schurr, 1979). This saving alone is nearly the energy equivalent of the DOE OCS oil and gas production goal for 1995.

NOAA recommends that a more comprehensive and rigorous analysis of alternative energy sources be included in the final EIS.

C. Need to Assure the Availability of Environmental Data for the Principal Decision Points in the Five-Year Lease Program

Section 20 of the OCSLAA requires the Secretary of the Interior to conduct a study of any area or region included in any oil and gas lease sale to establish information needed for assessment and management of the environmental impacts on the human, marine and coastal environments of the OCS and the coastal areas which may be affected by oil and gas development. The Secretary is also required to monitor the human, marine and coastal environments of these areas to provide time-series data to identify any significant changes in the quality and productivity of the environment, to establish trends in the areas studied and monitored, and for designing experiments to identify the causes of such changes.

The DEIS fails to specify what steps DOI is taking to assure that needed information on the effects of oil and gas activities on the human, marine, or coastal environment will be available for the principal decision points in the five-year lease program, particularly for sales in the frontier areas. For example, the data presently available on the impact of OCS oil and gas activities are insufficient to determine the effect of those activities on marine mammals, particularly endangered whales. Currently major research efforts by NOAA's National Marine Fisheries Service (NMFS) and BLM are underway to determine and assess the temporal and spatial distribution of whales in OCS lease areas and the effects of oil and oil-related activities on them. This research will augment the present state of knowledge, but, in most cases, the needed data on which to base prudent decisions on the effect of OCS development will not be available for at least two to three years.

NOAA therefore recommends that the FEIS provide more detail on how the timing of information developed in the Bureau of Land Management's Environmental Studies Program relates to decision points in the five-year leasing program and proposed schedule.

D. Need to Discuss the Requirements of Section 21 of the OCSLAA

The requirement of Section 21(b) of the OCSLAA to use the "best and safest technologies" determined to be economically feasible on all new drilling and production operations could have significant effects on the scheduling of leasing activities, particularly in frontier areas. However, the relationship between the five-year program and the requirements of Section 21 of the OCSLAA, to conduct a joint study of the adequacy of existing safety and health regulations and the technology, equipment and techniques available for the exploration, development and production of the minerals of the OCS is not discussed.

E. Need to Evaluate the Mandated Use of New Bidding Systems

The OCSLAA, particularly Section 205, modified the 1953 law by requiring use of new bidding systems in at least 20 percent and not more than 60 percent of the total area offered for leasing each year during the five-year period of the leasing program. Insufficient analysis of the effect of the use of new bidding systems during the five-year leasing program is a shortcoming in the DEIS.

One of the values of using alternative bidding systems in offshore areas is to promote environmental safeguards. For example, acceptance by the federal government of substantial amounts of money under the fixed cash bonus bid system utilized in almost all lease sales to date makes it difficult to modify, suspend, or cancel leases in response to environmental risks discovered after the initial lease sale. In addition, continued use of the bonus system could limit the flexibility of the federal government in reviewing development and production plans. Disapproval of development and production plans, possibly followed by cancellation, could be an unacceptable alternative when the money given to the federal government as much as five years earlier has been considered part of the general treasury. Use of alternative bidding systems, such as royalty or net profit, lessens this problem.

1. New Bidding Systems: Use of still other bidding systems, such as a work program commitment, could also facilitate environmental protection. A work program bidding system which requires a statement by the lessee as to proposed work (including timing and location) in advance of any exploration, or development and production, could in certain circumstances provide for continuing review by other affected federal agencies, and state, local and private interests, to ensure environmental safeguards.

Section 8(a)(1)(H) of the OCSLAA provides that the Secretary may submit other bidding systems for review by Congress and possibly implementation in future lease sales. One such system is the so-called dual leasing system, which might require new legislation or, at the minimum, Congressional approval. Some analysis should be included as to the advantages or disadvantages of this system from an environmental perspective and use of the system for lease sales in areas that pose risks to the environment. Under the dual leasing system, a lease is offered for exploration only, after which a separate decision is made on whether a new lease is to be offered for development and production. The environmental benefits of this option are obvious. Exploration would quantify the resources so that they could be balanced against the risks to the environment before a decision is made to develop any particular lease area.

2. Lease Period: The leasing program DEIS should also address the question of whether or not a lease should be issued for an initial period of five or ten years. While a five-year lease promotes expeditious development, a ten-year lease for certain areas (defined by the OCSLAA as areas where there is unusually deep water or other unusually adverse conditions) might be more appropriate. Exploration, timed for certain seasons as in Alaska, or timed to be completed when environmental information is obtained on risks to fisheries, endangered species, or the coastal environment, might be more appropriate in specific lease areas. This issue should be addressed in determining the size, timing and location of particular lease sales.

3. Size of Tracts: Another issue not addressed in the DEIS which could potentially affect the environmental consequences of a leasing schedule is the size of individual tracts. The OCSLAA provide that a tract should consist of a compact area not exceeding 5,760 acres "unless the Secretary finds that a larger area is necessary to comprise a reasonable economic production unit." A reasonable economic production unit is closely tied to the question of unitization. Unitization can provide some environmental advantages by requiring fewer exploration wells or production platforms to develop a lease area. The environmental consequences of having a smaller number of large lease tracts, instead of a larger number of 5760-acre tracts, should be addressed in the DEIS.

Attachments

Table 1

USGS (CONSERVATION DIVISION) ESTIMATES OF OCS OIL AND GAS RESOURCES TO BE DEVELOPED AS A RESULT OF LEASE SALES

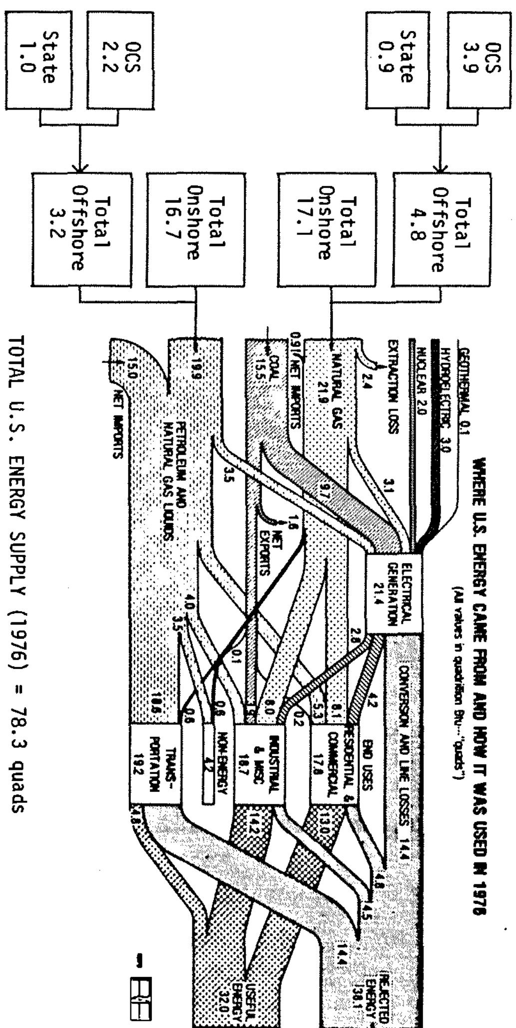
OCS Sale Area	Billion barrels oil	Energy equivalent (quads)*	Trillion cubic feet gas	Energy equivalent (quads)*	Total energy equivalent (quads)*
North Atlantic	0.078	0.45	0.40	0.41	0.86
Mid-Atlantic	0.005	0.03	0.60	0.62	0.65
South Atlantic and Blake Plateau	0.048	0.28	0.14	0.14	0.42
Gulf of Mexico	0.790	4.58	10.60	10.87	15.45
Southern California and Santa Barbara Channel	0.990	5.74	1.41	1.45	7.19
Central and Northern California	0.730	4.23	0.84	0.86	5.09
Gulf of Alaska	0.380	2.20	1.13	1.16	3.36
Kodiak	0.110	0.63	0.34	0.35	0.98
Cook Inlet	0.480	2.78	0.84	0.86	3.64
Northern Aleutian Shelf	0.360	2.09	0.82	0.84	2.93
St. George Basin	0.660	3.83	1.65	1.69	5.52
Navarin Basin	0.180	1.04	0.46	0.47	1.51
Norton Basin	0.270	1.57	0.43	0.44	2.01
Chukchi Sea	3.150	18.27	8.34	8.55	26.82
Beaufort Sea	0.980	5.68	2.46	2.52	8.20
TOTAL U.S. OCS	9.211	53.42	30.46	31.22	84.64

*Conversion factors:

oil -- 5.8 million Btu per barrel
gas -- 1,025 Btu per cubic foot
quad = 10^{15} Btu

Modified from: Table II-2 in the Draft Environmental Statement--Proposed Five-Year OCS Oil and Gas Lease Schedule, March 1980-February 1985. Bureau of Land Management: Washington, D.C. undated. p. 36.

Figure 1



TOTAL U.S. ENERGY SUPPLY (1976) = 78.3 quads

Modified from: Schurr, Sam H. (ed.), Energy in America's Future: The Choices Before Us. Baltimore, Md: Johns Hopkins University Press. 1979. p.47.

Department of Energy
Washington, D.C. 20461

Mr. Frank Gregg
Director
Bureau of Land Management
1800 C Street, NW.
Washington, DC 20240

23 OCT 1979

Dear Mr. Gregg:

Although we have not been fully able to evaluate your entire draft environmental statement entitled, Proposed Five-Year OCS Oil and Gas Lease Schedule due to the shortness of the comment period, we note three specific areas which require our comment.

The first is an editorial problem relating to your presentation of our final production goals (see Page 1). The units of oil production should be millions of barrels, not billions of barrels; also, the "Gas Production" heading is missing on the bottom table.

A second concern relates to the manner in which "oil spills" are treated. For example, in the summary it is stated:

> "Based on volume of oil estimated and historical experience, in excess of 48 oil spills greater than 1,000 barrels are statistically probable...".

While this statement may be technically correct, it is relatively uniformative since it is also technically correct to state that less than one oil spill, or any other range of values, is also "statistically probable". The statement as presently constructed is misleading in that it does not state the level of probability.

It is also our feeling that this information should be placed in perspective. That is, the number of oil spills of 1000 barrels or greater which would be expected with an equal level of probability from importing by tanker an equal amount of oil should also be presented.

Two final remarks regarding oil spills. First, the document is inconsistent with respect to whether the spills are 1000

barrels or greater or 100 barrels or greater (see table on page 124). Also, since the calculations concerning oil spills are a function of the production estimates (which, as we state in the following section appear to be greatly inflated and inconsistent with the DOI's previous statements regarding production from the proposed schedule) we are concerned that the number of spills is overstated.

Our major concerns relate to the total production forecasts presented in Table II-2 and the peak daily production forecasts. For example, in Table II-2 you indicate that 9.2 billion barrels of oil and 30.5 trillion cubic feet of natural gas are expected to be produced due to the five year lease schedule. These figures are over three times as large as DOE's oil production goals and over 4 times as large as DOE's gas production goals for the 1980-February 1985 lease sale timeframe. This statement is in direct conflict with DOI's announcement of June 8, 1979 that the proposed lease schedule is expected to produce only about 90 percent of oil production goals and 95 percent of gas production goals.

Several other facets relating to the production numbers are also of concern. First, there is no presentation or citation of any analysis. The cited production figures for the frontier areas of Alaska do, however, bear a curiously simple relationship to the unconditional undiscovered recoverable resource estimates prepared for use in formulating USGS Circular 725. The oil and gas production figures cited for the first sale (comprising a small percentage of the area of the province) in each of the five frontier areas included in the lease schedule (Northern Aleutian Shelf, St. George Basin, Navarin Basin, Norton Basin, and the Chukchi Sea) are precisely 50 percent of the unconditional undiscovered recoverable resource estimates cited by USGS as being present in the entire geologic province at water depths less than 200 meters. It is also noted that the estimates provided in the draft EIS for the first sale in Central and Northern California comprise 66 percent of the resources contained in that OCS planning region at all water depths. These figures do not conform with historical experience nor our estimates.

The consistency of the draft EIS estimates are also cause for concern. The above cited percentages for frontier areas are much higher than the percentage figure for the Beaufort Sea. The figures cited for the Beaufort Sea are 30 percent of USGS estimates. Although this percentage is also viewed as high, logic would indicate that since the Beaufort sea is at least a partial extension of the Prudhoe Bay geology and, therefore more is known about this area, the quantities that can be expected to be recovered from this highly attractive area would be no less than the aforementioned frontier areas.

A final comment on the total production estimates presented in Table II-2 concerns the variation between USGS geologic provinces and the OCS planning regions; i.e., the Beaufort Sea planning region includes a large portion of the Chukchi geologic provinces. As stated previously, the estimates presented for the Chukchi and Beaufort Seas are 50 and 30 percent, respectively, of the total resources estimated in the provinces at water depths less than 200 meters. However, on an OCS planning region basis, these percentages change to 60 and 22 percent respectively. Apparently the variation between planning regions and geologic provinces have not been recognized and adjusted.

Finally, the projection of six million barrels per day of peak oil production is considerably higher than our data would indicate should be projected. We would request that these estimates be re-examined. We would also appreciate an explanation of the manner in which they were made be provided.

Sincerely,

R. Dobie Langenkamp
Deputy Assistant Secretary
Oil, Natural Gas and Shale
Resources

RECEIVED

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY OCT 23 1979
WASHINGTON, D.C. 20460

OFFICE OF THE DIRECTOR
BUREAU OF LAND MANAGEMENT

OCT 22 1979

OFFICE OF THE ADMINISTRATOR

Mr. Frank Gregg, Director
Bureau of Land Management
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Gregg:

The Environmental Protection Agency (EPA), in accordance with its responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act, has reviewed the draft environmental impact statement on the Proposed Five Year OCS Oil and Gas Lease Sale Schedule (March 1980 - February 1985). The statement evaluates eight alternatives for a five year schedule consisting of 30-33 lease sales in OCS areas around the continental United States and Alaska. Of these, two alternatives involve sale delays for Alaskan areas and three additional alternatives involve omissions of Alaskan sale areas. We commend the Department's initiative in analyzing the various sociological, economic and environmental impacts of the proposed five year schedule.

As a matter of continuing concern, EPA again points out its extreme reservations concerning the acceleration of deepwater leasing which will necessitate the use of new subsea technology that, as yet, is unevaluated in terms of its environmental impact, and is not covered by existing regulations or operational controls. We continue to believe that the sale of deepwater tracts must be preceded by relevant analysis and development of standards for safe operation. We again urge the Department to fully evaluate this evolution of the leasing program to determine the environmental conditions and developmental scenarios that will foster the use of these systems, and to project the environmental impact of their increased use.

With regard to the eventual selection of a favored alternative, EPA strongly endorses the alternatives that consider delay or omission of Alaskan sales in frontier areas with high environmental hazards and sensitive ecosystems at risk.

Alternative #7 which omits from the schedule the Northern Aleutian Shelf, St. George Basin, Navarin Basin, Norton Sound and Chukchi Sea eliminates the potential of significant environmental harm to extremely important habitats for commercial fisheries, marine mammal and waterfowl populations, as well as deferring entry into hazardous ice condition areas for which appropriate development technology does not exist.

With regard to the technical content and analytical approach of the statement, we have several suggestions which we believe will improve its usefulness as a decision-making document. We believe the statement should stipulate the Bureau's intentions regarding real-time monitoring of sensitive areas contained in sale offerings such that any significant damage to unique resources such as coral reefs, hard bank communities, or fishery areas could be detected and remedial action initiated. These issues are of particular concern to EPA, especially with regard to our authorities for the control of pollution under the National Pollutant Discharge Elimination System.

We also suggest that an underlying premise of the selection of any OCS area for oil and gas development should be a scenario of the probable extent, impact, and possible mitigation of a catastrophic oil spill. This information should be available to the decision-maker, along with projections of hydrocarbon recoverability, to determine if a sale should be held in a specific region, and to schedule sales to take advantage of experience gained in previous development. As an example of this concept, the most probable catastrophic oil spill could be projected - <u>without</u> the imposition of mitigatory measures, and its full impact quantified. The costs of various levels of mitigation could then be evaluated with respect to their probable effectiveness. If adequate clean-up and restoration turned out to be prohibitively expensive, this would indicate that serious consideration should be given to removing the sale area from the schedule. Such an analysis could also be expanded upon in subsequent site specific EIS's to assess endemic natural hazards that could precipitate polluting events, generic biological effects as they may be affected by specific oceanographic and meteorologic conditions, the availability and cost of preventive and response equipment, and the net effectiveness of these efforts.

In view of these concerns and in accordance with our system for rating environmental impact statements, we have rated this statement as Category ER-2 (Environmental Reservations - Insufficient Information). Our environmental reservations pertain

to the offering of the Alaskan sale areas and the expanded deepwater leasing. Information deficiencies of the statement concern the discussion of the impacts of deepwater leasing, monitoring plans for sensitive areas, oil spill response and effectiveness for each sale area and the relationship of these factors to the decision process in the five year plan.

We appreciate the opportunity to review this document and hope our comments will assist you in the preparation of the final statement.

Sincerely yours,

for

William N. Hedeman, Jr.
Director
Office of Environmental Review (A-104)

United States Department of the Interior

ADDRESS ONLY THE DIRECTOR, FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

NOV 19 1979

Memorandum

To: Director, Bureau of Land Management

From: Associate Director, Fish and Wildlife Service

Subject: Comments on Department of Interior's Proposed Five Year OCS Oil and Gas Lease Schedule

We have reviewed the subject document, which considers potential environmental impacts of a proposed leasing schedule for the period March 1980 through February 1985 and offer specific comments for your consideration.

The purpose for the five year schedule is well defined by the OCS Lands Act, as amended. Less clear is the rationale for selecting the environmental issues analyzed in this environmental statement. In particular, we question why "impacts on habitats and resources for special concern" should be limited to "within leasing areas", as noted on p.6. Oil spill is one of the the greatest environmental threats of offshore oil exploration and development, and the potential impacts are not confined to the lease areas alone. In fact, impact to the resources of fragile coastal areas is of great concern and should be more heavily analyzed and considered.

We recommend correction of several statements pertaining to waterfowl and other marine wildlife resources. On p. 42, it should be noted that sea ducks migrate in coastal waters and not on the Georges Bank. Although large numbers of waterfowl may be killed by oil spills, other marine birds including loons, grebes and various alcids are more susceptible. Harbor seals whelp in small groups (not rookeries) along the Maine and New Hampshire coasts. There is only one small group of breeding gray seals on U.S. coast- at Muskeget Island, MA. On page 44, it should be noted that some of our largest losses of waterfowl to oil spills have occurred on Chesapeake and Delaware Bays.

Page 75-76, under the description of Coastal Habitats and Resources of Special Concern, the statement about number and extent of Atlantic wetland and estuarine systems increasing from north to south is not correct. Chesapeake Bay, the nation's largest estuary, is in the Mid-Atlantic and the South Alantic coast and is no more a "continuous estuary" than any other portion of the coast. Migratory and breeding habitat for waterfowl and

shorebirds is in the north and the greatest waterfowl concentrations are in the Chesapeake Bay area. Although 39 species of waterfowl may occur along the Atlantic coast, fewer than 20 can be considered common. Species with the largest winter populations in recent years have been: Canada goose, scaup, black duck and mallard. The third paragraph again implies that "South Atlantic is better". There are 400 species of birds and 23 National Wildlife Refuges in the North and Mid-Atlantic, and Massachusetts alone has recorded 414 species of birds.

Page 87; B.5. Coastal Habitats and Uses- the red wolf, American alligator, Houston toad, and Attwater's greater prairie chicken should be added to the discussion of endangered species of the Gulf Coast Region. In addition, it should be pointed out that critical habitat has been identified for several of these endangered species, not just the manatee. (This comment also applies to the discussion of endangered species on page 203.)

Page 93. The first sentence should read: "An example is the mussel poisoning species Gonyaulax catenella...:

Page 124; A.1 Oil Spills - The last paragraph of this section implies that the Bay of Campeche oil spill was stopped in several weeks by the drilling of a relief well. This is far from the truth as this spill, the largest ever to occur, has continued for several months and efforts to drill relief wells have been unsuccessful.

Page 156; B.2 a. Impact on Marine Ecosystems - This section should include mention of recent findings from studies funded by BLM and EPA Platform associated sea life in the Gulf of Mexico generally decreases with depth and within proximity to production discharges. The discussion of biological effects of crude oil spills should include the concern for possible effects on the eggs and larvae of fish and shellfish.

Page 180. The last sentence of paragraph 1 should read: "Pacific shrimp, spot prawn, dungeness crab..."

Page 185. Long Island Sound is neither an estuary nor located in the North Altantic. Waterfowl populations are fully as susceptible to oil spills during winter as during migration and large losses could be highly significant for some species. Furthermore, it should be clarified that oil contamination may be of greatest significance to all aquatic birds during the nesting season. Very small amounts of oil transferred from feathers of incubating birds can cause embryo mortalities. Also birds are dependent on large quantities of convenient food organisms at that time and an oil spill could cause abandonment of an entire nesting colony.

Pages 190-191; B.3.b. Impact on Sensitive Areas - The last sentence on page 190 should be changed to read "...and if monitoring showed that discharges were harming the biota of the bank, shunting could be imposed". It should be pointed out that authority exists to require protective measures in addition to those included in stipulations if conditions warrant such action. The second paragraph on page 191 should also be changed as it now contains a misleading statement regarding field observation of effects on productivity. Such observations are not an adequate means of determining the effect of productivity on population changes, largely due to historic changes in the fishing techniques and levels of effort which generally produce these observations.

Page 191. The first sentence in paragraph 4 should read "...which contain the hydrocoral Allopora californica..."

Page 205. The first sentence in paragraph 3 should read "...primarily between Pt. Lobo's and Morro Bay."

Page 216; B.3.d. Impact on Recreation - The conclusions section needs to be modified since recent oil spill experience in the Gulf of Mexico has resulted in major disruption of shoreline recreation on the lower Texas Coast.

Page 218. Although sport fishing may not be as extensive in Central and Northern California as it is in Southern California, individual conflicts between OCS development and sport fisheries could occur from changes in land use patterns and/or fish and wildlife habitats. Anglers could be displaced from traditional access points for fishing by the construction and operation of facilities necessary for an offshore oil industry. For example, many of the estuaries in Northern California are small and any development will necessitate the restriction or elimination of some sport fishing activities.

Page 225; B.4 Impact on other Management Plans - Fishery Management Plans should be added to the section covering the Gulf of Mexico.

We hope these comments will be of assistance to you in the preparation of the Final Statement.

MJ [signature]

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377- 4335

RECEIVED

November 2, 1979

NOV 5 1979

Mr. Frank Gregg
Director, Bureau of Land Management
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Gregg:

The Department of Commerce reviewed the draft environmental impact statement by the U.S. Department of the Interior relative to "Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, March 1980 - February 1985," and forwarded comments to you in our letter of October 22, 1979.

Since that time, additional information has developed which is pertinent to the project. This additional information from the National Oceanic and Atmospheric Administration is enclosed for your consideration.

We are pleased to have been offered the opportunity to review this statement.

Sincerely,

Sidney R Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure Memo from: Dr. R. J. Englemann
Environmental Research Laboratory
National Oceanic and Atmospheric Administration

URGENT
PP/EC
377-5181
ATTN. LEHMAN

OCSEAP's Comments on the BLM Programmatic DEIS

1. Better definition of sale areas is required at early stages in the leasing process or more time must be allowed between the call for nominations and the actual sale date. With the proposed tight leasing schedule and the loose definition of potential sale areas, there is insufficient time for study of the entire area of call in all scientific disciplines to provide adequate input to sale decisions.

This lack of lease area definition is exemplified in the DEIS map of the Alaskan lease areas (Fig. II-2). The area delineated as the Navarin Basin has previously been labeled by BLM as the Bering Sea Shelf lease area, which is not currently on the lease schedule. The St. George Basin in Fig. II-2 has no seaward boundary, and, in fact, includes an area northward of the Aleutians that is actually part of the Navarin Basin. The correct Navarin Basin lease area as previously defined by BLM is not distinguished on the map, but it is an offshore area north of the Aleutians, extending generally from 171 degrees W. Longitude to the International Date Line.

Further, the text on these areas is confusing because the location of the Navarin area has been corrected in some sections (p. 50, 184, 189) and not in others ("...on the Yukon-Kuskokwim delta between Pastal Bay and Cape Pierce. That area is adjacent to the Navarin Basin sale area." - p. 57).

Since it is unclear whether the environmental information presented for the Navarin Basin reflects the nearshore or offshore location, the data must be considered of dubious worth. Therefore, the states, agencies, and public cannot make valid comments on the deletion or delay of the sale areas when the areas presented in the DEIS are uncertain, and additional planning for environmental studies may be misdirected. It would be useful to delineate the geologic basins on all maps of a proposed area of call. DOI has information on where industry interest will most likely focus, and these areas will center primarily on the geologic basins.

Such a focusing on the most probable area of development would aid the environmental studies programs in planning and executing research that will be most informative to the decision process and most cost-effective to the DOI. It would also aid the DEIS reader in truly assessing the impacts of development in a region.

The narrative sections pertaining to the Navarin and St. George areas, as well as Fig. II-2, should be revised for inclusion in the Final EIS. Sufficient time should then be allowed for adequate review and comment on the proposed alternatives.

2. A very important environmental issue improperly glossed over in the DEIS is the impact of a spill under ice in the Beaufort Sea (p. 153). First, under ice circulation is not completely understood. Then, the statement, "This means that spilled oil may not be dispersed and can be easily collected...", is grossly oversimplified. There is no demonstrated capability by anyone to clean up oil spilled under ice. Further, if the spill occurs too late in the winter, the cleanup might not be possible before breakup when drifting ice could disperse the oil over a very large area.

This is but one example from the DEIS where impact conclusions are drawn, sometimes incorrectly, with no backup data. The general information is presented and then a rote conclusion is made: "In conclusion, available mitigating measures are expected to be adequate to respond to conditions in ..." (p. 154-155). The information given does not lend itself to this standard conclusion; such summaries should not be presented without supporting data or rationale.

3. Some discussion in the DEIS should evaluate the premise that the major impacts of OCS development in Alaska may not be spill related (p. iii). The worst environmental detriment may well be to the unique or unusual resources, habitats, and assemblages of organisms (p. iv) potentially impacted by development related activities. These organisms and habitats may be greatly disturbed by habitat destruction and competition, increased traffic and noise, non-oil pollutant discharges (e.g., changes in fresh water, turbidity, nutrients, etc.), and other changes that would occur from development and its associated increased populace.

4. The rationale behind the Spill Frequency Estimates Table and Table II-3 should be re-evaluated. Predicting spill frequencies in a lease area based solely on the calculated oil potential of the region is improper. Such an estimation assumes that the spill rate per barrel in Alaska and the Gulf of Mexico is the same. The assumption seems unwarranted in that the presence of subsea permafrost, ice stresses, ice gouging, severe storms, seismicity, and heavy fishing activity should increase the spill rate for both tanker and pipeline transportation.

Table II-3 carries implications for decision making that are neither accurate nor useful. There is no explanation as to how the level of sensitivity for the areas was arrived at. Does the sensitivity of a resource refer to the abundance of the resource or how vulnerable it is to impact? Where is the background data for either criteria? Some of the lease areas represent huge U.S. resources in fish and shellfish, and additionally, these commercial species are unaccustomed to disturbance in their habitat from pollutants, or development activities. This would seem to place fish and shellfish as highly sensitive in several Alaskan areas, yet all areas are listed uniformly as moderately sensitive. Sensitivity to offshore structures is not addressed adequately; there is reason to believe mammals will be impacted by the mere presence and the associated activity and noise surrounding these structures. Air quality, listed as low sensitivity, does not have to degenerate to unacceptable limits to be highly impacted. Degradation of the air quality to acceptable or poor could be considered a drastic reduction from the pristine air quality of certain Alaskan locales. Such examples can be cited for all of the listed parameters. There must be an explanation and documentation for the sensitivity designations.

The comparisons in the last three columns of Table II-3 are also meaningless. The predicted number of oil spills is questionable at best (see above comments). To compare that questionable figure to the number of sensitive parameters is of little value. The number of highly sensitive resources (e.g., three high sensitivities: birds, endangered, and other mammals) doesn't tell the value or importance of the resource to man or the ecosystem. It doesn't give abundance, diversity, vulnerability, dollar value or any other parameter that might indicate the importance of the resource.

However, even with a measure of the importance, value, or vulnerability of the resource, comparison to the number of predicted spills would still be of questionable value. The analysis should include the probability of impact upon the resource, the severity of the impact, and the chance or rate of recovery. In short, the comparisons made in the DEIS should be replaced with a more complete and valid analysis of likely impacts

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314

REPLY TO ATTENTION OF:
DAEN-CWR-P

30 OCT 1979

Mr. Frank Gregg
Director, Bureau of Land Management
Department of the Interior
Washington, D.C. 20240

Dear Mr. Gregg:

This is in response to your letter of 21 August 1979 requesting comments on the draft environmental impact statement (DEIS) concerning the proposed five-year Outer Continental Shelf oil and gas lease sale schedule. We have the following comments:

a. On page 17, paragraph 4a should be amended as follows:

"The U.S. Army Corps of Engineers has the responsibility for permitting structures on the Outer Continental Shelf. In cases involving construction of artificial islands and fixed structures on the Outer Continental Shelf lands which are under mineral lease from the Bureau of Land Management the Corps' review is limited to the impact of the proposed work only on navigation and national security."

b. On page 17, paragraph 4b should be amended to note that "upon receipt of an application for a permit, the Corps publishes a public notice to obtain the views of all interested parties." The paragraph should also note that "in cases involving structures or work in State waters, the decision whether to issue a permit must be based on a full public interest review including environmental, economic and conservation concerns, etc."

c. A bibliography should be included. The DEIS made many statements about possible impacts to ecological resources but did not provide references to justify or verify them.

Sincerely,

George F. Boone

GEORGE F. BOONE
LTC, Corps of Engineers
Assistant Director of Civil Works,
Environmental Programs

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.

25 OCT 1979

Director
Bureau of Land Management
Department of the Interior
18th & C Streets, NW
Washington, D.C. 20240

Dear Sir

The Air Force did not receive a copy of your Draft Environmental Statement, Proposed Five-Year OCS Oil and Gas Lease Schedule, March 1980 - February 1985 when it was distributed. However, we did obtain a copy subsequently and we have reviewed the statement and are submitting the attached comments (Atch 1). The proposed lease schedule has a special relevance for Air Force activities overlying several OCS areas.

These comments represent the concerns of the Air Force only, and do not speak for other DOD agencies.

Sincerely

HARRY P. RIETMAN
[illegible]
Directorate of [illegible]

1 Atch
Comments

Air Force Comments On
Draft Environmental Statement
Proposed Five - Year OCS Oil and
Gas Lease Schedule
March 1980 - February 1985

1. We appreciate the opportunity to review and comment on your Draft Environmental Impact Statement (EIS) "Proposed five-year OCS Oil and Gas Lease Schedule".

2. The Air Force as part of the Department of Defense (DOD) is committed to a philosophy that the OCS should be used in a manner consistent with the highest national interest. Our policy is to limit our own activities in the OCS to that considered essential for military purposes. To the extent you determine that the mineral potential of the OCS should be explored or developed, the Air Force as part of DOD will endeavor to accommodate to the maximum feasible extent the joint military and commercial utilization of these areas.

3. Of the thousands of miles of OCS area discussed in your EIS, only a few hundred miles in three distinct areas give the Air Force major concern. As you correctly state on page 163 of the EIS, oil and gas exploration and development creates a potential for conflict with military operations. Our three geographic areas of concern are the areas which are part of our Eastern, Western and Gulf Coast ranges. These areas lie to the east and south of Cape Canaveral, Florida, to the west and south of Vandenberg AFB, California, and to the south of Eglin AFB Florida, respectively.

4. Both the Eastern and Western ranges have been designated as "National Ranges" by DOD reflecting their status as unique national assets designed to support not only DOD programs, but those of other federal agencies as well. The Gulf Coast range is a principal research, development and training facility for airborne munitions.

5. All three ranges play a crucial role in Department of Defense programs and hence a vital role in our national security. One of the important reasons for these ranges is that they represent some of the few and ever decreasing number of places where military activities can be conducted without fear of damages to civilian concerns. The possibility of oil and gas exploration, and particularly development, on the OCS appears to sharply increase the potential for accident, damage or interference with vital national defense activities.

6. The extent of such increased potential is impossible to quantify from the information presented in the EIS. We believe it vital that as you particularize the details of each individual

sale, we continue to be allowed to work with you, through the Deputy Assistant Secretary of Defense (Installations and Housing), in developing mitigation measures necessary to allow both military activities and oil and gas OCS development to proceed with the least practicable interference to each other or to the public.

7. To date, our range personnel have enjoyed a close and constructive working relationship with your regional offices. Together, they have developed and implemented mitigation measures such as range clearance procedures, shelter and evacuation agreements and in some cases, where necessary, complete clear zones. We believe these types of arrangements agreed to between our operational people and your field offices will continue to be necessary for the sales proposed in your EIS. We will instruct our range personnel to work with you in developing and implementing such procedures.

8. Again, we see a need to work closely with you to mitigate possible conflict with military operations. Please continue to notify HQ AFESC/DER, Tyndall AFB, Fla 32403, as soon as any of your plans for these sales become defined as to proposed locations of lease tracts.

Cys to: AFESC/DER
AFSC/JA
DASD (EE&S)
DASD (I&H)

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ALASKAN REGION
701 C STREET BOX 14
ANCHORAGE, ALASKA 99513

FEDERAL AVIATION ADMINISTRATION

OCT 25 1979

Director
Bureau of Land Management
Department of the Interior
Eighteenth and C Street, N.W.
Washington, D.C. 20240

Dear Sirs:

We have completed a review of your draft Environmental Impact Statement on the proposed five-year OCS Oil and Gas Lease Sale schedule and have found no comments to offer that would assist you as you move toward finalizing the document. We appreciate the opportunity to review and comment on your document.

Sincerely,

FRANK AUSTIN
Acting Chief, Planning and Appraisal Staff

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OCT 24 1979

Director
Bureau of Land Management
Department of the Interior
18th & C Streets, NW
Washington, D.C. 20240

Dear Sir:

We appreciate the opportunity to comment on the draft environmental impact statement (DEIS) evaluating the proposed 5-year Outer Continental Shelf (OCS) oil and gas lease schedule. The Federal Energy Regulatory Commission's (FERC) Office of Pipeline and Producer Regulation (OPPR) offers the following comments:

(1) The statement on page 18 does not clearly describe the FERC's functions, particularly concerning OCS-related responsibilities. It would be more accurate to state that the FERC, an independent agency within DOE, had conferred upon it under the Natural Gas Act the authority to issue certificates of public convenience and necessity for proposed projects involving the transportation or sale of natural gas in interstate commerce. All natural gas produced from the OCS is considered to be interstate and, therefore, is subject to FERC jurisdiction. The Natural Gas Act, the National Environmental Policy Act, and the OCS Lands Act Amendments of 1978 all grant authority or require that the FERC investigate the environmental effects of a proposed offshore project, as well as the potential gas reserves, the need for this gas, and the availability of capital to develop this resource. The right of eminent domain may be exercised by pipeline companies in the appropriate court as necessary to acquire rights-of-way for the construction of Commission-authorized projects. Also, the FERC is primarily responsible for administering and enforcing compliance with the Natural Gas Policy Act (NGPA) of 1978 (92 Stat. 3350). As applied to OCS matters, the NGPA provides new wellhead pricing controls for certain natural gas produced from the OCS.

(2) The discussion of trends in alternative energy sources beginning on page 25 of the DEIS should note that gas shortages in past years have forced interstate pipeline companies to curtail deliveries of natural gas; this has increased our dependence on foreign oil and gas imports. It is clear that should even the most optimistic estimates of natural gas reserves prove correct, they would do very little to offset any future imbalance between natural gas supply and demand. However, realizing that a solution to the energy problem will be achieved only if all practicable energy supply options are utilized, the staff suggests that the DEIS further emphasize the national need for all forms of energy resource development. Energy resources such as coal, solar energy, and hydroelectric power should not be regarded as substitutes for the proposed lease sale but rather as a comprehensive national energy program.

Numerous factors indicate natural gas supplies will improve, at least for the short term. OPPR sees a strong supply picture this winter, projecting minimum curtailments in most of the major pipeline systems with no significant industrial or commercial disruptions or shutdowns. The nation's major interstate pipelines forecast an increase of gas deliveries of 136 billion cubic feet over last winter's levels. However, the long-term outlook for natural gas supplies is less clear. No realistic forecast of natural gas availability can be projected beyond the next few years until the provisions of the NGPA on production activity can be better evaluated.

One of the most promising and least speculative sources of new gas supply is the current development of conventional gas reserves in the Rocky Mountain area. Gas exploration and development projects have occurred there since the early 1970's. Emphasis has focused especially on eastern Utah, southwestern Wyoming, and western Colorado--areas where some of the most successful new field exploration in the United States is taking place. However, environmental concerns for this area will also govern the level at which exploration and development will proceed. The Commission is currently reviewing and analyzing several pipeline construction proposals to transport gas from the Rocky Mountain area to market.

(3) The discussion on page 40 concerning liquefied natural gas (LNG) is inaccurate in some areas. Concerning future west coast LNG capabilities, the FERC on September 26, 1979, conditionally approved construction of an LNG import facility at Point Conception, California. The proposed facility would import gas from Indonesia and from Cook Inlet in Alaska and would eventually vaporize LNG at an average plant output rate of 900 million cubic feet per day (cfd), with additional peaking capacity of 300 million cfd.

The LNG plant approved for construction in Louisiana is in the Lake Charles area and not the Lake Pontchartrain area, as indicated on page 40.

(4) The kinds of wastewater pollutants generated by a gas processing plant described on page 129 are typical of an old style chemical solvent process. The new state-of-the-art gas conditioning (sweetening) plants utilizing a physical solvent closed loop process usually emit only exhaust gas wastes to the atmosphere from process and hydraulic gas turbines.

(5) On page 135, it would be more accurate to state that the minimum land area required for an LNG terminal and associated facilities varies from 25 to 100 acres. Sites with as much as 1,200 acres have been proposed to FERC. These larger sites usually include dredge disposal areas, room for expansion, and buffer zones. As an example, the proposed Point Conception LNG terminal facility would be situated on a 209-acre site; the marine terminal would occupy 30 to 35 acres of subtidal land extending approximately 4,600 feet offshore. The proposed LNG liquefaction and storage facility for the Cook Inlet gas in Alaska would occupy a 59.3-acre tract.

(6) The Department of Energy (DOE) Alternative 2 schedule has several advantages over the Department of Interior (DOI) Alternative 1 proposed schedule. The DOE schedule would result in a greater number of OCS sales held in areas where oil and gas potential is most assured--the Gulf of Mexico. The Gulf of Mexico has the additional advantage of being able to transport hydrocarbon supplies to market quickly at low cost because of the availability of existing pipeline transportation networks in this area.

The DOE Alternative 2 schedule would allow 10 Alaskan sales, in seven different areas, while DOI's proposed Alternative 1 schedule would result in 9 Alaskan sales in nine separate areas. The DOE Alternative 2 schedule would concentrate exploration and development in fewer Alaska frontier areas. Therefore, both DOI and industry would be able to concentrate their resources in obtaining environmental and geophysical data gathering in fewer areas and perhaps require less onshore infrastructure investment.

The Commission is directing its attention and efforts toward regulatory actions to improve domestic natural gas supplies. The Commission staff recognizes the national importance of OCS exploration and development. We believe the proposed 5-year OCS oil and gas lease schedule has the potential to improve the energy supply, and therefore it is in the national interest. We support the goal of scheduling proposed OCS lease sales based on the principle of maximizing the economic benefits by scheduling the more beneficial lease sales at earlier times. However, we also recognize the importance of a balanced approach which will allow the development of energy supplies to meet the nation's social and economic objectives while at the same time giving full consideration to environmental issues.

Very truly yours,

Kenneth A. Williams

Kenneth A. Williams, Acting Director
Office of Pipeline and Producer
Regulation

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WEP-7/12)
WASHINGTON, D.C. 20590
PHONE: (202) 426-3300

16478.3a

Mr. Donald Truesdell
Acting Director
United States Department of
the Interior (542)
Bureau of Land Management
Washington, D.C. 20240

Dear Mr. Truesdell:

Your letter of August 21, 1979 requested Coast Guard comments on the Draft Environmental Impact Statement (DEIS) on the proposed Five-Year Outer Continental Shelf (OCS) Oil and Gas Lease Sale Schedule. The DEIS has been reviewed by personnel at Coast Guard Headquarters and the appropriate Coast Guard Districts. As the DEIS is broad in scope to cover the 30 potential lease sale areas, our comments concern broad programs for which the Coast Guard is responsible. Comments on the specific lease sales will be provided during the period of environmental review for the specific lease sale.

In summary the Coast Guard suggests the DEIS discuss methods of mitigating adverse environmental impacts. The DEIS should more accurately reflect the need to address potential vessel navigation conflicts in the proposed lease sale areas. Permitting and inspecting private aids to navigation can be expected to increase Coast Guard workload in the proposed lease sales. The impact from development of onshore support facilities along with criteria for safe pipeline burial should be more prominent in the DEIS. The DEIS should discuss and develop a method of insuring communication between users and regulators of the OCS and its resources.

Mitigating Measures. A general comment is that the DEIS does a good job of identifying environmental consequences and impacts upon a variety of topics without being site or locality specific. There is little attempt to identify mitigating measures for the adverse impacts. It is realized that each lease will have its own EIS to cover area specifics in greater detail, and that certain rules and criteria are being developed in light of recent legislation. However, we consider that these mitigating measures be more fully addressed in this DEIS.

Navigational Safety. Navigational safety is an area of primary Coast Guard concern. This includes the safety of transiting vessels, OCS drill rigs and structures, aids to navigation and pollution resulting from vessels and wells should a collision occur. The DEIS states that a large oil spill is the major environmental risk. It also recognizes that a certain amount of interference will occur between vessel traffic and offshore structures, especially in heavy traffic areas.

a. The DEIS is somewhat inconsistent. It treats this topic (possible interference with ship navigation and potential for increased accidents including the resulting spills) as an unavoidable adverse impact.

b. The DEIS does speak of the role of Traffic Separation Schemes (TSS) through OCS lease development and that the impact can be ameliorated to some degree by control of structure placement. This latter point is given very little attention. The designation of Port Access Routing System (PARS) by the Coast Guard under the authority of the Port and Tanker Safety Act of 1978 is also mentioned, but without indication that rules and regulations will govern the use of such designated port access route areas, e.g. oil and gas exploration, and the siting of fixed structures. As the PARS develops, conflicts will occur with oil and gas interests. Close liaison between the Coast Guard and the lessees will be necessary.

c. The DEIS does not mention Department of the Interior responsibilities for vessel navigation as expressed in Title II of the Outer Continental Shelf Lands Act Amendments of 1978 in Sections 202 and 208, Sub-section 18. This Act has companion aspects to the Port and Tanker Safety Act of 1978 on Port Access Routes.

d. The main point of the above comments is the view that this DEIS does not indicate that vessel navigation conflicts will be given any significant degree of attention in the proposed lease sales. Lease Sale 48 in June 1979 resulted in the sale of many additional tracts in and around the Santa Barbara Channel Traffic Separation Scheme, several of which are wholly within the TSS.

Aids to Navigation.

a. The proposed five-year lease schedule will impact significantly on the aids to navigation program of the Coast Guard. The estimated figures provide that the development of 7071 well sites with a total of 448 platforms would be necessary to develop the resources of the acreage to be leased. This will place an additional burden on both the District staffs and operating units because of the increase in the number of platforms to be inspected yearly.

b. Approximately 1414 sites will be developed each year and will require the submission of a private aids to navigation application form. To process each application, to examine it for accuracy, and to insure its inclusion into the Local Notice to Mariners requires approximately 3-4 man-hours each.

c. An inspection of the private aids to navigaton at each site should be conducted yearly. Normally the inspections are conducted by field units in conjunction with their normal operations. Many times, however, particularly in the Eighth and Seventeenth Coast Guard Districts, inspections cannot be accomplished in this manner and transportation either by the oil industry or the Coast Guard must be arranged. A conservative estimate of the average total time for inspecting each platform is three hours.

Therefore, each site will require approximately 6-7 man-hours which equates to approximately 9900 additional man-hours per year just for this lease schedule.

d. The number of total private aids have increased from 32,255 to 40,576 (26%) since 1975; this DEIS indicates that the same rate of increase will continue in the future. We submit that this lease schedule will have significant impact on the aids to navigation program by increasing considerably the burden on Coast Guard Districts and field units. Resource adjustments accommodating these and past increases are imperative if the Coast Guard is to fulfill its responsibilities to mitigate damage to the environment through effective enforcement of the obstruction light and sound signal provisions in 33 CFR 67.

<u>Offshore Development and Support Facilities.</u> The Coast Guard is particularly interested in support facilities and operations for offshore development as they are presently non-existent in the Twelfth Coast Guard District. This should have a significant impact on areas and shoreline adjacent to the high interest exploration area. This topic is only touched upon in the DEIS.

Pipelines are also discussed in various parts of the DEIS, with little in way of specifics. Policies or rules for burial are not covered. OCS Order No. 9 on Pipelines is still under development. Recently approved and proposed OCS projects in Southern California are indicative of an absence of adequate rules governing pipeline locations and burial depths in localities which conflict with vessel anchorage sites. The OCSLA Amendments of 1978 in Section 204, section 5(e) on pipeline right-of-ways states..."assuring maximum environmental protection by utilization of the best available and safest technologies, including the safest practices for pipeline <u>burial</u>...". The implementing regulations published in the Federal Register of 29 June 1979, repeat this statement, but make no further mention of burial. The pipeline granting officer is to consider the potential effect of the pipeline on the marine and coastal environment and include special stipulations and conditions. He <u>may</u> request and consider views and recommendations of Federal agencies, State agencies, industry, etc. Local experience in this area illustrates a lack of proper criteria, for pipeline burial.

<u>Fisheries.</u> Area and/or District Commanders serve as members of the various Regional Fishery Management Councils. The appropriate Coast Guard representative on the Councils should be kept informed of lease transactions within the region to insure knowledgeable interaction with the Council. In this manner the Coast Guard can operate in its unique capacity as a necessary interface and moderator between the diverse users of the oceans. Enclosure (1) lists the principal and alternate Coast Guard member on each Regional Fishery Management Council. Enclosure (2) provides the location of Coast Guard Area and District Commanders.

The need for effective communications between users of the Outer Continental Shelf should be obvious. This flow of information between users and appropriate agencies is critical if the resources of the OCS are to be wisely utilized. This was stated in the preceding comments and will become more critical as the Coast Guard increases its role as OCS Fund Administrator for offshore pollution. The final EIS should contain provisions for the proper flow of information between users of the OCS, Federal agencies and the public.

The following minor comments are provided:

a. Page iii on Environmental Consequences: it is indicated that 48 oil spills greater than 1000 barrels will occur. However, no time frame for this prediction is given.

b. Page vi on placement of structures and navigational conflicts: See earlier comment on unavoidable adverse impact and role of TSS.

c. Page 21 on Sealanes: The designation of port access routes is not limited to this territorial sea. High seas approaches outside the territorial sea area are also included.

d. Page 95 on Marine Sanctuaries: Santa Barbara Island is also among the locations being considered. This island is separated from the Channel Islands.

e. Page 162, Conclusion on Impact on Shipping and Navigation: The statement..."The placement of structures and the activities of both OCS related and non-OCS related vessels are presently regulated in all existing and proposed operating areas." is overstated and misleading. There is very little control over the navigation of vessels at sea, and the rules for the location of structures in existing OCS operating areas are sparse, and fewer still in proposed OCS areas. We agree that the development of sale specific lease stipulations is necessary.

f. Page 163 on Military Uses: The degree of control of vessel and other activities in the splash down area of the missile range is quite limited in International waters. Further, Vandenberg Air Force Base is not included in this list of such launch and test centers.

g. Page 257 on Tanker Lightering: Ships, not barges, are used to shuttle cargo from supertankers lightered off San Clemente Island.

h. Page 257 on Navigation Schemes: Exploratory drilling vessels are not limited on a case-by-case basis within the separation zones of the Southern California TSS's.

i. Page 258 (at top): The proposed TSS which would extend from Point Conception to the California and Oregon border would have very little effect upon OCS development acreage as it would be almost totally outside of the designated high interest areas of Lease Sale 53, except to provide access to three principal ports. This is in contrast to the two established TSS's in Southern California which necessarily pass through leased areas.

j. Page 272 on navigational conflicts between offshore structures and vessel traffic: See earlier comment on unavoidable adverse impacts and role of TSS.

The Coast Guard appreciates the opportunity to comment on this DEIS. The Coast Guard is prepared to review any DEIS on specific locations for oil and gas lease sales.

Sincerely,

K. G. WIMAN
Captain, U. S. Coast Guard
Acting Chief, Office of Marine
Environment and Systems

Encl: (1) List of Principal and Alternate Coast Guard members of Regional Fishery Management Council
(2) Map of Coast Guard Area and Districts

Designation of Nonvoting Members. The nonvoting Coast Guard members (Principal and Primary Alternate) of each Regional Fishery Management Council are designated as follows:

Council Name	State/Territories in Council	Principal Coast Guard Member	Primary Alternate
New England	ME, NH, MA, RI, CT	COMLANTAREA(A)	CCGDONE(d)
Mid-Atlantic	NY, NJ, PA, DE, MD, VA	COMLANTAREA(A)	CCGDFIVE(d)
South Atlantic	NC, SC, GA, FL	CCGDSEVEN(d)	(Note 1)
Caribbean	VI, PR	CCGDSEVEN(d)	COMGANTSEC
Gulf of Mexico	TX, LA, MS, AL, FL	CCGDEIGHT(d)	(Note 1)
Pacific	CA, OR, WA, ID	COMPACAREA(P)	(Note 2)
Western Pacific	HI, AS, GU, [NMI]	CCGDFOURTEEN(d)	(Note 1)
North Pacific	AK, WA, OR	CCGDSEVENTEEN(d)	(Note 1)

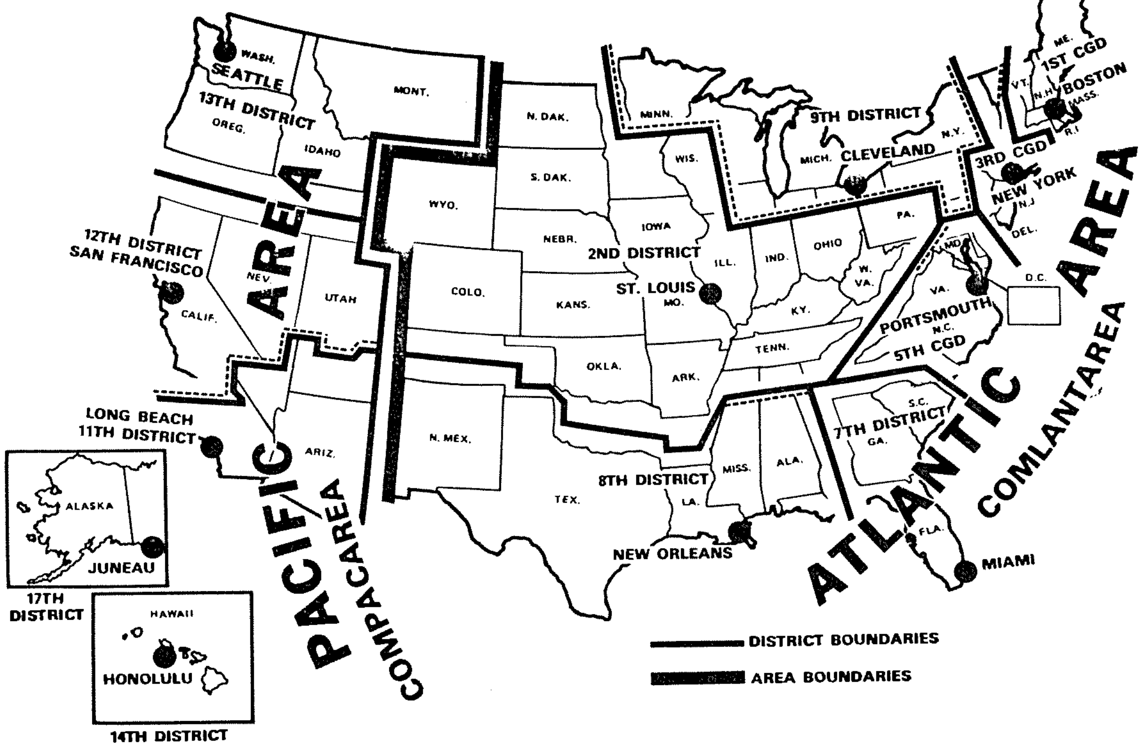
NOTES: (1) Senior staff officer as designated by principal member. Notify Commandant (G-000/74) of the name, title and security clearance of officers designated.

(2) CCGDELEVEN(d) or CCGDTHIRTEEN(d) as appropriate to agenda and/or location of Council meeting.

ENCLOSURE(1)

ENCLOSURE(2)

U.S. COAST GUARD DISTRICTS



STATE OF WASHINGTON
Dixy Lee Ray
Governor

WASHINGTON STATE PARKS AND RECREATION COMMISSION
7150 Cleanwater Lane, Olympia, Washington 98504
206/753-5755

September 11, 1979

35-2650-1820
DEIS - Proposed Five-Year OCS
Oil and Gas Lease Schedule
(E-1742)

Director (542)
Bureau of Land Management
Department of the Interior
18th & C Streets, N.W.
Washington, D.C. 20240

Dear Sir:

The staff of the Washington State Parks and Recreation Commission has reviewed the above-noted document and does not wish to make any comment.

Thank you for the opportunity to review and comment.

Sincerely,

David W. Heiser By P J Pearce

David W. Heiser, E.P., Chief
Environmental Coordination

DWH/PJP:jh

State of California
GOVERNOR'S OFFICE
OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO 95814

EDMUND G. BROWN JR.
GOVERNOR

October 19, 1979

Mr. Frank Gregg
Department of the Interior
C Street/Between 18th and 19th, NW
Room 5660
Washington, DC 20240

Dear Frank:

As you know, California State and local governments have an active interest in proposed OCS activity. While we agree that energy development can and must take place, we insist that it be carefully planned, that adequate analysis of potential impacts occur, and that impacts be minimized and fully mitigated.

Governor Brown expressed many of California's concerns regarding the proposed 5-year schedule in his September 19, 1979 letter to Secretary Andrus. Included in the Governor's comments were extensive analysis of deficiencies and problems. I hereby request that Governor Brown's letter on the schedule (Attachement B) be incorporated into the comments on the draft EIS on the proposed 5-year schedule.

The attached testimony and comments from state agencies and the above mentioned letter from Governor Brown constitute the comments of the State of California. As I stated in my testimony at the Bureau of Land Management's (BLM) October 3, 1979 hearing on the DEIS, we feel BLM generally did a good job in preparing the DEIS. But the topic is complex and you were operating under serious constraints. Unfortunately, we find the DEIS inadequate under the requlations of the Council of Environmental Quality and the OCS land Act Amendments. In addition, as indicated in the attached testimony and comments, there are numerous deficiencies and unanswered questions which must be addressed before the document can be considered adequate on a substantive basis. In particular, I want to highlight the requirement for consistency of implementation required by sections 110, 118, and 176 of the Clean Air Act and sections 204 and 208 of the OCS Lands Act Amendments of 1978.

I urge you to consider California's comments as you prepare the final EIS and finalize the 5-year schedule as required by the OCS Lands Act Amendments.

Sincerely,

Deni

Deni Greene
Acting Director

STATE OF CALIFORNIA COMMENTS

5 YEAR SCHEDULE OCS OIL AND GAS LEASING PROGRAM

DRAFT ENVIRONMENTAL IMPACT STATEMENT

STATE OF CALIFORNIA
GENERAL COMMENTARY ON DRAFT ENVIRONMENTAL
IMPACT STATEMENT "PROPOSED 5-YEAR OCS OIL AND GAS
LEASE SCHEDULE, March 1980 to February 1985"
Bureau of Land Management, Department of the Interior

October 18, 1979

I. NEPA REGULATIONS

The Draft EIS (DEIS) is inadequate because it fails to comply with the NEPA Regulations (title 40) in several significant aspects.

A. Discussion of Reasonable Alternatives

The NEPA regulations discuss in depth the requirement of considering reasonable alternatives to the proposed action, Sections 1502.1, 1502.2 subdivision (d), 1502.14. The EIS "shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." (§ 1502.L). Indeed, the section on alternatives is "the heart of the environmental impact statement". Section 1502.14.

The EIS is required to "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated", and "include reasonable alternatives not within the jurisdiction of the lead agency". (§ 1502.14, subdivision (a) and (c).) The Draft EIS on the Proposed Five Year Schedule is sadly deficient in this regard.

Alternative 1 includes 4 California sales:

Lease Sale 53 (Northern and Central California) in 1981;
Lease Sale 68 (Southern California) in 1982;
Lease Sale 73 ("California") in 1983;
Lease Sale 80 ("California") in 1984;

The Draft EIS recognizes that these four lease sales will result in significant environmental impacts off the California coast. (See e.g. DEIS pp. 41, 45-7, 217-18, 227-8, 268, 271.)

Alternative 2 would substitute or add sales. It drops the 1983 California sale and restricts the 1984 California sale to Southern California.

The DEIS discusses five other alternatives which delay or omit Alaska sales. However, there is no discussion of any alternative which even considers omitting or delaying California lease sales 53, 68 or 80.

The result of this ommission is that the DEIS fails to inform the decision makes of reasonable alternatives which would avoid or minimize significant adverse environmental impacts, in violation of Sections 1502.1, 1502.2, subdivision (d), and 1502.14. This is a substantial defect which goes "to the heart of the EIS," and renders it inadequate.

B. "Tiering" and Proper Consideration of the Issues Ripe for Decision

When a project progresses from a broad, programmatic stage to a subsequent site-specific stage, the NEPA regulations encourage "tiering". The purpose of tiering is to focus on the actual issues ripe for decision at each stage of environmental review. (§§ 1502.4, 1508.28, 1502.20.)

The OCS Lands Act Amendments, (§180) provides that the leasing schedule shall indicate as precisely as possible the size, timing and location of leasing activities. Thus, the issues which are ripe for decision now include the question of which areas of the United States outer continental shelf shall be considered for leasing in the next five years, and which shall not be considered. The proper formation of a plan under the OCS Lands Act Amendments, and the related EIS, requires deletion of those California OCS regions of high environmental sensitivity and low resource potential (see California's comments on the Proposed Five Year Leasing Schedule, incorporated herein by reference).

Nevertheless, Interior has taken the position that the only question of scheduling for areas with oil resources is not whether, but when action should be taken. Interior skirts the issue by stating that "inclusion of sales on the schedule does not represent a decision to lease". (DEIS, p. 6)

By erroneously taking the position that such issues are not ripe for decision, Interior has failed to formulate a leasing program which indicates "as precisely as possible the size, timing and location of leasing activities". The resultant schedule fails to meet the requirements of a "program" under the OCS Lands Act Amendments, and renders the DEIS inadequate as well.

C. Identification of Methodology and Reference to Sources

Section 1502.24 of the NEPA regulations provides:

"Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit references by footnote to the scientific and other sources relied upon for conclusions in the statement. An agency may place discussion of methodology in an appendix."

The DEIS is inadequate because it fails to identify the methodologies used and fails to make explicit references by footnote to the scientific and other sources relied upon, as required by Section 1502.24. Statements which are very significant are listed as "facts" without any citation of authority which can be challenged.

For example, in discussing the Northern and Central California sensitivity to oil spills, the DEIS (p. 193) states: "Approximately four oil spills greater than 1000 bbls. are estimated to result from the proposal which could impact these resources." There is no footnote stating the source of such information, and California cannot effectively challenge such statistics without knowing their source or how they were derived. The "scientific integrity" of the DEIS has not been insured, as required by the NEPA regulations.

D. Environmental Consequences

Pursuant to Section 1502.16 ("Environmental consequences"), the EIS "shall" include a discussion of "possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned." (§ 1502.16. subdivision (c).)

Although the DEIS contains a section entitled: "Impact On Other Management Plans", which recognizes that California has a Coastal Act (pp. 252, 256), it utterly fails to assess any possible conflicts between the proposed action and state objectives.

That these conflicts exist was made clear in California's Comments on the Five Year Leasing Schedule. Interior's proposed program sharply conflicts with various policies of the California Caostal Act (including, e.g., preservation of scenic and visual qualities of the coast) as well as California policies concerning air quality. Yet no discussion of these conflicts appears in the DEIS as required by the NEPA regulations. (§ 1502.16, subd. (c).)

Furthermore, section 1502.16, subdivision (e) requires EIS analysis of "energy requirements and conservation potential of various alternatives . . ." The DEIS fails to discuss conservation potential at all.

E. Failure to Adopt Procedures for Implementation of the NEPA Regulations

Section 1507.3, subdivision (a) requires that Interior (BLM) adopt regulations "not later than eight months" after publication of the NEPA regulations to supplement the NEPA regulations and set up procedures for implementation. The NEPA regulations were published November 29, 1978. More than eight months have elapsed and BLM has not yet even published proposed procedures. (Environmental Reporter, Current Developments, Volume 10 #22, September 28, 1979.) It is impossible for California to determine whether the DEIS has complied with requirements which have never been published. Interior's failure to publish the regulations as required renders the DEIS inadequate.

F. Use of the EIS as an Action - Forcing Device

The "primary purpose of an environmental impact statement is to serve as an action-forcing device to insure that the policies and goals defined in the Act are infused into ongoing programs and actions of the Federal Government." (§ 1502.1) Environmental impact statements are to serve as the means of assessing the environmental impact of proposed agency actions, rather than justifying decisions already made.

As Section F of the Coastal Commission Comments sets forth, the DEIS analysis is not being used to develop the schedule. The DEIS states that the proposed five year schedule is not an action which will have any unavoidance adverse impacts because it is only a schedule and makes no decision to hold any of the sales on the schedule (DEIS p. 267) As a result, the DEIS is not being used as an action-forcing device as required by NEPA regulations, § 1502.1, and the primary purpose of preparing an EIS has been defeated.

State of California
GOVERNOR'S OFFICE
SACRAMENTO 95814

EDMUND G. BROWN JR.
GOVERNOR

September 19, 1979

Cecil Andrus
Secretary of Interior
Interior Building, Room 6151
18th and C Streets, N.W.
Washington, D.C. 20240

Dear Cece:

Enclosed for your consideration are the State of California's comments on the proposed national Five-Year Schedule for leasing the Outer Continental Shelf.

I appreciate the opportunity to comment on the future development of California's offshore oil resources. This oil, combined with our enormous onshore resources, represents California's ability to make a significant contribution to the nation's energy needs. Our overall oil production currently stands at a little over one million barrels per day, supplying about 12% of the nation's oil production. Future production plans anticipate an incremental increase of 500,000 barrels per day by 1985.

The recent successful completion of Lease Sale #48 on schedule, and the rapid permitting of the Chevron and Shell production projects within the strict time limits of state law, demonstrate California's ability to insure expedited energy development.

I am concerned that the spirit of cooperation and consultation that we have developed with regards to OCS leasing has not been extended to the preparation of the Five-Year Schedule. Despite repeated discussions between state and local government representatives with your staff, the proposed schedule fails to meet the following concerns:

- The proposed schedule does not evaluate several critical factors that are required by the Congress in the OCS Lands Act Amendments.

- The schedule does not evaluate regions against each other and rank them in priority as required by the OCS Lands Act Amendments.

- The schedule proposes leasing of vast offshore areas that prevents a proper balancing of environmental risks with resource potential.

California is committed to the use of pipelines for transportation of OCS crude in order to minimize air pollution, reduce the threat of oil spills, and because tankers use large amounts of oil for power while pipelines do not. Future OCS leasing offshore California should be tied to the use of pipelines for transportation. If such a choice is made with regard to OCS production, then, especially for Lease Sale #53, it would be appropriate to balance the USGS resource estimates against the requirement of pipeline transportation. Based on information in the Five-Year Schedule and draft program EIS, there are areas of the California OCS where the resources are not sufficient to warrant the great environmental risk resulting from oil development without a pipeline and the resources also cannot economically support a pipeline.

The OCS Lands Act Amendments require balancing of resource production and environmental protection. Such balancing indicates that basins offshore San Diego, San Mateo, Bodega Bay and Mendocino would be deleted from the schedule as inappropriate for future development because of low resource potential and high environmental risk.

California is acting to produce oil for the nation from both onshore and offshore fields. I ask for your cooperation and strongly urge substantial modification in the final Five-Year Schedule to reflect the concerns of this state. The final schedule should provide all of the information required by the OCS Lands Act Amendments and incorporate this information into the balancing process. The schedule should also recognize that this balancing would result in the removal of the basins I have mentioned above from leasing activity. Finally, leasing which does take place off our coastline should be conditioned upon use of pipelines to transport the oil. This will minimize the risk of oil spills and air pollution and provide an energy efficient means of transportation.

Sincerely,

EDMUND G. BROWN JR.
GOVERNOR

Enclosure

STATE OF CALIFORNIA COMMENTS
ON PROPOSED FIVE-YEAR OCS LEASING SCHEDULE
SUBMITTED BY GOVERNOR EDMUND G. BROWN JR.
TO SECRETARY OF INTERIOR CECIL ANDRUS

CONTENTS

REQUIREMENTS OF OCS LANDS ACT AMENDMENTS FOR 5-YEAR LEASING PROGRAM.

The Interior Department has not shown how the factors mandated by Congress for consideration in developing the 5-Year Leasing Program were analyzed together to determine the proposed schedule for OCS lease sales. This is contrary to Section 18 of the OCS Lands Act ("OCSLA") which require that these factors be considered in developing the leasing program. Interior mentions these factors and describes some of them, but nowhere is there analysis as to how they were considered and compared in developing the proposed leasing schedule. Interior instead states that considerations such as environmental risk factors are treated "...as issues which need to be addressed, whether during the pre- or post- sale planning process, rather than possible impediments to comprehensive planning for leasing" (Tab B, Foreward, p.4).

Section 18 (a) of the Amendments provides that the leasing program shall indicate as precisely as possible the size, timing, and location of leasing activity proposed. Interior has failed to meet this requirement in the schedule by a) its designation of "California" as a proposed OCS leasing area for 1983 and 1984, a 24 million acre area within which some portion would be selected for leasing at a later time, and b) inclusion of five separate sedimentary basins in proposed Lease Sale #53 spanning 700 miles of coast and widely diverse habitats. Neither the broadly defined "California" OCS area nor the Lease Sale #53 area conform to the standard set in Section 18 (a) (2) of selecting OCS areas for development on the basis of oil and gas bearing physiographic regions, which clearly means sedimentary basins.

Section 18 (a) (3) of the OCSLA states that the timing and location of leasing shall be selected to the maximum extent practicable, so as to obtain a proper balance between the potential for environmental damage, the potential for the discovery of oil and gas, and the potential for adverse impact on the coastal zone. Because of the lack of data on the environmental impacts of OCS development in Northern and Central California reflect by the status of the Environmental Studies Program for this area (discussed below) it is not possible for Interior to do the analysis required by this section and make the required balance. The timing of a 1981 sale in Central and Northern California is premature in light of this section particularly. The location, covering five sedimentary basins, is likewise contrary to the requirements of the act because the balancing cannot seriously be done when such an extensive area is not divided into 5 physiographic areas.

Thus, DOI did not follow the requirements of the OCSLA to define the location of leasing activities "as precisely as possible," to base the schedule upon a comparison of various factors among "physiographic regions," and to "properly balance" between potential for environmental damage, discovery of oil and gas, and adverse impacts upon the coastal zone. Accordingly, it is impossible for California to meaningfully comment upon Lease Sale #53 and the "California" lease sales in comparison with other sales preposed in the program. Only when OCS areas are more clearly defined as to location and limited in size could the Secretary of Interior really consider the Congressionally-mandated factors.

In addition, Section 18 (a) (1) of the Amendments requires that Interior consider economic, social, and environmental values of the renewable and nonrenewable resources of the OCS, and the potential impact of oil and gas exploration on other resource values of the OCS and the marine, coastal and human environments in its management of the OCS. Option 4 of the proposed schedule, filling 100% of the Department of Energy's production goals, best meets this requirement; not only is it the only option which meets the DOE goal but it also proposes one sale for Central and Northern California, none for "California", and two for Southern California. However, even Option 4 does not reflect consideration by Interior of the value of the resources on the OCS and the potential impact on these resources if OCS development occurs because Lease Sale #53 still is included in its entirety, and still in 1981 before Environmental Studies on the area will be completed. Nowhere in the proposed schedule is there an evaluation of the tourist or recreation industries of California, a major source of revenue for the state and local governments and the commercial fisheries are quantified again not by discrete basin areas but by gross figures covering Central and Northern California. The federal government itself has invested hundreds of millions of dollars in developing the northern California parklands of Point Reyes, Golden Gate National Recreational Area and the Redwoods Park.

Impacts on the marine, coastal and human environments, included in Section 18 (a) (1) for consideration by Interior, also have been overlooked in the proposed schedule. Although these impacts are discussed in the Draft Environmental Impact Statement on the 5-Year Program, it is not clear how Interior will incorporate the analysis done in the DEIS into its decisions on the proposed schedule. One of the major impacts from OCS development in Central and Northern California, as the DEIS points out, is the conflict with existing uses of the OCS and the coast, especially commercial fishing uses, discussed later. Even though Sections 101 (13) and 102 (7) of the OCSLA both express the Congressional intent to minimize conflicts between OCS development and other uses, especially the recovery of fish and shellfish, this policy does not seem to have been carried out by Interior in selecting OCS areas for the proposed schedule.

The DEIS states that "the level of...impacts cannot be assessed in any quantitative manner at this time. The lack of specific tract locations (available at the sale proposal stage, ...) makes even qualitative assessment of impacts difficult, as proximity to resources of concern and oil spill trajectories cannot be determined at the program level of planning." (DEIS, p.v.) If this is the case, Interior is not following the mandates of the Amendments which require consideration of impacts, conflicting uses of the OCS, and value of the resources on the OCS. It is obvious that Interior must change its method of developing a five year program in order to meet the requirements of the OCSLA.

The eight factors listed in Section 18 (a) (2) that must be considered in selecting the timing and location of OCS activities are viewed by DOI as issues which do not preclude the leasing of any area (except Congressionally-excluded Point Reyes Wilderness), but which can be balanced either before or after a lease sale. The state of California strongly disagrees with this interpretation of "not whether but when" and urges that Interior consider and compare these factors in developing the final program as to the timing and location of lease sales. Discussion of each factor follows.

Geographical, Geological, Ecological, and Predictive Information. (Section (a) (2) (A), (H).

Congress has required that the following factors be considered in developing the program: "(A) existing information concerning the geographical, geological, and ecological characteristics of such regions"; and "(H)... relevant environmental and predictive information for different areas of the Outer Continental Shelf" (Section 18 (a) (2) (A)).

The proposed program includes some data on existing geographical, geological, and ecological characteristics of the 22 OCS areas, evaluation of resources, conflicts and environmental sensitivities, but no predictive information (Tabs 6, 7). "Environmental considerations" are organized in matrix from which is extremely oversimplified in that it attempts to describe the environment of an area such as the California OCS, which includes 24 million OCS acres by counting fisheries, marine mammals, birds, proposed marine sanctuaries and wetlands. Concerns such as air and water quality, capacity of an area for industrial development, or aesthetics in an area that supports a thriving tourist or recreation industry are not included as an "environmental consideration", leaving out important concerns listed in California's coastal management program and the laws, goals and policies of the state.

Tables rank environmental sensitivity of areas based on the environmental descriptions listed above, so they contain the same deficiencies in scope of information.

Nowhere in the proposed program is predictive information considered, as required by law. Assessment of future possible impacts on resources is crucial analysis. The only mention of any kind of predictive information is in the environmental sensitivity matrices that reduce environmental considerations to broad categories and meaningless ratings and fail to include mention of the economic and environmental losses that could result from OCS development.

ENVIRONMENTAL SUTDIES

Interior's environmental studies are referenced in the proposed program but are not considered in the leasing decision (Exhibit 7). The goal of the studies program is to develop information for use in leasing decisions. But many studies have not been completed in time to be used in the schedule or even in the EIS for specific lease sales. In addition, the studies described by DOI as "completed" in the proposed program have not been made available to the State. The program itself contains contradictory information on the status and description of these studies. The environmental studies are essential for OCS decisions. An area the size of California's OCS, along 1100 miles of coastline and containing at least 15 sedimentary basins, cannot be considered for four lease sales in accordance with the mandates set forth by Congress in the OCSLA unless a serious analysis of the specific affected marine and coastal environments is done on a basin-by-basin basis.

