Programmatic Environmental Assessment

Evaluation of Freeport-McMoRan Sulphur LLC's Applications to Inject OCS-Generated Resource Conservation and Recovery Act (RCRA) Exempt Exploration and Production (E&P) Waste into Salt Caverns and Caprock on Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299

MMS

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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Evaluation of Freeport-McMoRan Sulphur LLC's
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Exploration and Production (E&P) Waste into
Salt Caverns and Caprock on Sulphur and Salt
Lease OCS-G 9372, Main Pass Block 299

Prepared by

Minerals Management Service
Gulf of Mexico OCS Region

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PROGRAMMATIC ENVIRONMENTAL ASSESSMENT DETERMINATION

FINDING OF NO SIGNIFICANT IMPACT

Freeport-McMoRan Sulphur LLC's (Freeport) Applications to Inject OCS-Generated Resource Conservation and Recovery Act (RCRA) Exempt Exploration and Production (E&P) Waste into Salt Caverns and Caprock on Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299, have been reviewed. Our programmatic environmental assessment (EA) on the proposed disposal activities and disposal site is complete and results in a Finding of No Significant Impact (FONSI). Based on this EA, we have concluded that the proposed disposal method at MP 299 will not significantly affect the quality of the human environment. Preparation of an environmental impact statement (EIS) is not required. Attachments A and B list the mitigations that will be required to ensure environmental protection, consistent environmental policy, and safety as required by the National Environmental Policy Act (NEPA) of 1969, as amended; or as needed for compliance with 40 CFR 1500.2(f) regarding the requirement for Federal agencies to avoid or minimize any possible adverse effects of their actions upon the quality of the human environment.

This programmatic EA assesses the potential impacts of both the routine, planned activities associated with the proposed action and low-probability accidental events. The impact-producing factors associated with the routine, planned activities evaluated in this EA are the same as those considered in many previous NEPA evaluations of oil and gas activities (e.g., aircraft and vessel traffic, operational discharges, air emissions). Accidental events include waste spills, oil spills, and unintentional loss of trash and debris. The impacts associated with such accidental events have also been evaluated in previous NEPA evaluations of oil and gas activities. In the case of the proposed action, no significant impacts are expected to occur due to routine, planned activities. The only potential for significant impacts is associated with low-probability accidental events; the most likely impacts expected from the proposed action range from negligible to adverse but not significant. Mitigations have been included in the applications and additional mitigations are being required by MMS to further reduce the likelihood of impacts. These factors were considered in arriving at the FONSI determination.

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Attachment A

EXISTING MITIGATION

1. Injection of OCS-generated, RCRA-exempt E&P wastes into Cavern Nos. 3 and 5, and associated caprock must be limited to those wastes listed in your applications:

a. Application To Inject E&P Waste Into Salt Cavern OCS-G 9372 Well # CA-03-A Brine Well NTL No. 99-G22 Submitted August 15, 2001, and Amended October 17, 2001 (I.B.3.; pages 10 and 11);
b. Application To Inject E&P Waste Into Salt Cavern OCS-G 9372 Well # CA-05-A Brine Well NTL No. 99-G22 Submitted August 15, 2001, and Amended October 17, 2001 (I.B.3.; pages 10 and 11); and
c. Application To Inject E&P Waste Into Caprock OCS-G 9372 Wells # SW2-05-B, SW2-06-B, SW2-09-B, SW2-14-F, SW2-32-F, SW2-37-F, SW2-57-D, SW2-60-C, SW2-62-A, and SW2-75-B NTL No. 99-G22 Submitted August 15, 2001, and Amended October 17, 2001 (I.B.3.; pages 12 and 13).

Mitigation Effectiveness: The purpose of this existing mitigation is to provide a clear and concise listing of wastes acceptable for injection at MP 299 Cavern Nos. 3 and 5, and associated caprock. The mitigation will ensure that waste generators, waste transporters, and MP 299 waste facility personnel are knowledgeable about the waste types allowed to be injected at MP 299.
Mitigation Enforcement: The MMS will conduct MP 299 inspections that will include a review of waste receipt and handling forms to confirm that only those wastes listed in the above mitigation are being injected into Caverns Nos. 3 and 5, and associated caprock.

2. Non OCS-generated E&P waste may not be disposed of at MP 299. If OCS-generated, RCRA-exempt E&P wastes are transported onshore (e.g., for processing to remove hydrocarbons and/or other recyclable materials) prior to injection at MP 299, commingling of the OCS-generated waste with waste generated either in State territorial waters or onshore must not occur. Commingling of wastes must be prevented by use of your waste-tracking system and by handling these wastes in separate dedicated barges.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that only OCS-generated, RCRA-exempt E&P waste is injected at MP 299. The mitigation provides procedures to be followed when waste is transported onshore to prevent commingling of wastes.
Mitigation Enforcement: The MMS will conduct inspections at MP 299 that will include a review of Freeport's record keeping (waste-tracking system) to confirm that waste types and volumes generated by OCS operators are consistent with waste types and volumes transported to and ultimately injected at MP 299.

3. In accordance with your applications, injection of OCS-generated, RCRA-exempt E&P wastes into MP 299 salt caverns and caprock will be limited to wastes containing naturally occurring radioactive material (NORM) in concentrations less than 30 picocuries per gram and exposure rates of less than 50 microroentgens per hour inclusive of background.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that NORM-contaminated wastes (as defined above) are not injected into the salt caverns and caprock at MP 299.
Mitigation Enforcement: The MMS will conduct MP 299 inspections that will include a review of waste receipt and handling forms and NORM survey testing results to confirm that NORM-contaminated wastes are not injected into MP 299 salt caverns and caprock.

4. You have stated that audits of vessels (OSV's and SPB's) transporting waste will be conducted. You have stated that audit procedures will be implemented so as to ensure that every vessel maintains onboard at all times the appropriate plans and manuals including: a) Oil Transfer Procedures Manual; b) Vessel Operations Manual; c) Stability and Loading Manual; and d) USCG Approved Spill Response Plan. You must maintain records of the audits and provide them to MMS upon request.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that waste vessels transporting waste to MP 299 maintain the appropriate plans and manuals. Compliance with this mitigation is expected to reduce vessel accidents, waste spills, and potential environmental impacts.
Mitigation Enforcement: The MMS will review the audit results as appropriate.

5. You have stated that the transfer of waste materials will be monitored by platform or boat personnel under the terms of an approved USCG transfer plan. You must provide MMS with a copy of your approved USCG transfer plan upon request.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that the transfer of waste materials is monitored by appropriate personnel in compliance with an approved USCG transfer plan.
Mitigation Enforcement: The MMS will review the USCG transfer plan approval, as appropriate.

6. In accordance with your applications, you plan to comply with the following Recommended Practices (RP's):

a. RP for Development of a Safety and Environmental Management Program (SEMP) for Outer Continental Shelf (OCS) Operations and Facilities–American Petroleum Institute (API) RP 75 (Second Edition, July 1998) and
b. RP for Design and Hazards Analysis for Offshore Production Facilities–API RP 14J (Second Edition, May 2001).

Mitigation Effectiveness: The purpose of this existing mitigation is to provide a nontraditional, performance-focused tool (SEMP) for integrating and managing offshore operations. The purpose of SEMP is to enhance the safety and cleanliness of operations by reducing the frequency and severity of accidents. The MMS has four principal SEMP objectives: (1) focus attention on the influences that human error and poor organization have on accidents; (2) continuous improvement in the offshore industry's safety and environmental records; (3) encourage the use of performance-based operating practices; and (4) collaborate with industry in efforts that promote the public interests of offshore worker safety and environmental protection.
Mitigation Enforcement: The MMS will review Freeport's compliance with the above RP's.

ADDITIONAL MITIGATION

1. You must comply with the waste-spill response requirements outlined in Attachment B.

Mitigation Effectiveness: The purpose of this mitigation is to outline waste-spill response requirements. Requirements include required training for waste response personnel, exercises for waste-response personnel and equipment, maintenance and periodic inspection of waste response equipment, verification of the capabilities of waste response equipment, and procedures for notification in the event of a waste spill. Compliance with this mitigation is expected to reduce the potential impacts of a waste spill due to an effective waste-spill response.
Mitigation Enforcement: The MMS will review Freeport's waste spill and emergency action plan on an annual basis to determine compliance with this mitigation. The MMS may also conduct waste-spill response drills to verify compliance.

2. The MP 299 facility operators must commit to no more than three (3) vessel dockings per day at the facility to reduce the risk of vessel collisions that may result in an accidental spill. Vessels waiting to dock at the facility should maintain a position that is sufficiently removed (> 500 ft) from where vessels

docking or undocking at the facility are or will be maneuvering. Vessels may not operate immediately adjacent to vessels transferring wastes or fluids through hoses that may be floating at the sea surface.

Mitigation Effectiveness: The purpose of this mitigation is to reduce the risk of vessel collisions that may result in an accidental spill.

Mitigation Enforcement: The MMS will conduct inspections at MP 299 that will include observations of vessel docking operations and spacing to confirm the above mitigation is being met. The MMS will review Freeport's records to confirm that dockings are limited to no more than three per day.

TRANSPORTATION AND MARINE PROTECTED SPECIES

3. All personnel associated with the operation of the MP 299 waste disposal facility or its associated support craft (vessels or aircraft) shall be instructed to report all sightings and locations of injured or dead whales, dolphins, manatees, and sea turtles to the MMS, GOMR's Office of Leasing and Environment. If activities associated with the MP 299 waste disposal facility caused the injury or death of any of these animals, MMS shall require the responsible parties to assist the designated salvage and stranding network, as appropriate. Details describing how these sightings are to be reported and follow-up actions will be described in an NTL to be published in the near future (2002).

Mitigation Effectiveness: The purpose of this mitigation is to outline the procedures to be followed when reporting sightings and locations of injured or dead whales, dolphins, manatees, and sea turtles. It also outlines the procedures to be followed when assisting the designated salvage and stranding network, as appropriate, if activities associated with the MP 299 waste disposal operations caused the injury or death of these animals.

Mitigation Enforcement: The MMS will publish the NTL in 2002. Self-reporting of sightings and locations of injured or dead whales, dolphins, manatees, and sea turtles does not require a specific enforcement action on the part of MMS. If activities associated with the MP 299 waste disposal facility are responsible for the injured or dead animals, MMS shall require the responsible parties to assist the designated salvage and stranding network, as appropriate

4. Vessel operators must exercise a vigilant watch for whales and sea turtles, particularly in waters exceeding 656 ft (200 m) in depth where leatherback sea turtles, sperm whales, and other deep-diving cetaceans occur. Vessel operators must reduce vessel speeds to less than or equal to 12 kn in areas where whales and sea turtles are reported to occur (see NTL to be published in the near future (2002)). Vessel operators must also reduce vessel speeds to less than or equal to 10 kn when whales or sea turtles are observed in the vicinity of the vessel and are not to intentionally approach whales or leatherback turtles to within approximately one-quarter mile of the animal(s).

Mitigation Effectiveness: The purpose of this mitigation is to outline the procedures to be followed by waste transport vessels, particularly when operating in water depths greater than 656 ft. Compliance with this mitigation is expected to reduce vessel collisions with whales and sea turtles.

Mitigation Enforcement: The MMS will publish the NTL in 2002. This mitigation does not require a specific enforcement action on the part of MMS.

INJECTION OPERATIONS

5. Injection of OCS-generated, RCRA-exempt E&P wastes into Salt Cavern BR-1-A must be limited to the following wastes:

a. wastes that meet the definition of " water-based drilling fluid" and associated "drill cuttings," as defined by the Final NPDES General Permit for New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Category for the Western Portion of the Outer Continental Shelf of the Gulf of Mexico, modified December 18, 2001, and effective February 16, 2002, and that meet the same limitations imposed on their discharge by the USEPA permit, including LC_{50} limitations on toxicity and limitations on concentrations of cadmium and mercury in barite; and

b. wastes that qualify, per MMS NTL 99-G22, as "miscellaneous trash and debris associated with waste handling operations (e.g., gloves, tyvek suits) contaminated with the above described wastes."

Mitigation Effectiveness: The purpose of this mitigation is to ensure that only "water-based drilling fluid" and associated "drill cuttings" (that meet the same limitations imposed on their discharge by the USEPA permit) and "miscellaneous trash and debris" contaminated with these wastes are injected into Cavern No. 1.
Mitigation Enforcement: The MMS will conduct MP 299 inspections that will include a review of waste receipt and handling forms and will confirm that only those wastes listed in the above mitigation are being injected into Cavern No. 1.

6. To protect the formation from reaching its fracture pressure, the injection pumps should have: (1) a pressure safety high (PSH) sensor on their discharge lines set no higher than 90% of the formation fracture pressure which will function to shut down the pumps as a means of primary protection, and (2) a pressure safety valve (PSV) on the pump discharge lines set no higher than 95% of the formation fracture pressure as a means of secondary protection.

Mitigation Effectiveness: The purpose of this mitigation is to ensure that fractures are not created in the disposal formation thereby allowing a conduit for waste migration.
Mitigation Enforcement: The MMS will conduct inspections at MP 299. Also, MMS will review records of wellhead pressure of the injection tube (caverns and caprock) to determine compliance.

7. Freeport must provide MMS with study results that document the allowable pressure differential limit between Cavern Nos. 1 and 3; waste disposal into Cavern Nos. 1 and 3 must be consistent with the differential pressure determination.

Mitigation Effectiveness: The purpose of this mitigation is to determine the allowable pressure differential limit between Cavern Nos. 1 and 3 and to ensure that this limit is not exceeded.
Mitigation Enforcement: The MMS will conduct inspections at MP 299. Also, MMS will review the provided study results and compare these results to actual pressure recordings conducted at MP 299.

8. Slurry injection into the caverns must be of a salinity that will not cause leaching.

Mitigation Effectiveness: The purpose of this mitigation is to ensure that slurry injection into the MP 299 salt caverns does not cause leaching of the salt.
Mitigation Enforcement: The MMS will conduct inspections at MP 299 to ensure that certain wastes are dewatered prior to slurrification. Also, MMS will review chloride concentration records (of the incoming wastes) to determine whether the correct amount of brine needed for processing prior to injection was used.

9. The MMS will conduct an annual performance review (APR) of your waste disposal operations for both safety and environmental compliance, according to the following schedule:

a. Within 1 year of your start-up of waste disposal operations; and
b. Annually thereafter.

In support of this APR you must comply with NTL No. 2002-NO1 (Performance Measures for OCS Operators and Form MMS-131). Performance measures for waste disposal operations associated with MP 299 must be reported separately from any other OCS operations you may have. Also, for the purposes of this mitigation, all NTL references to "oil spills" must be interpreted as "oil spills" and "waste spills." You must break out the statistics for oil spills and waste spills.

Mitigation Effectiveness: The purpose of this mitigation is to collect and analyze performance measures information to determine if safety and environmental performance is improving over time through the implementation of the Safety and Environmental Management Program on the OCS and to provide offshore operators and organizations with a credible data source to demonstrate how well the offshore industry and individual companies are doing compared to those in other industries.

Mitigation Enforcement: The MMS will review Freeport's submitted Form MMS-131 (Performance Measures Data) and will conduct an APR.

MONITORING OF CAVERN/CAPROCK INTEGRITY

10. Side-scan-sonar techniques must be used to detect any gas plumes or visible material within 6 months of initiating waste disposal operations at MP 299 and at least once every 3 years thereafter. You must provide MMS with copies of your results upon request.

Mitigation Effectiveness: The purpose of this mitigation is to determine whether any material is escaping from below the seabed into the water column at MP 299.

Mitigation Enforcement: The MMS will review the results of the side-scan-sonar techniques.

11. Subsidence monitoring must be conducted using close contour high-resolution bathymetric measurement of the seafloor over the projected foot print of the salt dome within 6 months of initiating waste disposal operations at MP 299 and at least every 3 years thereafter. You must provide MMS with copies of your results upon request. The subsidence monitoring must indicate whether there is an adverse effect on the integrity of the caverns, caprock, or any structure or casing that penetrates the caprock or salt stock.

Mitigation Effectiveness: The purpose of this mitigation is to determine whether subsidence is occurring over the MP 299 salt dome and whether it may be adversely affecting operations or the environment.

Mitigation Enforcement: The MMS will review the results of the subsidence monitoring.

12. Sonar surveys must be conducted on each of the salt caverns according to the following frequency:

a. Prior to (within 2 months of) initiating waste injection into Cavern Nos. 1, 3, and 5;
b. At least once every 2 months for Cavern No. 1;
c. At least once every 3 years for Cavern Nos. 3 and 5;
d. Additional surveys must be conducted for any of the following reasons regardless of frequency:
    1. before commencing salt cavern closure operations;
    2. whenever leakage into or out of the salt cavern is suspected (does not apply to Cavern No. 1);
    3. after performing any remedial work to reestablish salt cavern well or salt cavern integrity; and
    4. whenever MMS believes a survey is warranted; and
e. You must provide MMS with copies of your results upon request.

Mitigation Effectiveness: The purpose of this mitigation is to ensure that sonar surveys are conducted on the salt caverns to determine their current size, shape, and overall integrity.

Mitigation Enforcement: The MMS will review sonar survey results.

AIR EMISSIONS

13. A deviation from the activities proposed in your applications that would increase NO_x emissions (e.g., use of higher horsepower waste transport vessels or increased time for unloading) could potentially cause the annual NO_x emissions to exceed the MMS exemption level. Therefore, if a deviation occurs, please be advised that revised applications must be submitted and approved before proceeding with the

deviated activity. The revised applications must include the recalculated emission amounts and, if the emissions exceed the MMS exemption level, also the air quality modeling as per 30 CFR 250.303(e).

Mitigation Effectiveness: The purpose of this mitigation is to outline MMS requirements should actual air emissions (particularly NO_x emissions) exceed the projected air emissions submitted in the applications.

Mitigation Enforcement: The MMS will review MP 299 operational records to determine whether the potential to exceed the projected air emission levels exists.

Recommendation: Due to the close proximity to Breton National Wildlife Area (BNWA) (i.e., within 100 km), the use of low-sulfur fuel and controls on emissions of nitrogen oxides is recommended.

TRASH AND DEBRIS

14. Waste disposal facility and vessel operators must take actions to achieve zero loss of trash and debris. Any trash and debris lost overboard must be recovered as safety permits. The operator must document any trash and debris not recovered, including a description of the trash or debris lost, date and location of loss, and source of the loss (platform, aircraft, or vessel). Operators shall submit this information in an annual report to the MMS, GOMR's Office of Leasing and Environment.

Mitigation Effectiveness: The purpose of this mitigation is to provide guidance on recovery, documentation, and reporting requirements for trash and debris lost overboard.

Mitigation Enforcement: Actions to achieve zero loss of trash and debris and self-reporting of trash and debris lost overboard and not recovered require no specific enforcement action on the part of MMS. The MMS will review Freeport's annual trash and debris documentation/reporting records.

RECORDS

15. Records of various MP 299 waste disposal facility activities (including but not limited to those listed in Section 4.1 of your Exhibit 1 - Operations Plan) must be retained in compliance with the following:

a. Your records program electronic database (web based) must be available to MMS;
b. All records developed during the operations of the Main Pass disposal facility must be retained at the facility in paper form for a minimum of five years after operations cease, or as long as the platform is in place, whichever is the longer period. All records must be retained throughout the operating life of the waste disposal facility and for five years following conclusion of any post-closure care requirements. All records must be available for review and inspection by MMS;
c. Should there be a change in the owner or operator of the disposal facility, copies of all records shall be transferred to the new owner or operator. The new owner or operator shall then have the responsibility of maintaining such records;
d. The MMS may require the owner or operator to deliver the records to MMS at the conclusion of the retention period; and
e. No records may be destroyed without MMS approval.

Mitigation Effectiveness: The purpose of this mitigation is to outline the MMS records-retention policy for waste disposal operations at MP 299.

Mitigation Enforcement: The MMS will periodically review and inspect required records.

Attachment B

Training Your Response Personnel

(a) You must ensure that the members of your spill-response operating team who are responsible for operating response equipment attend hands-on training classes at least annually. This training must include the deployment and operation of the response equipment they will use. Those responsible for supervising the team must be trained annually in directing the deployment and use of the response equipment.

(b) You must ensure that the spill-response management team, including the spill-response coordinator and alternates, receives annual training. This training must include instruction on:

(1) locations, intended use, deployment strategies, and the operational and logistical requirements of response equipment;

(2) spill reporting procedures;

(3) spill trajectory analysis and predicting spill movement; and

(4) any other responsibilities the spill management team may have.

(c) You must ensure that the qualified individual is sufficiently trained to perform his or her duties.

(d) You must keep all training certificates and training attendance records at the location designated in your response plan for at least 2 years. They must be made available to any authorized MMS representative upon request.

Exercises for your Response Personnel and Equipment

(a) You must exercise your entire response plan at least once every 3 years (triennial exercise). You may satisfy this requirement by conducting separate exercises for individual parts of the plan over the 3-year period; you do not have to exercise your entire response plan at one time.

(b) In satisfying the triennial exercise requirement, you must, at a minimum, conduct:

(1) An annual spill management team tabletop exercise. The exercise must test the spill management team's organization, communication, and decisionmaking in managing a response. You must not reveal the spill scenario to team members before the exercise starts.

(2) An annual deployment exercise of response equipment identified in your plan that is staged at onshore locations. You must deploy and operate each type of equipment in each triennial period. However, it is not necessary to deploy and operate each individual piece of equipment.

(3) An annual notification exercise for each facility that is manned on a 24-hour basis. The exercise must test the ability of facility personnel to communicate pertinent information in a timely manner to the qualified individual.

(4) A semiannual deployment exercise of any response equipment which the MMS Regional Supervisor requires an owner or operator to maintain at the facility or on dedicated vessels. You must deploy and operate each type of this equipment at least once each year. Each type need not be deployed and operated at each exercise.

(c) During your exercises, you must simulate conditions in the area of operations, including seasonal weather variations, to the extent practicable. The exercises must cover a range of scenarios over the 3-year exercise period, simulating responses to large continuous spills, spills of short duration and limited volume, and your worst-case discharge scenario.

(d) The MMS will recognize and give credit for any documented exercise conducted that satisfies some part of the required triennial exercise. You will receive this credit whether the owner or operator, a spill removal organization, or a Government regulatory agency initiates the exercise. The MMS will give you credit for an actual spill response if you evaluate the response and generate a proper record. Exercise documentation should include the following information:

(1) type of exercise;

(2) date and time of the exercise;

(3) description of the exercise;

(4) objectives met; and

(5) lessons learned.

(e) All records of spill-response exercises must be maintained for the complete 3-year exercise cycle. Records should be maintained at the facility or at a corporate location designated in the plan. Records showing that spill-removal organizations and spill-removal cooperatives have deployed each type of equipment also must be maintained for the 3-year cycle.

(f) You must inform the Regional Supervisor of the date of any exercise required by paragraph (b)(1), (2), or (4) of this section at least 30 days before the exercise. This will allow MMS personnel the opportunity to witness any exercises.

(g) The Regional Supervisor periodically will initiate unannounced drills to test the spill-response preparedness of owners and operators.

(h) The Regional Supervisor may require changes in the frequency or location of the required exercises, equipment to be deployed and operated, or deployment procedures or strategies. The Regional Supervisor may evaluate the results of the exercises and advise the owner or operator of any needed changes in response equipment, procedures, or strategies.

(i) Compliance with the National Preparedness for Response Exercise Program (PREP) Guidelines will satisfy the exercise requirements of this section. Copies of the PREP document may be obtained from the Regional Supervisor.

Maintenance and Periodic Inspection of Response Equipment

(a) You must ensure that the response equipment listed in your response plan is inspected at least monthly and is maintained, as necessary, to ensure optimal performance.

(b) You must ensure that records of the inspections and the maintenance activities are kept for at least 2 years and are made available to any authorized MMS representative upon request.

Verifying the Capabilities of Your Response Equipment

(a) The Regional Supervisor may require performance testing of any spill-response equipment listed in your response plan to verify its capabilities if the equipment

(1) has been modified;

(2) has been damaged and repaired; or

(3) has a claimed effective daily recovery capacity that is inconsistent with data otherwise available to MMS.

(b) You must conduct any required performance testing of booms in accordance with MMS-approved test criteria. You may use the document "Test Protocol for the Evaluation of Oil-Spill Containment Booms," available from MMS, for guidance. Performance testing of skimmers also must be conducted in accordance with MMS approved test criteria. You may use the document "Suggested Test Protocol for the Evaluation of Oil Spill Skimmers for the OCS," available from MMS, for guidance.

(c) You are responsible for any required testing of equipment performance and for the accuracy of the information submitted.

Whom Do I Notify if a Waste Spill occurs?

(a) You must immediately notify the appropriate MMS District Supervisor (New Orleans District Office, 1-504-736-2504 or 1-504-736-2505; Houma District Office, 1-985-868-4033; Lafayette District Office, 1-337-262-6632; Lake Charles District Office, 1-337-480-4600) if you observe a waste spill resulting from any activities associated with your waste disposal operations (e.g., during waste transfer to/from vessels, waste transport by vessel, waste storage, waste processing, and waste injection, or the escape of wastes from any of the caverns or caprock, etc.) regardless of the spill size or spill location (OCS or non-OCS waters).

(b) You must file a written followup report for any spill of 1 barrel or more. The appropriate MMS District Supervisor must receive this confirmation within 15 days after the spillage has been stopped. All reports must include the cause, location, volume, and remedial action taken. Reports of spills of more than 50 barrels must include information on the sea state, meteorological conditions, and the size and appearance of the slick (if applicable). The appropriate MMS District Supervisor may require additional information if it is determined that an analysis of the response is necessary.

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ABBREVIATIONS AND ACRONYMS

ac	acres
AHTS	Anchor handling tugs/supply vessels
APD	application for permit to drill
API	American Petroleum Institute
APR	annual performance review
ASA	Applied Science Associate
bbl	barrel
BNWA	Breton National Wildlife Area
BOD	biochemical oxygen demand
B.P.	before present
CARA	Conservation and Reinvestment Act
CEI	Coastal Environments, Inc.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
COE	U.S. Corps of Engineers
CPA	Central Planning Area
CSA	Continental Shelf Associates
CWA	Clean Water Act
DDT	Dichlorodipheny-ltrichloroethane
DGoMB	Deepwater Program: Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology
DM	departmental manual
DOCD	Development Operations Coordination Document
DOE	Department of Energy
DOI	Department of the Interior (U.S.) (also: USDOI)
DOT	Department of Transportation
DOTD	Department of Transportation and Development
DP	Dynamic positioning
E&D	Exploration and Development
E&P	exploration and production
EA	environmental assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
e.g.	for example
et al.	and others
EIS	environmental impact statement
EMAP-E	Environmental Monitoring and Assessment Program for Estuaries
EP	exploration plan
EPA	Eastern Planning Area
Era	Era Aviation
ESA	Endangered Species Act
ESI	Environmental Sensitivity Index
et al.	and others
et seq.	and the following
FAA	Federal Aviation Administration
FMC	Fishery Management Council
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
FONSI	Finding of No Significant Impact
FPSO	floating production storage and offloading
FR	Federal Register
Freeport	Freeport-McMoRan Sulphur LLC
FWS	Fish and Wildlife Service
G&G	geological and geophysical
GIS	geographical information system
GIWW	Gulf Intracoastal Waterway
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
H_2S	hydrogen sulfide
HMS	highly migratory species
IOGCC	Interstate Oil and Gas Compact Commission
IPF	impact producing factors
LARI	Louisiana Artificial Reef Initiative
LA Hwy 1	Louisiana Hwy 1
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LOOP	Louisiana Offshore Oil Port
MAFLA	Mississippi, Alabama, Florida
MAMES	Mississippi-Alabama marine ecosystem study
MASPTHMS	Mississippi-Alabama Shelf Pinnacle Trend Habitat Mapping Study
MARPOL	International Convention for the Prevention of Pollution from Ships
mg/l	milligrams per liter
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MP	Main Pass
MPRSA	Marine Protection, Research, and Sanctuaries Act
MPT	marine portable tote
MSA	Metropolitan Statistical Area
MSDS	material safety data sheet
MSW	Municipal Solid Waste
MWA	military warning area

NAAQS	National Ambient Air Quality Standards
NARP	National Artificial Reef Plan
NBS	National Biological Service
NEPA	National Environmental Policy Act, as amended
NFEA	National Fishing Enhancement Act
NHS	National Highway System
NMFS	National Marine Fisheries Service
nmi	nautical miles
NOx	nitrous oxides
NOAA	National Oceanic and Atmospheric Administration
NORM	naturally occurring radioactive material
NOW	Nonhazardous Oilfield Waste
NPDES	National Pollutant and Discharge Elimination System
NRC	National Response Corporation
NTL	Notice to Lessees and Operators
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act, as amended
OSRA	Oil Spill Risk Analysis
OSRO	Oil Spill Removal Organization
OSV	offshore supply vessel
PAH	polycyclic aromatic hydrocarbon
PBR	Potential Biological Removal
PCB	polychlorinated biphenyl
PD	production and development
PHI	Petroleum Helicopters, Inc.
PM	particulate matter
ppb	parts per billion
ppt	parts per thousand
PREP	Preparedness for Response Exercise Program
PSD	prevention of significant deterioration
PSH	pressure safety high
Psi	pounds per square inch
PSV	pressure safety valve
PSV	Platform supply vessel
RAHA	Risk Assessment and Hazards Analysis
RCRA	Resource Conservation and Recovery Act
RTR	Rigs-to-Reefs
RUE	right-of-use and easement
SBF	synthetic-based fluids
SCP	sustained casing pressure
SCUBA	self contained underwater breathing apparatus
SEMP	Safety and Environmental Management Program
sp.	species
SPB	self propelled barge
SO_x	sulfur oxides
SDWA	Safe Drinking Water Act
TAOS	technical assessment and operations support
TSS	total suspended solids
TVOC	total volatile organic compounds
TWC	treatment, workover, and completion
U.S.	United States
UIC	underground injection control
USCG	U.S. Coast Guard
USDOC	U.S. Department of Commerce
USDOI	U.S. Department of the Interior (also: DOI)
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compounds
WPA	Western Planning Area
WSEAP	Waste Spill and Emergency Action Plan
WTA	Water Test Area

Introduction

On August 20, 2001, the Minerals Management Service (MMS) received Freeport-McMoRan Sulphur LLC's (Freeport) Applications[1] to Inject OCS-Generated Resource Conservation and Recovery Act (RCRA) Exempt Exploration and Production (E&P) Waste into Salt Caverns and Caprock on Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299 (MP 299).

The purpose of this programmatic environmental assessment (EA) is to assess the potential impacts associated with the activities proposed in these applications. This EA is being designated as a programmatic EA because oil and gas operators holding leases in other areas of the Gulf of Mexico can subsequently apply for a right-of-use-and-easement to dispose of wastes at MP 299 (Chapter 1.3.3).

By use of tiering from the most recent Draft Environmental Impact Statement (EIS) for the Gulf of Mexico OCS Oil and Gas Lease Sales 2003-2007; Central Planning Area Sales 185, 190, 194, 198, and 201, and Western Planning Area Sales 187, 192, 196, and 200, Volumes I and II (USDOI, MMS, 2002), and referencing other related environmental documents, this EA concentrates on environmental effects and issues specific to the proposed action.

1. THE PROPOSED ACTION

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The primary purpose of the proposed action outlined by Freeport-McMoRan Sulphur LLC (Freeport) in their waste disposal applications is to provide a waste disposal alternative that provides economic, safety, and environmental advantages over the present waste management practices conducted on the Federal Outer Continental Shelf (OCS). The proposed action would also provide stability to Cavern No. 1. Under the Outer Continental Shelf Lands Act (OCSLA), as amended, the U.S. Department of the Interior (DOI) is required to manage the leasing, exploration, development, and production of oil, gas, sulphur, and salt resources on the Federal OCS. The Secretary of the Interior oversees the OCS oil, gas, sulphur, and salt program and is required to balance orderly resource development with protection of the human, marine, and coastal environments while simultaneously ensuring that the public receives an equitable return for these resources and that free-market competition is maintained.

The Secretary of the Interior, through the Minerals Management Service (MMS), is responsible for regulating activities on the OCS under the OCSLA and its amendments only as they relate to mineral or energy resources. Disposal of OCS wastes is considered an activity related to exploration and production of OCS mineral resources. On-lease disposal is authorized by MMS regulations at 30 CFR 250.300(b). Off-lease disposal can be granted under rights-of-use and easement (RUE) in accordance with 30 CFR 250.160. The Freeport waste disposal applications involve lease operators sending their OCS-generated Resource Conservation and Recovery Act (RCRA) exempt exploration and production (E&P) waste to an off-lease commercial disposal facility (MP 299) for injection into salt caverns and caprock. The MMS regulatory authority to approve this disposal method is discussed in detail in Chapter 1.3.2.

There are several decisions that need to be made by Federal agencies for the permitting of activities proposed by Freeport:

[1] In a letter dated January 3, 2002, MMS informed Freeport they were not the appropriate applicant for the right-of-use and easement (RUE) for the disposal of waste generated by the OCS oil and gas operations of others, which must be submitted in accordance with 30 CFR 250.160, prior to initiation of waste disposal operations at MP 299. However, to expedite matters, MMS determined that a programmatic EA could be conducted at this time on the applications submitted by Freeport to evaluate the proposed disposal method (injection into salt caverns and caprock) and disposal site (MP 299 Salt Cavern Nos. 1, 3, and 5, and associated caprock). Freeport was informed of the initial requirements for the approval and permitting process of a RUE for the proposed waste disposal operations in the MMS letter dated January 3, 2002. These requirements are summarized in Chapter 1.3.3.1. of this EA. However, for the sake of simplicity, the waste disposal operations proposed by Freeport will continue to be termed "Applications to Inject OCS-Generated Resource Conservation and Recovery Act (RCRA) Exempt Exploration and Production (E&P) Waste into Salt Caverns and Caprock on Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299."

- MMS–approve/disapprove/approve with modification(s) the waste disposal applications (waste disposal method at MP 299).

  The term "approve" means a determination by MMS that Freeport's applications propose an acceptable methodology for the injection of OCS-generated, RCRA-exempt E&P waste into salt caverns and caprock on Sulphur and Salt Lease OCS-G 9372, MP 299, with the mitigation listed in Appendix A. The MMS "approval" only refers to the disposal method and site and not the actual injection of waste (Chapter 1.3.3.1).

- U.S. Environmental Protection Agency (USEPA)–approve/disapprove/approve with modification(s) the National Pollution Discharge Elimination System (NPDES) permit.
- Fish and Wildlife Service (FWS)/National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries)–render Endangered Species Act (ESA) Section 7 Consultation biological opinions. NOAA Fisheries was formerly known as the National Marine Fisheries Service (NMFS).
- NOAA Fisheries–render Essential Fish Habitat (EFH) Consultation opinion.
- FWS–render major source review determination for air quality related values, including visibility status for BNWA.

1.2 DESCRIPTION OF THE PROPOSED ACTION

1.2.1 Background–Main Pass Block 299 Salt Dome Geology

The MP 299 salt dome is roughly circular in shape, having a relatively flat top and a minimum depth of about 1,300 ft below sea level, with a diameter of about 10,000 ft at the 3,000-ft subsea contour. The salt diapir is believed to extend from approximately 1,800 ft subsea to at least a depth of 25,000 ft. There is a minimum of approximately 1,500 ft of sedimentary overburden between the disposal formations (caprock or caverns) proposed for use by Freeport (Table 1-2) and the seafloor. The water depth in the vicinity of the platform complex at MP 299 is approximately 210 ft.

The MP 299 sulphur deposit occurs in limestone caprock over the top of the salt dome structure. The salt dome appears to be fairly typical of the piercement-type salt domes that have been drilled onshore and offshore along the Gulf Coasts of the United States and Mexico. Sulphur-bearing salt domes along the coast of the Gulf of Mexico (GOM) typically have a stratigraphic sequence as shown in Figure 1-1, wherein a diapiric salt body has pushed through a thick sedimentary sequence, and the top of salt lies relatively near the surface. Salt diapirs are able to push their way up through the sediment layers because salt is less dense or "bouyant" compared to the surrounding sediments and because salt can flow at higher temperatures and pressures. A sequence of anhydrite, shales, and other rock strata known as caprock may overlie the salt and sometimes hosts sulphur deposits. Salt domes in the GOM have a long history of oil and gas production because hydrocarbon can become trapped in sedimentary rock that is truncated against the salt dome flanks.

Geologic knowledge of the MP 299 sulphur deposit and salt dome is based primarily on the results of a drilling program conducted by a Joint Venture sulphur exploration program, with Freeport-McMoRan Resource Partners serving as operator. Exploration drilling at MP 299 began on December 1, 1988, and finished on March 20, 1989; the program included drilling 20 holes using typical contracted jack-up type offshore rigs. The total amount of subsea drilling was 37,515 ft. Drilling was conducted over the top of a known salt dome having hydrocarbon production around its rim. Total caprock thickness, some unmineralized and some hosting sulphur, was shown to vary from 121 ft to 538 ft. Limestone thickness ranged from 81 ft to 480 ft. Barren or noncommercial sulphur-bearing limestone varied from 17 ft to 448 ft in thickness. The commercial sulphur horizon varied in thickness up to 230 ft. Anhydrite ranged from only 2 ft up to 132 ft thick. The shallowest salt contact was at 1,764 ft subsea, while the deepest was at 1,928 ft subsea (Freeport, 2001).

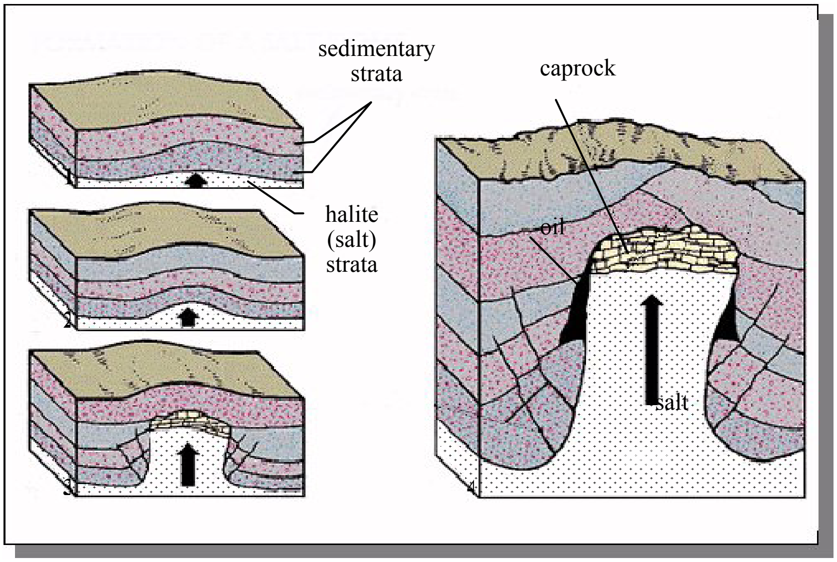

Figure 1-1. Typical genesis and stratigraphic sequence of sulphur-bearing salt domes along the coast of the Gulf of Mexico.

In general, the greatest caprock thickness and commercial sulphur horizon is in the southeastern part of the dome. The sulphur horizon tends to pinch out abruptly in the southeast while a more gradual thinning occurs in the western and northern sections. A thick zone of barren caprock exists in the extreme southeast quadrant of the dome. Caprock occurs over an area of approximately 1,700 acres (ac). The upper caprock in the central and southeastern area and in a smaller area northwest of the center consists of an unconsolidated calcite that contains oil and gas. Portions of the hard limestone just below this softer calcite are also oil bearing. Total area within these zones is approximately 631 ac (Freeport, 2001).

1.2.2 Background–Main Pass Block 299 Salt and Sulphur Production Processes and Oil Production Process

Since the proposed action is to inject OCS-generated, RCRA-exempt E&P waste into salt caverns and caprock on Sulphur and Salt Lease OCS-G 9372, MP 299, brief overviews of the salt and sulphur production processes are given below.

The salt production process involves injecting seawater into the salt formation using a set of concentric pipes within a brine well. Drilling activities are very similar to oil and gas or sulphur well drilling, and the well equipment is comparable. The nonsaturated water is injected through the lowest pipe causing the water to travel into the open hole, dissolving salt as it travels upward. By the time the water, now brine, reaches the casing, it is saturated, having achieved 26 percent salt by weight. The salt production process results in the formation of brine cavities within the salt dome. A flow diagram illustrating the various uses of produced brine [for sales and site use (e.g., for waste slurrification, caprock pressure maintenance, and drilling and completion)] is located in Appendix C (Exhibit 1 Operations Plan, Figure 10).

Sulphur is produced using the Frasch extraction process of melting the sulphur with heated brine (325º F). Heated brine is used because it results in more efficient melting of the sulphur (due to its high heat content and ability to sink relative to the surrounding formation water because of its greater density). First, a hole is drilled to the bottom layer of the salt dome caprock using the typical shallow hydrocarbon exploration equipment. To pump the hot water (brine) down and extract the sulphur, three concentric pipes with a protective casing are placed in the hole. Inside the outer casing, an 8-inch pipe is set through the caprock to the bottom of the sulphur deposit. The pipe's lower end is perforated. Then, a 4-in pipe is set to within a short distance of the bottom. Finally, a 1-in pipe is placed in the well to inject compressed air to air-lift the sulphur to the surface. The 1-in pipe reaches more than half way to the bottom of the well (Freeport, 1989).

Brine heated to about 325º F is pumped under a pressure of 100-250 pounds per square inch (psi) down the annulus between the 8-in and 4-in pipes, and during the initial heating period, down the 4-in pipe. The superheated brine is forced through the perforations at the bottom of the casing into the sulphur-bearing deposit. As the sulphur-bearing formation reaches and exceeds 246ºF, the melting point of sulphur, liquid sulphur flows to the bottom of the well. Sulphur's specific gravity is about twice that of water. Pumping heated brine down the 4-in pipe is then discontinued. Pressure of the hot water forced into the formation then forces liquid sulphur several hundred feet up the 4-in pipe (Freeport, 1978). Compressed air, injected at a pressure of about 500 psi, is forced down the smaller 1-in pipe, aerating and lightening the liquid sulphur so that it is carried to the surface (Freeport, 1978; Hazelton, 1970). In addition, bleedwater wells must be drilled to remove the large volumes of cool brine that accumulate with the formation. This allows more hot brine to be pumped into the dome and prevents a buildup of water and pressure at the bottom of the well (Hazelton, 1970). See Figure 1-2 below for a simplified view of the Frasch sulphur extraction process.

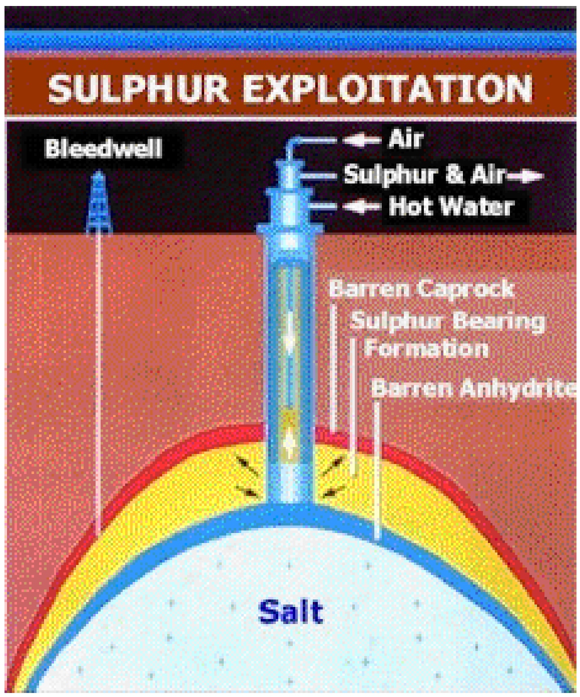

Figure 1-2. Frasch Sulphur Extraction Process.

The sulphur reserves underlying the sulphur and salt lease contain remaining estimated reserves of 60 million long tons of sulphur. This is the largest strategic reserve of elemental sulphur in the United States. Sulphur production ceased on August 31, 2000, due to unfavorable economics attributable to the combined effect of low sulphur prices and high natural gas prices (large volumes of natural gas are required to fire the boilers that heat the water injected into the formation in order to produce the sulphur and power the generators to produce electricity).

For more detailed information on sulphur and salt production at MP 299, please refer to MMS EA N-3425/R-2601 (10/90) and EA S-5469 (3/2001).

The oil and gas lease (OCS-G 12362), also held by Freeport, covers a portion of MP 299 and contains remaining estimated reserves of 5 million barrels (bbl). Current production rates are approximately 5,300 bbl per day. Oil and gas reserves are expected to be depleted by the year 2010. Oil exploration and production activities at MP 299 are similar to E&P activities conducted elsewhere in the GOM.

1.2.3 Main Pass Block 299–OCS-Generated, RCRA-Exempt, E&P Waste Disposal Applications

On August 20, 2001, the MMS GOM Region, Office of Field Operations, received Freeport-McMoRan Sulphur LLC's (Freeport) applications to inject OCS-generated, RCRA-exempt E&P waste into salt caverns and caprock (the rock formation overlying the salt dome, consisting of anhydrite, limestone, and sulphur ore) on Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299. The individual applications are listed below:

1. Application to inject OCS-generated, RCRA-exempt E&P waste into the salt cavern that underlies existing Brine Well #1-A (OCS-G 9372 Well #BR-01-A). The proposed injection well is to be re-named OCS-G 9372 Well #CA-01-A;

2. Application to inject OCS-generated, RCRA-exempt E&P waste into the salt cavern that underlies the former Brine Well #3-A (OCS-G 9372 Well #BR-03-A), which has been plugged and abandoned and will be re-entered in a well proposed to be named the OCS-G 9372 Well #CA-03-A—this new well will be the injection well;

3. Application to inject OCS-generated, RCRA-exempt E&P waste into the salt cavern that underlies the existing Brine Well #5-A (OCS-G 9372 Well #BR-05-A). The proposed injection well is to be re-named OCS-G 9372 Well #CA-05-A; and

4. Application to inject OCS-generated, RCRA-exempt E&P waste into the caprock (the rock formation overlying the salt dome, consisting of anhydrite, limestone and sulphur ore) that underlies 10 wells proposed for use as injection wells (OCS-G 9372 Wells #SW2-05-B, SW2-06-B, SW2-09-B, SW2-14-F, SW2-32-F, SW2-37-F, SW2-57-D, SW2-60-C, SW2-62-A, and SW2-75-B).

More information (e.g., surface location, current status, planned use, water depth, subsea depth of the disposal formations, and salinity) on the proposed wells to be used for waste disposal can be found in Appendix C (Exhibit 1 Operations Plan, Attachment 4).

The RCRA-exempt E&P wastes are wastes from the exploration, development, and production of crude oil, natural gas, and geothermal energy that are exempted from regulation as hazardous wastes under the RCRA Subtitle C (53 FR 25477) by a July 6, 1988, U.S. Environmental Protection Agency (USEPA) regulatory determination. On March 22, 1993, USEPA issued clarification of the 1988 determination (58 FR 15284). Only RCRA-exempt E&P wastes containing NORM in concentrations less than 30 picocuries per gram and exposure rates of less than 50 microroentgens per hour inclusive of background are proposed for injection at MP 299. The E&P exemption from RCRA Subtitle C Regulation is discussed in further detail in Chapter 1.4.1.

The following is a summarized chronology of major correspondence or events related to Freeport's waste injection applications:

8/20/01 - Freeport withdraws their applications submitted 1/25/01 and submits new applications that address issues outlined in the MMS letter requesting additional information and clarifications (sent to Freeport on 8/6/01).

10/5/01 - Freeport's applications are determined to be "incomplete/inadequate"; MMS sends a letter to Freeport requesting additional information and clarifications.

10/22/01 - Amended applications are received by MMS.

10/31/01 - Freeport sends a letter to the Council on Environmental Quality (CEQ) Energy Task Force requesting assistance in expediting the permitting process.

11/9/01 - MMS responds to CEQ regarding Freeport's request.

11/29/01 - Freeport's applications are determined to be "incomplete/inadequate"; additional information and clarifications request (advance copy) sent to Freeport.

1/3/02 - MMS response letter and official additional information and clarifications request sent to Freeport.

1/7/02 - Amended applications are received by MMS.

1/30/02 - Freeport's applications are determined to be "incomplete/inadequate."

2/7/02 - Freeport response letter to MMS letter (1/3/02) received by MMS.

2/7/02 - *Federal Register* notice published–Notification of preparation of an EA and upcoming public scoping meeting. Other agencies and interested parties were mailed letters notifying them of the upcoming public scoping meeting.

2/14/02 - Legal notices published in *The Times-Picayune* and *Baton Rouge Advocate* newspapers on February 14, 2002.

2/21/02 - Public scoping meeting held in New Orleans, Louisiana.

3/13/02 - Amended applications are received by MMS.

3/29/02 - Amended applications are received by MMS.

3/29/02 - Freeport's applications are determined to be "complete/adequate."

3/29/02 - Freeport's applications are sent to FWS for air quality major source review.

4/5/02 - The MMS initiates informal consultation with FWS/NOAA Fisheries for Section 7 Consultation.

4/11/02 - The MMS requests more detailed informal consultation with FWS/NOAA Fisheries for Section 7 Consultation.

4/22/02 - The MMS sends a letter to FWS/NOAA Fisheries outlining the current status of the Section 7 Consultation.

4/23/02 - The MMS receives a response from FWS regarding their air quality major source review; no further analysis is required from Freeport.

5/7/02 - The USEPA requests to review MMS programmatic EA prior to it being finalized.

5/13/02 - Freeport letter clarifying application information received by MMS.

5/22/02 - The MMS sends Freeport a letter requesting determination of which items they believe are protected from disclosure by exemption 4 (5 U.S.C. 552 (b)(4)) (in response to a May 16, 2002, Freedom of Information Act (FOIA) request from Ms. Cynthia Sarthou, Gulf Restoration Network).

5/24/02 - The MMS receives a Freeport letter clarifying USEPA approval to discharge effluents from the proposed E&P waste disposal project under the terms of the administratively extended existing NPDES permit.

6/4/02 - The MMS receives response from FWS indicating formal Section 7 consultation is required.

8/2/02 - The MMS sends programmatic EA to USEPA for review.

8/16/02 - The MMS initiates consultation with NOAA Fisheries for Essential Fish Habitat (EFH).

8/20/02 - The MMS receives USEPA's comments on the EA.

8/26/02 - The MMS initiates formal consultation with FWS/NOAA Fisheries for Section 7 Consultation.

Table 1-1 lists the contents of each application as amended.

Table 1-1

MP 299 Waste Disposal Application Contents

Application - Compliance with MMS NTL 99-G22	Exhibit 6 - Structure Maps
Exhibit 1 - Operations Plan	Exhibit 7 - Schematic Drawing of Wellbore(s)
Exhibit 2 - Monitoring Plan	Exhibit 8 - Well(s) Open Hole Log(s)
Exhibit 3 - Closure Plan	Exhibit 9 - Safety Plan
Exhibit 4 - Environmental Report	Exhibit 10 - Waste Spill and Emergency Action Plan
Exhibit 5 - Risk and Hazard Analysis	Technical Report

Freeport submitted numerous other technical reports, documents, well logs, and maps in support of the proposed waste disposal applications, in addition to those listed above. Also, numerous meetings were held between MMS and Freeport personnel during waste disposal application processing to discuss the submitted information.

This project combines the production of salt (in the form of brine) and the use of the caverns created by salt production (and in the course of sulphur production, which was previously conducted on the lease) as well as the caprock overlying the salt dome for waste disposal. On March 5, 2001, MMS completed an EA resulting in a Finding of No Significant Impact (FONSI) on Freeport's Development Operations Coordination Document (DOCD), S-5469, which proposed commercial salt production from MP 299.

MP 299 is located approximately 16 mi from shore, east of the Mississippi River Delta and Plaquemines Parish, Louisiana (Figure B-1a). The water depth in the vicinity of the platform complex at MP 299 is approximately 210 ft. The project would use existing onshore support bases located in Venice, Port Fourchon, and Morgan City, Louisiana (Figure B-1a). The geographical relationship of MP 299 to multiple-use areas (major cities, artificial reef areas, national wildlife refuges, military warning areas, shipping fairways, ordnance disposal areas) is shown in Figure B-1b. The geographical relationship of MP 299 to offshore regulatory features (prehistoric/historic archaeological high-probability blocks, live-bottom (pinnacle trend) stipulation blocks, topographic features stipulation blocks, and Breton National Wilderness Area Class I Area) is shown in Figure B-1c. The physical oceanography of the GOM near MP 299 is described in Appendix G.

Operational Description

Trinity Field Services, L.P. and Freeport have formed an alliance for the collection, transportation, handling, and disposal of OCS-generated, RCRA-exempt E&P waste. The E&P waste would be received in bulk or in cuttings boxes/marine portable tanks by offshore supply vessel (OSV) or self-propelled barge (SPB) at MP 299 from single and multiple offshore operating locations where the waste is generated. According to Freeport, transport of wastes by OSV and SPB to MP 299 could theoretically occur from anywhere on the OCS (offshore Louisiana, Mississippi, or Alabama). However, it would primarily occur within a "waste corridor" that essentially covers the Gulf of Mexico OCS south from Berwick, Louisiana (to the west) to the Central Planning Area (CPA)/Eastern Planning Area (EPA) boundary (to the east) (Figure B-1d). Depending on the size of the OSV, which could vary in size from 165-200-ft workboats, the tank capacities could be 1,500-4,000 bbl. Total OSV capacity could be up to 5,000 bbl. The SPB's proposed for use are 300 ft in length and contain 2 internal vessel tanks of 12,500 bbl each; total SPB capacity is 25,000 bbl. Boats arriving with cutting boxes and marine portable tanks would tie up to the platform in preparation for unloading. The platform crane would be used to lift each box or tank to the top deck of the platform where the box/tank would be disconnected from the crane sling and moved to the box/tank unloading area. The crane sling would be removed to and re-attached to an empty box or tank for return to the boat deck. Boats arriving with bulk slurried waste would also be tied up to the platform in a similar manner as for the boats described above. Once secured, the platform crane would lower an auxiliary skid mounted pumping unit to the boat deck. The auxiliary unit would be connected to the boat pumps normally used to pump out the boat tanks. The auxiliary unit acts as a booster pump to pump the slurried waste from the boat deck to the top deck of the platform. The waste would then be directed into either the operational cavern or into the caprock through the appropriate caprock well. The number, size, type of vessel, and waste carrying capacity of each vessel required to transport the projected waste volumes to MP 299 is described in detail in Appendix C (Exhibit 1 Operations Plan, Attachment 3). Vessel storage and transfer operations are also discussed in Appendix C (Exhibit 1 Operations Plan, Section 2.3).

The waste received at MP 299 would be either directly injected or injected after being temporarily stored and processed to extract recyclable materials or to enhance injection capability. Although it is expected that most waste would be offloaded by hose for immediate processing and disposal, Freeport's Operations Plan calls for the possible use of several waste-holding tanks on Platform PP2 (Freeport, 2002). Muds and solids coming onto the facility may be stored in these waste storage tanks temporarily (no more than 8 hours) prior to disposal (Freeport, 2001). Total capacity of the tanks available for temporary storage of wastes is 4,556 bbl. Table D-2 identifies the type, number, and holding capacity of all of the tanks available on the platform that could be used for waste handling. In some cases, waste would be processed at existing onshore facilities (Fourchon, Venice, and Morgan City, Louisiana) to remove hydrocarbons and/or other recyclable materials (primarily synthetic drilling fluids) and then taken to MP 299 for injection.

The MP 299 platform complex associated with the proposed waste disposal operations was previously constructed to support the development and production of sulphur and oil and gas reserves present in the formations above the MP 299 salt dome structure. The facility is over a mile in length and is one of the largest structures in the GOM (Appendix C, Exhibit 1 Operations Plan, Figure 1). Both drilling platforms PP1 and PP2 may be used to support the waste disposal activity. New equipment to be installed to accommodate waste injection would consist of a waste pump unit, air compressor, storage tanks, tank cleaning pumps, a tank cleaning vacuum system, waste pumps and dryers, and a waste air compressor (Appendix C, Exhibit 1 Operations Plan, Figures 2-4). An on-site testing laboratory would also be located on the platform where the following tests would be performed on the received wastes: pH, chloride concentration, conductivity, H_2S concentration, NORM survey, TVOC scan, retort (oil, solid, water separation), temperature, and mud weight. Waste sampling and testing procedures are discussed in detail in Appendix C, Exhibit 1 Operations Plan, Chapter 3. Monitoring activities at MP 299 include waste receipt, waste acceptance and refusal criteria, waste type and quantity, waste conditioning, operating reports, subsidence, air quality, and temperature surveys.

Per Freeport's March 27, 2002, amended applications, waste received at MP 299 would be injected via one of the following routes:

1. Waste received at platforms PP1 or PP2 would be injected into existing caprock wells located on platform PP2 (4 platform bridges connect platforms PP1 and PP2);
2. Waste received at platforms PP1 or PP2 would be injected into Cavern No. 1 via the existing brine Well #1-A (OCS-G 9372 Well #BR-01-A) located on Platform BS-2 (7 platform bridges connect platform PP1 or PP2 with platform BS-2) or, alternatively, via a proposed well to be named the OCS-G 9372 Well #CA-01 to be drilled from platform PP1, platform PP2, or one of the bridge support towers;
3. Waste received at platforms PP1 or PP2 would be injected into existing Cavern No. 3 via a proposed well to be named the OCS-G 9372 Well #CA-03-A to be drilled from platform PP1, platform PP2, or one of the bridge support towers; and
4. Waste received at platforms PP1 or PP2 would be injected into Cavern No. 5 via a proposed well to be named the OCS-G 9372 Well #CA-05-A to be drilled from platform PP1, platform PP2, or one of the bridge support towers.

The various operations and processes that would be used at MP 299 to implement the proposed waste management activities are described in detail in Appendix C (Exhibit 1 Operations Plan, Section 2). Illustrative process flow diagrams can be found in Appendix C (Exhibit 1 Operations Plan, Figures 1-10).

The proposed waste injection activities would span 26 years starting in 2002. The anticipated volume of OCS-generated, RCRA-exempt E&P wastes to be injected over the project life is estimated to be 119 million bbl (Appendix C, Exhibit 1 Operations Plan, Attachments 2 and 3). Approximately 1-8 million bbl of waste would be injected annually. Freeport estimates the typical waste streams to be injected would consist of approximately 16 percent solids, 77 percent liquids, and 7 percent hydrocarbons (Appendix C, Exhibit 1 Operations Plan, Attachment 2). Freeport anticipates the OCS-generated, RCRA-exempt E&P waste would consist mainly of water-based muds and cuttings, synthetic-based muds and cuttings, and oil-based muds and cuttings. Although Attachment 2 of Freeport's Operations Plan indicates that water-based drilling fluids and water-based muds (cuttings) account for 39 percent and 2 percent of the waste to be injected respectively, Freeport's January 7, 2002, amendment states that the combined volume of water-based fluids and cuttings could conceivably be as high as 70 percent of the waste. For this estimate, Freeport believes the volume and percentage of solid, liquid, and oil waste streams would be unchanged (although the combined percentages of other individual waste types would be reduced by an amount equal to the increase in water-based fluids and cuttings) (C. Brassow, 3/13/02).

The combined estimated disposal capacity of the caverns and barren/leached caprock is approximately 2.6 billion bbl. The volume, disposal capacity, and measurements of each of the individual caverns and caprock are listed in Table 1-2 below.

Table 1-2

MP 299 Cavern and Caprock Specifics

Disposal Site Name	Nominal Volume (million cubic ft)	Nominal Volume (million bbl)[1]	Disposal Capacity (million bbl)[2]	Size (ft) (height x width)	Sedimentary Overburden between Disposal Formation and Seabottom (SS) (ft)
Cavern BR-01	94.9	16.9	106	1,154 x 308	1,786
Cavern BR-03	85.3	15.3	96	600 x 417	2,065
Cavern BR-05 (current) Cavern BR-05 (expanded)	16.3 33.7	2.9 6.0	18 37.5	1,250 x 126 not given	2,216
Caprock	14,500	2,600	N/A	Leached and barren areas	1,486-1,617

[1] One barrel equals 5.615 cubic ft.
[2] Cavern disposal capacity is the amount of waste required to provide the solids to fill the cavern volumes. Based on 16% solids in the proposed waste stream, the total amount of E&P waste needed to provide the solids required to fill the caverns is 6.25 times greater than the volume of the caverns.

Figure B-2 depicts the relationship between the MP 299 salt dome, platform complex, Cavern Nos. 1, 3 and 5, and the proposed caprock waste injection area. Figures B-3a and B-3b show a 3-dimensional cross section view and plan view of Cavern Nos. 1, 3 and 5 in relationship to the platform complex.

Figure 1-3 below shows the E&P waste injection process during the early and late stages of injection.

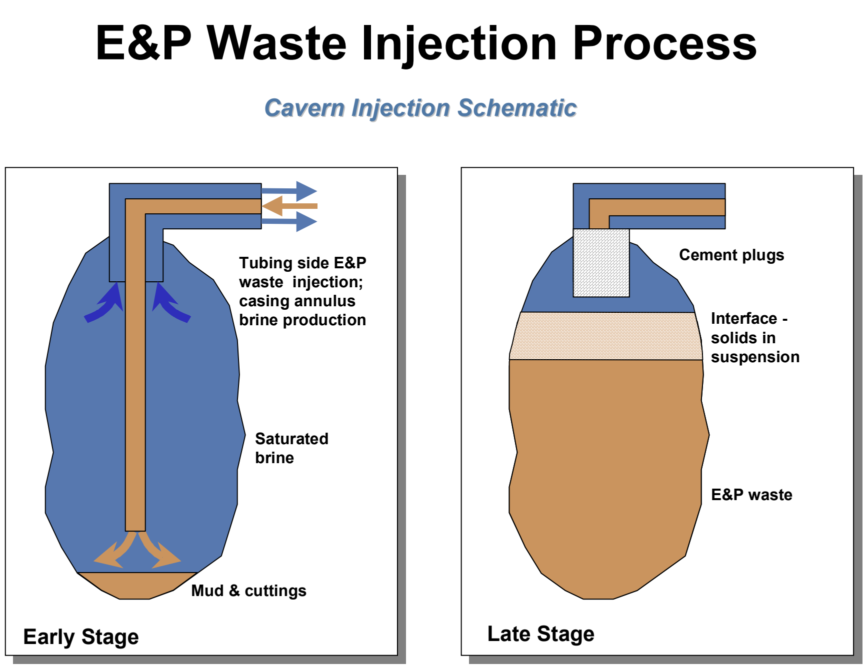

Figure 1-3. E&P Waste Injection Process.

Table 1-3 shows the tentative activity schedule proposed by Freeport for their MP 299 waste disposal project, as outlined in their applications received by MMS on August 20, 2001.

Table 1-3

MP 299 Waste Disposal Proposed Activity Schedule

Activity	Start Date	End Date
Project Engineering	August 2001	November 2001
Construction and Equipment Installation	December 2001	January 2002
Waste Receipt and Disposal to Caprock and Cavern No. 1	90 days after project approval (Revised to 1 day after project approval; 4/2002)	Caprock - 2028 Cavern No. 1 - when cavern is full
Re-drill Access Well to Cavern No. 3	June 2003	June 2003
Waste Receipt and Disposal to Cavern No. 3	July 2003	When cavern is full or 2028
Drill Access Well to Cavern No. 5	December 2005	December 2005
Waste Receipt and Disposal to Cavern No. 5	After Cavern Nos. 1 and 3 are full	When cavern is full or 2028
Drill Access Well to Establish New Salt Cavern[1]	June 2010	June 2010

[1]While air emissions associated with the potential drilling of another salt cavern are included in Freeport's air quality spreadsheets, drilling of an access well to establish a new salt cavern (with subsequent injection of wastes) is not part of the proposed activity being considered by MMS.

A brief summary of each of the application exhibits listed in Table 1-1 is provided below. To view a complete public information copy of Freeport's MP 299 waste disposal applications, please visit the MMS website http://www.gomr.mms.gov/homepg/offshore/mp299/index.html

Application–Compliance with MMS NTL 99-G22

The application is for a commercial disposal operation to be conducted in OCS waters, disposing of the E&P waste in the sub-seabed of the OCS. The MMS issued Notice to Lessees (NTL) 99-G22 ("Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes") effective September 24, 1999. This NTL provides clarification, interpretation, guidance, and additional information about the disposal, in the sub-seabed under a lease, of E&P wastes (as well as qualifying NORM that is not the subject of Freeport's applications). The NTL provides guidelines on the types of wastes that can be injected, disposal criteria, worker safety guidelines, and application information guidelines.

The present applications are unique in that MMS has not previously been asked to approve disposal of E&P waste in salt caverns or caprock associated with salt domes. Applications for approval under NTL 99-G22 have proposed injection of waste into fractured geological formations. No fracturing of either caprock or salt caverns is proposed by Freeport. Additionally, in previous applications MMS has allowed the designated operator of a lease to dispose of, on that lease, E&P waste generated by E&P operations conducted on that lease or on another lease of which it is designated operator. The present applications are the first applications received by MMS for disposal, by a designated operator of a lease, of E&P waste generated on leases of which it is not the designated operator (i.e., the application is for a commercial disposal operation to be conducted in OCS waters, disposing of the E&P waste in the sub-seabed of the OCS).

Freeport has addressed the requirements of NTL 99-G22 in this part of the application.

Applications to inject OCS-generated, RCRA-exempt E&P waste into the following:

(1) the salt cavern that underlies the former Brine Well #3-A (OCS-G 9372 Well #BR 03-A);

(2) the salt cavern that underlies the existing Brine Well #5-A (OCS-G 9372 Well #BR-05 A); and

(3) the caprock (the rock formation overlying the salt dome, consisting of anhydrite, limestone and sulphur ore) that underlies 10 wells proposed for use as injection wells (OCS-G 9372 Wells #SW2-05-B, SW2-06-B, SW2-09-B, SW2-14-F, SW2-32-F, SW2-37-F, SW2-57-D, SW2-60-C, SW2-62-A, and SW2-75-B).

The applications listed above propose the injection of the following OCS-generated, RCRA-exempt E&P wastes (E&P waste is defined by USEPA in 53 FR 25447 [especially page 25453], July 6, 1988, and clarified in 58 FR 15284, March 22, 1993) generated from OCS oil, natural gas, and sulphur and salt exploration and production activities:

- produced water;
- drilling fluids;
- drill cuttings;
- rigwash;
- workover wastes;
- cooling tower blowdown;
- packer fluids;
- produced sands;
- backwash;
- pigging wastes from gathering lines;
- well completion, treatment, and stimulation fluids;
- basic sediment and water and other tank bottoms from storage facilities that hold product and exempt wastes;
- accumulated materials such as hydrocarbons, solids, sand, and emulsion from production separators, fluid treating vessels, and production equipment;
- dehydration wastes, including glycol-based compounds, and molecular sieves;
- sweetening wastes for sulfur removal, including amine;
- precipitated amine sludge, iron sponge, and hydrogen sulfide scrubber liquid and sludge;
- pipe scale, hydrocarbon solids, hydrates, and other deposits removed from piping and equipment prior to transportation;
- wastes from subsurface gas storage and retrieval, except for the listed nonexempt wastes;
- constituents removed from produced steam, such as hydrogen sulfide and carbon dioxide, and volatilized hydrocarbons;
- materials ejected from a producing well during the process known as blowdown;
- waste crude oil from primary field operations and production;

- light organics volatilized from exempt wastes in production equipment, water-based drilling fluid and the associated cuttings, nonreclaimable, nonhazardous tank bottoms;
- noninjectable, nonhazardous waste material from produced water collection;
- produced formation sand;
- solid wastes from dehydration and sweetening, such as spent glycol and amine filters;
- solid filter media, molecular sieves, and precipitated amine sludge, iron sponge, and hydrogen sulfide scrubber;
- iron sulfide;
- spent activated carbon and other filtering and separation media;
- nonreclaimable oil-based or synthetic drilling fluid;
- cuttings generated while using oil or synthetic-based drilling fluid;
- nonhazardous, oily waste containing no reclaimable oil;
- hydrostatic test water from crude oil/natural gas pipelines;
- washwater generated from washout of vessels that contained only nonhazardous oil and gas waste;
- waste transportation vessel washout liquids; and
- "miscellaneous trash and debris associated with E&P waste handling operations (e.g., gloves, tyvek suits)" as is allowed by MMS NTL 99-G22.

The above wastes proposed for injection by Freeport are similar but not identical to the USEPA's list of RCRA-exempt E&P wastes given in Chapter 1.3 for the following reasons:

(1) the list includes only OCS-generated wastes;
(2) the list provides a more detailed breakdown of what OCS-generated wastes are considered exempt from regulation as hazardous waste under RCRA Subtitle C based on the following waste criteria: "It must be associated with operations to locate or remove oil or gas from the ground or to remove impurities from such substances and it must be intrinsic to and uniquely associated with oil and gas exploration, development or production operations; the waste must not be generated by transportation or manufacturing operations."
(3) the list includes specific sulphur wastes that are not technically considered RCRA-exempt E&P wastes but are not expected to exhibit characteristics of hazardous waste as determined by USEPA; and
(4) the list includes specific wastes allowed by MMS NTL 99-G22.

Application to Inject OCS-generated RCRA-exempt E&P Waste into the Salt Cavern that Underlies Existing Brine Well #1-A (OCS-G 9372 Well #BR-01-A)

This application proposes the injection of RCRA-exempt E&P wastes (E&P waste is defined by USEPA in 53 FR 25447 [especially page 25453], July 6, 1988, and clarified in 58 FR 15284, March 22, 1993) generated from OCS oil, natural gas, and sulphur and salt exploration and production activities that meet the definitions of "water-based drilling fluid" and associated "drill cuttings" contained in USEPA's "Final NPDES General Permit for New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Category for the Western Portion of the Outer Continental Shelf of the Gulf of Mexico (GMG290000) and Notice of a Proposed Modification to that Permit" published in the *Federal Register* of June 4, 2001, at 66 FR 107. This application is also for the injection of those wastes that qualify, per MMS NTL 99-G22, as "miscellaneous trash and debris associated with waste handling operations (e.g., gloves, tyvek suits)" contaminated with the above-described waste. No free hydrocarbons would be injected into salt cavern BR-1-A.

Exhibit 1–Operations Plan

Freeport's Operations Plan outlines operations procedures, sampling, and testing procedures, record-keeping procedures, and documentation procedures for all four applications. In support of these procedures, Freeport has provided platform schematics, waste flow diagrams for the BR-01A, BR-03A, BR-05A cavern access wells, cleaning process, caprock disposal, and brine production sales and site use. The operations plan also discusses waste volumes, and vessel transportation, and provides waste receipt and handling forms to be used. (See Appendix C for a complete copy of Freeport's Operations Plan).

Exhibit 2–Monitoring Plan

Freeport's Monitoring Plan outlines monitoring activities including waste receipt, waste acceptance and refusal criteria, waste type and quantity, waste conditioning, operating reports, subsidence, air quality, and temperature surveys. The monitoring plan also discusses record keeping, documentation, and record retention. In support of these monitoring activities, Freeport has provided a sample daily waste receipt form, waste refusal notification form, and a waste manifest form.

Exhibit 3–Closure Plan

Freeport's Closure Plan outlines cavern closure and caprock well closure procedures. These procedures include cavern shut-in and monitoring, post-filling seal monitoring, post-filling care plan, financial assurance, and post-filling care.

Exhibit 4–Environmental Report

Freeport's Environmental Report discusses environmental information that is similar to, but not identical to, the guidance provided in NTL 2000-G21 for plans in Area II of the GOM. Although MP 299 is located in Area I of the GOM, MMS determined that that more comprehensive and detailed guidelines for Area II of the GOM were appropriate due to the uniqueness of the proposed activity.

The Environmental Report included a discussion of alternatives to the proposed action, a description of the affected environment, and environmental consequences as a result of the proposed action.

Exhibit 5–Risk Assessment and Hazard Analysis

Freeport's Risk Assessment and Hazard Analysis (RAHA) is a procedure for identifying, evaluating, and controlling potential hazards related to injection of wastes at MP 299. The RAHA identifies potential hazards, determines potential events/sequences in which they might occur, evaluates the risk of occurrence, and identifies consequences, risk mitigation, and event management for various waste-handling and disposal operations (both on the platform as well as subsurface).

Exhibit 6–Structure Maps

Freeport provided geologic maps showing the structure of the salt caverns, caprock, and overlying formations at MP 299.

Exhibit 7–Schematic Drawing of Wellbore(s)

Freeport provided schematic drawings of the wellbores of the following salt cavern (brine) wells: OCS-G 9372 Well No. CA-01-A, OCS-G 9372 Well No. CA-03-A, and OCS-G 9372 CA-05-A. Schematic drawings of the wellbores of the following caprock wells were also provided: OCS-G 9372 Well Nos. SW2-05-B, SW2-06-B, SW2-09-B, SW2-14-F, SW2-32-F, SW2-37-F, SW2-57-D, SW2-60-C, SW2-62-A, and SW2-75-B.

Exhibit 8–Well(s) Open Hole Log(s)

Freeport provided open hole logs run on the following salt cavern (brine) wells: OCS-G 9372 Well No. CA-01-A, OCS-G 9372 Well No. CA-03-A, and OCS-G 9372 CA-05-A. Typical open hole logs were also provided for wells drilled into the caprock area.

Exhibit 9–Safety Plan

Freeport's Safety Plan identifies the policies, training, and procedures required of each employee including the following: (1) procedures for accident reporting and investigation; (2) alcohol, firearms, and controlled substance policy; (3) safety meetings; (4) training requirements; (5) general safety; (6) hazard communications program; (7) permit-required confined space program; (8) first aid; (9) respiratory protection program; (10) vehicle policy; (11) hearing protection program; (12) material handling; and (13) lockout/tagout program.

Exhibit 10–Waste Spill and Emergency Action Plan

Freeport's Waste Spill and Emergency Action Plan (WSEAP) outlines procedures for communication and coordination of response activities in the case of a waste spill or other emergency. The WSEAP includes a discussion of waste spill response, emergency response team description/duties, and plan implementation procedures. In support of these response activities, Freeport provided an emergency response coordination contact list, governmental agency contact list, emergency equipment and services contact list, list of site-specific emergency response plans, and material safety data sheets (MSDS) for the composition/ingredients of the wastes proposed for injection.

Technical Report

Freeport's Technical Report included technical information such as salt cavern sonar surveys by means of echo-sounding in the cavities, mine pressure vs. cavity pressure plots for the BR-01 Cavity, BR-03 Cavity integrity test, sonar comparison report, and BR-01 Cavity stability report.

1.3 REGULATORY FRAMEWORK

A brief summary of existing regulatory laws pertaining to discharges, injection, and dumping is provided below. The OCS Lands Act, as amended, is the basis for MMS's regulatory authority to approve downhole disposal of oil and gas wastes on the OCS. This regulatory authority is discussed in detail in Chapter 1.3.3.

The Federal Water Pollution Control Act (Clean Water Act), as amended

The Clean Water Act (CWA) regulates discharges into the water column from OCS oil and gas activities; therefore, it does not apply to sub-seabed disposal.

The Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) regulates underground injection. However, regulations at 40 CFR 144.1(g)(2)(I) expressly exclude "injection wells located on a drilling platform or other site that is beyond the State's territorial waters."

The Marine Protection, Research, and Sanctuaries Act (Ocean Dumping Act), as amended

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the dumping of material into ocean waters. Ocean waters are defined for the purpose of the Act as "those waters of the open seas lying seaward of the base line from which the territorial sea is measured, as provided for in the Convention on the Territorial Sea and the Contiguous Zone."

Based on comments received from the USEPA, it is USEPA's position that the MPRSA does apply to downhole disposal on the OCS when wastes are transported for the purpose of disposal.

1.3.1 USEPA Regulatory Authority–The Exploration and Production (E&P) Exemption from RCRA Subtitle C Regulation

The USEPA has authority over injection wells under the Safe Drinking Water Act (SDWA) Underground Injection Control (UIC) program provisions, pursuant to which it delegates this authority to the states. However, USEPA's regulations at 40 CFR 144.1 (g) (2) (i) expressly exclude "Injection wells located on a drilling platform or other site that is beyond the State's territorial waters." Also, USEPA has authority over ocean dumping (33 U.S.C. 1401 et seq.) under the MPRSA. Freeport will be subject to the provisions of USEPA's National Pollutant Discharge Elimination System (NPDES) regulations, and, accordingly, must obtain a USEPA NPDES Permit to discharge.

The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 and required the USEPA to (1) establish procedures for identifying wastes as either hazardous or nonhazardous and (2) promulgate requirements for the management of both.

The USEPA established four different criteria or characteristics to determine if a waste is hazardous: reactivity, corrosivity, ignitablility, and toxicity. The USEPA also listed certain specific wastes (including known poisons and carcinogens) as hazardous. Thus, hazardous wastes are described as characteristically hazardous or listed hazardous wastes. Hazardous waste disposal is regulated under RCRA Subtitle C regulations, which are extremely stringent. Nonhazardous wastes are regulated under RCRA Subtitle D regulations, which are less stringent and depend primarily on State controls.

When RCRA was amended in 1980, Congress decided that wastes generated by oil and gas exploration and production operations (as well as mining, geothermal operations, electric utilities, and cement kilns) required special consideration. The 1980 RCRA amendments (1) exempted oil industry exploration and production wastes from regulation under RCRA hazardous waste provisions (Subtitle C) and (2) directed USEPA to study such wastes and recommend appropriate regulatory action to Congress.

The USEPA conducted the study and submitted a report to Congress on exploration and production wastes on December 28, 1987. In the process of preparing the Report to Congress, the USEPA found it necessary to define the scope of the exemption for the purpose of determining which wastes were considered "wastes from the exploration, development or production of crude oil, natural gas or geothermal energy." Based upon statutory language and legislative history, the report to Congress identified several criteria used in making such a determination. In particular, for a waste to be exempt from regulation as hazardous waste under RCRA Subtitle C, it must be associated with operations to locate or remove oil or gas from the ground or to remove impurities from such substances and it must be intrinsic to and uniquely associated with oil and gas exploration, development, or production operations (commonly referred to simply as exploration and production or E&P); the waste must not be generated by transportation or manufacturing operations.

On the basis of that study, the USEPA made public its Regulatory Determination on June 30, 1988. This study, and the Regulatory Determination that followed, concluded the exemption is appropriate and should be continued. Based on the language of RCRA Section 3001(b)(2)(A) of the 1980 amendments to RCRA, review of the statute, and supporting legislative history, the USEPA stated they believe the following wastes were included in the temporary exemption set forth in the statute:

- produced water;
- drilling fluids;
- drill cuttings;
- rigwash;
- drilling fluids and cuttings from offshore operations disposed of onshore;
- well completion, treatment, and stimulation fluids;
- basic sediment and water and other tank bottoms from storage facilities that hold product and exempt wastes;
- accumulated materials such as hydrocarbons, solids, sand, and emulsion from production separators, fluid treating vessels, and production impoundments;
- pit sludges and contaminated bottoms from storage or disposal of exempt wastes;

- workover wastes;
- gas plant dehydration wastes, including glycol-based compounds, glycol filters, filter media, backwash, and molecular sieves;
- gas plant sweetening wastes for sulphur removal, including amine, amine filters, amine filter media, backwash, precipitated amine sludge, iron sponge, and hydrogen sulfide scrubber liquid and sludge;
- cooling tower blowdown;
- spent filters, filter media, and backwash (assuming the filter itself is not hazardous and the residue in it is from an exempt waste stream);
- packing fluids;
- produced sands;
- pipe scale, hydrocarbon solids, hydrates, and other deposits removed from piping and equipment prior to transportation;
- hydrocarbon-bearing soil;
- pigging wastes from gathering lines;
- wastes from subsurface gas storage and retrieval, except for the listed nonexempt wastes;
- constituents removed from produced water before it is injected or otherwise disposed of;
- liquid hydrocarbons removed from the production stream but not from oil refining;
- gases removed from the production stream but not from oil refining;
- materials ejected from a producing well during the process known as blowdown;
- waste crude oil from primary field operations and production; and
- light organics volatilized from exempt wastes in reserve pits or impoundments or production equipment.

Additional clarification of the RCRA Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes dated June 29, 1988 (53 FR 25446; July 6, 1988) was provided in 58 FR 1284, March 22, 1993.

The OCS-generated E&P wastes proposed for injection by Freeport (Chapter 1.2.3) are a subset of the E&P wastes listed above, which have been determined to be oil industry exploration and production wastes exempted from regulation under RCRA hazardous waste provisions (Subtitle C).

The sulphur and salt exploration wastes proposed for injection by Freeport are not technically considered RCRA-exempt E&P wastes since they are not wastes associated with operations to locate or remove oil or gas from the ground or to remove impurities from such substances and are not intrinsic to and uniquely associated with oil and gas exploration, development, or production operations. However, based on existing data and best engineering judgement, the USEPA determined that none of the wastes generated from sulphur production (wastewater, air emissions, sludge, filter cake, etc.) are expected to exhibit characteristics of hazardous waste. Therefore, the USEPA did not evaluate these materials further. Also, based on a review by USEPA of the Frasch mining process, there are no mineral processing operations involved in the production of sulphur via the Frasch process; therefore the wastes are not subject to the Mining Waste Exclusion [Bevill Exclusions (1980) (55 FR 15, January 23, 1990, pp. 2322-2324)].

1.3.2 State Regulatory Authority

State agencies have jurisdiction over E&P waste disposal onshore and in the sub-seabed of State waters; however, jurisdiction of State agencies does not extend into OCS waters. The State of Louisiana is currently considering the 4th Revision of proposed regulations to govern “Disposal of Oil and Gas

Exploration and Production Waste in Solution-Mined Salt Caverns" (Louisiana Administrative Code Title 43, Part XVII, Subpart 5 [Statewide Order No. 29-M-2]). The State of Texas also has a proposed cavern disposal well system rule, known as Statewide Rule 82. The MMS has reviewed these documents, and appropriate provisions of these proposed rules have been used by MMS as a guide for creating standards to apply to this proposal.

1.3.3 MMS Regulatory Authority

1.3.3.1 OCS Lands Act

The OCS Lands Act (OCSLA) makes it clear at 43 U.S.C. 1332(4)[2], 43 U.S.C. 1333(a)(1)[3], and other places where the terms mineral, mineral lease resource, or oil and natural gas are used that it pertains to the exploration, development, and production of mineral resources.[4] Minerals are oil, natural gas, sulphur, geothermal resources, and other minerals defined by 43 U.S.C. 1331(q).[5] The OCSLA Amendments are even more specific. Their primary purpose is to establish policies and procedures for managing the oil and natural gas resources of the OCS. All 10 stated purposes of the OCSLA Amendments at 43 U.S.C. 1802 refer directly or indirectly to oil and natural gas resources (sometimes called energy resources). It is clear that the Secretary of the Department of the Interior through the MMS is responsible for regulating activities on the OCS under the OCSLA and its amendments only as they relate to mineral or energy resources.

Waste disposal of OCS wastes is certainly an activity related to exploration and production of OCS mineral resources. On-lease disposal is authorized by MMS regulations at 30 CFR 250.300(b). Off-lease disposal has been granted under rights-of-use and easement (RUE) in accordance with 30 CFR 250.160.

The Freeport scenario involves a lease operator who proposes sending wastes to an off-lease disposal facility. To conduct such an activity, each lease operator that generates wastes for disposal at this facility would need a RUE approval under 30 CFR 250.160. To qualify under that regulation, the structure must be attached to the seabed and must be used for either (1) conducting exploration, development, or production operations, (2) for conducting other activities related to these operations, or (3) for other purposes approved by MMS. It is clear that a RUE can be granted to construct or use any kind of structure, as long as it is related to mineral resources. It is also clear that MMS has the authority to approve the structure under 30 CFR 250.160(e).[6] It is not clear whether MMS has the authority to actually approve a commercial waste disposal operation and the associated facilities under a RUE. However, MMS can approve this disposal method provided that the generator of the OCS-generated, RCRA-exempt E&P wastes designates Freeport as their agent under 30 CFR 250.145(a).[7] Freeport could then submit the appropriate RUE application under 30 CFR 250.160 and the disposal application required

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[2] "… since exploration, development, and production of the minerals of the Outer Continental Shelf will have significant impacts on coastal and non-coastal areas of the coastal States, and on other affected States, and in recognition of the national interest in the effective management of the marine, coastal, and human environments."

[3] "The Constitution and laws and civil and political jurisdiction of the United States are extended to the subsoil and seabed of the Outer Continental Shelf and to all artificial islands, and all installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring for, developing, or producing resources therefrom, or any such installation or other device (other than a ship or a vessel) for the purpose of transporting such resources, to the same extent as if the Outer Continental Shelf were an area of exclusive Federal jurisdiction located within a State."

[4] 30 CFR 250.106(a): "The Director will regulate all operations under a lease, right-of-use and easement or right-of-way to: (a) promote orderly exploration, development, and production of minerals resources;"

[5] "The term "minerals" includes oil, gas, sulphur, geopressured-geothermal and associated resources, and all other minerals which are authorized by an Act of Congress to be produced from "public lands" as defined in Section 1702 of this title.

[6] 30 CFR 250.160(e): "You must receive MMS approval for all platforms, artificial islands, and installations and other devices permanently or temporarily attached to the seabed."

[7] 30 CFR 250.145(a): "You or your designated operator may designate for the Regional Supervisor's approval, or the Regional Director may require you to designate an agent empowered to fulfill your obligation under the Act, the lease, or the regulations in this part."

by 30 CFR 250.300(b)(2)[8] for that lease operator. Subsequent operators could also designate Freeport as their agent. The MMS would then, in effect, be approving the commercial waste operations and the associated facilities under the aforementioned existing MMS regulations.

In an MMS letter dated January 3, 2002, Freeport was informed of the initial MMS requirements for the permitting and approval process of a RUE for the proposed waste disposal operations. These requirements are summarized below:

1. Each applicant (can be the lessee, the designated operator of the lease, or designated agent to submit the application) must submit a RUE in accordance with 30 CFR 250.160 to MMS and revise existing plans to provide for MP 299 as an alternate disposal site.
2. Each applicant who prefers to designate Freeport as its designated agent to conduct salt cavern/caprock waste disposal operations pursuant to the RUE must do so in accordance with 30 CFR 250.145.
3. A surety bond must be provided to expressly cover the waste disposal operations and costs associated with closure and post-closure operations.
4. Each operator must provide evidence of sudden and accidental pollution liability insurance.
5. Each operator must expressly acknowledge to MMS that any obligation associated with the waste disposal operations are the joint and several responsibility of all grantees under the RUE at the time any such obligation accrues, and of each future grantee, until the obligation is satisfied under 30 CFR 250 and 256, including any other requirements or obligations specifically agreed to by written agreement with MMS.
6. An appropriate fee schedule for uses of the OCS beyond those granted in leases, such as RUE's for the use of salt caverns for storage, must be established. The MMS is analyzing whether this requires the promulgation of regulations under the independent Offices Appropriations Act.
7. Prior to commencement of operations, each RUE grantee must enter into an approved underground storage agreement with MMS to permanently store OCS E&P waste on offshore lands. The MMS is currently in the process of drafting the necessary provisions, including RUE grantee storage fee provisions, for this agreement.

In a letter to MMS dated February 7, 2002, Freeport commented on several of the requirements listed above. With respect to items 1 and 2 above, Freeport recommended to MMS that one global, blanket RUE is appropriate for the entire GOM since "the form would be the exactly the same for every lessee/operator (only the Designation of Agent changes based on the lessee/operator and the leases subject to it)." A draft copy of this proposed global, blanket RUE and proposed Designation of Agent form is attached in Appendix I. The MMS is currently reviewing these proposed draft applications along with the other recommendations submitted by Freeport.

1.3.3.2 MMS Notice to Lessees 99-G22–"Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes"

The MMS's Notice to Lessees (NTL) 99-G22 ("Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes"), effective September 24, 1999, regulates the disposal, in the sub-seabed under a lease, of E&P wastes (as well as qualifying NORM, which is not the subject of Freeport's applications). The present applications are unique in that MMS has not previously been asked to approve disposal of E&P waste in salt caverns or caprock associated with salt domes. Previous applications for approval under NTL 99-G22 have proposed injection of waste into fractured geological formations. No fracturing of either caprock or salt caverns is proposed by Freeport. In previous waste disposal applications MMS has allowed the designated operator of a lease to dispose of, on that lease, E&P waste generated by E&P operations conducted on that lease or on another lease of which it is the designated operator. The present

[8] 30 CFR 250.300 (b)(2): "Approval of the method of disposal of drill cuttings, sand, and other well solids shall be obtained from the District Supervisor."

applications are the first applications MMS has received that propose a waste disposal method and site that would be used for disposal of E&P waste (generated off lease by a designated operator of a lease different than the designated operator of the disposal site). The applications are for a commercial disposal operation to be conducted in OCS waters, disposing of the E&P waste in the sub-seabed of the OCS. The MMS has determined that Freeport has either met the guidance provided by NTL 99-G22 or MMS has granted "waivers/departures" from the NTL guidance.

1.3.3.3 MMS Regulations

The MMS does not yet have specific regulations implemented to govern commercial waste disposal operations. However, Freeport would maintain in place (during E&P waste disposal operations) the same measures required to ensure compliance with MMS sulphur and salt mining regulations (Freeport, 2001). In addition, "Freeport …pursuant to Notice to Lessees (NTL) 99-G22 ("Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes") and other appropriate provisions of MMS regulations (particularly those contained in 30 CFR Part 250—Oil and Gas and Sulphur Operations in the Outer Continental Shelf), U.S. Coast Guard (USCG) and USEPA regulations, proposes to dispose of E&P waste in the salt caverns and caprock overlying them" (Freeport, 2001).

The MMS is in the process of developing guidelines/regulations for disposal of wastes into salt caverns and associated caprock. In support of this procedure, MMS has reviewed numerous documents and technical reports. The MMS has also consulted with numerous Federal, State, and private agencies, including the USEPA, NOAA Fisheries, FWS, Department of Energy (DOE), State of Louisiana, State of Texas, Solution Mining Research Institute, and Sandia National Lab–Underground Storage Technology Department. Chapter 5 of this programmatic EA contains a detailed discussion of consultation and coordination with other agencies. Since MMS's guidelines/regulations were not finalized prior to submittal of Freeport's applications, the draft requirements currently being developed will be included as required conditions in MMS's response letter to Freeport, for their proposed waste disposal method and site, as appropriate. These same conditions would be applied to RUE's submitted in accordance with 30 CFR 250.160.

Inspection and monitoring of Freeport's MP 299 waste disposal operations to ensure compliance with appropriate regulatory provisions will be conducted by MMS's New Orleans District Office.

2. ALTERNATIVES TO THE PROPOSED ACTION

2.1 NONAPPROVAL OF THE PROPOSAL

The MMS determines that Freeport's applications do not propose an acceptable methodology for the injection of OCS-generated, RCRA-exempt E&P waste into salt caverns and caprock on Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299. This alternative would result in no impact from the proposed action but could discourage the development of alternative waste management practices that may have economic, safety, and environmental advantages over present waste management practices. The potential advantages of waste disposal at MP 299, according to Freeport, are listed in Table 2-1.

