Recommendations and Record of Decision

Proposed Use of Floating Production, Storage, and Offloading Systems On the Gulf of Mexico Outer Continental Shelf Western and Central Planning Areas

1. Introduction

The United States Department of the Interior (DOI) Minerals Management Service (MMS) has prepared an environmental impact statement (EIS) to evaluate potential environmental effects of the proposed use of floating production, storage, and offloading (FPSO) systems in the deepwater part (areas >650 ft [200 m] in water depth) of the Western and Central Planning areas of the Gulf of Mexico Outer Continental Shelf (OCS) (proposed action). An FPSO is a floating production system that stores crude oil in tanks located in the hull of the vessel and periodically offloads the crude to shuttle tankers or ocean-going barges for transport to shore. The FPSO's may be used to develop marginal oil fields or used in areas remote from the existing OCS pipeline infrastructure. The EIS was prepared in accordance with the National Environmental Policy Act (NEPA), as amended, 42 U.S.C.§§ 4321-4370(d)(1994), and MMS implementing guidelines. The EIS was initiated not only to evaluate potential environmental impacts, but also to provide for public disclosure and input. The MMS also funded a comparative risk analysis to evaluate the risks associated with FPSO technology compared to those associated with three types of existing Gulf OCS deepwater facilities. The Record of Decision represents the culmination of this NEPA process and summarizes the proposed action and alternatives evaluated in this EIS, the conclusions of the impact analyses, and other information considered in reaching a programmatic decision on the proposed use of FPSO's. This document presents the Gulf of Mexico OCS Region's recommendations for the programmatic decision on the potential use of FPSO's in the deepwater areas of the Western and Central Planning Areas of the Gulf OCS. The selection of an alternative by the Associate Director for Offshore Minerals Management, and the signing of this document, will establish the Agency's Record of Decision for the EIS.

2. Background

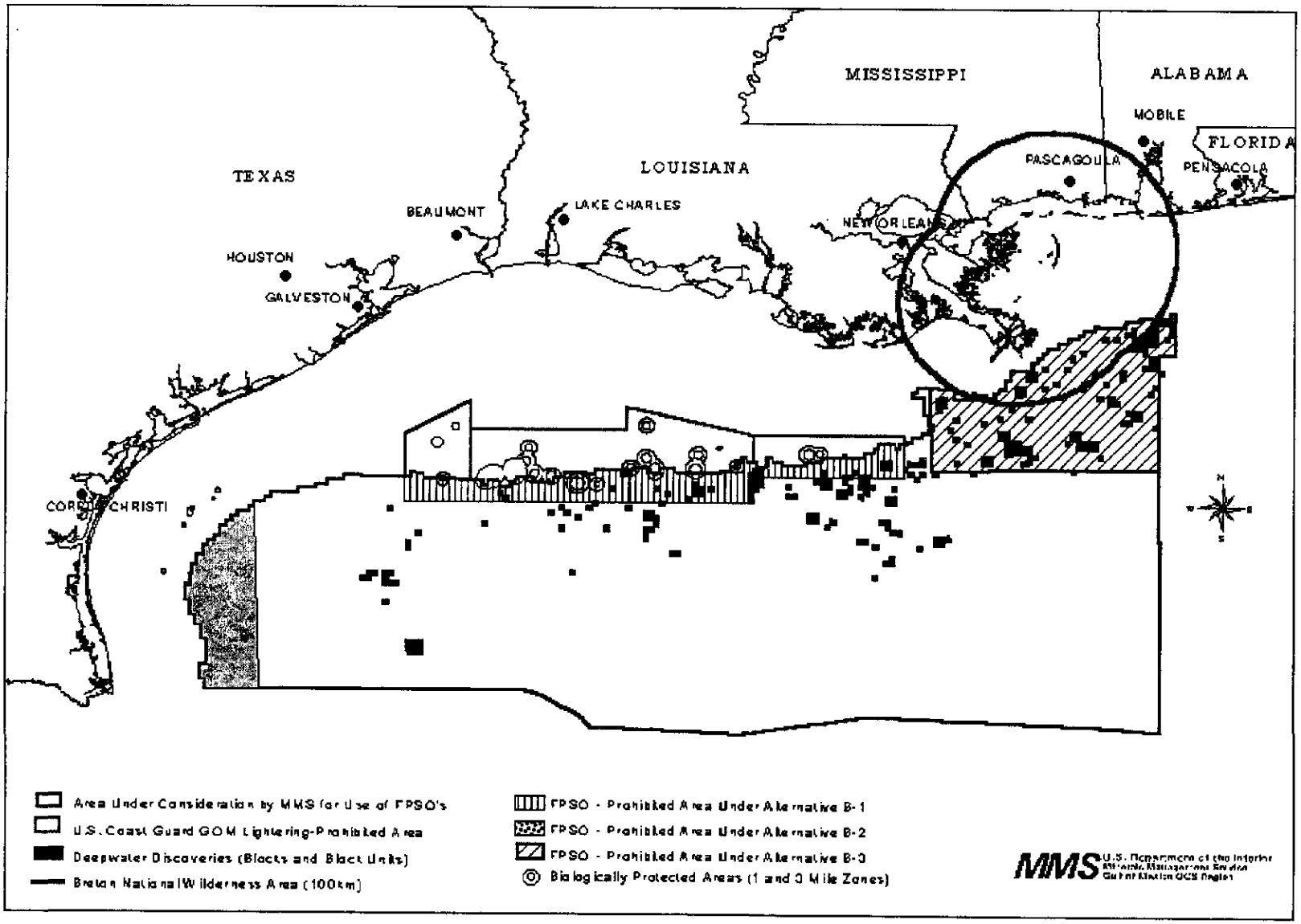
In 1996, OCS operators, as well as builders and operators of FPSO vessels, began having serious discussions with the MMS about the possibility of using FPSO systems in the Gulf of Mexico. The use of FPSO's has the potential to enhance industry's capabilities to develop oil and gas reserves in deepwater areas that otherwise would challenge or exceed the limits of current deepwater production and transportation infrastructure and technologies. The advantages offered by FPSO's include extensive deck space, adaptability to a wide range of sea conditions, independence from pipeline infrastructure, mobility that allows reuse of the FPSO to develop additional fields, and shortened cycle time (time from discovery to first production). The FPSO's offer an option to develop areas that present technological and/or economic barriers to development (e.g., great distances from existing pipeline infrastructure, extreme water depth, very irregular seafloor topography, or fields with marginal production potential).

Recognizing that the use of FPSO's would represent new technology and potential impacts in the Gulf OCS, the MMS approached the issue on several fronts. The U.S. Coast Guard (USCG), U.S. Fish and Wildlife Service (FWS), and the National Marine Fisheries Service (NMFS) were consulted on FPSO-related issues under their respective jurisdictions. The MMS sponsored and participated in several joint Federal/industry workshops to identify the technical, safety, and environmental issues and information needs related to FPSO's, as well as to gain a better understanding of FPSO technology and scope of operations around the world (OCS Report MMS 98-0019). A joint MMS/USCG/industry team has reviewed the existing MMS and USCG regulatory framework and identified which regulations appropriately apply to FPSO's, which regulations need revision to apply to FPSO's, and where there are gaps in the regulatory framework. This team also reviewed which industry standards and recommended practices might be appropriate to incorporate into the Federal regulatory framework.

Figure 1 shows the areas of the geographic alternatives studied in the EIS. The EIS is a programmatic document that examines the concept of, and fundamental issues associated with, the petroleum industry's proposed use of FPSO's in the Western and Central Planning Areas of the Gulf OCS. The EIS addresses the proposed action generically and does not constitute a review of any site-specific development proposal. The EIS considers a range of technical variations that would reasonably be expected to represent industry's intended applications of these systems. The major components of the "base-case," a generic FPSO system and operation, generally fall within a range of potentially viable design choices and configurations. The base-case that was evaluated is a permanently moored, double-hulled, ship-shaped FPSO with 1 million bbls of crude oil storage capability. In the EIS scenario, the area of potential deployment is limited to water depths greater than 650 ft (200 m) in the Western and Central Planning Areas of the Gulf. The produced oil would be periodically offloaded to shuttle tankers for transport to Gulf coastal ports; the associated gas, which under MMS regulations must be brought to market, would be transported to shore by pipeline. Consideration of the proposed action was limited to a 10-year period, 2001 through 2010, because rapidly changing technologies make projections beyond that timeframe very uncertain. The MMS projects that five FPSO's could be incrementally deployed by industry within the geographic area of consideration during this 10-year period. The EIS provides a programmatic NEPA review of the major aspects of FPSO's and FPSO-like operations, including on site-storage of large volumes of produced oil, offloading operations, surface transport of OCS-produced crude oil, and the potential fate and effect of very large accidental oil spills.

Information from a comparative risk analysis, the EIS, and other sources was considered in reaching the recommendations and decisions presented in this document. This Recommendation and Decision Document is not the end of MMS's evaluation of FPSO's and related issues. Programmatic and general studies will continue to be funded through the MMS Environmental Studies Program and the Technical Assessment and Research Program. The MMS will continue to work with the USCG to delineate jurisdictional issues based on the Memorandum of Understanding (MOU) between the two agencies. Refer to Section 11 of this document for additional details about the MMS and USCG initiatives underway to implement the MOU. The MMS will continue to consult and coordinate with the appropriate Federal and State agencies and be an active participant in industry workshops, conferences, and other forums.

This Recommendation and Decision Document does not constitute approval of any specific FPSO project. The FPSO proposals would be subject to further technical and environmental evaluation under established MMS and USCG review and decision processes (addressing engineering, safety, oil-spill response, air quality, water quality, and other site-specific reviews and evaluations); U.S. Environmental Protection Agency (USEPA) water quality permitting; and any applicable review by affected states for coastal zone consistency. The MMS will require submission and approval of a Deepwater Operations Plan (DWOP) and a Development Operations and Coordination Document (DOCD) before any FPSO operation could occur. The DOCD environmental review will be tiered off of the regional environmental analysis in the programmatic EIS and will focus on the site-specific and system-specific aspects of the proposed FPSO. Any proposed FPSO operations that are not within the range of operations evaluated in the programmatic EIS will require more extensive environmental and technical review to demonstrate equivalence to what was investigated by MMS.


MISSISSIPPI
ALABAMA
MOBILE
FLORIDA
PASCAGOULA
PENSACOLA
TEXAS
LOUISIANA
BEAUMONT
LAKE CHARLES
NEW ORLEANS
HOUSTON
GALVESTON
CORPUS CHRISTI
Area Under Consideration by MMS for Use of FPSO's
U.S. Coast Guard GOM Lightering-Prohibited Area
Deepwater Discoveries (Blocks and Block Units)
Breton National Wilderness Area (100km)
FPSO - Prohibited Area Under Alternative B-1
FPSO - Prohibited Area Under Alternative B-2
FPSO - Prohibited Area Under Alternative B-3
Biologically Protected Areas (1 and 3 Mile Zones)
MMS

3. Recommendations

The MMS has examined the concept of allowing the use of FPSO's in the Western and Central Planning Areas and found no compelling environmental reason why development and production plans proposing to use this method of production should not be submitted by the oil and gas industry for evaluation by the agency. The EIS analyses concluded that the potential impacts from routine operations of FPSO's are similar to those from currently accepted deepwater production systems with the exception of potential sulfur-dioxide-related, air quality impacts to the Breton National Wilderness Area (NWA). The MMS will evaluate the potential emissions and impacts of any proposed use of an FPSO within 100 kilometers (km) of the Breton NWA, and will impose emission restrictions and mitigation requirements to ensure that significant adverse air quality impacts to the Class I area do not occur from FPSO operations. The EIS analyses also concluded that the risk of accidental oil spill from FPSO systems and related shuttle tankering are comparable to the risk of oil spills from currently accepted deepwater production systems and related oil pipelines; the MMS-funded comparative risk analysis supports this conclusion. In summary, the EIS found that FPSO systems do not pose a greater threat to the environment than do currently accepted development and production systems.

