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IV. CONCERNS ABOUT ENVIRONMENTAL EFFECTS

INTRODUCTION

Offshore oil and gas exploration and development can cause a wide range of environmental effects which create concerns among the residents of nearby coastal areas. The environmental effects that can result from OCS oil and gas activities include changes in the physical and biological elements of the environment as well as changes in local economies, land use, and population. Taken together, such effects are often regarded as a threat to the character of coastal communities and the environmental amenities which attract people to these areas.

Over the past 20 years, the Department of the Interior, other Federal Agencies, State and local governments, and the oil and gas industry have developed a variety of measures to protect the environment from impacts associated with OCS activity. The Federal Government has enacted many environmental protection laws. These have been supplemented in many cases by State and local actions. Technologies for controlling environmental effects have been developed by the oil industry. Although these measures do not completely prevent adverse effects, they have limited the nature and extent of the damages that actually occur. The Task Force has undertaken the job of reviewing the potential effects that are of concern to coastal residents and examining the existing environmental protection measures. Its objective was to determine whether the effects that would or could occur warrant actions that have been proposed such as banning or delaying leasing and imposing more stringent environmental protection measures.

This chapter describes potential impacts to resources and communities in the following categories:

- Air Quality
- Oil Spills
- Commercial Fishing
- Protected Species
- Protected Lands
- Social and Economic Impacts (including onshore infrastructure changes and tourism losses)
- Water Quality

The discussion for each section contains a description of existing conditions and potential impacts posed by oil and gas leasing, exploration, development, and production in each of the three lease areas. In most cases, the Task Force relied on MMS estimates of hydrocarbon resources, scenarios describing anticipated development (both offshore and onshore), and oil spill trajectory models. Generally, these are the most comprehensive data available on these subjects. For information on environmental impacts, the Task Force reviewed MMS information in light of the findings of the NAS/NRC Report, the presentations and submissions from its public workshops, and additional information from Agencies represented on the Task Force.

IMPACTS ON AIR QUALITY

Summary of Concerns

The human health effects of air pollution make it a strong concern in areas where substantial emissions and meteorological conditions cause poor air quality. Southern California in particular has a combination of factors that cause poor air quality, create the need for stringent controls of emissions, and heighten concerns about the effects of additional emissions from offshore oil and gas activities. Ozone, which is formed by a photochemical reaction among pollutants in the atmosphere, is a primary concern in southern California. Reduced visibility is the concern in other areas that have excellent air quality. Table IV-1 summarizes the air quality concerns for the three sale areas.

Offshore oil and gas operations emit air pollutants from several sources including: (1) engine driven generators used to power platform and drilling equipment; (2) flaring of natural gas associated with oil production; (3) fugitive hydrocarbon emissions; and (4) emissions from support ships and helicopters. The types and quantities of air emissions typically associated with offshore oil and gas activities are shown in Tables IV-2 and IV-3.

Meteorological conditions play an important role in the transport and dispersion of emissions and, thus, have a strong effect on ambient air quality. The conditions that can result in higher onshore concentrations from long-range transport of offshore emissions are (1) a plume traveling in a stable air layer over the water, (2) winds blowing persistently toward shore, and (3) meteorological conditions which cause the polluted air mass to "slosh" back and forth over the coastal areas. On days when such conditions exist, OCS emissions can contribute to onshore air pollution problems. Under different conditions, offshore emissions can occur without adding measurably to onshore pollution loads. The build-up of ozone from reactions involving nitrogen oxides and volatile organic compounds is promoted by atmospheric temperature inversions which can trap pollutants over a wide area. When an inversion occurs onshore, emissions of nitrogen oxides and volatile organic compounds from OCS activities can contribute to ozone build-up.

Table IV-2 : Air Pollutants from OCS Activities

- Nitrogen oxides (NO_x) are an important factor in causing ozone pollution.
- Sulfur oxides (SO_x)
- Total suspended particulates (TSP) refers to all particle emissions, both reactive and nonreactive
- Carbon monoxide (CO)
- Volatile organic compounds (VOC) include all hydrocarbon compounds, except those that are nonreactive.
- Ozone (O₃) is not released from OCS sources but is formed as a result of photochemical reactions in the atmosphere involving VOC and NO_x.
- Particulate matter.

Table IV-1: Characterization of Air Quality Concerns

	General Description	Non-Attainment Categories	Class I PSD Areas	Closest Existing/ Potential OCS Development to Class I Area
Off Southwest Florida	Good to Excellent	none	Everglades National Park Ft. Jefferson National Monument	>30 Miles
Off Southern California	Poor	Ozone, NO ₂ , TSP, PM ₁₀ CO	Channel Islands National Park	6 Miles
Off Northern California	Good to Excellent	none	Redwoods National Park	15 Miles

Emission Sources: Platform power generation
Crew and supply boats
Gas flaring
Helicopter flights

**Table IV-3: Type and Quantities of Typical Emissions
from OCS Activities and Platforms**

Source	Emissions In Tons				
	NOx	VOC	SOx	CO	TSP
Exploration: 1					
Drilling Vessel 2	25-80	3-10	2-5	8-17	3-5
Boats In-transit 3	1-3	2-6	<1-2	<1-2	<1-2
Development and Production: 4					
Platform 5	65-160	20-45	1-10 6	45-70	3-6
Boats In-transit and at platform 3	10-100	3-60	1-3	3-10	1-3

- Notes: 1. Emissions in tons/operation
 2. Range for drilling depends upon exploration vessel engines used, target depth, and duration of operation
 3. Boat emissions vary with distance
 4. Emissions in tons/year
 5. Assumes power generated on the platform; (Electrified platforms can have all pollutant emissions in single digits.) Range for development and production depends upon the size of the platform, production throughput, and whether production is processed on the platform.
 6. SOx emissions can vary depending on the operation of sulfur content of the production. The number listed here does not include SOx emissions from the OS&T, which, depending on the operation of sulfur recovery equipment, can have emissions 10 times higher.

Air emissions from activities onshore are controlled under the Federal Clean Air Act, administered by the EPA, and related State and local laws. Under the Clean Air Act, States develop implementation plans to control emissions sufficiently to meet National Ambient Air Quality Standards (NAAQS). In addition, certain areas are designated as Class I because of their high air quality. In Class I areas, the EPA applies regulations designed for the Prevention of Significant Deterioration (PSD). New emission sources which exceed emission increments prescribed by the EPA are not allowed to locate in Class I areas.

The Clean Air Act does not apply to activities conducted on the OCS, which are outside State jurisdiction. Instead, OCS air emissions from drilling vessels and production platforms are regulated by the MMS under Section 5 (a)(8) of the OCS Lands Act. This provision requires compliance with NAAQS to the extent that OCS activities significantly affect the air quality of a State. Because of the different requirement of the OCS Lands Act, the existing MMS air quality regulations (30 FR 250.45 and 250.46) do not apply emission controls that are as stringent as those in effect in some adjacent onshore areas. Many of the participants in the Task Force workshops in California expressed the view that

it was inequitable to impose stringent controls on emissions from onshore activities while allowing less controlled emissions offshore. The MMS has been considering a rulemaking that would address this issue.

Support vessel and helicopter emissions are not currently regulated by either EPA under the Clean Air Act or MMS under the OCS Lands Act. They can account for as much as 50% of air pollutant emissions from OCS activities. The MMS is now considering regulating emissions from crew and supply vessels.

Sale Specific Concerns

Sale 116, Part II - Off Southwestern Florida

Air quality in most of the Eastern Gulf of Mexico Planning Area is generally considered very good. Air quality impacts of OCS-related development have not been a major issue in southwest Florida. Former Secretary of the Interior Hodel created a substantial coastal buffer area prohibiting leasing within 30 miles of the mainland and western Keys and 25 miles from the Dry Tortugas; this buffer removes concern for air pollutants except ozone. Meteorological and topographical conditions with the potential to cause inversions which promote ozone build-up are rare in the coastal region of southwest Florida. Likewise, there are no large sources of emissions of volatile organic compounds. Thus, based on the relatively low level of existing emissions, infrequent inversions, onshore ambient air quality, and distance of possible OCS activities from shore, there is little potential for ozone impacts from the Sale 116, Part II area.

The MMS conducts air pollution monitoring studies in other parts of the Gulf of Mexico, notably the Offshore Coastal Dispersion study of inert pollutants. Such studies are designed to detect any emerging air quality problems from OCS activities.

Everglades National Park is the only Class I PSD area near the proposed sale area. The 30-mile buffer should prevent any violations of PSD standards in Everglades National Park.

Any new processing facilities which may be constructed in Florida as a result of OCS development could have an impact on local air quality. The impact would depend on the location of the facilities and the controls and mitigation requirements imposed by regulatory officials with jurisdiction over onshore facilities. The MMS analysis does not project such facilities in the area.

Emissions from OCS activities in the Sale 116, Part II area are unlikely to cause air quality problems in adjacent onshore areas.

Sale 95 - Off Southern California

Parts of southern California, particularly the Los Angeles metropolitan area, suffer from the worst air quality in the Nation due to a combination of meteorology, topography, extensive urbanization, and rapid population growth. The majority of the onshore area adjoining Sale 95 is designated as nonattainment for the ozone standard set by EPA. Ozone levels in the South Coast Air Quality Management District exceed the health-based NAAQS as often as 150 days each year. Figure IV-1 illustrates the magnitude of the southern California ozone exceedences compared with the rest of the Nation. In the Ventura/Santa Barbara areas, the

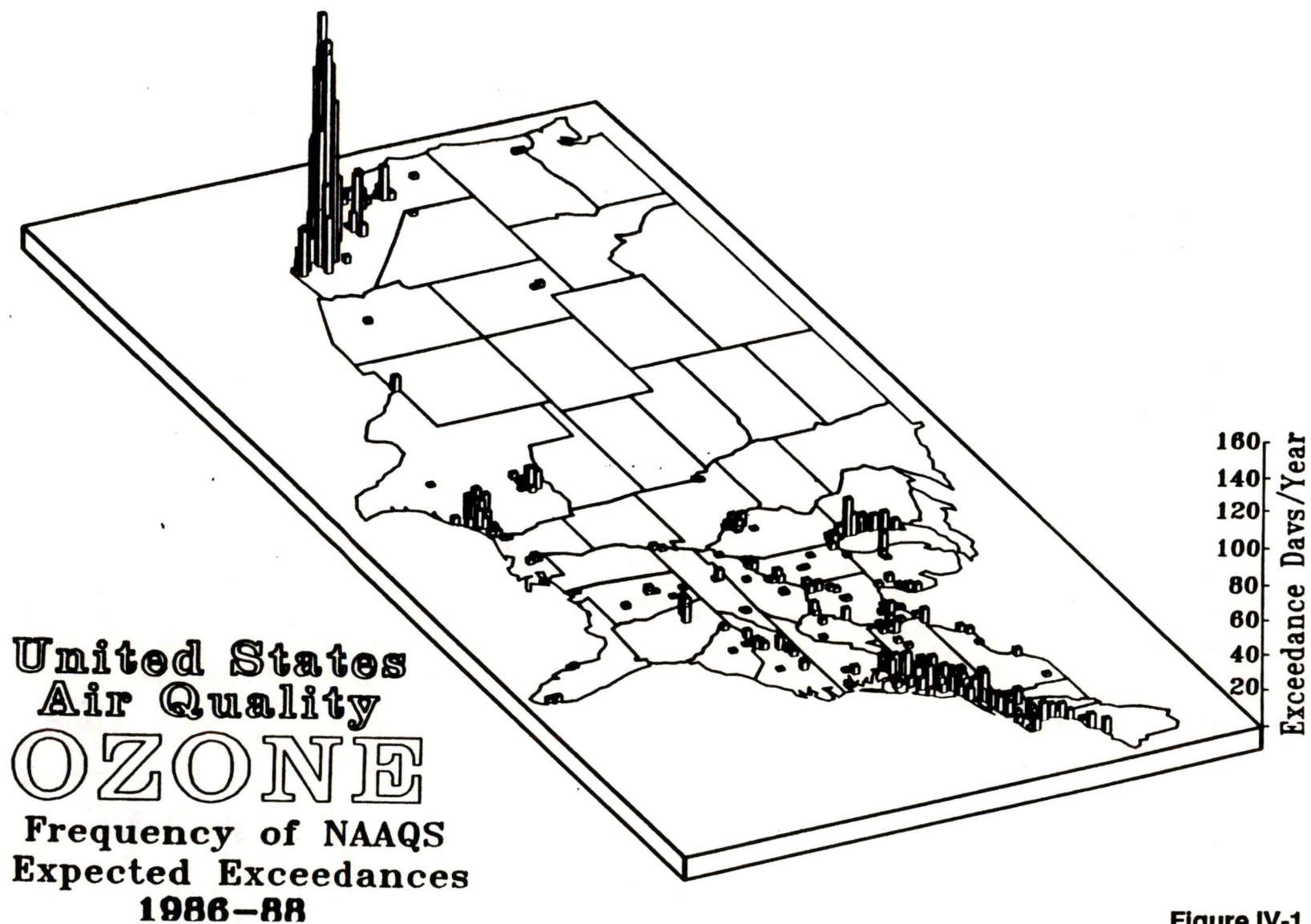


Figure IV-1

NAAQS for ozone is exceeded 10-15 days each year. The major source of emissions contributing to ozone and smog is motor vehicles. Other large sources include manufacturing, electric power generation, and petrochemical plants.

Table IV-4 shows the emissions of nitrogen oxide, a precursor to ozone, that are typical of OCS operations off California. Newer platforms with emission controls produce substantially lower emission levels.

Table IV-4: Typical Nitrogen Oxide Emissions from California OCS Activities

Annual Average Emissions (Tons/Year/Platform)

Source	Uncontrolled	Controlled
Electrified Platform	15.2 ¹	5.4 ²
Non-electrified Platform	159.9 ³	62.3 ⁴
Crew & Supply Vessels ⁵	10- 100	8-80

- Notes: 1. Average for 12 existing electrified platforms
 2. Average for 3 proposed electrified platforms
 3. Average for existing 5 production and 3 processing non-electrified platforms
 4. Average for 3 existing and 2 future production and processing non-electrified platforms
 5. Depends on distance from port to platform

The NAS/NRC found that "the relationship between OCS development and onshore air quality in the South Central Coast of California is as well understood as any such relationship in the U.S." According to MMS, air quality models suggest that offshore emissions do not play a significant role in causing NAAQS to be exceeded in southern California. However, because of the inherent uncertainties, results from other models make such conclusions about the contribution of OCS emissions to exceedences of NAAQS onshore debatable. For example, EPA models estimate that as a worst case, offshore air emissions can contribute up to 10% of the ambient ozone level, although the modeled cases showed that OCS emissions did not contribute to ozone violations. The EPA believes the models lack the sophistication to make adequately reliable findings about the contribution of OCS emissions to exceedence of ozone standards.

Onshore areas already implement stringent emission control standards and are in the process of adopting measures which would cause dramatic lifestyle changes for southern California residents. Proposed changes include massive carpooling programs and, eventually, elimination of gasoline powered vehicles. In addition, new regulations would greatly restrict use of charcoal lighter fluid and propane barbecue grills, gas lawn mowers, personal care sprays, and household fireplaces. Increasing emissions from OCS

development would exacerbate the air quality problem. In the face of increased offshore emissions, onshore sources would have to reduce emissions even further in order to comply with the NAAQS.

In January 1989, the MMS proposed regulations applicable offshore the State of California. The Task Force has been advised that MMS is in the process of drafting a more stringent rule which would establish a regulatory regime which controls OCS-related emissions off California in a manner which is substantially equivalent to the controls applicable to similar onshore facilities. This is consistent with the findings of the Task Force below.

It has also been suggested that the authority to regulate OCS emissions be transferred from the MMS to the EPA. The Task Force found that such a change in statutory jurisdiction is not necessary if MMS revises its OCS air quality regulations to make them substantially equivalent to the controls applicable to similar onshore facilities.

OCS development in the Sale 95 area could lead to increased levels of air pollutants in nonattainment areas of southern California at a time when those levels need to be reduced to meet NAAQS and California State standards. This issue can only be resolved by more stringent air emission control and mitigation requirements for OCS development.

Sale 91 - Off Northern California

Air quality in most of northern California is generally very good. The primary existing sources of air pollution in northern California are lumbering activities, agricultural operations, paper mills, and geothermal energy development. The most common air pollution problems are associated with particulates generated by lumbering and agricultural operations, odors associated with sulfur compound emissions from pulp mills, and hydrogen sulfide emissions from power generators in the Geysers geothermal area of Sonoma County. However, progress has been achieved over the last 2 decades in reducing these problems. Particulate emissions have been reduced by modifying wood waste burning practices and by replacing orchard heaters with wind machines and water spray systems. As a result, there has been a decrease in ambient levels of particulates at many locations over the last decade.

There are two Class I PSD areas in the North Coast Air Basin: the Redwoods National Park in Humboldt County and the Yolla-Bolly Middle Eel Wilderness Area in Trinity County. At the public workshops in Arcata, the Task Force heard concerns that air emissions from OCS development could degrade the air quality in Redwoods National Park.

The two important pollutants of major concern for air quality in this Class I area are particulate matter and sulfur dioxide. Generally, OCS activities emit small quantities of particulates [see Table IV-4.] Sulfur dioxide emissions from OCS activities depend upon the sulfur content of fuels used or the produced hydrocarbons. In the analysis done to date, summarized in the draft EIS for Sale 91, MMS found that the sulfur dioxide standards would not be violated for Redwoods National Park. Mitigation of particulate emissions is not addressed in the draft EIS; however, no leasing is proposed within 15 miles of the Park. The EPA commented that mitigation requirements for leases in the area should be at least as great as reductions that were required under Sale 73, with the possibility of greater future reduction requirements.

The air quality requirements that should apply to the Sale 91 area would require mitigation, by either controls or offsets, of any emissions that exceed the PSD increment for an onshore area. Thus, OCS-related facilities would not be expected to have a measurable impact on the Park, barring unusual siting or other considerations which are not apparent at this time.

The Task Force found that ozone pollution is not an issue in the Sale 91 area. Compliance with PSD requirements, particularly for the Class I National Park areas, is a major concern, but could be adequately addressed if revised MMS OCS air quality regulations require controls or mitigation that comply with the PSD requirements.

OIL SPILLS

Summary of Concerns

Oil spilled into marine and coastal environments can have severe adverse effects. These effects include the killing of animals and plants contacted by the oil, disruption of food chains and ecosystems, and spoiled recreational use and enjoyment of land and water resources.

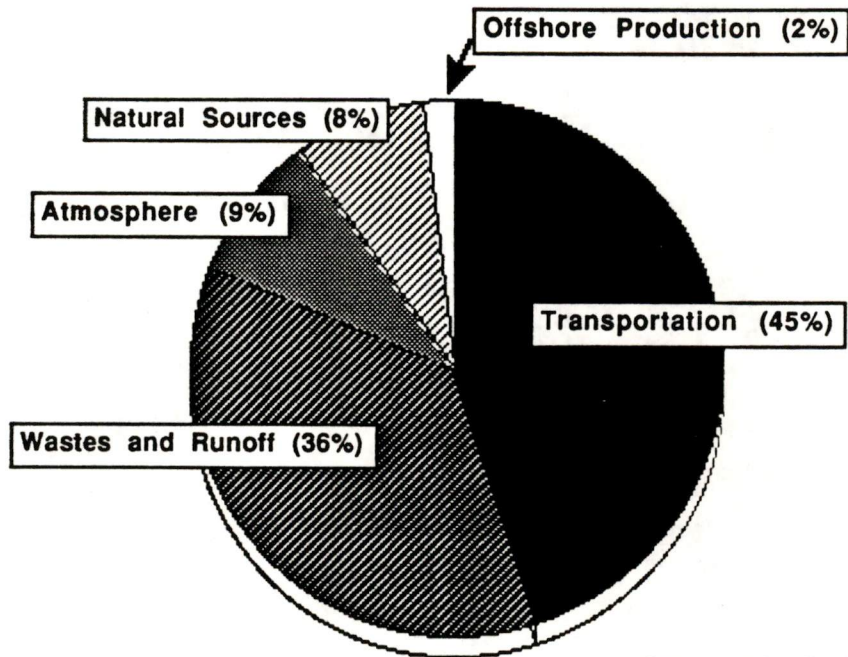
Birds, corals, fish, and marine mammals can die from the ailments caused by coming in contact with oil. Similarly, plants, such as sea grasses, kelp, and mangroves, can also die from the effects of oiling. The relatively short-term loss of plants and animals, which are links in the food chain, can cause ecosystem disruption lasting longer than the physical presence of spilled oil.

Oil enters the marine environment from a number of sources, both natural and caused by man. The largest source is transportation (See Figure IV-2) and derives primarily from accidental spills from tankers and intentional dumping of oiled bilge and ballast water.

Oil spills differ widely in size and effect. Public perceptions about oil spills are generally dominated by the pictures of large spills such as the spill of 260,000 barrels of crude oil from the *Exxon Valdez*, the largest U.S. oil spill. Most oil spills are much smaller and far less damaging. The effects of an oil spill depend on the resources contacted by the oil. Even a very large spill, exceeding 10,000 barrels, for example, could have very little or no detectable, long-term effect if spilled in the open ocean under conditions where the oil dispersed and weathered rapidly. On the other hand, a relatively small spill, such as a few hundred barrels, contacting resources very sensitive to oiling, could kill thousands of plants and animals and disrupt the affected ecosystem for a long period. Clearly, if a spill occurs within reach of land, the larger the size of the spill, the greater the chances that sensitive resources will be affected. Large spills can spread to greater areas and are less likely to be effectively contained and cleaned up.

Of all sources of oil in the marine environment, the contribution from OCS related activity is small. OCS spills tend to be small and infrequent. Table IV-5 shows the OCS-related spills exceeding 1,000 barrels during the last 25 years from the OCS. The MMS requires reporting of all spills but does not project statistics for spills less than 1,000 barrels in its environmental impact statements.

Figure IV-2: Oil in the Sea



Source: NAS, 1985,
Oil in the Sea: Inputs, Fates, and Effects

Table IV-5: OCS Oil Platform Spills*
Platform Spills of 1,000 Barrels or More, 1964 to 1988

Year	Location	Barrels	Cause
1964	Eugene Island	2,559	Collision / Fire
1964	Ship Shoal / Eugene Island	11,869	Storm / Blowout
1965	Ship Shoal	1,688	Blowout
1969	Santa Barbara	77,000	Blowout
1969	Ship Shoal	2,500	Collision / Blowout
1970	Main Pass	30,000	Fire
1970-1	South Timbalier	53,000	Blowout / Fire
1973	West Delta	9,935	Tank Rupture
1973	South Pelto	7,000	Barge Leak
1979	Main Pass	1,500	Collision
1980	High Island	1,456	Tank Overflow

*Note: All spills occurred in the Gulf of Mexico except the one off Santa Barbara, California

OCS Oil Pipeline Spills
Pipeline Spills of 1,000 Barrels or More, 1964 to 1988

Year	Location	Barrels	Cause
1967	West Delta	160,638	Anchor Dragging
1968	South Timbalier	6,000	Anchor Dragging
1969	Main Pass	7,532	Cause Unknown
1973	West Delta	5,000	Corrosion
1974	Eugene Island	19,833	Anchor Dragging
1974	Main Pass	3,500	Hurricane
1976	Eugene Island	4,000	Trawler Dragging
1981	South Pass	5,100	Anchor Dragging
1988	Galveston	15,000	Anchor Dragging

Since 1964, five of the eleven major OCS platform oil spills, those greater than 1,000 barrels, have been from loss of well control. The amount of oil that could enter the water, if a well remained uncontrolled, would depend primarily on the natural flow rate of the well. The oil will enter the environment at the rate determined by the natural pressures and other characteristics of the reservoir. The 1969 Santa Barbara Channel oil spill is the most well-known example of loss of well control.

Oil spills from pipelines occur primarily when a pipeline is damaged (by anchors, typically) or breaks. Since 1964, only one of the nine OCS pipeline spills greater than 1,000 barrels was from corrosion (See Table IV-5). Theoretically, the volume of an oil spill is limited to the volume of oil in the pipeline between the shut-off valves after the leak has been identified and the pipeline shut down.

Most small platform spills occur from oil in discharges, diesel fuel spillage, or during transfer of production. Outer Continental Shelf oil spills are generally smaller in size and less frequent than tanker spills (See Table IV-6). The Task Force learned that, in general, conditions prevalent in OCS oil and gas fields make very large spills less likely to occur from OCS platforms than from major tanker accidents.

Table IV-6: Oil Spills by Source
1,000 Barrels or Greater

<u>Source</u>	<u>Number of Spills</u>	<u>Average Spill Size (Barrels)</u>	<u>Median Spill Size (Barrels)</u>	<u>Barrels Spilled Per Billion Barrels Handled</u>
United States ¹				
OCS Platforms and Pipelines	20	21,000	6,500	.05
TAPS Tankers ²	6	51,000	14,000	.05
Worldwide Tankers ³	140	106,000	15,000	.14

- Notes: 1. Data for 1964-1988
 2. TAPS (Trans Alaska Pipeline System) tankers carry Alaskan crude oil from Valdez, Alaska to Long Beach, California and other U.S. ports.
 3. Data for 1974-1985

Source: MMS, 1989

The MMS has primary responsibility for prevention of OCS oil spills and ensuring appropriate containment and cleanup response should a spill occur. The MMS is also responsible for the assessment of oil spill risk and the identification of resources that could be damaged by OCS oil spills.

The blowout of Union Oil's Platform A in the Santa Barbara Channel in 1969 awakened many people to the kind of environmental damage that could result from offshore oil and gas exploration and development. The Santa Barbara spill was the largest U.S. OCS platform oil spill on record, spilling, by some estimates, as much as 77,000 barrels of oil in the first 10 days and seeping an additional 28,000 barrels through 1988. The Santa Barbara spill resulted in new legislation and spurred the development of new technologies and safety requirements that greatly increased the ability to protect the environment from adverse effects of OCS activities.

The primary means of preventing oil spills from loss of well control is the mandatory installation of blowout preventers at the well head and casing in the well. These measures automatically seal the well should it begin to get out of control. Lessees are also required to

take measures to prevent spillage of fuel oil and produced oil during transfers between vessels and platforms.

The MMS requires an Oil Spill Contingency Plan for oil and gas operations in the Federal OCS for both exploration and development phases. These contingency plans are required to ensure that lessees can effectively respond to an oil spill. Outer Continental Shelf contingency plans identify what equipment is located onsite and what equipment is available from specific contractors and how the equipment will be deployed in the event of a spill. The availability of containment and cleanup equipment both at OCS platforms and in nearby harbors increases the effectiveness of OCS spill response and reduces the likelihood of damage from OCS oil spills.

However, OCS contingency plans do not include assessments of how much oil can be contained or recovered under various conditions. They also do not specifically describe a credible worst case scenario or provide a plan to effectively respond to a credible worst case scenario. The MMS has recently completed a review of the maximum likely OCS spills. This review concluded that the maximum credible oil spill from any OCS platform would be 1000 to 6000 barrels per day. In the area off southern California where such flow rates are possible, the existing skimmers are capable of removing 13,000 barrels of oil per day. Thus, if conditions were to allow a spill of this size to be contained, it could be handled successfully by existing equipment.

If damage occurs due to an oil spill from an OCS platform, pipeline, or "shuttle tanker," responsibility for compensating damaged parties lies first with the owner and operator of the facility or vessel involved. In addition, the U.S. Coast Guard manages the Offshore Oil Pollution Compensation Fund, established by Title III of the OCS Lands Act Amendments of 1978, which is available to pay claims which exceed a responsible party's legal limit of liability, or if the responsible party cannot pay the claim. The Secretary of Transportation's last annual report on the fund reported that no claims had been presented to the fund during the 10 years since it was established; the fund has reached nearly \$128 million.

The Task Force also received briefings from the U.S. Coast Guard on the *Exxon Valdez* spill and subsequent cleanup efforts and the review of regional oil spill contingency plans being performed by the National Response Team. **The Task Force concluded that there are serious limitations in the capability to contain and clean up very large oil spills, especially in heavy seas and high winds.** These limitations apply to the equipment and techniques used to respond to OCS oil spills as well as to spills from tankers.