Sharing Environmental Risks. Section (a)(2)(B),(G). The OCS Lands Act also requires Interior to consider these two factors: "(B) An equitable sharing of developmental benefits and environmental risks among the various regions"; and (G) "the relative environmental sensitivity and marine productivity of different areas of the OCS" (Section 18(a)(2)(B) emphasis added). The proposed schedule does not seem to be based on these factors at all. While the 22 OCS areas are ranked for petroleum resources and ease of exploration, there is no ranking of the areas together on environmental sensitivity and marine productivity. There are some qualitative comparisons of areas within each of the four overall OCS regions, but nowhere is there any indication these comparisons were used to determine the location or timing of lease sales. Instead the proposed California sales are defined as such broad areas, i.e., the entire California OCS, that relative environmental sensitivity of offshore basins cannot be incorporated in the decision.

The five offshore basins conglomerated under the Central and Northern California area definition and the ten basins under the Southern California OCS make it meaningless to compare environmental risks and sensitivities for these enormous areas. The even broader "California" OCS area eliminates any basis for a schedule on environmental protection grounds.

The OCSLA requires that the Secretary "select the timing and location of exploration, development and production of oil and gas among the oil- and gas-bearing physiographic regions of the OCS based on the eight factors analyzed in this recommendation" [Section 18(a)(2)]. Oil and gas bearing physiographic regions is logically interpreted to mean geologic basins and not regions as broad as the Atlantic, Gulf, Pacific and Alaska, each of which contains two or more basins. However, the proposed schedule does not analyze the eight factors basin-by-basin but rather by the four large regions. The definition of the leasing areas then is so broad as to make any meaningful ranking and comparing of areas impossible. The "Central and Northern California" and the "California" definitions of leasing areas are so extensive, covering five offshore basins in Northern and Central California and ten in Southern California, and millions of OCS acres along hundreds of miles of coast, that the Congressionally mandated factors cannot seriously be analyzed and compared. If, for example, the Point Arena Basin offshore Mendocino County were an OCS area compared to all others, its low resource potential and high environmental risks would justify eliminating it from the schedule. But the analysis is so gross that no comparisons can be made.

Section 11(h) of the OCS Lands Act permanently excludes leasing within 15 miles of the boundaries of the Point Reyes Wilderness in Marin County. Interior interprets this exclusion to mean that Congress specifically intended to exclude no other OCS area from leasing (Tab B, Forward, pp. 2-3). This does not at all mean the Secretary of Interior cannot or should not exclude other OCS areas from leasing, and the program should explicitly include analysis of those specific basin-level OCS areas where the low petroleum resource potential and high environmental risks merit exclusion from the schedule. If Interior conducted the required analysis of all the factors such decisions could be made.

Interior's policy of not permanently excluding areas from leasing and of maintaining the option to lease tracts that were deleted from previous sales for environmental reasons make the Marine Sanctuary program all the more important. As OCS leasing increases, the marine sanctuary program under the Marine Mammal, Sanctuaries and Research Act of 1972 is supposed to establish those areas of special marine resource importance where OCS petroleum development should not take place. The sanctuary approval process is very complicated and is funded at only $500,000 a year nationwide with 10 federal staff, while the OCS program as represented in this program is budgeted for about $130 million and 1,479 federal staff (Tab. 10). Three California sanctuaries are in the consideration process by NOAA and are in the draft environmental statement process. Prohibition of petroleum development is one option being considered for these sanctuaries, but final regulations have not yet been proposed for the possible Santa Barbara Channel Islands, Monterey Bay, and Farallon Islands-Point Reyes marine sanctuaries.

Regional and National Energy Market. Section 18 (a)(2)(C).
Another factor Congress requires be considered is (C): "The location of such [leasing] regions with respect to, and the relative needs, of, regional and national energy markets". Interior and DOE seem to indicate as much OCS acreage as possible should be leased off the West Coast and Alaska, not because the production can economically be transported to national markets, but because it can and should be transported to Japan. While admitting there will be a large excess of domestic oil production on the West Coast in the 1980s, that factor seems to have no effect on the proposed schedule. That factor would seen to favor more sales in the Gulf of Mexico and the Atlantic, areas nearer to refineries that can process high sulfur oil and where imported oil would be displaced by OCS production. Instead transportation economics and location of leasing regions are simply assumed away as factors, with the assumption all West Coast oil can be transported east or to Japan.

Other Uses of the Sea and Seabed. Section 18 (a)(2)(D).
The OCS Lands Act Amendments require that the Five Year Program consider: "(D) the location of such regions with respect to other uses of the sea and seabed including fisheries, navigation, existing or proposed sealanes, potential sites for deepwater ports, and other anticipated uses of the resources and space of the OCS." Interior has not met the requirement to consider the conflicting uses of navigation, existing or proposed sealanes, and potential sites for deepwater ports. Further, the uses that are considered are reduced to simple "high, moderate, or low" assessments in contrast to the elaborate and extensive analyses done by DOE to support the oil production goals. A consideration of conflicting uses should compare these uses at the same level of economic detail. Again, areas analyzed are too large for a serious consideration of use conflicts.

Uses included in the use conflict matrix (Exhibit 6) are commercial and recreational fisheries, marine mammals and birds, and water fowl. No consideration of navigation, existing or proposed sealanes, and potential sites of deepwater ports also is provided for any of the 22 OCS areas considered for leasing. Coast Guard-established sealanes offshore Southern California and in the Santa Barbara Channel present a use conflict with OCS development. These lands were created to guide the vessel traffic off Southern California into safer, more clearly defined routes. Interior has permitted leasing in these lanes, setting a policy of ignoring its statutory responsibility in this area of use conflict.

Any use conflict analysis that is done must break down areas into single basin areas at least. Only then, with the estimated resource potential of an OCS basin, can an accurate rating of use conflicts be done. An area the size of the Northern and Central California OCS is too large for the simplified approach taken in the schedule.

The DEIS states that "adverse impact will be experienced by the commercial fishing industry" in Central and Northern California. "Conflicts for shore facilities are likely to be intense and fairly long-term. The magnitude of these impacts should be moderate". (p. 180) There is no indication as to how Interior will incorporate the analysis done in the DEIS in formulating its five-year leasing program. For example, in spite of the DEIS finding that the impacts on the commercial fishing industry will be intense and fairly long-term, Interior is proposing up to three sales in Central and Northern California. This ignores the Congressional intent expressed twice in the OCSLA Amendments to minimize conflicts with other uses of the OCS, particularly commercial fishing activities (See Sections 101(13) and 102(7) of the Amendments).

Interest of the Oil Companies. Section 18 (a)(2)(E).
The Act further requires consideration of: "(E) The interest of potential oil and gas producers in the development of oil and gas resources as indicated by exploration of nomination."

Industry ranked the 22 OCS areas with respect to potential resources and interest in exploration. But even with such explicit rankings, it is not clear how they were used to formulate the schedule, since industry ranked the Kodiak Area of Alaska 21 of 22 for interest in exploration, yet Interior has it scheduled for lease in 1980, well ahead of Alaska's Bristol Basin, ranked 4 of 22 but scheduled for 1983. It is clear from the proposed schedule and from the President's and Secretary Andrus' directives, that high petroleum resource potential has played the primary, perhaps, the only role in determining the schedule. But the analysis does not even indicate how this factor determined the proposed schedule, and again covers OCS areas too large for the analysis. For example, resource estimates for Northern and Central California lump together five basins, one of which has much higher estimates than the others and one of which has no oil projected at all.

Laws, Goals and Policies of Affected States. Section 18 (a)(2)(F).
This factor is discussed under the Section on Coastal Zone Management.

Involvement of State and Local Governments.
The intent of Congress that Interior work closely with States, and through State local governments in developing the leasing program, is expressed throughout the Amendments, (e.g. Sections 101(11), 102(4,5,6), 18(a)(2)(F), (c)(1),

(f)(3,5), and Section 19 in its entirety). Interior largely ignored the recommendations of the state of California and every affected county government in our recommendations for the Call for Nominations on Lease Sale 53. Our strong belief that the Environmental Studies on Central and Northern California be completed in time for incorporation into the Final Environmental Statement for Lease Sale 53, so that the extent of impacts on our economy and environment could be known before a decision to lease is made, has also found a deaf ear in Washington and the Regional Pacific OCS Office of the Bureau of Land Management. Asking for our comments and then rejecting them, with or without an explanation, is not involvement with state and local governments. Rather it creates false expectation that our comments, concerning the California coast while we are in the midst of long-range coastal planning, would be seriously considered.

The Interior Department has not adequately considered the factors listed in the OCS Lands Act Amendments of 1978 in developing the proposed programs. Adequate analytical consideration of these factors, expecially environmental protection factors, could substantially change the proposed schedule and would result in deleting from the schedule the leasing of offshore California sedimentary basins that have low petroleum resource potential and high environmental sensitivities. (See discussion of the California Coastal Management Program below.)

JAY S. HAMMOND
GOVERNOR

STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

The Honorable Cecil D. Andrus
Secretary of the Interior
U.S. Department of the Interior
Washington, D.C. 20240

Cece

Dear Secretary Andrus:

We appreciate the additional opportunity for the State of Alaska to convey to you its position on the proposed federal five-year oil and gas leasing program on Alaska's outer continental shelf. As you know, I have corresponded with you on this matter on three earlier occasions: December 12, 1978; May 4, 1979; and briefly on August 3. In this letter, I wish to address both the June version of your proposed leasing program and the draft environmental impact statement that was prepared to analyze your proposal. In your deliberations on the proposed program, please consider this correspondence together with that referred to above as we have attempted to build upon our original position.

The needs that I have elaborated upon in this letter are the following:

1. For you to seriously consider my proposed schedule as a viable alternative, that is in the state's and the country's long-term interest, and to defer the scheduling of the southwest portion of the Bristol Basin or North Aleutian Shelf area as well as the St. George Basin area.

2. For a new study area designation to be established that allows planning and assessment to begin in certain potential frontier lease areas without their being subjected to the political momentum that inevitably sets in once an area is formally scheduled.

3. For the Interior Department to reconcile the striking disparity between its environmentally conservative onshore policies in the Alaska lands issue and its overly ambitious offshore leasing proposal.

4. For adequate coordination of state and federal leasing schedules to occur.

5. For you to carefully assess industry's ability to implement as ambitious a program as you have proposed.

6. For you to fully weigh the oil and gas transportation implications of your proposal and to carefully reassess the merits of exporting Alaska crude oil.

7. For you to carefully consider the administrative implications of your proposal and to give your fullest support to the timely funding of state participation grants under the Coastal Energy Impact Program.

Comparison of Federal Proposal and Options with State Needs

While we laud your department's efforts to examine an array of alternative programs, two inconsistencies are apparent. First, the federal leasing schedule which I proposed both in December and in May is conspicuous by its absence as an alternative in both your June program proposal and the draft environmental impact statement. Given the fact that you are proposing approximately 9 out of 31 leases on the Alaska OCS, it is ironic that Alaska's proposal is not among the 11 alternative schedules displayed by Interior. Second, we are concerned with the low correlation between the alternatives you identified in June and those which are examined in the DEIS. Of the four options that you identified, only an updated version by the Department of Energy was analyzed in the EIS. Conversely, the EIS describes five options that your June proposal does not identify. This disparity between the two documents tends to hamper public understanding and raises a question as to how they are to be used as decision-making tools.

These concerns are particularly significant given the fact that the proposal and every alternative identified in the Interior Department documents reflect more ambitious leasing programs than that which I have proposed. A comparision of federal alternatives and the state's proposal appears in Tables 1 and 2 (enclosed). In Table 3, you will find a comparision of how your June alternatives and those in the DEIS compare in their responsiveness to the state's proposed program and the criteria upon which it is based. You will notice in Table 3 that your June proposal is among the options least responsive to state concerns. For clarity, I'd like to reemphasize my earlier position and the criteria upon which it has been based.

State's Proposed Alternative

We have organized prospective federal lease areas into the following three categories:

I. The following are lease areas for which proven technology exists for development for the 1979-1985 period. Infrastructure is rather advanced since previous oil exploration activity has taken place in all areas. Notice of Sale for these areas should proceed (in the order presented here) when a comprehensive set of lease stipulations and enforcement procedures is cooperatively developed by federal and state governments.

1. Joint federal-state nearshore Beaufort Sea (1979)

2. Gulf of Alaska (Yakutat tracts)

3. Lower Cook Inlet - Shelikof Strait

II. Sales in the following areas need to be delayed until proven, safe technology is developed through experience gained in the Beaufort Sea. Sequential nearshore to offshore progression of development is endorsed for each of the following regions and in the order listed. Portions of the Norton and Navarin Basin planning units may be appropriate areas for leasing by 1983-1985 assuming that advanced exploratory and development drilling techniques, transportaion methods and mitigating measures are sufficiently developed by the early 1980's, and if district coastal management plans are satisfactorily completed. These plans may be in place toward the latter part of the 1980-1985 period.

4. Navarin Basin

5. Norton Basin

6. Hope Basin

7. Kodiak Shelf

III. Sales in the following areas need to be postponed indefinitely pending resolution of major natural resource conflicts, availability of a comprehensive coastal environmental data base for development of strengthened regulatory mechanisms, decisions on marine sanctuary designation or other protective classification, evolution of arctic technological capability and completion of coastal management plans. The order in which these areas should be considered for additional research and for possible future scheduling is as follows.

8. Chukchi Sea

9. Southern Aleutian Shelf

10. St. George Basin

11. Bristol Basin

12. Beaufort Sea ice shear and offshore pack ice zones

We have consistently qualified this proposal by indicating the difficulty in evaluating potential lease areas that are as large and general as those you have described. There is, for example, considerable difference between the Navarin Basin lease area as it is administratively defined and the Navarin Basin as an offshore geologic feature. Our ultimate concurrence with a lease sale will depend on the tracts that you identify for leasing.

Criteria for State's Proposed Alternative

The state proposal was developed using the following major evaluation criteria to ensure consistency with state goals and policies:

1. Biological productivity and diversity and environmental sensitivity of certain key populations to disturbance;

2. Technological capability to safely explore and produce oil and gas resources;

3. Likely magnitude of adverse impacts on resources and water quality given knowledge of industry technology scenarios and oceanographic and biological processes within a lease area;

4. Economic value of harvestable renewable resources in a particular lease area and the presence or absence of endangered species;

5. Consideration of the area as a candidate for marine sanctuary designation;

6. Community preparedness, specifically the status of the district coastal management program in the area adjacent to the offshore oil province;

7. History of previous leasing or drilling in a proposed area;

8. Consistency with previous state policy positions submitted to the Department of the Interior.

I believe that the merits of my proposal to you were confirmed in the public comments that were conveyed to you in May. I further believe that our proposal has withstood the analysis and conclusions appearing in your DEIS. No significant new information on ice drilling or cleanup technology, environmental resources or local coastal management planning has become available which would warrant a departure from my earlier position.

Coordination of State and Federal Schedules

A point that I clarified in May regards the state's scheduling of leases in the Norton Basin and Chukchi Sea earlier than advocated in my proposal to you. Our schedule was developed last January based upon our best estimate of what the federal program might be. We intend to coordinate our offshore sales as closely as possible with yours and I urge you, once again, to schedule, with us, coordinated sales according to the schedule proposed above.

I further urge you to administer the federal leasing program without frequent alteration in order for the state to structure its leasing program in a timely and coordinated manner. The state's five-year leasing schedule, which requires approval of the state legislature, can be adjusted only with respect to the last two years. Frequent amendment of the federal schedule makes it virtually impossible to coordinate our leasing activities and hinders the planning efforts of industry, coastal communities, the state and federal environmental research units.

Industry Preparedness

We seriously question whether the petroleum industry is prepared to implement as ambitious a program as you proposed. It may be unwise for a prudent landowner to lease more land than the petroleum industry can reasonably be expected to develop, considering constraints on capital and equipment. This is particularly true if the federal government persists in its reluctance to grant 10-year lease terms in frontier areas.

Sohio Petroleum Company, one of the major North Slope producers, stated recently: "If a company were fortunate enough to obtain 10 leases (in the December Beaufort Sea lease sale)... it would clearly be impossible for financial and logistical reasons to commit to an aggressive exploratory effort on each lease simultaneously. With anything less than a 10-year term, therefore, it is highly unlikely that, given the short drilling season, adequate exploration can take place." If this statement is true with respect to the 1979 Beaufort lease sale, it logically follows that industry will find it difficult, if not impossible, to adequately explore all nine Alaska OCS areas proposed for leasing during the next five years.

Oil and Gas Transportation

We are further concerned as to how oil and gas discoveries as a result of sales on the five-year schedule will be transported to markets in the lower 48 states. If oil is found in the quantities anticipated in the Alaska OCS, more oil will be produced than can be refined on the West Coast. It appears unlikely that refinery capacity in California will be expanded enough to accommodate all resulting production. A West Coast oil surplus could persist into the 1990's to the economic detriment of the State of Alaska and the Nation. I urge you once again to reconsider the federal policy prohibiting the foreign sale of Alaskan crude oil, a simple solution to the surplus that would protect the interests of the Nation and the State of Alaska. With respect to natural gas discovered as a result of the five-year OCS leasing schedule, it is contemplated that LNG facilities will eventually be constructed to process and transport the gas which cannot be carried in the proposed Alaska Highway Gas Pipeline. Construction of new receiving terminals in the lower 48 would also be required. However, attempts to establish such LNG receiving facilities have been largely unsuccessful to date due to the inabiltiy to obtain the required state and federal permits, and the Department of Energy has had a clear policy opposing any new LNG applications.

In addition, we do not believe it is in the long-term interest to rapidly deplete the hydrocarbon resources in the Alaska OCS. Barring a technological breakthrough for inexpensive, clean energy in the near future, we believe Alaska's OCS hydrocarbons will be even more essential to the national economy and national security in the future than they are today. Just as prudent reservoir management demands a steady, conservative flow of production, rational resource development demands steady, methodical exploitation of the Alaska OCS.

Socioeconomic Impacts

The socioeconomic impacts to the state as a result of the proposed five-year leasing program are likely to be significant. The DEIS indicates that the state's population would increase by more than 45,000 persons over the long term if hydrocarbons are discovered in the quantities expected. Even if development takes place in the "enclave mode," which would isolate it from existing Native villages, local communities are nonetheless likely to experience economic and lifestyle disruptions.

The federal government's attitude toward the development of Alaska's energy and mineral resources is inconsistent, if not hypocritical. Current federal policies simultaneously propose immoderate environmental contraints and massive land withdrawals on upland acreage and rapid development of offshore areas. This apparent lack of coordination between the policies governing OCS development and Alaska lands legislation portends a myriad of future problems regarding the development of needed shore facilities and transportation and utility systems. In its vastly divergent onshore and offshore policies, the Department of the Interior has failed to strike an acceptable balance between environmental protection and energy development. Alaskans who actually inhabit the land should

Administrative Impacts

As currently structured, the proposed leasing program presents several administrative problems. Three major sales - Norton Basin, St. George Basin and the second Beaufort sale - are scheduled to take place within a six-month period between September 1982 and February 1983. Such a compressed timeframe for three major sales simply will not afford adequate time for sale preparation by the federal government, the state or the oil industry. The removal of St. George Basin from the schedule would ameliorate this problem.

The ability of state government to respond to an accelerated leasing program in a thorough and timely manner is also dependent upon adequate federal assistance. The failure of OMB and the Congress to make available state participation grants under the Coastal Energy Impact Program has negated the provision in the OCS Lands Act Amendments for such funds. An already low funding authorization continues to be eroded by inflation while the State of Alaska is already well into the monumental workload of responding to federal lease initiatives. This is an extremely significant problem in frontier areas, the bulk of which are proposed for Alaska.

Although the intent of the CEIP funds is admirable, appropriation under the present allocation formula is greatly lagging behind our actual needs even under the current leasing schedule. With the present allocation formula, funding will become available after much leasing has occurred. It will obviously come too late to mitigate many potential impacts. In summary, CEIP funds 1) were authorized at too low a level, 2) have not been appropriated and 3) are subject to allocation after the state is already well into the pre-leasing process.

Environmental Impacts

All apparently agree that rapid OCS development could have significant environmental consequences for Alaska's mostly wilderness coastline. The DEIS states that 36 oil spills greater than 1,000 barrels are statistically probable in Alaska waters as a result of development stemming from sales on your proposed schedule. Additional environmental impacts will occur from the construction and operation of onshore support facilities, pipelines, and terminals. Fish and wildlife populations will suffer from these activities. I'd like to briefly discuss some environmental concerns in the Bering Sea and Chukchi Sea.

A. Bering Sea - The two significant differences between your June proposal and your earlier one are 1) the addition of the southwest portion of what you earlier described as the Bristol Basin lease area, and have redesignated North Aleutian Shelf and 2) the rescheduling of the proposed St. George Basin sale from February 1985 to December 1982.

The state of Alaska's consistent position on leasing these regions has been to request indefinite postponement pending acquisition of more comprehensive oceanographic and biological resource information and development of district coastal management programs in this region to cope with onshore effects. This position has been shared by the National Marine Fisheries Service and the federal Fish and Wildlife Service. Scientific research in the Bering Sea conducted through the BLM-sponsored OCS Environmental Assessment Program (OCSEAP) has historically lagged behind that in other actual or proposed lease areas around Alaska since this research program has been primarily tailored to previous five-year schedules. None of these have recently listed the Bristol Basin area or St. George Basin area for leasing in the immediate future.

Historical beliefs regarding basic oceanographic properties in the Bering Sea have come under scrutiny through efforts of OCSEAP research, highlighting the need for further time to refine these new findings. One classic example of reevaluating our traditional beliefs about physical processes acting in the outer Bristol Basin and St. George Basin has been in the newly defined circulation regime in this region. Classical models have traditionally depicted strong currents through Unimak Pass which then divide, with one branch to the northwest and a second eastward along the Alaska Peninsula. This latter current was thought to run counter-clockwise around inner Bristol Basin and then northerly to the Bering Strait.

Recently collected data suggest that this simplified notion of shelf circulation is incorrect. Currents appear very weak over the southern Bering Sea shelf, are generally random with a slight northwest drift along the shelf edge and tend to be caused by tide and wind action. The result is little net flow on the Bering Shelf.

I mention this new evidence because its implications can be significant. Oil spill contingency planning and the tract selection process are radically affected by this new information. Previous spill trajectory models will require major revision as new empirical data become available. The lead time necessary to finetune the meager data base warrants an indefinite delay in leasing this broad continental shelf region.

As indicated on the enclosed map, the shallow waters of the North Aleutian Shelf represent major king and tanner crab spawning habitat and constitute the major migratory corridor for outmigrant juvenile sockeye salmon from the Bristol Bay drainages. This and other resource information have been

thoroughly documented in previous submissions of the state on five-year OCS lease scheduling.

It is becoming increasingly apparent that the federal government needs to revise its preleasing process by adopting an interim "contingency" or "study area" designation that would allow certain investigations to be authorized and funded without highly sensitive frontier areas being prematurely scheduled as "lease areas." This sort of classification would restore credibility to your planning process by not generating the momentum that invariably ensues following the scheduling of an area. Presently, the next decision step after an area appears on the federal schedule is the tentative selection of tracts. The federal government indicates that to be eligible for OCSEAP research, an area must be scheduled. Then at the call for tract nominations, we are advised that portions of a lease area must be tentatively nominated in order for the BLM to further study them and describe anticipated environmental impacts. Following this tentative tract selection is an environmental impact statement. This scheduled-unless-proven-otherwise approach is a very presumptuous process at best, as it can become very difficult to remove an entire lease area from the schedule, regardless of the merits of doing so.

If the North Aleutian Shelf and St. George Basin areas were designated simply as study areas as I have suggested, it would be possible for coastal management planning, environmental research and the study of appropriate mitigating measures to proceed in a timely, objective manner without prejudgement that the areas will be leased unless evidence can prevail to the contrary. Examples of serious issues for which mitigating measures could be developed are the accommodation of vessel traffic - fishing gear interactions, interference of subsea pipeline obstructions with trawling operations on the shelf and the timing of specific operations to minimize effects on spawning and nesting areas. The development of such mitigating measures is, incidentally, something that the state would like to work cooperatively on with your department.

B. Chukchi Sea - The Chukchi Sea is a third lease area that you are proposing for premature scheduling. The Chukchi presents a combination of several environmental hazards to development and a weak environmental information base. Preliminary survey efforts by federal OCSEAP research indicate that the incursions of sea ice pressure ridges and sea ice keels that can gouge the seafloor may come to within an average of a few hundred meters of the mainland shore. Technological and environmental preparedness call for a particularly cautious approach. The extremely narrow band of shorefast ice along the Chukchi coast raises a serious question as to the safety of federal leasing.

The Chukchi Sea sale proposal catches the state and the federal OCSEAP effort off-guard, since both anticipated a federal sale in the much reduced area of Hope Basin.

Because of this, considerable OCSEAP data were gathered in 1976 and 1977 in the Kotzebue Sound region (Hope Basin) of the greater Chukchi Sea. Hope Basin, in contrast to the Chukchi Basin, offers considerably less hazardous sea ice conditions and a somewhat better environmental information base. It is perhaps for this reason that industry prefers to explore in the Hope Basin (14th of 22 areas) rather than the Chukchi Basin (17th of 22 areas) despite lower estimated geologic potential there (14th as opposed to 10th of 22 areas).

I suggest that the Hope Basin and Chukchi Sea be united for planning and research purposes under one heading of Chukchi Sea. Then if a sale is proposed for late in the period 1980-1985, it need not yet be firmly decided whether such a sale would be in the northern or southern Chukchi. BLM and OCSEAP could then be mandated to recommence a systematic program of environmental background studies in these basins. Such a program was underway, then forestalled in fiscal 1978, as prospects for a Hope-Chukchi sale receded into the future. Evidence from the Beaufort sale region indicates that five years of concentrated environmental assessment is barely enough to indicate the best approaches for industry and government in frontier lease sales.

Alternative DEIS-5 calling for substitution of a Beaufort sale for the Chukchi sale is somewhat confusing. The state has previously stated its strong reservations about planning sales seaward of the outer edge of the landfast ice until technology is adequately tested through a prototype engineering program in zones of transitional and pack ice. It is not clear why it is assumed that another Beaufort sale would necessarily be seaward of the 1979 joint sale. There are areas of unleased land lateral to the 1979 joint sale that could be leased in the 1980-1985 period, possibly without demonstrated advances in drilling technology. If the re-uniting of north and south Chukchi areas is agreed to, then both federal and state governments could continue to consider several contingencies for additional sales, on a coordinated basis, within the arctic basins. New geological and technological discoveries could be combined with continuing Beaufort and resumed Chukchi environmental assessments to develop an orderly approach to several possible arctic sales in the 1980-1985 period.

Conclusion

I sincerely hope that you and your staff are able to fully grasp the significance of your proposal for the people of Alaska and on the natural resources upon which this and future generations of Americans must depend. Alaskans want to see the nation benefit from the natural resources here. We also want to see the development of these resources pursued in a very deliberate and metered fashion and not as an expedient to satisfy

political pressures of the moment. As always, I would be glad to personally discuss this important issue with you further as you approach your final lease program determination.

Sincerely,

Jay S. Hammond
Governor

Enclosures

cc: The Honorable Charles Duncan, Secretary of Energy
The Honorable Juanita Kreps, Secretary of Commerce
Mr. Allan Powers, Director of the Office of OCS Program Coordination, USDI
Mr. Frank Gregg, Director, Bureau of Land Management
Members of the Select Committee on OCS, U.S. House of Representatives
Senator Mike Gravel
Senator Ted Stevens
Senator Bill Sumner, Chairman, Alaska Senate Resource Committee
Representative Bill Miles, Co-Chairman, Alaska House Resource Committee
Representative Alvin Osterback, Co-Chairman, Alaska House Resource Committee
Ms. Esther Wunnicke, Manager Alaska BLM OCS Office

ENCLOSURES

1. Table 1. Comparison Between Federal Proposed Leasing Program and Optional Programs Announced by Secretary Andrus in June 1979, Governor's Proposed Program and State's Five-Year Leasing Program.

2. Table 2. Comparison Between Federal Proposed Leasing Program and Optional Programs Announced in Bureau of Land Management's Draft EIS, Governor's Proposal and State's Five-Year Leasing Program.

3. Table 3. Relative Responsiveness of Various Federal OCS Oil and Gas Leasing Options to State of Alaska Criteria.

4. Map of Marine Resources of the North Aleutian Shelf Proposed Lease Sale Area.

Table 1. Comparison of 1) Federal Proposed Leasing Program, 2) Optional Programs Announced by Secretary Andrus in June 1979, 3) Governor's Proposed Program and 4) State's Five-Year OCS Leasing Program
September 1979

(1) Contingency sales
(2) To be coordinated with federal sale decisions

		Federal Options					
	Federal Proposal (June 1979)	Prop. 1 (March schedule) compared to June Proposal, extra sale in Cook In., lacks Al., St. Geo. & Navarin later, Chukchi sooner.	Prop 2 Compared to Proposal, lacks N. Al. adds Bristol.	Prop. 3 Compared to Proposal, lacks N. Al. & St. Geo. later	Prop. 4 (D.O.E. Schedule) Compared to Proposal, extra sale in 3 areas, lacks N. Al. & Navarin, Norton later, Chukchi sooner.	Governor's Proposal	State Schedule
Gulf of Alaska	Oct. 1980	Oct. 1980	1980	1980	1980 & 1982	1980-85	----
Kodiak	Dec. 1980	Dec. 1980	1980	1980	1980	late in the period 1980-85	-----
Cook Inlet	Sept. 1981	Sept. 1981 & April 1984	1981	1981	1981	1980-85	1980, 1981 & 1983
N. Aleutian Shelf	Oct. 1983	---------	-----	-----	-----	indef. postpone	-----
All of Bristol Basin	-----	---------	1983	-----	-----	indef. postpone	-----
St. George Basin	Dec. 1982	Feb. 1985 (1)	1982	1983	1983 & 1985	indef. postpone	-----
Navarin Basin	Dec. 1984	Jan. 1985	1984	1984	-----	late in the period 1980-85	-----
Norton Basin	Sept. 1982	Nov. 1982	1982	1982	1983	late in the period 1980-85	late 1981 & mid 1983 (2)
Chukchi Sea	Feb. 1985	Dec. 1984 (1)	1985	1985	1984	indef. postpone	mid 1983 (2)
Beaufort Sea	Feb. 1983	Feb. 1983	1983	1983	1982 & 1984	indef. postpone. of ice shear & off-shore pack ice zones	early 1983

Table 1 (continued). Comparison of Federal Proposed Leasing Program, 2) Optional Programs Announced by Secretary Andrus in June 1979, 3) Governor's Proposed Program and 4) State's Five-Year OCS Leasing Program
September 1979

(1) Contingency sales
(2) To be coordinated with federal sale decisions

		Federal Options					
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Hope Basin	-----	---------	-----	-----	-----	late in the period 1980-85	-----
S. Aleutian Shelf	-----	--------	-----	-----	-----	indef. postpone	-----

Table 2. Comparison of 1) Federal Proposed Leasing Program, 2) Optional Programs Announced in Bureau of Land Management's Draft EIS, 3) Governor's Proposed Program and 4) State's Five-Year Leasing Program
September 1979

(1) To be coordinated with federal sale decisions

Sale	Federal Proposal (June 1979)	Federal Options: DEIS-2 (D.O.E. schedule with modifications) Compared to June Proposal, extra sales in 3 areas, lacks N. Al. & Navarin, Norton later.	DEIS-3 Compared to Proposal, delay Norton, St. George and N. Aleutian.	DEIS-4 Compared to Proposal, delay St. George one year.	DEIS-5 Compared to Proposal, omit N. Aleutian	DEIS-6 Compared to Proposal, omit Chukchi and substitute a Beaufort sale.	DEIS-7 Compared to Proposal, omit St. George, N. Aleutian, Navarin, Norton & Chukchi.	Governor's Proposal	State Schedule
Gulf of Alaska	Oct. 1980	1980 & 1983 (orig. 1982)	Oct. 1980	Oct. 1980	Oct. 1980	Oct. 1980	Oct. 1980	1980-85	-----
Kodiak	Dec. 1980	1980	Dec. 1980	Dec. 1980	Dec. 1980	Dec. 1980	Dec. 1980	late in the period 1980-85	-----
Cook Inlet	Sept. 1981	1981	Sept. 1981	Sept. 1981	Sept. 1980	Sept. 1981	Sept. 1981	1980-85	1980, 1981 & 1983
N. Aleutian Shelf (s.w. Bristol Basin)	Oct. 1983	-----	delay from 1983	Oct. 1983	-----	Oct. 1983	-----	indef. postpone	-----
All of Bristol Basin	-----	-----	-----	-----	-----	-----	-----	indef. postpone	-----
St. George Basin	Dec. 1982	1982 (orig. 1983) & 1984 (orig. 1985)	delay from 1982	delay until late 1983	Dec. 1982	Dec. 1982	-----	indef. postpone	-----
Navarin Basin	Dec. 1984	-----	Dec. 1984	Dec. 1984	Dec. 1984	Dec. 1984	-----	late in the period 1980-85	-----
Norton Basin	Sept. 1982	1983	delay from 1982	Sept. 1982	Sept. 1982	Sept. 1982	-----	late in the period 1980-85	late 1981 (1) & mid 1983
Chukchi Sea	Feb. 1985	1985 (orig. 1984)	Feb. 1985	Feb. 1985	Feb. 1985	-----	-----	indef. postpone	mid 1983 (1)
Beaufort Sea	Feb. 1983	1982 & 1984	Feb. 1983	Feb. 1983	Feb. 1983	Feb. 1983 & a second sale	Feb. 1983	indef. postpone of ice shear & offshore pack ice zones	early 1983

Table 2 (continued). Comparison of 1) Federal Proposed Leasing Program, 2) Optional Programs Announced in Bureau of Land Management's Draft EIS, 3) Governor's Proposed Program and 4) State's Five-Year Leasing Program
September 1979

(1) To be coordinated with federal sale decisions

Sale	Federal Proposal (June 1979)	Federal Options: DEIS-2 (D.O.E. schedule with modifications) Compared to June Proposal, extra sales in 3 areas, lacks N. Al. & Navarin, Norton later.	DEIS-3 Compared to Proposal, delay Norton, St. George and N. Aleutian.	DEIS-4 Compared to Proposal, delay St. George one year.	DEIS-5 Compared to Proposal, omit N. Aleutian	DEIS-6 Compared to Proposal, omit Chukchi and substitute a Beaufort sale.	DEIS-7 Compared to Proposal, omit St. George, N. Aleutian, Navarin, Norton & Chukchi.	Governor's Proposal	State Schedule
Hope Basin	-----	-----	-----	-----	-----	-----	-----	late in the period 1980-85	-----
S. Aleutian Shelf	-----	-----	-----	-----	-----	-----	-----	indef. postpone	

Table 3. Relative responsiveness of various federal OCS oil and gas leasing options to State of Alaska criteria. September 1979.

Option 1/	Degree of Responsiveness to State Criteria	Comments
State Proposal	Fully responsive	Most accurately reflects the criteria identified in Governor's correspondence to Secretary Andrus on both May 4, 1979 and December 12, 1978 and corresponds best to issues expressed by coastal communities in the spring of 1979.
Prop. 1 (Secretary's draft proposed program of March 1979)	Second most responsive	Although Kodiak, St. George, Norton and Chukchi sales indicated earlier than proposed by state, this option is otherwise responsive to state's position and criteria.
Prop. 3	Third most responsive	Kodiak, St. George, Norton and Chukchi sales indicated earlier than proposed by state; St. George is, however, a year later than in DEIS-5.
DEIS-5	Fourth most responsive	Kodiak, St. George, Norton and Chukchi sales indicated earlier than proposed by state.
Prop. 4 (D.O.E's first proposal)	Fifth most responsive	Kodiak, St. George and Chukchi sales indicated earlier than proposed by state.
DEIS-2 (D.O.E.'s second proposal)	Sixth most responsive	Kodiak, St. George and Chukchi sales indicated earlier than proposed by state and St. George indicated a year earlier than in Prop. 4.
DEIS-3	Unresponsive	Offers unknown period of preparedness in St. George but includes N. Aleutian and indicates Kodiak and Chukchi earlier than proposed by state.
DEIS-4	Unresponsive	Includes N. Aleutian and indicates Kodiak, St. George, Norton and Chukchi earlier than proposed by state.
Federal Proposal (June 1979)	Unresponsive	Includes N. Aleutian and indicates Kodiak, St. George, Norton and Chukchi earlier than proposed by state.
DEIS-6	Unresponsive	Includes N. Aleutian and indicated Kodiak, St. George, and Norton earlier than proposed by state.
Prop. 2	Unresponsive	Includes all of Bristol Basin and indicates Kodiak, St. George, Norton and Chukchi earlier than proposed by state.
[redacted]	[redacted]	[redacted]
DEIS 7	Unresponsive	Kodiak indicated earlier than proposed by state. Although considerable preparedness time is indicated for St. George, Navarin, Norton and Chukchi, there is serious question as to whether this offers the Secretary a viable option.

Continued on Next Page

1/ Options referred to as "Prop." are those appearing in Table 1 as proposed by the Secretary of the Interior in June 1979. Those referred to as "DEIS" appear in Table 2 and reflect the draft environmental impact statement.

CLIFF FINCH
Governor

MISSISSIPPI DEPARTMENT OF WILDLIFE CONSERVATION

Bureau of Marine Resources
P.O. Drawer 959
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(601) 864-4602
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Dr. John Ouzts
Cleveland, MS

L.C. "Billy" Gollott
Biloxi, MS

RICHARD YANCEY
Executive Director

RICHARD L. LEARD
Bureau Director

October 1, 1979

Director
Bureau of Land Management
Department of the Interior
18th and C Streets, N. W.
Washington, D. C. 20240

Dear Sir:

Provided are comments on the document entitled "United States Department of the Interior, Draft Environmental Statement, Proposed Five-Year OCS Oil and Gas Lease Schedule, March 1980 - February 1985."

On Page 2 of the document, it is stated that a factor to be considered in the timing and location of sales is "an equitable sharing of development benefits and environmental risks among the various regions." The equitable sharing is considered by the Bureau of Marine Resources of the Mississippi Department of Wildlife Conservation as an extremely important action to be encouraged through OCS oil and gas lease sale scheduling. This equitable sharing can be realized by providing for oil and gas development opportunities in all OCS regions. Thus, development efforts should occur in existing active OCS oil and gas development areas and in areas where no previous OCS oil and gas lease sales have been held, or, no recent sale has been held, and in areas where no development has taken place.

Implementation of the Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, March 1980 - February 1985, will contribute to accomplishing an equitable sharing of benefits and risks. Thus, the Bureau supports the Proposed Schedule as a reasonable program for ameliorating the intensity of environmental impacts in the respective OCS regions and especially in the Gulf of Mexico Region.

Sincerely,

Richard L. Leard

Richard L. Leard, Ph.D.
Bureau Director

CML:gb

cc: Mr. John L. Rankin

OSTEP
OFFICE OF SCIENCE, TECHNOLOGY & ENVIRONMENTAL POLICY

EDWIN W. EDWARDS, GOVERNOR
LEE W. JENNINGS, EXECUTIVE DIRECTOR

October 12, 1979

Director (542)
Bureau of Land Management
Department of the Interior
18th and C Streets, N.W.
Washington, D.C. 20240

RE: DES Proposed Five-Year OCS Oil and Gas Lease Schedule

Dear Sir;

Thank you for the opportunity to comment on the above referenced proposal. The State of Louisiana is an advocate of aggressive OCS development and management. We whole-heartedly support increased OCS activity and believe strongly in the concept that the U.S. energy needs can only be met through expanded oil and gas exploration.

We find no objection with the proposed schedule and alternatives. However, the DES insufficiently addresses the socioeconomic impact on the Gulf Coast region and fails to acknowledge the potential of geothermal/geopressured resource development.

The attached comments may necessitate extensive revisions to the DES. It is our desire that the final environmental statement be as accurate and as representative of the consequences of energy decisions as possible. We believe this to be the intent of the BLM and hope you find these comments useful.

Sincerely,

Tommy F. Hill

Tommy F. Hill
Manager, Field Operations

TFH/se

Attachment

POST OFFICE BOX 44066 • CAPITOL STATION • BATON ROUGE, LA 70804 • (504) 925-6580; LINC—427-6580
NATIONAL SPACE TECHNOLOGY LABORATORIES • NSTL STATION, MISSISSIPPI 39529 • (601) 688-3008

COMMENTS: DRAFT ENVIRONMENTAL STATEMENT

PROPOSED FIVE-YEAR OCS OIL
AND GAS LEASE SCHEDULE

The Draft EIS inadequately addresses the holistic effects of OCS development. Little or no attempt has been made to identify the interrelationships and subsequent real impacts of the lease schedule. The bit-by-bit approach of addressing individual lease areas as islands of impact is unrealistic and provides little insite into the probable impacts of adoption. To demonstrate the deficiencies of the methodologies employed, the following illustration is submitted:

(B) Environmental Consequences of Alternative 1
(3) Impacts of Special Concern
(a) Socioeconomic Impacts

EMPLOYMENT AND POPULATION

North Atlantic (410 Directly related peak employment)
Page 232 ". . . The fact that portions of rig crews will commute on a bi-weekly or monthly basis from areas such as the Gulf of Mexico where off-shore activity is already well developed."

Mid-Atlantic (225 Directly related peak employment)
Page 233 "Portions of the crews on platforms and rigs would commute on a bi-weekly basis from areas where off-shore activity is already well developed."

South Atlantic/Blake Plateau (85 Directly related peak employment)
Page 233 "Most of the drilling crews used in exploration and development will reside outside the South Atlantic coastal region and should not create infrastructural stresses. The remaining crew, usually at lower skill levels, could be local residents."

State of Alaska Page 237 through page 251
Consisting of:
Gulf of Alaska (865 Directly related peak employment)
Kodiac (750 Directly related peak employment)
Cook Inlet/Shelikof (910 Directly related peak employment)
Norton Basin (820 Directly related peak employment)
St. George Basin (1000 Directly related peak employment)
Northern Aleution Shelf (865 Directly related peak employment)
Beaufort Sea (1155 Directly related peak employment)
Navarin Basin (780 Directly related peak employment)
Chukchi Sea (2260 Directly related peak employment)

The socio-economic statements all contain language to the effect that enclave development assures minimum intrusion. The impact of peak employment will be controlled and eliminated. Only a small mild beneficial local impact would be expected, as a result of controlled transfer of a limited number of local residents from fishing to steady high paying petroleum employment.

The inference is that OCS workers will be imported from other regions with off-shore experience, the most likely being the Gulf of Mexico.

Gulf of Mexico (2600-5600 Directly related new employment)
Page 234 "It is expected that the proposed leasing schedule would generate between 13,000 and 28,000 direct OCS related jobs during peak activity. Most of these jobs would simply replace employment which would otherwise be lost to the region due to declining activity at other Gulf of Mexico off-shore production sites." ". . . The corresponding range for new employment is about 2600 to 5600 directly related new jobs."

Comment: Assuming 80% of the employments in new OCS regions are filled by experienced OCS workers from the Gulf of Mexico region, (It is also assumed that most workers will not take their families with them) then 7400 additional directly related OCS jobs should be added to the Gulf total. This brings the range to between 10,000 and 13,000. Total employment would then range between 17,500 and 22,800, while population growth would range between 50,000 to 65,000.

Other factors which may increase the manpower demands and further intensify the impact of the leasing schedule are:

1) Mexican Off-Shore Development - no information is currently available to estimate the number of rigs, platforms or crews to be supplied from the American Pool of Experience to support the Mexican Development Effort.

2) Deep Water Exploration - The DES projects that the current rate of platform placements will continue as a result of the proposed leasing schedule (300 in the Gulf Coast region). It is anticipated that a higher percentage of deep water platforms will be fabricated as a result of the leasing schedule. The manpower requirement to fabricate a deep water platform is much greater than that for a shallow water platform.

The inclusion of interrelated impacts as illustrated above causes an important shift in the identification and quantification of environmental stresses anticipated as a direct result of the leasing schedule.

The coastal areas of the Gulf of Mexico are stressed at the present time. Shoreline erosion, saltwater intrusion, soil subsidence, eutrophication of lakes and biologically important esturaries are well documented problems of the coastal zones. For Louisiana, the problems posed by large population growth stems from the fact that most of southern Louisiana is wetland, ecologically sensitive, and generally unsuitable for absorbing intensive rapid development. It, therefore, should be concluded that the majority of the environmental consequences of the lease schedule will be realized in the Gulf Coast region.

Several sections of the DES will require revision to reflect the magnitude of impacts now evident and possessing a high probability of occurrence. It is recommended that the following sections of the DES be reviewed and rewritten as needed to accurately portray the impacts now anticipated:

IV B, 2, b Impacts on Coastal Ecosystem
IV B, 2, c Impacts on Water Quality and Supply
IV B, 3, e Impacts on Air Quality

IV B, 4 Impacts on Other Management Plans
IV B, 5 Availability of Information
IV B, 6 Unavoidable Adverse Impacts
IV B, 7 Relationship between short-term uses of man's environment and long-term productivity
IV C - I Impacts of Alternatives two through eight - (preliminary calculations indicate that for the Gulf region new directly related employment of alternative two could range from 12,400 to 19,000; total employment could range from 21,700 to 35,900 and total population increase could range from 62,500 to 99,500)

It is anticipated that almost all of those employed in isolated areas will not take dependents with them. Normally this does not represent a problem. The numbers involved in frontier OCS activities and the time frames of separation suggests the possibility that the proposed lease schedule may induce family difficulties of a regional magnitude. It is recommended that the BLM:

A) Identify the number of isolated employments where dependents will not accompany the worker.

B) Provide a discussion of the impact created by absent heads of households. This discussion should include a concern for the total number of families, the amount of time the head of household will be absent and the number of children left to the care of a single parent.

The above illustration is submitted to assist the BLM in recognizing the necessity of utilizing methodologies which reveal and address in a comprehensive manner the total implications of oil lease decisions. It should be noted that other more subtle ecological relationships such as migratory patterns - food webs, etc., operate in system sizes larger than regional lease areas. Failure to fully develop a means for recognizing and addressing interrelated impacts seriously strains the credibility of the environmental statement.

PART II

GEOTHERMAL/GEOPRESSURE RESOURCES

"USGS circ. 790 assessment of the geothermal resources of the United States" estimates the total amount of disolved methane in the pore waters of sedimentary rocks in the northern Gulf of Mexico to be 59,000 X 10^{12} standard cubic feet. The methane resources is dissolved in pressured brines and represents a previously untapped resource. The relative newness of this discovery of this resource combined with the expense of drilling to the depths required (approximately 22,000 feet) and the new technology required to extract the methane from the brines has not made the development of this resource an economical venture. However, the deregulation of natural gas prices are expected to provide the stimulus for a heavy commitment in funds and effort to develop geopressured fields.

Current plans call for the completion of two test wells in Louisiana within the next year to 18 months. The questions concerning the technical feasibility of resource extraction are expected to be resolved and documented well within the time frame covered by the BLM lease schedule. As large portions of the geothermal/geopressured zone extends into the OCS area.

It is requested that the BLM DES address the potential development of

geopressured/geothermal wells particularly as it relates to:

1) BLM leasing policies and resource development plans.

2) The unique environmental stresses anticipated to accompany aggressive management.

3) The impact of intensive on-shore development on the BLM leasing schedule.

South Carolina Coastal Council

James M. Waddell, Jr.
Chairman

H. Wayne Beam, Ph.D
Executive Director

October 12, 1979

Director (542)
Bureau of Land Management
Department of the Interior
18th & C Streets, N.W.
Washington, D. C. 20240

Re: Draft Environmental Impact Statement, Proposed Five-Year OCS Oil & Gas Lease Schedule March 1980 - February 1985

Dear Director:

The above mentioned Environmental Impact Statement has been reviewed by the staff of the South Carolina Coastal Council, the Coastal Zone Management Agency in South Carolina. Although there may be substantial merit to various alternatives proposed and discussed in the statement, my comments are in response to the proposed Lease Sales to be held in the South Atlantic and Blake Plateau regions as they are the ones likely to have a direct impact on South Carolina.

The Proposal (Alternative 1) calls for Sale 56 in the South Atlantic in August, 1981, and Sale 78 in the Blake Plateau for January, 1984. While the Coastal Council foresees no problems with the date scheduled for Sale 56, the Blake Plateau Sale poses a number of potential problems. Primarily, the water depths for which the technology has not yet been developed are of concern.

In addition to the problems of exploration and production in such deep water, the transfer of the oil to tankers in these depths and currents could significantly increase the likelihood of oil spills. It is not our position to request a delay in Sale 78 at this time as technological advances may minimize these concerns by 1984. At the present time, however, the Council staff must express reservations about exploration in this area before significant technological developments are accomplished regarding both production and transfer oil in deep water.

On page 41, the sensitivity of various coastal resources for the South Atlantic are identified as relatively low to moderate. The rating appears inconsistent with the narrative in several places and inconsistent with the coastal area itself which has vast marsh areas and innumerable, delicate estuarine environments. These areas are absolutely essential to the important commercial fishing and shellfishing industries of the region. The sensitivity of the resources for these purposes should be rated as high as for recreation and tourism.

1116 Bankers Trust Tower • Columbia, South Carolina 29201 • (803) 758-8442

On pages 233-234 reference is made to the unlikely development of refining capacity throughout the South Atlantic region. Presently there are five or six refineries planned from Savannah, Georgia to Wilmington, North Carolina. Although most of these will probably be small refineries which may use imported crude, the narrative of the Final Environmental Impact Statement could more accurately reflect the refining capacity of the region.

In conclusion, South Carolina's Coastal Management Program received final approval in September, 1979 (cite page 254 of the DEIS).

I appreciate the opportunity to review and comment on the Draft Statement and look forward to receipt of the Final Statement.

Yours truly,

H. Wayne Beam

H. Wayne Beam
Executive Director

HWB:ebg

cc: Senator James M. Waddell, Jr., Chairman

COMMONWEALTH of VIRGINIA

Council on the Environment

J. B. JACKSON, JR.
ADMINISTRATOR

903 NINTH STREET OFFICE BUILDING
RICHMOND 23219
804-786-4500

October 16, 1979

Mr. Frank Gregg, Director
Bureau of Land Management
Department of the Interior
18th and C Streets, N. W.
Washington, D. C. 20240

SUBJECT: Proposed Five-Year OCS Oil and Gas Lease Schedule

Dear Mr. Gregg:

The Commonwealth of Virginia appreciates the opportunity to review the subject draft environmental impact statement. The Council on the Environment is responsible for coordinating that review and responding to the appropriate federal official. State agencies participating in the review of the draft EIS included:

Commission of Game and Inland Fisheries
Commission of Outdoor Recreation
Division of Industrial Development
Marine Resources Commission
State Air Pollution Control Board
State Office of Emergency and Energy Services
State Water Control Board
Virginia Institute of Marine Science
Virginia Port Authority

The Commonwealth of Virginia has no objection to the subject proposal. The State Air Pollution Control Board commented that since no on-shore facility locations were indicated in the statement, any discussion of on-shore air pollution would be speculative at this time. Off-shore air pollution will be regulated by the Department of the Interior and thus need not be addressed by said Board.

Sincerely,

J. B. Jackson, Jr.

JBJr:CHE:gcj
Enclosure

cc: The Honorable Maurice B. Rowe, Secretary of Commerce and Resources
Mr. Paul Pitts, State Air Pollution Control Board

Office of Planning and Budget

Executive Department

Clark T. Stevens
Director

G E O R G I A S T A T E C L E A R I N G H O U S E M E M O R A N D U M

TO: Director
Bureau of Land Management
Department of the Interior
18th & C Streets, N.W.
Washington, D.C. 20240

FROM: Charles H. Badger, Administrator
Georgia State Clearinghouse
Office of Planning and Budget

DATE: October 19, 1979

SUBJECT: RESULTS OF STATE-LEVEL REVIEW

Applicant: Interior, US Dept/BLM

Project: Draft EIS Proposed Five-Year OCS Oil and Gas Lease Schedule

State Application Identifier: 79-09-07-01

The State-level review of the above-referenced document has been completed. As a result of the environmental review process, the activity this document was prepared for is recommended for further development with the following recommendations for strengthening the project:

In general, the document does not satisfactorily address adverse impacts on the South Atlantic region, particularly those potential impacts on-shore from off-shore activities. Also, impacts in one region can occur from activities in adjacent regions; a concern which this document does not discuss. An examination of available research information, including current studies, should be included in BLM's study design for completion of the final EIS.

Our Historic Preservation Section has reviewed the Draft EIS in light of the Regulations of the President's Advisory Council on Historic Preservation and Executive Order 11593. The following specific comments on Section IVB2g are provided for BLM's consideration:

(1) Page 170 - The potential for prehistoric sites and historic resources which are located in marsh or tidal areas being impacted by oil spillage has not been adequately considered;

(2) Page 171 - Not only are on-shore cultural resources included in the Advisory Council Regulations, off-shore resources are also eligible for listing on the National Register of Historic Places (e.g. U.S.S. Monitor, H.L. Hunley) and may be commented on;

SAI# 79-09-07-01
Page Two
October 19, 1979

(3) Page 172 - The protection offered cultural resources by the National Historic Preservation Act of 1966 was expanded by Executive Order 11593 to include properties eligible for the National Register, as well as those already listed.

Also, the Department questions the conclusion that disturbance, whether by energy exploration activity or by archaeological/historic reseach, is beneficial to cultural resources as is implied.

Further, the concluding statement leads the reader to believe that industrial areas are excluded from eligibility to the National Register and, consequently, there is little need for impact concern.

This Department recommends that the studies to be performed prior to pipeline siting should be conducted as early as possible in the planning process so that time is allowed for adequate review by state agencies responsible for historic preservation concerna.

The following State agencies have been offered the opportunity to review and comment on this project: Department of Natural Resources
Office of Planning & Budget, Executive Dept.

cc: Barbara Hogan, DNR

CHB:if

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

EDWARD J. KING
GOVERNOR

JOHN A. BEWICK
SECRETARY

RECEIVED
OCT [illegible] 1979
BUREAU OF LAND MANAGEMENT

October 18, 1979

Frank Gregg, Director
Bureau of Land Management
Department of Interior
18th and C Streets, N.W.
Washington, D.C. 20240

Dear Frank,

I have enclosed, on behalf of the Governor, Massachusetts' comments on the draft Environmental Impact Statement on the Proposed Five Year Leasing Program. I would like to commend you and your staff for developing a good DEIS; we are pleased to see further consideration of the relative environmental sensitivity of the various OCS regions.

Our comments on the Proposed Five Year Leasing Program and on the DEIS focus particular attention on the adequacy of the assessment of the developmental benefits and the demonstration that an equitable sharing has been achieved. We recommend that the FEIS evaluate the regional benefits of development and the risks of environmental damage, and consider whether these benefits and risks have been equitably shared among the various OCS regions.

I am confident that these comments will be given due consideration in developing the final EIS on the leasing program and hope they will be of assistance.

Sincerely,

John A. Bewick

John A. Bewick
Secretary

JAB:PH:sar

MASSACHUSETTS FINAL COMMENTS

ON THE

FIVE YEAR LEASING PROGRAM DRAFT EIS

The draft environmental impact statement (DEIS) on the five year leasing program addresses, in a clear and concise manner, many issues of concern to the Commonwealth. The expeditious development of Outer Continental Shelf (OCS) resources, the protection of fisheries and the mitigation of coastal zone impacts are all of the utmost importance to Massachusetts. In fact, Congress, through the OCS Lands Act, requires the five year leasing program to strike a reasonable balance between the potential for oil and gas and the potential for environmental damage and adverse coastal zone impact. The DEIS has accomplished a great deal in setting the framework and providing the background analysis for the leasing program decision.

It is especially encouraging to note that one area in which Massachusetts has repeatedly requested further analysis, the relative marine sensitivity of OCS regions, has received substantial consideration in the DEIS.

With some exceptions, the DEIS is accurate and complete on the issues it addresses. There are, however, several additional issues which should be investigated in the final EIS. These include:

(a) The relative marine productivity of OCS regions;

(b) A cost/benefit analysis;

(c) Deepwater technology; and

(d) The equitable sharing of developmental benefits and environmental risks.

While these issues are discussed in more detail below, Massachusetts' previous submissions on the leasing program contain valuable data and should also be considered in preparing the final EIS (see Appendix 1).

(a) <u>Relative Marine Productivity of OCS Regions</u>

In the Commonwealth's previous comments on the draft and on the proposed leasing program, it was noted that the analysis of environmental sensitivity and marine productivity was seriously deficient. The DEIS has made substantial improvements in the relative ranking of OCS regions according to environmental sensitivity, but has done little to improve the analysis of marine productivity. The DEIS does not present sufficient information to compare the productivity of OCS regions with the exception of a few unsupported statements regarding certain areas being among the world's most productive.

In our previous comments, the Commonwealth suggested several measures, such as annual primary productivity, benthic biomass, fishery catch per unit area and maximum sustainable yield, by which Interior could evaluate marine productivity. The comments also contained data on the North Atlantic marine productivity and references for other regions. The Secretary of Commerce provided additional information and references in a letter to Secretary Andrus, dated January 18, 1979. The Bureau of Land Management's environmental studies program and environmental impact statements also contain extensive documentation on nearly every OCS region. Yet, the DEIS has not drawn upon these existing sources of data and has not provided a relative ranking of OCS regions by marine productivity.

(b) <u>Cost/Benefit Analysis</u>

The newly adopted Council on Environmental Quality regulations (40 CFR 1502.33), as well as the complicated nature of the issue at hand, suggest that a cost/benefit analysis should be prepared for the various alternatives being considered in the EIS. This analysis should consider the value of the oil and gas resources, and the potential adverse economic impacts on communities, on recreation and tourism, and on commercial fisheries.

In appraising the value of oil and gas resources, the FEIS should utilize the net energy value rather than the gross reserves. The net energy is the value of the resources in place minus the energy required to explore, develop, produce and transport the resource. The development of our national oil and gas resources, particularly in northern Alaska, will require a substantial input of energy and materials in order to bring these resources to market. Thus, the net energy available to the nation could be substantially less than the DEIS assumes.

(c) <u>Deepwater Technology</u>

In virtually every OCS region there is potential to lease tracts in deep water, beyond the current capabilities of oil and gas production technologies. While the option exists within the framework of the leasing program, not to lease in these deep water areas, the development of deepwater tracts needs to be addressed more fully from a national perspective. The FEIS should consider, at a minimum, three development options:

(1) Accelerated leasing of deepwater areas to encourage technological development;

(2) Limited leasing in areas where the geologic hazards and environmental conditions are well known and the risks of drilling are small (such as the Gulf of Mexico); and

(3) No deepwater leasing until production technology has been proven.

The unique nature of continental slope tracts warrant a thorough discussion in the FEIS of the problems associated with deepwater development, production and transportation technologies, and of the distinct ecological and oceanographic features of this area.

(d) Equitable Sharing of Developmental Benefits and Environmental Risks

One of the key provisions of Section 18 requires the Secretary of Interior to develop a leasing program which provides "an equitable sharing of developmental benefits and environmental risks among the various OCS regions". While the DEIS explains in considerable detail the regional environmental risks, neither the DEIS nor the proposed leasing program adequately assess the developmental benefits or demonstrate that an "equitable sharing" has been achieved. The Department of Interior's interpretation of Section 18(a)(2)(B) indicates that the Department has failed to consider the degrees of sensitivity or benefits existent in a given region. This interpretation mandates that any area that contains recoverable hydrocarbon resources must contribute. This seems to run contrary to the balancing requirement of the OCS Lands Act, as amended.

The benefits and risks need to be evaluated for each OCS region. The level of developmental benefits, comprised of increased capital expenditures, new jobs, lower energy costs, and an increase in per capita income will depend on the extent to which construction, refining, processing and support activities take place inside or outside of the leasing region. In the case of the North Atlantic, for example, platform construction and refining, will take place outside the New England region. The situation in Alaska is similar, with platforms being constructred on the West Coast and refining taking place in the lower 48. The developmental benefits are clearly not equally distributed.

The environmental risks, on the other hand, are nearly always localized in nature. The impacts of onshore development, oil spills and fishing conflicts, are confined to the immediate leasing region. As the DEIS demonstrates, the relative level of environmental risk varies considerably from region to region. The level of environmental damage will depend on the total extent of development, the transportation methods (pipelines vs. tankers), distance from shore, and other factors which will differ from region to region.

The Commonwealth recommends that the FEIS evaluate the regional developmental benefits of the OCS leasing program, perhaps in the context of a cost/benefit analysis, and consider whether the benefits and risks have been equitably shared among regions.

Technical Comments

Page 70 - The productivity statements made here are too generalized for this region. Primary productivity for this area is 3 to 5 times higher than other oceanic systems; standing crop of the benthos is estimated to be 1.8 times greater than that of the Gulf of Maine and 1.3 times greater than the Scotian Shelf, and the estimated annual maximum sustainable yield (MSY) for Georges Bank is 1.1 million metric tons.

Page 71 - It is misleading to say that many species in the lease sale area spawn in nearshore and estuarine areas. Georges Bank has distinct spawning stocks of cod, haddock, whiting, Atlantic sea herring, yellowtail flounder, blackback flounder, grey sole, and possibly, lobster. Therefore, this area is extremely important to the production of these fish species for commercial harvest. While some of these same species spawn inshore, they are not producing for the offshore area.

Page 124 - Another critical factor determining the impact of oil spills is the time of year the spill occurs in relation to the location, type, and duration of the spill. While the probability of a spill occurring in the North Atlantic may be low, its impacts could be severe if the spill occurred during the peak spawning time for many species; for instance, during the summer months, or if it occurred during heavy sea conditions, resulting in the incorporation of the oil into the bottom sediments. If this were to occur, the duration of the impact could be long term, up to 10 years could be required for the benthic communities to begin to re-establish (FEIS for Sale No. 42).

The entire section discussing oil spills includes no discussion of the impacts of chronic discharge of oil from OCS activities on the marine environment.

Page 174 - On a dollar per pound basis, using 1978 Massachusetts landings and value, sea scallops are more valuable than lobsters: $ 2.54/lb vs. $ 2.10/lb.

Page 186 - Areas utilized by spawning fish may be great, and the areas of concentration for spawning may be small, but given the circulation patterns of Georges Bank, the impact of a spill occurring almost anywhere on the Bank can be great. Again, there are distinct spawning stocks of fish on the Bank, and if a spill occurred, the impact on year class strength could be great.

Page 213 - The impact on the recreational fishery from an oil spill could be in the form of a reduced number of fish, or a reduced number of food fish for those species which are sought after by recreational/sports fishermen.

Page 226 - The regulation regarding air quality standards and OCS activities have yet to be promulgated.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
TRENTON

DIVISION OF COASTAL RESOURCES
~~DIVISION OF MARINE SERVICES~~

PLEASE ADDRESS REPLY TO:
P. O. BOX 1889
TRENTON, N. J. 08625

October 18, 1979

Mr. R. Frank Gregg, Director
Bureau of Land Management
Department of the Interior
18th & C Streets, Northwest
Washington, D.C. 20240

Dear Mr. Gregg:

I am submitting four additional comments on behalf of the State of New Jersey, prepared with the assistance of the New Jersey Department of Energy, on the Draft Environmental Statement--Proposed Five Year OCS Oil and Gas Lease Schedule, March 1980 through February 1985. This letter supplements my earlier comments addressed to the Department of the Interior (letter of October 1, 1979) and presented at the October 2, 1979, public hearing in New York City.

First, the relationship of the Environmental Studies Program to the newly reorganized OCS Advisory Board, including its Scientific Committee, should be clearly articulated. To be fully effective, the Environmental Studies Program should be directed in part by the Scientific Committee. In this regard, a more definitive discussion of the interrelationships is needed to ensure the coordination of the various elements of the OCS program. For example, the lessons learned from incidents such as the Campeche oil spill need to be considered explicitly in subsequent OCS decisions in a region.

Second, there is little discussion in the DES of either stipulations which may be instituted to prevent adverse impacts or mitigating measures which may be employed in response to impacts. It is recognized that, "The extent of these impacts will be largely determined by specific tract selection decisions and stipulations imposed in the sale decision, and by regulation in the post-sale stage." (Page vi, DES) However, the programmatic environmental statement should provide guidelines for administering subsequent lease sales. Although individual tracts may pose particular environmental risks, the mechanisms for preventing or reducing adverse impacts are likely to be similar. Accordingly, a more complete discussion of lease stipulations, mitigating measures and methods for determining appropriate levels of compensation is warranted.

Third, although the proposed Five Year Lease Schedule does not pose any specific problems for New Jersey, if OCS Sale 42 continues to be delayed, then the postponement of OCS Sale 52 in the North Atlantic should be considered. Otherwise, if OCS Sale 42 is delayed until mid-1980, the Mid and North Atlantic would face three lease sales within twenty-six months. As a consequence, the area could have difficulty in accommodating support and development facilities in an orderly, environmentally responsible manner.

A final and closely related comment pertains to the State's ability to respond to OCS exploration and development plans. Greater state participation in the spirit of the OCS Lands Act Amendments can only be accomplished by providing additional data on past drilling experiences as well as funding for hiring technically competent staff. I trust that the State OCS Participation Grants which now appear to be forthcoming soon will enable New Jersey and other states to participate fully in the program.

This concludes New Jersey's comments on the Draft Environmental Statement on the Proposed Five Year OCS Oil and Gas Lease Sale Program. We appreciate this opportunity to further comment on the program and look forward to continued participation in the management of OCS energy supplies.

Sincerely yours,

David N Kinsey

David N. Kinsey
Acting Director

DNK/mc

cc: Assistant Commissioner Richman
New Jersey Department of Energy

State of New Jersey
DEPARTMENT OF COMMUNITY AFFAIRS

JOSEPH A. LeFANTE
COMMISSIONER

363 WEST STATE STREET
POST OFFICE BOX 2768
TRENTON, N.J. 08625

August 28, 1979

Mr. Frank Basile, Manager
U.S. Department of the Interior
Bureau of Land Management
New York Outer Continental Shelf Office
Federal Building, Suite 32-120
26 Federal Plaza
New York, N.Y. 10007

RE: OSRC-FY-80-306 Proposed Five-Year OCS Oil and Gas Lease Schedule

Dear Mr. Basile:

The New Jersey State Clearinghouse has received and is processing your Project Notification as required by the provisions of the U. S. Office of Management and Budget Circular A-95 Revised and Chapter 85, New Jersey Laws of 1944. This project has been designated OSRC-FY-80-306.

The State Clearinghouse has assigned a 30 day review period effective with the date of this letter. This review period is consistent with our internal procedures and federal regulations relevant to your program. The appropriate state agencies have been requested to comment on your application while the State Clearinghouse will perform its own review. If comments are received and any conflicts or issues arise, the Clearinghouse will notify you. It may be necessary to request additional information and/or to schedule a conference in order to resolve the issues prior to clearance; otherwise you are cleared at the end of the review period to forward your final application to the federal funding agency, accompanied by a copy of this letter. It is the responsibility of the applicant to attach any comments to the application forwarded to the federal agency.

Please feel free to call upon the State Clearinghouse at any time to assist you with any problems or questions you may have with the A-95 review procedure.

Very truly yours,

Richard A. Ginman
State Review Coordinator

MARYLAND
DEPARTMENT OF STATE PLANNING
301 WEST PRESTON STREET
BALTIMORE, MARYLAND 21201
TELEPHONE: 301-383-2451

Harry Hughes
GOVERNOR

Constance Lieder
SECRETARY OF STATE PLANNING

August 28, 1979

Mr. Frank Basile, Manager
U.S. Department of the Interior
Federal Building, Suite 32-120
26 Federal Plaza
New York, New York 10007

RE: State Clearinghouse Project - Draft EIS - Proposed 5 Year OCS Oil & Gas Lease Schedule 80-8-249 (See 76-12-390)

Dear Mr. Basile:

The State Clearinghouse has received the above project. The review of this project has now been initiated and you may expect a reply from us by October 15, 1979. If you have any questions concerning this review, please contact Bryan Gatch (383-2499) of this Clearinghouse.

We are interested in your project and will make every effort to ensure prompt action. Thank you for your cooperation with the Clearinghouse program.

Respectfully,

James W. McConnaughhay
Chief, State Clearinghouse

cc: Lonnie Robbins

BG:pw

MARYLAND
DEPARTMENT OF STATE PLANNING
301 W. PRESTON STREET
BALTIMORE, MARYLAND 21201

HARRY HUGHES
GOVERNOR

CONSTANCE LIEDER
SECRETARY

October 15, 1979

Mr. Frank Basile, Manager
U.S. Department of the Interior
Federal Building, Suite 32-120
26 Federal Plaza
New York, New York 10007

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) REVIEW

Applicant: U.S. Department of Interior

Project: Draft EIS - Proposed 5 Year Atlantic Outer Continental Shelf (OCS) Oil and Gas Lease Sales Schedule

State Clearinghouse Control Number: 80-8-249

State Clearinghouse Contact: James McConnaughhay (383-2467)

Dear Mr. Basile:

The State Clearinghouse has reviewed the above project. In accordance with the procedures established by the Office of Management and Budget Circular A-95, the State Clearinghouse received comments from the following:

Department of Transportation, Department of Economic and Community Development including their Historical Trust section, Environmental Health Administration and our staff noted that the statement appears to adequately cover those areas of interest to their agencies.

Department of Natural Resources supported the statement and (copy attached) emphasized the need to continue a strong OCS Environmental Studies Program as a critical element in the proper management of OCS oil and gas exploration and production activities.

Worcester County and the Town of Ocean City were provided the opportunity to review and comment on the project within this review period but have not responded as of this date. If any substantial comments are received subsequent to this letter, the comments will be appropriately forwarded.

We hope these comments are useful in your continuing evaluation of this project and appreciate your attention to the A-95 review process.

Sincerely,

G. B. Gotch /
for James W. McConnaughhay
Director, State Clearinghouse

cc: Henry Silbermann
Max Eisenberg
Lowell Frederick
Clyde Pyers
John Yankus
Mayor H. Kelly

JMc:BG:pw

Maryland Department of State Planning
State Office Building
301 West Preston Street
Baltimore, Maryland 21201

Date: SEP 21 1979

DEPT. OF STATE PLANNING
RECEIVED
SEP 24 1979
REVIEWED
ANSWERED

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT OR ENVIRONMENTAL ~~EFFECTS REPORT~~

Applicant: U.S. Dept. of Interior

Project: Draft EIS - Proposed 5 Year OCS Oil & Gas Lease Schedule

State Clearinghouse Control Number: 80-8-249 (See 76-12-390)

We have reviewed the above draft environmental impact statement and our comments as to the adequacy of treatment of physical, ecological, and sociological effects of concern are shown below:

	Check (X) for each item None	Comment enclosed
1. Additional specific effects which should be assessed:	✓	
2. Additional alternatives which should be considered:	✓	
3. Better or more appropriate measures and standards which should be used to evaluate environmental effects:	✓	
4. Additional control measures which should be applied to reduce adverse environmental effects or to avoid or minimize the irreversible of irretrievable commitment of resources:	✓	
5. Assessment of seriousness of the environmental damage from this project, using the best alternative and control meausres:	✓	
6. Activities which appear to be inconsistent with the State approved Coastal Zone Management Program.	✓	
7. Issues which require further discussion of resolution as shown:	✓	

Signature [signature]

Title HENRY SILBERMANN ASSISTANT SECRETARY

Agency DEPARTMENT OF NATURAL RESOURCES

Address

JAMES B. COULTER
SECRETARY

LOUIS N. PHIPPS, JR.
DEPUTY SECRETARY

STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
TAWES STATE OFFICE BUILDING
ANNAPOLIS 21401

MEMORANDUM
Tidewater Administration
269-2235

Sept 21, 1979

TO: Henry Silberman

FROM: Mark Bundy MB

SUBJECT: State Clearinghouse Review #80-8-249 DEIS - Proposed 5 year OCS Oil & Gas Lease.

The above referenced document has been reviewed and comments are attached. It is recommended that the clearinghouse coordinator be notified that this project is not inconsistent with the goals and objectives of the Department or the State Coastal Zone Program.

MB/cjg

JAMES D. COULTER
SECRETARY

STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
TAWES STATE OFFICE BUILDING
ANNAPOLIS 21401

LOUIS N. PHIPPS, JR.
DEPUTY SECRETARY

MEMORANDUM
Tidewater Administration

Sept. 21, 1979

TO: Mark Bundy

FROM: Chris Ostrom CO 9/21

SUBJECT: Department of Natural Resources Comments on "Draft EIS Proposed OCS Oil & Gas Lease" - State Clearinghouse Project No. 80-8-249.

