United States Environmental Protection Agency
Region 6
1455 Ross Avenue
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SUPPLEMENTAL INFORMATION REPORT
to the
2004 FINAL ENVIRONMENTAL IMPACT STATEMENT

NEW SOURCE NPDES GENERAL PERMIT FOR DISCHARGES FROM THE OFFSHORE SUBCATEGORY OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY TO THE TERRITORIAL SEAS OF TEXAS (PERMIT NO. TXG260000)

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1.0 INTRODUCTION

1.1 DEFINITION OF TERRITORIAL SEAS

Section 402 of the federal Clean Water Act (CWA) authorizes the U.S. Environmental Protection Agency (EPA) to issue National Pollutant Discharge Elimination System (NPDES) permits to regulate discharges to the nation's waters. Region 6 of the EPA proposes to issue an NPDES general permit for waters adjacent to Texas for effluent discharges associated with oil and gas exploration, development, and production activities in the Territorial Seas of Texas. The coverage area, referred to as the Territorial Seas, are defined as the belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea, which is the line marking the seaward limit of inland waters, and extending seaward a distance of three miles. Although Texas claims mineral rights to three leagues, the CWA stipulates that, for the purpose of issuing discharge permits, the territorial seas extend three miles. The study area for this Supplemental Information Report (SIR), therefore, is the band of offshore waters that extends from the Texas shoreline to a distance of three nautical miles from the shore. The area is bounded by Louisiana to the north and east, and Mexico to the south.

Sections 402 and 403 of the CWA require that NPDES permits for discharges to the territorial seas, the contiguous zone, and the ocean be issued in compliance with EPA's regulations for preventing unreasonable degradation of the receiving water.

1.2 PURPOSE AND NEED FOR A SUPPLEMENTAL INFORMATION REPORT

The existing general permit (TXG260000), which EPA issued on November 4, 2005, included coverage for new sources. At that time, EPA determined that the decision to issue a new source NPDES general permit for oil and gas extraction in the Territorial Seas of Texas was a major federal action significantly affecting the quality of the human environment. The existing general permit regulates both existing sources and new sources (i.e., wells and platforms). The environmental review provisions of the National Environmental Policy Act (NEPA), as set out in Section 40 of the Code of Federal Regulations (CFR), Part 6, Subpart F (Environmental Review Procedures for the New Source NPDES program) are found in EPA regulations promulgated at 40 CFR 122.29(c). EPA had determined that its NEPA requirements were fully met through preparation of a Final Environmental Impact Statement (FEIS) in March 2004 in support of EPA's issuance of a final general permit (TXG260000) on November 4, 2005.

The existing permit implements three levels of technology-based pollution control: Best Conventional Technology (BCT), Best Available Technology (BAT), and New Source Performance Standards (NSPS) guidelines for the Offshore Subcategory (40 CFR Part 435, Subpart A) of discharges. The permit also includes limits and requirements necessary to assure that the authorized discharges comply with both Texas state water quality standards (WQS) and with the requirements of the CWA Section 403, as prescribed at 40 CFR 125 Subpart M "Ocean Discharge Criteria." Limits include whole effluent toxicity testing for discharges of produced water, chemically treated sea water, and chemically treated fresh water.

The existing permit prohibits discharges of drilling fluids, drill cuttings, and produced sand; produced water discharges have limits on oil and grease, 24-hour (end-of-pipe) acute toxicity, and 7-day chronic toxicity; and well treatment, completion, and workover fluids discharges are limited for oil and grease and priority pollutants. The permit prohibits the discharge of free oil associated with a number of other waste discharges. The permit also limits free oil, the concentration of treatment chemicals, and acute toxicity for chemically treated seawater and freshwater discharges.

EPA intends to revise and re-issue the existing TXG260000 NPDES general permit. This proposed general permit also regulates both existing sources and new sources. EPA has determined that re-issuing TXG260000 is a major federal action significantly affecting the quality of the human environment, and thus requires EPA to comply with the requirements of the NEPA. The proposed permit contains revisions to the existing general permit that continue discharge limitations and conditions of the existing permit or make them more stringent. The proposed permit removes the ten-year exemption for technology-based effluent limitations for new sources; clarifies requirements for an existing waste stream (surface preparation and coating activities); regulates one new waste stream (hydrate control fluid); adds CWA Section 316(b) Phase III cooling water intake structure requirements for new facilities; adds Best Management Practices (BMPs) addressing spill prevention; and changes certain notification and reporting requirements.

EPA determined that compliance with the requirements of the NEPA can be addressed through the development of a Supplemental Information Report (SIR) to the 2004 FEIS. Nearly all the provisions of the existing permit are retained; proposed revisions generally provide a greater degree of environmental protection. Therefore, the findings of the FEIS for the existing general permit are considered adequate to demonstrate compliance with the requirements of the NEPA with two exceptions that this SIR addresses: (1) the proposed changes in the re-issued general permit and (2) any changes in relevant Texas and federal statutes, regulations, or requirements since the publication of the FEIS for the existing general permit (e.g., revisions to Texas WQS or the Texas Coastal Management Plan).

The purpose of the SIR is to assess and evaluate the environmental consequences of the changes to the existing general permit and any changes to relevant statutes, regulations, or requirements as well as the alternative of not re-issuing the general permit (see Section 2 for a discussion of both the proposed action and the no action alternative). Although coverage of new sources under the proposed permit is the event triggering the NEPA requirement for developing the SIR, because the proposed permit covers existing and new sources, both existing and new source activities are considered in the SIR.

Prior to permit issuance, EPA must assure three conditions are met:

1. The permit must contain technology-based effluent limitation guidelines that comply with the requirements applicable to offshore oil and gas facilities (40 CFR 435);
2. The permit must comply with the requirements of Texas WQS;
3. The permit must be evaluated against EPA's published criteria for determination of unreasonable degradation. Unreasonable degradation is defined in the NPDES regulations (40 CFR 125.121[e]) as the following:
    a. Significant adverse changes in ecosystem diversity, productivity, and stability of the biological community within the area of discharge and surrounding biological communities;
    b. Threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms; and

c. Loss of aesthetic, recreational, scientific or economic values, which is unreasonable in relation to the benefit derived from the discharge.

Ten factors are specified at 40 CFR 125.122 for determining unreasonable degradation. They are the following:

1. The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;
2. The potential transport of such pollutants by biological, physical or chemical processes;
3. The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;
4. The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;
5. The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;
6. The potential impacts on human health through direct and indirect pathways;
7. Existing or potential recreational and commercial fishing, including finfishing and shellfishing;
8. Any applicable requirements of an approved Coastal Zone Management Plan;
9. Such other factors relating to the effects of the discharge as may be appropriate; and
10. Marine water quality criteria developed pursuant to Section 304(a)(1).

In the event that an assessment of these ten factors determines that unreasonable degradation may occur even with proposed technology and water quality-based permit conditions in place, CWA Section 403(c) authorizes EPA to impose more stringent permit conditions and/or monitoring.

1.3 ADMINISTRATIVE BACKGROUND

1.3.1 General Permits

CWA Section 301(a) provides that the discharge of pollutants is unlawful in the absence of authorizing permits. Section 402 of the CWA authorizes EPA to issue NPDES permits on condition that they meet applicable requirements of the CWA and other related regulations and standards. In particular, NPDES permits must include effluent limitations which require use of appropriate pollution control technology and which provide for compliance with EPA-approved state water quality standards.

EPA's regulations authorize the issuance of general permits to categories of discharges that have like characteristics (40 CFR 122.28). Moreover, under EPA regulations at 40 CFR 122.28(c)(1), the EPA Regional Administrator is required to issue general permits covering discharges from offshore oil and gas facilities within the Region's jurisdiction, in this case Region 6.

1.3.2 Existing Permit

Currently, oil and gas extraction activities in the Territorial Seas off Texas are subject to regulation under a general NPDES permit issued November 4, 2005 (TXG260000). While the permit expired in 2010, it has been administratively extended (per 40 CFR 122.6) and continues to apply to those lease blocks for which operators had applied for coverage prior to the 2010 expiration date.

Region 6 has issued no individual NPDES permits for oil and gas extraction activities in the Territorial Seas of Texas.

1.3.3 1993 and 2001 Effluent Guideline Rules

EPA's regulations with respect to discharges from offshore oil and gas operations, including activities in the territorial seas of coastal states, are set forth in 40 CFR 435, Subpart A. On March 4, 1993, EPA amended these regulations through a rulemaking entitled *"Final effluent limitations guidelines and new source performance standards for the offshore oil and gas industry."* The technology-based requirements in the 1993 effluent guideline rulemaking are applicable to offshore discharges from the oil and gas extraction activities in the Territorial Seas of Texas.

Under the 1993 rule, "new sources" are those which commence "significant site preparation work" (surveying, clearing or preparing an area of the ocean floor for the purpose of constructing or placing a development or production facility on or over the site), after the publication of NSPS - in this case, after March 1993. Under this definition, future exploration drilling is not considered a new source; therefore it will be regulated using the technology-based effluent guidelines for existing sources.

On January 22, 2001, EPA published final regulations establishing technology-based effluent limitations guidelines and standards for the discharge of synthetic-based drilling fluids (SBFs) and other non-aqueous drilling fluids from oil and gas drilling operations in the offshore subcategory - *"Effluent Limitations Guidelines and New Source Performance Standards for the Oil and Gas Extraction Point Source Category"* (66 FR 6849-6919). Because the proposed permit continues the existing permit's "no discharge" limitation for drilling fluids, this modification to the oil and gas industry offshore subcategory effluent limitation guidelines does not affect the proposed permit.

1.3.4 State Water Quality Standards

Texas has established state WQS for waters in the Territorial Seas, primarily for protection of aquatic life and for protection of human health based on consumption of that aquatic life. In general, the standards are based on water quality criteria (WQC) developed by EPA. The proposed general permit must contain requirements sufficient to ensure that state WQS are met. The 1993 technology-based rule established oil and grease limits, in part, as a surrogate pollutant for controlling discharges of toxic hydrocarbons (e.g. phenol, naphthalene, ethylbenzene, toluene). Additionally, the existing permit is based on compliance with direct, water quality-based limitations for nine, specified toxic organic pollutants and eleven toxic metals.

EPA WQC and Texas WQS are summarized in Table 1-1. This table has been updated from the table found in the FEIS to include EPA-approved revisions to Texas WQS that were adopted by the Texas Commission on Environmental Quality (TCEQ) effective August 17, 2000 and Texas WQS that were adopted by TCEQ on July 22, 2010 and were partially approved by EPA on June 29, 2011. Based on hydrodynamic modeling results for produced water discharges (see section 4.4

of this document for detailed discussion of modeling), the proposed permit complies with recently adopted Texas state WQS approved by EPA.

Table 1-1. Water Quality Standards and Criteria

Pollutant/Component	EPA Water Quality Criteria Marine Chronic(a)	Marine Acute(a)	Human Health(a,b)	Texas Water Quality Standards Marine Chronic(c)	Marine Acute(c)	Human Health(d)
Organic Pollutants (all units ug/L unless otherwise noted)						
Acenaphthene			990			
Anthracene			40,000			
Benzene			51			513
Benzo(a)pyrene			0.018			0.33
Bis(2-ethylhexyl) phthalate			2.2			41
Carbon tetrachloride			1.6			29
Chlorobenzene			1,600			5,201
Chloroform			470			7,143
Chrysene			0.018			327
Diethylphthalate			44,000			
Ethylbenzene			2,100			7,143
Fluorene			5,300			
Phenanthrene				4.6		7.7
Phenol		860,000				
Toluene			15,000			
Metals(e) (all units ug/L unless otherwise noted)						
Antimony			640			1,071
Arsenic	36	69	0.14	78	149	
Cadmium	8.8	40		8.75	40.0	
Chromium, +6	50	1100		49.6	1090	502
Copper	3.1	4.8		3.6	13.5	
Lead	8.1	210		5.3	133	3.83
Mercury	0.94	1.8		1.1	2.1	0.025
Nickel	8.2	74	4,600	13.1	118	1,140
Selenium	71	290	4,200	136	564	
Silver, as free ion		1.9			2	
Zinc	81	90	26,000	92.7	84.2	

Notes:
(a) EPA (2009)
(b) Human health criteria are fish consumption only
(c) TCEQ (§307.6, Table 1, August 17, 2000)
(d) TCEQ (§307.6, Table 2, July 22, 2010)
(e) Metals standards are for dissolved metals except for mercury

1.3.5 Anti-Degradation Criteria

Section 403 of the CWA requires imposition of effluent limitations as necessary to prevent unreasonable degradation of the marine environment. Prior to permit issuance, discharges must be evaluated against EPA's published criteria for determination of unreasonable degradation. Unreasonable degradation criteria, defined in the NPDES regulations (40 CFR 125.121[e]), and the ten factors specified in 40 CFR 125.122 for determining unreasonable degradation have been listed in Section 1.2, above.

EPA's assessment of the ten ocean discharge criteria factors was prepared in conjunction with the issuance of the existing permit. The FEIS developed for the existing permit represented EPA's anti-degradation assessment and contained EPA's assessment results. EPA determined that all authorized discharges in compliance with the permits would not cause unreasonable degradation of the marine environment. EPA's conclusion for the proposed permit is the assessment performed for the existing permit and presented in the 2004 FEIS - that unreasonable degradation will not occur as a result discharges in compliance with the requirements of the existing permit - is appropriate for the discharges assessed for the existing permit and continued under the proposed permit. However, the proposed permit includes a new waste stream that is not covered under the existing permit and, therefore, is assessed for its potential to cause unreasonable degradation of the marine environment in this SIR.

In the event that an assessment of these ten factors determines that either unreasonable degradation may occur even with proposed technology and water quality-based permit conditions in place, or that a determination cannot be made due to lack of data, Section 403(c) requires that the EPA not issue a permit for discharge to marine waters.

1.3.6 State Certification

In accordance with Section 401 of the CWA, the proposed NPDES general permit for the Territorial Seas of Texas must be certified by the State of Texas. The certification agency is the Texas Railroad Commission (TRRC).

1.4 RELATIONSHIP TO OTHER PERMITS

The regulatory authority for oil and gas operations in Texas is the Texas Railroad Commission (TRRC), which does not have authority from the EPA under the NPDES program to issue permits. Therefore, a general permit for discharges to the territorial seas, meeting state permitting and water quality requirements, is issued by the EPA. In Texas, there are currently 11 platforms covered under the existing general permit for the Texas Territorial Seas; 7 operators are actively discharging (see Table 2-2).

EPA Region 6 has issued NPDES general permits regulating discharges from oil and gas activities in the areas both landward and seaward of the Territorial Seas. In addition to a general permit covering oil and gas activities in the Territorial Seas of Texas, Region 6 has issued: a general permit covering activities in federal Outer Continental Shelf (OCS) waters of the Western Gulf of Mexico offshore Texas and Louisiana; and a general permit for operations in the Coastal Subcategory covering oil and gas activities in Texas state waters. The Louisiana Department of Environmental Quality (LDEQ) has been delegated authority to issue NPDES general permits for oil and gas operations and has issued a general permit covering Offshore Subcategory oil and gas activities in the Territorial Seas of Louisiana and Coastal Subcategory wells in Louisiana state waters. Table 1-2 summarizes information on these NPDES general permits.

1.5 RELATIONSHIP TO OTHER REGULATORY PROGRAMS

A number of laws, regulations and programs apply to offshore oil and gas activity and/or to the onshore disposal of the waste streams which result from that activity. Some of the most important of these are discussed below.

Table 1-2. NPDES Permits Governing Discharges from Oil and Gas Operations under EPA Region 6 Jurisdiction: Texas, Louisiana and Waters off Their Shores

Permit Area	Territorial Seas		Outer Continental Shelf	Coastal Waters	
NPDES Permit No.	TXG260000	LAG260000	GMG290000	TXG330000	LAG330000
Geographic coverage	Texas state waters from 0 to 3 nautical mi from shore	Louisiana state waters	Federal & Texas state waters, seaward of 3 nautical mi from shore	Texas coastal waters	Louisiana coastal waters
Type of facilities (1)	Existing and new sources	Existing and new sources	Existing and new sources	Existing and new sources - Coastal Subcategory wells; Stripper and OCS Subcategory wells discharging into Coastal Subcategory waters (2)	
Regulated discharges	All: produced water, produced sand, drilling fluids and cuttings, and all others		All: produced water, produced sand, drilling fluids and cuttings, and all others	All: produced water, produced sand, drilling fluids and cuttings, and all others	
Permit status	Final; effective 11/04/2005	Final; effective 11/13/2009	Final; effective 10/01/07	Final; effective 07/07/2007	Final; effective 12/01/2005
Basis for permit	BAT/NSPS Offshore Subcategory Effluent Limitations Guidelines; Texas WQS	BAT/NSPS Offshore Subcategory Effluent Limitations Guidelines; Louisiana WQS	BAT/NSPS Offshore Subcategory Effluent Limitations Guidelines; Federal WQC	Coastal Subcategory Effluent Limitations Guidelines; Texas WQS	Coastal Subcategory Effluent Limitations Guidelines; Louisiana WQS
NEPA EAs or EISs	FEIS for General New Source NPDES Permit For Discharges from the Offshore Subcategory of the Oil & Gas Extraction Point Source Category to the Territorial Seas of Texas (TXG260000) EPA Region 6, 2004	Issued by LDEQ, therefore, no NEPA review required	FSEIS for the Western Planning Area Lease Sale (BOEMRE, 2011); DSEIS for the Central Planning Area (BOEMRE, 2011); EPA is a cooperating agency	General New Source NPDES Permit For Discharges from the Offshore Subcategory of the Oil & Gas Extraction Point Source Category to the Coastal Waters in Texas (TXG330000) EPA Region 6, 2007	Issued by LDEQ, therefore, no NEPA review required

NOTES:
1) See glossary, particularly for definitions of "existing sources," "new sources," "BPT," "BAT," "BCT," and "NSPS."
2) Because coastal permits require zero discharge, NSPS could not be more restrictive, and therefore are unnecessary.

1.5.1 State Leases

Texas has ownership of mineral rights in its Territorial Seas. Oil and gas extraction activity is subject to authorization by leases from the Texas General Land Office (TGLO). Leases are offered for the production of oil and gas and other minerals. Royalties, generally 20-25 percent of production, accrue to the state. Leases contain a general environmental provision that requires the "highest degree of care and all proper safeguards" to prevent pollution from activities on the lease. For submerged lands, specifically, there is also a prohibition on the discharge of solid waste or garbage.

In addition, each submerged tract in Texas may be assigned one or more Resource Management Codes. These codes are intended to assist lessees with project planning. The codes were developed by participating state and federal agencies that are required by law to protect fish, wildlife, antiquities, and navigational resources. Prior to putting a lease up for bid the agencies review the lease and assign appropriate codes to the tract. Examples of code recommendations are use of special methods during dredging to reduce turbidity (such as near oyster reefs), routing pipelines to avoid reefs, protection of sensitive marine habitats, and timing of drilling activity to avoid nesting seasons.

The resource code recommendations do not become part of the lease contract, but they may result in development restrictions that become part of the Section 10 permit issued under the Rivers and Harbors Act of 1899 by the U.S. Army Corps of Engineers (COE) (see discussion of these permits in section 1.5.3.8). In most cases, tract development can proceed unhindered when an applicant can demonstrate that their plan is not inconsistent with the concerns listed in the codes. In cases where damage is unavoidable, development may be allowed, subject to absolute restrictions.

1.5.2 Natural Resource Protection

1.5.2.1 Endangered Species Protection

The Endangered Species Act of 1973 (ESA) establishes a national policy to protect and conserve threatened and endangered species and the ecosystem upon which they depend. The act prohibits federal agencies, from their direct or indirect actions, from jeopardizing threatened or endangered species or adversely modifying habitats essential to their survival. The act is administered by the Department of the Interior (DOI), the U.S. Fish and Wildlife Service (FWS), and the National Marine Fisheries Service (NMFS), part of the Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA). Section 7 of the ESA governs interagency cooperation and consultation. Before an EPA action can occur, the agency is required to identify federally-listed endangered or threatened species and their habitat that may be affected by the action. If listed species or their habitat may be affected, formal consultation in accordance with the procedures listed in 50 CFR Part 402 must be undertaken with FWS or NMFS, as appropriate (Minerals Management Service [MMS[1]], 1992, 40 CFR 6.302(h)).

For OCS activities in the Western and Central Gulf of Mexico Planning Areas, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) consults with FWS and/or NMFS at the multi-sale stage. This programmatic consultation covers OCS activities, including

1 Although the Minerals Management Service (MMS) changed its name to the Bureau of Ocean Energy Management Regulation and Enforcement (BOEMRE), this document will use the "MMS" designation in citations and references that have been published under the "MMS" designation. BOEMRE will be used in the text to refer to the agency.

lease sales, exploration, development, production, and decommissioning. BOEMRE does not consult on individual projects anywhere in the Gulf except in unusual circumstances (MMS, 2004).

EPA has determined that if the proposed permit is issued, there will be no adverse impacts on listed endangered or threatened species because:

1. EPA evaluated the requirements of 5 CFR 402 when it issued the 1981 and subsequent1983 permits, and determined at that time that biological opinions had already been issued for comparable actions and indicated compliance with the ESA;
2. The proposed permit is more stringent than the 1981 and subsequent 1983 permits, and consequently more protective of endangered species and their habitats;
3. In preparing this SIR, EPA has not identified any new information which reveals impacts not previously considered; and
4. It is not possible to assess all possible site-specific impacts from a general permit, but it is known that the principal adverse effects (related to explosive removals of platforms) are subject to effective regulatory oversight (see next section).

1.5.2.2 Erection and Removal of Platforms

As required by Section 10 of the River and Harbors Act (see Section 1.5.3.8, below), the Galveston District of the COE individually evaluates applications for placement of platforms from the shoreline to the three marine league line using individual and regional permits; between one mile offshore and the three marine league line they are authorized under general permits. General permits allow a reduced evaluation time but contain conditions that require ESA consultation if the rig is to be removed using explosives. All activities within one mile of shore and in anchorage areas and fairways require individual permit evaluation; ESA Section 7 consultation is required as a condition of these permits as well, if explosives are to be used in platform removal.

When an applicant requests to remove a platform, the COE initiates a Section 7 consultation with the NMFS. NMFS issues a biological opinion on the effects of removal on endangered species and may include an “incidental take” statement detailing required mitigation measures. The COE then authorizes the removal of the platform subject to the NMFS recommendations (Memorandum, Dunn to Swick, 1993). Processing of the Section 7 consultation typically requires three months.

In order to facilitate Section 7 review, the COE Galveston District has begun consultation with NMFS to develop generic explosive removal criteria that will allow NMFS to issue a generic biological opinion and ‘incidental take” statement. As long as COE and NMFS agree that the applicant’s explosive removal plan meets the criteria, a detailed Section 7 consultation would not be required. Data on the occurrence of endangered sea turtles in the territorial seas are too spotty to permit the use of geographic high- medium- or low-risk zones such as those BOEMRE has relied on for generic Section 7 consultation in federal waters (personal communication, Heinly, 1993).

1.5.2.3 Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act of 1972 (MMPA) establishes a national policy to protect and conserve marine mammals and their habitats. The act establishes a moratorium on the taking of marine mammals. A “take” is defined as activities “to harass, hunt, capture, kill, or attempt to harass, hunt, capture, or kill” marine mammals. NMFS, an agency in the Department of Commerce, manages cetacean (e.g., whale, dolphin, and porpoise) populations. The FWS, an agency of the Department of Interior, is responsible for manatees, sea otters, polar bears, dungongs, and walrus, while the NMFS has jurisdiction over all other marine mammals (MMS, 2002).

The Marine Mammal Commission (MMC) is responsible for reviewing and advising federal agencies on the protection and conservation of marine mammals because activities under the authority of federal agencies may constitute a "take" as defined under the MMPA. If it is ascertained that a taking may occur, an exemption to or waiver of the act's moratorium on taking would be required. A provision of the act under Section 101(a) directs the Secretary of Commerce/Interior to allow, on request, those engaged in oil and gas activities an exemption from the "taking" prohibitions stated within the act when the taking is unintentional, involves small numbers of individuals, and has negligible effects, provided that satisfactory provisions have been made to monitor and report the taking. In October 1995, NMFS issued regulations authorizing and governing the taking of bottlenose and spotted dolphins incidental to the removal of oil and gas drilling and production structures in the Gulf of Mexico for a period of five years (MMS, 1996b, 50 CFR 228).

The MMC coordinates with the FWS and NMFS to ensure that BOEMRE and offshore operators comply with the MMPA, and to identify mitigation and monitoring requirements for permits or approvals for activities like seismic surveys and platform removals (MMS, 2002).

1.5.2.4 Executive Orders 11988/11990: Protection of Wetlands and Floodplains

Executive Order 11988, "Floodplain Management," requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain. EPA's *Statement of Procedures on Floodplain Management and Wetlands Protection* (January 5, 1979) requires EPA programs to determine if proposed actions will be in or will affect wetlands or floodplains. If wetlands or floodplains are affected, the responsible official is required to prepare a floodplain/ wetlands assessment that will become a part of the corresponding NEPA compliance documentation (40 CFR 6.302).

Executive Order 11990, "Protection of Wetlands," requires federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. In addition to emergent vegetation, submerged rooted vascular plants (seagrasses) are covered by this order and CWA Section 404.

1.5.2.5 Section 404 of the Clean Water Act

Section 404 of the CWA requires a COE permit for the disposal or emplacement of dredge or fill material for development purposes and for the building of structures in all waters of the U.S. Section 404 requires COE approval, with consultation from other federal and state agencies, for the dredging of pipeline canals and navigation routes that service OCS production and for activities in the state jurisdictional coastal areas of the Gulf of Mexico. The offshore jurisdictional limits of the COE under the CWA extend to the limits of the territorial seas.

1.5.3. Natural Resource Management

1.5.3.1 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) and implementing regulations at 15 CFR Part 930 require that any federally licensed or permitted activity affecting the coastal zone of a state that has an approved coastal zone management program (CZMP) be reviewed by that state for consistency with the state's program. Under the act, applicants for federal licenses and permits must submit a certification that the proposed activity complies with an affected state's approved CZMP and will be conducted in a manner consistent with the CZMP. The state then has the responsibility to either concur with or object to the consistency determination under the procedures set forth by the CZMA and their approved plan.

For NPDES general permit programs, EPA submits a proposed general permit and consistency determination to the states for comment. Because the discharges covered by the proposed permit create the potential for impacts on state waters, consistency determinations for the general permit would be prepared and submitted to Texas. State comments must be carefully considered to make the activities authorized by the general permit consistent to the maximum extent practicable with the enforceable policies of a state's CZMP.

The Texas Coastal Coordination Council (CCC), composed of representatives from Texas agencies with responsibilities in the coastal zone, developed the policies framing the Texas CZMP. The Texas program has completed all of the steps necessary for federal approval. It was approved by the Ocean and Coastal Resources Management Division of NOAA in January 1997. EPA has conducted consultations with TGLO regarding coastal zone consistency to document compliance with the CZMA.

1.5.3.2 Section 401 Water Quality Certification by State Water Quality Agency

States adopt surface WQS pursuant to Section 303 of the CWA, and have broad authority to base those standards on the waters' use and value for "public water supplies, propagation of fish and wildlife, recreational purposes, and…other purposes." All permits must include effluent limitations at least as stringent as needed to maintain established beneficial uses and to attain the quality of water designated by states for their water. Thus, the states' WQS are a critical concern of the Section 401 certification process (EPA, 1989).

Under Section 401 of the CWA, a state has the authority to grant or deny "certification" for a federally permitted or licensed activity that can result in a discharge into navigable waters of the U.S., if the discharge will originate in that state. If a state denies certification, the federal permitting or licensing agency is prohibited from issuing a permit or license. The decision to grant or deny certification is based on a state's determination from data submitted by an applicant, and any other information available to the state, whether the proposed activity will comply with the requirements of certain sections of the CWA enumerated in Section 401(a)(1). These requirements address effluent limitations for conventional and nonconventional pollutants, water quality standards, NSPS, and toxic pollutants (Sections 301, 302, 303, 306 and 307). Also included are requirements of state law or regulation more stringent than those sections or their federal implementing regulations (EPA, 1989). States may apply the certification process to exert control of impacts from federal projects on wetlands when a state has standards for wetlands quality.

1.5.3.3 Marine Protection, Research, and Sanctuaries Act

The National Marine Sanctuary Program, administered by the NOAA, was established by the Marine Protection, Research, and Sanctuaries Act of 1972. The National Marine Sanctuaries Program is designed to identify areas of the marine environment of special national significance due to their resource or human use values, and to provide authority for promulgation of comprehensive and coordinated conservation management plans and regulations to protect marine sanctuary resources. Special use permits may be issued which authorize the conduct of specific activities in a national marine sanctuary if it is determined that such authorization is necessary to establish conditions of access to and use of any sanctuary resource or to promote public use and understanding of a sanctuary resource. An activity may be authorized only if it is compatible with the purposes for which the sanctuary is designated. There are no marine sanctuaries located within the Territorial Seas of Texas.

1.5.3.4 Magnuson Fishery Conservation and Management Act of 1976

Pursuant to Section 305(b) of the Magnuson Fishery Conservation and Management Act (MFCMA), federal agencies are required to consult with NMFS on any action that may result in adverse effects to essential fish habitat (EFH). The MFCMA establishes a fisheries conservation zone for the U.S. and delineates the area from the seaward boundaries of coastal states to 200 nautical miles. Certain OCS activities authorized by BOEMRE may result in adverse effects to EFH, and therefore, require EFH consultation.

The MFCMA created eight Regional Fishery Management Councils including the Gulf of Mexico Fishery Management Council (GMFMC). Under the Sustainable Fisheries Act of 1996, Congress required the NMFS to designate and conserve EFH for species managed under existing fisheries management plans. In March 2000, the BOEMRE's Gulf of Mexico Region consulted with the NMFS's Southeast Regional Office to prepare a NMFS regional finding for the Gulf of Mexico Region that allows BOEMRE to incorporate EFH assessments into NEPA documents. BOEMRE consulted with the NMFS on a programmatic level to address EFH issues for OCS oil and gas activities plans of exploration and production, pipeline rights-of-way, and platform removals. For OCS activities in the Western and Central Gulf of Mexico Planning Areas, BOEMRE consults with the NMFS at the multi-sale stage. This programmatic consultation covers OCS activities, including: lease sales, exploration, development, production, and decommissioning.

An EFH consultation for the Central Planning Area and Western Planning Area lease sales included in the 2002-2007 OCS Leasing Program, using the Draft Multi-Sale EIS as the NEPA document, was initiated in March 2002 by BOEMRE with the NMFS Southeast Regional Office. NMFS responded in April 2002, endorsing the implementation of resource protection measures previously developed cooperatively by BOEMRE and NMFS in 1999 to minimize and avoid EFH impacts related to exploration and development activities in the Central Planning Area and Western Planning Area.

Continuing agreements, including avoidance distances from designated "No Activity Zones," live-bottoms, or pinnacle features, and circumstances that require project-specific consultation, appear in BOEMRE Notice to Lessees (NTL) 2004-G05. Effective January 23, 2006, NMFS approved a revision to the EFH rules acknowledging amendments made by the GMFMC that included the identification of habitat areas of particular concern.

Further programmatic consultation was initiated and completed for the 2007-2012 lease sales addressed in a Multi-Sale EIS (MMS, 2007). The NMFS concurred by letter dated December 12, 2006, that the information presented in the Draft Multi-Sale EIS satisfies the EFH consultation procedures outlined in 50 CFR 600.920. Provided that BOEMRE proposed mitigations, previous EFH conservation recommendations, and the standard lease stipulations and regulations are followed as proposed, NMFS agrees that impacts to EFH and associated fishery resources resulting from activities conducted under the 2007-2012 lease sales would be minimal.

The action proposed in this SIR for the proposed NPDES general permit authorizes operational surface water discharges to the OCS area under EPA Region 6 jurisdiction. As a continuation of activities covered under the 2004 FEIS, and in the absence of any material adverse information, the activities considered in this SIR represents a subset of the effects discussed the multi-sale EISs.

1.5.3.5 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act provides that whenever the waters or channel of a body of water are modified by a department or agency of the U.S., the department or agency first shall consult with the FWS and with the head of the agency exercising administration over the wildlife resources of the state where construction will occur, with a view to the conservation of wildlife resources. EPA is not proposing to modify, divert, or control a body of water, so this statute does not apply to this action.

1.5.3.6 Coastal Barrier Resources Act of 1983

The Coastal Barriers Resources Act establishes 186 coastal barrier units that are included in a Coastal Barrier Resource System. The act prohibits all new federal expenditures and financial assistance within the Coastal Barrier Resource System, with certain specific exceptions including energy development. The purpose of this legislation was to end the federal government's encouragement of development on barrier islands by withholding federal flood insurance for new construction of or substantial improvements to structures on undeveloped coastal barriers (MMS, 1992).

1.5.3.7 National Estuarine Research Reserves/ National Estuary Program

The National Estuarine Research Reserve System, established by the Coastal Zone Management Act of 1972, is administered by the NOAA. The system serves to enhance public awareness and understanding of estuarine areas and to promote and coordinate research that will expand scientific knowledge of significant estuarine resources. For an area to be designated, the law of the coastal state in which the area is located must provide long-term protection for reserve resources that will ensure a stable environment for research. The Mission-Aransas National Estuarine Research Reserve is a component of National Estuarine Research Reserve System, located in Texas state waters.

The National Estuary Program, administered by EPA, was established in 1987 by an amendment to the CWA.The purpose of the National Estuary Program is to identify nationally significant estuaries, to protect and improve their water quality, and to enhance their living resources. Under the program, comprehensive conservation and management plans are developed to protect and enhance environmental resources. The plans recommend priority corrective actions and compliance schedules that address point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of nominated estuaries. Representatives from federal, state, and interstate agencies; academic and scientific institutions; and industry and citizen groups work to define objectives for protecting a nominated estuary, to select the chief problems to be addressed in the management plan, and to ratify a pollution control and resource management strategy to meet each objective. The Galveston Bay Estuary Program and the Coastal Bay Bends and Estuaries Program are components of the National Estuary Program located in Texas state waters.

1.5.3.8 Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable water of the U.S. The construction of any structure in or over any navigable water of the U.S., the excavating from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters is unlawful without prior approval from the COE. Section 4(e) of the OCS Lands Act (OCSLA) extends this legislation to prevent obstructions to navigation in navigable water from installations and devices located on the seabed to the seaward limit of the OCS.

1.5.3.9 Pollution Prevention Act of 1990

The Pollution Prevention Act charges EPA with developing and implementing a strategy to promote source reduction of potential pollutants through a variety of programs and initiatives. Pursuant to this charge, EPA published a pollution prevention strategy (56 FR 38). Regarding permits, the strategy states that EPA will promote cost-effective alternatives to conventional treatment alternatives. It states that EPA will work with industries to identify opportunities for pollution prevention when developing or renewing permits. Where authorized by law, EPA will give preference to performance standards that maximize the range of choices for permittees (56 FR 7859).

1.5.4 Cultural Resource Management

1.5.4.1 Historic and Archaeological Resources Policies

EPA is subject to the requirements and review procedures of the Historic Sites Act of 1935, the National Historic Preservation Act of 1966, the Archaeological and Historic Preservation Act of 1974, and Executive Order 11593, "Protection and Enhancement of the Cultural Environment."

Under Section 106 of the National Historic Preservation Act and Executive Order 11593, if an EPA action affects any property with historic, architectural, archaeological, or cultural value that is listed on or eligible for listing on the National Register of Historic Places, the agency shall comply with the procedures for consultation and comment promulgated in 36 CFR Part 800.

Under the Archaeological and Historic Preservation Act, if an EPA activity may cause irreparable loss or destruction of significant scientific, prehistoric, historic, or archaeological data, EPA or DOI is authorized to undertake data recovery and preservation activities (40 CFR 6.302).

Under the Historic Sites Act of 1935, the Secretary of the Interior is authorized to designate areas as national natural landmarks for listing on the National Registry of Natural Landmarks. In conducting an environmental review, EPA is to consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 36 CFR 62.6(d) to avoid undesirable impacts upon such landmarks (40 CFR 6.302).

Because the OCS is not federally owned land and the government has not claimed direct ownership of historic properties on the OCS, BOEMRE only has the authority to ensure that any agency funded and permitted actions do not adversely affect significant historic properties. Beyond avoidance of adverse impacts, BOEMRE does not possess the legal authority to manage the historic properties on the OCS. BOEMRE has conducted archaeological baseline studies of the OCS to determine where known historic properties may be located and to outline areas where presently unknown historic properties may be located (MMS, 2002).

1.5.5 Pollution Control Regulations

1.5.5.1 Federal Oil Spill Program

Section 311 of the CWA provides the authority for the federal government's oil spill program. The Oil Pollution Act of 1990 (OPA) contains significant modifications to many of the provisions of Section 311 of the CWA. Responsibility for implementing Section 311 is divided between EPA and the Department of Transportation by Executive Order 11735, Assignment of Functions under Section 311 of the CWA. In addition, Executive Order 12777, Implementation of Section 311 of the CWA and the OPA, authorizes the Secretary of the Interior to issue regulations requiring operators of offshore waters to provide for prevention and containment of oil spills and to submit oil spill response plans (MMS, 1996a). In the event of an oil spill from oil and gas activity on the OCS, BOEMRE is responsible for operations on the facility and the U.S. Coast Guard (USCG) is responsible for coordinating cleanup of the ocean. While the USCG has ultimate responsibility to ensure that an oil spill is effectively cleaned up, it is the responsibility of all OCS oil industry operators to take immediate corrective action if a spill occurs (MMS, 1996a).

Oil-spill-response planning in the U.S. is accomplished through a mandated set of interrelated plans. An Area Contingency Plan (ACP) represents the third tier of the National Response Planning System and as mandated by the OPA. ACPs cover sub-regional geographic areas. ACPs are a focal point of response planning, providing detailed information on response procedures, priorities, and appropriate countermeasures. The Gulf coastal area that falls within USCG District 8 is covered by the One Gulf Plan ACP, which includes separate Geographic Response Plans for areas covered by USCG Sector Corpus Christi, Sector Houston/Galveston, Sector Port Arthur, Sector Morgan City, Sector New Orleans, and Sector Mobile. The Miami ACP covers the remaining Gulf coastal area.

The ACPs are written and maintained by Area Committees assembled from federal, state, and local governmental agencies that have pollution response authority; non-governmental participants may attend meetings and provide input. The coastal Area Committees are chaired by respective federal On-Scene Coordinators from the appropriate USCG office and are composed of members from local or area-specific jurisdictions. Response procedures identified within an ACP or its Geographic Response Plan(s) reflect the priorities and procedures agreed to by members of the Area Committees.

The OPA requires contingency plans to address the response to a “worst-case” oil spill or a substantial threat of such a discharge. The oil spill contingency plans identify environmentally sensitive areas that could be affected by a spill. The plans include strategies for the protection of such areas and information on equipment locations and response times (MMS, 1996a). The plans also require that vessels and both onshore and offshore facilities have approved response plans. The basic requirements for oil spill contingency plans for OCS lessees are specified in BOEMRE regulations under 30 CFR 250.42. These plans adhere to specified requirements, including the demonstration that they have contracted with private parties to provide the personnel and equipment necessary to respond to or mitigate a “worst-case” spill (MMS, 1992). Ten spill equipment bases are designated by Clean Gulf Associates, the industry cooperative established to respond to oil spills in the Gulf. Bases are located in Ingleside, Houston, and Galveston, Texas.

1.5.5.2 Texas Oil Spill Prevention and Response Act

The Texas Legislature passed the Oil Spill Prevention and Response Act in 1991. The regulations were developed in response to a federal mandate for the development of spill prevention and control regulations by the states. The TGLO is responsible for contingency planning activities and for oil spills in state waters, at exploration and production facilities within 100 yards of coastal or tidally influenced waters and other designated facilities determined to pose a risk. Response to coastal oil spills of 240 barrels or less are under the jurisdiction of the TRRC. State inspections provide the basis for a 5-year certification (personal communication, Arambula, 1993). Facilities whose operations involve the transfer or storage of oil and gas must have a discharge prevention and response certificate which is valid for a period of 5 years. Operators must report annually on the status of their discharge prevention and response capability.

1.5.5.3 Air Quality Regulation

The Clean Air Act (CAA) requires that federal departments or agencies having jurisdiction over any property or facility, or engaged in any activity resulting in the discharge of air pollutants comply with all federal, state, interstate, or local requirements in the control and abatement of air pollution. The CAA is referred to in Section 5(a)(8) of the OCSLA, which describes the DOI's authority to regulate air emissions from OCS oil and gas facilities. BOEMRE has established regulations to comply with the CAA (MMS, 2002). BOEMRE also established procedures to regulate activities in hydrogen sulfide prone areas. These regulations allow the collection of information about potential sources of pollution for the purpose of determining whether projected emissions may result in onshore ambient air concentrations above significance levels (MMS, 1995a).

Section 328 of the CAA Amendments of 1990 gave EPA authority to establish requirements to control air emissions from OCS sources located offshore of the states along the Pacific, Arctic, and Atlantic coasts, and along the U.S. Gulf Coast off the state of Florida eastward of 87°30' W longitude to attain and maintain federal and state ambient air quality standards and to comply with the provisions of Part C of Title I of the CAA.

The Outer Continental Shelf Air Regulations (40 CFR Part 55) were promulgated by EPA on September 4, 1992. For OCS sources located within 25 miles of a state's seaward boundary, which is the case for oil and gas facilities covered under the proposed general permit, the requirements are the same as the requirements that would be applicable if the source were located in the corresponding onshore area. OCS sources located beyond 25 miles of states' seaward boundaries are subject to federal requirements only. A state may request delegation for the authority to implement and enforce the requirements of the OCS program within 25 miles of its seaward boundary.

1.5.5.4 Solid Waste Management

The disposal of solid and hazardous operational wastes is subject to EPA regulations under the Resource Conservation and Recovery Act (RCRA). Many oil and gas wastes are exempt from coverage under the hazardous waste regulations of Subtitle C of RCRA (53 FR 25446). Exempt wastes include those generally coming from an activity directly associated with the drilling, production, or processing of a hydrocarbon product. Nonexempt oil and gas wastes include those not unique to the oil and gas industry and used in the maintenance of equipment.

There are currently no federal regulations specific to the onshore management of offshore oil and gas industry wastes. Moreover, since the wastes are classified as Subtitle D wastes (i.e., nonhazardous), enforcement authority over exempted oil and gas industry wastes rests primarily with the states. Waste contaminated with naturally occurring radioactive materials (NORM) is a special management concern. Unlike man-made radioactive materials, NORM-contaminated waste is not subject to Nuclear Regulatory Commission regulations. At present there are no federal regulations specifically related to oil-field NORM-contaminated wastes.

Solid waste in Texas is generally regulated by the TCEQ; however, waste materials from activities associated with the exploration, development and production of oil and gas are regulated by the TRRC, under Section 91.101 of the Texas Natural Resources Code, up to the point of off-site refining (TRRC, 1992). Facilities disposing of these wastes are permitted by the TRRC and are operated commercially by third parties or as centralized facilities owned by the waste generator. An exception is waste contaminated by NORM at high levels. The Texas Department of Health regulates the possession, use and storage of such waste, but not its disposal.

1.5.5.5 Underground Injection Control

The regulation of underground injection wells in Texas is shared by the TCEQ and Environmental Services of the TRRC. The TRRC permits injection wells for the disposal of oil and gas drilling and production wastes under Chapter 27 of the Texas Water Code (TRRC, 1992). Even in these cases, the TCEQ has the responsibility for the determination of the base of ground water which must be protected. For injection of produced water back into oil and gas producing zones, the operator is required to provide a "surface casing letter" from the TCEQ, which defines the base of ground water requiring protection. For disposal of oilfield wastes into non-productive zones, the operator sends a copy of the TRRC permit application to the TCEQ; after evaluation, the TCEQ sends a letter of recommendation to the TRRC which also delineates the base of protected ground water (personal communication, Fuller 1993).

1.5.5.6 Regulation of Ocean Dumping

Ocean dumping is regulated by the Marine Protection, Research, and Sanctuaries Act (MPRSA), as amended (33 U.S.C. 1401 et. seq.). Two different categories of material are regulated by this act. Regulations implementing the MPRSA (40 CFR 220 et. seq.) require an EPA permit for all ocean dumping of industrial wastes and municipal sludge materials; however, the termination of ocean dumping of sewage sludge and industrial wastes by December 31, 1981, was mandated by 33 U.S.C. 1412a. The designated ocean areas where wastes may be disposed are listed in 40 CFR 228.

EPA publishes an annual report entitled *Ocean Dumping in the United States* that includes information on permit holders, types of waste approved for disposal under the permit, and yearly waste volumes disposed. EPA had one designated deep-water disposal area in the Gulf of Mexico, but the disposal area was officially re-designated on February 27, 1991. The current interim designated dredged material disposal sites are now being converted by EPA into formally designated sites. These sites have been used for the disposal of dredged material from the COE harbor entrance channel dredging programs, in most cases for as long as 25 years. The EPA-designated ocean disposal sites for dredged material in Texas state waters are: Sabine-Neches (4 sites); Galveston; Freeport Harbor 45-ft. Project; Freeport Harbor; Matagorda Ship Channel; Corpus Christi; Homeport Project; Port Mansfield; Brazos Island Harbor; and Brazos Island Harbor 42-ft. Project.

1.5.5.7 Regulations for the Prevention of Pollution by Solid Wastes from Ships

The Marine Pollution Research and Control Act of 1987 (MPRCA) implements Annex V of the International Convention for the Prevention of Pollution from Ships ("MARPOL"). Under provisions of the law, all ships and watercraft, including all commercial and recreational fishing vessels, are prohibited from dumping plastics at sea. The law also severely restricts the legality of dumping other vessel-generated garbage and solid waste items both at sea and in U.S. navigable waters. The USCG is responsible for enforcing the provisions of this law and has developed final rules for its implementation (55 FR 171, September 4, 1990), calling for adequate trash reception facilities at all ports, docks, marinas, and boat launching facilities (MMS, 2003).

Final rules published under the MPRCA explicitly state that fixed and floating platforms, drilling rigs, manned production platforms, and support vessels operating under a federal oil and gas lease

(33 CFR 151.73) are required to develop waste management plans (33 CFR 151.57) and to post placards reflecting MARPOL, Annex V dumping restrictions (33 CFR 151.59). Waste Management Plans will require oil and gas operators to describe procedures for collecting, processing, storing, and discharging garbage and to designate the person who is in charge of carrying out the plan. These rules also apply to all oceangoing ships of 40 feet or more in length that are documented under the laws of the U.S. or numbered by a state, and that are equipped with a galley and berthing. Placards noting discharge limitations and restrictions, as well as penalties for noncompliance, apply to all boats and ships 26 feet or more in length.

The Shore Protection Act of 1988 (FR 22546, May 24, 1989) prohibits the transportation of municipal or commercial waste within coastal waters by a vessel without a permit and number or other markings. The act establishes the requirements and procedures for permit application as well as the grounds for permit denial. The Secretary of Transportation issues, and has the discretion to deny permits, but must deny a permit if so requested by EPA. The act provides for control of the transfer of drilling muds, cuttings, and produced sands to transport vessels, the handling of these materials on the vessels, and the transfer to shore based facilities. At this time, only a limited permitting requirement has been implemented under the act.

2.0 DESCRIPTION AND EVALUATION OF ALTERNATIVES

2.1 EPA's ALTERNATIVES

2.1.1 Overview of Permitting Action

The NPDES general permit that EPA intends to issue for discharges from existing and new dischargers and new sources in the offshore subcategory of the oil and gas extraction point source category in the Territorial Seas of Texas is provided in Appendix A. The scope and content of the proposed general permit implement the 1993 technology-based effluent limitation guidelines and new source performance standards. The proposed permit will also contain provisions that ensure permitted discharges do not cause violations of state WQS. Some basic features of the proposed permit include the following:

- The permit will apply specifically to exploration, production, drilling, well completion, and well treatment operations in the Territorial Seas of Texas.
- The permit will apply to "existing sources" (i.e., all discharges that predate the permit, plus discharges from future exploration activities) and "new sources (see Section 1.3.3).
- The permit will establish effluent limitations, reporting requirements, and other conditions for the discharges; and establish current technology-based and water quality-based effluent limitations consistent with national effluent limitations guidelines, federal Ocean Discharge Criteria, and state WQS.
- Any oil and gas operator in the Territorial Seas of Texas will be required to file a written Notice of Intent to be covered under the proposed general permit. No public notice or site-specific NEPA analyses are required.

The proposed general permit retains all of the limitations and conditions that are contained in the existing permit. Neither the existing OCS general permit (see Table 1-2, Section 1.4) nor the proposed Territorial Seas permit authorizes Territorial Seas operations to discharge to OCS waters. There is no legal basis for existing sources or new sources located in the Territorial Seas to shift their discharge to the OCS, where requirements may be less stringent than in the Territorial Seas.

Important features in the existing permit that are to be retained in the proposed permit include: a prohibition of discharge of drilling fluids, drill cuttings and produced sand; numeric oil and grease limits, whole effluent toxicity limits, and requirements to meet effluent discharge limits to comply with revised Texas WQS for produced water discharges; prohibition of free oil from deck drainage; free oil prohibition, priority pollutant prohibition unless in trace amounts, and oil and grease numeric limits for well treatment, completion and workover fluids; prohibition on floating solids from sanitary and domestic wastes, plus residual chlorine requirements for sanitary waste and prohibition of foam from domestic waste; prohibition on discharge of garbage; prohibition of free oil and toxic pollutant limitations for chemically-treated fresh- and seawater; and prohibition of free oil from a variety of low volume, miscellaneous wastes.

Additional new, more stringent requirements in the proposed permit will include:

- Addition of numeric and toxicity limits on discharges of chemicals used for hydrate control.