The following discussion summarizes the alternatives considered in the EIS and rationale for the Gulf of Mexico OCS Region recommendations.

- Alternative A – Approve the general concept of using FPSO's in deepwater areas of the Western and Central Planning Areas of the deepwater Gulf OCS.

- Alternative B – Approve the general concept of using FPSO's with geographic and operational restrictions or conditions:

    - Alternative B-1 – exclude FPSO's from the USCG-designated lightering prohibited areas.

    - Alternative B-2 – exclude FPSO's from the Corpus Christi and Port Isabel map protraction areas (areas nearest the Texas coast).

    - Alternative B-3 – exclude FPSO's from the Viosca Knoll and Mississippi Canyon map protraction areas (areas nearest the Louisiana coast).

    - Alternative B-4 – require an attendant vessel be present with FPSO's.

- Alternative C – No action at this time (insufficient information to make a decision). Under Alternative C, FPSO proposals could still be submitted for environmental analysis on a case-by-case basis.

Recommend selection of *Alternative B-1* for a period of two years. Under Alternative B-1, FPSO's would be allowed to operate in the Western and Central Planning Areas of the Gulf in

water depths greater than 650 ft (200 m), except within the lightering prohibited areas established by USCG under 33 CFR Part 156 Subpart C. The MMS will defer to USCG jurisdiction and will not accept proposals for the use of FPSO's within the lightering prohibited areas for two years. The USCG has stated that offloading operations from an FPSO are considered lightering and are thus banned from the lightering prohibited areas. Under Title 33 CFR Part 156.225, the cognizant District Commander has the authority to establish a designated lightering zone for specific operations. The two-year period will provide time for additional discussions with USCG about the potential use of FPSO's within portions of the lightering prohibited areas, and what measures might be necessary to protect the environment should FPSO's be considered for use within the lightering prohibited areas. The time will also allow review of the applicability of the environmental assessment completed ten years ago by USCG in support of the rulemaking that established the lightering prohibited areas.

The Louisiana Department of Natural Resources recommended selection of this alternative to protect the Flower Garden Banks and other topographic features and because accidental spills in this area have the potential to reach coastal marshes in Louisiana. The MMS has established effective mitigation to protect benthic communities associated with seafloor topographic features from impacts from anchoring and mooring systems, pipeline installation, and operational discharges. The MMS believes that communities at these water depths would not be impacted by accidental surface spills that might occur from FPSO operations. The conclusions of the EIS analyses are that the risks and impacts of accidental spills associated with FPSO's are not significantly different from those associated with other deepwater systems.

Selection of Alternative B-1 meets MMS's mandate to manage safe leasing, exploration, development, and production of mineral resources on the Federal OCS, while recognizing the regulatory jurisdiction of the USCG. Alternative B-1 allows the MMS to select and impose measures to protect the environment (i.e., site-specific and proposal-specific environmental mitigation and safety controls), without excluding the potential use of FPSO's from areas for which FPSO's may be the only economically viable option for development and production of energy resources of vital importance to the Nation, except for the USCG-designated lightering prohibited areas.

Recommend against selection of *Alternative A* (the proposed action). Alternative A is conceptual approval of the use of FPSO systems in the deepwater areas of the Western and Central Planning Areas of the Gulf OCS, with no geographic restrictions or programmatic operational requirements. Alternative A would not reflect MMS's acknowledgement of USCG regulatory jurisdiction over lightering operations in U.S. waters. The Offshore Operators Committee and offshore operators and supporting industries submitted comments supporting selection of Alternative A.

Recommend against selection of *Alternative B-2.* Under Alternative B-2, FPSO's would not be permitted in the Corpus Christi or Port Isabel map protraction areas. This alternative was designed to evaluate whether FPSO operations in this area would pose greater risks from accidental oil spills than the risks posed by other deepwater development and production systems. The EIS analyses concluded that the risks and impacts of accidental spills associated

with FPSO's are not significantly different from those associated with other deepwater systems. No comment on this alternative was included in any of the three comment letters from the State of Texas. This alternative is not recommended for selection because exclusion of FPSO's from the Corpus Christi and Port Isabel map protraction areas would not reduce the overall risk of occurrence of, or potential impacts from, accidental oil spills.

Recommend against selection of *Alternative B-3.* Under Alternative B-3, FPSO's would not be permitted in the Viosca Knoll and Mississippi Canyon map protraction areas. This alternative was designed to evaluate whether FPSO operations in this area would pose greater risks from accidental oil spills than the risks posed by other deepwater development and production systems. The Louisiana Department of Natural Resources recommended selection of this alternative as this is the deepwater area closest to the Louisiana coast and has the greatest potential for accidental spills reaching the coastal marshes. The Florida Department of Environmental Protection recommended selection of this alternative to minimize risk to Florida's natural resources from an accidental oil spill. The EIS analyses concluded that the risks and impacts of accidental spills associated with FPSO's are not significantly different from those associated with other deepwater systems. This alternative is not recommended for selection because exclusion of FPSO from the Viosca Knoll and Mississippi Canyon map protraction areas would not reduce the overall risk of occurrence of or potential impacts from accidental oil spills.

Alternative B-3 is the environmentally preferable alternative. This alternative would eliminate the potential for any significant impacts from FPSO operations on air quality in Breton Sound NWA. The Region has not recommended selection of this alternative, however, because exclusion of FPSO's from the entire exclusion area specified under this alternative is not warranted to address the identified potential for significant impacts on air quality in the Breton Sound NWA Class I area. Proposed OCS operations within 100 km of the Breton Sound NWA are evaluated for potential air quality impacts. If potential impacts are indicated from a proposed FPSO operation, the MMS will impose emission restrictions and mitigation requirements to ensure that no significant air quality degradation of the Class I area occurs.

Recommend against selection of *Alternative B-4.* Under Alternative B-4, an attendant vessel would be required during FPSO offloading operations, as a measure to enhance safety and provide a level of immediate oil-spill response capability. Both the Louisiana Department of Natural Resources and the Florida Department of Environmental Protection recommended selection of this alternative to increase the safety of offloading operations and decrease response time if an oil spill does occur. This alternative is not recommended for selection because under this alternative an attendant vessel would be required for all FPSO's within the entire area of consideration. The potential usefulness of an attendant vessel as a mitigation measure for collision avoidance is location dependent; areas of greater vessel traffic (e.g., near shipping fairways) could realize greater benefits from this measure than areas far from vessel traffic. The potential effectiveness of an attendant vessel for early response to accidental spills does not appear to outweigh the chronic impacts from routine emissions and discharges from the attendant vessel or the potential for collisions with protected marine species. The MMS, in coordination with USCG, will consider requirement of an attendant vessel on a case-by-case basis.

Recommend against selection of *Alternative C.* Alternative C is the "no action" alternative. This alternative was intended to address the possibility that insufficient information would be available to evaluate the impact of FPSO's in the deepwater areas of the Western and Central Planning Areas of the Gulf OCS. This alternative is not recommended for selection because the MMS finds that there is sufficient information available to make the programmatic decision on the use of FPSO's Gulf OCS. The conclusions of both the EIS and the CRA are that there are no significant differences between the risks posed by FPSO's and the risks posed by deepwater production systems that are currently approved and operating in the Gulf of Mexico OCS.

4. Description of the Proposed Action

The proposed use of FPSO's in the Western and Central Gulf of Mexico OCS would provide industry with a deepwater production and transportation option in lease areas that present technological and/or economic barriers to development (e.g., great distances from existing pipeline infrastructure, extreme water depth, highly irregular ocean-bottom terrain, or fields with marginal production potential). These areas could potentially become viable candidates for development with the use of FPSO's. Refer to Section 11 of this document for a discussion of the disposition of the produced natural gas.

The EIS considered the range of "most likely configurations" of FPSO systems that would operate in the deepwater areas of the Western and Central Planning Areas of the Gulf. The base-case scenario for consideration is a generic FPSO system that incorporates the components, configuration, and types and level of activities that would reasonably be expected to represent industry's intended applications of these systems. The base-case scenario was defined in sufficient detail so that (a) a quantitative risk assessment (including a hazard analysis and accident frequency analysis) could be conducted, (b) environmental impact-producing factors could be identified, and (c) an environmental impact assessment could be completed.

The FPSO system likely to be proposed for use in the Gulf of Mexico OCS would involve the following basic components:

- ***FPSO vessel.*** The base-case scenario is a purpose-built, ship-shaped, double-hulled vessel, with a permanent, internal, turret mooring system. The base-case FPSO has oil storage capacity of 1 million bbls divided among ten 100,000-barrel storage tanks within the hull of the FPSO.
- ***Subsea system.*** The subsea systems (wells, flowlines, umbilicals, manifolds, and risers) associated with FPSO's would be essentially the same as those associated with other deepwater production activities presently occurring on the OCS.
- ***Production and processing facilities.*** The production and processing facilities associated with FPSO's would be essentially the same as those associated with other deepwater production activities presently occurring on the OCS.
- ***Gas export pipeline.*** Processed gas would be compressed and exported by pipeline to shore-side processing facilities.

- ***Crude oil offloading.*** Tandem offloading is the most likely configuration, with offloading occurring from once in 10 days to as high as once every three days during peak production.
- ***Shuttle Tankering.*** Under the base-case scenario, 500,000-bbl-capacity shuttle tankers would transport the processed crude oil to Gulf coastal ports or the Louisiana Offshore Oil Port. Under the Jones Act and OPA 90 requirements, shuttle tankers would be double hulled.

Consideration of the proposed action was limited to the 10-year period 2001 through 2010. A 10-year period was chosen for the analysis timeframe because rapidly changing technologies make projections beyond that timeframe very uncertain. The MMS projected that five FPSO's could be incrementally deployed by industry within the geographic area of consideration during the 10-year period. The EIS analysis assumed that the first FPSO could be deployed as early as 2001, and then, with the addition of one FPSO approximately every other year beyond 2001, five FPSO's could be operating in the geographic area of consideration by 2010.

The cumulative analysis considered environmental impacts that potentially could result from the proposed action when combined with past, present, and reasonably foreseeable future actions, including other OCS hydrocarbon development activities, other OCS activities and uses, maritime transport, and coastal activity.