The Draft EIS on the proposed 5 year OCS Oil & Gas lease schedule has been reviewed by all appropriate units within the Department of Natural Resources. The Department believes that the proposed schedule for the Mid-Atlantic region provides the necessary framework for developing OCS oil & gas resources on a timely basis. Based upon previous Mid-Atlantic OCS lease sales, it appears that the time interval between sales in the proposed schedule (and all proposed alternative schedules) will allow for the proper utilization of knowledge gained through previous sales and exploration activities. In addition, the schedule allows for a reasonable amount of time for the Bureau of Land Management OCS Environmental Studies Program to readjust study objectives in order to provide pertinent information for future lease sales which include new areas on the Mid-Atlantic continental shelf and slope.

The Department further believes that the continuation of a strong OCS Environmental Studies Program is critical to the proper management of OCS oil and gas exploration and production activities in the Mid-Atlantic region.

CO/cjg

OFFICE OF THE GOVERNOR

WILLIAM P. CLEMENTS, JR.
GOVERNOR

October 19, 1979

Mr. Frank Gregg, Director
Bureau of Land Management
U.S. Department of Interior
18th and Commerce Streets, N.W.
Washington, D. C. 20240

Dear Mr. Gregg:

The draft environmental impact statement entitled "Proposed Five-Year OCS Oil and Gas Lease Sale Schedule," prepared by the Bureau of Land Management, has been reviewed by the Budget and Planning Office and interested state agencies. Copies of the review comments are enclosed for your information and use. Environmental Impact Statement number 9-09-50-006 has been assigned to this document.

The enclosed comments are forwarded for your consideration. The Budget and Planning Office appreciates the opportunity to review this document. If we can be of further assistance in this matter, please do not hesitate to call on us.

Sincerely,

Leon Willhite

Leon Willhite, Manager
General Government Section
Budget and Planning Office

rh

Enclosures

EXECUTIVE OFFICE BUILDING • 411 WEST 13TH STREET • AUSTIN, TEXAS 78701

TEXAS DEPARTMENT OF WATER RESOURCES
1700 N. Congress Avenue
Austin, Texas

October 11, 1979

RECEIVED
OCT 11 1979
Budget, Planning

Mr. Paul T. Wrotenbery, Director
Budget & Planning Office
Executive Office Building
411 West 13th Street
Austin, Texas 78701

Dear Mr. Wrotenbery:

Re: U.S. Department of the Interior, Bureau of Land Management--Draft Environmental Statement (DES)--"Proposed Five-Year OCS Oil and Gas Lease Schedule." (SAI No. 9-09-006)

The Texas Department of Water Resources (TDWR) has reviewed the referenced report which discusses the environmental impacts, alternative plans involving tract deletions or additions, mitigation measures, and applicable regulations relative to the proposed five-year (i.e., March 1980-February 1985) Federal Outer Continental Shelf (OCS) oil and gas lease schedule involving 30 lease sales for 15 OCS areas totaling 28.8 million acres, located offshore of 20 Coastal States. The five-year leasing plan was prepared by the Secretary of the Interior, as required by Section 18 of the OCS Lands Act Amendments of 1978.

The report indicates that the oil and gas resources from the proposed five-year schedule are estimated at 9.21 billion barrels of oil and 30.46 trillion cubic feet of gas. The production projected from the 10.3 million acres offered for lease in 11 sales in the Gulf of Mexico OCS is estimated at 790 million barrels of oil and 1.06 trillion cubic feet of gas, (p. 36).

TDWR's staff review is restricted to the portions of the report having possible direct significant impacts on State of Texas water resources and water quality matters, within the TDWR statutory responsibilities. TDWR offers the following comments:

1. <u>Reference: Abstract, and pages iii, iv-viii, 36, 41.</u>
   TDWR notes the expected "high" sensitivity of navigation, recreation, tourism, and marine sancutaries in the Gulf of Mexico, to oil spills (p. 41). Of the total 48 oil spills greater than 1,000 barrels, considered statistically probable as a result of the proposed five-year program (Abstract, and pages iii, and 36), the Gulf of Mexico portion of the five-year program is expected to contribute an estimated 3.29 oil spills greater than 1,000 barrels. (pp. 36, 122-126). However, the potential environmental consequences of oil

spills (pp. 122-126) and other toxic substance discharges related to OCS oil and gas development (pp. 127-129) are discussed in an essentially <u>generic</u> sense rather than from a site-specific, definitive standpoint. e.g.,

> "...oil spills pose a potential adverse impact to recreation, through fouling of beaches; to commerical fishing, through fouling of gear, area closures, tainting and possible effects to fish stocks and to marine and coastal ecosystems." (p. iii)
>
> ....
>
> "...development activities...will cause chronic oil pollution through routine discharges and accidental spillage; the release of toxic chemicals in drilling muds and formation waters; smothering effects of due to pipeline burial. By and large these impacts will occur in localized areas around drilling platforms and pipelines. These impacts are also amendable to some degree of mitigation..." (p. iv)

TDWR notes the generic program impacts and the Gulf of Mexico regional impacts analyses (pp. 142-275) and the resulting provisos contained in the report (pp. v to viii), culminating in the basic finding that environmental impacts "cannot be assessed in a quantitative manner at this time." The report indicates the following essential generic findings and assurances:

> "The extent of these impacts will be largely determined by specific tract selections made at the sale decision stages, and <u>can be mitigated to some degree through tract selection decisions and stipulations imposed in the sale decision, and by regulation in the post-sale stage</u>." (p. vi; emphasis added).

In view of the foregoing observations, TDWR believes that the referenced document should be correctly identified as a <u>generic</u> or <u>programmatic</u> environmental statement.

2. <u>Pages 10, 12-14 and Appendix 3.</u>
   TDWR concurs, in principle, with the referenced generic or programmatic statement in view of the following relevant assurances which are specified or implied in the report:

   a. The proposed five-year program will be based on equitable sharing of developmental benefits and environmental risks, as called for in Section 18 (a)(3) of the OCS Lands Act Amendment of 1978. (e.g., see p. 4 of Appendix 3).

   b. Through the enforcement of OCS Order No. 7 (Pollution Prevention and Control), which requires the submission of oil spill contingency plans prior to approval of exploratory and development plans, USDI will ensure that an effective oil spill response capability is on location prior to any drilling. This order also prescribes pollution

Mr. Paul T. Wrotenbery
Page Three
October 11, 1979

prevention measures and discharge requirements, and regulates the types and methods of discharge of muds, cuttings, sanitary water, and other types of discharges. It also indicates discharges subject to regulation by the Environmental Protection Agency. (pp. 12-14, and p. 31 of Appendix 3).

c. While statement is first made on p. 10, that environmental reports normally will not be required for exploration and development operation plans in the Gulf of Mexico OCS offshore areas (except the Florida Coast), it is subsequently stated on p. 36 of Appendix 3, that UDSI plans to prepare a joint environmental statement for Sale No. A66 and Sale No. 66 in order to perform a thorough environmental and geotechnical analysis. This analysis will be helpful in developing final specific lease contract stipulations pertaining to operational activities safety, mitigations, and control. (pp. 35-36 of Appendix 3, and p. 10).

TDWR appreciated the opportunity to examine the referenced draft document. Please advise if we can be of further assistance.

Sincerely,

Harvey Davis
Executive Director

OFFICE OF THE GOVERNOR | BUDGET AND PLANNING OFFICE

Executive Office Building — 411 West 13th Street — Austin, Texas 78701

STATE CLEARINGHOUSE

APPLICANT: U.S. Department of Interior - Bureau of Land Management SAI NUMBER: 9-09-006

BUDGET AND PLANNING OFFICE CONTACT: John Gosdin PHONE: 512/475-6156

COMMENTS

The U.S. Department of Interior, Bureau of Land Management, Proposed 5-Year OCS Oil and Gas Lease Schedule has been reviewed. We generally agree with the conclusions regarding the impact of off-shore operations on on-shore air quality in the Western Gulf of Mexico area. As stated, the extent of impact will depend on the level of operation and the distance of operations from the shore. An additional factor will be the degree of stringency of atmospheric emissions control required by U.S. Department of Interior regulations that will govern OCS operations. We have previously reviewed OCS proposals for such controls and are satisfied that that Department intends to require controls generally consistent with those required for similar on-shore operations by the State and the U.S. Environmental Protection Agency.

RECEIVED
OCT 16 1979
Budget/Planning

Person Conducting Review (Signature) Roger R. Wallis Title Deputy Director

Agency Texas Air Control Board Date OCT 1979

STATE OF RHODE ISLAND & PROVIDENCE PLANTATIONS
EXECUTIVE CHAMBER
PROVIDENCE

J. JOSEPH GARRAHY
GOVERNOR

October 17, 1979

Mr. Frank Gregg
Director
Bureau of Land Management
Department of the Interior
18th & C Streets, N.W.
Washington, D. C. 20240

Dear Frank:

This is in response to the Bureau's request for comments on its Draft Environmental Statement for the proposed five-year OCS oil and gas lease schedule. Rhode Island has consistently supported all efforts to expedite the development of offshore oil and gas resources. In terms of energy availability and economic opportunity, our state has much to gain from lease sales in the North Atlantic. We recognize the cumulative benefit to our country as well, and are delighted by the observation that combined peak production from all proposed sale areas is expected to be some 6 million barrels per day - roughly the same as all current U. S. imports of crude oil. For a region as dependent upon imported oil as New England, that prospect seems most encouraging.

We have carefully reviewed the descriptions of the alternatives, environmental considerations and potential impacts and have found these subjects treated in a lucid and comprehensive manner as regards the North Atlantic. We wish to suggest, however, under the topic "Interrelationship with other Projects and Proposals" beginning on page 19, that the statement discuss the Endangered Species Act, with a special mention of cetaceans. This subject is treated adequately in the section beginning on page 200, but an earlier reference would be helpful.

Lastly, a minor point. On page 93, in the second line, the dinoflagellate genus Gonyaulax is misspelled.

We appreciate the opportunity to comment on the statement and wish you success in implementing the five-year plan.

Sincerely,

Dante G. Ionata, Director
Energy Capability & Management
Governor's Energy Office
80 Dean Street
Providence, Rhode Island 02903

North Carolina
Department of Administration
116 West Jones Street Raleigh 27611

James B. Hunt, Jr., Governor
Joseph W. Grimsley, Secretary

Division of State Budget and Management
John A. Williams, Jr., State Budget Officer
(919) 733-7061

October 22, 1979

Mr. Harold P. Sieverding
United States Department of the Interior
Bureau of Land Management
New Orleans Outer Continental Shelf Office
Hale Boggs Federal Building
500 Camp Street - Suite 841
New Orleans, Louisiana 70130

Dear Mr. Sieverding:

Re: SCH File #228-79; Draft Environmental Impact Statement on the Proposed Five-Year OCS Oil and Gas Lease

The State Clearinghouse circulated for review the above referenced document. Attached is a copy of a letter from Governor Hunt to Secretary Andrus which states North Carolina's position on the OCS Five-Year leasing plan. This letter is hereby submitted as the Clearinghouse response to the Draft environmental Impact Statement on this proposed plan.

Thank you for forwarding this document to this office for review.

Sincerely,

Chrys Baggett

Chrys Baggett (Mrs.)
Clearinghouse Director

CB/maw

Attachment

NEW ORLEANS OCS
FILE CODE
ROUTE INITIAL
MGR.
ASST. MGR.
1979
P. LEGAL
PAO
EAD
OPS
STUDIES
MGMT. SER.

Code: 542
ATTN: Abby Miller

STATE OF NORTH CAROLINA
OFFICE OF THE GOVERNOR
RALEIGH 27611

JAMES B. HUNT, JR.
GOVERNOR

September 21, 1979

Dear Cece:

This is in reference to your letter to me of June 25, 1979, requesting my comments on the proposed OCS 5-year leasing plan. My staff has reviewed your letter and attached documents. Although the plan is comprehensive and national in scope, I have restricted my comments to activities having direct impacts on North Carolina.

I am concerned that proposed lease sale #78 which was modified to include the entire South Atlantic is scheduled too soon following lease sale #56 to allow for meaningful assessment of drilling activities. It would seem to be in the interest of all involved not to hold a sale before exploratory drilling efforts have indicated whether or not the area is promising.

An additional concern involving the timing of proposed lease sale #78 focuses on the lead time needs of the Environmental Studies program. Previous coorespondence has indicated my concern for a rational decision making process based on current data. I want to request long in advance of any future sale that a comprehensive and current data base be established prior to the Call for Nominations to insure the opportunity for states and other interested groups to have meaningful participation based on facts not conjecture.

My staff has indicated that many of the most promising areas offshore North Carolina lie in deep water in areas of rather swift current. It is my hope that exploration in these areas will be posted until the technology is proven in fact and not just in theory. As was illustrated in the spoiling of many miles of North Carolina beaches in June and July of this year, an oil spill almost any where along the Atlantic coast could have substantial, direct impacts for coastlines many hundreds of miles away. I am anxious to support efforts to contribute to national energy independence, but not at the expense of valuable environmental and recreational resources.

I appreciate the opportunity you have afforded me to comment on this most important activity. I look forward to continued cooperation in this and many other endeavors.

My warmest personal regards.

Sincerely,

The Honorable Cecil Andrus
Office of the Secretary
U. S. Department of the Interior
Washington, D. C. 20204

STATE OF FLORIDA
Office of the Governor
THE CAPITOL
TALLAHASSEE 32301

BOB GRAHAM
GOVERNOR

November 5, 1979

Director
Bureau of Land Management
Department of Interior
18th and C Streets, N.W.
Washington, D.C.

Dear Sir:

This agency, functioning as the state planning and development clearinghouse, coordinated a review of the Draft Environmental Impact Statement Proposed Five Year OCS Oil and Gas Lease Schedule, SAI: 80-0345E. For your consideration, attached are comments submitted by our Department of Environmental Regulation. Governor Graham, by letter to Secretary Andrus, commented on this proposal in September.

We request that you consider the Department's letter of comment in developing your final Environmental Impact Statement for this proposal.

Sincerely,

Walter O. Kolb

Walter O. Kolb
Office of Planning and Budgeting
Intergovernmental Coordination

WOK/py

Attachments

SEP 07 1979

GOVERNOR'S OFFICE
Planning and Budgeting
Intergovernmental Coord.
SEP 26 1979
RECEIVED

Honorable Cecil D. Andrus
Secretary of the Interior
Washington, D.C. 20240

Dear Mr. Secretary:

The State of Florida has reviewed the June 18 proposed 5-Year Oil and Gas Leasing Program as required to be submitted under Subsection 18(c)(3) of the OCS Lands Act.

We have discussed the proposed South Atlantic and Blake Plateau leasing activities with North Carolina, South Carolina, and Georgia in numerous meetings at Atlanta and during a recent meeting with the Bureau of Land Management in Washington, D.C. Our reply for these areas is based on the concerns identified in these discussions and the background material you submitted. Our comments on the Eastern Gulf of Mexico are based on the State's discussions with the Bureau of Land Management, New Orleans and the comments and concerns expressed in the public meetings in Panama City and Pensacola, Florida, on March 20 and 21.

As we have indicated in past communications, the State of Florida supports OCS operations for leasing, exploration and production, providing that consideration is given to our unique coastal environment. Our concern in the proposed 5-Year Oil and Gas Leasing Program is mainly whether proper environmental studies will be funded, processed and performed, the data analyzed, and the resulting information sent to the states in time to meet the various leasing deadlines. We are pleased, therefore, to see your comment in your letter of June 18 to Vice President Mondale that your leasing program will be "coupled with my firm determination to proceed in a manner that protects the human, marine and coastal environments from undue risk and harm".

It is for this reason that the State of Florida has objected in the past to a proposed sale on the Blake Plateau until certain physical-meteorological studies are made in the area. We will continue to object until such environmental studies have been completed and danger to the drilling and platform operations has been determined and the information has been received by the USGS and the South Atlantic States. Since the studies recommended by USGS, BLM, and the states' study groups will take a minimum of three and possibly four years (two to three years of collection and one year to analyze data), it seems impossible for these studies to be completed in time to allow a sale in January of 1984. Therefore, the State of Florida would prefer Option 4, which would postpone the Blake Plateau sale until the collection and analysis of critical environmental and safety data could be accomplished.

The State of Florida has no objection to the proposed lease sale in the South Atlantic and Eastern Gulf of Mexico, providing the environmental studies requested under the FY 1979, FY 1980, and FY 1981 BLM Environmental Study Programs are completed before Notice of Sale. The State of Florida, having talked and met with the states of North Carolina, South Carolina, and Georgia and with the Bureau of Land Management, New Orleans and Washington, D.C. offices in regard to these studies, is not convinced that they are going to produce the data needed before Notice of Sale. Based on our limited knowledge of the actual contents of these studies and the suggested levels of funding, we cannot agree with your statement in your letter to Vice President Mondale that "I am convinced that with the improvements we have made in the design of the environmental study program, with our improved record of cooperation with the affected states, and with our improved management of the offshore activities, we can start planning for the sales I am proposing with a high degree of confidence". It is the State of Florida's belief that after consultation with the South Atlantic States we all have concerns whether the proper studies will be funded, processed, and completed before the schedule for Lease Sale #56 and whether the South Atlantic States should object to the sale based on inadequate environmental studies.

As we indicated in previous communications, we are concerned not only with the types and contents of the environmental studies, but with what effect the leasing areas have on the nature and contents of these studies. The background information in the proposed 5-year program defines various lease areas, and these areas are shown on a chart.

The South Atlantic is defined as "The primary area of interest is within the southeast Georgia embayment, 30 to 75 miles offshore and in water depths ranging from 30 to 800 meters". The Blake Plateau is defined as "It extends seaward of a line running 500 miles southwest from a point about 50 miles south of Cape Hatteras, North Carolina, to the north edge of the Florida Straits between Little Bahamas Bank and Florida. At its widest part along the 30th parallel it is 200 miles across extending from 70 to 300 miles east of Florida. It encompasses an estimated area of 64,000 square miles in water depths from 800 to 5000 meters". The Eastern Gulf of Mexico is defined as "Bounded on the north by the State of Alabama and the Panhandle of Florida. The eastern boundary is the Peninsula of Florida. The Continental Shelf comprises an area of approximately 70,000 square miles. Water depths in the area range from 20 to 3,200 meters".

In the case of the Eastern Gulf of Mexico, this could be interpreted to mean that you might offer lease sales south of 26°N (the southern limit of the existing sales to date) on the Western Florida Continental Shelf. Depending upon whether the Peninsula of Florida is considered to end at Jew Creek (25°N) or continue south and westward to the Dry Tortugas, sales could cover part or all of Florida Bay. Because of the extremely sensitive environmental conditions in this area (the Keys and their corals), the water transportation system, and the presence of major commercial and sports fisheries, we would have to object to any leasing south of 26°N until completion of at least three years of environmental studies in Florida Bay. No such studies are presently proposed in FY 1979, 1980 or 1981 Environmental Study Programs. Yet based on what has happened in the South Atlantic and Blake Plateau lease areas, tracts in the area could be up for sale during your proposed 5-year schedule.

The schedule identifies a number of sales in the Gulf of Mexico. In Option 4 there are thirteen listed in the Gulf of Mexico. Nine of these are marked Central and Western Gulf. This was the way that Lease Sale #62 was originally listed and defined during the call to industry for nominations. Recently, its geographic area was extended into the Eastern Gulf of Mexico after completion of two-thirds of the leasing process.

In a letter to you dated June 4, 1979, we have requested some special studies on these 37 tracts to define the hazard conditions and potential live bottom areas. In verbal conversations with the Bureau of Land Management, New Orleans office, in regard to our letter we find that these data are not available and that there is no indication that the USGS will perform such studies before notice of sale depriving not only the federal government but the states of decision-making information needed to "protect the human, marine and coastal environments from undue risk and harm". In short, unless the sales proposed in the 5-year schedule are accurately defined geographically and unless continuity of these areas is maintained throughout the schedule, it is impossible for study plans to provide the necessary information because of the lead times required for the studies.

Lease Sale #56 in the South Atlantic is another indication of a similar problem. In this case, it is not the addition of tracts during the lease process, but the expansion of the area outside of the defined limits of your proposed 5-year schedule. Lease Sale #56 nomination information given to the states indicated that 70 percent of the tracts was actually in the Blake Plateau area rather than the South Atlantic. Despite discussions between the South Atlantic States and the Bureau of Land Management, a number of these Blake Plateau tracts still remained in the lease sale as late as the Washington meeting in July.

Under these conditions, there is no way for there to be environmental data generated for those areas in time for the sale. This means that if the federal goverment does not stay within its defined lease areas and the states do not object, there is no way to perform an environmental program that will allow the decision-making information for both the federal and state organizations.

The State of Florida appreciates the opportunity to comment on the proposed 5-year Oil and Gas Leasing Program as of June 18, 1979. We stand ready to discuss with your personnel any of our comments or requests for clarification of our concerns.

Sincerely,

Bob Graham

Governor

BG/kr

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

BOB GRAHAM
GOVERNOR

JACOB D. VARN
SECRETARY

October 16, 1979

GOVERNOR'S OFFICE
Planning and Budgeting
Intergovernmental Coord.
OCT 19 1979
RECEIVED

Mr. Ron Fahs, Deputy Director
Policy Coordination
State Planning And Development Clearinghouse
Office of Research and Policy
Executive Office of the Governor
530 Carlton Building
Tallahassee, Florida 32301

Dear Mr. Fahs:

Re: Draft Environmental Impact Statement,
Proposed Five Year OCS Oil and Gas Lease
Schedule, March, 1980 - February, 1985,
Fla. SAI No. 80-0345E

The Bureau of Land Management has provided a comprehensive and thorough survey of the adverse environmental impacts associated with petroleum development of the outer continental shelf. This information is to be used in determining which of eight alternatives should be followed when scheduling some thirty oil and gas lease sales over a five year period to commence in 1980. The various alternatives differ by delaying or omitting sales in selected areas to allow time for further environmental studies or technological development. These sites are located in especially sensitive and/or hostile environments requiring greater protective measures and dependable methodologies prior to initiation of oil production activities. Gulf of Mexico and South Atlantic sales are not among those considered for omission from the five year schedule. In fact, except that Alternative 2 allows for three additional sales in the Gulf of Mexico, the differences between alternates pertain exclusively to Alaska and California OCS development.

With the exception of the "no action" alternative, Alternate 7 provides for the greatest mitigation of environmental damage associated with development under the full schedule. This alternate schedule allows fewer over all sales, omitting most of the Alaskan frontier tracts from consideration at this time. Not only are these areas the most sensitive to development-related pollution, but these are also the areas which

could suffer severely, both environmentally and socioeconomically, from related infrastructure development. Further, the sales omissions would allow time for the industry to refine shear zone and pack ice development technology. It is statistically predicted that 22 fewer large spills would occur with this alternative, as opposed to the 48 predicted for Alternate 1.

Because oil and gas development in the OCS cannot proceed without great risks to the natural environment, it should not be undertaken in any of the sale areas without employing all possible safequards, especially site-specific styled technology. Development in the sale areas adjacent to Florida creates a strong potential for environmental damage and water quality degradation from chronic pollutant emissions. Many of the tracts are in or close to some of the Gulf's more important fishing grounds. Live bottoms and reefs are unique and invaluable resources and should be afforded the highest degree of protection from drilling activities. Provisions should be made for self-containment of all platform wastes, including drilling discharges. Such measures would not only minimize direct impacts to surrounding habitat but also would reduce the potential for degradation in any downcurrent coastal environments from exposure to chronic routine discharges. The threat of a devastating spill is risk enough for sensitive Gulf and nearshore natural resources without the added burden of on-going, sub-lethal chemical stress.

Much of Florida's coastal zone, especially on the west coast, remains relatively undeveloped wilderness with a variety of special state and federal designations, not the least of which is endangered species habitat. Further, these areas are characterized by shallow, low energy tidal flats, protected lagoons, and embayments. Such features prevent expeditious and effective spill recovery operations so that environmental damage from a major spill can be expected to be pervasive and long-term. It appears that the only feasible way to reduce the odds of such an occurrence is to maximize the predictability of drilling technology and production methodology. Some specific concerns for the eastern Gulf operations include the following:

(1) The document emphasizes the importance of detailed sediment engineering surveys and structure design planning prior to drilling. The potential for hurricane incidence is referenced as an area-specific problem which must be accommodated by design engineering. We are concerned that the intended "100 year storm event" design criteria respresents a sufficient planning effort. It is recommended that platform operations be structured in anticipation of hurricane force winds and surges.

(2) Karst bottom topography is referenced as a potential instability problem. If this type of substrate greatly increases the probability of platform failure and, therefore, major spill occurrence, it appears warranted that maximal planning and design be undertaken prior to initiation of any drilling operations in such bottoms.

(3) A further problem anticipated for the eastern Gulf is the potential for blowouts from high pressure gas zones. The document concludes that these areas need to be avoided. Can this be done with certainty or is blowout potential high in the eastern Gulf in general? If the latter is the case, sales in these areas should be deferred until sufficient technology can be developed to reduce blowout probability.

(4) If oil is discovered offshore of Florida, land use conflicts can be expected in development of onshore industry infrastructure. Federal and State regulations applicable to water quality degradation and development in wetlands are not conducive to intense petroleum industrialization of the coastal zone. It is logical, therefore, to develop offshore areas where the supportive onshore infrastructure exists prior to developing sales adjacent to critical habitats, wildlife refuges, aquatic preserves, etc.

In all these cases, a demonstration of adequate technology or environmental assessment to meet these concerns should be afforded prior to opening these areas for sales. Where such investigations conclude that development cannot proceed with sufficient environmental safeguards, these areas should not be opened for sale.

We appreciate the opportunity to comment on this Draft Environmental Impact Statement. We would like to review the final document when it is prepared.

Sincerely,

Sanford Young

Sanford N. Young
Deputy Director

SNY/lf/sb

cc: Walt Kolb

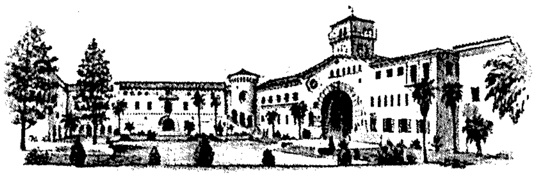
DAVID YAGER
Chairman
First District

ROBERT L. HEDLUND
Vice-Chairman
Fourth District

ROBERT E. KALLMAN
Second District

WILLIAM B. WALLACE
Third District

HARRELL FLETCHER
Fifth District



HOWARD C. MENZEL
County Clerk-Recorder
and Ex-Officio
Clerk of the
Board of Supervisors

Telephone (805) 966-1611
Ext. 271

COUNTY OF SANTA BARBARA
BOARD OF SUPERVISORS
105 East Anapamu Street
Santa Barbara, California 93101

RECEIVED
OCT 2 1979
OFFICE OF THE DIRECTOR
BUREAU OF LAND MANAGEMENT

September 24, 1979

Mr. Frank Gregg, Director
Bureau of Land Management
Department of the Interior
18th and C Streets, N.W.
Washington, D.C. 20240

Dear Mr. Gregg:

This letter presents the views of the Santa Barbara County Board of Supervisors on the Draft Environmental Impact Statement for the Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, March 1980 - February 1985. We are pleased to see many of our earlier recommendations beginning to surface in this document: recognition of air quality as the primary environmental concern of OCS leasing in this region and the commitment to pipeline transportation from production site to market region are prime examples. Where we differ, we are confident a reasonable solution of mutual benefit for the nation and Santa Barbara can be found.

You and your staff are to be commended for producing an EIS that is concise and to the point. The short format facilitates rapid familiarity with the subject of the EIS enabling careful review and comment by interested persons. We support your continued efforts in this regard.

To assist you in your efforts to improve this document the attached comments are arranged according to the five specific points contained in Section 102(2)(C) of NEPA. Comments identifying on a line-for-line basis factual errors you will want to correct as well are also inlcuded. In both instances our comments address only those issues which affect the coastal environment of Santa Barbara County.

In brief, the Board of Supervisors wish to express four major concerns:

First: While you have recognized air quality as a primary concern, your intention with respect to whose (local or federal) air quality standards will be enforced are unclear. We cannot emphasize too strongly the importance of enforcing local standards offshore Santa Barbara County. The EIS should be unambiguous on this point.

Second: We strongly concur with and support your assumption that a pipeline from production site to market area is the safest, environmentally preferable transportation mode.

Third: The destination of Alaskan LNG must be more carefully studied. With Point Conception the only LNG terminal on the West Coast, we are fearful that development pressures for expanding this facility to accommodate excess Alaskan LNG may once again overcome local, reasoned concerns expressed in previous Board documents.

Fourth: Under the Proposed Schedule, Santa Barbara County could be faced with four lease sales in four years and this, we assure you, creates serious staff workload problems at the local level.

RECOMMENDATIONS

We have reviewed the comments of the California Coastal Commission on the Proposed Five-Year Schedule and wish to inform you of our concurrence. We recommend that:

1. THE PROPOSED FIVE-YEAR OCS LEASING SCHEDULE MUST BE THOROUGHLY RE-EXAMINED: IT DOES NOT COMPLY WITH THE OCS LANDS ACT AMENDMENTS; IT PERPRETATES A "DRAIN AMERICA FIRST" POLICY WHICH MAY NOT BE IN THE NATIONAL INTEREST.

We have seen Santa Barbara Channel leased twice. All but 23 of its roughly 170 leasable tracts have been offered at least once. One hundred eighteen of these tracts have already been leased once. Hence, we strongly recommend:

2. THE SANTA BARBARA CHANNEL SHOULD BE DELETED FROM FUTURE SALES.

Lease Sale #53 opens up a whole new frontier where many environmental conditions are unknown. Hence, we recommend:

3. IF LEASE SALE #53 IS TO OCCUR, REASONED LOCAL CONCERNS MUST BE ACCOMMODATED: DRILLING MUST NOT BE PERMITTED IN VESSEL ROUTING SYSTEMS OR SENSITIVE BIOLOGICAL AREAS; LOCAL AIR STANDARDS MUST BE ENFORCED; EFFECTIVE OIL SPILL PROTECTION MUST BE OPERATIONAL; COMPREHENSIVE PLANNING, FROM PRODUCTION TO MARKETING MUST BE REALISTICALLY CONSIDERED.

The proposed Five-Year Schedule confirms a continuing glut of crude oil on the west coast and raises the possibility of dramatic increases in LNG being delivered to west coast terminals. Rather than exacerbate the situation, we recommend:

4. LEASE SALES #68, 73, AND 80 SHOULD BE DESIGNATED AS CONTINGENCY SALES; THE CHANNEL SHOULD BE DELETED FROM ALL THREE; THE SANTA BARBARA NORTH COAST OFFSHORE SHOULD BE DELETED FROM #73.

The OCS Lands Act Amendments requires OCS-related activities to comply with the Clean Air Act. Whether activities are in the OCS, state tidelands, or onshore, the standards must be the same. Hence, we strongly recommend:

5. LOCAL STANDARDS FOR AIR QUALITY MUST BE ENFORCED OFFSHORE CALIFORNIA.

Until direct knowledge of OCS resources is obtained by the federal government, these resources will continue to be sold in a manner that does not necessarily protect the public interest. Hence, we recommend that:

6. AT THIS CRITICAL JUNCTURE, FEDERAL EXPLORATION OF OCS RESOURCES SHOULD BE DONE TO DETERMINE THE RELATIVE VALUE OF THIS POTENTIAL ENERGY SOURCE.

Finally we recommend:

7. NATIONAL RESERVE STATUS SHOULD BE SERIOUSLY CONSIDERED FOR ALL REMAINING OCS UNLEASED TRACTS OFFSHORE SANTA BARBARA COUNTY.

Thank you for the opportunity to express these views. Our staff will be available at your convenience to discuss any of the points raised here and in the attached comments. We look forward to your response.

Sincerely,

David Yager

DAVID YAGER
Chairman

DY:sb
Encl.
cc: Bill Grant

SANTA BARBARA SUMMARY COMMENTS ON BLM'S

FIVE-YEAR LEASING PROGRAM DRAFT EIS

THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

If the schedule is carried out as proposed, the Board considers three areas of environmental impact of critical importance: oil spills, air quality and marine sanctuaries.

The Draft EIS notes the statiscially probable number of oil spills for southern California, including Santa Barbara Channel, to be 4.13 and for central and northern California, 4.19. Considering that 3/4 of the oil likely to be found in the southern California OCS will be in the Channel and over half of the oil estimated to be found in central and northern California OCS will be offshore Santa Maria, Santa Barbara County can expect, statistically, to see five major spills during the life of the project. With a probability of this many oil spills, the County must, again, insist that an oil spill clean-up capability demonstrated to be effective in the seas offshore Santa Barbara County be operational prior to any exploratory drilling. Such capability must be strategically located to protect remote sensitive coastal habitat areas from oiling.

With respect to air quality, our request is that you make clear the understanding that local standards will be the measure of compliance by OCS activities with the Clean Air Act. We fully agree with the Draft EIS that the air quality impacts of OCS development can be effectively mitigated--but only when, in the case of OCS development offshore Santa Barbara County, local standards are applied.

With respect to the document's discussion of marine sanctuaries (see page 256) we disagree completely with the conclusion: "If large Federal marine sanctuaries are established, such as the one proposed for the Santa Barbara Channel, multiple use conflicts involving oil and gas development, fishing, and boating could occur..." The very purpose of establishing such a marine sanctuary is to eliminate such potential conflicts. The author apparently assumes that designating an area as a marine sanctuary represents an atempt to frustrate other uses of the marine environment by imposing unreasonable environmental safeguards. This is not permissable under the Marine Sanctuaries Act. The purpose in designating the Channel as a marine sanctuary would be to spell out clearly the rules by which all activities may co-exist in the region and at the same time respect the unique environmental conditions that induce the competing interests in the Channel. Without such designation, the rules are unclear and conflicts between competing uses inevitable. This section of the Draft EIS must be rewritten to eliminate biases against responsible environmental management.

UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

In our negative nominations for proposed Lease Sale #53 we documented very carefully the unique environmental conditions offshore northern Santa Barbara County. Specifically, the area is identified in the literature as the "California Transition Zone," one of five such transition zones in the world. The marine environment offshore northern Santa Barbara County is in a pristine, undistrubed state. Introduction of OCS development activities will disturb this environment and constitute an unavoidable adverse environmental effect. Although our negative nominations in this area were ignored, we remain hopeful that through the lease sale process--as we have been assured on numerous occasions--reasoned environmental concerns will be respected.

ALTERNATIVES TO THE PROPOSED ACTION

Although the Draft EIS purports to evaluate eight alternatives, we view the first seven as having limited substantive merit and the

eighth as the only valid alternative. Yet Alternative 8, "No Action," is dismissed without a hearing. The No Action alternative raises several key issues which must be addressed in the EIS: how important is the OCS energy resource in regional and national energy supply/requirement balancing?; what alternative sources of energy would be developed if the OCS energy resource were unavailable?; are there advantages to reserving our last domestic frontier that outweigh the immediate and short-term gain of rapid OCS development?

RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND LONG-TERM PRODUCTIVITY

We would agree with your statement on page 274: "Few long-term productivity or environmental gains are expected as a result of the proposed schedule; the benefits of the leasing schedule are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas."

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

We would agree with the Draft EIS discussion under this heading.

SPECIFIC COMMENTS

Page 37, paragraph 4. Staff strongly supports this paragraph which recognizes pipelines as the "most desireable" transportation mode in southern California and the Santa Maria area.

Page 38, paragraph 4. The contention that at least .8 million B/D refining capacity should be available on the west coast for California and Alaska production is exceedingly subjective. It assumes California and Alaska production will back out foreign imports and that the overall mix of sweet and sour crudes from California and Alaska will match west coast refining capacity. A more detailed analysis should be provided on this particular point.

Page 40, paragraph 2. The conclusion that Alaskan LNG "may require major construction of LNG receiving terminals on the west coast of the U.S.,..." in order to accomodate 7 billion cubic feet per day is a major impact which should be evaluated more fully. The magnitude of this impact would be equivalent to constructing 5 Point Conception-size LNG terminal/vaporization facilities.

Page 46, paragraph 2. Staff commends DOI in recognizing the impact of OCS oil and gas development on air quality as the primary environmental concern in southern California.

Page 88, paragraph 5. Text should be updated to reflect the fact that, for all intents and purposes, the DOS Cuadras and Carpinteria fields are fully developed at this time.

Page 130, paragraph 3. The first sentence identifies power generation as the major single source for air pollution. This is so if pipeline transportation of crude oil is assumed. If uncontrolled tanker loading is permitted, the loading operation would be the major single source. Text should acknowledge the severe polluting consequences of uncontrolled tanker loading.

Page 134, paragraph 4. The gas plant described, with a capacity of 1 BCFD is unrealistic in size since no one OCS area is likely to account for production except a few of the Alaskan Provinces. Even then individual fields would most likely be served by separate gas plants under .1 BCF.

Page 217, paragraph 2. The estimated losses of $4 to $6 million to the recreation industry from an OCS oil spill in southern California appears low: the Santa Barbara spill economic losses were estimated in 1974 dollars at $5 million in direct losses to the economy and $24 million in indirect losses attributed to lost tax revenues to state and local governments. Regardless of the size of the loss, it is irresponsible to dismiss local losses as "quite small" by comparing them to the California recreation industry as a whole.

Page 225, paragraph 2. The text should identify what mitigation strategies will be considered for OCS-caused air pollution. Further, the test should comment on the issue of local versus federal standards for controlling air pollution on the OCS. In addition to the ultimate goal of land pipeline crude transportation in place of tankering, it is specifically requested that the Santa Barbara County Rule 327 regarding vapor control at cargo vessels be enforced by BLM. It is requested that the status of enforcement and emission inventory information be shared with the County A.P.C.D. annually. If deterioration of air quality occurs more frequently, it is further requested that a continuing liaison mechanism be established to work with A.P.C.D. on their new source review requirements at such time as new or altered facilities are considered.

Page 256, paragraph 2. The discussion of marine sanctuaries is unfounded and suggests a bias that designating an area as a marine sanctuary represents an attempt to obstruct OCS development. The text should be rewritten to reflect the purposes of the Marine Sanctuaries Act which provide for resolving conflicts among competing uses, not creating them.

Page 257, paragraph 5. The last sentence is unnecessary and inappropriate. It suggests a bias that traffic separation schemes should be subservient to temporal oil and gas activities rather than respect historic routes and approaches to harbors. The Port and Tanker Safety Act of 1978 recognizes the "paramount right of navigation over all other uses" in designated traffic separation schemes.

Page 264, paragraph 6. The text needs to be corrected to reflect the fact that central and northern California has a history of federal OCS leasing as a result of a 1963 lease sale held in the area. The text should note that no commercial discoveries were made at the time.

Page 271, paragraphs 3-6. This discussion of air quality impacts should discuss air pollution associated with offshore crude oil transfer operations. This omission is a significant deficiency in the text.

Page 276, paragraph 1. This paragraph explains that the location of California sales scheduled for 1983 (#73) and 1984 (#80) are unspecified to allow flexibility. Not specifying their location suggests inadequate schedule planning. Uncertainty as to their location also complicates onshore planning activities. Finally, by not specifying their location, it is conceivable that petroleum industry pressure could cause their occurrence in areas already heavily burdened with oil and gas activities. The location of these sales should be made clear.

Page 280, paragraphs 3-6. The discussion of impacts of the No Action alternative is entirely inadequate and should be rewritten.

KENAI PENINSULA BOROUGH

BOX 850 • SOLDOTNA, ALASKA 99669
PHONE 262-4441

DON GILMAN
MAYOR

September 24, 1979

Director
Bureau of Land Management
Department of the Interior
18th & C Streets, NW
Washington, DC 20240

Re: Draft Environmental Statement
Proposed Five-Year OCS Oil & Gas Lease Schedule
March 1980 - February 1985

Dear Sir:

All of the alternatives presented in the Draft Environmental Statement for Cook Inlet, except Alternative 8, no action, provide the same schedule. The Kenai Peninsula Borough supports any of the alternatives with regard to Cook Inlet except Alternative 8.

Because of our past experience with oil and gas leasing and development of non-OCS oil and gas, we raise no objections to the Lower Cook Inlet leasing schedule. We do not anticipate adverse environmental impacts of a magnitude to offset the gains from oil and gas activity. However, we will continue to expect that throughout the lease program local governments will be adequately informed in advance of operations that may affect them, and that operations will minimize adverse affects upon our renewable resource industries.

I thank you for this opportunity to comment.

Sincerely,

Donald E. Gilman

DONALD E. GILMAN, Mayor
Kenai Peninsula Borough

DEG:PW:kg

South Coast
AIR QUALITY MANAGEMENT DISTRICT

HEADQUARTERS, 9150 E. FLAIR DR., EL MONTE, CA 91731
ANAHEIM OFFICE, 1610 E. BALL RD., ANAHEIM, CA 92805 . (714) 991-7200
CARSON OFFICE, 950 DOVLEN PL., SPACE E, CARSON, CA 90746 . (213) 532-4102
COLTON OFFICE, 22850 COOLEY DR., COLTON, CA 92324 . (714) 824-2660

October 4, 1979

Director (542)
Bureau of Land Management
Department of the Interior
18th & C Streets N.W.
Washington, DC 20240

Dear Mr. Gregg:

RE: DES on Proposed 5-Year OCS Leasing Schedule.
Our #D 90905X

Thank you for the opportunity to review the above cited DES. We found that it was very highly generalized and therefore was difficult to evaluate in detail. The sections on air quality in Southern California were correct as far as they went, and we recognize that further detail cannot be provided in this kind of document.

We are preparing a study of air quality impacts and emissions possibly resulting from Lease Sales 35 and 48 on the South Coast Air Basin. It should be helpful in your further environmental documentation. It will be ready in December 1979, and we will forward copies to you and the BLM Pacific OCS office in Los Angeles.

Sincerely,

Brian W. Farris, Head
Impact Analysis and Energy
Resources Section
Headquarters
(213) 572-6418

BWF:js

Ned A. Rogoway, Director

Telephone (805) 549-5600

PLANNING DEPARTMENT
Courthouse Annex
San Luis Obispo, California - 93408

October 15, 1979

Frank Gregg, Director
Bureau of Land Management
Department of the Interior
18th and C Street, N. W.
Washington, D. C. 2040

RE: County Position on the Draft Environmental Statement for the 5 Year OCS Oil and Gas Schedule

Dear Mr. Gregg:

The Board of Supervisors of San Luis Obispo County adopted the attached Resolution Number 79-452 on October 15, 1979. This resolution and its accompanying attachment presents the official position of the County on the Draft Environmental Statement (DES) as well as a page-by-page critique of the DES as it pertains to San Luis Obispo County.

We are hopeful that you will seriously consider the resolution in developing the Final OCS Oil and Gas Lease Sale Schedule and will incorporate its suggestions and recommendations in a comprehensive environmental statement that adequately considers all reasonable alternatives, local concerns and environmental consequences.

If you desire to discuss any points in this resolution and its attachment feel free to contact Ronald DeCarli, Coastal Energy Impact Program, San Luis Obispo County Planning Department (805) 549-5981. We hope these comments prove helpful.

Sincerely,

Patricia Beck

PATRICIA BECK
Local Coastal Program

cc: Michael Fisher, Executive Director
California Coastal Commission
Carl C. Hetrick
South Central Coast Regional Commission
Greg Fox, Office of Planning & Research

IN THE BOARD OF SUPERVISORS

COUNTY OF SAN LUIS OBISPO, STATE OF CALIFORNIA

Mon day October 15, 1979

PRESENT: Supervisors Steve Mac Elvaine, Kurt P. Kupper, Howard D. Mankins, and Chairman Hans Heilmann

ABSENT: Supervisor Richard J. Krejsa

RESOLUTION NO. 79-452

IN THE MATTER OF THE DRAFT ENVIRONMENTAL STATEMENT PREPARED BY THE U. S. DEPARTMENT OF INTERIOR ON THE PROPOSED 5-YEAR OCS OIL AND GAS LEASE SCHEDULE

The following resolution is now offered and read:

WHEREAS, the Federal Government, acting through the Department of the Interior has prepared a National 5 Year OCS oil and gas lease schedule; and

WHEREAS, the timing and location of lease sales shall be based upon consideration of 8 factors pursuant to Section 18(A)(2) of the OCS Lands Act Amendments of 1978; and

WHEREAS, the Department of Interior, pursuant to the National Environmental Policy Act of 1969 as amended, has prepared a Draft Environmental Statement on this proposed 5 year OCS oil and gas schedule; and

WHEREAS, the Department of Interior has prepared this schedule based on unverified preliminary estimates of resources potential; and

WHEREAS, the San Luis Obispo County has reviewed the basis, substance and contents of these documents; prepared overall and specific comments per the attached Appendix; and has found the following as is more specifically described in the conclusion section of the attached Appendix:

a) The proposed 5 year OCS oil and gas schedule is not based on an adequate consideration of the factors identified in Section 18(A)(2)(A-H) of the OCS Lands Act Amendments of 1978.

b) The proposed lease sale areas are so large as to make an adequate comparison of these factors improbable.

c) The Draft Environmental Statement for the proposed 5 year is deficient in that it does not consider all reasonable alternatives.

NOW, THEREFORE, BE IT RESOLVED AND ORDERED that the Board of Supervisors of San Luis Obispo County recommend the Department of Interior consider the following as is more specifically described in the General Conclusion Section of the attached Appendix:

1. Redefine proposed lease sale areas into meaningful geographical areas showing common characteristics.

2. Develop a revised 5 year OCS oil and gas schedule for these redefined OCS areas which is based upon specific in-depth consideration of Section 18(A)(2)(A-H) of the OCS Lands Act Amendments of 1978

The undersigned Deputy Clerk of the Board of Supervisors certifies that pursuant to Section 25103 of the Government Code delivery of this document has been made on October 16, 1979.

MISBETH WOLLAM
County Clerk and Ex-Officio Clerk
of the Board of Supervisors

By Lillian L. Stewart
Deputy Clerk.

Ned A. Rogoway, *Director*

Telephone (805) 549-5600

PLANNING DEPARTMENT

Courthouse Annex

San Luis Obispo, California - 93408

October 15, 1979

Frank Gregg, Director
Bureau of Land Management
Department of the Interior
18th and C Street, N. W.
Washington, D. C. 2040

RE: County Position on the Draft Environmental Statement for the 5 Year OCS Oil and Gas Schedule

Dear Mr. Gregg:

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We are hopeful that you will seriously consider the resolution in developing the Final OCS Oil and Gas Lease Sale Schedule and will incorporate its suggestions and recommendations in a comprehensive environmental statement that adequately considers all reasonable alternatives, local concerns and environmental consequences.

If you desire to discuss any points in this resolution and its attachment feel free to contact Ronald DeCarli, Coastal Energy Impact Program, San Luis Obispo County Planning Department (805) 549-5981. We hope these comments prove helpful.

Sincerely,

PATRICIA BECK
Local Coastal Program

cc: Michael Fisher, Executive Director
California Coastal Commission – 631-Howard St, San Francisco 94105
Carl C. Hetrick
South Central Coast Regional Commission - 1224 Coast Village Circle, Suite 36, Santa Barbara, CA 93108
Greg Fox, Office of Planning & Research

APPENDIX

San Luis Obispo County Comments

Draft Environmental Statement

Proposed 5 Year OCS Oil and Gas Lease Schedule

<u>OVERALL COMMENTS</u>

1. The most obvious information lacking in the Draft Environmental Statement (DES) is the Department of Interior's (DOI) conclusion identifying which alternative is being recommended for congressional approval. We would suggest that this recommendation be emphasized with concise supporting documentation.

2. To clarify the alternatives being considered it would be helpful to include a table identifying all lease sales being considered within each alternative as well as the advantages and shortcomings of each alternative.

3. We would like to take issue with the alternatives being considered. Page 4 indicates that the comments received as a result of the Notice of Intent resulted in confining the alternatives to those included in the DES. A copy or abstract of these comments for an independent evaluation of the alternatives considered has not, however, been included in the DES. In addition, it does not appear that you are in compliance with Section 1502.14 of the Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act developed by the Council on Environmental Quality. This section requires an evaluation of <u>all</u> reasonable alternatives, and requires the consideration of reasonable alternative <u>not</u> within the jurisdiction of the lead agency, a no action alternative and an identification of the agency's preferred alternative. We contend that you have not considered all <u>reasonable</u> alternatives as discussed in more detail in our conclusion section.

4. We also want to restate our position that the proposed schedule is not based upon 8 specific factors required to be considered by Section 18 (a) of the OCS Lands Act in determining the size, location and timing of each lease sale. An elaboration of this issue is contained in our letter of September 17, 1979.

5. The timing of the lease sales proposed in California among all alternatives except alternative 2, do not conform with the optimum time suggested by the DOI on page 56. The suggested timing between sales outside the Gulf of Mexico is 3 years between the first and second sale. We would suggest this timing be used in the California lease sales.

6 An economic evaluation of the various alternatives is conspicuous by its absence. Such an analysis should be conducted to determine the short and long-term costs and benefits of each alternative, how the alternatives affect our Balance of Payments, and how they affect our short-term and more importantly long-term petroleum needs (not necessarily energy).

4. The discussion on socio-economic factors is misleading and inappropriate (page 97). This section should be rewritten to identify the socio-economic characteristics of the area and how OCS development may affect the area. Important factors to consider are population growth, service capabilities, potential economic and employment dislocations and tradeoffs, the potential for "boom-bust" growth patterns and the type of local economies in the area.

IV <u>Environmental Consequences</u>

5. The discussion on oil spill liklihood (page 123) should be expanded to discuss the various probabilities of an oil spill between different types of transportation/processing modes, including pipelines vs. tankering or on shore vs. offshore processing facilities.

6. The statement on page 127 that "...little significance can be attached to an average sized oil spill" requires further justification. Such a spill could become a problem along the Central California coastline characterized by near shore geologic basins, strong on shore winds and high wave heights ranging from 3-9' during 70% of the time.

7. The discussion on air emissions (pp. 130-131) is almost totally inadequate. Waste gas disposal emissions are alluded to, but emissions during operational OCS production equipment are ignored. The discussions regarding the health effects of NO2, sulfur dioxide. photo chemical oxidents and suspended particulates is so general as to portray a completely distorted description of the potential health effects of these pollutants. In addition to an elaboration of the above, this section should also discuss the effects of these pollutants on crops and property. The factors that could result in on shore air quality degradation (page 131) should also include off shore production platforms, and tanker loading operations.

8. The discussion on refining California OCS production (page 138) should be amended to incorporate the additional data described above under II-1.

9. The title on page 149 should be amended to include Central California.

10. On page 156 it is stated that low-level routine hydrocarbon discharges "...will also either enhance <u>or</u> inhibit phytoplankton activity..." Additional clarification should be added to this statement.

11. The conclusion on Impacts on Coastal Ecosystems too quickly dismisses the impact of an oil spill in kelp beds, rocky shores and estuaries. These habitats are not only important ecologically, but are extremely costly both economically and biologically to clean up and restore.

San Luis Obispo County Air Pollution Control District estimates that OCS development will cause an approximate 25% increase in our average daily hydrocarbon emissions, and cause substantial violation of the ozone standard.

Third, the reference to offsets as a mitigation measure is not easily used in rural counties that do not have a large number of other industrial facilities that can be used to create an air emission offset with OCS related development.

19. The section on Socio-Economic Impacts (pp. 235-236) is deficient in several respects: First, a population increase of up to 36,000 people can have a substantial impact to an area, especially in San Luis Obispo County which accounts for 73% of the projected oil in Lease Sale #53 and a proportionate population increase of 26,800; second, the section does not discuss the ability of an area to accommodate such an increase in terms of water availability, sewer and school capacity and other services; third, this section does not address the possible economic impact that may result from federal sanctions, should the increase in OCS related emissions shift the county from an "Attainment" to "Non-attainment" status. Estimated economic impact to this county ranges from $600,000 to over $4,000,000. The conclusion should be revised from a low to moderate impact to account for these various factors.

20. The discussion on Coastal Zone Management (pp. 255-256) should also include the present conflict between coastal management policies of consolidating industrial development, insuring compatibility of development with areas of high scenic quality, preserving marine and coastal resources and the rural character of parts of the coast, and protecting against the spillage of oil which infer the exclusion of certain areas of the coast from industrial development associated with OCS activities and the risk of oil spills; and the DOI position that all areas of the OCS <u>except</u> areas within 15 miles of the boundaries of the Point Reyes wilderness, which has hydrocarbon potential should be leased for OCS oil and gas production.

21. A major deficiency exists on the impact to marine sanctuaries (page 256). This section does not discuss the problem of a federal OCS lease draining the petroleum in a reservoir that is also within a state oil and gas sanctuary.

22. The section on Ports (page 257) should be expanded to address the types of impacts that could result from OCS related development in relatively small harbors such as Port San Luis and Morro Bay.

23. The discussion on Air Quality (page 271) should be expanded to include the differences in emissions from various transportation modes.

24. The DES should indicate on page 264 that all studies underway for LS #53 will not be available in time to be incorporated in the Draft EIS for LS #53, the only document that will be scrutinized via the public hearing process.

GENERAL CONCLUSIONS

After reviewing the information provided in the DEIS the accompanying background material used in developing the proposed 5 year OCS Oil and Gas Leasing Program the 1978 amendments to the OCS Lands Act and the regulations for implementing the procedural provisions of the National Environmental Policy Act developed by the President's Council on Environmental Quality, we find the following:

1. The proposed 5 Year Lease Schedule does not adequately consider the 8 Congressionally mandated factors required to be considered in developing the 5 Year Schedule pursuant to Section 18 (a) (2) (A-H) of the OCS Lands Act. Tab B of the background material used in developing the schedule mentions these factors, but does not explain how the factors were used in developing the schedule. In addition, the OCS areas considered within each lease sale are so large that analyzing and comparing the marine productivity, conflicts with other uses of the seabed, environmental sensitivity and other factors is meaningless.

RECOMMENDATION a) Define definite meaningful OCS areas sharing common characteristics b) Consider these areas based upon the 8 mandated factors and develop a revised 5 year schedule meeting the intent of the OCS Lands Act.

2. The Draft Environmental Statement (DES) for the proposed 5 year OCS Oil and Gas Lease Schedule does not adequately consider reasonable alternatives to the proposed action. The alternatives considered include various combinations on the number and timing of lease sales, but does not "include reasonable alternatives not within the jurisdiction of the lead agencys" as required by Section 1502.14(c) of the regulations for implementing the procedural provisions of the National Environmental Policy Act developed by the President's Council on Environmental Quality.

RECOMMENDATION Incorporate into the DES, reasonable alternatives that are not under the jurisdiction of the DOI. Such alternatives include: reducing the extend of OCS leasing to assure a viable supply of oil and gas is available for future use while placing an emphasis on: a) a national energy program focused on reducing energy demand rather than increasing energy supply. This would include an emphasis on energy conservation research and development in alternative energy sources, mass transit, etc.; b) maximize recovery of onshore oil and gas supplies through financial incentives, tertiary recovery research, etc.

3. Given the program and alternatives considered in the DES, which we do not feel meets the intent of the OCS Lands Act Amendments of 1978 nor the CEQ regulations for implementing NEPA, we recommend that the Secretary of the Interior adopt a revised Department of Energy Schedule (alternative #2) delaying LS #53 until such time that:

a. The baseline environmental studies for the Northern and Central California area are completed and incorporated into the Draft EIS (requires a delay of at least 6 months);

b. The northern tier pipeline is approved for construction to transport Alaskan oil to the Midwest thereby reducing the oversupply of oil on the West Coast (described above under Section II-1);

c. The ability to process West Coast and Alaskan OCS oil is assured.

Basis for Recommendation:

National Value

1. Meets 100% of the DOE production goals for the 5 year leasing program maximizing the national net economic value from OCS petroleum production (page 55).

2. Results in a greater number of sales held in the Gulf of Mexico where petroleum potential is most assured, where many of the preliminary environmental and geo-technical studies have been accomplished, and where the oil industry infrastructure and labor is available to bring hydrocarbons supplies to market quickly and at low cost (page 51)

3. Concentrates exploration and development exports in fewer frontier areas (page 54) providing additional time to obtain environmental base line studies and adopt coastal zone management programs in all areas proposed for leasing.

4. Allows the DOI to concentrate its resources for obtaining environmental and geophysical data in fewer areas and would allow industry to concentrate its geophysical data gathering in fewer areas and perhaps require less onshore infrastructure investment (page 54).

6. A delay of Lease Sale #53 until such time that the Northern Tier Pipeline is approved and refinery capacity is assured will maximize efficient utilization of those resources, minimize the possibility that an over supply of oil exists in any one area; and will eliminate the high costs of shipping oil through the Panama Canal to Texas.

Local Value

1. A delay in Lease Sale #53 will allow the time necessary to complete the scheduled environmental studies for incorporation in the draft EIS. We feel these studies should be available for use in the DEIS which serves as the basis for state and local comments on the proposed sale. Incorporating these studies in the final EIS does not give the public an opportunity to comment on the validity or accuracy of the studies. Table I identifies the present status of these environmental studies.

TABLE I
BLM STUDIES IN PREPARATION FOR DRAFT
ENVIRONMENTAL IMPACT STATEMENT - LEASE SALE #53

TYPE OF STUDY	DATE DRAFT WILL BE RECEIVED	DATE FINAL WILL BE RECEIVED
Summary of Knowledge of the Central & N Calif. Coastal & Offshore Areas	Completed	August, 1977
Marine Mammal & Seabird Survey of N & Central California	September, 1980	December, 1980-January, 1981
Oceanographic & Meteorologic Study of Offshore California	June, 1980	December, 1980
Ecological Characteristics of the N & Central Calif. Coastal Regions	January, 1980	April, 1980
Air Quality Modeling for the Onshore Lease Area (6 wks prior to DEIS)	February, 1980	?
Geohazards Assessment for the Proposed Lease Sale	December, 1979	August, 1980
Seabird Nesting Survey for Central & N California	November, 1979	1980
Effects of OCS activities on Cetaceans (whales, dolphins & porpoises) - Nat'l Study	Contract awarded Summer, 1979	?
Conflicts of Space & Facilities Use between the Fishing Industry & OCS activities - National Study	RFP Issued Summer, 1979	
OCS Development & Shellfish toxicity	(proposed) FY, 1980	proposed study
Risk assessment for coastal areas	(proposed) FY, 1980	proposed study
Acclamation of marine mammals within OCS lease areas	(proposed) FY, 1980	proposed study
Air Modeling study (to verify previous data)	(proposed) FY, 1980	proposed study

Note: Draft EIS - April, 1980
Public Hearing - June, 1980
Final EIS - October, 1980
State Comments Due - February, 1981
Sale - May, 1981

North Central Florida Regional Planning Council

2002 N.W. 13 ST., SUITE 202, GAINESVILLE, FLORIDA 32601 • TELEPHONE 376-3344 • CHARLES F. JUSTICE, EXECUTIVE DIRECTOR

October 16, 1979

Mr. Frank Gregg, Director
Bureau of Land Management
U.S. Department of the Interior
18th and C. Streets, N.W.
Washington, D.C. 20240

RE: A-95 Clearinghouse Review of U.S. Department of Interior, Bureau of Land Management-Draft Environmental Impact Statement-Proposed Five-Year Outer Continental Shelf Oil and Gas Lease Sale Schedule.

Dear Mr. Gregg:

Functioning as the Metropolitan and Areawide Planning and Development Clearinghouse as contemplated by OMB Circular A-95 for Administrative District III, State of Florida, the Clearinghouse Committee of the North Central Florida Regional Planning Council (NCFRPC) reviewed the above referenced Draft Environmental Impact Statement on October 10, 1979.

Subsequent to this review, the Committee voted to forward the following comments with regards to the proposal:

(1) The NCFRPC should be kept advised of OCS activities in the Gulf, especially the eastern Gulf.

(2) Increased activity in the Gulf should be accompanied by an increased state of preparedness for oil spill or other disaster.

(3) The environmental review process for each specific tract sale should be conducted as proposed in order that new technology and new estimates of impact may be evaluated.

(4) The DOI should evaluate its lease timing policies in terms of the implication that offering exploration leases creates vested rights which could conflict with needs for national reserves or other concerns [Reference: Proposed Phosphate Mining on the Osceola National

Mr. Frank Gregg
October 16, 1979
Page Two

(4) Continued

Forest, Florida]. While it may be sound energy policy to accurately determine energy resources, the DOI should consider that it may also be sound energy policy to save some reserves for later use or development with improved technology.

If you have any question regarding this matter, please do not hesitate to contact me.

Sincerely,

Charles L. Kiester
Director of Regional Planning

CC: Walter O. Kolb

CLK/vh

INUICH IKAYUQTAAT SUTIGULLIQAA PITQURATIGUN
LAW OFFICES OF
ALASKA LEGAL SERVICES CORPORATION
POST OFFICE BOX 309
BARROW, ALASKA 99723
TELEPHONE (907) 852-2311

October 12, 1979

Director
Bureau of Land Management
Department of the Interior
18th & C Streets, N.W.
Washington, D.C. 20240

RE: Draft Environmental Impact Statement--Proposed Five-Year OCS Oil and Gas Lease Sale Schedule

To the Director:

I have been asked the enclosed Resolution to you by the Village Council of Point Lay. This Resolution 79-01 is the Comment of the Village Council of Point Lay on the Draft Environmental Impact Statement on the Proposed Five-Year OCS Oil and Gas Lease Sale Schedule.

Sincerely yours,
ALASKA LEGAL SERVICES CORPORATION

Michael I. Jeffery
Attorney

Encl.

cc. Mrs. Esther C. Wunnicke, Manager, Alaska OCS Office, Anchorage
Hon. Walter Toorak, Mayor, Village Council of Point Lay

COMPREHENSIVE
PLANNING ORGANIZATION

Suite 524, Security Pacific Plaza
1200 Third Avenue
San Diego, California 92101
(714) 236-5300

September 27, 1979

Mr. W. Frank Gregg, Director
Bureau of Land Management (542)
Department of the Interior
18th & C Streets, N.W.
Washington, D.C. 20240

SUBJECT: Proposed Five-Year OCS Oil and Gas Lease Sale Schedule

Dear Mr. Gregg:

In accordance with the Department of the Interior's announcement, dated August 24, 1979, the following comments are submitted after our review of the Draft Environmental Statement for the Proposed Five-Year OCS Oil and Gas Lease Sale Schedule. As per the notice, our comments are directed at alternatives to the proposed action.

Lease Sale #48 was held this past June. Prior to the sale, Secretary Andrus withdrew the nearshore San Diego tracts because of "the concerns expressed by a number of groups in California, and balancing these concerns against the potential for oil and gas development." The factors the Secretary cites as a rationale for withdrawing those tracts have not changed, nor will they. The Comprehensive Planning Organization along with the County and City of San Diego and many other groups were in opposition to the nearshore tract offerings in Lease Sale #48. Nothing has occurred over the last several months which would change our position.

In our judgement, no significant technological advancements have been made to allow drilling in tracts greater than 400 meters in depth. Most of the tracts offered during the previous lease sale were located in deep water tracts. If there was an accident during the development of these tracts, the onshore costs to local governments would be substantial.

There have been few, if any, improvements in the southern California oil spill containment or clean-up capability. The San Diego region over the years has made a conscious decision to reduce its reliance upon the aerospace and defense related industries which have rather wide cyclical economic fluctuations. The regional economic strategy has been to emphasize the recreational and tourist sectors of the economy and selectively diversify the industrial base. The San Diego region has significant environmental assets and part of the strategy is the maintenance of those assets while promoting compatible economic development. The implication of nearshore oil and gas

development is inconsistent with the regional economic strategy, and in our judgement the existing oil spill clean-up process is an inadequate mitigation measure to protect the economic base from substantial adverse impacts.

The resource estimations for the San Diego nearshore tracts for lease sale #48 were a small amount of energy when computed against national consumption figures. The resource estimates should not change over the next five years unless new estimation techniques are used. Thus, San Diego, and indeed the Nation, will derive very nominal benefits from the production of these nearshore tracts at potentially higher real production costs.

It is because of these concerns that we ask that any petroleum development nearshore to San Diego be deleted from the three California lease sales which are scheduled during the next five years. The local governmental entities and groups have clearly articulated their concerns during Lease Sale #48. It is unlikely that the relatively short time frame will change the resource to be developed and San Diego's OCS oil and gas policy, and thus the offering of nearshore tracts to San Diego benefits no one. Any such tract offering will only expend limited local and federal resources. It is our judgement that the oil companies concur with this direction because the industry showed very little interest in Lease Sale #48 bidding for the offshore tracts which have a significantly greater estimated resource than the nearshore tracts.

Sincerely,

Paul Graham

PAUL GRAHAM
Chairman, Board of Directors

PG:JK:ce

cc: Congressman Lionel Van Deerlin
Congressman Bob Wilson
Congressman Clair Burgener
Senator Alan Cranston
Mayor Pete Wilson
Sec. Cecil Andrus

Department of Environmental Services
Planning and Development Division

BOARD OF SUPERVISORS
EDWARD J. BACCIOCCO, JR.
JAMES V. FITZGERALD
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COUNTY OF SAN MATEO
COUNTY GOVERNMENT CENTER • REDWOOD CITY • CALIFORNIA 94063

DAVID C. HALE
PLANNING DIRECTOR
(415) 364-5600, EXT. 4161

October 1, 1979

Director
Bureau of Land Management
Department of the Interior
18th and C Streets, N.W.
Washington, D.C. 20240

Comments On The Draft Environmental Statement Proposed Five-Year OCS Oil And Gas Lease Schedule

San Mateo County has received and reviewed the Draft Environmental Statement for the proposed five-year OCS oil and gas lease schedule. We appreciate the opportunity to respond with our environmental concerns. We realize that the EIS is programmatic and cannot cover in detail the environmental impacts of individual lease sale areas. Nevertheless, it is important that we point out the areas of environmental impact which are of concern to us to the end of obtaining an adequate discussion of these impacts in the DEIS for lease sale #53.

Initially, we do not agree with your interpretation of Sec. 18 (2) B of the OCS Lands Act as amended, which mandates "an equitable sharing of developmental benefits and environmental risks among the various regions." The Bureau of Land Management has interpreted this subsection to mean that all regions of the country are expected to contribute if economically-recoverable deposits of hydrocarbons are located off their shore, and to share in the risk of development. Clearly this interpretation does not allow for an equal distribution or sharing of the benefits and risks of OCS development among the various regions. Instead of a sharing of risks and benefits, we are faced with a situation in which our local economy and a pristine area of California coast could be damaged for years in exchange for an estimated six-day supply of oil for the nation. We do not believe that Congress intended that the Bureau of Land Mangement should interpret the OCS Lands Act in a manner which results in a federal agency playing "Russian Roulette" with the environmental resources of the regions involved in OCS lease sale activities. It is our opinion that Congress intended that a balance should be achieved between environmental risks and the developmental benefits of oil resources, and that BLM was to use the size, timing and location of lease sales to achieve this balance. The present lease sale schedule as proposed, maximizes oil production and minimizes attention given to environmental risk. It is our opinion that Congress intended a more judicious approach.

Parenthetically, Table II-3 which measures the relative environmental sensitivity of OCS leasing areas, does not define what is meant by High, Moderate, and Low environmental sensitivity. We hope that the DEIS for lease sale #53 will be specific about the meaning of these relative measures.

As previously mentioned, we realize that environmental impacts cannot be quantitatively assessed at the program level of planning. However, in the interest of achieving a balance between the meager resources assumed to be present off the shores of San Mateo County, and the environmental risks inherent in obtaining those resources, we request the following detailed analyses be included in the OEIS for lease sale #53:

1. An analysis of geological hazards, using data of the highest resolution available.

2. Air Quality Modeling of the effects of OCS offshore development on the San Francisco Bay Air Basin.

3. Land Use Impacts - a detailed analysis of the infrastructure requirements for servicing offshore facilities and an assessment of the ability of local service agencies to meet these needs.

4. An assessment of the cumulative environmental impacts of OCS development consisting of:

   a. A list of projects producing related or cumulative impacts;

   b. A brief but understandable summary of the expected environmental impacts to be produced by those projects;

   c. A reasonable analyses of the combined or cumulative impacts of all the projects.

An adequate discussion of the areas of concern mentioned above should provide the Secretary of Interior with the detailed information he will need to establish an equitable sharing of environmental risks and benefits. In addition, this information should also fill in the "gaps" of quantitative material which could not be addressed in the programmatic EIS on the five-year leasing schedule.

Sincerely yours,

David C. Hale
Planning Director

DH/WR:jr

ENVIRONMENTAL RESOURCE AGENCY
county of ventura

October 10, 1979

Director (542)
Bureau of Land Management
Department of the Interior
18th and C Streets, NW
Washington, D.C., 20240

Dear Sirs:

Subject: Draft Environmental Statement, Proposed Five-Year OCS Oil and Gas Lease Schedule

We appreciate the opportunity to comment on the above document. Our comments will pertain only to those lease sales which have the potential to impact Southern California, and more specifically Ventura County.

In general, the DES addresses many of the issues and impacts on Southern California from the indiviudal lease sales. In some cases it also suggests some general mitigation measures for these impacts.

On major omission, however, is the lack of a cumulative assessment. There are four proposed lease sales off the California coast, plus the recently completed Lease Sale 48, which will have significant cumulative impacts on Southern California and Ventura County. In addition, any other lease sale which could increase tanker traffic in California shipping lanes would add to the cumulative impacts.

This is very apparent with respect to air quality. OCS related developments are known to produce substantial amounts of reactive hydrocarbon (RHC) emissions, and prevailing winds over Southern California carry most of these emissions onshore. The DES briefly recognizes the potential impact of the proposed leases on air quality in Southern California, and indicates that the use of pipelines are desirable due to the air quality implications in the use of tanker terminal operations. Additional information should be provided in the Final Environmental Statement with respect to the cumulative impacts, and mitigation measures to be developed for controlling emissions so various agencies, such as Ventura County, can remain in conformance with requirements of the Clean Air Act Amendments of 1977.

In a closely related issue, there are two proposed lease sales offshore of California, Nos. 73 and 80, which lack specific tract locations. It is highly probable that OCS tracts in the Santa Barbara Channel will be included in these lease sale areas since oil industry officials have indicated that the Channel is their primary area of interest for OCS leases offshore of California. Becasue of this lack of information, it is impossible for a local agency to determine impacts from these lease sales. We understand this information will be available at the sale proposal stage and that another DES will be prepared then.

800 South Victoria Avenue, Ventura, CA 93009

Ventura County staff feels that an in-depth cumulative assessment should be part of each DES for the individual lease sales, which includes existing OCS developments and Lease Sale 48 impacts. In addition, the subject DES should have a cumulative impact section added. There should be enough information generated from previous environmental statements to accomplish this assessment.

Also, the DES does not prioritize the various regions through a comparative evaluation process. This priority ranking is required by the OCS Lands Act Amendments and should be done in the Final Environmental Statement due in January, 1980.

Again, thank you for the opportunity to provide these written comments.

Sincerely,

RESOURCE MANAGEMENT AGENCY

Victor R. Husbands, Director

VRH:db

cc: Board of Supervisors
Chief Administrative Officer
Coastal Commission

ambag
ASSOCIATION OF MONTEREY BAY AREA GOVERNMENTS
MAIL ADDRESS: P.O. BOX 190, MONTEREY, CALIFORNIA 93940 • TELEPHONE (408) 624-2117
OFFICE LOCATION: 23845 HOLMAN HIGHWAY, SUITE 227

October 11, 1979

Director
Bureau of Land Management
Department of the Interior
18th & C Streets, N.W.
Washington, D.C. 20240

Re: MCH Number 097925 - Proposed Five-Year OCS Oil and Gas Lease Schedule

Dear Sir:

AMBAG has circulated a summary notice of your draft environmental document to our member agencies and regional planning and management organizations for review and comment.

Enclosed are comments which were generated by AMBAG staff review. We would appreciate two copies of the Final Environmental Statement and notice of the action taken on the project.

Thank you for complying with the Clearinghouse process.

Sincerely yours,

Warren C. Freeman

Warren C. Freeman
Regional Planner
Metropolitan Clearinghouse

WCF/acs

Enc.

AMBAG A-95 REVIEW COMMENTS September 14, 1979

Draft Environmental Impact Statement
Proposed Five Year OCS Lease Sale Schedule

Introduction

As a followup to the review of the Draft Five Year Lease Plan for oil and gas production on the United States outer continental shelf, AMBAG has prepared this review of the DES for the proposed schedule. This review will be circulated throughout the region, to the Bureau of Land Management and to the California Coastal Commission. In addition, the review will be placed on the regular AMBAG Board agenda for October 10 and may be commented upon at that time.