Table 2-1

MP 299–Potential Advantages over Present Waste Management Practices Cited by Freeport

Waste Types	Current Waste Management Practice	MP 299 Waste Disposal Proposal	MP 299 Waste Disposal Advantages
E&P wastes that do not meet the standards for overboard discharge in accordance with NPDES permit	Sent to shore for disposal	Injected into Cavern No. 3, Cavern No. 5, or caprock at MP 299	1. Waterborne transportation mileage is estimated to be reduced by 50 %, thereby reducing costs, liabilities, and air emissions. 2. Land transportation mileage is reduced, thereby reducing costs, liabilities, and air emissions. 3. Transfers from vessels to vehicles and then to tanks at the onshore disposal facility are eliminated, along with hazards (such as spills) associated with additional overland transportation distances and handling. 4. Shipping accidents are less likely to occur in OCS waters (not near shore) where boat traffic, navigation hazards, and fog are less likely to exist. 5. Reduce the need for onshore disposal (including landfarming) which has a number of negative effects, including the following: some hydrocarbons volatize and enter the atmosphere as air pollution; and metals in the waste that are left in the soil may accumulate in the soil and later become available for biological uptake or introduction into the groundwater, eventually posing potential human health risks. 6. Reduce the need to construct new disposal sites in the future. 7. Additional recycling of synthetic drilling fluids or specialty additives from cuttings/waste streams and capture of accumulated hydrocarbons in cavern oil blanket.
	Disposed of via offshore injection wells (MMS NTL 99-G22)	Injected into Cavern No. 3, Cavern No. 5, or caprock at MP 299	Consolidation of sub-seabed disposal activities: 1. cost-effective injection alternative that small company operators will be able to afford; 2. MMS oversight enhanced by reducing the number of locations where E&P waste disposal is occurring; and 3. Disposal is not under pressure–fracturing of the formation does not occur.
E&P wastes that do meet the standards for overboard discharge in accordance with NPDES permit.	Discharge overboard in accordance with NPDES permit.	Injected into Cavern No. 1	1. Reduce overall water pollution (including smothering) by eliminating discharge into OCS waters.

According to Freeport, nonapproval of the proposal may also result in the following:

1. cavern stability would not be enhanced;
2. potential reduction in operating costs passed onto operators that could increase development, production, and transportation of much-needed hydrocarbon resources and thereby result in an increase in royalty income for the United States and energy for America, would not occur.

The following sections provide an overview of current waste management practices that represent alternatives to, and would be potentially impacted by, disposal of wastes into caverns and caprock at MP 299. These alternative waste management practices are discussed below:

Onshore Disposal Alternatives

1. subsurface injection;
2. salt cavern disposal; and
3. landfarming.

Offshore Disposal Alternatives

1. discharge to the sea (per NPDES Permit); and
2. sub-seabed disposal offshore (per MMS NTL 99-G22).

The different physical and chemical characteristics of the generated wastes make certain management methods preferable over others. In addition, most types of wastes lend themselves to more than one method of management. Each option has a different set of environmental impacts, regulatory constraints, costs, and capacity limitations.

The USEPA has established a hierarchy of waste management methods that it deems preferentially protective of the environment. For those technologies applicable to oil and gas production waste, the following general waste management techniques are described in order of USEPA's preference:

- Recycle/Reuse—When usable components such as oil or drilling mud can be recovered from a waste, these components are not discarded and do not burden the environment with impacts from either manufacturing or disposal.
- Treatment/Detoxification—When a waste cannot be recycled or reused, it can sometimes be treated to remove or detoxify a particular constituent prior to disposal. Neutralization of pH or removal of sulfides are examples of technologies that are used with oil and gas wastes.
- Thermal Treatment/Incineration—Wastes with organic content can be burned, resulting in a relatively small amount of residual ash that is incorporated into a product or sent to disposal. This technology results in air emissions, but the residuals are generally free of organic constituents.
- Subsurface Land Disposal—This technology places waste below usable drinking water resources and is viewed as superior to land filling because of the low potential for waste migration. Injection wells and salt cavern disposal are examples of this type of technology.
- Surface Land Disposal/Treatment—This type of technology involves the placement of wastes into a landfill or onto a landfarm. Although well-designed and constructed landfills minimize the potential for waste migration, generators remain concerned about migration of contaminants into water resources and avoid it whenever practical. The USEPA classifies surface land disposal as the least desirable disposal method.

2.1.1 Onshore Alternatives

There are 34 waste disposal facilities in the analysis area. Within the focus area, there are five facilities in coastal subarea TX-2, eight in LA-2, and three in LA-3. Some of these facilities receive one type of OCS waste (i.e., municipal solid waste), while others specialize in other types of OCS waste (i.e., nonhazardous oil-field waste). The infrastructure network needed to manage the spectrum of waste generated by offshore exploration and production activities and returned to land for management can be divided into three categories:

(1) transfer facilities at ports, where the waste is transferred from supply boats to another transportation mode, either barge or truck, toward a final point of disposition;

(2) special-purpose, oil-field waste management facilities, which are dedicated to handling particular types of oil-field waste; and

(3) generic waste management facilities, which receive waste from a broad spectrum of American industry, of which waste generated in the oil field is only a small part.

Federal regulations govern what may be discharged in GOM waters and set different standards in different parts of the Gulf Coast. Wastes that cannot be discharged or disposed of sub-seabed offshore must be brought to shore. Transportation, packaging, and unloading of the waste at ports are governed by U.S. Department of Transportation (DOT) regulations while the USCG regulates vessel fitness. Once on the dock, transportation and packaging is subject to an overlay of DOT and State laws. State regulations governing reporting and manifesting requirements may vary somewhat, but Federal law has, for the most part, preempted the field of transportation waste regulation. Dockside facilities that serve as transfer points from water to land modes of transportation are regulated by both USCG and State regulations covering the management of oil-field wastes.

Once at a waste management facility, regulations regarding storage, processing, and disposal vary depending on the type of waste. Wastes that fall under the oil and gas waste exemption of RCRA Subtitle C and would be subject only to State regulations regarding the disposal of oil-field wastes. 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 nonhazardous oilfield wastes (NOW) and in substantially higher disposal costs when managed by commercial disposal firms.

Differences in laws among the States lead to differences in waste management methods as well as industry preferences in the siting of waste facilities in certain States. The substantive differences that distinguish the States are comparatively few. Texas allows and regulates salt dome disposal of waste, while no other State does. Louisiana, Alabama, and Mississippi allow the landfilling of used oil filters and oil-based drilling muds, while Texas requires them to be recycled. Texas generally has stricter limits on the hydrocarbon content of waste going into municipal landfills. Texas also has regulations allowing oil-based drilling mud to be recycled through bioremediation into road-building material. None of the other Gulf States have enabled oil-field waste land application recycling operations in their regulatory framework.

Onshore waste disposal impact-producing factors include both routine, planned activities associated with this disposal alternative and low-probability accidental events. Many of the impact-producing factors associated with the routine, planned onshore disposal activities have been evaluated in previous NEPA evaluations of oil and gas activities as well as in this EA for the proposed action (e.g., vessel traffic, marine debris, and air emissions). Land-use requirements and land transportation are impact-producing factors unique to onshore disposal of wastes. Onshore disposal could cause nearby residences to experience increased noise, odor, traffic congestion, and land usage. Increased air emissions would also be associated with additional overland transportation distances and handling. With onshore waste disposal there are also environmental justice concerns of whether the waste disposal site and activities would have disproportionate environmental and health effects on people of ethnic or racial minorities or with low incomes.

Accidental events associated with onshore disposal of OCS-generated wastes include oil/waste spills or releases, vessel collisions, and unintentional loss of trash and debris. The impacts associated with such accidental events while enroute to shore have also been evaluated in previous NEPA evaluations of oil and gas activities and in this EA for the proposed action. Waste spills from onshore pits, or tanks could affect groundwater resources. Also, waste releases from onshore injection wells (including onshore salt caverns) could have the potential to affect groundwater resources if the wastes were to migrate out of the injection zone to a freshwater formation. Impacts to human health and safety may occur from onshore waste spills or releases due to the proximity of communities to onshore disposal sites.

Potential impacts to resources (e.g., water quality, air quality, sensitive coastal environments, benthic communities, marine mammals, sea turtles, coastal and marine birds, essential fish habitat and fish resources, Gulf sturgeon, beach mice, recreational resources, commercial fisheries, archaeological resources, and artificial reefs) from onshore waste disposal (excluding land use and land transportation) would be similar to impacts resulting from waste disposal at MP 299. Impacts resulting from waste disposal at MP 299 are analyzed in Chapter 4 of this EA.

2.1.1.1 Onshore Subsurface Injection

The term "subsurface injection" of waste is used here in its more traditional sense, meaning injection into a porous rock formation as opposed to the newer waste management method of salt cavern disposal discussed below, which is also technically subsurface injection but significantly different from this method both technically and legally. An injection well can best be envisioned as a producing well operating in reverse, with very similar drilling and completion procedures. Subsurface injection of aqueous fluids into a porous rock formation is the oldest and most established technology for disposal of produced waters onshore or when discharge is not allowed offshore. Underground injection is most suitable to relatively solids-free liquids, although the exceptions to the rule are very important to OCS waste management. Fluids are often filtered before injection because many injection formations cannot tolerate significant levels of solids without plugging. In these cases, the filtrate and sometimes the filters themselves then become a solid-form waste stream that must be managed. Some formations, on the other hand, are sufficiently porous and tolerant of solids so as to present a viable method of disposing of sludges.

Injection facilities do not require large surface facilities and can be located in industrial areas with minimal impact on surrounding land use. They often coexist in oil-producing regions relatively close to rural residences, with truck noise and odor nuisances being the principal disamenities that could present a problem to a nearby residence. Principal land-use requirements are space to park and maneuver trucks during unloading, tankage for receiving, and temporarily storing fluids unloaded from the trucks.

All of the onshore subsurface injection facilities currently injecting OCS-generated wastes are located in Jefferson County, Texas, southwest of Beaumont. The waste is transferred from supply boats to barge at Port Fourchon, Louisiana, then shipped to Port Arthur, Texas, via the Gulf Intracoastal Waterway (GIWW). Transportation to the injection facilities described below and in the salt cavern disposal section is by tank truck. Roads with maximum legal load-bearing capacities are required to handle the truck traffic.

Disamenities associated with this method are the visual and noise issues one might encounter at a producing well with a relatively large amount of tankage and pump noise. Facilities can include pits where waste is unloaded and oil is skimmed, with the potential for hydrocarbon odors. Increasingly though, pits are avoided because they present a greater threat to groundwater resources if they leak than tanks do. If the products received are sour (meaning they contain sulfurous compounds), odor problems can be significant to a larger area; otherwise, they are rarely an issue beyond the immediate proximity of the site. Facilities that receive waste via truck have the potential for large traffic impacts on smaller roads. Injection wells are sometimes perceived as a threat to groundwater resources, although the historical record of waste migrating out of the injection zone to a higher freshwater formation is very sparse. For the most part, regulators in energy-producing regions, who have a long experience with injection wells, are comfortable that the technology is protective of groundwater resources.

The lion's share of offshore solids-laden waste streams is presently injected at one facility—Newpark Environmental Services near Fannett, Texas. It is the most important NOW facility for the offshore industry, having received some 5 million bbl of offshore (State and OCS-generated) waste in 1998, constituting about 75 percent of the total offshore NOW streams shipped ashore. Some 500,000 bbl of this material is estimated to originate from Federal OCS activities. At 5 million bbl a year, the

Newpark Fannett facility contributes about 8.5 percent of the 2,800 trips per day on the road directly accessing the facility. This facility has a number of injection wells, not all of which are needed at any given time. A number of other injection wells are available (i.e., Newpark at Winnie, Texas; and Newpark near Big Hill, Texas) but few have Newpark Fannett's capability to handle solids-laden streams and few have focused on the logistical requirements of the offshore market to the extent Newpark has. These factors account for Newpark Fannett's very large share of the offshore market. Newpark Fannett appears to have some economies of scale that serve to offset the cost of a long barge trip back from transfer points such as Port Fourchon, Louisiana.

The cost of an underground injection system varies greatly with the scale and the difficulty associated with the fluid being managed. A high-volume, pipeline-gathered injection system can be operated for between $.05 per barrel and $.10 per barrel. In contrast, land-based commercial disposal wells, which serve wells that do not have sufficient volumes to justify a captive pipeline system, typically charge $.25 to $.40 per barrel in the Gulf Coast region, with transportation usually adding two or three times that amount. A slurry injection facility, such as the one described at Newpark's Fannett, Texas, facility, has all the requirements of a liquids injection facility, with the addition of equipment to store, pump, and grind sludge to the uniform-required particle size. Disposal prices at slurry injection facilities typically range from $8.00 to $14.00 per barrel at the wellhead.

2.1.1.2 Onshore Salt Cavern Disposal

Almost anything that can physically be pumped downhole can be disposed of in a salt cavern. This gives salt cavern disposal an advantage over subsurface injection for disposal of solids-laden sludges because in the latter considerable effort may be spent in grinding the solids down to a size small enough to be accepted by the rock formation. Although salt caverns can easily accept liquid, cost factors dictate that liquids will generally be disposed of through subsurface injection instead of salt cavern disposal. The reason is that salt caverns require an injection well for disposal of brine displaced from the salt cavern as waste is injected. As such, salt dome disposal creates a barrel-for-barrel requirement for injection well disposal. Thus, no fluids that can easily be managed by underground injection would be disposed of in salt caverns by choice.

Muds and solids that have been slurried can be pumped into synthetic voids formed within salt domes for the purposes of storage. These caverns are drilled and completed using solution-mining techniques and are used for storage of natural gas, crude oil, and other hydrocarbons. To create the cavern, a well must be drilled into the salt dome. Fresh water is then pumped into the salt dome where it becomes saturated with salt. Saturated saltwater is circulated out of the dome through the annulus of the same well, which then must be disposed of through a subsurface injection well operation. Before waste is introduced, the completed cavern then resembles a giant salt-sided jug of brine. Injection wells are an integral part of a salt cavern disposal operation because every barrel of saltwater displaced must be disposed of. Waste materials are then pumped into the cavern, displacing an equal volume of saltwater, which is injected in the disposal well operation. Like subsurface injection operations, salt cavern disposal facilities have minimal permanent impacts on the surface. Land is required for a wellhead, truck unloading, a small office, blending equipment, and tankage for short-term storage.

One commercial salt cavern, operated by Trinity Field Services, has recently opened near Hamshire, Texas, on the Trinity River. It presently receives waste only by truck, although management expects a barge mooring to be permitted within a year. If the company is successful in obtaining additional permits that would allow receipt by barge and securing dock space in ports to serve as transfer points, then the company may present a significant source of new capacity—perhaps on the scale of Newpark's. Four other commercial salt domes are operational in northeastern and western Texas. One commercial salt dome, Lotus, L.L.C. in Andrews County near the New Mexico border, accepts NORM, some of which comes from offshore operations. Due to their distance from the Gulf Coast, no others receive any OCS waste. With the addition of Trinity Field Services bringing 6.2 million bbl of available space to the market, enough to take 8-10 years' worth of OCS liquids and sludges transported ashore at current rates, the OCS has its first salt dome disposal operation in a competitive location.

Trinity Field Services publicizes prices of $8-15.00 per barrel, with discounts available for large volumes. Commercial salt caverns in other parts of Texas charge from $5 to $15 per barrel for NOW, with surcharges applicable if the material must be blended into a pumpable state. The technology has an advantage over typical subsurface injection in that the size of the solids pumped downhole is not an issue and it avoids the need to grind solids to a uniform particle size.

2.1.1.3 Onshore Landfills

Workers on a rig or production platform generate the same types of waste as any other consumer in industrial society and are therefore responsible for their fair share of municipal solid waste (MSW). Landfarm facilities are available to accept offshore waste but actually accept very little because offshore operators prefer other methods. The MSW disposal from offshore activities currently imposes only a small incremental load on landfills in the analysis area, probably no more than 5 percent of total receipts by all the landfills serving south Louisiana.

2.1.2 Offshore Disposal Alternatives

2.1.2.1 Discharge into the Sea (per 40 CFR 435, Subpart A)

The primary operational waste discharges generated during offshore oil and gas exploration and development are drilling fluids, drill cuttings, produced water, deck drainage, sanitary wastes, and domestic wastes. During production activities, additional waste streams include produced sand and well treatment, workover, and completion (TWC) fluids. Minor additional discharges occur from numerous sources; these discharges may include desalination unit discharges, blowout preventer fluids, boiler blowdown discharges, excess cement slurry, and uncontaminated freshwater and saltwater.

The USEPA, through general permits issued by the USEPA Region that has jurisdictional oversight, regulates all waste streams generated from offshore oil and gas activities. The USEPA published the most recent effluent guidelines for the oil and gas extraction point-source category in 1993 (58 FR 12454). The USEPA Region 4 has jurisdiction over the eastern portion of the Gulf of Mexico OCS including all of the EPA and the CPA off the coasts of Alabama and Mississippi. The USEPA Region 6 has jurisdiction over the rest of the CPA and all of the WPA. Each Region has promulgated general permits for discharges that incorporate the 1993 effluent guidelines as a minimum. The current Region 4 general permit was issued on October 16, 1998 (63 FR 55718), was modified on March 14, 2001 (66 FR 14988), and expires on October 31, 2003. The Region 6 general permit was issued on November 2, 1998 (63 FR 58722), was modified on April 19, 1999 (64 FR 19156), and expires on November 3, 2003. The USEPA also published new guidelines for the discharge of SBF on January 22, 2001 (66 FR 6850). On December 18, 2001, Region 6 published a notice of revision to the general permit, which became effective on February 16, 2002. The revision authorizes the discharge of drill cuttings produced using SBF and other nonaqueous-based drilling fluids and wastewater used to pressure test existing piping and pipelines. Region 4 has not revised the general permit to incorporate the new guidelines for SBF and other nonaqueous-based drilling fluids.

Federal OCS wastes discharged into the sea must be virtually free of hydrocarbons and any other chemicals that would be harmful to marine life. Produced water, by far the most abundant oil and gas waste stream, can meet this definition after appropriate treatment steps. Water-based drilling muds that are (1) made from clean barite, (2) without certain chemical additives, and (3) have not encountered hydrocarbons are also dischargeable into the sea. Finally, domestic and sanitary sewage from rig employees, after certain pretreatment steps, can be discharged into the sea under most circumstances.

Discharge into the sea is prevalent in OCS production and is regulated under 40 CFR, 435, Subpart A, which addresses application of the NPDES for Gulf Coast discharges. Discharge into the sea clearly has an overwhelming cost advantage because transportation costs are avoided. Cost for simple, continuous streams of produced water is virtually nothing, while setup to treat the most difficult intermittent stream might cost over a million dollars. Cost per barrel depends on the nature of the waste stream and life span of the wells served by the installation.

Impact-producing factors attributable to offshore disposal of wastes by discharge into the sea include both routine, planned activities associated with this disposal alternative and low-probability accidental events. The routine, planned discharge of wastes into the sea (operational discharges) have been evaluated in previous NEPA evaluations of oil and gas activities as well as in this EA for the proposed action. Discharges in compliance with USEPA NPDES permit conditions would not cause unreasonable degradation of the marine environment. Accidental events associated with offshore disposal of wastes by discharge into the sea include the unanticipated bypass of treatment facilities and upset conditions. Both may cause effluent limitations to be exceeded, thereby adversely affecting water quality.

Potential impacts to resources (e.g., water quality, air quality, sensitive coastal environments, benthic communities, marine mammals, sea turtles, coastal and marine birds, essential fish habitat and fish resources, gulf sturgeon, beach mice, recreational resources, commercial fisheries, archaeological resources, and artificial reefs), from offshore disposal of wastes by discharge into the sea would be similar to impacts associated with MP 299 waste disposal operational discharges. Impacts from MP 299 operational discharges are analyzed in Chapter 4.1.1.1 of this EA.

Subsurface Disposal Offshore (per MMS NTL 99-G22)

According to 30 CFR 250.300(b)(2), lessees and operators of Federal oil, gas, and sulphur leases and pipeline right-of-way holders must obtain approval from MMS of the methods used to dispose of drill cuttings, sand, and other well solids. Under this authority, the MMS Gulf Region requires that approval be obtained for the sub-seabed disposal of all E&P wastes. Guidance and instructions on the offshore sub-seabed disposal of wastes is provided by MMS's NTL 99-G22—"Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes"—effective September 24, 1999. This NTL provides guidelines on the types of wastes that are covered under the NTL, disposal criteria depending on the disposal technique to be employed (encapsulation or injection), worker safety guidelines, and application information requirements. This NTL can be found at the following MMS website: http://www.gomr.mms.gov/homepg/regulate/regs/ntls/ntl99-g22.html.

Other than Freeport's applications, MMS has not received any requests from operators to dispose of E&P wastes by sub seabed disposal into OCS salt caverns or caprock (whether on lease or offlease). Therefore, MMS has not attempted to analyze the potential for other OCS salt domes to act as suitable sites for waste disposal. Any request to use brine cavities/caverns (created by the dissolution of salt) or caprock formations (whether leached or barren) associated with salt domes would be reviewed by MMS on a case-by-case basis. Assuming offshore sub-seabed injection is conducted in compliance with NTL 99-G22, impact producing factors would be limited to low-probability accidental events. An EA conducted by MMS in 1996 on the potential environmental impacts from sub-seabed disposal of wastes determined that the injection "…criteria used in selecting an appropriate disposal formation and the fact that hydraulic fracturing is used to temporarily open the formation to receive the wastes makes it extremely unlikely that the wastes will ever re-enter the wellbore or enter the marine environment." Based on MMS's engineering conclusion that wastes injected into an appropriate formation or depleted reservoir (in compliance with NTL 99-G22) will not enter the marine environment, potential environmental impacts to resources (e.g., water quality, air quality, sensitive coastal environments, benthic communities, marine mammals, sea turtles, coastal and marine birds, essential fish habitat and fish resources, gulf sturgeon, beach mice, recreational resources, commercial fisheries, archaeological resources, and artificial reefs) from such a migration/release of wastes were not analyzed. To date, no information has been received by MMS indicating that wastes allowed to be injected sub-seabed on lease have experienced any uncontrolled migration either horizontally or vertically.

After considering the potential advantages and disadvantages of the proposed action compared to the currently existing onshore and offshore waste disposal alternatives discussed above, and the fact that we anticipate no significant environmental and human effects resulting from the proposed action, the nonapproval alternative was not selected.

2.2 APPROVAL OF THE PROPOSAL WITH EXISTING MITIGATION

Measures that Freeport proposes to implement to limit potential environmental effects are discussed in the applications. Freeport has stated they will conduct E&P waste disposal operations in accordance with MMS Notice to Lessees (NTL) 99-G22 ("Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes") and other appropriate provisions of MMS regulations (particularly those contained in 30 CFR Part 250—Oil and Gas and Sulphur Operations in the Outer Continental Shelf), Coast Guard and EPA regulations.

In this context, MMS's lease stipulations, OCS Operating Regulations, NTL's, and other regulations and laws were identified throughout this environmental assessment as existing mitigation to minimize potential environmental effects associated with the proposed action. Additional information can be found in the Draft Environmental Impact Statement (EIS) for the Gulf of Mexico OCS Oil and Gas Lease Sales 2003-2007; Central Planning Area Sales 185, 190, 194, 198, and 201, Western Planning Area Sales 187, 192, 196, and 200, Volumes I and II (USDOI, MMS, 2002); and in related environmental documents. Since additional mitigations were identified to avoid or mitigate potential impacts associated with the proposed action, this alternative was not selected for further analysis.

2.3 APPROVAL OF THE PROPOSAL WITH EXISTING AND ADDED MITIGATION

Measures that Freeport proposes to implement to limit potential environmental effects are discussed in the applications. Freeport has stated they will conduct E&P waste disposal operations in accordance with MMS Notice to Lessees (NTL) 99-G22 ("Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes") and other appropriate provisions of MMS regulations (particularly those contained in 30 CFR Part 250-Oil and Gas and Sulphur Operations in the Outer Continental Shelf), Coast Guard and EPA regulations.

In this context, MMS's lease stipulations, OCS Operating Regulations, NTL's, and other regulations and laws were identified throughout this environmental assessment as existing mitigation to minimize potential environmental effects associated with the proposed action. Additional information can be found in the Draft EIS for the Gulf of Mexico OCS Oil and Gas Lease Sales 2003-2007; Central Planning Area Sales 185, 190, 194, 198, and 201, Western Planning Area Sales 187, 192, 196, and 200, Volumes I and II (OCS EIS/EA MMS 2002-015); and in referenced related environmental documents. The mitigations listed in Appendix A will be required and included in MMS's approval of the proposed action to ensure environmental protection, consistent environmental policy, and safety by the National Environmental Policy Act (NEPA) of 1969, as amended. The mitigations have been divided into two groups:

1. Existing mitigation - mitigation proposed by Freeport that are being reiterated because they are central to the understanding of the proposed action or to avoiding or minimizing any possible adverse environmental effects associated with the proposed action.
2. Additional mitigation - mitigation required to avoid or minimize any possible adverse environmental effects associated with the proposed action. Many of the additional mitigation are based on Freeport's self-imposed mitigation that have been made more stringent by MMS (e.g., frequency of testing, monitoring, or reporting has been increased).

Mitigation effectiveness and enforcement is also addressed.

Operational constraints/mitigation considered but not analyzed in this programmatic EA include the following:

1. Alteration of the proposed waste injection sequence

   Require the filling of Cavern No. 1 with solids prior to injection of any waste into Cavern No. 3 or Caprock. The MMS Geological and Geophysical (G&G) analysis (Appendix G) determined that the potential benefits of this alternative were outweighed by the potential harmful effects associated with differential cavern pressures.

2. Limit the waste types proposed for injection into Caprock

   Limit injection of OCS-generated, RCRA-exempt E&P wastes to only the following wastes:

   a. wastes that meet the definition of " water-based drilling fluid" and associated "drill cuttings," as defined by the Final NPDES General Permit for New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Category for the Western Portion of the Outer Continental

Shelf of the Gulf of Mexico, modified December 18, 2001, and effective February 16, 2002, and that meet the same limitations imposed on their discharge by the USEPA permit, including LC_{50} limitations on toxicity and limitations on concentrations of cadmium and mercury in barite; and

b. wastes that qualify as, per MMS NTL 99-G22, as "miscellaneous trash and debris associated with waste handling operations (e.g., gloves, tyvek suits) contaminated with the above described wastes."

The MMS G&G analysis (Appendix G) determined that this alternative was not necessary.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The description of, and impacts to, the potentially affected environment and associated resources discussed in Chapters 3 and 4 of the EA are based on the potential impact-producing factors (IPF's) listed in Table B-1. The IPF's and assumptions are described below:

(1) Operational discharges per NPDES permit
(2) Noise
(3) Light
(4) Aircraft
(5) Marine debris
(6) Vessel traffic
(7) Air emissions
(8) Explosive removal of structures
(9) Oil/waste spills or releases

- Self Propelled Barge (SPB) Collision–Although an accidental oil/waste spill could occur anywhere along the transport route due to a vessel collision, such an accident has the greatest likelihood of occurring at MP 299 or at one of the onshore bases (Morgan City, Port Fourchon, or Venice, Louisiana). For this reason, only oil/waste spills originating at these locations are addressed in this programmatic EA. Also, potential impacts associated with oil/waste spills that could occur along a specific transportation route can be addressed when each applicant (can be the lessee, the designated operator of the lease, or designated agent to submit the application) submits a RUE in accordance with 30 CFR 250.160 to MMS and revises existing plans to provide for MP 299 as an alternate disposal site. The volume of oil/waste spilled as a result of such an accident is greater than for other oil/waste spill scenarios.
- In their October 19, 2001, amendment (as well as in numerous meetings with MMS), Freeport has stated their major waste types consist of water-based muds and cuttings, synthetic-based muds and cuttings, and oil-based muds and cuttings. Freeport determined that the greatest volume of hydrocarbons potentially spilled as a result of a SPB collision would result from the escape of all oil-based muds (estimated to be 8% diesel by volume) and cuttings from one of the SPB's two 12,500-bbl compartments, and the loss of all of its diesel fuel (Freeport, 2001). For this spill scenario, MMS has conservatively assumed 25 percent of the oil-based muds and cuttings would behave as "free oil" rather than the 8 percent estimated by Freeport.

- Cavern No. 1 Collapse[9]–There is the potential for Cavern No. 1 to collapse and release a maximum of 1.6 million bbl of brine with some entrained muds and cuttings to the seafloor (Freeport, 2001).

(10) Spill-response activities

3.1 Physical Elements of the Environment

3.1.1 Water Quality

Water quality is the ability of a waterbody to maintain the ecosystems it supports or influences. In the case of coastal and marine environments, the quality of the water is influenced by the rivers that drain into the area, the quantity and composition of wet and dry atmospheric deposition, and the influx of constituents from sediments. Besides the natural inputs, human activity can contribute to water quality through discharges, run-off, burning, dumping, air emissions, and spills. Also, mixing or circulation of the water can either improve the water through flushing or be the source of factors contributing to the decline of water quality.

Evaluation of water quality is done by direct measurement of factors that are considered important to the health of an ecosystem. The primary factors influencing coastal and marine environments are temperature, salinity, oxygen, nutrients, pH, pathogens, and turbidity or suspended load. Trace constituents such as metals and organic compounds can affect water quality. Altering the ecosystem through changes in any of these parameters can result in the destruction of specific species, support of undesirable or exotic species, and possibly mass mortality. The effects can either be localized or widespread.

The region under consideration is divided into coastal and marine waters for the following discussion. Marine water, as defined in this document, includes both State offshore water and Federal OCS waters, which includes everything outside any barrier islands to the Exclusive Economic Zone (EEZ). The inland extent is defined by the Coastal Zone Management Act. Although the processing facility at MP 299 is proximate to the Mississippi Delta coastal area, coastal and nearshore water quality could be impacted by accidental spills at any of the platforms or drilling facilities serviced by the waste disposal operation. However, such an accident has the greatest likelihood of occurring at MP 299 or at one of the onshore bases (Morgan City, Port Fourchon, or Venice, Louisiana). For this reason, this assessment will focus on coastal and marine waters most likely to be impacted.

3.1.1.1 Coastal Waters

The Gulf coastal area is comprised of one of the most extensive estuary systems in the world. Estuaries represent a transition zone between the freshwater of rivers and the higher salinity waters offshore. These bodies of water are influenced by freshwater and sediment influx from rivers and the tidal actions of the oceans. The primary variables that influence coastal water quality are water temperature, total dissolved solids (salinity), and suspended solids (turbidity). An estuary's salinity and temperature structure is determined by hydrodynamic mechanisms governed by the interaction of marine and terrestrial influences, including tides, nearshore circulation, freshwater discharges from rivers, and local precipitation. Gulf Coast estuaries exhibit a general east to west trend in selected attributes of water quality associated with changes in regional geology, sediment loading, and freshwater inflow.

Estuaries provide habitat for plants, animals, and humans. Marshes, mangroves, and seagrasses surround the Gulf Coast estuaries, providing food and shelter for shorebirds, migratory waterfowl, fish, invertebrates (e.g., shrimp, crabs, and oysters), reptiles, and mammals. Estuarine-dependent species constitute more than 95 percent of the commercial fishery harvests from the GOM. Several major cities are located along the coast, including Houston, New Orleans, Mobile, and Tampa. Shipping and marine

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[9] Freeport used the terminology Cavern No. 1 "collapse" in their applications to describe the potential failure of Cavern No. 1. In the context of this EA, Cavern No. 1 "collapse" refers to a roof failure (caprock failure since Cavern No. 1 does not have a salt roof) over Cavern No. 1 resulting in partial displacement of the cavern contents and the release of 1.6 million bbl of brine with some entrained muds and cuttings to the seafloor.

transport is an important industry, with 7 of the top 10 busiest ports in the U.S., in terms of total tonnage, located in Gulf estuaries.

Estuarine ecosystems are impacted by humans, primarily via upstream withdrawals of water for agricultural, industrial, and domestic purposes; contamination by industrial and sewage discharges and agricultural runoff carrying pesticides and herbicides; and habitat alterations (e.g., construction and dredge and fill operations). Drainage from more than 55 percent of the contiguous U.S. enters the GOM, primarily from the Mississippi River. Texas, Louisiana, and Alabama ranked first, second, and fourth in the nation in 1995 in terms of discharging the greatest amount of toxic chemicals (USEPA, 1999). The GOM region ranks highest of all coastal regions in the U.S. in the number of wastewater treatment plants (1,300), number of industrial point sources (2,000), percent of land use devoted to agriculture (31%), and application of fertilizer to agricultural lands (62,000 tons of phosphorus and 758,000 tons of nitrogen) (USDOC, NOAA, 1990).

A recent assessment of the ecological condition of GOM estuaries was published by the USEPA (1999). The assessment describes the general ecology and summarizes the "health" of all the Gulf estuarine systems. Sources of the data include the USEPA's Environmental Monitoring and Assessment Program for Estuaries (EMAP-E), the NOAA Estuarine Eutrophication Survey (USDOC, NOAA, 1997), and 305(b) reports from each state. A classification scheme based on designated beneficial uses was developed. Estuaries are classified primarily by aquatic life support, fish consumption, or recreation and whether they are fully, partially, or not supportive of these uses. From 1996 305(b) data, 78 percent of Gulf estuaries were surveyed, with 35 percent of the surveyed estuaries designated as impaired. Factors resulting in impairment were pathogen indicators (e.g., fecal coliform) and eutrophication indicators (e.g., nutrients, organic enrichment, and low dissolved oxygen).

3.1.1.2 Marine Waters

The marine water within the area of interest can be divided into three regions: the continental shelf west of the Mississippi River, the continental shelf east of the Mississippi River, and deep water (> 400 m). For this discussion, the continental shelf includes the upper slope to a water depth of 400 m. While the various parameters measured to evaluate water quality do vary in marine waters, one parameter, pH, does not. The buffering capacity of the marine system is controlled by carbonate and bicarbonate, which maintains the pH at 8.2.

3.1.1.2.1 Continental Shelf West of the Mississippi River

The Mississippi and Atchafalaya Rivers are the primary sources of freshwater, sediment, and pollutants to the continental shelf west of the Mississippi River (Murray, 1997). The drainage basin that feeds the rivers covers 55 percent of the contiguous U.S. While the average discharge from the Mississippi River exceeds the input of all other rivers along the Texas-Louisiana coast by a factor of 10, during low-flow periods, the Mississippi River can have a flow less than all the other rivers combined (Nowlin et al., 1998). A turbid surface layer of suspended particles is associated with the freshwater plume. A nepheloid layer composed of suspended clay material from the underlying sediment is always present on the shelf. The river system supplies nitrate, phosphate, and silicate to the shelf. During summer months, the low-salinity water from the Mississippi River spreads out over the shelf, resulting in a stratified water column. While surface oxygen concentrations are at or near saturation, hypoxia, defined as oxygen concentrations less than 2 milligrams per liter (mg/l) O_2, is observed in bottom waters during the summer months.

The zone of hypoxia on the Louisiana-Texas shelf is one of the largest areas of low oxygen in the world's coastal waters (Murray, 1997). The oxygen-depleted bottom waters occur seasonally and are affected by the timing of the Mississippi and Atchafalaya River discharges carrying nutrients to the surface waters. This, in turn, increases the carbon flux to the bottom, which, under stratified conditions, results in oxygen depletion to the point of hypoxia. The hypoxic conditions last until local wind-driven circulation mixes the water again. The area of hypoxia stretches over 17,000 km^2 at its peak and was observed as far away as Freeport, Texas. Increased nutrient loading since the turn of the 19th century correlates with the increased extent of hypoxic events (Eadie et al., 1992), supporting the theory that hypoxia is related to the nutrient input from the Mississippi and Atchafalaya River systems.

Shelf waters off the coast of Louisiana are contaminated with trace organic pollutants including polycyclic aromatic hydrocarbons (PAH), herbicides, chlorinated pesticides, and polychlorinated biphenyls (PCB's), and trace inorganic (metals) pollutants. Of particular note is the pervasive distribution of the herbicide Atrazine (Murray, 1997). The source of these contaminants is the river water that feeds into the area.

3.1.1.2.2 Continental Shelf East of the Mississippi River

Water quality on the continental shelf from the Mississippi River Delta to Tampa Bay is influenced by river discharge, run-off from the coast, and eddies from the Loop Current. The Mississippi River accounts for 72 percent of the total discharge onto the shelf (SUSIO, 1975). The outflow of the Mississippi River generally extends only 75 km (45 mi) to the east of the river mouth (Vittor and Associates, Inc., 1985) except under extreme flow conditions. The Loop Current intrudes in irregular intervals onto the shelf, and the water column can change from well mixed to highly stratified very rapidly. Discharges from the Mississippi River can be easily entrained in the Loop Current. The flood of 1993 influenced the entire northeastern Gulf shelf with some Mississippi River water transported to the Atlantic Ocean through the Florida Straits (Dowgiallo, 1994). Hypoxia is rarely observed on the Mississippi-Alabama shelf, although low dissolved oxygen values of 2.93-2.99 mg/l were observed during the Mississippi-Alabama marine ecosystem study (MAMES) cruises (Brooks, 1991).

The Mississippi-Alabama shelf sediments are strongly influenced by fine sediments discharged from the Mississippi River. A bottom nepheloid layer and surface lenses of suspended particulates that originate from river outflow characterize the shelf area. The West Florida Shelf has very little sediment input with primarily high-carbonate sands offshore and quartz sands nearshore. The water clarity is higher towards Florida, where the influence of the Mississippi River outflow is rarely observed.

A three-year, large-scale marine environmental baseline study conducted from 1974 to 1977 in the eastern GOM resulted in an overview of the Mississippi, Alabama, Florida (MAFLA) OCS environment to 200 m (SUSIO, 1977; Dames and Moore, 1979). Analysis of water, sediments, and biota for hydrocarbons indicated that the MAFLA area is pristine, with some influence of anthropogenic and petrogenic hydrocarbons from river sources. Analysis of trace metal contamination for the nine trace metals analyzed (barium, cadmium, chromium, copper, iron, lead, nickel, vanadium, and zinc) also indicated no contamination. A decade later, the continental shelf off Mississippi and Alabama was revisited (Brooks, 1991). Bottom sediments were analyzed for high-molecular-weight hydrocarbons and heavy metals. High-molecular-weight hydrocarbons can come from natural petroleum or recent biological production as well as input from anthropogenic sources. In the case of the Mississippi-Alabama shelf, the source of petroleum hydrocarbons and terrestrial plant material is the Mississippi River. Higher levels of hydrocarbons were observed in the late spring, which coincides with increased river influx. The sediments, however, are washed away later in the year, as evidenced by low hydrocarbon values in winter months. Contamination from trace metals was not observed (Brooks, 1991).

The SAIC (1997) summarized information about water quality on the shelf from DeSoto Canyon to Tarpon Springs and from the coast to 200 m water depth. Several small rivers and the Loop Current are the primary influences on water quality in this region. Because there is very little development in this area, the waters and surface sediments are uncontaminated. The Loop Current flushes the area with clear, low-nutrient water.

More recent investigations of the continental shelf east of the Mississippi River confirm previous observations that the area is highly influenced by river input of sediment and nutrients (Jochens et al., 2001). Hypoxia was not observed on the shelf during the three years of the study.

3.1.1.2.3 Deepwater

Limited information is available on the deepwater environment. Water at depths greater than 1,400 m is relatively homogeneous with respect to temperature, salinity, and oxygen (Nowlin, 1972; Pequegnat, 1983; Gallaway et al., 1988). Of importance, as pointed out by Pequegnat (1983), is the flushing time of the GOM. Oxygen in deep water must originate from the surface and be mixed into the deep water by some mechanism. If the replenishment of the water occurs over a long period of time, the addition of hydrocarbons through the discharge from oil and gas activities could lead to low oxygen and potentially hypoxic conditions in the deep water of the GOM. The time scales and mechanism for maintaining the high oxygen levels in the deep Gulf are unknown.

Limited analyses of trace metals and hydrocarbons for the water column and sediments exist (Trefry, 1981; Gallaway et al., 1988). Hydrocarbon seeps are extensive throughout the continental slope and contribute hydrocarbons to the surface sediments and water column, especially in the Central Gulf (Sassen et al., 1993). MacDonald et al. (1993) observed 63 individual seeps using remote sensing and submarine observations. Estimates of the total volume of seeping oil vary widely from 29,000 bbl/yr (MacDonald, 1998) to 520,000 bbl/yr (Mitchel et al., 1999). These estimates used satellite data and an assumed slick thickness. In addition to hydrocarbon seeps, other fluids leak from the underlying sediments into the bottom water along the slope. These fluids have been identified to have three origins: (1) seawater trapped during the settling of sediments; (2) dissolution of underlying salt diapirs; and (3) deep-seated formation waters (Fu and Aharon, 1998; Aharon et al., 2001). The first two fluids are the source of authigenic carbonate deposits while the third is rich in barium and is the source of barite deposits.

3.1.2 Air Quality

The proposed operations would occur west of 87.5º W. longitude and hence fall under MMS's jurisdiction for enforcement of the Clean Air Act. The air over the offshore OCS water is not classified, but it is presumed to be better than the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants. The lease block involved in the proposed action is MP 299, which is located offshore Louisiana (approximately 16 mi east of Plaquemines Parish, Louisiana) and offshore Mississippi (approximately 69 mi south of Jackson County, Mississippi). The corresponding onshore areas in both states are in attainment with all of the NAAQS (USEPA, 2002). MP 299 is located within 100 km of the Breton National Wilderness Area's Prevention of Significant Deterioration (PSD) Class I area.

The influence to onshore air quality is dependent upon meteorological conditions and air pollution emitted from the proposed action. The pertinent meteorological conditions are the wind speed and direction, the atmospheric stability, and the mixing height, which govern the dispersion and transport of emissions. The typical synoptic wind flow for this area is driven by the clockwise circulation around the Bermuda High, resulting in a prevailing southeasterly to southerly flow, which is conducive to transporting emissions toward shore. However, superimposed upon this synoptic circulation are smaller meso-scale wind flow patterns, such as the land/sea breeze phenomena. In addition, there are other synoptic-scale patterns that occur periodically, namely tropical cyclones, and mid-latitude frontal systems. Because of the routine occurrence of these various conditions, the winds blow from all directions in the area of concern (USDOI, MMS, 1988).

The atmospheric stability is typically expressed using the Pasquill-Gifford stability classes. However, not all of the Pasquill-Gifford stability classes are routinely found offshore in the GOM. Specifically, the F stability class is rare. "F" stability is characterized by the extremely stable condition (i.e., a strong radiative inversion) that usually develops at night, over land, with rapid radiative cooling of the ground surface and the air directly above it. This type of atmospheric stability strongly limits the vertical dispersion of emitted air pollutants. The large heat capacity of the GOM is simply incapable of losing enough heat overnight to set up a strong radiative inversion. Likewise, the A stability class is also rare. "A" stability is characterized by the extremely unstable condition that develops over land with very rapid warming of the ground surface and the air directly above it and the occurrence of colder air aloft. This type of atmospheric stability strongly enhances the vertical dispersion of air pollutants. Although, once again, the large heat capacity of the GOM does not allow for the ocean surface warming rapidly. Therefore, the most common stability classes over the GOM are slightly unstable to neutral, which are conducive to only a moderate amount of buoyant vertical dispersion.

The mixing height is a measure of the upward extent for the vertical dispersion of emitted air pollutants. Offshore mixing heights are rather shallow, generally less than 1,000 m (3,281 ft), as compared to onshore mixing heights, which are typically greater than 2,000 m (6,362 ft) during the day. Close to shore, the mixing height over the water increases notably from the typical offshore level, due to the water being shallower and the influence of the land, which penetrates out over the water for a short distance. Thus, with a typical southeasterly to southerly wind flow, which is conducive to transporting emissions toward shore, the extent of the vertical dispersion will increase as the shoreline is approached. This has the effect of lowering the resultant air pollutant concentration arising from emissions.

The composite of these meteorological conditions that influence the dispersion and transport of emissions is represented by an exemption level that can be compared to the projected air pollutant emissions for a proposed action.

Freeport's projected emissions and the exemption level for the proposal are depicted in Table 4-3.

3.2 BIOLOGICAL RESOURCES

3.2.1 Sensitive Coastal Environments

General information on the types and status of coastal landforms in the Central and Western Gulf is contained in USDOI, MMS (2001a). That information is summarized below.

3.2.1.1 Coastal Barrier Beaches and Associated Dunes

Barrier landforms include islands, spits, dunes, and beaches. They are usually long and narrow in shape, having been formed by reworked sediment transported by waves, currents, storm surges, and winds. Barrier landforms are in a state of constant change and they can be classified into two main types:

- Transgressive—where shorelines move inland and marine sediment deposits overlay terrestrial sediments. This type is usually rapidly eroding, low profile, with numerous washover channels.
- Regressive—where shorelines move seaward and terrestrial sediment deposits overlay marine sediments. This type is characterized by higher profile dunes, with few if any washover channels (USDOI, MMS, 2001a).

Both types are important ecologically. Barrier systems, particularly vegetated ones with fresh- and/or saltwater pools, may serve as habitat for a variety of fairly specialized species, including birds and some land mammals. The islands and spits protect the bays, lagoons, estuaries, salt marshes, seagrass beds, and other wetland habitat, some of which may contain threatened or endangered species.

The shore bases to be used by the activity—Morgan City, Port Fourchon, and Venice, Louisiana—are located in transgressive areas, where rates of shoreline retreat are the highest of those around the Gulf.

3.2.1.2 Wetlands

Wetlands are virtually continuous along the Gulf Coast, especially along the Louisiana coast. Wetlands include mudflats, mangroves, marshes (fresh, brackish, and salt), and hardwood and cypress-tupelo swamps. They may occur as isolated pockets, narrow bands, or large areas (USDOI, MMS, 2001a).

High-productivity, high-detritus input, and extensive nutrient recycling characterize coastal wetlands. They are important habitats for a large number of invertebrate, fish, reptile, bird, and mammal species, including rare and endangered species, and high-value commercial and recreational species for at least part of their life cycles.

The GOM coastal wetlands represent about half of the Nation's wetland area. These wetlands help support the exceptionally productive coastal fisheries (e.g., Gulf ports account for four of the top five ports in the U.S. in terms of landed weight) and about 75 percent of the migratory waterfowl traversing the country (Johnston et al., 1995). The USDOC, NOAA (1991) and Johnston et al. (1995) estimated that, although wetland area has decreased substantially over the last 30 years, about 1.3 million hectares (ha) of marshes, estuarine shrub-scrub, and freshwater forested/shrub-scrub remain on the Gulf Coast. Of these three categories, 80 percent is marsh, 19 percent is estuarine scrub-shrub, and 1 percent is forested wetland. Louisiana has the greatest area with 55 percent of the total (representing 69% of total marsh), followed by Florida with 18 percent (including 97% of total scrub-shrub, mostly mangrove), Texas with 14 percent, Alabama with 11 percent, and Mississippi with 2 percent (Johnston et al., 1995).

The National Biological Service (NBS) provides calculations of wetland losses that are more recent than the NOAA data. The NBS updates its wetland loss data every three years. Based on satellite imagery, NBS suggests that wetland losses are greater than previously thought although the rate of loss appears to be declining (Johnston et al., 1995). Since the 1980's, wetland areas have declined significantly around the Gulf (USDOI, MMS, 2001a). For these reasons, wetlands are an important issue when assessing impacts of coastal developments and/or accidental spills, in situations where spills may impinge on the coast.

The shore bases to be used by the proposed activity—Morgan City, Port Fourchon, and Venice, Louisiana—are located in areas where the rates of wetland loss are the highest around the Gulf.

3.2.1.3 Seagrasses

Seagrass communities are extremely productive and provide important habitat for wintering waterfowl, and spawning, nursery, and feeding habitat for several species of fish and shellfish, and some endangered and threatened species of manatee and sea turtles. Seagrass losses in the Gulf have been extensive over the last 50 years. Although found in isolated patches and narrow bands along the entire Gulf Coast in shallow, clear, estuarine areas, seagrasses mostly occur in the eastern portion of the GOM between Mobile Bay and Florida Bay. Florida contains about 693,000 ha (about 68%) of the 1.02 million ha estimated for all the Gulf States (Handley, 1995).

Louisiana has a large amount of submerged vegetation but only a small area of seagrass (about 5,657 ha in 1988) (Handley, 1995). The shore bases to be used by the activity—Morgan City, Port Fourchon and Venice, Louisiana—are located in areas where seagrasses are less common.

3.2.2 Benthic Communities/Organisms

Because there are no hard-bottom/live-bottom areas, pinnacles, or topographic features in close proximity of the MP 299 site, the benthic community in the MP 299 area is comprised of what lives in and on soft-bottom sediments. These types of communities include the full spectrum of living benthic organisms. Major groups include bacteria and other microbenthos, meiofauna (0.063-0.3 mm), macrofauna (larger than 0.3 mm), and megafauna (larger organisms such as crabs, sea pens, crinoids, demersal fish). All of these groups are represented in bottom sediments throughout the entire Gulf—from the continental shelf to the deepest abyss at about 3,850 m (12,630 ft). The communities of small infaunal organisms are ubiquitous and not addressed in this programmatic EA. Any potential localized impacts to these communities would quickly recover by colonization from surrounding communities of similar organisms of all size classes.

The nearest known chemosynthetic community is located in Viosca Knoll Block 826, approximately 40 nautical miles (nmi) to the east-southeast.

3.2.3 Marine Mammals

Twenty-nine species of marine mammals are known to occur in the GOM (Davis et al., 2000). The Gulf's marine mammals are represented by members of the taxonomic order Cetacea, which is divided into the suborders Mysticeti (i.e., baleen whales) and Odontoceti (i.e., toothed whales, dolphins, and their allies), as well as the order Sirenia, which include the manatee and dugong. Within the GOM, there are 28 species of cetaceans (7 mysticete and 21 odontocete species) and 1 sirenian species, the manatee (Jefferson et al., 1992).

3.2.3.1 Nonendangered and Nonthreatened Species

Cetaceans — Mysticetes

Bryde's Whale (Balaenoptera edeni)

The Bryde's whale (*Balaenoptera edeni*) is the second smallest of the balaenopterid whales; it is generally confined to tropical and subtropical waters (i.e., between latitude 40º N. and latitude 40º S.) (Cummings, 1985). Unlike some baleen whales, it does not have a well-defined breeding season in most areas; thus, calving may occur throughout the year. The Bryde's whale feeds on small pelagic fishes and invertebrates (Leatherwood and Reeves, 1983; Cummings, 1985; Jefferson et al., 1993).

There are more records of Bryde's whale than of any other baleen whale species in the northern GOM. It is likely that the Gulf represents at least a portion of the range of a dispersed, resident population of Bryde's whale (Jefferson and Schiro, 1997). Bryde's whale in the northern Gulf, with few exceptions, have been sighted along a narrow corridor near the 100-m (328-ft) isobath (Davis and Fargion, 1996; Davis et al., 2000). Most sightings have been made in the DeSoto Canyon region and off western Florida, though there have been some in the west-central portion of the northeastern Gulf. Group sizes range from one to seven animals.

Minke Whale (Balaenoptera acutorostrata)

The minke whale (*Balaenoptera acutorostrata*) is a small rorqual that is widely distributed in tropical, temperate, and polar waters. Minke whales may be found offshore but appear to prefer coastal waters. Their diet consists of invertebrates and fishes (Leatherwood and Reeves, 1983; Stewart and Leatherwood, 1985; Jefferson et al., 1993; Würsig et al., 2000).

The North Atlantic population migrates southward during winter months to the Florida Keys and the Caribbean Sea. There are 10 reliable records of minke whales in the GOM and all are the result of strandings (Jefferson and Schiro, 1997). Most records from the Gulf have come from the Florida Keys, although strandings in western and northern Florida, Louisiana and Texas have been reported (Jefferson and Schiro, 1997). Sightings data suggest that minke whales either migrate into Gulf waters in small numbers during the winter or, more likely, that sighted individuals represent strays from low-latitude breeding grounds in the western North Atlantic (Jefferson and Schiro, 1997; Davis et al., 1998 and 2000).

Cetaceans — Odontocetes

Pygmy and Dwarf Sperm Whales (Family Kogiidae)

The pygmy sperm whale (*Kogia breviceps*) and its congener, the dwarf sperm whale (*K. sima*), are medium-sized toothed whales that feed on cephalopods and, less often, on deep-sea fishes and shrimps (Leatherwood and Reeves, 1983; Jefferson et al., 1993; Caldwell and Caldwell, 1989). Hence, they inhabit oceanic waters in tropical to warm temperate zones (Jefferson and Schiro, 1997). They appear to be most common in waters over the continental slope and along the shelf edge. Little is known of their natural history, although a recent study of *Kogia* in South Africa has determined that these two species attain sexual maturity much earlier and live fewer years than other similarly sized toothed whales (Plön and Bernard, 1999).

Kogia have been sighted throughout the Gulf in waters that vary broadly in depth and seafloor topographies (Mullin et al., 1991; Davis et al., 1998 and 2000). The GulfCet I study reported these animals in waters with a mean bottom depth of 929 m (Davis et al., 1998). *Kogia* have been sighted over the continental shelf, but there is insufficient evidence that they regularly inhabit continental shelf waters. *Kogia* sightings made during GulfCet aerial surveys (1992-1997) in all waters between the 100-m and 2,000-m isobaths. Data also indicate that *Kogia* may associate with frontal regions along the shelf break and upper continental slope, areas with high epipelagic zooplankton biomass (Baumgartner, 1995). During the GulfCet II study, *Kogia* were widely distributed in the oceanic northern Gulf, including slope waters of the eastern Gulf. *Kogia* frequently strand on the coastline of the northern Gulf, more often in the eastern Gulf (Jefferson and Schiro, 1997). Between 1984 and 1990, 22 pygmy sperm whales and 10 dwarf sperm whales stranded in the GOM.

Beaked Whales (Family Ziphiidae)

Two genera and four species of beaked whales occur in the GOM. These encompass (1) three species of the genus Mesoplodon (Sowerby's beaked whale [*M. bidens*], Blainville's beaked *whale [M. densirostris*], and Gervais' beaked whale [*M. europaeus*]) and (2) one species of the genus Ziphius (Cuvier's beaked whale [*Ziphius cavirostris*]). Morphological similarities among species in the genus Mesoplodon make identification of free-ranging animals difficult. Generally, beaked whales appear to prefer oceanic waters, although little is known of their respective life histories. Stomach content analyses suggest that these whales feed primarily on deepwater cephalopods, although they also consume some mesopelagic fishes and deepwater benthic invertebrates (Leatherwood and Reeves, 1983; Heyning, 1989; Mead, 1989; Jefferson et al., 1993).

In the northern Gulf, beaked whales are broadly distributed in waters greater than 1,000 m over lower slope and abyssal landscapes (Davis et al., 1998 and 2000). Group sizes of beaked whales observed in the northern Gulf comprise 1-4 individuals per group (Mullin et al., 1991; Davis and Fargion, 1996; Davis et al., 2000). Sightings data indicate that Cuvier's beaked whale is probably the most common beaked whale in the Gulf (Jefferson and Schiro, 1997; Davis et al., 1998 and 2000). Würsig et al. (2000) indicates there are 18 documented strandings of Cuvier's beaked whales in the GOM. The Gervais' beaked whale is probably the most common mesoplodont in the northern Gulf, as suggested by stranding records (Jefferson and Schiro, 1997). Würsig et al. (2000) states there are four verified stranding records of Blainville's beaked whales from the GOM. Additionally, one beaked whale sighted during GulfCet II was determined to be a Blainville's beaked whale (Davis et al., 2000). Sowerby's beaked whale is represented in the Gulf by only a single record, a stranding in Florida; this record is considered extralimital since this species normally occurs much farther north in the North Atlantic (Jefferson and Schiro, 1997).

Dolphins (Family Delphinidae)

Atlantic Spotted Dolphin (Stenella frontalis)

The Atlantic spotted dolphin (*Stenella frontalis*) is endemic to the Atlantic Ocean within tropical to temperate zones. Surveys in the northern Gulf documented the Atlantic spotted dolphin primarily over the continental shelf and shelf edge in waters that were less than 250 m in depth, although some individuals were sighted along the slope in waters of up to approximately 600 m (1,969 ft) (Davis et al., 1998). Mills and Rademacher (1996) found the principal depth range of the Atlantic spotted dolphin to be much shallower at 15-100 m water depth. Griffin and Griffin (1999) found Atlantic spotted dolphins on the eastern Gulf continental shelf in waters greater than 20 m (30 km from the coast). A satellite-tagged Atlantic spotted dolphin was found to prefer shallow water habitat and make short dives (Davis et al., 1996). Atlantic spotted dolphins are sighted more frequently in areas east of the Mississippi River (Mills and Rademacher, 1996). Perrin et al. (1994a) relate accounts of brief aggregations of smaller groups of Atlantic spotted dolphins (forming a larger group) off the coast of northern Florida. While not well substantiated, these dolphins may demonstrate seasonal nearshore-offshore movements that appear to be influenced by prey availability and water temperature (Würsig et al., 2000). They are known to feed on a wide variety of fishes, cephalopods, and benthic invertebrates (Leatherwood and Reeves, 1983; Jefferson et al., 1993; Perrin et al., 1994a).

Bottlenose Dolphin (Tursiops truncatus)

The bottlenose dolphin (*Tursiops truncatus*) is a common inhabitant of the continental shelf and upper slope waters of the northern Gulf. It is the most widespread and common cetacean observed in the northern GOM. Sightings of this species in the northern Gulf are rare beyond approximately the 1,200-m (3,937-ft) isobath (Mullin et al., 1994b; Jefferson and Schiro, 1997; Davis et al., 2000). There appears to be two ecotypes of bottlenose dolphins, a coastal form and an offshore form (Hersh and Duffield, 1990; Mead and Potter, 1990). The coastal or inshore stock(s) is genetically isolated from the offshore stock (Curry and Smith, 1997). Genetic data also support the concept of relatively discrete bay, sound, and estuary stocks (Waring et al., 1999). In the northern GOM, bottlenose dolphins appear to have an almost bimodal distribution: a shallow water (16-67 m) and a shelf break (about 250 m) region. These regions may represent the individual depth preferences of the coastal and offshore forms (Baumgartner, 1995). Little is known of the behavior or ranging patterns of offshore bottlenose dolphins. Bottlenose dolphins are opportunistic feeders, taking a wide variety of fishes, cephalopods, and shrimp (Davis and Fargion, 1996; Jefferson and Schiro, 1997; Wells and Scott, 1999). Mating and calving occurs primarily from February through May.

Clymene Dolphin (Stenella clymene)

The Clymene dolphin (*Stenella clymene*) is endemic to the Atlantic Ocean and found only in tropical and subtropical waters (Perrin and Mead, 1994). Data suggest that Clymene dolphins are widespread within deeper Gulf waters (i.e., shelf edge and slope) (Davis et al., 2000; Würsig et al., 2000). The Clymene dolphin represents a significant component of the northern GOM cetacean assemblage (Mullin et al., 1994c). However, the few records of the Clymene dolphin in the northern Gulf in the past were probably a result of this species' recently clarified taxonomic status and the tendency for observers to confuse it with other species (Jefferson and Schiro, 1997). Sightings made during GulfCet surveys indicate the Clymene dolphin to be widely distributed in the western oceanic Gulf during spring and in the northeastern Gulf during summer and winter. Also, most sightings tended to occur in the central portion of the study area, west of the Mississippi Delta and east of Galveston Bay. Clymene dolphins have been sighted in water depths of 612-1,979 m (Davis et al., 1998). This species appears to feed on fishes and cephalopods (Leatherwood and Reeves, 1983; Jefferson et al., 1993; Mullin et al., 1994a).

False Killer Whale (Pseudorca crassidens)

The false killer whale (*Pseudorca crassidens*) occurs in oceanic waters of tropical and warm temperate zones (Odell and McClune, 1999). Most sightings have been made in waters exceeding 200 m, although there have been sightings from over the continental shelf (Davis and Fargion, 1996). Although sample sizes are small, most false killer whale sightings have been east of the Mississippi River (Mullin and Hansen, 1999). False killer whales primarily eat fish and cephalopods, but they have been known to attack other toothed whales (Leatherwood and Reeves, 1983; Jefferson et al., 1993).

Fraser's Dolphin (Lagenodelphis hosei)

The Fraser's dolphin (*Lagenodelphis hosei*) has a pantropical distribution (Perrin et al., 1994c) in oceanic waters and in areas where deep water approaches the coast. Fraser's dolphins feed on fishes, cephalopods, and crustaceans (Leatherwood and Reeves, 1983; Jefferson et al., 1993; Jefferson and Schiro, 1997). This species was previously known to occur in the northern Gulf based on a mass stranding in the Florida Keys in 1981 (Hersh and Odell, 1986). From 1992 to 1996, there were at least three strandings in Florida and Texas (Würsig et al., 2000). GulfCet ship-based surveys led to sightings of two large herds (greater than 100 individuals) and first-time recordings of sounds produced by these animals (Leatherwood et al., 1993). Fraser's dolphins have been sighted in the western and eastern Gulf at depths of around 1,000 m (3,281 ft) (Leatherwood et al., 1993; Davis and Fargion, 1996; Jefferson and Schiro, 1997; Davis et al., 2000).

Killer Whale (Orcinus orca)

The killer whale (*Orcinus orca*) is a cosmopolitan species that occurs in all oceans and seas (Dahlheim and Heyning, 1999). Generally, they appear to inhabit coastal, cold temperate and subpolar zones. Most killer whale sightings in the northern Gulf have been in waters greater than 200 m deep, although there are sightings made from over the continental shelf (Davis and Fargion, 1996). Killer whales are found almost exclusively in a broad area of the north-central Gulf (Jefferson and Schiro, 1997; O'Sullivan and Mullin, 1997; Mullin and Hansen, 1999). There was a sighting in May 1998 of killer whales in DeSoto Canyon (Ortega, 1998). Worldwide, killer whales feed on marine mammals, marine birds, sea turtles, cartilaginous and bony fishes, and cephalopods (Leatherwood and Reeves, 1983; Jefferson et al., 1993). An attack by killer whales on a group of pantropical spotted dolphins was observed during one of the GulfCet surveys (O'Sullivan and Mullin, 1997).

Melon-headed Whale (Peponocephala electra)

The melon-headed whale (*Peponocephala electra*) is a deepwater, pantropical species (Perryman et al., 1994) that feeds on cephalopods and fishes (Leatherwood and Reeves, 1983; Jefferson et al., 1993; Mullin et al., 1994c; Jefferson and Schiro, 1997). Sightings of this species in the northern Gulf have been primarily in continental slope waters west of the Mississippi River (Jefferson and Schiro, 1997; Davis et al., 1998 and 2000; Mullin and Hansen, 1999). The first two records of this species' occurrence in the Gulf are recent strandings, one in Texas in 1990 and the other in Louisiana in 1991 (Barron and Jefferson, 1993). GulfCet surveys resulted in many sightings of melon-headed whales, suggesting that this species is a regular inhabitant of the GOM (e.g., Mullin et al., 1994b).

Pantropical Spotted Dolphin (Stenella attenuata)

The pantropical spotted dolphin (*Stenella attenuata*) is distributed in tropical and subtropical marine waters of the world (Perrin and Hohn, 1994). It is the most common cetacean in the oceanic northern Gulf (Mullin et al., 1994a; Davis and Fargion, 1996; Davis et al., 2000). Pantropical spotted dolphins are typically found in waters deeper than 1,200 m deep (Mullin et al., 1994a; Davis et al., 1998 and 2000) but have been sighted over the continental shelf (Mullin et al., 1994a). It feeds on epipelagic fishes and cephalopods (Leatherwood and Reeves, 1983; Jefferson et al., 1993).

Pygmy Killer Whale (Feresa attenuata)

The pygmy killer whale (*Feresa attenuata*) occurs in tropical and subtropical waters throughout the world (Ross and Leatherwood, 1994), although little is known of its biology or ecology. Its diet includes cephalopods and fishes, though reports of attacks on other dolphins have been reported (Leatherwood and Reeves, 1983; Jefferson et al., 1993). The pygmy killer whale does not appear to be common in the Gulf; most records are of strandings (Jefferson and Schiro, 1997). Fourteen strandings have been documented from southern Florida to south Texas. Four ship sightings occurred during the GulfCet surveys, once off the south Texas coast in November and three in the spring in the west-central portion of the GulfCet study area. Sightings of this species have been at depths of 500-1,000 m (1,641-3,281 ft) (Jefferson and Schiro, 1997; Davis et al., 1998 and 2000).

Risso's Dolphin (Grampus griseus)

The Risso's dolphin (*Grampus griseus*) is a pantropical species that inhabits deep oceanic and continental slope waters of tropical and warm temperate zones (Kruse et al., 1999). Risso's dolphins in the northern Gulf have been frequently sighted along the shelf edge, along the upper slope, and most commonly, over or near the 200-m water isobath just south of the Mississippi River in recent years (Würsig et al., 2000). A strong correlation between Risso's dolphin distribution and the steeper portions of the upper continental slope is most likely the result of cephalopod distribution along the continental slope (Baumgartner, 1997; Davis et al., 2000). Risso's dolphins have been sighted over the continental shelf at water depths less than 200 m (Mullin et al., 1994a; Davis et al., 1998). Strandings and GulfCet sightings have occurred in all seasons in the GOM and it is likely that Risso's dolphins occur year-round in the GOM. Risso's dolphins feed primarily on squid and secondarily on fishes and crustaceans (Leatherwood and Reeves, 1983; Jefferson et al., 1993; Baumgartner, 1997; Würsig et al., 2000).

Rough-toothed Dolphin (Steno bredanensis)

The rough-toothed dolphin (*Steno bredanensis*) occurs in tropical to warm temperate marine waters globally (Miyazaki and Perrin, 1994). Sightings in the northern Gulf occur primarily over the deeper waters (950-1,100 m) off the continental shelf (Mullin et al., 1994a; Davis et al., 1998). Most sightings of the rough-toothed dolphin have been west of the Mississippi River (Mullin and Hansen, 1999); however, a mass stranding of 62 rough-toothed dolphins occurred near Cape San Blas, Florida, on December 14, 1997. Four of the stranded dolphins were rehabilitated and released; three carried satellite-linked transmitters (Wells et al., 1999b). Water depth at tracking locations of these individuals averaged 195 m. Data from the tracked individuals, in addition to sightings at Santa Rosa Beach on December 28-29, 1998 (Rhinehart et al., 1999), suggest a regular occurrence of this species in the northern Gulf. This species feeds on cephalopods and fishes (Leatherwood and Reeves, 1983; Jefferson et al., 1993).

Short-finned Pilot Whale (Globicephala macrorhynchus)

The short-finned pilot whale (*Globicephala macrorhynchus*) is found in warm temperate to tropical marine waters of the world, generally in deep offshore areas (Bernard and Reilly, 1999). In the northern Gulf, it is most commonly sighted along the continental slope at depths of 250-2,000 m (Jefferson and Schiro, 1997; Davis et al., 1998 and 2000). Short-finned pilot whales have been sighted almost exclusively west of the Mississippi River (Mullin and Hansen, 1999). There was one sighting of short-finned pilot whales in the slope in the Eastern Gulf during GulfCet II, in the extreme western part of the study area (Davis et al., 2000). Stranding records have declined dramatically over the past decade, which contributes to the evidence (though not conclusively) that this population may be declining in the GOM. Squid are the predominant prey, with fishes being consumed occasionally.

Spinner Dolphin (Stenella longirostris)

The spinner dolphin (*Stenella longirostris*) occurs worldwide in tropical oceanic waters (Perrin and Gilpatrick, 1994; Jefferson and Schiro, 1997). In the northern Gulf, most sightings of spinner dolphins have been east of the Mississippi River at depths of 500-1,800 m (1,641-5,906 ft) (Jefferson and Schiro, 1997; Mullin and Hansen, 1999; Davis et al., 2000). Spinner dolphins have mass stranded on two occasions in the GOM, each time on the Florida coast. Spinner dolphins appear to feed on fishes and cephalopods (Würsig et al., 2000).

Striped Dolphin (Stenella coeruleoalba)

The striped dolphin (*Stenella coeruleoalba*) occurs in tropical and subtropical oceanic waters (Perrin et al., 1994b). Sightings in the northern Gulf occur primarily over the deeper waters beyond the continental shelf (Jefferson and Schiro, 1997; Davis et al., 2000; Würsig et al., 2000). Striped dolphins feed primarily on small mid-water squid and fishes (especially lanternfish).

3.2.3.2.Endangered and Threatened Species

Cetaceans — Mysticetes

Blue Whale (Balaenoptera musculus)

The blue whale (*Balaenoptera musculus*) is the largest animal known. It feeds almost exclusively on concentrations of zooplankton (Yochem and Leatherwood, 1985; Jefferson et al., 1993). The blue whale occurs in all major oceans of the world; some blue whales are resident, some are migratory (Jefferson et al., 1993; USDOC, NMFS, 1998). Those that migrate move to feeding grounds in polar waters during spring and summer, after wintering in subtropical and tropical waters (Yochem and Leatherwood, 1985). Records of the blue whale in the northern Gulf consist of two strandings on the Texas coast (Lowery, 1974). There appears to be little justification for considering the blue whale to be a regular inhabitant of the GOM (Jefferson and Schiro, 1997).

Fin Whale (Balaenoptera physalus)

The fin whale (*Balaenoptera physalus*) is an oceanic species that occurs worldwide in marine waters and is most commonly sighted where deep water approaches the coast (Jefferson et al., 1993). Fin whales feed on concentrations of zooplankton, fishes, and cephalopods (Leatherwood and Reeves, 1983; Jefferson et al., 1993). The fin whale makes seasonal migrations between temperate waters, where it mates and calves, and polar feeding grounds that are occupied during summer months. Their presence in the northern Gulf is considered rare (Würsig et al., 2000). Sightings in the northern Gulf have typically been made in oceanic waters, chiefly in the north-central region of the Gulf (Mullin et al., 1991). There are seven reliable reports of fin whales in the northern Gulf, indicating that fin whales are not abundant in the GOM (Jefferson and Schiro, 1997). Sparse sighting data on this species suggest that individuals in the northern Gulf may be extralimital strays from their western Atlantic population (Jefferson and Schiro, 1997; Würsig et al., 2000).

Humpback Whale (Megaptera novaeangliae)

The humpback whale (*Megaptera novaeangliae*) occurs in all oceans, feeding in higher latitudes during spring, summer, and autumn, and migrating to a winter range over shallow tropical banks, where they calve and presumably conceive (Jefferson et al., 1993). Humpback whales feed on concentrations of zooplankton and fishes using a variety of techniques that concentrate prey for easier feeding (Winn and Reichley, 1985; Jefferson et al., 1993). There have been occasional reports of humpback whales in the northern Gulf off Florida: a confirmed sighting of a humpback whale in 1980 in the coastal waters off Pensacola (Weller et al., 1996); two questionable records of humpback whale sightings from 1952 and

1957 off the coast of Alabama (Weller et al., 1996); a stranding east of Destin, Florida, in mid-April 1998 (Mullin, 1998); and a confirmed sighting of six humpback whales in May 1998 in DeSoto Canyon (Ortega, 1998). Most recently, a lone humpback whale was photographed at MP 281 in December 2001. Humpback whales sighted in the GOM may be extralimital strays during their breeding season or during their migrations (Würsig et al., 2000). The time of the year (winter and spring) and the small size of the animals involved in many sightings suggest the likelihood that these records are of inexperienced juveniles on their first return migration northward (Weller et al., 1996).

Northern Right Whale (Eubalaena glacialis)

The northern right whale (*Eubalaena glacialis*) inhabits primarily temperate and subpolar waters. Northern right whales range from wintering and calving grounds in coastal waters of the southeastern United States to summer feeding, nursery, and mating grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf. During the winter, a portion of the population moves from the summer foraging grounds to the calving/breeding grounds off Florida, Georgia, and South Carolina. Right whales forage primarily on subsurface concentrations of zooplankton such as calanoid copepods by skim feeding with their mouths agape (Watkins and Schevill, 1976; Leatherwood and Reeves, 1983; Jefferson et al., 1993).

Confirmed historical records of northern right whales in the GOM consist of a single stranding in Texas (Schmidly et al., 1972) and a sighting off Sarasota County, Florida (Moore and Clark, 1963; Schmidly, 1981). The northern right whale is not considered a resident (year-round or seasonal) of the GOM; existing records probably represent extralimital strays from the wintering grounds of this species off the southeastern United States from Georgia to northeastern Florida (Jefferson and Schiro, 1997).

Sei Whale (Balaenoptera borealis)

The sei whale (*Balaenoptera borealis*) is an oceanic species that is not often seen close to shore (Jefferson et al., 1993). They occur in marine waters from the tropics to polar regions but are more common in mid-latitude temperate zones (Jefferson et al., 1993). Sei whales feed on concentrations of zooplankton, small fishes, and cephalopods (Gambell, 1985; Jefferson et al., 1993). The sei whale is represented in the northern Gulf by only four reliable records (Jefferson and Schiro, 1997). One stranding was reported for the Florida Panhandle and three strandings were in eastern Louisiana (Jefferson and Schiro, 1997). This species' occurrence in the northern Gulf is considered most likely to be accidental.

Cetaceans — Odontocetes

Sperm Whale (Physeter macrocephalus)

The sperm whale (*Physeter macrocephalus*) inhabits marine waters from the tropics to the pack-ice edges of both hemispheres, although generally only large males venture to the extreme northern and southern portions of their range (Jefferson et al., 1993). In general, sperm whales seem to prefer certain areas within each major ocean basin, which historically have been termed "grounds" (Rice, 1989). As deep divers, sperm whales generally inhabit oceanic waters, but they do come close to shore where submarine canyons or other geophysical features bring deep water near the coast (Jefferson et al., 1993). Sperm whales prey on cephalopods, demersal fishes, and benthic invertebrates (Rice, 1989; Jefferson et al., 1993).

The sperm whale is the only great whale that is considered to be common in the northern Gulf (Fritts et al., 1983b; Mullin et al., 1991; Davis and Fargion, 1996; Jefferson and Schiro, 1997). Sighting data suggest a northern Gulfwide distribution over slope waters. Congregations of sperm whales are commonly found in waters over the shelf edge in the vicinity of the Mississippi River delta in waters that are 500-2,000 m (1,641-6,562 ft) in depth (Mullin et al., 1994a; Davis and Fargion, 1996; Davis et al., 2000). Sperm whale sightings in the northern Gulf chiefly occur in waters with a mean seafloor depth of 1,105 m (Davis et al., 1998). Mesoscale biological and physical patterns in the environment are important in regulating sperm whale habitat use (Griffin, 1999). The GulfCet II study found that most sperm whales were concentrated along the slope in or near cyclones (Davis et al., 2000). Low-salinity, nutrient-rich water from the Mississippi River may contribute to enhanced primary and secondary productivity in the north-central Gulf, and thus provide resources that support the year-round presence of sperm whales south of the delta.

Consistent sightings in the region indicate that there is a resident population of sperm whales in the northern Gulf consisting of adult females, calves, and immature individuals (Mullin et al., 1994b; Davis and Fargion, 1996; Sparks et al., 1996; Jefferson and Schiro, 1997; Davis et al., 2000). Also, recent sightings were made in 2000 and 2001 of solitary mature male sperm whales in the DeSoto Canyon area (Lang, 2001). Sperm whales in the Gulf are currently considered a separate stock from those in the Atlantic and Caribbean (Waring et al., 1997).

Sirenians

West Indian Manatee (Trichechus manatus)

The West Indian manatee (*Trichechus manatus*) is the only sirenian known to occur in tropical and subtropical coastal waters of the southeastern U.S., GOM, Caribbean Sea, and the Atlantic coast of northern and northeastern South America (Reeves et al., 1992; Jefferson et al., 1993; O'Shea et al., 1995). During warmer months, manatees are common along the west coast of Florida from the Everglades National Park northward to the Suwannee River in northwestern Florida and less common farther westward. In winter, the population moves southward to warmer waters. Manatees are uncommon along the Florida Panhandle and are infrequently found (strandings and sightings) as far west as Louisiana and Texas (Powell and Rathbun, 1984; Rathbun et al., 1990; Schiro et al., 1998). One manatee that died in Louisiana waters was determined to be from Tampa Bay, Florida; this determination was based on a photoidentification rematch (Schiro et al., 1998). The manatees occasionally appearing in south Texas waters might be strays from Mexico rather than Florida (Powell and Rathbun, 1984).

Manatees are herbivores that feed opportunistically on submerged, floating, and emergent vegetation (USDOI, FWS, 1995). Distribution of the manatee is limited to low-energy, inshore habitats supporting the growth of seagrasses (Hartman, 1979). Manatees primarily use open coastal (shallow nearshore) areas and estuaries, and are also found far up freshwater tributaries. Shallow grass beds with access to deep channels are preferred feeding areas in coastal and riverine habitats (USDOI, FWS, 2001). Notwithstanding their association with coastal areas, a manatee was documented offshore at several OCS work barges where it was grazing on algae growing on the vessel's sides and bottom. Multiple sightings of the animal were made in October 2001 and occurred in waters exceeding 1,500 m in depth south of Mobile Bay, Alabama.

3.2.4 Sea Turtles

Of the seven or eight extant species of sea turtles, five are known to inhabit the waters of the GOM (Pritchard, 1997): the green turtle, the loggerhead, the hawksbill, the Kemp's ridley, and the leatherback. As a group, sea turtles possess elongated, paddle-like forelimbs that are modified for swimming and shells that are depressed and streamlined (Márquez-M., 1990; Ernst et al., 1994; Pritchard, 1997). Sea turtles spend nearly all of their lives in the water and only depend on land (specifically sandy beaches) as nesting habitat. They mature slowly and are long-lived. Generally, their distributions are primarily circumtropical, although various species differ widely in their seasonal movements, geographical ranges, and behavior. There are also considerable differences in behavior among populations of the same species (Márquez-M., 1990). All sea turtle species inhabiting the GOM are listed as either endangered or threatened under the Endangered Species Act of 1973 (Pritchard, 1997).

Hard-shell Sea Turtles (Family Cheloniidae)

Green Sea Turtle (Chelonia mydas)

The green sea turtle (*Chelonia mydas*) is the largest hard-shell sea turtle; adults commonly reach 100 cm in carapace length and 150 kg in weight (USDOC, NMFS and USDOI, FWS, 1991a). The green sea turtle is commonly found in tropical and subtropical marine waters with extralimital occurrences generally between latitude 40ºN. and latitude 40ºS. (USDOC, NMFS and USDOI, FWS, 1991a; Hirth, 1997). In U.S. Atlantic waters, green sea turtles are found around the U.S. Virgin Islands, Puerto Rico, and Atlantic and Gulf Coasts of the U.S. from Texas to Massachusetts.

Green sea turtles primarily occur in coastal waters, where they forage on seagrasses, algae, and associated organisms (Carr and Caldwell, 1956; Hendrickson, 1980). Small green sea turtles are omnivorous. Adult green sea turtles in the Caribbean and GOM are herbivorous, feeding primarily on seagrasses and, to a lesser extent, on algae and sponges. The adult feeding habitats are beds of seagrasses and algae in relatively shallow, protected waters; juveniles may forage in areas such as coral reefs, emergent rocky bottom, sargassum mats, and in lagoons and bays. Green sea turtles in the Western Gulf are primarily restricted to the Texas coast where seagrass meadows and algae-laden jetties provide them developmental habitat, especially during warmer months (Landry and Costa, 1999). Movements between principal foraging areas and nesting beaches can be extensive, with some populations regularly conducting transoceanic migrations (USDOC, NMFS and USDOI, FWS, 1991a; Ernst et al., 1994; Hirth, 1997).

Hawksbill Sea Turtle (Eretmochelys imbricata)

The hawksbill (*Eretmochelys imbricata*) is a small- to medium-sized sea turtle that occurs in tropical to subtropical waters of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. In the continental U.S., the hawksbill has been recorded in coastal waters of each of the Gulf States and along the Atlantic coast from Florida to Massachusetts (USDOC, NMFS, 1993), although sightings north of Florida are rare (Hildebrand, 1982). They are considered to be the most tropical of all sea turtle species and the least commonly reported sea turtle species occurring in the Gulf (Márquez-M., 1990; Hildebrand, 1995).

Coral reefs are generally recognized as the resident foraging habitat for both juveniles and adults. Adult hawksbills feed primarily on sponges (Carr and Stancyk, 1975; Meylan, 1988) and demonstrate a high degree of selectivity, feeding on a relatively limited number of sponge species, primarily demosponges (Ernst et al., 1994). Texas and Florida are the only states in the U.S. where hawksbills are sighted with any regularity (USDOC, NMFS, 1993). Stranded hawksbills have been reported in Texas (Hildebrand, 1982; Amos, 1989) and in Louisiana (Koike, 1996); these tend to be either hatchlings or yearlings. A hawksbill was captured accidentally in a purse seine net just offshore Louisiana (Rester and Condrey, 1996).

Kemp's Ridley Sea Turtle (Lepidochelys kempi)

The Kemp's ridley (*Lepidochelys kempi*) is the smallest sea turtle species and occurs chiefly in the Gulf of Mexico. It may also be found along the northwestern Atlantic coast of North America as far north as Newfoundland. It is the most imperiled of the world's sea turtles.

In the northern Gulf, Kemp's ridleys are most abundant in coastal waters from Texas to west Florida (Ogren, 1989; Márquez-M., 1990 and 1994; Rudloe et al., 1991). Kemp's ridleys display strong seasonal fidelity to tidal passes and adjacent beachfront environs of the northern Gulf (Landry and Costa, 1999). There is little prolonged utilization of waters seaward of the 50-m isobath by this species (Renaud, 2001). Adult Kemp's ridley turtles usually occur only in the Gulf, but juvenile and immature individuals sometimes range between tropical and temperate coastal areas of the northwestern Atlantic and Gulf (Márquez-M., 1990). Within the Gulf, juvenile and immature Kemp's ridleys have been documented along the Texas and Louisiana coasts, at the mouth of the Mississippi River, and along the west coast of Florida, as quoted in stranding reports (Ogren, 1989; Márquez-M., 1990).

Loggerhead Sea Turtle (Caretta caretta)

The loggerhead (*Caretta caretta*) is a large sea turtle that inhabits temperate and tropical marine waters of the Atlantic, Pacific, and Indian Oceans. This species is wide-ranging throughout its range and is capable of living in varied habitat types for a relatively long time (Márquez-M., 1990; USDOC, NMFS and USDOI, FWS, 1991b; Ernst et al., 1994). Loggerheads feed primarily on benthic invertebrates but are capable of feeding on a wide range of food items (Ernst et al., 1994). Juvenile and subadult loggerheads are omnivorous, foraging on pelagic crabs, molluscs, jellyfish, and vegetation captured at or near the surface (Dodd, 1988; Plotkin et al., 1993). Adult loggerheads forage on benthic invertebrates (Dodd, 1988). The loggerhead is the most abundant species of sea turtle occurring in U.S. waters of the Atlantic, from Florida to Cape Cod, Massachusetts. The loggerhead is probably the most common sea turtle species in the northern Gulf (e.g., Fritts et al., 1983a; Fuller and Tappan, 1986; Rosman et al., 1987; Lohoefener et al., 1990) and is currently listed as a threatened species.

Aerial surveys indicate that loggerheads are largely abundant in water depths less than 100 m (Shoop et al., 1981; Fritts et al., 1983a). During the GulfCet aerial surveys, loggerheads were sighted throughout the northern Gulf continental shelf waters near the 100-m isobath (Davis et al., 2000). Loggerheads were also sighted over very deep waters (>1,000 m). Sightings indicate that loggerhead distribution is not as coastal-associated as that of Kemp's ridley and green sea turtles (Landry and Costa, 1999). Loggerheads have also been sighted seaward of the shelf break in the northeast U.S. (Shoop and Kenney, 1992). Loggerhead abundance in continental slope waters of the eastern Gulf increased appreciably during winter (Davis et al., 2000).

Leatherback Sea Turtle (Family Dermochelyidae)

Leatherback Sea Turtle (Dermochelys coriacea)

The leatherback (*Dermochelys coriacea*) is the largest and most distinctive sea turtle. This species possesses a unique skeletal morphology, most evident in its flexible, ridged carapace, and in cold water maintains a core body temperature several degrees above ambient. They also have unique deep-diving abilities (Eckert et al., 1986). This species is the most wide-ranging sea turtle, undertaking extensive migrations from the tropics to boreal (cold-temperate regions of the northern latitudes) waters (Morreale et al., 1996; Hughes et al., 1998). Though considered oceanic, leatherbacks will occasionally enter bays and estuaries (Hoffman and Fritts, 1982; Knowlton and Weigle, 1989; Shoop and Kenney, 1992). Leatherbacks feed primarily on gelatinous zooplankton such as jellyfish, siphonophores, and salps (Brongersma, 1972), although they may ingest some algae and vertebrates (Ernst et al., 1994). Leatherbacks' stomach contents have been analyzed and data suggest that they may feed at the surface, at depth within deep scattering layers, or on the benthos. Florida is the only site in the continental U.S. where leatherbacks regularly nest (USDOC, NMFS and USDOI, FWS, 1992; Ernst et al., 1994; Meylan et al., 1995). The leatherback is currently listed as an endangered species.

Sightings of leatherbacks are common in oceanic waters of the northern GOM (Leary, 1957; Fritts et al., 1983a; Lohoefener et al., 1988, 1990; Collard, 1990; Davis et al., 2000). Based on a summary of several studies, Davis and Fargion (1996) concluded that the primary habitat of the leatherback in the northwestern Gulf is oceanic waters (>200 m). It has been suggested that the region from Mississippi Canyon east to DeSoto Canyon appears to be an important habitat area for leatherbacks (Davis and Fargion, 1996). Most sightings of leatherbacks made during the GulfCet surveys occurred slightly north of DeSoto Canyon (Davis and Fargion, 1996; Davis et al., 2000). The nearly disjunct summer and winter distributions of leatherback sightings over the continental slope in the Eastern Gulf during GulfCet II indicate that specific areas may be important to this species either seasonally or for short periods of time. These specific locations are most probably correlated with oceanographic conditions and resulting concentrations of prey. Other clustered sightings of leatherbacks have been reported for the northern Gulf: 8 leatherbacks were sighted one day in DeSoto Canyon (Davis and Fargion, 1996), 11 during one day just south of the Mississippi River Delta (Lohoefener et al., 1990), and 14 during another day in DeSoto Canyon (Lohoefener et al., 1990).

3.2.5 Coastal and Marine Birds

3.2.5.1 Seabirds

Most species of marine birds listed as either endangered or threatened inhabit nearshore waters along the coast and the continental shelf of the GOM, and rarely occur in deepwater areas (USDOI, MMS, 2001a). Forty-three species of seabirds representing four ecological categories have been documented from deepwater areas of the Gulf: summer migrants (e.g., shearwaters, storm-petrels, and boobies), summer residents that breed in the Gulf (e.g., sooty, least, and sandwich terns), winter residents (e.g., gannets, gulls, and jaegers), and permanent resident species (e.g., laughing gull, and royal and bridled terns) (Hess and Ribic, 2000; USDOI, MMS, 2001a). Some important species are listed in Table 3-1. The most abundant species typically found in deepwater areas include terns, storm petrels, and gulls (Hess and Ribic, 2000).

Table 3-1

Major Seabirds

Common Name	Scientific Name
Wilson's storm petrel	*Oceanites oceanicus*
Magnificent frigatebird	*Fregata magnificens*
Brown pelican	*Pelicanus occidentalis*
Northern gannet	*Morus bassanus*
Masked booby	*Sula dactylatra*

Seabirds' presence in the Gulf changes seasonally, with species diversity and overall abundance being highest in the spring and summer and lowest in fall and winter. Seabirds also tend to associate with various oceanic conditions including specific sea-surface temperatures and salinities (e.g., laughing gull, and black and sooty terns), areas of high plankton productivity (e.g., laughing gulls, pomarine jaeger, Audubon's shearwater, band-rumped storm-petrel, and bridled tern), and particular currents (pomarine jaeger) (Hess and Ribic, 2000). Non-seabirds (especially passerines) that seasonally migrate over the Gulf may use offshore oil and gas platforms and merchant, cruise, and Naval ships as artificial islands for rest and shelter during inclement weather. Diving birds (Table 3-2) respond to stress by diving instead of flying away and hence may expose themselves to disturbance.

Table 3-2

Diving Birds

Common Name	Scientific Name
Common loon	*Gavia immer*
Western grebe	*Aechmophorus occidentalis*
Horned grebe	*Podiceps auritus*
Eared grebe	*Podiceps nigricollis*
Pied-billed grebe	*Podilymbus podiceps*
Anhinga	*Anyinga anhinga*
Olivaceous cormorant	*Phalacrocorax olivaceus*
Double-crested cormorant	*Phylacrocorax auritus*

3.2.5.2 Shorebirds

Shorebirds are those members of the order Charadriiformes generally restricted to coastline margins (beaches, mudflats, etc.). The GOM shorebirds comprise five taxonomic families--Jacanidae (jacanas), Haematopodidae (oystercatchers), Recurvirostridae (stilts and avocets), Charadriidae (plovers), and Scolopacidae (sandpipers, snipes, and allies) (Hayman et al., 1986). An important characteristic of almost all shorebird species is their strongly developed migratory behavior, with some shorebirds migrating from nesting places in the far north to the southern part of South America (Terres, 1991). Both spring and fall migrations take place in a series of "hops" to staging areas where birds spend time feeding heavily to store up fat for the sustained flight to the next staging area; many coastal habitats along the GOM are critical for such purposes. Along the Gulf Coast, 44 species of shorebirds have been recorded; only 6 species nest in the area. The remaining species are wintering residents and/or "staging" transients (Pashley, 1991). Although variations occur between species, most shorebirds begin breeding at 1-2 years of age and generally lay 3-4 eggs per year. They feed on a variety of marine and freshwater invertebrates and fish, and small amounts of plant life.

3.2.5.3 Marsh and Wading Birds

The following families of mostly wading birds have some representatives in the northern Gulf: Ardeidae (herons and egrets), Ciconiidae (storks), Threskiornithidae (ibises and spoonbills), and Gruidae (cranes). They have long legs that allow them to forage by wading into shallow water, while their long bills and usually long necks are used to probe under water or to make long swift strokes to seize fish, frogs, aquatic insects, crustaceans, and other prey (Terres, 1991). Seventeen species of wading birds in the order Ciconiiformes are currently known to nest in the U.S., and all except the wood stork nest in the northern Gulf coastal region (Martin, 1991). Within the Gulf Coast region, Louisiana supports the majority of nesting wading birds. Great egrets are the most widespread nesting species in the Gulf region (Martin, 1991). Wading birds are listed in Table 3-3.

Table 3-3

Wading Birds

Common Name	Scientific Name
American bittern	*Botaurus lentiginosus*
Least bittern	*Ixobrychus exilus*
Great blue heron	*Ardea herodias*
Great egret	*Casmerodias albus*
Snowy egret	*Egretta thula*
Little blue heron	*Egretta caerulea*
Tricolored heron	*Egretta tricolor*
Reddish egret	*Egretta rufescens*
Cattle egret	*Bulbulcus ibis*
Green-backed heron	*Butorides striatus*
Black-crowned night heron	*Nycticorax nicticorax*
Yellow-crowned night heron	*Nyctanassa biolacea*
White ibis	*Eudocimus albus*
Glossy ibis	*Plegadis falconellus*
White-faced ibis	*Plegadis chini*
Roseate spoonbill	*Ajaia ajaja*

Along the GOM, most members of the family Rallidae have compact bodies; therefore, they are not labeled wading birds. They are also elusive and rarely seen within the low vegetation of fresh and saline marshes, swamps, and rice fields (Bent, 1926; National Geographic Society, 1983; Ripley and Beehler, 1985).