5. Alternatives Considered

Alternative A (Conceptual Approval of FPSO's). This alternative provides for acceptance of the general concept of using FPSO's within the range of design and operational variations considered in the EIS in deepwater areas of the Western and Central Planning Areas of the Gulf OCS. Under this alternative, FPSO's would be considered an acceptable deepwater development technology for use in the Western and Central Gulf OCS. Alternative A would generally have limited adverse impacts on most environmental resources, although significant impacts could occur under certain circumstances. Resources that could be significantly impacted by Alternative A include air quality, water and sediment quality, offshore environments, marine mammals, sea turtles, and commercial fisheries. These significant impacts would only occur under specific conditions; most of these impacts can be avoided by appropriate project planning, impact mitigation, and regulatory restrictions. The proposed action may result in some beneficial effects on fishery resources (artificial reef effects) and localized socioeconomic conditions (e.g., short-term direct employment, and increased indirect employment in support services).

Alternative B (Conditional Approval of FPSO's). This alternative provides for acceptance of the conceptual use of the base-case FPSO system in the Western and Central Planning Areas of the Gulf OCS, with geographic and operational restrictions or conditions. Certain restrictions were identified for consideration based on existing regulatory requirements and perceived risks. These restrictions or conditions are analyzed as variations of Alternative B.

Under ***Alternative B-1***, FPSO's would be allowed in the Western and Central Planning Areas of the Gulf OCS in water depths greater than 200 m (650 ft) except within the lightering prohibited areas established by the USCG under 33 CFR Part 156 Subpart C. The lightering prohibited areas exclude lightering operations and the USCG includes FPSO offloading operations in this definition. Although Alternative B-1 may have less risk of impacts than Alternative A on some benthic resources by excluding FPSO operations from areas near these sensitive resources, other development systems and pipelines have the potential for greater adverse impacts to benthic communities. The MMS has established effective mitigation to protect benthic communities associated with certain seafloor topographic features from direct impacts from anchoring and mooring, pipelines, and operational discharges. Communities at the water depths of the tops of the topographic features are not expected to be impacted by accidental surface spills. Although oil from a surface spill can be driven into the water column (measurable amounts have been documented down to a 10-m depth and modeling exercises have indicated oil may reach a depth of 20 m), at the water depths of the tops of the topographic features, oil would be at concentrations several orders of magnitude lower than the amount shown to have an effect on marine invertebrates.

Under ***Alternative B-2***, FPSO's would be allowed in the Western and Central Planning Areas of the Gulf OCS in water depths greater than 200 m (650 ft) except in the Corpus Christi and Port Isabel map protraction areas (the areas nearest the Texas coast). This alternative was designed to evaluate whether FPSO operations in this area would pose greater risks from accidental oil spills than the risks posed by currently accepted deepwater development and production systems. The conclusions of the EIS analyses are that the risks and impacts of accidental spills associated with FPSO's are not significantly different from those associated with other deepwater systems; the MMS-funded comparative risk analysis supports this conclusion. The MMS site-specific technical, safety, and environmental reviews provide an effective mechanism to reduce the risk of spill occurrence. The frequency analysis for accidental oil spills associated with FPSO operations showed that the risk of spill occurrence from FPSO's and associated shuttle tankering is comparable or less than the risk associated with alternative production systems and pipelines that are being and would be used in this area. Most spills from FPSO's are expected to be small (<1,000 bbl). The risk of larger spills from FPSO's is very low. Spills of less than 1,000 bbl are expected to dissipate within the first several days after a spill. . Modeled spill trajectories starting within these two areas and tracked for 3 days showed 0-2 percent risk of contact to land, with the most likely chance of contact being 0 percent. Both MMS and USCG require oil-spill response plans that provide adequate and appropriate spill preparedness for responding to accidental spills. Exclusion of FPSO's from the Corpus Christi and Port Isabel map protraction areas would not reduce the overall risk of occurrence of, or potential impacts from, accidental oil spills.

By limiting the area in which FPSO's are permitted, Alternative B-2 may result in less risk of impact to some benthic resources by excluding FPSO operations from areas near these resources. For all OCS operations in these areas, MMS has established effective mitigation to protect benthic communities in these areas from direct impacts from anchoring and mooring, pipelines, and operational discharges. Communities at these water depths are not expected to be impacted

by accidental surface spills. Spill prevention measures and approved oil spill response plans are required for all operations in the Gulf OCS.

Under ***Alternative B-3***, FPSO's would be allowed in the Western and Central Planning Areas of the Gulf OCS in water depths greater than 200 m (650 ft) except in the Viosca Knoll and Mississippi Canyon map protraction areas (the areas nearest the Louisiana coast). This alternative was designed to evaluate whether FPSO operations in this area would pose greater risks from accidental oil spills than the risks posed by currently accepted deepwater development and production systems. The conclusions of the EIS analyses are that the risks and impacts of accidental spills associated with FPSO's are not significantly different from those associated with other deepwater systems; the MMS-funded comparative risk analysis supports this conclusion. The MMS site-specific technical, safety, and environmental reviews provide an effective mechanism to reduce the risk of spill occurrence. The frequency analysis for accidental oil spills associated with FPSO operations showed that the risk of spill occurrence from FPSO's and associated shuttle tankering is comparable or less that the risk associated with alternative production systems and pipelines that are being and would be used in this area. Most spills from deployment of an FPSO are expected to be small (<1,000 bbl). The risk of larger spills from FPSO's is very low. Spills of less than 1,000 bbl are expected to dissipate within the first several days after a spill. Except for one modeled site located directly southeast of the mouth of the Mississippi River, modeled spill trajectories starting within these two areas and tracked for 3 days showed an average risk of 0.6 percent of contact. Both MMS and USCG require oil-spill response plans that provide adequate and appropriate spill preparedness for responding to accidental spills. Exclusion of FPSO from the Viosca Knoll and Mississippi Canyon map protraction areas would not reduce the overall risk of occurrence of or potential impacts from accidental oil spills.

By limiting the area in which FPSO's are permitted, Alternative B-2 may result in less risk of impact to some benthic and coastal resources by excluding FPSO operations from areas near these resources. For all OCS operations in these areas, MMS has established effective mitigation to protect benthic communities in these areas from direct impacts from anchoring and mooring, pipelines, and operational discharges. Communities at these water depths are not expected to be impacted by accidental surface spills. Spill prevention measures and approved oil spill response plans are required for all operations in the Gulf OCS.

Prohibiting the use of FPSO's in the exclusion area specified under Alternative B-3 would eliminate the potential for significant impacts on air quality in Breton Sound NWA. However, the exclusion area specified under Alternative B-3 is much larger than the area of concern for potential air quality impacts to the Breton Class I area. Regulations state that prior to approval, new projects located within 100 km of a Class I area must satisfy the Federal Land Manager that the project has no significant impact to the air quality of the Class I arca. Large projects beyond 100 km that pose a significant impact on a Class I area must also comply with Federal Land Manager criteria. Any proposed use of an FPSO within 100 km of the Breton Sound NWA would be evaluated by MMS for potential air quality impacts. The MMS will impose emission restrictions and mitigation requirements to ensure that no significant air-quality degradation of

the Class I area occurs from any proposed FPSO operation. Exclusion of FPSO's from the entire exclusion area specified under this alternative is not necessary to protect the Class I area.

Under ***Alternative B-4***, FPSO's would be allowed in the Western and Central Planning Areas of the Gulf OCS in water depths greater than 200 m (650 ft) and an attendant vessel would be required during offloading operations as a measure to enhance safety and provide a level of immediate oil-spill response capability. The EIS concluded that Alternative B-4 would have greater adverse impacts than Alternative A on air quality, water quality, offshore environments, marine mammals, sea turtles, commercial fisheries, the socioeconomic environment, and other uses. The projected increases in adverse impacts are expected to be slight, with resulting impacts remaining minor or negligible. To be an effective mitigation measure, the attendant vessel would need to be constantly underway and patrolling the area around the FPSO. Routine emissions and discharges associated with continuous operation of such a vessel, as well as the potential for collisions with protected marine species, pose their own impacts.

The presence of an attendant vessel might reduce the potential for collision and impacts from an accidental oil spill by providing quick response capabilities; however, the presence of this additional vessel also contributes to risk of collision. The potential usefulness of an attendant vessel as a mitigation measure for collision avoidance is location dependent; areas of greater vessel traffic (e.g., near fairways) could realize greater benefits than areas far from vessel traffic. A requirement for an attendant vessel for any and all FPSO's within the entire area considered under this alternative is not warranted. The MMS, in coordination with USCG, will consider requirement of an attendant vessel on a case-by-case basis.

Alternative C (No Action). This alternative is the "no action" alternative. Under this alternative the concept of using FPSO's in the Western and Central Planning Areas of the Gulf OCS in water depths greater than 200 m (650 ft) would not be accepted at this time based on this EIS analysis. This alternative was intended to address the possibility that insufficient information would be available to evaluate the impact of FPSO's fully enough to make a programmatic decision. The MMS finds that sufficient information is available to make a programmatic decision on the use of FPSO's in the Western and Central Planning Areas of the Gulf. Selection of Alternative C would not necessarily change the level of potential impacts on environmental resources from those that would result from the selection of Alternative A or any of the Alternative B options. Under Alternative C, oil fields that may have been developed using FPSO's might still be developed using alternative development and production systems (such as spars, TLP's column-stabilized units, and subsea tiebacks). Under Alternative C, FPSO's could still be proposed, evaluated, and approved on a case-by-case basis. If delaying or prohibiting the use of FPSO's were to result in some resources never being developed, then some potential economic benefits might not be realized.

6. Summary of Impact Conclusions

The EIS evaluated potential impacts from three phases of FPSO operations – installation, routine operations over the production life of the system, and decommissioning. The EIS analyzed potential impact-producing factors including seafloor disturbances, emissions, discharges, noise, infrastructure presence, support activities, and demand on coastal infrastructure. The EIS also

analyzed the risk of accidental events (both collisions and spill occurrence) and potential impacts that may result from these events. Direct, indirect, and cumulative impacts, local and regional effects, and short-term and long-term effects were evaluated. The major issues of concern considered and/or analyzed in this EIS include many of the same issues identified during scoping for previous MMS's NEPA documents covering OCS oil and gas development, as well as issues identified specifically for FPSO's in this EIS scoping process. The environmental and socioeconomic resources of concern addressed in the EIS are air quality, water and sediment quality, coastal habitats, benthic communities, marine mammals, sea turtles, coastal and marine birds, fish, commercial and recreational fisheries, recreational resources, cultural resources, and social and economic conditions. The major conclusions of the EIS impact analyses and the frequency analysis for accidental oil spills are listed below.

- Potential site-specific impacts are essentially the same as impacts associated with other deepwater development and production systems, except for potential air quality impacts to the Breton National Wilderness Area (NWA).

- Emissions from shuttle tankers idling during offloading could cause air quality exceedances in the Breton NWA, which is designated as a Prevention of Significant Deterioration Class 1 air quality area.

- Impacts during installation of FPSO systems are expected to be localized, minor, and short term, except for potential impacts to benthic communities from seafloor disturbances associated with installation of gas transmission pipelines.

- Impacts during routine production operations are expected to be localized and minor, except for possible air quality exceedances at the Breton NWA.