Public hearings now are scheduled on the Draft ES, and will be held October 1 through 5 in Anchorage, Alaska; Los Angeles, California; New Orleans, Louisiana; New York, New York; and Washington D.C.

The hearing in Los Angeles, California will be held October 3 through 4, 1979, in the Renaissance Room, Biltmore Hotel, 515 South Olive Street, Los Angeles, California 90013. Both hearing dates are scheduled for 9 a.m. to 5 p.m. with provisions to extend into the evening hours on October 3 if necessary.

Those who wish to present oral testimony must contact the Bureau of Land Management's Pacific OCS Office, 300 N. Los Angeles Street, Room 7127, Los Angeles, California (213-688-4324) no later than 4 p.m., September 24, 1979. Time preferences for presentations of oral statements will be honored whenever possible. Confirmation of actual individual scheduled times will be mailed to respective participants prior to the hearing date.

Summary

The DES discusses the proposed leasing schedule that was submitted to Congress in June of 1979, and examines seven alternatives to the schedule. The Draft ES also discusses regulations and mitigating measures which will be in effect for the sales on the proposed schedule.

The proposed action (Alternative 1) consists of a schedule of 30 Outer Continental Shelf (OCS) oil and gas lease sales for consideration in the period between March 1980 and February 1985. Sales are considered in the North Atlantic; Mid-Atlantic; South Atlantic, including Blake Plateau; Gulf of Mexico; Southern California, including Santa Barbara Channel, Gulf of Alaska; Cook Inlet and the Beaufort Sea; all areas where previous oil and gas lease sales have been held or are proposed to be held prior to March 1980. Sales are also considered in Central and Northern California; Kodiak; Northern Aleutian Shelf; St. George Basin; Navarin Basin; and the Chukchi Sea; all are areas where no previous OCS oil and gas lease sales have been held, or, in the case of Central and Northern California, no recent sale has been held, and no development has taken place.

Stipulations may be developed to address a wide variety of situations and concerns. In the past, they have most often been used to protect cultural and biological resources and to mitigate against potential geologic hazards. They may be used to restrict operations to a specific portion of a tract, when some portions are considered geologically adversely affected by operations.

In summary, development activities stemming from Alternative 1 will result in increased conflicts with other uses of the OCS; these range from minor inconveniences to local, severe short term use curtailments from oil spills, including those resulting from tanker collisions. Loss of lives from tanker collisions and other accidents may also result. The extent of these impacts will be largely determined by specific tract selections made at the sale decision stages, and can be mitigated to some degree through tract selection decisions and stipulations imposed in the sale decision, and by regulation in the post-sale stage.

Pages 32 through 40 present a description of the proposed action. They point out that OCS 53 (Central and Northern California) may produce as much as 730 million barrels of oil and 0.84 trillion cubic feet of oil within an area of 1.5 million acres. About 95 exploratory wells would be developed and if estimates prove correct, as many as 768 production wells on 33 platforms would be constructed. This level of production would carry with it a statistical probability of over 4 oil spills of at least 1,000 barrels each.

Pages 88 through 97 contain a generalized description of the physical and social characteristics of the entire Pacific Region. It is noted that the Santa Cruz basin lies adjacent to an onshore basin but that production has been relatively small. Several geologic characteristics are identified as being characteristic of instability in the sea floor and "...clues to the location of fractured reservoir rocks and shallow over-pressured gas pockets that can pose a danger to drilling operations." (page 92) The summertime wind patterns tend to trap any surface generated emissions within the marine air layer and transport them onshore. Damage to shipping and to waterfront areas along our coastal zone occasionally occurs as a result of tsumanies.

The environmental consequences of OCS development are presented on pages 122 through 275. These generalized impacts are expressed within the context of

• oil spills • offshore and onshore water effluents • offshore and onshore air emissions • service and support bases onshore (50 to 100 acres) • pipelines and pipeline terminals • drilling rigs and production platforms offshore

Conclusions expressed on page 150 state that "prospects for seismic activity within the life of oil and gas development (in OCS area 53) is relatively high." In addition the "gale force winds and fog which periodically frequent northern California coastal waters could also hamper navigation of support vessels serving offshore facilities." The placement of an anticipated 33 platforms would remove about 2,650 hectares of seafloor from travel fishing. Losses to fisherman can be expected to increase both from loss of gear and from contamination of species due to projected spills. Due to presently limited port facilities in our area conflict for space is "likely to be intense and fairly long term." (page 180) The impacts of spills on bird and mammal species are addressed only briefly noting that some endangered species and sea otters would be very sensitive to oil spills. Impacts on recreation and sport fishing are highly generalized noting only that, "...some disruption, and very possibly foreclosure...can be expected to result..." (page 218) AMBAG has developed detailed evaluations of our regional visitor economy and this information should be assessed and considered by the BLM.

Conclusions reached on air quality impacts (page 228) are unfounded because page 225 states that "project specific impacts can only be defined by preparation of any emissions inventory and through appropriate diffusion modeling." How, then, can the statement be made on page 228 that "Therefore, additions from OCS related development activities, though small, would need to be mitigated..." Socioeconomic impacts are treated on pages 235 and 236. It is estimated that 3,100 jobs directly related to production and another 9,000 jobs indirectly related to OCS production would be created. Just how many of these jobs and resulting households would be located in the AMBAG region is not revealed. Without this information no meaningful evaluation can be made of socioeconomic impacts within the AMBAG region.

Under the heading of "Impact on Other Management Plans" the California Coastal Plan and Local Coastal Plans are mentioned but no attempt is made to relate OCS development to these plans. Because Local Coastal Plans will not be certified until January of 1981 it is not yet possible to say if onshore support bases will be consistent with local plans.

Conclusion

This document is so highly generalized that it provides very little information for a given lease sale area, such as area 53, and even less information for the evaluation of any given basin within a lease sale area. Given that area 53 is ranked low in resource potential but rather high by industry due to transportation advantages and access to markets it would appear that economic gain is the overriding issue. This DES does little to demonstrate that the desire for economic gain has been carefully balanced against the existing environmental and economic well being of the AMBAG region.

VILLAGE COUNCIL OF POINT LAY

Resolution No. 79-01

A RESOLUTION OPPOSING OFFSHORE OIL LEASE SALES IN THE CHUKCHI SEA AND THE BEAUFORT SEA

WHEREAS, the Village of Point Lay is a federally-recognized IRA village on the shores of the Chukchi Sea. Our village is hundreds of miles from any major population area. Our 90 residents depend almost entirely on subsistence hunting for the food we eat. Mail is delivered only once a week and we have only one phone for our use. We hunt caribou and other game on land and beluga whales, seals, walrus and other marine mammals in the ocean. We fish in the rivers and the ocean. Without the subsistence hunting that we do, we could not survive at Point Lay; and,

WHEREAS, we have learned that the Department of the Interior and the State of Alaska are planning off shore oil lease sales in the Chukchi Sea near our village. We also know that the State and Federal governments are planning an offshore oil lease sale in the Beaufort Sea in December, 1979, and another Beaufort Sea sale in 1982 for lease areas in the pack ice seaward of the December, 1979, sale; and,

WHEREAS, representatives of our village travelled to Barrow to testify at the June 4, 1979, hearing on the Draft Environmental Impact Statement on the proposed Beaufort Sea oil and gas lease sale. The representatives stated our deep opposition to these offshore oil leasing plans. Now the Department of the Interior is proposing sales in even more dangerous areas for Arctic ice conditions; and,

WHEREAS, the Department of the Interior predicts one major oil spill from development in the Beaufort Sea sale area proposed for 1979; four more major spills from development of the Beaufort Sea sale area proposed for 1982; and eighteen more major spills from development in the sale area proposed for the Chukchi Sea in 1985; and,

WHEREAS, our village has already seen how oil spills hurt the sea mammals. Our residents report the 1969 fuel oil spill in the lagoon in front of our village from a fuel loading operation for the DEW line site near our village. For the first time in the memory of our oldest residents, NO seals came into the lagoon by our village for a year. The predicted oil spills from the oil exploration and development would drive away the marine mammals and fish from our area and make it impossible for use to continue as a village at Point Lay; and,

WHEREAS, federal law requires consultation with tribal governments to make sure that proposed federal actions are coordinated with tribal land use plans. The Village Council of Point Lay has been recognized since 1939 under the Indian Reorganization Act, and we find that these proposed federal actions and state actions for offshore leasing in the Beaufort Sea and the Chukchi Sea threaten the existence of our village and other groups of native people on the Arctic coastline who also depend on fish and marine mammals for their food; and,

WHEREAS, our village people know that the federal law also protects endangered species like the bowhead whale from activities that threaten its existence as a wildlife population. The bowhead whale migrates through the Chukchi Sea area twice each year and in or near the proposed Beaufort Sea sale areas twice each year. Oil and gas exploration and development would threaten noise and water pollution that would disturb the whales and even force them to no longer migrate along the Arctic Slope. Beluga whales that our village hunts would also be harmed in this way; and,

WHEREAS, the Native American Religious Freedom Act is a federal law that protects our native people in the exercise of their traditional religion and culture that is based on the subsistence hunting of marine mammals and other wildlife. This proposed oil and gas exploration will violate that Act by denying us access to our traditional subsistence hunting activities.

NOW, THEREFORE, BE IT RESOLVED by the Native Village Council of Point Lay, that it:

1. Opposes the Beaufort Sea Oil and Gas Lease sale proposed for December, 1979.

2. Opposes the additional lease sale proposed for the Beaufort Sea in 1982 and the Chukchi Sea in 1985.

3. Respectfully requests the Secretary of the Interior and also the Governor of Alaska to postpone indefinitely the proposals to allow oil exploration and development in the Beaufort Sea and Chukchi Sea, and to remove these areas from the leasing schedules now under consideration by the Government.

4. Finds as the tribal government for this coastline area of the Chukchi Sea that the plan of the Department of the Interior to allow offshore leasing in the Chukchi Sea will deny us access to subsistence hunting of marine mammals and other wildlife that is basic to our culture and so these leasing plans violate the Native American Religious Freedom Act.

Resolution No. 79-01
Page Three

5. Finds as the tribal government for this coastline area of the Chukchi Sea that the plan of the Department of the Interior to allow offshore leasing in the Chukchi Sea is not consistent with the tribal land use plans for this area and that such off shore oil lease should not be allowed.

INTRODUCED: SEPTEMBER 30, 1979

PASSED: SEPTEMBER 30, 1979

Walter Bodie
MAYOR OF THE NATIVE VILLAGE
COUNCIL OF POINT LAY

ATTEST:

Fred Tukrook
VILLAGE CLERK

BOARD OF SUPERVISORS
COUNTY OF HUMBOLDT
EUREKA, CALIFORNIA 95501 PHONE (707) 445-7471

RECEIVED
OCT 19 1979
OFFICE OF THE DIRECTOR
BUREAU OF LAND MANAGEMENT

October 15, 1979

Cecil Andrus, Secretary of the Interior
Frank Gregg, Director
Bureau of Land Management
Department of the Interior
18th and C Streets, N.W.
Washington, D.C. 20240

RE: Comments on the Draft EIS for the OCS Leasing Program

Dear Secretary Andrus:

As a local jurisdiction faced with the prospect of offshore oil and gas development, Humboldt County welcomes the chance to review an assessment of the potential impacts of the leasing program on our area.

The County presently produces about 2 billion cubic feet of dry gas per year onshore, contributing a small but significant amount in meeting the nation's energy demand. The proposal to explore and develop the offshore petroleum resources offers the potential of increased production, but must be balanced with the need to maintain the vitality of the renewable resource-dependent industries of the region.

The timber and fisheries industries, upon which the region's economy is almost entirely based, have experienced significant setbacks due to Federal programs in the past, and an additional proposal which might further set back our commercial fishing industry must be viewed with concern.

Based on a review of the information contained in the DEIS for the leasing program, the proposed schedule of leasing off the California coast does not appear to be in the County's interest. While the impacts on the fishing industry are predicted to be moderate, the possible compensating mitigation of increased investment and employment is predicted to be minimal. Futhermore, it appears that the national interest may be better served by the Department of Energy's schedule which concentrates efforts in the more promising areas and includes only one Northern and Central California sale in the next five years. We are, therefore, recommending that you drop sales #73 and #80 from the schedule. In regard to sale #53, we will defer opinion until we have reviewed the EIS for that particular sale this coming spring.

We trust that these recommendations and the comments that follow will be reflected in the final environmental statement and be given due consideration in the decision making process.

Sincerely,

Harry Pritchard

Harry Pritchard, Chairman
Humboldt County Board of Supervisors

HP/TH/dp

Attachments

cc: Governor Edmund G. Brown, Jr.
Michael Fischer, Executive Director
California Coastal Commission
William Grant, Director Pacific OCS Office
Bureau of Land Management

COMMENTS ON THE SCOPE AND ACCURACY OF THE DRAFT ENVIRONMENTAL STATEMENT FOR THE PROPOSED FIVE-YEAR OCS OIL AND GAS LEASE SCHEDULE

Submitted by Humboldt County Planning Department
October 12, 1979

1. The scope of analysis that the document is confined to is questionable, and seems to ignore repeated statements of concern in regard to California's OCS. The conclusions reached as a result of Interior Departments scoping of the issue appear to be dubious in light of the past history of controversy of the schedule, particularly in reference to the Northern and Central California region.

2. Given that the scope of the document is intended to be confinded to the points listed on pages 4 and 5, the document fails to even provide the analysis outlined on those pages; specifically, the document fails to assess the differences in levels of impacts resulting from Alternatives 2 and 6.

3. The mandate of Section 18(a)(2) A-H directing the timing and location of lease sales suggests the use of a comprehensive matrix approach to evaluate each region; Table II-3 on page 41 is an attempt at this, but fails to include the mandates of Section 18(a) B, C, E and F. While these mandates are considered elsewhere in the document, the presentation does not allow public evaluation of whether or not the Section 18 mandates have been adequately considered.

4. The argument that lack of specific tract locations precludes quantitative assessment of impacts (p.v) is not valid. USGS has made basin estimates for all the areas, and together with initial Call for Nominations results, provide adequate information to prepare development and production scenarios as outlined by methodologies such as those developed by the New England River Basin Commission. The argument that such and undertaking might be beyond the budget constraints of the program may be more valid, and should be used if it is the case. However, Interior should consider developing such capabilities for future leasing program schedule EIS's.

5. A similar argument is put forth in regards to transportation and marketing (pp. 32, 37). Indeed, these issues cannot be addressed with any certainty until after the leases are sold and exploratory drilling takes place - much too late under the present statutory arrangements which the exploration and production to provide a realistic decision point for development. Analysis should be undertaken in future documents using USGS basin estimates to project production, transportation, and marketing scenarios. Only when this level of analysis is reached will the Federal government be able to provide meaningful energy policy direction for the nation, and to be able to properly assess the role of OCS as an element of national energy policy.

6. Public evaluation of the analyses in the document is hampered by the lack of a bibliography.

7. Northern California Indians subsistence fish the Klamath River basin for anadromous species which migrate through the OCS. This should be recognized by providing a rating in Table II-3, p. 41.

8. Page 92. Physical Oceanography and Meteorology - "Its velocity, which averages about 0.2 knots,...". Velocity is a measurement of speed <u>and</u> direction. Winzler and Kelly study indicates a rate "of less than 0.5 knot." (p. IV-6)

   Marine Habitats and Resources - "red tide blooms are typically caused by dinoflagellates." Are there causes other than dinoflagellates? Discussion should include mention that anthropogenic introduction of micronutrients such as iron has been correlated with increased occurences of red tide blooms.

9. Page 149. Northern California. "Normal oceanographic conditions do not pose a serious threat to OCS development." The certainty of this statement must be questioned, since sea state data for this area is sparse and production technology for the depths encountered is only in the design phase. Production technology in waters deeper than 1200 is seriously constrained by normal physical oceanographic conditions.

10. Pages 159-160. Onshore Water Quality and Supply. "OCS-related facilities would cause only a minimal to moderate water supply impact." This section of the DEIS is perhaps the most questionable one of the entire document. The water needs of the OCS development are great in comparision to existing demand in Northern California. For Humboldt County, the most industrialized of the northern California counties, the projected OCS-related water demands appear to be on the same order of magnitude as the existing cumulative industrial demand. The paragraph should be changed to reflect the fact that the intensity of impacts on water supply is dependent on the size and excess capacity of existing systems, and that in some cases impacts may be very substantial.

11. Page 205. Endangered Species - Northern California "the proposal is not expected to result in jeopardy to endangered species, based on the assessment for similar species in southern California." The Section (IV. B.3.b.) which is referenced to contain a discussion of the grey whale does not discuss the grey whale. The DEIS for Lease Sale #48 predicts moderate (6-15% Population Injured, Destroyed, or Displaced) impacts on the grey whale for that lease sale alone. It is thus suspected that the increased amount of leasing proposed in the 5-Year leasing program which encompassses much of this whales' migratory route and feeding area could pose some jeopardy to it. A similar concern applies to the Brown Pelican.

City and County of San Francisco **Department of City Planning**

19 October 1979

Director (542)
Bureau of Land Management
Dept. of the Interior
18th & C Streets, NW
Washington, DC 20240

RE: DEIS for Proposed Five-year OCS Oil and Gas Lease Sale Schedule, March 1980- February 1985

Dear Director:

The following comments on subject DEIS are submitted on behalf of the City and County of San Francsico. San Francisco has an on-going interest in off-shore oil development policy because of potential economic and environmental effects of the development of Northern California Continental Shelf resources. General comments will be followed by comments on specific sections of the DEIS.

It is difficult to deal with a subject of this magnitude concisely and you are to be congratulated for the brevity of this document compared to many past EIS's; however, the balance of the coverage leaves some questions in the reader's mind. Can a decision on a proposal of this magnitude be made in the absence of consideration of the cumulative impacts of all aspects of the proposed project primary and secondary? References to unspecified mitigation measures do not meaningfully implement CEQ Guidelines Section 1502.16 (h). In tiered environmental analysis it is important to cover all the fundamental issues in the program over-view analysis in order to avert unpleasant surprises when later, detailed analysis is performed for specific implementation elements of an overall plan.

Page iii, Paragraph 3. If the largest environmental impact is expected to come from oil spills, how can a decision be made before estimates of probable numbers of spills can be made for all alternatives? Using worst case assumptions is it not possible to derive a worst case limiting value for the number of spills for all alternatives?

Page iv, Para. 1. If "the Atlantic leasing areas and Kodiak have a markedly smaller risk of oil spills than other regions, due to low projected amounts of oil," why is there no alternative that does not include these areas on the grounds that the least productive areas are least worth developing?

Page iv, Para 2. What are "major mitigation routes"? The current situation in the Gulf does not lead the reader to be sanguine about mitigation of oil spills, nor do the effects of past major oil spills. The statement that "these resources are discrete and limited enough that tract selection and mitigation measures for particular lease sales can mitigate adverse environmental impacts to the resources involved" is not particularly credible in the absence of substantiation. The main text does not contain enough information to allay anxiety on this point.

(415) 558-4656 **100 Larkin Street** **San Francisco, CA 94102**

Page v, Para 1. Under circumstances where "proximity to resources of concern and oil spill trajectories cannot be determined at the program level of planning" a worst case analysis should be made. This often serves as a means of determining what additional information is needed and can point out what types of mitigation measures should be sought and evaluated. If a program EIS is not used as a means of focussing analysis as a program develops, one of the potential benefits of the environmental review process is not realized. A program EIS should be used as a management tool in deciding how to allocate resources.

Page v, Para 3. Wouldn't chronic gear damage and loss, regardless of the availability of "compensation," be likely to affect long-term stability of the local fishing industry? What is the potential for gear damage and oil spills to cumulatively significantly affect local fishing which plays an important role in the economy of small coastal communities?

Page v, Para 4. How do you mitigate impacts on subsistence harvesting of fish and marine mammals in Alaska "without inducing cultural dislocation"?

Page viii, Para 2. Are coal and shale the only "alternate energy forms" considered? In view of the significant present energy policy debate on alternative mixes of energy sources, this paragraph which does not mention various forms of solar energy, energy conservation strategies, or other policy options does not appear to realistically reflect the actual policy options within Alternative 8.

Page 11, Para 2. If there is "provision...for comment by... executives of affected local governments", why did San Francisco have to request a copy of the DEIS instead of automatically receiving one? The earlier the opportunity for comment, the greater the cooperation you will receive from local government. It is possible that a DEIS copy sent to San Francisco was misrouted; however, this cannot be determined since the CEQ Guidelines Section 1502.10 (i) List of Agencies, Orgainzations, and Persons to Whom Copies of the Statement Are Sent does not appear to be included in the DEIS.

Page 30, Para 4. Oil shale development with current technology involves significant waste disposal and air pollution impacts. These certainly must be, and presumably have been taken into accout in policy development and were probably discussed in the cited EIS. The environmental impact of this energy source should be mentioned in this paragraph.

Page 30, Para. 5 Oil is economically significant not only as a direct energy source but also as a raw material for the petrochemical industry. It should be noted that biomass has the potential to fill both these needs.

Page 31 Why is there no mention of wind, wave or ocean thermal generation of electricity alternatives?

Page 34-5 These figures would have been helpful earlier and should be referenced in the Summary.

Page 34, Para. 2. What are the difficulties which could occur if all the crude is sour? What modification of existing refineries would be required if this were the case?

Page 40, Para 1. Why is there no reference to the Enviromental Impact Report for the Point Conception, CA LNG facility? LNG installations have significant disaster potential; it would be appropriate to reference analysis of these impacts, and to summarize them, pursuant to CEQ Guidelines Section 1502.21.

Page 41 Table II-3 does not contain enough information to enable the reader to decode the symbols in the three right-hand columns or to judge the assumptions used in assignment of Low, Medium, and High sensitivity to impact.

Page 47 Para 3. It is not clear what is meant by the "frontier" nature of Northern California.

Page 47. Section 1508.8 of the CEQ Guidelines indicates that the impacts to be covered in the EIS include economic effects. Discussions of the economic consequences of the impacts on fishing are consistently absent or understated in this DEIS.

Page 95. What would be the economic consequences of impacts on fisheries? Note that San Francisco Bay serves as a major "nursery " area and any oil spill which could impact San Francisco Bay would have impacts on juveniles of various species, such as the Dungeness crab, whose abundance could be affected for a number of years throughout the adult range of these species.

Page 122. Why is there no discussion of means of mitigating deliberate introduction of hydocarbons to the environment?

Page 126. Worst case analysis is appropriate in such a situation. The statement that "Given these circumstances little significance can be attached to an average size oil spill." is ambiguous. It is probably intended to mean that an average of a set of data with a large range is not very meaningful, but it can be read to mean that average sized spills are of no consequence.

Page 128. The table indicated the presence in drilling mud of detergents, which can have significant toxic impacts on biota, and of the carcinogen sodium chromate. The potential biological impacts of release of these substances into the Ocean is not discussed.

Page 129. What is the pollutant "Sludge conditions"?

Pages 131-2. A worst case analysis of all the impacts of the lease sale program should be made now rather than after a decision is made. Deferring analysis of the impacts of construction and operation of onshore facilities until "more specific information is known regarding sale location..." would mean that significant potential impacts would not be taken into consideration when the decision between lease plan options was made.

Page 157. Has recent work on the biological effects of petroleum components on marine organisms done at the National Marine Fisheries Service, Southwest Fisheries Center, Tiburon, CA been taken into account in this analysis?

Page 159, Para 4. What are the "appropriate mitigative measures" and what is the evidence of their effectiveness?

Page 160, Para 1. "Operations bases will require about one million gallons of fresh water...for each exploratory or development well which is drilled." On the North Coast of California it may be hard to get this much water during the dry season and there should be assurance that aquifers supplying local drinking water would not be affected.

Page 164, Para 6. The land use impacts will also result in increased demands for local and state agency services such as police, health, and fire to benefit new construction and permanent personnel. Is there a discussion of how such services would be funded elsewhere in this DEIS?

Page 165. Along hilly sections of the Northern California coast it may be difficult to find 25 to 100 acre sites without the disruption of major grading which could be objectionable in a coastal area (as well as expensive).

Page 168. Land use impacts should be considered not in terms of per cent of total area affected but in terms of per cent of inhabited area, per cent of critical habitat affected, etc.

Page 172, Para 3. "Though the sites revealed would be disturbed, they would be no less significant than if they were intact since they would represent unique habitation from a time period and location not previously examined." This statement is deserving of comment on two grounds. I do not believe that all historians or archaeologists would agree that it is better to destroy part of a site to get interesting information than to leave it intact for future careful examination that would reveal the maximum possible information. It is also not clear how finds can be described as "unique" in the absence of any information about their presence or nature.

Page 173, Para 7. Is there evidence that the sum available is adequate to cover the probably loss? Will economic losses due to time gaps between loss and replacement of equipment be covered?

Page 179. Have the City and County of Santa Barbara been consulted as to their view of the possible impacts? Some evidence of their opinions and concerns would be helpful.

Page 180. Conflicts for shore facilities may seem moderate in a national context but may be more than "moderate" from a local industry point of view. What are the potential economic consequences of such conflicts?

Page 205. If a sea otter with oil on its fur "would probably die," how can it be concluded that "the proposal is not expected to result in jeopardy to endangered species"?

Page 212, Para 4. "Repopulation of an area could be anticipated to be well underway by the end of the succeeding spawning cycle." Is this expected to be true of anemonies, sponges or sessile filter-feeders, all of which can be smothered and suffer effectively 100% local mortality?

Page 228, Para 3. Is it technically and economically feasible to mitigate air pollution impacts so that Northern California air conditions do not deteriorate? Air pollution is a constraint on industrial development in the Bay Area. If offshore oil development uses up all available offsets, what will happen to other kinds of development?

Page 235, Para 4. A brief explanation of the multiplier factors used in employment projections is needed so that these figures can be evaluated.

Pages 235-6. An estimate of to what extent jobs would go to local unemployed persons and to what extent skilled workers would be brought in from existing oil development areas is needed.

The concern of San Franciscans about the potential impacts of off-shore oil development is reflected in the attached resolution passed by the City Planning Commission. I urge that you reevaluate the balance of this document and take the time to acquire key missing information, including the results of recently initiated studies of socioeconomic impacts, before completing the Final EIS. Many people around the world consider the Northern California coast to be one of the most beautiful parts of the world; it deserves careful protection.

Thank you for the opportunity to comment on this document.

Sincerely yours,

Selina Bendix (cbws)

Selina Bendix, Ph.D.
Environmental Review Officer

cc: Rai Okamoto
Milton Edelin
Robert Passmore
Michael Semler
Mary Burns
City Planning Commissioners
Ron Bass, OPR
Norman Hill

SB:bs

ABAG
Association of Bay Area Governments
Hotel Claremont • Berkeley, California 94705 • (415) 841-9730

October 19, 1979

Frank Gregg, Director
Bureau of Land Management
Department of the Interior
18th and C Streets, NW
Washington, DC 20240

Dear Mr. Gregg:

Thank you for the opportunity to comment on the DES for the Proposed Five-Year OCS Oil and Gas Lease Schedule. Our staff has reviewed this report and is forwarding the following comments. ABAG's Executive Board has not taken a position on this document or the proposed schedule.

ABAG's Region includes nine counties, all of which are adjacent to either San Francisco Bay or the California Coast. Proposed Lease Sale #53, included in the five-year schedule, would have significant environmental and economic impacts on this Region. We are interested in seeing that such a massive Federal action as this Lease Sale be given complete, in-depth analysis with full consideration of State and local concerns before final decisions are made.

The prospect of oil and gas development off the coast of the San Francisco Bay Area, specifically Sonoma, Marin, and San Mateo Counties, has focused attention on the implications for coastal resources and local economies. Each of these counties has proposed "negative nominations" of tracts within Lease Sale #53 and have expressed grave concerns about the potential impacts that they may have to bear from OCS development relative to the benefits these tracts are expected to provide to the nation's supply of oil. In addition, the California Coastal Commission has asked that areas of California's coast that are highly sensitive to OCS development economically and environmentally be removed from the five-year schedule. Governor Brown, in his letter to Secretary Andrus, specifically notes that a balancing of resource production and environmental protection, as required by OCS Land Act amendments, indicates that basins offshore San Mateo and Bodega Bay would be deleted from the schedule as inappropriate.

ABAG has supported the extension of the schedule for Lease Sale #53 to ensure that all studies mandated by the OCS Lands Act amendments would be completed and given full consideration in the final decision. In keeping with this action, we would like to support the three counties and the Coastal Commission in their concerns, i.e., complete basin level impact analyses, achievement of a balance between environmental risks and developmental benefits of oil resources, and deletion of tracts that will have impacts on coastal resources that are highly sensitive from an environmental viewpoint. The impacts that could result are not just local in extent but have implications for the San Francisco Bay Area and for California. We strongly urge that BLM make every effort to incorporate these concerns into the process of completing the final environmental statement for the five-year schedule, the EIS for Lease Sale #53, and the final five-year schedule.

We note that the DES lacks sufficient detail to accurately assess the impacts of basin specific oil and gas development on coastal resources and on the on-shore economy. We assume that such detail will be contained in draft environmental impact statements for specific lease sales. We look forward to the review of these documents.

Sincerely,

Charles Q. Forester
Director of Planning

cc: Supervisor Fred Lyon, San Mateo County

AMBAG A-95 REVIEW COMMENTS September 14, 1979

Draft Environmental Impact Statement
Proposed Five Year OCS Lease Sale Schedule

Introduction

As a followup to the review of the Draft Five Year Lease Plan for oil and gas production on the United States outer continental shelf, AMBAG has prepared this review of the DES for the proposed schedule. This review will be circulated throughout the region, to the Bureau of Land Management and to the California Coastal Commission. In addition, the review will be placed on the regular AMBAG Board agenda for October 10 and may be commented upon at that time.

Public hearings now are scheduled on the Draft ES, and will be held October 1 through 5 in Anchorage, Alaska; Los Angeles, California; New Orleans, Louisiana; New York, New York; and Washington D.C.

The hearing in Los Angeles, California will be held October 3 through 4, 1979, in the Renaissance Room, Biltmore Hotel, 515 South Olive Street, Los Angeles, California 90013. Both hearing dates are scheduled for 9 a.m. to 5 p.m. with provisions to extend into the evening hours on October 3 if necessary.

Those who wish to present oral testimony must contact the Bureau of Land Management's Pacific OCS Office, 300 N. Los Angeles Street, Room 7127, Los Angeles, California (213-688-4324) no later than 4 p.m., September 24, 1979. Time preferences for presentations of oral statements will be honored whenever possible. Confirmation of actual individual scheduled times will be mailed to respective participants prior to the hearing date.

Summary

The DES discusses the proposed leasing schedule that was submitted to Congress in June of 1979, and examines seven alternatives to the schedule. The Draft ES also discusses regulations and mitigating measures which will be in effect for the sales on the proposed schedule.

The proposed action (Alternative 1) consists of a schedule of 30 Outer Continental Shelf (OCS) oil and gas lease sales for consideration in the period between March 1980 and February 1985. Sales are considered in the North Atlantic; Mid-Atlantic; South Atlantic, including Blake Plateau; Gulf of Mexico; Southern California, including Santa Barbara Channel, Gulf of Alaska; Cook Inlet and the Beaufort Sea; all areas where previous oil and gas lease sales have been held or are proposed to be held prior to March 1980. Sales are also considered in Central and Northern California; Kodiak; Northern Aleutian Shelf; St. George Basin; Navarin Basin; and the Chukchi Sea; all are areas where no previous OCS oil and gas lease sales have been held, or, in the case of Central and Northern California, no recent sale has been held, and no development has taken place.

Stipulations may be developed to address a wide variety of situations and concerns. In the past, they have most often been used to protect cultural and biological resources and to mitigate against potential geologic hazards. They may be used to restrict operations to a specific portion of a tract, when some portions are considered geologically adversely affected by operations.

In summary, development activities stemming from Alternative 1 will result in increased conflicts with other uses of the OCS; these range from minor inconveniences to local, severe short term use curtailments from oil spills, including those resulting from tanker collisions. Loss of lives from tanker collisions and other accidents may also result. The extent of these impacts will be largely determined by specific tract selections made at the sale decision stages, and can be mitigated to some degree through tract selection decisions and stipulations imposed in the sale decision, and by regulation in the post-sale stage.

Pages 32 through 40 present a description of the proposed action. They point out that OCS 53 (Central and Northern California) may produce as much as 730 million barrels of oil and 0.84 trillion cubic feet of oil within an area of 1.5 million acres. About 95 exploratory wells would be developed and if estimates prove correct, as many as 768 production wells on 33 platforms would be constructed. This level of production would carry with it a statistical probability of over 4 oil spills of at least 1,000 barrels each.

Pages 88 through 97 contain a generalized description of the physical and social characteristics of the entire Pacific Region. It is noted that the Santa Cruz basin lies adjacent to an onshore basin but that production has been relatively small. Several geologic characteristics are identified as being characteristic of instability in the sea floor and "...clues to the location of fractured reservoir rocks and shallow over-pressured gas pockets that can pose a danger to drilling operations." (page 92) The summertime wind patterns tend to trap any surface generated emissions within the marine air layer and transport them onshore. Damage to shipping and to waterfront areas along our coastal zone occasionally occurs as a result of tsumanies.

The environmental consequences of OCS development are presented on pages 122 through 275. These generalized impacts are expressed within the context of

- oil spills • offshore and onshore water effluents • offshore and onshore air emissions • service and support bases onshore (50 to 100 acres) • pipelines and pipeline terminals • drilling rigs and production platforms offshore

Conclusions expressed on page 150 state that "prospects for seismic activity within the life of oil and gas development (in OCS area 53) is relatively high." In addition the "gale force winds and fog which periodically frequent northern California coastal waters could also hamper navigation of support vessels serving offshore facilities." The placement of an anticipated 33 platforms would remove about 2,650 hectares of seafloor from travel fishing. Losses to fisherman can be expected to increase both from loss of gear and from contamination of species due to projected spills. Due to presently limited port facilities in our area conflict for space is "likely to be intense and fairly long term." (page 180) The impacts of spills on bird and mammal species are addressed only briefly noting that some endangered species and sea otters would be very sensitive to oil spills. Impacts on recreation and sport fishing are highly generalized noting only that, "...some disruption, and very possibly foreclosure...can be expected to result..." (page 218) AMBAG has developed detailed evaluations of our regional visitor economy and this information should be assessed and considered by the BLM.

Conclusions reached on air quality impacts (page 228) are unfounded because page 225 states that "project specific impacts can only be defined by preparation of any emissions inventory and through appropriate diffusion modeling." How, then, can the statement be made on page 228 that "Therefore, additions from OCS related development activities, though small, would need to be mitigated..." Socioeconomic impacts are treated on pages 235 and 236. It is estimated that 3,100 jobs directly related to production and another 9,000 jobs indirectly related to OCS production would be created. Just how many of these jobs and resulting households would be located in the AMBAG region is not revealed. Without this information no meaningful evaluation can be made of socioeconomic impacts within the AMBAG region.

Under the heading of "Impact on Other Management Plans" the California Coastal Plan and Local Coastal Plans are mentioned but no attempt is made to relate OCS development to these plans. Because Local Coastal Plans will not be certified until January of 1981 it is not yet possible to say if onshore support bases will be consistent with local plans.

Conclusion

This document is so highly generalized that it provides very little information for a given lease sale area, such as area 53, and even less information for the evaluation of any given basin within a lease sale area. Given that area 53 is ranked low in resource potential but rather high by industry due to transportation advantages and access to markets it would appear that economic gain is the overriding issue. This DES does little to demonstrate that the desire for economic gain has been carefully balanced against the existing environmental and economic well being of the AMBAG region.

October 16, 1979

Director
Bureau of Land Management
Department of the Interior
18th and C Streets, N.W.
Washington, D. C. 20240

Dear Sir:

The attached comments are Marin and Sonoma Counties response to the Draft Environmental Impact Statement for the Proposed Five-Year Oil and Gas Lease Schedule, March 1980-February 1985. These will also be submitted to the Regional and State Coastal Commissions and the Governor's Office for comment and consideration.

Should you have any questions or require further comment, please contact me at (415) 479-1100, Extension 2526 or (707) 527-2607.

Sincerely,

Richard Retecki

Richard Retecki
Planner
Coastal Energy Impact Program

RR:em
encl

The Department of Interior has proposed an offshore oil and gas lease schedule for the next five years. Congress will receive the schedule for review with final approval early in 1980. Also, the Bureau of Land Management has published a Draft Environmental Impact Statement (DEIS) which addresses the impacts of the proposed actions. These comments are Marin and Sonoma Counties' response to the base schedule and Draft Environmental Impact Statement.

Impacts are generally discussed for all regions included in the oil and gas lease schedule. Eight development alternatives are reviewed with alternatives 1 and 2 posing the most serious threats to the Northern and Central California Region. The no action alternative - Alternative 8, obviously would not have any impact on the region.

Onshore reserves, other energy sources, and offshore reserves are reviewed but a clear energy program is not apparent (pp.25-31). An evaluation is needed to elict the relative impacts of utilizing the various reserves and to produce a national energy program. Relying predominantly on one source does not seem to be the wisest way to proceed.

The DEIS is not specific in detail or scope. At this time, the document is not sufficient to adequately address the problems and impacts of the proposed actions. Sections are lacking in baseline data essential for decision making. It is not apparent how results were reached in the study when serious information gaps exist. More in-depth study and comparison are needed, plus all information from studies and research should be included.

The document states that oil spills are statistically probable and impacts to coastal and marine organisms will occur. Information is not contained to determine how extremely sensitive coastal areas, such as estuaries and wetlands, would be affected by a spill. For a region that contains some of the best examples of these resources, this is not acceptable. Studies must qualify the short and long-term impacts of such a mishap. Pursuit of one resource must not contain the possibility of damage or destruction to another.

Seismic activity is prevalent throughout the region. This impact on the project is treated lightly at best. A conclusion is reached that physical oceanographic conditions and seismic activity will not hamper offshore oil and gas development (p. 149). On such sketchy information it seems unlikely that this conclusion can be made. Studies with refined information on both subjects must be completed and incorporated before lease sale decisions continue.

Conflicts in navigation, harvesting operations and competition for shore facilities are stated in relation to the commercial and sport fishing industries (P 180). The exact nature and extent of such conflicts must be documented. These ocean dependent industries must bot be adversely impacted by oil and gas development. A comparison of fishing industry and oil and gas needs is necessary to determine the magnitude and length of conflicts and impacts. Fishing communities must be evaluated for their potential or non-potential to accept onshore development and expansion.

The marine and physical environments of northern California are extremely complex. Offshore rocks, coves, and intertidal areas offer a diversity of feeding, nesting, and living situations. Detailed information is needed to pin point the impacts on these highly sensitive environments and any species contained in them.

Recreation and tourism are a major point of the coastal economy in activity and revenue. The social character and scale of coastal habitation provide the sense of place that is the coast. Sufficient information is not available to determine the possible transition, change and/or disruption to these components of coastal life. Economic and value judgements concerning these resources and qualities must be substantiated in the DEIS process.

The EIS for lease sale #53, will be more specific in detail and impact assessment. A document general in scope will not be sufficient to evaluate the impacts of the OCS proposal. Marin and Sonoma Counties opposition to the lease sale and alternative schedules is retained. The potential impacts are too severe and the risks too great when weighed against a low quality, small quantity resource.

Richard Retecki
Planner
Coastal Energy Impact Program

STATEMENT FROM LARRY ODLE - MONTEREY BAY UNIFIED APCD

Unfortunately, due to staff illnesses and other meeting conflicts, representatives from the Monterey Bay APCD cannot attend the draft EIR hearing on OCS. Nevertheless, we do wish to have the following comments entered into the record.

Firstly, regarding the air quality analysis, it is obvious that the contracting agencies for BLM utilizing grant funds of $138,000 cannot possibly adequately address the air quality issue. The Monterey Bay APCD functions in conjunction with local agencies, have just completed in-depth analysis which suggests that air quality analysis just for the North Central Coast Air Basin alone would cost between 1 ½ and 2 million dollars. These costs are real costs and include a complete and thorough evaluation of the impacts of new air quality emissions in addition to the associated impacts with existing emissions.

Secondly, it is our position that OCS emissions must be adequately addressed and, as such, would reflect the existing situation that unmitigated OCS emissions will result in a no growth situation at the local level, especially in non-attainment areas. In other words, local districts will be requested to adopt new stationary source control strategies and make more stringent existing strategies just to offset the increased emissions from OCS activities.

INUICH IKAYUQTAAT SUTIGULLIQAA PITQURATIGUN
LAW OFFICES OF
ALASKA LEGAL SERVICES CORPORATION
POST OFFICE BOX 309
BARROW, ALASKA 99723
TELEPHONE (907) 852-2311

October 16, 1979

Director
Bureau of Land Management
Department of the Interior
18th & C Streets
Washington, D.C. 20240

Re: Draft Environmental Impact Statement, Proposed Five-Year OCS Oil and Gas Lease Schedule

To the Director:

I have received the enclosed Resolution 79-13 of the City of Point Hope, which they have asked me to forward to you as the comment of the City on the above Environmental Impact Statement. Please include it on the written record.

Sincerely,
ALASKA LEGAL SERVICES CORPORATION

Michael I. Jeffery

Michael I. Jeffery
Attorney

Encl.

cc. Hon. Lennie Lane, Mayor
Mrs. Esther C. Wunnicke, Manager, Alaska OCS Office

A RESOLUTION OF THE CITY OF POINT HOPE OPPOSING THE BEAUFORT AND CHUKCHI SEA OIL AND GAS LEASE SALES.

RESOLUTION NO. 79-13

WHEREAS, The Village of Point Hppe has a population of 495 permanent residents, located approximately 350 miles above the Arctic Circle, in the Chukchi Sea, and,

WHEREAS, For as long as anyone can remember the residents have relied upon sea mammals for food, clothing, and various necessities required to continue the preferred lifestyle, and,

WHEREAS, The animals that frequent the Beaufort and Chukchi Seas, are the Bowhead, Grey, White or Beluga whales; The Bearded, Spotted, Harbor, Fur, and Ringed Seals; The Polar Bear; White Fox; Walrus; Salmon; various game birds, game birds which have nesting sanctuaries at the USAF D.E.W. Line Station at Cape Lisbourne and another at Cape Thompson, and,

WHEREAS, These animals are the staple diet of the Inupiat, excepting for the Grey Whale; these animals frequent the Beaufort and Chukchi Seaa,and,

WHEREAS, The lifestyle has predominantly revolved around these animals, and,

WHEREAS, There is no firm conclusion nor gurantee by oil companies, nor the State or Federal governments as to the adverse impact upon these animals, and,

WHEREAS, The residents are not recognized as a critical factor in the Arctic Beaufort/Chukchi Ecosystems, and,

WHEREAS, The residents and their ancestors have developed a working relationship with the environment particular to the Arctic regions, and,

WHEREAS, Ice conditions and weather, which can be detrimental to exploritory or actual oil rigs, which the residents have had to live with and experience, before the advent of the Prudhoe Bay pump stations or before the Trans Alaska Oil Pipeline, should be recognized as untapped knowledge, which can be made available from the residents themselves, and,

WHEREAS, A blowout in the Beaufort or Chukchi Seas by offshore oil rigs could indefinately affect mammalian migration thus resulting in a loss of funds, and also the trust of the residents, and, WHEREAS, The Inupiat duly recognize that it is within the National Interest that new oil developements begin, and,

WHEREAS, There has not been adequate study of the ice conditions and the current conditions in the Chujchi Sea, and,

WHEREAS, It is the common consensus by the residents of the Beaufort and Chukchi Seas that the Spring, Fall and Winter ice conditions are the most unpredictable, and,

WHEREAS, It is within the interest of the residents of the Beaufort and Chukchi Seas to insure that the preferred lifestyles be maintained for the benefit of the generations to come, and,

THEREFORE BE IT RESOLVED, THAT BEFORE ANY LEASE FOR OIL OR GAS IS AQUIRED the Secretary of the Interior, the Governor of the State of Alaska, and the Mayor of the North Slope Borough jion us in recognizing the following requirements:

A.) Adequate research be made to insure the reliability of oil rig structure, in conditions particular to the Beaufort and Chukchi Seas.

B.) Designation of "critical habitat" for all marine life particular to the Beaufort and Chukchi Seas.

C.) Public Hearings in the villages concerned to recognize the residents have adequate knowledge of the surroundings to be affected by the proposed lease.

D.) The Expertise of the Local Residents about currents and ice conditions be utilized.

E.) Local residents be trained to operate and maintain oil rigs.

Lennie Lane [signature]
INTRODUCED BY

Lennie Lane [signature]
MAYOR'S SIGNATURE

Oct. 11, 1979
ADOPTION DATE

ATTEST

PETE WILSON
MAYOR

October 8, 1979

Mr. W. Frank Gregg, Director
Bureau of Land Management (542)
Department of the Interior
18th & C Street, N.W.
Washington, D.C. 20240

Subject: Proposed Five-Year OCS Oil and Gas Lease Sale Schedule

Dear Mr. Gregg:

Pursuant to the Department of Interior's announcement, dated August 24, 1979, I would like to submit to you the following comments concerning my review of the Proposed Five-Year OCS Oil and Gas Lease Sale Schedule.

My position has not changed and is consistent with my June 8, 1979 statement before the public hearing panel on Lease Sale No. 48 in San Diego. At that time, I asked Secretary of Interior, Cecil D. Andrus, to delay for the present, the drilling for oil in areas immediately adjacent to the California coast.

The reasons for that statement are still meritorious today. Technology is still not available to prevent oil spills in the areas adjacent to our coast or to prevent added smog to the Southern California basin. Because this technology is still not available and will not be available in the near future, I would ask that you hold these nearshore drilling sites in reserve until such technology is attainable, thus assuring total environmental safety and control of air pollution.

This is especially true since the risk of both environmental and economic disaster is great in relationship to the small amount of oil and gas that has been projected in the nearshore sites to our San Diego coast. What better place to store the natural gas and oil than in its storage state until technology has advanced to the point that those resources can be tapped without risk of economic and/or environmental disaster?

After the hearings on Lease Sale No. 48 in June of this year, Secretary Andrus recognized that the San Diego tracts were in fact a potential concern and deleted them from Lease Sale No. 48. The rationale behind the deletion of the nearshore tracts of Lease Sale No. 48 has not changed since June of this year. Certainly nothing has occurred in the very short time frame that has passed since Secretary Andrus acted so prudently.

CITY ADMINISTRATION BUILDING, 202 C STREET, SAN DIEGO, CALIFORNIA 92101 (714) 236-6330

San Diego is one of America's most popular coastline cities. Because of this, we have continuously and consistently argued for an environmental policy which has the dual function of promoting the City's economic and aesthetic health while also stressing its commitment to the goals and aims of national environmental and energy policies. In this regard, I would again urge you to delete the San Diego nearshore tracts.

By not exploiting this severely limited potential of the nearshore coast at the present time, two advantages will be accrued. The coastline will remain as environmentally sound, if not more sound, than prior to the drilling. Second, the potential energy will remain available for drilling should it become necessary to do so and should the technology exists to do so safely.

Sincerely,

Pete Wilson

PETE WILSON

PW/lc

Literature Citations
and
Selected Bibliography

Material used for this environmental statement, including some analyses and conclusions,s drawn partially from environmental assessments performed for previous OCS oil and gas lease sales, especially in non-frontier areas. The bibliographic citations below include these sale-specific environmental statements, specific data sources for the environmental statement, and major primary sources used for making impact assessment and conclusions in this as well as previous statements. The reader is referred to bibliographies included in the sale-specific environmental statements for further references. The reader is also referred to the bibliography for Appendix 8.

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Appendix 1

Consideration of Size, Timing and Location

Including material submitted to the Secretary on May 29, 1979 for his consideration in developing a tentative five-year OCS oil and gas leasing schedule for submittal to Congress on June 18, 1979

Available upon request from the Office of OCS Program Coordination, U.S. Department of the Interior, Washington, D.C. 20240

Size, Timing, and Location of Sales

Section 18(a) of the OCS Lands Act, as amended, requires that the Secretary develop a schedule of proposed lease sales indicating, as precisely as possible, the size, timing, and location of leasing activity. A discussion follows of the consideration which was given to these issues in developing the leasing program.

Size

The historical relationship between the area offered and the area bid upon and leased is presently being analyzed. The analysis includes all Federal OCS oil and gas lease sales from October 13, 1954, to February 28, 1979. Generally, about 30 percent of the area offered has been leased. Linear regression analysis is being used to determine the correlation between the area leased and the area offered. Tentative conclusions show that a greater percentage of the area offered is leased as the sale size declines. If an objective of the leasing program is to lease the greatest proportion of area offered per sale, then it appears that the area offered should be below 600,000 acres.

However, maximizing the percentage of the area leased per offering is not a significant consideration in determining sale size. It is important to be efficient in preparing for lease sales and, because costs of meeting the statutory and policy requirements of preparation are not proportional to the size of the area studied for leasing, there are efficiency benefits gained from considering larger areas in one sale action. It is also important to consider environmental issues and the availability of technology in determining sale size.

Probably the most important factor in determining sale size is the need to offer areas of sufficient size and quality to permit diverse exploration strategies to be tried. This will attract more potential bidders and will increase the likelihood of the early discovery of hydrocarbons.

In determining the size of a particular sale it is important to have the advice of exploration experts and USGS scientists and this advice is not required until the Call for Nominations and Comment is issued. Thus, at the present stage of 5-year schedule development it is not possible to estimate sale size with any degree of certainty, but it is reasonable to develop estimates based on our current best judgment.

The final sale size will be based on expected hydrocarbon potential, our ability to address environmental and social issues and the availability of technology for exploration and development. In terms of acres offered, we believe one million acres will be the upper end of the range in most cases, and that many sales be somewhat smaller. Statistics on available acreage in each of the 22 areas can be found in Part 7 - Area Descriptions. Based on the interest in the area, amount of available acreage, and taking into account technological constraints, we have compiled the following list of probable sale size by area:

Sale Areas	Acreage
North and Mid-Atlantic	800,000
South Atlantic	600,000

Blake Plateau	800,000
Gulf of Mexico	1,000,000 if 2/year 600,000 if 3/year
Southern California	600,000
Santa Barbara Channel	200,000
Central and Northern California	800,000
Cook Inlet, Gulf of Alaska	800,000
Kodiak	1,000,000
St. George, Navarin, Bristol	1,000,000
Norton Basin, Chukchi, Beaufort	600,000

Concerning the Kodiak sale area, tract selection for Sale #46 has already taken place and 3.2 million acreas are being analyzed in the environmental statement. We view this as a departure from what will normally be the case and estimate 1,000,000 acres as the typical size sale because of low industry interest. It is possible, however, that the first sale in the area could be considerably larger.

If at the time of tentative tract selection, industry interest is higher than we now anticipate, and the technological advances are made, we would consider larger sales than those estimated above, subject to our administrative capability to conduct appropriate sale preparations.

Timing

The timing of lease sales is influenced by seven key factors:

1. Sound energy policy calls for opening up offshore areas to oil and gas activity as soon as this can be responsibly done.

2. Sound energy policy calls for the leasing and development of areas yielding greater economic benefits earlier than less promising areas;

3. Relative ranking of areas accordingly to resource potential and industry interest in exploration provides a key to the probability of areas being hydrocarbon prone;

4. Availability of technology for exploration and development, determines the timing of successful industry operations in different areas;

5. Availability of environmental and geotechnical data determines ability to plan for sales and analyze the possible impacts of development;

6. Statutory and policy requirements for preparation of lease sales cannot be met immediately and simultaneously for all areas; and

7. Sales in frontier areas should be spaced so that the results of initial exploration can be available for planning subsequent sales.

The DOE OCS production goals are based on the principle of maximizing the economic benefits to the country by scheduling the more beneficial lease sales at earlier times. The economics of sale scheduling are discussed in more detail in DOE's production goals report and in the discussion on Economic Considerations in the 5-Year Leasing Program found under Part 8.

Unfortunately it is not administratively possible to offer all promising areas immediately and simultaneously. Numerous requirements must be met in preparing for lease sales. To determine the earliest possible sale dates in frontier areas, it is necessary to identify the work that must be done to meet these requirements and the time required to complete it.

First and foremost are the requirements specified by the National Environmental Policy Act and the OCS Lands Act, as amended. Other laws, such as the Endangered Species Act and the Marine Mammal Protection Act, require that steps be taken and therefore also need to be considered.

For those areas where lease sales have not been held, the availability of environmental and geotechnical information has significant bearing on timing. Considerable attention has been directed at integrating the environmental studies program with the 5-year leasing program, taking into account the issues which have been identified through the consultation process. Categories of studies have been determined and tied to a specific decision point. A list follows this discussion of the kinds of studies that will support decisionmaking throughout the leasing program, including post-lease activity. The estimates of appropriations and staff prepared for the leasing program reflect the cost of studies in this list.

The question of how much information is needed at the sale decision has been addressed. Scheduling sales in later years provides additional field seasons to collect information, assuming studies are funded from the very beginning. Each year of delay has a cost associated with it, in terms of postponing possible production of oil and gas, and the economic and social value associated with it. Much of the information collected in the studies is useful in post-sale decisions, such as in the review of exploratory and development plans. Authorities granted under the OCS Lands Act, as amended, are very broad and provide the Secretary with broad controls over the conduct of operations, to the extent of suspending operations under certain conditions or, in unusual cases, initiating procedures for lease cancellation. If there were major threats from OCS activity which would come to light with additional site specific studies, the costs of not waiting for those studies would be not so much increased environmental risks but an increased probability of invoking the lease cancellation provisions.

Another factor in determining when we will be prepared for a sale decision is the collection of geotechnical data. The geotechnical data are used in the evaluation of geohazards and for assessing the value of tracts for bid evaluation. In the past, high resolution geophysics for the geohazard analysis has not been available until a decision was made on the proposed notice of sale, rather than in time for inclusion in the final environmental impact statement. This information is collected on a tract specific basis and therefore cannot be collected until tentative tract selection is made. Because the geohazard analysis has environmental implications and because it can provide an early indication of tracts which may need to be deleted, a policy decision has been made to time activities so that the analysis can be included in the final environmental statement. In some instances, this has lengthened the time between tentative tract selection and release of the final environmental statement.

In order to reduce the length of time required between these two steps, tentative tract selection is scheduled in the first quarter of the year for sale areas where data can be collected only during the open water months because of ice conditions. The possibility also has to be considered that in some years, severe ice may prevent any data collection during the "normal" field season.

Planning Intervals
(in months)

Step/Category	I	II	III
Call for Nominations	0	0	0
Nominations Due	2	2	3
Tract Selection	2	3	4
Draft ES	10	12	13
Public Hearing	2	2	3
Final ES	3	4	4
Proposed Notice of Sale	2	2	2
State Comments Due	2	2	2
Energy Review	1	1	1
Notice of Sale	1	1	1
Sale	1	1	1
	26	30	34

Areas by Category

Category I - Gulf of Mexico

1. Central & Western Gulf
2. Eastern Gulf of Mexico

Category II - Successive Sales in Areas Outs Gulf of Mexico

1. North Atlantic
2. Mid-Atlantic
3. South Atlantic
4. Southern California
5. Santa Barbara Channel
6. Cook Inlet
7. Gulf of Alaska
8. Central & Northern California
9. Kodiak
10. Beaufort

Category III - New Areas

1. Blake Plateau
2. Florida Straits
3. Washington-Oregon
4. Southern Aleutian
5. Bristol Bay
6. St. George Basin
7. Bering-Norton
8. Hope
9. Chukchi
10. Navarin Basin

Another factor which relates to the timing of sales is the spacing between sales in an area. This applies to areas outside the Gulf of Mexico since the Gulf has an established onshore support system and can easily absorb a continuous level of activity. We have tried to develop a sequence which permits us to benefit from the exploratory results from one sale before the next sale is held. We also wish to provide for a steady level of exploratory activity which avoids the boom-bust problem, but still keeps exploratory rigs occupied once they are in an area. First and second sales in an area are spaced at 3-year intervals. The spacing of second and third sales is at 2-year intervals. Until commercial deposits of oil and gas are found in an area, it is difficult to know whether to schedule third and fourth sales. We have adopted the approach of including successive sales in the leasing program, while recognizing that if exploratory activities from first and second sales are unsuccessful, a third sale may be delayed or cancelled due to lack of interest.

Location

Resource potential, economic benefits, and industry interest in exploration are key determinants of where sales should be located. Taking into account the pre-sale planning which is necessary for first sales in frontier areas, we have attempted to select sale areas on the basis of resource potential, economic benefits, and interest in exploration, as indicated by industry responses. This differs somewhat from the approach taken by the Department of Energy in developing production goals which emphasizes the scheduling of sales according to economic value as determined by its computer model. We have also provided for successive sales in areas outside the Gulf of Mexico, in the event exploration from the first or second sales is successful.

Since industry interest in the Gulf of Mexico continues to be high, we have provided for an average of two sales a year in this region. The Gulf of Mexico has the advantage of being able to bring forth hydrocarbon supplies to market quickly at low cost, whereas selected frontier areas provide the promise of large new finds, which though more costly in dollars and time to produce, could have a significant effect on U.S. oil and gas reserves.

The issue of availability of transportation networks to bring supplies to market has also been considered but is not believed to be a constraint which should influence the location of lease sales. It is, however, an issue which requires a concerted effort on the part of the Federal Government to ensure that it is handled in an efficient and timely manner. Discussion of this issue can be found under Part 9.

Categories of Studies Related to Lease Sale Decisions 1/

Critical Studies Categories	Leasing Steps Data Will be Useful For
Blake Plateau	
Physical Oceanography	FES, SID, late modelling, stipulations
Geological Oceanography	" " " " "
Biological Oceanography	" " " " "
Chemical Oceanography	" " " " "
Bristol Basin	
Geological Hazards	FES, SID, late modelling, stipulations
Sea Ice Hazards	" " " " "
Pollutant Transport	" " " " "
Living Resources	" " " " "
Impact Assessment	Same plus DES and mitigating measures
Socio-Economic	" " " " " "
St. George Basin	
Geological Hazards	FES, SID, late modelling, stipulations
Pollutant Transport	" " " " "
Living Resources	" " " " "
Impact Assessment	Same plus DES and mitigating measures
Socio-Economic	" " " " " "
Navarin Basin	
Contaminant Distribution	DES, FES, SID, modelling, stipulations
Geological Hazards	FES, SID, late modelling, stipulations
Sea Ice Hazards	DES, FES, SID, modelling, stipulations
Oceanography Hazards	" " " " "
Pollutant Transport	FES, SID, late modelling, stipulations
Living Resources	" " " " "
Impacts Assessment	DES, FES, SID, modelling, stipulations
Socio-Economic	" " " " "
Norton Basin	
Geological Hazards	FES, SID, late modelling, stipulations
Permafrost	" " " " "
Sea Ice Hazards	" " " " "
Pollutant Transport	" " " " "
Living Resources	" " " " "
Impact Assessment	" " " " "
Socio-Economic	" " " " "

1/ This list only includes those study areas not already included in a study plan.

Chukchi Sea

Contaminant Distribution	DES, FES, SID, modelling, stipulations
Geological Hazards	FES, SID, late modelling, stipulations
Permafrost	" " " " "
Sea Ice Hazards	" " " " "
Oceanographic Hazards	DES, FES, SID, modelling, stipulations
Pollutant Transport	FES, SID, late modelling, stipulations
Living Resources	" " " " "
Impact Assessment	DES, FES, SID, modelling, stipulations
Socio-Economic	" " " " "

Hope Basin

Contaminant Distribution	DES, FES, SID, modelling, stipulations
Geological Hazards	FES, SID, late modelling, stipulations
Permafrost	" " " " "
Sea Ice Hazards	" " " " "
Oceanography Hazards	DES, FES, SID, modelling, stipulations
Pollutant Transport	FES, SID, late modelling, stipulations
Living Resources	" " " " "
Impact Assessment	DES, FES, SID, late modelling, stipulati
Socio-Economic	" " " " " "

Status of Studies for Kodiak and Central and Northern California

Kodiak Sale #46 - December 1980

Contaminant Distributions	Completed
Geohazard Study	One year of a 2-year study completed
Oceanographic Hazards	Completed
Pollutant Transport	Completed
Living Resources	One year of a 2-year study on endangered whales completed
Socio-Economic	Completed
Impact Assessment	One year of the 1 1/2 year study completed

Central and Northern California #53 - May 1981

Contaminant Distributions	Supporting characterization study completed
Geohazard Study	Completed
Oceanographic Hazards	Compilation of existing data complete. First year field work underway.
Pollutant Transport	Completed (referenced to existing data)
Living Resources	Preliminary characterization complete. One year marine mammal and seabird distribution study complete. Seabird nesting and seasonal use study complete.
Socio-Economic	Completed
Impact Assessment	Supporting characterization completed. Species-specific studies underway.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JUN 18 1979

Honorable Walter F. Mondale
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

Section 18 of the OCS Lands Act, as amended, requires the preparation of a 5-year leasing program. According to the statute, I am to submit, by June 18, 1979, a proposed leasing program to the Congress, the Attorney General, and the Governors of the affected States. This letter constitutes my submission of the program.

Section 18(a) of the Act establishes the content of the leasing program. Specifically, it requires that the program consist of a schedule of proposed lease sales indicating, as precisely as possible, the size, timing, and location of leasing activity which I determine will best meet national energy needs for the 5-year period following approval of the program. Section 18(b) adds the requirement that the program include certain estimates of appropriations and staff.

Attachment 1 is a schedule showing the location by area and timing of the sales in my proposed program which are planned for the period March 1980 through February 1985. The schedule also shows the pre-sale planning steps leading to a final decision on each of the proposed sales. While the 1979 column does not include the proposed sales which are scheduled for this year, they are proceeding on schedule: sale 48, southern California, June 1979; sale 58, Gulf of Mexico, July 1979; sale 42, North Atlantic, October 1979; sale 58A, Gulf of Mexico, November 1979; Federal/Stat joint sale in the Beaufort Sea, December 1979.

Attachment 2 contains two maps showing the general leasing areas where the sales on the proposed program will be considered. Attachment 3 is a listing of possible sale sizes. More precise descriptions of size and location of possible sales will be available when the planning for them gets underway.

Attachment 4 contains estimates of appropriations and staff for four specific activities as required by section 18(b). Because the four activities do not cover all the costs of the program, we have added a fifth activity covering the remaining costs so that you and others can see what the total costs are estimated to be over the 5-year period.

This letter and the four attachments mentioned above constitute my proposed leasing program as specified in the Act.

Section 18(c)(2) requires that when I submit my proposed program to the Congress, it be accompanied by copies of certain correspondence between the Governors of affected States and me. This correspondence is being completed and will be sent to you in a few days.

Section 18(a)(2) of the Act requires that in preparing the proposed program, I consider eight factors. When I send you the correspondence with the Governors, I will also send you a staff memorandum, and its attachments, discussing the required factors and other elements involved in my decision.

I have determined that the best way for the OCS leasing program to meet the energy needs of the nation is to adopt a schedule of proposed sales that provides for a mixture of lease sales among proven oil and gas producing areas and frontier areas. This coverage, coupled with my firm determination to proceed in a manner that protects the human, marine and coastal environments from undue risk and harm, has led me to propose a 5-year program with 30 sales plus a contingency sale. On a regional basis, the proposed schedule calls for six sales in the Atlantic, 11 in the Gulf of Mexico, four off California, and nine off Alaska. The contingency sale is in the Gulf of Mexico. Subsequent events, such as the deletion of another sale, will determine whether the contingency sale will be held as indicated, held at some other time during the 5-year period, deleted, or postponed until after February 1985.

There are several important aspects of the proposed schedule which I would like to emphasize:

-- In developing the proposed schedule, I have considered the availability of environmental, geologic and other information important to making sale decisions. I would be the first to agree that there are differences among experts about the precise nature and timing of needed information. However, I am convinced that with the improvements we have made in the design of the environmental studies program, with our improved record of cooperation with affected coastal States, and with our improved management of offshore activities, we can start planning for the sales I am proposing with a high degree of confidence.

-- The proposed program is compatible with the OCS production goals that were developed for us by the Department of Energy. Thus, it has a strong link with national energy policy.

-- The proposed program provides for an equitable sharing of development benefits. Hydrocarbon supplies, if found in commercial quantities on the OCS, can generally be transported to demand areas, according to the Department of Energy. Thus, DOE has concluded that regional markets will not constrain OCS production. That is, because of the efficiency of oil and gas transport, the use of produced hydrocarbons from the OCS is not limited to only those areas adjacent to the production.

-- The proposed program provides for an equitable sharing of environmental risks since all offshore regions will be expected to contribute supplies if economically recoverable discoveries are made.

-- I have considered the laws, goals, and policies of affected States, including coastal zone management programs where they are approved. I do not believe that there are any laws, goals, or policies or coastal zone management programs which would preclude the initiation of planning for any sales on the proposed program. There are, certainly, differences of opinion with some States about the timing of some potential sales, but I believe that the concept of equitable sharing of benefits and risks requires that the start of planning not be precluded. After the planning is completed, I will be in a better position to decide whether the sale should go forward or not, if certain areas should be precluded from leasing, or if special lease terms and conditions are required to provide extra protection to particular environmental values or resource uses.

-- The frontier area sales have been selected in order to maximize the chances of discovering hydrocarbons. This means scheduling a number of first-ever sales off Alaska, where there is a general consensus that the potential is high. In regard to Alaska, I have designated a new leasing area north of the Alaska Peninsula and Unimak Island that is south of 56° 30' North latitude and east of 165° West longitude. This area, the North Aleutian Shelf, was designated in order to start the consideration of this highly prospective location and at the same time provide protection for the exceptional marine resources in adjacent areas.

-- With respect to the two sales proposed off California in 1984 and 1985, I have not specified their location among the California leasing regions. This is because I expect that drilling of leased tracts and tracts soon to be leased may provide important information that will help us to better locate sales at a later date.

As you may know, my proposed schedule differs in some respects from the draft schedule that I asked the Governors to review in March. It includes four more sales over the 5-year period, it is more compatible with the Department of Energy's production goals, and it provides for earlier exploration of frontier areas to improve the chances for discovering important new domestic supplies of oil and gas. The tools provided to me by the Outer Continental Shelf Lands Act Amendments of 1978 give me the basis for proposing a program of this level.

In implementing the program, timely development will continue to be a cornerstone. Lessees will be expected to complete sufficient exploration so that if conditions warrant, a good start can be made toward beginning production within the primary term of the lease. It may be necessary to consider a longer than 5-year primary term in some new frontier areas, perhaps up to 10 years as is permitted by the 1978 Amendments to the OCS Lands Act.

The new 5-year program is not yet final. The law requires several more steps before I approve it early in 1980. Also, I have decided to prepare an environmental impact statement on the proposed schedule. Under our current timetable, the draft statement will be released in August of this year, and the final statement in January of next year before I finally approve the program.

I believe that it is in the interest of the nation to proceed with the proposed program. In order to provide the opportunity for us to do so, I have agreed to permit some of the early planning steps to take place before the final environmental statement is completed and the program is approved in 1980. These steps can be seen in the attached schedule. I want to assure you, however, that the start of planning is not an irrevocable commitment to lease sales. If the continuing reviews and comments show that it is in the national interest to change the timing of a proposed sale, I will certainly do so.

Sincerely,

Cecil D. Andrus

SECRETARY

Enclosures

IDENTICAL LETTER SENT TO: Hon. Thomas P. O'Neill, Jr., Speaker of the House of Representatives

PROPOSED OCS OIL AND GAS LEASE SALE SCHEDULE

JUNE 1979

1979[1]

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico									E		H	
55 Gulf of Alaska									E		H	
62 Gulf of Mexico									E		H	
46 Kodiak										E		
53 Central N. Calif.												
A66 Gulf of Mexico						C		D		T		
56 South Atlantic			C		D		T					
60 Cook Inlet		D			T							
66 Gulf of Mexico						C		D		T		
59 Mid-Atlantic							C		D			T
67 Gulf of Mexico												
68 Southern California[2]												C
52 North Atlantic										C		D
57 Norton Basin				C							D	
69 Gulf of Mexico												
70 St. George Basin							C			D		
71 Beaufort Sea										C		D
72 Gulf of Mexico												
73 California												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake												
79 Gulf of Mexico												
80 California												
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin												
84 Gulf of Mexico												
85 Chukchi Sea												

1980

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico		F		P		SC	R	N	S			
55 Gulf of Alaska			F		P		SC	R	N	S		
62 Gulf of Mexico		F				P		SC	R	N	S	
46 Kodiak	H				F		P		SC	R	N	S
53 Central N. Calif.				E		H				F		P
A66 Gulf of Mexico							E		H			F
56 South Atlantic							E		H			
60 Cook Inlet								E		H		
66 Gulf of Mexico							E		H			F
59 Mid-Atlantic											E	
67 Gulf of Mexico	C		D		T							
68 Southern California[2]		D			T							
52 North Atlantic				T								
57 Norton Basin		T										
69 Gulf of Mexico								C		D		T
70 St. George Basin		T										
71 Beaufort Sea			T									
72 Gulf of Mexico												
73 California											C	
74 Gulf of Mexico												
75 No. Aleutian Shelf					C			D				T
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake												
79 Gulf of Mexico												
80 California												
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin												
84 Gulf of Mexico												
85 Chukchi Sea												

1981

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.		SC	R	N	S							
A66 Gulf of Mexico		P		SC	R	N	S					
56 South Atlantic	F		P		SC	R	N	S				
60 Cook Inlet		F		P		SC	R	N	S			
66 Gulf of Mexico					P		SC	R	N	S		
59 Mid-Atlantic	H				F		P		SC	R	N	S
67 Gulf of Mexico			E		H			F		P		SC
68 Southern California[2]					E		H				F	
52 North Atlantic							E		H			
57 Norton Basin						E				H		
69 Gulf of Mexico										E		H
70 St. George Basin										E		
71 Beaufort Sea												E
72 Gulf of Mexico	C		D		T							
73 California	D			T								
74 Gulf of Mexico							C		D		T	
75 No. Aleutian Shelf												
76 Mid-Atlantic					C		D			T		
77 Gulf of Mexico[3]										C		D
78 So. Atlantic/Blake			C			D				T		
79 Gulf of Mexico												
80 California										C		D
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin						C			D			
84 Gulf of Mexico												
85 Chukchi Sea							C			D		

1982

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico	R	N	S									
68 Southern California[2]	P		SC	R	N	S						
52 North Atlantic	F		P		SC	R	N	S				
57 Norton Basin		F		P		SC	R	N	S			
69 Gulf of Mexico			F		P		SC	R	N	S		
70 St. George Basin	H				F		P		SC	R	N	S
71 Beaufort Sea			H				F		P		SC	R
72 Gulf of Mexico			E		H			F		P		SC
73 California				E		H				F		P
74 Gulf of Mexico									E		H	
75 No. Aleutian Shelf								E			H	
76 Mid-Atlantic										E		H
77 Gulf of Mexico[3]		T										E
78 So. Atlantic/Blake											E	
79 Gulf of Mexico	C		D		T							
80 California			T									
81 Gulf of Mexico					C		D		T			
82 North Atlantic				C		D			T			
83 Navarin Basin	T											
84 Gulf of Mexico											C	
85 Chukchi Sea		T										

1983

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
68 Southern California[2]												
52 North Atlantic												
57 Norton Basin												
69 Gulf of Mexico												
70 St. George Basin												
71 Beaufort Sea	N	S										
72 Gulf of Mexico	R	N	S									
73 California		SC	R	N	S							
74 Gulf of Mexico		F		P		SC	R	N	S			
75 No. Aleutian Shelf			F		P		SC	R	N	S		
76 Mid-Atlantic				F		P		SC	R	N	S	
77 Gulf of Mexico[3]		H			F		P		SC	R	N	S
78 So. Atlantic/Blake		H				F		P			R	N
79 Gulf of Mexico			E		H			F		P		SC
80 California					E		H				F	
81 Gulf of Mexico							E		H			F
82 North Atlantic									E		H	
83 Navarin Basin										E		
84 Gulf of Mexico		D		T								
85 Chukchi Sea												E

1984

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
68 Southern California[2]												
52 North Atlantic												
57 Norton Basin												
69 Gulf of Mexico												
70 St. George Basin												
71 Beaufort Sea												
72 Gulf of Mexico												
73 California												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake	S											
79 Gulf of Mexico	R	N	S									
80 California	P		SC	R	N	S						
81 Gulf of Mexico		P		SC	R	N	S					
82 North Atlantic			F		P		SC	R	N	S		
83 Navarin Basin	H				F		P		SC	R	N	S
84 Gulf of Mexico	E		H			F		P		SC	R	N
85 Chukchi Sea			H				F		P		SC	R

1985

SALE AREA	J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
46 Kodiak												
53 Central N. Calif.												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
68 Southern California[2]												
52 North Atlantic												
57 Norton Basin												
69 Gulf of Mexico												
70 St. George Basin												
71 Beaufort Sea												
72 Gulf of Mexico												
73 California												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
77 Gulf of Mexico[3]												
78 So. Atlantic/Blake												
79 Gulf of Mexico												
80 California												
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin												
84 Gulf of Mexico	S											
85 Chukchi Sea	N	S										

C - Call for Nominations
D - Nominations Due
T - Tentative Tract Selection
E - Draft Environmental Statement
H - Public Hearing

F - Final Environmental Statement
P - Proposed Notice of Sale
SC - State Comments Due
R - Energy Review
N - Notice of Sale

S - Sale

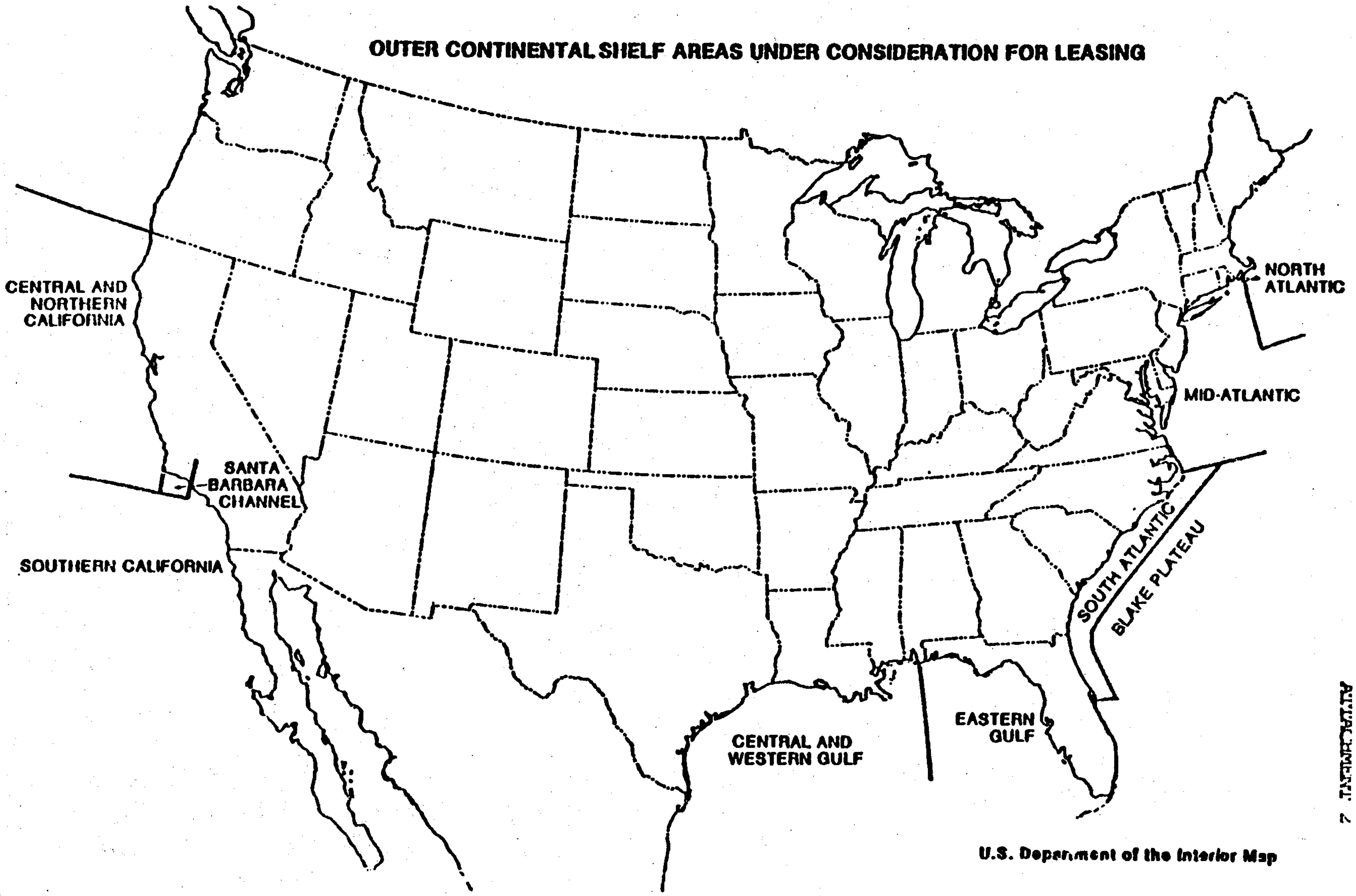
[1] The 1979 Column is included to indicate the pre-lease actions required for OCS lease sales scheduled for the period 3/80 - 2/85. Sales scheduled for dates in the latter half of 1979 include:
48 So. California June 1979
58 Gulf of Mexico July 1979
42 North Atlantic Oct. 1979
58A Gulf of Mexico Nov. 1979
Beaufort Sea Dec. 1979

[2] Includes Santa Barbara Channel.