3.2.5.4 Waterfowl

Waterfowl belong to the taxonomic order Anseriformes and include swans, geese, and ducks. A total of 27 species are regularly reported along the north-central and western Gulf Coast (Table 3-4); they include 1 swan, 4 geese, 7 surface-feeding (dabbling) ducks and teal, 4 diving ducks (pochards), and 11 others (including the wood duck, whistling ducks, sea ducks, ruddy duck, and mergansers) (Clapp et al., 1982; National Geographic Society, 1983; Madge and Burn, 1988). Many species usually migrate from wintering grounds along the Gulf Coast to summer nesting grounds in the north. Waterfowl migration pathways have traditionally been divided into four parallel north-south paths, or "flyways," across the North American continent. The Gulf Coast serves as the southern terminus of the Mississippi (Louisiana, Mississippi, and Alabama) flyway. Waterfowl are highly social and possess a diverse array of feeding adaptations related to their habitat (Johnsgard, 1975).

Table 3-4

Waterfowl in the Gulf of Mexico

Common Name	Scientific Name	Occurrence
Wood duck	*Aix sponsa*	Year-round
Canvasback duck	*Aythya valisineria*	Year-round
Redhead duck	*Aythya americana*	*
Ring-necked duck	*Aythya collaris*	*
Fulvous whistling duck	*Dendrocygna bicolor*	Nests in TX, LA
Lesser scaup	*Aythya affinis*	High abundance
Black scoter	*Melanitta nigra*	Low abundance
White-winged scoter	*Melanitta fusca*	TX, LA, AL; low abundance
Surf scoter	*Melanitta perspicilla*	Low abundance
Old squaw	*Clangula hemalis*	*
Common goldeneye	*Bucephala clangula*	*
Bufflehead	*Bucephala albeola*	*
Common merganser	*Mergus merganser*	*
Red-breasted merganser	*Mergus serrator*	*
Hooded merganser	*Lophodytes cucullatus*	*
Greater white-fronted goose	*Anser albifrons*	TX, LA, AL
Snow goose	*Chen caerulescens*	TX, LA, MS, AL
Canada goose	*Branta canadensis*	*
Brant	*Branta bernicla*	FL
Mallard	*Anas platyrhynchos*	*
Mottled duck	*Anas fulvigula*	TX, LA year-round
American widgeon	*Anas americana*	*
Northern pintail	*Anas acuta*	Abundant in TX
Northern Shoveler	*Anas clypeata*	*
Blue-winged teal	*Anas discors*	*
Cinnamon Teal	*Anas cyanoptera*	TX, west LA
Ruddy duck	*Oxyura jamaicensis*	*

*All waterfowl are wintering residents throughout the Gulf Coast unless otherwise indicated.

3.2.5.5 Endangered and Threatened Species

The following coastal and marine birds species that inhabit or frequent the northern GOM coastal areas are recognized by FWS as either endangered or threatened: piping plover, bald eagle, and brown pelican. The southeastern snowy plover is a species of concern to the State of Florida.

Piping Plover

The piping plover (*Charadrius melodus*) is a migratory shorebird that is endemic to North America. The piping plover breeds on the northern Great Plains, in the Great Lakes, and along the Atlantic Coast (Newfoundland to North Carolina); and winters on the Atlantic and GOM Coasts from North Carolina to Mexico and in the Bahamas West Indies. Hypothetically, plovers may have a preferred prey base and/or the substrate coloration provides protection from aerial predators due to camouflage from chromatic matching in specific wintering habitat. Such areas include coastal sand flats and mud flats in proximity to large inlets or passes, which may attract the largest concentrations of piping plovers (Nicholls and Baldassarre, 1990). Similarly, nesting habitat in the north includes open flats along the Missouri River and the Great Lakes. This species remains in a precarious state given its low population numbers, sparse distribution, and continued threats to habitat throughout its range.

Of the birds located on the United States wintering grounds during censuses of 1991 and 1996, 89 percent were found on the Gulf Coast and 8 percent were found on the Atlantic Coast. Piping plovers begin arriving on the wintering grounds in July and keep arriving until September. In late February, piping plovers begin leaving the wintering grounds to migrate back to breeding sites. Northward migration peaks in late March, and by late May most birds have left the wintering grounds. Migration is poorly understood.

Behavioral observations of piping plovers on the wintering grounds suggest that they spend the majority of their time foraging. Primary prey for wintering plovers includes polychaete marine worms, various crustaceans, insects, and sometimes bivalve mollusks. They peck prey from on top of or just beneath the sediment. Foraging usually is on moist or wet sand, mud, or fine shell. In some cases, a mat of blue-green algae may cover this substrate. When not foraging, plovers can be found in aggressive encounters, roosting, preening, bathing, and moving among available habitat locations. The habitats used by wintering birds include beaches, mud flats, sand flats, algal flats, and washover passes (areas where breaks in the sand dunes result in an inlet). Wintering plovers are dependent on a mosaic of habitat patches, and move among these patches depending on local weather and tidal conditions.

Primary constituent elements essential for the conservation of wintering piping plovers are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. Critical habitat units consist of all land from Mean Lower Low Water to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is the only species of sea eagle that regularly occurs on the North American continent (USDOI, FWS, 1984). Its range extends from central Alaska and Canada to northern Mexico. The bulk of the bald eagle's diet is fish, though it will opportunistically take birds, reptiles, and mammals (USDOI, FWS, 1984). The general tendency is for winter breeding in the South with a progressive shift toward spring breeding in northern locations. In the southeast, nesting activities generally begin in early September; egglaying begins as early as late October and peaks in late December. The historical nesting range of the bald eagle within the southeastern U.S. included the entire coastal plain and shores of major rivers and lakes. There are certain general elements that seem to be consistent among nest site selection. These include (1) the proximity of water (usually within ½ mi) and a clear flight path to a close point on the water, (2) the largest living tree in a span, and (3) an open view of the surrounding area. The proximity of good perching trees may also be a factor in site selection. An otherwise suitable site may not be used if there is excessive human activity in the area. The current range is limited, with most breeding pairs occurring in peninsular Florida and Louisiana, and some in South Carolina, Alabama, and east Texas. Sporadic breeding takes place in the rest of the southeastern states and in the Florida Panhandle. One hundred twenty nests have been found in Louisiana; only 3 nests occurred within 5 mi of the coast (Patrick, 1997). The bald eagle was listed as endangered in 1967 in response to the declines due to DDT and other organochlorines that affected the species' reproduction (USDOI, FWS, 1984). In July 1995, the FWS reclassified the bald eagle from endangered to threatened in the lower 48 states (*Federal Register*, 1995b).

Brown Pelican

The brown pelican (*Pelicanus occidentalis*) is one of two pelican species in North America. It feeds entirely upon fish captured by plunge diving in coastal waters. Organochlorine pesticide pollution apparently contributed to the endangerment of the brown pelican. In recent years, there has been a marked increase in brown pelican populations along its entire former range. The population of brown pelicans and their habitat in Alabama, Florida, Georgia, North and South Carolina, and locations northward along the Atlantic Coast were removed from the endangered species list in 1985. Within the remainder of the range, which includes coastal areas of Mississippi where populations are not secure, the brown pelican remains listed as endangered (*Federal Register*, 1985a). The brown pelican is not federally listed in Florida, but it is listed by the State as a species of special concern.

Southeastern Snowy Plover

The following account of the southeastern snowy plover (*Charadrius alexandrius tenuirostris*) is taken from Gore and Chase (1989). The species nests on coastal sand beaches and interior alkali flats. Observed nest sites in the Florida Panhandle ranged from the Florida-Alabama border eastward beyond

Little St. George. At some locations more than 1.5 breeding pairs/km were counted. Most nests are near the front dune and close to vegetation. Vehicles and humans may cause nest failure. Human activity is absent near the beaches of Eglin West and Eglin East because Eglin Air Force Base has restricted areas. This may account for a high nest count in part of this area.

3.2.6 Essential Fish Habitat and Fish Resources

3.2.6.1 Essential Fish Habitat

Healthy fish resources and fishery stocks depend on essential fish habitat (EFH) waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. Due to the wide variation of habitat requirements for all life history stages for managed species, EFH has been identified throughout the GOM, including all coastal and marine waters and substrates from the shoreline to the seaward limit of the EEZ.

There are Fishery Management Plans (FMP) in the GOM region for shrimp, red drum, reef fishes, coastal migratory pelagics, stone crabs, spiny lobsters, coral and coral reefs, billfish, and highly migratory species (HMS). The GOM Fishery Management Council (FMC*) Generic Amendment for Addressing Essential Fish Habitat Requirements* (1998) amends the first seven FMP's listed above, identifying estuarine/inshore and marine/offshore EFH for over 450 managed species (about 400 in the Coral FMP). Although not part of the GOM Fishery Management Council's FMP's, separate Fishery Management Plans have been finalized by NMFS for Atlantic tunas, swordfish and sharks, and the Atlantic billfish fishery (USDOC, NMFS, 1999a and b). The Gulf of Mexico FMC *Generic Amendment* also identifies threats to EFH and makes a number of general and specific habitat preservation recommendations for pipelines and oil and gas exploration and production activities within State waters and OCS areas.

The fish habitat in the MP 299 area is soft sediment bottom composed of various proportions of sand silt and clay. The physical structures located in the MP 299 complex area are the most significant EFH in the block. A total of 23 structures are in the block, 17 of which are located in very close proximity to each other. These structures represent a significant amount of hard substrate and artificial reef complex.

3.2.6.2 Description of Fish Resources

The GOM supports a great diversity of fish resources that are related to variable ecological factors, including salinity, water quality, primary productivity, and bottom type. These factors differ widely across the GOM and especially between the inshore and offshore waters. Characteristic fish resources are associated with the various environments and are not randomly distributed. High densities of fish resources are associated with particular habitat types. Approximately 46 percent of the southeastern United States' wetlands and estuaries important to fish resources are located within the GOM (Mager and Ruebsamen, 1988). Consequently, estuary-dependent species of finfish and shellfish dominate the fisheries. Nearly all species significantly contributing to the GOM's commercial catches are estuarine dependent. Even the offshore demersal species are indirectly related to the estuaries because they influence the productivity and food availability on the continental shelf (Darnell and Soniat, 1979; Darnell, 1988).

About 10 percent of finfish in the GOM are not directly dependent on estuaries during their life history. This group can be divided into demersal and pelagic species. Coastal pelagics would include mackerels, cobia, bluefish, amberjack, and dolphin. These species move seasonally. Deep waters of the GOM appear to be a significant spawning area for other commercially important pelagic species such as tuna and swordfish. Information on fish larvae from deepwater areas of the GOM is limited.

Specific to this action, MP 299 is located approximately 13 nmi from the nearest shoreline (Mississippi River Delta) to the west-southwest at a water depth of about 63 m (206 ft). The nearest hard/live-bottom features are approximately 31 nmi to the east-northeast. Although there are a number of species managed by the GOMFMC that could occur in the vicinity of MP 299, without any hard substrate, their abundance would be expected to be very low if they occurred at all. Fish species of principal interest in this area are the oceanic pelagic species. These species (tuna, sharks, swordfish, and billfish) are managed directly by NOAA Fisheries. Due to the attraction effect on highly migratory species by any structure in open water, HMS abundance would be expected to be higher as a result of the presence of the MP 299 structures.

3.2.6.2.1 Oceanic Pelagics (including Highly Migratory Species)

Common oceanic pelagic species include tunas, marlins, sailfish, swordfish, dolphins, wahoo, and mako sharks. In addition to these large predatory species, there are halfbeaks, flyingfishes, and driftfishes (Stromateidae). Lesser-known oceanic pelagics include opah, snake mackerels (Gempylidae), ribbonfishes (Trachipteridae), and escolar.

Oceanic pelagic species occur throughout the GOM, especially at or beyond the shelf edge. Oceanic pelagics are reportedly associated with mesoscale hydrographic features such as fronts, eddies, and discontinuities. Fishermen contend that yellowfin tuna aggregate near sea-surface temperature boundaries or frontal zones; however, Power and May (1991) found no correlation between longline catches of yellowfin tuna and sea-surface temperature (defined from satellite imagery) in the GOM. The occurrence of bluefin tuna larvae in the GOM associated with the Loop Current boundary and the Mississippi River discharge plume is evidence that these species spawn in the GOM (Richards et al., 1989). Many of the oceanic fishes associate with drifting Sargassum, which provides forage areas and/or nursery refugia.

Additional information on individual species of finfish and shellfish and their life histories can be found in Sections III.B.7. and III.C.2. of the Final EIS for Central GOM Lease Sales 169, 172, 175, 178, and 182 (USDOI, MMS, 1997).

3.2.6.2.2 Mesopelagics (midwater fishes)

Mesopelagic fish assemblages would not occur in the MP 299 area due to the relatively shallow depths of 60-68 m; however, deep, continental slope water is located a short distance (less than 15 nmi) to the south and southwest. Mesopelagic fish assemblages in the GOM are numerically dominated by myctophids (lanternfishes), with gonostomatids (bristlemouths) and sternoptychids (hachetfishes) common but less abundant in collections. These fishes make extensive vertical migrations during the night from mesopelagic depths (200-1,000 m or 656-3,280 ft) to feed in higher, food-rich layers of the water column (Hopkins and Baird, 1985). Mesopelagic fishes are important ecologically because they transfer substantial amounts of energy between mesopelagic and epipelagic zones over each diel cycle.

Bakus et al. (1977) analyzed lanternfish distribution in the western Atlantic Ocean and recognized the GOM as a distinct zoogeographic province. Species with tropical and subtropical affinities were most prevalent in the GOM lanternfish assemblage. This was particularly true for the Eastern Gulf, where Loop Current effects on species distribution were most pronounced. Gartner et al. (1987) collected 17 genera and 49 species of lanternfish in trawls fished at discrete depths from stations in the southern, Central, and Eastern Gulf. The most abundant species in decreasing order of importance were *Ceratoscopleus warmingii*, *Notolychus valdiviae*, *Lepidophanes guentheri*, *Lampanyctus alatus, Diaphus dumerili*, *Benthosema suborbitale*, and *Myctophum affine*. Ichthyoplankton collections from oceanic waters yielded high numbers of mesopelagic larvae as compared with larvae of other species (Richards et al., 1989). Lanternfishes generally spawn year-round, with peak activity in spring and summer (Gartner, 1993).

3.2.7 Threatened and Endangered Fish (Listed and proposed for listing)

3.2.7.1 Gulf Sturgeon

The Gulf sturgeon (*Acipenser oxyrhynchus desotoii*) is the only listed threatened fish species in the GOM. In 1991, the Gulf sturgeon was listed as threatened and subsequently, a recovery plan was developed to ensure the preservation and protection of Gulf sturgeon spawning habitat (Gulf Sturgeon Recovery/Management Task Team, 1995). The decline of the Gulf sturgeon is believed to be due to overfishing, the damming of coastal rivers, and the degradation of water quality (Barkuloo, 1988). A subspecies of the Atlantic sturgeon, Gulf sturgeon are classified as anadromous, with immature and mature fish participating in freshwater migrations. Gill netting and biotelemetry have shown that subadults and adults spend 8-9 months each year in rivers and 3-4 of the coolest months in estuaries or Gulf waters. Sturgeon less than about two years old remain in riverine habitats and estuaries throughout the year (Clugston, 1991). According to Wooley and Crateau (1985), Gulf sturgeon occur in most major riverine and estuarine systems from eastern Louisiana to the Suwannee River, Florida, and marine waters of the Central and Eastern GOM south to Tampa Bay. Important waters west-to-east and north-to-south are Biloxi Bay, Pascagoula Bay, Mobile Bay, Choctawhatchee Bay, the Apalachicola River, the Ochlockounee River, and the Suwannee River.

It is not possible, at present, to estimate the size of the Gulf sturgeon populations throughout the range of the subspecies. Estimates have been completed recently of the Suwannee, Apalachicola, and West Pearl Rivers, and the first year of a 3-year study has been completed on the Choctawhatchee River. Surveys have not been conducted yet on the remaining river systems that historically contained Gulf sturgeon.

Gulf sturgeon historically spawned in major rivers of Alabama, Mississippi, and the northern Gulf Coast of Florida. Until recently only two spawning sites were known, both in the Suwannee River in Florida. Eggs have now been discovered in six locations within the Choctawhatchee River system in Florida and Alabama (Patrick, 1998). In spring, large subadults and adults that migrate from the estuaries or the Gulf into the passes of major rivers and feed primarily on lancelets, brachiopods, amphipods, polychaetes, and globular molluscs. Small sturgeon that remain in river passes during spring feed on amphipods, shrimp, isopods, oligochaetes, and aquatic insect larvae (Clugston, 1991). During the riverine stage, adults cease feeding, undergo gonadal maturation, and migrate upstream to spawn. Spawning occurs in freshwater reaches of the rivers, over coarse substrate in deep areas, or holes with hard bottoms and some water current (Sulak and Clugston, 1998; Fox et al., 2000). Females lay large numbers of eggs. The fecundity range of large adult females is about 4,000,000-7,000,000 eggs. These eggs are adhesive and will attach to rocks, vegetation, or other objects. They hatch in about 1 week depending upon the temperature of the water.

Gulf sturgeon in the rivers and estuaries are sampled through capture with nets suspended from floats in the rivers and river mouths. Gill nets with mesh wide enough not to close the very large opercula are used. Fish biologists use conventional fishing gear, tag-recapture techniques, and ultrasonic and radio telemetry to track migration up and down the rivers and to and from the estuaries and the Gulf. Migration from the estuaries to the sea is recorded in fall when the fish disappear from river mouths and estuaries. No capture or tracking is feasible in the open Gulf just when the fish migrate into it because cold fronts come every 2-3 days, with up to 9-ft seas. Conditions are dangerous for the size of vessel required, and the paths traveled in the open Gulf cannot be followed beyond the estuaries. Thus, the offshore winter distribution of Gulf sturgeon relative to the location of the activities under the proposed action is unknown. However, there are no reports of this species in Federal waters (Sulak, 1997).

Tagging studies suggest that Gulf sturgeon exhibit a high degree of river fidelity. Stabile et al. (1996) analyzed Gulf sturgeon populations from eight drainages along the GOM for genetic diversity. He noted significant differences among Gulf sturgeon stocks and suggested that they displayed region-specific affinities and may exhibit river-specific fidelity. Stabile et al. (1996) identified four region-specific or river-specific stocks (from west to east): (1) the Pearl River, Louisiana, and Pascagoula River, Mississippi; (2) the Escambia and Yellow Rivers, Florida; (3) the Choctawhatchee River, Florida; and (4) the Apalachicola Ochlockonee, and Suwannee Rivers, Florida.

Sturgeons are bottom suction feeders that have ventrally located, highly extrusible mouths. The sturgeon head is dorsoventrally compressed with eyes dorsal so benthic food under the sturgeon's mouth will not be visible. However, they have taste barbels, like catfish, to detect prey. The barbels are also useful for feeding in high-order streams when the streams are muddy. However, Gulf sturgeons are common in clear-water streams also. The barbels may locate food at night when the visibility of prey is low from any direction.

A proposed rule to designate critical habitat for the Gulf sturgeon was published in a *Federal Register* (39105 – 39199) notice on June 6, 2002. The FWS is proposing critical habitat for the Gulf sturgeon that will include 14 geographic areas among the Gulf of Mexico rivers and tributaries. These 14 geographic areas (units) encompass approximately 2,544 river kilometers (1,580 river miles) and 6,042 km^2 (2,333 mi^2) of estuarine and marine habitat.

Critical habitat unit river systems (with tributaries in parentheses) are Pearl (Bogue Chitto), Pascagoula (Leaf, Bowie, Chickasawhay, and Big Black Creek), Escambia (Sepulga and Conecuh), Yellow (Blackwater and Shoal), Choctawhatchee (Pea), Apalachicola (Brother), and Suwannee (Withlacoochee).

Critical habitat unit estuarine and marine systems are Lake Borgne, Little Lake, Lake Pontchartrain, Lake St. Catherine, The Rigolets, Mississippi Sound, Mississippi nearshore Gulf, Pensacola Bay, Santa Rosa Sound, nearshore Gulf of Mexico, Choctawhatchee Bay, Apalachicola Bay, and Suwannee Sound.

3.2.7.2 Smalltooth Sawfish

In November 1999, NOAA Fisheries (formerly National Marine Fisheries Service) received a petition from the Center for Marine Conservation requesting that this species be listed as endangered under the Endangered Species Act (ESA). NOAA Fisheries completed a status review for smalltooth sawfish (*Pristis pectinata*) in December 2000, and published a proposed rule to list the U.S. population of this species as endangered under the ESA on April 16, 2001. The following information is excerpted from NOAA Fisheries Office of Protected Resources web site (http://www.nmfs.noaa.gov/prot_res/species/fish/Smalltooth_sawfish.html) and the status review prepared by NOAA Fisheries. The December 2000 status review is also available for downloading at the cited website.

Sawfish, like sharks, skates and rays, belong to a class of fish called elasmobranchs, whose skeletons are made of cartilage. Sawfish are actually modified rays with a shark-like body, and gill slits on their ventral side. Sawfish get their name from their "saws"—long and flat snouts edged with pairs of teeth that are used to locate, stun, and kill prey. Their diet includes mostly fish but also some crustaceans.

The smalltooth sawfish is one of two species of sawfishes that inhabit U.S. waters. The smalltooth sawfish commonly reaches 18 ft (5.5 m) in length and may grow to 25 ft (7 m). Little is know about the life history of these animals, but they may live up to 25-30 years and mature after about 10 years. Like many elasmobranchs, the smalltooth sawfish is ovoviviparous, meaning the mother holds the eggs inside of her until the young are ready to be born, usually in litters of 15-20 pups.

In the United States, the smalltooth sawfish is generally an inhabitant of inshore bars, mangrove edges, and seagrass beds, but may be occasionally found in deeper neritic waters. The smalltooth sawfish was said to be commonly found in shallow water throughout the northern Gulf of Mexico, especially near river mouths and in large bays and was common in peninsular Florida (Walls, 1975). Historical records indicate that the smalltooth sawfish have been found in the lower reaches of the Mississippi and St. Johns Rivers and the Indian River lagoon system. Individuals have also historically been reported to migrate northward along the Atlantic seaboard in the warmer months. Estimating from the latitudinal limits within which they are year-round residents and from the summer-winter temperatures of the Carolinian waters that they visit during the warmer half of the year, the lower thermal limit to their normal range is probably about 16-18ºC.

Bigelow and Schroeder (1953) report that sawfish in general subsist chiefly on whatever small schooling fish may be abundant locally, such as mullets and the smaller members of the herring family. Bigelow and Schroeder also reported that they feed to some extent on crustacea and other bottom dwelling inhabitants. The smalltooth sawfish is noted as often being seen “stirring the mud with its saw” to locate its prey. Bigelow and Schroeder noted the smalltooth sawfish has been reported to attack schools of small fishes by slashing sideways with its saw and then eating the wounded fish.

The smalltooth sawfish in the northern and western Gulf of Mexico have become rare in the last 30 years. Expansion of commercial fishing and an increase in scientific exploratory fishing in the Gulf of Mexico in the 1950’s and 1960’s produced many records of smalltooth sawfish, primarily from the northwestern Gulf in Texas, Louisiana, Mississippi, and Alabama. Sawfish catches have historically been reasonably common in Texas, Louisiana, and Mississippi. Reports of captures have dropped dramatically and the trend of decline in the region is apparent. Louisiana, an area of historical localized abundance, has experienced a marked decline in sawfish landings and landings per unit effort (Simpfendorfer, 2000). The lack of smalltooth sawfish records since 1984 from the area west of peninsular Florida is a clear indication of decline of the species abundance in the northwestern Gulf. Peninsular Florida has been the U.S. region with the largest numbers of capture records of smalltooth sawfish and apparently is the only area that historically hosted the species year-round. Although no longer common, smalltooth sawfish were once characteristic and prominent elements of the inshore Florida ichthyofauna. NOAA Fisheries does not have information supporting that there is a population in Mexico. Quantitative data are not available to conduct a formal stock assessment for smalltooth sawfish.

3.2.8 Alabama, Choctawhatchee, St. Andrew, and Perdido Key Beach Mice

Hall (1981) recognizes 16 subspecies of field mouse (*Peromyscus polionotus*), 8 of which are collectively known as beach mice. Of Gulf Coast subspecies, the Alabama, Perdido Key, Choctawhatchee, and St. Andrew beach mice occupy restricted habitats in the mature coastal dunes of

Florida and Alabama and are listed as endangered (USDOI, FWS, 1987). Populations have fallen to levels approaching extinction. For example, in the late 1980's, estimates of total remaining beach mice were less than 900 for the Alabama beach mouse, about 80 for the Perdido Key beach mouse, and about 500 for the Choctawhatchee beach mouse. All four mice are listed as endangered: the Alabama subspecies in Alabama, the Perdido Key subspecies in both Alabama and Florida, and the St. Andrew and Choctawhatchee subspecies in Florida. The Alabama, Perdido Key, and Choctawhatchee beach mice were listed as endangered in the 1980's. The St. Andrew beach mouse was not listed as endangered until 1998 and is the only listed subspecies without designated critical habitat. Continued monitoring of populations of all subspecies along the Gulf Coast between 1985 and the present indicates that approximately 52 km (32.3 mi) of coastal dune habitat are now occupied by the four listed subspecies (1/3 of historic range). The Santa Rosa beach mouse occupies Santa Rosa Island of the Gulf Islands National Seashore. It is not listed as threatened or endangered and is not analyzed in this EA.

The *Federal Register* (1985b) cites habitat loss as the primary cause for declines in populations of beach mice. The reduced distribution and numbers of the beach mouse subspecies have continued because of multiple habitat threats over their entire range (coastal real estate development and associated human activities, military activities, coastal erosion, severe storms, and catastrophic effects of hurricanes). Destruction of Gulf Coast sand dune ecosystems for commercial and residential development has destroyed about 60 percent of the original beach mouse habitat.

The inland extent of the habitat may vary depending on the configuration of the sand dune system and the vegetation present. There are commonly several rows of dunes paralleling the shoreline and within these rows there are generally three types of microhabitat. First, the frontal dunes are sparsely vegetated with widely scattered coarse grasses including sea oats (*Uniola paniculata*), bunch *grass (Andropogon maritimus*), and beach grass (*Panicum amarum* and *P. repens*), and with seaside *rosemary (Ceratiola ericoides*), beach morning glory (*Ipomoea stolonifera*), and railroad vine (*I. pes-caprae*). Secondly, frontal dune grasses appear as a lesser component on the higher rear scrub dunes, which support the growth of slash pine (*Pinus elliotti*), sand pine (*P. clausa*), and scrubby shrubs and oaks, including yaupon (*Ilex vomitoria*), marsh elder (*Iva* sp.), scrub oak (*Quercus myrtifolia*), and sand-live *oak (Q. virginiana var. maritima*). Thirdly, the interdunal areas contain sedges (*Cyperus* sp.), rushes *(Juncus scirpoide*s), and salt grass (*Distichlis spicata*). Beach mice are restricted to the coastal barrier sand dunes along the Gulf.

Optimal overall beach mouse habitat is currently thought to be comprised of a heterogeneous mix of interconnected habitats including primary dunes, secondary dunes, scrub dunes, and interdunal areas. Beach mice dig burrows mainly in the primary, secondary, and interior scrub dunes where the vegetation provides suitable cover. Most beach mouse surveys conducted prior to the mid-1990's were in primary and secondary dunes because investors assumed they were the preferred habitat of beach mice. A limited number of surveys in scrub dunes and other interior habitat resulted in less knowledge of the distribution and relative abundance there. In coastal environments, the terms "scrub" and "scrub dune" refer to habitat or vegetation communities adjacent to and landward of primary and secondary dune types where scrub oaks are visually dominant. Interior habitat can include vegetation types such as grass-like forbs (forbs are the herbs other than grasses). There is substantial variation in scrub oak density and cover within and among scrub dunes throughout the ranges of beach mice. The variation, an ecological gradient, is represented by scrub oak woodland with a relatively closed canopy at one end of a continuum. At the other extreme of the gradient, scrub dunes are relatively open with patchy scrub ridges and intervening swales or interdunal flats dominated by herbaceous plants. For the three subspecies discussed above that have critical habitat areas (Alabama, Perdido Key, and Choctawhatchee beach mice), the major constituent elements that are known to require special management considerations or protection are dunes and interdunal areas and associated grasses and shrubs that provide food and cover (USDOI, FWS, 1985a and b).

For the most part, beach mice feed nocturnally in the dunes and remain in burrows during the day. Their diets vary seasonally but consist mainly of seeds, fruits, and insects (Ehrhart, 1978; Moyers, 1996). Changes in availability of foods result in changes in diets between seasons and account for variability of seasonal diets between years. Autumn diets of beach mice consist primarily of seeds and/or fruits of sea oats, evening primrose (*Oenothera humifusa*), bluestem (*Schizachyrium maritimum*), and dune spurge (*Chamaesyce ammannioides*). Sea oats and beach pea (*Galactia sp.*) dominate winter diets. Spring diets primarily consist of dune toadflax (*Linaria floridana*), yaupon holly (*Ilex vomitoria*), seashore *elder (Iva* *imbricata*), and greenbrier (*Smilax* sp.). Summer diets are dominated by evening primrose, insects, dune toadflax, and ground cherry (*Physalis augustifolia*) (Moyers, 1996). Management practices designed to promote the recovery of dune habitat, increase food sources, and enhance habitat heterogeneity may aid in recovery of beach mouse populations.

In wild populations, beach mice have an average life span of about nine months. Males and females reach adulthood and are able to reproduce at approximately 35 days of age. Females can nurse one litter while pregnant with another litter. From captive colonies we know that litter size is 1-8 with an average of four. Young are weaned in 2-3 weeks and are generally on their own 1-2 weeks later.

Hurricanes are a natural environmental phenomenon affecting the Gulf Coast, and beach mice have evolved and persisted in coastal dune habitats since the Pleistocene. Hurricanes are part of a repeated cycle of destruction, alteration, and recovery of dune habitat. The extensive amount of predevelopment coastal dune habitat along the Gulf Coast allowed beach mice to survive even the most severe hurricane events to repopulate the habitat as it recovered. Beach mice are affected by the passage of hurricanes along the northwest Florida and Alabama Gulf Coast. Since records on hurricane intensity began in 1885, 32 hurricanes have struck northwest Florida within the historic ranges of the four Gulf Coast beach mouse subspecies (Williams and Duedall, 1997; Doehring et al., 1994; Neumann et al., 1993). In addition, since 1899, 11 hurricanes have hit the coast of Alabama.

Hurricanes generally produce damaging winds, storm tides and surges, and rain that erode barrier island, peninsular, and mainland beaches and dunes. Following hurricanes, the dune system begins a slow natural repair process that may take 3-20 years depending on the magnitude of dune loss (Salmon et al., 1982). During this period, sea oats and pioneer dune vegetation become established, collecting sand and building dunes. As the dunes grow and become stable, other successional dune vegetation colonizes the area (Gibson and Looney, 1994), and beach mouse food sources and habitats are reestablished.

Tropical storms periodically devastate Gulf Coast sand dune communities, dramatically altering or destroying habitat, and either drowning beach mice or forcing them to concentrate on high scrub dunes where they are exposed to predators. The rate of recovery of food supplies for beach mice is variable with some areas adversely affected for an extended period of time by a hurricane and post-hurricane conditions. How a hurricane affects beach mice depends primarily on its characteristics (winds, storm surge, and rainfall), the time of year (midsummer is the worst), where the eye crosses land, population size, and impacts to habitat and food sources. The interior dunes and related access corridors may be essential habitats for beach mice following survival of a hurricane. For the three subspecies discussed above that have critical habitat areas (Alabama, Perdido Key, and Choctawhatchee beach mice), the major constituent elements that are known to require special management considerations or protection are dunes and interdunal areas and associated grasses and shrubs that provide food and cover (USDOI, FWS, 1985a and b).

Beach mice have existed in an environment subject to recurring hurricanes, but tropical storms and hurricanes are now considered to be a primary factor in the beach mouse's decline. It is only within the last 20-30 years that the combination of habitat loss to beachfront development, isolation of remaining habitat blocks and beach mouse populations, and destruction of remaining habitat by hurricanes have increased the threat of extinction of several subspecies of beach mice.

Reasons for Current Status

Beachfront development continues to be the greatest threat. The combinations of habitat loss to beachfront development, isolation of remaining habitat blocks and beach mouse populations, and destruction of remaining habitat by hurricanes have increased the threat of extinction of several subspecies of beach mice. Habitat reduction and fragmentation have affected the ability of beach mice to quickly recover following tropical storms and have become a major threat to the recovery of the three subspecies.

3.3 Socioeconomic Conditions and Other Concerns

The addition of any new human activity, such as the proposed action to operate an offshore waste disposal facility at MP 299, can affect local communities in a variety of ways. Typically, these effects are in the form of people and money, which can translate into changes in local social and economic institutions and land use. In this section, MMS describes the current socioeconomic analysis area baseline in order to differentiate the effects of the proposed action.

3.3.1 Socioeconomic Analysis Area

The MMS defines the analysis area for potential impacts on population, labor, and employment as that portion of the GOM coastal zone whose social and economic well-being (population, labor, and employment) is directly or indirectly affected by the OCS oil and gas industry (Figure B-4). Geographically the analysis area is defined as all coastal counties and parishes along the U.S. portion of the GOM and any inland counties and parishes where offshore oil and gas activities are known to exist, offshore-related petroleum industries are established, or one or more counties or parishes within a Metropolitan Statistical Area (MSA) are on the coast. For examination purposes, MMS has divided the analysis area into coastal subareas. The counties and parishes included in each coastal subarea are presented in Figure B-4. With respect to the proposed action, the focal area includes coastal subareas TX-2, LA-2, and LA-3, areas where coastal infrastructure has the potential to be impacted.

3.3.2 Land Use and Infrastructure

The following summarizes the analysis area's land use and infrastructure. For a more detailed description, including figures and tables, please refer to Chapter 3.3.3 (Human Resources and Land Use) in Gulf of Mexico OCS Oil and Gas Lease Sales 2003-2007: Central Planning Area Sales 185, 190, 194, 198, and 201; Western Planning Area Sales 187, 192, 196, and 200, Draft Environmental Impact Statement, Volumes I and II (USDOI, MMS, 2002) (also known as "Multisale"). The counties and parishes along the coasts of Texas and Louisiana represent some of the most valuable coastline in the U.S. The Texas coast is a mixture of urban, industrial, recreational beaches, wetlands, forests, and agricultural areas. Louisiana's coastline is mostly vast areas of wetlands; some small communities and industrial areas extend inward from the wetlands. Multisale Figure 3-10 (USDOI, MMS, 2002; Volume 2) illustrates the analysis area's key infrastructure. Several international and regional airports are located throughout the analysis area. One major interstate (I-10) traverses the area along the inner margin of the coastal zone while six interstates access the area longitudinally. There are numerous highways into and across the analysis area. The area's railroad configuration is similar to the highway system. An extensive maritime industry exists in the analysis area. Figure B-5 shows the major ports and domestic waterways in the focus area, while Tables B-4 and B-5 present the 1999 channel depth, number of trips, and freight traffic of OCS-related waterways. Fourteen of the 50 leading U.S. ports (based on millions of short tons in 1999) are located on the GOM (U.S. Dept. of the Army, 2001).

3.3.3 Current Economic Baseline Data

The industry's ability to economically explore and develop OCS resources would impact the potential volume of waste available to be disposed at the proposed waste facility. Therefore, a description of the industry's economic indicators follows.

During September 2001, natural gas futures plummeted below $2 per thousand cubic feet for the first time since April 1999. Natural gas demand from manufacturers, which accounts for about a quarter of U.S. consumption, is down and a turnaround in the economy is not expected in the short term (Houston Chronicle On-line, 2001a). Although natural gas prices remain substantially below the $10/mcf high of two years ago, prices have moved moderately higher over the last six months. Futures prices for Henry Hub natural gas remain stable over the next 12 months with an average of $3.651/mcf (Oilnergy, 2002). Immediately following the September 11, 2001, terrorist attacks on the United States, oil and gold prices surged (COMTEX, 2001). Crude oil prices then dropped, taking their biggest hit in 10 years during September 2001 (Houston Chronicle On-line, 2001b). Oil prices have since moved moderately higher with a steeper increase since January 2002. Future prices for light sweet crude remain stable over the next 12 months with an average of $25.37/bbl (Oilnergy, 2002). Current crude oil and natural gas prices are above the economically viable threshold for drilling in the GOM.

New rig deliveries and orders are another indicator of the industry. Fifteen new rigs were delivered in 2000, three of which were speculative new builds. A survey by Lehman Brothers asked over 60 "leading experts" how many rig orders would be placed for 2001. The average of all the predictions was 13" (Greenberg, 2001). Offshore constructions for 2002 do not appear as strong (Greenberg, 2002).

Drilling rig use is employed by the industry as another barometer of economic activity. Utilization rates hovered around 90 percent or better for most of 2000 through May 2001 before beginning a downward spiral to a low of nearly 50 percent in November 2001. Since November, utilization rates have been slowly increasing; the GOM rig market appears to be stabilizing (One Offshore, 2001a). Offshore drilling rig day rates have remained flat or declined; too much excess rig capacity exists in the market for rates to increase significantly. In addition, the pace of deepwater drilling has slowed as royalty relief for shallow-water, deep-gas drilling has somewhat shifted the offshore drilling focus, putting downward pressure on day rates. More than a dozen deepwater rigs will reach the end of their current firm contract commitments this year, which may result in continued softness in rates for this rig market segment (Greenberg, 2002). A depressed offshore rig market historically has meant fewer offshore service vessels (OSV) working since demand for OSV's is positively correlated with demand for offshore rigs. In the past, as demand for rigs has decreased, the industry has offered break-even rates or lower on rigs and OSV's in an effort to increase utilization rates. This downturn though is different. Industry is dry-docking rigs and OSV's in order to increase day rates. While this strategy has worked for larger supply vessels, smaller crewboats have experienced both lower utilization and day rates (Greenberg, 2002).

Another indicator of the direction of the industry is the exploration and development (E&D) expenditures of the major oil and gas companies. After substantially cutting their E&D budgets during the 1998 and 1999 fiscal years, majors and independents increased their spending in 2000 and 2001. This trend is expected to change in 2002. Based on Salomon Smith Barney and Lehman Brothers' annual survey of major and independent U.S. oil and gas companies, 2002 E&D upstream spending is expected to drop 12 and 19 percent, respectively, over 2001 levels. The main reason for the expected cuts is low energy prices, particularly for natural gas. Because of the lower planned E&D spending, Salomon Smith Barney projects that GOM rig utilization will average 76 percent in 2002 (WorkBoat, 2002).

Lease sales are another indicator of the offshore oil and gas industry. Sales over the last several years have resulted in a relative increase in the number of blocks leased. In addition, recent lease sales show a continued interest in deep water and a renewed interest in shallow water due to new royalty relief provisions for shallow water natural gas.

3.3.4 Economic and Demographic Conditions

The analysis area's demographic and economic conditions are described in detail in Chapter 3.3.3 (Human Resources and Land Use) of the Multisale (USDOI, MMS, 2002). Multisale Tables 3-12 through 3-27 contain the analysis area's baseline projections for population, age, race and ethnic composition, education, employment, business patterns, income, and wealth over the life of the proposed action. These tables present the projections by coastal subarea, each GOM State, and the U.S. Projections through 2040 are based on the Woods and Poole "Complete Economic and Demographic Data Source" (Woods and Poole, 2001). These baseline projections assume the continuation of existing social, economic, and technological trends. Therefore, the projections include population and employment associated with the continuation of current patterns in OCS leasing activity as well as the continuation of trends in other industries important to the region. While the OCS industry may not be the dominant industry in a coastal subarea, it can be in a specific locale within a coastal subarea, causing that focal point to experience impacts.

3.3.5 OCS-Related Coastal Infrastructure

Unless otherwise indicated, the following information is from the MMS study, "Deepwater Program: OCS-Related Infrastructure in the Gulf of Mexico Fact Book" (Louis Berger Group, Inc., 2001). Multisale Table 4-8 (USDOI, MMS, 2002; Volume 2) shows the coastal infrastructure in the analysis area by coastal subarea.

The Gulf of Mexico OCS Region has one of the highest concentrations of oil and gas activity in the world. The offshore oil and gas industry has experienced dramatic changes over recent years, particularly since 1981. Historically, most of the activity has been concentrated on the continental shelf off the coasts of Texas and Louisiana. Future activity is expected to extend into progressively deeper waters. The high level of offshore oil and gas activity in the GOM is accompanied by an extensive development of onshore service and support facilities. The major types of onshore infrastructure include gas processing plants, navigation channels, oil refineries, pipelines and pipeline landfalls, pipecoating and storage yards, platform fabrication yards, separation facilities, service bases, terminals, and landfills and disposal sites for drilling and production wastes. These support industries employ thousands of workers and are responsible for billions of dollars in economic activity in the analysis area. Virtually all of these support industries are found adjacent to ports.

The move into deep water has increased activity and has led to a significant transformation for some contractors. Since ports with sufficient draft to accommodate deepwater-servicing equipment are limited, onshore effects appear to be concentrated in a few communities. This contrasts with earlier, nearer-shore developments that are supported by many ports and coastal communities.

3.3.5.1 Service Bases

All offshore personnel, supplies, and equipment must come from the land-based support industry. All of those services must pass through a port to reach the drilling site. A service base is a community of businesses that load, store, and supply equipment, supplies and personnel needed at offshore work sites. While some service bases focus primarily on supplies, others focus on transportation. A service base primarily serves the OCS planning area and coastal subarea in which it is located, but it may also provide significant services for the other OCS planning areas and coastal subareas. As OCS operations have progressively moved into deeper waters, larger vessels with deeper drafts have been phased into service, mainly for their greater range of travel, greater speed of travel, and larger carrying capacity. Service bases with the greatest appeal for deepwater activity have several common characteristics: strong and reliable transportation system; adequate depth and width of navigation channels; adequate port facilities; existing petroleum industry support infrastructure; location central to OCS deepwater activities; adequate worker population within commuting distance; and insightful strong leadership. Typically, deeper draft service vessels require channels with depths of 6-8 m.

Multisale Table 3-33 (USDOI, MMS, 2002; Volume 2) shows the 50 service bases currently used for the OCS. The proposed action is expected to impact the areas of Port Fourchon, Morgan City, and Venice, Louisiana, which are the designated service bases for the proposed action, and Port Arthur, Texas where most OCS waste currently is disposed. In addition to servicing the offshore, several of the service bases are commercially oriented ports. Based on numbers provided by Offshore Data Services, the ports of Cameron, Fourchon, Morgan City, and Venice, Louisiana, service over 81 percent of all GOM mobile rigs and over 91 percent of all deepwater rigs (One Offshore, 2001b). With respect to shallow-water platforms, Cameron, Fourchon, Intracoastal City, and Morgan City, Louisiana, service 55 percent of the CPA platforms, the market area for the proposed waste disposal facility. Fourchon, Morgan City, and Venice, Louisiana, service 84 percent of the CPA deepwater platforms.

The following are profiles of the three designated service bases for the proposed action. An effort has been made to describe their operational structure as well as to describe their facilities and equipment.

Port Fourchon, Louisiana

Port Fourchon, Louisiana, located at the mouth of Bayou Lafourche, is one of the main service-supply bases for offshore oil and gas exploration and development in the GOM. Technological advances and the passage of the 1995 Deep Water Royalty Relief Act have resulted in the rise of deepwater exploration, which in turn has caused Port Fourchon to become one of the OCS Program's focal points; the port services 90 percent of the Gulf's deepwater activity. Over 82,500 offshore workers use the port for helicopter transportation each year, while approximately 170 OCS-related vessels a day travel in and out of the port. In addition to over 130 oil- and gas-related businesses, the Louisiana Offshore Oil Port (LOOP) facilities are located at the port. LOOP is the only offshore oil terminal in the United States; it transports an estimated 13-15 percent of the Nation's imported crude oil.

The port is connected to the Gulf Intracoastal Waterway (GIWW) via Bayou Lafourche, the Houma Navigation Canal, and the Barataria Waterway. The port's channel is 26 ft deep, enabling it to accommodate the larger OCS supply vessels. The port also houses a large number of docks with crane service, loading/unloading equipment, warehouses, refrigerated warehouse, and numerous storage yards. Improved and unimproved property is available.

Edison Chouest, in 1996, built their C-Port facility in Fourchon as a one-stop shopping service base for the offshore. The C-Port is a multi-services port terminal facility supplying offshore vessels that operate in the GOM. The facility can load/offload deck cargoes, fuel, water, cements, barites, liquid muds, and completion fuels simultaneously. These services are provided under the protection of a covered building, eliminating weather and darkness, while improving safety and efficiency, making it a highly cost-effective, cost-saving solution (Edison Chouest, 2001). Prior to C-Port, it took 2-3 days to service a vessel; today, service time is down to a few hours. In addition, offshore companies need to lease fewer service boats because of the larger, technologically advanced ships that Chouest is building. In 1999 Chouest completed a second C-Port at Port Fourchon—C-Port 2. Together, C-Port and C-Port 2 are servicing 90 percent of the deepwater activity. The success of the C-Port caused Port Fourchon to emerge as the deepwater service-base port for the OCS. To service the WPA and northern Mexico, Chouest has started constructing a C-Port in Galveston, Texas. Services at the new Texas C-Port should commence at the end of 2002 or the beginning of 2003. In order to service the EPA, Chouest has started scouting sites for a C-Port in either Pascagoula, Mississippi, or Mobile/Theodore, Alabama.

While location on the GOM is an advantage to Port Fourchon, it has limited water access to major metropolitan centers. In addition, the two-lane Louisiana Highway 1 (LA Hwy 1), the ports only access, and the lack of rail access are major impediments for the port. LA Hwy 1, largely a rural, substandard two-lane road, is the only land-based transportation route to the port. In 1995 LA Hwy 1 was selected as part of the National Highway System (NHS) because of its intermodal link to this Nation’s energy supply. The NHS Act designates roads that are critical for the economy, defense, and mobility of the nation. In December 2001, Congress designated LA Hwy 1 as one of only 44 high-priority corridors in the U.S. based on its significance to the Nation’s energy infrastructure.

The focusing of offshore service activities at Port Fourchon has created significant stresses to LA Hwy 1. Results from a MMS study on the impacts of expanding OCS activities in south Lafourche Parish (Port Fourchon) estimated a 3-6 percent growth in daily vehicle traffic along LA Hwy 1. Actual 2000 growth was 24 percent; the national average is 2-5 percent. Over 1,000 OCS supply and equipment trucks travail LA Hwy 1 to the port each day. In addition, LA Hwy 1 serves as an evacuation and oil-spill-response route for offshore. The study indicated the level of services provided by LA Hwy 1 will decline significantly through time. Furthermore, statistics from the Louisiana Department of Transportation and Development (DOTD) reveal LA Hwy 1 is twice as deadly as any similar class highway in the state.

Exacerbating the traffic problems on LA Hwy 1 are delays caused by the six bridge openings necessary to accommodate barge traffic on Bayou Lafourche. Fifty percent of all oil and gas materials brought to Port Fourchon is barged. On average each bridge is opened 16 times a day, resulting in bottlenecks, increased accidents, and a lower quality of life. Part of the increased barge traffic is from shipping an average of 600,0000 gallons of fresh water per day to the port for offshore activities. Deepwater expansion has significantly increased the demand for water, taxing the local freshwater district. Port Fourchon uses 30 percent of the local water supply but comprises only 1 percent of the serving population.

While the State and local governments have received revenue from the increased OCS activity at Port Fourchon, the cost of impacts from OCS operations have exceeded growth in the revenue stream. At present, the Louisiana DOTD, which manages LA Hwy 1, and Port Fourchon are completing a draft environmental impact statement (EIS) on a new four-lane highway. Funding is estimated at $650 million. The port and community leaders realize that efforts such as the Conservation and Reinvestment Act (CARA) will be vital in mitigating OCS impacts, but it will not completely cover the cost of a new highway. Monies from the Act are to be used for all offshore oil and gas impacts; consequently, only a portion can go to infrastructure projects.

The Port Fourchon facility to be used by Freeport is located in the C-Port 2 complex. The amount of land used by Trinity is about 2 ac (more or less) and has plan dimensions of about 200 x 400 ft. Current waste processing capacity for the management of cutting boxes and marine portable tanks is about 2,500 bbl per day. There is about 300 bbl of storage capacity onshore, exclusive of the barge capacity (Freeport, 2002).

Morgan City, Louisiana

The Port of Morgan City is located within the community of Morgan City in St. Mary Parish, Louisiana. With immediate access to I-49, it is one hour away from New Orleans, Lafayette, and Baton Rouge. Two thousand linear feet of rail spur and 1,500 linear feet of sidings connect the port warehouses with Burlington Northern mainline. Daily rail service is provided by Burlington Northern. The port was created in 1952. Since 1957, it has been active in both domestic and international trade. Morgan City is the only medium-draft harbor between New Orleans and Houston on the Gulf. Its 400-ft wide channel is maintained by the U.S. Army Corps of Engineers (COE) to a constant depth of 20 ft. Its docking and cargo-handling facilities serve a wide variety of medium-draft vessels.

Centrally located along the Gulf Coast, the port is only 18 mi from the open waters of the GOM at the intersection of the GIWW and the Atchafalaya River. It is on the east bank of the Atchafalaya River in a natural, wide, and deep harbor known as Berwick Bay. The Atchafalaya River, the GIWW, and Bayous Boeuf, Black, and Chene are the connections to traffic throughout the continental United States and abroad. The Atchafalaya River has its beginnings at the junction of Old River, which connects to the Mississippi River.

The port is suitable to handle container, general, and bulk cargo. There are over 200 private dock facilities located in the Morgan City vicinity, most of which are oil and gas related. These facilities have heavy-lift, barge-mounted cranes with capacities to 5,000 tons, track cranes to 300 tons, and mobile cranes to 150 tons. Facilities include a 500-ft dock with a 300-ft extension, a 20,000-ft^2 warehouse with rail access, a large marshalling yard, a 50-ton capacity mobile track crane, 3 forklifts, a 35-ton cherry picker, and a rail spur. In addition to 3.75 ac of on-dock storage, about 12 ac of auxiliary yard storage is available. Bulk cargo loading/unloading from/to barge and from/to yard from trucks and rail is also offered.

The port is currently working with the COE to determine if there is justification for dredging the channel to 35 ft. McDermott, who uses the channel, cannot compete with foreign companies to manufacture the larger platforms required by deep water because of the lack of channel depth necessary to transport the platforms to open waters.

The Berwick (Morgan City) facility to be used by Freeport is about 1 ac (more or less) and has plan dimensions of 200 x 200 ft (more or less). The current processing (receipt) capacity is about 2,500 bbl per day for cuttings boxes and marine portable tanks (Freeport, 2002).

Venice, Louisiana

According to Freeport, the Venice facility proposed for use will be ready for commercial operations in early 2002. Operations at the facility have been initiated to service one company at the current time. The facility has a size of about 1.75 ac with plan dimensions of approximately 400 x 150 ft. The current waste capacity is about 2,500 bbl per day for cuttings boxes and marine portable tanks. There is no waste storage capacity at this facility other than about 200 bbl for wash-out water used for cleaning boxes and tanks (Freeport, 2002).

3.3.5.2 Service Vessels

Service vessels are one of the primary modes of transporting personnel between service bases and offshore platforms, drilling rigs, derrick barges, and pipeline construction barges. In addition to offshore personnel, service vessels carry cargo (i.e., freshwater, fuel, cement, barite, liquid drilling fluids, tubulars, equipment, and food) offshore and waste from offshore to onshore. Although length is typically used to describe supply vessels, it is actually the liquid mud capacity and dynamic positioning capability that are the most important criteria for deepwater operators. Most operators view 220-ft boats as the minimum in supporting drilling operations. There are currently 376 supply vessels (platform supply vessels (PSV's) and anchor-handling tugs/supply vessels (AHTS)) in the GOM analysis area (up from a 1993 low of 247 units). Since 1996, 116 (or 35%) of the 376 supply vessels have been built.

The emergence of deepwater drilling has become the most important factor going forward in the GOM supply-boat industry. As a result of newbuilds and conversions, the number of drilling rigs capable of drilling in over 3,000 ft of water has quadrupled since 1996. Compared to the shallow waters of the GOM, deepwater drilling support requires a significantly enhanced supply boat. In deep water more drilling mud is required to fill wellbore and risers. Thus, deepwater supply vessels need large, liquid mud capacities. Deepwater drilling rigs generally operated farther from shore than conventional shallow-water units. Weather patterns can be more severe, and the sea conditions are typically rougher. Therefore, in order for a supply vessel to safely maintain its position near a deepwater rig, dynamic positioning (DP) is required. With DP capability, a supply vessel uses global positioning satellites to determine an exact location and small engines or thrusters to maintain the boat's position.

Given the relative youth of the GOM deepwater industry, exploration and production (E&P) operating practices have not been standardized. While some E&P companies have chosen to employ two boats of the 200- to 205-ft class for support of a deepwater drilling rig, it appears that most are moving toward the use of one larger boat (220+ ft) to support activities. Several E&P companies in the analysis area are currently undertaking the concept of boat pooling. Rather than assigning specific boats to specific rigs, E&P companies are experimenting with the use of several boats for a pool of rigs. Some operators will share their contracted boats with other E&P companies, while others are using boat pooling specifically for their own rigs. Initial indications are that E&P companies have been successful in reducing their boat usage. Along the same vein, there is a growing interest among E&P customers toward the issue of logistics as a way to improve efficiency and reduce costs. The larger boats that have been added by the industry have the capacity and capability to serve multiple rigs on one trip from port. This is a critical factor in the logistics business.

Freeport will use one small speed crewboat for transporting facility crews and supplies. This crewboat will make one round trip per week to the proposed facility. In addition, there will be a standby/offshore supply vessel that will make one trip per week to the proposed facility. Large offshore supply vessels and self-propelled barges will transport the E&P waste from offshore platforms to the proposed waste facility. The number of trips for these vessels will vary over the life of the proposed project (Freeport, 2002).

3.3.5.3 Helicopter Hubs

Helicopter hubs or "heliports" are facilities where helicopters can land, load and offload passengers and supplies, refuel, and be serviced. These hubs are used primarily as flight support bases to service the offshore oil and gas industry. Most of the OCS-related helicopter trips originate at helicopter hubs in coastal Texas and Louisiana. There are 128 heliports in the analysis area that support OCS activities. Of the 128 heliports, 32 are in coastal Subarea TX-2, 28 in LA-2, and 27 in LA-3. Freeport estimates that helicopter use during the proposed waste disposal operations will be two landing-takeoff cycles per day. Heliports at Port Fourchon, Morgan City/Berwick, and Venice, Louisiana, will be used (Freeport, 2002).

3.3.5.4 Disposal and Storage Facilities for Offshore Operations

The following sections provide an overview of the waste management methods that would be potentially impacted by disposal of wastes into caverns and caprock at MP 299. The proposed action presents an alternative to the following offshore waste management practices currently in place:

(1) discharge to the sea (per NPDES Permit);
(2) sub-seabed disposal offshore (per MMS NTL 99-G22); and
(3) onshore disposal (per Federal/State regulations).

Unless otherwise stated, the following information is from the MMS study, "Deepwater Program: OCS-Related Infrastructure in the Gulf of Mexico Fact Book" (Louis Berger Group, Inc., 2001).

There are 34 waste disposal facilities in the analysis area. Within the focus area, there are five facilities in coastal Subarea TX-2, eight in LA-2 and three in LA-3. Some of these facilities receive one type of OCS waste (i.e., municipal solid waste), while others specialize in other types of OCS waste (i.e., nonhazardous oil-field waste). The infrastructure network needed to manage the spectrum of waste generated by offshore exploration and production activities and returned to land for management can be divided into three categories:

(1) transfer facilities at ports, where the waste is transferred from supply boats to another transportation mode, either barge or truck, toward a final point of disposition;
(2) special-purpose, oil-field waste management facilities, which are dedicated to handling particular types of oil-field waste; and
(3) generic waste management facilities, which receive waste from a broad spectrum of American industry, of which waste generated in the oil field is only a small part.

The first two categories lend themselves to a capacity analysis while the third does not. The capacity of a waste facility has two dimensions. The first is the throughput capacity over a given period of time. In the short term, a waste facility can face limits to the volume of waste it accepts either from permit conditions or from physical limitations to the site, such as unloading bays, traffic conditions, or equipment capacity. Life-of-site capacity is also a limiting factor for disposal facilities. Limitations of storage space or, in the case of an injection well, service life of the well make it necessary to consider what must happen after existing facilities have exhausted their capacity.

A number of different types of waste are generated as a result of offshore exploration and production activity. The different physical and chemical character of these wastes make certain management methods preferable over others. The types of waste include

- solids, such as drill cuttings, pipe scale, produced sand, and other solid sediments encountered during drilling, completion, and production phases;
- aqueous fluids having relatively little solids content, such as produced waters, waters separated from a drilling mud system, clear brine completion fluids, acids used in stimulation activities, and wash waters from drilling and production operations. (Although most of these are potentially dischargeable under the NPDES general permit, the possibility always exists that some amount of material will become contaminated beyond the limits of treatment capabilities and cannot be discharged. A minute percentage of the total volume consists of chemicals (such as zinc bromide), which do not meet discharge criteria.);
- drilling muds (oil-based, synthetic, or water-based);
- NORM, such as tank bottoms, pipe scale, and other sediments that contain naturally high levels of radioactive materials. (NORM occurs in sludge and also as scale on used steel vessels and piping when equipment has been exposed to other NORM materials after very long periods of use.);
- industrial hazardous wastes, such as solvents and certain compounds, with chemical characteristics that render them hazardous under Subtitle C of the Resource Conservation and Recovery Act (RCRA) and thus not subject to the exemption applicable to wastes generated in the drilling, production, and exploration phases of oil and gas activities;
- nonhazardous industrial oily waste streams generated by machinery operations and maintenance, such as used compressor oils, diesel fuel, and lubricating oils, as well as pipeline testing and pigging fluids. (Wastes from marine transportation as well as pipeline construction and operations are always classified as industrial wastes, while some operators and State regulators may choose to handle or classify waste from drilling and production machinery this way). Used oil generated by exploration and production operations may legally be mixed with produced oil, but refineries discourage the practice. These streams often become commingled with wash water. They may be handled in drums or in bulk as part of a larger waste stream.); and
- municipal solid waste generated by the industry's personnel on offshore rigs, platforms, tankers, and workboats.

Federal regulations govern what may be discharged in GOM waters and set different standards in different parts of the Gulf Coast. Wastes that cannot be discharged or disposed of sub-seabed offshore must be brought to shore. Transportation, packaging, and unloading of the waste at ports are governed by U.S. Department of Transportation (DOT) regulations while the U.S. Coast Guard (USCG) regulates vessel fitness. Once on the dock, transportation and packaging is subject to an overlay of DOT and State laws. State regulations governing reporting and manifesting requirements may vary somewhat, but Federal law has, for the most part, preempted the field of transportation waste regulation. Dockside facilities that serve as transfer points from water to land modes of transportation are regulated by both USCG and State regulations covering the management of oil-field wastes.

Once at a waste management facility, regulations regarding storage, processing, and disposal vary depending on the type of waste. Most would fall under the oil and gas waste exemption of RCRA Subtitle C and would be subject only to State regulations regarding the disposal of oil-field wastes. A minute volume of the waste would be subject to Federal regulation as hazardous waste under RCRA Subtitle C. State laws governing hazardous wastes are allowed to be more restrictive than Federal law, but no material differences exist between State and Federal law in Texas, Louisiana, Mississippi, or Alabama. For the most part, the wastes generated by oil-field activities, called nonhazardous oil-field waste (NOW), are exempt from hazardous waste regulation by Federal law because they are produced from the exploration, development, or production of hydrocarbons and thus fall under what is generally referred to as the oil and gas waste exemption found in 40 CFR 261.

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.

Differences in laws among the states lead to differences in waste management methods as well as industry preferences in the siting of waste facilities in certain states. The substantive differences that distinguish the states are comparatively few. Texas allows and regulates salt dome disposal of waste, while no other state does. Louisiana, Alabama, and Mississippi allow the landfilling of used oil filters and oil-based drilling muds, while Texas requires them to be recycled. Texas generally has stricter limits on the hydrocarbon content of waste going into municipal landfills. Texas also has regulations allowing oil-based drilling mud to be recycled through bioremediation into road-building material. None of the other Gulf States have enabled oil-field waste land application recycling operations in their regulatory framework.

The U.S. Environmental Protection Agency (USEPA) has established a hierarchy of waste management methods that it deems preferentially protective of the environment. For those technologies applicable to oil and gas production waste, the following general waste management techniques are described in order of USEPA's preference:

- Recycle/Reuse—When usable components such as oil or drilling mud can be recovered from a waste, these components are not discarded and do not burden the environment with impacts from either manufacturing or disposal.
- Treatment/Detoxification—When a waste cannot be recycled or reused, it can sometimes be treated to remove or detoxify a particular constituent prior to disposal. Neutralization of pH or removal of sulfides are examples of technologies that are used with oil and gas wastes.
- Thermal Treatment/Incineration—Wastes with organic content can be burned, resulting in a relatively small amount of residual ash that is incorporated into a product or sent to disposal. This technology results in air emissions, but the residuals are generally free of organic constituents.
- Subsurface Land Disposal—This technology places waste below usable drinking water resources and is viewed as superior to land filling because of the low potential for waste migration. Injection wells and salt cavern disposal are examples of this type of technology.
- Surface Land Disposal/Treatment—This type of technology involves the placement of wastes into a landfill or onto a land farm. Although well-designed and constructed

landfills minimize the potential for waste migration, generators remain concerned about migration of contaminants into water resources and avoid it whenever practical. The USEPA classifies surface land disposal as the least desirable disposal method.

Several waste management methods are used to handle the spectrum of wastes generated by OCS activity, and most types of wastes lend themselves to more than one method of management. Each option has a different set of environmental impacts, regulatory constraints, costs, and capacity limitations.

Discharge into the Sea (per 40 CFR, 435, Subpart A)

Federal OCS wastes discharged into the sea must be virtually free of hydrocarbons and any other chemicals that would be harmful to marine life. Produced water, by far the most abundant oil and gas waste stream, can meet this definition after appropriate treatment steps. Water-based drilling muds that are (1) made from clean barite, (2) without certain chemical additives, and (3) have not encountered hydrocarbons are also dischargeable into the sea under emerging regulations. Finally, domestic and sanitary sewage from rig employees, after certain pretreatment steps, can be discharged into the sea under most circumstances.

Discharge into the sea is prevalent in OCS production and is regulated under 40 CFR 435, Subpart A, which addresses application of the NPDES for Gulf Coast discharges in the WPA and CPA. Discharge into the sea clearly has an overwhelming cost advantage because transportation costs are avoided. Cost for simple, continuous streams of produced water is virtually nothing, while setup to treat the most difficult intermittent stream might cost over a million dollars. Cost per barrel depends on the nature of the waste stream and life span of the wells served by the installation.

Subsurface Disposal Offshore (per MMS NTL 99-G22)

According to 30 CFR 250.300(b)(2), lessees and operators of Federal oil, gas, and sulphur leases and pipeline right-of-way holders must obtain approval from MMS of the methods used to dispose of drill cuttings, sand, and other well solids. Under this authority, the MMS Gulf Region requires that approval be obtained for the sub-seabed disposal of all E&P wastes. Guidance and instructions on the offshore sub-seabed disposal of wastes is provided by MMS's NTL 99-G22—"Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes"—effective September 24, 1999. This NTL provides guidelines on the types of wastes that are covered under the NTL, disposal criteria depending on the disposal technique to be employed (encapsulation or injection), worker safety guidelines, and application information requirements. This NTL can be found at the following MMS website: http://www.gomr.mms.gov/homepg/regulate/regs/ntls/ntl99-g22.html.

Onshore Disposal (current nonhazardous oil-field waste sites)

Subsurface Injection

The term "subsurface injection" of waste is used here in its more traditional sense, meaning injection into a porous rock formation as opposed to the newer waste management method of salt cavern disposal discussed below, which is also technically subsurface injection but significantly different from this method both technically and legally. An injection well can best be envisioned as a producing well operating in reverse, with very similar drilling and completion procedures. Subsurface injection of aqueous fluids into a porous rock formation is the oldest and most established technology for disposal of produced waters onshore or when discharge is not allowed offshore. Underground injection is most suitable to relatively solids-free liquids, although the exceptions to the rule are very important to OCS waste management. Fluids are often filtered before injection because many injection formations cannot tolerate significant levels of solids without plugging. In these cases, the filtrate and sometimes the filters themselves then become a solid-form waste stream that must be managed. Some formations, on the other hand, are sufficiently porous and tolerant of solids so as to present a viable method of disposing of sludges.

Injection facilities do not require large surface facilities and can be located in industrial areas with minimal impact on surrounding land use. They often coexist in oil-producing regions relatively close to rural residences, with truck noise and odor nuisances being the principal disamenities that could present a problem to a nearby residence. Principal land-use requirements are space to park and maneuver trucks during unloading, tankage for receiving, and temporarily storing fluids unloaded from the trucks.

All of the onshore subsurface injection facilities currently injecting OCS-generated wastes are located in Jefferson County, Texas, southwest of Beaumont. The waste is transferred from supply boats to barge at Port Fourchon, Louisiana, then shipped to Port Arthur, Texas, via the GIWW. Transportation to the injection facilities described below and in the salt cavern disposal section is by tank truck. Roads with maximum legal load-bearing capacities are required to handle the truck traffic.

Disamenities associated with this method are the visual and noise issues one might encounter at a producing well with a relatively large amount of tankage and pump noise. Facilities can include pits where waste is unloaded and oil is skimmed, with the potential for hydrocarbon odors. Increasingly though, pits are avoided because they present a greater threat to groundwater resources if they leak than tanks do. If the products received are sour (meaning they contain sulfurous compounds), odor problems can be significant to a larger area; otherwise, they are rarely an issue beyond the immediate proximity of the site. Facilities that receive waste via truck have the potential for large traffic impacts on smaller roads. Injection wells are sometimes perceived as a threat to groundwater resources, although the historical record of waste migrating out of the injection zone to a higher freshwater formation is very sparse. For the most part, regulators in energy-producing regions, who have a long experience with injection wells, are comfortable that the technology is protective of groundwater resources.

The lion's share of offshore solids-laden waste streams is presently injected at one facility; Newpark Environmental Services near Fannett, Texas. It is the most important NOW facility for the offshore industry, having received some 5 million bbl of offshore (State and OCS-generated) waste in 1998, constituting about 75 percent of the total offshore NOW streams shipped ashore. Some 500,000 bbl of this material is estimated to originate from Federal OCS activities. At 5 million bbl a year, the Newpark Fannett facility contributes about 8.5 percent of the 2,800 trips per day on the road directly accessing the facility. This facility has a number of injection wells, not all of which are needed at any given time. A number of other injection wells are available (i.e., Newpark at Winnie, Texas; and Newpark near Big Hill, Texas) but few have Newpark Fannett's capability to handle solids-laden streams and few have focused on the logistical requirements of the offshore market to the extent Newpark has. These factors account for Newpark Fannett's very large share of the offshore market. Newpark Fannett appears to have some economies of scale that serve to offset the cost of a long barge trip back from transfer points such as Port Fourchon, Louisiana.

The cost of an underground injection system varies greatly with the scale and the difficulty associated with the fluid being managed. A high-volume, pipeline-gathered injection system can be operated for between \$.05 per barrel and \$.10 per barrel. In contrast, land-based commercial disposal wells, which serve wells that do not have sufficient volumes to justify a captive pipeline system, typically charge \$.25 to \$.40 per barrel in the Gulf Coast region, with transportation usually adding two or three times that amount. A slurry injection facility, such as the one described at Newpark's Fannett, Texas, facility, has all the requirements of a liquids injection facility, with the addition of equipment to store, pump, and grind sludge to the uniform-required particle size. Disposal prices at slurry injection facilities typically range from \$8.00 to \$14.00 per barrel at the wellhead.

Salt Cavern Disposal

Almost anything that can physically be pumped downhole can be disposed of in a salt cavern. This gives salt cavern disposal an advantage over subsurface injection for disposal of solids-laden sludges because in the latter considerable effort may be spent in grinding the solids down to a size small enough to be accepted by the rock formation. Although salt caverns can easily accept liquid, cost factors dictate that liquids will generally be disposed of through subsurface injection instead of salt cavern disposal. The reason is that salt caverns require an injection well for disposal of brine displaced from the salt cavern as waste is injected. As such, salt dome disposal creates a barrel-for-barrel requirement for injection well disposal. Thus, no fluids that can easily be managed by underground injection would be disposed of in salt caverns by choice.

Muds and solids that have been slurried can be pumped into synthetic voids formed within salt domes for the purposes of storage. These caverns are drilled and completed using solution-mining techniques and are used for storage of natural gas, crude oil, and other hydrocarbons. To create the cavern, a well must be drilled into the salt dome. Fresh water is then pumped into the salt dome where it becomes saturated with salt. Saturated saltwater is circulated out of the dome through the annulus of the same well, which then must be disposed of through a subsurface injection well operation. Before waste is introduced, the completed cavern then resembles a giant salt-sided jug of brine. Injection wells are an integral part of a salt cavern disposal operation because every barrel of saltwater displaced must be disposed of. Waste materials are then pumped into the cavern, displacing an equal volume of saltwater, which is injected in the disposal well operation. Like subsurface injection operations, salt cavern disposal facilities have minimal permanent impacts on the surface. Land is required for a wellhead, truck unloading, a small office, blending equipment, and tankage for short-term storage.

One commercial salt cavern, operated by Trinity Field Services, has recently opened near Hamshire, Texas, on the Trinity River. It presently receives waste only by truck, although management expects a barge mooring to be permitted within a year. If the company is successful in obtaining additional permits that would allow receipt by barge and securing dock space in ports to serve as transfer points, then the company may present a significant source of new capacity—perhaps on the scale of Newpark's. Four other commercial salt domes are operational in northeastern and western Texas. One commercial salt dome, Lotus, L.L.C. in Andrews County near the New Mexico border, accepts NORM, some of which comes from offshore operations. Due to their distance from the Gulf Coast, no others receive any OCS waste. With the addition of Trinity Field Services bringing 6.2 million bbl of available space to the market, enough to take 8-10 years' worth of OCS liquids and sludges transported ashore at current rates, the OCS has its first salt dome disposal operation in a competitive location.

Trinity Field Services publicizes prices of $8-15.00 per barrel, with discounts available for large volumes. Commercial salt caverns in other parts of Texas charge from $5 to $15 per barrel for NOW, with surcharges applicable if the material must be blended into a pumpable state. The technology has an advantage over typical subsurface injection in that the size of the solids pumped downhole is not an issue and it avoids the need to grind solids to a uniform particle size.

Landfills

Workers on a rig or production platform generate the same types of waste as any other consumer in industrial society and are therefore responsible for their fair share of municipal solid waste (MSW). Landfarm facilities are available to accept offshore waste but actually accept very little because offshore operators prefer other methods. The MSW disposal from offshore activities currently imposes only a small incremental load on landfills in the analysis area, probably no more than 5 percent of total receipts by all the landfills serving south Louisiana.

3.3.6 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, entitled Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which directs Federal agencies to assess whether their actions have disproportionate environmental and health effects on people of ethnic or racial minorities or with low incomes. Those effects also encompass social and economic consequences. This Executive Order complements the NEPA mandating the Federal agency in charge of the proposed action to provide opportunities for community input during the environmental documentation process.[10]

Environmental justice is not at issue in the actual offshore Gulf of Mexico OCS planning areas. It becomes important in nearshore and onshore activities that result from a proposed action. In this application for a waste disposal facility, there are four steps in the projected process where the health and well-being of residents could be adversely affected: (1) transfer of the liquid waste to OSV's or SPB's; (2) transport of the waste from holding facilities; (3) transfer from the carrying vessels to the facility; and (4) leakage and spills resulting from transfer or transport. Concerns related to items (1) through (3) above center on increases in onshore activity such as employment, migration, commuter and truck traffic, noise and air pollution, and on additions to or expansions of the supporting infrastructure such as supply ports, and onshore disposal sites for offshore waste. Concerns related to leakage or spills focus on the point of

[10] See Chapter 5 for a discussion of scoping, and community consultation and coordination.

origin of the waste to its injection into a permanent disposal and all the potential in between of accidents and/or structural weaknesses in the water-bound vessels. All of the steps and the concerns are contained in this case in a "waste-producing corridor," which the applicant defines from Morgan City, Louisiana, to the CPA/EPA boundary. The waste corridor would extend from the Federal/State boundary over 200 mi offshore to the EEZ. As addressed in a previous section of the programmatic EA, "Onshore Disposal-Subsurface Injection," there is the potential for disproportionate and visible negative effects. Such effects would be part of an environmental justice issue only if the injection wells in Jefferson County, Texas, were planned recipients of the waste from MP 299. The applicant says this is not the case.

The U.S. Census data aggregated at the county/parish level are too broad to show geographic distributions of minority and low-income populations. Hence, the smaller, more detailed census tract level is preferable and 1997 projections of 1990 Census data for minority and low-income populations are available at present. There is one caveat: the U.S. Census 1997 nationwide definition of poverty was a household income of less than $16,276. The MMS data include figures for income of greater than $15,000 and greater than $25,000. The MMS has chosen to use the lower figure since it is closer to the nationwide definition and since the cost of living is generally lower in the South than for the Nation as a whole.

Figure B-6 maps census tracts that are 50 percent or more minorities for the coastal areas of Texas, Louisiana, Mississippi, and Alabama. The MMS chose this percentage based on CEQ (1997) guidelines that defined a minority population of an affected area exceeding 50 percent as an appropriate definition for environmental justice analysis. Most of these concentrations occur outside of the waste corridor defined in the application. The Louisiana census tracts around Morgan City and along the Mississippi River below New Orleans are areas of mixed industry and agriculture; both coastal areas are sparsely inhabited. These pockets of minority populations do not match the distribution of the offshore oil industry and its supporting infrastructure. Instead, they are the product of urbanization and of the historical role African-Americans had in southern agriculture.

Figure B-7 maps census tracts that have 50 percent or more of low-income households. The CEQ (1997) guidance for defining low income areas is less explicit than it is for minority areas. The MMS selected the 50-percent level as comparable to the minority definition. In almost every case, these census tracts are neighborhoods in large or coastal urban areas (e.g., Galveston, Houston, Beaumont, Lafayette, Baton Rouge, New Orleans, Biloxi, and Mobile). Except in south Texas, all low-income census tracts are also minority census tracts. Again, like the concentrations of minority population, these pockets of poverty are a product of urbanization and southern agriculture.

The most likely coastal settlement affected by the proposal is the Port of Fourchon in Lafourche Parish, Louisiana, with a concentration of OCS-related infrastructure. Like its neighbors Morgan City and Lafayette, Lafourche Parish is heavily involved in the offshore oil industry, particularly fabrication and support sectors. The founding and continued expansion of Port Fourchon, a port designed for deepwater OCS support, has added to the industry's presence (Keithly, 2001; Hughes, 2002). Much of Lafourche Parish is coastal wetlands. Habitable land—high ground—comprises narrow natural levees formed by existing and ancient bayous. Roads are built on top of these levees and communities are built along the roads and in the long, narrow bands described as "string settlements" (Davis and Place, 1983). This settlement pattern has tended to mix residential and business activities and to limit residential segregation by ethnicity and income. For example, the Houma, a State-recognized Indian nation in the parish, resides interspersed among the dominant population group and are physically indistinguishable (Gibson, 1982; Fischer, 1970). Both the rich and the poor of Port Fourchon in Lafourche Parish have experienced the effects of port-related truck traffic, which is forced to use LA Highway 1 as the only roadway to and from the port. This programmatic EA and past EIS's have identified this as an issue of community-wide concern.

3.3.7 Recreational Resources

The northern GOM coastal zone has become increasingly developed over the past 20 years. In addition to homes, condominiums, and some industry, this coastline supports one of the major recreational regions of the U.S., particularly for marine fishing and beach activities, both of which are viewed as public assets. There is a diversity of natural and developed landscapes and seascapes, including coastal beaches, barrier islands, estuarine bays and sounds, river deltas, and tidal marshes. Other recreational resources are publicly owned and administered, such as national and State seashores, parks, beaches, and wildlife lands, as well as designated preservation areas, such as historic and natural sites and landmarks, wilderness areas, wildlife sanctuaries, research reserves, and scenic rivers. Gulf Coast residents and tourists from throughout the nation, as well as from foreign countries, use these resources extensively and intensively for recreational activity. Commercial and private recreational facilities and establishments, such as resorts, marinas, amusement parks, and ornamental gardens, also serve as primary-interest areas. Locating, identifying, and observing coastal and marine birds is a recreational activity of growing interest and importance all along the Gulf Coast.

The U.S. coastline along the GOM runs from Brownsville, Texas, and the southern tip of Padre Island, north, east, and south to the Dry Tortugas off Key West, Florida. It encompasses the confluence with the sea of the Mobile and Mississippi Rivers, which have the two largest delta systems in the U.S. (Alabama State Docks Department, 2001). More than 25 years ago, Congress set aside outstanding examples of Gulf coastal beach and barrier island ecosystems to be managed by the National Park Service for the preservation, enjoyment, and understanding of their inherent value. State and county legislation added to this preservation program so that today there is a lengthy list of reserves, refuges, and public parks.

The value of recreation and tourism in the GOM coastal zone from Texas through Florida has been estimated at almost $20 billion annually (USDOI, MMS, 2001b). A significant portion of these expenditures is made in coastal counties, where major shoreline beaches are primary recreational attractions. Over one million people annually visit the mainland unit and barrier island beaches of the Gulf Island National Seashore in Mississippi and Florida.

One result of such a volume of visitors is the trash and debris they leave. Trash and debris from OCS operations can wash ashore also, especially on beaches west of the Mississippi River. Such litter could adversely affect the ambience of the beach environment, detract from the enjoyment of beach activities, and increase administrative costs on maintained beaches. Some trash items, such as glass, pieces of steel, and drums with chemical residues, can be a health threat to users of recreational beaches.

In this section, the coastline has been divided into segments according to topography, discrete human and other biological populations, barrier island formations, and special preservation areas. This gives the reader the chance to put in geographical context the textual descriptions. Only those segments of the coastline potentially impacted by an accidental spill/release of oil or waste at MP 299 or a proposed shore base are addressed.

Louisiana—Beaches: The three parishes of Cameron, Lafourche, and Jefferson comprise this segment. Spanning part of this coastline is the Barataria-Terrebonne National Estuary, the Atchafalaya National Wildlife Refuge, and the Jean Lafitte National Historic Park and Reserve.

Mississippi and Alabama—Gulf Islands: Gulf Islands National Seashore in this part of the Gulf stretches some 40 mi from Hancock, Harrison, and Jackson Counties in Mississippi to neighboring Mobile County and Dauphin Island in Alabama and over into the Florida Panhandle. This part of the National Seashore accommodates more than 1 million recreational visits a year. In addition to beaches, the Seashore harbors historic forts, shipwrecks, wetlands, lagoons and estuaries, seagrass, fish and wildlife, and archaeological sites. In 1978, Congress designated approximately 1,800 ac on Horn and Petit Bois Islands, part of the Gulf Islands National Seashore in Mississippi, as components of the National Wilderness System. And there is a national estuarine research reserve at Grand Bay (Weeks Bay Reserve Foundation, 1999).

Alabama—-Gulf Shores: The southernmost part of Baldwin County is also known as Pleasure Island. It was a peninsula until the COE built the intracoastal waterway and cut the land ties to the mainland. Mobile Bay is part of the national estuary program, and Weeks Bay, at the southeastern end of the bay, is also part of the national estuarine research reserve system.

Florida Panhandle—West: This segment encompasses the three counties of Escambia, Santa Rosa, and Okaloosa and is called "The Emerald Coast." The area includes the eastern portion of Gulf Islands National Seashore. Grayson State Park in Escambia County is near the Alabama/Florida State line and, hence, contiguous to the easternmost point of the "waste corridor. "

Other recreational activities are fishing and diving offshore. Both are important along the entire Gulf coastline, especially in counties and parishes with bays and harbors to support marinas, boat launching sites, bait shops, boat rentals, and charters. Fishing and diving for pleasure are done from private boats, charter boats, or party boats. Trips take hours or days, depending on the wishes of the owner or client; those trips often are within a few feet of offshore oil/gas structures. Fish congregate around such artificial structures and where there are fish, there are fisher folk and divers.

Freeport's proposal is centered on its lease at MP 299, just east of Venice, Louisiana. The waste corridor delineated includes waters off the coasts of Alabama, Mississippi, and Louisiana to slightly west of Port Fourchon. Hence, the area we describe here will coincide with that corridor. As stated above, marine recreational activities are important to all coastal areas along the Gulf. That importance stems from the millions of people and dollars centered on fishing and diving. Tables B-6 and B-7 are based on data from both an MMS-sponsored study and the NOAA Fisheries ongoing survey. These tables show demand and expenditures and prove beyond doubt just how much marine recreation means to local economies.

Table B-6 shows that fishing from private and charter boats is clearly more popular in Louisiana than in the other two coastal states listed. This has as much to do with the plethora of boats and boating as a cultural past time of traditional coastal residents as it does the easy access to offshore waters from the bayous, bays, rivers and wetlands of the state's coastline.

Table B-7 gives the flip side of the marine recreational coin: money. The amount of expenditures varies markedly. The totals for Alabama and Mississippi combined are less than the $137 million, which anglers and divers spent in the same year (1999) in Louisiana. Table B-7 shows the differences in spending patterns between coastal and non-coastal residents and allows the reader to distinguish between what economists call "transfer payments" as opposed to new monies generated from outside a given place. Transfer payments mean that coastal residents are merely transferring their incomes from one sector, say medical care, to another, that of recreation. New monies being spent by persons outside the local economies are considered more beneficial because their multiplier effect is stronger: that is, new monies generate higher degrees of income and job spin-offs.

3.3.8 Military Warning Areas/Water Test Areas

Military warning areas (MWA's) are designated areas of the GOM where the control of radio or other equipment emitting electromagnetic energy must be in accordance with the requirements specified by the commander of the command headquarters for the specific warning area, to the degree necessary to prevent damage to, or unacceptable interference with Department of Defense flight, testing, or operational actives, conducted within the individual designated warning areas. Positive control of boats, ships, and aircraft operating in the warning areas must also be maintained in accordance with the requirements specified by the commander.

MP 299 is not located in any of the designated MWA's or water test areas (WTA's) of the GOM. The most likely routes to be taken by boats and aircraft in support of the proposed activities would be within the MP 299 "E&P Waste Corridor" as defined by Freeport (Figure B-1d). For this scenario vessels could traverse MWA's W-92, W-155, and W-453, and Eglin WTA 1 and 3. According to Freeport, bulk slurry collections of wastes could expand the economically attractive area for waste collection, in which case routes taken by boats and aircraft in support of the proposed activities could also traverse MWA's W-59 and W-147.

According to Freeport, it is not currently conceivable that MWA's or WTA's other than those listed above may be traversed in support of the proposed activity. However, if boats and aircraft operated on behalf of Freeport do traverse additional MWA's or WTA's, Freeport has agreed to contact the appropriate individual command headquarters for these additional areas concerning the control of electromagnetic emissions and use of boats and aircraft (Freeport, 2001).

3.3.9 Commercial Fisheries

The GOM provides more than 26 percent of the commercial fish landings in the continental United States (40% when Alaska is excluded) and yielded the Nation's second largest regional commercial fishery weight and third in value in 1999 (total for all species: 1,947 million pounds and $776 million) (USDOC, NMFS, 2001). Commercially important species include the estuary-dependent species such as Atlantic menhaden, shrimps, oyster, crabs, and sciaenids (drums). The GOM shrimp fishery is the most valuable in the United States, accounting for 71.5 percent of the total domestic production (USDOC, NMFS, 2001).

Menhaden, with landings of about 1.5 billion pounds and valued at $78 million, was the most important Gulf species in quantity landed during 1999. Shrimp, with landings of nearly 242 million pounds and valued at about $478 million, was the most important Gulf species in value landed during 1999. The 1999 Gulf oyster fishery accounted for nearly 67 percent of the national total with landings of 14 million pounds of meats, valued at about $28 million. The Gulf blue crab fishery accounted for 24 percent of the national total with landings of 45 million pounds, valued at about $32 million (USDOC, NMFS, 2001).

Epipelagic commercial fishes include dolphin, sharks (mako, silky, and thresher), snake mackerels (escolar and oilfish), swordfish, tunas (bigeye, blackfin, bluefin, and yellowfin), and wahoo (Gulf of Mexico Fishery Management Council, 1998). These species are widespread in the Gulf and at least some probably occur in the MP 299 area. Nonetheless, it does not appear likely that significant fisheries for epipelagic fishes will develop in the MP 299 project area because of the generally low productivity and risks associated with the numerous structures in this area.

The numerous structures in MP 299 would offer the most significant fish resources for commercial harvest. Red snapper and grouper use the artificial reefs created by oil and gas structures, and the bottom depths in the MP 299 area are also ideal for these commercial species. It would be expected that each structure would support a total fish population of between 10,000 and 30,000 fish (Stanley and Wilson, 2000), and approximately 500-2,000 red snapper would be expected to reside at each structure (Gitschlag et al., 2000).

3.3.10 Archaeological Resources

Archaeological resources are any material remains of human life or activities that are at least 50 years of age and that are of archaeological interest (30 CFR 250.2). The Archaeological Resources Regulation (30 CFR 250.194) provides specific authority to each MMS Regional Director to require archaeological resource surveys, analyses, and reports. Surveys are required prior to any exploration or development activities on leases within the high-probability areas (NTL 2002-G01, effective March 2002).

3.3.10.1 Prehistoric

Available geologic evidence suggests that sea level in the northern GOM was at least 90 m, and possibly as much as 130 m, lower than present sea level, and that the low sea-stand occurred during the period 20,000-17,000 years Before Present (B.P.) (Nelson and Bray, 1970). Sea level in the northern Gulf reached its present stand around 3,500 years B.P. (Coastal Environments, Inc., 1986).

During periods that the continental shelf was exposed above sea level, the area was open to habitation by prehistoric peoples. The advent of early man into the GOM region is currently accepted to be around 12,000 years B.P. (Aten, 1983). According to the sea-level curve for the northern GOM proposed by Coastal Environments, Inc. (CEI) sea level at 12,000 B.P. would have been approximately 45 m below the present still stand (CEI, 1977 and 1982). On this basis, the continental shelf shoreward of about the 45-m bathymetric contour has potential for prehistoric sites dating after 12,000 B.P. Because of inherent uncertainties in both the depth of sea level and the entry date of prehistoric man into North America, MMS adopted the 12,000 years B.P. and the 60-m water depth as the seaward extent of the prehistoric, archaeological high-probability area.

The proposed action is to inject OCS-generated, RCRA-exempt E&P waste into the salt caverns and caprock that underlie the existing MP 299 sulphur and salt lease. The applicant proposes to inject OCS-generated, RCRA-exempt E&P waste into a salt cavern that underlies existing Brine Well No. 1-A, existing Brine Well No. 5-A, and former Brine Well No. 3-A, which has been plugged and abandoned and will be re-entered. Also, the applicant proposes to inject OCS-generated, RCRA-exempt E&P waste into the caprock that underlies 10 wells proposed for use as injection wells.

The proposed action will take place from the existing platforms and former production facilities, and no additional seafloor disturbance is anticipated.

3.3.10.2 Historic

With the exception of the Ship Shoal Lighthouse structure, historic archaeological resources on the OCS consist of historic shipwrecks. A historic shipwreck is defined as a submerged or buried vessel, at least 50 years old, that has foundered, stranded, or wrecked and is presently lying on or is embedded in the seafloor. This includes vessels (except hulks) that exist intact or as scattered components on or in the seafloor. A 1977 MMS archaeological resources baseline study for the northern GOM concluded that two-thirds of the total number of shipwrecks in the northern Gulf lie within 1.5 km of shore and most of the remainder lies between 1.5 and 10 km of the coast (CEI, 1977). A subsequent MMS study published in 1989 found that changes in the late 19th-and early 20th-century sailing routes increased the frequency of shipwrecks in the open sea in the Eastern Gulf to nearly double that of the Western and Central Gulf (Garrison et al., 1989). The highest observed frequency of shipwrecks occurred within areas of intense marine traffic, such as the approaches and entrances to seaports and the mouths of navigable rivers and straits.

Review of the Garrison et al. (1989) shipwreck database lists no shipwrecks that fall within MP 299; therefore, this block lies within a low-probability zone for historic shipwrecks. The MMS shipwreck database should not be considered exhaustive lists of shipwrecks. Regular reporting of shipwrecks did not occur until late in the 19th century, and losses of several classes of vessels, such as small coastal fishing boats, were largely unreported in official records.

Wrecks occurring in deeper water would have a moderate to high preservation potential, as can be seen by the copper-clad wreck in Mississippi Canyon Block 74. In the deep water, temperature at the seafloor is extremely cold, which slows the oxidation of ferrous metals. The cold water would also eliminate the wood-eating shipworm *Terredo navalis* (Anuskiewicz, 1989; page 90).

Aside from acts of war, hurricanes cause the greatest number of wrecks in the Gulf. The wreckage of the 19th century steamer *New York*, which was destroyed in a hurricane in 1846 lies in 16 m of water and has been documented by MMS (Irion and Anuskiewicz, 1999) as scattered over the ocean floor in a swath over 1,500 ft long. Shipwrecks occurring in shallow water nearer to shore are more likely to have been reworked and scattered by subsequent storms than those wrecks occurring at greater depths on the OCS. Historic research indicates that shipwrecks occur less frequently in Federal waters. However, these wrecks are likely to be better preserved, less disturbed, and, therefore, more likely to be eligible for nomination to the National Register of Historic Places than are wrecks in shallower State waters.

The proposed action is to inject OCS-generated, RCRA-exempt E&P waste into the salt caverns and caprock that underlie the existing MP 299 sulphur and salt lease. The applicant proposes to inject OCS-generated, RCRA-exempt E&P waste into a salt cavern that underlies existing Brine Well No. 1-A, existing Brine Well No. 5-A, and former Brine Well No. 3-A, which has been plugged and abandoned and will be re-entered. Also, the applicant proposes to inject OCS-generated, RCRA-exempt E&P waste into the caprock that underlies 10 wells proposed for use as injection wells.

The proposed action will take place from the existing platforms and former production facilities, and no additional seafloor disturbance is anticipated.

3.3.11 Artificial Reefs and Rigs-to-Reefs Development

Artificial reefs have been used along the coastline of the U.S. since the early 19th century. Stone (1974) documented the use of obsolete materials to create artificial reefs has provided valuable habitat for numerous species of fish in areas devoid of natural bottom. Stone (1979) found reefs in marine waters not only attract fish but in some instances enhance the production of fish as well.

The long-standing debate as to whether artificial reefs contribute to biological production or merely attract the associated marine resources still remains within the artificial reef scientific arena. While no unified answer to this dichotomy persists among the artificial reef researchers, the generally accepted conclusion is that artificial reefs both attract and produce fish. This conclusion depends on a variety of factors, such as associated species, limiting environmental factors, fishing pressure, and type of materials used. The degree to which any of the above factors can be controlled will dictate whether any particular artificial reef is a producer or an attractor. In reality many artificial reefs probably do both at the same time.

3.3.11.1 Artificial Reef Programs and Plans

In 1984, the U.S. Congress, recognizing the social and economic value in developing artificial reefs, passed the National Fishing Enhancement Act (NFEA). The NFEA called for the development of a national plan to provide guidance to those individuals, organizations, and agencies interested in artificial reef development and management. The NFEA directed the Secretary of Commerce to develop and publish a long-term National Artificial Reef Plan (NARP). In 1985, the Department of Commerce's NOAA Fisheries wrote and completed the NARP. The Plan was written to promote and facilitate responsible and effective artificial reef use based on the best scientific information available.