- The frequency analysis for accidental oil spills showed that the risk of spill occurrence from FPSO's and associated shuttle tankering is comparable the risk associated with accepted deepwater production systems and pipelines. Most spills from FPSO's are expected to be small (less than 1,000 bbl). The risk of larger spills from FPSO's is very low. Spills of less than 1,000 bbl are expected to dissipate within the first several days after a spill. Given the distance from shore, a spill occurring in the deepwater areas of the Gulf of Mexico OCS would not be expected to contact shore within three days.

- Most of the risk of oil spills from FPSO operations would be associated with the shuttle tanker transport, not the FPSO itself.

- The risk of a spill from shuttle tankers is about the same as the risk of a spill from pipelines.

- The increase in the amount of shuttle tanker traffic from FPSO operations would be an extremely small percentage of the overall amount of maritime traffic in the Gulf of Mexico. FPSO-related shuttle tankers would make an extremely small contribution to

the impacts from maritime traffic (e.g., emissions, discharges, port usage, erosion of channels from passage of vessels).

Impact Conclusions – FPSO Installation, Routine Operations andDecommissioning

Air Quality. Under Alternative A, emissions from routine offloading operations may result in a long-term significant impact in air quality at Breton Sound NWA due to exceedances of the SO_2 standard. The temporary flaring/venting options for gas disposition (or handling) could also have significant impacts on air quality.

Alternatives B-1 and B-2 would have negligible effect on the potential impacts to air quality. Alternative B-3 would effectively mitigate any potential impacts from FPSO-related emissions on the Breton NWA. Alternative B-4 would increase air quality impacts above that projected for Alternative A. For operations in the northeastern part of the Mississippi Canyon area, any air quality impacts could be further exacerbated by the presence of an attendant vessel under Alternative B-4.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed (using currently accepted development systems or with an FPSO that has had sufficient subsequent environmental and technical evaluation).

Water and Sediment Quality. Alternative A would have an adverse, but not significant impact, on water quality. Support vessel traffic from the shorebase(s) to the FPSO site(s) would produce adverse but not significant impacts on coastal water and sediment quality. If vessel traffic is concentrated in one or a few ports, then significant, localized impacts on water quality and sediment quality could occur. Anchoring and installation/emplacement activities would produce localized, short-term impacts on offshore sediment quality. During routine production operations at the FPSO, water discharges and wastewater discharges from the FPSO and support vessels would produce localized, adverse, but not significant, impacts on offshore water quality.

Alternatives B-1, B-2, and B-3 would have negligible effects on the potential impacts to coastal and offshore water and sediment quality. Alternative B-4 would increase impacts on water quality; however, impacts would be expected to remain adverse but not significant.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Coastal Environments. Alternative A would have generally negligible impacts on coastal environments (i.e., coastal barrier beaches, dunes, wetlands, and seagrass beds). Adverse but not significant impacts on coastal environments could occur from incremental increases in erosion rates, sediment re-suspension, and turbidity associated with incremental increases in vessel traffic, depending upon the location of operations and the nature of adjacent coastal resources.

Alternatives B-1, B-2, B-3, and B-4 would have negligible effects on the potential impacts to coastal environments.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Offshore Environments. Alternative A would have generally negligible, localized impacts on offshore environments (plankton, topographic features, and deep benthic communities). Anchoring, structure emplacement, and pipelaying would produce adverse but not significant impacts on soft-bottom benthic communities. Use of either suction pile or driven pile anchoring techniques (instead of drag anchoring) may slightly reduce impacts on the benthos by reducing the total amount of seafloor area affected. Recolonization of disturbed areas is expected during the first several years following FPSO installation and operation. With proper avoidance mitigation, impacts on chemosynthetic communities from installation activities would be negligible. Any damage to chemosynthetic communities would represent a significant, long-term impact. Bottom-founded structures may provide hard substrate for epifaunal attachment, possibly a beneficial impact.

Alternatives B-1, B-2, and B-3 would have negligible effects on the potential impacts to offshore environments. Alternative B-4 may produce a slight increase in impact on both water column and deep benthic environments. This incremental increase in discharges would be minor, and impacts on plankton would remain negligible. If a dedicated anchor is required for the attendant vessel, additional, minor direct impacts on benthic communities would occur and would remain adverse but not significant.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Marine Mammals. Under Alternative A, normal operations would cause localized, adverse impacts on marine mammals, primarily from noise and/or visual disturbances from helicopters, service vessels, and shuttle tankers. Expected increases in service vessel and shuttle tanker traffic associated with normal operations may also increase the probability of collisions between these vessels and marine mammals. Although the risk of collisions may vary, any collision with an endangered species would constitute a significant impact. A collision with a non-listed species would be considered adverse, but not locally or regionally significant. Ingestion of, or entanglement with, any solid debris accidentally lost overboard would produce a negligible impact on marine mammals.

Alternatives B-1 and B-2 would have negligible effects on the potential impacts to marine mammals. Alternative B-3 may mitigate potential impacts of FPSO activities on local populations of sperm whales. Alternative B-4 has the potential for greater impacts on marine mammals; however, the impacts from additional noise or discharges from an attendant vessel are not considered to be significant.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Sea Turtles. Under Alternative A, installation and routine operation of an FPSO would have generally negligible impacts on sea turtles. Collisions with service vessels and shuttle tankers and installation of OCS pipelines may produce adverse or significant impacts. Expected increases in vessel traffic associated with installation may increase the probability of collisions between these vessels and sea turtles. Any collision that causes death of a sea turtle would constitute a significant impact, as all species are currently listed as endangered or threatened species. Destruction of shallow water habitats and beaches as a result of the installation of OCS pipelines may produce adverse but not significant impacts on sea turtles through loss of nesting habitat.

Alternatives B-1, B-2, and B-3 would have negligible effects on the potential impacts to sea turtles. Alternative B-4 has the potential for increased impact on sea turtles from additional subsea mechanical noise and additional discharges, as well as from collisions. Impacts on sea turtles resulting from these sources are considered to be adverse but not significant.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Coastal and Marine Birds. Alternative A would produce negligible or adverse impacts on coastal and marine birds. OCS pipeline landfalls could cause adverse impacts on coastal birds from associated destruction or alteration of coastal habitat and related disturbance from installation operations. With appropriate placement (and avoidance of sensitive avian habitat), impacts are not expected to be significant. Fewer pipeline landfalls would result from the use of FPSO systems than would result from the use of other accepted deepwater production systems. Helicopter and service vessel traffic related to normal FPSO operations would produce only a negligible impact on coastal and marine birds.

Alternatives B-1, B-2, B-3, and B-4 would have negligible effects on the potential impacts to coastal and marine birds.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Fish Resources. Alternative A would have negligible or beneficial impacts on fish resources, except for potentially adverse impacts on highly migratory fish. Anchors and other bottom-founded structures could serve as fish attracting devices (FAD's), a beneficial impact on species preferring bottom relief. Highly migratory fish species could be diverted from traditional migratory routes and, consequently, from traditional spawning or feeding areas. Such

disruptions in migration patterns could result in short- or long-term effects on the feeding behavior in deepwater fishes, an adverse but not significant impact. In situ abandonment of bottom-founded structures would create a permanent FAD effect for benthic fishes; significant impacts are not expected.

Alternatives B-1, B-2, and B-3 would have negligible effects on the potential impacts to coastal and marine birds. Alternative B-4 would have an incrementally greater adverse, but still negligible, impact on fish resources.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Commercial Fisheries. The proposed action would have negligible to adverse, localized, long-term impacts on commercial fisheries. The presence of FPSO's, pipelines, and vessel traffic would preclude deepwater trawling and longlining in relatively small areas surrounding these structures and activities, causing an adverse but not significant impact. FPSO's in water depths greater than 1,000 ft would have greatly less chance for conflicts with trawling and bottom longlining. Partial structure abandonments could cause permanent loss of relatively small fishing areas, a negligible impact on commercial bottom fisheries.

Alternative B-1 and B-2 would have less of an impact on demersal fisheries (i.e., bottom longlining and trawling), especially areas in water depths between 600 and 1,500 ft. Alternative B-1 and B-2 would, however, produce an incremental increase in space-use conflicts with the surface longline fishing, causing an adverse but not significant impact. Alternative B-3 would have less impact than Alternative A on the royal red shrimp fishery, which generally occurs in the proposed exclusion area (i.e., within water depths of 600-1,500 ft). Alternative B-4 would have negligible effects on the potential impacts to commercial fisheries.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Socioeconomic Environment. Alternative A could have short-term socioeconomic benefits along the Gulf coast during construction phases. Impacts of normal FPSO and shuttle tanker operations on the socioeconomic environment would be negligible.

Alternatives B-1would have negligible effects on the potential social and economic impacts. Alternatives B-2 and B-3 would also have negligible effects on social and economic impact overall; however, the beneficial effects of FPSO-related construction and employment may be less. Alternative B-4 may slightly increase employment, but the effect on potential impacts would be negligible.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Recreational Resources and Beach Use. Alternative A would have negligible, localized, adverse impacts on recreational resources and beach use. Slight increases in the number of vessel and helicopter transits would produce minor, incremental impacts on viewsheds in the vicinity of transit routes.

Alternatives B-1, B-2, and B-3 would have negligible effects on the potential impacts to recreational resources and beach use.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Other Uses. Alternative A would have negligible impacts on other uses of the Gulf of Mexico, such as commercial and military uses. Incremental increases in vessel traffic, helicopters, and shuttle tankering would produce the potential for increased conflicts with other uses of surface, airspace, and underwater areas, but these impacts are expected to be negligible.

Alternatives B-1, B-2, and B-3 would have less impact than Alternative A on other uses by excluding FPSO's from designated areas. Alternative B-4 would have a minor incremental increase in impact on other uses, but this would still represent a negligible impact.

Under Alternative C, the level of activity and the associated environmental consequences could be essentially the same as the activities and impacts that might occur under any of the other EIS alternatives, because the resources might still be developed.

Impact Conclusions – Accidental Oil Spill

Air, Water, and Sediment Quality. On a regional basis, oil spills would produce adverse but not significant impacts on ambient air quality, water and sediment quality. Impacts would be relatively short term (i.e., for the duration of the spill).

During the first few days, localized significant impacts to air quality may occur, depending upon the proximity of the spill to sensitive onshore receptors (e.g., the Class I area).

Significant impacts may occur if oil was ignited prior to release (i.e., where spilled oil density greatly exceeds that of seawater), resulting in sinking oil reaching the benthos where it will affect sediment quality.

Coastal Environments. On a local basis, contact by oil spills would produce adverse impacts on coastal barrier beaches or wetlands. The significance of the impact would depend upon volume of oil contacting the coastal environment, the degree of oil weathering, and the characteristics of the contacted coastal environment. Oil spills would not be expected to produce either adverse or

significant impacts on seagrass beds. Probabilities for spilled oil reaching Florida seagrass beds are very low.

Offshore Environments. Oil spills would produce either negligible or adverse but not significant impacts on offshore environments, including state offshore waters, menhaden spawning grounds, and topographic features. Oil from surface spills would not be expected to reach topographic features. Oil from spills in deepwater would be weathered by the time it reached state offshore waters or menhaden spawning grounds. Any impacts are projected to be short term.