The Regional Contingency Plans required by the U.S. Coast Guard are now being reviewed by the National Response Team to determine whether they are adequate for maximum likely oil spills. While these contingency plans identify sensitive coastal areas for priority in containment and cleanup efforts, in most cases Agencies like the National Park Service which are responsible for managing such resources do not have the direct capability to take actions to protect these resources from being oiled by a nearby spill.

For each lease sale, the MMS assesses the oil spill risk associated with the oil and gas development that could occur. The MMS first estimates the amount of oil that could be found, developed, and produced. This volume is compared to historical spill rates to estimate the risk of a spill occurring during the life of the operation. The MMS estimates

the oil spill risk associated with new development only (base case risk) and associated with all potential sources in the planning area (cumulative risk).

The MMS based its analyses of oil spill risk from the three sales on the historic spill record. Despite the generally good record, these analyses show that if oil is produced in the amounts estimated, the chance of a spill greater than 10,000 barrels ranges from 10% to 36% over the 30 year life of the oil fields that might be discovered.

The MMS calculates oil spill risk based on the spills greater than 1,000 and greater than 10,000 barrels per billion barrels produced, transported via pipeline, or transported via tanker throughout the OCS. As Table IV-6 shows, the risks of a spill from tankers, as compared to an OCS platform or pipeline, are much greater in both frequency of occurrence and the amount of oil spilled. The MMS and States require pipelines when appropriate and when permits can be obtained in order to take advantage of their superior safety. The statistics in Table IV-5 cover spills reported from 1964 to 1988.

The Task Force learned that the coastal areas near each of the three proposed OCS lease sales were subject to the risk of oil spills from existing tanker traffic and, in the case of southern California, existing State and Federal offshore production. Compared to the risk of spills from these existing sources, the additional risk from the development resulting from the three sales is small.

Current oil spill risk assessments identify tanker traffic as the most significant threat of an oil spill in each of the three areas. Table IV-7 compares the annual peak production projection for Sale 116, Part II, Sale 95 and Sale 91 with the non-OCS crude oil and petroleum product transported through the sale areas by tanker. The Task Force learned that the Florida and California State governments have recently proposed or enacted legislation authorizing funds to respond to an oil spill, but these efforts have not yet resulted in specific improvements in spill prevention or response technology. The Task Force found that, in general, tankers pose a much greater risk of a catastrophic oil spill than offshore production.

Table IV-7: OCS vs. Non-OCS Oil in the Sale Areas
Millions of Barrels of Oil Per Year

Lease Sale	Non-OCS Tankered Crude and Product*	Peak OCS Production From Lease Sale
Sale 116, Part II	960	5
Sale 95	430	28
Sale 91	210	38

* Data for domestic traffic is from 1986; 1985 for imports and exports.

Figures IV- 3, 4 and 5 show the cumulative risk of oil spills in each of the sale areas from all sources. These statistics cover the projected 30 year production horizon, if the sales were conducted and commercial hydrocarbons discovered.

The assessment of the potential damages from oil spills involves estimating the trajectories that spilled oil might follow. Potential trajectories are derived from studies of physical oceanographic and meteorologic data using computer simulations. Trajectory analyses can show where oil is likely to go if spilled in various locations under various conditions. This information can be helpful in planning oil spill responses to protect nearby environmental resources. Currently, however, trajectory analyses are essentially projections of water movement which account for neither natural nor human effects on spilled oil. Thus, they tend to overstate the extent of contact an oil spill would have with coastal resources.

The NAS/NRC Report identified weaknesses in the information available for the analysis of oil spill trajectories and the effects of oil spills on specific environments and ecosystems. The NAS/NRC found that generally, there is a need for more field studies to accumulate enough information to estimate oil spill trajectories. For example, more information is needed regarding coastal circulation off southern California. Specifically, a unified description of the Southern California Bight should be developed. In Sale 116, Part II, the NAS/NRC judged the data on the Loop Current circulation during the summer months inadequate and also recommended drifter studies to support conjecture about water flow south of the Florida Keys onto the continental shelf. The NAS/NRC also found that a general lack of understanding about the transport and the fate of spilled oil mixed vertically in the water column.

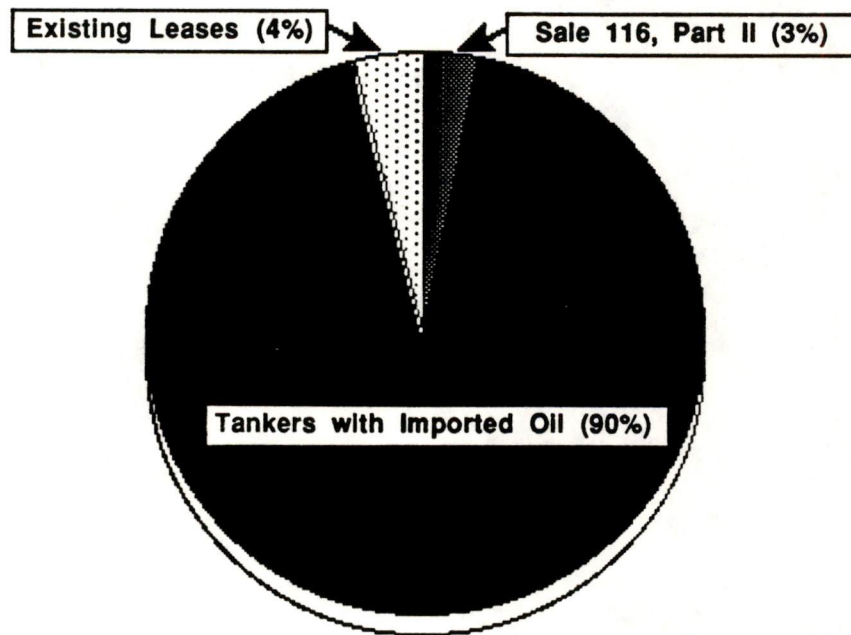
With respect to ecology, the NAS/NRC found that "existing information on sensitivity and recovery of critical habitats (e.g., coral reefs, mangroves, and sea grasses) is inadequate to predict the impact of OCS-related activities." The lack of information concerning the sensitivity and recovery of habitats and species would be a major concern in all three sale areas if new oil fields were discovered and produced.

The Task Force has concluded:

- **The risk that an oil spill greater than 1,000 barrels will occur due to OCS-related activities in the three proposed lease sale areas is small compared to the risk of a significant spill from other existing sources, notably non-OCS tanker and barge traffic;**
- **Although the risk of occurrence of a significant-sized OCS oil spill is small, the environmental effect of such a spill could be significant;**
- **Coastal and marine resources deserve greater protection from oil spills, from all sources, than is now available; and**
- **Government and the oil and shipping industries should act now to achieve significantly better protection from oil spills for coastal and marine resources, regardless of whether OCS leasing and development proceeds in the three proposed lease sale areas.**

Figure IV-3: Cumulative Spill Risk - Off Southwestern Florida
Contribution to Overall Risk of a Spill From Each Source

10,000 Barrels or More Over 30 Years



Overall Risk From All Sources: 97%

Figure IV-4: Cumulative Spill Risk - Off Southern California
Contribution to Overall Risk of a Spill From Each Source

10,000 Barrels or More Over 30 Years

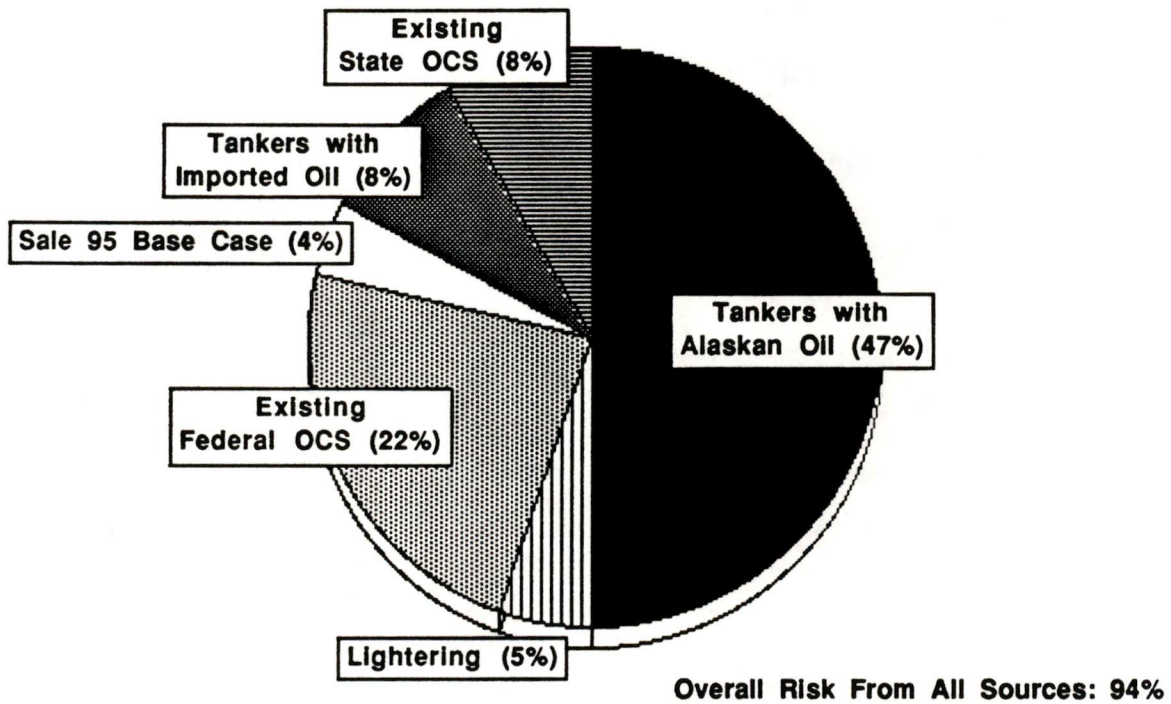
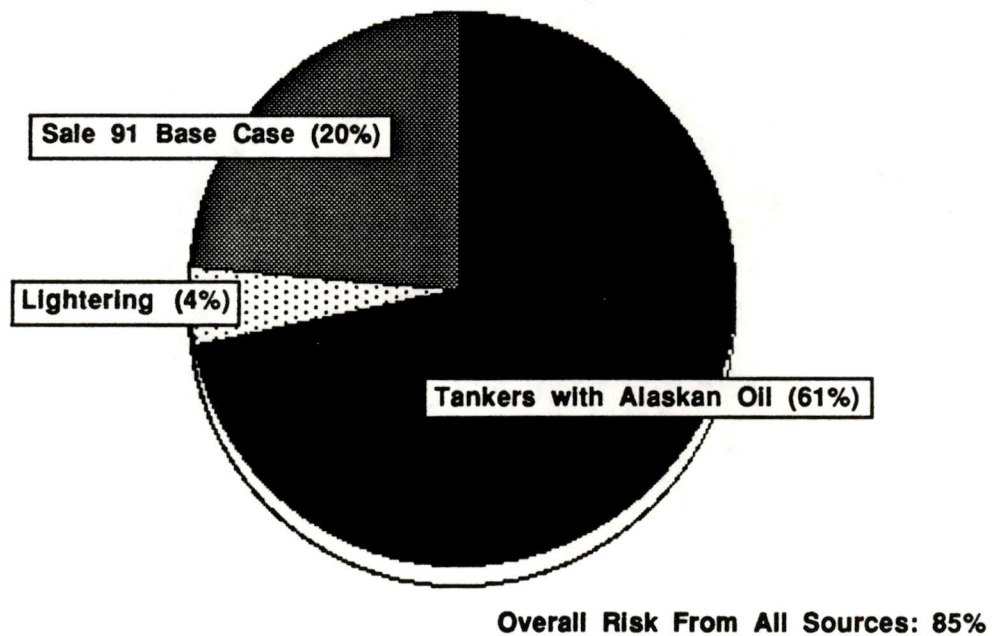


Figure IV-5: Cumulative Spill Risk - Off Northern California
Contribution to Overall Risk of a Spill From Each Source
10,000 Barrels or More Over 30 Years



Sale Specific Concerns

Table IV-8 summarizes oil spill probabilities that are discussed in the following sections for each lease sale.

**Table IV-8: Probability of One or More Oil Spills*
Greater Than 10,000 Barrels**

Lease Sale	116 (II)	95	91
Sale	10%	11%	36%
Tankers	96%	82% ¹	77%
Overall Probability (All Sources)	97%	86% ¹ 94% ²	85%

Notes: * See Figures IV-3, 4 and 5 for spill sources not itemized in this table
The above probabilities are not additive, as they are derived from a non-linear distribution.

1. Excludes all Federal OCS production
2. Includes all Federal OCS production

Percent of Overall Probability Attributable to:

Sale	3%	4%	20%
Tankers	90%	60%	65%

Sale 116, Part II- Off Southwestern Florida

The Task force reviewed MMS estimates of the oil spill risk and trajectory analyses for Sale 116, Part II. These studies show that the estimated OCS oil production from the sale would create a 10% chance of an oil spill greater than 10,000 barrels which, if uncontained, could contact sensitive resources in the Everglades and the Keys. The importance of the environmental resources in these areas makes it imperative to develop measures to protect them from oil spills before production begins.

Petroleum geologists believe that if oil is found in this area, it will most likely resemble oil found onshore in the Sunniland Formation. This oil is highly viscous and must be pumped to the surface. For this reason, the likelihood of a blowout during exploration or production drilling is extremely low.

The Southwest Florida Shelf, Dry Tortugas, and Florida Keys currently face threats of oil spills from the merchant transport fleet, particularly tankers and freighters, which transit the area. The MMS estimated that there is a 96% chance of an oil spill greater than 10,000 barrels occurring from maritime transport in this area over the next 30 years, even without OCS oil and gas activity. Nearly 1 billion barrels of crude oil and petroleum products are shipped through the Straits of Florida each year.

The simulations of spilled oil done by the Oil Spill Risk Assessment Task Force were from four sites located northwest of the Keys. Models results showed that many oil trajectories were entrained in the Loop Current and moved out of the area through the Straits of Florida. The earliest contact of oil to the Keys was 33 hours, while the earliest contact to the Florida mainland was 90 hours. However, less than 1% of the simulations contacted land in this timeframe. Over 30 days, the maximum length of the model simulations, 25% of the simulations contacted the Keys, and 11% contacted the mainland.

Sale 95 - Off Southern California

The MMS has estimated the probability of oil spill occurrence associated with an assumed production of 230 million barrels of oil in the Sale 95 area over a 31-year period. The estimated probability of a spill over 1,000 barrels is 27%. For a spill exceeding 10,000 barrels, the probability is 11%.

As in the Sale 116, Part II area, there is substantial risk of oil spills from tanker traffic. Assuming no OCS development in this region over the next 31 years, the risk from Alaskan and local tankers of oil spills greater than 1,000 and 10,000 barrels is 95% and 83%, respectively. With OCS oil production in the estimated amounts from Sale 95, the risk of oil spills increases to 96% and 85%, respectively.

There is additional risk in this area from existing Federal and State leases. The risk of oil spills exceeding 1,000 and 10,000 barrels, respectively, is 85% and 47% for existing Federal leases; and 56% and 23% from existing State leases. This increased the overall chance of an oil spill larger than 1,000 barrels from all sources (OCS and tanker activity) to greater than 99.5%; and to 94% for a spill larger than 10,000 barrels.

Sale 91 - Off Northern California

Here, too, the risk of oil spills from tanker traffic overshadows the risk of spills from OCS development. Assuming no OCS development in this region over the next 30 years, the risks of oil spills exceeding 1,000 and 10,000 barrels, respectively, from Alaskan and local tankers are estimated to be 89% and 77%. With the estimated OCS oil production from Sale 91, the risk of an oil spill greater than 1,000 barrels increases from 89% to 96%.

The MMS has estimated the probability of oil spill occurrence associated with an assumed production of 400 million barrels of oil in the Sale 91 area over a 30 year period. The estimated probability of an OCS spill greater than 1,000 barrels is 57%. For an OCS spill greater than 10,000 barrels the probability is 36%.

Within the proposed sale area, the probability of a spill is much higher in the Point Arena Basin than in the Eel River Basin. This is because the likelihood of spill occurrence is directly related to the estimated volume of oil production. A large majority of the

anticipated oil production would occur in the Point Arena Basin.

An oil spill in this region from any source would mainly affect commercial fishing, marine mammals, and seabirds. If a spill were not contained at sea and came ashore along the rocky and inaccessible coast of northern California, it could cause contamination that only natural processes could clean up.

Given prevailing winds and currents, the areas having the highest probability of contact from a spill include the shore along Mendocino County, the Gulf of Farallones and Cordell Bank National Marine Sanctuaries, and the Point Reyes National Seashore just north of San Francisco.

If severe weather and sea state conditions prevailed after a major oil spill in this area, effective containment and cleanup would be very difficult. Containment equipment cannot operate efficiently in high waves or swells. Average wave heights exceed 6 feet, the practical limit of existing equipment, over 50% of the time off Point Arena.

COMMERCIAL FISHERIES CONCERNS

Summary of Concerns

Three major concerns were voiced by commercial and recreational fishermen about the potential impacts of oil and gas development in the three areas: (1) the potential effects of space and scheduling conflicts, (2) the loss or destruction of habitat from OCS oil and gas operations, and (3) the loss of livelihood from an oil spill that could affect the fish or fishing in the areas. The value and harvest of the fisheries of major concern are summarized in Table IV- 9.

Competition for OCS space is the major source of conflict between the fishing and the oil and gas industries. Geophysical surveys and drilling operations in prime fishing areas could displace fishing efforts for a short, but possibly critical, period of time. Oil development and production structures could interfere with some fishing efforts for many years. The more mobile fisheries, such as trawling for bottom fish or shrimp, are the most likely to be susceptible to space-use conflicts from offshore structures. The stationary fisheries, such as lobster and crab potting, are more likely to be affected by oil and gas support operations (vessel traffic) than by stationary structures.

The area excluded by offshore structures varies depending on the type of structure and water depth. Floating exploration drilling rigs use an extensive array of anchors to hold the position of the drilling rig. Approximately 3 square miles may be excluded from fishing activities by such structures. Jackup rigs that rest on the bottom preempt a much smaller area, generally less than 1 square mile. Generally, fishing exclusions from exploration activities will last for a maximum of 120 days.

Each production and development platform results in less than 1 square mile of area lost to the fishing industry. Unlike the short-term nature of the exclusion from exploration, production and development structures would exclude most mobile fisheries in the immediate area for 20-30 years.

Table IV-9: Commercial Fisheries Harvest and Value

	Fisheries of Major Concern	1988 Annual Harvest (million pounds)	1988 Ex-Vessel Value (\$ millions)
Off Southwest Florida *	Pink Shrimp	5.9	15.3
	Spiny Lobster	6.1	16.9
	Snapper	2.1	3.3
	Groupers	8.1	12.3
Off Southern California	Shrimp	0.7	1.0
	Flatfish	5.2	3.6
	Rockfish	6.6	2.6
	Shellfish	2.1	5.6
	Shark	1.5	1.7
	Urchin	19.0	7.0
Off Northern California	Shrimp	10.2	4.2
	Salmon	5.2	14.6
	Urchin	19.0	7.0
	Dungeness Crab	7.7	10.2
	Rockfish	17.4	6.5
	Sole	13.5	4.6

Major Concerns: Space-use conflicts, habitat loss, oil spills

* Lee, Collier, Monroe and Dade Counties

Two factors can increase the amount of OCS area that is lost to fisheries, both associated with specific methods of fishing. Free-drifting fishing gear (drift gill nets and long lines), typically set at night, move with the prevailing currents and are under minimal, if any, control of the fishermen. These fishermen, therefore, must allow for a much larger safety buffer upcurrent from OCS structures. Trawl fisheries may be excluded from a large area if a number of structures are located proximate to each other; here, the exclusion is increased due to the difficulty in setting and retrieving the gear in confined areas. The stationary fisheries, such as potting, set nets, and hook and line, are less affected by offshore structures.

Natural factors can reduce the overall effects of space loss on most commercial fisheries. Most of the important fish species are mobile to some extent, and although physical space may be lost to fishermen, the fish can be available to harvest when outside of the preempted area. Of course, even the most mobile fish will have some portion of the stock in preempted areas at any given time. As additional area is lost to fishermen, fishing effort and costs increase to maintain the same quantity of landings.

Additional concerns have been raised on the potential for residual effects after seismic operations in certain areas. Although the fishermen are physically able to fish the area after seismic operations have concluded, claims have been made that the fish disperse and cannot be caught by the fishermen. In addition, gear damage could occur as a result of offshore oil and gas activity. This damage would affect the harvest of individual fishermen and cause lost time and wages.

Potential competition for coastal facilities, such as docking areas and repair and storage facilities, also contributes to the concerns of the fishing industry. All fisheries may be affected by loss of onshore facilities. Onshore conflicts may occur if industrial development preempts fishing industry uses.

Also of concern to the fishing community is the potential destruction or modification of fish habitat because of coastal development, oil and gas structure placement, or operational discharges from drilling activities. Concerns were raised that the discharge of drill muds and cuttings could bury bottom organisms, alter live-bottom communities, and affect fish habitat. In addition, the placement of structures or operational discharges that occur in discrete spawning areas could affect the viability of future generations. Construction of onshore facilities and expansion of port facilities could result in destruction of habitat.

The chemical component of drilling fluids can be toxic to fish species if high enough concentrations occur. In addition, chronic, low-level inputs of hydrocarbons associated with drilling discharges may have sublethal effects on organisms living on the bottom nearby. These organisms are a part of the food chain on which commercial fisheries depend.

Offshore oil and gas accidents may have adverse impacts on fish, shellfish, invertebrate prey species, vegetation, and habitat. A large oil spill can cause significant impacts on marine and estuarine ecosystems. One spill can affect a portion of a year class of fish if it hits an estuary or nursery area. Extensive mortality of eggs and larvae that float or swim near the water surface or are in shallow water and which contact the spill can occur. These life stages are the most sensitive to toxic effects from spilled petroleum hydrocarbons. If a spill occurs in or contacts a sheltered or partially enclosed coastal area, remnants of the spill may persist for a number of years and affect subsequent year classes, probably with decreasing overall effects over time. The effects of egg and larval mortality on fisheries harvest cannot be realistically estimated because of highly complex environmental and ecological processes affecting recruitment of young fish to the harvested population. However, the overall effects will be influenced by the portion of the year class which is affected.

Adult fish, for the most part, are able to avoid spilled oil which is floating on the surface. Fish and shellfish eggs and larvae are much more susceptible to exposure to spilled oil in open-water environments.

Oil in the water can damage fishing gear. In the event of a severe spill, public concerns over fish tainting can temporarily disrupt a local market for fish.

There are currently a variety of measures in place to manage the potential adverse environmental effects that oil and gas activities could have on the fisheries and fish resources. To minimize the area lost to fishing from offshore exploratory structures, operators in some areas have been required to use jackup drilling rigs in water depths of

175 feet or less. The MMS also requires training for oil industry personnel on how to recognize and avoid interfering with fishing activities.

For the Santa Barbara Channel, a joint oil/fishing industry liaison committee has been formed to provide information to each industry and to assure that oil and gas industry activities are scheduled in a manner that minimizes conflicts with commercial fishermen. The joint committee is also working towards establishing voluntary vessel traffic lanes to concentrate OCS vessel traffic away from fishing areas.

Fishermen who suffer damage to or loss of fishing gear from OCS oil and gas-related tools, equipment, etc., may file a claim with the Fishermen's Contingency Fund, established by Title IV of the OCS Lands Act Amendments of 1978, which is funded by assessments on offshore leases and permits. The Fund compensates for damaged gear and some resulting economic loss (i.e., 50% of the gross income lost because of the damage to fishing gear). The Fund currently contains approximately \$2 million. In the Santa Barbara Channel, the joint committee established a program to cover damage claims while they are being processed.

The existing permitting process for offshore activities seeks to minimize potential environmental effects on nearby live-bottom areas or other unique habitats. Stipulations on existing leases in southern California, for example, require that offshore structures be sited in a manner that avoids direct impacts on unique biological areas. The control of oil spills has been discussed above; the control of water discharges is discussed in a later section of this chapter.

There are limitations in current knowledge of these effects on fisheries. For example, there is currently insufficient data to clearly separate spatial exclusion effects from natural harvest variability. This is due, in part, to a lack of adequate information on the distribution and abundance of various species, as noted by the NAS/NRC Report.

With regard to the potential effects of seismic surveys on fish harvests, preliminary studies funded by MMS indicate that seismic sound sources can cause a response in rockfish that affects the catch of these important commercial species. However, data are not available to make an assessment of the duration or spatial extent of these effects under normal operating conditions.

Overall, there is little information specific to these areas that can be used to evaluate the long-term environmental effects of OCS activities on the habitat. However, habitat effects are most likely to result from the physical effects of structure placement, anchoring, and drilling discharges. Existing laboratory and field studies indicate a low accumulation of heavy metals in organisms from drilling fluids, primarily because the metals are discharged in a relatively insoluble form. The NAS /NRC Report indicates a need for more site-specific monitoring and analysis in some areas. Additionally, the MMS lacks the data needed for long-term assessment of the effectiveness of decisions on siting, permit actions, and mitigation techniques.

The actual effects on fish populations from an open-water oil spill are unknown and probably cannot be known. The overall effects would be determined by a multitude of confounding factors including: size of the spill, season, species, location, weather, type of oil, and ocean currents. In addition, it is currently impossible to project the resultant effect of egg and larval losses on subsequent recruitment to the population. It is certain that

detrimental effects on individual eggs, larvae, and fish would occur as a result of an OCS oil spill. However, because of their mobility and the broad distribution of most fish species, it is unlikely that these effects would result in measurable changes in the overall fish population.

Oil spills that contact land are of more immediate concern because they cause losses in habitat or nursery areas. Still, the overall effect on fish population levels and commercial fisheries from such losses is unknown. However, it is probable that such losses would have persistent effects. Overall, there is a fairly large base of information on the lethal and sublethal effects of petroleum hydrocarbons on individual specimens of various fish species. What is lacking is an understanding of the linkage between the temporary or permanent loss of habitat, the loss of eggs, or the death of larvae and the resulting effects on harvestable fish populations.

The Task Force finds that while coordination and management of OCS activities can minimize space use conflicts at sea, competition for port space will be a concern in this planning area.

In addition, the Task Force found that additional mitigation concerning management of onshore facilities; controls in biologically sensitive areas; enforcement and improvements in oil spill prevention, containment, and cleanup should be implemented, when necessary, to better protect the commercial and recreational fishing industries.

Sale Specific Concerns

Sale 116, Part II - Off Southwestern Florida

Commercial fisheries in southwest Florida include high-value species such as shrimp, spiny lobster, and stone crab. The potential effects of spatial exclusion in these fisheries is not the primary issue in southwest Florida. The major concern centers around possible oil spills and the potential loss or degradation of habitat that supports fish populations. Seagrass beds, coastal wetlands, and mangrove forests are examples of the habitats that would be at risk from an oil spill.

The southwest Florida area is an important recreational fishing area; concerns center on the effects of an oil spill on the tourist industry and loss of aesthetic appeal for vacationers. Recreational fishing in the Florida Keys and Everglades brings millions of dollars into the local economy.

The Tortugas Shrimp Sanctuary is an important nursery area for pink shrimp and is within the Sale 116, Part II area. The potential effects of an oil spill contacting the sanctuary are of major concern.

The Task Force finds that habitats which are important to commercial fish stocks and recreational fishing would be at risk if an oil spill occurred from tanker operations or OCS activities.

Sale 95 - Off Southern California

The marine environment offshore southern California is rich in fish life. In 1988, the

landings in southern California contributed approximately 300 million pounds to the total U.S. fisheries harvest.

Space-use conflicts are the dominant concerns off the California coast and are exacerbated here because of the relatively narrow continental shelf. The level of conflict has been mitigated with the advent of the joint oil/fisheries committee. If offshore oil and gas operations increase, the potential for onshore conflicts over docking, repair, and storage facilities will increase.

Loss of offshore fish habitat for the rocky reef fisheries and the effects of seismic activities on rockfish harvest are major concerns of the fishermen of southern California. The loss of fishing gear from obstructions or from oil and gas vessel activity and just compensation for gear losses continue to be a general concern of fishermen. The potential effects of oil spills on fishing, fishing gear, and fish populations remains a concern.

The Task Force finds that effects on commercial fishing cannot be fully mitigated but can be substantially reduced by careful management and coordination of OCS activities to avoid conflicts with fishermen.

