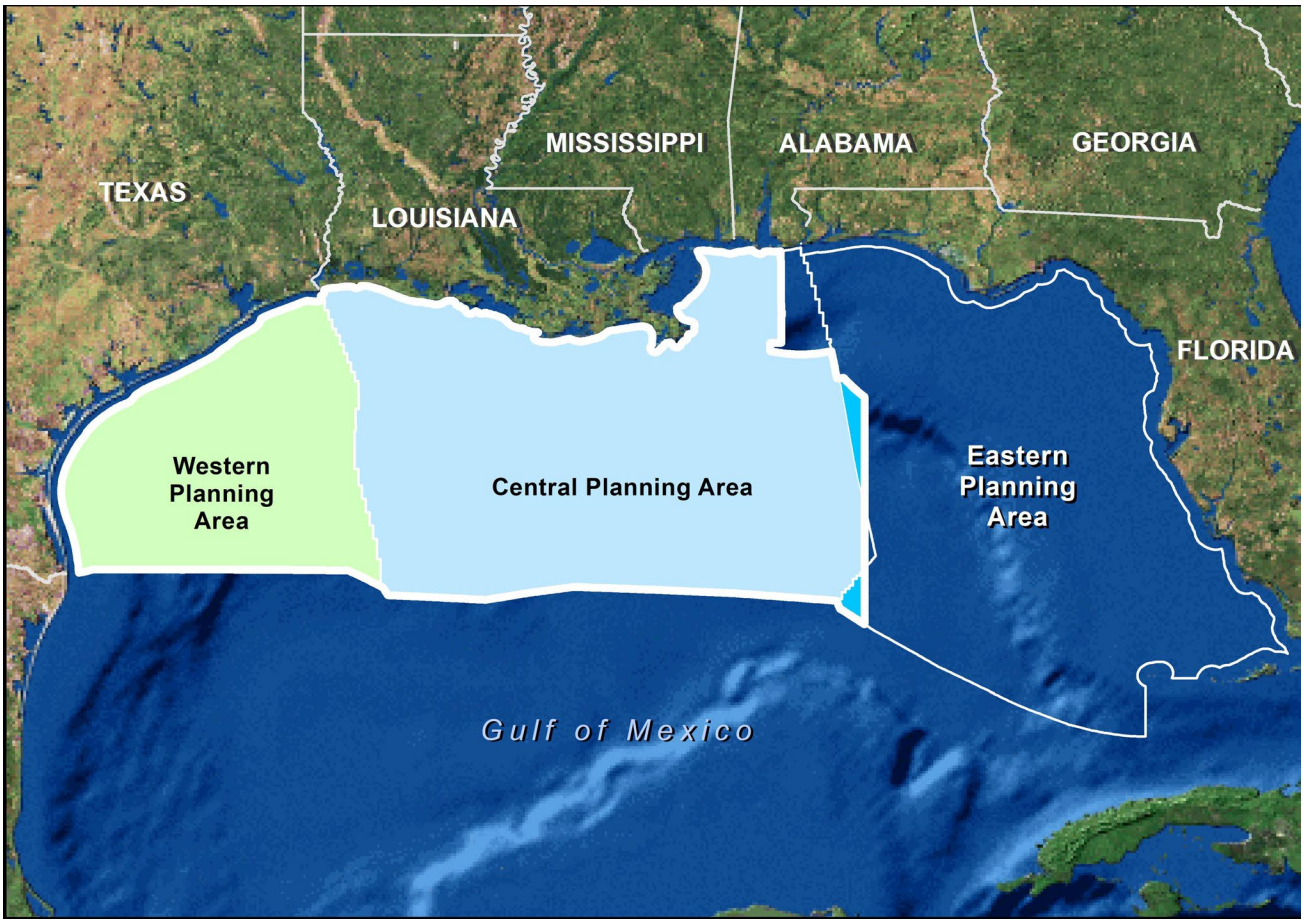
OCS EIS/EA
BOEM 2022-060

Gulf of Mexico OCS Oil and Gas Lease Sales 259 and 261

Draft Supplemental Environmental Impact Statement



U.S. Department of the Interior
Bureau of Ocean Energy Management
New Orleans Office

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Author

Bureau of Ocean Energy Management
New Orleans Office

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REGIONAL DIRECTOR'S NOTE

This Draft Supplemental Environmental Impact Statement (EIS) re-analyzes a Federal action, i.e., a Gulf of Mexico (GOM) Outer Continental Shelf (OCS) lease sale. This document is expected to be used to inform the lease sale processes for GOM Oil and Gas Lease Sales 259 and 261, which BOEM is required to hold by the end of March and September 2023, respectively as directed in the Inflation Reduction Act of 2022 (Pub. L. No. 117-169, enacted Aug. 16, 2022). This Supplemental EIS tiers from and updates the *Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2022; Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261; Final Multisale Environmental Impact Statement* (2017-2022 GOM Multisale EIS) and *Gulf of Mexico OCS Lease Sale: Final Supplemental Environmental Impact Statement 2018* (2018 GOM Supplemental EIS), and it incorporates by reference all of the relevant material in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

While BOEM has no discretion on whether to hold these sales, BOEM is preparing this supplemental EIS to follow its normal leasing process to the fullest extent possible. Pursuant to the Outer Continental Shelf Lands Act's staged leasing process, the Bureau of Ocean Energy Management (BOEM) will make an announcement on the first GOM lease sale, i.e., GOM Lease Sale 259, following the completion of this analysis.

This Draft Supplemental EIS analyzes the potential impacts of a proposed action on the marine, coastal, and human environments. It is important to note that this Draft Supplemental EIS was prepared using the best information that was publicly available at the time the document was prepared. This Supplemental EIS's analysis focuses on identifying the baseline conditions and potential environmental effects of oil and natural gas leasing, exploration, development, and production in the GOM. This Supplemental EIS will also assist decisionmakers in making informed, future decisions regarding the approval of operations, as well as leasing.

BOEM's New Orleans Office and its predecessors have been conducting environmental analyses of the effects of OCS oil and gas development since the inception of the National Environmental Policy Act of 1969. We have prepared and published more than 70 draft and 70 final EISs. Our goal has always been to provide factual, reliable, and clear analytical statements in order to inform decisionmakers and the public about the environmental effects of proposed OCS oil- and gas-related activities and their alternatives. We view the EIS process as providing a balanced forum for early identification, avoidance, and resolution of potential conflicts. It is in this spirit that we welcome comments on this document from all concerned parties.

Michael A. Celata
Regional Director
Bureau of Ocean Energy Management
New Orleans Office

COVER SHEET

Draft Supplemental Environmental Impact Statement
for
Gulf of Mexico OCS Oil and Gas Lease Sales 259 and 261

	Draft (x)	**Final ( )**
Type of Action:	Administrative (x)	Legislative ( )

Area of Potential Impact: Offshore Marine Environment and Coastal Counties/Parishes of Texas, Louisiana, Mississippi, Alabama, and northwestern Florida

Agency	Region Contacts
U.S. Department of the Interior Bureau of Ocean Energy Management New Orleans Office (GM 623E) 1201 Elmwood Park Boulevard New Orleans, LA 70123-2394	Michelle Nannen michelle.nannen@boem.gov Helen Rucker helen.rucker@boem.gov

ABSTRACT

This Draft Supplemental Environmental Impact Statement (EIS) re-analyzes a proposed Federal action, i.e., a Gulf of Mexico (GOM) Outer Continental Shelf oil and gas lease sale. This document is expected to be used to inform the lease sale processes for GOM oil and gas Lease Sales 259 and 261, which BOEM is required to hold by the end of March and September 2023, respectively, as directed in the Inflation Reduction Act of 2022 (Public Law 117-169, enacted August 16, 2022). While BOEM has no discretion on whether to hold these lease sales, BOEM is preparing this Supplemental EIS to follow its normal leasing process to the fullest extent possible. This Supplemental EIS contains analyses of the potential environmental impacts that could result from a Gulf of Mexico lease sale, but the analyses may be applied and supplemented as appropriate to inform the lease sale processes for GOM oil and gas Lease Sales 259 and 261 as directed in the Inflation Reduction Act of 2022.

This Draft Supplemental EIS provides the following information in accordance with the National Environmental Policy Act and its implementing regulations, and it will be used in the leasing processes for GOM oil and gas Lease Sales 259 and 261. This document includes the purpose of and need for the proposed action, identification of the alternatives, description of the affected environment, and an analysis of the potential environmental impacts of the proposed action, alternatives, and associated

activities, including proposed mitigating measures and their potential effects. Potential contributions to cumulative impacts resulting from activities associated with the proposed action are also analyzed.

Hypothetical scenarios were developed on the levels of activities, accidental events that are foreseeable (such as oil spills), and potential impacts that might result if the proposed action is adopted. Activities and disturbances associated with the proposed action on biological, physical, and socioeconomic resources are considered in the analyses.

This Draft Supplemental EIS analyzes the potential impacts of the proposed action on air and water quality, coastal habitats, deepwater benthic communities, *Sargassum*, live bottom habitats, fishes and invertebrates, birds, protected species, commercial and recreational fisheries, recreational resources, archaeological resources, human resources, and land use. It is important to note that this Draft Supplemental EIS was prepared using the best information that was publicly available at the time the document was prepared. Where relevant information on reasonably foreseeable significant adverse impacts is incomplete or unavailable, the need for the information was evaluated to determine if it was essential to a reasoned choice among the alternatives and, if so, was either acquired or in the event it was impossible or exorbitant to acquire the information, accepted scientific methodologies were applied in its place.

Copies of this Draft Supplemental EIS and the other referenced publications may be obtained from the Bureau of Ocean Energy Management, New Orleans Office, Office of Communications (GM 335A), 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394, by telephone at 504-736-2519 or 1-800-200-GULF, or on the Internet at http://www.boem.gov/nepaprocess/.

EXECUTIVE SUMMARY

This Draft Supplemental Environmental Impact Statement (EIS) analyzes a proposed Federal action, i.e., a Gulf of Mexico (GOM) Outer Continental Shelf (OCS) oil and gas lease sale. This document is expected to be used to inform the lease sale processes for GOM oil and gas Lease Sales 259 and 261, which BOEM is required to hold by the end of March and September 2023, respectively, as directed in the Inflation Reduction Act of 2022 (Public Law 117-169, enacted August 16, 2022). This Draft Supplemental EIS incorporates by reference all the relevant material in the *Outer Continental Shelf Oil and Gas Leasing Program: 2017-2022; Final Programmatic Environmental Impact Statement* (BOEM 2016c; 2016d)*; Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261—Final Multisale Environmental Impact Statement* (2017-2022 GOM Multisale EIS; [BOEM 2017b]) and *Gulf of Mexico OCS Lease Sale: Final Supplemental Environmental Impact Statement 2018* (2018 GOM Supplemental EIS, BOEM 2017a). This Supplemental EIS has been prepared to aid in the determination of whether or not new available information indicates if either GOM oil and gas Lease Sales 259 or 261 would result in new significant impacts not analyzed in the 2017-2022 GOM Multisale EIS or 2018 GOM Supplemental EIS. This Supplemental EIS also includes an expanded greenhouse gas (GHG) analysis and, in accordance with recent Executive Orders, BOEM also provides an analysis of monetized impacts from these estimated GHG emissions (even though the National Environmental Policy Act (NEPA) does not require such an analysis in the absence of a cost-benefit analysis). **Chapter 4.0.2.1** provides an overview of the methodology and results of BOEM's greenhouse gas analysis, which is described more fully in the *Gulf of Mexico OCS Oil and Gas Leasing Greenhouse Gas Emissions and Social Cost Analysis* (BOEM 2022), herein referred to as the Gulf of Mexico GHG Analysis, which is incorporated by reference into this Supplemental EIS.

Chapter 1 – Purpose of and Need for the Proposed Action

The proposed action evaluated in this Supplemental EIS is to hold an oil and gas lease sale on the Federal OCS in the GOM. This Supplemental EIS is expected to inform the lease sale processes for GOM oil and gas Lease Sales 259 and 261, which BOEM is required to hold as directed in the Inflation Reduction Act of 2022. This Supplemental EIS will utilize new information to re-analyze a single proposed action (i.e., a single lease sale in the GOM). While BOEM has no discretion on whether to hold these lease sales, BOEM is preparing this Supplemental EIS to follow its normal leasing process to the fullest extent possible. BOEM's announcement on the first GOM lease sale, i.e., GOM Lease Sale 259, will be made following the completion of this analysis. BOEM's announcement on GOM Lease Sale 261 will be made in the normal course and may be based on additional NEPA review that may update this Supplemental EIS, as appropriate.

The purpose of the proposed Federal action addressed in this Supplemental EIS is to offer for lease those areas that may contain economically recoverable oil and gas resources in order to further the orderly development of OCS oil and gas resources in accordance with the Outer Continental Shelf Lands Act (OCSLA), which specifically states that these areas "should be made available for expeditious and orderly development, subject to environmental safeguards" (OCSLA, 43 U.S.C. §§ 1331 *et seq*.), and in accordance with the Inflation Reduction Act, which requires BOEM to hold

both GOM Lease Sales 259 and 261. The need for the proposed action (i.e., a GOM lease sale) is to manage the development of the OCS energy resources in an environmentally and economically responsible manner, as required under Section 18 of the OCSLA. Oil serves as the feedstock for liquid hydrocarbon products, including gasoline, aviation and diesel fuel, and various petrochemicals. Oil from the Gulf of Mexico OCS contributes to meeting domestic demand and enhances national economic security. Since the U.S. is expected to continue to rely on oil and natural gas to meet its energy needs, this proposed action would contribute to meeting domestic demand and to reducing the need for imports of these resources.

Chapter 2 – Proposed Action and Alternatives

- **Alternative A:** An OCS oil and gas lease sale to include all available unleased blocks in the GOM, with the exception of whole and partial blocks within the boundary of the Flower Garden Banks National Marine Sanctuary, blocks deferred by the Gulf of Mexico Security Act of 2006, and blocks that are adjacent to or beyond the United States' Exclusive Economic Zone
- **Alternative B:** An OCS oil and gas lease sales excluding unleased blocks in the Western Planning Area (WPA) proposed lease sale area, blocks deferred by the Gulf of Mexico Security Act of 2006, and blocks that are adjacent to or beyond the United States' Exclusive Economic Zone
- **Alternative C:** An OCS oil and gas lease sales excluding unleased blocks in the Central Planning Area/Eastern Planning Area (CPA/EPA) proposed lease sale areas and whole and partial blocks within the boundary of the Flower Garden Banks National Marine Sanctuary
- **Alternative D:** Alternative A, B, or C, excluding the unleased blocks subject to the Topographic Features, Live Bottom (Pinnacle Trend), and Blocks South of Baldwin County, Alabama, Stipulations
- **Alternative E:** No Action. The cancellation of a single lease sale.

The Bureau of Ocean Energy Management (BOEM) considers the use of mitigation at all phases of energy development and planning. Mitigations can be applied at the prelease stage, typically through applying lease stipulations, or at the post-lease stage, by applying site-specific mitigating measures to plans, permits, and/or authorizations (refer to Appendix A of the 2017-2022 GOM Multisale EIS). The lease stipulations being considered in this analysis are the Topographic Features; Live Bottom (Pinnacle Trend); Military Areas; Evacuation; Coordination; Blocks South of Baldwin County, Alabama; Protected Species; United Nations Convention on the Law of the Sea Royalty Payment; Restrictions due to Rights-of-Use and Easements for Floating Production Facilities; the Stipulation on the Agreement between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico (Transboundary Stipulation); and the Royalties on All Produced Gas Stipulation. Post-lease mitigating measures have been implemented for over 40 years in the Gulf of Mexico region. Following a lease sale, an applicant seeks approvals to develop their lease by preparing and submitting OCS plans. The OCS plans are

reviewed by BOEM and the Bureau of Safety and Environmental Enforcement and, depending on what is proposed to take place on a specific lease, plans may be denied, approved, or approved with conditions of approval (COA). The COAs become part of the approved post-lease authorization and include environmental protections, requirements that maintain conformance with law, the requirements of other agencies having jurisdiction, or safety precautions.

Chapter 3 – Impact-Producing Factors and Scenario

This chapter describes the potentially occurring actions associated with a single lease sale and the cumulative activities that provide a framework for a detailed analysis of the potential environmental impacts. Exploration and development scenarios describe the infrastructure and activities that could potentially affect the biological, physical, and socioeconomic resources in the GOM. They also include a set of ranges for resource estimates, projected exploration and development activities, and impact-producing factors.

Offshore activities are described in the context of scenarios for a proposed action (**Chapter 3.1**) and for the OCS Oil and Gas Program (**Chapter 3.3**). BOEM's Gulf of Mexico Regional Office developed these scenarios to provide a framework for detailed analyses of potential impacts of a lease sale. The scenarios are presented as ranges (low to high) of the amounts of undiscovered, unleased hydrocarbon resources estimated to be leased and produced as a result of a proposed action. The scenarios encompass a range of activities (e.g., the installation of platforms, drilling wells, and pipelines; and the number of helicopter operations and service-vessel trips) that would be needed to develop and produce the amount of forecasted oil and gas resources.

Chapter 4 – Description of the Affected Environment and Impact Analysis

This chapter reexamines and summarizes the affected environment and the potential impacts of a single lease sale under Alternatives A-E. Detailed affected environment descriptions and impact analyses are analyzed by resource in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS, and they are hereby incorporated by reference. Analysis of the alternatives for each resource considers routine activities, accidental events, cumulative impact analysis, incomplete or unavailable information, and conclusions for each resource. This Supplemental EIS also incorporated by reference from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS the baseline data in the assessment of impacts from a proposed action on the resources and the environment (**Chapter 4**). **Table ES-1** provides a list of the resources included in this analysis and a comparison of expected impact levels by alternative (derived from each resource analysis in **Chapter 4**).

A search by BOEM's subject-matter experts was conducted for each resource to consider new information made available since publication of the 2018 GOM Supplemental EIS. It must also be emphasized that, in arriving at the overall conclusions for certain environmental resources, the conclusions are not based on impacts to individuals, small groups of animals, or small areas of habitat, but on impacts to the resources/populations as a whole.

BOEM's subject-matter experts determined through literature searches and communications with other agencies and academia that there was no new information made available since publication of the 2018 GOM Supplemental EIS that would alter the impact conclusions to the potential impacts from a lease sale. Therefore, the analyses and potential impacts for the resources remain the same as those that were presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. These impact conclusions are presented in **Chapter 4** of this Supplemental EIS. The analyses and potential impacts detailed in the previous NEPA documents remain valid and, as such, apply for GOM Lease Sales 259 and 261.

Table ES-1. Alternative Comparison Matrix for a Single Lease Sale

Impact Level Key[1]					
Beneficial[2]	Negligible	Minor	Moderate		Major
	Alternative				
Resource	A	B	C	D	E
Air Quality	Minor	Minor	Minor	Minor	None
Water Quality	Negligible	Negligible	Negligible	Negligible	None
Coastal Habitats					
Estuarine Systems	Moderate	Moderate	Minor	Moderate	Negligible
Coastal Barrier Beaches and Associated Dunes	Minor	Minor	Negligible to Minor	Negligible to Minor	Negligible
Deepwater Benthic Communities	Negligible	Negligible	Negligible	Negligible	None
Sargassum and Associated Communities	Negligible	Negligible	Negligible	Negligible	None
Live Bottoms					
Topographic Features	Negligible	Negligible	Negligible	Negligible	None
Pinnacles and Low-Relief Features	Negligible to Minor	Negligible to Minor	Negligible	Negligible	None
Fishes and Invertebrate Resources	Minor	Minor	Minor	Minor	None
Birds	Moderate	Moderate	Moderate	Moderate	None
Protected Species					
Marine Mammals	Negligible	Negligible	Negligible	Negligible	None
Sea Turtles	Negligible	Negligible	Negligible	Negligible	None
Beach Mice	Negligible	Negligible	Negligible	Negligible	None
Protected Birds	Negligible	Negligible	Negligible	Negligible	None

Impact Level Key[1]					
Beneficial[2]	Negligible	Minor	Moderate		Major
	Alternative				
Resource	A	B	C	D	E
Protected Corals	Negligible	Negligible	Negligible	Negligible	None
Commercial Fisheries	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Recreational Fishing	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Recreational Resources	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Archaeological Resources	Negligible[3]	Negligible[3]	Negligible[3]	Negligible[3]	None
Human Resources and Land Use					
Land Use and Coastal Infrastructure	Minor	Minor	Minor	Minor	None
Economic Factors	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible to Minor
Social Factors (including Environmental Justice)	Minor	Minor	Minor	Minor	None

Note: Some resources have a range for the impact levels to account for certain variables such as the uncertainty of non-OCS oil- or gas-related activities, the level and magnitude of potential accidental events, and the minimization of the OCS oil- or gas-related impacts through lease stipulations, mitigations, and/or regulations. The impact-level ratings have been specifically tailored and defined for each resource within the Chapter 4 impact analysis of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

[1] The findings for Alternatives A-D are the incremental contribution of a proposed action added to what would be expected to occur under the No Action Alternative (i.e., no lease sale). Therefore, each impact determination under Alternatives A-D assumes that the cumulative conditions and impacts (i.e., past, present, and future activities as a result of past lease sales) under the No Action Alternative would still be present.

[2] The level of beneficial impacts is specified in the analysis, which could range from low, medium, or high.

[3] The level of impacts for archaeological resources ranges between negligible to major and is dependent upon whether a survey is performed, mitigation is imposed, mitigation is followed, or a site is identified prior to the activity.

In accordance with CEQ guidelines to provide decisionmakers with a robust environmental analysis, the *Gulf of Mexico Catastrophic Spill Event Analysis* technical report (BOEM 2021c) provides an analysis of the potential impacts of a low-probability catastrophic oil spill, which is not part of a proposed action and not likely expected to occur, to the environmental and cultural resources and the socioeconomic conditions analyzed in **Chapter 4**.

Lifecycle Greenhouse Gas Emissions and Social Cost of Greenhouse Emissions

This Supplemental EIS includes an expanded greenhouse gas (GHG) analysis. **Chapter 4.0.2.1** provides an overview of the methodology and results of BOEM's greenhouse gas

analysis, which is described more fully in Gulf of Mexico GHG Analysis (BOEM 2022), which is incorporated by reference in this Supplemental EIS. The analysis estimates the GHG emissions from domestically produced or consumed energy that could result from selecting a leasing scenario (using the same exploration and development scenario as Alternative A in this Supplemental EIS) and a No Leasing Alternative (the No Action Alternative). The difference is presented as the incremental GHG emissions attributable to the leasing scenario. This analysis has been expanded to include a quantification of GHG emissions resulting from a shift in foreign oil consumption attributable to the leasing scenario. Additionally, in accordance with recent Executive Orders, BOEM also provides an analysis of monetized impacts from these estimated GHG emissions. The "social cost of carbon" (SCC), "social cost of nitrous oxide" (SCN), and "social cost of methane" (SCM) are collectively referred to as the "social cost of greenhouse gases" (SC-GHG). The SC-GHG is an estimate of the generalized economic damages associated with an increase in GHG emissions. BOEM applies the SC-GHG to the estimates of GHG emissions. The results are then presented as monetized, potential climate damages attributable to a leasing scenario (analyzed as Alternative A in this Supplemental EIS) or the No Action Alternative.

Such analysis should not be construed to mean that a cost determination is necessary to address potential impacts of GHGs associated with specific alternatives. Although NEPA requires consideration of "effects" that include "economic" and "social" effects (40 CFR § 1508.8(b)), NEPA does not require an economic cost-benefit analysis (40 CFR § 1502.23). The GHG emission estimates were annualized and monetized; however, they do not constitute a complete cost-benefit analysis nor does the cost of GHG numbers present a direct comparison with other impacts analyzed in this Supplemental EIS. For instance, BOEM's overall economic analysis for a GOM lease sale does not monetize most of the major costs or benefits and does not include all revenue streams from a GOM lease sale but seeks to quantify certain impacts related to employment numbers and labor income. The social cost of GHG analysis is provided only as a useful measure of the benefits of GHG emissions reductions to inform agency decisionmaking. This is a new and evolving approach, and BOEM will continue to evaluate the methodology with input from outside experts and the public. Refer to **Chapter 4.0.2.1** and the Gulf of Mexico Analysis (BOEM 2022), which is incorporated by reference, for a full description and detailed discussion on the methodology and results of the GHG emissions and social cost of GHG emissions analysis.

Air Quality

The level of impacts to air quality from a single lease sale would be similar for Alternatives A-D. While there are some differences in the number of activities associated with the alternatives, many of the impacts associated with the alternatives are similar because the types of activities that occur are similar and the differences are not large enough to change the range of impact conclusions. There are two versions of the "Air Quality Modeling in the Gulf of Mexico Region" study. The conclusions based on the 2019 report did not change from the conclusions based on the 2018 draft interim assessment. The potential impact of a single lease sale would be **minor** throughout the Gulf of Mexico. Impacts of a single lease sale to the U.S. Department of the Interior, Fish and Wildlife Service's (FWS), Class I Breton Wilderness Area would be **moderate**. The impacts from a proposed

activity are a small addition to the cumulative impacts on air quality when compared with emissions from onshore sources, existing oil and gas activity in State and Federal waters, commercial marine shipping, and other activities conducted in Federal waters. Therefore, the incremental contribution of the routine activities and accidental events associated with a proposed action to the cumulative impacts on air quality is expected to be **minor** to the coastal nonattainment areas. Under Alternative E, there would be no new activities associated with a single lease sale; therefore, the incremental impacts would be **none** because new impacts would be avoided entirely. However, impacts associated with current and past lease sales and non-OCS oil- and gas-related activities would continue.

Water Quality

The impacts on water quality from routine operational discharges associated with a proposed action (i.e., Alternatives A-D) are considered **negligible** (beyond 1,000 m; 3,281 ft) to moderate (within 1,000 m; 3,281 ft) of the source, and the impacts on water quality from oil spills are considered moderate, even with the implementation of safety requirements and mitigating measures. The impacts from a proposed action are a small addition to the cumulative impacts on water quality when compared with inputs from hypoxia, potentially leaking shipwrecks, chemical and weapon dumpsites, natural oil seeps, and natural turbidity. Therefore, the incremental contribution of the routine activities and accidental events associated with a proposed action to the cumulative impacts on water quality is expected to be negligible for any of the action alternatives (i.e., Alternatives A-D). Alternative E, cancellation of a single lease sale, would result in no new activities associated with a lease sale; therefore, the incremental impacts would be **none** because new impacts would be avoided entirely. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E.

Coastal Habitats

Estuarine Systems

The impacts to estuarine systems from routine activities associated with a proposed action are expected to be **minor** to **moderate** depending on the alternative (**none** for Alternative E). The impacts to estuarine systems from accidental events associated with a proposed action are expected to be **minor** for all alternatives (**none** for Alternative E). Cumulative impacts from all sources (including both OCS oil- and gas-related and non-OCS oil- and gas-related) would be **major** for all alternatives (i.e., Alternatives A-D). This major impact is due to cumulative OCS oil- and gas-related spills resulting from all past and present leasing activities, including the millions of barrels that entered the GOM from the *Deepwater Horizon* oil spill. A lease sale would result in a relatively minor addition to existing routine activities and accidental events; therefore, the incremental contribution to the cumulative impacts on estuarine systems would be **minor** to **moderate** depending on the alternative (**none** for Alternative E).

Under Alternative A, the impacts of a proposed action on estuarine systems are expected to be **moderate**, and the incremental contribution to the cumulative impacts is expected to be **moderate**.

The impacts of Alternative B would be **moderate** (like Alternative A), except impacts to estuarine systems in Texas would be **negligible** because no new OCS oil- and gas-related activity is forecasted in the WPA. For this reason, the incremental contribution of Alternative B to the cumulative impacts on estuarine systems is expected to be **moderate**. The impacts of Alternative C would be less than those of Alternative A, as only a fraction of the resulting activity forecast for Alternative A is projected under Alternative C. Under Alternative C, there would be **negligible** impacts to estuarine systems in Louisiana, Mississippi, Alabama, and the panhandle of western Florida while incrementally more impacts to the estuarine systems of Texas. Therefore, because the effects of impact-producing factors on estuarine systems would be less for Alternative C than for Alternative A, the incremental contribution of Alternative C to the cumulative impacts on estuarine systems is expected to be **minor**. The impacts of Alternative D would be nearly identical to those of the alternative it is combined with because the available unleased blocks with topographic features do not contain wetlands or submerged vegetation (i.e., estuarine systems) and are too distant (over 25 kilometers [km]; 16 miles [mi]) from the coast to have indirect impacts either. Under Alternative E (No Action) there would be no additional impacts to estuarine systems for a single lease sale. There could be some incremental increase in impacts caused by a compensatory increase in imported oil and gas to offset reduced OCS production, but it would likely be **negligible**.

Coastal Barrier Beaches and Associated Dunes

Impacts to coastal beaches and dunes from routine activities and accidental events related to a proposed action under Alternative A are expected to be **negligible** to **minor** since most routine activities are located far from coastal beaches. The impacts of Alternative B would be **negligible** to **minor** (like Alternative A), except impacts to coastal barrier beaches and dunes in Texas would be **negligible** because no OCS oil- and gas-related activity is forecasted in the WPA. The impacts of Alternative C would be less than those of Alternative A, as only a fraction of the resulting activity forecast for Alternative A is projected under Alternative C. Under Alternative C, there would be **negligible** incremental impacts to coastal barrier beaches and dunes in Louisiana; zero to **negligible** impacts to Mississippi, Alabama, and the panhandle of western Florida; and incrementally more impacts to the beaches and dunes of Texas. The impacts of Alternative D would be nearly identical to those of the alternative it is combined with because the available unleased blocks with topographic features do not contain coastal barrier beaches and dunes and are too distant (over 25 km; 16 mi) from the coast to have indirect impacts. Under Alternative E (No Action) there would be no additional impacts to coastal barrier beaches and associated dunes for a single lease sale. There could be some incremental increase in impacts caused by a compensatory increase in imported oil and gas to offset reduced OCS production, but it would likely be **negligible**. The incremental contribution of Alternatives A-D to the cumulative impacts to coastal barrier beaches and associated dunes is expected to be **minor** (**none** under Alternative E). Cumulative impacts from all sources (including both OCS oil- and gas-related and non-OCS oil- and gas-related) would be **major** for all alternatives (i.e., Alternatives A-D). This major impact is due to cumulative OCS oil- and gas-related spills resulting from all past and present leasing activities, including the millions of barrels that entered the GOM from the *Deepwater Horizon* oil spill.

Deepwater Benthic Communities

At the regional scope of this analysis, and assuming adherence to all expected regulations and mitigations, impacts from reasonably foreseeable routine activities are expected to be **negligible** for any of the action alternatives. For Alternative B, proposed OCS oil- and gas-related activities would also contribute incrementally, but only a **negligible** amount, to the overall OCS oil- and gas-related and non-OCS oil- and gas-related cumulative effects experienced by deepwater benthic communities, assuming the continuation of expected mitigation practices. Alternative C would not fundamentally alter the conclusions reached for Alternative A, but it would reduce the potential impacts of a lease sale in the available unleased blocks in the CPA/EPA. Although the area proposed for leasing in the WPA is relatively smaller than the proposed area of the CPA/EPA and would experience less projected OCS oil- and gas-related activity (refer to **Chapter 3**), deepwater benthic communities are found throughout all deep waters of the GOM and, therefore, the impacts associated with Alternative C could still potentially cause some negative effects. Alternative D would do relatively little to reduce the impacts as a result of the routine activities, accidental events, or cumulative impacts to deepwater benthic communities. Deepwater benthic communities are generally found in depths >300 m (984 ft), and the vast majority of lease blocks covered by the exclusion areas in Alternative D are in shallower waters. Existing mitigation practices would continue to be applied to the proposed activities under Alternatives A-D, reducing the expected level of impacts from a single lease sale to **negligible** for any of the action alternatives. Under Alternative E, a lease sale would be cancelled; therefore, the potential for impacts of that proposed action are **none** because new impacts to deepwater benthic communities related to a cancelled lease sale would be avoided entirely though existing activity would continue. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Sargassum and Associated Communities

Sargassum has a yearly cycle that allows quick recovery from impacts. Therefore, most routine and accidental impact-producing factors for Alternatives A-D would be expected to result in **negligible** impacts because they only impact a small percentage of the population and because impacts would be limited in size and scope as new plants rapidly replace the impacted plants. Under Alternative E, a lease sale would be cancelled and the potential for impacts from routine activities and accidental events would be **none** because new impacts would be avoided entirely. Under Alternative E, impacts to *Sargassum* would be limited to cumulative impacts associated with past, present, and future OCS oil- and gas-related development and non-OCS oil- and gas-related activities.

Live Bottoms

Topographic Features

Overall, given adherence to the Topographic Features Stipulation, which is a required mitigation as a result of the 2017-2022 National OCS Program's Record of Decision and will be applied for Lease Sales 259 and 261, or the exclusion of the areas to which that stipulation is applied from leasing, reasonably foreseeable impacts to topographic features from routine activities, accidental events, and the cumulative impacts for any of the action alternatives (i.e., Alternatives A-D) are

expected to be **negligible**. Alternative B or C would not fundamentally alter the conclusions reached under Alternative A. Many OCS lease blocks near the features are already leased, and impacts from non-OCS oil- and gas-related activities are not expected to decrease. Under Alternative D, BOEM could hold a lease sale excluding the leasing of any and/or all blocks subject to the Topographic Features, Live Bottom (Pinnacle Trend), and Blocks South of Baldwin County, Alabama, Stipulations. Topographic features would experience fewer impacts through the additional distancing of OCS oil- and gas-related activities, further reducing the probability of impacts under Alternative D. An accidental spill may still reach a topographic feature, but it is expected that the increased distance would provide more dispersal time, and subsequent time for impact mitigation, as the spill travels the additional distance across unleased blocks. Alternative D would do little to change the overall cumulative impacts to topographic features. Many OCS lease blocks near the topographic features are already leased, and impacts from non-OCS oil- and gas-related activities are not expected to decrease. Under Alternative E, a lease sale would be cancelled. Therefore, the potential for new incremental impacts is **none** because new OCS oil- and gas-related impacts to topographic features related to the cancelled lease sale would be avoided entirely. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Pinnacles and Low-Relief Features

Overall, given adherence to the Live Bottom (Pinnacle Trend) Stipulation, which is a required mitigation as a result of the 2017-2022 National OCS Program's Record of Decision and will be applied for Lease Sales 259 and 261, or the exclusion of the areas to which that stipulation is applied from leasing, reasonably foreseeable impacts to pinnacle and low-relief feature communities from routine activities, accidental events, and the cumulative impacts for any of the action alternatives (i.e., Alternatives A-D) are expected to be **negligible** or **negligible** to **minor**, depending on the alternative. Alternative B would not fundamentally alter the overall conclusion reached under Alternative A for incremental impacts from a lease sale. Many OCS lease blocks near the features are already leased, and non-OCS oil- and gas-related activities are not expected to decrease. Under Alternative C, BOEM could hold a lease sale excluding the CPA/EPA available unleased blocks and would only offer all available unleased blocks in the WPA. Alternative C would not fundamentally alter the conclusions reached under Alternative A or B, but it would reduce the potential impacts of a lease sale on the available unleased CPA/EPA blocks, including known high concentrations of pinnacle and low-relief feature communities in the Pinnacle Trend blocks and other portions of the northeastern CPA (Figure 4-9 of the 2018 GOM Supplemental EIS). Under Alternative D, BOEM could hold a lease sale excluding leasing on any and/or all blocks subject to the Topographic Features, Live Bottom (Pinnacle Trend), and Blocks South of Baldwin County, Alabama, Stipulations. Known pinnacle and low-relief features in the Pinnacle Trend area would be further protected by the increased distancing of OCS oil- and gas-related activities, reducing the probability of impacts under Alternative D. An accidental spill may still reach a feature, but it is expected that the increased distance would provide more dispersal time, and subsequent time for mitigation, as the spill travels the additional distance across unleased blocks. Under Alternative E, a lease sale would be cancelled. Therefore, the potential for new incremental impacts is **none** because new OCS oil- and gas-related impacts to pinnacle and

low-relief feature communities related to a cancelled lease sale would be avoided entirely. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Fish and Invertebrate Resources

As with the previous analyses examining the various proposed alternatives, the distribution of fish and invertebrate species in the GOM is considered to be generally even throughout their range of habitat within the planning areas, and the potential for impacts to populations is considered to be independent of the planning area(s) analyzed. Therefore, at a planning area scale, it is expected that the relative level of impacts would be the same for Alternatives A-D. Alternative E would offer no new lease blocks for exploration and development; therefore, no impacts from a lease sale would occur. However, there would be continuing impacts associated with the existing oil- and gas-related activities from previously permitted activities and previous lease sales. Therefore, for the proposed Alternatives A-D, the expected level of impact associated with routine activities, accidental events, and cumulative impacts from OCS oil- and gas-related and non-OCS oil- and gas-related sources is expected to range from **negligible** to **moderate** and would depend upon the impact-producing factors and the affected species. No impacts would be expected to result from Alternative E due to the cancellation of a single lease sale (excluding cumulative impacts from ongoing and past activities) because new impacts would be avoided entirely. Cumulative impacts of current and past activities (i.e., OCS oil- and gas--related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Birds

Since Alternative A is regionwide (i.e., includes the WPA, CPA, and EPA portions of the proposed lease sale area), it would have more OCS oil- and gas-related activities than the other alternatives, and thus more potential for impacts. Impacts from the other alternatives would follow in a graded fashion. However, offshore pelagic seabird habitat is distributed throughout the planning areas. Therefore, activities occurring only in specific planning areas pose similar potential impacts to offshore pelagic seabird populations as do activities occurring in all planning areas. Therefore, because of the diversity and distribution of offshore pelagic seabird species in the Area of Interest, the level of impacts would be the same for Alternatives A-D. Alternative E would offer no new lease blocks for exploration and development; therefore, no impacts from a single lease sale would occur because new impacts would be avoided entirely. However, there would be continuing impacts associated with the existing oil and gas activities from previously permitted activities and previous lease sales. For all alternatives (i.e., Alternatives A-D), the cumulative impacts of OCS oil- and gas-related sources would be expected to be **moderate** while the cumulative impacts on non-OCS oil and gas-related would be expected to be **major**.

Protected Species

Marine Mammals

The effects associated with selection of any of the alternatives would be equivalent because of the diversity and distribution of marine mammal species throughout the potential Area of Interest. The analyses assumed a wide distribution of species and considered impacts to marine mammal species occurring in a wide range of habitats across all planning areas. While a WPA lease sale (Alternative C) as described in **Chapter 2** would be in a smaller area with less projected activity than a regionwide (Alternative A) or CPA/EPA lease sale (Alternative B) as described in **Chapter 2**, marine mammal species are widely distributed throughout the planning areas and may travel great distances across the entire GOM. As such, activities isolated to specific areas pose similar potential impacts to populations as do activities occurring in all planning areas. Therefore, a similar mix of species would be exposed to the analyzed impact-producing factors, regardless of the specific action alternative selected. For example, if a marine mammal species were to be accidentally struck by an OCS vessel, it would have the same impact to that individual and its respective population estimate in the WPA as it would in the CPA or EPA. Although a smaller leased area resulting in less projected OCS oil- and gas-related activity could decrease the likelihood of OCS oil- and gas-related activities impacting marine mammal populations, such as the Rice's whale and coastal bottlenose dolphin, there are not enough conclusive data on the density, general distributions, and possible migratory behaviors of marine mammal populations in the GOM throughout the year to support a reasonable conclusive analysis. Therefore, because of the diversity and wide distribution of species in the Area of Interest, the level of impacts would be the same for Alternatives A-D. Under Alternative E, there would be no new activities associated with a single lease sale; however, impacts associated with past lease sales and non-OCS oil- and gas related activities would continue.

Proposed OCS oil- and gas-related activities would also contribute incrementally to the overall OCS oil- and gas-related and non-OCS oil- and gas-related cumulative effects experienced by marine mammal populations. At the regional, population-level scope of this analysis, impacts from reasonably foreseeable routine activities and accidental events could be **negligible** to **moderate** for Alternative A, B, C, or D. However, the incremental contribution of a proposed action to cumulative impacts to marine mammal populations, depending upon the affected species and their respective population stock estimate, even when taking into consideration potential impacts (*Deepwater Horizon* explosion, oil spill, and response; non-OCS oil- and gas-related activities; and the minimization of the OCS oil- and gas-related impacts through lease stipulations and regulations), is expected to be **negligible**.

The incremental contribution of a lease sale (i.e., Alternative A, B, C, or D) to cumulative impacts to marine mammal populations, depending upon the affected species and their respective population estimate, even when taking into consideration the potential impacts of the *Deepwater Horizon* explosion, oil spill, and response; non-OCS oil- or gas-related factors; and the minimization of OCS oil- or gas-related impacts through lease stipulations and regulations, would be expected to be negligible as a result of a proposed action (i.e., Alternative A, B, C, or D) and the period analyzed. Under Alternative E, cancellation of a lease sale, the impacts on marine mammals within the Gulf of

Mexico would be **none** because new impacts would be avoided entirely. However, cumulative impacts from previous lease sales and non-OCS oil- and gas-related activities would remain.

Sea Turtles

The effects associated with selection of any of the action alternatives would be equivalent because of the diversity and random distribution of sea turtles throughout the potential Area of Interest. The analyses assumed a wide distribution of species and considered impacts to sea turtles occurring in a wide range of habitats across all planning areas. While a WPA lease sale (Alternative C) would be in a smaller area with less projected activity than a regionwide (Alternative A) or CPA/EPA lease sale (Alternative B) as described in **Chapter 2**, sea turtles are distributed throughout the planning areas. As such, activities isolated to specific planning areas pose similar potential impacts to populations as do activities occurring in all planning areas. Therefore, because of the free-swimming ability and wide distribution of species across the Area of Interest, the level of impacts would be the same for Alternatives A-D. At the regional, population-level scope of this analysis, impacts from reasonably foreseeable routine activities and accidental events could be **negligible** to **moderate** for all action alternatives. However, Alternative E, cancellation of a lease sale, would avoid impacts from a lease sale and the related post-lease activities as the lease sale would not be held; only impacts from past lease sales and associated post-lease activities or other geological and geophysical permits would continue.

Beach Mice

Because of the distribution of species in the Area of Interest, the level of impacts would be generally the same for Alternatives A, B, and D. Alternative C would have no impacts since no beach mice habitat exists near the WPA proposed lease sale area. The WPA is approximately 380 mi (612 km) from known beach mouse habitat; Oil-Spill Risk Analysis (OSRA) modeling calculated a <0.05 to 1 percent chance of oil from a catastrophic spill contacting beach mouse habitat 30 days post-spill. Alternative E, cancellation of a lease sale, would be **none** because new impacts would be avoided entirely, and only impacts associated with ongoing activities from past lease sales and non-OCS oil- and gas-related activities would occur. Overall, the incremental contribution of impacts from reasonably foreseeable routine activities and accidental events to the overall cumulative impacts on beach mice is from Alternatives A, B, and D expected to be **negligible**.

Protected Birds

Due to the precautionary requirements and monitoring discussed in **Chapter 4.9.4**, the impacts to protected birds would be **negligible** for any of the action alternatives (i.e., Alternatives A-D). The impacts of Alternative B would be the same as Alternative A for all previously specified protected bird species, except for the whooping crane with the listed population in Texas (i.e., only in the WPA). The Cape Sable seaside sparrow, roseate tern, and the Mississippi sandhill crane are not found off Texas; therefore, they would not be impacted by a lease sale in the WPA (i.e., Alternative C). The impacts of Alternative D would be the same as Alternative A, B, or C because the areas of potential exclusion are specific to areas that do not have any impact on Endangered Species Act (ESA)-protected bird

species or their habitats. The impacts of Alternative E, the cancellation of a single lease sale, would yield no additional incremental impacts to ESA protected birds or their habitats because new impacts would be avoided entirely. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Protected Corals

Under Alternatives A and C, the proposed activities would have the same impact levels to protected corals whether they occur in the WPA, CPA, or EPA. While the WPA is a smaller area with less projected activity than is proposed for the CPA/EPA (refer to **Chapter 3**), many of the protected corals either occur on the East and West Flower Garden Banks, all of which are part of the Flower Garden Banks National Marine Sanctuary, and are not proposed for leasing under any alternative or are far from the area of proposed activities. Additional protection is provided through lease stipulations and post-lease activity reviews and associated site-specific information requirements and (when necessary) mitigations. Because of these protective measures and because protected corals occur generally far from areas of proposed activities, impacts from reasonably foreseeable routine activities and accidental events are both expected to be **negligible**. A negligible impact would be largely undetectable and may cause slight, localized changes to a protected coral species community in which recovery from the impact is expected. No mortality or injury to an individual or group would be expected to occur. Under Alternative B, a lease sale would not occur in the WPA; therefore, impacts to protected corals in the WPA as a result of a lease sale would not be reasonably foreseeable to occur. Under Alternative B there would, however, be ongoing cumulative impacts to the resources associated with ongoing OCS oil- and gas-related activities resulting from previous lease sales and from non-OCS oil- and gas-related activities and conditions. If Alternative B were selected, some reduction in impacts to protected corals found within the WPA may occur. However, this reduction may take years to be realized as it would likely be many years before production on existing leases will end. Since post-lease activities occur over decades, it would take several years before there would likely be a noticeable decrease in post-lease activities from previous oil and gas lease sales. Under Alternative D, should the blocks subject to the Topographic Features Stipulation be excluded, protected corals would be further protected by distancing OCS oil- and gas-related activities farther from these habitats, thereby reducing the probability of potential impacts from routine activities or accidental events. Under Alternative E, the cancellation of a single lease sale, there would be no new activities associated with a lease sale and, therefore, no associated impacts; however, impacts from activities associated with past lease sales and non-OCS oil- and gas-related activities and conditions would continue.

Commercial Fisheries

The level of impacts to commercial fisheries would range from **beneficial** to **minor** for Alternatives A-D. While there are some differences in the number of activities associated with the alternatives, many of the impacts associated with the alternatives are similar because the types of activities that occur are similar and the differences are not large enough to change the range of impact conclusions. The exact impacts would depend on the locations of activities, species affected, intensity

of commercial fishing activity in the affected area, and substitutability of any lost fishing access. Alternative E, the cancellation of a single lease sale, would prevent these impacts from occurring, except for potential **negligible** impacts arising from adjustments to incomes in the economy. Under Alternative E, fisheries would still be subject to the impacts from current and past activities from the OCS Oil and Gas Program, as well as the impacts from non-OCS oil- and gas-related activities.

Recreational Fishing

The level of impacts to recreational fishing would range from **beneficial** to **minor** for Alternatives A-D. While there are some differences in the number of activities associated with the alternatives, many of the impacts associated with the alternatives are similar because the types of activities that occur are similar and the differences are not large enough to change the range of impact conclusions. Alternative E, the cancellation of a single lease sale, would prevent these impacts from occurring, except for **negligible** changes to recreational fishing due to changes in income patterns in the economy. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Recreational Resources

Because of the relatively small contribution of any given lease sale under any of the action alternatives (i.e., Alternatives A-D) to the overall OCS Oil and Gas Program, in addition to other non-OCS oil- and gas-related activities, the incremental impacts of a proposed action to recreational resources are expected to be **beneficial (low)** to **minor** adverse effects. There could be **negligible** impacts to recreational resources due to the small economic adjustments that would occur in light of Alternative E, the cancellation of a single lease sale. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative. A detailed analysis of recreational resources can be found in Chapter 4.12 of the 2017-2022 GOM Multisale EIS and a summary in Chapter 4.12 of the 2018 GOM Supplemental EIS. Onshore and offshore OCS oil- and gas-related activities are expected to be the same for Alternatives A-D.

Archaeological Resources

For the purposes of this analysis, all alternatives may be assumed to have effectively similar potential impacts to archaeological resources. Therefore, the level of impacts would be the same for Alternatives A-D. When archaeological resources are identified, evaluated, and avoided or mitigated, the potential impact of a proposed action under Alternatives A-D is expected to be **negligible**. However, if an archaeological site were to be impacted due to a failure to properly identify, evaluate, and avoid or mitigate it, those impacts may range from **negligible** to **major**. Under Alternative E, the cancellation of a single lease sale, there would be no new activities associated with a lease sale, and impacts would be **none**; however, impacts associated with past lease sales and non-OCS oil- and gas-related activities would continue.

Human Resources and Land Use (Including Environmental Justice)

Land Use

For any of the action alternatives (i.e., Alternatives A-D), the cumulative impacts on land use and coastal infrastructure could range from **beneficial** to **moderate** for OCS oil- and gas-related activities and **beneficial** to **major** for non-OCS oil- and gas-related activities, depending on the specifics of each situation, whether the impacts are measurable, how long the impacts would last, and the size of the affected geographic area as defined in Chapter 4.14.1 of the 2017-2022 GOM Multisale EIS. Alternative E would result in no lease sale and, thus, the direct impacts as a result of a lease sale would be **none**, and there would be no incremental contribution of impacts to land use and coastal infrastructure beyond a temporary negative economic impact for the oil and gas industry and coastal states, such as Louisiana, that are more dependent on oil and gas revenues. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Economic Factors

The alternatives should be viewed in light of the OCS Oil and Gas Program, as well the numerous forces that can affect energy markets and the overall economy. Most of the incremental economic impacts of a proposed action are forecast to be **beneficial**, although there would be some **minor** adverse impacts that may occur as a result of accidental events. The exact impacts will be roughly proportional to the amount of resulting oil and gas industry activity that occurs as a result of a proposed action. There are some differences in the number of activities associated with the alternatives. However, except for Alternative E, any differences are small, and since the types of activities associated with the alternatives are the same, these small differences are not sufficient to change the range of impact conclusions. Alternative E, cancellation of a lease sale, would negatively impact firms and employees that depend on recurring leases; therefore, the impacts of Alternative E would be **negligible** to **minor**, with some partially offsetting **beneficial** impacts. Cumulative impacts of current and past activities (i.e., OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative.

Social Factors (Including Environmental Justice)

The impacts for social factors would be similar for Alternatives A-D; however, the level of impacts would be directly related to the level of OCS oil- and gas-related activity in the Gulf of Mexico. Alternative B would produce proportionately smaller OCS oil- and gas-related activity than Alternative A, and Alternative C would result in less OCS oil- and gas-related activity than Alternatives A or B. The impacts of Alternative D could be less than Alternative A, B, or C, but this difference would likely be indiscernible. The *incremental contribution* of a proposed action to cumulative impacts of a single lease sale under Alternatives A-D would be **minor** for communities and people in the Gulf Coast region. Under Alternative E, the cancellation of a single lease sale, there would be no new activities associated with a lease sale; however, impacts associated with past lease sales and non-OCS oil- and gas-related activities would continue.

Environmental Justice Determination: The oil and gas industry in the GOM region is expansive and long-lived, developing over 80 decades with substantial infrastructure in place to support both onshore and offshore activities. BOEM's scenario estimates call for 0-1 new gas processing plant and 0-1 new pipeline landfall over the 50-year life of a single proposed action. Impacts to GOM populations from a proposed action would be immeasurably small for environmental justice since these low-income and minority communities are located onshore and distant from Federal OCS oil- and gas-related activities. Also, since these vulnerable populations are located within the larger context of onshore and State-regulated nearshore oil and gas activities that are connected to downstream infrastructure over which BOEM has no regulatory authority, BOEM has determined that a proposed action would not produce added environmental justice impacts in the GOM region.

Chapter 5 – Consultation and Coordination

This chapter summarizes the ongoing consultation and coordination efforts used in preparing this Supplemental EIS. This includes a description of the Call for Information, Area ID Memorandum, and Notice of Intent to Prepare a Supplemental EIS processes. A summary of past scoping efforts for the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS was included since scoping is not required for a Supplemental EIS under 40 CFR § 1502.9(c)(4). Additionally, summaries of consultations with Federal and State agencies under the Coastal Zone Management Act, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and National Historic Preservation Act, and government-to-government consultation and coordination were included.

Chapter 6 – References

This chapter includes all the citations referenced throughout this Supplemental EIS.

Chapter 7 – List of Preparers

This chapter provides a list of all the preparers of this Supplemental EIS.

Chapter 8 – Glossary

This chapter is a glossary of the terms used throughout this Supplemental EIS.

Appendix A – Proposed Lease Mitigating Measures (Stipulations)

This appendix details the proposed lease stipulations.

Appendix B – Consultation Correspondence

This appendix collects the letters associated with the various consultations.

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ABBREVIATIONS AND ACRONYMS

µg	Microgram
µm	Micrometer
2017-2022 National OCS Program	*2017-2022 Outer Continental Shelf Oil and Gas Leasing: Proposed Final Program*
2017-2022 National OCS Program EIS	*Outer Continental Shelf Oil and Gas Leasing Program: 2017-2022, Final Programmatic Environmental Impact Statement*
2017-2022 GOM Multisale EIS	*Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2022; Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261—Final Multisale Environmental Impact Statement*
2018 GOM Supplemental EIS	*Gulf of Mexico OCS Lease Sale: Final Supplemental Environmental Impact Statement 2018*
2019-2024 Draft Proposed Program	*2019-2024 National Outer Continental Shelf Oil and Gas Leasing: Draft Proposed Program*
2019-2024 National Program	National Outer Continental Shelf Oil and Gas Leasing Program for 2019-2024
2D	two dimensional
3D	three dimensional
ac	Acre
Agreement	Agreement between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico
Area ID	Area Identification
AQRV	air quality-related value
bbl	Barrel
Bbbl	billion barrels
Bcf	billion cubic feet
BBO	billion barrels of oil
BOE	billion barrels of oil equivalent
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
B.P.	before present
BSEE	Bureau of Safety and Environmental Enforcement
BTEX	benzene, toluene, ethylbenzene, and xylene
Call	Call for Information
CAMx	Comprehensive Air-quality Model with extensions
CD	Consistency Determination
CEQ	Council on Environmental Quality

CFR	Code of Federal Regulations
CG	Coast Guard (also: USCG)
CH_4	Methane
CMAQ	Community Multiscale Air Quality
CMP	Coastal Management Program
CO	carbon monoxide
COA	conditions of approval
CO_2	carbon dioxide
CO_2-e	CO_2-equivalent
COE	Corps of Engineers (U.S. Army)
CPA	Central Planning Area
CZMA	Coastal Zone Management Act
DOCD	development operations coordination document
DOI	Department of the Interior (U.S.) (also: USDOI)
DOT	Department of Transportation (U.S.) (also: USDOT)
DPP	development and production plan
EFH	essential fish habitat
e.g.	for example
EIA	Economic Impact Area
EIS	environmental impact statement
EP	exploration plan
EPA	Eastern Planning Area
ESA	Endangered Species Act of 1973
et al.	and others
et seq.	and the following
FPSO	floating production, storage, and offloading system
FR	*Federal Register*
ft	Feet
FWS	Fish and Wildlife Service
G&G	geological and geophysical
GHG	greenhouse gas
GOADS	Gulfwide Offshore Activity Data System
GOM	Gulf of Mexico
GOMESA	Gulf of Mexico Energy Security Act
Gulf of Mexico GHG Analysis	*Gulf of Mexico OCS Oil and Gas Leasing Greenhouse Gas Emissions and Social Cost Analysis*
GWEI	Gulfwide Emission Inventory
H_2S	hydrogen sulfide

ha	Hectare
HRG	high-resolution geophysical
Hz	Hertz
i.e.	that is
km	Kilometer
LA	Louisiana
LCA	Louisiana Coastal Area
LNG	liquefied natural gas
LOOP	Louisiana Offshore Oil Port
m	Meter
MAG-PLAN	MMS Alaska-GOM Model Using IMPLAN
MARAD	Maritime Administration (U.S. Department of Transportation)
MATS	Modeled Attainment Test Software
mg/L	milligrams/liter
mi	Mile
mm	Millimeter
MMbbl	million barrels
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MODU	mobile offshore drilling unit
N.	North
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
nmi	nautical-mile
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Assessment
NTL	Notice to Lessees and Operators
O_3	Ozone
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSHA	Occupational Safety and Health Administration

OSRA	Oil Spill Risk Analysis
OSRP	oil-spill response plan
OSV	offshore support vessel
Pb	Lead
PBR	Potential Biological Removal
PDARP/PEIS	*Deepwater Horizon Oil Spill: Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement*
PM	particulate matter
$PM_{2.5}$	particulate matter less than or equal to 2.5 mm
PM_{10}	particulate matter less than or equal to 10 mm
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
RCP	Representative Concentration Pathways
ROD	Record of Decision
SC-GHG	social cost of greenhouse gases
SC	source category
SCC	social cost of carbon
SCM	social cost of methane
SCN	social cost of nitrous oxide
SO_2	sulphur dioxide
SO_x	sulphur oxides
Tcf	trillion cubic feet
TPY	tons per year
Trustees	Natural Resource Damage Assessment Trustees
U.S.	United States
U.S.C.	United States Code
UME	unusual mortality event
USCG	U.S. Coast Guard (also: CG)
USDHS	U.S. Department of Homeland Security
USDOC	U.S. Department of Commerce
USDOE	U.S. Department of Energy
USDOI	U.S. Department of the Interior (also: DOI)
USDOT	U.S. Department of Transportation (also: DOT)
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VGP	Vessel General Permit

VOC	volatile organic compound
VSP	vertical seismic profiling
W.	West
WPA	Western Planning Area
WRF	Weather and Research Forecasting
yr	Year

CONVERSION CHART

To convert from	To	Multiply by
centimeter (cm)	inch (in)	0.3937
millimeter (mm)	inch (in)	0.03937
meter (m)	foot (ft)	3.281
meter^2 (m^2)	foot^2 (ft^2)	10.76
meter^2 (m^2)	yard^2 (yd^2)	1.196
meter^2 (m^2)	acre (ac)	0.0002471
meter^3 (m^3)	foot^3 (ft^3)	35.31
meter^3 (m^3)	yard^3 (yd^3)	1.308
kilometer (km)	mile (mi)	0.6214
kilometer^2 (km^2)	mile^2 (mi^2)	0.3861
hectare (ha)	acre (ac)	2.47
liter (L)	gallons (gal)	0.2642
degree Celsius (°C)	degree Fahrenheit (°F)	°F = (1.8 x °C) + 32
1 barrel (bbl) = 42 gal = 158.9 L = approximately 0.1428 metric tons 1 nautical mile (nmi) = 1.15 mi (1.85 km) or 6,076 ft (1,852 m) tonnes = 1 long ton or 2,240 pounds (lb)		

CHAPTER 1

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1 THE PROPOSED ACTION

1.1 INTRODUCTION

This Supplemental Environmental Impact Statement (Supplemental EIS) re-analyzes a proposed Federal action, i.e., a Gulf of Mexico (GOM) Outer Continental Shelf (OCS) oil and gas lease sale. This document is expected to be used to inform lease sale processes for GOM oil and gas Lease Sales 259 and 261, which BOEM is required to hold by the end of March and September 2023, respectively, as directed in the Inflation Reduction Act of 2022 (Public Law 117-169, enacted August 16, 2022). While BOEM has no discretion on whether to hold these lease sales, BOEM is preparing this Supplemental EIS to follow its normal leasing process to the fullest extent possible. The remaining proposed lease sale areas are comprised of the Western, Central, and a small portion of the Eastern Planning Areas (WPA, CPA, and EPA, respectively) not subject to Presidential withdrawal. These planning areas are located off the States of Texas, Louisiana, Mississippi, Alabama, and Florida (**Figure 1-1**).

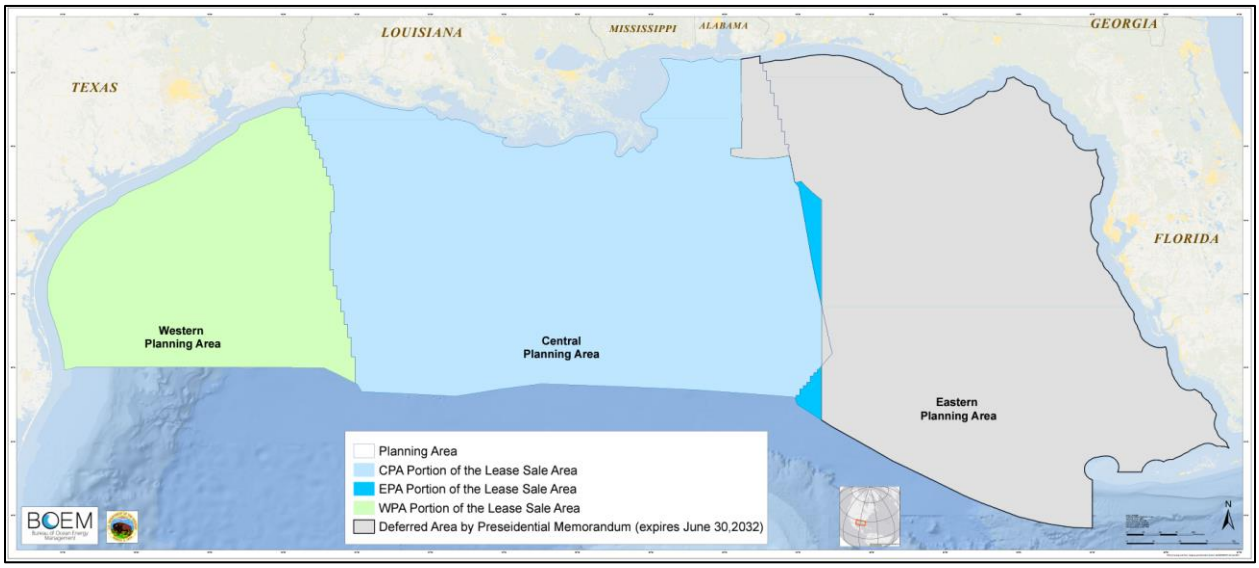

Figure 1-1. Proposed Lease Sale Area.

While BOEM was preparing this Supplemental EIS, the United States Court of Appeals for the District of Columbia Circuit filed its Opinion in the *Gulf Restoration Network v. Haaland* appeal (No. 20-5179) on August 30, 2022, in which plaintiffs argued that BOEM had not met certain National Environmental Policy Act (NEPA) obligations for GOM Lease Sales 250 and 251. In its Opinion, the court held, in part, that BOEM had failed to properly address a Government Accountability Office (GAO) report about asserted deficiencies in the Bureau of Safety and Environmental Enforcement's (BSEE) enforcement of its regulations. While this Supplemental EIS was initially planned to inform decisions regarding Lease Sales 259 and 261, it also includes a discussion of the GAO report in accordance with the D.C. Circuit Court's opinion.

The Bureau of Ocean Energy Management (BOEM) issued the *2017-2022 Outer Continental Shelf Oil and Gas Leasing: Proposed Final Program* (BOEM 2016a), which proposed 10 GOM oil and gas lease sales, with 2 lease sales to be held each year. While the National OCS Program provides a framework and general guide for leasing during the Program's term, the Secretary of the Interior has discretion under the Outer Continental Shelf Lands Act (OCSLA) and other applicable laws to determine whether and when to hold individual lease sales (refer to 43 U.S.C. § 1344(e)). Although the 2017-2022 National OCS Program has expired and the final two lease sales in the GOM, i.e., GOM Lease Sales 259 and 261, were not held, the Inflation Reduction Act of 2022 requires that BOEM hold Lease Sale 259 for the Gulf of Mexico by March 31, 2023, and Lease Sale 261 for the Gulf of Mexico by September 30, 2023. In addition, the Inflation Reduction Act of 2022 has language indicating that BOEM must hold an offshore oil and gas lease sale consisting of at least 60 million acres in a year prior to holding an offshore wind lease sale. During the development of the 2017-2022 National OCS Program, BOEM conducted region-specific reviews by Program Areas (i.e., the portions of the OCS planning areas that remained in consideration for leasing during the 2017-2022 National OCS Program development process); consequently, BOEM prepared the following analyses to support individual lease sale decisions, and these will be used for this analysis:

- *Outer Continental Shelf Oil and Gas Leasing Program: 2017-2022; Final Programmatic Environmental Impact Statement* (BOEM 2016c; 2016d);
- *Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2022; Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261—Final Multisale Environmental Impact Statement* (2017-2022 GOM Multisale EIS) (BOEM 2017b); and
- *Gulf of Mexico OCS Lease Sale: Final Supplemental Environmental Impact Statement 2018* (2018 GOM Supplemental EIS) (BOEM 2017a).

This Supplemental EIS tiers from, updates, and incorporates by reference all relevant material in the 2017-2022 National OCS Program EIS, 2017-2022 GOM Multisale EIS, and 2018 GOM Supplemental EIS. This Supplemental EIS contains analyses of the potential environmental impacts that could result from GOM Lease Sale 259 in the GOM, but the analyses may be supplemented as appropriate to prior to GOM Lease Sale 261.

The Proposed Action

The proposed action evaluated in this Supplemental EIS is to hold an oil and gas lease sale on the Federal OCS in the GOM. This Supplemental EIS will inform the lease sale processes for GOM Lease Sales 259 and 261, which BOEM must hold by the end of March and September 2023, respectively, as directed in the Inflation Reduction Act. It analyzes a single proposed action (i.e., a single lease sale in the GOM). Pursuant to the OCSLA staged leasing process, BOEM typically must make an individual decision on whether and how to proceed with each lease sale; however, as noted above, BOEM is required to hold GOM Lease Sales 259 and 261 by March and September 2023, respectively, under the Inflation Reduction Act of 2022. While BOEM does not have any discretion in

holding either of these two lease sales, BOEM has prepared this Supplemental EIS to follow its normal leasing process to the fullest extent practicable. BOEM's announcement of the GOM lease sale, i.e., GOM Lease Sale 259, will be made following the completion of this NEPA analysis. The announcement on GOM Lease Sale 261 will be made in the normal course and may include additional NEPA review that may update this Supplemental EIS, as appropriate.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of and need for the proposed Federal action (i.e., a GOM lease sale) is to offer for lease those areas that may contain economically recoverable oil and gas resources in order to further the orderly development of OCS oil and gas resources in accordance with the OCSLA. This legislation specifically states that these areas "should be made available for expeditious and orderly development, subject to environmental safeguards" (43 U.S.C. §§ 1331 *et seq*.). On August 16, 2022, President Biden signed the Inflation Reduction Act of 2022, which requires BOEM to hold GOM Lease Sale 259 by March 31, 2023, and GOM Lease Sale 261 by September 31, 2023. Each individual lease sale would provide qualified bidders the opportunity to bid upon and lease available acreage in the Gulf of Mexico OCS in order to explore, develop, and produce oil and natural gas. Oil serves as the feedstock for liquid hydrocarbon products, including gasoline, aviation and diesel fuel, and various petrochemicals. Oil from the Gulf of Mexico OCS contributes to meeting domestic demand and enhances national economic security. Since the U.S. is expected to continue to rely on oil and natural gas to meet its energy needs, each proposed action would contribute to meeting domestic demand and to reducing the need for imports of these resources. Refer to Chapter 1.2 of the 2017-2022 GOM Multisale EIS for details on petroleum consumption and energy needs in the United States, as well as the Gulf of Mexico OCS region's resource potential. Energy forecasts remain subject to heightened levels of uncertainty due to effects of the 2019 novel coronavirus (COVID-19) pandemic. The COVID-19 pandemic initially reduced economic activity and caused decreases in both energy supply and demand. However, energy production and consumption levels have been gradually recovering from the pandemic. The volatility in energy markets continues though as supply and demand patterns adjust to changing conditions. Energy markets are expected to eventually stabilize, and the long-term trends for oil and gas markets are not likely to substantially change due to the pandemic (Energy Information Administration 2021a; 2021d). In 2021, BOEM completed an assessment of undiscovered oil and gas resources of the Nation's OCS, which updated the Gulf of Mexico OCS region's resource potential (BOEM 2021a). In a comparison of the 2000, 2006, 2011, 2016, and 2021 undiscovered technically recoverable resources (UTRR) assessment results in the GOM, the UTRR mean estimate for oil dropped 38 percent to 29.59 billion barrels of oil (BBO), while the estimate for gas decreased 61 percent from 141.76 trillion cubic feet of gas to 54.84 trillion cubic feet (Tcf) of gas. The overall decrease in UTRR is due in part to the refinement of field-size distributions and the estimated number of prospects for some mature geologic plays in the Gulf of Mexico OCS, particularly on the shallow-water shelf.

1.3 GULF OF MEXICO POST-LEASE ACTIVITIES

BOEM and BSEE are responsible for managing, regulating, and monitoring oil and natural gas exploration, development, and production operations on the OCS to promote the orderly development

of mineral resources in a safe and environmentally sound manner. BOEM's regulations for oil, gas, and sulphur lease operations are specified in 30 CFR parts 550, 551, 554, and 556. BSEE's regulations for oil, gas, and sulphur operations are specified in 30 CFR parts 250 and 254. Refer to Appendix A of the 2017-2022 GOM Multisale EIS for descriptions of post-lease activities. All plans for OCS oil- and gas-related activities (e.g., exploration and development plans) go through rigorous BOEM review and approval to ensure compliance with established laws and regulations before any project-specific activities can begin on a lease. Mitigating measures, or conditions of approval, are incorporated and documented in plans and permit applications submitted to BOEM. Conditions of approval are based on BOEM's and BSEE's technical and environmental evaluations of the proposed operations and may be applied to any OCS plan, permit, right-of-use and easement, or pipeline right-of-way grant. Refer to Appendix B of the 2017-2022 GOM Multisale EIS ("Commonly Applied Mitigating Measures") for more information on the mitigating measures that BOEM and BSEE often apply to permits and approvals. Operational compliance of the mitigating measures is enforced through BSEE's onsite inspection program.

BOEM and BSEE issue Notices to Lessees and Operators (NTLs) to provide clarification, description, or interpretation of a regulation; provide guidelines on the implementation of a special lease stipulation or regional requirement; or convey administrative information. A detailed listing of the current Gulf of Mexico OCS region's NTLs is available through BOEM's Gulf of Mexico Regional Office's website at http://boem.gov/Regulations/Notices-Letters-and-Information-to-Lessees-and-Operators.aspx or through the Regional Office's Public Information Office at 504-736-2519 or 1-800-200-GULF. A detailed listing of BSEE's Gulf of Mexico OCS Region's current NTLs is available through BSEE's website at https://www.bsee.gov/guidance-and-regulations/guidance/notice-to-lessees.

1.4 Regulatory Framework

Federal laws mandate the preparation of a national OCS oil and gas leasing program (i.e., OCSLA) and the environmental review process (e.g., OCSLA and NEPA). Implementing regulations encourage orderly, safe, and environmentally responsible development of oil, natural gas, alternative energy sources, and other mineral resources on the OCS. BOEM consults with numerous Indian Tribes and Federal and State departments and agencies that have authority to govern and maintain ocean resources pursuant to other Federal laws. For more information on BOEM's consultation partners for specific Federal regulations and specific consultation and coordination processes with Indian Tribes, and Federal, State, and local agencies, refer to Chapter 1.5 of the 2017-2022 GOM Multisale EIS. In addition, a detailed description of major Federal laws and environmental regulations that are relevant to the OCS leasing process is provided in the *Gulf of Mexico OCS Regulatory Framework* technical report, which can be found on BOEM's website (BOEM 2020a).

1.5 Other Pertinent Environmental Reviews or Documentation

On August 3, 2015, the USEPA announced the Clean Power Plan, which is a step towards reducing carbon pollution from power plants. The final rule for the *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units* was published in the

Federal Register on October 23, 2015 (*Federal Register* 2015). On February 9, 2016, the Supreme Court stayed implementation of the Clean Power Plan pending judicial review. On June 19, 2019, the USEPA issued the Affordable Clean Energy rule to replace the Clean Power Plan. On January 19, 2021, the D.C. Circuit vacated the Affordable Clean Energy rule and remanded it to the USEPA for further proceedings. On February 12, 2021, the USEPA published a memo to assist USEPA staff to answer questions from the states about the court's decision (USEPA 2021c). The Clean Power Plan was vacated by the Supreme Court on June 30, 2022, in *West Virginia v. Environmental Protection Agency, 142 S.Ct. 2587* (2022). Regardless, BOEM's analyses in the 2017-2022 National OCS Program, 2017-2022 GOM Multisale EIS, and 2018 GOM Supplemental EIS would not be affected or changed by the USEPA's actions related to the regulation of greenhouse gas emissions (GHG) from power plants. The range of activity described by the scenarios in these NEPA documents represents BOEM's best estimate of the range of possible production volumes and associated activity that can reasonably be expected from the acreage leased during a single lease sale. The range provides subject-matter experts the flexibility to develop impact analyses for the full array of potential activity that can be expected from an individual lease sale regardless of changing policies. BOEM is confident that the scenario development methodology used in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS analyses adequately projects Gulf of Mexico OCS oil- and gas-related activities in both the short term and long term.

In February 2016, the U.S. Government Accountability Office (GAO) prepared a report called *Oil and Gas Management: Interior's Bureau of Safety and Environmental Enforcement Restructuring Has Not Addressed Long-Standing Oversight Deficiencies* (GAO 2016). This report examined the extent to which BSEE's ongoing (at the time) restructuring had enhanced its capabilities for (1) investigations, (2) environmental compliance, and (3) enforcement. The GAO reviewed laws, regulations, and policies related to BSEE's restructuring and oversight activities. The GAO had nine recommendations, including that BSEE (1) complete and update its investigative policies and procedures, (2) conduct and document a risk analysis of the regional-based reporting structure, and (3) develop procedures for enforcement actions. BSEE began addressing the recommendations in 2016 and according to GAO, as of 2021, all recommendations related to restructuring of offshore oil and gas oversight have been closed and implemented (GAO 2021). The GAO removed the segment from its High Risk Series. After independently reviewing the GAO reports, including the updates on the GAO website closing out the recommendations on oversight and restructuring, BOEM has determined that the GAO report and the recommendations that have now been implemented by BSEE do not change the reasonably foreseeable environmental impacts that may result from an oil and gas lease sale and that were evaluated in the 2017-2022 GOM Multisale EIS or 2018 GOM Supplemental EIS. In those analyses, BOEM continued to acknowledge that, while industry practices and government regulations and oversight minimize the risk of oil spills and other accidental events, there is no way to guarantee that accidental events will not occur, as evidenced by historical data. Balancing the presumption in NEPA reviews that agencies are entitled to rely on a presumption of regularity in compliance and enforcement while also acknowledging accidental events are unauthorized, BOEM has examined the potential for reasonably foreseeable accidental events separately (refer to **Chapter 3.3**) due to their potential to occur and lead to significant and severe environmental impacts. The potential impact of accidental events is considered for each resource in **Chapter 4.0**. As noted

above, BOEM has also considered a catastrophic spill analysis technical report (BOEM 2021c), which is incorporated by reference.

On August 4, 2017, a Notice of Availability was published in the *Federal Register* for BOEM's *Gulf of Mexico OCS Proposed Geological and Geophysical Activities: Western, Central, and Eastern Planning Areas – Final Programmatic Environmental Impact Statement* (Gulf of Mexico G&G Final Programmatic EIS, BOEM 2017c). A Record of Decision (ROD) was subsequently published on December 4, 2020 (BOEM 2020b). The ROD does not authorize any geological and geophysical (G&G) activities, but rather it establishes a framework for additional mandatory environmental reviews for site-specific actions and identifies applicable mitigating measures governing any future G&G activities in the region. BOEM will analyze the potential impacts of future site-specific actions in subsequent evaluations, which will tier from the Gulf of Mexico G&G Final Programmatic EIS and which can be found online at https://www.boem.gov/gulf-mexico-geological-and-geophysical-gg. As new scientific information becomes available, these additional findings can be incorporated into the survey-specific environmental reviews through an adaptive management approach.

On September 28, 2018, BSEE published revisions to the 2018 Oil and Gas Production Safety Systems Rule, which became effective on December 27, 2018 (*Federal Register* 2018b), and on May 2, 2019, BSEE published revisions for the 2019 Well Control and Blowout Preventer Rule, which became effective on July 15, 2019 (*Federal Register* 2019c). BOEM has independently reviewed BSEE's Final Environmental Assessment and Finding of No Significant Impact (FONSI) for the 2019 Well Control and Blowout Preventer Proposed Rule and the Final Environmental Assessment and FONSI for the 2018 Oil and Gas Production Safety Systems Rule (BSEE 2018c; 2018d; 2019b; 2019c). The analyses in those environmental assessments and FONSIs are incorporated by reference herein. For purposes of this supplemental analysis, BOEM agrees with BSEE's conclusions that the rule changes do not change or increase environmental risks from what they were under the 2016 rules. BOEM concludes that the final changes to the rules do not change the conclusions of the 2017-2022 GOM Multisale EIS or 2018 GOM Supplemental EIS. BOEM agrees with the conclusions because the changes to the rules carefully removed unnecessary burdens while leaving critical safety provisions intact, did not change the overall risks related to oil and gas activities on the OCS, and did not change the potential impacts that may result from OCS oil and gas activities in the Gulf of Mexico, as evaluated in the 2017-2022 GOM Multisale EIS, 2018 GOM Supplemental EIS, and BOEM's *Gulf of Mexico OCS Catastrophic Spill Event Analysis* technical report (BOEM 2021c) and incorporates by reference in those EISs.

On May 14, 2020, BOEM announced final revisions on the Air Quality Control, Reporting, and Compliance Rule. As discussed in BOEM (2020a), the final rule ensures that BOEM's air quality regulations remain in compliance with the OCSLA requirements. Specifically, the final rule ensures that BOEM applies up-to-date values for the Significance Levels in 30 CFR § 550.303(e) consistent with those already established by the U.S. Environmental Protection Agency (USEPA) for analogous purposes (40 CFR § 51.165(b)(2)). This rulemaking makes other improvements to the regulations to clarify and correct inconsistencies but would not result in any different or additional environmental

impacts. The new rule does not affect the Bureau of Ocean Energy Management's NEPA analyses and conclusions found in the 2018 GOM Supplemental EIS.

On February 1, 2021, BOEM published an update to the *Gulf of Mexico OCS Catastrophic Spill Event Analysis* technical report (BOEM 2021c). In 2017, BOEM prepared the *Catastrophic Spill Event Analysis* technical report as a standalone report in support of the 2017-2022 GOM Multisale EIS and subsequent 2018 GOM Supplemental EIS. In 1986, the Council on Environmental Quality (CEQ) regulations were amended to rescind the requirement to prepare a "worst-case analysis" for an EIS (refer to 40 CFR § 1502.22(b)(4)). The regulation, as amended, states that catastrophic, low-probability impacts must be analyzed if the analysis is "supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." The August 16, 2010, CEQ report, prepared following the *Deepwater Horizon* explosion, oil spill, and response in the GOM, recommended that the Bureau of Ocean Energy Management, formerly the Minerals Management Service and Bureau of Ocean Energy Management, Regulation and Enforcement, should "Ensure that NEPA [National Environmental Policy Act] documents provide decisionmakers with a robust analysis of reasonably foreseeable impacts, including an analysis of reasonably foreseeable impacts associated with low-probability catastrophic spills for oil and gas activities on the Outer Continental Shelf" (CEQ 2010). This 2021 updated evaluation is a robust analysis of the impacts from low-probability catastrophic spills and is made available to all applicable decisionmakers including, but not limited to, the Secretary of the U.S. Department of the Interior, the Assistant Secretary of Land and Minerals Management for an oil and gas lease sale, and the Regional Supervisors of the Gulf of Mexico Regional Office's Office of Environment and Office of Leasing and Plans. The analysis presented in this report is intended to be a general overview of the potential effects of a low-probability catastrophic spill in the Gulf of Mexico, which is not reasonably foreseeable nor a part of the proposed action, but has been evaluated nonetheless and is incorporated by reference herein.

1.6 FORMAT AND ORGANIZATION OF THIS SUPPLEMENTAL EIS

The remaining chapters in this Supplemental EIS are described below.

- **Chapter 2** describes the proposed action, including the potential lease sale options and the alternatives, being analyzed in this Supplemental EIS; discusses the potential mitigating measures (pre- and post-lease), including the proposed stipulations; and provides a broad comparison of impacts by alternative.
- **Chapter 3** describes all of the potentially occurring actions associated with a GOM lease sale and the cumulative activities that provide a framework for detailed analyses of the potential impacts analyzed in **Chapter 4**.
- **Chapter 4** summarizes the affected environment and the potential impacts of a GOM lease sale and each alternative by resource, focusing on any new information that may affect previous conclusions for each resource since publication of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

- **Chapter 5** describes the consultation and coordination efforts used in preparing this Supplemental EIS.
- **Chapter 6** includes all of the citations referred to throughout this Supplemental EIS.
- **Chapter 7** is a list of the preparers of this Supplemental EIS.
- **Chapter 8** is a glossary of terms.
- **Appendix A** includes the proposed lease mitigating measures (stipulations).
- **Appendix B** includes the consultation coordination letters.

CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTION

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

One presiding principle of NEPA is that alternatives analyzed can accomplish the purpose of and need for the proposed action (Section 102(C)(iii) of 42 U.S.C. § 4332), with the exception of the required No Action Alternative. This chapter presents a reasonable range of alternatives to the proposed action and also summarizes the alternatives that were considered but eliminated from further analysis. Specifically, four action alternatives (Alternatives A-D) and a no action alternative (Alternative E) are described in this chapter, which are similar to the alternatives considered in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. BOEM also presents the potential mitigating measures that could be used to reduce the environmental impact of the proposed action or alternatives at the lease sale stage. Finally, this chapter presents the issues and resources to be analyzed and summarizes the potential impacts by alternative. This comparison will sharply define the issues and provide the decisionmaker and the public a clear analysis of the options.

2.2 SUPPLEMENTAL EIS NEPA ANALYSIS

This Supplemental EIS is intended to focus on any relevant significant new information, methodologies, and/or issues since publication of the previous lease sale NEPA documents from which it tiers. Since GOM Lease Sales 259 and 261 and their projected activities are very similar to all other GOM lease sales proposed under the 2017-2022 National OCS Program, the impacts from a single GOM lease sale (i.e., GOM Lease Sale 259) reanalyzed in this Supplemental EIS may be applied to GOM Lease Sale 261, as authorized under 40 CFR § 1502.4, which allows related or similar proposals to be analyzed in one EIS. This Supplemental EIS tiers from, updates, summarizes, and incorporates by reference the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. This Supplemental EIS also includes an expanded GHG analysis and, in accordance with recent Executive Orders, BOEM also provides an analysis of monetized impacts from these estimated GHG emissions. **Chapter 4.0.2.1** provides an overview of the methodology and results of BOEM's greenhouse gas analysis, which is described more fully in the Gulf of Mexico GHG Analysis (BOEM 2022), which is incorporated by reference in this Supplemental EIS.

2.3 ALTERNATIVES, MITIGATING MEASURES, AND ISSUES

In this Supplemental EIS, BOEM will analyze five alternatives for the Proposed Action, i.e., four action alternatives and a no action alternative. Through the scoping efforts for the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, numerous issues and topics were identified for consideration. During the scoping period for the 2017-2022 GOM Multisale EIS, a number of alternatives or deferral options were suggested and examined for inclusion in Chapter 2.2.2 of the 2017-2022 GOM Multisale EIS. Scoping for the 2018 GOM Supplemental EIS provided additional alternative and deferral options described in Chapter 2.2.2 of the 2018 GOM Supplemental EIS. Those alternative and deferral options were also reexamined during the preparation of this Supplemental EIS. These suggestions included additional deferrals, policy changes, and suggestions beyond the scope of this Supplemental EIS. BOEM has not identified any new significant information that changes its conclusions in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS or that

indicates that those previously excluded proposed alternatives or deferral options are appropriate for further in-depth analysis. The justifications for not carrying those suggestions through detailed analyses in this Supplemental EIS are the same as those used in the 2012-2017 GOM Multisale EIS and 2018 GOM Supplemental EIS.

2.3.1 Alternatives Considered

The discussions below describe the alternatives that are considered for this environmental analysis. All available unleased blocks within the WPA, CPA, and EPA portions of the proposed lease sale area, with the exceptions as outlined for each alternative below, are being considered for each representative lease sale. The mitigating measures (pre- and post-lease), including the proposed stipulations, are fully described in **Chapter 2 and Appendix A** of this Supplemental EIS. Alternatives A-E have been previously analyzed in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, and their conclusions have been verified in this Supplemental EIS.

2.3.1.1 Alternative A – Gulf of Mexico OCS Lease Sale

Alternative A would allow for a GOM lease sale encompassing all three planning areas within the U.S. portion of the Gulf of Mexico OCS. This alternative would allow for a GOM lease sale encompassing the three GOM planning areas of the WPA, CPA, and EPA not currently under Presidential withdrawal. Under Section 12(a) of the OCS Lands Act, 43 U.S.C. § 1341(a), the President may "withdraw from disposition any of the unleased lands of the Outer Continental Shelf." On September 8, 2020, the areas of the OCS designated by Section 104(a) of the Gulf of Mexico Energy Security Act of 2006, Public Law 109-432, were withdrawn from disposition by leasing for 10 years, beginning on July 1, 2022, and ending on June 30, 2032 (White House 2020). BOEM is analyzing this approach to provide greater flexibility, including more frequent opportunity to bid on rejected, relinquished, or expired OCS lease blocks in all three GOM planning areas. More frequent lease sales in the planning areas (through biannual GOM leasing) may also expedite and increase the present value of leasing and tax revenues. For a ease sale, all available unleased blocks within the WPA, CPA, and EPA portions of the proposed lease sale area for oil and gas operations (**Figure 2-1**) would be available for lease, with the following exceptions:

(1) whole and portions of blocks currently under Presidential withdrawal (White House, 2020);

(2) blocks that are adjacent to or beyond the United States' Exclusive Economic Zone; and

(3) whole and partial blocks within the boundaries of the Flower Garden Banks National Marine Sanctuary as of the July 2008 Memorandum on Withdrawal of Certain Areas of U.S. OCS from Leasing Disposition.

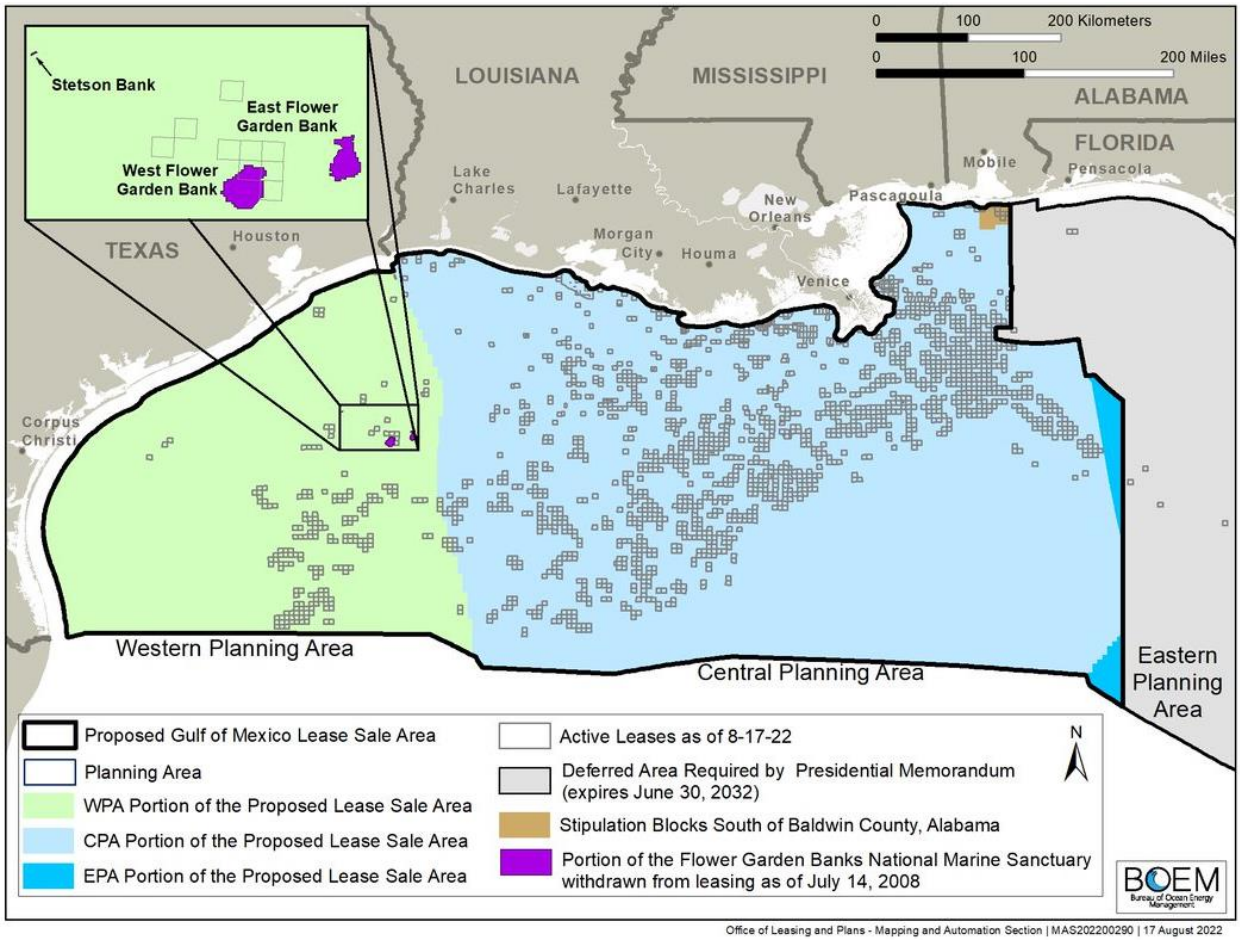

Figure 2-1. Proposed Lease Sale Area for Alternative A, Encompassing the Available Unleased Blocks within All Three Planning Areas (a total of approximately 94.14 million acres with approximately 84.11 million acres available for lease as of August 2022).

Under Alternative A, a GOM lease sale would include all three BOEM planning areas not under Presidential withdrawal, encompassing a total of approximately 94.14 million acres with approximately 84.11 million acres available for lease as of August 2022. Leasing information related to all three planning areas is updated monthly and can be found on BOEM's website at http://www.boem.gov/Gulf-of-Mexico-Region-Lease-Map/.

In general, a GOM lease sale under Alternative A would represent an incremental contribution of 1.2-4.2 percent of the total Cumulative OCS Oil and Gas Program production scenario in the GOM based on barrels of oil equivalent resource estimates (**Table 3-2**). The estimated amounts of resources projected to be leased, discovered, developed, and produced as a result of a typical GOM lease sale under Alternative A are 0.211-1.118 BBO and 0.547-4.424 Tcf of gas (refer to **Table 3-3**).

2.3.1.2 Alternative B – Gulf of Mexico OCS Lease Sale Excluding Available Unleased Blocks in the WPA Portion of the Proposed Lease Sale Area

Alternative B would allow for a lease sale encompassing the CPA and a portion of the EPA not currently under Presidential withdrawal within the U.S. portion of the Gulf of Mexico OCS (**Figure** 2-2). Available blocks within the WPA would ***not*** be considered under this alternative. This alternative would offer for lease all available unleased blocks within the CPA and EPA portions of the proposed lease sale area for oil and gas operations, with the following exceptions:

(1) whole and portions of blocks not currently under Presidential withdrawal; and

(2) blocks that are adjacent to or beyond the United States' Exclusive Economic Zone.