Marine Mammals. Mysticetes (baleen whales) are considered more likely to be affected by an oil spill than odontocetes because of mysticetes feeding mechanisms and preferred prey. Small oil spills are unlikely to produce significant impacts on marine mammals. Impacts of larger spills could be significant, of regional importance, and long term. Spill frequencies for larger spills are very low and the probability of exposure to oil from accidental spills from FPSO's or shuttle tankers is low; thus, risk of significant impact to marine mammals from an oil spill is low.

Sea Turtles. Sea turtles are at high risk of suffering serious injury or death if exposed to oil or tar balls, a significant impact given the listed status of all Gulf sea turtle species. The probability of exposure to oil from accidents on FPSO's and shuttle tankers is low; thus, risk of significant impact is correspondingly low. Small oil spills are unlikely to produce significant impacts on sea turtles located well inshore. Impacts from larger spills could be significant (i.e., affecting adults in coastal waters, smothering nests on nesting beaches), of regional importance, and long term. Spill frequencies for larger spills are very low and the probability of exposure to oil from accidental spills from FPSO's or shuttle tankers is low; thus, risk of significant impact to sea turtles from an oil spill is low.

Coastal and Marine Birds. Exposure to oil could result in significant impacts to coastal and marine birds. Large congregations, rookeries, and foraging areas are particularly sensitive. Endangered waterbirds and shorebirds are extremely susceptible to oil in the coastal and intertidal zones, where oil contact resulting in serious injury or mortality is a significant impact. Small oil spills are unlikely to produce significant impacts on coastal and marine birds located inshore of FPSO operations. Impacts from larger spills could be significant, of regional importance, and long term. Spill frequencies for larger spills are very low and the probability of exposure to oil from accidental spills from FPSO's or shuttle tankers is low; thus, risk of significant impact to coastal and marine birds from an oil spill is low.

Fish Resources. Pelagic eggs and larvae of Gulf fishes are vulnerable to oil exposure. The loss of large numbers of embryos and larvae would be an adverse (but not significant) impact, localized, and short term in nature. Impacts on adults from oil exposure are not as severe. The probability of exposure to oil from accidental spills from FPSO's or shuttle tankers is low; thus, risk of significant impact to fish resources from an oil spill is low.

Commercial Fisheries. Nearshore waters and estuarine environments are important habitat to commercially important species. While pelagic eggs, larvae, and juveniles of commercially important fishery species are vulnerable to oil exposure, there are no apparent impacts on adult,

harvestable stocks of those species where early life stages have been exposed to spilled oil. Similarly, recruitment does not appear to be affected by oil exposure. Contamination of tissues of select fish species has minimal impact on health risk. Impacts on commercial fisheries from oil spills would be adverse but not significant. These impacts would be localized and short term. The probability of exposure to oil from accidental spills from FPSO's or shuttle tankers is low; thus, risk of significant impact to commercial fisheries from an oil spill is low. The impact on commercial fisheries associated with closure of a local fishery by state agencies following an oil spill would be adverse but not significant, localized, and of relatively short duration.

Socioeconomic Environment. Of the 13 labor market areas (LMAs) evaluated, only the Brazoria area has a high potential for adverse (but not significant impacts) on oil spill-sensitive employment sectors. Oil spills would have negligible impacts on other LMAs. Impacts upon local infrastructure from cleanup operations would be adverse (but not significant), relatively short term, and localized.

Recreational Resources and Beach Use. On a local basis, oil spills would have negligible, adverse (but not significant), or significant impacts on recreational resources along coastal barrier beaches and within protected embayments and wetlands of the western and central Gulf coast. Impact severity would depend upon spill size, the nature of the oil coming ashore (e.g., highly vs. lightly weathered), the location and characteristics of the recreational resource, season, the nature and extent of cleanup operations, and the amount of time a particular recreational area is closed due to cleanup and/or restoration activities. Impacts may be long term, depending upon spill location and relative sensitivity of the recreational resource affected (e.g., impacts on affected wetlands are generally greater than similar spill exposure on a barrier beach). The probability of large, nearshore spills is low. Smaller spills that occur in deepwater are not expected to reach shore.

Cultural Resources. Contact with oil may have an adverse effect on historical resources (e.g., historical piers, esplanades, boardwalks, landings, port structures, etc.). Contact with oil may severely affect archaeological sites, particularly fragile prehistoric shell midden sites that frequently occur along the Gulf coast.

Other Uses. Oil spills would produce negligible to adverse (but not significant) impacts on other uses (e.g., other Gulf of Mexico oil and gas activities, commercial shipping, and military testing and training operations), primarily through limited preclusion of offshore waters prompted by the presence of the oil spill and oil spill response equipment. Such impacts are expected to be localized and relatively short term.

Impact Conclusions – Cumulative Impacts

Installation, routine operations, and decommissioning activities related to FPSO's would have impacts on air quality and the marine and coastal environments, and could potentially affect commercial fisheries. These impacts are expected to be minimal in magnitude, and localized and/or of short duration (e.g., during periods of installation and decommissioning activities), and therefore less than significant. The degree to which potential FPSO operations might contribute to significant and adverse cumulative impacts would depend on several factors, including

meteorological conditions, fuel characteristics, horsepower, emissions controls, FPSO location, distance from sensitive receptors, and the emissions associated with other activities in the region. The FPSO's are projected to be fewer than 4 percent of the deepwater production startups projected through 2010. Consequently, the incremental contribution of installation, decommissioning and routine operations of FPSO systems toward cumulative adverse impacts in the Gulf region is not expected to be significant.

Emissions that occur during offloading combined with the emissions associated with routine FPSO operations may represent a significant incremental contribution to cumulative adverse impacts on air quality. Additional emissions from other potential on-site sources, including dynamic-positioning (DP) stationkeeping, use of attendant vessels during offloading, and any MMS-approved flaring, could exacerbate the contribution to cumulative impacts on air quality. The incremental contribution to emissions would be of special concern for FPSO's in the northern portion of the Mississippi Canyon Area, which could contribute to significant incremental impact on air quality of the Breton NWA, a Class I area under the Wilderness Act of 1964. The potential impacts were identified for the modeled diesel-powered shuttle tanker idling during offloading operations at an FPSO located within 100 km of the Breton Class I area. The model did not include any mitigation of potential emissions. The potential for any significant contribution to a cumulative adverse impact on air quality would be highly dependent on the location of FPSO's and their proximity to each other, as well as their proximity to other emissions sources, orientation to sensitive receptors, and meteorological conditions. In OCS areas distant from the coast, FPSO operations are not expected to result in significant incremental impacts on air quality, because the emissions would disperse into a substantial volume of the atmosphere.

Transport of OCS-produced oil to inshore or shore-side facilities would be accomplished with shuttle tankers rather than oil pipelines. The potential impacts associated with oil pipelines that would have otherwise been installed would not occur.

Imported crude oil and products that will pass through Gulf ports are projected to increase during the ten-year period used for the EIS analysis. Foreign and domestic tanker transits at these ports may increase from the current 16,334 port transits annually to 20,000-22,000 port transits annually by 2010. The five FPSO's used for the EIS scenario are projected to generate 365-685 shuttle tanker transits to Gulf coastal ports in 2010. This would represent 1.8-3.4 percent of all tanker transits projected for that year.

The projected increase in tanker traffic activity, both in terms of vessel transits and the total volume of petroleum to be transported in the Gulf of Mexico on an annual basis, during the 2001 through 2010 period would bring increased potential for accidents and associated oil spills. The projected increase in demand for petroleum products is expected to continue, and the increase in imports required to meet that demand will be the principal controlling factor in determining the degree to which oil will be transported to U.S. refinery ports and terminals by tankers. Inasmuch as FPSO and shuttle tanker spill risks are comparable to the existing deepwater production structure and oil pipeline risks, increases in oil imports, in the form of increased tanker transits

into Gulf coastal refinery ports and terminals, will drive the cumulative increase for risk of oil spills.

The FPSO operations would incrementally contribute to the demand for support services and, therefore, to the cumulative beneficial and adverse impacts that could be realized at locations for ports and service bases serving deepwater developments. It is expected that infrastructure and services demands and impacts of routine operations would increase relative to the total number of expected tanker transits in the Gulf of Mexico and its ports. The projected shuttle tanker transits associated with potential FPSO operations on the OCS would represent a small percentage of annual tanker transits into Gulf ports during 2001-2010. The incremental impact of routine operations for FPSO shuttle tankers is not expected to be a significant portion of the potential cumulative effects.

7. Mitigation and Risk-Reducing Measures

The Council on Environmental Quality provides the following directions regarding identification of mitigation measures. "Mitigation measures must be considered even for impacts that by themselves would not be considered 'significant.' All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and thus would not be committed as part of the ROD's of these agencies."

Mitigation measures that are identified as potentially applicable to the proposed use of FPSO's on the Gulf OCS include those that would address potential impacts associated with FPSO installation and routine operations; the incorporation of risk-reducing measures that would lessen the potential for accidents that could result in an oil spill or minimize the volume of an oil spill should an accident occur; and mitigation measures for ensuring appropriate and timely oil spill response, should a spill occur. All of the mitigation measures identified in the EIS address site-specific or proposal-specific potential impacts. These measures are most appropriately considered and applied on a case-by-case basis.

Routine Operations

The EIS analysis determined that potentially significant air quality effects could result from shuttle-tanker offloading operations in the northeast quadrant of the Mississippi Canyon protraction area. A shuttle tanker idling during offloading operations could generate sulfur dioxide emissions that could exceed Class I standards in the Breton NWA in offshore Louisiana. As for every OCS development plan, the MMS will perform a proposal-specific and site-specific review for potential air quality impacts from proposed operations. The MMS will impose appropriate emission thresholds to ensure that specific proposed operations do not exceed the Class I air quality standards. Several available measures may effectively reduce sulfur dioxide emissions from shuttle tankers during offloading to levels that are below the exceedence levels for this Class I air quality area. These measures include:

- Use of low-sulphur fuels;
- Use of gas turbine engines;

- Mooring the shuttle tanker during offloading operations; or
- Prohibiting or restricting offloading operations within 100 km of the Breton NWA Class I air quality area.

Risk-Reducing Measures

The oil spill frequency analysis included identification of measures for reducing the risk of accidents and for potentially minimizing the volume of oil released, should an accident occur. There are a number of variations in system design, configuration, and operation that, alone or in combination, could be employed to minimize the risk of an oil spill. An extensive list of potentially applicable risk-reducing measures was developed as part of the risk assessment effort (Table 4-33, Section 4.4.1, of the EIS).

- Measures to reduce the risk of oil spills from the operation of shuttle tankers would be the most effective in reducing the total volume of oil spilled from FPSO operations. As shuttle-tanker operations are under USCG jurisdiction, the MMS and USCG will work together to evaluate and reduce spill risks on a project-by-project basis.

- Measures that protect against escalation of explosion or fire to the cargo area are likely to be the most effective means of reducing the risk of oil spills from the FPSO itself. Incorporation of these measures is inherent to MMS safety review and integral to the designs of systems as mandated by the industry standards, which are incorporated into the MMS operating regulations.