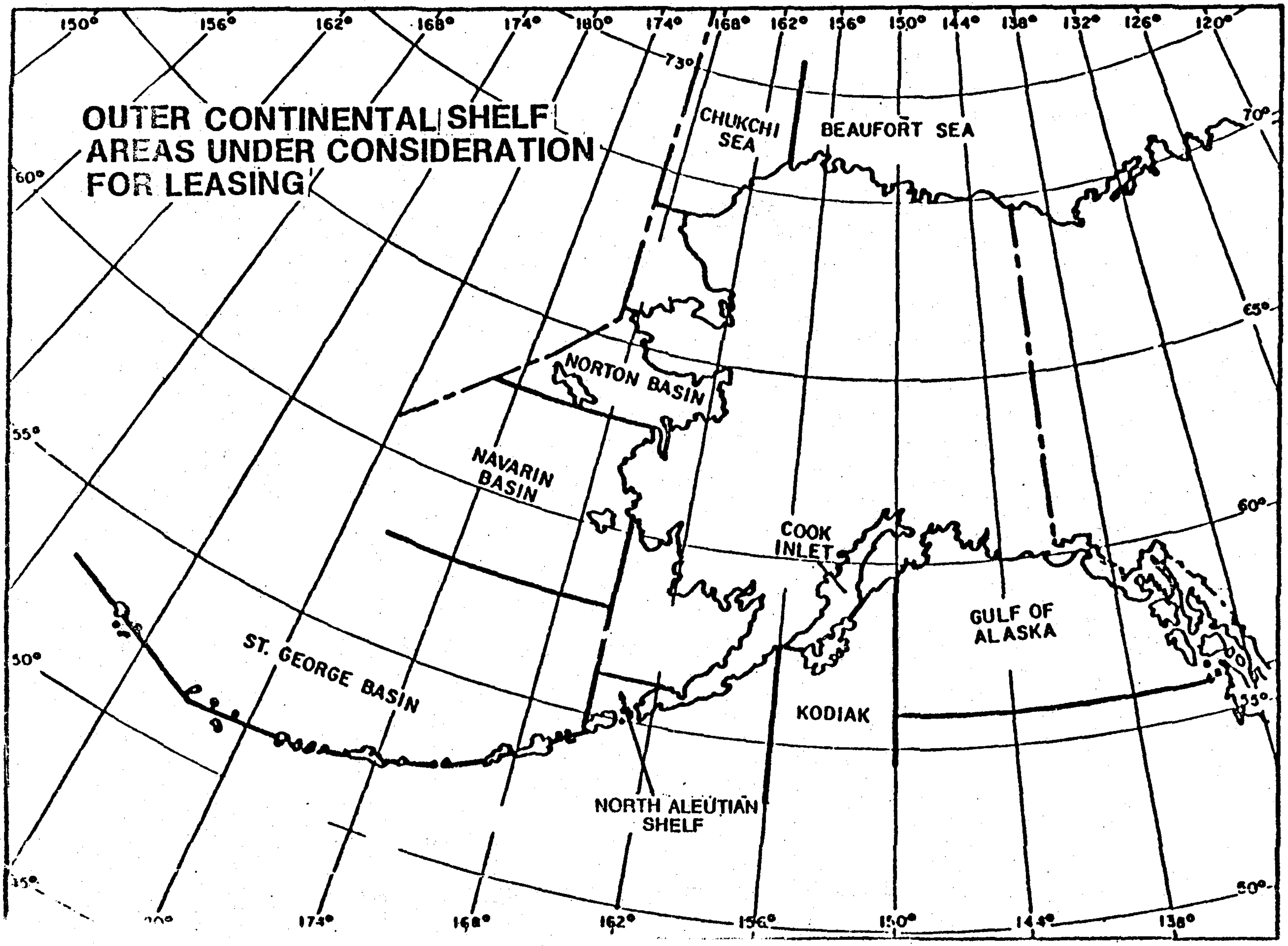
[3] This sale has been included in this schedule in order that planning may be commenced. Subsequent events (e.g., deletion of another sale from this schedule) will determine whether this sale will be held as indicated, now at some other time during the 5-year period, deleted or postponed until after February 1985.

ATTACHMENT 1

OUTER CONTINENTAL SHELF AREAS UNDER CONSIDERATION FOR LEASING



U.S. Department of the Interior Map


OUTER CONTINENTAL SHELF
AREAS UNDER CONSIDERATION
FOR LEASING
CHUKCHI SEA
BEAUFORT SEA
NORTON BASIN
NAVARIN BASIN
COOK INLET
GULF OF ALASKA
ST. GEORGE BASIN
KODIAK
NORTH ALEUTIAN SHELF
150°
156°
162°
168°
174°
180°
174°
168°
162°
156°
150°
144°
138°
132°
126°
120°
73°
70°
65°
60°
55°
50°
60°
55°
50°
174°
168°
162°
156°
150°
144°
138°

ATTACHMENT 3

June 1979

OCS Leasing Program

Size of Potential Sales

Area	Potential Size (millions of acres)
North Atlantic	0.8
Mid-Atlantic	0.8
South Atlantic	0.6
Blake Plateau	0.8
Gulf of Mexico	1.0
Southern California 1/	0.8
Central and Northern California	0.8
California	0.8
Gulf of Alaska	0.8
Cook Inlet	0.8
Kodiak	1.0
North Aleutian Shelf	1.0
St. George Basin	1.0
Navarin Basin	1.0
Norton Basin	0.6
Chukchi Sea	0.6
Beaufort Sea	0.6

1/ Includes Santa Barbara Channel.

ATTACHMENT 4

June 1979

Estimated Appropriations and Staff Requirements

for

Proposed 5-Year Leasing Program

Format

The following table provides estimates of appropriations and full-time permanent staff (FTP) necessary to support the proposed leasing program. It should be noted that this is an initial estimate and has not been evaluated through either internal or Office of Management and Budget processes and is subject to refinement.

The data are displayed in accordance with section 18(b) of the OCS Lands Act, as amended, which requires estimates of four specific activities. In addition, a general category, General Administrative Activities, was added to cover those costs not specifically required by section 18(b), but necessary in order to fully reflect the cost of managing the program. These five categories of activities are described below.

1. Obtain resource information and any other information required to prepare the leasing program (18(b)(1)). This includes the work performed by the USGS in preparing regional oil and gas resource assessments and tract-specific evaluations of common depth point and high resolution seismic data. Also included is the biological resource information provided by FWS.

2. Analyze and interpret exploratory data and any other information that may be acquired under the OCS Lands Act, as amended (18(b)(2)). This activity covers the USGS operation of the OCS oil and gas information program mandated by the OCS Lands Act, as amended.

3. Conduct environmental studies and prepare environmental statements (18(b)(3)). This activity includes contract costs for the BLM environmental studies program (e.g., socio-economic, endangered species, resource conflicts). For the BLM, the figures also include $2.0 million and 51 FTP's in each year for the preparation of environmental statements which in the standard budget presentation are not included with the environmental studies program. The remaining FTP's (50 for each year) are for the support of the environmental studies program, appropriations for which are included in the activity, General Administrative Activities.

USGS funds and staff are used for regional assessments of geologic hazards used in summary reports prepared prior to the call for nominations and comments, more detailed analyses of geologic hazards and oil spill trajectory analysis used in the environmental statements prepared for potential sales, and for the preparation of development-stage environmental statements.

4. <u>Supervise lease operations</u> (18(b)(4)). This is a function of the USGS. It involves review of drilling, production and pipeline plans and operations, inspections of rigs and platforms to insure safety and compliance with regulations, and maintenance of royalty accounts.

5. <u>General administrative activities</u>. For the BLM, examples of general administrative activities include: the call for nominations and comments, tentative tract selection, public hearings on environmental statements, preparation of decision documents, support of the environmental studies program; post-sale analysis of bids; support of the Intergovernmental Planning Program for Leasing, Transportation and Facilities Siting; and analysis and approval of rights-of-way applications.

Examples of GS activities include analytical support and participation in most of the steps and activities mentioned in the preceding paragraph, and special support activities such as estuarine and coastal geologic investigations related to onshore impacts of OCS development.

The Fish and Wildlife Service, the Office of the Solicitor and the Office of OCS Program Coordination all participate in the management of the OCS program and all their costs are included in this activity other than the gathering and analyzing resource information by FWS.

Occasionally, other organizational units of the Department of the Interior, such as the National Park Service and the Bureau of Indian Affairs participate in the OCS program. However, since they do not have a continuing role and do not have specific staff and financial resources dedicated to the management of the OCS program, estimates for them are not included in this analysis.

<u>Assumptions</u>

The costs of the OCS program are a function of many variables, the most important of which are the number and geographic distribution of sales in any year and over the five-year schedule, and the type and extent of workload generated by a sale in a specific area. These cost estimates have been prepared using past experience in the program, e.g., knowledge of data needed to support the program, the costs and timing of data acquisition and average workload generated by a sale, the resources needed to supervise lease operations, as general guidelines. The bureaus can estimate from past experience what is likely to be required to support a sale in a particular sale area. For example, in Alaska, high resolution seismic data, acquired under contract, can cost up to twice as much as high resolution seismic data in the Mid-Atlantic; a development plan for a Gulf of Mexico lease would be expected sooner after the lease is awarded than one for a North Atlantic lease; weather conditions might seriously affect the environmental studies program in Alaska whereas off the lower 48 states weather conditions would not be as serious a constraint on data gathering. Costs of supervising are particularly subject to uncertainty since they depend on the level of exploration, development and production activities which will result during the 5-year period, both from sales on the proposed schedule and from earlier sales.

Comparison with FY 1980 Budget

The FY 1980 budget presently funds the OCS leasing program at $130.1 million and 1,479 FTP's. Specific funding is as follows:

	$ Millions	FTP
USGS	81.2	1,227
BLM	48.0	228
FWS	.3	6
OCS Coordination	.5	10
SOL	.3	8
	130.3	1,479

$34.7 million of BLM OCS budget and $5.7 million of USGS OCS budget is for environmental studies.

June 1979

Estimated Appropriation and Staff Requirements for Proposed 5-Year OCS Leasing Program 1/

Activity	FY 1980		FY 1981		FY 1982		FY 1983		FY 1984		FY 1985	
	$ million	FTP 2/	$ million	FTP	$ million	FTP	$ million	FTP	$ million	FTP	$ million	FTP
Resource Information:												
USGS	42.9	605	44.1	630	53.5	630	44.0	630	46.4	630	46.6	630
FWS	.2	5	.4	6	.5	8	.6	9	.7	11	.7	11
Total	43.1	610	44.5	636	54.0	638	44.6	639	47.1	641	47.3	641
Exploration Data:												
USGS	3.3	3	3.3	3	3.3	3	3.3	3	3.3	3	3.3	3
Environmental Statements and Studies:												
BLM 3/	41.8	101	39.8	101	28.6	101	23.9	101	23.2	101	21.2	101
USGS	9.8	78	9.9	79	9.9	79	9.9	79	9.9	79	9.9	79
Total	51.6	179	49.7	180	38.5	180	33.8	180	33.1	180	31.1	180
Supervise Lease Operations:												
USGS	30.7	505	32.9	513	38.1	597	41.1	631	43.5	673	43.9	673
General Administrative Activities:												
BLM	15.8	149	15.6	149	14.2	157	13.6	157	13.4	157	13.2	157
USGS	2.8	67	2.8	67	2.8	67	2.8	67	2.8	67	2.8	67
FWS	.1	2	.1	2	.1	2	.1	2	.1	2	.1	2
OCS Coordination	.5	10	.5	10	.5	10	.5	10	.5	10	.5	10
Solicitor	.4	11	.4	12	.4	13	.5	14	.5	14	.5	14
Total	19.6	239	19.4	240	18.0	249	17.5	250	17.3	250	17.1	250
Summary:												
BLM	57.6	250	55.4	250	42.8	258	37.5	258	36.6	258	34.4	258
USGS	89.5	1,258	93.0	1,292	107.5	1,376	101.0	1,410	105.9	1,452	106.5	1,452
FWS	.3	7	.5	8	.6	10	.7	11	.8	13	.8	13
OCS Coordination	.5	10	.5	10	.5	10	.5	10	.5	10	.5	10
Solicitor	.4	11	.4	12	.4	13	.5	14	.5	14	.5	14
Total	148.3	1,536	149.8	1,572	151.8	1,667	140.2	1,703	144.3	1,747	142.7	1,747

1/ Estimates do not include costs of studies, operations, assessment and administrative costs incurred during 5-year period for sales which will be held after February 1985.

2/ Full-time permanent positions.

3/ For each year, includes $2.0 million and 51 FTP's for preparation of environmental statements.

Appendix 2

INDUSTRY INTEREST IN OCS LEASING REGIONS

	RESOURCE POTENTIAL Industry	INTEREST IN EXPLORATION Industry
1.	Central & West Gulf of Mexico	Central & West Gulf of Mexico
2.	Beaufort Sea	Santa Barbara
3.	Santa Barbara	Beaufort Sea
4.	Mid-Atlantic	Bristol Basin
5.	St. George Basin	North Atlantic
6.	Bristol Basin	Mid-Atlantic
7.	Southern California	Central & Northern California
8.	North Atlantic	Southern California
9.	Norton Basin	St. George Basin
10.	Chukchi Sea	Norton Basin
11.	Navarin Basin	Eastern Gulf of Mexico
12.	Central & Northern California	Navarin Basin
13.	Blake Plateau	Cook Inlet
14.	Hope Basin	Hope Basin
15.	Eastern Gulf of Mexico	Blake Plateau
16.	Cook Inlet	Gulf of Alaska
17.	Gulf of Alaska	Chukchi Sea
18.	South Atlantic	South Atlantic
19.	Kodiak	Washington-Oregon
20.	Washington-Oregon	Florida Straits
21.	Southern Aleutian	Kodiak Shelf
22.	Florida Straits	South Aleutian

Appendix 3

SUMMARY OF STATE COMMENTS CONCERNING DEVELOPMENT OF FIVE-YEAR OCS LEASING SCHEDULE

A copy of the letter following was also sent to:

Honorable Hugh Gallen, Governor of New Hampshire

Honorable Ella T. Grasso, Governor of Connecticut

Honorable Dick Riley, Governor of South Carolina

Honorable Robert Graham, Governor of Florida

Honorable Cliff Finch, Governor of Mississippi

Honorable Victor L. Atiyeh, Governor of Oregon

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

Honorable Joseph E. Brennan
Governor of Maine
State House
Augusta, Maine 04330

Dear Governor Brennan:

In accordance with section 18(c)(3) of the OCS Lands Act, as amended, I am enclosing for your review a copy of the proposed program for OCS oil and gas lease sales covering the period March 1980 through February 1985, together with the background material which I used in reaching my decision. The proposed program is in the form of a submission to the Congress dated June 18, 1979 (Enclosure A). The background material is a memorandum to me dated May 29, 1979, and its attachments (Enclosure B). I am also sending the proposal to the Attorney General and publishing it in the Federal Register.

I would appreciate receiving any comments and recommendations you may have on the proposed program by September 21, 1979. After considering your comments and recommendations and those of other interested parties, and considering the draft environmental statement which is being prepared and the comments thereon, I will review my decision. Then, as required by section 18(d)(2) of the Act, I will transmit the program to the President and to the Congress, together with any comments received. I will indicate at that time why any specific recommendation of the Attorney General or of a State or local government was not accepted. This transmittal is required to take place at least 60 days prior to my approving the leasing program. I plan on having the final program in effect by March 1980.

The draft environmental statement on the proposed 5-year program will be released in August 1979, and the final statement will be issued in January 1980, prior to my final approval of the leasing program.

Section 18(a) of the Act identifies certain factors which must be considered in preparing the 5-year leasing program. I have considered the characteristics of the OCS regions, as required by the Act, in arriving at my decision on the proposed program. The enclosed background material was used in that regard. While a potential for conflict

with other uses of the OCS, such as commercial fishing and navigation, and with the coastal zone has been identified, I believe the broad authorities we have to control oil and gas activities offshore and the procedures we have put in place to implement those authorities, as determined by both legal and policy requirements, will enable us to resolve possible difficulties so that oil and gas leasing can be conducted in a safe manner. I will work closely with the Governors of affected States and with other Cabinet Officers to ensure that any possible conflicts are resolved. I have not ascertained any impediments to consideration of OCS areas for leasing because of any State laws, goals or policies which have been identified, or because of provisions of any coastal zone management programs.

The Department of Energy (DOE) has been very helpful in ensuring the proper link between Federal energy leasing policy and overall national energy policy. In addition to providing guidance on national energy policy requirements, DOE examined possible constraints on OCS production from the viewpoint of regional energy demand and supply and concluded there are no constraints on OCS production resulting from these considerations. DOE also concluded that a lack of transportation facilities should not affect leasing plans off the West Coast or Alaska. This has allowed me to select areas for leasing from the perspective of the total national energy picture, rather than being limited by regional requirements.

The proposed program I have adopted is designed to increase the chances of finding and producing oil and gas in offshore areas, consistent with the requirements of the OCS Lands Act, as amended. President Carter in his April 5 Energy Message emphasized the importance of enhanced production from the OCS in order to reduce reliance on insecure and expensive imports. As compared with the schedule I transmitted to you in March, the revised schedule increases the number of sales from 26 to 30, and provides for an average of six sales a year. It calls for six sales in the Atlantic, 11 in the Gulf of Mexico, four off California, and nine off Alaska. In developing the proposed program, earlier consideration has been provided for Alaskan frontier area sales where the resource potential is believed to be the highest. Changes in the scheduling of lower 48 basins are primarily directed at increasing our ability to respond to the findings of exploration resulting from prior sales.

I believe that the program I am proposing will significantly strengthen our national effort to develop additional domestic energy supplies, while at the same time, using all the extensive authorities of the OCS Lands Act, as amended, will assure protection of our Nation's cherished human and environmental values. While I have provided for earlier scheduling of sales in frontier areas where the resource potential is believed to be

high, the availability of environmental and geotechnical data has been carefully considered in the timing of all sales. The future direction of the environmental studies program will be guided by the timing of the activities proposed in the 5-year program.

Section 18(a)(2)(B) of the Act calls for an equitable sharing of developmental benefits and environmental risks. I believe the program I am putting forward will allow all regions of the country to contribute to energy supplies if economically recoverable deposits of hydrocarbons are located off their shores, and to share in the environmental risks of development. As I noted earlier, hydrocarbon supplies, if found in commercial quantities on the OCS, can generally be transported to demand areas, according to the DOE. Thus, DOE has concluded that regional markets will not affect OCS production. That is, because of the efficiency of oil and gas transport, the use of produced hydrocarbons from the OCS is not limited to only those areas adjacent to production. Information relating to the possible levels of production, economic benefits and environmental risks has been reviewed. Further, the OCS Lands Act, as amended, provides the legal framework to ensure that oil and gas exploration and development can be conducted safely in all areas of the United States.

Your continued interest and assistance in developing this program is greatly appreciated.

Sincerely,

Cecil D. Andrus

SECRETARY

Enclosures:

A. Proposed program--Letter of June 18, 1979, to the Congress.

B. Background material--Memorandum of May 29, 1979.

A copy of the letter following was also sent to

Honorable J. Joseph Garrahy, Governor of Rhode Island

Honorable Hugh L. Carey, Governor of New York

Honorable Brendan T. Byrne, Governor of New Jersey

Honorable Harry Hughes, Governor of Maryland

Honorable Richard Thornburgh, Governor of Pennsylvania

Honorable Pierre S. duPont IV, Governor of Delaware

Honorable John N. Dalton, Governor of Virginia

Honorable James B. Hunt, Jr., Governor of North Carolina

Honorable George Busbee, Governor of Georgia

Honorable Forrest James, Jr., Governor of Alabama

Honorable William Clements, Governor of Texas

Honorable Edmund G. Brown, Jr., Governor of California

Honorable Jay S. Hammond, Governor of Alaska

Also following are summaries of comments received from these Governors or their representatives, and responses to the comments. References in the responses to Tabs refer to background material prepared for the Secretary of the Interior and available through the Department of the Interior, Office of OCS Program Coordination, Washington, D.C. 20240.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JUN 25 1979

Honorable Edward J. King
Governor of Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

In accordance with section 18(c)(3) of the OCS Lands Act, as amended, I am enclosing for your review a copy of the proposed program for OCS oil and gas lease sales covering the period March 1980 through February 1985, together with the background material which I used in reaching my decision. The proposed program is in the form of a submission to the Congress dated June 18, 1979 (Enclosure A). The background material is a memorandum to me dated May 29, 1979, and its attachments (Enclosure C). I am also sending the proposal to the Attorney General and publishing it in the Federal Register.

Comments received from you, or on your behalf, relating to the draft proposed program provided to you on March 9 are addressed in Enclosure B. I would appreciate receiving any comments and recommendations you may have on the proposed program by September 21, 1979. After considering your comments and recommendations and those of other interested parties, and considering the draft environmental statement which is being prepared and the comments thereon, I will review my decision. Then, as required by section 18(d)(2) of the Act, I will transmit the program to the President and to the Congress, together with any comments received. I will indicate at that time why any specific recommendation of the Attorney General or of a State or local government was not accepted. This transmittal is required to take place at least 60 days prior to my approving the leasing program. I plan on having the final program in effect by March 1980.

The draft environmental statement on the proposed 5-year program will be released in August 1979, and the final statement will be issued in January 1980, prior to my final approval of the leasing program.

Section 18(a) of the Act identifies certain factors which must be considered in preparing the 5-year leasing program. I have considered the characteristics of the OCS regions, as required by the Act, in arriving at my decision on the proposed program. The enclosed background material was used in that regard. While a potential for conflict

with other uses of the OCS, such as commercial fishing and navigation, and with the coastal zone has been identified, I believe the broad authorities we have to control oil and gas activities offshore and the procedures we have put in place to implement those authorities, as determined by both legal and policy requirements, will enable us to resolve possible difficulties so that oil and gas leasing can be conducted in a safe manner. I will work closely with the Governors of affected States and with other Cabinet Officers to ensure that any possible conflicts are resolved. I have not ascertained any impediments to consideration of OCS areas for leasing because of any State laws, goals or policies which have been identified, or because of provisions of any coastal zone management programs.

The Department of Energy (DOE) has been very helpful in ensuring the proper link between Federal energy leasing policy and overall national energy policy. In addition to providing guidance on national energy policy requirements, DOE examined possible constraints on OCS production from the viewpoint of regional energy demand and supply and concluded there are no constraints on OCS production resulting from these considerations. DOE also concluded that a lack of transportation facilities should not affect leasing plans off the West Coast or Alaska. This has allowed me to select areas for leasing from the perspective of the total national energy picture, rather than being limited by regional requirements.

The proposed program I have adopted is designed to increase the chances of finding and producing oil and gas in offshore areas, consistent with the requirements of the OCS Lands Act, as amended. President Carter in his April 5 Energy Message emphasized the importance of enhanced production from the OCS in order to reduce reliance on insecure and expensive imports. As compared with the schedule I transmitted to you in March, the revised schedule increases the number of sales from 26 to 30, and provides for an average of six sales a year. It calls for six sales in the Atlantic, 11 in the Gulf of Mexico, four off California, and nine off Alaska. In developing the proposed program, earlier consideration has been provided for Alaskan frontier area sales where the resource potential is believed to be the highest. Changes in the scheduling of lower 48 basins are primarily directed at increasing our ability to respond to the findings of exploration resulting from prior sales.

I believe that the program I am proposing will significantly strengthen our national effort to develop additional domestic energy supplies, while at the same time, using all the extensive authorities of the OCS Lands Act, as amended, will assure protection of our Nation's cherished human and environmental values. While I have provided for earlier scheduling of sales in frontier areas where the resource potential is believed to be

high, the availability of environmental and geotechnical data has been carefully considered in the timing of all sales. The future direction of the environmental studies program will be guided by the timing of the activities proposed in the 5-year program.

Section 18(a)(2)(B) of the Act calls for an equitable sharing of developmental benefits and environmental risks. I believe the program I am putting forward will allow all regions of the country to contribute to energy supplies if economically recoverable deposits of hydrocarbons are located off their shores, and to share in the environmental risks of development. As I noted earlier, hydrocarbon supplies, if found in commercial quantities on the OCS, can generally be transported to demand areas, according to the DOE. Thus, DOE has concluded that regional markets will not affect OCS production. That is, because of the efficiency of oil and gas transport, the use of produced hydrocarbons from the OCS is not limited to only those areas adjacent to production. Information relating to the possible levels of production, economic benefits and environmental risks has been reviewed. Further, the OCS Lands Act, as amended, provides the legal framework to ensure that oil and gas exploration and development can be conducted safely in all areas of the United States.

Your continued interest and assistance in developing this program is greatly appreciated.

Sincerely,

Cecil D. Andrus

SECRETARY

Enclosures:

A. Proposed program--Letter of June 18, 1979, to the Congress.

B. Discussion of comments received on draft proposed program of March 1979.

C. Background material--Memorandum of May 29, 1979.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JUN 25 1979

Honorable Edwin Edwards
Governor of Louisiana
State Capitol
Baton Rouge, Louisiana 70804

Dear Governor Edwards:

In accordance with section 18(c)(3) of the OCS Lands Act, as amended, I am enclosing for your review a copy of the proposed program for OCS oil and gas lease sales covering the period March 1980 through February 1985, together with the background material which I used in reaching my decision. The proposed program is in the form of a submission to the Congress dated June 18, 1979 (Enclosure A). The background material is a memorandum to me dated May 29, 1979, and its attachments (Enclosure C). I am also sending the proposal to the Attorney General and publishing it in the Federal Register.

Enclosure B is a copy of my prior response to your comments on the draft proposed program. I would appreciate receiving any comments and recommendations you may have on the proposed program by September 21, 1979. After considering your comments and recommendations and those of other interested parties, and considering the draft environmental statement which is being prepared and the comments thereon, I will review my decision. Then, as required by section 18(d)(2) of the Act, I will transmit the program to the President and to the Congress, together with any comments received. I will indicate at that time why any specific recommendation of the Attorney General or of a State or local government was not accepted. This transmittal is required to take place at least 60 days prior to my approving the leasing program. I plan on having the final program in effect by March 1980.

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I believe that the program I am proposing will significantly strengthen our national effort to develop additional domestic energy supplies, while at the same time, using all the extensive authorities of the OCS Lands Act, as amended, will assure protection of our Nation's cherished human and environmental values. While I have provided for earlier scheduling of sales in frontier areas where the resource potential is believed to be

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Your continued interest and assistance in developing this program is greatly appreciated.

Sincerely,

Cecil

SECRETARY

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B. Response to comments received on draft proposed program of March 1979.

C. Background material--Memorandum of May 29, 1979.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

APR 25 1979

Honorable Edwin Edwards
Governor of Louisiana
Baton Rouge, Louisiana 70804

Dear Governor Edwards:

Thank you for your letter of March 28, 1979, concerning the draft proposed 5-year OCS Oil and Gas Leasing Program. We will take your comments into account when we develop the proposed 5-year program to be submitted to Congress this June. Consistent with section 18 of the OCS Lands Act, as amended, we will aim for an equitable sharing of developmental benefits and environmental risks. Your views on this point will be carefully considered.

I do, of course, share your view that development of OCS oil and gas resources benefits our nation from an economic, national security, as well as environmental perspective. We have done considerable work in involving all interested parties in the development of the program. We may, however, have to place greater emphasis on explaining the very positive contribution made by development of the OCS. We will explore this idea further.

Thank you again. We will be sending you the proposed program for review and comment this June which will reflect consideration of your comments.

Sincerely,

/S/

SECRETARY

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JUN 25 1979

Honorable Dixy Lee Ray
Governor of Washington
State Capitol
Olympia, Washington 98504

Dear Dixy:

In accordance with section 18(c)(3) of the OCS Lands Act, as amended, I am enclosing for your review a copy of the proposed program for OCS oil and gas lease sales covering the period March 1980 through February 1985, together with the background material which I used in reaching my decision. The proposed program is in the form of a submission to the Congress dated June 18, 1979 (Enclosure A). The background material is a memorandum to me dated May 29, 1979, and its attachments (Enclosure C). I am also sending the proposal to the Attorney General and publishing it in the Federal Register.

Enclosure B is a copy of my prior response to your comments on the draft proposed program. I would appreciate receiving any comments and recommendations you may have on the proposed program by September 21, 1979. After considering your comments and recommendations and those of other interested parties, and considering the draft environmental statement which is being prepared and the comments thereon, I will review my decision. Then, as required by section 18(d)(2) of the Act, I will transmit the program to the President and to the Congress, together with any comments received. I will indicate at that time why any specific recommendation of the Attorney General or of a State or local government was not accepted. This transmittal is required to take place at least 60 days prior to my approving the leasing program. I plan on having the final program in effect by March 1980.

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I believe that the program I am proposing will significantly strengthen our national effort to develop additional domestic energy supplies, while at the same time, using all the extensive authorities of the OCS Lands Act, as amended, will assure protection of our Nation's cherished human and environmental values. While I have provided for earlier scheduling of sales in frontier areas where the resource potential is believed to be

high, the availability of environmental and geotechnical data has been carefully considered in the timing of all sales. The future direction of the environmental studies program will be guided by the timing of the activities proposed in the 5-year program.

Section 18(a)(2)(B) of the Act calls for an equitable sharing of developmental benefits and environmental risks. I believe the program I am putting forward will allow all regions of the country to contribute to energy supplies if economically recoverable deposits of hydrocarbons are located off their shores, and to share in the environmental risks of development. As I noted earlier, hydrocarbon supplies, if found in commercial quantities on the OCS, can generally be transported to demand areas, according to the DOE. Thus, DOE has concluded that regional markets will not affect OCS production. That is, because of the efficiency of oil and gas transport, the use of produced hydrocarbons from the OCS is not limited to only those areas adjacent to production. Information relating to the possible levels of production, economic benefits and environmental risks has been reviewed. Further, the OCS Lands Act, as amended, provides the legal framework to ensure that oil and gas exploration and development can be conducted safely in all areas of the United States.

Your continued interest and assistance in developing this program is greatly appreciated.

Sincerely,

Cecil

SECRETARY

Enclosures:

A. Proposed program--Letter of June 18, 1979, to the Congress.

B. Response to comments received on draft proposed program of March 1979.

C. Background material--Memorandum of May 29, 1979.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

MAY 8 1979

Honorable Dixy Lee Ray
Governor of Washington
Legislative Building
Olympia, Washington 98504

Dear Dixy:

I appreciated receiving your April 5 letter commenting on the draft proposed 5-Year OCS Oil and Gas Leasing Program. In accord with section 18 of the OCS Lands Act, as amended, we will consider the Washington Coastal Zone Management Program in the event a lease sale is proposed in your area. Further, we intend to build early State-Federal planning and coordination into any proposed lease sale action to ensure consistency with State coastal zone management programs and to provide for integration of the environmental studies program with the leasing program.

Thank you again for your comments. We will be sending you a copy of the proposed program we submit to Congress in June and will again request your comments.

Sincerely,

(Sgd) Cece

SECRETARY

Response to letter dated April 17, 1979, from Governor Edward J. King, Commonwealth of Massachusetts.

Comment: Further documentation is necessary on how the eight factors listed in section 18(a)(3) were incorporated in the determination of the schedule, with specific emphasis on "an equitable sharing of developmental benefits and environmental risks" and the "the relative environmental sensitivity and marine productivity" of OCS regions.

Response: Item B of section 18(a)(3) calls for an equitable sharing of developmental benefits and environmental risks. This is interpreted to mean that all regions of the country are expected to contribute supplies if economically recoverable deposits of hydrocarbons are located off their shores, and to share in the environmental risks of exploration and development. The proposed program provides for an equitable sharing of developmental benefits and environmental risks. The environmental sensitivity is described under Tab B - Part 6. Hydrocarbon supplies, if found in commercial quantities on the OCS, can generally be transported to demand areas, according to the Department of Energy. Thus, DOE has concluded that regional markets will not affect OCS production. That is, because of the efficiency of oil and gas transport, the use of produced hydrocarbons from the OCS is not limited to only those areas adjacent to production. Information relating to levels of production, economic benefits and probable environmental risks has been reviewed. The proposed program includes sales in all areas where there is a reasonable indication of hydrocarbon potential and where the environmental and geotechnical information we believe is necessary to support sound decisions will be available in the 5-year period under consideration. Further information on this issue can be found in the foreword to the background material located under Tab B and in the section, Size, Timing, and Location of Sales, located under Tab B - Part 5.

With respect to an environmental ranking of the 22 areas, we have chosen to separate the 22 areas into four distinct regions: Atlantic Region, Gulf Region, Pacific Region, and the Alaska Region. This was done, since in general, these regions support biologically distinct species with different habitat requirements, significant species diversity, and differing species use. Information on the question of environmental sensitivity can be found under Tab B - Part 7.

Comment: Interior should demonstrate how the lease sale schedule incorporates concerns other than the agency's internal administrative requirements, especially those factors listed in section 18(a)(2) and explain how the schedule provides for a "proper balance between the potential for environmental damage, the potential for the discovery of oil and gas and the potential for adverse impact on the coastal zone."

Response: The background material found under Tab B has been organized to facilitate understanding how the requirements of section 18 have been met.

To the extent practicable, we have scheduled sales in new areas on the basis of resource potential, taking into account the time required to collect the environmental and geotechnical data which are useful in the steps leading to a sale decision. We believe that our pre-sale planning process, together with the extensive authorities provided under the OCS Lands Act, as amended, should enable oil and gas development to be conducted safely, without significant environmental damage or adverse impact on the coastal zone.

Comment: Interior should incorporate estimates of appropriations and staff in the proposed leasing program.

Response: Estimates of appropriations and staff are attached to the letter of June 18, 1979, and can be found under Tab B - Part 10.

Comment: Interior should demonstrate how environmental and geotechnical studies will be tied to the leasing program, assess whether the ongoing studies in the North Atlantic provide sufficient information to carry out the two sales and include estimates of appropriations and staff required to conduct environmental and geotechnical studies.

Response: A discussion of the relevance of the environmental studies program to the scheduling of sales can be found under Tab B - Part 5. The Bureau of Land Management and the Geological Survey have prepared estimates of appropriations and staff required to conduct environmental and geotechnical studies. These estimates can be found as discussed above.

Comment: Massachusetts supports Interior's proposed timing between first and second sales and the accelerated timing for successive sales.

Response: The proposed program provides for the timing supported by Massachusetts.

Response to letter dated April 12, 1979, from Governor J. Joseph Garrahy, State of Rhode Island.

Comment: Recommends that lease Sale #52 be held 2 years after lease Sale #42 which he hopes will be held in the summer of 1979.

Response: The proposed program continues to provide for an approximate 3-year interval between first and second sales in a frontier area. Interior hopes to be able to hold lease Sale #42 in October 1979 in Providence, Rhode Island, and proposes to hold lease Sale #52 in August 1982. This 3-year spacing will enable us to benefit from the exploratory results from the first sale before the next sale is held and to provide for a steady level of activity in the North Atlantic. As we learn more about an area we can space sales more closely. For example, the second and third North Atlantic sales are spaced at a 2-year interval. A discussion of this issue can be found under Tab B - Part 5 of the enclosed background material.

Response to letter dated April 12, 1979, from Hugh L. Carey, Governor, State of New York and letter dated April 25, 1979, from Gregory H. Sovas, Chief, Bureau of Mineral Resources, State of New York.

Comment: The Governor's letter expressed appreciation for the opportunity for early review of the draft leasing program and looks forward to further consultation on this important matter. Informed us that the State Department of Environmental Conservation is the lead State agency for OCS matters and that they would provide further comments directly to Interior.

Response: The Department appreciates the State's continuing interest in the development of the 5-year program and looks forward to futher coordination with the State.

Comments from Mr. Sovas are addressed below.

Comment: Further work is needed on how the industry input was used in developing the schedule and how the environmental studies program would be integrated into the leasing program and how other Federal agency resources were considered. An environmental impact statement is needed and the option chosen by the Secretary on March 9 should be included in any further amendment to the program.

Response: With respect to the use of industry rankings, the proposed program is designed to provide earlier consideration of certain Alaskan frontier areas where the resource potential is believed to be the highest. We have judged the level of resource potential on the basis of information provided both by the Geological Survey and the industry. Industry and Geological Survey rankings can be found under Tab A of the background material. Other industry recommendations can be found under Tab B - Part 4.

The availability of environmental and geotechnical data has been carefully considered in the timing of all sales; a discussion of this issue can be found under Tab B - Part 5, size, timing, and location of sales. Estimates of appropriations and staff, which include funding for environmental studies and geotechnical data for the proposed program, are attached to the letter of June 18, 1979, and can be found under Tab B - Part 10.

Concerning the OCS related responsibilities of other agencies, letters are being sent to other Cabinet officials asking for their assistance in implementing the proposed program.

An environmental impact statement is being prepared. The draft is to be released in August, 1979 and the final in January, 1980.

The March 9 proposal was included in the background material used in developing the proposed program.

Response to letter dated March 19, 1979, from Glenn Paulson, Assistant Commissioner for Science and Research, State of New Jersey.

Comment: In order to more thoroughly evaluate competing uses and the environmental studies program, an environmental impact statement should be prepared on the 5-year schedule.

Response: A decision has been made to prepare an environmental impact statement on the proposed schedule. This will permit a more extensive treatment of other uses and resources in the OCS. The draft statement is to be released in August 1979, and the final statement will be issued in January 1980 prior to Secretary Andrus' final approval of the leasing program. We also have expanded the discussion of the ecological characteristics of the OCS areas in the background material presented to the Secretary. This information can be found under Tab B - Parts 6 and 7.

We also are providing for a strong link between the environmental studies program and the 5-year leasing program. In determining sale dates, careful consideration was given to the availability of environmental and geotechnical data. For those areas where leasing has not taken place and available information is currently lacking to support pre-sale steps, we estimated how long it would take to collect the information we believe is useful. A discussion of this issue can be found under Tab B - Part 5. Now that a decision has been made on the direction the program is going to take through February 1985, the studies program is being designed to support the various pre-leasing steps. The estimates of appropriations and staff which are being submitted to Congress with the program include funding for the studies. The Department plans to work closely with the States in assuring that the funds allocated to the program are for studies which improve the quality of decision-making.

Comment: There should be a careful and conscious coupling of steps in the lease sales in any area so that all data on oil and gas discoveries, environmental impacts and other information from earlier sales and studies can be fully integrated into each additional sale.

Response: With respect to the linkages between sales in a region a discussion of size, timing, and location of sales can be found under Tab B - Part 5. We believe that in frontier areas the spacing of first and second sales at 3-year intervals, and successive sales at 2-year interevals will provide for a orderly flow of information from one sale to the next.

Comment: New Jersey supports the Department's policy on diligent development, introduction of contingency sales, advanced plannning for the Alaskan OCS and the more orderly consideration of geohazards. Because of the potential resource base off Alaska, the planning effort should begin as early as possible.

Response: The Department continues to maintain a strong position on the question of diligent development. Lessees will be expected to complete sufficient exploration so that, if conditions warrant, a good start can be made toward beginning production within the primary term of the lease. It may be necessary to consider a longer than 5-year primary term in some new frontier areas, as permitted by the OCS Lands Act Amendments.

A contingency sale is listed in 1983 in the Gulf of Mexico. A decision has been made to hold the 1981 sale in the Gulf of Mexico, which was previously listed as a contingency sale, because of the high level of interest in the Gulf and the need to increase our domestic supplies. We continue to provide sufficient time for inclusion of the geohazard analysis in the final environmental statement.

The proposed program includes earlier consideration of the Alaskan areas with high potential, coupled with an expanded effort to collect environmental and geohazard information.

Response to letter dated May 1, 1979, from Governor Harry Hughes, Governor of Maryland

Comment: The State believes the draft proposed program is a sound one which will provide the necessary framework for developing the OCS resources on a timely basis and feels that Maryland's views have been correctly summarized.

Response: The Department appreciates Maryland's continuing interest and assistance in the development of the program and looks forward to continuing to work closely with the State.

Response to letter dated April 20, 1979, from Richard N. Benson, Geologist, State of Delaware

Comment: If in the Mid-Atlantic, or other frontier areas, commercial discoveries are made, provision should be made for an amended program to allow more sales and assure diligent development. If environmental and other considerations allow, the time between the call for nominations and the sale should be shortened.

Response: With respect to the future amendments of the program, section 18 of the OCS Lands Act, as amended, requires that the Secretary review the approved leasing program at least once each year. This review will allow us to consider the results of exploration and to revise the program accordingly.

We appreciate the comment concerning the length of time between Call for Nominations and Comments and the sale. We would also like to see this period shortened, but believe that in doing so we would jeopardize our ability to perform a thorough environmental and geotechnical analysis. One of the reasons we have provided for additional time is to enable us to have the tract-specific geohazard analysis included in the final environmental statement. This will provide all interested parties the opportunity to comment on the implications of this analysis in a timely manner. This has been an important issue in the Mid-Atlantic area.

Comment: The Baltimore Canyon trough is a very large sedimentary basin which will require a long period of exploration before its hydrocarbon potential is determined. There should be State involvement in the Call area decisions. Delaware is interested in the Call area including the hinge zones located close to State coastal areas.

Response: In determining the Call area for sale #59, the Bureau of Land Management will consult with the affected coastal States. We recognize the value of having the entire trough evaluated, both from an environmental and hydrocarbon perspective.

Comment: Development of the schedule should include consideration of, and resolution of, any conflicts between possible competitive uses of the OCS.

Response: In regard to multiple uses of the OCS, we have identified them in Tab B - Part 7 of the background material and will continue to work with the relevant agencies to resolve them. Letters are being sent to the Departments of Energy, Commerce, Defense and Transportation asking for their support in the implementation of the 5-year program. We also are further analyzing these concerns in the environmental impact statement being prepared on the schedule.

Response to letters dated March 22 and April 20, 1979, from Maurice B. Rowe, Secretary of Commerce and Resources, Commonwealth of Virginia.

Comment: A major concern of Virginia is the necessity for adequate energy planning and dependable broad based energy supplies. Supports requirement that successful bidders move expeditiously and supports improved availability of geological information. There is a need for a continuing environmental program which includes adequate gathering and analysis of timely data, and for the protection of unique and fragile ecosystems.

Response: Interior will continue to provide for early State/Federal coordination and planning in the lease sale process. Diligent development will be required with lessees being expected to complete sufficient exploration so that, if conditions warrant, a good start can be made toward beginning production within the primary terms of the lease. It may be necessary to consider a longer than 5-year primary term in some new frontier areas, as permitted by the OCS Lands Act Amendments. We continue to provide sufficient time for inclusion of the geohazard analysis in the final environmental statement.

Funding is planned for a continuation of the environmental studies program which is being tailored to meet the requirements of the proposed program. States will be encouraged to participate in the decisions on what future studies/investigations are appropriate for sound decisions-making.

Response to letter dated April 23, 1979, from Governor James B. Hunt, Jr., of North Carolina.

Comment: Support for OCS Sale #56 is dependent on environmental information being supplied in a timely manner.

Response: A good deal of information has already been collected on the South Atlantic area. Further studies are planned which will be tailored to meet the schedule proposed for both Sale #56 and the South Atlantic-Blake Plateau Sale in 1984. Tab B - Part 7 of the background material provides information on the studies conducted to date and currently in progress. Interior has benefitted from the contribtuion of Governor Hunt's staff to the studies program and looks forward to maintaining a close working relationship.

It is important to note that the information collected and environmental assessments made are useful in post-sale decisions as well as pre-sale actions, such as in the review of exploratory and development plans. Authorities granted under the OCS Lands Act, as amended, are very broad and provide extensive controls over the conduct of operations to the extent of suspending operations under certain conditions or in unusual cases, initiating procedures for lease cancellation. If there were major threats from OCS activity which would come to light with additional site specific studies, the costs of not waiting for those studies would be not so much increased environmental risks but an increased probability of invoking the lease cancellation provision.

Response to letter dated April 20, 1979, from Governor George Busbee, State of Georgia.

Comment: Shares the view of the Geological Survey that there be an effective oil spill response capability on location prior to any drilling.

Response: Interior will continue to provide for this through the enforcement of OCS Order No. 7-Pollution, Prevention, and Control which requires the submission of an oil spill contingency plan prior to approval to exploratory and development plans. We have required that a demonstration take place before operations could commence in the South Atlantic.

Comment: Information should be provided in a timely manner to support lease sale decisions.

A good deal of information has already been collected on the South Atlantic area. Further studies are planned which will be tailored to meet the schedule proposed for both Sale #56 and the South Atlantic-Blake Plateau Sale in 1984. Tab B - Part 7 of the background material provides information on the studies conducted to date and currently in progress. Interior has benefitted from the contribution of Governor Busbee's staff to the studies program and looks forward to maintaining a close working relationship. Discussions are continuing with the affected States about the environmental studies program.

It is important to note that the information collected and environmental assessments made are useful in post-sale decisions as well as pre-sale actions, such as in the review of exploratory and development plans. Authorities granted under the OCS Lands Act, as amended, are very broad and provide extensive controls over the conduct of operations to the extent of suspending operations under certain conditions or in unusual cases initiating procedures for lease cancellation. If there were major threats from OCS activity which would come to light with additional site specific studies, the costs of not waiting for those studies would be not so much increased environmental risks but an increased probability of invoking the lease cancellation provision.

Comment: Adequate information is still not available on live bottoms even though exploratory plans are being submitted for approval in areas where live bottoms exist.

Response: As discussed under Tab B - Part 7 of the background material, studies have been conducted on hard bottoms to determine existence of live bottoms, and in fact, a request for proposal was recently issued for continuing investigations. Lessees are also required by lease stipulation to provide interpretations of live or hard bottoms prior to submission of an exploratory plan. If preliminary surveys indicate the presence of live bottoms, further investigations are required. These may consist of physical sampling or visual observations consisting of a videotape. The results of these surveys are made available to State representatives. If a live bottom is located, the lessee must either relocate the well 1,820 meters from the site or shunt or transport all drill fluids and cuttings away from the site and monitor the effects of the operations on the environment. The Geological Survey's District Supervisor decides on the appropriate course of action.

Response to letter dated April 19, 1979, from Thomas Joiner, Oil and Gas Supervisor, Geological Survey of Alabama.

Comment: A test is being drilled in Mobile Bay. It is hoped that the Gulf of Mexico contingency sales for OCS lands off Alabama can take advantage of a discovery in Mobile Bay. Our current energy situation points up a need to expedite leasing and development, with emphasis on frontier areas.

Response: Tracts to be included in future Gulf of Mexico sales will, in part, be dependent upon industry's response to the Call for Nominations and Comments, and areas offshore Alabama will be included in the call. If discoveries are made in Mobile Bay and industry then nominates acreage in the adjacent OCS, such tracts will be considered for inclusion in sales.

A contingency sale in the Gulf of Mexico is included in the proposed leasing schedule. The rationale for including contingency sales in the schedule is to provide a mechanism for maintaining the same level of exploration and development, in the event a sale outside the Gulf of Mexico is withdrawn from the schedule. Subsequent events will determine whether this sale will be held as indicated, held at some other time during the 5-year period, deleted or postponed until after February 1985. With respect to emphasizing frontier areas, the proposed program provides for earlier consideration of frontier areas with high resource potential than the March draft did.

Response to letter dated May 3, 1979, from Governor William Clements, Jr., State of Texas.

Comment: Certain modifications should be made if the mandate of the President's Energy Message of April 5, 1979, is to be met. Specifically, this will entail moving into certain of the higher potential areas much faster than proposed in the March 9 schedule. Urged that the areas of the Bering Sea Shelf assigned high resource potential be moved up in the schedule.

Response: Modifications to the proposed March 9 schedule have been made to meet the mandate of the President's second Energy Message. Further, the proposed program provides for earlier consideration of certain Alaskan frontier area sales where the resource potential is believed to be the highest.

Comment: Urged DOI to take all possible measures, consistent with current law, to reduce the considerable time involved from initial call for nominations to the final sale dates.

Response: We share Texas' concern regarding the length of time between Call for Nominations and final sale. Although we would like to see this period shortened, we believe that to do so we would jeopardize our ability to perform a thorough environmental and geotechnical analysis. One of the reasons we have provided for additional time is to enable us to have the tract-specific geohazard analysis included in the final environmental statements. However, we are investigating means of increasing efficiency. In the Gulf of Mexico we intend to write a joint environmental statement for Sale #A66 and Sale #66. If this effort is successful we may apply the concept to other sales in previously explored areas thus utilizing the benefits of this experience.

Comment: Place priority on the highest quality tracts in the process of tract selection. Quality of offered tracts is as critical as volume of acreage.

Response: The Department also believes that the quality of offered tracts is as critical as the volume of acreage. In this respect, the 1984 Cook Inlet sale was dropped in order that resources could be allocated to quality lease sales in the new frontier areas. Further information on this comment can be found under Tab 4, Industry Recommendations, and Tab 5, Size, Timing, and Location of Sales of the background material.

Response to letter dated May 31, 1979, from Deni Greene, Deputy Director, Office of Planning and Research, State of California.

Comment: No policy decision should be made on a proposed leasing program until an EIS that adequately addresses the major issues is completed.

Response: The draft environmental statement will be made available in August, and its findings will be considered at the time of the Secretarial decision on the proposed final leasing program which is scheduled to be submitted to Congress and the President in November. The final statement will be completed in January 1980, and its findings will also be considered when the Secretary make his final decision on the leasing program in February 1980.

Comment: Several environmental studies of concern to California have not been funded; the studies program can only be useful if it is timed so that the studies are completed in time for their results to be factored into the leasing decisions. Recommends that lease Sale #53 be dropped and supports adding in that time frame another sale area so that the energy needs of America will not be adversely affected. Recommends that a sale not be scheduled off Central and Northern California until 1984 and that it be included in Category III "New Areas" to permit more time for preparation of the environmental statement. Completion of studies might lead to the environmental concerns outweighing the benefits of the sale leading to its cancellation. Further, California State government and oil refineries are studying the State's refinery configuration which could be the basis for industry to proceed with refinery retrofit so that additional quantities of California and Alaska high sulfur crude can be processed into clean fuels. The conversion will be expensive and may not be completed until the middle of the next decade. Additional time may also be needed for air quality considerations. Care should be exercised to coordinate OCS development with national energy needs and development of other regional energy resources.

Response: The proposed program continues to include lease Sale #53 in 1981. It is Interior's judgement that sufficient information will be available to accomplish the steps in the pre-sale planning process. Consideration of leasing in the Central and Northern California area has been underway since 1977, and additional time was allotted for preparation of the environmental statement. Studies which have been completed or which are currently underway are summarized under Tab B - Part 7 of the background material. Funding for a continuation of the studies program is provided in the estimates of appropriations and staff found under Tab B - Part 10.

The program is designed to provide for an equitable sharing of developmental benefits and environmental risks. All regions of the country are being asked to contribute if economically recoverable deposits of hydrocarbons are located off their shores, and to share in the environmental risks of development. The program calls for four sales off California, whereas there are six sales in the Atlantic, 11 in the Gulf of Mexico and nine off Alaska.

We encourage the retrofitting of refineries on the West Coast. If a sale is held in 1981, production would not be expected until 1985 or later which would be consistent with the schedule you have proposed.

Regulations will be in place prior to the scheduled date for Sale #53 controlling OCS activities so that they will not impede the achievement and maintenance of national ambient air quality standards on-shore as required by section 5(a)(8) of the OCS Lands Act, as amended.

Concerning the link with national energy policy, the Department of Energy has provided us with final OCS oil and gas production goals. In addition to providing guidance on national energy policy requirements, DOE examined possible constraints on OCS production from the viewpoint of regional energy demand and supply and concluded there are no constraints on OCS production resulting from these considerations. The DOE also concluded that transportion facilities should not constrain leasing plans off the West Coast or Alaska.

Comment: Recommends that the tracts which were deleted in lease sale #48 not be included in future sales in the program.

Response: Decisions on whether specific tracts will be offered in one of the proposed sales will be made as part of the pre-sale planning process as specified in the planning schedule and will be based on the information available at that time. Whereas the same judgement may be reached as was for OCS Sale #48, we believe it would be inconsistent with the purposes of the OCS Lands Act, as amended, to permanently exclude any areas from consideration with the exception of the area within 15 miles of the boundaries of the Point Reyes wilderness area.

Response to letter dated May 4, 1979, from Governor Jay S. Hammond, State of Alaska.

Comment: Believes the March 9 schedule strikes a good balance, and urges that Interior resist any backsliding toward accelerated leasing philosophy that prevailed a few years ago. In general, the comments received from local government support the leasing sequence proposed by Alaska in December. Community representatives tend to emphasize concerns or questions they may have rather than the year in which leasing should or should not occur. Alaska recommends that the following leasing sequence be followed:

(1) There is no objection to proceeding with sales in nearshore Beaufort Sea, Gulf of Alaska and Cook Inlet;

(2) Sales in Navarin Basin, Norton Basin, Hope Basin, and the Kodiak Shelf should be delayed until safe technology is developed in the nearshore Beaufort Sea;

(3) Sales in the nearshore areas of Norton and Navarin Basins may be appropriate for leasing by 1983-1985; and

(4) Sales in the Chukchi Sea, Southern Aleutian Shelf, St. George-Bristol Basin, and the Beaufort Sea ice shear and offshore pack ice zones need to be postponed indefinitely.

Eight evaluation criteria were used by the State to ensure consistency with State goals and policies. One State policy which has received increased emphasis since the December submission is the need to develop a viable bottomfish industry in Alaska. Keenly interested in Interior doing all it can to maintain and even enhance the productivity of Alaska's fisheries by coordinating leasing operations, stipulations and port development so as to comply with the needs of Alaska's developing fisheries industry.

Response: Because of the need to develop additional, secure supplies of oil and gas, and in order to comply with the President's Energy Message of April 5, the decision has been made to provide for earlier consideration of Alaskan areas where there is an indication of high potential for hydrocarbon discovery. The changes affecting Alaska are as follows: Norton Basin has been moved from December 1982 to September 1982; St. George Basin has been moved from February 1985 to December 1982 and is no longer identified as a second category sale; a sale is listed for October 1983 in a new planning region called the North Aleutian Shelf; the 1984 Cook Inlet sale has been dropped; the Navarin Basin sale has been moved from January 1985 to December 1984; and the Chukchi Sea sale has been moved from December 1984 to February 1985 and is no longer identified as a second category sale. Careful attention has been given to our ability to collect environmental and geotechnical data which we believe will be useful for the pre-sale decision points. A discussion of how the environmental studies program has been considered in determining sale dates can be found under Tab B - Part 5 of the background material. We also have considered the availability of technology to ensure safe operations in the respective areas. Industry views on the availability of technology can be found under Tab B - Part 4 of the background material.

We believe the broad authorities which have been provided to the Department to control oil and gas activities offshore and the procedures we have put in place to implement those authorities, as determined by both legal and policy requirements, will enable us to resolve possible difficulties so that oil and gas leasing can be conducted in a safe manner.

Comment: There are several areas in which the State of Alaska advocates particularly strong coordination between Federal agencies directly or indirectly involved in leasing off Alaska. There is a strong need for the State to be presented with one leasing schedule. The Federal Government needs to give as high a priority to assuring marketability of Alaska production (from both Federal and State leases) as it does to leasing itself. DOI must work closely with Commerce on the relationship between any marine sanctuaries that NOAA might pursue off Alaska and Federal leases that are planned. Also, the CEIP program must be adequately funded and funds must be continually available to coastal communities to be effective, including the funding for the OCS Participation Grants. Further, the BLM studies program consisting of socio-economic research by BLM and the OCS Environmental Assessment Program managed by NOAA must reach usable levels of completion before leasing in an area.

Response: With respect to the Department of Energy, final production goals have been provided and were considered in deciding on the proposed program. The only leasing schedule which States will be asked to review is the one included as part of the proposed program. Letters are being sent to the Departments of Energy and Commerce asking for their assistance in ensuring that all steps needed to support the five-year program are implemented. We plan to work closely with the Department of Energy on the question of marketability of oil and gas, and we will keep Alaska apprised of our progress. Concerning the environmental studies program, the estimates of appropriations and staff which are being forwarded to Congress provides for both the collection of environmental and geotechnical data which we believe will be useful in supporting the pre-sale decision points. We will work closely with Commerce to ensure that our future study efforts are tied in directly with the decision points in the 5-

The Department shares the State's concern regarding the need for adequate funding of the CEIP program. We have expressed support for additional funding of this program in letters we have sent to both Commerce and the Office of Management and Budget.

Appendix 4

Appropriations and Staff Estimated to be Required for the Five-Year Leasing Schedule Proposal

Estimated Costs of 5-Year OCS Oil and Gas Leasing Activities

($ Millions)

ACTIVITY	FY 1980		FY 1981		FY 1982 1/		FY 1983 1/		FY 1984 1/		FY 1985 1/	
	$	FTP	$	FTP	$	FTP	$	FTP	$	FTP	$	FTP
Resource Information												
USGS	42.9	605	44.1	630	53.5	630	44.0	630	46.4	630	46.6	630
FWS	.2	5	.4	6	.5	8	.6	9	.7	11	.7	11
Total	43.1	610	44.5	636	54.0	638	44.6	639	47.1	641	47.3	641
Exploration Data												
USGS	3.3	3	3.3	3	3.3	3	3.3	3	3.3	3	3.3	3
Environmental Studies and Statements												
BLM	41.8	101	39.8	101	28.6	101	23.9	101	23.2	101	21.2	101
USGS	9.8	78	9.9	79	9.9	79	9.9	79	9.9	79	9.9	79
Total	51.6	179	49.7	180	38.5	180	33.8	180	33.1	180	31.1	180
Supervise Lease Operations												
USGS	30.7	505	32.9	513	38.1	597	41.1	631	43.5	673	43.9	673
General Administrative Activities												
BLM	15.8	149	15.6	149	14.2	157	13.6	157	13.4	157	13.2	157
USGS	2.8	67	2.8	67	2.8	67	2.8	67	2.8	67	2.8	67
FWS	.1	2	.1	2	.1	2	.1	2	.1	2	.1	2
OCS Coordination	.5	10	.5	10	.5	10	.5	10	.5	10	.5	10
SOL	.4	11	.4	12	.4	13	.5	14	.5	14	.5	14
Total	19.6	239	19.4	240	18.0	249	17.5	250	17.3	250	17.1	250
TOTAL	148.3	1,536	149.8	1,572	151.9	1,667	140.3	1,703	144.3	1,747	142.7	1,747

1/ Estimates do not include cost of studies, assessment and administrative costs incurred during 5-year period for sales which will be held after February 1985. Totals may differ slightly from Table 1 due to rounding.

Appendix 5

BUREAU OF LAND MANAGEMENT
OUTER CONTINENTAL SHELF OFFICES (OCS)
AND
AVAILABILITY OF OCS ENVIRONMENTAL STATEMENTS

AVAILABILITY OF ENVIRONMENTAL STATEMENTS CONCERNING
OIL AND GAS LEASE SALES ON THE OUTER CONTINENTAL SHELF (OCS)

With the exception of initial review copies to Federal agencies (and a few copies available immediately after release through the BLM Public Affairs Office (130), OCS statements are distributed by the OCS Offices, rather than by the Washington Office. Copies of statements in print may be obtained by writing or calling the following:

Office Address	Telephone
(GULF OF MEXICO AND SOUTH ATLANTIC SALES)	
New Orleans Outer Continental Shelf Office Bureau of Land Management Hale Boggs Federal Building 500 Camp Street, Suite 841 New Orleans, Louisiana 70130	(FTS) 682-6541 (Com) 504-589-6541
(PACIFIC COAST SALES, EXCLUSIVE OF ALASKA)	
Pacific Outer Continental Shelf Office Bureau of Land Management 1340 W. Sixth Street, Room 200 Los Angeles, California 90017	(FTS) 798-7234 (Com) 213-688-7234
(ALL ALASKA SALES)	
Alaska Outer Continental Shelf Office Bureau of Land Management P. O. Box 1159 Anchorage, Alaska 99510	(Com) 907-276-2955
(NORTH AND MID-ATLANTIC SALES)	
New York Outer Continental Shelf Office Bureau of Land Management 26 Federal Plaza Suite 32-120 New York, New York 10007	(Com) 212-264-2960

Environmental maps may be obtained separately from the statements, at cost, from the OCS offices.

Available, EXCLUSIVE OF FINAL VOLUMES (Environmental Maps 1/), from the NATIONAL TECHNICAL INFORMATION SERVICE, 5285 Port Royal Road, Springfiled, Virginia 22161 or call the Sales Office (703-321-8543).

FINAL ENVIRONMENTAL STATEMENT	VOL.	ACCESSION NO	PRICE CODE-- PAPER 2/	
Programmatic--	SET	PB273699/AS		$101.00
Proposal to Increase	1	PB273700/AS	E15	
Oil & Gas Leasing on	2	PB273701/AS	E16	
the OCS	3	PB273702/aS	E17	
Lower Cook Inlet	1, Pt. 1	PB272966/AS	A25	
(#CI)	1, Pt. 2	PB272967/AS	A24	
	2	PB272268/AS	A99	
Mississippi, Alabama,	1	EIS-MS-73-1651-F-1	A15	
Florida (#32)	2	EIS-MS-73-1651-F-2	A11	
	3	EIS-MS-73-1651-F-3	A16	
	4	EIS-MS-73-1651-F-4	A15	
	5	EIS-MS-73-1651-F-5	A12	
Southern California	SET	PB279060/AS		$93.00
(#35)	1	PB279061/AS		$26.50
	2	PB279062/AS		$21.50
	3	PB279063/AS		$24.00
	4	PB279064/AS		$24.00
Northern Gulf of Alaska	1	PB272969	A20	
(#39)	2	PB272970		
		NOT REPRODUCIBLE BY NTI - UNAVAIABLE		

1/ These ENVIRONMENTAL MAPS are out-of-print for some of these statements; other are available, however, from the applicable OCS Offfice at cost, generally between $5.00 and $10.00.

2/ Single volumes are also available on microfiche.

Available, EXCLUSIVE OF FINAL VOLUME (Environmental Maps) from the SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, Washington, D.C. 20402:

FINAL ENVIRONMENTAL STATEMENT	VOL.	STOCK NO.	PRICE
Mid-Atlantic (#40)	1	024-011-0080-1	$6.80
	2	024-011-0081-0	$6.35
	3	024-011-0082-8	$8.10

Appendix 6

Deepwater Technology

Prepared by New Orleans OCS Office, Bureau of Land Management

June 1979

Industry Deepwater Capabilities

As the need for new sources of oil and gas increases, the necessity for exploration in deeper and more hostile environments becomes inevitable. Oil and gas development in these environments will require the use of new equipment suitable for working at such depths; however, the major factor determining the ability to produce oil and gas in deep water is economics. At the present time, there is a surplus of deepwater drilling capability.

Exploitation of hydrocarbon reserves occurs in several stages: exploratory drilling; development drilling and establishment of production facilities; transportation of the products.

The rigs most commonly used for exploratory drilling are drill barges, jack-ups, semi-submersibles and drill ships. Drill barges are most commonly used in inland waters. Jack-up rigs are limited in water depth by the length of the legs. There is currently at least one jack-up rig capable of drilling in depths up to 130m. Semi-submersibles and drill ships are most commonly used for deep water drilling.

Semi-submersible drilling rigs, also known as column-stabilized drilling units, provide a much larger deck space than drill ships but offer substantially less storage capacity in terms of weight. This is due to the much smaller waterplane area of semi-submersibles as compared to drill ships. Semi-submersible vessels are quite stable; roll seldom exceeds 5^{o} on a properly found vessel, even in the most severe seas. All but one of the semi-submersible drill units utilize conventional catenary mooring systems, which is one of the limiting factors in water depth capability. In moderate water depths, chain gives a better catenary action, but in water depths greater than about 365 meters, the weight of the chain makes it difficult to accommodate and carry aboard sufficient chain. In such cases, a chain and wire rope system is used. Dynamic positioning is much more advantageous in deep water. Only one semi-submersible rig, the SEDCO 709, has a dynamic positioning system. It also has more horsepower than any other drill vessel (approximately 26,000 to 30,000 HP). At present, there are approximately eight semi-submersibles capable of drilling in water depths of 450-610 m and only two are capable of operating in depths of 610-760 m.

Such drillships as the GLOMAR CHALLENGER and GLOMAR EXPLORER are capable of drilling in any water depth. The GLOMAR CHALLENGER, however, is involved with scientific sampling and purposely avoids any potential oil and/or gas prone areas; and the GLOMAR EXPLORER is currently involved with deep ocean mining. Other drill ships, such as the DISCOVERER 534, DISCOVERER SEVEN SEAS, and NEDDRILL 2, are designed to drill in waters up to 1,829 m deep. Most of these vessels utilize a dynamic positioning system, although some have mooring systems as well.

Due to the greater load capacity resulting from the greater waterplane area of the hull, drillships in general have greater capabilities for drilling in deeper water. For deep drilling from a floating vessel, the blow-out preventer stack (BOP) and well controls must be placed on the seafloor. Under threat of inclement weather, or in other emergencies, the entire riser string must be disconnected at the seafloor, retrieved and laid down on deck. This procedure necessitates the retrieval of all drilling mud in the riser. Most drill ships have a mud storage capacity of around 4,000 barrels, whereas most semi-submersible vessels have only a 1,200-1,500 barrel capacity.

Floating drill units make up about 50 percent of today's mobile offshore fleet. Drilling from a floating platform is very different from drilling on a bottom-supported platform or onshore, and requires some very specialized equipment. In any type of drilling, the ability to keep a constant preselected weight on the drill bit is extremely important. To counteract the up and down movement of waves, all floating units have some sort of heave compensator. These units are attached to the traveling block or crown block and through the use of high pressure air or air/oil, the loads caused by the rise and fall of the vessel are balanced out (fig. 1).

Additional problems are posed by the riser system in a floating drilling operation since it must also allow for the up and down movement of the waves. This problem is mitigated through the

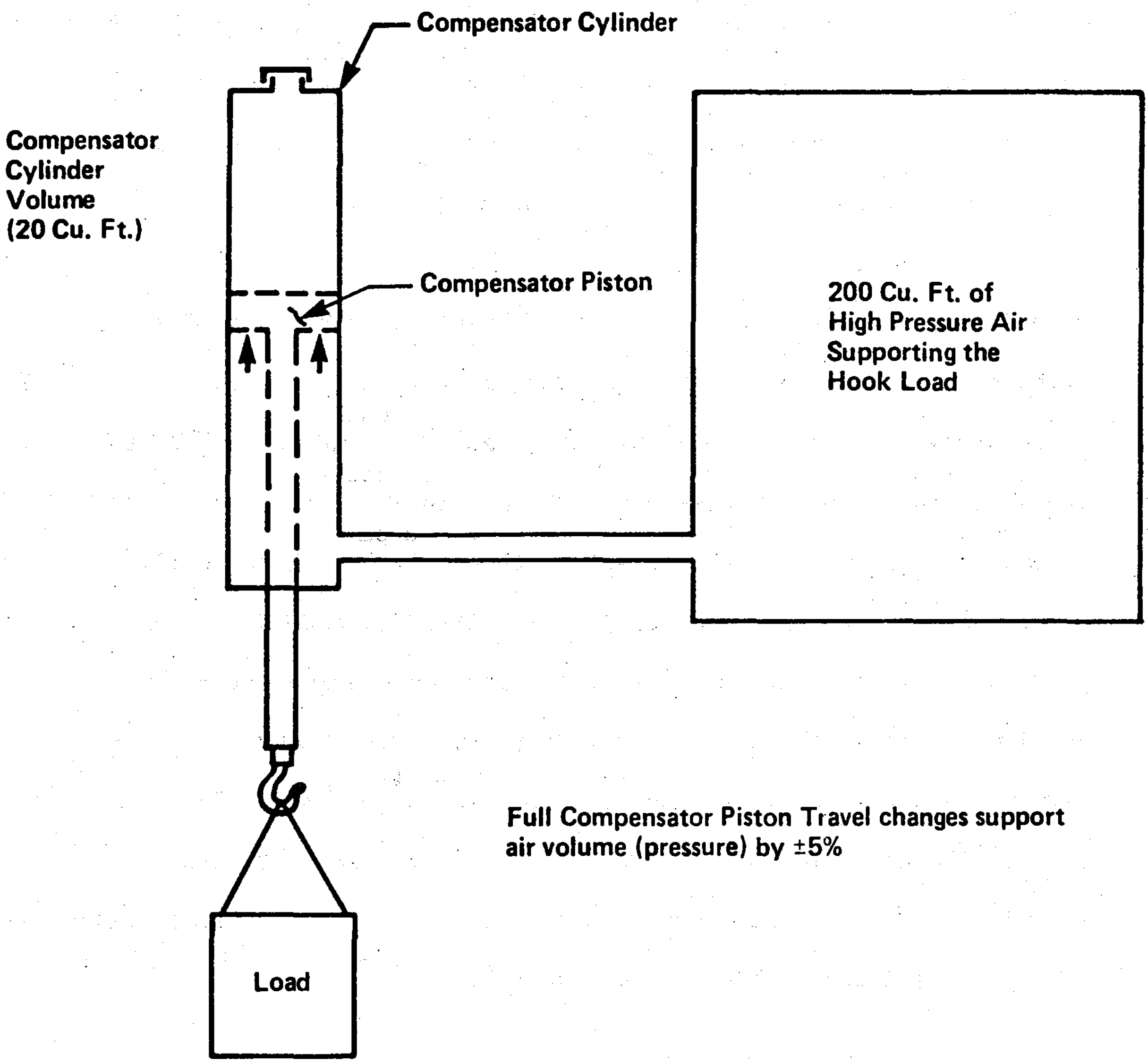

FIGURE 1 SIMPLE PNEUMATIC COMPENSATOR SYSTEM

use of slip-joints in the riser itself and a riser tensioning system which operates similarly to the heave compensator previously described. Guidelines leading to the subsea blow-out preventor and wellhead also have similar tensioning systems.