Sale 91 - Off Northern California

The Sale 91 area is located within productive commercial fishing grounds. Annual landings in the area are approximately 100 million pounds. Commercial fishing is among the top three industries in the area.

Because of the relatively narrow shelf off northern California (less than 10 miles in some areas), space-use concerns are one of the major issues; trawl fisheries for shrimp, soles, and other groundfish would be the most affected fisheries. Competition for harbor space in this area is a primary concern for the fishing community in this area.

Another uncertainty that has been raised has been the potential effects of offshore oil and gas activities on potential biological areas of particular importance such as discrete spawning or nursery areas. Furthermore, the general effects of drilling discharges on fish habitat has been identified as a potential problem.

Based upon the review of information presented at briefings, public workshops, in response to the Federal Register Notice on concerns in the study areas, the NAS Report, and other scientific and technical information, the Task Force concluded that conflicts between commercial fishing and offshore oil and gas industries have occurred in other areas and are likely to occur in the Sale 91 area. However, it is apparent that many of the conflicts can be resolved or significantly mitigated. The Task Force bases its conclusion that potential impacts on commercial fishing can be mitigated appreciably on the success of the Santa Barbara area Joint Oil/Fishing Committee.

EFFECTS ON PROTECTED SPECIES

Summary of Concerns

Each of the three sale areas is inhabited by a number of species that have been placed under the protection of Federal statutes. These species include a variety of marine mammals as well as birds, fish, and reptiles that are endangered or threatened. The protections provided by the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) reflect the high value which the people of the United States place upon the maintenance of wildlife.

Protected species can be affected by offshore oil and gas activities in a number of ways. A summary of these effects is presented in Table IV-10. Onshore and nearshore habitat loss and degradation are caused mainly by increases in industrial and other development in the coastal zone, by discharges of pollutants, and by operation of commercial and recreational vessel traffic.

Oil can cause physiological effects on individuals of protected species that become coated with oil or ingest it either directly or by eating contaminated prey. Populations of protected species can also be affected if an oil spill reduces the availability of their food resources. The effects of oil on marine mammals and sea birds can be particularly severe.

Noise from oil and gas support vessels and aircraft can disturb and disrupt essential activities of protected species. These activities include feeding, mating, calving (or nesting), migrating, socializing, and hauling out. Such effects on marine mammals and birds are generally short term, nonlethal, and localized. However, repeated overflights can cause birds to abandon nests and seals to stampede, killing young. Collisions between oil and gas support vessels and sea animals such as manatees, marine turtles, and whales can damage the individuals involved, sometimes fatally.

The ESA and the MMPA provide the authorities for designating species to be protected. The ESA authorizes the U. S. Fish and Wildlife Service (FWS) to list species as endangered and threatened. It mandates that no federally conducted, funded, or authorized activity may jeopardize the continued existence of listed species or adversely affect their critical habitats. The MMPA provides comparable protection for marine mammals. It is administered by the National Marine Fisheries Service (NMFS) and FWS.

These acts require that Federal Agencies consult with NMFS and FWS to identify ways to avoid jeopardizing listed species and to minimize incidental "takings." The MMS follows these consultation procedures. The FWS and NMFS provide biological opinions stating whether the proposed lease sale would jeopardize any protected species and identifying concerns which need to be addressed as subsequent activity evolves.

If an incidental taking of an individual of a protected species is likely, NMFS and FWS also process requests for special incidental take regulations for those who would conduct the activity. To ensure compliance with the ESA and MMPA, the MMS develops and enforces appropriate protective measures to be taken by lessees. These measures are specified in lease stipulations and Notices to Lessees and Operators which regulate activities on the OCS. The MMS also regularly informs lessees of their obligations under these laws.

Table IV-10: Characterization of Protected Species Concerns

	<u>Effects of Chronic Activities</u>	<u>Effects of Oil Spills</u>
Mammals	• Noise: disturbs, migration, feeding, mating, haul out • Traffic: collisions • Onshore development: habitat destruction, pollutant load	• Physiological: impairs feeding ability/ digestion; respiration; thermal protection • Ecological: prey contamination
Birds	• Noise: disturbs nesting, roosting, feeding, mating • Traffic: overflights disturb nesting • Onshore development: habitat destruction, pollutant load	• Physiological: impairs feeding ability/ digestion; respiration • Ecological: prey contamination; habitat destruction
Reptiles	• Traffic: collisions • Onshore development: habitat destruction, pollutant load	• Physiological: impairs digestion; respiration • Ecological: prey contamination; toxin bioaccumulation

The MMS takes a number of measures to prevent disturbance of protected species. For example, biologically sensitive areas may be deleted from a lease offering or the disturbing activities may be restricted to times when the protected species are not present. Conditions can be imposed on leases and permits to eliminate or minimize disturbance. In the past, the MMS has instructed operators to use procedures designed to mitigate the adverse effects of noise, to limit boat speeds, and to take precautions to avoid collisions with protected species. The oil spill prevention and containment measures that have been discussed in a previous section of this chapter help to protect species from the dangers of contact with oil.

Onshore and nearshore habitat loss and degradation are controlled mainly by State and local governments and such Federal Agencies as the U.S. Army Corps of Engineers, EPA, and U.S. Coast Guard. Although it has no direct jurisdiction over these onshore areas, MMS frequently works with the Federal Agencies that do, and with oil and gas operators, to ensure that species are suitably protected.

To some extent, the knowledge needed to determine effects on protected species is limited. Of particular concern is the lack of full understanding of the long-term habitat degradation that might result from many years of discharging environmental contaminants into the essential habitats of aquatic protected species.

Some physical effects of oiling on whales, dolphins, sea birds, sea otters, and marine turtles are known from experimental studies. These include temporary fouling of whales' baleen plates, temporary skin damage on dolphins and turtles, and sea bird and sea otter mortality. Less is known about other effects such as the long-term effects of contaminant buildup in organs and tissues and of chronic oiling on species' natality, reproduction rates, and timing of sexual maturity.

Many behavioral responses of whales, dolphins, sea otters, seals and sea lions, and birds to noise have been studied and are known. These responses appear to be temporary and localized. However, the extent to which these and other protected species adapt to noise remains poorly understood. Such habituation probably varies widely among species and may be critical to determining long-term effects. The threshold at which the cumulative effects of noise or other disturbances surpass the ability of a species to continue activities essential to its survival is not generally known.

The Task Force concluded that effects on protected species and wildlife are important enough to warrant additional management attention but are not, by themselves, sufficient to justify a delay in leasing.

Sale Specific Concerns

Sale 116, Part II - Off Southwestern Florida

Protected species of special concern in this area include manatees, nesting marine turtles, American crocodiles, sooty terns, brown boobies, whales, dolphins, and marine turtles nearshore and offshore.

Continuing habitat loss and degradation caused by a rapidly expanding population and associated development in southwestern Florida threaten many of these species. For example, the manatees experience increased injury and mortality from collisions with recreational boats whose numbers increase as the population grows. Outer Continental

Shelf oil and gas activities involve minimal additional development of onshore support facilities and slightly increased likelihood of support vessel collisions with manatees. The primary risk from OCS activities is from oil spill contamination of protected species habitat nearshore and onshore. High-productivity mangrove swamps, seagrass beds on which manatees feed, green sea turtle nesting beaches, and habitat of the American crocodile are particularly vulnerable.

The FWS' biological opinion for Sale 116 concluded that there was potential jeopardy to manatees if support vessels were not limited to operations from specified support bases. The NMFS' opinion concluded that no jeopardy to marine mammal and sea turtle species would arise, but noted concerns that available information on the distribution and abundance of whales, dolphins, and marine turtles are inadequate and need to be augmented.

To protect manatees, MMS limits support vessel traffic to and from a few onshore support bases and restricts boat speeds and maneuvering in manatee areas. If development and production are to proceed, additional environmental review will be necessary, and the MMS and the wildlife Agencies will develop and implement appropriate constraints to protect manatees and other protected species.

The NAS/NRC Report concluded that information on marine turtles and marine mammals is inadequate or not sufficiently reliable for leasing decisions in this area and that still more information would be needed for development and production decisions.

The Task Force finds that existing mitigating measures and safeguards appear to be adequate and effective for protection of manatees. However, there are persistent risks to all protected species from potential oil spills. Additionally, the information on the distribution and abundance of whales, dolphins, and marine turtles offshore would be useful for enhanced assessment of environmental effects, particularly of oil spills.

Sale 95 - Off Southern California

Protected species of special concern in and near this area include gray and other "great" whales, dolphins, marine turtles, seals and sea lions, California sea otters, brown pelicans, least terns, light-footed clapper rails, and pelagic sea birds (including the world's only breeding colony of Zantus murrelet).

Because southern California is highly developed, additional habitat loss or degradation due specifically to OCS activities is unlikely. Offshore oil and gas production and wildlife populations coexist in many parts of the area, particularly in the Santa Barbara Channel where California sea lions frequently bask on oil platforms and associated equipment. Humpback whales and sea lions are frequently observed in the Channel without apparent reaction to drilling and support vessels working nearby. The numerous natural oil seeps in the area cause occasional bird oiling but have little adverse effect on protected species such as migrating whales. Still, the threat of large oil spills contacting protected species habitat, particularly in bays and estuaries, requires protective measures.

There are no recent FWS or NMFS biological opinions for leasing and exploration in the area, but opinions for a recent development plan in the Santa Barbara Channel concluded that no jeopardy to protected species would occur. These opinions expressed concerns about potential oiling and noise effects on least tern habitat and on seal and sea lion

rookeries. These concerns have been addressed through aerial overflight restrictions and through operating restrictions on oil and gas support vessels. The NMFS also expressed concern about potential cumulative effects of oil and gas and other activities on Guadalupe fur seals and gray whale migration routes.

The NAS/NRC Report concluded that available biological information is adequate for leasing decisions in this area, but more information is needed about birds along the Pacific coast of Baja California (Mexico). The report also concluded that more information would be needed for development and production decisions.

The Task Force concluded that existing information on protected species is adequate for leasing decisions. The Task Force also concluded that continued attention to mitigating measures and safeguards for protecting species of concern in the area is needed.

Sale 91 - Off Northern California

This area includes the same species of special concern noted for the Sale 95 area, except that marine turtles and Zantú's murrelets are rarer here. If oil from this area were transported into San Francisco Bay, species there (light-footed clapper rails, salt-marsh harvest mice, and California least terns) and farther south (sea otters) might also be affected severely by OCS oil spilled during shipping or unloading operations. This risk would be offset by reductions the amounts of Alaskan and other crude oil that would be brought into San Francisco from Long Beach.

Unlike southern California, northern California is relatively undeveloped. Outer Continental Shelf exploration would cause minimal habitat loss and degradation because existing support facilities would be used. The threat of large oil spills contacting protected species habitat, especially near the Farallon Islands and the numerous rookeries and haulout areas of Stellar and California sea lions and harbor seals, is a major concern.

The FWS and NMFS biological opinions for leasing and exploration in this area concluded that no jeopardy to protected species would occur. However, both Agencies expressed concerns similar to those noted for the Sale 95 area.

The major risk to protected species in this planning area is from possible oil spills. Oil spill prevention and adequate response capability are essential for managing risk to protected species in this area.

The NAS/NRC Report concluded that available biological information is adequate for a leasing decision in this area, but that more information would be needed for development and production decisions.

To further reduce potential adverse effects to protected species, the collection of additional information and the adoption of appropriate protections would be helpful. Such protections range from improved oil spill contingency planning to the adoption of buffers in the vicinity of nearshore areas important to the protected species.

The protective measures currently employed by MMS should be augmented by additional requirements as they are identified. Key questions that must be answered to assess the need for additional requirements are: (1) What are the cumulative effects of oil and gas and other activities on protected species? (2) What is the threshold at which the cumulative

effects or noise or other disturbance surpass species' abilities to continue essential activities? (3) Do protected species habituate to noise and, if so, for how long and to what extent?

The Task Force suggests that the Department of the Interior and oil and gas operators, service companies, and transportation companies cooperatively seek answers to these questions to determine areas that should be deleted or deferred from leasing and ways to optimize protection of biologically sensitive resources.

IMPACTS ON PROTECTED LANDS

Summary of Concerns

Nationally and internationally recognized, ecologically sensitive coastal areas are located near each of the three proposed sale areas. National and state parks, wildlife refuges, seashores and sanctuaries, and other public recreation areas provide unparalleled wildlife habitat as well as opportunities for public enjoyment. Everglades National Park, Channel Islands National Park, Cordell Bank, and Farallones National Marine Sanctuaries are prime examples of protected lands near the three sale areas. In addition to the areas protected by Federal statutes, there are many State and local parks, beaches, and wildlife areas in the coastal areas near the three sales.

The main environmental concern for protected lands is from the threat of a possible oil spill. The threat of damage arises from two sources; either a tanker spill from a vessel in transit, or a spill due to OCS operations. As noted earlier in this chapter, the probability of a large spill (over 10,000 barrels) from a tanker accident is greater than from OCS operations. In fact, the additional risk of a spill from OCS operations that could damage protected lands near the three sale areas is very small.

Nevertheless, the Task Force has concluded that the exceptional value of these sensitive resources justifies a high standard of protection from oil spill risk and damage, regardless of the source of risk.

The Task Force found that the current level of protection afforded protected lands in the event of a spill is the same as provided to all environmental resources under Federal oil spill contingency plans. The Task Force recognizes that these contingency plans represent a general defense against damage, but are probably not sufficient to assure that harm to especially sensitive resources would be minimized in the event of a major spill. The Task Force therefore recommends that Federal managers of protected lands should begin to prepare their own oil spill contingency response plans which includes coordination with the U.S. Coast Guard, the MMS, the oil and gas industry, and state and local governments.

Sale Specific Concerns

The resources which could be affected by a spill from tanker transport or OCS activity and which therefore need to be addressed by oil spill contingency plans differ in each of the three sale areas.

Sale 116, Part II - Off Southwestern Florida

In the Sale 116 Part II area, a large oil spill could severely affect the fragile ecosystem of southwestern Florida. This area contains a number of significant wildlife refuges, marine sanctuaries and parks, including Everglades National Park and Fort Jefferson National Monument (Dry Tortugas), which have been designated International Biosphere Reserves; and Looe Key and Key Largo National Marine Sanctuaries. The Keys-Everglades complex is the only mangrove-coral reef ecosystem in the coterminous United States. Although the entire ecosystem of the region is considered sensitive, the resources which require particular attention in specific oil spill contingency plans are coral reefs, mangroves, and sea grass beds. These provide important habitat for many species, and could be seriously harmed and slow to recover from the effects of a spill.

Sale 95 - Off Southern California

The Sale 95 area also contains national parks and sanctuaries which deserve additional protection. The Channel Islands National Park and the Channel Islands National Marine Sanctuary are located near active leases in the Santa Barbara Channel. Oil spill contingency planning for sensitive resources in this region would need to address specific protection for marine mammals, sea birds, and offshore park lands, such as the Channel Islands.

Sale 91 - Off Northern California

An oil spill would threaten similar resources in the Sale 91 area. Marine mammals and sea birds could be adversely affected and oil spill contingency plans for the Cordell Bank and Gulf of the Farallones Marine Sanctuaries are needed to minimize the impact of an oil spill on the resources and habitat of these areas.

SOCIAL AND ECONOMIC IMPACTS

Summary of Concerns

In all three areas, people attending workshops vehemently expressed the concern that the character of their communities would be changed by oil and gas operations offshore and by onshore support facilities. The changes would result from: 1) increased population resulting from the creation of new jobs; 2) demand for onshore support and processing facilities; and 3) reduction in tourism due to oil spills on beaches or the sight of offshore platforms from shore. People in northern California and southwestern Florida fear that offshore development will bring the boom-bust development patterns found in coastal areas of the central and western Gulf of Mexico. In densely populated southern California, where residents value their beaches and scenic coastline highly, the opposition to offshore development focuses on air quality degradation, land-use changes, and the fear of a major accident like the 1969 Santa Barbara oil spill.

The Task Force learned that these effects may differ over time, depending upon the phase of offshore activity. These phases are summarized in Table IV-11. For example, exploration activities generally have different population, employment, public service and land use impacts than either the development or production phases of the OCS life cycle. Moreover, the Task Force found that the terms "socioeconomic effects" or "socioeconomic

Table IV-11: Characterization of Social and Economic Concerns

	1986 Population In Adjacent Counties	Change In Population 1981-86	Employment Bases	Regional Setting	Major Concerns
Off Southwest Florida	2.2 million	13.2 %	Tourism, services, fishing	Rural, resort development, protected areas along coast	1. Land use changes 2. Visual impacts 3. Loss of Tourism
Off Southern California	13.8 million	12.7 %	Heavy industry, services, tourism	Urban with heavy industry to rural agriculture	1. Land use changes in rural areas 2. Cumulative impacts 3. Visual impacts 4. Loss of Tourism
Off Northern California	189 thousand	7.4 %	Forestry, fishing, agriculture, tourism	Rural, extensive federal and state land	1. Land use changes 2. Chronic pollution 3. Visual impacts 4. Inadequate infrastructure

impacts" are used to describe a wide variety of discrete onshore consequences which can range from waste water treatment to aesthetic perceptions.

These concerns manifest themselves in slightly different ways in each of the sale areas due to differences in population size, existing economic structure, and major land uses. For example, similar levels of offshore activity are accurately perceived to have very different infrastructure impacts in the small communities of northern California as compared with Los Angeles.

The Task Force found that thinking about onshore effects could be clarified by identifying and examining several classes or sources of impacts. For purposes of analysis, the Task Force has found it helpful to distinguish at least three types of onshore impacts which can result from offshore development: (1) direct project impacts, (2) population and employment impacts and (3) attitudes and emotions.

The first category of impacts include those which are directly caused by specific offshore activities and projects, such as dock space for supply boats, warehousing space, and construction staging areas. Direct effects also include land use changes and public service requirements associated with onshore oil and gas processing: water and sewer services, transportation, fire protection, and pollution control. Direct project impacts can occur during oil and gas exploration, development, or production. These effects tend to be physical and economic in nature because they affect the local community's infrastructure, land use, and ability to finance public services needed by the industry. Local planning to accommodate and mitigate project impacts can only be successful when industry plans are made clear, and thus can be facilitated by industry cooperation. Chapter VI discusses onshore facility consolidation and voluntary joint local government/industry committees as means for addressing project impacts.

The second class of effects includes those which are caused generally by changes in local population and employment. Examples of such effects are the impacts of growth or decline on housing demand and prices, personal income, welfare costs, school attendance and capacities, police protection, sewage treatment, solid waste disposal, and other general demands on community facilities. These effects of offshore activity on a community may be evident in varying degree for a significant period of time, and can have social as well as physical and economic dimensions. These broader community effects are often not as easy to measure and plan for as direct project impacts, but they are nonetheless real and in large degree can be anticipated, analyzed and dealt with by local plans and policies. A key element in dealing successfully with general, community-wide impacts of offshore activity is the availability of sound information and analysis upon which to base local planning decisions. Development of improved socioeconomic data and some analysis of the onshore effects of alternative offshore development scenarios during the prelease process should be useful for anticipating community effects.

The third class of impacts is not readily measured, and in fact may be impossible to resolve satisfactorily. These are the attitudes and feelings which people develop from knowing that the oil and gas industry might conduct operations nearby. Many view the industry as an intrusion on the landscape which will change the "character" of the community and thereby diminish both their enjoyment of it as well as the desire of others to visit. Perhaps the most specific concerns in this category are aesthetic objections to platforms and the fear that an oil spill will damage beaches and affect recreation and tourism. Some people who have worked hard and sacrificed in order to be able to live in an area with high quality

coastal resources are particularly upset by the possibility that those resources could be affected by oil and gas activities.

Tourism and recreation are multi-billion dollar industries in California and Florida, producing significant revenues to State and local governments. Tourism has surpassed manufacturing and agriculture to become the largest industry in California (\$36 billion revenues annually) and Florida (\$22 billion revenues annually). As the economic significance of tourism has increased, so have communities' interests in protecting the coastal and marine resources which attract visitors.

Many individuals, organizations, and government agencies believe that oil and gas development is not compatible with recreation and tourism and will result in significant economic losses at local and State levels. The Task Force found that there are few studies that establish the strength of the cause and effect relationship between offshore oil and gas activities and diminished tourism and recreation. As the NAS/NRC Report noted, the results of these studies are conflicting and inconclusive.

The Task Force recognizes the validity of community concern about such changes, but also recognizes that the nature and extent of possible effects is difficult to predict accurately at the time a lease sale is being contemplated. The difficulty in prediction of onshore effects arises because the strength and scope of community, physical, social and economic impacts depends upon the timing, duration, size, and technology of specific offshore operations. However, the character of offshore activities cannot be predicted prior to a lease sale because the number of tracts that may actually be bid upon and leased is unknown. Moreover, the location and size of the oil and gas fields, if any, that will be found, is difficult to predict. Thus, the assessment of social and economic effects prior to a lease sale must be based on scenarios that describe the offshore and onshore activities that are typical of those expected to occur rather than on predictions of what will occur, when, and where.

More accurate assessment of some social and economic effects becomes possible when lessees file exploration plans, because these indicate the location, timing, and extent of offshore exploratory drilling. This information can be used to assess the effects of the planned exploration on local population, primary and secondary employment, demand for public services and housing, and warehousing and dock space. It can also be used to revise scenarios about possible oil and gas development activities that could follow if exploration is successful.

Similarly, if exploration yields commercial oil and gas discoveries, production and development plans submitted by lessees will provide additional information for more detailed assessments of the effects on nearby communities. At this stage the need for onshore support facilities may intensify land use conflicts and increase physical infrastructure demands, while employment and population effects may diminish.

The NAS/NRC report found that the available socioeconomic information was inadequate for all three areas. It suggested that the MMS collect additional data and perform analyses of socioeconomic effects similar to those done for other major Federal projects. Despite the recognized difficulty of evaluating specific socioeconomic effects due to the uncertainties inherent in offshore leasing and exploration, the Task Force has concluded that planning and coordination could be improved by conducting more analysis at the prelease stage, and by distinguishing the several types or classes of onshore effects, each of which may call for

a different kind of assessment, planning, and local government response. Assessments need to be revised at the exploration and development stages to provide more specific and accurate projections of the effects that need to be considered in local planning.

The Task Force concludes that prelease information and analysis could be improved by collecting more socioeconomic data and using it to estimate the onshore impacts of several offshore exploration, development and production scenarios. These scenarios, and the community impact profiles derived from them, could be presented in the EIS for each proposed lease sale. The factual basis for constructing these impact profiles would be community baseline studies conducted by the MMS. These baseline studies would collect and analyze information on demography, economic structure, tax base, and expenditures, public service capacities, public and private infrastructure including utilities, land use, housing stock, and measures of social and economic status.

Many local governments near the three sale areas are faced with ongoing economic development pressures which are addressed by policies and controls embodied in a variety of land use plans and coastal zone management programs. Onshore facilities needed to support OCS oil and gas activities must comply with the procedural and regulatory provisions of these policies. Local permitting processes can ensure that acceptable sites are chosen and that adverse impacts are mitigated. Controversies often arise, however, when oil and gas support facilities are proposed.

In order to reduce such conflicts, the impact assessment information needs to be used in a consultative process that begins early in the preparations for a lease sale and continues through the exploration and development phases. Local governments, oil companies, the MMS and other Federal and State Agencies need to participate in these discussions to identify and resolve conflicts raised by onshore support facilities. **The Task Force has concluded that development of offshore oil and gas resources may create onshore land use conflicts and demands on infrastructure that need to be better addressed. Conflict could be reduced if better consultative relationships were established among the oil industry, Federal, State, and local governments and other affected parties for planning and coordinating the onshore activities of OCS lessees.**

The Task Force also concluded that OCS impacts on tourism and recreation are a major concern for which further information is needed to determine the magnitude of impacts. However, tourism losses alone are not likely to be sufficient to provide a basis for canceling or delaying lease sales. They should be addressed as a part of other efforts or new efforts to control and mitigate onshore impacts.

Sale Specific Concerns

Although public concerns about socioeconomic effect are generally similar in all three of the sale areas, there are some differences in the emphasis placed on specific effects from one area to another, and sometimes between communities within the same area. In southwestern Florida, concerns about the potential impacts of offshore development on recreation and tourism and population growth receive priority attention. In southern California, effects on tourism are also a concern, but especially so for communities south of Los Angeles and the San Diego area. For communities north of Los Angeles, onshore land use conflict and growing demands on infrastructure seem particularly important.

Communities in the Sale 91 area cite population growth and infrastructure problems which could change the character of the area and adversely affect the tourism industry.

IMPACTS ON WATER QUALITY

Summary of Concerns

Degradation of water quality near exploratory drilling rigs and production platforms may be caused by acute discharges, such as oil spills, and routine, chronic discharges of drilling muds, drill cuttings, produced waters, sanitary wastes, and oil. The scientific literature contains many studies documenting impacts of oil spills on water quality and other components of the marine environment. However, the NAS/NRC Report raised concern about the lack of information regarding impacts of long-term, chronic discharges, particularly their effects on sensitive ecosystems such as mangroves, sea grasses, and corals in Florida. The NAS/NRC Report was critical of MMS for not thoroughly monitoring conditions at existing platforms to determine the extent of chronic, long-term impacts.

The OCS discharges that cause the primary water quality concerns are drilling muds, drill cuttings and produced water. Drilling muds are fluids that lubricate the drill bit and help to control pressure in the well. Drill cuttings are fragments of the geological formations penetrated by the drill bit. They are carried to the surface with the drilling fluids. Produced water is the water brought up from subsurface formations along with the oil and gas that is extracted.

The potential for environmental harm from drilling fluids and cuttings arises from toxicity, oxygen demand and suspended sediments. Added oil (historically diesel fuel) and biocides are the primary sources of toxicity. Water based drilling muds, which have come into widespread use, have much lower toxicity than oil based muds. Oxygen demand from muds and cuttings can be high, creating low oxygen levels in the discharge area.

Suspended sediments can increase turbidity in the area around the discharge and can bury organisms living on the ocean bottom nearby. The effects of discharging muds and cuttings thus depend on the nature of the ecology on the nearby bottom and the specific content of the muds and cuttings. Depending on currents and water depth, discharged drill cuttings can smother an area within 500 meters of the discharge and increase sedimentation and turbidity. Discharged drilling fluids can create a turbidity plume which can extend up to 4 km from the discharge. Sedimentation is likely to increase out to 1 km from the discharge. At present, the most common mitigation for the discharge of drill muds and cuttings is shunting of the discharge to a water depth that helps assure that the drill cuttings settle to the bottom near the well site. This minimizes the area of the seabed that may be buried.

Produced water may contain a variety of hydrocarbons, trace metals and chemicals used in well maintenance. It is highly saline and low in dissolved oxygen. In some situations, produced water may contain radionuclides. The plume of a produced water discharge tends to sink because of its salinity, carrying the hydrocarbons and other chemicals it contains to the bottom. Generally, such discharges do not create substantial environmental harm when they occur in the open marine environment.

All discharges are regulated by EPA under the authority of the Clean Water Act through the

National Pollutant Discharge Elimination System (NPDES) program. NPDES permits issued by EPA specify the treatment required and the limits on discharges. The NPDES permit may require "no discharge" if warranted.

The Task Force concluded that the known water quality-related environmental impacts of OCS activities can be adequately evaluated and regulated under the EPA's NPDES program. The Task Force also found a lack of information on the long-term effects of chronic discharges.

Sale Specific Concerns

Sale 116, Part II - Off Southwestern Florida

Much of the concern about the effects of OCS activities on water quality off southwestern Florida focuses on possible degradation of the currently excellent water quality in this area. The waters off Florida have high clarity and good light penetration with little, if any, turbidity except in shallow areas after storms. Excellent water quality off southwestern Florida is a primary factor in the attractiveness of the area, particularly for recreational diving and fishing.

Florida has designated the State waters adjacent to State and National Parks as "Outstanding Florida Waters" and prohibits discharges that reduce water quality, including those that increase turbidity.

Former Secretary of the Interior Hodel and Florida Governor Martinez appointed a joint task force to assess the potential environmental impacts from OCS oil and gas activities in the Sale 116, Part II area. The Joint DOI/Florida Task Force members agreed that discharges from exploration platforms would occur frequently but cause water quality effects of low severity. They also agreed that site specific analyses of drill rig locations would be needed to determine the effects at a particular site. Decisions about the discharge of drilling muds and cuttings need to be based upon detailed knowledge of the organisms living on the seabed near the drilling site.

