UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT
GULF OF MEXICO OCS REGION
NEW ORLEANS, LOUISIANA

SITE-SPECIFIC ENVIRONMENTAL ASSESSMENT

OF

EXPLORATION PLAN NO. S-8017

FOR

LLOG Exploration Offshore LLC

September 8, 2020

RELATED ENVIRONMENTAL DOCUMENT

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 Environmental Impact Statement
(OCS EIS/EA BOEM 2017-009)

Gulf of Mexico OCS Lease Sale
Final Supplemental Environmental Impact Statement 2018
(OCS EIS/EA BOEM 2017-074)

Biological Opinion Oil and Gas Leasing, Exploration, Development, Production, Decommissioning, and All Related Activities in the Gulf of Mexico Outer Continental Shelf
(FWS April 20, 2018)

Biological Opinion of the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico
(NMFS March 13, 2020)

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

The Bureau of Ocean Energy Management (BOEM) has prepared a Site-Specific Environmental Assessment (SEA) (No. S-8017) complying with the National Environmental Policy Act (NEPA). NEPA regulations under the Council on Environmental Quality (CEQ) (40 CFR § 1501.3 and § 1508.9), the Department of the Interior (DOI) NEPA implementing regulations (43 CFR § 46), and BOEM policy require an evaluation of proposed major federal actions, which under BOEM jurisdiction includes approving a plan for oil and gas exploration or development activity on the Outer Continental Shelf (OCS).

NEPA regulation 40 CFR § 1508.27(b) requires significance to be evaluated in terms of context and intensity. The context and intensity of impacts caused by similar actions to that proposed were examined at a basin-wide scale in the Gulf of Mexico (GOM) in the following NEPA documents:

- 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 Environmental Impact Statement (Multisale EIS) (OCS EIS/EA BOEM 2017-009);
- Gulf of Mexico OCS Lease Sale Final Supplemental Environmental Impact Statement 2018 (2018 SEIS) (OCS EIS/EA BOEM 2017-074);
- Biological Opinion Oil and Gas Leasing, Exploration, Development, Production, Decommissioning, and All Related Activities in the Gulf of Mexico Outer Continental Shelf (FWS 2018 BO) (Issued by United States Fish and Wildlife Service [FWS] April 20, 2018); and
- Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (2020 BO) (Issued by National Marine Fisheries Service [NMFS] March 13, 2020).

The Proposed Action: LLOG Exploration Offshore LLC (LLOG) Supplemental Exploration Plan for drilling operations on the OCS of the GOM proposes to explore for hydrocarbons by drilling, completing, testing and installing subsea well head and/or manifold of up to two wells: Wells C and C-Alt in Ewing Bank Block 877, Lease Number OCS-G 35295 in the Central Planning Area of the GOM.. The proposed activities are located south of Grand Isle, Louisiana approximately 67 miles (108 kilometers) from the nearest Louisiana shoreline in Plaquemines Parish, Louisiana. The water depth at the proposed well sites is 1,570 feet (479 meters). LLOG proposes using either a Dynamically Positioned (DP) semisubmersible or a DP drillship, a mobile offshore drilling unit to drill these wells.

Resources and Impacts Considered: The impact analysis for the proposed activity focused on the exploration activities and the resources that may be potentially impacted. The impact producing factors (IPFs) include: (1) air emissions; (2) drilling and overboard discharges; (3) seafloor disturbance from well emplacement; (4) vessel traffic and noise; (5) marine trash and debris and other accidental events including vessel strikes, trash and oil spill.

In this SEA, BOEM has considered two alternatives: (1) No Action and (2) the Proposed Action as submitted. BOEM has assessed the impacts of the proposed action on the following resources:

1) air quality;
2) water quality;
3) deepwater benthic communities;
4) marine mammals;
5) sea turtles;
6) fish resources and essential fish habitat; and
7) archaeological resources.

Potential impacts on these resources are summarized below. Direct contact is potentially the most disruptive impact for resources fixed or lying on the sea bottom, and it is weighted most heavily out of all other potentially impacting factors. Pre-activity surveys of the sea bottom required by BOEM may identify potentially sensitive deepwater benthic communities and archaeological resources. At this time no deepwater benthic communities or archaeological resources on the sea bottom are known that could be disturbed by the proposed activity. In the event that either type of resource is encountered, the operator is instructed to avoid impacts to these resources and notify BOEM per the regulations. By operators following the regulations and the regulatory guidance found in the notices to lessees and operators, lease stipulations,

and mitigation measures in the NMFS 2020 BO and FWS 2018 BO, potential impacts to air quality, water quality, deepwater benthic communities, marine mammals, sea turtles, fish resources and essential fish habitat, and archaeological resources from the proposed activities were determined to be negligible and BOEM will require additional conditions of approval.

Our evaluation in this SEA has selected Alternative 2 and serves as the basis for approving the proposed action. Alternative 2 is the Proposed Action as Submitted with additional mitigation and monitoring measures as required under the Endangered Species Act (ESA) Consultation with NMFS that concluded March 13, 2020 (2020 BO). BOEM concludes that no potentially significant adverse impacts are expected to occur to any affected resources by allowing the proposed action to proceed, provided that the specific conditions of approval as part of the ESA Consultation process with NMFS as identified below are met by the operator.

- **COMPLIANCE WITH BIOLOGICAL OPINION TERMS AND CONDITIONS AND REASONABLE AND PRUDENT MEASURES:** This approval is conditioned upon compliance with the Reasonable and Prudent Measures and implementing Terms and Conditions of the Biological Opinion (BO) issued by the National Marine Fisheries Service on March 13, 2020. This includes mitigation, particularly any appendices to Terms and Conditions applicable to the plan, as well as record-keeping and reporting sufficient to allow BOEM and BSEE to comply with reporting and monitoring requirements under the BO; and any additional reporting required by BOEM or BSEE developed as a result of BO implementation. The NMFS BO 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).

- **SUPPORT BASES AND VESSEL TRANSIT ROUTES**: Approval of your plan is conditioned upon your use of the support bases and vessel transit routes as described in your plan. BOEM/BSEE must be notified at least 15 days prior to any vessel route changes that require transit of the Bryde's Whale area, and you must receive prior approval for that transit from BOEM/BSEE.

- **SEISMIC SURVEY OPERATION, MONITORING, AND REPORTING GUIDELINES**: The applicant will follow the guidance provided under Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on NOAA Fisheries internet website at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.

- **MARINE TRASH AND DEBRIS AWARENESS AND ELIMINATION**: The applicant will follow the guidance provided under Appendix B. Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on NOAA Fisheries internet website at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.

- **VESSEL-STRIKE AVOIDANCE/REPORTING**: The applicant will follow the guidance provided under Appendix C. Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on the NOAA Fisheries internet site at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.

- **SEA TURTLE RESUSCITATION GUIDELINES:** The applicant will follow the guidance provided under Appendix J. Sea Turtle Handling and Resuscitation Guidelines found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on the NOAA Fisheries internet site at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.

- **MOON POOL MONITORING AND REPORTING**: A moon pool has been identified during review of your plan submittal. If any sea turtle or other marine mammal is detected, you are required to contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov for additional guidance and incidental report information.

  Moon pools with hull doors should attempt to keep doors closed when no activity is occurring within the moon pool, unless the safety of crew or vessel require otherwise. This will prevent animals from entering the confined area.

  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 at hourly recurring checks for at least five minutes of the video feed, or at hourly recurring visual checks of the moon pool for at least five minutes by a dedicated crew observer with no other tasks during that 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 should be conducted at a rate that will minimize potential harm, if safety permits.

  Closing the hull door ○ Should the moon pool have a hull door that can be closed, then prior to closure the moon pool must be monitored continuously by a dedicated crew observer with no other tasks, prior to closure and following closure to ensure that no individual ESA-listed species is trapped within the hull closed moon pool doors. 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.

  Movement of the vessel (without closed hull door) and equipment deployment/retrieval:

  o 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 ESA-listed species are present in the moon pool area.

  o If an ESA-listed species is observed in the moon pool, the vessel must not be moved and equipment must not be deployed or retrieved, to the extent practicable, unless the safety of crew or vessel requires otherwise. NMFS must be contacted immediately at nmfs.psoreview@noaa.gov. If the observed animal leaves the moon pool, the operator may commence activities.

  o Should an ESA-listed species be observed in a moon pool prior to activity commencement, recovery of the animal or other actions specific to the scenario may be required to prevent interaction with the animal. Operators shall not take such action except at the direction of and after contact with NMFS.

  Should an interaction with equipment or entanglement/entrapment of any ESA-listed species occur (e.g., the animal cannot or does not leave the moon pool on its own volition), the interaction must be reported immediately. Any observation of a leatherback sea turtle within a moon pool, regardless of whether interaction with equipment or entanglement/entrapment is observed, must be reported immediately to the ESA Section 7 biologist at 301-427-8413 (nmfs.psoreview@noaa.gov). For minimum reporting information to include, see bullet list below.

  For assistance with sea turtles contact the number(s) below:

State Stranding network
Texas 361-949-8173 x 226
Louisiana 844-732-8785
Mississippi 228-369-4796
Alabama 866-732-8878
Florida 888-404-3922
* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report
For assistance with marine mammals contact the number(s) below:
State Stranding network
Texas 800-962-6625
Louisiana 504-235-3005
Mississippi 888-767-3657
Alabama 877-942-5343
Florida 888-404-3922
* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report
For assistance with other ESA-listed species (e.g., giant manta ray, oceanic whitetip shark or Gulf sturgeon):
contact the ESA Section 7 biologist at 301-427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov.

After the appropriate stranding networks have been contacted for assistance, you may call BSEE at 985-722-7902 for questions or additional guidance on recovery assistance needs (if still required), continued monitoring requirements, and incidental report information which at minimum is detailed below.

Within 24 hours of any event or observation within the moon pool, if not previously contacted for a specific interaction, notify NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov with the following information:

1. Time, date, water depth, and location (latitude/longitude) of the first discovery of the interaction;
2. Name, type, and call sign of the vessel in which the event occurred;
3. Size and location of moon pool within vessel (e.g., hull door or no hull door);
4. Equipment being utilized at time of interaction;
5. Species identification (if known) or description of the animal involved;
6. Approximate size of animal;
7. Condition of the animal during the event;
8. Photographs or video footage of the animal;
9. Stranding network line that was contacted for assistance;
10. General narrative and timeline describing the events that took place;
11. Whether activities in the moon pool were halted or changed upon observation of the animal; and
12. Whether the animal remains in the pool at the time of the report, or if not, the time/date the animal was last observed.

- **SLACK-LINE PRECAUTIONS AND REPORTING REQUIREMENT:** If operations require the use of flexible, small diameter (< 1 in) nylon, plastic, or fiber lines to support operations (with or without divers), operators/contractors must reduce the slack in the lines to prevent accidental

entanglement of ESA-listed species. The following measures are required (noting that diver safety is paramount, and the following measures should be followed only in cases where they do not jeopardize human safety):

● 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.

● 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.

● Should the line tender and/or diver become aware of any ESA-listed species entanglement, the following protocols must be followed as soon as safety permits.

Should an ESA-listed species interaction resulting in entanglement, entrapment and/or injury occur, the interaction must be reported immediately or after diver safety (if present) is ensured. For assistance with marine mammals contact the number(s) below:

Marine Mammals	Telephone
State Stranding network	
Texas	800-962-6625
Louisiana	504-235-3005
Mississippi	888-767-3657
Alabama	877-942-5343
Florida	888-404-3922

* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report

For assistance with sea turtles contact the number(s) below:

Sea Turtles	Telephone
State Stranding network	
Texas	361-949-8173 x 226
Louisiana	844-732-8785
Mississippi	228-369-4796

Alabama 866-732-8878

Florida 888-404-3922

* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report

Assistance with other ESA-listed species (e.g., giant manta ray, oceanic whitetip shark, or Gulf sturgeon) should contact the ESA section 7 biologist at 301-427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov.

After the appropriate stranding networks have been contacted for assistance, you may call BSEE at 985-722-7902 for questions or additional guidance on recovery assistance needs (if still required), continued monitoring requirements, and incidental report information which at minimum is detailed below.

Within 24 hours of any event or observation, notify NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov with the following information:

1. Time, date, water depth, and location (latitude/longitude) of the first discovery of the interaction;
2. Name, type, and call sign of the vessel (or platform) in which the event occurred;
3. Species identification (if known) or description of the animal involved;
4. Condition of the animal during the event;
5. Photographs or video footage of the animal;
6. Stranding network line that was contacted for assistance; and
7. General narrative and timeline describing the events that took place.

Conclusion: BOEM has evaluated the potential environmental impacts of the proposed action. Based on SEA No. S-8017, a determination is made that the proposed action would have no significant impact on the marine, coastal, or human environment. Therefore, an Environmental Impact Statement will not be required.

PERRY BOUDREAUX

Digitally signed by PERRY BOUDREAUX
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Chief, Environmental Operations Section
Office of Environment
New Orleans Office
Bureau of Ocean Energy Management

September 8, 2020
Date

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SITE-SPECIFIC ENVIRONMENTAL ASSESSMENT (SEA) PREPARED FOR LLOG EXPLORATION OFFSHORE LLC'S SUPPLEMENTAL EXPLORATION PLAN: S-8017

1. OVERVIEW

The purpose of this Site-Specific Environmental Assessment (SEA) is to determine whether the proposed activities outlined in the Supplemental Exploration Plan (EP), S-8017, initially submitted by LLOG Exploration Offshore LLC (LLOG) on July 27, 2020 will significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act (NEPA) and whether an Environmental Impact Statement (EIS) must be prepared. LLOG's Supplemental EP proposes to explore for hydrocarbons by drilling, completing, testing and installing subsea well head and/or manifold of up to two wells: Wells C and C-Alt in Ewing Bank Block 877, Lease Number OCS-G 35295 in the Central Planning Area (CPA) of the Gulf of Mexico (GOM).

This SEA is tiered from the current NEPA documents that evaluated a broad spectrum of potential impacts resulting from drilling activities across the GOM Outer Continental Shelf (OCS) that include:

- Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2022 Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 256, 257, 259, and 261 Final Environmental Impact Statement (Multisale EIS) (USDOI, BOEM, 2017a);
- Gulf of Mexico OCS Lease Sale Final Supplemental Environmental Impact Statement 2018 (2018 SEIS) (USDOI, BOEM, 2017b);
- Biological Opinion Oil and Gas Leasing, Exploration, Development, Production, Decommissioning, and All Related Activities in the Gulf of Mexico Outer Continental Shelf (FWS 2018 BO) (Issued by United States Fish and Wildlife Service [FWS] April 20, 2018); and
- Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (2020 BiOp) (Issued by National Marine Fisheries Service [NMFS] March 13, 2020).

The "tiering" process is provided for in the NEPA implementing regulations (40 CFR § 1502.20 and § 1508.28) and is designed to reduce and simplify the size of subsequent environmental analyses of actions included within the broader program previously examined in NEPA compliance documents by eliminating discussions of impacts that would be repetitive. This allows focus on those site-specific concerns and effects related to the specific action proposed. Document tiering in the Bureau of Ocean Energy Management (BOEM) is subject to additional guidance under Department of the Interior (DOI) regulations at 43 CFR § 46.140 wherein the site-specific analysis must note which conditions and effects addressed in the programmatic document remain valid and which conditions and effects require additional review.

Although the analyses of drilling-related impacts prepared in the Multisale EIS and 2018 SEIS are comprehensive, new information has become available with respect to the following:

- **Emission Impacts on Air Quality** – the EP contains project-specific emissions data not known during the preparation of the programmatic analyses;
- **Discharge Impacts on Offshore Water Quality** – the EP contains project-specific discharge data not known during the preparation of the programmatic analyses;
- **Bottom Impacts on Deepwater Benthic Communities** – the EP contains project-specific information not known during the preparation of the programmatic analyses;
- **Noise/Vessel-Strike Impacts on Marine Mammals –** the environmental baseline since completion of the Multisale EIS, 2018 SEIS, 2018 BO, and 2020 BO may have experienced slight changes and new information has become available since the preparation of the programmatic analyses;
- **Noise/Vessel-Strike Impacts on Sea Turtles –** the environmental baseline since completion of the Multisale EIS, 2018 SEIS, 2018 BO, and 2020 BO may have experienced slight changes and new information has become available since the preparation of the programmatic analyses;
- **Discharge Impacts/Disturbances to Fish and Fisheries –** the environmental baseline since completion of the Multisale EIS, 2018 SEIS, 2018 BO, and 2020 BO may have experienced slight

changes and new information has become available since the preparation of the programmatic analyses; and

- **Bottom Impacts on Potential Archaeological Resources** – the EP contains project-specific information not known during the preparation of the programmatic analyses.

Therefore, **Chapter 3** of this SEA focuses on how the new information, including a discussion of the known effects of the *Deepwater Horizon* explosion, spill, and response activities on the analyzed resources, relates to the routine, accidental, and cumulative environmental effects of this proposed action. Where applicable, relevant affected environment discussions and impact analyses from the Multisale EIS, 2018 SEIS, 2018 BO, and 2020 BO are summarized and utilized for this site-specific analyses, and are incorporated by reference into this SEA. Relevant condition(s) of approval identified in this SEA, Multisale EIS, 2018 SEIS, 2018 BO, and 2020 BO have been considered in the evaluation of the proposed action.

1.1. BACKGROUND

BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) are mandated to manage and oversee the exploration and development of OCS oil, gas, and mineral resources while ensuring safe operations and the protection of the human, marine, and coastal environments. BOEM and BSEE issue oil and gas leases and regulates exploration, development, production, and decommissioning. Prior to authorizing activities related to these phases, BOEM conducts the appropriate NEPA review. BOEM's Office of Leasing and Plans oversees the submittal of EPs and Development Operations Coordination Documents (DOCDs) pursuant to 30 CFR § 550, subpart B.

Lessees and operators submit EPs and DOCDs to provide BOEM with information needed to adequately evaluate the overall potential impacts on OCS resources prior to seeking any individual permit approvals, such as an application for permit to drill (APD). Most of the information in EPs and DOCDs is presented in basic statements, figures, lists, and tables that simply provide the necessary details on the proposed exploration, development, production, and/or transportation operations. One exception is the Environmental Impact Analyses (EIA) required in EPs under 30 CFR § 550.227 and in DOCDs under 30 CFR § 550.261; wherein, the operator provides environmental information and makes impact conclusions regarding their activities.