When drilling in deep water, the riser itself presents some special problems, and is generally the limiting factor in deep water exploratory drilling capability. The riser is connected to the subsea wellhead through a ball-joint, which allows up to 5° of angular movement of the riser with respect to the wellhead. In general, operations are terminated if the ball-joint angle exceeds 3.5°. In deep water, the marine riser must support the column of heavy drill mud inside it, and therefore very strong and heavy pipe is required. Since the riser must be kept in tension to prevent buckling, special adjustable floatation elements are attached to the riser and much of the weight may be supported by a riser tensioning system located on the drilling vessel.

Another piece of equipment common to floating rigs is the traveling block guide rails and dolly. This equipment keeps the traveling block, which hangs from the crown block on the derrick, centered over the rotary table and the hole. In addition, floating rigs generally have power-assisted pipe racking while bottom supported rigs do not.

As technology advances, deep water exploration drilling records are being broken almost yearly. In 1969, Exxon drilled several wells in waters deeper than 300 m, one of which was in almost 400 m of water off California. In 1970, Exxon drilled another well off California in 456 m. Shell, in 1974, broke Exxon's record with a well drilled off Gabon in some 633 m of water. Shell drilled another well in the same area at a depth of 698 m in 1975. Then in 1976, the depth record was extended to 1,055 m by Esso Exploration off Thailand. In 1977, Esso Exploration broke their own depth record with a well drilled off Surinam in 1,204 m. Getty, as operator for the Seagap Group and Hydro-Congo, extended the depth record to 1,325 m off the coast of Congo in 1978. Again in 1979, Getty established a new record with a well in the Mediterranean off Barcelona, Spain, in 1,353 m using the drillship DISCOVERER SEVEN SEAS. Getty's record did not last for long. On April 28, 1979, Texaco, along with several other companies, spudded in a well with the DISCOVERER SEVEN SEAS in 1486 meters of water off St. Johns, Newfoundland.

The major limiting factor in the exploitation of hydrocarbon reserves in deepwater is not in drilling, but in completion and production. Subsea completions are necessary in water depths that are not accessible from conventional platforms. Subsea completions also augment conventional platforms by: 1) developing parts of smaller structures and allowing gas or water injection in the periphery of a structure; 2) allowing the development of fields not economically viable with a conventional platform; and 3) providing early production allowing improved initial cash flow.

The first known underwater completion in North America was made in 1943 in Lake Erie. Since then over 300 subsea completions have been made in Lake Erie in less than 26 m of water. Subsea production technology has been under development since the early 1960's in the Gulf of Mexico. These wells are controlled by hydraulic or electrohydraulic systems, serviced with pressure activated tools through the flowline, and have downhole automatic shut-in systems. Between 1960 and 1974, 106 subsea completions were made worldwide.

In completing most of these wells the equipment used require divers. The current working depth limit for a diver is approximately 460 m, and this requires 12-14 hours to pressurize the diver to depth. The diver is allowed three hours lock-out working time. About 10 days are required for decompression. Depending on the individual, 30 days can be spent pressurizing, working, and decompressing. This procedure is very expensive and time consuming.

In order to reduce the need for divers, techniques have been developed for installation of subsea completions from surface vessels and submersibles. There are two types of subsea completions now in use. The first type, called a wet tree, consists of the wellhead standing on or below the ocean floor on a template (fig. 2). The second system consists of a

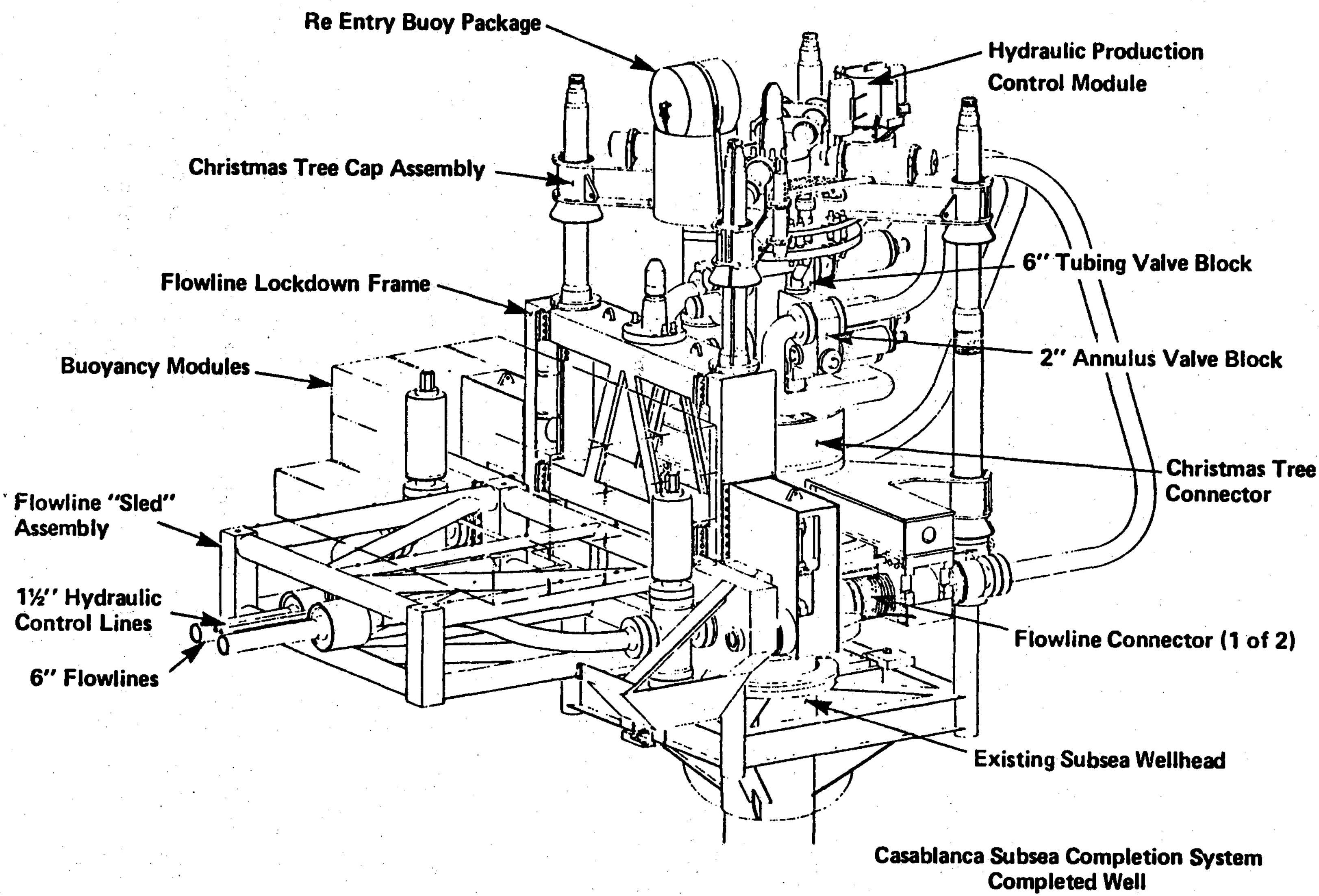

FIGURE 2 WET SUBSEA COMPLETION

wellhead enclosed in a chamber at one atmosphere of pressure (fig. 3). The chamber allows a man to work on the well in a shirt sleeve environment. The advantage to the dry completions is that well control lines and the flowline can be connected from inside the chamber. The wet tree requires connections to be made on the outside by a diver, submersible, or a surface guide line; a costly proposition in deep water depths. The depth of water is not a critical factor in the dry completion because the wall thickness of the chamber can be increased to withstand greater pressures. According to one industry expert the current limit to operating depths without divers is the ability to service the installation and the completion from surface vessels. Lockheed can service to 365 m with a tethered submersible. The development of umbilical cables to depths of 610 m is underway. The world record for commercial wellhead completions is now claimed by Lockheed Petroleum Services, Ltd. when they placed a one-atmosphere subsea wellhead at a depth of 164 m in the Namorado Field offshore Rio de Janeiro, Brazil.

Wet tree completions have been installed and are in production in various parts of the world. One system, shown in figure 2, is in use in the Casablanca Field in the Mediterranean Sea south of Barcelona, Spain, in 120-150 m of water. The system is designed for diverless installation with manipulator back-up. The installation of this system was accomplished without diver assistance. A tubing head adapter with four guide posts was lowered down the four guidelines attached to the existing subsea wellhead. This unit was then locked into place hydrau-

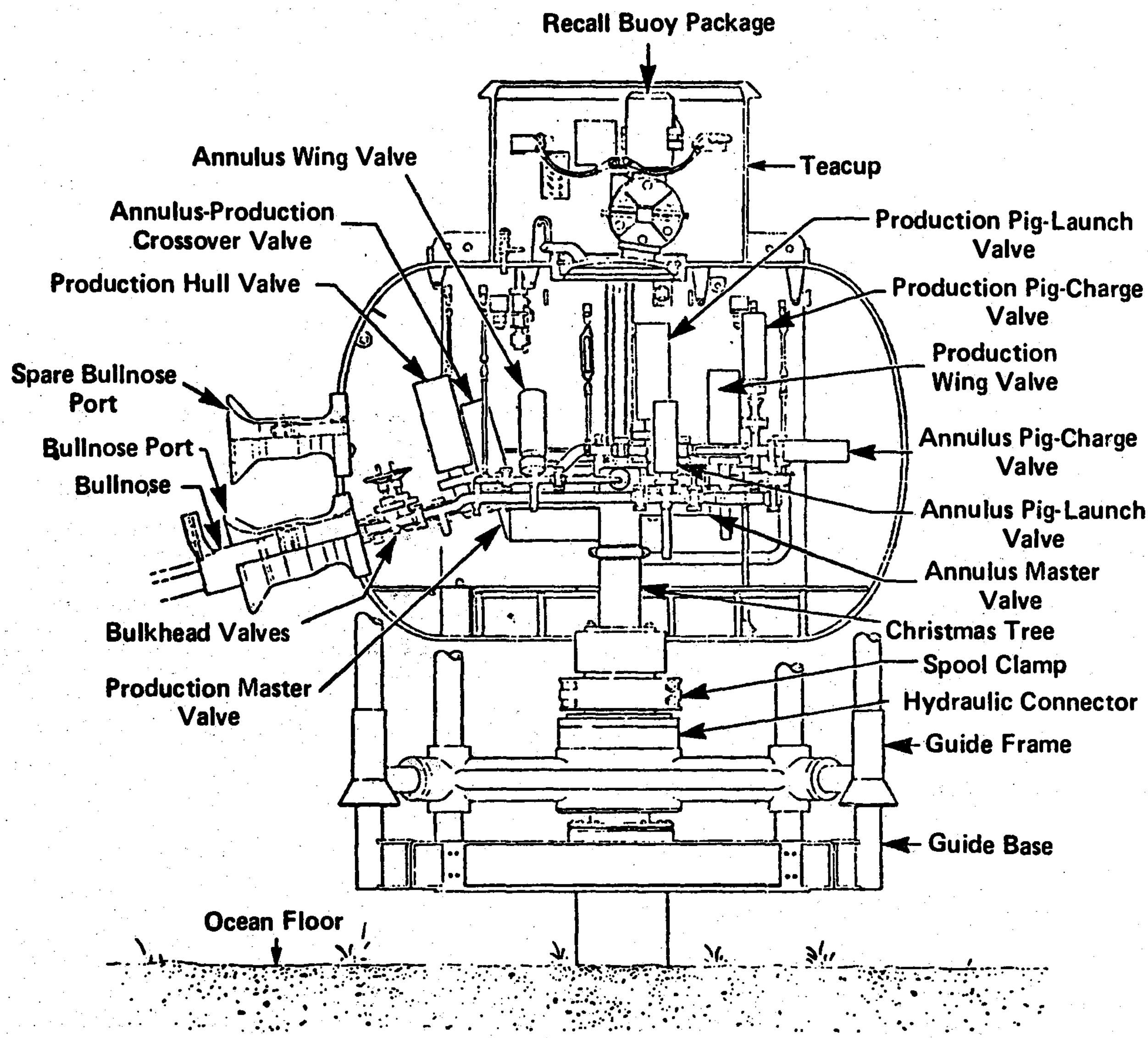

FIGURE 3 DRY SUBSEA COMPLETION

lically and pressure tested. Then, a modified blow-out preventer stack was lowered on the guidelines and was guided into position by the guide posts. It was then locked down onto the tubing head adapter with hydraulics. At this point, the tubing hanger, downhole equipment, and well tubing were installed and the well was temporarily plugged. The blow-out preventer was then removed and the Christmas tree (wellhead) assembly was run, landed and locked into place and tested. A lower riser package containing hydraulically-operated completion and work-over controls was used to attach the Christmas tree assembly, and after the assembly was in place, the lower riser package was retrieved. A flowline pull-in tool and lockdown frame were then lowered and locked into place on two of the guide posts. The flowlines were connected to a "sled" which was attached to wire ropes from the pull-in tool and the sled, with the flowlines, was pulled into position in the lockdown frame. Hydraulically-actuated wedges were driven home locking the sled to the lockdown frame. The wires were cut off remotely and the pull-in tool was retrieved. The lower riser package was re-lowered and locked into place on top of the Christmas tree. Flowline connectors are extended, locked and pressure tested. Both tubing plugs were pulled and the well was brought into production and cleaned up. When servicing is required, a pop-up buoy is remotely released. The design lifetime for the system is 20 years. With the exception of the control system, the unit may be left on the seafloor for 20 years. The control cap is designed for a service interval of five years. Several similar systems are also in production in the North Sea.

Seal-Comex, a service company, is currently conducting an economic study for Mobil Oil Corporation for installation of a subsea production system in the East Breaks Area, offshore Texas. This Maniford Center has been tested for four years and is now being considered for installation in water depths of 305-365 m.

Cameron Iron Works began development work on a non-guideline drilling system in 1972 and has delivered systems for work in 915 m. New designs and concepts have produced a system capable of drilling in depths of 1,525 m.

In October 1974, Exxon installed a Subsea Production System 27 mi southeast of Grand Isle, Louisiana, in 52 m of water. The system was installed, controlled and operated remotely utilizing equipment and diverless techniques suitable for producing oil and gas in water depths of approximately 600 m. A major component of the system is called a maintenance manipulator. When needed, this robot can be lowered to the template and moves around the unit on a track. The manipulator has a system of underwater television cameras built in so the operator on the surface can control its movements. Initial production began in February 1977. This system probably represents the greatest advanc of subsea production technology.

Subsea completions are designed for installation in at least 600 m of water. Deeper designs could be perfected if needed. However, when production from deep-water completions is realized, a means of transportation must be provided. Two choices are available: hydrocarbons may be piped to the surface and transported by tankers to land-based facilities or they may be transmitted by pipelines all the way.

ETPM has developed a method for laying pipe up to 42-in diameter in 1,000 m of water. This method is called RAT for Remorquage (towing), Aboutage (connecting) and Tension. Strings of pipe up to 1,000 m long are assembled on shore and fitted with buoyancy tanks. The strings are then towed to the laying site and connected by passing over a special dynamically positioned lay barge. They are then laid in a conventional manner. The method has been tested in the North Sea laving 42-in pipe in 250 m of water.

Santa Fe Engineering and Construction Company has constructed the first reel-type pipelaying ship, Apache, scheduled to begin work in the summer. The pipe is welded together on shore, spooled onto a large reel, and rolled off at the site. The Apache will be able to hold up to 50.5 mi of 4-in pipe, 5.7 mi of 16-in pipe, or various sizes in between. It will be able to lay 16-in pipe in water depths around 610 m and smaller lines in water depths of 915 m. With smaller portable reels, it can lay a bundle of several pipes at one time. Conventional and semi-submersible lay barges are in operation in depths of more than 610 m.

Research is currently underway on the design of pipeline and pipe-laying equipment, with special emphasis on how best to lay the pipe up to 30-in diameter in depths to 1,830 m.

If production is brought to the surface for shipment by tanker, special treatment and handling equipment may be required and some type of platform may be necessary at the site.

In shallow waters, conventional platforms have become the industry standard for production. From these platforms a number of wells are typically drilled and the well head completions are on the platform and not on the seafloor. The maximum depth to date for the installation of a conventional platform is 312 m by Shell Oil Company's 46,000 ton Cognac platform 24 km south of the mouth of the Mississippi River. The platform stands 386 m above the seafloor and 73 m above the surface of the ocean. It will have a record 62 wells. The base section was installed during the summer and fall of 1977. The other two sections were installed in the summer of 1978. Initial production is to begin in late 1979.

In an effort to reduce the amount of steel required, and thereby the price, Exxon, as well as Mobil, Union and Amoco, are actively involved in designing a guyed tower for use in 300-m water depths (fig. 4). This structure would be bottom-supported and held upright by 16 guys, four at each corner. Moorings are designed for the life of the structure (a

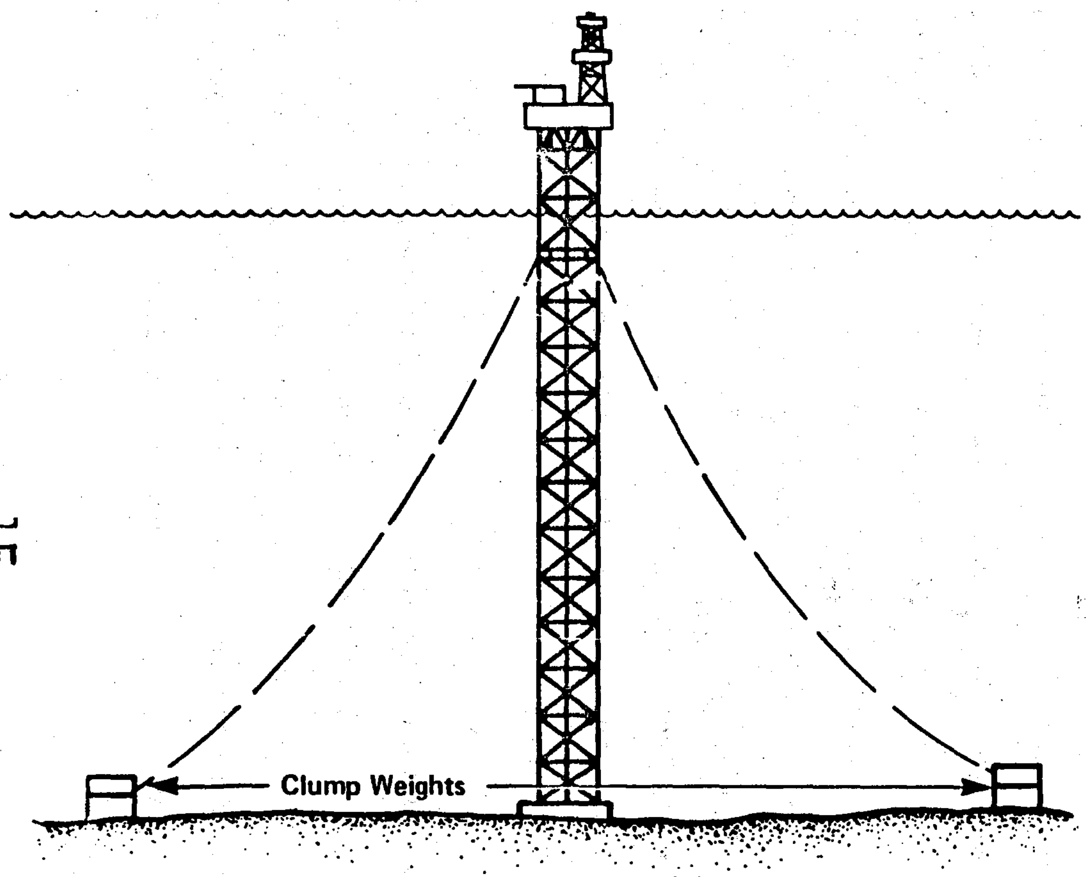

FIGURE 4 GUYED TOWER

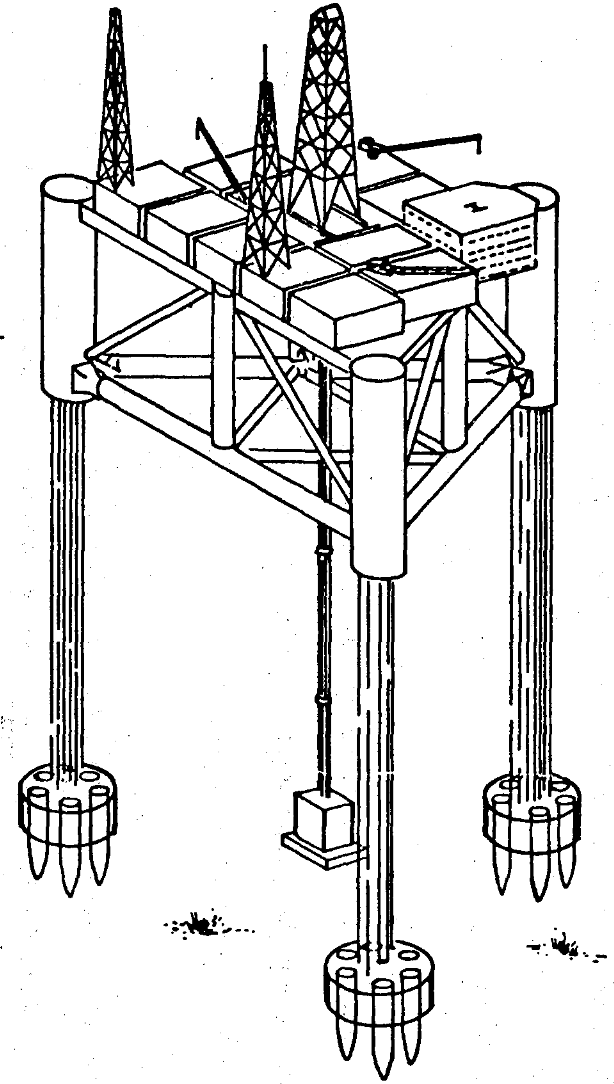

FIGURE 5 TENSION-LEG PLATFORM

minimum of 20 years). The deck of the structure would be able to move up to 40% of the wave displacement (2 to 3 m in a storm). In October 1975, Exxon installed a one-fifth scale model of a guyed tower in 100 m of water off Grand Isle, Louisiana. The tower was highly instrumented and over two years of data confirm that the guyed tower is a feasible and practical platform concept for water depths of 200 to 600 m.

Another concept in production facilities for deep water is the tension leg platform (TLP) (fig. 5). The TLP is a floating structure which is held down by essentially vertical tension members which remain in tension regardless of cyclic loads due to current, wind and waves. This design is a compliant structure; it is able to move with waves and currents to a tolerable extent. In 1975, Deep Oil Technology, Inc., installed a prototype instrumented TLP in some 60 m of water off California. The TLP will soon be tested with suspended risers as a one-third scale model at a water depth of 200 m. Conoco and Amoco will be the first to install a TLP production system when they place their design in 189 m in the North Sea.

Semi-submersible drill rigs have also been used as floating production platforms. In June of 1975, the Hamilton Brothers first produced oil from their Argyll Field in the United Kingdom Sector of the North Sea using the converted semi-sub TRANSWORLD 58 connected to a seafloor manifold and anchor base by a composite riser. Six satellite subsea-completed wells currently produce to the subsea manifold in 79 m of water. After on-board processing, the gas is flared and crude is pumped back down the composite riser and to a single buoy mooring system nearby for shipment by tanker. There are currently about 150 semi-subermisble units worldwide. Of these, approximately 18 have been converted to other uses, including three for oil production.

Although drilling riser technology, subsea completion technology and floating platform technology have been recently extended to beyond 1,000 m, production risers along with remote flowline connectors, represent the critical development component associated with deep water production systems. The deepest floating production riser system presently in service is that of the Argyll Field in some 76 m. The composite riser in the Argyll Field is vessel-supported and consists of a central structural riser surrounded by a number of smaller independent satellite risers. The central riser, which in this case carries the low pressure crude to the seafloor and then to a single point mooring for shipment, is designed to withstand the axial and flexural stresses generated by tension, wave action, vessel offset and current. This structural riser would also be the one to receive the buoyancy modules in deeper water. The satellite risers would also need buoyancy modules in very deep water. There is little doubt that a vessel-supported composite riser system could be designed to operate in 1,000 m. A major question, however, is whether the proportion of time that wells would be shut-in would be economically acceptable. The avoidance of frequent shutting-in of production during inclemente weather would require specialized facilities. Furthermore, re-entry of the riser into the subsea manifold would present complex problems in the deep environment.

Another concept for improving production efficiency and re-entry in water depths greater than 365 m is the free-standing composite riser (fig. 6). This system consists of a composite riser fitted with a buoyancy element to provide necessary support to the riser in the disconnect mode, and a remote connect/disconnect stab located at a depth of approximately 100 m in order to put it below the wave action but still within reach of divers. Guidelines from the buoyancy element at the top of the riser to the surface vessel would facilitate a diverless connection.

Another riser system which offers an extremely bright outlook for future deepwater production is the articulated riser system used for Exxon's Submerged Production System (SPS). This riser, along with the system, has been under test since 1975 in the Gulf of Mexico. The system consists of a base on the seafloor to which all the flowlines run. The lower 300 m (for a system designed for 500 m) consists of a tension member which also provides a housing for the flowlines and which is supported by a buoyancy element. Unlike the free-standing composite riser, there is no provision for an emergency disconnect at the buoyancy chamber level. The SPS riser is designed to withstand maximum sea states and currents and remain connected. The upper 200 m consists of two 100+ m long sections joined in the middle and at each end by three articulated

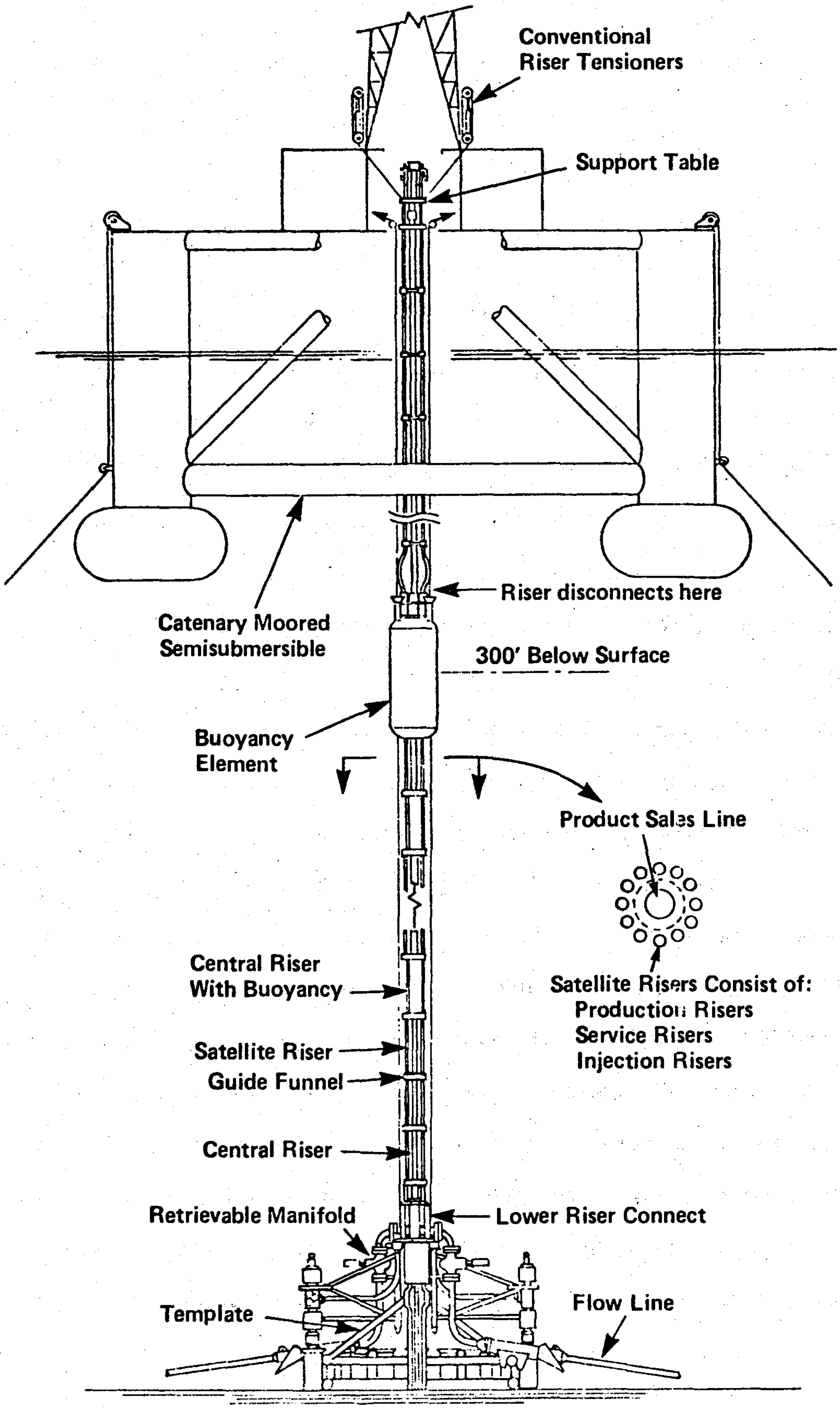

FIGURE 6 FREE-STANDING RISER

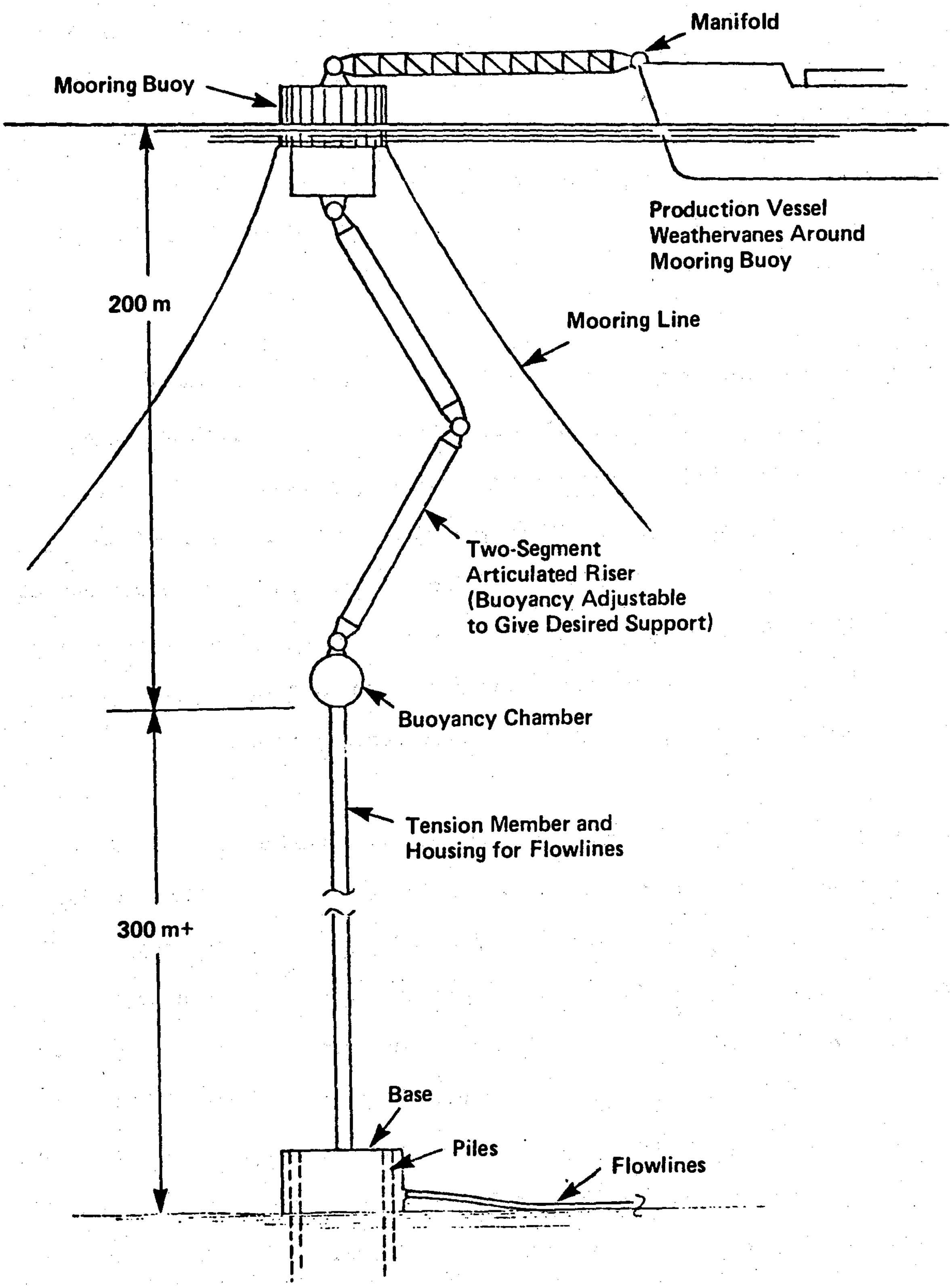

FIGURE 7 EXXON ARTICULATED RISER

joints. At the surface, the articulated joint is attached to a surface mooring buoy with a permanent yoke attached to a production vessel, probably a converted tanker. The surface mooring buoy locates and supports the upper end of the riser. Each segment has adjustable buoyancy to provide the desired support. Exxon feels that this system would be operable in depths to 1,000 m.

The fourth system, designed by Deep Oil Technology, Inc., is for use with a tension leg platform. This sytem consists of individual risers specifically designed to take advantage of the inherent stability of the tension leg platform. The platform and risers would be designed to withstand maximum environmental conditions without the need to disconnect the risers. The upper termination of the risers is on the cellar deck level of the platform where the production trees and wing valve blocks (wellhead) are located, much like a conventional platform.

To be viable, deep water production systems must relinquish dependence on diver assistance and convert to automated techniques. Man's diving capabilities in deep water are quite limited. Although submersible vessels exist that provide a 1-atmosphere environment for man to any depth, his ability to perform mechanical tasks remotely is limited. For such tasks, divers are required. The French diving company, COMEX, set a new open ocean deep-diving record in October 1977 in the Mediterranean off the south of France. COMEX and French Navy divers were saturated in a chamber to a depth of 430 m. They were lowered to that depth and made

In summary, the deepest exploration well for oil or gas is presently being drilled in 1486 meters of water off Newfoundland, and the industry presently has the capability to drill in water depths to about 1830 meters. Research is currently being conducted by several major oil companies and projections from such research are that within 5 years, technology will permit drilling in water depths to 3000 meters. The deepest commercial discovery to date is in 671 m of water off Spain, but was of insufficient quantity to justify development. The deepest commercial wellhead completion is a dry completion in 164 meters in the Namorado Field off Rio de Janiero, Brazil. The deepest wet tree subsea completion is in 146 meters in the North Sea. One of the major oil companies, however, feels that they can presently produce in up to 900 meters of water and that within 10 years, they will have the technology to produce in over 1800 meters of water.

a total of 10 hours of working dives during which they made an 8-in pipeline connection. Two divers, one from COMEX and one from the French Navy, made two 10-minute bounce dives to a record depth of 501 m. Decompression time from 430 m to the end of saturation was just over seven days and 17 hours.

Oil and gas operations in ever greater water depths require the use of new and more economical production systems. Subsea completion technology is being tested in shallow depths to provide procedures to be used in very deep water. All industry experts agree that if given the necessary economic incentives, the technology will be available. A secondary result of subsea completion technology is the ability to develop small reservoirs without the expenditures required for a surface structure. As the price of oil increases on the world market, the feasibility to utilize more sophisticated production systems will be realized.

The capability for deep-water drilling has been in existence for several years and, in fact, a surplus of that capability is expected to continue for several more years. The deep wells drilled in the next several years will probably be drilled by a dozen major oil companies in order to meet lease or concession obligations. Production riser technology is the limiting factor in our ability to exploit reserves of hydrocarbons occurring in deep water. Before that exploitation can take place, the price of oil will have to increase significantly in order to make it economically feasible.

Appendix 7

Data Regarding Refining of Crude Oil

of

Various Vicosities and Sulfur Contents

Geographic Distribution of Crude Oil Field Condensate, and other Feedstock Slates in 1978

(MB/D)

	Refinery Location					
	PAD I	PAD II	PAD III	PAD IV	PAD V	Total
Sweet Crude Oil	944(804)	2,534(813)	3,652(1106)	273(18)	687(529)	8,091
Medium Sulfur Crude Oil						
Light Medium Sulfur	50	187	386	96	219	937
Heavy Medium Sulfur	*	176	270	0	1,016	1,462
	50(42)	363(243)	656(380)	96(42)	1,235(463)	
High Sulfur Crude Oil						
Light High Sulfur	481	762	2,288	*	41	3,572
Heavy High Sulfur	443	474	698	152	802	2,568
	924(868)	1,236(541)	2,986(1400)	152(0)	1,203(118)	
Total Crude Oil	1,918	4,132	7,294	521	2,765	16,630
Field Condensate	Nil	10	91	9	Nil	110
Other Feedstocks	104	220	714	29	177	1,244
Total Crude Oil, Field Condensate and Other Feedstocks	2,022	4,362	8,099	560	2,942	17,984

*Reclassified to protect confidentiality.

Source: National Petroleum Council. 1979. Refinery Flexibility; An Interim Report

**Amount from foreign sources is based on estimated import proportions for 1978 from Item 9 in National Petroleum Refiners Association Volume: Capability of U.S. Refineries to Process Sweet/Sour Crude Oil, March 15, 1978

Geographic Distribution of Crude Oil
Field Condensate, and other Feedstock Slates in 1978
(MB/D)

	Refinery Location					
	PAD I	PAD II	PAD III	PAD IV	PAD V	Total
Sweet Crude Oil	833(710)	2,388(767)	3,610(1094)	258(17)	744(573)	7,883
Medium Sulfur Crude Oil						
Light Medium Sulfur	37	231	346	84	136	834
Heavy Medium Sulfur	101	75	167	0	822	1,164
	138(115)	306(205)	513(298)	84(37)	958(360)	
High Sulfur Crude Oil						
Light High Sulfur	308	587	1,543	*	53	2,491
Heavy High Sulfur	416	488	587	125	579	2,196
	724(680)	1,075(470)	2,130(1000)	125(0)	632(62)	
Total Crude Oil	1,745	3,769	6,254	467	2,334	14,568
Field Condensate	Nil	15	58	14	*	87
Other Feedstocks	137	270	746	26	195	1,374
Total Crude Oil, Field Condensate and Other Feedstocks	1,882	4,054	7,058	507	2,529	16,029

*Reclassified to protect confidentiality.

Source: National Petroleum Council. 1979. Refinery Flexibility; An Interim Report
**Amount from foreign sources is based on estimated import proportions for 1978 from Item 9 in National Petroleum Refiners Association Volume: Capability of U.S. Refineries to Process Sweet/Sour Crude Oil, March 15, 1978

Appendix 8

Hydrocarbons and Drilling Fluids in the Marine Environment

Prepared by James Cimato
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Washington, D.C.
January, 1980

portions of this material was taken from material prepared for and appearing in the Final and Supplement to the Final Environmental Impact Statement for OCS Sale No. 42.

TABLE OF CONENTS

I. Hydrocarbons[1]

A. Introduction

Hydrocarbons, organic compounds containing only carbon and hydrogen, are universal components of the marine environment (Blumer, Souza and Sass, 1970). Marine hydrocarbons originate from a variety of sources, including decaying phyto - and zooplankton, routine tanker and shipping operations, terrestrial runoff, atmospheric fallout, natural seepage, and shipping and offshore well disasters (Ahearn, 1974). The quantities from each of these sources are not known and probably vary widely by category and in their total sum from year to year.

Hydrocarbons can be divided into biogenic hydrocarbons, hydrocarbons native to organisms; and petroleum hydrocarbons (PHC), hydrocarbons found in fossil fuels. Under natural conditions, biogenic hydrocarbons can be synthesized by marine organisms, metabolized from their food source, or converted from precursor compounds obtained with their food source (National Academy of Sciences, 1975).

Anderson, Clark, and Stegeman (1974) indicate some basic differences between biogenic and petroleum hydrocarbons. However, not all of the differences apply to all organisms, nor to all crude oils and refined products (NAS, 1975). Distinguishing characteristics of petroleum include the following:

1. Petroleum contains a much more complex mixture of hydrocarbons, with much greater ranges of molecular structure and weight.

2. Petroleum contains several homologous series with adjacent members usually present in nearly the same concentration. The approximate unity ratio for even-and odd-numbered alkanes is an example, as are the homologous series of C_{12} - C_{22} branched alkanes. Conversely, marine organisms have a strong predominance of odd numbered C_{15} through C_{21} alkanes.

3. Petroleum contains more kinds of cycloalkanes and aromatic hydrocarbons. Also, the numerous alkyl-substituted ring compounds have not been reported in organisms. Examples are the series of mono-, di-, tri-, and tetramethyl benzenes and the mono-, di-, tri-, and tetramethyl naphthalenes.

4. Petroleum contains numerous naphthenoaromatic hydrocarbons that have not been reported in organisms. Petroleum also contains numerous heterocompounds containing sulphur (S), nitrogen (N), and oxygen (O), metals, and the heavy asphaltic compounds. Although little is known about the distribution of thiophenes in living organisms, the presence of various homologous series of alkyl substituted benzo-, dibenzo-, and naphthobenzo-thiophenes are characteristic of petroleum.

A brief review of the occurrence of the various classes of hydrocarbons from petroleum and biological origins follows. More complete reviews were made by Gerarde and Gerarde (1962) for biogenic hydrocarbons, by Clark (1966) for saturated hydrocarbons, and by Anderson et al. (1974a) for total hydrocarbons, with an update by Clark and Brown (1977) for all hydrocarbons.

Saturated Hydrocarbons (alkanes or paraffins)

Both short- and long-chain alkanes occur naturally in marine organisms. Toxicity to organisms of these fractions at low concentrations is less than those of aromatics, but alkanes may cause anaesthesis and narcosis, or interfere with feeding, nutrition and communication in aquatic organisms (Goldacre, 1968; Whittle and Blumer, 1970; Blumer et al., 1972). Branched alkanes have been found in marine macro-organisms, and pristane, a branched alkane, is abundant in some plankton and fish. Biogenic alkanes are predominantly odd numbered chains, while petroleum alkanes occur in a 1:1 ratio of odd and even numbered chains.

Petroleum contains abundant amounts of saturated hydrocarbons. Crude oil and most refined oil contain a series of n-alkanes with chain lengths of C_1 - C_{60}. Branched alkanes, including pristane, farnesane and phytane, are also present. Long chain saturated hydrocarbons occur in petroleum and refined products, except for lubricating oil.

Unsaturated Hydrocarbons (olefins or alkanes)

Alkenes often account for a major percentage of biogenic hydrocarbons in aquatic organisms. Squalene, a triterpenoid precursor in the biosynthesis of cholesterol, is the major hydrocarbon constituent of basking shark liver, shark liver oil, and cod liver oil (NAS, 1975). Isoprenoid C_{19} and C_{20} mono-, di-, and triolefins are present in copepods and some fish (Blumer et al., 1969). Several straight-chain-mono- to hexaolefins have

[1] The following discussion is adapted with updated modifications from National Academy of Sciences (1975) and Anderson et al. (1974a), Neff (1979) and other sources as indicated.

found in considerable quantities in many organisms (Blumer et al., 1970; Youngblood et al., 1971, 1973). The polyolefins, heneicosahexaene and carotene, are prevalent in algae. Alkenes may serve in biochemical communications, but their exact biological roles are poorly understood (Blumer, 1969).

Olefinic hydrocarbons are rarely present in crude oils, but are formed in some refining processes and are present in gasoline and cracked petroleum products.

Alicyclic Hydrocarbons

Cycloalkanes and cycloalkenes containing one to three non-aromatic rings are present in a number of terrestrial plants (Gerarde and Gerarde, 1962). Most are classified as terpenes because of their structural relationships to isoprenes. Terpenes are released to the atmosphere in large amounts from conifers (Rasmussen and Went, 1965).

By molecular type, naphthene hydrocarbons (cycloalkanes) comprise 50 percent of an "average," worldwide crude (NAS, 1975). Crudes from different sources, however, can differ appreciably.

Aromatic Hydrocarbons

Aromatic hydrocarbons have been isolated from terrestrial plants and spices (Gerarde and Gerarde, 1962). The natural occurrence of aromatics in marine organisms is still the subject of debate. Neither Blumer et al. (1969) nor Di Salvo et al. (1975) were able to isolate or detect aromatic hydrocarbons in plankton or mussels (Mytilus californianus). ZoBell's (1971) review of polynuclear aromatic hydrocarbons in the marine environment suggests that some are synthesized by marine microorganisms. Borneff et al. (1968) also suggested that higher boiling aromatics may be synthesized by marine organisms. All the aromatic hydrocarbons are in extremely low concentrations, generally less than 1 percent of the total hydrocarbons of marine organisms analyzed to date (NAS, 1975).

Aromatic hydrocarbons represent a large percentage of the components of crude oil and an even larger percentage of the components of a refined product.

Nonhydrocarbon Compounds in Petroleum

Although more than 75 percent of most petroleum is composed of hydrocarbons, many other compounds (some toxic) are present in varying concentrations. The compounds include cresols, xylenols, naphthols, quinolines, pyridines, and hydroxy- benzoquinolines which are of particular concern because of their great toxicity and solubility in water. Except for the UV-fluorescent examinations by Zitko and Carson (1970), apparently no analyses of nonhydrocarbon components for use in estimating petroleum contamination of aquatic organisms have been reported. Unfortunately, no degradation studies using these compounds are in the commonly-accessible literature (Anderson et al, 1974a).

B. Uptake of Petroleum Hydrocarbons by Organisms

Petroleum hydrocarbons are available to marine organisms in several different physical and chemical forms and the resultant uptake by organisms is dependent on the available form and the degree of the exposure, including the amount and duration (Stegeman and Teal, 1973). Petroleum, from its initial unmodified fluid condition through to its final residual form can undergo a complex system modification, including dispersion by physical forces, and chemical modification by oxidative and biological processes when leaked into the marine environment. Most of the oil in a slick will remain on the ocean surface, since hydrocarbons compounds are essentially hydrophobic and consequently have low solubilities in water, generally in the ppm to ppb range (NAS, 1975).

Other processes, affecting the oil, include evaporation and/or solution of the lower molecular weight paraffins (alkanes) and aromatics, solution of the more polar non-hydrocarbon compounds, emulsification of the petroleum, particularily heavy asphaltic crudes or residual oils, direct sea-air exchange by wave-produced spray and busting bubbles, photochemical oxidation of some hydrocarbons and non-hydrocarbon compounds, formation of tar lumps from weathered crude, and agglutination of oil on suspended particulate matter (NAS, 1975). Petroleum, therefore is presented to pelagic organisms in dissolved, dispersed, suspended or sedimented forms.

Petroleum hydrocarbons (PHC) may enter the food web by two pathways. The first involves the active uptake of dissolved or dispersed petroleum, mainly via the gills and possibly through the soft body surface of marine worms. The other method involves the passage of PHC into the gut from the water column and/or water surface while drinking or gulping water, and from ingestion of PHC absorbed on particles, including living and dead matter (NAS, 1975). The relative importance of the pathways is still largely unknown, and will vary according to the species, the method of feeding and respiration of the organisms, the type of habitat, the state of the sea, and the physical and chemical form of the petroleum.

Kauss et al. (1973) found that freshwater phytoplankton rapidly take up C-14 labelled naphthalene from solution. The microalgae, Chlamydomonas angulosa, continued to take up the radioactivity during the seven day test period.

Evidence indicates that the majority of hydrocarbons enter molluscs, some crustaceans, and fish via gill membranes (Anderson et al., 1974a). Equilibration of hydrocarbons can occur between organisms and the seawater that passes over their gills or other membranes exposed to seawater.

Assuming the concentration of hydrocarbons in coastal waters of 10 ug/l (micrograms per liter) and in food of 10 ug/l (Stegeman and Teal, 1973; Brown et al., 1973), an animal would be exposed to more than an order of magnitude larger amount of hydrocarbons in water processed to obtain oxygen for metabolism of the food than that amount present in the food itself (NAS, 1975).

Several groups of zooplankton, including copepods, euphausiids, amphipods, crab zoea, ctenophores, and jellyfish, rapidly took up radioactive isotopes of benzpyrene, methylcholanthrene, and naphthalene from seawater solution (Lee, 1975). The size of the animal appeared to be a factor in the amount of hydrocarbon taken up. Similarily Corner et al. (1976) found that adult female copepods, Calanus helgolandicus, accumulated a detectable quantity of C-14 labelled naphthalene from concentrations as low as 0.10 ug/l (ppb). Harris et al. (1977) later extended Corner's findings to include seven species of copepods. Cohen (1973) demonstrated that corals will incorporate petroleum hydrocarbons when exposed to 3-10 ppm Iranian crude.

For concentrations up to 540 ug/l (ppb) of No. 2 fuel oil, Stegeman and Teal (1973) found a direct relationship between the hydrocarbon concentration in the water and the uptake rate by oysters, Crassostrea virginica. At higher concentrations the rate of uptake fell, due to the oysters remaining tightly closed when exposed to concentrations of 900 ug/l. Stegeman and Teal (1973) postulated that the uptake through the gills is the major route by which the oysters accumulated hydrocarbons from the water.

Lee et al. (1972a) report the uptake of dissolved hydrocarbons by the gill tissue of the mussel Mytilus edulis, and then transfer of the hydrocarbons to other tissues. Electron microscopic studies of the uptake of iron suggest that the gill tissue of this mussel has a micellar layer on the surface of the gill that is responsible for the absorption of hydrophobic compounds (Pasteels, 1968). Work on the uptake of dissolved hydrocarbons by marine fish also demonstrated the entrance of hydrocarbons through the gills (Lee et al. 1972b).

Yevich and Barry (1970) reported on tissue damage brought about by exposure to crude oils and other pollutants; such damage includes sloughing of the epithelium and atypical basal cell hyperplasia of the ciliated inner gills of quahogs (Mercenaria mercenaria). The question also arises, then as to the effect the loss of the protective membrane coatings of the gills has on the rate of absorption of hydrocarbons from water.

The uptake of petroleum hydrocarbons from ingestion of food and sediment particles and from gulping or drinking dispersed or dissolved hydrocarbons may also be an important method of incorporating PHC in the food web. Following the Arrow incident in Chedabucto Bay, plankton were observed to ingest large quantities of small drops of Bunker C oil (Conover, 1971). The oil was eliminated in the form of fecal matter (up to 7 percent Bunker C oil by weight). No chemical analysis of the fecal matter or of the whole copepods was reported that might have provided some indication of whatever degradation or partitioning, if any, of the oil took place. Parker (1970) also demonstrated the presence of considerable quantities of oil in the guts of copepods and barnacle larvae. Grose and Mattson (1977)reported that zooplankton was contaminated during the Argo Merchant oil spill. Copepods were observed with oil on feeding appendages, in alimentary tracts, and on the surface of the body.

Corner et al. (1976) compared the uptake of C-14 labelled naphthalene from sea-water solution and diet in copepods. The dietary route of entry was quantitatively more important than via solution, especially in experiments with living diets.

C. Metabolism

1. Anabolism

a. Total Accumulation

Upon entering the organism, either by ingestion of particulate matter or through active uptake of the gills, PHC can be either passed through the organisms as feces or become incorporated into the body tissues. According to Anderson et al. (1974a), a significant amount of PHC is taken up and accumulated, at least temporarily, within the body tissue of most fish and invertebrates upon exposure to an oil spill. Tables 1 and 2 summarize some of the reports on the hydrocarbon levels in presumably contaminated and presumably uncontaminated tissues. The data shown in the tables, however, should be treated with certain amount of caution, because of the number of variables involved, especially the methods of analysis and the type of oil. The methods of analysis - UV absorption and fluorescence spectrophotometry, infrared spectrometry, mass spectrometry and the various chromatography procedures—measure hydrocarbons in a different manner and consequently produce slightly different results. The other significant variable is the composition of the oil itself.

The data in Table I relate to organisms collected from localities, presumed to be high in PHC contamination, and therefore the compounds detected are likely to be petroleum derived. The samples were judged as contaminated on the basis of the types of hydrocarbons present. Table I lists the hydrocarbons according to the types indicated by the investigators. Usually the samples analyzed by fluorescence yield low values in terms of total hydrocarbon concentrations because of the sensitivity of the method only for aromatics. Most samples listing only "paraffins" should also be considered as reflecting a very small part of the total hydrocarbons (Anderson et al., 1974a), especially for shellfish (Stegeman, 1974).

It is evident that high concentrations of PHC can be found in organisms from spill areas as well as areas of chronic contamination. In many cases, the hydrocarbon level of the waters from which organisms have been taken have not been reported. In other cases, under prolonged exposures, the concentrations could have fluctuated over such a wide range that such information would not realistically reflect the true exposure concentrations. The relative amount of accumulation varies greatly with the organisms involved, concentration of hydrocarbon in the water, and composition of the petroleum, etc. On a dry weight basis, the actual amount accumulated can be quite substantial. Di Salvo et al. (1975) reported that a preliminary determination of surface hydrocarbons showed the presence of 1.25 ppb while dry weight tissue from mussels, *Mytilus edulis*, exposed for 90 days was recorded as 300 ppm, hydrocarbons.

In contrast to the PHC concentrations in presumably contaminated organisms, concentrations of hydrocarbons in supposedly uncontaminated populations (Table 2) are consistently much lower. This is particularly true for the molluscs, where concentrations of 1 to 2 ppm or less are approximately 10 to 100 times lower than those of the contaminated organisms. "Natural" concentrations in some fish and crustaceans appear somewhat higher and in a few cases might be suspect; although these samples were all considered uncontaminated by the investigators based on parameters other than the total hydrocarbon content (Anderson et al., 1974a).

As a part of the Bureau of Land Management's Environmental Studies Program aliphatic and aromatic hydrocarbons were measured in marine organisms from the following outer continental shelf areas: Georges Bank, Baltimore Canyon, Georgia Embayment, Gulf of Mexico, Southern California, and Alaska. Concentrations reported for samples analyzed from 1975-1978 are consistent with those reported in Table 2.

A striking feature of Table 2 is that these low levels occur in organisms from all coastal regions of the continent. The concentrations from 0.01 to 10 ppm are the lower limits of analysis based on current techniques and may in many cases represent mostly biogenic compounds. In such cases a few compounds can be expected to constitute the major portion of the hydrocarbon components.

There have to date been a number of studies describing the experimental accumulation of PHC by marine organisms.

Fucik and Neff (1977) observed an inverse relationship between temperature and hydrocarbon uptake in the temperate clam, *Rangia cuneata*, and the boreal clam *Protothaca staminea*, while salinity changes had only a slight effect on *R. cuneata* when exposed to the WSF of south Louisiana crude for three days. Harris et al. (1977) also reported a negative correlation between temperature and hydrocarbon uptake for seven species of copepods exposed to radiolabelled naphthalene for 24 hours. Table 3 summarizes results of some of these studies and indicates tissue levels of PHC which can be achieved under a variety exposure conditions (Anderson et al., 1974a). Roesijadi et al. (1978) observed that deposit feeders generally accumulate hydrocarbons to a greater extent than suspension feeders when both were exposed to sediments contaminated with Prudhoe Bay crude oil. Most of the studies in Table 3 were performed under static conditions for relatively short periods, i.e., hours to days. The majority used very high exposure levels of emulsions, dispersions, water soluble fractions or slicks ranging from approximately 50 to 10,000 ppm. These could be taken as partially resembling the situation early in the history of an oil spill. Others were very brief static exposure to single compounds (Lee et al., 1972a), or long term exposure to low levels of fuel oil in a flowthrough system (Stegeman and Teal, 1973). The last experiment could be considered to represent the conditions of an exposure to chronic sources of contamination in harbors, etc. In fact, the 335 ppm total hydrocarbons accumulated by oysters after seven weeks (Stegeman and Teal, 1973) is not very different from the 236 ppm total hydrocarbons in oysters from the Houston ship channel (Ehrhardt, 1972) shown in Table 2.

Based on dry tissue weight, Di Salvo et al. (1975) found hydrocarbon concentrations as high as 530 ppm in mussels exposed to low level chronic oil pollution in San Francisco Bay.

TABLE 1 - Tissue Samples - Presumably Contaminated

SPECIES	PROBABLE SOURCE	HC TYPE[1]	ANALYSIS	WET ug/g	REFERENCE
Macro algae					
Fucus sp.	Spill - Bunker C	n-paraffins	GC	5.8	Clark et al., 1973
Snails					
Littorina littorea	Spill	Bunker C arom.	Fluoro	27-600	Scarratt&Zitko, 1972
Thais lamellosa	Spill-#2 fuel oil	n-paraffins	GC	5.4	Clark, 1974
Clams					
Mercenaria mercenaria	Sewage effluent	C-16-32	GC	16	Farrington & Quinn, 1973
Mya arenaria	Spill	#2 fuel oil	GC/MS	26	Blumer et al., 1970b
	Spill	Bunker C arom.	UVabs	267	Gilfillan et al,1978
Oysters					
Crassostrea virginica	Chronic	Paraffins, mono & di-aromatics	GC/MS TLC	236	Ehrhardt, 1972
	Harbor	C17-32	GC	10	Stegeman, 1974
	Spill	#2 fuel oil	GC/MS	70	Blumer et al., 1970a
	Chronic	Polynuclear arom.	UV	1	Cahnmann & Kuratsane, 1957
	Chronic-harbor	Saturates	GC/MS	15	Meiggs, 1973 (Galveston)
	Chronic-harbor	Saturates	GC	13-29	Meiggs, 1973(San Francisco)
	Chronic-harbor	Total HC	GC	160	R.D. Anderson, 1973 (Galveston Red Bluff Reef)

[1] Though only n-paraffins were indicated in some cases, the probable presence of other petroleum-type hydrocarbons, e.g., aromatics are not to be excluded.

(continued) TABLE 1 - Tissue Samples - Presumably Contaminated

SPECIES	PROBABLE SOURCE	HC TYPE[1]	ANALYSIS	WET ug/g	REFERENCE
	Chronic-harbor	Saturates, C_{12-24}	GC	11.1	R.D. Anderson, 1973 (Galveston Halfway Reef)
		Dimethylnaphthalenes	GC	0.6	R.D. Anderson, 1973 (Galveston Halfway Reef)
		Trimethylnaphthalenes	GC	0.6	R.D. Anderson, 1973 (Galveston Halfway Reef)
Mussels					
Modiolus modiolus	Spill	#2 fuel oil	GC	218	Burns & Teal, 1971
	Spill	Bunker C aromatics	Fluoro	21-372	Scarratt & Zitko, 1972
Mytilus edulis	Spill	Bunker C aromatics	Fluoro	77-103	Zitko, 1971
	Chronic harbor	n-paraffins	GC	0.99	Clark & Finley,1973b
	Spill-#2 fuel oil	n-paraffins	GC	1.4	Clark & Finley,1973b
	Chronic harbor	benzo(a)pyrene	Fluoro	.0001-.03	Mix et al., 1977
Mytilus californiaus	Spill-Bunker C	n-paraffins	GC	0.87	Clark & Finley,1973b

(continued) TABLE 1 - Tissue Samples - Presumably Contaminated

Species	Probable Source	HC Type[1]	Analysis	WET μg/g	Reference
Scallops					
Acquipecten irradians muscle	Spill	#2 fuel oil	GC	7-14	Blumer et al., 1970b
Barnacles					
Mitella polymerus	Spill-Bunker C	n-paraffins	GC	11.8	Clark et al., 1973
Crabs					
Cancer irroratus	Spill	Bunker C aromatics	Fluoro	7-11	Scarratt & Zitko, 1972
Hemigrapsus nudus	Spill-Bunker	n-paraffins	GC	2.9	Clark et al., 1973
Lobster					
Homarus americanus--gut	Spill	Bunker C aromatics	Fluoro	103-130	Scarratt & Zitko, 1972
--stomach	Spill	Bunker C aromatics	Fluoro	15-230	Scarratt & Zitko, 1972
--claw muscle		Bunker C aromatics	Fluoro	2-3	Scarratt & Zitko, 1972
--abdominal muscle		Bunker C aromatics	Fluoro	1-4	Scarratt & Zitko, 1972
Urchins					
Stronglyocentrotus droebachiensis	Spill-Bunker C	Bunker C aromatics	Fluoro	17-94	Scarratt & Zitko, 1972
Mullet					
Mugil cephalus-flesh	Chronic-harbor	Kerosene taint	GC/MS	860	Shipton et al., 1970
Whitefish-flesh	Spill	Diesel oil	GC	29-88	Ackman & Noble, 1973
Flatfish	Chronic-coast	C14-20	GC	4	Bowen, 1971

(continued) TABLE 1 -

SPECIES	PROBABLE SOURCE	HC TYPE[1]	ANALYSIS	WET ug/g	REFERENCE
Sponge	Iranian crude spill	aromatics	GC-MS	6.7-13.7	O. Grahl-Nielsen, 1978
Anemone	"	"	"	.6-18.0	"
Starfish	"	"	"	7.0- 1.7	"
Limpet	"	"	"	6.2- 5.4	"
Winkle	"	"	"	17.7-19.8	"
Mussel	"	"	"	28.7	"

Source: Anderson et al., 1974a.

TABLE 2
Natural Tissue Hydrocarbon Levels
(from Anderson et al., 1974)

Species	Locality	HC Type	Analysis	WET µg/g	Reference
Macro Algae					
Nereocystis (kelp)	Puget Sound, Wash.	n-paraffins	GC	0.74	Clark, 1974
Ulva sp. (sea lettuce)	Puget Sound, Wash.	n-paraffins	GC	20.3-23.0	Clark, 1974
Fucus sp.	Puget Sound, Wash.	n-paraffins	GC	3.03-55.7	Clark & Blumer, 1967
	Washington Coast	n-paraffins	GC	9.51-57.2	Clark & Blumer, 1967
	New Hampshire	n-paraffins	GC	8.96	Clark & Blumer, 1967
	Woods Hole, Mass.	n-paraffins	GC	34.9	Clark & Blumer, 1967
	Falmouth, Mass.	n-paraffins	GC	38.7	Clark & Blumer, 1967
Snails					
Thais lamellosa	Puget Sound, Wash.	n-paraffins	GC	0.06-1.5	Clark, 1974
Littorina littorea	Eastern Canada	Aromatics	Fluoro	11	Zitko, 1971
Littorina sp.	Valdez, Alaska	n-paraffins	GC	16.1	Clark, 1974
Limpets					
Notoacmea scutum	Puget Sound, Wash.	n-paraffins	GC	2.5	Clark, 1974
Chiton					
Mopalia sp.	Puget Sound, Wash.	n-paraffins	GC	0.50	Clark, 1974
Clams					
Mercenaria mercenaria	Narragansett Bay, R.I.	Total HC	GC	2.9	Farrington & Quinn, 1973
Mya arenaria	Eastern Canada	Aromatics	Fluoro	8	Zitko, 1971
Mya sp.	Valdez, Alaska	C16-28	GC	1.1	Kinney, 1973
Pangia cuneata	Trinity Bay in Galveston, Texas	Naphthalene	UV Spec	0.16	Cox & Anderson, 1974
		Methylnaphthalene	UV Spec	0.11	Cox & Anderson, 1974
		Dimethylnaphthalene	UV Spec	0.06	Cox & Anderson, 1974

Table 2

Species	Locality	HC Type	Analysis	WET µg/g	Reference
Oysters					
Crassostrea virginica	Redfish Reef in Galveston Bay	Saturated HC	GC/MS	1.5	Meiggs, 1973
	Aransas Bay, Texas	Saturated HC	GC/MS	1	Meiggs, 1973
	Quisset, Mass.	Total HC	GC	1-2	Stegeman & Teal, 1973
	Galveston Island				
	East Lagoon	Total HC	GC	2.0	R.D. Anderson, 1973
	Eight Mile Road Reef	Total HC	GC	2.0	R.D. Anderson, 1973
	Eight Mile Road Reef	Saturated	GC	0.1	R.D. Anderson, 1973
	Eight Mile Road Reef	Aromatics	GC	0.1	R.D. Anderson, 1973
Ostrea edulis	Newport, Oregon	n-paraffins	GC	0.35	Clark et al., 1974
Mussels					
Mytilus edulis	Puget Sound, Wash.	n-paraffins	GC	0.37-21.6	Clark, 1974
	Valdez, Alaska	n-paraffins	GC	0.40-0.95	Clark, 1974
	Newport, Oregon	n-paraffins	GC	0.34	Clark et al., 1974
	Eastern Canada	Aromatics	Fluoro	3	Zitko, 1971
	Valdez, Alaska	C_{16-28}	GC	1.9	Kinney, 1973
Mytilus californianus	Washington Coast	n-paraffins	GC	0.45	Clark & Finley, 1973b
	Puget Sound, Wash.	n-paraffins	GC	0.088-0.58	Clark, 1974
Barnacles					
Mitella polymerus	Washington Coast	n-paraffins	GC	1.41	Clark et al., 1973
	Puget Sound, Wash.	n-paraffins	GC	1.22-4.54	Clark, 1974
Balanus cariosus	Washington Coast	n-paraffins	GC	0.66	Clark, 1974
Scallop					
Acquipecten irradians	Waquoit Bay, Mass.	Saturates	GC	2.3-55	Blumer et al., 1970a
Shrimp					
Pandalis borealis	North Atlantic	Saturates	GC	43.6	IDOE, 1972
Unidentified species	Arctic Ocean	n-paraffins	GC	0.37-21.6	Clark, 1974
Palaemonetes pugio	Galveston Island Marsh at Eight Mile Road	Saturated Total (C_{20-31})	GC	24.8	Tatem & Anderson, 1974
		(C_{22-28} each)	GC	3.1-3.9	Tatem & Anderson, 1974
		(C_{22}			

TABLE 2

Species	Locality	HC Type	Analysis	WET µg/g	Reference
Palaemonetes pugio	Marsh at Eight Mile Road	Saturated Total	GC	10.9	Tatem & Anderson, 1974
		(C21-26)	GC	3.9	Tatem & Anderson, 1974
Penaeus setiferus (postlarvae)	Mariculture by Dow Chemical	Saturated Total	GC	15.0	Cox & Anderson, 1974
		Aromatics Total	GC	8.0	Cox & Anderson, 1974
Crabs					
Hemigrapsus nudus	Washigton Coast	n-paraffins	GC	0.28	Clark et al., 1973
	Puget Sound, Wash.	n-paraffins	GC	0.082-3.65	Clark, 1974
Cancer irroratus	Eastern Canada	Aromatics	Fluoro	7	Zitko, 1971
Uca minax		Naphthalene	UV Spec	0.24	Cox & Anderson, 1974
		Methylnaphthalene	UV Spec	0.15	Cox & Anderson, 1974
		Dimethylnaphtha-lene	UV Spec	0.09	Cox & Anderson, 1974
Sesarma cinereum	Trinity Bay in Galveston Bay	Naphthalenes	UV Spec	0.22	Cox & Anderson, 1974
		Methylnaphthalenes	UV Spec	0.10	Cox & Anderson, 1974
		Dimethylnaphtha-lenes	UV Spec	0.08	Cox & Anderson, 1974
Lobster					
Homarus americanus					
stomach	Eastern Canada	Aromatics	Fluoro	19	Zitko, 1971
gut	Eastern Canada	Aromatics	Fluoro	57	Zitko, 1971
claw muscle	Eastern Canada	Aromatics	Fluoro	4	Zitko, 1971
abdominal muscle	Eastern Canada	Aromatics	Fluoro	5	Zitko, 1971
Urchin					
Strongylocentrotus sp.	Eastern Canada	Aromatics	Fluoro	22	Zitko, 1971
S. purpuratus	Washington Coast	n-paraffins	GC	0.18	Clark, 1974
Flounder					
Syneium gunteri	Gulf of Mexico	n-paraffins	GC	8.7	IDOE, 1972
Unidentified species	Alaska	n-paraffins	GC	8.0	IDOE, 1972

TABLE 2

Species	Locality	HC Type	Analysis	WET ug/g	Reference
Flounder (cont.)					
Pseudopleuronectes americanus	Eastern Canada				
gut		Aromatics	Fluoro	21	Zitko, 1971
skin and flesh		Aromatics	Fluoro	0	Zitko, 1971
Perch					
Sebastes marinus - livers	North Atlantic	Hydrocarbons	GC	110	IDOE, 1972
	Georges Bank	Hydrocarbons	GC	20.6	IDOE, 1972
Haddock					
Gadus aeglefinus - livers	North Atlantic	Hydrocarbons	GC	210	IDOE, 1972
	Georges Bank	Hydrocarbons	GC	252	IDOE, 1972
Pollock					
Pollachius varins - livers	Georges Banks	Hydrocarbons	GC	262	IDOE, 1972
Greenland halibut					
Reinhavdtius hippo-glossoides - livers	North Atlantic	Hydrocarbons	GC	230	IDOE, 1972
	Gulf of Maine	Hydrocarbons	GC		
Whitefish - flesh	Alberta, Canada	Diesel oil-like	GC	4-14	Ackman & Noble, 1973
Yellow sole					
Lamanda	Valdez, Alaska	C_{16-28}	GC	0.51-0.97	Kinney, 1973
Herring eggs					
Clupea pallasil	Puget Sound, Wash.	n-paraffins	GC	3.1	Clark, 1974
Cod					
Gadus callarias - livers	North Atalntic	Saturates	GC	128-345	IDOE, 1972
Gadus morhua - livers	North Atlantic	Saturates	GC	332	IDOE, 1972
Boreogadus esmarki	North Atlantic	Saturates	GC	117	IDOE, 1972
	Arctic Ocean	n-paraffins	GC	12.6	Clark, 1974

TABLE 2

Species	Locality	HC Type	Analysis	WET µg/g	Reference
Mackeral Scomberomorus cavalla	Gulf of Mexico	n-paraffins	GC	11.3	IDOE, 1972
Barracuda Sphyraena barracuda	Texas	n-paraffins	GC	22.6	IDOE, 1972
Atlantic salmon Salmo salar	Eastern Canada	Aromatics	Fluoro	10	Zitko, 1971
Citharichthys sordidus	Tanner Banks	aliphatic(F1) aromatic(F2) unsaturate	GC GC	4.4-10 17.4-27.1	Rossi et al., 1979
Mytilus californianus	Bird Rock, Santa Catalina Island	total alkanes total alkanes	GC GC	8.7 2.3	Risebrough et al., 1979
Urophycis regius	Georgia Embayment	saturated	GC	1-35	R.F. Lee, 1979

Source: Anderson et al., 1974

TABLE 3

Tissue Hydrocarbon Levels Resulting from Laboratory Exposure

SPECIES	EXPOSURE CONDITIONS	HC TYPE	ANALYSIS	WET ug/g	REFERENCE
Clams					
Rangia cuneata	1000 ppm #2 fuel oil,48 hr	Total saturated	GC	26	Anderson, 1973
		Mono-& diarom.	GC	481	Anderson, 1973
		Poly aromatics	GC	34	Anderson, 1973
Mya arenaria	Bunker C	Aromatics	Fluoro	87	Zitko, 1971
	Chronically oiled from	Bunker C	Fluorescence		
mantle	Chedabucto Bay, N.S.	Aromatics	Spectroscopy	0	Vandermuelen, 1978
mantle edge	Depurated for 92 days			7.9	
siphon	in oil free seawater			4.5	
siphon epidermis				22.0	
gills & lappets				3.5	
gut/hepatopancreas/foot				11.4	
style				0	
adductor muscle				8.4	
hinge ligament				0	
Oysters					
Crassostrea virginica					
	1000 ppm #2 fuel oil, 48 hr.	Total saturated	GC	4	Anderson, 1973
		Mono- & diarom.	GC	121	Anderson, 1973
		Poly aromatics	GC	5	Anderson, 1973
	1000 ppm #2 fuel oil, 96 hr	Total saturated	GC	3	Anderson, 1973
		Naphthalness	GC	84.1	Anderson, 1973
		Triaromatics	GC	9.5	Anderson, 1973
	106 ppb #2 fuel oil, 7 wks.	Saturates & arom	GC	335	Stegeman & Teal, '73
	1000 ppm Kuwait crude, 96 hr	Total saturated	GC	46.0	Anderson, 1973

Table 3. Continued

Species	Exposure Conditions	HC Type	Analysis	WET ug/g	Reference
Shrimp					
Penaeus aztecus	20% WSF[1]#2 fuel oil, 24 hr	Sat. (individual peaks)	GC	0.1	Cox & Anderson, 1973
		Naphthalenes		0.1	
		Methylnapthalenes	GC	1.4	Cox & Anderson, 1974
		Dimethylnaphthalenes	GC	0.3	Cox & Anderson, 1974
		Trimethylnaphthalenes	GC	0.6	Cox & Anderson, 1974
Penaeus aztecus	Underslick of #2 fuel oil for 24 hr in a pond exposure	Saturated Total	GC		Cox & Anderson, 1974
		(C13-24)	GC	6.2	Cox & Anderson, 1974
		(C4-Benzenes)	GC	1.2	Cox & Anderson, 1974
		Naphthalene	GC	3.3	Cox & Anderson, 1974
		1-Methylnaphthalenes	GC	8.0	Cox & Anderson, 1974
		2-Methylnaphthalenes	GC	8.9	Cox & Anderson, 1974
		Dimethylnaphthalenes	GC	19.2	Cox & Anderson, 1974
		Trimethylnaphthalenes	GC	4.2	Cox & Anderson, 1974
		Phenanthrenes	GC	12.7	Cox & Anderson, 1974
Palaemonetes pugio	0.9 ppm OWD[2] #2 fuel oil				
	for 2 hr	Naphthalenes	GC	3.1	Tatem & Anderson, 1974
	6 hr	Naphthalenes	GC	5.5	Tatem & Anderson, 1974
	10 hr	Naphthalenes	UV	4.0	Tatem & Anderson, 1974
Lobster					
Homarus americanus gut	10,000 ppm Bunker C, 6-1/2 days	Aromatics	Fluoro	1,810	Scarrett & Zitko, 1972
stomach		Aromatics	Fluoro	2,840	Scarrett & Zitko, 1972
abdominal muscle		Aromatics	Fluoro	137	Scarrett & Zitko, 1972
claw muscle		Aromatics	Fluoro	33	Scarrett & Zitko, 1972

[1]A water-soluble fraction (WSF) was prepared by mixing 1 part oil over 9 parts water for 20 hours, and the water phase was diluted to 20% of its original concentration of hydrocarbons (see Anderson et al., 1974)

[2]Oil was added to water such that 500 ml contained 0.9 ppm of oil. This mixture was shaken at 200 cycles/min. for 5 min. and after 60 min. the animals were placed in the mixture.