During exploration, produced waters should not present an environmental risk. However, some produced waters during the development and production phase may not meet the water quality standards for some metals. Produced waters in some parts of the Gulf of Mexico contain elevated levels of barium, beryllium, cadmium, chromium, copper, iron, lead, nickel, silver, and zinc. Such pollutants may need to be treated before produced waters are discharged. If development and production occur in the Sale 116, Part II area, measures need to be taken to ensure that discharges of produced waters do not degrade water quality near sensitive resources. Such controls are achievable within the NPDES permit process.

Sale 95 - Off Southern California

The waters off southern California are among the most heavily used in the country for both recreation and for disposal of municipal and industrial waste water. Concerns about the water quality effects of OCS activities reflect local residents' desires to avoid further degradation.

The existing discharges into the Southern California Bight are substantial. Twenty-eight municipal and industrial sources discharge over one billion gallons of effluent per day into coastal waters. Some publicly owned treatment works are discharging in violation of legal requirements, notably Hyperion (Los Angeles) and San Diego. Waste water discharged from municipal outfalls contains a number of potentially toxic chemicals. Non-point surface runoff contains a variety of hydrocarbon and toxic pollutants and is the second largest source of water pollutants, amounting to 67 billion gallons per year.

Southern California waters are also affected by natural oil seeps. Most documented natural oil seeps in the Southern California Planning Area are in the Santa Barbara Channel and on the Santa Monica and San Pedro shelves. Estimates of oil entering the water from seeps in the Santa Barbara Channel range from 40 to 670 barrels per day. More than 900 seeps have also been identified off Point Conception. One oil company has established a system for capturing oil and gas from natural seeps.

Water discharges from both existing OCS activities and those that could occur on new leases are controlled under the EPA's NPDES permits. The existing permits limit the discharge of both toxics and conventional pollutants (including oil, suspended solids and biological oxygen demand) into Federal waters off California. The NPDES system is adequate to prevent degradation of the waters off California by OCS activities.

Sale 91 - Off Northern California

Water quality in the Sale 91 area is generally excellent. Concerns about the water quality effects of OCS activities focus on the degradation of the otherwise pure waters off northern California. The excellent water quality in the area is of particular importance to the quality of fish caught in offshore fisheries, especially abalone.

During the winter and spring runoff, turbidity may increase within the river plumes. The increased turbidity is accompanied by an increase in organic and trace metal levels. These seasonal events are natural phenomena which create natural variations in water quality.

Humboldt Bay is the only region of relatively light industrial activity in the northern California. Activities in and around the bay which could contribute to oceanic water quality degradation include agriculture, industry, and sewage treatment. Two pulp mills operate on the north spit of the bay, and both have short ocean outfalls which discharge an effluent that consists of solid organic wastes and dissolved chemicals. There is much agricultural activity, including both dairy and farming operations, surrounding Humboldt Bay; this is probably the greatest source of non-point pollution in the region.

Discharges from activities on any leases issued in the northern California area need to be carefully managed to avoid degradation of water quality. The NPDES program provides the basis for appropriate assessment and control.

V. BENEFITS OF OCS OIL AND GAS PRODUCTION

PUBLIC COMMENTS ABOUT OCS BENEFITS AND ENERGY POLICY

One of the concerns repeatedly expressed in the Task Force workshops was whether there was sufficient need for and benefit from the OCS oil and gas that might be produced in the three sale areas to warrant the risks of environmental damage that could result. Many people expressed the belief that a carefully worked out national energy policy, particularly one that called for greater energy conservation, could reduce the need for oil and thus eliminate the benefit from additional OCS leasing in the three sale areas. In addition, the NAS/NRC Report noted the concern that the objectives to be served by OCS leasing and development are not adequately defined or placed in context by national energy policy.

Many opponents of leasing stated that conservation should be treated as a substitute for additional OCS oil and gas production. Because conservation reduces the demand for oil, they reason, the production of oil can be reduced by a like amount. Alternatively, because oil conservation and domestic oil production can both reduce oil imports, some regard them as substitutes in pursuing energy security goals.

The Task Force also heard from representatives of the oil industry who emphasized the importance of OCS oil and gas as a source of domestic energy supplies and expressed concern about the dangers of growing dependence on oil imports.

The Task Force regarded this issue as one of the central issues that must be addressed in making decisions about the three lease sales. It asked the Department of Energy (DOE) to conduct a briefing on the process under way for developing the new National Energy Strategy, on the trends in energy consumption, production and oil imports, and on the potential for additional oil production and conservation. The Task Force analyzed the information provided by DOE and MMS on the benefits of OCS oil and gas production. This section summarizes the results of this analysis and presents the Task Force's findings and conclusions with regard to the benefits of the three lease sales and the potential for greater oil conservation.

BENEFITS OF OCS OIL AND GAS PRODUCTION

Based on the DOE briefing and a review of MMS documents, the Task Force identified two types of benefit from the oil and gas production that could result from the three lease sales:

1. energy security benefits and
2. economic benefits.

Energy security benefits arise through reduction of oil imports. Such benefits arise by reducing the potential losses in the U.S. economy from a disruption in the supply of oil from foreign sources or from sharp increases in world oil prices. The economic benefits are those that arise in the form of additional income to individuals, governments, or corporations in the United States. Such income is derived from ownership of the oil and gas rights, as is the case of the Federal Government, or from investments in exploration and development by lessees.

As will be discussed in more detail in this chapter, the Task Force learned that the amounts of oil and gas that might be discovered in the three sale areas are significant, perhaps as much as 2 billion barrels of oil and 3 trillion cubic feet of gas, if discoveries are made in all three areas. New reserves of this amount would make a significant addition to U.S. reserves, which have been declining and are currently about 30 billion barrels of oil and 207 trillion cubic feet of gas. The economic benefits from such discoveries could be as high as \$8 billion dollars.

Energy Security Benefits

The OCS of the United States is a major source of our country's oil and natural gas supplies, providing about one-fifth of total domestic production. As transportation and heating fuels, oil and natural gas are critical components of our economy. They account for more than two-thirds of our Nation's energy requirements, and they will continue to be our primary energy sources for years to come.

Although domestic supplies of natural gas are adequate to meet most of our demand, domestic production of oil falls far short of our needs. As a result, our Nation is dependent on large volumes of oil imports. The development of our domestic oil resources in new fields, including those that might be discovered in the three OCS sale areas, would reduce our need for oil imports and thus would help to ensure that our Nation does not become overly dependent on insecure supplies of foreign oil.

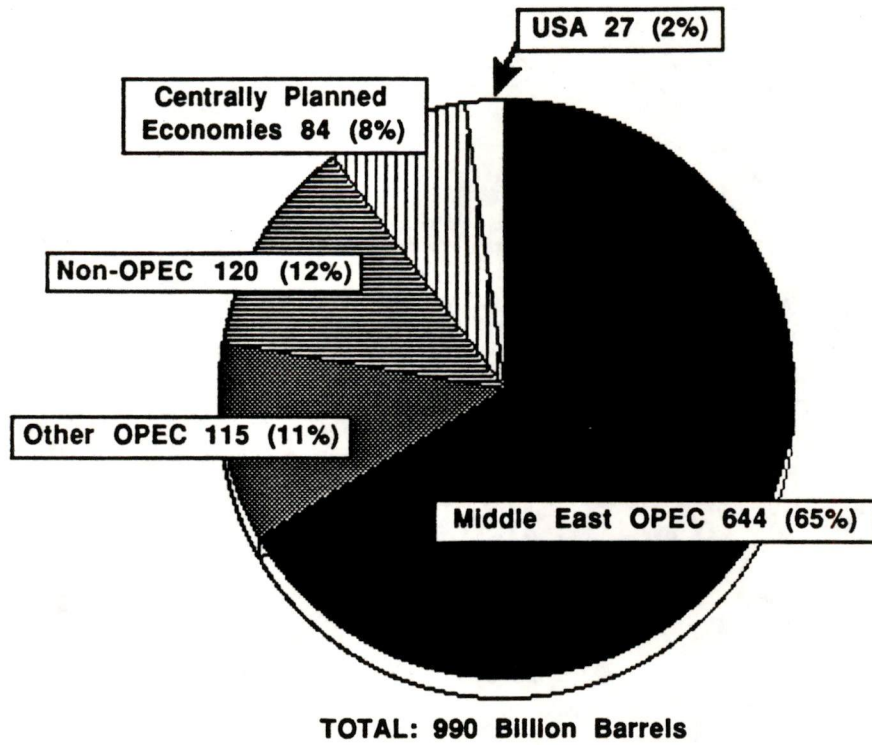
The energy security benefits of OCS oil and gas production arise because certain economic costs that result from imports are reduced by reducing oil imports. These economic costs of oil imports are losses to our economy that are not reflected in the price paid for imported oil. They include losses that result from the trade deficit as well as the losses in economic productivity that result when the economy is forced to adjust to rapid changes in oil prices or a disruption in import supplies. The oil price shocks of 1973-1974 and 1979-1980 provided many examples of these losses including recession, inflation, and widespread unemployment in industries whose business is sharply reduced when oil prices increase.

A threat to U.S. energy security, particularly the possibility of sharp oil price increases, results from concentration of the world's current oil reserves in the Persian Gulf area. Figure V-1 shows the distribution of the world's oil reserves (known oil that can be recovered economically with current technology at today's prices). Of all the world's oil reserves, over 63% are in the region surrounding the Persian Gulf. In that region, Saudi Arabia has the largest reserves, with over a quarter of the free world total. Other OPEC countries hold another 12%.

The remaining quarter of the world's reserves is spread among the non-OPEC producers. Although the United States is the largest consumer of oil and is still the second largest producer, it holds just 3% of the world reserves.

The DOE estimates that by the year 2000, OPEC's share of the world market will be between 50% and 60%, and supplies from the volatile Persian Gulf region could be between 35% and 40%.

Figure V-1: World Oil Reserves



U.S. Vulnerability to Oil Supply Disruptions

The United States will grow increasingly more dependent on oil from OPEC producers, especially those in the Persian Gulf. As a result, the United States will become more vulnerable to oil supply disruptions and oil price increases. This results from the fact that OPEC production is generally controlled by governments that coordinate their oil production and pricing policies through a cartel. The more oil the United States acquires from the world market, the more the U.S. economy is subject to the risk of damage from sharp oil price increases or supply disruptions.

There are additional risks as well. Growth in OPEC's power to set high oil prices will increase the unpredictability of the world oil market. Increased volatility is likely to have an adverse effect on capital investment in further exploration and development of U.S. oil resources and alternative energy supplies.

In the short-term, to protect our economy from sudden increases in the price of oil due to a supply disruption, the United States has built a significant strategic stockpile of oil. The Strategic Petroleum Reserve now contains over 850 million barrels of oil that can be drawn down and distributed at a rate of 3.25 million barrels per day. Our allies also maintain substantial volumes of oil stocks. Worldwide stockdraw capabilities would be sufficient to respond effectively to supply disruptions of the duration and magnitude that occurred during the 1970's.

Economic Benefits

The Task Force learned that MMS has developed measures of the economic benefits of OCS oil and gas development which it has used in a variety of decisions and which have been upheld by several court rulings. The primary measure of benefit which the MMS uses is net economic value. The net economic value of the oil and gas produced from an OCS reserve is the total value of the revenues from sale of the oil and gas produced less the total costs of the exploration, development, production, and transportation incurred to bring the oil and gas to the point of sale. Oil and gas resources for which costs are greater than the revenues from sale of the resulting production yield no net economic value.

The Task Force learned that the process used in leasing OCS oil and gas assures that only those oil and gas resources that would yield economic benefits are leased and developed. The OCS leasing system, through competitive bidding for leases and competitive, profit-oriented operation of leases by private firms, assures that only those oil and gas fields that have net economic value get produced. Fields that have net economic value yield production revenues that exceed costs. Fields that are profitable for oil companies to lease, explore, and develop have production revenues that exceed costs by enough to cover bonuses, royalties, and taxes and still provide profits to the lessee. Thus, fields that are profitable enough to attract industry investment are fields that also hold benefit for the economy.

POTENTIAL BENEFITS FROM THE THREE SALE AREAS

In order to examine in detail the potential contribution of the three sale areas, the Task Force sought answers to the following questions:

1. What are the current trends in U.S. oil consumption, production, and imports?
2. Why are these trends occurring?
3. What is the effect of these trends on the benefits from the oil and gas that might be produced if the three lease sales were to proceed?

Overview of the Current Situation: Declining Production and Rising Imports

As Figure V-2 shows, U.S. oil production has been steadily declining for the last 4 years. The sharp decline in oil prices in 1986 and the subsequent period of relatively low prices have reduced drilling activity, accelerated the abandonment of low-volume wells, and discouraged the use of enhanced oil recovery techniques. Additions to U.S. oil reserves have dropped off sharply. The rate of decline in production accelerated in 1989, resulting in a September 1989 production level of 7.7 million barrels per day, the lowest in 25 years. Through the first 9 months of 1989, production fell an average of 480,000 barrels per day, or 6% compared to last year. This is due primarily to the fact that Alaska North Slope production has begun to fall.

While production has been declining during the past 4 years, U.S. consumption of oil has increased substantially. Total oil consumption for the first 9 months of 1989 averaged 17 million barrels per day compared to 15.6 million barrels per day during the same period in 1985. The growth in U.S. oil consumption has been caused by general economic growth and the effects of lower incentives for conservation, particularly in the transportation sector. The transportation sector accounts for over two thirds of U. S. oil use, more than 11 million barrels per day. Transportation alone uses more oil than we produce domestically.

The result of declining production and growing consumption has been reliance on growing volumes of imported oil, as shown in Figure V-3. Net imports now average over 7 million barrels per day, or 42% of consumption. This is the highest dependence on imports since 1979.

Impact of Price on U.S. Production and Consumption

One of the underlying causes of these trends is the response of producers and consumers to prices. Over the past two decades, three abrupt changes in world oil prices—two upward price "shocks" in the 1970's and one price "collapse" in the mid-1980's—have demonstrated the sensitivity to price of crude oil production and consumption in the United States.

Higher oil prices in the 1970's caused a strong upturn in U.S. oil industry activity. Increased investments resulted in further drilling of existing fields in the Lower 48, as well as in new production capacity in Prudhoe Bay, Alaska. However, in the United States as a whole, the additional oil produced from the new drilling did not result in a major increase in overall domestic production. Rather, it merely halted a 10-year decline in production. Unfortunately, the reserves added as a result of this intense drilling activity were barely enough to replace the reserves depleted through production. Because the United States has

Figure V-2: U.S. Oil Consumption and Production: 1980-1989

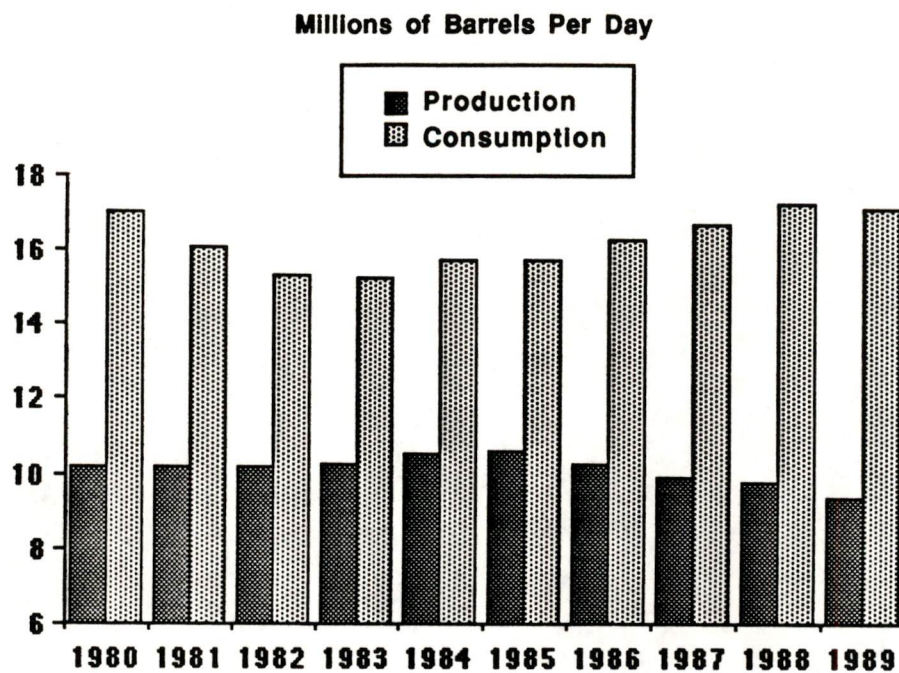
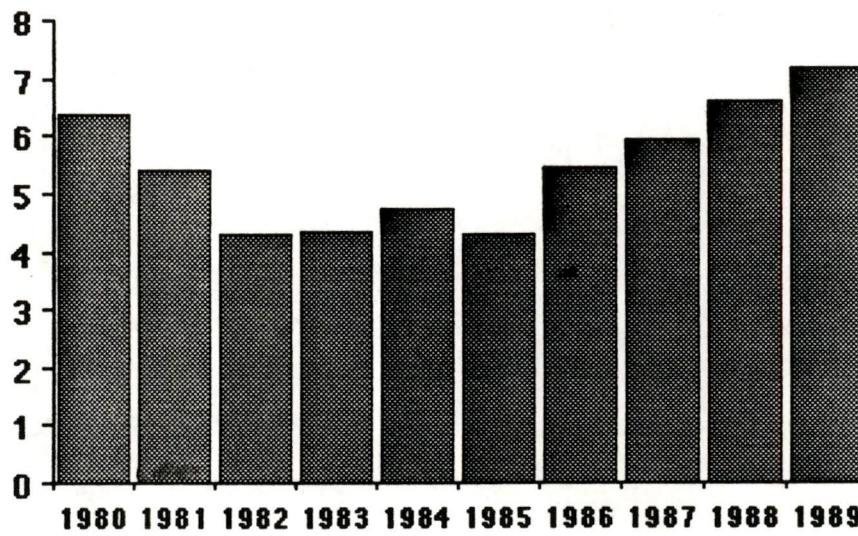
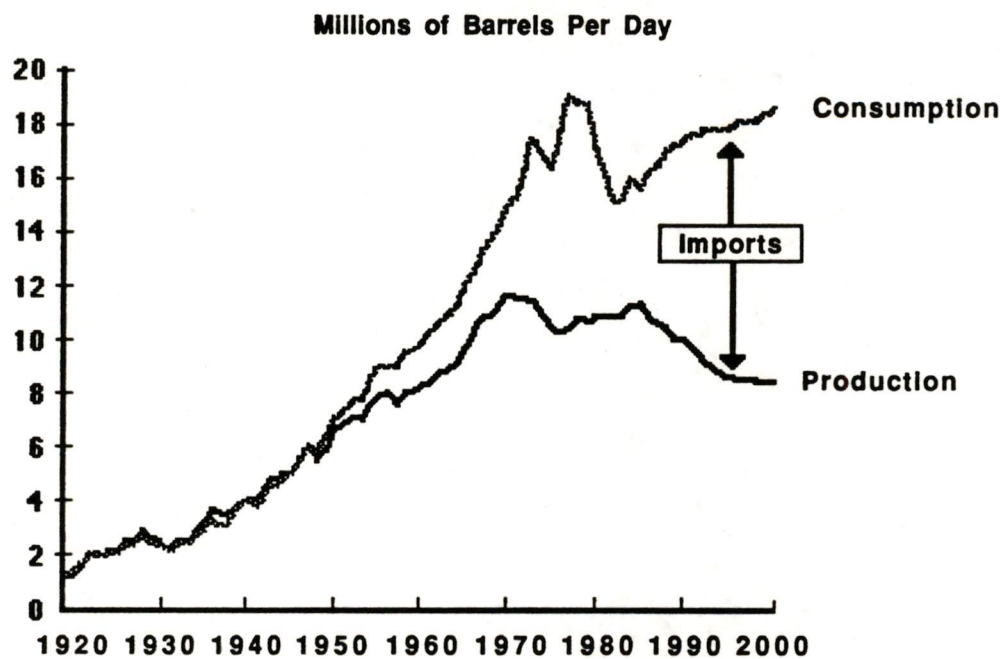


Figure V-3: U.S. Petroleum Net Imports: 1980-1989

Millions of Barrels Per Day



**Figure V-4: U.S. Oil Consumption,
Production, and Imports: 1920-2000**



been explored so extensively—over 80% of the oil and gas wells drilled world-wide have been drilled in this country—most of the very large oil fields have probably been discovered. The potential for massive additions to reserves is limited. This is especially true for the onshore areas of the Lower 48 where most of the drilling has occurred.

The 1986 price collapse and the subsequent price volatility were devastating to U.S. exploration and development investments, because most of the oil and gas resources remaining to be discovered in the United States are very costly. This makes the returns on such investments highly vulnerable to lower oil prices. The level of corporate capital investment in U.S. oil exploration and production has been steadily falling for the last 4 years, resulting in a drop in total number of wells drilled. The active drilling rig count for 1988 averaged 937, compared to 964 in 1987, and the 1981 peak of 4000. Total exploration and production wells decreased from a high in 1981 of 90,000 to a 1988 low of 30,000. This slowdown has affected exploratory drilling in new "frontier" areas, including Arctic regions and offshore areas, as well as drilling in known oil fields.

According to the DOE, the decline in drilling activity will have a serious impact on our ability to maintain domestic oil production at current levels. The number of skilled workers in the oil production and service sector—including petroleum engineers, geologists, geophysicists, jobbers, and drillers—has decreased by almost 50% since 1981. This decline limits the speed at which the industry could respond to an upturn in world oil prices.

Oil consumption is also affected by oil prices. In the 1970's, price increases motivated consumers to undertake major efforts to reduce energy consumption and to use energy more efficiently. Without the improvements in energy efficiency that have taken place since 1974, the United States would be using about 8 million barrels per day more oil than it does today.

However, lower oil prices during the past 4 years and strong economic growth in the latter part of the 1980's have once again increased our use of oil. Demand rebounded to 17.2 million barrels per day in 1988, a 3% increase over 1987 levels and the highest level of petroleum consumption since 1979.

Oil Supply and Demand Outlook for the Future

In order to determine the effects of recent trends on the benefits of the future oil and gas production that could result from the three lease sales, it is necessary to project oil production, consumption, imports, and prices for the period during which those resources would be produced. Production from the three lease sales is not likely to begin much before 2000 and will extend at least until 2030. It is difficult to project with confidence so far into the future. The DOE projections for the 1990's, however, indicate growing oil demand and continued falling production in the United States, leading inevitably to an increasing dependence on oil imports during this period.

The DOE projections are shown in Figure V-4. They are based on the assumption that world oil prices remain low, within the range of \$20 to \$28 by the year 2000. The DOE forecasts a fall in U.S. crude oil production of 2.7% per year through the next decade, resulting in an average daily production of 5.9 million barrels in the year 2000.

At these low oil prices, U.S. oil consumption is expected to reach 18.6 million barrels per day by the year 2000. Oil imports will increase from 7.2 million barrels per day in 1989 to about 9.3 million barrels per day in 1995. They could increase by another 1 million barrels per day by the year 2000.

Conventional recovery of the oil discovered to date in the United States has left about 340 billion barrels of oil remaining in the ground. Of this amount, about 17 billion barrels are currently estimated to be recoverable (using current enhanced oil recovery technology) at an oil price of \$30 per barrel in 1987 dollars. Enhanced oil recovery (EOR) techniques include more sophisticated methods of extraction, such as hot water flooding or injection of carbon dioxide or chemicals, to push the oil into the well. However, the decline in oil prices since 1986 has rendered most EOR techniques uneconomic.

An estimated 36 billion barrels of oil could be removed from known reservoirs using advanced EOR techniques. However, these advanced methods are the most expensive means of oil extraction and will only be used when the price of oil is higher than \$30 per barrel.

Low oil prices have caused the abandonment of many low-production domestic wells that are primary candidates for application of EOR techniques. The abandonment of these wells results in the loss of remaining oil resources that could have been produced. The DOE estimates that economic access to as much as 40% of the remaining resources from these low-production wells may have already been abandoned.

In the long term, the Nation must look to other energy sources that can provide an alternative to oil, particularly fuels for the transportation sector that are not based on oil. Although expected increases in automobile fuel efficiency and growing use of alternative fuels will dampen the growth rate of U.S. oil consumption, American consumers will remain heavily dependent on oil well into the next century. Consequently, economic and environmentally sound development of the Nation's remaining oil resources, including those that might be found in the three lease sale areas, will be needed.

Potential Contribution of OCS Resources to U.S. Oil Reserves

Domestic oil production plays an important role in the U.S. energy balance, providing about one-quarter of total energy consumption. There is little chance of finding a number of supergiant oil fields like the ones that have dominated U.S. oil production in the past. Thus, U.S. oil production in the future will be comprised of many smaller fields. Each increment, including the potential production from the three lease sale areas under consideration, represents an important addition to total U.S. production.

Until new oil and gas fields have been located by drilling, it is not possible to be sure that any new production will result from lease sales in the three areas. There is a chance that no oil and gas will be found. Using seismic data, the MMS is able, however, to identify possible reservoirs and estimate the amounts of oil and gas they could contain if, in fact, they contain any oil and gas at all.

The MMS has prepared estimates of undiscovered oil and gas resources for each of the three sale areas, based on the assumption that at least one developable field will be found in the area. Because of the uncertainty in the estimates, the Task Force concluded that it is

appropriate to recognize the range covered by the estimates instead of focusing on a single number. The low estimate in the range is the amount which is rated as having a 95% chance of being found or exceeded if there is oil or gas present. The high estimate is the amount rated as having only a 5% chance of being found or exceeded if there is oil or gas present.

The MMS estimates for the currently unleased acreage in three sale areas are as follows:

Lease Sale 116, Part II, off southwestern Florida:

- from 190 to 880 million barrels of oil,
- from 0.04 to 0.12 trillion cubic feet of natural gas.

Lease Sale 95, off southern California:

- from 200 to 960 million barrels of oil,
- from 0.37 to 2.10 trillion cubic feet of natural gas.

Lease Sale 91, off northern California:

- from 20 to 92 million barrels of oil
- from 0.49 to 1.67 trillion cubic feet of natural gas.

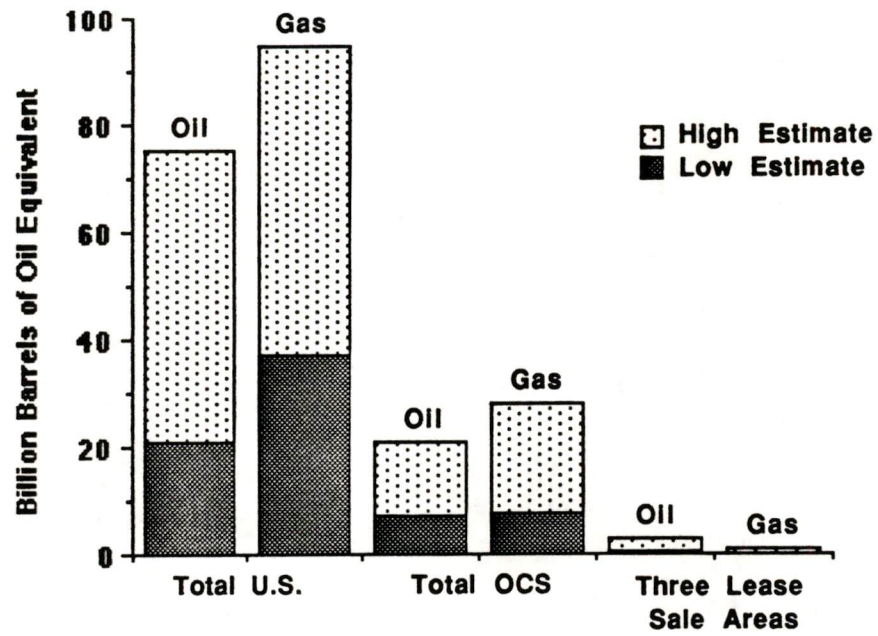
If all three areas contain developable oil and gas fields, they could contain over 2 billion barrels of oil and over 3 trillion cubic feet of natural gas. Total U.S. OCS undiscovered economically recoverable resources are estimated at about 4 to 14 billion barrels of oil and about 44 to 114 trillion cubic feet of gas. Thus, the resources that might be located in the three lease sale areas are significant, representing about 14% of total OCS oil resources and 3% of total OCS gas resources. Figure V-5 shows a comparison of the estimates of undiscovered economically recoverable oil and gas resources for the three sale areas, the entire OCS and the total for the United States.