The scope of the effects on the environment in the GOM from the activities proposed in SHORT NAME's EP were fully discussed and analyzed in the Multisale EIS, 2018 SEIS, 2018 BO, and 2020 BO and the specific locations, equipment, methodologies, and the duration of the proposed activities will result in impacts similar to those discussed in the Multisale EIS, 2018 SEIS, 2018 BO, and 2020 BO. This SEA was prepared by BOEM to evaluate the activity-specific issues related to the applicant's proposed activities in addition to the new information.

1.2. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

LLOG has submitted a plan to conduct exploration activities on the OCS. The purpose of the proposed action is to drill, complete, test and install subsea well head and/or manifold of up to two wells so that LLOG can utilize the information to evaluate the potential for, and develop plans for, the development and production of hydrocarbon resources on the OCS, which would help satisfy the Nation's need for energy.

The need for this action is established by BOEM's responsibility under the Outer Continental Shelf Lands Act (OCSLA) to make OCS lands 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. Section 11 of OCSLA (43 U.S.C. § 1340) requires oil and gas lessees seeking to conduct exploration activities to first obtain approval from the Secretary who has delegated the authority to grant such approval to BOEM.

In response to the proposed action in LLOG's plan, BOEM is required by OCSLA to approve, approve with modifications, or deny the plan within 30 days (see 43 U.S.C. § 1340(c)(1)). The criteria that BOEM will apply in reaching a decision to approve, approve with modifications, or deny the plan within 30 days and the scope of its discretion are provided by Section 11 of OCSLA and detailed in the implementing regulations (30 CFR § 550, subpart B). Authorizing the proposed action, as outlined in the supplemental EP S-8017, allows LLOG to pursue its rights under the lease and to conduct exploration drilling activities.

1.3. DESCRIPTION OF THE PROPOSED ACTION

LLOG's supplemental EP for drilling operations on the OCS of the GOM proposes to explore for hydrocarbons by drilling, completing, testing and installing subsea well head and/or manifold of up to two wells: Wells C and C-Alt in Ewing Bank Block 877, Lease Number OCS-G 35295 in the Central Planning Area of the GOM. The proposed activities are located south of Grand Isle, Louisiana approximately 67 miles (108 kilometers) from the nearest Louisiana shoreline in Plaquemines Parish, Louisiana. The water depth at the proposed well sites is 1,570 feet (479 meters). LLOG proposes using either a Dynamically Positioned (DP) semisubmersible or a drillship, a mobile offshore drilling unit (MODU) to drill these wells. The proposed drilling will start tentatively on October 15, 2020 and will end on March 1, 2021, however, the drilling will only take approximately 45 days and completion will take approximately 45 days. Supply and crewboat facilities to support the proposed action are to be located in existing facilities in Port Fourchon, Louisiana, approximately 73 mi (117 km) north of the project location. Port Fourchon will be used as the debarkation point for equipment, supplies, and crews supporting the proposed action. Air support will be flown out of Galliano, Louisiana (94 mi [151 km] north). LLOG does not expect any shore-based construction or expansion in association with this proposed action. The types of support vessels and their potential travel frequency during exploratory drilling are included LLOG's plan (LLOG, 2020).

1.4. IMPACT-PRODUCING FACTORS

An impact-producing factor (IPF) is any activity or process resulting from an approved operation that causes impacts to the environment, such as an emission, effluent, or physical disturbance. The IPFs from the routine activities proposed by the operator in this plan include: (1) waste and discharges from vessel operations and exploration activities; (2) air emissions from equipment and vessels; (3) noise from vessel and helicopter transportation and drilling activities; and (4) bottom disturbances from well activities. The routine IPFs are expected to occur during the operations conducted under the proposed action and are addressed in each of the site-specific analyses in **Chapter 3** under "Routine Activities."

The analyses in **Chapter 3** also consider IPFs that might result from an accidental event. The primary IPFs from potential accidents related to OCS drilling activities include: (1) vessel collisions with marine mammals and sea turtles; (2) oil spills and blowouts; (3) bottom disturbances from lost/jettisoned debris; and (4) helicopter collisions with coastal and/or marine birds. Unlike the IPFs associated with routine activities, the IPFs from accidental events are not expected because of the low probabilities of such events from occurring, existing/recently implemented safety measures and condition(s) of approval, and an increased level of operator awareness observed since the *Deepwater Horizon* spill. The accidental IPFs are detailed and addressed in each of the site-specific analyses under "Accidental Events."

The Multisale EIS and 2018 SEIS considered the routine and accidental IPFs described above; however, additional information related to the oil spill/blowout IPF has been collected since the *Deepwater Horizon* spill that was not available during the preparation of the programmatic analyses; Appendix A; Accidental Oil-Spill Discussion (http://www.boem.gov/Appendix-A-Deepwater-SEA-Oil-Spill-Discusssion/), introduces the new data and describes the circumstances that might result if an accidental spill were to occur. Additionally, the analyses of the "Accidental Events" incorporate information from Appendix B of the 2012-2017 WPA/CPA Multisale EIS (USDOI, BOEM, 2012), "Catastrophic Spill Event Analysis," to address the potential impacts to the environment in the unlikely event that a catastrophic spill similar to the *Deepwater Horizon* spill was to occur. This analysis was later updated and published as a "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c) and hereby incorporated by reference.

Accidental Spill Concerns

Since spills are unplanned, unforeseeable events, BOEM is required to rely on past experiences to predict many factors regarding oil-spill risks. Based on experience and the operations proposed in LLOG's plan, the potential sources of hydrocarbon spills from the proposed activity would include the following:

- A storage tank accident on the MODU;
- A transfer operation mishap between the supply vessel and the MODU;
- A leak resulting from damage to the fuel tanks on one of the supply or crew boats; and/or
- A blowout of a proposed well.

Potential Spills from Vessels/Transfer Operations

As indicated above, offshore spills from LLOG's proposed action are possible if an accident were to damage a storage tank onboard the drilling rig, the crewboat, offshore support vessel, or the fuel supply vessel. Historically, accidents of this nature have resulted from unintentional vessel collisions and transfer incidents during the offloading of diesel fuel to the drilling rig. LLOG plans to use a DP semisubmersible or drillship using a subsea blowout preventer (BOP) to conduct the proposed activities. There are several tanks onboard the MODUs that store fuel and lubricants necessary for the rig's operation. A worst-case discharge scenario from a rupture and spill from the vessels are:

	Largest Main Tank Capacity	Total Diesel Oil Capacity
DP Semisubmersible	4,634 bbl	18,079 bbl
DP Drillship	16,686 bbl	36,595 bbl

Additionally, the supply boat proposed to support the drilling operations has an estimated fuel tank capacity of 500 bbl, the crew boat has an estimated fuel tank capacity of 500 bb), and the diesel oil supply vessel has an estimated fuel tank capacity of 1900 bbl. The helicopter proposed to support activities has an estimated fuel tank capacity of 279 gal (6.6 bbl) (LLOG, 2020).

Potential Spills from a Loss of Well Control/Blowout

BOEM and BSEE require that all losses of well control (blowouts) be reported. The current definition for "loss of well control" used by BOEM and BSEE is:

- Uncontrolled flow of formation or other fluids. The flow may be to an exposed formation (an underground blowout) or at the surface (a surface blowout);
- flow through a diverter; or
- uncontrolled flow resulting from a failure of surface equipment or procedures.

Losses of well control (also known as blowouts) can occur during exploratory drilling, development drilling, completion, production, or workover operations. A blowout can occur when improperly balanced well pressures result in the sudden, uncontrolled releases of fluids from a wellbore or wellhead (PCCI, 1999; Neal Adams Firefighters, Inc., 1991). Since 1971, most OCS blowouts have resulted in the release of gas; blowouts resulting in the release of oil have been rare. The most recent blowout was related to the *Deepwater Horizon* spill, which resulted in the release of both gas and oil. In the event of a blowout, an operator's first course of action is to activate the BOP to close the well. The BOP may be located on the surface of the drilling rig or on the seafloor. There are built-in redundancies in the BOP system to allow activation of selected components with the intent to seal off the well bore. If a subsea BOP cannot be operated from the drill rig, it can be operated at the seafloor using remotely-operated vehicles (ROVs).

If the blowout occurs during drilling, pieces of the rock formation below the drill bit may fail and collapse into the wellbore because of the pressure drop. Formation fragments subsequently clog or "bridge" the drill bit or pipe, reducing or stopping flow (PCCI, 1999). Completed wells, or those in production, present more severe consequences in the event of a blowout due to the hole being fully cased down to the producing formation that lowers the probability of bridging (PCCI, 1999).

If the BOP fails and the well does not bridge, there are other options available to control the blowout that include capping/shut-in, capping/diverting, surface stinger, vertical intervention, offset kill, and drilling relief wells (Neal Adams Firefighters, Inc., 1991). Of these methods, a relief well is the most important remedy and may be required immediately (even if it is not the first choice), since it is typically considered the ultimate solution for well control. A relief well must be drilled from a nearby platform or drillship. It is estimated that drilling a relief well in deep water can take anywhere from 30 to 120 days or more. The actual amount of time required to drill the relief well will depend upon the complexity of the intervention, the location of a suitable rig, the type of operation that must be terminated in order to release the rig (e.g., may need to secure the well before releasing the rig), and any problems mobilizing personnel and equipment to the location.

Catastrophic Spill Event Analysis

After the *Deepwater Horizon* explosion, oil spill, and response, BOEM prepared a "Catastrophic Spill Event Analysis," a region-wide evaluation that identifies the most likely and most significant impacts from a high-volume blowout and oil spill that continues for an extended period of time, which was included as Appendix B in the 2012-2017 WPA/CPA Multisale EIS (USDOI, BOEM, 2012). Since then, this analysis has been reviewed and updated. This analysis, which is based on credible scientific evidence, identifies the most likely and most significant impacts from a high-volume blowout and oil spill that continues for an extended period of time and has been published as an independent white paper, "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c). The scenario and impacts discussed in that white paper are comparable to that of a spill similar to the *Deepwater Horizon* spill and are not associated with IPFs anticipated to result from routine activities or even more reasonably-feasible, accidental events that could occur during the proposed action. The conclusions made in that white paper are addressed in the SEA's impact analyses (**Chapters 3.2 to 3.8**) and hereby incorporated by reference.

Site-Specific Estimate of Spill Risk

LLOG's plan describes measures for blowout prevention, likelihood for surface intervention to stop a blowout, and early intervention in the event of a blowout. LLOG has developed standards for well control, personnel safety, and an emergency response plan and these methods are stated in detail in the plan submitted by LLOG (LLOG, 2020). As per the information provided in LLOG's plan, the MODU, LLOG plans to use will deploy a subsea BOP while drilling the well (LLOG, 2020). An estimate of spill risk from LLOG's proposed activities was calculated using the drilling spill rate for the entire OCS and the estimated number of wells to be drilled. The resulting value, 0.00014 or 0.014 percent, is used to address the risk of a spill >1,000 bbl occurring during the proposed action. When examining only wells in deep water (in water depths >500 ft; (152 m)), past data suggest the chance of a major spill from a deepwater well under current regulations and practices is 1 in 4,957 (USDOI, BOEM, 2012).

Though not proposed or expected, LLOG has estimated that a worst-case discharge (WCD) scenario from a blowout of one of the well under this proposed action could be 222,538 BOPD of 27.5° American Petroleum Institute (API) gravity crude. In accordance with enhanced agency oversight, BOEM verified the operator's calculations used to determine the WCD volume.

LLOG indicated in their plan that mechanical failure/collapse of the borehole in a blowout scenario is influenced by several factors including in-situ stress, rock strength and fluid velocities at the sand face. Given the substantial fluid velocities inherent in the WCD, and the scenario as defined where the formation is not supported by a cased and cemented wellbore, it is possible that the borehole may fall/collapse/bridge over within a span of a few days, significantly reducing the outflow of the rates. For this blowout scenario, no bridging is considered. LLOG has developed standards for well control, personnel safety, and emergency response plan. These methods are stated in detail in the plan (LLOG, 2020).

In the event a relief well is required due to blowout, LLOG indicates in their plan that they have one rig under contract and that Rig share and resource sharing agreements are in place between members of the Helix Well Containment Group (LLOG, 2020). For this project, LLOG estimates that it will take approximately 19 days to assess the situation and move to the relief well site; approximately 41 days to drill a relief well; 20 days to perform kill operations and secure the well for a total of 80 days to drill and complete a relief well. Also, there are no existing facilities/platforms nearby from where the relief well can be drilled. Additional details related to the proposed action can be found in LLOG's proposed exploration plan (LLOG, 2020).

Spill Response Requirements

Agency regulations require that all owners and operators of oil handling, storage, or transportation facilities located seaward of the coastline submit an Oil-Spill Response Plan (OSRP) before they can use a facility. BSEE has issued notices to lessees and operators (NTL) No. 2012-N06 (*Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans*), which informs operators of OSRP requirements and requires that they have adequate resources available to protect the environment from spills from their facilities. The Environmental Protection and Response Plan within the OSRP outlines the availability of spill containment and cleanup equipment and trained personnel necessary to ensure that a full-response can be deployed during an oil-spill emergency. All the proposed activities and facilities in this plan will be covered by the Regional Oil Spill Response Plan (OSRP) filed

by LLOG (Operator Number 02058) in accordance with 30 CFR 550 and 30 CFR 254 and deemed in compliance by BSEE on July 21, 2020. LLOG also certifies it has the capability to respond, to the maximum extent practicable, to worst-case discharge, or a substantial threat of such a discharge, resulting from the activities proposed in their supplemental EP (LLOG, 2020).

Spill Response

Discussion about spill response is already included in Appendix A: (http://www.boem.gov/Appendix-A-Deepwater-SEA-Oil-Spill-Discusssion/.

Oil-Spill-Response Plan

Discussion about oil-spill response plan is already included in Appendix A: (http://www.boem.gov/Appendix-A-Deepwater-SEA-Oil-Spill-Discusssion/).

BSEE Spill-Response Program

Discussion about oil-spill response plan is already included in Appendix A: (http://www.boem.gov/Appendix-A-Deepwater-SEA-Oil-Spill-Discusssion/).

Subsurface Response

Most oil-spill response strategies and equipment are based upon the simple principle that oil floats. However, as evident during the *Deepwater Horizon* spill, this is not always true. Sometimes oil suspends within the water column or sinks to the seafloor and sometimes it does all three: floats, suspends, and sinks. Oil suspended in the water column and moving with the currents is difficult to track using standard visual survey methods. Trajectory models traditionally used to predict floating oil movement and fate are not applicable to submerged oil - oil that is suspended in the water column and/or that sinks. There are no proven methods for the containment of submerged oil, and methods for recovery of submerged oil have limited effectiveness (Coastal Response Research Center, 2007).

Efforts to contain and/or recover suspended oil have focused on different types of nets, either the ad hoc use of fishing nets or specially designed trawl nets. There has been research conducted on the design of trawl nets for recovery of emulsified fuels. However, the overall effectiveness for large spills is expected to be very low. Suspended oil can occur as liquid droplets or semisolid masses in sizes ranging from millimeters to meters in diameter. At spills where oil has been suspended in the water column, responders have devised low technology methods for tracking the presence and spread of oil over space and time. For suspended oil, these methods include stationary systems such a snare sentinels, which can consist of any combination of the following: a single length of snare on a rope attached to a float and an anchor; one or more crab traps on the bottom that are stuffed with snare; and minnow or other type of traps that are stuffed with snare and deployed at various water depths. The configuration would depend upon the water depth where the oil is located within the water column. Currently, it is not possible to determine the particle size, number of particles, or percent oil cover in the water column based upon the visual observations of oil on these systems (Coastal Response Research Center, 2007).

Spills involving submerged oil trigger the need for real-time data on current profiles (surface to bottom), wave energy, suspended sediment concentrations, detailed bathymetry, seafloor sediment characteristics, and sediment transport patterns and rates. These data are needed to validate or calibrate models (both computer and conceptual), direct sampling efforts, and predict the behavior and fate of the submerged oil. This information might be obtained through the use of acoustic Doppler current profilers, dye tracer studies, rapid seafloor mapping systems, and underwater camera or video systems that could record episodic events (Coastal Response Research Center, 2007). During the *Deepwater Horizon* spill, fluorometers were used successfully to detect the presence of oil.

Surface Response

Prior to the DeepSpill sea trials, there was some doubt about whether oil released subsea in deep water would reach the sea surface. The surface slick formed after the DeepSpill crude oil releases contained patches of water-in–oil emulsion with film thickness more than adequate for containment with oil booms and also sufficient thickness for efficient treatment with chemical dispersant, similar to what actually happened during the *Deepwater Horizon* spill. However, the DeepSpill sea trials indicated that the potential lifetime of the crude oil slick would be short, which resulted in the report suggesting that the slick could be

left to disperse naturally without attempting any mechanical cleanup (Johansen et al., 2001). The fact that the experiment did not involve the quantity of crude that was lost per day and on an ongoing basis for approximately 87 days as occurred during the *Deepwater Horizon* spill may account for the observed differences in slick behavior between the experiments and the GOM spill. As occurred during the Norwegian Sea trials, there was no hydrate formation at the damaged riser during the uncontrolled flow during the *Deepwater Horizon* spill.

The *Deepwater Horizon* spill incident indicated that, although released at a water depth of 5,000 ft (1,524 m), once the oil surfaced, a variety of response methods were effective on the oil that surfaced near the source. The options for oil combat in deep water are the same as those used for shallower waters (mechanical recovery, dispersion, in-situ burning). Response to the oil as it emulsified and moved farther from the source proved more difficult. The emulsified oil had to be chased down by the responders, making it more difficult for the skimmers to stay in skimmable oil. The emulsified oil was also less likely to be effectively burned or dispersed.

A variety of standard cleanup protocols were used for removing *Deepwater Horizon* oil from beaches, shorelines, and offshore water (**Table 1**). After the *Deepwater Horizon* spill, BSEE (then BOEMRE) issued NTL No. 2010-N10 (*Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources)* that became effective on November 8, 2010. This NTL applies only to operators conducting operations using subsea blowout BOPs or surface BOPs on floating facilities. The NTL also informs lessees that BSEE will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy surface and subsea containment resources that would be adequate to promptly respond to a blowout or other loss of well control. Although the NTL does not require that operators submit revised OSRPs that include this containment information at this time, operators were notified of BSEE's intention to evaluate the adequacy of each operator to comply in their current OSRP.

Source Control and Containment

The type of information that BSEE reviews pursuant to this NTL includes, but is not limited to:

- Subsea containment and capture equipment, including containment domes and capping stacks;
- Subsea utility equipment, including hydraulic power, hydrate control, and dispersant injection equipment;
- Riser systems;
- Remotely operated vehicles;
- Capture vessels;
- Support vessels; and
- Storage facilities.

Table 1
Primary Cleanup Options Used during the *Deepwater Horizon* Spill Response.