(continued)

TABLE 3

Tissue Hydrocarbon Levels Resulting from Laboratory Exposure

SPECIES	EXPOSURE CONDITIONS	HC TYPE	ANALYSIS	WET ug/g	REFERENCE
		Naphthalenes	GC	55.1	Anderson, 1973
		Triaromatics	GC	6.0	Anderson, 1973
Crassostrea gigas	50 ppm #2 fuel oil, 11 days	Saturated	GC	1.3	Vaughan, 1973
Ostrea lurida	10% outboard motor effluent, 10 days	n-paraffins	GC	0.96	Clark et al., 1974
Mussels *Mytilus edulis*	0.1 ppm mono- & diaromatics 4-24 hours	Same	Radio.	6	Lee et al., 1972a
	0.1 ppm poly aromatics	Same	Radio	0.6	Lee et al., 1972a
	Slick, #2 fuel oil 48 hrs.	n-paraffins	GC	7.9	Clark & Finley, 1974
	Slick, #5 fuel oil 32 hrs.	n-paraffins	GC	7.4	Clark & Finley, 1974
	10% outboard motor effluent	n-paraffins	GC	1.10	Clark et al., 1974
Perch *Cymatogaster aggregata*	50 ppm #2 fuel oil, 96 hr	Saturated	GC	2.3	Vaughan, 1973
		Diaromatics	GC	19	Vaughan, 1973
Flounder *Pseudopleuronectes americanus* Gut	Bunker C				
skin		Aromatics	Fluoro	622	Zitko, 1971
flesh		Aromatics	Fluoro	182	Zitko, 1971
		Aromatics	Fluoro	7	Zitko, 1971

Source: Anderson et al., 1974

b. Sites of Storage

Although it has been demonstrated that hydrocarbons concentrate in certain organs, it is actually with the lipids that they become associated (Blumer and Sass, 1972a). Stegeman and Teal (1973) found a direct relation between the lipid content of oysters and the amount of hydrocarbons accumulated. Shipton et al. (1970) reported the dark meat and the fatty layer adjacent to the skin were more severely tainted with a hydrocarbon similar to kerosene than the white meat, and that the tainted flesh had a higher fat content than the untainted flesh of fish caught at the same time. Vale et al. (1970) examined livers with optical and electron microscopes and found excessive amounts of free fat, typical of fatty infiltration, in tainted fish as compared with untainted mullet. Fatty liver in higher animals can be caused by petroleum distillates (Browning, 1953).

Roubal (1973), working with excised spinal cord tissue of coho salmon, indicated that hexane and similar hydrophobic compounds are directed away from nerve membrane surface to sites in the lipid bilayer of the membrane, while aromatic hydrocarbons and benzyl alcohol contribute to membrane surface changes. The complex lipoproteins of plasma membranes and organelle membranes of all tissues are possible storage sites (NAS, 1975).

According to a summary paper by Anderson et al. (1974a), accumulated petroleum hydrocarbons are rapidly transferred to the gall blader, brain and other neural tissues, and the liver of fish and to the digestive gland of shrimp. Damage to fish having concentrations of petroleum hydrocarbons in the nervous system can be seen as an increase in nonadaptive behavior responses.

Lee et al. (1972b) and Anderson et al. (1974a) found localization of hydrocarbons in the gall bladder, liver, and brain of marine fish. During depuration in clean water the hydrocarbons were apparently transported to the liver and gall bladder for detoxification and excretion. A significant amount of contamination remained in the heart and brain until the point of final release. Since the compounds are transported by the blood, it is not surprising that the concentration in the heart is high, but an explanation for high levels in the brain requires further investigation. McCain et al. (1978) also reported large amounts of aromatics remaining in the liver of English sole after 27 days exposure to Alaskan crude oil.

Cox and Anderson (1974) reported that brown shrimp, Penaeus aztecus, accumulate the naphthalene fraction of hydrocarbons primarily in the digestive gland or hepatopancreas throughout the exposure period. The content of these compounds in the other organs and tissues decreases steadily, even during exposure. The gill tissue maintains a relatively consistent level of contamination (approximately 0.6 ppm) during the depuration until the point of final release by the digestive gland (about 250 hours). Since the gills are richly supplied with blood, the contamination level found may well represent contamination level in the blood of the shrimp.

Rice et al. (1976) reported that aromatic hydrocarbons were accumulated to the highest concentration in the gut of pink salmon fry after 10 hours exposure to the WSF of three different oils: No. 2 fuel oil, Prudhoe Bay crude oil, and Cook Inlet crude oil. Both gills and muscle also contained small amounts of aromatics. The authors suggested that the high level of naphthalenes in the gut imply that oil is being actively metabolized in the liver yielding products excreted by the gall bladder.

Scarratt (1971) reported commercial species of scallops which had ingested Bunker C oil had a detectable amount of Bunker C hydrocarbons in the mantle, digestive gland, adductor muscle and gonad. Di Salvo et al. (1975) reported hydrocarbons in the gonads of mussels. Operation Oil (1970) reported that oil was present in the muscle tissue, digestive tract and other organs in scallops, periwinkles, sea urchins, and other intertidal benthos examined after Bunker C oil had been spilled in the Arrow accident. Blumer and Sass (1972a) also reported hydrocarbons in adductor muscles of oysters after the West Falmouth spill.

2. Catabolism

a. Pathways

The metabolic pathways involving oxidases and other enzymes, important in the degradation of aromatic and paraffinic hydrocarbons by mammalian systems, have been well studied (Boyland and Solomon, 1955; Falk et al. 1962; McCarthy, 1964; Diamond and Clark, 1970; Daly et al., 1972). Aromatic hydrocarbons undergo hydroxylation, followed by conjugation with sulfate or glucose, and are finally excreted as a water-soluble product. Straight chain hydrocarbons are hydroxylated at the terminal end and further oxidized to the fatty acid that can be broken down by β-oxidation (NAS, 1975). Highly branched chain hydrocarbons, such as pristane and phytane, are probably oxidized to an acid (e.g. phytanic acid), which can be further oxidized by a combination of alpha and beta oxidation (Mize et al., 1969).

Metabolism of hydrocarbons in marine organisms is less well understood, but several studies have been conducted. Malins (1977) has reviewed the biochemical transformations mechanisms which aromatic hydrocarbons may be subject to in marine organisms. Some organisms, normally showing virtually no enzyme activity, may exhibit detectable aryl hydrocarbon hydroxylase (AHH) when exposed to inducing agents. AHH activities are commonly based on the conversion of a single substrate, such as benzo(a) pyrene, to hydroxy derivatives and thus may not necessarily represent the capability of an organism to degrade the complex mixtures of aromatic hydrocarbons in petroleum. Degradation of sizable quantities (between 10 and 500 ug) of aromatic and paraffinic hydrocarbons did occur in marine fish and some marine invertebrates (Stegeman and Teal, 1973; Lee et al., 1972a,b). Other benthic marine invertebrates, phytoplankton, and some zooplankton, over a period of a month, were unable to oxidize either paraffinic or aromatic hydrocarbons. Several species of copepods were unable to metabolize hydrocarbons but could degrade paraffinic hydrocarbons (NAS, 1975). The liver or the liver-like organ in some invertebrates, hepatopancreas, is assumed to be the site of hydrocarbon degradation. Unaltered hydrocarbons are sent to these organs where hydroxylation and other detoxification reactions occur. In those invertebrates where degradation does not occur. some of the detoxifying microsomal oxidases in the hepatopancreas may be missing. Hydroxylated products are found when fish and some crustacea are given aromatic and paraffinic hydrocarbons. The serum lipoproteins appeared to have a role in carrying the hydroxylated hydrocarbons to various tissues from the liver in both fish and lobsters (NAS, 1975).

Lee (1975) found that all of the crustaceans studied, including copepods, amphipods, crab, zoea, and euphausiids, had the ability to metabolize naphthalene, benzpyrene, methylcholanthrene, and octadecane. Ctenophores and jellyfish were not able to metabolize benzpyrene. The identified metabolites from the zooplantktonic crustaceans included napthol, hydroxybenzpyrene, hydroxymethylcholanthrene and hydroxyoctadecane. The metabolic pathway appears to be similar to those in mammals. Corner et al. (1976) found similar results. The copepod, Calanus helgolandicus, metabolized the aromatic hydrocarbon, naphthalene. Vandermeulen and Penrose (1978) reported that Mya arenaria, Mytilus edulis, and Ostrea edulis were unable to metabolize benzopyrene or imipramine while trout readily metabolized these compounds.

A somewhat less efficient and slower hydrocarbon metabolizing system has been reported in crustaceans (Anderson et al., 1974a). Studies with molluscs have failed to demonstrate the presence of any hydroxylases activity or metabolism of hydrocarbons (Carlson, 1972). Lee et al. (1972a) also failed to observed formation of metabolites of hydrocarbons by mussels.

Although long chain paraffinic hydrocarbons (carbon chain lengths between C_{12} - C_{30}) are a common constituent of marine organisms, they usually account for only a few percent of the total lipid. Most aromatic hydrocarbons present in petroleum are not known to by synthesized by marine organisms, though there are reports of biosynthesis of benzpyrenes by freshwater green algae (Borneff and Fischer, 1962). Perhaps half of the hydrocarbons in the sea are hydrocarbons manufactured by living organisms while half are petroleum compounds (Button, 1971). This assumption is valid only if the hydrocarbons synthesized by living organisms are metabolized at the same rate as petroleum hydrocarbons. From the above discussion, it certainly appears that many petroleum hydrocarbons are more resistent to degradation than those synthesized by living organisms.

b. Depuration or Discharge

The variations of uptake and loss of petroleum hydrocarbons under laboratory conditions (Lee et al. 1972a) and those found after real-life spills are related to the degree of the exposure---the amount of the pollutant and the duration, as well as the physical and chemical properties of the pollutant (Stegeman and Teal, 1973). Once within the organism, PHC are accumulated, at least temporarily (Anderson et al. 1974a), and possibly stored where they are not metabolized or metabolized only very slowly (NAS, 1975). The ability of organisms to depurate accumulated hydrocarbons is a controversial issue.

The microalgae, Chlamydomonas angulosa, apparently possesses no mechanism of actively removing accumulated naphthalene, or its derivatives if there are any (Kauss et al., 1973). Cell division appears to be the only method available to Chlamydomanas cell to rid themselves of naphthalene or at least reduce its content.

Following the Arrow incident in Chedabucto Bay, Conover (1971) observed plankton ingesting large quantities of small drops of Bunker C oil, and eliminating the PHC in the form of fecal matter (up to 7% Bunker C oil by weight). Parker (1970) also demonstrated the presence of considerable quantities of oil in the fecal pellets of copepods and barnacle larvae. The oil apparently passes unchanged into the fecal material (NAS, 1975).

Preliminary results following the Argo Merchant spill, indicate that the oil was in alimentary tracts and fecal pellets of copepods, collected within and adjacent to the spill area (Grose and Mattson, 1977). Copepods, collected 70 days after the grounding, still contained petroleum residues.

After being transferred to radioactive-free seawater, zooplanktonic crustaceans, gradually released accumulated radiocarbon tagged hydrocarbons during the first few days (Lee, 1975). A more dramatic decrease occurred after three days. A small percentage (less than 1% of the ingested hydrocarbon) was stored, even after a long depuration time.

Corner et al. (1976) found that the route of entry was an important factor in the rate of depuration in copepods. Naphthalene, accumulated directly from seawater, was rapidly depurated; less than 5% of the original radioactivity could be detected after 10 days in the animals. Naphthalene, accumulated from the diet, was depurated slower; approximately 33% of the original radioactivity still remained in the animals after 10 days. R. P. Harris et al. (1977) extended the above study to include seven species of copepod and to investigate the relationship between hydrocarbon retention and dry weight, ash-free dry weight and total lipid content. Significant positive correlations were demonstrated between naphthalene retention and copepod size measured as dry weight and total lipid content; a negative correlation was observed with temperature, and retention was diminished in animals starved for progressively longer periods. Following a 24 hour exposure ^{14}C-1 naphthalene, the animals were transferred to clean seawater and an exponential depuration was observed in all cases but Eurytemora affinis which retained detectable amounts after 34 days.

Blumer et al. (1970a) report that when oysters, Crassostrea virginica, are exposed to water-oil mixtures, they nonselectively accumulate a wide variety of PHC in their tissues which are retained for several months or perhaps indefinitely. The oil, highly aromatic No. 2 fuel oil, remained relatively unchanged in composition or quantity in the oysters (Blumer and Sass, 1972a). The persistence of the hydrocarbons, its presence in adductor muscle tissue, and the lack of further degradation of the hydrocarbons indicate that it becomes part of the organisms lipid pool (Blumer and Sass, 1972a).

Stegeman and Teal (1973) exposed oysters, Crassostrea virginica, to No. 2 fuel oil at a concentration of 106 ug/l (ppb) for 50 days. In terms of total wet body weight, hydrocarbon equilibrium was reached in five to six weeks, with rapid accumulation the first 13 days. However, in terms of lipid content, equilibrium was not reached. When placed in clean water, the oysters depurated 90 percent within two weeks, but retained a concentration of over 30 times that before exposure. They concluded that at least some of the PHC had become a stable component having a slow turnover rate.

Anderson (1973) exposed the clam, Rangia cuneata, and the oyster, Crassostrea virginica, to south Louisiana crude oil and No. 2 fuel oil for periods up to 4 days. The accumulated levels of tissue contamination decreased to less than detectable concentrations (0.1 ppm) in from 24 to 52 days. The aromatic hydrocarbons were accumulated to the greatest extent and retained the longest in these studies. Anderson and Neff (1974) found similar results with the uptake and release of naphthalenes (aromatics) from No. 2 fuel oil by clams, Rangia cuneata.

Further evidence of the importance of naphthalenes in the contamination of the marine organisms is shown by the work of Vaughan (1973). During 15 days of exposure to oil, Pacific oysters, Crassostrea gigas, were found to accumulate significant amounts of dimethylnaphthalenes. On removal from the contaminated water, the tissue content of dimethylnaphthalenes decreased to a level slightly above the background within 9 days in clean flowing sea water.

Clark and Finley (1974) have demonstrated the uptake of paraffins by mussels, Mytilus edulis, reaching a level of 112 ppm dry weight after 48 hours of exposure to No. 2 fuel oil. While the majority (94.6%) of the accumulated hydrocarbons were released during the first two weeks of maintenance in clean sea water, approximately 6 ppm (dry weight) was present after 14 and 35 days of depuration.

Lee et al. (1972a) found similar results with the mussel, Mytilus edulis. Using isotopically labeled petroleum-derived alkanes and aromatic hydrocarbons, the molluscs released more than 90 percent of the accumulated hydrocarbons within 2 weeks of their return to isotope free sea water.

Di Salvo et al. (1975) also report incomplete depuration in mussels. The mussels, Mytilus edulis and M. californiunus, after being held in polluted areas (San Francisco Bay) for 90 days and subsequently transferred to non-polluted areas (North Carolina coast) for 10 weeks, still retained some pollutants.

Mussels collected from the Scripps Institute of Oceanography pier showed a buildup of petroleum hydrocarbons for several days after a fuel oil spill. But three weeks later, none of the material could be found in the mussels (Lee and Benson, 1973).

Alyakrinskaya (1966) found that Mytilus galloprovincialis in the Black Sea could tolerate high concentrations of oil. During filtration of oil-polluted water, the molluscs formed pseudofeces (material not passed through the gut), connecting the oil in mucous. The mucoid oil was subsequently discharged.

Simulating an oil spill, Anderson et al. (1974a) found that estuarine fish and macroinvertebrates completely depurated hydrocarbons accumulated after short term exposures of four days or less. After a 24 hour exposure to concentrations of No. 2 fuel oil, the fish, Fundulus similis, and the shrimp, Panaeus aztecus, had released accumulated hydrocarbons to background levels (Anderson and Neff, 1974).

Geraci and Smith (1976) found oil on the anus and on the hind flippers of ringed seals, after they were fed oil (25 ml and 75 ml). There was no obvious deleterious effects or behavioral alterations. The liver, generally regarded as a prime target organ for hydrocarbon damage in mammals, was not damaged.

The present data indicates that there may be two forms of hydrocarbon accumulation in bivalve molluscs and other organisms: 1) A short-term form where PHC are taken up rapidly and depurated completely or to background levels within a range of several weeks to two months (Lee and Benson, 1973; Anderson et al., 1974a). 2) A long-term hydrocarbon burden accumulated in tissues that is not completely discharged (Blumer et al., 1970a; Blumer and Sass, 1972a; Lee et al., 1972a,b; Stegeman and Teal, 1973; Clark and Finley, 1974; Di Salvo et al., 1975; Lee, 1975; Corner et al., 1976). Because they apparently have the ability to catabolize hydrocarbons, shrimp, fish and marine mammals would probably not retain the residual hydrocarbon concentration as do molluscs.

The avenues of depuration of accumulated hydrocarbons vary. In molluscs and certain zooplankton which can not degrade hydrocarbons, bile salts or some other natural detergents are able to emulsify hydrocarbons and allow passage through the gut, and into the feces. On the gills, molluscs can also connect oil drops with mucous, discharging the material as pseudofeces without passing the oil through the gut (Alyakrinskaya, 1966). Fish use oxidases and other enzymes to form water soluble products from the hydrocarbons, discharging the hydrocarbons probably in the urine, via the gall bladder and kidney. In marine mammals, hydrocarbons are also converted to water soluble products that go through the bile and into the feces and urine. The avenue for the discharge of hydrocarbons by the lobster and related invertebrates has not been determined (NAS, 1975).

Molluscs, crustaceans, and fish are all capable of disposing of accumulated PHC, but the mechanism responsible for depuration have yet to be clearly defined, especially for crustaceans and molluscs. Rates of PHC metabolism in vivo under various environmental conditions are at this point impossible to estimate (Anderson et al., 1974a). Information is also lacking on what percentage of PHC metabolities, some of which may be toxic (Daly et al., 1972) are retained or excreted by fish and crustacean, and what percent of the retained hydrocarbons in molluscs are toxic.

c. Microbial Degradation

A necessary part of the food cycle in all systems is the decomposition of organic matter. Decomposition of petroleum hydrocarbons will be briefly discussed. Two comprehensive reviews which have been compiled are Friede et al. (1972) and Ahearn and Meyers (1973). Other important reviews and bibliographies include Moulder and Varley (1971), Karczewska (1972), and ZoBell (1969, 1971, 1973) and Karrick (1977).

The rates of microbial degradation of fossil hydrocarbons and derivaties in the marine environment vary within the chemical complexity of the crude, the microbial populations, and many of the environmental conditions (Friede et al., 1972; ZoBell, 1973). With this multivariate system, it is impossible to predict with either ease or accuracy the rate of microbial oil removal (NAS, 1975). Few reliable field measurements have been made in the marine environment (Blumer et al., 1973b; Robertson et al., 1973; Atlas et al., 1978; Colwell et al., 1978). Laboratory experiments, in which conditions are optimal for oxidation, can only give some indication of maximum rates (Friede et al., 1972; Liu, 1973, Bartha and Atlas, 1973; Kator, 1973; ZoBel, 1973). Rates of the microbial degradation of various fractions of oil or oil products can be measured on a time scale of weeks in some instances (Floodgate, 1972, 1972), and immeasurably slow in others (Johnson, 1970). Environmental stresses such as temperature and salinity changes, wave action, and sunlight not only directly affect the growth and metabolism of the micro-organisms but also alter the physical state (e.g., emulsification) and ultimately the chemical nature (e.g., oxidation) of the hydrocarbons (NAS, 1975).

Temperature increases may accelerate growth rates, thereby increasing biodegradation (Friede et al., 1972; ZoBell, 1973). Ludzack and Kinhead (1956) found that the percentage of oil degraded per week as 50-80 percent at 25°C, 30 to 50 percent at 20°C, 20 to 30 percent at 10°C, and no apparent degradation at 4°C. A rise in temperature also increases the rate of evaporation of more volatile components, some of which are degradable and some of which are toxic (Atlas and Bartha, 1972b). Viscosity is lower at higher temperatures, thereby increasing the chance of emulsification and increasing the surface area available for microbial activity and solubility (ZoBell, 1973). Temperature decreases may not necessarily reduce the overall rate of microbial biodegradation significantly if special psychrophilic cultures develop (Robertson et al., 1973; Traxler, 1973).

Factors influencing the biodegradation of oil, include oxygen content, nitrogen and phosphorous concentrations, and numerous other variables, such as presence of alternative carbon sources, microbial predators, and presence of sufficient hydrocarbon substrate to develop a viable culture (Gunkel, 1968; Friede et al., 1972). Oxygen content is probably always sufficient for degradation of oil at the surface layer and in the upper water column of the open ocean (Friede et al., 1972). However, if the water or sediments become anoxic, then rates of biodegradation will be markedly reduced (Davis, 1967). Nitrogen and phosphorous concentrations strongly influence the rate of oxidation in laboratory experiments (Gunkel, 1967, 1968; Atlas and Bartha, 1972a), but only may be limiting factors in open oceans (NAS, 1975). The other variables are not sufficiently known to precisely determine <u>in situ</u> effects on microbial oil utilization (NAS, 1975).

The only substances, known with certainty to be produced in measureable quantities in the marine environment by microbial activity, are microbial tissue (Gunket, 1968) and carbon dioxide (Robertson et al., 1973). However, numerous intermediates and end products are known to accumulate in laboratory experiments, including aliphatic alcohols, acids, and equivalent aromatic derivatives, which may be disruptive to chemotaxis by marine life (Klug and Markovetz, 1971; Friede et al., 1972; Mitchell et al., 1972; Zafiriou, 1972). A small amount of information indicates that certain bacterial strains may store hydrocarbons in vacuoles (Finnerty et al., 1973). Since some marine animals feed on bacteria, this is a possible route into the food web (NAS, 1975).

The process of "seeding and/or fertilization" of oil spills to facilitate biodegradation has not been fully explored (Midget, 1973). A potential use for microbial seed cultures, particularly those possessing emulsifying properties, is for the treatment of local enclosed conditions such as tanker ballast waters prior to their discharge (Rosenberg and Gutnick, 1973) and for the treatment of bilge waters processed in harbor installations. It seems probable however, that multiseed stocks of varied metabolic capabilities will be required for different types of oil, which, at present, are not technically feasible on open waters or beaches (NAS, 1975).

D. <u>Carcinogenicity</u>

Some doubt remains as to the direct carcinogenicity of crude oil and crude oil residues. Polynuclear aromatic hydrocarbons (PAH), some of which are known carcinogens such as 3, 4-benzpyrene, phenanthrene, and chrysene, are present in very small amounts in crude oils (NAS, 1975). Little information is available on the concentration levels of PAH in an oil spill, or on magnification, if it occurs, in the food web.

Carruthers et al. (1967) suggest that all crude oils and oil products containing hydrocarbons with bioling points between 300-500°C should be viewed as potential cancer inducers. Different types of carcinogens, found in crude oils, include 3,4-benzpyrene present in crude from Libya, Venezeula and the Persian Gulf (Grafer and Winter, 1968), and 1,2-benzanthracene and alkybenzanthracenes from Kuwait oil (Carruthers et al., 1967).

Zooplantonic crustaceans, including copepods, euphausiids, crab zoea, and amphipods, can metabolize 3, 4-benzpyrene (Lee, 1975). Most of the benzpyrene and metabolites are discharged. Even after long depuration periods, small amounts of the hydrocarbon were still present, possibly never being discharged during the life of the animal.

The carcinogenic 3, 4-benzpyrene behaves similarily to the naphthalenes in pattern of uptake, retention, and release in clams (Anderson and Neff, 1974). Organisms accumulated naphthalenes in tissues in greater amounts than other hydrocarbons and released them more slowly (Anderson, 1973).

Shellfish, although alive, were reported to contain the carcinogen 3,4-benzpyrene (Battelle Memorial Institute, 1967). Similarly barnacles, attached to creosoted poles, were reported to contain the same carcinogenic hydrocarbon. Mice, injected with extracts from the barnacles, developed sarcomas.

Hyperplasia (increase in the rate of cell division) in reproductive cells of bryozoan in response to the addition of coal tar derivatives was reported by Powell, Sayce, and Tafts (1970). They noted that similar abnormalities may have occurred in coastal fauna exposed to spills such as the Torrey Canyon and the Santa Barbara blowout.

However, most observations of these spills were concerned with mortality and may not have detected the sublethal effects.

Straughan and Lawrence (1975) investigated the response of a number of bryozoan species to exposure to natural oil seepage, but found normal cell formation. A three year study of natural oil seeps near Santa Barbara reported similar findings (Straughan, 1976). All organisms were present that would be expected to be in that environment if oil seepage were not there, and exposure to natural oil seepage had no effect on either the growth rate or reproductivity of the organisms (Straughan, 1976).

As suggested previously, the concern of petroleum related carcinogenicity must extend beyond the parent hydrocarbon compound to the metabolite produced by the organism. Stegeman (1977) as cited in Neff (1979) provided evidence that the MFO-cytochrome P-450 (an enzyme system which initiates the metabolism of certain lipophilic organic compounds) system of fish is able to produce carcinogenic or mutagenic metabolites in vitro. Similar results were obtained by Payne et al. (1978) when hepatic microsomes of rainbow trout were exposed to the PAH-enriched fraction of used crankcase oil.

Many, but not all, carcinogenic chemicals are also mutagenic or teratogenic. Thus the carcinogenicity of a chemical is often inferred from its mutagenicity or teratogenicity. While the solitary sponge Sycon raphanus was unaffected, teratogenic activity was observed by Korotkova and Tokin (1968) in the colonial calareous sponges Leucosolenia complicata and L. variabilis when exposed to 5g/liter of benzo(a)pyrene. Teratogenic and mutagenic activity was also observed in planarians when exposed to either 3-methylcholanthrene or benzo(a) pyrene (Foster, 1969 as cited in Neff, 1979).

The studies cited used levels of contaminants not likely to be found in the marine environment. Additional research is needed in this area to extend results to a greater diversity of species and environmentally significant concentrations.

Ishio et al. (1971; 1972a,b; as cited in Neff, 1979) reported the growth of a cancer-like hyperplasia in the marine alga Porphyra tenera cultivated in coastal waters near industrial wastewater outfalls from the city of Ohmuta, Japan. The causative agent appeared to be related to the bottom sediments rather than the diluted wastewater and chemical analysis identified benzanthone and possible 12-hydrodibenzo (cd, ghi) perylene in the fraction having the greatest carcinogenic potency. Here again, synergistic effects are completely unknown.

ZoBell (1971) reported the natural synthesis and metabolism of carcinogenic hydrocarbons by several marine organisms. Thus, oil pollution is certainly not the only source for carcinogenic hydrocarbon introduction into marine food webs. Suess (1972) recognized that carcinogens were in seafoods but concluded that they would probably not be dangerous unless the foods contained an excess amount of polynuclear aromatic hydrocarbon carcinogens. Carcinogenesis in oil contaminated marine organisms has not been proven, but circumstantial evidence suggests that petroleum hydrocarbons may be involved in initiating tumors in fishes (Nelson-Smith, 1972) and clams (Barry et al., 1971; Barry and Yevich, 1972). Yevich and Barscz (1977) found two types of cancer in soft shell clams during two oil spills involving No. 2 fuel oil and No 5 diesel oil. One type forms in gonodal tissue and quickly spreads to other organs, while the other type is a blood cell from similar to leukemia.

The amount of carcinogens potentially consumed by man eating contaminated seafood seems small when compared to other sources such as green vegetables and roast meat (NAS, 1972). The National Academy of Sciences (1975) workshop estimates that the carcinogen 3,4-benzpyrene concentration on a dry weight basis arising from a high level of contamination by petroleum to be 5ug/kg dry weight. Maximum concentration levels of 3,4-benzpyrene, in comparison, was found to be 12.8 ug/kg in lettuce (Grimmer, 1966), and 4.0 ug/kg in water extracted from tea (Borneff and Fischer, 1962). The only report of BaP accumulation by a marine animal following an oil spill is that of Bories et al. (1976; as cited in Neff, 1979). Eleven days after a spill, mussels contained approximately 55 ug BaP/kg.

Appreciable concentrations of carcinogenic PAH have been found in various fried, grilled, roasted, and smoked fish and meat products (NAS, 1975). Lijinsky and Shukik (1965) report 8 ug/kg of PAH in dry smoked salmon, 50 ugBaP/kg in charcoal-broiled steak (Lijinsky, 1967) and Goreloya and Dikum (1965) found up to 10.5 ug/kg in homesmoked sausages. The possible human effects from environmental carcinogens, both terrestrial and marine, are largely unknown (NAS, 1975).

Knowledge of the properties of all the constitutents of petroleum is not complete; therefore, there might be other dangerous materials present in petroleum that have not been identified (NAS, 1975). 3,4-Benzpyrene is only perhaps 1/20 percent of the total carinogenic PAH from various environmental sources (Andelman and Suess, 1970). Certainly, another area that needs to be studied and considered is the possible mutagenic effects (Boesch et al., 1974).

Conclusions regarding the effects of oil and carcinogens in the marine environment are based on limited information. Further research is needed in the field of carcinogens and man's exposure to them (Ehrhardt, 1972; NAS, 1975), especially considering the recent evidence of Yevich and Barszcz (1977). Although the amount of carcinogens potentially consumed from marine sources seems small compared to terrestrial sources (vegetables and roasted meat), the prevailing philosophy favors a conservative view that there is no lower threshold of carcinogens in the body and that increases should be avoided (Boesch et al., 1974).

E. Food Web Magnification

Evidence suggests classical food web magnification (an increasing concentration of hydrocarbons per weight of tissue or lipid at successively higher trophic levels) of petroleum hydrocarbons does not occur. The principal evidence for this is:

1. Organisms so far tested have the ability to depurate at least the majority of accumulated hydrocarbons. Food chain magnification is dependent upon long term retention of the pollution in tissues.

2. Much of the hydrocarbons ingested by zooplankton and other organisms passes through the gut without ever becoming accumulated into the body tissues.

3. The most important method of hydrocarbon accumulation is apparently transference across the gill surface. According to the National Academy of Science (1975), "Apparent food chain magnification may more likely be a function of the ability of different species to accumulate hydrocarbons from the water than a function of their position in the food web."

Recent studies of zooplankton have found that aromatic hydrocarbons are retained in the storage tissue (Lee, 1975); that dietary uptake of aromatics is quantitatively a more important route of entry into copepods than direct accumulation from seawater (Corner et al., 1976); and that copepods contained petroleum residues over two months after the spill (Grose and Mattson, 1977). This data suggests that petroleum hydrocarbons can be transferred to higher trophic levels. However, magnification probably does not occur, since the higher trophic levels can catabolize hydrocarbons.

The possibility exists for some selective hydrocarbon buildup in the food chain through molluscs and zooplankton which retain a portion of the toxic aromatic hydrocarbons. Although magnification would not occur, greater than normal levels of aromatic hydrocarbons could be passed on to the next trophic level. The resultant damage to the predator is not known, but would depend upon the concentration of aromatics in the prey, frequency of consumption, and toxicity or carcinogenicity of the particular aromatic hydrocarbons within the tissue of the prey organism.

Food web magnification may occur in birds, since chlorinated hydrocarbon pesticides have been found to be accumulated in birds on land. The accumulation of petroleum hydrocarbons may pose a threat to marine bird populations.

The fact that the animals tested do accumulate hydrocarbons in rather large quantities in a relatively short time indicates that temporary food chain buildup can occur. The naphthalenes, which are among the most toxic petroleum fractions, remain within the prey species the longest (Anderson et al., 1974). The carcinogen 3,4-benzpyrene acts similarly to naphthalenes in animal tissues. If the temporary accumulation of naphthalenes and/or 3,4-benzpyrene reached high enough concentrations in predators, death or cancer would result. The impacts would be of far shorter duration and of less impact on the marine ecosystem than if the classical food chain buildup did occur.

There are other nonhydrocarbon components of oil (including but not limited to those discussed in Section I) which could be magnified through the food web. Very little information is available for many of these compounds and, although most occur in small concentrations, the long range effects are not completely understood. Similarly, while it is known that parent hydrocarbons can be rapidly depurated by many marine organisms, little is known about the transfer of metabolic products through the food web.

Another possible implication of oil spills in the marine environment is a decrease in the available food supply due to the death of prey species which have succumbed to the toxic fractions of oil. A detailed discussion of this factor is beyond the scope of this paper.

Synergistic Effects

Synergistic interactions of oil and other pollutants are not well understood. Sublethal concentrations of oil may lower the resistence of organisms to other pollutants. Similarly, other pollutants may lower the toxic threshold of oil. Immersion studies of seals in crude oil have shown that nonstressed seals exhibited only transient eye problems and minor kidney and possibly liver lesions, when immersed (Geraci and Smith, 1976). No permanent damage was observed. Seals, stressed by captivity, died within 71 minutes after immersion in oil.

Harvey et al. (1974) have found relatively high levels of industrial polychlorobiphenyls (PCBs) and DDTs in marine life of the Atlantic Ocean. Plankton samples had PCB levels in their body lipids ranging up to hundreds of parts per million. Liver samples of fish collected from Georges Bank had concentration of PCBs and DDT ranging from 1.5 to 45 ppm wet weight of liver.

As Farrington [1] points out, petroleum hydrocarbons and organic pollutants tend to accumulate in the same organs. Therefore, the combined effects of petroleum and PCBs could be more than a simple addition of the effects of the pollutants acting independently.

In a review of the literature, Varanasi and Malins (1977) noted that compounds such as phenol and PCBs are known to alter the aryl hydrocarbon hydroxylase (AHH) activity in mammals. Gruger et al (1976) as cited in Varanasi and Malins (1977) reported that 1 ppm of PCB in the diet over a two moth period result in stimulation of hepatic AHH in O. kisutch, whereas the same treatment with Prudhoe Bay crude oil yielded no such activity. The authors surmised that genetic factors, sex, size and other undefined factors may be responsible for wide variations in AHH activities in aquatic species.

[1] J. W. Farrington, Written Testimony, Proposed OCS Oil and Gas Lease Sale #42, North Atlantic, Boston, Massachusetts, December 7, 1976.

II. Heavy Metals

Natural Occurrence and Sources from Offshore Petroleum Operations

Heavy metals occur naturally in sea water in relatively low concentrations. Table 4 lists average background concentrations in the open ocean for several heavy metals that have been associated with offshore petroleum operations. The residence time of the metal ions and their complexes is an estimate of turnover time in the marine environment. It must be emphasized that there are many dynamic physical and biological processes in the ocean that continually affect these "average" concentrations. Generally the concentrations in Table 4 would be applicable to the open ocean area away from the direct influence of the coastal zone. In the coastal zone, especially in estuaries, near river mouths and in areas of high levels of industrial or muncipal discharges, the concentrations can be several times higher.

Natural sources of heavy metals to the ocean are river water, wind blown material from land following the weathering of rocks and tectonically active ridges where heavy metals are emitted in heavy brines. In coastal regions, additional major sources of heavy metals include sewage discharges, industrial effluents and atmospheric pollution. As an example of the atmospheric source, Patterson and Settle (1974, as cited by NSF/IDOE, 1974) found that atmospheric particle input is a major source of industrial lead in the Southern California Bight, comparable to the input of lead from storm runoff, rain and sewage. The atmospheric lead originates from cars burning leaded gasoline.

Many heavy metals in trace amounts are essential for animal and plant life. At present fourteen trace elements are known to be essential for animal life; iron, zinc, copper, manganese, cobalt, iodine, molybdenum, selenium, chromium, tin, nickel, fluorine, silicon and vanadium. These elements serve as components of enzymes or enzyme systems, enzyme activators, and components of vitamins, hormones and respiratory pigments. A few heavy metals such as arsenic, lead, cadmium and mercury are often referred to as toxic elements since they are toxic to marine organisms at relatively low concentrations and have no other known biological significance (Underwood, 1974). However, any of the heavy metals normally accumulated by marine organisms can be toxic if they are ingested or taken up at sufficiently high levels for long enough periods. Heavy metals and other trace metals in marine organisms are held by strong chemical bonds and are not readily released into the marine environment (Goldberg, 1965).

Table 4 Background Concentrations of Heavy Metals in the Ocean

Element	Seawater conc. µg/l (ppb)	Principal Dissolved Species	Residence Time in Ocean (years)
- V	2	$VO_2(OH)^{-2}$	8.0×10^4
- Cr	0.5	CrO_4^{-2}, Cr^{+3}	2.0×10^4
- Mn	2	Mn^{+2}	1.0×10^4
- Fe	3	-	2.0×10^2
- Co	0.4	Co^{+2}	1.6×10^5
- Ni	7	Ni^{+2}	9.0×10^4
- Cu	3	Cu^{+2}	2×10^4
- Zn	10	Zn^{+2}	2×10^4
- As	2.6	$HAsO_4^{-2}$	5×10^4
		$H_2AsO_4^{-1}$	
- Cd	0.1	Cd^{+2}	-
- Ba	20	Ba^{+2}	4×10^4
- Hg	0.2	$HgCl_4^{-2}$,	8×10^4
		$HgCl^{o}_2$	
- Pb	0.03	Pb^{+2}	2.0×10^3
- Ag	0.04	Ag^{+1}	2.1×10^6

Modified from: Goldberg et al. (1971).

Offshore petroleum operations are potential sources of heavy metals to the coastal waters. Heavy metals are present in petroleum, formation waters (oil field brines) and drilling fluids. Crude oils vary greatly in trace element composition, and variations in trace elements groups can occur from well to well in a particular geological formation (Filby and Shah, 1971). Concentrations of heavy metals and other trace elements in several crude oils are presented in Table 5. Nickel (Ni) and vanadium (V) are generally the most abundant metallic elements in crude, but as shown in Table 5, cobalt (Co), mercury (Hg), iron (Fe) and zinc (Zn) can be abundant in some crudes, in this case California crude. According to Filby and Shah (1971), very little is known of the forms of occurrence of trace elements other than Ni and V in crude oil. Ni and V occur partly as porphyrin complexes and partly in non-porphyrin type compounds associated with the high-molecular-weight material of the oil. The resins and asphaltenes contain most of the trace elements. These groups are not definite classes of compounds but are colloidal materials covering broad molecular-weight and polarity ranges (Filby and Shah, 1971).

Formation waters contain heavy metals in various concentration ranges. Formation waters are either discharged into the ocean after separation of oil fractions or reinjected into formation reservoirs. Median concentrations of various trace metals in formation waters are given in Table 6.

Drilling muds used during drilling operations may be discharged periodically or accidentally into the ocean. Because of this, concern has been expressed over the introduction into the marine environment of toxic substances since the two major components of drilling mud are barite (barium sulfate) and ferrochrome lignosulfonate which contain the elements barium and chromium, known to be toxic in certain of their elemental states. A conference on the environmental aspects of chemical use in well-drilling operations held in May 1975 in Houston, Texas addressed these and other problems. The following information can be found in the report of the conference.

Barium sulfate, used as a weighting agent durint drilling, is also used as a contrast medium for roentgenographic purposes and as an antidiarrheal and demulcent powder. Toxicity studies using Mollienisias latipinna (mollies) show that heavy concentrations of barium sulfate (up to 100,000 ppm for 96 hrs) exhibit no toxicity to fish (Grantham and Sloan, 1975).

Table 5

Trace Element Contents of 6 Crude Oils[a]

Elemental Conc(μg/g)[b]	RF-1	RF-2	RF-3	RF-4	RF-5	RF-6
Ni	93.5	113.0	78.6	116.8	1.28	20.5
V	7.5	6.0	4.9	112.0	26.0	8.2
Co	12.7	13.9	14.5	0.198	0.001	0.0354
Hg	21.2	1.49	1.46	0.139	0.0143	0.0898
Fe	73.1	77.2	89.5	36.9	<5.0	4.94
Zn	9.32	19.50	19.60	2.619	<0.0907	9.08
Cr	0.634	0.685	0.729	0.330	<0.1	0.081
Mn	2.54	3.10	2.96	0.21	<1.50	0.79
As	0.656	1.63	0.67	1.20	<0.2	0.0773
Au	2.8×10^{-6}	....	....	3.0×10^{-6}	$<10^{-7}$	6.4×10^{-5}
Sb	0.0517	0.061	0.11	0.273	$<10^{-3}$	0.055
Se	0.364	0.454	0.333	0.369	0.009	0.128
Sc	8.8×10^{-3}	9.0×10^{-3}	4.6×10^{-3}	4.4×10^{-3}	9.5×10^{-5}	$<10^{-5}$
Cu	0.93	1.25	1.13	0.21	<0.2	0.19
Na	11.1	65.2	15.5	25.0	<1.0	13.0
Ca	192.0	75.1	103.0	150.0	<20.0	<20.0

[a]Oils RF-1, 2, 3 from California; RF-4, Venezuela; RF-5, Louisiana and RF-6, Libya

[b]Conc = concentrations in ppm

From Filby and Shah (1971)

Table 6

MEDIAN CONCENTRATIONS OF TRACE METALS IN PRODUCED WATERS[a)]

Median concentration (equaled or exceeded by 50% of the samples) in each area[1]

	Number of samples	Total solids (median) (g/l)	Co	Cr	Cu	K	Li	Mg
Illinois Basin	22	98	ND	2p	10p?	300	15	6,000
Louisiana and Texas Gulf Coast	79	69	ND	<1p	<25p	300	ND	250
East Texas	88	66	ND[2]	ND	< 1	<50	ND	250
North Texas	24	222	ND	<1p	150p	300	ND	3,000
West Texas and New Mexico	168	111	ND	2p	1p	350	15	1,000
Permian only	74	143	ND	2p	2p	400	10	1,000
Pennsylvanian only	34	115	ND	3p	< 1p	300	10	1,000
Silurian-Devonian only	15	55	ND	2p	4p	300	10	400
Ordovician-Cambrian only	21	67	ND	<2p	4p	400	15	800
Anadarko Basin[3]	118	137	ND	10p	10p	250	10	1,550
Williston Basin, post-Paleozoic	25	59	<5p	<2p	<25p	300	ND	250
Williston Basin, Paleozoic	55	173	ND	3p	3p?	800	35	600
Powder River Basin	22	5	<5p	<2p	<25p	300	ND	40
Other Wyoming	28	5	ND	ND	ND	300	ND	100
Colorado	18	5	<5p	ND	<25p	300	ND	30
California	116	18	ND	5p	5p	45	ND	90
Seawater	-	35	0.27p	0.04p-0.07p	1p-15p	380	0.1	1,272
Estimated Detection Limit	-	-	1p	1p	1p	50	2	10

	Mn	Ni	Sn	Sr	Ti	V	Zr
Illinois Basin	175p	ND	< 1p	300	<10p	ND	<10p
Louisiana and Texas Gulf Coast	3.5	<1p	< 1p	65	<10p	ND	<10p
East Texas	3.3	<1p	3p	350	ND[2]	ND[2]	ND
North Texas	45	15p	12p	450	7p?	ND	<10p
West Texas and New Mexico	1.8	<1p	< 1p	200	<10p	ND	ND
Permian only	1.7	<1p	< 1p	90	<10p	<1p	ND
Pennsylvanian only	2.8	<1p	< 1p	300	<10p	<1p	ND
Silurian-Devonian only	300p	<1p	1p	90	<10p	ND	ND
Ordovician-Cambrian only	400p	<1p	1p	250	<10p	ND	ND
Anadarko Basin[3]	5.6	6p	2p	300	<10p	<1p	<10p
Williston Basin, post-Paleozoic	300p	<3p	< 1p	100	ND	<1p	ND
Williston Basin, Paleozoic	660p	ND	< 1p	95	<10p	<1p	ND
Powder River Basin	450p	<3p	< 1p	25	<10p	<1p	<10p
Other Wyoming	300p	ND	< 1p	20	<10p	<1p	ND
Colorado	300p	<3p	<10p	20	<10p	<1p	<10p
California	950p	10p	2.5p	10	<10p	<1p	ND
Seawater	1p-10p	5.4p	3p	13	Present	0.3p	ND
Estimated Detection Limit	1p	1p	1p	16	10p	1p	10p

[a)]Taken from Rittenhouse, Fulton, Grabowski, and Bernard

[1]ND = below detection limits; p = concentration in parts per billion, otherwise parts per million.

[2]No data; less sensitive methods of analysis used.

[3]Includes Oklahoma Platform and Ardmore Basin.

Another report shows low toxicity but some physical problem with Salmo salar, Atlantic salmon because of suspended solids (Zitko, 1975). Concentrations of these magnitudes would exist only at the point of discharge.

Ferrochrome lignosulfonate is used as a deflocculant or thinning agent in drilling muds. Whereas chromium itself is highly toxic to certain species, when bound it is less toxic (Zitko, 1975) and it has been shown that in ferrochrome lignosulfonate the chromium is firmly chelated and may not be removed from the lignosulfonate complex even by strong ion-exchange resins and that the chromium is in the trivalent oxidation state (McAtee and Smith, 1969, as cited in Zitko, 1975). Toxicity studies using Mollienisias latipinna (mollies) have indicated that the compound itself is of low toxicity (killed some test animals at 70 to 450 ppm concentrations). These concentrations could be found near discharge points (Hollingsworth and Lockhart, 1975).

Heavy metals can also be introduced into sea water by the dissolution of drilling platform legs and pipelines. The metals released would be iron with lesser amounts of nickel and molybdenum. The time required for metal decomposition through chemical and microbial erosion is not presently known, but with present safeguards, may be around ten years. Dissolution would occur at a very slow rate and should not appreciably add to the concentration of heavy metals around platforms and pipelines in the water column or in sessile marine organisms, although this has yet to be demonstrated.

Concerning the levels of concentration of heavy metals in the marine environment, IDOE (1972) concluded that with the possible exception of lead, the current levels of heavy metals in marine ecosystems are derived primarily from natural rather than technological sources. However, local inputs in the estuarine and coastal environments can increase the levels in the water column, sediments and marine organisms. In a study of the effects of offshore petroleum operations on the environment, in the Gulf of Mexico, the Gulf Universities Research Consortium (GURC) concluded that all the heavy metals observed in the water column were in the ranges reported for oceanic waters except for barium for which the results were inconclusive. A zinc concentration gradient was found that decreased with distance from the oil platforms (GURC, 1974). However, the investigation did not analyze distribution of heavy metals in the marine organisms or in the sediments.

Results from the second year (1977-78) of the four year EPA/NOAA environmental study of the Buccaneer Oil/Gas Field (BOF) indicate there are trace metal gradients decreasing away from platform structures in surficial sediments, and there are elevated concentrations of Ba, Pb, Sr, and Zn in surficial sediments within 180 meters of the structures. Increases in trace metal concentration were suspected of coming from the platform structures, corrosion, metal debris on the bottom, old drilling muds, and production water (Anderson and Schwarzer, in press).

In 1978 the Bureau of Land Management sponsored an extensive investigation of the ecology around twenty production platforms in the Central Gulf of Mexico. Trace metals concentration gradients of Ba, Cd, Cr, Cu, Pb, Ni and Zn decreased with distance from platform structures and were presumed to result from production associated activities. Several species of shrimp, flounder, and snapper as well as other fish and benthos were analyzed for trace metals. When the results of the analyses were compared with data from other environmental investigations in the Gulf of Mexico, no evidence of bioaccumulation was found (Tillery, 1979).

Uptake

Marine organisms can accumulate heavy metals by absorption across body surface and gills from the water or by ingestion of food containing heavy metals. Food sources can include heavy metals adsorbed onto suspended particles or plankton, heavy metal compounds that have precipitated into the sediments and ingested by deposit feeders and heavy metals concentrated by organisms and preyed upon by other organisms in higher levels of the food web.

Once heavy metals are introduced into the ocean, concentrations are lowered by dilution and removed from sea water by precipitation, adsorption, and absorption by marine organisms. The amount of dilution depends on the currents, mixing and circulation patterns in the area of discharges as well as the medium in which the metals are discharged. For example, heavy metals introduced in crude oil or formation water of greater density than the surrounding water would probably tend to mix less with the ambient water mass and retain their higher concentrations for a longer period of time. The use of diffuser technology in many sewage outfalls helps to dilute the effluents faster and prevents a large dose of highly concentrated effluent impacting one area at one time.

Precipitation of a metal to the sediments occurs if the concentration of the metal is higher than the solubility of the least soluble compound that can be formed between the metal and anions in the water such as carbonate, hydroxyl or chloride. The concentrations of heavy metals which can remain in solution are orders of magnitude higher than those usually found in the sea and normally the sea is considerably undersaturated with heavy metals (Bryan, 1971).

Adsorption of metals can occur on the surfaces of suspended and deposited particulate matter such as clays, phytoplankton, hydrated ferric oxide and hydrated manganese dioxide. However, all heavy metals are not equally readily adsorbed. Zinc, copper and lead are probably readily adsorbed by both hydrated ferric oxide and hydrated manganese dioxide, but cobalt and nickel prefer hydrated manganese dioxide while silver is not readily adsorbed by either (Bryan, 1971). According to Lowman et al. (1971), surface adsorption, including ion exchange, is probably an important uptake path for phytoplankton. Glooschenko (1969) found that the greatest of mercury-203 (^{203}Hg) per cell in a population of coastal marine diatoms (Chaetoceros costatum) was by adsorption onto a population killed with formalin rather than uptake by absorption of living cells. This passive uptake for the dead cells could also be due to increased membrane permeability to the mercury. In either case, the uptake by adsorption was greater than the active absorption process of live cells.

It has been found that heavy metals in natural waters are predominantly associated with particles suspended in water. Whenever attempts have been made in the natural environment to detect the amounts of heavy metals in solution versus the amount adsorbed onto or part of particles, investigators have discovered that only a small percentage of the heavy metals are in solution. It is not known if the particles that have adsorbed the heavy metals can be absorbed. It is generally thought that the particles must be ingested or taken into cells by phagocytosis and that the metal must be solubilized to be absorbed in solution (Hartung, 1972).

Uptake by absorption from sea water through the gills, body surface or gut wall is an important pathway for heavy metals to enter marine organisms from dilute sea water solutions has been well demonstrated. The amount of heavy metal absorbed depends on many physical and chemical factors such as the concentration of the heavy metal in solution, the chemical form of the complex, the ligands available for complexing the metals, particle size, the nature of the particles available for adsorption in the water, pH and alkalinity. Biological characteristics of the organism also affect the absorption rate and amount: the species of the organism, age, metabolic rate, and previous health (Hartung, 1972). A further complicating factor is that an equilibrium may be established between the organism, its food and the concentration of the heavy metal in the water (Lowman et al., 1971).

Concentrations factors for various marine organisms for several elements including heavy metals are given in Table 9. It can be seen that these factors range up to more than a million or more for the heavy metals. Concentration factor is defined as "the ratio of the concentration of an element or radionuclide in an organism or its tissues to that concentration directly available from the organism's environment under equilibrium or steady-state conditions (Lowman et al., 1971). However, marine organisms accumulate heavy metals and other elements from many sources including food, water, suspended particles and deposited sediments. Therefore, the concentration factors listed should be viewed as indicators that can be changed by biological and environmental factors.

Bryan (1973) reported a seasonal variation in the concentrations of trace metals in two scallop species from the English Channel. Variations between species were observed, but the highest values of metals occurred in autumn and winter when phytoplankton productivity was low, while the values decreased when phytoplankton production increased. The metals looked at were Ag, Co, Cr, Cu, Mn, Ni, Pb, Zn, Al, Cd, and Fe and they were concentrated in the kidneys and digestive glands to the greatest extent. Bryan reasoned that the seasonal variation was due to three factors:

1. More food from increased phytoplankton productivity in spring and summer results in increased metabolic activity for the scallop and increased excretion of wastes, including excess heavy metals.

2. The uptake of metals by phytoplankton decreases the concentration in the water. Also extracellular products from the phytoplankton may chelate metals in the water thereby reducing their availability to the scallops.

3. In the times of high productivity, the amount of metal/phytoplankton cell decreases, since the cell membranes increase and the metal concentrations remain virtually the same.

Other organisms besides particle feeders like the scallops probably have seasonal variations in their uptake of heavy metals, although there has been little investigation to date of this environmental variable.

Storage and Metabolism

Once heavy metals are taken up by marine organisms they are usually used in enzyme systems or stored in a particular body tissue, sometimes for just a temporary period. The place of storage in the organism and its subsequent pathway through the organism is dependent on several variables including the type of metal, the form of the metal complex, the method of uptake, species and the age of the organism. In general, elements that are concentrated in marine organisms can be grouped into one of five categories: 1) structural elements - carbon, nitrogen, phosphorus (silicon, calcium and strontium, in some cases); 2) catalyst elements - iron, copper, zinc, manganese, and cobalt (nickel, chromium, cadmium and silver may follow these elements); 3) elements easily hydrolyzed at sea water pH; 4) heavy halogens; and 5) heavy divalent ions barium, radium and lead (Lowman et al., 1971). Most of the heavy metals of concern occur in the catalyst element group.

Different groups of marine organisms are able to accumulate and store heavy metals in their tissues depending on their ability to regulate the concentration in their body compared to the environmental concentration. This involves not only uptake and storage of heavy metals but also release of the metals back to the environment. For example, according to Bryan (1971) when the concentrations of metals such as zinc or copper in sea water are increased, the concentrations in oysters increase appreciably while the concentrations in the flesh of crustaceans such as crabs or lobsters remain relatively constant. Storage sites for most organisms include the digestive glands, muscle tissue, skeletal tissue and gills.

For small marine crustaceans (*Euphausia pacifica*, *Thysanoessa spinifera*, *Pandulus stenolepis* and *P. platyceros*) Fowler et al. (1970) found that zinc-65 fed through a food chain accumulated primarily in the interstitial spaces between muscle fibers, in the eye, within the exoskeleton and on the interior surface of the exoskeleton. These locations were the same as those for storage of zinc-65 from water absorption processes. However, the source of the zinc affected the saturation levels of the tissues. When uptake was from food, the muscle tissue (and hepatopancreas at times)contained a higher percentage of the total zinc level in shrimps and euphausiids than the exoskeleton. When uptake was from water, the percentage of total zinc level was higher in the exoskeleton. The fact that a significant percentage of zinc was located in the exoskeleton from labelled food uptake suggests that the zinc was transported rapidly by the haemolymph from the gut to the exoskeleton (Fowler et al., 1970). The investigators concluded that since most of the zinc-65 was located between cells rather than inside of cells, most ingested zinc apparently accumulates in excess of the animals' needs and is not used metabolically.

In other marine crustaceans primary storage has been found to occur in the hepatopancreas for excess zinc in lobster blood and for excess copper in the shrimp *Crangon vulgaris* (Bryan, 1971). Another crustacean, the fiddler crab *Uca pugilator*, concentrated mercury primarily in the gill tissues with lesser amounts in the hepatopancreas and green gland. Very small amounts were found in the carapace and muscle tissues (Vernberg and Vernberg, 1972). See Figure The mode of uptake by the crab, however, was absorption of mercury from sea water.

Molluscs accumulate heavy metals in the digestive glands and kidneys primarily (Bryan, 1971; Bryan, 1973; Penreath, 1973). Anderlini (1974) discovered high concentration of cadmium (up to 1400 ppm) in the digestive glands of the red abalone *Haliotis rufescens* from samples along the California coast. He looked at eight heavy metals (silver, cadmium, chromium, copper, lead, mercury, nickel and zinc) and reported varying concentrations in the gills, mantle, digestive gland and foot muscle. The concentrations in the different tissues varied with the metal type, the concentrations of the metal in the sea water and the method of uptake.

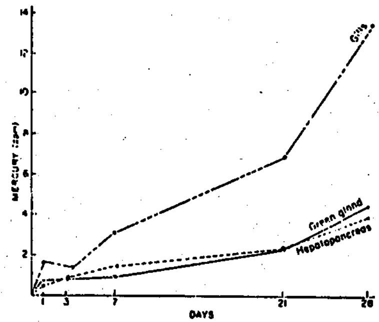

FIGURE 5—Mercury in tissues of *Uca pugilator* after exposure of the crabs to 9×10^{-7} M $HgCl_2$ (0.18 ppm Hg) in 30‰ seawater at 25°C for varying lengths of time.

From Vernberg and Vernberg (1972)

For example, nickel had the highest concentrations in the gill (up to 100 ppm), more than 2-3 times the nickel levels in other tissues. This was probably due to absorption and accumulation of nickel into the mucous sheets of the gills as well as absorption by the gills themselves (Anderlini, 1974). An investigation of several heavy metals in North Atlantic finfish revealed that muscle tissue of these Osteichthys species concentrated arsenic, cadmium, copper, mercury and zinc in varying amounts. Mercury and cadmium concentrations in muscle tissues of Chondrichthys species studied tend to be higher than those of Osteichthys while arsenic concentrations were definitely higher. The liver of Chondrichthys had higher concentrations of arsenic, cadmium, copper and zinc compared to other Chondrichthys tissues (Windom et al., 1973a). Silver, cadmium, chromium, copper, nickel, lead and zinc concentrate mainly in the gonads and liver of the Dover sole with smaller amounts in the edidermis. Specimens were taken from outfall and control areas off Southern California (SCCWRP, 1974). Chow et al., (1974) found lower concentrations of lead in tuna muscle than had been reported previously. Muscle tissue contained about 0.003 ppm of lead while epidermis had about 2 ppm in wet tissue. High concentrations in fish fins from tuna is due to the mucin secreted by the mucous cells of the epidermis which forms a mucous slime from a glycoprotein. The authors conclude that it is likely that strong heavy metal complexing sites in the proteins take up lead from sea water and incorporate it into the slime. They conclude that most of the lead in time is probably contained in this epidermal mucous layer and that it is unlikely that much lead passes through the skin barrier from sea water (Chow et al., 1974). Analysis of epidermal mucous and kidneys from an adult sculpin (Scopaena guttata) exposed to large concentrations of lead acetate over three months results in accumulation of lead in the mucous. The lead did not increase in the muscle tissue, but did increase in the kidney and bone. Apparently the kidney is metabolizing the accumulated lead and some of it is deposited in the bone (NSF/IDOE, 1974).

Evidence that the form of the metal compound is important for the storage site derives from observations of 70% of the total mercury in carnivorous fish muscle occurring as methymercury. For invertebrates omnivores, the percentage of methylmercury is less. Samples of liver and spleen from sharks contained low amounts of methylmercury compared to total mercury (NSF/IDOE, 1974). At the cellular level, the distribution of lead-210 in sea urchin embryos (Strongylocentrotus purpuratus) has been investigated by Nash (1975). He reported that embryos can absorb significant amounts of lead from levels as low as 4.18×10^{-6} ppm. Most of the absorbed lead was concentrated in the nuclear portion of the cell homogenate.

All of these investigations indicate that there are many variables involved in the storage and metabolism of heavy metals in marine organisms. At present little is still known about the pathways of uptake, metabolism, storage and release of heavy metals and their transport through the marine ecosystems.

Discharge and Release into the Marine Environment

There have been few studies to date of the release or depuration of heavy metals from marine organisms to the marine environment. Although data on retention times are scanty, there are indications that metals concentrated in animal tissues are retained at significant concentrations for several months (Andersen et al., 1974b). Discharge of heavy metals from marine organisms can take place by ion exchange across cell membranes of gill and body surfaces, loss by molting exoskeleton that have concentrated heavy metals, excretion of heavy metals into the gut and loss of feces and excretion in the urine. All of these processes help an organism to regulate the concentration of heavy metals and other substances accumulated from sea water or food, but the extent and rate of their release is poorly known for heavy metals.

Bryan (1971) reports that excretion of metals across the gills appears to occur: in the shore crab, Carcinus maenas, and in the rainbow trout, Salmo gairdnerii. The cyprid larva of the barnacle, Balanus amphitrite niveus, excrets excess copper into the lumen of the gut and the octopus, Octopus dofleini, excretes both copper and zinc into the rectal fluid. Crustaceans can excrete copper, zinc, cobalt, manganese and mercury in the urine. Little information is known about excretion of heavy metals from fish except that excretion of zinc in the urine of the rainbow trout is relatively unimportant (Bryan, 1971). The rate of loss of methyl mercury from species of carnivorous fish is very slow. Methyl mercury in fish has a half-life of about two years according to Miettinen et al. (1971, as cited by Hartung, 1972).

A long-term experiment concerning the elimination of zinc-65, cesium-137 and cerium-144 by euphausiid shrimps determined that approximately 96% of the initial body concentration was eliminated over a five month period (Fowler et al., 1971). The biological half-life of ^{65}Zn was 140 days, and the percentage of ^{65}Zn lost in molts compared to the total in the organism was 1%. Assuming that loss through fecal pellets is small, the major mechanism for ^{65}Zn loss for euphausiid would be isotopic exchange with the water. From Figure 6 it can be observed that approximately 90% of the ^{65}Zn was lost after 30 days.

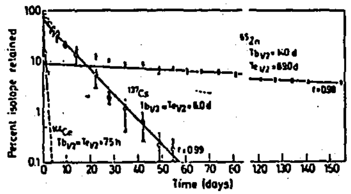

Fig. 6. Euphausia pacifica. Loss of 3 radionuclides from similar-sized euphausiids (Mean dry weight 2.4 mg). ^{65}Zn, n = 3; ^{137}Cs, n = 5; ^{144}Ce, n = 2; r: correlation coefficient. Bars indicate ranges of animal activity. All data were corrected for physical decay of the isotope except ^{137}Cs. $Tb_{1/2}$: biological half-life; $Te_{1/2}$: effective half-life; T: 10 °C. d: days

From Fowler et al. (1971)

In a study of the mussel, Mytilus edulis, and its accumulation of some heavy metal isotopes from sea water, Pentreath (1973) observed that the greatest accumulation was in the stomach and digestive gland for all isotopes. However, after two weeks iron-59 occurred in the mussel foot in the byssus gland area that attaches the mussel to the substrate. Following another two week period, the iron-59 clusters disappeared. The author postulated that the iron might be secreted into new byssus threads. After 42 days in filtered sea water, the loss of the metals from the stomach and digestive gland was as follows:

	Zinc	Manganese	Iron
% loss in dry weight from stomach and digestive gland	23.1	14.3	52.2

There was no loss from the adductor muscle (Pentreath, 1973). Young and Folsom (1967, as cited by Pentreath, 1973) recorded a long half-life for zinc-65 in the mussel, Mytilus californianus, of 76 $\pm$ 3.5 days.

Other observations of release of heavy metals by molluscs include a biological half-life of 193 days for manganese excretion from scallops (Bryan, 1973). No appreciable decrease in the concentrations of cadmium and zinc in dog whelps and limpets was found in the Bristol Channel after seven weeks and three weeks cleansing in clean sea water. A crab (Carcinus maenas L.) lowered its zinc concentration significantly but not the cadmium concentration after seven weeks cleansing (Peden et al., 1973).

Therefore, from these few investigations one can find evidence that marine organisms can release heavy metals back to the environment, but the time of release is relatively long. There is some evidence to indicate that molluscs may not be able to regulate heavy metal concentrations in their tissues as well as crustaceans (Bryan, 1971). However, it is not known if this difference is due to separate pathways of uptake and storage, different methods of release or differences in the bonding of the metals and their complexes in the tissues.

Food Web Magnification

There is ample evidence to indicate that heavy metals accumulate in the marine food web in a variety of organisms at various trophic levels and through a variety of uptake pathways. As can be seen from the preceding discussion, heavy metals can be concentrated by absorption across gills, body surfaces and gut walls; adsorption into organisms, suspended and deposited particles; and taken up from food sources. The concentration factors listed in Table 8 reflect tremendous abilities for marine organisms to concentrate elements from very dilute solutions in sea water. However, as mentioned previously the significane of the concentration factors is obscured by the many variables and pathways involved in the uptake of heavy metals by marine organisms. Classical food web magnification, or the increasing concentrations of an element per weight of tissue in successively higher trophic levels, for heavy metals is complicated by not only the various uptake pathways but also by the ability of some organisms to release the heavy metals back to the marine environment eventually and therefore regulate concentrations in their tissue against environmental gradients. The whole process is just not well enough understood at this time.

Most of the characteristics of heavy metals in the marine environment favor their magnification in the food web. Like PCB's and synthetic chemicals, heavy metals are relatively resistant to chemical and biological degradation. Evidence has been presented that the half-life of metals in tissues is relatively long before being excreted. The half-life can range up to two years for methylmercury compounds in fish. The longevity of the metals in tissues and the high concentrations factors of many marine organisms suggest that food web magnification can take place. Most of the incidents of high levels of heavy metals found in marine organisms in the ocean occur in coastal waters and point sources near pollution sources from land. A toxic effect on a consumer in the higher levels of the marine food web, including man, can result from feeding or organism further down in the food web that have concentrated heavy metals at levels that have no apparent effect on the food organism.

Besides the much publicized occurrence of mercury compounds in high concentrations in some tuna and swordfish, heavy metals such as arsenic, cadmium, copper, zinc, chromium, lead, nickel and silver have been reported in various organisms from the marine environment throughout the world (LeBlanc and Jackson, 1973; Stenner and Nickless, 1975; Peden et al., 1973; Stenner and Nickless, 1974; Anderlini, 1974; Windom et al., 1973a; Windom et al., 1973b; Chow et al., 1974; and Bryan, 1973). In a study of mercury in plankton in the North Atlantic, Windom et al. (1973b) reported concentrations of less than 0.2 to 0.4 ppm in open ocean plankton compared to 5.3 ppm in nearshore plankton in polluted areas. The samples included mostly copepods and arrow worms with eleven samples containing phytoplankton.

The authors hypothesized that the mercury was possibly transported from the nearshore plankton to the open ocean food web rather than through direct transport in the water since the dilution factors over the distances involved would be tremendous.

In a related study from the same area in the higher levels of the food web, Windom et al. (1973a) analyzed several heavy metals in various species of fin fish. In this investigation they found no tendecy for onshore-offshore differences in concentration for Osteighthys or Chondrichtys. There were differences in levels of accumulation and storage places for different metals in both groups as mentioned previously in this discussion. For Osteichthys arsenic concentrations ranged from less than 1.0 to 6.4 mg/g (ppm) and mercury concentrations from 0.1 to 3.0 mg/g. However, what is significant is that copper, cadmium and zinc concentrations were similar in all fish studies except for the smaller plankton-eating fish (anchovies and myctophids) which had much large concentrations of these metals than the other fishes. This would suggest depletion of these metals up the food chain, and not magnification, since the plankton on which these fish feed have an even higher concentration of these metals (Windom et al., 1973a).

A similar instance of food chain accumulation, but not magnification, could be found in predators of the red abalone, Haliotis refuscens, off the California coast. Anderlini (1974) reported a high concentration of cadmium (up to 1400 ppm) in the digestive glands of the red abalone. However, cadmium levels in the kidneys of mollusc-eating sea otters (Enhydra lutris) off the California coast ranged from 89 to 300 ppm. Although this was higher than cadmium in fish-eating sea lions (from 18 to 63 ppm) from a comparable level in the food web, the point is that the cadmium levels did not approach those found in the abalone. Therefore, the cadmium was probably accumulated in the food chain, but classical magnification probably does not take place. Whether or not the levels of cadmium were increased in the next trophic level, the large amounts of cadimum in the higher level predators would be cause for concern. Other marine mammals, birds, fish and man at the upper levels of the marine food web can be affected by high concentrations of certain heavy metals accumulated in the food web.

What does this mean for heavy metals introduced into the ocean from offshore petroleum operations? Evidence has been presented that heavy metal concentrations in petroleum, formation waters and drilling fluids can range from 10 to 10^5 times the natural background levels of the open ocean (see Tables 4-8). Therefore, events such as accidental massive or chronic oil spills, accidental loss of drilling fluids and the discharge of formation waters can introduce higher loads of heavy metals into the ocean. The introduced metals are then diluted by sea water, precipitated out, adsorbed on particles or other organisms and absorbed by some marine organisms to various degrees. These discharges would be localized sources occurring around drilling platforms for the most part.

Therefore, there could be some uptake of metals especially by the sessile organisms around the platforms. It is not known to what extent this occurs and to what levels the heavy metals would concentrate in the water column, sediments or marine organisms as a result of petroleum operations. Field investigations conducted to date (GURC, 1974; Anderson and Schwarzer, in press; Tillery, 1979) documenting the levels of trace metals in the environment around OCS structures have indicated ranges of heavy metals in the water column within the ranges for metals in open ocean water except for Ba, where the data was inconclusive; elevated concentrations of Ba, Pb, Sr, Zn, Cd, Cr, Cu and Ni within a few hundred meters of the structures; and no evidence of bioaccumulation in marine organisms.

The input of heavy metals to the marine environment and accumulation in the food web due to offshore petroleum operations should be far less significant than sources of heavy metals from land in most coastal waters such as river runoff, sewage effluent and industrial wastes. Since the effects of heavy metal input from offshore petroleum operations into the marine food web are largely unknown it is advisable to continue study in this area.