This was the first effort at the Federal or State level to establish guidelines to assist individuals and/or organizations in the development and management of artificial reefs. The NARP states that properly designed, constructed, and located artificial reefs can enhance the habitat and diversity of fishery resources; enhance United States' recreational and commercial fishing opportunities; increase the energy efficiency of recreational and commercial fisheries; and contribute to the U.S. coastal economies.

The NARP provides general criteria for selection of materials for artificial reef application. These criteria include (1) function, which is related to how well a material functions as reef habitat; (2) compatibility, which is related to how compatible a material is with the environment; (3) durability, which is related to how long a material will last in the environment; (4) stability, which is related to how stable a material will be when subject to storms, tides, currents, and other external forces; and (5) availability, which is related to how available a material is to an artificial reef program.

3.3.11.2 Louisiana Artificial Reef Plan

In response to the NFEA, the Louisiana Artificial Reef Initiative (LARI) combined the talents of university, State, Federal, and industry representatives to develop an artificial reef program for the State. As a result, the Louisiana Fishing Enhancement Act (Act 100) became law in 1986. Subsequently, the Louisiana Artificial Reef Plan was written and contains the rationale and guidelines for implementation and maintenance of a State artificial reef program. The State plan is implemented under the leadership of the Louisiana Department of Wildlife and Fisheries. Materials for use as artificial reefs are accepted and placed within reef planning areas. Artificial reef complexes are established within reef planning areas on the basis of the best available information regarding bottom type, currents, bathymetry, and other factors affecting performance and productivity of the reefs. The LARI approved nine artificial reef-planning areas where artificial reefs can be sited (Kasprzak and Perrett, 1996).

The proposal for waste disposal in MP 299 is located in the Offshore Louisiana Main Pass Artificial Reef Planning Area. The Main Pass Artificial Reef Planning Area is located north and east of the mouth of the Mississippi River and in the Main Pass leasing area (Figure B-8). The Main Pass Artificial Reef Planning Area encompasses 19 lease blocks (i.e., MP 144-145, 272-273, and 292-306), all of which are in the MP area (Figure B-8).

3.3.11.3 Rigs-to-Reefs Development

Rigs-to-Reefs (RTR) is a catchy term for converting obsolete, nonproductive offshore oil and gas platforms to designated artificial reefs (Reggio, 1987). Offshore oil and gas platforms began functioning as artificial reefs in 1947 when Kerr McGee completed the world’s first commercially successful oil well in 5.6 m of water, 70 km south of Morgan City, Louisiana. Today, approximately 4,000 offshore oil and gas platforms exist on the OCS, supplying approximately 98 percent of natural gas and 91 percent of the oil on our Nation's Federal OCS. In addition to meeting the world’s energy need, these platforms also form one of the world's most extensive defacto artificial reef systems.

The use of obsolete oil and gas platforms for reefs has proven to be highly successful. Their availability, design profile, durability, and stability provide a number of advantages over the use of traditional artificial reef materials.

3.3.11.4 Louisiana Rigs-to-Reefs

To capture this recyclable and valuable fish habitat, the State of Louisiana, with the passing of The Louisiana Fishing Enhancement Act, signed into law an RTR plan for the State. The State law set up a mechanism to transfer ownership and liability of the platform from oil and gas companies to the State when the platform ceases production and the lease is terminated. The company (donor) saves money by donating a platform to the State (recipient) for a reef rather than scrapping the platform onshore. The industry then donates 50 percent of the savings to the State to operate and manage the State’s artificial reef program. Since the inception of the RTR plans, 167 retired platforms have been donated and used for reefs offshore Gulf Coast States.

Over 90 percent of the 4,000 Gulf OCS platforms are located offshore Louisiana. Consequently, the State is the leader in the transfer and capture of platforms for reefs. Louisiana has some 100 of the 167 platforms that, to date, have been permanently converted to artificial reefs.

At present, only one RTR (i.e., platform reef) exists in the Main Pass Artificial Reef Planning Area. The RTR site is located in MP 300, which is adjacent to and one block west of MP 299 (Figure B-8). Close coordination between MMS and the State artificial reef program offices is done to preclude potential conflict between oil and gas development and existing reef materials. All proposed RTR projects and COE permit notices for reefs are coordinated and reviewed by MMS for potential conflict with oil and gas infrastructure (i.e., platforms and pipelines) and development.

4. POTENTIAL ENVIRONMENTAL EFFECTS

For analysis purposes in this EA, potential impacts were classified into one of three impact levels (i.e., degree of impact), including

- significant impact;
- adverse (but not significant) impact; and
- no (or negligible) impact.

The three impact levels cited above categorize the negative effects on a resource and reflect the range of negative (or neutral) impacts. Of most interest are the negative impacts that are potentially significant. The threshold for determining a significance impact, termed significance criteria, varies depending upon several factors, including the resource affected and the spatial and temporal attributes (or scope) of each impact-producing factor (i.e., local vs. regional; short- vs. long-term). Within a NEPA framework, such attributes correspond to “context” (i.e., extent and duration) and “intensity” (i.e., magnitude and severity). Therefore, significance criteria are resource specific. Impacts from a proposed action or alternative(s) may also be direct or indirect. As a consequence, direct impacts evaluated in the following sections are classified based on level or degree of impact and the spatial and temporal attributes. Indirect impacts are similarly classified, as appropriate. The applicable significance criteria and appropriate definitions of spatial and temporal attributes for resource-specific impacts are defined in Table B-3.

4.1 PHYSICAL ELEMENTS OF THE ENVIRONMENT

4.1.1 Impacts on Water Quality

The MP 299 operation may impact water quality through the release of wastes into the water. The release may be a permitted operational waste or an accidental release. The location, type, and volume of a permitted discharge is within the specifications of the permit and are known. In contrast, the location and type of a potential spill or release is not known. Additionally, the volume of potentially spilled material is not known but it can be estimated. Table 4-1 provides a summary of the assumptions made about permitted discharges and accidental waste spills or releases to water (other than hydrocarbon spill scenarios that are provided in Table D-3).

The operation would involve the transport of waste directly to MP 299 from other OCS activities or the transport of waste to onshore transfer and service locations prior to delivery to the MP 299 location. During onshore "layover," OCS waste would be composited and processed. No commingling with waste generated from non-OCS sites would occur. The impact to water quality from the vessel traffic and bilge and ballast water associated with this traffic is expected to be minimal. In addition, waste discharges from the MP 299 E&P waste disposal operation are projected to be within USEPA NPDES permitted limits.

Table 4-1

Waste Discharge, Spill, or Release Scenarios (maximum volumes)

Type of Discharge	Potential Location	Potential Size	Discharge, Spill or Release Composition	Comments
Discharges from Permitted Outfalls to Water				
Discharges from permitted outfalls	MP 299 facility	See Table 4-2.	See Table 4-2. Discharges are expected to be within USEPA NPDES permit conditions.	Expected discharge volumes during waste disposal operations are much less than USEPA NPDES permitted volumes for sulphur operations (see Table 4-2).
Accidental Spills to Water				
Vessel (SPB) collision[(1)]	MP 299 facility or shore base (Venice, Fourchon, Morgan City)	Muds and cuttings: a. 12,500 bbl[(1)] b. 12,500 bbl c. 12,500 bbl	Muds and cuttings: a. oil-based (diesel or mineral oil); or b. synthetic-based; or c. water-based	OSRA Model used to determine transport variable. Sintef Applied Chemistry Model used to predict the material balance of spilled oil. ASA CHEMMAP Model – Modeled barite as surrogate for fate of water-based drilling mud.
Waste storage tank	MP 299 facility	880 bbl	See spill composition listed under vessel collision.	Represents largest single tank.

Table 4-1. Waste Discharge, Spill, or Release Scenarios (maximum volumes) (continued).

Type of Discharge	Potential Location	Potential Size	Discharge, Spill or Release Composition	Comments
Hose transfer	MP 299 facility, shore base, or location where the waste is generated	60 bbl	See spill composition listed under vessel collision.	
Cutting box or MPT transfer incident	MP 299 facility, shore base, or location where the waste is generated	25 bbl	See spill composition listed under vessel collision.	
Cavern No. 1 collapse	MP 299	1.6 million bbl	Maximum of 1.6 million bbl of brine. Some waste could also be released should the collapse occur after initiation of waste injection into Cavern No. 1.	Not modeled. The brine would gradually mix with seawater. Per Freeport - MP 299 Cavern No. 1 location: • Release of brine most likely from numerous point sources over the salt dome (2,600' diameter area) over a period of hours or days • Heavy brine would initially remain in the depression/crater created by the cavern roof collapse (2,600' wide x max 45' deep) • Seafloor depression diameter remains constant regardless of the amount of cavern fill material • Brine would then dilute with the currents • When Cavern No. 1 is filled with E&P waste to the 80-90% fill range, subsidence would be reduced to the point that the upper sediments would yield plastically rather than fracture and no fluid would reach the Gulf floor in case of such an accident.

(1) A SPB collision could result in the loss of all the contents of one of the SPB's internal tanks. Assumes 25% of the oil-based muds and cuttings volume (3,125 bbl) is diesel or mineral oil that behaves as "free" oil. The diesel or mineral oil is discussed in the Hydrocarbon Spill Accidents section below.

4.1.1.1 Impacts from Permitted Operational Releases

Wastewater and waste solids would be generated during the operation of Freeport's MP 299 commercial E&P waste disposal facility. At present, Freeport continues to operate under the NPDES Permit #LA0084727. This permit has been administratively continued beyond its May 31, 1999, expiration date by submittal of a complete permit renewal application on November 10, 1998. In a letter to USEPA dated December 11, 2001, Freeport requested to add sub-seabed E&P waste disposal to the activities covered under the permit renewal application and the existing NPDES permit. In a March 5, 2002, email message and a letter dated April 18, 2002, to Freeport, USEPA has determined that Freeport is authorized to discharge effluents from the proposed E&P waste disposal project under the terms of the administratively extended existing permit, provided the discharges are consistent with the representations in the permit application. This authorization is effective until USEPA reissues a new, modified permit for the facility. In the April 18, 2002, letter, USEPA states that "[W]hen a new permit is proposed [by EPA] for the facility, all potential discharges associated with the waste disposal operations will need to be included. This will include all discharges made at the surface as well as any potential discharge as a result of seepage from the salt dome and associate caprock to the Gulf of Mexico." Therefore, while Freeport is actively pursuing modification and renewal of the NPDES permit, Freeport nonetheless retains authorization to begin operation of the E&P waste project under the terms of the existing permit.

The original permit was for Freeport's sulphur mine operations. The original permit listed 11 outfalls. They are the (1) power plant, (2) sanitary effluents, (3) mine-water effluent, (4) domestic effluent, (5) well-sealing effluent, (6) drilling fluid, (7) drill cuttings, (8) rig cooling water, (9) oil/water separator, (10) miscellaneous effluents, and (11) pressure control effluent. Many of the waste streams generated in sulphur mining operations are similar to the projected E&P waste disposal waste streams. The NPDES Discharge Monitoring Reports require monitoring visual oil and grease, temperature difference, sulphide, flow, toxicity, total suspended solids, oil, and grease. At the Sanitary Effluent Outfall, flow, residual chlorine, and visual floating solids are reported. For the commercial E&P waste operation, no well-sealing effluent and no pressure-control effluent would be generated.

Freeport supplied MMS with recent NPDES monitoring information for all NPDES permitted outfalls for October 1999 through June 2000. Sulphur operations ceased August 30, 2000. This information indicates compliance with NPDES permit requirements.

Table 4-2 shows the current and projected future discharges and flow rates. Outfalls 006 (drilling fluids), 007 (drill cuttings), and 009 (oil/water separators) may be used during the drilling of additional wells in support of waste disposal operations, but they do not represent outfalls to be used for commercial disposal of E&P waste.

The primary effects of activities would be localized increases in total suspended solids (TSS) or turbidity. Sanitary and domestic waste discharges are expected to increase nutrient input and biological oxygen demand (BOD) slightly, but this is not normally a concern in open oceanic waters because of dilution and dispersion. All discharges would be at or below existing regulatory discharge criteria designed to mitigate significant environmental effects. Therefore, operational discharges are not expected to impact water quality. Compliance with NPDES permit requirements for discharges and effluents would prevent a significant impact to the surrounding water quality.

Table 4-2

Summary of Freeport's E&P Waste Disposal Project's Applicable Effluent Outfalls and Discharges
(NPDES Permit #LA0084727)

NPDES Permit Information		E&P Waste Disposal Operations Information	
Outfall Identification[(1)]	Permitted Flow Rates(million gallons daily (MGD))	Constituents Applicable to E&P Waste Disposal Operations	E&P Waste Disposal Operations Flow Rates (million gallons daily (MGD))
Outfall 001 – Power Plant	0.118 MGD avg. 1.683 MGD max.	Reverse osmosis units, brine desander unit, and other miscellaneous sources.	0.012 MGD avg. 0.168 MGD max
Outfall 002 – Sanitary Effluents	0.006 MGD avg. 0.008 MGD max.	Multiple outfalls discharge sanitary wastes after treatment in approved Marine Sanitation Devices.	0.0006 MGD avg. 0.0008 MGD max
Outfall 003 – Mine Water Effluent	0.162 MGD avg. 3.516 MGD max.	Brine desander unit.	0.0081 MGD avg. 0.176 MGD max.
Outfall 004 – Domestic Effluent	0.01 MGD avg. 0.02 MGD max.	Domestic wastes, galley wastes, dish and laundry wastewater, showers, sinks, etc. (excludes sanitary waste)	0.001 MGD avg. 0.002 MGD max.
Outfall 006 – Drilling Fluid	0.042 MGD avg. 0.084 MGD max.	Fluid generated during drilling for brine, sulphur, and waste operations. This outfall would not be used for commercial disposal of E&P waste. Freeport would use this outfall to drill additional wells for brine, sulphur, and waste operations.	0.042 MGD avg. 0.084 MGD max.
Outfall 007 – Drill Cuttings	0.02 MGD avg. 0.075 MGD max.	Wastes from the shale shakers, desanders, and drill cuttings with some adhering drilling fluids. This outfall would not be used for commercial disposal of E&P waste. Freeport would use this outfall to drill additional wells for brine, sulphur, and waste operations.	0.02 MGD avg. 0.075 MGD max.
Outfall 008 – Rig Cooling	0.75 MGD avg. 1.7 MGD max.	Non-contact cooling water for drilling-rig operations.	0.248 MGD avg. 0.561 MGD max.
Outfall 009 – Oil/Water Separators	0.025 MGD avg. 0.1 MGD max.	Separators manage oil-contaminated waters from drip pans, equipment skids, washdowns, equipment maintenance, oil storage and handling area, and miscellaneous sources. This outfall would not be used for commercial treatment and disposal of E&P waste.	0.0063 MGD max 0.025 MGD max.
Outfall 010 – Miscellaneous Effluents	1.5 MGD avg. 2.3 MGD max.	Freshwater, seawater, and brine from numerous sources including, but not limited to, plant, rig, and structure washdowns; seawater overflows; non-contact cooling water; lab sink wastes; air compressor condensate; hydrostatic pipe-testing water; water drained for normal plant maintenance; fresh water; seawater overflowed and/or drained from storage tanks; seawater pump testing; fire control system testing and use; water from brine well startup; pump packing leakage; untreated seawater; brine, ballast, and fresh water from other sources; and miscellaneous drips and drains.	1.5 MGD avg. 2.3 MGD max. (intermittent)

[(1)] Not all NPDES Permit outfalls are shown. Only NPDES Permit outfalls that would apply to E&P waste disposal operations are shown.

4.1.1.2 Impacts from an Accidental Waste Spill

4.1.1.2.1 Water-based Muds and Cuttings

Drilling fluid is the circulating fluid (mud) used in the rotary drilling of wells to clean and condition the hole and to counterbalance formation pressure. Well treatment, workover and completion fluids, which are used to condition and protect a well, may also be mixed in to the drilling fluid. Water-based drilling fluid means that the continuous phase and suspending medium for solids is a water-miscible fluid, regardless of the presence of oil as defined by the Final NPDES General Permit for New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Category for the Western Portion of the Outer Continent Shelf of the Gulf of Mexico, modified December 18, 2001, and effective February 16, 2002. Water-based muds may become contaminated with oil during the drilling process. Therefore, the general permit for OCS discharge prohibits the overboard discharge of free oil.

There is the potential for Cavern No. 1 to collapse with a resulting release of brine and some entrained muds and cuttings to the seafloor (Freeport, 2001). Water-based fluids (muds) and associated drill cuttings to be injected into Cavern No. 1 must meet the same limitations imposed on their discharge by the USEPA permit, including LC_{50} limitations on toxicity and limitations on concentrations of cadmium and mercury in barite. Wastes that do not meet the limitations for injection into Cavern No. 1 may still be injected into any of the other MP 299 caverns or caprock. The impacts of an accidental release of water-based muds and cuttings caused by the collapse of Cavern No. 1 are discussed in Chapter 4.1.1.2.3.

Freeport's waste sampling and testing procedures are discussed in Chapters 3.1 through 3.2.9 of their Exhibit 1 - Operations Plan for E&P Waste Disposal in Salt Caverns and Associated Caprock, Amended October 17, 2001, that is included in Appendix B of this programmatic EA. According to Freeport, the following tests will be performed on all wastes received at MP 299 for injection into caverns or caprock: pH, chloride concentration, conductivity, H_2S concentration, NORM, total volatile organic compounds (TVOC), retort to determine the amounts of oil, solid water separation, temperature, and mud weight. Wastes will be refused for disposal at MP 299 if the concentration of NORM is > 30 picocuries per gram. Extremely high (caustic) or low (acidic) wastes may also be refused, unless neutralized. The final density and ambient temperature of slurried waste will also be recorded. Salinity of slurried waste and brine will be periodically checked by determination of density, chlorides content test, conductivity, or other appropriate testing techniques.

An accidental spill of water-based muds and cuttings would have similar impacts to a permitted discharge. The main difference in these "release" scenarios would be the rate at which the waste spill or discharge could occur. The USEPA permit allows for the daily discharge of 1,000 bbl of water-based drilling mud per hour. In the case of an accidental spill, a larger volume, possibly 12,500 bbl, could be spilled in several hours. A single accidental waste spill would release comparable or less water-based muds and cuttings than is typically discharged during the drilling of a well. Therefore, the impact of a spill is expected to be minor.

The impacts of the discharge of water-based muds and cuttings have been extensively researched by the USEPA for the development of the effluent limitation guidelines and standards. The MMS has funded research to determine the impact of permitted muds and cuttings discharges upon the sediment characteristics of the seafloor and the benthic communities. The greatest effects to the benthos are within 100-200 m of the drilling mud discharge, primarily due to the increased coarsening of the sediment by cuttings. Alterations to the sediment grain size and composition have been noted to a distance of 500 m. The sand content of sediments closest to the platform discharge increased in comparison to background levels. The presence of drilling fluids, measured by barium concentration, typically reach background levels within 1,000 m from the point of discharge, dependent upon discharge depth, water depth and currents (GOOMEX). The concentration of barium and the alterations to the sediment composition diminish with distance from the platform.

The solids within the mud and cuttings discharges (sand, barite, clays, and gypsum) have a range of particle sizes with a corresponding range of settling velocities. Flocculation of some particulates will increase the settling velocity. A surface discharge of water-based muds and cuttings would result in increased turbidity through the water column. The muds and cuttings would also impact the sediment. The strong acids, bases, and salt solutions that are used as well treatment, workover, and completion fluids react with seawater and other waste streams and are neutralized as they mix.

The MMS used the CHEMMAP model designed by Applied Science Associates (ASA), of Narragansett, Rhode Island, to model the movement of a waste spill in the OCS environment. Model parameters included the use of actual winds and currents data collected in the vicinity of MP 299 and the use of physical and chemical data for barite to represent spilled waste. The model indicated that within 9 hours the mean vertical water concentration of barite particles had decreased to 1 ppm or less and had traveled approximately 10 nmi from MP 299. Barite is just one component of drilling mud. Additives, which make up a smaller portion of the muds, could be more soluble in water or travel farther than barite, depending upon their solubility in water, particle size, and density.

More details on the parameters used in the model and the results are presented in Appendix E.

4.1.1.2.2 Oil and Synthetic-based Muds and Cuttings

The impacts of the accidental spill of oil-based muds and cuttings intended for disposal at MP 299 would be similar to the spill of water-based muds and cuttings discussed above. Sediment grain size and composition will be physically altered from the settled muds and cuttings. Barite, which is also used in oil-based mud formulations, would release a turbidity plume to the water. The distance that the plume would travel would be influenced by water currents.

The effect of cuttings, which are coated with diesel or mineral oil, would further impact the seafloor. Oil-coated cuttings can impact benthic organisms by changing the sediment characteristics. In the case of diesel oil, cuttings coated with oil would contribute polycyclic aromatic hydrocarbons (PAH's) to the environment. The PAH's are a family of compounds that are both persistent in the environment and toxic to benthic organisms. The type of oil adhered to the cuttings will influence the toxicity to benthic organisms. Diesel oil contains about 5-10 percent PAH's whereas mineral oil, a refined petroleum product, contains only about 0.35 percent PAH's.

Synthetic-based muds are water insoluble. The cuttings are "oil wet" and, when discharged to the ocean, tend to clump together in large particles that settle rapidly to the seafloor. Several field studies have shown that the highest concentrations of SBF cuttings are located within about 100 m from the platform. However, SBF cuttings may be deposited 1-2 km from the discharge point. Studies of SBF-coated cuttings have noted that bacterial degradation of the fluid may decrease the dissolved oxygen levels at the seafloor. The types of SBF's permitted for use in the GOM have been selected from a wider range of products because of their more rapid microbial biodegradation rates.

In addition to the inorganic mud constituents and oil adhered to the cuttings, the free oil would impact the environment. Potential sources of an oil spill as a result of the proposal are addressed in Appendix D. The impact of the oil would be related to the type and amount of oil spilled.

4.1.1.2.3 Impacts of a Release from the Collapse of Cavern No. 1

A release of waste could also occur as a result of the collapse of MP 299 Cavern No. 1. Various engineering and geotechnical reports have been prepared by Freeport and MMS regarding the structural integrity of the caprock and caverns at MP 299. Also, the facility was designed and constructed to allow for 75 ft of subsidence as the geological structure "gives" as a result of the sulphur operations. In the summer of 2001, several of the platform structures at MP 299 were evacuated, living facilities removed, and personnel exclusion zones established due to safety concerns related to the stability of Cavern No. 1. The operator has since maintained the personnel exclusion zone and has proposed filling Cavern No. 1 with water-based, OCS-generated, RCRA-exempt E&P wastes to increase stability. Establishment and maintenance of operations to inject E&P waste into Cavern No. 1 would not be affected by these safety concerns because personnel would not be required to work within the exclusion zone during the proposed activities. Waste received at platforms PP1 or PP2 would be injected into Cavern No. 1 via the existing brine Well #1-A (OCS-G 9372 Well #BR-01-A) located on Platform BS-2 via piping or, alternatively, via a proposed well to be named the OCS-G 9372 Well #CA-01 to be drilled from platform PP1, platform PP2, or one of the bridge support towers.

A collapse of Cavern No. 1 has been identified as the most likely scenario for failure of any of the salt caverns or associated caprock to be used for waste injection. The cavern is currently filled with saturated brine. The seawater has a salinity of about 35 ppt and a density of about 8.5 lb/gallon (Freeport, Appendix 7, Section B). The brine has a salinity of about 26 percent or 260 ppt and a density of about 10 lb/gallon. After initiation of waste injection into Cavern No. 1, the brine may contain trace levels of residual well treatment, workover, and completion fluid chemicals. The waste will not be highly acidic or basic since Freeport will monitor waste pH and will neutralize the waste when necessary. Some surfactants, solvents, and biocides, which are added to treat the mud and condition the fluid, may still be present in the mud or liquid phase within Cavern No. 1. However, the concentrations of these chemicals would be of such a low concentration that the water quality would not be affected should they be released as a result of the collapse of Cavern No. 1.

As the E&P waste is injected into Cavern No. 1 and settles to the bottom, brine is removed from the top of the cavern. If the caprock were to fail and spall into Cavern No. 1, brine and possibly some associated waste would be forced upwards from the cavern into the caprock. Freeport estimated the volume of brine that might travel upward into the caprock formation, penetrate the sediment column over the salt dome and upward-migrate to the seafloor, to be a maximum of 1.6 million bbl, depending on during what stage of operation failure occurred. The brine may contain trace levels of residual well treatment, workover and completion fluid chemicals. The projected concentrations of individual chemicals within the brine solution is influenced by the nature of the wastes, solubility, temperature, and pressure and was not determined as part of this analysis. Freeport determined that the release of brine would most likely occur from numerous point sources over the salt dome (2,600-ft diameter area) over a period of hours or days. It is expected that the brine, which is denser than seawater, would initially remain in the depression created by the cavern roof collapse (2,600 ft wide by a maximum of 45 ft deep) and would then dilute slowly with the currents.

Freeport states the seafloor depression diameter remains constant regardless of the amount of cavern fill material until the cavern is filled (with RCRA exempt E&P waste) to the 80- to 90 percent fill range, at which time the subsidence would be reduced to the point that the upper sediments would yield plastically rather than fracture, and no fluid would reach the Gulf floor in case of a cavern roof failure.

As previously noted, there is the potential for Cavern No. 1 to collapse with a resulting release of brine and some entrained muds and cuttings to the seafloor (Freeport, 2001). Water-based fluids (muds) and associated drill cuttings to be injected into Cavern No. 1 must meet the same limitations imposed on their discharge by the USEPA permit, including LC_{50} limitations on toxicity and limitations on concentrations of cadmium and mercury in barite. Wastes that do not meet the limitations for injection into Cavern No. 1 may still be injected into any of the other MP 299 caverns or caprock.

Mitigation

Injection of OCS-generated, RCRA-exempt E&P wastes into Salt Cavern BR-1-A must be limited to the following wastes:

(1) wastes that meet the definition of " water-based drilling fluid" and associated "drill cuttings," as defined by the Final NPDES General Permit for New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Category for the Western Portion of the Outer Continental Shelf of the Gulf of Mexico, modified December 18, 2001, and effective February 16, 2002, and that meet the same limitations imposed on their discharge by the USEPA permit, including LC_{50} limitations on toxicity and limitations on concentrations of cadmium and mercury in barite; and

(2) wastes that qualify as, per MMS NTL 99-G22, as "miscellaneous trash and debris associated with waste handling operations (e.g., gloves, tyvek suits)" contaminated with the above described wastes."

4.1.2 Impacts on Air Quality

Freeport's project combines the production of salt (in the form of brine) under a supplemental DOCD (S-5469) and the use of the caverns created by salt production (and in the course of sulphur production, which was previously conducted on the lease) as well as the caprock overlying the salt dome, for waste disposal as proposed in their applications to inject OCS-generated, RCRA-exempt E&P waste. The waste disposal applications propose some changes in equipment and changes to the time of operation from the previously approved supplemental DOCD (S-5469), which only addressed brine production. The net result is an increase in air pollutant emissions. This increase is primarily due to the E&P waste injection activities. However, even when the new emissions for the E&P waste disposal are added to the new brine production emissions, the total annual emission rates for the various air pollutants are still below the MMS exemption level (e.g., 505 tons per year vs. 543 tons per year of NO_x, respectively, for the year 2027). The air emissions are projected to steadily increase over the life of the project, peaking in 2027, as depicted in Table 4-3.

The air emissions arising from the E&P waste injection operation would be predominantly associated with the waste transport vessels (i.e., OSV's and SPB's) while in transit (i.e., within 25 mi) and moored at the facility. In addition, there will be pumps and a crane located at the facility to assist in the waste transfer.

Since sulphur production has been discontinued at this facility, those air emissions, to a notable extent, off-set the emissions from the proposed E&P waste injection operation. In addition, at least in the first several years of operation, it is expected that the overall emissions from vessel traffic associated with onshore waste disposal will be decreased as waste producers begin to use the MP 299 E&P waste facility rather than onshore facilities which require longer transit distances. Therefore, emissions from vessel traffic associated with waste disposal are going to occur with or without the project.

Table 4-3

Projected Emissions for Waste Disposal at MP 299
(tons)

Year	PM	SO_X	NO_X	VOC	CO
2002	7.11	30.18	228.41	107.41	50.29
2003	8.61	37.07	280.12	111.42	61.77
2004	10.31	44.85	338.35	115.12	74.27
2005	11.79	51.67	389.48	117.58	85.43
2006-2009	11.73	51.39	387.39	121.02	84.97
2010	11.21	48.99	369.39	122.01	81.05
2011	11.15	48.71	367.31	122.47	80.59
2012	11.51	50.36	379.66	123.41	83.29
2013	11.86	51.98	391.82	124.39	85.94
2014-2015	12.22	53.63	404.19	125.46	88.64
2016-2017	11.64	50.95	384.11	125.87	84.26
2018	11.99	52.58	396.27	127.33	86.91
2019	12.35	54.21	408.53	128.49	89.58
2020	12.70	55.85	420.79	129.64	92.26
2021	12.48	54.82	413.07	130.29	90.58
2022	12.83	56.44	425.23	131.53	93.23
2023	13.19	58.09	437.58	132.82	95.92
2024	13.32	58.68	442.03	133.96	96.89
2025	14.17	62.55	470.99	135.83	103.21
2026	14.65	64.79	487.79	137.43	106.88
2027	15.16	67.11	505.20	139.09	110.68
MMS exemption level	542.79	542.79	542.79	542.79	21,857.68

Since the project is located within 100 km of the Breton National Wilderness Area (BNWA) and since the maximum annual emission rate for nitrogen oxides is greater than 250 tons per year, this project plan was forwarded to the FWS, Air Quality Branch, Denver, Colorado, for their review. On April 23, 2002, FWS determined that Freeport's actual emissions increases are very minimal and they did not have any further need for analysis from Freeport (Porter, 2002).

There is expected to be a limited degree of air quality degradation in the immediate vicinity of the brine production and waste disposal activities. In addition, in the event of an accidental release of air pollutants, air quality may be affected further from the activities. For example, the accidental release of gaseous organic compounds, typically referred to as volatile organic compounds (VOC's), which are photochemically active, could contribute to elevated ozone concentrations. This possibility is greatly enhanced if the release occurs on a hot sunny day in an environment with high concentrations of NO_x. Although the nearest onshore areas are currently in attainment for ozone, several coastal parishes or counties may soon be designated nonattainment under the new 8-hour ozone standard. According to ambient data collected in the 3-year period of 1998-2000, ozone levels in St. Mary Lafourche, Jefferson, and Orleans Parishes in Louisiana; Hancock and Jackson Counties in Mississippi; and Mobile County in Alabama exceed the 8-hour ozone standard. If the accidental release were due to a fire, then particulate matter (PM) and combustion emissions would be released in addition to VOC's. This could also favor the photochemical creation of ozone due to the increase in NO_x produced by the fire's combustion. Further, although the nearest onshore areas are in attainment for the PM standards, USEPA recently promulgated a new standard for the size fraction less than 2.5μM in diameter, and sufficient monitoring has not yet been conducted to establish the attainment status. The PM emissions may also contribute to visibility impairment in the BNWA.

Mitigation

A deviation from the activities proposed in your applications that would increase NO_x emissions (e.g., use of higher horsepower waste transport vessels or increased time for unloading) could potentially cause the annual NO_x emissions to exceed the MMS exemption level. Therefore, if a deviation occurs, please be advised that revised applications must be submitted and approved before proceeding with the deviated activity. The revised applications must include the recalculated emission amounts and, if the emissions exceed the MMS exemption level, also the air quality modeling as per 30 CFR 250.303(e).

Recommendation

Due to the close proximity to BNWA (i.e., within 100 km), the use of low sulfur fuel and controls on emissions of nitrogen oxides is also recommended.

Conclusion

In conclusion, for the proposed activity, the total annual emission rates for the various air pollutants are below the MMS exemption level. There is expected to be a limited degree of air quality degradation in the immediate vicinity of the MP 299 facility. The FWS review of the proposed activity has determined that Freeport's actual emissions increases are very minimal and no further analysis from Freeport is required. No significant impacts (refer to "Air Quality" significance criteria and terminology and resource-specific definitions outlined in Table B-3) to air quality are expected to occur.

4.2 BIOLOGICAL RESOURCES

4.2.1 Impacts on Sensitive Coastal Environments

4.2.1.1 Coastal Barrier Beaches and Associated Dunes

The following section describes potential impacts to coastal barrier beaches and associated dunes as a result of the proposed action. Potential impact-producing factors associated with the proposed action include an accidental spill of muds and cuttings (including oil based) resulting from a vessel collision, spill-response activities, and vessel traffic. A summary of maximum potential accidental spills to water including potential spill location, size, and composition, can be found in Table 4-1. For the oil-based muds and cuttings spill scenario, MMS assumed that 25 percent of the muds and cuttings volume (3,125 bbl) is diesel or mineral oil that behaves as "free" oil. For this scenario, the entire contents of the vessel's diesel tank (1,333 bbl) are also assumed to spill. Therefore, the maximum volume of spilled oil that could result from the proposed activity is 4,458 bbl. For a spill occurring at MP 299, the OSRA Model was used to determine probable spill movement around the GOM and projected contacts with the shore (Transport Variable), and the Sintef Applied Chemistry Model was used to predict the material balance of the spilled oil. The ASA CHEMMAP Model was used to model the fate of spilled barite, which was used as a surrogate for the fate of spilled water-based muds and cuttings (Appendix E).

Spills

Should oil contact a beach, the volume of oil involved might range from a few very dispersed gallons of oil to a volume that approaches the projected volume of oil that might exist in the slick on the day of contact, as indicated by the Sintef model. The length of beach that might be contacted could range to about 20 km (12 mi). The possible range for dispersal patterns of contacting oil ranges from small, diffusely scattered specks to heavy concentrations spread over the beach.

Severe adverse impacts to dunes contacted by a spill are very unlikely. For storm tides to carry oil from a spill across and over the dunes, strong southerly or easterly winds must persist for an extended time prior to or immediately after the spill. Strong winds required to raise water levels adequately to contact dunes would also accelerate oil slick dispersal, thereby reducing impact severity at a landfall site. In addition, a study in Texas showed that oil disposal on vegetated sand dunes had no deleterious effects on the existing vegetation or on the recolonization of the oiled sand by plants (Webb, 1988).

Spill-response Activities

Cleanup operations associated with large spills can affect the stability of barrier beaches more than the spill itself. If large quantities of sand were removed during spill cleanup operations, a new beach profile and sand configuration would be established in response to the reduced sand supply and volume. The net result of these changes would be accelerated rates of shoreline erosion at the contact site and downdrift of that site. This situation would be accentuated in sand-starved or eroding barrier beaches, such as those found on the Louisiana coast. State governments around the Gulf have recognized these problems and have established policies to limit sand removal by cleanup operations.

Vessel Traffic

Appendix C, Exhibit 1, Operations Plan, Attachment 3 lists the vessel traffic to MP 299 required to transport the projected waste volumes. Additional vessel traffic is also required for operational support and brine transport. While OCS-related servicing should increase in Port Fourchon, Morgan City, and Venice, Louisiana, due to the proposed action, there may be a reduction in activity at the ports due to decreased traffic bringing OCS waste to shore for transfer to barge. There is no current model that indicates a potential impact on barrier beach and dune environments due to vessel traffic other than the potential risk of a spill as the result of a vessel collision.

Conclusion

Should a spill contact a barrier beach, oiling is expected to be light and sand removal during cleanup activities minimized or not part of the response. Severe adverse impacts to dunes contacted by a spill are very unlikely. Proposed vessel traffic is not expected to adversely impact coastal barrier beaches and associated dunes. No significant impacts to the physical shape and structure of barrier beaches and associated dunes are expected to occur as a result of the proposed action. No significant impacts (refer to "Coastal Environments" significance criteria and terminology and resource-specific definitions outlined in Appendix B – Table B-3) to sensitive barrier beach and dune environments are expected to occur.

4.2.1.2 Wetlands

The following section describes potential impacts to wetlands as a result of the proposed action. Potential impact-producing factors associated with the proposed action include an accidental spill of muds and cuttings (including oil-based) resulting from a vessel collision, spill-response activities, and vessel traffic. A summary of maximum potential accidental spills to water, including potential spill location, size, and composition can be found in Table 4-1. For the oil-based muds and cuttings spill scenario, MMS assumed that 25 percent of the muds and cuttings volume (3,125 bbl) is diesel or mineral oil that behaves as "free" oil. For this scenario, the entire contents of the vessel's diesel tank (1,333 bbl) are also assumed to spill. Therefore, the maximum volume of spilled oil that could result from the proposed activity is 4,458 bbl. For a spill occurring at MP 299, the OSRA Model was used to determine probable spill movement around the Gulf of Mexico and projected contacts with the shore (Transport Variable), and the Sintef Applied Chemistry Model was used to predict the material balance of the spilled oil. The ASA CHEMMAP Model was used to model the fate of spilled barite, which was used as a surrogate for the fate of spilled water-based muds and cuttings (Appendix E).

Spills

Offshore oil spills associated with the proposed action can result from platform accidents or navigation accidents. Offshore spills are much less likely to have a deleterious effect on vegetated coastal wetlands or seagrasses than inshore spills. Coastal oil spills can result from a vessel collision or transfer incident, with the majority occurring as a result of transfer operations. Current data indicates that approximately 64 percent of coastal spills occur inland. The most likely location of a coastal spill as a result of the proposed action would be at the shore bases of Morgan City, Port Fourchon, or Venice, Louisiana. Spills from support vessels could occur from navigation accidents and would be largely confined in navigation channels and canals. Slicks may spread quickly through the channel by tidal, wind, and traffic (vessel) currents. Spills that damage wetland vegetation fringing and protecting canal banks will accelerate erosion of those once protected wetlands and spoil banks (Alexander and Webb, 1987).

Shoreline types have been rated (via Environmental Sensitivity Indices, (ESI's); Hayes et al., 1980; Irvine, 2000) according to their expected retention of oil and, to some extent, biological effects are believed to be aligned with oil persistence. This relationship is evident in various low-energy environments like salt marshes and other coastal wetland habitats. Oil has been found or estimated to persist for at least 17-20 years in such environments (Teal et al., 1992; Baker et al., 1993; Irvine, 2000). Effects on marsh vegetation can be severe, and in some instances where there has been further damage due to cleanup activities, recovery has been estimated to take from 8 to 100 years (Baca et al., 1987; Baker et al., 1993).

The side effects of the depletion of marsh vegetation, which are of special concern to coastal Louisiana, Mississippi, Alabama, and parts of coastal Texas, is increased erosion. Cleanup activities in marshes may accelerate rates of erosion and retard recovery rates, which have been reported to occur from years to decades following a spill.

The critical concentration of oil is that concentration above which impacts to wetlands will be long term and recovery will take longer than two growing seasons, and which causes plant mortality and some permanent wetland loss. Critical concentrations of various oils are currently unknown and are expected to vary broadly for wetland types and wetland plant species. Louisiana wetlands are assumed to be more sensitive to oil contact than elsewhere in the Gulf because of high cumulative stress.

Oil-spill Response Activities

The cleanup of oil spills in coastal marshes remains a problematic issue because wetlands can be extremely sensitive to the disturbances associated with cleanup activities. Once a marsh is contacted by an oil spill, a response is carried out according to the approved OSRP. Often the best course of action is to let the impacted area(s) recover naturally in order to avoid secondary impacts associated with the cleanup process (McCauley and Harrel, 1981; Long and Vanderrneulen, 1983: Getter et al., 1984; Baker et al., 1993; Mendelssohn et al., 1993). Foot traffic and equipment traffic, such as marsh buggies, on the marsh surface during cleanup operations are considered secondary impacts that can have adverse effects on the recovery of the marsh by trampling vegetation, accelerating erosion, and burying oil into anaerobic sediment where it may persist for years (Getter et al., 1984).

Vessel Traffic

Appendix C, Exhibit 1, Operation Plan, Attachment 3 lists the vessel traffic to MP 299 required to transport the projected waste volumes. Additional vessel traffic is also required for operational support and brine transport. Waves generated by vessels erode unprotected shorelines and accelerate erosion in areas already affected by natural erosion process. According to Johnson and Gosselink (1982), canals that have high navigation usage in coastal Louisiana widen about 2.58 m/yr, compared with 0.95 m/yr for little used canals. The OCS-related navigation canals are assumed to generally widen at an average rate of 1.5 m/yr. Approximately 3,200 km of OCS-related navigation canals, bayous, and rivers are found in the coastal regions around the Gulf, exclusive of channels through large bays, sounds, and lagoons. About 700 km of these channels are found around the WPA; another 2,000 km are found in the CPA.

While OCS-related servicing should increase in Port Fourchon, Morgan City, and Venice, Louisiana, due to the proposed action, there may be a reduction in activity at the ports due to decreased traffic bringing OCS waste to shore for transfer to barge. An increase in the number of vessels creating wakes could potentially increase impacts to coastal habitats including wetlands.

Conclusion

Although the probability of occurrence is low, the greatest threat to wetland habitat is from an inland spill resulting from a vessel accident. While a resulting slick may cause minor impacts to wetland habitat and surrounding habitat, the equipment and personnel used to clean up a slick over the impacted area may generate the greatest secondary impacts to the area. Associated foot traffic may work oil farther into the sediment than would otherwise occur. Close monitoring and restrictions on the use of bottom-disturbing equipment would be needed to avoid or minimize those impacts.

Adverse impacts to wetlands resulting from a spill originating from the proposed action are unlikely to occur. However, if an offshore spill occurs, and the oceanographic and meteorological conditions are such that a large amount of oil contacts wetlands, adverse impacts could occur. If a spill occurs inshore, wetlands in the spill vicinity could be adversely impacted. Vessel traffic from the proposed action is not expected to adversely impact wetlands. No significant impacts (refer to "Coastal Environments" significance criteria and terminology and resource-specific definitions outlined in Table B-3) to wetlands are expected to occur.

4.2.1.3 Seagrasses

The following section describes potential impacts to seagrass beds as a result of the proposed action. Potential impact-producing factors associated with the proposed action include an accidental spill of muds and cuttings (including oil based) resulting from a vessel collision, spill-response activities, and vessel traffic. A summary of maximum potential accidental spills to water, including potential spill location, size, and composition, can be found in Table 4-1. For the oil-based muds and cuttings spill scenario, MMS assumed that 25 percent of the muds and cuttings volume (3,125 bbl) is diesel or mineral oil that behaves as "free" oil. For this scenario, the entire contents of the vessel's diesel tank (1,333 bbl) are also assumed to spill. Therefore, the maximum volume of spilled oil that could result from the proposed activity is 4,458 bbl. For a spill occurring at MP 299, the OSRA Model was used to determine probable spill movement around the Gulf of Mexico and projected contacts with the shore (Transport Variable), and the Sintef Applied Chemistry Model was used to predict the material balance of the spilled oil. The ASA CHEMMAP Model was used to model the fate of spilled barite, which was used as a surrogate for the fate of spilled water-based muds and cuttings (Appendix E).

Spills

The degree of impact from oil spills depends on the location of the spill, characteristics, water depth, currents, and weather. Offshore oil spills are much less likely to contact seagrass communities than are inshore spills because the seagrass beds are generally protected by barrier islands, peninsulas, sand spits, and currents.

Some oils can emulsify; suspended particles in the water column will adsorb oil in a slick, decreasing the oil's suspendability and causing some of the oil to be dispersed downward into the water column. Typically, seagrass communities reduce water velocity among the vegetation as well as for a short distance above it. Minute oil droplets, whether or not they are bound to suspended particulates, may adhere to the vegetation or other marine life, may be ingested by animals, or may settle onto bottom sediments. In all of these situations, oil has a limited life because it will be degraded chemically and biologically. Microbes, which are found in all marine environments, are considered the greatest degraders of oil (Zieman et al., 1984). Because estuaries have a greater suspended particulate load and greater microbial population, oil degrades more rapidly there (Lee, 1977). Oil that penetrates deeply into the sediments is less available for dissolution, oxidation, or microbial degradation. If buried, oil may be detectable in the sediments for 5 years or more, depending upon the circumstances.

The cleanup of slicks in shallow or protected waters (less than 5 ft deep) may be performed using johnboats or booms, anchors, and skimmers mounted on boats or shore vehicles. Personnel assisting in oil-spill cleanup in water shallower than 3-4 ft may readily wade through the water to complete their tasks.

Because of the location of seagrass communities and associated submerged aquatic vegetation, inshore spills pose the greatest threat. Such spills may result from either a vessel collision or transfer incident. If an oil slick settles into a protective embayment where seagrass beds are found, shading may cause reduced chlorophyll production; shading for more than about 2 weeks could cause thinning of leaf density. Under certain conditions, a slick could reduce dissolved oxygen in an embayment and cause stress to the bed and associated organisms due to reduced oxygen conditions. Once the slick largely vacates the embayment, light and oxygen levels are returned to pre-slick conditions.

Increased water turbulence due to storms or vessel traffic will break apart the surface sheen and disperse some oil into the water column, as well as increase suspended particle concentration, on which the dispersed oil will adsorb. Typically, these situations will not cause long-term or permanent damage to the seagrass beds, although some dieback of leaves is projected for one growing season. No permanent loss of seagrass is projected to result from oil contact, unless an unusually low tidal event allows direct contact between the slick and vegetation. The greatest impact under the more probable circumstances is a reduction for up to 2 years of the diversity or population of epifauna and benthic fauna found in seagrass beds.

Oil-spill Response Activities

The problematic issue regarding oil-spill cleanup in seagrass meadows is somewhat similar to that of coastal marshes because, like wetlands, seagrass meadows can be extremely sensitive to the disturbances associated with cleanup activities. Once a seagrass meadow is impacted by an oil spill, a response is carried out according to the approved OSRP. Often the best course of action is to let the impacted area(s) recover naturally in order to avoid secondary impacts associated with the cleanup process (McCauley and Harrel, 1981; Long and Vandenneulen, 1983: Getter et al., 1984; Baker et al., 1993; Mendelssohn et al., 1993). Foot traffic and equipment traffic on seagrass beds during cleanup operations are considered secondary impacts that can have adverse effects on the recovery of the area by trampling the submerged vegetation, uprooting, and burying oil into anaerobic soils where it may persist for years (Getter et al., 1984).

Vessel Traffic

Appendix C, Exhibit 1, Operations Plan, Attachment 3 lists the vessel traffic to MP 299 required to transport the projected waste volumes. Additional vessel traffic is also required for operational support and brine transport. While OCS-related servicing should increase in Port Fourchon, Morgan City, and Venice, Louisiana, due to the proposed action, there may be a reduction in activity at the ports due to decreased traffic bringing OCS waste to shore for transfer to barge. Vessels that vary their inland route from established navigation channels can directly scar beds of submerged vegetation with their propellers, keels (or flat bottoms), and anchors. Many vessel captains will cut corners of channel intersections or navigate across open water where they may unexpectedly encounter shallow water where beds of submerged aquatic vegetation may occur. Propellers may superficially damage a bed by leaving a few narrow cuts. If a vessel becomes stuck, however, efforts to free it can cause more severe damage. Damage may be as extensive as broadly plowed scars from the keel of a large boat accompanied by extensive prop washing; trampling by waders; and additional keel, prop, and propwash scars left by other vessels that assisted in freeing the first boat.

Depending upon the submerged plant species involved, scars about 0.25-in wide cut through the middle of beds would take 1-7 years to recover. Similar scars through sparser areas would take 10 years or more to recover. The broader the scar, the longer the recovery period. Extensive damage to a broad area may never be corrected (Sargent et al., 1995; Durako et al., 1992).

Coarser-grained materials fall out of suspension within a matter of hours. Less dense sediments settle to the water bottom within a matter of days or are washed into other locations by tidal or current activity. These finer-grained sediments are generally more easily resuspend by storms than the original surface sediments. Hence, for a period of time after disturbance occurs, water turbidity will be greater than usual in the vicinity of the disturbance. With time, increased turbidity will decrease to predisturbance conditions, as the lighter materials are either dispersed to deeper water by currents, where they are less available for resuspension, or they are consolidated into or under denser sediments.

For estuarine species that thrive in salinities of about 0.5-25 ppt, this elevated turbidity may not pose a significant problem because they have adapted to turbid conditions typical of estuaries. For seagrasses in environments with higher salinities and even freshwater submerged vegetation that require clearer waters, substantially reduced water clarity and shading, as may be caused by an oil slick lasting for longer than about 4 days, will decrease chlorophyll production. If such conditions continue for longer than about 2 weeks, plant density in the bed will begin to decrease. If plant density is reduced substantially as the root, thatch, and leaf coverage decline, further increases in turbidity will occur. Such impacts can be mitigated in several ways. Activities over grass beds should be closely monitored to avoid breaking the sediment surface and digging into the bed. Trampling or repeatedly walking over a path through the bed should be avoided.

Conclusion

The shore bases to be used during the proposed action—Morgan City, Port Fourchon and Venice, Louisiana—are located in areas where seagrasses are not common. In the unlikely event that an oil spill would impact a seagrass bed meadow, any impacts that would occur would be minimal. Vessel traffic from the proposed action is not expected to impact seagrass meadows. No significant impacts (refer to "Coastal Environments" significance criteria and terminology and resource-specific definitions outlined in Table B-3) to seagrass meadows are expected to occur.

4.2.2 Impacts on Benthic Communities/Organisms

4.2.2.1 Chemosynthetic Communities

As the area involved in the MP 299 proposed action is located in water depths between 60 and 70 m, no chemosynthetic communities (excluding bacterial) would occur in this continental shelf habitat. Water depths of 400 m and greater are located less than 20 nmi to the south-southeast of MP 299, but the closest known chemosynthetic community is located more than 40 nmi to the east in Viosca Knoll Block 826. It is not expected that any accidental spill or release from MP 299 offloading or storage facilities would impact deepwater areas conducive for the existence of chemosynthetic communities.

Conclusion

The proposed action in MP 299 would not have an impact on known chemosynthetic communities, and no potential communities are located in the vicinity of the impacting activities.

4.2.2.2 Benthos and Sediment Communities

As described in Chapter 3.2.2, the communities of small infaunal organisms living within the soft sediment bottom are ubiquitous and not addressed in this programmatic EA. Any potential localized impacts to these communities would quickly recover by colonization from surrounding communities of similar organisms of all size classes. Larger, bottom-dwelling organisms, termed megafauna (e.g., shrimp and crabs), in the immediate vicinity of the proposed project could be impacted by accidental events, including a large brine release resulting from a cavern collapse or accidental spills of muds and cuttings from barge collisions. It is assumed that brine released from a potential cavern collapse will initially be retained in the subsidence depression (2,600 ft wide by 45 ft deep) created by the collapse. The brine would then dilute with the currents.

Conclusion

Accidental barge spills or cavern collapses could disturb megafauna communities, specifically commercial species including shrimp, by possibly smothering and displacing them from areas within limited distances of the MP 299 sites and within small areas of the bottom surrounding accidental barge spills of water-based, synthetic-based, or oil-based drilling muds. Brine released from a cavern collapse would have little impact on surrounding megafauna if it is retained in the resulting graben or "sink hole" caused by the collapse. All size classes of benthos occupying the area directly above the collapsed cavern would likely be smothered or killed due to resuspension of sediments or submergence in brine. A limited area surrounding the crater would probably be impacted due to resuspended sediments and some impact from brine diffused into the water column near the bottom. However, field studies of the impact of very high volumes of diffused brine have demonstrated limited biological effects (e.g., the Bryan

Mound Strategic Petroleum Reserve brine disposal site reached 250 ppt brine discharge rates of 1 million bbl/day for many months. Results of a benthos study at Bryan Mound concluded that elevated salinity and ionic imbalance had mixed effects on the benthos if any (Hann and Randall, 1983). Partial recovery of the community will occur within weeks or months of the disturbance resulting from recruitment from surrounding areas followed by a more or less full recovery within 1 year. This will not result in a significant impact on megafauna benthic communities as determined by the significance criteria in Table B-3.

4.2.3 Impacts on Marine Mammals

The major impact-producing factors affecting marine mammals as a result of the proposed commercial waste disposal activities include the noise generated by helicopters, vessels, and operating facilities; vessel traffic; explosive structure removals; jetsam and flotsam from associated service vessels and disposal facilities; degradation of water quality from operational discharges; accidental chemical/waste spills or releases; and spill response actions. These factors may acutely and/or chronically impact marine mammals in the Gulf. (NOTES: (1) The significance terms [significant, adverse but not significant, negligible] used within this analysis are defined in Table B-3. They do not account for the probability of an impact occurring, but only the significance should an impact occur. (2) Presently, most lessees and/or operators are not required to report the "take" of marine protected species, such as marine mammals or sea turtles.)

Additional information regarding the potential impacts of these impact-producing factors on marine mammals can be found in the Final EIS for Gulf of Mexico Lease Sale 181 (USDOI, MMS, 2001b) and the Draft EIS for the Gulf of Mexico OCS Oil and Gas Lease Sales 2003-2007; Central Planning Area Sales 185, 190, 194, 198, and 201, Western Planning Area Sales 187, 192, 196, and 200, Volumes I and II (USDOI, MMS, 2002); and in referenced related environmental documents. An analysis of the potential impacts of these impact-producing factors that could result from the proposed action is provided below.

Proposed Action Analysis

Figure B-9 shows MP 299 relative to selected cities, shore bases, State coastlines, planning areas, and GOM bathymetry.

Helicopter activity is predicted at two landing-takeoffs per day at the MP 299 facility. The Federal Aviation Administration (FAA) Advisory Circular 91-36C encourages pilots to maintain higher than minimum altitudes (noted below) over noise-sensitive areas. Corporate helicopter policy states that helicopters should maintain a minimum altitude of 700 ft while in transit offshore and 500 ft while working between platforms. In addition, guidelines and regulations promulgated by NOAA Fisheries under the authority of the Marine Mammal Protection Act (MMPA) include provisions specifying helicopter pilots to maintain an altitude of 1,000 ft within 100 yd (91 m) of marine mammals. It is unlikely that cetaceans would be affected by routine OCS helicopter traffic operating at these altitudes, provided pilots do not alter their flight patterns to more closely observe or photograph marine mammals that they see. It is expected that about 10 percent of helicopter trips would occur at altitudes below the specified minimums listed above as a result of inclement weather. Overflights may elicit a startle response from, and disturb cetaceans nearby (depending on the activity of the animals) (Richardson et al., 1995). Occasional overflights probably have no long-term consequences on cetaceans; however, frequent overflights could have long-term and indirect consequences if they repeatedly disrupt vital activities, such as feeding, and breeding. Frequent overflights are expected in coastal and Federal neritic waters. Generally, overflights become less frequent and dispersed as the distance from a shore base to the OCS facilities being serviced increases; however, many offshore fields are supported by resident helicopters, resulting in increased localized overflights. The area supported by a resident helicopter is dependent in part on the size of the field that it supports. Short-term disturbance of individual cetaceans may occur on occasion as helicopters approach or depart OCS facilities, if animals are near the facility. Some disruption of behavioral activities may occur, but the impact is unlikely to adversely affect a species or stock through annual recruitment or survival rates. Long and short-term impacts attributable to helicopter activity is believed to be negligible to marine mammals.

The MP 299 facility currently produces sounds at intensities and frequencies that could be heard by cetaceans. It is expected that noise from disposal activities would be relatively constant and of similar intensity to activities it currently supports. Potential effects on GOM marine mammals include disturbance (subtle changes in behavior, interruption of previous activities, or short- or long-term displacement); masking of calls from conspecifics, reverberations from own calls, and other natural sounds (e.g., surf, predators); stress (physiological); and hearing impairment (permanent or temporary) by explosions and strong nonexplosive sounds. Noise emanating from the MP 299 facility may disrupt cetacean (primarily neritic species of dolphins) activities (e.g., feeding and mating), or animals may simply avoid the area if the noise is too offensive. Such avoidance would likely be ephemeral though, because dolphins are often sighted swimming around other oil and gas facilities producing similar noise in the region. The impact to marine mammals is regarded as negligible.

An estimated 936 dockings per year (2.56 dockings per day) by OSV and SPB are expected at MP 299. Transport of wastes by OSV and SPB to MP 299 could occur from anywhere in the northern Gulf that OCS E&P wastes are generated. It would primarily occur within a "waste corridor" that covers the Gulf of Mexico OCS from Morgan City, Louisiana (to the west) to the CPA/EPA boundary (to the east). The waste corridor extends south from the Federal/State boundary over 200 mi offshore to the EEZ. Vessel traffic to the onshore bases located at Fourchon, Venice, and Berwick (Morgan City), Louisiana, may also occur. Noise from vessel traffic may elicit a startle and/or avoidance reaction from cetaceans or mask their sound reception. There is the possibility of short-term disruption of movement patterns and behavior, but such disruptions are unlikely to affect survival or productivity. It is not known whether toothed whales exposed to recurring vessel disturbance will be stressed or otherwise affected in a negative but inconspicuous way. The short-term impact posed by vessel noise is believed negligible.

Increased vessel traffic increases the probability of collisions between vessels and marine mammals, resulting in injury or death to some animals. Smaller delphinids may approach vessels that are in transit to bow-ride. Limited observations on a NOAA Fisheries cruise off the mouth of the Mississippi River in the summer of 2000 indicated that sperm whales appeared to avoid passing service vessels. However, marine mammalogists conducting surveys in the CPA during the summer of 2001 documented an adult killer whale that bore conspicuous and aged scarring across its back that were indubitably the result of a collision with a motor vessel. A manatee was unintentionally hit and killed by a boat off Louisiana (Schiro et al., 1998). Another manatee was killed by vessel traffic (type of vessel unknown) in Corpus Christi Bay in October 2001 (Beaver, 2001). It appears that there is limited threat posed to smaller, coastal delphinids where the majority of OCS vessel traffic occurs; however, vessels traversing oceanic waters of the northern Gulf may strike sperm whales and other deep-diving cetaceans (e.g., *Kogia* and beaked whales). Deep-diving whales are more vulnerable to vessel strikes because of the extended surface period required to recover from extended deep dives. Whales that socialize in groups at or near the surface are also more susceptible to vessel strikes. Such behavior makes more than one animal vulnerable to vessel strikes at a time, but also increases the likelihood of their detection by vessel crewmembers. Manatees are rare in the northwestern Gulf; consequently, there is little risk posed by OCS vessel traffic. The Potential Biological Removal (PBR) for many GOM dolphin stocks are two or more animals (USDOC, NOAA, 2001). The PBR for some Gulf stocks are unknown because the minimum population estimate cannot be estimated. The PBR for GOM stocks of the sperm whale, Bryde's whale, and Cuvier's beaked whales are calculated at 0.8 animals or less. Although the risk is believed low, injury or mortality to most dolphin species resulting from vessel strikes would qualify as an adverse but not significant impact. However, injury to or mortality of one sperm whale, Bryde's whale, or Cuvier's beaked whale from a vessel strike constitutes a significant impact. There is a low probability that a vessel strike to a sperm whale, Bryde's whale, or Cuvier's beaked whale would occur. Therefore, the most likely impact is expected to be adverse but not significant.

Many types of materials, including plastics, are used during offshore operations. Some of this material is accidentally lost overboard where cetaceans can consume it or become entangled by it. The result of ingesting some materials lost overboard could kill or debilitate animals. Animals becoming entangled in OCS flotsam may also be killed or debilitated. Should a sperm whale, Bryde's whale, or Cuvier's beaked whale be debilitated or killed by OCS flotsam, it would constitute a significant impact. Because the accidental release of OCS trash and debris is managed, the risk of impact is believed low. Therefore, the most likely impact is expected to be adverse but not significant.

Produced waters, drill muds, and drill cuttings are routinely discharged into offshore waters and contain trace metals (e.g., cadmium, chromium, lead, and mercury) and a suite of hazardous substances (e.g., sodium hydroxide, potassium hydroxide, ammonium chloride, hydrochloric acid, hydroflouric acid, and toluene) (see Boehm et al., 2001, or Ayers et al., 1980 for more complete lists). Most operational discharges are diluted and dispersed when released offshore and are considered to have sublethal effects

(API, 1989; NRC, 1983; Kennicutt, 1995). The impact to the environment is minimized through the permit requirements. The permit sets toxicity or volume limits on discharges. The permit sets a maximum concentration for several metals that are present in barite. The permit does allow the use of trace amounts of priority pollutants in well treatment, workover, and completion chemicals that are used downhole and on the surface as part of the produced water or waste drilling mud or cuttings stream.

Some hazardous chemicals are used offshore. Strong acid solutions are used to stimulate formation production. Corrosive base and salt solutions are used to maintain pH and condition the well. The acids, bases, and salts react with other waste streams and seawater and are gradually neutralized following use. Freeport will not accept caustic or acidic wastes for injection. The application states that they will test the pH of all wastes and either refuse to accept the waste or neutralize it prior to injection. Other chemicals, such as surfactants and solvents that may be toxic to aquatic life, are used in trace amounts. These chemicals often serve as carrier solutions to keep a well treatment chemicals in a form so that they remain functional as it is pumped down the well. Biocides are used to prevent algal growth. These agents are preselected for use because of low toxicity, and in the case of a biocide, a short half-life.

Contaminants in the effluent could contribute to the poisoning of and could over time kill or debilitate marine mammals or adversely affect the food chains and other key elements of the Gulf ecosystem (Tucker & Associates, Inc., 1990). Cetaceans may have some interaction with these discharges. Because OCS discharges are diluted and dispersed in the offshore environment, and are but one of multiple sources of contaminants introduced into the northern Gulf, impacts to cetaceans from operational discharges are at most regarded as adverse but not significant.

The scenarios analyzed for potential oil/waste spills associated with the proposed action include a spill at MP 299 or at one of the onshore bases at Morgan City, Fourchon, or Venice, Louisiana. The scenario source of such spills stems from a vessel collision. The scenario analyzed comprises a spill of 12,500 bbl of oil-based, synthetic-based, or water-based muds and cuttings, and 1,333 bbl of diesel fuel. Oil/waste spills introduced in coastal waters at one of the onshore bases are assumed to encroach upon adjacent coastal lands and impact resources occurring in impacted waters.

Spills originating in or migrating through coastal waters of Louisiana may impact groups of the bottlenose dolphin, Atlantic spotted dolphin, or the West Indian manatee. Bottlenose dolphins are abundant in coastal waters of the northern Gulf. Manatees are sometimes encountered in Louisiana waters, and more frequently in waters eastward toward Florida. Freeport has stated that remediation efforts after a waste spill event occurs will include the collection and removal of spilled waste. Freeport has also stated that spills of materials that are insoluble in water and that sink are to be recovered. The recovery of spill materials that are soluble in water has been deemed impracticable. Although such materials may degrade water quality for the short term in a localized area, marine mammals occurring in the vicinity of the onshore bases in Louisiana may move to unaffected areas. It is expected that remediation activity will also disturb and displace any marine mammals in the area for the short term. The impact to marine mammals occurring in coastal waters where a spill occurs is believed adverse but not significant for the short term.

A spill of wastes and diesel fuel being transported to or from the MP 299 facility may impact neritic and/or oceanic species of marine mammals in the northern Gulf. The magnitude of impact would depend, in part, on the location of the spill (e.g., SPB sinking as a result of a vessel collision while transiting through the waste corridor), the composition of the materials spilled, and the movement and fate of the spilled hydrocarbons/wastes in the offshore environment. The greatest diversity and abundance of cetaceans inhabiting the GOM is found in its oceanic waters. Individual cetaceans are not necessarily randomly distributed in the offshore environment but are instead prone to forming groups of varying sizes. In some cases, several species may be found aggregating in the same area. Based on abundance estimates and a hypothetical spill surface area, spills occurring in these waters could impact more species and more individuals than coastal spills potentially impacting coastal marine mammals. It is noteworthy that the endangered sperm whale inhabits oceanic waters within 20 mi of the MP 299 facility. The waste corridor for the proposed action includes a major portion of waters inhabited by the Gulf's sperm whale stock. Given the prospect that a oil/waste spill occurs in offshore waters and that marine mammals are contacted by any resulting slick, the short-term impact would likely be broadly localized and adverse but not significant.

Freeport intends to extract selected material from the E&P waste prior to disposal using equipment at the MP 299 facility. This will include removing synthetic drilling fluids or free hydrocarbons from the cuttings/waste streams after they are unloaded at the MP 299 platforms. Reconditioned fluids are then to be resold to operators for other drilling activities. Reconditioned fluids are presumed transported from the MP 299 facility via OSV's or SPB's. It is expected that reconditioned fluids will include significantly higher concentrations of associated hazardous chemicals and trace elements than levels delivered in drilling fluids arriving at the MP 299 facility prior to undergoing recycling procedures. Should a vessel transporting the reconditioned fluids incur a collision that results in the spillage of part or all of the fluids being transported, the fluids could pose an increased lethal dose of chemicals exceeding that of a generic diesel/oil-spill scenario. Marine mammals coming into contact with the spill may suffer lethal or sublethal leading to lethal (over time) exposure. Groups of marine mammals may be exposed in one spill event. In the event that such an accident should occur, the impact to marine mammals could be significant if animals of strategic stocks (e.g., sperm whale) were affected. The likelihood of such a spill occurring is expected to be very low; therefore, the most likely impact to marine mammals would be adverse but not significant.

Vessel collisions with other vessels or marine mammals are accidental events. It is noteworthy that vessel collisions and associated spills are most likely to occur in areas where vessel traffic is concentrated, such as near shipping ports. Although vessel operations at offshore facilities are routine and distributed rather broadly in time and space, the pattern of vessel activity for this proposed action varies substantially from other OCS activities involving vessel activity patterns. In the case of the proposed action, the facility in MP 299 will become a hub of vessel activity associated with the transport of E&P wastes and recovered fluids. This increases the likelihood of a vessel collision occurring at the MP 299 facility. Freeport has estimated the vessel dockings at MP 299 to be 936 dockings per year (2.56 dockings per day) by OSV and SPB. The daily docking estimate is a subset of the annual docking numbers and does not necessarily accurately reflect the daily docking activity; i.e., there may be more than 2.56 dockings on some days and fewer on other days. Given that more dockings are likely to occur on some days, the potential for vessel collisions and an associated spill would increase.

An accidental release of waste could also occur as a result of the collapse of the MP 299 Cavern No. 1. Specifics of the accidental release from the collapse of Cavern No. 1 are given in Chapter 4.1.1.2.3. No other collapse scenarios were analyzed. If the caprock were to collapse into Cavern No. 1, brine and possibly some associated waste would be forced upwards from the cavern. Freeport estimated the volume of brine that might travel upward into the caprock formation and vent to the seafloor to be 1.6 million bbl. Freeport determined that the release of brine would most likely occur from numerous point sources over the salt dome (2,600-ft diameter area) over a period of hours or days. It is expected that the brine, which is denser than seawater, would initially remain in the depression created by the cavern roof collapse (2,600-ft wide by a maximum of 45 ft deep) and would then dilute slowly with the currents. Wastes proposed for injection into Cavern No. 1 are restricted to water-based muds and cuttings, which contain trace metals and hazardous chemicals (see Boehm et al., 2001, for a list of chemicals contained in water-based muds and cuttings). These chemicals and trace elements could be carried with the brine to the seafloor following the collapse of Cavern No. 1 and could be transported via other fluids to the seafloor after the cavern is nearly full and most of the brine has been extracted. There could be some interaction of the wastes and associated chemicals when aggregated inside the salt dome under the ambient pressures to which they will be exposed, pre- or post-cavern collapse. Based on the scenario that Cavern 1 collapses, brine from the cavern is expected to migrate to the seafloor and pool in the depression formed by the subsiding earth over a period of hours to days. It is also reasonable to expect that other fluid wastes (containing concentrated hazardous chemicals and trace metals) injected into the cavern will also immigrate to the seafloor along the same pathways that the brine travels over a period of hours to days, resulting in the pooling of brine and fluid wastes (including hazardous chemicals and trace metals). Based on the scenario, the brine would dilute over time with seawater passing over the pooled brine. So too might the other fluids, perhaps at rates different than that of the brine. It is noteworthy that the brine and hazardous chemicals or trace metals in solution that may be introduced over hours to days to the localized area are toxic to marine life depending on a suite of factors. Exposed marine organisms that are not killed by these fluids may become contaminated by them, making them available for bioaccumulation up the food web and subsequently impacting marine mammals. At the least, the collapse of any cavern or substrate overlying the injected wastes whereupon brine and wastes may migrate to the seafloor above would degrade the water quality of the area for days or weeks.

Spills of any size degrade water quality, and residuals become available for bioaccumulation within the food chain. Slicks may spread at the sea surface or may migrate underwater from the seafloor through the water column and never broach the sea surface. Regardless, a slick is an expanding, but aggregated mass of chemicals that, with time, will disperse into smaller units as it evaporates (if at the sea surface) and weathers. As the slick breaks up into smaller units (e.g., slickets) and soluble components dissolve into the seawater, tarballs may remain within the water column. Tarballs may subsequently settle to the seafloor or attach to other particles or bodies in the sea. As residues of an oil/waste spill disperse and commit to the physical environment (water, sediments, and particulates), populations or stocks of cetaceans may be exposed via the waters that they drink and swim, as well as via the prey they consume. For example, tarballs may be consumed by marine mammals and by other marine organisms, and eventually bioaccumulate within marine mammalian predators. Although marine mammals may (or may not) avoid oil/waste spills or slicks, it is highly unlikely that they are capable of avoiding spill residuals in their environment. Consequently, the probability that a marine mammal is exposed to oil/waste residuals resulting from a spill extends well after the spill has dispersed from its initial aggregated mass. Populations of marine mammals in the northern Gulf will be exposed to residuals of oils/wastes spilled as a result of the proposed actions during their lifetimes. The level of impact depends upon the oils/wastes that marine mammals are exposed to, their concentrations, and the period of exposure, the existing health of the animals, and the life stage of the animals exposed to the oils/wastes. The most likely impacts are expected to be adverse but not significant.

Caverns No. 1 and No. 3 have existing platforms located above them. Freeport is taking actions to decommission these structures. Freeport's Structural Removal Applications submitted August 5 and August 8, 2002, indicated that these and other MP 299 structures would be removed using abrasive cutting tools and that no explosives would be used for the removal. As previously stated in this EA, Cavern No. 1 has the potential to collapse due to the absence of a salt roof over the cavern. Cavern No. 1 will contain water-based muds and cuttings; however, MMS has determined that even explosive removal of the platform(s), which is not the proposed removal method, would not cause Cavern No. 1 to collapse (Appendix H). In any event, whether Freeport decides to use mechanical means or explosives to remove platforms in MP 299, they would have to submit a structure removal application to MMS. At that time, MMS would prepare a separate EA to analyze the potential impacts of such removals.

On August 5, 2002, MMS received Freeport's Structure Removal Application for the MP 299 Power Plant Platform (MMS ID No. 23784-03). The application stated that the subsea jacket portion of the power plant was to be removed using abrasive cutting tools and that no explosives would be used for the removal. The MMS prepared a separate EA analyzing the potential impacts of the mechanical removal of this structure. The EA resulted in a FONSI.

On August 8, 2002, MMS received Freeport's Structure Removal Applications for the MP 299 BS-1 (MMS ID No. 24248-01), BS-2 (MMS ID No. 24248-02), BS-Y3 (MMS ID No. 24248-03), BS-4 (MMS ID No. 24248-04), BS-5 (MMS ID No. 24248-05), BS-6 (MMS ID No. 24248-06), and QTR (MMS ID No. 23874-05) structures. All of these applications also stated that the subsea jacket portion of the structures were to be removed using abrasive cutting tools and that no explosives would be used for the removals. The MMS prepared a separate EA analyzing the potential impacts of the mechanical removal of these structures. The EA resulted in a FONSI. Refer to Appendix C, Exhibit 1 Operations Plan, Figure 1, for a plan view of the MP 299 platform complex that shows the specific bridge connected structures listed above.

Summary and Conclusion

There is no conclusive evidence whether anthropogenic noise has or has not caused long-term displacements of, or reductions in, marine mammal populations. Small numbers of marine mammals could be killed or injured by chance collision with service vessels, or by eating indigestible debris, particularly plastic items, lost from service vessels or the MP 299 facility. Small numbers of marine mammals may also over time be killed or debilitated as a result of acute or chronic exposure to hazardous chemicals and trace elements in concentrated E&P wastes spilled accidentally. The injury or death of any sperm whale, Bryde’s whale, or Cuvier’s beaked whale would be a significant impact. Contaminants in waste discharges and drilling muds might impact marine mammals through food-chain biomagnification. Spill response activities may disrupt normal behavioral activity and temporarily displace marine mammals from foraging, nursery, or mating areas. Significant impacts to marine mammals could occur as a result of low probability accidental events associated with the proposed action. The most likely impacts to marine mammals from the proposed action are expected to be adverse but not significant.

4.2.4 Impacts on Sea Turtles

The major impact-producing factors resulting from activities associated with the MP 299 proposed action that may affect loggerhead, Kemp's ridley, hawksbill, green, and leatherback turtles include noise from operating facilities, helicopters, and vessel traffic; vessel strikes; brightly-lit platforms; explosive platform removals; water-quality degradation from operational discharges; OCS-related trash and debris; accidental oil/waste spills; and spill response actions. These factors may acutely and/or chronically impact sea turtles in the Gulf. (NOTES: (1) The significance terms [significant, adverse but not significant, negligible] used within this analysis are defined in Table B-3. They do not account for the probability of an impact occurring, but only the significance should an impact occur. (2) In most cases, lessees and operators are not required to monitor for, or report the "take" of, marine protected species, such as marine mammals or sea turtles.)

Additional information regarding the potential impacts of these impact-producing factors on sea turtles can be found in the Final EIS for Gulf of Mexico Lease Sale 181 (USDOI, MMS, 2001b) and the Draft EIS for the Gulf of Mexico OCS Oil and Gas Lease Sales 2003-2007; Central Planning Area Sales 185, 190, 194, 198, and 201, Western Planning Area Sales 187, 192, 196, and 200, Volumes I and II (USDOI, MMS, 2002); and in referenced related environmental documents. An analysis of the potential impacts of these impact-producing factors that could result from the proposed action is provided below.

Proposed Action Analysis

Figure B-9 shows MP 299 relative to selected cities, shore bases, State coastlines, planning areas, and GOM bathymetry.

Helicopter activity is predicted at two landing-takeoffs per day at the MP 299 facility. The FAA Advisory Circular 91-36C encourages pilots to maintain higher than minimum altitudes (noted below) over noise-sensitive areas. Corporate helicopter policy states that helicopters should maintain a minimum altitude of 700 ft while in transit offshore and 500 ft while working between platforms. It is unlikely that sea turtles would be affected by routine OCS helicopter traffic operating at these altitudes, provided pilots do not alter their flight patterns to more closely observe or photograph sea turtles that they see. It is expected that about 10 percent of helicopter trips would occur at altitudes below the specified minimums listed above as a result of inclement weather. Routine overflights may elicit a startle response from, and disturb sea turtles nearby (depending on the activity of the animals). Occasional overflights probably have no long-term consequences on sea turtles; however, frequent overflights could have long-term consequences if they repeatedly disrupt vital functions, such as feeding and breeding. Frequent overflights are expected in coastal and Federal neritic waters. Generally, overflights become less frequent as the distance from shore of the OCS facilities being serviced increases; however, many offshore fields are supported by resident helicopters, resulting in increased localized overflights. The area supported by a resident helicopter is dependent in part on the size of the field that it supports.

There are no systematic studies published concerning the reactions of sea turtles to aircraft overflights, and anecdotal reports are scarce. It is assumed that aircraft noise could be heard by a sea turtle at or near the surface and could cause it to alter its activity (Advanced Research Projects Agency, 1995). In the wild, most sea turtles spend at least 3-6 percent of their time at the surface. Despite the brevity of their respiratory phases, sea turtles sometimes spend as much as 19-26 percent of their time at the surface, engaged in surface basking, feeding, orientation, and mating (Lutcavage et al., 1997). Sea turtles located in shallower waters have shorter surface intervals, whereas turtles occurring in deeper waters have longer surface intervals. Temporary disturbance to sea turtles may occur on occasion as helicopters approach or depart the MP 299 facility, if animals are near the facility. Such short-term impact is believed negligible to sea turtles.

The MP 299 facility currently produces sounds at intensities and frequencies that could be heard by sea turtles. It is expected that noise from disposal activities would be relatively constant and of similar intensity to activities it currently supports. Potential effects on sea turtles include disturbance (subtle changes in behavior, interruption of previous activities, or short- or long-term displacement); stress (physiological); and hearing impairment (permanent or temporary) by explosions and strong nonexplosive sounds. The impact is regarded as negligible.

An estimated 936 dockings per year (2.56 dockings per day) by OSV and SPB are expected at MP 299. Transport of wastes by OSC and SPB to MP 299 could occur from anywhere in the northern Gulf that OCS E&P wastes are generated. It would primarily occur within a "waste corridor" that covers the

Gulf of Mexico OCS from Morgan City, Louisiana (to the west) to the CPA/EPA boundary (to the east). The waste corridor extends south from the Federal/State boundary over 200 mi offshore to the EEZ. Vessel traffic to the onshore bases located at Fourchon, Venice, and Berwick (Morgan City), Louisiana, may also occur. Although the distributions of the different sea turtle species inhabiting the Gulf vary, all five species are known to occur within the waste corridor of the proposed action, as well as in waters adjacent to the MP 299 facility and onshore bases. Noise from vessel traffic may elicit a startle and/or avoidance reaction from sea turtles. There is the possibility of short-term disruption of movement patterns and behavior, but such disruptions are unlikely to affect survival or productivity. It is not known whether sea turtles exposed to recurring vessel disturbance will be stressed or otherwise affected in a negative but inconspicuous way. The short-term impact posed by vessel noise is believed negligible.

Increased vessel traffic increases the probability of collisions between vessels and sea turtles, resulting in injury or death to some animals. Because the risk is believed low, the most likely impact to sea turtles resulting from vessel strikes is expected to be adverse but not significant.

Many types of materials, including plastics, are used during offshore operations. Some of this material is accidentally lost overboard where turtles can consume it. Sea turtles can become entangled in or ingest debris accidentally lost and associated with the MP 299 facility or associated vessels. Leatherback turtles that mistake plastics for jellyfish may be more vulnerable to gastrointestinal blockage than other sea turtle species. Entanglement or ingestion of flotsam may debilitate or kill sea turtles, resulting in a significant impact; however, the most likely impact from flotsam attributable to the proposed action on sea turtle populations is expected to be adverse but not significant. The probability of flotsam ingestion/entanglement is unknown; however, because the accidental release of OCS trash and debris is managed, the risk of impact is believed low

Produced waters, drill muds, and drill cuttings are routinely discharged into offshore waters and contain trace metals (e.g., cadmium, chromium, lead, and mercury) and a suite of hazardous substances (e.g., sodium hydroxide, potassium hydroxide, ammonium chloride, hydrochloric acid, hydroflouric acid, and toluene) (see Boehm et al., 2001, or Ayers et al., 1980 for more complete lists). Most operational discharges are diluted and dispersed when released offshore and are considered to have sublethal effects (API, 1989; NRC, 1983; Kennicutt, 1995). The impact to the environment is minimized through the permit requirements. The permit sets toxicity or volume limits on discharges. The permit sets a maximum concentration for several metals that are present in barite. The permit does allow the use of trace amounts of priority pollutants in well treatment, workover, and completion chemicals that are used downhole and on the surface as part of the produced water or waste drilling mud or cuttings stream.

Some hazardous chemicals are used offshore. Strong acid solutions are used to stimulate formation production. Corrosive base and salt solutions are used to maintain pH and condition the well. The acids, bases, and salts react with other waste streams and seawater and are gradually neutralized following use. Freeport will not accept caustic or acidic wastes for injection. The application states that they will test the pH of all wastes and either refuse to accept the waste or neutralize it prior to injection. Other chemicals, such as surfactants and solvents that may be toxic to aquatic life, are used in trace amounts. These chemicals often serve as carrier solutions to keep a well treatment chemicals in a form so that they remain functional as it is pumped down the well. Biocides are used to prevent algal growth. These agents are preselected for use because of low toxicity, and in the case a biocide, a short half-life. Contaminants in the effluent could contribute to the poisoning of and over time kill or debilitate sea turtles or adversely affect the food chains and other key elements of the Gulf ecosystem. Sea turtles may have some interaction with these discharges. Because OCS discharges are diluted and dispersed in the offshore environment, and are but one of multiple sources of contaminants introduced into the northern Gulf, impacts to sea turtles from operational discharges are at most regarded as adverse but not significant.

Little or no damage is expected to the physical integrity, species diversity, or biological productivity of live-bottom habitat used by sea turtles as a result of a proposed action unless a spill occurs that impacts these areas.

The scenarios analyzed for potential oil/waste spills associated with the proposed action include a spill at MP 299 or at one of the onshore bases at Morgan City, Fourchon, or Venice, Louisiana. The scenario source of such spills stems from a vessel collision. The scenario analyzed comprises a spill of 12,500 bbl of oil-based, synthetic-based, or water-based muds and cuttings, and 1,333 bbl of diesel fuel. Oil/waste spills introduced in coastal waters at one of the onshore bases are assumed to encroach upon adjacent coastal lands and impact resources occurring in impacted waters. Since sea turtle habitat in the Gulf includes inshore, neritic, and oceanic waters, as well as numerous beaches in the region, sea turtles could be impacted by accidental spills resulting from operations associated with the proposed actions of the commercial waste disposal facility.

Because oil/waste spills introduced specifically in coastal waters of Louisiana are assumed to impact adjacent lands, there is a likelihood that spilled oil will impact nesting beaches eastward to Escambia County, Florida. In Louisiana, loggerhead nesting beaches on the Chandeleur Islands are vulnerable to an oil spill originating in adjacent waters; however, these islands do not appear to have been used in the last several years because they suffered significant hurricane damage.

Depending on the timing of the spill's occurrence in coastal waters, its impact and resulting cleanup may interrupt sea turtle migration, feeding, mating, and/or nesting activity for extended periods (days, weeks, months). Spills originating in or migrating through coastal waters of Louisiana, Mississippi, Alabama, and Florida may impact any of the five sea turtle species inhabiting the Gulf. Kemp's ridley is the most endangered sea turtle species and is strongly associated with coastal waters of Texas and Louisiana. Also, green, hawksbill, loggerhead, and leatherback sea turtles use coastal waters of the Western Gulf, whose densities may be considerably greater during warmer months than those occurring offshore during the same period. Aside from the acute effects noted if sea turtles encounter an oil slick, the displacement of sea turtles to less suitable habitats from habitual feeding areas impacted by oil/waste spills may increase vulnerability to predators, disease, or anthropogenic mortality. A high incidence of juvenile sea turtle foraging occurs along certain coastal regions of the Gulf Coast. Prime examples of known foraging areas for juvenile sea turtles in the Gulf are the Texas Laguna Madre, extending from the Texas-Mexico border to Mansfield Pass, Texas, for green turtles; and Sea Rim State Park, Texas, to Mermentau Pass, Louisiana, for Kemp's ridleys (Renaud, 2001). The interruption of feeding activities for extended periods may influence the recovery of sea turtle populations.

A spill of wastes and diesel fuel being transported to or from the MP 299 facility may impact sea turtles offshore in the northern Gulf. The magnitude of impact would depend, in part, on the location of the spill (e.g., SPB sinking as a result of a vessel collision while transiting through the waste corridor), the composition of the materials spilled, and the movement and fate of the spilled hydrocarbons/wastes in the offshore environment. Individual sea turtles are not necessarily randomly distributed in the offshore environment but are sometimes known to form aggregations of varying sizes. In some cases, several species may be found aggregating in the same area. Given the prospect that an oil/waste spill occurs in offshore waters and that sea turtles are contacted by any resulting slick, the short-term impact would likely be broadly localized and adverse but not significant.

Freeport intends to extract selected material from the E&P waste prior to disposal using equipment at the MP 299 facility. This material will include removing synthetic drilling fluids or free hydrocarbons from the cuttings/waste streams after they are unloaded at the MP 299 platforms. Reconditioned fluids are then to be resold to operators for other drilling activities. Reconditioned fluids are presumed transported from the MP 299 facilities via OSV's or SPB's. It is expected that reconditioned fluids will include higher concentrations of associated hazardous chemicals and trace elements than levels delivered in drilling fluids arriving at the MP 299 facility prior to undergoing recycling procedures. Should a vessel transporting the reconditioned fluids incur a collision that results in the spillage of part or all of the fluids being transported, the fluids pose an increased lethal dose of chemicals exceeding that of a generic diesel/oil spill scenario. Sea turtles (and most notably hatchlings and juveniles) coming into contact with the spill may suffer lethal or sublethal leading to lethal (over time) exposure. Aggregations of sea turtles may be exposed in one spill event. In the event that such an accident should occur, the impact to sea turtles would be significant; however, the likelihood that such a spill would occur in conjunction with the presence of aggregations of sea turtles is regarded as very low. Therefore, the most likely impacts are expected to be adverse but not significant.

Vessel collisions with other vessels or sea turtles are accidental events. It is noteworthy that vessel collisions and associated spills are most likely to occur in areas where vessel traffic is concentrated, such as near shipping ports. Although vessel operations at offshore facilities are routine and distributed rather broadly in time and space, the pattern of vessel activity for this proposed action varies substantially from other OCS activities involving vessel activity patterns. In the case of the proposed action, the facilities at MP 299 will become a hub of vessel activity associated with the transport of E&P wastes and recovered fluids. This increases the likelihood of a vessel collision occurring at the MP 299 facility. Freeport has estimated the vessel dockings at MP 299 to be 936 dockings per year (2.56 dockings per day) by OSV and SPB. The daily docking estimate is a subset of the annual docking numbers and does not necessarily accurately reflect the daily docking activity; i.e., there may be more than 2.56 dockings on some days and fewer on other days. Given that more dockings are likely to occur on some days, the potential for vessel collisions and an associated spill would increase.

An accidental release of waste could also occur as a result of the collapse of the MP 299 Cavern No. 1. Specifics of the accidental release from the collapse of Cavern No. 1 are given in Chapter 4.1.1.2.3. No other collapse scenarios were analyzed. If the caprock were to collapse into Cavern No. 1, brine and possibly some associated waste would be forced upwards from the cavern. Freeport estimated the volume of brine that might travel upward into the caprock formation and vent to the seafloor to be 1.6 million bbl. Freeport determined that the release of brine would most likely occur from numerous point sources over the salt dome (2,600-ft diameter area) over a period of hours or days. It is expected that the brine, which is denser than seawater, would initially remain in the depression created by the cavern roof collapse (2,600 ft wide by a maximum of 45 ft deep) and would then dilute slowly with the currents. Wastes proposed for injection into Cavern No. 1 are restricted to water-based muds and cuttings, which contain trace metals and hazardous chemicals (see Boehm et al., 2001, for a list of chemicals contained in water-based muds and cuttings). These chemicals and trace elements could be carried with the brine to the seafloor following the collapse of Cavern No. 1 and could be transported via other fluids to the seafloor after the cavern is nearly full and most of the brine has been extracted. There could be some interaction of the wastes and associated chemicals when aggregated inside the salt dome under the ambient pressures to which they will be exposed, pre- or post-cavern collapse. Based on the scenario that Cavern No. 1 collapses, brine from the cavern is expected to migrate to the seafloor and pool in the depression formed by the subsiding earth over a period of hours to days. It is reasonable to similarly expect that other fluid wastes (containing concentrated hazardous chemicals and trace metals) injected into the cavern will also immigrate to the seafloor along the same pathways that the brine travels over a period of hours to days, resulting in the pooling of brine and fluid wastes (including hazardous chemicals and trace metals). Based on the scenario, the brine would dilute over time with seawater passing over the pooled brine. So too might the other fluids, perhaps at rates different than that of the brine. It is noteworthy that the brine and hazardous chemicals or trace metals that may be introduced over hours to days to the localized area are toxic to marine life depending on a suite of factors. Exposed marine organisms that are not killed by these fluids may become contaminated by them; making them available for bioaccumulation up the food web and subsequently impacting sea turtles. At the least, the collapse of any cavern or substrate overlying the injected wastes whereupon brine and wastes may migrate to the seafloor above would degrade the water quality of the area for days or weeks.

All neonate sea turtles undertake a passive voyage via oceanic waters following nest evacuation. Depending on the species and population, their voyage in oceanic waters may last 10 or more years. Beaches of the Caribbean Sea and GOM are used as nesting habitat, and hatchlings evacuating these nesting beaches emigrate to oceanic waters seaward of their nesting sites. Surface drifter card data (Lugo-Fernandez et al., 2001) indicate that circulation patterns in the Caribbean Sea and southern Gulf of Mexico may transport neonate and young juvenile sea turtles from these areas to oceanic waters off the coasts of Texas and Louisiana. Moreover, these journeys begin as pulsed events, with many hatchlings emerging and emigrating offshore at the same times. Oceanic OCS waters of the GOM are also inhabited by subadult and adult leatherback and loggerhead sea turtles; however, adults of any endemic sea turtle species may be found offshore. Consequently, oil/waste spills occurring in these waters may impact multiple turtles, particularly neonate or young juvenile sea turtles associating with oceanic fronts or refuging in sargassum mats where oil slicks, decomposing residues, and tarballs are likely to accumulate. Depending upon the oils/wastes that sea turtles are exposed to, their concentrations, and the period of exposure, the impact may be significant; however, because the probability of an oil/waste spill is low, the most likely impact is expected to be adverse but not significant.

There is a small probability that a single sea turtle will encounter an oil slick resulting from a single, small spill. Increasing the size of a slick or factoring in the frequency of spills increases the likelihood that an animal will encounter a single slick during the lifetime of an animal; many sea turtle species are long-lived and may traverse throughout waters of the northern Gulf. The web of logic is incomplete without considering the abundance (stock or population) of each species inhabiting the Gulf. The likelihood that members of a sea turtle population (e.g., Kemp's ridley) may encounter an oil slick resulting from a single spill during a 40-year period is greater than that of a single individual encountering a slick during its lifetime. It is impossible to estimate precisely what sea turtle species, populations, or individuals will be impacted, to what magnitude, or in what numbers, since each species has unique distribution patterns in the Gulf and because of difficulties attributed to estimating when and where accidental oil/waste spills will occur during the lifetime of the proposed action.

Spills of any size degrade water quality, and residuals (e.g., oils, hazardous chemicals, and trace elements) become available for bioaccumulation within the food chain. Slicks may spread at the sea surface or may migrate underwater from the seafloor through the water column and never broach the sea surface. Regardless, a slick is an expanding, but aggregated mass of oil/waste that, with time, will disperse into smaller units as it evaporates (if at the sea surface) and weathers. As the slick breaks up into smaller units (e.g., slickets) and soluble components dissolve into the seawater, tarballs may remain within the water column. Tarballs may subsequently settle to the seafloor or attach to other particles or bodies in the sea. As residues of an oil spill disperse and commit to the physical environment (water, sediments, and particulates), sea turtles of any life history stage may be exposed via the waters that they drink and swim, as well as via the prey they consume. For example, tarballs may be consumed by sea turtles and by other marine organisms, and eventually bioaccumulate within sea turtles. Although sea turtles may (or may not) avoid oil/chemical spills or slicks, it is highly unlikely that they are capable of avoiding spill residuals in their environment. Consequently, the probability that a sea turtle is exposed to oil resulting from a spill extends well after the oil/chemical spill has dispersed from its initial aggregated mass. Populations of sea turtles in the northern Gulf will be exposed to residuals of oils/chemicals spilled as a result of the proposed actions during their lifetimes. Depending upon the oils/wastes that sea turtles are exposed to, their concentrations, and the period of exposure, the impact may be significant; however, the most likely impact is expected to be adverse but not significant.