Type	Fresh Oil	Sheens	Mousse	Tar Balls	Burn Residue
On-Water Response	Disperse, skim, burn	Light sheens very difficult to recover, heavier sheens picked up with sorbent boom or sorbent pads	Skim	Snare boom	Manual removal

On-Land Response	Sorbent pads, manual recovery, flushing with water, possible use of chemical shoreline cleaning agents	Light sheens very difficult to recover, heavier sheens picked up with sorbent boom or sorbent pads	Sorbent pads, manual recovery	Snare boom, manual removal, beach cleaning machinery	Manual removal

Source: USDOC, NOAA, 2010**.**

To address the improved containment systems expectations to rapidly contain a spill as a result of a loss of well control from a subsea well (addressed in NTL No. 2010-N10), several oil and gas industry majors initiated the development of a rapid response system. This system is designed to fully contain oil flow in the event of a potential future underwater blowout and to address a variety of scenarios. The system would consist of specially designed equipment constructed, tested, and available for rapid response. It is envisioned that this system could be fully operational within days to weeks after a spill event occurs. The system is designed to operate in up to 10,000 ft (3,048 m) water depth and will add containment capability of 100,000 BOPD (4.2 million gallons per day). The companies that originated this system have formed a non-profit organization, the Marine Well Containment Company (MWCC), to operate and maintain the system. MWCC will provide fully trained crews to operate the system, will ensure the equipment is operational and ready for rapid response and will conduct research on new containment technologies. This system will connect by risers to vessels that are designed to safely capture, store and offload the oil. This improves safety and environmental protection by fully securing the well via capping and shut-in or by containing the oil flow until the well is under control. It also enhances safe operations by reducing congestion (i.e., fewer vessels, risers/flowlines). Until this equipment is available, MWCC has built a subsea containment equipment system that is engineered to be used in water depths up to 8,000 ft (2,438 m) and has the capacity to contain 60,000 BOPD. This initial response system includes a capping stack with the ability to shut in oil flow or to flow the oil via flexible pipes and risers to surface vessels.

Another option for source control and containment is through the use of the equipment stockpiled by Helix Energy Solutions Group, Inc. (Helix). The Helix initiative involves more than 20 smaller energy companies, and supplements the MWCC response effort. Helix has stockpiled the equipment that it found useful in the *Deepwater Horizon* response and is offering it to oil and gas producers for immediate use. The Helix system centers on three ships: the *Helix Producer I*; the *Q4000*: and the *Express* deepwater construction vessel. These vessels played a role in the *Deepwater Horizon* response and continue to work in the Gulf. Together, the Helix ships and related equipment can handle up to 55,000 BOPD, 70,000 bbl of liquid natural gas, and 95 million cubic ft of natural gas at depths up to 8,000 ft (2,438 m). The primary difference between the MWCC system and the Helix system is that nothing needs to be built for the Helix system; it has been field tested and is currently available for deployment. Another group, Wild Well Control, is also providing some subsea containment capability and debris removal to offshore operators.

BOEM and BSEE will not allow an operator to begin drilling operations until adequate subsea containment and collection equipment as well as subsea dispersant capability is determined by the bureau to be available to the operator and sufficient for use in response to a potential incident from the proposed well(s). However, it would be impossible to predict with any degree of certainty the percentage of oil that could be contained subsea in the event of a spill or when or if complete containment would even be possible. There are some situations where this equipment might not be able to be used to control the well, for example, if the drilling structure were to fall directly on top of the well as debris during a loss of well control event. If a loss of well control event occurred in the future, it is possible that it could be contained in a best case scenario within weeks with the utilization of the rapid subsea containment packages, thereby greatly limiting the amount of oil potentially lost to the environment.

Summary

In the event of a spill, particularly a blowout, there is no single method of containing and removing it that would be 100 percent effective. Removal and containment efforts to respond to an ongoing spill would likely require multiple technologies, including mechanical cleanup, burning of the slick, and chemical dispersants. Even with the deployment of all of these 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.

It is likely that larger spills in deep waters and under the right conditions would require the simultaneous use of all available cleanup methods (mechanical cleanup, dispersant application, and in-situ burning). That being said, when one considers the historical/statistical data, the recent subsea containment improvements, BOEM's and BSEE's enhanced oversight, and industry's heightened safety awareness since the *Deepwater Horizon* spill, it is reasonable to conclude that an accidental spill event is not likely to occur.

2. ALTERNATIVES CONSIDERED

2.1. NO ACTION ALTERNATIVE

Alternative 1 - If selected, the operator would not undertake the proposed activities. If the proposed activities are not undertaken, all environmental impacts, including additional routine, accidental, or cumulative impacts to the environmental and cultural resources described in the Multisale EIS, 2018 SEIS, 2018 BO, and NMFS 2020 BO would not occur.

2.2. THE PROPOSED ACTION AS SUBMITTED

Alternative 2 - This is BOEM's *Preferred Alternative* – If selected, the operator would undertake the proposed activities as requested in their plan. This alternative assumes that the operator will conduct their operations in accordance with their lease stipulations (in addition to any amendments), the OCSLA, and all applicable regulations (as per 30 CFR § 550.101(a)), and guidance provided in all appropriate NTLs (as per 30 CFR § 550.103), conditions of approval as required under the Endangered Species Act (ESA) Consultation with National Marine Fisheries (NMFS) that concluded March 13, 2020 (2020 Biological Opinion [BO] and with FWS that concluded on April 20, 2018 (FWS 2018 BO). However, no additional, site-specific condition(s) of approval would be required by BOEM.

2.3. SUMMARY AND COMPARISON OF THE ALTERNATIVES

If selected, Alternative 1, the No Action Alternative, would result in the operator not exercising its rights under the lease and conducting their proposed activities. Alternative 1 would not result in any impacts to the environmental resources analyzed in **Chapter 3**; however, the lessee would not develop the oil and gas resources of its lease for the benefit of the U.S. economy. Alternative 2 is the Preferred Alternative because it meets the objectives of the purpose and need and will allow the proposed action to be conducted safely and with the necessary conditions to limit or negate potential environmental impacts.

Condition(s) of Approval Required under the Preferred Alternative

The need for, and utility of, the following conditions of approval discussed in the relevant impact analysis section of this SEA. Alternative 2 is the proposed action as submitted with additional conditions of approval as required under the ESA Consultation with NMFS that concluded March 13, 2020 (2020 BO). To ensure adequate environmental protection, the following condition of approval is applied:

- **COMPLIANCE WITH BIOLOGICAL OPINION TERMS AND CONDITIONS AND REASONABLE AND PRUDENT MEASURES:** This approval is conditioned upon compliance with the Reasonable and Prudent Measures and implementing Terms and Conditions of the Biological Opinion (BO) issued by the National Marine Fisheries Service on March 13, 2020. This includes mitigation, particularly any appendices to Terms and Conditions applicable to the plan, as well as record-keeping and reporting sufficient to allow BOEM and BSEE to comply with reporting and monitoring requirements under the BO; and any additional reporting required by BOEM or BSEE developed as a result of BO implementation. The NMFS BO 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).
- **SUPPORT BASES AND VESSEL TRANSIT ROUTES**: Approval of your plan is conditioned upon your use of the support bases and vessel transit routes as described in your plan. BOEM/BSEE must be notified at least 15 days prior to any vessel route changes that require transit of the Bryde's Whale area, and you must receive prior approval for that transit from BOEM/BSEE.

- **SEISMIC SURVEY OPERATION, MONITORING, AND REPORTING GUIDELINES**: The applicant will follow the guidance provided under Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on NOAA Fisheries internet website at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.
- **MARINE TRASH AND DEBRIS AWARENESS AND ELIMINATION**: The applicant will follow the guidance provided under Appendix B. Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on NOAA Fisheries internet website at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.
- **VESSEL-STRIKE AVOIDANCE/REPORTING**: The applicant will follow the guidance provided under Appendix C. Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on the NOAA Fisheries internet site at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.
- **SEA TURTLE RESUSCITATION GUIDELINES:** The applicant will follow the guidance provided under Appendix J. Sea Turtle Handling and Resuscitation Guidelines found in the Biological Opinion issued by the National Marine Fisheries Service on March 13, 2020. The guidance can be accessed on the NOAA Fisheries internet site at https://www.fisheries.noaa.gov/resource/document/appendices-biological-opinion-federally-regulated-oil-and-gas-program-gulf-mexico.
- **MOON POOL MONITORING AND REPORTING**: A moon pool has been identified during review of your plan submittal. If any sea turtle or other marine mammal is detected, you are required to contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov for additional guidance and incidental report information.

  Moon pools with hull doors should attempt to keep doors closed when no activity is occurring within the moon pool, unless the safety of crew or vessel require otherwise. This will prevent animals from entering the confined area.

  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 at hourly recurring checks for at least five minutes of the video feed, or at hourly recurring visual checks of the moon pool for at least five minutes by a dedicated crew observer with no other tasks during that 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 should be conducted at a rate that will minimize potential harm, if safety permits.

  Closing the hull door ○ Should the moon pool have a hull door that can be closed, then prior to closure the moon pool must be monitored continuously by a dedicated crew observer with no other tasks, prior to closure and following closure to ensure that no individual ESA-listed species is trapped within the hull closed moon pool doors. 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.

  Movement of the vessel (without closed hull door) and equipment deployment/retrieval:

  - o 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 ESA-listed species are present in the moon pool area.

o If an ESA-listed species is observed in the moon pool, the vessel must not be moved and equipment must not be deployed or retrieved, to the extent practicable, unless the safety of crew or vessel requires otherwise. NMFS must be contacted immediately at nmfs.psoreview@noaa.gov. If the observed animal leaves the moon pool, the operator may commence activities.

o Should an ESA-listed species be observed in a moon pool prior to activity commencement, recovery of the animal or other actions specific to the scenario may be required to prevent interaction with the animal. Operators shall not take such action except at the direction of and after contact with NMFS.

Should an interaction with equipment or entanglement/entrapment of any ESA-listed species occur (e.g., the animal cannot or does not leave the moon pool on its own volition), the interaction must be reported immediately. Any observation of a leatherback sea turtle within a moon pool, regardless of whether interaction with equipment or entanglement/entrapment is observed, must be reported immediately to the ESA Section 7 biologist at 301-427-8413 (nmfs.psoreview@noaa.gov). For minimum reporting information to include, see bullet list below.

For assistance with sea turtles contact the number(s) below:
State Stranding network
Texas 361-949-8173 x 226
Louisiana 844-732-8785
Mississippi 228-369-4796
Alabama 866-732-8878
Florida 888-404-3922
* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report
For assistance with marine mammals contact the number(s) below:
State Stranding network
Texas 800-962-6625
Louisiana 504-235-3005
Mississippi 888-767-3657
Alabama 877-942-5343
Florida 888-404-3922
* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report
For assistance with other ESA-listed species (e.g., giant manta ray, oceanic whitetip shark or Gulf sturgeon):
contact the ESA Section 7 biologist at 301-427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov.

After the appropriate stranding networks have been contacted for assistance, you may call BSEE at 985-722-7902 for questions or additional guidance on recovery assistance needs (if still required), continued monitoring requirements, and incidental report information which at minimum is detailed below.

Within 24 hours of any event or observation within the moon pool, if not previously contacted for a specific interaction, notify NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov with the following information:

1. Time, date, water depth, and location (latitude/longitude) of the first discovery of the interaction;
2. Name, type, and call sign of the vessel in which the event occurred;
3. Size and location of moon pool within vessel (e.g., hull door or no hull door);
4. Equipment being utilized at time of interaction;
5. Species identification (if known) or description of the animal involved;
6. Approximate size of animal;
7. Condition of the animal during the event;
8. Photographs or video footage of the animal;
9. Stranding network line that was contacted for assistance;
10. General narrative and timeline describing the events that took place;
11. Whether activities in the moon pool were halted or changed upon observation of the animal; and
12. Whether the animal remains in the pool at the time of the report, or if not, the time/date the animal was last observed.

- **SLACK-LINE PRECAUTIONS AND REPORTING REQUIREMENT:** If operations require the use of flexible, small diameter (< 1 in) nylon, plastic, or fiber lines to support operations (with or without divers), operators/contractors must reduce the slack in the lines to prevent accidental entanglement of ESA-listed species. The following measures are required (noting that diver safety is paramount, and the following measures should be followed only in cases where they do not jeopardize human safety):

● 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.

● 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.

● Should the line tender and/or diver become aware of any ESA-listed species entanglement, the following protocols must be followed as soon as safety permits.

Should an ESA-listed species interaction resulting in entanglement, entrapment and/or injury occur, the interaction must be reported immediately or after diver safety (if present) is ensured. For assistance with marine mammals contact the number(s) below:

Marine Mammals	Telephone
State Stranding network	
Texas	800-962-6625
Louisiana	504-235-3005

Mississippi	888-767-3657
Alabama	877-942-5343
Florida	888-404-3922

* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report

For assistance with sea turtles contact the number(s) below:

Sea Turtles	Telephone
State Stranding network	
Texas	361-949-8173 x 226
Louisiana	844-732-8785
Mississippi	228-369-4796
Alabama	866-732-8878
Florida	888-404-3922

* If you do not receive a response, go to the following website to ensure the listed number is correct: https://www.fisheries.noaa.gov/report

Assistance with other ESA-listed species (e.g., giant manta ray, oceanic whitetip shark, or Gulf sturgeon) should contact the ESA section 7 biologist at 301-427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov.

After the appropriate stranding networks have been contacted for assistance, you may call BSEE at 985-722-7902 for questions or additional guidance on recovery assistance needs (if still required), continued monitoring requirements, and incidental report information which at minimum is detailed below.

Within 24 hours of any event or observation, notify NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov with the following information:

1. Time, date, water depth, and location (latitude/longitude) of the first discovery of the interaction;
2. Name, type, and call sign of the vessel (or platform) in which the event occurred;
3. Species identification (if known) or description of the animal involved;
4. Condition of the animal during the event;
5. Photographs or video footage of the animal;
6. Stranding network line that was contacted for assistance; and
7. General narrative and timeline describing the events that took place.

2.4. ALTERNATIVES CONSIDERED BUT NOT ANALYZED

Several other alternatives were considered and reviewed during the preparation of this SEA and coordination of the resource reviews. Ultimately, a viable alternative is required to be a logical option for carrying out the proposed action, ensure that the purpose and need can be met, and be feasible under the regulatory directives of the OCSLA and all other applicable guidance. The table below lists the alternatives that were considered but dismissed and not analyzed further along with the rationale for the decision:

Alternatives Considered but Not Analyzed.

Dismissed Alternative	Alternative Detail	Reason Not Analyzed
Daytime Drilling Only.	The alternative would restrict all drilling operations to the hours between legal sunrise and sunset to take advantage of the increased lighting in an effort to improve safety.	This alternative does not consider that adequate lighting is available on vessels and MODUs, existing safety protocols, and that the premature stopping of some drilling/well operations prior to critical junctures could lead to highly-problematic and unsafe situations.
Drilling from an Anchored MODU Only.	The alternative would only allow drilling activities from an anchored MODU to reduce air quality impacts from the increased emissions released from DP MODUs.	This alternative does not consider the limited availability of conventionally-moored MODUs in the GOM or the negligible air quality concerns for temporary operations taking place a great distance from shore.
Incorporation of "Seasonal" Drilling Windows.	The alternative would be based upon observed "seasonal" migrations or behavioral patterns exhibited by marine protected species (MPS) and would restrict the proposed drilling operations for several weeks/months each year.	This alternative would have to rely upon incomplete seasonal data as most migratory MPS are not found in the GOM and it would not be able to account for year-round equipment and personnel contracting.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1. INTRODUCTION

The discussion below will: (1) briefly describe/summarize the pertinent affected resources; (2) discuss whether proposed activities and their IPFs would have significant impacts to the human environment of the GOM; and (3) identify significant impacts, if any that would require further NEPA analysis in an EIS. The description of the affected environment and impact analysis are presented together in this section for each resource. For the impact analysis, resource-specific significance criteria were developed for each category of the affected environment. The criteria reflect consideration of both the context and intensity of the impact at issue (see 40 CFR § 1508.27). For the sake of this document, the criteria for impacts to environmental resources are classified into one of the three following levels:

- Significant Impact (including those that could be mitigated to non-significance);
- Adverse but Not Significant Impact; or
- Negligible Impact.

Preliminary screening for this assessment was based on a review of this relevant literature; previous SEAs, the Multisale EIS and 2018 SEIS, and statistics/data pertinent to historic and projected activities. BOEM initially considered the following resources for impact analysis:

- marine mammals (including Endangered Species Act (ESA) listed species);

- sea turtles (all are ESA listed species);
- fishes (including listed species and ichthyoplankton);
- commercial and recreational fisheries;
- coastal and marine birds (including ESA listed species);
- benthic communities (including deepwater benthic communities, live bottoms, and topographic features);
- archaeological resources;
- military uses;
- recreational and commercial diving;
- socioeconomic conditions (including employment, marine transportation, and infrastructure);
- geology/sediments; and
- air and water quality.

The impact analyses focus on a broad group of oil and gas activities and resources with the potential for non-negligible impacts. Routine, accidental, and cumulative impacts from exploration activities similar to those proposed by LLOG are analyzed in the Multisale EIS, 2018 SEIS, FWS 2018 BO, and NMFS 2020 BO that considered the proposed activities as well as impacts to resources relevant to the proposal. The level of impacts associated with each interaction was analyzed and described in the Multisale EIS, 2018 SEIS, FWS 2018 BO, and NMFS 2020 BO and is incorporated by reference.

The Multisale EIS, 2018 SEIS, FWS 2018 BO, and NMFS 2020 BO provides a comprehensive characterization of biological and socioeconomic resources that may be adversely affected by oil and gas exploration and development activities. For this SEA, BOEM evaluated the potential impacts resulting from the operator's proposed activities that were not considered in the Multisale EIS and 2018 SEIS. This section concentrates on the potential impacts of the proposed action on the following affected resources:

- air quality;
- offshore water quality;
- deepwater benthic biologically sensitive resources;
- marine mammals (including Endangered Species Act [ESA] listed species);
- sea turtles (all are ESA listed species);
- fish (including ESA listed species) and essential fish habitat (EFH); and
- archaeological resources.