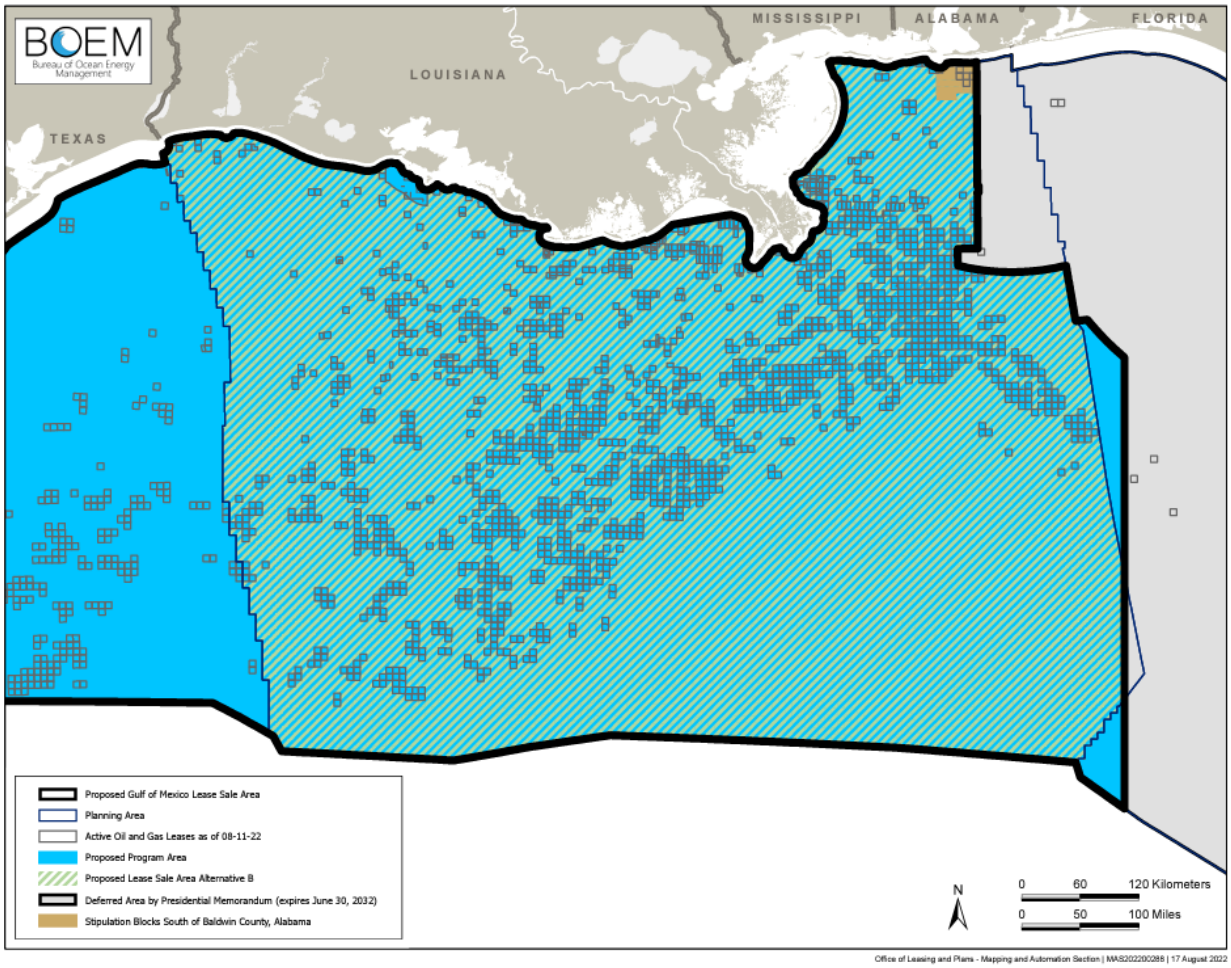

Figure 2-2. Proposed Lease Sale Area for Alternative B, Excluding the Available Unleased Blocks in the WPA (a total of approximately 66.45 million acres with approximately 55.94 million acres available for lease as of August 2022).

In general, a lease sale that would include all available unleased blocks in the CPA and a portion of the EPA not under Presidential withdrawal would represent an incremental contribution of 1.0-3.6 percent of the total Cumulative OCS Oil and Gas Program production scenario in the GOM based on barrels of oil equivalent resource estimates (**Table 3-2**). The estimated amounts of resources projected to be leased, discovered, developed, and produced because of a lease sale under Alternative B are 0.185-0.970 BBO and 0.441-3.672 Tcf of gas (**Table 3-3**).

2.3.1.3 Alternative C – Gulf of Mexico OCS Lease Sale Excluding Available Unleased Blocks in the CPA/EPA Portions of the Proposed Lease Sale Area

Alternative C would allow for a lease sale encompassing the WPA within the U.S. portion of the Gulf of Mexico OCS (**Figure 2-3**). Available blocks within the CPA and EPA would ***not*** be considered under this alternative. This alternative would offer for lease all available unleased blocks within the WPA portion of the proposed lease sale area for oil and gas operations, with the following exception:

(1) whole and partial blocks within the boundaries of the Flower Garden Banks National Marine Sanctuary as of the July 2008 Memorandum on Withdrawal of Certain Areas of U.S. OCS from Leasing Disposition.

The proposed Alternative C lease sale area encompasses virtually all the WPA's approximately 28.58 million acres as that planning area is described as a subset of Alternative A. In general, a lease sale that would include all available unleased blocks in the WPA would represent an incremental contribution of 0.2-0.6 percent of the total Cumulative OCS Oil and Gas Program production scenario in the GOM based on barrels of oil equivalent resource estimates (**Table 3-2**). The estimated amounts of resources projected to be leased, discovered, developed, and produced because of a lease sale offering only WPA available blocks are 0.026-0.148 BBO and 0.106-0.752 Tcf of gas (**Table 3-3**).

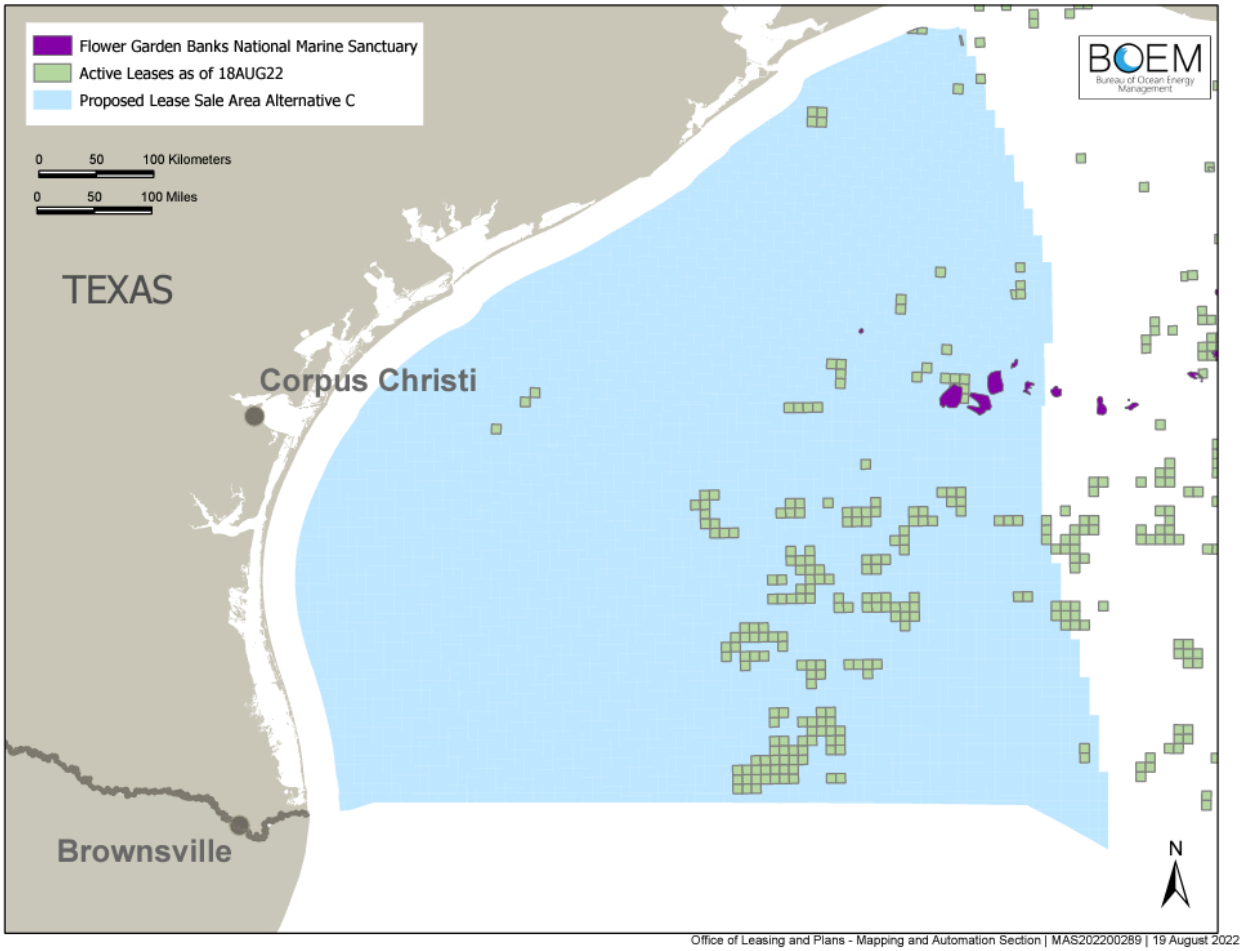

Figure 2-3. Proposed Lease Sale Area for Alternative C, Excluding the Available Unleased Blocks in the CPA and EPA (a total of approximately 27.53 million acres with approximately 27.29 million acres available for lease as of August 2022).

2.3.1.4 Alternative D – Alternative A, B, or C, with the Option to Exclude Available Unleased Blocks Subject to the Topographic Features, Live Bottom (Pinnacle Trend), and/or Blocks South of Baldwin County, Alabama, Stipulations

Alternative D could be combined with any of the action alternatives above (i.e., Alternative A, B, or C) and would allow the flexibility to offer leases under any alternative with additional exclusions. Under Alternative D, the decisionmaker could exclude from leasing any available unleased whole or partial blocks that would otherwise have been subject to any one and/or a combination of the following stipulations:

- Topographic Features Stipulation;
- Live Bottom (Pinnacle Trend) Stipulation; and
- Blocks South of Baldwin County, Alabama Stipulation (not applicable to Alternative C).

This alternative considered blocks subject to these stipulations because these areas have been emphasized in scoping for previous NEPA documents, can be geographically defined, and adequate information exists regarding their ecological importance and sensitivity to OCS oil- and gas-related activities. Figure 2-5 of the 2017-2022 GOM Multisale EIS illustrates one example of the blocks that could be excluded under this alternative (shaded in blue).

A total of 207 blocks within the CPA and 160 blocks in the WPA would be affected by the Topographic Features Stipulation (**Figure 2-4**). There are currently no identified topographic features protected under this stipulation in the EPA. The Live Bottom (Pinnacle Trend) Stipulation covers the pinnacle trend area of the CPA, affecting a total of 74 blocks (**Figure 2-4**). More details on the blocks affected by the Topographic Features Stipulation and the Live Bottoms (Pinnacle Trend) Stipulation can be found at http://www.boem.gov/Biologically-Sensitive-Areas-List/. Maps indicating the areas affected by the Topographic Features Stipulation can be found at http://www.boem.gov/Topographic-Features-Stipulation-Map-Package/.

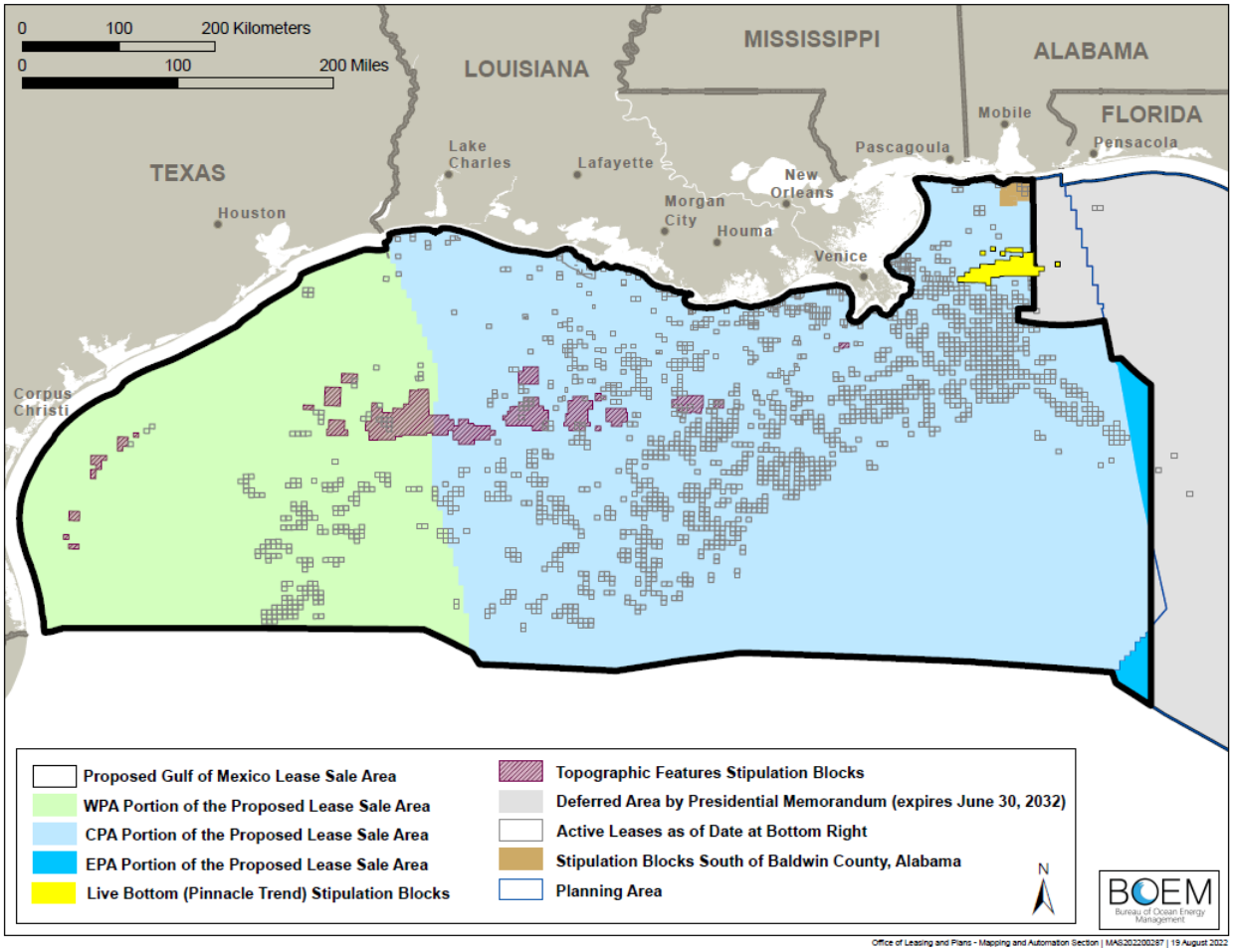

Figure 2-4. Identified Topographic Features, Pinnacle Trend, and Blocks South of Baldwin County, Alabama, Stipulation Blocks in the Gulf of Mexico (a total of approximately 94.14 million acres with approximately 81.6 million acres available for lease as of August 2022).

As of the publication of this Supplemental EIS, the Blocks South of Baldwin County, Alabama, Stipulation (herein referred to as the Baldwin County Stipulation Blocks) would apply to a total of 32 blocks (Mobile Blocks 826-830, 869-874, 913-918, 957-962, 1001-1006; and Viosca Knoll Blocks 33-35) within 15 mi (24 km) of Baldwin County, Alabama (representing less than 1% of the total number of blocks to be offered under Alternative A or B). The Blocks South of Baldwin County, Alabama, Stipulation was first created in response to a proposal raised by a prior Governor of Alabama on previous EISs and which would exclude the above-listed blocks from OCS oil and gas leasing to mitigate visual impacts of concern. Rather than remove the OCS blocks from leasing, the Blocks South of Baldwin County, Alabama, Stipulation requires subsea development technology, shared surface production structures, distancing, and camouflage of structures within 15 mi (24 km) of Baldwin County, Alabama. The stipulation has been continually adopted in annual CPA lease sales since 1999 and has effectively mitigated visual impact. The stipulation specifies requirements for consultation that lessees must follow when developing plans for fixed structures (refer to **Appendix A** of this Supplemental EIS) while still allowing leasing and OCS oil- and gas-related operations in the area, which could not occur with the complete removal of these OCS blocks from leasing. If any of the other action alternatives are selected, BOEM expects this stipulation to be included in the Final Notice of Sale; therefore, visual impacts would be reduced to the greatest extent practicable should the stipulation be applied.

Alternative D, if adopted, would prevent any OCS oil and gas post-lease-related activity whatsoever in the affected blocks as a result of a lease sale; thus, it would eliminate any potential direct impacts to the biota of those blocks from OCS oil- and gas-related activities, which otherwise could be conducted within the blocks. Under Alternative D, the number of blocks that would become unavailable for lease represents only a small percentage of the total number of blocks to be offered under Alternative A, B, or C (<4%, even if blocks subject to all three stipulations were excluded). Therefore, Alternative D could reduce offshore infrastructure and activities, but Alternative D may (and BOEM believes it is more reasonable to expect would) only delay activity or shift the location of offshore infrastructure and activities farther from these sensitive zones and not lead to a reduction in overall offshore infrastructure and activities. The regional impact levels for all resources, except for the topographic features and live bottoms, would be similar to those described under Alternative A, B, or C. All of the assumptions (including the proposed stipulations and other potential mitigating measures designed to reduce environmental risk) and estimates would remain the same as described for Alternatives A, B, or C. The exclusion of this small subset of available unleased blocks could reduce exploration, development, and production flexibility and, therefore, could result in adverse economic effects (e.g., reduced royalties). A detailed discussion of the development and exploration scenarios and related impact-producing factors is included in **Chapter 3**.

2.3.1.5 Alternative E – No Action

Alternative E is the cancellation of a single GOM lease sale, which would require Congressional action. Although the Inflation Reduction Act of 2022 requires that both Lease Sales 259 and 261 be held, this alternative is being included for comparative purposes and because NEPA's implementing regulations provide that an EIS must include the analysis of a no action alternative

(40 CFR § 1502.14). The opportunity for development of the estimated oil and gas that could have resulted from the proposed action alternatives, as described above, would be precluded or postponed to a future lease sale. Any potential environmental impacts resulting from a lease sale would not occur. Activities related to previously issued leases and permits (as well as those that may be issued in the future under a separate lease sale decision) related to the OCS Oil and Gas Program would continue. If a single lease sale were to be cancelled, the resulting development of oil and gas would most likely be postponed; therefore, the overall level of OCS oil- and gas-related activity would only be reduced by a small percentage, if any. Therefore, the cancellation of a single lease sale would not significantly change the environmental impacts of overall OCS oil- and gas-related activity over the short or long term. In the short term, activities from existing leases would continue; only after not holding several lease sales would there likely be any noticeable drop in exploration and development activities as older leases reach the end of their production and new leases are not issued to replace those activities. However, the cancellation of a single lease sale may result in direct economic impacts to the individual companies, and revenues collected by the Federal Government (and thus revenue disbursements to the States) could also be adversely affected. If future lease sales were to occur, the impacts from the cancellation of a single lease sale to individual companies and Federal revenues would likely be minor.

BOEM has received comments in the past to consider a no action alternative that includes no lease sales at all. The *Outer Continental Shelf Oil and Gas Leasing Program: 2017-2022; Final Programmatic Environmental Impact Statement* (BOEM 2016c; 2016d) discusses the impacts of no future OCS oil and gas leasing in detail, and that analysis is hereby incorporated by reference. Given the Gulf of Mexico's OCS oil and gas leasing history and the recent enactment of the Inflation Reduction Act of 2022, it seems unlikely that no future leasing is reasonably foreseeable in the short term (at least the next 10 years). Over the next 10 years, under the Inflation Reduction Act of 2022, there must be one or more offshore OCS oil and gas lease sales (aggregating to at least 60 million acres) in the year preceding issuance of an offshore renewable energy lease. As such, as the U.S. transitions to cleaner energy, we expect oil and gas leasing to proceed in the Gulf of Mexico for at least the next 10 years. In the short term BOEM anticipates continued leasing because of the passage of the Inflation Reduction Act of 2022 and its stipulation that oil and gas lease sales be offered prior to renewable energy leases being issued. In addition, BOEM is currently preparing the *Outer Continental Shelf Oil and Gas Leasing Program: 2023-2028, Final Programmatic Environmental Impact Statement*, which includes a no action alternative that analyzes the impacts of not scheduling new leasing for all GOM lease sales in the Program. The Draft EIS is currently out for public review, and a decision will likely be made next year.

2.3.2 Other Alternatives and Deferrals Considered But Not Analyzed in Detail

2.3.2.1 Areas Excluded from Leasing Based on Sensitive Biological Habitat and Reduced Leasing Activity

BOEM considered a reduced lease sale area alternative for GOM Lease Sales 259 and 261 that would have allowed for a lease sale encompassing portions of the CPA and WPA within the U.S. portion of the Gulf of Mexico OCS. Available blocks within the EPA would ***not*** be considered under

this alternative. This alternative would offer for lease all available unleased blocks within the WPA and CPA portions of the reduced lease sale area for oil and gas operations, with the following exceptions:

(1) whole and portions of blocks not currently under Presidential withdrawal (White House 2020);

(2) blocks that are adjacent to or beyond the United States' Exclusive Economic Zone in the area known as the northern portion of the Eastern Gap;

(3) whole and partial blocks within the boundaries of the Flower Garden Banks National Marine Sanctuary as of the July 2008 Memorandum on Withdrawal of Certain Areas of U.S. OCS from Leasing Disposition;

(4) whole and partial blocks that are proposed to be subject to the Topographic Features Stipulation (and whose exclusion was analyzed in Alternative D);

(5) whole and partial blocks that are proposed to be subject to the Live Bottom (Pinnacle Trend) Stipulation (and whose exclusion was analyzed in Alternative D);

(6) whole and partial blocks in coastal OCS waters shoreward of the 20-m (66-ft) isobath; and

(7) whole and partial blocks that have not, in the last 5 years, had extensive bidding activity, actively pursued geologic plays, areas of recent seismic acquisition and processing, or exploration and development activity.

This alternative considered removing whole or partial blocks subject to the Topographic Features and Live Bottom (Pinnacle Trend) Stipulations because these areas have been emphasized in scoping for previous NEPA analyses, can be geographically defined, and adequate information exists regarding their ecological importance and sensitivity to OCS oil- and gas-related activities. This alternative also considers removing whole or partial blocks in coastal OCS waters shoreward of the 20-m (66-ft) isobath. The restriction is intended to avoid additional stressors to coastal stocks of bottlenose dolphin (*Tursiops truncatus*). In addition, this alternative considers removing whole and partial blocks that have not, in the last 5 years, had extensive bidding activity, actively pursued geologic plays, areas of recent seismic acquisition and processing, or exploration and development activity, in order to make available for lease areas of recent and concentrated industry activity while encouraging lease sale bidding competition in a smaller footprint, as well as reducing the impact to the environment by focusing leasing activity in areas of concentrated industry activity in the last 5 years near existing infrastructure within that footprint.

This alternative was developed to analyze a potential reduction in impacts to the environment by (1) avoiding areas that are otherwise proposed for protection from bottom disturbance from OCS oil- and gas-related activity by BOEM through lease stipulations (for analysis on excluding these blocks, refer to Alternative D), (2) avoiding coastal OCS waters shoreward of the 20-m (66-ft) isobath,

and (3) focusing leasing on areas of concentrated industry activity in the last 5 years that have existing infrastructure.[1] This alternative was eliminated from further consideration because Section 50264 of the Inflation Reduction Act requires GOM Lease Sales 159 and 261 to be conducted "in accordance with the Record of Decision approved by the Secretary on January 17, 2017, described in the notice of availability entitled 'Record of Decision for the 2017-2022 Outer Continental Shelf Oil and Gas Leasing Program Final Programmatic Environmental Impact Statement; MMAA104000' issued on January 17, 2017." That Record of Decision referred to a regionwide approach for the GOM lease sale; therefore, this alternative was eliminated.

2.3.2.2 Eliminated Alternatives and Deferrals Detailed in Previous NEPA Documents

Chapter 2.2.3 of the 2017-2022 GOM Multisale EIS and Chapter 2.2.2 of the 2018 GOM Supplemental EIS includes detailed descriptions of alternatives previously considered, but not analyzed in detail in this Supplemental EIS, including the following:

- previous multisale approach, which consisted of a total of 12 proposed lease sales, including 5 annual proposed lease sales in the WPA, 5 annual proposed lease sales in the CPA, and 2 proposed lease sales in the EPA;
- exclude blocks subject to Flower Garden Banks National Marine Sanctuary expansion;
- additional buffer zones around potential areas of concern (e.g., the blocks subject to Congressional moratorium pursuant to the Gulf of Mexico Energy Security Act of 2006 (which is not under Presidential withdrawal) and the Gulf Islands National Seashore);
- proposed lease sale offering only available unleased blocks in the EPA;
- proposed lease sale with additional mitigating measures for sperm whale high-use areas;
- Gulf of Mexico OCS proposed lease sale excluding blocks within the De Soto Canyon area;
- Gulf of Mexico OCS proposed lease sale excluding blocks within loggerhead sea turtle critical habitat;
- delay leasing until the state of the Gulf of Mexico's environmental baseline since the *Deepwater Horizon* explosion, oil spill, and response is better understood; and
- use renewable energy in place of oil and gas.

[1] As a result of the removal of whole and partial blocks in coastal OCS waters shoreward of the 20-m (66-ft) isobath, whole and partial blocks south of Baldwin County, Alabama, subject to the Blocks South of Baldwin County, Alabama, Stipulation, as analyzed in Alternative D, as well as Significant Sand Resource Blocks in the WPA and CPA, are also removed from leasing.

The justifications for not engaging in detailed analysis of these alternatives and deferrals is provided in the 2017-2022 GOM Multisale EIS, and BOEM has identified no new information that changes these conclusions.

2.3.3 Mitigating Measures

Agencies are required to identify and include in an EIS those appropriate mitigating measures not already included in the proposed action or alternatives. BOEM considers the use of mitigation at all phases of energy development and planning. Mitigations can be applied at the prelease stage, typically through applying lease stipulations, or at the post-lease stage by applying site-specific mitigating measures to plans, permits, and/or authorizations (refer to Appendix A of the 2017-2022 GOM Multisale EIS).

2.3.3.1 Proposed Lease Mitigating Measures (Stipulations)

The potential lease stipulations and mitigating measures included for analysis in this Supplemental EIS were developed as a result of numerous scoping efforts for the continuing OCS Oil and Gas Program in the Gulf of Mexico (**Appendix A**). The 11 lease stipulations being considered are as follows:

- Topographic Features Stipulation;
- Live Bottom (Pinnacle Trend) Stipulation;
- Military Areas Stipulation;
- Evacuation Stipulation;
- Coordination Stipulation;
- Blocks South of Baldwin County, Alabama, Stipulation;
- Protected Species Stipulation;
- United Nations Convention on the Law of the Sea Royalty Payment Stipulation;
- Restrictions due to Rights-of-Use and Easements (RUE) for Floating Production Facilities Stipulation;
- Stipulation on the Agreement Between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico (Transboundary Stipulation); and
- Royalties on All Produced Gas.

These mitigating measures will be considered for adoption by the decisionmaker, as applicable, under authority delegated by the Secretary of the Interior. The Topographic Features and Live Bottom (Pinnacle Trend) Stipulations were applied as programmatic mitigation in the 2017-2022 National OCS Program EIS (BOEM 2016c; 2016d) and Record of Decision (BOEM 2017d); therefore,

they would apply to all leases issued under the 2017-2022 National OCS Program should Alternative A, B, or C be chosen. The stipulations would not apply under Alternative E, as that is the cancellation of a lease sale, or Alternative D, because those stipulation blocks would be removed from leasing under Alternative D. The analysis of the other nine stipulations for any particular alternative does not ensure application of the stipulations to leases that may result from any lease sale nor does it preclude minor modifications in wording during subsequent steps in the prelease process if comments indicate changes are necessary or if conditions change. Any stipulations or mitigation requirements to be included in a lease sale will be described in the Record of Decision and Final Notice of Sale for that lease sale. BSEE has the authority to monitor and enforce these conditions under 30 CFR part 250 subpart N and may seek remedies and penalties from any operator that fails to comply with those conditions, stipulations, and mitigating measures.

2.3.3.2 Prelease Mitigating Measures (Stipulations) by Alternative

Table 2-1 indicates what stipulations could be applied for each alternative. Alternative D would consider the same stipulations as Alternative A, B, or C, as applicable, with the exception of removing the Topographic Features and Live Bottoms (Pinnacle Trend) Stipulations since all blocks subject to these stipulations would not be made available. Since Alternative E is the cancellation of a lease sale, no stipulations would apply.

Table 2-1. Applicable Stipulations by Alternative.

Stipulation	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E[1]
Topographic Features	X[2]	X	X	–[3]	–
Live Bottoms	X	X	–	–	–
Military Areas	X	X	X	X	–
Evacuation	X	X	–	See A, B, or C	–
Coordination	X	X	–	See A, B, or C	–
Blocks South of Baldwin County, Alabama	X	X	–	See A, B, or C	–
Protected Species	X	X	X	X	–
United Nations Convention on the Law of the Sea Royalty Payment	X	X	X	X	–
Restrictions due to RUE for Floating Production Facilities	X	X	–	See A, B, or C	–
Transboundary	X	X	X	X	–
Royalties on All Produced Gas	X	X	X	X	–

Stipulation	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E[1]

Note: RUE = rights-of-use and easements.

[1] Alternative E would cancel a lease sale and no new leasing activities would occur; therefore, no stipulations would apply.

[2] Stipulations that would apply to specific lease blocks under any given alternative are marked with an X.

[3] Stipulations that would not apply, because the stipulation blocks or areas are not within the proposed sale area for that alternative, are marked "–".

2.3.3.3 Post-lease Mitigating Measures

Post-lease mitigating measures have been implemented for over 40 years in the Gulf of Mexico region. Following a lease sale, an applicant seeks approvals to develop their lease by preparing and submitting OCS plans. The OCS plans are reviewed by BOEM and, depending on what is proposed to take place on a specific lease, plans may be denied, approved, or approved with conditions of approval (COA). The COAs become part of the approved post-lease authorization and include environmental protections, requirements that maintain conformance with law, the requirements of other agencies having jurisdiction, or safety precautions. Over time, BOEM realized that many of these site-specific mitigations were recurring and developed a list of commonly applied "standard" mitigations. Some BOEM-identified mitigating measures are incorporated into OCS oil- and gas-related operations through cooperative agreements or efforts with industry and State and Federal agencies. Mitigating measures are an integral part of BOEM's program to ensure that operations are conducted in an environmentally sound manner (with an emphasis on avoiding or minimizing any adverse impact of routine operations on the environment). Operational compliance of the mitigating measures is enforced through BSEE's onsite inspection program. BOEM is continually revising applicable mitigations to allow the Gulf of Mexico Regional Office to more easily and routinely track mitigation compliance and effectiveness. Appendix A of the 2017-2022 GOM Multisale EIS discusses BOEM's rigorous post-lease processes and Appendix B of the 2017-2022 GOM Multisale EIS describes over 120 standard mitigations that may be required by BOEM or BSEE as a result of plan and permit review processes for the Gulf of Mexico OCS region.

2.3.4 Primary Topics and Resources Evaluated

Issues are defined by the Council on Environmental Quality (CEQ) to represent those principal "effects" that an EIS should evaluate in-depth. Scoping identifies specific environmental resources and/or activities rather than "causes" as significant issues (CEQ 1981). The analysis in the EIS can then show the degree of change from the present conditions for each issue to the actions arising from the proposed action.

2.3.4.1 Issues to be Analyzed

Chapter 2.2.5.1 of the 2017-2022 GOM Multisale EIS addresses the issues related to potential impact-producing factors and the environmental and socioeconomic resources and activities that could be affected by OCS oil- and gas-related activities. Chapter 4 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS describes the resources and activities that could be affected by the impact-producing factors described in Chapter 3 of those documents and that are summarized in this Supplemental EIS and incorporated by reference. In addition, **Chapter 4** of this Supplemental EIS

describes the resources and activities that could be affected by the impact-producing factors described in **Chapter 3** and include the following resource topics:

- Air Quality (including greenhouse gas emissions)
- Water Quality (Coastal and Offshore)
- Coastal Habitats (Estuarine Systems and Coastal Barrier Beaches and Associated Dunes)
- Deepwater Benthic Communities (Chemosynthetic and Deepwater Coral)
- *Sargassum* and Associated Communities
- Live Bottom Habitats (Topographic Features, Pinnacles, and Low-Relief Features)
- Fishes and Invertebrate Resources
- Birds
- Protected Species (Marine Mammals, Sea Turtles, Beach Mice, Protected Birds, and Protected Corals)
- Commercial Fisheries
- Recreational Fishing
- Recreational Resources
- Archaeological Resources (Historic and Prehistoric)
- Human Resources and Land Use (Land Use and Coastal Infrastructure, Economic Factors, and Social Factors, Including Environmental Justice)

As previously noted, the CEQ regulations for implementing NEPA instruct agencies to adopt an early process (termed "scoping") for determining the scope of issues to be addressed and for identifying significant issues related to a proposed action. Under 40 CFR § 1502.9, a supplemental EIS is not required to perform additional scoping activities. The scoping efforts of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS have been deemed adequate for the scope of issues addressed in this Supplemental EIS.

Comments received during scoping were analyzed in detail in Chapters 4 and 5.6.2.2 of the 2017-2022 GOM Multisale EIS and discussed, summarized, and/or updated as needed in Chapters 4 and 5.6.2.2 of the 2018 GOM Supplemental EIS and **Chapter 4** of this Supplemental EIS. These issues include the following:

- cumulative impacts to coastal resources, including wetlands;
- downstream and life cycle greenhouse gas emissions from lease sales;
- climate change on GOM environmental resources, including warmer oceans, increased storms and flood events, and land loss;
- economic impacts as a result of canceling or holding a proposed lease sale; and
- oil and chemical spills, including continued effects from past spills and leaking wells and pipelines.

Since publication of the 2018 GOM Supplemental EIS, additional analysis for life cycle greenhouse gas (GHG) emissions are published in the Gulf of Mexico GHG Analysis (BOEM 2022). BOEM's greenhouse gas analysis has been updated to include a newly developed quantitative analysis of the proposed action's impact on foreign oil consumption and the resulting GHG emissions

under the No Action Alternative. Additionally, the updated GHG analysis in **Chapter 4.0.2.1** provides estimates of the monetary value of changes in GHG emissions that could result from holding the proposed action. This is an emerging methodology that BOEM is looking to refine and expand for future NEPA analyses in response to modeling improvements, increased data availability, expert input, and feedback from the public.

2.3.4.2 Issues Considered but Not Analyzed

As part of the scoping process, agencies shall identify and eliminate from detailed study the issues that are not significant to the proposed action or have been covered by prior environmental review.

Comments received during scoping for the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS were analyzed in detail in Chapter 5.6.2.2 of the 2017-2022 GOM Multisale EIS and summarized and/or updated as needed in Chapter 5.6.2.2 of the 2018 GOM Supplemental EIS. The issues raised by these comments included the following:

- compensatory mitigation;
- updates and safety improvements implemented by regulators and industry;
- well-stimulation activities and associated environmental impacts;
- substitution effects of renewable energy sources in place;
- environmental justice concerns related specifically to those living near petrochemical facilities.

2.1 COMPARISON OF IMPACTS BY ALTERNATIVE

The full analyses of the potential impacts of routine activities and accidental events associated with a proposed action and a proposed action's incremental contribution to the cumulative impacts are described in the individual resource discussions in Chapter 4 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, and summarized in **Chapter 4** of this Supplemental EIS. **Table** 2-2 provides a comparison of expected impact levels by alternative and is derived from the analysis of each resource in Chapter 4 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS for Alternatives A-E. The findings for Alternatives A-E represent the *incremental contribution* of a lease sale to the cumulative impacts from past, present, and future activities in the GOM. These activities include both OCS oil- and gas-related and non-OCS oil- and gas-related activities that would be expected regardless of whether a lease sale were to occur. Cumulative impacts of current, past, and reasonably foreseeable future activities would continue to occur under Alternative E. As a result, a separate treatment of the cumulative effects under Alternative E is not considered here, and the cumulative impacts analysis under Alternative A remains applicable.

Table 2-2. Alternative Comparison Matrix.

Impact Level Key[1]					
Beneficial[2]	Negligible	Minor	Moderate		Major
	Alternative				
Resource	A	B	C	D	E
Air Quality	Minor	Minor	Minor	Minor	None
Water Quality	Negligible	Negligible	Negligible	Negligible	None
Coastal Habitats					
Estuarine Systems	Moderate	Moderate	Minor	Moderate	Negligible
Coastal Barrier Beaches and Associated Dunes	Minor	Minor	Negligible to Minor	Negligible to Minor	Negligible
Deepwater Benthic Communities	Negligible	Negligible	Negligible	Negligible	None
Sargassum and Associated Communities	Negligible	Negligible	Negligible	Negligible	None
Live Bottoms					
Topographic Features	Negligible	Negligible	Negligible	Negligible	None
Pinnacles and Low-Relief Features	Negligible to Minor	Negligible to Minor	Negligible	Negligible	None
Fishes and Invertebrate Resources	Minor	Minor	Minor	Minor	None
Birds	Moderate	Moderate	Moderate	Moderate	None
Protected Species					
Marine Mammals	Negligible	Negligible	Negligible	Negligible	None
Sea Turtles	Negligible	Negligible	Negligible	Negligible	None
Beach Mice	Negligible	Negligible	Negligible	Negligible	None
Protected Birds	Negligible	Negligible	Negligible	Negligible	None
Protected Corals	Negligible	Negligible	Negligible	Negligible	None
Commercial Fisheries	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Recreational Fishing	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Recreational Resources	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Archaeological Resources	Negligible[3]	Negligible[3]	Negligible[3]	Negligible[3]	None

Human Resources and Land Use					
Land Use and Coastal Infrastructure	Minor	Minor	Minor	Minor	None
Economic Factors	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible to Minor
Social Factors (including Environmental Justice)	Minor	Minor	Minor	Minor	None

Note: Some resources have a range for the impact levels to account for certain variables such as the uncertainty of non-OCS oil- or gas-related activities, the level and magnitude of potential accidental events, and the minimization of the OCS oil- or gas-related impacts through lease stipulations, mitigations, and/or regulations. The impact-level ratings have been specifically tailored and defined for each resource within the Chapter 4 impact analysis of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

[1] The findings for Alternatives A-D are the incremental contribution of a proposed action added to what would be expected to occur under the No Action Alternative (i.e., no lease sale). Therefore, each impact determination under Alternatives A-D assumes that the cumulative conditions and impacts (i.e., past, present, and future activities as a result of past lease sales) under the No Action Alternative would still be present.

[2] The level of beneficial impacts is specified in the analysis, which could range from low, medium, or high.

[3] The level of impacts for archaeological resources ranges between negligible to major and is dependent upon whether a survey is performed, mitigation is imposed, mitigation is followed, or a site is identified prior to the activity.

2.2 SUMMARY OF IMPACTS

A search by BOEM's subject-matter experts was conducted for each resource to consider new information made available since publication of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. It must also be emphasized that, in arriving at the overall conclusions for certain environmental resources, the conclusions are not based on impacts to individuals, small groups of animals, or small areas of habitat but on impacts to the resources/populations as a whole.

BOEM's subject-matter experts determined through literature searches and communications with other agencies and academia that there was no new information made available since publication of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS that would alter the impact conclusions to the potential impacts from a lease sale. Therefore, the analyses and potential impacts for the resources remain the same as those that were presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. These impact conclusions are summarized in **Chapter 4** of this Supplemental EIS and are incorporated by reference. The analyses and potential impacts detailed in the previous NEPA documents remain valid and, as such, apply for GOM Lease Sales 259 and 261.

In accordance with CEQ guidelines to provide decisionmakers with a robust environmental analysis, the *Gulf of Mexico Catastrophic Spill Event Analysis* technical report (BOEM 2021c) provides an analysis of the potential impacts of a low-probability catastrophic oil spill, which is not part of a proposed action and not likely expected to occur, to the environmental and cultural resources and the socioeconomic conditions analyzed in **Chapter 4**.

CHAPTER 3

IMPACT-PRODUCING FACTORS AND SCENARIO

3 IMPACT-PRODUCING FACTORS AND SCENARIO

3.1 INTRODUCTION

Chapters 3.1 and 3.2 of the 2017-2022 GOM Multisale EIS describe in detail the routine and accidental impact-producing factors and activity scenarios associated with Alternatives A-D that could potentially affect the biological, physical, and socioeconomic resources of the Gulf of Mexico. Routine and accidental impact-producing factors and activity scenarios are described in **Chapters 3.2 and 3.3** below. Under Alternative E, no activity from a lease sale would occur; however, activities from prior lease sales, which are described in cumulative activities, are anticipated to continue. The cumulative impact-producing factors and activity scenarios resulting from past and future lease sales that are relevant to all alternatives are described in detail in Chapter 3.3 of the 2017-2022 GOM Multisale EIS and are summarized in the 2018 GOM Supplemental EIS, and have been updated with any new activities in **Chapter 3.4** of this Supplemental EIS. The following information is a summary of the impact-producing factors from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, as well as updated scenario information, in particular for lease sale changes in royalty rates and lease terms.

3.2 ROUTINE ACTIVITIES

3.2.1 Resource Estimates

A scenario describes the offshore activities that could occur for a single lease sale under each alternative. BOEM's Gulf of Mexico Regional Office reanalyzed trends since the development of the scenarios for the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS to determine if the trends are within the forecasted ranges for GOM Lease Sales 259 and 261. Ranges of activity within the scenarios are developed to provide the ability to characterize the full range of potential environmental impacts that could be possible from a single lease sale. BOEM continually updates models and formulas used to develop these scenarios. The proposed action scenarios presented herein were updated based on the following factors:

- recent trends in the amount and location of leasing, exploration, and development activity;
- estimates of undiscovered, unleased, conventionally recoverable oil and gas resources in the planning area;
- existing offshore and onshore oil and/or gas infrastructure;
- industry information; and
- oil and gas technologies, and the economic considerations and environmental constraints of these technologies.

The OCS oil and gas operations on a lease generally occur in four phases: (1) exploration to locate viable oil or natural gas deposits; (2) development well drilling, platform construction, and pipeline infrastructure; (3) operation (oil or gas production and transport); and (4) decommissioning

of facilities once a reservoir is no longer productive or profitable. Detailed descriptions of these activities can be found in Chapter 3.1 of the 2017-2022 GOM Multisale EIS. Under a proposed action, activities would occur on OCS leases only after a lease sale is held. Although unusual cases exist where activity on a lease may continue beyond 50 years, forecasts indicate that the significant activities associated with exploration, development, operation, and decommissioning of leases in the GOM occur well within the 50-year analysis period of a single lease sale. Note that subsea activity may take place on a lease without additional platforms being built. In these instances, a subsea structure may be built on a lease acquired during the lease sale but tied back to a platform on a lease acquired during a previous lease sale. This could potentially increase the lifespan of a platform built as a result of a previous lease sale.

The major impact-producing factors of a single lease sale projected to develop and produce the estimated oil and gas resources for Alternatives A, B, and C are given in **Table 3-1**, including estimates of the major impact-producing factors related to the projected levels of exploration, development, and production activity. Alternatives D and E are not presented in the **Table 3-1** for the following reasons. Alternative D could reduce offshore production when chosen in conjunction with Alternative A, B, or C. However, it is also possible that Alternative D would only shift the location of offshore infrastructure and activities farther from sensitive topographic zones and not lead to a reduction in production. Refer to **Chapter 2.3.1.4** for more information on Alternative D. Under Alternative E, no activity from the lease sale would occur, but activity from prior lease sales is anticipated to continue; this is further discussed in **Chapter 3.4.1** below. Estimates of resources and facilities are distributed into subareas based on water depth. The activities found in **Table 3-1** would occur within the 50-year analysis period of 2020-2069. When analyzing hydrocarbon resources by planning area across the GOM, the majority of oil and gas resources are located within the boundaries of the CPA; therefore, the majority of activity is expected to occur in the CPA.

Expected Activity by Alternative

To analyze the estimated hydrocarbon resources and associated activities and infrastructure (including the number of exploration and delineation wells, production platforms, and development wells) and resulting impact-producing factors for each alternative, the geographic ranges of each alternative were divided into offshore subareas based upon ranges in water depth. **Figure 3-1** depicts the location of the offshore subareas or water-depth ranges. The water-depth ranges were developed to reflect the technological requirements, related physical and economic impacts as a consequence of the oil and gas potential, exploration and development activities, and lease terms unique to each water-depth range.

Table 3-1. Offshore Scenario Activities Related to a Single Lease Sale for Alternative A, B, or C from 2020 through 2069.

Activity	Alternative[1]	Offshore Subareas (m)[2]						Totals[3]
		0-60	60-200	200-800	800-1,600	1,600-2,400	>2,400	
Exploration and Delineation Wells	A	24-634	8-300	5-11	6-15	5-8	5-16	53-984
	B	20-570	5-293	2-8	2-10	2-2	2-10	33-893
	C	4-64	2-7	2-3	3-5	3-6	3-6	17-91
Development and Production Wells[4]	A Total	14-326	7-220	7-95	13-51	10-37	10-38	61-767
	B Total	10-282	4-211	4-78	10-35	9-31	9-34	46-671
	C Total	4-44	4-9	4-17	4-16	3-6	3-4	22-96
	A Oil	1-35	0-23	3-46	6-22	5-19	4-19	19-164
	B Oil	1-32	0-23	2-38	5-18	4-16	4-17	16-144
	C Oil	0-5	0-1	2-9	1-5	1-4	1-3	5-27
	A Gas	1-35	0-23	3-46	6-22	5-19	4-19	19-164
	B Gas	5-169	2-120	0-17	1-7	1-6	1-7	10-326
	C Gas	2-27	2-6	0-4	1-7	0-1	0-1	5-46
Installed Production Structures	A	8-183	4-85	1-4	1-3	1-2	1-3	16-280
	B	7-158	3-81	1-3	1-2	1	1-2	14-247
	C	3-25	2-4	1	1	1	1	9-33
Production Structures Removed Using Explosives	A	6-130	3-63	0	0	0	0	9-193
	B	5-112	2-60	0	0	0	0	7-172
	C	2-18	2-3	0	0	0	0	4-21
Total Production Structures Removed	A	8-183	4-85	1-4	1-3	1-2	1-3	16-280
	B	7-158	3-81	1-3	1-2	1	1-2	14-247
	C	3-25	2-4	1	1	1	1	9-33
Length of Installed Pipelines (km)[5]	A	59-527	53-417	53-327	78-358	59-275	53-240	355-2,144
	B	40-395	34-336	33-240	55-233	50-227	42-210	254-1,641
	C	20-132	20-81	20-88	24-125	10-48	11-31	105-505
Service-Vessel Trips (1,000's round trips)	A	9-265	4-126	6-51	7-38	7-26	7-36	43-541
	B	8-229	3-120	6-39	6-26	6-15	6-25	38-452
	C	3-36	2-6	6-13	6-13	6-12	6-11	30-89
Helicopter Operations (1,000's trips)[6]	A	52-2,131	34-1,409	8-71	8-53	8-36	8-53	122-3,750
	B	43-1,848	26-1,426	8-53	8-36	8-18	8-36	105-3,415
	C	17-299	17-71	8-18	8-18	8-18	8-18	70-440

[1] Alternative D could reduce activity values of the combined Alternative A, B, or C; however, it is expected to have the same production and related activities as Alternative A, B, or C. Refer to **Chapters 2.3.1.4** for more information. Alternative A would be a regionwide lease sale, Alternative B would be the CPA/EPA portions of the proposed lease sale area, and Alternative C would be the WPA portion of the proposed lease sale area.

[2] Refer to **Figure 3-2**.

[3] Subareas totals may not add up to the planning area total because of rounding.

[4] Development and Production Wells includes some exploration wells that were re-entered and completed. These wells were removed from the Exploration and Delineation well count.

[5] Projected length of pipelines does not include length in State waters.

[6] Helicopter trips include circuits. This means that each take-off and landing is counted as a trip and is not necessarily one trip offshore or one trip onshore. Trips may occur between platforms within a water depth.

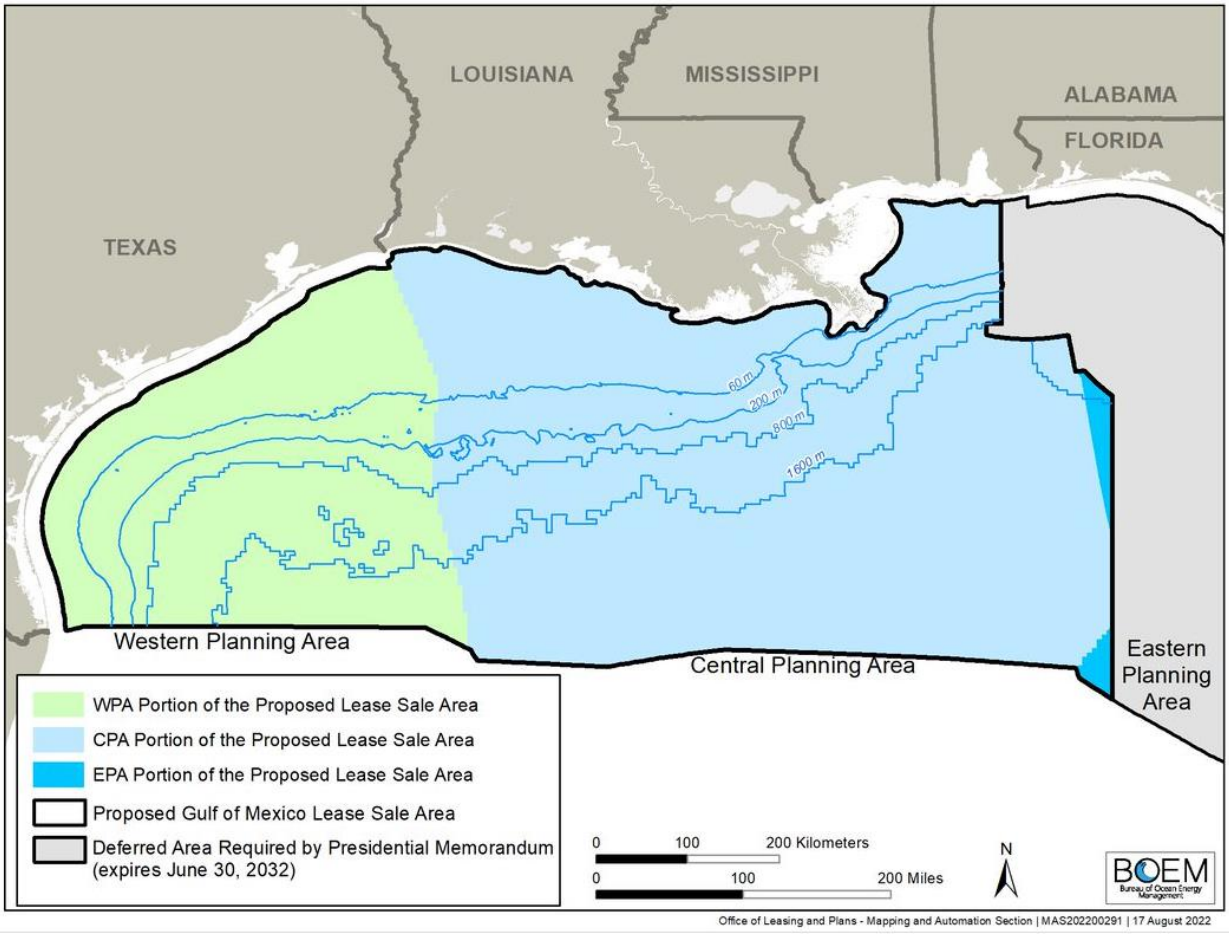

Figure 3-1. Offshore Subareas in the Gulf of Mexico.

Estimates of associated activities and infrastructure or the major impact-producing factors related to the projected levels of exploration, development, and production activity were developed for each of the subareas (water-depth ranges) for Alternatives A, B, and C, and are presented in **Table 3-1**.

The Inflation Reduction Act requires that BOEM issue leases with a minimum royalty rate of 16 2/3 percent and a maximum rate of 18 3/4 percent. This will require an increase in the royalty rate for leases in less than 200 m (656 ft) of water depth as GOM Lease Sales 251, 252, 253, 254, 256, and 257 had shallow water rates of 12.5 percent. BOEM may also consider changes to the minimum bonus bid and annual rental rate as a result of this lease sale(s).

The forecasted scenario presented in the 2017-2022 GOM Multisale EIS and 2018 Supplemental EIS included a royalty rate of 18 3/4 percent throughout the GOM. BOEM modeled the range of anticipated oil and natural gas production volumes and associated levels of exploration, development, and decommissioning activity on a per lease sale basis under varying economic conditions; segregated anticipated production volumes into water depth categories; and compared the high case forecasted for wells drilled to leases sold. Through this analysis, BOEM has verified

that the effective change in activity due to any royalty rate allowed by the Inflation Reduction Act is within the range of the forecast scenarios presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. BOEM also finds that any change in activity due to a 16 2/3 percent shallow-water royalty rate would also be within that range. BOEM's analysis further indicates that changes to the minimum bonus bid and the annual rental rate would similarly not result in activity changes outside the range presented in the Supplemental EIS. Any additional activity that could occur as a result of the change in fiscal terms is still expected to be within the range of the reasonably foreseeable activity scenario under which the impact analysis was performed.

BOEM adjusted primary lease terms in the 800-m to less than 1,600-m (2,625- to 5,249-ft) water-depth range for GOM Lease Sales 256 and 257 from 7 to 10 years. Prior to Lease Sale 256, the primary term for a lease issued in water depths ranging from 800 m to less than 1,600 m (2,625 to 5,249 ft) as a result of a lease sale was 7 years. If the lessee spuds a well within the 7year primary term, the lessee would earn an additional 3 years, resulting in a 10-year extended primary term. BOEM recognizes that many of the remaining resources left to find and produce in this water-depth range of the GOM present significant technical and economic challenges. This has been the finding of several studies recently completed by BOEM. Prior to GOM Lease Sale 256, BOEM completed a review of the anticipated oil and gas production volumes and associated estimates of anticipated exploration and development activity levels developed for the 2017-2022 National OCS Program. The review process was focused on (1) identifying and analyzing new information that has become available since our estimates were originally published, (2) integrating the new information into our forecast models, and (3) reviewing model output data to ensure that the new information does not generate activity-level estimates that are outside the range of what was anticipated. The results of this analysis showed that the range of anticipated production volumes and activity-level estimates remain current and that no changes to these parameters are required as a result in the change in lease terms for the 800- to 1,600-m (2,625 to 5,249-ft) water depth. Due to the previous lease term having the option of 10 years (7 years + 3 years), a change in lease term to a simple 10 year primary term would fall within the range of the forecasted activity (Riches 2020). Since the range of potential activity remains the same, the range of potential impacts also remains the same for either lease term.

BOEM acknowledges that recent significant fluctuations in oil prices due to the global demand, as well as other factors, may affect the number of leases sold in Lease Sales 259 and 261. However, operators make their leasing decisions on a 5- to 10-year timeframe, and those with a strong financial structure may see a lease sale as an opportunity to build their leasehold inventory for greater upside potential when prices increase. Lessees would likely place a higher weight on future price forecasts than prices at any one point in time. Industry and the futures market anticipate higher prices in the future when the potential leases would be developed. BOEM also assesses receipt of fair market value for oil and gas leases issued from this lease sale. Energy production and consumption levels have been gradually recovering from the pandemic. The volatility in energy markets continues though as supply and demand patterns adjust to these changing conditions. Energy markets are expected to eventually stabilize, and the long-term trends for oil and gas markets are not likely to substantially change due to the pandemic. Considering the current status of the oil market, BOEM has reviewed the anticipated oil and gas production volumes and associated

estimates of anticipated exploration and development activity levels developed for the 2017-2022 National OCS Program. BOEM's review process was focused on (1) identifying and analyzing new information that has become available since our estimates were originally published, (2) integrating the new information into our forecast models, and (3) reviewing model output data to ensure that the new information does not generate activity level- estimates that are outside the range of what was anticipated. This analysis showed that the range of anticipated production volumes and activity-level estimates remain current and that no changes to these parameters are required as a result of the COVID-19 pandemic (Riches 2020). Since the range of potential activity remains the same, the range of potential impacts also remains the same.

3.2.2 Exploration and Delineation

While the activities associated with exploration, development, production, and decommissioning of leases in the GOM are expected to occur during the 50-year analysis period of 2020-2069, the Cumulative OCS Oil and Gas Program scenario has an analysis period of 70 years or 2020-2089. The Cumulative OCS Oil and Gas Program scenario includes the 50-year analysis period for a single lease sale. It is important to note that a single lease sale, no matter which alternative is selected, would represent only a small portion of activity and a small incremental contribution to the overall Cumulative OCS Oil and Gas Program activity forecasted to occur between 2020 and 2089 (refer to **Table 3-2**). Further information about the Cumulative OCS Oil and Gas Program scenario can be found in **Chapter 3.3.1** below.

Table 3-2. Incremental Contribution (expressed as a percent) of Each Alternative of a Single Lease Sale (2020-2069) in Relation to Each Cumulative Production Scenario.

Single Lease Sale (2020-2069)	Percent of Production of a Single Lease Sale in Relation to		
	Cumulative Production in the GOM (2020-2089)	Cumulative Production in the CPA/EPA (2020-2089)	Cumulative Production in the WPA (2020-2089)
Alternative A	1.2-4.2%	–	–
Alternative B	1.0-3.6%	1.2-4.4%	–
Alternative C	0.2-0.6%	–	1.2-3.5%

Note: Alternative D could reduce production values of the combined Alternative A, B, or C. Refer to **Chapter 2.3.1.4** for more information on Alternative D.

Table 3-3 presents the projected oil and gas production for a single lease sale under each alternative (2020-2069) and for the Cumulative OCS Oil and Gas Program (2020-2089). Refer to **Table 3-1** above for the offshore scenario activities related to a single lease sale for Alternative A, B, or C from 2020 through 2069, which are associated with these projected oil and gas volumes in the Gulf of Mexico OCS.

Table 3-3. Projected Oil and Gas in the Gulf of Mexico OCS.

Reserve/Resource Production	Lease Sale (2020-2069)	OCS Cumulative (2020-2089)
Alternative A		
Oil (BBO)	0.211-1.118	15.482-25.806
Gas (Tcf)	0.547-4.424	57.875-108.513
Alternative B		
Oil (BBO)	0.185-0.970	13.707-22.152
Gas (Tcf)	0.441-3.672	46.328-84.009
Alternative C		
Oil (BBO)	0.026-0.148	1.775-3.654
Gas (Tcf)	0.106-0.752	11.547-24.504

Note: Alternative D could reduce production values of the combined Alternative A, B, or C. Refer to **Chapter 2.3.1.4** for more information on Alternative D.

BBO = billion barrels of oil.

Tcf = trillion cubic feet.

Regardless of the alternative, the majority of oil and gas resources are located within the boundaries of the CPA. Therefore, for a proposed action under Alternative A, which would encompass all acreage available for lease within the WPA, CPA, and EPA, the majority of the activity would still be located in the CPA. Relatively more exploration and development drilling and structure installation would occur on the shelf (in depths <200 m [660 ft]) than in deep water, regardless of the production case scenario; however, more total volume of oil and gas is expected from deep water than on the shelf. **Figure 3-2 (A, B)** gives the reader an idea of within which water-depth category the majority of GOM production would occur; however, production would not be equally distributed across water-depth categories and would have geographic specificity based on geology. The highest production in a given year would be 0.051 billion barrels of oil equivalent (BOE), and the highest production in any given 5-year span would be 0.246 BOE (averaging 0.049 BOE per year when producing), demonstrating that the forecasted production occurs throughout the 40 years and is not consolidated into a narrow timeframe, i.e., a single year.

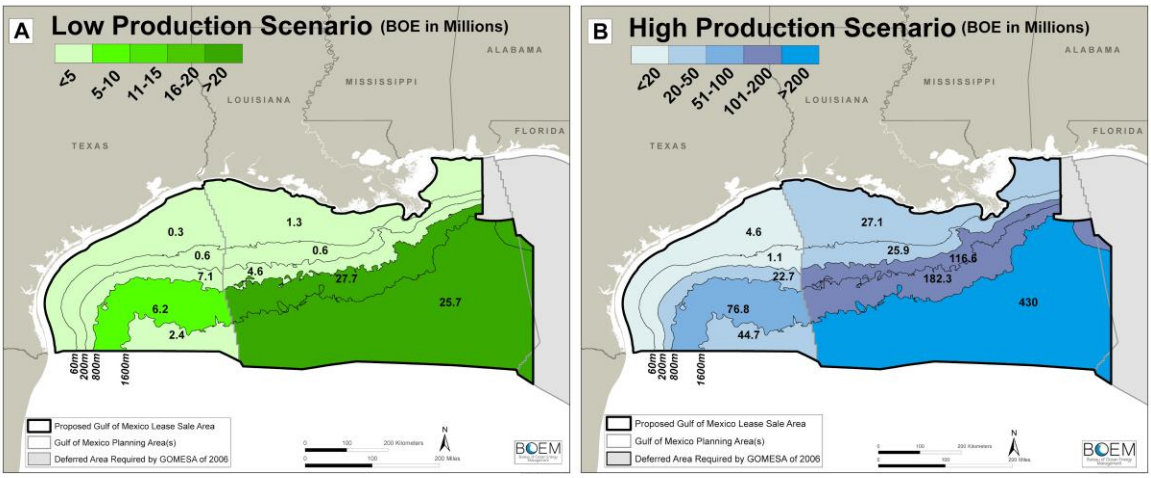

Figure 3-2. Total Oil and Gas Production (BOE) in the Gulf of Mexico in the Low and High Production Scenario by Water Depth.

3.2.3 Discharges and Wastes

The primary operational wastes and discharges generated during offshore oil and gas exploration and development are drilling fluids, drill cuttings, various waters (e.g., bilge, ballast, fire, and cooling), deck drainage, sanitary wastes, and domestic wastes. During production activities, additional waste streams include produced water, produced sand, and well-treatment, workover, and completion fluids. Minor additional discharges occur from numerous sources. 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. Permits issued under Section 402 of the Clean Water Act for offshore activities must comply with any applicable water quality standards and/or Federal water quality criteria, as well as Section 403 of the Clean Water Act.

BOEM has reexamined the information for discharges and wastes presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the list of references searched and provided below. New information was found for discharges and wastes after a search of relevant information. This new information updates BOEM's knowledge of the potential impacts of contaminants in produced water and discharges on organisms in the environment or the buildup of contaminants in marine sediments.

On September 19, 2017, USEPA Region 6 released the new version of its National Pollutant Discharge Elimination System Permit (NPDES) for "New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Point Source Category for the Western Portion of the Outer Continental Shelf of the Gulf of Mexico (GMG290000)" (USEPA 2017b). The USEPA Region 4 NPDES General Permit (GEG460000) for "New and Existing Sources in the Offshore Subcategory of the Oil and Gas Extraction Category for the Eastern Portion of the Outer Continental Shelf of the Gulf of Mexico" went into effect on January 20, 2018. The publication of the updated permits does not change the conclusions of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Farkas et al. (2020) examined the impact of anionic polyacrylamides (APAM) on multiple developmental stages of two marine copepod species in Norway, with the expectation that the application of APAM for enhanced oil recovery may increase going forward. The early developmental stages of these copepod species were most sensitive to APAM exposure. However, the lowest observed lethal concentration (LC_{50}), at 144 mg/L, is expected by the authors to be significantly below what would occur in seawater contaminated with produced water. This is due to the rapid dilution of produced water from the point source. Additionally, this was only investigated with two marine copepod species and is narrow in scope.

The potential for ^{226}Ra (the most common radioactive isotope of the element radium) contamination in marine sediments was examined in Ahmad et al. (2021). The researchers collected marine sediments close to a nearshore water discharge site and produced water from an active oil field site in the United Kingdom, as well as a nearby beach. Radium co-precipitated with barite (as radiobarite) in the marine sediment samples, resulting in measurable activities of ^{226}Ra in these samples that were downstream of a produced-water discharge site. However, the question of the long-term and acute impacts of these radiobarite particles in marine sediments was not examined and remains to be resolved.

In a Brazilian study (Bento and Campos 2021), researchers evaluated the acute (15-minute exposure) toxic effects on a luminescent bacteria species (*Vibrio fischeri*) from nine different chemicals that could be expected to be found in produced water. These chemicals include diethylene glycol, an H_2S scavenger (glycol derivative), a corrosion inhibitor, and others. Their experiments were not *in-situ* experiments (i.e., using collected seawater), but rather they used synthetic produced water wherein they exposed the bacterium to the chemicals. By themselves, several of these chemicals were moderately toxic, but their toxicity can increase substantially after mixing with crude oil. However, this study focused specifically on effects and does not address either long-term or cumulative impacts, is limited to one bacterium species, and only used synthetic produced water. These four studies are useful; however, due to their narrow scopes and methodological limitations, their results do not change the conclusions in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

3.2.4 Coastal Infrastructure

The extensive presence of coastal infrastructure is not subject to rapid fluctuations and results from long-term industry trends. Existing oil and gas infrastructure is expected to be sufficient to handle development associated with a proposed action. An expansive pipeline network is the primary method used to transport a variety of liquid and gaseous products between OCS production sites and onshore facilities around the GOM (**Table 3-4**). Historically, barging in the GOM has remained less than 1 percent, and it is assumed that barging would continue to account for less than 1 percent of the oil transported for the entire OCS Program and for any single alternative. Shuttle tankers are used to transport crude oil from floating production, storage, and offloading (FPSO) systems to Gulf Coast refinery ports or to offshore deepwater ports such as the Louisiana Offshore Oil Port (LOOP); the percentage of oil tankered is provided in **Table 3-4**. The FPSOs are only projected to occur in

water depths >1,600 m (5,250 ft). Because only one structure is projected to be installed in the >1,600-m (5,250-ft) water depth (refer to **Table 3-1**), this structure may be either a FPSO or another type of floating platform (refer to Chapter 3.1.3.2 of the 2017-2022 GOM Multisale EIS). As a result, the oil from this structure is expected to be 100 percent piped or 100 percent tankered.

Table 3-4. Oil Transportation Scenario under Alternative A, B, or C.

Activity	Alternative[1]	Offshore Subareas (m)[2]					Totals[3]
		0-60	60-200	200-800	800-1,600	>1,600	
Percent Oil Piped[4]	A	72-94%	100%	100%	100%	100%	100-66%
	B	70-94%	100%	100%	100%	100%	100-50%
	C	100%	100%	100%	100%	100%	100%
Percent Oil Barged	A	28-6%	0%	0%	0%	0%	0%
	B	30-6%	0%	0%	0%	0%	0%
	C	0%	0%	0%	0%	0%	0%
Percent Tankered[5]	A	0%	0%	0%	0%	0%	0-34%
	B	0%	0%	0%	0%	0%	0-50%
	C	0%	0%	0%	0%	0%	0%

[1] Alternative D could reduce activity values of the combined Alternative A, B, or C. Refer to **Chapter 2.3.1.4** for more information on Alternative D. Percentage values indicated here would not change.
[2] Refer to **Figure 3-1**. Ranges are reported from the low production case scenario to the high production case scenario.
[3] Subareas totals may not add up to the planning area total because of rounding.
[4] 100% of gas is assumed to be piped.
[5] Tankering is forecasted to occur only in water depths >1,600 m (5,250 ft).

3.2.5 Air Emissions

BOEM has reexamined the information for air emissions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. New information was found for air emissions after a search of relevant information and contributes to BOEM's understanding of air emissions.

New information was found for air emissions via the *Year 2017 National Emissions Inventory Report* (USEPA 2020a) and *Year 2017 Emission Inventory Study* (Wilson et al. 2019a). These documents are the most recent inventory reports. These two emission inventory reports indicate that most of the criteria air pollutants, criteria precursor air pollutants, hazardous air pollutants, and greenhouse gas emissions come from onshore sources.

On May 14, 2020, the U.S. Department of the Interior and BOEM announced a final rule to update air quality regulations for activities BOEM authorizes in the CPA and WPA in the Gulf of Mexico. Among other things, the final rule updated the Significance Levels in 30 CFR § 550.303(e), which are based on the values currently set forth in USEPA regulations at 40 CFR § 51.165(b)(2). This rulemaking makes other improvements to the regulations to clarify and correct inconsistencies but will not result in any different or additional environmental impacts. The projected scenarios, such as the amount and location of activities and projected air pollutant emissions that were evaluated in

the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS and used to reach the lease sale conclusions, have not changed.

3.3 ACCIDENTAL EVENTS

As a consequence of routine activities or operations assumed to occur routinely throughout the lifetime of a lease, the potential for accidents exists. Accidental events are unauthorized but are examined separately due to their potential to occur and lead to significant and severe environmental impacts. Industry practices and government regulations minimize the risk of oil spills and other accidental events. Despite these efforts, there is no way to guarantee that accidental events will not occur and industry and government entities prepare to respond to a spill or other accident. The types of reasonably foreseeable accidental events include releases into the environment (e.g., oil spills, loss of well control, accidental air emissions, pipeline failures, and chemical and drilling fluid spills), collisions (e.g., helicopter, service vessels, and platforms), and spill-response activities. Substantial preventative measures and Federal regulatory requirements from prevention to spill response, which are summarized below and described in greater detail in Chapter 3.2 of the 2017-2022 GOM Multisale EIS, are in place to mitigate these events.

3.3.1 Oil-Spill Analysis Summary

The ranges presented in this oil-spill analysis summary were derived from the scenarios presented in the 2017-2022 GOM Multisale EIS. Upon evaluation of Alternative D, oil spill figures are anticipated to be similar to, but no greater than, Alternative A. The proposed lease sale area for this alternative is smaller than Alternative A and may reduce the area of potential impact. The reduction to the proposed lease sale area does not directly correlate to OCS oil- and gas-related activity, which is projected to shift to the proposed lease sale area.

Analysis of Offshore Spills ≥1,000 bbl

The mean number of spills estimated to occur as a result of each alternative is provided in **Table 3-5**. The range of the mean number of spills reflects the range of oil production volume estimated as a result of each alternative. The mean number of future spills ≥1,000 barrels (bbl) is calculated by multiplying the spill rate by the volume of oil estimated to be produced as a result of each alternative. Spill rates were calculated based on the assumption that spills occur in direct proportion to the volume of oil handled and are expressed as the number of spills per billion barrels of oil handled (spills/BBO).

Table 3-5. Mean Number and Sizes of Spills Estimated to Occur in OCS Offshore Waters from an Accident Related to Rig/Platform and Pipeline Activities Supporting Each Alternative Over a 50-Year Time Period.

Spill Size Group	Spill Rate (spills/BBO)[1]	Number of Spills Estimated			Estimated Median Spill Size (bbl)[1]
		Alternative A	Alternative B	Alternative C	
0-1.0 bbl	2,020	424-2,258	374-1,959	51-290	<1
1.1-9.9 bbl	57.4	12-64	11-56	2-9	3
10.0-49.9 bbl	17.4	4-20	3-17	1-3	
50.0-499.9 bbl	11.3	2-13	2-11	<1-2	126
500.0-999.9 bbl	1.63	<1-2	<1-2	<1	
Platforms					
≥1,000-9,999 bbl	0.25	<1	<1	<1	5,066
≥10,000 bbl	0.13	<1	<1	<1	–[2]
Pipelines					
≥1,000-9,999 bbl	0.88	<1-1	<1	<1	1,720
≥10,000 bbl	0.18	<1	<1	<1	–[2]

Notes: The number of spills estimated is derived by application of the historical rate of spills (1996-2010) per volume of crude oil handled based on the projected production for each alternative (**Table 3-3**). The actual number of spills that may occur in the future could vary from the estimated number.

[1] The spill rates presented are a sum of rates for United States OCS platforms/rigs and pipelines. The average (vs. the median) spill sizes for a larger number of spill size categories can also be found in the original source (Anderson et al. 2012).

[2] During the last 15 years, the only platform- or pipeline-related spill ≥10,000-bbl was the *Deepwater Horizon*. However, this spill is considered to be a low-probability catastrophic event, which is not reasonably foreseeable and is therefore not included.

The probabilities for oil-spill occurrence resulting from each alternative (2017-2066) and the Cumulative OCS Oil and Gas Program (2017-2086) for offshore spills ≥1,000 bbl can be found in **Table 3-6** and for spills ≥10,000 bbl in **Table 3-7**. The Oil Spill Risk Analysis (OSRA) model estimates the chance of oil spills occurring during the production and transportation of a specific volume of oil over the lifetime of the scenario being analyzed. The estimation process uses a spill rate constant, based on historical accidental spills ≥1,000 bbl and ≥10,000 bbl, expressed as a mean number of spills per billion barrels of oil handled. For this analysis, the low estimate and high estimate of projected oil production for a single lease sale for each alternative and for the Cumulative OCS Oil and Gas Program (2017-2086) are used. For more information on OCS spill-rate methodologies and trends, refer to Anderson et al. (2012). A discussion of how the range of resource estimates was developed is provided in Chapter 3.1.2 of the 2018 GOM Supplemental EIS.

Table 3-6. Oil-Spill Occurrence Probability Estimates for Offshore Spills ≥1,000 Barrels Resulting from Each Alternative (2017-2066) and the Cumulative OCS Oil and Gas Program (2017-2086).

	Forecasted Oil Production (Bbbl)[1]	Mean Number of Spills Estimated to Occur				Estimates of Probability (% chance) of One or More Spills			
		Platforms	Pipelines	Tankers	Total	Platforms	Pipelines	Tankers	Total
Single Lease Sale Alternatives									
Alternative A[2]	0.210	0.05	0.19	0	0.24	5	17	<0.5	21
	1.118	0.28	0.98	0.01	1.27	24	63	<0.5	72
Alternative B[3]	0.185	0.05	0.16	0	0.21	5	15	<0.5	19
	0.970	0.24	0.85	0	1.10	22	57	<0.5	67
Alternative C[4]	0.026	0.01	0.02	0	0.03	1	2	<0.5	3
	0.148	0.04	0.13	0	0.17	4	12	<0.5	15
Cumulative OCS Oil and Gas Program									
GOM	15.482	3.87	13.62	0.08	17.57	98	>99.5	7	>99.5
	25.806	6.45	22.71	0.13	29.29	>99.5	>99.5	12	>99.5
CPA/EPA	13.590	3.40	11.96	0.07	15.42	97	>99.5	7	>99.5
	22.381	5.60	19.70	0.11	25.40	>99.5	>99.5	11	>99.5
WPA	1.892	0.47	1.66	0	2.14	38	81	<0.5	88
	3.425	0.86	3.01	0	3.87	58	95	<0.5	98

Notes: Bbbl = billion barrels.
"Platforms" refers to facilities used in exploration, development, or production.
[1] Values represent the low and high resource estimates. Refer to **Table 3-1** for more information on resource estimates.
[2] A lease sale in the WPA, CPA, and the areas of the EPA not under Presidential withdrawal.
[3] A lease sale excluding blocks in the WPA.
[4] A lease sale excluding blocks in the CPA/EPA.

Source: Ji et al. (2017)

Table 3-7. Oil-Spill Occurrence Probability Estimates for Offshore Spills ≥10,000 Barrels Resulting from Each Alternative (2017-2066) and the Cumulative OCS Oil and Gas Program (2017-2086).

	Forecasted Oil Production (Bbbl)[1]	Mean Number of Spills Estimated to Occur				Estimates of Probability (% chance) of One or More Spills			
		Platforms	Pipelines	Tankers	Total	Platforms	Pipelines	Tankers	Total
Single Lease Sale Alternatives									
Alternative A[2]	0.210	0.03	0.04	0	0.07	3	4	<0.5	6
	1.118	0.15	0.20	0	0.35	14	18	<0.5	29
Alternative B[3]	0.185	0.02	0.03	0	0.06	2	3	<0.5	6
	0.970	0.13	0.17	0	0.30	12	13	<0.5	26
Alternative C[4]	0.026	0	0	0	0.01	<0.5	<0.5	<0.5	1
	0.148	0.02	0.03	0	0.05	2	3	<0.5	4
Cumulative OCS Oil and Gas Program									
GOM	15.482	2.01	2.79	0.02	4.82	87	94	2	99
	25.806	3.35	4.65	0.04	8.04	97	99	4	>99.5
CPA/EPA	13.590	1.77	2.45	0.02	4.23	83	91	2	99
	22.381	2.91	4.03	0.04	6.97	95	98	4	>99.5
WPA	1.892	0.25	0.34	0	0.59	22	29	<0.5	44
	3.425	0.45	0.62	0	1.06	36	46	<0.5	65

Notes: Bbbl = billion barrels.
"Platforms" refers to facilities used in exploration, development, or production.

[1] Values represent the low and high resource estimates. Refer to **Table 3-1** for more information on resource estimates.
[2] A lease sale in the WPA, CPA, and the areas of the EPA not under Presidential withdrawal.
[3] A lease sale excluding blocks in the WPA.
[4] A lease sale excluding blocks in the CPA/EPA.

Source: Ji et al. (2017).

Analysis of Offshore Spills <1,000 bbl

The number of spills <1,000 bbl estimated to occur over the next 50 years as a result of each alternative is provided in **Table 3-5**. The number of spills is estimated by multiplying the oil-spill rate for each of the different spill size groups by the projected oil production as a result of each alternative (**Table 3-1 and Table 3-3**). As spill size increases, the occurrence rate decreases and so the number of spills estimated to occur decreases.

Analysis of Coastal Spills

Spills that occur in State offshore waters and/or navigation channels, rivers, and bays (coastal waters) from barges and pipelines carrying OCS-produced oil are referred to as coastal spills. These spills occur at shoreline storage, processing, and transport facilities supporting the OCS oil and gas industry. BOEM projects that most (>90%) oil produced as a result of a proposed action under the action alternatives would be brought ashore via pipelines to oil pipeline shore bases, stored at these facilities, and eventually transferred via pipeline or barge to GOM coastal refineries. Because oil is commingled at shore bases and cannot be directly attributed to a particular lease sale, this analysis of coastal spills addresses spills that could occur prior to the oil arriving at the initial shoreline facility. It is also possible that non-OCS oil may be commingled with OCS oil at these facilities or during subsequent secondary transport.

Table 3-13 of the 2018 GOM Supplemental EIS details the number of spills that have occurred in the GOM by state between January 2002 and July 2005. When limited to just oil- and gas-related spill sources such as platforms, pipelines, mobile offshore drilling units (MODUs), and support vessels, the number and most likely spill sizes to occur in coastal waters in the future are expected to resemble the patterns that have occurred in the past as long as the level of energy-related commercial and recreational activities remain the same. The coastal waters of Louisiana, Texas, Mississippi, Alabama, and Florida have had a total of 165, 7, 3.2, 0.2, and 0, spills <1,000 bbl/yr, respectively. Assuming future trends would reflect past historical records, it is also predicted that Louisiana would be the state most likely to have a spill ≥1,000 bbl occur in water 0-3 mi (0-5 km) offshore. Between 2002 and 2015, only two spills ≥1,000 bbl occurred in coastal waters (refer to Table 3-13 of the 2018 GOM Supplemental EIS), and those occurred in the coastal waters of Louisiana.

3.3.2 Collisions

Most collision mishaps are the result of service vessels colliding with platforms or vessel collisions with pipeline risers. From 1999-2018, the leading causes of helicopter accidents were

engine related, loss of control or improper procedures, helideck obstacle strikes, controlled flight into terrain, and other technical failures (Helicopter Safety Advisory Conference 2019).

3.3.3 Chemical and Drilling-Fluid Spills

BOEM has reexamined the information for chemical and drilling-fluid spills presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. BOEM corresponded with BSEE personnel and examined BSEE's annual reports from 2015 and 2016, as well as checked a previously used webpage (BSEE 2015; 2016). **Table 3-8** (below) updates Table 3-21 (Number and Volume of Chemical and Synthetic-Based Fluid Spills for 10-49 Barrels and >50 Barrels in the Gulf of Mexico from 2007 through 2014) of the 2017-2022 GOM Multisale EIS (Tolbert et al. 2017). In 2015, there was a synthetic-based fluid spill that was larger than some previously reported. BSEE was not aware of any special reason for this. Despite that, the averages appear to be within the range of typical reported data.

Table 3-8. Oil-Spill Occurrence Probability Estimates for Offshore Spills ≥10,000 Barrels Resulting from Each Alternative (2017-2066) and the Cumulative OCS Oil and Gas Program (2017-2086).

Year	Product Lost (bbl)		Number of Spills		Average Spill Volume (bbl)	
	SBF	Chemical	SBF	Chemical	SBF	Chemical
A. Spills 10-49 bbl						
2007	110	17	6	1	18	17
2008	73	102	2	6	37	17
2009	38	24	1	2	38	12
2010	54	51	3	3	18	17
2011	73	0	2	0	37	0
2012	88	12	4	1	22	12
2013	51	20	2	1	26	20
2014	0	0	0	0	0	0
2015	12	41	1	1	12	41
2016	0	78	0	3	0	26
New average with 2015/2016 numbers	50	35	2	2	21	16
Average value before 2015/2016 data	61	28	3	2	24	12
B. Spills Greater Than 50 bbl						
Year	Product Lost (bbl)		Number of Spills		Average Spill Volume (bbl)	
	SBF	Chemical	SBF	Chemical	SBF	Chemical
2007	1,518	550	2	1	759	550
2008	1,849	3,229	2	16	925	202
2009	602	500	4	3	151	167

Year	Product Lost (bbl)		Number of Spills		Average Spill Volume (bbl)	
	SBF	Chemical	SBF	Chemical	SBF	Chemical
2010	131	123	2	1	66	123
2011	252	0	2	0	126	0
2012	158	1,595	3	5	53	319
2013	0	0	0	0	0	0
2014	323	66	3	1	108	66
2015	2,712	628	3	2	904	314
2016	175	1,274	1	2	175	637
New average with 2015/2016 numbers	772	797	2	3	327	238
Average value before 2015/2016 data	604	758	2	3	273	178

bbl = barrel.
SBF = synthetic-based fluid.

3.3.4 Spill Response

In the event of a spill, particularly a loss of well control, there is no single method of containment and removal that would be 100-percent effective. Offshore removal and spill-containment efforts to respond to an ongoing spill offshore would likely require multiple technologies, including source containment, mechanical spill containment and cleanup, *in-situ* burning of the slick, and the use of chemical dispersants. It is likely that larger spills under the right conditions would require the simultaneous use of all available cleanup methods. There are many situations and environmental conditions that could necessitate different approaches. Spill cleanup is a complex and evolving technology, and every new tool then becomes part of the spill-response tool kit. Therefore, each spill-response technique/tool has its specific uses and benefits (Walker and Fingas 2017). Even with the deployment of all of these spill-response technologies, it is likely that, with the operating limitations of today's spill-response technology, not all of the oil could be contained and removed offshore.

The sensitivity of the contaminated shoreline is the most important factor in the development of cleanup recommendations. Shorelines of low productivity and biomass can withstand more intrusive cleanup methods such as pressure washing. Shorelines of high productivity and biomass are very sensitive to intrusive cleanup methods and, in many cases, the cleanup is more damaging than allowing natural recovery. Refer to Chapter 3.2.8 of the 2017-2022 GOM Multisale EIS for more information on specific spill-response techniques. For information on the effects of spill-response activity, refer to Chapter 4 of the 2017-2022 GOM Multisale EIS.

Within BSEE, the Oil Spill Preparedness Division addresses all aspects of oil-spill planning and preparedness. Additional information about the Oil Spill Preparedness Division can be found on BSEE's website at https://www.bsee.gov/what-we-do/oil-spill-preparedness. BOEM receives and

reviews the worst-case discharge information submitted for exploration plans (EPs), development and production plans (DPPs), and development operations coordination documents (DOCDs) on the OCS. BOEM also has regulatory requirements addressing site-specific, oil-spill response plans (OSRPs). Pursuant to 30 CFR §§ 550.219 and 550.250, operators are required to provide BOEM with an OSRP that is prepared in accordance with 30 CFR part 254 subpart B with their proposed exploration, development, or production plan for the facilities that they will use to conduct their activities or alternatively to reference their approved regional OSRP. Refer to Chapter 3.2.8 of the 2017-2022 GOM Multisale EIS for more information.

3.4 CUMULATIVE ACTIVITIES

A cumulative impact "results from the incremental impact of [an] action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR § 1508.7). The scope of a proposed action is important to consider in a broader context that accounts for the full range of actions and associated impacts taking place within the Gulf of Mexico, currently and into the foreseeable future. Repeated actions, even minor ones, may produce significant impacts over time.

The cumulative impacts assessment focuses on the resources, ecosystems, and human communities that may be affected by the incremental impacts associated with a proposed action (under any of the action alternatives), in combination with other past, present, and reasonably foreseeable future actions. Cumulative impacts on a given resource, ecosystem, or human community may result from single actions or a combination of multiple actions over time. These may be additive, less than additive (countervailing), or more than additive (synergistic).

Many of the past, present, and reasonably foreseeable future actions and trends that would contribute to cumulative impacts under any of the action alternatives (Alternatives A-D) also contribute to cumulative impacts under the No Action Alternative (Alternative E). As a result, a separate treatment of the cumulative effects under Alternative E is not considered here, and the cumulative impacts analysis under Alternative A remains applicable. Under Alternative E, a proposed action (i.e., a single OCS oil and gas lease sale) would not occur and, as a result, energy could be obtained from other sources to replace the lost oil and gas production. The opportunity for development of the estimated oil and gas that could have resulted from a proposed action (i.e., a single lease sale) or alternative to a proposed action, as described above, would be precluded or postponed to a future lease sale, as detailed in **Chapter 2.3.1.5**.

3.4.1 Cumulative OCS Oil and Gas Program Scenario

The Cumulative OCS Oil and Gas Program scenario includes all activities (i.e., routine activities projected to occur and accidental events that could occur) from past, current, and future lease sales. This includes projected activity from past lease sales for which exploration or development has either not yet begun or is continuing and from future lease sales that would be held as a result of current or future Five-Year Programs (5 programs are included in this cumulative analysis). This equates to a 70-year timeframe or 2020-2089 and includes a 50-year analysis period

(2020-2069) for a single lease sale. Activities that take place as a result of Five-Year Programs beyond the next four programs are not included in this analysis.

It is reasonably foreseeable to assume that lease sales would continue to be proposed for many years to come, at least until 2032, in the Gulf of Mexico region based on resource availability, existing infrastructure, projected time lapses required for any other major energy sources to come online, and language in the Inflation Reduction Act that indicates that an OCS oil and gas lease sale consisting of at least 60 million acres must occur in a year prior to holding an offshore wind lease sale. For the purposes of conducting cumulative impact analyses here, even though additional NEPA reviews would be required, five National OCS Programs were assumed to occur (the current National OCS Program plus an additional 4; therefore, an additional 20 years of lease sales), resulting in activities that could occur over the next 70 years. However, the level of activities (i.e., exploration wells, production wells, and pipelines) becomes more speculative as time is projected into the future. The causes for this include uncertainty related to oil prices, resource potential, transitioning to a cleaner national energy strategy, and the cost of development and resource availability (e.g., drilling rig availability) versus the amount of acreage leased from a lease sale.

Therefore, these scenarios do not predict future OCS oil- and gas-related activities with absolute certainty, even though they were formulated using historical information and current trends in the oil and gas industry. These scenarios are only approximate since future factors such as the contemporary economic marketplace, the availability of support facilities, and pipeline capacities are all unknowns. Notwithstanding these unpredictable factors, the scenarios used in this Supplemental EIS represent the best assumptions and estimates of a set of future conditions that are considered reasonably foreseeable and suitable for presale impact analyses. The development scenarios do not represent BOEM's recommendation, preference, or endorsement of any level of leasing or offshore operations, or of the types, numbers, and/or locations of any onshore operations or facilities for future programs. Methodologies for the Cumulative OCS Oil and Gas Program scenario are similar to those for a typical lease sale scenario analysis and are described in detail in above. **Table 3-9 and Table** 3-10 present projections of the major activities and impact-producing factors related to future Cumulative OCS Oil and Gas Program activities.

Table 3-9. Future Activity Projections Associated with the Cumulative OCS Oil and Gas Program (2020-2089), Including All Future Activities that are Projected to Occur from Past, Current, and Future Lease Sales.

Activity	Region[1]	Offshore Subareas (m)[2]						Totals[3]
		0-60	60-200	200-800	800-1,600	1,600-2,400	>2,400	
Exploration and Delineation Wells	GOM	939-2,562	253-1,166	110-170	153-240	97-278	119-301	1,671-4,717
	CPA/EPA	775-1,999	202-1,007	83-142	88-184	70-142	99-211	1,317-3,685
	WPA	164-563	51-159	27-28	65-56	27-136	20-90	354-1,032
Development and Production Wells[4]	GOM Total	4,050-9,225	1,570-4,324	912-2,034	617-1,127	446-723	633-985	8,238-18,418
	CPA/EPA Total	3,170-6,634	1,139-3,558	676-1,557	490-779	405-623	595-899	6,475-14,050

	WPA Total	880-2,591	431-766	236-477	137-348	41-100	38-86	1,763-4,368
	GOM Oil	438-987	164-453	446-993	280-487	230-372	310-482	1,868-3,774
	CPA/EPA Oil	354-740	122-379	326-750	240-385	207-319	289-437	1,538-3,010
	WPA Oil	84-247	42-74	120-243	40-102	23-53	21-45	330-764
	GOM Gas	2,440-5,566	894-2,457	186-415	149-288	79-126	126-194	3,874-9,046
	CPA/EPA Gas	1,898-3,972	645-2,015	142-327	95-152	72-110	119-179	2,971-6,755
	WPA Gas	542-1,594	249-442	44-88	54-136	7-16	7-15	903-2,291
Installed Production Structures	GOM	2,168-5,121	558-1,638	36-71	26-38	16-38	23-42	2,827-6,948
	CPA/EPA	1,760-3,682	432-1,347	23-54	17-26	14-21	20-30	2,266-5,160
	WPA	408-1,439	126-291	13-17	9-12	2-17	3-12	561-1,788
Production Structures Removed Using Explosives	GOM	2,435-4,388	568-1,310	0	0	0	0	3,003-5,698
	CPA/EPA	2,051-3,315	440-1,065	0-0	0-0	0-0	0-0	2,491-4,380
	WPA	384-1,073	128-245	0-0	0-0	0-0	0-0	512-1,318
Total Production Structures Removed	GOM	3,381-6,148	784-1,796	39-69	36-44	20-33	21-31	4,281-8,121
	CPA/EPA	2,847-4,639	608-1,459	26-54	25-31	17-22	18-24	3,541-6,229
	WPA	534-1,509	176-337	13-15	11-13	3-11	3-7	740-1,892
Length of Installed Pipelines (km)[5]	GOM	2,181-15,822	1,432-10,511	1,078-8,037	1,268-8,265	700-7,001	704-7,359	7,363-56,995
	CPA/EPA	586-11,799	388-8,355	328-6,390	385-6,381	364-6,168	405-6,750	2,456-45,843
	WPA	1,595-4,023	1,044-2,156	750-1,647	883-1,884	336-833	299-609	4,907-11,152
Service-Vessel Trips (1000's of Trips)	GOM	2,443-6,998	645-2,300	284-942	213-556	134-498	187-577	3,909-11,873
	CPA/EPA	1,978-5,037	496-1,892	186-722	140-389	115-306	163-440	3,079-8,788
	WPA	465-1,960	150-408	98-221	72-167	19-192	23-137	830-3,085
Helicopter Operations (1000's of Operations)	GOM	11,714-55,063	4,511-25,155	270-1,162	183-651	139-422	183-546	17,000-83,000
	CPA/EPA	9,614-40,734	3,544-21,159	191-898	148-440	121-352	165-475	13,786-64,059
	WPA	2,098-14,329	966-3,996	78-264	34-211	17-70	17-70	3,214-18,941

[1] Region GOM would be past and future regionwide lease sale activity, Alternative CPA/EPA would be the Central and Eastern planning area activity, and Alternative WPA would be the Western portion of the GOM lease sale area.

[2] Refer to **Figure 3-1**.

[3] Subareas totals may not add up to the planning area total because of rounding.

[4] Development and Production Wells include some exploration wells that were re-entered and completed. These wells were removed from the Exploration and Delineation well count.

[5] Projected length of pipelines does not include length in State waters.

Table 3-10. Future Oil Transportation Projections Associated with the Cumulative OCS Oil and Gas Program (2020-2089), Including All Future Transportation that is Projected to Occur from Past, Current, and Future Lease Sales.