Concerns About the Estimated Amounts of Oil and Gas

Local residents near each sale area told the Task Force that in their view, the amount of oil and gas estimated to be in the sale area was so small that it did not warrant taking the risks associated with exploration and development. Often, this point was made by citing the number of days that the estimated amount of oil would last at current consumption rates. The Task Force examined this concern in light of information from the MMS on the amounts of oil and gas that might be discovered in each sale area. It also reviewed the NAS/NRC assessment of the adequacy of the data and methods on which MMS based its assessment of the resource potential. The NAS/NRC concluded that the methods and data used by the MMS to estimate undiscovered oil and gas resources in the three areas were adequate. The NAS/NRC noted that the methods used by the MMS would tend to underestimate the amounts of undiscovered oil and gas resources in a sale area.

Based on its review of this information, the Task Force identified two problems that need to be addressed. The first problem arises from the estimating methods that are used to reflect the uncertainty inherent in all measures of undiscovered oil and gas resources. These methods yield estimates which can be misleading about the amounts of oil and gas that will be developed if exploration is successful. The second problem arises from the widespread practice of estimating the number of days of U.S. oil consumption that would

Figure V-5: Comparison of Estimates of Undiscovered Economically Recoverable Oil and Gas



be provided by the estimated amounts of oil and gas.

In reviewing the MMS and NAS/NRC materials on oil and gas resource estimates, the Task Force recognized that the fundamental problem is that only exploratory drilling can provide reliable information about the location and size of oil and gas fields in an area. Until drilling has been completed, estimating the amount of oil and gas that might be found and produced in an area is similar to estimating the amount of prize money that will be won from a handful of lottery tickets. All that can be known is that there might be a grand prize, a minor prize or two, or no prize at all.

Analysts have developed ways to estimate the value of a lottery ticket that reflect the chances of winning a prize. Using these methods, a lottery ticket with a 1 in 1 million chance of yielding a \$1 million prize is worth \$1. Both the prize and the chance of winning it are reflected in this estimate. The value is much smaller than the prize because of the small chance of winning. The actual outcome, however, is either zero or \$1 million.

Unfortunately, estimates made using similar methods to reflect all the possible outcomes of oil and gas exploration can be misleading to those trying to determine if exploration is worthwhile. The MMS and the NAS/NRC agree that the mathematically correct way to express the amount of oil and gas that might be found in an area uses the various amounts that are possible, including zero, and the chances for finding each amount. The statistics on oil and gas exploration show that the vast majority of prospects that are drilled are found to contain no oil or gas. Estimates for an area that reflect an 80% or 90% chance of finding no oil or gas in each prospect, in addition to the small chance of finding significant amounts, are smaller than the amounts that might actually be found. Such estimates are technically referred to as risked mean estimates.

For a sale area, there is only a small chance that the amount of oil and gas actually discovered will be equal to the risked mean estimate. Often, the most likely result of exploration is no discovery. If oil and gas are found, the amount is most likely to be greater than the risked estimate. The Task Force has concluded that the use of risked mean estimates, while mathematically correct, can be misleading to those not familiar with the methods used to compute such estimates.

The MMS also produces "unrisked" estimates of the amounts of oil and gas that might be found in an area. The technical term for such estimates is "conditional" estimates, because they are predicated on the condition that oil and gas deposits exist in the area. To illustrate, a conditional estimate for a lottery ticket that could pay \$1 million is \$1 million. Conditional estimates give a better sense of the gains that might result. Their primary limitation, however, is that the conditional estimates for a number of areas cannot be added together without allowing for the change in the probabilities. The chances of winning \$5 million from 5 tickets in 5 lotteries like the one above are much less than the chance of winning \$1 million in one lottery.

Both risked and conditional estimates need to be considered in assessing whether the resource potential of an area makes it worthwhile to lease. Risked estimates are useful for comparing the potential of areas with different chances of discovery. Conditional estimates, on the other hand, give a better sense of the amount of oil and gas that might be found in an area. The estimates provided earlier in this chapter are conditional estimates.

The second problem to be addressed is raised by those who compute the number of days that an estimated amount of oil would last at the current rate of oil consumption in order to judge the potential benefit of leasing an area. The Task Force heard such computations repeatedly in its workshops. Local residents most frequently concluded that because the estimated amount of oil was only a few days of consumption, it was not worth leasing.

The Task Force examined this issue by analyzing whether such an approach would give logically consistent results and whether the number of days of oil consumption is a good measure of the benefits of OCS oil production. In general, if such a comparison is logically consistent, then the greater the benefit from a given amount of oil, the more worthwhile it should appear from the computation. If providing oil for consumption is a primary benefit of OCS production, then the greater our rate of consumption, the more important it is to have production to meet that consumption.

Computing the number of days of consumption that could be provided by the estimated oil in a sale area gives the opposite result. The greater the rate of consumption, the fewer the number of days a given amount of oil could cover. Thus, if we were consuming relatively little oil as the result of very successful conservation efforts, such a comparison would make leasing in a sale area appear more beneficial than if we were consuming oil at a profligate rate. The number of days of consumption is clearly not a logically consistent indicator of the benefit of leasing in an area.

Furthermore, if all oil and gas discoveries yielding only a few days of U.S. consumption were forgone, the cumulative effect would be crippling to U.S. production because most individual discoveries are smaller than those expected in the three sale areas. There are only a few areas of similar size in the United States that hold the potential to contribute as much to future domestic oil and gas discoveries as these three areas.

As discussed in the previous section, the Task Force has concluded that the energy security benefits and the economic benefits are the best measures of the benefits of producing OCS oil and gas. Neither of these types of benefits is captured by computing the number of days of consumption covered by the estimate of the oil to be found.

In conclusion, the Task Force finds that the number of days of oil consumption from a given lease sale is not a useful way to judge whether that sale is worthwhile.

Contribution of OCS Oil and Gas to the Economy

The MMS has also helped the Task Force prepare estimates of the economic benefit that could result if the estimated amounts of oil and gas are found. These estimates are based upon the assumption that oil prices grow from about \$19 to about \$28 (in constant dollars) in 2030. These projected oil prices are generally consistent with DOE's projections. The Task Force recognizes the possibility that the economic benefits could be larger if oil prices grow more rapidly than assumed. The net economic value estimates for the three areas are as follows:

- Lease Sale 116, Part II, off southwestern Florida:
- from \$0.4 to \$1.8 billion

Lease Sale 95, off southern California:
• from \$0.9 to \$4.3 billion

Lease Sale 91, off northern California:
• from \$0.4 to \$1.4 billion

The Task Force has examined the potential for realizing both the energy security and economic benefits from OCS production. **The Task Force finds that such benefits are important to the Nation. Therefore, the Task Force concludes that careful consideration should be given to leasing proposals for the three sales and their associated environmental issues. None of these leasing proposals can be rejected as having insufficient potential benefits to warrant consideration.**

ENERGY POLICY AND CONSERVATION

The Task Force examined the question of whether the development of a new National Energy Strategy could, by incorporating additional conservation measures, reduce or eliminate the need for the additional OCS production that may result from the three lease sales. To do this, it first analyzed the logical relationship between oil conservation measures and the benefits of OCS oil and gas production. Then, it reviewed the information provided by DOE on the potential for additional oil conservation.

Oil conservation measures are attractive because they have the added benefit of avoiding the environmental effects that can result from both the production and the consumption of oil. In this view, additional oil conservation measures should be considered as alternatives that would avoid the environmental effects of leasing oil and gas in each of the three sale areas. If conservation and OCS production are substitutes, then it follows that a national energy policy which calls for greater conservation should call for less OCS oil and gas production, perhaps eliminating the need for leasing in one or more of the three sale areas. Following this logic, decisions to move forward with leasing in the three sale areas should not be made until the new National Energy Strategy being developed by DOE has been completed.

The Task Force began with the principle that in order for two actions to be true logical substitutes for each other, the conduct of one must essentially eliminate the motive for undertaking the other. It then examined oil conservation to determine whether additional conservation could eliminate the benefits that could be realized from additional oil production.

Many conservation measures are worthwhile on their own merits; that is, they reduce oil imports, producing both energy security benefits and economic benefits. Oil conservation can produce energy security benefits by reducing the amount of oil imported by the United States. Conservation measures yield economic benefits in the same manner as oil production, by costing less than the cost of the oil they save. Oil conservation can also yield environmental benefits by avoiding the environmental damages that result from oil production and consumption.

While both OCS production and oil conservation can reduce oil imports, the key question is whether they are substitutes for each other in producing benefits. The Task Force found that they are not. Substitute measures must be able to replace each other; using one measure must eliminate the reason for using the other for such replacement to occur. If it does not, then the two actions can be taken together to produce greater benefits than each could produce separately or to help achieve the same objective more effectively than either one by itself. Two such actions are complements rather than substitutes.

The Task Force examined the question of whether oil conservation and OCS oil production are likely to be substitutes in achieving energy security benefits. For this to occur, oil imports would need to be low enough to permit the additional conservation measures in question to reduce imports to a level at which the economy would be much less severely damaged by oil supply disruptions or price shocks.

A substitute for OCS oil production in producing economic benefits must therefore leave essentially no benefits to be realized from the oil production in question. One way of posing the question then, is: can oil conservation make otherwise profitable oil fields unprofitable? For oil conservation measures to have such an effect, they must increase the costs of finding and producing OCS oil or decrease oil prices, or both, sufficiently to make costs exceed price. Otherwise, conservation would not reduce or eliminate the economic benefits of additional oil production. Oil conservation is not likely to affect the costs of oil and gas operations. A substantial reduction in U.S. oil demand might, however, reduce the world oil price. For this effect to be measurable, the conservation measures in question must substantially reduce the total demand for OPEC oil.

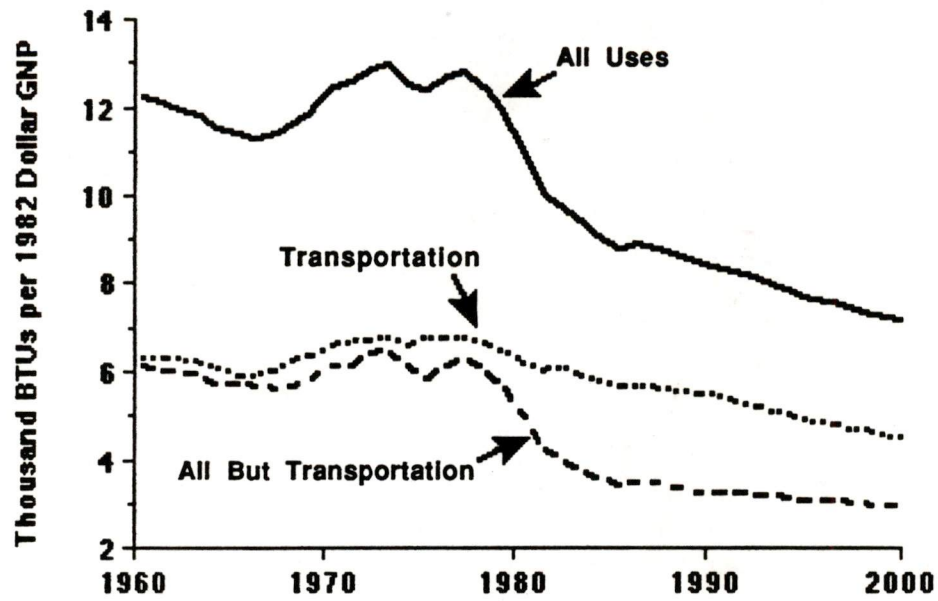
The Task Force reviewed materials provided by DOE on energy conservation in general and oil conservation in particular to determine whether it is likely that oil conservation in the United States could have these two effects. These materials and the Task Force analysis are summarized below.

The Potential for Increased Oil Conservation

As shown in Figure V-6, the concentration of oil use in the U.S. economy has fallen 31% since the late 1970's, from 12.2 thousand Btus per dollar of GNP in 1978, to 8.4 thousand Btus per dollar of GNP in 1988. This decline in oil use is due to a number of changes in our economy. Improvements in equipment design have increased efficiency. Fuel switching has played a major role in decreasing our dependence on oil. In many cases, residential, commercial, and industrial consumers have substituted natural gas, coal, and electricity for oil. Increased imports of oil-intensive goods, such as plastics and steel, have led to changes in the mix of domestically produced goods.

Changes in energy prices have strongly influenced energy conservation by causing a diverse set of consumption responses within all sectors of the economy. The high oil prices of the 1970's brought an energy awareness to industry, homeowners, and transportation operators. This stimulated the search for better ways of using energy. For example, consumers purchased more fuel-efficient vehicles and appliances, adjusted thermostats, and weatherized their homes. Businesses replaced heating and cooling equipment, installed energy-management systems, and built more efficient buildings. Manufacturers adopted more efficient processes and equipment. Concurrently, higher energy prices caused industrial growth to shift from energy-intensive industries, such as

Figure V-6: U.S. Oil Use Intensity



making steel, toward less intensive goods and services, further slowing the growth of energy use. Other important factors, including efficiency standards, technology development efforts, and information programs, facilitated this market response to the increased energy prices.

The most important part of this market response has been the adoption of new, more efficient technology. Improved efficiency in new cars, appliances, buildings, and industrial heat-recovery equipment are examples of technology development that provided products that used less energy but still delivered the same level of goods or services. These responses, which produced most of the 37 quad savings over the 15-year period from 1973 to 1988, were seen in all sectors of the economy.

Oil can be conserved in three ways: (1) by using it more efficiently, (2) by substituting other fuels, or (3) by curtailing the consumption of goods and services that use oil. Some efficiency improvements and fuel changes are economical under currently projected prices. These changes can be expected to be made through the normal operation of the economy and will produce direct economic gains. Other efficiency improvements and fuel changes are technically feasible but would not be economic unless oil prices grow more rapidly than projected. These changes could be made to occur, at least to some extent, by governmental action.

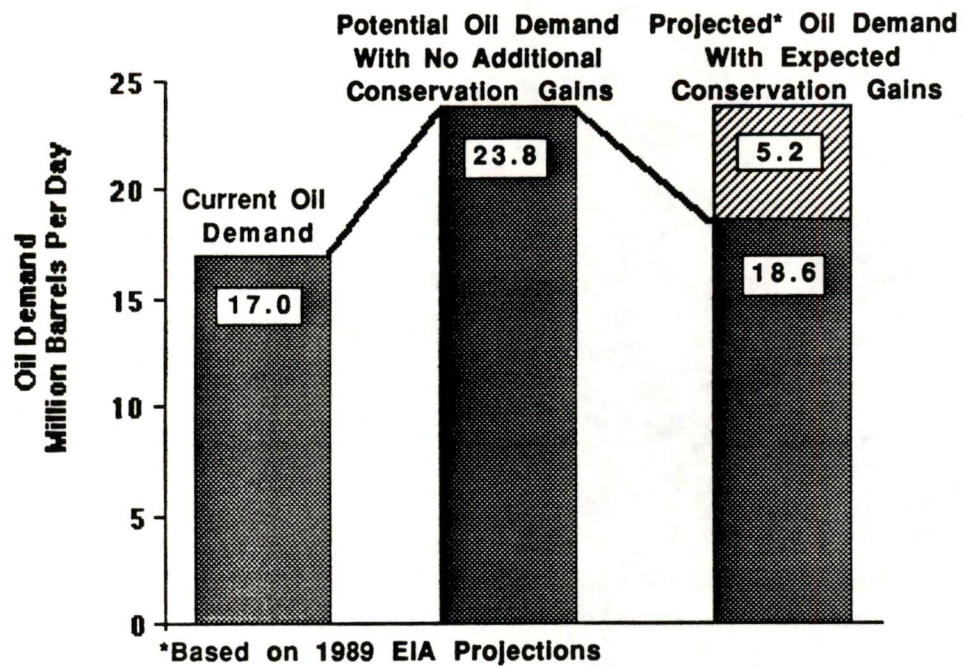
Although the potential for overall energy conservation is large, the potential for oil conservation without substantial curtailment is more limited for several reasons:

- Fewer economic retrofit opportunities exist, and, with current oil prices at relatively low levels, there is less price driven incentive to increase efficiency.
- Outside the transportation sector, only a limited amount of new boilers and processing equipment, is being purchased. This restricts the market penetration potential of more efficient equipment, and it discourages research and development of more efficient oil-using technology.
- A large amount of fuel switching already has taken place. The potential for more fuel switching depends on expanding gas availability in oil-dependent regions or developing more efficient electricity-using technology.

As shown in Figure V-6, a continuing decline in the oil intensity (oil use per dollar of GNP) is expected to result from normal operation of the economy under projected oil prices. Most of the decline is expected to come from continuing gains in transportation fuel efficiency. Only small gains are expected in the non-transportation sectors because of the lack of economic incentives and the limited opportunities for improved efficiency that remain. Even the larger gains projected for the transportation sector are speculative, given current forecasts of relatively low future oil prices and consumer indifference to auto fuel economy.

As Figure V-7 shows, the projected declines in oil use relative to our economic growth, if realized, will produce about 5 million barrels per day of oil additional conservation savings. Three-quarters of these savings will be in the transportation sector due to turnover in the

Figure V-7: Oil Conservation Potential to the Year 2000
In Millions of Barrels Per Day



Source: DOE, 1989

automotive and truck fleet and an expected increase in new vehicle efficiency. Aircraft efficiency will also rise as newer, more efficient aircraft are brought into the fleet.

Outside the transportation sector, the largest gain in oil conservation will likely come from the substitution of natural gas and coal for industrial residual and distillate oil. Also, trends indicate a continuing shift towards more electricity-intensive economic activity. The buildings sector of the economy will make a small contribution to oil savings as oil-heated homes make up a declining portion of total housing. However, even with these expected conservation gains, oil demand is projected to increase to over 18 million barrels per day by the year 2000.

Potential Additional Oil Conservation Beyond Expected Savings

The expected gains in oil conservation during the next 10 years do not include conservation potential that is technically feasible but not likely to be realized under current policies and market conditions. Additional conservation could be achieved through further, technically feasible, fuel switching and efficiency improvements. These potential additional savings primarily are in the transportation sector. Realizing oil conservation potential beyond expected savings would require major shifts in transportation modes and fuels under conditions that are unlikely to be either economically efficient or viable in the near term.

The greatest potential for reducing U.S. oil demand lies in the transportation sector. As Figure V-8 shows, transportation accounts for approximately two-thirds of total U.S. oil use. The technology to increase the fuel economy of cars, trucks, and aircraft is well developed and much is already in production. The potential impact of this technology is enhanced by the relatively high rates of additions to and turnover of the fleets of vehicles and aircraft. However, even with the technology that is now available, major changes in product design and consumer acceptance would be required to achieve additional, technically feasible conservation.

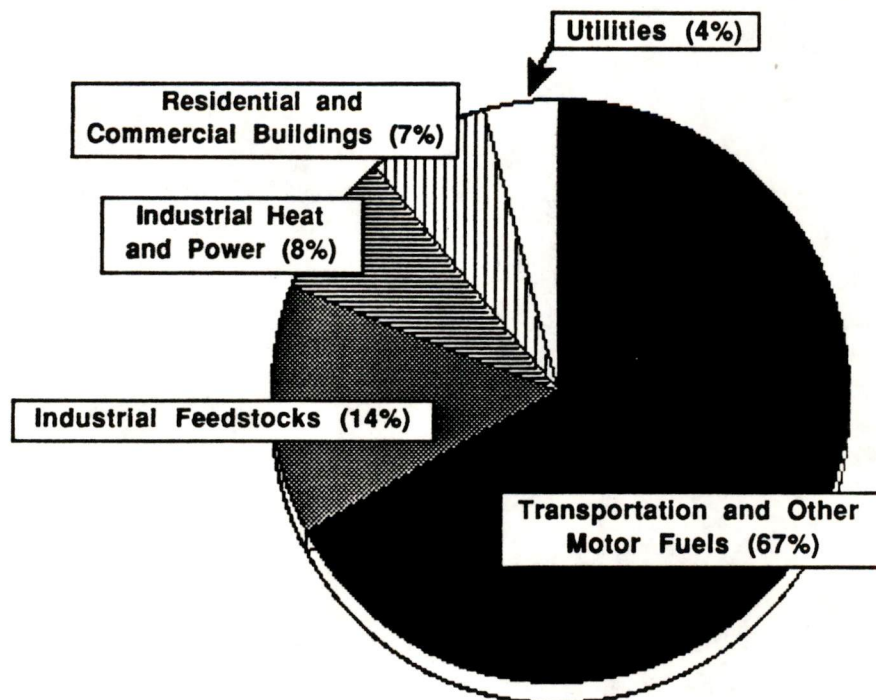
A large amount of fuel substitution may be technically feasible in the transportation sector. This would require extensive use of alcohol fuels, methanol or ethanol, compressed natural gas, propane, and gasoline additives. The prospects for increased use of these fuels would be enhanced by enactment of the President's Clean Fuels Program.

The technology needed to use alternative fuels, such as methanol or compressed natural gas, or even electricity, is currently in the demonstration stage. However, 30 to 40 million compatible vehicles and \$20 to \$30 billion in investments would be required to build a large alternative fuels infrastructure.

The residential and commercial buildings sectors combined account for a small portion of total U.S. oil consumption, all of which is used for space and water heating. Less than 20% of the total energy used in these sectors is provided by oil, and over one-half of that amount is used in the northeast where access to natural gas is limited.

The large fraction of buildings that have already been retrofitted limits the potential for further economically efficient improvements in existing buildings. Also, the ability to fully substitute fuels in these sectors is constrained by the nature of those buildings still using oil. The majority of these buildings and homes are old and in rural locations where access to other fuels is limited or expensive.

Figure V-8: Current U.S. Oil Use
1988 Demand - 17 Million Barrels Per Day



Oil conservation potential in the industrial sector is limited by the special-purpose nature of industrial oil use. While oil accounts for more than a third of the sector's energy use, only a quarter of this amount is used as fuel for heat and power and could thus be replaced. Oil uses such as feedstocks, asphalt, lubrication, and wax are technical dependencies that cannot be readily reduced through substitution or efficiency increases.

Non-feedstock or non-refinery fuel uses, such as building and water heating, crop drying, and steam raising/process heat, are the most promising for efficiency improvements in the industrial sector.

The primary opportunity for substitution in this sector would be the use of natural gas in lieu of residual fuel oil. No substitution of light oil products, such as distillate fuel oil, seems likely in the short- to mid-term, since over 80% of industrial distillate is used in remote locations where fuel substitution is technically difficult.

The electric utility sector is not a major consumer of oil. Therefore, it has limited ability to contribute to oil conservation potential. In 1988, oil-fired electric power generation accounted for only 6% of total generation and 4% of total oil consumption. Options for further reducing oil consumption in this sector are limited to switching from oil to gas, mainly in the northeast, and increasing electric power output from existing nuclear plants. Because of the fuel conversion that has already taken place and the limited remaining opportunities for conversion, oil conservation potential in the electric utility sector through the year 2000 is minimal.

Summary of Oil Conservation Potential

The potential for additional oil conservation in the United States, beyond the savings that are already expected to occur as the result of projected prices and normal economic processes, is summarized as follows:

- Much of the oil use that is embedded in all sectors of the economy has no readily available substitutes, and there are limited options for use of new conservation measures.
- Oil use is likely to grow as the U.S. economy grows, even if additional conservation potential is realized.
- The technical potential for oil conservation could, if fully realized, keep oil use at today's level or possibly marginally reduce it, but it would be uneconomic at currently projected oil prices.
- Major changes in the industrial infrastructure and transportation system would be required to achieve oil conservation beyond the savings that are expected to occur.
- Even with major infrastructure changes, such as expansion of the natural gas distribution system, most of the additional conservation measures would not be cost effective at current oil prices. Higher oil prices, or another strong economic or regulatory stimulus, in addition to infrastructure changes, would be required to achieve additional oil conservation beyond expected savings.

The DOE's analysis makes clear the fact that the United States does not have the potential to eliminate oil imports in the next decade or two by undertaking even the most technologically advanced conservation measures. The DOE's analysis also shows that it is not likely that the estimated savings from oil conservation will be sufficient to reduce world oil prices to the point that there would be no economic benefit from development of the oil and gas resources that might be found in the three sale areas.

The conservation estimates above cover oil savings that are likely to result from the incentives created by oil prices or the use of technically feasible though uneconomic oil efficiency and fuel switching improvements. These estimates do not deal with oil use curtailment, that is, the reduction of oil consumption that might be achieved if the Government instituted policies to require less consumption of goods and services that use oil than consumers would otherwise choose, given the prices that exist. Implementation of such policies would need to be based on widespread agreement that it is better for people as consumers to give up some part of the value which they associate with energy services than to suffer the losses that are expected to result from substantial dependence on oil imports in future decades.

A number of participants in Task Force workshops raised the possibility that oil conservation in the form of Government instituted curtailment could eliminate the need for the oil and gas production that could occur in the three sale areas. The Task Force examined the question of whether such curtailments, if added to the estimates of economically and technically feasible conservation, could eliminate the benefits of oil and gas production in the three areas.

Only by drastic curtailment, that is, widespread restriction of oil consumption which American consumers would otherwise enjoy, could imports be reduced below 5 million barrels per day as they were at their lowest level in the 1980's. Even if this were to happen, it is not likely to reduce the world oil price sufficiently to make development of the oil and gas resources in the three areas uneconomic. The Task Force recognized that it would take a substantial amount of oil use curtailment to achieve this result.

While some individuals believe that such curtailment is needed, it is unclear whether the majority of people in the United States would support extensive governmental restrictions on oil consumption. The Task Force concluded that there is little evidence at this point that the American public would support enactment of oil use curtailments substantial enough to eliminate the benefits of oil and gas production in the three areas.

Absent large scale curtailment of oil consumption in the United States, the total oil production from all economical possibilities, including the three OCS lease sales, leaves substantial levels of oil imports that could be reduced further by conservation. Furthermore, the total of all potential oil conservation measures, save drastic curtailment of oil use, leaves substantial oil imports that could be reduced by additional oil production. More importantly, the combination of all possible economic oil production and economic and technically feasible conservation measures still leaves oil imports that could be reduced by even further production and conservation should new opportunities for either or both emerge in the future.

The conclusion for the purposes of the Task Force's work is as follows: greater oil conservation, though a worthwhile component of a National Energy Strategy, would not eliminate the national benefits from, and is not a substitute for, the additional oil production that may be achieved from leasing and development in the three sales under review by the Task Force. These sales should be considered on their own merits, that is, by evaluating the potential environmental effects which remain despite appropriate protection and mitigation measures and considering whether such effects are acceptable in light of the potential benefits. Oil conservation measures are an important part of our national energy policy and will be considered on their own merits.

VI. ASSESSMENT OF OPTIONS AND ENVIRONMENTAL PROTECTION MEASURES

SUMMARY OF OPTIONS DEVELOPED BY TASK FORCE

The Task Force has developed three options for each of the three sale areas, plus a set of additional environmental protection measures which should be developed for application, where appropriate, to leases issued in the future in all three sale areas.

All options provide for the collection of additional information in response to the findings of a report by the NAS/NRC which found some of the available information inadequate for leasing decisions.

All options provide for additional environmental protection measures. Some address environmental concerns specific to a sale area, others could be applied in all three areas.

The options differ primarily in the timing of the lease sales and in the limits placed on the location of leasing or drilling. Option C for each sale generally delays future leasing decisions longer than Options A and B.

In developing options, the Task Force recognized that OCS lease sales must be scheduled in a 5-year leasing program approved by the Secretary of the Interior. The three lease sales addressed by the Task Force, as well as follow on sales in the same OCS areas, are scheduled in the 1987-1992 5-Year Leasing Program. Additional sales could be scheduled in a new 5-year leasing program. The Secretary is tentatively planning to release a proposal for a new 5-year program for comment in March 1990. If gaps and overlaps between 5-year programs are avoided, the new program will cover the 1992-1997 period. It would be followed by a 1997-2002 program. The options for the three sale areas reflect the structure imposed by the 5-year program requirement.