Other environmental and socioeconomic conditions, identified in the initial list of resources considered for impact analysis above, such as military uses, were considered and the potential impacts that could occur from activities, such as the proposed activities, were fully addressed in the Multisale EIS and 2018 SEIS and deemed negligible (40 CFR § 1508.27) and are not discussed in this SEA. Space-use conflicts with recreational and commercial fishing vessels will be negligible compared to the area available for these activities, and there is a potential for an increase in some types of fishing activity due to development. There are no known recreational and/or commercial diving operations regularly occurring in the area. Although development could necessitate a negligible increase in commercial dive activity, potential impact levels do not warrant further analysis. Coastal and marine birds were not further analyzed due to the distance from shore and the temporary nature of the proposed activities. Topographic and pinnacle features were not further analyzed due to the distance from the proposed activities to the nearest topographic and/or pinnacle features (~41 mi and ~121 mi (~67 km and ~194 km) respectively)). No socioeconomic effects were further analyzed due to the type, the temporary nature, and employment size, of the proposed activity. There is no expansion or modification of support bases proposed as a result of this activity. Additionally, support vessel operations are comparable to that described and analyzed in the Multisale EIS and 2018 SEIS for similar activities. The potential impacts of a low-probability, Catastrophic Oil-Spill event, such as the *Deepwater Horizon* spill to the environmental resources and socioeconomic conditions listed above are fully addressed in the Catastrophic Spill Event Analysis (Appendix B of the 2012-2017 WPA/CPA Multisale EIS (USDOI, BOEM, 2012)). This analysis was later updated and published as a "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c) and a respective resource summary of that analysis is provided in each impact review below.

Deepwater Horizon Impacts Incorporated into SEA Analyses

BOEM, in conjunction with the well operator and other Federal and State agencies, continues to monitor and evaluate both the short-term and long-term impacts of the accidental spill. There is ongoing research to assess the impacts to resources from the *Deepwater Horizon* blowout, spill, and response efforts. For many resources, the data are still being collected and analyzed through the National Resource Damage Assessment (NRDA) process. BOEM continues to seek data and research results from the NRDA process and the scientific community. Results of this research are forthcoming, and BOEM subject matter experts are continuing to update their analyses as this information becomes available.

Chapter 3 of this document describes the environmental and archaeological resources and the potential routine, accidental, and cumulative impacts of the proposed action on the resources that could be affected by the proposed activities. These descriptions present environmental resources as they are now, thus providing new baseline information that is informed by the *Deepwater Horizon* spill for analyses of potential impacts from the proposed activities.

3.2. AIR QUALITY

3.2.1. Affected Environment

The complete description of the air quality in the GOM region is set forth in Chapter 4.1 of the Multisale EIS and 2018 SEIS and is incorporated by reference. The following information is a summary of the description incorporated from the Multisale EIS and 2018 SEIS. Ewing Bank Block 877 is located west of 87.5° W. longitude and hence, falls under BOEM jurisdiction for enforcement of the Clean Air Act (CAA). The air over the OCS water is not classified, but some criteria pollutants may exceed the National Ambient Air Quality Standards (NAAQS) (USDOI, BOEM, 2017a and b). The proposed exploration activities are located approximately 67 mi (108 km) from the nearest coastline of Plaquemines Parish, Louisiana. The Houston/Galveston, Texas area is in nonattainment for the 2008 ozone 8-hour standard. As of October 1, 2015, the United States Environmental Protection Agency (USEPA) strengthened NAAQS for ozone and will release new designated areas in the future after a comprehensive assessment of science, human health risk and exposure and alternative policy options before a rulemaking is proposed. Two new 1-hour NAAQS standards went into effect in 2010. They are the 1-hour NO_2 standard of 100 ppb and the 1-hour SO_2 standard of 75 ppb. The entire St. Bernard Parish, Louisiana is in nonattainment for the 2010 1-hr sulfur dioxide (SO_2) standard, and part of the Evangeline Parish is in nonattainment for the same pollutant standard. Other than these areas, the coastal areas are in attainment of the NAAQS for ozone, carbon monoxide, nitrogen oxides, sulphur oxides, and particulate matter. For Prevention of Significant Deterioration (PSD) purposes, the coastal areas are classified as a Class II Areas.

Influences to onshore air quality are dependent upon meteorological conditions and air pollution emitted from operational activities. The pertinent meteorological conditions regarding air quality are the wind speed and direction, the atmospheric stability, and the mixing height (which govern the dispersion and transport of emissions). The typical, large-scale wind flow for the GOM area is driven by the clockwise circulation around the Bermuda High, resulting in a prevailing southeasterly to southerly wind flow, which is conducive to transporting air pollution emissions toward shore. However, superimposed upon this large-scale circulation are smaller scale wind-flow patterns, such as the land/sea breeze phenomenon. In addition, there are other large-scale weather features that occur periodically, namely tropical cyclones, and mid-latitude frontal systems. Because of the routine occurrence of these various conditions, the winds blow from all directions in the area of concern (MacDonald et al., 2004).

3.2.2. Impact Analysis

A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed activities on air quality can be found in Chapter 4.1 of the Multisale EIS and 2018 SEIS and is incorporated by reference. The following information is a summary of the impact analyses.

3.2.2.1. Alternative 1

If selected, Alternative 1, the No Action alternative, would result in the operator not undertaking the proposed activities as described in the plan. Therefore, the IPFs to air quality would not occur. For

example, there would be no volatile organic compound (VOC) emissions that would result in potential localized degradation of air quality.

3.2.2.2. Alternative 2

If selected, Alternative 2, the Proposed Action as Submitted with additional conditions of approval as required under the NMFS 2020 BO, would result in the operator undertaking the proposed activities, as requested and conditioned in the plan. As described in the analyses below, impacts to air quality from the proposed action are expected to be short-term, localized, and not lead to significant impacts.

Routine Activities

Air quality would be affected in the immediate vicinity of the proposed operations, service vessels, and aircraft. The impact from emissions for the proposed activities described in this Supplemental EP will not exceed BOEM's exemption levels per 30 CFR § 550.303(d), which would exempt the operator from additional air quality modeling. The proposed activities are not expected to significantly affect onshore air quality due to the distance from shore and the distance from the area of the proposed action to any PSD Class I air quality area, such as the Breton National Wildlife Refuge.

Accidental Events

Should a spill of oil occur, the VOCs, which would escape to the atmosphere from a surface slick, are precursors to photochemically produced ozone. A spike in VOCs could contribute to a corresponding spike in ozone, especially if the release were to occur on a hot sunny day in a NO_2-rich environment. Should an accidental or emergency flaring or venting of gas occur, VOCs, methane, and carbon monoxide would also escape to the atmosphere. VOCs and nitrogen oxides can contribute to ozone formation in the presence of sunlight. Additionally, flared and vented gas can contain hydrogen sulfide which could result in emitted SO_2. With the exception of Houston/Galveston, Texas area, the corresponding onshore area is in attainment for ozone. Additionally, with the exception of the St. Bernard Parish and part of the Evangeline Parish, Louisiana, the corresponding onshore area is in attainment for SO_2. Due to the distance from shore, the proposed activities are not expected to have any impacts to onshore air quality, including nonattainment areas. If a fire occurs, prior to containment, particulate and combustible emissions will be released in addition to the VOCs. Emissions of pollutants into the atmosphere from routine activities associated with the proposed activities are expected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, emission heights, emission rates, and the distance of these emissions from onshore.

Despite the recent *Deepwater Horizon* spill, historical trends in the GOM (see **Chapter 1.4** and the "Catastrophic Spill Event Analysis" white paper) indicate that catastrophic spill events are not likely to occur as a result of the activities associated with the proposed action. In the event of a catastrophic spill similar to the *Deepwater Horizon* spill, the "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c) discusses the most likely and most significant impacts to air quality as it relates to the four phases of a major spill/blowout:

1) **Initial Event** (Section 2.2.1.1.; Page B-4);
2) **Offshore Spill** (Section 3.2.1.1; Page B-15);
3) **Onshore Contact** (Section 4.2.1.1; Page B-30); and
4) **Post-Spill, Long-Term Recovery** (Section 5.2.1.1.; Page B-40).

As the Catastrophic Spill Analysis in "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c) concludes, the potential impacts from a catastrophic spill could include air quality impacts that would require extensive recovery times.

Cumulative Impacts

Cumulative impacts on air quality within the offshore area would come primarily from non-OCS oil/gas activities in the Gulf as well as sources on land such as generated outside the OCS and include emissions from industrial plants, power generation, and urban transportation. The location of the proposed action is far removed from coastal populations or industrial activity. The proposed activities are located over 67 mi (108 km) from the nearest shoreline, and would not affect the overall quality of air over the coast because of the distance to shore. Figure 4-1 of the Multisale EIS and 2018 SEIS (USDOI, BOEM, 2017a and b) shows the Texas and Louisiana ozone attainment status. Except for Southeast Texas (Houston-Galveston-

Brazoria), which is in nonattainment for ozone, and St. Bernard Parish and part of Evangeline Parish, Louisiana, which is in nonattainment for SO_2, the Gulf's coastal areas are currently designated as "attainment" for all of the NAAQS regulated pollutants (USEPA, 2020). Minor to moderate cumulative impacts on air quality are expected as a result of the proposed activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other activities in the area, though the incremental impacts from the proposed activities are expected to be **minor**.

Conclusion

The air quality in the immediate vicinity of the proposed activities would be affected by the projected emissions, but the 67mi (108 km) distance between the area of the proposed action and the nearest shoreline results in substantial dilution factors for point-source emissions from the proposed action so that onshore air quality impacts would be well below levels considered to be significant.

3.3. OFFSHORE WATER QUALITY

3.3.1. Affected Environment

The description of water quality in offshore waters of the GOM is set forth in Chapter 4.2 of the Multisale EIS and 2018 SEIS and is incorporated by reference. The following information is a summary of the description incorporated from the Multisale EIS and 2018 SEIS.

The GOM is the ninth largest waterbody in the world. The Mississippi River Basin drains 41 percent of the contiguous United States. The basin covers more than 1,245,000 square miles, and includes all or parts of 31 states and two Canadian provinces (USACE, 2020).

The physical oceanography of the deep Gulf can be approximated as a two-layer system with an upper layer about 800- to 1,000-m (2,625- to 3,281-ft) deep that is dominated by the Loop Current and associated clockwise (anticyclonic) eddies (Welsh et al., 2009; Inoue et al., 2008); and the lower layer below ~1,000 m (3,281 ft) that has near uniform currents (Welsh et al., 2009; Inoue et al., 2008).

Deep waters east of the Mississippi River are affected by the Loop Current and associated warm-core anticyclonic eddies, which consist of clear, low-nutrient water (Muller-Karger et al., 2001). Cold-core cyclonic eddies also form at the edge of the Loop Current and are associated with upwelling and nutrient-rich, high-productivity waters. More details on the physical oceanography of the GOM are available in Chapter 4.2 of the Multisale EIS and 2018 SEIS.

Typical water quality parameters that are considered important to the health of coastal and marine environments include temperature, salinity, dissolved oxygen, nutrients, pH, turbidity, and pollutants.

Surface water temperatures in the GOM vary seasonally from about 29 ºC (84 ºF) in the summer to about 19 ºC (65 ºF) in the winter (Gore, 1992). In the summer, warm water may be found from the surface down to a thermocline at depths to about 160 ft (50 m) deep. Minimum water temperatures at the deep seafloor approach 4º C (39 ºF).

The salinity at the sea surface in the offshore central GOM is generally 36 parts per thousand (ppt) (Gore, 1992). Lower salinities are characteristic nearshore where fresh water from the rivers mix with shallow Gulf waters. For example, salinity in open water near the coast may vary between 29 and 32 ppt during fall and winter, but it may decline to 20 ppt during spring and summer due to increased runoff (USDOI, MMS, 2000).

Dissolved oxygen (DO) concentrations in seawater vary as a function of temperature and barometric pressure. In general, cold water supports higher DO concentrations than warm water. DO concentrations between 5 and 10 milligrams per liter (mg/L) are considered beneficial to aquatic life. The GOM hypoxic zone is a band of oxygen-stratified water that stretches along the Texas-Louisiana shelf each summer where the DO concentrations are less than 2 mg/L. It is the largest hypoxic area in the entire western Atlantic Ocean (Turner et al., 2005). The hypoxic zone is the result of excess nutrients, primarily nitrogen, carried downstream by rivers to discharge to coastal waters. Density stratification results where the less dense, nutrient-rich fresh water spreads on top of the denser seawater and prevents oxygen from replenishing the bottom waters. The excess nutrients cause phytoplankton blooms which eventually die and sink to the bottom, where bacterial decomposition consumes DO.

Seawater generally averages pH 8 at the surface due to marine systems being buffered by carbonates and bicarbonates. However, in the open waters of the GOM, pH ranges from approximately 8.1 to 8.3 at

the surface (Gore, 1992). The pH decreases to approximately 7.9 at a depth of 700 m (2,297 ft), and in deeper waters, it increases again to approximately 8.0 (Gore, 1992).

GOM coastal waters offshore of Texas, Louisiana, Mississippi, and Alabama exhibit high turbidity due to suspended sediment in river discharge, especially during seasonal periods of heavy precipitation. High turbidity may extend up to 50 mi offshore the Mississippi River and lesser distances to the east and west along the coast. Storms may also resuspend soft bottom sediments on the continental shelf, causing an increase in turbidity near the seafloor. Stratified water normally restricts this turbid water to within 20 m (66 ft) from the seafloor up into the water column (Bright et al., 1976; Bright and Rezak, 1978). Warm-core eddies can entrain and transport high turbidity shelf waters to farther offshore over deep Gulf waters. Outside of these areas, water clarity in the GOM is good to excellent, with low levels of suspended sediment.

River runoff may include pollutants such as nutrients, pesticides and other organic chemicals, and metals. The Mississippi River introduces approximately 3,680,938 bbl of oil and grease per year from land-based sources (NRC, 2003) into the waters of the GOM. Offshore waters, especially deeper waters, are more directly affected by natural seeps. Hydrocarbons enter the GOM through natural seeps at a rate of approximately 980,392 bbl per year (a range of approximately 560,224-1,400,560 bbl per year) (NRC, 2003).

The National Research Council estimated that, on average, approximately 26,324 bbl of oil per year entered Gulf waters from petrochemical and oil refinery industries in Louisiana and Texas. Spills to coastal waters include pipeline releases (annual estimate of 6,230 bbl), tank vessel incidents (5,390 bbl), and coastal facility releases (5,180 bbl); while spills to offshore waters include pipeline releases (annual estimate of 420 bbl) and tank vessel incidents (10,500 bbl) (NRC, 2003).

The April 2010 *Deepwater Horizon* oil spill resulted from failures of a cement well seal and subsea blowout preventer. The Government estimated that approximately 4.9 million barrels of oil were released during the event (Oil Spill Commission, 2011a), and that 1.84 million gallons of dispersant were used subsea at the wellhead and on the surface (Oil Spill Commission, 2011b). Additionally, the corresponding emission of methane from the wellhead during the event was estimated between 9.14×10^9 and 1.25×10^{10} moles (Kessler et al., 2011). Short-term and long-term effects from the *Deepwater Horizon* oil spill are discussed in "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c).

3.3.2. Impact Analysis

A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed activities on offshore water quality can be found in Chapter 4.2 of the Multisale EIS and 2018 SEIS, and is incorporated by reference. The IPFs associated with the proposed activities in Ewing Bank Block 877 that could affect marine water quality include: (1) turbidity from bottom disturbances from well emplacement activities; (2) drilling discharges, including cuttings with associated drilling muds; and (3) accidental spills of crude oil, diesel fuel, chemicals, or other materials from vessels/blowouts in marine waters. As explained below, due to the type and the temporary nature of the proposed activities, no substantive impacts would be expected.

3.3.2.1. Alternative 1

If selected, Alternative 1, the No Action Alternative, would result in the operator not undertaking the proposed activities as described in the plan. Therefore, the IPFs to offshore water quality would not occur. There would be no turbidity issues related to well emplacement activities that would result in potential localized degradation of water quality, no discharges during the drilling of the well and no accidental spills of crude oil, diesel fuel, chemicals, or other materials from vessels/blowouts in marine waters.

3.3.2.2. Alternative 2

If selected, Alternative 2, the Proposed Action as Submitted with additional conditions of approval as required under the NMFS 2020 BO, would result in the operator undertaking the proposed activities as requested and conditioned in the plan. As described in the analyses below, impacts to water quality from the proposed action, as submitted by the operator, are expected to be short-term, localized and not lead to significant impacts.

Routine Operations

Impacts to water quality from routine activities associated with drilling or production may include overboard discharges of fluids and cuttings during drilling, development, and workovers of exploration and production wells; and service-vessel discharges.

The primary operational waste streams generated during offshore oil and gas exploration, development and production are drilling fluids, drill cuttings, various waters (e.g., bilge, ballast, fire, and cooling), deck drainage, sanitary wastes, domestic wastes, produced water, produced sand, and well treatment, workover, and completion fluids. Minor additional waste streams include desalination unit discharges, blowout preventer fluids, boiler blowdown discharges, excess cement slurry, several fluids used in subsea production, and uncontaminated freshwater and saltwater.

The U.S. Environmental Protection Agency (USEPA) (Regions 4 and 6) regulates all waste streams generated from offshore oil and gas activities. Section 403 of the Clean Water Act requires that National Pollutant Discharge Elimination System (NPDES) permits be issued for discharges to the territorial seas (baseline to 3 mi [5 km]), the contiguous zone, and the ocean in compliance with USEPA's regulations for preventing unreasonable degradation of the receiving waters. Water Quality Standards consist of the waterbody's designated uses, water quality criteria to protect those uses and to determine if they are being attained, and antidegradation policies to help protect high-quality waterbodies. Discharges from offshore activities near State water boundaries must comply with all applicable State Water Quality Standards. In general, waste streams that can be discharged overboard include water-based drilling fluids and drill cuttings, synthetic-based fluid-wetted drill cuttings, cement slurries, various treated waters and sanitary wastes, and uncontaminated freshwater and saltwater provided they meet the criteria of the applicable NPDES permit.

Discharged water may not cause a sheen on the water surface, and the oil/grease concentration may not exceed 42 mg/L daily maximum, or 29 mg/L monthly average. The discharge must also be characterized for toxicity. The NPDES permits require no discharge within 1,000 m (3,281 ft) of an area of biological concern. Region 4 also requires no discharge within 1,000 m (3,281 ft) of any federally designated dredged material ocean disposal site.

Impacts to offshore waters from routine activities associated with the subject plan should be minimal. A detailed impact analysis of the routine impacts to offshore waters due to OCS activities can be found in Chapter 4.2 the Multisale EIS and 2018 SEIS.