Activity	Region	Offshore Subareas (m)[1]						Totals[2]
		0-60	60-200	200-800	800-1,600	1,600-2,400	>2,400	
Percent Oil Piped[3]	GOM	94-95%	100%	100%	100%	89.6-87.4%	87.4-85.7%	91.6-90.6%
	CPA/EPA	94-95%	100%	100%	100%	97.8-96.3%	94.9-95.3%	90.8-91.0%
	WPA	100%	100%	100%	100%	100-89%	100-86.4%	100-95.1%
Percent Oil Barged	GOM	6-5%	0%	0%	0%	0%	0%	0.2%
	CPA/EPA	6-5%	0%	0%	0%	0%	0%	0.2%
	WPA	0%	0%	0%	0%	0%	0%	0%
Percent Tankered[4]	GOM	0%	0%	0%	0%	10.4-12.6%	12.6-14.3%	8-9%
	CPA/EPA	0%	0%	0%	0%	12.2-13.7%	5.1-4.7%	9-8.75%
	WPA	0%	0%	0%	0%	0-11%	0-13.6%	0-4.85%

[1] Refer to **Figure 3-1**. Ranges are reported from the low production case scenario to the high production case scenario.
[2] Subareas totals may not add up to the planning area total because of rounding.
[3] 100% of gas is assumed to be piped.
[4] Tankering is forecasted to occur only in water depths >1,600 m (5,250 ft).

3.4.2 Non-OCS Oil- and Gas-Related Impact-Producing Factors

The impact-producing factors considered in this chapter are defined as other past, present, and reasonably foreseeable future activities occurring within the same geographic range and within the same timeframes as the aforementioned projected routine activities and potential accidental events, but that are not related to the Cumulative OCS Oil and Gas Program. Chapter 3.3.2 of the 2018 GOM Supplemental EIS summarizes other impact-producing factors that could potentially affect an environmental or socioeconomic resource in addition to OCS oil- and gas-related activity.

State Oil and Gas

Cumulative offshore production in Texas State waters has increased since 2010 to 42.70 billion barrels of oil and 4.21 trillion cubic feet of gas (Railroad Commission of Texas 2020a; 2020b). Oil and gas production in Louisiana State waters has decreased since 2013 to a level of 4.24 million barrels of oil in 2019, with 2.17 million barrels of oil in 2020 year-to-date, and 15.3 million cubic feet of gas in 2019, with 6.81 million cubic feet of gas in 2020 year-to-date (State of Louisiana Department of Natural Resources 2020a; 2020b). In Alabama between 1987 and 2018, a total of 3.943 trillion cubic feet of gas and 764,270 barrels of oil were produced in State waters (State of Alabama Oil and Gas Board 2018). No new information was found for Mississippi or Florida.

Rigs-to-Reefs

Recent data suggest that the Rigs-to-Reefs Program is increasing in utilization. From 2002 through September 19, 2017, an average of 12.8 percent of removal permits were requested to be considered for the Rigs-to-Reefs Program (BSEE 2020f).

Marine Vessel Activity

As of 2015, total vessel calls in U.S. Gulf of Mexico ports made up more than one-half (51% of all calls) the total vessel calls in the United States (MARAD 2015). Tankers also make more calls (31% of all calls) in U.S. Gulf of Mexico ports than in other areas of the United States.

Hurricanes

From 2017 to 2022, several hurricanes and tropical storms crossed through the GOM or made landfall on coastal areas of the GOM. Oil and natural gas production was reduced for several days during Hurricanes Harvey, Nate, Michael, Barry, Laura, Sally, Delta, Zeta, and Ida, and Tropical Storms Gordon, Cindy, and Cristobal; however, damage to platforms and refineries from each hurricane or tropical storm appeared minimal (BSEE 2017a; 2017b; 2017c; 2018a; 2018b; 2019a; 2020a; 2020b; 2020c; 2020d; 2020e; 2021a). In August 2021, a pipeline and a wellhead on the seafloor were impacted by Hurricane Ida and resulted in accidental releases. Aerial images taken by NOAA showed an oil spill approximately 2 miles south of Port Fourchon, Louisiana, which was attributed to a ruptured pipeline and a spill discovered 5 miles from the Bay Marchand Port was attributed to a wellhead discharging oil (Powell 2021; USCG 2021).

Hypoxia

The 2021 area of low oxygen that forms annually in the Gulf of Mexico, west of the Mississippi River off the coasts of Louisiana and Texas, was larger than the average measured over the past 5 years. In 2021, the area was measured as 6,334 mi^2 (16,405 km^2), which was larger than the forecasted size of 4,880 mi^2 (12,639 km^2) (NOAA 2021).

No new information was found for non-OCS oil- and gas-related spills, military warning and water test areas, offshore deepwater ports and nearshore liquefied natural gas terminals, development of gas hydrates, aquaculture, OCS sand borrowing, noise from non-OCS oil- and gas-related activity, coastal environments, Mississippi River hydromodification and eutrophication, and sedimentation.

CHAPTER 4

AFFECTED ENVIRONMENT AND IMPACT ANALYSIS

4 AFFECTED ENVIRONMENT AND IMPACT ANALYSIS

4.0 OVERVIEW

The impacts of a GOM lease sale were analyzed in the 2017-2022 GOM Multisale EIS. The 2018 GOM Supplemental EIS was prepared to update the analyses and inform decisions for the GOM lease sales in 2018 and beyond, as appropriate, and like the Multisale EIS, analyzes a single proposed action (i.e., a Gulf of Mexico OCS oil and gas lease sale). This GOM Supplemental EIS contains summaries of and updates to the previous analyses of the potential environmental impacts that could result under Alternatives A-E from a lease sale in the Gulf of Mexico (i.e., GOM Lease Sale 259), but the analyses may be applied and supplemented as appropriate to inform the decision for GOM Lease Sale 261. This Supplemental EIS tiers from, summarizes, updates, and incorporates by reference all of the relevant material in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.0.1 Issues Analyzed in this Supplemental EIS

The major issues that frame the environmental analyses in this Supplemental EIS are the result of concerns raised during years of scoping for the Gulf of Mexico OCS Oil and Gas Program. Issues related to OCS oil and gas exploration, development, production, and transportation activities include the potential for oil spills, wetlands loss, air emissions, wastewater discharges and water quality degradation, marine trash and debris, structure and pipeline emplacement activities, platform removal, vessel and helicopter traffic, multiple-use conflicts, support services, demographics, land-use planning, impacts to recreation and beaches, aesthetic interference, environmental justice, and consistency with State coastal zone management programs. Environmental resources and activities identified during the scoping process for the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS that warrant an environmental analysis include air quality, water quality, coastal habitats (including wetlands, seagrasses/submerged aquatic vegetation, barrier beaches and associated dunes), deepwater benthic communities, *Sargassum* and associated communities, live bottom habitats (including topographic features and pinnacle trends), fishes and invertebrate resources, birds, marine mammals, sea turtles, beach mice, protected birds, protected corals, commercial fisheries, recreational fishing, recreational resources, archaeological resources, land use and coastal infrastructure, economic factors, and socioeconomic factors (including environmental justice).

4.0.2 Issues of Programmatic Concern

4.0.2.1 Climate Change

Issues related to climate change, including global warming, sea-level rise, and programmatic aspects of climate change relative to the environmental baseline for the GOM are discussed in Chapter 4.2.1 of the 2017-2022 National OCS Program EIS and are hereby incorporated by reference. New information since publication of the 2017-2022 National OCS Program EIS, 2017-2022 GOM Multisale EIS, and 2018 GOM Supplemental EIS was found for climate change after searching relevant sources, including Google Scholar, government agencies, and climate science journal publications. This new information contributes to BOEM's understanding of climate change issues, but it does not

change the conclusions presented in the 2017-2022 National OCS Program EIS, 2017-2022 GOM Multisale EIS, and 2018 GOM Supplemental EIS. For instance, a growing wealth of long-term atmospheric, ocean, and ecosystem observations has provided fundamental information on how climate change affects the way that carbon moves through Earth's environment; however, many fundamental questions remain unanswered (Kaushik et al. 2020). The most challenging issue with societal relevance is whether the rate at which the land and ocean can sequester carbon will continue to keep pace with rising carbon dioxide and methane emissions.

A revision of the "Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions" was proposed (https://www.regulations.gov/, docket ID CEQ-2019-0002) (*Federal Register* 2019a) in recent years; however, the CEQ rescinded that guidance consistent with Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (*Federal Register* 2021a; 2021e). The Gulf Coast provides a valuable setting to study deeply connected natural and human interactions (NASEM 2018). In particular, the concentration of energy-related infrastructure in the region has imprinted changes in the natural landscape. The comprehensive NASEM 2018 study identifies critical areas of research on relevant long-term timescales, i.e., 10-50 years and 50-200 years, that encompass high-priority gaps in understanding regional climate change. Regarding GHG emissions from land sources, Merrill et al. (2018) includes natural sequestration systems to discuss net emissions of GHG associated with fossil fuels in the United States. Natural ecosystems can be sources or sinks (through sequestration) of GHG; however, there is scientific consensus that an important fraction of atmospheric CO_2 is absorbed by the ocean (USEPA 2017a). Merrill et al. (2018) used a dynamic vegetation model to estimate stocks and fluxes from land areas, but no coastal or oceanic natural environments were included to evaluate net GHG in the conterminous United States.

In August 2021, the intergovernmental Panel on Climate Change (IPCC) unveiled its most recent assessment, the Sixth Assessment Report-AR6 (IPCC 2021) addressing the most up-to-date physical understanding of Earth's climate system and climate change. The full report chapters are publicly available, but only in an accepted and approved format. They remain subject to final edition and should be available as a final version in 2022. The IPCC Working Group I wrote the latest report that would be the base document to inform negotiations in the United Nations Climate Change Conference of the Parties (COP26, https://ukcop26.org/) in October 2021. There is a debate regarding the baseline scenarios, known as Representative Concentration Pathways (RCP), proposed since previous IPCC Assessment reports and how much warming might result from a range of global carbon emissions (Wheeling 2020). The most extreme scenario RCP-8.5 (called business as usual) results in a substantial burning of fossil fuel, increase in global temperature of nearly 5ºC (41ºF), and mean sea level roughly a meter higher. However, Burgess et al. (2020) found that emissions trajectories in climate assessments from IPCC overshot actual energy emissions over the past 15 years largely because socioeconomic factors are not considered in modeling simulations. On the other hand, Schawlm et al. (2020) stated that, despite recent progress in decreasing emissions, the most aggressive scenario (RCP-8.5) of fossil fuel use is as a useful tool for quantifying physical climate risk over near- to mid-term climate policy-relevant time horizons. Tong et al. (2019) declares that if existing

fossil-fuel energy infrastructure continues to operate at recent historical rates, the committed Paris Agreement climate goals would be jeopardized.

The IPCC Summary for Policy Makers is a high-level document based on key findings of the IPCC Working Group I report in the AR6. Duncombe (2021) briefly summarizes five takeaways presented in the IPCC Summary for Policy Makers. For instance, global warming is predicted to reach 1.5°C (34.7ºF) above pre-industrial levels by the early 2030s, exceeding the lower goal of the Paris Agreement in 2015 (Richman 2015), with challenging consequences like the Arctic which could be ice free by mid- to late century; sea level could rise by a meter by 2100, inundating cities; and extreme heat waves could become more intense and frequent. Global average temperature will be determined by the amounts of GHG emissions within the next decades. The new report presents five scenarios with high confidence levels based on socioeconomic assumptions, climate change mitigations, and air pollution controls. Two of them, the very low and low emissions stay below 2°C (36ºF) and they require net-zero emissions and carbon removal by mid- to late century. The other three, mid-level, high, and very high emissions, are beyond the lower level of the Paris Agreement. Also, the AR6 states that for any long-term climate solution, net-zero carbon dioxide (CO_2) is a requirement. Combined sharp cuts of CO_2 per decade and carbon capture are required in the most aggressive road map for policy makers.

The American Meteorological Society published the *State of Climate in 2020* (Blunden and Boyer 2021), acknowledging that dominant GHG continued to increase in 2020 with concentrations for CO_2 at 412.5 ppm, the highest in the modern instrumental record and in ice core records dating back 800,000 years. While CO_2 emissions were estimated to decrease in 2020 during the COVID-19 pandemic, such reduction did not materially affect CO_2 atmospheric accumulation. The highest net oceanic uptake of CO_2, approximately 3 petagrams, was observed in 2020 and was the highest in the 39-year record corresponding almost to 30 percent of two recent decades average. There was a transition between El Niño and La Niña conditions in 2020; even so, the annual global surface temperature over the land and oceans was among the three highest in records dating to the mid- to late 1800s. Although many recent studies have discussed the impacts of climate change, few have quantified the risks to socially vulnerable groups and understanding the degree-related impacts (USEPA 2021a).

4.1 GREENHOUSE GAS EMISSIONS ANALYSIS

This chapter provides an overview of BOEM's updated GHG methodology and results. BOEM updated its analysis of life cycle greenhouse gas emissions (Wolvovsky and Anderson 2016) to include a newly developed quantitative analysis of Alternative A's impact on foreign oil consumption and the resulting increase of GHG emissions. BOEM organizes its analysis into two parts. The first part estimates GHG emissions resulting from domestically produced or consumed fuels. The second part includes emissions when considering the shift in foreign oil consumption. Refer to the Gulf of Mexico GHG Analysis (BOEM 2022), which is incorporated by reference herein, for a more detailed discussion of the methodology, analysis, and results.

The domestic component quantifies full life cycle GHG emissions (i.e., upstream, midstream, and downstream) associated with fuels produced or consumed domestically. The analysis considers both the life cycle emissions associated with the proposed action (i.e., the production and consumption of OCS produced oil and gas under Alternative A) as well as the emissions associated with the energy substitutes that would replace the forgone OCS oil and gas under the No Action Alternative (e.g., the production and consumption of increased imports, increased onshore production, and fuel switching). The GHG emissions and social cost analysis presented here is taken directly from the Gulf of Mexico GHG Analysis. That document compares the leasing scenario, which is identical to Alternative A[2], to the No Leasing scenario, which is the same as the No Action Alternative, or Alternative E when referencing a single lease sale.

In addition to estimating emissions from domestically produced or consumed products, BOEM's analysis also considers emissions associated with a change in foreign oil consumption. As a result of a lease sale, BOEM estimates a slight decrease in oil prices, which would increase global demand and lead to other changes in the global energy market. BOEM's analysis quantitatively considers the emissions associated with the increased global oil consumption and qualitatively addresses upstream and midstream emissions of foreign oil shifts and the full life cycle emissions of the shifts in other foreign energy market sources in the Gulf of Mexico GHG Analysis (BOEM 2022).

Table 4-1 shows the estimates of life cycle GHG emissions of domestically consumed or produced energy and the change in emissions associated with the increase in foreign oil consumption. These results, and the rest of the analysis and tables, are taken directly from the Gulf of Mexico GHG Analysis (BOEM 2022). BOEM estimates about 21.2 million metric tons of carbon dioxide equivalent (CO_2e) will be emitted due to Alternative A from upstream activities and that 44.9 million metric tons of CO_2e would be emitted from upstream activities associated with the energy substitutes in the No Action Alternative. The increase in emissions associated with the No Action Alternative represents the increase in per barrel GHG emissions from substitute sources. The mid- and downstream analysis shows that the No Action Alternative results in fewer emissions than Alternative A due in part to the estimated reduced demand associated with the relatively higher prices under the No Action Alternative. In net, the life cycle analysis of domestic consumption and production shows that selection of the No Action Alternative results in very similar emissions to the emissions estimated under Alternative A, with slightly higher GHG emissions under the No Action Alternative than would be emitted under Alternative A. When the analysis is expanded to consider emissions from foreign energy markets, BOEM finds the No Action Alternative results in fewer global GHG emissions as there would be an additional 46.8 million metric tons of global emissions as a result of a lease sale under Alternative A.

[2] For the Gulf of Mexico GHG Analysis, BOEM used the mid-case scenario from the most recent 2017-2022 GOM Multisale EIS in its modeling of GHG emissions. This is deemed conservative for Alternative A since this mid-case represents the combined activity stemming from a single year in a 5-year and 10-lease sale schedule of lease sales. Further, Alternatives B-D are reductions of the Alternative A proposed lease sale area.

Table 4-1. Life Cycle Greenhouse Gas Emissions.

Mid-Activity Case (CO_2e, thousands of metric tons)			
	Domestic Production and Consumption Only		Foreign Only
	Upstream	Midstream and Downstream	Downstream (oil only)
Alternative A	21,183	243,141	46,769
No Action	44,888	225,047	N/A
Difference	(23,705)	18,094	46,769

Notes: Values rounded to nearest 1,000 metric tons.
For ease of comparison, BOEM provides combined totals of all three GHG emissions in CO_2 equivalent, or CO_2e. CH_4 and N_2O are converted to CO_2e using USEPA current Global Warming Potentials (USEPA 2021b).

After estimating GHG emissions, BOEM then monetizes the social costs of those GHG emissions to estimate Alternative A's incremental social cost of GHG emissions relative to the No Action Alternative (**Table 4-2**). At a 3 percent discount rate and an average level of statistical damages, having a lease sale under Alternative A would result in savings of $440 million when considering domestically produced or consumed OCS oil, natural gas, and their substitutes alone. The social cost due to increased foreign emissions under Alternative A (3%, average statistical damages) is $2.04 billion. While this does not consider the cost of GHG emissions from shifts in foreign energy market consumption of other substitute fuel sources or the upstream or midstream GHG emissions from any foreign energy market substitutes, BOEM believes that the quantified amount is a reasonable approximation given the best available and credible information currently available. The Gulf of Mexico GHG Analysis (BOEM 2022) discusses in greater detail the components of the monetization and variation among the estimates, such as the discount rate and statistical damages.

Table 4-2. Total Social Cost of Greenhouse Gas Emissions.

Mid-Activity Case (billion 2022 $)					
Discount Rate	Damages Statistic	Domestic Production and Consumption			Foreign Downstream Emissions from Oil
		Alternative A	No Action Alternative	Difference	
5.0%	Average	$2.87	$3.07	($0.21)	$0.50
3.0%	Average	$11.58	$12.03	($0.44)	$2.04
2.5%	Average	$17.79	$18.33	($0.55)	$3.13
3.0%	95th Percentile	$35.26	$36.33	($1.07)	$6.21

Notes: Values rounded to nearest $10 million. A positive value is a cost. A negative value is a benefit. The incremental social cost of greenhouse gases represents the difference between Alternative A and the No Action Alternative. Therefore, a negative incremental value suggests that costs are higher under the No Action Alternative or lower under Alternative A.

In conclusion, as described in the Gulf of Mexico GHG Analysis, BOEM finds that there is only a marginal difference in domestic emissions from Alternative A relative to those of the No Action Alternative. As shown in **Table 4-1**, there are slightly higher emissions from substitutes under the No Action Alternative above those of Alternative A. However, when considering the higher GHG emissions estimated from an increase in foreign oil consumption under Alternative A (as presented in

Table 4-1), BOEM finds that global GHG emissions under the No Action Alternative are estimated to be slightly lower when compared to those under Alternative A. While BOEM's analysis does include quantification of GHG emissions from foreign oil consumption, the analysis can neither include quantification of foreign oil's upstream and midstream nor foreign substitutes' full life cycle emissions at this time. However, such estimates would not be expected to change the general conclusions of BOEM's analysis as BOEM expects the result of fewer global GHG emissions in the No Action Alternative to remain. BOEM's greenhouse gas quantitative and qualitative analyses together represent the best available and credible approach for comparison of GHG emissions from Alternative A and the No Action Alternative and serve as a proxy for evaluating and comparing impacts to climate change under Alternative A and the No Action Alternative.

4.1.1 Supplemental EIS Impact Analyses

Summaries of the affected environment and the potential impacts of a single lease sale under each alternative are presented and reexamined in **Chapters 4.2-4.15**. The affected environment descriptions and impact analyses by resource are detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS, and are hereby incorporated by reference. The analysis of the alternatives for each resource considers routine activities, accidental events, cumulative impact analysis, incomplete or unavailable information, new information available since publication of the 2018 GOM Supplemental EIS, and conclusions for each resource. This Supplemental EIS also incorporated by reference from the 2017-2022 GOM Multisale EIS the baseline data in the assessment of impacts from a proposed action on the resources and the environment.

Within each resource summary and within the full analysis in the 2017-2022 GOM Multisale EIS, the cumulative analysis considers environmental and socioeconomic impacts that may result from the incremental impact of a proposed action when added to all past, present, and reasonably foreseeable future OCS oil- and gas-related activities (OCS Oil and Gas Program), as well as non-OCS oil- and gas-related activities (e.g., import tankering and commercial fishing). This includes projected activity from lease sales that have been held, but for which exploration or development has not yet begun or is continuing.

A summary of the potential impacts from a proposed action on each environmental and socioeconomic resource and the conclusions of the analyses can be found in the following discussions. **Table 4-3** provides a comparison of expected impact levels by alternative and is derived from the analysis of each resource. The findings for Alternatives A-E would be a proposed action's *incremental contribution* to the cumulative impacts from past, present, and future activities in the GOM. These activities would include both OCS oil- and gas-related and non-OCS oil- and gas-related activities that would be expected regardless of whether or not a lease sale was to occur. The impact-level ratings have been specifically tailored and defined for each resource within the impact analysis of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. General impact conclusions are presented below. Cumulative impacts of current, past, and reasonably foreseeable future activities, however, would continue to occur under Alternative E.

It must be emphasized that, in arriving at the overall conclusions for certain environmental resources (e.g., birds, fisheries, and wetlands) for each alternative, the conclusions are based on potential impacts to the resources or species population as a whole, not to individuals, small groups of animals, or small areas of habitat. BOEM analyzes impacts on a finer geographic scale and mitigations that are appropriate for consideration through site-specific environmental reviews at the post-lease stage. Each resource topic discussion includes a threshold effects determination and includes a resource-specific definition of impact level. These discussions can be found in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Additionally, potential beneficial effects of a proposed action were considered and identified in individual resource chapters. For example, implementation of a lease sale is anticipated to have beneficial impacts in the Area of Interest for economics due to the direct and indirect spending associated with the oil and gas industry.

Beneficial – Impacts would be positive. The level of beneficial impacts is specified in the analysis, which could be low, medium, or high.

Negligible – Impacts may or may not cause observable changes to natural conditions; regardless, they do not reduce the integrity of a resource.

Minor – Impacts cause observable and short-term changes to natural conditions but they do not reduce the integrity of a resource.

Moderate – Impacts cause observable and short-term changes to natural conditions and/or they reduce the integrity of a resource.

Major – Impacts cause observable and long-term changes to natural conditions and they reduce the integrity of a resource.

Table 4-3. Alternative Comparison Matrix for a Single Lease Sale.

Impact Level Key[1]					
Beneficial[2]	Negligible	Minor	Moderate	Major	
	Alternative				
Resource	A	B	C	D	E
Air Quality	Minor	Minor	Minor	Minor	None
Water Quality	Negligible	Negligible	Negligible	Negligible	None
Coastal Habitats					
Estuarine Systems	Moderate	Moderate	Minor	Moderate	Negligible
Coastal Barrier Beaches and Associated Dunes	Minor	Minor	Negligible to Minor	Negligible to Minor	Negligible
Deepwater Benthic Communities	Negligible	Negligible	Negligible	Negligible	None
Sargassum and Associated Communities	Negligible	Negligible	Negligible	Negligible	None

Live Bottoms					
Topographic Features	Negligible	Negligible	Negligible	Negligible	None
Pinnacles and Low-Relief Features	Negligible to Minor	Negligible to Minor	Negligible	Negligible	None
Fishes and Invertebrate Resources	Minor	Minor	Minor	Minor	None
Birds	Moderate	Moderate	Moderate	Moderate	None
Protected Species					
Marine Mammals	Negligible	Negligible	Negligible	Negligible	None
Sea Turtles	Negligible	Negligible	Negligible	Negligible	None
Beach Mice	Negligible	Negligible	Negligible	Negligible	None
Protected Birds	Negligible	Negligible	Negligible	Negligible	None
Protected Corals	Negligible	Negligible	Negligible	Negligible	None
Commercial Fisheries	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Recreational Fishing	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Recreational Resources	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible
Archaeological Resources	Negligible[3]	Negligible[3]	Negligible[3]	Negligible[3]	None
Human Resources and Land Use					
Land Use and Coastal Infrastructure	Minor	Minor	Minor	Minor	None
Economic Factors	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Beneficial to Minor	Negligible to Minor
Social Factors (including Environmental Justice)	Minor	Minor	Minor	Minor	None

Note: Some resources have a range for the impact levels to account for certain variables such as the uncertainty of non-OCS oil- or gas-related activities, the level and magnitude of potential accidental events, and the minimization of the OCS oil- or gas-related impacts through lease stipulations, mitigations, and/or regulations. The impact-level ratings have been specifically tailored and defined for each resource within the Chapter 4 impact analysis of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

[1] The findings for Alternatives A-D are the incremental contribution of a proposed action added to what would be expected to occur under the No Action Alternative (i.e., no lease sale). Therefore, each impact determination under Alternatives A-D assumes that the cumulative conditions and impacts (i.e., past, present, and future activities as a result of past lease sales) under the No Action Alternative would still be present.

[2] The level of beneficial impacts is specified in the analysis, which could range from low, medium, or high.

[3] The level of impacts for archaeological resources ranges between negligible to major and is dependent upon whether a survey is performed, mitigation is imposed, mitigation is followed, or a site is identified prior to the activity.

4.2 AIR QUALITY

4.2.1 Summary

BOEM has reexamined the analysis for air quality presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.2.4**. No new information was discovered that would alter the impact conclusion for air quality presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of air quality, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.1 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.1 of the 2018 GOM Supplemental EIS. **Chapter 4.2.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.2.2 Analysis of Alternatives A-E Summary

Air quality is the degree of pollution in the ambient air and is assessed by measuring the pollutants in the air. To protect public health and welfare, the Clean Air Act established National Ambient Air Quality Standards (NAAQS) for certain common and widespread pollutants. The six common "criteria pollutants" are particle pollution (also known as particulate matter, $PM_{2.5}$ and PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and ozone (O_3). Air emissions from OCS oil and gas development in the Gulf of Mexico would arise from emission sources related to drilling and production with associated vessel support, flaring and venting, decommissioning, fugitive emissions, and oil spills. Associated activities that take place as a result of a proposed action support and maintain the OCS oil and gas platform sources. Air emissions from non-OCS oil- and gas-related emissions in the Gulf of Mexico would arise from emission sources related to State oil and gas programs, onshore industrial sources, onshore and offshore transportation sources, and natural events. Since the primary NAAQS are designed to protect human health, BOEM focuses on the impact of these activities on the States, where there are permanent human populations. For this Supplemental EIS analysis, the affected environment comprises the WPA, CPA, and EPA, including the States of Texas, Louisiana, Mississippi, Alabama, and Florida, and the respective State waters, as these are the areas that BOEM's Gulf of Mexico Regional Office could reasonably be expected to impact. This area of potential effects also includes national parks and Federal wilderness areas where air quality and air quality-related values (primarily visibility) are protected more stringently than under the NAAQS. There are protected Class I areas in the GOM region, specifically: the Breton Wilderness Area in Louisiana; and the Bradwell Bay Wilderness Area, Chassahowitza National Wilderness Area, Everglades National Park, and St. Marks Wilderness Area in Florida.

In the "Air Quality Modeling in the Gulf of Mexico Region" study (refer to **Chapter 4.2.4** of this Supplemental EIS and Appendices B-D of the 2018 GOM Supplemental EIS), photochemical grid modeling was conducted to assess the impacts to nearby states of existing and future OCS oil and

gas exploration, development, and production. There are two versions of this study, which are described in more detail in **Chapter 4.2.4** of this Supplemental EIS. The conclusions based on the 2019 report did not change from the conclusions based on the 2018 draft interim assessment, which can be found in Appendices B-D of the 2018 GOM Supplemental EIS.

The air quality modeling study examines the potential impacts of the lease sales with respect to the NAAQS for the criteria pollutants O_3, NO_2, SO_2, CO, $PM_{2.5}$, PM_{10}; the air quality-related values, including visibility and acid deposition (sulfur and nitrogen) in nearby Class I and sensitive Class II areas; and the incremental impacts of Prevention of Significant Deterioration (PSD) pollutants (NO_2, PM_{10}, $PM_{2.5}$) with respect to PSD Class I and Class II increments. (*Note: For post-lease activities, if a facility is determined as a major source, a regulatory PSD increment consumption analysis as would be required in accordance with the New Source Review program requirements of the Clean Air Act*).

Historic trend data are limited for a lease sale consisting of the WPA, CPA, and small portion of the EPA not subject to Congressional moratoria. In the scenario in **Chapter 3** of this Supplemental EIS and Chapter 3.1 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, the projected activities of a single lease sale are based on a range of observations and provide a reasonable expectation of oil and gas production anticipated from a single lease sale. Results from improved scenarios and simulations in the "Air Quality Modeling in the Gulf of Mexico Region" study show that the potential impacts of a single lease sale would be **minor**. More specifically, the potential impacts of a single lease sale to the Breton Wilderness Area would be **moderate**, whereas the overall potential impacts of a single lease sale would be **minor** for all other areas. However, as new data become available, BOEM anticipates future modeling to refine its predictions.

The incremental contribution of a lease sale under Alternatives A-D to the cumulative impacts would most likely have a **minor** effect on coastal nonattainment areas because most impacts on the affected resource could be avoided with proper mitigation at the post-lease stage. Portions of the Gulf Coast onshore areas have ozone levels that exceed the Federal air quality standard, but the incremental contribution from a lease sale would be very small and would not on their own cause an exceedance. Alternative E, the cancellation of a single lease sale, would result in no new activities associated with a lease sale; therefore, the incremental impacts would be **none** because new impacts would be avoided entirely. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E.

BOEM contracted an air quality modeling study in the GOM region to assess the impacts of OCS oil- and gas-related development to nearby States, as required under the OCSLA. The data from forecasted emissions resulting from the 10 proposed GOM lease sales in the 2017-2022 National OCS Program was annualized using BOEM's Resource Evaluation's mid-case scenario. These results are presented in Appendices B-D of the 2018 GOM Supplemental EIS and (Wilson et al. 2019b). Under the 10 lease sale mid-case scenario, the cumulative impacts to the Breton Wilderness Area and Gulf Islands National Seashore would be **moderate**, whereas the overall cumulative impacts of the 10 proposed lease sales would be **minor** to **moderate**.

The cumulative impacts would most likely have a **moderate** effect on coastal nonattainment areas for certain pollutants. Portions of the Gulf Coast onshore areas have ozone levels that exceed the Federal air quality standard, but the cumulative impacts from past, present, and future lease sales do not on their own cause an exceedance. A full analysis of air quality can be found in Chapter 4.1 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.1 of the 2018 GOM Supplemental EIS.

4.2.3 Incomplete or Unavailable Information

This chapter discusses the incomplete or unavailable information needed to assess the impacts from OCS oil- and gas-related activities. As noted earlier, the final Air Quality Modeling Report (Wilson et al. 2019b) has been published and does not change the conclusions made previously based on the 2018 draft interim assessment in Appendices B-D of the 2018 GOM Supplemental EIS.

Incomplete and unavailable information includes data that may have become available since the Air Quality Modeling Report (Wilson et al. 2019b) was started. The unavailable information includes study inputs. The study used the 2014 GWEI. Since then BOEM has published a 2017 GWEI, and an 2021 inventory is in progress. The USEPA also now has more current national emission inventory data than what was used to establish cumulative impacts and more recent onshore monitoring data than was available when the study began. If these data were available to be used in a more recent study, it is expected that the results would not change because the activities that generate the emissions do not vary widely from year to year. Therefore, BOEM has determined that more timely emissions and monitoring information is not essential to a reasoned choice among alternatives.

4.2.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet sources (e.g., Texas Commission on Environmental Quality, Louisiana Department of Environmental Quality, and USEPA) were examined to assess recent information regarding air quality that may be pertinent to a proposed action. New information was found for air quality after searching relevant Internet and government sources, including the USEPA's website. BOEM's air quality subject-matter experts regularly review USEPA's website since the Clean Air Act is the law authorizing the USEPA to establish the National Ambient Air Quality Standards to protect public health and public welfare and to regulate emissions of hazardous air pollutants. The new information discovered and described below represents updates to BOEM's air quality modeling capability. Because this new information only serves to supplement our analytical capability and does not show any additional impacts, the overall impact conclusions in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS remain unchanged.

One GWEI study was released documenting the 2014 air pollutant emission inventory for OCS oil and gas sources in the GOM (Wilson et al. 2017). This information has been used to update emissions in the final modeling effort in the "Air Quality Modeling in the Gulf of Mexico Region" study

described above. No new information that would add to the analyses or change the conclusions reached by BOEM was discovered since publication of the 2018 GOM Supplemental EIS.

A second GWEI study was released documenting the 2017 air pollutant emission inventory for OCS oil and gas sources in the GOM. It will support future EISs through its use as updated input (Wilson et al. 2019a).

An update to the air quality modeling study to conduct photochemical and dispersion modeling for the GOM region to assess the OCS oil and gas development pre- and post-lease impacts to the states was published on September 3, 2019 (Wilson et al. 2019b). BOEM's most recent air quality modeling study and data analysis is the *Air Quality Modeling in the Gulf of Mexico Region* study (Wilson et al. 2019b). There are two versions of this study. The first version of the study was published in Appendices F, G, and H of the 2017-2022 GOM Multisale EIS. After completion of the initial modeling, BOEM directed the contractor to prepare a revised modeling analysis using lessons learned from the previous work. Several improvements were incorporated. The first version used the 2011 Emissions Inventory and the same year as base for future simulations and cumulative analysis. In the second version, BOEM replaced the 2011 emissions with the 2014 Emissions Inventory. Additional changes between the first version and the second version include an improved geographical distribution of OCS sources on the shelf, corrections to the sea-salt algorithm, and inclusion of emissions from a single lease sale, as well as 10 lease sales, and source apportionment. The 2011 calendar year emissions for most pollutants were significantly higher compared to the calendar year 2014 emission inventory (Wilson et al. 2017). On the other hand, the 2014 emission inventory was more recent and had a reliable methodology to allocate the emissions using global positioning systems to track vessel movements. In both versions of the study, BOEM used the year 2012 meteorology because it is more representative of average regional climatology. Temperatures over the GOM in 2011 were climatologically high and precipitation was low compared to 2012, which was more representative of a typical year.

Wilson et al. (2019b) made improvements to the first version based on comments and recommendations from the USEPA, industry, and the general public. BOEM concluded that the study was highly influential under the *OMB 2004 Peer Review Bulletin* (*Federal Register* 2005). As a result, BOEM contracted the National Academies of Sciences, Engineering, and Medicine (NASEM) to provide an independent technical review of Wilson et al. (2019b). The National Academies Board on Atmospheric Sciences and Climate appointed an ad hoc committee to conduct this review reported in the NASEM (NASEM 2019). The committee that reviewed the Air Quality Modeling in the Gulf of Mexico Region study concluded that there were "potential underestimates of the impacts of GOMR emissions on air quality" (NASEM 2019). Their reasons included the lack of performance evaluations of the highest air quality impacts from offshore to onshore and not using warmer years for modeling ozone, PM_{10}, and $PM_{2.5}$ formation (NASEM 2019). The "Air Quality Modeling in the Gulf of Mexico Region" study also had similar conclusions regarding uncertainties, stating "one of the key uncertainties associated with analyzing the air quality impacts from offshore oil and gas sources in the Gulf of Mexico is the magnitude of the modeled ozone and particulate matter concentrations over the Gulf waters" (Wilson et al. 2019b). These uncertainties are likely due to the lack of available offshore

air quality monitoring data. At this time, reported results are consistent with previous BOEM analyses and do not alter previous conclusions.

BOEM has also embarked on new a form of emissions inventory for the year 2021. Operators are using the new inventory tool called Outer Continental Shelf Air Quality System (OCS AQS). The OCS AQS is a web-based solution that replaces the legacy Gulfwide Offshore Activity Data System (GOADS) emission inventory system. The main purpose is to collect activity data, automatically calculate emissions, and perform quality assurance. This new process is advantageous because it does not require software installation, it has import and export features, activity can be entered monthly rather than at the end of the year, it includes all historical emission inventory data, and it generates reports and has mapping features. The completed 2017 GWEI and the 2021 Inventory currently in progress were not used in the Air Quality Modeling Study.

Research has assessed methane (CH_4) emissions from oil and gas industry in the GOM. Yacovitch et al. (2020) collected shipboard measurements downwind from offshore oil and gas platforms in February 2018. Yacovitch and coworkers sampled methane, ethane, and combustion tracers. They found significant variability within the emission composition (based on the methane to ethane ratio) between individual sites. There was a total of 103 sampling sites in shallow and deep waters.

Similarly, Gorchov Negron et al. (2020) used aircraft to assess methane emissions in the GOM during January 2018 at shallow and deepwater platforms and drillships. Gorchov Negron and coworkers developed an approach that combined facility-level sample results, production data, and emissions inventory estimates to generate an aerial-based inventory of CH_4. They compared their results with the USEPA greenhouse gas inventory. Gorchov Negron et al. (2020) found that their estimates were consistent with the USEPA's inventory for the deepwater platforms and drillships but were higher than the USEPA's inventory for shallow-water platforms and drillships. At this time, reported results are consistent with previous BOEM analyses and do not alter previous conclusions.

4.2.5 Conclusion

BOEM has reexamined the analysis for air quality presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regards to the updated scenario provided in **Chapter 3** and the understanding that no new information on air quality has been discovered since publication of the 2018 GOM Supplemental EIS that would alter the impact conclusion for air quality presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.3 WATER QUALITY

4.3.1 Summary

BOEM has reexamined the analysis for water quality presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on new information presented in **Chapter 4.3.4**. No new information was discovered that would alter the impact conclusions for water quality presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analyses and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of water quality, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.2 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.2 of the 2018 GOM Supplemental EIS. **Chapter 4.3.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.3.2 Analysis of Alternatives A-E Summary

Water quality is a term used to describe the condition or environmental health of a waterbody or resource, reflecting its particular biological, chemical, and physical characteristics and the ability of the waterbody to maintain the ecosystems it supports and influences. It is an important measure for both ecological and human health. Water quality patterns and trends are complex and variable. Assessments over more than two decades reveal that water quality in coastal and nearshore areas of the northern GOM are rated as fair. Coastal water impacts associated with routine OCS oil- and gas-related activities include increases in turbidity resulting from pipeline installation and navigational canal maintenance, discharges of bilge and ballast water from support vessels, and runoff from shore-based facilities. Farther offshore, water quality tends to be rated good except for the hypoxic area that typically forms along the shelf west of the Mississippi River during the summer (Kennicutt 2017). The largest impact-producing factors affecting water quality are operational discharges and wastes, drilling fluid spills, chemical and waste spills, and oil spills. The activity associated with a lease sale could contribute a small percentage to existing and future OCS oil- and gas-related activities. The specific discharges, drilling muds, cuttings, produced water, and accidents resulting in spills would occur in proportion to production volume and, therefore, would add a small increase to the currently anticipated impacts. Furthermore, the vessel traffic and vessel-related discharges associated with a lease sale represent a fraction of the current ongoing commercial shipping and military activity in the Gulf of Mexico. The impacts of operational discharges, sediment disturbances resulting in increased turbidity, and accidental releases are a small percentage of the current overall impacts to coastal and offshore waters.

The impacts of OCS Oil and Gas Program-related routine operational discharges (detailed in Chapter 3.1.5.1 of the 2017-2022 GOM Multisale EIS and summarized in Table 3-8 of the 2018 GOM Supplemental EIS) on water quality under Alternatives A-D are considered **negligible** beyond 1,000 m (3,281 ft) to **moderate** within 1,000 m (3,281 ft) of the source. The potential impacts from OCS Oil

and Gas Program-related oil spills on water quality under Alternatives A-D are considered **moderate**, even with the implementation of safety requirements and mitigating measures. This is because activities to address oil spills may cause secondary impacts to water quality, such as the introduction of additional hydrocarbons into the dissolved phase through the use of dispersants and the sinking of hydrocarbon residuals from burning. The impacts from a proposed action are a small addition to the cumulative impacts on water quality when compared with inputs from hypoxia, potentially leaking shipwrecks, chemical and weapon dumpsites, natural oil seeps, and natural turbidity. Therefore, the incremental contribution of the routine activities and accidental events associated with a proposed action to the cumulative impacts on water quality is expected to be **negligible** for Alternative A, B, C, or D. Alternative E, the cancellation of a single lease sale, would result in no new activities associated with a lease sale; therefore, the incremental impacts would be **none** because new impacts would be avoided entirely. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E. A full analysis of water quality can be found in Chapter 4.2 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.2 of the 2018 GOM Supplemental EIS.

4.3.3 Incomplete or Unavailable Information

In preparation for this Supplemental EIS, BOEM has reviewed the latest information available relative to the potential impact-producing factors on water quality, which is presented in **Chapter 3**. Much of the information pertaining to water quality impacts from the *Deepwater Horizon* oil spill and response has been discussed in previous NEPA documents, and water quality has recovered from the *Deepwater Horizon* oil spill and response. BOEM has identified incomplete or unavailable information that may be relevant to reasonably foreseeable impacts on water quality. Much of this information relates to non-OCS oil- and gas-related impacts. Specifically, potentially polluting shipwrecks and chemical and weapon disposal areas may cause potential impacts to offshore water quality and the marine environment. There are no publicly available data regarding these potential impacts, in part because no entity has been tasked with this responsibility. It is not foreseen that this information would be publicly available to include in this NEPA analysis regardless of the costs or resources needed to obtain it. BOEM has used the best available scientific information available and believes that any additional information would not likely change the impacts conclusions and is not essential to a reasoned choice among alternatives.

4.3.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

A search of relevant literature and government sources for information pertinent to water quality in the GOM since publication of the 2018 Supplemental EIS resulted in finding updates to the USEPA Region 4 and Region 6 NPDES permits, the updated estimated hypoxic zone in the GOM, and a USEPA assessment of coastal GOM water quality.

The final NPDES General Permit No. GMG290000 for “New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Point Source Category for the Western Portion of the Outer Continental Shelf of the Gulf of Mexico” was reissued by USEPA

Region 6 on September 19, 2017, with an effective date of October 1, 2017, and an expiration date of September 30, 2022. Permittees covered by the previous version of the permit, which expired on September 30, 2017, were automatically covered by the reissued permit starting on October 1, 2017 (USEPA 2017b; 2017d).

The final NPDES General Permit No. GEG460000 for "New and Existing Sources in the Offshore Subcategory of the Oil and Gas Extraction Category for the Eastern Portion of the Outer Continental Shelf of the Gulf of Mexico" was reissued by USEPA Region 4 on December 21, 2017, with an effective date of January 20, 2018. The term of the permit will be no longer than 5 years from the effective date of the permit (USEPA 2017c).

A recent global, deepwater review of environmental impacts from the oil and gas industry, which was written to influence management strategies, noted the global need for more baseline data, monitoring, and geospatial information (Cordes et al. 2016). The review noted how better baseline data would have been helpful after the *Deepwater Horizon* explosion, oil spill, and response. However, the scope of the review did not include detailed information on all of the studies and monitoring efforts that have taken place since the *Deepwater Horizon* explosion, oil spill, and response in the Gulf of Mexico. The study noted general environmental impacts, but it did not include all of the detailed information that BOEM includes in its EISs. Some BOEM mitigation efforts were briefly noted, but the authors focused their discussion on environmental protections from the Bureau of Ocean Energy Management's NTLs and not the more robust requirements laid out in the Code of Federal Regulations and the U.S. Environmental Protection Agency's NPDES permit, which specifically includes limitations, prohibitions, and reporting requirements for discharges and wastes generated from offshore oil and gas facilities. The review also noted some areas where further studies could be relevant. However, since this review was global in nature and did not include all of the latest post-*Deepwater Horizon* information and failed to acknowledge regulatory requirements in the Code of Federal Regulations and the U.S. Environmental Protection Agency's NPDES permit, this review does not change the conclusions of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

The Vessel Incidental Discharge Act was enacted on December 4, 2018, to regulate incidental discharges from commercial vessels. The law authorized the USEPA and the U.S. Coast Guard to develop standards of performance for vessel discharges and to implement, monitor, and enforce regulations. The Vessel Incidental Discharge National Standards of Performance were published in the *Federal Register* on October 26, 2020, with a 30-day public comment period, which closed on November 25, 2020. The final standards and regulations are anticipated to be published in 2022 (USEPA 2020b).

On August 3, 2021, Louisiana State University and the Louisiana Universities Marine Consortium released the 2021 size of the Gulf of Mexico hypoxic zone, or "dead zone," which is an area of low oxygen that persists in Louisiana and Texas coastal waters each summer and that can kill fish and marine life. The 2021 size of 6,334 mi^2 (16,400 km^2) measured July 25-July 31, 2021, was the sixteenth largest measured since dead zone mapping began in 1985 (LSU and LUMCON 2021). As stated on page 3-212 of the 2017-2022 GOM Multisale EIS, the Louisiana-Texas hypoxic zone is

considered to be unrelated to OCS oil- and gas-related activities but is discussed as a potential cumulative effect.

The USEPA's assessments performed over more than two decades have concluded that water quality in a majority of estuaries and coastal environments along the northern Gulf of Mexico coast is highly influenced by human activities. One of the most prevalent causes of degraded water quality in the coastal areas of the Gulf of Mexico is excessive levels of anthropogenic nutrients that create widespread coastal eutrophication. Eutrophication lowers dissolved oxygen concentrations, increases chlorophyll a concentrations, diminishes water clarity, and can lead to toxic/nuisance algal blooms and loss of submerged aquatic vegetation. These assessments consistently have concluded that water quality in the coastal areas of the Gulf of Mexico is fair (USEPA 2021d).

4.3.5 Conclusion

BOEM has reexamined the analysis for water quality presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regard to the updated scenario provided in **Chapter 3** and the new information on water quality since publication of the 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for water quality presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS; therefore, the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.4 COASTAL HABITATS

4.4.1 Estuarine Systems (Wetlands and Seagrasses/Submerged Vegetation)

4.4.1.1 Summary

BOEM has reexamined the analysis for estuarine systems presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapters 4.4.1.4 and 4.4.2.4**. No new information was discovered that would alter the impact conclusions for estuarine systems presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of estuarine systems, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.3.1 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.3.1 of the 2018 GOM Supplemental EIS. **Chapter 4.4.1.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.4.1.2 Analysis of Alternatives A-E Summary

The estuarine system is the transition zone between freshwater and marine environments. It can consist of many habitats, including wetlands and those containing submerged vegetation. The coastline of the WPA, CPA, and EPA is more than 75,639 km (47,000 mi) (NOAA 2008) and comprises more than 750 bays, estuaries, and sub-estuary systems (USEPA 2012). These coastal and estuarine ecosystems provide important nursery grounds and adult habitat for numerous species, including fish, invertebrates, and birds, while seagrass beds provide foraging habitat for sea turtles and manatees (Byrnes et al. 2017). The largest impact-producing factors from routine activities affecting estuarine systems are regular navigation channel maintenance dredging and vessel operation. The impacts may include increased erosion rates, removal of sediments, increased turbidity, and changes in salinity (Erftemeijer and Lewis III 2006; Kenworthy and Fonseca 1996; Onuf 1996). The impacts to these habitats from routine activities associated with a proposed action are expected to be **negligible** to **moderate**. **Minor** impacts would be due to the projected low probability for any new pipeline landfalls (0-1 projected), the minimal contribution to the need for maintenance dredging, and the mitigating measures expected to be used to further reduce or avoid these impacts (e.g., the use of modern techniques such as directional drilling). However, impacts caused by vessel operations related to a proposed action over 50 years would be **moderate** considering the permanent loss of hundreds of acres of wetlands. Accidental oil spills can vary widely in their impacts depending on the volume and type of oil, condition of the oil as it reaches shore, time of year, spill distance, and composition of the plant community affected. However, several of the impacts can include plant die-back, erosion, loss of plant cover, and conversion into mudflats or open water. Spill recovery efforts may cause negative impacts as well. Often, the best course of action is to let the impacted area(s) recover naturally to avoid secondary impacts associated with the cleanup process, such as trampling vegetation, accelerating erosion, and burying oil (Getter et al. 1984; Long and Vandermeulen 1983; Mendelssohn et al. 1993; Michel et al. 2013). Overall, impacts to estuarine habitats from small and large oil spills associated with activities related to a proposed action would be expected to be **minor** because of the distance of most post-lease activities from the coast, the expected weathering and biodegradation of spilled oil over that distance, the projected low probability of large spills near the coast, the resiliency of wetland vegetation, and the available cleanup techniques. Refer to the updated *Gulf of Mexico Catastrophic Spill Event Analysis* technical report for an analysis of impacts from a low-probability catastrophic spill event (BOEM 2021c).

Cumulative impacts to estuarine habitats are caused by a variety of factors, including the OCS oil- and gas-related and non-OCS oil- and gas-related activities outlined in Chapter 4.3 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, and human and natural impacts. Development pressures in the coastal regions of the GOM have been largely the result of tourism and residential beach-side development, and this trend is expected to continue. Storms would continue to impact the coastal habitats and have differing impacts. The incremental contribution of a proposed action to the cumulative impacts on estuarine habitats is expected to be **minor** to **moderate** depending on the selected alternative. Under Alternative E, the cancellation of a single lease sale would result in no new activities associated with a lease sale. There could, however, be some incremental increase in impacts from vessel operations and navigational channel maintenance dredging (i.e., two

impact-producing factors for estuarine systems) caused by a compensatory increase in imported oil and gas to offset reduced OCS production, but it would likely be **negligible**. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative. A full analysis of estuarine habitats can be found in Chapter 4.3.1 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.3.1 of the 2018 GOM Supplemental EIS.

4.4.1.3 Incomplete or Unavailable Information

BOEM has identified incomplete or unavailable information regarding estuarine habitat. There is incomplete information about impacts resulting from routine activities, as the scenario forecast is only an estimate and many global factors can affect OCS oil- and gas-related activity.

There are unknowns regarding the future restoration efforts that are being planned, such as what projects would ultimately be constructed and how successful they may be. In addition, the future rates of relative sea-level rise are not known with certainty, and thus, resulting future impacts to wetlands are unknown beyond predictions based on models and trends. Future rates of coastal development are unknown, as is the extent of impacts to estuarine systems thereof.

BOEM acknowledges that there remains incomplete or unavailable information that may be relevant to reasonably foreseeable significant impacts on estuarine systems. This incomplete or unavailable information includes potential data on the *Deepwater Horizon*, explosion, oil spill, and response that may be forthcoming. As there is substantial information available since the *Deepwater Horizon* explosion, oil spill, and response, which is included in the 2017-2022 GOM Multisale EIS, BOEM believes that the incomplete or unavailable information regarding the effects of the *Deepwater Horizon* explosion, oil spill, and response on estuarine systems would likely not be essential to a reasoned choice among alternatives. Regardless of the costs involved, it is not within BOEM's ability to obtain this information from the NRDA process within the timeline contemplated in the NEPA analysis for this Supplemental EIS. BOEM's subject-matter experts have used what scientifically credible information is available in their analyses and applied it using accepted scientific methodology.

Many studies have been produced that demonstrate the effects of exposure of wetland plants to crude oil, covering a wide range of exposure intensity, longevity, and oil characteristics. Much has been learned about the different survival and recovery rates of various plant species. In addition, studies have been produced regarding the long-term impacts of canal dredging and pipeline installation on wetlands.

4.4.1.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet sources (including the U.S. Department of the Interior, Geological Survey; National Wetlands Research Center; Gulf of Mexico Alliance; NOAA; Journal of Marine Science and Engineering; Marine Pollution Bulletin; and scientific publication databases including Science Direct, Elsevier, and JSTOR) were examined to assess recent information regarding estuarine systems that may be pertinent to a proposed action. BOEM used reasonably accepted

scientific methodologies to extrapolate from existing information in completing this analysis and formulating the conclusions presented here. New information was found for coastal habitats after a search of relevant literature. These new references support the information in the Affected Environment; therefore, the impact conclusions for coastal habitats presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS still apply.

In Barataria Bay, the microbial community in *Deepwater Horizon*-oiled sediments showed decreased diversity and smaller population sizes of sulfate-reducing and denitrifying bacteria (Bae et al. 2018). A study focused on determining the recovery of salt marshes' ecosystem functionality (i.e., denitrification capacity) after exposure to the *Deepwater Horizon* oil spill. Researchers found that certain drivers of ecosystem denitrification capacity either recovered or established a new, stable state after 6 years. Oiling intensity (e.g., light, moderate, or heavy) played a vital role in the long-term recovery of marsh ecosystem services (Tatariw et al. 2018). As of June 2018, 8 years after the *Deepwater Horizon* oil spill, oil-derived organics (alkanes and polycyclic aromatic hydrocarbons [PAHs]) remain about 10 times higher than background concentrations in oiled marsh sediment, suggesting that oil contamination may persist for many more years (Turner and Rabalais 2019). This persistence is partially due to the low oxygen concentrations of marsh soils. These references are relevant for determining the recovery status of coastal habitats after the *Deepwater Horizon* oil spill.

For other ongoing cumulative impacts, a recent study suggests that previous models may have overestimated the resiliency of Louisiana marshes as they relied on short-term (e.g., decades or less) data to inform their findings. Modeling that uses relative sea-level rise rates on a longer term scale (e.g., thousands of years) suggests that coastal marshes in the Mississippi Delta may be less resilient than assumed in recent estimates (Törnqvist et al. 2020). New remote-sensing technology is also being used to study wetland losses and gains in the GOM. Potter (2021) used ground-truthed Landsat satellite imagery to analyze changes in western Barataria Basin, Louisiana's wetlands post-Hurricane Katrina (2005 to 2018). Conversion of wetland-to-water was strongly skewed to areas with historic oil and gas well locations. Western Barataria Basin has experienced a net loss of marshlands post-Katrina, but Potter (2021) found that several restoration efforts projects (e.g., Turtle Bay, Little Lake/Round Lake, and Bayou L'Ours) have substantially offset these losses.

4.4.1.5 Conclusion

BOEM has reexamined the analysis for estuarine systems presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regards to the updated scenario provided in **Chapter 3** and the understanding that no new information on estuarine systems has been discovered since publication of the 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for estuarine systems presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.4.2 Coastal Barrier Beaches and Associated Dunes

4.4.2.1 Summary

BOEM has reexamined the analysis for coastal barrier beaches and associated dunes presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.4.2.4**. No new information was discovered that would alter the impact conclusion for coastal barrier beaches and associated dunes presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of coastal barrier beaches and associated dunes, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action, are presented in Chapter 4.3.2 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.3.2 of the 2018 GOM Supplemental EIS. **Chapter 4.4.2.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.4.2.2 Analysis of Alternatives A-E Summary

The coastal barrier beaches and associated dunes are those beaches and dunes that line the coast of the northern GOM, including both barrier islands and mainland beaches. Barrier islands make up more than two-thirds of the northern GOM shoreline (Morton et al. 2004). These shorelines are usually sandy beaches and are composed of wind-blown sand and other unconsolidated, predominantly coarse sediments. The largest impact-producing factor from routine activities affecting estuarine systems is navigation channel maintenance dredging. This activity removes sediment from the system, contributing to beach erosion. The impacts to coastal barrier beaches and dunes from routine activities associated with a proposed action are expected to be **negligible** to **minor** due to the minimal number of projected onshore pipelines, the minimal contribution to vessel traffic and to the need for maintenance dredging, and the mitigating measures that would be used to further reduce or avoid these impacts. Accidental oil spills and response activities, if they reach shore, can affect beaches and dunes through faunal community shifts, toxic effects, and physical disturbance of response efforts. A coastal oil spill from a nearshore vessel accident or pipeline rupture, and related onshore cleanup activities, would pose a greater threat to coastal beaches. Overall, impacts to coastal barrier beaches and dunes from accidental events associated with OCS oil- and gas-related activities related to a proposed action would be expected to be **minor** because of the distance of most resulting activities from the coast, the expected weathering of spilled oil, the projected low probability of large spills occurring near the coast, and available cleanup techniques. Refer to the updated *Gulf of Mexico Catastrophic Spill Event Analysis* technical report for an analysis of impacts from a low-probability catastrophic spill event (BOEM 2021c).

Cumulative impacts to coastal barrier beaches and dunes are caused by a variety of factors, including the OCS oil- and gas-related and non-OCS oil- and gas-related activities outlined in

Chapter 4.3.2 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS and other human and natural impacts. Cumulative OCS oil- and gas-related sources, such as spills resulting from all past and present leasing activities (including the millions of barrels that entered the GOM from the *Deepwater Horizon* oil spill) are estimated to have had a **major** impact on coastal barrier beaches and dunes. For non-OCS oil- and gas-related sources, development pressures in the coastal regions of the GOM have been largely the result of tourism and residential beach-side development, and this trend is expected to continue. Efforts to stabilize the GOM shoreline through the construction of manmade structures can deprive natural restoration of the barrier beaches (i.e., sediment nourishment and sediment transport), which has adversely impacted coastal beach landscapes. Storms would continue to affect coastal habitats in differing impact levels. These cumulative non-OCS oil and gas-related sources are expected to have **major** impacts on coastal barrier beaches and dunes. The incremental contribution of a proposed action (including reasonably foreseeable oil spills and other accidental events) to the cumulative impacts on coastal barrier beaches and dunes is expected to be **minor** for the action alternatives (i.e., Alternatives A-D). The No Action Alternative (i.e., Alternative E), which is the cancellation of a single lease sale, would result in no new activities associated with a lease sale and, therefore, would have no incremental contribution to the cumulative impacts on coastal barrier beaches and dunes. Cumulative impacts from all current and past sources (including both OCS and non-OCS oil- and gas-related sources) would continue for all alternatives, including Alternative E (i.e., the No Action Alternative). A full analysis of coastal barrier beaches and associated dunes can be found in Chapter 4.3.2 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.3.2 of the 2018 GOM Supplemental EIS.

4.4.2.3 Incomplete or Unavailable Information

BOEM acknowledges that there remains incomplete or unavailable information regarding coastal barrier beaches and associated dunes in the GOM. There is incomplete information about routine impacts, as the scenario forecast is only an estimate and many global factors can affect OCS oil- and gas-related activity. Future rates of coastal development are unknown, as is the extent of such impacts to coastal barrier beaches. There are unknowns regarding future planned restoration efforts, such as what specific projects would ultimately be constructed and their success. In addition, the future rates of relative sea-level rise are not known with certainty (Hausfather 2013), and thus, the resulting impacts to coastal barrier beaches and associated dunes are unknown beyond predictions based on models and trends.

A large body of information regarding impacts of the *Deepwater Horizon* explosion, oil spill, and response on coastal barrier beaches and associated dunes has been developed and continues to be developed through the Natural Resource Damage Assessment (NRDA) process, but information remains incomplete. Though substantial information has become available since the *Deepwater Horizon* explosion, oil spill, and response, which was analyzed in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, BOEM believes that the incomplete or unavailable information regarding the effects of the *Deepwater Horizon* explosion, oil spill, and response on coastal barrier beaches and dunes would likely not be essential to a reasoned choice among alternatives. The incomplete information would not be available within the timeframe contemplated by the NEPA

analysis of this Supplemental EIS. However, much is known about the extent of the oiling of beaches and the continuing degradation of the remaining oil.

BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives. BOEM's subject-matter experts have used what scientifically credible information is available in their analyses and applied it using accepted scientific methodology. Many studies have demonstrated the effects of exposure of beaches to crude oil, covering a wide range of exposure intensity, longevity, and oil characteristics. Much has been learned about the impact of oil-spill cleanups on beaches and the degradation rates of oil over time. In addition, studies have been conducted regarding the long-term impacts of navigation canal dredging on beaches and barrier islands.

4.4.2.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet sources (including the U.S. Department of the Interior, Geological Survey; National Wetlands Research Center; Gulf of Mexico Alliance; NOAA; Louisiana State University; and scientific publication databases including Science Direct, Elsevier, and JSTOR) were examined to assess recent information regarding coastal barrier beaches and associated dunes that may be pertinent to a proposed action. No new information that would add to the analyses or change the conclusions was discovered since publication of the 2018 GOM Supplemental EIS.

The *Deepwater Horizon* oil buried in Florida beach sediments was degraded after 1 year, such that hydrocarbon concentrations were similar to those of reference stations (Huettel et al. 2018). This rapid degradation was attributed to tidal pumping and oil-spill cleanup activities. *Deepwater Horizon* oil in the form of sediment-oil-agglomerates on sandy Florida beaches is slow to degrade and may persist for at least three decades, if not longer (Bociu et al. 2019). These references are relevant for determining the recovery status of coastal habitats after the *Deepwater Horizon* oil spill.

A recent study (Caudle et al. 2019) used the Chiroptera LIDAR and Imaging System to study the shoreline change rates along the southern Texas Gulf Coast from 2000 to 2013. Historical studies suggest that the shoreline in the study area retreated at 86 percent of the monitoring sites, with an average rate of 2.2 m/yr (7.2 ft/yr) between 1937 and 2013. Between 2000 and 2013, the rates decreased to an average 1.1 and 1.3 m/yr (3.6 and 4.3 ft/yr) at Padre Island and Brazos Island, respectively, with 76 percent of the sites retreating. Between 2010 and 2013, 64 percent of the monitoring sites advanced an average distance of 4.9 m (16.1 ft) (Caudle et al. 2019).

4.4.2.5 Conclusion

BOEM has reexamined the analysis for coastal barrier beaches and associated dunes presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regards to the updated scenario provided in **Chapter 3** and the understanding that no new information on coastal barrier beaches and associated dunes was discovered since publication of the 2018 GOM Supplemental EIS. Therefore, no new information was discovered that would alter the impact conclusion for coastal barrier beaches and associated dunes presented in those documents, and the

analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.5 DEEPWATER BENTHIC COMMUNITIES

4.5.1 Summary

BOEM has reexamined the analysis for deepwater benthic communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.5.4**. No new information was discovered that would alter the impact conclusion for deepwater benthic communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of deepwater benthic communities, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.4 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.4 of the 2018 GOM Supplemental EIS. **Chapter 4.5.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.5.2 Analysis of Alternatives A-E Summary

BOEM defines “deepwater benthic communities” as including both chemosynthetic communities (chemosynthetic organisms plus seep-associated fauna) and deepwater coral communities (deepwater coral plus associated fauna). These communities are typically found in water depths of 984 ft (300 m) or deeper throughout the GOM.

The OCS oil- and gas-related impact-producing factors for deepwater benthic communities can be grouped into three main categories: (1) bottom-disturbing activities; (2) drilling-related sediment and waste discharges; and (3) accidental oil spills. These impact-producing factors have the potential to damage individual deepwater habitats and disrupt associated benthic communities if insufficiently distanced or otherwise mitigated. However, impacts from individual routine activities and accidental events are usually temporary, highly localized, and expected to impact only small numbers of organisms and substrates. Moreover, the expected site-specific reviews and the application of mitigations will distance activities from deepwater benthic communities, greatly diminishing the potential effects. Therefore, at the regional scope of this analysis, and assuming adherence to all expected regulations and mitigations, the impact to deepwater benthic communities as a result of the proposed activities are expected to be ***negligible*** for any of the action alternatives. Impacts from accidental events are expected to be **negligible** to **minor** for any of the action alternatives. The expected OCS oil- and gas-related activities from a proposed action would also *contribute incrementally* to the overall OCS oil- and gas-related and non-OCS oil- and gas-related cumulative effects experienced by deepwater benthic communities, but only by a ***negligible*** amount. Under Alternative E, the cancellation of a single lease sale, the potential for impacts would be **none** because

new impacts to deepwater benthic communities related to a cancelled lease sale would be avoided entirely. The overall OCS oil- and gas-related cumulative impacts to deepwater benthic communities are estimated to be **negligible** to **minor**. Non-OCS oil- and gas-related activities such as commercial fishing (currently negligible) and shifting baseline environmental conditions related to climate change (currently negligible but likely to increase over time should current trends continue or worsen) could cause more noticeable impacts on deepwater benthic communities over the next 50 years. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative. A full analysis of deepwater benthic communities can be found in Chapter 4.4 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.4 of the 2018 GOM Supplemental EIS.

4.5.3 Incomplete or Unavailable Information

BOEM identified incomplete or unavailable information related to deepwater benthic communities and potential OCS oil- and gas-related impacts, i.e., the locations of deepwater benthic communities in the GOM, the toxicity of oil and dispersants to deepwater benthic organisms, the long-term effects of OCS oil- and gas-related infrastructure, the long-term effects associated with climate change-related factors, and the ecological effects and interactions between deepwater benthic communities and deepwater fish communities. BOEM will continue to analyze and support the collection of the best available scientific information related to deepwater benthic communities. However, a complete understanding of these communities and all environmental parameters affecting them is not necessary for a reasoned choice among alternatives. BOEM's distancing criteria, as described in NTL 2009-G40, prevent oil and gas infrastructure from being installed in close proximity to sensitive deepwater coral communities, avoiding or minimizing the potential for adverse impacts and the disruption of the important influences that these corals have on adjacent habitat and benthos.

In completing this analysis and in making conclusions, BOEM used the best available science to determine the range of reasonably foreseeable impacts, applying accepted scientific methodologies to both integrate existing information and extrapolate potential outcomes. Therefore, BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.5.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet database sources (including literature from relevant peer-reviewed journals and reports) were examined to assess recent information regarding deepwater benthic communities that may be pertinent to a proposed action. New information was found for deepwater benthic communities after searching relevant literature. Sources searched include Google Advanced Scholar Search and Google Advanced Book Search. The cited references are noteworthy in that they further support the previously described characterization of the affected environment, but they do not change any of the impact conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Girard et al. (2018) documented oil spill-related impacts to deepwater corals and monitored the impacted colonies' recovery. The researchers determined that recovery is slow and dependent upon the extent of initial impacts; there is evidence suggesting more heavily impacted colonies may not recover (Girard et al. 2018).

A microbiome is the complete set of symbiotic microbes, including an organism's DNA. Their taxonomy is identified by their DNA. Three articles on coral microbiomes (Girard et al. 2016; Kellogg 2019; Kellogg et al. 2017) reaffirm and build upon earlier, more speculative research (Al-Dahash and Mahmoud 2013), which had been novel at the time and was specifically mentioned in the 2017-2022 GOM Multisale EIS as a potential mechanism explaining successful association of deepwater corals in close proximity to natural hydrocarbon expulsion/seeps, which implied a potential new understanding of a portion of the baseline affected environment in the GOM. Symbiotic microbes of deepwater corals are an adaptation to proximity of some of the holobionts (which are the combination of host and symbiont) to natural hydrocarbon expulsion/seeps. This provides new understanding of the baseline affected environment in the GOM. BOEM finds this noteworthy, but it does nothing to change the impact analyses as these adaptations only relate to naturally occurring background levels of hydrocarbons and not to higher hydrocarbon levels associated with accidental or catastrophic spills, which was previously discussed in the 2017-2022 GOM Multisale EIS.

A lipid metabolome is the complete set of lipid metabolites (lipids that take part in metabolic chemical reactions) in an organism. Deepwater coral species have distinct lipid metabolomic fingerprints, and at the site, individual, and population scale, they have high lipid metabolomic diversity (Vohsen et al. 2019). This is important to their baseline because it may be an adaptation to natural stressors; it may also protect them from anthropogenic stressors including climate change (Vohsen et al. 2019).

Connectivity is important to deepwater coral species recovery after serious anthropogenic or natural mortality because recovery depends on recruitment by larvae from outside the area of impact. Successful recruitment depends on transportation of sufficient numbers of spawned larvae connecting (by water currents) to downstream settling sites; this is called connectivity. For the Gulf of Mexico deepwater coral *Callogorgia delta*, depth differences between a larval source and its destination on the scale of tens to at most a few hundreds of meters restrict connectivity far more than horizontal separation on a scale of about 250 km (155 mi) (Bracco et al. 2019). This is because currents tend to run somewhat parallel to isobaths rather than perpendicular to them.

Additionally, new research published by Bourque and Demopoulos (2018) suggest that deepwater coral communities influence the benthos in adjacent habitat. Sediment grain size and organic carbon content are important factors in determining the density and structure of infaunal communities. Altered hydrodynamic flow near deepwater coral communities influences the sediment grain size and organic content of the adjacent benthic habitat.

New information was identified that improves our understanding of the spatial distribution and community structure within deepwater canyons in the central Gulf of Mexico. Shantharam et al. (2020)

found that macrofauna abundance and species richness decreased and evenness increased with depth within De Soto Canyon. Cluster analysis identified three depth-related groups that conform to previously established (Pequegnat et al. 1990) bathymetric boundaries: Shelf/Slope-Transition (300-700 m; 984-2,697 ft); the Archibenthal Zone (700-1,650 m; 2,697-5,413 ft); and the Abyssal (>2,000 m; 6,562 ft). Community structure is most related to fluorometry and oxygen saturation, combined with one or more of the following: salinity; particulate organic carbon; sediment organic carbon; and slope. Canyon wall abundances were higher than the canyon axis or adjacent slope, for which the differences may result from the entrainment of seasonal water masses characterized by high salinity, oxygen saturation, fluorometry, and turbidity. Variability in community composition may be due to the influence of hydrocarbon seeps within the canyon.

New research refines our understanding of the spatial distribution of molluscs within the Gulf of Mexico basin. Shantharam and Baco (2020) used the Biodiversity of the Gulf of Mexico database (BioGoMx) to investigate species richness and the trophic diversity of six major classes of benthic molluscs in the Gulf of Mexico. Assemblage distributions were compared among geographic region (NW, NE, SW, and SE) and depth class (inshore, upper shelf, lower shelf, upper slope, lower slope, and abyssal plain) for a total of 24 geographic-depth units. The eastern Gulf of Mexico contains greater species richness than the western Gulf of Mexico. This may be due to the proximity of the eastern Gulf of Mexico to and exchange with the tropical Caribbean and West Indian regions. The northern Gulf of Mexico contained higher species richness than the southern Gulf of Mexico; however, this may be a function of sampling bias. Mollusc richness peaked at the upper shelf (20-60 m; 66-197 ft), with cephalopods and scaphopods peaking on the lower shelf (60-200 m; 197-656 ft), and then decreased. The dominance of carnivores among Gulf of Mexico molluscs (46%) is attributed to the high proportion of gastropod species. Suspension feeders (22%), grazers (14%), herbivores (8%), and parasitic species (5%) followed. The latter were primarily found at abyssal depths (species richness was 19% of the total there). Chemosymbiotic species are prevalent in the Gulf of Mexico due to the occurrence of cold seep habitat.

Zimmerman et al. (2020) conducted a 58-year temporal analysis of deep-sea coral generic diversity using a machine learning model to simulate deep-sea coral occurrences on the deep shelf (50-200 m; 164-656 ft) and slope (210-2,000 m; 689-6,562 ft). Their goal was to develop a historical baseline of deep-sea coral biodiversity in order to characterize benthic community vulnerability to anthropogenic factors. In the northern Gulf of Mexico, there was a statistically significant decrease in deep-sea generic coral biodiversity in simulated data in all ecoregion/depth pairs, but not for observed data. The lowest levels of generic richness were observed for the 2007/2008-2018 time interval compared to the preceding five decades. There was a relatively stable trend in the number of observed genera on the shelf and a decrease in the number of observed genera on the slope. These results indicate that deep-sea coral diversity can decrease rapidly. The authors suggest that this indicates that coral biodiversity may not mitigate deep-sea ecosystem change. The determination of the mechanisms that may be causing these changes was not within the scope of this study but does create a framework for its evaluation.

New information that improves our understanding of the spatial distribution of the effects of the 2010 *Deepwater Horizon* oil spill was identified, but it does not alter previous conclusions. Approximately 2-3 months after the Macondo (*Deepwater Horizon*) well was capped, 227 stations were sampled to collect data on impacts from the spill on benthic communities. Fifty-eight of those stations were analyzed (summarized in Reuscher et al. 2020). Reuscher et al. (2020) analyzed data from an additional 58 of these stations to measure impacts of the spill to infauna communities, doubling the footprint analyzed. The authors concluded that oil and spill-related products spread farther in the northeastern and southwestern directions from the wellhead than previously thought, causing damage to meiofauna and microfauna in an area of ~263 km^2 (102 mi^2). High nematode to copepod ratios confirmed meiofauna community disturbance.

Schwing et al. (2020) reviewed and synthesized research on benthic impacts, recovery, processes, and interactions among communities and organisms, and vulnerability and resilience analysis for size-based benthic groups following the *Deepwater Horizon* oil spill. Findings included evidence supporting the following: microbial communities returned to near baseline conditions within 2 years of the spill; foraminifera assemblages are significantly different post-spill; decreases in evenness (how equal the community is numerically) and increases in abundance of meiofauna consistent with an increase in opportunistic taxa related to *Deepwater Horizon*-induced stressors; and decreases in Shannon diversity (accounts for evenness and abundance) of microfauna. There is also evidence of continuing impacts to the resiliency of local benthic megafauna. In summary, the response and recovery of benthic organisms and communities is spatially and temporally variable, with larger organisms requiring longer to recover.

Bytingsvik et al. (2020) investigated the sensitivity in the deep-sea carbonate coral *Lophelia pertusa* to the dispersant Corexit 9500 and hydrocarbons in 96-hour tests. Corals showed high sensitivity to all contaminants after measuring the LC_{50} (lethal concentration causing 50% mortality) and EC_{50} (effective concentration causing 50% reduction in polyp activity). Shrimp also showed similar sensitivities to these contaminants, indicating that multiple benthic species would potentially be at risk. These results support previously reported findings.

Goode et al. (2020) provided a meta-analysis of current literature on the resilience of benthic communities located on seamounts to trawling disturbance. Deep-sea corals play an integral role in community development within benthic communities. Their findings suggest that the mean total abundance of benthic communities will gradually increase if protected from trawling activities, but this response is not the same across all taxonomic groups. Long-lived species benthic species will have comparatively lower resilience compared to short-lived fauna. Moreover, removal of corals from benthic communities by trawling can provide opportunity for competitor species to grow, impacting other native benthic assemblages. The authors concluded that recovery of benthic communities from trawling disturbance will, on average, be at least several decades. While this study evaluated benthic communities located on seamounts, the conclusions are relevant to coral-dominant, deep-sea benthic communities in general.

4.5.5 Conclusion

BOEM has reexamined the analysis for deepwater benthic communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for deepwater benthic communities, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.6 *SARGASSUM* AND ASSOCIATED COMMUNITIES

4.6.1 Summary

BOEM has reexamined the analysis for *Sargassum* and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.6.4**. No new information was discovered that would alter the impact conclusion for *Sargassum* and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of *Sargassum* and associated communities, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with the proposed action are presented in Chapter 4.5 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.5 of the 2018 GOM Supplemental EIS. **Chapter 4.6.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.6.2 Analysis of Alternatives A-E Summary

Sargassum in the GOM is comprised of *S. natans* and *S. fluitans*, and is characterized by a brushy, highly branched thallus with numerous leaf-like blades and berrylike pneumatocysts. The *Sargassum* cycle is truly expansive, encompassing most of the western Atlantic Ocean and the GOM with the growth, death, and decay of these plant and epiphytic communities, which may play a substantial role in the global carbon cycle. Several impacting factors can affect *Sargassum*, including vessel-related operations, oil and gas drilling discharges, operational discharges, accidental spills, non-OCS oil- and gas-related vessel activity, and coastal water quality. Routine vessel operations and accidental events that occur during drilling or vessel operations and oiling due to an oil spill are the impact-producing factors that could be reasonably expected to impact *Sargassum* populations in the GOM. All these impact-producing factors would result in the death or injury to the *Sargassum* plants or to the organisms that live within or around the plant matrix through either physical contact and breaking up of *Sargassum* mats or through coating and toxicity of oil or chemicals. However, the unique and transient nature of *Sargassum*'s life cycle, and the broad range of the plants and animals that use the plant matrix help to buffer against impacts that may occur at any given location. Impacts to the overall *Sargassum* community are therefore expected to be **negligible** from either routine activities or reasonably foreseeable accidental events for any of the action alternatives. The *incremental contribution* of a proposed action on the population of *Sargassum* would be ***negligible***

when considered in the context of cumulative impacts to the population. Under Alternative E, the cancellation of a single lease sale, the potential for impacts from routine activities and accidental events would be **none** because new impacts to *Sargassum* and associated communities related to a cancelled lease sale would be avoided entirely. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E. Impacts from changing water quality would be much more influential on *Sargassum* than OCS development and would still occur without the presence of OCS oil- and gas-related activities. A full analysis of *Sargassum* and associated communities can be found in Chapter 4.5 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.5 of the 2018 GOM Supplemental EIS.

4.6.3 Incomplete or Unavailable Information

Although much is known about *Sargassum* and its life history, incomplete or unavailable information still remains. This incomplete or unavailable information includes information on the effects of *in situ* oil exposure and the factors influencing the movement patterns of *Sargassum.* BOEM used existing information and reasonably accepted scientific methodologies for extrapolation in completing the analysis above. BOEM has determined that there are few foreseeable significant adverse impacts to the *Sargassum* population associated with a proposed action, using publications such as Brooks et al. (2018) who suggest that *Sargassum* is continually present in the west-central GOM and that it moves in a general west-to-east pattern during the growing season; however, movements at a finer temporal or spatial scale are more difficult to predict. With respect to the effects of oiling from the *Deepwater Horizon* oil spill, Liu et al. (2014) noted that the toxicity or presence of oil across the surface waters of the GOM was variable at any given time, suggesting that it is difficult to predict the effects of *Sargassum* coming into contact with surface oil. Additionally, Lindo-Atichati et al. (2012) suggested that patterns of larval fish in the surface currents in the northern GOM were not consistent spatially or temporally and that they were highly dependent on mesoscale current structures like the Loop Current and associated eddies. Combined, these studies suggest that, as *Sargassum* is passively moved in the surface waters, its presence at any given location or at any given time is difficult to predict, especially as the population grows exponentially during the growing season. Ultimately, the ephemeral and wide-ranging nature across the northern GOM and the reproductive capabilities of *Sargassum* provide a life history that is resilient towards localized or short-term deleterious impacts, such as those expected to be associated with OCS oil- and gas-related routine activities and non-catastrophic oil or synthetic-based fluid spills. Therefore, BOEM has determined that the incomplete information on *Sargassum* is not essential to a reasoned choice among alternatives and that the information used in lieu of the unavailable information is acceptable for this analysis.

4.6.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for *Sargassum* and associated communities after searching relevant literature. Sources searched include Google Scholar, Springer, Elsevier, Cambridge University Pres, Wiley Publishing, and Bio One web databases. Because this new information only

further supports the previously described characterization of the affected environment, this new information does not alter the impact conclusions for *Sargassum* and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Since 2011, the density and areal coverage of *Sargassum* has dramatically increased in the Gulf of Mexico. In 2018, the extent of *Sargassum* created the largest macroalgae bloom ever recorded (Wang et al. 2019). The Great Atlantic *Sargassum* Belt stretches from West Africa to the Gulf of Mexico and may be caused by excess nutrient discharge from the Amazon River and changes in ocean circulation (Oviatt et al. 2019; Wang et al. 2019).

4.6.5 Conclusion

BOEM has reexamined the analysis for *Sargassum* and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 Supplemental EIS with regards to the updated scenario provided in **Chapter 3** and the understanding that new information on *Sargassum* and associated communities has been discovered since publication of the 2018 GOM Supplemental EIS; this information further supports the previously described characterization of the affected environment. Therefore, no new information was discovered that would alter the impact conclusion for *Sargassum* and associated communities presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.7 LIVE BOTTOMS

4.7.1 Topographic Features

4.7.1.1 Summary

BOEM has reexamined the analysis for topographic features and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.7.1.4**. No new information was discovered that would alter the impact conclusion for topographic features and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of topographic features and associated communities, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.6.1 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.6.1 of the 2018 GOM Supplemental EIS. **Chapter 4.7.1.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.7.1.2 Analysis of Alternatives A-E Summary

Topographic features (Chapter 4.6.1 of the 2017-2022 Multisale EIS and 2018 GOM Supplemental EIS) are a subset of GOM live bottom habitats that are large enough to have an especially important ecological role, with specific protections defined in the Topographic Features Stipulation. Within the Gulf of Mexico, BOEM has identified 37 topographic features where some degree of protection from oil and gas development may be warranted based on geography and ecology. These subsea banks provide areas of hard substrate that support benthic and fish communities with relatively high biomass, diversity, and abundance. Many of these habitats remain relatively pristine and have a high aesthetic and scientific value, in part because they represent ecological and/or geographic extremes for many species (Johnston et al. 2015; Nash et al. 2013; Rezak and Bright 1981). Of the possible impact-producing factors considered, it was determined that bottom-disturbing activities associated with drilling, exploration, and vessel operations were the only impact-producing factors associated with routine activities that could reasonably be expected to impact topographic features. Impacts could result through crushing, increased turbidity, or smothering from sediment deposited on the seafloor. The impact-producing factors resulting from accidental events include bottom disturbances associated with the accident or response (e.g., equipment falling to the seafloor, anchoring), as well as the release of sediments and toxins during oil-spill response operations.

Application of the proposed Topographic Features Stipulation under Alternatives A-C, which is a required mitigation as a result of the 2017-2022 National OCS Program's Record of Decision (detailed in **Appendix A** of this Supplemental EIS) and will be applied for GOM Lease Sales 259 and 261, and removing these blocks from leasing under Alternative D would assist in preventing or minimizing potential impacts to topographic feature communities by increasing the distance of OCS oil- and gas-related activities from these features. Compliance with the Topographic Features Stipulation is assumed in this analysis. Application of this stipulation has resulted in **negligible** impacts by a proposed action to topographic features from routine activities and accidental events. The *incremental contribution* of a proposed action to the overall cumulative impacts is expected to be ***negligible*** under Alternatives A-C with adherence to the required Topographic Features Stipulation and ***negligible*** under Alternative D because the Topographic Features Stipulation blocks would not be available for lease. Both the application of the Topographic Features Stipulation and the removal of Topographic Features Stipulation blocks from leasing would minimize impacts to these features by distancing OCS oil- and gas-related, bottom-disturbing activity from them. Under Alternative E, the cancellation of a single lease sale, the potential for new incremental impacts to topographic features is **none** because new impacts would be avoided entirely. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E. Impacts ranging from **negligible** to **moderate** may still be expected from non-OCS oil- and gas-related activities such as fishing, pollution, and climate change; however, the incremental impact of the proposed activities should not result in a meaningful augmentation of the overall expected impacts. A full analysis of topographic features can be found in Chapter 4.6.1 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.6.1 of the 2018 GOM Supplemental EIS.

4.7.1.3 Incomplete or Unavailable Information

BOEM recognizes that there is incomplete or unavailable information related to topographic features and associated communities in general and specifically in relation to routine activities, accidental events, and cumulative impacts. However, the available information is adequate to make a determination with respect to reasonably foreseeable impact-producing factors associated with a proposed action. Since the 1970s, BOEM and its predecessor agencies have supported long-term monitoring of the East and West Flower Garden Banks within the Flower Garden Banks National Marine Sanctuary for any impacts related to OCS oil- and gas-related activities. At the East and West Flower Garden Banks, corals have generally flourished (refer to Johnston et al. 2021, and references therein) even as OCS oil- and gas-related development has occurred, sometimes just outside of the stipulated No Activity Zone. BOEM used existing information and reasonably accepted scientific methodologies to extrapolate from available information in completing this analysis and formulating the conclusions presented here. BOEM has determined that incomplete or unavailable information, as identified above, could not be acquired within the timeframe of this analysis, and the currently available body of evidence supports past analyses and does not indicate that adverse impacts to topographic features would be expected as a result of a proposed action. Therefore, BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.7.1.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for live bottoms (topographic features) after searching relevant literature. Sources searched include Google Scholar, Elsevier, Research Gate, Springer, Wiley Publishing, Royal Society Publishing, and Inter-Research. This new information only updates the description of the affected environment and contributes to BOEM's knowledge of non-OCS oil- and gas-related cumulative impacts. Existing guidance to operators, adherence to BOEM's Topographic Features Stipulation, and distancing of OCS oil- and gas-related activities from the Flower Garden Banks National Marine Sanctuary are sufficient to mitigate potential impacts. Therefore, the new information does not alter the impact conclusions for topographic features presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

On May 1, 2020, the National Oceanic and Atmospheric Administration (NOAA) published a proposed rule to expand the boundaries of the Flower Garden Banks National Marine Sanctuary (FGBNMS) (*Federal Register* 2020b). Pursuant to Executive Order 13795, NOAA requested an analysis from BOEM on the potential OCS oil and gas resources and development impacts of the proposed expansion. The NOAA's significance determination in their Proposed Rule for the Expansion of the FGBNMS stated that the "proposed action would not have a significant negative economic impact on OCS oil and gas development in the Gulf of Mexico." For this consultation, BOEM determined that the proposed FGBNMS expansion could result in a reduction in the Nation's recoverable oil and gas reserves. However, BOEM agreed that these impacts do not appear to rise to the level of "economically significant" as defined in Executive Order 12866 ($100 million per year). BOEM requested that NOAA recognize valid existing rights of the active leases within the proposed expansion areas. A final rule for the proposed FGBNMS was published in the *Federal Register* on

January 19, 2021 (*Federal Register 2021b*). BOEM determined that the expansion would not change the analysis because BOEM already considered impacts to topographic features and live bottoms (which largely overlap with the expanded boundaries) and the mitigating effects of the stipulations. Any OCS oil- and gas-related activities in the boundaries would require a permit or certification from NOAA, and they would be required to distance activities from features in the blocks. Additional language has been added to the Topographic Features Stipulation for this and future lease sales. This language notifies lessees that, should their lease block in the future be included in a national marine sanctuary, their operations may be subject to additional requirements and regulations from the NOAA, and a permit from that agency may be required in certain instances.

Recent research suggests that the East and West Flower Garden Banks could serve as nursery habitat for one or more Mobulid species (Stewart et al. 2018). While additional research would be necessary to confirm whether these banks serve as nursery habitat for mantas, confirmation would not affect BOEM's impact conclusions in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Researchers in Australia investigating potential impacts to corals following a 3D seismic survey concluded that the survey caused no mortality and no discernable physical impacts to exposed corals (Heyward et al. 2018).

In 2016, there was a localized mortality event at the Flower Garden Banks. New research suggests that low oxygen concentrations (Johnston et al. 2019b) or higher water temperatures (Johnston et al. 2019a) were the cause of this bleaching event. Genetic evidence from two endangered coral species (*Orbicella* spp.) at the East Flower Garden Bank indicates that hyposaline surface conditions due to the passage of Hurricane Harvey in 2017 is linked to sublethal stress related to redox state and mitochondrial function in benthic invertebrates (Wright et al. 2019). The overall duration of this stressed state in these corals is unknown but, as hurricanes are a regular occurrence in the GOM, this type of impact is likely both common and temporary.

The introduction of invasive species associated with live bottom habitat have the potential to cause habitat modification to the reef ecosystem. Invasive lionfish (*Pterois volitans*) first arrived in the Gulf of Mexico in 2010 and currently inhabit the coasts of all five Gulf Coast States, as well as artificial and natural reefs. As lionfish grow, fish comprise a greater part of their diet (Dahl and Patterson 2014). Their density, feeding patterns, growth rate, and lack of predators have the potential to significantly affect benthic communities. An ulcerative skin disease impacting lionfish was first observed in late 2017 and 2018 and has resulted in an overall density decline of the species (Harris et al. 2020), which may mitigate their overall effect on benthic communities. The invasive regal demoiselle (*Neopomacentrus cyanomos*) has been recorded on the Flower Garden Banks (Johnston et al. 2020). Potential effects from its spread are currently unknown; however, they are unlikely to have any unusual ecological advantages over native species (Robertson et al. 2016).

The invasive ahermatypic stony coral *Tubastraea coccinea* is found throughout the Gulf of Mexico, often attached to oil and gas platforms. Derouen et al. (2020) developed a species distribution

model for *T. coccinea* to identify determinants of invasion and to predict potential range expansion in the GOM. The model indicates that distribution is correlated with surface variables (i.e., mean pH and mean calcite) and benthic variables (i.e., maximum current velocity, minimum iron, and minimum dissolved oxygen). The model suggests expansion of this species is most likely to occur within the western half of the northern Gulf of Mexico, with the highest occurrences clustered along the Texas and Louisiana coasts between 88° and 97° W. longitude.

This information is helpful for analysis of cumulative effects and the contribution of multiple stressors to these sensitive ecosystems. At this time, reported results are consistent with previous BOEM analyses and do not alter previous conclusions of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.7.1.5 Conclusion

BOEM has reexamined the analysis for topographic features and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the additional information presented above. No new information was discovered that would alter the impact conclusion for topographic features and associated communities presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.7.2 Pinnacles and Low-Relief Features

4.7.2.1 Summary

BOEM has reexamined the analysis for pinnacles and low-relief features and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the additional information presented below. No new information was discovered that would alter the impact conclusion for pinnacles and low-relief features and associated communities presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed in these documents still apply for GOM Lease Sales 259 and 261.

A detailed description of pinnacles and low-relief features and associated communities, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.6.2 of the 2017 2022 GOM Multisale EIS and summarized in Chapter 4.6.2 of the 2018 GOM Supplemental EIS. The following information is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Any new information that has become available since these documents were published is presented below.

4.7.2.2 Analysis of Alternatives A-E Summary

The Pinnacle Trend is an area of high-relief pinnacle features approximately 64 mi x 16 mi (103 km x 26 km) in water depths ranging from approximately 200 to 650 ft (60 to 200 m). This area is in the northeastern portion of the CPA at the outer edge of the Mississippi-Alabama shelf between

the Mississippi River and De Soto Canyon. Outside of the Pinnacle Trend area, low-relief live bottom epibenthic communities occur in isolated locations in shallow waters (<984 ft; 300 m) throughout the GOM, wherever there exists suitable hard substrate and other physical conditions (e.g., depth, turbidity), allowing for community development. Hard bottom habitats occur throughout the GOM. In this analysis, low-relief features are equivalent to any potentially sensitive biological feature (PSBF) that is neither a topographic feature or defined pinnacle that is in less than a 300-m (984-ft) water depth.

The impact-producing factors for pinnacles and low-relief live bottom features and associated communities can be grouped into three main categories: (1) bottom-disturbing activities; (2) drilling-related sediment and waste discharges; and (3) oil spills. These impact-producing factors have the potential to damage individual pinnacle and low-relief feature habitats and disrupt associated benthic communities if insufficiently distanced or otherwise mitigated. Under Alternatives A and B, the Live Bottom (Pinnacle Trend) Stipulation, which is a required mitigation as a result of the 2017-2022 National OCS Program's Record of Decision, will be applied for GOM Lease Sales 259 and 261, along with site-specific reviews of permit applications and associated distancing requirements, would mitigate potential impacts to the communities as a result of both routine activities and accidental events. Under Alternatives C and D, the Live Bottom (Pinnacle Trend) Stipulation blocks would not be leased, either because they are not part of the proposed lease sale area (Alternative C) or because they would be removed from leasing within the lease sale area (Alternative D) and, therefore, OCS oil- and gas-related, bottom-disturbing activities would be distanced from live bottoms in the Pinnacle Trend area, mitigating potential routine activities and accidental events.

However, live bottom communities are found throughout the GOM, not just in the blocks subject to the Topographic Features and Live Bottom (Pinnacle Trend) Stipulations and, therefore, the impacts associated with Alternatives A-D could potentially cause some negative effects to live bottoms on OCS blocks that would not have stipulations applied under Alternatives A and B or be eliminated from leasing under Alternatives C and D. However, BOEM's site-specific seafloor reviews help identify live bottom features and mitigate impacts to them by distancing bottom-disturbing OCS oil- and gas-related activity from these features.