- Prohibition on discharge of and BMP requirements for collection of the material resulting from surface preparation for structure maintenance activities
- Removal of a 10-year exemption from compliance with technology-based requirements of 40 CFR Part 435, Subpart A (contained in the existing permit)
- Addition of requirements that regulate cooling water intake structures for offshore oil and gas extraction new sources under the CWA Section 316(b) Phase III Rule
- Prohibition of uncontrollable discharges caused by equipment failure or facility damage and blowout preventer BMPs
- Requirement for more detailed environmental and operational data submitted with Notices of Intent to be covered under the proposed permit.

2.1.2 EPA’s Preferred Alternative

EPA's preferred alternative is to issue the proposed NPDES general permit for discharges from the oil and gas extraction point source category to the Territorial Seas of Texas. The impacts associated with this federal action are presented in this Supplemental Information Report (SIR) to the 2004 FEIS developed for the existing permit.

EPA has the alternative of issuing the general NPDES permit with minor changes in specific provisions. For example, as proposed, the regulation of produced water discharges will be based on the results of computer models which utilize environmentally conservative assumptions. EPA could use less conservative modeling assumptions, resulting in smaller, less stringent changes in the produced water limitations.

2.1.3 No Action Alternative

The principal alternative to issuing the proposed NPDES general permit available to EPA is the No Action Alternative. The No Action Alternative results from EPA choosing to not re-issue the proposed NPDES general permit. The result of selecting the No Action Alternative would be termination of authorization under which current and future offshore oil and gas operations in the Territorial Seas of Texas are allowed to discharge.

The consequence of allowing the existing general permit to expire would be that all oil and gas operations in the Territorial Seas would need to seek individual NPDES permits. In the case of new sources, this would require preparation of a site-specific environmental assessment or environmental impact statement. The No Action Alternative would dramatically increase the time, effort, and resources required of both operators and EPA. Also, because of the increased effort required for preparing an application for an individual NPDES permit, the level of oil and gas activity, especially new drilling and production, would likely be substantially reduced compared to the level of activity anticipated to occur under the proposed, re-issued general permit, although the extent of reduction has not been quantified.

The benefit of issuing individual permits, compared to the re-issued, proposed general permit, is negligible: the individual NPDES permits would likely be issued with the same permit terms, limitations, and conditions as the proposed general permit. Thus, the substantially greater administrative burden of issuing individual permits is not associated with any commensurate increase in environmental benefit.

2.2 PERMIT REQUIREMENTS

The discharge limitation requirements of the proposed permit are summarized in Table 2-1. All of the current discharge limitations that are found in the existing permit have been retained in the proposed permit. One new waste stream, hydrate control fluids, has been identified and is subject to discharge limitations and conditions under the proposed permit.

Major features of the proposed permit that provide environmental protection beyond that included in the existing permit include:

- removal of the 10-year exemption for new sources
- no discharge of produced water from wells going into production after the effective date of the proposed permit; requirement to pass both 24-hour acute and 7-day chronic toxicity tests prior to discharge
- a phase out of the pre-dilution provision for produced water toxicity testing
- regulating the discharge of hydrate control fluids
- clarification of the regulation of wastes from surface preparation of coatings
- implementing Phase III guidelines for cooling water intake structures
- explicit spill prevention language covering equipment failures or any expected discharges
- produced water ambient monitoring and toxicity testing
- notification and reporting requires more information with Notice of Intent submissions.

2.2.1 Projected Number of Wells and Platforms

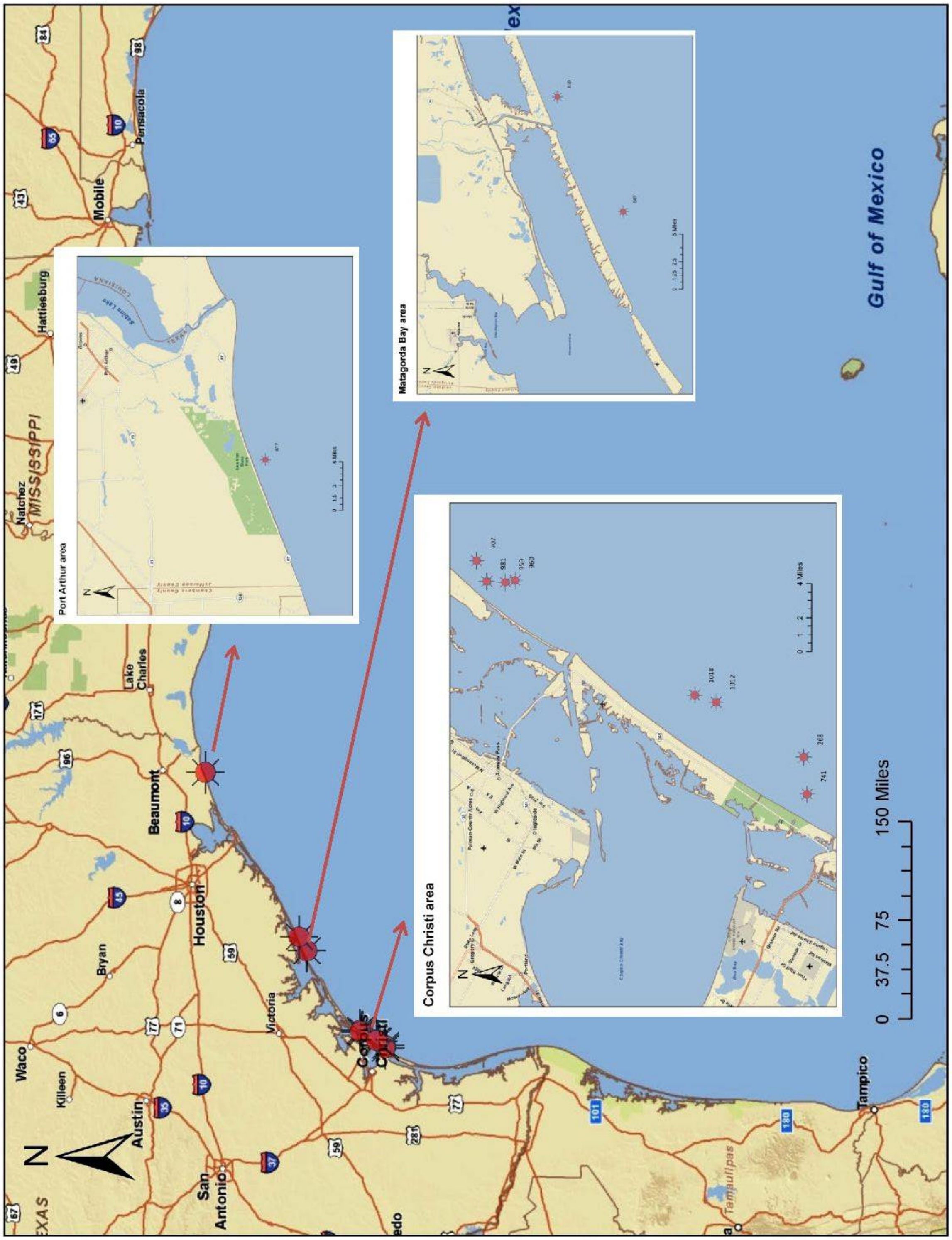
The 2004 FEIS presented information that EPA used to project oil and gas activity in the Texas Territorial Seas. Based on the level of activity under the existing permit, EPA believes there is no material change to the expected level of activity under the proposed permit, and the analysis presented in the 2004 FEIS is applicable to and valid for the proposed permit.

EPA (1993d) estimated the number of existing wells in the Territorial Seas that would be affected by the proposed general permit. There are currently about 35 active wells and 11 active platforms in the Territorial Seas of Texas. BOEMRE estimates the average life of an oil well is 12 years and that of a gas well is 14 years; the average platform life is about 20 years (MMS, 1992). Based on historical patterns and known reserves, the anticipated oil and gas activities in the Territorial Seas of Texas is not likely to materially change over the duration of the proposed permit. EPA is aware of one company, Baycorp, which is expected to apply for coverage under the proposed general permit. Existing well locations in the Texas Territorial Seas are shown in Figure 2-1; platform data are provided in Table 2-2 (in section 2.2.2.4, below).

Table 2-1. Proposed TXG260000 NPDES General Permit Requirements

Waste stream, Pollutant, or Activity	Permit Requirements
Drilling fluids, drill cuttings, produced sand	▪ Discharge is prohibited
Produced water	▪ Oil and grease: daily maximum of 42 mg/L and a monthly average of 29 mg/L ▪ 24-hour acute and 7-day chronic toxicity: the 7-day average minimum and monthly average minimum "No Observable Effect Concentration" (NOEC) must be equal to or greater than the critical dilution concentration specified in Appendix A, Table 1-A or 1-B of the permit ▪ No discharge from new production wells (defined as wells started after the effective date of the permit) ▪ Ambient toxicity monitoring and testing
Deck drainage	▪ No discharge of free oil, as determined by static sheen test
Well treatment, completion, and workover fluids	▪ No discharge of free oil, as determined by static sheen test ▪ Oil and grease limits: daily maximum/monthly average of 42 mg/L and 29 mg/L ▪ No discharge of priority pollutants, except in trace amounts
Sanitary wastes	▪ Small (continuously manned by 1-9 staff) or large (a staff of 10 or more) platforms,: no discharge of floating solids ▪ Large platforms: must maintain a residual chlorine value of at least 1 mg/L
Domestic wastes	▪ No discharge of floating solids for all platforms ▪ Discharge of floating solids, foam, and virtually all types of garbage is prohibited, in accordance with the MPRSA and Coast Guard regulations, 33 CFR Part 151
Chemically treated seawater and freshwater	▪ No discharge of free oil, as determined by static or visual sheen test ▪ Discharge shall not exceed: 1) The maximum concentrations and any other conditions specified in the EPA product registration labeling if the chemical is an EPA registered product 2) The maximum manufacturer's recommended concentration, or 3) 500 mg/L ▪ The 48-hour minimum and monthly average minimum NOEC must be equal to or greater than the critical dilution concentration specified in the permit
Hydrate control fluids	▪ Subject to same requirements as produced water if separate waste steam; may be comingled with produced water
Wastes from surface preparation and coating	▪ Collect as much material as is practicable ▪ No discharge of collected material
Miscellaneous discharges	▪ No discharge of free oil, as determined by static sheen test ▪ No discharge of floating solids or foam
Garbage	▪ No discharge
Halogenated phenols	▪ No discharge
Dispersants, surfactants, detergents	▪ Minimize, except as needed to comply with OSHA worker safety requirements
Operations in areas of biological concern, including marine sanctuaries	▪ No discharge
Cooling water intake structures (fixed new sources)	▪ Compliance with requirements of the CWA §316(b) Phase II Rule (71 FR 35005-35046, June 16, 2006), including impingement/entrainment reduction; through screen velocity standard of < 0.5 feet per second or alternative technology demonstrated comparable to the standard

Figure 2-1. Locations of Existing Wells in the Territorial Seas of Texas



2.2.2 Potential Discharges Addressed by the General Permit

The following discussion of waste discharges from offshore oil and gas activities is based on EPA (2004) and encompasses each of the waste streams covered by the general permit. Waste streams that are regulated by the proposed general permit include:

- Drilling Fluids
- Drill Cuttings
- Produced Water
- Produced Sand
- Well Treatment, Workover, and Completion Fluids
- Sanitary Waste
- Domestic Waste
- Chemically Treated Freshwater and Seawater
- Hydrate Control Fluids
- Deck Drainage
- Wastes from Surface Preparation and Coating (Maintenance)
- Garbage
- Miscellaneous Wastes
    - Desalination Unit Discharge
    - Diatomaceous Earth Filter Media
    - Blowout Preventer Fluids
    - Ballast and Storage Displacement Water
    - Bilge Water
    - Uncontaminated Freshwater/Seawater
    - Boiler Blowdown
    - Source Water and Sand
    - Muds, Cuttings, and Cement at the Seafloor.

These discharges are characterized as to their sources, uses, and physical and chemical compositions below.

2.2.2.1 Drilling Fluids

Drilling fluids (also known as drilling muds or muds) are suspensions of solids and dissolved materials in a water (WBFs), oil (OBFs), or synthetic (SBFs) -based fluid. These fluids are used in rotary drilling operations. The rotary drill bit is rotated by a hollow drill stem made of pipe, through which the drilling fluid is circulated. Drilling fluids are formulated for each well to meet specific physical and chemical requirements. Geographic location, well depth, rock type, geologic formation, and other conditions affect the mud composition required. The number and nature of mud components varies by well, and several to many products may be used at any time to create the necessary properties. The primary functions of a drilling fluid include the following:

- Transport drill cuttings to the surface

- Control subsurface pressure
- Lubricate the drill string
- Clean the bottom of the hole
- Aid in formation evaluation
- Protect formation productivity
- Aid formation stability.

Five basic components account for approximately 90 percent, by weight, of the materials that compose drilling muds:

Barite. Barite is a chemically inert mineral that is heavy and soft. In water-based muds, barite is composed of over 90 percent barium sulfate. Barite is used to increase the density of the drilling fluid to control formation pressure. The concentration of barite in drilling fluid can be as high as 700 lb/bbl. Quartz, chert, silicates, other minerals, and trace levels of metals can also be present in barite.

Clay. The most common clay used is bentonite, which is composed mainly of sodium montmorillonite clay (60 to 80 percent). It can also contain silica, shale, calcite, mica, and feldspar. Bentonite is used to maintain the rheologic properties of the fluid and prevent loss of fluid by providing filtration control in permeable zones. The concentration of bentonite in mud systems is usually 5-35 lb/bbl.

Lignosulfonate. Lignosulfonate is used to control viscosity in drilling muds by acting as a thinning agent or deflocculant for clay particles. Concentrations in drilling fluid range from 1-15 lb/bbl. It is made from the sulfite pulping of wood chips used to produce paper and cellulose. Ferrochrome lignosulfonate, the most commonly used form of lignosulfonate, is made by treating lignosulfonate with sulfuric acid and sodium dichromate.

Lignite. Lignite is a soft coal used in drilling muds as a deflocculant for clay, to control the filtration rate, and to control mud gelation at elevated temperatures. Concentrations vary from 1-15 lb/bbl. Lignite products are more commonly used as thinners in freshwater muds.

Caustic soda. Sodium hydroxide is used to maintain the pH of drilling muds between 9 and 12. A pH of 9.5 provides for maximum deflocculation and keeps the lignite in solution. A more basic pH lowers the corrosion rate and provides protection against hydrogen sulfide contamination by limiting microbial growth.

Drilling fluids can be water, oil, or synthetic based. In WBFs, water is the suspending medium for solids and is the continuous phase, whether or not oil is present. WBFs are composed of approximately 50 percent to 90 percent water by volume, with additives comprising the rest. WBFs may contain diesel oil, up to 4 percent, added to reduce torque and drag. In a stuck pipe situation, a "pill" (diesel oil or oil-based drill fluid) is pumped down the drill string and "spotted" in the annulus area. The pill may or may not be separated out of the bulk fluid system. If the pill is removed, some residual diesel still remains in the mud system.

OBFs are those with oil, typically diesel, as the continuous phase and water as the dispersed phase. These fluids contain blown asphalt and usually 1 percent to 5 percent water emulsified into the system with caustic soda or quicklime and organic acid. Silicate, salt, and phosphate may also be present. OBFs are generally more costly and are more toxic to marine organisms than WBFs. They were historically used in more difficult drilling conditions. The advantages of OBFs include: excellent thermal stability when drilling deep, high-temperature wells; better lubricating characteristics for drilling deviated wells; and the ability to drill thick, water-sensitive shales with fewer stuck pipe or hole wash-out problems. The primary disadvantages of diesel oil-based systems are their cost and their adverse environmental impact. Mineral oil-based mud systems have been proven to be a less toxic alternative.

SBFs are a relatively new class of drilling muds that are particularly useful when greater performance is needed than can be accommodated using water based fluids, such as drilling a deviated well or drilling in deep water. They were developed to combine the technical advantages of OBFs with the low persistence and toxicity of WBFs. In SBFs, the continuous liquid phase is a well-characterized synthetic organic compound. A salt brine is usually dispersed in the synthetic phase to form an emulsion. The other ingredients of SBFs include emulsifiers, barite, clays, lignite, and lime. The synthetic compound in SBFs may be a refined hydrocarbon, ether, ester, or acetal. Synthetic hydrocarbons include normal (linear) paraffins, linear alpha olefins, poly alpha olefins, and internal olefins. While the majority of the current drilling in the Gulf of Mexico is done using WBFs, SBFs are a commonly used alternative. Many operators have begun to use synthetic based fluids exclusively in deep water.

Pollutants of concern from discharged drilling fluids include metals that are found in barite added to the mud system and organics that are present in mineral and diesel oils added for lubricity or to free stuck pipe. From SBFs, pollutants of concern are linear paraffins, linear alpha olefins, poly alpha olefins, and internal olefins. Biodegradation of SBFs in sediments can result in a decrease in sediment oxygen concentration. If the initial base fluid concentration is high enough, the sediments become anoxic (MMS, 2000). For a 10,000-foot and 18,000-foot well, the average volume of drilling fluid discharged is 5,349 bbl and 10,486 bbl, respectively (EPA, 1993). These volumes represent 43 percent and 47 percent of the total drilling fluid generated to drill the well.

The final effluent guidelines for the offshore subcategory of the oil and gas industry established technology-based limitations for drilling fluid discharges (58 FR 12454, March 4, 1993 and 66 FR 6849, January 22, 2001). Based on evaluation of the best available technology, the guidelines established a prohibition on the discharge of drilling fluids within 3 miles from shore. Wastes must be transported to shore for disposal or recycling. Therefore, EPA proposes to prohibit the discharge of drilling fluids and drill cuttings in the Texas Territorial Seas general permit. It should be noted that the NPDES general permit for the Territorial Seas of Louisiana prohibits discharges of drilling fluids and drill cuttings (see 62 FR 59687, November 4, 1997).

2.2.2.2 Drill Cuttings

Drill cuttings are fragments of the geologic formation broken loose by the drill bit and carried to the surface by the drilling fluids that circulate through the borehole. They are composed of the naturally occurring solids found in subsurface geologic formations and bits of cement used during the drilling process. Cuttings are removed from the drilling fluids by a shale shaker and other solids control equipment before the fluid is re-circulated down the well.

The shale shaker, a vibrating screen, removes large particles from the fluid. If the shaker is damaged or a bypass problem occurs, the cuttings are removed by gravitational settling. A series of solids control equipment (SCE) components progressively remove finer and finer particles. SCE components include desanders, desilters, and centrifuges. After removal, the cuttings may be discharged from the rig near or below the water surface. When authorized, the solids discharged primarily consist of: drill cuttings, wash solution, and drilling mud that still adheres to the cuttings. The cuttings, when discharged, can contain as much as 60 percent by volume drilling fluids (EPA, 1985a).

The rate of discharge of drill cuttings can vary from 1 bbl/hr to 10 bbl/hr. Discharge rates are greater when the well is shallower because the drilling rate is higher and larger bits are used. Ayers (1980) estimates that 3,000 bbl to 6,000 bbl of wet solids are discharged over the life of a well. EPA (1993) estimates the volumes to range from 1,430 bbl to 2,781 bbl for 10,000-foot and 18,000-foot wells, respectively.

The final effluent guidelines for the offshore subcategory of the oil and gas industry established technology-based limitations for drill cuttings discharges (March 4, 1993; 58 FR 12454). The guidelines established a prohibition on the discharge of drill cuttings within 3 miles from shore. The proposed general permit for the Texas Territorial Seas includes the prohibition of drill cuttings, as required by the national Effluent Limitations Guidelines.

2.2.2.3 Deck Drainage

The proposed general permit defines deck drainage as waste resulting from platform washings, deck washings, deck area spills, rainwater, and runoff from curbs, gutters, and drains, including drip pans and wash areas. The runoff collected as deck drainage also may include detergents used in deck and equipment washing.

In deck drainage, oil and detergents are the pollutants of primary concern. During drilling operations, spilled drilling fluids also can end up as deck drainage. Acids (hydrochloric, hydrofluoric, and various organic acids) used during workover operations may also contribute to deck drainage, but generally these are neutralized by deck wastes and/or brines prior to disposal.

A typical platform-supported rig is equipped with pans to collect deck and drilling floor drainage. The drainage is separated by gravity into waste material and liquid effluent. Waste materials are recovered in a sump tank, then treated and disposed, returned to the drilling mud system, or transported to shore. The liquid effluent, primarily washwater and rain water, is discharged.

EPA (1993) reports the average discharge of deck drainage for offshore platforms in the Gulf of Mexico is 50 bbl/d. The proposed permit includes a requirement that deck drainage discharges may not contain free oil, as required by the national Effluent Limitation Guidelines.

2.2.2.4 Produced Water

Produced water is the water brought up from the hydrocarbon-bearing strata with oil and gas. Produced water includes small volumes of treatment chemicals that return to the surface with the produced fluids and pass through the produced water system. It constitutes a major waste stream from offshore oil and gas production activities. Produced water is composed of formation water that is brought to the surface with the oil and gas, injection water (used for secondary oil recovery), and various added chemicals (biocides, coagulants, corrosion inhibitors, etc.). The constituents include: dissolved, emulsified, and particulate crude oil constituents; natural and added salts; organic and inorganic chemicals; solids; and metals. Chemicals used on production platforms such as biocides, coagulants, corrosion inhibitors, cleaners, dispersants, emulsion breakers, paraffin control agents, reverse emulsion breakers, and scale inhibitors also may be present.

The volume and pollutant concentration data used in this analysis are based on state permit application and monitoring data submitted to the Oil and Gas Division of the Railroad Commission of Texas by eleven operators in the Territorial Seas of Texas. Discharge rates range from 0 bbl/d at four platforms to a range of 7 bbl/d to 3,885 bbl/d at the remaining seven platforms, averaging 440 bbl/d (see Table 2-2). Locations of the eleven platforms are shown in Figure 2-2.

Table 2-2. Locations of Platforms and Produced Water Discharges - Territorial Seas of Texas

Permit No.	County/ District	Discharge Location	Latitude/ Longitude	Water Depth	Operator	Permitted bbl/d	Actual bbl/d
00268	Nueces/04	ST 903S	27 38’ 23.669”/ 97 08’ 02.472”	52 ft	Osprey Petroleum Company, Inc.	1,700	240
00687	Matagorda/03	ST 5825S	28 30’ 11.05”/ 96 05’ 29.113”	42 ft	Vamos Oil & Gas, LLC	3000	0
00707	Aransas/04	ST 830S	27 54’ 48.8253”/ 96 57’ 59.2649”	34 ft	Forest Oil Corporation	250	20
00741	Nueces/04	ST 900S	27 38’10.66”/ 97 09’ 51.73”	30 ft	Osprey Petroleum Company, Inc.	630	620
00850	Matagorda/03	ST 527S	28 35’ 26.7895”/ 95 56’ 20.3608”	26 ft	Energy Development Corporation	1,500	0
00852	Jefferson/03	ST 60S	29 37’ 20.07”/ 94 07’ 28.82”	24 ft	Sterling Exploration & Production Company, LLC	5,000	3,885
00959	Aransas/04	ST 833S	27 53’ 40.7104”/ 96 59’ 03.6933”	32 ft	Forest Oil Corporation	400	0
00960	Aransas/04	ST 840S	27 53’ 10.3369”/ 96 58’ 59.7917”	32 ft	Forest Oil Corporation	600	45
00981	Aransas/04	ST 833S	27 54’ 36.8619”/ 96 59’ 03.6933”	35 ft	Forest Oil Corporation	300	0
01012	Nueces/04	ST 883S	27 42’ 53.7”/ 97 05’ 14.6”	45 ft	Amerada Hess Corporation	500	7
01018	Nueces/04	ST 748L	27 43’ 57.906”/ 97 04’ 51.442”	65 ft	Osprey Petroleum Company, Inc.	100	18
Source: Discharge monitoring data submitted to the Railroad Commission of Texas Oil and Gas Division.							

Produced water can be classified into three groups: meteoric, connate, and mixed, depending on its origin. Meteoric water is water that originates as rain and fills porous or permeable shallow rocks or percolates through them along bedding planes, fractures, and permeable layers. Carbonates, bicarbonates, and sulfates in the produced water are indicative of meteoric water. Connate water is the water in which the marine sediments of the original formation were deposited. It comprises the interstitial water of the reservoir rock and is characterized by chlorides, mainly sodium chloride, and high concentrations of dissolved solids. Mixed waters have both high chloride and sulfate-carbonate-bicarbonate concentrations suggesting meteoric water mixed or partially displaced by connate water (MMS, 1982a).

The salinity and chemical composition vary from different strata and different petroleum reserves. Based on a study of 30 platforms in the Gulf of Mexico (EPA, 1985a), the chloride concentration of produced water ranges from 3,400 mg/L to 172,500 mg/L. Produced water generally contains little or no dissolved oxygen and the water may contain high concentrations of total organic carbon and dissolved organic carbon, primarily in the form of volatile aromatic hydrocarbons and aliphatic hydrocarbons, due to the water being intermingled with petroleum (Boesch and Rabalais, 1989).

Produced waters may include radionuclides such as radium (Ra). Ambient waters in the open ocean contain approximately 0.05 pCi/L of radium. Radionuclide data from Gulf of Mexico coastal oil and gas lease areas show ^{226}Ra concentrations of 16 pCi/L to 393 pCi/L and ^{228}Ra concentrations of 170 pCi/l to 570 pCi/L in produced waters. Texas data (only two submissions) report a total average concentration of 348 pCi/L.

After treatment in an oil-water separator, produced water is usually discharged into the sea, or in some cases is re-injected for disposal or pressure maintenance purposes. The proposed permit includes imitations on the concentration of oil and grease in produced water. The limitations are 29mg/L for a monthly average and 42 mg/L for a daily maximum, as required by final effluent guidelines for the offshore subcategory.

The permit also proposes a whole effluent toxicity (WET) limitation to ensure that the discharge does not cause toxic conditions in the receiving waters. The limitation requires that the measured 7-day average minimum and monthly average minimum No Observable Effect Concentration (NOEC) not be less than a calculated critical dilution concentration as defined in Appendix A, Table 1 of the proposed permit. In addition, the effluent must pass a 24-hour Lethal Concentration (LC50) test using 100 percent effluent.

2.2.2.5 Produced Sand

Produced sand is the fine solids removed from produced water. Produced sand includes desander discharge from the produced water waste stream and blowdown of water phase from the produced water treating system. Sands that are finer and of low volume may be carried through the treatment system and appear as suspended solids in the produced water effluent, or they may settle in treatment vessels. If sand particles coarser or volumes larger the solids are removed in cyclone separators, thereby producing a solid-phase waste. The sand that drops out in these separators is generally contaminated with crude oil (oil production) or condensate (gas production) and requires washing to recover the oil. The sand is washed with water combined with detergents or solvents. The oily water is directed to the produced water treatment system or to a separate oil-water separator to become part of the produced water discharge following oil separation. The final effluent guidelines prohibit the discharge of produced sand. The proposed permit contains this prohibition; thus, produced sand will be transported to shore for disposal.

2.2.2.6 Well Treatment, Workover, and Completion Fluids

Well treatment fluids are any fluids used to restore or improve productivity by chemically or physically altering hydrocarbon-bearing strata after a well has been drilled. Workover fluids are salt solutions, weighted brines, polymers, and other specialty additives used in a producing well to allow safe repair and maintenance or abandonment procedures. Completion fluids are salt solutions, weighted brines, polymers, and various additives used to prevent damage to the wellbore during operations which prepare the drilled well for hydrocarbon production. The volume of fluids needed for workover, treatment, and completion operations depends on the type of well and the specific operation being performed. Workover and completion fluids mostly remain within the wellbore. Therefore, the volume generated is approximately one well volume of fluid. Treatment fluids can react with or be lost to the formation. The total volume generated is 1 to 3 well volumes of fluid (EPA, 1993). The volumes of well treatment, completion, and workover fluids discharged are presented in Table 2-3.

Table 2-3 Typical Volumes from Well Treatment, Workover, and Completion Operations

Operation	Type of Material	Discharge Volume (barrels)
Completion and Workover	Packer Fluids	100 to 1,000
	Formation Sand	1 to 50
	Metal Cuttings	< 1
	Completion/Workover Fluids	100 to 1,000
	Filtration Solids	10 to 50
	Excess Cement	< 10
Well Treatment	Neutralized Spent Acids	10 to 500
	Completion/Workover Fluids	10 to 200

Source: EPA, 1993

Well treatment fluids are water solutions incorporating acids (using hydrochloric acid, hydrofluoric acid, and acetic acid). Formation solubility, reaction time, and reaction products determine the type of acid used. A treatment operation consists of a preparation solution of ammonium chloride (3-5 percent) to force the hydrocarbons into the formation; an acid solution; and a post-flush of ammonium chloride that remains in the formation for 12 hours to 24 hours to force the acid farther into the formation before being pumped out. Solvents may also be used for well treatment, including hydrofluoric acid, hydrochloric acid, ethylene diamine-tetra-acetic acid (EDTA), ammonium chloride, nitrogen, methanol, xylene, and toluene. Additives such as corrosion inhibitors, mutual solvents, acid neutralizers, diverters, sequestering agents, and antisludging are often added to treatment fluid solutions. Pollutant concentrations for a well treatment fluid used in two wells in California are presented in Table 2-4.

Table 2-4. Analysis of Fluids from an Acidizing Well Treatment

Analyte	Concentration (ug/l)	Analyte	Concentration (ug/l)
Aluminum	53.1	Silver	< 0.7
Antimony	< 3.9	Sodium	1,640
Arsenic	< 1.9	Thallium	5.0
Barium	12.6	Tin	6.66
Beryllium	< 0.1	Titanium	0.68
Boron	31.9	Vanadium	36.1
Cadmium	0.4	Yttrium	0.19
Calcium	35.3	Zinc	28.5
Chromium	19	Zinc	28.5
Cobalt	< 1.9	pH	2.48
Copper	3.0	Organics	
Iron	572	Aniline	434
Lead	< 9.82	Naphthalene	ND
Magnesium	162	o-Toluidine	1,852
Molybdenum	< 0.96	2-Methylnaphthalene	ND
Nickel	52.9	2,4,5-Trimethylanine	2,048
Selenium	< 2.9	Oil and Grease	619

Source: EPA, 1993.

Workover fluids are placed in a well to allow safe repair and maintenance for abandonment procedures or to reopen plugged wells. During repair operations, the fluids are used to create hydrostatic pressure at the bottom of the well to control the flow of oil or gas and to carry materials out of the well bore. To reopen wells, fluids are used to stimulate the flow of hydrocarbons. Both of these operations must be accomplished without damaging the geologic strata. To reopen or increase productivity in a well, hydraulic fracturing of the formation may be necessary. Hydraulic fracturing is achieved by pumping fluids into the bore hole at high pressure, frequently exceeding 10,000 psi. Proper fracturing creates reservoir fractures, thereby improving the flow of oil to the well; improving the ultimate oil recovery by extending the flow paths, and aiding in the enhanced oil recovery operation.

Over a period of time the fractures may close. Materials can be introduced into the fissures to keep them open. Typical materials used include sand, ground walnut shells, aluminum spheres, glass beads, and other inert particles. These "propping agents" are carried into the fractures by the workover fluid. High solids drilling fluids used during workover operations are not considered workover fluids by definition and therefore must meet drilling fluid effluent limitations before discharge may occur. Packer fluids, low solids fluids between the packer, production string, and well casing, are considered to be workover fluids and must meet only the effluent requirements imposed on workover fluids.

Well completion occurs if a commercial-level hydrocarbon reserve is discovered. Completion of a well involves setting and cementing the casing, perforating the casing and surrounding cement to provide a passage for oil and gas from the formation into the wellbore, installing production tubing, and packing the well. Completion fluids are used to plug the face of the producing formation while drilling or completion operations are conducted in hydrocarbon-bearing formations. The completion fluids create a thin film of solids over the surface of the producing formation without forcing the solids into the formation. A successful completion fluid is one that does not cause permanent plugging of the formation pores. The composition of the completion fluid is site-specific depending on the nature of the formation. Drilling fluids remaining in the wellbore during logging, casing, and cementing operations or during temporary abandonment of the well are not considered completion fluids and are regulated as drilling fluids discharges.

The final effluent guidelines for offshore established limitations on the oil and grease concentration in treatment, completion, and workover fluids discharges. The permit proposes that discharges must meet a daily maximum limitation of 42 mg/L and a monthly average limitation of 29 mg/L for oil and grease, as specified in the guidelines. When these fluids are discharged as part of the produced water stream, they must also meet the produced water toxicity limit of a 7-day average minimum and monthly average minimum NOEC that is equal to or greater than the critical dilution concentration specified in Appendix A, Table 1 of the proposed permit and no acute toxicity as demonstrated in a 24-hour LC50 test using 100 percent effluent.

2.2.2.7 Sanitary Wastes

The sanitary wastes discharged offshore are human body wastes from toilets and urinals. The volume and concentrations of these wastes vary widely with time, occupancy, platform characteristics, and operational situation. Usually the toilets are flushed with brackish water or seawater. Due to the compact nature of the facilities, the wastes have less dilution water than common municipal wastes. This creates greater waste concentrations. Some platforms combine sanitary and domestic waste waters for treatment; most maintain sanitary wastes separate for chemical or physical treatment by Coast Guard approved marine sanitation devices. The permit proposes a limitation on residual chlorine to ensure that proper treatment for bacteria is maintained. The limitation requires that residual chlorine must meet a minimum concentration of 1 mg/L and shall be maintained as close to that concentration as possible. In addition, no floating solids may be discharged.

2.2.2.8 Domestic Wastes

Domestic wastes (gray water) originate from sinks, showers, safety showers, eye wash stations, laundries, food preparation areas, and galleys on the larger facilities. These wastes are generally discharged without treatment. The proposed permit has a limitation requiring that no solids or foam may be discharged. In addition, the proposed permit specifies that soaps and detergents must be phosphate free.

2.2.2.9 Hydrate Control Fluids

Water vapor mixed with natural gas may cause corrosion or develop hydrate formation in pipeline resulting in flow blockage. Hydrate formation may also be a problem in deepwater operations. Glycol and/or other chemicals may be used to dehydrate natural gas or deepwater pipelines. EPA proposes the effluent limitations for hydrate control fluids to be the same as those for produced water, whether it is commingled and discharged with the produced water waste stream or discharged as a separate waste stream. These limitations are: technology-based limits on oil and grease of 29 mg/L monthly average and 42 mg/L daily maximum; water quality-based limits of no toxic pollutants in toxic amounts at the critical dilution for produced water based on 24-hour acute (end-of-pipe) whole effluent toxicity and 7-day chronic toxicity (based on dilution at the edge of the mixing zone).

2.2.2.10 Wastes from Surface Preparation and Coating

Regulations at 33 CFR 151 and the current permit prohibit the discharge of garbage. Under the regulations, garbage is defined to include maintenance waste. This prohibition has led to confusion regarding the level of effort required to capture maintenance waste associated with sandblasting and other types of surface preparation and painting, or coating, of the prepared surface. To resolve this issue, new language in the proposed permit requires that operators capture as much waste as practicable. The discharge of that collected waste is prohibited.

When performing operations such as sand blasting, operators typically utilize tarps or other means to capture as much waste material as practicable. It is, however, not possible to capture all waste materials when conducting these operations without creating a safety risk for personnel. The discharge of fugitive material, such as windblown sand or paint spray, is not included in that discharge prohibition if operators take all steps practicable to capture waste material. EPA included the same requirements in the 2007 reissued OCS general permit (GMG290000). Since this change only clarifies the requirement that operators capture as much waste as practicable and does not authorize the discharge of any new waste stream, the scope of the permit is not expanded as a result of this clarification.

2.2.2.11 Miscellaneous Wastes

The proposed permit contains a no free oil limitation for miscellaneous wastes as determined by monitoring for a sheen on the surface of the receiving water.

Desalination Unit Discharge. This waste stream is the residual high-concentration brine discharged from distillation or reverse-osmosis units used for producing potable water and high-quality process water offshore. It has a chemical composition and ratio of major ions similar to seawater, but with high concentrations. This waste is discharged directly to the sea as a separate waste stream. The typical volume discharged from offshore facilities is less than 240 bbl/d.

Diatomaceous Earth Filter Media. Diatomaceous earth filter media are used in the filtration unit for seawater or other authorized completion fluids. It is periodically washed from the filtration unit for discharge.

Blowout Preventer Fluids. A vegetable, mineral oil, or glycol solution is used as a hydraulic fluid in blowout preventer (BOP) stacks while drilling a well. The BOP may be located on the seafloor and is designed to contain pressures in the well that cannot be maintained by the drilling mud. Small quantities of BOP fluid are discharged periodically at the seafloor during testing of the BOP device. The volume of BOP fluid discharge ranges from 67 bbl/d to 314 bbl/d during BOP testing (EPA, 1993).

Ballast Water and Storage Displacement Water. Ballast and storage displacement water are used to stabilize the platform and rig while drilling. Two types of ballast water are found in offshore producing areas: tanker ballast and platform ballast. Tankers must register with EPA under the Vessel General Permit; tanker ballast water is not covered under this proposed NPDES permit.

Platform stabilization (ballast) water is taken from the waters adjacent to the platform and may be contaminated with stored crude oil and oily platform slop water. More recently designed and constructed floating storage platforms use permanent ballast tanks that become contaminated with oil only in emergency situations when excess ballast must be taken on. Oily water can be treated through an oil-water separation process prior to discharge. Storage displacement water from floating or semi-submersible offshore crude oil structures is mainly composed of seawater. Much of its volume can usually be discharged directly without treatment. Water that is contaminated with oil may be passed through an oil-water separator for treatment.

Bilge Water. Bilge water, which seeps into all floating vessels, is a minor waste for floating platforms. This seawater becomes contaminated with oil and grease and with solids such as rust where it collects at low points in vessels. Bilge water is usually directed to the oil-water separator system used for the treatment of ballast water or produced water, or it is discharged intermittently. The total volume of ballast/bilge water discharged is 70 bbl/d to 620 bbl/d (EPA, 1993).

Uncontaminated Seawater. Seawater used on the platform for various reasons is considered uncontaminated if chemicals are not added before it is discharged. Included in this discharge are waters used for fire control equipment and utility lift pump operation, pressure maintenance and secondary recovery projects, fire protection training, pressure testing, and non-contact cooling.

Boiler Blowdown. Boiler blowdown discharges consist of water discharged from boilers as is necessary to minimize solids build-up in the boilers, including vents from boilers and other heating systems.

Source Water and Sand. Discharges of source water and sand consist of water from non-hydrocarbon bearing formations used for the purpose of pressure maintenance or secondary recovery, including the entrained solids.

2.2.2.12 Garbage

Garbage is made up of the solid wastes associated with the operations on the platform. These include: synthetic ropes, fishing nets, plastic bags, dunnage, lining, packing materials, paper, rags, glass, metal bottles, crockery, food waste and others. Garbage is governed by the USCG under MARPOL 73/78 (the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto). USCG regulations at 33 CFR Part 151 specify regulations for disposal of garbage. These are summarized in Table 2-5.

In accordance with USCG regulations, the proposed permit contains a prohibition of the discharge of garbage.

Table 2-5. Garbage Discharge Restrictions[1]

Garbage Type	Fixed or Floating Platforms and Associated Vessels[2] (33 CFR 151.73)
Plastics - includes synthetic ropes and fishing nets and plastic bags	Disposal prohibited (33 CFR 151.67)
Dunnage, lining, packing materials that float	Disposal prohibited
Paper, rags, glass, metal bottles, crockery, and similar refuse	Disposal prohibited
Paper, rags, glass, etc. comminuted or ground[3]	Disposal prohibited
Victual waste not comminuted or ground	Disposal prohibited
Victual waste comminuted or ground[3]	Disposal prohibited < 12 miles from nearest land and in navigable waters of the US
Mixed garbage types	See footnote 4

1 Source: EPA, 1993.

2 Fixed or floating platforms and associated vessels include all fixed or floating platforms engaged in exploration, exploitation, or associated offshore processing of seabed mineral resources, and all ships within 500 m (0.31 mi) of such platforms.

3 Comminuted or ground garbage must be able to pass through a screen with a mesh size no larger than 25 mm (1 inch) (33 CFR 151.75).

4 When garbage is mixed with other harmful substances having different disposal requirements, the more stringent disposal restrictions shall apply.

2.2.2.13 Cooling Water Intake Structures

Section 316(b) of the CWA requires that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. EPA promulgated 316(b) Phase III regulations which require that new offshore oil and gas facilities take measures to reduce entrainment and impingement of aquatic life. The 316(b) Phase III regulation applies to new facilities which intake at least 2 million gallons per day of water and use at least 25 percent for cooling. Facilities affected by these new requirements are new facilities for which construction commenced after July 17, 2006. In general, the regulations require operators to submit information demonstrating that new 316(b) Phase III facilities will be designed so that the water intake velocity is less than 0.5 feet per second and other measures such as screens are employed to reduced entrainment when feasible. These new requirements are proposed to be included in the reissued permit. The application requirements are proposed to be required to be submitted as a part of the notice of intent to be covered by the general permit.

The 316(b) Phase III regulations also require baseline and periodic biological monitoring. Baseline monitoring is required to characterize the biological community which could be impacted by the intake of cooling water. Periodic monitoring is intended to measure the number organisms and types of species entrained in the system. As proposed, the permit will require new 316(b) Phase III facilities to conduct this biological monitoring. The permit is also proposed to give operators the option of participating in an EPA approved industry-wide study to fulfill these monitoring requirements. Such a study will need to include sufficient detail such that EPA can determine that intake structure designs are sufficient to minimize impacts due to entrainment and impingement and that no additional measures are warranted.

2.2.3 Related Oil and Gas Activities

In addition to waste discharges at wells and platforms, offshore oil and gas development and production involves other activities which impact the environment. The available documents generally do not quantify these activities for the Territorial Seas, but do provide estimates for the OCS and in some cases the entire offshore area (see MMS, 1992; MMS, 1993; EPA, 1993a; MMS, 2007).

For some activities, the regional values can be used to develop order-of-magnitude estimates of activity in the Territorial Seas; see discussions below. These levels of activity are assumed to occur if the general permits are issued (with or without the variations in alternatives discussed in Section 2.1). Note that in addition to the levels of activity described below, there will be activity in the Territorial Seas related to the offshore operations.

Rig Emplacement. Emplacement of drilling rigs causes disruption and suspension of sediments in the immediate vicinity of the structure. The emplacement or removal of these structures disturbs small areas of the sea bottom beneath or adjacent to the structure. If mooring lines of steel, chain, or synthetic polymer are anchored to the sea bottom, areas around the structure can also be directly affected by their emplacement. This disturbance includes physical compaction or crushing beneath the structure or mooring lines and the re-suspension and settlement of sediment caused by the activities of emplacement. Movement of floating types of facilities will also cause the movement of the mooring lines in its array. Small areas of the sea bottom will be affected by this kind of movement (MMS, 2007). Presence of rigs and platforms may conflict with fishing interests for space, but tend to attract fish. Rigs visible from shore may have aesthetic, recreation or tourism impacts.

Explosive Removal. Except in very deep water, it is common for explosive removal to be used on platforms which are at the end of their useful life at a particular location. Explosive removal of a structure may harm nearby marine organisms, although BOEMRE has issued guidelines for avoidance of adverse impacts to sea turtles and cetaceans (MMS, 1992). Based on the assumed average life of platforms, and the number of existing and prospective platforms, approximately 250 explosive removals might occur in the Territorial Seas over the next 35 years. Federal laws and regulations that apply to all platform removal operations include the Magnuson Fisheries Conservation and Management Act, the CWA, the National Fishing Enhancement Act, USCG regulations, and NOAA (NMFS) regulations. State laws include the Texas Artificial Reef Act as administered by the Texas Department of Parks and Wildlife.

Service Vessels. These boats transport supplies, services and personnel to offshore oil and gas structures. Service vessels can be a source of space-use conflicts among various offshore users. Collisions and contacts may damage fishing gear, may kill marine mammals or endangered species, or may result in property damage or personal injury. The traffic may affect fish resources. Deck drainage, bilge pumping and trash dumping can affect water quality and biota. Anchors and chains can severely damage live bottom areas. Based on BOEMRE information developed for the OCS, and assuming that for at least one year all platforms are in place simultaneously, the number of vessel trips that would be associated with anticipated level of activity probably would not exceed about 4,100 trips/year for servicing development wells and production platforms. EPA (1993b) has calculated that the zero discharge requirement for drilling fluids and drill cuttings could generate 5-6 vessel trips per well, or an additional 300-360 trips per year. In addition there would be some trips associated with workovers and pipe laying for which no estimates are available.

Onshore Infrastructure. Onshore infrastructure to support offshore oil and gas activities includes pipelines, service vessel bases, oil receiving terminals, ports, navigation channels, platform fabrication yards, produced waste separation facilities, refineries and gas processing plants. The oil and gas industry has thrived in the Gulf of Mexico. With the industry has come a logistical support system that links all phases of the operation and extends beyond the local community. Land-based supply and fabrication centers provide the equipment, personnel, and supplies necessary for the industry to function through intermodal connections at the Gulf Coast ports. The necessary onshore support segment includes inland transportation to supply bases, equipment manufacturing, and fabrication. The offshore support involves both waterborne and airborne transportation modes (MMS, 2007).

Construction of facilities in coastal environments can adversely impact wetlands and other sensitive environments, while operations produce water pollutant discharges, air emissions and solid waste. The vast majority of the onshore infrastructure already in place will be sufficient to support the offshore oil and gas activities from prior, past and future lease sales in the Gulf of Mexico (MMS, 1990b).

Blowouts. Blowouts, in which well control is lost, result in the release of gas (air emissions) and oil (water pollution) to the environment. BOEMRE research indicates that there are approximately 7 blowouts per 1,000 well starts; that two-thirds occur during the development and production stages; and that some 23 percent of all blowouts result in some spill of oil. Large spills are relatively rare—between 1958 and 1986 BOEMRE data reveal that 8 percent of blowouts resulted in spills of 50 bbl or more, while 4 percent in spills of 1000 bbl or more (MMS, 1992). The historical, statistical confidence that large spills from blowouts are rare notwithstanding, the Deepwater Horizon oil spill occurred on April 20, 2010 and released an estimated 4.93 million barrels of oil into the Gulf of Mexico.

During the Deepwater Horizon MC252 Spill (DWH oil spill), oil and gas were discharged from the wellhead approximately 5,000 feet below the sea surface for 87 days until the well was successfully capped on July 15, 2010. Of the total estimated 4.93 million barrels of oil that were spilled, approximately 1.4 million barrels were estimated to be naturally dispersed (approximately 45 percent) or chemically dispersed (approximately 55 percent). The majority of that amount was dispersed at the wellhead (U.S. Coast Guard et al, 2010). During the DWH oil spill response, a total of 1.84 million gallons of dispersants were applied, with 1.06 million gallons applied at the surface and 0.78 million gallons directly at the wellhead on the seafloor (National Commission, 2010b as cited OSAT, 2010).

In response to the spill, BOEMRE has undertaken a broad series of actions to increase the safety of deepwater offshore drilling and development operations. On October 14, 2010, BOEMRE issued an interim final rule (the Safety Measures Interim Final Rule) at 75 FR 63346, *"Increased Safety Measures for Energy Development on the Outer Continental Shelf."* The Safety Measures Interim Final Rule implements certain safety measures recommended in the Department of the

Interior's May 27, 2010 report to the President *"Increased Safety Measures for Energy Development on the Outer Continental Shelf."* This rule amended drilling, well completion, well workover, and decommissioning regulations related to well control. The rule included regulations governing: subsea and surface blowout preventers, well casing and cementing, secondary intervention, unplanned disconnects, well completion, and well plugging. Among other things, the Safety Measures Interim Final Rule incorporated by reference recommended practice guidance from the American Petroluem Institute (API), including API RP 53, *"Recommended Practices for Blowout Prevention Equipment Systems for Drilling Wells"* and API RP 65-Part 2, *"Isolating Potential Flow Zones During Well Construction."*

BOEMRE issued Notice to Lessees (NTL) No. 2010-N10, *"Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources,"* effective November 8, 2010. This NTL directs operators using subsea BOPs or surface BOPs on a floating facility to submit a statement, signed by an authorized company official, that the operator will conduct all activities authorized by a Permit to Drill in compliance with all applicable regulations, including the Safety Measures Interim Final Rule. This NTL also informed operators that BOEMRE will be evaluating whether they have submitted adequate information to demonstrate their ability to access and deploy containment resources that would be adequate to promptly respond to a blowout or other loss of well control, in accordance with BOEMRE's existing regulations. On December 13, 2010, BOEMRE released its approved requirements for Exploration Plans and Development Operations Coordination Documents for activities that involve the use of subsea BOPs of a surface BOP on a floating facility

Pipelines. The pipeline network in the Gulf Coast states is extensive. Pipelines transport crude oil and natural gas from the wellhead to the processing plants and refineries. Pipelines transport natural gas from producing states such as Texas and Louisiana and to a lesser extent Mississippi and Alabama to utility companies, chemical companies, and other users throughout the nation. Pipelines are used to transport refined petroleum products such as gasoline and diesel from refineries in the Gulf of Mexico region to markets all over the country. Pipelines are also used to transport chemical products (MMS, 2007).

The nationwide natural gas pipeline network has grown substantially since the 1990's. The increasing growth in natural gas demand over the past several years has led to an increase in the utilization of pipelines and has resulted in some pressure for expansion in several areas. In the Gulf of Mexico, a number of offshore pipeline projects have been completed in recent years. In 2003, three major deepwater offshore gas pipeline systems were completed, primarily to serve new deepwater platforms. The largest of the three was the Okeanos Deepwater Pipeline (Phase 1), a 119-km (74-mi), 24-inch, 1.2 billion cubic feet per day (Bcf/d) pipeline serving the NaKika field complex 240 km (150 mi) southeast of New Orleans (MMS, 2007). In 2004, six offshore deepwater projects added 501 km (311 mi) of pipeline and 1.8 Bcf/d of capacity in the Gulf of Mexico (MMS, 2007). Most of these projects transport gas to interconnections with existing systems, such as the Destin and Nautilus pipelines, that transport natural gas onshore (MMS, 2007).