- Measures that protect against passing-vessel collisions would reduce oil-spill risk. An attendant vessel is the only "active" system available to intervene and potentially prevent a collision and any resulting fire, explosion, or oil spill. The presence of an attendant vessel might reduce the potential for collision. It might also increase the risk of collision between the attendant vessel and shuttle tanker or FPSO. The potential usefulness of an attendant vessel as a mitigation measure for collision avoidance is location dependent; areas of greater vessel traffic (e.g., near fairways) could realize greater benefits than areas far from vessel traffic. The requirement for an attendant vessel may be an appropriate mitigation measure for an FPSO located near a high traffic area. The MMS and USCG will coordinate in considering requirement of an attendant vessel on a case-by-case basis. The FPSO's design (double hull) configuration also provides an effective measure to reduce the potential consequences associated with a collision; the energy necessary to penetrate both hulls (10-12 ft apart) is substantial.

- Measures that prevent or control process releases.

Oil-Spill Response Readiness

Several different methods are currently available for response to offshore oil spills, including application of oil dispersants, mechanical containment and recovery, and *in-situ* burning. Each

of these response methods may serve to reduce or eliminate oil spill-related impacts. The critical time period for spill response (i.e., mobilization of spill response manpower, transportation, materials, and supplies) is within 24-48 hours after an accidental release of oil. In consideration of the analysis of current spill response capabilities for the Gulf of Mexico Region (presented in Section 4.4.3. of the EIS), the MMS will consider, on a project-by-project basis, requiring on-site supplies for cleanup of small spills and pre-positioning of supplies may enhance mitigation to protect sensitive resources from significant impacts.

The presence of an attendant vessel might reduce the potential for impacts from an accidental oil spill by providing quick response capabilities. The MMS and USCG will coordinate in considering the requirement of an attendant vessel on a case-by-case basis.

8. Summary of the *Frequency Analysis of Accidental Oil Releases From FPSO Operations in the Gulf of Mexico*

Risk Assessment

In conjunction with preparation of the EIS, a quantitative risk assessment was performed by Det Norske Veritas (DNV, Offshore Department, Risk and Reliability Services Division, Houston, Texas) on the base-case FPSO. The overall objective of the risk assessment was to determine the potential risk of oil spills from operations unique to FPSO's operating in the Gulf of Mexico. The specific objectives of this risk assessment were to:

- predict the frequency of accidental releases of oil from operation of the base-case FPSO in the Gulf of Mexico;
- identify hazards that pose the greatest risks;
- evaluate differences in risk between the base-case FPSO and range of design options; and
- identify and evaluate feasible risk mitigation measures.

The risk study considered all aspects of operation of the FPSO, from the wellheads through oil and gas production, and export of the oil by shuttle tanker and the gas by pipeline to shore. External and environmental risk factors (e.g., collisions with passing merchant vessels, severe weather) were considered in the assessment. Risks associated with shuttle tankers during transit to a shore terminal were also assessed. FPSO systems and operations not considered in the risk study used for the EIS include construction, installation, commissioning, drilling, workover, decommissioning since they are similar to other production systems already operating in deepwater.

A standard approach to risk analysis was used to quantify the risk of accidental releases of oil from the FPSO. The risks from FPSO operations were compared to those of accepted deepwater technologies to identify risk factors unique to FPSO operations. These risks were measured by

examining each accidental event and comparing its frequency or outcome against that of the corresponding operation on a tension leg platform (TLP), which represented accepted deepwater technology for the Gulf OCS. The results of this comparison were used to predict the risks unique to FPSO operation.

A hazard identification was done to identify all potential sources of an accidental release of oil to the environment, characterize them in terms of the accident causes, and identify measures that help to prevent, detect, control, or mitigate the potential accident scenarios. In addition, the hazard identification assesses the direct consequences of accidents and the potential for escalation.

Accident event frequencies were calculated for each of the identified hazards from a statistical analysis of available experience-based data. These frequencies indicate the likelihood that a hazard will occur in any given year. The accident frequencies were determined by a combination of the presence of accident causes and the effectiveness of appropriate preventative measures. Accident causes include those that are present continuously (e.g., fatigue loading) and those that arise spuriously (e.g., dropped objects). To be effective, a preventative measure must address the specific hazard and be reliable (in an operable condition when required). The contribution of accident causes and preventative measures for each of the hazards are represented in "fault trees." A fault tree is a graphical technique for showing the combinations of undesirable events that result in the specified accident.

Consequence calculations were used to quantify how each accident could develop and result in the loss of oil into the sea. For each accident event, the consequence calculations account for the effectiveness and reliability of measures to detect the accident, to control it once detected, and to mitigate against the consequences of the accident increasing in severity or extent (escalation). The calculations also consider the likelihood of escalation if mitigation is unsuccessful. The various combinations of successful detection, control, and mitigation, and potential escalation result in several possible outcomes. The likely oil spill was predicted for each outcome using professional judgment.

Data Sources

Because of the generality of the base-case description of the FPSO systems, specific details on FPSO's, their configuration, operation, hazards, and risks required for the analysis were drawn from DNV's experience with analyses of similar developments, including confidential proprietary information belonging to other clients of DNV. Input data for the risk analysis of shuttle tanker transport operations were extracted from an analysis of the MMS's tanker oil-spill database for tankers operating in U.S. waters (Anderson and LaBelle (1994) and DNV's manual[1]. Input data for the offshore offloading operation from the FPSO to the shuttle tanker were taken from the Marine Board's tanker lightering study commissioned by the USCG and

[1] DNV's manual is a constantly updated compendium of DNV's offshore risk assessment experience. The manual describes good modern practice in offshore quantitative risk assessment, and addresses all major aspects of this subject. The manual includes recommended analytical techniques and data sources. The manual is a proprietary commercial asset to DNV.

from MMS lease sale EIS's, as well as from a client-confidential DNV study conducted for an existing FPSO operating in the North Sea. Input data for the risk analysis of FPSO operations were taken from DNV's in-house manual. Input data for FPSO operations were also taken from DNV's experience on FPSO projects for other clients, including six comprehensive and proprietary assessments for specific FPSO development projects in the North Sea and North Atlantic, as well as a deepwater Gulf of Mexico development project.

The risk of shuttle-tanker transport spills used in this assessment was derived from a database of tanker spills in U.S. waters with incidents extending back to the 1970's. This incident database covers a large range of years and provides a wide experience base for determining what the historic risk of tanker transport spills has been. The large range of years covered also means that recent regulatory and other risk-reducing measures are not well represented in the predicted risk of tanker transport spills. Recent mitigative and corrective actions should result in improved tanker performance in the future as compared to the performance predicted using this database. Therefore, the risk of shuttle tanker transport spills predicted in this assessment may well be conservative (overstated).

The MMS's most recent analysis of oil spills greater than or equal to 1,000 bbls in U.S. water during 1985-1999 (Anderson and LaBelle, 2001) estimates the spill rate for tankers at 0.72 spills (≥1,000 bbl) per billion barrels of oil transported. The MMS analysis also estimates the spill rate for offshore spills from OCS pipeline transport at 1.38 spills (≥1,000 bbl) per billion barrels of oil transported. Between 1985 and 1999, there were 8 offshore OCS pipeline spills (≥1,000 bbl) with an average size of 6,700 bbl. During the same time period, there were 20 crude oil spills (≥1,000 bbl) from tankers in U.S. waters with an average spill size of 22,800 bbl. Twelve of the tanker spills occurred in port (average size 5,600 bbl). The eight "at-sea" tanker spills averaged 48,600 bbl.

Results

The results from the risk study can be summarized as follows:

- The frequency of FPSO-unique oil releases greater than 1,000 bbls is 0.037 per billion bbls produced for FPSO-related failures, and 1.2 per billion bbls for shuttle tanker-related failures. (The production rate is assumed to be 150,000 bbls of oil per day.) For spill risk on the FPSO itself, excluding offloading and shuttle tanker transport, FPSO-unique spill risk comprises only 5 percent of the total risk. The remaining 95 percent of spills are not unique to FPSO operations and would be equally likely and have similar outcomes for a TLP or other deepwater production alternative.

- Approximately 94 percent of the volume of potential FPSO-unique spills is likely to be due to the transfer of oil from the FPSO to the shuttle tanker and from the shuttle tanker transit to shore.

- More than 53 percent of the volume of potential FPSO-unique spills is likely to be from shuttle tankers near port

- Approximately 39 percent of the volume of potential FPSO-unique spills is likely to be from shuttle tankers in transit to port.

- The risk of shuttle tanker transport spills should be compared with the risk of spills from oil transport by offshore pipeline. Based on the DNV risk assessment, it is expected that for shuttle tanker transport there will be 1.21 spills with volumes greater than 1,000 bbls for every billion bbls transported. From the MMS analysis of 1985-1999 offshore spill data (Anderson and LaBelle, 2001), it is expected that for OCS pipeline transport there will be 1.38 spills $\geq$1,000 bbls for every billion bbls transported. Therefore, the oil-spill risk for shuttle tanker transport is comparable to that of pipeline transport. If a tanker spill rate of 0.72 spills $\geq$1,000 bbl for every billion barrels transported (Anderson and LaBelle, 2001) is considered, the oil-spill risk for shuttle tanker spills is less than that of pipeline transport.

- Nearly 2 percent of the volume of potential FPSO-unique spills is likely to be from the transfer of oil from the FPSO to the shuttle tanker. However, this volume is comprised entirely of the smaller spill sizes (less than 1,000 bbls).

- Risk of oil spills during offloading from the FPSO to the shuttle tanker is similar to that for lightering operations in the Gulf of Mexico, where there is a history of low spill frequency and small spill volumes.

- Oil release during processing of the produced oil is the single largest FPSO-unique risk for releases on the FPSO.

- For events on the FPSO, accidents that escalate to the cargo area (which comprises escalation consequences from most of the hazard categories in Table 4-30) represent the largest FPSO-unique risk.

- Collisions with passing merchant vessels are low-frequency events but account for slightly more than 1 percent of all the FPSO-unique oil released due to the potential for large-volume spills.

The conclusion based on the risk assessment is that the risk of spills unique to FPSO's operations in the Gulf of Mexico is low. The assessment of oil-spill risks performed for this study should be regarded as generic to the concept of using FPSO's in deep water. More detailed analysis would accompany the evaluation of specific FPSO permit applications. At that time, the locations of a proposed FPSO and associated tanker routes would be more defined, and the risk from transportation routes closer to shore would be evaluated.

9. Summary of the *Comparative Risk Analysis*

Concurrent with the EIS, an MMS-funded Comparative Risk Analysis (CRA) was performed to compare the relative risks of an FPSO system with three other deepwater development systems: fixed platform production hub, a spar, and a tension leg platform (TLP). All of the production

systems except the FPSO are currently in use for deepwater development projects in the U.S. Gulf of Mexico. The study was performed under contract to the Offshore Technology Research Center, with technical support from EQE International and the industry consortium DeepStar. The CRA used the same base-case FPSO system that was used in the EIS. The overall intent of the CRA was to provide MMS context and perspective for FPSO risks, and to assist with MMS decisions regarding the potential use of FPSO's in the Gulf OCS. The CRA was also designed to help MMS understand the risk contributions of the various components (subsystems) and phases of operation.