The Task Force has also identified several measures which, if implemented, would provide substantially greater protection for environmental resources while still allowing exploration, development, and production programs to continue. Consideration of these measures responds to the Task Force's finding that OCS activities can in fact, have negative effects on important and valuable environmental resources, but that most instances of adverse effects are not so important as to warrant or justify delay or cancellation of leasing. Thus, where future exploration, development, and production occur in the three sale areas, the following control and mitigation measures should be considered:

- Require transport of OCS oil in pipelines where technically feasible and environmentally preferable;
- Improve OCS oil spill risk assessment, contingency planning, and response capability;
- Encourage consolidation of onshore facilities to reduce demand on existing public services, infrastructure, and land use changes;
- Establish processes to assist local communities to address onshore impacts associated with OCS development;
- Require no discharge of drilling muds/fluids in sensitive areas;
- Establish joint oil/fishing industry coordinating committees in areas where OCS activities are likely to conflict with commercial fishing; and
- Strengthen policies to protect environmentally sensitive areas.

These measures are discussed in greater detail beginning on page VI-16.

Sale 116, Part II - Off Southwestern Florida

SALE 116, PART II SUMMARY

Acreage	~ 14 million															
Number of Tracts	2500 whole or partial blocks															
Sale area status	FEIS completed October 1987; proposed Notice of Sale delayed															
Sale timing	At the time of the President's call for study, it was considered procedurally possible to hold a sale in 5-6 months															
Mean resource estimate	110 million barrels of oil are expected to be leased, developed, and produced															
Probability of commercially recoverable discovery	99%															
Net economic value	About \$218 million															
Cumulative oil spill risk	<table><tr><td></td><td colspan="2">PROBABILITY OF ONE OR MORE SPILLS</td></tr><tr><td></td><td>Without Sale</td><td>With Sale</td></tr><tr><td>SPILL SIZE</td><td></td><td></td></tr><tr><td>≥1,000 bbl</td><td>>99.5%</td><td>>99.5%</td></tr><tr><td>≥10,000 bbl</td><td>96%</td><td>97%</td></tr></table>		PROBABILITY OF ONE OR MORE SPILLS			Without Sale	With Sale	SPILL SIZE			≥1,000 bbl	>99.5%	>99.5%	≥10,000 bbl	96%	97%
	PROBABILITY OF ONE OR MORE SPILLS															
	Without Sale	With Sale														
SPILL SIZE																
≥1,000 bbl	>99.5%	>99.5%														
≥10,000 bbl	96%	97%														

Location of Sale Area and Estimated Hydrocarbon Resources

Proposed Lease Sale 116, Part II contains about 14 million acres in the 74 million acre Eastern Gulf of Mexico Planning Area.

The Eastern Gulf of Mexico Planning Area is the OCS region which lies offshore the entire coastline of western Florida from near Mobile, Alabama to the Florida Keys. The Sale 116, Part II area includes only the region offshore the southwestern Florida coast south of 26 degrees north latitude, from Naples to the Florida Keys. This area is known as the South Florida Basin. There are 73 existing leases in the sale area. Figure II-2 shows the location of Proposed Sale 116, Part II within the Eastern Gulf of Mexico Planning Area.

The MMS's mean estimates for the oil and gas resources in the Sale 116, Part II area are 610 million barrels of oil and 110 billion cubic feet of gas. The probability of at least one commercial accumulation is 100%. Of this total resource, 490 million barrels of oil and 80 billion cubic feet of gas are estimated to be unleased; 140 million barrels of oil and 30 billion cubic feet of gas are estimated to be within the 73 existing leases. The amount expected to be leased as a result of Sale 116, Part II is a portion of the total unleased resource estimate; 110 million barrels of oil (and no commercial quantities of gas) are estimated to be leased, developed, and produced as a result of Sale 116, Part II. The probability of at least one discovery of commercial quantities of hydrocarbons on leases issued in Sale 116, Part II is 99%.

The standard method for measuring the benefits of OCS activity is to estimate the net economic value of potential production. The national economic benefit from holding a lease sale in this area is estimated to be about \$218 million, assuming oil prices gradually increasing from \$19 per barrel.

Option A:

Cancel Sale 116, Part II, and defer subsequent leasing decisions until additional oceanographic, ecological, and socioeconomic data in response to the NAS/NRC Report have been collected.

Revise requirements for OCS oil spill contingency plans to improve their effectiveness and develop improved means of assessing the risk of oil spill damage.

Existing Leases: Proceed with decisions about exploration and development on existing leases under normal OCS Lands Act and CZMA procedures.

The major feature of this option is that it would cancel the proposed sale and would make any future leasing decisions in the Part II area conditional upon collection of additional oceanographic, ecological, and socioeconomic data, in response to the NAS/NRC Report. All decisions on leasing would be deferred until additional data had been gathered and analyzed. The Secretary will use these data, as well as other information, as a basis for any future decisions on possible leasing in this area. Moreover, before leasing could proceed, the MMS would strengthen oil spill contingency planning requirements to improve their effectiveness. The MMS would also improve the methods it uses to assess the risk of oil spill damage.

Although this option would not permit any new leases to be offered until completion of further study, it would allow for the possibility of proceeding with exploration of the 73 existing leases in the Part II area. However, additional environmental controls would be required to protect the Everglades and Keys from oil spills.

This option would greatly reduce many of the most significant environmental risks and potential effects associated with the current proposal to offer 14 million acres for lease. The 73 existing leases in the area purchased in previous sales would remain open to the possibility of exploration and development. These 73 leases cover about 400,000 acres. The acreage that would likely be explored and developed is far less. To date, two plans of exploration have been filed for three leases. The MMS mean conditional resource estimate for the existing leases is 140 million barrels of oil.

Exploration of the existing leases without an additional lease sale would lead to more limited production. Therefore, the probability of an OCS oil spill in the area would be less than the risk associated with conducting the sale as originally planned. The probability of an oil spill greater than 1,000 barrels associated with production that could occur on the 73 existing leases is estimated to be 23%. The probability of such a spill associated with the recovery of resources from the existing leases plus leases issued in Sale 116, Part II is estimated to be 38%. Thus, the chance of damage to coastal resources which are especially sensitive to spilled oil (coral, sea grasses, and mangroves) would be somewhat less. Similarly, this option would reduce risks to the commercial and sport fisheries as well as marine mammals and other wildlife. Nevertheless, tanker traffic would remain the major source of an oil spill that could damage the coastal environment and protected lands of southwestern Florida and the Keys.

The onshore effects which may result from development of any of the 73 existing leases are uncertain, but they are likely to be minimal since neither pipeline construction nor onshore support services or processing would be expected on the Florida coast. Support bases would be located at one or two places onshore in Florida, relatively convenient to the offshore activities. These service bases involve low levels of activity at the site.

Under this option, the minimum time before a lease sale could occur would be extended from 6 months (from the time the current moratorium expires) to 5 or 6 years. Thus, the earliest that production from new leases could occur would be similarly delayed. About \$200 million in net economic benefits from this sale would be delayed, and as much as four times that amount in benefits from possible future sales would be delayed, because access to an estimated 490 million barrels of unleased oil and gas resources would also be postponed.

The estimated national benefits of this alternative are based on the possible production of 140 million barrels of oil estimated for the existing 73 leases. The estimated net economic value of these resources is about \$280 million.

Option B:

Cancel Sale 116, Part II.

Exclude the Part II area from consideration in formulating the new 1992-1997 5-Year Program.

Existing Leases: Proceed with decisions about exploration and development on existing leases under normal OCS Lands Act and CZMA procedures.

The DOI should undertake discussions with Florida and existing lessees to facilitate purchase of existing leases by the State, if the State so desires.

This option contains all the environmental safeguards of Option A, but differs from Option A in two important respects. First, this alternative would definite postponement of any consideration of leasing in this area until after 1997; whereas Option A would permit the possibility of a new sale under the 1992-1997 5-Year Leasing Program, provided that additional oceanographic, ecological, and socioeconomic studies were completed in time to allow a sale prior to 1997.

Second, this option could result in no exploration and development on the 73 existing leases if the State of Florida were willing and able to negotiate purchase of them in order to prevent activity. If successful, State purchase would be a faster and more certain way to prevent development than attempting to cancel the leases under section 5 of the OCS Lands Act. However, the purchase of existing leases would not assure a permanent ban on future development since these and other tracts might be offered in a later sale. The cost of buying back these leases is estimated to be about \$200 million. These factors could dampen Florida's interest in negotiating purchase of the leases.

The important feature of this option is that no significant environmental effects from a new lease sale are possible until some time after 1997. This delay would allow ample time for the MMS to schedule and conduct further studies of the ecology, physical oceanography, and socioeconomic effects of offshore leasing in southwestern Florida. Some adverse effects could occur if negotiation to purchase the existing leases failed and if applications to explore and develop them were approved. However, additional environmental controls to protect the Everglades and Florida Keys would have to be in effect.

With Option B, the minimum time before a lease sale could occur would be extended from 6 months (from the time the current moratorium expires) to 7 years. Thus, the earliest production could occur would be similarly extended. As with Option A, about \$200 million in net economic benefits from this sale would be delayed, and as much as four times that amount in benefits from future sales would be delayed, because access to 490 million barrels of unleased oil and gas resources would also be postponed. Moreover, in the event of State purchase of existing leases, national benefits associated with an estimated 140 million barrels of economically recoverable oil resources, estimated to be about \$280 million, would be lost.

The economic effect of this option would be to postpone any national benefit until after 1997, unless some or all of the estimated 140 million barrels of oil which may be discovered on the 73 existing leases is produced.

Option C:

Cancel Sale 116, Part II.

Exclude the Part II area from consideration in formulating the new 1992-1997 5-Year Program and the 1997-2002 5-Year Program.

Existing Leases: The DOI should undertake discussions with Florida and existing lessees to facilitate State purchase of existing leases. The Secretary should initiate procedures that could lead to cancellation of the existing leases pursuant to section 5 of the OCS Lands Act. If these leases are canceled, it would prevent drilling on existing leases. Selection of this option would reflect the view that the existing oil spill threat to environmental resources in this region is too great and that additional risk from any source, including OCS exploration and development, is not justified at this time.

This option contains all of the environmental safeguards of Options A and B and would further postpone consideration of a lease sale until the turn of the century, during formulation of a 5-year program for the 2002-2007 time period. Moreover, this alternative

would take a clear position against any exploration and development of the 73 existing leases in the area. Instead of placing the entire burden for buying back existing leases on the State of Florida as in Option B, this option calls for the Secretary of the Interior to begin lease cancellation procedures under section 5 of the OCS Lands Act and to initiate discussions with the State and lessees regarding the State's purchase of the existing leases. Under this approach, the State and the Federal Government might share the costs of cancellation.

As with Options A and B, additional oceanographic, ecological, and socioeconomic studies would be conducted to inform any future leasing decisions, and environmental controls to protect the Everglades and Keys from oil spills would be implemented.

Under Option C, the minimum time before a lease sale could occur would be extended from 6 months (from the time the current moratorium expires) to 12 years, and the earliest production would be likewise delayed. About \$200 million in net economic benefits from this sale would be delayed, and as much as four times that amount in benefits from possible future sales would be delayed, since access to an estimated 490 million barrels of unleased oil and gas resources would be postponed. In the event of cancellation of existing leases, net economic benefits of about \$280 million associated with an estimated 140 million barrels of economically recoverable oil resources would be lost. In addition, the cancellation of all 73 existing leases could cost the Federal Government about \$200 million.

Protecting the Everglades and Keys from Oil Spills

A key feature of all three options is the establishment of a program to provide greater protection from oil spills to the environmental resources of the Everglades and Keys ecosystem. The Task Force has found that even without OCS activity, the use, value, and unique environmental sensitivity of the Everglades and Keys resources are great enough to warrant increased protection from oil spills from existing sources (e.g., tanker transport). The Task Force suggests the development of a system for oil spill protection for the Everglades National Park and Florida Keys resources.

These efforts to improve protection of the Everglades and Keys should involve the DOI, the Department of Commerce, the U.S. Coast Guard, the EPA, and representatives from the oil and gas industry. In addition, the U.S. Coast Guard should study the feasibility of moving oil tanker routes further from the environmental resources in the Keys and Everglades.

Sale 95 - Off Southern California**SALE 95 SUMMARY**

Acreage	~ 6.7 million															
Number of Tracts	1280 whole or partial blocks in the DEIS analysis															
Sale area status	The initial Area Identification was completed October 1987; a supplemental Call was issued in November 1988; the second Area Identification was postponed; no DEIS has been prepared															
Sale timing	At the time of the President's call for study, it was considered procedurally possible to hold a sale in 16 months															
Mean resource estimate	312 million BOE (230 million bbl of oil and 460 billion cubic feet of gas) are expected to be leased, developed, and produced															
Probability of commercially recoverable discovery	100%															
Net economic value	About \$1 billion															
Estimated level of activity	2 platforms are likely with up to 40 development wells															
Cumulative oil spill risk	<table><tr><td></td><td colspan="2">PROBABILITY OF ONE OR MORE SPILLS</td></tr><tr><td></td><td>Without Sale</td><td>With Sale</td></tr><tr><td>SPILL SIZE</td><td></td><td></td></tr><tr><td>≥1,000 bbl</td><td>>99.5%</td><td>>99.5%</td></tr><tr><td>≥10,000 bbl</td><td>93%</td><td>94%</td></tr></table>		PROBABILITY OF ONE OR MORE SPILLS			Without Sale	With Sale	SPILL SIZE			≥1,000 bbl	>99.5%	>99.5%	≥10,000 bbl	93%	94%
	PROBABILITY OF ONE OR MORE SPILLS															
	Without Sale	With Sale														
SPILL SIZE																
≥1,000 bbl	>99.5%	>99.5%														
≥10,000 bbl	93%	94%														

Location of the Sale Area and Estimated Hydrocarbon Resources

Proposed Lease Sale 95 includes about 6.7 million acres of the 30 million acre Southern California Planning Area, the OCS region between the United States/Mexican border and the San Luis Obispo/Monterey County line. Figure II-3 outlines the offshore areas proposed for leasing under Sale 95.

Figure VI-1 illustrates the major oil bearing regions in the Southern California Planning Area. The major regions are the offshore Santa Maria Basin, the Santa Barbara Channel, the Inner Basin, and the Outer Basin. There are 123 active leases in the planning area, 44 of which have not yet been explored. The Inner Basin south of Newport Beach is the only nearshore area where there has been no leasing. Exploration and production are ongoing in

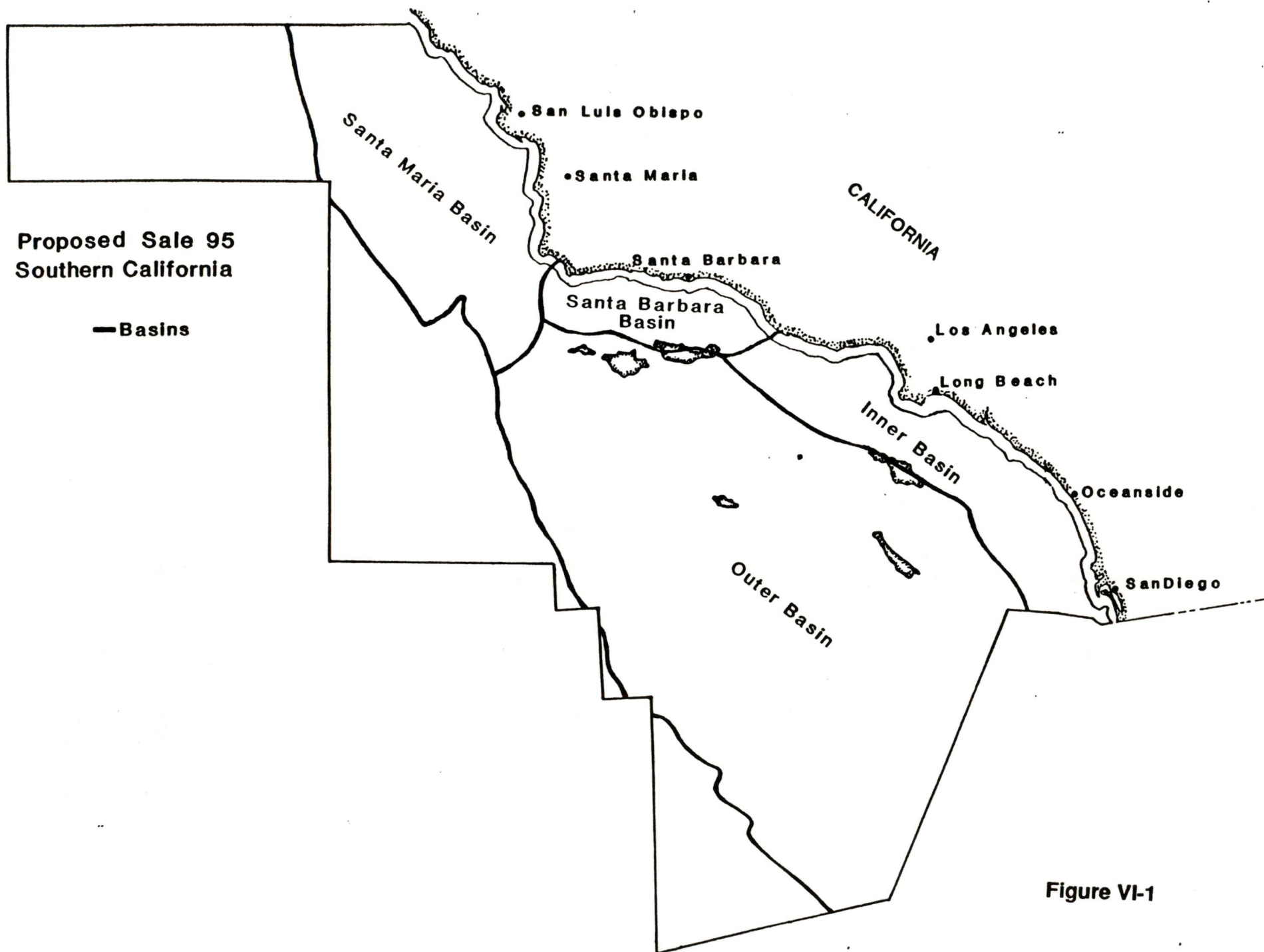


Figure VI-1

the Santa Barbara Channel and Santa Maria Basin; production is occurring from four leases offshore Long Beach in the northern portion of the Inner Basin; the five leases in the Outer Basin have yet to be explored. Current annual production of 33.6 million barrels of oil and 34.5 billion cubic feet of gas is concentrated in the Santa Barbara Channel.

The MMS's mean estimates for the oil and gas resources in the Southern California Planning Area are 1.31 billion barrels of oil and 3.01 trillion cubic feet of gas. The probability that commercial hydrocarbons exist in the area is 100%. Of this amount, 970 million barrels of oil and 2.21 trillion cubic feet of gas are estimated to be unleashed in the entire planning area.

Sale 95 contains about 22% of the acreage of the entire planning area. The amount of unleashed resources estimated in the Sale 95 area are 530 million barrels of oil and 1.07 trillion cubic feet of gas. Of these amounts, 230 million barrels of oil and 460 billion cubic feet of gas are estimated to be leased as a result of holding Sale 95. Current discovered resources (reserves) for this area include 1.3 billion barrels of oil and 2.0 trillion cubic feet of gas.

The standard method for measuring the benefits of OCS activity is to estimate the net economic value of potential production. Assuming oil prices gradually increasing from \$19, the national economic benefits realized would be about \$1 billion.

Option A:

A-1: Proceed with preparations for a lease sale but defer final leasing decisions until after additional oceanographic and socioeconomic data in response to the NAS/NRC report have been collected.

A-2: Cancel Sale 95, and defer subsequent leasing decisions until additional oceanographic and socioeconomic data in response to the NAS/NRC report have been collected.

Establish air quality controls for the California OCS that are substantially equivalent to those applied onshore.

Revise requirements for OCS oil spill contingency plans to improve their effectiveness, and develop improved means of assessing the risk of oil spill damage.

Option A-1 would give the Secretary of the Interior the discretion to proceed with preparations for a lease sale when he determines that it is appropriate in light of the progress in collecting additional data. Option A-2 directs the Secretary to cancel Sale 95. Both would defer decisions on any leasing in the area until additional oceanographic and socioeconomic data have been gathered and analyzed in response to the NAS/NRC Report. The Secretary will have the benefit of these data and other relevant information in making decisions on whether to pursue leasing in this area. If a decision to lease is made, the new information would be used in determining which tracts to offer and what environmental controls to apply to the leases in order to resolve environmental concerns. The data will be especially helpful in further assessing the effects of a possible oil spill as well as in examining likely onshore impacts of offshore development. Further, the MMS would strengthen oil spill contingency planning requirements to improve their effectiveness. The

MMS would also improve the method it uses to assess the risk of oil spill damage.

This option, as well as the other two, address the problem of onshore air quality in southern California. The Task Force found that the most important environmental issue is the possible effect of oil and gas development on the region's air quality. Existing air quality is regarded as the worst in the Nation, particularly for ozone, and offshore development could exacerbate the problem. By requiring equitable air quality standards for OCS operations, this option would assure that no further degradation of air quality would occur as a result of OCS emissions.

With this option, the minimum time before a lease sale could occur would be extended from 2 years to 3 years and or longer, depending on the timing of oceanographic studies. The minimum time before production could occur would be similarly extended. About \$1 billion in net economic benefits from this sale and a similar amount of benefits from anticipated future sales in the area would be delayed, since access to 530 million barrels of oil and 1 trillion cubic feet of gas resources estimated for the unleased sale area would be postponed.

Option B:

Defer leasing decisions until the 1992-1997 5-Year Leasing Program.

Offer tracts only in Santa Maria Basin and San Diego Outer Basin in the next sale off southern California.

Conduct additional oceanographic and socioeconomic studies prior to making leasing decisions for any future sale.

Establish air quality controls for the California OCS that are substantially equivalent to those applied onshore.

Revise requirements for OCS oil spill contingency plans to improve their effectiveness, and develop improved means of assessing the risk of oil spill damage.

This option would defer any leasing decisions in the area until sometime during the 1992-1997 5-Year Program. If additional oceanographic and socioeconomic studies could be completed, this option would allow for the possibility of a lease sale prior to 1997. The results of these studies, along with other information, would be used by the Secretary in making any leasing decisions. Although there would be no drilling on new leases, exploration and development could continue on existing leases. The MMS would continue to refine its assessment of the oil and gas resources in the area to provide a basis for these future decisions. Leasing would proceed only if new OCS air quality standards have proven substantially equivalent to standards onshore. Also, before leasing could proceed, the MMS would strengthen oil spill contingency planning requirements to improve their effectiveness and would improve the methods it uses to assess the risk of oil spill damage.

The principal difference from Option A is that if the Secretary decided that a lease sale should be offered in the 1992-1997 period, he would offer tracts only in the Santa Maria Basin and the San Diego Outer Basin.

The option for proceeding with leasing in the Santa Maria Basin needs to be considered in light of the likelihood that related onshore facilities would probably be located in Santa Barbara County, which has already experienced substantial development. Because there has been little drilling of the larger prospects in Santa Maria Basin, there may be a greater chance for large discoveries than remains in the Channel. The generally deep water, however, may make such resources less beneficial economically.

Leasing in the Outer Basin may be more acceptable environmentally than leasing closer to shore because the greater distance from shore reduces visual impacts and reduces the chance that an oil spill from operations on a lease would contact the coast. However, tanker transportation of oil from this basin to shore would partially offset the reduction in the risks to the coast. Because there may be large prospects that have not been drilled, there is a chance for large discoveries. However, as the geology and economics are less favorable in this area, the chance of finding commercial quantities of oil and gas is considerably lower.

This option would defer leasing in the Santa Barbara Channel in light of the intensity of current and planned oil and gas development on existing leases off Santa Barbara County. These developments have been slowed by concerns about the onshore impacts. Once such problems have been worked out, however, additional leasing and development should be possible without substantial increases in onshore facilities if activities are appropriately phased. Additional leasing in the Santa Barbara Channel holds a lower probability of discovering new large oil fields, because most of the larger prospects there have already been drilled.

This option also defers leasing in the Inner Basin in light of its proximity to highly valued, intensively used coastal resources in San Diego County, Orange County, and Los Angeles County. However, because the larger prospects in this area have not been drilled, deferring leasing would forgo a good chance for large discoveries.

The net economic benefits from a sale limited to the Santa Maria Basin and the Outer Basin would be reduced from about \$1 billion to less than \$400 million. The estimated unleased resources made available for leasing would be reduced from 530 million barrels of oil and 1 trillion cubic feet of gas to 240 million barrels of oil and 0.75 trillion cubic feet of gas. The benefits from unleased resources in the Inner Basin and the Santa Barbara Channel would be delayed at least 5 years.

Option C:

Cancel Sales 95 and 138.

Exclude the southern California area from consideration in formulating the new 1992-1997 5-Year Program.

Conduct additional oceanographic and socioeconomic studies prior to making leasing decisions for the next sale.

Establish air quality controls for the California OCS that are substantially equivalent to those applied onshore.

Revise requirements for OCS oil spill contingency plans to improve their

effectiveness, and develop improved means of assessing the risk of oil spill damage.

This option would delay any leasing in the southern California area until after 1997. As with Options A and B, no leasing decisions would be made by the Secretary until additional oceanographic and socioeconomic studies have been completed in response to the NAS/NRC Report. Also, air quality standards for the California OCS would be in effect which are substantially equivalent to those applied onshore. Further, before leasing could proceed the MMS would strengthen oil spill contingency planning requirements and would improve the methods it uses to assess the risk of oil spill damage.

Option C is similar to Option A in that it does not restrict the geographic scope of possible leasing, but it does provide for a definite delay of all new activity until after 1997, which Option A does not. Unlike Option B, this option imposes no geographic limits on areas which could be leased, but it would provide a definite deferral of leasing for at least 5 years longer than Option B.

Because Option C postpones any possible leasing for at least 7 years, it also defers any potential production for a similar period. With this option, about \$1 billion in net economic benefits from leasing would be delayed.

OCS Air Quality Regulations and Tanker Route Study

The Task Force has found that the air emission controls applied to OCS facilities should be substantially equivalent to those applied to onshore facilities, unless safety and technical considerations justify a less stringent standard. A component of all three of the options above is the promulgation of a rule making the standards for regulating air quality on the OCS substantially equivalent to regulatory standards onshore. The MMS has been drafting a new proposed rulemaking consistent with this finding.

Also included in all three options is the suggestion that a study be conducted to consider moving tanker routes away from existing OCS facilities in the Santa Barbara Channel. Such a study, to be conducted by the U.S. Coast Guard, should also include consideration of establishing a vessel traffic system in the Santa Barbara Channel and creating traffic separation zones south of the Channel Islands National Park and National Marine Sanctuary.

Concerns about oil spills from all sources in the southern California area are substantial. The Task Force has concluded that they could be addressed more effectively by focusing greater effort on the prevention and containment of oil spills from all sources of risk, especially tankers. Improvements in oil spill response capabilities in the area could limit potential damage to valuable coastal resources by more than the increased risk due to additional OCS leasing. Increased capabilities would also reduce the risk of damage from an OCS oil spill.

Sale 91 - Off Northern California**SALE 91 SUMMARY**

Acreage	~ 1.1 million															
Number of Tracts	223 whole or partial blocks: 167 in Point Arena Basin and 56 in the Eel River Basin															
Sale area status	Public hearing completed February 1988; final EIS delayed															
Sale timing	At the time of the President's call for study, it was considered procedurally possible to hold a sale in 10 months															
Mean resource estimate	546 million BOE (400 million bbl of oil and 820 billion cubic feet of gas) are expected to be leased developed and produced															
Probability of commercially recoverable discovery	51%															
Net economic value	About \$975 million															
Estimated level of activity	2 production platforms in the Eel River Basin and 10 production platforms in the Point Arena Basin. Production in the Point Arena Basin is expected to be concentrated in the southern portion of the basin.															
Cumulative oil spill risk	<table><tr><td></td><td colspan="2">PROBABILITY OF ONE OR MORE SPILLS</td></tr><tr><td></td><td>Without Sale</td><td>With Sale</td></tr><tr><td>SPILL SIZE</td><td></td><td></td></tr><tr><td>≥1,000 bbl</td><td>91%</td><td>96%</td></tr><tr><td>≥10,000 bbl</td><td>77%</td><td>85%</td></tr></table>		PROBABILITY OF ONE OR MORE SPILLS			Without Sale	With Sale	SPILL SIZE			≥1,000 bbl	91%	96%	≥10,000 bbl	77%	85%
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	Without Sale	With Sale														
SPILL SIZE																
≥1,000 bbl	91%	96%														
≥10,000 bbl	77%	85%														

Location of the Sale Area and Estimated Hydrocarbon Resources

Proposed Lease Sale 91 includes 1.1 million acres of the 28.5 million acre Northern California Planning Area, which is the OCS region lying between the southern boundary of Mendocino County and the California/Oregon border. Figure II-4 shows the location of Proposed Sale 91 within the Northern California Planning Area.