In general, on a yearly basis, about 1 percent of strandings identified by the U.S. Sea Turtle Stranding Network are associated with oil (e.g., Teas and Martinez, 1992). Turtles do not always avoid contact with oil (e.g., Lohoefener et al., 1989). Contact with petroleum and consumption of oil and oil-contaminated prey may seriously impact turtles; there is direct evidence that turtles have been seriously harmed by petroleum spills. Oil/chemical spills and residues have the potential to cause chronic (longer-term lethal or sublethal oil-related injuries) and acute (spill-related deaths occurring during a spill) effects on turtles. Several mechanisms for long-term injury can be postulated: sublethal initial exposure to oil-causing pathological damage; continued exposure to hydrocarbons persisting in the environment, either directly or through ingestion of contaminated prey; and altered prey availability as a result of the spill.

Due to spill response and cleanup efforts, some spilled oil/wastes may be recovered before they reach the coast. However, cleanup efforts in offshore waters may result in additional harm or mortality of sea turtles, particularly to neonates and juveniles. Oil spills and spill-response activities at nesting beaches, such as beach sand removal and compaction, can negatively affect sea turtles. Although spill-response activities such as vehicular and vessel traffic during nesting season are assumed to affect sea turtle habitats, further harm may be limited because of efforts designed to prevent spilled oil from contacting these areas, as mandated by OPA 90. Increased human presence could influence turtle behavior and/or distribution, thereby stressing animals and making them more vulnerable to predators, the toxicological effects of oil, or other anthropogenic sources of mortality. Depending upon the spill-response activities that sea turtles are exposed to, their actions, frequency, and magnitude may result in significant impacts; however, the most likely impact is expected to be negligible because of precautions taken during oil spill contingency planning.

Caverns No. 1 and No. 3 have existing platforms located above them. Freeport is taking actions to decommission these structures. Freeport's Structural Removal Applications submitted August 5 and August 8, 2002, indicated that these and other MP 299 structures would be removed using abrasive cutting tools and that no explosives would be used for the removal. As previously stated in this EA, Cavern No. 1 has the potential to collapse due to the absence of a salt roof over the cavern. Cavern No. 1 will contain water-based muds and cuttings; however, MMS has determined that even explosive removal of the platform(s), which is not the proposed removal method, would not cause Cavern No. 1 to collapse (Appendix H). In any event, whether Freeport decides to use mechanical means or explosives to remove platforms in MP 299, they would have to submit a structure removal application to MMS. At that time, MMS would prepare a separate EA to analyze the potential impacts of such removals.

On August 5, 2002, MMS received Freeport's Structure Removal Application for the MP 299 Power Plant Platform (MMS ID No. 23784-03). The application stated that the subsea jacket portion of the power plant was to be removed using abrasive cutting tools and that no explosives would be used for the removal. The MMS prepared a separate EA analyzing the potential impacts of the mechanical removal of this structure. The EA resulted in a FONSI.

On August 8, 2002, MMS received Freeport's Structure Removal Applications for the MP 299 BS-1 (MMS ID No. 24248-01), BS-2 (MMS ID No. 24248-02), BS-Y3 (MMS ID No. 24248-03), BS-4 (MMS ID No. 24248-04), BS-5 (MMS ID No. 24248-05), BS-6 (MMS ID No. 24248-06), and QTR (MMS ID No. 23874-05) structures. All of these applications also stated that the subsea jacket portion of the structures were to be removed using abrasive cutting tools and that no explosives would be used for the removals. The MMS prepared a separate EA analyzing the potential impacts of the mechanical removal of these structures. The EA resulted in a FONSI. Refer to Appendix C, Exhibit 1 Operations Plan, Figure 1, for a plan view of the MP 299 platform complex that shows the specific bridge connected structures listed above.

Summary and Conclusion

Activities associated with the proposed action have the potential to harm sea turtles. These animals could be impacted by the noise generated by offshore facilities, helicopter and vessel traffic; vessel collisions; brightly-lit platforms; explosive removals of offshore structures; jetsam and flotsam generated by MP 299 facilities and associated vessels; degradation of water quality resulting from discharges; oil/waste/chemical spills; and spill-response activities. Impacts may be significant; however, the most likely impacts are expected to be adverse but not significant, based on the low probabilities of occurrence. Lethal effects are most likely to result from accidental collisions with vessels; ingestion of, or entanglement with flotsam; or extended exposure to spilled oil/waste/chemicals. Contaminants in discharges or spills might over time impact sea turtles through food-chain biomagnification. Consequently, populations of sea turtles in the northern Gulf could be exposed to residuals of oils/wastes/chemicals spilled attributed to the proposed action during their lifetimes. Chronic or acute exposure may debilitate or kill sea turtles over time. Exposure to hydrocarbons persisting in the sea following the dispersal of an oil/waste slick would most likely result in sublethal impacts (e.g., decreased health, reproductive fitness, and longevity; and increased vulnerability to disease) to sea turtles. Sea turtle hatchlings exposed to and becoming fouled by or consuming tarballs persisting in the sea following the dispersal of an oil slick could be killed. Significant impacts to sea turtles could occur as a result of low probability accidental events associated with the proposed action; however, the most likely impacts are expected to be adverse but not significant.

4.2.5 Impacts on Coastal and Marine Birds

4.2.5.1 Nonthreatened/Nonendangered Birds

This section discusses the possible effects of the proposed action on coastal and marine birds of the GOM and its contiguous waters and wetlands. Air emissions, water quality degradation resulting from discharges, helicopter and service-vessel traffic and noise, light attraction, accidentally discarded trash and debris from service vessels and the facility, potential accidental waste/oil spills, and related spill-response activities may impact coastal and marine birds.

Air Emissions

Emissions of pollutants into the atmosphere from the activities associated with the proposed action are projected to have minimal effects on offshore air quality because of the prevailing atmospheric conditions, emission heights, and pollutant concentrations. Such emissions are projected to have negligible effects on onshore air quality because of the atmospheric regime, emission rates, and distance of these emissions from the coastline. These judgments are based on average steady state conditions; however, there will be days of low mixing heights and low wind speeds that could further decrease air quality. These conditions are characterized by fog formation, which in the Gulf occurs about 31 days a year, mostly during winter. Impacts from offshore sources are reduced in winter because the frequency of significant onshore winds decreases (to just 8% of the time) and the removal of pollutants by rain increases. The summer is more conducive to air quality effects as onshore winds occur more frequently (to about 34% of the time). Emissions of pollutants from the proposed action are projected to have negligible effects on coastal and marine birds.

Helicopter and Service-Vessel Traffic and Noise

Helicopter and service-vessel traffic related to the proposed action could sporadically disturb feeding, resting, or nesting behavior of birds or cause abandonment of preferred habitat. These impact-producing factors could contribute to indirect population loss through reproductive failure resulting from nest abandonment. The FAA (Advisory Circular 91-36C) and corporate helicopter policy state that, when flying over land, the specified minimum altitude is 610 m (2,000 ft) over populated areas and biologically sensitive areas such as wildlife refuges and national parks. However, pilots traditionally have taken great pride in not disturbing birds. It is expected that approximately 10 percent of helicopter trips would occur at altitudes somewhat below the minimums listed above as a result of inclement weather. Although these incidents are only seconds in duration and sporadic in frequency, they can disrupt coastal bird behavior and, at worst, possibly result in habitat or nest abandonment.

Service vessels would use selected nearshore and coastal (inland) navigation waterways, or corridors, and adhere to protocol established by the USCG for reduced vessel speeds within these inland areas. Routine presence and low speeds of service vessels within these waterways would diminish the effects of disturbance from service vessels on nearshore and inland populations of coastal and marine birds. The effects of routine service-vessel traffic on birds offshore, therefore, would be negligible.

Light

Seabirds (e.g., laughing gulls and petrels) may be attracted by lights and/or structures and may remain and feed in the vicinity of the waste disposal site. Light associated with the proposed action is projected to have negligible effects on these seabirds.

Operational Discharges

Chapter 4.1.1.1 provides an analysis of the impacts of the proposed action on water quality. All discharges will be at or below existing regulatory discharge criteria that are designed to mitigate significant environmental effects. Therefore, operational discharges are not expected to impact water quality. Both the direct and indirect impacts of operational discharges on seabirds (e.g., laughing gulls and petrels) are expected to be negligible.

Trash and Debris

Coastal and marine birds are commonly observed entangled and snared in discarded trash and debris. In addition, many species readily ingest small plastic debris, either intentionally or incidentally. Such interactions can lead to serious injury and death. The MMS prohibits the disposal of equipment, containers, and other materials into offshore waters by lessees (30 CFR 250.300). Thus, it is expected that coastal and marine birds would seldom become entangled in or ingest OCS-related trash and debris. MARPOL (Annex V, Public Law 100-220; 101 Statute 1458; effective January 1989) prohibits the disposal of any plastics at sea or in coastal waters. Thus, due to the low potential for interaction between nonthreatened and nonendangered coastal and marine birds and project-related debris, any impacts are expected to be adverse but not significant.

Spills

A slick resulting from an accidental spill of diesel fuel and the release of diesel from oil-based cuttings is presumed for this analysis (Tables 4-1 and B-2). Such a slick could reach the coast between Lafourche Parish, Louisiana, and Escambia County, Florida. Various birds along contacted shoreline could experience mortality and reproductive stress. Should this low probability accidental spill event occur, impacts to nonthreatened and nonendangered birds are expected to be adverse but not significant. Recovery would depend on subsequent influxes of birds from nearby feeding, roosting, and nesting habitats.

Spill-Response Activities

Coastal and marine birds may also be impacted by associated spill-response activities. Any effects would be especially critical for intensively managed populations such as endangered and threatened species that need to maintain a viable reproductive population size or that depend upon a few key habitats. Oil-spill cleanup methods often require heavy traffic on beaches and wetland areas, application of oil dispersant and bioremediation chemicals, and the distribution and collection of oil containment booms and absorbent material. The presence of humans, along with boats, aircraft, and equipment, would also disturb coastal birds after a spill. Investigations have shown that oil dispersant mixtures pose a threat to bird reproduction similar to that of oil (Albers, 1979; Albers and Gay, 1982). The external exposure of adult birds to oil/dispersant emulsions may reduce chick survival more than exposure to oil alone; however, successful dispersal of a spill will generally reduce the probability of exposure of coastal and marine birds to oil (Butler et al., 1988). It is possible that changes in the mortality or reproductive rates may also be a result of disturbance from increased human activity related to cleanup, monitoring, and research efforts (Maccarone and Brzorad, 1994). A growing number of studies indicate that current rehabilitation techniques are not effective in returning healthy birds to the wild (Anderson et al., 1996; Boersma, 1995; Sharp, 1995, and 1996). Deterrent or preventative methods, such as scaring birds from the path of an approaching oil slick or the use of booms to protect sensitive colonies, have extremely limited applicability. Should a low probability accidental spill event occur, spill-response activities may be required. Impacts to nonthreatened and nonendangered coastal and marine birds from spill-response activities are expected to be negligible.

4.2.5.2 Federally Endangered and Threatened Birds

Piping Plover

The impact-producing factors for shorebirds not listed as endangered or threatened, discussed above, also apply to the piping plover. A slick resulting from a spill of diesel fuel and the release of diesel from oil-based cuttings is presumed for this analysis (Tables 4-1 and B-2). Such a slick could reach the coast between Lafourche Parish, Louisiana, and Escambia County, Florida. If the slick reached the coast, it could injure or kill birds foraging or roosting along the shoreline. However, concentrations of shorebirds in general seldom reach 10-100 in the limited stretch of beach (less than 1/2 mile) that could be polluted by a single slick. Concentrations of piping plover would be considerably less than shorebirds in general, and mortality of piping plover would also be substantially less. An oil slick could contact piping plover critical habitat at any time of the year. The birds may or may not be using this wintering habitat at the time and may be on their northern breeding grounds. If that is the case, after cleanup and weathering of oil, birds that migrate from the northern breeding grounds would likely experience no impacts when they return to their wintering critical habitat. Oil would have the greatest impact if birds were present when the slick contacted the critical habitat. Due to the low probability of a spill occurring and contacting shore, the most likely impacts to the piping plover or its critical habitat are expected to be adverse but not significant.

If spill-response activities are required, disturbance from increased human activity related to cleanup, monitoring, and research efforts could occur. Therefore, impacts to the piping plover from spill-response activities are expected to be negligible because they are observed to be timid and fly away if approached. Impacts to piping plover critical habit from spill-response activities are expected to be adverse but not significant.

Wildlife is known to consume trash such as styrofoam cups, straws, and plastic cup lids. Piping plover are especially sensitive to such trash because foraging piping plover would have full view of such material on the open beaches. The MMS prohibits the disposal of equipment, containers, and other materials into offshore waters by lessees (30 CFR 250.300. MARPOL (Annex V, Public Law 100-220; 101 Statute 1458; effective January 1989) prohibits the disposal of any plastics at sea or in coastal waters. Interactions with trash and debris (e.g., entanglement or ingestion) could lead to serious injury and death of piping plover. However, there is a low potential for interaction between the piping plover and project-related trash and debris due to the prohibitions cited above. Therefore, impacts to the piping plover from trash and debris are expected to be adverse but not significant.

Bald Eagle

The bald eagle feeds on fish, waterfowl, shorebirds, and carrion near water. This bird may come in contact with an oil spill by eating contaminated, dead, or dying prey. Bald eagles have narrow preferences for nesting habitat. Any oiling of aquatic feeding habitat resulting in nest site abandonment could lead to relocation of a nest to less preferred habitat. This event, in turn, would reduce population growth for this already threatened species. However, the bald eagle has high mobility and, when an oil slick enters the feeding habitat, it may relocate feeding to unpolluted parts of the waterbodies. When relocating feeding far from the nest, the eagle would successfully home to its nest after feeding because it prefers to build its nest in a highly visible place over the forest canopy with a clear short path from the water. Should a low probability accidental spill event occur, most likely only one bird or a mated pair would be impacted because like most raptors, bald eagles are not gregarious. Therefore, it is expected that impacts to the bald eagle would be adverse but not significant.

Brown Pelican

The brown pelican is a species of special concern in Louisiana and Mississippi although it is no longer listed as endangered or threatened in Florida or Alabama (USDOI, FWS, 1998). The brown pelican is known to nest on Guillard Island, Alabama, a dredge spoil island in Mobile Bay. There have been no reported nesting sites in Mississippi. Impacts to individual brown pelicans would be similar to those identified for the nonendangered, nonthreatened species discussed in preceding sections.

A slick resulting from a spill of diesel fuel and the release of diesel from oil-based cuttings is presumed for this analysis (Tables 4-1 and B-2). Such a slick could reach the coast between Lafourche Parish, Louisiana, and Escambia County, Florida. If the slick reached the coast, it could injure or kill birds foraging or roosting along the shoreline. However, concentrations of shorebirds in general seldom reach 10-100 in the limited stretch of beach (less than 1/2 mile) that could be polluted by a single slick. Concentrations of brown pelican would be considerably less than shorebirds in general, and mortality would be substantially less in brown pelican also. Therefore should this low probability accidental spill event occur, impacts to the brown pelican are expected to be adverse but not significant.

If spill-response activities are required, disturbance from increased human activity related to cleanup, monitoring, and research efforts could occur. Impacts to the brown pelican from spill-response activities are expected to be negligible.

The MMS prohibits the disposal of equipment, containers, and other materials into offshore waters by lessees (30 CFR 250.300. MARPOL (Annex V, Public Law 100-220; 101 Statute 1458; effective January 1989) prohibits the disposal of any plastics at sea or in coastal waters. Interactions with trash and debris (e.g., entanglement or ingestion) could lead to serious injury and death of brown pelican. However, there is a low potential for interaction between the brown pelican and project-related trash and debris. Impacts to the brown pelican from trash and debris are expected to be adverse but not significant.

Conclusion

It is expected that the majority of effects from the proposed action on nonthreatened and nonendangered coastal and marine birds would be sublethal (behavioral effects and non-fatal intakes of discarded debris), causing temporary disturbance and displacement of localized groups, mostly inshore. However, chronic stress such as digestive upset, partial digestive occlusion, sublethal ingestions, and behavioral changes are often difficult to detect. Such stresses can weaken individuals and make them more susceptible to infection and disease as well as making migratory species less fit for migration.

Coastal and marine birds may encounter periodic disturbance and temporary displacement of localized groups and individuals from the routine activities associated with the proposed action. Decreases in the numbers of adults and/or nests could occur as a result of an oil spill if spill-related coastal habitat loss or degradation occurs. The potential for a spill to be transported from MP 299 to shore is given in Table D-4. Species experiencing the loss of individuals could require up to several years to recover to pre-existing states.

Impacts to threatened and endangered coastal and marine birds from a low probability accidental spill event, or interaction with trash and debris are expected to be adverse but not significant. Impacts to threatened and endangered coastal and marine birds from spill response activities are expected to be negligible.

4.2.6 Impacts on Essential Fish Habitat, Fish Resources, and Commercial Fisheries

Due to the close association between discussions of proposed MP 299 impacts on fish resources and commercial fisheries, the previously separate treatment of commercial fisheries has been combined in this single section.

Healthy fish resources and fishery stocks depend on waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. Because of the wide variation of habitat requirements for all life history stages for managed fish species, the EFH for the GOM includes all coastal and marine waters and substrates from the shoreline to the seaward limit of the EEZ.

Effects on fish resources and EFH from activities and accidental events that may be associated with MP 299 activities could result from the collapse of storage Cavern No. 1 and accidental loss of barge contents in block MP 299 (potentially including oil-based drilling muds). The maximum volumes of wastes considered in an accidental barge spill are shown in Table B-2. A diesel spill (from both diesel tanks and oil-based muds) resulting from a barge accident in block MP 299 would have the greatest potential to affect fish resources, EFH, and commercial fishing in the Gulf. Drill cuttings with mud adhering to them could also be released to the water column from a barge accident. However, contaminant levels (excluding oil-based mud) will reach background levels about 1,000 m (3,281 ft) from the accident site and be undetectable beyond 3,000 m (9,843 ft) from the site using drilling mud discharges from a surface location as a model (USDOI, MMS, 2000; Section IV.A.(3)(b)). Synthetic-based drilling fluids (SBF) are virtually nontoxic, and cuttings with adherent SBF are expected to reach the seabed quickly in the form of clumps. Biological effects on the benthos are not expected beyond 500 m (1,640 ft) (Jensen et al., 1999). Numerous studies have demonstrated that mercury impurities associated with drilling mud barite are not in a form capable of being metabolized by marine organisms that might come in contact with discharged drilling fluid solids (Neff and Waugh, 1989). A release of oil-based drilling muds is treated as a hydrocarbon spill.

The toxicity of an oil spill depends on the concentration of the hydrocarbon components exposed to the organisms (in this case diesel) and the variation of the sensitivity of the species considered. The geographic range of the pollutant effect depends on the mobility of the resource, the characteristics of the pollutant, and the tolerance of the resource to the pollutant in question. The effects on and the extent of damage to fisheries resources and Gulf commercial fisheries from a diesel spill would be restricted by time and location. The direct effects of spilled petroleum on fish occur through the ingestion of hydrocarbons or contaminated prey, through the uptake of dissolved petroleum products through the gills and epithelium by adults and juveniles, and through the death of eggs and decreased survival of larvae (NRC, 1985). Adult fish must experience continual exposure to relatively high levels of hydrocarbons over several months before secondary toxicological compounds that represent biological harm are detected in the liver (Payne et al., 1988). Upon exposure to spilled petroleum, liver enzymes of fish oxidize soluble hydrocarbons into compounds that are easily excreted in the urine (Spies et al., 1982). Adult fish also possess some capability for metabolizing oil (Spies et al., 1982).

Adult fish are likely to actively avoid a spill, thereby limiting the effects and lessening the extent of damage (Baker et al., 1991; Malins et al., 1982; Maki et al., 1995). Observations at oil spills around the world, including the *Exxon Valdez* spill in Prince William Sound, consistently indicate that free-swimming fish are rarely at risk from oil spills (Lancaster et al., 1998; Squire, 1992). Fish swim away from spilled oil, and this behavior explains why there has never been a commercially important fish-kill on record following an oil spill.

When contacted by spilled hydrocarbon, floating eggs and larvae, with their limited mobility and physiology, and most juvenile fish are killed (Linden et al., 1979; Longwell, 1977). Fish over-produce eggs on an enormous scale and the overwhelming majority of them die at an early stage, generally as food for predators. Even a heavy death toll of eggs and larvae from an oil spill may have no detectable effect on the adult populations exploited by commercial fisheries. In order for an oil spill to affect fish resources at the population level, it would have to be very large and cover a very large area that corresponded to an area of highly concentrated eggs and larvae. In addition, the oil would have to disperse deep enough into the water column at levels high enough to cause toxic effects. None of these events are projected, even with the maximum release of 4,458 bbl of diesel related to a SPB sinking.

Since the majority of fish species within the MP 299 area are estuary dependent, coastal environmental degradation resulting from accidental events associated with MP 299 activities, although indirect, has the potential to adversely affect EFH and fish resources. An accidental spill of oil-based drilling muds that contact coastal bays, estuaries, and waters of the OCS when pelagic eggs and larvae are present have the greatest potential to affect commercial fishery resources. For eggs and larvae contacted by a spill, the effect is expected to be lethal. Coastal waters, wetlands, and estuaries within Louisiana, Mississippi, Alabama, and Florida may be affected by an accidental barge spill (Chapter 4.1.1). A spill contacting a low-energy inshore area would affect localized populations of commercial fishery resources, such as menhaden, shrimp, and blue crabs. This could result in a temporary decrease in local populations on a local scale.

Commercial fishermen will actively avoid the area in which an accidental spill event has occurred. Even if fish resources successfully avoid spills, tainting (oily-tasting fish), public perception of tainting, or the potential of tainting commercial catches will prevent fishermen (either voluntarily or imposed by regulation) from attempting to fish in the spill area. This, in turn, could decrease landings and/or the value of catch from the local area for several months. However, most commercial GOM fish species can be found in many adjacent locations. Gulf commercial fishermen do not fish in one locale and have responded to past petroleum spills without discernible loss of catch or income by moving elsewhere for a few months.

Conclusion

Accidental events resulting from storage, transport to, and offloading of waste materials in MP 299 area of the GOM have the potential to cause some detrimental effects on fisheries and fishing practices. If a barge spill were to occur in open waters of the OCS proximate to mobile adult finfish or shellfish, the effects would likely be nonfatal and the extent of damage would be reduced due to the capability of adult fish and shellfish to avoid a spill, to metabolize hydrocarbons, and to excrete both metabolites and parent compounds. The effect of proposed-action-related oil spills (diesel) on fish resources and commercial fishing is expected to cause less than a 1 percent decrease in standing stocks of any population, commercial fishing efforts, landings, or value of those landings and would be negligible and indistinguishable from natural population variations.

It is expected that coastal environmental degradation from an accidental spill (resulting from oil-based mud release) would have little effect on fish resources or EFH. Impacts to wetlands due to a petroleum (diesel) spill contacting inland areas is addressed in Chapter 4.2.1.2.

Little or no impact is expected on commercial fishers from routine project activities. There are no currently active safety exclusion zones around MP 299 structures. Increased vessel traffic (2.5 dockings/day; Appendix C, Exhibit 1, Operation Plan, Attachment 3 lists just the vessel traffic required to transport the projected waste volumes to MP 299) will result in some necessary avoidance of vessel activity at some distance from the MP 299 structures. There will be some unavoidable loss of fishing space due to the physical presence of barges approaching and offloading OCS wastes, but much of this area would already have been avoided by trawling activities due to the large number of closely situated structures already in MP 299.

In the case of accidental events, including a barge sinking, or a cavern collapse, the USCG could enforce a safety zone around the area(s), excluding normal commercial fishing activities for an extended period of time. In the event of a spill, commercial fishermen will actively avoid the area. Even if fish resources successfully avoid spills, tainting (oily-tasting fish), public perception of tainting, or the potential of tainting commercial catches from oil or dispersants will prevent fishermen (either voluntarily or imposed by regulation) from initiating activities in the spill area. This, in turn, could decrease landings and/or the value of catches for several months. However, GOM species can be found in many adjacent locations; Gulf commercial fishermen do not fish in one locale and have responded to past petroleum spills without discernible loss of catch or income by moving elsewhere for a few months.

In summary, it is expected that potential marine or coastal environmental degradation from the accidental events related to the proposed action would not have significant effect on fish resources, essential fish habitat, or commercial fishing.

4.2.7 Impacts on Threatened and Endangered Fish (Listed and proposed for listing)

4.2.7.1 Gulf Sturgeon

Existing occurrences of Gulf sturgeon in 1996 extended from the Mississippi River to Charlotte Harbor in western Florida (Patrick, 1996).

An accidental spill of diesel or oil-based drilling fluids and cuttings is the impact-producing factor most likely to impact the Gulf sturgeon. Gulf sturgeon can take up oil by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products across gill mucus and gill epithelium. Upon any exposure to spilled oil, liver enzymes of adult fish oxidize soluble hydrocarbons into compounds that are easily excreted in the urine (Spies et al., 1982). Behavior studies of other fish species suggest that adult sturgeon are likely to actively avoid an oil spill, thereby limiting the effects and lessening the extent of damage (Baker et al., 1991; Malins et al., 1982). In adult Gulf sturgeon, contact with or ingestion/absorption of spilled diesel or oil released from oil-based drill muds and cuttings can result in death or nonfatal physiological irritation, especially of gill epithelium and the liver.

A summary of maximum potential accidental spills to water including potential spill location, size, and composition can be found in Table 4-1. The maximum volume of oil that is assumed to potentially spill as a result of the proposed activity is 4,458 bbl, resulting from the collision of a SPB at MP 299 or at one of the three onshore bases. The Gulf sturgeon would not be impacted by a spill occurring at an onshore base because none of the onshore bases are located within the geographical range of the Gulf sturgeon. An offshore oil spill resulting from the proposed action is assumed only in MP 299, and the Gulf sturgeon only occurs offshore in the winter. The winter subsurface ecosystem with prey and feeding habitat for Gulf sturgeon would have little contact with a diesel or other hydrocarbon slick floating overhead, even in shallow water, but may contact emulsified, chemically dispersed hydrocarbons. Given the volume of water diluting such hydrocarbons, they would be nontoxic before possible contact with a demersal Gulf sturgeon.

Conclusion

The Gulf sturgeon could be impacted by oil spills resulting from the proposed action. The impact of the proposed action on the Gulf sturgeon could cause nonfatal irritation of gill epithelium or the liver in a few adults. No significant impacts (refer to "Gulf Sturgeon" significance criteria and terminology and resource-specific definitions outlined in Table B-3) to Gulf sturgeon are expected to occur as a result of the proposed action.

4.2.7.2 Smalltooth Sawfish

Fishing and habitat alteration and degradation in the past century have reduced the U.S. population of the smalltooth sawfish (USDOC, NMFS, 2000). At present, the smalltooth sawfish is primarily found in southern Florida in the Everglades and Florida Keys. Historically, this species was common in neritic and coastal waters of Texas and Louisiana. Many records of the smalltooth sawfish were documented in the 1950's and 1960's from the northwestern Gulf in Texas, Louisiana, Mississippi, and Alabama. Since 1971, however, there have been only three published or museum reports of the species captured in the region, all from Texas (1978, 1979, and 1984). Additionally, reports of captures have dropped dramatically. Louisiana, an area of historical localized abundance, has experienced marked declines in sawfish landings. The lack of smalltooth sawfish records since 1984 from the area west of peninsular Florida is a clear indication of their rarity in the northwestern Gulf.

Activities associated with the proposed action have the potential to harm the smalltooth sawfish. These animals could be impacted by explosive removal of offshore structures, jetsam and flotsam generated by MP 299 facilities and associated vessels, degradation of water quality resulting from discharges, oil/waste spills, and spill-response activities. Impacts may be significant; however, because the current population is primarily found in southern Florida in the Everglades and Florida Keys, the most likely impacts to these rare animals are expected to be negligible.

The most serious potential impacts to the smalltooth sawfish from the proposed action would stem from accidental oil/waste spills, including wastes released from Cavern No. 1, should it collapse. Wastes released may foul or contaminate any sawfish, potential prey, or the demersal habitat impacted by the wastes. A release attributable to the collapse of Cavern No. 1 may cause the long-term displacement of sawfish from the impact area. However, the most likely impact is expected to be negligible because the sawfish is basically only found now in southern Florida; therefore, occurrence and displacement of sawfish at the potential impact area is highly unlikely.

4.2.8 Impacts on Alabama, Choctawhatchee, St. Andrew, and Perdido Key Beach Mice

The Alabama, Perdido Key, Choctawhatchee, and St. Andrew beach mice are designated as protected species under the Endangered Species Act of 1973. The mice occupy restricted habitat behind coastal foredunes of Florida and Alabama (Ehrhart, 1978; USDOI, FWS, 1987). Portions of these areas have been designated as critical habitat. The major impact-producing factors associated with the proposed action that may affect the mice include beach trash and debris, a spill at MP 299 or one of the onshore bases, and spill-response activities.

Trash and Debris

Beach mice may entangle themselves in trash and debris or may mistakenly consume it. The MMS prohibits both accidental and deliberate disposal of equipment, containers, and other materials into offshore waters by lessees (30 CFR 250.300). Thus, it is expected that beach mice would seldom entangle themselves in OCS-related trash and debris or ingest it. MARPOL (Annex V, Public Law 100-220; 101 Statute 1458; effective January 1989) prohibits the disposal of any plastics at sea or in coastal waters. Thus, due to the low potential for interaction between beach mice and project-related debris, any effects will be negligible.

Operational Discharges

The operational discharges applicable to E&P waste disposal operations are listed in Table 4-2. Chapter 4.1.1.1 provides an analysis of the effects of the proposed action on water quality. All discharges will be at or below existing regulatory discharge criteria are designed to mitigate significant environmental effects. Operational discharges are not expected to impact water quality and none of the discharges would come ashore in beach mouse habitat.

Spills

The potential accident scenarios that were analyzed for impacts on beach mouse are listed in Table B-2. The only scenario that could impact beach mice is a spill of oil in MP 299. An oil slick would have to come ashore on a storm surge to reach beach mouse habitat behind the foredunes. The probability of such a fate of an oil slick is so low that it does not meet the level for take. Direct contact with spilled oil can cause skin and eye irritation. Other direct toxic effects come from asphyxiation from inhalation of fumes, oil ingestion, and food contamination. Indirect oil impacts include food reduction.

Spill Response Activities

Vehicular traffic and activity associated with oil-spill cleanup activities can degrade preferred habitat and cause displacement. In the unlikely event of contact with diesel or hydrocarbons released from spilled, oil-based drilling muds, spill cleanup activities are not expected to disturb beach mice or their habitats. The home range of the beach mice is designated habitat that receives particular consideration during spill cleanup, as directed by the Oil Pollution Act of 1990. Because of the critical designation and general status of protected species habitats, spill contingency plans include requirements to minimize adverse effects from vehicular traffic during cleanup activities and to maximize protection efforts to prevent spilled hydrocarbons with beach mouse habitat.

Conclusion

An impact from the proposed action on the Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice is possible but unlikely as a result of beach trash and debris, spills of diesel or oil-based muds and cuttings, and spill-response activities because of the prohibition of trash and debris discard; the low probability of occurrence of spills of diesel or oil-based muds and cuttings and subsequent contact with beach mice; and the protected species and habitat requirements for cleanup included in the Oil Pollution Act of 1990.

The proposed action is not expected to harm the Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice or their habitats. No significant impacts (refer to "Beach Mice" significance criteria and terminology and resource-specific definitions outlined in Table B-3) to beach mice are expected to occur as a result of the proposed action.

4.3 Socioeconomic Conditions and Other Concerns

The importance of the oil and gas industry to the coastal communities of the GOM is significant, particularly in south Louisiana, eastern Texas, and coastal Alabama. Dramatic changes in the level of OCS oil and gas activity over recent years have resulted in parallel fluctuations in population, labor, and employment in the analysis area. The addition of any new human activity, such as the proposed action to operate an offshore waste disposal facility at MP 299, can affect local communities in a variety of ways. Typically, these effects are in the form of people and money, which can translate into changes in the local social and economic institutions and land use. In Chapter 3.3.1 MMS defined the potential impact region as that portion of the Gulf of Mexico coastal zone whose social and economic well-being (population, labor, and employment) is directly or indirectly affected by the proposed action. This analysis considers the effects of OCS-related, impact-producing activities from the proposed action in relation to the continuing baseline of non-OCS-related factors. Non-OCS factors include fluctuations in workforce, net migration, relative income, oil and gas activity from State waters, wetland loss, and tropical storms. Unexpected events that may influence oil and gas activity within the analysis area but cannot be predicted are not considered in this analysis.

4.3.1 Impacts on Land Use and Infrastructure

Chapter 3.3.2 discusses land use and infrastructure associated with the analysis area. While land use in the impact area will change over time, the majority of this change is estimated as general regional growth. Changes in land use as a result of the proposed action are expected to be contained and negligible. The existing land use and infrastructure are expected to be sufficient to handle activities associated with the proposed action.

Accidental events such as oil or waste spills and vessel collisions would have no effects on land use. Coastal or nearshore spills could have short-term adverse effects on infrastructure requiring clean up of any oil or wastes spilled.

4.3.2 Impacts on Economic and Demographic Conditions

Chapters 3.3.3 and 3.3.4 discuss the analysis area's baseline population, demographic, and employment projections (Tables 3-12 through 3-27 in USDOI, MMS, 2002, Volume 2). Because the baseline projections assume the continuation of existing social, economic, and technological trends, they also include population associated with the continuation of current patterns in OCS Program activities. Population impacts from the proposed action are expected to be minimal and mirror those assumptions associated with employment described below. The increase in employment will most likely be met with the existing population and available labor force in the analysis area. The mix of males to females is expected to remain virtually unchanged as will the age distribution and median age of the analysis area. Activities relating to the proposed action are not expected to affect the racial distribution or the educational levels of the analysis area.

Given the proposed action, there would probably be very little economic stimulus to the analysis area. The majority of the probable changes in employment would likely occur in Texas (where current OCS waste facilities are located) and Louisiana (where the three designated service bases are located). The increase in employment would most likely be met with the existing population and available labor force in the analysis area and would therefore not require additional local housing or government services. Some changes in employment may occur to a lesser extent in the Mississippi/Alabama area due proximity to the proposed offshore location and service bases. Most of the employment changes should be a redistribution of jobs from current sectors to new sectors as a result of the proposed action. For example, there may be a decrease in barge workers and truck drivers who currently transport the OCS waste from port terminals to waste facilities in Texas. This decrease, though, could be offset by an increase in the number of workers associated with the proposed action. In truth, implementation of the proposed action could lead to reduced employment due to increased efficiency of OCS waste disposal – the elimination of transfer to port terminals via supply vessels and the elimination of barge and truck transfer of the waste to Texas.

The most probable area to be affected by a spill is Plaquemines Parish, Louisiana, followed by St. Bernard Parish, Louisiana (Table D-4). Accidental events such as oil or waste spills and vessel collisions would have no effects on the analysis area's population or demography.

The resource costs of cleaning up an oil spill, either onshore or offshore, were not included in the economic analysis for the proposed action (Chapter 4.3.2) for two reasons. First, the potential impact of oil- or waste-spill cleanup activities is a reflection of the spill's opportunity cost. The cleanup and remediation of a spill may involve the expenditure of millions of dollars and the creation of hundreds of jobs. While such expenditures are revenues to business and employment/revenues to individuals, the cost of responding to a spill is not a benefit to society and is a deduction from any comprehensive measure of economic output. A spill's opportunity cost has two generic components: cost and lost opportunity. Cost is the value of goods and services that could have been produced with the resources used to cleanup and remediate the spill if the resources had been able to be used for production or consumption. The second is the value of the opportunities lost or precluded to produce (e.g., harvest oysters) or consume (e.g., recreational/tourism activities) (Pulsipher et al., 1999). The second reason for excluding the costs of cleaning up a spill from the proposed action economic analysis is that the occurrence of a spill is not a certainty. Spills are random accidental events. Even if the proposed action were to occur, the timing, numbers, sizes, offshore locations of occurrence, and onshore locations of contact of potential spills occurring over the life of a proposed action are all unknown variables. Additionally, the cost involved in any given cleanup effort is influenced by a variety of factors: whether or not the waste contains oil, whether or not the oil comes ashore, the type of coastal environment contacted by the spill, weather conditions at the time of the incident, the type and quantity of oil spilled, and the extent and duration of the oiling.

Opportunity cost employment associated with the cleanup and remediation of a spill is expected to be temporary and of short duration (less than one year aside from the legal industry involvement). Cleanup employment is expected to minimally impact the analysis area. The immediate social and economic consequences for the region in which a spill occurs are a mix of things that include not only additional opportunity cost jobs and sales but also non-market effects such as traffic congestion, strains on public services, shortages of commodities or services, and disruptions to the normal patterns of activities or expectations. These negative short-term social and economic consequences of a spill are expected to be modest as measured by projected cleanup expenditures and the number of people employed in cleanup and remediation activities. Negative long-term economic and social impacts may be more substantial if fishing, shrimping, oystering, and/or tourism were to suffer or were to be perceived as having suffered because of the spill (Pulsipher et al., 1999).

4.3.3 Impacts on OCS-Related Coastal Infrastructure

The proposed action will use the existing onshore service bases located in Port Fourchon, Morgan City, and Venice, Louisiana. During proposed activities, one round trip per week is anticipated. All of these service bases are capable of providing the services necessary for the proposed action; therefore, no onshore expansion or construction is anticipated with respect to the proposed action. While OCS-related servicing should increase in Port Fourchon, Morgan City, and Venice, Louisiana, due to the proposed action, there may be a reduction in activity at the ports due to decreased traffic bringing OCS waste to shore for transfer to barge.

Onshore subsurface injection and salt cavern disposal facilities will continue to develop in the analysis area. Long-term capacity to install subsurface injection facilities onshore is itself not scarce and oil-field waste injection well permits do not generally attract much public opposition. The main limitation to widespread use of land-based subsurface injection facilities is the space at docks and the traffic in and out of ports. With the addition of Trinity Field Services to the market, the OCS has its first salt dome disposal operation in a competitive location, with 6.2 million barrels of space available initially. This is enough capacity to take 8-10 years' worth of OCS liquids and sludges at current generation rates and a potential of several times that amount with additional solution mining (Louis Berger Group, Inc., 2001). In addition, salt domes locations are well known and others could be placed into service as demand dictates. Salt caverns are a finite resource, but nevertheless have the potential to take decades' worth of OCS offsite NOW generation. The OCS-generated waste that is brought to shore (approximately 600,000 bbl) represents a small percentage of the total oil and gas waste received by disposal facilities (for the most part Trinity and Newpark in Texas). Therefore, OCS activity does not generate a large part of the waste stream into onshore waste disposal sites (subsurface injection and salt cavern disposal), and the decrease in onshore waste disposal activity as a result of the proposed action is not expected to notably affect the overall industry.

The use of landfarming of OCS waste is likely to continue its downward trend in the future, particularly with greater availability of injection methods for wastes containing solids. Assuming a landfill (1) presently had OCS waste constituting 5 percent of its waste stream (from Chapter 3.3.5.4), (2) the remaining life of a landfill was 20 years at current fill rates, and (3) OCS waste doubled but the rest of the incoming waste stream remained flat, then the OCS activities would cause the landfill to be closed at the end of 19 years as a result of the OCS contribution increase. With no waste received from OCS activities at all, the landfill would close in 21 years. Therefore, OCS activity does not generate a large part of the waste stream into landfills and the decrease in onshore waste disposal activity as a result of the proposed action is not expected to affect the overall industry.

Coastal or nearshore spills could have short-term adverse effects on OCS-related coastal infrastructure requiring clean up of any oil or waste spilled.

Conclusion

Activities relating to the proposed action to operate an offshore waste disposal facility at MP 299 are expected to minimally affect the analysis area's land use, infrastructure, demography, population, employment, and OCS-related coastal infrastructure. Baseline patterns and distributions of these factors, as described in Chapter 3.3.3, are expected to be maintained. The majority of the probable changes in employment, and therefore population, would most likely occur in Texas (where current OCS waste facilities are located) and Louisiana (where the three designated service bases are located). Changes in land use as a result of the proposed action are expected to be contained and negligible. Minimal effects on population are projected from activities associated with the proposed action. The increase in employment will most likely be met with the existing population and available labor force in the analysis area and will therefore not require additional local housing or government services. Most of the employment changes should be a redistribution of jobs from current sectors to new sectors as a result of the proposed action.

Port Fourchon, Morgan City, and Venice, Louisiana, the designated service bases, are capable of providing the services necessary for the proposed activities; therefore, no onshore expansion or construction is anticipated with respect to the proposed action. While OCS-related servicing should increase in Port Fourchon, Morgan City, and Venice, Louisiana, due to the proposed action, there may be a reduction in activity at the ports due to decreased traffic bringing OCS waste to shore for transfer to barge. The OCS-generated waste that is brought to shore represents a small percentage of the total oil and gas waste received by disposal facilities (subsurface injection, salt cavern disposal, and landfarming). Therefore, OCS activity does not generate a large part of the waste stream into onshore waste disposal sites, and the decrease in activity as a result of the proposed action is not expected to notably affect the overall industry.

The short-term social and economic consequences for the Gulf coastal region, should a spill occur includes opportunity cost employment and expenditures that could have gone to production or consumption rather than spill-cleanup efforts. Non-market effects such as traffic congestion, strains on public services, shortages of commodities or services, and disruptions to the normal patterns of activities or expectations are also expected to occur in the short term. These negative, short-term social and economic consequences of an accidental spill are expected to be modest in terms of projected cleanup expenditures and the number of people employed in cleanup and remediation activities. Negative, long-term economic and social impacts may be more substantial if fishing, shrimping, oystering, and/or tourism were to suffer or were to be perceived as having suffered because of the spill.

4.3.4 Impacts on Environmental Justice

Environmental justice involves questions of disproportionate and negative effects on minority and/or low-income populations. Figures B-6 and B-7 show census tracts with high concentrations of minority groups and low-income households. The reader will note that these populations are scattered throughout the coastal counties and parishes. Because the distribution of low-income and minority populations does not parallel the distribution of industry activity, effects of a proposed action are not expected to be disproportionate.

The company proposes to use onshore transfer stations in Venice, Port Fourchon, and/or Morgan City. These are already centers of oil and gas supporting activities. Employment should fluctuate little during the 26 years of the proposed waste disposal. Waste transport vessel traffic to MP 299 will range from an estimated 2 trips a week in 2002 to 14 trips a week in 2025, per the company's applications. The risk of spills is projected to be low. Transport of the waste to MP 299 will be phased to rely equally on both OSV's and SPB's by the year 2027. The MMS did not attempt to determine whether the risk of spills might change depending on the technology of each kind of vessel. Residents of Lafourche Parish may bear more negative consequences due to the fragile roadway that links the parish to the port. Such fragility will be strained further with increased activity of waste transfer and storage, as minimal as that activity is projected to be. The concentrated socioeconomic impacts in Lafourche Parish are not expected to have disproportionate effects on minority and low-income populations for several reasons. The Parish is not predominately minority or low income (Figures B-6 and B-7). Existing information indicates that the Houma, a Native American tribe recognized by the State of Louisiana, are not expected to be disproportionately affected because they are not residentially segregated but, rather, live interspersed among the non-minority population (Fischer, 1970).

Conclusion

Because of the presence of an existing extensive and widespread support system for the OCS-related industry and associated labor force, the effects of the proposed waste disposal should be widely distributed and little felt. The MMS cannot predict who will be hired and where new infrastructure might be located but there should be few if any disproportionately high or adverse environmental or health effects on minority or low-income people.

4.3.5 Impacts Concerning Military Warning Areas

MP 299 is not located in any of the designated Military Warning Areas (MWA's) or Water Test Areas (WTA's) of the GOM. However, our review indicates that the routes to be taken by boats and aircraft in support of the proposed activities are located in or could traverse MWA W-59, MWA W-92, MWA W-147, MWA W-155, MWA W-453, and Eglin WTA-1 and 3. Therefore, MMS's Office of Field Operations will apply the following mitigation to the proposed activity:

Mitigation 11.1 (Advisory) - MWA W-92

Our review indicates that the routes to be taken by boats and aircraft in support of your proposed activities are located in or could traverse Military Warning Area W-92. Therefore, please be advised that you will contact the Naval Air Station, Air Operations Department, Air Traffic Division/Code 52, New Orleans, Louisiana 70146-5000 [contact ACC A.W. Thrift at (504) 678-3100 or (504) 678-3101] concerning the control of electromagnetic emissions and use of boats and aircraft in Military Warning Area W-92.

Mitigation 11.2 (Advisory) - MWA W-147

Our review indicates that the routes to be taken by boats and aircraft in support of your proposed activities are located in or could traverse Military Warning Area W-147. Therefore, please be advised that you will contact the 147th Fighter Wing, Operations Officer, Houston, Texas 77034 [contact Msgt. Winsor at (281) 929-2716 or (281) 929-2683] concerning the control of electromagnetic emissions and use of boats and aircraft in Military Warning Area W-147.

Mitigation 11.4 (Advisory) - MWA W-155

Our review indicates that the routes to be taken by boats and aircraft in support of your proposed activities are located in or could traverse Military Warning Area W-155. Therefore, please be advised that you will contact the Naval Air Station, Chief - Naval Air Training, Office No. 206, Corpus Christi, Texas 78419-5100 [contact Comdr. M. Thompson at (512) 939-3862 or (512) 939-2621] concerning the control of electromagnetic emissions and use of boats and aircraft in Military Warning Area W-155.

Mitigation 11.6 (Advisory) - MWA W-453

Our review indicates that the routes to be taken by boats and aircraft in support of your proposed activities are located in or could traverse Military Warning Area W-453. Therefore, please be advised that you will contact the Air National Guard-CRTC, Gulfport/ACTS, Gulfport, Mississippi 39507 [contact TSgt. D. Crawford or TSgt. L. Wyche at (228) 867-2433] concerning the control of electromagnetic emissions and use of boats and aircraft in Military Warning Area W-453.

Military 11.8 (Advisory) - Eglin WTA-1 or Eglin WTA-3

Our review indicates that the routes to be taken by boats and aircraft in support of your proposed activities are located in or could traverse Eglin Water Test Area No. (1)(3). Therefore, please be advised that you will contact the Air Armament Center, Programs Division, Eglin Air Force Base, Florida 32542-5495 [contact Ms. Dorine White at (850) 882-3899 or (850) 882-4188] concerning the control of your electro-magnetic emissions and use of boats and aircraft in Eglin Water Test Area No. (1)(3).

Mitigation 11.10 (Advisory) - MWA W-59

Our review indicates that the routes to be taken by boats and aircraft in support of your proposed activities are located in or could traverse Military Warning Area W-59. Therefore, please be advised that you will contact the Naval Air Station-JRB, New Orleans, Louisiana 70143-0027 [contact Msgt. Proze at (504) 391-8696 or (504) 391-8697] concerning the control of electromagnetic emissions and use of boats and aircraft in Military Warning Area W-59.

According to Freeport, it is not currently conceivable that MWA's or WTA's, other than those listed above, may be traversed in support of the proposed activities. However, if boats and aircraft operated on behalf of Freeport do traverse additional MWA's or WTA's, Freeport has agreed to contact the appropriate individual command headquarters for these additional areas concerning the control of electromagnetic emissions and use of boats and aircraft (Freeport, 2001). Points of contact and telephone numbers for additional MWA's or WTA's can be found in the appropriate MMS Final EIS.

Based on Freeport's compliance with these mitigative measures, no environmental impacts are anticipated and potential multiple-use conflicts on the OCS will be minimized.

4.3.6 Impacts on Recreational Resources and Beach Use

The annual value of recreation and tourism in the GOM coastal zone from Texas through Florida has been estimated in the billions of dollars (USDOI, MMS, 2001b; pages III-101 through III-102). A significant portion of these expenditures is made where major shoreline beaches are primary recreational attractions such as the coastline of Mississippi and Alabama.

The primary impact-producing factors associated with offshore oil and gas development or associated activities such as those proposed in the waste disposal applications, and most widely recognized as major threats to the enjoyment and use of recreational waters, are oil spills, visibility of platforms and/or wells, and trash and debris. Additional factors such as noise from supply vessels and increased roadway or water traffic can adversely affect a recreational experience. The applicant estimates waste transporting trips of 104 per year in 2002, 312 per year in 2003, and up to 728 per year by 2027. This is a 600 percent increase over the 26 year life of the proposed action. Whether these trips originate from Venice, Berwick (Morgan City) or Port Fourchon, they will add incrementally to the vessel traffic and, hence, to the risk of accidents. Furthermore, the gradual use of self-propelled barges (SPB's) —from 52 trips per year in 2010 to 364 trips per year in 2027—also expands the potential for larger single spills.[11]

A substantial recreational fishery, including SCUBA diving, is directly associated with oil and gas production platforms and stems from the fact that platforms function as high profile artificial reefs that attract fish. The vast majority of the proposed activity would occur within the applicant's waste corridor (Figure B-1d). Hence, the potential is there for this waste transfer and transport process to affect recreation.

The physical presence of platforms and drilling rigs visible from shore and noise associated with vessels traveling between coastal shore bases and offshore operation sites can adversely affect the natural ambience of primitive coastal ecosystems. Drilling rigs and platforms placed 3-10 mi from shore are within sight range of shoreline recreational beaches. The MP 299 platform is located approximately 16 mi from shore, east of the Mississippi River Delta and Plaquemines Parish, Louisiana (Figure B-1a). State oil and gas operations are already occurring on nearshore tracts off Louisiana and Alabama. Although these factors may affect the quality of the recreational experience, they are unlikely to reduce the number of recreational visits to coastal beaches in the Central Gulf.

Conclusion

The proposed onshore and marine operations will increase the amount of trash and debris along the coastal areas. It is expected, however, that the increase will be minimal and will have little effect on the number of users of beaches and other recreational opportunities.

4.3.7 Impacts on Archaeological Resources

4.3.7.1 Prehistoric Archaeological Resources

MP 299 is located within MMS's designated high-probability areas for the potential occurrence of prehistoric archaeological resources. Lease blocks with a high probability for prehistoric archaeological resources may only be found landward of a line that roughly follows the 60-m (200-ft) bathymetric contour. The MMS recognizes the 12,000 B.P. date and 60 m (200 ft) water depth as the seaward extant of prehistoric archaeological potential on the OCS (CEI, 1977; revised July 1982). The water depth of MP 299 is approximately 63 m (210 ft). Using the relative sea level curve provided by CEI, the seafloor in the project area was last dry land approximately 14,400 B.P. Based on the water depth and currently accepted sea level curve, there is a very low probability for the occurrence of prehistoric archaeological resources in this lease block. Therefore, it is highly unlikely that the proposed action will have any affect on prehistoric archaeological resources in this block.

Proposed Action Analysis for Prehistoric Archaeological Resources

The proposed action is to inject OCS-generated, RCRA-exempt E&P waste into the salt caverns underlying existing Brine Well Nos. 1-A and 5-A, former Brine Well No. 3-A, and the caprock underlying 10 existing wells proposed for use as injection wells. The proposed offshore development as described in this plan cannot result in an impact to an inundated prehistoric archaeological site because the area has already been disturbed by the initial construction of these wells and platform installation. The proposed action does not require any new construction activities that disturb the seafloor. Only one impact-producing factor could cause adverse impacts to an unknown prehistoric archaeological site in MP 299. If Cavern No. 1 was to collapse, it would form a subsidence crater approximately 2,600 ft wide by 45 ft deep (Table B-2). If an unknown archaeological site was present within this area of subsidence it could be disturbed or destroyed.

The MMS also recognizes both the 12,000 B.P. date and 60-m (200-ft) water depth as the seaward extant of prehistoric potential on the OCS. The water depth of MP 299 is approximately 60 m (210 ft).

[11] The applicant states that the SPB's will have two holds, each with a 12,500-bbl capacity. Compare this to a staffed OSV with a 5,000-bbl capacity.

Therefore, the water depth is approximately 3 m deeper than the earliest known prehistoric archaeological sites in the GOM area.

Conclusion

It is highly unlikely that the proposed action would have any impact on prehistoric archaeological resources. This analysis is based on the water depth, prior seafloor disturbances in and around the wells to be used for injection, and the lack of any required new construction activities that would disturb the seafloor.

However, should Cavern No. 1 collapse, forming a subsidence crater as described in Table B-2, there could be damage of an unknown prehistoric archaeological site.

4.3.7.2 Historic Archaeological Resources

There are areas of the northern GOM that are considered to have a high probability for historic period shipwrecks as defined by an MMS-funded study and shipwreck model (Garrison et al., 1989). The study expanded the shipwreck database in the GOM from 1,500 to more than 4,000 wrecks. Statistical analysis of shipwreck location data identified two specific types of high-probability areas—the first within 10 km (6 mi) of the shoreline, and the second proximal to historic ports, barrier islands, and other shipwreck loss traps (Anuskiewicz, 1989; page 76). High-probability search polygons associated with individual shipwrecks were created to afford protection to wrecks located outside of the two aforementioned high-probability areas.

There are no known historic shipwrecks reported within the vicinity of the proposed action; however, there could be unknown shipwrecks within the project area.

Proposed Action Analysis for Historic Archaeological Resources

Only one impact-producing factor could cause adverse impacts to unknown historic archaeological resources in MP 299. If Cavern No. 1 was to collapse, it would form a subsidence crater approximately 2,600 ft wide by 45 ft deep (Table B-2). Approximately 45 ft of seafloor subsidence could change the original archaeological provenance of a shipwreck site and could destroy fragile ship remains, such as the hull and wooden or ceramic artifacts, and could disturb the site context. The result would be the loss of archaeological data on ship construction, cargo, and the social organization of the vessel's crew, and the concomitant loss of information on maritime culture for the time period from which the ship dates.

A review of the geophysical report submitted by the applicant for this lease block indicated that no seafloor features suggestive of historic shipwrecks were recorded during the lease block's side-scan-sonar survey. Therefore, it is unlikely that an historic shipwreck will be affected by the proposed action.

Conclusion

There are no known reported shipwrecks within MP 299, and a side-scan sonar survey of the lease block did not record any evidence of possible unknown historic shipwrecks. Therefore, it is highly unlikely that any historic shipwreck will be adversely affected by the proposed action.

However, should Cavern No. 1 collapse, forming a subsidence crater as described in Table B-2, there could be damage of a historic shipwreck. The cavern collapse could impact a shipwreck because of incomplete knowledge on the location of shipwrecks in the Gulf. Such an event would result in the disturbance or destruction of important historic archaeological information.

4.3.8 Impacts on Artificial Reefs and Rigs-to-Reefs Development

Present practice and approval of permitted artificial reef materials are confined to State artificial reef areas set aside for receipt of reef materials. The material is inspected, marked, and dates of transport and deployment on site are recorded and submitted to the State prior to permitting the material for reef.

Presently, only one artificial reef, i.e. platform reef, exists in the Main Pass Artificial Reef Planning Area. The Rigs-to-Reef (RTR) site is located in MP Block 300, adjacent to and one block west of MP Block 299 where the waste disposal activities are proposed (Figure B-8).

Close coordination between MMS and the State artificial reef program offices is done to preclude potential conflict between oil and gas development or other operations (waste disposal) permitted by the MMS, and existing reef materials located within an area of proposed operations.

All proposed artificial reefs and RTR projects and COE permit notices for reef are coordinated and reviewed by the MMS for potential conflict with oil and gas infrastructure (i.e., platforms and pipelines) and development.

Conclusion

Potential environmental impacts to artificial reefs and rigs-to-reef development from the proposed waste disposal activities at MP 299 are not expected.

4.4 Cumulative Impacts

The MMS has addressed the cumulative effects of OCS- and non-OCS-related activities for the Central Planning Area and the Gulf Coast region as part of NEPA documentation completed for multisale lease activities. This includes the area potentially affected by the proposed waste disposal activities at MP 299. The analyses below summarize information on relevant cumulative effects, tiering from previous NEPA documents. Recent NEPA documents applicable to the MP 299 area include the Final EIS for Central GOM Lease Sales 169, 172, 175, 178, and 182 (USDOI, MMS, 1997) and the Draft EIS for the Gulf of Mexico OCS Oil and Gas Lease Sales 2003-2007; Central Planning Area Sales 185, 190, 194, 198, and 201, Volumes I and II (USDOI, MMS, 2002). Potential effects specific to the proposed MP 299 project are addressed in Chapters 4.1-4.3 of this EA.

4.4.1 Physical Elements of the Environment

4.4.1.1 Impacts on Water Quality

4.4.1.1.1 Coastal

Contaminant inputs to coastal waters bordering the GOM are due primarily to the large volumes of water entering the Gulf from rivers draining over two-thirds of the contiguous U.S., from a large number of municipal and industrial point- and nonpoint-source discharges, and from spill events. Numerous studies have identified the Mississippi River, which drains two-thirds of the U.S., as the major source of contamination for Gulf waters (e.g., Bedinger, 1981; Brooks and Giammona, 1988). The proposed project at MP 299 is located approximately 16 mi from the mouth of the Mississippi River.

Major sources expected to contribute to the contamination of Gulf coastal waters in the future include the petrochemical industry (oil and gas exploration and development in State offshore waters and OCS and processing of hydrocarbons), agriculture, urban expansion, municipal and camp sewerage treatment processes, marinas, commercial fishing, maritime shipping, and hydromodification activities. Lesser sources of contaminants are likely to be forestry, recreational boating, livestock farming, manufacturing industry activities, nuclear power plant operations, and pulp and paper mills. Runoff and wastewater discharge from these sources will cause water quality changes that will result in a significant percentage of coastal waters not attaining Federal water quality standards.

Vessel traffic will also degrade coastal water quality through routine releases of bilge and ballast waters, chronic fuel and tank spills, trash, and domestic and sanitary discharges. Increased turbidity from extensive dredging operations to support commercial activities and oil and gas development projected to continue within the Gulf coastal zone constitutes another considerable type of nonpoint-source pollution in the Gulf's coastal waters.

Degradation of water quality conditions due to these inputs is expected to continue. The Gulf Coast has been heavily used and is now showing some signs of environmental stress. Large areas experience nutrient overenrichment, low-dissolved oxygen, toxin and pesticide contamination, shellfish ground closures, and wetland loss. Dredging of coastal areas to support coastal development, access for oil and gas wells in State waters, and pipeline emplacements will continue to increase each year. Increased turbidity from dredging operation and dumping of sediments into the coastal water would effect the water quality of the coastal area.

Water quality in coastal waters will be impacted by supply vessel usage and infrastructure discharges.

Impacts to coastal water quality from the proposed action are not expected to be significant. The incremental contribution of the proposed action to cumulative impacts on coastal water quality is expected to be negligible.

4.4.1.1.2 Marine Waters

Contaminant inputs to GOM marine waters include offshore, coastal, and land-based sources. Numerous studies have identified the Mississippi River, which drains two-thirds of the U.S., as the major source of contamination for Gulf waters (e.g., Bedinger, 1981; Brooks and Giammona, 1988). Contaminants released to coastal waters can be transported to offshore marine waters. Offshore sources of contaminants include the OCS oil and gas operations, marine transportation, commercial fishing, and natural hydrocarbon seeps.

Spills of oil and other hazardous substances could occur from vessels transporting crude oil and petroleum products, from vessels transporting other products (including E&P wastes) through Gulf waters, and from OCS oil and gas production operations. The amount of oil dispersed and dissolved from an oil slick is not likely to cause adverse water quality conditions for more than a few months. The frequency of occurrence and the size of the spills are the major factors determining water quality degradation.

Bottom disturbance resulting from drilling wells, blowouts, emplacement and removal of platforms and pipelines, and vessel anchoring can increase water-column turbidity in the overlying offshore waters. Besides causing turbidity, sediment disturbance can result in the resuspension of any accumulated pollutants. These events are expected to result in localized, short-term changes in water quality in the immediate vicinity but would not be of consequence to regional water quality.

Vessel traffic associated with the extensive maritime industry, oil and gas operations (including the transport of E&P wastes to onshore locations), and recreational and commercial fishing operations will also degrade marine water quality through routine releases of bilge and ballast waters, chronic fuel and tank spills, trash, and domestic and sanitary discharges into offshore waters. Natural hydrocarbon seeps have been documented in the deepwater area of the GOM (Brooks et al., 1986

, 1987, and 1990; USDOI, MMS, 1996). MacDonald et al. (1996) identified 63 oil slicks from one or more remote-sensing images. These seeps contribute soluble hydrocarbon components into the water column.

The Mississippi River will continue to be the major source of contamination of the Gulf. Over time, continuing coastal water quality contamination will degrade offshore water quality. As the assimilative capacity of coastal waters is exceeded, there will be a subsequent, gradual movement of the area of degraded waters farther offshore over time.

Impacts to offshore water quality from the proposed action are not expected to be significant. The incremental contribution of the proposed action to cumulative impacts on offshore water quality is expected to be negligible.

4.4.1.2 Impacts on Air Quality

Effects on air quality within the project area will come primarily from industrial, power generation, and urban emissions. The coastal areas nearest the project area are currently designated as "attainment" for all of the NAAQS-regulated pollutants. Although the nearest onshore areas are currently in attainment for ozone, several coastal parishes or counties may soon be designated nonattainment under the new 8-hour ozone standard. According to ambient data collected in the 3-year period of 1998-2000, ozone levels in St. Mary Lafourche, Jefferson, and Orleans Parishes in Louisiana; Hancock and Jackson Counties in Mississippi; and Mobile County in Alabama exceed the 8-hour ozone standard. In addition, although USEPA reclassified Lafourche Parish to attainment on December 26, 2001, the Parish is a maintenance area, which means the area has established enforceable emission control requirements that will be implemented if the area suffers a future ozone violation.

Although the nearest onshore areas are currently in attainment for the PM standards, USEPA recently promulgated a new standard for the size fraction less than 2.5µM in diameter, and sufficient monitoring has not yet been conducted to establish the attainment status. The PM emissions may also contribute to visibility impairment in the BNWA.

The total annual emission rates for the proposed project are below the MMS exemption level and no significant impacts are expected to occur. The incremental contribution of the proposed action to cumulative impacts on air quality is expected to be negligible.

4.4.2 Biological Resources

4.4.2.1 Impacts on Sensitive Coastal Environments

4.4.2.1.1 Coastal Barrier Beaches and Associated Dunes

Most adverse effects to barrier beaches and dunes in the Central Gulf region have resulted from human activities. These adverse effects have resulted from changes to the natural dynamics of water and sediment flow along the coast. Examples of these activities include pipeline canals, channel stabilization structures, beach stabilization structures, recreational and commercial development, and removal of coastal vegetation. Human activities cause direct impacts as well as accelerate natural process that deteriorate coastal barrier features. Sediment deprivation and rapid submergence have resulted in severe, rapid erosion of most of the barrier landforms along the Louisiana coast. The barrier system of coastal Mississippi and Alabama is well supported on a coastal barrier platform of sand.

The impacts of oil spills from both OCS and non-OCS sources to the sand-starved Louisiana coast should not result in long-term alteration of landform if the beaches are cleaned using techniques that do not significantly remove sand from the beach or dunes. In the Central Gulf area, the barrier beaches of deltaic Louisiana have the greatest risk of sustaining impacts from oil-spill landfalls because of the large number of oil production facilities within 50 km of the coast. The cleanup impacts of the these spills could result in short-term (up to 2 years) adjustment in beach profiles and configurations as a result of sand removal and disturbance during cleanup operations. Some contact to lower areas of sand dunes is expected. These contacts would not result in significant destabilization of the dunes.

Natural processes that cause adverse impacts to barrier beaches and dunes include storms, subsidence, and sea-level rise acting upon shorelines with inadequate sand content and supply.

Deterioration of Gulf barrier beaches is expected to continue in the future. Federal, Louisiana, and parish governments have made efforts over the last 10 years to slow the landward retreat of Louisiana's Gulf shorelines.

No significant impacts to barrier beaches or dunes are expected to occur as a result of the proposed action. The incremental contribution of the proposed action to cumulative impacts on coastal barrier beaches and dunes impacts is expected to be negligible.

4.4.2.1.2 Wetlands

In the areas that might be affected by the proposed action in the Central Gulf area, the conversion of wetlands to agricultural, residential, and commercial uses has generally been the major cause of wetland loss. Commercial uses include dredging for both waterfront developments and coastal oil and gas activities. Wetland loss is projected to continue around the Gulf. Existing regulations and development permitting procedures indicate that development-related wetland loss may be slowed and that few new onshore OCS facilities, other than pipelines, will be constructed in wetlands. Significant adverse impacts to wetlands from maintenance dredging are not expected because the large majority of the material would be disposed of in existing disposal areas. Alternative dredged material disposal methods can be used to enhance and create coastal wetlands.

Impacts from State onshore oil and gas activities are expected to occur as a result of dredging for new canals and for maintenance, usage of existing rig access canals and drill slips, and preparation of new well sites. Indirect impacts from dredging new canals for State onshore oil and gas development and from maintenance of the existing canal network is expected to continue.

A variety of mitigation efforts are being used to protect against direct and indirect wetland loss. The non-maintenance of mitigation structures that reduce canal construction impacts can have substantial impacts upon wetlands.

Deltaic Louisiana is expected to continue to experience the greatest loss of wetland habitat. Wetland loss is also expected to continue in coastal Mississippi and Alabama, but at slower rates.

The greatest threat to wetlands from the proposed action would be from an inland oil spill caused by a vessel accident, which would have a low probability of occurrence. No impacts to wetlands are expected from the proposed action and the incremental contribution of the proposed action to cumulative impacts on wetlands is expected to be negligible.

4.4.2.1.3 Seagrasses

Seagrasses are adversely affected by several human activities. These activities include changes to water quality resulting from riverine input, stream channelization, urban runoff, and industrial discharges; physical removal of plants by various forms of dredging, anchoring, and grounding of vessels; and severe storms. These impacts and the general decline of seagrasses are expected to continue into the near future. Various local, State, and Federal programs are focused upon reversing this trend.

Large, water-control structures associated with the Mississippi River influence salinities in coastal areas, which in turn influences the location of seagrass communities and associated epifauna. Where flooding or other freshwater flow to the sea is reduced, regional average salinities generally increase. Average salinities in areas of the coast that receive increased freshwater flows as a result of the above flood controls are generally reduced. Beds of submerged vegetation (seagrass) adjust their locations based on their salinity needs. If the appropriate salinity range for a species is located where other environmental circumstances are not favorable, the new beds will be either smaller, less dense, or may not colonize at all.

Inshore oil spills generally present greater risks of adversely impacting submerged vegetation and seagrass communities than do offshore spills and can cause die-back to the seagrass vegetation and supported epifauna, which will be replaced for the most part within one to two growing seasons, depending upon the season in which the spill occurs. Contact of seagrasses with crude and refined oil has been implicated as a causative factor in the decline of seagrass beds and in the observed changes in species composition within them (Eleuterius, 1987).

Because of the floating nature of oil and the microtidal range that occurs in the Central Gulf area, oil spills alone would typically have very little impact on seagrass beds and associated epifauna. The cleanup of slicks can cause significant scarring and trampling of submerged vegetation and seagrass beds while the slick is over shallow, protected waters that are less than 5-ft deep.

Seagrass communities and associated habitat can be scarred by anchor drags, trampling, trawling, loggerhead turtles, occasional seismic activity, and boats operating in water that is too shallow for their keels or propellers. These actions remove or crush plants. The greatest scarring results from smaller boats operating in the vicinities of larger populations of humans and registered boats. A few State and local governments have instituted management programs that have resulted in reduced scarring.

Dredging causes problems for beds of submerged vegetation. These actions uproot, bury, and smother plants as well as decrease oxygen in the water; and reduce the amount of necessary sunlight. Dredging generates the greatest overall risk to submerged vegetation. Channel dredging to create and maintain waterfront real estate, marinas, and waterways will continue to cause the greatest impacts to higher salinity submerged vegetation.

The shore bases to be used for the proposed action (Morgan City, Port Fourchon, and Venice, Louisiana) are located in areas where seagrasses are not common. In the unlikely event that an inland spill associated with the proposed action contacted an area containing seagrasses, impacts would be minimal. No significant impacts to seagrasses are expected from the proposed action and the incremental contribution of the proposed action to cumulative impacts on seagrasses is expected to be negligible.

4.4.2.2 Impacts on Deepwater Benthic Communities/Organisms

The water depths at MP 299, the location of the proposed action, range from 60-70 m. No chemosynthetic or deepwater benthic communities occur in this area nor is it expected that activities associated with the proposed action would cause any impacts to these communities. The closest known chemosynthetic community is located more than 40 nmi to the east.

4.4.2.3 Impacts on Marine Mammals

Cumulative impacts to marine mammals in the Central Gulf region include the degradation of water quality resulting from operational discharges, vessel traffic, noise generated by platforms, drillships, helicopters and vessels, seismic surveys, explosive structure removals, oil spills, oil-spill response activities, loss of debris from service vessels and OCS structures, commercial fishing, capture and removal, and pathogens. The cumulative impact on marine mammals is expected to result in a number of chronic and sporadic sublethal effects (behavioral effects and nonfatal exposure to or intake of OCS-related contaminants or discarded debris) that may stress and/or weaken individuals of a local group or population and predispose them to infection from natural or anthropogenic sources. Few deaths are expected from oil spills, chance collisions with OCS service vessels, ingestion of plastic material, commercial fishing, and pathogens. Oil spills and slicks of any size are estimated to be erratic events that would periodically contact marine mammals. Deaths as a result of structure removals are not expected due to ESA Section 7 consultations. Disturbance (noise from vessel traffic and drilling operations, etc.) and/or exposure to sublethal levels of toxins and anthropogenic contaminants may stress animals, weaken their immune systems, and make them more vulnerable to parasites and diseases that normally would not be fatal. The net result of any disturbance would be dependent upon the size and percentage of the population likely to be affected; ecological importance of the disturbed area; environmental and biological parameters that influence an animal's sensitivity to disturbance and stress; or the accommodation time in response to prolonged disturbance (Geraci and St. Aubin, 1980). Collisions between cetaceans and ships, though expected to be rare events, could cause serious injury or mortality.

The proposed action could cause adverse impacts to marine mammals due to chance collisions with vessels, by eating certain trash or debris, or due to impacts from oil spills or waste spills or subsequent spill-response activities. Impacts to marine mammals are not expected to be significant and the incremental contribution of the proposed action to cumulative impacts on marine mammals is expected to be negligible.

4.4.2.4 Impacts on Sea Turtles

Cumulative impact-producing factors that may harm sea turtles and their habitats include structure installation, dredging, water quality and habitat degradation, trash and flotsam, vessel traffic, seismic surveys, explosive structure removals, oil spills, oil-spill response activities, natural catastrophes, pollution, vessel collisions, commercial and recreational fishing, human consumption, beach lighting, and power plant entrainment. Sea turtles could be killed or injured by chance collision with OCS and non-OCS vessels or eating marine debris, particularly plastic items. It is expected that deaths due to structure removals would rarely occur due to mitigation measures established by ESA Section 7 consultations. The presence of and the noise produced by vessels and by the construction, operation, and removal of drilling rigs may cause physiological stress and make animals more susceptible to disease or predation, as well as disrupt normal activities. Contaminants from OCS waste discharges and drilling muds and non-OCS sources might indirectly affect sea turtles through food-chain biomagnfication; there is uncertainty concerning the possible effect. Oil spills and oil-spill response activities may cause turtle deaths. Contact with, and consumption of oil and oil-contaminated prey, may seriously impact turtles. Sea turtles have been seriously harmed by oil spills in the past. The majority of OCS activities are estimated to be sublethal (behavioral effects and nonfatal exposure to intake of OCS-related contaminants or debris). Chronic sublethal effects (e.g., stress) resulting in persistent physiological or behavioral changes and/or avoidance of impacted areas could cause declines in survival or productivity, resulting in either acute or gradual population declines.

The proposed action could cause adverse impacts to sea turtles due to chance collisions with vessels; by eating certain trash or debris; impacts from oil spills or waste spills or subsequent spill-response activities; noise from facilities, helicopters, or vessels; or brightly-lit platforms. Impacts to sea turtles are not expected to be significant and the incremental contribution of the proposed action to cumulative impacts on marine mammals is expected to be negligible.

4.4.2.5 Impacts on Coastal and Marine Birds

Cumulative activities that could detrimentally affect coastal and marine birds include air emissions, water quality degradation, habitat loss and modification resulting from coastal construction and development, collisions with aircraft or vessels, noise from aircraft and vessels, trash and debris, and lighting. Any effects could be especially critical to endangered or threatened species that must maintain a viable reproductive population size or are dependent on a few key habitat factors. Aircraft or vessel traffic could sporadically disturb feeding, resting, or nesting behavior of birds or cause abandonment of preferred habitat. Birds could become entangled and snared in trash and debris. In addition, they may ingest small plastic debris that could lead to injury or death. It is expected that the majority of effects from the major impact-producing factors on coastal and marine birds are sublethal (behavioral effects and nonfatal exposure to or intake of contaminants or discarded debris) and will usually cause temporary disturbances and displacement of localized groups inshore. Chronic sublethal stress, however, is often undetectable in birds. It can serve to weaken individuals (which is especially serious for migratory species) and expose them to infection and disease. Lethal effects, resulting primarily from uncontained coastal oil spills and associated spill-response activities in wetlands and other biologically sensitive coastal habitats, are expected to remove a number of individuals from any or all groups through primary effects from physical oiling and the ingestion of oil, and secondary effects resulting from the ingestion of oiled prey. Recruitment of birds through successful reproduction is expected to take up to many years, depending upon the species and existing conditions. The net effect of habitat loss from oil spills, new construction, and maintenance and use of pipeline corridors and navigation waterways will alter species composition and reduce the overall carrying capacity of disturbed area(s) in general.

The cumulative effect on coastal and marine birds is expected to result in a discernible decline in the numbers of birds that form localized groups or populations, with associated change in species composition and distribution. Some of these changes are expected to be permanent, as exemplified in historic census data, and to stem from a net decrease in preferred and/or critical habitat.

The proposed action could cause adverse impacts to coastal and marine birds due to routine activities or low-probability accidental events. Impacts to coastal and marine birds are not expected to be significant and the incremental contribution of the proposed action to cumulative impacts on coastal and marine birds is expected to be negligible.

4.4.2.6 Impacts on Essential Fish Habitat, Fish Resources, and Commercial Fisheries

Activities resulting from the OCS Program and non-OCS events in the northern GOM have the potential to cause detrimental effects on EFH, fish resources, and commercial fishing. Impact-producing factors that can affect EFH, fish resources, and commercial fishing include coastal and marine environmental degradation, commercial and recreational fishing techniques or practices, hurricanes, installation of production platforms, underwater OCS obstructions, production platform removals, seismic surveys, petroleum spills, subsurface blowouts, pipeline trenching, and offshore discharges of drilling muds and produced waters.

Degradation of water quality, loss of essential habitat (including wetland loss), pathogens, trash and debris, riverine influences, and overfishing could affect EFH, fish resources, and commercial fishing. Eggs and larvae are more susceptible than adults to environmental contaminants. Portions of the Gulf experience hypoxia during portions of the year. However, areas of hypoxia typically occur only on the continental shelf. Federal and State fishery management agencies will control the "take" of commercial fishes. The agencies' primary responsibility is to manage effectively the fishery stock to perpetuate commercially important species. Various management plans aimed at selected species have been and will continue to be prepared. The GOM will remain one of the Nation's most important commercial fisheries area.

The potential marine or coastal environmental degradation that could result from low-probability accidental events related to the proposed action is not expected to have a significant effect on EFH, fish resources, or commercial fishing. The incremental contribution of the proposed action to cumulative impacts on EFH, fish resources, or commercial fishing is expected to be negligible.

4.4.2.7 Impacts on Threatened and Endangered Fish (listed and proposed for listing)

4.4.2.7.1 Gulf Sturgeon

The Gulf sturgeon can be impacted by activities considered under the cumulative scenario, including oil spills, alteration and destruction of habitat, and commercial fishing. Contact with spilled oil can result in nonfatal irritation of gill epithelium or the liver. Substantial damage to Gulf sturgeon habitats is expected from habitat alteration due to dredging and other activities, as well as natural catastrophes. As a result, it is expected that the Gulf sturgeon will experience a decline in population sizes and a displacement from their current distribution that will last more than one generation. Deaths of adult sturgeon are expected to occur from commercial fishing.

The Gulf sturgeon could be impacted by oil spills associated with the proposed action, but impacts are not expected to be significant. The incremental contribution of the proposed action to cumulative impacts on Gulf sturgeon is expected to be negligible.

4.4.2.7.2 Smalltooth Sawfish

The smalltooth sawfish can be impacted by activities considered under the cumulative scenario, including oil spills, alteration and destruction of habitat, and commercial fishing. Contact with spilled oil/waste can result in fouling or contamination of sawfish, potential prey or the demersal habitat of the sawfish. Substantial damage to smalltooth sawfish habitats is expected from habitat alteration due to dredging and other activities, as well as natural catastrophes. As a result, it is expected that the smalltooth sawfish will experience a decline in population sizes and a displacement from their current distribution that may last more than one generation. Deaths of adult smalltooth sawfish are expected to occur from commercial fishing.

The smalltooth sawfish could be impacted by activities associated with the proposed action including oil/waste spills, spill-response activities, and trash and debris; however, impacts are not expected to be significant. The incremental contribution of the proposed action to cumulative impacts on smalltooth sawfish is expected to be negligible.

4.4.2.8 Impacts on Alabama, Choctawhatchee, St. Andrew, and Perdido Key Beach Mice

Cumulative activities have the potential to harm or reduce the numbers of Alabama, Choctawhatchee, St. Andrew, and Perdido Key beach mice. Those activities include oil spills, oil-spill response activities, alteration and reduction of habitat, predation and competition, and beach trash and debris. The majority of OCS-related activities and events, as well as oil spills stemming from import tankering and prior and future lease sales, are not expected to contact beach mice or their habitats. Non-OCS activities or natural catastrophes could potentially deplete some beach mice populations to unsustainable levels, especially if reintroduction could not occur.

The potential for impacts to beach mice from the proposed action is highly unlikely and no significant impacts are expected. The incremental contribution of the proposed action to cumulative impacts on beach mice is expected to be negligible.

4.4.3 Socioeconomic Conditions and Other Concerns

4.4.3.1 Impacts on Economic and Demographic Conditions

The economic and demographic conditions evaluated in this EA include that portion of the GOM's coastal zone whose social and economic well being (population, labor, and employment) is directly or indirectly affected by the OCS oil and gas activities. The energy industry has become increasingly more global. While the OCS Program, in general, has played a significant role in the GOM region's economy and demography, the activities anticipated as a result of the proposed action are expected to have minimal economic and demographic consequences to the region as a whole.

The incremental contribution of the proposed action to cumulative impacts on economic and demographic conditions is expected to be negligible.

4.4.3.2 Impacts on Population and Education

The area's population is expected to grow at an average annual rate of 1.0-1.5 percent over the next 40 years, with that growth slowing over time. This population growth is based on continuation of existing conditions, including OCS energy development. Activities associated with the proposed action are not expected to affect the population's growth rate. Education levels are expected to remain largely unchanged.

The incremental contribution of the proposed action to cumulative impacts on population and education is expected to be negligible.

4.4.3.3 Impacts on Infrastructure and Land Use

Sufficient infrastructure is in place to support activities associated with the proposed action. Sufficient land is designated in commercial and industrial parks and adjacent to the existing ports to minimize potential disruption to current residential and business use patterns. While land use in the area will change over time, the majority of this change is expected to be general regional growth.

The incremental contribution of the proposed action to cumulative impacts on infrastructure and land use is expected to be negligible.

4.4.3.4 Impacts on Navigation and Port Usage

There are approximately 50 shore bases that are traditionally used by the oil and gas industry to support activities on the Federal OCS. Certain shore bases cater to OCS development almost to the exclusion of other port uses. Those shore bases are expanding in response to OCS oil and gas activities in general; however, no new expansion or construction is expected at these existing shore bases to support offshore activities associated with the proposed action.

The incremental contribution of the proposed action to cumulative impacts on navigation and port usage is expected to be negligible.

4.4.3.5 Impacts on Employment

The oil and gas and service industries are very important to many of the communities of the GOM, including in coastal Louisiana. Changes in OCS oil and gas activities have significant employment implications to these communities, particularly in industries directly and indirectly related to oil and gas development. However, the energy industry has global markets (both for the supply of goods and services needed to produce energy and the demand for energy products). Mergers, relocations, and consolidation of oil and gas companies' assets have affected employment in the GOM region in recent years.

Employment changes to the coastal communities as a result of the proposed action are not expected to be significant. The incremental contribution of the proposed action to cumulative impacts on employment is expected to be negligible.

4.4.3.6 Impacts on Environmental Justice

Because of the presence of an extensive and widespread support system for OCS and associated labor force, the effects of the cumulative case are expected to be widely distributed and, except in Louisiana, little felt. In general, the cumulative effects of the OCS Program are expected to be economic and have a limited but positive effect on low-income and minority populations. In Louisiana, these positive economic effects are expected to be greater.

This proposed project, in combination with existing extraction activities on the OCS, should prove beneficial to minority peoples and those with low incomes. Benefits would be derived from direct employment in the oil/gas industry, in a supporting service, or in another part of the economy positively affected by financial multipliers. This is contingent, of course, on the persons' willingness to seek employment in a highly volatile industry. It is also contingent on these individuals having the job skills and experience needed to meet the labor requirements of the various companies.

The proposed action is not expected to cause any significant adverse environmental effects on minority or low-income people. The incremental contribution of the proposed action on to cumulative impact on environmental justice is expected to be negligible.

4.4.3.7 Impacts on Recreational Activities and Beach Use

Factors such as land development, civil works projects, and natural phenomena have affected, and will continue to affect, beach stabilization, which ultimately affects the recreational use of beaches. Many of the people in the adjacent coastal states live in the coastal zone. Pressure on the natural resources within the coastal zone is expected to continue or possibly increase.

Impacts from man-induced debris and litter derived from both offshore and onshore sources are likely to diminish the tourist potential of beaches and to degrade the ambience of shoreline recreational beaches chronically, thereby affecting the enjoyment of recreational beaches throughout the Gulf. The MMS requires that companies operating on the OCS have an established waste management plan for all of their offshore activities. While some accidental loss of solid wastes may occur from time to time, it is expected to have a negligible impact on recreational resources. MARPOL Annex V and the special efforts to generate cooperation and support for reducing marine debris through the GOM Program's Marine Debris Action Plan should lead to a decline in the level of human-generated trash adversely affecting recreational beaches throughout the Gulf. Although trash from onshore sources will continue to adversely affect the ambience of recreational beaches, the level of chronic pollution should decline. Beach use at the regional level is unlikely to change.

Aircraft associated with OCS activities will normally be flying high enough (610 m or more) to avoid disturbing beach-goers.

The proposed action is not expected to cause any significant adverse effects on recreational activities and beach use. The incremental contribution of the proposed action to cumulative impacts on recreational activities and beach use is expected to be negligible.

4.4.3.8 Impacts on Archaeological Resources

4.4.3.8.1 Prehistoric

The MMS's analysis, based on existing relative sea level data, indicates that there is no potential for the occurrence of prehistoric archaeological sites in water depths greater than 60 m. The aforementioned statement is based on the current acceptable seaward extent of the prehistoric archaeological high-probability area in the GOM. The effects of the various impact-producing factors related to OCS and non-OCS activities (pipeline and platform installations, drilling rig emplacement and operation, dredging, and anchoring activities) may have resulted in the loss of significant or unique prehistoric archaeological information. In the case of factors related to OCS Program activities in the cumulative activity area, it is reasonable to assume that most impacts would have occurred prior to 1973 (the date of initial archaeological survey and clearance requirements).

No additional impacts are expected to prehistoric archaeological resources as a result of the proposed action; therefore, there would be no incremental contribution to cumulative impacts to prehistoric archaeological sites.

4.4.3.8.2 Historic

The effects of the various impact-producing factors related to OCS and non-OCS activities (pipeline and platform installations, drilling rig emplacement and operation, dredging, and anchoring activities) may have resulted in the loss of significant or unique historic archaeological information. In the case of factors related to OCS Program activities in the cumulative activity area, it is reasonable to assume that most impacts would have occurred prior to 1973 (the date of initial archaeological survey and clearance requirements). The potential of an interaction between rig or platform emplacement and a historic shipwreck is greatly diminished by requisite site surveys, but it still exists. Such an interaction could result in the loss of or damage to significant or unique historic information. MP 299 is not located in one of the MMS's designated historic archaeological high-probability areas and a side-scan sonar survey of the lease did not record any evidence of previously unknown shipwrecks.

No additional impacts are expected to historic archaeological resources as a result of the proposed action; therefore, there would be no incremental contribution to cumulative impacts to historic archaeological sites.

5. CONSULTATION AND COORDINATION

Notification of MMS preparation of a programmatic EA on Freeport's Applications to Inject OCS-generated, RCRA-exempt E&P waste into salt caverns and caprock on sulphur and salt Lease OCS-G 9372, MP 299, and notification of a public scoping meeting to be held in New Orleans on February 21, 2002, was published in the *Federal Register* on February 7, 2002. The Notice provided the public with a 30-day comment period to provide issues that should be addressed in the programmatic EA.

Also on February 7, 2002, MMS mailed letters to the Governors of Louisiana, Mississippi, and Alabama, Louisiana State Secretary Mr. JackCaldwell, USEPA, FWS, NOAA Fisheries, Louisiana Department of Wildlife and Fisheries (LDWF), and the Sierra Club announcing the public scoping meeting and providing a copy of the *Federal Register* Notice as an enclosure. On February 14, 2002, MMS placed legal notices in *The Times-Picayune* and *Baton Rouge Advocate* newspapers summarizing Freeport's MP 299 waste disposal applications, welcoming comments, and announcing the public scoping meeting.

The MMS received responses from the USEPA and from the Office of the Governor for the State of Alabama. Table 5-1 summarizes the list of organizations that provided written comments and MMS's response.

Table 5-1

Written Comments and MMS's Response

Letter Signed By	Organization Represented	Response Received and MMS Action
Suzanne E. Schwartz (Director)	USEPA	Letter received 3/5/02-USEPA is continuing their research into this proposal, especially the applicable statutory and regulatory authorities. There have been numerous telephone discussions between MMS and USEPA's Ms. Elizabeth Beiring and Scot Wilson on this topic as well as on specifics of the waste disposal applications.
Don Siegelman (Governor)	State of Alabama	Letter received 3/19/02-The State of Alabama did not have any comment on the proposed activity because the site is located 16 mi offshore, east of Plaquemines Parish, Louisiana. No MMS action taken.

The public scoping meeting was held in New Orleans on February 21, 2002. The MMS presented an overview of the EA being prepared and Freeport provided information on the applications. The public was given an opportunity to ask questions and provide input on issues that should be addressed in the programmatic EA. In addition to MMS, Freeport and their consultants, representatives from five companies or agencies were in attendance. Table 5-2 lists these attendees, their organization, questions, or comments provided and MMS's responses.

Pursuant to the Coastal Zone Management regulations at 15 CFR 930 (Subpart D), OCS permits and licenses, including OCS plans, are subject to Federal consistency review by affected States. The MMS met with the States of Louisiana and Mississippi on October 31, 2001, and November 7, 2001, respectively, and advised State officials of our receipt of applications for waste disposal in MP 299. As waste disposal activities are not specifically listed as an OCS activity, they would be subject to consistency review by the States of Mississippi or Louisiana, and subject to the requirements of 15 CFR 930.53 and 54 (Subpart D). If specific activities are later submitted to MMS in individual OCS plan(s), they would be subject to the procedures outlined in 15 CFR 930.77 through 930.85 (Subpart E). The State of Louisiana subsequently notified MMS that consultation on unlisted activities is not required until further notice. As a result of the November 7, 2001, consultation with the State of Mississippi, Minerals Management Service was not notified that the State requested to review the MP 299 project for federal consistency with its coastal program. However, prior to waste disposal at MP 299, applicants will be required to submit a right-of-use and easement for disposal off lease as well as include MP 299 as an alternate disposal site in their EP or DOCD. The States will receive initial and supplemental EPs and DOCDs per the current CZM policy and procedures.

Freeport has certified that the general activities described in the MP 299 waste disposal applications comply with the States of Louisiana and Mississippi Coastal Zone Management Program(s).

The MMS also coordinated with the USEPA concerning NPDES issues and regulatory concerns, NOAA Fisheries and FWS concerning Section 7 Endangered Species Consultation, NOAA Fisheries concerning EFH consultation, FWS (Denver) concerning air quality major source review issues, DOE concerning salt cavern requirements, State of Louisiana and State of Texas concerning applicable waste disposal regulations, etc.

On May 7, 2002, USEPA requested to review a copy of the EA before it was finalized in order to help expedite their review of the Freeport proposal. In response to this request, MMS sent two copies of the "draft" EA to USEPA on August 2, 2002, one to USEPA Headquarters and one to USEPA Region 6. The MMS received confirmation on August 5 and August 6, 2002, from the two USEPA offices that they had received the EA and had begun their review. The MMS requested that USEPA complete their review within 10 working days. On August 20, 2002, MMS received one combined response letter from USEPA Headquarters and USEPA Region 6 requesting that several EA issues be addressed or clarified by MMS. The MMS reviewed the USEPA comment letter and revised the EA as appropriate.

On August 16, 2002, MMS sent a "draft" copy of the EA to NOAA Fisheries initiating EFH consultation. The MMS requested an EFH consultation at a programmatic level because oil and gas operators holding leases in other areas of the Gulf of Mexico will apply for a right-of-use-and-easement for waste injection at MP 299.

On August 26, 2002, MMS sent "draft" copies of the EA to NOAA Fisheries and FWS initiating formal Section 7 Endangered Species Consultation.

Table 5-2

Public Scoping Meeting Questions/Comments and MMS's Response

Commentator's Name	Organization Represented	Question/Comment (Q) and MMS Response/Answer (A)
Blaine Segura	BP	Q1 - Will a geological and geophysical (G&G) analysis be included in the MMS EA? A1 - Yes, a G&G analysis will be included as an appendix in the EA. Q2 - Concerns over ownership (Freeport vs. Trinity vs. OSFI). How might a change in ownership affect the applications or the EA? A2 - The MMS's speculation concerning the potential effects to the EA was not appropriate at this time. To date, the only applications MMS has received are the Freeport applications that are currently under review. Freeport responded that they believed the applications should not be affected. The question of ownership was based on Freeport discussions/agreements with other companies that have not been finalized.
Warren Lorentz	FWS	Q3 - Will oil-spill trajectory modeling (i.e., an oil-spill review) be conducted as part of the EA? A3 - Yes, an oil-spill review will be included in the EA. The MMS did not speculate on what oil-spill risk analysis (OSRA) run might be used for the analysis.
George Sellers	Chevron/Texaco	No questions/comments.
Steve Mobley	RPC	No questions/comments.
Carol Wascim	Office of Conservation, Louisiana Department of Natural Resources	Q4 - Will onshore wastes be allowed to be disposed of at MP 299? A4 - No. Freeport's waste disposal applications do not propose disposal of onshore wastes at MP 299. Q5 - Will onshore wastes be allowed to be disposed of at MP 299 at a later date if the current applications are amended? A5 - Freeport's current waste disposal applications only propose injection of OCS-generated, RCRA-exempt E&P waste at MP 299. The MMS did not speculate on how future potential amendments to applications might be processed.