At the broad geographic and temporal scope of this analysis, and assuming adherence to all expected lease stipulations and typically applied regulations and mitigations, routine activities are expected to have short-term localized effects. Although accidental events have the potential to cause severe damage to specific pinnacle and low-relief feature communities, the number and likelihood of such events is expected to be very small. At the regional scope of this analysis, the *incremental contribution* of impacts from reasonably foreseeable routine activities and accidental events to the overall cumulative impacts is expected to be ***negligible*** to ***minor*** because bottom-disturbing activities would be distanced from live bottoms in the Pinnacle Trend area through the application of the Live Bottom (Pinnacle Trend) Stipulation (Alternatives A and B) or not leasing the OCS blocks subject to the Live Bottom (Pinnacle Trend) Stipulation (Alternatives C and D). In addition, OCS oil- and gas-related activities outside of the stipulation blocks would be mitigated through site-specific seafloor reviews and the application of appropriate conditions of approval on post-lease OCS oil- and

gas-related activities. Proposed OCS oil- and gas-related activities would contribute incrementally to the overall OCS and non-OCS oil- and gas-related cumulative impacts experienced by pinnacle and low-relief feature habitats. Under Alternative E, the cancellation of a single lease sale, the potential for impacts to pinnacle and low-relief feature communities are **none** because new impacts would be avoided entirely. Cumulative impacts of current and past activities (OCS and non-OCS oil- and gas-related activities such as fishing, pollution, and climate change), however, would continue to occur under this alternative. The OCS oil- and gas-related cumulative impacts to live bottom communities are estimated to be **negligible** to **minor**. A full analysis of pinnacles and low-relief features can be found in Chapter 4.6.2 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.6.2 of the 2018 GOM Supplemental EIS.

4.7.2.3 Incomplete or Unavailable Information

BOEM recognizes that there is incomplete or unavailable information related to GOM live bottom habitats in general and specifically in relation to routine activities, accidental events, and cumulative impacts for OCS oil- and gas-related activities and cumulative non-OCS oil- and gas-related activities. However, the information available is adequate to make a determination with respect to reasonably foreseeable impact-producing factors associated with a proposed action.

Research in offshore marine systems is logistically complex and requires substantial resources to conduct. The total amount of research on live bottom habitats has therefore been limited, although BOEM and its predecessor agencies have funded numerous studies over the past 40 years. An example of incomplete knowledge is the exact distribution of GOM live bottom habitats. To address this knowledge gap, BOEM requires operators to provide detailed, updated, site-specific survey information about potential live bottom habitats; this information is reviewed by subject-matter experts prior to approval of individual proposed activities, and appropriate protective mitigations are applied where appropriate.

Given the geographic and temporal scope of a proposed action, it is expected that impacts resulting from a particular lease sale would have negligible impacts on the overall status of GOM pinnacle and low-relief feature communities. BOEM will continue to analyze the best available scientific information related to live bottom habitats for indications of potential OCS activity-related impacts and other relevant information. BOEM used reasonably accepted scientific methodologies to extrapolate from existing information in completing this analysis and formulating the conclusions presented here. BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives.

4.7.2.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet sources (including Elsevier, PLoS ONE, Taylor and Francis Online, NOAA's NCCOS Publications Explorer, and Wiley Online Library) were examined to assess recent information regarding pinnacles and low-relief features and associated communities that may be pertinent to a proposed action. No new information that would add to the analyses or change the conclusions was discovered since publication of the 2018 GOM Supplemental EIS.

Recent research suggests that mesophotic coral and sponge ecosystems, in addition to hosting unique assemblages of species found only in these transitional zones (Baldwin et al. 2018; Diaz and Pomponi 2018), may also serve as refuge for reef species more commonly associated with shallower habitats (Vaz et al. 2016). These findings reinforce BOEM's earlier assessments of the Pinnacle Trend's ecological importance, but they do not affect the impact determinations.

4.7.2.5 Conclusion

BOEM has reexamined the analysis for pinnacles and low-relief features presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for pinnacles and low-relief features and associated communities presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.8 Fish and Invertebrate Resources

4.8.1 Summary

BOEM has reexamined the analysis for fish and invertebrate resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.8.4**. No new information was discovered that would alter the impact conclusion for fish and invertebrate resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of fish and invertebrate resources, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with the proposed action are presented in Chapter 4.7 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. **Chapter 4.8.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.7 of the 2018 GOM Supplemental EIS.

4.8.2 Analysis of Alternatives A-E Summary

The distribution of fishes and invertebrates in the GOM varies widely, and species may be associated with different habitats at various life stages, which is discussed in detail in Chapter 4.7.1 of the 2017-2022 GOM Multisale EIS. The impact-producing factors expected to affect these resources are anthropogenic sound, bottom-disturbing activities, habitat modification, and accidental oil spills. The impacts from routine activities, excluding infrastructure emplacement, would be expected to be **negligible** to **minor** due to the resulting short-term, localized effects. The installation of OCS oil- and gas-related infrastructure constitutes a long-term, local habitat modification and is hypothesized to have resulted over the life of the program in **moderate** changes in the distribution of some species. Although this impact is not necessarily adverse and infrastructure is expected to be decommissioned to allow sites to be restored to their natural state, the cumulative impact over the life

of the OCS Oil and Gas Program is spatially and temporally extensive. Accidental spills have been historically low-probability events and are typically small in size. Therefore, the expected impact to fishes and invertebrate resources from accidental oil spills is **negligible**. Commercial and recreational fishing are expected to have the greatest direct effects on fish and invertebrate resources, resulting in impact levels ranging from negligible for most species to potentially moderate for some targeted species (e.g., hogfish *[Lachnolaimus maximus*], gray triggerfish [*Balistes capriscus*], and greater amberjack [*Seriola dumerili*]). As such, the analysis of routine activities and accidental events indicates that the *incremental contribution* from OCS oil- and gas-related activities to the overall cumulative impacts on fish and invertebrate resources as a result of a single lease sale would be ***minor***. Under Alternative E, the cancellation of a single lease sale, the expected impacts on fish and invertebrate resources would be **none** because new impacts would be avoided entirely. However, cumulative impacts of ongoing and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related) would continue to occur under this alternative. A full analysis of fish and invertebrate resources can be found in Chapter 4.7 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.7 of the 2018 GOM Supplemental EIS.

With respect to fish and invertebrate resources, the effects associated with the selection of any of the proposed action alternatives (i.e., Alternatives A-D) would be considered equal because of the diversity and widespread distribution of fish and invertebrate species throughout the potential area of interest. The analyses assume a nonrandom distribution of species (i.e., distribution is associated with habitat preference and habitat availability) and consider impacts to fish and invertebrate resources occurring in a wide range of habitats across all planning areas. While the WPA is a smaller area with less projected activity than is proposed for the CPA/EPA (refer to **Chapter 3**), the distribution of fish and invertebrate species is nonrandom (i.e., species are associated with habitat preferences). However, within the GOM, the distribution of species may generally be considered even throughout their range of habitat within the planning areas. As such, the potential for impacts to populations is independent of the planning area(s) analyzed. Differences in specific populations potentially exposed to impact-producing factors and the potential impacts may be more easily estimated as specific sites and activities become known. Therefore, the analysis of routine OCS oil- and gas-related activities indicates that the expected overall impact to fish and invertebrate resources, depending on the impact-producing factor and the affected species, would range from **negligible** to **moderate** for the period analyzed. For example, muds and cuttings discharged at the surface for a well drilled at a water depth of 5,000 ft (1,524 m) would have a negligible impact on coastal species, such as menhaden, whereas a small spill in coastal waters and subsequent response activities could disrupt a spawning event or temporarily displace coastal fishes from the affected area (minor). Moderate impacts would only be expected if impact-producing factors affected habitat or populations to an extent that would be expected to exceed natural variations in population abundance or distribution but not result in a long-term decline. Under Alternative E, the incremental impacts on fishes and invertebrate resources within the Gulf of Mexico would be **none** because new impacts would be avoided entirely; however, impacts would continue from past and ongoing OCS oil- and gas-related activity.

4.8.3 Incomplete or Unavailable Information

Analyses of routine activities, accidental events, and cumulative impacts drew upon the most recent and best available scientific research to assess the potential effects on many fish and invertebrate species and their habitats. Nonetheless, BOEM identified incomplete or unavailable information related to impacts to fish and invertebrate resources resulting from OCS oil- and gas-related and non-OCS oil- and gas-related activities in the GOM. Anthropogenic sound and habitat modification directly or indirectly affect large areas of the GOM and potentially impact thousands of species. However, the response of individuals, groups of conspecifics (members of the same species), and communities are highly variable and inconsistent. In addition, BOEM recognizes that there is incomplete information with respect to potential long-term effects resulting from exposure to oil from reasonably foreseeable spills. Although additional information on these impact-producing factors may be relevant to the evaluation of impacts to fish and invertebrate resources, BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives. The findings collectively indicate that impacts are likely, but limited, and are not expected to induce a population-level response. BOEM recognizes the potential that populations with spatially limited distributions or increased sensitivity to an impact-producing factor may be more severely impacted than current research suggests. However, sufficient data to conduct a complete assessment of all potentially affected species are not available or obtainable within the timeline contemplated in the NEPA analysis of this Supplemental EIS. BOEM used the best available science to determine the range of reasonably foreseeable impacts and applied accepted scientific methodologies to integrate existing information and extrapolate potential outcomes in completing this analysis and formulating the conclusions presented here.

4.8.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet sources (including PLoS ONE, Taylor and Francis Online, NOAA's NCCOS Publications Explorer, Google Scholar, Elsevier, Research Gate, Springer, Wiley Publishing, Royal Society Publishing, and Inter-Research) were examined to assess recent information regarding fish and invertebrate resources that may be pertinent to a proposed action. New information was found for fish and invertebrate resources, but it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Many fish and invertebrate species have habitat preference shifts linked to critical life history stages. Such shifts affect species distribution and are considered in BOEM's analysis of potential impacts to fish and invertebrate resources. Long-term monitoring programs intended to assess any changes in the distribution and age structure of managed fish species have been in place for decades in the GOM. Results from these monitoring programs inform stock assessments, fisheries management decisions, and numerous studies. Monitoring data collected by the Louisiana Department of Wildlife and Fisheries (Ward et al. 2018) have indicated little support for large-scale species redistributions or reductions in populations that were predicted to occur by Ainsworth et al. (2018), using end-to-end ecosystem modeling.

Powers et al. (2018) characterized the distribution and age composition of red snapper (*Lutjanus campechanus*) on the inner and mid-shelf of the north-central GOM continental shelf (offshore of the Mississippi and Alabama border) and found that this species demonstrates ontogenetic changes in habitat use that differ slightly from similar studies. Age 0- and 1-year-old fish were found primarily in shallow water (~10-40 m; 33-66 ft) over unconsolidated muddy bottom, 2- to 8-year-old fish were predominantly captured at both artificial and natural reefs, and older fish (5-42 years old) were caught away from reef structures over unstructured bottoms in all depth strata (20-100 m; 131-328 ft). The authors also found that red snapper (primarily 2-8 years old) were four times more abundant on artificial reefs than on natural reefs and 27 times more abundant on artificial reefs than on unstructured bottom. Another study used hydroacoustic and video data collected from both standing and toppled platforms and found that red snapper was the dominant species present in both scenarios, with fish communities differing among depth layers, seasonality, and between the structure types (Reynolds et al. 2018).

While the results of the aforementioned studies may raise some concern over the impacts of decommissioning activities (i.e., explosive removals) to GOM red snapper populations due to resulting mortalities, a recent study by Gallaway et al. (2020) indicated that the impacts are relatively minor (1% to 8% of the estimated stock abundance) for red snapper, gray triggerfish (*Balistes capriscus*), vermillion snapper (*Rhomboplites aurorubens*), and cobia (*Rachycentron canadum*) at the current removal rate. In contrast, losses to greater amberjack (*Seriola dumerili*) could potentially represent 45 percent of the known stock. However, the authors speculate that the most recent stock assessment estimates of absolute abundance for greater amberjack in the GOM is inaccurate and needs further examination. In an effort to improve the greater amberjack abundance estimates for both the southeast and GOM regions, Federal funding totaling $9 million was recently awarded to a research team that will conduct an independent study to estimate the absolute abundance of this species, as well as their movements and how they are distributed by habitat, including artificial, natural, and uncharacterized habitats (Schneider 2021). A similar effort known as “The Great Red Snapper Count” was recently conducted in the GOM and results from that assessment revealed that the absolute abundance of the red snapper stock in the GOM was estimated to be significantly higher (118 million) than Federal fisheries officials had previously estimated (36 million) (Stuntz et al. 2021). It is important to note here that Gallaway et al. (2020) used the Gulfwide red snapper stock estimates developed by Federal fisheries managers (i.e., 36 million) versus the updated estimate resulting from the Stuntz et al. (2021) assessment in their impact analysis.

Elliott et al. (2019a) published a review on information gaps in understanding the impacts of seismic surveys on marine vertebrates. These gaps include potential displacement in the water column, physiological impacts, potential impacts of masking on acoustically active fish species, and the potential for habitat avoidance. BOEM concludes that the unavailable information from this study may be relevant to foreseeable significant adverse impacts to fish because the full extent of impacts on fish is not known. However, BOEM has analyzed the issues brought forward in Elliott et al. (2019a) in its *Gulf of Mexico OCS Proposed Geological and Geophysical Activities in the Gulf of Mexico: Western, Central, and Eastern Planning Areas – Final Programmatic Environmental Impact Statement* (BOEM 2017c). In that Programmatic EIS, BOEM determined impacts to fish resources and EFH are

assessed as **negligible** to **minor** for airgun surveys as well as vessel and equipment noise based on the potential to disrupt spawning aggregations or schools of important prey species, the mobile and temporary nature of most surveys, the small area of the seafloor affected during surveys, and the possibility of fishes temporarily moving away from noise that is affecting them.

Research into the effects of chronic exposure to polycyclic aromatic hydrocarbons (PAHs) has identified trends that could indicate potential long-term fitness declines in some populations of demersal fishes (Pulster et al. 2020b; Snyder et al. 2019). The continued presence of PAHs in sediments disturbed and ingested by demersal fishes (e.g., tilefish), periodic resuspension of contaminated sediments by environmental events and anthropogenic activities, and exposure to both natural and anthropogenic periodic contamination unrelated to OCS oil- and gas-related activities (e.g., atmospheric, run-off, and vessels) may be affecting the condition of fishes in areas of increased exposure. Over time, the researchers posit that such effects may result in decreased fecundity or habitat shifts within affected populations.

Comprehensive baselines for petroleum contamination (i.e., biliary PAH concentrations) in GOM fishes were developed by Pulster et al. (2020a) for 2,503 fishes, comprised of 91 species from samples taken over 7 years (2011-2018). The northern GOM had significantly higher biliary PAH concentrations than fish sampled from the West Florida Shelf and the coastal regions of Mexico and Cuba. Yellowfin tuna (*Thunnus albacares*), golden tilefish (*Lopholatilus chamaelonticeps*), and red drum (*Sciaenops ocellatus*) had the highest concentrations of contaminants, whereas concentrations were relatively low for most other species such as snappers and groupers. Although declines in oil contamination for many demersal species were documented in the years following the *Deepwater Horizon* oil spill, recent increases detected in some species suggests the potential for interactions between multiple input sources (e.g., natural and anthropogenic inputs) and the possible resuspension of oil-contaminated sediments.

Continued research has been conducted in deep pelagic habitats of the GOM, which were among the environments most affected by the *Deepwater Horizon* oil. Romero et al. (2020) analyzed the tissue of five midwater oceanic cephalopod species in the northern GOM before the *Deepwater Horizon* oil spill and for two periods after the spill (i.e., 2011 and 2015-2016, respectively). The composition of PAHs shifted to a more petrogenic source (e.g., crude oil) after the spill that then weathered and mixed with other sources in 2015-2016. Concentrations of PAHs in tissue samples were generally lower in 2011 relative to 2010, which the authors attributed to potential post-spill food web effects (e.g., decreases in prey availability and/or dietary quality). In contrast, PAH concentrations increased by 84 percent between 2015 and 2016 in one mesopelagic, nonmigrating species (*H. corona*), possibly due to extended exposure to oil residues persistent at depth and/or the resuspension of contaminated sediments. For the aforementioned studies investigating PAH contamination in GOM fishes and invertebrates, long-term monitoring would be needed to determine the effects beyond the immediate observations.

Recent research by Bolser et al. (2020) on fishes associated with petroleum platforms in the GOM has further elucidated both the environmental and structural drivers (i.e., characteristics of

platforms) of the horizontal (i.e., latitudinal and longitudinal) and vertical (i.e., position in the water column) species-specific distribution patterns. The majority of study species (11 of 17) were not influenced by the predictors used (e.g., distance from shore, number of platforms within 3.1 mi [5 km], salinity, temperature, and dissolved oxygen) and were found to associate with platforms over a wide range of environmental conditions and structural characteristics, suggesting that these variables may not be as important as the simple number of platforms available. However, distance from shore was a significant predictor of horizontal distributions for economically valuable species such as greater amberjack (*Seriola dumerili*) and vermillion snapper (*Rhomboplites aurorubens*), as well as dissolved oxygen levels for red snapper (*Lutjanus campechanus*). Vertical distributions of red snapper on petroleum platforms were significantly influenced by temperature, salinity, dissolved oxygen, and seafloor depth.

A recent study published by Meekan et al. (2021) assessed the impacts of a seismic survey on the assemblages of several commercially targeted demersal fish species (e.g., *Lutjanidae sp*.) using a large-scale experiment off the coast of Western Australia. Results indicated that no short-term (days) or long-term (months) impacts on the composition, abundance, size structure, behavior, and movement were measured a result of exposure. The multiple lines of evidence presented in this study suggest that seismic surveys have little impact on demersal fishes in tropical shelf environments.

At this time, reported results are consistent with previous BOEM analyses and do not alter previous conclusions. Therefore, the new information is not essential to a reasoned choice among alternatives because BOEM has already considered these issues in its determination of impacts to fish and invertebrate resources.

4.8.5 Conclusion

BOEM has reexamined the analysis for fish and invertebrate resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regards to the updated scenario in **Chapter 3** and the understanding that no new information essential to an analysis of fish and invertebrate resources has been discovered since publication of the 2018 GOM Supplemental EIS. Therefore, no new information was discovered that would alter the impact conclusion for fish and invertebrate resources presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.9 BIRDS

4.9.1 Summary

BOEM has reexamined the analysis for birds presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.9.4**. No new information was discovered that would alter the impact conclusion for birds presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261.

A detailed description of birds, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.8 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.8 of the 2018 GOM Supplemental EIS. **Chapter 4.9.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.9.2 Analysis of Alternatives A-E Summary

The affected species of birds include both terrestrial songbirds and many groups of waterbirds. Passerines, or songbirds, represent many of the breeding and wintering birds within the Gulf Coast States. They are only found offshore when migrating across the GOM, and they cannot stop and rest or feed on the water. Some species of seabirds live primarily offshore except when breeding and, therefore, are rarely observed in the nearshore environment. The remaining species are found within coastal and inshore habitats and may be more susceptible to potential deleterious effects resulting from OCS oil- and gas-related activities because their abundance or density overlaps spatially and temporally with these activities, and due to the potential of oil impacting their habitat or food resources.

Routine impacts to coastal, marine, and migratory birds that were considered include routine discharges and wastes, anthropogenic noise from platform severance with explosives and geophysical surveys with airguns, platform presence and lighting, and pipeline landfalls. These impact-producing factors can affect birds through entanglement and ingestion of non-food items, leading to mortality or decreased fitness, barotrauma from noise sources, attraction to and collisions with platforms and nocturnal circulation from platform presence and lighting (Russell 2005), and disturbance of shoreline or wetland habitat from pipeline landfalls. The impacts to birds from routine OCS oil-and gas-related activities are similar wherever they may occur in the GOM and are not expected to affect a substantial number of birds (i.e., population-level effects). Further, no injury to or mortality of a small number of individuals or a small flock would occur. Therefore, impacts are considered **negligible** for discharges, wastes, and noise and **minor** for platform severance, airgun geophysical surveys, and platform presence and lighting.

Accidental events such as oil spills, spill cleanup activities, and emergency air emissions can impact birds. Hydrocarbons may affect birds through inhalation or ingestion while eating oiled prey, preening oiled plumage, or drinking hydrocarbons in water (Leighton 1993). Birds and prey may be killed by toxic oiling (Leighton 1993). Oiled plumage can also be lethal because it causes loss of insulation, ability to fly, and buoyancy, as well as it can be transferred from such plumage to egg shells during incubation and can cause embryo mortality (Leighton 1993). Seabirds may not always experience the greatest impacts from an accidental spill, but it may take longer for populations to recover because of their unique population ecology (demography). Some species of seabirds have larger clutches (e.g., laughing gulls [*Leucophaeus atricilla*] usually have three eggs per clutch except in the tropics) and may recover quite quickly. However, many species of seabirds can have a clutch size of just one egg along with a relatively long life span and an often delayed age of first breeding. Because of the latter case, impacts on seabirds from overall accidental events would be expected to be **moderate**. Impacts from overall accidental events on other waterbirds farther inshore would also

be expected to be **moderate** because of the extensive overlap of their distributions with oiled inshore areas and shorelines expected to be impacted by a large oil spill (≥1,000 bbl). Moderate impacts would affect a substantial abundance of birds but would not be measurable population impacts.

The overall cumulative impacts on birds from OCS oil- and gas-related sources are expected to be **moderate**, and the non-OCS oil- and gas-related anthropogenic events and natural processes are considered **major** because of the anthropogenic impact of non-native infectious diseases. The *incremental contribution* of a proposed action to the overall cumulative impacts to birds in the Gulf of Mexico OCS is considered ***moderate*** for Alternatives A-D because of the potential impacts that could result from a large oil spill (≥1,000 bbl; not a catastrophic event). Alternative E (No Action Alternative) is the cancellation of a single lease sale, therefore, would offer no new lease blocks for exploration and development; therefore, the incremental contribution to the overall cumulative impacts to birds would be **none** because new impacts would be avoided entirely. However, there would be continuing impacts associated with the existing OCS oil- and gas-related activities from past, present, and reasonably foreseeable permitted activities and previous lease sales. A full analysis of birds can be found in Chapter 4.8 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.8 of the 2018 GOM Supplemental EIS.

4.9.3 Incomplete or Unavailable Information

BOEM has identified incomplete or unavailable information related to impacts on birds resulting from OCS oil- and gas-related activities and non-OCS oil- and gas-related activities in the GOM. BOEM's subject-matter experts have used the available scientifically credible evidence presented below and applied accepted scientific methodologies to integrate existing information and extrapolate potential outcomes in completing this analysis and formulating the conclusions presented herein.

Few studies have evaluated the impact of artificial light along the coast on birds, and it is unknown if it is relevant to evaluating whether adverse impacts from the human environment are significant. However, this information is not essential to a reasoned choice of among alternatives. BOEM used available information to fill the data gap. Existing information (Longcore and Rich 2004) shows that outdoor lights at night can have lethal impacts due to collisions and exposure to predators. Sublethal impacts may also occur; nocturnal migrants may become entrapped by lights and birds may avoid otherwise favorable nesting sites in lighted areas (Longcore and Rich, 2004). The impact level of obstruction lighting located on platforms also needs further study. The best available information was obtained from a study by observers on platforms, a model of energy reserves of migratory birds, and several studies of the effect of light on birds. This scientific information, presented in the 2017-2022 GOM Multisale EIS, supports the conclusion that platform lighting, in general, has **minor** impacts.

4.9.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for birds after a search of relevant literature available through various printed and Internet sources (including websites of 5 Federal agencies [i.e., FWS, USEPA, USGS, NOAA, and BOEM]; 5 State agencies [i.e., Texas Parks and Wildlife Department; Louisiana Department of Wildlife and Fisheries; Mississippi Department of Wildlife, Fisheries, and Parks; Alabama Wildlife and Freshwater Fisheries Division; and Florida Fish and Wildlife Conservation Commission]; and 4 nonprofit stakeholders [i.e., National Fish and Wildlife Foundation, Nature Conservancy, Barataria-Terrebonne National Estuary Program, and the National Audubon Society]). Environmental journal articles were also located online using three search engines (i.e., JSTOR, Google Advanced Scholar Search, and Google Advanced Book Search). Resources were examined to assess recent information regarding birds that may be pertinent to a proposed action. The new information expands BOEM's knowledge base with regards to sublethal impacts to birds and describes lethal impacts to a very small number of birds. Information was found on the positive and negative influences of many waterbird species in the proposed action area located on the coast. No population-level impacts were described; therefore, it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

A BOEM-funded study found that brown pelicans breeding in the eastern GOM (the Florida panhandle) experienced lower year-round exposure to surface pollutants, while central (Alabama, Mississippi, and Louisiana) and western (Texas) breeders had similar year-round exposure rates (Lamb 2016). Oil and gas platforms and pipelines, along with shipping traffic and port locations, are the majority of sources of acute and chronic pollution in the GOM (Lamb 2016). Lamb et al. (2019) used GPS tracking devices to characterize the year-round habitat preferences of the eastern subspecies *P.o. carolinensis* of brown pelicans, which breeds in the northern GOM across all three of BOEM's planning areas. Their habitat preferences suggest that highly productive, low-salinity habitats (i.e., estuaries) are crucial during energy-intensive periods (e.g., chick-rearing and molting). The data also found a distinct separation between brown pelican breeders from EPA-located colonies and those in the CPA and WPA. The EPA breeders only shared 15 percent of their total year-round habitat area, while breeders from the CPA and WPA overlapped habitat usage 30-40 percent. The only area in which breeders from all three planning areas overlapped was in the Mississippi River Delta region. Further investigation is suggested by the researchers to understand this separation.

Lamb et al. (2020) conducted the BOEM-funded effort to explore the ecological drivers of brown pelican (*Pelecanus occidentalis*) movement patterns, health, and reproductive success in the GOM. Some of the key conclusions from this report found that the proximity of a breeding colony to a localized stress event (e.g., oil spill) should not be the only consideration when assessing the probability of an individual encountering the event. This is in part due to the spatial and temporal overlap of different breeding colonies. Further, the reproductive success of brown pelicans in the northern GOM was found to be strongly linked to the individual's ability to locate and forage on abundant, small, schooling fish as well as maintaining a high rate of meal provisioning. The report identified three areas suggested for future research regarding brown pelican diet: the frequency,

timing, and location of interactions with commercial fisheries; pelican diets during migration and wintering periods; and the effect of natural and anthropogenic stressors on prey availability or quality. Lamb et al. (2020) also assessed the risk exposure faced by brown pelicans in the northern GOM and found their PAH profile to be diverse and comprised of mostly alkylated PAHs, suggesting petrogenic sources (e.g., crude oil). Finally, corticosterone (i.e., CORT) concentrations in brown pelican feathers can be used as a predictor for many ecological and biological parameters (e.g., nutritional stress and survival of chicks to fledging stage).

Coastal breeding waterbird species, such as those in the northern GOM, especially encounter negative anthropogenic effects (e.g., coastal land loss, sea-level rise, and oil spills). Sea-level rise washes away beach-nesting birds' habitat, subsidence and sea-level rise alter and/or remove marsh nesters' habitat, and island habitat is declining from erosion. Hurricanes that are destructive to birds also occur, especially on the coast. Besides this, waterbird species that are completely or primarily restricted to coastal areas have nearly linear ranges that naturally limit their population sizes (Remsen et al. 2019). Among the Gulf Coast States' and the world's coasts, the Mississippi River has historically built Louisiana's coastal wetlands (especially marshes), thus causing singularly high coastal wetland bird population sizes. The Louisiana Wildlife Action Plan lists the seaside sparrow as "apparently secure" and the clapper rail as "demonstrably secure." They are the only marsh-breeding species listed as a national FWS species of conservation concern in concordance with the Louisiana Wildlife Action Plan (Remsen et al. 2019).

Several studies have been published on the impacts of oil on birds. Short-term exposure of seabirds to oil resulted in a large number of observed clinical symptoms (endpoints), such as organ weight changes, gross organ lesions, biochemical changes, histopathology (tissue disorders), oxidative stress (including hemolytic anemia), heart change (including echocardiograms), and blood smear (blood cell count). Impacts, however, were mostly sublethal (Alexander et al. 2017; Dean et al. 2017; Harr et al. 2017a, 2017b, 2017c; Horak et al. 2017; Pritsos et al. 2017). Birds exposed to small amounts of oil were shown to fly poorly in wind tunnel experiments (Maggini et al. 2017b), when homing (Perez et al. 2017a), and during repeated 161-km (100-mi) experimental flights (Perez et al. 2017b). The experimental results simulated those encountered during long-distance migration. Metabolites are (usually small) molecules that are intermediates in metabolic pathways, producing products as endpoints. Investigation of such pathways by chemical analysis showed that many metabolites were remarkably altered in seabirds' blood plasma and livers after repeated sublethal exposure to external oil (Dorr et al. 2019). A total of nine metabolites were affected in blood plasma and eight were altered in the liver. Amino acid, energy, and fatty acid metabolic pathways were impacted in oiled seabirds. Several of the metabolites were part of the complex one-carbon cycle. The cycle may provide a feed-forward pathway in which a substance activates genes that code for enzymes that make more of the substance (Dorr et al. 2019). In other words, the cycle may cause epigenetic changes.

4.9.5 Conclusion

BOEM has reexamined the analysis for birds presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS regarding the updated scenario provided in **Chapter 3** and based on the new information presented in **Chapter 4.9.5**. No new information was discovered that would alter the impact conclusion for birds presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.10 PROTECTED SPECIES

4.10.1 Marine Mammals

4.10.1.1 Summary

BOEM has reexamined the analysis for marine mammals presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.10.1.4**. No new information was discovered that would alter the impact conclusion for marine mammals presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of marine mammals, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.9.1 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.9.1 of the 2018 GOM Supplemental EIS. **Chapter 4.10.1.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.10.1.2 Analysis of Alternatives A-E Summary

The Gulf of Mexico marine mammal community is diverse and distributed randomly throughout the GOM, with the greatest abundances and diversity of species inhabiting oceanic and OCS waters. Twenty-one species of cetaceans and one species of sirenian regularly occur in the GOM (Davis et al. 2000; Jefferson et al. 1992) and are identified in NMFS' Gulf of Mexico Stock Assessment Reports (Hayes et al. 2018; 2019; 2020). The GOM's Cetacea include the suborders Mysticeti (i.e., baleen whales) and Odontoceti (i.e., toothed whales), and the order Sirenia, which includes the West Indian manatee (*Trichechus manatus*). While all marine mammals are protected under the Marine Mammal Protection Act, only the sperm whale (*Physeter microcephalus*) and Rice's whale[3] (*Balaenoptera ricei*) are listed as endangered, and the West Indian manatee is listed as threatened under the Endangered

[3] On August 23, 2021, NMFS published a direct final rule in the *Federal Register* (86 FR 47022): "Endangered and Threatened Wildlife and Plants; Technical Corrections for the Bryde's Whale (Gulf of Mexico Subspecies)." The NMFS revises the common name to Rice's whale, the scientific name to *Balaenoptera ricei*, and the description of the listed entity to entire species. The changes to the taxonomic classification and nomenclature do not affect the species' listing status under the ESA or any protections and requirements arising from its listing. This rule became effective on October 22, 2021.

Species Act, as described in detail in the 2017-2022 GOM Multisale EIS. The Final Rule (84 FR 15446) to list the GOM Bryde's whale (newly named Rice's whale) as endangered was issued and became effective on May 15, 2019 (*Federal Register* 2019b). The impact-producing factors affecting marine mammals in the GOM as a result of past, present, and reasonably foreseeable OCS oil- and gas-related activities are decommissioning activities, operational discharges, G&G activities, noise, transportation, marine debris, and accidental oil spills and spill-response activities. Accidental events involving large spills, particularly those continuing to flow fresh hydrocarbons into oceanic and/or outer shelf waters for extended periods (i.e., days, weeks, or months), pose a chance of impacting marine mammal populations inhabiting GOM waters. While accidental events cannot be predicted and have the potential to impact marine mammal species, the size and number of such non-catastrophic events is expected to be very small based on OSRA modeling. Further, catastrophic oil spills are not reasonably foreseeable, and most of the OSRA modeled oil spills are of a size and number that population-level impacts are unlikely. Refer to the updated *Gulf of Mexico Catastrophic Spill Event Analysis* technical report for an analysis of impacts from a low-probability catastrophic spill event (BOEM 2021c).

Proposed OCS oil- and gas-related activities would also contribute incrementally to the overall OCS oil- and gas-related and non-OCS oil- and gas-related cumulative effects experienced by marine mammal populations. At the regional, population-level scope of this analysis, impacts from reasonably foreseeable routine activities and accidental events could be **negligible** to **moderate** for Alternatives A, B, C, or D. However, the incremental contribution of a proposed action to cumulative impacts to marine mammal populations, depending upon the affected species and their respective population stock estimate, even when taking into consideration potential impacts (*Deepwater Horizon* explosion, oil spill, and response; non-OCS oil- and gas-related activities; and the minimization of the OCS oil- and gas-related impacts through lease stipulations and regulations), is expected to be **negligible**. Under Alternative E, cancellation of a single lease sale, the impacts on marine mammals in the Gulf of Mexico would be **none** because new impacts would be avoided entirely. However, cumulative impacts from previous lease sales and non-OCS oil- and gas-related activities would remain. A full analysis of marine mammals can be found in Chapter 4.9.1 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.9.1 of the 2018 GOM Supplemental EIS.

4.10.1.3 Incomplete or Unavailable Information

BOEM has identified incomplete information regarding impacts of the *Deepwater Horizon* explosion, oil spill, and response on marine mammals in the GOM. This incomplete information may be relevant to the evaluation of adverse impacts because it could provide changes in the baseline environmental conditions for marine mammals in the affected environment from the *Deepwater Horizon* oil spill and response, exacerbating any impacts from a proposed action. In NEPA, the term "baseline" usually consists of the pre-project environmental conditions. For the purpose of this Supplemental EIS, the baseline is the condition of resources in the vicinity of the project as they exist at the time this environmental analysis began. The injuries assessed within the *Deepwater Horizon Oil Spill: Programmatic Damage Assessment and Restoration Plan and Final Programmatic*

Environmental Impact Statement do not necessarily equate to the current baseline as defined in NEPA (Deepwater Horizon Natural Resource Damage Assessment Trustees 2016). Quantification of a new baseline has several difficulties, including the lack of pre-spill data, the interpretation of post-spill data, and other potential parameters that may have contributed to the quantification of the new baseline. The difference between the state of the resources in an earlier injury assessment and in a current baseline assessment equals any recovery that may have occurred. In addition, the injury assessment reviews a worst-case impact scenario while a baseline assessment determines a reasonable understanding of the current state of the resource.

On December 13, 2010, NMFS declared an unusual mortality event (UME) for cetaceans (whales and dolphins) in the Gulf of Mexico; it was later closed in May 2016. Evidence of the UME was first noted by NMFS as early as February 2010, before the *Deepwater Horizon* explosion, oil spill, and response. The UME investigation and the Deepwater Horizon Natural Resource Damage Assessment (NRDA) process determined that the *Deepwater Horizon* explosion, oil spill, and response resulted in the death of marine mammals and is the most likely explanation of the persistent, elevated stranding numbers in the northern Gulf of Mexico after the spill. Data have supported that the adrenal and lung disease observed in dolphins was most likely due to exposure to petroleum products from the spill. This has resulted in both dolphin mortalities and fetal loss. Research, while ongoing, suggests that the effect on these populations has not ended, with evidence of failed pregnancies found in 2015 (NMFS 2019a).

Temporal and spatial boundaries of this UME are being redefined but are currently based in March 2010-July 2014. Studies published from the NRDA process evaluating the possible impacts of the *Deepwater Horizon* explosion, oil spill, and response on bottlenose dolphins exposed to oiling have shown overall poor health and prevalence of poor body condition, disease, and abnormalities as compared with bottlenose dolphins in the Gulf of Mexico that were not exposed to oiling (Schwacke et al. 2014; Venn-Watson et al. 2015). Bacterial pneumonia was also identified from dolphins before and during the UME, but it was detected more in the UME dolphins (Venn-Watson et al. 2015). While this information may ultimately be useful in expanding the available knowledge on baseline environmental conditions following the *Deepwater Horizon* explosion, oil spill, and response, it remains difficult to draw specific conclusions regarding the current overall bottlenose dolphin population in the GOM.

Even with publications such as the Venn-Watson et al. (2015) marine mammal study, the best available information on impacts to GOM marine resources does not yet provide a complete understanding of the population impacts of the oil spill and active response/cleanup activities from the *Deepwater Horizon* explosion and oil spill on marine resources as a whole in the GOM. Relevant data on the status of marine mammal populations after the UME and *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. For example, even 20 years after the *Exxon Valdez* spill, the long-term impacts to marine mammal populations remained unknown (Matkin et al. 2008) and investigations continue. Therefore, it is not

possible for BOEM to obtain this information within the timeframe contemplated for the NEPA analysis in this Supplemental EIS, regardless of the cost or resources needed.

Unavailable information provides challenges in understanding the baseline conditions and changes within marine mammal populations. The impacts of tropical storms and hurricanes in the GOM have never been determined, and the impacts remain difficult to quantify. The impacts associated with the *Deepwater Horizon* explosion, oil spill, and response make an understanding of the cumulative impacts less defined. BOEM used existing information and accepted scientific methodologies to extrapolate from publicly available information on marine mammals in completing the relevant analysis of marine mammal populations. There are existing leases in the GOM with ongoing or the potential for exploration, drilling, and production activities. In addition, non-OCS oil- and gas-related activities would continue to occur in the GOM irrespective of a proposed action (e.g., fishing, military activities, and scientific research). Therefore, BOEM concludes that the unavailable information from these events may be relevant to foreseeable significant adverse impacts to marine mammals because the full extent of impacts on marine mammals is not known. However, BOEM has determined that the information is not essential to a reasoned choice among alternatives for this Supplemental EIS (including the No Action and Action Alternatives) because none of the sources reveal reasonably foreseeable significant adverse impacts to marine mammals that were not otherwise considered in this Supplemental EIS.

4.10.1.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for marine mammals after searching through relevant sources. Because the new information provides support for or was already considered in the previous BOEM analyses, it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. BOEM will continue the persistent review of best available science, as well as consultations with NMFS and FWS, to keep informed on new data regarding marine mammals. On March 13, 2020, NMFS published their Biological Opinion for oil and gas lease sales; for more information, refer to the Endangered Species Act in **Chapter 5**. An Incidental Take Regulation (ITR) on Geophysical Surveys Related to Oil and Gas Activities in the Gulf of Mexico was published in the *Federal Register* (2021c) on January 19, 2021, with a 90-day implementation period, or an effective date of April 19, 2021, and ending April 19, 2026. For more information, refer to the Endangered Species Act in **Chapter 5**.

More information assessing the impacts of the *Deepwater Horizon* explosion, oil spill, and response to marine mammals has become available since publication of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Findings from multiple studies analyzing the Barataria Bay and Mississippi Sound bottlenose dolphin (*Tursiops truncatus*) populations, in addition to other marine mammal populations, further support that the *Deepwater Horizon* explosion, oil spill, and response contributed to the adverse health effects described in the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Deepwater Horizon Natural Resource Damage Assessment Trustees 2016), including impaired stress responses, high prevalence of lung and adrenal lesions,

persistent lung and pulmonary disease, and reproductive failure; though other factors specific to this area certainly continuously and historically contribute to these stresses (Frasier et al. 2020; Morano et al. 2020; Schwacke et al. 2017; Smith et al. 2017; Takeshita et al. 2017). Takeshita et al. (2017) stated that "while many of these studies have now been published…a true understanding of the long-term effects of DWH oil contamination (and the associated response activities) on northern GOM marine mammals will require sustained investigation and monitoring." Review of the new information expands on but supports the conclusions found in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

There is incomplete or unavailable information related to the long-term effect of the *Deepwater Horizon* explosion, oil spill, and response. Relevant data on the status of marine mammal populations after UMEs and the *Deepwater Horizon* explosion, oil spill, and response may take years to acquire and analyze, and impacts from the *Deepwater Horizon* explosion, oil spill, and response may be difficult or impossible to discern from other factors. Therefore, it is not possible for BOEM to obtain this information within the timeframe contemplated for analysis in this NEPA analysis, regardless of the cost or resources needed.

Two GOM marine mammal species have had reclassifications under the Endangered Species Act. The status of the Florida sub-species of the West Indian manatee was reclassified from "endangered" to "threatened" in 2017 (*Federal Register* 2017). On April 15, 2019, NMFS published the final rule to list the GOM Bryde's whale (*Balaenoptera edeni*), now named the Rice's whale (*Balaenoptera ricei*), as endangered, and it became effective on May 15, 2019 (*Federal Register* 2019b). These status changes were included in BOEM's previous NEPA analysis since both were anticipated and considered.

Recent evidence shows that the population of Bryde's whales in the northern GOM is actually a new species of baleen whale, Rice's whale (*Balaenoptera ricei*) (*Federal Register* 2021d; Rosel et al. 2021). A new, evolutionarily divergent lineage of baleen whale, Rice's whale, was identified based on genetic data and found to be restricted primarily to the northern GOM. Based on vessel and aerial survey sightings, the primary core habitat of Rice's whale is in the northeastern GOM, centered in De Soto Canyon in water depths between 150 and 410 m (492 and 1,345 ft) (Rosel et al. 2021).

Historically, there has been much debate on whether marine mammals can suffer from a form of decompression sickness caused by *in vivo* (in the natural body) nitrogen gas-bubble expansion. However, recent pathological findings of two Risso's dolphins (*Grampus griseus*) suggest that, while rare, it is possible as a result of rapid ascent to the surface while struggling with prey during hunting (Fernández et al. 2017). Although more investigation is needed, this study brings to question how exposure to stressful situations, whether from natural or anthropogenic sources, may affect the diving behavior of marine mammals, including rapid ascents that may ultimately lead to death. More information is needed to further understand this subject and will require sustained investigation and monitoring. Review of this information does not change the conclusions found in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Potential changes in diving behavior as a result of

the routine activities are expected to be short-term and temporary. Thus, none of the routine activities are likely to cause such diving sickness.

There is incomplete and unavailable information related to decompression sickness in marine mammals. Conditions such as this were analyzed in the *Gulf of Mexico OCS Proposed Geological and Geophysical Activities in the Gulf of Mexico: Western, Central, and Eastern Planning Areas; Final Programmatic Environmental Impact Statement* (BOEM 2017c), and the rarity of the condition described in the literature does not make this new information essential to a reasoned choice among alternatives.

A study by Garrison et al. (2018) found strong associations between mesoscale physical features, sperm whales (*Physeter macrocephalus*), and their prey in the GOM. Squid biomass was found to be highest at intermediate depths, particularly between 600 and 700 m (1,989 and 2,297 ft), that correspond to primary sperm whale feeding depths. Sperm whale sightings occurred in two distinct habitats. First, there were consistent sightings along the 1,000-m (3,281-ft) isobath in regions of weakly positive sea-surface height. These occurred from the Mississippi Canyon region into the western GOM. Second, there were strong concentrations of sperm whales in deeper waters of the central GOM, primarily associated with the low sea-surface height anomaly and along the boundary with the Loop Current.

A report by Barkaszi and Kelly (2019) contained a compilation and analysis of visual and acoustic protected species (i.e., marine mammal and sea turtle) observation data collected during seismic operations in the GOM from 2009 to 2015. For whales and dolphins, there is evidence that the closest points of approach to airgun arrays are significantly farther during full power operations than during silence, indicating that there may be some avoidance response to the full power operations. Sighting durations for whales showed significantly shorter durations during silence than during minimum source or full power. Further, longer sighting durations corresponded to increased surface times and less dive behaviors.

There was an UME for bottlenose dolphins due to elevated strandings in the northern GOM that lasted from February 1 to November 30, 2019 (NMFS 2020b). This UME, which has closed, was found to be environmentally driven by exposure to low salinity waters resulting from extreme freshwater discharge from watersheds that drain into the GOM (NMFS 2020b). Since July 2018, there is an UME for bottlenose dolphins in southwest Florida which is non-active, with closure pending (NMFS 2020a). Partial or full necropsy examinations on dolphins had positive results for the red tide toxin (brevetoxin), indicating that this UME is tied to a harmful algal bloom. Additional sampling, testing, and coordination are underway.

The NMFS has released updated marine mammal Stock Assessment Reports, which could change the exposure numbers and the estimation of impacts to various stocks (Hayes et al. 2018; 2019; 2020). However, based on the conservative assumptions built into the initial impact calculations for the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, and without identification or observation of significant increases in the densities (or other factors), the variation of the densities and

other similar factors can be assumed to change the numerical impact calculations, but they should still be reasonably accurate and representative given the conservative nature of the marine mammal exposure modeling.

Southall et al. (2019) published updated marine mammal noise exposure criteria, including scientific recommendations for hearing impacts. Elliott et al. (2019a) published a review on information gaps in understanding the impacts of seismic surveys on marine vertebrates. These gaps include marine mammal response to potential masking by seismic surveys, the extent and duration of avoidance behavior, and physiological impacts. BOEM concludes that the unavailable information from this study may be relevant to foreseeable significant adverse impacts to marine mammals because the full extent of impacts on marine mammals is not known. However, BOEM has analyzed the issues brought forward in Elliott et al. (2019a) in its *Gulf of Mexico OCS Proposed Geological and Geophysical Activities in the Gulf of Mexico: Western, Central, and Eastern Planning Areas; Final Programmatic Environmental Impact Statement* (BOEM 2017c). In that Programmatic EIS, BOEM determined

> Impacts to marine mammals from all IPFs associated with deep-penetration seismic airgun surveys may result in extensive (i.e., affecting large numbers of individuals) short-term but not severe impacts with possible, albeit limited, physical injury or possible mortality (resulting only from vessel collisions). … However, when impacts from deep penetration seismic airgun surveys to all marine mammals within the AOI during the 10-year timeframe of this Programmatic EIS are considered for the impact level determination, the overall impact level [ranges from minor to moderate]. Duarte et al. (2021) examined changing ocean soundscapes due to anthropogenic activities and climate change, and their potential effects on marine species. Evidence indicates that anthropogenic noise can affect the behavior and physiology of marine species, depending on several factors such as acoustics, behavioral context, and the physical environment. Overall], the new information found is not essential to a reasoned choice among alternatives because BOEM has already considered these issues in its determination of impacts to Marine Mammals.

4.10.1.5 Conclusion

BOEM has reexamined the analysis for marine mammals presented in the 2017-2022 GOM Multisale EIS and 2018 Supplemental EIS with regard to the additional information presented above. No new information was discovered that would alter the impact conclusion for marine mammals presented in those documents, and the analysis and potential impacts detailed in 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261. At the regional, population-level scope of this analysis, impacts from reasonably foreseeable routine activities and accidental events could be **negligible** to **moderate** for all action alternatives.

4.10.2 Sea Turtles

4.10.2.1 Summary

BOEM has reexamined the analysis for sea turtles presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.9.2.5**. No new information was discovered that would alter the impact conclusion for sea turtles presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of sea turtles, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.9.2 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.9.2 of the 2018 GOM Supplemental EIS. **Chapter 4.9.2.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.10.2.2 Analysis of Alternatives A-E Summary

Five ESA-listed sea turtle species are present throughout the northern GOM year-round: Northwest Atlantic Ocean DPS loggerhead (*Caretta caretta*); Kemp's ridley (*Lepidochelys kempii*); North Atlantic DPS green (*Chelonia mydas*); Northwest Atlantic DPS (proposed) leatherback (*Dermochelys coriacea*); and hawksbill (*Eretmochelys imbricata*). However, only Kemp's ridley and loggerhead sea turtles commonly nest on beaches in the GOM during the nesting season. All five species are highly migratory with individuals migrating into nearshore waters as well as other areas of the GOM, North Atlantic Ocean, and the Caribbean Sea. Historically, intense harvesting of eggs, loss of suitable nesting beaches, and fishery-related mortality led to rapid declines of sea turtle populations.

Anthropogenic impacts continue to pose the greatest threat to sea turtles. Sea turtle critical habitat and nesting sea turtles are threatened with climate change, natural disasters, beach erosion, armoring, nourishment, artificial lighting, beach driving and cleaning, increased human presence, human response to disasters, coastal development, recreational beach use including equipment and furniture, exotic dune and beach vegetation, natural habitat obstructions, military testing and training activities, poaching, and nest predation.

Due to the expected implementation of mitigations (e.g., the NMFS 2020 GOM BiOp and 2021 Amended ITS Appendices and conditions of approval on post- and/or prelease activities), routine activities (e.g., noise or transportation), and accidental events (e.g., oil spills) related to a proposed action are not expected to have long-term adverse effects on the population size or productivity of any sea turtle species or populations in the northern GOM. Lethal effects could occur from chance collisions with OCS oil- and gas-related service vessels or ingestion of accidentally released plastic materials from OCS oil- and gas-related vessels and facilities. However, as part of the protected species stipulation, the NMFS 2020 GOM BiOp and 2021 Amended ITS Appendix C ("Vessel Strike

Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols") and NMFS 2020 GOM BiOp Appendix B ("Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols") are commonly applied. Most routine activities and accidental events as a result of a proposed action are therefore expected to have **negligible** to **moderate** impacts. For example, a minor impact might be a behavioral change in response to noise while a moderate impact might be a spill contacting an individual and causing injury or mortality (not anticipated and unlawful for this proposed action).

The effects associated with Alternative A, B, C, or D would be equivalent because of the diversity and distribution of sea turtles throughout the GOM. The analyses in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS assumed a wide distribution of species and considered impacts to sea turtles occurring in a wide range of habitats across all planning areas. While a WPA lease sale (Alternative C) would be in a smaller area with less projected activity than a regionwide (Alternative A) or CPA/EPA lease sale (Alternative B) as described in **Chapter 2**, sea turtles are distributed throughout the GOM planning areas. As such, activities isolated to specific areas pose similar potential impacts to populations as do activities occurring in all planning areas. Therefore, because of the free-swimming ability and wide distribution of species across the GOM, the level of impacts would be the same for Alternatives A-D. However, Alternative E would avoid impacts from a lease sale and the related post-lease activities because the single lease sale would not be held; only impacts from past lease sales and associated post-lease activities would continue. Thus, under Alternative E, the impacts on sea turtles from the cancellation of a single lease sale within the Gulf of Mexico would be **none** because new impacts would be avoided entirely. However, cumulative impacts from previous lease sales and non-OCS oil- and gas-related activities would remain. The incremental contribution of a proposed action to the cumulative impacts on sea turtles would be expected to be **negligible**. Population-level impacts are not anticipated.

A full analysis of sea turtles can be found in Chapter 4.9.2 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.9.2 of the 2018 GOM Supplemental EIS.

4.10.2.3 Incomplete or Unavailable Information

Unavailable information provides challenges in understanding the baseline conditions and changes within sea turtle populations. The impacts associated with the *Deepwater Horizon* explosion, oil spill, and response makes an understanding of the cumulative impacts less defined but overall changes the baseline as in conceivably less numbers of individual species. Not all of the information collected during the NRDA process, which was used as a basis for NMFS' determinations, has been published to date. BOEM continues to use existing information and reasonably accepted scientific methodologies to extrapolate from publicly available information on sea turtles in completing the relevant analyses of sea turtle populations and associated impacts. BOEM concludes that the unavailable information for the analysis herein may be relevant to foreseeable significant adverse impacts to sea turtles, though such impacts would be associated with a low-probability catastrophic spill, which is not part of the proposed action nor reasonably foreseeable as a result of any post-lease activities. Therefore, BOEM has determined that the incomplete or unavailable information is not

essential to a reasoned choice among alternatives for this Supplemental EIS (including the No Action and action alternatives).

4.10.2.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for sea turtles after searching relevant literature. This new information supports the previous BOEM analyses. The new information found is not essential to a reasoned choice among alternatives because BOEM has already considered these issues in its determination of impacts to sea turtles; therefore, it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. On March 13, 2020, NMFS published their Biological Opinion for oil and gas lease sales; for more information, refer to the Endangered Species Act in **Chapter 5**.

More information assessing the impacts of the *Deepwater* Horizon explosion, oil spill, and response to sea turtles has become available since publication of the 2018 GOM Supplemental EIS. Findings from multiple studies analyzing exposed sea turtle populations further support that the *Deepwater* Horizon explosion, oil spill, and response contributed to the adverse health effects described in the *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement* (Deepwater Horizon Natural Resource Damage Assessment Trustees 2016), including adrenal insufficiency, which can result in reduced reproduction and, in some cases, death (Frasier et al. 2020; Kocmoud et al. 2019; Lauritsen et al. 2017; Mitchelmore et al. 2017; Shaver et al. 2017; Stacy et al. 2017; Wallace et al. 2017; Ylitalo et al. 2017).

Nelms et al. (2016) and Piniak et al. (2016) published new studies regarding potential impacts of noise on sea turtle hearing. Through a systematic review, policy comparison, and stakeholder analysis, Nelms et al. (2016) found that potential impacts of seismic surveys on sea turtles vary (i.e., hearing damage, entanglement, and critical habitat exclusion) and can be obscure due to the lack of research. Thus, understanding the impacts on individuals and populations can be challenging. By measuring auditory evoked potential responses of juvenile green sea turtles to tone pip stimuli, Piniak et al. (2016) found that these turtles have a narrow range of underwater and aerial low-frequency hearing. Aerial sound pressure thresholds were lower than those underwater, though they detected a larger frequency range underwater (Piniak et al. 2016). Also, sound intensity level thresholds were lower underwater. Elliott et al. (2019a) published a review on information gaps in understanding the impacts of seismic surveys on marine vertebrates. These gaps include the physiological responses of sea turtles (e.g., stress hormone levels) to airguns in a field setting, short- and long-term behavioral responses (e.g., changes to diving, foraging, migration patterns, and nesting behavior), and the impact of airguns on sea turtle distribution and abundance at sea. BOEM concludes that the unavailable information from this study may be relevant to foreseeable significant adverse impacts to sea turtles because the full extent of impacts on sea turtles is not known. However, BOEM analyzed the issues brought forward in Elliott et al. (2019a) in its *Gulf of Mexico OCS Proposed Geological and Geophysical Activities in the Gulf of Mexico: Western, Central, and Eastern Planning Areas; Final*

Programmatic Environmental Impact Statement (BOEM 2017c). In that Programmatic EIS, BOEM determined

> Impacts on sea turtles are assessed as minor for airgun surveys for Alternatives A through D and F because they are not expected to result in substantial changes to behavior, growth, survival, annual reproductive success, or lifetime reproductive success (fitness).

Climate change poses a programmatic issue of concern for sea turtles, especially during the nesting season. Bevan et al. (2019) collected incubation temperatures at nesting beaches for the critically endangered Kemp's ridley (*Lepidochelys kempii*) (i.e., Tamaulipas, Mexico, and Padre Island, Texas) over a period of 3 years. The range of temperatures were significantly different across the three locations. However, they represented a restricted range of incubation temperatures, which is a determining factor for critical biological events. Northern beaches in Texas and Mexico could provide cooler incubation temperatures (exhibiting differences in male to female hatching ratios), but the likelihood of this range shift is diminished due to several life history factors of the Kemp's ridleys (e.g., age to maturity, sex determination mechanism, and nesting site fidelity).

Putman et al. (2019) developed a useful predictive model for the distribution and abundance variation of young sea turtles in the western North Atlantic, with implications in the GOM. Higher densities of overall young sea turtles were predicted in the northern GOM versus the southern GOM, but with a high degree of temporal variability. This is likely due to the ongoing ocean circulation processes. Relatively high densities of Kemp's ridleys were predicted in the western and central GOM, green turtles (*Chelonias mydas*) in the northern GOM, and loggerheads (*Caretta caretta*) in the eastern GOM. Overall, there has been an increasing trend of sea turtle densities in the northern GOM from 1996 to 2017, which suggests that anthropogenic activities have not had an overall negative population-level impact.

A report by Barkaszi and Kelly (2019) contained a compilation and analysis of visual and acoustic protected species (i.e., marine mammal and sea turtle) observation data collected during seismic operations in the GOM. There was a slightly higher visual detection rate for sea turtles during active airgun operations than silence. Loggerhead turtle sighting rates were the same both inside and outside the *Sargassum* critical habitat.

Garrison et al. (2020) found that loggerhead turtles in the northern GOM were typically found in shallow water in late spring/early summer and then migrated into deeper water during fall and/or winter months. The spatial and seasonal variation in loggerheads represents the shift in habitats and behavioral modes across seasons, with animals moving into deeper waters and spending progressively less time at the surface during cooler months. There was a significant interaction between season and day, indicating that the diurnal effects were different among the different seasons. Garrison et al. (2020) also found that, during the winter and spring, Kemp's ridley turtles spent a larger amount of time near the surface during daylight hours compared to night hours. During the summer, the time at the surface was the same for both day and night and was not significantly different during

the fall. Dive-surface behaviors for loggerheads and Kemp's ridleys indicated important seasonal, diurnal, and spatial effects on the time available at the surface.

Hart et al. (2020) identified high use foraging sites for loggerhead turtles in the northeastern GOM, specifically the Big Bend region off the northwest Florida coast. This region was found to be an important year-round foraging site for loggerheads from several distinct population segments. Further, a range of individual variation in home range size was observed; larger home ranges were in greater water depths.

Iverson et al. (2020) identified migration corridors of post-nesting female adult loggerhead turtles in the GOM and Florida Straits, and overlaid the corridors on shipping density, commercial line fishing, and shrimp trawling data. This yielded hotspots in the Florida Straits, off the northwest Florida coast, and off the Tampa Bay coast. Loggerheads migrated in neritic and oceanic waters, with some leaving the GOM. Neritic waters west of Florida and in the Florida Straits were observed to be high-use migration corridors, with migration mainly occurring in July and August.

In a study to analyze juvenile green sea turtle movements in the northwestern GOM, Metz et al. (2020) found that tracked green turtles exhibited strong seasonal fidelity to their original capture locations. All turtles displayed residency in Texas bays during summer months (March-November) while 5 of the 15 individuals exhibited seasonal migrations into Mexican waters following passage of strong cold fronts in December and January. Winter (e.g., Mexico) and summer (e.g., Texas) core areas were not significantly different.

Duarte et al. (2021) examined changing ocean soundscapes due to anthropogenic activities and climate change, and their potential effects on marine species. Evidence indicates that anthropogenic noise can affect the behavior and physiology of marine species, depending on several factors, such as acoustics, behavioral context, and the physical environment.

4.10.2.5 Conclusion

BOEM has reexamined the analysis for sea turtles presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regard to the additional information presented above. No new information was discovered that would alter the impact conclusion for sea turtles presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261. At the regional, population-level scope of this analysis, impacts from reasonably foreseeable routine activities and accidental events could be **negligible** to **moderate** for all action alternatives.

4.10.3 Beach Mice

4.10.3.1 Summary

BOEM has reexamined the analysis for beach mice presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in

Chapter 4.10.3.4. No new information was discovered that would alter the impact conclusion for beach mice presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of beach mice, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.9.3 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.9.3 of the 2018 GOM Supplemental EIS. **Chapter 4.10.3.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.10.3.2 Analysis of Alternatives A-E Summary

The four subspecies of beach mouse (i.e., Alabama [*Peromyscus polionotus ammobates*]; Perdido Key [*Peromyscus polionotus trisyllepsis*]; Choctawhatchee [*Peromyscus polionotus allophrys*]; and St. Andrew [*Peromyscus polionotus peninsularis*]) are small coastal rodents that are only found along specific beaches in parts of Alabama and northwest Florida, and are federally listed as endangered. Populations of the listed subspecies have fallen to levels approaching extinction. Beach mice rely on dune systems as favorable habitat for foraging and maintaining burrows. Impacts to beach mice may occur directly to the animal or its habitat. Due to the distance between beach mouse habitat and OCS oil- and gas-related activities, impacts from routine activities are not likely to affect beach mouse habitat except under very limited situations. Pipeline emplacement or construction, for example, could cause temporary degradation of beach mouse habitat; however, these activities are not expected to occur in areas of designated critical habitat. Accidental oil spills and associated spill-response efforts are not likely to impact beach mice or their critical habitat because the species live above the intertidal zone where contact is highly unlikely. Habitat loss from non-OCS oil- and gas-related activities (e.g., beachfront development) and predation have the greatest impacts to beach mice. Overall, the incremental contribution of impacts from reasonably foreseeable routine activities and accidental events to the overall cumulative impacts on beach mice is expected to be **negligible**. Under Alternative E, the cancellation of a single lease sale, the impacts on beach mice would be **none** because new impacts would be avoided entirely. However, cumulative impacts from previous lease sales and other non-OCS oil- and gas-related activities would remain. A full analysis of beach mice can be found in Chapter 4.9.3 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.9.3 of the 2018 GOM Supplemental EIS.

4.10.3.3 Incomplete or Unavailable Information

BOEM has determined that there is no incomplete or unavailable information regarding the listed beach mice relevant to the potential impacts from a proposed action or alternatives, and no such information was essential to a reasoned choice among alternatives. BOEM's existing information and reasonably accepted scientific methodologies from available information on beach mice was used in completing the relevant analysis of impacts.

4.10.3.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information (various printed journal articles and internet sources) for beach mice was found after searching relevant literature and government information. Sources searched include the FWS' website, Google Scholar, Elsevier, Cambridge University Press, and the Journal of Mammalogy. This new information provides support for the previous BOEM analyses and does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS as **negligible**. Most of the new information relates to updates of the status of the species prepared by FWS per their requirements. The resulting new information found below is not essential to a reasoned choice among alternatives because BOEM has already considered these issues in its determination of impacts to beach mice. BOEM will continue the review of best available science to keep informed on new data regarding beach mice.

The FWS conducted a 5-Year Review on the status of the Choctawhatchee beach mouse, including new information about impacts due to Hurricane Michael in October 2018 (FWS 2019c). There are four populations of the Choctawhatchee beach mouse, which are found at Topsail Hill Preserve State Park, Grayton Beach State Park, St. Andrews State Park, and Shell Island/West Crooked Island and adjacent private lands. In October 2018, Hurricane Michael impacted the Shell Island/West Crooked Island area and severely damaged the Choctawhatchee beach mouse habitat and population. Approximately 30 ft (9 m) of primary dune was removed and other areas were inundated or washed over. Even with these impacts, there was no change to the FWS' classification or priority ranking of the Choctawhatchee beach mouse. The Choctawhatchee beach mouse population remains as declining. The species status remains endangered.

The FWS conducted a 5-Year Review on the status of the St. Andrew beach mouse, including new information about impacts due to Hurricane Michael in October 2018 (FWS 2019e). Currently, there are three known populations: East Crooked Island on Tyndall Air Force Base and adjacent private lands to the east; Rish Park; and St. Joe State Park. In October 2018, Hurricane Michael hit the area and severely damaged the St. Andrew beach mouse habitat and population. Hurricane Michael severed portions of East Crooked Island and St. Joe State Park and eroded the majority of primary dunes in St. Joe State Park. Both the development of new islands and dune erosion created movement barriers for the mice due to the loss of suitable habitat. With the additional stress of Hurricane Michael across the entire species range, all populations are currently fragile. The habitat and associated populations are projected to continue to rebound over the next several years; however, another severe impact in the same area could have devastating effects. The species status remains endangered.

The FWS prepared an amended recovery plan for the Perdido Key beach mouse (FWS 2019d). Track tube monitoring indicated that the Perdido Key beach mouse was detected and doing well in three of the five critical habitat units, including Gulf State Park, Perdido Key State Park, and Gulf Islands National Seashore. At that time, threats such as habitat destruction and fragmentation, stochastic events such as hurricanes, and predation from non-native (feral cats) and native predators continue to lower population numbers. The criteria for the recovery plan have not been changed.

Other new information about the Perdido Key beach mouse includes a 5-year Review by FWS on the species status (FWS 2021). There are two populations of the Perdido Key beach mouse, which is found at the Johnson Beach Unit of the Gulf Island National Seashore and Perdido Key State Park. Efforts were made to re-establish a population at Gulf State Park - Florida Point through the release of captive born individuals in 2010. The 2010 release into Gulf State Park - Florida Point of captive born individuals appeared to re-establish Perdido Key beach mouse in areas of the Gulf State Park - Florida Point through 2014. Later monitoring at the Gulf State Park - Florida Point detected the likelihood of genetic mixing between the introduced mice at Gulf State Park - Florida Point and the wild population at Perdido Key State Park (Greene et al. 2017). Greene et al.'s research demonstrated that captive-born beach mice could be used to reestablish populations when wild populations are too small to provide donors for translocation. Other genetic studies have detected some movement between the three parks. Movement of individuals between the Gulf Island National Seashore, Perdido Key State Park, and Gulf State Park - Florida Point has been attributed to the construction of frontal sand berms beginning in 2005, which provide connection between the parks. Ongoing monitoring of the Perdido Key beach mouse population between 2015 and 2019 continued to detect Perdido Key beach mice at the three parks. Hurricane Sally (2020) directly impacted the Perdido Key beach mouse areas and severely damaged the habitat and population. Some impact assessment regarding Hurricane Sally impacts to the Perdido Key beach mouse is still underway. Even with these impacts and the continuing impact assessment, there was no change to the FWS' classification or priority ranking of the Perdido Key beach mouse. The Perdido Key beach mouse population remains as declining. The species status remains endangered.

New information about the Alabama beach mouse includes a 5-Year Review by FWS of the species (FWS 2019a). There are two populations of the Alabama beach mouse, one located from Little Lagoon Pass to the tip of Fort Morgan Peninsula and the second with the Gulf State Park. These populations are isolated from one another. Following a series of storm events in the early 2000s, including Hurricanes Ivan (2004) and Katrina (2005), Alabama beach mouse populations were significantly impacted within their range and determined to be extirpated from the Gulf State Park. The Alabama beach mouse was reintroduced to the Gulf State Park through the release of relocated individuals from Bon Secour National Wildlife Refuge and Fort Morgan State Park. The 2010 release into Gulf State Park appears to have re-establish Alabama beach mouse in the park. The construction of frontal sand berms beginning in 2005 along the cities of Gulf Shores and Orange Beach seem to have provided dispersal corridors and additional habitat for the Alabama beach mouse. The Alabama beach mouse population is improving and continues to recover following the devastating hurricanes of 2004 (Ivan) and 2005 (Katrina). The species status remains endangered. Following the preparation of the 5-Year Review, FWS prepared an amended recovery plan for the Alabama beach mouse, which included delisting criteria of the Alabama beach mouse (FWS 2019b). The previous plan had not identified recovery criteria for delisting.

Other new information includes the development of a Bayesian network model of habitat suitability, including stressors such as non-native predators (feral cats), to develop a decision support tool related to beach mouse habitat availability and suitability (Cronin et al. 2021). The model differs from other previous methodologies that examined extinction risk as a function of human development

and storms. The model was developed to estimate habitat availability based on suitability that considered a wide range of criteria that could ultimately determine additional habitat requirements for species downlisting and potential management actions to improve existing habitat. The study found that post-storm recovery and recolonization by mice populations occurs over an extended time period of 5-7 years. Based on existing habitat availability and suitability, the habitat requirements for portions of the Perdido Key and Choctawhatchee beach mice populations may be met based on the modeled habitat. However, this determination was qualified in that it was within the model's probabilistic framework, and incomplete geospatial information still exists. The habitat model could be used to identify habitat quality and prioritize the locations of habitat improvement efforts for future 5-Year Status Reviews conducted by FWS.

Evans and Malcom (2020) conducted four case studies using automated logarithms to detect land-cover change. The case studies compared remote-sensing data of the same areas over two different time periods. The testing utilized open source platforms and were effective at detecting and quantifying this overall habitat change. One case study looked at small-scale changes in a St. Andrew beach mouse wetland or grassland habitat where residential construction occurred. The case study evaluated the logarithms effectiveness in detecting habitat loss and study showed that 0.3 km^2 (0.1 mi^2) within a 4.7 km^2 (1.8 mi^2) area was changed. Use of the habitat change comparisons like this have the potential to be applied to future conservation planning or 5-Year Status Reviews conducted for beach mice by FWS.

4.10.3.5 Conclusion

BOEM has reexamined the analysis for beach mice presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented above . No new information was discovered that would alter the impact conclusion for beach mice presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261. Alternative C would have no impacts because no beach mice habitat exists near the WPA proposed lease sale area. Alternative E, No Action, would only have impacts associated with ongoing activities from past lease sales and non-OCS oil- and gas-related activities.

4.10.4 Protected Birds

4.10.4.1 Summary

BOEM has reexamined the analysis for protected birds presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.10.3.4**. No new information was discovered that would alter the impact conclusion for protected birds presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of protected birds, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.9.4 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.9.4 of the 2018 GOM Supplemental EIS. **Chapter 4.10.4.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.10.4.2 Analysis of Alternatives A-E Summary

Protected birds are those species or subspecies listed under the ESA by FWS as threatened or endangered due to the decrease in their population sizes or loss of habitat. The protected birds analyzed in this Supplemental EIS (as described in the 2017-2022 GOM Multisale EIS) include those ESA-listed threatened or endangered species that use the OCS or coastal counties/parishes along the GOM during any part of their lifecycle. Other species that met these criteria were excluded if their habitats were more upland or away from the coast (listed in Appendix F of the 2017-2022 GOM Multisale EIS). The habitats of the protected bird species described in this Supplemental EIS vary from upland habitat, freshwater wetlands, estuaries, coastal beaches, and tidal flats to offshore migration and foraging. BOEM has undergone consultation with FWS to minimize the potential impacts to ESA-listed species. The 2018 FWS BiOp states that routine activities are not likely to adversely affect listed birds (FWS 2018). Impacts from routine activities that would impact protected birds, including discharges and wastes (affecting air and water quality), noise, and possibly artificial lighting, would be **negligible**. The listed bird species considered are typically coastal birds and would not be exposed to much of the OCS oil- and gas-related activities. Waste discharges to air or water produced because of routine activities are regulated by USEPA and BOEM, and these discharges are subject to limits to reduce potential impacts; therefore, due to precautionary requirements and monitoring, the impacts to protected birds would be **negligible**. The major impact-producing factors resulting from accidental events associated with a proposed action that may affect protected birds include accidental oil spills and response efforts. In the case of an accidental oil spill, impacts would be **negligible** to **moderate** depending on the magnitude and time and place of such an event. Major impacts could occur if a large oil spill occurred with direct contact to a protected bird species or if the habitat became contaminated, resulting in mortality of a listed species. Marine debris produced by OCS oil- and gas-related activities because of accidental disposal into the water may affect protected birds by entanglement or ingestion. Due to the regulations prohibiting the intentional disposal of items, impacts would be expected **negligible** overall; however, impacts may scale up to **moderate** if the accidental release of marine debris caused mortality of a listed bird, though is unlikely from OCS oil-and gas-related activities due to applicable conditions of approval attached to permits, as opposed to non-OCS oil- and gas-related activities, which are not regulated by BOEM.

Overall, BOEM would expect **negligible** impacts to protected birds considering routine activities, **negligible** to **moderate** considering accidental events and OCS oil- and gas-related cumulative impacts, and **negligible** to **major** considering non-OCS oil- and gas-related cumulative impacts. Due to the precautionary requirements and monitoring discussed in Chapter 4.9.4 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, the incremental contribution of a

proposed action to the cumulative impacts on protected birds would be **negligible** for any of the action alternatives (i.e., Alternatives A-D). Under the No Action Alternative (i.e., Alternative E), which is the cancellation of a single lease sale, the additional incremental contribution to cumulative impacts on ESA-protected birds or their habitats would be **none** because new impacts would be avoided entirely. Cumulative impacts of current and past activities (including both OCS oil and gas-related and non-OCS oil and gas-related), however, would continue to occur under this alternative. A full analysis of protected birds can be found in Chapter 4.9.4 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.9.4 of the 2018 GOM Supplemental EIS.

4.10.4.3 Incomplete or Unavailable Information

Refer to **Chapter 4.9** ("Birds") for existing incomplete or unavailable information related to protected birds. The conclusions remain unchanged.

4.10.4.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for protected birds after a search of relevant literature via various printed journal articles and Internet sources (including Ecological and Environmental Safety, Ecotoxicology and Environmental Safety, Journal of Experimental Biology, and Environmental Pollution, Google Advanced Scholar Search, Google Advanced Book Search, the National Audubon Society's website, and the FWS' website) were examined to assess recent information regarding protected birds that may be pertinent to a proposed action. The new information expands BOEM's knowledge base with regards to sublethal impacts on birds and describes sublethal impacts to a minimal number of birds. No population-level impacts were described; therefore, it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Sublethal impacts of oil spills may have consequences on populations of birds of conservation concern because new studies show that even small (sublethal) amounts of external oil on flight feathers or on both flight and body feathers may impair bird take-off and subsequent flight (Maggini et al. 2017a; 2017b; Perez et al. 2017a; 2017b). Nevertheless, this new information does not change or alter the overall conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, but further informs the impact analysis.

The eastern black rail (*Laterallus jamaicensis jamaicensis*) has been listed as threatened under the ESA, which was effective on November 9, 2020 (*Federal Register* 2020c). Wintering and resident eastern black rails within the GOM region are found primarily along the Texas coast, western Louisiana coast, and Florida's Gulf Coast. Eastern black rail sightings in the other Gulf Coast States would be considered a vagrant or an accidental migrant. On April 26, 2021, FWS concurred with our determination that implementation of the proposed action is not likely to adversely affect the eastern black rail (refer to **Chapter 5** for additional information).

4.10.4.5 Conclusion

BOEM has reexamined the analysis for protected birds presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS and based on the additional information presented above. No new information was discovered that would alter the impact conclusion for protected birds presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.10.5 Protected Corals

4.10.5.1 Summary

BOEM has reexamined the analysis for protected corals presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.9.5.5**. No new information was discovered that would alter the impact conclusion for protected corals presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for the GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of protected corals, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.9.5 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.9.5 of the 2018 GOM Supplemental EIS. **Chapter 4.10.5.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.10.5.2 Analysis of Alternatives A-E Summary

Elkhorn (*Acropora palmata*), staghorn (*Acropora cervicornis*), boulder star (*Orbicella franksi*), lobed star (*Orbicella annularis*), and mountainous star (*Orbicella faveolta*) corals are listed by NMFS as threatened due to the decrease in their population sizes. Distribution of those listed species within the U.S. Exclusive Economic Zone ranges from the State of Florida to the Flower Garden Banks National Marine Sanctuary and the U.S. territories of Puerto Rico, U.S. Virgin Islands, and Navassa Island. Because of their protected status, the relative impacts from a proposed action on a particular group of coral colonies could have disproportionately higher population-level effects than what might be experienced by other non-listed coral species. BOEM therefore consults with NMFS to minimize any potential impacts to these species. Though the listed species are protected (i.e., given ESA status), they could experience the same types of potential impact-producing factors from a proposed action as other coral species inhabiting live bottom habitats. For a detailed description and impact analysis of live bottom habitats in the GOM, refer to Chapter 4.6 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.9.1 of the 2018 GOM Supplemental EIS. Without effective mitigations, routine activities and accidental events resulting from a proposed action could directly impact coral habitats within the GOM.

The site-specific survey information required for post-lease reviews of permit applications would allow BOEM to identify and protect live bottom features (which protected corals may inhabit) from potential harm by proposed OCS oil and gas-related activities by requiring that bottom-disturbing activity be distanced from live bottom features. Assuming adherence to the expected lease stipulations and other post-lease protective restrictions and mitigations, the routine activities related to a proposed action could have short-term localized and temporary effects on protected corals, if any. Impacts from reasonably foreseeable routine activities for Alternatives A-D would be **negligible**. While accidental events have the potential to cause severe damage to specific coral communities, the number of such events is expected to be small, and any impacts would be reduced or prevented by the lease stipulations and post-lease distancing requirements. Furthermore, the OCS lease blocks in the EPA that are closest to ESA-defined critical habitat areas for listed corals are not being offered in a lease sale due to the current Presidential withdrawal and are therefore too distant to be reasonably affected by routine activities or accidental events. In addition, many of the protected corals occur within boundaries of the Flower Garden Banks National Marine Sanctuary, as of the July 2008 Memorandum on Withdrawal of Certain Areas of U.S. OCS from Leasing Disposition, and are not proposed for future leasing under any of the alternatives in this Supplemental EIS, 2018 GOM Supplemental EIS, or 2017-2022 Gulf of Mexico Multisale EIS. Therefore, the incremental contribution of activities resulting from a proposed action to the overall cumulative impacts on protected corals is expected to be **negligible**. Proposed OCS oil- and gas-related activities would contribute incrementally to the overall OCS oil- and gas-related and non-OCS oil- and gas-related cumulative impacts experienced by corals. The non-OCS oil- and gas-related cumulative impacts to protected corals are expected to be greater than any impacts related to OCS oil- and gas-related activities. Under Alternative E, cancellation of a single lease sale, the impacts on protected corals would be **none** because new impacts would be avoided entirely. However, cumulative impacts from previous lease sales and non-OCS oil- and gas-related activities would remain. A full analysis of protected corals can be found in Chapter 4.9.5 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.9.5 of the 2018 GOM Supplemental EIS.

4.10.5.3 Incomplete or Unavailable Information

Refer to **Chapter 4.7** ("Live Bottom Habitats") for incomplete or unavailable information related to protected corals. The conclusions remain unchanged.

4.10.5.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet sources, including literature from relevant peer-reviewed journals and reports, were examined to assess recent information regarding protected corals that may be pertinent to a proposed action.

New information was found for protected corals after searching relevant literature. Sources searched include the NOAA Fisheries' website, Google Scholar, Directory of Open Access Journals, Bulletin for Marine Science, Reefbase Online Library, Journal of Marine Research, and Web of Science. The new information updates the description of the affected environment but does not alter

the impact conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Limer et al. (2020) used a biophysical model to investigate the dispersal of two species of coral larvae, the mountainous star coral, a protected coral, and the mustard hill coral in the Flower Garden Banks. The results of the modeling indicated that recirculation of the larval coral caused by eddies attributed to the Loop Current could act as a re-seeding mechanism for Flower Garden Banks' coral populations and make the Flower Garden Banks' reefs relatively self-sustaining.

Bytingsvik et al. (2020) investigated the sensitivity in the deep-sea carbonate coral *Lophelia pertusa* to the dispersant Corexit 9500 and hydrocarbons in 96-hour tests. Corals showed high sensitivity to all contaminants after measuring the LC_{50} (lethal concentration causing 50% mortality) and EC_{50} (effective concentration causing 50% reduction in polyp activity). These results are similar to those previously reported in the literature, but the authors also caution against long-term, chronic exposure to these pollutants.

Schwing et al. (2020) provide a review of the impacts of the *Deepwater Horizon* spill on benthic resilience, including corals. For corals specifically, the paper reiterates previous literature regarding coral impacts (i.e., tissue and branch loss, and colony injury) and mortality. Findings include evidence of microbial communities returned to near baseline conditions within 2 years of the spill. Foraminifera assemblages are significantly different post-spill. There is a decrease in evenness (how equal the community is numerically) and an increase in abundance of meiofauna consistent with an increase in opportunistic taxa related to *Deepwater Horizon*-induced stressors. There is a decrease in Shannon diversity (accounts for evenness and abundance) of microfauna. There is also evidence of continuing impacts to the resiliency of local benthic megafauna. In summary, the response and recovery of benthic organisms and communities is spatially and temporally variable, with larger organisms requiring longer to recover.

In Goode et al. (2020), the authors provide a lengthy meta-analysis of the literature on the resilience of benthic communities to trawling disturbance. Deep-sea corals play an integral role in community development within benthic communities. Their findings suggest that the mean total abundance of benthic communities will gradually increase after protections are in place, but this response is not the same across all taxonomic groups. Long-lived species, such as deep-sea corals, will likely have low resilience. Moreover, the removal of corals from benthic communities from trawling can provide opportunity for competitor species to grow. The authors conclude that recovery of benthic communities from trawling disturbance will on average be at least several decades after protections are enacted. The authors focus on seamounts rather than undersea canyons populating the Gulf of Mexico and OCS, but their conclusions are still relevant.

Huang et al. (2021) prepared a summary of known studies on plastic impacts to corals. A number of impacts to corals from plastics was identified from the review of studies conducted worldwide. The review identified mechanisms for impacts. The presence of microplastics increased the susceptibility of coral to disease. Plastics caused physical abrasions and injuries to coral tissues,

transported foreign microbial communities to reefs, and caused a physical barrier to corals during feeding. While corals can expel plastics, coral ingestion of plastics can result in blockages and the transfer of pathogens and associated chemical contaminants. Laboratory studies demonstrated that plastic ingestion can impact coral energetics, growth, and health.

A laboratory study evaluated larval longevity and competency period (Miller et al. 2020), which is the time period that larvae are able to remain in the water column and still be able to settle and metamorphose, in two endangered corals. The study examined *Orbicella faveolata* (mountain star coral) and the *Acropora* complex (staghorn and elkhorn corals). The *Orbicella faveolata* had a competency period between 3 and 5 or 4 and 7 days after spawning. The *Acropora palmata* (elkhorn coral) had a competency period of 7-8 or 10-11 days. The longer competency period suggests differences in dispersion potential between protected coral species. Dispersion potential may improve the prediction of connectively of reef-building coral populations and localized recovery potential of a particular species.

A long-term study (Guzman et al. 2020) evaluated post-spill impacts on subtidal coral reef communities over a 30-year period with data collected over varying intervals. Corals found at locations impacted by a spill were compared to unimpacted controls. Percent cover, diversity, community composition, and recruitment were examined. Two of the species evaluated were the branching corals *Acropora cerviconrus* (staghorn coral) and *Acropora palamata* (elkhorm coral). Ball- or boulder-shaped corals were also evaluated. The *Acropora palmata* (elkhorn coral) showed decreased percent cover in the short term and longer term compared to controls for the same species. Species richness was lower in the 10 years following the spill; however, 20 years post-spill, species richness was not significantly different between oiled and control sites. Short-term responses were stronger for branching corals, including the protected elkhorn coral, which could have implications for that protected species' localized populations success following a spill event. Due to multiple other stressors, long-term impacts from the spill to the coral communities studied were not reliably demonstrated.

A proposed rule designating critical habitat for the threatened Caribbean corals (i.e., *Orbicella annualris, O. faveolata, O. franksi, Dendrogrya cylindru*, *and Mycetophyllia ferox*) is currently under review (*Federal Register* 2020a). The three Orbicella species are found within the boundaries of the Gulf of Mexico's CPA and are located at the Flower Garden Banks, which are the areas proposed for critical habitat designation. The Flower Garden Banks have protections associated with national marine sanctuary designation and through lease stipulations, which are described in the Bureau of Ocean Energy Management's NTL No. 2009-G39, "Biologically-Sensitive Underwater Features and Areas." The existing protections associated with lease stipulations include specific isobath offsets from the banks, no activity zones, and offsets for discharges. These protections already apply to the areas proposed for critical habitat. The critical habitat designation is not expected to change the mitigating measures already implemented while conducting OCS oil- and gas-related activities in the vicinity of the Flower Garden Banks.

A *Federal Register* request for initiation for the 5-year review of staghorn, elkhorn, pillar, rough cactus, lobed star, mountainous star, and boulder star corals was posted on January 7, 2021 (*Federal Register* 2021g). Review will evaluate if any of these species should be delisted or reclassified from endangered to threatened or from threatened to endangered. Since these protected species are currently protected under a national marine sanctuary designation, lease stipulations, and applicable NTLs, future reclassification is not expected to change protections to these species related to BOEM's Oil and Gas Program.

DeLeo et al. (2021) provides an examination of exposure of coral to oil and dispersant constituents. This laboratory study looked at coral response on the genetic level in an effort to identify specific cellular impacts and potential pathways of the impacts. The study identified a range of metabolic, immunological, skeletal growth, and cellular damage on two species of corals that resulted from exposure to oil, dispersant constituents, and a combination of both. The research is a continuation of investigations began following the *Deepwater Horizon* oil spill when it was suggested that the combination of oil and dispersant exposure could be more harmful than oil exposure alone on marine invertebrates. This study provides additional support to previous findings that the combination of oil and dispersant exposure, especially when exposure to the dispersant is prolonged, is more harmful than oil exposure alone.

Corals will likely be impacted due to elevated sea-surface temperatures associated with climate change. Recent monitoring at the Flower Garden Banks (Johnston et al. 2019a) demonstrated resilience of the coral communities after a bleaching event in 2016. The bleaching event was preceded by seawater temperatures exceeding 30°C (86°F) for 36 and 21 days, respectively, at the East and West Flower Garden Banks. Following the 2016 bleaching event, which was the most severe documented for the Flower Garden Banks, post-bleaching monitoring documented full recovered of coral colonies by August 2017. While the study did not specifically describe individual species recovery, endangered corals species inhabit the Flower Garden Banks. In particular, the boulder star coral *Orbicella franski* is a common coral species found at the Flower Garden Banks. Monitoring was conducted during previously Flower Garden Banks' long-term monitoring. The monitoring documented that there was no significant decline in coral cover from 2016 to 2017.

This investigation of heat stress on corals (Levas et al. 2018), which included the endangered mountainous star coral *Orbicella faveolate*, exposed corals to elevated temperatures and monitored the corals after they were returned to the reef for a variety of characteristics, including endosymbiont concentrations, energy reserves, and calcification, and then determined recovery. All three species, including the endangered mountainous star coral, recovered within a year. Levas et al. (2018) suggest that some species of corals, including endangered corals, are resilient through isolated beaching events tied to elevated sea-surface temperatures.

4.10.5.5 Conclusion

BOEM has reexamined the analysis for protected corals presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the information presented above. No new

information was discovered that would alter the impact conclusion for protected corals presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.11 COMMERCIAL FISHERIES

4.11.1 Summary

BOEM has reexamined the analysis for commercial fisheries presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.11.4**. Updated data on baseline commercial fishing activity has become available. However, no new information was discovered that would alter the impact conclusion for commercial fisheries presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of commercial fisheries, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.10 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.10 of the 2018 GOM Supplemental EIS. **Chapter 4.11.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.11.2 Analysis of Alternatives A-E Summary

The Gulf of Mexico is home to a large and complex commercial fishing industry. Finfish and shellfish landings in the Gulf of Mexico comprised 19 percent of total U.S. landings in 2014 (NMFS 2016). Some of the most economically important commercial fisheries in the Gulf of Mexico are white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*), eastern oysters (*Crassostrea virginica*), Gulf menhaden (*Brevoortia patronus*), blue crab (*Callinectes sapidus*), red grouper (*Epinephelus morio*), red snapper (*Lutjanus campechanus*), and tunas (*Thunnus* spp.). The impacts of a proposed action on fish populations are presented in **Chapter 4.8**. Routine activities such as seismic surveys, drilling activities, and service-vessel traffic can cause space-use conflicts with fishermen. Structure emplacement could have positive or negative impacts depending on the location and species. For example, structure emplacement prevents trawling in the associated area and, thus, could impact the shrimp fishery. On the other hand, production platforms can facilitate fishing for reef fish such as red snapper and groupers. The eventual removal of production platforms would reverse these positive and negative impacts. Therefore, a proposed action could cause **beneficial (low)** to **minor** impacts to commercial fisheries by affecting fish populations or by affecting the socioeconomic aspects of commercial fishing. Accidental events, such as oil spills, could cause fishing closures and have other impacts on the supply and demand for seafood. However, accidental events that could arise from a proposed action would likely be small and localized and thus would have **negligible** to **minor** impacts. A proposed action would be relatively small when compared with

the overall OCS Oil and Gas Program, State oil and gas activities, overall vessel traffic, tropical storms/hurricanes, economic factors, Federal and State fisheries management strategies, and other non-OCS oil and gas-related factors. Therefore, the *incremental contribution* of a proposed action to the cumulative impacts on commercial fisheries would range from ***beneficial (low)*** *to* ***minor*** adverse effects for any of the action alternatives. The exact impacts would depend on the locations of activities, the species affected, the intensity of commercial fishing activity in the affected area, and the substitutability of any lost fishing access. Alternative E, the cancellation of a single lease sale, would prevent these impacts from occurring, except for potential **negligible** impacts arising from adjustments to incomes in the economy. Under Alternative E, the cancellation of a lease sale, fisheries would still be subject to the impacts from the OCS Oil and Gas Program, as well as the impacts from non-OCS oil- and gas-related activities. A full analysis of commercial fisheries can be found in Chapter 4.10 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.10 of the 2018 GOM Supplemental EIS.

4.11.3 Incomplete or Unavailable Information

BOEM has determined that there is incomplete or unavailable information related to commercial fisheries. Some of this incomplete or unavailable information relates to fish populations that support commercial fishing, which is discussed in **Chapter 4.8**. For example, there is incomplete or unavailable information regarding the chronic, long-term impacts of the exposure of commercially valuable fish and invertebrates to oil. This information is unavailable because these impacts would only become evident through time. However, research into this subject in the northern GOM has shown that species who live in close association with contaminated sediments, such as tilefish (*Lopholatilus chamaeleonticeps*), may be subject to repeated exposure to trapped contaminants and experience sublethal impacts such reduced fitness (Snyder et al. 2019). In lieu of the incomplete or unavailable information, BOEM used various data sources and studies, including the most recent NMFS landings data, as well as the information in Carroll et al. (2016), to estimate the affected environment and impacts of OCS oil- and gas-related and non-OCS oil- and gas-related activities for commercial fishing. BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives because existing data sources are sufficient for BOEM to reasonably estimate impacts. BOEM will continue to refine its approaches to alleviate the risk attributable to this incomplete or unavailable information.

4.11.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for commercial fisheries after searching standard sources of commercial fishing data such as Federal and State agency websites, Google Scholar, Elsevier, Springer, Wiley Publishing, and Inter-Research. This new information updates and supports previous BOEM analyses. Therefore, it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

The NOAA Fisheries Service reports each year to the Congress and Fishery Management Councils on the status of all fish stocks in the Nation. The Gulf of Mexico Fishery Management Council

provides the current information on commercial fishing rules for U.S. Federal waters of the Gulf of Mexico (GMFMC 2021). The NMFS's *Fisheries of the United States, 2019* is an annual update to U.S. fisheries statistics, such as data on landings, consumption, and prices (NMFS 2021b). The NMFS' *Fisheries Economics of the United States, 2017* (NMFS 2018) provides more detailed breakdowns of fisheries statistics by state and provides estimates of the economic impacts of commercial fisheries in each state. This report shows that landings revenues in the Gulf of Mexico increased from $912 million in 2016 to $980 million in 2017. Bruce et al. (2018) analyzed the impacts of seismic surveys on fisheries catch rates. This study found little evidence of consistent catch rate changes subsequent to a seismic survey. Guiry et al. (2021) analyzed the historical sheepshead populations in the Gulf of Mexico and found evidence for large-scale population depressions due to rapid human population growth and sustained harvesting pressure. While these reports expand the knowledge base about commercial fisheries, none of the new information discovered since publication of the 2018 GOM Supplemental EIS would alter the analyses or change the conclusions.

In September 2019, a Federal disaster declaration was issued for Louisiana, Mississippi, and Alabama when oyster and coastal shrimp fisheries were severely impacted by freshwater flooding into Mississippi Sound as a result of freshwater flow from the Bonnet Carrè Spillway in 2019 (NMFS 2019b). The Spillway was opened multiple times from 2016 to 2020 to relieve pressure on Mississippi River levees, causing negative impacts to coastal fisheries (Byrd 2019). Moore et al. (2020) estimated the economic impact of climate change from 2021 to 2100 on low and high emission environments on 16 major U.S. fisheries and found a net loss of $2.1 billion consumer surplus on low emission and $4.2 billion on high emission environments when discounted at 3 percent.

The COVID-19 pandemic continues to negatively affect fisheries in the GOM (Bennett et al. 2020; Peters 2020). White et al. (2021) assessed past and present landings and trade data, and found substantial declines in fresh seafood catches, imports, and exports relative to the previous year, while frozen seafood products were generally less affected. The Coronavirus Aid Relief and Economic Security Act (CARES) earmarked $300 million in relief funds for fisheries and aquaculture (NMFS 2020c). Additional allocation of $255 million in fisheries assistance funding was provided by the Consolidated Appropriations Act of 2021 to the states with coastal and marine fishery participants who have been negatively affected by COVID-19 (NMFS 2021e). The Gulf States Marine Fisheries Commission (GSMFC) in coordination with NOAA Fisheries is working to distribute the funds in the GOM region (GSMFC 2020). As the COVID-19 pandemic is ongoing, the full extent of these impacts is unknown and will remain uncertain for the foreseeable future. This incomplete or unavailable information regarding potential impacts to commercial fisheries may be relevant to determining alterations to the baseline. However, at this time such a determination is not possible because the pandemic is an ongoing, fluid event. BOEM continues to monitor the effects of the event as they develop.