The quantitative risk analysis was performed using a series of progressive workshops building on the previous workshops' findings: System Descriptions and Definitions; Hazard Identification (Events and Outcomes); Preliminary Quantitative Risk Analysis (QRA), and Final Review (Refine QRA; ensure consistency and clarity). Interviews, data collection, and preparatory work were performed between the workshops. Expertise from all facets of offshore oil and gas development was brought together in the study, including lease operators, contractors, consultants, classification societies, and regulatory agencies. The industry sources represent a significant segment of the world's deepwater experience and expertise in equipment design, construction, operation, and risk studies. The technical expertise and practical experience of the engineering personnel involved, and the format of the study were critical factors in the successful completion of the CRA.

Representative descriptions of existing and typical technology used in the Gulf OCS were developed for each of the deepwater production systems. The subsystems considered for each production facility included platform and subsea well systems, production trees, pipelines, import and export risers, and the topsides. A 20-year lifetime was assumed for the risk assessment, beginning with the first production of oil and ending with shut-in of the final of the last well. The physical system boundaries included production, processing, transportation of produced hydrocarbons from the production facility to shore, drilling/completions/workovers during the facility lifetime (excluding any pre-drilling), and major modifications.

Three risk measures were evaluated and analyzed for each system based on the total volume of oil spilled (chronic environmental risk), the maximum volume spilled in a single incident (acute environmental risk), and the total number of fatalities (human safety risk).

The risks (both for spills and fatalities) were extrapolated directly from historical experience in the Gulf of Mexico to predict future performance using MMS and USCG databases whenever possible. The study started with raw datasets that were as complete as possible in the preliminary risk assessments, and refined the data so they were relevant predicting the future performance of the FPSO in the Gulf OCS. For example, the frequency of shuttle tanker spills of greater than 10,000 bbl is based on the USCG datasets for crude oil tanker spills occurring in the Gulf of Mexico. This dataset was refined to account for the benefits demonstrated to date and expected to occur as a result of OPA 90 (i.e., the datasets used were 1992-1999). For spills of less than 10,000 bbl, the CRA used post-OPA 90 data for crude tankers worldwide. Likewise, the spill risks from process systems onboard the various deepwater production systems were based on incidents that occurred after 1990. Incidents prior to 1990 were discarded due to the

implementation of MMS regulations in 30 CFR 250, specifically the incorporation of standards such as API RP 14B, 14C, and 14H. These standards address the design and operation of the safety devices installed to protect both personnel and the environment.

Three risk measures were evaluated and analyzed for each system based on the total volume of oil spilled (chronic environmental risk), the maximum volume spilled in a single incident (acute environmental risk), and the total number of fatalities (human safety risk). The risks (both for spills and fatalities) were extrapolated directly from historical experience in the Gulf of Mexico to predict future performance using MMS and USCG databases whenever possible. For example, the frequency of shuttle tanker spills of greater than 10,000 bbl is based on the USCG datasets for crude oil tanker spills occurring in the Gulf of Mexico post-OPA 90 (1992-1999). For spills of less than 10,000 bbl, the CRA used post-OPA 90 data for crude tankers worldwide.

The major conclusions from the comparative analysis are as follows:

- There are no significant differences in the oil-spill risks among the four systems studied.

- Rare, large spills rather than frequent, small spills dominate the average total volume of oil spilled during the facility lifetime. More than 70 percent of the total spill volume is predicted to come from a single event for each of the systems studied in the CRA. Table 3.3 from the CRA Final Report has been repeated below to show the relative expected return periods for the various spill sizes.

	CRA Table 3.3 – Expected Return Period (years) Between Spills						
System	1 – 10 bbl	10 – 100 bbl	100 – 1,000 bbl	1,000 – 10,000 bbl	10,000 – 100,000 bbl	100,000 – 500,000 bbl	500,000 – 1 million bbl
Spar	0.8	3	15	60	580	Not credible	Not credible
TLP	0.8	3	15	60	580	Not credible	Not credible
Jacket Hub	3	8	35	91	920	Not credible	Not credible
FPSO	3	3	12	110	2,500	4,700	300,000

- The major contribution to the oil-spill risk is the transportation of oil from the production facility to the shore terminal (pipeline for the spar, TLP, and fixed hub platform; shuttle tanker for the FPSO). The CRA found that while the volume of a shuttle tanker spill is likely to be greater, the frequency of spills is likely to be smaller than for large pipeline spills; the risk (frequency "times" consequence) is comparable.

- There are no significant differences in the fatality risks among the four systems studied. Production, drilling and well intervention activities dominate the total fatality risk for all of the systems studied in the CRA. The results are comparable to those reported for other industrial activities and for the oil and gas industry throughout the world.

The major finding of the CRA is that "the expected risks associated with the FPSO are comparable to those for already accepted alternatives for deep-water production, including a spar, a TLP and a shallow-water jacket serving as a hub and a host to deep-water production" (OTRC, 2001). Because the risks are comparable, there was no attempt to mitigate the risks represented on the FPSO to a level lower than already present in other production systems used for deepwater. It is noted that the EIS and other research initiatives (Bechtel, 1999) have developed comprehensive lists of potential risk reducing measures; none of those efforts have examined the measures from a quantitative effectiveness or cost-benefit perspective.

10. Summary of the Oil-Spill Risk Analysis

The MMS's oil-spill risk analysis (OSRA) model is a statistical modeling tool used to predict the environmental risks of contact to environmental features from oil spills. The OSRA model simulates a large number of hypothetical oil-spill trajectories and calculates the number of times these modeled trajectories contact or pass over specified environmental resources. The probabilities of contact generated by the OSRA model run are termed conditional probabilities. These probabilities do not take into account the likelihood of spill occurrence. The model does not distinguish between possible sources of surface spills (i.e., the spill could come from a TLP, an FPSO, a shuttle tanker, etc.). The model outputs do not account for spill size, the likely persistence time of oil spilled onto the water surface, or the sensitivity of the resources that may be contacted. Observed surface slicks have dissipated rapidly due to weathering of the oil

mixture spilled, as well as a result of effective cleanup activities that occur in the hours following a spill event. Spill size must also be taken into account when determining the duration of a slick.

Seven deepwater sites and a single site along a potential tanker route were chosen as hypothetical spill sites to be modeled. These sites were selected as representative of the geographic range and water depth intervals of possible FPSO sites. Trajectory simulations were modeled and the probabilities of contact to offshore natural resources or shore segments were calculated for periods within 3, 20, and 30 days. In addition, spill trajectories from hypothetical spill sites in a grid of about every 60 miles in the deepwater area were modeled. A cluster analysis on these results was done to determine the areas with similar risk of contact to shoreline segments. To factor in the risk of occurrence, the results of the frequency analysis of accidental releases of oil from FPSO in the Gulf of Mexico (Section 8) were used to weight the conditional probabilities. To factor in the persistence of spilled oil, a separate model was run that predicted the percent loss from the slick over time due to natural weathering processes. Two typical deepwater oils were modeled to determine slick persistence. Hypothetical spill sizes ranged from 1,000 bbl to 300,000 bbl. The analysis concluded that 53-78 percent of the original volume of spilled oil would be lost from the sea surface by 30 days due to natural weathering processes. Finally, an analysis of industry's spill response capabilities was performed.

Under ***Alternative A,*** the trajectory model results showed that 4 of the 24 modeled offshore resources have a 15 percent or greater risk of being contacted by a spill should one occur from any of the eight modeled spill sites and last up to 30 days. The offshore resources were Texas State offshore waters, Louisiana State offshore waters, and the western and central winter menhaden spawning grounds. Conditional probabilities that a spill may contact the Flower Gardens National Marine Sanctuary within 30 days range from less than 0.5 percent to 10 percent. Of the 8 locations modeled, hypothetical spills starting from within the Corpus Christi lease area and the tanker "route" to Beaumont/Port Arthur, Texas, resulted in the highest likelihood of contacting selected offshore features. For slicks lasting only up to 3 days, the OSRA model predicted that only a few offshore resources would be contacted, with the likelihood of contact very low.

The cluster analysis identified 10 offshore area groupings for the 30-day spill trajectories. Averaged probabilities of contact from hypothetical oil spills within each of the 10 offshore areas were calculated for the U.S. shoreline land segments. The shoreline segments most likely (about 21 percent probability) to be contacted, should a spill occur and persist, were those located in south Texas and in Plaquemines Parish in Louisiana. The probabilities of contact within 30 days to land segments from the eight representative spill points showed a similar trend. The highest probability of contact was 20 percent for a hypothetical spill from the Corpus Christi area reaching Aransas, Refugio, or Calhoun Counties in Texas within 30 days. Upon factoring in the risk of occurrence and the expected effectiveness of spill response, little, if any, oil would be expected to reach sensitive coastal areas.

Under ***Alternative B-2,*** FPSO's would not be permitted in the Corpus Christi or Port Isabel map protraction areas. This alternative was designed to evaluate whether FPSO operations in this area would pose greater risks from accidental oil spills than risks posed by currently accepted

deepwater technologies. The OSRA model spill trajectory results support the decision not to choose this alternative. Modeled spill trajectories starting within these two areas and tracked for 3 days showed 0-2 percent risk of contact to land, with the most likely chance of contact being 0 percent.

Under ***Alternative B-3,*** FPSO's would not be permitted in the Viosca Knoll and Mississippi Canyon map protraction areas. This alternative was designed to evaluate whether FPSO operations in this area would pose greater risks from accidental oil spills than risks posed by currently accepted deepwater technologies. The OSRA model spill trajectory results support the decision not to choose this alternative. Except for one modeled site located directly southeast of the mouth of the Mississippi River, modeled spill trajectories starting within these two areas and tracked for 3 days showed an average risk of 0.6 percent of contact.

11. Regulatory Model and Review Process for FPSO Proposals

The MMS has determined through the development of a Regulatory Model for FPSO-based projects that the existing MMS rules provide the necessary review mechanisms to evaluate an FPSO-based development. Development of the Regulatory Model was initiated during the first quarter of 2000. The objective was to ensure MMS had the "tools" to take action on a development application proposing the use of an FPSO. A further objective was to clarify MMS and USCG responsibilities regarding FPSO issues since both agencies share jurisdiction (the Memorandum of Understanding signed December 16, 1998, broadly describes the agency jurisdictions for fixed and floating production systems).

Development of a Regulatory Model began with an assessment of the adequacy of MMS's 30 CFR 250 regulations for addressing an FPSO-based development in the Gulf of Mexico, and an overview of the initiatives underway both in the U.S. and internationally to address FPSO issues. In addition to regulatory initiatives, guidelines and research projects were reviewed to the extent they were available to MMS. The findings from MMS's initial review identified several industry standards that would enhance the regulatory program for all deepwater floating production systems (including FPSO's). The initial review also recommended further review in conjunction with the USCG and the offshore industry.

At the request of MMS, the Offshore Operators Committee (OOC) convened a workgroup to identify the applicable regulations, standards, guidelines, and recommended practices for design and operation of FPSO systems. In particular, the workgroup was asked to identify gaps in the existing standards, guidelines, and recommended practices. The OOC-led workgroup included representatives from MMS, USCG, classification society groups, the American Petroleum Institute (API), and several Gulf of Mexico operators actively involved with FPSO operations in other areas of the world. The findings and recommendations from the workgroup were provided to MMS and USCG in a report dated October 2, 2000.