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8. APPENDICES

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Appendix B: Figures/Tables
Appendix C: Freeport's Exhibit 1 - Operations Plan
Appendix D: Accidental Oil/Waste Spill/Release Review
Appendix E: Barite Spill
Appendix F: Physical Oceanograpy Review
Appendix G: Geological/Geophysical and Engineering Review
Appendix H: Explosive Structure Removal Review
Appendix I: Freeport's Draft Proposed Application for Right of Use and Easement and Designation of Agent form

APPENDIX A

MITIGATION

Attachment A

EXISTING MITIGATION

1. Injection of OCS-generated, RCRA-exempt E&P wastes into Cavern Nos. 3 and 5, and associated caprock must be limited to those wastes listed in your applications:

a. Application To Inject E&P Waste Into Salt Cavern OCS-G 9372 Well # CA-03-A Brine Well NTL No. 99-G22 Submitted August 15, 2001, and Amended October 17, 2001 (I.B.3.; pages 10 and 11);
b. Application To Inject E&P Waste Into Salt Cavern OCS-G 9372 Well # CA-05-A Brine Well NTL No. 99-G22 Submitted August 15, 2001, and Amended October 17, 2001 (I.B.3.; pages 10 and 11); and
c. Application To Inject E&P Waste Into Caprock OCS-G 9372 Wells # SW2-05-B, SW2-06-B, SW2-09-B, SW2-14-F, SW2-32-F, SW2-37-F, SW2-57-D, SW2-60-C, SW2-62-A, and SW2-75-B NTL No. 99-G22 Submitted August 15, 2001, and Amended October 17, 2001 (I.B.3.; pages 12 and 13).

Mitigation Effectiveness: The purpose of this existing mitigation is to provide a clear and concise listing of wastes acceptable for injection at MP 299 Cavern Nos. 3 and 5, and associated caprock. The mitigation will ensure that waste generators, waste transporters, and MP 299 waste facility personnel are knowledgeable about the waste types allowed to be injected at MP 299.
Mitigation Enforcement:The MMS will conduct MP 299 inspections that will include a review of waste receipt and handling forms to confirm that only those wastes listed in the above mitigation are being injected into Caverns Nos. 3 and 5, and associated caprock.

2. Non OCS-generated E&P waste may not be disposed of at MP 299. If OCS-generated, RCRA-exempt E&P wastes are transported onshore (e.g., for processing to remove hydrocarbons and/or other recyclable materials) prior to injection at MP 299, commingling of the OCS-generated waste with waste generated either in State territorial waters or onshore must not occur. Commingling of wastes must be prevented by use of your waste-tracking system and by handling these wastes in separate dedicated barges.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that only OCS-generated, RCRA-exempt E&P waste is injected at MP 299. The mitigation provides procedures to be followed when waste is transported onshore to prevent commingling of wastes.
Mitigation Enforcement: The MMS will conduct inspections at MP 299 that will include a review of Freeport's record keeping (waste-tracking system) to confirm that waste types and volumes generated by OCS operators are consistent with waste types and volumes transported to and ultimately injected at MP 299.

3. In accordance with your applications, injection of OCS-generated, RCRA-exempt E&P wastes into MP 299 salt caverns and caprock will be limited to wastes containing naturally occurring radioactive material (NORM) in concentrations less than 30 picocuries per gram and exposure rates of less than 50 microroentgens per hour inclusive of background.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that NORM-contaminated wastes (as defined above) are not injected into the salt caverns and caprock at MP 299.
Mitigation Enforcement: The MMS will conduct MP 299 inspections that will include a review of waste receipt and handling forms and NORM survey testing results to confirm that NORM-contaminated wastes are not injected into MP 299 salt caverns and caprock.

4. You have stated that audits of vessels (OSV's and SPB's) transporting waste will be conducted. You have stated that audit procedures will be implemented so as to ensure that every vessel maintains onboard at all times the appropriate plans and manuals including: a) Oil Transfer Procedures Manual; b) Vessel Operations Manual; c) Stability and Loading Manual; and d) USCG Approved Spill Response Plan. You must maintain records of the audits and provide them to MMS upon request.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that waste vessels transporting waste to MP 299 maintain the appropriate plans and manuals. Compliance with this mitigation is expected to reduce vessel accidents, waste spills, and potential environmental impacts.
Mitigation Enforcement: The MMS will review the audit results as appropriate.

5. You have stated that the transfer of waste materials will be monitored by platform or boat personnel under the terms of an approved USCG transfer plan. You must provide MMS with a copy of your approved USCG transfer plan upon request.

Mitigation Effectiveness: The purpose of this existing mitigation is to ensure that the transfer of waste materials is monitored by appropriate personnel in compliance with an approved USCG transfer plan.
Mitigation Enforcement: The MMS will review the USCG transfer plan approval, as appropriate.

6. In accordance with your applications, you plan to comply with the following Recommended Practices (RP's):

a. RP for Development of a Safety and Environmental Management Program (SEMP) for Outer Continental Shelf (OCS) Operations and Facilities–American Petroleum Institute (API) RP 75 (Second Edition, July 1998) and
b. RP for Design and Hazards Analysis for Offshore Production Facilities–API RP 14J (Second Edition, May 2001).

Mitigation Effectiveness: The purpose of this existing mitigation is to provide a nontraditional, performance-focused tool (SEMP) for integrating and managing offshore operations. The purpose of SEMP is to enhance the safety and cleanliness of operations by reducing the frequency and severity of accidents. The MMS has four principal SEMP objectives: (1) focus attention on the influences that human error and poor organization have on accidents; (2) continuous improvement in the offshore industry's safety and environmental records; (3) encourage the use of performance-based operating practices; and (4) collaborate with industry in efforts that promote the public interests of offshore worker safety and environmental protection.
Mitigation Enforcement: The MMS will review Freeport's compliance with the above RP's.

ADDITIONAL MITIGATION

1. You must comply with the waste-spill response requirements outlined in Attachment B.

Mitigation Effectiveness: The purpose of this mitigation is to outline waste-spill response requirements. Requirements include required training for waste response personnel, exercises for waste-response personnel and equipment, maintenance and periodic inspection of waste response equipment, verification of the capabilities of waste response equipment, and procedures for notification in the event of a waste spill. Compliance with this mitigation is expected to reduce the potential impacts of a waste spill due to an effective waste-spill response.
Mitigation Enforcement: The MMS will review Freeport's waste spill and emergency action plan on an annual basis to determine compliance with this mitigation. The MMS may also conduct waste-spill response drills to verify compliance.

2. The MP 299 facility operators must commit to no more than three (3) vessel dockings per day at the facility to reduce the risk of vessel collisions that may result in an accidental spill. Vessels waiting to dock at the facility should maintain a position that is sufficiently removed (> 500 ft) from where vessels

docking or undocking at the facility are or will be maneuvering. Vessels may not operate immediately adjacent to vessels transferring wastes or fluids through hoses that may be floating at the sea surface.

Mitigation Effectiveness: The purpose of this mitigation is to reduce the risk of vessel collisions that may result in an accidental spill.

Mitigation Enforcement: The MMS will conduct inspections at MP 299 that will include observations of vessel docking operations and spacing to confirm the above mitigation is being met. The MMS will review Freeport's records to confirm that dockings are limited to no more than three per day.

TRANSPORTATION AND MARINE PROTECTED SPECIES

3. All personnel associated with the operation of the MP 299 waste disposal facility or its associated support craft (vessels or aircraft) shall be instructed to report all sightings and locations of injured or dead whales, dolphins, manatees, and sea turtles to the MMS, GOMR's Office of Leasing and Environment. If activities associated with the MP 299 waste disposal facility caused the injury or death of any of these animals, MMS shall require the responsible parties to assist the designated salvage and stranding network, as appropriate. Details describing how these sightings are to be reported and follow-up actions will be described in an NTL to be published in the near future (2002).

Mitigation Effectiveness: The purpose of this mitigation is to outline the procedures to be followed when reporting sightings and locations of injured or dead whales, dolphins, manatees, and sea turtles. It also outlines the procedures to be followed when assisting the designated salvage and stranding network, as appropriate, if activities associated with the MP 299 waste disposal operations caused the injury or death of these animals.

Mitigation Enforcement: The MMS will publish the NTL in 2002. Self-reporting of sightings and locations of injured or dead whales, dolphins, manatees, and sea turtles does not require a specific enforcement action on the part of MMS. If activities associated with the MP 299 waste disposal facility are responsible for the injured or dead animals, MMS shall require the responsible parties to assist the designated salvage and stranding network, as appropriate

4. Vessel operators must exercise a vigilant watch for whales and sea turtles, particularly in waters exceeding 656 ft (200 m) in depth where leatherback sea turtles, sperm whales, and other deep-diving cetaceans occur. Vessel operators must reduce vessel speeds to less than or equal to 12 kn in areas where whales and sea turtles are reported to occur (see NTL to be published in the near future (2002)). Vessel operators must also reduce vessel speeds to less than or equal to 10 kn when whales or sea turtles are observed in the vicinity of the vessel and are not to intentionally approach whales or leatherback turtles to within approximately one-quarter mile of the animal(s).

Mitigation Effectiveness: The purpose of this mitigation is to outline the procedures to be followed by waste transport vessels, particularly when operating in water depths greater than 656 ft. Compliance with this mitigation is expected to reduce vessel collisions with whales and sea turtles.

Mitigation Enforcement: The MMS will publish the NTL in 2002. This mitigation does not require a specific enforcement action on the part of MMS.

INJECTION OPERATIONS

5. Injection of OCS-generated, RCRA-exempt E&P wastes into Salt Cavern BR-1-A must be limited to the following wastes:

a. wastes that meet the definition of " water-based drilling fluid" and associated "drill cuttings," as defined by the Final NPDES General Permit for New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Category for the Western Portion of the Outer Continental Shelf of the Gulf of Mexico, modified December 18, 2001, and effective February 16, 2002, and that meet the same limitations imposed on their discharge by the USEPA permit, including LC_{50} limitations on toxicity and limitations on concentrations of cadmium and mercury in barite; and

b. wastes that qualify, per MMS NTL 99-G22, as "miscellaneous trash and debris associated with waste handling operations (e.g., gloves, tyvek suits) contaminated with the above described wastes."

Mitigation Effectiveness: The purpose of this mitigation is to ensure that only "water-based drilling fluid" and associated "drill cuttings" (that meet the same limitations imposed on their discharge by the USEPA permit) and "miscellaneous trash and debris" contaminated with these wastes are injected into Cavern No. 1.

Mitigation Enforcement: The MMS will conduct MP 299 inspections that will include a review of waste receipt and handling forms and will confirm that only those wastes listed in the above mitigation are being injected into Cavern No. 1.

6. To protect the formation from reaching its fracture pressure, the injection pumps should have: (1) a pressure safety high (PSH) sensor on their discharge lines set no higher than 90% of the formation fracture pressure which will function to shut down the pumps as a means of primary protection, and (2) a pressure safety valve (PSV) on the pump discharge lines set no higher than 95% of the formation fracture pressure as a means of secondary protection.

Mitigation Effectiveness: The purpose of this mitigation is to ensure that fractures are not created in the disposal formation thereby allowing a conduit for waste migration.

Mitigation Enforcement: The MMS will conduct inspections at MP 299. Also, MMS will review records of wellhead pressure of the injection tube (caverns and caprock) to determine compliance.

7. Freeport must provide MMS with study results that document the allowable pressure differential limit between Cavern Nos. 1 and 3; waste disposal into Cavern Nos. 1 and 3 must be consistent with the differential pressure determination.

Mitigation Effectiveness: The purpose of this mitigation is to determine the allowable pressure differential limit between Cavern Nos. 1 and 3 and to ensure that this limit is not exceeded.

Mitigation Enforcement: The MMS will conduct inspections at MP 299. Also, MMS will review the provided study results and compare these results to actual pressure recordings conducted at MP 299.

8. Slurry injection into the caverns must be of a salinity that will not cause leaching.

Mitigation Effectiveness: The purpose of this mitigation is to ensure that slurry injection into the MP 299 salt caverns does not cause leaching of the salt.

Mitigation Enforcement: The MMS will conduct inspections at MP 299 to ensure that certain wastes are dewatered prior to slurrification. Also, MMS will review chloride concentration records (of the incoming wastes) to determine whether the correct amount of brine needed for processing prior to injection was used.

9. The MMS will conduct an annual performance review (APR) of your waste disposal operations for both safety and environmental compliance, according to the following schedule:

a. Within 1 year of your start-up of waste disposal operations; and
b. Annually thereafter.

In support of this APR you must comply with NTL No. 2002-NO1 (Performance Measures for OCS Operators and Form MMS-131). Performance measures for waste disposal operations associated with MP 299 must be reported separately from any other OCS operations you may have. Also, for the purposes of this mitigation, all NTL references to "oil spills" must be interpreted as "oil spills" and "waste spills." You must break out the statistics for oil spills and waste spills.

Mitigation Effectiveness: The purpose of this mitigation is to collect and analyze performance measures information to determine if safety and environmental performance is improving over time through the implementation of the Safety and Environmental Management Program on the OCS and to provide offshore operators and organizations with a credible data source to demonstrate how well the offshore industry and individual companies are doing compared to those in other industries.

Mitigation Enforcement: The MMS will review Freeport's submitted Form MMS-131 (Performance Measures Data) and will conduct an APR.

MONITORING OF CAVERN/CAPROCK INTEGRITY

10. Side-scan-sonar techniques must be used to detect any gas plumes or visible material within 6 months of initiating waste disposal operations at MP 299 and at least once every 3 years thereafter. You must provide MMS with copies of your results upon request.

Mitigation Effectiveness: The purpose of this mitigation is to determine whether any material is escaping from below the seabed into the water column at MP 299.

Mitigation Enforcement: The MMS will review the results of the side-scan-sonar techniques.

11. Subsidence monitoring must be conducted using close contour high-resolution bathymetric measurement of the seafloor over the projected foot print of the salt dome within 6 months of initiating waste disposal operations at MP 299 and at least every 3 years thereafter. You must provide MMS with copies of your results upon request. The subsidence monitoring must indicate whether there is an adverse effect on the integrity of the caverns, caprock, or any structure or casing that penetrates the caprock or salt stock.

Mitigation Effectiveness: The purpose of this mitigation is to determine whether subsidence is occurring over the MP 299 salt dome and whether it may be adversely affecting operations or the environment.

Mitigation Enforcement: The MMS will review the results of the subsidence monitoring.

12. Sonar surveys must be conducted on each of the salt caverns according to the following frequency:

a. Prior to (within 2 months of) initiating waste injection into Cavern Nos. 1, 3, and 5;
b. At least once every 2 months for Cavern No. 1;
c. At least once every 3 years for Cavern Nos. 3 and 5;
d. Additional surveys must be conducted for any of the following reasons regardless of frequency:
    1. before commencing salt cavern closure operations;
    2. whenever leakage into or out of the salt cavern is suspected (does not apply to Cavern No. 1);
    3. after performing any remedial work to reestablish salt cavern well or salt cavern integrity; and
    4. whenever MMS believes a survey is warranted; and
e. You must provide MMS with copies of your results upon request.

Mitigation Effectiveness: The purpose of this mitigation is to ensure that sonar surveys are conducted on the salt caverns to determine their current size, shape, and overall integrity.

Mitigation Enforcement: The MMS will review sonar survey results.

AIR EMISSIONS

13. A deviation from the activities proposed in your applications that would increase NO_x emissions (e.g., use of higher horsepower waste transport vessels or increased time for unloading) could potentially cause the annual NO_x emissions to exceed the MMS exemption level. Therefore, if a deviation occurs, please be advised that revised applications must be submitted and approved before proceeding with the

deviated activity. The revised applications must include the recalculated emission amounts and, if the emissions exceed the MMS exemption level, also the air quality modeling as per 30 CFR 250.303(e).

Mitigation Effectiveness: The purpose of this mitigation is to outline MMS requirements should actual air emissions (particularly NO_x emissions) exceed the projected air emissions submitted in the applications.

Mitigation Enforcement: The MMS will review MP 299 operational records to determine whether the potential to exceed the projected air emission levels exists.

Recommendation: Due to the close proximity to Breton National Wildlife Area (BNWA) (i.e., within 100 km), the use of low-sulfur fuel and controls on emissions of nitrogen oxides is recommended.

TRASH AND DEBRIS

14. Waste disposal facility and vessel operators must take actions to achieve zero loss of trash and debris. Any trash and debris lost overboard must be recovered as safety permits. The operator must document any trash and debris not recovered, including a description of the trash or debris lost, date and location of loss, and source of the loss (platform, aircraft, or vessel). Operators shall submit this information in an annual report to the MMS, GOMR's Office of Leasing and Environment.

Mitigation Effectiveness: The purpose of this mitigation is to provide guidance on recovery, documentation, and reporting requirements for trash and debris lost overboard.

Mitigation Enforcement: Actions to achieve zero loss of trash and debris and self-reporting of trash and debris lost overboard and not recovered require no specific enforcement action on the part of MMS. The MMS will review Freeport's annual trash and debris documentation/reporting records.

RECORDS

15. Records of various MP 299 waste disposal facility activities (including but not limited to those listed in Section 4.1 of your Exhibit 1 - Operations Plan) must be retained in compliance with the following:

a. Your records program electronic database (web based) must be available to MMS;
b. All records developed during the operations of the Main Pass disposal facility must be retained at the facility in paper form for a minimum of five years after operations cease, or as long as the platform is in place, whichever is the longer period. All records must be retained throughout the operating life of the waste disposal facility and for five years following conclusion of any post-closure care requirements. All records must be available for review and inspection by MMS;
c. Should there be a change in the owner or operator of the disposal facility, copies of all records shall be transferred to the new owner or operator. The new owner or operator shall then have the responsibility of maintaining such records;
d. The MMS may require the owner or operator to deliver the records to MMS at the conclusion of the retention period; and
e. No records may be destroyed without MMS approval.

Mitigation Effectiveness: The purpose of this mitigation is to outline the MMS records-retention policy for waste disposal operations at MP 299.

Mitigation Enforcement: The MMS will periodically review and inspect required records.

Attachment B

Training Your Response Personnel

(a) You must ensure that the members of your spill-response operating team who are responsible for operating response equipment attend hands-on training classes at least annually. This training must include the deployment and operation of the response equipment they will use. Those responsible for supervising the team must be trained annually in directing the deployment and use of the response equipment.

(b) You must ensure that the spill-response management team, including the spill-response coordinator and alternates, receives annual training. This training must include instruction on:

(1) locations, intended use, deployment strategies, and the operational and logistical requirements of response equipment;

(2) spill reporting procedures;

(3) spill trajectory analysis and predicting spill movement; and

(4) any other responsibilities the spill management team may have.

(c) You must ensure that the qualified individual is sufficiently trained to perform his or her duties.

(d) You must keep all training certificates and training attendance records at the location designated in your response plan for at least 2 years. They must be made available to any authorized MMS representative upon request.

Exercises for your Response Personnel and Equipment

(a) You must exercise your entire response plan at least once every 3 years (triennial exercise). You may satisfy this requirement by conducting separate exercises for individual parts of the plan over the 3-year period; you do not have to exercise your entire response plan at one time.

(b) In satisfying the triennial exercise requirement, you must, at a minimum, conduct:

(1) An annual spill management team tabletop exercise. The exercise must test the spill management team's organization, communication, and decisionmaking in managing a response. You must not reveal the spill scenario to team members before the exercise starts.

(2) An annual deployment exercise of response equipment identified in your plan that is staged at onshore locations. You must deploy and operate each type of equipment in each triennial period. However, it is not necessary to deploy and operate each individual piece of equipment.

(3) An annual notification exercise for each facility that is manned on a 24-hour basis. The exercise must test the ability of facility personnel to communicate pertinent information in a timely manner to the qualified individual.

(4) A semiannual deployment exercise of any response equipment which the MMS Regional Supervisor requires an owner or operator to maintain at the facility or on dedicated vessels. You must deploy and operate each type of this equipment at least once each year. Each type need not be deployed and operated at each exercise.

(c) During your exercises, you must simulate conditions in the area of operations, including seasonal weather variations, to the extent practicable. The exercises must cover a range of scenarios over the 3-year exercise period, simulating responses to large continuous spills, spills of short duration and limited volume, and your worst-case discharge scenario.

(d) The MMS will recognize and give credit for any documented exercise conducted that satisfies some part of the required triennial exercise. You will receive this credit whether the owner or operator, a spill removal organization, or a Government regulatory agency initiates the exercise. The MMS will give you credit for an actual spill response if you evaluate the response and generate a proper record. Exercise documentation should include the following information:

(1) type of exercise;

(2) date and time of the exercise;

(3) description of the exercise;

(4) objectives met; and

(5) lessons learned.

(e) All records of spill-response exercises must be maintained for the complete 3-year exercise cycle. Records should be maintained at the facility or at a corporate location designated in the plan. Records showing that spill-removal organizations and spill-removal cooperatives have deployed each type of equipment also must be maintained for the 3-year cycle.

(f) You must inform the Regional Supervisor of the date of any exercise required by paragraph (b)(1), (2), or (4) of this section at least 30 days before the exercise. This will allow MMS personnel the opportunity to witness any exercises.

(g) The Regional Supervisor periodically will initiate unannounced drills to test the spill-response preparedness of owners and operators.

(h) The Regional Supervisor may require changes in the frequency or location of the required exercises, equipment to be deployed and operated, or deployment procedures or strategies. The Regional Supervisor may evaluate the results of the exercises and advise the owner or operator of any needed changes in response equipment, procedures, or strategies.

(i) Compliance with the National Preparedness for Response Exercise Program (PREP) Guidelines will satisfy the exercise requirements of this section. Copies of the PREP document may be obtained from the Regional Supervisor.

Maintenance and Periodic Inspection of Response Equipment

(a) You must ensure that the response equipment listed in your response plan is inspected at least monthly and is maintained, as necessary, to ensure optimal performance.

(b) You must ensure that records of the inspections and the maintenance activities are kept for at least 2 years and are made available to any authorized MMS representative upon request.

Verifying the Capabilities of Your Response Equipment

(a) The Regional Supervisor may require performance testing of any spill-response equipment listed in your response plan to verify its capabilities if the equipment

(1) has been modified;

(2) has been damaged and repaired; or

(3) has a claimed effective daily recovery capacity that is inconsistent with data otherwise available to MMS.

(b) You must conduct any required performance testing of booms in accordance with MMS-approved test criteria. You may use the document "Test Protocol for the Evaluation of Oil-Spill Containment Booms," available from MMS, for guidance. Performance testing of skimmers also must be conducted in accordance with MMS approved test criteria. You may use the document "Suggested Test Protocol for the Evaluation of Oil Spill Skimmers for the OCS," available from MMS, for guidance.

(c) You are responsible for any required testing of equipment performance and for the accuracy of the information submitted.

Whom Do I Notify if a Waste Spill occurs?

(a) You must immediately notify the appropriate MMS District Supervisor (New Orleans District Office, 1-504-736-2504 or 1-504-736-2505; Houma District Office, 1-985-868-4033; Lafayette District Office, 1-337-262-6632; Lake Charles District Office, 1-337-480-4600) if you observe a waste spill resulting from any activities associated with your waste disposal operations (e.g., during waste transfer to/from vessels, waste transport by vessel, waste storage, waste processing, and waste injection, or the escape of wastes from any of the caverns or caprock, etc.) regardless of the spill size or spill location (OCS or non-OCS waters).

(b) You must file a written followup report for any spill of 1 barrel or more. The appropriate MMS District Supervisor must receive this confirmation within 15 days after the spillage has been stopped. All reports must include the cause, location, volume, and remedial action taken. Reports of spills of more than 50 barrels must include information on the sea state, meteorological conditions, and the size and appearance of the slick (if applicable). The appropriate MMS District Supervisor may require additional information if it is determined that an analysis of the response is necessary.

APPENDIX B

FIGURES/TABLES

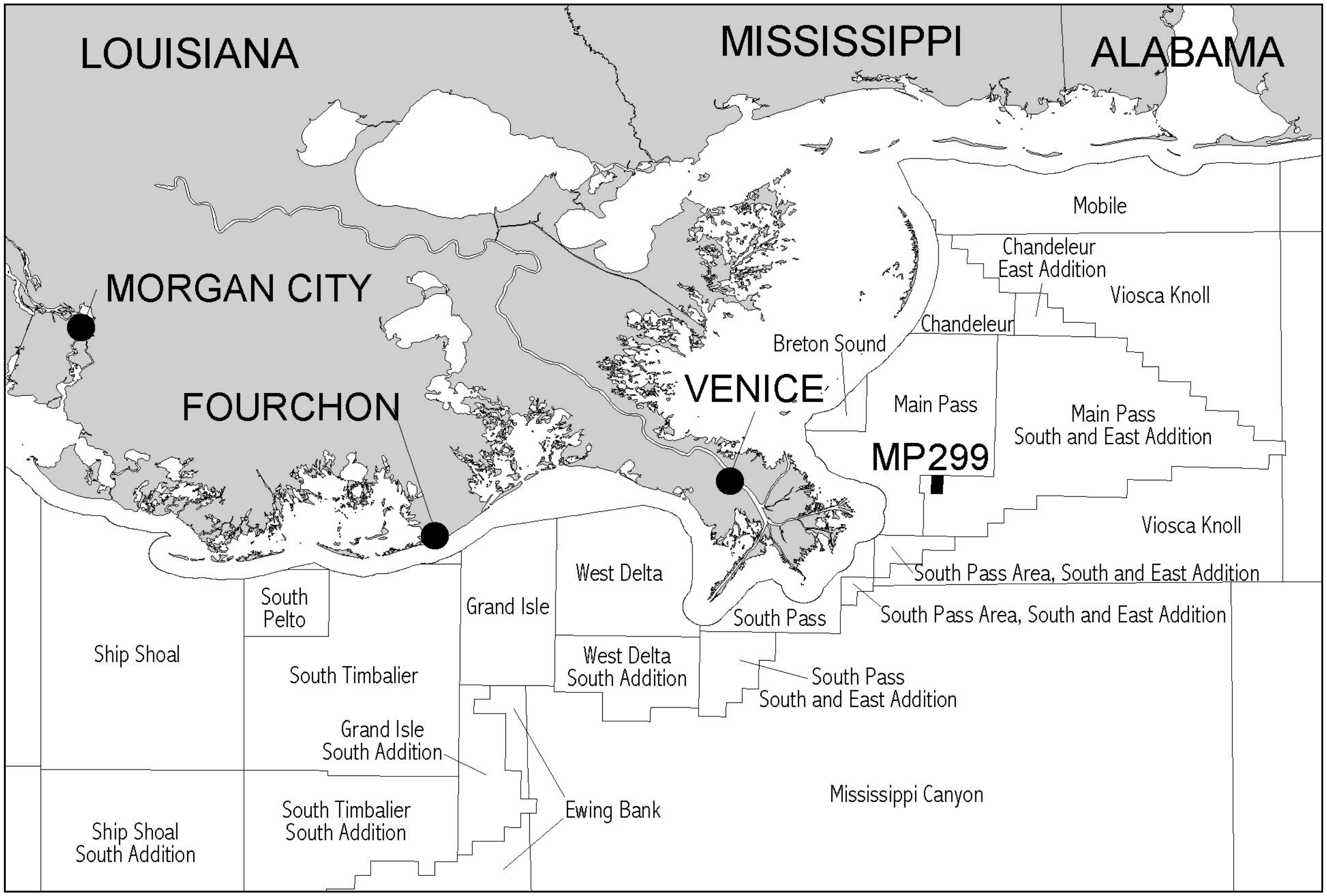

Figure B-1a. MP 299 Relationship to the Gulf Coastline and Shore Bases.

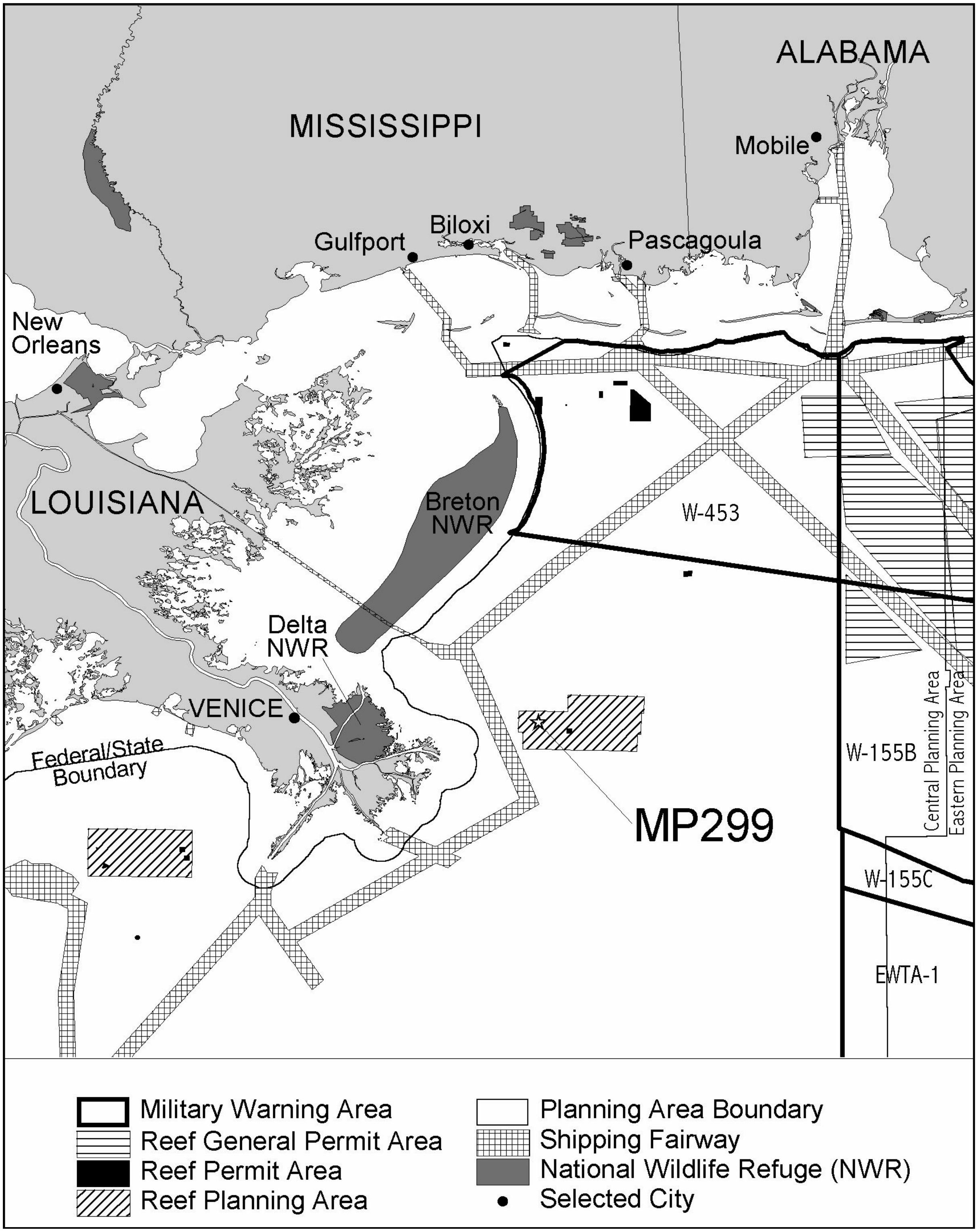

Figure B-1b. MP 299 Relationship to Multiple Use Areas.

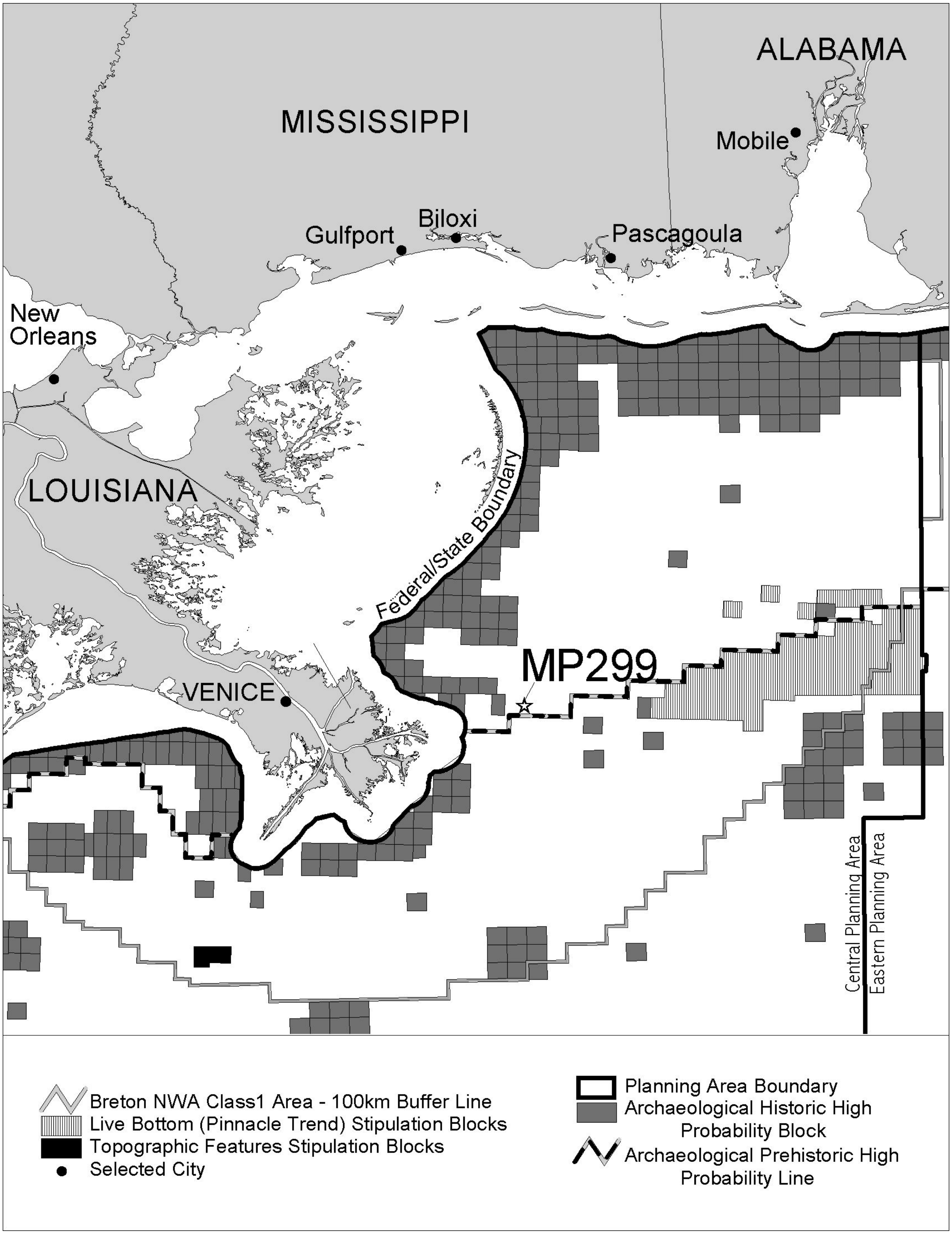

Figure B-1c. MP 299 Relationship to Offshore Regulatory Features.

Main Pass Mine E&P Waste Logistics

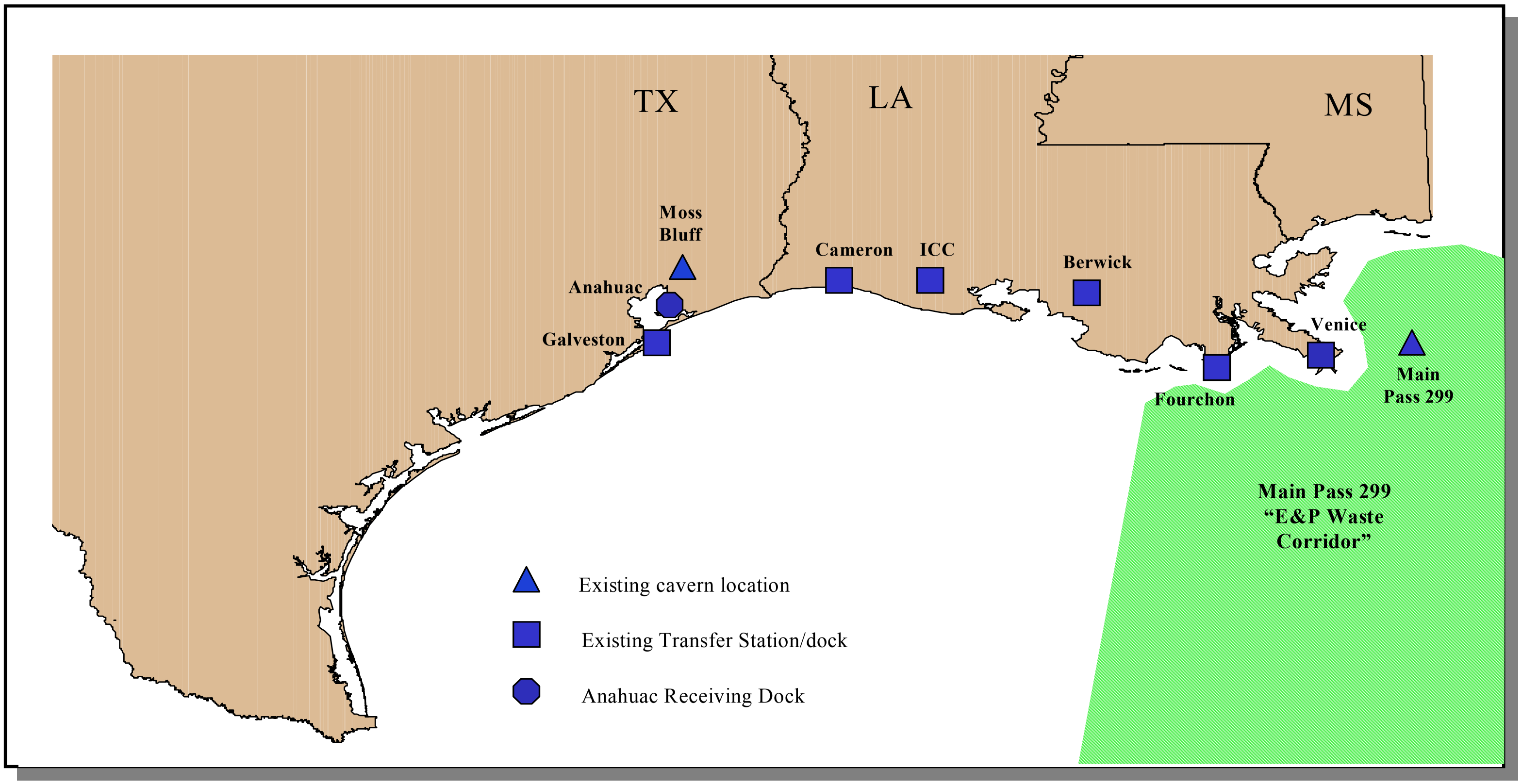

Figure B-1d. MP 299 E&P Waste Logistics

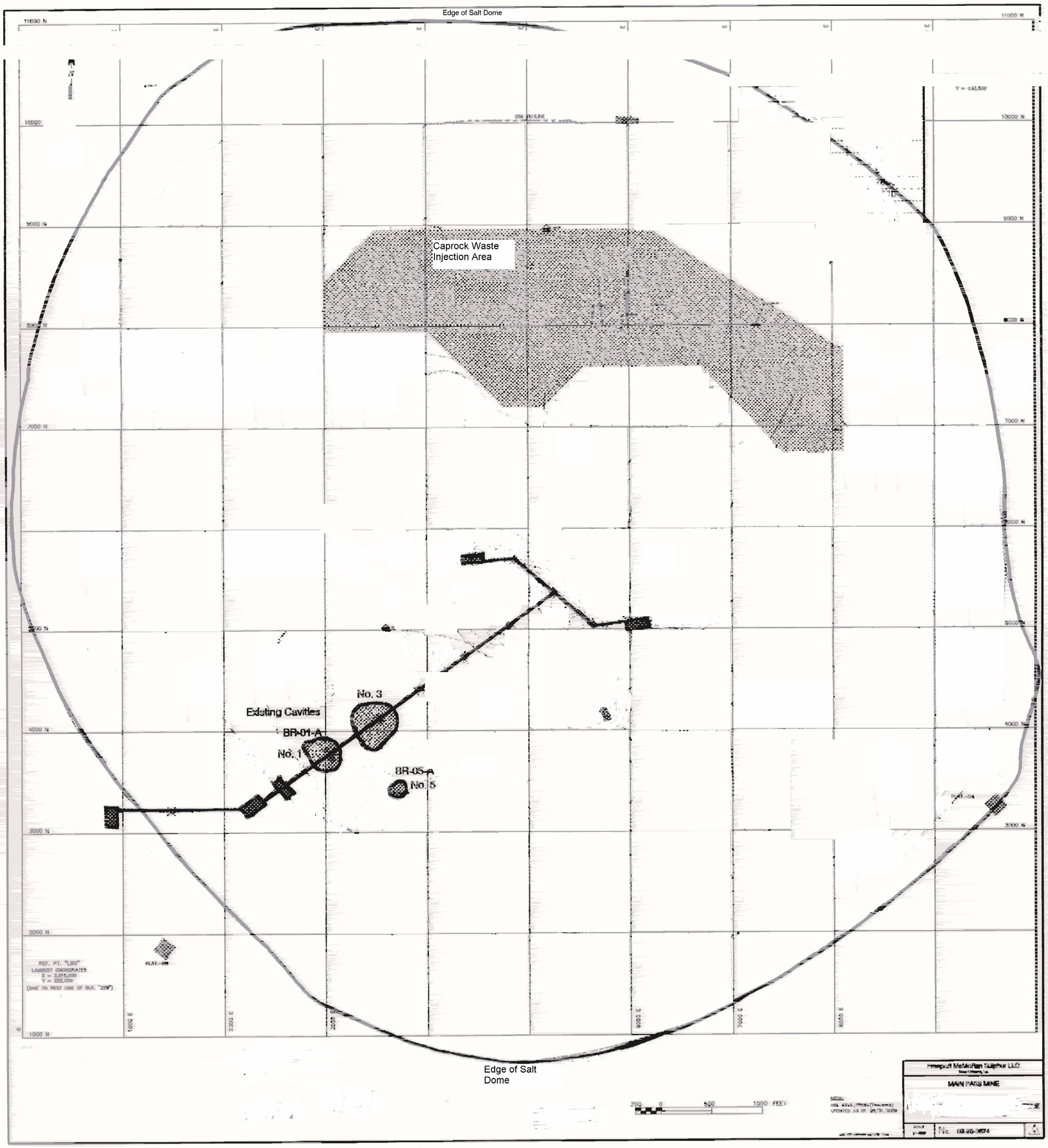

Figure B-2. MP 299 plan view of salt dome, platform complex, Cavern Nos. 1, 3 and 5, and the proposed caprock waste injection area

Figure B-3a. MP 299 3-dimensional cross section view and plan view of Cavern Nos. 1, 3 and 5 in relationship to the platform complex.

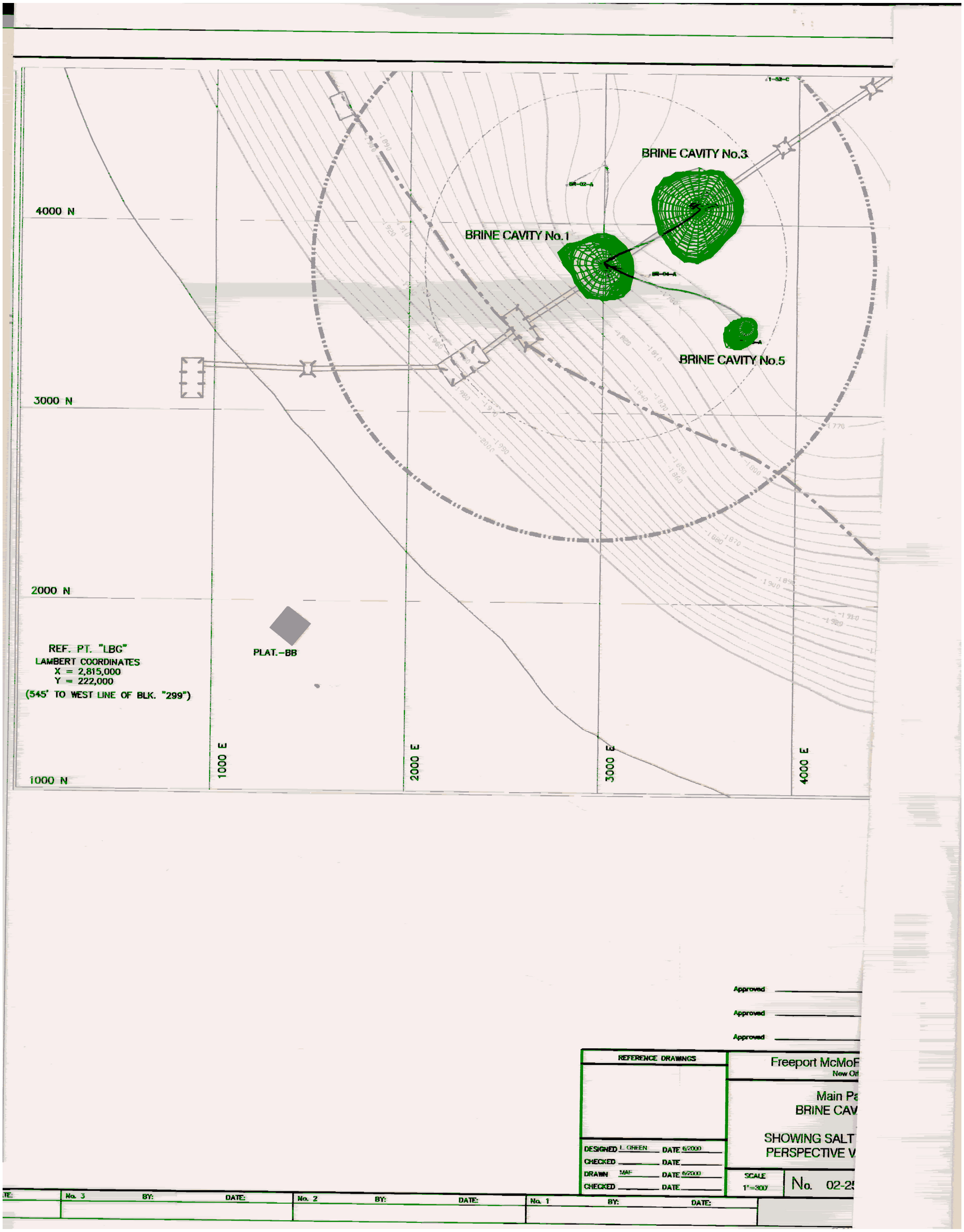

Figure B-3b. MP 299 plan view of Cavern Nos. 1, 3 and 5 in relationship to the platform complex.

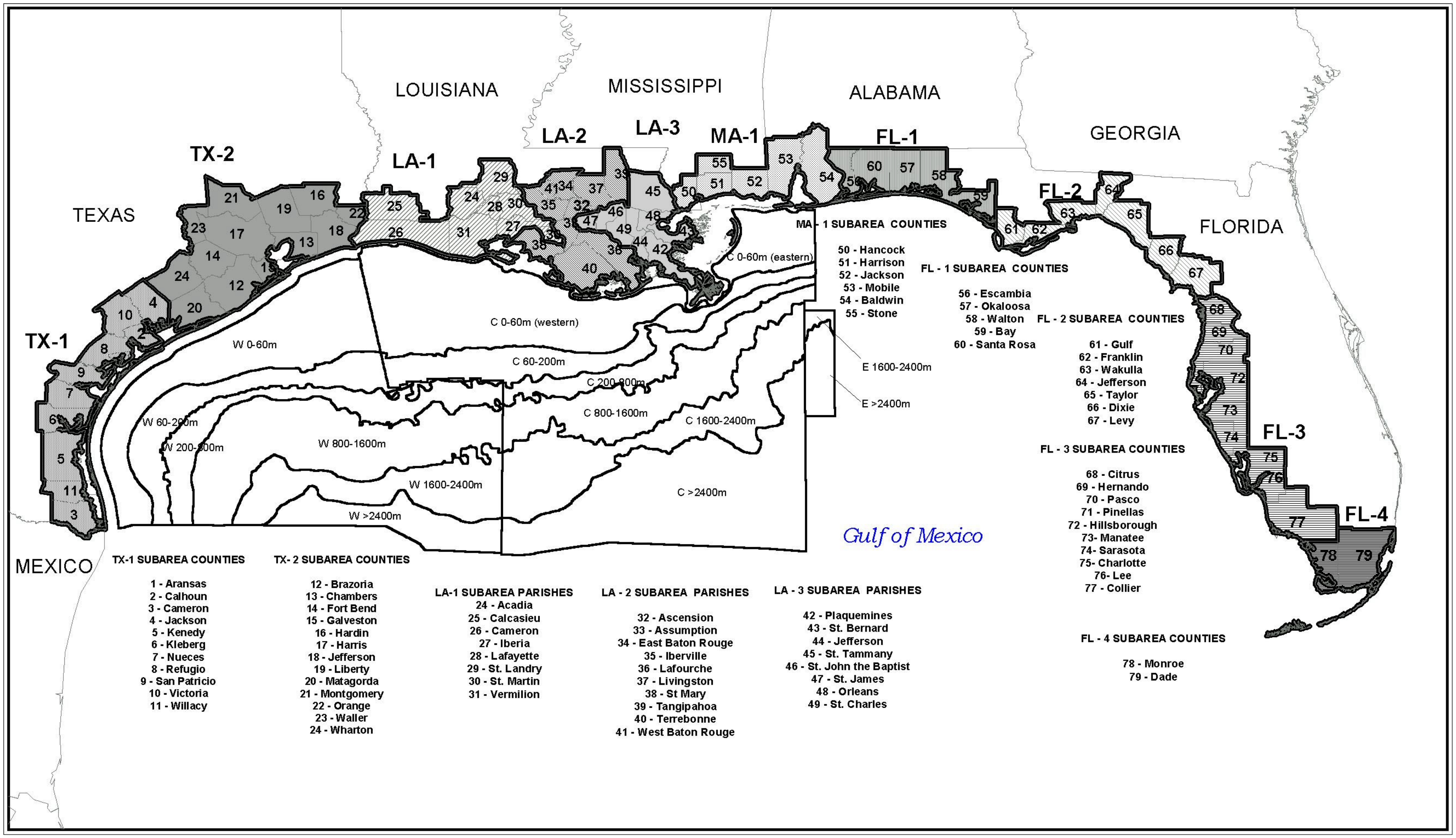

Figure B-4. Gulf of Mexico Offshore and Coastal Subareas.

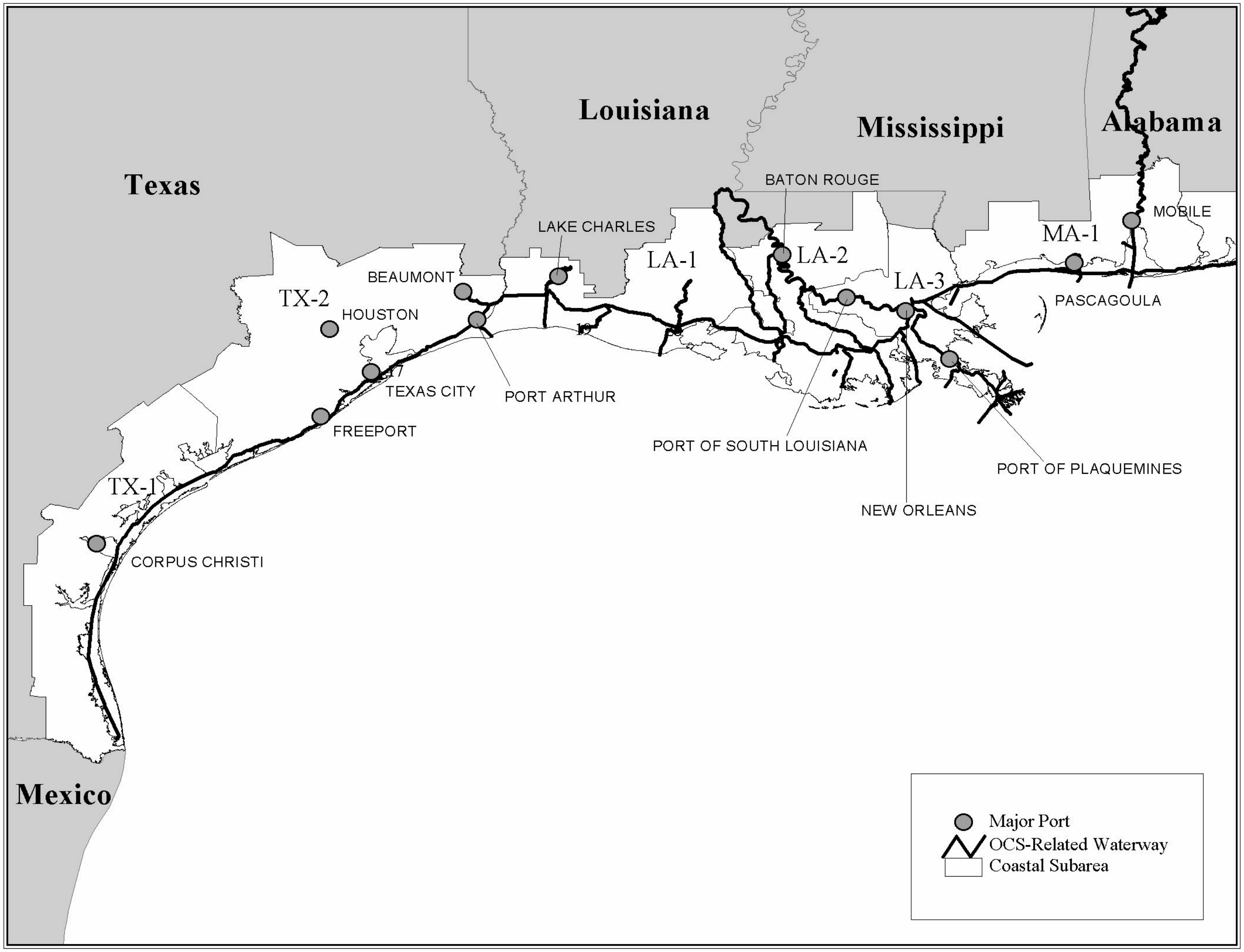

Figure B-5. Major Ports and Domestic Waterways in the Gulf of Mexico.

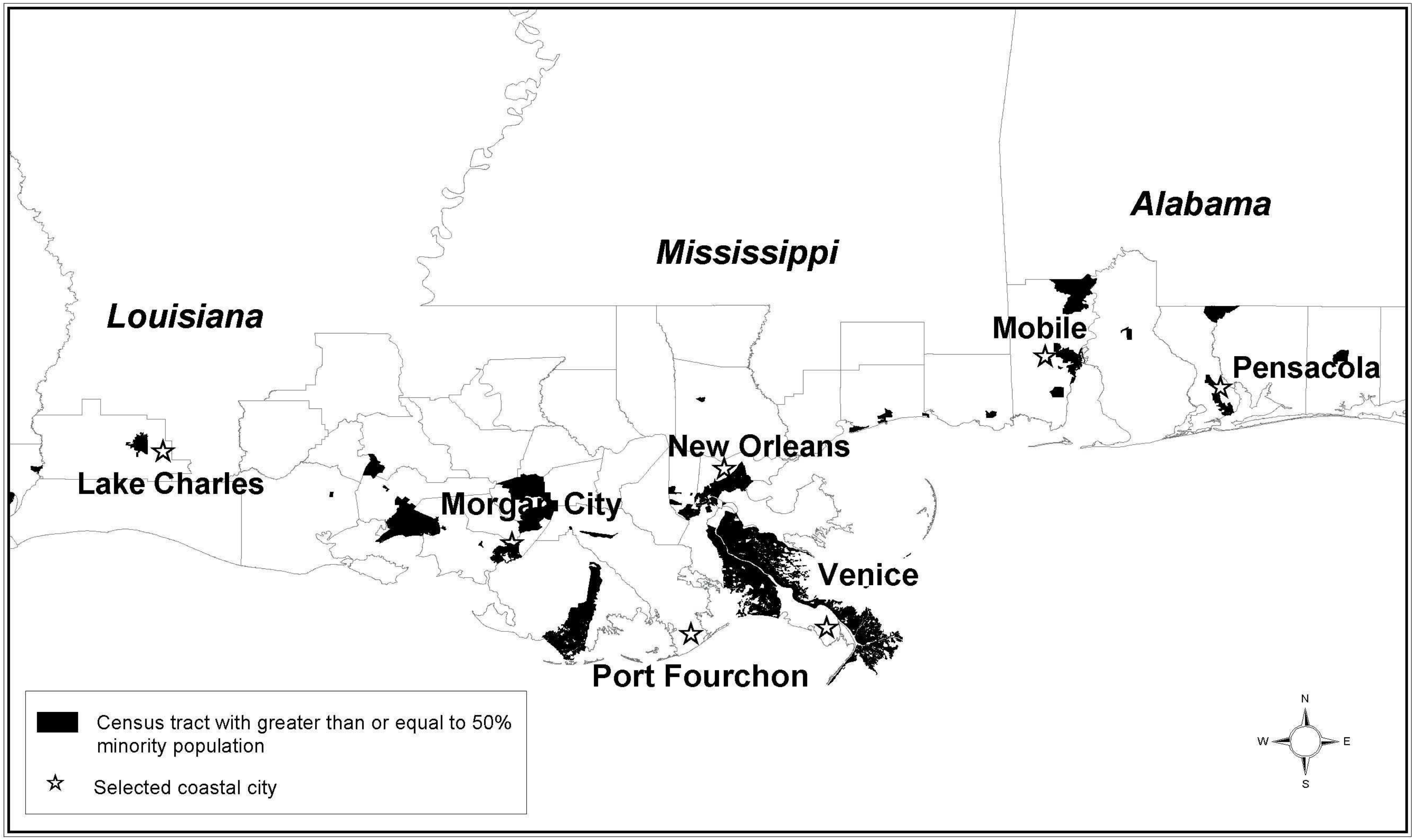

Figure B-6. Areas with 50 Percent or Greater Minority Populations.

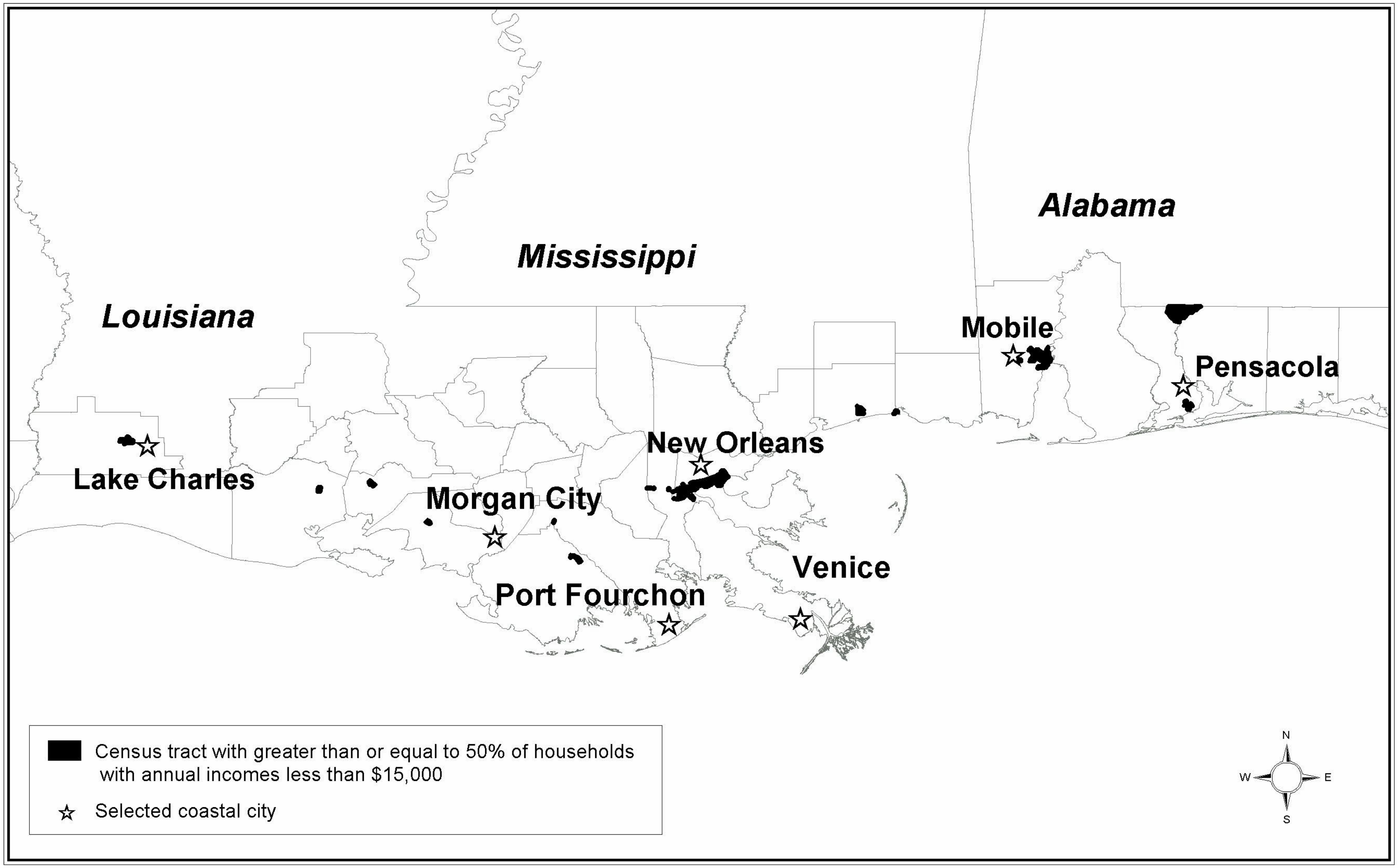

Figure B-7. Areas with 50 Percent or More Households with Annual Incomes of Less Than $15,000.

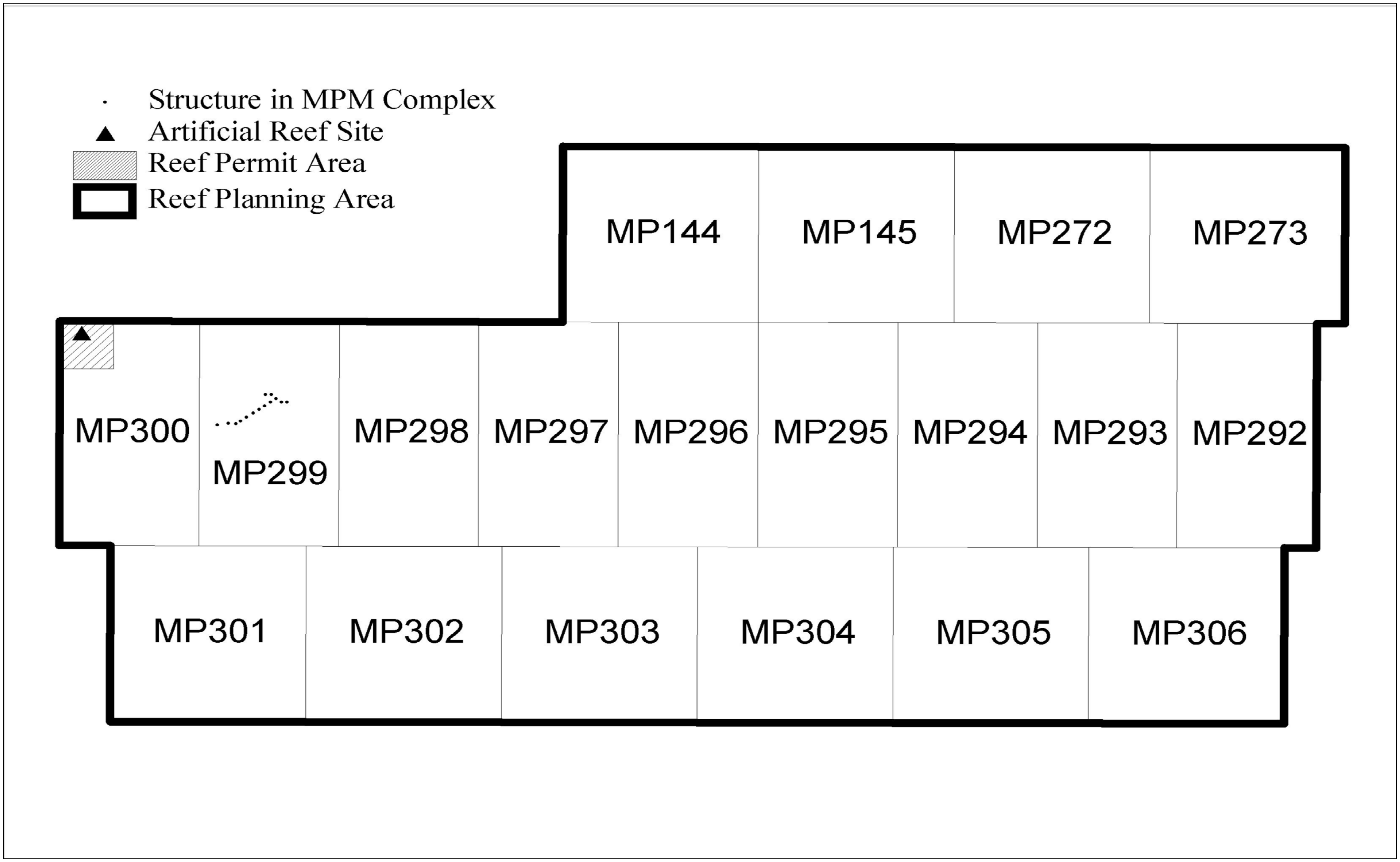

Figure B-8. Main Pass Artificial Reef Planning Area.

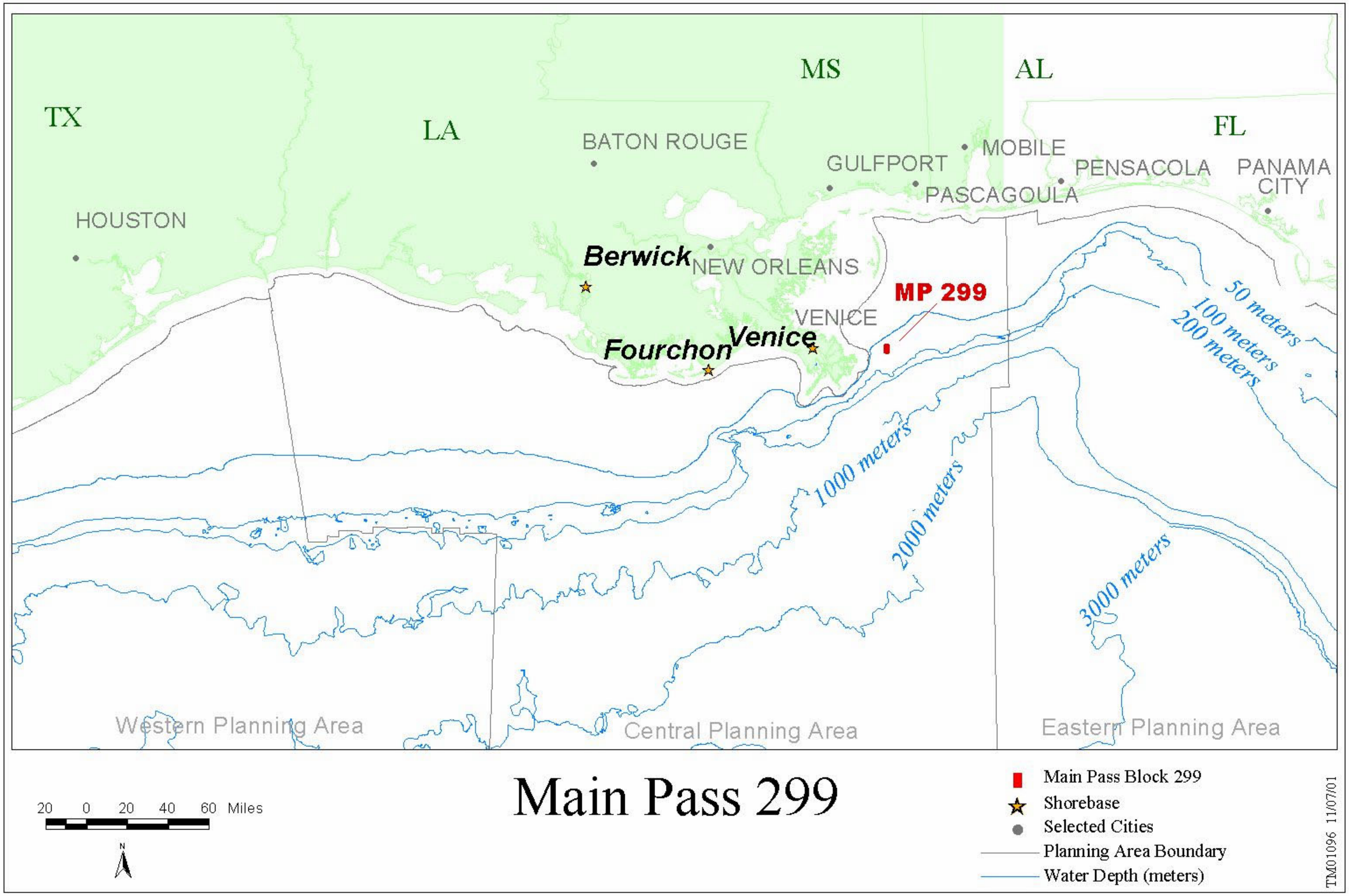

Figure B-9. MP 299 - Relationship to Bathymetry of the GOM.

Table B-1

Potential Impact-Producing Factors

Potential Impact-Producing Factors	Description/Comments
Operational discharges Outfall numbers correspond to NPDES permit for sulphur operations outfall numbers	Constituents Applicable to E&P Waste Disposal Operations: Outfall 1 - Power Plant (reverse osmosis units, brine desander unit, other miscellaneous sources) Outfall 2 - Sanitary effluents (all constituents) Outfall 3 - Mine water effluent (brine desander Unit) Outfall 4 - Domestic effluent (all constituents) Outfall 6 - Drilling fluid (all constituents. These outfalls will not be used for commercial disposal of E&P waste. Freeport may use this outfall to drill additional wells for brine, sulphur and waste operations. Outfall 7 - Drill cuttings (same note as above) Outfall 8 - Rig cooling water (all constituents) Outfall 9 - Oil/water separators (all constituents. These outfalls will not be used for commercial treatment and disposal of E&P waste. Outfall 10 - Miscellaneous effluents (all constituents except heat reclaimer overflows, steam traps, and steam condensate)
Noise	N/A
Light	N/A
Aircraft	Helicopter use will be two landing-takeoff cycles per day.
Marine debris	N/A
Vessel traffic (.continued)	• Although the exact vessel routes are not known, the routes will be along established waterways and courses commonly used by vessels servicing the offshore E&P industry. The greatest concentration of vessel traffic would be at or near MP 299 and then the primary shore bases of Venice and Port Fourchon, Louisiana. • Waterborne transportation mileage is estimated to be reduced by 50% for waste transported to MP 299 rather than onshore for disposal (Freeport, 2001). Overall OCS vessel traffic allocated to waste disposal would likely increase as a result of the proposed action. This is based on Freeport's estimates that wastes previously destined for discharge overboard (per NPDES permit) or disposal via offshore injection wells on lease (per MMS NTL 99-G22) would instead be injected at MP 299. Freeport estimates that 41-70% of the waste to be injected at MP 299 would be water-based muds and cuttings. These wastes would have likely been discharged overboard under an approved NPDES permit.
Air emissions	See Table 4-3 in Chapter 4.1.2.

Explosive removal of structures	See analysis in Appendix H. MP 299 Structure Removal Applications received on August 5, and August 8, 2002, proposed removal by mechanical methods (abrasive cutting tools) rather than explosives.
Oil/waste spill or release	See Table B-2 (Potential Impact-Producing Factors (Oil/Waste Spill or Release).
Spill-response activities	N/A

Table B-2

Potential Impact-Producing Factors - Oil/Waste Spilled or Released

Potential Oil/Waste Spilled or Released	Type of Oil/Waste Spilled or Released	Volume of Oil/Waste Spilled or Released (bbl)	Location of Oil/Waste Spilled or Released Addressed in EA
SPB containing muds and cuttings (oil-based, synthetic-based, or water-based) sinks as a result of being rammed by another vessel. Collision results in the loss of all of the SPB's diesel fuel (1,333 bbl) and all of the contents of one of the SPB's 12,500-bbl compartments.	1. Muds and cuttings: a. oil-based (diesel or mineral oil); or b. synthetic-based; or c. water-based. 2. Diesel fuel	1. Muds and cuttings: a. 12,500 bbl[1] b. 12,500 bbl c. 12,500 bbl 2. 1,333 bbl	Spill at MP 299: Diesel fuel (all scenarios) and diesel/mineral oil (oil-based muds and cuttings scenario) potentially impacts Lafourche Parish, Louisiana, to Escambia County, Florida (based on OSRA 10-day C1-4 transport variable). Modeled barite as a surrogate for water-based muds and cuttings. Modeling indicated that within 9 hours the mean vertical water concentration of barite particles had decreased to 1 ppm or less and had traveled approximately 10 nmi from MP 299 (based on ASA CHEMAP model). Spill at Onshore Bases of Morgan City, Fourchon, and Venice: Diesel fuel (all scenarios) and muds and cuttings (all scenarios) potential impacts are limited to the immediate area around the onshore bases.
Cavern No. 1 collapse	Brine. There is also the possibility of the release of some entrained waste (water-based muds and cuttings) in the brine.	Maximum of 1.6 million bbl of brine. Some waste could also be released should the collapse occur after initiation of waste injection into Cavern No. 1.	Per Freeport - MP 299 Cavern No. 1 location: • release of brine most likely from numerous point sources over the salt dome (2,600' diameter area) over a period of hours or days • heavy brine would initially remain in the depression/crater created by the cavern roof collapse (2,600' wide X max 45' deep) • seafloor depression diameter remains constant regardless of the amount of cavern fill material • brine would then dilute with the currents • when Cavern No. 1 is filled with E&P waste to the 80-90 % fill range, subsidence will be reduced to the point that the upper sediments will yield plastically rather than fracture, and no fluid will reach the Gulf floor in case of such an accident.

[1] Assumes 25% of the oil-based muds and cuttings volume (3,125 bbl) is diesel or mineral oil that behaves as "free" oil.

Table B-3

Significance Criteria

Resource	Significance Criteria	Terminology and Resource-Specific Definitions
Air Quality	Exceedance of onshore ambient air quality standards is considered to be a **significant** impact. Specifically, this would include noncompliance with State and National Ambient Air Quality Standards (NAAQS) for any of six criteria pollutants, including sulfur dioxide (SO_2), nitrogen dioxide (NO_2), respirable particulates (PM_{10}, particulates <10 microns in diameter), carbon monoxide (CO), zone (O_3), and lead (Pb). Exceedance of significance levels established by the MMS and the U.S. Fish and Wildlife Service (FWS) is also considered to be significant. Exceedance of the MMS standard would be considered significant under NAAQS and Prevention of Significant Deterioration (PSD) regulations. An exceedance of the FWS impact levels at a receptor located in a Class I area would be considered significant.	Refer to 40 CFR Part 50, and 30 CFR Subpart C for NAAQS, MMS significance levels, and FWS significance levels.
Water and Sediment Quality	Exceedance of current effluent or discharge limitations established under existing regulatory discharge limitations (e.g., by the National Pollutant Discharge Elimination System (NPDES) general permit for new and existing sources in offshore waters of the Gulf of Mexico or NPDES individual permit) would be considered a **significant** impact.	Exceedance is defined as noncompliance resulting in fines and/or revocation of NPDES permit.
Coastal Environments	Impacts on coastal environments (wetlands, coastal barrier beaches and associated dunes, seagrasses) are considered locally **significant** if they are likely, either directly or indirectly, to change the ecological function of the habitat in a localized area for five years or longer (i.e., cause long-term change).	For coastal environments impact assessment, a "short-term" impact would include any impact to coastal landforms or communities that is not observable one year (i.e., one annual cycle) after the event. "Long term" would include any impact to coastal landforms or biotic communities that is permanent (based on human timeframes), persists for an indefinite period of years, or remains observable more than 10 years after the event. A "local" impact is one that is confined to a well-defined and specific geographic area along a coastline. A "regional" impact is one that affects coastal landforms or biotic communities over a large geographic area, or specific types of landforms or biotic communities over widely separated geographic areas. In this case, the threshold or risk for significant environmental impact must be estimated based on scientific judgment and taking into consideration the relative condition and abundance of specific marine resources in the vicinity of the proposed action.

Table B-3. Significance Criteria (continued).

Resource	Significance Criteria	Terminology and Resource-Specific Definitions
Offshore Environments	An impact on offshore environments (including water column and deep benthic environments [chemosynthetic communities, and pinnacles]) is considered to be locally **significant** if it is likely to directly or indirectly cause measurable change in (a) species composition or abundance beyond that of normal variability or (b) ecological function within a species range for 5 years or longer (i.e., long-term). Measurable changes occurring for less than 5 years would be considered short-term, locally significant impacts. For an impact to be locally significant, the extent of the impact would be relatively small compared to total population or community size in the immediate region. The threshold for significance is determined by scientific judgement and takes into consideration the relative importance of the habitat and/or species affected. Impacts of regional significance are judged by the same criteria as those for local significance, except that the impacts cause a change in the ecological function within the population or community. The expected extent of the impact (e.g., total numbers affected), relative to those present in the region, is determined in the same way as that for locally significant impacts. This determination takes into consideration the importance of the species and/or habitat affected and its relative sensitivity to environmental perturbations.	For offshore environments impact assessment, the term "short term" can be broadly defined as a time period of five years or less, whereas "long term" would include time periods greater than five years. Spatial attributes are not as easily quantified. "Local" (or "localized") impacts can be broadly defined as those that occur in a relatively small area, compared to the broad or limited extent of the community or population of concern. "Regional" impacts would encompass broader areal extent, yet would also consider the extent of the community or population.
Marine Mammals	Any impact is **significant** if (a) the potential biological removal (PBR) level is exceeded for any marine mammal stock (i.e., any mortality or serious injury would be considered an exceedance of the PBR level for any strategic stock or listed species); or (b) any listed species or strategic stock is displaced from critical habitat (or key habitat if critical habitat is not formally designated) for any length of time; or (c) there is long-term or permanent displacement of any species from preferred feeding, breeding, or nursery habitats (other than critical habitat); or (d) there is a substantial (or chronic) disruption of behavioral patterns to an extent that may adversely affect a species or stock through effects on annual rates of recruitment or survival. Any impact is **adverse but not significant** if; (a) mortality or serious injury occurs to marine mammals, but not in excess of the PBR (i.e., no deaths or serious injuries of strategic stocks or listed species); or (b) there is a short-term displacement of marine mammals from preferred feeding, breeding, or nursery grounds (but not critical habitat); or (c) there is some disruption	For marine mammal impact assessment, a "short-term" impact can be defined as infrequent and temporary, one which is characterized by sudden onset and short duration. Short-term impacts may occur within fixed and varied geographic locations. Considering the average life spans of marine mammals, the duration of a short-term impact would be one which may last seconds, hours, or perhaps even up to several days. A "long-term" impact is an impact or series of impacts that is characterized by long duration or frequent reoccurrence, typically within a specific geographic location. Considering the average life spans of marine mammals, the duration of a long-term impact would be one which may last an appreciable fraction of an individual animal's lifetime (i.e., perhaps months to years). A "local" (or "localized") impact is one that occurs within a defined location, is not widespread or general in extent, and affects only restricted numbers of individuals of one or more species but is unlikely to affect the population status of the impacted species or stock of a species. A "regional" impact is one that may affect the status of a species or local stock of a species. The areal extent of a regional impact may vary greatly, ranging from a broad geographic area (one that encompasses one or more ecological habitats or

Table B-3. Significance Criteria (continued).

Resource	Significance Criteria	Terminology and Resource-Specific Definitions
	of behavioral patterns, but to an extent that is unlikely to adversely affect a species or stock through effects on annual rates of recruitment or survival. Any is **negligible** if there is (a) no mortality or serious injury to any marine mammal; (b) no displacement of listed species or strategic stocks from critical habitat; (c) no displacement of any species from preferred feeding, breeding, or nursery grounds; or (d) little or no disruption of behavioral patterns or other sublethal effects.	systems) to a much smaller area, as in the case where a species, stock, or a life stage of a species is concentrated into a relatively small area (e.g., sperm whales off the Mississippi River Delta). A "strategic stock" includes those stocks that are not listed under the Endangered Species Act but that have estimated human-caused mortality greater than PBR. The term "population stock" or "stock" means a group of marine mammals of the same species or smaller taxa in a common spatial arrangement, that interbreed when mature. The term "PBR" refers the total number of individuals of a particular species (or stock) that may be removed without seriously and irreversibly affecting that species' ability to maintain itself.
Sea Turtles	Any impact is **significant** if (a) the species-specific jeopardy threshold level is exceeded for any sea turtle; or (b) there is any displacement of sea turtle species from critical habitat (or key habitat, in the absence of a formally designated critical habitat); or (c) there is a long-term or permanent displacement of any sea turtle species from preferred feeding, breeding, or nursery habitats (other than critical habitat); or (d) there is a substantial (or chronic) disruption of behavioral patterns to an extent that may adversely affect a species or stock through effects on annual rates of recruitment or survival. Any impact is **adverse but not significant** if there is (a) mortality or serious injury to sea turtles, but not exceeding jeopardy threshold standards; or (b) short-term displacement of sea turtles from preferred feeding, breeding, or nursery grounds (but not critical habitat); or (c) some disruption of behavioral patterns, but to an extent that is unlikely to adversely affect a species or stock through effects on annual rates of recruitment or survival. Any impact is **negligible** if there is (a) no mortality or serious injury to any sea turtle; or (b) no displacement of any species from critical habitat; or (c) no displacement of any species from preferred feeding, breeding, or nursery grounds; or (d) little or no disruption of behavioral patterns or other sublethal effects.	For sea turtle impact assessment, the spatial and temporal definitions are similar to those noted for marine mammals. A "short-term" impact is one that is infrequent and temporary, characterized by sudden onset and short duration, and occurring within either fixed or varied geographic locations; the duration of a short-term impact ranges from seconds to several days. A "long-term" impact is one or a series of impacts characterized by long duration or frequent reoccurrence, typically within a specific geographic location; the duration of a long-term impact may represent an appreciable fraction of an individual animal's lifetime (i.e., perhaps months to years). A "local" (or "localized") impact is one that occurs within a defined location, is not widespread or general in extent, and affects only restricted numbers of individuals of one or more species but is unlikely to affect the population status of the impacted species or stock of a species. A "regional" impact is one that may affect the status of a species or local stock of a species. The areal extent of a regional impact may vary greatly, ranging from a broad geographic area (one that encompasses one or more ecological habitats or systems) to a much smaller area, as in the case where a species, stock, or a life stage of a species is concentrated into a relatively small area.
Coastal and Marine Birds	Any impact is **significant** if there is (a) exceedance of the species-specific jeopardy standard threshold for any coastal or marine bird; or (b) any displacement of coastal or marine bird species from critical habitat (or key habitat, if a formal critical habitat has not been designated); or (c) long-term or permanent displacement of any coastal or marine bird species from preferred feeding, breeding, or nesting habitats (other than	A "short-term" impact is one that is infrequent and temporary, characterized by sudden onset and short duration, and occurring within either fixed or varied geographic locations; the duration of a short-term impact ranges from seconds (e.g., aircraft noise) to several days (e.g., where impacts of air emissions are aggravated by prevailing weather conditions). A "long-term" impact is one or a series of impacts characterized by long duration or frequent reoccurrence, typically within a specific geographic

Table B-3. Significance Criteria (continued).

Resource	Significance Criteria	Terminology and Resource-Specific Definitions
	critical habitat); or (d) substantial (or chronic) disruption of behavioral patterns to an extent that may adversely affect a species or stock through effects on annual rates of recruitment or survival. Any impact is **adverse but not significant** if there is (a) mortality or serious injury to coastal or marine birds, but not exceeding jeopardy threshold standards; or (b) short-term displacement of coastal or marine birds from preferred feeding, breeding, or nesting habitats (but not critical habitat); or (c) some disruption of behavioral patterns, but to an extent that is unlikely to adversely affect a species or stock through effects on annual rates of recruitment or survival. Any impact is **negligible** if there is (a) no mortality or serious injury to any coastal or marine bird; or (b) no displacement any coastal or marine bird species from critical habitat; or (c) no displacement of any species from preferred feeding, breeding, or nesting habitats; or (d) little or no disruption of behavioral patterns or other sublethal effects.	location; the duration of a long-term impact may represent an appreciable fraction of a generation, or an individual animal's lifetime (i.e., perhaps months to years). A "local" (or "localized") impact is one that occurs within a defined location, is not widespread in extent, affects only restricted numbers of individuals or one or more species, and is unlikely to affect the population status of the impacted species or stock of a species. A "regional" impact is one that may affect the status of a species or local stock of a species. The area of a regional impact may vary greatly, from a broad geographic area that encompasses one or more ecological habitats or systems to a relatively smaller area, as in the case where a species, stock, or a life stage of a species is concentrated into a relatively small area (e.g., large cohesive flocks). "Behavioral patterns" are defined as time budget patterns (e.g., schedules of behavior) or energy budget patterns (e.g., food energy versus costs of reproduction, migration, nesting, and molting).
Fish Resources	An impact on resources is considered to be locally **significant** if it is likely to directly or indirectly cause measurable change in (a) species composition or abundance beyond that of normal variability or (b) ecological function within a species range for 5 years or longer (i.e., long term). Measurable changes occurring for less than 5 years would be considered short-term, locally significant impacts. For an impact to be locally significant, the extent of the impact (e.g., individual species, total number of fish affected) would be relatively small compared to total population or community size in the immediate region. The threshold for significance is determined by scientific judgment and takes into consideration the relative importance of the habitat and/or species affected. Impacts of regional significance are judged by the same criteria as those for local significance, except that the impacts cause a change in the ecological function within the population or community. The number of fish affected, relative to those present in the region, is determined in the same way as that for locally significant impacts. This determination takes into consideration the importance of the species and/or habitat affected and its relative sensitivity to environmental perturbations. Consideration of Essential Fish Habitat (EFH) is an important and necessary component of any impact	In fish resources impact assessment, "short term" refers to periods of a year or less, whereas "long term" encompasses a time period of more than a year, up to one or more decades. "Local" (or "localized") impacts extend from meters up to 1 km (0.6 mi), whereas "regional" ranges from 1 km (0.6 mi) to hundreds of kilometers (0.6 to 62+ mi).

Table B-3. Significance Criteria (continued).

Resource	Significance Criteria	Terminology and Resource-Specific Definitions
	assessment.	
Commercial Fisheries	Impacts are considered **significant** if (a) fishers are precluded from 2% or more of the fishing grounds during waste disposal operation; (b) 2% or more of the fishers are precluded from a fishing area for all or most of a fishing season; or (c) economic losses due to a decrease in catchability of target species exceeds 2% of the annual value.	In commercial fisheries impact assessment, spatial and temporal definitions are identical to those provided for fish resources. "Short term" refers to periods of a year or less, whereas "long term" encompasses a time period of more than a year, up to one or more decades. "Local" (or "localized") impacts extend from meters up to 1 km (0.6 mi), whereas "regional" ranges from 1 km (0.6 mi) to hundreds of kilometers (0.6 to 62+ mi).
Social and Economic Environment	There are yet to be established, widely accepted conventions regarding significance criteria or standards for social and economic environmental outcomes. In some cases, socioeconomic and sociocultural information does not readily lend itself to quantification. Most analysts assess socioeconomic and sociocultural outcomes in qualitative terms, assessing the available evidence, noting positive and negative consequences thereof. For the purposes of this analysis, a **significant** impact to social and economic resources would be realized if 3-5% of the labor force is affected, although this determination must be considered relative to the qualitative evidence available.	For social and economic impact assessment, "short term" refers to an impact duration of five years or less, whereas "long term" is defined as any impact that exceeds five years. "Local" (or "localized") is defined as an impact that occurs within a specified labor market area, whereas "regional" encompasses those impacts that are manifest within a set of two or more labor market areas.
Recreational Resources and Beach Use	There are no established, quantitative criteria available for impacts to recreational resources and beach use. Qualitative criteria for recreational resources, including aesthetic or visual considerations, encompass the following: Recreational impacts are considered **significant** if they cause long-term interference with coastal access or recreational use, or long-term degradation of a significant recreational resource; and Visual and aesthetic impacts are considered **significant** if they affect a large viewing population, are relatively close to the affected viewing population, remain for a long period of time, or present a substantial degree of change inconsistent with the existing viewshed.	For the impact assessment pertinent to recreational resources and beach use, spatial and temporal definitions are similar to those applied to social and economic resources. "Short term" refers to an impact duration of five years or less, whereas "long term" is defined as any impact that exceeds five years. "Local" (or "localized") is defined as an impact that occurs within a specified recreational area or beach, or within several recreational or beach areas within close proximity to one another (e.g., within 15 km [9 mi]). The definition for "regional" is problematic. However, in general, "regional" encompasses those impacts that are manifest within one or more recreational or beach areas, depending upon the extent of the individual recreational or beach area, or the proximity of several areas to one another (e.g., greater than 15 km [9 mi]).
Beach Mice	Any impact is **significant** if there is (a) any displacement of a beach mouse species from critical habitat for any length of time; or (b) long-term or permanent displacement of any beach mouse species from preferred feeding, breeding, or nursery	A "short-term" impact is one that is infrequent and temporary, characterized by sudden onset and short duration, and occurring within either fixed or varied geographic locations; the duration of a short-term impact ranges from seconds (e.g., aircraft noise) to several days (e.g., where impacts

Table B-3. Significance Criteria (continued).