4.11.5 Conclusion

BOEM has reexamined the analysis for commercial fisheries presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regards to the updated scenario provided in

Chapter 3. No new information was discovered that would alter the impact conclusion for commercial fisheries presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.12 RECREATIONAL FISHING

4.12.1 Summary

BOEM has reexamined the analysis for recreational fishing presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.12.4**. Updated data on baseline recreational fishing activity have become available. However, no new information was discovered that would alter the impact conclusion for recreational fishing presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of recreational fishing, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.11 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.11 of the 2018 GOM Supplemental EIS. **Chapter 4.12.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.12.2 Analysis of Alternatives A-E Summary

Recreational fishing is a popular pastime in many parts of the Gulf of Mexico. The Gulf of Mexico's extensive estuarine habitats (**Chapter 4.4.1**), live bottom habitats (**Chapter 4.7**), and artificial substrates (including artificial reefs, shipwrecks, and oil and gas platforms) support several valuable recreational fisheries. The NMFS estimates that there were $10.4 billion in trip and durable goods expenditures in 2015 related to recreational fishing in the Gulf of Mexico (NMFS 2017). Some of the key recreational species in the Gulf of Mexico are seatrouts (*Cynoscion spp.*), red drum (*Sciaenops ocellatus*), red snapper (*Lutjanus campechanus*), striped mullet (*Mugil cephalus*), Atlantic croaker (*Micropogonias undulatus*), and Spanish mackerel [*Scomberomorus maculatus*] (NMFS 2017). Alternatives A-D can affect recreational fishing by affecting fish populations or by affecting the socioeconomic aspects of recreational fishing. The impacts of Alternatives A-D on fish populations are presented in **Chapter 4.8**. Routine activities could cause **beneficial (low)** to **minor** impacts on recreational fishing because disruptions to fish populations could reduce landings in proportion to the amount of recreational fishing activities in an area (refer to **Chapter 4.12.1**). Vessel traffic can cause space-use conflicts with anglers. Structure emplacement generally enhances recreational fishing, although this positive effect would be offset during decommissioning unless a structure was maintained as an artificial reef. Accidental events, such as oil spills, can cause **negligible** to **minor** impacts due to the resulting fishing closures and the impacts to the aesthetics of fishing in an area. However, accidental events that could arise would likely be small and localized. Alternatives A-D

should also be viewed in light of overall trends in OCS platform decommissioning, State oil and gas activities, overall vessel traffic, tropical storms/hurricanes, economic factors, and Federal and State fisheries management strategies. The *incremental contribution* of a proposed action to the cumulative impacts of Alternatives A-D on recreational fisheries are expected to be ***beneficial (low)*** *to* ***minor*** because of the limited amount of activity and also the positive and negative impacts would partially offset each other. Alternative E, the cancellation of a single lease sale, would cause some economic adjustments (refer to **Chapter 4.15.2**), which could cause **negligible** impacts to recreational fishing activities. For example, Alternative E would cause workers in the oil and gas industry's supply chain to lose income, which could slightly lessen their propensity to go recreational fishing. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative. A full analysis of recreational fishing can be found in Chapter 4.11 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.11 of the 2018 GOM Supplemental EIS.

4.12.3 Incomplete or Unavailable Information

BOEM has identified incomplete or unavailable information regarding the extent to which recreational fishing is dependent upon OCS platforms, as well as on the site-specific determinants of this dependency. In lieu of this incomplete or unavailable information, BOEM used existing information and reasonably accepted scientific methodologies. For example, BOEM used data on recreational fishing activity provided by the Texas Parks and Wildlife Department and NMFS to examine trends in recreational fishing in various areas. BOEM has also used information from Hiett and Milon (2002) and Ajemian et al. (2015), which provide some information on the scale and location of platform-dependent recreational fishing. BOEM does not expect the incomplete or unavailable information to significantly change its estimates of the impacts of the OCS Oil and Gas Program on recreational fishing activity because BOEM still has enough baseline data to reasonably estimate impacts. Therefore, BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives. BOEM will continue to refine its approaches to alleviate the risk attributable to this incomplete or unavailable information.

4.12.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for recreational fishing after searching standard sources of recreational fishing data and publications, such as Federal and State agency websites, Google Scholar, Elsevier, Research Gate, Springer, Wiley Publishing, and Inter-Research. This new information updates and supports previous BOEM analyses. Therefore, it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

The NMFS' *Fisheries of the United States, 2019* (NMFS 2021b) is an annual update to U.S. fisheries statistics and includes a national overview of recreational fishing. The NMFS' *Fisheries Economics of the United States, 2017* (NMFS 2021a) provides more detailed breakdowns of fisheries statistics by state and provides estimates of the economic impacts of recreational fishing in each state. The Texas Parks and Wildlife Department collects and monitors data on marine recreational fishing

activity in Texas (NMFS 2021b). The NMFS releases data on recreational fishing activity in Mississippi, Alabama, and West Florida (NMFS 2021b). Beginning in 2014, NMFS did not provide updated data for Louisiana, which is when the Louisiana Department of Wildlife and Fisheries assumed responsibility for recreational fishing data. The Louisiana Recreational Creel Survey, which provides weekly estimates of recreational fish harvests, was certified by NOAA Fisheries in January 2018 as an alternative to NOAA's Marine Recreational Information Program's surveys (LDWF 2020). There have been recent changes to the Marine Recreational Information Program's methodologies for collecting and reporting recreational fishing data (NMFS 2021d). Over the last several years, there have been variations in the recreational fishing statistics, but these data variations do not rise to the level of significance necessary to alter the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Camp et al. (2018) present baseline data on the distances traveled by anglers to fish for various species near Florida. Farmer et al. (2020) present a case study of the forecasting methods used to estimate GOM red snapper Federal recreation seasons.

In September 2019, a Federal disaster declaration was issued for Louisiana, Mississippi, and Alabama when oyster and coastal shrimp fisheries were severely impacted by freshwater flooding into Mississippi Sound as a result of freshwater flow from the Bonnet Carrè Spillway in 2019 (NMFS 2019b). The Spillway was opened multiple times from 2016 to 2020 to relieve pressure on Mississippi River levees, causing negative impacts to coastal fisheries (Byrd 2019). The economic impacts to recreational fishing for the 2016-2020 time period are not yet clear; however, Posadas and Posadas (2017) studied the impact of the 2011 Bonnet Carrè Spillway opening and estimated that the Mississippi oyster fishery suffered foregone landing values ranging from $21.8 to $46.0 million, lost 145-324 jobs per year from 2011 to 2013, and lost labor income was estimated at $1.8-$8 million per year.

The COVID-19 pandemic continues to negatively affect fisheries in the GOM (Bennett et al. 2020; Peters 2020). The Coronavirus Aid Relief and Economic Security Act (CARES) earmarked $300 million in relief funds for fisheries and aquaculture (NMFS 2020c). An additional allocation of $255 million in fisheries assistance funding was provided by the Consolidated Appropriations Act of 2021 to states with coastal and marine fishery participants who have been negatively affected by COVID-19 (NMFS 2021e). The Gulf States Marine Fisheries Commission (GSMFC), in coordination with NOAA Fisheries, is working to distribute the funds in the GOM region (GSMFC 2020). Recreational fishing experienced largely negative economic impacts in the first half of 2020 due to pandemic-related shutdowns, supply-chain disruptions, decreases in demand, losses of revenues, and increased costs related to necessary safety precautions to prevent the spread of the virus (e.g., purchasing personal protective equipment, testing workers, quarantining) (NMFS 2021c; Upton 2020). For the January through June 2020 time period, 94 percent of charter boat operators in NOAA's Southeast Region experienced revenue losses of 58 percent on average, compared to the same time period in 2019. Some 64 percent of the operators shutdown completely for 1-3 months (NMFS 2021f). The Gulf of Mexico region experienced a 50 percent reduction of aggregate fishing trips in 2020 compared to previous years due to decreased access to fishing possibly tied to COVID-19 mitigation policies, reduced resources for fishing trips, and fears of COVID-19 exposure through fishing (Apriesnig and Thompson 2021). Midway et al. (2021) conducted a survey of recreational anglers in

10 U.S. states and found that a small overall increase in the fishing effort was reported, but access restrictions to fishing locations vary by state. The increase in the fishing effort was mainly due to lost jobs or lost work hours of anglers. Many anglers reported that fishing helped with mental stress and family bonding during the pandemic.

As the COVID-19 pandemic is ongoing, the full extent of these impacts is unknown and will remain uncertain for the foreseeable future. This incomplete and unavailable information regarding potential impacts to recreational fishing may be relevant to determining alterations to the baseline. However, at this time such a determination is not possible because the pandemic is an ongoing, fluid event. BOEM continues to monitor the effects of the event as they develop.

4.12.5 Conclusion

BOEM has reexamined the analysis for recreational fishing presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for recreational fishing presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.13 RECREATIONAL RESOURCES

4.13.1 Summary

BOEM has reexamined the analysis for recreational resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.13.4**. Updated data on the number of visitors and the amount of visitor spending supported by parks along the Gulf Coast have become available. However, no new information was discovered that would alter the impact conclusion for recreational resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of recreational resources, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.12 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.12 of the 2018 GOM Supplemental EIS. **Chapter 4.13.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.13.2 Analysis of Alternatives A-E Summary

Recreational resources are natural or manmade things that are used as part of activities that are primarily for human enjoyment. The GOM is home to various resources that support recreational activities. These include ocean-based resources as well as resources in the counties and parishes along the Gulf of Mexico. Alternatives A-D would contribute to the **negligible** to **minor** space-use

conflicts (from vessel traffic) and visual impacts (from the visibility of OCS structures) that arise due to the broader OCS Oil and Gas Program. Structure emplacements can have **beneficial (low)** impacts on recreational fishing and diving because platforms often act as artificial reefs, but the eventual removal of these structures would lead to **negligible** to **minor** negative impacts. Oil spills can have a **negligible** to **minor** negative effect on beaches and other coastal recreational resources. Alternatives A-D should also be viewed in light of the overall OCS Oil and Gas Program, as well as various non-OCS oil- and gas-related factors, such as beach/wetlands erosion, beach disruptions, and economic factors and activities that can cause space-use conflicts and aesthetic impacts such as commercial and military activities. Because of the relatively small contribution of any given lease sale under any of the proposed action alternatives (i.e., Alternatives A-D) to the overall OCS Oil and Gas Program, in addition to other non-OCS oil- and gas-related activities, the *incremental contribution* of a proposed action to the cumulative impacts on recreational resources is expected to be ***beneficial (low)*** *to* ***minor*** adverse effects. Under Alternative E, the cancellation of a single lease sale, there could be **negligible** impacts to recreational resources due to the small economic adjustments. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this alternative. A full analysis of recreational resources can be found in Chapter 4.12 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.12 of the 2018 GOM Supplemental EIS.

4.13.3 Incomplete or Unavailable Information

There is some incomplete or unavailable information regarding the visual impacts from a proposed action. In particular, the perception of people towards the visibility of structures that could arise in certain areas are not fully known. BOEM has determined that such information is not essential to a reasoned choice among alternatives because much of this uncertainty relates to the inherent uncertainty regarding where (and what types) of structures would arise from a proposed action. In addition, existing information allows for sufficient estimates of the overall dependence of visual impacts to factors such as distance, height, brightness, and general location. BOEM used generally accepted scientific principles to estimate the visual impacts of a proposed action, including literature sources, data sources, and photographic evidence. This evidence suggests that the incremental visual impacts of a proposed action would be **negligible** to **minor**. In addition, BOEM has issued an Information to Lessees and Operators to ensure that visual impacts near the Gulf Islands National Seashore are considered at BOEM's site-specific review stage, and BOEM has a stipulation to reduce visual impacts for leases within 15 miles of Baldwin County, Alabama.

4.13.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various sources (including Internet searches related to the Gulf Islands National Seashore, economic conditions, and oil-spill impacts) were examined to assess recent information regarding recreational resources that may be pertinent to a proposed action. A new report by Cullinane Thomas et al. (2019) provides estimates of the number of visitors, amount of spending, number of jobs, and amount of income in 2017 supported by each national park along the Gulf Coast. The number of visitors and the amount of visitor spending supported by national parks along the Gulf Coast

experienced slight annual variations from 2014 to 2017, but these variations do not alter the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

New information was found for recreational resources after searching relevant literature and government information. This new information updates and supports previous BOEM analyses. Therefore, it does not change the impact conclusions for recreational resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Based on the latest available data from NOAA Economics: National Ocean Watch, the tourism and recreation sector was the largest employer in the Gulf of Mexico ocean economy in 2016 (NOAA Office for Coastal Management 2019). A new report by Cullinane Thomas and Koontz (2021) provides estimates of the number of visitors, amount of spending, number of jobs, and amount of income in 2019 supported by each National Park Service unit along the Gulf Coast. The number of visitors and the amount of visitor spending supported by National Park Service units along the Gulf Coast experienced slight annual variations from 2014 to 2019.

The U.S. Travel Association produces a plethora of data and research on travel and tourism in the U.S., including estimated total annual travel and tourism spending by state. In 2019, domestic and international travelers spent $82 billion in Texas, $13.9 billion in Louisiana, $7.1 billion in Mississippi, $11.6 billion in Alabama, and $112.6 billion in Florida (U.S. Travel Association 2020); however, these estimates focus only on spending by visitors, which excludes spending on recreational activities by local residents. Therefore, the total economic impact of the recreation and tourism industry in the Gulf Coast States is likely greater than these estimates.

The NOAA provides a list of Federal and State tools and resources online related to harmful algal blooms in the Gulf of Mexico, including forecast bulletins and a monitoring system, which aim to help stakeholders mitigate issues related to harmful algal blooms (NOAA 2020). There are potential health consequences for beachgoers who may interact with harmful algal blooms, such as respiratory, throat, eye, and skin irritations (CDC 2021b). The recent opening of the Bonnet Carré Spillway in 2019 increased the flow of freshwater into Lake Pontchartrain, Lake Borgne, and Mississippi Sound, causing algae blooms off the Gulf Coast, which resulted in many beach closures and the disruption of some recreational activities and seasonal tourism jobs in the area over the summer months (Fitzhugh 2019; Hauser 2019; Sharp 2019). All Mississippi Gulf Coast beaches and waters were reopened by October 2019 with no observed impacts from the algae blooms to the Gulf Islands National Seashore (Walck 2019). While hotel revenue along the Mississippi Gulf Coast dropped nearly 3-8 percent in June and July, it is estimated that beach vendors, fishing charters, and other support businesses saw revenue declines of up to 70 percent (Weatherly 2019a). In January 2020, it was announced that low-interest Economic Injury Disaster Loans of up to $2 million would be available for small businesses and private nonprofit organizations, including tourism-related businesses, on the Gulf Coast that were negatively impacted by the algae blooms (Cruz 2020; Morris 2020; U.S. Small Business Administration 2020).

Recreation and tourism activities are influenced by the state of the overall national economy as higher levels of disposable income allow consumers to dedicate more money to travel and leisure activities. The recent COVID-19 pandemic, which spreads from person-to-person, has led to severe economic disruption in the United States as many states and cities have issued stay-at-home orders for extended lengths of time. Oxford Economics (2020) has modeled the expected downturns for the U.S. travel industry in 2020 resulting from COVID-19 and estimates that travel sector revenue losses will exceed any other sector on the national scale, outpacing by more than nine times the impact of 9/11 on travel sector revenue. Cruises, the global tourism sub-sector most often in the news as the pandemic initially spread with many ships stuck at sea, may not be able to resume ships setting sail until there is a vaccine or until rapid testing can occur pre-boarding (Gössling et al. 2020). As of July 2020, uncertainty abounds with regards to the timing and scale of regional impacts related to COVID-19 as the virus continues to spread and the number of deaths continue to increase in the United States. For example, tourists began returning to Alabama beaches the first weekend of May 2020 after 42 days of closures due to COVID-19, including what is typically peak spring break travel season (Busby 2020). Even though May 2020 was a record-breaking month for some Alabama short-term coastal rental companies and tour operators, the losses experienced in the preceding months due to COVID-19 are not likely to be fully recovered (Sharp 2020). Counties across the Florida panhandle faced a 2-month ban on short-term vacation rentals that was lifted on May 19, 2020, but only with continued restrictions on bookings from selected states with high coronavirus infection rates and deaths, further demonstrating that impacts will vary by location and time, especially given the uncertainty of regional tourism demand and travel restrictions during the summer months (Harress 2020). Tourism and recreation are sensitive to disposable income. During this period of the 2nd quarter of 2020, the U.S. gross domestic product fell at an annual rate of 32.9 percent (following a fall of 5.0% in the first quarter), and personal expenditures fell $1.57 trillion (following a fall of $232.5 billion during the quarter before) (Bureau of Economic Analysis 2020b). According to the U.S. Bureau of Economic Analysis, although the attributions cannot be precise, these losses were due to COVID-19 and they occurred at a time when impacts were beginning to be mitigated by government assistance payments and the lifting of “stay-at-home” orders. These problems are COVID-19 related. The Centers for Disease Control and Prevention (CDC) (2021a) tracks daily cases of COVID-19 infections, which illustrates this unpredictability. For example, despite policies and vaccines, the CDC has tracked the rise and fall of three waves of new cases since the original outbreak. For example, both Louisiana and Texas experienced large waves of new cases that peaked in July 2020, November-January 2021, and May-September 2021. The course of COVID-19 and the responses of businesses and their customers has remained unpredictable and is probably the greatest uncertainty regarding this industry. BOEM will continue to monitor this issue.

4.13.5 Conclusion

BOEM has reexamined the analysis for recreational resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for recreational resources presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.14 ARCHAEOLOGICAL RESOURCES

4.14.1 Summary

BOEM has reexamined the analysis for archaeological resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.14.4**. No new information was discovered that would alter the impact conclusion for archaeological resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of archaeological resources, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.13 of the 2017-2022 GOM Multisale EIS and Chapter 4.13 of 2018 GOM Supplemental EIS. **Chapter 4.14.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.14.2 Analysis of Alternatives A-E Summary

Archaeological resources are any material remains of human life or activities that are at least 50 years of age and can provide scientific or humanistic understanding of past human behavior, cultural adaptation, and related topics through the application of scientific or scholarly techniques, such as controlled observation, contextual measurement, controlled collection, analysis, interpretation, and explanation (30 CFR § 550.105). Both precontact- and historic-period archaeological resources may be found on the OCS. Precontact refers to Native American archaeological sites or artifacts that date prior to the arrival of Europeans in North America beginning in the late 15th century A.D. This includes sites associated with the first humans to occupy areas of the Gulf Coast that are now submerged on the OCS. Historic resources are those that date to after European arrival in North America; on the Gulf of Mexico OCS, these include historic shipwrecks, aircraft, and a single historic lighthouse, the Ship Shoal Light.

Regardless of planning area, the greatest potential impact to precontact and historic archaeological resources as a result of a proposed action under any of the action alternatives is site specific and would result from direct contact to the resource from an offshore activity or accidental event. For the OCS Oil and Gas Program, this includes the placement of drilling rigs and production systems on the seafloor; pile driving associated with platform emplacement; pipeline placement and installation; the use of seismic receiver nodes and cables; the dredging of new channels, as well as maintenance dredging of existing channels; anchoring activities; post-decommissioning activities, including site-clearance trawling; the masking of archaeological resources from industry-related infrastructure and debris; and accidental oil spills and associated cleanup activities.

During post-lease activities, each permitted action would be assessed for site-specific potential impacts during the permit application process. Archaeological surveys, where required prior to an operator conducting OCS oil- and gas-related activities on a lease, are expected to be effective at

identifying possible archaeological sites. The technical requirements of the archaeological resource reports are detailed in NTL No. 2005-G07, "Archaeological Resource Surveys and Reports." Under 30 CFR § 250.194(c), 30 CFR § 250.1010(c), and 30 CFR § 550.194(c), lessees are required to immediately notify BOEM's and BSEE's Regional Directors if an archaeological resource is discovered during their operations.

Accidental events producing oil spills may threaten archaeological resources along the Gulf Coast. Should a spill contact an archaeological site, damage might include direct impact from oil-spill cleanup equipment, contamination of materials, and/or looting. A major effect from an oil-spill impact would be contamination of a historic coastal site, such as a historic fort or lighthouse. It is expected that any spill cleanup operations would be considered a Federal action for the purposes of Section 106 of the National Historic Preservation Act and would be conducted in such a way as to minimize impacts to archaeological resources to the extent possible. Recent research suggests that the impact of direct contact of oil on historic properties may be long term and not easily reversible without risking damage to fragile historic materials (Chin and Church 2010).

The potential for accidental spills is low, their impacts would generally be localized, and the cleanup efforts would be regulated. Therefore, a proposed action is not expected to result in impacts to archaeological resources; however, should such impacts occur, unique or substantial archaeological information could be lost, and this impact could be irreversible.

There is also the potential for debris from vessels and offshore structures to be lost on the OCS. Debris resulting from accidental events could cause impacts to archaeological resources similar to those expected from routine activities, such as damage through direct physical contact and/or the inability to identify the resources in geophysical survey data due to magnetic or acoustic signal masking.

In conclusion, a proposed action's post-lease activities, including the drilling of wells and installation of platforms, installation of pipelines, anchoring, the removal of platforms and other structures installed on the seafloor, and site clearance activities, as well as accidental events such as loss of debris, may result in **negligible** to **major** impacts to archaeological sites. **Major** impacts could potentially occur if the mitigations described in Chapter 4.13 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS were not applied to post-lease activities and there was resulting disturbance of archaeological resources. When archaeological resources are identified, evaluated, and avoided or mitigated, the *incremental contribution* of a proposed action is expected to result in ***negligible***, long-term cumulative impacts to archaeological resources. However, if an archaeological site were to be impacted due to a failure to properly identify, evaluate, and avoid or mitigate it, those impacts may range from **negligible** to **major**. Under Alternative E, cancellation of a single lease sale, the impact-producing factors discussed in Chapter 4.13 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS would not take place for that or those lease sale; therefore, the impacts would be **none**. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E. A full analysis

of archaeological resources can be found in Chapter 4.13 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.13 of the 2018 GOM Supplemental EIS.

4.14.3 Incomplete or Unavailable Information

There is incomplete or unavailable information regarding the location of individual archaeological resources in the Gulf of Mexico. The locations of all archaeological resources in the GOM cannot be determined at this time because the overall costs of obtaining that information through geophysical surveys of the entire GOM are exorbitant. However, significant archaeological resources potentially may be located throughout the OCS, as has been demonstrated through existing archival research, analysis of historic navigation routes, industry surveys, and BOEM's studies (BOEM 2021e). This incomplete information may be relevant to adverse impacts because the locations and integrity of many archaeological resources remain unknown. Nevertheless, this incomplete information would not be available within the timeline contemplated in the NEPA analysis of this Supplemental EIS. It would take several years before data confirming the presence (or lack thereof) of archaeological resources, and the status of each, could be investigated, analyzed, and compiled. Archaeological sites within the GOM have the potential to be buried, embedded in, or laying on the seafloor. The seafloor is comprised of highly variable bathymetric and geophysical regimes, which differentially affect the ease and ability to identify, ground truth, and evaluate archaeological sites. This variability, combined with the scope of the acreage within the GOM, results in the aforementioned exorbitant costs and time factors.

Future site- or lease-specific, remote-sensing surveys of the seafloor, where required, could be used to identify potential resources within areas of proposed seafloor impact (NTL No. 2005-G07, "Archaeological Resource Surveys and Reports"). The results of these surveys are reviewed in tandem with credible scientific evidence from previously identified sites, regional sedimentology, and physical oceanography that is relevant to evaluating the adverse impacts on resources that are part of the human environment. The survey data, when available, are analyzed by industry and BOEM's archaeologists prior to the authorization of any new or significant bottom-disturbing impacts and, if necessary, avoidance of potential archaeological resources is required. Archaeological surveys are expected to be effective in identifying resources to allow for mitigation of impacts and protection of the resource during OCS oil- and gas-related activities. A proposed action is not expected to have a reasonably foreseeable significant impact because BOEM's evaluation of such impacts is based upon pre-disturbance and site-specific surveys, the results of which BOEM uses to require substantial avoidance of any potential resource that could be affected by the proposed activity. Therefore, BOEM has determined that the gaps in information on the presence or status of archaeological resources is not essential to a reasoned choice among alternatives.

4.14.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was identified for archaeological resources after searching relevant literature. BOEM's archaeologists regularly review the major marine and maritime archaeology journals for recently published research, including The Journal of Maritime Archaeology, Historical Archaeology,

The International Journal of Nautical Archaeology, American Antiquity, etc., as well as research indexes such as JSTOR. This new information updates and supports previous BOEM analyses. Therefore, it does not change the conclusions presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

Three recent articles (Hamdan et al. 2018; Mugge et al. 2019; Salerno et al. 2018) stem from research funded by BOEM to investigate the impacts of oil exposure to historic shipwrecks and their microbial environments as a result of the *Deepwater Horizon* explosion, oil spill, and response. Hamdan et al. (2018) found that analysis of 16S rRNA sequence libraries, sediment radiocarbon age data, sedimentation rates, and hydrocarbons revealed that the mid-20th century German U-boat *U-166* and the early 19th century wooden-hulled sailing vessel known as the Mardi Gras Wreck (16GM01) were exposed to deposited oil during a rapid sedimentation event following the Mississippi Canyon 252, Macondo well blowout and oil spill in 2010. Impacts to shipwreck microbiomes included a significant increase in Piscirickettsiaceae-related sequences in surface sediments and reduced biodiversity relative to unimpacted sites. Additionally, microbiome community structure, similar to that found at *U-166* and the Mardi Gras Shipwreck, was identified at the shipwreck known as the Mica Wreck, but the physical and chemical parameters were different, potentially indicating indirect effects from the oil spill (Hamdan et al. 2018). Mugge et al. (2019) concluded that metal loss on experimental carbon steel disks placed at the study sites was increased at sites within the spill plume, and time-series imagery indicates that the rate of metal loss on *U-166* has accelerated since the spill.

Salerno et al. (2018) documents that the release of hydrocarbons and chemical dispersant in marine environments may affect the structure of benthic microbial communities and biofilms found on artificial substrates, such as historic steel shipwrecks. Experiments were performed to determine the impacts of crude oil, dispersed crude oil, and dispersant on the community structure and function of microorganisms in seawater and on biofilms formed on carbon steel, a common ship hull construction material. Steel corrosion was also monitored to illustrate how oil spills may impact the preservation of steel shipwrecks. Overall, functional gene analyses revealed a decrease in genes (predicted using PICRUSt and observed in sequenced metagenomes) associated with hydrocarbon degradation in dispersant-treated biofilms. This study indicates that exposure to oil and dispersant could disrupt the composition and metabolic function of biofilms colonizing metal hulls, as well as corrosion processes, potentially compromising shipwrecks as ecological and historical resources (Salerno et al. 2018).

Rees et al. (2019) assessed eight Native American sites on Louisiana's Gulf Coast for the effects of the *Deepwater Horizon* oil spill in 2010. Crude oil and dispersant used during the cleanup response were detected in redeposited shoreline middens and intact archaeological contexts. The proximate impacts on the archaeological record include contamination of artifacts, ecofacts, and samples, with the potential for long-term impacts on radiocarbon dating and archaeometry. Pretreatment can mitigate the effects of contaminants on radiocarbon dating and elemental analyses. Other analytical methods, such as absorbed pottery residue analysis, are more adversely affected by a combination of crude oil and dispersant. Integrated cultural resources management planning should take into account the potential effects of an oil spill on archaeological sites and the increased time and cost expenditures for field and lab research in hazardous conditions and with contaminated collections.

Evans (2016) conducted additional remote-sensing and subsurface sampling investigations of potential prehistoric archaeological features on the Gulf of Mexico OCS that had been previously identified in oil and gas industry surveys. This study sought to improve upon earlier research by expanding tested areas into deeper water and using different analyses to determine the most effective methods for paleolandscape identification. Evans (2016) confirmed that paleosurfaces containing resources that were available and desirable for potential human occupants remain intact in the northwestern Gulf of Mexico OCS in areas that are currently up to 30 m (98 ft) below sea level and 48 km (30 mi) offshore. No features that had been anthropogenically modified were conclusively identified, nor were they expected to be given the study's data collection limitations. Evans (2016) recommended that future work at the study areas include additional coring or excavating 1 m x 1 m (3.3 x 3.3 ft) units at burned features and an interpreted shell deposit to determine if they are naturally occurring or human modified. Evans (2016) also recommended that BOEM reevaluate agency programmatic guidance on NTL-compliant geophysical surveys to improve resolution of paleochannels, including running survey lines both parallel and perpendicular to channel features, staggering the direction of adjacent survey lines, and conducting more subsurface sampling to confirm the presence or absence of potential archaeological surfaces. Finally, Evans (2016) emphasized that BOEM should coordinate additional research on prehistoric archaeology as part of the agency's management strategy and to inform NTL survey guidance.

Heinrich et al. (2020) attempted to develop a model for Late Pleistocene to recent modification of the northern GOM coastal plain during Holocene transgression in order to evaluate the preservation potential of paleosurfaces within the study area. The study relied on existing subsurface data collected from numerous sources, including hazard and archaeology surveys conducted by the oil and gas industry to meet BOEM's regulatory requirements. Heinrich et al. (2020) identified several issues with how lease block hazard and archaeological surveys identify paleolandforms, which has significant implications for the identification of avoidance areas for the protection of potential archaeological resources. There is no common nomenclature for identified paleolandforms and other geomorphic structures. For example, the most common terms used are *paleochannel* and *channel*. The reevaluation of these features, however, identifies most of these features as either paleovalleys or channel belts. Both are significantly wider and more variable than inset paleochannels. The data are too fragmentary and inconsistent to determine the interrelationships between fluvial features. As this study did not have representative seismic data for each of the originally identified fluvial features, they could not be reinterpreted. Lastly, the features mapped in these surveys likely vary in age from Late Marine Isotope Stage (MIS) 5 (130-80 thousand years ago) to either late MIS 2 (Last Glacial Maximum) or early MIS 1 (Holocene), i.e., any features dating later than late MIS 2 (~20-15 thousand years ago) are too old to contain preserved archaeological deposits. Many, if not most, archaeological surveys identify areas of avoidance based solely on the presence of a preserved subsurface paleolandform feature, regardless of the type or age of said feature.

In terms of mapping submarine paleolandforms and potential paleolandscapes, Heinrich et al. (2020) made the recommendations below.

- Regional terminology should be standardized.
- There needs to be clear definition of, recognition of, and differentiation among paleovalleys, paleochannels, and channel belts.
- A type-seismic section for specific paleovalleys, paleochannels, and channel belts mapped for that block should be included in the report.
- Geophysical data should be submitted with block survey reports for BOEM analysis and development of regional geologic models from multiple block surveys and archiving for future or alternate uses such as sand resources identification.
- Geologic sampling to ground-truth geophysical data and absolute dating of potential paleolandscapes within fluvial valleys should be conducted using appropriate techniques.
- Block survey data (not just interpreted map products) should be applied to develop a regional geologic model and conceptual model for shelf evolution.
- When new surveys are conducted, BOEM should provide regional models to operators for edge matching with previous studies and context locally for their study area.
- BOEM should digitize and make readily available online the U.S. Geological Survey seismic lines of Suter and Berryhill Jr. (1985) and other regional surveys conducted by the U.S. Geological Survey and Landsat Ground Station that are preserved only as analog or paper forms.
- Uniform classification schemes, nomenclature, and recognition criteria for submerged landforms and potential paleolandscapes should be developed.

Finally, Heinrich et al. (2020) concluded that a better understanding is needed of the depositional and/or erosional response during marine transgression within valley estuarine systems to determine preservation potential of prehistoric landscapes within valley fill packages and recommended that BOEM's avoidance criteria should be developed based on a strong understanding of shelf and/or valley-fill evolution in response to sea-level rise. The results of this study demonstrate the possibility that many of the paleofluvial systems being avoided in the vicinity of the study area are far too old for potential human occupation.

The recent studies published by Evans (2016) and Heinrich et al. (2020) do not alter the conclusion of the 2018 GOM Supplemental EIS that potential impacts to cultural resources from impact-producing factors range from negligible to major. BOEM's archaeologists acknowledge the limitations of BOEM's recommended survey guidance identified by these recent studies and will consider their recommendations in more detail to determine if they are appropriate and feasible to incorporate into BOEM's resource management practices.

4.14.5 Conclusion

BOEM has reexamined the analysis for archaeological resources presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS with regard to the updated scenario provided in **Chapter 3** and based on the information presented above. No new information was discovered that would alter the impact conclusion for archaeological resources presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.15 Human Resources and Land Use (Including Environmental Justice)

4.15.1 Land Use and Coastal Infrastructure

4.15.1.1 Summary

BOEM has reexamined the analysis for land use and coastal infrastructure presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapters 4.15.1.4, 4.15.2.4, and 4.15.3.4**. No new information was discovered that would alter the impact conclusion for land use and coastal infrastructure presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of land use and coastal infrastructure, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.14.1 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.14.1 of the 2018 GOM Supplemental EIS. **Chapter 4.15.1.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 Supplemental EIS.

4.15.1.2 Analysis of Alternatives A-E Summary

A current snapshot of land use and coastal infrastructure in the GOM reveals a physically, culturally, and economically diverse landscape, with the petroleum industry playing a substantially larger role in some states (i.e., Texas and Louisiana) than in the rest of the GOM region. The counties and parishes along the Gulf Coast represent some of the most valuable coastline in the U.S., including miles of recreational beaches and an extended system of barrier islands. Land uses vary from urban centers with manufacturing and service industries to rural areas with farming, ranching, and hundreds of thousands of acres of wetlands and protected habitat. These counties and parishes vary in their histories and in the composition and economic activities of their respective local governments.

Oil and gas exploration, production, and development activities on the OCS are supported by an expansive onshore network of coastal infrastructure that includes hundreds of large and small companies. Routine operations associated with a proposed action are not expected to produce any major impacts to land use and coastal infrastructure because OCS oil- and gas-related activities are

supported by this long-lived, wide-ranging onshore network. Potential impacts from routine operations could range from **negligible** to **moderate**, depending on the location, scale, and type of activity. The impacts of reasonably foreseeable accidental events such as oil spills, chemical and drilling fluid spills, and vessel collisions are not likely to last long enough to adversely affect overall land use or coastal infrastructure in the analysis area and would therefore be **negligible** to **moderate**. The cumulative analysis includes impacts that could result from a lease sale combined with baseline conditions, all past, present, and future OCS oil- and gas-related lease sales and activities, as well as all past, present, and reasonably foreseeable future actions that are external to OCS oil- and gas-related activities. Activities relating to all past, present, and future OCS oil- and gas-related activities are expected to minimally affect the current land use of the analysis area because most subareas have standard land-use zoning requirements, strong industrial bases, and designated industrial parks. Non-OCS oil- and gas-related activities contribute substantially to the cumulative impacts on land use and coastal infrastructure, while the *incremental contribution* of a proposed action to cumulative impacts is expected to be ***minor***. Impact-level definitions (i.e., beneficial, negligible, minor, moderate, and major) specific to land use and coastal infrastructure can be found in Chapter 4.14.1 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

For any of the action alternatives (i.e., Alternatives A-D), the cumulative impacts on land use and coastal infrastructure could range from **beneficial** to **moderate** for OCS oil- and gas-related activities and from **beneficial** to **major** for non-OCS oil- and gas-related activities depending on the specifics of each situation, whether the impacts are measurable, how long the impacts would last, and the size of the affected geographic area as defined in Chapter 4.14.1 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Under Alternative E, cancellation of a single lease sale, the direct impacts as a result of a lease sale would be **none**, and there would be no incremental contribution of impacts to land use and coastal infrastructure beyond a temporary negative economic impact for the oil and gas industry and coastal states, such as Louisiana, that are more dependent on oil and gas revenues. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under this Alternative E. A full analysis of land use and coastal infrastructure can be found in Chapter 4.14.1 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.14.1 of the 2018 GOM Supplemental EIS.

4.15.1.3 Incomplete or Unavailable Information

BOEM has identified incomplete information regarding the potential impacts of coastal land loss on land use and coastal infrastructure. This incomplete information may be relevant to adverse impacts because it is not completely known how subsidence, sea-level rise, and erosion is affecting industry or what plans industry is making to mitigate current or future impacts. Because there are hundreds of large and small property-owning businesses spread across the coastal zone, which directly and indirectly support the offshore petroleum industry, the identity of these properties and the possibilities of losses due to subsidence, sea-level rise, and erosion cannot be completely determined and quantified at this time.

BOEM has employed reasonably accepted scientific methodologies to extrapolate from existing information on dredged material and other approaches used to mitigate for land loss in completing its analysis and formulating the conclusions presented here. For a more detailed discussion on deltaic land loss, refer to **Chapter 4.4.2** ("Coastal Barrier Beaches and Associated Dunes"). In the case of coastal ports, for example, dredged materials from navigation slips are used to fill in property and mitigation habitat areas for wildlife and to act as a barrier to protect ports from storm surges (Volz 2013). This example shows that, although BOEM does not possess a complete understanding of what industrial infrastructure improvements may occur, such as mitigation for land loss, industry would most likely mitigate as necessary to protect existing and growing infrastructure. With each passing year, the pressure increases to act and protect critical oil and gas infrastructure (Traywick 2016). Like any industrial infrastructure improvements, future adaptations would occur on an as-needed basis or as new technologies become available. Given that coastal infrastructure will continue to be subject to the impacts of coastal land loss and routine tropical storm activity, considerable motivation to protect existing infrastructure will continue; therefore, BOEM has determined that the information is not essential to a reasoned choice among alternatives. BOEM continues to monitor industry and its infrastructure footprint over time to document short- and long-term impacts of continued land loss.

4.15.1.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

BOEM has researched the availability of new information that may affect land use and coastal infrastructure, including Internet sources such as Federal and State agency websites, academic journals, and trade publications. The new information described below represents changes to the baseline affected environment and is relevant to the cumulative rather than to the routine and accidental impact analyses for land use and coastal infrastructure. This new information further supports BOEM's previous analyses and provides additional support for the cumulative analysis conclusion that non-OCS oil- and gas-related factors contribute substantially to the cumulative impacts on land use and coastal infrastructure. Therefore, the overall impact conclusions in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS remain unchanged.

The developments discussed in this paragraph are directly related to the longstanding onshore shale boom and are relevant to the cumulative impact analysis for land use and coastal infrastructure rather than analysis of impacts related to routine OCS oil- and gas-related operations. Also, these operations provide additional support for the conclusion that non-OCS oil- and gas-related factors contribute substantially to the cumulative impacts on land use and coastal infrastructure and that their long-term trends can be difficult to predict. Levels of oil exports have risen rapidly since the U.S. oil export ban was lifted, leading to plans for the expansion of existing *onshore* oil export terminals and the construction of new terminals as companies strive to meet foreign demand (Energy Information Administration 2018b; Ngai and Sims 2017). Some of these projects have faced obstacles with debates over how they may affect existing ports, such as the Port of Corpus Christi in Texas (Druzin 2018a), and other projects, such as the Mid-Barataria Sediment Diversion in Plaquemines Parish, Louisiana (Schleifstein 2018a). Increased foreign demand for U.S. oil also has resulted in plans for construction of additional *offshore* oil export terminals to load Very Large Crude Carriers (VLCC).

Existing ports and terminals are undergoing modifications, such as improving current infrastructure and widening canals to accommodate demand (Doyle 2018; Reuters 2018). Increased demand for natural gas exports and applications for permits to construct natural gas liquefaction plants are generally on the rise (FERC 2018a; 2018b; Magill 2017; WGNO 2016), though one gas-to-liquids plant proposed for Lakes Charles, Louisiana, has been abandoned as no longer economically viable (Griggs 2017). In 2017, a new small-capacity refinery came online in Corpus Christi, Texas (Energy Information Administration 2018a). A new pipeline landfall is planned in south Texas, originating in Texas State waters (Passut 2017), and a subsea pipeline is under construction between Texas and Mexico (Nagarin 2017; Offshore Technology 2017). Four pipelines are proposed in Louisiana to connect liquefied natural gas (LNG) facilities to existing pipelines (Office of National Marine Sanctuaries 2016).

Currently, the fate of many planned LNG projects is uncertain. A recent study (Energy Information Administration 2021f) finds that the future competitiveness of coastal Gulf of Mexico LNG exports would be sensitive to the price of oil. The study predicts a growing demand for United States LNG exports over the next 50 years with high petroleum prices but that, beyond 2025, if prices remain around $50 per barrel, no LNG facilities that are not currently planned would be undertaken. The buildup of additional LNG export facilities may or may not add substantially to the GOM's petroleum-related infrastructure. As current onshore pipeline capacity has decreased, more companies are transporting crude oil by rail and truck from the Permian Basin in Texas to Gulf Coast export terminals (Druzin 2018b).

In 2020, COVID-19 caused a world-wide economic slowdown that brought steep declines in demand for U.S. oil and gas products. By April 2020, in the face of the slowdown and such mitigation efforts as "stay at home" orders, U.S. consumption of petroleum products was 31 percent lower from the average values the months before. Demand had crashed to 1990s levels but appeared to be stabilizing (Energy Information Administration 2020b). In 2020, the COVID-19 pandemic also began negatively impacting land use and coastal infrastructure. These impacts are ongoing, widespread, and not completely understood because they are still unfolding. From the initial stay-at-home orders and business closures to the early re-openings that led to a surge in new cases and renewed public health restrictions to prevent the spread of the virus, the pandemic continues to disrupt daily living. As a consequence, the Nation is experiencing a severe economic downturn (Bureau of Economic Analysis 2020a) with historic unemployment (Bureau of Labor Statistics 2020) and serious impacts to the fiscal health of local and State governments, public services, housing, and energy markets (Energy Information Administration 2020b; Garnham 2020; McNichol and Leachman 2020; Pagano and McFarland 2020). The two main drivers of the dramatic and negative reversal in the energy markets included the COVID-19 pandemic, which caused a steep drop in energy demand, and the flooding of the market by feuding OPEC nations. These events are producing long-term structural changes in the oil and gas industry (Dismukes 2020). The effects of these disruptive events will continue to ripple throughout the economy and likely affect land use and coastal infrastructure in multiple ways. For example, unemployed persons may not be able to pay their rent, which means decreased revenues for landlords who need to pay their mortgages and make repairs to properties, leading to a greater likelihood of evictions for renters, foreclosures for the landlords, and increased likelihood of blight from

lack of property maintenance. Homeowners face the same issues, and these negative effects flow to lending institutions, local businesses, and local and State governments. Plans for land development or infrastructure expansion will necessarily shift or disappear. Property values in some areas may decline and public services will likely decrease. Experts are predicting long-term negative effects for the energy sector in Louisiana (Mosbrucker 2020), which likely holds true for other states with a large energy sector. At this point, we do not have a complete picture of all the effects related to the pandemic and commodity price collapse, but BOEM will monitor the situation as it continues to unfold.

Evidence was found of new developments that address the ongoing issue of incomplete or unavailable information related to coastal land loss. A transportation project to elevate Louisiana Highway 1 (LA 1), which connects Port Fourchon with the rest of the Nation, has moved into Phase 2E, which will improve and widen the elevated highway curve at Leeville, Louisiana, and extend LA 1 to the north (LA 1 Coalition 2018). Previously, analysts have noted that $100 billion of oil and gas infrastructure is under threat of inundation in coastal Louisiana (Traywick 2016). Since that analysis, studies have updated subsidence rates along much of coastal Louisiana, finding the rates to be higher than previously known (Nienhuis et al. 2017), and have identified communities and areas at higher risk of flooding and effective inundation under different sea-level rise scenarios, including large areas in Louisiana and Texas (Dahl et al. 2017; Spanger-Siegfried et al. 2017). The National Institute of Environmental Health Sciences (2014) found that more needs to be done to gain a better understanding of how environmental changes affect coastal communities and infrastructure, especially Gulf Coast energy infrastructure (Schleifstein 2018b). Particularly susceptible to storm damage and land loss, the State of Louisiana has invested over $800 million in projects to restore its barrier islands, and the State's 2017 Coastal Master Plan calls for an additional $1.5 billion over the next 50 years in storm protection and coastal restoration projects (Baurick 2018). The Fourth National Climate Assessment describes the many impacts of climate change to land use and coastal infrastructure, such as increasingly severe flooding, and identifies measures being taken or planned for the future to mitigate those negative effects (U.S. Global Change Research Program 2018). Extreme precipitation and flooding events are expected to increase in frequency (Scott 2019). BOEM will continue to monitor developments related to incomplete or unavailable information regarding the potential impacts of coastal land loss on land use and coastal infrastructure.

On September 14, 2021, Hurricane Nicholas made landfall 50 mi (80 km) south of Houston as a Category 1 hurricane, temporally shutting down the Colonial Pipeline (supplying natural gas to the East Coast) and closing the Houston Ship Canal for weeks. On August 29, 2021, Hurricane Ida made landfall near Port Fourchon as a Category 4 hurricane, shutting down an estimated 96 percent of OCS petroleum crude production, 94 percent of its natural gas production, and closing or damaging nine or more refineries. Flood control systems, much improved since Hurricane Katrina, protected the New Orleans urban area from Hurricane Ida's devastating flooding but failed to protect coastal and outlying areas. Hurricane Ida's infrastructure damages are substantial, and production was not expected to return to normal until October 2021. Infrastructure repairs are expected to take much longer (Energy Information Administration 2021c; Small 2021).

4.15.1.5 Conclusion

BOEM has reexamined the analysis for land use and coastal infrastructure presented in the 2017-2022 GOM Multisale EIS and 2108 GOM Supplemental EIS based on the new information presented above. No new information was discovered that would alter the impact conclusion for land use and coastal infrastructure presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.15.2 Economic Factors

4.15.2.1 Summary

BOEM has reexamined the analysis for economic factors presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented in **Chapter 4.15.2.4**. No new information was discovered that would alter the impact conclusion for economic factors presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. The analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of economic factors, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.14.2 of the 2017-2022 GOM Multisale EIS and Chapter 4.14.2 of the 2018 GOM Supplemental EIS. The following information is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

4.15.2.2 Analysis of Alternatives A-E Summary

Economic factors are factors that explain and quantify the human behaviors that determine the positive and negative impacts from the proposed alternatives. Chapter 4.14.2.1 of the 2017-2022 GOM Multisale EIS provides detailed economic and demographic data for Gulf of Mexico economic impact areas, provides background research regarding the offshore oil and gas industry, and presents data from the Office of Natural Resources' revenue regarding sales volumes, sales values, and revenues received from offshore oil and gas activities.

A lease sale (Alternatives A-D) would lead to **beneficial** impacts arising from industry expenditures, government revenues, corporate profits, and other market impacts. Some of these impacts would be concentrated along the Gulf Coast, while others would be widely distributed. A lease sale could also lead to negative economic impacts (**negligible** to **minor**) arising from accidental events and disruptions to other industries. There would be some differences in economic impacts among the alternatives (i.e., Alternatives A-D), corresponding to the differences in the scales and distributions of likely activities. Chapter 4.14.2 of the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS presents detailed estimates of the economic impacts of Alternatives A-D. The alternatives should be viewed in light of the OCS Oil and Gas Program, as well the numerous forces that can affect energy

markets and the overall economy. Most of the *incremental contribution* of cumulative impacts from a proposed action on economic impacts are forecast to be ***beneficial***, although there would be some ***minor*** adverse impacts. Alternative E, cancellation of a single lease sale, would negatively impact firms and employees that depend on recurring leases; therefore, the impacts of Alternative E would be **negligible** to **minor**, with some partially offsetting **beneficial** impacts. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E. A full analysis of economic factors can be found in Chapter 4.14.2 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.14.2 of the 2018 GOM Supplemental EIS.

4.15.2.3 Incomplete or Unavailable Information

BOEM has identified incomplete information regarding the onshore geographic distributions of economic impacts arising from the OCS Oil and Gas Program, which would allow BOEM to better estimate the impacts from routine activities, accidental events, and cumulative impacts. This information is difficult to obtain since most data sources do not adequately differentiate between onshore and offshore oil and gas activities. In addition, standard data sources do not trace revenue and corporate profit streams to ultimate expenditures. BOEM used reasonably accepted scientific methodologies to extrapolate from existing information in completing the relevant analysis and formulating the conclusions presented here. For example, BOEM used the MAG-PLAN Model to estimate the impacts of the alternatives and OCS Oil and Gas Program. Elliott et al. (2020) suggest that the COVID-19 post-pandemic era may change how we conduct environmental research related to the green transition, pricing carbon externalities, and the role of uncertainty. BOEM may not fully understand the implications of raising royalty rates on BOEM's lease sales to offset future climate costs, but BOEM will continue to develop the approach to refine economic impacts estimation methodologies of different alternative scenarios. The economic impacts arising from the OCS Oil and Gas Program are generally positive, not adverse. Therefore, the incomplete or unavailable information, while relevant, is not essential to a reasoned choice among alternatives.

4.15.2.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

New information was found for economic factors after searching relevant literature. BOEM searched various Internet sources and standard sources of economic data. This new information further supports the impact conclusions for economic factors presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Therefore, the analysis and potential impacts detailed and summarized in those NEPA documents still apply for GOM Lease Sales 259 and 261.

BOEM aggregates 133 counties and parishes along the Gulf of Mexico region into 23 economic impact areas based on economic and demographic similarities among counties and parishes (Varnado and Fannin 2018). BOEM also developed the Cumulative Impacts Model (CIM) and Lifecycle Impacts Model (LCIM), which both build upon previous economic and financial analysis frameworks developed by BOEM, to enhance its capacity for assessing the economic and fiscal impacts of OCS oil- and gas-related activities in the Gulf of Mexico (Price et al. 2020; USDOI Office of Policy Analysis 2021). The Office of Policy Analysis released the *U.S. Department of the Interior:*

Economic Report, FY 2019 (USDOI Office of Policy Analysis 2021). This report estimates that U.S. offshore oil and gas activities supported 270,600 jobs and $31.78 billion in domestic value-added in Fiscal Year 2019. BOEM's regularly updated "Fair Market Value" webpage describes the rental rates, royalty rates, and other terms associated with Gulf of Mexico leases (BOEM 2021d). Some OCS oil- and gas-related activities are subject to partial or full royalty exemptions. BOEM's "Royalty Relief Information" webpage provides more information regarding BOEM's royalty relief programs (BOEM 2020c).

The Energy Information Administration's *Annual Energy Outlook 2021* presents modeled forecasts of various energy market variables through 2050 (Energy Information Administration 2021b). The Energy Information Administration's *Short-term Energy Outlook* provides monthly short-term (2-year) forecasts of energy market variables and analyses of recent energy market developments (Energy Information Administration 2021e). The GOM offshore production is expected to be sustained despite current market conditions, which is partially a result of deepwater discoveries that occurred during exploration before the 2015 price collapse. Committed deepwater GOM developments have continued according to schedule, while some nearshore operators have had to recently shut-in production (Redden 2020). Offshore oil and gas production are generally slow to respond to changes in energy prices since offshore developments take years to be designed, approved, and developed. Offshore Magazine (2021) provides a monthly update of developments in the offshore oil and gas industry, including analysis of recent industry reports focused on the impacts of the 2020 oil price crash and the COVID-19 pandemic. Now, demand is returning as the U.S., China, and other parts of the world reopen for business as the impact from the pandemic diminishes.

The NOAA supplies updated data estimates for employment, wages, and the gross domestic product for the six economic sectors that depended on the Gulf of Mexico in 2018 (NOAA Office for Coastal Management 2021). These sectors are marine construction, mineral extraction, tourism and recreation, living resources, ship and boat building, and marine transportation. Dismukes and Upton (2020) provide additional information regarding issues facing the Gulf of Mexico region's energy economy. This report also provides impacts of COVID-19, forecasts regarding energy prices, energy production, capital expenditures, LNG development, and overall energy employment. Kaiser and Narra (2018) provide a robust overview of GOM oil and gas infrastructure inventories and trends, as well as an operating cost data analysis and a decommissioning forecast for shallow and deepwater regions. Recent changes in the U.S. tax law codified in the Tax Cuts and Jobs Act of 2017 (U.S. Congress 2017) reduced the corporate income tax rate and changed the rate structure, which would likely contribute positively to corporate profits. Given the global decline in economic activity due to COVID-19, overall world-wide oil and gas activity in 2020 fell more than expected, and it did in the GOM region as well. Activities reached mid-year lows but, since then, oil and gas prices have stabilized and reached to the 2018 level (Dismukes and Upton 2020). The year 2021 saw a significant surge in oil prices because of the U.S. and world market's reopening. Petroleum demand is driven primarily by the transportation sector, and demand and prices are projected to slowly increase over the next 3 years (Dismukes and Upton 2020). The short-term energy outlook remains uncertain due to ongoing recovery from the COVID-19 pandemic (Energy Information Administration 2021e). Gulf Coast oil production is anticipated to decline from its high of 8.0 million barrels per day in 2019 to

7.6 million barrels per day in 2023. Thus, both U.S. and Gulf Coast oil production are anticipated to decline over the next 3 years (Dismukes and Upton 2020).

On January 27, 2021, Climate Day, President Biden issued an Executive Order called "Tackling the Climate Crisis at Home and Abroad" to address climate change policy that included a moratorium on new oil and gas lease permits on Federal lands and waters. This Executive Order directs to achieve net-zero carbon emissions by 2050 and establishes the White House Office of Domestic Climate Policy and National Climate Task Force consisting of Cabinet-level officials and chaired by the national climate advisor (*Federal Register* 2021f). However, this policy of pausing the sale of new oil and gas leases was blocked by a Federal judge in Louisiana (Partlow and Eilperin 2021), and OCS oil and gas leasing has begun again. The administration also finalized a new target to regulate greenhouse gases by reducing emissions 50 percent to 52 percent below 2005 levels by 2030 (Friedman 2021). For more information on life cycle greenhouse gas emissions, refer to **Chapter 4.0.2**, Issues of Programmatic Concern.

4.15.2.5 Conclusion

BOEM has reexamined the analysis for economic factors presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for economic factors presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.15.3 Social Factors (Including Environmental Justice)

4.15.3.1 Summary

BOEM has reexamined the analysis for social factors presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. No new information was discovered that would alter the impact conclusion for social factors presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. Further, the analysis and potential impacts detailed and summarized in those documents still apply for GOM Lease Sales 259 and 261 for Alternatives A-E.

A detailed description of social factors, along with the full analyses of the potential impacts of routine activities, accidental events, and cumulative impacts associated with a proposed action are presented in Chapter 4.14.3 of the 2017-2022 GOM Multisale EIS and summarized in Chapter 4.14.3 of the 2018 GOM Supplemental EIS. **Chapter 4.15.3.2** is a summary of the resource description and impact analysis incorporated from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. An environmental justice determination follows in **Chapter 4.15.3.2**.

4.15.3.2 Analysis of Alternatives A-E Summary

The petroleum industry as a whole in the Gulf of Mexico region has matured over several decades and is well-developed, expansive, extensive, and deeply intertwined in the regional communities and economies of the five coastal states, i.e., Texas, Louisiana, Mississippi, Alabama,

and Florida. Potential social impacts resulting from a proposed action would occur within the larger socioeconomic context of the GOM region. The affected environment of the analysis area is quite large geographically and in terms of population (133 counties and parishes with over 22.7 million residents). This long-lived, well-developed, and extensive industry functions within a much larger context, a socioeconomic framework that weaves through the region in a complex, inter-connected grid-like manner. Nothing occurs as an isolated event but rather results from and simultaneously triggers other events, all of which are experienced at varying degrees of negative or positive impact. The impacts from routine activities related to a proposed action are expected to be **negligible** to **moderate**, widely distributed, and to have limited impact because of the existing extensive and widespread support system for the petroleum industry and its associated labor force. Outside of a low-probability catastrophic oil spill, which is not reasonably foreseeable and not part of a proposed action, any potential accidental events are not likely to be of sufficient scale or duration to have adverse and disproportionate long-term impacts for people and communities in the analysis area and would therefore range from **negligible** to **moderate**. In the cumulative analysis, impacts from OCS oil- and gas-related activities would range from **beneficial** to **moderate**. Non-OCS oil- and gas-related factors, which include all human activities, natural events, and processes, actually contribute more to cumulative impacts than do factors related to OCS oil- and gas-related activities alone because of the analysis area's complex socioeconomic framework, and these result in **beneficial** to **major** impacts. The *incremental contribution* of a proposed action to cumulative impacts would be ***minor***. Alternative E would result in the cancellation of a single lease sale and, thus, the overall incremental impacts as a result of Alternative E would be **none** because new impacts would be avoided entirely. Cumulative impacts of current and past activities (OCS oil- and gas-related and non-OCS oil- and gas-related), however, would continue to occur under Alternative E.

Coastal populations experience cumulative impacts that occur from all human activities and natural processes and events. The cumulative analysis includes impacts that could result from a lease sale combined with baseline conditions, all past, present, and future OCS oil- and gas-related lease sales and activities, as well as all past, present, and reasonably foreseeable future actions that are external to OCS oil- and gas-related activities. Within this divided analytical framework of OCS oil- and gas-related and non-OCS oil- and gas-related impacts, the largest quantity of impact-producing factors for coastal populations occur as non-OCS oil- and gas-related impacts because OCS oil- and gas-related activities form a very small part of the greater, complex socioeconomic structure in the GOM. The *incremental contribution* of a proposed action to cumulative impacts of a single lease sale would be ***minor*** for communities and people in the Gulf Coast region.

Environmental Justice Determination: The oil and gas industry in the GOM region is expansive and long-lived, developing over 80 decades with substantial infrastructure in place to support both onshore and offshore activities. BOEM's scenario estimates call for 0-1 new gas processing plant and 0-1 new pipeline landfall over the 50-year life of a single proposed action. Impacts to GOM populations from a proposed action would be immeasurably small for environmental justice since these low-income and minority communities are located onshore and distant from Federal OCS oil- and gas-related activities. Also, since these vulnerable populations are located within the larger context of onshore and State-regulated nearshore oil and gas activities that are connected to downstream infrastructure

over which BOEM has no regulatory authority, BOEM has determined that a proposed action would not produce environmental justice impacts in the GOM region. A full analysis of social factors and an environmental justice determination can be found in Chapter 4.14.3 of the 2017-2022 GOM Multisale EIS, which is summarized and updated in Chapter 4.14.3 of the 2018 GOM Supplemental EIS.

4.15.3.3 Incomplete or Unavailable Information

BOEM has identified unavailable information that is relevant to people and communities regarding the impacts of the *Deepwater Horizon* explosion, oil spill, and response. This information cannot be obtained because long-term health impact studies, subsistence studies, and the NRDA restoration process are ongoing, and data from these efforts would be unavailable and unobtainable for some time. In order to fill this data gap, BOEM has used existing information and reasonably accepted scientific methodologies to extrapolate from available information in completing the relevant analysis, including information that has been released after the *Deepwater Horizon* explosion, oil spill, and response and studies of past oil spills, which indicate that a low-probability, catastrophic oil spill, which is not part of a lease sale and not reasonably expected to occur, may have adverse impacts on residents in GOM coastal communities. Research into possible long-term health impacts of the *Deepwater Horizon* explosion, oil spill, and response continues (Abramson et al. 2010; National Institute of Environmental Health Sciences 2014; Substance Abuse and Mental Health Services Administration and CDC 2013). Because long-term health impacts to coastal populations are unknown, this information may be relevant to the evaluation of impacts from the *Deepwater Horizon* explosion, oil spill, and response; therefore, BOEM continues to seek additional information as it becomes available and bases the previous analysis on the best information currently available. Although long-term health impacts to people and communities may be relevant to this analysis, BOEM has determined that the incomplete or unavailable information is not essential to a reasoned choice among alternatives based on the information discussed above.

4.15.3.4 New Information Available Since Publication of the 2018 GOM Supplemental EIS

Various printed and Internet sources (including peer-reviewed research publications, JSTOR, Google Scholar, WorldCat; Nola.com; AL.com; National Academies of Sciences, U.S. Department of Health and Human Services, National Institutes of Health; USEPA; USDOC, Bureau of the Census and Bureau of Labor Statistics; USDHS, Federal Emergency Management Agency; USDOE, Energy Information Administration; RestoreTheGulf.gov website; *Deepwater Horizon* Oil Spill Portal; Louisiana Department of Environmental Quality; Mississippi Department of Environmental Quality; Alabama Department of Environmental Management; State of Florida Department of Environmental Protection; Louisiana Recovery Authority; Louisiana Office of Community Development; Gulf Coast Ecosystem Restoration Council; Alabama Gulf Coast Recovery Council; RESTORE Mississippi; RESTORE the Texas Coast; Florida Department of Environmental Protection; Port Houston; The Greater Lafourche Port Commission; LA1 Coalition; Reuters; Rigzone; Marine Ecosystems and Management (MEAM) Newsletter; *Offshore Magazine*; *Workboat*; and *Oil and Gas Journal*) were examined to assess recent information regarding social factors that may be pertinent to a proposed action. New research has been published concerning the current and projected future impacts of coastal land loss, subsidence, climate change, and sea-level rise on communities in southern

Louisiana, the Gulf of Mexico, and the U.S. more generally (Colten et al. 2018; Dahl et al. 2017; Hardy et al. 2018; Simms 2017); marginalized communities in southern Louisiana (Colten et al. 2018; Hemmerling and Colten 2017); and the health impacts of the *Deepwater Horizon* oil spill (Croisant et al. 2017; Gam et al. 2018; Kwok et al. 2017; McGowan et al. 2017; Peters et al. 2017; Rung et al. 2016; Rung et al. 2017; Strelitz et al. 2018). While the information continues to expand on BOEM's knowledge of these issues, none of the new information that would change BOEM's conclusions since publication of the 2018 GOM Supplemental EIS.

New information was found for social factors (including environmental justice) after searching relevant sources. Sources checked for new information include the following: JSTOR; Google Scholar; WorldCat; Nola.com; AL.com; National Academies of Sciences; USEPA; U.S. Department of Energy, Energy Information Administration; U.S. Department of Commerce, Census Bureau; Louisiana Department of Environmental Quality; Louisiana's CPRA; Louisiana Office of Community Development; Gulf Coast Ecosystem Restoration Council; Alabama Gulf Coast Recovery Council; RESTORE Mississippi; RESTORE the Texas Coast; Florida Department of Environmental Protection; Port Houston; The Greater Lafourche Port Commission; Marine Ecosystems and Management (MEAM) Newsletter; *Offshore Magazine*; *Workboat*; *Oil & Gas Journal*; *Deepwater Horizon* Oil Spill Portal; and *Deepwater Horizon* Project Tracker. The new information discovered and described below represents changes to the baseline affected environment and catastrophic oil-spill impacts (which are not reasonably foreseeable) and is relevant to the cumulative and catastrophic oil-spill impacts instead of the routine impact analysis for social factors (including environmental justice). Because this new information serves to supplement our existing baseline and cumulative analyses, the overall impact conclusions in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS remain unchanged.

Since preparation of the 2018 GOM Supplemental EIS, a considerable amount of research has been published concerning the current and projected future impacts of coastal land loss, subsidence, sea-level rise, and climate change on communities in southern Louisiana, the Gulf Coast, and the U.S. more generally. Also published are works on marginalized communities and disaster or disaster prevention in southern Louisiana and Houston, on planning and flooding in Louisiana, and on the impacts of the opening of the Bonnet Carré spillway on coastal Mississippi, new research on the impacts of the *Deepwater Horizon* explosion and oil spill, and information on the impacts of the COVID-19 pandemic and the subsequent oil price drop of early 2020.

Dahl et al. (2017) analyzed the rates of socioeconomic vulnerability and three projections of sea-level rise to identify communities that, without intervention, would experience effective inundation (inundations regular enough to disrupt normal functioning) and would have a high percentage of residents lacking the means to respond. They concluded that most of the south Louisiana and east Texas coasts would fit into this category by 2035 in the intermediate low scenario. In the intermediate high scenario, additional socially vulnerable communities in central Texas, southern Louisiana, eastern Mississippi, western Alabama, and the Gulf Coast of Florida would experience effective inundation. Hauer (2017) predicts that, by 2100 and in the absence of adaptation, Florida and Louisiana are the U.S. states likely to lose the most population from sea-level rise-induced migration

(2.5 million and 0.5 million, respectively), with Texas likely to gain the most population (nearly 1.5 million). This kind of population movement would have significant impacts on the coastal communities and how they interact with the offshore oil and gas industry by altering community function and changing the distribution of populations, markets, and available labor.

Hemmerling and Colten (2017) identified potential geographic and demographic impacts of OCS oil- and gas-related hazards on minority and low-income populations in three coastal Louisiana parishes using GIS techniques to integrate locations of OCS oil- and gas-related activities, census data, and transportation data from the early 2000s. The study considered the locations of residences and key subsistence resources. The authors concluded that there was very little evidence of systematic environmental injustice in the siting procedures of various oil-related industries. In most cases, the demographic makeup of the community changed after the facilities were constructed, either increasing or reducing the percentage of minorities in the area. The authors noted environmental justice concerns, especially ensuring residents' access to accurate and up-to-date data about neighborhood and environmental health risks for informed decisionmaking about their residence, subsistence, and cultural activities. Hemmerling et al. (2020a) also examined the relationship between the oil and gas industry and communities, noting that, while it has positive economic impacts, it has also increased community vulnerability to economic fluctuations. Hemmerling et al. (2021) examined 30 years of changing trends in exposure to risk in Louisiana's coastal zone. They considered the full range of petroleum-related industrial infrastructure: shipbuilding and repair yards; onshore production and storage facilities; gas processing plants; refineries and petrochemical plants; and gas and petroleum pipelines to name several. Hemmerling et al. (2021) find that, at the beginning of the period they examined, there was a general toward trend toward diminishing levels of risk exposure in coastal Louisiana and other rural areas. However, in the coastal zone, this trend reverses, and hazard exposures intensify as the offshore petroleum industry begins to intensify, and this wider range of upstream and downstream industry industrial activities began to concentrate in the area. The authors note that this has disproportionately impacted Native Americans and Asians living on the coast. In recent years, Louisiana has experienced increased releases of toxic chemicals from petrochemical plants, increasing the hazards to which nearby communities are exposed (Schleifstein 2019a). The State of Louisiana, Department of Environmental Quality's budget and staffing have also been significantly reduced, raising questions about the agency's ability to enforce environmental regulations (Schleifstein 2019b). Louisiana is additionally facing increasing fiscal responsibility to plug growing numbers of wells abandoned by bankrupt oil and gas companies, a situation worsened by a State agency in charge of regulating the oil and gas industry that has not fulfilled its legal obligations (Schleifstein 2020).

Research continues on coastal Louisiana communities' relationship with climate change, land loss, coastal restoration, and related processes. Colten et al. (2018) and Simms (2017) use interviews with coastal Louisiana residents to explore migration decisions in the face of coastal land loss and restoration efforts. Colten et al. (2018) explain that, while mobility was a key practice after hurricanes and oil spills in the past, those were different economic, social, and ecological circumstances. Residents currently resisting migration, especially forced migration in the face of large-scale coastal restoration projects, do so for multiple reasons, including their histories of traumatic relocations, their

attachment to place, economic exigencies, and in protest of Louisiana's history of discriminating against disadvantaged populations and rural areas in its protection and restoration decisions. The authors noted that the State has, at the time of publication, no plan to work with communities impacted by coastal restoration and that, as people leave, the conditions will continue to deteriorate for those who stay. Simms (2017) emphasizes the livelihood, cultural, and social connections to place, including practices that increase resilience in disaster, which could be destroyed in forced or unplanned migrations. At the time, policy discussions did not currently take these practices into account, which could likely have detrimental effects on the populations and cultures of southern Louisiana. Colten (2019) details how human adaptation to climate change in southern Louisiana has been disjointed and focused on short-term solutions, leading to poor adaptation at the larger scale and longer term. Similarly, in Louisiana, planning for flooding often rests at the level of local community organizations that can favor development, regardless of flood risk, leading to increasingly costly and destructive flood events (Colten and Grismore 2018).

In recognition of the challenges faced in southern Louisiana and the need for holistic, community-based adaptation and risk planning, LA SAFE conducted a series of community meetings in coastal communities and combined the results with scientific data on expected coastal changes and planning expertise to produce a compilation of community-based adaptation strategies (Louisiana's Strategic Adaptations for Future Environments 2019). Research on coastal planning in Louisiana found that participatory modeling can be used successfully as a tool to incorporate traditional ecological knowledge in coastal restoration planning and as a way to increase participation from local residents and build their trust in the State, its agents, and the process (Hemmerling et al. 2019). Research with a State-recognized Tribe in Terrebonne Parish, Louisiana, found that Tribal communities are particularly susceptible to harms from environmental change because the environment is connected to cultural knowledge tied to health and well-being, and separation from or alteration of that environment can therefore threaten the knowledge and its contribution to health and well-being (Billiot et al. 2019). The authors suggest that this is further evidence that marginalized communities or communities that rely more closely on the land will be more susceptible to climate change and its impacts. In Louisiana, coastal planning has become increasingly centralized and science based. However, that approach ignores histories of discrimination and inequity and comes at a cost to small rural communities and their subsistence, minority, and low-income residents. Planning could be improved with the incorporation of additional safeguards, participation, and local knowledge (Hemmerling et al. 2020b).

Climate change and its impacts and its anticipated impacts have been widely studied. The Fourth National Climate Assessment (U.S. Global Change Research Program 2018) emphasizes that climate change brings new risks to communities but that the impacts are unevenly distributed. Already vulnerable groups are more likely to feel negative impacts. Indigenous peoples are among those groups with an increased likelihood of experiencing negative impacts, including impacts to their livelihoods and economies, and physical, mental, and indigenous values-based health. Attempts at adaptation may be blocked by preexisting institutional barriers and a lack of published information on these resources. Ongoing attempts to develop Tribal sovereignty and cultural and language revitalization may be particularly threatened by climate change (Jantarasami et al. 2018). Hardy et al.

(2018) noted that communities face varied and varying exposure to and impacts from climate change due to how their dynamic social and economic situations do or do not make them vulnerable to these changes. Beyond the physical characteristics of place, they identify four social and economic factors that influence community vulnerability to climate change, i.e., specifically, access to resources, culture, governance, and information. They emphasized that, to be successful, attempts to reduce or understand vulnerability to a given hazard must consider how these four factors interact with exposure, sensitivity, and adaptive capacity. In a study of residential property in Florida and risk from climate change, the authors found that Florida is at risk of increased flooding and property devaluation related to climate change impacts. These risks are unevenly distributed, and five of the nine counties expected to see the most devaluation are along the Gulf Coast. Additionally, all of the counties expected to see the highest percentage of homes exposed to flooding are all along the Gulf Coast (Woetzel et al. 2020).

Research is ongoing on Asian-American communities in the Gulf Coast region. Schewe et al. (2019) analyzed participation of Vietnamese American fishers on the U.S. Gulf Coast in collaborative resource management of commercial fisheries. They found that mistrust, language barriers, and the use of digital technologies by management agencies limit opportunities for participation by community members but that citizen-science, when well designed, can facilitate community engagement. DeYoung et al. (2019) studied well-being and disaster preparedness among individuals in Cambodian and Laotian immigrant communities along the Alabama, Mississippi, Florida, and Louisiana coasts. They found that these communities have unique vulnerabilities tied to their histories and composition, with elders being particularly vulnerable; the sense of community was positively correlate with a sense of wellbeing; and confidence in preparedness, the ability to cope with a financial crisis, and trust in local government disaster response were all positively correlated with preparedness.

Research in Houston indicates that minorities and individuals with disabilities have disproportionately greater exposure to environmental hazards (Chakraborty et al. 2019) and lesser access to environmental benefits, although the latter has seen some improvement over time due to shifting residence patterns (Elliott et al. 2019b). Flooding from Hurricane Harvey disproportionately impacted minority and low socioeconomic-status households (Collins et al. 2019). During Hurricane Harvey, those who engaged in pre-storm mitigation at their homes experienced faster recovery and suffered fewer health and stress-related consequences (Grineski et al. 2019). The Houston-Galveston area, however, does not have sufficient shelter capacity to serve residents with housing and transportation needs (Karaye et al. 2019). Baer and her co-authors investigated attitudes towards hurricane evacuation in Galveston, Texas, reporting that people chose not to evacuate either because they did not believe the reports of the potential dangers or they understood the reports and deemed evacuation more hazardous (Baer et al. 2019). The Harvey Data Project (Civis Analytics et al. 2019), a data collection and analysis project, provides details on the location and scale of Hurricane Harvey damage in Houston and develops a new methodology for understanding storm damage that the city intends to use in recovery from future flood events. This report notes that 56 percent of households directly impacted by Hurricane Harvey flooding were not in a FEMA flood zone; that the impacts were very unevenly distributed, resulting in highly at-risk areas for recovery; and that official techniques significantly underestimate damage, particularly damage suffered by more vulnerable populations.

The Mississippi River experienced a historic high-water event during 2019. Due to the high water, in 2019, the U.S. Army, Corps of Engineers opened the Bonnet Carré spillway twice, for a total of 123 days for both historic events (USACE 2019). These openings released trillions of gallons of fresh water into Lake Pontchartrain and, from there, the Mississippi Sound, creating algae blooms, closing all the Mississippi beaches and some additional waters to swimming and fishing, and killing dolphins. This persisted throughout the summer, disrupting livelihoods and tourism, and raising fears of impacts similar to the *Deepwater Horizon* oil spill (Lee 2019; Sharp 2019; Weatherly 2019b). The waters were reopened in October 2019, and in December 2019, the Mississippi Secretary of State sued the U.S. Army Corps of Engineers and the Mississippi River Commission for their operation of the flood control structures on the Mississippi River (Amy 2019).

Ongoing research on the social impacts of the *Deepwater Horizon* oil spill indicates that the recovery of fishermen has been uneven, full recovery has not yet been attained, and the coastal fishing communities in Louisiana have been faced with the most lasting negative impacts (Halmo et al. 2019). Research on coastal restoration activities following the *Deepwater Horizon* oil spill indicates that coastal restoration, the path a State was on before the catastrophe, influences how restoration will be conducted, leading to variability in processes and projects undertaken (Austin and Phaneuf 2020). Research is ongoing on the health impacts of the *Deepwater Horizon* oil spill (Crossett et al. 2013; Gam et al. 2018; Kwok et al. 2017; McGowan et al. 2017; Nugent et al. 2019; Peters et al. 2017; Rung et al. 2016; 2017; 2019; Strelitz et al. 2018). New evidence indicates that exposure to dispersants increased the chance of neurological symptoms among U.S. Coast Guard spill responders (Krishnamurthy et al. 2019).

During winter 2019-2020, a novel coronavirus and associated disease, COVID-19, originated in Wuhan Province, China. It quickly spread around the globe, attaining pandemic proportions by March 11, 2020, and a national state of emergency in the U.S. was declared on March 13, 2020 (Taylor 2020). The five Gulf Coast States or jurisdictions within them declared stay-at-home orders and some declared mandatory quarantine periods for visitors. Information on this situation is shifting rapidly, as are the resources where the information is available. During the pandemic, information was available on the CDC website (CDC 2021a). Public health data indicate that non-Hispanic black persons, Hispanics and Latinos, and American Indians/Alaska Natives experience higher rates of infection, severe cases, and death than non-Hispanic whites (CDC 2020). Early research has demonstrated that exposure to fine particle air pollution is associated with increases of death rate from COVID-19 (Wu et al. 2020). As COVID-19 spread and travel and industry slowed, first in China and then around the globe, demand for oil fell and an oil war between Saudi Arabia and Russia kept production high, leading oil prices to fall precipitously over spring 2020 (Stickney 2020). The appearance of COVID-19 on oil platforms in the Gulf of Mexico by April 8, 2020, has led to increased questions about how the industry will face this coupled pandemic and oil price collapse (Sneath 2020). How this complex, multifaceted situation will continue to develop is unknown, but it will likely have diverse, long-lasting impacts on the five Gulf Coast States and has the potential to alter baseline conditions. BOEM will continue to monitor the situation and seek the best information available on the impacts of the COVID-19 pandemic.

4.15.3.5 Conclusion

BOEM has reexamined the analysis for social factors presented in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS based on the new information presented above. No new information was discovered that would alter the impact conclusion for social factors presented in those documents, and the analysis and potential impacts detailed in the 2017-2022 GOM Multisale EIS and summarized in the 2018 GOM Supplemental EIS still apply for GOM Lease Sales 259 and 261.

4.16 Unavoidable Adverse Impacts of a Proposed Action

Unavoidable adverse impacts associated with a proposed action are expected to be primarily short term and localized in nature and are summarized below. All OCS oil- and gas-related activities involve temporary and exclusive use of relatively small areas of the OCS over the lifetimes of specific projects. Lifetimes for these activities can be days, as in the case of seismic surveys, or decades, as in the case of a production structure or pipeline. No activities in the OCS Oil and Gas Program involve the permanent or temporary use or "taking" of large areas of the OCS. Cumulatively, however, a multitude of individual projects results in a major use of OCS space. Where feasible, mitigation measures (**Chapter 2.3.3**) are applied to reduce the impacts of a proposed action. Unavoidable adverse impacts have been identified for many of the resources described in this chapter and are summarized below. For a more complete description of unavoidable adverse impacts, refer to the 2017-2022 GOM Multisale EIS.

Air Quality: Unavoidable short-term impacts on air quality could occur through offshore engine combustion, spill events (evaporation and volatilization of the lighter components of crude oil), and spill-response activities (combustion from surface burning and aerial spraying of dispersant chemicals). Additionally, adverse impacts could last the life of the project since hydrocarbon production is inherently a source of pollutants that can be mitigated but not eliminated.

Greenhouse Gas Emissions: Unavoidable impacts to the climate could occur through emissions related to the life cycle of the produced hydrocarbons. The contribution of the greenhouse gases from this proposed action could add to the global budget and contribute to global climate change.

Water Quality, Offshore: Routine offshore operations would cause some unavoidable adverse impacts to varying degrees on the quality of the surrounding water. Drilling, construction, overboard discharges of drilling mud and cuttings, and pipelaying activities would cause an increase in the turbidity of the affected waters. Accidental spills from platforms, spill-response activities, and the discharge of produced waters could result in increases of hydrocarbon, trace metal, and chemical concentrations in the water column in the vicinity of the platforms.

Water Quality, Onshore: Unavoidable impacts to onshore water quality would occur as a result of discharges such as runoff and effluent discharges from existing onshore infrastructure and vessel

traffic (i.e., low-quantity oil leakage, treated sanitary and domestic waste, bilge water, and contaminants known to exist in ship paints).

Coastal Habitats, Wetlands: If an oil spill contacts coastal wetlands, adverse impacts could be high in localized areas. Some unavoidable impacts could occur during pipeline and other related coastal construction, but others could result from dredging, wake erosion, and other secondary impacts related to channel use and maintenance as a result of a proposed action.

Coastal Habitats, Beaches and Barrier Islands: Oil spills and response activities could result in adverse impacts if the sand is removed and not replaced, and a beach could experience several years of small surface residue balls (also called tarballs) washing ashore over time, causing an aesthetic impact.

Offshore Biological Habitats: Unavoidable adverse impacts would take place if an oil spill occurred and contacted offshore biological habitats, such as *Sargassum* at the surface or benthic habitats on the bottom. There could be some adverse impacts on organisms contacted by oil, dispersant chemicals, or emulsions of dispersed oil droplets and dispersant chemicals that, at this time, are not completely understood, particularly in subsurface environments.

Fish and Invertebrate Resources: Unavoidable adverse impacts from routine operations would take place from discharges from vessels and platforms. If an oil spill occurs, the oil, dispersant chemicals, or emulsions of oil droplets and dispersant chemicals could temporarily displace mobile fish species on a population or local scale. There could also be impacts on prey and sublethal impacts on fish.

Birds: Unavoidable adverse impacts from routine operations on birds could result from noise, helicopter and OCS service-vessel traffic, coastal facility and platform lighting, and floating trash and debris. Oil spills and oil-spill cleanup activities could also affect birds and their prey species.

Protected Species, Marine Mammals and Sea Turtles: Unavoidable adverse impacts from routine operations could occur from seismic surveys, water quality and habitat degradation, helicopter disturbance, vessel collision, and discarded trash and debris. An oil spill could temporarily degrade habitat if spilled oil, dispersant chemicals, or emulsions of dispersed oil droplets and dispersant chemicals contact free-ranging individuals or groups, calving grounds, or nesting sites.

Protected Species, Beach Mice, Birds, and Corals: Unavoidable loss of individuals that are ESA-listed species may occur after an oil spill from the acute impact of being oiled or the chronic impact of oil having eliminated, reduced, or rendered suboptimal the food species upon which they were dependent.

Commercial Fisheries and Recreational Fishing: Unavoidable adverse impacts from routine operations are loss of open ocean or bottom areas desired for fishing, loss of gear from bottom obstructions, or fishery closures due to an oil spill.

Recreational Resources: Unavoidable adverse impacts from routine operations may result in the accidental loss overboard of some floatable debris that may eventually come ashore on frequented recreational beaches. An oil spill could make landfall on recreational resources, leading to local or regional economic losses and stigma effects, causing potential users to avoid the area after acute impacts have been removed.

Archaeological Resources: Unavoidable adverse impacts from routine operations could lead to the loss of unique or significant archaeological information if unrecognized at the time an area is disturbed.

Economic and Social Factors: Unavoidable adverse impacts from routine operations follow trends in supply and demand based on the commodity prices for oil, gas, and refined hydrocarbon products. An oil spill could cause temporary increases in economic activity associated with spill-response activity; however, this increased economic activity could be offset by temporary work stoppages that are associated with spill-cause investigations and would involve a transfer or displacement of demand to different skill sets.

4.17 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible or irretrievable commitment of resources refers to impacts or losses to resources that cannot be reversed or recovered. Examples are when a species becomes extinct or when wetlands are permanently converted to open water. In either case, the loss is permanent.

4.17.1 Coastal Habitats

An irreversible or irretrievable loss of wetlands and associated biological resources could occur if wetlands are permanently lost because of impacts caused by dredging and construction activities that displace existing wetlands or from oil spills severe enough to cause permanent die-back of vegetation and conversion to open water.

4.17.2 Biological Resources

An irreversible loss or degradation of ecological habitat caused by cumulative activity tends to be incremental over the short term. Irretrievable loss may not occur unless or until a critical threshold is reached. It can be difficult or impossible to identify when that threshold is, or would be, reached.

4.17.2.1 Protected Species

Irreversible loss of individuals that are protected species could occur from an unintended vessel strike or after a large oil spill from the acute impact of being oiled or the chronic impact of oil having eliminated, reduced, or rendered suboptimal the food species upon which they were dependent. Whether the loss of individuals would lead to a permanent loss of that species that cannot be reversed or recovered would be dependent on the population status/condition of that species at the time of the loss of individuals. It can be difficult or impossible to identify or predict when that threshold is, or would be, reached.

4.17.2.2 Fish and Invertebrate Resources, Deepwater Benthic Communities, Live Bottoms, Commercial Fisheries, and Recreational Fishing

Irreversible loss of fish and invertebrate resources (including commercial and recreational species) deepwater benthic communities, live bottoms, commercial fisheries, and recreational fishing, may be caused by structure removals or from unintended large oil spills.

4.17.3 Archaeological Resources

Any loss of discovered or undiscovered archaeological resources on or below the seafloor of the OCS in developed areas would be an irreversible and irretrievable commitment of resources.

4.17.4 Oil and Gas Development

Subsequent development and extraction of hydrocarbons as a result of a proposed action represents an irreversible and irretrievable commitment by the removal and consumption of nonrenewable oil and gas resources.

4.17.5 Loss of Human and Animal Life

Any loss of human and animal life from unpredictable and unexpected acts of man and nature (i.e., unavoidable accidents, accidents caused by human negligence or misinterpretation, human error, and adverse weather conditions) would be an irreversible and irretrievable commitment of resources. Some normal and required operations, such as structure removal, can kill sea life in proximity to explosive charges or by removal of the structure that served as the framework for invertebrates living on it and the fish that lived with it.

4.18 Relationship Between the Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The short-term impacts on various components of the environment in the vicinity of the proposed action are related to long-term impacts and the maintenance and enhancement of long-term productivity.

4.18.1 Short-Term Use

Short term refers to the total duration of oil and gas exploration and production activities. Extraction and consumption of offshore oil and natural gas is a short-term benefit. Depleting a nonrenewable resource now removes these domestic resources from being available for future use.

The specific impacts of a proposed action vary in kind, intensity, and duration according to the activities occurring at any given time (**Chapter 3**). Initial activities, such as seismic surveying and exploration drilling, result in short-term, localized impacts. Development drilling and well workovers occur sporadically throughout the life of a proposed action but also result in short-term, localized impacts. Activities during the production life of a platform may result in chronic impacts over a longer period of time (over 25 years), potentially punctuated by more severe impacts as a result of accidental

events or a spill. Platform removal is also a short-term activity with localized impacts, including removal of the habitat for encrusting invertebrates and fish living among them. Many of the impacts on physical, biological, and socioeconomic resources discussed in **Chapter 4** are considered to be short term (being greatest during the construction, exploration, and early production phases). These impacts would be further reduced by the mitigating measures discussed in **Chapter 2.3.3**.

The OCS development off Texas and Louisiana has enhanced some recreational and commercial activities. A proposed action could increase these incidental benefits by the presence of offshore development. As mineral resources become depleted, platform removals would occur and may result in a decline in these activities, but this could be offset by the Rigs-to-Reefs Program.

The short-term exploitation of hydrocarbons for the OCS Oil and Gas Program in the Gulf of Mexico may lead to long-term impacts on biologically sensitive resources and areas if an oil spill occurs. A spill and spill-response activity could temporarily interfere with commercial and recreational fishing, beach use, and tourism in the area where the spill makes landfall and in a wider area based on stigma effects. The leasing may also result in onshore development and population increases that could cause very short-term adverse impacts to local community infrastructure, particularly in areas of low population and minimal existing industrial infrastructure.

4.18.2 Relationship to Long-Term Productivity

Long-term refers to an indefinite period beyond the termination of oil and gas production. Over a period of time after peak oil production has occurred in the Gulf of Mexico, a gradual easing of the specific impacts caused by oil and gas exploration and production would occur as the productive reservoirs in the GOM have been discovered, produced, and become depleted.

After the completion of oil and gas production, a gradual ramp-down to economic conditions without OCS oil- and gas-related activity would be experienced, while the marine environment is generally expected to remain at or return to its normal long-term productivity levels. Primary productivity varies in the GOM from eutrophic coastal and estuarine waters to the oligotrophic deep ocean. Production on the shelf off the Mississippi River and within estuaries is approximately 300 grams carbon per m^2/yr. On the shelf, at a distance from the Mississippi and Atchafalaya Rivers or where upwelling is sparse, production is approximately 200 grams carbon per m^2/yr. Production is much lower in the surface waters over the deep GOM basin. Therefore, primary production in the GOM is dominated by processes along the margins of the GOM (Turner and Rabalais 2019). The interaction of numerous physical and chemical processes makes it difficult to understand the control of primary production, tease out trends, and relate any species or habitat responses to such production (Lohrenz et al. 1999). A more thorough discussion of primary production in the Gulf of Mexico is available in BOEM's *Biological Environmental Background Report for the Gulf of Mexico OCS Region* (BOEM 2021b).

Major ecosystem services (i.e., positive benefits provided by ecosystems to humans) managed within the context of the Gulf of Mexico large marine ecosystem include recreational and

commercial fisheries, oil and gas production, tourism, and potentially future renewable energy development (BOEM 2021b). To help sustain the long-term productivity of the Gulf of Mexico ecosystem, the OCS Oil and Gas Program continues to improve the knowledge and mitigation practices used in offshore development to enhance the safe and environmentally responsible development of OCS oil and gas resources. The OCS Oil and Gas Program also provides for structures to be used as site-specific artificial reefs and fish-attracting devices for the benefit of commercial and recreational fishermen and for sport divers and spear fishers.

CHAPTER 5

CONSULTATION AND COORDINATION

5 CONSULTATION AND COORDINATION

5.1 INTRODUCTION

BOEM is conducting consultations and other activities to comply with the following laws, including but not limited to, the development of consistency determinations (CDs) under CZMA, consultation under the Endangered Species Act (ESA) for potential impacts to listed species or designated critical habitat, completion of an Essential Fish Habitat assessment pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, and a request for comments and consultation with federally recognized Indian Tribes pursuant to the National Historic Preservation Act and Executive Order 13175. Pursuant to NEPA, BOEM has conducted public involvement activities during review of this Draft Supplemental EIS. This chapter describes the processes with which BOEM worked with other Federal and State agencies, Tribal governments, and the public during the development of this Supplemental EIS.

5.2 COASTAL ZONE MANAGEMENT ACT

The Federal agency performs a consistency review pursuant to the Coastal Zone Management Act (CZMA), and CDs are prepared for each coastal State along the Gulf of Mexico with a federally approved Coastal Management Program (CMP) prior to each of the lease sales. To prepare the CDs, BOEM reviews each State's federally approved Coastal Management Plan and analyzes the potential impacts as outlined in the 2017-2022 GOM Multisale EIS, 2018 GOM Supplemental EIS, and this Supplemental EIS; new information; and applicable studies as they pertain to the enforceable policies of each CMP. The CZMA requires that Federal actions that have reasonably foreseeable coastal effects (i.e., effects to any coastal use or resource of the coastal zone) be "consistent to the maximum extent practicable" with relevant enforceable policies or guidelines of the State's federally approved coastal management program (15 CFR part 930 subpart C).

Based on these and other analyses, BOEM's Gulf of Mexico Regional Office's Regional Director makes an assessment of consistency, which is then sent to the States of Texas, Louisiana, Mississippi, Alabama, and Florida for Gulf of Mexico lease sales; Texas and Louisiana for WPA lease sales; or Louisiana, Mississippi, Alabama, and Florida for CPA and/or EPA lease sales. If the State concurs, BOEM proceeds with the lease sale. A State's concurrence may be presumed when a State does not provide a response within the 60-day review period. A State may request an extension of time to review the CD within the 60-day period, which the Federal agency shall approve for an extension of 15 days or less. If a State objects, it must do the following under the CZMA:

(1) indicate how BOEM's prelease proposal is inconsistent with the State's federally approved CMP and suggest alternative measures to bring BOEM's proposal into consistency with the State's CMP; or

(2) describe the need for additional information that would allow a determination of consistency. In the event of an objection, the Federal and State agencies should use the remaining portion of the 90-day review period to attempt to resolve their differences (15 CFR § 930.43(b)).

At the end of the 90-day review period, the Federal agency shall not proceed with the activity over a State agency's objection unless the Federal agency concludes that, under the "consistent to the maximum extent practicable" standard described in 15 CFR § 930.32, consistency with the enforceable policies of the CMP is prohibited by existing law applicable to the Federal agency, and the Federal agency has clearly described, in writing, to the CZMA State agency the legal impediments to full consistency; or the Federal agency has concluded that its proposed action is fully consistent with the enforceable policies of the CMP, though the State agency objects. Unlike the consistency process for specific OCS plans and permits, there is no procedure for administrative appeal to the Secretary of Commerce for a Federal CD for prelease activities. In the event that there is a serious disagreement between BOEM and a State, either agency may request mediation. Mediation is voluntary, and the Secretary of Commerce would serve as the mediator. Whether there is mediation or not, the final CD is made by DOI, and it is the final administrative action for the prelease consistency process. Each Gulf Coast State's CMP is described in Appendix J of the 2017-2022 GOM Multisale EIS.

On May 7, 2021, NOAA's Office for Coastal Management received a request for approval of changes to the federally approved Florida CMP pursuant to the CZMA regulations at 15 CFR part 923 subpart H. The NOAA Office for Coastal Management approved the request to incorporate changes, subject to a qualification, on June 21, 2021, which would apply to Federal actions proposed on or after this date of approval. The approved changes and relevant documentation can be found on NOAA's website at https://coast.noaa.gov/czmprogramchange/#/public/change-view/1256. As per 15 CFR § 923.81(f), approved program changes would not apply retroactively to State-Federal consistency reviews initiated prior to the date NOAA approved the changes, except as allowed by 15 CFR § 930.46. Therefore, NOAA's approved changes to the FCMP would apply to consistency reviews and CDs that are prepared for the State of Florida for each CPA and/or EPA lease sale that is proposed after June 21, 2021.