The expectation is that most natural gas and oil produced in the Territorial Seas will be piped to shore, primarily using existing pipelines. It is expected that few if any trunk lines will be built and that, where feasible, new platforms will tie into existing gathering lines to transport their product to the main trunk line (Hebert, 1993). New flow lines and some gathering lines would be required. However, estimates on the extent and location of these lines are not available. Where new gathering lines are required, BOEMRE estimates that for the OCS about 8 km (5 mi) of line are needed for each platform. No construction of additional pipelines is projected for transport of produced water to shore for disposal (EPA 1993c; Shannon, 1993).

Tankers and Barges. Within the Territorial Seas, some of the oil may be barged ashore. Shuttle tanker and barge operations pose the risk of oil pollution from accidents and routine transfer operations. In 1988, the USCG reported that the current discharge rate for oil during transfer operations is approximately 7.7 spills per 1,000 transfers. Additional discharges occur from routine operations, including tank washing, ballasting, bilge pumping and fuel release. Additional impacts include the risk of collisions, damage from anchoring, and air emissions.

Materials Disposal. Most NORM and nonhazardous oil-field wastes (NOW) are only handled by specialized oil-field waste facilities in the Gulf Coast area. The results of an API study published in 2000 suggested that only 3 percent of drilling wastes, only 0.5 percent of produced water, and 15 percent of associated wastes are sent to these offsite commercial facilities for disposal (MMS, 2007).

Newpark Resources, Inc. is one of the largest companies operating waste facilities on the Gulf Coast. Newpark operates seven receiving and transfer facilities along the coast from Venice, Louisiana, to Corpus Christi, Texas. Waste products are collected at the transfer facilities from offshore, land, and inland waters exploration and production markets. The company also owns a fleet of 49 double-skinned barges certified by the USCG to transport oil and gas operational wastes to support these facilities. Waste received at the transfer facilities is moved by barge through the Gulf Intracoastal Waterway to a processing and transfer facility at Port Arthur, Texas, and if not recycled, is trucked to injection disposal facilities at Fannett, Texas. Including its 400-ac site near Fannett, Texas, the company holds an inventory of approximately 1,250 ac of injection disposal property in Texas and Louisiana (MMS, 2007). The company is the only offsite facility in the U.S. Gulf Coast licensed for the direct injection of NORM into disposal wells at their Big Hill, Texas, facility (MMS, 2007).

Newpark has been handling an increased amount of Gulf Coast waste. The volume processed from the Gulf Coast has increased from 5.8 million barrels (MMbbl) in 2002 to 6.9 MMbbl in 2005 and a projected 7.2 MMbbl in 2006. However, Newpark’s market share has been decreasing (from 66 percent in 2002 to 55 percent in 2006) (MMS, 2007).

Waste fluids and solids containing NORM are subject to state regulations that require special handling and disposal techniques. There are currently no federal regulations governing NORM. The special handling and disposal requirements for NORM generally result in the segregation of these materials from NOW and in substantially higher disposal costs when managed by commercial disposal firms. The TRRC has jurisdiction over the handling and disposal of NORM wastes produced during the exploration and production of oil and gas. All other disposal of NORM wastes is regulated by the TCEQ (MMS, 2007). The TRRC regulates the disposal of oil and gas NORM under Title 16, Part 1, Chapter 4, Subchapter F, or the Texas Administrative Code. The disposal methods prohibited by Subchapter F include discharge of oil and gas NORM waste other than produced water, spreading of oil and gas NORM waste on public or private roads, and any other method not specifically provided for by Subchapter F (MMS, 2007).

The disposal options for NORM-contaminated solids differ from the options for NORM contaminated equipment. The NORM-contaminated solids, such as pipe scale, may be disposed of on the site where they were generated by burial or placement in a well that is being plugged and abandoned. Contaminated soil may be spread onto the land under certain conditions. Subchapter F also authorizes disposal of oil and gas NORM waste at a licensed facility and injection of NORM treated by a licensee provided the operator complies with specific requirements contained in the rule. The NORM contaminated equipment that is waste, i.e., equipment that is no longer wanted, may be recycled as scrap metal or disposed of. Subchapter F does not allow the burial of NORM-contaminated equipment. Buried flowlines that contain NORM, however, may remain buried contingent on the lease agreement. The NORM-contaminated tubulars and other equipment may also be placed in a plugged and abandoned well. Equipment must be removed from a lease when the last well on the lease is plugged. All tanks, vessels, related piping, and flowlines be emptied, and requires all tanks, vessels, and related piping to be removed in 120 days (MMS, 2007).

3.0 AFFECTED ENVIRONMENT

3.1 PHYSICAL AND CHEMICAL OCEANOGRAPHY

To address the biological, physical, and chemical transport processes listed among the ten factors specified in the Ocean Discharge Criteria presented in Chapter 1 and used to determine unreasonable degradation, the physical and chemical oceanography of the Texas Territorial Seas is extensively characterized in Section 5.1 of EPA's 2004 FEIS. This general description of the oceanography is supplemented by additional physical oceanographic data that were used in modeling produced water effluent dilution, found in Section 6.3 of the 2004 FEIS.

For this SIR, EPA is updating relevant portions of the characterization of the affected environment that were provided in the 2004 FEIS. Two recent data sources are the 2007 FEIS for Gulf of Mexico Oil and Gas Lease Sales: 2007 – 20012 (MMS, 2007) and the draft supplemental EIS for the Gulf of Mexico OCS Oil and Gas Lease Sale: 2011, Western Planning Area Lease Sale 218 (BOEMRE, 2011).

The 2004 FEIS and data have been reviewed. This SIR includes recent information and updated data. The result of this review of updated information has not resulted in a material change in the conclusions provided in the 2004 FEIS.

3.1.1 Physical Oceanography

3.1.1.1 Coastal Geomorphology

The Gulf coastline of Texas is approximately 367 mi (591 km) in length. The State of Tamaulipas, in northeastern Mexico, has a Gulf shoreline of about 634 mi (378 km). The barrier islands of both areas are mostly accreted sediments reworked from river deposits, previously accreted Gulf shores, bay and lagoon sediments, and exposed seafloors (MMS, 2007). This reworking continues today as these barrier beaches and islands move generally to the southwest. During the period of about 1850-1975, net coastal erosion occurred in the following three groups of counties in Texas: (1) Cameron, Willacy, and southern Kenedy; (2) northern Matagorda, Brazoria, and southern Galveston; and (3) Jefferson, Chambers, and far northern Galveston (MMS, 2007). These generalized trends appear to be continuing (MMS, 2007).

Elevations of Galveston Island and Bolivar Peninsula beach ridges generally range from 5-10 ft (1.5-3 m) above sea level (MMS, 2007). The beaches of Galveston Island and Bolivar Peninsula are locally eroding or accreting. Accreting shorelines have a distinct beach berm and a wide back beach. Eroding beaches are relatively narrow, and the beach berm and back beach may be absent. Construction of seawalls and jetties on Galveston Island has contributed to erosion there.

Padre Island is moderately regressive; the shoreline is retreating and more land is being exposed. It is typically 5-10 ft (1.5-3 m) above sea level and occasionally overwashed by hurricane surges. On the northern portion, some dunes may rise 20-30 ft (6-9 m) and the dune ridge is generally continuous. On the southern portion, the dune ridge is a series of short discontinuous segments. The dry winds and arid nature of this southern portion destabilize sand dunes. Sand flats and coppice dunes occupy the southern portion of the island. Vegetation on Padre Island is generally sparse, becoming sparser on its southern portion. The vegetation largely consists of grasses and scrubby, woody growth (MMS, 2007). Any activity that reduces the sparse vegetation cover of this area initiates erosion.

Exceptions to the above are the once regressive Matagorda Peninsula and Rio Grande Headland. The Matagorda Peninsula accreted as the Brazos-Colorado River Delta. Later, the peninsula became transgressive and the sediments were reworked to form flanking arcs of barrier sand spits. Washover channels cut the westward arc of the peninsula, forming barrier islands. The Rio Grande Headland has also become transgressive and sand spits formed to its north and south. Today, longshore drift is southerly at these sites. Their northern spits are now eroding and their southern spits are accreting.

The Chenier Plain of eastern Texas and western Louisiana began developing about 2,800 years ago. During that period, Mississippi River Delta sediments were intermittently eroded, reworked, and carried into the Chenier Plain area by storms and coastal currents. This deposition gathered huge volumes of mud and sand, forming a shoreface that slopes very gently, almost imperceptibly, downward for a very long distance offshore. This shallow mud bottom is viscous and elastic, which generates hydrodynamic friction (MMS, 2007). Hence, wave energies along the barrier shorelines of the Chenier Plain are greatly reduced, causing minimal longshore sediment transport along the Chenier Plain (MMS, 2007). More recently, this shoreline has been eroding as sea level rises, converting most of this coast to transgressive shorelines.

Today, the Red River and about 30 percent of the Mississippi River are diverted to the Atchafalaya River. The diversions have increased the sediment load in the longshore currents, which generally move slowly westward along the coast.

The barrier beaches of the Chenier Plain are generally narrow, low, and sediment starved due to the natures of coastal currents and the shoreface. Here and there, beach erosion has exposed relic marsh terraces that were buried by past overwash events. West of about Fence Lake, Texas, the beach is typical, being composed of shelly sand; although, it is no more than 200 ft (61 m) wide. Its shoreface sediments are similar (MMS, 2007). East of Fence Lake, the shoreface contains discontinuous mud deposits among muddy sands. During low tides, extensive mudflats are exposed east and west of Fence Lake. The beach in this area is much narrower and becomes a low escarpment, where wave action cuts into the salt marsh (MMS, 2007).

Hurricane Rita (September 2005) severely impacted the shoreface and beach communities of Cameron Parish in southwest Louisiana. Some small towns in this area have no standing structures remaining. A storm surge approaching 6 m (20 ft) caused beach erosion and overwash, which flattened coastal dunes depositing sand and debris well into the backing marshes (MMS, 2007).

Hurricane Ike (September 2008) came ashore over southeast Texas with an enormous storm surge that stretched from Galveston, Texas, across all of coastal Louisiana. The strongest storm surge devastated Galveston and the Bolivar Peninsula where most of the shoreline is coastal wetland. The storm surge of marine water pushed far inland where the salty water burned plants, leaving them wilted and brown for hundreds of miles along the coast. In addition to damaging wetland vegetation, as the water returned to the Gulf of Mexico it stripped marsh vegetation and soil off the land (Watson, 2009).

3.1.1.2 Circulation

Winds are more variable near the coast than over open waters because coastal winds are more directly influenced by the moving cyclonic storms that are characteristic of the continent and because of the land and sea breeze regime. During the relatively constant summer conditions, the southerly position of the Bermuda High generates predominantly southeasterly winds, which become more southerly in the northern Gulf. Winter winds usually blow from easterly directions with fewer southerlies but more northerlies.

The frequency of cold fronts in the Gulf exhibits similar patterns during the four-month period of December through March. During this time, the area of frontal influence reaches 10^{o}N latitude. Frontal frequency is about nine fronts per month in February and about seven fronts per month in March. By May, the frequency decreases to about four fronts per month and the region of frontal influence retreats to about 15^{o}N latitude. During June-August, frontal activity decreases to almost zero and fronts seldom reach below 25^{o}N latitude (MMS, 2007). Prevailing winds off Texas for January and July are presented graphically in EPA's 2004 FEIS, Figures 5-1 and 5-2.

The tides in the Gulf of Mexico have smaller ranges than those in other coastal areas of the U.S., normally ranging from 1 ft to 4 ft (0.3 m to 1.2 m) depending on location and time of year. The Gulf has diurnal, semidiurnal, and mixed (both diurnal and semidiurnal; see FEIS Figure 5-3). Onshore winds and low barometric readings, or offshore winds and high barometric readings, cause daily waters to be higher or lower than predicted. In shelf areas, meteorological conditions occasionally mask local tidal induced circulation. Tropical storms in summer and early fall may affect the area with high winds (60+ ft/s or 18+ m/s), waves (23+ ft or 7+ m), and storm surge (10-25 ft or 3-7.5 m). Winter storm systems also may cause moderately high winds, waves, and storm conditions that mask local tides. The physical oceanography in the western Gulf of Mexico differs from the rest of the Gulf due to the greatly decreased influence of the Loop Current. Loop Current eddies (LCEs) traveling westward through the Gulf eventually dissipate in the western Gulf area.

The major large-scale permanent circulation feature present in the Western and Central Gulf is an anti-cyclonic (clockwise-rotating) feature oriented about ENE-WSW with its western extent near 24^{o}N latitude off Mexico. There has been debate regarding the mechanism for this anti-cyclonic circulation and the possible associated western boundary current along the coast of Mexico. Elliott (as cited in MMS, 2007) attributed LCEs as the primary source of energy for the feature, but Sturges (as cited in MMS, 2007) argued that wind stress curl over the western Gulf is adequate to drive an anti-cyclonic circulation with a western boundary current. Sturges found annual variability in the wind stress curl corresponding to the strongest observed boundary current in July and the weakest in October. Based on ship-drift data, Sturges showed the maximum northward surface speeds in the western boundary current were 0.8-1ft/s (25-30 cm/s) in July and about 0.16 ft/s (5 cm/s) in October; the northward transport was estimated to vary from 88 ft^3/s to 265 ft^3/s (2.5 m^3/s to 7.5 m^3/s). Sturges reasoned that the contribution of LCEs to driving this anti-cyclonic feature must be relatively small. Others have attributed the presence of a northward flow along the western Gulf boundary to ring-slope ring interactions (MMS, 2007).

Another major feature that has a pronounced effect on circulation in the area is the semi-permanent anti-cyclonic gyre formed by both wind stress and LCEs. The gyre exists between 22^{o}N and 25^{o}N latitude. It has a north-south diameter of approximately 136 mi (220 km) and an east-west diameter of approximately 273 (400 km). The general flow pattern for the Texas offshore area follows the coastline and is southerly during the winter, turning to the east at about 25^{o}N latitude (see FEIS Figure 5-4). The average current velocities in the northwest Gulf of Mexico range from 0.33 ft/s to 1 ft/s (10 cm/s to 30 cm/s) with a maximum velocity range from 1.75 ft/s to 6 ft/s (53 cm/s to 180 cm/s). Current velocities correspond to wind changes, with approximately a 12-hour lag time for full response of the currents to wind changes. Table 3-1 depicts a comparison of observed winds and currents for several depths at the Buccaneer Oil Field in the northwest area of the Gulf.

Table 3-1. Summary of Wind and Currents for the Gulf of Mexico Buccaneer Oil Field July 26-August 30, 1978, and February 14-March 20, 1979

Source	July-August 1978		February-March 1979	
Wind	ft/s	m/s	ft/s	m/s
Mean speed	12.8	3.9	23.3	7.1
Maximum speed	52.8	16.1	50	15.2
Direction (from ºT)	180 (S)		045 (NE)	
Currents @ 14.8 ft depth (4.5 m)	ft/s	cm/s	ft/s	cm/s
Mean speed	0.58	17.8	0.61	18.6
Maximum speed	0.1	3.0	1.9	58
Residual speed	2.03	62.0		13.5
Residual direction (towards ºT)	185 (S)		250 (SW)	
Currents @ 34.4 ft depth (10.5 m)	ft/s	cm/s	ft/s	cm/s
Mean Speed	0.42	12.9	0.50	15.2
Maximum speed	1.87	57.0	1.97	60.0
Residual speed	0.14	4.3	0.30	9.4
Residual direction (towards ºT)	23 (SW)		250 (WSW)	
Currents @ 59 ft depth (18.0 m)	ft/s	cm/s	ft/s	cm/s
Mean Speed	0.24	7.3	0.37	11.2
Maximum speed	1.51	46.0	1.38	42.0
Residual speed	0.11	3.4	0.14	4.4
Residual direction (towards ºT)	250 (WSW)		260 (W)	

Source: Danek and Tomlinson, 1980, as cited in EPA, 2004.

3.1.1.3 Temperature, Salinity, and Dissolved Oxygen

Sea surface temperatures in the Gulf range from nearly isothermal in August to a sharp horizontal gradient in January. In January, the temperatures range from 25°C in the Loop Current core to 14°C or 15°C along the shallow northern coastal estuaries. In August, the temperatures in the Gulf range from 29°C to 30°C (see FEIS Figure 5-5). The lowest values may be as low as 10°C in the Louisiana-Mississippi shelf region, depending on snowmelt from the upper Mississippi Valley. In winter, the nearshore bottom waters are 3°C to 10°C cooler than the offshore waters (see FEIS Figure 5-6). An isothermal water column is the result of storm activity that mixes the waters in the northern Gulf. A permanent seasonal thermocline occurs in deeper offshelf waters throughout the Gulf. In summer, warming surface waters help raise bottom temperatures in all shelf areas, producing a monotonic distribution of bottom temperatures from about 28°C at the coast decreasing to about 19°C at the shelf break (NOAA, 1985; see FEIS Figure 5-7).

Surface salinities along the northern Gulf are a function of wind-driven currents and freshwater input from the Mississippi and Atchafalaya Rivers. During low freshwater input, deep Gulf water penetrates shelf waters and salinities near the coastline ranging from 29,000-32,000 mg/L. Spring and summer months show strong horizontal salinity gradients due to high freshwater input. Inner shelf salinity values are < 20,000 mg/L (MMS, 1990). Freshwater runoff only affects inner and mid-shelf waters within 18.6 mi (30 km) of the coast. Lowest salinities occur in May. Currents from the cyclonic gyre and wind stress cause a band of low salinities (as low as 20,000 mg/L) off the south coast of Texas to the northwest along the shelf (CSA, 1988); this band disappears by August.

In near-surface waters, dissolved oxygen values range from 5-9 mg/L; dissolved oxygen values in the mixed layer average 4.6 mg/L, with some seasonal variation (CSA, 1988). Oxygen values generally decrease to about 3.5 mg/L with depth through the mixed layer. During the warmer months, hypoxic (< 2.0 mg/L), and anoxic (< 0.1 mg/L) conditions have been found to occur in the lower water column. Boesch and Rabalais extensively studied hypoxic conditions in 1985 through 1987 (CSA, 1988). Hypoxic conditions exist in summer months in areas as large as 1.7-2.5 million acres (7,000-10,000 km^2), between the Mississippi River Delta and the northern coast of Texas. These conditions extended from the 10-0-m contour on the inner shelf. The earliest that hypoxic conditions have been found was April, and the latest was October (CSA, 1988).

The zone of hypoxia on the Louisiana-Texas shelf is one of the largest hypoxic areas in the world's coastal waters. Oxygen-depleted bottom waters occur seasonally and are affected by the timing of Mississippi and Atchafalaya River discharges that carry nutrients to the Gulf, increasing carbon flux to the bottom. Under stratified conditions, this results in oxygen depletion to the point of hypoxia. The hypoxic conditions last until local wind-driven circulation mixes Gulf surface waters. The average size of the hypoxic zone increased from 2.1 million acres (8500 km^2) during 1985-1992 to more than 4 million acres (16,200 km^2) during 1993-2001. The largest year measured was 2002 when the hypoxic zone occupied 5.4 million acres (21,800 km^2; MMS, 2007). Increased nutrient loading since the turn of the 19th century correlates with the increased extent of hypoxic events (MMS, 2007), supporting the theory that hypoxia is related to the nutrient input from the Mississippi and Atchafalaya River systems.

Although less studied than the Louisiana hypoxic zone, hypoxia in Texas waters is not unknown. At least as early as 1979, hypoxia was reported in Texas coastal waters off Freeport (Harper 1981). The event coincided with a major flooding from the Brazos River in May and June, and resulted in reduced benthic richness and diversity. After a July storm event, the hypoxia ended and benthic community parameters returned to normal.

Hypoxic areas off the Louisiana coast have been extensively studied and documented. When conditions were right, this "dead zone" was thought to extend into Texas. However, hypoxia surveys have generally not crossed into Texas waters. Although hypoxia has occurred in Texas waters over the last 24 years, little research has been conducted to understand the linkage between hypoxia in Texas and Louisiana waters. Recently, Texas A&M researchers discovered a break in the hypoxic zone at the Texas-Louisiana border, suggesting that Texas may have an independent hypoxic zone. The hypoxic zone ran continuously over the area sampled, from Beaumont to Galveston (DiMarco et al. 2009). NOAA has issued a grant to Texas A&M to investigate hypoxia in Texas waters for the next five years.

3.1.2 Chemical Oceanography

Runoff from approximately two-thirds of the drainage area of the U.S. and more than one-half of the area of Mexico empties into the Gulf of Mexico. This large amount of freshwater influx originates from a mixture of direct and point source stormwater discharges and nonpoint source runoff from a variety of industrial, municipal, urban, rural, and agricultural sources. This input is mixed into the surface water of the western Gulf and makes the chemistry of parts of the western Gulf quite different from typical open ocean waters

3.1.2.1 Nutrients

The principal micronutrients about which generalizations can be drawn are phosphate, nitrate, and silicate. Phosphates range from 0 to 0.25 mg/L, averaging 0.021 mg/L in the mixed layer (MMS, 1990) and shelf values do not vary significantly from open Gulf values. Nitrate values in the Gulf range from 0.0031 mg/L to 0.14 mg/L, averaging 0.014 mg/L (MMS, 1990) and tend to be higher in the offshore waters than in the nearshore waters. Silicates range predominantly from 0.048 mg/L to 1.9 mg/L; open Gulf values tend to be lower than shelf values (MMS, 1990). The nutrient values for the nearshore waters of the western Gulf are lower than those in the central Gulf (CSA, 1988). An intrusion of nutrient-rich, oxygen-poor water is apparent at depths of 656 ft to 984 ft (200 m to 300 m), although effects of this intrusion are often seen up to a depth of 230 ft (70 m).

3.1.2.2 Trace Metals

The largest source of trace metals in the Gulf of Mexico is runoff and rivers; other sources include atmospheric deposition (e.g., mercury from coal burning power plants) and human activities (CSA, 1988). Trace metal concentrations are higher in areas offshore of Louisiana than offshore of Texas (CSA, 1988) and the trace metal composition of nearshore sediments of Louisiana are similar to those in the suspended material of the Mississippi River (CSA, 1988). Some metals, such as cadmium, lead, and zinc, are transported by the Mississippi River in higher than average concentrations.

For all Texas coastal waters, the Texas Department of State Health Services issued a fish consumption advisory based on mercury concentrations in seafood. Mercury is a dangerous toxic metal, especially for children. Exposure to mercury can cause attention and language deficits, impaired memory, and impaired visual and motor function in children. The advisory states the following:

- King mackerel greater than 43 inches (1.1m) in total length should not be consumed.
- King mackerel 37-43 inches (0.95-1.1 m) in total length:
    - Adults should limit consumption to no more than one, 8-ounce (225 g) meal per week.
    - Women of child-bearing age and children should limit consumption to not more than one, 8-ounce (225 g) meal per month.
- King mackerel less than 37 inches (0.95 m) in total length are safe for unrestricted consumption.

3.1.2.3 Hydrocarbons

Data presented in the initial portion of this section on hydrocarbons are summarized from MMS (2007) prior to the Gulf oil spill from the Deepwater Horizon in 2010. A discussion of information developed after the Deepwater Horizon spill is presented at the end of this section.

Petroleum hydrocarbons can enter the Gulf from a wide variety of sources. These sources include both natural geochemical processes and the onshore and offshore activities of man. Natural seeps are the predominant petroleum hydrocarbon source to offshore waters. The discharge of petroleum hydrocarbons in produced water is the largest oil input to the OCS that is the result of human activities. However, land-based sources are the greatest source of hydrocarbons to coastal waters.

Spills of hydrocarbons may occur in both offshore and coastal waters when crude oil is extracted and during transportation and consumption of petroleum products. MMS (2007) divided its analysis into Western and Eastern Gulf areas so regional contributions from industrial activities or urban areas were discernable; values presented here are for Western Gulf coastal waters (see Table 3-2). These estimates include information presented in *Oil in the Sea III, Inputs, Fates, and Effects* (Committee on Oil in the Sea: Inputs, Fates, and Effects, National Research Council [NRC], as cited in MMS, 2007), and incorporate new research and databases that have become available since the 1985 version of Oil in the Sea.

Although the Gulf comprises one of the world’s most prolific offshore oil-producing areas and has heavily traveled tanker routes, inputs of petroleum from natural and onshore sources typically far outweigh the contribution from offshore activities. Natural seeps provide about 95 percent of the total input to the Gulf of Mexico. Estimates have ranged from 28,000 bbl per year (4,000 tons) to 204,000 bbl (29,150 tons) of oil per year (MMS, 2007). Using commercial remote-sensing data, MMS (2007) estimated a range of 280,000 bbl to 700,000 bbl per year (40,000 to 100,000 tons per year) with an average of 490,000 bbl (70,000 tons) for the northern Gulf, excluding the Bay of Campeche. Using this estimate and assuming seep scales are proportional to surface area, the NRC (as cited in MMS, 2007) estimated annual seepage for the entire Gulf at about 980,000 bbl (140,000 tons) per year. As seepage is a natural occurrence, the rate remained the same throughout BOEMRE’s 40-year analysis period.

Land-based sources provide the largest petroleum input to coastal waters of the Western Gulf — 77,000 bbl (11,000 tons) of petroleum hydrocarbons annually. Land-based sources include residual petroleum hydrocarbons in municipal and industrial wastewater treatment facility discharges as well as urban run-off. The Mississippi River carries the majority of petroleum hydrocarbons into Gulf waters from land-based drainage that occurs far upriver. With increased urbanization, particularly in coastal areas, the amount of impervious paved surface increases and oil contaminants deposited on these roads and parking lot surfaces are washed into adjacent streams and waterbodies.

Oil spills from oil and gas extraction operations occur during the production, transportation, and consumption of oil, and include a wide variety of sources: spills from production wells and platforms during extraction; spills during transportation by tanker, barge and other vessels; spills from pipelines in both federal and state waters; shore-based storage tanks and coastal facilities; mystery sources; and spills during refining and consumption. The composition of spilled hydrocarbons includes crude oil and refined fuels, such as diesel. BOEMRE (MMS, 2007) estimates that 630 bbl (90 tons) of petroleum hydrocarbons are spilled from coastal Western Gulf sources and 350 bbl (50 tons) are spilled from offshore Western Gulf sources. Spills from pipelines in the coastal area of the Western Gulf contribute 6,230 bbl (890 tons) and are the largest amount of oil by source to that region. Spills of refined products from coastal pipelines and marine terminals are the main contributors to the coastal facility inputs to coastal waters. Tank vessel spills input 10,500 bbl (1,500 tons) per year to the Western OCS.

Table 3-2. Average Annual Inputs (1990-1999) of Petroleum Hydrocarbons to Coastal Waters of the Western Gulf of Mexico

Source	(Tons)	(bbl)
Extraction of Petroleum		
Platforms Spills	90	630
Atmospheric Releases (VOC's)	Trace	Trace
Permitted Produced-Water Discharges	590	4,130
Sum of Extraction Inputs	680	4,760
Transportation of Petroleum	na	na
Pipeline Spills	890	6,230
Tank Vessel Spills	770	5,390
Coastal Facilities Spills[1]	740	5,180
Atmospheric Releases (VOC's)[2]	Trace	Trace
Sum of Transportation[3]	2,400	16,800
Consumption of Petroleum		
Land-based Sources[4]	11,700	77,000
Recreational Vessels	770	5,390
Vessel > 100 GT[5] (spills)	100	700
Vessel > 100 GT (operational discharges)	Trace	Trace
Vessel < 100 GT (operational discharges)	Trace	Trace
Deposition of Atmosphere Releases (VOC's)	90	630
Aircraft Jettison of Fuel	NA	NA
Sum of Consumption	12,000	84,000

[1] Coastal facility spills do not include spills related to exploration and production or from vessels. "Coastal Facilities" include: aircraft, airport, refined product in coastal pipeline, industrial facilities, marinas, marine terminals, military facilities, municipal facilities, reception facilities, refineries, shipyards, and storage tanks.
[2] Volatization of light hydrocarbons during tank vessel loading, washing, and voyage.
[3] Sums may not match.
[4] Inputs from land-based sources during consumption of petroleum are the sum of three wastewater discharges: municipal, industrial (non- petroleum refining), and petroleum refinery. Urban runoff is also included.
[5] Gross tons
NA = not available; VOC's = volatile organic compounds.

Source: NRC as cited in MMS, 2007

Hydrocarbons are higher off Louisiana and east Texas, than off south Texas. They are particularly high around the Mississippi Delta (CSA, 1988). The biggest sources of hydrocarbons in the Gulf include the Mississippi River, local oil and gas production activities, and ship traffic. Other sources include outflow from other rivers, atmospheric deposition, and natural seepage. Hydrocarbons with high molecular weights are usually found floating on the surface; these include tar balls, crude oil, and fuel oil residues. Highly toxic, volatile hydrocarbons with low molecular weight are water soluble compounds, including polynuclear aromatic hydrocarbons such as naphthalenes. Gaseous hydrocarbons are also found in the water column mostly due to natural seepage near the Mississippi River.

During the Deepwater Horizon MC252 Spill (DWH oil spill), oil and gas were discharged from the wellhead approximately 5,000 feet below the sea surface for 87 days until the well was successfully capped on July 15, 2010. The National Incident Command Flow Rate Technical

Group estimated that 4.93 million barrels of oil were released from the well. Of the total volume spilled, approximately 1.4 million barrels were estimated to be naturally dispersed (some 45 percent) or chemically dispersed (some 55 percent). The majority of that amount was dispersed at the wellhead. The following discussion is primarily derived from the *Summary Report for Sub-Sea and Sub-Surface Oil and Gas Dispersant Detection: Sampling and Monitoring, Operational Science Advisory Tea*m, 12/17/2010 (OSAT, 2010).

During the DWH oil spill response, a total of 1.84 million gallons of dispersants were applied, with 1.06 million gallons applied at the surface and 0.78 million gallons directly at the wellhead on the seafloor (National Commission, 2010b as cited OSAT, 2010). The Gulf Coast Ecosystem Restoration Task Force reported findings for the following year through its web-based portal (Restore the Gulf.org, 2010). Select DWH oil spill statistics are provided in Table 3-3.

Table 3-3. Deepwater Horizon Oil Spill Response Facts

RESPONSE FACTS	FATE OF OIL
• 4.9 million barrels of oil discharged • 47, 829 responders, at peak • 9,700 vessels, at peak • 6,500 government and commercial vessels • 3,200 vessels of opportunity • 3.8 million feet of hard boom deployed • 9.7 million feet of soft boom deployed • 1.8 million gallons of dispersants used • 411 in-situ burns conducted (265,450 barrels of oil) • 127 surveillance aircraft • 4 incident command posts (TX, LA, AL, and FL) • 17 subordinate branches • 32 equipment staging areas • 1 aviation coordination center, Tyndall AFB • 1.4 million barrels of liquid waste collected • 92 tons of solid waste collected	• 4.9 million barrels of oil discharged • 800,000 plus barrels oily water recovered • More than 400 in-situ burns conducted • 265,000 plus barrels oil removed by in-situ burns • 770,000 plus gallons subsea dispersants applied • 1.07 million gallons of dispersants applied

Source: OSAT, 2010.

The United Area Command (UAC) formed the Operational Science Advisory Team (OSAT) as a small, interagency team to assess near real-time data collected by the response team relative to specific indicators and to identify sampling gaps as part of an adaptive sampling strategy. OSAT (OSAT, 2010) provides an assessment of the distribution of oil- and dispersant-related chemicals that remain in the water column and/or bottom sediments. The report provided a summary of sampling results to inform decision makers on further oil removal operations. The report also included results from independent scientific investigations into the DWH oil spill and used specific indicators established by the UAC to define the presence or absence of potentially actionable (removable) oil. These indicators were:

- Qualitative observations of oil
- Environmental risks associated with oil-related organic compounds
- Human health risks from exposure to oil-contaminated water
- Environmental risks related to dispersant component chemicals
- Fishery closures

- Toxicity to benthic invertebrates
- Comparison of analytical chemistry measurements to reference stations and measurements from earlier in the year
- Indicators of hypoxia in deep water seaward of the continental shelf.

Key findings by the OSAT are presented in Table 3-4. No oil attributable to the DWH oil spill was found on Texas beaches, estuaries, or marshes.

Table 3-4. Key Findings of the Operational Science Advisory Team

1.	No deposits of liquid-phase MC252 oil were identified in sediments beyond the shoreline.
2.	No exceedances of EPA's Human Health benchmark were observed.
3.	No exceedances of EPA's dispersant benchmarks were observed.
4.	Since August 3, 2010, <1 percent of water samples and ~1 percent of sediment samples exceeded EPA's Aquatic Life benchmarks for polycyclic aromatic hydrocarbons (PAHs). Analysis of individual samples indicated that none of the water sample exceedances were consistent with MC252. Of the sediment exceedances, only those within 3 km of the wellhead were consistent with MC252.
5.	Published research indicates that MC252 oil is weathering and biodegrading under natural conditions. Estimates of weathering and degradation rates vary, precluding the use of simple empirical models to assess the persistence of residual MC252 oil.
6.	Of the previously closed fisheries, 87,481 mi^2 (state and federal) have been reopened; 1041 mi^2 around the wellhead remain closed. In addition, 4,213 mi^2 were closed to Royal Red shrimping on November 24, 2010.
7.	Quantitative results indicate that deposits of drilling mud-entrained oil remain near the wellhead. Seven sediment samples within 3 km of the wellhead collected since August 3, 2010 exceed aquatic life benchmarks for PAHs, with oil concentrations of 2000- 5000 parts per million.
8.	The study of tar mats in shallow nearshore waters was identified as a sampling gap. The sampling methods previously used did not sufficiently address tar mats. A focus group (OSAT-2) was chartered by the UAC to address this issue.

Source: OSAT, 2010.

In July 2010 (TPWD, 2010) the TGLO reported that tar balls found on Galveston County beaches were from the BP DWH oil spill. Oil was also found and being cleaned up from McFaddin Beach earlier that week. By the end of that week, teams of scientists had visited five locales including Port Arthur and West Galveston Island, according to the Texas Parks and Wildlife Department (TWPD). The five-person teams of scientists planned to visit 21 coastal locales and gather samples to determine beach conditions, water chemistry, living creatures in shallow water, mud and sand, as well as other factors. This stage of the plan established a baseline to monitor any impact of the spill, according to TPWD. TPWD coordinated with the TGLO, TCEQ, FWS, National Park Service and NOAA. A NOAA contractor accompanied each team to provide chain of custody quality control and oversee the shipping of samples, which went to contracted out-of-state laboratories for analysis.

Other studies have not confirmed the presence of oil contamination from the DWH oil spill in Texas. EPA collected samples from Texas for water and sediment quality. The westernmost reported water and sediment quality sampling location for the DWH oil spill was Port Arthur, Texas. This location was sampled twice (6/9/2010 and 8/11/2010). Both samplings included sediment and water quality analyses. There were no differences between results of the two sample periods and neither indicated levels of oil-related organic compounds for the water analysis and neither exceeded the benchmark levels for contaminates in the water and sediment samples (EPA, 2011a).

In a USGS open file report (Rosenbauer et al., 2010), hydrocarbons were extracted and analyzed from sediment and tarballs collected from the northern Gulf of Mexico coast that was potentially impacted by Macondo-1 (M-1) well oil from the DWH oil spill. The study included five stations located from Galveston Island to the Louisiana border. The identification of M-1 well oil in the sediment samples was based on a combination of an interpretation of the compounds identified in the mass spectra of the sediment extracts and a multivariate statistical analysis of the biomarker ratios utilizing hierarchical cluster analyses (HCA) and principal component analyses (PCA). M-1 well oil has been identified in sediment and tarballs collected from Louisiana, Alabama, Mississippi, and Florida. The M-1 well oil was genetically linked with 11 of 49 sediment samples and 17 of 20 tarballs. None of the sediment hydrocarbon extracts from Texas correlated with the M-1 well oil. Oil-impacted sediments are confined to the shoreline adjacent to the cumulative oil slick of the DWH oil spill, and no impact was observed outside of this area

Although the other four Gulf States closed areas to fishing throughout the period of the DWH oil spill, no Texas states waters were closed for commercial or recreational fishing. At its peak, 37 percent of Gulf waters (88,522 mi^2) were closed to fishing due to the DWH oil spill. Prior to re-opening, fish samples in all areas went through sensory testing and analysis for PAH chemical contaminants. After extensive consultation with the Food and Drug Administration (FDA), NOAA re-opened approximately 26,388 mi^2 located at the southern extent of the federally-closed area. Additional areas were re-opened in August and September, 2010; most remaining areas were re-opened in October and November, 2010. However, one re-opened area was closed again when tarballs were found in nets with Royal Red Shrimp. As of publication, 4,213 mi^2 remained closed to Royal Red shrimping in an area covering portions of the OSAT's offshore and deep-water zones (OSAT, 2010).

3.1.2.4 Synthetic Organics

High levels of synthetic organic compounds such as pesticides (e.g. DDT), polychlorinated biphenyls (PCBs), and related organochlorine compounds have been detected in the Gulf of Mexico (CSA, 1988). The most common of these compounds are DDT, PCB, and dieldrin. These compounds are brought to the nearshore waters of the Gulf of Mexico by rivers and streams.

3.1.2.5 Radionuclides

In the Gulf of Mexico, there are both natural and anthropogenic radionuclides. Uranium, thorium, and their radioactive daughter elements are radionuclides that occur naturally in the Gulf of Mexico. Concentrations of uranium in the nearshore waters of the Gulf are variable due to runoff and river discharge. Uranium concentrations in the offshore waters of the Gulf are comparable to those in the world's oceans (CSA, 1988). Some Texas rivers drain from uranium mining activities or from agricultural activities that may produce uranium associated with phosphate fertilizer.

Isotopes of radium are found in produced water. In the Gulf of Mexico, ambient ^{226}Ra concentrations range from 0.07 pCi/L to 0.30 pCi/L and ambient ^{228}Ra concentrations range from <0.30 pCi/L to 0.93 pCi/L (Hart et al., 1995). Radium concentrations tend to increase with depth in the ocean, paralleling the concentrations of barium and silica (Chung, 1980; Nozaki 1991). Typical concentrations of radium isotopes in deep ocean waters are 0.04 pCi/L to 0.16 pCi/L. ^{226}Ra is more abundant than ^{228}Ra in open ocean waters. Radium is added to the northwest Gulf of Mexico in measurable amounts, mostly by offshore oil and gas operations.

3.1.2.6 Dispersants

In response to the DWH oil spill, 1.84 million gallons of dispersants (Corexit 9500 and some Corexit 9527) were used to break up the oil spill. Of the total amount used, 1.06 million gallons were applied at the surface and 0.78 million gallons were injected below the surface near the site of the oil release. Dispersants do not remove oil, but emulsify or break up oil into small droplets to better mix with the water and disperse the slick.

Using dispersants to remove oil from the water surface is thought to have several potential benefits (Cleveland, 2011). First, less oil floats ashore where it can adversely affect shorelines and estuarine environments. Second, animals and birds that float on or wade through the water surface are less exposed to oil. Third, dispersants may accelerate the rate at which oil biodegrades. Smaller droplets have a larger surface-area-to-volume ratio, which allows microorganisms greater access to the oil, and speed their rate of consumption. The expected acceleration of this biodegradation is often cited as a major reason to use dispersants (Cleveland, 2011). Early experiments show that deepwater dispersants never mixed with surface dispersants. In September, dispersant components were still present in significant concentrations even 200 miles (322 kilometers) from the wellhead (Handwerk, 2011).

According to Cleveland (2011) there are uncertainties regarding both the actual realization of some of these benefits, especially in the subsea, and potential offsetting costs. For instance, less oil on the surface means more in the water column, increasing exposure for subsurface marine life. In addition, while the smaller droplets may accelerate biodegradation, their smaller size increases the dissolution of potentially toxic compounds and exposure to aquatic organisms. Moreover, the assumption of increased biodegradation may not always be accurate. Some studies have found that dispersants have no effect on the biodegradation rate or may even inhibit biodegradation. It is also only largely in the aftermath of the BP well explosion that scientists have begun to research the extent to which oil-eating bacteria are present at the low temperatures of deepwater. Finally, there is no reason to suppose that all dispersants act in the same manner. They may, depending upon their chemical makeup, have strikingly dissimilar impacts. For example, some evidence indicates that the ionic surfactant in Corexit 9527 and 9500 inhibits biodegradation while their non-ionic surfactants increase biodegradation.

3.2 BIOLOGICAL OVERVIEW

Factors 3 and 4 of the 10 factors used to determine unreasonable degradation under the Ocean Discharge Criteria regulations (see Chapter 1) require assessment of the biological communities that may be exposed to pollutants, the presence of endangered species, any unique species or communities of species, and the importance of the receiving water to the surrounding biological communities. This section describes the biological communities and the threatened or endangered species of the territorial seas of Texas.

The 2004 FEIS and more recently available information and data have been reviewed and updated where they are changed. The result of this review of updated information has not resulted in any material change in the conclusions provided in the 2004 FEIS.

3.2.1 Primary Productivity

Primary production is the synthesis of organic matter by organisms using nutrients and energy derived from solar radiation or chemical reactions. The organic matter produced by plants, primarily through photosynthesis, is used by the plant for respiration, growth, and reproduction. As primary producers, phytoplankton support the food-consuming marine population, animals, and bacteria at the bottom of the food chain. The nutrient levels in the territorial seas of Texas originate primarily from the Mississippi and Atchafalaya river systems. Other streams and upwellings contribute to the nutrient levels, but to a lesser degree.

3.2.1.1 Phytoplankton

Standing crops of phytoplankton are measured by cell counts (cells/m^3) and by chlorophyll concentrations (mg Chl/m^3). Surface primary production is measured by milligrams of carbon per cubic meter per hour (mg C/m^3/h). These measurements show great variability, caused by seasonal and areal distribution. Phytoplankton depend on light and nutrient availability; other environmental factors such as temperature and salinity have little effect on phytoplankton concentrations. Phytoplankton are limited by light in the winter and by nutrients in the summer. Transport of nutrients depends on shelf circulation resulting from wind, deep Gulf water movements, and discharges from the Mississippi and other local rivers (CSA, 1988). Phytoplankton counts are highest in the spring and second highest in the fall.

Chlorophyll concentrations of the open Gulf average approximately 0.2 mg Chl/m^3. Surface primary production in the open Gulf averages 0.33 mg C/m^3/h (CSA, 1988). Offshore south Texas, nearshore water phytoplankton average 85,000 cells/m^3 while offshore phytoplankton average 30,000 cells/m^3 (CSA, 1988). Chlorophyll concentrations average 2.5 mg Chl/m^3 in the nearshore waters off south Texas and 0.6 mg Chl/m^3 in the offshore waters (CSA, 1988). Primary production ranges from 0.00-2.10 mg C/m^3/h (CSA, 1988). Chlorophyll maxima are also associated with the nepheloid layer which exists off the south Texas coast during the summer and fall (Flint and Rabalais, 1981; Kamykowski and Bird, 1981; Bird, 1983).

3.2.1.2 Macrophytes and Algae

Seagrass beds are common in Texas because of the fresh water inflow from the Mississippi River. In the northern Gulf of Mexico, an estimated 3 million hectares (7.4 million acres) of seagrass beds exist, of which 0.5 percent are located in Texas and Louisiana; 98 percent of the seagrass beds are located in Florida, and 1 percent are located in Alabama and Mississippi (MMS, 1990). *Salicornia* spp., and *Juncus* spp. represent about 30 percent of the macrophytes and algae populations.

Seagrasses in Texas are widely scattered beds in shallow, high-salinity coastal lagoons and bays. The most extensive seagrass beds are found in both the Upper and Lower Laguna Madre along the Texas coast, as well as Baffin Bay. In the Texas Laguna Madre, seagrass meadows are the most common submerged habitat type. Although permanent meadows of perennial species occur in nearly all bay systems along the Texas Gulf Coast, most of the state's seagrass cover (79 percent) is found in the Laguna Madre (MMS, 2007), with seagrasses covering about 60,047 acres (243 km^2) in the upper portion of the Laguna Madre (MMS, 2007). Seagrasses are largely excluded from bays north of Pass Cavallo where rainfall and inflows are high and salinity's average less than 20 ppt, as well as the upper, fresher portions of most estuaries. Seagrasses in the Laguna Madre constitute a unique resource that cannot be duplicated elsewhere on the Texas coast (MMS, 2007). Lower-salinity, submerged beds of aquatic vegetation are found inland and discontinuously in coastal lakes, rivers, and the most inland portions of some coastal bays (MMS, 2007).

The distribution of seagrass beds in coastal waters of the Western and Central Gulf have diminished during recent decades. Primary factors believed to be responsible include dredging, dredged material disposal, coastal development including shore armoring, trawling, water quality degradation, hurricanes, a combination of flood protection levees that have directed freshwater and sediments away from wetlands, saltwater intrusion that moved growing conditions closer inland, and infrequent freshwater diversions from the Mississippi River into coastal areas during flood stage (MMS, 2007).

The coastal wetlands and estuarine waters of the Gulf of Mexico contribute significantly to total productivity in the territorial seas. Macrophyte production comprises an estimated 75 percent of total plant production in estuarine-wetland complexes (Thayer and Ustach, 1981). Macroalgae and epiphytes may comprise 25 percent of total production in a wetland habitat. Phytoplankton chlorophyll and production in Gulf coast estuaries may be as high as 7 mg Chl/m^3, and 300 g C/m^2/yr (Thayer and Ustach, 1981).

3.2.1.3 Zooplankton

Food supply, water mass circulations, and breeding seasons are factors in distribution and abundance of zooplankton (CSA, 1988). Although daily vertical migrations of zooplankton are common, they do not prove to be a significant factor in surface or bottom counts of zooplankton (CSA, 1988). Organic detritus and phytoplankton are the food sources on the continental shelf. Phytoplankton are the main food supply of offshore zooplankton.

The main areas in which zooplankton has been studied on the Texas-Louisiana continental shelf area off Timbalier Bay, off the Calcasieu River, and four transects off south Texas (CSA, 1988). Zooplankton demonstrate seasonal distribution and abundance that are similar to the fluctuations of phytoplankton (CSA, 1988). Zooplankton were studied at four transects on the south Texas continental shelf. Nearshore station zooplankton counts were generally higher than for offshore stations, although species diversity increased with distance from shore. Nearshore station counts had a mean of 3,496 individuals/m^3 versus 1,055 individuals/m^3 at the offshore stations. Zooplankton counts in northernmost stations averaged 2,943 individuals/m^3 compared to 2,008 individuals/m^3 in southernmost stations.

Copepods are the dominant zooplankton group found in all Gulf waters, and particularly in south Texas waters. Copepod abundance followed the same trends as the total zooplankton counts, with a nearshore copepod count of 2,053 individuals/m^3 and an offshore count of 607 individuals/m^3. The copepod count was 1,900 individuals/m^3 at the northernmost station and 974 individuals/m^3 at the southernmost station (CSA, 1988). The copepod count was generally higher inshore than offshore. Based on the Corpus Christi transect, seasonal variation is apparent

— in the nearshore and mid-shelf, a spring peak and a summer low is apparent, while offshore the peak was in the winter with the lows in the spring and fall.

Icthyoplankton on the south Texas shelf, as reported in NOAA (1975), are most abundant in August and September, and least abundant in December and January. NOAA found 49 families, 84 genera, and 50 species, with anchovies, codlets, and gobies comprising 57 percent of total larvae. *Penaeus* spp. larvae peak in spring, late summer and early fall in nearshore areas. In deeper zones, fall and winter are times of greatest abundances. In general, intermediate zones, from 23 to 82 km (14 to 51 mi) from shore, have the highest average abundances.

Although laboratory studies have shown heavy metals and chlorinated hydrocarbons kill and damage zooplankton, holoplankton are only temporarily affected because of mixing and dilution of the chemicals and rapid reproduction (CSA, 1988). Meroplankton may be affected in adult stages (CSA, 1988).

3.2.2 Benthic Fauna

The distribution of benthic fauna in the coastal waters of the Gulf of Mexico is correlated primarily with physical factors, substrate being the most important. In general, benthic habitats can be described primarily on the basis of sediment texture and water depth. Water depth, or distance from shore, is a major influence on the type of sediment and benthic fauna found in a given habitat. Other important factors in determining benthic distribution include temperature, salinity, illumination, exposure to air, nutrient availability, currents, tides, and wave shock.

3.2.2.1 Marsh Communities

The coastal marsh meiofaunal community includes nematodes, harpacticoid copepods, kinorhynchs, ostracods, small polychaetes, and some insect larvae (Vittor and Associates, 1985). It also includes larvae and juveniles of larger species. Most meiofauna in the marsh community are deposit feeders, feeding on bacteria and particles of organic detritus which make up much of the upper layer of marsh sediments (Vittor and Associates, 1985).

Marsh macroinfauna include polychaetes, mollusks, and crustaceans. There are six dominant polychaete species and one dominant bivalve species; dominant crustaceans include a mysid species, two isopod species, and an amphipod species (Vittor and Associates, 1985). Macroinfauna are most abundant along marsh channels and ponds, where flowing water provides greater aeration of marsh sediments and where biological production is greater.

Marsh macroepifaunal communities include bivalves, gastropods and crustaceans. The predominant bivalve species include two mussels and the Eastern oyster; gastropods exhibited three dominant species; dominant crustaceans include six crab species and shrimp species (Vittor and Associates, 1985).

3.2.2.2 Estuarine Communities

The meiofauna of estuarine waters are composed of larval and juvenile metazoans (temporary meiofauna) and adult metazoans (permanent meiofauna), such as nematodes, kinorhynchys, harpacticoid copepods, gastrotrichs, etc. Many natural and anthropogenic factors influence macrofaunal species distribution and density in estuarine areas. These factors include: temperature, salinity, dissolved oxygen, seasonality, wave shock, prevailing current patterns and intensity, substrate type, and pollution.