Resource	Significance Criteria	Terminology and Resource-Specific Definitions
	habitats (other than critical habitat); or (c) substantial (or chronic) disruption of behavioral patterns to an extent that may adversely affect a species or stock through effects on annual rates of recruitment or survival. Any impact is **adverse but not significant** if there is (a) mortality or serious injury to beach mice, or (b) short-term displacement of beach mice from preferred feeding, breeding, or nursery habitats (but not critical habitat); or (c) some disruption of behavioral patterns, but to an extent that is unlikely to adversely affect a species or stock through effects on annual rates of recruitment or survival. Any impact is **negligible** if there is (a) no mortality or serious injury to any beach mouse; or (b) no displacement of any beach mouse species from critical habitat; or (c) no displacement of any species from preferred feeding, breeding, or nursery habitats; or (d) little or no disruption of behavioral patterns or other sublethal effects.	of air emissions are aggravated by prevailing weather conditions). A "long-term" impact is one or a series of impacts characterized by long duration or frequent reoccurrence, typically within a specific geographic location; the duration of a long-term impact may represent an appreciable fraction of a generation, or an individual animal's lifetime (i.e., perhaps months). A "local" (or "localized") impact is one that occurs within a defined location, is not widespread in extent, affects only restricted numbers of individuals or one or more species, and is unlikely to affect the population status of the impacted species or stock of a species. A "regional" impact is one that may affect the status of a species or local stock of a species. The area of a regional impact may vary greatly, from a broad geographic area that encompasses one or more ecological habitats or systems to a relatively smaller area, as in the case where a species, stock, or a life stage of a species is concentrated into a relatively small area. "Behavioral patterns" are defined as patterns of behavior such as feeding, resting, grooming, carrying a litter to term, nursing a litter, and teaching offspring to forage and survive on their own.
Gulf Sturgeon and Smalltooth Sawfish	Any impact is **significant** if there is (a) any displacement of the species from critical habitat for any length of time; or (b) long-term or permanent displacement of gulf sturgeon or smalltooth sawfish from preferred feeding, breeding, or nursery habitats (other than critical habitat); or (c) substantial (or chronic) disruption of behavioral patterns to an extent that may adversely affect the species or stock through effects on annual rates of recruitment or survival. Any impact is **adverse but not significant** if there is (a) mortality or serious injury to gulf sturgeon or smalltooth sawfish, or (b) short-term displacement of gulf sturgeon or smalltooth sawfish from preferred feeding, breeding, or nursery habitats (but not critical habitat); or (c) some disruption of behavioral patterns, but to an extent that is unlikely to adversely affect the species or stock through effects on annual rates of recruitment or survival. Any impact is **negligible** if there is (a) no mortality or serious injury to any gulf sturgeon or smalltooth sawfish; or (b) no displacement of the species from critical habitat; or (c) no displacement of the species from preferred feeding, breeding, or nursery habitats; or (d) little or no disruption of behavioral patterns or other sublethal effects.	A "short-term" impact is one that is infrequent and temporary, characterized by sudden onset and short duration, and occurring within either fixed or varied geographic locations; the duration of a short-term impact is several days or more. A "long-term" impact is one or a series of impacts characterized by long duration or frequent reoccurrence, typically within a specific geographic location; the duration of a long-term impact may represent an appreciable fraction of a generation, or an individual animal's lifetime (i.e., years). A "local" (or "localized") impact is one that occurs within a defined location, is not widespread in extent, affects only restricted numbers of individuals, and is unlikely to affect the population status of the impacted species or stock of a species. A "regional" impact is one that may affect the population status of a species or local stock of a species (e.g., an oil spill contacting inlets and passes during a population' entry to an estuary from the open Gulf or exit into the Gulf). The area of a regional impact may vary greatly, from a broad geographic area that encompasses one or more ecological habitats or systems to a relatively smaller area, as in the case where a species, stock, or a life stage of a species is concentrated into a relatively small area. "Behavioral patterns" are defined as patterns of behavior such as feeding or resting.
Other Uses	There are no established, quantitative criteria available for impacts to other uses. A qualitative criterion for a **significant**	For other uses impact assessment, the absence of quantitative significance criteria is problematic: however, similarities can be established

Table B-3. Significance Criteria (continued).

Resource	Significance Criteria	Terminology and Resource-Specific Definitions
	impact includes long-term interference with other uses of the Gulf by commercial and/or military interests.	between other uses and specific resource areas (i.e., recreational resources and beach use). In general, a "short term" impact refers to an impact duration of five years or less, whereas "long term" is defined as any impact that exceeds five years. "Local" (or "localized") is defined as an impact that occurs within 15 km (9 mi) of the impact source. In general, "regional" encompasses those impacts that are manifest within an area greater than 15 km (9 mi) from the source of the impact.

Table B-4

Waterway Depth and Number of Trips, 1999

Waterway	Project Depth (ft)	Total Trips						Foreign Trips						Domestic Trips					
		Upbound			Downbound			Upbound			Downbound			Upbound			Downbound		
		Total	Tanker	Other	Total	Tanker	Other	Total	Tanker	Other	Total	Tanker	Other	Total	Tanker	Other	Total	Tanker	Other
Gulf Intracoastal Waterway (GIWW)																			
Mobile Bay, AL to New Orleans, LA	12	24456	4004	20452	24199	4115	20084	0	0	0	0	0	0	24456	4004	20452	24199	4115	20084
Mississippi River, LA to Sabine River, TX	12	63374	19445	43929	62664	19219	43445	0	0	0	0	0	0	63374	19445	43929	62664	19219	43445
Texas Harbors, Channels, and Waterways																			
Beaumont (Neches River)	40, 34, 30	11737	5434	6303	11818	5555	6263	1180	1009	171	1147	985	162	10557	4425	6132	10671	4570	6101
Port Arthur	40	6193	2396	3797	6203	2400	3803	352	110	242	308	96	212	5841	2286	3555	5895	2304	3591
Sabine Pass Harbor	40, 42	3249	371	2878	3063	337	2726	95	3	92	83	2	81	3154	368	2786	2980	335	2645
Sabine-Neches Waterway	40, 42, 34, 30, 25, 12, 13	39022	17642	21380	32039	15163	16876	1633	1123	510	1544	1084	460	37389	16519	20870	30495	14079	16416
Louisiana Harbors, Channels, and Waterways																			
Atchafalaya River, Morgan City to Gulf of Mexico	20	9573	1067	8506	9147	1015	8132	452	0	452	170	2	168	9121	1067	8054	8977	1013	7964
Bayou Lafourche and Lafourche-Jump Waterway	24, 9, 6, 12	23869	1203	22666	23230	1132	22098	1020	2	1018	292	0	292	22849	1201	21648	22938	1132	21806
GIWW, Morgan City-Port Allan Route	12	14894	6723	8171	14914	6755	8159	0	0	0	0	0	0	14894	6723	8171	14914	6755	8159
Mississippi River Gulf Outlet via Venice Vicinity	16, 14	17984	847	17137	17754	820	16934	1	0	1	61	2	59	17983	847	17136	17693	818	16875
Port of Plaquemines	45	28444	2229	26215	28334	2255	26079	635	133	502	454	86	368	27809	2096	25713	27880	2169	25711

NA means that information is not available.
Source: U.S. Dept. of the Army, Corps of Engineers, 2001.

Table B-5

Freight Traffic, 1999 (thousands)

Waterway	All Commodities	Crude Petroleum					Petroleum Products					Coal	Chemicals	Crude Materials	Primary Mfgr Goods	Food & Farm Production	Mfgr Equip Machinery & Prod	Other
	Total	Total	Total	Foreign Imports	Exports	Domestic Total	Total	Total	Foreign Imports	Exports	Domestic Total	Total	Total	Total	Total	Total	Total	Total
Gulf Intracoastal Waterway (GIWW)																		
Mobile Bay, AL to New Orleans, LA	21856	1328	0	0	0	1328	5839	0	0	0	5839	4974	3605	4656	1256	162	36	0
Mississippi River, LA to Sabine River, TX	61084	10497	0	0	0	10497	17953	0	0	0	17953	247	12478	14081	2631	1517	1064	616
Texas Harbors, Channels, and Waterways																		
Beaumont (Neches River)	69404	47017	45857	45857	0	1160	12897	5193	3023	2170	7704	2	5994	1781	595	1103	15	0
Port Arthur	18309	8011	7977	7977	0	34	6812	1740	604	1136	5072	64	1374	670	734	36	32	576
Sabine Pass Harbor	949	837	0	0	0	837	49	0	0	0	49	0	9	6	5	9	34	0
Sabine-Neches Waterway	114383	57111	53834	53834	0	3277	29223	6934	3627	3307	22289	152	17418	4795	3064	1871	170	579
Louisiana Harbors, Channels, and Waterways																		
Atchafalaya River, Morgan City to Gulf of Mexico	2101	828	0	0	0	828	131	61	61	0	70	0	2	182	172	412	367	7
Bayou Lafourche and Lafourche-Jump Waterway	194	57	57	57	0	0	91	4	4	0	87	0	2	3	2	36	3	0
GIWW, Morgan City-Port Allan Route	23202	1060	0	0	0	1060	6115	0	0	0	6115	169	7635	6538	1151	504	23	7
Mississippi River Gulf Outlet via Venice Vicinity	2790	211	0	0	0	211	1026	0	0	0	1026	0	26	195	73	216	923	120
Port of Plaquemines	62462	7964	6193	6193	0	1771	6006	1445	474	971	4561	23143	5923	5799	3779	9837	7	4

Table B-6

Demand for Fishing/Diving 1999

State	Total Trips	Percentage near O/G Structures	Trips Near O/G Structures
Private Boats			
Alabama	505,635	41.4%	209,333
Mississippi	507,545	19.7%	99,986
Louisiana	2,067,076	16.6%	343,135
Total:	3,080,256	21.2%	652,454
Charter Boats			
Alabama	71,394	21.0%	14,993
Mississippi	49,426	21.7%	10,725
Louisiana	73,770	23.1%	17,041
Total:	194,590	22.0%	42,759
Party Boats			
Alabama	15,386	0.0%	0
Mississippi	0	0.0%	0
Louisiana	7,913	100.0%	7,913
Total:	23,299	34.0%	7,913
Dive Trips			
Alabama	11,124	48.9%	5,440
Mississippi	11,166	100.0%	11,166
Louisiana	45,476	100.0%	45,476
Total:	67,766	91.6%	62,082
All Totals	3,365,911	22.7%	765,208

Source: Hiett and Milon 2002:2-4; MRFSS' web site www.st.nmfs/gov/pls as of 6/19/02.

Table B-7

Monies Spent in 1999 Fishing/Diving Near O/G Structures

	State of Alabama			State of Mississippi			State of Louisiana		
	Coastal Resident	Non-Coastal Resident	Total Expenditures	Coastal Resident	Non-Coastal Resident	Total Expenditures	Coastal Resident	Non-Coastal Resident	Total Expenditures
Private Boat									
Trip-related	$ 14,252,215	$ 3,261,822	$ 17,514,037	$ 13,525,815	$ 2,423,891	$ 15,949,706	$ 38,598,650	$ 6,499,712	$ 45,098,362
Equipment	$ 26,249,912	$ 816,408	$ 27,066,320	$ 6,533,760	$ 41,339,228	$ 47,872,988	$ 73,596,064	$ 4,840,707	$ 78,436,771
Totals	$ 40,502,127	$ 4,078,230	$ 44,580,357	$ 20,059,575	$ 43,763,119	$ 63,822,694	$ 112,194,714	$ 11,340,419	$ 123,535,133
Charter Boat									
Trip-related	$ 38,592	$ 11,513,675	$ 11,552,267	$ 1,134,784	$ 3,409,334	$ 4,544,118	$ 1,324,304	$ 1,430,420	$ 2,754,724
Equipment	$ 99,678	$ 4,089,264	$ 4,188,942	$ 78,314	$ 130,506	$ 208,820	$ 287,219	$ 136,093	$ 423,312
Totals	$ 138,270	$ 15,602,939	$ 15,741,209	$ 1,213,098	$ 3,539,840	$ 4,752,938	$ 1,611,523	$ 1,566,513	$ 3,178,036
Party Boat	N/A	N/A	N/A	N/A	N/A	N/A			
Trip-related							$ 568,585	$ 935,574	$ 1,504,159
Equipment							$ 61,638	$ 879,745	$ 941,383
Totals							$ 61,638	$ 879,745	$ 941,383
Private Diving									
Trip-related	$ 282,750	$ -	$ 282,750	$ 1,884,537	$ 926,700	$ 2,811,237	$ 9,437,134	$ 632,480	$ 10,069,614
Equipment	$ 4,340	$ -	$ 4,340	$ 221,560	$ -	$ 221,560	$ 242,791	$ 100,015	$ 342,806
Totals	$ 287,090	$ -	$ 287,090	$ 2,106,097	$ 926,700	$ 3,032,797	$ 9,679,925	$ 732,495	$ 10,412,420
Total All Marine Recreational Activities	$ 40,927,487	$ 19,681,169	$ 60,608,656	$ 23,378,770	$ 48,229,659	$ 71,608,429	$ 123,547,800	$ 13,639,427	$ 137,125,589

APPENDIX C

EXHIBIT 1 - OPERATIONS PLAN

Exhibit 1

OPERATIONS PLAN

FOR E&P WASTE DISPOSAL IN SALT CAVERNS AND ASSOCIATED CAPROCK

MAIN PASS BLOCK 299
LEASE OCS-G 9372

OFFSHORE LOUISIANA

Amended October 17, 2001

OPERATIONS PLAN
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FIGURES

ATTACHMENTS

Development and Facility Operations Plan

1. GENERAL

1.1 Purpose and Objective

Trinity Field Services, L.P. ("Trinity") and Freeport-McMoRan Sulphur, LLC ("Freeport") have formed a Gulf Coast Alliance for the collection, transportation, handling and disposal of non-hazardous oil and gas exploration and production waste ("E&P waste") generated in OCS waters. Freeport has contracted with Trinity to develop and operate the E & P waste recycling and disposal facility at Main Pass 299. This Facility Development and Operations Plan presents the plans and procedures for E & P waste recycling and disposal at the location. Activities that will occur at the facility include the following:

- Facilities will be installed on an existing Main Pass 299 platform to facilitate the offloading, pumping, storage, processing and injection of E & P waste;
- Additional pumping injection and storage facilities may be installed on a second Main Pass 299 platform as business requirements dictate;
- The facility will be staffed on a 24 hour/7 day basis when E & P waste operations are ongoing;
- Trinity and its alliance partners will be responsible for marketing of E & P waste disposal service;
- Trinity will coordinate with its alliance partners the logistics for collection of E & P waste in marine vessels from single and multiple OCS operating locations and transportation of waste to Main Pass 299 as well as the direct receipt of waste from generators that provide their own transportation.

1.2 Scope

The scope of this plan is to cover those areas of operations that will allow a review of the activities necessary to collect, transport, receive, store, process and dispose of waste streams at the platform location. These activities include discussions of Operating Procedures, Hazards Mitigation and Personnel Evacuation Procedures, Sampling and Testing Procedures, Training and Safe Work Practices and Record Keeping and Documentation Procedures.

2. OPERATING PROCEDURES

2.1 E & P Waste Collection, Transportation, Storage, Processing and

Disposal Practices

The application for the E & P project consists of four separate applications which include three separate cavern disposal applications and one application for caprock disposal wells. There are ten separate caprock disposal wells included in the application. If all four applications for E & P waste disposal are approved simultaneously, it is anticipated that operations will be conducted in the following priority:

- Caprock wells – proposal anticipates initially using three wells which are currently being used for mine pressure maintenance water injection.
- Cavern BR-01
- Cavern BR-03
- Cavern BR-05

  Note: It is anticipated that the designation of these caverns will eventually be changed to the #CA-01-A, #CA-03-A and #CA-05-A wells, respectively.

The project life is anticipated to be 25 years starting in January 2002. The volume estimates for the project are presented in Attachment 2.

The proposed injection schedule for each site (ie BR-01, BR-03, BR-05 and Caprock Wells) are as follows:

- BR-01
  - Begin operations 90 days after receipt of approval of project.
  - Pump solids and brine mixtures into cavern until cavern is full of solids or other MMS approved waste streams.
  - After filling is complete begin closure following most current closure procedures.
  - After closure is complete, implement sealing and abandonment procedures.

- BR-03
  - Begin operations after re-entry well is completed into BR-03 cavern.
  - Pump waste streams not otherwise acceptable at BR-01 locations until cavern is full of solids and recovered hydrocarbons.
  - After filling is complete, begin closure following most current closure procedures.
  - After closure is complete, implement sealing and abandonment procedures.

- BR-05
  - Begin operation after BR-01 or BR-03 are full.
- Caprock Wells
  - Begin operation 90 days after receipt of approval of project.
  - Pump waste streams acceptable to MMS and return brine from cavern into caprock.
  - Continue injection until caverns are full.

- Begin closure using most current closure procedures.
- Complete plugging and abandonment of wells.

Injection into BR-01 and into the caprock wells will be simultaneously performed. When BR-03 is on line, then operations into both caverns and caprock wells can be simultaneous.

2.1.1 Collection and Transportation

Several methods for collecting and transporting E&P waste will be utilized.

- E&P waste will be collected for disposal in 25 BBL cutting boxes or portable tanks at offshore platform locations using screw conveyors, vacuum systems or pneumatic systems. The systems utilized for cuttings collection on the platforms vary according to operator preference.
- These cutting boxes or tanks will be transferred from the platforms to work boats and from work boats to the Main Pass 299 platform by cranes. Waste from cutting boxes and portable tanks may also be pumped (boat pumps or platform pumps lowered to the boat may be used) from the work boats to the Main Pass 299 platform. In some cases, the boxes or tanks may be transported to shore bases first prior to transfer into barges or boat tanks for final delivery to Main Pass 299. The shore base transfer stations operated by Trinity that may support Main Pass 299 are found in Venice, Port Fourchon and Berwick (Morgan City). **Two** of the above transfer stations have been permitted for E&P waste receipt and transfer by the Louisiana Department of Natural Resources under regulations found at 43 LAC Section 501 et seq. **and the third(Venice) is pending.**
- Bulk slurrification of the E&P waste will also be performed on the platform and the waste will then be pumped directly into the holding tanks on the work boats for transfer to Main Pass 299.
- The volume of waste in bulk slurry form will vary depending on the size of the work boat. Estimated volumes for 165 ft., 180 ft., 185 ft. and 200 ft. boats are 1540 bbls, 1732 bbls, 1800 bbls and 4000 bbls respectively. Work boats larger than 200 feet may also be used.
- A pneumatic conveyance system, which allows the transfer of E&P waste from the platform into special purpose tanks on the work boats at low pressure and high volumetric throughput will also be used when appropriate.
- Where applicable, a “milk run” collection system will be used where several generators’ waste will be commingled on a designated work boat on a routine dedicated schedule of pickup.
- Workboats’ tanks will be pumped off to the Main Pass 299

platform using boat pumps or platform pumps lowered to the boat. Boat sizes will vary in length from 165 to 200 feet in length with slurry volumes using auxiliary tanks of up to 4000 bbls.

2.1.2 Storage and Processing

- At the platform, the waste will be transferred from the transportation vessel to temporary (less than 24 hour) storage tanks, directly to the processing equipment, or directly to one of the disposal wells (either cavern or caprock).
- Selected recyclable materials may be removed from the E&P waste prior to disposal using equipment located on the platform. Recycled material will include synthetic drilling fluids or hydrocarbon based material.
- The E&P waste may be sent through a high speed impeller or other type of grinder system and/or slurried with salt water, brine, viscosifier (gel), return liquids from cavern injection, or other liquid E&P waste to enhance the injection process. The final density of the conditioned waste will range from 12 to 16 pounds per gallon (ppg) after conditioning. Brine, with a density of 10 ppg will be the normal conditioning fluid.

2.1.3 Disposal

- E&P waste will be disposed of in to the salt caverns associated with Brine Well Nos. BR-01, BR-03-A and BR-05. Waste will also be disposed into the caprock formation through a series of ten caprock wells. The waste will be pumped from storage tanks, processing equipment, or directly from transportation vessels to the salt cavern injection wells or to the caprock wells.
- The surface injection pressure and volumes of wastes will be monitored and regulated so that the well integrity pressure of the salt cavern, or caprock fracture pressure will not be exceeded by the injection process.
- The surface injection pressure for the cavern will be limited to less than a gradient of 0.624 psi/ft of depth below the water line. The volume of the waste will be a maximum of 12 bbls/min. The maximum fracture pressure gradient is estimated to be 0.95 psi/ft.
- All topside transfer lines and the cavern well and caprock well injection strings will be flushed with brine on a regular basis. Provisions will be made to allow pigging of the lines if necessary to remove any accumulated solids in horizontal pipelines.
- The three caverns each have different gross capacity from

each other. Cavern BR-01 has a nominal capacity of 16.9 million barrels, Cavern BR-03-A has a nominal capacity of 15.3 million barrels and Cavern BR-05 has a nominal capacity of 2.9 million barrels.

- The disposal volume of waste to fill the above capacity is estimated at 105 million bbls for BR-01, 96 million bbls for BR-03-A and 18 million bbls for BR-05 to fill the cavern with solids, therefore the total volume of waste placed is higher than the gross volume of the cavern.
- Cavern BR-05 may be expanded to 6 million barrels before waste disposal begins.
- Future plans for the facility include the possibility of solution mining new additional cavern (s).

These volumes were estimated based on analysis of typical wastes streams that yield approximately 16% solids, 7% hydrocarbon and 77% water (fluids).

2.2 Facility Layout

The Main Pass 299 platform was constructed to support the development and production of sulphur and oil and gas resources present in the caprock formation above the Main Pass 299 salt dome structure. Sulphur production was discontinued in August 2000. Oil and gas resources are still being produced from the Main Pass 299 block.

The platform was designed to maximize the production of both sulphur and oil and gas resources. New equipment to support waste disposal activity will be installed on the platform. The plan view of the platform complex is attached in Figure 1. Both drilling platform (PP1 and PP2) may be used to support the waste disposal activity. The Plan View of PP2 is shown on Figures 2 & 3. A typical cross-section view of the receiving platform is shown on Figure 4, which illustrates the two decks on the platform.

2.3 Process Descriptions

Various operations and processes will be utilized at the Main Pass 299 location to implement the waste management activities. Additional processes occur at the onshore transfer locations that will in part support the Main Pass project. Two of the onshore facilities which are located at Port Fourchon, Louisiana and Berwick (Morgan City), Louisiana have been reviewed and permitted by the Louisiana Department of Natural Resources in conformance with state rules and regulations for at 43 LAC Section 501 et. seq. and the permit at Venice, Louisiana is pending: Copies of the existing permits are included as Attachment 6. The processes performed at these locations include receipt of cutting boxes and MPT tanks and slurried drilling fluids in larger boat tanks. The boxes and tanks are received and unloaded, reloaded on boats, dumped, rinsed and washed, all in a manner as described below. These are essentially the same processes to be included at Main Pass.

Once the boxes or tanks are received (or pumped off), the material is placed in a large receiving barge and the boxes and tanks are rinsed and cleaned of material. Each receipt of waste are recorded on forms acceptable to the state and records are provided to the state on a monthly basis. A similar approach is described below for the Main Pass project.

Recycling of selected wastes streams may be undertaken at the Main Pass location. The recycling will occur at the same location as the waste receipt (on platform PP1 or PP2). The recycling will consist of removing synthetic drilling fluids or free hydrocarbons from the cuttings/waste streams after they are unloaded onto the platform. The equipment may include either horizontal or vertical centrifuges to remove the fluids from the cuttings and clarifiers / filters to recondition the fluids once they are recovered. The reconditioned fluids are resold to operators for other drilling activity. In addition, accumulated hydrocarbons captured in the cavern are also reclaimed periodically using the oil blanket annulus pathway.

The various specific process flow diagrams are described below and illustrated on the attached process flow diagrams.

Drawing No. 00-99-0034: Brine Well BR-01-A Flow Diagram

Only water based cuttings will be collected in the platform storage units for disposal into Cavern BR-01-A. The wastes will be de-watered to remove excess fluids. They will then be re-slurried with brine, pumped through the surface piping and wellhead, and injected into the BR-01-A cavity. Brine returns from the well will be collected for use in re-slurrying of additional waste, sales or other uses. The excess brine will be disposed of by injection into the caprock formation. The fluids removed during the initial de-watering process will be disposed of by injection into the caprock formation.

Drawing No. 00-99-0035: Brine Well BR-03-A Flow Diagram

Water, oil and synthetic based cuttings and other E&P waste will be collected in the platform storage units for disposal into Cavern BR-03-A. The wastes will be processed and slurried, pumped through the surface piping and wellhead, and injected into BR-03-A cavity. Brine returns from the well will be collected for use in re-slurrying of additional waste, sales or other uses. The excess brine will be disposed of by injection into the caprock formation. Any fluids removed during the initial processing may be disposed of by injection into the caprock formation.

Drawing No. 00-99-0036: Brine Well BR-05-A Flow Diagram

Water, oil and synthetic based cuttings and other E&P waste will be collected in the platform storage units for disposal into Cavern BR-05-A.

The wastes will be processed and slurried, pumped through the surface piping and wellhead, and injected into BR-05-A cavity. Brine returns from the well will be collected for use in re-slurrying of additional waste, sales or other uses. The excess brine will be disposed of by injection into the caprock formation. Any fluids removed during the initial processing may be disposed of by injection into the caprock formation.

Drawing No. 00-99-0037: Cleaning Process Flow Diagram

Water or brine mixed with soaps or other cleaning chemicals will be used for cleaning vessels and equipment. The unit to be cleaned will be brought to the cleaning basin and washed out with the cleaning solution. The dirty water and sludge from the cleaning process will be collected and pumped through the surface piping and wellhead and into either a caprock well or an appropriate cavern. Any brine returns will be collected for use in cleaning solution make-up, sales or other uses. Excess brine will be disposed of by injection into the caprock formation.

Drawing No. 00-99-0038: Caprock Disposal Flow Diagram

Water, oil and synthetic based cuttings and other E&P waste will be collected in the platform storage units for injection into the caprock formation. The wastes will be processed, slurried and pumped through the surface piping and caprock injection wellhead and into caprock. No returns will be taken at the surface. Any fluids removed during the processing may also be disposed of by injection into the caprock formation.

Drawing No. 00-99-0039: Brine Production Sales and Site Use Flow Diagram

Waste slurry for disposal (or seawater for brine production) is injected into a brine well cavity. Brine from the cavity returns to the surface and is collected in tanks on the platform to be distributed to one of the following possible uses:

- Use for slurrying of cuttings and waste for disposal into a brine well (or caprock)
- Treatment for brine sales
- Inject into caprock for mine pressure maintenance
- Use on site for well control, killing wells or drilling and completion fluids
- Miscellaneous other potential on site uses.

Brine used for slurrying of waste that is re-injected into a brine well (or sea water injected into a brine well) will produce more brine to continue the brine production and use cycle.

2.3.1 Receipt and Unloading Procedures

Waste will arrive at the Main Pass 299 location by boat or self propelled barge (SPB). Boats will transfer the waste either in bulk slurried form contained in large boat tanks or contained in 25barrel cutting boxes or MPT tanks. Depending on the size of the individual boat which can vary in size from 165 foot to 200 foot work boats, the tank capacities can vary between 1500 and 4000 bbl. Total vessel capacity can be up to 5000 bbls.

Boats arriving with cutting boxes and tanks will tie up to the platform in preparation for unloading. The platform crane will be used to lift each box or tank to the top deck of the platform where the box/tank will be disconnected from the crane sling and moved to the box/tank unloading area. The crane sling is removed to and re-attached to an empty box or tank for return to the boat deck.

Boats arriving with bulk slurried waste will also be tied up to the platform in a similar manner as boats described above. Once secured, the platform crane will lower an auxiliary skid mounted pumping unit to the boat deck. The auxiliary unit will be connected to the boat pumps normally used to pump out the boat tanks. The auxiliary unit acts as a booster pump to pump the slurried waste from the boat deck to the top deck of the platform. The waste is then directed into either the operational cavern or into the caprock through the appropriate caprock well.

Specific procedures which have been developed include:
TFS-Standard Operating Procedures

- Offloading MPT (Marine Portable Tanks) and cuttings boxes off of transporter (boat deck, truck decks) for land, dockside and offshore locations.
- Transferring via hose from vessel to dockside, dockside to vessel, vessel to platform
- Personal protective equipment policy

TFS JSEA

- TFS - Forklift
- TFS - Crane Operations
- TFS - Boarding Vessels
- TFS - Transferring of material via hose

2.3.2 Loading Procedures

Boats arriving at the platform with cutting boxes or tanks generally will return to the rig or shore base with cleaned and rinsed boxes ready for filling. Empty boxes/tanks will be placed back on the boat using the platform crane. After the crane has lifted a full box or tank to the top deck, the box/tank will be disconnected from the crane and the line connected to an empty box or tank. The box is then lowered to the boat deck and the line connected to a new loaded box or tank ready for lifting to the top deck.

Each cutting box or tank has a standard volume of approximately 25 barrels of capacity. The density of the waste can vary between 9 and 20 pounds per gallon as received. The lower weight material contains very low concentrations of solids and the higher weight materials are generally special fluids with high weighting additives. The more normal weight will vary between 12 and 16 pounds per gallon (ppg) as received. After the waste streams are slurried, the weight will drop somewhat because of the addition of slurrying brine but the range of conditioned waste is still estimated as between 12 and 16 ppg prior to injection.

The loading/unloading cycle is somewhat dependant on the weight of a full box and sea conditions. The estimated cycle time is 20 minutes for unloading a full box and loading an empty box back on the boat deck. At this cycle rate, approximately 1.3 million barrels of waste per platform can be unloaded on an annual basis based on a 24 hour per day, 7 day per week working schedule. Higher annual volumes are possible using bulk slurry unloading procedures and/or utilizing the second platform for managing waste receipt.

2.3.3 Box/Tank Emptying

As previously described, boxes and tanks of 25 bbl capacity will be unloaded from the boat deck and lifted to the top deck of the platform. Once the crane line is disconnected from the box/tank, the container is moved by forklift to the processing area. The processing area is covered to prevent the elements impacting operations and is underlain by a steel drip pan to prevent any spills or leaks from escaping into the Gulf Waters. The drip pan is sloped in such a manner as to run into the suspended receiving pit. Figure 2 is attached which illustrates in plan view this emptying location.

The boxes or tanks are placed in a cradle that hydraulically clamps the box or tank securely in place. The cradle, which will be placed on a low wheeled trolley, is moved into the covered area for emptying. The cradle is secured to the trolley using a pinned connection that is designed to allow the box to be tipped through an angle of up to 145° so that the contents will come out of the box or tank and can be rinsed. While still tipped in the emptying position, the box/tank is rinsed with a high pressure water stream. The wash water and contained waste goes into the receiving pit.

After emptying, the box is tipped back into its original position and the box moved out of the processing area. The box is placed in the storage area after it is removed from the processing area. The box/tank storage areas are illustrated on Figure 2.

2.3.4 Box/Tank Cleaning

Boxes and tanks will be rinsed after the waste material has been removed from the box/tank. The rinsing will be performed using a high pressure water wand that will be inserted into the box or tank during the emptying process. The excess material removed by the high pressure rinsing will be directed into the receiving pit suspended below the top deck. This material will be incorporated into the other portions of the waste, slurried and then pumped into the cavern or caprock.

After rinsing, the box or tank will be inspected to insure that the rinsing was effective. If not, the process will be repeated until the results are satisfactory. Cleaning agents containing surfactants, alcohol or other material may be used in rinsing or final cleaning. The amount of agents used will be small compared to the volume of wash water. After a particular client's waste project is complete and the boxes or tanks are ready to be released from service, the boxes or tanks will be final rinsed and cleaned. The material removed from the tank during this process will be combined with other waste streams for disposal.

2.3.5 Box/Tank Storage

Rinsed and cleaned boxes and tanks will be temporarily stored on the top deck in designated box and tank storage areas. Boxes and tanks will be moved as necessary using fork lifts to maneuver the boxes and tanks. A limited inventory of boxes or tanks will be maintained on the platform in order to maximize receiving capabilities of full boxes and tanks. The storage area is illustrated on Figure 2.

2.3.6 Waste Slurry and Pumping

Waste streams will be received at the Main Pass location via boxes and tanks and in bulk slurry form. As described previously, waste received in boxes and tanks will be emptied from the boxes or tanks and then will be slurried prior to pumping into the cavern or caprock formations.

The slurry will be formed by mixing the waste with brine that is obtained either from the brine well or brine that is displaced from the active disposal cavern. The brine is generally saturated with a density of approximately 10 ppg. It is anticipated that up to a 1:1 ratio of brine to waste will be used in the slurrying process. The brine will be added to the waste streams in the receiving pit to facilitate movement of the wastes to the slurry (mixing) tank. The waste and brine co-mingled into a homogeneous mixture in this tank by using gun lines to circulate the material and using agitators/mixers where necessary. The slurried waste may be temporarily stored in tanks before injection if necessary. Temporary storage will be less than 24 hours: The final slurry density is expected to vary between 12 and 16 ppg.

Experience at other Trinity sites indicates that a typical waste stream will contain approximately 16 percent solids, 7 percent hydrocarbons (oil) and about 77 percent fluids. This is considered representative of OCS waste streams that will be managed at Main Pass 299. After the brine is added to the waste, the slurry will contain about 8 percent solids by volume and the hydrocarbon about 3.5 percent on a volumetric basis if the 1:1 ratio is used on a waste stream by waste stream basis, these percentages may vary depending on initial solid or hydrocarbon content. Table 2-1 is attached which estimates the annual amounts of solids, fluids and hydrocarbons to be received at the site prior to conditioning. The various specific waste types from which the solids, fluids and hydrocarbons are derived are also in the table.

Slurried waste may be temporarily stored on the platform if there are equipment problems that would disrupt pumping. Redundant critical equipment will be available to minimize storage time. It is anticipated that less than 24 hours of storage time will be necessary on the platform.

After the slurry has been formed, it will be pumped into the cavern. The pumping system can inject E&P waste into the cavern and caprock at a rate of 12 bbls/min. The maximum injection pressure will be limited depending on fracture pressure of the formation. A discussion of fracture pressure is provided below.

2.3.6.1 Salt Cavern Pressures

The stress state that produces fracture in a salt dome is primarily dependent on the rate of pressurization and the configuration of the opening in which pressurization is occurring. Fracture (if it occurs) occurs on the walls of the bore hole or cavern. A rapid pressure rate increase such as an mechanical integrity test (MIT) will cause the salt to react nearly elastically and if the fracture pressure is exceeded, the salt will fracture. A slow build up of pressure over time such as occurs in cavern fluid after cavern closure will cause the salt to act in a more ductile manner, allowing brine permeation into the grain boundaries of the salt as opposed to fracturing. The shape of the cavern (cylindrical versus spherical for example) can affect strength limits in regard to fracturing. Other factors contribute to the pressure that produces fracture. However, rate of pressurization and geometry of the opening being pressurized are the two most important factors.

The pressure that produces a fracture in a borehole in a salt dome in the Gulf Coast is generally equal to the vertical stress resulting from the weight of the material above the location of the fracture plus some measure of the salt tensile strength. The weight of salt is about 135 pounds per cubic foot producing a vertical stress of about 0.94 psi/foot of depth. The tensile strength of salt in hydraulic fracture is about 200 psi. If we assume 200' of seawater as at MP 299, 1,375' of 0.870 psi/ft sands & shales; 200' of 0.924 psi/ft caprock overlying the salt; 400' of salt at 135 ppcf or 0.94 psi/ft, plus salt tensile strength factor of 200psi/2400' - salt's fracture gradient at 2400'ss at MP 299 calculates to be 0.950 psi/ft. The fracture bottom hole pressure (BHP) at the top of the MP 299 salt caverns are:

- Cavern #1: not applicable because this cavern is in communication with Caprock

- Cavern #3: Top of Cavern at 2,065'ss X 0.950 psi/ft = 1,962 psi BHP
- Cavern #5: Top of Cavern at 2,216'ss X 0.950 psi/ft = 2,105 psi BHP

Onshoreregulations prohibit pressuring waste disposal caverns higher than 0.8 psi/ft. If bottom hole injection pressure exceeded the fracture gradients listed above one could assume that fracturing is occurring. Operating procedures will limit cavern injection pressures well below the fracture level.

2.3.6.2 Caprock Pressures

The fracture gradient in a salt dome caprock can be highly variable. Some portions of a salt dome caprock cannot be fractured simply because they are so permeable (100 darcies) in barren caprock at MP 299 that it is essentially impossible to pump at a rate to reach fracture pressure. Based on cement squeeze experience in upper caprock that can, in some areas, have an initial dense section, the fracture gradient is generally considered to be 12 ppg equivalent or 0.624 psi/ft. Continuous mine pressure readings in caprock are available from a pressure monitoring well. Mine pressure in caprock is maintained by fluid injection at a BHP range of 865-870 psi or 0.535 psi/ft based on pressure instrument depth of 1,624'ss. In order for Caprock to fracture, mine pressure would have to be raised from the present 867 psi BHP to (1,624' X 0.624 psi/ft) 1,014 psi BHP, an increase of 147 psi. Considering the huge volume of Caprock porosity (2.6 billion bbls in barren and leached caprock), it would be difficult to achieve this pressure increase if one desired to. This event is virtually impossible to occur by accident with the pressure monitoring facilities and operating procedures that are in place. If fracturing of caprock and leakage of fluid upward through the overlying sands and shales did occur, evidence of this would be picked up on temperature surveys above caprock.

2.3.7 Brine Storage and Disposal

Brine is displaced from the caverns when waste is injected into the cavern. The brine is returned to the top of the platform where a portion is stored for use in the slurrying process. Excess brine (brine not needed for slurrying) is either sold as a drilling fluid component or is disposed in the caprock as a replacement fluid for the seawater currently used to maintain mine pressure in the caprock.

The quality of brine displaced from the brine is measured and recorded. If the brine will be sold, then analytical tests are performed to assure that customer specification are met. Brine for slurring or re-injection into the caprock is not analyzed other than recording quantity, temperature and density.

3. SAMPLING AND TESTING PROCEDURES

3.1 Sampling Procedures

Sampling and testing of incoming material will be done before disposal into cavern or cap rock is allowed. A sample of product being shipped to MPM for disposal will be provided by the generator and will accompany the material. After an initial sample is tested, other samples may be drawn from containers to monitor the waste stream. If during disposal operations, a change in product is noted (i.e. color, content etc) processing will cease and new sampling and testing will be done. If the product differs due to test results, the job will be stopped and generator will be contacted. Re-commencement of operations will be determined on a case by case basis.

3.2 Testing Procedures

After the vessel is secured:

- Manifest and sample of product (sample is sent from shipping location with load) are sent to platform;
- Paper work is examined to assure correctness;
- Sample is sent to on site testing lab

Lab technician will perform the following tests:

3.2.1 Ph – determines corrosivity of product. Data is used as a guideline in choice of personal protective equipment

- ❑ Using electronic measuring-
  - Run self calibration test on unit, insert test probe into sample, run test and record reading.
- ❑ Using test paper (color change)-
  - Dip test strip into sample, when strip has changed color compare strip to chart and record reading.

3.2.2 Chloride concentration – determines salinity of product. Data is used to determine amount of brine needed for processing and as a guideline in choice of personal protective equipment.

- ❑ Using a approved beaker,
  - Place 100 ml of distilled water in beaker
  - Add 8-10 drops form a pipette containing potassium chromate
  - Using a chemical resistant syringe, add .05cc of sample to beaker
  - Fill a 10ml pipette with silver nitrate
  - Place beaker on magnetic stirring unit and place on low speed
  - As sample is stirred, slowly add drops of silver nitrate from 10ml pipette until you observe a color change (from orange to white)
  - Check the scale on side of pipette to determine the amount of drops used to produce color change
  - Match this number to *standard chloride chart,* the number to right of matched number is your chloride reading.
  - Record result

3.2.3 Conductivity – relates to chloride testing. Data used by regulatory agencies and clients to monitor well conditions through waste streams.

- ❑ Using a electronic conductivity measuring device
  - Calibrate unit

- Place probe into sample
- Observe reading on unit
- Compare reading to standard conductivity chart to get final reading
- Record result

3.2.4 H_2S concentration – determine presence and amount of hydrogen sulfide gas in product. Data is used as guideline in choice of personal protective equipment.

- Using electronic hydrogen sulfide meter-
  - Calibrate unit
  - Place sample in testing device
  - When meter has run cycle observe reading
  - Record reading

3.2.5 NORM survey – to determine presence and level of naturally occurring radioactive material (NORM) in product. Data is used to determine if material is acceptable (<30 Pico curries/gram) and to act as a guideline in choice of personal protective equipment.

- Using approved testing device
  - Calibrate unit
  - Record background readings
  - Place sample in testing unit
  - Run test
  - Record result

3.2.6 TVOC scan (total volatile organic compound) – determine presence of potentially hazardous compounds in product. Data is used by state and federal agencies to monitor material and serve as a guideline in choice of personal protective equipment.

- Using approved TVOC meter
  - Calibrate unit
  - Place sample in testing unit
  - Run testing sequence
  - Record results

This test is essentially the same test as used to determine the presence of BTEX. A different test protocol is used to quantitatively analyze BTEX.

3.2.7 Retort (oil, solid, water separation) – determine amounts of each that are present in product. Data is used to monitor activity in cavern.

- Using a standard retort oven
  - Change (if needed) filter media (steel wool) in upper condenser cup
  - Fill the 20ml (lower) cup of the condenser with sample
  - Put high temperature tread lube on lower cup treads and screw it into upper cup
  - Place condenser unit into oven and close cover
  - Place a 100ml scaled test tube under lower cup drip port (part of

cup that is exposed from oven)
  - Turn on retort oven, light will go while unit is operating and will go off when test is complete (30 minutes)
  - When unit has turned off remove test tube, read findings
    - Water will be on bottom of test tube, record number on beaker (test tube) as percent
    - Oil will form a layer over water, record reading from the point oil contacts water to the point that oil stops, record as percent
    - Air space above oil layer to the 100 mark of sample beaker is solids area, observe point that oil stops to the 100 mark and record as percent
  - Record results

3.2.8 **Temperature** – determine temperature at time of sampling. Used in conjunction with conductivity test results.

- ❑ Insert temperature probe into sample and record results

3.2.9 **Mud weight** – determine weight of product. Data is used in slurry mix calculations.

- ❑ Using standard balance beam scale
  - Fill cup on end of balance beam with sample
  - Place beam on pivot point
  - Slide counter weight (opposite end of beam from sample cup) until the bubble in level (located on top of beam, above pivot point) is in center position
  - Observe number which is lined up under counter weight, this is the sample weight
  - Record reading as pounds per gallon

Results of testing will be sent to the operations manager, results will be used in the planning of job task, and will be recorded in task package.

Samples are labeled and placed in storage for a period of thirty days. After thirty days they are properly disposed of.

4. RECORD KEEPING AND DOCUMENTATION PROCEDURES

Various types of records will be developed and maintained at the Main Pass location. Additionally, documentation of various procedures will be made. Retentiontimes for various records are dictated by state or federal regulations. All records will be retained to comply with La DNR and MMS regulations.

4.1 Record Keeping

Record of various activities will be made at the Main Pass location. These records will include the following:

- Records of waste shipments received
- Records of vessel names or ID
- Quantity and type of waste received
- Analytical test results and equipment calibration
- Quantity of brine used for slurry
- Quantity of brine returned from caverns
- Quantity of brine re-injected
- Quantity of waste slurried
- Quantity of slurry injected (cavern)
- Quantity of slurry injected (caprock)
- Density of slurry injected (cavern)
- Density of slurry injected (caprock)
- Well head pressure of injection tube (cavern)
- Well head pressure of injection tube (caprock)
- Well head pressure of brine return annulus
- Well head pressure of blanket control annulus
- Temperature of return brine
- Temperature of formation above caprock
- Well head inspection
- Monitoring equipment inspection and calibration
- Meter inspection and calibration
- Accidents
- Fire
- Explosions

Other records may be developed as operations make it prudent to do so. Certain records are recorded on state of federal mandated forms. Any records required to be on dedicated forms such as manifest records, receipt records, etc. will be maintained in the correct format.

4.2 Documentation Procedures

The location manager on duty is responsible for obtaining and recording the information required in the records program. In some cases, the original source of the information will be written records such as lab test results and summaries. In other cases, it is anticipated that electronic equipment will record the information such as well head injection pressure. These data will be summarized and entered into an injection report summary. These summary reports will also be entered into an electronic database (web based) that allows for immediate review at remote locations. Portions of the database may be available for MMS review.

All records and data will be available for review and inspection at the Main Pass location. The records will be maintained for a minimum of three years prior to archiving.

4.3 Records Retention

All records developed during the operations of the Main Pass disposal facility will be retained at the facility in paper form for a minimum of three years after operations cease or as long as the platform is in place whichever is the longer period. A companion set of records will be maintained at Trinity Field Services, L.P. headquarters in Houston, Texas. If regulatory requirements for document retention changes then these changes will be incorporated into the retention policy.

The records destructions policy will be that records older than five years or older than regulatory requirements will be routinely destroyed. Exceptions to the policy will include operational data on the caverns and caprock which may be retained for a longer period of time.

FIGURES

FIGURE 1
Plan View of MPM Complex

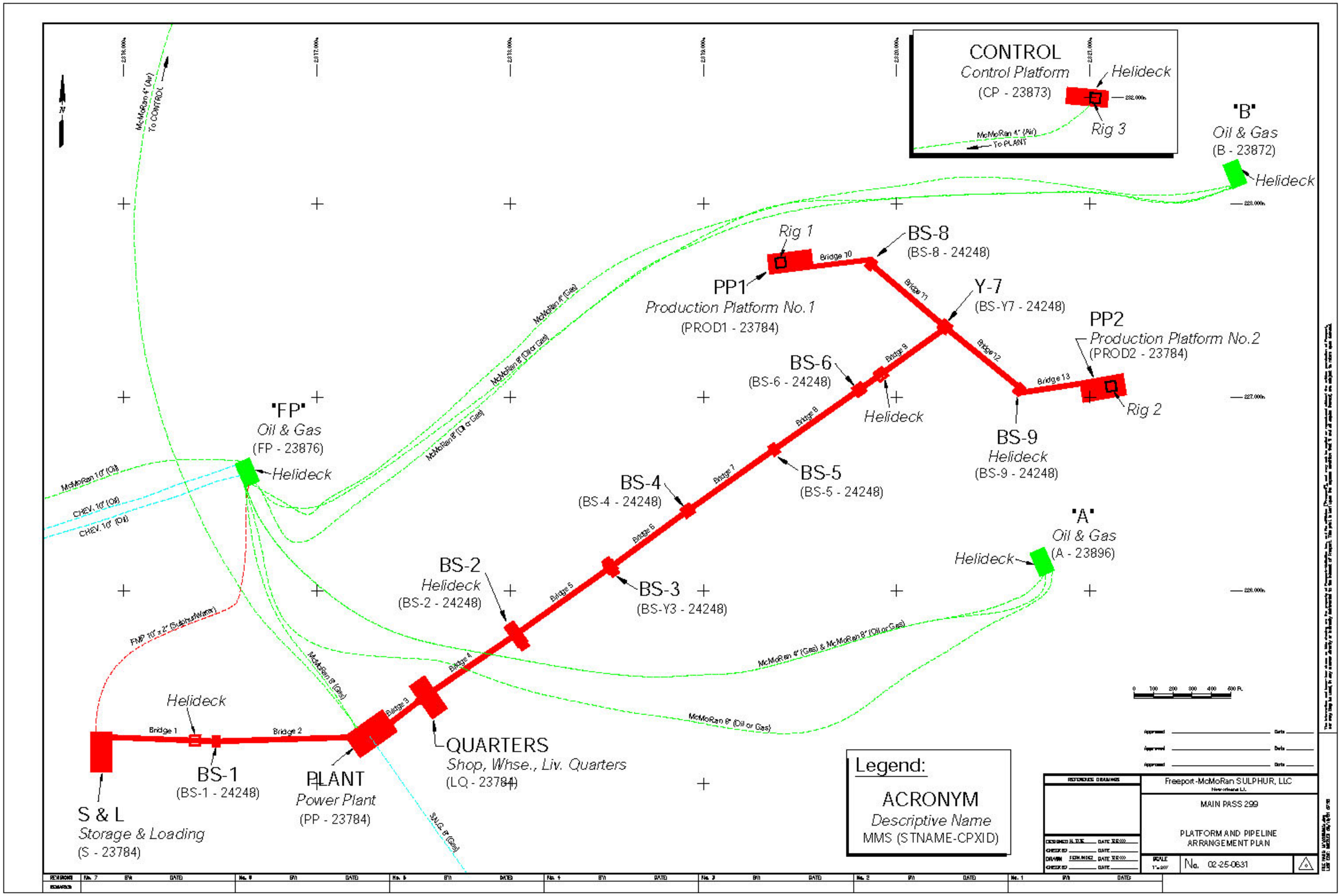


Figure 1 - Plan View of MPM Complex

FIGURE 2
Plan View of Top Deck – PP2

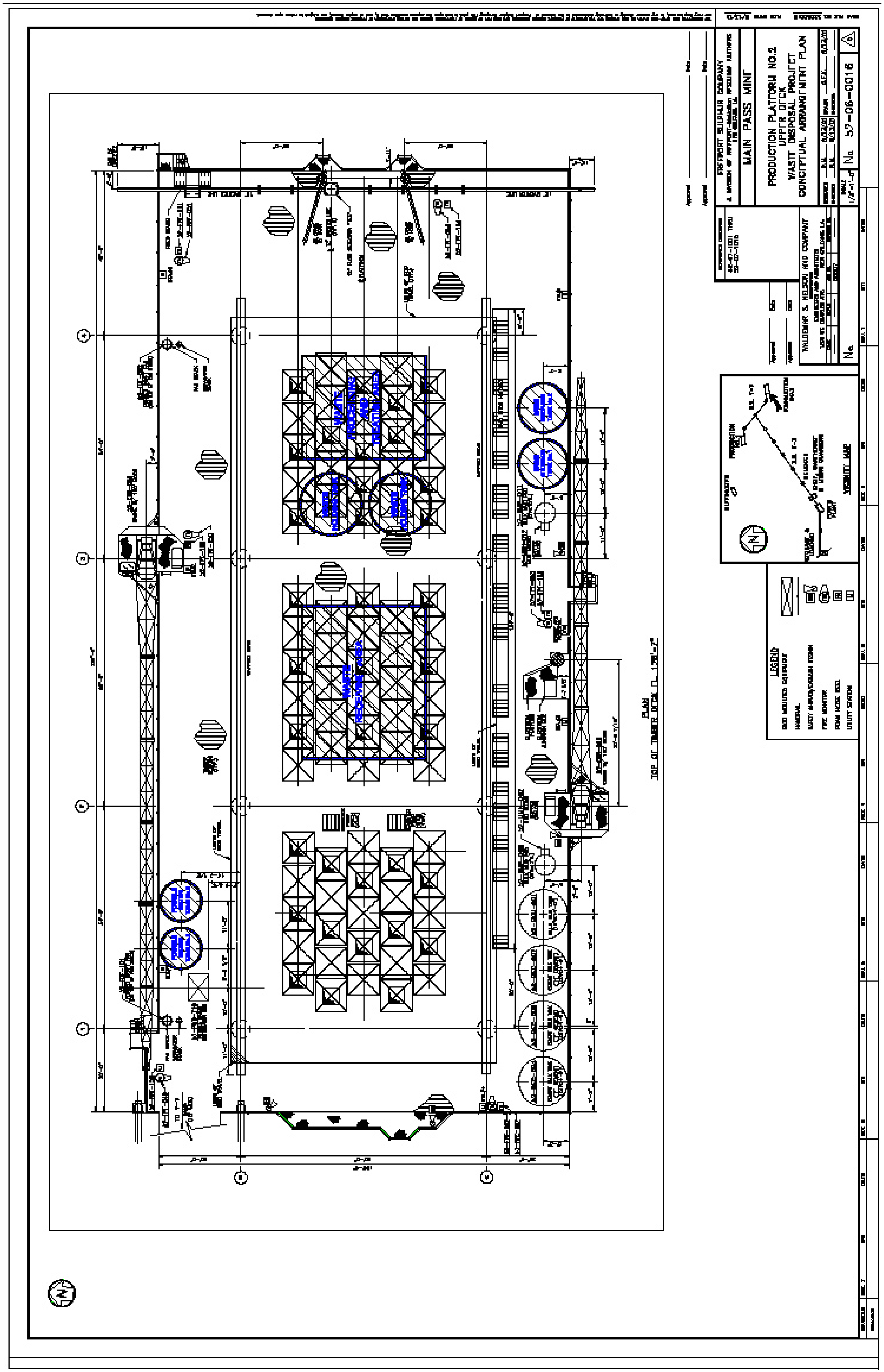


Figure 2 - Plan View of Top Deck - PP2

FIGURE 3
Plan View of Second Deck – PP2

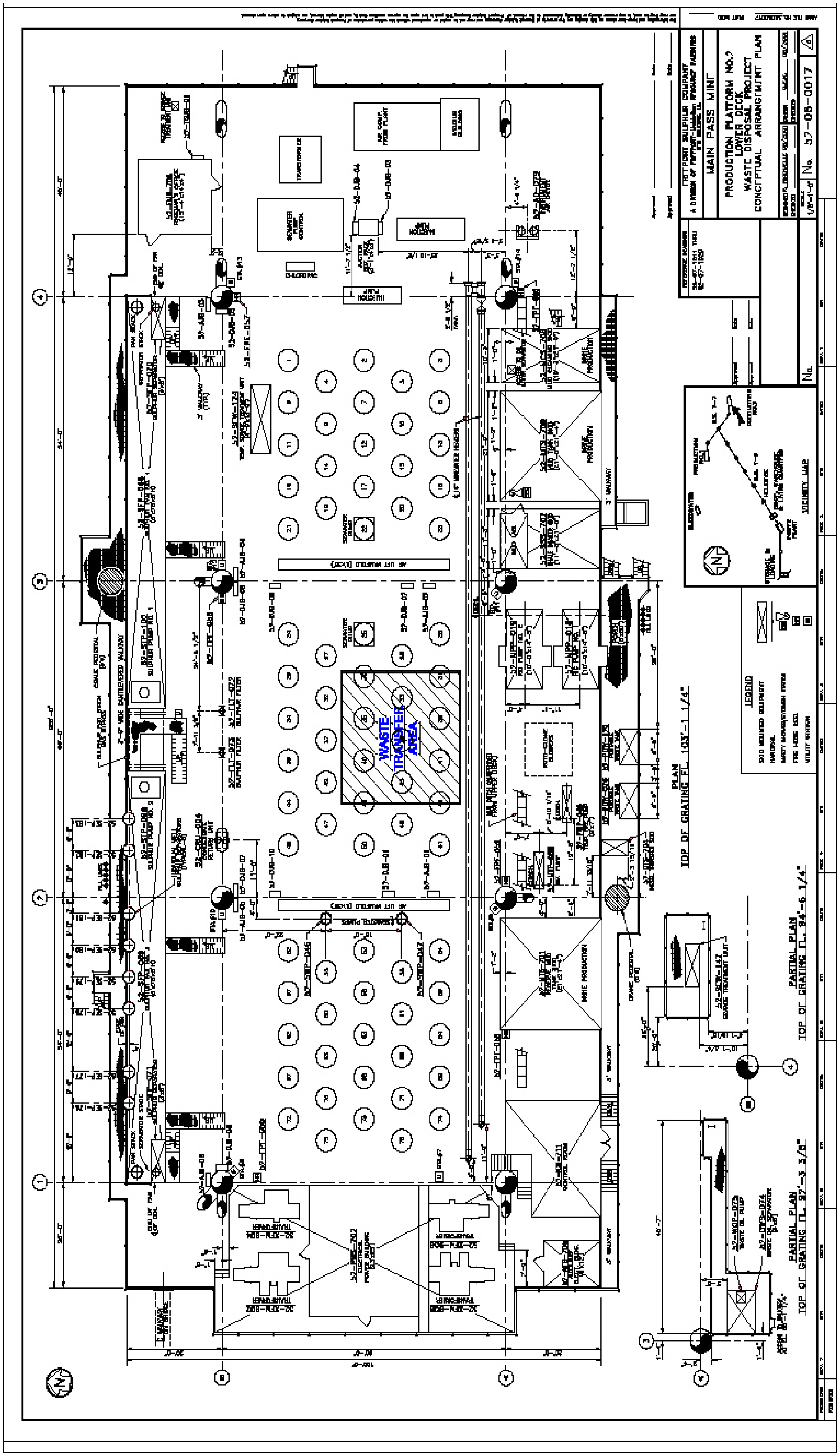


Figure 3 - Plan View of Second Deck - PP2

FIGURE 4
Cross Section – PP2

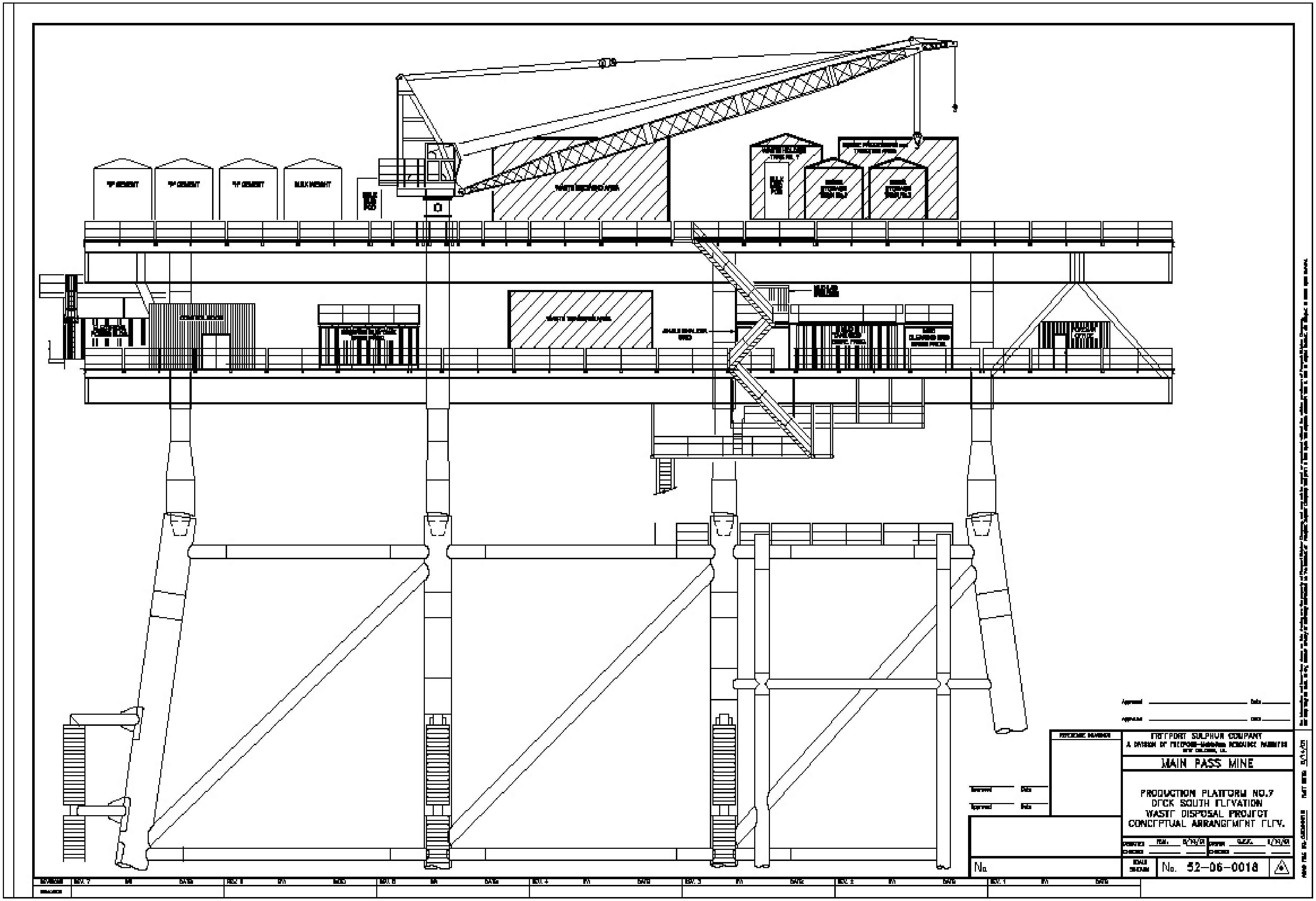


Figure 4 - Cross Section - PP2

FIGURE 5
BR-01A Flow Diagram

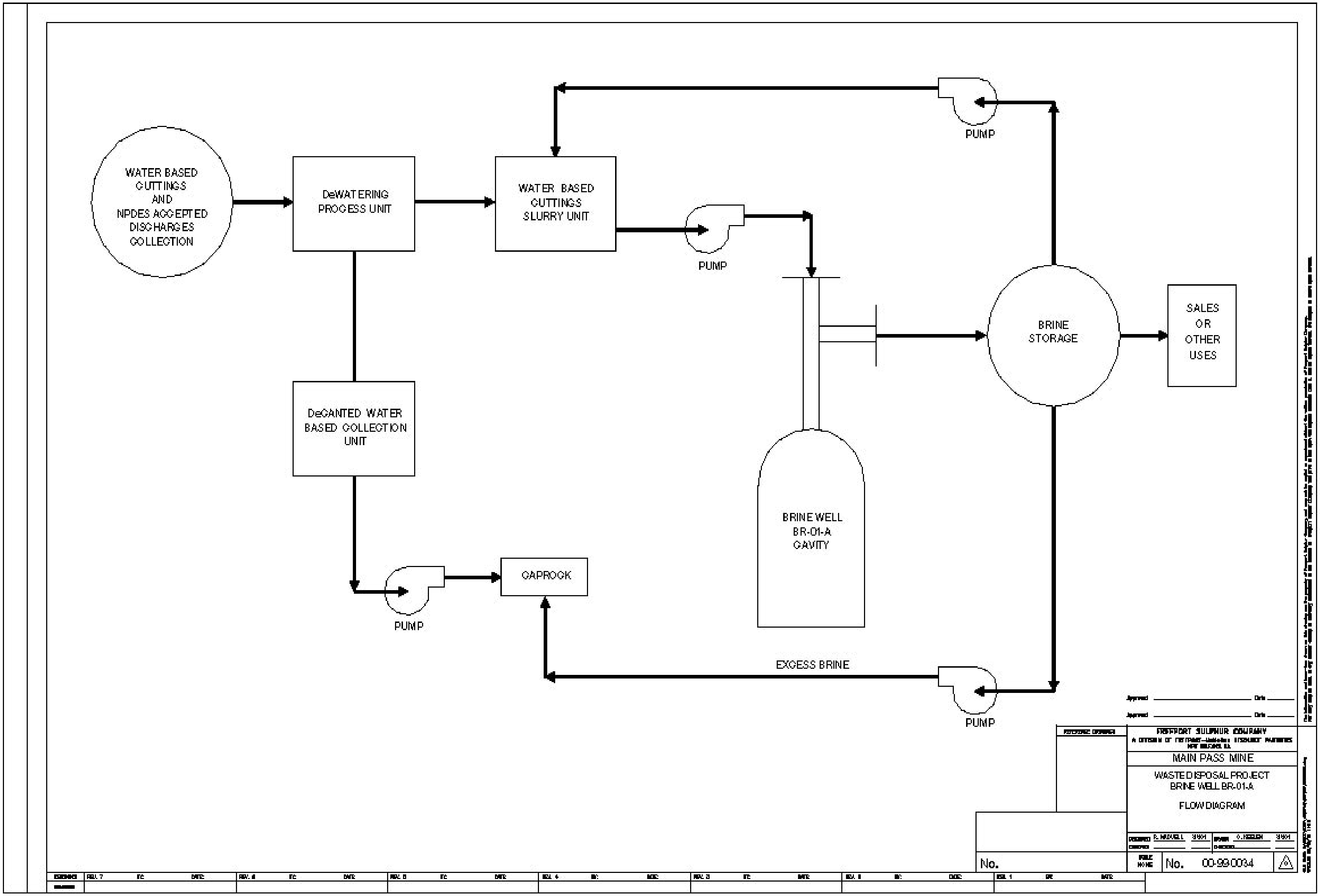

WATER BASED CUTTINGS AND NPDES ACCEPTED DISCHARGES COLLECTION
DeWATERING PROCESS UNIT
WATER BASED CUTTINGS SLURRY UNIT
DeCANTED WATER BASED COLLECTION UNIT
PUMP
PUMP
PUMP
PUMP
CAPROCK
BRINE WELL BR-01-A CAVITY
EXCESS BRINE
BRINE STORAGE
SALES OR OTHER USES
FREEPORT SULPHUR COMPANY
MAIN PASS MINE
WASTE DISPOSAL PROJECT BRINE WELL BR-01-A
FLOW DIAGRAM
No.
No. 00-99-0034

Figure 5

FIGURE 6
BR-03A Flow Diagram

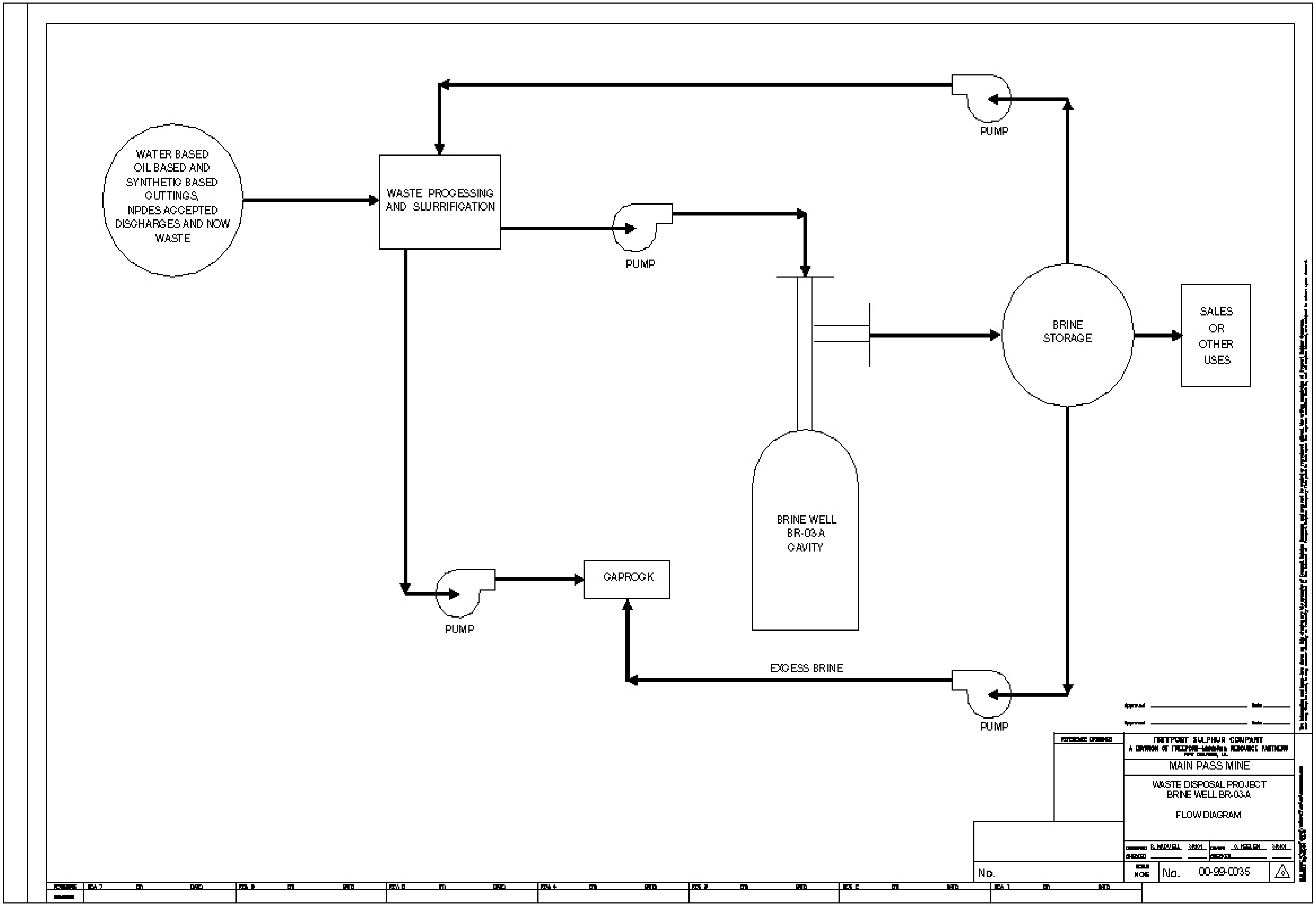

WATER BASED
OIL BASED AND
SYNTHETIC BASED
CUTTINGS,
NPDES ACCEPTED
DISCHARGES AND NOW
WASTE
WASTE PROCESSING
AND SLURRIFICATION
PUMP
PUMP
PUMP
PUMP
CAPROCK
BRINE WELL
BR-03-A
CAVITY
BRINE
STORAGE
SALES
OR
OTHER
USES
EXCESS BRINE
FREEPORT SULPHUR COMPANY
MAIN PASS MINE
WASTE DISPOSAL PROJECT
BRINE WELL BR-03-A
FLOW DIAGRAM
No.
No. 00-99-0035

Figure 6

FIGURE 7
BR-05A Flow Diagram

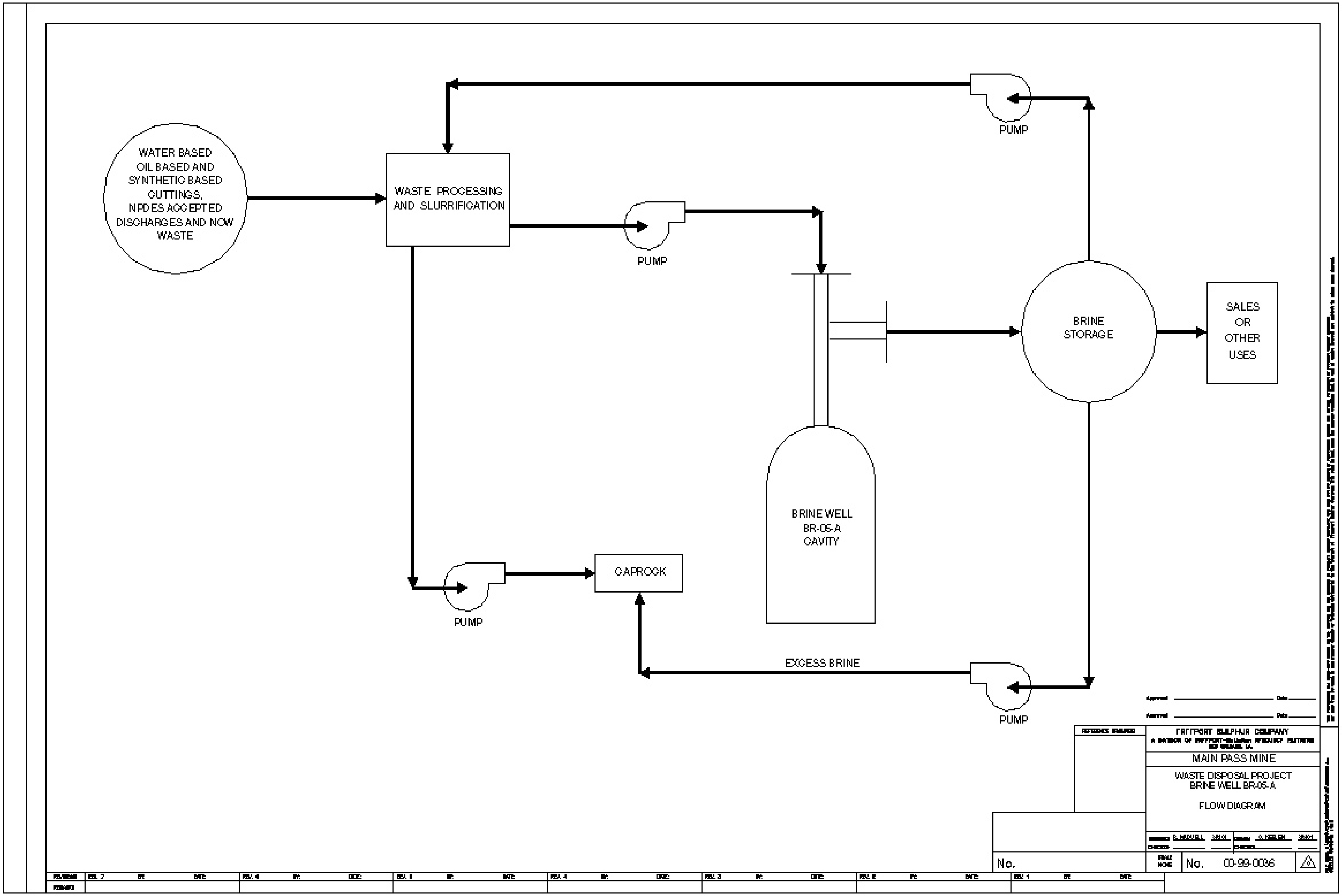

WATER BASED
OIL BASED AND
SYNTHETIC BASED
CUTTINGS,
NPDES ACCEPTED
DISCHARGES AND NOW
WASTE
WASTE PROCESSING
AND SLURRIFICATION
PUMP
PUMP
PUMP
PUMP
CAPROCK
BRINE WELL
BR-05-A
CAVITY
BRINE
STORAGE
SALES
OR
OTHER
USES
EXCESS BRINE
FREEPORT SULPHUR COMPANY
MAIN PASS MINE
WASTE DISPOSAL PROJECT
BRINE WELL BR-05-A
FLOW DIAGRAM
No.
No. 00-99-0036

Figure 7

FIGURE 8
Clean Process Flow Diagram

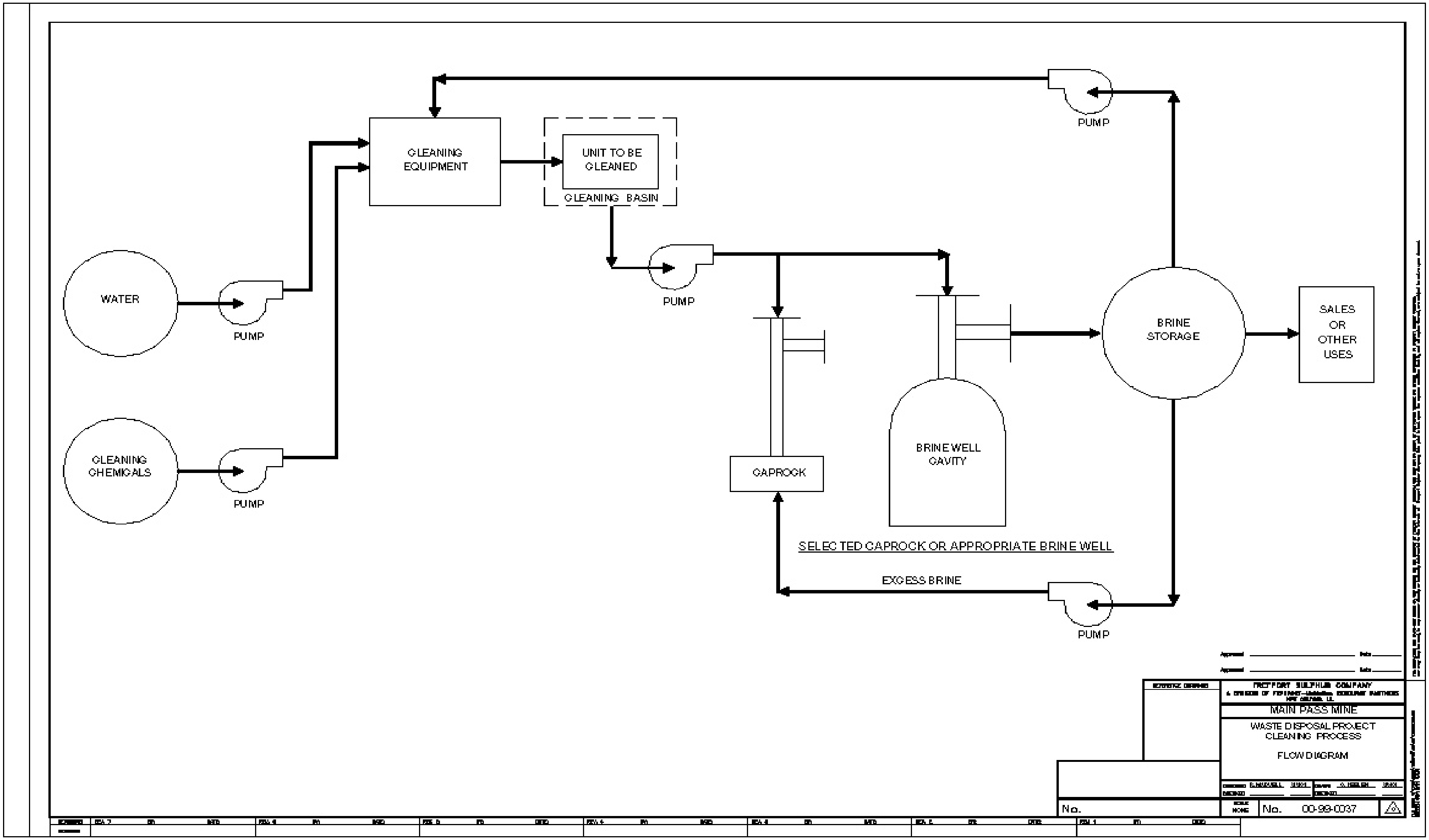

WATER
CLEANING CHEMICALS
PUMP
PUMP
CLEANING EQUIPMENT
UNIT TO BE CLEANED
CLEANING BASIN
PUMP
CAPROCK
BRINE WELL CAVITY
SELECTED CAPROCK OR APPROPRIATE BRINE WELL
EXCESS BRINE
PUMP
BRINE STORAGE
PUMP
SALES OR OTHER USES
FREEPORT SULPHUR COMPANY
MAIN PASS MINE
WASTE DISPOSAL PROJECT
CLEANING PROCESS
FLOW DIAGRAM
No. 00-99-0037

Figure 8

FIGURE 9
Caprock Disposal Flow Diagram

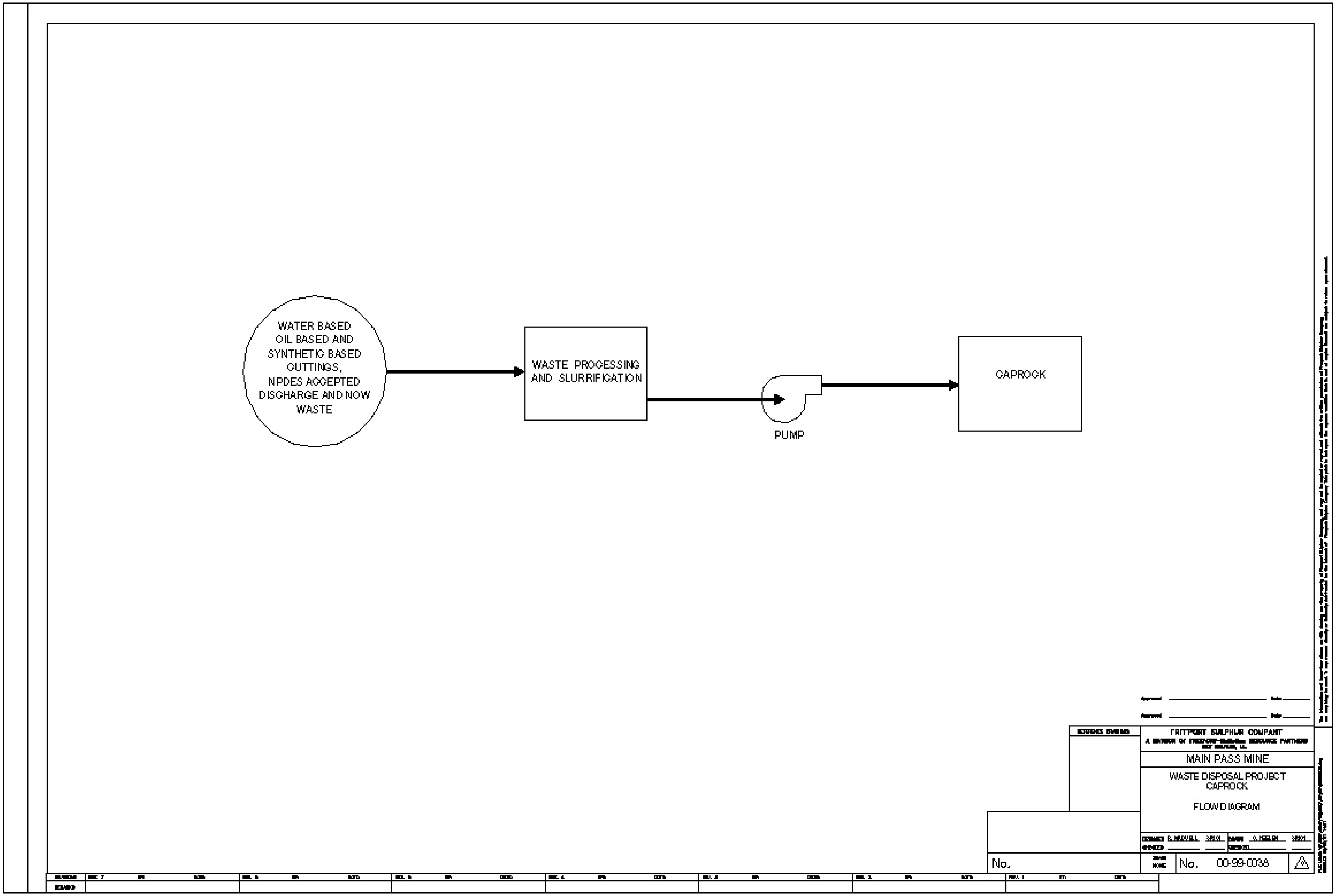

WATER BASED
OIL BASED AND
SYNTHETIC BASED
CUTTINGS,
NPDES ACCEPTED
DISCHARGE AND NOW
WASTE
WASTE PROCESSING
AND SLURRIFICATION
PUMP
CAPROCK
MAIN PASS MINE
WASTE DISPOSAL PROJECT
CAPROCK
FLOW DIAGRAM
No.
No. 00-99-0038

Figure 9

FIGURE 10
Brine Production Sales and Site Use Flow Diagram

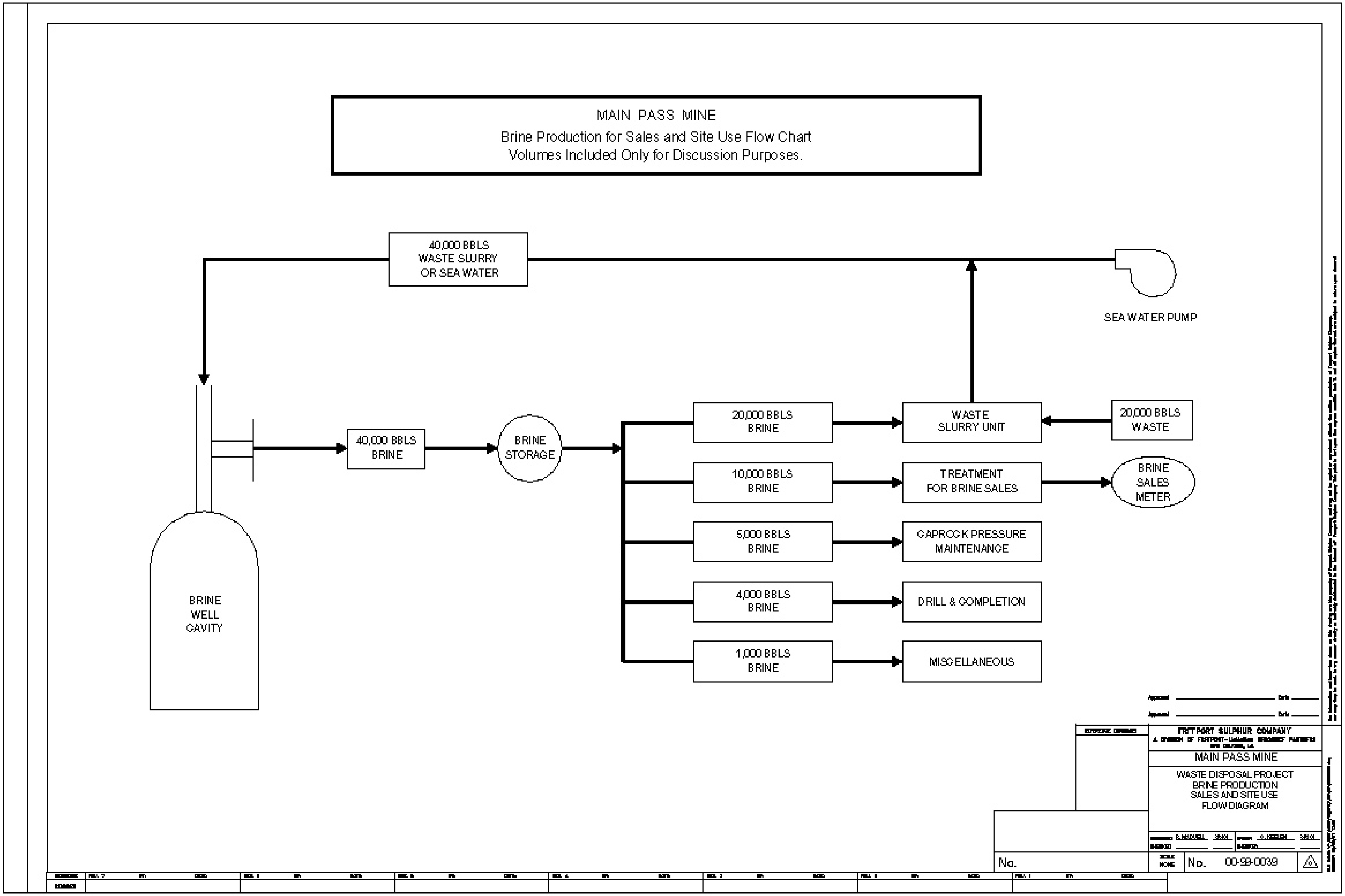

MAIN PASS MINE
Brine Production for Sales and Site Use Flow Chart
Volumes Included Only for Discussion Purposes.
40,000 BBLS
WASTE SLURRY
OR SEA WATER
SEA WATER PUMP
BRINE
WELL
CAVITY
40,000 BBLS
BRINE
BRINE
STORAGE
20,000 BBLS
BRINE
10,000 BBLS
BRINE
5,000 BBLS
BRINE
4,000 BBLS
BRINE
1,000 BBLS
BRINE
WASTE
SLURRY UNIT
TREATMENT
FOR BRINE SALES
CAPROCK PRESSURE
MAINTENANCE
DRILL & COMPLETION
MISCELLANEOUS
20,000 BBLS
WASTE
BRINE
SALES
METER
MAIN PASS MINE
WASTE DISPOSAL PROJECT
BRINE PRODUCTION
SALES AND SITE USE
FLOW DIAGRAM
No.
No. 00-99-0039

Figure 10

ATTACHMENTS

ATTACHMENT 1
Receipt / Handing Forms

Attachment 1
Receipt and Handling Forms

Introduction

The Gulf Coast states, particularly the states of Louisiana and Texas have developed comprehensive regulatory programs to manage E&P waste material. The state of Louisiana has developed a series of receipt and handling forms that will be utilized as well as specific forms that Trinity has adapted or will later develop for the reporting of waste products received and managed at Main Pass. Trinity has permitted and operational transfer station in Louisiana (Morgan City (Berwick) and Fourchon) and one pending permit in Venice, Louisiana. These stations may be used to support the activities at Main Pass. The forms are attached herein that will be utilized at the Main Pass facility.

TRINITY FIELD SERVICES, L.P.

Shipping Control Ticket

For Shipping of Nonhazardous Oilfield Waste

Manifest Number ______

D.T. Number ______

Part 1: **TO BE COMPLETED BY GENERATOR**

Company Name: ______ Phone No: ______

Business Address: ______

Origination of Waste:

Well Name/No: ______ Location: ______

Rig Name/No: ______ Quantity of Waste: ______

Description of Waste: ______

Destination: **TRINITY FIELD SERVICES** ______ **FACILITY**

Date of Shipment: ______

CERTIFICATION: "I certify that the foregoing is true and correct to the best of my knowledge."

______ *Signature of Authorized Agent*

______ *Printed Name of Authorized Agent*

Part 2: **TO BE COMPLETED BY TRANSPORTER**

Transporter's Name: ______ Phone No: ______

Mailing Address: ______ Permit No: ______

Truck Plate No: ______ Trailer Plate No: ______

Boat and/or Barge Name/No. (if applicable): ______

Location of Load Pick up: ______

THE FOLLOWING STATEMENT MUST BE SIGNED BY TRUCK DRIVER/BOAT CAPTAIN PRIOR TO UNLOADING AND OFFLOADING: "I certify that no other material has been placed in this vessel since loading of the material described in Part 1 above."

Date Received: ______

______ *Signature of Transporter's Agent*

Part 3: **TO BE COMPLETED BY TRINITY FIELD SERVICES**

Received at **TRINITY FIELD SERVICES** ______ **FACILITY**

Truck Plate No: ______ Trailer Plate No: ______

Boat and/or Barge Name/No. (if applicable): ______

This is to certify that **TRINITY FIELD SERVICES** has received the above indicated waste and has disposed of it in an authorized manner, at a permitted site.

Date Received: ______

______ *Signature of Authorized Agent*

DISTRIBUTION: Original - Generator's 2nd Copy Yellow - TRINITY FIELD SERVICES Pink - Transporter Gold - Generator's 1st Copy

UIC-26 Waste Refusal Notification

Mail to: DNR, Office of Conservation, Injection and Mining Division
P.O. Box 94275, Baton Rouge, LA 70804-9275

Overnight to: DNR, Office of Conservation, Injection and Mining Division
625 North 4th Street, Baton Rouge, LA 70802

Date:________________

Commercial Facility Name:________________________________ Site Code:__________

Contact Person:____________________________ Phone Number:____/______________

Manifest # of Refused Load:______________________ Waste Type:________________

Description of Waste:____

Origination of Waste:____

Name of Generator:____________________________ Generator Code:______________

Contact Person:____________________________ Phone Number:____/______________

Name of Transporter:____

Contact Person:____________________________ Phone Number:____/______________

Truck & Trailer License No.:____ or

Barge & Tug ID.:____

Reason for Refusal:

- Manifest Not Properly Completed
- Generator Does Not Have a Generator Code Number
- pH • 2.0
- pH • 12.5
- NORM Reading:________________microR/hr
- Other ______________________________________

Attach to this form the Conservation copy (original) of the manifest form of the refused load and mail to the address listed above.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this report and all attachments and that, based on my personal knowledge or inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Disposer Authorized Representative:____________________________ Title:________________
(Please Print Name)

Signature:____ Date:________________

FORM UIC-26 *WWW.DNR.STATE.LA.US/CONS/DOCUMENTS.SSI* Rev. 01/01

EXPLORATION & PRODUCTION (E&P) WASTE SHIPPING CONTROL TICKET

Manifest No. 2530128

UIC - 28

STATE OF LOUISIANA
OFFICE OF CONSERVATION
P.O. BOX 94275
BATON ROUGE, LA 70804-9275

CONSERVATION COPY
ORIGINAL

CODES

PART I: TO BE COMPLETED BY GENERATOR

Generator ____________________

Address ____________________ ( ) ________ Telephone No.

City/State/Zip ____________________

ORIGINATION OF WASTE (see instructions on back)

Well Name & No. / Description ____________________

Field Code Field ____________________

WASTE IDENTIFICATION AND AMOUNT (IN 42 GALLON BARRELS)

01	Salt Water	07	Prod. Sands/Solids	13	BS & W Waste		
02	Oil Base Mud	08	Fresh Water	14	Pipeline Water/Waste		
03	Water Base Mud	09	Rainwater	15	Com. Facility Waste		
04	Completion Fluids	10	Washout Water	16	Oil Spill Waste		
05	Prod. Pit Sludges	11	Washout Pit Water	50	Salvage Crude Oil		
06	Prod. Tank Sludges	12	Gas Plant Waste	99	Other		

SITE CODE

DESTINATION OF WASTE

Commercial Facility (Company) Name ____________________

Site Name ____________________

CERTIFICATION: The waste described above was consigned to the carrier named below. I certify that the foregoing is true and correct to the best of my knowledge.

☐ am ☐ pm

Signature of Generator's Authorized Agent — Date and Time of Shipment

PSC PERMIT

PART II: TO BE COMPLETED BY TRANSPORTER IN PRESENCE OF GENERATOR

Transporter ____________________ Telephone No.

Address ____________________ Truck License No.

City/State/Zip ____________________ Trailer License No.

If transported by barge, barge and tug identification ____________________ Barge and Tug Id.

CERTIFICATION: I certify that the waste in quantity above was received by me for shipment to the above destination.