5.3 ENDANGERED SPECIES ACT

The Endangered Species Act of 1973 (ESA, 16 U.S.C. §§ 1531 *et seq*.), as amended, establishes a national policy designed to protect and conserve threatened and endangered species and the ecosystems upon which they depend. Section 7(a) (2) of the ESA requires each Federal agency to ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the adverse modification of designated critical habitat.

On April 20, 2018, FWS issued its 10-year Biological Opinion (BiOp) for BOEM and BSEE's OCS oil- and gas-related activities in the GOM (including holding lease sales), which does not include any terms and conditions for the protection of endangered species that the Bureaus, lessees, or operators must implement. The FWS BiOp stated that any future consultations may be informal dependent upon the likelihood of take.

On March 13, 2020, NMFS issued a BiOp and related terms and conditions and reasonable and prudent measures for future approvals of OCS oil- and gas-related activities (including lease sales) in the Gulf of Mexico for the protection of species listed as endangered or threatened under the ESA and under NMFS' jurisdiction. The NMFS' programmatic BiOp addresses any future lease sales and any future approvals issued by BOEM and BSEE, under both existing and future OCS oil and gas leases in the GOM, over a 10-year period. Applicable terms and conditions and reasonable and prudent measures from NMFS' BiOp would be included in a lease sale in the Protected Species Stipulation (as described in **Chapter 2.3.3.1 and Appendix A**); other specific Conditions of Approval (COA) would also be applied to post-lease approvals (e.g., permits and plans). The NMFS BiOp can be found online at https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-and-gas-program-activities-gulf-mexico. The appendices and protocols can be found online at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico. The NMFS BiOp made a jeopardy determination concerning GOM Bryde's[4] whales (now Rice's whale) due to the potential for vessel strikes for service vessels transiting the GOM Rice's whale area, which is largely in the area of the Gulf of Mexico and which was subject to Congressional moratorium and is now under Presidential withdrawal (*Federal Register* 2021d). BOEM reviewed this analysis and found that the activities and effects from a lease sale are not reasonably foreseeable as a result of a proposed action since service vessels expected to service leases issued as a result of a lease sale are likely to use ports closer to the WPA and CPA, and are unlikely to transit across greater distances through the withdrawal area to get to the leases. Nevertheless, BOEM notified NMFS in April 2021 that it was formally accepting the reasonable and prudent alternative for the GOM Rice's whale, and on May 7, 2021, NMFS accepted BOEM's approach and stated it would not need to further amend its BiOp to reflect that change. The NMFS had previously updated the 2020 BiOp and appendices in April 2021 to reflect other changes (the amended appendices can be found online at https://repository.library.noaa.gov/view/noaa/29355). In accordance with 50 CFR §§ 402.2 and 402.14(g)(8) and the 1998 consultation handbook, BOEM and BSEE are implementing the reasonable and prudent alternative to comply with Section 7(a) of the ESA and ensure that there is no jeopardy for the Rice's whale. BOEM and BSEE will also verify whether, for the few service-vessel routes on post-lease approvals that might travel through the Rice's whale area, any additional post-lease mitigations are required. Therefore, a decision to hold a lease sale is not expected to reduce appreciably the likelihood of both survival and recovery of the GOM Rice's whales, and in the unlikely event that post-lease activities are proposed that could impact the GOM Rice's whale, both BSEE and BOEM have the discretion to require additional mitigations at that time. The impacts to ESA-listed species from an oil and gas lease sale are addressed in **Chapter 4.10** of this Supplemental EIS, as well as in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS.

[4] On August 23, 2021, NMFS published a direct final rule in the *Federal Register* (86 FR 47022): Endangered and Threatened Wildlife and Plants; Technical Corrections for the Bryde's Whale (Gulf of Mexico Subspecies). The NMFS revises the common name to the Rice's whale, the scientific name to *Balaenoptera ricei*, and the description of the listed entity to the entire species. The changes to the taxonomic classification and nomenclature do not affect the species' listing status under the ESA or any protections and requirements arising from its listing. This rule became effective on October 22, 2021.

BOEM petitioned NMFS for rulemaking under the Marine Mammal Protection Act (MMPA, 16 U.S.C. §§ 1361 *et seq.*) to assist industry in obtaining incidental take coverage for marine mammals due to oil and gas deep-penetration seismic G&G surveys in the Gulf of Mexico. On January 19, 2021, NMFS published in the *Federal Register* (2021c) its final "Incidental Take Regulation on Geophysical Surveys Related to Oil and Gas Activities in the Gulf of Mexico" as a result of the petition; the rule took effect on April 19, 2021. In April 2021, NMFS amended the Incidental Take Statement associated with the 2020 BiOp (which also served as the intra-service consultation for the rule). The amendment updated Appendices A and C to align with the regulation and updated the COAs developed since the release of the programmatic BiOp. The Appendices and COAs may be imposed on lessees and operators through compliance reviews associated with the Programmatic BiOp when lessees or operators submit requests for plans or permits, or through Letters of Authorization issued under the rule. Any additional mitigations applied by industry through the rule would only be expected to further reduce impacts already addressed in the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS. As the final incidental take regulation took effect on April 19, 2021, survey operators are now able to apply for Letters of Authorization.

Based on the most recent and best available information at the time, BOEM and BSEE will continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under NEPA and other statutes. Refer to **Appendix B** for copies of the consultation letters.

5.4 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act, Federal agencies are required to consult with NMFS on any action that may result in adverse effects to essential fish habitat (EFH). The NMFS published the final rule implementing the EFH provisions of the Magnuson-Stevens Fisheries Conservation and Management Act (50 CFR part 600) on January 17, 2002. Certain OCS oil- and gas-related activities authorized by BOEM may result in adverse effects to EFH and therefore require EFH consultation.

BOEM prepared an EFH Assessment technical report that describes the OCS proposed activities, analyzes the effects of the proposed activities on EFH, and identifies proposed mitigating measures (BOEM 2016b). The EFH Assessment was sent to NMFS on June 8, 2016, with a letter requesting formal consultation. The regional programmatic EFH consultation covering all Gulf of Mexico OCS activities through 2022 concluded on September 14, 2017, when BOEM and BSEE accepted the formalized conservation recommendations put forth by NMFS. The agreed upon conservation recommendations contain provisions for initiating supplemental discussions should it be determined that site-specific or activity-specific consultation is necessary. A new programmatic EFH consultation is currently ongoing and expected to be complete by December 2022. Once complete, BOEM will incorporate agreed upon revisions to reporting and mitigation measures as appropriate.

5.5 NATIONAL HISTORIC PRESERVATION ACT

In accordance with the National Historic Preservation Act (54 U.S.C. §§ 300101 *et seq*.), Federal agencies are required to consider the effects of their undertakings on historic properties. The implementing regulations for Section 106 of the National Historic Preservation Act, issued by the Advisory Council on Historic Preservation (36 CFR part 800), specify the required review process. In accordance with 36 CFR § 800.8(c), BOEM intends to use the NEPA substitution process and documentation for preparing a prelease EIS and Record of Decision or a post-lease environmental assessment and Finding of No Significant Impact to comply with Section 106 of the National Historic Preservation Act in lieu of 36 CFR §§ 800.3-800.6. Because of the extensive geographic area analyzed in this Supplemental EIS and because identification of historic properties will take place after leases are issued, BOEM will complete its Section 106 review process once BOEM has performed the necessary site-specific analysis of post-lease activities prior to issuing a permit or approving these activities. Additional consultations with the Advisory Council on Historic Places, State Historic Preservation Offices, federally recognized Indian Tribes, and other consulting parties may take place at that time, if appropriate. Refer to Chapter 4.13 of the 2017-2022 GOM Multisale EIS for more information on this review process and **Appendix B** of this Supplemental EIS for copies of the State Historic Preservation Offices' concurrence letters.

BOEM initiated a request for comment on the NOI for the 2017-2022 GOM Multisale EIS via a formal letter to each of the affected Gulf Coast States on April 3, 2015. A 30-day comment period was provided. The State Historic Preservation Officers for Alabama, Florida, and Louisiana responded via formal letters, all concurring that no historic properties will be affected. The Florida State Historic Preservation Officer further requested to be notified and given the opportunity to comment should any cultural resources be identified off the Florida coast. No additional responses were received.

BOEM solicited Tribal comment and consultation on the *2017-2022 Outer Continental Shelf Oil and Gas Leasing: Draft Proposed Program* and NOI for the 2017-2022 OCS Oil and Gas Leasing Programmatic EIS via a formal letter on March 4, 2015, and on the Draft 2017-2022 GOM Multisale EIS via a formal letter on May 19, 2016. The Final 2017-2022 GOM Multisale EIS and Draft 2018 GOM Supplemental EIS were sent to each Tribe in April 2017, again requesting Tribal comment or additional consultation.

Those letters were addressed to each of the Gulf Coast State-affiliated federally recognized Indian Tribes, including the Alabama-Coushatta Tribe of Texas, Caddo Nation of Oklahoma, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Muscogee (Creek) Nation, Poarch Band of Creek Indians, Seminole Tribe of Florida, Seminole Nation of Oklahoma, and Tunica-Biloxi Indian Tribe of Louisiana.

In response to these communications, the Choctaw Nation of Oklahoma indicated that the 2017-2022 GOM Multisale EIS activities will affect the Tribe's area of historic interest. The Tribe requested to be updated on archaeological surveys and that any work be stopped and their Historic

Preservation Department be notified immediately in the event that Native American artifacts or human remains are encountered (Bilyeu, official communication 2017b). The Poarch Band of Creek Indians indicated that they do not have any specific concerns with BOEM's activities on the OCS, but they request continued notifications concerning BOEM's activities (Jones, official communication 2015). Additionally, the Jena Band of Choctaw indicated a general concern over adverse effects to documented or undocumented precontact and historic sites in the CPA and requested notification should an undertaking be unable to avoid a potential resource or in the event of a post-review discovery, as well as to continue being notified concerning BOEM's activities (Shively, official communication 2015; Shively and Jones 2015).

In September 2017, BOEM received an email comment from the Alabama Historical Commission on the *Gulf of Mexico OCS Proposed Geological and Geophysical Activities: Western, Central, and Eastern Planning Areas; Final Programmatic Environmental Impact Statement*. The State Archaeologist commented that their office had erroneously not submitted comments during the Draft Programmatic EIS review and that they felt Alternatives A-G have the potential to adversely affect cultural resources in Alabama waters (Hathorn, official communication 2017). They requested to be included in consultations involving any future activities in Alabama waters.

BOEM conducts Section 106 of the National Historic Preservation Act consultations with State Historic Preservation Offices for site-specific permitted activities with Areas of Potential Effect in State waters. No recent consultations have identified historic properties with the potential to be adversely affected by those activities.

No additional responses have been received from the above-referenced outreach efforts; however, BOEM continues to regularly correspond with designated Tribal representatives to determine if any of the individual Tribes desire consultation on these or other agency activities.

5.6 GOVERNMENT-TO-GOVERNMENT TRIBAL CONSULTATION

In accordance with Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments," Federal agencies are required to establish regular and meaningful consultation and collaboration with Tribal officials in the development of Federal policies that have Tribal implications to strengthen the United States' government-to-government relationships with Indian Tribes and to reduce the imposition of unfunded mandates upon Indian Tribes. On March 4, 2015, BOEM sent a formal letter to federally recognized Indian Tribes notifying them of the development of the *2017-2022 Outer Continental Shelf Oil and Gas Leasing: Draft Proposed Program* and accompanying Programmatic EIS, as well as the *Gulf of Mexico Proposed Geological and Geophysical Activities: Western, Central, and Eastern Planning Areas—Programmatic EIS*. That letter was addressed to each of the Gulf Coast State-affiliated Indian Tribes, including the Alabama-Coushatta Tribe of Texas, Caddo Nation of Oklahoma, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Poarch Band of Creek Indians, Seminole Tribe of Florida, Seminole Nation of Oklahoma, and Tunica-Biloxi Indian Tribe of Louisiana. The letter was intended to be the first step

of a long-term and broad consultation effort between BOEM and the Gulf-area Tribes, inclusive of all BOEM activities that may occur under the Draft Proposed Program, as well as ongoing activities. On May 19, 2016, another formal letter was sent announcing and soliciting consultation on the releases of the 2017-2022 Proposed Program, Draft 2017-2022 National OCS Program EIS, and Draft 2017-2022 GOM Multisale EIS. That letter was sent to each of the above-listed Tribes, as well as to the Muscogee (Creek) Nation. The Final 2017-2022 GOM Multisale EIS and Draft 2018 GOM Supplemental EIS were sent to each Tribe in April 2017, again requesting Tribal comment or additional consultation.

In response to these communications, the Choctaw Nation of Oklahoma indicated that the 2017-2022 GOM Multisale EIS activities will affect the Tribe's area of historic interest. The Tribe requested to be updated on archaeological surveys and that any work be stopped and their Historic Preservation Department be notified immediately in the event that Native American artifacts or human remains are encountered (Bilyeu, official communication 2017b). The Poarch Band of Creek Indians indicated that they do not have any specific concerns with BOEM's activities on the OCS, but they request continued notifications concerning BOEM's activities (McCullers, official communication 2015). Additionally, the Jena Band of Choctaw indicated a general concern over adverse effects to documented or undocumented precontact and historic sites in the CPA and requested notification should an undertaking be unable to avoid a potential resource or in the event of a post-review discovery, as well as to continue being notified concerning BOEM's activities (Shively, official communication 2015; Shively and Jones 2015).

In August 2017, BOEM sent a letter to Gulf of Mexico-affiliated Tribes regarding the Request for Information to support development of the 2019-2024 National Outer Continental Shelf Oil and Gas Leasing Program (Program) (Celata, official communication 2017). Responses were received from The Choctaw Nation of Oklahoma (Bilyeu, official communication 2017a) and Muscogee (Creek) Nation (Wendt, official communication 2017). Both Tribes indicated that the proposed activities are within their historic area of interest, that they wanted to continue to receive information on the development of the Program, and that they were potentially interested in future consultations. The Choctaw Nation of Oklahoma's Historic Preservation Department clarified during later discussions that their interest was primarily in State waters and that they did not wish to consult at that time but requested notification if any precontact archaeological resources are discovered in Federal waters (Jones, official communication 2017).

Following the Secretary of the Interior's announcement of the Draft Proposed Program in January 2018, phone calls were made to each of the Gulf of Mexico-affiliated Tribes, and additional emails were sent to the Poarch Band of Creek Indians, Seminole Nation of Oklahoma, and Chitimacha Tribe of Louisiana to provide additional information on the Program at those Tribes' request (Jones, official communication 2018; Phaneuf, official communication 2018). No additional responses were received and no Tribes requested consultations at that time.

In January 2019, BOEM notified Tribes of the intent to prepare a Supplemental EIS evaluating the remaining oil and gas lease sales for 2020-2022. Tribes were invited to provide input and consult

on the development of the Supplemental EIS, including becoming a cooperating agency (Jones, official communication 2019). No responses were received.

BOEM continues to consult with Tribes on oil and gas activities and other BOEM-authorized activities proposed on the Gulf of Mexico OCS and will update this summary as additional efforts are conducted.

BOEM has also analyzed environmental justice issues for minority and low-income populations, which is broadly applicable to federally recognized Indian Tribes. Further information on that analysis can be found in **Chapter 4.15.3** of this Supplemental EIS, Chapter 4.14.3.3 of the 2017-2022 GOM Multisale EIS, and Chapter 4.14.3.1 of the 2018 GOM Supplemental EIS.

5.7 Lease Sale Process and the National Environmental Policy Act

5.7.1 Development of the Proposed Action

This Draft Supplemental EIS updates the analysis for a proposed Federal action, i.e., a Gulf of Mexico OCS oil and gas lease sale. This document is expected to be used to inform the decision for GOM Lease Sales 259 and 261. BOEM conducted early coordination with appropriate Federal and State agencies and other concerned parties to discuss and coordinate the prelease process for the lease sales and this Supplemental EIS.

5.7.1.1 Call for Information and Area ID Memorandum

Pursuant to the Outer Continental Shelf Lands Act of 1953, as amended (OCSLA), BOEM published a Call for Information (Call) to request and gather information to determine the Area ID for each lease sale. The Call was published in the (*Federal Register* 2018a) on December 26, 2018. The comment period for the Call closed on January 25, 2019. BOEM received three comments in response to the Call; these comments are summarized below.

Private Citizen (California)

- suggests exploring clean energy solutions instead of fossil fuels

Private Citizen (California)

- suggests focusing on renewable energy to limit the worst effects of climate change

Center for Biological Diversity (co-signed by 25 additional organizations)

- suggests halting all GOM oil and gas lease sales included in the Draft Proposed Program
- states that BOEM violated the Antideficiency Act by putting staff back to work during the government shutdown

- states that the proposed lease sales are inconsistent with our Nation's energy needs

Using information provided in response to the Call and from scoping comments received for the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS, BOEM developed an Area ID recommendation memorandum. The Area ID is an administrative prelease step that describes the geographic area for environmental analysis and consideration for leasing. All of this information was used to develop a proposed action and a reasonable range of alternatives for the 2017-2022 GOM Multisale EIS, 2018 GOM Supplemental EIS, and this Supplemental EIS. On November 20, 2015, the Area ID decision was prepared for all proposed lease sales from 2017-2022. The Area ID memo recommended keeping the area of the GOM comprised of unleased blocks in the WPA, CPA, and EPA not subject to Congressional moratorium, pursuant to the Gulf of Mexico Energy Security Act of 2006 (which is now under Presidential withdrawal), which will be included for GOM Lease Sales 259 and 261.

5.7.2 Development of the Draft Supplemental EIS

5.7.2.1 Scoping

Under 40 CFR § 1502.9(c)(4), scoping is not required for a Supplemental EIS. Multiple opportunities for public input on the relevant issues, alternatives and resources to be evaluated with a GOM lease sale, including scoping and the Draft EIS comment periods for the 2017-2022 GOM Multisale EIS (BOEM 2017b) and 2018 GOM Supplemental EIS (BOEM 2017a). A summary of the scoping comments from the 2017-2022 GOM Multisale EIS and 2018 GOM Supplemental EIS is provided below.

2017-2022 GOM Multisale EIS

- BOEM received a total of 10 comments during the public scoping period from April 29 to June 1, 2015.
- Many of the comments cited broad environmental concerns or specific concern about impacts on marine wildlife in general or on protected species such as marine mammals and sea turtles. Others cited concerns about impacts to critical habitats, fish and fisheries, sensitive benthic communities, and pelagic resources. Several of the comments had concerns about the effects of oil spills and the safety of offshore operations. Within the broad category of socioeconomics, comments focused on impacts on fisheries, recreation, tourism, and local jobs.
- Some of the comments provided recommendations for the inclusion of particular alternatives or mitigation in this Supplemental EIS analysis. Some comments recommended the implementation of specific analysis methodologies, while others recommended that recent industry technology and safety advances be taken into consideration.

2018 GOM Supplemental EIS

- BOEM received a total of 441 comments during the public scoping period from August 19 to September 19, 2016; 433 comments in response to the NOI; and 8 comments at the scoping meetings.
- Almost 380 individual comments were received in support of the proposed lease sales, 356 of which were form letters. Commenters stated that future leases are vital to the national economy and security, and are integral to the State of Louisiana and local economies and jobs. Several noted that oil and gas companies and employees must be good stewards of the environment and continue to provide more emphasis on safety. Several commenters stated that the recent downturn in oil and gas prices is hurting small towns and southern states in general.
- Twenty-three individual comments were received that opposed future lease sales. Commenters stated that renewable energy should be pursued instead of oil and gas, fossil fuels should be left in the ground, and new lease sales are not compatible with the Paris Treaty. Issues of concern included the impacts of oil and gas on greenhouse gas emission and global climate change, the impacts of climate change on the GOM's environmental resources, warmer oceans, increased storms and flooding events, and land loss. Several commenters also expressed concern about continuing oil and chemical spill risks, continuing effects of past oil and chemical spills, leaking wells and pipelines, and a lack of reasonable alternatives. Environmental resources of concern included protected species (i.e., marine mammals, sea turtles, beach mice, protected birds, and corals), wetlands, fish nurseries, coral reefs, seafood safety, and environmental justice. Comments were received expressing concerns for environmental justice related to those living nearby petrochemical processing facilities.

5.7.2.2 Cooperating Agencies

According to Part 516 of the DOI Departmental Manual, BOEM must invite eligible government entities to participate as cooperating agencies when developing an EIS in accordance with the requirements of NEPA and CEQ regulations. BOEM must also consider any requests by eligible government entities to participate as a cooperating agency with respect to a particular EIS and must either accept or deny such requests.

CHAPTER 6

REFERENCES CITED

6 REFERENCES CITED

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CHAPTER 7

LIST OF PREPARERS

7 PREPARERS

Helen Rucker, Chief, Environmental Assessment Section

Michelle Nannen, NEPA Coordinator, Environmental Scientist
Ross Del Rio, NEPA Co-Coordinator, Environmental Scientist

Mark Belter, Chief, Biological and Social Sciences Unit
Doleswar Bhandari, Economist
Alicia Caporaso, Marine Archaeologist
Sindey Chaky, Social Scientist
Nicole Charpentier, Coastal Zone Management Coordinator, Marine Biologist
Leonard Coates, Supervisor, Mapping and Automation Section
Sarah Coffman, Chief, Economics Division
Donald (Tre) W. Glenn III, Protected Species Biologist
Mike Gravois, Geographer, Mapping and Automation Section
Jose Hernandez, Physical Scientist
Jack Irion, Unit Supervisor, Marine Archaeologist
Stacey Johnson, NEPA Coordinator
Douglas Jones, Senior Marine Archaeologist
Harry Luton, Social Scientist

Hayley Karrington, Protected Species Biologist
Stacie Merritt, Physical Scientist
Deborah Miller, Technical Editor
Aditi Mirani, Economist
William Moore, Geographer, Mapping and Automation Section
Trevis Olivier, Environmental Scientist
Charles Paris, Economist
Stephen Pomes, Librarian
Catherine Rosa, Environmental Assessment Specialist
John Schiff, Physical Scientist
Katherine Segarra, Unit Supervisor, Marine Biologist
Scott Sorset, Marine Archaeologist
Mariana Steen, Marine Biologist
Sara Thompson, Information Management Specialist
Sarah Vaughn, Physical Scientist
Susan Erin O'Reilly Vaughan, Chief, Physical/Chemical Sciences Section
Jeri Wisman, Marine Biologist
Eric Wolvovsky, Meteorologist

CHAPTER 8

GLOSSARY

8 GLOSSARY

Acute—Sudden, short term, severe, critical, crucial, intense, but usually of short duration, as opposed to chronic. Effects associated with acute can vary depending on the context of its use (e.g., acute [short-term] exposure could be more or less problematic than chronic [long-term] exposure).

Anaerobic—Capable of growing in the absence of molecular oxygen.

Annular preventer—A component of the pressure control system in the BOP that forms a seal in the annular space around any object in the wellbore or upon itself, enabling well control operations to commence.

Anthropogenic—Coming from human sources, relating to the effect of humankind on nature.

Antipatharian Transitional Zone—The area located between 50 and 90 m (164 and 295 ft), where available light is reduced and there is a gradual ecosystem change from tropical shallow-water corals that are dependent on light to deeper water species, such as antipatharian black corals that are not.

API gravity—A standard adopted by the American Petroleum Institute for expressing the specific weight of oil.

Aromatic—Class of organic compounds containing benzene rings or benzenoid structures.

Attainment area—An area that is shown by monitored data or by air-quality modeling calculations to be in compliance with primary and secondary ambient air quality standards established by USEPA.

Barrel (bbl)—A volumetric unit used in the petroleum industry; equivalent to 42 U.S. gallons or 158.99 liters.

Benthic—On or in the bottom of the sea.

Biological Opinion—The FWS or NMFS evaluation of the impact of a proposed action on endangered and threatened species, in response to formal consultation under Section 7 of the Endangered Species Act.

Block—A geographical area portrayed on official BOEM protraction diagrams or leasing maps that contains approximately 5,760 ac (2,331 ha; 9 mi^2).

Blowout—An uncontrolled flow of fluids below the mudline from appurtenances on a wellhead or from a wellbore.

Blowout preventer (BOP)—One of several valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and drill pipe or in open hole (i.e., hole with no drill pipe) during drilling completion operations. Blowout preventers on jackup or platform rigs are located at the water's surface; on floating offshore rigs, BOPs are located on the seafloor.

Cetacean—Aquatic mammal of the order Cetacea, such as whales, dolphins, and porpoises.

Chemosynthetic—Organisms that obtain their energy from the oxidation of various inorganic compounds rather than from light (photosynthetic).

Coastal waters—Waters within the geographical areas defined by each State's Coastal Zone Management Program.

Coastal wetlands—forested and nonforested habitats, mangroves, and marsh islands exposed to tidal activity. These areas directly contribute to the high biological productivity of coastal waters by input of detritus and nutrients, by providing nursery and feeding areas for shellfish and finfish, and by serving as habitat for birds and other animals.

Coastal zone—The coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder) strongly influenced by each other and in proximity to the shorelines of several coastal states; the zone includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches, and it extends seaward to the outer limit of the United States territorial sea. The zone extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters. Excluded from the coastal zone are lands the use of which is by law subject to the discretion of or which is held in trust by the Federal Government, its officers, or agents (also refer to State coastal zone boundaries).

Completion—Conversion of a development well or an exploration well into a production well.

Condensate—Liquid hydrocarbons produced with natural gas; they are separated from the gas by cooling and various other means. Condensates generally have an API gravity of 50°-120°.

Continental margin—The ocean floor that lies between the shoreline and the abyssal ocean floor, includes the continental shelf, continental slope, and continental rise.

Continental shelf—General term used by geologists to refer to the continental margin province that lies between the shoreline and the abrupt change in slope called the shelf edge, which generally occurs in the Gulf of Mexico at about the 200-m (656-ft) water depth. The continental shelf is characterized by a gentle slope (about 0.1°). This is different from the juridical term used in Article 76 of the United Nations Convention on the Law of the Sea Royalty Payment (refer to the definition of Outer Continental Shelf).

Continental slope—The continental margin province that lies between the continental shelf and continental rise, characterized by a steep slope (about 3°-6°).

Critical habitat—Specific areas essential to the conservation of a protected species and that may require special management considerations or protection.

Crude oil—Petroleum in its natural state as it emerges from a well or after it passes through a gas-oil separator, but before refining or distillation. An oily, flammable, bituminous liquid that is essentially a complex mixture of hydrocarbons of different types with small amounts of other substances.

Delineation well—A well that is drilled for the purpose of determining the size and/or volume of an oil or gas reservoir.

Demersal—Living at or near the bottom of the sea.

Development—Activities that take place following discovery of economically recoverable mineral resources, including geophysical surveying, drilling, platform construction, operation of onshore support facilities, and other activities that are for the purpose of ultimately producing the resources.

Development and Production Plan (DPP)—A document that must be prepared by the operator and submitted to BOEM for approval before any development and production activities are conducted on a lease or unit in any OCS area other than the western Gulf of Mexico.

Development Operations Coordination Document (DOCD)—A document that must be prepared by the operator and submitted to BOEM for approval before any development or production activities are conducted on a lease in the western Gulf of Mexico.

Development well—A well drilled to a known producing formation to extract oil or gas; a production well; distinguished from a wildcat or exploration well and from an offset well.

Direct employment—Consists of those workers involved in the primary industries of oil and gas exploration, development, and production operations (Standard Industrial Classification Code 13—Oil and Gas Extraction).

Discharge—Something that is emitted; flow rate of a fluid at a given instant expressed as volume per unit of time.

Dispersant—A suite of chemicals and solvents used to break up an oil slick into small droplets, which increases the surface area of the oil and hastens the processes of weathering and microbial degradation.

Dispersion—A suspension of finely divided particles in a medium.

Drilling mud—A mixture of clay, water or refined oil, and chemical additives pumped continuously downhole through the drill pipe and drill bit, and back up the annulus between the pipe and the walls of the borehole to a surface pit or tank. The mud lubricates and cools the drill bit, lubricates the drill pipe as it turns in the wellbore, carries rock cuttings to the surface, serves to keep the hole from crumbling or collapsing, and provides the weight or hydrostatic head to prevent extraneous fluids from entering the well bore and to downhole pressures; also called drilling fluid.

Economically recoverable resources—An assessment of hydrocarbon potential that takes into account the physical and technological constraints on production and the influence of costs of exploration and development and market price on industry investment in OCS exploration and production.

Effluent—The liquid waste of sewage and industrial processing.

Effluent limitations—Any restriction established by a State or USEPA on quantities, rates, and concentrations of chemical, physical, biological, and other constituents discharged from point sources into U.S. waters, including schedules of compliance.

Epifaunal—Animals living on the surface of hard substrate.

Essential habitat—Specific areas crucial to the conservation of a species and that may necessitate special considerations.

Estuary—Coastal semi-enclosed body of water that has a free connection with the open sea and where freshwater meets and mixes with seawater.

Eutrophication—Enrichment of nutrients in the water column by natural or artificial methods accompanied by an increase of respiration, which may create an oxygen deficiency.

Exclusive Economic Zone (EEZ)—The maritime region extending 200 nmi (230 mi; 370 km) from the baseline of the territorial sea, in which the United States has exclusive rights and jurisdiction over living and nonliving natural resources.

Exploration Plan (EP)—A plan that must be prepared by the operator and submitted to BOEM for approval before any exploration or delineation drilling is conducted on a lease.

Exploration well—A well drilled in unproven or semi-proven territory to determining whether economic quantities of oil or natural gas deposit are present.

False crawls—Refers to when a female sea turtle crawls up on the beach to nest (perhaps) but does not and returns to the sea without laying eggs.

Field—An accumulation, pool, or group of pools of hydrocarbons in the subsurface. A hydrocarbon field consists of a reservoir in a shape that will trap hydrocarbons and that is covered by an impermeable, sealing rock.

Floating production, storage, and offloading (FPSO) system—A tank vessel used as a production and storage base; produced oil is stored in the hull and periodically offloaded to a shuttle tanker for transport to shore.

Gathering lines—A pipeline system used to bring oil or gas production from a number of separate wells or production facilities to a central trunk pipeline, storage facility, or processing terminal.

Geochemical—Of or relating to the science dealing with the chemical composition of and the actual or possible chemical changes in the crust of the earth.

Geophysical survey—A method of exploration in which geophysical properties and relationships are measured remotely by one or more geophysical methods.

Habitat—A specific type of environment that is occupied by an organism, a population, or a community.

Hermatypic coral—Reef-building corals that produce hard, calcium carbonate skeletons and that possess symbiotic, unicellular algae within their tissues.

Harassment—An intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, feeding or sheltering.

Hermatypic—Corals in the order Scleractinia that build reefs by depositing hard calcareous material for their skeletons, forming the stony framework of the reef. Corals that do not contribute to coral reef development are referred to as ahermatypic (non-reef-building) species.

Hydrocarbons—Any of a large class of organic compounds containing primarily carbon and hydrogen. Hydrocarbon compounds are divided into two broad classes: aromatic and aliphatics. They occur primarily in petroleum, natural gas, coal, and bitumens.

Hypoxia—Depressed levels of dissolved oxygen in water, usually resulting in decreased metabolism.

Incidental take—Takings that result from, but are not the purpose of, carrying out an otherwise lawful activity (e.g., fishing) conducted by a Federal agency or applicant (refer to Taking).

Infrastructure—The facilities associated with oil and gas development, e.g., refineries, gas processing plants, etc.

Jack-up rig—A barge-like, floating platform with legs at each corner that can be lowered to the sea bottom to raise the platform above the water.

Kick—A deviation or imbalance, typically sudden or unexpected, between the downward pressure exerted by the drilling fluid and the upward pressure of *in-situ* formation fluids or gases.

Landfall—The site where a marine pipeline comes to shore.

Lease—Authorization that is issued under Section 8 or maintained under Section 6 of the Outer Continental Shelf Lands Act and that authorizes exploration for, and development and production of, minerals.

Lease sale—The competitive auction of leases granting companies or individuals the right to explore for and develop certain minerals under specified conditions and periods of time.

Lease term—The initial period for oil and gas leases, usually a period of 5, 8, or 10 years depending on water depth or potentially adverse conditions.

Lessee—A party authorized by a lease, or an approved assignment thereof, to explore for and develop and produce the leased deposits in accordance with regulations at 30 CFR part 250 and 30 CFR part 550.

Littoral zone—Marine ecological realm that experiences the effects of tidal and longshore currents and breaking waves to a depth of 5-10 m (16-33 ft) below the low-tide level, depending on the intensity of storm waves.

Longshore sediment transport—The cumulative movement of beach sediment along the shore (and nearshore) by waves arriving at an angle to the coastline and by currents generated by such waves.

Macondo—Prospect name given by BP to the Mississippi Canyon Block 252 exploration well that the *Deepwater Horizon* rig was drilling when a blowout occurred on April 20, 2010.

***Macondo* spill**—The name given to the oil spill that resulted from the explosion and sinking of the *Deepwater Horizon* rig from the period between April 24, 2010, when search and recovery vessels on site reported oil at the sea surface, and September 19, 2010, when the uncontrolled flow from the *Macondo* well was capped.

Marshes—Persistent, emergent, nonforested wetlands characterized by predominantly cordgrasses, rushes, and cattails.

Military warning area—An area established by the U.S. Department of Defense within which military activities take place.

Minerals—As used in this document, minerals include oil, gas, sulphur, and associated resources, and all other minerals authorized by an Act of Congress to be produced from public lands as defined in Section 103 of the Federal Land Policy and Management Act of 1976.

Naturally occurring radioactive materials (NORM)—naturally occurring material that emits low levels of radioactivity, originating from processes not associated with the recovery of radioactive material. The radionuclides of concern in NORM are Radium-226, Radium-228, and other isotopes in the radioactive decay chains of uranium and thorium.

Nepheloid—A layer of water near the bottom that contains significant amounts of suspended sediment.

Nonattainment area—An area that is shown by monitoring data or by air-quality modeling calculations to exceed primary or secondary ambient air quality standards established by USEPA.

Nonhazardous oil-field wastes (NOW)—Wastes generated by exploration, development, or production of crude oil or natural gas that are exempt from hazardous waste regulation under the Resource Conservation and Recovery Act (*Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes,* dated June 29, 1988, 53 FR 25446; July 6, 1988). These wastes may contain hazardous substances.

Oceanic zone—Offshore water >200 m (656 ft) deep. It is the region of open sea beyond the edge of the continental shelf and includes 65 percent of the ocean's completely open water.

Offloading—Unloading liquid cargo, crude oil, or refined petroleum products.

Operational discharge—Any incidental pumping, pouring, emitting, emptying, or dumping of wastes generated during routine offshore drilling and production activities.

Operator—An individual, partnership, firm, or corporation having control or management of operations on a leased area or portion thereof. The operator may be a lessee, designated agent of the lessee, or holder of operating rights under an approved operating agreement.

Organic matter—Material derived from living plants or animals.

Outer Continental Shelf (OCS)—All submerged lands that comprise the continental margin adjacent to the United States and seaward of State offshore lands.

Passerines—Perching birds (members of the Order Passeriformes) and songbirds.

Potential Biological Removal (PBR)—Of or pertaining to the open sea; associated with open water beyond the direct influence of coastal systems.

Pelagic—Of or pertaining to the open sea; associated with open water beyond the direct influence of coastal systems.

Plankton—Passively floating or weakly motile aquatic plants (phytoplankton) and animals (zooplankton).

Platform—A steel or concrete structure from which offshore development wells are drilled.

Play—A prospective subsurface area for hydrocarbon accumulation that is characterized by a particular structural style or depositional relationship.

Primary production—Organic material produced by photosynthetic or chemosynthetic organisms.

Produced water—Total water discharged from the oil and gas extraction process; production water or production brine.

Production—Activities that take place after the successful completion of any means for the extraction of resources, including bringing the resource to the surface, transferring the produced resource to shore, monitoring operations, and drilling additional wells or workovers.

Province—A spatial entity with common geologic attributes. A province may include a single dominant structural element such as

a basin or a fold belt, or a number of contiguous related elements.

Ram—The main component of a blowout preventer designed to shear casing and tools in a wellbore or to seal an empty wellbore. A blind shear ram accomplishes the former and a blind ram the latter.

Recoverable reserves—The portion of the identified hydrocarbon or mineral resource that can be economically extracted under current technological constraints.

Recoverable resource estimate—An assessment of hydrocarbon or mineral resources that takes into account the fact that physical and technological constraints dictate that only a portion of resources can be brought to the surface.

Recreational beaches—Frequently visited, sandy areas along the Gulf of Mexico shorefront that support multiple recreational activities at the land-water interface. Included are National Seashores, State Park and Recreational Areas, county and local parks, urban beachfronts, and private resorts.

Refining—Fractional distillation of petroleum, usually followed by other processing (e.g., cracking).

Relief—The difference in elevation between the high and low points of a surface.

Reserves—Proved oil or gas resources.

Rig—A structure used for drilling an oil or gas well.

Riser insertion tube tool—A "straw" and gasket assembly improvised during the *Macondo* spill response that was designed to siphon oil and gas from the broken riser of the *Deepwater Horizon* rig lying on the sea bottom (an early recovery strategy for the *Macondo* spill in May 2010).

Royalty—A share of the minerals produced from a lease paid in either money or "in-kind" to the landowner by the lessee.

Saltwater intrusion—Saltwater invading a body of freshwater.

Sciaenids—Fishes belonging to the croaker family (Sciaenidae).

Seagrass beds—More or less continuous mats of submerged, rooted, marine, flowering vascular plants occurring in shallow tropical and temperate waters. Seagrass beds provide habitat, including breeding and feeding grounds, for adults and/or juveniles of many of the economically important shellfish and finfish.

Sediment—Material that has been transported and deposited by water, wind, glacier, precipitation, or gravity; a mass of deposited material.

Seeps (hydrocarbon)—Gas or oil that reaches the surface along bedding planes, fractures, unconformities, or fault planes.

Sensitive area—An area containing species, populations, communities, or assemblages of living resources, that is susceptible to damage from normal OCS oil- and gas-related activities. Damage includes interference with established ecological relationships.

Shear ram—The component in a BOP that cuts, or shears, through the drill pipe and forms a seal against well pressure. Shear rams are used in floating offshore drilling operations to provide a quick method of moving the rig away from the hole when there is no time to trip the drill stem out of the hole.

Site fidelity or philopatry—The tendency to return to a previously occupied location.

Spill of National Significance—Designation by the USEPA Administrator under 40 CFR § 300.323 for discharges occurring in the inland zone and the Commandant of the U.S. Coast Guard for discharges occurring in the coastal zone, authorizing the appointment of a National Incident Commander for spill-response activity.

State coastal zone boundary—The State coastal zone boundaries for each CZMA-affected State are defined at https://coast.noaa.gov/czm/media/StateCZBoundaries.pdf.

Structure—Any OCS facility that extends from the seafloor to above the waterline; in petroleum geology, any arrangement of rocks that may hold an accumulation of oil or gas.

Subarea—A discrete analysis area.

Subsea isolation device—An emergency disconnection and reconnection assembly for the riser at the seafloor.

Supply vessel—A boat that ferries food, water, fuel, and drilling supplies and equipment to an offshore rig or platform and returns to land with refuse that cannot be disposed of at sea.

Taking—To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any endangered or threatened species, or to attempt to engage in any such conduct (including actions that induce stress, adversely impact critical habitat, or result in adverse secondary or cumulative impacts). Harassments are the most common form of taking associated with OCS Program activities.

Tension-leg platform (TLP)—A production structure that consists of a buoyant platform tethered to concrete pilings on the seafloor with flexible cable.

Tidal prism—The volume of water in an estuary or inlet between mean high tide and mean low tide, or the volume of water leaving an estuary at ebb tide.

Trunkline—A large-diameter pipeline receiving oil or gas from many smaller tributary gathering lines that serve a large area; common-carrier line; main line.

Turbidity—Reduced water clarity due to the presence of suspended matter.

Volatile organic compound (VOC)—Any organic compound that is emitted to the atmosphere as a vapor.

Water test areas—Areas within the eastern Gulf where U.S. Department of Defense research, development, and testing of military planes, ships, and weaponry take place.

Weathering (of oil)—The aging of oil due to its exposure to the atmosphere, causing marked alterations in its physical and chemical makeup.

KEYWORD INDEX

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APPENDIX A

PROPOSED LEASE MITIGATING MEASURES (STIPULATIONS)

A PROPOSED LEASE MITIGATING MEASURES (STIPULATIONS)

A.1 INTRODUCTION

Mitigations can be applied at the lease sale stage, typically through applying what are commonly referred to as lease stipulations to OCS oil and gas leases as a result of any given lease sale. Stipulations are attached to OCS oil and gas leases and are legally binding. Stipulations are applied to leases when a lessee obtains a lease, while conditions of approval are applied to permits during the post-lease review process.

This appendix discusses the potential lease stipulations that could be considered for a lease sale. These potential lease stipulations were developed from numerous scoping efforts for the 2017-2022 National OCS Oil and Gas Program, which will be considered for GOM Lease Sales 259 and 261, as well as from lease stipulations applied in previous lease sales. The Topographic Features and Live Bottom (Pinnacle Trend) Stipulations have been applied as programmatic mitigation in the 2017-2022 National OCS Program EIS (BOEM 2016c; 2016d) and Record of Decision (BOEM 2017d) and, therefore, would apply to all leases issued for GOM Lease Sales 259 and 261 in designated lease blocks. The other nine lease stipulations described below could be considered for GOM Lease Sales 259 and 261, as applicable. The analysis of any stipulations for any particular alternative does not ensure that the Assistant Secretary for Land and Minerals Management will make a decision to apply the stipulations to OCS oil and gas leases that may result from any OCS oil and gas lease sale nor does it preclude minor modifications in wording during subsequent steps in the prelease process if comments indicate changes are necessary or if conditions change.

Lease stipulations are considered for adoption by the Assistant Secretary for Land and Minerals Management, under authority delegated by the Secretary of the Interior, and any stipulations to be included in a lease sale are described in the Record of Decision for that lease sale. Mitigating measures in the form of lease stipulations are added to the lease terms and are therefore enforceable as part of the lease. In addition, each exploration and development plan, as well as any pipeline applications that result from a lease sale, will undergo a NEPA review, and additional project-specific mitigations may be applied as conditions of plan approval at the post-lease stage. The BSEE has the authority to monitor and enforce these conditions and, under 30 CFR part 250 subpart N, may seek remedies and penalties from any operator that fails to comply with those conditions, stipulations, and mitigating measures.

Some lease stipulations apply to all blocks that may be offered, while other lease stipulations apply only to specified blocks. Each Final Notice of Sale package will include maps indicating which blocks will have potential lease stipulations, and the “List of Blocks Available for Leasing” contained in the Final Notice of Sale package will identify the lease stipulations applicable to each block. The Final Notice of Sale package will contain the Final Notice of Sale, information to lessees, and lease stipulations. A recent list of frequently applied lease stipulations for Gulf of Mexico OCS oil and gas lease sales includes the following:

- Stipulation No. 1 – Military Areas;
- Stipulation No. 2 – Evacuation;
- Stipulation No. 3 – Coordination;
- Stipulation No. 4 – Protected Species;
- Stipulation No. 5 –Topographic Features;
- Stipulation No. 6 – United Nations Convention on the Law of the Sea Royalty Payment
- Stipulation No. 7 – Agreement between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico
- Stipulation No. 8 – Live Bottom
- Stipulation No. 9 – Blocks South of Baldwin County, Alabama
- Stipulation No. 10 – Restrictions due to Rights-of-Use and Easements for Floating Production Facilities
- Stipulation No. 11 – Royalties on All Produced Gas

A.2 STIPULATION NO. 1 – MILITARY AREAS

A.2.1 Stipulation Overview

Stipulation No. 1 may be included in leases, issued as a result of an OCS oil and gas lease sale, located within the Warning Areas and Eglin Water Test Areas as shown in **Figure A-1**. The Military Areas Stipulation has been applied to all blocks leased in military areas since 1977 and reduces potential impacts, particularly in regard to safety, but it does not reduce or eliminate the actual physical presence of OCS oil- and gas-related operations in areas where military operations are conducted. The stipulation contains a “hold harmless” clause (holding the U.S. Government harmless in case of an accident involving military operations) and requires lessees to coordinate their activities with appropriate local military contacts.

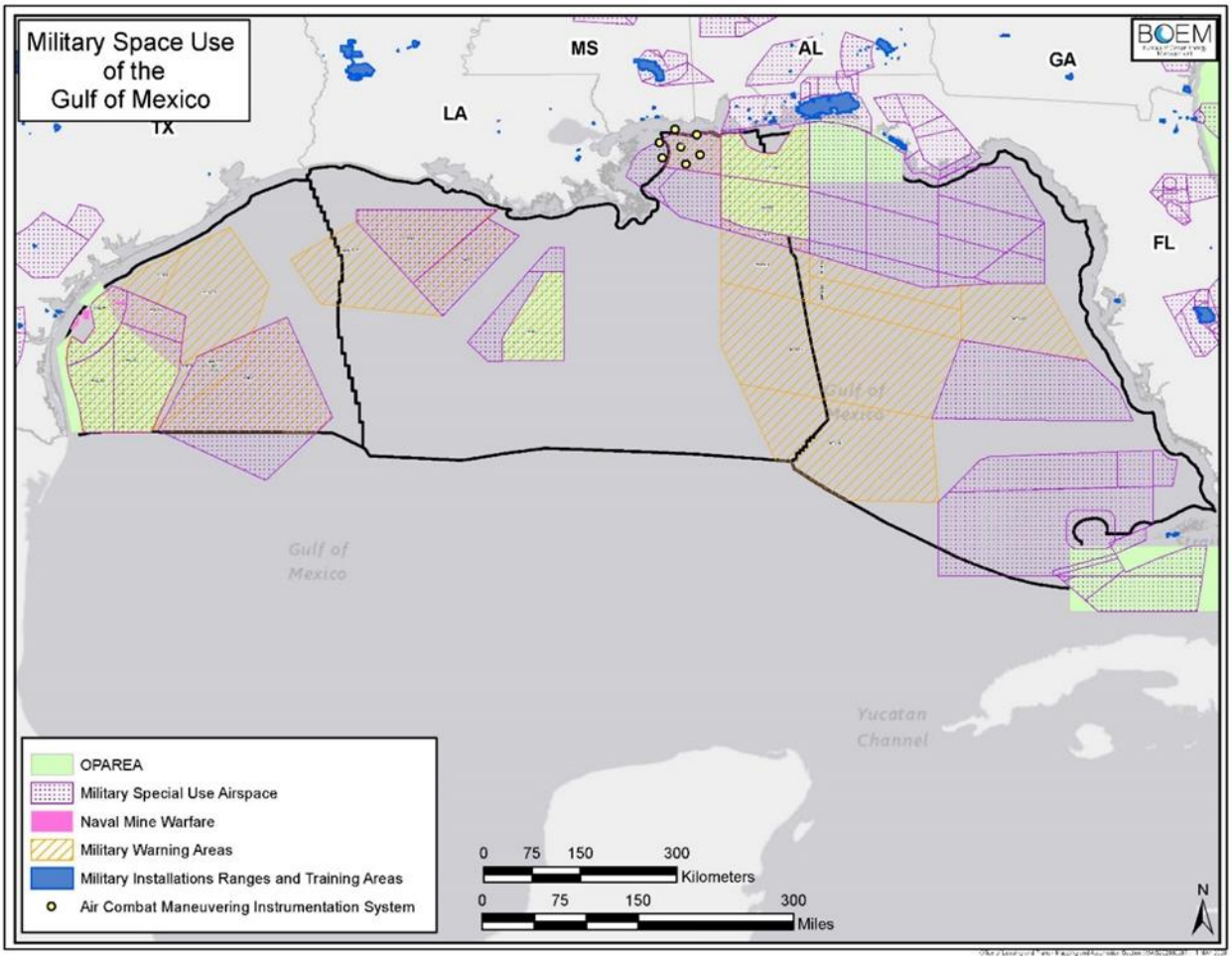


Figure A-1. Military Warning Areas and Eglin Water Test Areas in the Gulf of Mexico

A.2.2 Potential Stipulation Language

The potential stipulation reads as follows:

A. Hold and Save Harmless

Whether compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property that occur in, on, or above the Outer Continental Shelf (OCS), and to any persons or to any property of any person or persons who are agents, employees, or invitees of the lessee, its agents, independent contractors, or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the OCS if such injury or damage to such person or property occurs by reason of the activities of any agency of the United States (U.S.) Government, its contractors or subcontractors, or any of its officers, agents, or employees, being conducted as a part of, or in connection with, the programs and activities of the command headquarters listed in the table in Section C, Operational.

Notwithstanding any limitation of the lessee's liability in Section 14 of the lease, the lessee assumes this risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the U.S. Government, its contractors or subcontractors, or any of its officers, agents, or employees. The lessee further agrees to indemnify and save harmless the U.S. Government against all claims for loss, damage, or injury sustained by the lessee, or to indemnify and save harmless the U.S. Government against all claims for loss, damage, or injury sustained by the agents, employees, or invitees of the lessee, its agents, or any independent contractors or subcontractors doing business with the lessee in connection with the programs and activities of the aforementioned military installation, whether the same be caused in whole or in part by the negligence or fault of the U.S. Government, its contractors or subcontractors, or any of its officers, agents, or employees, and whether such claims might be sustained under a theory of strict or absolute liability or otherwise.

B. Electromagnetic Emissions

The lessee agrees to control its own electromagnetic emissions and those of its agents, employees, invitees, independent contractors, or subcontractors emanating from individual designated defense warning areas in accordance with the requirements specified by the commander of the command headquarters listed in the following table to the degree necessary to prevent damage to, or unacceptable interference with, Department of Defense flight, testing, or operational activities conducted within individual designated warning areas. Necessary monitoring, control, and coordination with the lessee, its agents, employees, invitees, independent contractors, or subcontractors will be affected by the commander of the appropriate onshore military installation conducting operations in the particular warning area, provided, however, that control of such electromagnetic emissions shall in no instance prohibit all manner of electromagnetic communication during any period of time between a lessee, its agents, employees, invitees, independent contractors, or subcontractors, and onshore facilities.

C. Operational

The lessee, when operating, or causing to be operated on its behalf, a boat, ship, or aircraft traffic in an individual designated warning area, must enter into an agreement with the commander of the individual command headquarters listed in the following list, prior to commencing such traffic. Such an agreement will provide for positive control of boats, ships, and aircraft operating in the warning areas at all times.

Warning and Water Test Area	Command Address	Contact(s)	Email	Phone
W-59	Naval Air Station JRB 159 Fighter Wing 400 Russell Avenue, Box 27 Building 285 (Operations) New Orleans, Louisiana 70143-0027	TSgt. Michael Frisard	michael.j.frisard.mil@mail.mil	(504) 391-8637
		TSgt. Scott Fenton	scott.p.fenton2.mil@mail.mil	(504) 391-8695 /8696
W-92	Fleet Area Control and Surveillance Facility Attention: Deputy Airspace Officer 118 Albemare Ave. P.O. Box 40 Jacksonville, Florida 32212	Ronald McNeal	ronald.mcNeal@navy.mil	(904) 542-2112
W-147	147 OSS/OSA 14657 Sneider Street Houston, Texas 77034-5586	Sgt. Dion Folley	dion.r.folley.mil@mail.mil	(281) 929-2142
		Sgt. Gina Turner	gina.l.turner@mail.mil	(281) 929-2710 /2803
W-155	NASP Sector Control Attention: Facility (FACSFAC) NAS Pensacola 1860 Perimeter Road, Building 3963 NASP Florida 32508-5217	Facility (FACSFAC) NAS	NASP.SECTORCONTROL@navy.mil	(850) 452-2735 Base Operations: (850) 452-2431
W-228	Chief, Naval Air Training Code N386 (ATC and Air Space Management) Naval Air Station Corpus Christi, Texas 78419-5100	Tom Bily	thomas.bily@navy.mil	(361) 961-0145
W-453	Air National Guard – CRTC 4715 Hewes Avenue, Building 60 Gulfport, Mississippi 39507-4324		usaf.ms.ms-crtc.mbx.mscrtc-director-of-operations@mail.mil	(228) 214-6027
W-602	VQ-4 Operations Department 7791 Mercury Road		TNKR_VQ4_Dep_Skeds@navy.mil	(405) 739-5700

Warning and Water Test Area	Command Address	Contact(s)	Email	Phone
	Tinker AFB, Oklahoma 73145-8704			
Eglin Water Test Areas 1, 2, 3, and 4	101 West D Ave, Bldg. 1, Suite 116 Eglin AFB, Florida 32562	Steven C. Dietzius, Technical Director (96TW/CT)		(850) 882-0762
	Range and Operations Sustainment Section 96 TW/XPO Eglin AFB, Florida 32542	Mr. Charles Smith	charles.smith.7@us.af.mil	(850) 882-5614

A.2.3 Effectiveness of the Lease Stipulation

The hold harmless section of the military stipulation serves to protect the U.S. Government from liability in the event of an accident involving the lessee and military activities. This serves to reduce the impact of OCS oil- and gas-related activity on the communications of military missions and reduces the possible impacts of electromagnetic energy transmissions on missile testing, tracking, and detonation. The operations of the military and the lessee and its agents will not be affected by this chapter.

The operational section requires notification to the military of OCS oil- and gas-related activity to take place within a military use area. This allows the base commander to plan military missions and maneuvers that will avoid the areas where OCS oil- and gas-related activities are taking place or to schedule around these activities. Prior notification helps reduce the potential impacts associated with vessels and helicopters traveling unannounced through areas where military activities are underway.

This stipulation reduces potential impacts, particularly in regard to safety, but it does not reduce or eliminate the actual physical presence of OCS oil- and gas-related operations in areas where military operations are conducted. The reduction in potential impacts resulting from this stipulation makes multiple-use conflicts between military operations and OCS oil- and gas-related activities unlikely. Without the stipulation, some potential conflict is likely. The best indicator of the overall effectiveness of the stipulation may be that there has never been an accident involving a conflict between military operations and OCS oil- and gas-related activities.

A.3 STIPULATION NO. 2 – EVACUATION

A.3.1 Stipulation Overview

Stipulation No. 2 may be included in leases issued as a result of an OCS oil and gas lease sale located in the easternmost portion of the CPA and any blocks leased in the EPA. An evacuation stipulation has been applied to all blocks leased in these areas since 2001. The Evacuation Stipulation is designed to protect the lives and welfare of offshore oil and gas personnel. The OCS oil- and

gas-related activities have the potential to occasionally interfere with specific requirements and operating parameters for the lessee's activities in accordance with the military stipulation clauses contained herein. If it is determined that the operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize the national defense or to pose unacceptable risks to life and property, then a temporary suspension of operations and the evacuation of personnel may be necessary.

A.3.2 Potential Stipulation Language

A. The lessee, recognizing that oil and gas resource exploration, exploitation, development, production, abandonment, and site cleanup operations on the leased area of submerged lands may occasionally interfere with tactical military operations, hereby recognizes and agrees that the United States reserves and has the right to temporarily suspend operations and/or require evacuation on this lease in the interest of national security. Such suspensions are considered unlikely in this area. Every effort will be made by the appropriate military agency to provide as much advance notice as possible of the need to suspend operations and/or evacuate. Advance notice of fourteen (14) days normally will be given before requiring a suspension or evacuation, but in no event will the notice be less than four (4) days.

   Temporary suspension of operations may include the evacuation of personnel and appropriate sheltering of personnel not evacuated. Appropriate shelter means the protection of all lessee personnel for the entire duration of any Department of Defense activity from flying or falling objects or substances; it will be implemented by a written order from the Bureau of Safety and Environmental Enforcement (BSEE) Gulf of Mexico Regional Supervisor for District Field Operations (RSDFO), after consultation with the appropriate command headquarters or other appropriate military agency or higher authority.

   The appropriate command headquarters, military agency, or higher authority will provide information to allow the lessee to assess the degree of risk, and provide sufficient protection for, the lessee's personnel and property. Such suspensions or evacuations for national security reasons normally will not exceed seventy-two (72) hours; however, any such suspension may be extended by order of the BSEE Gulf of Mexico RSDFO. During such periods, equipment may remain in place, but all production, if any, must cease for the duration of the temporary suspension if the BSEE Gulf of Mexico RSDFO so directs. Upon cessation of any temporary suspension, the BSEE Gulf of Mexico RSDFO immediately will notify the lessee that such suspension has terminated and operations on the leased area can resume.

B. The lessee must inform BSEE of the persons/offices to be notified to implement the terms of this stipulation.

C. The lessee is encouraged to establish and maintain early contact and coordination with the appropriate command headquarters to avoid or minimize the effects of conflicts with potentially hazardous military operations.

D. The lessee is not entitled to reimbursement for any costs or expenses associated with the suspension of operations or activities or the evacuation of property or personnel in fulfillment of the military mission in accordance with subsections A through C above.

E. Notwithstanding subsection D, the lessee reserves the right to seek reimbursement from appropriate parties for the suspension of operations or activities, or the evacuation of property or personnel, associated with conflicting commercial operations.

A.3.3 Effectiveness of the Lease Stipulation

This stipulation would provide for the evacuation of personnel and shut-in of operations during any events conducted by the military that could pose a danger to ongoing OCS oil- and gas-related operations. It is expected that the invocation of these evacuation requirements would be extremely rare. It is expected that these measures would eliminate dangerous conflicts between OCS oil- and gas-related activities and military operations. Continued close coordination between BSEE and the military may result in improvements in the wording and implementation of these stipulations.

A.4 STIPULATION NO. 3 – COORDINATION

A.4.1 Stipulation Overview

Stipulation No. 3 may be included in leases issued as a result of an OCS oil and gas lease sale located in the easternmost portion of the CPA or any blocks leased in the EPA. A coordination stipulation has been applied to all blocks leased in these areas since 2001. The Coordination Stipulation is designed to increase communication and cooperation between military authorities and offshore oil and gas operators. Specific requirements and operating parameters are established for the lessee's activities in accordance with the Military Areas Stipulation clauses. For instance, if it is determined that the operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize the national defense or to pose unacceptable risks to life and property, then certain measures become activated and the OCS oil- and gas-related operations may be curtailed in the interest of national defense.

A.4.2 Potential Stipulation Language

A. The placement, location, and planned periods of operation of surface structures on this lease during the exploration stage are subject to approval by the Bureau of Ocean Energy Management (BOEM) Gulf of Mexico Regional Director (RD) after the review of an operator's Exploration Plan (EP). Prior to approval of the EP, the lessee must consult with the appropriate command headquarters regarding the location, density, and planned periods of operation of such structures, and to maximize exploration while minimizing conflicts with Department of Defense activities.

When determined necessary by the appropriate command headquarters, the lessee will enter into a formal Operating Agreement with such command headquarters, which delineates the specific requirements and operating parameters for the lessee's activities in accordance with the military stipulation clauses contained herein. If it is determined that the operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize national defense or to pose unacceptable risks to life and property, then the BOEM Gulf of Mexico RD may approve the EP with conditions, disapprove it, or require modification in accordance with 30 CFR part 550. The BOEM Gulf of Mexico RD will notify the lessee in writing of the conditions associated with plan approval, or the reason(s) for disapproval or required modifications.

Moreover, if there is a serious threat of harm or damage to life or property, or if it is in the interest of national security or defense, pending or approved operations may be suspended or halted in accordance with 30 CFR part 250. Such a suspension will extend the term of a lease by an amount equal to the length of the suspension. The Bureau of Safety and Environmental Enforcement (BSEE) Gulf of Mexico RD will attempt to minimize such suspensions within the confines of related military requirements. It is recognized that the issuance of a lease conveys the right to the lessee, as provided in Section 8(b)(4) of the Outer Continental Shelf Lands Act (OCSLA), 43 U.S.C. § 1337(b)(4), to engage in exploration, development, and production activities conditioned upon other statutory and regulatory requirements.

B. The lessee is encouraged to establish and maintain early contact and coordination with the appropriate command headquarters to avoid or minimize the effects of conflicts with potentially hazardous military operations.

C. If national security interests are likely to be in continuing conflict with an existing Operating Agreement, EP, Development and Production Plan, or Development Operations Coordination Document, the BSEE Gulf of Mexico RD, in consultation with BOEM, will direct the lessee to modify any existing Operating Agreement or to enter into a new Operating Agreement to implement measures to avoid or minimize the identified potential conflicts, subject to the terms and conditions and obligations of the legal requirements of the lease.

A.4.3 Effectiveness of the Lease Stipulation

This stipulation would provide for review of pending oil and gas operations by military authorities and could result in delaying oil and gas operations if military activities have been scheduled in the area that may put the oil and gas operations and personnel at risk or if such operations could result in serious threat of harm or damage to life or property, or jeopardize the national security or defense.

A.5 STIPULATION NO. 4 – PROTECTED SPECIES

A.5.1 Stipulation Overview

Stipulation No. 4 may be included in all leases issued as a result of an OCS oil and gas lease sale. The Protected Species Stipulation has been applied to all blocks leased in the GOM since December 2001. This stipulation was developed in consultation with the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service and the U.S. Department of the Interior, Fish and Wildlife Service in accordance with consultation requirements under the Endangered Species Act and the Marine Mammal Protection Act, and is designed to minimize or avoid potential adverse impacts to federally protected species under both Acts.

A.5.2 Potential Stipulation Language

A. The Endangered Species Act (16 U.S.C. §§ 1531 *et seq*.) and the Marine Mammal Protection Act (MMPA) (16 U.S.C. §§ 1361 *et seq*.) are designed to protect threatened and endangered species and marine mammals and apply to activities authorized under the Outer Continental Shelf Lands Act (OCSLA, 43 U.S.C. §§ 1331 *et seq*.). The Congressional Declaration of Policy included in OCSLA provides that it is the policy of the United States that the OCS should be made available for expeditious and orderly development, subject to environmental safeguards, in a manner that is consistent with the maintenance of competition and other national needs (see 43 U.S.C. § 1332). Both the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) comply with these laws on the OCS.

B. The lessee and its operators must:

1. Comply with the Reasonable and Prudent Measures and implementing Terms and Conditions of the Biological Opinion issued by the National Marine Fisheries Service (NMFS) on March 13, 2020 (2020 NMFS BiOp), as amended. This includes mitigation, particularly any appendices to Terms and Conditions applicable to the activity, as well as record-keeping and reporting sufficient to allow BOEM and BSEE to comply with reporting and monitoring requirements under the BiOp; and any additional reporting required by BOEM or BSEE developed as a result of implementation of the 2020 NMFS BiOp and 2021 Amended Incidental Take Statement (ITS) and Revised Appendices.

    - The 2020 NMFS BiOp may be found here: https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-and-gas-program-activities-gulf-mexico
    - The Appendices and protocols may be found here: https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico

- The 2021 Amended ITS and Revised Appendices may be found here: https://www.fisheries.noaa.gov/resource/document/amended-incidental-take-statement-and-revised-appendices

2. Immediately report all sightings and locations of injured or dead protected species (e.g., marine mammals and sea turtles) to the appropriate hotlines listed at https://www.fisheries.noaa.gov/report (phone numbers vary by state) as required in the 2020 NMFS BiOp and 2021 Revised Appendix C. If oil and gas industry activity is responsible for the injured or dead animal (e.g., injury or death was caused by a vessel strike, entrapment or entanglement), the responsible parties must notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov, respectively.

3. Unless previously approved by BOEM or BSEE through a plan or permit issued under this lease, notify BOEM at least 15 days prior to any proposed vessel transit of the Bryde's whale area, and receive prior approval for that transit from BOEM. The Bryde's whale area, as described in the 2020 NMFS BiOp, includes the area from 100- to 400-meter isobaths from 87.5° W to 27.5° N as described in the status review (Rosel et al. 2016), plus an additional 10 km around that area.

The lessee and its operators, personnel, and subcontractors, while undertaking activities authorized under this lease, must implement and comply with the specific mitigation measures outlined in the following Appendices of the 2020 NMFS BiOp and 2021 Amended ITS and Revised Appendices:

- Appendix A: "Seismic Survey Mitigation and Protected Species Observer Protocols";
- Appendix B: "Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols";
- Appendix C: "Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols";
- Appendix I: "Explosive Removal of Structure Measures"; and
- Appendix J: "Sea Turtle Handling and Resuscitation Guidelines".

Certain post-lease approvals (e.g., for activities proposing new and unusual technologies, certain seismic surveys) will require step-down review by NMFS, as provided by the 2020 NMFS BiOp and 2021 Amended ITS, and additional mitigations to protect ESA-listed species may be applied at that time. At the lessee's option, the lessee, its operators, personnel, and contractors may comply with the most current measures to protect species in place at the time an activity is undertaken under this lease, including but not limited to, new or updated versions of the 2020 NMFS BiOp, the 2021 ITS and Appendices, or through new or activity-specific consultations. The

most current applicable terms and conditions and reasonable and prudent measures from the 2020 NMFS BiOp, 2021 Amended ITS and Appendices, or other relevant consultations will be applied to post-lease approvals. The lessee and its operators, personnel, and subcontractors will be required to comply with the mitigation measures identified in the above referenced 2020 NMFS BiOp and 2021 Amended ITS (including Appendices), and additional measures in the conditions of approvals for their plans or permits.

A.5.3 Effectiveness of the Lease Stipulation

This stipulation was developed in consultation with NMFS and FWS, and is designed to minimize or avoid potential adverse impacts to federally protected species. The stipulation immediately implements existing mitigations on post-lease activities and notifies lessees that subsequent approvals for OCS oil- and gas-related activities may include additional mitigations (as conditions of approval) when those actions have the potential to impact marine mammals, sea turtles, and other federally protected species. Among other protections, these requirements and conditions provide protection by ensuring that operations are conducted at least a minimum distance away from the animal.

A.6 STIPULATION NO. 5 – TOPOGRAPHIC FEATURES

A.6.1 Stipulation Overview

High-relief topographic features that provide habitat for coral-reef-community organisms are located in the WPA and CPA. BOEM protects these features from OCS oil- and gas-related activities through stipulations attached to leases. There are currently no identified topographic features protected under this stipulation in the EPA.

The OCS oil- and gas-related activities resulting from an OCS oil and gas lease sale could have potentially severe impacts on or near hard bottom communities in the GOM. The DOI has recognized this issue and has made the Topographic Features Stipulation part of leases on or near these biotic communities since 1973 to mitigate potential impacts. By applying the stipulation, potential impacts from nearby OCS oil- and gas-related activities were mitigated to the greatest extent possible. This stipulation does not prevent the recovery of oil and gas resources but would serve to protect valuable and sensitive biological resources.

If applied, this stipulation would likely be included in leases issued as a result of an OCS oil and gas lease sale on blocks within the areas indicated in **Figure A-2**. The detailed topographic features map package is available from BOEM's New Orleans Office, Public Information Office and on BOEM's website at http://www.boem.gov/Topographic-Features-Stipulation-Map-Package/. BOEM policy, as it relates to the Topographic Features Stipulation, is described in NTL No. 2009-G39, "Biologically-Sensitive Underwater Features and Areas," and can be found on BOEM's website at https://www.boem.gov/sites/default/files/regulations/Notices-To-Lessees/2009/09-G39.pdf. Specific OCS blocks affected by the Topographic Features Stipulation are listed on BOEM's website at

https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Gulf-of-Mexico-Region/topoblocks.pdf. A detailed map showing the locations of the affected blocks can be found on BOEM's website at https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Gulf-of-Mexico-Region/topomap.pdf.

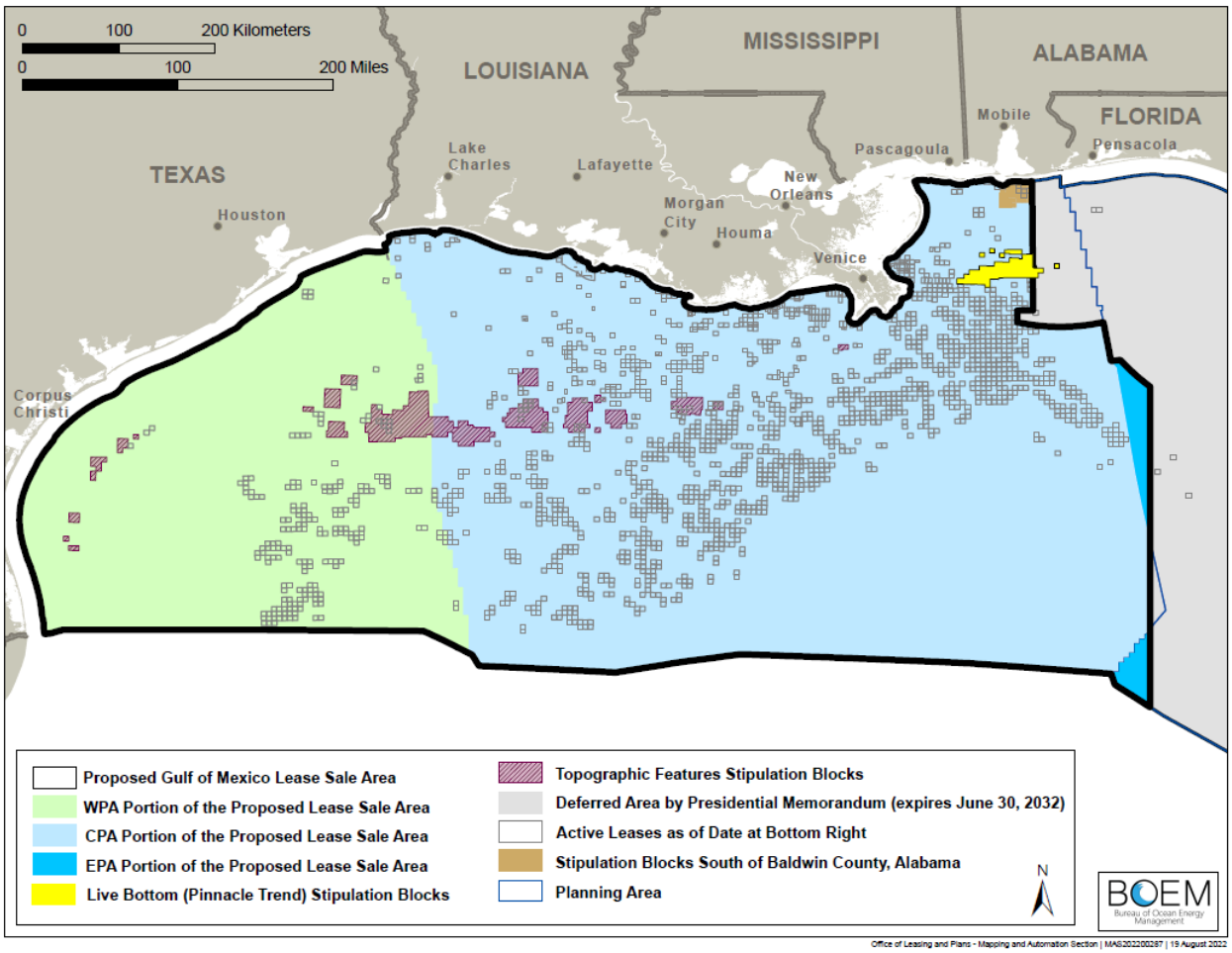


Figure A-2. Blocks That Could Be Subject to the Topographic Features Stipulation, Live Bottom Stipulation, or the Blocks South of Baldwin County, Alabama Stipulation in the Gulf of Mexico Overlaid with the 2017-2022 GOM Multisale EIS Proposed Lease Sale Areas.

The Topographic Features Stipulation was formulated based on consultation with various Federal agencies and comments solicited from the States, industry, environmental organizations, and academic representatives. The stipulation is based on years of scientific information collected since the inception of the stipulation. This information includes various Bureau of Land Management/MMS (BOEM)-funded studies of topographic highs in the GOM; numerous stipulation-imposed, industry-funded monitoring reports; and the National Research Council's report entitled *Drilling Discharges in the Marine Environment* (NRC 1983). The blocks affected by the previously applied Topographic Features Stipulation are shown in **Figure A-2**.

This stipulation would establish No Activity Zones at the topographic features where no bottom-disturbing activity, including anchoring and structure emplacement, would be allowed. The No Activity Zone would protect the most sensitive reef biota that are found at the peaks of the topographic features within the No Activity Zone. Each bank-specific No Activity Zone is described in the table in **Appendix A.6.2** below. Outside the No Activity Zone, additional restrictive buffer zones based on an essential fish habitat programmatic consultation with NOAA Fisheries would be established to distance OCS oil- and gas-related, bottom-disturbing activities from the No Activity Zone. Oil and gas operations could occur within these buffer zones, but drilling discharges would be shunted to near the seafloor within the zones. Shunting of the drilling effluent to near the seafloor allows cuttings to be discharged deeper than the portions of the high-relief topographic feature where the most sensitive reef-building corals live. Low-relief banks would likely have a No Activity Zone and restrictive buffer zones surrounding the No Activity Zone but would not have a shunting requirement. Shunting near these low-relief banks would discharge drilling muds in the same water-depth range as the features' associated biota that are being protected and could potentially smother those features.

Three topographic features (i.e., the East Flower Garden Bank, West Flower Garden Bank, and Stetson Bank) comprise the Flower Garden Banks National Marine Sanctuary as of the publication of this document. Because the features of the East and West Flower Garden Banks have received National Marine Sanctuary status, under BOEM's Topographic Features Stipulation, they are now protected to a greater degree than the other topographic features, as outlined in the table in **Chapter A.6.2** below. Under BOEM's Topographic Features Stipulation and based on an essential fish habitat programmatic consultation with NOAA Fisheries, the added provisions at the East and West Flower Garden Banks include a larger and deeper No Activity Zone and a larger shunting zone (4 mi [6 km] surrounding the No Activity Zone) than the other BOEM-protected topographic features. Stetson Bank, which was made part of the Flower Garden Banks National Marine Sanctuary in 1996, does not have the same biological complexity as the East and West Flower Garden Banks, and therefore has similar No Activity Zone and shunting zone protections to the other BOEM-protected topographic features.

A.6.2 Potential Stipulation Language

The stipulation provides for protection of the following banks through the applicable mitigating measures in the Western Planning Area.

Bank Name	No Activity Zone (defined by isobaths in meters)
Shelf Edge Banks	
West Flower Garden Bank	100 (Defined by 1/4 x 1/4 x 1/4 system)
East Flower Garden Bank	100 (Defined by 1/4 x 1/4 x 1/4 system)
MacNeil Bank	82
29 Fathom Bank	64
Rankin Bank	85
Bright Bank[1]	85

Bank Name	No Activity Zone (defined by isobaths in meters)
Stetson Bank	52
Appelbaum Bank	85
Low-Relief Banks[2]	
Mysterious Bank	74, 76, 78, 80, 84
Coffee Lump	Various
Blackfish Ridge	70
Big Dunn Bar	65
Small Dunn Bar	65
32 Fathom Bank	52
Claypile Bank[3]	50
South Texas Banks[4]	
Dream Bank	78, 82
Southern Bank	80
Hospital Bank	70
North Hospital Bank	68
Aransas Bank	70
South Baker Bank	70
Baker Bank	70

Notes:
1. Central Planning Area bank in the Gulf of Mexico with a portion of its "1-Mile Zone" and/or "3-Mile Zone" in the WPA.
2. Only paragraph A applies.
3. Paragraphs A and B apply. In paragraph B, monitoring of the effluent to determine the effect on the biota of Claypile Bank is required rather than shunting.
4. Only paragraphs A and B apply.

The stipulation provides for protection of the following banks through the applicable mitigating measures in the Central Planning Area:

Bank Name	No Activity Zone (defined by isobaths in meters)
Alderdice Bank	80
Bouma Bank	85
Bright Bank[1]	85
Diaphus Bank[2]	85
Elvers Bank	85
Ewing Bank	85
Fishnet Bank[2]	76
Geyer Bank	85
Jakkula Bank	85
McGrail Bank	85
Parker Bank	85
Rezak Bank	85

Sackett Bank[2]	85
Sidner Bank	85
Sonnier Bank	55
Sweet Bank[3]	85

Notes:
1. Gulf of Mexico CPA bank with a portion of its "3-Mile Zone" in the Gulf of Mexico Western Planning Area.
2. Only paragraphs A and B apply.
3. Only paragraph A applies.

The lessee and its operators, personnel, and subcontractors are responsible for carrying out the specific mitigation measures outlined in the most current Notice To Lessees and Operators (NTLs) as described at https://www.boem.gov/guidance, which provide guidance on how to follow the requirements of this stipulation (NTL No. 2009-G39). See the "Topographic Features Stipulation Map" and the figures in the "Western and Central Gulf of Mexico Topographic Features Stipulation Map package" on the Bureau of Ocean Energy Management website at http://www.boem.gov/Topographic-Features-Stipulation-Map-Package/. In addition to the foregoing, the lessee, its operators, personnel, and subcontractors, as applicable, shall comply with the following:

A. No activity, including the placement of structures, drilling rigs, pipelines, or anchoring, will be allowed within the listed isobath ("No Activity Zone") of the banks listed above.

B. Operations within the area shown as the "1,000-Meter Zone" on the "Topographic Features Stipulation Map" must be restricted by shunting all drill cuttings and drilling fluids to the bottom through a structurally sound downpipe that terminates at an appropriate distance, but no more than 10 meters, from the bottom.

C. Operations within the area shown as the "1-Mile Zone" on the "Topographic Features Stipulation Map" must be restricted by shunting all drill cuttings and drilling fluids to the bottom through a structurally sound downpipe that terminates at an appropriate distance, but no more than 10 meters, from the bottom. Where a "1-Mile Zone" is designated, the "1,000-Meter Zone" in paragraph B is not designated. This restriction on operations also applies to areas surrounding the Flower Garden Banks, namely the "4-Mile Zone" surrounding the East Flower Garden Bank and the West Flower Garden Bank.

D. Operations within the area shown as "3-Mile Zone" on the "Topographic Features Stipulation Map" (http://www.boem.gov/Topographic-Features-Stipulation-Map-Package/) must be restricted by shunting all drill cuttings and drilling fluids from development operations to the bottom through a structurally sound downpipe that terminates at an appropriate distance, but no more than 10 meters, from the

bottom. If more than two exploration wells are to be drilled from the same surface location within the "3-Mile Zone," all drill cuttings and drilling fluids must be restricted by shunting to the bottom through a downpipe that terminates at an appropriate distance, but no more than 10 meters, from the bottom.

A.6.3 Effectiveness of the Lease Stipulation

The purpose of the stipulation is to protect the biota of the topographic features from adverse impacts due to routine OCS oil- and gas-related activities. Such impacts include physical damage from anchoring and rig emplacement and potential toxic and smothering impacts from muds and cuttings discharges. The Topographic Features Stipulation has been used on leases since 1973 to effectively prevent damage to the biota of these banks from routine OCS oil- and gas-related activities. Anchoring related to OCS oil- and gas-related activities on the sensitive portions of the topographic features has been prevented. Monitoring studies have demonstrated that the shunting requirements of the stipulations are effective in preventing the muds and cuttings from impacting the biota of the banks. Long-term monitoring studies conducted by the NOAA and BOEM at the East and West Flower Garden Banks have shown that no significant long-term changes have been detected in coral cover or coral diversity at the East and West Flower Garden Banks from 1988 to 2017 (Johnston et al. 2013; 2015; 2018; Zimmer et al. 2010) and probably not since the first measurements were taken in the mid-1970s (Gittings 1998). The stipulation, if adopted for an OCS oil and gas lease sale, will continue to protect the biota of the banks.

A.7 Stipulation No. 6 – United Nations Convention on the Law of the Sea Royalty Payment

A.7.1 Stipulation Overview

Stipulation No. 6 could be included in leases issued as a result of a lease sale in the WPA and CPA in the area beyond the U.S. Exclusive Economic Zone, formerly known as the "Western Gap" (**Figure A-3**).

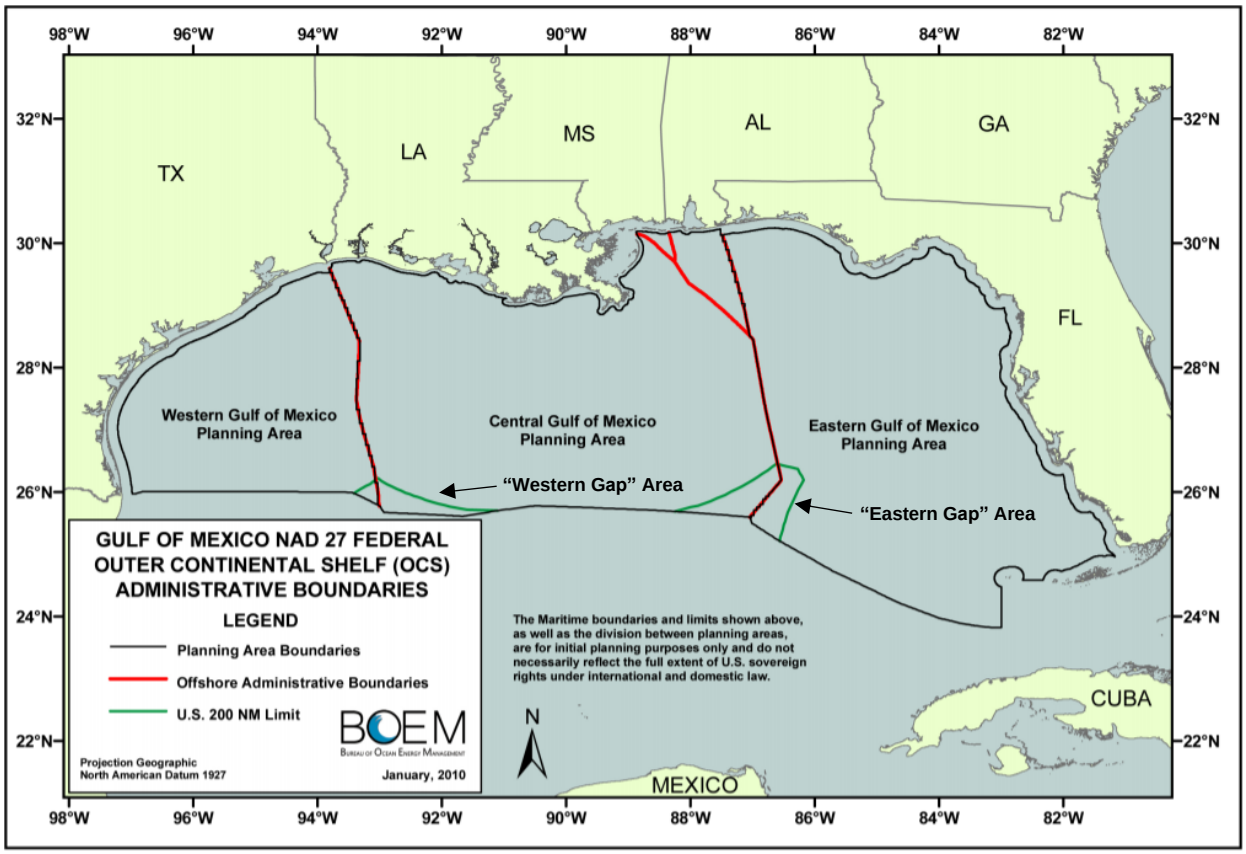


Figure A-3. Gulf of Mexico OCS Administrative Boundaries, the "Western Gap" Area, and the "Eastern Gap" Area.

A.7.2 Potential Stipulation Language

If the United States of America becomes a party to the 1982 United Nations Convention on the Law of the Sea (UNCLOS, or Convention) prior to or during the life of a lease issued by the U.S. Government on a block or portion of a block located beyond its Exclusive Economic Zone as defined in UNCLOS, and subject to such conditions that the Senate may impose through its constitutional role of advice and consent, then the following royalty payment lease provisions will apply to the lease so issued, consistent with Article 82 of UNCLOS:

A. UNCLOS requires annual payments by coastal states party to the Convention with respect to all production at a site after the first five years of production at that site. Any such payments will be made by the U.S. Government and not the lessee.

B. For the purpose of this stipulation regarding payments by the lessee to the U.S. Government, each lease constitutes a separate site, whether or not a lease is committed to a unit.

C. For the purpose of this stipulation, the first production year begins on the first day of commercial production (excluding test production). Once a production year begins, it will run for a period of 365 days, whether or not the lease produces

continuously in commercial quantities. Subsequent production years will begin on the anniversary date of first production.

D. If total lease production during the first five years following first production exceeds the total royalty suspension volume(s) provided in the lease terms, or through application and approval of relief from royalties, the provisions of this stipulation will not apply. If, after the first five years of production, but prior to termination of this lease, production exceeds the total royalty suspension volume(s) provided in the lease terms, or through application and approval of relief from royalties, the provisions of this stipulation no longer will apply effective the day after the suspension volumes have been produced.

E. If, in any production year after the first five years of lease production, due to lease royalty suspension provisions or through application and approval of relief from royalties, no lease production royalty is due or payable by the lessee to the U.S. Government, then the lessee will be required to pay, as stipulated in paragraph I below, UNCLOS-related royalty in the following amount so that the required Convention payments may be made by the U.S. Government as provided under the Convention:

   1. In the sixth year of production, one percent of the value of the sixth year's lease production saved, removed, or sold from the leased area;

   2. After the sixth year of production, the Convention-related royalty payment rate will increase by one percent for each subsequent year until the twelfth year and will remain at seven percent thereafter until lease termination.

F. If the United States becomes a party to UNCLOS after the fifth year of production from the lease, and a lessee is required, as provided herein, to pay UNCLOS-related royalty, the amount of the royalty due will be based on the above payment schedule as determined from first production. For example, the U.S. Government's accession to UNCLOS in the tenth year of lease production would result in an UNCLOS-related royalty payment of five percent of the value of the tenth year's lease production, saved, removed, or sold from the lease. The following year, a payment of six percent would be due and so forth, as stated above, up to a maximum of seven percent per year.

G. If, in any production year after the first five years of lease production, due to lease royalty suspension provisions or through application and approval of relief from royalties, lease production royalty is paid but is less than the payment provided for by the Convention, then the lessee will be required to pay to the U.S. Government the Convention-related royalty in the amount of the shortfall.

H. In determining the value of production from the lease if a payment of Convention-related royalty is to be made, the provisions of the lease and applicable regulations will apply.

I. The UNCLOS-related royalty payment(s) required under paragraphs E through G of this stipulation, if any, will not be paid monthly but will be due and payable to the Office of Natural Resources Revenue on or before 30 days after expiration of the relevant production lease year.

J. The lessee will receive royalty credit in the amount of the UNCLOS-related royalty payment required under paragraphs E through G of this stipulation, which will apply to royalties due under the lease for which the Convention-related royalty accrued in subsequent periods as non-Convention-related royalty payments become due.

K. Any lease production for which the lessee pays no royalty other than a Convention-related requirement, due to lease royalty suspension provisions or through application and approval of relief from royalties, will count against the lease's applicable royalty suspension or relief volume.

L. The lessee will not be allowed to apply or recoup any unused UNCLOS-related royalty credit(s) associated with a lease that has been relinquished or terminated.

A.8 Stipulation No. 7 – Agreement between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico

A.8.1 Stipulation Overview

Stipulation No. 7 could be included in leases issued as a result of future OCS oil and gas lease sales that are wholly or partially located within 3 statute miles (2.6 nmi; 4.8 km) of the Maritime and Continental Shelf Boundary with Mexico, commonly referred to as the "Eastern Gap" (**Figure A-3**). The Eastern Gap area is comprised of any and all blocks in the WPA and CPA that are wholly or partially located within 3 statute miles (2.6 nmi; 4.8 km) of the Maritime and Continental Shelf Boundary with Mexico, as the Maritime Boundary is delimited in the Treaty to Resolve Pending Boundary Differences and Maintain the Rio Grande and the Colorado River as the International Boundary, signed November 24, 1970; the Treaty on Maritime Boundaries between the United Mexican States and the United States of America, signed on May 4, 1978; and, as the continental shelf in the western Gulf of Mexico beyond 200 nmi (230 mi; 370 km) is delimited in the Treaty between the Government of the United Mexican States and the Government of the United States of America, signed on June 9, 2000.

A.8.2 Potential Stipulation Language

The *Agreement between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico* (Agreement), signed on February 20, 2012, entered into force on July 18, 2014. All activities carried out under this lease must comply with the Agreement and any law, regulation, or condition of approval of a unitization agreement, plan, or permit adopted by the United States to implement the Agreement before or after issuance of this lease. The lessee is subject to, and must comply with, all terms of the Agreement, including, but not limited to, the following requirements:

A. When the United States is obligated under the Agreement to provide information that may be considered confidential, commercial, or proprietary to a third-party or the Government of the United Mexican States, if the lessee holds such information, the lessee is required to provide it to the lessor as provided for in the Agreement;

B. When the United States is obligated under the Agreement to prohibit commencement of production on a lease, Bureau of Safety and Environmental Enforcement (BSEE) will direct a Suspension of Production with which the lessee must comply;

C. When the United States is obligated under the Agreement to seek development of a transboundary reservoir under a unitization agreement, the lessee is required to cooperate and explore the feasibility of such a development with a licensee of the United Mexican States;

D. When there is a proven transboundary reservoir, as defined by the Agreement, and the relevant parties, including the lessee, fail to conclude a unitization agreement, the lessee's rights to produce the hydrocarbon resources will be limited by the terms of the Agreement;

E. If the lessee seeks to jointly explore or develop a transboundary reservoir with a licensee of the United Mexican States, the lessee is required to submit to BSEE information and documents that comply with and contain terms consistent with the Agreement, including, but not limited to, a Proposed unitization agreement that designates the unit operator for the transboundary unit and provides for the allocation of production and any redetermination of the allocation of production; and

F. The lessee is required to comply with and abide by determinations issued as a result of the Agreement's dispute resolution process on, among other things, the existence of a transboundary reservoir, and the allocation and/or reallocation of production.

The lessee and its operators, personnel, and subcontractors are required to comply with these and any other additional measures necessary to implement the provisions of the Agreement, including, but not limited to, conditions of approval for their plans and permits for activities related to any transboundary reservoir or geologic structure subject to the Agreement.

A copy of the Agreement is attached to this lease. The lessee accepts the risk that a provision of the Agreement or any United States law, regulation, or condition of approval of a unitization agreement, plan, or permit implementing the Agreement may increase or decrease the lessee's obligations and rights under the lease. The summary of provisions of the Agreement set forth above is provided for the lessee's reference. To the extent this summary differs or conflicts with the express language of the Agreement or implementing regulations, the provisions of the Agreement and

regulations are incorporated by reference in their entirety and will control and be enforceable as binding provisions of this lease.

A.8.3 Effectiveness of the Lease Stipulation

The Transboundary Agreement removes uncertainties regarding development of transboundary resources in the resource-rich Gulf of Mexico. As a result of the Agreement, nearly 1.5 million ac of the OCS would be made more accessible for exploration and production activities. BOEM's estimates indicate that this area contains as much as 172 million barrels of oil and 304 billion cubic feet of natural gas. The Agreement also opens up resources in the Western Gap that were off limits to both countries under a previous treaty that imposed a moratorium along the boundary. The Transboundary Agreement sets clear guidelines for the development of oil and natural gas reservoirs that cross the maritime boundary. Under the Agreement, U.S. companies and Petróleos Mexicanos (PEMEX) would be able to voluntarily enter into agreements to jointly develop those reservoirs. In the event that consensus cannot be reached, the Transboundary Agreement establishes the process through which U.S. companies and PEMEX can individually develop the resources on each side of the border while protecting each nation's interests and resources.

A.9 STIPULATION NO. 8 – LIVE BOTTOM

A.9.1 Stipulation Overview

BOEM protects live bottoms in the GOM through two stipulations attached to leases, as well as through post-lease conditions of approvals attached to permits. BOEM defines "live bottom areas" as seagrass communities or those areas that contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; or areas whose lithotope favors the accumulation of turtles, fishes, and other fauna. Live bottom features may include pinnacle trend features, low-relief features, or potentially sensitive biological features (PSBFs). Protective measures have been developed over time based on the nature and sensitivity of these various live bottom habitats and their associated communities, as understood from decades of BOEM-funded and other environmental studies. These protections were developed into two stipulations, the Live Bottom (Pinnacle Trend) Stipulation and the Live Bottom (Low-Relief) Stipulation, as discussed below. These stipulations have historically been applied to OCS leases in areas with known concentrations of these live bottom features.