There are two distinct areas within the planning area proposed for leasing in Sale 91. The Point Arena Basin, which includes about 800,000 acres and 167 tracts, is located offshore Mendocino County, near the coastal communities of Fort Bragg and Mendocino. There are about 300,000 acres and 56 tracts in the Eel River Basin, located offshore Humboldt County near the communities of Arcata and Eureka.

The MMS's mean estimates for the oil and gas resources in the Northern California Planning Area are 770 million barrels of oil and 1.69 trillion cubic feet of gas. The probability that commercial hydrocarbons exist in the planning area is 60%. All of the undiscovered resources in this area are unleased. The Sale 91 area is a subset of the entire planning area; the amounts of undiscovered resources in the Sale 91 area are 440 million barrels of oil and 980 billion cubic feet of gas. The probability that hydrocarbons exist in the sale area is 51%. Of the total undiscovered resources estimated to be in the sale area, 400 million barrels of oil and 820 billion cubic feet of gas are estimated to be leased as a result of Sale 91.

The principal differences between the Point Arena and Eel River Basins are:

- (1) the area proposed to be offered for leasing in the Point Arena Basin is about 800,000 acres versus 300,000 acres in Eel River;
- (2) the estimated resources are significantly greater in Point Arena;
- (3) Point Arena is primarily oil-prone, while Eel River is gas-prone;
- (4) if oil and gas is found, the level of offshore development would probably be much higher in Point Arena, 10 offshore platforms versus 2 in Eel River; and
- (5) the onshore effects would be greater from Point Arena offshore development, because the Mendocino County communities are very small and lack supporting infrastructure to accommodate large scale oil and gas development.

The standard method for measuring the benefits of OCS activity is to estimate the net economic value of potential production. According to MMS calculations, the national benefits from holding Sale 91 are estimated to be about \$975 million, assuming oil prices gradually increasing from \$19.

Option A:

A-1: Proceed with preparations for a lease sale but defer final leasing decisions until after additional socioeconomic data in response to the NAS/NRC report have been collected.

A-2: Cancel Sale 91, and defer subsequent leasing decisions until additional socioeconomic data in response to the NAS/NRC report have been collected.

Revise requirements for OCS oil spill contingency plans to improve their effectiveness, and develop improved means of assessing the risk of oil spill damage.

Establish air quality controls for the California OCS that are substantially equivalent to those applied onshore.

Reevaluate the effects on fisheries and institute measures to reduce conflicts with commercial fishing.

Option A-1 would give the Secretary of the Interior the discretion to proceed with preparations for a lease sale when he determines that it is appropriate in light of the progress in collecting additional data. Option A-2 directs the Secretary to cancel Sale 91. Both would defer decisions on any leasing in the area until additional socioeconomic data have been collected in response to the NAS/NRC Report. This information will improve understanding of possible onshore impacts of offshore leasing and will help the Secretary in making decisions on whether to pursue leasing in this area. If a decision to lease is made, the new information would be used in determining which tracts to offer and what environmental controls to apply to the leases in order to reduce environmental concerns.

In addition, the MMS would strengthen oil spill contingency planning requirements to improve their effectiveness. The MMS would also improve the method it uses to assess the risk of oil spill damage.

Finally, in order to preserve the region's excellent air quality, the MMS would also promulgate OCS air quality standards substantially equivalent to those in effect onshore.

Under Option A, the minimum time before a lease sale could occur would be extended from about 1 year to 2 years or more. The minimum time before production could occur would be similarly extended. About \$975 million in net economic benefits from this sale and a similar amount from anticipated future sales would be delayed since access to the 440 million barrels of oil and the 1 trillion cubic feet of gas in the unleased sale area would be postponed.

Option B:

Defer leasing decisions until the 1992-1997 5-Year Leasing Program.

Offer tracts only in the Eel River Basin in the next sale off northern California.

Conduct additional socioeconomic studies prior to leasing decisions for the next sale.

Establish air quality controls for the California OCS that are substantially equivalent to those applied onshore.

Reevaluate the effects on fisheries and institute measures to reduce conflicts with commercial fishing.

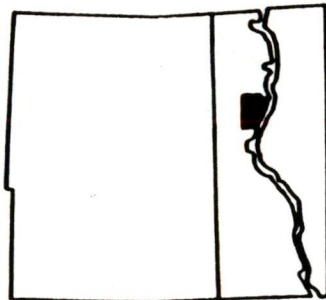
This option would defer any leasing decisions in the area until the 1992-1997 5-Year Program. Prior to deciding on any lease sale, additional socioeconomic studies would be performed. The Secretary would take these study results into account in making decisions on whether to lease in the area. If a sale is scheduled for the 1992-1997 period, only tracts in the Eel River Basin would be included. This option would reduce the area originally proposed for lease by 73%, from 1.1 million acres to about 300,000 acres. Figure VI-2 shows the area that might be offered in an Eel River Basin sale. Leasing in the gas-prone Eel River Basin would greatly diminish the likelihood of oil discovery and thus reduce oil spill risk.

**Proposed Sale 91
Northern California**

Option B

 **Available Acreage**

N. CALIFORNIA PLANNING AREA



SEE DETAIL MAP

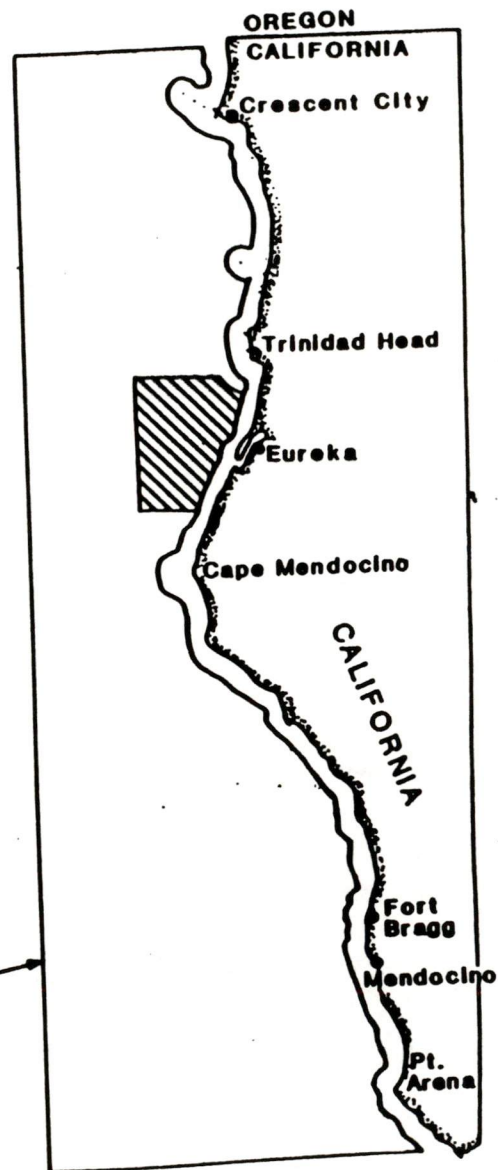


Figure VI-2

In addition, this option would preserve existing air quality by requiring offshore standards that area substantially equivalent to those in effect onshore.

Also, the MMS would reexamine the location of commercial fishery resources in the area and reassess potential impacts of offshore development on highly productive areas in the Eel River Basin. In light of such study, the Secretary would consider the desirability of eliminating some tracts.

Offering only the Eel River Basin would reduce the net economic benefits from \$975 million to less than \$100 million. This option reduces the sale area resources from 440 million barrels of oil and 1 trillion cubic feet of gas to 20 million barrels of oil and 0.4 trillion cubic feet of gas. The balance of the benefits and resources would be delayed by at least 5 years.

Option C:

Cancel Sale 91 and Sale 128.

Exclude the Northern California Planning Area from consideration in formulating the new 1992-1997 5-Year Program.

This option would cancel Sale 91 and the next sale scheduled, Sale 128. Further, no sales would be considered for this area in the 1992-1997 5-Year Program. The MMS would conduct socioeconomic studies prior to considering a sale under the 1997-2002 5-Year Program, and the Secretary would take the results of these studies into account in making decisions whether to lease in the area during the 1997-2002 period.

As in Option A and B, offshore air quality standards would be adopted which are substantially equivalent to those applied onshore. Moreover, the MMS would review the location of important commercial fishery resources in the area and reassess the possible impacts of offshore development on their productivity. This review could lead to the elimination of some tracts offered for lease.

With Option C, the minimum time before a lease sale could occur would be extended from about 1 year to 7 years, and the earliest production could occur would be similarly extended. About \$975 million or more in net economic benefits from this sale and a similar amount of benefits from anticipated future sales in the area would be delayed.

ADDITIONAL ENVIRONMENTAL PROTECTION AND MITIGATION MEASURES

The Task Force identified a number of additional measures which should be developed for consideration when future leasing decisions are made in the three areas. It also suggests that some of these measures be taken in the near future in order to reduce the environmental effects of exploration and development on existing leases or to protect environmental resources in one or more of the three areas from damages that could result from other existing activities.

Implementation of the control measures outlined in this section could often impose considerable costs on the lessee. The Task Force believes that these costs are the primary reason the measures are not already in use or practice everywhere on the OCS. The Task Force recognizes that requiring these control and mitigation measures in the three sale areas could increase the costs and substantially reduce the benefits of developing oil and gas resources and thus could discourage the industry from bidding on leases. It is likely, however, that future increases in the price of oil and gas commodities will increase lease values, so that protection measures which are uneconomic now may become feasible later.

The Task Force recognizes that environmental resources in the three sale areas vary considerably in breadth and value and that implementing all protection measures may not be appropriate in every leasing area. For each of the measures described, the Task Force suggests that criteria be established which determine the application of the control and mitigation measures. When OCS activity threatens to degrade an environmental resource, the value of which is sufficiently high, the criteria would specify the protective measure warranted. For example, the necessity of improving the existing poor air quality onshore in southern California justifies measures in the OCS which would not further degrade onshore air quality.

A description of control and mitigation measures and general criteria for their application follows:

- Require Transport of OCS Oil in Pipelines Where Feasible and Environmentally Preferable

The risk of oil spills from OCS pipelines is less than the spill risk for tankers. The MMS currently applies lease stipulations to encourage pipeline transport of oil produced on the OCS (e.g., Stipulation #5, Sale 91 EIS; all California sales on the 1987-1992 5-Year Program include such a stipulation). The MMS lease stipulations specify that pipeline transport is preferable, subject to the availability of pipeline rights-of-way, technological feasibility, environmental preference, and net social benefit. **The Task Force concludes that the lease stipulation should be strengthened by specifying that pipelines should be used to transport OCS oil ashore where feasible and environmentally preferable.**

- Improve OCS Oil Spill Risk Assessment, Contingency Planning, and Response Capability

Improve OCS Oil Spill Risk Assessment

Outer Continental Shelf oil spill risk modeling should continually be updated to reflect current operations and transportation of oil.

Risk assessments should include a description of the maximum credible spill and its potential effects.

Potential damages from oil spills should be assessed by incorporating equipment performance capabilities into oil spill trajectory models to assess the effectiveness of response personnel and equipment in reducing the extent of oil contacting sensitive environmental resources.

The MMS should determine which tracts in a proposed sale can be identified as having a higher likelihood of having any spilled oil contact sensitive resources.

Improve Prelease Information

Oil spill response effectiveness should be a part of presale evaluation of the possible damages of an oil spill. The basis for lease sale decisions should include information about the extent to which oil spill response would reduce the damage caused by an oil spill.

Response effectiveness should be analyzed for particular sale areas using development scenarios, oil spill statistics, equipment performance estimates from MMS studies, and the oil spill trajectory model which MMS currently employs.

The MMS should conduct a sale area-specific, comparative oil spill risk analysis to evaluate the spill risk:

- 1) with OCS development; and
- 2) without OCS development, but with increased tanker traffic needed to meet the current and (expected) increasing demand for oil.

Improve Oil Spill Contingency Planning on the OCS

Require that each OCS Oil Spill Contingency Plan

- 1) be revised annually to reflect changes including but not limited to personnel, response technologies, potential spill size, and oil spill risk;
- 2) clearly describe the current maximum credible spill;
- 3) document a realistic response for the current maximum credible spill scenario;
- 4) document a realistic response for a spill scenario that may be considered "more likely;"
- 5) address whether or not a local infrastructure can support a large scale emergency response, and if it cannot, describe what must be done so that it can;
- 6) list sources of oil spill response equipment and personnel, and note contact people and telephone numbers for each source;
- 7) list what equipment is available from each source;
- 8) describe how and when all offsite response resources listed in the contingency plan will be obtained, transported, and deployed;
- 9) address the changes required for an extended response which are necessary to meet changing characteristics of oil, location, etc.;
- 10) address waste removal from the spill site and waste disposal;
- 11) clarify organizational responsibilities; and
- 12) identify significant environmental features, and describe appropriate

responses to protect these resources.

Require the MMS to consider the performance of equipment and personnel when determining the amount and location of equipment, the minimum number of personnel required on-site and their specific duties, and the amount of training and drills required to maintain readiness of personnel and equipment.

Compile and regularly update a set of established regional guidelines for reviewing and approving oil spill contingency plans. This will facilitate thorough and efficient annual reviews of oil spill contingency plans.

Establish MMS regulations to specify the lessee's commitment to following those provisions of the oil spill contingency plans which detail adequate numbers of trained, ready response personnel and allow for effective MMS enforcement.

Implement an effective "oil spill inventory system" to identify location of response equipment in the United States and internationally.

Review port contingency plans by the National Response Team and U.S. Coast Guard Captain of the Port's needs to consider interrelationships with OCS oil spills.

Pre-approve the use of specified dispersants to control spills of specified types of oil under specified seasonal/climatic/location conditions. Decisions should be made by MMS, U.S. Coast Guard, EPA, and local/State environmental officials.

Improve planning and field coordination among various Federal and State agencies with responsibility for natural resources protection (parks, sanctuaries, wildlife).

OCS Oil Spill Drills

Regional guidelines for conducting unannounced oil spill response drills need to be developed and documented.

Hold more frequent, realistic training exercises for Government and industry personnel with emphasis on improving integration of activities of different levels of government in spill response and Government/industry activities.

Industry, Federal, State, and local plans must be coordinated and understanding of plans must include top officials (not just technical staff) who will be on the front line in a big spill.

Establish Minimum Standards for OCS Oil Spill Response

Standard test procedures should be developed for OCS oil spill response equipment, and the capability of existing oil spill response technology should be evaluated.

Minimum performance standards should be established for OCS oil spill response equipment.

Outer Continental Shelf oil spill response time requirements should be established; lessees should be required to demonstrate ability to meet these standards as a condition of exploration and development.

- **Encourage Consolidation of Onshore Facilities to Reduce Demand on Existing Onshore Public Services, Infrastructure, and Land Use Changes**

Development and production of OCS oil and gas requires onshore marine terminals, processing plants, and crew and supply support facilities which can change the existing land use and place additional loads on public services infrastructure such as electric utilities, water and sewer systems, and ports and harbors. Potential displacement of existing land uses and increased demands on local services and infrastructure as a result of OCS development and production were among the concerns most frequently raised by local government officials during the Task Force's workshops in the sale areas.

Building fewer onshore facilities through consolidation clearly has the potential to reduce lessee development and operating costs. Further, consolidation of facilities could reduce a number of demands on local governments including facility permitting, regulation and compliance, and service provision.

Planning larger facilities to handle future production from the same area could reduce the need for additional sites, construction, and demand on services. The local governments would also issue fewer permits to induce consolidated use of onshore facilities.

Facility consolidation could produce substantial savings for both industry and local governments.

In order to support local governments in their land use planning, the Task Force suggests that lease stipulations or notices to lessees incorporate local ordinances relevant to siting and consolidation of OCS onshore facilities.

- **Establish Processes to Assist Local Communities to Address Onshore Impacts Associated With OCS Development**

Representatives from the oil industry, State and local governments, and local industries should be convened to determine appropriate ways to reduce adverse affects of onshore facility development associated with OCS development. Voluntary subcommittees could be created to address specific onshore issues such as: (1) community services including schools, (2) ports and harbors, and (3) recreation and tourism. These committees could function in a manner similar to the joint oil/fisheries committee in the Santa Barbara County area, which is funded by the oil and gas industry. This would not entail great expense.

The Task Force finds that MMS and NOAA can play a mediating role between State and local governments and the oil industry in mitigating adverse onshore effects of OCS development.

- **Require No Discharge of Drilling Muds/Fluids in Sensitive Areas**

Discharge of drilling muds and cuttings is known to adversely affect some biota including plankton, coral, and fish larvae. A variety of alternatives to direct ocean discharge are required by lease stipulation, State regulation, and NPDES permits. The alternatives

include shunting to ocean bottom, barging to land disposal, incineration, injection, and barging to ocean dump site.

The Task Force finds that mitigation programs should be required for drilling in sensitive environments to reduce adverse effects.

Consistent with the recommendations of the NAS/NRC report, MMS should institute a research program to evaluate the chronic effects of muds, cuttings, and other discharges on the marine environment.

• **Establish Joint Oil Industry/Fishing Industry Coordinating Committees in Areas Where OCS Activities Are Likely to Conflict With Commercial Fishing**

- Joint committees should be funded by industry and operated jointly by the oil and commercial fishing industries.
- Joint committee should meet to resolve issues including, but not limited to:
 - (1) scheduling of geophysical surveys;
 - (2) oil industry activity in traditional fishing areas; and,
 - (3) compensation and mitigation programs.

The Task Force suggests the establishment of a joint oil industry/fisheries industry liaison committee wherever leasing is to occur. It should be similar to the Joint Oil/Fisheries Committee which focuses on potential conflicts offshore San Luis Obispo, Santa Barbara and Ventura Counties. The Task Force thinks that fishermen and seismic operators should be able to work out a schedule of seasons and locations as a means to avoid conflict. Seasonal discharge restrictions may also be appropriate.

With regard to heavy vessel traffic, there need to be mutually agreeable traffic corridors in order to minimize damage to fishing gear. In the event that there is damage to fishing gear as a result of heavy vessel traffic or seismic surveys, a set of mutually agreeable guidelines is needed for agreeing how to compensate or mitigate for potential impacts. The Task Force also suggests that guidelines are needed to establish the length of time between the date a claim is filed and the date the claimant receives compensation. This process needs to be as efficient as possible in order to permit timely gear replacement.

The Task Force recognizes that the majority of problems which occur between the fishing and the oil and gas industries are the result of space and scheduling conflicts. The Task Force finds that a joint oil industry/fisheries industry committee would be capable of handling many conflicts.

• **Strengthen Policies to Protect Environmentally Sensitive Areas**

The Secretary of the Interior could strengthen policies to protect National and State parks, marine sanctuaries, and wildlife areas that exist near leasing areas.

Means of special protection might include:

- (1) defer areas near designated parks, wildlife refuges, marine sanctuaries, and areas of special biological significance;

- (2) require resource management agencies, in conjunction with oil and oil transportation industries, to consider ways to respond to oil spills in order to protect significant resources; and
- (3) notify Federal, State, and private oil spill response officials of the presence of significant natural resources to assure that OCS oil spill contingency plans address what is necessary to protect natural resources in case of emergency.

The Secretary of the Interior should strengthen policies to protect significant biological features such as pinniped haul-out areas, coral reefs, hard bottoms, sea mounts, canyon heads, and seagrass beds that exist throughout the areas under consideration.

MMS should be required to include lease stipulations that would:

- (1) protect biologically sensitive resources to the maximum extent practicable; and
- (2) require mitigation of impact to sensitive biological resources wherever practical.

**The Adequacy of Environmental Information For
Outer Continental Shelf Oil and Gas Decisions:
Florida and California**

**Committee to Review the Outer Continental Shelf
Environmental Studies Program**

Board on Environmental Studies and Toxicology

**Commission on Physical Sciences,
Mathematics, and Resources**

National Research Council

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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Executive Summary

The environmental impacts of oil and gas production on the U.S. outer continental shelf (OCS) have been studied and debated for many years. The issues derive from the complexity of coastal and offshore marine processes and ecosystems, human socioeconomic systems, and interactions with OCS oil and gas development activities. Recently, intensified public concern has led to congressional moratoria on drilling in several OCS areas.

On February 9, 1989, President Bush announced his decision to postpone leasing for OCS areas off southwestern Florida (sale 116, part 2), northern California (sale 91), and southern California (sale 95). At the same time, the President created a cabinet-level task force to review the environmental concerns for these three OCS areas, and he also requested independent advice from the National Research Council (NRC). The NRC was asked to assess the adequacy of the available scientific and technical information on estimated hydrocarbon resources and potential environmental effects for the three specified areas.

The National Research Council has addressed these questions many times in the past. In 1973, President Nixon asked the Council on Environmental Quality and the National Research Council to review OCS environmental concerns. Again, in 1978, the National Research Council issued a review of the OCS Environmental Studies Program, which was then managed by the Bureau of Land Management; in 1983, it issued a report on drilling muds and fluids; and in 1985, it released its report, *Oil in the Sea: Inputs, Fates, and Effects*.

In addition, two directly relevant studies were already being carried out by the NRC when President Bush requested this new evaluation. The Committee on Undiscovered Oil and Gas Resources was already reviewing the methods used to estimate onshore and offshore hydrocarbon resources, and the Committee to Review the Outer Continental Shelf Environmental Studies Program (the OCS committee), along with its three panels on physical oceanography, ecology, and socioeconomics, was in the process of reviewing the Minerals Management Service (MMS) program of studies that provides environmental information for OCS oil and gas decisions nationwide. Because these studies had been under way for some time, the NRC committees had

the committees did not have to review the three specified OCS lease areas in isolation. A great deal of relevant information had already been developed by the committees in studying the relationships between scientific knowledge and the OCS leasing program as a whole.

This report, by the OCS committee and its three panels, reviews the adequacy of information bearing upon the potential environmental impacts of OCS oil and gas activities for the three sale areas. The review focuses on physical oceanography, ecology, and socioeconomics. To carry out its charge, the OCS committee and its panels had to consider the overall OCS leasing process, and particularly the leasing decision itself. This was essential to answer the main question regarding the "adequacy" of scientific information for leasing decisions. Scientific and technical questions dominated the committee's and panels' deliberations, but institutional aspects of the leasing process, the law and policies that shape it, and practical realities all influenced these deliberations and the committee's working concept of adequacy.

CRITERIA FOR ADEQUACY

The committee's working definition of "adequacy" for this assessment has two aspects: completeness and scientific quality. Of course, "complete" scientific information in the ultimate sense is neither feasible nor necessary for making decisions. Rather, the committee's criteria for completeness were based on what constitutes enough information for OCS decisions; they are detailed and explained in the three chapters that deal with physical oceanography, ecology, and socioeconomics. The standards of scientific quality entail repeatability, reliability, and validity of measurements and analyses, including appropriateness of methods and subject. The working definition of scientific quality used by the committee and panels was whether the methods described represent the current state of good practice in each scientific field (i.e., whether they would be likely to pass peer review). This does not imply that the criterion is actual publication in a peer-reviewed scientific journal, but rather that the quality of the data and scientific interpretations used for OCS decisions should meet this basic scientific standard. The committee applied this standard to the information for each of the three OCS regions considered in this report.

CONCLUSIONS AND RECOMMENDATIONS, BY LEASE SALE AREA

The committee concluded that the available scientific and technical information bearing on potential environmental impacts is currently inadequate for decisions about development and production in all three OCS lease sale areas. For decisions on leasing, the following table summarizes the committee's overall conclusions for each of the three areas (see text for discussion of the availability, quality, and use of the information).

<u>Lease Sale Area</u>	<u>Physical Oceanographic</u>	<u>Ecological</u>	<u>Socioeconomic</u>
Southwestern Florida (Area 116, Part 2)	Marginal	Inadequate	Inadequate
Northern California (Area 91)	Adequate	Adequate	Inadequate
Southern California (Area 95)	Inadequate	Adequate	Doubtful

Overall, the committee judged that the currently available information in some categories is at least marginally adequate to make leasing decisions for each of the sale areas, but better information in one or more categories is needed for every area. The present physical oceanographic information is marginally adequate for leasing decisions off northern California, but inadequate for southern California. For southwestern Florida, enough is known to provide

reasonable first-order estimates of the movement of spilled oil, but better information enabling error estimates would be desirable for a leasing decision. The ecological information is sufficient to make leasing decisions for both California areas (although better information is needed on birds in Baja California). The ecological information is inadequate for southwestern Florida. The available socioeconomic information is inadequate for a leasing decision for two of the three sale areas—southwestern Florida and northern California. The Socioeconomics Panel has not had sufficient time to evaluate the considerable literature on socioeconomic in southern California. No EIS has been produced for lease sale 95 in southern California, and the socioeconomic information provided by MMS to the panel is inadequate for informed decision making there.

Lease Sale 116, Part 2 (Southwestern Florida)

Physical oceanographic information is sufficient to predict that any oil spill in the sale area would probably soon hit the coast. The ecological and socioeconomic information currently being used or available for a leasing decision is inadequate or not sufficiently reliable for a leasing decision for the southwestern Florida OCS area. More information in all three scientific disciplines would be needed for development and production decisions.

The physical oceanography of the region is known with sufficient certainty to provide first-order estimates showing that oil spills associated with OCS activities would have a high probability of interacting with sections of the Florida coast. However, it is difficult without further data to ascertain the range of error in the results of models used to provide the first-order estimates. The uncertainties of oil spill trajectories could be narrowed with more focused studies of the physical oceanography of the region. These studies are within the current capabilities and state of knowledge in physical oceanography and could be accomplished within a few years after initiation.

Ecological information needed for a leasing decision should include characterization of the environment, identification of the biological resources at risk, and a basic understanding of ecological relationships. Where rare or endangered species and communities unique to the United States exist, as in the southwestern Florida leasing area, more extensive characterization should be required before a leasing decision is made. Additional information is needed to assess the sensitivity of unique coastal ecosystems, such as corals, seagrasses, and mangroves, to the long-term chronic releases from OCS production activities as well as to the immediate and long-term impacts of spilled oil. Therefore, more detailed site- and ecosystem-specific information is needed to assess potential impacts of OCS activities before a leasing decision is made.

The socioeconomic aspects of environmental impacts have been inadequately addressed in the assessments to date. Indeed, many potential and actual impacts have not even been considered.

Lease Sale 91 (Northern California)

Ecological information is adequate and physical oceanographic information is marginally adequate for a leasing decision, but socioeconomic aspects of the scientific and technical information now being used or available to make a leasing decision for the northern California OCS area are inadequate. More information in all three scientific disciplines would be needed for development and production decisions.

The physical oceanography of the area is reasonably well known; this information is adequate for a leasing decision for the area. However, there is a need for better coordination of actual field observations with the oil spill risk assessments for the area. Continued site-specific data gathering and assessment during exploration, development, and production—if they occur—are recommended to refine models and provide a more thorough understanding of the physical oceanography in the region.

Baseline information on the distribution and abundance of many species of marine organisms is sufficient for a leasing decision. More detailed site-specific studies on the sensitivity of different components of the ecosystem to various impacts of OCS activities should be obtained if exploration occurs.

The socioeconomic studies and assessments in this area are inadequate for making a leasing decision. Many potential and known impacts have not been considered.

Lease Sale 95 (Southern California)

Ecological information is adequate for a leasing decision, but physical oceanographic and socioeconomic aspects of the scientific and technical information now being used or available for the southern California OCS area are inadequate or not sufficiently reliable for a leasing decision. More information in all three scientific disciplines would be needed for development and production decisions.

The physical oceanography of the southern California lease sale area is extremely complex. Currently available information is insufficient to make a leasing decision. However, studies to provide adequate information for the area are within the current capabilities and state of knowledge in physical oceanography and could be accomplished within a few years after initiation.