Accidental Events

Accidental events associated with the subject plan that could impact offshore water quality include spills of oil and refined hydrocarbons, releases of natural gas and condensate, spills of chemicals or drilling fluids, loss of well control, pipeline failures, collisions, or other malfunctions that would result in such spills. Spills from collisions are not expected to be significant. Overall, since major losses of well control and blowouts are rare events, potential impacts to offshore water quality are not expected to be significant except in the rare case of a catastrophic event. Although response efforts may decrease the amount of oil in the environment, the response efforts may also impact the environment through, for example, increased vessel traffic and the application of dispersants. Natural degradation processes will also decrease the amount of residual oil over time. Chemicals used in the oil and gas industry are not a significant risk to water quality because they are either nontoxic, are used in minor quantities, or are only used on a noncontinuous basis. A detailed impact analysis of the accidental impacts that may be associated with the proposed action on offshore waters can be found in Chapter 4.2 of the Multisale EIS and 2018 SEIS. Accidental spills as a result of a catastrophic event are discussed in "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c).

In the event of a catastrophic spill similar to the *Deepwater Horizon* spill, the "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c) discusses the most likely and most significant impacts to offshore water quality as it relates to three of the four phases of a major spill/blowout:

1) **Initial Event** (Section 2.2.1.2.; Page B-5);
2) **Offshore Spill** (Section 3.2.1.2; Page B-16);
3) **Onshore Contact** (offshore water quality not included in this discussion); and
4) **Post-Spill, Long-Term Recovery** (Section 5.2.1.2.; Page B-40).

The potential impacts from a catastrophic spill could result in both temporary and long term offshore water quality degradation that would require extensive recovery times. However, despite the *Deepwater Horizon* spill, historical trends in the GOM (see **Chapter 1.4** and the "Catastrophic Spill Event Analysis" white paper) indicate that catastrophic spill events are not likely to occur as a result of the proposed action.

Cumulative Impacts

Exploration, development, and production activities contribute to cumulative water quality degradation in offshore waters. Surface spills of oil, diesel fuel, and other materials may occur from vessels transporting crude oil and petroleum products; from vessels involved in commercial fishing, freight or passenger transport; and from OCS operations. Such spills are low volume and are readily dispersed on the water surface. Well blowouts can disturb the bottom, increase turbidity, and put hydrocarbons into the sea. Should an oil spill ≥1,000 bbl (but not catastrophic) occur, localized, short-term changes in water quality would be expected; however, cumulative impacts on water quality over the long term would be **negligible**.

Therefore, no significant cumulative impacts on offshore water quality would be expected as a result of the proposed activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development; as well as other activities in the area.

Conclusion

Impacts on offshore water quality from the operational discharges that would be expected to result from the proposed action are negligible because of: 1) existing USEPA regulations; 2) water depth; 3) distance of the project from the coast; 4) weathering; and 5) dilution factors. Spilled oil originating from the project is not expected to be ≥1,000 bbl and is expected to be substantially recovered/weathered while still at sea. Operator-initiated activities to contain and clean up an oil spill would begin as soon as possible after an event. Small quantities of unrecovered oil would weather and largely biodegrade within two weeks.

No significant long-term impacts on offshore water quality would be expected from the subject plan because of the type of and temporary nature of the proposed activity. Near-bottom water quality would be affected by increased turbidity and disturbed substrates during the period of well emplacement. Any effects from the elevated turbidity would be short term, localized, and reversible.

3.4. DEEPWATER BENTHIC COMMUNITIES

For purposes of OCS activity impact analyses, BOEM defines "deepwater benthic communities," to include chemosynthetic and deepwater coral communities in the GOM as those typically found in water depths of 984 ft (300 m) and greater (USDOI, BOEM, 2017a and b).

3.4.1. Affected Environment

A description of chemosynthetic and deepwater coral communities in the GOM region can be found in Chapter 4.4 of the Multisale EIS and 2018 SEIS. The following information is a summary of the descriptions in the EISs, and are incorporated by reference into this SEA.

The continental slope in the GOM extends from the edge of the continental shelf at a depth of about 656 ft (200 m) to a water depth of approximately 9,840 ft (3,000 m) (USDOI, BOEM, 2017a and b). The vast majority of the GOM has a soft, muddy bottom in which burrowing infauna are the most abundant invertebrates. Ewing Bank Block 877 falls into this category and the water depth of the proposed activity is approximately 1,570 ft (479 m).

A remarkable assemblage of invertebrates is found in association with hydrocarbon seeps in the GOM. Chemosynthetic communities can occur at or near hydrocarbon seeps and are defined as persistent, largely sessile assemblages of marine organisms dependent upon symbiotic chemosynthetic bacteria as their primary food source (MacDonald, 1992). Invertebrate taxa in these communities include tube worms and bivalves, among others. Symbiotic chemosynthetic bacteria live within specialized cells in the invertebrate organisms and are supplied with oxygen and chemosynthetic compounds (methane and sulfides) by the host via specialized blood chemistry (Fisher, 1990). Chemosynthetic bacteria, which live on mats, in sediment, and in symbiosis with chemosynthetic invertebrates, use a carbon source independent of photosynthesis to make sugars and amino acids. The host, in turn, lives off the organic products subsequently released by the chemosynthetic bacteria and may even feed on the bacteria themselves. Chemosynthetic communities can become established when a hard substrate is available for colonization at or near a seep. Depending on the

situation, sessile benthic invertebrates can settle on and colonize carbonate substrate. These organisms form additional structure upon the seafloor, increasing the complexity of the habitat that may provide support to a variety of deepwater corals, invertebrates and fishes.

Some deepwater corals form communities occurring at or near hydrocarbon seeps, or on exposed outcrops, and may be found in association with chemosynthetic communities. Deepwater coral communities are also found on shipwrecks, and deepwater oil and gas infrastructure. These coral communities are distinctive and provide three-dimensional habitat for a range of fishes and invertebrates. Hard-bottom habitats in deep water include communities dominated by *Lophelia pertusa*, with other corals such as the bamboo coral (*Keratoisis flexibilis*) and zigzag coral (*Madrepora oculata*). Numerous other invertebrates are also associated with these benthic habitats (Sulak et al., 2008; Cordes et al., 2008; Fisher et al., 2007; Schroeder et al., 2005).

Hydrocarbon seep communities in the GOM have been reported to occur at water depths greater than 300 m (984 ft) (USDOI, BOEM, 2017a and b). To date, there are over 300 documented deepwater benthic communities comprised of chemosynthetic organisms and/or deepwater corals. Once thought rare, research suggests that deepwater faunal communities are regularly associated with seafloor features commonly found in the vicinity of the primary geophysical signatures of the seabed for hydrocarbon migration to the seafloor. These areas include those where hydrocarbons percolate through sediments or where hydrocarbons move along faults that reach the seafloor. More than 23,000 positive anomalies have been identified from seismic survey data and each may represent a habitat where a hard substrate and a deepwater community may be found. However, until an anomaly has been visited and confirmed, it is unknown if hard substrates are exposed and capable of supporting deepwater benthic communities.

To map areas of probable habitat for deepwater benthic communities, scientists at BOEM analyzed decades of three-dimensional seismic data to classify seafloor returns exhibiting anomalously high or low reflectivity. The areas of high reflectivity represent patches of anomalous seafloor returns that likely indicate patches of hard seafloor that would provide substrate for deepwater benthic communities. Most confirmed hard bottoms in the deepwater GOM were created by the precipitation of calcium carbonate substrate by chemosynthetic bacterial activity and are capable of supporting deepwater benthic communities. However, non-biogenic hard bottoms are also found at escarpments, seafloor-reaching faults, or where salt formations reach the surface. Investigations of the seafloor at patches of high reflectivity indicate that chemosynthetic and coral communities are much more common in the deepwater GOM than previously known (USDOI, BOEM, 2017a and b). Also, areas of low reflectivity (negative anomalies) can be indicative of gassy sediments and mud volcanoes with a high flux of hydrocarbons from the seafloor. Although uncommon, chemosynthetic bivalves may be found in areas with a high flux of hydrocarbons.

3.4.2. Impact Analysis

A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed activities on chemosynthetic communities and deepwater coral communities can be found in Chapter 4.4 of the Multisale EIS and 2018 SEIS. The following information is a summary of the impact analyses in the Multisale EIS and 2018 SEIS and it is incorporated by reference into this SEA.

Any hard substrate communities located in deep water would be particularly sensitive to impacts from OCS activities restulting in bottom disturbances and increased turbidity. Such impacts to these habitats could permanently prevent recolonization by similar organisms requiring hard substrate. The IPFs associated with the proposed activities in Ewing Bank Block 877 that could affect deepwater benthic communities include physical impacts from: (1) well emplacement activities; (2) drilling discharges, including cuttings and drilling muds; and (3) seafloor blowouts without an oil spill during well drilling or emplacement of subsea infrastructure.

3.4.2.1. Alternative 1

If selected, Alternative 1, the No Action Alternative, would result in the operator not undertaking the proposed activities as described in the plan. Therefore, the IPFs to deepwater benthic communities would not occur. For example, there would be no well emplacement activities that could result in physical damage to the deepwater benthic communities or their substrates, no drilling discharges that could result in burial of the organisms, or no burial due to a blowout.

3.4.2.2. Alternative 2

If selected, Alternative 2, the Proposed Action as Submitted with additional conditions of approval as required under the NMFS 2020 BO, would result in the operator undertaking the proposed activities as requested and conditioned in the plan. Examples of potential impacts to possible deepwater benthic communities include, but are not limited to, damage from well emplacement activities, smothering from drilling discharges, possible sedimentation and/or oil contamination from a blowout, and crushing or burial from emplacement of subsea infrastructure. Because the operator is required to follow all existing lease stipulations as well as the applicable regulations as clarified by NTLs (the operator reaffirmed compliance in its plan as cited above), conditions outlined in the following analyses related to NTL No. 2009-G40 will result in reducing the probability of impacts to deepwater benthic communities.

Routine Operations

The NTL No. 2009-G40, (*Deepwater Benthic Communities*) provides guidance related to BOEM's regulations implementing a policy of avoidance of sensitive deepwater benthic communities or areas that have a high potential for supporting these community types, as interpreted from geophysical records. According to NTL No. 2009-G40, all plans submitted for deep water (984 ft, 300 m or greater) will be reviewed for the presence of deepwater benthic communities that may be affected by the proposed activity. Wells must be located a distance of at least 2,000 ft (610 m) from possible and known deepwater benthic communities to prevent cuttings from smothering the communities, and any seafloor disturbance (anchors, anchor chains, cables) must be at least 250 ft (76 m) from a possible or known deepwater benthic community. Lessees intending to explore or develop in water depths >984 ft (300 m) are required to provide information about geophysical surveys of the area of proposed activities and to evaluate the data for indications of conditions that may support sensitive deepwater benthic communities.

Well Emplacement Activities: Emplacement of the wells, and associated subsea infrastructures can cause disturbances with lethal and sub-lethal effects such as (1) crushing; (2) burial; and (3) decreased fitness if substantial quantities of sediments are suspended in the water column during operations.

For this plan, LLOG proposes to use a DP drillship or DP semisubmersible to conduct their drilling activities; therefore, there are no anchors associated with the proposed operations. Also, the site-specific deepwater benthic communities review conducted for the proposed activities determined that there were no potential sensitive deepwater benthic communities or habitat that could support such communities within 2,000 ft (610 m) of the proposed well sites.

Drilling Discharges: Routine surface discharges from development drilling and production facility operations in water depths of 1,000 m (3,280 ft) can reach detectable accumulations at distances of at least 1 km (0.6 mi) (CSA, 2006); however, substantial sediment accumulations will be limited in distance from the surface discharge point. For discharges on the seafloor during initial well jetting, sediment accumulation may reach distances of approximately 100 m (328 ft) and could result in mounding in the immediate area around the well site (CSA, 2006). In both situations, splays of discharges tend to deposit in the direction of prevailing currents. Any discharges landing on any deepwater communities in substantial quantities during these activities could result in impacts directly due to mortality or indirectly due to sub-lethal impacts.

Distancing bottom disturbing activities from features that could support deepwater benthic communities, as described in NTL No. 2009-G40, minimizes potential impacts to deepwater benthic communities due to drilling discharges. Because of this distancing, any drill cuttings from deepwater operations would not come in contact with a deepwater community or would be diluted to such an extent to not result in negative impacts to a deepwater community. Because many deepwater organisms are long-lived with low reproductive rates, if a chemosynthetic community was impacted, it could take decades or centuries to recover depending on the size of the community. The deepwater benthic communities review conducted for this proposed action did not detect any sensitive deepwater benthic communities or habitat that could support such communities within 2,000 ft (610 m) of the proposed well sites. As such, impacts from discharges related to the proposed activities are not expected.

Accidental Events

A blowout, as used here, is from expulsion of gas and/or water and/or suspended sediment and/or insubstantial oil out of a well. A blowout at the seafloor without the presence of substantial quantities of

oil could occur when excess pressure in the well exceeds the capacity (both the operator's and the drilling apparatus' capacity) to contain the well. A blowout at the seafloor could create a crater on the sea bottom and/or suspend and disperse large quantities of bottom sediments, burying both infaunal (living in the sediment) and epifaunal (living on the sediment) organisms and interfering with sessile invertebrates that rely on filter-feeding organs. Rapid burial by accumulations of sediment >1 ft (>30 cm) in thickness is likely to be lethal for all benthic organisms based on analysis of escape trace fossils from the geologic record (Frey, 1975; Basan et al., 1978; Eckdale et al., 1984). Lesser accumulations of sediment (or cuttings) may be lethal to some sessile (attached or immotile) invertebrates and survivable by motile organisms. Similar to impacts from drill cuttings, impacts from a blowout would be limited because of the duration and areal extent of the accident. Distancing the well at least 610 m (2,000 ft) from any feature that could support deepwater benthic communities also reduces that possibility of organisms being smothered by disturbed sediment. Any oil, sediments, or fluids released by a seafloor blowout of this nature could have potentially adverse effects on sensitive deepwater benthic communities. However, there are several reasons why substantive impacts from these are very unlikely for this IPF: First, the likelihood of any size blowout is very small. Since reporting requirements changed in 2006, there have been no reported blowouts of this nature (USDOI, BSEE, 2017). Second, any sediments or fluids in this type of blowout would be limited in quantity, and the blowout would be limited in duration. As such, the sediments or fluids would either rise to the surface or be rapidly diluted in the water column and not impact any deepwater communities given the proper distancing requirements. This type of blowout is not considered a catastrophic event similar to the *Deepwater Horizon* explosion and spill. For information on this type of event see the "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c).

Impacts of any disturbance from routine activities would be local and short-term. Given distancing requirements, severe impacts resulting from a blowout event without substantial oil are negligible at the community or the population level. The deepwater benthic communities review conducted for this proposal did not identify any potential, high-density deepwater benthic communities or habitat that could support such communities within 2,000 ft (610 m) of the proposed well sites. Therefore, impacts to deepwater benthic communities from accidental blowouts are not expected.

Cumulative Impacts

Considering the remote location of these habitats, the operator's proposed activities would constitute the primary effect on the resources that may exist in the area of the proposed action. As such, the potential cumulative impacts from all other GOM activities would be identical to a combination of the Routine and Accidental Events described above. Given the negligible impacts on deepwater benthic communities because of the application of BOEM avoidance criteria as described in NTL No. 2009-G40, the cumulative impacts are also **negligible**.

Conclusion

As mentioned earlier, either a DP semisubmersible or a DP drillship will be used for the proposed activities, anchors will not be required and the potential for bottom-disturbing activities will be reduced during routine activities.

The proposed activities are expected to have negligible impacts on the ecological function, abundance, productivity, and/or distribution of deepwater benthic communities given adherence to distancing requirements found in NTL No. 2009-G40. The operator in its plan proposes compliance with the regulations as clarified by NTL No. 2009-G40. Bottom disturbances from emplacement activities, drilling discharges, or blowouts without substantial oil would be sited away from any sensitive deepwater benthic communities. Any sediments or fluids that could come in contact with the organisms would be diluted to a concentration where the impact to the deepwater benthic community would be negligible.

3.5. MARINE MAMMALS

3.5.1. Affected Environment

The marine mammal community is diverse and distributed throughout the northern Gulf waters. The GOM's marine mammals are represented by members of the taxonomic order Cetacea, including suborders Mysticeti (i.e., baleen whales) and Odontoceti (i.e., toothed whales), as well as the order Sirenia (i.e.,

manatee). Twenty-one species of cetaceans and one species of Sirenia regularly occur in the GOM and are identified in the NMFS Stock Assessment Reports (SAR) (Jefferson et al., 1992; Davis et al., 2000; Roberts et al., 2016; Hayes et al., 2018; Hayes et al., 2019). A complete description of marine mammals can be found in Chapter 4.9 of the Multisale EIS and 2018 SEIS, and in the NMFS 2017 and 2018 SAR (Hayes et al., 2018, 2019, and 2020) and NMFS 2020 BO, and are incorporated by reference.

Threatened or Endangered Marine Mammal Species

Only two cetaceans, the sperm whale (*Physeter macrocephalus*) and the GOM Bryde's whale (*Balaenoptera edeni*), regularly occur in the GOM and are listed as endangered under the ESA. On January 8, 2016 (81 FR 999), the United States Fish and Wildlife Service (FWS) issued a proposed rule and notice to reclassify the West Indian manatee from endangered to threatened (*Federal Register*, 2016a) which was later issued as a Final Rule (82 FR 16668) on April 5, 2017 (*Federal Register*, 2017). On December 2, 1970, in the Final Rule (35 FR 18319), the sperm whale was listed as endangered throughout its range. The Final Rule (84 FR 15446) to list the GOM Bryde's whale as endangered was issued and became effective on May 15, 2019 (*Federal Register*, 2019). The only commonly occurring baleen whale in the northern GOM is the Bryde's whale. Most sightings have been made in the De Soto Canyon region and off western Florida, although there have been some in the west-central portion of the northeastern GOM. The best estimate of abundance for Bryde's whales in the northern GOM is 33 individuals, which is the last estimate from a 2009 survey (Hayes et al., 2018 and 2020). Sperm whales in the GOM are not evenly distributed, showing greater densities in areas associated with oceanic features that provide the best foraging opportunities (USDOC, NMFS, 2020a).

Non-ESA-Listed Marine Mammal Species

Nineteen toothed cetaceans (including beaked whales and dolphins) regularly occur in the GOM but are not ESA-listed. Despite being non-listed, the Marine Mammal Protection Act (MMPA) of 1972 protects all marine mammals.

Unusual Mortality Events (UME)

An UME is defined under the Marine Mammal Protection Act as a "stranding that is unexpected, involves a significant die-off of any marine mammal population, and demands immediate response." A list of active and closed UMEs with updated information can be found at the following website: https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events.