In a 12-month study conducted by Espey, Houston and Associates (unpublished) in the Trinity-San Jacinto Estuary, annelids were found to be the most prominent phyla (49 percent), followed by arthropods (25 percent) and mollusks (20 percent). Three remaining phyla (Bryozoa, Rhynchocoela, and Chordata) together comprised 6 percent of the species identified. Polychaetes dominated the benthic collections at all stations (74 percent of overall collections), mollusks comprised 15 percent of overall collections, and arthropods, rhynchocoels, chordates, and bryozoans together comprised 11 percent of overall collections.

3.2.2.3 Continental Shelf Communities

Shelf macrofauna of south Texas demonstrated zonation (Flint and Rabalais, 1981). Biologic factors affecting the distribution and abundance of macrofaunal communities include predation, competition, food availability, physiological tolerance limits, and population characteristics (fecundity, longevity, variability; Flint and Rabalais, 1981). In the Tuscalusa Trend study (Vittor and Associates, 1985), macroinfaunal communities were characterized by substrate habitat and depth and grouped into beach-related habitat (6-12 ft; 2-4 m), inner shelf habitat (seaward to 65 ft; 20 m), intermediate shelf habitat (65-200 ft; 20-60 m), and outer shelf habitat (the territorial seas of Texas are generally located in water depths of less than 200 ft (60 m).

In a study of the inner shelf waters off Galveston, Texas (Harper and McKinney, 1980), the polychaete *Paraprionospio pinnata* was the numerically dominant species. Population fluctuations of *P. pinnata* were found to largely determine the total population density of the region, with the exception of large sets of two bivalve species. Amphipods and bivalves displayed pronounced seasonality, with populations increasing primarily in the spring and again to a lesser degree in the fall. Polychaetes did not exhibit well-defined seasonal fluctuations. Polychaetes also dominate the macrofaunal community in a study of the inner shelf off Freeport, Texas (Harper et al., 1981). However, the community was not dominated by any certain species. Faunal abundance was found to decrease during July through January and increase through April. The benthos along the shallow Texas shelf has also been occasionally affected by seasonal hypoxia, and changes in the benthic community structure reflect varying responses of taxonomic groups to recovery following hypoxic events (Harper et al., 1981).

In a study of the south Texas shelf (Flint and Rabalais, 1981) polychaetes are the dominant taxa, comprising about 60 percent of the species. Crustaceans account for 15 percent of the species and mollusks account for 12 percent. The inner shelf of the region (15-30 m; 49-98 ft) is characterized by a variable hydrography and poorly-sorted sandy sediments which provide an unstable habitat in which few species exhibit dominant abundance. Characteristic fauna genera in the region include the polychaetes and a bivalve and amphipod species.

3.2.3 Commercially Important Benthic Invertebrates

3.2.3.1 Brown Shrimp

Brown shrimp (*Farfantepenaeus aztecus*; formly *Penaeus aztecus*) are concentrated offshore of Texas and Louisiana (NOAA, 1985), inhabiting waters from shore to the 110-m (361-ft) contour. They are benthic, preferring soft substrate such as mud or sandy mud (NOAA, 1985; MMS, 1990). Brown shrimp are nocturnal omnivores, feeding on detritus, algae, benthic polychaetes, amphipods and nematodes (MMS, 1990).

3.2.3.2 White Shrimp

White shrimp (*Litopenaeus setiferus;* formly *Penaeus setiferus*) range from Apalachicola Bay, Florida to Campeche Bay, Mexico in the Gulf of Mexico. Adults prefer benthic habitats with substrates of mud or clay, at depths less than 90 ft (27 m) but most commonly less than 45 ft (14 m). Juveniles are found in the estuaries on vegetated substrates of mud or peat. Both juveniles and adults are omnivores, feeding during the day on detritus, algae, benthic polychaetes, mollusks, and zooplankton, although juveniles prefer fecal pellets (NOAA, 1985; MMS, 1990).

3.2.3.3 Eastern Oyster

The Eastern oyster (*Crassostrea virginica*) is a sedentary, benthic mollusk found attached to shell reefs, firm mud/shell bottoms, and other hard substrates throughout estuaries, shallow nearshore waters, and near river mouths. It ranges from the Gulf of St. Lawrence in the western Atlantic Ocean to the Yucatan Peninsula in the Gulf of Mexico. They are filter feeders, feeding primarily on diatoms, flagellates, bacteria, and detritus. Currents are important to oysters in supplying food, removing waste, and carrying larvae (MMS, 1990).

3.2.3.4 Blue Crab

The blue crab (*Callinectes sapidus*) is a demersal decapod crustacean found throughout the Gulf of Mexico, from Florida to the Yucatan Peninsula. Blue crab inhabit estuaries and nearshore waters to depths of about 300 ft (90 m), most commonly in waters less than 115 ft (35 m). The species generally favors muddy and sandy bottoms in shallow waters with some vegetation (NOAA, 1985). They are opportunistic omnivores feeding on annelids, mollusks, crustaceans, carrion, detritus, and are occasionally cannibalistic (MMS, 1990).

3.2.4 Fish

3.2.4.1 Gulf Menhaden

Gulf menhaden (*Brevoortia patronus*) is a nearshore, pelagic species ranging throughout the shelf waters of the Gulf, from south Florida to Veracruz, Mexico (Lassuy, 1983; NOAA, 1985; MMS, 1990). They prefer soft substrate. In the spring and summer, they are found near the shoreline; while in the winter they move further offshore to depths of 400 ft (120 m) (MMS, 1990). Juveniles are in shallow estuarine bays. Both juvenile and adults Gulf menhaden are omnivorous filter feeders, feeding on phytoplankton, zooplankton, detritus, and bacteria (MMS, 1990).

3.2.4.2 Black Drum

Black drum (*Pogonias cromis*) is a demersal, estuarine-dependent species that is distributed throughout the Gulf. It is found over a variety of substrates including sand, mud, and oyster beds. It is most abundant in coastal and estuarine areas off of Texas and Louisiana to water depths of 165 ft (50 m). Black drum are most commonly found in areas receiving large river runoffs (NOAA, 1985). Black drum migrate to the entrances of large sounds, bays, and passes to spawn from January to June. Peak spawning season occurs in February and March. The black drum is a carnivore, feeding on benthic mollusks, crustaceans, and fish.

3.2.4.3 Red Snapper

Red snapper (*Lutjanus campechanus*) is a schooling species found throughout the Gulf. It prefers rocky and hard substrates around reefs and other submerged objects in waters depths of 65-650 ft

(20 to 200 m) and inhabits the lower water column. Juveniles inhabit inland, coastal, and offshore waters on sandy substrates. Adults reproduce in offshore waters from June to October. They can tolerate salinities from 18,000 to 40,000 mg/L. They are benthic carnivores preferring annelids, mollusks, crustaceans, other invertebrates, and some fish as sources of food. Juveniles have a similar diet, but also feed on zooplankton (NOAA, 1985).

3.2.4.4 Spotted Seatrout

Spotted seatrout (*Cynoscion nebulosus*) is a demersal, estuarine species that inhabits Gulf waters up to 20 m in depth and is often associated with sand flats, seagrass beds, salt marshes, and tidal pools of higher salinity. Juveniles use the heavily vegetated areas of estuaries as nursery grounds (NOAA, 1985). They are carnivores at the top of the food chain in estuaries, preying on fish, shrimp, and other invertebrates.

3.2.4.5 King Mackerel

King mackerel (*Scomberomorus cavalla*) is found throughout the Gulf in the area between the shoreline and the 650-foot (200-m) contour. They are also found in the western Atlantic from New England to Rio de Janeiro, Brazil. Their prey includes fish throughout the water column, including herrings, jacks, and drums, and sometimes shrimp and squid (NOAA, 1985). In spring, the king mackerel migrates from southern Florida to the northern Gulf and returns to southern Florida during the cooler months. When fish are young, they exhibit schooling behavior. The adults are often found singly around structures such as oil rigs (NOAA, 1985).

3.2.4.6 Red Drum

Red drum (*Sciaenops ocellatus*) is a demersal fish found in estuaries and nearshore waters to depths of 130 ft (40 m). Its preferred substrates include sand, mud, and oyster reefs (NOAA, 1985). It feeds on organisms that occur on or near the bottom such as crab, shrimp, mollusk, and other invertebrates and small fish. Very young fish eat copepods, amphipods, and shrimp (NOAA, 1985). Generally, red drum move inshore in the spring and offshore in the fall. They prefer deeper water in colder weather. Red drum usually stay within the same bay system. They are often sighted in the Gulf in large schools (NOAA, 1985).

3.2.4.7 Atlantic Croaker

Atlantic croaker (*Micropogonias undulatus*) is an estuarine-dependent, demersal fish that is common throughout the Gulf. It is usually found over mud and sand/mud bottoms in coastal waters to depths of 400 ft (120 m) (NOAA, 1985). Adults are opportunistic carnivores. Larvae eat zooplankton. Juveniles begin by feeding on microbenthos, progressing to detritus and then as adults feed on crustaceans, mollusks, and fish (NOAA, 1985).

3.2.4.8 Sand Seatrout

The sand seatrout (*Cynoscion arenarius*) is a demersal fish found in the coastal and shelf waters in the Gulf of Mexico. It is one of the most abundant fish in the estuaries and shelf waters of the Gulf. The sand seatrout commonly inhabits sandy and muddy bottoms out to the edge of the continental shelf (NOAA, 1985).

3.2.4.9 Sea Catfish

Sea catfish (*Ariopsis*) are opportunistic feeders whose diet includes seagrass, corals, sea cucumbers, gastropods, polychaetes, crustaceans, and human garbage (Muncy and Wingo, 1983). They prefer sand flats and organic substrates and their preferred depth is temperature-dependant.

3.2.4.10 Atlantic Bluefin Tuna

Atlantic bluefin tuna (*Thunnus thynnus*) are among the most valuable fish in global markets. The International Commission for the Conservation of Atlantic Tunas (ICCAT) currently manages the Atlantic bluefin tuna as two distinct populations, with western Atlantic spawners of the Gulf of Mexico forming a distinct population genetically from the eastern spawners of the Mediterranean Sea. The western Atlantic stock has suffered a significant decline in spawning stock biomass since 1950, and a 20-year rebuilding plan has failed to revive the population or the North American fishery (Teo, 2010). Spawning in the Gulf of Mexico occurs between mid-April and mid-June when females, which mature around age 8, release approximately 30 million eggs each. The highest density of bluefin larvae, the primary indicator of spawning, occurs in the northern Gulf of Mexico with lesser larval concentrations appearing off the Texas coast and in the Straits of Florida (MarineBio Conservation Society, 2011).

3.2.5 Non-Endangered Marine Mammals

Twenty-nine species of marine mammals occur in the Gulf (MMS, 2007). The Gulf's marine mammals are represented by members of the taxonomic order Cetacea, divided into the suborders Mysticeti (i.e., baleen whales), Odontoceti (i.e., toothed whales), and the order Sirenia, which includes the manatee and dugong. Within the Gulf, there are 28 species of cetaceans (7 mysticete and 21 odontocete species) and 1 sirenian species, the manatee (MMS, 2007). Table 3-5 provides the estimated abundances of surveyed cetaceans in the Gulf.

Few marine mammals commonly occur in the inshore waters. Within the study area, only the West Indian Manatee, right and sperm whales, and bottlenose and striped dolphin are regularly observed (MMS, 1983 and Fritts et al., 1983). Bottlenose dolphin are notably the most common, occurring in bays, inland waterways, ship channels, and nearshore waters.

The cetaceans found in the Gulf include species that occur in most major oceans and which, for the most part, are eurythermic (Schmidly 1981). These include the sei, fin, blue, humpback, sperm, goosebeaked, false killer, killer, grampus, and saddleback whales; and the Atlantic bottlenose and striped dolphin. Nine cetaceans may be considered warm-stenotherms with distributions centered in tropical warm-temperature waters (Schmidly, 1981). These are the Bryde's, pygmy sperm, dwarf sperm, Blainville's beaked, pygmy killer, and short-finned pilot whales and the rough-toothed, bridled, and spinner dolphins. The right and minke whales have distinct bipolar distributions and are regarded as cold-stenothermal (Schmidly, 1981).

Table 3-5. Estimated Abundance of Surveyed Cetaceans in the Northern Gulf of Mexico Oceanic Waters

Species	Common Name	Estimated Number of Individuals
Balaenoptera edeni	Bryde's whale	40
Physeter macrocephalus	Sperm whale	1,349
Kogia spp.	Dwarf or pygmy sperm whale	742
Ziphius cavirostris	Cuvier's beaked whale	95
Unidentified ziphiid	Unidentified beaked whales	146
Feresa attenuata	Pygmy killer whale	408
Pseudorca crassidens	False killer whale	1,038
Orcinus orca	Killer whale	133
Globicephala sp.	Pilot whale	2,388
Peponocephala electra	Melonheaded whale	3,451
Grampus griseus	Risso's dolphin	2,169
Tursiops truncatus	Bottlenose dolphin	27,559
Steno bredanensis	Rough-toothed dolphin	2,223
Lagenodelphis hosei	Fraser's dolphin	726
Stenella frontalis	Atlantic spotted dolphin	30,947
Stenella longirostris	Spinner dolphin	11,971
Stenella attenuate	Pantropical spotted dolphin	91,321
Stenella clymene	Clymene dolphin	17,355
Stenella coeruleoalba	Striped dolphin	6,505

Source: Waring et al., 2004 as cited in MMS, 2007.

3.2.6 Endangered Species

There are 14 federally endangered or threatened species that occur in the Gulf of Mexico: two birds, five reptiles, one fish, and seven marine mammals. Table 3-6 provides an overview of the federally-listed species, vulnerability, and status. Figures 3-1, 3-2, 3-3 and 3-4 show the ranges of Gulf sturgeon, piping plover and whooping crane, sea turtles and West Indian manatee, and whales, respectively. Subsequent discussions of these federally listed species and relative state listed species follow.

Table 3-6. Federally Listed Endangered/Threatened Species Overview

Common Name	Scientific Name	Global Status	Federal Status	State Status
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	G3-Vulnerable	Threatened	Not listed
Found throughout the Gulf of Mexico. Gulf sturgeon numbers declined due to overfishing throughout most of the 20th century. The decline was exacerbated by habitat loss from the construction of water control structures, such as dams and sills, mostly after 1950. In several rivers throughout the range, dams have severely restricted sturgeon access to historic migration routes and spawning areas. Threats and potential threats include habitat modifications associated with dredged material disposal, removal of trees and roots, and other navigation maintenance activities; incidental take by commercial fishermen; poor water quality from contamination by pesticides, heavy metals, and industrial chemicals; aquaculture and incidental or accidental introductions; and the Gulf sturgeon's slow growth and late maturation (USFWS 2003).				

Table 3-6. Federally Listed Endangered/Threatened Species Overview

Common Name	Scientific Name	Global Status	Federal Status	State Status
Piping plover	*Charadrius melodus*	G3-Vulnerable	Threatened	Threatened
Winter along Gulf Coast beaches from Florida to Mexico, and Atlantic coast from Florida to North Carolina. The Texas coast has had at most 1,900 wintering individuals. Strong threats related primarily to human activity; disturbance by humans, predation, and development pressure are pervasive threats. Current favorable population trends depend on intensive management. Primary threats are destruction and degradation of summer and winter habitat, shoreline erosion, human disturbance of nesting and foraging birds, and predation (Burger, 1993).				
Whooping crane	*Grus americana*	G1-Critically imperiled	Endangered	Endangered
One self-sustaining population nests in Canada, winters primarily along the Texas coast; wild population in 2006 was 338 with about 215 individuals in the only self-sustaining Aransas-Wood Buffalo National Park population that nests in Wood Buffalo National Park and adjacent areas in Canada and winters in coastal marshes in Texas. Criitical habitat designated in Texas includes Aransas, Calhoun, and Refugio Counties. Main factors affecting the populations of whooping crane along the Gulf coast are insecticides, nest disturbance, and habitat loss related to onshore recreation and shore-front development. Current threats to wild cranes include collisions with manmade objects such as power lines and fences, accidental shooting, predators (especially predation of flightless chicks), specimen collection, human disturbance, disease and both West Nile virus and H5N1 avian influenza virus, habitat destruction and contamination, severe weather (drought), and a loss of two-thirds of the original genetic material. (CWS and USFWS, 2007)				
Green sea turtle	*Chelonia mydas*	G3-Vulnerable	Threatened	Threatened
Distributed worldwide in warm oceans; exploited heavily for meat and eggs and as a component of other products; nesting and feeding habitats are being destroyed/degraded by pollution and development; large decline over the long term, more recently possibly stable or increasing in some areas. In Texas, range throughout the Gulf of Mexico; an occasional visitor to the Texas coast. Major threats include degradation of nesting habitat, including beach lighting, human predation on nesting females and foraging turtles (e.g., for meat and use in commercial products); collection of eggs for human consumption; predation on eggs and hatchlings; mortality in fishing gear and other debris; collisions with boats; contact with chemical pollutants; and epidemic outbreaks of fibropapilloma or "tumor" infections (Mitchell, 1991, Ehrhart and Witherington, 1992, Tuato`o-Bartley et al., 1993, Losey et al., 1994, Barrett, 1996, NMFS and USFWS, 2007).				
Hawksbill sea turtle	*Eretmochelys imbricata*	G3-Vulnerable	Endangered	Endangered
Widely distributed in tropical and subtropical seas, but due to heavy exploitation much less abundant than in the past, and likely declining; at least 20,000 females nest each year; nesting locations have been reduced due to beach development and disturbance. In Texas, range throughout the Gulf of Mexico - an occasional visitor to the Texas coast. Greatest threat is harvest for commercial (e.g., tortoiseshell trade) and subsistence (meat, eggs,) purposes (NMFS and USFWS, 2007).				
Leatherback sea turtle	*Dermochelys coriacea*	G2-Imperiled	Endangered	Endangered
Oceanic distribution is nearly worldwide, but there are few nesting sites; many nesting areas have few breeding females and suffer from human predation; range and number of occurrences have undergone reduction; recent severe population declines at some nesting locations. A rare visitor to the Texas coast. Major threats include egg collecting and mortality associated with bycatch in longline, trawl, and gillnet fisheries throughout the range (Spotila et al. 2000, Ferraroli et al. 2004, Lewison et al. 2004). Other concerns include harvest of adult females at nest beaches for meat and oil, nesting habitat loss, pollution, and adult ingestion of floating plastics and trash (Lewison et al., 2004).				
Loggerhead turtle	*Caretta caretta*	G3-Vulnerable	Threatened	Threatened
Wide distribution and not uncommon in warm oceans and seas; many nesting sites are protected, though perhaps not adequately; subject to many threats that land conservation alone cannot solve. In Texas, range throughout the Gulf of Mexico - an occasional visitor to the Texas coast. Threatened through direct exploitation for food (including eggs) and curio materials, incidental take (chiefly by drowning in shrimp trawls), and by habitat degradation, including beach development, beachfront lighting (Peters and Verhoeven 1994, Salmon and Witherington 1995), ocean pollution (including marine debris, which may be ingested), and dredging (direct kills and injuries).				

Table 3-6. Federally Listed Endangered/Threatened Species Overview

Common Name	Scientific Name	Global Status	Federal Status	State Status
Kemp's ridley sea turtle	*Lepidochelys kempii*	G1-Critically imperiled	Endangered	Endangered
Range centered in Gulf of Mexico; only one major nesting area, along Gulf Coast of Tamaulipas, Mexico; population includes 7,000-8,000 adult females and is increasing; May be found throughout Gulf of Mexico but nesting limited to southern Texas. Major threats include degradation of beach and coastal marine/estuarine habitats and mortality in commercial fisheries; vulnerable to oil spills. Present significant threats: beach and coastal development; various coastal marine habitat degradation (e.g., bottom trawling and dredging of inshore and nearshore areas); mortality in shrimp nets and other fishing; boat collisions; oil spills and exposure to other contaminants; and entanglement and ingestion of marine debris (especially plastics) (Thompson, 1990; CSTC, 1990; USFWS, 1992, 1998; NMFS and USFWS, 2007).				
West Indian manatee	*Trichechus manatus*	G2-Imperiled	Endangered	Endangered
Small range in coastal areas from the southeastern U.S. to northeastern South America; extremely rare in Texas; population size probably not much larger than a few thousand adults; high mortality rate, often a result of boat collisions and hunting; threat from boat collisions is increasing despite improved regulations; low reproductive rate; population stable or possibly increasing in Florida and Puerto Rico, but a good estimate of the population in Florida is now several years old, status and trend poorly known elsewhere. Threats include habitat loss and degradation, and mortality from boat collisions, hunting, fishing, red tide poisoning, entrapment in water control structures, entanglement in fishing gear, and exposure to cold temperatures.				
Right whale	*Eubalaena glacialis*	G1-Critically imperiled	Endangered	Not listed
Remnant populations occur in the North Atlantic; extremely low numbers; populations have failed to increase significantly even with protection; threats include collisions with boats, entanglement in fishing gear, disturbance by human activity, and general environmental deterioration. Initial large decline due primarily to hunting that occurred through the mid-1930s. Lack of population recovery has been attributed to mortality caused by collisions with ships and entanglement in fishing gear, degradation of feeding habitat (e.g., through effects of pollution on zooplankton), human disturbance (ships) (Right Whale Recovery Team, 1990).				
Blue whale	*Balaenoptera musculus*	G3-Vulnerable	Endangered	Not listed
Large range in the Pacific, Atlantic, and southern oceans; low population numbers, far below historical levels, due to whaling; current population more than 10,000, with some populations increasing. Today the species may be negatively affected by food-chain alterations resulting from commercial fishing/whaling (J. Barlow, pers. comm., 1995). There is concern among some biologists that underwater sound waves, such as those to be transmitted as part of the Acoustic Thermometry of Ocean Climate project (see Schmidt, 1994, Science 264:339-340), may detrimentally impact marine mammals; all agree that more information is needed on the impact of noise on marine mammals.				
Fin whale	*Balaenoptera physalus*	G3-Vulnerable	Endangered	Endangered
Widespread in Atlantic, Pacific, Indian, and Southern oceans; populations were greatly reduced by historical commercial whaling. Rare in Texas – only one confirmed record from 1951. Populations in all oceans were greatly reduced by historical commercial whaling. Threatened by heavy metal pollution from dumped waste in the Mediterranean. Human exploitation of euphausiids in the southern ocean is a potential threat.				
Sei whale	*Balaenoptera borealis*	G3-Vulnerable	Endangered	Not listed
Widespread but relatively rare throughout the world's oceans; difficult to protect due to migratory existence. Populations in all oceans have been depleted by overexploitation				
Humpback whale	*Megaptera novaeangliae*	G4-Apparently secure	Endangered	Endangered
Large worldwide range extends throughout all oceans; depleted by past overharvesting; population size now exceeds 60,000 and has increased over the past several decades; vulnerable to marine pollution, disturbance by boat traffic, and entanglement in fishing gear, but these are not major threats, and the species is now apparently secure. Historically, populations were greatly reduced by commercial whaling. Humpback whales have been protected from commercial whaling worldwide since 1966, and there have been few catches since 1968 (Reilly et al. 2008). The species remains vulnerable to marine pollution, disturbance by boat traffic, mortality from boat collisions, and entanglement in fishing gear (Volgenau et al., 1995 Todd et al., 1996, Mazzuca et al., 1998), but these factors currently are not significantly interfering with population recovery.				

Table 3-6. Federally Listed Endangered/Threatened Species Overview

Common Name	Scientific Name	Global Status	Federal Status	State Status
Sperm whale	*Physeter macrocephalus*	G3-Vulnerable	Endangered	Not listed
Occurs widely in all oceans; protected by international and national regulations; total population is large (several hundred thousand) but trend is difficult to determine; threatened by general deterioration of marine ecosystem. Historically hunted for spermaceti, ambergris, and oil. No longer threatened by direct catching, but entanglement in fishing gear may cause mortality in some areas. Potentially threatened by ocean pollution and ingestion of plastics. Since the introduction of fast ferries into the Canary Islands in 1999, significant increases in collisions fatal to whales, mainly sperm whales, have been observed (Tregenza et al., 2004).				

Sources: Texas Parks and Wildlife Department (http://www.tpwd.state.tx.us/huntwild/wild/species/endang/) FWS, Southwest Region Ecological Services (http://www.fws.gov/southwest/es/) NatureServe, NatureServe Explorer (http://www.natureserve.org/explorer/)

Figure 3-1. Range of Gulf sturgeon.

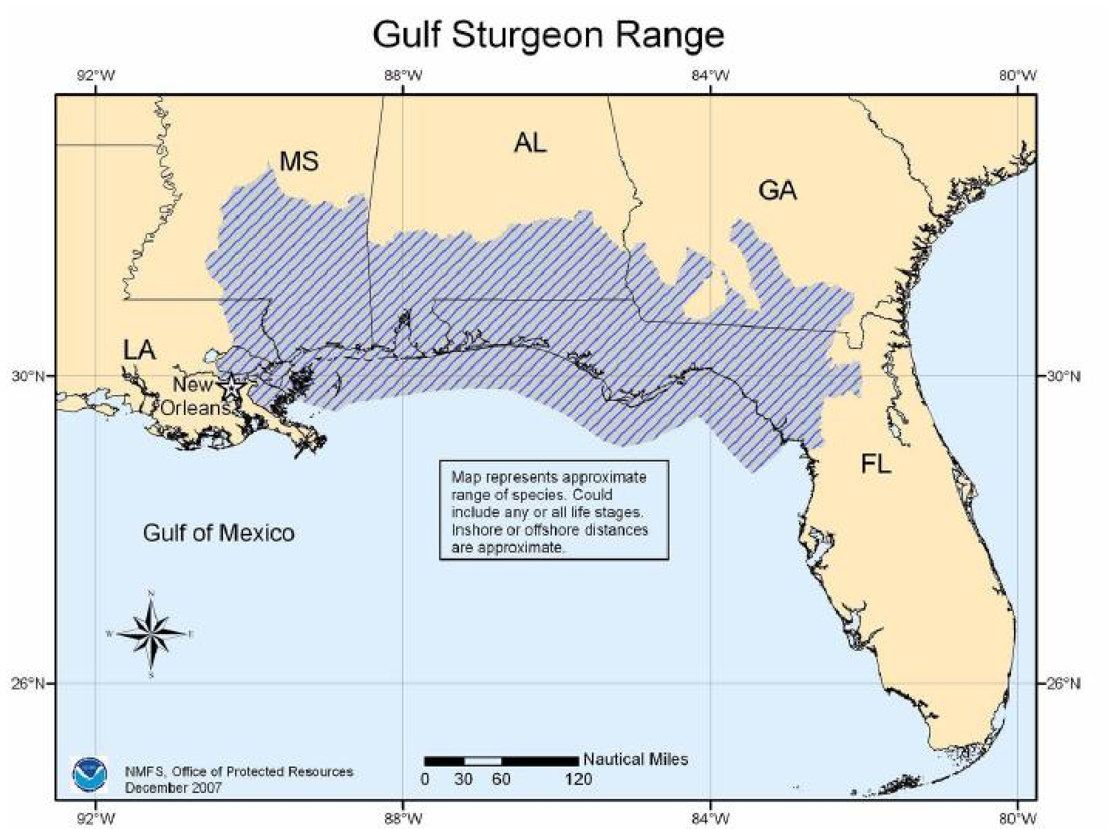
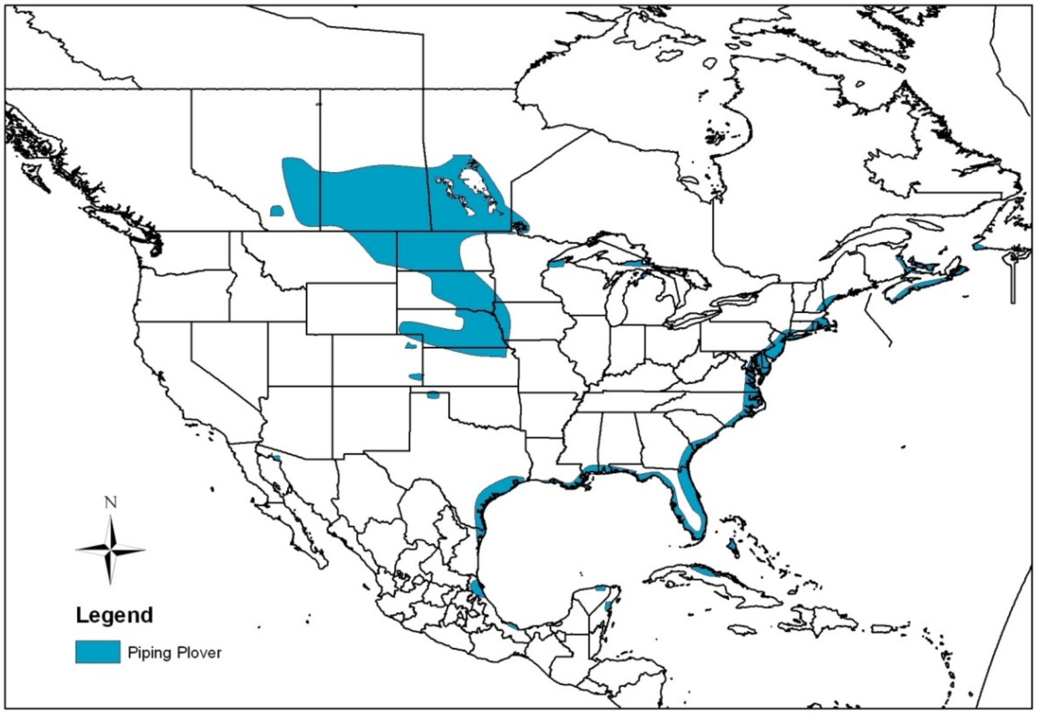


Figure 3-2. Range of Piping Plover and Whooping Crane

Piping Plover - North American distribution



Whooping Crane - North American distribution

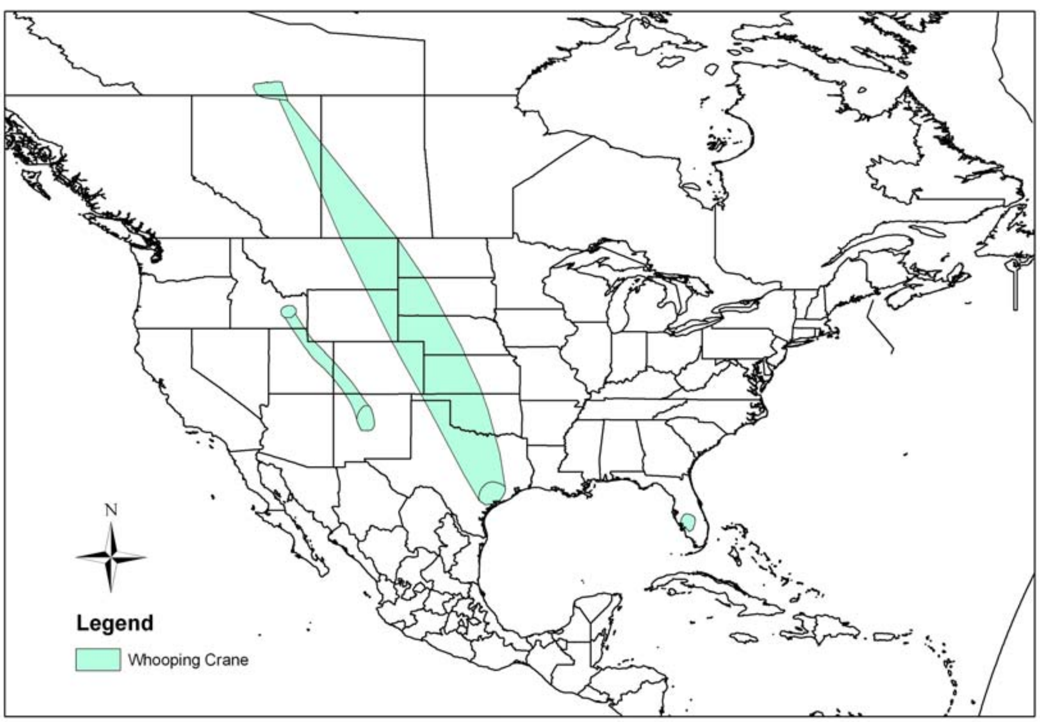
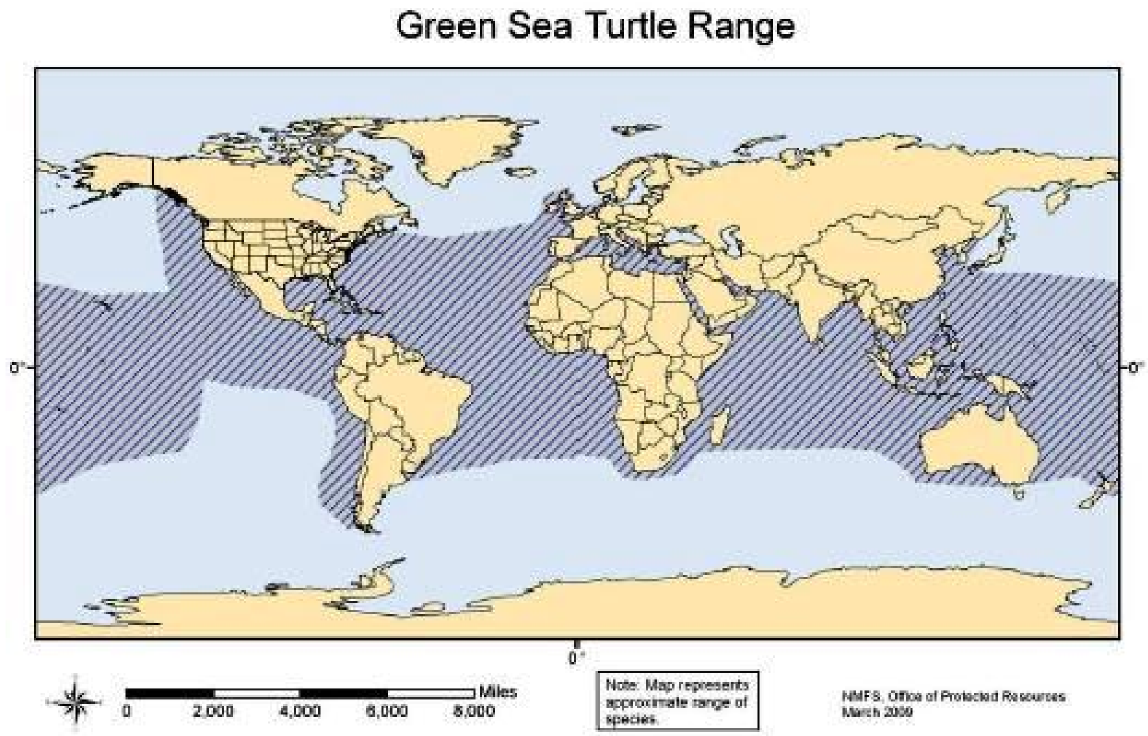


Figure 3-3. Ranges of Sea Turtles and West Indian Manatee



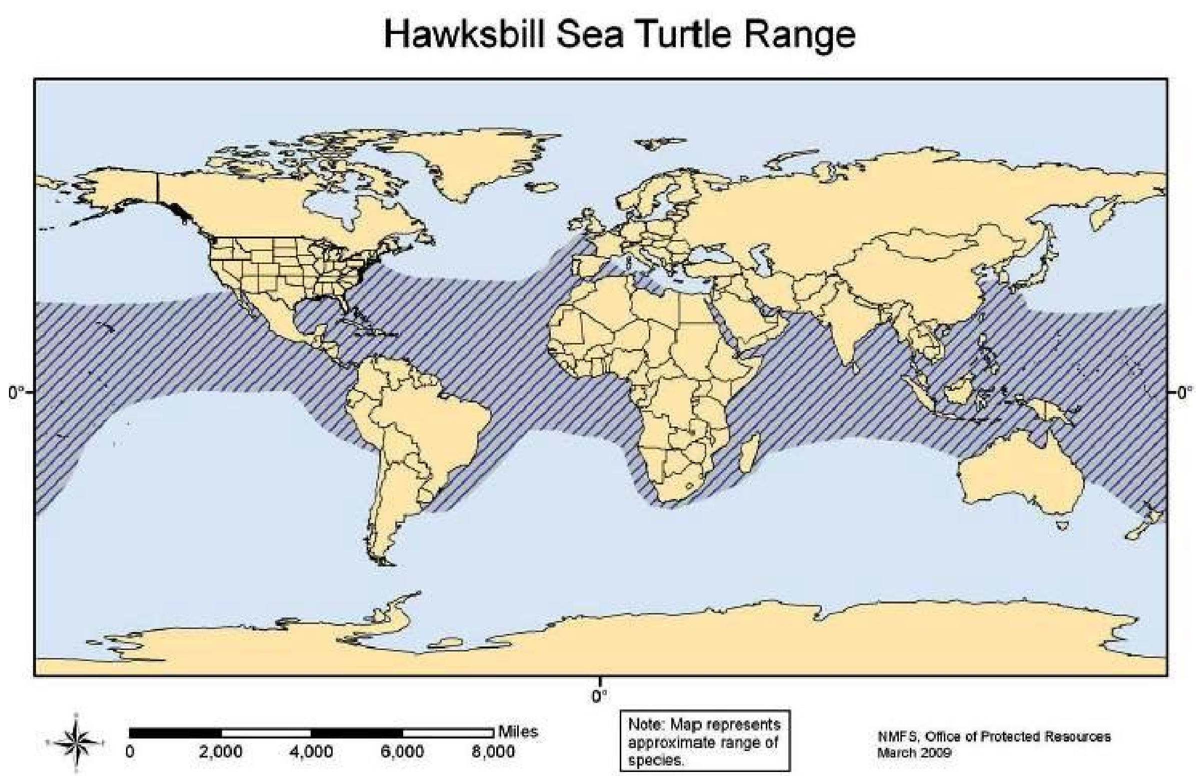
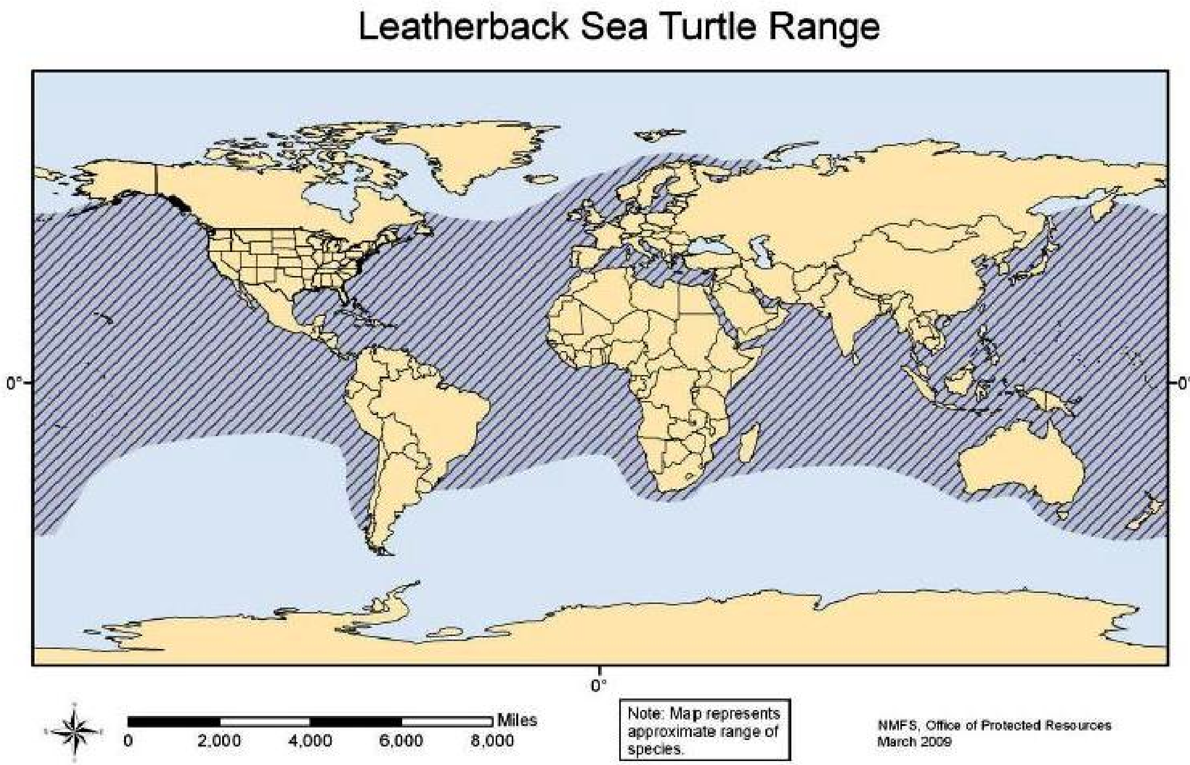


Figure 3-3. Ranges of Sea Turtles and West Indian Manatee (continued)



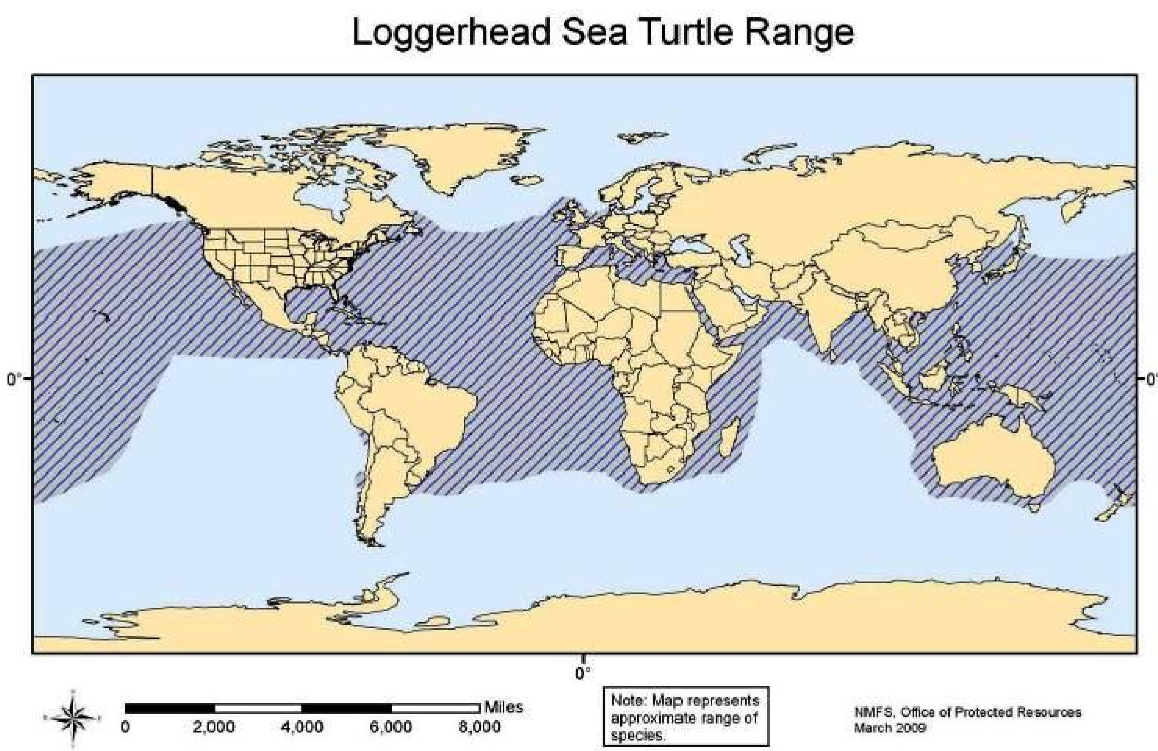
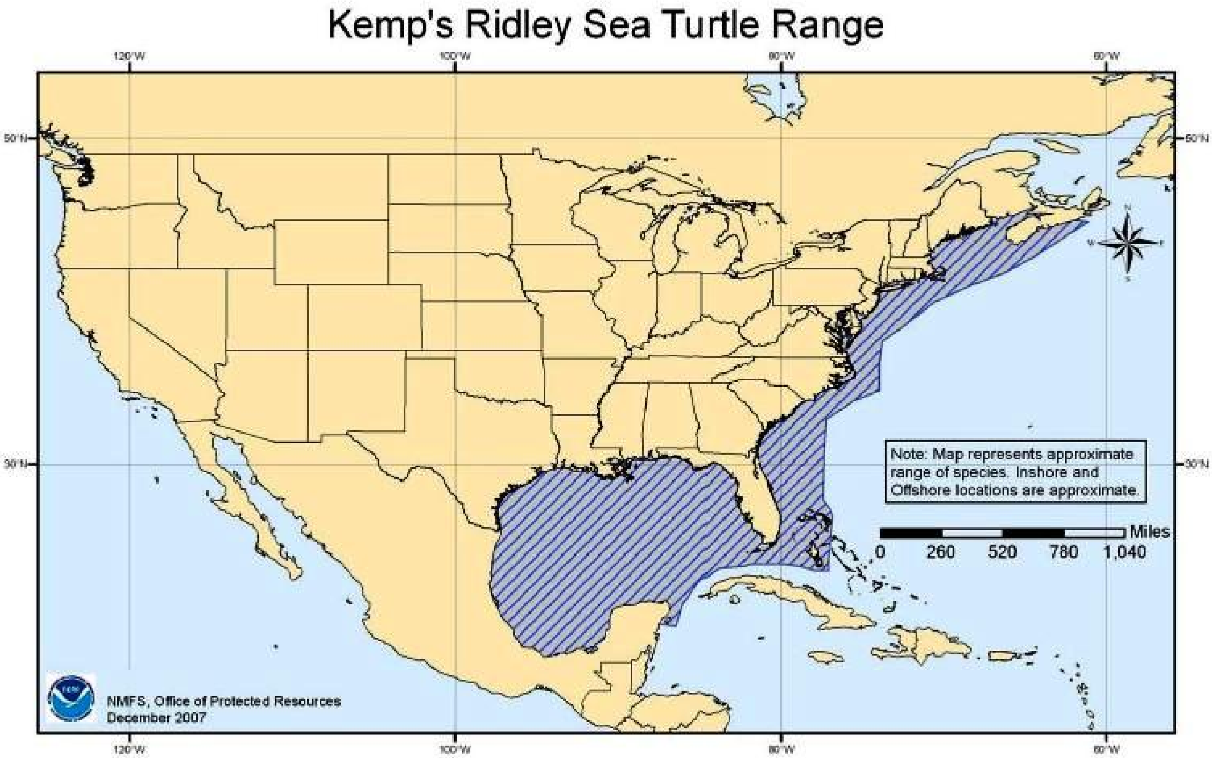


Figure 3-3. Ranges of Sea Turtles and West Indian Manatee (continued)



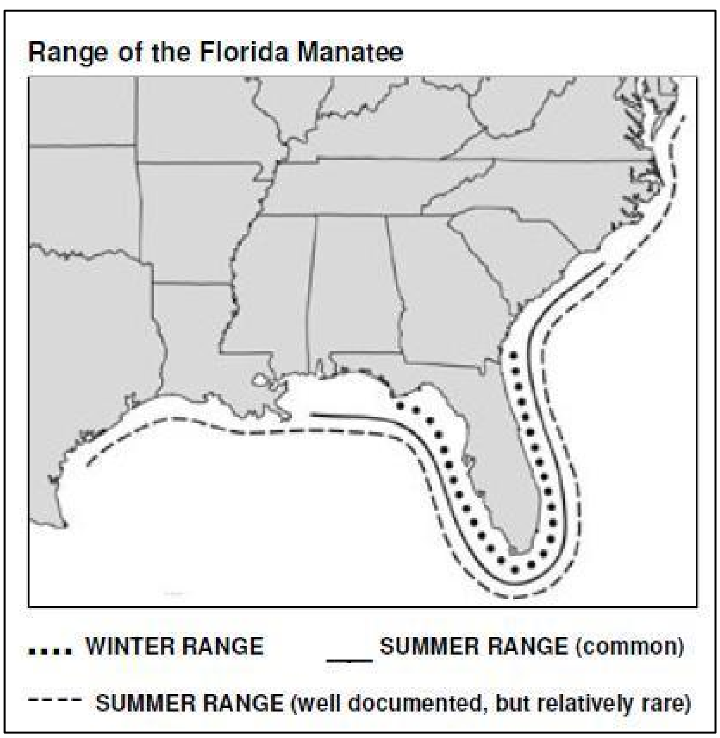
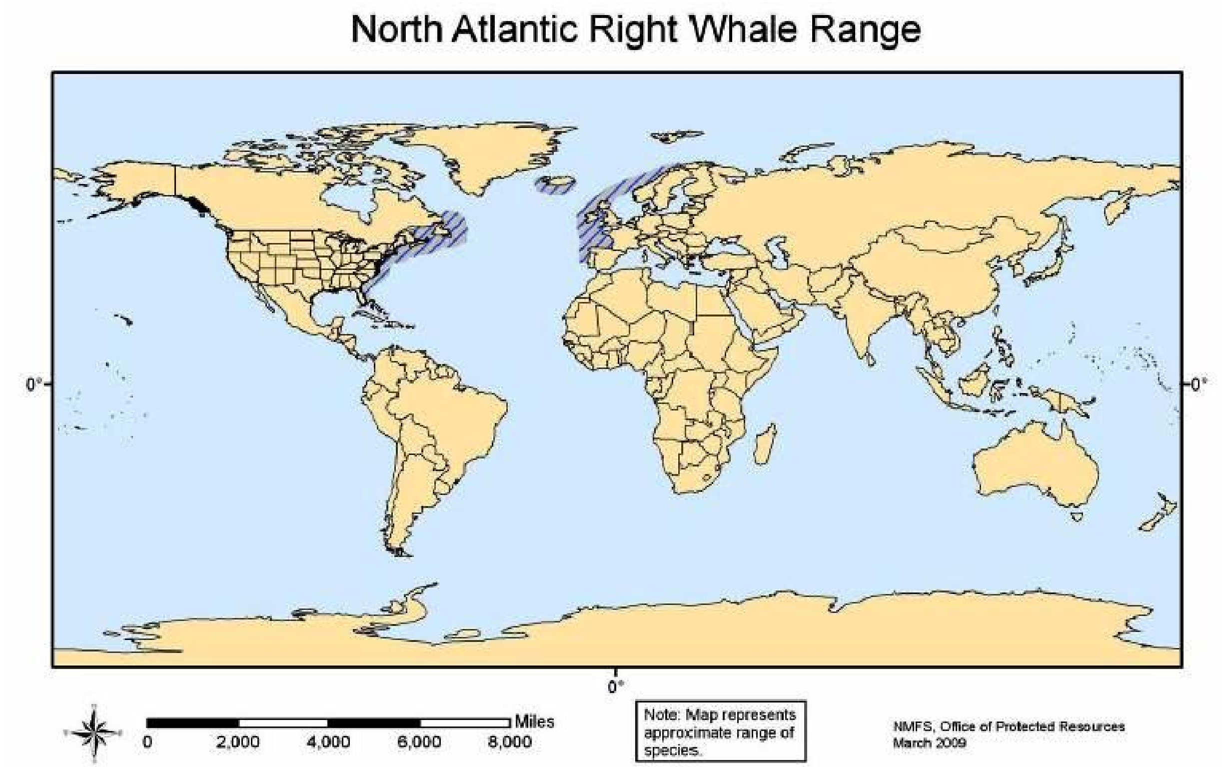