The two Live Bottom Stipulations are intended to protect hard bottom habitat and their associated live bottom communities from damage and, at the same time, provide for recovery of potential oil and gas resources nearby. The PSBFs, which are found throughout the GOM, are not protected by lease stipulations but are protected by mitigations that are attached as conditions of approval to permits at the post-lease review stage. BOEM policy as it relates to these lease stipulations and post-lease mitigations is described in NTL No. 2009-G39, "Biologically-Sensitive Underwater Features and Areas," and can be found on BOEM's website at https://www.boem.gov/sites/default/files/regulations/Notices-To-Lessees/2009/09-G39.pdf. Specific

OCS blocks affected by the Live Bottom Stipulations are listed on BOEM's website at https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Gulf-of-Mexico-Region/topoblocks.pdf. A detailed map showing the locations of the affected blocks can be found on BOEM's website at https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Gulf-of-Mexico-Region/topomap.pdf.

The Pinnacle Trend is located offshore Mississippi and Alabama in the northeastern CPA. The pinnacles are a series of topographic irregularities with variable biotal coverage, which provide structural habitat for a variety of pelagic fish. The pinnacles would be classified as live bottom under the Live Bottom Stipulation. The Live Bottom (Pinnacle Trend) Stipulation has been routinely applied to appropriate CPA oil and gas lease sales since 1974 to protect the known Pinnacle Trend features in the CPA. The Live Bottom (Pinnacle Trend) Stipulation would be included on leases on 74 OCS lease blocks in the northeastern CPA, including the Main Pass Area, South and East Addition Blocks 190, 194, 198, 219-226, 244-266, 276-290; Viosca Knoll Area Blocks 473-476, 521, 522, 564, 565, 566, 609, 610, 654, 692-698, 734, 778; and Destin Dome Area Blocks 577, 617, 618, and 661 (refer to **Figure A-2 and Figure A-4**). Within the Live Bottom (Pinnacle Trend) Stipulation blocks, no bottom-disturbing activities may occur within 30 m (100 ft) of any hardbottom/pinnacles that have a vertical relief of 8 ft (2 m) or more. A bottom survey report showing pinnacle location and proposed bottom-disturbing activity will be required as part of any permit application to ensure that sensitive seafloor features are avoided.

Live bottom (low-relief) features are seagrass communities; areas that contain biological assemblages consisting of sessile invertebrates living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; and areas where a hard substrate and vertical relief may favor the accumulation of turtles, fishes, or other fauna. The Live Bottom (Low Relief) Stipulation OCS blocks are located in water depths of 100 m (328 ft) or less in the EPA and 142 OCS blocks in the northeastern CPA, including Pensacola Blocks 751-754, 793-798, 837-842, 881-886, 925-930, and 969-975; and Destin Dome Blocks 1-7, 45-51, 89-96, 133-140, 177-184, 221-228, 265-273, 309-317, 353-361, 397-405, 441-448, 485-491, 529-534, and 573-576 (refer to **Figure A-4**). Within the Live Bottom (Low Relief) Stipulation Blocks, no bottom-disturbing activities may occur within 30 m (100 ft) of any live bottom (low-relief) feature. A bottom survey report showing live bottom location and proposed bottom-disturbing activity will be required as part of any permit application to ensure that sensitive seafloor features are avoided. While the Live Bottom (Low Relief) Stipulation blocks described here are located in areas currently under Presidential withdrawal, they could be subject to this stipulation if the Presidential withdrawal expired and they were leased in the future.

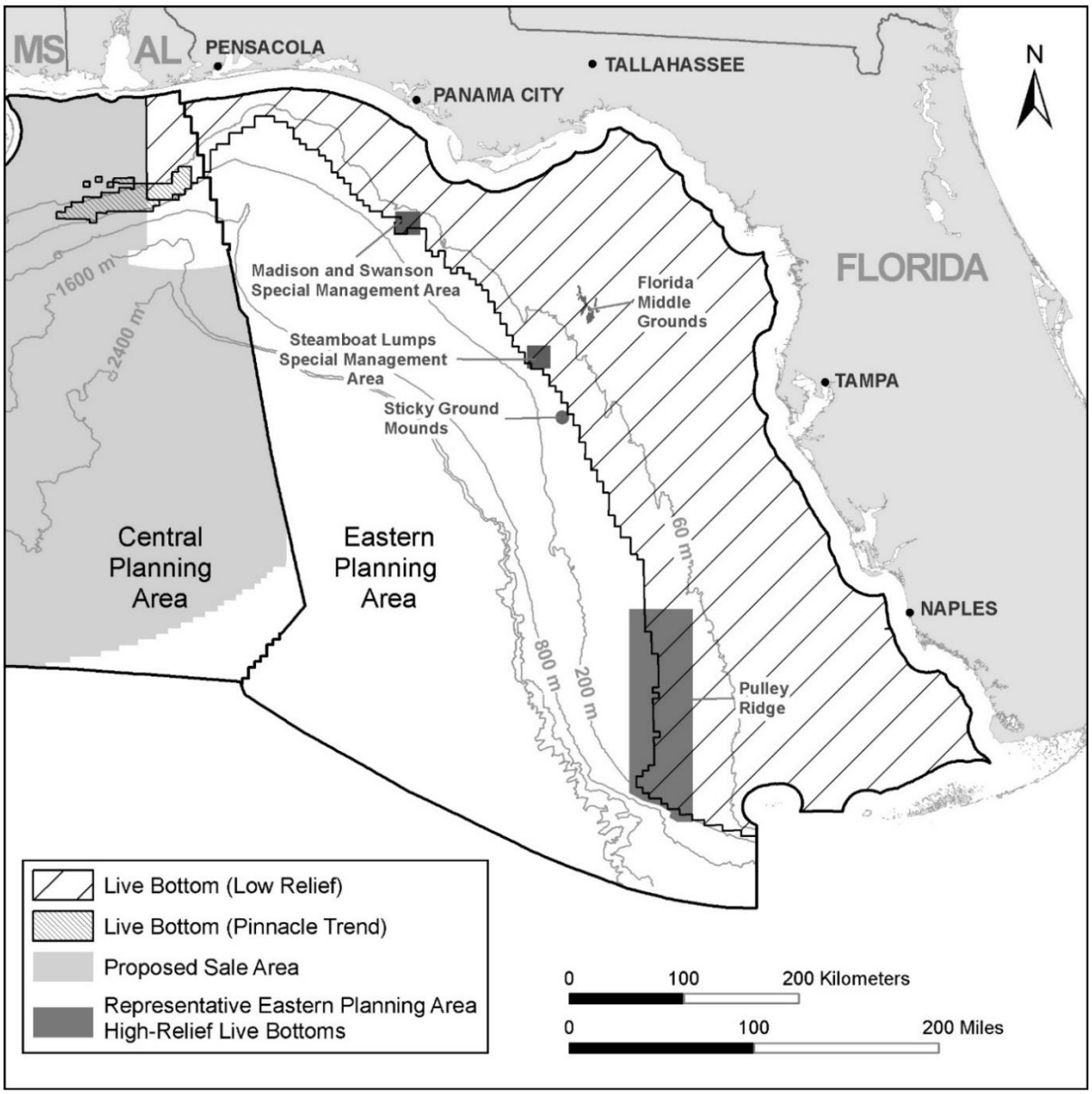


Figure A-4. Live Bottom (Low Relief) Stipulation Blocks in the EPA and CPA.

The PSBFs are those features not protected by a biological lease stipulation that are of moderate to high relief (8 ft [2 m] or higher), provide surface area for the growth of sessile invertebrates, and attract large numbers of fish. These features are located outside any No Activity Zone of any of the named topographic features or the 74 live-bottom (pinnacle trend) stipulated blocks. Because PSBFs occur throughout the GOM, they are not protected through lease stipulations that apply to specific OCS blocks but rather are protected by conditions of approval attached to permits following a site-specific review of a permit application. No bottom-disturbing activities may occur within 30 m (100 ft) of any PSBF. A bottom survey report showing PSBF location and proposed bottom-disturbing activity will be required as part of any permit application to ensure that sensitive seafloor features are avoided.

The potential stipulation language outlined below is only for the Live Bottom (Pinnacle Trend) Stipulation. This stipulation is the only Live Bottom Stipulation that has been applied to OCS oil and gas leases recently because the live bottom, low-relief blocks in the EPA and CPA are currently under Presidential withdrawal. Should the Presidential withdrawal end, stipulation language will be included for the live bottom (low-relief) OCS blocks. In addition, because there are no lease stipulations for PSBFs, their protection will be handled at the post-lease, site-specific review stage and conditions of approval will be added to permits to prevent any potential damage to those features.

A.9.2 Potential Stipulation Language

The proposed stipulation reads as follows:

A. For the purpose of this stipulation, "live bottom areas" are defined as seagrass communities or those areas that contain biological assemblages consisting of sessile invertebrates such as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; or areas whose lithotope favors the accumulation of turtles, fish, and other fauna. Live bottom features may include Pinnacle Trend features, low-relief features, or potentially sensitive biological features.

B. Prior to any drilling activities or the construction or placement of any structure for exploration or development on this lease, including but not limited to, anchoring, well drilling and pipeline and platform placement, the lessee will submit to the Bureau of Ocean Energy Management (BOEM) Gulf of Mexico Regional Director (RD) a live bottom survey report containing a bathymetry map prepared using remote-sensing techniques. The bathymetry map shall be prepared to determine the presence or absence of live bottoms that could be impacted by the proposed activity. This map must encompass the area of the seafloor where surface-disturbing activities, including anchoring, may occur.

C. If it is determined that the live bottoms might be adversely impacted by the proposed activity, the BOEM Gulf of Mexico RD will require the lessee to undertake any measure deemed economically, environmentally, and technically feasible to protect the live bottom areas. These measures may include, but are not limited to, relocation of operations and monitoring to assess the impact of the activity on the live bottom areas.

A.9.3 Effectiveness of the Lease Stipulation

The sessile and pelagic communities associated with the crest and flanks of the live bottom features could be adversely impacted by OCS oil- and gas-related activities if such activities took place on or near these communities without the Live Bottom Stipulation. Impacts from mechanical damage, including anchors, could potentially be long term if the physical integrity of the live bottoms themselves became altered. By identifying the live bottom features present at the activity site, the lessee would

be directed to avoid placement of the drilling rig and anchors on the sensitive areas. Through detection and avoidance, this stipulation would minimize the likelihood of mechanical damage from OCS oil- and gas-related activities associated with rig and anchor emplacement to the sessile and pelagic communities associated with the crest and flanks of such features.

For many years, the live bottom stipulations have been made a part of leases on blocks in the CPA and EPA (prior to moratoria) to ensure that potential damage to pinnacle trend areas and low-relief features from nearby OCS oil- and gas-related activities is mitigated to the greatest extent possible. This stipulation does not prevent the recovery of oil and gas resources; however, it does serve to protect valuable and sensitive biological resources. Studies at the Pinnacle Trend have shown that the Live Bottom (Pinnacle Trend) Stipulation has successfully prevented mechanical damage to the pinnacle habitats through the survey and distancing requirements, and sediments have not shown elevated barium levels from OCS oil- and gas-related activities within 25 km (15 mi) of the area (CSA and Texas A&M University Geochemical and Environmental Research Group 2001).

A.10 Stipulation No. 9 – Blocks South of Baldwin County, Alabama

A.10.1 Stipulation Overview

This stipulation could be included on leases on blocks south of and within 15 mi (24 km) of Baldwin County, Alabama (**Figure A-2**). The stipulation would specify requirements for consultation that lessees must follow when developing plans for fixed structures, with the goal of reducing potential visual impacts.

A.10.2 Potential Stipulation Language

The proposed stipulation reads as follows:

A. To minimize visual impacts from development operations on this block, the lessee will contact lessees and operators of leases in the vicinity prior to submitting a Development Operations Coordination Document (DOCD) to determine if existing or planned surface production structures can be shared. If feasible, the lessee's DOCD should reflect the results of any resulting sharing agreement, propose the use of subsea technologies, or propose another development scenario that does not involve new surface structures.

B. If the lessee cannot formulate a feasible development scenario that does not call for new surface structure(s), the lessee's DOCD should ensure that they are the minimum distance necessary for the proper development of the block and that they will be constructed and placed using orientation, camouflage, or other design measures in such a manner as to limit their visibility from shore.

C. The Bureau of Ocean Energy Management (BOEM) will review and make decisions on the lessee's DOCD in accordance with applicable Federal regulations

and BOEM assessments, and in consultation with the State of Alabama (Geological Survey/Oil and Gas Board).

A.10.3 Effectiveness of the Lease Stipulation

For several years, the then-Governor of Alabama had indicated opposition to new leasing south and within 15 mi (24 km) of Baldwin County but requested that, if the area is offered for lease, a lease stipulation to reduce the potential for visual impacts should be applied to all new leases in this area. Prior to the decision in 1999 on the Final Notice of Sale for Lease Sale 172, BOEM's New Orleans Office's Regional Director, in consultation with the Geological Survey of Alabama/State Oil and Gas Board, developed a lease stipulation to be applied to any new leases within the 15-mi (24-km) area to mitigate potential visual impacts. The stipulation specifies requirements for consultation that lessees must follow when developing plans for fixed structures. A lessee's DOCD should reflect the results of any resulting sharing agreement, should propose the use of subsea technologies, or should propose another development scenario that does not involve new surface structures. If the lessee cannot formulate a feasible development scenario that does not call for new surface structure(s), the lessee's DOCD should ensure that the structures are the minimum necessary for the proper development of the block and that they will be constructed and placed, using orientation, camouflage, or other design measures, in such a manner as to limit their visibility from shore. The stipulation has been continually adopted in annual CPA lease sales and regionwide lease sales since 1999 and has effectively mitigated visual impacts.

A.11 Stipulation No. 10 – Restrictions due to Rights-of-Use and Easements for Floating Production Facilities

A.11.1 Stipulation Overview

This proposed stipulation is intended to be lease sale-specific language and would incorporate maps for each potentially affected block containing rights-of-use and easements (refer to **Figure A-5** for an example map). This stipulation is designed to minimize or avoid potential space-use conflicts with moored and/or floating production facilities that have already been granted rights-of-use and easements in particular OCS blocks.

A.11.2 Proposed Stipulation Language

The proposed stipulation reads as follows:

The lessee may not conduct activities, including, but not limited to, the construction and use of structures, operation of drilling rigs, laying of pipelines, and/or anchoring on the seafloor or in the water column within the areas depicted by the attached map(s). Nevertheless, sub-seabed activities that are part of exploration, development, and production activities from outside the areas depicted on the attached maps may be allowed within the areas depicted by the attached map(s), including the use of directional drilling or other techniques.

A.11.3 Effectiveness of the Lease Stipulation

This stipulation is designed to minimize or avoid potential space-use conflicts with moored and/or floating production facilities that have already been granted rights-of use and easements in particular OCS blocks. BOEM has effectively used this stipulation for over a decade to make bidders aware of other activities with rights-of-use and easements on the blocks offered for OCS oil and gas leasing, and BOEM may require buffers or additional requirements prior to issuing leases on those specific blocks.

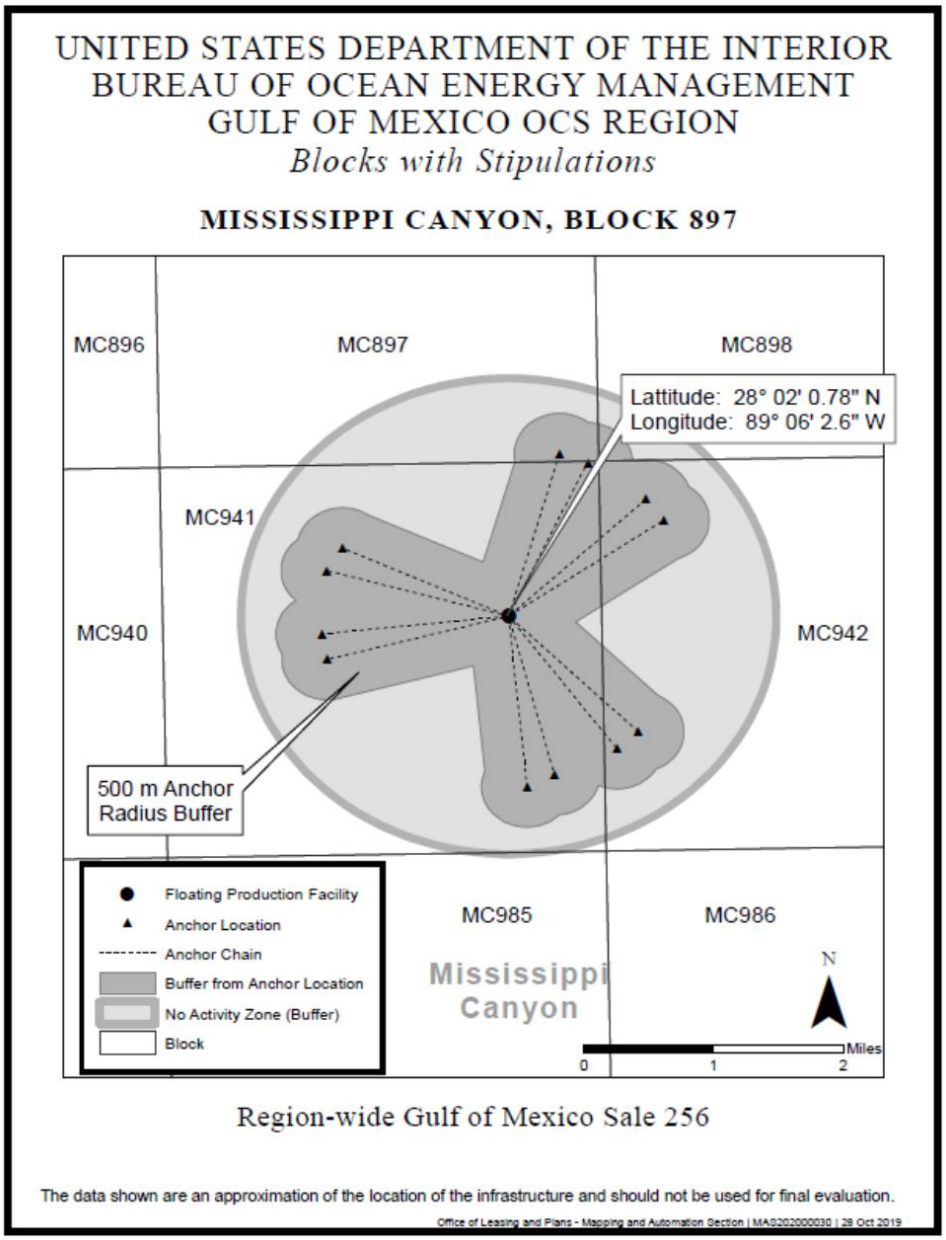


Figure A-5. Example Map of a Block Subject to This Stipulation under Region-wide Gulf of Mexico Lease Sale 256 (complete Notice of Sale package can be found on BOEM's website at https://www.boem.gov/sale-256).

A.12 STIPULATION NO. 11 –ROYALTIES ON ALL PRODUCED GAS

A.12.1 Stipulation Overview

This stipulation may be included in all leases issued as a result of an OCS oil and gas lease sale.

A.12.2 Potential Stipulation Language

The proposed stipulation reads as follows:

> Pursuant to Section 50263 of the Inflation Reduction Act of 2022 Public Law 117-169, 136 Statute 1818 (2022), royalties must be assessed and paid accordingly by the lessee(s)/operator(s) on all gas produced under this lease, including all gas that is consumed or lost by venting, flaring, or negligent releases through any equipment during upstream operations. The lessee(s)/operator(s) must value any gas or liquid hydrocarbons, including that consumed or lost by venting, flaring, or negligent releases, in accordance with the provisions of 30 CFR part 1206.
>
> This royalty will not apply with respect to:
>
> (1) gas vented or flared for not longer than 48 hours in an emergency situation that poses a danger to human health, safety, or the environment;
>
> (2) gas used or consumed within the area of the lease, unit, or communitized area for the benefit of the lease, unit, or communitized area; or
>
> (3) gas that is unavoidably lost.
>
> For any gas that the lessee(s)/operator(s) produces, but for which the lessee(s)/operator(s) does not pay royalties, the lessee(s)/operator(s) bear the burden of proof in demonstrating to the satisfaction of BOEM and the Office of Natural Resource Revenues that one or more of these exceptions to the requirement to pay royalties under this stipulation applies.

A.12.3 Effectiveness of the Lease Stipulation

This is a new lease stipulation that may be included in all leases issued as a result of an OCS oil and gas lease sale. Pursuant to Section 50263 of the Inflation Reduction Act of 2022, Public Law 117-169, 136 Statute 1818 (2022), royalties must be assessed and paid accordingly by the lessee(s)/operator(s) on all gas produced under this lease, including all gas that is consumed or lost by venting, flaring, or negligent releases through any equipment during upstream operations. The lessee(s)/operator(s) must value any gas or liquid hydrocarbons, including that consumed or lost by venting, flaring, or negligent releases, in accordance with the provisions of 30 CFR part 1206.

APPENDIX B

CONSULTATION CORRESPONDENCE

B CONSULTATION CORRESPONDENCE

United States Department of the Interior

BUREAU OF OCEAN ENERGY
MANAGEMENT, REGULATION, AND ENFORCEMENT

Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

In Reply Refer To: MS 5430

JUL 30 2010

Dr. Roy E Crabtree, Ph.D.
Regional Administrator
Southeast Region
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Dr. Crabtree,

The Bureau of Offshore Energy Management, Regulation, and Enforcement (BOEM; formerly the Minerals Management Service) requests that the National Marine Fisheries Service (NMFS) reinitiate consultation (based on the existing consultation and resulting Biological Opinion (BO) dated June 29, 2007) under Section 7 of the Endangered Species Act (ESA) of 1973 on the effects of the Five-Year Outer Continental Shelf Oil and Gas Leasing Program (2007-2012) in the Central and Western Planning Areas of the Gulf of Mexico. This request is in response to the Deepwater Horizon (DWH) incident and is meant to comply with 50 CFR § 402.16.

BOEM believes the DWH incident and the resulting oil spill necessitate this reinitiation action. We understand the oil spill and the associated impacts to listed species and designated critical habitat cannot be fully quantified at this time and that some potentially relevant information will not be available until after NMFS completes its emergency response consultations under the ESA. However, we acknowledge that the spill volumes and scenarios used in the analysis for the existing NMFS BO need to be readdressed given the "rare event" of a spill exceeding 420,000 gallons as referenced in the current NMFS BO has occurred and that affects to and the status of some listed species or designated critical habitats may have been altered as a result of the DWH incident and therefore require further consideration.

We also recognize that both NMFS and BOEM will need to agree upon an extended consultation timeframe in order to allow for NMFS to first complete the emergency response consultations and re-establish the environmental baseline. Further, we recognize that oil spill response efforts have required and may continue to require much of the NMFS's resources. We ask that you provide us an initial estimate on a consultation timeframe. We understand, however, that this timeframe may be adjusted depending on the timing and outcome of the aforementioned actions.

DOI 004484

We will consider the existing NMFS BO to remain in effect until the reinitiated consultation is completed and a new BO is available. In the interim, BOEM will continue to comply with all Reasonable and Prudent Measures and their Terms and Conditions under this existing BO along with implementing the current BOEM-imposed mitigation, monitoring and reporting requirements. In addition, BOEM will continue to institute the BO's Conservation Recommendations, such as pile driving noise characterization, standardization of observer qualifications and protocols, reduction of marine debris, and general scientific research efforts on the effects of oil and gas activities on listed species and designated critical habitat. Based on the most recent and best available information at the time, BOEM will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under the National Environmental Policy Act and other statutes. Further, BOEM will continue to provide NMFS with any additional information relevant to this ESA Section 7 consultation reinitiation if and when it becomes available.

We look forward to working with NMFS during this formal consultation reinitiation process. If you have any questions or require any additional information, please contact Deborah Epperson, Protected Species Biologist, Leasing and Environment Division, Deborah.Epperson@mms.gov or 504-736-3257.

Sincerely,

Joseph A. Christopher
Regional Supervisor

United States Department of the Interior

BUREAU OF OCEAN ENERGY
MANAGEMENT, REGULATION, AND ENFORCEMENT

Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

In Reply Refer To: MS 5430

JUL 30 2010

Mr. James Boggs, Field Supervisor
Louisiana Field Office
U.S. Fish and Wildlife Service
646 Cajundome Boulevard, Suite 400
Lafayette, Louisiana 70506-4290

Dear Mr. Boggs,

The Bureau of Offshore Energy Management, Regulation, and Enforcement (BOEM; formerly the Minerals Management Service) requests that the Fish and Wildlife Service (FWS) reinitiate consultation (based on the existing consultation dated September 14, 2007) under Section 7 of the Endangered Species Act (ESA) of 1973 on the effects of the Five-Year Outer Continental Shelf Oil and Gas Leasing Program (2007-2012) in the Central and Western Planning Areas of the Gulf of Mexico. This request is in response to the Deepwater Horizon (DWH) incident and is meant to comply with 50 CFR § 402.16.

The existing consultation was completed using the informal consultation process and found that this program was not likely to adversely affect listed species or designated critical habitats. The FWS provided its written concurrence with that determination in a letter to BOEM dated September 14, 2007. At this time, BOEM believes the DWH incident and the resulting oil spill necessitate reconsideration of this ESA consultation. We understand the oil spill and the associated impacts to listed species and designated critical habitat cannot be fully quantified at this time and that some potentially relevant information will not be available until after the FWS completes its emergency response consultations under the ESA. However, we acknowledge that the spill volumes and scenarios used in the analysis for the existing FWS consultation need to be readdressed given the "rare event" of a spill exceeding 420,000 gallons as referenced in the current NMFS BO has occurred and that affects to and the status of some listed species or designated critical habitats may have been altered as a result of the DWH incident and therefore require further consideration.

We also recognize that both FWS and BOEM will need to agree upon an extended consultation timeframe in order to allow for FWS to first complete the emergency response consultations and re-establish the environmental baseline. Further, we recognize that oil spill response efforts have required and may continue to require much of the FWS's resources. We ask that you provide us an initial estimate on a consultation timeframe. We understand, however, that this timeframe may be adjusted depending on the timing and outcome of the aforementioned actions.

We will consider the existing consultation to remain in effect until the reinitiated consultation is completed. In the interim, BOEM will continue to comply with all mitigation, monitoring and reporting measures incorporated into the September 14, 2007 consultation by FWS. Based on the most recent and best available information at the time, BOEM will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under the National Environmental Policy Act and other statutes. Further, BOEM will continue to provide FWS with any additional information relevant to this ESA Section 7 consultation request if and when it becomes available.

We look forward to working with FWS during this consultation reinitiation process. If you have any questions or require any additional information, please contact Deborah Epperson, Protected Species Biologist, Leasing and Environment Division, Deborah.Epperson@mms.gov or 504-736-3257.

Sincerely,

Joseph A. Christopher
Regional Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1875 Century Boulevard
Atlanta, Georgia 30345

In Reply Refer To:
FWS/R4/ES

SEP 27 2010

Joseph A. Christopher
Regional Supervisor
Bureau of Ocean Energy Management, Regulation and Enforcement
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

RE: MS-5430, Request to Reinitiate Consultation under Section 7 of the Endangered Species Act of 1973 on the Effects of the Five-Year Outer Continental Shelf Oil and Gas Leasing Program (2007-2012) in the Central and Western Planning Areas of the Gulf of Mexico in Response to the Deepwater Horizon Incident.

Dear Mr. Christopher:

The U.S. Fish and Wildlife Service (Service) received the subject request dated July 30, 2010 on August 4, 2010. We concur with your assessment that at this time the Deepwater Horizon incident and the resulting oil spill necessitate reconsideration of the existing consultation dated September 14, 2007, and concluded informally. The incident and resulting oil spill represent new information regarding potential adverse affects to endangered and threatened species that has not previously been assessed. Furthermore, the status of some listed species or designated critical habitats may have been altered as a result of the Deepwater Horizon incident and therefore require further consideration.

As acknowledged in your letter, the Service is fully engaged in oil spill response efforts, which continues to require much of our resources. We are engaged in emergency section 7 consultations with the Coast Guard, U.S. Army Corps of Engineers as well as other federal agencies to minimize the adverse effects of oil spill response efforts on listed species. Once the emergency response efforts cease we will be able to conclude emergency response consultations. Only after we have fully assessed the effects of response actions, as well as the released oil, can we begin to effectively re-assess the effects of the five-year outer continental shelf oil and gas leasing program (2007-2012) in the central and western planning areas of the Gulf of Mexico, as these steps will be necessary to re-establish the environmental baseline of species and habitat status.

At this time it is difficult to predict a timeframe for completion of the aforementioned actions and emergency consultations. Current response activities and level of resource commitment to the response are expected to continue through early December when response activities may be reduced. It may be timely to hold a meeting to discuss the consultation process and timelines after the first of the year.

As you have identified, the potential spill volumes and scenarios used in the analysis for the existing consultation do need to be re-addressed given the "rare event" of a spill exceeding 420,000 gallons. We encourage the Bureau to conduct additional modeling to address this scenario and its potential effects on listed species and their designated critical habitats. Additional discussion as to the specifics of the modeling, as well as other information relevant to the consultation should be discussed at a future meeting. Please contact Deborah Fuller (337) 291-3124 at the Lafayette, Louisiana Field Office to schedule a meeting. I look forward to discussing this further.

Sincerely,

"for" Cynthia K. Dohner
Regional Director

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

In Reply Refer To: MS 5430

FEB 0 3 2012

Dr. Roy E. Crabtree
Regional Administrator, Southeast Region
National Marine Fisheries Service
263 13th Avenue South
Saint Petersburg, Florida 33701

Dear Dr. Crabtree,

The purpose of this letter is to finalize the interim Endangered Species Act project-specific consultation procedures between the Bureau of Ocean Energy Management (BOEM) and the National Marine Fisheries Service (NMFS). Specifically we are responding to your December 21, 2011 rejoinder to our November 23, 2011 letter (both attached).

These interim procedures are for the Gulf of Mexico oil and gas activities covered by the NMFS June 29, 2007 biological opinion[1]. The BOEM is in the process of completing a biological assessment for a new Section 7 consultation that will supersede this agreement.

Per your request, BOEM has agreed to a 15 calendar day timeline for review of exploration plans (EP) and geological and geophysical (G&G) survey permits. The BOEM also agrees to a 30 calendar day timeline for review of development and production plans (DPP) and development operations coordination documents (DOCD).

As requested, BOEM has clarified (via telecom with NMFS-SERO staff on January 11, 2012) that relevant oil spill response plan (OSRP) information is included in EPs and DOCDs. The NMFS will not require an additional OSRP review. In the event that NMFS needs more information than what is provided in the EP or DOCD, NMFS may request the relevant Regional OSRP on a case-by-case basis.

The BOEM will provide NMFS with the requested documents for review in the following manner:

Type	NMFS Review (Calendar Days from receipt of BOEM email notification)	Process
G&G Permits	15	1. BOEM posts public information copy on BOEM website (www.BOEM.gov). 2. BOEM sends notification email to NMFS with relevant web link. 3. NMFS provides comments to BOEM within allotted time.
EPs	15	
DPPs	30	
DOCDs	30	

The primary NMFS point of contact for review of BOEM activities will be Mr. Kyle Baker. All emails will be sent directly to him (kyle.baker@noaa.gov). The primary points of contact for BOEM will be Ms. Mimi Griffitt for EPs, DPPs, and DOCDs (michelle.griffitt@boem.gov) and Mr. John Johnson for G&G permits (john.johnson@boem.gov).

Please respond in writing if you concur with this process for interim project-specific consultation. Upon receipt of your concurrence, BOEM will begin sending all new permit/plan applications for your review.

For additional information or questions regarding these interim consultation procedures please contact Dr. Deborah Epperson at deborah.epperson@boem.gov or at (504) 736-3257.

John Rodi

Enclosures

cc: J. Bennett (MS 4042)

1 National Marine Fisheries Service. 2007. Endangered Species Act biological opinion on the Five-Year Outer Continental Shelf Oil and Gas Leasing Program (2007-2012) in the Central and Western Planning Areas of the Gulf of Mexico. June 29, 2007.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701-5505
727.824.5312, FAX 824.5309
http://sero.nmfs.noaa.gov

FEB 8 2012

F/SER32:KPB

Mr. John Rodi, Regional Director
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Blvd
New Orleans, LA 70123-2394

Re: MS 5430

Dear Mr. Rodi:

This responds to your letter dated February 3, 2012, regarding interim Endangered Species Act (ESA), project-specific consultation procedures with the Bureau of Ocean Energy Management (BOEM). These procedures have been coordinated between personnel from each of our offices. I concur with the implementation of these interim procedures until a new biological opinion is completed on the BOEM/BSEE lease program for the Gulf of Mexico. I look forward to the continued cooperation between our two agencies on these important issues.

For additional coordination regarding these interim consultation procedures, please contact Kyle Baker at kyle.baker@noaa.gov or Adam Brame (adam.brame@noaa.gov) at (727) 824-5312.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

April 20, 2018

Mr. Michael A. Celata
Regional Director, BOEM
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123

Mr. Lars Herbst
Regional Director, Gulf of Mexico OCS Region
Bureau of Safety and Environmental Enforcement
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) on the effects of Bureau of Ocean Energy Management's (BOEM) and Bureau of Safety and Environmental Enforcement's (BSEE) proposed oil and gas leasing, exploration, development, production, decommissioning, and all related activities in the Gulf of Mexico (GOM) Outer Continental Shelf (OCS) within existing leased areas and those areas proposed for future leasing in the Western Planning Area (WPA), the Central Planning Area (CPA), and the Eastern Planning Area (EPA).

Based on our review of the proposed action, as illustrated in the attached BO, formal consultation is not required for this action. No further Endangered Species Act (ESA) consultation with the Service for the proposed action will be necessary for the duration covered under this BO, unless there are new species that become listed, new critical habitat designated, or there are changes in the scope, location, or impacts of the proposed action. Furthermore, future consultations for this action may not warrant formal consultation and could be handled informally dependent upon the likelihood of take.

We appreciate BOEM's continued coordination and cooperation in the conservation of threatened and endangered species and their critical habitat. If you require further assistance regarding ESA coordination, or have questions regarding the content of this letter, please contact Ms. Karen Soileau (337/291-3132) of this office.

Sincerely,

Joseph A. Ranson
Field Supervisor

Louisiana Ecological Services Office

cc: Protected Species Coordinator, BSEE, New Orleans, LA
Energy Coordinator, Ecological Services, FWS, Atlanta, GA (ES/CPA)
ESA Consultation Coordinator, FWS, Southeast Region, Tallahassee, FL
Field Supervisor, Ecological Services, FWS, Daphne, AL
Field Supervisor, Ecological Services, FWS, Jacksonville, FL
Field Supervisor, Ecological Services, FWS, Panama City, FL
Field Supervisor, Ecological Services, FWS, Vero Beach, FL
Field Supervisor, Ecological Services, FWS, Jackson, MS
Field Supervisor, Ecological Services, FWS, Houston, TX
Field Supervisor, Ecological Services, FWS, Corpus Christi, TX
Andrew Strelcheck, Deputy Regional Administrator, NOAA, St. Petersburg, FL
Rachel Sweeney, Protected Resources Division, NOAA, St. Petersburg, FL
LDWF, Baton Rouge, LA

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

MAR 13 2020

Refer to NMFS No.: FPR-2017-9234

Dr. Walter Cruikshank
Acting Director, Bureau of Ocean Energy Management
1849 C Street, NW
Washington, D.C. 20240

RE: Endangered Species Act Section 7 programmatic biological opinion on the federally regulated oil and gas program in the Gulf of Mexico

Dear Dr. Cruickshank:

Enclosed is the National Marine Fisheries Service's (NMFS) programmatic biological opinion on the effects of the Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) Gulf of Mexico Oil and Gas Program; and the US Environmental Protection Agency's (USEPA) proposed action of overseeing air emissions and water discharges from the oil and gas program on endangered and threatened species and designated critical habitats under NMFS' jurisdiction. This consultation also considered the NMFS Permits and Conservation Division's issuance of a 5-year regulation pursuant to the Marine Mammal Protection Act, and subsequent letters of authorization for the take of marine mammals incidental to the oil and gas program. We have prepared the programmatic biological opinion pursuant to section 7(a)(2) of the Endangered Species Act, as amended (ESA; 16 U.S.C. 1536(a)(2)).

The programmatic biological opinion addresses activities and actions associated with all past BOEM leases operating in the Gulf of Mexico at present, as well as future actions and activities associated with new leases awarded in the Gulf of Mexico in the first ten years following issuance of this programmatic biological opinion (through approximately 2029). Because each lease is projected to have a 40-year lifespan, the programmatic biological opinion considers all federally regulated oil and gas program activities including: exploration, development (construction), production, and decommissioning (structure removal) in the Gulf of Mexico expected to occur over the next 50 years. This programmatic biological opinion is comprehensive and includes multiple actions and activities associated with the oil and gas program, and has built in annual review processes for adaptive management in order to streamline and reduce the need for individual future ESA consultations.

The following were considered in the biological opinion: sperm whale, Gulf of Mexico Bryde's whale, Northwest Atlantic loggerhead sea turtle, Kemp's ridley sea turtle, North Atlantic Distinct Population Segment and South Atlantic Distinct Population Segment green sea turtle, leatherback sea turtle, hawksbill sea turtle, Gulf sturgeon, giant manta ray, and oceanic whitetip shark; and Gulf sturgeon and loggerhead critical habitat. Based on our assessment, we concluded that:

- The NMFS' Protected Resources Permits and Conservation Division's proposed action (i.e., the MMPA rule) will not be completed at the time the biological opinion is released. The opinion may need to be amended once the MMPA rule is finalized depending on the contents of the final rule.
- The USEPA's proposed action is not likely to adversely affect ESA-listed species or designated critical habitat.
- The BOEM/BSEE's proposed action is not likely to jeopardize the continued existence of sperm whale, Northwest Atlantic loggerhead sea turtle, Kemp's ridley sea turtle, North Atlantic Distinct Population Segment and South Atlantic Distinct Population Segment green sea turtle, leatherback sea turtle, hawksbill sea turtle, Gulf sturgeon, giant manta ray, and oceanic whitetip shark or destroy or adversely modify designated critical habitat; and
- The BOEM/BSEE's proposed action is likely to jeopardize the continued existence of the Gulf of Mexico Bryde's whale. For this reason, the programmatic biological opinion proposes a Reasonable and Prudent Alternative for BOEM and BSEE actions containing mitigation measures to avoid such jeopardy.

This concludes section 7 consultation on this action. The BOEM, BSEE, USEPA, and NMFS Permits and Conservation Division are required to reinitiate formal consultation on this action, where it retains discretionary involvement or control over the action and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this consultation; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have any questions regarding this biological opinion, please contact me at (301) 427-8407 or donna.wieting@noaa.gov, or Cathy Tortorici at (301) 427-8495 or cathy.tortorici@noaa.gov.

Sincerely,

Donna S. Wieting

Donna S. Wieting
Director, Office of Protected Resources
National Marine Fisheries Service

cc: Scott Angelle, BSEE
Brent Larson, USEPA Region 6
Molly Davis, USEPA Region 4
Kelly Fortin, USEPA Region 4
Jolie Harrison, NMFS

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT

Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

In Reply Refer To: GM 673E

Ms. Cathy Tortorici
Division Chief
Endangered Species Act Interagency Cooperation Division Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Via US. Mail and Electronic Mail

Dear Ms. Tortorici:

The Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE, collectively the Bureaus), in the spirit of adaptive management and in agreement with the National Marine Fisheries Service (NMFS), are submitting the following revised procedures for the programmatic biological opinion (BiOp) signed on March 13, 2020, *Biological Opinion for Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. We are proposing certain revised procedures and conditions so that some activities previously identified in the activities under the proposed action identified in the BiOp as requiring stepdown review will no longer require said reviews. We propose that rather than requesting step-down reviews by NMFS on these activities, we will instead apply new or revised standardized mitigation measures. In support of this proposal, we are providing information below regarding the activity (e.g., approval of Deepwater Operations Plans [DWOPs]) that clarifies the nature of our existing analyses or mitigation and its effectiveness.

As further explained below, we do not believe that these changes to the conditions and mitigations will significantly change the effects of the action on species or designated critical habitat listed under the Endangered Species Act (ESA), and in most cases will reduce any potential impacts to species or designated habitat. Therefore, BOEM, BSEE and NMFS have agreed that these revised procedures will not trigger reinitiation of consultation under 50 CFR 402.16. We request that NMFS, through a reciprocal letter published to NMFS' website or amendment to the BiOp, make any necessary modifications to the Incidental Take Statement (ITS) and Reasonable and Prudent Measures (RPMs) / Terms & Conditions (T&Cs) from the BiOp to reflect these changes to our action's step-down requirements and mitigation measures.

Background

Due to the programmatic nature of the consultation and broad scope and duration of the actions and activities associated with the proposed action, it was necessary to continue to obtain information about some of the activities that could potentially have adverse impacts to species listed under the ESA after completion of the BiOp. Those activities were subsequently incorporated into a step-down review process as described in the BiOp. The step-down provisions of Section 3.4 of the BiOp identified specific categories of actions or activities anticipated to warrant further review and evaluation by NMFS and BOEM/BSEE (collectively "the agencies"). Those reviews include the following:

- How BOEM/BSEE would evaluate whether such actions would be expected to have effects of an extent and nature consistent with those effects already evaluated in the BiOp;
- Whether there are any potential effects to ESA-listed species that would be different than those already evaluated in the BiOp;
- Whether those effects would be consistent with the effects already evaluated in the BiOp if the activities were modified (e.g., through different mitigation measures); and
- Whether further consultation would be required.

Between April and September 2020, BOEM and BSEE reviewed incoming new and supplemental plans and permit applications for consistency with the BiOp and its RPMs/T&Cs. The Bureaus included NMFS in the step-down review process as necessary prior to BOEM/BSEE approval. Details evolved with each Bureau-level review and with NMFS comments received in response to requests for step-down review. The categories of activities for step-down review[1] that are relevant to the Bureaus' revised procedures outlined in this letter include the use of vessels with moon pools and activities involving slack lines in the water associated with diving and other operations as part of the oil and gas program in the Gulf of Mexico. As a result, BOEM and BSEE, in concert with NMFS, developed standard mitigation measures to be applied as standard conditions of approval (COAs) on these activities. We determined that these standard measures, when applied to these activities, provide greater certainty with respect to the potential effects of these activities on ESA-listed species.

As outlined in 3.4 Step-down Review, "Aspects of this step-down review process may be discussed and possibly revised during annual activity reviews, as necessary (e.g., phasing out of certain type reviews)." Although we have not yet reached an annual review, we are proposing at this time to modify how we manage certain activities such that they will no longer require step-down review. We propose that, instead of doing step-down reviews on these particular activities, we instead will apply a set of standardized mitigation measures where appropriate. As further explained below, we do not believe that this modification will change the effects of the action on ESA-listed species or designated critical habitat, so we do not believe these changes trigger reinitiation of consultation under 50 CFR 402.16. However, we request that NMFS amend its ITS, RPMs, and T&Cs to reflect these changes to the step-down requirements and mitigation measures in the BiOp.

[1] For example, NMFS included in the BiOp a requirement for step-down reviews for seismic surveys. However, BOEM is not proposing at this time any additional mitigations to remove the need for NMFS review of those activities and thus that step-down review will continue.

Below are the categories of activities that we propose would not require further step-down reviews under the revised action. The bulleted list and subsequent descriptions below are BOEM and BSEE's requested changes to the step-down review procedures/protocols currently outlined in the BiOp in the following order:

- Activities that may use slack lines, including diving activities, in the water column;
- Activities that may use a vessel with an enclosed moon pool;
- DWOP; and
- Certain geological and geophysical activities, using equipment operating at and above 180 kHz or using coring.

Use of equipment that entail lines in the water column

There are several types of activities associated with federally regulated oil and gas activities in the Gulf of Mexico that utilize lines in the water column which could result in an entanglement risk to ESA-listed species. These activities include, but are not limited to, the use of diver lines employed during pipeline installation, removal and decommissioning in place activities, and deployment of remotely operated vehicles (ROV) with tethers on drilling rigs.

Divers are employed during pipeline installation and removal, and decommissioning activities for several different functions. They generally conduct the following activities:

- Uncover pipelines, connect and disconnect pipeline segments, connect and disconnect associated equipment, perform cutting activities, install endcaps, bury pipelines and equipment and take instrument readings.
- Setting saws on main structure members for non-explosive removals and on cross members for explosive or non-explosive structures removals.
- Surveying for post-structure removal debris or as a preliminary site clearance even when site clearance trawling activities will be conducted later, and, in some instances, in lieu of trawling.

Other instances where slack-lines may be in the water include operational and/or safety lines, ropes or netting in moon pools.

Through BOEM and BSEE review of permit applications and plans to ensure consistency with the BiOp, BOEM and BSEE have gained a greater understanding of the volume and variety of activities that use lines in the water column associated with both structure removal and pipeline activities. As a result of the increased level of understanding of activities that utilize lines in the water column and the potential risks to ESA-listed species associated with these activities, the agencies jointly developed a programmatic approach, via standard mitigation measures, to minimize potential risks from these activities to ESA-listed species. We will be applying the new mitigation measures, required through the slack-line COAs (see attachment below), to new or modified permits and plans going forward.

The slack-line COAs will be applied to all categories of activities (plans, G&G permitting, pipeline, and structures removals) where slack lines could be utilized. BOEM and BSEE

determined that the use of slack lines in the water column is not likely to adversely affect ESA-listed species due to the limited past interactions and low potential for entanglement or entrapment of listed species in these lines. With the application of the standard mitigation measures through the requirement of the slack-line COAs (see attachment below), the potential for entanglement associated with lines in the water column would be further minimized.

BOEM and BSEE would continue to conduct permit application and plan reviews for these activities to ensure compliance with the requirements of the BiOp. In cases where the reviews identify other BiOp-required categories for step-down review, BOEM would still refer the activity to NMFS through the step-down review process. With the application of the slack-line COAs, the potential risk of entanglement associated with slack lines in the water column will be effectively minimized, and therefore we request that no further step-down reviews be required for those permits/projects that have potential lines in the water where the slack line COAs are applied. As this revised process for slack-lines does not significantly change the effects on listed species or designated critical habitat and is expected to only further reduce those effects previously identified, the Bureaus and NMFS agree that this revision does not require reinitiated consultation.

Vessels with Moon pools

Through the plan and permit application reviews, BOEM has determined that moon pools are a feature of a variety of vessels utilized across the federally regulated oil and gas program. Vessels used for diving or drilling activities often contain moon pools. As discussed previously, diving activities are a feature of a variety of tasks associated with structure removals and pipeline installation, removal and decommissioning in place. Additionally, vessels used to support pipeline installation and removal activities may contain moon pools.

Through the plan and permit application review process, BOEM and BSEE have gained a greater understanding of the volume and variety of activities that utilize moon pools. As a result of the increased level of understanding of activities that utilize moon pools, and the potential low risks to ESA-listed species associated with these activities, the agencies jointly developed a programmatic approach, via standard mitigation measures, to minimize potential risks from these activities to ESA-listed species. We will begin applying new mitigation measures, required through the COAs (see attachment below) to new and modified plans and permits going forward.

The moon pool COAs would be applied to all categories of activities (plans, G&G permitting, pipeline and structures removals) where moon pools would be utilized. The range of activities reasonably expected with moon pools are:

- Deploying or retrieving Remotely Operated Vehicles (ROVs);
- Deploying or retrieving Autonomous Underwater Vehicles (AUVs);
- Drilling apparatus deployment, use and retrieval;
- Using various submarine tools that are attached via tethers;
- Use by human divers for entry and exit; and
- Pipelaying or decommissioning activities.

BOEM and BSEE have determined that the use of moon pools in the situations listed above is not likely to adversely affect ESA-listed species due to known limited interactions and the low potential for entanglement or entrapment of listed species within moon pools. The application of the moon pool COAs would further reduce the potential for entanglement or entrapment; therefore, the Bureaus and NMFS concur that consultation does not need to be reinitiated due to these additional COAs and mitigations. If moon pool activities fall outside the scope of those described in the bullets above, then a detailed description of those activities will need to be provided to the Bureau and NMFS and a step-down review would still be required, so that a determination of potential effects to ESA listed species can be made.

BOEM and BSEE would continue to conduct permit application and plan reviews for these activities to ensure compliance with the BiOp during all individual activities. In cases where the reviews identify other BiOp-required categories for step-down reviews, the Bureau will refer the activity to NMFS through the step-down review process. With application of the moon pool COAs, the potential risk of entanglement and entrapment associated with moon pools will be effectively minimized, therefore we request that NMFS concur that no further step-down reviews are required for the specific permit and plan activities that potentially utilize moon pools when the moon pool COAs (see attachment below) are applied.

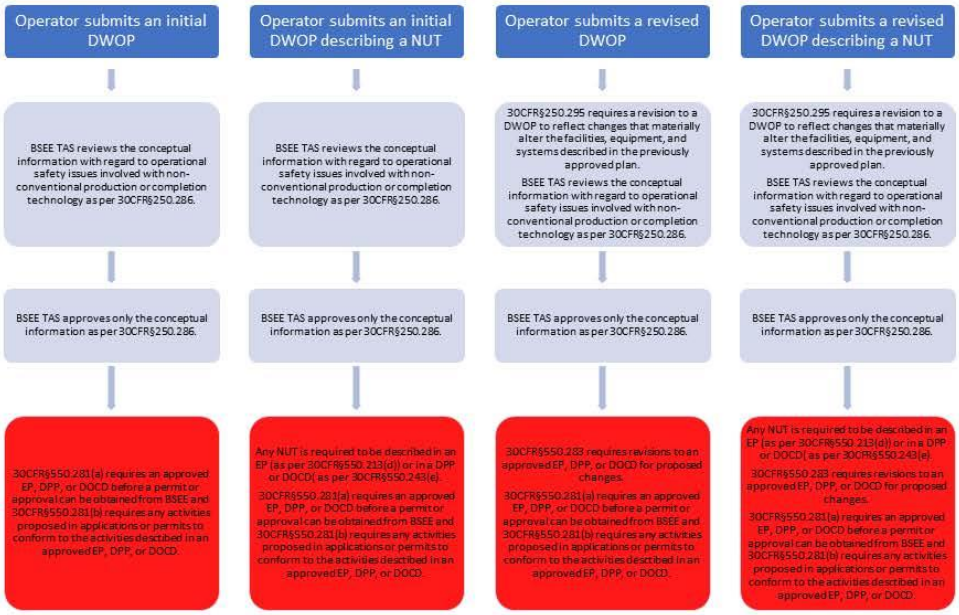
DWOPs

As described in 30 CFR § 250.286, a DWOP is a plan that provides conceptual information for the BSEE Technical Assessment Section to review a deepwater development project, or any other project that uses non-conventional production or completion technology, from a total system approach. The information described in a DWOP may be used as a supplement to other required submittals, but a DWOP "does not replace . . . other submittals required by the regulations such as Exploration Plans (EPs), Development and Production Plans (DPPs), and Development Operations Coordination Documents (DOCDs)" as per 30 CFR § 250.286(a). Additionally, 30 CFR § 550.281(b) also requires that activities permitted by BSEE be addressed in an approved EP, DPP, or DOCD and not just a DWOP. In other words, any actions or activities that may be described or proposed in a DWOP cannot be immediately approved or permitted through that plan because they must first be detailed in an associated EP, DPP, DOCD, and/or an associated permit application submitted for review and approval. BSEE approval of a DWOP does not immediately approve any "on the water" activities that could result in impacts to an endangered species or affect designated critical habitat.

BSEE proposes to no longer submit DWOPs for step-down review, as originally described in Section 3.4 of the BiOp. The associated regulatory requirements for DWOPs only allow for review and approval of the conceptual information, and therefore, do not result in immediate approval of any proposed actions or activities under a DWOP. Any activity that requires step-down review would therefore go through that review at the later plan or permit application stage when the specific, activity details are more certain; therefore, requiring step-down review at the earlier DWOP phase as well is both premature (as no activities can commence before, and the plans will be more certain at, the EP, DPP, DOCD, or permit application stage) and unnecessarily duplicative. The conceptual information provided in a DWOP does not meet the criteria described in section 3.4 of the BiOp because no action nor activity can commence, as per

30 CFR § 250.286. At this point in the regulatory review process NMFS would see only the conceptual information in a DWOP. The proposed actions or activities could only be meaningfully evaluated under the BiOp at the EP, DPP, DOCD, or permit application stage if step-down reviews are required for the relevant activity. New or Unusual Technology (NUT) is defined as technologies that have not been used previously or extensively in a BOEM Outer Continental Shelf (OCS) region or have not been used previously under anticipated operating conditions (30 C.F.R. §550.200).

BSEE created the following chart to describe this regulatory review process:



BSEE conducts reviews of conceptual information under a DWOP for administrative purposes and that review would have no effect on ESA-listed species or critical habitat. Any new and unusual technology proposed under the DWOP review process is required to be represented in an associated, subsequent EP, DPP, DOCD, or permit application to capture that new and unusual technology or other activity requiring step-down review. Therefore, we request that no further step-down reviews be required for DWOPs as the information in these plans will be detailed in an associated EP, DPP, DOCD, or permit application and undergo review by BOEM or BSEE to determine if a step-down review is required at that time. As noted above, as approval of a DWOP results in no effects to listed species or designated critical habitat, this procedural change does not require reinitiation of consultation.

Non-airgun high-resolution geophysical (HRG) survey equipment that operates at and above 180 kHz

As described in the BiOp, non-airgun HRG sources include but are not limited to side-scan sonars, boomers, sparkers (in limited situations) and compressed high-intensity radiated pulse sub-bottom profilers and single-beam or multibeam depth sounders. As described in Appendix A of the BiOp, non-airgun HRG sources with frequencies ≥180 kHz have acoustic characteristics that do not require detailed effects analyses because their frequency ranges are outside the general hearing ranges of all marine mammals, sea turtles and fish. As the HRG sources with frequencies ≥180 kHz would not be detectable by any ESA-listed species, these sources would have "*no effect*" on any ESA-listed species and any associated critical habitat in the Gulf of Mexico.

Therefore, BOEM is requesting that HRG survey activities utilizing equipment that operates exclusively at frequencies ≥180 kHz no longer require further step-down reviews; as HRG surveys at these frequencies result in no effects to listed species or designated critical habitat, this procedural change does not require reinitiation of consultation. BOEM and BSEE would continue to conduct permit and plan reviews for these and similar activities to ensure compliance with the 2020 BiOp and all relevant T&Cs and RPMs (through application of COAs) is ensured during individual activities. In cases where BOEM reviews identify other triggers for step-down review, including the use of HRG survey equipment with operating frequencies <180 kHz, BOEM will still refer those activities to NMFS for step-down reviews. BOEM will continue to document any instances of the use of HRG sources, including those with frequencies ≥180 kHz, in the annual review with NMFS.

Coring activities as part of geotechnical surveys

Coring activities occur as part of geotechnical surveys and are not associated with geophysical surveys (e.g., seismic and HRG surveys). As part of the proposed action in the BiOp, coring activities occur in minimal numbers relative to other G&G activities. Bottom sampling uses devices that penetrate anywhere from a few centimeters to several meters below the sea floor. Samples of near-surface sediments are typically obtained by dropping a piston core or gravity core (a dart or essentially a weighted tube) to the ocean floor and recovering it with an attached wire line. Samples can also be obtained using a grab (a device with a jaw-like mechanism) or with a dredge, which is a wire cage dragged along the sea floor. These coring activities are fully described in the BiOp and are expected to have few to no environmental effects, mainly related to a local and temporary decrease in water quality in the immediate area of the core, effects so minimal that they are either insignificant or discountable. Coring activities currently require step-down review because the BiOp requires that all G&G activities undergo step-down review. However, we propose to no longer carry out step-down reviews for coring activities as originally required under the general category for G&G activities in Section 3.4 of the BiOp, because they were determined not likely to adversely affect ESA-listed species or designated critical habitat. Therefore, this procedural change does not alter the effects on listed species or designated habitat and reinitiation is not required.

Conclusion

As described above, we have determined certain oil and gas activities either have no or little effect on ESA-listed species or, with the additional proposed mitigations, effects can be effectively reduced such that further step-down reviews are unnecessary. While the effects were already so low as to be discountable or would only be reduced with application of the mitigation, the type of effects of the action are not different than those analyzed in the BiOp and the level of effects would not be significantly altered. As such no reinitiation is necessary. Therefore, in the spirit of adaptive management, BOEM and BSEE request that NMFS modify the ITS, RPMs, and T&Cs as necessary to reflect the above changes to the step-down review process.

Again, we appreciate the opportunity to continue to work together on a reasonable implementation of the BiOp.

Sincerely,

AGATHA-MARIE KALLER
Digitally signed by AGATHA-MARIE KALLER
DN: c=US, o=U.S. Government, ou=Department of the Interior, ou=Bureau of Ocean Energy Management, cn=AGATHA-MARIE KALLER, 0.9.2342.19200300.100.1.1=14001001248643
Date: 2020.11.03 13:47:58 -06'00'

Arie Kaller
Supervisor, Office of Environment, BOEM

I agree:

TOMMY BROUSSARD
Digitally signed by TOMMY BROUSSARD
Date: 2020.11.03 13:56:28 -06'00'

TJ Broussard
Regional Environmental Officer, Office of Environmental Compliance, BSEE

cc: Michael Celata,
Field Special Assistant – Interior Region 6,
Director, Gulf of Mexico Office; Bureau of Ocean Energy Management
1201 Elmwood Park Blvd (GM333C)
New Orleans, LA 70123

Lars Herbst
Field Special Assistant – Interior Region 4,
Director, Gulf of Mexico OCS Office; Bureau of Safety and Environmental Enforcement
1201 Elmwood Park Blvd (GE432A)
New Orleans, LA 70123

Attachment

Attachment

MOON POOL MONITORING Condition of Approval:

A moon pool has been identified during review of your plan submittal. The requirements below must be followed for any activities entailing use of the moon pool, except under circumstances when complying with these requirements would put the safety of the vessel or crew at risk. If any protected species (i.e. species protected under the Endangered Species Act [ESA] and/or Marine Mammal Protection Act [MMPA]) is detected in the moon pool, you are required to follow the appropriate procedures described in the *Reporting Requirements* condition of approval (COA) in your plan approval.

Application of these measures includes, but is not limited to, dive support vessels, service vessels, pipelaying vessels, drillships, floating platforms (e.g., SPAR), mobile offshore drilling units, and other facilities with enclosed moon pools (e.g., well in the hull of a vessel, with or without a door).

General Requirements

- Where the moon pools have hull doors, the operator(s) should keep the doors closed as much as reasonably practicable when no activity is occurring within the moon pool, unless the safety of crew or vessel require otherwise. This will prevent protected species from entering the confined area during periods of non-activity.
- Use of a moon pool requires regular monitoring while open to the water column and if a vessel is not underway. Regular monitoring means 24-hour video monitoring with hourly recurring checks for at least five minutes of the video feed, or hourly recurring visual checks of the moon pool for at least five minutes by a dedicated crew observer with no other tasks during that short visual check.
- If water conditions are such that observers are unable to see within a meter of the surface, operations requiring the lowering or retrieval of equipment through the moon pool must be conducted at a rate that will minimize potential harm to protected species.

Closure of the Hull Door

- Should the moon pool have a hull door that can be closed, then prior to and following closure, the moon pool must be monitored continuously by a dedicated crew observer with no other tasks to ensure that no individual protected species is present in the moon pool area. If visibility is not clear to the hull door from above (e.g., turbidity or low light), 30 minutes of monitoring is required prior to hull door closure.
- If a protected species is observed in the moon pool prior to closure of the hull door, the hull door must not be closed, except for human safety considerations. Once the observed animal leaves the moon pool, the operator may commence closure. If the

Attachment

observed animal remains in the moon pool after closure, contact NMFS or BSEE prior to the closure of the hull doors according to reporting requirements (see *Reporting Requirements* COA under *Reporting of Observations of Protected Species within an Enclosed Moon Pool)*.

Movement of the Vessel (no hull door) and Equipment Deployment/Retrieval

- Prior to movement of the vessel and/or deployment/retrieval of equipment, the moon pool must be monitored continuously for a minimum of 30 minutes, by a dedicated crew observer with no other tasks, to ensure no individual protected species is present in the moon pool area.
- If a protected species is observed in the moon pool prior to movement of the vessel, the vessel must not be moved and equipment must not be deployed or retrieved, except for human safety considerations. If the observed animal leaves the moon pool, the operator may commence activities. If the observed animal remains in the moon pool contact BSEE prior to planned movement of the vessel according to reporting requirements (see *Reporting Requirements* COA under *Reporting of Observations of Protected Species within an Enclosed Moon Pool*.
- Should a protected species be observed in a moon pool prior to activity commencement (including lowering or retrieval of equipment), recovery of the animal or other actions specific to the scenario may be required to prevent interaction with the animal. If protected species are observed during activity, only reporting is required (see *Reporting Requirements* COA). Operators must not take such action except at the direction of, and after contact with, NMFS (see *Reporting Requirements* COA).

SLACK-LINE PRECAUTIONS Condition of Approval:

If operations require the use of flexible, small diameter (< 2 inch) lines to support operations (with or without divers), operators/contractors must reduce the slack in the lines, except for human safety considerations, to prevent accidental entanglement of protected species (i.e. species protected under the Endangered Species Act [ESA] and/or Marine Mammal Protection Act [MMPA]). This requirement includes tether lines attached to remotely operated equipment. The requirements below must be followed for any activities entailing use of flexible, small diameter lines that will not remain continuously taut, except when complying with these requirements would put the safety of divers, crew or the vessel at risk:

- Operators must utilize tensioning tools and/or other appropriate procedures to reduce unnecessary looseness in the lines and/or potential looping;
- The lines must remain taut, as long as additional safety risks are not created by this action;

Attachment

- A line tender must be present at all times during dive operations and must monitor the line(s) the entire time a diver is in the water; and
- Should the line tender and/or diver become aware of an entanglement of an individual protected species, the reporting requirements described in the *Reporting Requirements* COA must be followed as soon as safety permits.

REPORTING REQUIREMENTS Condition of Approval:

Review of your proposed activities identified use of equipment that has the potential for entanglement and/or entrapment of protected species (i.e. species protected under the Endangered Species Act [ESA] and/or Marine Mammal Protection Act [MMPA]) that could be present during operations. In case of entrapment, procedures and measures for reporting are dependent upon the situation at hand. **These requirements replace those specific to dead and injured species reporting in respective sections of Appendix A (insofar as they relate to geophysical surveys) and Appendix C of the 2020 Biological Opinion on the Bureau of Ocean Energy Management's Oil and Gas Program Activities in the Gulf of Mexico.**

*Incidents Requiring **Immediate** Reporting*

Certain scenarios or incidents require immediate reporting to Federal agencies; these are described below:

Should any of the following occur at any time, **immediate reporting** of the incident is required after personnel and/or diver safety is ensured:

- Entanglement or entrapment of a protected species (i.e., an animal is entangled in a line or cannot or does not leave a moon pool of its own volition).
- Injury of a protected species (e.g., the animal appears injured or lethargic).
- Interaction, or contact with equipment by a protected species.
- Any observation of a leatherback sea turtle within a moon pool (regardless of whether it appears injured, or an interaction with equipment or entanglement/entrapment is observed).

1. As soon as personnel and/or diver safety is ensured, report the incident to National Marine Fisheries Service (NMFS) by contacting the appropriate expert for 24-hr response. If you do not receive an immediate response, you must keep trying until contact is made. Any failed attempts should be documented. Contact information for reporting is as follows:
    a. **Marine mammals**: contact **Southeast Region's Marine Mammal Stranding Hotline at 1-877-433-8299**.
    b. **Sea turtles**: contact **Brian Stacy, Veterinary Medical Officer at 352-283-3370.** If unable to reach Brian Stacy, contact Lyndsey Howell at (301) 301-3061. This includes the immediate reporting of **any observation of a leatherback sea turtle within a moon pool**.
    c. **Other protected species** (e.g., giant manta ray, oceanic whitetip shark, or Gulf sturgeon)**:** contact the **ESA Section 7 biologist at 301-427-8413**

Attachment

(nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov.

d. Minimum reporting information is described below:
   i. Time, date, water depth, and location (latitude/longitude) of the first discovery of the animal;
   ii. Name, type, and call sign of the vessel in which the event occurred;
   iii. Equipment being utilized at time of observation;
   iv. Species identification (if known) or description of the animal involved;
   v. Approximate size of animal;
   vi. Condition of the animal during the event and any observed injury / behavior;
   vii. Photographs or video footage of the animal, only if able; and
   viii. General narrative and timeline describing the events that took place.

2. After the appropriate contact(s) have been made for guidance/assistance as described in 1 above, you may call BSEE at 985-722-7902 (24 hours/day) for questions or additional guidance on recovery assistance needs (if still required) and continued monitoring requirements. You may also contact this number if you do not receive a timely response from the appropriate contact(s) listed in 1. above.
   a. Minimum post-incident reporting includes all information described above (under 1.d.i-viii) in addition to the following:
      i. NMFS liaison or stranding hotline that was contacted for assistance;
      ii. For moon pool observations or interactions:
      iii. Size and location of moon pool within vessel (e.g., hull door or no hull door);
      iv. Whether activities in the moon pool were halted or changed upon observation of the animal; and
      v. Whether the animal remains in the pool at the time of the report, or if not, the time/date the animal was last observed.

Reporting of Observations of Protected Species within an Enclosed Moon Pool

If a protected species is observed within an enclosed moon pool and does not demonstrate any signs of distress or injury or an inability to leave the moon pool of its own volition, measures described in this section must be followed (only in cases where they do not jeopardize human safety). Although this particular situation may not require immediate assistance and reporting as described under *Incidents Requiring Immediate Reporting* (see above), a protected species could potentially become disoriented with their surroundings and may not be able to leave the enclosed moon pool of their own volition. In order for operations requiring use of a moon pool to continue, the following reporting measures must be followed:

Within 24 hours of any observation, and daily after that for as long as an individual protected species remains within a moon pool (i.e., in cases where an ESA listed species has

Attachment

entered a moon pool but entrapment or injury has not been observed), the following information must be reported to BSEE (protectedspecies@bsee.gov):

1. For an initial report, all information described under 1.d.i-viii above should be included.
2. For subsequent daily reports:
   a. Describe the animal's status to include external body condition (e.g., note any injuries or noticeable features), behaviors (e.g., floating at surface, chasing fish, diving, lethargic, etc.), and movement (e.g., has the animal left the moon pool and returned on multiple occasions?);
   b. Description of current moon pool activities, if the animal is in the moon pool (e.g., drilling, preparation for demobilization, etc.);
   c. Description of planned activities in the immediate future related to vessel movement or deployment of equipment;
   d. Any additional photographs or video footage of the animal, if possible;
   e. Guidance received and followed from NMFS liaison or stranding hotline that was contacted for assistance;
   f. Whether activities in the moon pool were halted or changed upon observation of the animal; and
   g. Whether the animal remains in the pool at the time of the report, or if not, the time/date the animal was last observed.

United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
New Orleans Office
1201 Elmwood Park Blvd
New Orleans, Louisiana 70123-2394

In Reply Refer To: GM 673E

Mr. Joseph Ranson, Field Supervisor
U.S. Fish and Wildlife Service
Louisiana Ecological Services
200 Dulles Drive
Lafayette, Louisiana 70506
joseph_ranson@fws.gov

Via Electronic Mail

Dear Mr. Ranson:

Pursuant to the Biological Opinion (BiOp) dated April 20, 2018, the Bureau of Ocean Energy Management's (BOEM) and Bureau of Safety and Environmental Enforcement's (BSEE) are requesting concurrence with our determination of the effect of proposed oil and gas leasing, exploration, development, production, decommissioning, and all related activities in the Gulf of Mexico Outer Continental Shelf (OCS) within existing leased areas and those areas proposed for future leasing in the Western Planning Area, the Central Planning Area, and the Eastern Planning Area on the newly designed threatened eastern black rail (*Laterallus jamaicensis jamaicensis*). The BiOp is for a ten-year period and any future consultations for this action may not warrant formal consultation and could be handled informally dependent upon the likelihood of take. The listing of a new species was identified as a potential trigger for reinitiation.

On October 8, 2020, a Final Rule was published that listed the eastern black rail as threatened with no critical habitat. The rule became effective on November 9, 2020. Attached is the BOEM evaluation regarding the potential effects from the OCS oil- and gas-related activities on the eastern black rail. Based on our evaluation, OCS oil and gas activities would have no effect or would be not likely to adversely affect the eastern black rail except in the case of a low-probability catastrophic spill, which is not reasonably certain to occur. Since a low-probability spill is not reasonably certain to occur, this type of spill has not been evaluated as either a direct or an indirect effect of the proposed action. As such, BOEM and BSEE have determined that the effects of the proposed action are not likely to jeopardize the continued existence of the eastern black rail.

If you have any questions regarding the above information or need any additional information for clarification, please do not hesitate to contact Dr. Tre Glenn at (504) 736-1749 or tre.glenn@boem.gov, and Mr. Daniel Leedy at (504) 736-2597 or daniel.leedy@bsee.gov.

Sincerely,

AGATHA-MARIE KALLER

Digitally signed by AGATHA-MARIE KALLER
DN: c=US, o=U.S. Government, ou=Department of the Interior, ou=Bureau of Ocean Energy Management, cn=AGATHA-MARIE KALLER, 0.9.2342.19200300.100.1.1=14001001248643
Date: 2021.02.12 06:41:16 -06'00'

Arie Kaller
Supervisor, Office of Environment
BOEM, Gulf of Mexico OCS Region

cc: Ms. Brigette Firmin, brigette_firmin@fws.gov
Mr. Joe Hodges, joe_hodges@fws.gov
Mr. T.J. Broussard, t.j.broussard@boem.gov

Enclosure:

Eastern Black Rail

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1. Species Description

In April 2010 the US Fish & Wildlife Service (FWS) received a petition to list 404 aquatic, riparian, and wetland species from the southeastern U.S., which included the eastern black rail (*Laterallus jamaicensis jamaicensis*). On September 27, 2011, the FWS published a 90-day finding on 374 of the petitioned species, including the eastern black rail, indicating that listing may be warranted (Federal Register 2011). On October 9, 2018 the FWS proposed to list the eastern black rail as threatened (Federal Register 2018). A final rule to the listing of the eastern black rail was published on October 8, 2020, with an effective date of November 9, 2020 (Federal Register, 2020). There is currently no critical habitat established for eastern black rail (USFWS, 2020). The eastern black rail (*Laterallus jamaicensis jamaicensis*) is protected under the Migratory Bird Treaty Act (USFWS, 2013).

The eastern black rail is a subspecies of the black rail and is a small and cryptic wetland dependent subspecies. The eastern black rail relies on salt, brackish, and freshwater marsh habitats that can be tidally or non-tidally influenced (Federal Register, 2018). Within these habitats the birds use the transition zone between the emergent wetlands and the upland interface (Federal Register, 2020) vegetated by emergent plants, including rushes, grasses, and sedges. The eastern black rail requires dense vegetative cover, made up of fine-stemmed emergent plants that form a dense canopy or cover. If scrub densities become too high, the habitat may become unsuitable. The eastern black rail uses areas of moist or flooded soils with, or adjacent to, very shallow waters (<6 centimeters). The eastern black rail forages on small aquatic and terrestrial invertebrates, especially insects and seeds (USFWS, 2018).

Historically, the eastern black rail was widely distributed in the eastern United States, Mexico, Central America, and the Caribbean in both inland and coastal areas. However, the distribution of the eastern black rail in New England, the Appalachian, and Central Lowlands has effectively been eliminated. Some populations remain in both inland and coastal areas within the Mid-Atlantic Coastal Plain, Southeast Coastal Plain, Southwest Coastal Plain and Great Plains. Current information suggests that there are two populations in the south-central U.S: one migratory population breeds in Colorado and Kansas then winters in Texas; the second non-migratory population lives in Texas year-round. A third population occurs in the U.S. Atlantic coast and is suspected to migrate and winter on the southern Atlantic coast and in the Caribbean and Central America (Federal Register, 2018). Migration of the eastern black rail is poorly understood. Within the Gulf of Mexico region, wintering and resident birds are found primarily along the Texas Coast, the western Louisiana Coast, and the Gulf Coast of Florida (Federal Register, 2018; USFWS, 2018). Eastern black rail sightings in the other Gulf Coast states would be considered a vagrant or as an accidental migrant.

Based on the best available data, there are currently no precise population estimates for this subspecies. However, over the past 10 to 20 years, the U.S. population has experienced declines of 75% or greater. In 2017, pre-Hurricane Harvey, population estimates along the upper Texas coast were estimated at 1,299 individuals (USFWS, 2018). The upper Texas coast was significantly impacted by flooding from Hurricane Harvey and the eastern black rail are expected to have experienced population declines from such impacts. Between 355 and 815 breeding pairs are estimated to reflect the Atlantic Coast and Florida Atlantic and Gulf Coast populations

(USFWS, 2018). Again, those areas were impacted by multiple hurricane events after those estimates.

2. Environmental Baseline Factors

The oil from the *Deepwater Horizon* (DWH) event has had serious direct and indirect impacts to coastal and marine birds, and such effects were far more serious for birds using the Central Planning Area (CPA) than the Western Planning Area (WPA), because the extent of the spill remained east of the WPA boundary. At this time, it is unknown what the long-term impacts are to respective species populations. Data are lacking on spatial and temporal aspects of search effort, and, more important, data on sex-age composition of the collected sample. Sex-age composition data would be beneficial because they provide insights into the short- and long-term impacts for a given avian species, as well as information necessary to gauge a species' recovery potential. It is reasonable to infer from the limited data available that not all species groups were impacted similarly and that not all species within a group were impacted similarly. There may be delayed effects for some species due to major impacts to certain year classes (i.e., subadults), such that the impacts will not be realized until the dead individuals would have attained breeding age. Individual life-history strategies, starting population size and trajectory, and sex and age composition of the population before the DWH event will ultimately dictate the impacts at the population level. It should also be noted that the total body count and the total modeled estimate of avian mortality from an oil spill is a poor indicator of "effect" or "impact" to a given species' population, because not all birds are of equal reproductive value to the population (i.e., reproductive age females are "worth" more to the population). To address this, some form of calculating and/or deriving lost bird-years and recovery to baseline conditions is necessary and requires knowledge of the age-sex composition of the oiled sample of birds, as well as age-sex structure of the target population (Multisale EIS-USDOI, BOEM, 2012a-c).

Unavailable information on the effects to coastal and marine birds from the DWH event (and thus changes to the avian baseline in the affected environment) makes an understanding of the potential impacts from the Outer Continental Shelf (OCS) oil and gas activities less clear. Relevant data on the status of bird populations after the DWH event may take years to acquire and analyze through the Natural Resource Damage Assessment (NRDA) process, and impacts from the DWH event may be difficult or impossible to discern from other factors.

For Endangered Species Act (ESA) purposes, the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) continue to maintain that a low-probability catastrophic spill is neither a direct nor an indirect effect of the proposed action. A low-probability catastrophic spill is, by definition, not reasonably certain to occur. The National Marine Fisheries Service (NMFS) indicate that under their ESA guidance they may also consider the risk of a catastrophic event discountable as it may have adverse effects but a very low risk occurrence; regardless, the Bureaus believe that a future catastrophic spill is not reasonably certain to occur, as the risk is exceedingly low, particularly after the implementation of new safety measures and advances in containment technologies after the DWH event. The Bureaus do, however, recognize FWS's interest in considering this type of event for informational purposes. The information and analyses that BOEM has provided, as part of this consultation, is information based on the best available information as required under ESA and by BOEM expert opinion. Other methods of analysis are significantly limited in their applicability and availability, nor would they provide any meaningful or useful information to be used to assess risk of catastrophic spill occurrence at this programmatic level of oil and gas activities in the Gulf of Mexico. While the Bureaus acknowledge that, even with the most stringent standards, risk can never be wholly eliminated, they believe that the risk of a

catastrophic spill, which was small even before the DWH spill, has been further reduced with the development of this suite of safety protocols, regulations, and new technologies. The Bureaus believe, with a high level of confidence, that a catastrophic oil spill is now even less likely to occur during the consultation period of this proposed action (see Appendix L in the Biological Assessment).

3. Routine Activities

3.1 Major Factors

The possible effects of routine activities on eastern black rail along the Gulf of Mexico are discussed below.

- habitat loss and fragmentation;
- behavioral effects due primarily to disturbance from OCS helicopter and service-vessel traffic and associated noise;
- mortality due to exposure and intake of OCS-related contaminants, e.g., produced waters and discarded debris; and
- sublethal, chronic effects from air emissions.

3.1.1 Habitat Loss and Fragmentation

The greatest negative impact to coastal and marine birds is the loss, alteration, and fragmentation of preferred or critical habitat (Fahrig, 1997 and 1998). This is particularly true for threatened and/or endangered species, whereby populations tend to be at or approaching some critical threshold in abundance (Dennis et al., 1991; Belovsky et al., 1994).

Pipeline landfalls, terminals, and other onshore OCS-related infrastructure can destroy or fragment otherwise suitable avian habitats (e.g., wetlands), resulting in the displacement of associated avian communities. Seabird nesting colonies are particularly sensitive to disturbance and habitat alteration or loss, and known colonies should always be avoided by construction activities. Environmental regulations (Section 404 of the Clean Water Act, U.S. Dept. of the Army Corps of Engineers) require restoration (or mitigation) of wetlands modified (e.g., drain, fill, dredge) or destroyed by pipe laying barges and associated onshore infrastructure. However, onshore pipelines cross a wide variety of coastal environments and can affect certain species often not associated with freshwater, marine, or estuarine systems.

Fidelity to coastal and marine roosting, nesting, and foraging sites likely varies among species and within and among years for a given species along the Gulf Coast. Site abandonment along the northern Gulf Coast has often been attributed primarily to habitat loss and fragmentation, and also to excessive human disturbance (Visser et al., 2005; LeDee et al., 2008). Many of the overwintering shorebird species remain within relatively well-defined, winter-use areas throughout the season, and some species exhibit among-year wintering site fidelity, at least when not disturbed by humans (Drake et al., 2001). These species are particularly vulnerable to localized impacts resulting in habitat loss or fragmentation unless they disperse to more favorable habitats when disturbed. This assumes that such habitats are available, in proximity to, and are of similar or greater quality compared with the disturbed habitat (Block and Brennan, 1993; Johnson, 2005).

Eastern black rails are considered both resident and migratory to the Texas Coast and migratory to the Florida Gulf Coast (Federal Register 2018). Because of the eastern black rail's use of the specific transition zone between wetlands and uplands and their specific vegetative needs (Tolliver, 2017), their ability to relocate to suitable habitat may be less likely than other wading bird species. These habitat types have experienced significant declines, with some areas in the

eastern black rail's historical range losing over 90% of their prairie habitat (Sampson and Knopf, 1994). The displacement into the secondary selected habitat may be of lesser quality, resulting in reduced survival and reproduction (Knutson et al., 2006).

Birds may relocate from an impacted habitat to an alternative habitat, but several factors may affect this ability and success (Boulinier and Lemel, 1996). However, the newly-occupied habitat may be of lesser quality, resulting in reduced survival and reproduction (Knutson et al., 2006). This may have short-term or long-term implications, depending on the species (Battin, 2004). In their study of non-OCS oil and gas development at Padre Island National Seashore in Texas, Lawson et al. (2011) documented declines in abundance of several species of wintering passerines with decreasing distance from roads. However, the authors did not detect a difference in abundance among active drilling sites, active pumping stations, abandoned well sites, or roads (Lawson et al., 2011, Figure 1).

3.1.2 Helicopter and Vessel Traffic

Disturbance effects related to OCS activities (e.g., air and vessel traffic) can have variable impacts to avian populations depending on the type, intensity, frequency, duration, and distance to the disturbance source (Bélanger and Bédard, 1989; Conomy et al., 1998; Blumstein, 2003). For birds, hearing sensitivity seems most acute in the range of 1–5 kHz, similar to the most sensitive mammals in this range; above and below that range, avian performance appears to be inferior (Manci et al., 1988, p. 32). Birds vocalize as a form of communication for predator detection-avoidance, food-finding, and migration. More important, for many avian species, aural communication (i.e., calls or songs) is used for locating mates, determining mate quality, and maintaining pair bonds (Welty and Baptista, 1988). Anthropogenic sound (i.e., noise pollution) may mask or otherwise interfere with avian communication (Bayne and Dale, 2011). Disturbance-related impacts do not typically result in direct mortality. Rather, effects tend to manifest themselves through the following:

- behavioral changes (Bélanger and Bédard, 1990);
- reduced pairing success (Habib et al., 2007);
- selection of alternative habitats that may be suboptimal;
- creating barriers to movement or decreasing available habitat (Bayne et al., 2005a and 2005b);
- decreases in foraging time (Verhulst et al., 2001);
- reduced foraging efficiency;
- reduced time spent resting or preening (Tarr et al., 2010);
- prey switching;
- increases in energy expenditures due to flight behavior and temporary displacement (compared to resting, preening, or foraging) (Platteeuw and Henkens, 1997; Ackerman et al., 2004); and
- possible decreases in reproductive effort or nest success (Béchet et al., 2004; McGowan and Simons, 2006).

Overall, the literature reviewed suggests negative short- and long-term disturbance effects to birds (Carney and Sydeman, 1999).

Noise, with particular reference to military aircraft as a disturbance factor, has been previously reviewed by Larkin et al. (1996), Gutzwiller and Hayden (1997), and Efroymson et al. (2000). Helicopters appear to exert a greater influence on avian behavior (flight initiation distance, duration in flight, and distance flown) than airplanes, which is likely due to the much higher decibel level associated with the prop wash (Ward et al., 1994 and 1999). Komenda-Zehnder et al. (2003, p. 10) recommended minimum flight altitudes (above sea level) of 450 m (1,476 ft) for helicopters and 300 m (984 ft) for airplanes, based on results for disturbance to wintering waterbirds (mostly ducks). In the Gulf of Mexico, all aircraft are required to follow the Federal Aviation Administration's Advisory Circular 91-36C (1984) minimum altitude of 610 m (2,000 ft). This requirement is not tracked and it is likely that some of the helicopters departing from onshore sites to offshore platforms fly below the Federal Aviation Administration's minimum in areas of high bird density (e.g., waterbird colonies, beach-nesting bird colonies, and National Wildlife Refuges) to reduce total travel time or reduce fuel consumption, and during periods of inclement weather, high winds, or low ceilings. Although helicopter traffic in support of offshore oil and gas activities is anticipated to occur frequently, such disturbances tend to be relatively short in duration.

3.1.3 Air Emissions

In North America, there is a dearth of information concerning potential impacts of air pollution on birds, other than effects related to acid rain (Hames et al., 2002; Rimmer et al., 2005). In his review of air pollution impacts on wildlife, Newman (1979) stated that information was too limited to draw conclusions regarding species sensitivity.

Sources of air pollution on the OCS in support of routine activities include the following:

1. service support vessels, i.e., boats, ships, etc.;
2. helicopters;
3. generators and other related gas- or diesel-powered engines on platforms;
4. flaring; and
5. other equipment on platforms (i.e., vents, fugitives, glycol dehydrators, pneumatic pumps, and pressure level controllers, boilers, heaters, and burners).

In their Gulfwide inventory of emissions from platforms, Wilson et al. (2010) documented a 19 percent increase (up over 9,000 tons since previous inventory) in volatile organic compounds (VOCs), and the overall activity of flaring increased. For more details about the list of OCS-related emission sources, the types of pollutants monitored, and total platform emission estimates, refer to Wilson et al. (2010, Table 8-1).

It is well known that the myriad constituents of air pollution (e.g., As, Cd, Se, H_2S, NO_x, CO, CO_2, CH_4, O_3 [ozone], Pb, Hg, MeHg, Fl, Al, SO_2, PAH's, chlorofluorocarbons, hydrochlorofluorocarbons, particulate matter [PM], and fly ash) may be harmful to wildlife (Newman and Schreiber, 1988; Schreiber and Newman, 1988) and humans. These and other pollutants are regulated onshore by the U.S. Environmental Protection Agency (USEPA) under the Clean Air Act (CAA) of 1970 and subsequent provisions. Under provisions of the CAA Amendments of 1990, the USEPA Administrator has jurisdiction in OCS areas eastward of 87.5°W longitude in the Gulf of Mexico and, in consultation with the Secretary of the Interior and the Commandant of the U.S. Coast Guard, established the requirements to control air pollution in that area of the Gulf. Effects of air pollutants on birds can result in major die-offs or effects can be relatively subtle including behavioral changes; changes in distribution and habitat

use; increased susceptibility to parasites, diseases, and infections; physiological and respiratory stress; and anemia (Newman, 1979; Newman and Schreiber, 1988; Eeva et al., 1994). According to Newman and Schreiber (1988), the low number of reported incidents involving wildlife is likely a function of lack of awareness and recognition of the problem rather than a low incidence of occurrence (Newman and Schreiber, 1988, Tables 1-2). Air pollution may result in changes to avian populations through their distribution or abundance, but it may be difficult to separate emission-related effects from other population-limiting factors (i.e., food limitation, change in distribution of preferred foods, weather-related effects to habitats, or anthropogenic impacts to habitats, etc.) and their interactions (Schreiber and Newman, 1988, p. 350). In addition, cross-seasonal effects or annual variation in recruitment or mortality may be occurring in other regions (e.g., food shortage on the wintering grounds or on staging areas, major mortality event during migration [Newton 2006 and 2007]), masking air pollution effects or making it more difficult to discern such effects.

Recovery potential for a species or its ability to withstand additional population-level losses due to anthropogenic impacts, including air pollution, is largely a function of its life-history strategy (Sæther and Bakke, 2000; Sæther et al., 2004). It is likely that birds using the CPA would encounter greater levels of air pollution than birds using the WPA or Eastern Planning Area (EPA) due to (1) greater number of platforms and more flaring from platforms at a given point-in-time in the CPA than WPA, (2) greater number of total vessel trips in the CPA than WPA, and (3) greater number of helicopter support trips in the CPA than WPA (see the "OCS oil and gas activities Analysis" section below). Therefore, total air pollution associated with CPA OCS oil and gas activities would likely be greater in the CPA than in the WPA (Wilson et al., 2010). This does not consider between-area differences in prevailing winds, differences in associated infrastructure onshore, or other sources of inputs onshore.

There are very few studies assessing contaminants' effects on black rails (Eddleman et al. 1994), despite the fact that contaminants' impacts on waterbirds have long been studied. One concern specific to eastern black rails is the wide-spread use of pesticides to control mosquito marsh populations (Morris et al., 2005; Poulin et al., 2010; Lagadic et al., 2014), but the importance of mosquitoes to the eastern black rail's diet is currently unknown. Overall, according to the FWS, there is no evidence of specific contaminant threats to the eastern black rail that could impact the subspecies at a population level (U.S. Fish and Wildlife Service, 2018).

3.1.4 Produced Water

Produced water impacts on birds can vary from short term to long term and from sublethal to lethal. Produced water has previously received limited attention relative to potential effects to birds using offshore waters or as a chronic source of pollution (Stephenson, 1997; Wiese et al., 2001). The reasons are based on the following assumptions:

1. the regulatory limits established by USEPA eliminate or significantly reduce the potential for negative effects to birds; and
2. produced water and its constituent pollutants will be diluted simply as a function of the dilution potential of the ocean, eliminating or minimizing potential harm to birds.

Produced water, including its constituent pollutants, is the largest waste stream associated with oil and gas production (Veil et al., 2004; Welch and Rychel, 2004). The volume of produced water is not constant over time and increases over the life of an individual well (Veil et al., 2004). It has been estimated that U.S. wells produce 7 bbl of produced water for every barrel of

oil and may comprise as much as 98 percent of the material brought to the surface for wells nearing the end of productivity (Veil et al., 2004). Produced water is composed of a number of different substances, including trace heavy metals, radionuclides, sulfates, treatment chemicals, produced solids, and hydrocarbons (see Veil et al., 2004, Table 2-1, for a complete list of substances and amounts from Gulf of Mexico wells). Pollutants discharged into navigable waters of the U.S. are regulated by USEPA under the Clean Water Act of 1972 and subsequent provisions (33 U.S.C. §1251 et seq.). Specifically, a NPDES permit must be obtained from USEPA under Sections 301(h) and 403 (45 FR 65953, October 3, 1980) of the Clean Water Act. However, not all water pollutants are regulated or are regulated at levels that will prevent effects to wildlife, including birds (Fraser et al., 2006, pp. 148–150).

Impacts to birds from pollutants remaining in produced water may be from ingestion, contact (direct), or from the changes in the abundance, distribution, or composition of preferred foods (indirect). O'Hara and Morandin (2010) documented measurable oil transfer to feathers and impacts to feather microstructure at sheen thickness as low as 0.1–0.3 micrometer. A light coating of hydrocarbons and other substances found in produced water is enough to negatively affect feather microstructure, potentially compromising its buoyancy, insulation (i.e., thermoregulatory function and capacity), and flight characteristics (Stephenson, 1997; O'Hara and Morandin, 2010).

3.1.5 Marine Debris

Ingestion or entanglement with plastic materials may lead to injury or death. The effects of plastic ingestion may be long-term and may include physical deterioration due to malnutrition; plastic material cannot digest often leading to a distention of the stomach, thus preventing its contraction and simulating a sense of satiation (Moser and Lee, 1992; Pierce et al., 2004). The chemical toxicity of some plastics can be high, posing a hazard in addition to obstruction and impaction of the gut (Fry et al., 1987). Some birds also feed plastic debris to their young, which could reduce fledging success and offspring survival rates. As a result of stress from the consumption of debris, individuals may weaken, facilitating infection and disease; migratory species may then not have the energetic capacity to initiate migration or complete the migration process. The Notice to Lesee (NTL) 2012-BSEE-G01, issued on January 1, 2012, applied to activities permitted before March 13, 2020 and provides standards for marine trash and debris awareness and elimination. On March 13, 2020, updated guidance was provided under Appendix B of the Biological Opinion issued by NMFS. The Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols can be accessed on the NOAA Fisheries website (https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico). The updated guidance provides standards for activities permitted after March 13, 2020.

3.1.6 OCS Oil and Gas Activities

The routine activities are discussed below and are expected to be of short duration and limited in scope.

3.1.6.1 Vessel and Air Traffic

Service vessels would use selected nearshore and coastal (inland) navigation waterways, or corridors, and should adhere to regulations set forth by the U.S. Coast Guard (USCG) for reduced vessel speeds within these inland areas. The effects would be limited to the immediate vicinity of the vessel and would be of short duration. Impacts are expected to "not likely to adversely affect" this species.

The Federal Aviation Administration and corporate helicopter policy advise helicopters to maintain a minimum altitude of 700 ft (213 m) while in transit offshore and 500 ft (152 m) while working between platforms. When flying over land, the specified minimum altitude is 1,000 ft (305 m) over unpopulated areas or across coastlines and 2,000 ft (610 m) over populated areas and biologically sensitive areas such as National Wildlife Refuges and National Parks. Many relatively undisturbed coastal areas and refuges provide preferred and/or critical habitat for feeding, resting (or staging), and nesting birds. The effects are expected to be of short duration and limited in scope. Impacts from helicopter flights associated with routine activities are expected to "not likely to adversely affect" this species.

Overall, the predicted scenario statistics suggest a far greater number of exploration and production wells, more installed structures, far greater length of installed pipelines, and much higher level of support related activities in the CPA compared with the WPA or EPA.

3.1.6.2 Air Pollution

Emissions of pollutants into the atmosphere from the activities associated with CPA OCS oil and gas activities should result in minimal effects on offshore and onshore air quality because of the prevailing atmospheric conditions, emission heights and rates, and pollutant concentrations. The most likely pathway for air pollution to affect birds is through acidification of inland waterbodies and soils, and a subsequent change in trophic structure (White and Wilds, 1998; USDOC, NOAA, 2011a). Even though the levels of activity are much greater in the CPA compared with the WPA or EPA, impacts to birds from decreased air quality due to routine activities are expected to be negligible because air quality impacts from CPA OCS oil and gas activities are unlikely to impact ambient air quality (but see Wilson et al., 2010).