2018-2020 Southwest Florida Bottlenose Dolphin UME (UME 66)

Since July 2018, the 2018-2019 Southwest Florida Bottlenose Dolphin UME was issued because of elevated bottlenose dolphin mortalities. Southwest Florida has been experiencing an ongoing severe bloom of a red tide organism since November 2017. The results from several necropsies showed positive findings of red tide toxin (brevetoxin) indicating this UME is related to the bloom. Other species such as fish, sea turtles, and manatees have also been impacted by the algal bloom (USDOC, NMFS, 2020c).

3.5.2. Impact Analysis

A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed activities on marine mammals can be found in Chapters 4.9 of the Multisale EIS and 2018 SEIS, and is incorporated by reference. The IPFs with the proposed activities in Ewing Bank Block 877 that could affect marine mammals include: (1) vessel noise and collisions; (2) marine debris; (3) water-quality degradation from drilling rig effluents; (4) oil spills and spill-response activities; and (5) drilling noise.

3.5.2.1. Alternative 1

If selected, Alternative 1, the No Action Alternative, would result in the operator not undertaking the proposed activities as described in the plan. Therefore, the site-specific IPFs to marine mammals 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 decision) related to the OCS activities would not increase. The No Action alternative would not significantly change the environmental impacts of overall OCS oil and gas related activity as described in the Multisale EIS, 2018 SEIS, 2018 FWS BO, and NMFS 2020 BO and routine, accidental, and cumulative impacts would still occur from other activities.

3.5.2.2. Alternative 2

If selected, Alternative 2, the Proposed Action as Submitted with additional conditions of approval as required under the 2020 BO, would result in the operator undertaking the proposed activities as requested and conditioned in the plan and required as part of lease stipulations. The operator is required to adhere with the mitigation and monitoring measures provided in the Reasonable and Prudent Measures and implementing Terms and conditions in the 2020 BO and protocols found under Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols; Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols; and Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols. Compliance with the Reasonable and Prudent Measures and implementing Terms and conditions in the 2020 BO and protocols found in the Appendices should negate or lessen the chance of significant impacts to marine mammals under this alternative.

Routine Operations

Vessel Traffic

The proposed activities are expected to require several roundtrip supply-vessel and crew-vessel trips per week. Slow-moving cetaceans or those that spend extended periods of time at the surface might be expected to be the most vulnerable (Vanderlaan and Taggert, 2007). Smaller delphinids often approach vessels that are in transit to bow-ride; however, vessel strikes are less common for these faster moving mammals or are underreported (Wells and Scott, 1997). Florida manatees are commonly found in shallow coastal waters of Florida, but they have been found along the entire northern GOM from Florida to Texas (Fertl et al., 2005), though some recent deepwater sightings have occurred. Vessel strikes are the most common cause of human-induced mortality for manatees (State of Florida, Fish and Wildlife Conservation Commission, 2020), and most manatees bear prop scars from contact with vessels. The vast majority of strikes to manatees result from recreational and fishing vessels, not those related to oil and gas activities.

Worldwide, most vessel strikes of large whales occur when vessels are traveling at speeds greater than approximately 10 knots (Conn and Silber, 2013; Jensen and Silber, 2004; Laist et al., 2001; Vanderlaan and Taggart, 2007). If a vessel strike occurs, the animal may experience no injuries, minor non-serious injuries, serious injuries, or death, which largely depends on the size and speed of the vessel (NMFS, 2020a). Both Gulf of Mexico Bryde's whale and sperm whales are vulnerable to vessel strikes. One confirmed vessel strike to a GOM Bryde's whale occurred in 2009. While there are no known recent vessel strikes to sperm whales, one possible lethal strike occurred in 1990 and a non-lethal strike in 2005. Additionally, a sperm whale is believed to have been struck by a U.S. Navy vessel in 2001 (USDOC, NMFS, 2020a).

The lack of response by sperm whales to oncoming vessels suggest the whales may not hear or see ships approaching or the whales are habituated to the high level of vessel operation activity in the GOM. The Bryde's whale spends much of its' time within 15 m of the water surface and at night on the surface, which makes it more likely to be struck by a vessel. With the Bryde's whale vessel strike mitigation measures required by the 2020 BO in place and as proposed under Alternative 2, NMFS estimated an annual rate of zero lethal Bryde's whale vessel strikes per year from oil and gas vessels traffic greater than 10 knots (USDOC, NMFS, 2020a).The proposed activities are located outside of the area where the Bryde's whale is likely to be present. The operator has not proposed any service vessels or vessel traffic within the Bryde's whale habitat area. Under Alternative 2, the operator is required to notify BOEM 15 days prior to any vessel transit within the Bryde's whale area; approval from BOEM is required prior to any vessel transit changes.

In their 2020 BO, NMFS estimated an annual rate of 0.10 vessel strikes likely to result in no or minor injuries to sperm whales per year from oil and gas activities (USDOC, NMFS, 2020a).

By selecting Alternative 2, the operator is required to follow mitigation and monitoring measures in Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols outlined in the 2020 BO. With these mitigation and monitoring measures in place, the impacts to the sperm whales, the Bryde's whale, and other marine mammals is determined to be **minor**.

Noise

Marine mammals, including the Bryde's whale and sperm whales, use sound in their environmental to detect prey, predators, and habitat types, as well as navigation and communication. Constant sounds in the environmental can mask an animal's ability to communicate and hear important sounds within their environment (USDOC, NMFS, 2020a). In general, acute injury, or Permanent Threshold Shift (PTS), and disturbance would occur with the animal in close proximity to the sound. Temporary Threshold Shift (TTS) are short durations of auditory impairment that is usually recoverable within days or hours (USDOC, NMFS, 2020a).

The NMFS sets the 180-dB root-mean-squared (rms) isopleth where on-set of auditory injury or mortality (level A harassment) to cetaceans may occur. Southall et al. (2007) suggests this level should rather be at 230 dB rms for a nonpulsed sound, such as drilling noise. The source levels from drilling are relatively low (154 dB and below, as cited by Greene, 1986 in Richardson et al., 1995), below the level B (behavioral) harassment threshold of 160 dB set by NMFS under the MMPA. According to Southall et al. (2007), for behavioral responses to nonpulses (such as drill noise), data indicate considerable variability in received levels associated with behavioral responses. Contextual variables (such as novelty of the sound to the marine mammal and operation features of the sound source) appear to have been at least as important as exposure level in predicting response type and magnitude. While there are some data from the Arctic on baleen whales, there is little information on the behavioral responses by marine mammals to drilling noise in the GOM. Southall et al. (2007) summarized the existing research, stating that the probability of avoidance and other behavioral effects increases when received levels increase from 120 to 160 dB. Marine mammals may exhibit some avoidance behaviors, but their behavioral or physiological responses to noise associated with the proposed project are unlikely to have population-level impacts in the northern GOM.

Vessel Noise

Vessel noise can have acute effects such as short-term behavioral and stress response. The nature of behavioral response cetaceans exhibit to vessels may depend on vessel speed, size, and distance from the animal, as well as the number and frequency of vessel encounters (USDOC, NMFS, 2020a). The dominant source of vessel sound from the proposed action is propeller cavitation, although other ancillary sounds may be produced. The intensity of sound from vessels is related to size and speed. Large ships tend to be noisier than small ones and ships underway with a full load or towing/pushing produce more sound than unladen vessels (USDOC, NMFS, 2020a). Noise from service-vessel traffic may elicit a startle and/or avoidance reaction from whales and dolphins or mask their sound reception. Vessel noise from the proposed action will produce low levels of noise, generally in the 150 to 170 dB re 1 µPa-m at frequencies below 1,000 Hz. Vessel noise is transitory and generally does not propagate at great distances from the vessel. The NMFS 2020 BO concluded that the effects of vessel noise to sperm whales are not likely to adversely affect the species and Bryde's whales are likely to be adversely affected from vessel noise (USDOC, NMFS, 2020a). The behavioral disruptions potentially caused by noise and the presence of service-vessel traffic will have **negligible** effects on cetacean populations in the northern GOM.

Aircraft Noise

The noise and the shadow from helicopter overflights, take-offs, and landings can cause a startle response and can interrupt whales and dolphins while resting, feeding, breeding, or migrating (Richardson et al., 1995). The Federal Aviation Administration's Advisory Circular 91-36D (September 17, 2004) encourages pilots to maintain higher than minimum altitudes over noise-sensitive areas. Guidelines and regulations put in place by NOAA Fisheries under the authority of the MMPA include provisions specifying that helicopter pilots maintain an altitude of 1,000 ft (305 m) within 300 ft (91 m) of marine mammals. The proposed action is expected to have helicopter support with multiple transits between the MODU and/or platform, and airbase. The duration of the effects resulting from a startle response is expected to be short-term during routine flights, and the potential effects will be insignificant and not likely to adversely affect sperm and Bryde's whales (USDOC, NMFS, 2020a). Since these occurrences would be temporary and pass within seconds, marine mammals are not expected to be adversely affected by routine helicopter traffic operating at prescribed altitudes and impacts are considered **negligible**.

Drilling and Production Noise

Offshore drilling and production involves a variety of activities that produce underwater sounds at intensities and frequencies that can be heard by cetaceans. The sound sources from fixed or stationary production platforms are localized and are not expected to produce sound levels over great distances. Noise from drilling could be continuous or intermittent, sudden, and at times high intensity as operations take place. Sounds emanating from drilling activities from fixed platforms are considered not very intense and generally are at very low frequencies near five Hz (USDOC, NMFS, 2020a). Gales (1982) reported received levels of 119 to 127 dB re 1 μPa-m at near-field measurements, while other measurements have recorded higher levels of sound up to 185 dB (rms) from platforms or 195 dB (rms) from drill ships. The estimated frequencies of drilling from semisubmersible vessels are broadband from 80-4,000 Hz with an estimated source level (SL) of 154 dB re 1μPa at 1 m. The tone of 60 Hz were SLs of 149 dB, 181 Hz were 137 dB, and 301 Hz were 136 dB (Greene, 1986). Drillships show somewhat higher sound levels as a result of mechanical sounds generated through the drillship hull and by the use of thrusters to maintain position while drilling. Sounds from semisubmersible platforms also show rather low sound source levels. In general, the sounds associated with offshore oil and gas exploration and production are generally at low levels and typically at very low frequencies (~4.5 to 38 Hz) (Gales, 1982).

Casing Conductor (Drive Pipe) Installation

Due to the frequency of exploratory and development drilling operations on the OCS, the greatest number of pile-driving operations involve the setting or installation of casing conductors. Most casing conductors range in diameter from 12-36 inches and have wall thicknesses that run from 0.25-0.75 inches. These are generally driven into the substrate until the conductor "meets refusal" or cannot be driven further without damage. Conductor casings can also be jetted into the sea bed; however, the ease of mobilization of hammer drivers coupled with their speed of penetration, minimizes the use of jetting equipment, which requires more time to deploy and is often unviable due to water depth and sediment type. Most casing conductor driving operations occur in water depths less than 200 m (656 ft).

Dynamically Positioned Vessels

The potential effects that water-transmitted noise has on marine mammals include disturbance (subtle changes in behavior, interruption of previous activities, or short- or long-term displacement), masking of sounds (calls from conspecifics, reverberations from own calls, and other natural sounds such as surf or predators), physiological stress, and hearing impairment. Individual marine mammals exposed to recurring disturbance could be negatively affected. The temporary and transient noise associated with drilling and production is not expected to produce more than negligible to minor impacts on marine mammals since they are not expected in amplitudes sufficient to cause hearing behavioral effects and due to the wide-ranging behavior of marine mammal species. NMFS determined stationary and localized effects of platform-associated sounds, sperm whale encounters near platforms would be very brief as they swim by, and the potential effects of these sounds to disturb sperm whales will be insignificant. Construction and operation sounds other than pile driving will have insignificant effects on Bryde's whales.

Marine Debris

Marine debris has the potential to adversely affect marine mammals through ingestion and entanglement. These effects could result in reduced feeding, reduced reproductive success, and potential injury, infection, or death. NMFS concluded marine debris is likely to adversely affect sperm and Bryde's whales. Implementation of Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols and the International Convention for the Prevention of Pollution form Ships (MARPOL) requirements under the United States Coast Guard (USCG) may reduce, but not eliminate the risk of marine debris (USDOC, NMFS, 2020a). Without implementation of mitigations, marine mammals would be more vulnerable to direct impacts from entanglement in or ingestion of OCS marine debris. The impacts from OCS marine debris with implementation of mitigations are expected to be **negligible**.

Water Degradation

Waste streams generated by the drilling process include drilling fluids, drill cuttings, produced water, and deck drainage. The platform also contributes sanitary and domestic wastes. During production, there are additional waste streams including produced sand and well treatment, workover, and completion fluids. Further minor discharges include releases from desalination units, blowout preventer fluids, boiler blowdown, and excess cement slurry.

The USEPA regulates discharges from oil and gas operations to offshore marine waters in the Gulf of Mexico through NPDES general permits. Discharges of produced water, drilling fluids, drill cuttings, and chemically treated miscellaneous discharges under the NPDES general permit will be required to meet the whole effluent toxicity requirements. NMFS determined because of USEPA regulation, most of the routinely discharged chemicals are not expected to result in exposure intensities that would adversely affect listed species because they are diluted and dispersed when released in marine waters. Without implementation of discharge requirements under the NPDES permit, marine mammals would be more vulnerable to direct impacts from degraded water quality; therefore, potential impacts to marine mammals from water quality impacts are expected to be **negligible**.

Accidental Events

Oil Spills and Response Activities

BOEM defines a very large spill, as any spill volume greater than or equal to 10,000 bbl, and provided NMFS with information projecting that two oil spills greater than or equal to 10,000 bbl may occur over the duration of 10 years (through 2029); however, a defined an upper volume for such a spill size can not be predicted. BOEM "does not consider an extremely large event as reasonably certain to occur" over the time frame of the 2020 BO, although BOEM does acknowledge that impacts from the *Deepwater Horizon* spill warranted inclusion in NMFS 2020 consultation and BO as part of the environmental baseline.

The oil from an oil spill can adversely affect cetaceans by causing soft tissue irritation, fouling of baleen plates, respiratory stress from inhalation of toxic fumes, food reduction or contamination, direct ingestion of oil and/or tar, and temporary displacement from preferred habitats. The long-term impacts to marine mammal populations are poorly understood but could include decreased survival and lowered reproductive success. The range of toxicity and degree of sensitivity to oil hydrocarbons and the effects of cleanup activities on cetaceans are unknown. One notion concerning the use of dispersants is that chemical dispersion of oil will considerably reduce the impacts to aquatic mammals, primarily by reducing their exposure to petroleum hydrocarbons (French-McCay 2004; NRC, 2005). Dispersants are chemicals that reduce surface tension between oil and water, leading to oil droplet formation, so that the oil will more readily disperse into the water column. Dispersants typically contain surfactants and solvents and are used to entrain oil in the water column so as to protect shorelines from floating oil, but in turn, increases exposure to underwater organisms (USDOC, NMFS, 2020a). Chemical dispersant application during an oil spill may lower the amount of oil to which an aquatic mammal is exposed while increasing the potential loss of the insulative properties of fur through the reduction of surface tension at the fur-water interface (NRC, 2005).

Impacts from the dispersants are unknown but dispersants may contain ingredients that are known to irritate sensitive tissues of marine mammals (NRC, 2005). There have been no experimental studies and only a handful of observations suggesting that oil has harmed any manatees (St. Aubin and Lounsbury, 1990). Types of impacts to manatees from contact with oil include: (1) asphyxiation due to inhalation of hydrocarbons; (2) acute poisoning due to contact with fresh oil; (3) lowering of tolerance to other stressors due to the incorporation of sublethal amounts of petroleum components into body tissues; (4) nutritional stress through damage to food sources; and (5) inflammation or infection and difficulty eating due to oil sticking to the sensory hairs around their mouths (Preen, 1989, in Sadiq and McCain, 1993, AMSA, 2003). For a population whose environment is already under great pressure, even a localized incident could be population level (St. Aubin and Lounsbury, 1990). Spilled oil might affect the quality or availability of aquatic vegetation, including seagrasses, upon which manatees feed.

In the event of catastrophic spill similar to the *Deepwater Horizon* spill, the "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c) discusses the most likely and most significant impacts to marine mammals as it relates to the four phases of a major spill/blowout:

1) **Initial Event** (Section 2.2.2.3.; Page B-6);
2) **Offshore Spill** (Section 3.2.2.3; Page B-18);
3) **Onshore Contact** (Section 4.2.2.3; Page B-32); and
4) **Post-Spill, Long-Term Recovery** (Section 5.2.2.3; Page B-41).

More detailed information can be found in the Multisale EIS and 2018 SEIS.

Conclusion

The sections above discuss the potential range of effects to marine mammals from the proposed activity and any of these effects has the potential individually or cumulatively to result in impacts to marine mammal species commonly found in the GOM and proposed action area. However, BOEM finds that the potential for such effects from the proposed action are unlikely to rise to significant levels for the following reasons:

- Mysticetes, as low-frequency hearing specialists, are the species groups most likely to be susceptible to impacts from nonpulse sound (intermittent or continuous) given that their hearing ranges overlap most closely with the noise frequencies produced from drilling (Southall et al., 2007). However, most mysticete species that may occur in the GOM (i.e., North Atlantic right, blue, fin, sei, humpback, and minke) are considered either "extralimital," "rare," or "uncommon" within the GOM (Wursig et al., 2000; Hayes et al., 2019). The only commonly occurring baleen whale in the northern GOM is the Bryde's whale which is limited in its range. Given the small geographic scope of the proposed action, the presence of these species within the action area is not anticipated.
- The remaining marine mammal species in the GOM are considered either mid-frequency hearing specialists (e.g., sperm whales, beaked whales, and dolphins) with hearing ranges that slightly overlap with sound frequencies produced from drilling noise (Southall et al., 2007), or high-frequency specialists (pygmy and dwarf sperm whales). It is expected that there will be some overlap in the frequencies of the drill source and the hearing thresholds of the marine mammals present in the GOM. Wartzok and Ketten (1999) stated that bottlenose dolphins have hearing thresholds ranging from less than 5 kHz to over 100 kHz. Ridgway and Carder (2001) found, through auditory brainstem analysis, that pygmy sperm whales have thresholds from 90 to 150 kHz. Gordon et al. (1996) found that a stranded sperm whale had lower hearing limits at around 100 Hz while Ridgway and Carder (2001) found that a sperm whale calf had best hearing sensitivity between 5 and 20 kHz. Since there is some overlap in drilling and vessel sound levels produced and hearing thresholds of marine mammals, there is potential for the drilling noise produced to cause auditory and non-auditory effects, PTS, TTS, behavioral changes, or masking but it is expected to be limited.
- The estimated source levels of drilling from semisubmersible vessels (Greene, 1986) all fall below the 180 dB Level A harassment isopleths.
- The operator proposes adherence with the guidance provided under the NMFS 2020 BO Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols, which appreciably reduces the likelihood of marine mammals encountering marine debris from the proposed activity.