Figure 3-4. Ranges of Whales



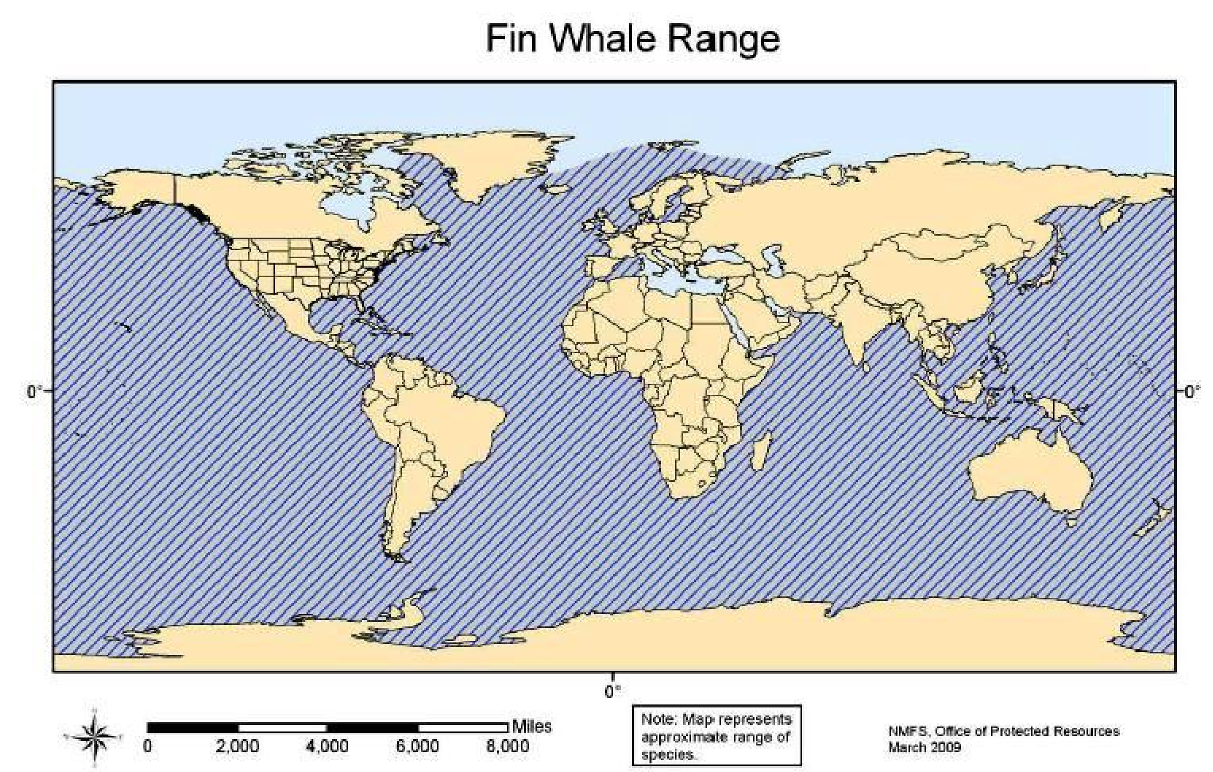
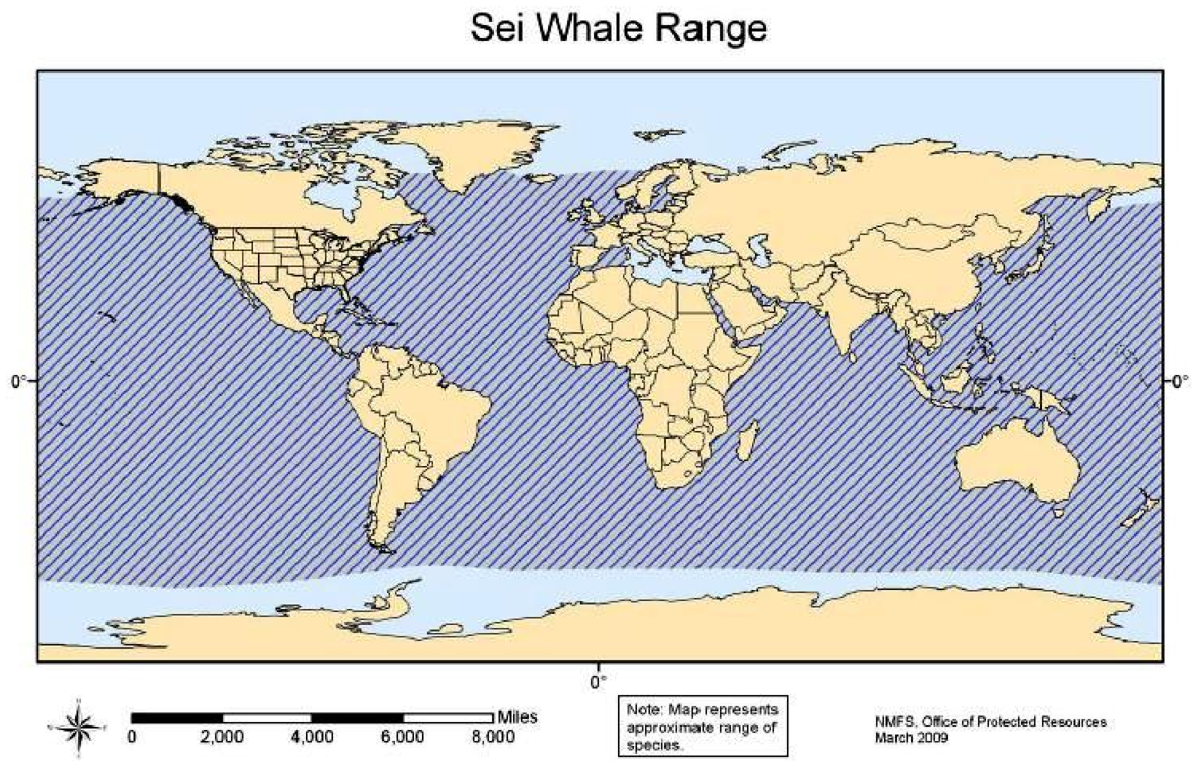
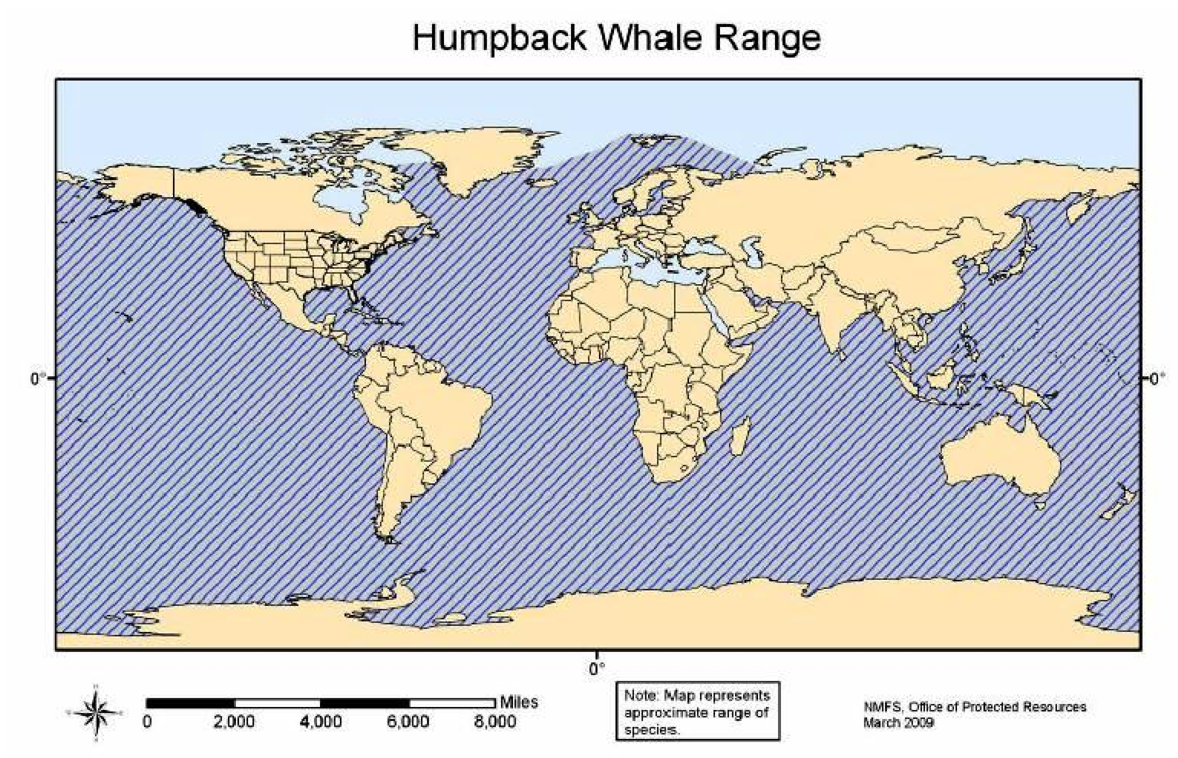


Figure 3-4. Ranges of Whales (continued)





3.2.6.1 Federally Listed Fish

Gulf Sturgeon. The Gulf sturgeon (*Acipenseroxyrinchus oxyrhynchus) desotoi*), also known as the Gulf of Mexico sturgeon, is an anadromous fish (breeding in freshwater after migrating up rivers from marine and estuarine environments), inhabiting coastal rivers from Louisiana to Florida during the warmer months and overwintering in estuaries, bays, and the Gulf of Mexico (USFWS, 2003). Adult gulf sturgeons usually spend approximately three quarters of the year in rivers and one quarter (cooler months) in estuaries or Gulf of Mexico waters. Younger gulf sturgeons do not tend to migrate to open waters of the Gulf, but remain in riverine and estuarine environments. Adults range from 1.2 to 2.4 m (4 to 8 ft) in length, with adult females larger than males. The Pearl and Bogue Chitto Rivers in Louisiana and Mississippi are the most western reaches of its range (MMS, 2007), which extends east to the Suwannee River in Florida. Sporadic occurrences have been recorded as far west as the Rio Grande River between Texas and Mexico, and as far east and south as Florida Bay (USFWS, 2003).

3.2.6.2 Federally Listed Birds

Piping Plover. The piping plover (*Charadrius melodus*) is federally-listed as threatened and also listed as threatened in Texas. The estimated world population is 4,000 birds. The piping plover frequents unvegetated open sand areas where it feeds mainly on surface and infaunal invertebrates. The extensive sand flats of Laguna Madre, along the south Texas coast, and other barrier islands are important habitats. During winter, piping plovers inhabit beaches, sandflats, and dunes from North Carolina to Mexico. Loss of appropriate beaches and other littoral habitats is due to the increasing pressure of recreation, coastal development, and dune stabilization. Their preferred breeding habitat is often disturbed by humans (USFWS, 1990). The Gulf population of piping plovers, as of 1988, was 323 birds.

Whooping Crane. The whooping crane (Grus americana) is listed as endangered at both the federal and state level, with critical habitat designated in Aransas, Calhoun, and Refugio Counties. This aquatic-dependent species inhabits marshes, river bottoms, potholes, prairies, and crop land. Wintering whooping cranes occur in South Texas in marshes, tidal flats, uplands, and barrier islands. Migrating whooping cranes feed primarily in crop lands and roost in marshy wetlands. When migrating, the whooping crane's diet includes small grains in agricultural fields, green foliage, aquatic plants, insects, crustaceans, and small vertebrate animals. During the summer months, whooping cranes feed on insects, frogs, rodents, small birds, minnows, and berries. During the winter, this species eats primarily animal foods, such as blue crabs and clams. Primary threats to the whooping crane include destruction of wintering and breeding habitats, collision with power lines and fences, shooting, specimen collection, and human disturbance. Indirect threats adversely affecting this species are contamination of its food supply or affecting the food supply availability. The whooping crane does not rely on aquatic organisms as its primary source of food in inland areas

3.2.6.3 Other Birds

Brown Pelican. The brown pelican (*Pelecanus occidentalis*) is a species of colonial bird that nests on small coastal islands in salt and brackish waters. They are rarely found more than 20 miles from land. Their diet consists primarily of fish, including menhaden, mullet, sardines, and pinfish. On the Gulf Coast, the species is found in Florida, Alabama, Louisiana, Texas, Mississippi, and Mexico. U.S. populations appear to be steady or increasing, with Gulf Coast populations increasing steadily (NatureServe, 2011). Historical decline of the brown pelican is attributed to their ingestion of pesticides (USFWS, 1991). They are also highly susceptible to abandoning their nests once disturbed (USFWS, 1991). In Texas today, the major threats to the continued recovery of the Brown Pelican appear to be human disturbance and loss of nesting habitat.

The brown pelican was federally delisted, due to recovery, in 2009 (74 FR 59444-59472, 2009) however it is still listed as endangered in Texas. Similar to other birds of interest in the Gulf region (see Section 3.2.6.2 above), the principal theats to the brown pelican today are associated with upland and human-induced habitat and nest disturbance. Additionally, EPA does not expect any significant insecticide use on offshore platforms which could threaten brown pelicans, and there is none associated with the authorized discharges that EPA is proposing under this proposed general permit action.

Least Tern. The least tern (*Sterna antillarum*) is the smallest North American tern. Adults average 8 to 10 inches in length, with a 20 inch wingspan. Three subspecies of terns are identified, being identical in appearance and segregated on the basis of separate breeding ranges. The Eastern or Coastal Least Tern (*Sterna antillarum antillarum*) breeds along the Atlantic coast from Maine to Florida and west along the Gulf coast to south Texas. The California Least Tern (*Sterna antillarum browni*) breeds along the Pacific coast from central California to southern Baja California,but is not known in Texas. The Interior Least Tern (*Sterna antillarum athalassos*) breeds inland along the Missouri,Mississippi, Colorado,Arkansas, Red, and Rio Grande River systems.

The Eastern or Coastal Least Tern is not federally listed as endangered or threatened or the state of Texas. The Interior Least Tern is listed as both federally and state endangered, except within 50 mi of the coast (50 FR 21784-21792, 1985). Therefore, the area covered by the proposed permit would not involve areas associated with the endangered interior least tern. Furthermore, the threats to this subspecies are generally associated with inland channelization of rivers, irrigation projects, and construction of reservoirs which adversely impact nesting habitat, actions not associated with activities under the proposed general permit.

Bald Eagle. The bald eagle (*Haliaeetus leucocephalus*) is a large raptor with a body up to 3 ft (1 m) in length and a wingspread of about 7 feet (2 m). Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories and with increasing frequency on human-made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water where the eagles usually forage. Shoreline trees or snags located near reservoirs provide the visibility and accessibility needed to locate aquatic prey.

After recovering from near extinction due to the use of DDT and other pesticides in the 1940s, the bald eagle was delisted from the federal endangered species list on August 9, 2007. In Texas, the bald eagle continues to be listed as a threatened species. Bald eagles are present year-round throughout Texas as spring and fall migrants, breeders, or winter residents. The bald eagle population in Texas is divided into two populations; breeding birds and nonbreeding or wintering birds. Breeding populations occur primarily in the eastern half of the state and along coastal counties from Rockport to Houston. Nonbreeding or wintering populations are located primarily in the Panhandle, Central, and East Texas, and in other areas of suitable habitat throughout the state.

Subsequent to the ban on DDT, threats to bald eagles are now primarily related to loss of habitat and human disturbance. While natural habitat loss has occurred at a steady rate due to human development, increased construction of large reservoirs in eastern Texas has expanded suitable bald eagle habitat. Additionally, offshore oil and gas production associated with the proposed permit would not disturb eagle nesting areas and the limited offshore use of insecticides would not threaten bald eagles.

3.2.6.3 Reptiles

Green Sea Turtle. The green sea turtle (*Chelonia mydas*) is threatened in Texas. It is found throughout the world in tropical and semi-tropical waters. In Texas, green turtles were once an important commercial harvest (MMS, 1989). Ehrenfeld (1974) estimated that the total world population of sexually mature green turtles was no more than 100,000 to 400,000, while Caribbean stocks alone may have amounted to 50 million in the 17th century. Primary breeding grounds in North America are located on the southern Florida beaches. Approximately 375 green turtles nest in Florida, with 400 to 800 nests being reported each year. Nesting is primarily reported between May and August and occurs only on Florida beaches and along the Yucatan Peninsula (Rabalais, 1987).

Juvenile green turtles are common in the lagoons and bays along the Florida and Texas coasts. The upper west coast of Florida is a principal feeding ground. Observations indicate that they enter inlets during the summer months and feed on the copious supplies of turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrighti*), widgeon grass (*Ruppia maritima*), and other plant life, algae, and small invertebrates that exist in these locations (Raymond, 1985). Because breeding and nesting grounds tend to be far from forage areas, the green turtle frequently migrates very long distances, and tagged females rarely appear in the same nesting area twice. Adult green turtles are rarely sighted in the open waters of the Gulf of Mexico. Human threats include: oil spills, live bottom smothering with sediments and drilling fluids, dredging, coastal development, agricultural and industrial pollution, seagrass bed degradation, shrimp trawling and other fisheries, boat collisions, under water explosions, ingestion of marine debris, entanglement in marine debris, and poaching.

Hawksbill Sea Turtle. The hawksbill sea turtle (*Eretmochelys imbricata*) is a medium sized turtle averaging approximately 2.8 ft (0.85m) in curved carapace length with a weight of approximately 176 lbs (80 kg). This species can occur near all of the states on the Gulf of Mexico, and is sighted most often in Florida and Texas. Seventy seven sightings were reported along the Texas coast from 1972 to 1984. Nesting in the continental United States only occurs in southeastern Florida and the Florida Keys. The hawksbill sea turtle is endangered in Texas.

Hildebrand (1987) studied the movements of hawksbill hatchlings based on the pattern of the IXTOC oil spill, which occurred offshore from their nesting site. He concluded that they were propelled northward in warm months by their neonatal "swimming frenzy." During the colder months, they return south. Hildebrand surmised that the pelagic young use sargassum or *Trichodesmium* for cover at this time. At a later age, the hawksbill becomes a benthic feeder. It inhabits reefs, shallow coastal areas, rocky areas, and passes and is generally found in waters less than 20 m deep. The hawksbill is omnivorous: although it prefers sponge, its diet consists of algae, seagrasses, soft corals, crustaceans, mollusks, sponges, jellyfish, and sea urchins.

No reliable estimates are available on hawksbill populations, but their numbers appear to be decreasing due to habitat encroachment and destruction caused by man and natural disasters (Mager, 1985). Threats to this species include: poaching, oil spills, vessel anchoring and groundings, artificial lighting at nesting sites, mechanical beach cleaning, increased human presence, beach vehicular driving, entanglement at sea, ingestion of marine debris, commercial and recreational fisheries, water craft collisions, sedimentation and siltation, and agricultural and industrial pollution. The only state where stranded hawksbill turtles are frequently reported is Texas (MMS, 1989).

Leatherback Sea Turtle. The leatherback sea turtle (*Dermochelys coriacea*) is endangered in Texas. It is the largest of all of the sea turtles, with adults generally weighing 450 to 1,530 lbs (200-7600 kg) and having a carapace length of 4.5 to 6 ft (1.4-1.8 m). It is distinct from the other sea turtles in the Gulf with its main anatomical difference, as its name suggests, being the lack of a real shell, instead being covered by a thick, leather-like skin. The leatherback is the most oceanic of all sea turtles, being found in the Pacific, Atlantic, and Indian Oceans. It also ranges farther north than other turtles, as far as Labrador and Alaska. Males, juveniles, and hatchlings are sighted in the shallow waters of the Gulfs of Maine and Mexico. The leatherback's diet consists of tunicates and jellyfish. In the Gulf of Mexico, its primary prey is the jellyfish, *Stomalophus melagris* (Rabalais, 1987).

The number of nesting females is estimated to be as high as 120,000 (Pritchard, 1983) and as low as 70,000 (Mrosovsky, 1983) worldwide. In the Gulf of Mexico, nesting most often occurs along the coast of Mexico. Most of the females tagged while nesting are never seen again suggesting that nesting is not restricted to one preferred site (Hughes, 1982). Existing threats to this species include commercial shrimping, oil spills, and boat collisions.

Loggerhead Turtle. Loggerhead turtles are threatened in Texas. They are the most abundant of the marine turtles found in the Gulf of Mexico, concentrated primarily toward the Florida coast. Survival is threatened by habitat loss and drowning in shrimp trawls, and threats also include: beach erosion, beach armoring, artificial lighting, mechanical beach cleaning, recreational beach equipment and vehicles, non-native vegetation, poaching, dredging, pollution, marina and dock development, oil spills, oil development on live bottoms that disrupt or smother foraging grounds with sediments and drilling fluids, oil and tar discharged during pumping of bilges, underwater explosions, fisheries, ingestion of marine debris, and boat collisions.

Adult loggerhead turtles (*Caretta caretta*) average 250 lbs (115 kg) in weight and 3 ft (1 m) in carapace length. They tend to inhabit the continental shelf and estuaries in a range from Newfoundland to Argentina and concentrate nesting in the temperate zones and sub-tropics. Foraging areas for adult loggerheads include the Gulf of Mexico. Loggerhead turtles have been observed as far as 500 mi (800 km) out in open sea and in the bays and estuaries of Texas. Rabalais (1987) postulated that they migrate north each year with the shrimp fleet from the Rio Grande. Hildebrand (1987) confirmed that loggerheads and shrimp apparently have similar seasonal migration patterns. Their diet generally consists of gastropod and pelecypod molluscs and decapod crustaceans. Post hatchlings also consume macro-plankton and *Sargassum.*

An estimated 14,000 females nest in southeastern U.S. each year. Loggerheads nest on various barrier islands and beaches from the Florida Keys, west to the Chandeleur Islands off Louisiana (where most of the nesting occurs), and throughout coastal Texas, especially on North and South Padre Islands (MMS, 1989; MMS, 1990). Loggerheads will disperse to feeding grounds after nesting. Loggerheads are omnivorous, feeding on shellfish, crab, hermit crab, barnacles, oyster, conch, sponge, jellyfish, squid, sea urchin and sometimes fish, algae, and seaweed (NMFS, 1987).

Kemp's Ridley Sea Turtle. The Kemp's ridley sea turtle (*Lepidochelys kempii*) is endangered in Texas. It is among the smallest of the sea turtles. Adult turtles are generally less than 100 lbs (45 kg) with a straight carapace of approximately 2.1 ft (0.65 m) in length. Kemp's ridley turtles are known to range as far north as New England during the summer months. In the Gulf of Mexico, the species is found mainly in coastal areas. The Kemp's ridley has the most restricted range of the five turtle species found in the Gulf, with the greatest concentrations of mature Kemp's ridleys occurring in the shallow coastal areas of Louisiana and the Tabasco-Campeche area of Mexico (Raymond, 1985).

Only one key nesting area exists; an isolated stretch of beach no more than 15 miles long, in the Mexican state of Tamaulipas near the village of Rancho Nuevo. Only 300 to 350 females nest each year between April and June (Van Meter, 1990). Isolated females have nested on Padre Island National Seashore and other locations in the western Gulf. The Kemp's Ridley is the only sea turtle to nest routinely during daylight hours. Nesting occurs during periods of strong wind, possibly because the wind will cover the tracks and nest sites.

The diet of the Kemp's ridley sea turtle consists mostly of various species of crab (e.g., *Ovalipes, Callinectes*) but includes crustaceans, jellyfish, mollusks, fish, gastropods, and echinoderms. Hatchlings are omnivorous, becoming more carnivorous as they become larger and more mobile.

Population size estimates vary, but the Kemp's ridley adult population is generally estimated at less than 2,000 (USFWS, 1987b). Hunting both turtles and eggs contributed to the decline of this species. Existing threats include: development and encroachment of nesting beaches, erosion of beaches, vehicular traffic on beaches, fisheries, oil spills, floating debris, dredging, and explosive removal of old oil and gas platforms. Because of the alarming decline in the Kemp's ridley population, the Mexican Fisheries Department, FWS, NMFS, and the National Park Service cooperated in a 10-year program to establish nesting sites in the U.S., with eggs collected in Mexico and transported to artificial nests at Padre Island National Seashore (USFWS, 1990).

3.2.6.4 Marine Mammals

Five baleen whales (the northern right, blue, fin, sei, and humpback), one toothed whale (the sperm whale), and one sirenian (the West Indian manatee) occur in the Gulf and are listed as federally endangered. The sperm whale is common in oceanic waters of the northern Gulf and appears to be a resident species, while the baleen whales are considered rare or extralimital in the Gulf (MMS, 2007). The West Indian manatee (*Trichechus manatus*) typically inhabits only coastal marine, brackish, and freshwater areas (MMS, 2007). The sei, fin, and humpback whales are eurythermic and occur in most major oceans. The right whales have distinct bipolar distributions and are regarded as cold-stenothermal (Schmidly, 1981). The right, blue, fin, sei, and humpback, whales are baleen whales, whereas the sperm whale belongs to the odontocetes or "toothed" whale group.

West Indian Manatee. West Indian manatees *(Trichechus manatus)* have been sighted in Texas and is listed as endangered. It is a massive, thick skinned, aquatic mammal with paddle-like forelimbs, no hindlimbs, and a horizontally flattened tail. The diet of the manatee consists of submergent, emergent, and floating plants. The average length of a manatee is about 10 ft (3 m) and the average weight is 800-1220 lbs (360-540 kg) (Van Meter, 1989). Females may be bigger and heavier than males. The West Indian manatee is found only in the southeastern U.S., ranging only as far north as Charlotte Harbor on the west coast and Sebastian River on the east coast of Florida in the winter. They are sighted as far as Louisiana and Virginia in the summer (USFWS, 1989).

The exact number of West Indian manatees is unknown, but winter aerial surveys at warm-water refuges in 1985 counted a minimum of 800-1,200 animals (USFWS, 1989), of which 9 percent to 13 percent were calves (Van Meter, 1989). A dead manatee was recovered in Texas in 1986. Manatee sightings have become more frequent in Louisiana and less frequent in Texas. The manatees sighted in Texas are believed to be part of the Mexican population while the ones in Louisiana are part of the Florida population (Van Meter, 1990).

Many areas are designated as critical habitat for the manatee on the Gulf coast of Florida (USFWS, 1990). Decline of the manatee is attributed to overfishing of the species for its meat, oil, and leather. Currently, cold stress, calf mortality, and human disturbance also are threats to the manatee.

Right Whale. Right whales (*Eubaleana glacialis*) are endangered throughout the Gulf. In the western North Atlantic, there are estimated to be 70-350 individuals (NMFS, 1991); the population is unknown in the Gulf of Mexico. Observations of right whales in the Gulf consist of one in 1963 off Manatee County, Florida and two reported off Brazoria County, Texas in 1972 (MMS, 1990). The only other record of the right whale in the Gulf is a stranding in Texas (Mullin et al., 1991). Right whales feed by "skimming" at or below the surface for copepods and euphasids.

The northern right whale is a medium sized baleen whale with a length up to 56 ft (17 m) and weight up to 140,000 lbs (64 metric tons; Mt). Diet consists mainly of copepods and juvenile euphausiids (krill). Northern right whales generally have been observed from Greenland to the coast of Florida in the north Atlantic The northern right whale is thought to exist in the Gulf, although, there have been only two sightings since 1900. One of those sightings was off the coast of Florida, and the other sighting was a calf stranding on the Texas Coast.

The main reason for decline of this species is historic hunting. Existing human impacts to this species include: collisions with ships, entrapment or entanglement in fishing gear and habitat destruction such as dredging or sewer discharges. The species is thought to tend to avoid offshore oil and gas operations. The right whales also are in direct competition for space with humans and other species (NMFS, 1991).

Blue Whale. Blue whales are the largest of the whales and, in the North Atlantic, can grow to 90 ft (27 m) in length and weigh nearly 300,000 lbs (136 Mt). Krill is the main food of this species. They range from the subtropics to Baffin Bay and the Greenland Sea, but are rarely seen in continental shelf waters along the eastern coast of the United States. Blue whales have been known to occasionally stray into the Gulf of Mexico. The historic decline in this species is thought to be the result of hunting, which has since ceased. On-going human impacts include: collisions with ships, disturbance by vessels, entrapment and entanglement in fishing gear, acoustic and chemical pollution, and military operations.

Fin Whale. Fin whales (*Balaenoptera physalus*) are listed as endangered by NMFS. They occur from Greenland in the western North Atlantic, to the Gulf of Mexico and the Caribbean

(Leatherwood et al., 1976). Fin whales have been stranded in all regions of the Gulf and sightings are recorded in the Gulf throughout the year, suggesting a somewhat isolated population (Caldwell and Caldwell, 1973; Breiwick and Braham, 1984). During an eleven month aerial survey, a fin whale was sighted in the De Soto Canyon area in November 1989 (Mullin et al., 1991).

The fin whale is the second largest whale species, growing to more than 75 ft (23 m) in length and 150,000 lbs in weight. This species is found throughout the North Atlantic from the Gulf of Mexico northward to the edges of the polar ice cap and tend to occur over the continental shelf and slope in greater than 200 m of water. Fin whales migrate seasonally and feed in more northerly latitudes while fasting in southerly latitudes. The fin whale's diet consists of krill, squid, and small fish (Lowery, 1974) and feeding takes place mainly in the summer.

Like the other endangered whale species, the reason for decline of the finback whale is historic hunting. Existing human impacts include: collisions with ships, disturbance of vessels, entrapment and entanglement in fishing gear, habitat degradation, and military operations. Presently, hunting in the North Atlantic only occurs in Greenland. Under the International Whaling Commission's aboriginal subsistent whaling authorization, 20 whales are allowed to be taken each year.

Sei Whale. Sei whales (*Balaenoptera borealis*) occur in all oceans and are endangered. Sei whales are widely distributed in the nearshore and offshore waters of the western North Atlantic but are rare in tropical and polar areas. Like other whales, they tend to spend the summer in the northern latitudes and winter farther south. They prefer deep water and can be found over the continental slope, basins between banks, and submarine canyons. Sei whales do not normally enter semi-enclosed waters such as the Gulf of Mexico. However, there are recorded strandings along the northern coast of the Gulf of Mexico. During an eleven month aerial survey from July 1989 until June 1990, Mullin et al. (1991) may have sighted a sei whale in De Soto Canyon off the coast of Mississippi, although it is unclear whether it was a sei whale or a Bryde's whale. Two sei whales were reported off Plaquemines Parish, Louisiana in 1956 (MMS, 1990). Their preferred food consists of calanoid copepods and krill. In the North Atlantic, their diet consists primarily of copepods, although they take euphasids and small schooling fish. Major human impacts to the species include: collisions with ships, disturbance from vessels, entrapment and entanglement in fishing gear, and military operations.

Humpback Whale. The humpback whale (*Megaptera novaeangliae*) is a medium sized baleen whale. They have short, rotund bodies characterized by long flippers. The humpback whale grows in length up to 60 ft (18 m) and can weigh up 100,000 lbs (44 Mt). This species is known to occur in all ocean basins worldwide and it generally inhabits areas over the continental shelves, their slopes, and near some oceanic islands. Humpback whales are migratory, summering in higher latitudes and wintering in tropical or temperate latitudes). Feeding is thought to mainly occur in the more productive summer range. They are not thought to normally inhabit the Gulf of Mexico. Observations have been made in the Gulf off the Cuban coast in 1918, near Tampa Bay in 1962 and 1989, and once along the Texas Coast of a young, immature animal observed at the inshore side of Bolivar Jetty near Galveston in February 1992 (Texas Tech University, 1997). Humpback whales feed at the surface or in midwater range. Their prey include: euphasids, copepods, herring, capelin, sand lance, juvenile salmon, arctic cod, pollock, and pteropod and cephalopod mollusks (Breiwick and Braham, 1984).

Humpback whales have been endangered since 1970 after a great reduction in numbers from commercial whaling (Marine Mammal Commission, 1988). Historically, they have been threatened by commercial vessel traffic, commercial fisheries, and coastal development; more recently, causes of human impact are entrapment/entanglement in fishing gear, collisions with ships, acoustic disturbance from ships and aircraft, and whale-watching tour boats.

Sperm Whale. Sperm whales (*Physeter macrocephalus*) are the largest of the toothed whales, averages 62 ft (19 m) in length and can weigh as much as 120,000 lbs (55 Mt). The sperm whale is endangered. This species occurs throughout most of the oceans from the tropics to the polar ice caps. They are noted for their ability to make prolonged deep dives, and generally occupy deep waters and are rarely seen over the continental shelf. Their diet consists primarily of squid but includes many other deep water species and bottom dwellers (Breiwick and Braham, 1984).

In the past, they were numerous enough in the Gulf of Mexico to justify full-scale whaling operations, and along with relatively common sightings, suggest there may be a separate population in the Gulf (Fritts et al., 1983). During an aerial survey of the north-central Gulf of Mexico in 1989, sperm whales were the second most commonly sighted whale (Mullin et al., 1991). Like the other whale species, historic hunting resulted in their decline. Existing human impacts are: entrapment and entanglement in fishing gear, collisions with ships, and acoustic disturbance from ships, and aircraft.

3.2.7 Essential Fish Habitat

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MFCMA), Federal agencies are required to consult with NMFS on any action that may result in adverse effects to essential fish habitat (EFH). The Act establishes a fisheries conservation zone for the U.S. and delineates an area from the seaward boundaries of coastal states to 200 nautical miles. The NMFS published the final rule implementing the EFH provisions of the MFCMA (50 CFR 600) on January 17, 2002. Certain OCS activities authorized by BOEMRE may result in adverse effects to EFH, and therefore, require EFH consultation.

The MFCMA created eight Regional Fishery Management Councils including the Gulf of Mexico Fishery Management Council (GMFMC). The act requires that a fishery management plan be prepared for each commercial species (or related group of species) that is in need of conservation and management within each respective region. From 1976 to 1992, fisheries management plans have been implemented for the following species or groups of species: shrimp, stone crab, spiny lobster, coastal migratory pelagic fish, coral and coral reefs, reef fishes, billfish, red drum, and highly migratory species. Under the most recent congressional reauthorization of the act, Atlantic tuna, swordfish, sharks, and Atlantic billfish are now included for protection.

When the Sustainable Fisheries Act of 1996 reauthorized the MFCMA, Congress required NMFS to designate and conserve EFH for species managed under an existing fisheries management plan. EFH are areas of higher species density and include waters and substrate necessary to fish for spawning, breeding, feeding, or growth.

EFH that occur in the Gulf of Mexico are described below based on GMFMC (2005):Red Drum: EFH include all estuaries; Vermilion Bay, Louisiana, to the eastern edge of Mobile Bay, Alabama, out to depths of 25 fathoms; Crystal River, Florida, to Naples, Florida between depths of 5 and 10 fathoms; and Cape Sable, Florida to the boundary between the areas covered by the

GMFMC and the South Atlantic Fishery Management Council (SAFMC) between the depths of 5 and 10 fathoms.

- Reef Fish and Coastal Migratory Pelagics: all estuaries; the U.S./Mexico border to the boundary between the areas covered by the GMFMC and the SAFMC from estuarine waters out to depths of 100 fathoms.
- Shrimp: all estuaries; the U.S./Mexico border to Fort Walton Beach, Florida, from estuarine waters out to depths of 100 fathoms; Grand Isle, Louisiana, to Pensacola Bay, Florida, between depths of 100 and 325 fathoms; Pensacola Bay, Florida, to the boundary between the areas covered by the GMFMC and the SAFMC out to depths of 35 fathoms, with the exception of waters extending from Crystal River, Florida, to Naples, Florida.
- Stone Crab: all estuaries; the U.S./Mexico border to Sanibel, Florida, from estuarine waters out to depths of 10 fathoms; and from Sanibel, Florida, to the boundary between the areas covered by the GMFMC and the SAFMC out to depths of 15 fathoms.
- Spiny Lobster: from Tarpon Springs, Florida, to Naples, Florida, between depths of 5 and 10 fathoms; and Cape Sable, Florida, to the boundary between the areas covered by the GMFMC and the SAFMC out to depths of 15 fathoms.
- Coral: the total distribution of coral species and life stages throughout the Gulf of Mexico, including: coral reefs in the North and South Tortugas Ecological Reserves, East and West Flower Garden Banks, McGrail Bank, and the southern portion of Pulley Ridge; hard bottom areas scattered along the pinnacles and banks from Texas to Mississippi, at the shelf edge and at the Florida Middle Grounds, the southwest tip of the Florida reef tract, and predominant patchy hard bottom offshore of Florida from approximately Crystal River south to the Florida Keys.

Only reef fish, shrimp, stone crab, and coral may occur in the Texas Territorial Seas. The activities under the general permit are not likely to cause impacts on the fishery habitats designated at EFH.

3.3 COMMERCIAL AND RECREATIONAL FISHERIES

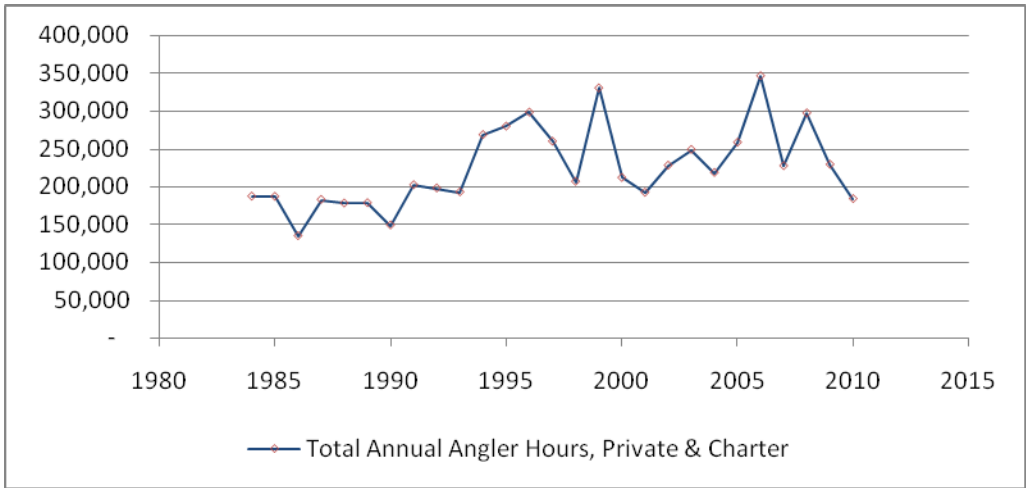
This section characterizes the important recreational and commercial fisheries of the western Gulf of Mexico by weight, value, landings, and ex-vessel value defined below. Marine fishing in the territorial seas of Texas is a combination of recreational and commercial fishing. Recreational fishing includes both private-boat and chartered-boat fishing. Commercial fishing is categorized into two fisheries, shell and fin. Shellfisheries include shrimp, Eastern oyster, crab, and squid. Finfisheries include black drum, snapper, flounder, grouper, and many other finfish.

The 2004 FEIS and more recently available information and data have been reviewed and updated where they are changed. The result of this review of updated information has not resulted in any material change in the conclusions provided in the 2004 FEIS.

3.3.1 Recreational Fisheries Statistics

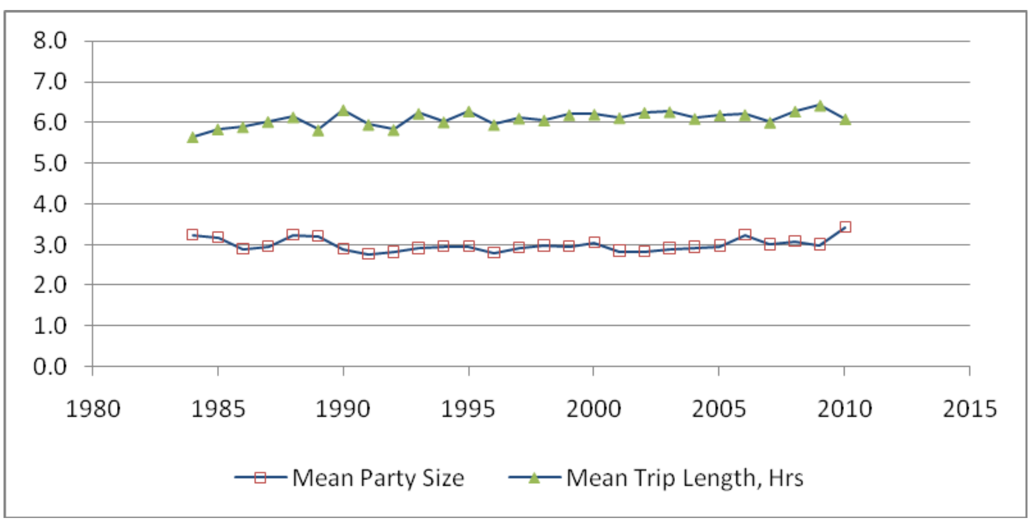
In 2009, over 2.8 million recreational anglers took 22 million fishing trips in the Gulf of Mexico Region. Almost 90 percent of these anglers were residents of a regional coastal county. Of the total fishing trips taken, 59 percent were from a private or rental boat and another 37 percent were shore-based. Spotted seatrout were the most frequently caught species or species group with 29 million fish caught in 2009, and represented 47 percent of total fish caught in the region. Figures 3-5 and 3-6 present boat-related recreational fishing effort data for 1984 through 2010. Figure 3-5 presents annual estimated total private boat and charter boat angler hours; Figure 3-6 presents estimated mean party size and mean trip duration over the same period.

Figure 3-5. Annual Angler Hours, Private and Charter Boats



Source: M Fisher, Rockport Marine Lab, Texas Parks and Wildlife Department, personal communication, June 22, 2011

Figure 3-6. Annual Angler Mean Party Size and Trip Length (hrs), Private and Charter Boats



Source: M Fisher, Rockport Marine Lab, Texas Parks and Wildlife Department, personal communication, June 22, 2011

The contribution of recreational fishing activities in the Gulf of Mexico Region are reported in terms of economic impacts at the state level (employment, sales, income, and value added impacts) and expenditures on fishing trips and durable equipment at the regional level.

Employment impacts in Texas for 2009 recreational fishing supported 22,127 full and part jobs and generated total sales of $2,846,858. Overall, these employment impacts were generated by expenditures on recreational fishing trips taken by anglers (private or rental boat, for-hire boat, or shore-based trips) and expenditures on durable equipment. Most of the employment impacts in 2009 were generated by expenditures on durable equipment of 91 percent in Texas.

In addition to employment impacts, the contribution of recreational fishing activities to the Texas economy can be measured in terms of sales impacts and the contribution of these activities to gross domestic product (value added impacts). In 2009, sales impacts were $2.8 billion in Texas. Value added impacts for the same year were $1.4 billion in Texas. Table 3-7 indicates the recreational 2009 economic impacts; Table 3-8 indicates angler trip and durable expenditures (NMFS, 2011).

In 2009, spotted seatrout was the most commonly caught species in Texas (810,000 fish), followed by red drum (285,000 fish) and Atlantic croaker (117,000 fish). Over the 10-year period from 2000 to 2009, spotted seatrout and red drum consistently averaged as the most harvested fish. Table 3-9 provides a breakdown of the harvest and release of recreational fish from 2000 to 2009 (NMFS, 2011).

Table 3-7. 2009 Economic Impacts of Recreational Fishing Expenditures (million dollars)

	Jobs	Sales, $	Income, $	Value Added,$
Trip Impacts by Fishing Mode:				
For-Hire	498	45.8	14.5	25.5
Private Boat	1,331	152.9	46.1	81.7
Shore	250	27.3	8.4	14.7
Total Durable Equipment Impacts	20,047	2,620.9	841.0	1,312.8
Total Trip & Durable Equipment Economics	22,127	2,846.9	910.0	1,434.7

Source: TPWD unpublished data as cited (NMFS-2011).

Table 3-8. 2009 Angler Trip & Durable Expenditures (million dollars)[1]

Fishing Mode	Trip Expenditures		Equipment	Durable Expenditures
	Non-Residents	Residents	Fishing Tackle	157.4
For-Hire	1.46	25.7	Other Equipment	82.8
Private Boat	3.85	99.1	Boat Expenses	718.3
Shore	1.31	17.6	Vehicle Expenses	215.8
			Second Home Expenses	921.1
Total Trip Expenditures	6.61	142.5	Total Durable Equipment Expenditures	2,095.5
Total State Trip and Durable Equipment Expenditures				2,244.6

Source: TPWD unpublished data as cited (NMFS, 2011).

[1]The Marine Recreational Information Program (MRIP) does not collect participation (number of anglers) or effort (number of trips) data for Texas. To calculate trip expenditure estimates, effort by fishing mode is estimated based on 2009 data provided by the TPWD. These effort estimates were reviewed by the TPWD. To calculate angler expenditure estimates (durable equipment expenditures), participation estimates were based on the sum of saltwater licenses sold in Texas plus a proportion of combination licenses sold in Texas. The landings reporting method changed in 2007; these data are not comparable to earlier years.

Table 3-9. Harvest of Key Recreational Finfish (thousands of fish)[1]

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Atlantic croaker	209	230	111	96	109	95	101	95	64	117
Black drum	104	130	72	85	68	53	73	66	82	98
King mackerel	19	15	16	19	15	14	29	11	8	16
Red drum	285	244	233	270	273	231	318	289	266	285
Red snapper	53	47	53	40	40	49	69	45	41	31
Sand seatrout	291	79	173	119	176	125	129	95	152	111
Sheepshead	78	80	84	76	67	81	78	46	46	34
Southern flounder	100	125	91	111	100	81	64	49	64	47
Spotted seatrout	1,128	966	965	939	934	855	987	916	917	810

Source: TPWD unpublished data as cited (NMFS-2011).

1. The Texas Department of Wildlife collects information about harvest and not total catch.

3.3.2 Commercial Fisheries Statistics

BOEMRE (2011) reported that detailed descriptions of commercial fishing can be found in Chapter 3.3.1 of the MMS, 2007 Multisale EIS and in Chapter 4.1.12.1 of the MMS, 2008 OCS Oil and Gas Lease Sales: 2009-2012 Supplemental EIS. The following is a summary of the information incorporated from the Multisale EIS, the 2009-2012 Supplemental EIS, and Western Planning Area Lease Sale 218 Draft Supplemental EIS.

In 2009, the Gulf of Mexico Region's seafood industry generated $1.7 billion in sales impacts in Louisiana and $1.7 billion in sales impacts in Texas. The sector that generated the greatest employment impacts by state was the importers sector with 34,000 jobs in Florida and 2,500 jobs in Texas. The harvest sector in Texas generated 3,700 jobs.

Shrimp landings revenue and shrimp landings declined in the face of falling ex-vessel prices (decreasing 43 percent, a 33 percent decrease in real terms, from 2000 to 2009). This decrease in ex-vessel price can be partly attributed to loss of market share to shrimp imports, which increased 59 percent from 2000 to 2009, while landings of shrimp in the Gulf decreased 14 percent over the same time period. Shellfish landings revenue was dominated by Louisiana, which also contributed the most ($222 million) followed by Texas ($143 million) (NMFS-2011).

Menhaden, with landings of over 1 billion pounds and valued at $60.5 million, was the most important Gulf species in terms of quantity landed during 2009. The menhaden catch was up from 927.5 million pounds, worth $64.3 million, in 2008 in the Gulf of Mexico, although the price per pound was down (BOEMRE, 2011).

In 2009 shrimp (brown, pink, royal red, and white), with landings of over 256.5 million pounds and valued at about $314 million, were the most important shellfish in terms of value landed. Shrimp production was up throughout the Gulf from 186.3 million pounds in 2008 to 256.5 million pounds in 2009, although the price was down from $356.3 million in 2008 to $313.7 in 2009. Blue crabs, another of the most valued shellfish of the Gulf Coast, produced 59.1 million pounds in 2009 worth approximately $43.7 million (BOEMRE, 2011).

In 2008 the shellfish (shrimp and crabs) harvest was approximately 99.5 million pounds, valued at approximately $150.2 million. Shrimp harvest alone was 62.9 million pounds, valued at $153.9 million. In the western Gulf, a total of approximately 3.9 million pounds of finfish were landed in 2008 worth approximately $7.7 million. Black drum was the largest catch at approximately 1.5 million pounds (BOEMRE, 2011)

The American oyster (*Crassostrea virginica*) also is harvested in Texas estuaries from Galveston Bay west to East Matagorda Bay. Historically, the largest oyster harvest in Texas comes from Galveston Bay because of its favorable salinity regime. In 2008, the total harvest of oyster meats from Texas was 2.7 million pounds worth approximately $8.8 million dollars. This catch is down from 5.6 million pounds worth approximately $19.3 million in 2007, a 110 percent decrease in harvest. Oyster harvest in Galveston Bay was down 0.7 million pounds (-38 percent) in 2008, and the oyster harvest in San Antonio Bay was down 1.1 million pounds of meats (-1,408 percent). Harvest of oyster meats decreased in all bays across the coast with the exception of East Matagorda Bay where the harvest, although small (9,700 pounds), was up 71 percent in 2008 over the 2007 harvest of 2,800 pounds (BOEMRE, 2011).