3.1.6.3 Produced Water

Produced water is an operational discharge containing hydrocarbons, trace heavy metals, radionuclides, sulfates, treatment chemicals, and produced solids that represents most of the waste discharged from offshore oil extraction production facilities (Veil et al., 2004; Welch and Rychel, 2004). The degradation of coastal and estuarine water quality expected to result from of OCS-related discharges, particularly when added to existing degradation from other sources, may affect coastal birds directly by means of acute or chronic toxic effects from ingestion or contact, or indirectly through the contamination of food sources or habitat loss and/or degradation (Fraser et al., 2006). Operational discharges or runoff in the offshore environment could also affect seabirds that remain and feed in the vicinity of offshore OCS structures and platforms (Wiese et al., 2001; Burke et al., 2005). These impacts could also be both direct and indirect. Many seabirds feed and nest in the Gulf; therefore, water quality may also affect breeding success (measured as the ratio of fledged birds per nest to hatched birds per nest). The NPDES permit maximum allowable oil and grease concentration is an average of 29 mg/L per month for the OCS and specifies a maximum (daily average) of 42mg/L daily, which are events

that may cause sheens (Fraser et al., 2006, p. 149). However, the permittee is required to monitor free oil using the visual sheen test method on the surface of the receiving water. Monitoring is performed once per day when discharging, during conditions when observation of a sheen on the surface of the receiving water is possible in the vicinity of the discharge, and when the facility is manned. It is unlawful to discharge produced water that causes a visible sheen. Impacts from produced-water discharges associated with routine activities are expected to "not likely to adversely affect" this species.

3.1.6.4 Habitat Loss and Fragmentation

The analysis of the potential impacts to coastal environments (**Chapters 3.1.2.1 and 4.2.1.3**) concludes that WPA, CPA, or EPA OCS oil and gas activities are not expected to adversely alter barrier beach configurations beyond existing, ongoing impacts in localized areas downdrift of artificially jettied and maintained channels. Adverse impacts of pipeline and navigation canals are the most significant OCS-related and proposed-action-related impacts to wetlands that may be used by many species of birds. Initial impacts are locally significant and largely limited to where OCS-related canals and channels pass through wetlands.

3.1.6.5 Trash and Debris

Coastal and marine birds are susceptible to entanglement in floating, submerged, and beached marine debris, specifically in plastics discarded from both offshore sources and land-derived litter and waste disposal. It is believed that coastal and marine birds are less likely to become entangled in or ingest OCS-related trash and debris due to BSEE regulations that prohibit the disposal of equipment, containers, and other materials into offshore waters by lessees (30 CFR 250.300). Also, MARPOL, Annex V, Public Law 100-220 (101 Statute 1458), prohibits the disposal of any plastics, garbage, and other solid wastes at sea or in coastal waters (effective January 1, 1989, and enforced by USCG). The BSEE policy regarding marine debris prevention is outlined in NTL 2012-BSEE-G01 and Appendix B, Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols, found in the Biological Opinion issued by the NMFS on March 13, 2020. As such, impacts to birds from OCS-related trash and debris associated with routine activities are expected to be negligible.

4. Accidental Events

The following analysis includes information developed and incorporated in the wake of the DWH event (Oil Spill Commission, 2011b). Additional information on oil-spill impacts to birds and results from avian monitoring related to the DWH event can be found in **Chapter 4.1.1.14.1 of the Multisale EIS** (USDOI, BOEM, 2012b). A more detailed discussion of catastrophic oil-spill events can be found in **Appendix B**–but as noted above, BOEM does not consider a catastrophic event to be an effect of the OCS oil and gas activities as it is not reasonably certain to occur. Additional information regarding oil-spill occurrence, probabilities, and volumes for the Gulf of Mexico can be found in Anderson and Labelle (2000), and Oil Spill Commission (2011b).

These results and the reviews from the Oil Spill Commission (2011c, 2011d, and 2011e) suggest that oil-spill probabilities and estimates of spill size and frequency may be biased low, or at a minimum, impacts to infrastructure from hurricanes should also be considered as a variable when attempting to model oil spill-related parameters and associated risk (Stewart and Leschine, 1986; Pulsipher et al., 1998; Kaiser and Pulsipher, 2007). The BOEM has run a new OSRA catastrophic spill analysis included in the Multisale EIS, and the EPA FEIS.

Due to the aging infrastructure, particularly pipelines, spill-related risks or probabilities may not be constant over the life of the OCS oil and gas activities, especially in the event of hurricanes. This section discusses impacts to coastal and marine birds resulting from accidents reasonably certain to occur as associated with the OCS oil and gas activities. Impact-producing factors include oil spills and oil-spill cleanup activities, including the release of rehabilitated birds. As previously mentioned in **Chapters 4.1.1.14.1 and 4.1.1.14.2 of the Multisale EIS** (USDOI BOEM, 2012a–2012c), it is recognized that, due to either the small initial population size, the initial population trajectory, or both, for threatened and endangered avian species, any spill and associated cleanup activities would likely have a proportionately greater negative effect to the population (Dennis et al., 1991; Belovsky et al., 1994). With the DWH event, Congress and various Federal commissions have indicated potential interest in holding parties involved in accidental events that impact migratory birds responsible under the Migratory Bird Treaty Act (Alexander, 2010; Corn and Copeland, 2010).

4.1 Oil Spills and Response

Oil spills represent the greatest potential direct and indirect impact to coastal and marine bird populations. Birds that are heavily oiled succumb to acute toxicity effects shortly after exposure (Clark, 1984; Leighton, 1993). If the physical oiling of individuals or local flocks of birds occurs, some degree of both acute and chronic physiological stress associated with direct and secondary uptake of oil would be expected. Small coastal spills, pipeline spills, and spills from accidents in navigable waterways can contact and affect the different groups of coastal and marine birds, most commonly seabirds, divers, marsh- and wading birds, waterfowl, and some species of shorebirds (King and Sanger, 1979, Table 1; Williams et al., 1995, Table 5; Camphuysen, 2006, Table 6).

Lightly oiled birds can sustain tissue and organ damage from oil ingested during feeding and grooming or from oil that is inhaled. Birds that are heavily oiled usually die. Lighter polycyclic aromatic hydrocarbons (PAHs), like naphlalene and phenanthrene, are volatile and water-soluble, but they are somewhat more persistent compared with lighter, more volatile, and more

water-soluble hydrocarbons like benzene (Albers, 2006). Low levels of oil may have multiple deleterious effects, including the following:

- changes in behavior;
- interference with feeding drive and food detection;
- alteration of food preferences and ability to discriminate between poor compared to ideal food items;
- predator detection and avoidance;
- definition and defense of breeding and feeding territories;
- kin recognition;
- weakening of pair bonds (Butler et al., 1988);
- changes in incubation behavior (Butler et al., 1988; Fry et al., 1986);
- reduced provisioning of nestlings and fledglings, leading to reduced growth and survival (Trivelpiece et al., 1984; Boersma et al., 1988); and
- alteration of homing ability and fidelity for highly philopatric species.

Residual material that remains after evaporation and solubilization are water-in-oil emulsions (mousse), which are the primary pollutant onshore after oil from offshore spills actually reaches land. The mixing of mousse and sediments form aggregates that have the odor of oil and, after photo- and biological oxidation, form asphaltic "tarballs" and pavements (Briggs et al., 1996). Mousse emulsions may be the most toxic petroleum component because they are the most hydrophobic and will penetrate the hydrophobic core of the plasma membrane of cells and will cause disruption of the membrane and enter the cells as well (Briggs et al., 1996 and 1997). Common symptoms of exposed birds include dehydration, gastrointestinal problems, infections, arthritis, pneumonia, hemolytic anemias, cloacal impaction, and eye irritation. Therefore, antibiotic treatments, nutritional support, rehydration, and other protocols are used at rehabilitation centers (Briggs et al., 1996 and 1997).

When oil gets into vegetated or unvegetated sediment, low redox potentials, absence of light, and waterlogged substrate may result in oil that can neither be oxidized by bacteria and sunlight nor evaporate. The oil may also remain in its unweathered toxic state indefinitely. However, weathering-related effects on the oil from its path offshore to the coast ameliorates, to some extent, toxicity at the shoreline.

The use of feeding areas at the sea surface and intertidal wetland zone, where spilled oil tends to accumulate, makes the waterbirds, shorebirds, and some species of seabirds vulnerable to exposure to oil (Dunnet, 1982). If physical oiling of individuals or local groups of birds occurs, some degree of both acute and chronic physiological stress associated with direct and secondary uptake of oil would be expected (Burger and Fry, 1993; Leighton, 1993). Affected individuals may initially appear healthy, but they may be affected by physiological stress that does not occur until much later. Biochemical impacts of lighter PAHs have not been extensively described but may include increased susceptibility to physiological disorders including disruption of homeostasis; weakened immune systems and reduced resistance to disease; and disruption of respiratory functions (Briggs et al., 1996). The physiology and biochemical network of a bird

has many components, interactions, and functions that may provide potential points of attack from petrochemicals (Welty and Baptista, 1988). The network and internal feedback system also provide routes by which an effect on one process can lead to cascading sublethal, chronic effects in other systems (Burger and Fry, 1993; Albers, 2006).

Under natural conditions, water does not penetrate through the vanes of the feathers because air is present in the tiny pores in the lattice structure of the feather vane. Oil, with its reduced surface tension, and hydrophobic characteristics, adheres to keratin and mats the feather barbules into clumps; the lattice opens up (breaks down) and water penetrates and displaces insulating air (Lambert et al., 1982; O'Hara and Morandin, 2010). Oil also mats the feathers together, displacing insulating properties of trapped air (Jenssen, 1994). Dispersants also reduce water surface tension in the feather lattice pores (due to their surfactant component), and render them water-attracting instead of water-repelling (Stephenson, 1997; Stephenson and Andrews, 1997). Thus, at a certain surface tension, water will penetrate the feathers, and death from reduced thermoregulatory function may result (Lambert et al., 1982; Stephenson, 1997; Stephenson and Andrews, 1997). Birds that must feed on or in the water will lose heat faster than semiaquatic birds (e.g., wading- and shorebirds) that can feed with dry plumage on land (Jenssen, 1994).

Ingestion of oil by birds affects reproductive ability (Velando et al., 2005a and 2005b; Zabala et al., 2010). It may reduce eggshell thickness, resulting in eggs being cracked by incubating adults. Alonso-Alvarez et al. (2007a and 2007b) used blood chemistry of yellow-legged gulls (*Larus michahellis*) to compare long-term sublethal toxicity of the *Prestige* oil spill with short-term experimental sublethal toxicity in captive birds fed small amounts of fuel oil. Long-term effects were measured about 19 months after the spill. Short-term effects were measured in captive birds fed a small amount of fuel oil for 7 days. Adults from oiled colonies and fuel-oil-fed experimental birds had higher total PAHs and lower levels of three natural metabolites. Calcium was lower in oil-fed females than in control females, but it was the same in oil-fed and control males. Calcium is critical to females during follicular development because it is used for production of the egg shell. Ingestion of oil may alter liver enzyme function, osmoregulatory function, adrenocortical processes, and corticosteroid levels, and it may cause anemia (Lambert et al., 1982; Rocke et al., 1984; Pérez et al., 2010). Burger (1997) reported that exposure to small amounts of oil reduces immune response to diseases or results in decreases in body mass such that impacts may not be documented for many years or until oiled birds face additional environmental stressors, at which time exposed birds tend to experience higher levels of mortality compared with unexposed birds.

External oiling of eggs can slow embryonic growth, induce tumor growth, reduce gas conductance through the eggshell, and decrease hatchability (Jenssen, 1994). Impacts on vital life-history characteristics such as growth rates (Szaro et al., 1978a and 1978b; Trivelpiece et al., 1984) or reproductive parameters such as reproductive success can occur, resulting in possible local population extinction. Indirect effects occur by fouling of nesting habitat and by displacement of individuals, breeding pairs, or populations to less favorable habitats; changes in preferred prey abundance and distribution have also been documented (Esler et al., 2002; Golet et al., 2002; Velando et al., 2005b). Competition from con- and hetero-specifics may prevent displaced birds from accessing and occupying unoiled or undisturbed habitats, particularly for seabird colonies in southeastern Louisiana.

Oil spill response activities along the shore may disturb nesting populations of birds and reduce the suitability of the habitat due to air, vehicle, and foot traffic. The operation may use personnel with varied experience or training that can contribute to such impacts.

In general, research on long-term survival and reproduction of rehabilitated, oiled birds is limited, and results to date are mixed (Anderson et al., 1996; Sharp, 1996; Anderson and Labelle, 2000; but see Golightly et al., 2002; Mazet et al., 2002; Underhill et al., 1999). Success of rehabilitation for oiled birds may be a function of capture and handling methods, overall oiling and exposure of the individual, facility design, and availability of food, water, and space while in captivity, as well as species-specific characteristics, including body size, metabolism, and resting-heart-rate. It is critical that rehabilitated birds remain disease-free while in captivity. A major concern for holding wild animals, including birds, in facilities post-spill is the potential to expose the wild population to diseases once rehabilitated individuals are released. In some cases, the loss from disease could equal or exceed losses due to oil contamination. The efficacy of rehabilitation of birds after an oil spill remains a contentious and unresolved issue among avian ecologists and the scientific community alike (Estes, 1998; Jessup and Mazet, 1999).

Timing (i.e., if peak periods in bird density overlap temporally with the spill; Fraser et al., 2006), location (high compared to low bird density area), wind conditions, wave action, and distance to the shore may have a greater overall effect on bird mortality than spill volume and fluid type (Wilhelm et al., 2007; Castège et al., 2007; Byrd et al., 2009). *Exxon Valdez* spilled only about 10.8 million gallons, but it killed about 100,000–300,000 birds (Piatt et al., 1990a and 1990b; Piatt and Ford, 1996). The sea state at the time of the *Exxon Valdez* accident was relatively calm, and the oil was heavy, high-viscosity crude, resulting in little capability for chemical treatment or natural dispersal, breakdown, and weathering. Because of its undispersed state, the *Exxon Valdez* oil affected principally surface-dwelling and shore-dwelling organisms, such as birds. As oil weathered, the exposure of seabirds to oil from the *Exxon Valdez* spill shifted from direct oiling to ingestion of oil with prey or of contaminated prey (Piatt and Anderson, 1996; Seiser et al., 2000; Golet et al., 2002; Esler et al., 2010; but see also Wiens et al., 2001 and 2004). For a long-term review of the ecosystem following the *Exxon Valdez* spill, refer to Peterson et al. (2003).

Parsons (1994) provides the following unique before–after data for impacts of a spill on birds. Extensive shoreline and salt marsh were oiled by a January 1990 Exxon spill in the Arthur Kill and Kill van Kull estuaries of New York Harbor. Double-crested cormorants had achieved their maximum population growth by 1991. Productivity of herring gulls remained unchanged by the spill. Most heron populations increased after the spill. The greater black-backed gull population declined. Snowy egrets and glossy ibis used salt marsh and mud flat habitat, some of which was oiled. Black-crowned night heron and glossy ibis had delayed nesting after the spill and, along with snowy egret, showed lower reproductive success after the spill. Reproductive parameters like egg laying and hatching were generally higher than during the chick-rearing period, likely attributable to reduced food availability for provisioning chicks. Waterfowl were not affected seriously, except for a short-term decline in mallards. Short- and long-term responses by birds to an oil spill are likely to be species-specific and may be a function of the species' life history and its habitat use and diet (Piatt et al., 1990a; Burger and Fry, 1993; Votier et al., 2005). For a given avian species, if its preferred habitat and food resource are also impacted by a spill, the species will be forced to locate and settle in alternative habitats, modify its foraging behavior, or select alternative food resources. Conversely, fidelity to the impacted area could result in

reduced energy uptake through reduced food availability, reduced foraging success, prey switching, or residual sublethal toxicity effects, which may negatively impact body condition and survival (e.g., after the *Exxon Valdez* spill, harlequin ducks [Esler et al., 2000 and 2002] and pigeon guillemots [Seiser et al., 2000; Golet et al., 2002]).

4.1.1 OCS Oil and Gas Activities

Oil spills introduced specifically into coastal waters (as opposed to spills immigrating to coastal waters from offshore) as a result of OCS oil and gas activities are assumed to encroach upon adjacent coastal lands. The Oil Spill Risk Analysis (OSRA) is a model that calculates the movement of hypothetical spills by successively integrating time sequences of two spatially gridded input fields: the surface ocean currents and the sea level winds. Thus, the OSRA model generates time sequences of hypothetical oil spill impact locations–essentially, oil-spill trajectories to assist in estimating impacts to resources. It does not consider the unlikely and unanticipated scenario of an OCS oil spill occurring in close proximity to eastern black rail preferred habitat at the same time as an extremely high tide, wetland loss, a hurricane and sea level rise. OSRA modeling for all three planning areas (CPA, WPA, and EPA) has been completed and is provided below. For more details on OSRA, see Appendix G.

Representative species of the seven bird groups are widely distributed across the Gulf; therefore, an oil spill, depending on its size and distribution, would likely affect only a small fraction of a given species' population. The combined probabilities varied greatly depending on duration (10 days compared to 30 days) and the avian species group considered in the WPA and CPA. The combined probabilities (which represent the estimated probability that 1 or more hypothetical spills ≥1,000 bbl will both occur and contact a resource) associated with avian habitats varied little, irrespective of spill duration (10 days versus 30 days) and the avian species group or threatened or endangered species considered in the EPA.

Depending on the size of the spill, location, time of year, duration, and magnitude of associated oil-spill cleanup efforts, associated activities may impact or further exacerbate coastal bird issues regardless of personnel training and experience (National Audubon Society, Inc., 2010). Should such a spill occur, the OSRA model projected a spill risk within 10 and 30 days for the WPA, CPA and EPA (Figures 1-5). The counties where this species occurs is in Table 1.

Table 1. Coastal counties or parishes of the Gulf of Mexico with eastern black rail occurrence (USFWS, 2018)

Florida		Louisiana	Texas	
Broward	Lee Levy Manatee	Cameron	Aransas	Jefferson
Charlotte	Miami-Dade Monroe		Brazoria	Jackson
Collier Citris Dixie	Pasco Pineallas		Calhoun	Kleberg

Florida		Louisiana	Texas	
Escambia Franklin	Santa Rosa		Chambers	Matagorda
Gulf Hernando	Sarasota Taylor		Galveston	Nueces
Jefferson	Wakulla			

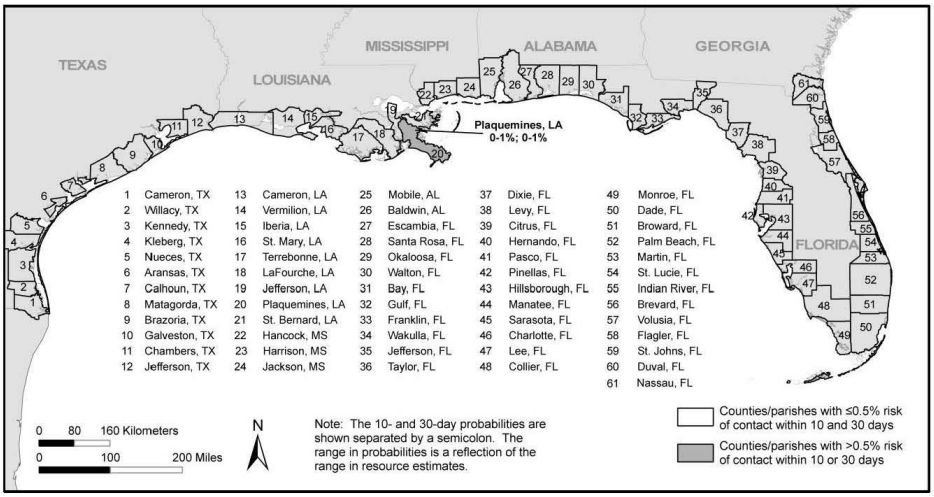

Figure 1. OSRA probabilities of an accidental oil spill (≥1,000 bbl) occurring and contacting within 10 and 30 days the shoreline (counties and parishes) as a result of EPA OCS oil and gas activities.

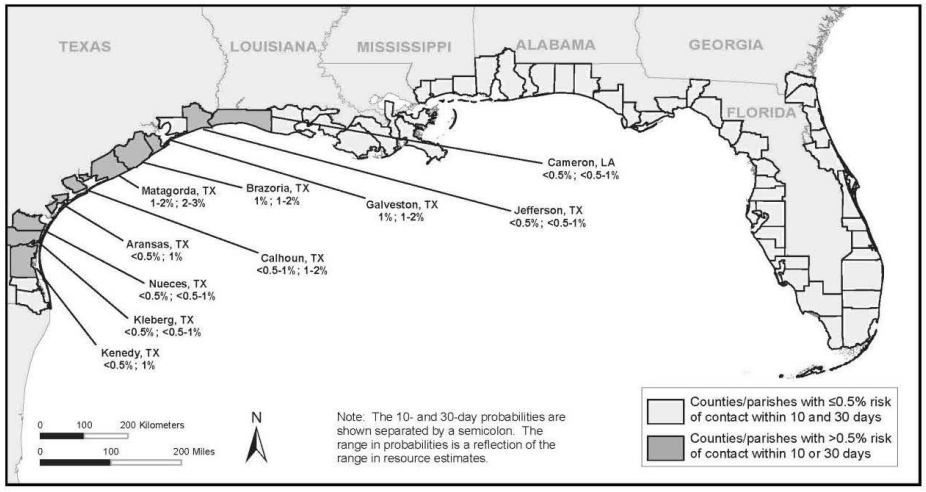

Figure 2. OSRA probabilities of an accidental oil spill (≥1,000 bbl) occurring and contacting within 10 and 30 days the shoreline (counties and parishes) as a result of a WPA OCS oil and gas activities (only counties and parishes with a >0.5% risk of contact within 10 or 30 days are labeled).

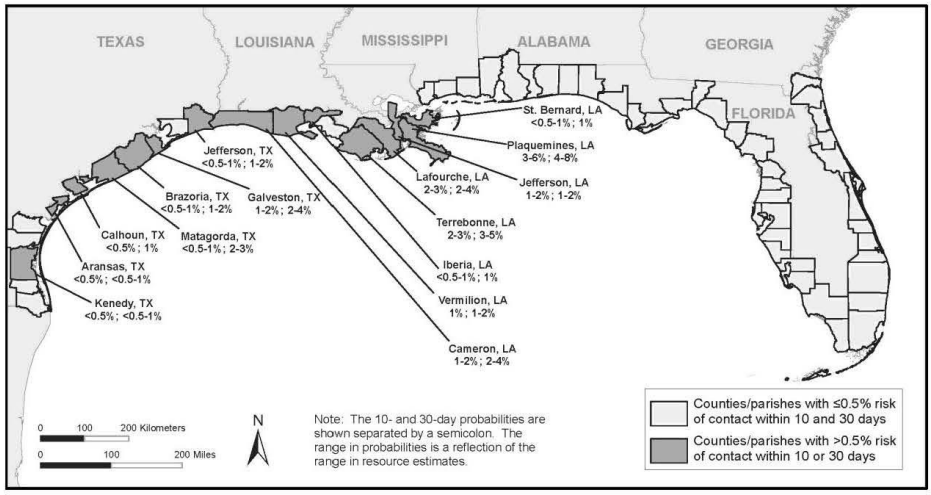

Figure 3. OSRA probabilities of an accidental oil spill (≥1,000 bbl) occurring and contacting within 10 and 30 days the shoreline (counties and parishes) as a result of a CPA OCS oil and gas activities (only counties and parishes with a >0.5% risk of contact within 10 or 30 days are labeled).

In general terms, coastal waters of the planning areas are expected to be impacted by many, frequent, small spills (<1 bbl); few, infrequent, moderately-sized spills (>1 bbl and <1,000 bbl); and a single, large (≥1,000 bbl; risk of <1–2) spill. The assessment of spill frequency (i.e., frequent, infrequent, unlikely) is based relative to the 40-year life span of a lease. Pipelines pose the greatest risk of a large spill occurring in coastal waters. Estimates from spill data show that Federal offshore waters will be subjected to many frequent small spills (≤1 bbl); few, infrequent, moderately-sized spills (>1 bbl and <1,000 bbl); and rare large spills (≥1,000 bbl) as a result of OCS oil and gas activities.

Oil spills introduced specifically into coastal waters (as opposed to spills immigrating to coastal waters from offshore) as a result of OCS oil and gas activities are assumed to encroach upon adjacent coastal lands (For more details on OSRA, see Appendix G). The OSRA modeling results (10- and 30-day probabilities) indicate that a large spill (>1,000 bbl) in Federal offshore waters, should one occur, would have a 3–5 percent and 9–16 percent probability (from CPA) and 5–8 percent and 8–14 percent (from WPA) of impacting Texas State offshore waters. State offshore waters in Louisiana are divided into east and west Louisiana. West Louisiana has a 10–18 percent and 14–25 percent probability (from CPA) and <0.5 percent and a 1 percent (from WPA) while east Louisiana has a 2–4 percent and 3–5 percent probability (from CPA) and <0.5 percent and <0.5 percent (from WPA).

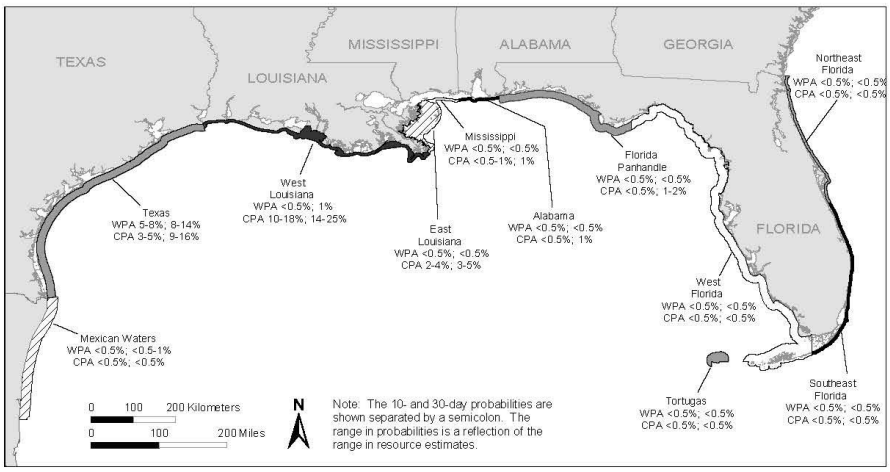

Figure 4. OSRA probabilities of oil spills (≥1,000 bbl) occurring and contacting within 10 and 30 days state offshore waters as a result of a WPA or CPA OCS oil and gas activities.

The OSRA modeling results (10- and 30-day probabilities) indicate that a large spill (>1,000 bbl), if it were to occur in Federal offshore waters (EPA), would have a <0.5 percent probability of impacting Texas State offshore waters. State offshore waters in Louisiana are divided into east and west Louisiana. West Louisiana has a <0.5–1.0 percent probability while east Louisiana has a <0.5–1.0 percent probability of impacts if such a spill were to occur. The OSRA model

projected a spill impact risk of <0.5 percent for state offshore waters eastward of Louisiana as a result of activities in the EPA.

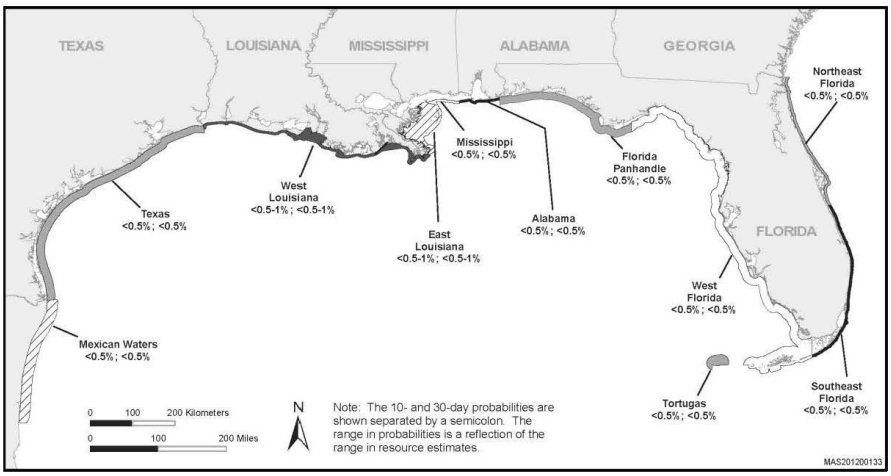

Figure 5. OSRA Probabilities of oil spills (≥1,000 bbl) occurring and contacting within 10 and 30 days state offshore waters as a result of an EPA OCS oil and gas activities.

5. Cumulative Effects

This cumulative analysis considers impact-producing factors (refer also to CEQ, 1997; Pierce, 2011) that may adversely affect populations of threatened and endangered avian species, as well as nonthreatened and nonendangered species related to OCS and non-OCS activities.

5.1 OCS-Related and Non-OCS-Related Air Pollutants

Air pollutants include the amount of sulfur dioxide (and other regulated pollutants) expected to be released due to OCS oil and gas activities, as well as State oil and gas activities. These pollutants may adversely affect coastal and marine birds and their habitats (**Chapter 4.1.1.14.2**). Pollutant emissions into the atmosphere from the activities under the cumulative analysis are expected to have minimal effects on offshore air quality because of the prevailing atmospheric conditions, emission heights, and pollutant concentrations, as regulated by USEPA (but see Wilson et al., 2010, Tables 8-1 and 8-2).

Emissions of pollutants into the atmosphere under the cumulative analysis are projected to have minimal effects on onshore air quality because of the atmospheric regime, emission rates, and the distance of these emissions from the coastline. Onshore impacts to air quality from emissions under the OCS cumulative analysis are expected to be within both Class I and Class II PSD allowable increments, as applied to the respective subareas. Increases in onshore annual average concentrations of NOx, SOx, and PM10 under the cumulative analysis are estimated to be less than Class I and Class II PSD allowable increments for the respective subareas as per both the steady-state and plume dispersion analyses, and they are assumed to be below concentrations that could harm coastal and marine birds (but see **Chapter 4.1.1.14.2**; see also Newman, 1979; Newman and Schreiber, 1988).

Although direct impacts (i.e., mortality) on coastal and marine birds due to air quality under the cumulative analysis are expected to be minimal, indirect impacts may include chronic, sublethal effects including reduced egg viability and hatchability, smaller overall clutch sizes, reduced fledging body mass, and overall fledging success, leading to overall reduced recruitment (refer to Eeva et al., 1997, 2003, and 2005). These effects could be the result of impacts to a bird's habitat or food supply rather than directly on individual birds, per se. If habitat and food resources are negatively impacted by air pollutants during the pre-laying period, it could influence energy devoted to the clutch. At the same time, these same effects could manifest themselves by reduced provisioning rates by adults to nestlings and/or fledglings or by provisioning at similar rates, but with different food resources (i.e., prey switching, whereby the alternative prey has less per capita energy).

Although the incremental contributions of offshore emissions are below or within those allowed by law, it is uncertain to what extent the contributions from OCS-related activities to the overall production of air pollutants on an annual or cumulative basis (refer to Wilson et al., 2010, Tables 8-1 and 8-2) could adversely impact avian populations in the Gulf of Mexico region. Nevertheless, these impacts would not be expected to rise to population-level impacts across the Gulf.

5.2 Water Quality Degradation

Water quality (**Chapters 4.2.1.2.1.1-4.2.1.2.2.4**) of coastal environments will be affected by bilge water from service vessels and point- and nonpoint source discharges from supporting infrastructure associated with OCS oil and gas development (refer to Veil et al., 2004, Table 2-1, for a complete list of substances and amounts from Gulf of Mexico wells). Water quality in marine waters will be impacted by the discharges from drilling, production, and platform removal operations (Veil et al., 2004; Welch and Rychel, 2004; Fraser et al., 2006). Degradation of coastal and inshore water quality resulting from factors related to OCS oil and gas activities; crude oil imports by tankers; and other commercial, military, and recreational offshore and coastal activities is expected to impact coastal and marine birds (**Chapter 4.1.1.16.2**; see also Fraser et al., 2006).

In 2008, USEPA (2008) rated the overall condition of the waters in the Gulf of Mexico at 2.2 (on a scale from 1 to 5, with 5 being highest), one of the lowest scores of any region in the U.S. NOAA (USDOC, NOAA, 2011a, Figure 54) noted that almost half of the 37 major estuarine systems in the Gulf of Mexico were considered moderately polluted. Further, 14 percent of all Superfund sites nationwide that have been cleaned up or remediated occur in the Gulf Coast region (USDOC, NOAA, 2011a, p. 40); 99 of 189 (52%) counties and parishes in Texas, Louisiana, Alabama, Mississippi, and Florida are coastal. Not included during USEPA's monitoring program (USEPA, 2008) were waters in the hypoxic zone (O_2 depleted water) found on the Gulf of Mexico continental shelf adjacent to the outflows of the both the Mississippi and Atchafalaya Rivers (Rabalais et al., 2002a). This area is well known and represents the second largest coastal zone of hypoxia in the world (Rabalais et al., 2001 and 2002b). Thus, the waters of the Gulf Coast region are some of the most contaminated in the U.S. The incremental addition related to OCS oil and gas activities would contribute to further degradation of water quality, but this remains a small addition when compared with all other natural and anthropogenic sources.

5.3 Platform and Pipeline Oil Spills and Any Improperly Directed Spill Response Activities

Oil spills have the greatest potential to impact coastal and marine birds. Use of waterbird, marshbird, shorebird, and seabird feeding areas at the sea surface and at the intertidal wetland zone, where spilled oil may accumulate, makes many avian species extremely vulnerable to spilled oil. Exposure to small amounts of oil may result in long-term, sublethal, chronic impacts on birds with the potential to impact food resources through changes in distribution and abundance (i.e., availability of preferred foods) (e.g., Esler et al., 2002). Mortality from oil spills is often related to numerous symptoms of toxicity. Pipelines are roughly 2 times more likely to produce >1,000 bbl spills compared with facilities.

The extensive oil and gas industry operating in the Gulf area may have caused low-level, chronic, petroleum contamination of coastal waters (Holdway, 2002; Jernelöv, 2010). Outside of a catastrophic event, petroleum spills or releases that result from OCS oil and gas activities would be expected to be small, particularly when compared with naturally occurring seeps in the GOM. Nevertheless, lethal effects are expected primarily from uncontained, inshore oil spills and associated, spill-response activities in wetlands, and other biologically sensitive coastal habitats (National Audubon Society, Inc., 2010; USDOI FWS, 2010e).

5.4 Aircraft and Vessel Traffic and Noise from Helicopters and Service Vessels

Helicopter and service-vessel traffic related to OCS activities would likely disturb feeding, resting, and nesting behavior of birds (at least temporarily), and it may also cause temporary or permanent abandonment of nests, nestlings, fledglings, and emigration from or avoidance of disturbed, preferred habitat (Burke et al., 2005). The Federal Aviation Administration (FAA Advisory Circular 91-36C) and corporate helicopter policy states that helicopters must maintain a minimum altitude of 700 ft (213 m) while in transit offshore and 500 ft (152 m) while working between platforms. When flying over land, the specified minimum altitude is 1,000 ft (305 m) over unpopulated areas or across coastlines and 2,000 ft (610 m) ft over populated areas and biologically sensitive areas, such as wildlife refuges and national parks. The net effect of OCS-related flights on coastal and marine birds is expected to result in temporary, often sporadic disturbances, which may result in displacement of localized individuals. During nesting periods, this could ultimately result in some reproductive failure from nest abandonment or depredation of eggs and young in the absence of a disturbed adult.

Service vessels are expected to use selected nearshore and coastal (inland) navigation waterways, and they are further expected to adhere to guidelines established by USCG for reduced vessel speeds within these inland areas. Routine presence and low speeds of service vessels within these waterways may reduce the disturbance effects from service vessels on nearshore and inland populations of coastal and marine birds. However, to date, efficacy of these measures has not been quantified. It is expected that service-vessel traffic may routinely disturb some populations of coastal and marine birds occurring within these areas.

5.5 Habitat Loss, Alteration, and Fragmentation Resulting from Coastal Facility Construction and Development

Habitat loss and fragmentation remain the largest threats to avian diversity and abundance in the U.S. and worldwide (Gaston et al., 2003; Barrow et al., 2005; Lepczyk et al., 2008). Cumulative activities related to OCS oil and gas activities will likely contribute to further loss, alteration, and fragmentation of avian habitat although at a much smaller spatial scale than non-OCS private and commercial construction and development activities (White and Wilds, 1998).

5.6 Pipeline Landfalls

Factors contributing to coastal landloss or modification include construction of pipeline landfalls for OCS oil and gas activities. From 1996 through 2009, there were 12 OCS-related pipeline landfalls in Louisiana and Texas. Adverse impacts of pipeline canals are the most significant OCS-related impacts to wetlands (Ko and Day, 2004a and 2004b; Morton et al., 2006). Initial impacts are locally significant and largely limited to where OCS-related canals pass through wetlands (Johnston et al., 2009). Wetlands are one of the most ecologically diverse and economically important habitats in the Gulf region, providing a host of benefits to the region's fish and wildlife resources (USDOC, NOAA, 2011a).

Dahl (2006) estimated an annual loss rate of 5,540 ac (2.242 ha) for the intertidal estuarine and marine wetland class, mostly in Louisiana, from all impacting factors. He stated that several factors may have contributed to wetland losses between 1998 and 2004, including deficiency in

sediment deposition, canals and artificially created waterways, wave-related erosion, land subsidence, and saltwater intrusion.

5.7 Trash and Debris

Coastal and marine birds may experience chronic physiological stress from sublethal exposure to or intake of contaminants or discarded debris associated with OCS-related activities. This may result in disturbances to and displacement of individuals. Chronic sublethal stress is often a challenge to detect in birds, and more importantly, to directly link to a given environmental stressor independent of other environmental factors (Wiens et al., 2001; Parker and Wiens, 2005). Sublethal stresses may weaken individuals (especially serious for migratory species), making them more susceptible to infection, disease, and parasites. Recruitment of birds and a population's recovery from a major mortality event may take many years, depending upon the species and its life-history strategy.

Much of the floating material discarded from vessels and structures offshore presumably drifts ashore, remains within coastal waters, or eventually sinks. These materials may include lost or discarded fishing gear, such as gill nets and monofilament lines, which cause the greatest overall damage to birds (Tasker et al., 2000; Dau et al., 2009; Ryan et al., 2009). Coastal and marine birds are commonly entangled in discarded trash and debris (Robards et al., 1995). Many species will readily ingest small plastic debris, either intentionally or incidental to consuming prey. Interaction with plastic materials may lead to debilitating injuries or death (Pierce et al., 2004).

It is believed that coastal and marine birds are less likely to become entangled in or ingest OCS-related trash and debris as a result of BSEE regulations regarding the disposal of equipment, containers, and other materials into offshore waters by lessees (30 CFR 250.300, NTL 2012-BSEE-G01, and Appendix B, Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols found in the Biological Opinion issued by NMFS on March 13, 2020). In addition, MARPOL, Annex V, Public Law 100-220 (101 Statute 1458), prohibits the disposal of any plastics at sea or in coastal waters (effective January 1, 1989). To date, the efficacy of these regulations on reducing seabird mortality has not been quantified. Despite these regulations, unknown quantities of plastics and other materials are discarded and lost in the marine environment, and so remain a threat to individual birds (Azzarello and Van Vleet, 1987).

5.8 Other Activities Not Related to the OCS Energy Program

Non-OCS related impacts may result in billions of bird deaths compared to the incremental effect of the OCS oil and gas activities (http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/BOEM-2012-019_v2.aspx).

The below list includes these non-OCS related impacts and are presented in more detail within the Multisale EIS (see Multisale EIS USDOI, BOEM, 2012b, pages 4–810):

- Habitat loss, alteration, and fragmentation associated with commercial and residential development
- Tanker oil spills and spills related to oil and gas activities in coastal state waters and spill-response activities
- Pollution of coastal waters resulting from municipal, industrial, and agricultural runoff and discharge

- Nonconsumptive recreation
- Maintenance and use of navigation waterways
- Collisions of coastal and marine birds with various anthropogenic structures
- Diseases
- Climate change and related impacts
- Storms and floods
- Coastal development
- Fisheries interactions

6. Summary and Conclusion

The majority of the effects resulting from BOEM and BSEE routine activities on the eastern black rail are expected to be sublethal (e.g., primarily disturbance-related effects). There is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that routine activities from the preexisting OCS Program are impacting coastal and marine bird populations. When compared with other causes of bird mortality, the routine events associated with the OCS Program are unlikely to result in population-level impacts to the eastern black rail.

Overall, impacts to avian species from routine activities are "not likely to adversely affect" these species. The impacts include the following:

- temporary behavioral changes, temporary or permanent changes in habitat use, temporary changes in foraging behavior, temporary changes to preferred foods or prey switching, temporary or permanent emigration, temporary or permanent reductions in nesting, hatching, and fledging success;
- sublethal, chronic effects due to exposure to or intake of OCS-related contaminants via spilled oil, pollutants in the water from service vessels, produced water, or discarded debris;
- minimal habitat impacts (based on actual acres of footprint) are expected (onshore or within State waters) to occur directly from routine activities resulting from the OCS oil and gas activities (but see Johnston et al., 2009); and
- secondary impacts from pipeline and navigation canals to coastal habitats will occur over the long term and may ultimately displace species to other habitats, if available.

Presently, there are no Gulf of Mexico mitigations (or stipulations) in place specific to the protection and conservation of any birds (including migratory birds) (USDOI, FWS and USDOI, MMS, 2009). However, avoidance measures and conditions are routinely placed on permitted activities to protect habitats.

Overall, impacts to coastal and marine birds associated with accidental events (oil spills regardless of size) in the WPA should be less than in the CPA due to the following factors: fewer platforms; lower oil-spill probabilities; and much lower numbers of predicted oil spills, particularly pipeline spills over the life of WPA OCS oil and gas activities. Oil spills (and disturbance impacts associated with clean up) that may be expected as a result of the OCS oil and gas activities could have the greatest impact on coastal and marine birds. Depending on the timing and location of the spill, even small spills can result in major avian mortality events (Piatt et al., 1990a and 1990b; Castège et al., 2007; Wilhelm et al., 2007). Small amounts of oil can affect birds, and mortality from oil spills is often related to numerous symptoms of toxicity (Burger and Gochfeld, 2001; Albers, 2006). Data from actual spills strongly suggest that impacts to a bird species' food supply are typically delayed after initial impacts from direct oiling (e.g., Esler et al., 2002; Velando et al., 2005b; Zabala et al., 2010). Sublethal, long-term effects of oil on birds have previously been documented (Esler et al., 2000; Alonso-Alvarez et al., 2007a), including changes to sexual signaling (Pérez et al., 2010).

Oil-spill impacts on birds from WPA, CPA, or EPA OCS oil and gas activities are expected to be adverse but not significant given the number and relatively small size of spills expected over the 40-year life of OCS oil and gas activities. Impacts of oil-spill cleanup from OCS oil and gas activities are also expected to be adverse but not significant, but they may be negligible depending on the scope and scale of efforts.

Incidental take, as defined at 50 CFR 402.02, refers only to takings that result from an otherwise lawful activity. The Clean Water Act (33 U.S.C. 1251 et seq.), as amended by the Oil Pollution Act of 1990 (33 U.S.C. 2701 et seq.), prohibits discharges of harmful quantities of oil, as defined at 40 CFR 110.3, into waters of the United States. Therefore, even though this biological assessment considers the effects on listed species by oil spills that may result from BOEM and/or BSEE activities, these impacts would result from an unlawful activity (i.e., oil spills) and have no protective coverage under Section 7(o)(2) of the ESA.

Human-induced disturbance effects often tend to get overlooked or underestimated as potential population-limiting factors for birds (Hockin et al., 1992; Newton, 1998, pp. 365-369). The cumulative effect on coastal and marine birds from all sources is expected to result in changes in species composition and distribution, and a discernable (i.e., low thousands) decline in the number of birds that form localized groups or populations. Some of these changes are expected to be permanent and to stem from a net decrease in preferred habitat for all birds, and possibly impacts to and declines in critical habitat for some endangered species. However, the incremental contribution of the OCS oil and gas program to the cumulative impact is considered "not likely to adversely affect" listed bird species, because the effects of the most probable impacts, such as operational discharges and helicopters and service-vessel noise and traffic, are expected to be sublethal; and some displacement of local individuals or flocks may occur, and displaced birds may move to other habitats, if available.

In general, the net effect of habitat loss from oil spills reasonably expected as a result of OCS oil and gas activities, OCS pipeline landfalls, and maintenance and use of navigation waterways, as well as habitat loss and modification resulting from coastal facility construction and development, will probably reduce the overall carrying capacity of the disturbed habitat(s). That is, impacted habitats may result in reductions to both species composition (fewer species) and abundance (lower numbers) as compared with what the area supported historically. These would be the most serious cumulative impacts on birds.

Disease is often lethal and may take millions of birds annually, but it should be considered a "naturally" occurring avian mortality factor unless the pathogen is introduced by humans (see Newton, 1998). Storms and floods represent natural, often major, disturbances to which exposed organisms are generally adapted. An exception would be hurricane-related storm surges, which are exacerbated by coastal wetland loss in Louisiana and throughout the northern Gulf (Costanza et al., 2008; Engle, 2011). Effects from sea-level rise may be particularly severe for many species of breeding marsh birds and shorebirds (e.g., brown pelican, sandwich tern, black skimmer, Forster's tern, laughing gull, gull-billed tern, royal tern, snowy plover, least tern, and Wilson's plover; USDOI FWS, 2010c), and several species of wintering shorebirds that rely on beaches, flats, dunes, sandbars, shorelines, islands, estuaries, and other low-lying, tidally-influenced habitats in the Gulf of Mexico (Galbraith et al., 2002; North American Bird Conservation Initiative, 2010). Even a nominal rise in sea level (USDOC NOAA, 2011a, pp. 36–37) would inundate much of this habitat, making it unsuitable for many, if not most, of these

species. Sea level rise will reduce suitable habitat availability for the eastern black rail and overwhelm habitat persistence. Increased flooding and inundation, saltwater intrusion, and other effects from sea level rise may affect the persistence of coastal or wetland plants that are vital habitat for the eastern black rail (Warren and Niering, 1993; Morris et al., 2002). Further, increased high tide flooding will directly impact the eastern black rail through nest destruction and egg loss at their nesting habitats (Sweet et al., 2017b). Sea level rise may also increase the intensity and frequency of such flooding events.

In conclusion, routine activities and accidental events associated with OCS oil and gas development, are "not likely to adversely affect" the eastern black rail in the Gulf of Mexico. The effects of the OCS oil and gas activities, when viewed in light of the effects associated with other past, present, and reasonably foreseeable future activities may result in adverse impacts to the eastern black rail; however, the effects are not likely to jeopardize the continued existence of this species. A summary of effects from activities is provided in Table 2.

Table 2. Summary of Potential Effects from OCS Oil and Gas Activities for Eastern Black Rail

Species	Activity	No Effect	Not Likely to Adversely Affect	Likely to Adversely Affect
Eastern Black Rail	Discharges		X	
	Aircraft Noise and Operation		X	
	Vessel Noise and Operation	X		
	Drilling and Production Noise	X		
	Marine Debris		X	
	Accidental Events (Oil Spills)		X	

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For further detail on this document, please see relevant sections in the originally provided Biological Assessment and associated Appendices.

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United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
New Orleans Office
1201 Elmwood Park Blvd
New Orleans, Louisiana 70123-2394

In Reply Refer To: GM 673E

Catherine Marzin
Acting Director, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910
catherine.marzin@noaa.com

Via Electronic Mail

Dear Ms. Marzin:

The Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE, collectively the Bureaus), are submitting to the National Marine Fisheries Service (NMFS) the following response to the Bryde's whale (possibly renamed in the future to Rice's whale[1]) jeopardy determination and associated reasonable and prudent alternative (RPA) included in NMFS's programmatic biological opinion entitled, *Biological Opinion for Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*, which was signed on March 13, 2020 (hereinafter, the 2020 BiOp). During ongoing implementation of the 2020 BiOp and during discussions regarding the jeopardy determination and RPA, the Bureaus implemented a condition of approval on all new and modified permit and plan approvals which noted that approval was based on there being no planned transit through the Bryde's whale area and that any future transit through the area would require advance notice and approval by the Bureaus.

After ongoing coordination between the Bureaus and NMFS, and in accordance with 50 CFR 402.15(b), BOEM and BSEE are notifying you that the Bureaus have decided to adopt the RPA for the Bryde's whale which will eliminate the jeopardy determination for that species in the 2020 BiOp. BOEM requests that NMFS, through a reciprocal letter published to NMFS' website or amendment to the 2020 BiOp, acknowledge and accept the Bureaus' adoption of the RPA which eliminates the jeopardy determination for the Bryde's whale, and update the 2020 BiOp incidental take statement and terms and conditions as necessary.

[1] Rosel, P.E., L.A. Wilcox, T.K. Yamada, and K.D. Mullin. 2021. A new species of baleen whale (*Balaenoptera*) from the Gulf of Mexico, with a review of its geographic distribution. *Marine Mammal Science*.

Again, we appreciate the opportunity to continue to work together on implementation of the 2020 BiOp.

Sincerely,

MICHAEL CELATA

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Date: 2021.04.13 08:48:17 -05'00'

Michael A. Celata
Regional Director, BOEM

I agree:

Lars Herbst 4/19/21

Lars Herbst, Regional Director, BSEE

cc: Ms. Cathy Tortorici
Chief, ESA Interagency Cooperation Division
Office of Protected Resources
NOAA's National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Ms. Allison Hernandez
Biologist, ESA Interagency Cooperation Division
Office of Protected Resources
NOAA's National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Mr. Jordan Carduner
ESA Interagency Cooperation Division
Office of Protected Resources
NOAA's National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Dr. Arie Kaller
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
Regional Supervisor
Office of Environment
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123

Mr. TJ Broussard
Bureau of Safety and Environmental Enforcement
Gulf of Mexico OCS Region
Regional Environmental Officer
Office of Environmental Compliance
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Louisiana Ecological Services
200 Dulles Drive
Lafayette, Louisiana 70506

April 26, 2021

Mr. Michael A. Celata
Regional Director, BOEM
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123

Mr. Lars Herbst
Regional Director, Gulf of Mexico OCS Region
Bureau of Safety and Environmental Enforcement
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123

Dear Mr. Celata and Mr. Herbst:

Please reference Mr. Tré Glenn's February 12, 2021, electronic mail and attached biological evaluation (BE) for the Bureau of Ocean Energy Management's (BOEM) and Bureau of Safety and Environmental Enforcement's (BSEE) proposed oil and gas leasing, exploration, development, production, decommissioning, and all related activities in the Gulf of Mexico Outer Continental Shelf (OCS) within existing leased areas and those areas proposed for future leasing in the Western Planning Area (WPA), the Central Planning Area (CPA), and the Eastern Planning Area (EPA) on the threatened eastern black rail (*Laterallus jamaicensis jamaicensis*). With a mutual agreement to extend the Service's response date, the BOEM and BSEE request our review of and concurrence with their determination that the proposed activities are not likely to adversely affect the eastern black rail. We have reviewed the information provided and offer the following comments in accordance with provisions of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq).

Proposed Action

The proposed action area includes coastal waters of Texas (TX), Louisiana (LA), Mississippi (MS), Alabama (AL), and Florida (FL) where OCS oil and gas activities are expected to occur across the western, central, and eastern planning areas that are maintained by BOEM and BSEE. The WPA is primarily located within coastal waters of Texas, the CPA within coastal waters of Louisiana, Mississippi, and Alabama, and the EPA within coastal waters of Florida. The proposed action would allow for routine OCS oil and gas activities to continue within the WPA, CPA, and EPA. Activities include aircraft and vessel traffic, pipeline landfalls, terminals,

platforms, drilling, discharge, and removal operations. These activities facilitate existing or proposed oil and gas leasing, exploration, development, production, and decommissioning within the action area. Potential occurrence of marine debris resulting from OCS oil and gas activities are included for consideration regarding the proposed action.

Methods for carrying out these activities will follow previously established regulations or protocols in order to ensure compliance with safe operations. Vessels utilizing navigation waterways or corridors will adhere to U.S. Coast Guard regulations to limit vessel speeds within inland areas. Aircraft will adhere to altitude restrictions set forth by the Federal Aviation Administration while working offshore between platform sites or when flying over inland areas. Pipeline landfalls and terminals as well as other onshore infrastructure that result in wetland destruction or modification within the action area require mitigation or restoration as outlined by Section 404 of the Clean Water Act. Discharges, such as produced water, are restricted based on maximum allowable amounts permitted by the National Pollutant Discharge Elimination System. Additionally, daily monitoring will be performed by the permittee through a visual sheen test to maintain compliance with the allowable amounts of discharge. Marine debris that may occur from OCS oil and gas activities within the proposed action area have multiple regulations to prevent introduction of waste material. These include the BSEE regulation (NTL 2012-BSEE-G01) to prohibit improper disposal of equipment, the National Marine Fisheries Service's (NMFS) Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols, and the International Convention for the Prevention of Pollution from Ships (MARPOL).

Effects Analysis

Eastern Black Rail

Data for the eastern black rail (EBR) is limited and populations are not well defined throughout the species range. Within Louisiana, the EBR currently has nine identified coastal parishes where habitat may be suitable. Cameron and Vermillion Parish have known occurrence for the EBR while Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard Parishes have potential for occurrence. Potentially disturbing activities from the proposed OCS oil and gas activities, such as noise disturbance, air pollution, habitat loss or degradation, and environmental contaminants, could impact the EBR or known/potential habitat. Protocols and regulations provided within the BE, such as those mentioned above, should reduce the potential for harmful effects to the EBR or lessen the impact of those effects if OCS oil and gas activities were to interact directly or indirectly with the species. As mentioned within the BE, oil spills that may occur from these activities have the greatest potential to impact coastal birds like the EBR. Oil that makes its way inland to the coastal parishes inhabited by the EBR or into suitable habitats could negatively impact the species by causing displacement, reduced survival, or direct mortality. However, the probability of such an event occurring as a result of OCS oil and gas activities is relatively low. The Oil Spill Risk Analysis (OSRA) model is utilized within the BE to calculate the probability of an accidental oil spill across the coastal counties or parishes of TX, LA, MS, AL, and FL. For the state of Louisiana, the probability of an accidental oil spill (≥1,000 bbl) occurring and contacting the shoreline within 10 to 30 days as a result of EPA and WPA OCS oil and gas activities are between 0.5 – 1 percent. For the CPA, the probability for LA is between 0.5 – 8 percent varying significantly across the parishes. The probability for oil

spills occurring and contacting LA offshore waters is similar for the WPA and EPA, but the CPA is much higher, between 2 – 25 percent. For the EBR, a marsh bird primarily utilizing inland habitats, the increased potential for impact to offshore waters should not be a significant risk to the species or its known/potential habitats within Louisiana's coastal parishes.

Eastern black rails are considered year-round residents along the Texas Gulf Coast. They are known to occur and breed from Jefferson County to Cameron County, with Texas having one of the highest known population numbers of eastern black rails throughout the species range. As previously mentioned, oil that makes its way inland to coastal Texas counties inhabited by the EBR or into suitable habitats could negatively impact the species by causing displacement, reduced survival, or direct mortality. However, the probability of such an event occurring as a result of OCS oil and gas activities is relatively low. The OSRA model is utilized within the BE to calculate the probability of an accidental oil spill across the coastal counties or parishes of TX, LA, MS, AL, and FL. For the state of Texas, the probability of an accidental oil spill (≥1,000 bbl) occurring and contacting the shoreline within 10 to 30 days as a result of CPA OCS oil and gas activities are between 0.5 – 4 percent. For the EPA, the probability for TX is less than 0.5 percent. However, for the WPA, the probability for TX is between 0.5 – 3 percent varying significantly across the coastline. Per the BE, the OSRA modeling results (10- and 30-day probabilities) indicate that a large spill (>1,000 bbl) in Federal offshore waters, should one occur, would have a 3 – 5 percent and 9 – 16 percent probability (from CPA), 5 – 8 percent and 8 – 14 percent probability (from WPA), and ≤ 0.5 percent probability (from EPA) of impacting Texas offshore waters. For the EBR, a marsh bird primarily utilizing inland habitats, the increased potential for impact to offshore waters should not be a significant risk to the species or its known/potential habitats within Texas coastal counties.

The eastern black rail occurs year-round in Florida and has potential for occurrence in Alabama and Mississippi. As mentioned previously, oil that makes its way inland to coastal Florida counties inhabited by the EBR or into suitable habitats could negatively impact the species by causing displacement. Oil that goes into potential habitat for the EBR, such as the coastal counties of Alabama and Mississippi, could negatively impact those habitats by causing degradation or habitat loss. However, the probability of such an event occurring as a result of OCS oil and gas activities is relatively low. The OSRA model is utilized within the BE to calculate the probability of an accidental oil spill across the coastal counties or parishes of TX, LA, MS, AL, and FL. For AL, MS, and FL, the probability of an accidental oil spill (≥1,000 bbl) occurring and contacting the shoreline within 10 to 30 days as a result CPA, EPA, and WPA OCS oil and gas activities are ≤ 0.5 percent. Per the BE, the OSRA modeling results (10- and 30-day probabilities) indicate that a large spill (>1,000 bbl) in Federal offshore waters, should one occur, would have between a 0.5 – 2 percent chance of impacting offshore waters of AL, MS, and FL as a result of CPA, EPA, and WPA OCS oil and gas activities. For the EBR, a marsh bird primarily utilizing inland habitats, the increased potential for impact to offshore waters should not be a significant risk to the species or its known/potential habitats within Alabama, Mississippi, and Florida.

The proposed OCS oil and gas activities within the WPA, CPA, and EPA could potentially impact the EBR or its habitat within coastal counties or parishes within TX, LA, MS, AL, and FL. Effects such as displacement in response to noise disturbance or reduced survival from oil

spills could occur from the aforementioned project activities. However, taking into consideration the protocols and regulations that will be implemented to reduce environmental impacts and the risk analyses demonstrating a low probability of oil spills that could significantly impact the species, the OCS oil and gas activities are not likely to adversely affect the eastern black rail. Accordingly, the Service concurs with your determination that implementation of the proposed action is not likely to adversely affect the eastern black rail.

We appreciate the cooperation exhibited by your agencies and look forward to future coordination with BOEM/BSEE in the conservation of endangered and threatened species in the Gulf of Mexico and adjacent coastal habitats. If you have any questions regarding this letter, please contact Joe Hodges (337-291-3109) of this office.

Sincerely,

BRIGETTE FIRMIN

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Date: 2021.04.26 16:48:28 -05'00'

Brigette D. Firmin
Acting Field Supervisor
Louisiana Ecological Services Office

cc: FWS, Ecological Services, Houston, TX
FWS, Ecological Services, Jackson, MS
FWS, Ecological Service, Daphne, AL
FWS, Ecological Services, Panama City, FL
Tré Glenn, BOEM, New Orleans, LA
Arie Kaller, BOEM, New Orleans, LA
T.J. Brousssard, BSEE, New Orleans, LA
Daniel Leedy, BSEE, New Orleans, LA

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

April 26, 2021

Arie Kaller, Supervisor
Office of Environment
Bureau of Ocean Energy Management, Gulf of Mexico
1201 Elmwood Park Blvd.
New Orleans, LA 70123

T.J. Broussard, Regional Environmental Officer
Office of Environmental Compliance
Bureau of Safety and Environmental Enforcement, Gulf of Mexico
1201 Elmwood Park Blvd.
New Orleans, LA 70123

Dear Ms. Kaller and Mr. Broussard,

This letter responds to your letter dated November 3, 2020, requesting a change to your proposed action described in the National Marine Fisheries Service (NMFS) March 13, 2020 programmatic biological opinion (2020 BiOp) on oil and gas activities in the Gulf of Mexico, and your email on November 25, 2020 in which you reiterated your determination that the changes described in the letter will not cause any effect to Endangered Species Act (ESA)-listed species or critical habitat that was not already considered in the biological opinion, and that Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) (BOEM/BSEE) concluded that reinitiation of consultation is not required. This letter also responds to your letter dated April 15, 2021, requesting a change to Appendix I of the BiOp.

Your request in the November 3, 2020 letter entails the removal of specific activities from the proposed action's step-down review process, as described in section 3.4 of the 2020 BiOp. Step-down review involves BOEM/BSEE and NMFS conducting a project-specific review of an activity. The need for, and type of, project-specific review varies depending on the level of uncertainty at the programmatic consultation stage regarding aspects or potential effects of specific projects, approvals, or other actions that will be implemented in the future.

While we agree it is not necessary to reinitiate consultation on the 2020 BiOp, we are amending the associated incidental take statement (ITS) to reflect the changes in BOEM/BSEE's step-down procedures, as well as to address NMFS' Office of Protected Resources (OPR), Permits and Conservation Division issuance of final regulations to govern the taking of marine mammals incidental to geophysical survey activities conducted by oil and gas industry operators in the

Gulf of Mexico over the course of five years, pursuant to section 101(a)(5) of the Marine Mammal Protection Act (MMPA). These regulations will henceforth in this letter be called "MMPA rule".

The step-down procedures outlined in the 2020 BiOp identified specific categories of actions or activities anticipated to warrant further review and evaluation by NMFS and BOEM/BSEE. Those procedures address the following:

- How BOEM/BSEE will evaluate whether such actions or activities would be expected to have effects of an extent and nature consistent with those effects already evaluated in the 2020 BiOp;
- Whether there are any potential effects to ESA-listed species from those actions or activities that would be different than those already evaluated in the 2020 BiOp;
- Whether those effects would be consistent with the effects already evaluated in the 2020 BiOp if the activities were modified (e.g., through different mitigation measures); and
- Whether further consultation would be required based on analysis of the actions or activities.

The categories of activities or plans that BOEM/BSEE requested to be removed from the proposed action's step-down review requirements are detailed below and include the following:

- activities that require the use of moon pools;
- activities that entail lines in the water ("slack lines");
- use of geophysical equipment that operates at frequencies above 180 kHz;
- coring activities; and
- conceptual Deepwater Operations Plans.

The requested removal of these categories of activities from the list of categories requiring step-down review in the 2020 BiOp would constitute changes to the proposed action on the part of BOEM/BSEE. As explained below, BOEM/BSEE and NMFS coordinated closely on the development of these changes, based on additional study and information gained during step-down reviews conducted after the 2020 BiOp and ITS were issued, and also coordinated on the development of effective mitigation measures that can be applied programmatically via standardized permit conditions of approval (COA), in order to remove the need for additional step-down review. Accordingly, we do not believe that these changes will change the effects of the action on, or conclusions related to, species or designated critical habitat listed under the ESA, nor do such changes trigger reinitiation of consultation under 50 CFR 402.16. However, the changes make necessary some minor modifications to the ITS and Reasonable and Prudent Measures (RPMs) / terms & conditions (T&Cs) that were issued with the 2020 BiOp, to reflect these changes to step-down review requirements and related changes to mitigation measures. The rationale for our conclusion that the removal of each of these categories of activities from step-down review requirements will not change the anticipated effects of the proposed action on listed species is discussed below.

As described in the November 3, 2020 BOEM/BSEE letter, there are several categories of activities associated with federally regulated oil and gas activities in the Gulf of Mexico that utilize moon pools. Moon pools represent a potential entrapment risk to ESA-listed species. This entrapment risk exists only for "enclosed" moon pools (i.e., well in the hull of a vessel, with or

without a door). There have been documented instances of entrapments of ESA-listed species within moon pools, some of which resulted in injuries to sea turtles, and these instances were the basis for the inclusion of moon pool-related activities in the step-down review process.

NMFS reviewed activities using moon pools via the step-down review process since April 2020. Through these reviews, as well as communications with BOEM/BSEE and industry representatives, NMFS and BOEM/BSEE acquired additional information on the types of activities associated with the use of moon pools (e.g., drilling, pipe-laying, use of divers, etc.), the types of equipment and personnel involved in these activities, and how to best minimize associated potential risks to ESA-listed species.

Since April 2020 there have also been four documented instances of sea turtles observed within moon pools on offshore vessels or structures associated with oil and gas activities in the Gulf of Mexico. BSEE remained in constant communication with the operators during these instances, and also relayed information to us during each response. These instances provided NMFS, BOEM and BSEE with information on risks to ESA-listed species and how best to minimize those risks. In addition, we solicited input from subject matter experts within NMFS on potential impacts to ESA-listed species from entrapment in moon pools, as well as best management practices to minimize impacts when ESA-listed species enter moon pools.

We used the information about moon pools to develop a suite of mitigation measures that BOEM/BSEE will now apply programmatically through COAs to reduce potential effects of this activity on ESA-listed species. We are now confident that the newly-developed programmatic approach to BOEM/BSEE-applied mitigation measures for moon pools is appropriate and sufficiently protective to minimize potential effects from project-specific activities that use moon pools without the need for additional step-down review of such approvals.

Henceforth, BOEM/BSEE will programmatically apply these newly-developed mitigation measures as non-discretionary COAs on all permits that are issued for activities that entail the use of moon pools to minimize or avoid harm to protected species. The application of these COAs and subsequent implementation of the measures for relevant activities will minimize or avoid take related to entanglement and entrapment. A copy of these COAs, provided by the Bureaus, is attached to this letter (in addition to the attached COAs, NMFS will be adding to the Terms and Conditions a requirement for BSEE that instances of protected species observed in a moon pool must be reported daily for as long as an animal remains within the moon pool). Therefore, we are modifying the ITS, RPMs and T&Cs to reflect removal of this category of activities from step-down review requirements. As described above, removal of this category of activities from step-down review requirements does not change the effects of the action or the conclusions of the 2020 BiOp.

As noted in the November 3, 2020 BOEM/BSEE letter, there are several types of activities associated with federally regulated oil and gas activities in the Gulf of Mexico that utilize lines in the water column. These lines in the water column have the potential to result in an entanglement risk to ESA-listed species if they are not taut, or if there is "slack" in the lines. There have been a limited number of reported prior instances of entanglements of protected species due to "slack

lines" in the water associated with oil and gas related activities (as noted in Section 8.6 of the 2020 BiOp) that resulted in injury or death.

There are measures in the 2020 BiOp that address this risk: in the proposed action for the NMFS PR1, there are required measures related to ocean bottom nodes or similar gear to minimize the risk of entanglement. Also part of the proposed action is a requirement for step-down review of activities that may result in an entanglement risk. This was incorporated into the action and ITS at the time of the 2020 BiOp due to the level of uncertainty that remained regarding the scope of activities under the oil and gas program that had potential to result in an entanglement risk, beyond those that were known to have an associated risk of entanglement (e.g., ocean bottom nodes). The 2020 ITS Terms and Conditions included generalized risk reduction for entanglement or entrainment (T&C #1, C, i). Reporting of any instances of entanglement is also required in the Terms and Conditions (T&C #3 part 2, BSEE, B, vii).

Similar to the process described above related to moon pools, NMFS has reviewed activities that utilize slack lines in the water through the step-down review process since April 2020. Through these reviews as well as discussions with BOEM/BSEE and industry representatives, NMFS and BOEM/BSEE acquired information on the types of activities associated with the use of slack lines (e.g., remotely operated vehicles, use of divers for decommissioning activities, etc.) and best practices to minimize associated risks to ESA-listed species. NMFS and BOEM/BSEE also developed revisions to improve reporting measures for observations of dead and injured protected species. NMFS also solicited input from subject matter experts on best practices to avoid impacts to ESA-listed species from entanglement in slack lines.

As with moon pools, we used the information about slack line related activities to develop a suite of mitigation measures that BOEM/BSEE will now apply programmatically to reduce potential effects of this activity on ESA-listed species. We are now confident that the newly-developed programmatic approach to BOEM/BSEE-applied mitigation measures for slack lines is appropriate and sufficiently protective to minimize potential effects from project-specific activities that use slack lines and are sufficiently protective to minimize potential effects from project-specific activities that use slack lines. Henceforth, BOEM/BSEE will programmatically apply these newly-developed mitigation measures as non-discretionary COAs on all permits that are issued for activities that entail the use of slack lines to minimize or avoid harm to protected species.

The application of these COAs and subsequent implementation of the measures for relevant activities will minimize or avoid take related to entanglement. A copy of these COAs, provided by BOEM/BSEE, is attached to this letter. Therefore, we are modifying the ITS, RPMs and T&Cs to reflect removal of this category of activities from the step-down review requirements. As described above, removal of this category of activities from step-down review requirements does not change the effects of the action or the conclusions of the 2020 BiOp.

As described in your letter, Deepwater Operation Plans (DWOP) are plans that are reviewed by BOEM/BSEE that conceptually describe planned activities. Those activities are then reviewed by BOEM/BSEE through internal review procedures when BOEM/BSEE get to a planning document stage, such as a Development and Production Plan (DPP), Exploration Plan (EP), or

Development Operations Coordination Document (DOCD). That review by BOEM/BSEE then determines whether each proposed activity necessitates step-down review by NMFS.

We agree with you that a requirement to also review DWOPs via step-down review, in addition to step-down review of DPPs, EPs or DOCDs for the same activity, is redundant. In addition, those conceptually proposed activities as described in DWOPs may not be an accurate representation of an actual activity that ultimately is described in a DPP, EP or DOCD (i.e., while the same activity is described in a DWOP and in a subsequent DPP, EP or DOCD, the description of the activity in the DPP, EP or DOCD is more accurate than the description in the DWOP as more information on the activity is known at the DPP, EP or DOCD stage of the process). Based on the above, we agree with your request for removal of the requirement for step-down review of DWOPs. This change removes the requirement for step-down review of DWOPs from the proposed action. NMFS will therefore revise the associated RPMs and T&Cs in the ITS accordingly to reflect this removal.

The use of non-airgun geophysical and geotechnical (G&G) survey equipment that operates above 180 kHz and the activity of coring were both G&G-related activities that were included in the 2020 BiOp. However, frequencies above 180 kHz are outside the functional hearing ranges of the species that were considered in the 2020 BiOp (Popper et al. 2019; Bartol et al. 1999; Dow et al. 2008; Lenhardt 1994; Lenhardt 2002; Moein et al. 2006; Piniak 2012; Ridgway et al. 1969; Southall et al. 2007). Grab and piston coring activities, such as bottom sampling detailed in the 2020 BiOp, are expected to occur at minimal levels and do not cause noise in the underwater environment. Pursuant to 2020 BiOp, all G&G activities were required to undergo step-down review. However, based on the best available scientific and commercial information, the 2020 BiOp determined non-airgun geophysical equipment that operates above 180 kHz and coring activities are not expected to have any effects on ESA-listed species. Therefore, we agree with BOEM/BSEE' request that these two categories of activities can be removed from the requirement for step-down review. This change will therefore remove these two activities from the general G&G category that triggers step-down review by NMFS. In other words, all but these two activity categories under G&G will remain part of the step down process.

We conclude that BOEM/BSEE's removal of the above activity categories from the proposed action's step-down review requirements are not expected to change the effects of the proposed action analyzed in the 2020 BiOp. NMFS also concludes that these changes to the proposed action will not change the amount or extent of incidental take associated with the proposed action relative to what was considered in the existing 2020 BiOp. With the new mitigation measures provided in the revised action, NMFS finds that for these categories of activities, the corresponding requirements in the T&Cs in the 2020 BiOp's ITS are no longer required to address uncertainty about the effects of these categories of activities. Accordingly, the analysis and conclusions in the 2020 BiOp will not be changed, and NMFS will amend the ITS and associated RPMs and T&Cs to reflect the changes as described herein for the BOEM/BSEE proposed action.

Your request in the April 15, 2021 letter entails a revision to requirements in Appendix I of the BiOp related to monitoring of explosive severance activities. You noted that the existing flight time requirements could pose logistical and safety issues where flight times surpass fuel tank

capacities for safe operations. Specifically, your request is to revise the time requirement for post-detonation aerial surveys, from 45 minutes to 30 minutes of monitoring, due to logistical and safety concerns about 45 minute post-detonation aerial surveys potentially requiring refueling of helicopters used for monitoring. As stated in your letter, while pre-detonation monitoring is intended to minimize potential impacts on ESA-listed species, post-detonation monitoring is intended only to monitor for any impacts of the activity after it has occurred (i.e., injury or mortality of sea turtles). Thus, a revision to the post-detonation monitoring period would in no way change the ability of aerial surveys to minimize impacts to ESA-listed species due to explosive severance activities. We have confirmed with the Protected Species Observer Program that revising the post-detonation monitoring period from 45 to 30 minutes will not impact the ability to effectively monitor for any impacts to ESA-listed species following explosive severance activities. We therefore agree with your request and have implemented the requested change to Appendix I of the BiOp. We also agree with your conclusion that this revision will not result in any changes to the effects of the action on ESA-listed species or designated critical habitat beyond those considered in the BiOp, nor would it change the amount or extent of take of ESA-listed species as a result of the proposed action, and we therefore agree with your conclusion that this revision does not trigger reinitiation of consultation under 50 CFR §402.16.

Attached to this letter are BOEM/BSEE's request letters, COAs that will be applied programmatically to the respective activities through the BOEM/BSEE internal review process, and amended ITS including revised appendices.

Sincerely,

Cathryn E. Tortorici TORTORICI.CATHRYN.ELISA.1365826850
Chief, ESA Interagency Cooperation Division

cc:

Michael Celata
Field Special Assistant – Interior Region 6,
Director, Gulf of Mexico Office; Bureau of Ocean Energy Management
1201 Elmwood Park Blvd (GM333C)
New Orleans, LA 70123

Lars Herbst
Field Special Assistant – Interior Region 4,
Director, Gulf of Mexico OCS Office; Bureau of Safety and Environmental Enforcement
1201 Elmwood Park Blvd (GE432A)
New Orleans, LA 70123

Attachment

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

May 7, 2021

Michael Celata
Field Special Assistant – Interior Region 6,
Director, Gulf of Mexico Office; Bureau of Ocean Energy Management
1201 Elmwood Park Blvd (GM333C)
New Orleans, LA 70123

Lars Herbst
Field Special Assistant – Interior Region 4,
Director, Gulf of Mexico OCS Office; Bureau of Safety and Environmental Enforcement
1201 Elmwood Park Blvd (GE432A)
New Orleans, LA 70123

RE: National Marine Fisheries Service response to the Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement Adoption of the Reasonable and Prudent Alternative for the Gulf of Mexico Programmatic Biological Opinion

Dear Mr. Celata and Mr. Herbst:

Thank you for your letter dated April 19, 2021 regarding the Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement adoption of the National Marine Fisheries Service's Reasonable and Prudent Alternative (RPA) from the March 13, 2020 programmatic biological opinion (2020 BiOp) on oil and gas activities in the Gulf of Mexico. Per the ESA section 7 regulations (50 C.F.R. § 402.02; 16 U.S.C. § 1536(b)(3)(A); 16 U.S.C. § 1536(b)(4); 50 C.F.R. § 402.14(i); § 402.15) there is no requirement to revise the 2020 BiOp or incidental stake statement based on your adoption of the RPA so we will not be issuing a revised BiOp.

We appreciate our continued work together to implement the 2020 BiOp. If you have any questions, please contact Cathy Tortorici, Chief of the ESA Interagency Cooperation Division at cathy.tortorici@noaa.gov or 301.427.8495.

Sincerely,

MARZIN.CATHERINE.G.1365836082 Digitally signed by MARZIN.CATHERINE.G.1365836082 Date: 2021.05.06 15:43:47 -04'00'

Catherine Marzin
Acting Director, Office of Protected Resources

cc:
Arie Kaller, Supervisor
Office of Environment
Bureau of Ocean Energy Management, Gulf of Mexico
1201 Elmwood Park Blvd.
New Orleans, LA 70123

T.J. Broussard, Regional Environmental Officer
Office of Environmental Compliance
Bureau of Safety and Environmental Enforcement, Gulf of Mexico
1201 Elmwood Park Blvd.
New Orleans, LA 70123

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

August 12, 2021

Refer to NMFS No: FPR-2017-9234 (PCTS);
OPR-2017-00002 (ECO)

Arie Kaller, Supervisor
Office of Environment
Bureau of Ocean Energy Management, Gulf of Mexico
1201 Elmwood Park Blvd.
New Orleans, LA 70123

T.J. Broussard, Regional Environmental Officer
Office of Environmental Compliance
Bureau of Safety and Environmental Enforcement, Gulf of Mexico
1201 Elmwood Park Blvd.
New Orleans, LA 70123

RE: 2020-2021 Gulf of Mexico BiOp Annual Review and Adaptive Management Process

Dear Ms. Kaller and Mr. Broussard:

A requirement of the March 13, 2020 Biological Opinion (BiOp) on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico and associated amended incidental take statement is an annual review process involving the National Marine Fisheries Service (NMFS), the Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement (BOEM/BSEE) every year the BiOp is in effect. Because the first annual review is now due, NMFS Office of Protected Resources staff began discussions with BOEM/BSEE staff regarding the annual review and the timeline for its completion. On July 12, 2021,NMFS sent BOEM/BSEE a proposed timeline (see below) based on our discussions. We are writing to request your comments or revisions to the proposed timeline by August 31, 2021, or we will presume concurrence with the proposed timeline.

The annual review process is critical to ensure that annual aggregate activities and associated effects remain within the scope of the opinion. The annual review process is also important to ensure that adjustments to mitigation and/or monitoring requirements can be made, as necessary, via the adaptive management process.

The proposed action in the BiOp stated for timing: "The annual review will cover all projects that occur within a year and will occur during the second quarter of the year for the previous calendar year." We proposed the timeline below to account for this annual review representing the first time an annual summary report will be submitted by BOEM/BSEE under the BiOp and therefore more time may be necessary to meet the annual review requirements. The proposed timeline includes time for BOEM/BSEE to pull together the necessary information, make adjustments to data management systems, or complete other necessary tasks associated with summarizing the program; and for NMFS to conduct reviews of drafts and prepare comments.

Review Parameters:

- Summary report reflects all BOEM/BSEE activities that occurred under the Gulf of Mexico program from March 13, 2020 - March 12, 2021.

Proposed Timeline:

September 2021 - Provide draft summary report on program activities (based on draft outline on which NMFS provided comments).

October 2021 - First annual review meeting to resolve comments and ensure full program coverage.

November 2021 - Revised draft summary report for NMFS review

December 2021 - Final summary report

Proposed October 2021 Meeting Goals:

- Ensure that the report comprehensively summarizes BOEM/BSEE activities to implement the BiOp
- Identify implemented actions that are working, those that may not be working and how to resolve those points of concern.

As noted above, because this is the first year that we are conducting the annual review, we are attempting to accommodate the need for more time to complete the annual summary report. While we understand that more time may be required during this first annual review process, we want to ensure that a timeline for completion of the annual review process is agreed upon by BOEM/BSEE and NMFS. We look forward to working with you on the annual review process.

If you have any questions, please contact Allison Hernandez at 301-427-8413, or by email allison.hernandez@noaa.gov or Jordan Carduner at 301-427-8483, or by email jordan.carduner@noaa.gov, or me at (301) 427-8495, or by email at cathy.tortorici@noaa.gov.

Sincerely,

CARRUBBA.LISAMARIE.1365823932 Digitally signed by CARRUBBA.LISAMARIE.1365823932 Date: 2021.08.12 16:09:20 -04'00'

Dr. Lisamarie Carrubba
for Cathryn E. Tortorici,
Chief, ESA Interagency Cooperation Division
Office of Protected Resources

United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
New Orleans Office
1201 Elmwood Park Blvd
New Orleans, Louisiana 70123-2394

August 31, 2021

Cathy Tortorici
Chief, ESA Interagency Cooperation Division
Office of Protected Resources
NOAA's National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

RE: 2020-2021 Gulf of Mexico BiOp Annual Review and Adaptive Management Process

Dear Ms. Tortorici,

This is a response to your letter to the Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement (BOEM/BSEE) dated August 12, 2021. I am responding on behalf of both BOEM and BSEE. Your letter proposed a timeline for the annual review process required by the March 13, 2020, Biological Opinion (BiOp) on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico and associated amended incidental take statement. After reviewing your proposed timeline and considering the current BOEM/BSEE workload, we will submit a final, annual report to the National Marine Fisheries Service (NMFS) no later than December 31, 2021. We appreciate the input NMFS has already provided on the adaptive management plan and the ongoing, constructive engagement among the staff of our three bureaus. After the delivery of the first annual report in December, we would be pleased to receive feedback from NMFS and engage in a focused meeting/workshop to inform and improve ongoing BiOp implementation and future annual reviews. We propose this workshop be held in February 2022 after NMFS has had sufficient time to review the first annual report. We will contact NMFS in late January to determine a date that fits everyone's schedule.

If you have any questions please reach out to Tre Glenn (tre.glenn@boem.gov) or Beth Nord (beth.nord@boem.gov).

Sincerely,

Arie Kaller

Arie Kaller, Regional Supervisor
Office of Environment
BOEM GOMRO

TJ Broussard

TJ Broussard
Office of Environmental Compliance
BSEE GOMRO

FLORIDA DEPARTMENT *of* STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

April 15, 2015

Mr. Douglas Jones
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

RE: DHR Project File No.: 2015-1591 / Received by DHR: April 3, 2015
10 Proposed Gulf of Mexico (GOM) Lease Sales – 2017-2022 Draft Proposed Program

Dear Mr. Jones:

Thank you for providing our office with the opportunity to comment in the early stages of the preparation of an environmental impact statement (EIS). Pursuant to 36 CFR Part 800.8, the Bureau of Ocean Energy Management (BOEM) can elect to fulfill its responsibilities under Section 106 of the National Historic Preservation Act of 1966 in coordination with the preparation of an EIS under the National Environmental Policy Act.

We concur that BOEM's proposed 2017-2022 GOM lease sales will have no effect on historic properties provided that BOEM's staff of marine archaeologists evaluates each proposed APE. This office should be notified and given the opportunity to comment should any cultural resources be identified.

If you have any questions, please contact Deena Woodward, Community Assistance Consultant, by email at *Deena.Woodward@dos.myflorida.com*, or by telephone at 850.245.6333 or 800.847.7278.

Sincerely

Robert F. Bendus, Director
Division of Historical Resources
& State Historic Preservation Officer

BISON CONNECT

Jones, Douglas <douglas.jones@boem.gov>

RE: DHR project file 2015-1591

1 message

Woodward, Deena S. <Deena.Woodward@dos.myflorida.com> Tue, May 12, 2015 at 7:45 AM
To: "Jones, Douglas" <douglas.jones@boem.gov>

Hi Doug,

We are primarily interested in resources that are identified off of Florida that cannot be avoided. Let me know if you have any other questions.

Sincerely,

Deena S. Woodward

Community Assistance Consultant/ Archaeologist | State Lands Compliance and Review | Bureau of Historic Preservation | Division of Historical Resources | Florida Department of State | 500 South Bronough Street | Tallahassee, Florida 32399 | 850.245.6333 | 1.800.847.7278 | Fax: 850.245.6439 | dos.myflorida.com/historical

FLORIDA DEPARTMENT OF STATE
DIVISION OF
Historical Resources

From: Jones, Douglas [mailto:douglas.jones@boem.gov]
Sent: Friday, May 08, 2015 10:59 AM
To: Woodward, Deena S.
Subject: DHR project file 2015-1591

Hello Ms. Woodward,

I wanted to follow up on a letter I received from your office, which was in response to our notification of BOEM's 2017-2022 Gulf of Mexico Lease Sale Draft Proposed Program. We appreciate the Florida DHR's concurrence that no historic properties will be affected; however, I wanted to seek clarification (or maybe provide it) on one other statement in your letter. It requests that your office "should be notified and given the opportunity to comment should **any** cultural resources be identified" (emphasis mine). Due to the volume of offshore oil and gas development activities, we receive site specific archaeological surveys virtually every day, and the majority

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

April 30, 2015

Joseph A. Christopher
Regional supervisor
Office of Environment
BOEM
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Re: AHC 2015-0778
Gulf of Mexico Lease Sales 2017-2022
GM 673E
Gulf of Mexico

Dear Mr. Christopher:

Upon review of the above referenced project, we have determined that we agree that the proposed phased approach to meeting Section 106 requirements is reasonable and appropriate for this undertaking. We look forward to working with BOEM on these future projects.

We appreciate your commitment to helping us preserve Alabama's historic archaeological and architectural resources. Should you have any questions, please contact Amanda McBride at 334.230.2692 or Amanda.McBride@preserveala.org. Have the AHC tracking number referenced above available and include it with any future correspondence.

Sincerely,

Lee Anne Wofford
Deputy State Historic Preservation Officer

LAW/AMH/amh

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

In Reply Refer To: GM 673E

APR - 3 2015

Pam Breaux
SHPO
Department of Culture, Recreation & Tourism
1051 North Third Street
Baton Rouge, Louisiana 70802

The proposed undertaking will have no adverse effect on historic properties. This effect determination could change should new information come to our attention.

Pam Breaux 5-12-15

Pam Breaux
State Historic Preservation Officer

Date

Dear Ms. Breaux:

The Bureau of Ocean Energy Management (BOEM) is pleased to initiate Section 106 consultation, as required by the National Historic Preservation Act, for the 10 proposed Gulf of Mexico (GOM) lease sales in the 2017-2022 draft proposed program. BOEM is proposing to hold one sale each in 2017 and 2022, and two sales each in 2018, 2019, 2020, and 2021. A proposed schedule of lease sales is enclosed. A multiple sale environmental impact statement (EIS) is being prepared and the draft EIS is currently in preparation.

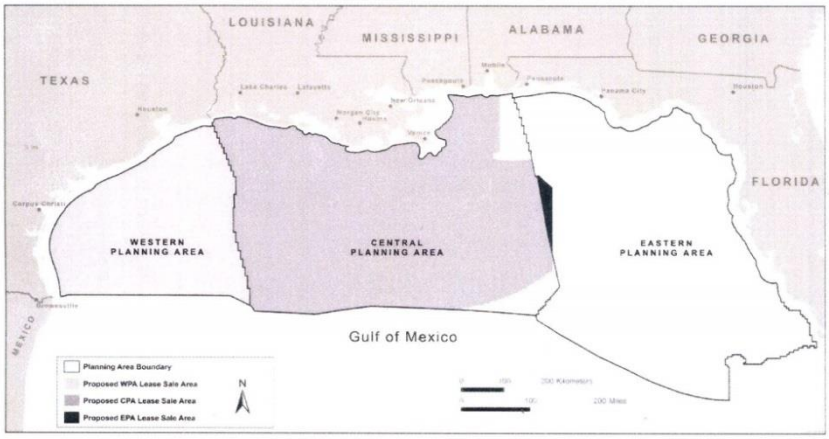

Figure 1. Proposed Lease Sale Area

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

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ARCHAEOLOGY

accepted to be around 12,000 years before the present (B.P.). The sea-level curve for the northern GOM suggests that sea level at 12,000 B.P. would have been approximately 45-60 meters (m) [148-197 feet (ft.)] below the present day sea level. On this basis, the continental shelf shoreward of the 45-60 m (148-197 ft.) bathymetric contours 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, BOEM adopted the 60 m (197 ft.) water depth as the seaward extent for archaeological site potential in the GOM. Since water depths in the Eastern Planning Area vastly exceed 60 m (197 ft.), with depths in the range between 245 m (800 ft.) and 933 m (3,062 ft.), there is no potential for the presence of submerged prehistoric archaeological sites.

Historic properties within the GOM would likely consist of historic shipwrecks. An 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 embedded in the seafloor. This includes vessels that exist intact or as scattered components on or in the seafloor. BOEM and its predecessor agency Minerals Management Service have contracted studies in 1977, 1989, and again in 2003 that indicated the potential presence of over 3,000 historically reported shipwrecks in the GOM. This list should not be considered exhaustive; 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. Fifty-one confirmed historic vessels have been located in Federal waters in the GOM, two in the Western Planning Area, five in the Eastern Planning Area, and 44 in the Central Planning Area, nearly half of which have been found in deepwater blocks in Mississippi Canyon, Green Canyon, and Viosca Knoll. Nearly all of these have been discovered as a result of BOEM mandated oil industry conducted surveys. The discoveries include six early 19th century wooden sailing vessels, lying in depths between 823 m (2,700 ft.) and 1,310 m (4,300 ft.) of water, seven 19th or early 20th century sailing ships, and one 17th or 18th century wreck. There are also several World War II casualties located in deepwater off the mouth of the Mississippi River (e.g., *Alcoa Puritan, GulfPenn, GulfOil, Halo, Virginia, Robert E. Lee*, and the German submarine *U-166*). All of these wrecks have been investigated using a remotely operated vehicle from a surface vessel and are in an excellent state of preservation.

Activities associated with lease sales that have the potential to disturb offshore historic resources include: (1) use of bottom cables for seismic data collection; (2) anchoring, which may disturb host or overlying sediment; (3) emplacement and removal of bottom-founded structures; (4) exploratory drilling; and (5) trenching for and laying pipelines. The area of potential effect (APE) for these undertakings is the vertical and horizontal extent of the related seafloor disturbing activities. Historic property identification efforts under the leases issued from the proposed 2017-2022 GOM lease sales will occur in a phased approach as defined in 36 CFR 800.4.

The potential of an interaction between rig or platform emplacement and an historic property is greatly diminished by requisite site surveys. In certain circumstances, the Bureau of Safety and Environmental Enforcement Regional Director may require the preparation of an archaeological report to accompany pipeline applications under 30 CFR 250.1007(a)(5). The BOEM Regional Director has authority to require certain types of surveys before submission of an Exploration

Plan, Development and Production Plan, or Development Operations Coordination Document under 30 CFR 550.194. As part of the environmental reviews conducted for post-lease activities within the GOM, available historical, geological, and survey information on each proposed action within the APE will be evaluated by BOEM's staff of marine archaeologists regarding the potential presence of archaeological resources to determine if additional archaeological resource surveys and mitigation are warranted. If potential historic properties (archaeological resources) are discovered and may be affected by the proposed undertaking, BOEM will develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects on historic properties. BOEM usually requires lessees to modify their undertakings to avoid all impacts to the potential historic property. If avoidance is not practical, BOEM will consult with the State Historic Preservation Office to resolve adverse effects to the historic property and to determine the appropriate resolution of these adverse effects. Additionally, BOEM requires lessees to adhere to a chance finds/unanticipated discovery clause that requires a lessee to stop seafloor disturbing activities in the vicinity of the discovered potential resource and to report of any cultural material found during activities carried out on the lease.

Based on BOEM's reasonable and good faith identification efforts, and BOEM's proposed avoidance of adverse effects to any potential historic properties discovered during industry-required surveys, BOEM has determined that the proposed 2017-2022 GOM lease sales will have no effect upon historic properties. BOEM requests your concurrence with this finding. If you have any questions, please feel free to contact Mr. Douglas Jones at (504) 736-2859 or by email at douglas.jones@boem.gov.

Sincerely,

for Joseph A. Christopher
Regional Supervisor
Office of Environment

Enclosure

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

May 10, 2016

LISA D. JONES
ACTING EXECUTIVE DIRECTOR
STATE HISTORIC PRESERVATION OFFICER

TEL: 334-242-3184
FAX: 334-240-3477

Mr. Gary D. Goeke
Chief, Environmental Assessment Section
Office of Environment (GM 623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Re: AHC 2016-0729
Draft 2017-2022 GOM Multisale EIS
Gulf of Mexico

Dear Mr. Goeke:

Upon review of the above referenced document, we request that a professional maritime archaeologist survey the project area(s) to identify any cultural resources that may be present. Please submit the resulting report to our office for review and determination prior to construction activities. Please note that the report should conform to Alabama state guidelines for maritime survey (enclosed).

We appreciate your commitment to helping us preserve Alabama's historic archaeological and architectural resources. Should you have any questions, please contact Amanda McBride at 334.230.2692 or Amanda.McBride@preserveala.org. Have the AHC tracking number referenced above available and include it with any future correspondence.

Sincerely,

Lee Anne Wofford

Lee Anne Wofford
Deputy State Historic Preservation Officer

LAW/AMH/amh

The Department of the Interior Mission

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated Island Communities.

The Bureau of Ocean Energy Management Mission

The Bureau of Ocean Energy Management (BOEM) is responsible for managing development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.