Baseline information on the distribution and abundance of species of marine organisms is adequate for making a leasing decision for southern California. Additional information regarding the interaction of OCS activities with other disturbances (both anthropogenic and natural disturbances) is needed during exploration to predict future impacts of development and production.

There is a substantial body of socioeconomic information for southern California; the panel has not had enough time to review all of it. There is no EIS for sale 95. The staff papers provided by MMS for sale 95 in lieu of a draft EIS (U.S. DOI, 1989) are not adequate to make a leasing decision. The committee and panel cannot judge at this time whether additional studies are needed or whether there is enough information to support an adequate analysis.

CONCLUSIONS AND RECOMMENDATIONS, BY TYPE OF INFORMATION

Physical Oceanography

The body of knowledge on the physical oceanography of the three regions varies considerably in scope and quality. For example, the data base for southwestern Florida is relatively incomplete. Few modern oceanographic studies have been undertaken for this region, e.g., as compared to northern California. Present numerical modeling work for the Gulf of Mexico is marginal. Oil Spill Risk Analysis (OSRA) model results give reasonable first-order estimates; spilled oil can be expected to hit the shore because of the boundary Loop Current. However, it is difficult without further information to ascertain the range of error in results with the present OSRA model.

A considerable amount of information exists concerning the circulation off northern and central California. Although some features of the circulation could be studied further, new observations should focus on the estimation of trajectories and trajectory statistics. There is not a correspondingly complete description of circulation for the Southern California Bight. Although MMS has used a circulation model for input to the OSRA model, it has not taken advantage of all available observations. The flow field in the bight is not well known. The circulation model is not complete and does not reproduce several prominent observed features of the coastal circulation. This model may not be adequate for use in impact assessment. Substantial fieldwork to provide a better observational picture of circulation in the Southern California Bight needs to be undertaken. Numerical general circulation models alone will not provide sufficient realism for trajectory prediction or estimation of trajectory statistics. Model studies need to be supplemented

with observations. Trajectory predictions or estimations of trajectory statistics realistic for use in risk analysis or in accident management cannot be obtained without new fieldwork, including drifter studies. Although these observations may ultimately help the development of circulation models, which it is hoped will be in quantitative agreement with existing data, the first priority should be to take more observations and incorporate them into trajectory predictions.

Ecology

The basic information needed to make a leasing decision anywhere includes a characterization of the environment, identification of the biological resources at risk, and a basic understanding of ecological relationships. For southwestern Florida, where unique habitats and endangered and rare species exist, more extensive characterization of the sensitivity of biota to OCS-related activities, characterization of recovery rates, and identification of mitigating measures are needed.

For both California lease areas (91 and 95), there is enough baseline information to make an informed decision about leasing, although more information is needed about birds along the Pacific coast of Baja California (Mexico). More detailed site-specific analyses would be needed during exploration. If commercial quantities of petroleum are discovered, additional information will be necessary to assess the environmental impact of development and production. For lease sale 116, part 2 in Florida, the information is not currently adequate to make a leasing decision.

In addition to these general conclusions, the Ecology Panel had several overall concerns about the information available for decision making, especially concerning details of exploration, development, and production. First, the Department of the Interior (DOI) has relied too heavily upon the OSRA model for prediction of impacts. This has resulted in an emphasis on the probability of an oil spill instead of on the effects of a spill. Second, there is a lack of general process-level studies. Third, not enough attention has been paid to inshore, onshore, and estuarine areas. Fourth, there has been too narrow a focus on oil spills and not enough on the other potential impacts associated with development and production. Fifth, potential recovery rates of ecosystems after damage have been overestimated in the EISs. Sixth, sublethal and chronic effects of oil and gas activities have been largely ignored. Although such effects are difficult to predict, a much better understanding should have been obtained by now through investigations of oil and gas production in the Gulf of Mexico and southern California. Finally, much of the information on the distribution and abundance of various species covers too short a time span.

Socioeconomics

Socioeconomic information for two of the three lease sales—southwestern Florida (116, part 2) and northern California (91)—is not sufficient for informed decisions concerning OCS oil and gas activities. The panel has not had sufficient time to evaluate the considerable literature on socioeconomics in southern California. No EIS has been produced for lease sale 95 in southern California, and the information provided by MMS (U.S. DOI, 1989) to the panel is inadequate for informed decision making there. The panel has two major conclusions regarding lease sales 116, part 2 and 91:

- Standard social and economic analyses have been inadequately performed. In standard practice social and economic analyses of natural resource development focus on the direct and secondary impacts associated with development and production, as well as the related infrastructure and public-financing requirements. These analyses deal primarily with impacts that are quantifiable, often in economic terms. Such analyses were not systematically carried out by DOI; the data often were not current, not at the appropriate level of disaggregation to be useful at the local level, and not analyzed in a way that helps decision making. In addition, most of the studies have not built on previous work. Despite the abundant experience with OCS

development and production, there has been little followup research to validate assumptions and conclusions.

- Significant types of social and economic impacts have been ignored. Different kinds of social and economic impacts other than those that DOI has addressed can occur from OCS activities. Some begin even before a lease is sold. There is no program to systematically study and evaluate this class of impacts, and they have not even been considered in the EISs. The mere announcement of a lease sale can raise fear and uncertainty, stimulate organized political resistance, encourage land speculation, lead to lawsuits, and result in widespread anger and alienation among citizens who feel that their rights are being violated and their ways of life threatened. Responses to the possibility of sales have constituted intense, effective, and costly opposition to the government's leasing program, but the information necessary to analyze them and other prelease impacts has not been gathered. The panel has not yet completed its investigation of the management and policy implications of these impacts. For the present, the panel notes that these impacts are real and have proved costly.

SOME UNDERLYING CONCERNS

Separation of Leasing from Development and Production

One matter of underlying concern to the committee and panels involves the phasing of OCS leasing, exploration, development, and production as currently practiced. Studies by MMS's Environmental Studies Program and the assessments found in DOI's environmental impact statements have focused almost entirely on the lease sale stage. Two fundamental problems result from this practice. First, the exact location of oil and gas reservoirs is unknown at the prelease stage. As a result, it is impossible to identify the specific future location of facilities and to predict specific environmental impacts of development. Equally important, the uncertainty about actual oil and gas reserves at the prelease stage makes it difficult to balance the national benefits of production against the environmental risks. Second, by the time producing reservoirs are identified, the industrial lessor typically has committed enormous amounts of money to the lease. DOI has never implemented the procedures provided in the OCS Lands Act Amendments of 1978 (OCSLAA) for lease cancellation, and so a decision to lease is generally perceived as tantamount to a decision to develop and produce, provided that commercial reserves are found in a lease area. This point has been made in prior studies and was considered in depth by Congress in the deliberations leading to the 1978 OCSLAA. As DOI's EISs point out, it is often not possible to do adequate assessment before leasing. However, once it does become possible to generate the needed information and analysis, a decision not to proceed with development has already been effectively precluded.

The perception is widespread that leasing implies development and production if commercial quantities of hydrocarbon resources are found. In a 1984 Supreme Court decision (*Secretary of the Interior vs. California*, 104 S. Ct. 656), the majority wrote: "... a lease sale is a crucial step. Large sums of money change hands, and the sale may therefore generate momentum that makes eventual exploration, development, and production inevitable." The minority wrote: "Approval for exploration and development by the lessee is obviously the expected and intended result of leasing; if it were not, the Secretary would not bother to lease and the lessees would not bother to bid." In spite of provisions for a "focusing of analysis and review [that] will occur at later stages in lease sale planning ... most states doubt that adequate analysis will be performed, and that decision alternatives will be preserved through the process" (Hershman et al., 1988). Many local, state, and federal government officials have expressed similar points of view to the OCS committee and panels. Furthermore, several MMS officials have informed the committee that out of hundreds of OCS development and production plans submitted by industry since 1978, although modifications have been required, none has ever been denied by the Department of the Interior. For these reasons, the committee and panels cannot confirm that there is a de facto separation of OCS leasing from development and production decisions in actual current practice.

In requiring development and production plans (except in the Gulf of Mexico, where OCSLAA does not require them), OCSLAA recognizes the distinction between environmental

impacts at the exploration versus the development and production stages. Only one development and production plan in each planning area is required by OCSLAA to be declared "a major Federal action," and hence to need an EIS. This requirement has resulted in detailed EISs and extensive public debate over development plans in the Santa Maria Basin and Santa Barbara Channel of California. Presumably, similar analysis and dialog will take place as other new "frontier areas" (i.e., areas that do not yet have producing wells) are opened. But the perception that the "no development" scenario is effectively precluded after leasing has affected the tone of the debate.

The committee believes that until this problem is resolved, effective environmental assessment and a credible public dialog will be difficult. A more comprehensive EIS at the development and production stage could take advantage of improved knowledge and additional studies to gain information. The committee recognizes that such a change in procedure could imply important changes in how industry and the federal government treat lease sale bids, revenues from bids and royalties, and associated economic issues. Nevertheless, the current delays in timely and orderly leasing decisions caused by environmental concerns might be reduced significantly by changes in current leasing procedures. Therefore, the committee concludes,

If a more comprehensive assessment for the entire possible sequence of OCS oil and gas activities cannot be made at the time of the leasing decision, then leasing and exploration should be more clearly separated in practice from development and production, with distinctly different phases of scientific data-gathering and analysis.

Science and Public Opinion

A second matter of underlying concern to the committee involves the apparent effects of regional public opinion on the development of scientific information on which to base leasing decisions. The committee is struck by the differences it has found between regions with respect to the content and quality of MMS studies and environmental assessments. Socioeconomic elements that are emphasized in Alaska have not been emphasized elsewhere. Environmental studies funded in California are not funded in the Gulf of Mexico. Some of these differences in emphasis can be justified on scientific and technical grounds. For example, in some cases, less is done in one region because adequate information is already available or because the scientific significance of a particular study is greater at one place than another. Similarly, certain socioeconomic issues might be critical in rural or frontier areas, but of only marginal significance in Los Angeles. Nevertheless, substantially greater resources and effort have been expended for those areas in which offshore activity was being protested, perhaps at the expense of regions that had no less exposure to potential environmental impacts, but where there was less protest.

National Energy Policy

Finally, the committee notes the present uncertainties as to national (federal) energy policy. In the largest sense, the leasing of federal offshore petroleum resources represents an assertion of national objectives (energy policy and the management of federal resources) in a context with high potential for conflict. This potential has obviously been realized in conflicts between the federal programs responsible for offshore leasing and various environmental groups, affected states, local governments, and other governmental jurisdictions. These groups have raised many concerns about environmental quality, other uses of the ocean and coast, and the avoidance of undue socioeconomic impacts.

Adequate scientific information is clearly a key element in the effort to resolve these conflicts. However, the committee also is keenly aware of the demand for offshore energy and the federal revenues derived from offshore leasing. There is concern that these objectives, however legitimate, are not adequately defined or placed in context by national energy policy, although current efforts at the Department of Energy to reassess the national energy policy are

encouraging. Although largely undefined at present, these objectives nonetheless appear to drive the MMS program, largely determining the pace of leasing and the perceived need for MMS to meet program goals.

**Evaluation of the Hydrocarbon Resource Estimates
for the Offshore Areas of
Northern and Southern California
and Florida South of 26° Latitude**

**Committee on Undiscovered Oil and Gas Resources
Board on Earth Sciences and Resources
Commission on Physical Sciences, Mathematics, and Resources
National Research Council**

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Frank Press is president of the National Academy of Sciences.

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EXECUTIVE SUMMARY

The Committee on Undiscovered Oil and Gas Resources was asked to review and evaluate (1) the methods and procedures used by the Minerals Management Service (MMS) to estimate oil and gas resources for three outer continental shelf (OCS) areas and (2) the adequacy of the information for producing credible estimates for those areas. The committee established two panels to study these matters, one for the two areas of northern and southern California (lease sales 91 and 95, respectively) and the other for the South Florida Basin (lease sale 116, part 2). In working sessions at the MMS field offices where the information is maintained, the panels examined representative information, which is proprietary, pertinent to the OCS area and reviewed the methods and procedures applied to the information by the professional staff that conducted the resource estimate.

The panel that conducted the reviews of the northern and southern California areas finds that the MMS has an extensive and adequate data base for the two areas from which to develop resource estimates. The professional staff is judged to be highly qualified, and their methods and procedures in the assessment process appear to be generally appropriate. In the panel's opinion the current resource estimates are very likely conservative because of incomplete consideration of potential stratigraphic accumulations and other conceptual plays not detectable by seismic methods and because of MMS risking techniques and economic screening.

The panel was not able to evaluate directly the current MMS resource estimate for the South Florida Basin because the estimate was not available at the time the review was conducted. However, the panel examined the quantity and quality of available data and reviewed the methods and procedures employed in the resource estimation process.

Because no wells have been drilled in the basin, there is no firm basis for the determination of velocities or other stratigraphic control of the seismic data, no direct evidence of rock units that could serve as hydrocarbon reservoirs, and no direct method of recognizing potential hydrocarbon source rocks. Consequently, it is reasonable to expect large uncertainties in the resource estimate. However, good use is made of well data in adjacent areas, and the seismic lines, although sparse in parts of the basin, are of very high quality. The methods and procedures employed by the staff in extrapolating from areas with information to areas with little data are entirely appropriate for the level of information available for the basin.

The Committee on Undiscovered Oil and Gas Resources (the parent committee for the review of the three lease areas that are the subject of this report) is conducting a review of the methodologies and procedures used by MMS, and the information available to the agency in producing hydrocarbon resource estimates for all offshore areas of the United States. At the time of the preparation of the panel reports, the committee had not reached conclusions concerning some aspects of the methodologies and procedures that influence the hydrocarbon resource estimates produced by MMS. Therefore, the members of the two panels (who are members of the parent committee as well) conducted the review of these three lease areas without considering such issues of methodologies and procedures. The committee concurred with this approach, and will provide further elaboration in its report scheduled for release in March 1990.

INTRODUCTION

In his budget address to Congress on February 9, 1989, President Bush announced the establishment of a cabinet-level task force to review environmental concerns associated with outer continental shelf (OCS) oil and gas activities in three OCS lease areas: southwestern Florida (sale 116, part 2), southern California (sale 95), and northern California (sale 91). The National Research Council was asked to provide the task force with a review of scientific and technical information about environmental concerns and petroleum resources.

Committees in two boards of the National Research Council were already involved in relevant studies. The Committee on Undiscovered Oil and Gas Resources in the Board on Earth Sciences and Resources was reviewing methods of estimating onshore and offshore undiscovered hydrocarbon resources. The Committee to Review the Outer Continental Shelf Environmental Studies Program in the Board on Environmental Studies and Toxicology was reviewing the Environmental Studies Program (ESP) of the Minerals Management Service (MMS). On the basis of their experience with these nationwide reviews, the committees undertook to review the information pertaining to the three sale areas of concern. This report is from the Committee on Undiscovered Oil and Gas Resources.

To address the request, two panels of the committee were established: one panel was assigned the task of reviewing the Minerals Management Service (MMS) estimates of undiscovered hydrocarbon potential of the northern and southern California portions of the OCS (lease sales 91 and 95, respectively); the second panel was assigned to review the estimates for the southwestern Florida portion of the OCS (lease sale 116, part 2).

This report is the product of the combined efforts of the two panels.

The charge to each of the panels was to do the following:

1. Review and evaluate methodologies of estimates by MMS, and others, regarding the quantity and chemical composition of potential hydrocarbon resources in the OCS area(s).
2. Assess the adequacy and reliability of the existing scientific and technical information to make the following determinations in each subject and area under consideration; specifically (a) what is known, plus reasonable extrapolation accompanied by an expression of the error or uncertainty, (b) what information is missing and the reasons why (e.g., difficulty of measurement, confounding of data, lack of theory, or insufficient time), (c) what information could be obtained with reasonable increments of investigative resources (e.g., personnel, financial support, facilities, and time), and (d) what most needs to be known to support decision making on a factual basis comparable to other similar problems?

The findings presented herein are to be considered preliminary and subject to review and possible modification by the committee in its forthcoming report.

NORTHERN AND SOUTHERN CALIFORNIA OUTER CONTINENTAL SHELF AREAS

In order to evaluate the data and methodology used in estimating oil and gas resources in the northern and southern California OCS, the panel held a three-day meeting on June 26-28, 1989, at the regional office of MMS in Los Angeles. During the panel meetings with MMS, a thorough, detailed, in-depth review of the entire scope of lease sales evaluation procedures and resource assessment processes was conducted. Los Angeles MMS regional supervisor, Robert Paul, and his professional staff presented every aspect of their methodology to the panel with complete cooperation, openness, and constructive attitudes, and full access to data, thought processes, and systems applications was given. At least 12 MMS personnel participated in the review.

Evaluation of Methodology

The panel reviewed the entire process by which economic evaluations for lease sales are derived on a tract basis and by which oil and gas resources are calculated. Because of the extensive seismic data base available to MMS in both the northern and the southern California lease sale areas, structural prospect mapping is the primary focus for identifying undiscovered resources of oil and gas. The same method used to evaluate prospects for tract economics is used in the resource assessment process.

In the MMS Pacific Region a threefold, stratigraphically subdivided play definition is used: i.e., pre-Monterey, Monterey, and post-Monterey. Undiscovered resources are aggregated from prospect to basin to area to region. This process is consistent within the region, but does not conform to "play definition and analysis" as used both offshore and onshore elsewhere in the National Assessment.

In both the MONTCAR (tract evaluation) and the PRESTO (resource assessment) programs, critical aspects lie in the methods by which risk is assessed with respect to zones, prospects, basins, and areas. Definition and application of probabilistic dependence and independence in risk analysis may significantly alter resource estimates. For example, in one case where four zones were evaluated by individual chance of success (1 minus percent risk) to arrive at a prospect chance of success, the zones were assumed to be independent, an assumption that the panel judged to be unwarranted and which resulted in a prospect chance of success of 0.73. If the zones had been judged to be dependent, the result would have been 0.85 (zone chance factors used were 0.98, 0.97, 0.90, and 0.85). Because the chance of success is a direct multiplier in the operation which determines prospect reserves, significant reserve reduction would occur in multimillion barrel prospects. The significance of the probabilistic dependence/independence assumptions are currently under review and will be addressed in the committee's report.

It is apparent to the panel, though, that current practice may result in conservative estimates of undiscovered resources in both areas. A substantial effort to improve current risk assessment practice is warranted. First, statistical studies of well data to determine the empirical nature of zone risk dependencies should be undertaken. Few have been done. Second, the results of such studies should be incorporated into MMS risk assessment procedures.

Using all available subsurface well data and extensive seismic reflection data, MMS personnel do attempt to define, map, and estimate undiscovered resources for "postulated" or "unidentified" plays. These include stratigraphic traps (e.g., pinchouts or truncations), complex structures (e.g., thrust faults), diagenetic alterations (e.g., opal-chert), and statistical projections of unmapped structural closures in areas with widely spaced seismic grids.

Inherent difficulties in identifying, justifying, and quantifying unidentified prospects may result in underestimating undiscovered resources, particularly in the more remote frontier areas such as the Eel River Basin of the northern California OCS area and the outer banks and basins of the Southern California OCS area. For example, in the northern California Eel River Basin, the entire "postulated" resource was allocated to an estimated 4 "unidentified" structural prospects as compared to 92 "identified" structural prospects. In the entire basin the unidentified category yielded a risked total resource of only 5 million barrels of oil as compared to a total of 159 million barrels of oil for the identified category. This process does not include possible stratigraphic or other types of conceptual traps known to occur in other California basins.

With regard to the chemical composition of potential hydrocarbon resources, MMS has utilized available data sources including public as well as purchased proprietary geochemical analyses of specific wells, surface sections, bottom samples, basins, and areas. Engineering data from field and production history are effectively applied by direct projection or by analog comparisons.

Determination of total basin generative capacity as a means of estimating the quantity of hydrocarbons is not used except by analogy based upon onshore basin comparisons.

Focus upon the Monterey Formation as the dominant source (and reservoir) may have the effect of downplaying other potential hydrocarbon source beds and thus tend to understate their contribution to postulated or unidentified plays in resource assessment processes. Nevertheless, the MMS methodology in characterizing the types and compositions of hydrocarbons in potential accumulations seems to the panel to be a fundamentally sound state-of-the-art application of geochemical data and principles.

At this stage in the committee's review of the MMS methodology to estimate quantity and chemical composition of potential hydrocarbon resources, the assessments of the northern California area and the southern California area seem to be adequate for economic tract evaluation decision making. The panel considers that the process appears to develop a conservative estimate through application of multiple risking approaches and economic screening. If this is sustained in the committee's final report, the MMS resource estimation efforts will probably be found to understate the undiscovered resource base that could yield potentially recoverable reserves.¹

Conclusions

In reviewing what is known, it is apparent that MMS has an unequaled, extensive data base of geological, geophysical, engineering, and production information on the southern and northern California OCS. The panel views this data base as adequate for making sound estimates of the hydrocarbon resources in these areas. The staff is highly qualified and applies currently accepted, state-of-the-art methods to their analyses and interpretations. Continued study, review of methods, and sensitivity testing of results of risking and dependence versus independence could benefit the process of resource assessment.

A critical element with respect to missing information lies in the inability of MMS (or USGS) to obtain the use of certain confidential data concerning state of California waters in the 3-mile zone. The California State Lands Commission retains control over the data,

¹ The term "recoverable reserves" is used herein in its standard connotation of referring to those identified hydrocarbons that are recoverable by all existing methods except for enhanced oil/gas recovery.

which results in a critical gap in the transition area of projection of interpretive trends from onshore to offshore.

Although MMS has extensive seismic grid coverage, especially in the productive and more competitive basins and areas, northern portions of the Eel River Basin of northern California and the western extremities of the southern California outer banks and basins could be better understood with a denser seismic grid.

In order to enhance decision making based upon the relative values and significance of potential resource development, it is important to utilize the best possible knowledge and understanding of these resources. More emphasis on conceptual geologic plays or prospects could improve the "postulated" or "unidentified" component of the assessment.

Priorities within MMS now limit detached analysis of prospects to post-sale evaluation of tracts having received bids. Because the resource assessment process is directly related, and dependent upon, the lease sale process, more detailed mapping and evaluation of prospects as a routine treatment of tracts prior to sales could yield a more defensible result.

In the panel's view, MMS tends to emphasize the economic assessment of specific tracts for lease sale purposes. A policy of greater emphasis on resource base assessment processes within MMS, could result in more definitive knowledge of the resource base available for long-term exploration and development under different political, technological, and economic scenarios. This, in turn, could provide better support for enlightened decision making.

SOUTH FLORIDA BASIN OUTER CONTINENTAL SHELF, SOUTH OF 26° LATITUDE

In order to evaluate the data and methodology used in estimating oil and gas resources in the South Florida Basin OCS, the panel held a two-day meeting on June 27-28, 1989, at the regional offices of MMS in Metairie, Louisiana. The meeting was conducted in an informal, work-session format with excellent cooperation from the MMS regional supervisor for resource evaluation and his staff. Eight MMS professional staff members participated in the meetings.

Evaluations of Methodology

Geology/Geophysics Data Base

As their studies of the South Florida Basin were in an early stage of development and were ongoing, according to MMS staff, there is a limited data base. Extensive use of the available geologic literature was made in defining the nature of the basin and in focusing on the primary objective zones. No wells have been drilled in the offshore part of the basin to date, but well data from 6 dry holes along the Sarasota Arch, 11 dry holes along the Pine Key Arch, north and south of the basin, respectively, 3 dry holes in state waters on the south flank of the Sarasota Arch to the northeast of the basin, and data from the onshore, productive Sunniland Trend were extrapolated to define potentially productive zones. These data consisted of various types of well logs, sample logs, and well histories. At this stage of the studies, no samples had been examined by MMS personnel, but the panel was informed that this is planned for the near future.

Seismic data consisted of commercial seismic lines of good quality ranging in age from 1981 through 1988. The highest density of the seismic grid pattern was concentrated on and around acreage blocks associated with prior lease sales. Several Lower Cretaceous horizons and top of basement were identified on the seismic lines and were used to construct structure contour maps. A limited amount of geochemical data is commercially available for most of the wells drilled along the southern flank of the basin, but this has not been included in the MMS assessment. Total organic carbon sufficient for generating hydrocarbons is present in the onshore Sunniland source rocks. Thermal history plots for the onshore wells suggest that mature source rocks may be present offshore.

Lower Cretaceous formations make up most of the prospective section. Prospective horizons are the Dollar Bay carbonate and evaporite sequence, the Sunniland Formation, which has produced over 92 million barrels of oil from onshore fields, the porous Brown dolomite, the Pumpkin Bay and deeper carbonate sequence and the Lower Cretaceous Shelf Edge Reef Trend. Additional potential exists in Triassic(?) basal sands over the basement surface and in grabens. The presence of porous, prospective sections in the wells surrounding the basin leads to the interpretation that there may be zones of comparable reservoir quality within the basin itself.

A total of 141 structural traps have been mapped, using the available seismic grid. The traps are predominantly anticlinal closures and fault closures. An additional 119 structures have been interpreted by projecting the number of mapped prospects from areas of good seismic control into areas where seismic coverage is sparse or nonexistent.

Resource Assessment Procedures

The absence of wells drilled in the offshore parts of the basin results in greater uncertainty in resource estimation. Information obtained from wells aids in interpreting the seismic data through refinement of velocity profiles for the stratigraphic section and in correlating seismic reflectors with specific subsurface rock units. Furthermore, logs, samples, and cores from wells permit the identification and evaluation of potential source and reservoir rocks. If successful, these wells can provide for direct detection of hydrocarbons. The lack of such analytical tools impedes the assessment process. Although the panel is not in a position to determine either the number or the location of wells needed to characterize adequately the hydrocarbon potential of the basin, at least one stratigraphic test well is necessary for the reasons cited above.

Because of the nonuniform distribution of seismic control, it was necessary to extrapolate from areas of dense seismic grid where traps were well-defined to areas of no control in order to estimate the total number of possible traps in the resource assessment area. This extrapolation was done by direct analogy: the number of and size distribution of unidentified prospects in areas of sparse control are chosen to match experience in areas with good seismic control. Most of the identified traps are structural (e.g., fault or fold closures), and the estimated total number of traps is considered to be conservative. The panel had some concern with the narrow range of uncertainty expressed about the number of unidentified prospects at the time of its meeting with this branch of MMS.

Lack of data within the South Florida Basin generally has prevented the identification of stratigraphic traps (e.g., pinchouts or unconformities) to the extent to which they are probably present. Stratigraphic traps are very common in the equivalent stratigraphic intervals throughout the Gulf Coast region, and it is reasonable to expect that they will become increasingly important in this basin as the data necessary to identify them develop.

Various estimates of trap filling were used in calculating volumetric estimates of the resources of the basin, but the calculations were not complete at the time of the meeting. In the interim, calculated ultimate recoveries from other Lower Cretaceous fields along the Gulf Coast trend were used as indirect analogs to provide an indication of what order of magnitude might be expected in the resource estimate.

The current method of assessing unidentified prospects based on a sample of seismically generated prospects is subjective in character and might be usefully supplemented in future assessments with objective statistical methods specifically tailored to a seismic search for prospects.

The procedure for assigning risks to prospects follows standard MMS practice: judgmental probabilities of .90 to .94 for the prospect risk in frontier provinces is reasonable in light of experience elsewhere. In this assessment, MMS did not encounter the problem of assigning multiple zone risks. However, as exploration proceeds and information accumulates, the need will emerge to appraise multiple zone risks systematically. The committee will address this subject in more detail in its report.

Conclusions

At this writing, MMS is in the process of determining its resource estimate for the South Florida Basin but does not have it completed. The MMS regional supervisor for the Gulf Coast confirmed on August 29, 1989, that the resource estimate was in Washington pending final review. As the resource estimate of oil and gas for the basin was not available from MMS at the time this report was completed, the panel was not able to assess its credibility.

Although the available data are limited in the South Florida Basin, it is apparent to the panel from its meeting with MMS staff that they are using appropriate techniques for interpreting the geological potential of the basin. The methods used in predicting the number, distribution, and volume of structural traps are appropriate for this frontier area at this stage in its history. Because the estimation procedure does not include prediction of stratigraphic traps, the panel believes that the total resource estimate will probably be very conservative.

The Committee on Undiscovered Oil and Gas Resources (the parent committee for this panel) will comment further on the resource estimate of the South Florida Basin in its report to be issued in March 1990.