Most of these decreases are attributed to Hurricane Ike due to the large amounts of silt that were deposited on oyster beds in Galveston Bay. The Texas Parks and Wildlife Department currently has two oyster reef restoration projects underway in Galveston Bay. The larger of these projects involves planting 20 ac (8 ha) of cultch in East Bay, an area heavily silted by Hurricane Ike, to rebuild commercial reef (BOEMRE, 2011). The Deepwater Horizon event, which affected much of the Gulf of Mexico, was largely to the east of Texas. There were no fishery (recreational or commercial) closures in Texas, no oyster bed closures, and only a single report of oil on Galveston Island (Fisher, personal communication 2010, as cited in BOEMRE, 2011).

In 2009, commercial fishermen in the Gulf of Mexico Region landed 1.4 billion pounds of finfish and shellfish, earning $629 million in landings revenue. Landings revenue was dominated by shrimp ($325 million) and oyster ($72 million). These species commanded ex-vessel prices of $1.30 and $3.21 per pound, respectively, and comprised 63 percent of total landings revenue, but only 19 percent of total landings in the Gulf of Mexico Region.

Louisiana and Texas had the highest landings revenue in the region in 2009, $284 million and $150 million, respectively. In terms of pounds landed, Louisiana had the highest landings (1 billion pounds) with Texas landing 99 million pounds.

Trends in commercially important Gulf fisheries species/species groups for 2000 - 2009 are provided in Table 3-10 (ex-vessel value) and Table 3-11 (total annual catch weight) for commercially important Gulf fisheries. Tables provide data for shellfish (shrimp, oysters, and blue crab) and for finfish/other (Atlantic croaker, black drum, flounder, grouper, red snapper, vermillion snapper, tunas). Figure 3-7 shows total landings and revenue trends graphically. The trend in price per pound values correlates with the revenue trend, not landings.

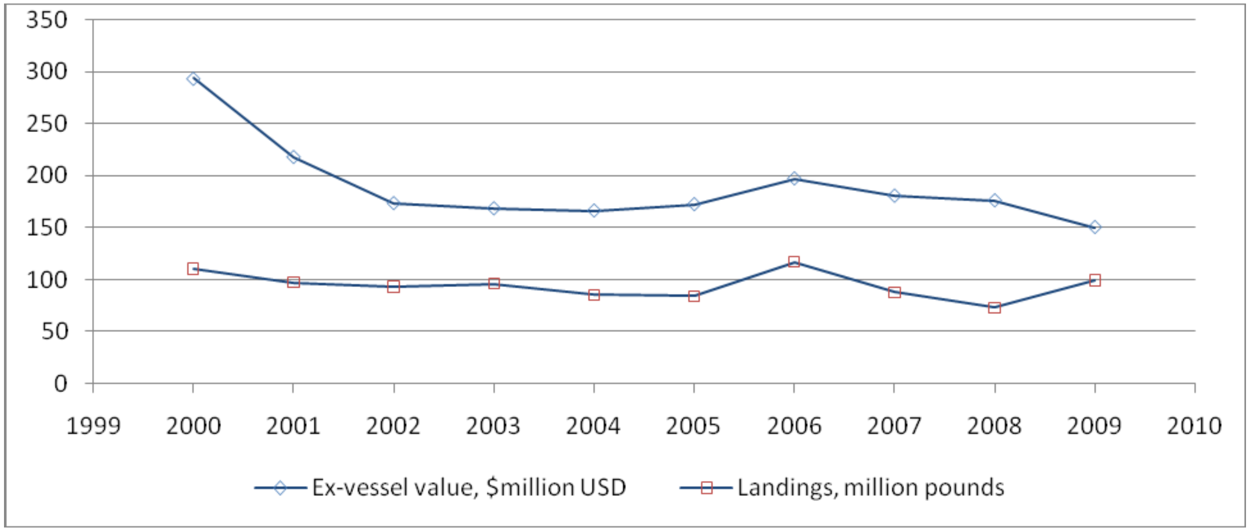
Table 3-10. Total Landings Revenue (ex-vessel value) of Key Species/Species Groups (million $USD)

	2000	2001	2002	2003	2004	200.	2006	2007	2008	2009
Total revenue	293.6	218.0	73.3	168.3	166.2	172.3	197.3	180.6	176.1	150.2
Shellfish	284.5	210.3	163.7	159.3	155.5	161.5	185.9	171.1	168.4	142.7
Finfish & Other	9.1	7.6	9.6	9.0	10.7	10.8	11.4	9.5	7.7	7.5
Source: TPWD unpublished data as cited in NMFS 2011										

Table 3-11. Total Landings of Key Species/Species Groups (million pounds)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total landings	110.6	97.4	93.3	96.1	85.6	84.23	117.1	87.9	73.0	99.5
Shellfish	104.4	*92.3*	87.0	90.9	79.7	78.5	111.3	83.1	69.2	95.4
Finfish & Other	6.2	5.1	6.3	5.2	5.9	5.8	5.8	4.8	3.9	4.1
Source: TPWD unpublished data as cited in NMFS 2011										

Figure 3-7. Gulf Landings and Revenue, Commercially Important Species/Groups, 2000 - 2009



Source: TPWD unpublished data as cited in NMFS 2011

3.4 TEXAS COASTAL MANAGEMENT PROGRAM

Ocean discharge criteria requires that any activity that has the potential of affecting state waters must be reviewed for consistency with the state's federally approved Coastal Zone Management Program. Section 5.4 of the EPA's 2004 FEIS provides an extensive discussion of the Texas Coastal Management Program (CMP). EPA Region 6 has contacted the TGLO and inquired about any changes in the Texas CMP since the development of the 2004 FEIS. TGLO has informed EPA Region 6 that there have been no material program changes related to offshore oil and gas activities; 16 TAC, Chapter 3, Section 3.8 has been amended but for minor technical corrections only.[2] The description of the Texas CMP provided in the 2004 FEIS is not repeated in this SIR. The most relevant material is summarized below.

The 2004 FEIS and more recently available information and data have been reviewed and updated where they have changed. The result of this review of updated information has not resulted in any material change in the conclusions provided in the 2004 FEIS.

3.4.1 Special Aquatic Sites

Of the ten factors used to determine unreasonable degradation, Factor 5 requires consideration of potential impacts of special aquatic sites, which under the Texas CMP are located in 16 coastal natural resource areas. According to the Texas CMP these special aquatic sites, as well as surrounding coastal natural resource areas may not be adversely affected by the proposed activity. General examples of special aquatic sites located in coastal natural resource areas

include the following: Algal flats, National seashores, Archaeological sites, Navigational safety areas, Bay bottoms (of biological productivity), Nursery habitats, Clam beds (*Rangia*), Oyster reefs, Coral reefs, Parks, Critical habitat, Recreational areas, Historic sites, Rookeries, Marine sanctuaries and refuges, Submerged grassbeds, Monuments, and Wilderness areas.

In Texas, the following state, federal, and privately managed recreational and wildlife areas occur within or border the territorial seas:

- Three State Parks: Mustang Island State Park, Sea Rim State Park, and Galveston
- Island State Park;
- Two State Recreation Areas: Brazos Island State Recreation Area and Bryan
- Beach State Recreation Area;
- One State Fishing Pier, Queen Isabelle State Fishing Pier;
- One National Seashore, Padre Island National Seashore;
- Two National Wildlife Refuges: McFaddin National Wildlife Refuge and Texas
- Point National Wildlife Refuge;
- Galveston Bay (part of the National estuary program since 1988); and

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[2] Personal communication dated May 26, 2011 from Sheri Land, Director - Grant Programs and Support Coastal Resources Division, Texas General Land Office to John MacFarlane. NEPA Specialist EPA, Region 6, Office of Planning and Coordination, Compliance Assurance and Enforcement Division

- Four National Registered Historical Sites: Mansfield Cut Underwater District, Dunn Ranch Novillo Camp, Galveston Seawall, and Point Bolivar Lighthouse.

In addition, numerous clam and oyster beds occur in the territorial seas of Texas and adjacent Gulf coastal waters.

3.4.2 Texas Coastal Coordination Council

The Texas Coastal Coordination Council (CCC), established in 1991, is a 12-member interagency board responsible for administering the Texas CMP. The Texas CMP provides common goals and policies to guide local, state, and federal management of the State's coastal natural resources, such as critical coastal erosion areas and coastal wetlands. The CCC's mission is to coordinate the State's approach to managing its coastal resources and responding to coastal issues.

The 12-member Council is composed of one member from each of the seven state natural resource agencies, four members appointed by the Governor who represent specific coastal interests, and one non-voting member representing the Texas Sea Grant College Program. Ex officio members serve during their terms in office while appointed members serve two-year, overlapping terms.

To achieve its mission, the CCC, with administrative support from TGLO staff, carries out three key functions:

- Reviewing government actions that affect the Texas coast and certify that they are consistent with the Texas CMP
- Passing federal funds through to coastal communities for projects that help control erosion, promote responsible development and coastal access, and enhance areas considered critical
- Helping small businesses and individuals prepare the appropriate permit applications and supporting documents needed to conduct business in the coastal region.

3.4.3 Federal and State Consistency

Under the Texas Natural Resource Code §33.2052, the Texas CCC reviews state agency rulemaking actions that an agency voluntarily submits to the council for certification for consistency with the Texas CMP. The CCC either certifies the rule as consistent or denies certification and recommends to the agency how to correct any deficiencies. An annual report is prepared on the entire status of the program and includes annual figures for all interagency network activities. Ongoing efforts to improve the monitoring and enforcement of the Texas CMP includes an in-house consistency review group that continually examines both state and federal consistency review processes for making recommendations to the Council and its executive committee. As a result of recommendations made by the consistency review group, the Council has amended the rules on federal consistency procedures.

Disposal of oil and gas waste in the coastal areas under the Texas CMP shall comply with the following policies:

a. All discharges shall comply with all provisions of surface water quality standards established by the TCEQ under Section 501.14(f) of the proposed rule on Discharge of Municipal and Industrial Wastewater to Coastal Waters.

b. New wastewater outfalls shall be located where the discharge will not adversely affect critical areas. Existing wastewater outfalls that adversely affect critical areas shall be either discontinued or relocated so as not to adversely affect critical areas within two years of the effective date of this section.

c. The TRRC shall notify TCEQ and the TPWD upon receipt of an application for a new permit to discharge produced waters to waters under tidal influence. In determining compliance with these policies, the Railroad Commission shall consider the effects of salinity from the discharge.

3.4.4 Requirements of the Federal Coastal Zone Management Act

The Coastal Zone Management Act requires that states with approved coastal zone management programs (CZMPs) determine consistency for any federally licensed or permitted activities affecting the coastal zone of that state (16 USC Sec. 1456[c][A] Subpart D). Under the act, applicants for federal licenses and permits must submit a certification that the proposed activity complies with the state's approved CZMP and will be conducted in a manner consistent with that CZMP. The state then has the responsibility to either concur with or object to the consistency determination. For NPDES general permits, the EPA is considered to be the applicant and will submit the general permit and consistency certification to the state for a consistency determination.

Consistency certifications are required to include the following information (15 CFR 930.58):

- A detailed description of the proposed activity and its associated facilities;
- A brief assessment relating the probable coastal zone effects of the proposal and its associated facilities to relevant elements of the CZMP;
- A brief set of findings indicating that the proposed activity, its associated facilities, and their effects are consistent with relevant provisions of the CZMP; and
- Any other information required by the state.

The waste streams of greatest concern for potential impacts, drilling fluids and cuttings, are prohibited from discharges within 3 miles of shore. Operators must haul these wastes to shore and disposed of in regulated waste treatment facilities. The waste stream of second greatest concern, produced water, also is regulated under the general permit. In Texas, the discharge of produced water is subject to technology and water quality based limitations that ensure consistency with the Texas Coastal Management Plan (CMP). Discharge of produced sand is prohibited in Texas. The remaining discharges, of less significant volume and environmental concern, also are subject to technology and water quality based limitations that would ensure consistency with the TCMP.

The information presented throughout this document should sufficiently address the concerns and information requirements outlined above for consistency reviews under the TCMP. Discharges in compliance with the proposed permit for the territorial seas of Texas will be consistent with the TCMP goals, policies, and guidelines.

3.5 AIR QUALITY

The 2004 FEIS and more recently available information on air quality have been reviewed and updated. The Clean Air Act (CAA) established the National Ambient Air Quality Standards

(NAAQS). The primary standards are set to protect public health, and the secondary standards are set to protect public welfare, such as visibility or to protect vegetation. The current NAAQS address six criteria pollutants: carbon monoxide, lead, nitrogen dioxide (NO_2), particulate matter (PM), ozone (O_3) and sulfur dioxide (SO_2) (see Table 3-12). EPA considers particulate matter in two categories according to size. Coarse particulate matter is smaller than 10 µm (PM_{10}), and fine particulate matter is less than 2.5 µm in size ($PM_{2.5}$). Under the CAA, EPA is periodically required to review and, as appropriate, modify the criteria based on the latest scientific knowledge.

Table 3-12. National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	8-hour (1) 1-hour (1)	None	
Lead	0.15 µg/m^3 (2)	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide	53 ppb (3) 100 ppb	Annual (Arithmetic Average) 1-hour (4)	Same as Primary None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour (5)	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3 35 µg/m^3	Annual (6) (Arithmetic Average) 24-hour (7)	Same as Primary Same as Primary	
Ozone	0.075 ppm (2008 std) 0.08 ppm (1997 std) 0.12 ppm	8-hour (8) 8-hour (9) 1-hour (10)	Same as Primary Same as Primary Same as Primary	
Sulfur Dioxide	0.03 ppm 0.14 ppm 75 ppb (11)	Annual (Arithmetic Average) 24-hour (1) 1-hour	0.5 ppm None	3-hour (1)

(1) Not to be exceeded more than once per year.
(2) Final rule signed October 15, 2008.
(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).
(5) Not to be exceeded more than once per year on average over 3 years.
(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).
(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as USEPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) USEPA is in the process of reconsidering these standards (set in March 2008).
(10) (a) USEPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <1.
(11) (a) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Source: BOEMRE, 2011.

Effective December 17, 2006, EPA revoked the annual PM_{10} standard and revised the 24-hour $PM_{2.5}$ from 65 µg/m^3 to 35 µg/m^3. EPA proposed a revision to the 8-hour O_3 standard in January 2010. A value within the range of 0.060 to 0.070 ppm was recommended. In December 2010, EPA asked the Clean Air Scientific Advisory Committee (CASAC) to review the studies used to make the O_3 recommendation to ensure EPA's decision is grounded in the best science. EPA is currently reconsidering the standard but has not yet issued a final rule.

On July 12, 2011, EPA proposed action on the combined review of the secondary NAAQS for oxides of nitrogen (NO_X) and oxides of sulfur (SO_X). EPA sets secondary standards to protect against environmental damage caused by certain air pollutants. Consistent with the scientific evidence pointing to the interrelated impacts of NO_X and SO_X on plants, soils, lakes and streams, EPA assessed the environmental effects of these pollutants together. NO_X and SO_X in the air can damage the leaves of plants, decrease their ability to produce food – photosynthesis – and decrease their growth. EPA proposed to retain the existing secondary standards for NO_X and SO_X and concluded that the existing secondary standards protect plants from the direct effects of exposure to these pollutants in the air (e.g., decreased growth and foliar injury).

Air quality depends on multiple variables - the location and quantity of emissions, dispersion rates, distances from receptors, and local meteorology. Meteorological conditions and topography may confine, disperse, or distribute air pollutants in a variety of ways.

The Clean Air Act Amendments of 1990 (CAAA) established classification designations based on regional monitored levels of ambient air quality. These designations impose mandated timetables and other requirements necessary for attaining and maintaining healthful air quality in the U.S. based on the seriousness of the regional air quality problem.

When measured concentrations of regulated pollutants exceed standards established by the NAAQS, EPA may designate an area as a nonattainment area for a regulated pollutant. The number of exceedances and the concentrations determine the nonattainment classification of an area. In the CAAA there are five classifications of nonattainment status - marginal, moderate, serious, severe, and extreme. In the Houston-Galveston area of the Texas coast there are several counties that are in nonattainment status. These are summarized in Table 3-13.[3]

3.5.1 Emission Sources and Controls

Engines on platforms and service vessels emit various pollutants (NO_X, CO, PM_{10}, SO_2, and volatile organic compounds [VOC]) and the materials utilized, produced and/or transported emit hydrocarbons and other VOC. Air pollutants also are released from oil spills, with initial mass emission rates being high and then decreasing rapidly over time. The type of emissions depends on whether there is a fire. Without fire, oil spills release VOC and hydrogen sulfide; with fire, the emissions are standard by-products of combustion.

[3] EPA interprets the nonattainment or maintenance area boundary to extend to the state's seaward boundary, which for Texas is 3 leagues, or approximately 9 miles.

Table 3-13. Houston-Galveston Area Nonattainment Areas

County	Criteria Pollutant	Classification
Brazoria Co.	8-Hr Ozone	Severe 15
Chambers Co.	8-Hr Ozone	Severe 15
Fort Bend Co.	8-Hr Ozone	Severe 15
Galveston Co.	8-Hr Ozone	Severe 15
Harris Co.	8-Hr Ozone	Severe 15
Liberty Co.	8-Hr Ozone	Severe 15
Montgomery Co.	8-Hr Ozone	Severe 15
Waller Co.	8-Hr Ozone	Severe 15
8-Hour Ozone Classifications: Extreme - Area has a design value of 0.187 ppm and above. Severe 17 - Area has a design value of 0.127 up to but not including 0.187 ppm Severe 15 - Area has a design value of 0.120 up to but not including 0.127 ppm Serious - Area has a design value of 0.107 up to but not including 0.120 ppm. Moderate - Area has a design value of 0.092 up to but not including 0.107 ppm. Marginal - Area has a design value of 0.085 up to but not including 0.092 ppm.		

Source: www.epa.gov/oaqps001/greenbk/ancl.htm; as of 8/30/2011.

Air pollution control techniques used at production facilities include condensation, flaring, low NO_X burners, air-to-fuel controllers, carbon adsorption, fixed and floating tank roofs, and inspection and maintenance programs. Controls for fugitive emissions from vessels may include submerged loading techniques, refrigeration, compression absorption, thermal oxidation, and vapor displacement into an empty cargo tank. Pipeline emissions are controlled primarily by inspection and maintenance. Based on survey data collected in 2000 from nearly 2,900 oil and gas platforms in the Gulf of Mexico, Table 3-14 provides estimated criteria pollutant emissions from offshore platforms; Table 3-15 provides estimates for non-platform emissions. These values are for the all platforms in the Gulf. Only OCS data are being presented for this SIR because emissions specific to the Texas Territorial Seas were not available. As stated in TCEQ (2010), offshore platforms operating in Texas state waters appear not to be major point sources because data could not be obtained from permits or the State of Texas Air Reporting System (STARS), which only includes major point sources.

Table 3-16 provides a total emissions estimate per platform based on these Gulf-wide inventory values. High variability exists among platforms due to different equipment usage, processes, oil-bearing formations, and both platform and reservoir age. These estimates are likely high for the Territorial Seas platforms covered by the proposed permit as they do not require as much drilling and support vessel activity.

The CAA requires Texas to develop, implement, maintain, and enforce a State implementation Plan (SIP), with appropriate air pollution control regulations and strategies, to ensure that state air quality meets the NAAQS established by the EPA. Areas within Texas that are designated as nonattainment for any of these criteria pollutants are subject to additional planning and control requirements.

Table 3-14. Total Platform Emission Estimates for Criteria Pollutants

Equipment	Emissions (tons/year - tpy)					
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_X	VOC
Amine Units	0	0	0	0	2100	1
Boilers/Heaters/Burners	511	446	29	29	2	21
Diesel Engines	894	4043	194	193	143	217
Drilling Equipment	7,759	9,783	176	173	1,197	487
Flares	471	90	2	0	1	8
Fugitives	0	0	0	0	0	29,826
Glycol Dehydrators	0	0	0	0	0	2,572
Loading Losses	0	0	0	0	0	7
Losses from Flashing	0	0	0	0	0	3,625
Mud Degassing	0	0	0	0	0	353
Natural Gas Engines	80,679	56,546	241	241	17	1,542
Natural Gas Turbines	1,830	7,141	147	147	12	47
Pneumatic Pumps	0	0	0	0	0	2,316
Pressure/Level Controllers	0	0	0	0	0	990
Storage Tanks	0	0	0	0	0	5,627
Vents	0	0	0	0	0	11,897
Total Emissions (tpy)	92,144	78,049	789	783	3,472	59,536
Per Platform Average tons/year	31.8	26.9	0.272	0.270	1.20	20.5
pounds/year	63,548	53,827	544	540	2,394	41,059

Source: MMS, 2004.

Table 3-15. Total Non-Platform Emission Estimates for Criteria Pollutants

Source Category	Emissions (tpy)				
	CO	NO_X	PM_{10}	SO_2	VOC
Drilling Rigs	2,147	20,453	508	3,440	197
Helicopters	6,060	1,438	107	177	2,285
Pipelaying Vessels	1,408	13,416	333	2,257	129
Platform Construction and Removal Vessels	284	2,257	56	384	29
Support Vessels	7,314	56,660	1,415	9,680	757
Survey Vessels	15	151	4	25	1
Total OCS Oil/Gas Production Sources (tpy)	17,228	94,375	2,423	15,963	3,400
Per Platform Average tons/year	5.94	32.5	0.836	5.50	1.17
pounds/year	11,881	65,086	1,671	11,009	2,345

Source: MMS, 2004.

Table 3-16. Total Emission Estimate for Criteria Pollutants on a Per Platform Basis

Total Per Platform average	Emissions					
	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_X	VOC
tons/year	37.7	59.5	1.11	0.270	6.70	21.7
pounds/year	75,429	118,913	2,215	540	13,403	43,404
Estimated Territorial Seas Annual Emissions (11 platforms)						
tons/year	415	655	12.2	2.97	73.7	239
pounds/year	829,719	1,308,043	24,365	5,940	147,433	477,444

Source: MMS, 2004.

Currently Texas has a federally-approved SIP that protects air quality and has emission control plans for areas that violate the NAAQS. Any proposed project must meet the requirements of the CAA and the specific provisions of the approved SIP. Under 40 CFR Part 93, Subpart B entitled "Determining Conformity of General Federal Actions to State or Federal Implementation Plans," EPA has responsibility as a federal sponsoring and approving agency to make a conformity determination to ensure that this project is consistent with the approved SIP and does not impede with the attainment process, worsen the current conditions or contribute to violations of the ozone standard. The "*de minimis*" values for the Houston-Galveston-Brazoria nonattainment areas (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties) are 25 tons per year for both VOCs and NO_X. The average per platform emissions calculated in Table 3-16 show that the VOCs and NO_X emissions from a platform are close to or below the *de minimis* values as based on the Gulf-wide estimates.

In an air quality study published in 1995 (MMS, 1995b), an extensive offshore and onshore inventory of pollutant sources found that offshore petroleum development-related emissions in lease tracts adjacent to the Houston and Beaumont/Port Arthur areas represent less than 2 percent of the total anthropogenic NO_X emissions and less than 1 percent of VOC emissions in the Houston/ Beaumont/Port Arthur onshore nonattainment areas.

3.5.2 Greenhouse Gas Emissions

The following greenhouse gas emissions data are provided in EPA's "Inventory of US Greenhouse Gas Emissions and Sinks: 1990 - 2009" (EPA, 2011). For the entire U.S., production field operations of natural gas account for about 59 percent of total methane emissions from natural gas systems, which include production, processing, and the transmission and storage of gas. Production field operations of petroleum systems account for about 98 percent of the total U.S. methane emissions from petroleum systems, which include oil production, transportation, and refining operations.

For natural gas systems, field production emissions occur from the wells themselves, gathering pipelines, and well-site gas treatment facilities such as dehydrators and separators. In 2009, emissions from field production activities accounted for approximately 59 percent of methane emissions and about 34 percent of non-combustion CO_2 emissions from natural gas systems. The majority of methane emissions are from pneumatic devices, well clean-ups, and gas well completions, and re-completions with hydraulic fracturing. Flaring emissions account for the majority of non-combustion CO_2 emissions.

From 1990 to 2009, methane emissions from natural gas systems in the U.S. increased 17 percent and non-combustion CO_2 emissions decreased 14 percent. Improvements in management practices and technology (e.g., replacement of older equipment) have helped stabilize emissions. In 2008, methane emissions showed an increase due to an increase in production and production wells.

For U.S. petroleum systems, vented methane from field operations accounts for over 90 percent of the emissions; unburned methane combustion emissions account for 6.4 percent; fugitive emissions are 3.4 percent; and process upset emissions are under 0.2 percent. In order of magnitude, the most dominant sources of emissions are: shallow water offshore oil platforms; natural gas-powered, high bleed pneumatic devices; oil tanks; natural gas-powered, low bleed pneumatic devices; gas engines; deep water offshore platforms; and chemical injections pumps. These sources combined account for 94 percent of the emissions from petroleum systems production field operations.

Based on survey data collected in 2000 from nearly 2,900 oil and gas platforms throughout the Gulf of Mexico (both state waters and OCS), Table 3-17 provides estimated greenhouse gas emissions from offshore OCS platforms; Table 3-18 provides estimates for non-platform greenhouse gas emissions.

Table 3-17. Total Greenhouse Gas Emission Estimates for Platform Sources[1]

Equipment	Emissions (tpy)		
	CH_4	CO_2	N_2O
Amine Units	18	0	0
Boilers/Heaters/Burners	9	741,563	9
Diesel Engines	5	168,906	N/A
Drilling Equipment	69	508,714	N/A
Flares	159	290	0
Fugitives	107,141	0	0
Glycol Dehydrators	11,400	0	0
Losses from Flashing	79,756	1,812	0
Mud Degassing	1,836	7	0
Natural Gas Engines	15,112	3,377,352	N/A
Natural Gas Turbines	192	2,454,703	67
Pneumatic Pumps	15,480	298	0
Pressure/Level Controllers	11,796	217	0
Vents	330,780	7,047	0
Total Emissions (tpy)	573,753	7,260,909	76
Total Emissions Per Platform (tpy)	198	2,500	0.026
pounds/year	396,000	5,000,000	52

[1] Emission factors for these pollutants were not available for loading losses and storage tanks.
Source: MMS, 2004.

Table 3-18. Total Greenhouse Gas Emission Estimates for Non-Platform Sources[1]

Source Category	Emissions (tpy)	
	CO_2	N_2O
Drilling Rigs	1,359,432	N/A
Helicopters	130,077	N/A
Pipelaying Vessels	891,699	N/A
Platform Construction and Removal Vessels	151,629	N/A
Support Vessels	3,814,905	N/A
Survey Vessels	9,975	N/A
Total OCS Oil/Gas Production Sources (tpy)	6,357,717	N/A
Total Emissions Per Platform (tpy)	2,192	
pounds/year	4,384,632	

[1] CH_4 emissions were not estimated for non-platform sources.
Source: MMS, 2004.

Table 3-19 provides a total greenhouse gas emissions estimate per platform based on these Gulf-wide inventory values. As previously noted, high variability exists among platform emissions due to different equipment usage, processes, oil-bearing formations, and both platform and reservoir age.

Table 3-19. Total Emission Estimate for Greenhouse Gases on a Per Platform Basis

Total Per Platform Average	Emissions		
	CH_4	CO_2	N_2O
tons/year	198	4,692	0.026
pounds/year	396,000	9,384,000	52
Estimated Territorial Seas Annual Emissions (11 platforms)			
tons/year	2,178	51,612	0.286
pounds/year	4,356,000	103,224,000	572

Source: MMS, 2004.

In response to the FY 2008 Consolidated Appropriations Act, EPA issued 40 CFR 98, which requires reporting of greenhouse gas emissions. On November 8, 2010, Subpart W of the Greenhouse Gas Reporting Rule was finalized. Subpart W requires petroleum and natural gas facilities that emit 25,000 metric tons or more of CO_2 equivalents per year to report emissions from equipment leaks and venting. EPA has determined that the activity data (Gulfwide Offshore Activities Data System [GOADS]) that have been collected to fulfill BOEMRE's emissions inventory may be used to comply with Subpart W of the Greenhouse Gas Reporting Rule. Subpart C of the Greenhouse Gas Reporting Rule requires operators to report greenhouse gas emissions from general stationary fuel combustion sources to EPA. At this time, BOEMRE's GOAD's activity data may not be used to comply with Subpart C; therefore, affected operators will have to perform some additional efforts in order to comply (BOEMRE, 2011).

The 2004 FEIS did not address greenhouse gas emissions. Based on the updated information, the platforms in the Territorial Seas do not appear to have emissions that will exceed the 25,000 tpy threshold for direct annual emissions of greenhouse gases.

3.5.3 Deepwater Horizon Air Quality Impacts

Morris et al. (2010) reported on potential air quality impacts from the DWH oil spill. Morris et al. identified the contributions to surface ozone pollution levels from natural and anthropogenic sources, both local and remote in nature, using ozonesondes. This source identification was performed (1) through an analysis of sonde data, including ozone concentrations, wind speed and direction, and relative humidity data, and (2) through an analysis that combined trajectory calculations with surface monitor data. They also examined regional changes in Ozone Monitoring Instrument (OMI) measurements of formaldehyde and ozone from 2004-2010. In particular, they compared the 2010 sonde, surface monitor, and satellite data after the DWH oil spill with data from previous years to determine the impact, if any, of the large source of hydrocarbons in the Gulf of Mexico on air quality in Southeast Texas. OMI Tropospheric Column NO_2 satellite data for the Gulf Coast in 2009 and 2010 indicate no significant differences before and after the DWH spill. Satellite data for formaldehyde indicated levels throughout the Gulf generally were elevated by 50 percent to 100 percent in 2010 compared to the same time period in 2009. Based on OMI satellite data, TCEQ surface monitors in Houston, and Houston ozonesondes, the authors stated there was no conclusive evidence to attribute air quality impacts to the DWH oil spill.

3.6 ARCHEOLOGICAL AND HISTORIC RESOURCES

The activities associated with this general permit have the potential to impact cultural resources. EPA is subject to the requirements of the Historic Sites Act of 1935 (16 U.S.C 461 et. seq.), the National Historic Preservation Act of 1966 (16 U.S.C 470 et. seq.), the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469 et. seq), and Executive Order 11593, “Protection and Enhancement of the Cultural Environment.” These statutes and the order establish review procedures. Under Section 106 of the National Historic Preservation Act and Executive Order 11593, if an EPA action affects any property with historic, architectural, archaeological, or cultural value that is listed on or eligible for listing on the National Register of Historic Places, the Agency shall comply with the procedures for consultation and comment promulgated in 36 CFR Part 800. Under the Archaeological and Historic Preservation Act, if an EPA activity may cause irreparable loss or destruction of significant scientific, prehistoric, historic, or archaeological data, EPA or DOI is authorized to undertake data recovery and preservation activities (40 CFR 6.302).

There are four National Registered Historical Sites that may be affected by discharges from offshore oil and gas operations in the Territorial Seas of Texas.

Mansfield Cut Underwater District is one of four national registered historical sites adjacent to the territorial seas of Texas. Mansfield Cut is located in Port Isabel and encompasses 25,000 under water acres. On September 11, 1967, Jeff Burke and his associates located the oldest Spanish ship wrecks found on the coasts of the United States, 413 years after they sank. The State of Texas passed an antiquities act giving the state sole possession of offshore wrecks; therefore, Burke and his associates lost ownership to the treasure. This underwater historical site holds invaluable history.

Dunn Ranch Novillo Camp, one of the national registered historical sites located adjacent to the territorial seas of Texas, is on Padre Island southeast of Corpus Christi. In 1879, Patrick Dunn was the padrone of the island, establishing one of the world's most unusual cattle ranches where cattle knelt to drink from underground water tanks and were corralled into driftwood pens. Novillo camp was one of four working camps each a day's ride from each other. After fifty years of ownership, Patrick Dunn sold Padre Island. The original buildings which housed the ranchers still stand at the historical site.

Galveston Seawall is another of the national registered historical sites located adjacent to the territorial seas of Texas. On September 8, 1900, the Great Galveston hurricane killed over 6,000 people and devastated one third of the city. To prevent such a natural disaster from devastating the city again Galveston erected a wide seawall in 1904. The city built a seawall 7miles (11 km) long and 17 feet (5 m) high and began a tremendous grade raising project. Galveston's Seawall now extends 54,790 feet (16.7 km), one-third of Galveston's ocean front.

Point Bolivar Lighthouse is one of four national registered historical sites located near the territorial seas of Texas. It is located at Bolivar Peninsula on Galveston Bay. The lighthouse was built in 1872 and towers 117 feet (36 m) above sea level. It guided mariners for 61 years and was retired in 1933 when it was replaced by the South Jetty light. The lighthouse withstood the onslaught of two of the worst storms recorded on the Texas Gulf Coast, the 1990 and 1915 hurricanes. It is now privately owned and is not open to visitors. The inner mechanisms have been removed of which the lamps and reflectors have been reassembled and are on display at the Galveston County Museum.

Under the proposed permit, discharges to historical areas are not authorized.

3.7 SOCIOECONOMICS

The coastal areas of Texas vary substantially in socio-economic patterns, although economic growth and decline at a regional level have been closely tied to activity in the oil and gas industry. In addition to the clear economic issues related to the large commercial and recreational fishing industries, there are socioeconomic issues related to onshore impacts from offshore oil and gas activities. Such impacts include, for example, a wide variety of shore-based support activities - support vessels; drill rig, platform, pipeline, and vessel repair and maintenance; air (helicopter) support; fuel and energy supply; onshore and seaborne transportation and safety; solid waste management; and technical support services for drilling and production activities.

Thus, there are many socioeconomic and onshore environmental consequences of offshore oil and gas extraction. Their consequences and EPA's determination on onshore impacts were discussed in the FEIS for the 2004 general permit for all wastes streams, and remain unchanged, with one exception: onshore waste management for wastes from maintenance operations. The 2004 FEIS and more recently available information and data have been reviewed and updated where they have changed. The result of this review of updated information has not resulted in any material change in the conclusions provided in the 2004 FEIS.

The proposed permit authorizes discharges of a number of minor and *de minimus* waste streams that are presently authorized under the existing permit, under the same permit conditions and limitations required under the existing permit. These discharges include: deck drainage; well treatment, completion, and workover fluids; sanitary and domestic wastes; blowout preventer fluids; desalination unit process wastes; ballast and storage displacement water; bilge water; uncontaminated fresh and seawater; chemically-treated fresh and seawater; boiler blowdown; source water and sand; drilling muds, cuttings, and cement at the seafloor; and diatomaceous earth filter media. EPA has evaluated these discharges in the 2004 FEIS for the existing permit. There are no changes in either effluent quality or receiving water characteristics that modify or alter EPA's determinations provided in the FEIS for the existing permit. Thus, the conclusions and determinations presented in that FEIS for these waste streams remain valid for the proposed permit, and this Supplemental Information Report does not discuss them further.

The only new waste stream evaluated in this SIR is hydrate control fluids discharges. This discharge has little or no potential to result in adverse socioeconomic consequences from onshore support of the offshore activity covered under the proposed permit because it will be either discharged onsite with produced water or piped ashore with produced water for onshore treatment. The proposed permit clarifies or better defines the waste stream from surface preparation (waste associated with sandblasting and other types of surface preparation and painting, or coating, of the prepared surface). The discharge limitation on the waste stream, however, is zero discharge of collected wastes; collected wastes must be transported to shore for disposal. However, the proposed permit only clarifies the requirements for operators and does not increase the anticipated amount of waste transported to shore. This limitation, thus, does not create the potential for onshore impacts resulting from the requirement to transport and dispose of this waste onshore.

The only other factor in EPA's consideration of socioeconomic and onshore impacts from the proposed permit is that the proposed permit also may alter the level of oil and gas activity in the Texas Territorial Seas. The pace of oil and gas development in the Gulf of Mexico is expected to remain largely consistent with past levels. As a result, the nature and extent of impacts to land use and the existing infrastructure are not expected to change appreciably from past experience. The oil and gas industry has been an integral part of the Gulf of Mexico economy for decades, and the continuation of industry activities is not expected to result in any major land use or infrastructure impacts for the region.

3.7.1 Demographics

The Texas Gulf coast is bordered by 13 counties. The median income, poverty levels, and racial distribution of the population in these counties are presented in Table 3-20.

Table 3-20. Gulf Coast Socioeconomic Indicators - 2007

Geography	Median Household Income	Percent of Population Below Poverty	Percent of Population			
			White (not Hispanic)	Black	Hispanic or Latino	Other (1)
U.S.	$50,740	13.0%	66%	12.8%	15.1%	6.6%
Texas	$47,563	16.3%	47.9%	12.0%	36.0%	4.1%
Gulf Coast Counties						
Jefferson	$39,499	17.1%	48.1%	34.7%	13.8%	3.4%
Chambers	$62,164	8.6%	71.3%	10.6%	16.0%	2.1%
Galveston	$52,392	12.4%	60.7%	14.7%	20.9%	3.7%
Brazoria	$60,784	9.8%	57.8%	11.1%	25.9%	5.2%

Geography	Median Household Income	Percent of Population Below Poverty	Percent of Population			
			White (not Hispanic)	Black	Hispanic or Latino	Other (1)
Matagorda	$38,680	22.5%	48.6%	12.2%	36.2%	3.0%
Calhoun	$41,822	15.7%	48.8%	2.8%	43.8%	4.6%
Aransas	$38,281	18.2%	72.0%	1.8%	22.2%	4.0%
San Patricio	$40,506	17.4%	43.5%	2.5%	52.2%	1.8%
Nueces	$41,140	19.1%	34.7%	4.3%	59.1%	1.9%
Kleberg	$37,008	24.4%	25.1%	3.7%	68.0%	3.2%
Kenedy	$30,581	15.9%	24.1%	0.8%	75.1%	>0.1%
Willacy	$24,961	39.9%	11.0%	2.6%	86.5%	>0.1%
Cameron	$29,289	34.3%	12.6%	1.0%	86.2%	0.2%

(1) Other includes American Indian and Alaska Native persons, Hawaiian and Other Pacific Islanders, and Asians.
Source: Fedstats.gov.

Along the mid-Texas Gulf coast, the Houston-Sugar Land-Baytown metropolitan statistical area (MSA[4]) includes 13 counties, including four that border the Gulf: Brazoria, Chambers, Galveston, and Matagorda. The Houston-Sugar Land-Baytown MSA is the sixth-largest MSA in the nation and the second-largest in Texas with a population of over 5.7 million people in 2008. One county, Harris, contains 70 percent of the MSA population (Texas Comptroller of Public Accounts, 2010).

In 2008, this region's population was 42.7 percent white, 33.9 percent Hispanic, 16.5 percent black, and 5.5 percent Asian. The remaining 1.4 percent of the population is "other," which includes American Indian, Alaska Native, Native Hawaiian, and those claiming descent from two or more races (Texas Comptroller of Public Accounts, 2010).

The median household incomes in this region ranged from $38,244 in Walker County to $83,968 in Fort Bend County. Based on jobs, the oil and gas field machinery and equipment industry was the second most competitive industry in the area for non-metro counties surrounding the Houston MSA (Texas Comptroller of Public Accounts, 2010).

On the southern Texas coast, including eight counties bordering the Gulf, the population has been increasing at a higher rate than the rest of the state since 2000. This area includes two coastal MSAs: Brownsville-Harlingen and Corpus Christi. In the south Texas counties, the under-25 year old population is significantly higher than the rest of the state (44 percent vs. 38 percent). This younger population puts a higher demand on resources, mainly in terms of education costs (Texas Comptroller of Public Accounts, 2008).

In 2008, 81 percent of the South Texas region population was of Hispanic ethnicity, compared to 36 percent in the state overall. The concentration of Hispanics in the South Texas region is more

[4] An MSA is defined by the U.S. Census Bureau as a large population nucleus, together with adjacent communities having a high degree of social and economic integration with that core. Metropolitan statistical areas comprise one or more entire counties.

than twice as high as the state's and more than five times higher than the nation's (Texas Comptroller of Public Accounts, 2008).

The median household incomes in South Texas ranged from $17,843 in Starr County (inland) to $38,740 in Nueces County, where Corpus Christi is located. Of the 50 most competitive industries in South Texas, oil and gas pipeline construction is ranked 37. This ranking is based on changes in employment between 2002 and 2007[5] (Texas Comptroller of Public Accounts, 2008).

BOEMRE (2011) evaluated potential environmental justice impacts on the Gulf coast as a result of proposed lease sales on the OCS. Their findings state that population impacts from a proposed action are projected to be minimal (<1% of the total population) for the three geographic regions of the Texas coast (north, central and southern). The baseline population patterns and distributions are expected to remain unchanged as a result of a proposed action. The increase in employment is expected to be met primarily with the existing population and available labor force. Accidental events associated with a proposed action, such as oil or chemical spills, blowouts, and vessel collisions, would likely have no effects on the demographic characteristics of the Gulf coastal communities. The cumulative activities are projected to minimally affect the analysis area's demography.

3.7.2 Environmental Justice

The 2004 FEIS did not present an analysis of environmental justice concerns. This SIR provides new information and analyses related to impacts on demographics and environmental justice as related to Texas coastal communities.

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was issued on February 11, 1994, and focuses Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The EO directs Federal agencies to develop environmental justice strategies to help address disproportionately high and adverse human health or environmental effects of their programs on minority and low-income populations. EPA considers a variety of factors in addressing environmental justice that generally include one or more of the following: public health; cumulative impacts; social costs; and welfare impacts. Environmental justice analyses are conducted to ensure that the costs and benefits of the proposed action are not experienced differently by communities that do and those that do not have environmental justice concerns, including such factors as public health, cumulative impacts, social costs, and welfare impacts.

The proposed permit may potentially alter the level of oil and gas activity in the Texas Territorial Seas, and thus poses a potential adverse environmental justice impact. However, EPA does not anticipate any material increase in offshore oil and gas activity in the Texas Territorial Seas resulting from issuance of the proposed permit.

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5 The ranking is based on each industry's change in the region as (1) the portion attributable to the overall growth or decline of the nation's economy, (2) the portion attributable to the industry's national level of growth or decline above or below the national trend, and (3) the portion attributable to the region's competiveness as a site for the industry.

The Houston-Galveston Area Council (H-GAC) is a regional organization of local governments. H-GAC considers issues and cooperates in solving area-wide problems. H-GAC (2007) provides a breakdown of environmental justice populations in the Houston-Galveston area. Table 3-21 presents this breakdown by county based on U.S. census blocks.

There are no environmental justice issues in the actual Territorial Seas of Texas. However, the proposed permit may present very limited environmental justice concerns from the nearshore activities that are related to the proposed action. These concerns include emissions or discharges from increases in both shore boat activity and solid waste management activities associated with increased shore-disposal of surface preparation maintenance wastes. This activity is not likely to represent any significant increase in overall vessel traffic or waste management handling. The increase in such activity, relative to the far greater quantities of other oil and gas wastes that are presently transported to shore (drilling fluids, drill cuttings, produced sand) under the existing permit, is negligible.

Table 3-21. Breakdown of Environmental Justice Significant Block Groups by County[6]

County	# of Block Groups	Significant Block Groups (% of Total)	Total Significant Population	Significant Population (% of Total)	% Significant Population as % of Total County Population
Brazoria	2	0.006	1,728	0.508	0.715
Chambers	1	0.003	465	0.137	1.7
Fort Bend	3	1.0	3,861	1.1	1.0
Galveston	37	12.5	29,953	8.8	11.9
Harris	244	82.4	294,320	86.5	8.6
Liberty	4	1.3	3,751	1.1	5.3
Montgomery	3	1.0	3,437	1.0	1.1
Waller	2	0.006	2,705	0.795	8.3
Total	296	100%	340,220	100	7.3

Source: H-GAC, 2007

EPA Region 6 is developing and implementing a comprehensive, cross-media project in the West side community of Port Arthur, Texas. The project involves governmental officials, religious leaders, industrial officials, community leaders and citizens in a collaborative community-based approach to improve the community's public health and the environment.

An action plan developed for the project resulted in three grants and contract support for outreach and community meeting activities. The three grants included:

- A "Healthy Homes Outreach Project," University of Texas Foundation in collaboration with University of Texas Medical Branch at Galveston and Community in Power and Development Association,

6 Significance was determined by comparing percent of minority, low-income, and elderly residents in each block to the average for the entire region and assigning a score for a ratio lower than the regional average (score of 0); a ratio equal to but less than twice the rate of the region (score of 1); and a ratio of at least twice the regional average (score of 2). The block is then ranked as low (0-1), moderate (2-3), or significant (4-6) based on the aggregate score.

- An “After School Environmental Science Lab Project,” Tekoa Charter School, and
- The Golden Triangle Empowerment Center Job Training Program.

The primary contract support activity is development of an EPA ‘Environmental Profile’ outreach document that summarizes joint EPA and State evaluations of the best available information about environmental conditions (e.g., data and predictive tools). A City – EPA, two-day Summit in Port Arthur, Texas occurred on November 8-9, 2010. The summit brought together stakeholders to discuss thoughtful strategies and approaches to improve the quality of life for Port Arthur residents. The facilitated dialogue highlighted several crucial challenges that could be effectively addressed through a thoughtful local, state and federal collaboration.

Throughout 2011, efforts are being made to address six critically important issues that were identified at the Summit and formalized in Port Arthur’s Plan. These issues will be addressed by the formation of six issue specific workgroups composed of a cross-section of stakeholders.

There are a number of results expected from the EJ Showcase Community project. The environmental profile outreach document will inform the public of federal and state permits and authorizations, and identify opportunities for input into permit conditions. The Port Arthur Environmental Justice Plan is expected to impact environmental quality, promote the revitalization of the Downtown and Westside areas, address unemployment and significant health care challenges, improve the energy efficiency of residences, and facilitate alternative housing for residents of the Carver Terrace Assisted Housing Project.

BOEMRE (2011) provides that because of the extensive and widespread support system for oil and gas activities and the associated work force, the effects of the proposed activity are expected to be widely distributed and little felt. In general, cumulative effects are expected to economic, to have a limited but positive effect, and to not have disproportionate high/adverse environmental or health effects on low-income and minority populations. While this BOEMRE document covers activities on the OCS rather than in the Territorial Seas, the conclusions are still deemed appropriate for the proposed permit. The proposed permit is unlikely to materially alter the level of oil and gas activity in the Texas Territorial Seas, and thus, is not likely to adversely affect communities of concern.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 SIGNIFICANT CHANGES TO EXISTING PERMIT

The proposed permit contains ten significant changes to the existing permit, including:

1) Add hydrate control fluids to the list of authorized discharge. Hydrate control fluids may be discharged with, and are subject to the discharge limitations of, produced water. If hydrate control fluids must be discharged separately from produced water discharges, it must comply with all requirements established for produced water

2) Add 316(b) Phase III regulations to new facilities that intake 2 million gallons per day of water and use at least 25 percent for cooling. New facilities are those for which construction commenced after July 17, 2006. The proposed 316(b) regulations require operators to submit information demonstrating that new 316(b) Phase III facilities will be designed for water intake velocities less than 0.5 feet per second to reduce impingement, as well as other measures where feasible, e.g., screens to reduce entrainment.

3) Remove the provision in the existing permit that gave new sources a ten-year exemption from new and more stringent technology-based requirements.

4) Prohibit discharge of produced water from new production wells that start generating produced water after the effective date of the final permit. Additionally for authorized produced water discharges, require a facility to meet both 7-day chronic and 24-hour acute whole effluent toxicity (WET) limits before it can discharge produced water.

5) Phase out the authorization for pre-dilution of produced water prior to WET testing.

6) No discharge of chemically-treated miscellaneous discharges if they fail the required toxicity test.

7) Clarify the limitations on the discharge of garbage, which includes maintenance wastes, to require operators to capture as much maintenance waste associated with sandblasting and other types of surface preparation and painting, or coating, of the prepared surface as is practicable, and prohibit the discharge of any collected wastes.

8) Uncontrollable discharges caused by failures of equipment, blowout, damage to the facility, or any form of unexpected discharge are not authorized. Specific best management practices (BMPs) for blow out preventers (BOPs) and spill prevention are also proposed in this permit renewal.

9) Include more information (i.e., platform identifier, depth of water, expected drill dates, and etc.) to be submitted with the Notification of Intent (NOI).

10) As a result of the April 20, 2010 Transocean's Deepwater Horizon offshore drilling rig explosion and significant oil spill, to include ambient water quality and produced water monitoring programs so EPA may further evaluate the effects of this authorization of discharges in the future.

This section summarizes the potential effects that may occur as a result of the activities permitted under the proposed general permit for the territorial seas of Texas. Major discharges from exploration, development, and production of oil and gas resources, i.e., drilling fluids, drill cuttings, and produced water, have been extensively studied (Avanti, 1993; Boesch and Rabalais, 1887; National Research Council, 1983). Operational wastes from exploration, development and production have the demonstrated potential to adversely affect the marine environment, including both toxic effects and physical effects (smothering and sediment texture alterations). Based on available data, demonstrated effects have been shown to be relatively localized, within several hundred meters (>985 ft) for produced waters and drilling fluids from exploratory wells, and within a kilometer (0.621 mi) of development (multi-well) platforms.

Conditions and limitations have been imposed under the proposed permit that mitigate known sources of potential impact and also address whole effluent toxicity permitting requirements. The prohibition on discharges of drilling fluids, drill cuttings, and produced sand that is required under the existing permit is continued under the proposed permit; additionally, new sources for produced water discharges are prohibited under the proposed permit. These prohibitions eliminate any potential toxic or physical effects of these discharges.

The proposed permit authorizes discharges of a number of minor and *de minimus* waste streams that are presently authorized under the existing permit, under the same permit conditions and limitations required under the existing permit. These discharges include: deck drainage; well treatment, completion, and workover fluids; sanitary and domestic wastes; blowout preventer fluids; desalination unit process wastes; ballast and storage displacement water; bilge water; uncontaminated fresh and seawater; chemically-treated fresh and seawater; boiler blowdown; source water and sand; drilling muds, cuttings, and cement at the seafloor; and diatomaceous earth filter media. These discharges have been evaluated in the FEIS for the existing permit. There are no changes to the effluent quality or receiving water characteristics that modify or alter EPA’s determinations provided in the FEIS for the existing permit. Therefore, these waste streams will not be covered in this section of the Supplemental Information Report.