The geographic scope of the proposed action is small in relation to the ranges of marine mammals in the GOM. The proposed activities are not expected to cause long-term or permanent displacement of the animals from preferred habitats, nor will they result in the destruction or adverse modification of any habitats. In conclusion, because of the scope, timing, and transitory nature of the proposed action and the condition(s) of approval and monitoring requirements in place, the noise related to the proposed drilling operation is not expected to result in PTS, TTS, behavioral change, masking, or non-auditory effects to marine mammals in the GOM that would rise to the population level.

Cumulative Impact Analysis

The proposed action may cumulatively affect cetaceans when viewed in light of the *Deepwater Horizon* explosion, spill, and response. Oil and gas leasing, exploration, development and production activities could impact marine mammals from the degradation of water quality resulting from operational discharges; vessel traffic; noise generated by platforms, drilling rigs, helicopters, and vessels; seismic surveys; explosive structure removals; oil spills; oil-spill-response activities; and loss of debris from service vessels and OCS structures. The cumulative impact on marine mammals is expected to result in a number of

chronic and sporadic sublethal effects (i.e., behavioral effects and nonfatal exposure to or intake of OCS-related contaminants or discarded debris) that may stress and/or weaken individuals of a local group or population and predispose them to infection from natural or anthropogenic sources (Harvey and Dahlheim, 1994).

Few deaths are expected from chance vessel collisions and ingestion of plastic material. Disturbance (noise from vessel traffic and drilling operations, etc.) and/or exposure to sublethal levels of toxins and anthropogenic contaminants may stress animals, weaken their immune systems, and make them more vulnerable to parasites and diseases that normally would not be fatal (Harvey and Dahlheim, 1994). The net result of any disturbance will depend upon the size and percentage of the population likely to be affected, the ecological importance of the disturbed area, the environmental and biological parameters that influence an animal's sensitivity to disturbance and stress, and the accommodation time in response to prolonged disturbance (Geraci and St. Aubin, 1980).

The effects of the proposed action, when viewed in light of the effects associated with other relevant activities, may impact marine mammals in the GOM. However, the operator is required to follow all existing lease stipulations, regulations, NTLs, and mitigation and monitoring measures provided in the 2020 BO under Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols; Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols; Appendix E: Summary of Oil Industry Discharges to the OCS Authorized by USEPA General NPDES Permits; and Appendix H: Cetacean and Sea Turtle Wildlife Response Guidance for the Gulf of Mexico. Because of the operator's reaffirmed compliance regulatory requirments, as well as the limited scope, timing, and geographic extent of the proposed action, effects from the proposed activities on marine mammals will be **negligible**. Therefore, no population level cumulative impacts to marine mammals would be expected as a result of the proposed activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area as well as other activities in the area. More detailed information can be found in the Multisale EIS and 2018 SEIS.

3.6. SEA TURTLES

3.6.1. Affected Environment

The life history, population dynamics, status, distribution, behavior, and habitat use of sea turtles can be found in Chapter 4.9 of the Multisale EIS and 2018 SEIS, and is incorporated by reference. Of the extant species of sea turtles, five are known to inhabit the waters of the GOM (Pritchard, 1997): the leatherback, green, hawksbill, Kemp's ridley, and loggerhead. These five species are all highly migratory, and individual animals will migrate into nearshore waters as well as other areas of the North Atlantic Ocean, GOM, and Caribbean Sea. All five species of sea turtles found in the GOM have been federally listed as endangered or threatened since the 1970's. Critical habitat has been designated for the Northwest Atlantic Ocean Loggerhead sea turtle population segment (DPS) in the GOM (*Federal Register*, 2014).

In 2007, FWS and NMFS published 5-year status reviews for all federally listed sea turtles in the GOM (USDOC, NMFS and USDOI, FWS, 2007a-e). A 5-year review is an ESA-mandated process that is conducted to ensure that the listing classification of a species as either threatened or endangered is still accurate. As of 2013, two 5-year reviews have been updated for the Leatherback and Hawksbill sea turtles (USDOC, NMFS and USDOI, FWS, 2013a and b). Both agencies share jurisdiction for federally listed sea turtles and jointly conducted the reviews. After reviewing the best scientific and commercially available information and data, agencies determined that the current listing classification for the five sea turtle species remain unchanged.

3.6.2. Impact Analysis

A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed exploration activities on sea turtles can be found in Chapter 4.9 of the Multisale EIS and 2018 SEIS, and is incorporated by reference. The diversity of a sea turtle's life history leaves it susceptible to many natural and human impacts, including impacts while it is on land, in the benthic environment, and in the pelagic environment. The IPFs associated with the proposed activities in Ewing Bank Block 877 that could affect sea turtles include: (1) vessel noise and collisions; (2) marine debris; (3) water-quality degradation from drilling rig effluents; (4) oil spills and spill-response activities; and (5) drilling noise.

3.6.2.1. Alternative 1

If selected, Alternative 1, the No Action Alternative, would result in the operator not undertaking the proposed activities as described in the plan. Therefore, the site specific IPFs to sea turtles 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 decision) related to the OCS activities would not increase. The No Action Alternative would not significantly change the environmental impacts of overall OCS oil and gas related activity as described in the Multisale EIS and 2018 SEIS and routine, accidental, and cumulative impacts would still occur from other activities.

3.6.2.2. Alternative 2

If selected, Alternative 2, the Proposed Action as Submitted with additional conditions of approval as required under the NMFS 2020 BO, would result in the operator undertaking the proposed activities as requested and conditioned in the plan and required as part of lease stipulations. The operator is required to adhere with the mitigation and monitoring measures provided in the NMFS 2020 BO under Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols; Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols; and Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols. Compliance with the regulations as clarified in the NMFS 2020 BO should negate or lessen the chance of significant impacts to sea turtles under this alternative (USDOC, NMFS, 2020a).

Routine Operations

Vessel Noise and Collisions

The first IPF associated with the proposed action that could affect ESA-listed sea turtles is impacts from vessel noise and vessel collisions. The dominant source of noise from vessels is propeller operation, and the intensity of this noise is largely related to ship size and speed. Vessel noise from the proposed action would produce low levels of noise, generally in the 150 to 170 dB re 1 µPa-m at frequencies below 1,000 Hz. Vessel noise is transitory and generally does not propagate at great distances from the vessel. Also, available information indicates that sea turtles do not greatly utilize environmental sound. As a result, the NMFS 2007 Biological Opinion concluded that effects to sea turtles from vessel noise are discountable (USDOC, NMFS, 2007). The NMFS 2020 BO similarly concluded that sound sources associated with vessel movement were not likely to adversely affect sea turtles (USDOC, NMFS 2020a).

Drilling activities would produce sounds transmitted into the water that could be intermittent, sudden, and at times could be high intensity as operations take place. However, sea turtles are not expected to be impacted by this disturbance because the NMFS in their 2007 Biological Opinion determined that "drilling is not expected to produce amplitudes sufficient to cause hearing or behavioral effects to sea turtles or sperm whales; therefore, these effects are insignificant."

Popper et al. (2014) published sound exposure guidelines for fishes and sea turtles. The guidelines were broad-ranging and provided non-quantified, generalized guidelines for shipping noise as a low risk of impairment, unless the turtle is in the near field range (within tens of meters), which would pose a moderate risk of TTS that can recover over time. The risk for noise to cause masking and behavior effects range from low to high depending on the location of the turtle relative to the noise (Popper et al., 2014).

Sea turtles spend at least 3-6 percent of their time at the surface for respiration and perhaps as much as 26 percent of time at the surface for basking, feeding, orientation, and mating (Lutcavage et al., 1997). Based on the behavioral observations of turtle avoidance of small vessels, green turtles may be susceptible to vessel strikes at speeds as low as two knots (Hazel et al. 2007). Although there have been hundreds of thousands of vessel trips that have been made in support of offshore operations during the past 40 years of OCS oil and gas operations, there have been no reports of OCS-related vessels having struck sea turtles. This is most likely because a strike with a turtle would probably go undetected by larger vessels and strikes are not reported. Despite the lack of on-water reporting, stranding records show that interactions between vessels and sea turtles in the GOM are quite common (USDOC, NMFS, 2020a). Data show that collisions with all types of commercial and recreational vessels are a cause of sea turtle mortality in the GOM (Lutcavage et al., 1997). Stranding data for the U.S. Gulf and Atlantic Coasts, Puerto Rico, and the U.S.

Virgin Islands show that between 1986 and 1993 about 9 percent of living and dead stranded sea turtles had boat strike injuries (Lutcavage et al., 1997). Vessel-related injuries were noted in 13 percent of stranded turtles examined from the GOM and the Atlantic during 1993 (Teas, 1994), but this figure includes those that may have been struck by boats post-mortem. Large numbers of loggerheads and 5-50 Kemp's ridley turtles are estimated to be killed by vessel traffic per year in the U.S. (NRC, 1990; Lutcavage et al., 1997).

There have been no known documented sea turtle collisions with drilling and service vessels in the GOM; however, collisions with small or submerged sea turtles may go undetected. Based on sea turtle density estimates in the GOM, the encounter rates between sea turtles and vessels would be expected to be greater in water depths less than 200 m (USDOC, NMFS, 2007). Additionally, recent satellite tracking studies have provided data to support that larger turtles often remain closer to shore to feed, nest and/or migrate; for loggerheads (Hart et al., 2013 and 2014) and Kemp's ridleys (Shaver et al., 2014). By selecting Alternative 2, the operator is required to follow mitigation and monitoring measures in Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols outlined in the NMFS 2020 BO. With these mitigation and monitoring measures in place, the impacts to sea turtles is determined to be **minor**.

With implementation of these measures and the avoidance of potential strikes from OCS vessels, the NMFS 2020 BO concluded that the risk of collisions between oil/gas-related vessels (including those for geological and geophysical [G&G], drilling, production, decommissioning, and transport) and sea turtles is appreciably reduced, but strikes may still occur. BOEM monitors for any takes that have occurred as a result of vessel strikes and also requires that any operator immediately report the striking of any animal.

To date, there have been no known or reported strikes of sea turtles by drilling vessels. Given the scope, timing, and transitory nature of the proposed action and with this established condition(s) of approval, effects to sea turtles from drilling vessel collisions is expected to be **negligible**.

Marine Debris

Many types of plastic materials end up as solid waste during drilling and production operations. Some of this material is accidentally lost overboard where sea turtles could consume it or become entangled in it. The incidental ingestion of marine debris and entanglement could adversely affect sea turtles. Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g. tar balls, plastic bags/pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the pelagic environment (i.e., leatherbacks, juvenile loggerheads, and juvenile green turtles) (USDOC, NMFS, 2020a). Implementation of Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols and the International Convention for the Prevention of Pollution form Ships (MARPOL) requirements under the United States Coast Guard (USCG) may reduce, but not eliminate the risk of marine debris (USDOC, NMFS, 2020a). Without implementation of mitigations, sea turtles would be more vulnerable to direct impacts from entanglement in or ingestion of OCS marine debris. The impacts from OCS marine debris with implementation of mitigations are expected to be **negligible**.

Water Degradation

Most operational discharges are diluted and dispersed when released in offshore areas and are considered to have sublethal effects (NRC, 1983; API, 1989; Kennicutt, 1995; Kennicutt et al., 1996). Any potential impacts from drilling fluids would be indirect, either as a result of impacts to prey species or possibly through ingestion via the food chain (Neff et al., 1989). The USEPA regulates discharges from oil and gas operations to offshore marine waters in the GOM through NPDES general permits. Discharges of produced water, drilling fluids, drill cuttings, and chemically treated miscellaneous discharges under the NPDES general permit will be required to meet the whole effluent toxicity requirements. NMFS determined that because of USEPA regulation, most of the routinely discharged chemicals are not expected to result in exposure intensities that would adversely affect listed species being that they are diluted and dispersed when released in marine waters. Without implementation of discharge requirements under the NPDES permit, sea turtles would be more vulnerable to direct impacts from degraded water quality. Impacts from water degradation are expected to be negligible due to the localized nature of the proposed activity and the wide-ranging habits of sea turtle species in the GOM.

Accidental Events

Oil Spills and Response Activities

The oil from an oil spill can adversely affect sea turtles by causing soft tissue irritation, respiratory stress from inhalation of toxic fumes, food reduction or contamination, direct ingestion of oil and/or tar, and temporary displacement from preferred habitats (Lutz and Lutcavage, 1989). The long-term impacts to sea turtle populations are poorly understood but could include decreased survival and lowered reproductive success. The range of toxicity and degree of sensitivity to oil hydrocarbons and the effects of cleanup activities on sea turtles are unknown. Impacts from the dispersants are unknown, but may have similar irritants to tissues and sensitive membranes as they are known to have had on seabirds and marine mammals (NRC, 2005).

In the event of a catastrophic spill similar to the *Deepwater Horizon* spill, the "Catastrophic Spill Event Analysis" white paper (USDOI, BOEM, 2017c) discusses the most likely and most significant impacts to sea turtles as it relates to the four phases of a major spill/blowout:

1) **Initial Event** (Section 2.2.2.4.; Page B-7);
2) **Offshore Spill** (Section 3.2.2.4; Page B-19);
3) **Onshore Contact** (Section 4.2.2.4; Page B-33); and
4) **Post-Spill, Long-Term Recovery** (Section 5.2.2.4; Page B-41).

In the event of a catastrophic spill similar to the *Deepwater Horizon* spill, any substantive impact to sea turtles is very unlikely because the potential impacts from a catastrophic spill would be similar to the aforementioned routine and accidental issues. However, despite the *Deepwater Horizon* spill, historical trends in the GOM (see **Chapter 1.4**) indicate that catastrophic spill events are not likely to occur as a result of the activities associated with the proposed action.

Cumulative Impact Analysis

Activities considered under the cumulative scenario, including the proposed action, may affect sea turtles. Sea turtles may be impacted by oil and gas leasing, exploration, development and production activities including the degradation of water quality resulting from operational discharges, vessel traffic, noise generated by platforms, drilling rigs, helicopters and vessels, seismic surveys, explosive structure removals, oil spills, oil-spill-response activities, loss of debris from service vessels and OCS structures, commercial fishing, capture and removal, and pathogens. The cumulative impact of these ongoing OCS activities on sea turtles is expected to result in a number of chronic and sporadic sublethal effects (i.e., behavioral effects and nonfatal exposure to or intake of OCS-related contaminants or discarded debris) that may stress and/or weaken individuals of a local group or population and that may predispose them to infection from natural or anthropogenic sources.

Few deaths are expected from chance collisions with OCS service vessels, ingestion of plastic material, commercial fishing, and pathogens. Disturbance (noise from vessel traffic and drilling operations, etc.) and/or exposure to sublethal levels of toxins and anthropogenic contaminants may stress animals, weaken their immune systems, and make them more vulnerable to parasites and diseases that normally would not be fatal during their life cycle. The net result of any disturbance depends upon the size and percentage of the population likely to be affected, the ecological importance of the disturbed area, the environmental and biological parameters that influence an animal's sensitivity to disturbance and stress, or the accommodation time in response to prolonged disturbance (Geraci and St. Aubin, 1980). As discussed above, lease stipulations and regulations are in place to reduce vessel strike mortalities.

Incremental injury effects from the proposed action on sea turtles are expected to be **negligible** for drilling and vessel noise and **minor** for vessel collisions, but will not rise to the level of significance because of the limited scope, duration, and geographic area of the proposed drilling and vessel activities and the relevant regulatory requirements.

The effects of the proposed action, when viewed in light of the effects associated with other relevant activities, may affect sea turtles occurring in the GOM. With the enforcement of regulatory requirements for drilling and vessel operations and the scope of the proposed action, incremental effects from the

proposed activities on sea turtles will be **negligible** (drilling and vessel noise) to **minor** (vessel strikes). The best available scientific information indicates that sea turtles do not greatly use sound in the environment for survival; therefore, disruptions in environmental sound would have little effect. Consequently, no significant cumulative impacts would be expected from the proposed activities or as the result of past, present or reasonably foreseeable oil and gas leasing, exploration, development and production in the GOM.

Conclusion

The sections above discuss the potential range of effects to sea turtles from the proposed action, including: (1) vessel noise and collisions; (2) marine debris; (3) water-quality degradation from drilling rig effluents; (4) oil spills and spill-response activities; and (5) drilling noise. The potential effects of the proposed activity on sea turtles will not rise to the level of significance for the following reasons:

- The best available scientific information indicates that sea turtles do not greatly use sound in the environment for survival; therefore, disruptions in environmental sound would have little effect.
- The scope, timing, and transitory nature of the proposed action will produce limited amounts of drilling noise in the environment. As described, effects of vessel noise on sea turtles are considered "discountable" (USDOC, NMFS, 2020a).
- Implementation of Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols and the International Convention for the Prevention of Pollution form Ships (MARPOL) requirements under the United States Coast Guard (USCG), appreciably reduces the likelihood of sea turtles encountering marine debris from the proposed activity.

The risk of collisions between sea turtles and vessels associated with the proposed action exists but would not rise to the level of significance given:

- Under 30 CFR § 550.282, as clarified by mitigation and monitoring measures in Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols outlined in the NMFS 2020 BO , BOEM provides guidelines for the monitoring programs designed to minimize the risk of vessel strikes to sea turtles and other protected species and the reporting of any observations of injured or dead protected species.
- The NMFS 2020 BO determined that monitoring measures should appreciably reduce the potential for vessel strikes. The NMFS issued an Incidental Take Statement on sea turtle species; the Statement contains reasonable and prudent measures (RPMs) with implementing terms and conditions to help minimize take. As the operator has indicated that the vessel strike avoidance guidance (Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols) will be followed, there should be appreciably reduced numbers of sea turtles that may be incidentally taken from routine offshore vessel operations; however, the available information on the relationship between these species and OCS oil and gas activities indicates that sea turtles may be killed or injured by vessel strikes. Therefore, pursuant to Section 7(b)(4) of the ESA, NMFS anticipates incidental take and granted a limited number of Incidental Take Authorizations to BOEM for sea turtle mortalities by vessel strikes. BOEM continues to monitor for any strikes to ensure this authority is not exceeded and to date, none have been reported.The scope, timing, and transitory nature of the proposed action will result in limited opportunity for vessel strikes to sea turtles during operations.

3.7. Fish Resources and Essential Fish Habitat

3.7.1. Affected Environment

A detailed description of the Fish Resources and Essential Fish Habitat (EFH) of the GOM may be found in Chapter 4.7 of the Multisale EIS and 2018 SEIS, and is incorporated by reference into this SEA. The following section provides a summary of the information found in the Multisale EIS and 2018 SEIS.