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TABLE OF CONTENTS

DRILLING FLUIDS: Use and Disposal on the OCS

I. Introduction

Drilling fluids have been used in conjunction with rotary drilling (the use of a drill bit turned by a length of hollow drill pipe) since the early 1800s (Ray, 1978). Water was used as the first drilling fluid. The water was pumped down the pipe, and through the bit. The cuttings, created by the rotating bit, were carried back to the surface by the water. As hole depths increased, it was found that properties other than cutting removal were important for drilling fluids (Ray, 1978). Other important properties included balancing formation pressures, and sealing the walls of the bore hole.

By 1947 when the first offshore well out of sight of land was drilled, drilling fluid engineering was an established field (Adams, 1978). Today there are over 1,000 tradename products available for drilling fluid formulation (World Oil, 1977). These 1,000 tradename products represent somewhere on the order of 55 compounds, of which only about a dozen are used to drill a typical well (Ray, 1978).

During the last decade, considerable public concern has arisen over the discharge of drilling fluids and cuttings into the marine environment (Ray, 1978). In response to this concern, field studies, commonly called "rig monitoring," have been conducted around drilling operations off Alaska, in the Canadian Arctic, off California, in the Gulf of Mexico, and in the Atlantic. Chemical analysis of drilling fluids and its components have been done, and the relative toxicity of the fluids and components have been measured in bioassay tests. Dispersion models have been used to predict movement and dilution of discharged drilling fluids.

Offshore drilling operations in the U.S. and the subsequent discharge of drilling fluids are regulated principally by two Federal agencies. The U. S. Geological Survey (USGS) supervises the overall drilling operations and the U.S. Environmental Protection Agency (EPA) establishes guidelines and criteria for effluent discharges. In some regions, EPA has applied the National Pollution Discharge Elimination System (NPDES) permitting procedure to the discharge of drilling fluids from exploratory rigs. The NPDES permits can limit the content and the discharge rate of drilling fluids (U.S. EPA, Region II, NPDES permits for the Mid-Atlantic, Sale #40 area). Two other agencies are also involved in discharge control, the Bureau of Land Management (BLM), and the National Oceanic and Atmospheric Administration (NOAA). BLM is reponsible for stipulations for lease sales (which can affect type and depth of discharges), and NOAA becomes involved if drilling occurs near or in designated Marine Sanctuaries.

This appendix is a compilation of published literature on the fate and effects of drilling fluids, and is divided into four parts: 1) a discussion of drilling fluids, its function, its components, and common disposal practices on the Outer Continental Shelf (OCS); 2) a review of the environmental fate and effects of drilling fluids, including acute toxicity (laboratory data), dispersion and dilution models, and field studies; 3) a discussion of field and laboratory studies; and 4) a conclusion section.

Studies on the environmental consequences of drilling fluids are continuing. The Environmental Protection Service of Canada (Environment Canada) is currently testing different drilling fluids, and combinations of components to try and find a less toxic mixture of drilling fluids. EPA, Region II required a "rig monitoring" study in the Mid-Atlantic, that was funded by the oil companies. American Petroleum Institute (API) is funding laboratory studies on the toxicity of drilling fluids to warmwater, and cold-water species. Exxon Oil Company is conducting research on the dispersion and dilution of drilling fluids discharged at maximum rates ("bulk" discharges). EPA, Gulf Breeze, is conducting research on the toxicity of drilling fluids, especially the bactericides used in the fluids. These studies and future ones should help in the understanding of the face and effects of drilling fluids.

II. Drilling Fluids

A. Functions and Components

Drilling fluids are used today in the drilling of oil and gas well to do the following :

1. Cool and lubricate the drilling bit and drill pipe,
2. Transport drill cuttings to the surface,
3. Be thixotropic, so that cuttings will remain suspended when circulation is interrupted,
4. Have sufficient density to provide hydrostatic pressures higher than formation pressures.
5. Coat the well bore wall with a filter cake to prevent fluid loss to permeable formation,
6. Have a low viscosity while flowing,
7. Not interfere with interpretation of geological and electrical information required for lithology and logging evaluations, and
8. Minimize corrosion (Adams, 1978)

To accomplish these various tasks, the drilling fluid must be carefully matched to formations and drilling conditions encountered. The pH, viscosity, and mud weight (usually expressed in pounds per gallon) must be controlled and monitored. The basic fluid is a water-based clay suspension with ferrochrome or chrome lignosulfonate added to control viscosity and fluid loss, barium sulfate (barite) added to increase fluid density, and sodium hydroxide to keep pH alkaline (normal range from 9-11). Some special application drilling fluids are oil based or invert emulsion types. These special drilling fluids will not be discussed in this appendix, since current EPA guidelines and USGS OCS Orders prevent the disposal of such fluids into the marine environment. Table I lists the most common components of drilling fluids by function and their primary application. Only about twelve of these would be used in drilling a typical well. Table II lists the typical compositions of three common drilling fluids. The drilling fluids discharged into the environment are complex mixtures, with most of the compounds in suspension, rather than solution.

B. Drilling Practices

Drilling rigs have different drilling practices, equipment, and subsequently different discharge rates. The following description of drilling practices is a generalized discussion, taken from Otteman (1976), ECOMAR (1978), and Dames and Moore (1978).

The first 150 $\pm$ feet is drilled or jetted with seawater. The resulting sea water is returned directly to the sea floor without being pumped to the rig. Approximately 2500 cubic feet (450 barrels) of drill cuttings are discharged at the sea bottom. While drilling to 1,000 feet, typically only seawater is used as a drilling fluid and it is discharged overboard. If the formation clays do not make a viscous enough mud, bentonite (a clay) is added to the system. Approximately 7,000 barrels of water and formation muds or bentonite is discharged during drilling. Before running the conductor pipe to 1,000 feet, approximately six tons of bentonite are added to the 1,000 barrel saltwater system. When the conductor pipe is cemented, this bentonite-saltwater system is discharged overboard.

While drilling the remainder of the hole, the drilling fluid is continously cycled back through the mud system (Figure I). Some mud is discharged with the drill cuttings as they come off the shale shakers, desanders, and desilters (discharge rate from 10-50 barrels per hour); and periodically drilling fluid is discharged overboard as excess amounts are generated from the formation (maximum discharge is 400 barrels; discharge rate is about 700 barrels per hour; total discharge time is from 30 to 35 minutes). Approximately 2,000 barrels of bentonite - lignosulfonate mud will be discharged overboard from 1,000 to 10,000 feet. While drilling from 10,000 to 18,000 feet, the discharge rate from shakers, desanders, and desilters will not exceed 50 barrels per day; approximately 4,000 barrels of lignosulfonate drilling fluids is discharged overboard in the 10,000 to 18,000 foot interval. When the well is completed, the drilling fluid which remains in the surface system (from 800 to 2,100 barrels, depending on the drilling rig) is discharged overboard at a rate of 700 to 800 barrels per hour.

The table below shows the weights of drilling fluid components discharged for an 18,000 foot well.

Material	Weight (short tons)
Barium sulfate	375.0
Drilled solids	269.5
Bentonite clay	125.5
Lignosulfonate	20.7
Lignite	20.0
Sodium hydroxide	6.8
Defoamer/detergent	1.2
Cellulose polymer	0.3

Bactericides are frequently added to drilling fluids to prevent microbial degradation of organic additives and to suppress the formation of hydrogen sulfide by sulfate-reducing bacteria. The types of bactericides currently used in drilling and completion fluids are listed below. Sodium pentachlorophenate (Dowicide G) is used in drilling fluid systems at concentrations of 0.25 to 0.50 pounds per barrel (715 to 1430 ppm - parts per million), and sodium trichloropenate (Dowicide B) at concentrations of 0.1 to 0.2 pounds per barrel (280-560 ppm) (Industry/Government Working Group "A," 1976).

Types of Bactericides Currently
Used in Drilling Fluids
(from Rohichaux, 1975)

Aldehydes	-	Formaldehyde, paraformaldhyde gluteraldehyde
Chlorinated phenols	-	Pentachlorophenol, alkyl, dischloropenol, sodium salts of phenols
Quaternary amines	-	Alkyl dimethyl ammonium chloride, coco dimethyl benzyl ammonium chloride
Diamine salts	-	Acetate salts of coco or tallow diamines
Other	-	Caustic, alkyl phosphates, heavy metal salts.

Drilling fluids contain dissolved metals. The metal concentrations may be related to the content of barites and lignosulphonates in the drilling fluid (Beak Consultants, 1974). The content of barite and lignosulfonate vary with different fluids and vary with depth. Table III is a compilation of data on the concentrations of metals in drilling fluids. Data from Siferd (1976) point out that the concentrations do vary between different fluids, and vary with depth.

III. Environmental Fate and Effects

A. Acute Toxicity

McAuliffe and Palmer (1976) summarized some of the published toxicity data on drilling fluid components. Their summary is presented in Table IV. The principal solid components, bentonite and barite (barium sulfate), are insoluble, inert, and nontoxic (Offshore Operators Committee, 1976). The toxicities of ferrochrome and chrome lignosulfonates appear to be the highest of the materials added to drilling muds in appreciable quantities.

Bactericides, used in drilling fluids, are especially toxic. Pentachlorophenate or Dowicide G (tradename), is a chlorinated hydrocarbon that is toxic to freshwater fish at less than 0.1 ppm (24 hr. LC-50 data from EPA, Washington, D.C.). Pentachlorophenate and other halogenated phenols are not only toxic at very low concentrations, but also could have long term environmental effects (biomagnification in the food web). If discharged at recommended concentrations, this disposal could result in the introduction of large quantities of this chlorinated hydrocarbon into the marine system.

Metal concentrations in drilling fluids have been implicated as one possible causative factor in the toxicity of the fluid, but not for all drilling fluids (Moore, Beckett, and Weir, 1975). Analysis of eight drilling fluids revealed that the metal concentrations in three of the samples were potentially the causative agent, or one of the agents. The four major sources of toxicity were identified as metal chlorides (KCl), solids (barite), viscosity, and speciality products (e.g. bactericides, etc.). Overall toxicities ranged from 0.29% to 85% (96 hr LC-50, 2,900 to 850,000 ppm).

Data on the assimilation of heavy metals by marine organisms in bioassy tests in Cook Inlet, Alaska were highly variable, and inconclusive (Dames and Moore, 1978). Sublethal concentrations of drillings mud (3 percent mud) on mussels (Modiolus modiolus) did produce effects: a reduction of feeding and respiration (pumping) time, delayed byssus thread formation, and, possibly, uptake of abnormal levels of heavy metals (Ba , Cr, and Pb). Salmon and shrimp developed necrosis of respiratory epithelium and hyperplastic changes in target cell lines within 96 hours.

Table V summarizes the toxicity data on whole drilling fluids. The 96 hour LC-50's (lethal concentration resulting in 50% mortality in 96 hours)ranged from 100 to 790,000 ppm (parts per million). EG&G (1976) reported 96 hr LC-50's are as low as 100 ppm for the copepod, *Acartis tonsa*. Dames and Moore (1978) found 96 hr LC-50's as low as 3,000 ppm for pink salmon fry, *Oncorhynchus gorbuscha*.

Two studies, Thompson and Bright (1977) and McAuliffe and Palmer (1976), have found that downhole circulated (or "used") whole muds are more toxic than laboratory aged (or "fresh") muds. Thompson and Bright (1977) tested the effects of two drilling fluid components and a "used" whole fluid on the clearing rate of three species of coral. All three species could effectively clear barite and aquagel (the two components), but were unable to clear the used drilling fluid, which was lethal. Similarily, McAuliffe and Palmer (1976) found the California killifish were relatively unaffected by any of the drilling fluids tested, except by the downhole circulated lignosulfonate fluid. The reasons for the unusual toxicity of used whole mud in both cases is unknow. The drilling fluid maybe changed by the downhole pressures and high temperatures of the subsurace formations. It is known that high temperatures can degrade lignosulfonates (Carney and Harris, 1975). The degradation products of lignosulfonates or other components of the mud could be the lethal agent or agents. This question is currently being investigated by Chevron Research (McAuliffe, personal communication) and by the Environmental Protection Service of Canada (Thackeray, personal communication). Tagatz et al. (1978) found that when sand was covered with or mixed with drilling muds in a laboratory study the number of individuals and the frequency of occurrence of macrobenthic species was reduced. Annelids and coelenterates were significantly lower in the mixed substrate experiment, while arthropods were significatly affected only by mud cover over sand. Drilling mud/sand mixtures were prepared in ratios of 1 to 5 and 1 to 10 while the drilling mud cover was 0.2 cm thick.

Thompson (1979) conducted eight modified 96 hour bioassays in the field on seven species of reef-building corals. Two different drilling fluids were added to enclosed samples at dilution ranging from 10,000: 1 down to 1,000:1. Three species (*Monastrea annularis*, *Agaricia agaricites*, and *Acropora cervicornis*) were killed after 65 hours exposure to the 1000:1 dilution. It was also observed that a 10,000:1 dilution of the drilling fluid caused a statistically significant increase in polyp retraction for five of the seven species tested. Thompson also concluded that burial under the drilling mud may result in mortality somewhate sooner than when buried by carbonate reef sand.

In addition to government research, several programs measuring the acute toxicity of drilling muds and uptake/depuration rates of associated trace metals are presently ongoing at Texas A & M University, University of Washington and Bowdoin College. These programs have used several species of finfish, shellfish, and crustacea and a number of age classes. Most of the results of these and other similar research efforts are presently unpublished. It is anticipated that the Symposium on Environmental Fate and Effects of Drilling Fluids and Cuttings to be held in Orlando, Florida on January 21-24, 1980 will increase significantly the information available on this subject.

Neff (personal communication) has conducted bioassay and uptake/release studies on several species of polycheates, crustacea, and bivalves using spud mud, chrome lignosulfonate mud, mud-weight lignosulfonate mud and, high weight lignosulfonate mud. The test muds were fractioned into the following phases before use: mud aqueous fraction, suspended particulate fraction, suspended solids phase, and layered solid phase. Results of Neff's experiments are included in Table VII. Toxicity varied over the species tested but the mid-weight lignosulfonate mud appeared to be the most toxic. In a layered solid phase experiments using chrome lignosulfonate mud, the juvenile life stages of *Neanthes arenaceodentata* and *Donax variabilis texasiana* had a much higher survival rate than the corresponding adult forms tested. Clams exposed to the layered solid phase rapidly accumulated as much as eight time the background level of chromium over a 16 hour period, and returned to background levels after 24 hours in clean water. The adult *Palaemonetes pugio* also depurated chromium rapidly to background levels suggesting that it is not assimilated but passed through the gut.

B. Dilution and Dispersion

Plume models have been developed and applied to drilling fluid discharges to predict the dilution and dispersion of the effluent (Mobil Plume Model, 1976; Dames and Moore, 1978). Field studies have also been conducted around drilling rigs to measure actual dilution and dispersion rates (Nalco, 1976, ECOMAR, 1978; Dames and Moore, 1978). In general, plume models tend to underestimate dilutions. Mathematical models indicate dilutions on the order of 100:1 within 100 meters from the outfalls, whereas field observations indicate dilutions on the order of 10,000:1 in the same distance (Dames and Moore, 1978). The mathematical models are geared towards the analysis of steady-state, one or two-dimensional flow field, relying heavily upon dilution mechanisms of entrainment, buoyancy and turbulent dispersion. *In situ* experiments around semi-submersible indicate that a complex three-dimensional field of motion is generated by in the interaction of the semi-submersible structure with the ocean currents (Dames and Moore, 1978). Consequently, the dilution factors, as derived from the mathematical models, should be considered as very conservative estimates (understanding actual dilutions).

In compliance with EPA requirements for NPDES permits in the Mid-Atlantic, a plume model study was undertaken to determine the dilution factors for discharges in the vicinity of an operating semi-submersible drilling platform. The study was funded by Mobil Oil Corporation (Mobile Plume Model, 1976). In the study, the dilution factor was defined as the ratio of the concentration of material at a particular point to the initial concentration at the discharge point. The model used a uniform current field, constant diffusion coefficients and settling velocities to predict dilution factors. The model varied flow rates (500 to 2,000 gallons/minute) and mud densities (1.2 to 2.0 grams per cubic centimeter). Table VI shows the centerline dilutions corresponding to inital densities of the drilling mud. Although the dilution factor is greater in the more dense mud, the concentration was still larger for the more dense mud due to the larger initial concentration. Low flow rates for all three mud densities will disperse the material throughout the water column, whereas higher flow rates will cause the major portion of the drilling mud to be transported directly to the bottom. The higher flow rates (2000 gallons/minute) could result in a density flow of the drilling mud along the bottom.

Density flows of the drilling mud along the bottom are theoretically possible but practically improbable. Experiments around drilling discharges indicate that the dilution factors of the model underestimate actual dilution by two orders of magnitude. Studies around drilling operations also indicate that maximum discharge rates for drilling fluids are from 700 to 800 barrels/hour, 490 to 560 gallons/minute. Thus using practical flow rates (500 gallons/minute) and even conservative dilution factors the discharged drilling fluid will be dispersed throughout the water column.

Dames and Moore (1978) used theoretical models and field experiments to determine the dilution rate of the discharged drilling fluid from a semi-submersible. One mathematical model (jet type model) predicted dilutions on the order of 100:1 within 100 meters of the discharge, whereas dye experiments found that the effluent was diluted on the order of 10,000:1 or more within the same distance. The differences was attributed to the interaction of the semi-submersible structure with the ocean currents, generating non-steady, turbulent flow. A wake was formed behind the moored semi-submersible at current speeds greater than 0.1 knots (5.4 cm/sec).

Nalco (1976) measured the dilution rates around a drill ship in Cook Inlet, Alaska. Similar to the findings of Dames and Moore (1978), Nalco found that the effluent was rapidly diluted and dispersed, undergoing turbulent mixing/dilution in the vicinity of the drill ship. Dilution as measured by injected dye experiments, was on the order of 10,000:1 near the drill ship.

ECOMAR (1978) measured the dilution rates around a semi-submersible off California. Mud dilutions of 500:1 to 1000:1 were recorded within 3 meters of the point of discharge. Additional subsequent dilutions of 100:1 occurred between the source samplings and a distance of approximately 100 meters. Thus at distances of 100 meters, dilutions of up to 50,00 to 100,000:1 from whole mud concentrations were measured. The dilutions were for discharge rates of 10 barrels per hour. Higher discharge rates (750 barrels per hour) indicated a slower dilution: dilutions of 1000:1 at 1 to 3 meters from the discharge: 100:1 beyond 500 meters: 300:1 at 625 meters; and 100:1 again at 800 meters. The high 1000:1 dilution near the discharge may be do to a sampling error, and the actural dilution less. Thus with discharges of 100 meters from the discharge; with discharges of 750 barrels per hour, similar dilutions occur at distances of 500 to 800 meters.

C. Field Studies

Field studies have been conducted around drilling rigs to determine the effects of drilling discharges. Most of these "rigs monitoring" studies have been funded by oil companies. Two studies carried out in the Gulf of Mexico were funded by the Bureau of Land Management.

Mobil Oil Corporation funded a monitoring study of their drilling operations near the East Flower Garden Bank, off Texas. Sediment and seawater were analyzed for barium, chromium, iron, lead and hydrocarbon before, during and after drilling operations; and observations of the coral reef were made. There were marked elevations of barium, iron, an dlead in sediments at the drill site during and after drilling. Barium increased frm 22 to 425 parts per million (ppm), iron increased from 8.5 to 13,000 ppm, and lead increased from 4.6 to 12.7 ppm. Hydrocarbon levels in sediments did not vary during and after drilling operations. The drilling fluids were discharged near the bottom. The chemical analysis indicated that this served to concentrate them near the drill site and prevented them from reaching the coral reef (Continental Shelf Associates, 1975).

Union Oil Company funded a monitoring study of their activities near the West Flower Garden Bank, off Texas, to assess the deleterious effect of their operations on the coral reef. The drilling fluid outfall was placed near the sea floor. The investigation found no discernible effect from the drilling operations on the reefal communities (Marine Technical Consulting Services, 1976). Post drilling barium analysis indicated elevated levels of barium in the sediments. The high concentrations were within 300 meters of the drill site. Pre-drilling barium concentrations ranged from less than 50 ppm to 1300 ppm; post drilling levels from 4.6 to 7800 ppm.

Continental Oil Company funded a study of their drilling operations near Baker Bank, off Texas. The drilling fluids were disposed of a the sea surface. Increased levels of barium in the sediments were found after drilling. Pre-drilling barium levels ranged from 344 to 419 ppm. Postdrilling levels were as high as 1618 ppm at 500 meters from the drill stie, and 678 ppm at 1,000 meters (Continental Shelf Associates, 1976a).

Burmah Oil and Gas Company funded an investigation of their drilling operaitons near Stetson Bank, off Texas. The drilling fluid outfall was located near the seafloor. Significant increases in sediment barium concentrations were limited to within 300 meters of the well site. Pre-drilling barium concentrations in core samples ranged from 609 to 658 ppm. Post-drilling concentrations of elevated barium levels ranged from 803 to 2763 ppm (Continental Shelf Associates, 1976).

Ocean Production Company funded a monitoring study of their drilling activities on Georges Bank (COST Well, G-1). The study examined pH, turbidity, suspended solids, total and dissolved chromium, total and dissolved barium, and currents. Currents in the area were substantial, ranging from a low of 0.8 knots to a maximum of 3.3 knots. The study found that the discharges of drilling fluids had no significant impact on pH, suspended solids, turbidity (except within 100 yards of the outfall), soluble barium, and chromium in sea water. The currents at the drill site rapidly dispersed and diluted the discharged drilling fluids (Environmental Devices Corporation, 1976).

Shell Oil Company funded a study of their drilling operations near Tanner Banks, off California. The study gathered information on currents, sedimentation, effects on reefal communities, and the effluent plume. Dispersion and settling of the majority of drilling wastes was rapid. Background levels of suspended solids and trace metals were reached within 200 meters of the discharge source, with discharge rates of 10 barrels per hour. Discharge rates of 754 barrels per hour resulted in increased levels of suspended solids and trace metals (over background) within 1000 meters of the discharge point. Trace elements, barium, chromium and lead, were present in the sediments below the drill site. The highest barium concentrations, 1680 mg/kg (control station - 466 mg/kg), were located less than 95 meters from the outfall; the highest chromium concentration, 6.11 mg/kg (control station - 2.07 mg/kg), was within 125 meters of the outfall; and the highest lead concentration, 9.9 mg/kg (control - 0.24 mg/kg), was also within 125 meters of the outfall. Of the three trace metal components, chromium was the most rapidly dispersed; barium and lead showed more potential for accumulatoin. No accumulations of drill cutting were observed. During the study, 70 to 90 percent of the materials settling to the bottoms were transported and/or dispersed beyond detection. The plume was visually apparent for 3 to 4 kilometers from drill site (ECOMAR Inc., 1978).

Atlantic Richfield Company funded a study of drilling operations in Cook Inlet, Alaska. The study measured the spatial and temporal extent of the discharge, performed bioassay tests on active drilling mud, and assessed the effect of discharges of drilling mud and cuttings on the benthic and pelagic communities. Static bioassays, conducted onboard the drilling vessels, found that the most sensitive organisms was pink salmon fry (96 hr LC-50 of 3000 ppm). Plume models and in situ measurements found that the currents greater than 0.1 knot were sufficient to dilute drilling mud discharges by a factor of 10,000:1 within a distance of 100 meters. Biological assessments determined that rates of accumulation of cuttings and drilling fluid on the bottom in a dynamic environment such as in Cook Inlet were not great enough to measurably affect benthic populations (Dames and Moore, 1978).

In a BLM funded study offshore Texas, sediment barium levels were found to increase during drilling throughout the 1,000 meter sampling radius. Barium concentrations greater than 1,000 ppm were found 500 meters from the drill site. Post-drilling samples, taken three months after the termination of drilling, showed that barium concentrations greater than 1,000 ppm remained within a radius of 200 meters from the drill site. Barium levels over the entire area had decreased. Presumably, the barium sulfate (barite) deposited during the drilling operations had been redistributed and diluted prior to the post drilling analysis (SUSIO, 1976).

In another BLM funded study offshore Texas, sediment concentrations of zinc, barium, cadmium and lead increased at the drill site, compared to pre-drilling levels. Barium increased from 100 to 500 ppm; zinc from 65 to 200 ppm; cadmium from 0.07 to 0161; and lead from 7.6 to 20.5 ppm. (The values for post drilling are the highest concentrations of the three samples reported from the post drilling analysis). The increases were only at the drill site. The increased levels of zinc, barium, and cadmium were related to the drilling activity. The increased in lead were postulated to be from the fuel used by the rig and supply vessels (University of Texas, 1977).

The nine rig monitoring studies, summarized above, were conducted in different localities, used different equipment, and involved different sampling patterns and techniques. Despite these differences, the studies do show a number of correlations. The correlations are listed below.

a. The effluent is rapidly diluted and dispersed.
b. Discharge of drilling wastes usually result in increased levels of barium and sometimes lead, zinc, cadmium, and chromium, in the sediments near the drill site.

c. The areal extent of the increased levels of barium and the other trace elements depends on the current and the position of the outfall with respect to the sea floor. If the outfall is near the bottom, then the areal extent is generally less than 300 meters. If the outfall is near the sea surface, then the areal extent can be greater than 1,000 meters.

d. Background levels of suspended solids and trace metals in sea water are reached within 200 meters of the discharge source, when the discharge rate is 10 barrels per hour; and reached within 1,000 meters of the source, when the discharge rate is 750 barrels per hour.

e. Plumes from the discharges can be visually apparent up to 3 to 4 kilometers from the drill site.

f. Drilling activities did not apparently affect the hydrocarbon levels in the water column or in the sediments near drilling sites.

IV. Discussion

Drilling fluids are complex mixtures. The basic fluids is a water-based clay suspension with ferrochrome or chrome lignosulfonate added to control viscosity and fluid loss, barium sulfate added to increase fluid density, and caustic or sodium hydroxide to control pH. Drilling fluids are essential for drilling wells on the Outer Continental Shelf. Except for oil-based and inversion emulsion type, these fluids have historically been disposed of into the marine environment.

Acute toxicity bioassays indicate that most drilling fluid components are relatively nontoxic. Analysis of field and lab data indicate that concentrations of drilling mud within a few meters will not exceed 96-hr. LC-50's, except during "bulk" discharges (discharge rates of 700 to 800 per hour). Bulk discharges rates are maintained usually for less than 4 hours. The field and laboratory studies so indicate two areas of possible concern: 1) discharge of chlorinated pesticides or bactericides, and 2) toxicity of "used" or downhole circulated mud.

Chlorinated hydrocarbons have been shown to have severe environmental effects. If discharged at estimated concentrations of 0.25 to 0.50 compounds per barrel (715 to 1430 ppm), the discharge could result in the introduction of large quantities of chlorinated hydrocarbons into the environment. In response to the observed toxicity, the U.S. Geological Survey published a Notice to Lessees and Operators (Federal Register, Vol. 44, No. 129, July 3, 1979) which banned the use of halogenated phenols in OCS oil and gas operations after October 1, 1979.

Dowcide G, (sodium pentachloroplenate, a chlorinated hydrocarbon), is currently banned from use in drilling operations in Canada.

The causative agent or agents for the increased toxicity of "used" or downhole circulated mud is unknown. This question is being studies by Chevron, by Environment Canada, and by Texas A & M University. However, dispersion and dilution studies indicate that the effluent is rapidly diluted upon discharge. Thus, the drilling effluent will only be toxic near the discharge.

When drilling fluids are disposed of at or near the sea surface, then the radius of the impact zone can be 1 kilometer. If the outfall is located near the sea bottom, the radius of the zone of impact is generally less than 300 meters. This latter disposal method has been found to be useful when drilling near biotic communities which are sensitive to turbidity (Adams, 1978).

Conclusions

1. Non-oil based drilling fluids are only slightly toxic.

2. The disposal of drilling fluids (non-oil-based) into the marine environment can be accomplished with minimal impacts on the environment.

3. Near-bottom disposal is an effective means of limiting initial impacts of drilling fluids in areas where biotic communities are sensitive to turbidity.

4. More research is needed on the causative agent or agents that increase the toxicity of "used" or downhold circulated mud.

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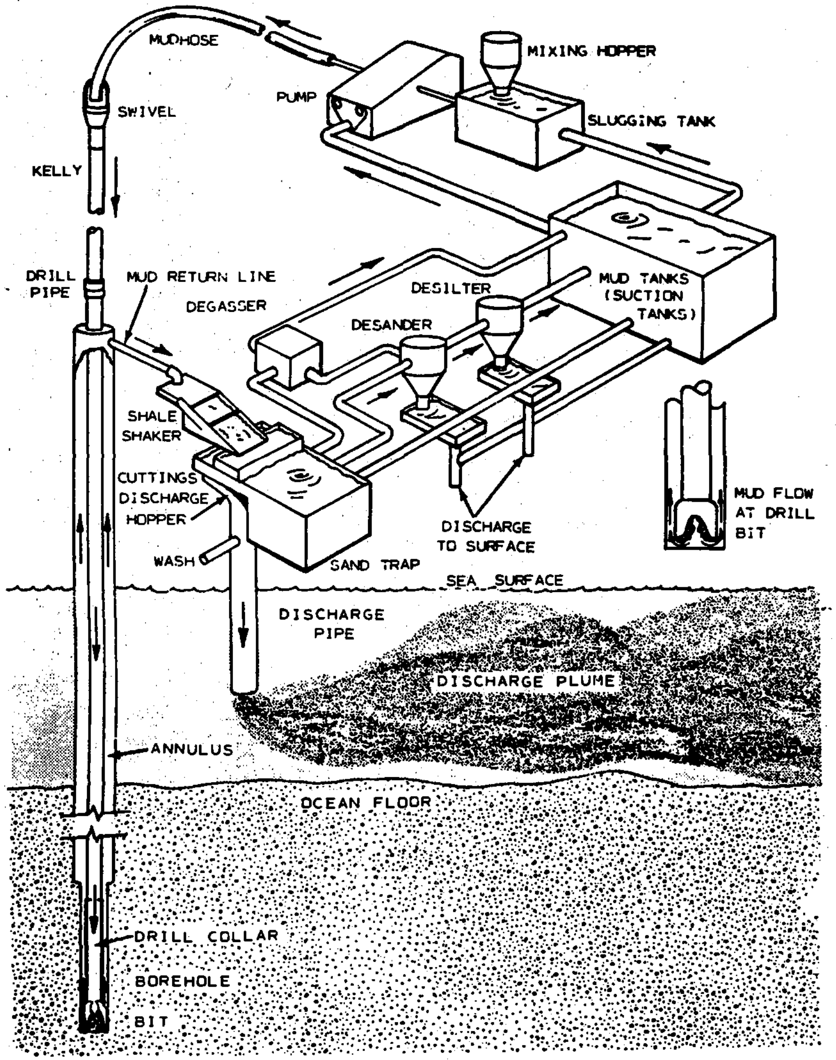

Source: ECOMAR, 1978.

Figure 1

DRILLING FLUID CIRCULATION PATH

Table I - Common Drilling Fluid Components

Description	Primary Application
Weighting Agents And Viscosifiers	
Barite	For increasing mud weight up to 20 lbs/gal.
Calcium Carbonate	For increasing weight of oil muds up to 10.8 lbs/gal.
Lead Sulphide	For increasing mud weight up to 32 lbs/gal.
Bentonite	Viscosity and filtration control in water base muds.
Sub-Bentonite	For use when larger particle size is desired for viscosity and filtration control.
Attapulgite	Viscosifier in salt water muds.
Beneficiated Bentonite	Quick viscosity in fresh water upper hole muds with minimum chemical treatment.
Asbestos Fibers	Viscosifier for fresh or salt water muds.
Bacterially Produced Large Organic Polymer	Viscosifier and fluid loss control additive for low solids muds.
Dispersants	
Sodium Tetraphosphate	Thinner for low pH fresh water muds.
Sodium Acid Phyrophosphate	For treating cement contamination.
Quebracho Compound	Thinner for fresh water and lime muds.
Causticized Quebracho	1-2 ratio caustic-Quebracho for thinning low pH fresh water muds.
Hemlock Extract	Thinner for fresh water muds and in muds containing salt (10,000 to 15,000 ppm).
Modified Tannin	Thinner for fresh and salt water muds alkalized for pH control.
Mined Lignite	Dispersant, emulsifier and supplementary additive for fluid loss control.
Causticized Lignite	1-6 ratio caustic-lignite dispersant, emulsifier and supplementary fluid loss additive.
Calcium Lignosulfonate	Thinner for SCR and lime muds.
Modified Lignosulfonate	Dispersant and fluid loss control additive for water base muds.
Blended Lignusulfonate Compound	Dispersant, fluid loss agent and inhibitor for RD-111 mud systems.
Fluid Loss Reducers	
Pregelatinized Starch	Control fluid loss in saturated salt water, lime and SCR muds.
Sodium Carboxymethyl Cellulose	For fluid loss control and barite suspension in water base muds.
Sodium Carboxymethyl Cellulose	For fluid loss control and viscosity building in low solids muds.
Sodium Carboxymethyl Cellulose	For fluid loss control in gyp, sea water and fresh water muds.
Polyanionic Cellulosic Polymer	For fluid loss control and viscosifier in salt muds.
Sodium Polyacrylate	For fluid loss control in calcium free low solids muds.
Sodium Polyacrylate	For fluid loss control in low solids muds.
Lubricants, Detergents, Emulsifiers	
Extreme Pressure Lubricants	Used in water base muds to impart extreme pressure lubricity.
Processed Hydrocarbons	Used in water base muds to lower down-hole fluid loss and minimize heaving shale.
Oil Dispersible Asphalts	Used in water base muds to aid in controlling heaving shale.
Oil Soluble Surfactants	Used for spotting around differentially stuck pipe.
Detergent	Used in water base muds to aid in dropping sand. Emulsifies oil, reduces torque and minimizes bit balling.
Non-Ionic Emulsifier	Emulsifier for surfactant muds.
Blend of Anionic Surfactants	Emulsifier for salt and fresh water muds.
An Organic Entity Neutralized with Amines	Non-polluting lubricant for water base muds.
Blend of Fatty Acids Sulfonates, Asphaltic Materials	Used for spotting around differentially stuck pipe where weights in excess 10 ppg are required.
Defoamers, Flocculants, Bactericides	
Aluminum Stearate	Defoamer for lignosulfonate muds.
Sodium Alkyl Aryl Sulfonate	Defoamer for saturated salt muds.
Flocculating Agent	Used to drop drilled solids where clear water is desirable for a drilling fluid.
Paraformaldehyde	Prevents starch from fermenting when used in muds of less than saturation or alkalinity less than 1 cc.
Sodium Pentachlorophenate	Bactericide used to prevent fermentation.
Lost Circulation Materals	
Fibrous Material	Filler as well as matting material.
Fibrous Mineral Wool	Often used in areas where acids are later employed to destroy the material.
Walnut Shells- Fine	Most often used to prevent lost circulation.
Walnut Shells- Medium	Used in conjunction with fibers or flakes to regain lost circulation.
Walnut Shells- Coarse	Used where large crevices or fractures are encountered.
Ground Mica- Fine	Used for prevention of lost circulation.
Ground Mica- Coarse	Forms a good mat at face of well bore.
Cellophane	Used to regain lost circulation.
Combination of granules, flakes and fibrous materials of various sizes in one sack.	Used where large crevices or fractures are encountered.
Blended high fluid loss soft plugging material	One sack mixture for preparing soft plugs for severe lost circulation.
Speciality Products	
Shale Control Reagent	Calcium chloride mud for inhibiting the swelling of bentonitic shales.
Bentonite Extender	Increases yield of bentonite to form very low solids drilling fluid.
Non-Ionic Surfactant	Primary surfactant for formulating surfactant muds. May be used in hot holes for viscosity stability.
Filming - Amine	Corrosion inhibitor.

Table I. Continued.

Description	Primary Application
	Commercial Chemicals
Sodium Chromate	Used in water base muds to prevent high temperature gelation and as a corrosion inhibitor.
Sodium Hydroxide	For pH control in water base muds.
Sodium Carbonate	For treating out calcium sulfate in low pH muds.
Sodium Bicarbonate	For treating out calcium sulfate or cement in high pH muds.
Barium Carbonate	For treating out calcium sulfate (pH should be above 10 for best results).
Calcium Sulfate	Source of calcium for formulating gyp muds.
Calcium Hydroxide	Source of calcium for formulsting lime muds.
Sodium Chloride	For saturated salt muds and resistivity control.
Potassium Hydroxide	For pH stability and inhibition.
Chrome Alum (chromic chloride)	For use in cross-linking XC Polymer systems.
	Oil Base and Invert Emulsion Muds
Invert Emulsion (Water in Diesel Oil)	Protects sensitive producing formulations
Oil Base Mud	Basically same application as Ken-X.
Gelatinous Oil Base Fluid	For casing recovery, corrosion control and protection of fresh water sands.
	Emulsifiers for Invert Emulsions
Primary Emulsifier	Primary additives to form stable water-in-oil emulsion.
Viscosity and Gel Builder	Provides weight suspension.
Hi-Temperature Stabilizer	Improves emulsion under high temperature conditions.
Hi-Temperature Stabilizer	Improves emulsion, weight suspension and fluid loss under high temperature conditions.

Table II. Typical Compositions of Three Common Types of Drilling Muds.

Material	Seawater Gel Mud (lbs/bbl)[1]	Lightly Treated Lignosulfonate Mud (lbs/bbl)[1]	Lignosulfonate Freshwater Mud (lbs/bbl)[1]
Drill Solids	48-60	55-70	65-80
Bentonitic Clay	30-40	20-30	20-30
Caustic - Sodium Hydroxide	0.5-1.5	1.0-2.0	1-2
Mica Flakes	0.0-0.5		
Cellulose Polymer	0.0-0.25	0.0-0.25	
Barum Sulfate		45-60	55-150
Lignosulfonate		4-6	4-8
Lignite		0-3	3-8
Defoamer/Detergents		0-3	0.5

[1]lbs/bbl - pounds per barrel; 1 lb/bbl is approximately equal to 2850 ppm.

Source: U.S. Environmental Protection Agency, Draft NPDES permits, Mid-Atlantic.

Table III. Heavy metal concentrations in various drilling fluids, expressed in mg/l.

Metal	Beak Consultants, 1974 (dissolved)[1]	Hrudey and McMullen, 1975 (total/soluble)[2]	Siferd, 1975 (unfiltered/filtered)[3]	Moore et al., 1975[4]
Barium (Ba)	-	11-520,000/ 2	-	-
Cadmium (Cd)	<0.05	-	-	0.015-0.035
Chromium (Cr)	3.5-6.1	1.1-64/0.07-7.7	0.1-909/0.001-560	0.018-360
Copper (Cu)	<0.05	-	0.25-250/0.001-7.9	0.02-40
Iron (Fe)	2.8-5.3	-	1.4-9250/0.002-68	22.0-12,333
Lead (Pb)	<0.25	-	-	0.10-2.75
Nickel (Ni)	-	-	-	0.08-0.40
Zinc (Zn)	0.04-0.3	-	0.6-1700/0.001-8.5	0.20-1900

[1]Whole mud samples from the Imperial Adgo F-28 and Pullen E-17 artifical island drilling operations.
[2]Whole mud samples; drilling fluid labeled Immerk B-48.
[3]Whole mud samples; 12 different sampling sites; drilling mud samples from various depths.
[4]Whole mud samples; 8 different drilling muds; three muds from different depth intervals.

Table IV. - Summary of Published Drilling Fluid Component Toxicities
(Adapted from McAuliffe and Palmer, 1976)

Test Material	Bioassay** Media	Test Organism	Toxicity LC50-96(a), ppm (b) (Unless Otherwise indicated)	Reference
Adgo F28	F	Rainbow trout	480,000	Beak Consultants, 1974
Aluminum sterate	F	Rainbow trout	1,100	Beckett et al., 1975
Ammonium phosphate	F	Rainbow trout	100 (toxic)	Beck Consultants, 1974
Ammonium sulphate	F	Rainbow trout	100 (toxic)	
Aqugel (Wyoming Bentonite)	M	American oyster	7,500 (nontoxic)	Daugherty, 1957
Barite	M	American oyster	50-60 (LC50-216)	
	M	Various organisms	7,500	Daugherty, 1957
	F	Sailfin molly	100,000	Grantham and Sloan, 1975
	M	Sailfin molly	100,000	Grantham and Sloan, 1975
	F	Rainbow trout	7,500 (threshold LC50)	Falk and Lawrence, 1973
	F	Rainbow trout	24,000	Beak Consultants, 1974
Barite fluid extract	F	Rainbow trout	nontoxic	Shaw, 1975
Bark extract modified hemlock	M	White shrimp	265	Chesser and McKensie, 1975
Baroyd	M	American oyster	nontoxic	Daugherty, 1957
Ben-Ex	F	Rainbow trout	527-836*	Falk and Lawrence, 1973
Bentonite	F	Rainbow trout	10,000	Falk and Lawrence, 1973
Bentonite	M	American oyster	110-119 (LC50-192 day)	Cabrera, 1968
Benatonite fluid extract	F	Rainbow trout	<28,570 (nontoxic)	Shaw, 1975
	M	Sailfin molly	100,000	Grantham and Sloan, 1975
Calcium chloride	F	Water flea (Daphnia)	920 (Threshold immobilization)	Anderson, et al., 1948
Calcium chloride	F	Mosquito fish	13,400	Wallen et al., 1957
Calcium chloride	F	Bluegill	10,650	Williams and Jones, 1975
Capryl alcolhol	F	Rainbow trout	56-100*	Falk and Lawrence, 1975
Carbonox (lignitic material)	M	Various organisms	7,500	Daugherty, 1957
	F	Rainbow trout	1,300	Beckett et al., 1975
Carboxy methyl cellulose, regular	F	Rainbow trout	10,000	Falk and Lawrence, 1975
Carboxy methyl cellulose, Hi-Vis	F	Rainbow trout	10,000	Falk and Lawrence, 1975

Table IV. Continued.

Test Material	Bioassay** Media	Test Organism	Toxicity LC50-96(a), ppm (b) (Unless Otherwise indicated)	Reference
Caustic soda (NaOH)	F	Rainbow trout	730	Logan et.al., 1973
Cellulose-calcium carbonate workover additive	M	White shrimp	1,925	Chesser and McKenzie, 1975
Cement (oil well)	M	Various organisms	70-450	Daugherty, 1957
Chromate Cr+6, soft water	F	Mosquito fish	107	Wallen et.al., 1957.
Chrome lignosulfonate	F	Sailfin molly	7,800	Daugherty, 1957
Chrome lignosulfonate	F	Rainbow trout	5,600	Beak Consultants, 1974
Chrome lignosulfonate	M	White shrimp	465	Chesser and McKenzie, 1975
Chrome lignosulfonate	M	Sailfin molly	12,200	Hollingsworth and Lockhart, 1975
Crude oil	F	Rainbow trout	400 (lethal)	Shaw, 1975
Cypan	F	Rainbow trout	1,200-1,300	Beckett et al., 1975
Desco	F	Rainbow trout	1,200	Beckett et al., 1975
Dextrid	F	Rainbow trout	1	Beckett et al., 1975
Diatomaceous earth fluid extract	F	Rainbow trout	14,285 (not lethal)	Shaw, 1975
Dichromate Cr+6, hard water	F	Bluegill	133	Logan et.al., 1973
Dichromate Cr+6, soft water	F	Mosquito fish	100	Wallen et.al., 1957
	F	Bluegill	118	Falk and Lawrence, 1973
Dodecyl sodium sulphate	F	Rainbow trout	5-7	Beak Consultants, 1974
Dominion rig wash	F	Rainbow trout	10-18	Falk and Lawrence, 1973
Dowicide-B	F	Rainbow trout	0.75	Beckett et al., 1975
Ferrochrome lignosulfonate	M	Rainbow trout	1,140-2,050	Falk and Lawrence, 1973
Fibertex	M	Various organisms	7,500	Daugherty, 1957
Formaldehyde	F	Water flea (Daphnia)	2 (48-hr threshold conc.)	McKee and Wolf, 1963
	M&F	Salmon	28 (critical)	McKee and Wolf, 1963
Gilsonite, powdered	F	Rainbow trout	100 (nontoxic)	Shaw, 1975
Gypsum	F	Rainbow trout	756,000	Falk and Lawrence, 1973
Imperes (progelantinized starch)	M	Various organisms	500-7,500	Daugherty, 1957
Iron Carbonate (siderite)	F	Sailfin molly	10,000	Grantham and Sloan, 1975
Iron lignosulfonate	M	White shrimp	2,100	Chesser and McKenzie, 1975

Table IV. Continued.

Test Material	Bioassay** Media	Test Organism	Toxicity LC50-96(a), ppm (b) (Unless otherwise indicated)	Reference
Jelflake (shredded cellophane)	M	Various organisms	7,500	Daugherty, 1957
Kelzan-XC (polymer Xanthum gum)	F	Rainbow trout	320-560*	Falk and Lawrence, 1973
Lignite	F	Sailfin molly	24,500	Hollingsworth and Lockhart, 1975
Lignite	M	Sailfin molly	15,000 (100% survival)	Hollingsworth and Lockhart, 1975
Lignosulfonate thinners	F	Rainbow trout	100 (toxic)	Shaw, 1975
Metso beads	F	Rainbow trout	100-560*	Falk and Lawrence, 1973
Mica (mica flakes)	M	Various organisms	7,500	Daugherty, 1957
Montmorillonite clay	F	Water flea	100 (toxic)	Robinson, 1957
Oilfos (sodium tetraphosphate)	M	Various organisms	7,500	Daugherty, 1957
Paraformaldehyde	F	Rainbow trout	46-78*	Falk and Lawrence, 1973
Phosphoric acid ester dispersant	F	Rainbow trout	10 (toxic)	Shaw, 1975
Polyacrylamide bentonite flocculent	F	Rainbow trout	100 (nontoxic)	Shaw, 1975
Polyacrylate, low molecular wt.	M	White shrimp	3,500	
Potassium chloride	F	Water flea (Daphnia)	432 (threshold conc.)	Anderson et al., 1948
	F	Water flea (Daphnia)	317 (LC50-48)	Beisinger and Christensen, 1972
Potassium chloride	F	Mosquito fish	920	Wallen et.al., 1957
Potassium chloride	F	Bluegill	2,010	Dowden and Bennett, 1965
Potassium chloride	F	Rainbow trout	1,920-2,090*	Falk and Lawrence
Potassium chloride, reagent grade	F	Rainbow trout	1 (lethal)	Shaw, 1975
Potassium chromium sulphate	F	Rainbow trout	560-1,000*	Falk and Lawrence, 1973
Potassium chromic sulphate Cr+3, soft water	F	Bluegill	8.5	Pickering and Henderson, 1966
Potassium chromic sulphate Cr+3, hard water	F	Bluegill	75	Pickering and Henderson, 1966

Table IV. Continued.

Test Material	Bioassay** Media	Test Organism	Toxicity LC50-96(a), ppm(b) (Unless otherwise indicated)	Reference
Quadrafos	M	Various organisms	500-7,500	Daugherty, 1957
Quebracho	F	Sailfin molly	135	Hollingsworth and Lockhart, 1975
Rig wash compound	F	Rainbow trout	7,200 (lethal)	Shaw, 1975
Skot-free	F	Rainbow trout	36-76*	Falk and Lawrence, 1973
Sodium acid pyrophosphate	F	Various organisms	500 (toxic)	Daugherty, 1957
Sodium acid pyrophosphate	F	Sailfin molly	1,200	Hollingsworth and Lockhart, 1975
Sodium bicarbonate	F	Rainbow trout	7,500	Falk and Lawrence, 1973
Sodium chloride	F	Water flea (Daphnia)	3,680 (threshold conc.)	Anderson et.al., 1948
	F	Water flea (Daphnia)	4,625(LC50-48)	Beisinger and Christensen, 1972
Sodium chloride	F	Mosquito fish	17,550	Wallen et.al., 1957
	F	Bluegill	12,946	Dowden and Bennett, 1965
Sodium pyrophosphate	F	Rainbow trout	662-1,140*	Falk and Lawrence, 1973
Spersene	F	Rainbow trout	2,500-5,000	Beckett et al., 1975
Sump fluid, composite	F	Lake chub	225,000	Falk and Lawrence, 1973
Sump fluid, surface	F	Lake chub	810,000	Falk and Lawrence, 1973
Swift's rig wash	F	Rainbow trout	11-42*	Falk and Lawrence, 1973
Tanino	M	American oyster	90-170 (LC50-108)	Cabrera, 1968
Torq-trim	F	Rainbow trout	1,580-3,250*	Falk and Lawrence, 1973
Tricron	F	Rainbow trout	46-87*	Falk and Lawrence, 1973
Visbestos	F	Rainbow trout	2,750	Beckett et al., 1975
White lime	M	Various organisms	70-450	Daugherty, 1954.

(a) LC50-X = lethal or median concentration giving 50% mortality in X hours
(b) ppm is mg/l or ul/l
* range of 95% confidence level
** F = Freshwater
M = Estuarine or marine water

Table V
Summary of Published Drilling Fluid Toxicities

Test Material	Bioassay Media[1]	Test Organism	Toxicity (ppm)[2]	Reference
Drilling mud, 4000 feet	F	Rainbow trout	98,000[3]	Beak Consultants, 1974
6000 feet			50,000[3]	
7000 feet			260,000[3]	
8000 feet			250,000[3]	
Drilling mud, 3000 feet			115,000[3]	
Immerk B-48, drilling fluid	F	Lake white-fish	25,000[3]	Lawrence and Scherer, 1974
	F	Rainbow trout	75,000[3]	
Immerk B-48, mud filtrate	F	Lake white-fish	50,000[3]	
Shell Kipnik, drilling fluid	F	Lake white-fish	25,000[3]	Lawrence and Scherer, 1974
	F	Rainbow trout	42,000[3]	
Rig 51, drilling fluid	F	Lake chub	35,500[3]	Falk and Lawrence, 1973
	F	Ninespine stickle backs	103,000[3]	
	F	Rainbow trout	112,000[3]	
	F	Rainbow trout	8,300[3]	Logan, Sprague, and Hicks, 1973
Drilling mud, lignosulfonate (10 lb/gal, pH-9.4)[4]	M	California killifish	350,000[3]	McAuliffe and Palmer, 1976
Drilling mud, lignosulfonate (10 lb/gal, pH-10.2)[4]	M		380,000[3]	
Drilling mud, nondispersed (10 lb/gal, pH-9.2)[4]	M		790,000[3]	
Drilling mud, nondispersed (10 lb/gal, pH-9.9)[4]	M		680,000[3]	
Drilling mud, KCl (10 lb/gal, pH-8.6)[4]	M		40,000[3]	
Drilling mud, KCl (14 lb/gal, pH-8.8)[4]	M		46,000[3]	

Table V. Continued.

Test Material	Bioassay Media[1]	Test Organism	Toxicity (ppm)[2]	Reference
Drilling mud, lignosulfonate (11 lb/gal, pH-8.2)[5]	M	California killifish	5,000[3]	McAuliffe and Palmer, 1976
Drilling mud, nondispersed (17 lb/gal, pH-8.8)[5]	M		687,000[3]	
Drilling mud, lignosulfonate	M	American oyster	1,000-2,000[6]	Cabrera, 1968
Shell Kipnik, drilling fluid, KCl polymer	F	Rainbow trout	42,000[7]	B.C. Research, 1976
	M	Rainbow trout	24,000[7]	
	M	Coho Salmon	29,000[7]	
	M	Chum Salmon	24,000[7]	
	M	Pink Salmon	41,000[7]	
	M	Mussel worm	37,000[7]	
	M	Soft-shelled clam	42,000[7]	
	M	Purple beach crab	53,000[7]	
Aquitaine et.al., Polar Bear drilling mud, seawater polymer	F	Rainbow trout	130,000[7]	
	F	Coho Salmon	130,000[7,8]	
	M	Coho Salmon	130,000[7,8]	
	M	Mussel worm	220,000[7,8]	
	M	Soft-shelled clam	320,000[7]	
	M	Purple beach crab	530,000[7]	
	M	Sand flea	230,000[7,8]	
Sun Bux et.al. Pelly drilling mud, KCl-XC polymer	F	Rainbow trout	34,000[7]	
	F	Coho salmon	20,000[7]	
	M	Coho salmon	23,000[7]	
	M	Mussel worm	41,000[7]	
	M	Soft-shelled clam	56,000[7]	
	M	Purple beach crab	78,000[7]	
	M	Sand flea	14,000[7]	

Table V. Continued.

Test Material	Bioassay Media[1]	Test Organism	Toxicity (ppm)[2]	Reference
Shell Niglintgak drilling mud, weighted Shell polymer	F	Rainbow trout	16,000[7,8]	B.C. Research, 1976
	F	Coho salmon	4,000[7,8]	
	M	Coho salmon	15,000[7]	
	M	Mussel worm	23,000[7]	
	M	Soft-shelled clam	10,000[7]	
	M	Purple beach crab	62,000[7]	
	M	Sand flea	34,000[7]	
Sun Bux et.al. Pelly drilling mud, gel chemical - XC	F	Rainbow trout	42,000[7,8]	
	F	Coho salmon	23,000[7]	
	M	Coho salmon	39,000[7]	
	M	Mussel worm	(9)	
	M	Soft-shelled clam	(9)	
	M	Purple beach crab	(9)	
	M	Sand flea	80,000[7]	
Sun Bux et.al. Pelly drilling mud, weighted gel XC-polymer	F	Rainbow trout	18,000[7]	
	F	Coho salmon	24,000[7,8]	
	M	Coho salmon	190,000[7]	
	M	Mussel worm	320,000	
	M	Soft-shell clam	(9)	
	M	Purple beach crab	560,000[7]	
	M	Sand flea	420,000[7]	
Dome Imp Imnak drilling mud, gel XC-polymer	F	Rainbow trout	42,000[7,8]	
	F	Coho salmon	23,000[7,8]	
	M	Coho salmon	30,000[7]	
	M	Mussel worm	200,000[7]	
	M	Soft-shell clam	(9)	
	M	Purple beach crab	(9)	
	M	Sand flea	(9)	

Table V. Continued.

Test Material	Bioassay Media[1]	Test Organism	Toxicity (ppm)[2]	Reference
Drilling muds, saltwater gel mud	M	Copepod	100[7]	EG & G, 1976
	M	Atlantic silverside	100,000[7]	
Drilling muds, lightly treated ferrochromelignosulfonate saltwater/freshwater mud	M	Copepod	10,000[7]	
	M	Atlantic silverside	48,500[7]	
Drilling mud, ferrochromelignosulfonate freshwater mud	M	Copepod	100[7]	
	M	Atlantic Silverside	100,000[7]	
Drilling mud, active system	M	Shrimp	32,000-150,000[7]	Dames and Moore, 1978
		Pink Salmon fry	3,000- 29,000[7]	
		Amphipods	10,000-200,000[7]	
		Mysids	10,000-150,000[7]	
		Isopods	70,000[7]	
		Brine Shrimp	100,000[7]	
		Sculpins	100,000-200,000[7]	
		Modiolus	30,000[7]	

[1]Bioassy media = F - Freshwater; M - Estuarine or marine.
[2]ppm is mg/l or ul/l.
[3]LC50-96 hours = lethal concentration giving 50% mortality in 96 hours.
[4]Laboratory aged mud samples.
[5]Downhole circulated samples.
[6]LC50-144 hours = lethal concentration giving 50% mortality in 144 hours.
[7]LC50-96 hours = lethal concentration giving 50% mortality in 96 hours; ppm is estimated from published values.
[8]A formal probit analysis could not be run, since only 0% and 100% responses were obtained. The LC50 is an estimate.
[9]LC50 greater than 560,000 ppm.

Source: Adapted, with updated modifications, from McAuliffe and Palmer (1976).

Table VI. Mud Pit Dump Discharge Characteristics.

Flow Rate (gallons per minute)	Density of Drilling Mud (grams per cubic centimeter)	Dilution Factor**	
		Unstratified	Stratified
500	2.0	156	156
	1.5	123	123
	1.2	87	87
1,000	2.0	98	98
	1.5	77	77
	1.2	55	55
2,000	2.0	62	62
	1.5	49	49
	1.2	35	35

**Dilution Factor at 20.0 meter depth (156 is defined as 1/156).

Source: Mobil Plume Model, 1976.

Table VII Results of Drilling Fluid Toxicities
(with permission of J. Neff, 1980)

A. The acute toxicity measured as LC-50 (median lethal concentration) of the suspended particulate phase (SPP) of four used drilling muds to adult coquina clams Donax variabilis texasiana following different lengths of exposure. LC-50 values are in percent of the stock SPP preparation.

Mud type	Exposure duration (hours)				
	24	48	72	96	192
chrome lignosulfonate	im	im	92.4	53.7	N.D.
mid-weight lignosulfonate	im	49	38	29	20
high-weight lignosulfonate	im	95	77	56	41
spud	im	im	im	im	im (100%)

im - insufficient mortality at highest exposure concentration to compute LC-50. Number in parentheses is the percent survival after exposure for 192 hours to the 100% SPP.

N.D. - LC-50 value not determined for this time interval

B. The acute toxicity measured as the 96-hour LC-50 (median lethal concentration at 96 hours) of four used drilling muds to three species of marine crustaceans and one species of marine polychaete worms. LC-50 values are in percent of the stock mud aqueous fractions (MAF).

Mud type	Species: Clibanarius vittatus adults	Penaeus aztecus juveniles	Palaemonetes pugio 1st Zoeae	Palaemonetes pugio adults	Ophryotrocha labronica adults
chrome lignosulfonate	28.7	41.5	27.5	92.4	im (100%)
Mid-weight lignosulfonate	34.5	16	35.0	91.0	60.0
high-weight lignosulfonate	65.6	ND	48.0	im(93.3%)	im(87.5%)
Spud	ND	ND	im(100%)	im(100%)	im(100%)

ND - No bioassay performed

im - insufficient mortality at highest exposure concentration to compute an LC-50. Number in parentheses is the percent survival after exposure for 96 hours to the 100% MAF.

C. Results of bioassays with five species of marine invertebrates exposed to the layered solid phase (LSP) of a used chrome lignosulfonated drilling mud. Exposure concentrations are in ml mud/liter seawater.

	Species: Neanthes arenaceodentata		Ophryotrocha labronica	Mysidopsis almyra	Donax variabilis texasiana		Aequipecten amplicostatus
Life Stage	juveniles	adults	adults	1 day	juveniles (<1cm)	adults (>1 cm)	adults
Exposure conc. ml/1	40	40	50	25	100	100	20
Exposure period (hrs)	96	96	96	168	96	96	96
percent survival	77.5	25	95	55	32	0	40

Appendix 9

Exploratory and Operational Technology

in

The Arctic

1. <u>Exploratory and Operational Technology in the Arctic</u>

The Soviet Union borders on 52 percent of the Arctic Ocean and controls approximately 70 percent of the Arctic continental shelf. The Soviets have yet to explore offshore, however, onshore discoveries found near the Arctic Circle are being vigorously developed by the Russians.

The first major resource developed by the Russians was natural gas. The reserve is located 2,000 miles west of the Bering Strait, and supplies Takutsk, a city of approximately 85,000 people, located in eastern Siberia The original pipelines supplying Yakutsk trasversed above the permafrost land and as a result numerous breaks in service occurred due to thermal expansion of the gas. A new large-diameter line, buried to a depth of approximately 5 feet, and transporting refrigerated gas is expected to solve the thermal expansion problems.

West of the Takutsk supply area, approximately 1,600 miles in the Tyumen Province of western Siberia, the Soviet Union has discovered a number of huge anticlinal gas reservoirs. This cluster of fields contains reserves totalling roughly 25 times as much as the gas in the Prudhoe Bay field. The world's largest gas field, Urengoi, with probable reserves of nearly 180 trillion cubic feet, is located here. These fields are drilled by directional gas wells in clusters of six to eight, and the collected gases are processed at the fields for removal of moisture and heavier hydrocarbons, then compressed, refrigerated, and pipelined to distant markets. About half of the gases contain condensate; none have hydrogen sulfide. Towns accommodating 10,000 people have recently been built to house personnel to operate the fields and process plants. Pipe has been airlifted in. The pipelines are buried in permafrost for approximately the first 150 miles. The pipe laying process has had to overcome such obstacles as the cold climate, seasonal darkness, swamps, rivers and permafrost. Several pipelines with a maximum diameter of 56 inches, extending for 2,500 miles, and operating at up to 1,400 psi are presently operational. Additional lines with similar specifications are presently under construction. A single line with the aforementioned specifications can handle up to 3.2 billion cubic feet of gas daily compared to the 2.0 to 2.4 BCFD design for the Prudhoe Bay gas.

Finland, Sweden, and Norway have had no exploratory work at these northern latitudes. In the North Sea, 62° North latitude, has been the northerly limit to date for exploration and production. Oil is the dominant resource in that region.

The next area, located west of Greenland, between Greenland and Canada, is a narrow extension of the Davis Strait. In this region two wells have been drilled using drillships with quick-disconnect drill systems to permit movement of the ships in order to avoid icebergs. Iceberg keel tracts 30 feet deep have been observed in waters as deep as 1,000 feet in this area. One of the two wells was drilled in 540 feet of water to a total depth of 10,500 feet, and the other was drilled in 1,470 feet of water to a total depth of 11,870; the latter contained gas.

In the Canadian Arctic Islands further west, a great deal of exploratory effort has been expended in the last decade onshore and more recently offshore. Through 1976, 115 wells were drilled. Exploratory work is actively continuing. Discoveries to date include one onshore oilfield, the Bent Horn which is economically marginal at perhaps 250 million barrels of recoverable reserves, plus seven major gas fields, each with at least one trillion cubic feet of gas and a total of about 14 TCF. One of these fields, Drake, may have 4.5 TCF. These gas fields were discovered onshore and others have subsequently been discovered offshore. Onshore drilling has been generally of standard technology for the conditions at these latitudes. Supplies are brought in by barge and icebreaker on the Mackenzie River from Eastern Canada during the short summer season. During the rest of the year there is heavy reliance on Hercules aircraft for freight shipments and on Twin Otter or similar lighter aircraft for personnel movement. Helicopters have been employed on short hauls.

Resolute, located on Cornwallis Island, was an early forward base for supplies, however exploratory successes have been occurring farther northwest on Cameron, Ellef Ringnes, and especially Melville Islands. As a result the supply route has shifted directly to sub-bases on those islands.

Some of the wells on these islands have had oil shows. There are indications of tar sands, but the area so far appears to be strongly gas prone. The structures tend to be less than 20 percent filled with gas, and all of the gas fields appear to be of the same geologic age. Depth is generally less than 10,000 feet deep. The gas is nearly pure methane. Bent Horn oil was found at about 10,700 feet depth, on Cameron Island, and was 47 API.

The offshore gas exploratory technology has been particularly noteworthy. Wells have been drilled on top of the ice pact in waters as deep as 905 feet, as much as 14 miles from shore, and with a drilling rig capable of going to an exploratory offshore depth of 10,000 feet. The first ice platform well was the Jackson Bay G-16A, 4 miles off Ellef Ringnes Island in 200 feet of water, and with it, an extension to a major gas field was found, at a depth of 4,600 feet, in early 1976. Several other ice platform wells have been successful, and perhaps the most interesting and most completely documented was the Drake F-76. This well, a $21 million project, was drilled to 3,720 feet total depth, in 200 feet of water one mile off the east coast of the Sabine Peninsula of Melville Island. The rig was especially designed for subsea completions, and it worked successfully with the resulting gas piped ashore under water and ice from a wet Christmas tree wellhead diverless hookup to an 18-inch flowline bundle. The flowline is trenched and refrigerated at water depths of 60 feet and less, onto shore where flow testing equipment has been employed. The trenching, the gravel pipeline cover, and refrigeration of the flowline provides protection from ice scouring. Methanol injection in the gas well prevents hydrate problems. This design is considered adequate for subsea diverless completions in water as deep as 1,500 feet. The ice at the wellsite was 7 feet thick, prior to being artificially thickened in winter to 23 feet, and wooden beams and insulation formed the foundation for the rig. The rig was designed to compensate for up to 15 feet of ice platform horizontal movement, but the ice proved to be quite stable. That tends to be the case for surface ice in winter among these islands. No production operations have as yet occurred in this area, but studies of marketing technologies and economics are continuing.

Further west of Canada is the Mackenzie River delta located in the Beaufort Sea. In this region, ice-strengthed drillships working in waters ranging from 100 to 200 feet deep, have been effectively employed. The technique has been substantially improved since first being employed and has resulted in extending the drilling season from 60 days in 1976 to almost 120 days in 1978.

The total cost through 1978 of three of these drillships and associated supply equipment, plus a forward base located at Tuktoyaktuk was approximately $250 million. The operations resulted in three significant discoveries.

One of the operational problems is that of dealing with subsea permafrost. This condition is encountered approximately 100 miles from shore at a sub-surface depth of 1400 to 2000 feet. The base of the permafrost is surrounded with superpressured melt water posing a potential hazard to the intergrity of the well. The problem has been alleviated through the use of permafrost cement for a drill depth of the first 3000 feet.

While a marked discovery of oil has yet to be made, in the event of such a discovery, an insulated flowline to shore similar to the one used in 150 feet of water off the coast of Indonesia would be a point of reference for Arctic water design.

Reports indicate that operating costs range between $30 and $40 million per well. These reports also indicate that LNG and icebreaker tankers may be the only way to bring these resources to market. However, pipelines, as a mode of transportation southward, are presently under consideration.

In shallow and coastal waters in the Mackenzie River delta, the primary technoogy has centered on artificial islands. The seventeenth such island was under construction in late 1978, and water depths for these islands have ranged from 3 feet to 62 feet. Gravel and sand, with sandbagged shores, have been the principal construction materials, and the surface area when finished has typically been 250 feet by 400 feet, with 10 feet of freeboard on top of which the rig flooring is placed. One island was built from two sunken river barges surrounded by pumped-in silt and sand, with a sandbag berm surrounding the entire island as the final protection from surface ice pressures.

The typical construction method is to use a dredging barge, with a silt remover, to get to gravel and sand and (preferably) not more than 10 percent by weight of silt. The barge has a suction system and a pump which pumps the slurry through a floating large-diameter flexible tube to the proposed drillsite. The end of the flexible tube is held in position by two sunken tugs. One island requiring 2.1 million cubic yards of slurry was built in 88 days using this system.

Gravel, the very important artificial island construction material, is reported to be "ubiquitous" offshore in the Arctic region, but may lie under a silt layer which in places in 30 feet thick.

In deeper waters, generally deeper than 40 feet, an alternate design using a caisson metal wall as a slurry retainer, with the caisson being re-usable, appears to be competitive, but to date this design has not been put into actual practice. One other design, for waters approaching drillship operating depths (approximately 100 feet deep), is a conical steel structure for retaining or resting on some gravel fill; this monocone design has sidewalls which allow ice to move up and then curve backwards for brakage.

Tides are 1.5 feet high and, except for occasional quick short storms. The waves are mild. The centennial (100 year) wave is estimated to be 25 feet high. In ice-free waters this area would be suitable to submersibles, jackups, and drilling barges. Supply logistics are similar to those described for the drillship area. Drilling on these islands can occur year-round. The islands have reportedly cost \$2 to \$15 million each, depending on gravel source, location and water depth.

The principal operating companies in northern Canadian waters are: Panarctic in the Islands, Dome in the drillships, and Imperial on the artificial islands.

2. Alaskan Beaufort Sea Area

From 1964 to 1968 the oil industry drilled approximately 50 dry holes on State-leased lands between NPRA and the Wildlife Refuge before the Prudhoe Bay strike was reported in June 1968.

Since that time there have been 11 seasonal waterlifts by ocean-going barges bringing supplies. The enclave has a population of about 5,500 persons, most of whom regularly rotate out and back by air to more southerly home locations. Investment in the enclave is reported to be $2,900 per barrel per day of production, with production at 1.2 million barrels per day. Freight has also been brought to the enclave by truck up the operator-built haul road north of Fairbanks, by air freigh from Anchorage and Fairbanks or the lower 48 States, by ship and rail to Fairbanks, and from the United States midwest north down the Mackenzie River by barge. A 48 inch diameter pipeline, 800 miles long across Alaska from Prudhoe to Valdez, moves Prudhoe oil into tankers for ocean routing to markets.

The infrastructure for Beaufort Sea exploration and production efforts is therefore generally in place. The one exception at this time is the lack of a pipeline or other technique to move natural gas to market, and the Northwest Gas Pipeline Company has proposed a pipeline across Alaska to connect through Canada into the lower 48 States. The pipeline will require a gas preparation plant, and the financing of this plant remains uncertain at this time.

Most of the few successful wells on Alaskas north slope, from the Wildlife Sanctuary on the east to Barrow on the west, have discovered small gas fields.

The weather in the sale area is a low precipitation area with about six inches of moisture falling annually, mostly in the form of late summer and early winter snow. Summer temperatures approach 40° F and winter temperatures reach -50° F, but 60 mph winds in winter can create very cold wind-chill factors and blowing snow. Ground snowstorms of this type can keep aircraft from taking off, and any type of surface transport may be dangerous at such times. Generally, for most of the year the climate-adapted equipment permits reasonably normal work patterns.

The tides in the sale area have a one foot range and the waters normally have moderate waves. Water depths are generally less than 60 feet, although a few outside tract corners are at the 80-foot contour of depth. The deepest water inside the barrier island is 25 feet. The area is subject to sudden surges, occurring perhaps once a decade in the months of September and October in which winds of a few knots rise to gale force in minutes. These winds have whipped waves to heights of at least 11 or 12 feet, breaching, in one instance, one of the causeways at Prudhoe. Warnings of such storms have been difficult to obtain in a timely manner.

Ice in the area is a complex subject. The open water season along the coast lasts usually about 2 months in late summer. Ice forming along the shoreline may hold water with as much as 50 percent salinity. In mid- to late winter, the smooth ice out to the barrier islands may have a thickness of about 2.5 feet, and is usually relatively stable. Fast ice beyond the barrier islands may, in late winter, experience a thermal expansion of 3 feet or more, moving outward from shore. Beyond the fast ice is the shear zone of grounded ice ridges where scouring of the bottom occurs. Farther out is the ice pack, moving westerly parallel to shore at a rate of 1.2 to 1.5 miles per day. In late spring or early summer ice thawing on the seawater surface, plus rivers pouring out fresh water over the ice area, cause a complex salinity pattern.

Prudhoe Bay permafrost extends to an estimated depth about 1,850 feet. Its occurrence offshore, as to depth and extent is not well known except for some areas closer to shore. Test holes indicate that permafrost declines rapidly from surface to 70 feet and more when seawater appears under the shore-fast ice. Bonded permafrost may be at a depth of 300 feet, and a distance of 8.5 miles offshore. The data are limited. Drilling onshore in permafrost requires 5 feet of gravel in order to provide necessary insulation.

Exploratory efforts along the coast widened appreciably when a well was successful in a non-Prudhoe reservoir 55 miles east of Prudhoe. It is possible that this success will result in eventual construction of a satellite enclave of equipment and personnel at that location. Two follow-up wells have been moderately encouraging.

Several wells elsewhere along the coast have been drilled directionally to the offshore, and artificial islands of gravel have also been employed. One novel technique not used elsewhere has been the grounded ice island or platform. Union built a one-season ice island, and Exxon is experimenting with a multi-seasonal ice island portected by insulation during the summer seasons. Union's well went to 9,809 feet total depth.

3. Beaufort Sale Area Technology

Technology applied in this sale area will use parts or all of the technologies which have been successful elsewhere in similar climates and waters.

The basic exploratory platform will be an artificial island grounded to the seafloor. The island may be of gravel and sand, or gravel with caisson, or a sunken drilling barge capable of being refloated, or a thickened ice island. If drilling is permitted from the barrier islands, those islands will form the base of a platform built by gravel to 10 feet of freeboard. A few directionally-drilled exploratory wells will be sited onshore; probably less than 5 percent of the sale area can be explored adequately with this method. Grounded ice islands have many advantages in shallow waters if they can be kept frozen from year to year.

Permanent production platforms will probably be enlarged gravel islands.

Pipelines to shore will likely enter a gravel-built causeway as protection from ice scour.

All islands will require protective berms, caissons, sandbags, or pilings, especially to resist ice movement westward and seasonally away from shore.

New technology which may favorably affect drilling in this area, as well as other places around the globe, include measurement-while-drilling (MWD), chainbelt drills, downhole motors, and advances in drilling rig designs. It is reported that an international oil company has committed for a Class 7+ icebreaker in a Helsinki, Finland shipyard and it also is reported that a Canadian oil company is designing a large hovercraft for use as a highly portable exploratory drilling platform. MWD is perhaps currently of the greatest interest in the oil industry; it will provide a wide variety of instant information regarding the working status at the drill bit.

APPENDIX 10

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INDEX

M

N

O

P

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