Of the significant changes in the proposed permit listed above, only one has the potential to result in adverse consequences that require new analyses: authorization of a new waste steam - hydrate control fluids. A second waste stream has its requirements better defined in the proposed permit (waste associated with sandblasting and other types of surface preparation and painting, or coating, of the prepared surface); however, no discharge of this waste stream is authorized under the proposed permit. All of the remaining changes either increase the level of environmental protection or are unchanged from the existing permit and apply to waste streams that have not changed in effluent quality or quantity since the development of the FEIS for the existing permit.

The only other aspect of the proposed permit that could have potential adverse consequences not evaluated in the FEIS for the existing permit is related to changes in the Texas WQS that have occurred since the development of the FEIS. The only authorized waste stream in the existing permit that has a material potential for violating the revised Texas WQS is produced water. Although the proposed permit contains changes to the existing permit that increase the level of environmental protection related to this waste stream (see items 3, 4, and 5 listed above), produced water is still considered a major waste stream with a potential for adverse consequences. Thus, the changes in the Texas WQS require a re-analysis of the compliance of produced water discharges in meeting the revised standards.

Therefore, in this section of the Supplemental Information Report, the potential adverse environmental consequences of only three items are discussed: hydrate control fluids, wastes from surface preparation maintenance operations, and produced water. All other waste streams have not changed in their effluent quality or quantity since the development of the FEIS for the existing permit. The conclusions and determinations presented in that FEIS remain valid for the proposed permit, and are not discussed in this Supplemental Information Report.

4.2 HYDRATE CONTROL FLUIDS

Gas hydrates are a unique, energy-rich, and poorly understood class of chemical substances in which molecules of one material (in this case solid-state water - ice) form an open lattice that physically encloses molecules of a certain size (in this case - methane) in a cage-like structure without chemical bonding (BOEMRE, 2011). Glycol and/or other chemicals may be used to dehydrate natural gas or deepwater pipelines. Hydrate prevention is normally accomplished through the use of methanol, ethylene glycol, or triethylene glycol as inhibitors, and the use of insulated pipelines and risers. Chemical injection is sometimes provided both at the wellhead and at a location within the well just above the subsurface safety valve. Wells that have the potential for hydrate formation can be treated with either continuous chemical injection or intermittent or "batch" injection. In many cases, batch treatment is sufficient to maintain well flow. In such cases, it is necessary only to inject the inhibitor at well start-up, and the well will continue flowing without the need for further treatment (MMS, 2007).

Most hydrate control fluids are commonly discharged with produced waters and thus are subject to the requirements of produced water in the proposed permit. If hydrate control chemicals are discharged separately from produced water, the discharge is subject to all discharge conditions and limitations as produced water. With the zero discharge of produced water for new facilities and the current discharge and monitoring requirements of produced water, EPA expects there will be no adverse impacts from the discharge of hydrate control fluids to the Territorial Seas of Texas.

4.3 SURFACE PREPARATION MAINTENANCE

Regulations at 33 CFR 151 and the current permit prohibit the discharge of garbage. Under the regulations, garbage is defined to include maintenance waste. This prohibition has led to confusion regarding the level of effort required to capture maintenance waste associated with sandblasting and other types of surface preparation and painting, or coating, of the prepared surface. Operators typically utilize tarps or other means to capture waste material; however, it is not possible to capture all waste materials.

To resolve this issue, new Best Management Practices (BMP) language is included in the proposed permit that requires operators to capture as much waste as is practicable. Furthermore, the discharge of that collected waste is prohibited under the proposed permit. The discharge of fugitive material, such as wind-blown sand or paint spray, is not included in that discharge prohibition if operators take all steps practicable to capture waste material. Zero discharge of surface preparation or maintenance wastes and *de minimus* releases of fugitive material should have no negative impact to the Territorial Seas of Texas.

EPA has proposed BMPs to control and minimize the release of these materials to the marine environment, requiring operators to capture as much of this material as is practicable and zero discharge of captured wastes. The uncollected, fugitive wastes from such operations would enter the water column as highly dispersed airborne deposition. EPA believes there are virtually no material adverse environmental impacts from these fugitive wastes due to: the particulate nature of these wastes, the small quantities of such materials, the large airborne dispersion of these materials prior to their entering marine waters over an commensurately large surface deposition area, and the intermittent nature of these operations. EPA does not expect any short-term or long-term cumulative impacts from these wastes.

4.4 PRODUCED WATER

4.4.1 Transport and Persistence

The following sections describe the transport and fate of produced water discharges and the modeling used to assess the potential water quality and human health impacts. The proposed permit incorporates a provision for zero discharge of produced water from new wells that become productive after the effective date of the proposed permit.

No major changes within the chemical makeup of produced water discharges are expected to have occurred between the existing permit and the proposed permit. As result, there are no material changes to the transport and fate descriptions, analyses, and conclusions developed for the FEIS for the existing permit. The only exception to the general applicability of the transport and persistence discussions in the FEIS conclusion is that Texas WQS have been revised since the FEIS was prepared for the existing permit. Therefore, water quality analyses for produced water pollutants, therefore, have been re-assessed in this SIR (see Section 4.4.2.3, below). Because the remainder of the transport and persistence discussions presented in the FEIS for the existing permit is unchanged for the proposed permit, these discussions are merely summarized below.

4.4.1.1 Produced Water Transport Processes

Physical Processes. The major physical transport processes affecting the fate of discharged produced water and associated chemicals include dispersion, volatilization, and adsorption/sedimentation. Hydrocarbons that become associated with sedimentary particles by adsorption can accumulate around production platforms, either settling to the seafloor through the water column or more directly through interaction of the discharge plume and the bottom.

Because produced waters are a continuous source of light aromatic hydrocarbons over the life of a field (generally 10 to 30+ years), there is a potential for these chemicals to accumulate in sediments. This situation differs from most oil spill situations, where after the spill ends, chemicals are rapidly lost and the sediments generally exhibit declining lighter aromatics with time.

An important factor affecting the fate of hydrocarbons in produced water is volatilization. Produced water contains a high fraction of volatile compounds (e.g., benzene, xylenes, toluene), that can easily evaporate. However, because produced water can be much more dense than seawater (salinities >150 ppt are not uncommon), discharge plumes sink rapidly, and elevated levels of benzene in bottom water have been observed

Biological Transport. Biological transport processes occur when an organism performs an activity with one or more of the following results:

- An element or compound is removed from the water column;
- A soluble element or compound is relocated within the water column;
- An insoluble form of an element or compound is made available to the water column; and/or
- An insoluble form of an element or compound is relocated.

Biological transport processes include (1) ingestion and excretion in fecal pellets, (2) reworking of sediment to move material to deeper layers (bioturbation), (3) bioaccumulation in soft and hard tissues, and (4) biomagnification. Organisms remove material from suspension through ingestion of fine (1-50 µm) suspended particulate matter and excretion of large fecal pellets (30-3,000 µm) with a settling velocity typical of coarse silt or fine sand grains. Zooplankton play a major role in transporting metals and petroleum hydrocarbons from the upper water levels to the sea bottom, with the largest fraction of ingested metals moving through the animal with unassimilated food and excreted in a more concentrated state in fecal pellets. For example, a population of calanoid copepods grazing on an oil slick could transport three tons of oil per km^2 (0.386 mi^2) per day to the bottom.

Bioaccumulation and Biomagnification. Studies assessing biomagnification of certain petroleum hydrocarbons are more limited than for other pollutants. Available data suggest these contaminants are not subject to biomagnification. Reasons for this observation may include: (1) the primary source of these compounds for organisms may be absorption from the water column rather than ingestion; or (2) organic molecules can be metabolized - biological half-lives of some petroleum hydrocarbons can be short, with many species purging themselves within a few days.

However, there is some evidence that hydrocarbons discharged with produced water are bioaccumulated by various marine organisms (the related process of bioconcentration is discussed Section 4.5.3 of this SIR). In the central Gulf of Mexico low levels of alkylated benzenes, naphthalenes, alkylated naphthalenes, phenanthrene, alkylated three-ring aromatics, and pyrene were found in a variety of fish and epifauna. Isomer distributions of alkylated benzenes and naphthalenes were similar to those seen in crude oil.

In the Buccaneer Field, barnacles from the platform fouling community at 3 m below the surface contained up to 4 ppm petroleum alkanes. Many fouling community species and associated pelagic fish were contaminated with hydrocarbons discharged in produced water. Petroleum hydrocarbons were found in 15 of 31 fish species examined around the Buccaneer Field platform. With one exception, most shrimp did not contain alkanes, which probably reflects the highly migratory behavior of these animals. Among nine benthic organisms examined for petroleum hydrocarbons, yellow corals (*Alcyonarians*) contained alkanes, although these could be biogenic, and although few winged oyster (*Pteria colymbus*) contained petroleum alkanes, they contained methylnaphthalenes and benzo(a)pyrene.

During October 1994 through December 1995 the *Gulf of Mexico Produced Water Bioaccumulation Study* (April 1997) was performed by the Offshore Operators Committee and prepared by the CSA, Inc. The monitoring study design involved semiannual collections of tissues of mollusk, crustacean, and fish species at platform discharging more than 4,600 bbl/d and analysis of these samples for volatile organic compounds, semivolatile organic compounds, metals, and radionueclides. The *Gulf of Mexico Produced Water Bioaccumulation Study* showed no significant evidence demonstrating bioaccumulation of target chemicals by marine organisms.

Results between this study and earlier studies do not correlate. This inconsistency may be due to the permitted pollutant limits that have been imposed on operators discharging produced water into the Gulf of Mexico after earlier studies, e.g., the Buccaneer Field study, were performed.

4.4.2 Discharge Modeling

The fate of produced water discharges was simulated using CORMIX-GI, version 4.2GT. Because there have been no material changes to the effluent quality and ambient conditions required for model input, there are no material changes to the analyses and conclusions developed for the FEIS for the existing permit. Because the modeling discussion presented in the FEIS for the existing permit is unchanged for the proposed permit, these discussions are merely summarized below.

4.4.2.1 CORMIX Expert System Description

The Cornell Mixing Zone Expert System (CORMIX) is a series of software subsystems for the analysis, prediction, and design of aqueous conventional or toxic pollutant discharges into watercourses. CORMIX was developed to predict the dilution and trajectory of submerged, single port discharges of arbitrary buoyancy (positive, negative, neutral) into water body conditions representative of rivers, lakes, reservoirs, estuaries, or coastal waters (i.e., shallow or deep, stagnant or flowing, uniform density or stratified).

In developing the existing permit, CORMIX-GI, version 4.2GT, was used for produced water dilution estimates. CORMIX-GI v4.2GT is a Windows®-based system that is more efficient to use than previous versions and better facilitates sensitivity analysis. Since then, a newer version of CORMIX has been released (CORMIX 7.0). The critical dilution percentage effluent table, a matrix table of critical dilution percentages at differing discharge rates (0 bbl/d to 25,000 bbl/d) and water depths (0 m to >16 m), has been remodeled and the outputs from CORMIX 7.0 were compared to that of CORMIX-GI v4.2GT. A detailed discussion of the remodeling is provided in the Fact Sheet to the proposed permit.

The resulting table of critical dilution percentage values from the remodeling effort was compared to the table of critical dilution percentages from the initial modeling for the existing permit. This comparison showed that in almost all cases the critical dilution percentage produced by CORMIX 7.0 was below the corresponding value at the same discharge rate and water depth that was produced by CORMIX-GI v4.2GT. The dilutions projected by CORMIX 7.0 were greater that those projected by CORMIX-GI v4.2GT, thus indicating CORMIX-GI v4.2GT is the more conservative model system with the parameters used. Because permittees are operating under the requirements of the existing permit, which are based on CORMIX-GI v4.2GT, modeling and critical dilutions in the existing permit are retained in the proposed permit. The modeling for the existing permit are discussed below

4.4.2.2 Model Input and Results

Model input parameters are provided in Table 4-1. The CORMIX model predictions for Texas produced water discharges are shown in Table 4-2 for the acute (50-ft; 15m), chronic (200-ft; 61 m), and human health (400-ft; 122 m) mixing zones. To develop a reasonable worst case scenario, the highest pollutant concentrations from available Texas discharge data were used for comparison with water quality standards. These results are used for the water quality analyses in Section 4.6 of this document. Permit application data (reasonable worst case scenario) submitted by operators to the TRRC Oil and Gas Division were entered into the CORMIX model for derivation of dilution estimation results.

Table 4-1. Input Data End Model Results for the Territorial Seas of Texas

CORMIX-G1, Version 4.2GT, Input Data	Acute 50 ft	Chronic 200 ft	Human Health 400 ft
Average depth	8.30 m	8.3 m	8.30 m
Ambient velocity	0.16 m/s	0.16 m/s	0.16 m/s
Darcy-Weisbach friction factor	0.02	0.02	0.02
Wind velocity	3.9 m/s	3.9 m/s	3.9 m/s
Surface density	1009.6 kg/m^3	1009.6 kg/m^3	1009.6 kg/m^3
Bottom density	1016.875 kg/m^3	1016.875 kg/m^3	1016.875 kg/m^3
Port diameter	0.15 m	0.15 m	0.15 m
Discharge flow rate	0.007 m^3/s	0.007 m^3/s	0.007 m^3/s
Discharge port height	1 m	1 m	1 m
Vertical discharge angle	90 deg	90 deg	90 deg
Discharge density	962 kg/m^3	962 kg/m^3	962 kg/m^3
Dilution Estimate, D_i/D_0	0.00513281	0.00356137	0.00275404
Dilution, D	194.8	280.8	363.1

Table 4-2. Calculated Reasonable Worst Case Scenario for Produced Water Pollutant Concentrations (3,885 bbl/d discharge; 7.32 meter water depth)

Pollutant	Effluent Concen-tration	Concen-tration @ 50 ft (µg/l)	Acute Criteria[a] @ 50 ft (µg/l)	Concen-tration @200 ft (µg/l)	Chronic Criteria[a] @ 200 ft (µg/l)	Concen-tration @ 400 ft (µg/l)	Human Health Criteria[b] (µg/l)
Aluminum	610	3.13	---[c]	2.17	---	1.68	---
Arsenic	90	0.462	149	0.321	78	0.248	---
Barium	564,000	2,890	---	2,008.6	---	1,553	---
Benzene	13,100	67.13	---	46.654	---	36.1	**513**
Cadmium	100	0.513	45.4	0.356	10	0.275	---
Chromium, hex	143	0.734	1,090	0.51	49.6	0.394	**502**
Copper	260	1.33	13.5	0.926	3.6	0.716	---
Cyanide	30.0	0.154	---	0.107	---	0.0826	---
Lead	400	2.05	133	1.42	5.3	1.102	**3.83**
Mercury	1.90	0.00975	2.1	0.00677	1.1	0.00523	0.025
Nickel	639	3.28	118	2.28	13.1	1.76	**1,140**
Selenium	268	1.38	564	0.95	136	0.738	---
Silver	20.0	0.103	2.0	0.0712	---	0.0551	---
Zinc	218	1.12	92.7	0.776	84.2	0.600	---

(a) All standards listed are from Texas Surface Water Quality Standards §§307.1-307.10, August 17, 2000
(b) **Bolded** standards revised, approved by EPA June 29, 2011; all others are from the source cited in footnote (a)
(c) Surface water quality standards have not been adopted by the State of Texas for these pollutants

4.4.3 Toxicity and Bioaccumulation

EPA is required to determine whether all discharges seaward of the baseline comply with the Ocean Discharge Criteria (40 CFR Part 125.122). In making such a determination, EPA considers the 10 criteria listed at Part 125.122. These are:

1. The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;
2. The potential transport of such pollutants by biological, physical or chemical processes;
3. The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;
4. The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;
5. The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;
6. The potential impacts on human health through direct and indirect pathways;
7. Existing or potential recreational and commercial fishing, including finfishing and shellfishing;
8. Any applicable requirements of an approved Coastal Zone Management plan;
9. Such other factors relating to the effects of the discharge as may be appropriate; and
10. Marine water quality criteria developed pursuant to Section 304(a)(1).

Factors 1 and 6 of the 10 factors for determining unreasonable degradation both address concerns about the toxic and human health effects from discharges. This section provides a summary of the information available concerning the toxicity and potential for bioaccumulation of discharges of produced water. Drilling fluids discharges are not addressed due to the prohibition of their discharge under current BAT effluent guidelines for the offshore subcategory.

No major changes within the chemical makeup of produced water discharges are expected to have occurred between the existing permit and the proposed permit. As result, there are no material changes to the toxicity and bioaccumulation descriptions, analyses, and conclusions developed for the FEIS for the existing permit. Thus, the discussion presented in the FEIS for the existing permit is unchanged for the proposed permit; that discussion is merely summarized below.

4.4.3.1 Toxicity of Produced Water

Discharge of produced water from oil and gas platforms is of interest for this evaluation because of potential toxicity and bioaccumulation of pollutants in produced water. Potential biological effects occurring as a result of produced water discharges include osmotic stress if salinity varies significantly from ambient sea water, respiratory stress if dissolved oxygen (DO) levels are low, bioaccumulation of various components, and toxic effects from hydrocarbon and heavy metal constituents.

The probability of these effects occurring is a function of total volume discharged within a water mass and the dilution and dispersion processes acting on the effluent plume. Produced water discharged from platforms located in the Texas territorial seas is more dense than ambient sea water and is expected to sink toward the sea floor. The mixing rates of these types of discharges depend on current/wave conditions, density difference between the effluent and the receiving water, distance between the discharge pipe and the sea floor, and the discharge pipe configuration.

If the salinity of the produced water is similar to ambient seawater, osmotic stress is improbable and respiratory stress is likely to be restricted to localized, near-field areas. Minimal impact of this type is likely unless the quantity (volume) of discharge is such that DO is measurably depressed within the water mass. This is most likely to occur only in shallow, poorly flushed embayments, not in the open waters found in the Gulf of Mexico.

4.4.3.2 Acute Toxicity

Several studies have examined the toxicity of produced water. In an earlier,1981 study on produced water from the Buccaneer Field in the Gulf of Mexico offshore Texas, results were presented for several species, life stages, seasons, produced water sources, and testing conditions. The results indicate a range in toxicity of LC50 values (concentration lethal to 50 percent of test organisms) from 8,000 ppm to 154,000 ppm for invertebrates and 7,000 ppm to 408,000 ppm for the vertebrates tested (Table 4-3). More recent studies have conducted toxicity evaluations and tests using produced water and a variety of test species and results are quite comparable. At the high end of toxicity were LC50 values of 500 ppm, 9,000 ppm, and 11,700 ppm; at the lower end of toxicity LC50 values ranged from 550,000 ppm to 1,000,000 ppm. These results are summarized in Table 4-4.

Several studies have examined the causes of toxicity in produced water. A toxicity identification evaluations of produced water showed toxicity is due to volatile compounds, neutral semi-volatile organic compounds, particulate matter (precipitated at neutral pH), and suspended solids. The particular toxicants identified are hydrogen sulfide and hydrocarbons. Also, biodegradation of produced water, resulting in a 95 percent removal of dissolved organic carbon, resulted in a10-fold reduction in toxicity.

Table 4-3. Median Lethal Concentrations and Associated 95% Confidence Intervals for Organisms Acutely Exposed to Formation Water under Various Experimental Conditions

Organism	Test Season	Formation Water Used	Test Temperature, ºC	LC50 [a,b]	95% Confidence Interval [a,b]
Test Series No.1[c]					
Brown Shrimp: Larva	Spring 1979	D [d]	28	10,000	7,000-15,000
	Spring 1979	E	28	12,000	9,000-18,000
	Spring 1979	F	28	8,000	6,000-12,000
	Spring 1979	G	28	8,000	5,000-11,000
Subadult	Summer 1978	A	25±1	94,000	63,000-172,000
	Fall 1978	B	22±1	60,000	0-100,000
	Winter 1979	C	18±2	183,000	130,000-279,000
	Spring 1979	D	24±1	61,000	47,000-76,000
Adult	Summer 1978	A	25±1	94,000	63,000-172,000
	Fall 1978	B	22±1	78,000	38,000-183,000
	Winter 1979	C	18±2	178,000	132,000-240,000
White Shrimp: Subadult	Spring 1979	D	24±1	90,000	61,000-156,000
	Summer 1978	A	25±1	56,000	51,000-62,000
	Fall 1978	B	22±1	61,000	48,000-76,000
Adult	Winter 1979	D	18±1	133,000	67,000-366,000
	Summer 1978	A	25±1	81,000	48,000-153,000
	Fall 1978	B	22±1	62,000	27,000-110,000
	Winter 1979	C	18±1	92,000	58,000-150,000
Barnacle	Spring 1979	D	24±1	37,000	24,000-52,000
	Summer 1978	A	25±1	33,000	25,000-38,000
	Fall 1978	B	22±1	84,000	68,000-104,000
	Winter 1979	C	18±2	154,000	111,000-222,000
Crested blenny	Spring 1979	D	24±1	60,000	49,000-71,000
	Summer 1978	A	25±1	158,000	100,000-320,000
	Fall 1978	B	22±1	408,000	320,000-560,000
	Spring 1979	D	24±1	178,000	135,000-235,000
Test Series No. 2 [e]					
Barnacle	Winter 1979	C	18±2	8,000	5,000-13,000
Cr. blenny	Spring 1979	D	24±1	7,000	5,000-12,000
Test Series No. 3 [f]					
White shrimp, Subadult	Fall 1978	B	22±1	62,000	48,000-76,000
Test Series No. 4 [g]					
Brown Shrimp, Subadult	Spring 1979	H	25-29	44,000	25,000-60,000
Barnacle	Spring 1979	H	25-29	51,000	34,000-68,000

Table 4-3. Median Lethal Concentrations and Associated 95% Confidence Intervals for Organisms Acutely Exposed to Formation Water under Various Experimental Conditions

Source: Rose and Ward, 1981

[a] All LC50s and associated 95 percent confidence intervals are 96-hr values except in the case of larval brown shrimp, for which 48-hr values are reported. Units are ppm formation water.

[b] In most cases, LC50s and related confidence intervals were calculated by the moving average method. However, the binomial method was employed in Test Series No. 1 for subadult brown shrimp tested in the fall as well as for crested blennies tested in the summer and fall. The probit method was used for Test Series No. 4.

[c] Static laboratory tests; oxygen demand of formation water not evaluated. Except in the case of tests with larval brown shrimp, test and control media were aerated to maintain dissolved oxygen concentration (DO) above 4 mg/l. Aeration was not required to maintain a DO above 4 mg/l in tests with larval shrimp.

[d] Letters indicate different produced water samples; tests with the same letter were performed on the same sample

[e] Static laboratory tests; oxygen demand of formation water evaluated. Test and control media were not aerated. Although DO of control media remained above 4 mg/l during the tests, DO of test media decreased to 0.5-3.2 mg/l (barnacle) and 1.2-4.0 mg/l (crested blenny) by the end of the 96-hr testing period.

[f] Flow-through laboratory tests; oxygen demand of formation water not evaluated. Test and control media were aerated to maintain DO above 4 mg/l.

[g] Flow-through platform tests; oxygen demand of formation water not evaluated. Test and control media were aerated to maintain DO above 4 mg/l.

Table 4-4. Acute Lethal Toxicity of Produced Waters to Marine Organisms

Species	Life Stage	LC50/EC50 (ppm)[a]	Reference
Balanus tintinnabulum (Barnacle)	Adult	83,000	NMFS, 1980
Penaeus setiferus (White shrimp)	Adult Adult Subadult Larvae Larvae	116,000 78,000-178,000 60,000-183,000 9,500 (48-hr LC50) 8,000-12,000 (48-hr LC50)	NMFS, 1980 Rose & Ward, 1981 Rose & Ward, 1981 NMFS, 1980 Rose & Ward, 1981
Penaeus aztecus (Brown shrimp)	Adult	70,000	NMFS, 1980
Hypleurochilus geminatus (Crested blennie)	Adult Adult	269,000 158,000-408,000	NMFS, 1980 Rose & Ward, 1981
Cyrpinodon variegatas (Sheepshead minnow)	Adult Adult Adult	550,000-600,000 11,700->1,000,000 54,400->280,000	Andreason & Spears, 1983 Avanti, 1992 Moffitt et al., 1992
Mytilus californianus (California mussels)	Embryo	21,200 (48-hr EC50)	Higashi et al., 1992
Mysidopsis bahia (Mysid)	Adult	23,000-160,000 19,000-93,000 500->1,000,000	Moffitt et al., 1987 Montgomery, 1987 Avanti, 1992
Pimephales promelas (Fathead minnow)	Adult	170,000-220,000 (24-hr LC50)	Sauer et al., 1992
Ceridaphnia dubia (Daphnid)	Adult	80,000 (24-hr LC50)	Sauer et al., 1992
Skeletonema costatum	---	45,000-676,000 (48-hr EC50)	Brandenhaug et al., 1992
Microtox	---	40,000-192,000 (4-hr)	Brandenhaug et al., 1992

[a] 96-hr LC50/EC50 unless otherwise noted.

4.4.3.3 Chronic and Sublethal Toxicity

In addition to acute effects, chronic, lethal, and sublethal effects must be considered. Where a hypersaline produced water plume contacts the bottom, impacts can be expected from anoxic and hypersaline conditions. The benthic community, especially infauna and less mobile epifauna, would be severely disrupted in the immediate vicinity of the discharge in cases where the plume hits the bottom such as in shallow water. For example, in a shallow water site in Trinity Bay, Texas, severe disruption of benthos within 150 m (500 ft) of the discharge point occurred; in a study of two produced water outfalls in coastal Texas, significant impacts to benthic community structure were observed and sediment and pore-water toxicity tests found significant impact extending to 370 meters (1214 ft) from the outfall. In a study conducted in Santa Barbara, California, detectable developmental effects were observed at 100-500 m (325-1650 ft) from the outfall. Produced water effluent plumes, however, are not likely to directly contact the bottom if the discharge point is greater than seven meters (23 ft) above the sea floor.

Under the previous general permit (TXG260000), dischargers are required to submit Discharge Monitoring Reports with chronic toxicity tests results to the EPA. Discharge Monitoring Reports showed that for mysids the no observed effect level (NOEL) for the lethal effects 7-day chronic testing, ranged from 3.6 percent to 0.2 percent, with a mean of 0.79 percent. For Menidia, the NOEL for the lethal effects 7-day chronic testing, results ranged from 3.4 percent to 0.2 percent, with a mean of 0.72 percent.

4.4.3.4 Bioconcentration Potential of Produced Water Constituents

Bioconcentration is a special case of bioaccumulation, defined as uptake and retention of a chemical from water exposure alone. The magnitude of bioconcentration is measured as the bioconcentration factor (BCF). The BCF is the ratio at equilibrium of the concentration of a chemical in the tissues of the organism to the concentration of the chemical in solution in the water to which the organism was exposed. The BCF can also be measured as the ratio of the uptake rate constant or uptake clearance to the release rate constant at equilibrium. Reviewing the estimated BCFs for pollutants found in produced water (Table 4-5) naphthalene, zinc, copper, xylenes, and radium exhibit the highest bioaccumulation potential.

Table 4-5. Estimated Accumulation Factors of Pollutants Found in Produced Waters [a]

Component	Bioaccumulation Factor
Arsenic	44
Benzene	5.21
2-Butanone	1
Cadmium	64
Copper	290
2,4-Dimethylphenol	94
Ethylbenzene	37.5
Iron	NA
Lead	49
Manganese	NA
Naphthalene	426
Nickel	47
Phenol	1.4

Table 4-5. Estimated Accumulation Factors of Pollutants Found in Produced Waters [a]

Component	Bioaccumulation Factor
Radium	140
Toluene	10.7
Xylene (total)	208
Zinc	432

[a] Source: Versar, 1992

The industry conducted an in depth bioaccumulation study under a previous Outer Continental Shelf general permit from October, 1994 through December, 1995. The study compared non-discharging platforms and platforms discharging 4,800 bpd to 14,000 bpd. Results of this study on approximately 500 marine tissue samples analyzed for produced water pollutants did not demonstrate a difference for bioaccumulation of target pollutants between discharging and non-discharging platforms. Benzene, benzo(a)pyrene, toluene, and ethylbenzene were not detected in 97 percent of the samples analyzed; bis(2-ethylhexyl)phthalate was not detected in 90 percent; fluorine was not detected in 89 percent; and phenol was not detected in 86 percent of the samples.

Arsenic and mercury were detected in all marine tissue samples, but there was no statistically significant difference between levels of arsenic and mercury from discharging and non-discharging platform vicinities and were comparable to levels of arsenic and mercury found in marine animals throughout the world's oceans. Cadmium was detected in 82 percent of the samples analyzed. However, there was no statistically significant difference between cadmium levels of marine animals of discharging and non-discharging platform vicinities.

Total radium (the sum of ^{226}Ra and ^{228}Ra) was detected in less than half of the samples of fish, blue crab, and oyster collected in this study above the minimum detection limit. Two samples of fish contained more than 0.1 pCi/g of ^{226}Ra near discharging platforms, one sample of yellow chub and one sample of red snapper, both collected in the spring and both containing 0.17 pCi/g dry weight ^{226}Ra. Forty samples of marine fishes and oyster contained 0.10 pCi/g or more of ^{228}Ra. The highest measured concentrations of ^{228}Ra were near discharging platforms: 0.38 pCi/g in red snapper and 0.23 pCi/g in creole fish. However, of all the tissue samples containing 0.10 pCi/g or more of ^{228}Ra, 65 percent (26) were from non-discharging stations while only 35 percent (14) were from produced water discharging platforms. Two oyster samples that contained more than 0.1 pCi/g ^{228}Ra were collected near a non-discharging site off the Louisiana coast. Thus, there is little evidence that radium bioaccumulation from produced water discharges occurred in the species examined in this study.

4.4.4 Water Quality Analyses

Factor 6 of the 10 factors used to determine if there is unreasonable degradation, considers potential human health impacts, and Factor 10 requires assessment of marine water quality criteria. This section assesses the potential for violations of Texas WQS. Marine water quality criteria, human health criteria, and additional criteria are evaluated. No major changes within the chemical makeup of produced water discharges are expected to have occurred between the existing permit and the proposed permit. As result, the only material changes to the water quality descriptions, analyses, and conclusions developed for the FEIS for the existing permit are changes in Texas WQS since the development of the FEIS. Thus, the discussion below presents a re-analysis of potential water quality impacts using revised Texas WQS.

4.4.4.1 Texas Water Quality Standards

Potential impacts to marine water quality or human health are assessed through comparison of produced water discharge pollutant concentrations with the standards and criteria established for the individual pollutants. Discharges are compared to state marine acute, marine chronic, and human health-based WQS through implementation of waste load allocation models as directed by the Texas regulatory agencies.

The Texas Water Quality Standards, set forth as Title 30 of the Texas Administrative Code, Chapter 307, establish general and numerical criteria for discharges to state waters. TCEQ maintains and administers the water quality of the state by implementing the standards through the permitting process. Regulation of discharges to state waters from activities associated with the exploration, development, and production of oil and gas or geothermal resources is under the jurisdiction of the TRRC. All discharges authorized by the Railroad Commission, however, must comply with Texas WQSs Additional regulations for produced water discharges from oil and gas facilities are also established by the Railroad Commission under Rule 8 of the Statewide Rules for Oil, Gas, and Geothermal Operations.

The Water Permits & Management Division of TCEQ prepared an implementation guidance document entitled *Implementation of the Texas Natural Resource Conservation Commission Standards Via Permitting* (August 23, 1995) as guidance on determining correct permit limitations. For this analysis, the Texas implementation guidance document is followed.

General criteria of the state surface water quality standards apply to all waters of the state (i.e., including waters within a mixing zone), except where specifically exempted, and apply to the following parameters:

- Aesthetics
- Taste and odor
- Floating debris and suspended solids
- Turbidity and color
- Foaming and frothing material
- Oil, grease, or related residue.
- Toxic parameters
- Temperature
- Salinity
- Total toxicity
- Antidegradation

EPA approved Texas WQS by TCEQ August 17, 2000. However, on June 30, 2010 TCEQ revised the August 17, 200 WQS and adopted new standards. On June 29, 2011 EPA Region 6 responded to the TCEQ regarding the revised WQS with a partial approval of the standards. EPA approved revisions to four human health standards:

- Benzene - the standard was revised to 513 ug/L
- Chromium (hexavalent) - a human health standard of 502 ug/L was introduced
- Lead - the standard was revised to 3.83 ug/L
- Nickel - a human health standard of 1,140 ug/L (dissolved phase) was introduced.

All remaining aquatic and human health standards are unchanged. The numeric standards for pollutants found in Texas produced waters are provided in Table 4-6.

4.4.4.2 Texas Water Quality Analyses and Results

Produced water discharges were analyzed to determine compliance with EPA-approved 2010 numeric State Water Quality Standards. The analysis was accomplished using the highest permitted discharge rate under the state permitting program, managed by the Railroad Commission of Texas, and effluent data obtained from that state agency (per Table 6.1 of the 2004 FEIS). Water quality based limits used for the comparison were derived using the TEXTOX program, developed by TCEQ. The critical dilutions used to calculate the reasonable potential are based on CORMIX 7.0 modeling results. The implementation plan requires comparison of the effluent concentration with 70 percent and 85 percent of the calculated monthly average water quality based limits. A limit is required to be included in a permit when effluent data are shown to exceed 85 percent of the calculated limit. In cases where the effluent is shown to exceed 70 percent of the calculated limit, monitoring is required to be included in permits. EPA conducted a comparison of the previous produced water data obtained from the Railroad Commission of Texas with the values calculated to be 70 percent of the monthly average limits based on the most recent state WQS, and results are shown in Table 4-7.

Table 4-6. Texas Surface Water Quality Standards

Parameter	Surface Water Quality Standards (µg/l)		
	Marine Acute	Marine Chronic	Human Health
Aluminum	---	---	---
Arsenic (a)	149	78	---
Barium	---	---	---
Benzene	---	---	**513**
Cadmium (a)	45.4	10	---
Chromium, hex (a)	1,090	49.6	**502**
Copper (a, b)	13.5	3.6	---
Cyanide	---	---	---
Lead (a)	133	5.3	**3.83**
Mercury	2.1	1.1	0.025
Nickel (a)	118	13.1	**1,140**
Selenium	564	136	---
Silver, as free ion	2.0	---	---
Zinc (a)	92.7	84.2	---
Toxic Parameters	Waters will not be toxic to man from ingestion of water, consumption of aquatic organisms, or contact with skin, or to territorial or aquatic life.		
Temperature	Water temperature shall be maintained so as to not interfere with the reasonable use of such waters. The maximum temperature differential beyond the mixing zone is 4ºF in fall, winter, and spring and 1.5ºF in summer.		

Source: Surface WQS, Effective 17 Aug 2000; **bold** values were revised and received EPA approval 20 Jun 2010

--- Surface water quality standards have not been determined by the State of Texas for these pollutants.

(a) Indicates that the criteria for a specific parameters are for the dissolved portion in water; all other criteria are for total recoverable concentrations, except where noted.

(b) In designated oyster waters, an acute saltwater copper criterion of 3.6 µg/l applies outside of the mixing zone of permitted discharges; specified mixing zones for copper will not encompass oyster reefs containing live oysters.

Table 4-7. Numeric Water Quality Based Limits Analysis

Parameter	Effluent Conc. (µg/L)	70% Aquatic Life Limit (µg/L)	70% Human Health Limit (µg/L)
Aluminum	610	N/A	N/A
Arsenic	90	9,559	N/A
Barium	564,000	N/A	N/A
Benzene	13,100	N/A	93,570
Cadmium	100	1,762	N/A
Chromium, hexavalent	143	8,742	91,564
Copper	260	715	N/A
Cyanide	30	359	N/A
Lead	400	2,399	17,094
Mercury	1.90	135	4.56
Nickel	639	2,309	208,000
Selenium	268	23,970	N/A
Silver	20	291	N/A
Zinc	218	9,643	N/A

Based on EPA's analysis conducted on August 2, 2011 using TEXTOX MENU #5, the produced water discharges proposed to be authorized by the general permit do not have the potential to exceed state water quality standards. Therefore, no limits or monitoring are proposed to be required based on the numeric water quality standards. EPA Region 6 is submitting the proposed general permit, including the Region's determination that the permit will not violate Texas WQS, for review and certification by the State.

4.4.5 Toxicity Testing Requirements

Produced water discharges contain pollutants in quantities that may have the potential to cause toxic conditions in the receiving water in violation of Section 101(a)(3) of the Clean Water Act. Whole effluent toxicity testing is the most direct measure of the potential toxicity of an effluent in the receiving water.

It is the national policy of EPA to use toxicity testing to evaluate the toxic effects of a discharge upon the receiving waters (49 FR 9016, 3/9/84). Also, the goal of Third Round and Post Third Round NPDES permits is that no chronic toxicity is allowed outside the mixing zone. The State has established narrative criteria which, in part, state that "surface waters will not be toxic to men or terrestrial or aquatic life." The implementation procedures stated in the "Procedures for Implementing the Texas Surface Water Quality Standards" (January, 2003) require no chronic toxicity at the edge of the mixing zone.

Requirements are based on state WQS and CWA Section 403(c). Water quality standard-based limits are proposed for 24-hour acute (end-of-pipe) toxicity and 7-day chronic toxicity based on the dilution at the edge of the mixing zone. In accordance with EPA's policy, Texas's narrative criteria, and the implementation document, the draft permit includes whole effluent toxicity limits and monitoring for produced water discharges. The mixing zone defined by Texas for chronic aquatic life (200 ft; 61 m) was used to calculated critical dilutions for the toxicity limits.

As discussed above in Section 4.4.2, a revised version of CORMIX has been released. When EPA finalized the expired permit in 2005, CORMIX-GI v.4.2GT was used to determine the dilution of produced water discharges at the edge of the various mixing zones. EPA has remodeled these produced water discharge scenarios using CORMIX 7.0 and compared the results to those obtained in the development of the existing permit using CORMIX-GI v.4.2GT. The analysis determined that the existing permit critical dilution percentages are more conservative than those obtained using CORMIX 7.0; therefore, the modeling effort that was used to establish the existing permit critical dilutions has been retained for the proposed permit.

In the previous analysis, the following input parameters were used:

Density Gradient	= 0.2291 $kg/m^3/m$
Ambient seawater density	= 1017 kg/m^3
Produced water density	= 1070 kg/m^3
Current velocity	= 4 cm/sec
Wind velocity	= 4 m/sec
Pipe diameter	= 0.1524 m.

Because the size of pipe only causes minor changes to critical dilution and the 6-inch diameter is a common size for a discharge pipe, the critical dilution values listed in the 2005 issued permit could be simplified based on the 6-inch (15 cm) diameter pipe as shown on Table 4-8. The depths used on the dilution tables are based on representative water depths in which platforms are located in the territorial seas of Texas. The results of this analysis, developed for the existing permit, are valid in all regards for the proposed permit.

Table 4-8. Critical Dilution for Produced Water Toxicity Limitations

Discharge Rate (bbl/day-m3/s)	Water Depth (meters)[1]						
	0 - 4	4 - 6	6 - 9	9 - 12	12 - 14	14 - 16	> 16
500 - 0.00092	0.33	0.2	0.15	0.15	0.15	0.15	0.15
1,000 – 0.0018	0.7	0.4	0.22	0.22	0.22	0.22	0.22
2,000 – 0.0037	1.3	0.8	0.54	0.31	0.31	0.31	0.31
3,000 – 0.0055	1.9	1.1	0.73	0.38	0.38	0.38	0.38
4,000 – 0.0074	2.4	1.3	0.91	0.6	0.44	0.44	0.44
5,000 – 0.0092	2.8	1.6	1.1	0.8	0.49	0.49	0.49
6,000 – 0.011	3.2	1.8	1.2	0.9	0.54	0.54	0.54
7,000 – 0.0129	3.6	2	1.3	1	0.58	0.58	0.58
8,000 – 0.0147	3.9	2.2	1.5	1.1	0.71	0.62	0.6
9,000 – 0.0166	4.3	2.4	1.6	1.2	0.83	0.65	0.63
10,000 – 0.0184	4.6	2.6	1.7	1.3	0.93	0.68	0.66
15,000 – 0.0276	5.9	3.3	2.2	1.4	1.3	1	0.78
20,000 – 0.0368	7.1	3.9	2.6	1.7	1.6	1.3	0.88
25,000 – 0.0460	7.8	4.2	2.9	1.9	1.8	1.6	0.96

[1] Distance between the discharge pipe and the seafloor.

4.5 POTENTIAL IMPACTS

This section summarizes the potential effects that may occur as a result of the activities permitted under the proposed general permit for the territorial seas of Texas. Major discharges from exploration, development, and production of oil and gas resources, i.e., drilling fluids, drill cuttings, and produced water, have the demonstrated potential to adversely affect the marine environment. Adverse effects include both toxic effects and physical effects (smothering and sediment texture alterations). Based on available data, demonstrated effects have been shown to be relatively localized, within several hundred meters for produced waters.

Conditions and limitations have been imposed under the proposed permit that mitigate known sources of potential impact and also address whole effluent toxicity permitting requirements. The prohibition on discharges of drilling fluids, drill cuttings, and produced sand that is required under the existing permit is continued under the proposed permit; additionally, new sources for produced water discharges are prohibited under the proposed permit. These prohibitions eliminate any potential toxic or physical effects of these discharges.

The proposed permit authorizes discharges of a number of minor and *de minimus* waste streams that are presently authorized under the existing permit, under the same permit conditions and limitations required under the existing permit. These discharges include: deck drainage; well treatment, completion, and workover fluids; sanitary and domestic wastes; blowout preventer fluids; desalination unit process wastes; ballast and storage displacement water; bilge water;

uncontaminated fresh and seawater; chemically-treated fresh and seawater; boiler blowdown; source water and sand; drilling muds, cuttings, and cement at the seafloor; and diatomaceous earth filter media. These discharges have been evaluated in the FEIS for the existing permit. There are no changes to the effluent quality or receiving water characteristics that modify or alter EPA's determinations provided in the FEIS for the existing permit. Therefore, these waste streams will not be covered in this section of the Supplemental Information Report.

The pace of oil and gas development in the Gulf of Mexico is expected to remain largely consistent with past levels. As a result, the nature and extent of impacts to land use and the existing infrastructure are not expected to change appreciably from past experience. The oil and gas industry has been an integral part of the Gulf of Mexico economy for decades, and the continuation of industry activities is not expected to result in any major land use or infrastructure impacts for the region.

4.5.1 Hydrate Control Fluids

Hydrate control fluids are discharged in relatively small quantities. Most hydrate control fluids are commonly discharged with produced waters. As such, they are subject to all permit requirements imposed on produced water. Thus, under the proposed permit, hydrate control fluids are subject to the same technology-based, water quality-based, and whole effluent toxicity limits as produced water. However, if hydrate control chemicals are discharged separate from produced water, these discharges also must meet the same permit conditions, limitations, and requirements that the proposed permit imposes on produced water. EPA has evaluated the potential adverse impacts of produced water, a major waste from offshore oil and gas activities, and has concluded that with all provisions, conditions, limitations, and requirements of the proposed permit in place, discharges of produced water will not result in adverse impacts to the environment (see Section 4.7.3, below). Therefore, EPA also concludes there should be no negative impacts from the discharge of hydrate control fluids to the Territorial Seas of Texas.

4.5.2 Surface Preparation Maintenance

The proposed permit clarifies the definition and regulation of wastes from surface maintenance activities. The discharge of such wastes constitutes "garbage" under Coast Guard regulations at 33 CFR 151, and thus is considered a discharge waste stream. The proposed permit requires operators to capture as much of these wastes as practicable and the discharge of such collected waste is prohibited under the proposed permit. However, capturing all such waste material is not possible, so the release of fugitive material, such as wind-blown sand or paint spray, is not included in that discharge prohibition if operators take all steps practicable to capture this waste material. Zero discharge of surface preparation or maintenance wastes and *de minimus* releases of fugitive material should have no negative impact to the Territorial Seas of Texas.

4.5.3 Produced Water

4.5.3.1 Toxicity

The chemical properties of produced water that could cause toxic effects in marine organisms and ecosystems include elevated salinity, altered ionic balances, low dissolved oxygen, heavy metals, petroleum hydrocarbons, and other organics. The major constituents of concern in produced water are petroleum hydrocarbons and heavy metals. Other produced water constituents or properties are unlikely contributors to significant impacts in the marine environment. Because of the generally observed level of mixing in open water, most physical/chemical features of produced water do not appear to pose a hazard to water column biota in open waters.

The potential toxicity of produced water is mitigated through two key provisions of the proposed permit. The first provision provides for produced water acute and chronic whole effluent toxicity limits and monitoring to insure there are no significant changes in effluent quality in this waste stream that may invalidate EPA's conclusions on the environmental impacts of produced water. The second is that EPA has performed a series of produced water plume modeling analyses, developed under reasonable worst case effluent and ambient conditions, to determine what critical dilutions are required to mitigate the potential toxicity of produced water. Then, based on this modeling EPA has included permit conditions that restrict operators to produced water discharge rates and configurations that achieve the dilution needed to avoid effluent toxicity from produced water.

These modeling analyses were detailed in the FEIS for the existing permit; no changes in effluent quality or ambient conditions have occurred since the FEIS. Therefore, EPA's basis and conclusions have not changed from those detailed in the FEIS - it is unlikely that produced water discharges will adversely impact the Territorial Seas of Texas. EPA's proposed permit also includes a no discharge provision for produced water from new wells that become productive after the effective date of the permit.

4.5.3.2 Potential Benthic Impacts

In shallow water environments where suspended sediment concentrations are high, dissolved and colloidal hydrocarbons and metals from produced water tend to become adsorbed to suspended particles and settle to the bottom. The benthic community is likely to be impacted by produced water discharges, especially if the produced water is hypersaline and the receiving water is shallow (<5 m; <16 ft). Under such conditions, organic and metallic pollutants in produced water may affect the benthos even if the plume does not impact the bottom directly, because these chemical constituents would be expected to quickly adsorb to suspended matter in the water column and eventually settle to the bottom. The extent of these effects will depend on the duration, volume, and dispersion of the plume.

The territorial seas have greater currents, greater water depths and lower concentrations of suspended particulate matter than bays or coastal waters. Thus, any effects of produced water discharges would be minimized. Additionally, discharges meet all state WQS, including whole effluent toxicity. In high energy areas such as the territorial seas, EPA concludes benthic community disruption to any great degree beyond the immediate vicinity of the discharge is unlikely, or if found, is expected to be localized or of a relatively small magnitude.

4.5.3.3 Potential Bioaccumulation

Bioaccumulation of produced water contaminants from water column exposure is not likely due to the high degree of mixing in open Gulf waters. EPA considers it unlikely that produced water plumes will have any substantial interaction with bottom sediments, which is the condition under which hydrocarbon accumulation would be expected to occur.

Although earlier research has indicated that some bioaccumulation of produced water pollutants was observed, a large industry-wide Gulf of Mexico study submitted to EPA found no significant trends in bioaccumulation of pollutants by marine animals between discharging and non-discharging platforms. Benzene, toluene, ethylbenzene, fluorine, benzo(a)pyrene, phenol, and bis(2-ethylhexyl)phthalate were each detected in less than 14 percent of some 500 tissue samples analyzed. Arsenic and mercury were detected in all tissue samples; however, there was no significant difference between levels of arsenic and mercury from discharging and non-discharging platform vicinities and tissue concentrations were comparable to levels found in marine animals throughout the world's oceans.

Monthly average (29 mg/l) and daily maximum (42 mg/l) oil and grease limits from the existing permit are extended in the proposed permit. In addition, discharge rate and configuration limitation and requirements are continued. These permits conditions, the no discharge provision for produced water from new wells, and compliance with Texas WQS will mitigate potential bioaccumulation impacts from produced water discharges

4.5.3.4 Potential Water Quality Impacts

Produced water discharges were analyzed by using the highest permitted discharge rate under the state permitting program managed by the TRRC, and effluent data obtained from that state agency. Water quality-based limits used for the comparison were derived using the TEXTOX program, developed by the TCEQ. EPA conducted a comparison of the previous produced water data obtained from the TRRC with the values of the most recent state WQS. Based on EPA's analysis, produced water discharges proposed to be authorized by the general permit do not have the potential to exceed state water quality standards. Thus, no limits or monitoring, based on numeric water quality standards, are required.

4.5.4 Potential Impact of Discharges on Fisheries and EFH

Assessing the socioeconomic consequences of adverse effects on fisheries from discharges of produced water is the focus of this section. The importance of the commercial and recreational fisheries to the regional economy of the Gulf of Mexico and to the state economy of Texas was discussed in Section 3.3. As presented in Section 3.3, in 2009 the Gulf of Mexico region's seafood industry generated $1.7 billion in sales impacts in Texas. The sector that generated the greatest employment impacts by state was the importers sector with 34,000 jobs in Florida and 2,500 jobs in Texas. The harvest sector in Texas generated 3,700 jobs. Texas had landings revenues in 2009 of $150 million. In terms of pounds landed, Texas landings totaled 99 million pounds (NMFS, 2011). In 2009, over 2.8 million recreational anglers took 22 million fishing trips in the Gulf of Mexico region. Almost 90 percent of these anglers were residents of a regional coastal county. Of the total fishing trips taken, 59 percent were taken from a private or rental boat and another 37 percent were shore-based.

Any impacts on fisheries around offshore platforms in the territorial seas are expected to be relatively localized and short-term. In a low energy environment, the produced water discharge plume may contact the bottom. This may create anoxic conditions in the immediate vicinity of the discharge. The species that have a greater potential to be affected by oil and gas discharges in the territorial seas are demersal or bottom feeding fish. There also is the potential for toxic effects, although only for a limited area. The energetics and water depths in which oil and gas platforms are found in the open waters of the Territorial Seas of Texas will minimize fisheries impacts because of the relatively rapid mixing of the produced water plume and relatively limited potential for produced water plumes to interact with sediments. Additionally, produced water discharges will meet the Texas WQS and whole effluent toxicity limitations under the proposed permit. The presence of oil and gas platforms creates habitat and may actually enhance fisheries, especially for recreational fishing.