A key component of MMS's ability to review an FPSO-based development is the Deepwater Operations Plan (DWOP) described in Notice to Lessees (NTL) 2000-N06 (currently being incorporated into the regulations at 30 CFR Subpart B). The DWOP addresses MMS's review of the deepwater development project from a total system perspective without writing new

regulations, i.e., using the existing regulations that provide for the use of alternative compliance measures. The information required to be submitted in a DWOP focuses on characterizing the production system on a component basis, including the following: structural aspects of the facility (fixed, floating, subsea); stationkeeping (includes mooring system); wellbore, completion, riser systems; safety systems; offtake; and hazards and operability of the production systems. By design, the DWOP is able to look at the components of a proposed development system to see how they relate to previously approved production systems. Information is gathered for the individual components of the various types of deepwater production systems and integrated into a review that is focused from a total systems perspective. The DWOP also provides the mechanism for MMS to move forward with actions on a development project even though all the technical issues have not been completely identified or resolved. The DWOP provides MMS with the ability to determine that the operator has designed and built sufficient safeguards into the production system to prevent the occurrence of significant safety or environmental incidents.

The Regulatory Model development has resulted in an MMS-proposed regulatory package to enhance the existing rules through the incorporation of several recommended practices. A complete rewrite of the Platforms and Structures section (Subpart I) in 30 CFR 250 is one of the key parts of this regulatory package to address all floating production systems (including FPSO's); the current Subpart I addresses fixed facilities and references numerous out-of-date technical standards. Also part of this effort is the incorporation of several recommended practices into the existing pollution prevention regulations (30 CFR 250). Listed below are the documents to be incorporated into the regulations:

- *API RP 2FPS, Recommended Practice for Planning, Designing, and Constructing Floating Production Systems, First Edition (published as a draft - "not to be used for design at this time" in March 2001)*

- *API RP 2RD, Design of Risers for Floating Production Systems (FPSs) and Tension-Leg Platforms (TLPs), First Edition, June 1998.*

- *API RP 2SK, Recommended Practice for Design and Analysis of Stationkeeping Systems for Floating Structures, Second Edition, December 1996, Effective Date: March 1, 1997.*

- *API RP 14J, Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities, First Edition, Sept. 1, 1993.*

- *API Specification (Spec) 17J, Specification for Unbonded Flexible Pipe, Second Edition, November 1999, Effective Date: July 1, 2000.*

- *API RP 2SM, Recommended Practice for Design, Manufacture, Installation, and Maintenance of Synthetic Fiber Ropes for Offshore Mooring, (publication in early 2001).*

Publication of the MMS regulatory package (Documents Incorporated by Reference and Subpart I rewrite) was published as a Draft Rule in December 2001. This initiative will enhance MMS's ability to regulate all floating production systems, including FPSO's, in the Gulf of Mexico OCS.

The MMS and USCG continue to discuss the implementation of the MOU between the two agencies. This effort is designed to minimize duplication of effort and to ensure a consistent regulatory review for FPSO-based developments.

Additional efforts by the USCG to enhance the regulatory model for an FPSO-based development include seeking clarification from the U.S. Customs Service regarding the applicability of flag-state requirements to FPSO's and shuttle tankers. The USCG received a response from the Customs Service in a letter dated March 7, 2001. The response states that shuttle tankers must comply with Jones Act requirements (U.S. built, flagged, and manned). The Customs Service further stated that an FPSO permanently-moored at an OCS location would not be required to be coastwise qualified unless it is used to transport oil or natural gas to a U.S. port or a deepwater port located on the OCS (e.g., LOOP). The API has also commissioned a workgroup to further address concerns associated with shuttling crude oil from OCS production facilities to ports in the U.S. Gulf of Mexico. The USCG has been directly involved in the API-led effort.

Gas disposition has been discussed throughout the development of the regulatory model to address questions about flaring and reinjection of the produced natural gas. The MMS will require the operator to transport produced gas to market. This will likely require a dedicated pipeline for associated gas production. The MMS has consistently stated that flaring of gas would not be permitted on an extended basis. The MMS regulations do provide for some limited volume, short duration flaring upon approval. Further, MMS has stated that reinjection of the produced gas would generally not be permitted without a commitment from the operator to produce the gas at a later time. The MMS acknowledges that there are emerging technologies for converting gas to liquids, gas compression for ship-born transport, etc., that have been identified in industry studies as technically and economically feasible. These alternatives, along with pipeline options, must be considered in decisions about gas disposition.

12. Consultation and Coordination

Public participation and agency consultation were conducted in compliance with NEPA and CEQ guidelines, and played a major role throughout the preparation of this EIS. The MMS invited affected Federal, State, and local agencies and other interested parties to participate in the EIS process. Methods of consultation and coordination focused on the scoping process. Letters, telephone conversations, and meetings facilitated communication with involved agencies.

A Notice of Intent to Prepare the EIS was published in the *Federal Register* on June 10, 1999 (Appendix C). A notification letter, also dated June 10, 1999, was sent to 883 interested parties, including regulatory agencies identified on the project mailing list, to inform them of the upcoming scoping meetings and the purpose of the project. Five scoping meetings, which were held in locations near major Gulf ports, provided forums for interested parties and agencies to voice issues and concerns regarding the proposed action.

Formal consultation was initiated with the USCG to determine their jurisdictional authority over FPSO operations. The USCG representatives were actively involved in the public scoping

meetings, development of the EIS scenario, and preparation of sections of the EIS related to USCG jurisdiction.

Other agencies were consulted for input and comment on the document, including FWS and NMFS. To comply with the Marine Mammal Protection Act, consultation with NMFS was conducted to obtain a listing and baseline description of the 29 species of marine mammals known to occur in the Gulf of Mexico. In accordance with the Magnuson Fishery Conservation and Management Act of 1976 and the Magnuson–Steven Act of 1996, the NMFS and the Gulf of Mexico Fishery Management Council were consulted. Baseline descriptions of the important commercial fisheries in the deep waters of the Gulf and Essential Fish Habitats (EFH) of the Western and Central Planning Areas of the Gulf were obtained. In compliance with the Endangered Species Act (ESA), consultation with FWS and NMFS provided a listing of threatened and endangered species that may occur in the proposed action area. Formal consultations under ESA Section 7 were initiated with FWS and NMFS. Both FWS and NMFS provided Biological Opinion (BO's) stating that the potential use of FPSO's as analyzed in the EIS is covered under their existing non-jeopardy BO's prepared for the Western and Central Planning Area Multisale EIS's.

The MMS published a Notice of Availability (NOA) for the Draft EIS in the *Federal Register* on August 11, 2000. The MMS held four public hearings soliciting comments on the Draft EIS. The hearings provided a forum for public statements on the proposed action and the content and findings of the Draft EIS. The public comment period on the document ended on October 10, 2000. The NOA for the Final EIS was published in the *Federal Register* on February 9, 2001. The 30-day period following the release of the Final EIS ended March 11, 2001.

13. Comments Received on the Final Environmental Impact Statement

Five comment letters were received on the Final EIS. Below is a summary of the issues raised in each letter and brief MMS responses.

- ManaSota-88 recommends that no FPSO's be allowed in the Gulf as FPSO's would have significant impacts, and there is no reason to allow additional oil and gas production.

  MMS Response: The EIS analyses concluded that the only FPSO-specific impact is potential exceedance of the sulfur dioxide threshold in the Breton Class I air quality area by idling shuttle tankers during offloading operations with 100 km of the area. The MMS routinely does site-specific analysis for potential air quality impacts form any proposed OCS operations within 100 km of Breton. Several measures are available that can effectively prevent significant emission impacts.

- The Associated Federal Pilots and Docking Masters of Louisiana, L.L.C., commented on the requirements for qualification for Federal pilots and their excellent professional safety record.

- Litton-Avondale Industries wrote to endorse the qualifications and record of Federal Pilots.

- The Texas Natural Resource Conservation Commission reviewed the Final EIS and had no comments.

- The Florida Department of Environmental Protection had five major comments: Florida (a) disagrees with deferring until the proposal stage the Essential Fish Habitat (EFH) consultation with the NMFS and recommends MMS fund EFH studies; (b) requests consideration of establishing transit tanker routes for shuttle tankers to avoid areas of high seasonal abundance of turtles; (c) requested including the resident population to the endangered sperm whale in the Mississippi Canyon area as a modeled offshore resources in the MMS Oil Spill Risk Analysis Model; (d) Florida continues to support Alternative B; and(e) as a potentially affected state under 30 CFR 250,105, Florida requests the opportunity to review any development proposals, supplement EIS's, or Environmental Assessments that address the use of FPSO's in the Central Planning Area.

  MMS Responses: a) By agreement between MMS and NMFS, formal EFH consultation will occur at the proposal stage when sufficient information is available on the location and configuration of the proposed FPSO is available. (b) Establishing transit routes is solely under the jurisdiction of the U.S. Coast Guard. Turtles are not gregarious and do not congregate. Concentrations may occur near shore during nesting season. Shuttle tankers enroute to coastal ports would be within the port traffic corridors when this close to shore. (c) Although the distribution of sperm whales in the Mississippi Canyon area is highly aggregated, with congregations being most common along the shelf edge and slope in the vicinity of the Mississippi River Delta, the movements of this sperm whale population are not well known. The results of including a very large offshore resource area in the OSRA model would not be meaningful. (d) Comment noted. (e) All development plans that propose use of FPSO technology will be sent to the affected states for Federal consistency review. Per NEPA, EIS's (including supplemental EIS's) are provided for public review and comment.

14. Decision

_____ **Alternative A** (Approval of the general concept of using FPSO's in deepwater areas of the Western and Central Planning Areas of the deepwater Gulf OCS.)

__X__ **Alternative B-1** (Approval of the general concept of using FPSO's except within the USCG-designated lightering prohibited areas.)

_____ **Alternative B-2** (Approval of the general concept of using FPSO's except in the Corpus Christi and Port Isabel map protraction areas (areas nearest the Texas coast).)

_____ **Alternative B-3** (Approval of the general concept of using FPSO's except in the Viosca Knoll and Mississippi Canyon map protraction areas (areas nearest the Louisiana coast)).

_____ **Alternative B-4** (Approve the general concept of using FPSO's with a requirement for an attendant vessel.)

_____ **Alternative C** (No action at this time (insufficient information to make a decision)).

_____ **Other** _____

This decision, authorized by the signature below, and this Recommendation and Decision Document together establish the Agency's Record of Decision on the Environmental Impact Statement prepared on the Proposed Use of Floating Production, Storage, and Offloading Systems on the Gulf of Mexico Outer Continental Shelf, Western and Central Planning Areas. This programmatic decision is effective immediately. This decision does not constitute approval of any specific FPSO project. Submission, review, and approval of all required OCS plans, permit applications, and other submittals must be completed for every proposed FPSO system.

Dated: 13 December 2001

Carolita U. Kallaur
Associate Director for
Offshore Minerals Management