☐ am ☐ pm

Signature of Transporter's Agent — Date and Time Received

SITE CODE

PART III: TO BE COMPLETED BY COMMERCIAL FACILITY

Facility (Company) Name ____________________

Site Name ____________________

CHEMICAL ANALYSES

TVOC (ppm)	Temp (°F)	H_2S (ppm)	Chloride (Mg/l)	Conductivity (mmhos/cm)	pH

CERTIFICATION: I certify that the waste described in Part I was received by me via the transporter described in Part II.

☐ am ☐ pm

Signature of Facility Agent — Date and Time Received

Rev. 5/00

Class II Well Injection Pressure & Rate Daily Monitoring Log

Mail to: DNR, Office of Conservation, Injection and Mining Division, P.O. Box 94275, Baton Rouge, LA 70804-9275
Overnight to: DNR, Office of Conservation, Injection and Mining Division, 625 North 4th Street, Baton Rouge, LA 70802

UIC-36 FOR MONTH OF ________________, 20___

This form is to be completed and returned to IMD no later than the 15th day of the following month at the address listed above.

Operator's Name & Site Location:				Operator Code:
Well Name and Number:		Serial No.:		MASIP[a]:
Field	Parish		Sect	Twp / Rng

Day	Maximum Daily Injection Pressure (psi)	Maximum Daily Injection Rate (gpm)	Recorder Initials & Time of Reading	COMMENTS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				

[a] Maximum Authorized Surface Injection Pressure

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this report and all attachments and that, based on my personal knowledge or inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Operator's Representative: ______________________________ Title: ______________
(Please Print Name)

Signature: ______________________________ Date: ______________

FORM UIC-36 WWW.DNR.STATE.LA.US/CONS/DOCUMENTS.SSI Rev. 1/01

Barge Worksheet

BARGE #		DATE	IN:	OUT:
BARRELS	SOLIDS	OIL	WATER	MANIFEST

ATTACHMENT 2
Waste Volumes for Main Pass 299

	MPM VOLUME ESTIMATES (MONTHLY & ANNUALLY)												
	2019	2020	2021	2022	2023	2024	2025	2026	2027				YEAR
SOLIDS													
includes: oil base muds(6%),water based muds(2%), synthetic based muds(4%),BS&W wastes(<1%), production tank sludges(<1%), pipeline washout(<1%) produced sands(<1%), production sands and solids(<1%) tankbottoms(<1%), spill residues(<1%) **estimated at 16% of total waste volume**	881173	925232	971494	1020068	1071072	1124625	1180873	1239916	1301912				
LIQUIDS													
includes: water base drilling fluids(39%), washwater(<1%) mud mixing fluids(2%), synthetic drilling fluids(18%), produced waters(2%), completion fluids(2%), salt water(2%) production tank water(2%), rainwater(2%),spill residue(2%) pipeline washwater(2%), BS&W water(2%), washout water(2%) **estimated at 77% of total waste volume**	4240647	4452680	4675314	4909080	5154533	5412260	5682950	5967097	6265451				
OIL													
includes: oil base muds(3%), synthetic fluids(2%), production and storage tank sludges(<1%) salvage crude oil(<1%),oil spill sludges(<1%), pipeline fluids(<1%), washout residues(<1%) **estimated at 7% of total waste volume**	385513	404789	425029	446280	468594	492024	516632	542463	569586				
TOTALS	5507334	5782701	6071836	6375428	6694199	7028909	7380454	7749476	8136949				60727286

	MPM VOLUME ESTIMATES (MONTHLY & ANNUALLY)												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	YEAR
SOLIDS													
includes: oil base muds(6%),water based muds(2%), synthetic based muds(4%),BS&W wastes(<1%), production tank sludges(<1%), pipeline washout(<1%) produced sands(<1%), production sands and solids(<1%) tankbottoms(<1%), spill residues(<1%) **estimated at 16% of total waste volume**	512640	538272	565186	593445	623117	654273	686986	721336	724944	761191	799250	839213	
LIQUIDS													
includes: water base drilling fluids(39%), washwater(<1%) mud mixing fluids(2%), synthetic drilling fluids(18%), produced waters(2%), completion fluids(2%), salt water(2%) production tank water(2%), rainwater(2%),spill residue(2%) pipeline washwater(2%), BS&W water(2%), washout water(2%) **estimated at 77% of total waste volume**	2467080	2590434	2719956	2855953	2998751	3148688	3306122	3471429	3488791	3663230	3846392	4038712	
OIL													
includes: oil base muds(3%), synthetic fluids(2%), production and storage tank sludges(<1%) salvage crude oil(<1%),oil spill sludges(<1%), pipeline fluids(<1%), washout residues(<1%) **estimated at 7% of total waste volume**	224280	235494	247269	259632	272614	286244	300557	315584	317163	333021	349672	367156	
TOTALS	3204000	3364200	3532410	3709030	3894482	4089205	4293665	4508349	4530897	4757442	4995314	5245080	50124074

	MPM VOLUME ESTIMATES (MONTHLY & ANNUALLY)							2006					
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
SOLIDS													
includes: oil base muds(6%),water based muds(2%), synthetic based muds(4%),BS&W wastes(<1%), production tank sludges(<1%), pipeline washout(<1%) produced sands(<1%), production sands and solids(<1%) tankbottoms(<1%), spill residues(<1%) **estimated at 16% of total waste volume**	31200	32000	32800	33600	34400	35200	36000	36800	37600	38400	39200	40000	
LIQUIDS													
includes: water base drilling fluids(39%), washwater(<1%) mud mixing fluids(2%), synthetic drilling fluids(18%), produced waters(2%), completion fluids(2%), salt water(2%) production tank water(2%), rainwater(2%),spill residue(2%) pipeline washwater(2%), BS&W water(2%), washout water(2%) **estimated at 77% of total waste volume**	150150	154000	157850	161700	165550	169400	173250	177100	180950	184800	188650	192500	
OIL													
includes: oil base muds(3%), synthetic fluids(2%), production and storage tank sludges(<1%) salvage crude oil(<1%),oil spill sludges(<1%), pipeline fluids(<1%), washout residues(<1%) **estimated at 7% of total waste volume**	13650	14000	14350	14700	15050	15400	15750	16100	16450	16800	17150	17500	
TOTALS	195000	200000	205000	210000	215000	220000	225000	230000	235000	240000	245000	250000	2670000

	MPM VOLUME ESTIMATES 2005 (MONTHLY & ANNUALLY)												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
SOLIDS													
includes: oil base muds(6%),water based muds(2%), synthetic based muds(4%),BS&W wastes(<1%), production tank sludges(<1%), pipeline washout(<1%) produced sands(<1%), production sands and solids(<1%) tankbottoms(<1%), spill residues(<1%) **estimated at 16% of total waste volume**	24560	24880	25200	25520	25840	26160	26480	26800	27120	27440	27760	30800	
LIQUIDS													
includes: water base drilling fluids(39%), washwater(<1%) mud mixing fluids(2%), synthetic drilling fluids(18%), produced waters(2%), completion fluids(2%), salt water(2%) production tank water(2%), rainwater(2%),spill residue(2%) pipeline washwater(2%), BS&W water(2%), washout water(2%) **estimated at 77% of total waste volume**	118195	119735	121275	122815	124355	125895	127435	128975	130515	132055	133595	148225	
OIL													
includes: oil base muds(3%), synthetic fluids(2%), production and storage tank sludges(<1%) salvage crude oil(<1%),oil spill sludges(<1%), pipeline fluids(<1%), washout residues(<1%) **estimated at 7% of total waste volume**	10745	10885	11025	11165	11305	11445	11585	11725	11865	12005	12145	13475	
TOTALS	153500	155500	157500	159500	161500	163500	165500	167500	169500	171500	173500	192500	1991000

	MPM VOLUME ESTIMATES (MONTHLY & ANNUALLY)								2004				
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
SOLIDS													
includes: oil base muds(6%),water based muds(2%), synthetic based muds(4%),BS&W wastes(<1%), production tank sludges(<1%), pipeline washout(<1%) produced sands(<1%), production sands and solids(<1%) tankbottoms(<1%), spill residues(<1%) **estimated at 16% of total waste volume**	20720	21040	21360	21680	22000	22320	22640	22960	23280	23600	23920	24240	
LIQUIDS													
includes: water base drilling fluids(39%), washwater(<1%) mud mixing fluids(2%), synthetic drilling fluids(18%), produced waters(2%), completion fluids(2%), salt water(2%) production tank water(2%), rainwater(2%),spill residue(2%) pipeline washwater(2%), BS&W water(2%), washout water(2%) **estimated at 77% of total waste volume**	99715	101255	102795	104335	105875	107415	108955	110495	112035	113575	115115	116655	
OIL													
includes: oil base muds(3%), synthetic fluids(2%), production and storage tank sludges(<1%) salvage crude oil(<1%),oil spill sludges(<1%), pipeline fluids(<1%), washout residues(<1%) **estimated at 7% of total waste volume**	9065	9205	9345	9485	9625	9765	9905	10045	10185	10325	10465	10605	
TOTALS	129500	131500	133500	135500	137500	139500	141500	143500	145500	147500	149500	151500	1686000

	MPM VOLUME ESTIMATES (MONTHLY & ANNUALLY) 2003												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
SOLIDS													
includes: oil base muds(6%),water based muds(2%), synthetic based muds(4%),BS&W wastes(<1%), production tank sludges(<1%), pipeline washout(<1%) produced sands(<1%), production sands and solids(<1%) tankbottoms(<1%), spill residues(<1%) **estimated at 16% of total waste volume**	12800	13200	13600	14000	14400	14800	15200	15600	16800	17600	18800	20400	
LIQUIDS													
includes: water base drilling fluids(39%), washwater(<1%) mud mixing fluids(2%), synthetic drilling fluids(18%), produced waters(2%), completion fluids(2%), salt water(2%) production tank water(2%), rainwater(2%),spill residue(2%) pipeline washwater(2%), BS&W water(2%), washout water(2%) **estimated at 77% of total waste volume**	61600	63525	65450	67375	69300	71225	73150	75075	80850	84700	90475	98175	
OIL													
includes: oil base muds(3%), synthetic fluids(2%), production and storage tank sludges(<1%) salvage crude oil(<1%),oil spill sludges(<1%), pipeline fluids(<1%), washout residues(<1%) **estimated at 7% of total waste volume**	5600	5775	5950	6125	6300	6475	6650	6825	7350	7700	8225	8925	
TOTALS	80000	82500	85000	87500	90000	92500	95000	97500	105000	110000	117500	127500	1170000

	MPM VOLUME ESTIMATES (MONTHLY & ANNUALLY) 2002												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
SOLIDS													
includes: oil base muds(6%),water based muds(2%), synthetic based muds(4%),BS&W wastes(<1%), production tank sludges(<1%), pipeline washout(<1%) produced sands(<1%), production sands and solids(<1%) tankbottoms(<1%), spill residues(<1%) **estimated at 16% of total waste volume**	6160	6320	6400	6480	6640	6800	7040	7280	7600	8000	12000	12400	
LIQUIDS													
includes: water base drilling fluids(39%), washwater(<1%) mud mixing fluids(2%), synthetic drilling fluids(18%), produced waters(2%), completion fluids(2%), salt water(2%) production tank water(2%), rainwater(2%),spill residue(2%) pipeline washwater(2%), BS&W water(2%), washout water(2%) **estimated at 77% of total waste volume**	29645	30415	30800	31185	31955	32725	33880	35035	36575	38500	57750	59675	
OIL													
includes: oil base muds(3%), synthetic fluids(2%), production and storage tank sludges(<1%) salvage crude oil(<1%),oil spill sludges(<1%), pipeline fluids(<1%), washout residues(<1%) **estimated at 7% of total waste volume**	2695	2765	2800	2835	2905	2975	3080	3185	3325	3500	5250	5425	
TOTALS	38500	39500	40000	40500	41500	42500	44000	45500	47500	50000	75000	77500	582000

ATTACHMENT 3
Vessel Transportation to Main Pass 299

E&P WASTE TRANSPORTATION TO MAIN PASS 299

Optimal Combination of E&P Waste Transport Vessel Types

Year	E&P Waste Transport Trips/Week	E&P Waste Transport Vessel Combination SPB--OSV *	Estimated E&P Waste Annual Volume (Barrels)
2002	2	0--2	582,000
2003	6	0--6	1,170,000
2004	10	0--10	1,686,000
2005	14	0--14	1,991,000
2006	14	0--14	2,670,000
2007	14	0--14	3,204,000
2008	14	0--14	3,364,200
2009	14	0--14	3,532,410
2010	11	1--10	3,709,030
2011	11	1--10	3,894,482
2012	12	1--11	4,089,205
2013	13	1--12	4,293,665
2014	14	1--13	4,508,349
2015	14	1--13	4,530,897
2016	11	2--9	4,757,442
2017	11	2--9	4,995,314
2018	12	2--10	5,245,080
2019	13	2--11	5,507,334
2020	14	2--12	5,787,701
2021	12	3--9	6,071,836
2022	13	3--10	6,375,428
2023	14	3--11	6,694,199
2024	13	4--9	7,028,909
2025	14	5--9	7,380,454
2026	14	6--8	7,749,476
2027	14	7--7	8,136,949

* This represents the number of weekly trips of SPBs (25,000 bbl capacity) and OSVs (5,000 bbl capacity) to move the annual estimated volume to the location at MP 299.

Transfers in Bulk (Internal Vessel Tanks + Deck Tanks):

Vessel Type	Internal Vessel Tank Volume (bbls.)	Number of Deck Tanks (500 bbls. each)	Total Vessel Capacity (bbls.) Internal + Deck
OSV 165 ft.	1,540	1	2,040
OSV 180 ft.	1,730	2	2,730
OSV 185 ft.	1,800	2	2,800
OSV 200 ft.	4,000	2	5,000
SPB 300 ft.	25,000	0	25,000

Transfers in Cuttings Boxes:

Vessel Type	Number of Cuttings Boxes (25 bbls. each)	Total Vessel Capacity (bbls.)
OSV 165 ft.	20	500
OSV 180 ft.	30	750
OSV 185 ft.	30	750
OSV 200 ft.	40	1,000

ATTACHMENT 4
Proposed Wells for Waste Disposal

Main Pass Mine
Well Detail Table
Proposed Wells for Waste Disposal

Well Name	Surface Location North (ft.)	Surface Location East (ft.)	Bottom Location North (ft.)	Bottom Location East (ft.)	Bottom Location (SS) (ft.)	Current Status	Planned Use	Water Depth (ft.)	Disposal Formation Used Area	Disposal Formation Used Top (SS) (ft.)	Disposal Formation Used Bottom (SS) (ft.)	Salinity Shallow Water (ppm)
SW2-05-B	5051	6137	6952	7949	1781	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1531	1779	32000
SW2-06-B	5074	6129	8207	7326	1753	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1617	1751	32000
SW2-09-B	5065	6126	7395	7674	1776	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1489	1776	32000
SW2-14-F	5064	6118	8764	5914	1767	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1595	1767	32000
SW2-32-F	5056	6075	7816	6801	1708	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1486	1706	32000
SW2-37-F	5055	6067	8195	6228	1723	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1503	1722	32000
SW2-57-D	5055	6018	8104	5939	1713	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1537	1712	32000
SW2-60-C	5046	6016	8772	5714	1760	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1592	1758	32000
SW2-62-A	5053	6010	8196	5651	1715	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1543	1713	32000
SW2-75-B	5042	5992	7413	5184	1697	Sea Water Injection for Mine Pressure Maintenance	Sea Water Injection and All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	210	Caprock	1528	1695	32000
BR-01-A	3796	3003	3794	2984	3410	Brine Cavity Monitoring	Water Based Cuttings and NPDES Accepted Discharges Disposal	211	Salt Cavity No. 1	1786	2980	13000
Previous BR-03-A New Well Required	To Be Determined	To Be Determined	To Be Determined	To Be Determined	To Be Determined	P & A 'd	All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	211	Salt Cavity No. 3	2065	2697	13000
BR-05-A	3790	3007	3386	3681	3871	Brine Production	All Types Drilling Cuttings, NPDES Accepted Discharges and E&P Waste Disposal	211	Salt Cavity No. 5	2216	3514	13000

Notes:
Locations are provided in FSC coordinates to allow correlation with FSC maps. To obtain Lambert coordinates from the above, X = 2,815,000 + East Coordinate and Y = 221,000 + North Coordinate.
Depths are provided in sub-sea (SS) feet to provide a consistent datum plain for wells drilled from multiple rigs with differing rotary heights.
To calculate TVD's: For Rig 2 add 163 ft.; For Rig 1 add 166 ft.; For BR-01-A, BR-03-A and BR-05-A add 140 ft.
Logs of the upper sands were not collected on wells BR-03-A and BR-05-A. Salinities for the upper sands is the same as BR-01-A due to these wells being in very close proximity to BR-01-A.
Logs of the upper sands at PP2 were only collected on well 2-75-B. Salinities for the upper sands for the other wells at PP2 are the same as 2-75-B due to these wells being in very close proximity to 2-75-B.
There are no fresh water sands above caprock. Analysis of water samples from sands in wells drilled from PP1 and PP2 ranged from a low of 14,600 ppm to a high of 19,800 ppm.
Sea water salinities at Main Pass range from 20,000 to 33,000 ppm.

Attachment 5
Existing Transfer Station Permits
Berwick, LA. ; Port Fourchon, LA.

STATE OF LOUISIANA
OFFICE OF CONSERVATION
BATON ROUGE, LOUISIANA

October 19, 2000

ORDER NO. 2000 - 10 CFA

Order approving the construction and operation of a commercial nonhazardous oilfield (exploration and production) waste (NOW/E&P waste) processing and transfer station facility by Trinity Storage Services, L.P. (T179) of Houston, Texas

****

Pursuant to the power delegated under the laws of the State of Louisiana, and particularly Title 30 of the Louisiana Revised Statutes of 1950 as amended, and as implemented in rules and regulations promulgated by the Commissioner of Conservation, and after two public hearings held under Docket No. IMD 2000 - 04 in Thibodaux, Louisiana on August 9, 2000 and September 20, 2000 following legal publication of notice, the following order is issued and promulgated by the Commissioner of Conservation as being reasonably necessary to carry out the provisions of the laws of this state.

THE COMMISSIONER OF CONSERVATION FINDS AS FOLLOWS:

1) That notice of intent to file an application for a permit to operate a commercial nonhazardous oilfield (exploration and production) waste (NOW/E&P waste) processing and transfer station facility was given by Trinity Storage Services, L.P. (Trinity) in accordance with the provisions of LRS 30:4(I) and LAC 43:XIX.129.M, by publication in The Advocate, the official journal of the State of Louisiana, and the Daily Comet, the official journal of Lafourche Parish.

2) That Trinity, after thirty (30) day notice as required by LRS 30:4(I) and LAC 43:XIX.129.M, applied to the Office of Conservation for approval to construct and operate a commercial NOW/E&P waste processing and transfer station facility.

3) That the Trinity facility is to be located in Section 14, Township 23 South, Range 22 East, Lafourche Parish, Louisiana.

4) That the application submitted to the Office of Conservation by Trinity was complete and supplied all information required by Statewide Order No. 29-B as amended.

5) That a public hearing was held in Thibodaux, Louisiana, on August 9, 2000, after public notice had been given by the Office of Conservation in The State Register on June 20, 2000 and in The Advocate on June 20, 2000, and by Trinity in the Daily Comet on July 13, 14 and 17, 2000, all in accordance with the provisions of LRS 30:4(I) and LAC 43:XIX.129.M.

6) That a public hearing was held in Thibodaux, Louisiana, on September 20, 2000, after public notice had been given by the Office of Conservation in The State Register on August 20, 2000 and in The Advocate on August 18, 2000, and by Trinity in the Daily Comet on August 31, September 1 and September 2, 2000, all in accordance with the provisions of LRS 30:4(I) and LAC 43:XIX.129.M.

7) That the Trinity NOW/E&P waste processing and transfer station facility, as approved, will consist of a NOW/E&P (1) hopper barge storage system; (2) container/truck washing area; and (3) an oil-based and/or synthetic drilling fluid liquids recovery/recycling plant.

8) That the Trinity Lafourche Parish NOW/E&P waste processing and transfer station facility will be utilized for receipt, processing and/or temporary storage of NOW/E&P waste until such waste is either processed to separate recoverable liquids from oil-based and/or synthetic drilling fluid wastes or transported to the Trinity Storage Services, L.P. Non-Hazardous Oil and Gas Waste Injection Facility (Texas Railroad Commission Permit Numbers 11317 & 11318) located in Liberty County, Texas.

9) That all recoverable drilling fluid liquids shall be provided to M-I L.L.C. for recycling.

10) That the NOW/E&P waste processing and transfer station facility, as proposed and pursuant to the permit application and this Order, will be constructed, completed, equipped, operated and maintained by Trinity Storage Services, L.P. in accordance with the provisions of Statewide Order No. 29-B, as amended, and particularly LAC 43: XIX.129.M.

11) That Trinity Storage Services, L.P. will maintain evidence of financial responsibility in the appropriate amount for any liability for damages which may be caused to any party by the escape or discharge of any material or waste from the NOW/E&P waste processing and transfer station facility.

12) That Trinity Storage Services, L.P. will maintain the appropriate funding in favor of the State of Louisiana, providing for the adequate closure of the processing and transfer station facility.

13) That Trinity Storage Services, L.P. will keep such records and make such reports as required by Statewide Order No. 29-B, as amended.

14) That the response to the "IT Decision" questions was timely submitted by the applicant and filed with the Lafourche Parish authorities. The Office of Conservation has reviewed the responses and found the responses acceptable in support of the application.

NOW, THEREFORE IT IS ORDERED THAT:

1) The proposal of Trinity Storage Services, L.P. of Houston, Texas, Operator Code T179, to construct and operate a commercial NOW/E&P waste processing and transfer station facility in Section 14, Township 23 South, Range 22 East, Lafourche Parish, Louisiana, as set forth in the application, is hereby approved.

2) Except as to the extent supplemented by these Findings and Order, the provisions of Statewide Order No. 29-B, LAC 43:XIX.129.M, as amended by the Office of Conservation, shall apply to the construction and operation of this "Type A" NOW/E&P waste processing and transfer station facility.

3) Trinity Storage Services, L.P. must notify the Commissioner when construction is complete (Statewide Order No. 29-B, Section 129.M.5.d.iv) and shall not commence receiving and processing NOW/E&P waste until the facility has been inspected for compliance with the conditions of the permit and Statewide Order No. 29-B, LAC 43:XIX.129.M.

4) Any future facility modifications shall be subject to the provisions of Statewide Order No. 29-B, LAC 43:XIX.129.M.5.

5) The issuance of this permit does not convey, grant or establish any property rights to any movable or immovable property of any sort, or any exclusive privileges of servitude to or on behalf of Trinity Storage Services, L.P. This permit further does not authorize any injury to private or public property, or any invasion of personal rights, or any infringement or suspension of Federal, State or local laws or regulations.

6) Findings of Fact numbered 7, 8, 9, 10, 11, 12 and 13 are hereby approved and are expressly ordered.

7) This Order shall be effective on and after October 19, 2000.

OFFICE OF CONSERVATION OF
THE STATE OF LOUISIANA

Philip N. Asprodites,
Commissioner of Conservation

EXHIBIT "A"

RESPONSE TO COMMENTS

Received During the Hearing and Public Comment Period
for

Trinity Storage Services, L.P.
Fourchon, Lafourche Parish
Docket No. IMD 2000-04

Introduction:

Trinity Storage Service, L.P. (Trinity) of Houston, Texas submitted an application seeking approval from the Office of Conservation to construct and operate a commercial nonhazardous oilfield (exploration and production) waste (NOW/E&P waste) processing and transfer station facility, located in Section 14, Township 23 South, Range 22 East, Fourchon, Lafourche Parish, Louisiana. Said application was scheduled for a public hearings on August 9, 2000 and September 20, 2000 at the Thibodaux City Courtroom located at the second floor of the Starks Municipal Complex, 1309 Canal Blvd., Thibodaux, Louisiana. At the hearings, the public was given an opportunity to submit oral and/or written comments concerning the application. The public comment period was open until 4:30 pm September 27, 2000 to receive any comments after the hearing.

Having received written comments during the public comment period and after reviewing the transcript of the public hearing, the Commissioner's response to those significant comments raised are as follows:

1. *This area* (where the facility will be located) *is a marsh with a delicate eco system. It is prone to flooding.*

Trinity has demonstrated in the permit application that the property where the facility will be located meets the location criteria requirements of Statewide Order No. 29-B, Section 129.M, specifically LAC 43:XIX.129.M.2.d.iv.

Trinity is developing its facility at the C-Port-II location in Port Fourchon. The C-Port-II development was permitted by the U.S. Army Corps of Engineers and has been constructed. The specific location for the Trinity facility is also already constructed and is an existing industrial site. The permit application submitted by Trinity contains a U.S. Army Corps of Engineers approved jurisdictional determination on the property where the site will be located dated June 5, 2000. The adjacent sites on the three land based sides of the Trinity location are also currently developed. The fourth side is bulk headed and fronts a dredged channel.

Furthermore, the existing ground elevation at the Trinity facility site is +7 MSL which puts the site above any flooding potential except for hurricane induced storm surges from large storms. The location is subject to a specific Spill Prevention Containment and Control (SPCC) plan, which is mandated by the Oil Pollution Act (OPA) of 1990. The US Coast Guard administers the implementation of this act. The SPCC plan must be reviewed and accepted by the US Coast Guard prior to the beginning of operations at the facility. The plan outlines the procedures to be followed during a potential flood event that could result in contamination of ecologically sensitive areas.

2000-10 CFA ExhibitAResponse.wpd

STATE OF LOUISIANA
OFFICE OF CONSERVATION
BATON ROUGE, LOUISIANA

SECOND SUPPLEMENT TO ORDER NO. 97-05 CFT

August 16, 2001

Order concerning request to transfer ownership of a commercial nonhazardous oilfield (exploration and production) waste (NOW/E&P) transfer station facility located in Berwick (Site Code 5109) from Brandt Energy Environmental L.P. (B203) of Lafayette, Louisiana to Trinity Storage Services, L.P. dba Trinity Field Services, L.P. (T192) of Houston, Texas and to change the disposal destination of said facility

****

Pursuant to the power delegated under the laws of the State of Louisiana, and particularly Tile 30 of the Louisiana Revised Statutes of 1950 as amended, and as implemented in rules and regulations promulgated by the Commissioner of Conservation, and after receiving written requests for a transfer of ownership dated February 10, 2001 and a minor permit modification submitted on June 16, 2001, the following Second Supplement to Order No. 97-05 CFT is issued and promulgated by the Commissioner of Conservation as being reasonably necessary to carry out the provisions of the laws of this state.

THE COMMISSIONER OF CONSERVATION FINDS AS FOLLOWS:

1) That, effective May 25, 1999, Office of Conservation Order No. 99-04 CFT authorized transfer of ownership of Site Code 5109 to Brandt Energy Environmental, L.P. of Lafayette, Louisiana.

2) That on February 10, 2001, Brandt Energy Environmental L.P. submitted a request to the Office of Conservation to transfer ownership of Site Code 5109 to Trinity Storage Services, L.P. dba Trinity Field Services, L.P. (Trinity) of Houston, Texas.

3) That Trinity has submitted the following information to the Office of Conservation:

a) The name and address of the new permittee (owner):

Trinity Storage Services, L.P. dba Trinity Field Services, L.P.
3700 Buffalo Speedway, Suite 1000
Houston, Texas 77098-3705

b) A copy of the lease in effect on the property;

c) An acceptable closure plan and cost estimate for adequate site closure set by this office at $200,256.00;

d) Documentation of compliance with the appropriate financial responsibility requirements of Statewide Order No. 29-B.

4) That transfer of permit responsibility, insurance coverage and liability, was submitted by the new permittee to the Office of Conservation as required by Statewide Order No. 29-B.

5) That on June 18, 2001, Trinity submitted correspondence to the Office of Conservation to change the authorized NOW/E&P waste disposal destination for the Berwick facility, Site Code 5109, to the Trinity Non-hazardous Oil and Gas Waste Injection Facility, Texas Railroad Commission Permit No. 11318, Well No. 1A, located on the Wm. McFaddin Lease, Moss Bluff Field in Liberty County, Texas and Texas Railroad Commission Permit No. 10965, Well No. TSS #2, located on the Trinity Storage Services Lease, Moss Bluff Field in Liberty County.

NOW, THEREFORE IT IS ORDERED THAT:

1) The permits which authorize Brandt Energy Environmental L.P. to operate a commercial NOW/E&P waste transfer station located in Berwick (Site Code 5109) St. Mary Parish, Louisiana be and hereby are transferred to Trinity Storage Services, L.P. dba Trinity Field Services, L.P. (Trinity) of Houston, Texas, Operator Code T192.

2) Responsibility for compliance with the terms and conditions of the original permit (Order 97-05 CFT) and this Order, the requirements of Statewide Order No. 29-B, and liability for any violations of the rule will shift from Brandt Energy Environmental, L.P. of Lafayette, Louisiana to Trinity on the effective date of this Order.

THIS IS TO CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF OFFICIAL RECORDS ON FILE AT THE OFFICE OF CONSERVATION, BATON ROUGE, LOUISIANA.

DATE [signature] 8-24-2001
CUSTODIAN OF RECORDS
JOSEPH S. BALL, JR.

3) Trinity shall equip, operate, and maintain this transfer station in accordance with the provisions of Statewide Order No. 29-B as amended and particularly LAC 43:XIX.Subpart 1.Chapter 5.

4) This Order shall be effective on and after August 16, 2001.

Office of Conservation
State of Louisiana

Philip N. Asprodites,
Commissioner of Conservation

INSTRUCTIONS FOR COMPLETION OF EXPLORATION & PRODUCTION (E&P) WASTE SHIPPING CONTROL TICKET

Part I: To Be Completed by Generator

- Enter the generator code, name, address, and telephone number. The Office of Conservation, Injection and Mining Division (IMD) publishes and periodically updates an active well list which should be used to obtain and verify codes for generator, well code, and field code. (Note: Generator Code is the same as Operator Code on Form OGP) When applicable, the Form UIC 23 temporary permit number must be entered in lieu of a generator code.

- Enter the well name, number and code. Use the Lease-Unit (LU) code for producing wells. (Note: This code appears in the first column of Form OGP). Use the well Serial Number for permitted or plugged wells. Codes for central gathering points, commingling facilities, some pipeline drip points, etc., can be found in the second column of revised form OGP. Coding assistance, or any information required, may be obtained from IMD by calling (225) 342-5515. The following special LU codes are authorized.

LU Code	Description
999905	UIC 23 (Attach Copy)
999906	Out of State Waste (show state after Field)
999907	Waste from Federal Offshore Waters (OCS)
999908	Uncoded Non-Producing Facility

- Enter the Field Code. Refer to IMD's active well list for this code.

- Enter the waste quantity (in 42 gallon barrels) in the space next to the appropriate description. Detailed descriptions are as follows:

01 Salt water (produced brine or produced water). Except for salt water whose intended and actual use is in drilling, workover or completion fluids or in enhanced mineral recovery.
02 Oil base drilling mud and cuttings.
03 Water base drilling mud and cuttings.
04 Completion, workover and stimulation fluids.
05 Production pit sludges.
06 Production storage tank sludges.
07 Produced oily sands and solids.
08 Produced formation fresh water.
09 Rainwater from ring levees and pits at production and drilling facilities.
10 Washout water generated from the cleaning of containers that transport E&P waste and are not contaminated by hazardous waste or material.
11 Washout pit water and solids from oilfield related carriers that are not permitted to haul hazardous waste.
12 Natural gas plant E&P processing waste which is or may be commingled with produced formation water.
13 Waste from approved salvage oil operators who only receive waste oil (BS&W) from oil and gas leases
14 Pipeline test water which does not meet discharge limitations established by the appropriate state agency; or pipeline pigging waste, i.e., waste fluids/solids generated from the cleaning of a pipeline.
15 Waste from approved commercial E&P storage, treatment and/or disposal facilities.
16 Material used in crude oil spill cleanup operations.
50 Waste containing salvageable crude/hydrocarbons bound for a permitted salvage oil facility.
99 Any other E&P waste not described above. Approval of the Office of Conservation is required. Please attach a description of these wastes with the manifest.

- Enter the commercial facility company name, site code, and site name. If waste is shipped out of state, the site code is "9999". The generator's agent must sign the manifest, and enter date and time (check appropriate AM or PM box) of shipment.

Part II: To Be Completed by Transporter

- Enter transporter Public Service Commission (PSC) permit code, transporter name, address, and telephone number. Use code "9998" for waste moved by Generator, "9997" if moved by marine vessel. Enter the truck and trailer license number or if transported by barge, the barge and tug identification. Transporter's agent must sign, date, and enter time received (check AM/PM).

Part III: To Be Completed by Commercial Facility Agent

- Enter facility (company) name, site code and site name, and the results of the chemical analyses. Enter the signature of facility agent, date and time received (AM/PM). Unless otherwise approved by the IMD, a commercial facility may only receive E&P waste by truck during daylight hours (as defined in Table No. 1119, "Sunrise and Sunset at Baton Rouge, La." Nautical Almanac Office, U.S. Naval Observatory, Washington, D.C.)

APPENDIX D

ACCIDENTAL SPILLS OR RELEASES OF WASTES OR HYDROCARBONS

1. ACCIDENTAL SPILLS OR RELEASES

1.1 WASTE SPILL ACCIDENTS

The most likely source of waste to the environment would be the result of an accidental spill resulting from a vessel collision. Although an accidental waste spill resulting from a vessel collision could theoretically occur anywhere along the transport route, such an accident would most likely occur at MP 299 or at one of the onshore bases (Morgan City, Port Fourchon, or Venice, Louisiana). For this reason, waste spills originating at these locations were chosen as the scenario for analysis in this programmatic EA.

Offshore supply vessels (OSV's) and self-propelled barges (SPB's) would be used to transport the waste. The waste received may be coming from the OCS platform where it originated or it may be OCS waste that was transported to shore for processing and then delivered to MP 299. Wastes that have been separated from synthetic-based fluids (SBF's), which can be cleaned and reused, are the most likely type of waste to have been processed on shore and then transferred to MP 299 for disposal.

The OSV's range in size from 165 ft to 300 ft in length and have a total vessel capacity of 2,040 bbl to 25,000 bbl (October 19, 2001, letter from Freeport to MMS). The total vessel capacity includes the volume of the internal tank and the deck tanks. Typically, estimates of spill volume are based on the spill of the contents from a single tank, in this case 12,500 bbl. The tank is assumed to contain either water-based muds and cuttings, synthetic-based muds and cuttings, or oil-based muds and cuttings (25% diesel or mineral oil and 75% cuttings and muds).

1.1.1 Waste Spill Response

Freeport has submitted a Waste Spill and Emergency Action Plan that provides guidelines regarding how Freeport will communicate and coordinate response actions in the case of a waste spill or other emergency. Where practical, Freeport's Waste Spill and Emergency Action Plan states that remediation efforts after a waste spill event will include the collection and removal of spilled waste.

Material Safety Data Sheets (MSDS) for the types of materials expected to be received at the MP 299 facility are included in Appendix B of Freeport's Exhibit 10 - Waste Spill and Emergency Action Plan. These MSDS sheets have been grouped into the following categories: (1) spills that create sheens (i.e., are insoluble in water and float); (2) spills of materials that are insoluble in water and that sink; (3) spills of material that are soluble in water; and (4) releases of materials that are gases.

1.1.1.1 Response to Spills that Create Sheens

Table 1 in Attachment E of Freeport's Waste Spill and Emergency Action Plan identifies the materials that, if spilled, would be expected to be insoluble, float, and create sheens. This listing includes both the diesel that will be used at the MP 299 facility and the hydrocarbons that could be part of the waste material received for disposal. An accidental release of these hydrocarbons would be responded to following Freeport's Regional Oil Spill Response Plan as discussed in Section 1.2.6 of this Appendix.

1.1.1.2 Response to Spills of Materials that are Insoluble in Water and that Sink

Table 2 in Attachment E of Freeport's Waste Spill and Emergency Action Plan identifies the materials that, if spilled, would be expected to be insoluble and sink. If a spill of these materials took place, the operator indicates that consultants having experience in responding to materials that sink would be used. Phone contacts for these consultants are included as footnotes to this table. Discussions with some of the contractors listed indicate that the most likely form of recovery for this material, if not contained in a cuttings tank or marine portable tank when spilled, would be the use of divers with vacuum hoses. Containers of material that were accidentally lost would be recovered through the use of divers to verify the location and then to hook cable(s) onto the tank or box so that it could be pulled up. The ability for the successful recovery of wastes that sink would depend upon the amount spilled, the water depth, and the weather and sea conditions at the time of the recovery attempt.

1.1.1.3 Response to Spills of Material that are Soluble in Water

Table 3 in Attachment E of Freeport's Waste Spill and Emergency Action Plan identifies the materials that, if spilled, would be expected to be soluble in water. Since these materials are soluble in water, the collection and removal of this spilled waste is impracticable.

1.1.1.4 Response to Releases of Materials that are Gases

Table 4 in Attachment E of Freeport's Waste Spill and Emergency Action Plan identifies the gas materials that, if spilled, would impact air and not water. Since these materials are gases, the collection and removal of this spilled waste is impracticable.

1.1.2 Spill Prevention

The MMS has pollution prevention requirements at 30 CFR 250.300 and conducts periodic facility inspections to ensure compliance. Freeport states that regardless of whether the operations involve the transfer of cuttings boxes or marine portable tanks or transfers of bulk material, these operations will be manned at all times, thereby reducing the chance for an undetected spill to occur. If a cuttings box or marine portable tank loss were to occur during transfer operations, Freeport indicates that it would be unlikely for a spill to occur because during this process the boxes and tanks are sealed. All platform deck locations will be underlain with plating and curbing to mitigate the loss of waste material should any spill occur. Any wastes or rainwater runoff recovered after a spill will be directed into the caprock disposal wells. For transfers of bulk waste, all hose connections will be taped prior to beginning any pumping both on the vessel deck and on the platform deck in order to reduce the chance of a spill occurring (Freeport, 2002).

1.2 HYDROCARBON SPILL ACCIDENTS

1.2.1 Potential Sources of a Hydrocarbon Spill as a Result of the Proposal

Refer to Chapter 1.2.3 for a description of the proposal and a listing of the type of wastes proposed by Freeport for injection. As indicated in this Chapter, this proposal involves the transport and disposal of wastes that may include oil-based muds and cuttings and/or small amounts of other oil products as listed within Table 1 in Attachment E of Freeport's Waste Spill and Emergency Action Plan. These identified oil-based wastes will be injected into salt Cavern Nos. 3 and 5 and the caprock (the rock formation overlying the salt dome) located at MP 299. The oil component of oil-based muds and cuttings can be either diesel or mineral oil. The waste will be received at the MP 299 facility in bulk or in cuttings boxes or marine portable tanks by offshore supply vessels or in bulk by self-propelled barges.

The proposal also calls for the transport and injection of a minimum blanket of 10,000 bbl of diesel into salt Cavern Nos. 3 and 5 to act as a buffer to prevent the dissolution of the cavern roofs. Once this diesel blanket exceeds more than 40,000 to 50,000 bbl of hydrocarbons as a result of the oil gradually separating from the injected wastes, a portion of this combined oil may then be removed from the caverns and transported to shore for potential recycling. It is anticipated that this oil would consist of a mixture of the oils listed within Table 1 in Attachment E of Freeport's Waste Spill and Emergency Action Plan and either diesel or mineral oil associated with the oil-based drilling muds and cuttings (Freeport, 2002). The proposal also mentions recovery of synthetic drilling fluids or free hyrodocarbons for resale. The projected frequency or specific volumes of the above events was not estimated by Freeport. Since the proposal states that only water-based muds and cuttings will be disposed of within salt Cavern No. 1, this section of the analysis will not examine the proposed plans for disposal at Cavern No.1. The potential sources for the loss of diesel and/or oil associated with the waste as a result of an accident related to the proposed activity are identified in Table D-1.

Table D-1

Potential Sources of Hydrocarbon Spills from the Proposed Activity

Location	Source
Offshore	• a bulk storage tank(s) accident on the facility; • a leak from the associated piping used to possibly transport the waste to the injection well or to transport the excess oil removed from the diesel blanket; • an accident during the processing of the waste transported to the MP 299 facility in the cuttings boxes or marine portable tanks; • a vessel collision or accident at the facility or enroute to or from the facility (i.e., types of vessels associated with the proposal include diesel supply vessels, vessels bringing waste for disposal, vessels carrying recovered oil from the facility to shore, etc.); and • an accident during the transfer (offloading or onloading by hose, cutting box, and/or marine portable tank) of - the diesel used on the facility for support operations and injection into the caverns; - the wastes containing oil brought to the facility for injection; or - the recovered oil removed from the diesel blanket or during the waste processing.
Onshore	• a storage tank(s) accident at the shore base; • a vessel collision or accident at the shore base (i.e., types of vessels associated with the proposal include a diesel supply vessel, vessels bringing waste for disposal, vessels carrying recovered oil from the facility to shore, etc.); and • an accident during the transfer (offloading or onloading by hose, cutting box, or marine portable tank) of - the diesel to be brought to the facility for support operations and injection into the caverns; - the wastes containing oil brought to the onshore location for collection for eventual transport to the MP 299 facility for injection; or - the recovered oil removed from the diesel blanket or during waste processing brought to the shore base for recycling.

1.2.1.1 Facility Storage

Although it is planned that most waste will be offloaded by hose for immediate processing and disposal, Freeport's Operations Plan calls for the possible use of several waste-holding tanks on Platform PP2 (Freeport, 2002). Muds and solids coming onto the facility may be stored in these waste storage tanks temporarily (no more than 8 hours) prior to disposal (Freeport, 2001). The facility will also contain one 1,000-bbl fuel storage tank to accommodate the anticipated fuel usage at MP 299 (Freeport, 2001). The available tank storage at all of the potential shore base locations was not provided and is, therefore, not addressed further. Table D-2 identifies all of the tanks available on the platform that could be used for waste handling.

1.2.1.2 Vessel Storage and Transfer Operations

Offshore supply vessels associated with the proposed project can range in size from 165 to 200 ft in length and can have internal tanks with a carrying capacity of from 1,540 bbl to 4,000 bbl with an additional one to two 500-bbl tanks on the deck. The largest offshore supply vessel proposed for use has a total carrying capacity of 5,000 bbl. The total carrying capacity for the 300-ft long, self-propelled barge proposed for use is 25,000 bbl. The self-propelled barge has two 12,500-bbl internal vessel tanks. Transfer of an auxiliary, skid-mounted pumping unit that is lowered to the boat deck will offload the bulk slurried waste. The auxiliary unit acts as a booster pump to pump the slurried waste from the boat deck to the top deck of the platform by transfer hose.

Table D-2

Temporary Waste Storage Tanks at the MP 299 Facility

Type	Number of Tanks	Holding Capacity of Each Tank (bbl)
Waste-holding tanks	2	575
Mud pits[(1)]	2	450
Brine storage tanks [(1)]	2	178
Waste processing and storage area	1	695
Waste receiving area	1	575
Waste transfer area	1	880

[(1)] Per the operator, the mud pits and the brine storage tanks will be used for waste handling if needed (Freeport, 2002).

The waste can also be transported on offshore supply vessels to the MP 299 facility in 25-bbl cuttings boxes or marine portable tanks. Depending upon the size of the individual boat, the carrying capacity for the 25-bbl cuttings boxes or tanks can vary. The maximum size 200-ft offshore supply vessel proposed for use can carry 40 cuttings boxes for a total carrying capacity of 1,000 bbl. These containers are lifted off the vessel and placed on the facility by the platform crane, where they are moved to the box/tank unloading area for further processing (Freeport, 2001).

1.2.2 Spill Prevention

The MMS has pollution prevention requirements at 30 CFR 250.300 and conducts periodic facility inspections to ensure compliance. Freeport states that regardless of whether the operations involve the transfer of cuttings boxes or marine portable tanks or transfers of bulk material, these operations will be manned at all times, thereby reducing the chance for an undetected spill to occur. If a cuttings box or marine portable tank loss were to occur during transfer operations, Freeport indicates that it would be unlikely for a spill to occur because during this process the boxes and tanks are sealed. All platform deck locations will be underlain with plating and curbing to mitigate the loss of waste material should any spill occur. Any wastes or rainwater runoff recovered after a spill will be directed into the caprock disposal wells. For transfers of bulk waste, all hose connections will be taped prior to beginning any pumping both on the vessel deck and on the platform deck in order to reduce the chance of a spill occurring (Freeport, 2002).

1.2.3 Hydrocarbon Spill Scenarios

Based upon the proposed action identified by the operator, the hypothetical hydrocarbon spill scenarios included in Table D-3 were developed and considered for further analysis.

Table D-3

Hypothetical Hydrocarbon Spill Scenarios

Source	Potential Location(s)	Hypothetical Hydrocarbon Spill Volume (bbl)	Assumptions Used in the Scenario
Storage tank	MP 299 facility	1,000	The loss of the maximum contents of the largest tank, a 1,000-bbl diesel fuel tank, on the MP 299 facility.
Offshore supply vessel	MP 299 facility, shore base, or enroute	1,125	The loss of the entire carrying capacity of the internal vessel tank (4,000 bbl) and one of two 500-bbl deck tanks on the largest offshore supply vessel proposed for use by Freeport. The internal vessel tank and deck tank are filled with oil-based drilling muds and cuttings. The oil in the oil-based muds and cuttings is diesel. Twenty-five percent of the total volume of oil-based muds and cuttings contained within the tank are diesel.
Self- propelled barge	MP 299 facility, shore base, or enroute	4,458	The loss of the entire contents of the one 1,333-bbl diesel fuel tank and one of the two 12,500-bbl waste storage tanks on the 300-ft self-propelled barge proposed for use by Freeport. The vessel's internal storage tank is filled with oil-based drilling muds and cuttings. The oil in the oil-based muds and cuttings is diesel. Twenty-five percent of the total volume of oil-based muds and cuttings contained within the tank are diesel (3,125 bbl).
Hose transfer incident	MP 299 facility, shore base, or location where the waste is generated	60	The incident could involve either diesel, oil-based muds and cuttings, or recovered oil from the caverns for recycling. The loss includes the contents of the transfer hose (10 bbl) and 50 bbl that flowed prior to the discovery and shut-in. The shut-in of the hose takes 10 minutes. The flowrate for the hose is 5 bbl/min. For this scenario, 100% of the spilled product is oil.
Cutting box or marine portable tank transfer incident	MP 299 facility, shore base, or location where waste is generated	6	One cutting box or portable tote tank is lost during the crane transfer incident. The 25-bbl cutting box or portable tote tank is filled with oil-based drilling muds and cuttings. Twenty-five percent of the total volume of this tank is diesel.

Spill Scenario to Be Analyzed

As identified in Table D-3, most of the hydrocarbon spill scenarios involve the loss of relatively small amounts of oil products when compared to the larger volume of wastes that would be spilled in the same scenario. After examining the various scenarios in Table D-3, it was decided to use the 4,458-bbl, self-propelled barge incident at the MP 299 facility for this analysis. This scenario was selected because it involved the greater volume of diesel oil as the result of the loss of the vessel's fuel tank in addition to the loss of one of the 12,500-bbl waste tanks (diesel oil would be only a small component of the oil-based muds and cuttings that might be transported in the waste tank). In addition, all of the other scenarios that were considered in Table D-3 reflected volumes far less than the self-propelled barge incident. Therefore, it was determined that the 4,458-bbl vessel incident selected would be representative of the various other scenarios and that no further analysis of these other scenarios was needed.

1.2.4 Transport Variable Representing the Potential for a Spill to be Transported to Important Environmental Resources

The transport variable is derived using an oil-spill trajectory model. This model predicts the direction that winds and currents would transport spills. The model uses an extensive database of observed and theoretically computed ocean currents and fields that represent a statistical estimate of winds and currents that would occur over the life of the project, which may span several decades. The coastline and associated environmental resources that the transport variable indicates could be contacted within 10 days after a 1,000-bbl spill event, as a result of the oil-spill trajectory model run, are presented in Table D-4. However, when examining the results shown in Table D-4, it should be kept in mind that they do not reflect the low likelihood that such a spill would occur as a result of the proposed activity.

Table D-4

Transport Variable (expressed as a percent chance) Representing the Potential for a 1,000-bbl Spill to be Transported from the MP 299 Facility to Important Environmental Resources within 10 Days

Environmental Feature [1]	State	MP 299 (Cluster Area C1-4) Transport Variable[2][3][4] (% within 10 days)
County or Parish		
Lafourche	LA	1
Jefferson	LA	<0.5
Plaquemines	LA	35
St. Bernard	LA	12
Harrison	MS	1
Jackson	MS	3
Mobile	AL	2
Escambia	FL	1
State Offshore Waters		
Offshore Texas	TX	<0.5
Offshore Louisiana West of Mississippi River	LA	13
Offshore Louisiana East of Mississippi River	LA	65
Offshore Mississippi	MS	6
Offshore Alabama	AL	4
Offshore Florida Panhandle	FL	3
Offshore Florida Peninsula	FL	<0.5
Beaches		
Gulf Islands	AL/MS	5
Gulf Shores	AL	1
Panhandle Beaches	FL	1

(1) Environmental features not included in this listing all resulted in a less than 0.5% chance.
(2) The percent chance that winds and currents will move a point starting at MP 299 and ending at specified coastal features. The results are calculated using a numerical model that simulates the trajectory of a drifting point projected onto the surface of the Gulf waters using temporally and spatially varying winds and ocean current fields. These probabilities do not factor in the risk of spill occurrence or consideration of the spill size, any spill response or cleanup actions, or any dispersion and weathering. The effect these factors have on slick persistence is accounted for by the length of time of the modeled simulation. In this case, the point is allowed to drift on the water surface for 10 days.
(3) Model results used are for MMS's C1-4 cluster area. These cluster areas represent areas that exhibit a similar trajectory pattern for all points originating within the cluster area contacting 10-mi land segments (unpublished results).
(4) < 0.5 = less than 0.5%.

If the hypothetical 4,558-bbl, self-propelled barge spill were to occur at one of the proposed shore base locations, it is assumed that the shore base facility and its surrounding shoreline area would be impacted by the spill.

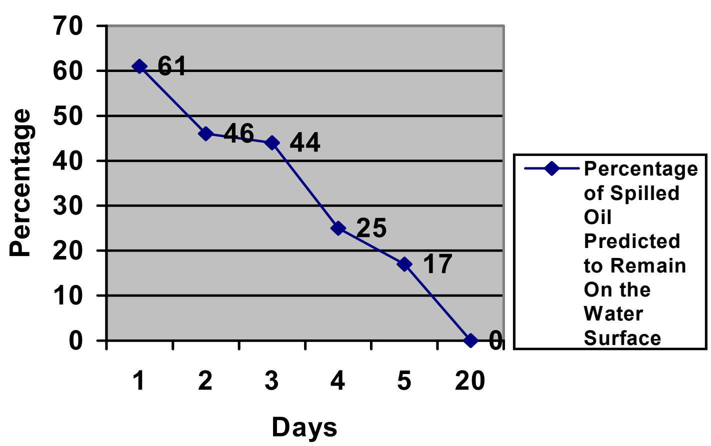
1.2.5 Assumptions about the Characteristics and Fates of Spilled Hydrocarbons

For the evaluation of this proposed action, the Sintef Oil Weathering Model version 2.0 (Sintef model) developed by Sintef Applied Chemistry was run. The Sintef model calculations essentially predict the material balance of spilled hydrocarbons as a function of time assuming the spilled oil is not transported subsea.

Because a large portion of the oil released in the hypothetical 4,458-bbl, self-propelled barge incident would come from the loss of the diesel tank, for the purposes of this analysis, it was assumed that all of the oil released would be diesel. In addition, although the diesel component of oil-based drilling muds or cuttings would be somewhat tied up in the muds and cuttings and would be expected to only gradually be released, for the purposes of this analysis, it was conservatively assumed that this diesel component would be instantly released and would quickly reach the surface in the form of a surface slick. For this reason, representative diesel oil having a specific gravity of 0.864 (API of 32) was selected for use in the Sintef model run.

The Sintef oil-spill scenario assumed the instantaneous loss of 4,458 bbl of diesel fuel during a vessel collision under conservative spring weather conditions (20º C sea-surface temperature and low wind speeds (6 kn) with no frontal passages). The Sintef model results showed that the majority of oil that was lost due to weathering occurred due to evaporation.

The percentage of the hypothetically spilled oil remaining on the water surface per day up to 20 days, as calculated by the Sintef model run, is depicted in Figure D-1. As shown in Figure D-1, the Sintef scenario run for the 4,458-bbl instantaneous spill indicates that approximately 10 percent of the spill would remain on the water surface 10 days after the spill occurred. As indicated, none of the oil would be expected to persist on the water surface beyond 20 days.



1.2.6 Hydrocarbon Spill Response

The MMS has extensive requirements for the prevention of oil spills and the preparedness to respond to an oil spill in the event of an accidental spill from the MP 299 facility.

MMS Spill-Response Program

The MMS Oil-Spill Response Program oversees the review of oil-spill-response plans, coordinates inspection of oil-spill-response equipment, and conducts unannounced oil-spill drills. This program also supports continuing research to foster improvements in spill prevention and response. Studies funded by MMS address issues such as spill prevention and response, in-situ burning, and dispersant use.

Spill Response for the MP 299 Facility

The subject operator has an oil-spill-response plan on file with MMS that would cover its MP 299 facility and has current contracts with an offshore oil-spill-response organization (OSRO). The Regional Oil-Spill Response Plan covering Freeport's MP 299 facilities is designed to help personnel respond quickly and effectively to environmental incidents and is a guide that they are required to follow in handling spill-response situations. Spill-response planning for any of the vessels associated with this proposal falls under the U.S. Coast Guard jurisdiction and regulation. The transfer of waste materials will be monitored by platform or boat personnel under the terms of an approved USCG transfer plan (Freeport, 2001).

Freeport will be responsible for ensuring that a response to an oil spill from the MP 299 facility would be in full accordance with the applicable Federal and State laws and regulations, as well as with Freeport's own plan(s) for accidental oil-spill prevention and containment. Freeport would be expected to mount a response strategy to effectively respond to an oil spill from the facility. Either mechanical or dispersant application equipment that is contractually available to the operator through OSRO membership or contracts may be used to respond to an oil spill. The spill-response countermeasure selected would be determined at the time of a spill based upon the conditions at that time (i.e., weather conditions, location of a spill, potential trajectory of a spill, chemical characteristics of the oil, etc.).

The MMS will continue to verify the operator’s capability to respond to oil spills at the MP 299 facility via the MMS Oil-Spill Program. The operator is required to keep their MMS-required, oil-spill-response plan up to date in accordance with MMS regulations. The operator must also conduct an annual drill to test the adequacy of their spill preparedness. The MMS also conducts unannounced drills to further verify the adequacy of an operator’s spill-response preparedness; such a drill could be conducted at the MP 299 facility.

APPENDIX E

SPILL OF BARITE AT MP 299, PLATFORM PP-2
APPLIED SCIENCE ASSOCIATES, CHEMMAP MODEL

SPILL OF BARITE AT MP 299, PLATFORM PP-2
APPLIED SCIENCE ASSOCIATES, CHEMMAP MODEL

The Applied Science Associate's (ASA) model was used to predict the transport of a water-based mud spill at MP 299. Because barite ($BaSO_4$) is the main component of drilling mud, it was used as a surrogate for a drilling mud spill. Freeport estimates that up to 70 percent of the waste received at MP 299 would be water-based drilling muds and cuttings.

Barite is a naturally occurring inorganic salt material mined in various locations throughout the world. It is used as a weighting agent to adjust the density of drilling fluids. The amount of barite in drilling fluids is in the range of 20-190 lb of barite per barrel of drilling fluid depending on the fluid (Duke et al., 1984). Barite is supplied as a fine powder and is insoluble in water. If discharged into the marine environment, it will ultimately end up in the sediment where it is a natural constituent of many marine sediments (Boehm et al., 2001).

The background concentration of barium in OCS sediments is about 500 ppm (USEPA, 1985) but can range from about 1 ppm to 2,000 ppm in marine sediments (Trefry, 1982). The background concentration of barium in seawater is about 15-20 ppb (CSA, 1997). Barite has a low toxicity. No conclusive LC50 values could be measured on barite. EC_{50} data was found on two marine species. The lowest EC_{50} was 16.2 mg/l (approximately 16,200 ppm) 96-hr EC_{50}.

The contents of one 12,500-bbl tank was assumed to spill. The tank contents are 100 percent muds and cuttings. It was assumed that the spilled tank contained 6,250 bbl of waste mud with a barite concentration of about 100 lb per barrel or 625,000 lb of barite.

The spill was assumed to occur at Platform PP2 at 88.76073º W. longitude and 29.26651º N. latitude on January 1, 1998. This point is approximately 16 land miles (mi) northeast of the Louisiana coastline and 31 mi of the westernmost Pinnacle Trend feature. Actual current and wind data were used to run the model. The current data was collected from March 21, 1997, to April 5, 1999, from DeSoto Canyon, and wind data was collected from January 1, 1992, to December 31, 2000. The depth of the water at MP 299 is 210 ft (64 m). No additional site-specific waters or habitat features were added to the model.

Barite, because of its small particulate size, about 10 microns (µm), will sink very slowly and disperse widely. Dispersion and settling rates are controlled by the water currents at the time of the spill. Seasonal variations in current will move the spill in different directions. The ASA model was used with site-specific winds and currents data to determine the trajectory of a spill during four seasons in 1998. The runs on different dates (not shown) moved in different directions but underwent similar dispersion and vertical movement.

Table E-1

Input Parameters to CHEMMAP

Salinity	32 ppt
Temperature	20°C
Barite particle size	10 µm
Barite solubility in seawater	Insoluble

Discussion and Results

The model generates a large amount of information to describe the spill. The following information has been extracted to describe the size and length of time of the barite plume in the water and the area of sediment impacted. It is a small part of the information generated about the barite spill.

Table E-2

Summary Results

Time Elapsed Since Spill (January 1, 1998, 0 hours)	Diameter of Area (nmi) with Mean Vertical Water Concentration		
	0.1–1 ppm	1–10 ppm	10–100 ppm
1 hour	Narrow perimeter band encircling the 10-100 ppm oval.	Narrow perimeter band encircling the 10-100 ppm oval.	0.3
2 hour	Fringe	0.93	0.2
4 hour	2.4	1.0	Nonexistent
6 hour	3.2	0.9	Nonexistent
9 hour	3.4	Nonexistent	Nonexistent

One hour after the spill, the barite was dispersed over a range of concentrations in water (Table E-2). The diameter of the area that contained a mean barite concentration of 10-100 ppm was 0.3 nmi. Two hours after the spill, the diameter of the area that contained a mean barite concentration of 10-100 ppm had reduced to 0.2 nmi in size. The mean vertical barite concentration range of 1-10 ppm occupied the largest area, with a diameter of 1.0 nmi at 4 hours. By nine hours, the mean vertical water concentration of barite particles had decreased to 1 ppm or less (Figure E-1). Within four days of the barite spill, the barite had completely dispersed to below background barium concentrations in seawater. The mean water concentration never exceeded 100 ppm and was 100 times less than the 96-hr EC_{50} throughout the model.

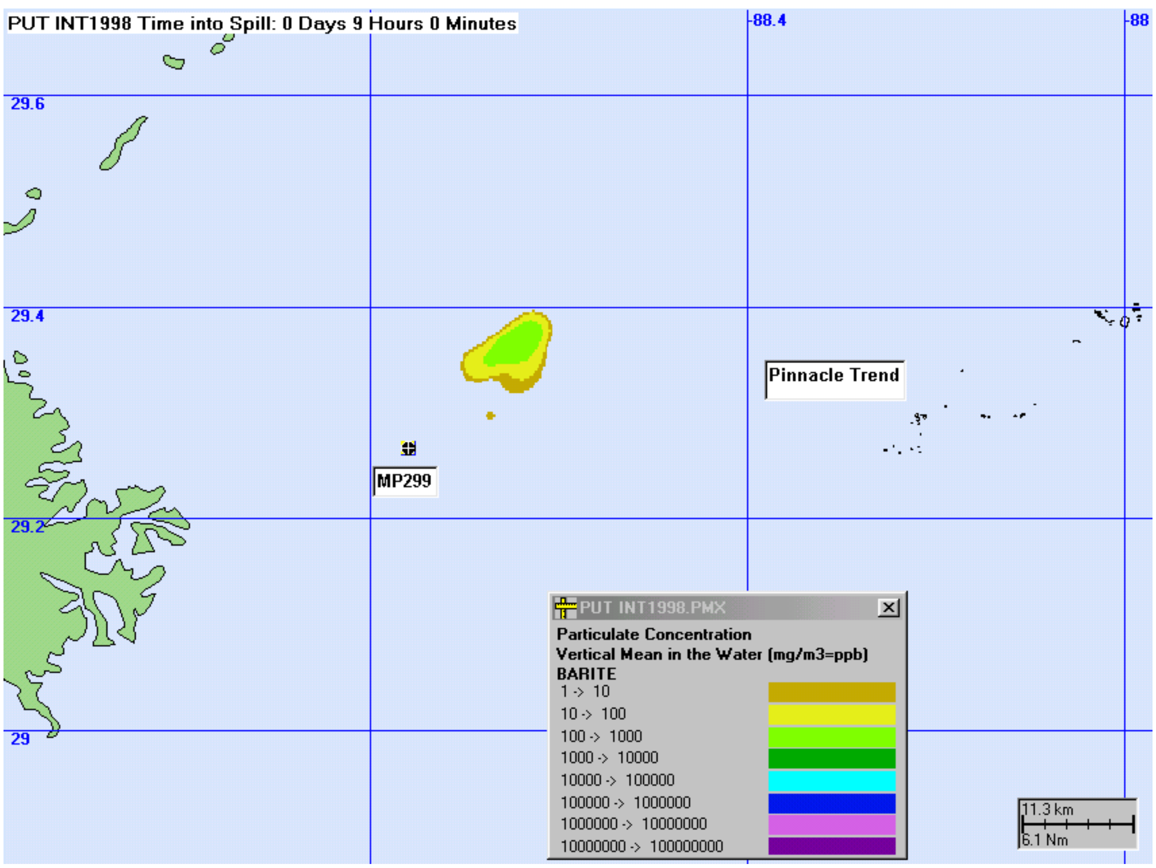


Figure E-1. Mean vertical concentration of spill at 9 hours into spill.

The model also provides the mass of settled barite particles over an area of seabed. The number is presented as grams per square meter (g/m^2). The hypothetical January 1, 1998, water-based drilling fluid spill of 625,000 lb traveled to the northeast. The plume was well dispersed before it reached the sediments (Table E-2). Approximately 48 hours after the spill, the barite started to deposit upon sediments. The barite loading to the sediments rarely exceeded 1-10 g/m^2. Currents continued to disperse the settled barite. Barite loading to the sediments from a spill at MP 299 would be negligible.

APPENDIX F

PHYSICAL OCEANOGRAPHY

PHYSICAL OCEANOGRAPHY

The Gulf of Mexico (GOM) is a semi-enclosed, subtropical sea with a surface area about 1.6 million km^2 (USDOI, MMS, 2000). The main physiographic regions of the Gulf Basin are the continental shelf (including the Campeche, Mexican, and U.S. shelves), continental slopes and associated canyons, abyssal plains, the Yucatan Channel, and Florida Straits.

The GOM is unique oceanographically with a basin depth of 3,000 m and two shallow entrances of the Yucatan Strait (1,600-m depth) and the Straits of Florida (1,000-m depth) (USDOI, MMS, 2000). The offshore oceanography is dominated by the Loop Current, the main origin of the Gulf Stream, and the inshore oceanography is heavily influenced by major freshwater input from precipitation and numerous river systems, including some extremely large ones such as the Mississippi and Atchafalaya Rivers.

There are at least five major identifiable watermasses in the Central GOM (USDOI, MMS, 2001):

- Gulf of Mexico Water—(0-250 m; 0-820 ft),
- Tropical Atlantic Central Water—(250-400 m; 820-1,312 ft),
- Antarctic Intermediate Water (phosphate maximum) —(500-700 m; 1,641-2,297 ft),
- Antarctic Intermediate Water (salinity maximum) —(600-860 m; 1,969-2,822 ft), and
- Mixed Upper North Atlantic Deep and Caribbean Mid Water—(1,000-1,100 m; 3,281-3,609 ft).

These watermasses can be identified by their different temperatures and chemical signatures based on salinity, dissolved oxygen, nitrate, phosphate, and silicate concentrations.

In addition to the above watermasses, there is an upper mixed isothermal layer that varies in thickness but averages about 75 m in thickness (Pequegnat, 1983). Sea surface (i.e., 0-m depth) temperatures within the relevant area are fairly constant throughout the Gulf in August, about 30°C. In January, surface waters cool considerably in northern coastal areas (14-15°C) and slightly in the center of the Loop Current to 25°C (USDOI, MMS, 2000).

Oceanographic fronts are important features of marine systems because they tend to be productive areas and also concentrate drifting material such as plankton, which attracts fish, birds, turtles, and mammals for feeding purposes. Fronts form along sharp discontinuities in temperature and/or salinity; they can be horizontal or vertical and surface or subsurface. In the Gulf, semi-permanent fronts form along the interface between the low salinity coastal or riverine water and offshore water, and along edges of major currents (e.g., the Loop Current) and eddies.

The Loop Current, a dominant feature of the Gulf, enters through the Yucatan Strait and exits through the Straits of Florida where it becomes the Gulf Stream. The Current flows clockwise around the fairly static water in the center of the Gulf. Its influence can be seen in hydrographic data to depths as deep as 800-1,000 m. It is a highly variable current in geographic extent (may go as far north as Mississippi-Alabama Shelf), width (25-50 km), and velocity (normally 100-200 cm/sec but up to 300 cm/sec) (USDOI, MMS, 2000).

On average about once a year and on no regular pattern, the Loop Current will form into a "warm core eddy" with a diameter of 300-400 km, a depth to 1,000 m, and velocities of 50-200 cm/sec. These warm-core eddies normally move to the western Gulf at speeds between 2 and 5 km per day out of the study area and have a life span of about one year. Smaller eddies (both clockwise and counterclockwise) are also created by the Loop Current and by other less known sources. Other currents are also present in the Gulf as ephemeral; semi-permanent and permanent features, primarily wind-driven by prevailing winds and by extreme events such as hurricanes. The mechanisms of some currents are poorly known and are still subject to study (USDOI, MMS, 2001). Short-lived, intense current jets have been reported at mid-depths (to about 200 m; see Figure 3-17 *in* USDOI, MMS, 2001) along the Louisiana-Texas slope, but little is known about them (USDOI, MMS, 2000). Warm-core Loop Current eddies interacting with the continental slope to the north can result in strong eastward flow and negative offshore temperature gradients to at least 500-m water depth, and cold core Loop Current frontal eddies interacting with the slope can result in westward flow following the slope bathymetry. The most characteristic flow pattern in the DeSoto Canyon continental slope region is a two-layer jet with eastward flow at the surface and a return flow at depth. The transition between the upper and lower flows varies with the offshore forcing, but it is typically between 200 and 300 m (Hamilton et al., 2000).

Coastal currents, based on historical current meter data for the northern GOM, are described in Dinnel et al. (1997); their predominant directions are downcoast. The mean direction of flow was downcoast (about 10º south of westward in direction) during just 39 days of summer current meter measurements taken at 13 m depth. These measurements were taken at a mooring located about 75 km (47 mi) southwest of MP 299 in 82 m of water. Maximum downcoast current velocity measured at this mooring was 79.8 cm/s, and mean was 5.7 cm/s with 20.7 cm/s variance.

Considerably more current data is available from the recent DeSoto Canyon Eddy Intrusion Study (Hamilton et al., 2000), and this data was taken closer to MP 299 than the data discussed in Dinnel et al. (1997). During the DeSoto Canyon Eddy Intrusion Study, currents were measured for two years over the full water column at a mooring located in 100 m of water about 35 km (22 mi) northeast of the MP 299 site. Direction of current flow in this region can be heavily influenced by Loop Current frontal eddies and associated processes, but it tended to be oriented in the upcoast (easterly) direction although patterns of downcoast and across-isobath flow were also observed. Mean flow at 15 m was in the upcoast direction at less than 10 cm/s, and mean flow at 70 m was downcoast and considerably smaller in magnitude. Vertically averaged alongshore velocity maxima did not exceed 100 cm/s, even during Hurricane Georges.

High-frequency currents in continental slope regions near the DeSoto Canyon are dominated by inertial oscillations, with periods of ~1 day, that are present in deep water throughout the year. At the shelf break, inertial oscillations are present in the summer but not in the winter because of lack of stratification in winter. Hurricanes passing over the slope produce a strong inertial response, which can persist for many days (Hamilton et al., 2000).

Average wave heights for the northern Gulf have been reported at 1 m with 94 percent being 2 m or less with a maximum height to 9.5 m (Quayle and Fulbright, 1977, in USDOI,MMS, 2001). Because the GOM is an enclosed sea, and thus fetch is somewhat limited, long-period, large amplitude waves are rare except during extreme events such as hurricanes (USDOI, MMS, 2001). The maximum 100-year wave height has been estimated as 21 m for water depths of 100 m and greater (USDOI, MMS, 2000).

APPENDIX G

GEOLOGICAL AND GEOPHYSICAL REVIEW

Technical Analysis of MP 299 Waste Disposal Project

Freeport submitted four applications to MMS addressing the disposal of OCS-generated E&P waste by means of injection into several salt caverns and a formation overlying the salt caverns at their sulfur and salt lease, OCS-G 9372, in MP 299. The specific applications address waste disposal into caprock, Cavern No. 1, Cavern No. 3, and Cavern No. 5. The MP 299 salt caverns were not constructed for the sole purpose of waste disposal but are now under consideration for such service. The caverns are the result of salt production in support of Frasch sulfur mining. Sulfur mining was terminated in August 2000; brine extraction continues at MP 299.

Several drivers have been identified by Freeport for this waste disposal project. One of the principle drivers is a desire by an increasing number of OCS operators to implement zero discharge limits at their exploration and development sites. Another is the proximate location of MP 299 to many of the deepwater activities. The MP 299 proposal is also seen as a desirable alternative to the existing OCS-generated E&P waste disposal efforts—land farming, onshore injection, and ocean disposal. The analyses conducted by the Technical Assessment and Operations Support (TAOS) Section of MMS concentrated on engineering and geologic/geophysical aspects of the proposed action to assess any potential hazards that might exist as a result of the waste disposal plan. The TAOS Section has relied on the information in the MP 299 applications submitted August 17, 2001, subsequent information provided by Freeport, and an extensive search of literature that addresses waste injection processes and risk studies.

The geologic and engineering review identified concerns regarding the potential for catastrophic failure due to cavern integrity issues and raised concerns about waste disposal into caprock overlying the caverns.

The information provided below discusses the risk[12] of these catastrophic events in the context of the Freeport applications and historical experience with cavern storage, and present scenarios that can be used by MMS decisionmakers as they evaluate the technical and environmental analyses.

Summarized below are findings from the detailed analysis and an accompanying discussion that supports approval of the four disposal proposals.

Caprock Injection

The caprock overlying the MP 299 caverns consists of leached limestone where sulphur extraction has occurred from numerous wells. In the MMS reviews and discussions to date, several concerns have been raised as the basis for deeming caprock either acceptable or unacceptable for waste disposal. The general concern identified focused on the overall integrity of the caprock and overlying formations. The major specific concern raised was the number of penetrations into the caprock.

Our findings concluded that all wells drilled were in compliance with MMS regulations governing casing and cementing practices. It is recognized that cementing practice is critical to gaining the proper isolation of zones that could communicate to the surface through the casing's annular space, as well as the structural support needed for the wellbore. The MMS sustained casing pressure (SCP) program establishes monitoring frequencies for such leak paths in the casing annuli, along with a rigorous review process to evaluate the acceptability of such leak paths in the context of the pollution potential, risk to personnel, and magnitude of the occurrence. As a comparison, there are in existence more than 8,000 wells in the Gulf of Mexico OCS affected by SCP. The MMS approves departure requests from companies to allow both producing and shut-in wells to maintain SCP subject to periodic monitoring and diagnostic requirements.[13]

The potential annular leak paths in the MP 299 wells are no more hazardous than what is approved after a detailed analysis by MMS for oil-and gas-producing wells. The reasons they are no more hazardous are presented below.

[12] Risk is defined as the product of frequency and consequence.

[13] A departure is granted only if the operator can demonstrate to MMS' satisfaction that there is an acceptable level of safety represented by the situation. Reference 30 CFR 250.142 for details about the departure process and Letter to Lessees dated January 13, 1994, for information about the SCP program.

- Oil and gas wells with SCP will typically have pressures higher than the injection pressures planned for MP 299; there are wells in the Gulf of Mexico OCS that are affected by pressures ranging up to 5,000 pound square inch gravity (psig).
- SCP wells will routinely bleed either gas or some type of fluid – formation water, completion fluid, mud, or oil.
- The flow potential for slurried, OCS-generated E&P waste through micro-fractures or channels in the annular cement of the wells penetrating the caprock is significantly less than oil, gas, or water; the likely result would be plugging of the communication path should slurried, OCS-generated E&P waste leak.

The MMS's regulations require that all wells that are no longer useful for lease operations must be plugged and abandoned in a manner that assures downhole isolation of all zones and protection of freshwater aquifers. To ensure that all paths to the surface are permanently closed, MMS requires:

1. cement plugs set at least 100 ft below and 100 ft above all oil, gas, and freshwater zones to isolate fluids in the strata in which they are found and to prevent them from escaping into other strata or to the seafloor;
2. as necessary, other plugs set to isolate any open hole, perforated intervals, or casing stubs;
3. the plugging of all annular spaces that communicate with open hole or the surface with at least 200 ft of cement; and
4. a surface plug set within the first 150 ft below the mudline.

Concerns were also raised about how the waste injection would affect the productivity of the oil zone in the caprock. The Production and Development (PD) Office of MMS was requested to review the Freeport applications from this conservation perspective. At present, there are over 1.3 million gallons of water per day being injected into the caprock for pressure maintenance of the caprock formation, which includes the oil reservoir. Freeport's studies have shown that this injection has enhanced recovery of the oil reservoir by acting similarly to a water drive. It is anticipated that the waste injection would afford the same benefits. The PD Office determined that this proposal would not affect the recovery of oil from the formation, and the waste would not mingle with the production stream.

A restriction identified to mitigate the already low probability of OCS-generated E&P waste migration to the surface is to limit the injection pressure to less than the fracture pressure of the formation. While this limitation of injection pressure has been agreed to by Freeport, a higher injection pressure (exceeding the fracture pressure of the formation) could be allowed with a supporting geomechanical and hydraulic analysis that addressed fracture propagation potential (magnitude and direction) and flow potential through the fractures.

General Description of Cavern Waste Injection

In this project, E&P waste material would be slurried in surface unloading/processing facilities and pumped through surface piping and wellheads, into the brine well injection tubing, where it would be transported into the salt cavern. Salt brine would be displaced out of the cavern through the tubing/casing annulus and back up to the surface. This displaced brine would be used for slurrification of additional waste or will be sold to brine customers. The excess brine would be disposed of by injection into the caprock formation, along with the mine-pressure maintenance, sea-water injection stream and other E&P waste materials. This process would continue until the caverns are filled with E&P waste.

Cavern No. 1 Injection

Numerous concerns were raised regarding the suitability of Cavern No. 1 as a waste injection disposal site. Much of the concern was based on the inability to “guarantee” the long-term integrity of Cavern

No. 1. The TAOS Section recognizes that Cavern No. 1's stability would improve once it is filled with solids.

Another concern raised was potential leaching due to the volume of fluids cycled through the cavern in an injection scenario. Clarification provided by Freeport in a letter dated January 7, 2002, commits to "water-based drilling fluid and associated cuttings" and "miscellaneous trash and debris that has been slurried with saturated brine" into Cavern No. 1. The water-based drilling fluids and associated cuttings injected into Cavern No. 1 must meet the same limitations imposed on their discharge by the USEPA permit, including LC_{50} limitations on toxicity and limitations on concentrations of cadmium and mercury in barite.

Salt exhibits visco-plastic behavior that is time dependent, is characterized by high strength, and is virtually impermeable (10-10 darcies). Because of this behavior, salt is an excellent media for encapsulation of waste materials. Cavern disposal does not result in any fracturing of the salt formation. Release of the waste slurry contained in a cavern would either occur mechanically through failure of the well bore or some component of the surface equipment, or the result of cavern collapse. Mechanical failures are mitigated through continued surveillance, inspection, and monitoring, which will be mandated as part of the MMS approval. The stability of liquid-filled caverns increases with the density of the filling fluid. Solids provide long-term insurance against creep effects that could result in failure of the cavern and unintended release of the cavern materials.

Injection as proposed by Freeport into Cavern No. 1 would result in an increasingly stable system. A detailed closure plan addresses how to ensure that the cavern remains stable through the critical transition phase.[14] Abandonment details for the cavern would require well-specific analysis by MMS prior to initiating closure.

Cavern No. 3 Injection

Geologic and engineering assessments of the Cavern No. 3 proposal identified concerns with the proximity to Cavern No. 1. It is noted that the wall thickness between Caverns No. 1 and No. 3 is less than an "industry standard" referenced as 300 ft. The Interstate Oil and Gas Compact Commission (IOGCC) recommends a web thickness ratio of 4:1 (cavity spacing to cavity diameter), while geotechnical studies done by researchers indicate a cavity spacing-to-diameter approaching 2:1 is safe due to the bridging effect that transfers stresses to outer regions of the salt dome. The IOGCC does provide for lower spacing to diameter ratios when supported by geomechanical studies.[15] Note that the industry practices are based on gas storage caverns, (which are more likely to fail than liquid-or solid-filled caverns).

An additional concern raised was that leaching during the fill-up process would reduce the wall thickness between Cavern Nos. 1 and 3. Ideally, waste injection should be conducted simultaneously in Cavern Nos. 1 and 3; however, operating with an established differential pressure limit would provide assurances that web design limits are not exceeded.[16]

Leaching is directly related to the slurry salinity. As such, it is a practical conclusion that the operator must mitigate the potential for leaching by slurrying the waste with a saturated brine solution to minimize additional leaching when injecting into any of the caverns.

Cavern No. 5 Injection

There were no specific concerns raised for waste disposal using Cavern No. 5. Industry standards from groups such as API and IOGCC establish recommended practice for cavern size, shape, etc. These should be adhered to in managing waste disposal into Cavern No. 5.

[14] Transition phase will occur once the cavern is closed; during this time the cavern fluid will increase in temperature, resulting in some pressure build. Studies addressing this phenomenon have been based on brine-filled caverns and show that the pressure build is not sufficient to compromise the integrity of the cavern; cement plug failure in the wellbore would be likely only if the compressive strength of the plug is exceeded.

[15] "Natural Gas Storage in Salt Caverns – A Guide for State Regulators" (1995).

[16] Freeport has initiated work to study the allowable differential pressure between the two caverns. The results of this work should be part of the operating plan that requires MMS action.

Worst-case Scenario

The worst-case release has been identified as the failure of the largest cavern (Cavern No. 1), which would result in a release of 1.6 million bbl of brine at the seafloor. The USEPA has currently approved a bleedwater (comparable to brine) discharge of 12.5 million bbl per month for the MP 299 facility. Therefore, the worst-case scenario release volume for the total failure of the largest cavern is less than the average allowable discharge volume of bleedwater over a 4-day period. The risk of a catastrophic event occurring in conjunction with the MP 299 waste disposal proposal is extremely low.

Conclusion

Based on the above discussions, the scope of Freeport's proposal, and the context of the proposed actions with other activities deemed acceptable on the OCS, the concerns about long-term integrity of the caverns and the containment of wastes in the caprock are noted and do not present an unacceptable risk. Therefore, the applications should be approved with the following mitigations.

Mitigations

Approval of Freeport's applications as proposed with the following conditions:

(1) Caprock injection must be limited to less than the fracture pressure of the formation (plus a safety factor) unless otherwise justified with studies of the rock properties;

(2) Freeport must provide MMS with study results that document the allowable pressure differential limit between Cavern Nos. 1 and 3; waste disposal into Cavern Nos. 1 and 3 must be consistent with the differential pressure determination; and

(3) Slurry injection into the caverns must be of a salinity that will not cause leaching.

APPENDIX H

EXPLOSIVE STRUCTURE REMOVAL REVIEW

EXPLOSIVE STRUCTURE REMOVAL REVIEW

The following discussion was summarized in part from information provided by Dr. J. Whyatt, National Institute for Occupational Health and Safety (written communication, March 2002).

Explosives can cause cracking in both the near and far fields. Near-field fractures are caused by explosive shock and gas pressure. Blast-induced vibrations may also cause fracture of sensitive structures in the far field.

In the near field, fracturing is dominated by crushing of the immediate blasthole wall and extension of fractures driven by explosive-generated gas pressure. Fracture growth will continue while this pressure significantly exceeds the combined pore pressure and tensile strength in the rock. Fractures will extend preferentially toward a free face (e.g., ground, seafloor, open rock wall, etc.). Intersection of the fracture with a free face will vent gas pressure and halt fracturing. Pressure is also vented through the blasthole, although this is often intentionally slowed by stemming (plugging) the upper portion of the blasthole. Detonation in unconsolidated sediments (15 ft below mudline) should vent gas pressure rapidly, limiting gas-driven fracturing to within roughly 15 ft of the charge.

Fracturing in the far field through the action of blast-induced vibrations has been studied for a variety of applications, and guidelines are readily available (e.g., Blasters' Handbook). Generally, blast vibration intensity is characterized by peak particle velocity (PPV) at a point as the blast-induced shock wave passes. Blast vibrations will spread out and attenuate or decay as they travel from the blast source. Attenuation is greatest in weak, soft rock which tends to absorb rather than transmit vibrational energy. It is least in strong, elastic rock. Equations from the Blasters' Handbook can be used to estimate this decay, and the effect various levels of vibration will have.

For example, the effects of an explosive charge detonated in very weak rock (most representative of the expected strength of unconsolidated GOM sediments) with an H-factor of 24 can be calculated for various distances (Table H-1 below). The table uses a maximum distance of 1,500 ft to explore the PPV levels experienced at caprock or caverns at MP 299 for seafloor detonation of various charges.

Table H-1
Effects of a Detonated Explosive Charge

Explosive Charge (lb)[1]	Distance (ft)	PPV (in/s)	Comments/Damage
50	10	13.78438	Would cause rockfalls from caverns or propagate faults up to 10 ft away
50	50	1.04196276	1 PPV is the regulatory limit for homes sited within 300-5,000 ft from a mine blast (Office of Surface Mining)
50	100	0.346248	0.5 PPV is Bureau of Mines recommended limit to prevent cracking of plaster-on-lath walls (Report of Investigation 8507).
50	500	0.0263655	No effect
50	1,500	0.0045461	PPV for 50-lb charge reaching caprock or cavern
500	1,500	0.0286841	No effect
5,000	1,500	0.1809844	Still no measurable effect (need more than twice this PPV to crack plaster-on-lath walls)

[1]A 50-lb explosive charge was chosen as the minimum explosive charge in the table above because 50-lb is the maximum charge allowed per detonation under the Section 7 Generic Consultation. A 5,000-lb charge was chosen as the maximum explosive charge since this value is much greater than the largest explosive charge ever used to remove a structure in the GOM.

Reference

Blasters' Handbook. 1998. 17th edition, International Society of Explosives Engineers, Cleveland, Ohio. 744 pp.

APPENDIX I

FREEPORT'S DRAFT PROPOSED APPLICATION FOR RIGHT OF USE AND EASEMENT AND DESIGNATION OF AGENT FORM

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VIA HAND DELIVERY

DRAFT

__________, 2002

Mr. Donald C. Howard
Regional Supervisor
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United States Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

Attention: Mr. Nick Wetzel
Plan Unit Supervisor

APPLICATION FOR RIGHT-OF-USE AND EASEMENT

E&P Waste Disposal Facility

LEASE OCS-G 9372, MAIN PASS BLOCK 299

Ladies and Gentlemen:

In accordance with 30 CFR 250.160 and 161, Freeport-McMoRan Sulphur LLC (Freeport), requests a Right-of-Use and Easement (RUE) in order to enable Lease OCS-G 9372, Main Pass Block 299, to receive, for disposal, E&P waste from OCS leases in accordance with Notice to Lessees (NTL) 99-G22 ("Guidelines for the Sub-Seabed Disposal and Offshore Storage of Solid Wastes") and the provisions herein.

This RUE application is submitted in order to allow each OCS Lessee/Operator to send, for permanent disposal, RCRA-exempt oilfield waste (E&P waste), generated solely from the Leases listed in its Designation of Agent, to Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299, for injection into the salt caverns and caprock subject to that lease (in accordance with Freeport's permits).

Prior to approval of the RUE requested herein, a surety bond in the amount of $____________ will be provided to the MMS. Additional insurance for pollution in the amount of $_____________, or an Oil Spill Financial Responsibility (OSFR) rider in this amount, will be provided prior to approval of the RUE.

Freeport hereby acknowledges that, once granted, the RUE will be subject to the Underground Disposal Agreement between Freeport-McMoRan and the MMS, including the provisions of that agreement regarding a fee schedule. It is understood that there are no additional fees, bonuses, rentals or royalties to be paid to the MMS in order to maintain the RUE, once granted.

Additionally, Freeport hereby acknowledges that, as is provided in the Designations of Agent, in case of default on the part of the designated agent, the lessee/operator and the agent are jointly and severally responsible for compliance, regarding disposal, at Main Pass Block 299, of E&P waste produced from the Leases subject to the Designation of Agent, in accordance with this RUE application, pursuant to 30 CFR 250.146, and the lessee/operator shall make full and prompt compliance with all regulations, Lease terms, or orders of the Secretary of the Interior or his representative. This standard of joint and several liability shall be consistent with that established and provided by 33 USC 1321 and 42 USC 9607, notwithstanding therein any exclusion for petroleum.

Below, in accordance with the provisions of 30 CFR 250.161, are the additional information items required to be submitted with an application for a RUE:

(a) Details of the proposed uses and activities including access needs and special rights of use that you may need:

Approval of this RUE application will enable the implementation of the following system: E&P waste will be received from OCS leases at Main Pass 299 and directly injected, or, alternatively, temporarily stored, processed to extract recyclable materials or to enhance injection capability and then injected, into salt caverns or caprock underlying Main Pass Block 299. At times some OCS-generated E&P waste will be processed at existing onshore facilities (Fourchon, Venice and Morgan City, Louisiana) to remove hydrocarbons and/or other recyclable materials (primarily hydrocarbons and synthetic drilling fluids), then taken to Main Pass 299 for injection.

Access needs are consistent with the access needs of the sulphur production operations previously conducted on Lease OCS-G 9372, Main Pass Block 299 (quoting from page 8 of the Environmental Report submitted by Freeport-McMoRan Sulphur LLC August 15, 2001, as amended October 17, 2001):

> [I]t is anticipated that there will be a total of 18 dockings per week at the Main Pass 299 facilities (14 trips per week for E&P waste transport, 2 trips per week for transport of produced brine [pursuant to earlier approval], 1 trip per week for a crewboat and 1 trip per week for standby/supply vessel). The total of 18 trips per

> week calculates to 936 trips per year, which equates to an average of 2.56 trips per day. For comparison purposes, the Main Pass Sulphur Mine DOCD submitted in 1989 provided for 1 trip per day for a crewboat; .91 trips per day for self-propelled barges; 1 trip every 2 days for a supply boat; and 1 trip per week for a standby boat. This calculates out to *932* trips per year, which equates to an average of *2.55* trips [Italics original].

There are no special rights of use that are needed.

(b) A description of all facilities for which you are seeking authorization:

Authorization is not actually sought for any facilities—the facilities on Lease OCS-G 9372, Main Pass Block 299, are there pursuant to the rights granted under the terms of that lease. In this RUE application, Freeport is applying for the right to permanently dispose of E&P waste from OCS leases in the salt caverns and caprock of Lease OCS-G 9372, Main Pass Block 299.

(c) A map or plat describing primary and alternate project locations:

Attached hereto and made a part hereof, as Exhibit 2, is a map. Because Main Pass Block 299's combined attributes of a massive salt body and existing surface infrastructure are critical to the project, there is no information provided regarding alternate project locations.

(d) A schedule for constructing any new facilities, drilling or completing any wells, anticipated production rates, and productive life of existing production facilities:

Below is a summary of the "Schedule Activities" provided on page 9 of the Environmental Report submitted by Freeport-McMoRan Sulphur LLC August 15, 2001, as amended October 17, 2001 (and as further adjusted for current projected timing):

- **PROJECT ENGINEERING: JANUARY – JUNE 2002**
- **Construction & Equipment Installation: April 2002 – December 2002**
- **WASTE RECEIPT & DISPOSAL TO CAPROCK AND CAVERN: JUNE 2002**
- Re-drill Access Well to No. 3 Cavern: June 2003
- Drill Access Well to No. 5 Cavern: December 2005
- Drill Access Well to Establish New Salt Cavern: June 2010.

Freeport, as it is acting both in the capacity as agent for each Lessee/Operator and as operator of Sulphur and Salt Lease OCS-G 9372, Main Pass Block 299, hereby signifies also that it has been notified of this application, consents to it, and waives opportunity to comment on it under 30 CFR 250.160 (d).

Thank you, and, if you need any further information, please contact Mr. John Seip at 504-582-4314.

Sincerely,

David C. Landry

EXHIBIT 1

PROPOSED DESIGNATION OF AGENT

UNITED STATES

DEPARTMENT OF THE INTERIOR

MINERALS MANAGEMENT SERVICE

DRAFT

DESIGNATION OF AGENT

The lessee/operator identified below is, on the records of the Minerals Management Service, a leaseholder and/or operator of the lease(s) appearing on Attachment 1 ("Leases") attached hereto and made part hereof, and hereby designates

Name: Freeport-McMoRan Sulphur LLC

2313
Company Number of Designated Agent

Address: 1615 Poydras Street
New Orleans, LA 70112

as his agent with full authority to act in his behalf in conducting those actions necessary in order to secure required authorizations and in complying with the terms of the Leases and regulations applicable thereto regarding disposal of E&P waste therefrom at Main Pass Block 299, and as operator on his behalf with respect to conducting disposal operations at Main Pass Block 299 of E&P waste from the Leases, and on whom the Regional Supervisor or his representative may serve written or oral instructions in securing compliance with the Operating Regulations.

It is understood that this designation of agent does not relieve the lessee/operator of responsibility for compliance with the terms of the Leases, laws, and regulations applicable to the area. In case of default on the part of the designated agent, the lessee/operator and the agent are jointly and severally responsible for compliance, regarding disposal, at Main Pass Block 299, of E&P waste produced from the Leases, in accordance with the Right of Use and Easement application of the agent, pursuant to 30 CFR 250.146, and the lessee/operator shall make full and prompt compliance with all regulations, Lease terms, or orders of the Secretary of the Interior or his representative. This standard of joint and several liability shall be consistent with that established and provided by 33 USC 1321 and 42 USC 9607, notwithstanding therein any exclusion for petroleum.

It is also understood that this designation of agent does not constitute an assignment of any interest in the Leases. The lessee/operator agrees to notify the Regional Supervisor promptly of any change in the designated agent.

____
Company Number of Lessee

____
(Name of Lessee/Operator)

____
(Authorized Signature of Lessee/Operator)

____
(Date)

ATTACHMENT 1

LEASES

[Listed in a format to be agreed to]

<u>EXHIBIT 2</u>

MAP

[To be supplied by Freeport-McMoRan]