Oil and gas structures are a major focus of all forms of offshore recreational fishing and some types of commercial fishing. Platforms receive the most attention by sport fishermen in the Texas Territorial Seas. The preferred fishing locations for private and charter boat fishermen in portions of the western and central Gulf are oil and gas structures, and the ones located in nearshore areas close to major coastal population access points are visited most often.

If significant discharges were to occur without sufficiently protective constraints, fish eggs, larvae, and juveniles could be damaged or destroyed, and fishing (such as reef fishing or shrimping) could be disrupted in fishing areas within close proximity to platform discharges. Many of the fish species that congregate around petroleum structures are prime sport-fishing targets (snapper, mackerels, etc.).

Concerns regarding sublethal effects of discharges on major sport-fishing targets around platforms have been raised and addressed by several studies that concluded trace contaminants were noted in some sport fish collected near platforms; however, these contaminants were not significant and there was little evidence of bioaccumulation. Potential impacts of produced water from a single facility are thought to be highly localized, and thus could only have a very limited impact on an entire fish population. Therefore the discharges will bear no socioeconomic consequences on the fisheries. With the conditions of the proposed permit in place (i.e., acute and chronic whole effluent toxicity limitations, compliance with Texas WQS, discharge rate and/or configuration restrictions; discharge prohibitions on drilling fluids, drill cuttings, produced sand, produced water from new wells, and surface maintenance discharge), there is little potential for adverse socioeconomic impacts to Gulf fisheries.

EFH in the permit coverage area were identified in section 3.2.7.These areas are subject to management measures that minimize, to the extent practicable, adverse impacts on important habitats caused by fishing and to protect commercially and recreationally important species. EPA has consulted with the NMFS and provided information that was the basis for EPA's determination that the proposed permit will not adversely affect EFH. In response EPA received concurrence from NMFS on June 17, 2011.

4.5.5 Socioeconomic and Onshore Impacts

As discussed above, there are clear economic issues related to the large commercial and recreational fishing industries. In addition, there are socioeconomic issues related to onshore impacts from offshore oil and gas activities. The coastal areas of Texas vary substantially in socio-economic patterns, although economic growth and decline has been closely tied to activity in the oil and gas industry.

Economic costs associated with the zero discharge of drilling wastes and produced sands were determined to be reasonable by EPA, in the Oil and Gas Extraction Industry, Offshore Subcategory Effluent Limitation Guideline rule-making in 1993. Zero discharge of drilling fluids and drill cuttings are a requirement of the existing permit, so the continuation of those permit requirements would result in no net economic impact. The only changes in the proposed permit that could result in any socioeconomic impacts that were not previously evaluated in the 2004 FEIS are those related to hydrate control fluids. Overall economic impacts from these waste streams to the oil and gas industry, and to related federal and state revenues, are expected to be negligible.

The pace of oil and gas development in the Gulf of Mexico is expected to remain largely consistent with past levels. As a result, the nature and extent of impacts to land use and the existing infrastructure are not expected to change appreciably from past experience. The oil and gas industry has been an integral part of the Gulf of Mexico economy for decades, and the continuation of industry activities under the terms of the proposed permit is not expected to result in any major land use, infrastructure, transportation, or waste disposal capacity impacts for the region.

4.5.5.1 Hydrate Control Fluids

Hydrate control fluids are discharged either commingled with produced water or as a separate waste stream, but under both cases they are subject to the proposed permit's requirements imposed on produced water. Because of the permit limits on hydrate control fluids, there would be no socioeconomic or onshore impacts expected due to the inclusion of hydrate control fluids in the permit. The material economic impact to the industry for compliance with the proposed permit requirements are expected to be negligible because this waste stream is likely to be commingled with produced water for discharge, and thus result in no measurable increase in monitoring and reporting costs.

4.5.5.2 Surface Preparation Maintenance

This waste stream consists of the captured sand and surface coatings waste from the surface preparation and painting of structures at a drilling or production facility. Particles resulting from sandblasting contain contaminants such as copper, lead, and other heavy metals and silica that may be hazardous to the marine environment as well as to human health. The BMPs for these wastes, which would include fine particulates of sand and fine paint chips, require operators to collect spent abrasives routinely and properly store them pending their shipment for onshore disposal.

The possibility of any material adverse impacts on onshore waste management is expected to be negligible. These wastes are generated intermittently and represent a very small fraction of far larger waste streams - drilling fluids, drill cuttings, produced sand - that are currently required to be transported to shore from offshore structures. Wastes from maintenance operations represent a minor factor in terms of transport vessel requirements and capacity; vessel energy use and air quality impact; and vessel safety. There also is a negligible demand for onshore disposal capacity and negligible concern over proper disposal site safety. The proposed permit only clarifies the requirements in the existing permit, and thus does not result in any increase in the amount of wastes that must be transported to shore. The projected level of drilling and development activity during the term of this proposed general permit is not expected to produce any waste capacity or safety issues resulting from requiring onshore disposal for surface preparation maintenance wastes from maintenance operations.

4.5.6 Potential Impacts to Coastal Resources

Waste streams associated with oil and gas activities are produced water, domestic waste and sanitary waste. These waste streams may have the potential to impact Texas coastal natural resource areas where special aquatic sites are located. The following potential impacts represent those that may occur without the limitations and conditions proposed under the general permit.

- Disruption of the natural supply and transport of sediment and nutrients
- Discharge of pollutants such as inorganic compounds; radioactive wastes; and toxic organic and metallic pollutants
- Alteration of physical characteristics of nearshore waters, including dissolved oxygen; temperature; and salinity
- Disruption to biological resources, such as primary production; benthos; fisheries resources; spawning seasons, seasonal migrations, spawning and nesting; ecosystem diversity; and habitat alteration
- Disruption to special aquatic sites, including critical areas for endangered species; spawning or nesting areas for important wildlife or fisheries species; designated wildlife management or sanctuary areas; archaeological sites; and recreational areas, parks, or national seashores
- Cumulative or secondary impacts, such as toxicity, bioaccumulation, and human health risks.

Miscellaneous discharges are discharged in relatively small volumes and may cause only localized impacts.

The existing permit was certified by the Texas CCC as consistent with the Texas CMP. All of the existing permit terms, conditions, and limitations have been retained or strengthened in the proposed permit. Because the proposed permit is more environmentally protective than the existing permit, EPA has determined that the proposed permit will be consistent with the Texas CMP. Coastal zone consistency will not be reviewed until the final permit is issued.

4.5.7 Potential Impact on Federally Listed Threatened and Endangered Species

This biological evaluation accounts for the direct, indirect, and cumulative effects of the proposed reissuance of the NPDES permit on Federally-listed threatened and endangered species. The following federally listed threatened and endangered species have been reported to exist in the Territorial Seas offshore of Texas:

- Fish: Gulf sturgeon (*Acipenser oxyrinchus desotoi*);
- Birds: Piping plover (*Charadrius melodus*) and Whooping crane *(Grus americana).*
- Whales: northern right (*Eubalaena glacialis*), blue (*Balaenoptera musculus*), finback (*Balaenoptera physalus*), sei (*Balaenoptera borealis*) humpback (*Megaptera novaeangliae*) and sperm (*Physeter macrocephalus*);
- Other mammals: West Indian manatee (*Teicheschus manatus latirostris*);
- Turtles: Kemps ridley (*Lepidochelys kempii*), loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), green (*Chelonia mydas*).

EPA Region 6 has determined that the proposed permit may, but is very unlikely to adversely affect these species. EPA has entered into ESA Section 7 consultations with the NMFS and

FWS. EPA has received correspondence from the NMFS, dated June 5, 2005 (See Appendix B) in which the Service concurred with EPA's determination that the proposed action is not likely to adversely affect endangered and threatened species under the purview of the NMFS. EPA also has received email correspondence with FWS dated July 20, 2011 in which the FWS agrees that the likelihood of an impact occurring on nesting sea turtles is discountable and concurs with EPA's determination of "may affect, but is not likely to adversely affect" for the five listed sea turtles.

EPA based its ESA Consultation and Determination of No Effect for the Gulf sturgeon on the following considerations: Discharges proposed to be authorized by this permit reissuance will not affect the main human induced threats to the Gulf sturgeon of habitat destruction or commercial fishing. Causes of habitat degradation are predominantly construction of dams that interfere with migration, ground water usage which diminish the natural flow to rivers, and dredging. Those factors occur in inland waters and not in the area of the Gulf of Mexico covered under the Texas Territorial Seas General Permit. Discharges proposed to be authorized by this permitting action are not expected to result in any changes to the level or type of potential threats to the Gulf sturgeon from commercial fishing. Furthermore, water quality protection standards and prohibitions on the discharge of drilling fluids included in the general permit are sufficient to limit potential toxic effects to aquatic species.

EPA based its ESA Consultation and Determination of No Effect for the Piping Plover and the Whooping Crane on the following considerations: The main factors affecting the populations of threatened or endangered birds along the Gulf coast are insecticides, nest disturbance, and habitat loss. EPA does not expect activities associated with oil and gas operations in the territorial seas to contribute to those factors. EPA also does not expect any significant insecticide use on offshore platforms, and there is none associated with the authorized discharges that EPA is proposing under this proposed general permit action. EPA considers nest disturbance and habitat loss as related to onshore recreation and shorefront development and not to offshore oil and gas operations.

EPA based its ESA Consultation and Determination of No Effect for the West Indian manatee on the following considerations: Historically, manatees were heavily hunted for meat, hides and bones until nearly extirpated. Current threats to the species include loss of habitat and human-related mortality, caused primarily by watercraft collisions; poaching; entanglement in fishing nets and line; and crushing or drowning in floodgates. Natural causes of mortality are related to cold temperature exposure, red tide, and disease. Manatees prefer shallow, slow moving rivers, river mouths, estuaries, bays, and other coastal ecosystems in subtropicals and tropical waters, not open ocean waters covered under the proposed permit. Within the U.S., they are primary confined to Georgia and peninsular Florida. Because of his habitat and distribution, manatees are not expected to be present near offshore platforms or other oil and gas extraction structures.

4.5.8 Potential Impacts and Ocean Discharge Criteria

EPA must determine that any discharge seaward of the baseline is in compliance with the requirements of 40 CFR 125.122, "Ocean Discharge Criteria." The discussions presented in Chapters 3 and 4 of the SIR all contribute to this determination. Table 4-9 provides a crosswalk between the applicable sections of the SIR and these ten factors. Based on the information presented in the SIR and considering the ten factors enumerated at 40 CFR 125.122, EPA has determined that the proposed general permit will not result in unreasonable degradation of the marine environment.

Table 4-9. Crosswalk Between SIR Sections and Ocean Discharge Criteria

Ocean Discharge Criterion	Applicable SIR Section(s)
1. The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;	4.4 Transport and Persistence
2. The potential transport of such pollutants by biological, physical or chemical processes;	4.4 Transport and Persistence
3. The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;	4.5.4 Potential Impact of Discharges on Fisheries and Essential Fish Habitat 4.7.3.1 Produced Water Toxicity 4.7.3.2 Potential Benthic Impacts (Produced Water) 4.7.3.3 Potential Bioaccumulation (Produced Water) 4.7.7 Potential Impacts on Federally-listed Threatened and Endangered Species
4. The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;	4.4 Transport and Persistence 4.5 Potential Impacts 4.6 Water Quality Analyses
5. The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;	4.7.6 Potential Impacts to Coastal Resources
6. The potential impacts on human health through direct and indirect pathways;	4.4.1.2 Bioaccumulation and Biomagnification 4.5.2 Bioconcentration Potential of Produced Water Constituents 4.7.3.4 Potential Water Quality Impacts (Produced Water)
7. Existing or potential recreational and commercial fishing, including finfishing and shellfishing;	4.5.1 Toxicity of Produced Water 4.5.2 Bioconcentration Potential of Produced Water Constituents 4.5.4 Potential Impact of Discharges on Fisheries and Essential Fish Habitat 4.7.4 Potential Impact of Discharges on Fisheries 4.7.5 Socioeconomic Impacts
8. Any applicable requirements of an approved Coastal Zone Management plan;	4.7.6 Potential Impacts to Coastal Resources
9. Such other factors relating to the effects of the discharge as may be appropriate;	4.7.5 Socioeconomic Impacts 4.8 Other Impacts
10. Marine water quality criteria developed pursuant to Section 304(a)(1).	4.4.2 Discharge Modeling 4.6 Water Quality Analyses 4.7.3.4 Potential Water Quality Impacts

4.6 OTHER IMPACTS

4.6.1 Air Quality

Although BOEMRE studies have been conducted for the OCS, these studies can be used when evaluating influences of oil and gas exploration and production within the Territorial Seas of Texas. The BOEMRE regulations (30 CFR 250.303) establish 1-hr and 8-hr significance levels for CO. A comparison of the projected emission rate to the BOEMRE exemption level is used to assess CO impacts. The formula to compute the emission rate in tons/yr for CO is:

$$\text{Rate} = 3{,}400 \times D^{2/3},$$

where D represents distance in statute miles from the shoreline to the source; this formula is applied to each facility.

Ozone impacts, which were studied in the Gulf of Mexico Air Quality Study (GMAQS), indicated that OCS activities have little impact on ozone exceedance episodes (>120 ppb) in coastal nonattainment areas. Total OCS contributions to the exceedance episodes studied were less than 2 ppb. In the GMAQS, the model was also run using double emissions from OCS petroleum development activities and the resulting attributable ozone concentrations, during modeling exceedance episodes, were still small, ranging 2-4 ppb.

The activities under a proposed action would not result in a doubling of the emissions, and because the proposed activities are substantially smaller than this worst-case scenario, it is logical to conclude that their impact would be substantially smaller, and not interfere with the States' scheduled compliance with the NAAQS (MMS, 2007).

Additionally, 30 CFR 250.303(f)(2) requires that if a facility would significantly impact an onshore nonattainment area (defined as exceeding the BOEMRE significance levels), then it would have to reduce its impact fully through the application of the best available control technology (BACT) and possibly through offsets as well. The 8-hour ozone standard (0.075 ppm) has been fully implemented as of 2008. It is more stringent than the previous 1-hour standard, but did not result in more areas being classified as nonattainment for ozone.

In response to the new ozone standard, updated ozone modeling was performed using a preliminary Gulf-wide emissions inventory for the year 2000 to examine the O_3 impacts with respect to the 8-hour ozone standard. Two modeling studies were conducted, one modeling study focused on the coastal areas of Louisiana extending eastward to while the other modeling effort dealt with O_3 levels in Southeast Texas (MMS, 2007). The results of this study indicated a maximum contribution of 0.2 ppb or less to areas exceeding the standard (MMS, 2007).

The zero discharge requirement for drilling and production solids under the existing permit resulted in increased vessel traffic for onshore disposal and thus minor increases in air emissions. However, no provision in the proposed permit would result in any increase over that already considered in the 2004 FEIS for the existing permit. Zero discharge for new sources of produced water should not increase vessel traffic nor air emissions because information provided by industry indicates that most operators have transported produced water over pipelines to onshore for disposal or benefit reuses.

4.6.2 Greenhouse Gases

Oil or gas extraction sites produce associated gases, in particular CO_2 and methane, which have a very significant impact on the greenhouse effect and are major contributors to global climate change. Rising global temperatures are expected to raise sea level, and change precipitation and other local climate conditions. Individual platforms in the Territorial Seas are not expected to emit more than the 25,000 tpy threshold for reporting emissions as required by Subpart W for petroleum and natural gas facilities under the Greenhouse Gas Reporting Rule.

4.6.3 Visual Impacts

The visual impact of offshore platforms within 3 miles from shore is a continuing concern among coastal communities, especially those with a strong tourism economy. None of the changes in the proposed permit have any material effect on visual resources, but rather only serve to increase the environmental protection afforded by the permit. The proposed permit is unlikely to materially alter the level of oil and gas activity in the Texas Territorial Seas, and thus, the visual characteristics of these waters. Thus, the determination on visual impacts provided in the 2004 FEIS is likewise unchanged and still valid.

4.6.4 Cultural Resources

Oil and gas activities in the territorial Seas will have the potential to impact cultural resources, especially shipwrecks. However, the proposed general permit does not authorize discharges that adversely affect properties listed or eligible for listing in the National Register of Historical Places. None of the changes in the proposed permit have any material effect on cultural resources, but rather only serve to increase the environmental protection afforded by the permit. The proposed permit is unlikely to materially alter the level of oil and gas activity in the Texas Territorial Seas, and thus, the potential for adversely affecting cultural resources. Thus, EPA considers the determination on cultural resources impacts provided in the 2004 FEIS is likewise unchanged and still valid.

EPA received concurrence with its determination in a letter from Amy Borgens, State Marine Archeologist, Texas Historical Commission, dated July 29, 2011.

4.6.5 Environmental Justice

The 2004 FEIS did not present an analysis of environmental justice concerns. This SIR provides new information and analyses related to impacts on demographics and environmental justice as related to Texas coastal communities.

There are no environmental justice issues in the actual Territorial Seas of Texas. However, the proposed permit may present very limited environmental justice concerns related to the nearshore activities that result from oil and gas activities. Section 3.8 described the population areas of concern in the Houston-Galveston area. Potential impacts could result from increases in both shore boat activity and solid waste management activities associated with increased shore-disposal of surface preparation maintenance wastes. These activities are not likely to represent any significant increase over current vessel traffic or waste management handling. The increase in such activity, relative to the current quantities of oil and gas wastes that are presently transported to shore (e.g., drilling fluids, drill cuttings, produced sand) under the existing permit, is negligible.

BOEMRE (2011) evaluated impacts on the Gulf Coast as a result of proposed lease sales on the OCS. Their findings state that population impacts from a proposed action are projected to be minimal (<1 percent of the total population) for any economic impact area (EIA) in the region (metropolitan areas including both coastal and inland counties around Brownsville/Corpus Christi, Houston/Galveston, and Beaumont/Port Arthur). The baseline population patterns and distributions are expected to remain unchanged as a result of a proposed action. The increase in employment is expected to be met primarily with the existing population and available labor force.

Accidental events associated with a proposed action, such as oil or chemical spills, blowouts, and vessel collisions, would likely have no effects on the demographic characteristics of the Gulf coastal communities. Spills and other accidential events may pose temporary impacts on environmental justice concerns such as subsistence fishing in coastal areas, local water and air quality, and other temporary community impacts; however such effects would not be discriminatory or disproportionate. With the exception of a catastrophic accidental event, such as the DWH event, the impacts of oil spills, vessel collisions, and chemical/drilling fluid spills are not likely to be of sufficient duration to have adverse and disproportionate long-term effects for low-income and minority communities in the analysis area. Further, the proposed permit is unlikely to materially alter the level of oil and gas activity in the Texas Territorial Seas, and thus, is not likely to adversely affect communities of concern.

4.6.6 Cumulative Impacts

Impacts from discharges authorized by the proposed general NPDES permit are evaluated in combination with EPA's permits for coastal and outer continental shelf waters. At this time, EPA has not identified any aspect of the actions which the NPDES permit will authorize in the Territorial Seas of Texas that could interact with actions authorized in other ways or would either cause impacts to be significantly greater than those resulting from the simple addition of the impacts from different sources or cause impacts cumulatively to cross an environmentally significant threshold.

The First Circuit Court of Appeals in the State of Louisiana recently remanded the LAG260000 general permit for oil and gas extraction, development, and production facilities in the Territorial Seas of Louisiana in a Court decision dated June 10, 2011. The Court found that the state-issued permit did not provide for direct testing or bio-monitoring requirements to verify that the discharge of produced water to the Territorial Seas of Louisiana causes no significant environmental impact. NORM was specifically a concern. The Texas Territorial Seas permit proposes that operators must collect and analyze for ^{226}Ra and ^{228}Ra in sediment samples from beneath the discharge point, and down current at 50, 100, and 200 feet from the discharge.

The proposed permit will lead to a very minor increase in energy consumption related primarily to service vessel traffic (for transfer of surface preparation maintenance wastes onshore). This waste steam is expected to impose a negligible increase in the amount of materials currently transferred to shore for disposal. The projected level of drilling and development activity during the term of this general permit is not expected to produce any capacity or safety issues as a result of requiring onshore disposal for wastes from maintenance operations.

The proposed general NPDES permit continues to eliminate turbidity and toxicity impacts from the discharge of drilling wastes and produced sand. EPA anticipates that discharges of produced water will lead to limited impacts in the immediate vicinity of the outfall (and within the authorized mixing zone). Because of the zero discharge requirement for new sources of produced water, as existing discharges terminate, produced water discharges will gradually drop to zero.

The pace of oil and gas development in the Gulf of Mexico is expected to remain largely consistent with past levels. The changes in the proposed permit are not expected to result in any change in the level of oil and gas activity in the Texas Territorial Seas. As a result, the nature and extent of impacts to land use and the existing infrastructure are not expected to change appreciably. The oil and gas industry has been an integral part of the Gulf of Mexico economy for decades, and the continuation of industry activities is not expected to result in any major land use or infrastructure impacts for the region.

5.0 COORDINATION AND SUPPORTING INFORMATION

5.1 SCOPING AND EIS REVIEW

EPA Region 6 has performed extensive EIS review for the NPDES general permits issued for oil and gas operations in the Gulf of Mexico. Region 6 issued a Notice of Intent (NOI) to prepare an EIS on new sources related to NPDES General Permits for the Offshore Subcategory of the Oil and Gas Extraction Category proposed for the Territorial Seas of both Texas and Louisiana, dated January 1994.

Scoping issues were considered through the NOI and other informal procedures, including interagency meetings conducted in July, 1993. The Draft EIS was issued in January 1994, for review and comment from interested agencies, officials, groups and individuals. EPA's public hearing to receive comments on the Draft EIS was held on March 16, 1994. The Final EIS issued in June 1996, however, covered only EPA's proposed general permit action for Louisiana, recognizing that a separate FEIS would be prepared prior to its decision on the NPDES general permit for the Territorial Seas of Texas.

For the 1994 Draft EIS, an informal coordination process was conducted and several issues identified: 1) the EIS should adequately characterize how EPA's decision would impact aquatic toxicity, especially with respect to effects on protected animals; and 2) that the EIS should evaluate socio-economic consequences of the regulations, including the capacity of onshore infrastructure to deal with increased waste streams. Informal discussions also recognized that BOEMRE identified several environmental issues as significant for offshore oil and gas activities: air quality; archaeological resources; coastal barrier beaches; coastal and marine birds; commercial fisheries; benthic communities; marine mammals, marine turtles; recreational resources and activities; socio-economic conditions; water quality; wetlands (MMS, 1992).

EPA received written scoping comments for the 1994 Draft EIS from the National Park Service, the FWS, and the Sierra Club Legal Defense Fund. EPA continued its coordination process as the EIS and much discussion concerned the relationship of the Territorial Seas NPDES permits and EIS with other general permits and NEPA documents. EPA detailed the relationship between the various federal and state water permits and the offshore and coastal subcategory permits issued by Region 6 for oil and gas operations in the Gulf of Mexico region.

Additional issues also were raised including; the need to characterize the storage and disposal of NORM-contaminated wastes; economic impacts to the oil and gas industry, and to State revenues derived from the industry; possible pipeline construction, e.g. to convey produced water to onshore injection sites; the need for a generic Section 7 consultation process related to explosive platform removals; and possible locations of biologically sensitive areas.

EPA relied on its 1994 Draft EIS in preparing the 2004 Draft FEIS, updating the environmental baseline as appropriate in the continuing NEPA review process for the existing oil and gas NPDES general permit for the Territorial Seas of Texas. EPA undertook consultations with the Advisory Council on Historic Preservation, NMFS, the FWS, the Texas GLO, and the Texas Railroad Commission. EPA invited comment on the 2003 Draft FEIS and the proposed NPDES general permit. EPA issued the FEIS for the Territorial Seas of Texas, followed by a Record of

Decision and final NPDES general permit. The notice of availability of the EIS in the Federal Register initiated a 45-day period during which official review comments were solicited from federal, state, and local agencies, groups and individuals. Table 5.1 lists agencies, organizations and persons who were on the EPA Region 6 EIS mailing list to receive the 2004 Draft FEIS. The consultation process with the appropriate state and Federal Agencies (to include the NMFS, FWS, Texas GLO, and State Historical Preservation Officer) were addressed through the issuance process prior to issuing the General Permit.

The SIR to the FEIS relies heavily on the 2004 FEIS. The SIR addresses revisions to the existing permit that are being proposed in the re-issued permit and any changes in the information base or statutory/regulatory changes (e.g., revisions to Texas WQS) that have occurred since the development of the 2004 FEIS.

EPA Region 6 has completed all agency coordination related to the proposed oil and gas general permit for the Territorial Seas of Texas.

5.2 ESA SECTION 7 CONSULTATION

When the 1981 general permits were issued, EPA determined that biological opinions had already been issued for comparable actions and indicated compliance with the Endangered Species Act. Since that time, consultations with NMFS and FWS have taken place for OCS oil and gas development projects in the Gulf of Mexico. For example, in 1987, the NMFS rendered a biological opinion in response to the EIS (MMS, 1987) for the proposed oil and gas lease sales 113/115/116. NMFS concluded the actions discussed in the 1987 MMS EIS were not likely to jeopardize the continued existence of any endangered or threatened species under their jurisdiction. This opinion addressed all phases of OCS exploration, development and production activities but excluded explosive platform removals until additional data become available.

In 1992, the NMFS referenced their 1987 Biological Opinion in responding to an EIS prepared for the proposed oil and gas lease sales 142/143 (MMS, 1992). Explosive platform removals were excluded from consideration in that consultation. NMFS concluded that because no “new” information that might alter their 1987 opinion had become available, and because the areas and species impacted by the proposed activity remained unchanged, the conclusions of their November 2, 1987 opinion were valid and were applicable to the proposed lease sales 142 and 143 in the central and western Gulf. According to NMFS, non-explosive removal of oil and gas structures and all other phases of oil and gas activity were not likely to adversely affect species under NMFS jurisdiction.

During development of the NPDES General Permit for existing sources in the OCS region of the western Gulf of Mexico, EPA submitted a biological assessment (BA) to the NMFS pursuant to Section 7 of the ESA. NMFS concurred with the BA determination that populations of endangered/threatened species under the purview of the NMFS would not be adversely affected by the proposed action.

In the 2004 FEIS, based on the consultations identified above, EPA affirmed its 1981 conclusion that (1) there will be no adverse input on listed endangered and threatened species and (2) that biological opinions have been issued for actions comparable to the proposed issuance of a general NPDES permit in the territorial Seas of Texas. EPA also determined that issuance of the permit would not cause an adverse impact to threatened and endangered species. This determination was provided to USFWS and NMFS for their review. EPA received concurrence from the NMFS with EPA's determination on endangered species in a letter dated June 20, 2005.

EPA determined that permit issuance will not result in adverse impacts to listed endangered species and submitted the proposed general permit and its determination to NMFS and FWS for their review. In a reply dated June 30, 2011, FWS responded that the reissuance of the general permit "may affect, but is not likely to adversely affect" nesting Kemp's ridley, loggerhead, leatherback, hawksbill, and green sea turtles. The FWS stated that it does not provide concurrences for "no effect" determinations on species. However, by EPA having made a "no effect" determination for all other listed species, FWS believes that EPA has complied with (7)(a)(2) of the Endangered Species Act by making a determination.

5.3 EFH CONSULTATION

In the 2004 FEIS, EPA determined that issuance of the permit would not cause an adverse impact to Essential Fish Habitat. EPA submitted the Draft FEIS and general permit to NMFS for its review. EPA received concurrence from the NMFS with EPA's EFH determination in a letter dated November 25, 2003 (See Appendix A).

EPA determined that permit issuance will not result in adverse impacts to EFH, and submitted the proposed general permit and its determination to NMFS. EPA received concurrence from NMFS that permit issuance will not adversely affect EFH in a letter dated June 17, 2011 (See Appendix B).

5.4 CWA WATER QUALITY CERTIFICATION

EPA concluded in its 2004 FEIS that issuance of the general permit would not violate Texas WQS. EPA submitted the Draft FEIS and general permit to the Railroad Commission of Texas for certification from the State that permit issuance would not result in violations of Texas WQS. EPA received a certification that the general permit would not violate Texas WQS in a letter dated June 12, 2004 (See Appendix B).

EPA determined that permit issuance will not result in violations of Texas WQS and will submit the proposed general permit and its determination to the Railroad Commission of Texas for review.

5.5 TEXAS COASTAL MANAGEMENT PLAN CONSISTENCY

EPA determined in the 2004 FEIS that issuance of the general permit was consistent with the Texas CMP. EPA submitted the Draft FEIS and general permit for review by the Texas Coastal Coordination Council (CCC) for consistency of the general permit with the Texas CMP. EPA received concurrence that the general permit was consistent with the Texas CMP in a letter dated December 8, 2003 (See Appendix A).

EPA determined that permit issuance will not result in violations of the Texas CMP and will submit the proposed general permit and its determination to the Texas CCC for review.

5.6 NHPA SECTION 106 NHPA COORDINATION

Section 106 of the Natural Historic Preservation Act of 1966 requires federal agencies to consider the effect of an undertaking on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register of Historic Places. In the 2004 FEIS EPA concluded that permit issuance would have no effect on the cultural resources of Texas. EPA forwarded the Draft EIS, general permit, and its assessment to the Advisory Council on Historic Preservation and to the State Historic Preservation Office of Texas.

EPA determined that permit issuance will result in no effects to the cultural resources of Texas and submitted the proposed general permit and its determination to the Advisory Council on Historic Preservation and to the State Historic Preservation Office of Texas for review. EPA received concurrence with its determination from the Texas Historical Commission, dated July 27, 2011.

5.7 PREPARERS

The SIR on EPA's Proposed Re-issuance of a NPDES General Permit (GP) for Discharges from the Offshore Subcategory of the Oil and Gas Extraction Point Source Category to the Territorial Seas of Texas (Permit No. TXG260000) was prepared for EPA Region 6 by Avanti Corporation, under subcontract to Gannet Fleming, and Gannett Fleming under Task Order #1-009 of the EPA Office of Federal Activities NEPA Support Contract # EP-W-08-024. EPA directed the scope of services provided by Avanti and Gannet Fleming and reviewed all material presented in the SIR.

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7.0 GLOSSARY AND ACRONYMS

Abundance	The number of individuals of a species inhabiting a given area. Normally, a community of several component species will inhabit an area. Measuring the abundance of each species is one way of estimating the comparative importance of each component species.
Acute	Sudden, short-term, severe, critical, crucial, intense, but usually of short duration.
Adsorb	To adhere in an extremely thin layer of molecules to the surface of a solid or liquid.
Ambient	Pertaining to the undisturbed or unaffected conditions of an environment, i.e. to "background" conditions.
Anoxia	Absence of oxygen.
Anthropogenic	Relating to the effects or impacts of man on nature. Construction wastes, garbage, and sewage sludge are examples of anthropogenic materials.
Aphotic Zone	Zone where the levels of light entering through the surface are not sufficient for photosynthesis or for animal response.
Assemblage	A group of organisms sharing a common habitat.
Attainment area	An area that is shown by monitored data or that is calculated by air quality modeling not to exceed any primary of secondary ambient air quality standards established by the EPA.
BAT	Best available technology economically achievable. The CWA requires that EPA base nonconventional and toxic pollutant effluent limits in NPDES permits on BAT, a standard which generally represents the best performing existing technology in an industrial category, and which may never be less stringent than BPT.
Barrel (bbl)	A volumetric unit used in the petroleum industry equivalent to 42 U.S. gallons or 158.99 liters.
Barrier island	Long sand bar islands that form along coasts under certain conditions. Barrier islands compose much of the coast of Texas and are present in Louisiana.
Baseline	The characteristics of an environment before the onset of an action which can alter that environment. Baseline data serve as a benchmark for measurement and interpretation of other data.
Bathymetry	The slope and slope features 'underwater Topography" present in the Gulf of Mexico inner continental shelf.
BCT	Best conventional pollutants control technology. The CWA requires that EPA base conventional pollutant effluent limits in NPDES permits on BCT, a standard which generally represents the best performing existing technology in an industrial category, and which may never be less

	stringent than BPT.
Benthos	All marine organisms (plant or animal) living on or in the bottom of the sea.
Bioaccumulation	The uptake and assimilation of materials (e.g., heavy metals) leading to elevated concentrations of the substances within organic tissue, blood, or body fluid.
Bioassay	A method for determining the toxicity of a substance by the effect of varying concentrations on growth or survival of suitable plants, animals or micro-organisms. The concentration which is lethal to 50 percent of the test organisms or causes a defined effect in 50 percent of the test organisms, often is expressed in terms of lethal concentration (LC_{50}) or effective concentration (EC_{50}), respectively.
Biological half-time	The time it takes, after exposure, for one half of a set of organisms to purge themselves of a substance, such as a pollutant, either by breaking it down or expelling it.
Biomass	The amount of living matter in a given habitat.
Biota	Animals and plants inhabiting a given region.
Blowout	An uncontrollable flow of fluids from a wellhead or wellbore. Unless otherwise specified, a flow of fluids from a flowline is not considered a blowout as long as the wellhead control valves can be automatically or manually activated. If the wellhead control valves become inoperative, the flow is classified as a blowout.
BOD	Biochemical Oxygen Demand or Biological Oxygen Demand: the amount of dissolved oxygen required by aerobic micro-organisms to degrade organic matter in a sample of water usually held in the dark at $20^{\circ}C$ for 5 days. Used to assess the potential rate of substrate degradation and oxygen utilization in aquatic ecosystems, which in turn is usually an indicator of pollution by biodegradable organic substances and certain forms of nitrogen.
BOE	Barrel of oil equivalent. Used to compare various fuels based on their energy content.
BOEMRE	US Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement
BPJ	Best professional judgement.
BPT	“Best practicable control technology currently available”, a standard applicable to discharges prior to March 1989 under CWA 301(b) (1) (A); represents the average of the best existing performance of well known technologies and techniques for control of pollutants, and applies to conventional, nonconventional and toxic pollutants.
Brine	Water saturated or strongly impregnated with salt.
CFR	Code of Federal Regulations

CHC	Chlorinated hydrocarbon
Chronic	Of long duration or recurring frequently
Coast line	As defined in the Submerged Lands Act, the line of ordinary low water along that portion of the coast which is in direct contact with the open ocean and the line marking the seaward limit of inland waters.
Coastal Subcategory	Oil and gas facilities located landward of the coast line where the wellhead is located over a surface waterbody, including wetlands. Categorization is due to technological differences with dryland wells than to proximity to the coast.
Coastal zone	The coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states; the zone includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches and extends seaward to the outer limit of the United States territorial sea. The zone extends inland from the shorelines only the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters. Excluded from the coastal zone are lands the use of which is by law subject to the discretion of or which is held in trust by the Federal Government, it officers, or agents.
Completion fluids	Salt solutions, weighted brines, polymers and various additives used to prevent damage to the well bore during operations which prepare the drilled will for hydrocarbon production. These fluids move into the formation and return to the surface as a slug with the produced waters. Drilling muds remaining in the wellbore during logging, casing and cementing operations or during temporary abandonment of the well are not considered completion fluids and are regulated by drilling fluids requirements.
Continental shelf	The continental margin province that lies between the shoreline and the abrupt change in slope called the shelf edge, which generally occurs around a water depth of 200m. The shelf is characterized by a gentle slope (ca. 0.1°).
Conventional Pollutant	pH, BOD, oil and grease, TSS, and fecal coliform.
Cost/benefit ratio	A comparison of the price, disadvantages and liabilities of any project versus profit and advantages.
Critical habitat	Specific areas essential to the conservation of a protected species and that may require special management considerations or protection.
Crude oil	An oily, flammable bituminous liquid that occurs in many places in the upper strata of the earth, either in see pages or in reservoirs; essentially a complex mixture of hydrocarbons of difference types with small amounts of other substances; as distinguished from refined oil manufactured from it.

Curie (Ci)	The conventional unit of activity defined as the quantity of a given radioisotope that undergoes nuclear transformation or decay at a rate of 3.7 x 10^{10} (37 billion) disintegrations each second. One Ci is approximately equal to the decay of one gram of Ra-226.
Current meter	An instrument for measuring the speed of a current, and often the direction of flow.
CZMA	Coastal Zone Management Act
Deck Drainage	All waste resulting from platform washings, deck washing, deck area spills, equipment washings, rainwater, and runoff from curbs, gutters, and drains, including drip pans and wash areas.
Demersal	Living at or near the bottom of the sea.
Density	The mass per unit volume of a substance, usually expressed in grams per cubic centimeter (1 g water in a volume of 1 cc @ 4° C).
Development	Activities that take place following discovery of mineral in paying quantities, including geophysical activity, drilling, platform construction, and operation of all onshore support facilities, and that are for the purpose of ultimately producing the minerals discovered.
Diatoms	Microscopic phytoplankton characterized by a cell wall of overlapping silica plates. Sediment and water column populations vary widely in response to changes in environmental conditions.
Discharge	Something that is emitted; flow rate of a fluid at a given instant expressed as volume per unit of time.
Dispersion	The dissemination of discharged matter over large area by natural processes, e.g., currents.
Diversity	A concept reflecting, in its simplest form, the number of species in a community or assemblage. Measurements of diversity also often include an indication of the relative abundance of each species.
DMR	Discharge Monitoring Report (required by NPDES permit).
Dissolved oxygen (DO)	The quantity of oxygen (expressed in mg/liter, ml/liter or parts per million) dissolved in a unit volume of water. DO is a key parameter in the assessment of water quality.
DOC	Department of Commerce (US; also: USDOC).
DOD	Department of Defense (US).
DOE	Department of Energy (US)
DOI	Department of the Interior (US; also: USDOI).
Domestic waste	Discharge from galleys, sinks, showers, safety showers, eye wash stations, hand washing stations, fish cleaning stations and laundries.
Drill cuttings	Particles generated by drilling into the subsurface geological formations including cured cement carried to the surface with the drilling fluid.

Drilling fluids	Fluid sent down the hole including drilling muds and any specialty products, from the time a well is begun until final cessation of drilling in that hole.
Drilling mud	A special mixture of clay, water or refined oil, and chemical additives pumped downhole through the drill pipe and drill bit. The mud cools the rapidly rotating bit, lubricates the drill pipe as it turns in the well bore, carries rock cuttings to the surface, serves to keep the hole from crumbling or collapsing, and provides the weight or hydrostatic head to prevent extraneous fluids from entering the well bore and to control downhole pressures that may be encountered (drilling fluid).
EA	Environmental Assessment
Ecosystem	The organisms in a community together with their physical and chemical environments.
Effluent	The liquid waste of sewage and industrial processing.
Effluent Limitations Guidelines	Technology-based guidelines issued by EPA in order to implement the Clean Water Act. These guidelines typically are based on BPT, BAT, and BCT technology.
Endangered and threatened species	Those species identified in 43 FR 238 (December 11, 1978) and subsequent publications.
Environmental Impact Statement (EIS)	A statement required by the National Environmental Policy Act of 1969 (NEPA) or similar State law in relation to any major action significantly affecting the environment; a NEPA document.
EPA	Environmental Protection Agency (US; also: USEPA).
ESA	Environmental Species Act of 1973
Estuary	A semi-enclosed coastal body of water which has a free connection to the sea within which the mixing of saline and fresh water occurs.
Existing source	A facility in operation or having commenced "significant site preparation work" (surveying, clearing or preparing an area of the ocean floor for the purpose of constructing or placing a development or production facility on or over the site), before publication of New Source Performance Standards (NSPS).
Exploration	The process of searching for minerals. Exploration includes: (1) geophysical surveys, where magnetic, gravity, seismic, or other systems are used to detect or infer the presence of such minerals, and (2) any drilling, except development drilling, whether on or off known geological structures. Exploration also includes drilling a well in which a discovery of oil or natural gas in paying quantities is made and the drilling, after such a discovery, of any additional well that is needed to delineate a reservoir and to enable the lessee to determine whether to proceed with development and production.
Fauna	The animal life of any location, region or period.
Field	An area within which hydrocarbons have been concentrated and trapped

	in economically producible quantities in one or more structural or stratigraphically related reservoirs.
Finfish	Term used to distinguish "normal" fish (e.g., with bones, scales and fins, and capable of swimming) from shellfish, usually in reference to commercially important species.
Flood current	Tidal current moving toward land, or up a tidal stream.
FR	Federal Register
Fugitive emissions	Emission into the atmosphere that could not reasonable pass through a stack, chimney, vent or other functionally equivalent opening.
FWS (USFWS)	U.S. Fish and Wildlife Service, U.S. Department of the Interior
GIWW	Gulf Intra Coastal Waterway
GMFMC	Gulf of Mexico Fishery Management Council
GPCD	Gallons per capita per day
Habitat	A specific type of place that is occupied by an organism, a population, or a community
Hydrocarbon	Any of a large class of organic compounds containing primarily carbon and hydrogen. Hydrocarbon compounds are divided into two broad classes: aromatic and aliphatic. They occur primarily in petroleum, natural gas, coal, and bitumens.
Hypoxia	Depressed levels of oxygen in waters, usually leading to decreased metabolism.
Indicator species	An organism so strictly associated with particular environmental condition that its presence is indicative of the existence of such conditions.
Infauna	Aquatic animals which live in the bottom sediment.
Initial mixing	Dispersion or diffusion of liquid, suspended particulate, and solid phases of a waste material which occurs within 4 hours after dumping.
Invertebrates	Animals lacking a backbone or internal skeleton.
LC_{50}	The concentration of a toxicant that is lethal (fatal) to 50 percent of the organisms tested in a specified time period.
LDEQ	Louisiana Department of Environmental Quality
Lease	Any legally valid authorization of exploration for, and development and production of, minerals.
Longshore current	A current which flows in a direction parallel to a coastline.
Lubricity	Oily smoothness; ability to reduce friction.
Mixing zone	The area contiguous to a discharge where mixing with receiving waters takes place and in which it may be acceptable that water-quality not meet certain criteria applicable to the receiving water.
MMPA	Marine Mammal Protection Act of 1972
MPRSA	Marine Protection, Research, and Sanctuaries Act of 1972

MMS	Minerals Management Service, U.S. Department of the Interior. See also BOEMRE.
Monitoring	Observation of environmental effects through biological and chemical data collection and analyses.
NAAQS	National Ambient Air Quality Standards
Nautical mile	6080.32 feet, or 1.15 statute miles
Nekton	Free swimming aquatic animals which move independently of water currents.
NEPA	National Environmental Policy Act
New source	A facility which commences "significant site preparation work" (surveying, clearing or preparing an area of the ocean floor for the purpose of constructing or placing a development or production facility on or over the site), after publication of New Source Performance Standards (see also NSPS).
NMFS	National Marine Fisheries Service, NOAA
NOAA	National Oceanic and Atmospheric Administration, U.S. Department of Commerce
Non-attainment area	Any area that is shown by monitored data or that is calculated by air quality modeling to exceed any primary or secondary ambient air quality standards established by the EPA.
NORM	Naturally occurring radioactive materials, which are those radionuclides of primordial origin and terrestrial natural which possess sufficiently long half-lives to have survived in detectable quantities since the formation of the earth, with their radioactive decay products.
NOW	Non-hazardous oil field waste
NPDES	National Pollutant Discharge Elimination System, the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing point source discharge permits, under sections 307, 318, 402 and 405 of the Clean Water Act.
NSPS	New Source Performance Standards. Pollution control requirements based on best available demonstrated technology at new plants; most stringent standards.
OCS	Outer Continental Shelf, that area seaward of state waters.
OCSLA	Outer Continental Shelf Lands Act
Offshore	The area seaward of the coast line.
Onshore Subcategory	Oil and gas facilitation landward of the coast line where the wellhead is located on dry land.
Operator	An individual, partnership, firm, or corporation having control or management of operations on a leased areas or portion thereof. The operator may be a lessee, designated agent of the lessee, or holder of operating rights under an approved operating agreement.

Organic	Noting or pertaining to a class of chemical compounds existing in or derived from plants or animals, as well as all other compounds of carbon.
Parameter	Values or physical properties which describe the characteristics or behavior of a set of variables.
Pelagic	Pertaining to water of the open ocean beyond the Continental Shelf and above the abyssal (deepest water) zone.
Persistence	The ability of a substance, such as a pollutant, to resist biodegradation.
Perturbation	A disturbance of a natural or regular system; any departures from an assumed steady state of a system.
Phytoplankton	Minute, passively floating or plant life in a body of water; the base of the food chain in the sea.
Plankton	The passively floating or weakly swimming, usually minute animal and plant life in a body of water.
Platform	A steel or concrete structure from which offshore development wells are drilled.
ppm	parts per million
Produced sand	Sand and other solids removed from the produced waters. Produced sand also includes de-sander discharge from produced water waste stream and blowdown of water phase from produced water treating system.
Produced water	Those waters and particulate matter brought to the surface during oil and gas production. These waters may contain high levels of total dissolved solids, oxygen-demanding wastes, toxic metals, oil and grease contaminants, and naturally occurring radionuclides.
Production	Activities that take place after the successful completion of any means for the removal or minerals, including such removal, field operations, transfer of minerals to shore, operation, monitoring, maintenance, and workover drilling.
Radioactivity	The property of an unstable atom of a radioactive element whereby the atom transforms (decays) spontaneously by emission of radiation into an atom of a different element. Radioactive properties of unstable atoms are determined by nuclear considerations only and are independent of their physical or chemical states.
RCRA	Resource Conversation and Recovery Act
Region 6	Region 6 of the USEPA, comprising New Mexico, Oklahoma, Arkansas, Texas, and Louisiana, and waters off their shores.
Reinjection	The pumping of waste products, such as produced water, down a well, either one drilled for that purpose or not in usage, for the purpose of disposal in subsurface formations or for increase hydrocarbon recovery via increased pressures in the formation.
Runoff	That portion of precipitation which ultimately reaches streams, rivers, lakes, and oceans.

Salinity	The amount of salts dissolved in water; expressed in parts per thousand ($^{o}/_{oo}$, or ppt).
Sanitary waste	Human body waste discharged from toilets and urinals.
Scale	A coating on the inside of piping or process machinery formed by the precipitation of minerals from fluid passing through.
Seagrass beds	More or less continuous mats of submerged, rooted, marine, flowering vascular plants occurring in shallow tropical and temperate waters. Seagrass beds provide habitat, including breeding and feeding grounds, for adults and/or juveniles of many of the economically important shellfish and finfish. As such, this habitat type is especially sensitive to oil spill impacts.
Sediment	Material deposited (as by water, wind, or glacier) or a mass of deposited material.
Shelf water	Water which originated in, or can be traced to the Continental Shelf, differentiated by characteristic temperature and salinity.
Shellfish	Any invertebrate, usually of commercial importance, having a rigid outer covering, such as a shell or exoskeleton; includes some molluscs (e.g., clams and oysters) and arthropods (e.g., shrimps, crabs, lobsters); term is the counterpart of finfish.
SHPO	State Historic Preservation Officer
Species	A group of morphologically similar organisms capable of interbreeding and producing fertile offspring.
Statute mile	5280 feet; the stand measure on land.
Stripper well	A well which produces such small volume of oil that the gross income provides only a small margin of profit or, in many cases, does not even cover actual cost of production.
Substrate	The solid material upon which an organism lives, or to which it is attached (e.g., rocks, sand, mud).
Surveillance	Systematic observation of an area by visual, electronic, photographic, or other means for the purpose of ensuring compliance with applicable laws, regulations, permits, and safety.
Suspended solids	Finely divided particles of a solid temporarily suspended in a liquid (e.g., soil particles in water).
TCEQ	Texas Commission on Environmental Quality
Territorial Seas	The belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending seaward a distance of three miles.
TGLO	Texas General Land Office
Trace element	An element found in the environment in extremely small quantities; usually includes metals constituting 0.1 percent (1,000 ppm) or less, by

	weight, in the earth's crust.
TRRC	Texas Railroad Commission.
Toxic pollutants	65 organic compounds and metals listed by the EPA at 40 CFR 401.15.
Turbidity	Cloudy or hazy appearance in a naturally clear liquid caused by a suspension of colloidal liquid droplets fine solids, or small organisms.
TPWD	Texas Parks and Wildlife Department
VOC	Volatile organic compounds, light hydrocarbons that normally exist as gases, and are often entrapped in liquid or solid organic compounds, to evaporate or be released when heat is applied. VOCs are an air quality concern because they contribute to the formation of low level atmospheric ozone.
Water Quality Criteria/Standards	Concentration limits for conventional pollutants, some metals, and toxic pollutants. Criteria are suggested by the Federal government, and locally-adjusted water quality standards are adopted by states.
Well treatment fluids	Any fluid used to restore or improve productivity by chemically or physically altering hydrocarbon-bearing strata after a well has been drilled. These fluids move into the formation and return to the surface as a slug with the produced water. Stimulation fluids include substances such as acids, solvents, and propping agents.
WQC	Water quality criteria
WQS	Water quality standards
WET	Whole Effluent Toxicity is a term used to describe the aggregate toxic effect of an aqueous sample (e.g., whole effluent wastewater discharge) as measured by an organism's response upon exposure to the sample (e.g., lethality, impaired growth or reproduction).
Workover fluids	Salt solutions, weighted brines, polymers, and other specialty additives used in a producing well to allow safety repair and maintenance or abandonment procedures. High solids drilling fluids used during workover operations are not considered workover fluids by definition and therefore must meet drilling fluid effluent limitation before discharge may occur. Packer fluids, low solids fluids between the packer, production string and well casing, are considered to be workover fluids and must meet only the effluent requirements imposed on workover fluids.
Zone of initial dilution (ZID)	The small area at the immediate point of discharge where initial dilution with receiving waters occurs, and which may not meet certain criteria applicable to the receiving water. A ZID is substantially smaller than a mixing zone.
Zooplankton	Weakly swimming animals whose distribution in the ocean is ultimately determined by current movements.