The NMFS 2020 BO identified the following Federally listed threatened fish species in the GOM: the Gulf sturgeon, the oceanic whitetip shark and the giant manta ray. The Gulf sturgeon (*Acipenser oxyrinchus*

oxyrinchus) was listed as threatened October 30, 1991 (56 CFR §49653, September 30, 1991). The oceanic whitetip shark (*Carcharhinus longimanus*) was listed as threatened January 30, 2018 under the ESA (83 FR 4153). The giant manta ray (*Manta birostris*) was listed as threatened January 22, 2018 under the ESA (83 FR 2916). A detailed description of the Gulf sturgeon and critical habitat, and oceanic white tip shark and giant manta ray may be found in Sections 6.2.11 to 6.2.14 of the NMFS 2020 BO.

The NMFS and USFWS jointly designated Gulf sturgeon critical habitat on April 18, 2003 (50 CFR §226.214). Seven of the marine and estuarine units of the Gulf sturgeon critical habitat (Units 8-14) are found along the states of Louisiana, Mississippi, Alabama, and Florida (Figure 90 of the NMFS 2020 BO).

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity" [16 U.S.C. § 1801(10)]. These habitats are crucial for maintaining healthy fish resources and fishery stocks. Due to the wide variation of habitat requirements for all life history stages of managed species, NOAA and the Gulf of Mexico Fishery Management Council initially identified EFH throughout the GOM to include all coastal and marine waters and substrates from the shoreline to the seaward limit of the Exclusive Economic Zone (200 mi [322 km] from shore). The EFH final rule summarizing EFH regulation (50 CFR § 600) outlines additional interpretation of the EFH definition. Waters, as defined previously, include "aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate." Substrate includes "sediment, hard bottom, structures underlying the waters, and associated biological communities." Necessary is defined as "the habitat required to supporting a sustainable fishery and the managed species' contribution to a healthy ecosystem." "Fish" includes "finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds," whereas "spawning, breeding, feeding or growth to maturity" covers the complete life cycle of those species of interest.

The EFH for the oceanic whitetip shark in the project area includes localized areas in the central GOM and Florida Keys. Although no EFH or critical habitat has been designated, the giant manta rays are widespread in the GOM. Giant manta rays occupy tropical, subtropical, and temperate oceanic waters and productive coastlines and are commonly found offshore in oceanic waters, but are sometimes found feeding in shallow waters (less than 10 meters) during the day (Miller, 2016).

The GOM supports a great diversity of fish species, including a wide variety of commercially and recreationally valuable fishes, most of which are linked either directly or indirectly to the estuaries ringing the Gulf. The life history of estuarine-dependent species involves spawning on the continental shelf; the transportation of eggs, larvae, or juveniles back to the estuary nursery grounds; and the migration of the adults back to the sea for spawning. Monthly ichthyoplankton collections over the years 2004-2006 offshore of Alabama confirmed that peak seasons for ichthyoplankton concentrations on the shelf are spring and summer (Hernandez et al., 2010). Additionally, the waters of the northern GOM support many coastal pelagic fishes and highly migratory species, some of which spawn exclusively in this region. The distribution of fish species is related to ecological factors (e.g., salinity, temperature, bottom type, primary production and availability of prey) which vary, sometimes widely, across the Gulf and between inshore and offshore waters. Characteristic fish resources are associated with various environments and are not randomly distributed.

Although a generalized analysis suggests, for locations off the continental shelf, species richness and abundance decrease with depth, Rowe and Kennicutt (2009) found food resources are a dominant factor controlling distribution of deepwater benthos in the GOM. Inputs such as the Mississippi River and hydrocarbon seep communities influence local densities of fauna associated with a given depth zone. Descriptions of ecological groups of fishes that occur in the region, including oceanic pelagics and mesopelagics, can be found in Chapter 4.7 of the Multisale EIS and 2018 SEIS.

3.7.2. Impact Analysis

A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed exploration activities on fish and essential fish habitat can be found in Chapters 4.7 of the Multisale EIS and 2018 SEIS, and is incorporated by reference. A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed exploration activities on federally listed threatened species can be found in Sections 8.4, 8.7, 8.8, 10, 11.3 and 11.4 of the NMFS 2020 BO, and is incorporated by reference. The IPFs associated with activities proposed that could affect EFH and fish resources include: (1) coastal and marine environmental degradation; (2) presence of a MODU; (3) temporary discharge of drilling cuttings and associated drilling fluids; and (4) blowouts and oil spills. The NMFS 2020 BO identified IPFs

associated with activities proposed that could affect federally listed threatened species including: (1) marine trash and debris; (2) vessel collisions; and (3) oil spills.

3.7.2.1. Alternative 1

If selected, Alternative 1, No Action Alternative, would result in the operator not undertaking the proposed activities as described in the plan. Therefore, the IPFs to fish and EFH would not occur. For example, there would be no drilling noise that would result in behavioral change, masking, or non-auditory effects to the fish resources, no long-term or permanent displacement of fish resources from preferred habitats, and no destruction or adverse modification of any habitats. No IPFs to ESA listed species would result from marine trash and debris, vessel collisions, or oil spills.

3.7.2.2. Alternative 2

If selected, Alternative 2, the Proposed Action as Submitted with additional conditions of approval as required under the NMFS 2020 BO, would result in the operator undertaking the proposed activities as requested and conditioned in the plan. As described in the analyses below, impacts to fish and EFH from the proposed action are expected to be short-term, localized and not lead to significant impacts. Impacts from the proposed activities are not expected to reduce appreciably, the likelihood of both the survival and recovery of federally listed threatened species.

Routine Activities

Routine activities, such as the discharge of drilling fluids and cuttings offshore would contribute to localized temporary marine environmental degradation. Drilling operations are restricted in time, and pelagic species in the area could easily avoid discharge plumes. Routine discharges from the MODU would be highly diluted in the open marine environment. The presence of the MODU will act as a fish-attracting device for the short period of time the rig is on site; however, routine discharges on fish resources will be very limited in duration.

In the last five year NMFS species review, vessel strikes were identified as an emerging threat for Gulf sturgeon. The NMFS 2020 BO *Effects Analysis* for Gulf sturgeon estimated one nonlethal and 21 lethal vessel strikes would occur over 50 years as a result of vessels associated with the proposed action. The effects to Giant manta rays and Oceanic white tip sharks from vessel strikes are discountable. The operator is required to adhere with the mitigation and monitoring measures provided in the NMFS 2020 BO under Appendix C: Gulf of Mexico Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols. Compliance with the regulations as clarified in the NMFS 2020 BO should reduce or avoid impacts from vessel strikes under this alternative. Many types of plastic materials end up as solid waste during drilling and production operations. Some of this material is accidentally lost overboard where fish or federally listed threatened species could consume it or become entangled in it. The incidental ingestion of marine debris and entanglement could adversely affect fish and federally listed threatened species. Implementation of Appendix B: Gulf of Mexico Marine Trash and Debris Awareness and Elimination Survey Protocols and the International Convention for the Prevention of Pollution from Ships (MARPOL) requirements under the United States Coast Guard (USCG) may reduce, but not eliminate the risk of marine debris (USDOC, NMFS, 2020a). The NMFS 2020 BO determined that Gulf sturgeon, oceanic whitetip sharks, and giant manta rays are not likely to be adversely affected by marine debris resulting from the proposed action.

Accidental Events

Accidental blowouts and spills with limited quantities of hydrocarbons also have the potential to affect fish resources and EFH, but there is no evidence to date that fish or EFH in the Gulf have been adversely affected at a population level by spills or chronic contamination. At the scale of this EA, any accidental impact would be limited in scope and affected fishes would likely be replaced by organisms from beyond the area of impact or would be colonized during the next recruitment event. Early life stages of fishes may be more sensitive than adults to potentially adverse impacts resulting from exposure to hydrocarbons. For

this reason, BOEM considers eggs and larval fishes to be at greater risk than adults in the event of exposure to contamination resulting from a spill or blowout. The specific effects of oil on fish can include direct lethal toxicity, sublethal disruption of physiological processes (internal lesions), suffocation due to oil coating gills, incorporation of hydrocarbons causing tainting or accumulation in the food chain, and changes in biological habitat (Moore and Dwyer, 1974; Incardona et al., 2014; Murawski et al., 2014). However, due to typically high fecundity and relatively wide distribution of eggs and larvae, it is unlikely spilled contaminants would overlap spatially and temporally with a fraction of eggs and larvae large enough to significantly impact populations. Furthermore, most adult fishes are expected to avoid adverse environmental conditions, minimizing the potential for impacts resulting from oil and dispersants. Estuaries are important nursery areas (EFH) for fish and aquatic life. Impacts related to oiling of these areas could result in the destruction of marsh habitat, facilitate in the erosion of coastlines, and increase the potential for adversely impacting juvenile fishes. A discussion of the impacts of oil on adult fish, fish eggs, and larvae can be found in Chapter 4.7 of the Multisale EIS and 2018 SEIS. Given that the potential for a blowout or a spill is small, there is a limited possibility for large amounts of oil released from a blowout or spill reaching shore. Additional sensitive habitat features and potential impacts to these habitats are discussed in **Chapter 3.4** (Deepwater Benthic Communities) of this document.

Accidental blowouts and spills also have the potential to affect federally listed species, but there is no evidence to date that there have been adverse impacts to population levels by spills or chronic contamination. Considering the location of Gulf sturgeon critical habitat in relation to oil and gas activities, the likely dilution of oil reaching nearshore areas, and the on-going weathering and dispersal of oil over time, it is not anticipated that the effects from oil spills will appreciably diminish the value of Gulf sturgeon designated critical habitat for the conservation of the species.

The likelihood of an individual giant manta ray or oceanic white tip shark being in the area of an oil spill is small and only those individuals found in the footprint of an oil spill would be affected. A small number of giant manta rays or oceanic white tip sharks are likely to be exposed to oil, and those exposures would likely result in effects similar to other marine species. Because data related to abundance estimates for oceanic whitetip sharks and giant manta rays in the GOM is limited, NMFS is not able to quantify an estimated number of oil spill exposures or mortalities for this species.

Cumulative Impacts

Cumulative activities that could impact fish, EFH, and federally listed threatened species in the area of the proposed action include State oil and gas activity, coastal development, crude oil imports by tanker, commercial and recreational fishing, hypoxia (i.e., red or brown tides), removal of OCS structures, vessel strikes, and offshore discharges of drilling muds and produced waters. It is expected that environmental degradation from the proposed action and non-OCS activities would affect fish populations, EFH, and federally listed threatened species; however, the incremental contribution of the proposed action to these cumulative impacts would be small and almost undetectable for fish and EFH and discountable for federally listed threatened species. Therefore, no significant cumulative impacts on EFH, fish resources, of federally listed threatened species would be expected as a result of the proposed activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area as well as other activities in the area.

Conclusion

The proposed action is expected to have little impact on any fish, EFH, or federally listed threatened species endemic to the northern GOM. Specific effects from any one oil spill would depend on several factors, including timing, location, volume and type of oil, environmental conditions, and countermeasures used. If a blowout occurred, ichthyoplankton, fish eggs, or larvae would suffer mortality in areas where their numbers are concentrated and where oil concentrations are high. However, impacts are still expected to be minimal to nonexistent based on the low probability of a spill occurring (see **Chapter 1.4**).

3.8. ARCHAEOLOGICAL RESOURCES

3.8.1. Affected Environment

Archaeological resources are defined in 30 C.F.R. § 550.105 as "any material remains of human life or activity that are at least 50 years of age and that are of archaeological interest." Archaeological resources on the OCS can be divided into two types: prehistoric and historic. Detailed descriptions of these resource types are provided in Chapter 4.13 of the Multisale EIS and 2018 SEIS. The following information is a summary of these descriptions, which are hereby incorporated by reference into this SEA.

Prehistoric

Geologic features that have a high probability for associated prehistoric sites in the northwestern and north central Gulf (from Texas to Alabama) include barrier islands, river channels and associated floodplains and terraces, and salt dome features. Also, a high probability for prehistoric resources may exist landward of a line that roughly follows the 60-m bathymetric contour, which represents the Pleistocene shoreline during the last glaciation some 12,000 years ago when the coastal area of Texas and Louisiana is generally considered to have been populated. BOEM is currently reviewing evidence to determine if a change in the currently accepted area of prehistoric site probability is warranted. The water depth in the area of the proposed action precludes the potential for prehistoric sites or artifacts.

Historic

Historic archaeological resources on the federal OCS include shipwrecks and a single light house (Ship Shoal Light). Historic research has identified over 4,000 potential shipwreck locations in the Gulf, with nearly 1,500 of these potential shipwreck locations on the OCS (Garrison et al., 1989). The historic record, however, is by no means complete, and the current ability to predict potential sites has proven inaccurate. As demonstrated by several studies (Pearson et. al., 2003; Lugo-Fernandez et al., 2007; Krivor et al., 2011; Rawls and Bowker-Lee, 2011), many more shipwrecks are likely to exist on the seafloor than have been accounted in available historic literature. Currently a high-resolution remote sensing survey is the most reliable method for identifying and avoiding historic archaeological resources.

A 2003 study recommended including some deepwater areas, primarily on the approach to the Mississippi River, among those lease areas requiring archaeological investigation. With this in mind, BOEM revised its guidelines for conducting archaeological surveys in 2005 and added about 1,200 lease blocks to the list of blocks requiring an archaeological survey and assessment. Archaeological survey blocks were further expanded in 2011 and current requirements are posted on the BOEM website under NTL No. 2005-G07 and Joint NTL No. 2011-G01. At present, high-resolution geophysical, ROV, and/or diver survey and investigation is required for bottom disturbing activities.

Historic shipwrecks have, with the exception of three significant vessels found by treasure salvers, been primarily discovered through oil industry sonar surveys in water depths up to 9,000 ft (2,743 m). In the last five years, over four dozen potential shipwrecks have been located and several of these ships have been confirmed visually as historic vessels. Many of these wrecks were not previously suspected to exist in these areas, based on the historic record. The preservation of historic wrecks found in deep water has been outstanding because of a combination of environmental conditions and limited human access.

The *Deepwater Horizon* spill released an estimated 53,000-62,000 bbl of oil per day for almost three months. Much of the oil was treated with dispersant at the sea surface and at the source in a water depth of 5,000 ft (1,524 m). The use of dispersants at the wellhead could result in currently unknown effects from dispersed oil droplets settling to the seafloor and could possibly contaminate exposed artifacts and wood or steel hulls such as those observed on many deepwater sites (Atauz et al., 2006; Church et al., 2007; Church and Warren, 2008; Ford et al., 2008).

The best available information does not provide a complete understanding of the effects, if any, of the spilled oil and potential response/cleanup activities on archaeological resources that may be located in deep water. Though information on the actual impacts to submerged archaeological resources is non-existent at this time, oil settling to the seafloor due to dispersant use at the wellhead could come into contact with archaeological resources. At present, there is no evidence of this having occurred. An experimental study has suggested that while the degradation of wood in terrestrial environments is initially retarded by contamination with crude oil; at later stages, the biodeterioration of wood is accelerated (Ejechi, 2003). While there are different environmental constraints that affect the degradation of wood in terrestrial and waterlogged environments, soft-rot fungal activity, one of the primary wood degrading organisms in submerged environments, was shown to be increased in the presence of crude oil.

3.8.2. Impact Analysis

A detailed impact analysis of the routine, accidental, and cumulative impacts of the proposed activities on historic archeological resources can be found in Chapters 4.13 the Multisale EIS and 2018 SEIS, and is incorporated by reference. The IPF associated with the proposed action that could affect submerged archaeological resources is seafloor disturbance. These discussions also are summarized below and hereby incorporated by reference into this SEA.

The routine IPF associated with LLOG's proposed development activities in the area of the proposed action that could affect archaeological resources is limited to direct contact or disturbance during well emplacement activities or equipment used for the drilling operations.

The historically-available literature is not sufficient to identify historic shipwreck losses in the area of the proposed action as historic records of losses occurring this far offshore are not location-specific (Pearson et. al., 2003; Lugo-Fernandez et al., 2007; Krivor et al., 2011; and Rawls and Bowker-Lee, 2011). However, if a historic resource exists in the area of drilling, direct physical contact with a shipwreck site could destroy fragile materials, such as the hull remains or artifacts, and could disturb the site context (Atauz et al., 2006; Church and Warren, 2008). To date, two historically-significant shipwrecks were found to have suffered damage from drilling activities because of a lack of knowledge of their presence.

The IPFs that could be associated with accidental events include seafloor disturbances from jettisoned/lost debris and, as discussed above, deterioration from potential oil spills. Similar to routine impacts, discarded/lost material that falls to the seabed has the potential to damage and/or disturb archaeological resources. Oil spills and their remediation efforts could also accelerate deterioration of archaeological resources. A detailed discussion of all potential impacts is found below.

3.8.2.1. Alternative 1

If selected, Alternative 1, the No Action Alternative, would result in the operator not undertaking the proposed activities as described in the plan. Therefore, the IPFs mentioned above (i.e., bottom disturbance associated with well emplacement and the use of equipment associated with drilling operations) would not take place, and any impact that these actions could cause would not occur. Likewise, under the No Action Alternative, there would be no possibility of a spill. As a result, whatever archaeological resources may be present in the area of potential effect (APE) would not be affected in any way if the no-action alternative was selected.

3.8.2.2. Alternative 2

If selected, Alternative 2, the Proposed Action as Submitted with additional conditions of approval as required under the NMFS 2020 BO, would result in the operator undertaking the proposed activities as requested and conditioned in the plan. Examples of potential impacts to archaeological resources would include, but are not limited to, damage to potential resources from well emplacement activities, lost/discarded material, and potential impacts from an accidental oil spill. As described in the proposed plan and discussed below, the proposed activities are not expected to have significant impacts on known or unknown historical archaeological resources.

Routine Activities

Impacts to a historic site could result from direct physical contact causing irreversible damage. The undisturbed provenience of archaeological data (i.e., the 3-dimensional location of archaeological artifacts) allows archaeologists to accumulate a record of where every item is found, and to develop a snapshot as to how artifacts relate to other items or the site as a whole. The analysis of artifacts and their provenience is one critical element used to make a determination of eligibility to the National Register of Historic Places and is essential in understanding past human behavior and ways of life. Impacts from the proposed operations could alter the provenience and destroy fragile remains, such as the hull, wood, glass, ceramic artifacts and possibly even human remains, or information related to the operation or purpose of the vessel. The destruction and loss of this data eliminate the ability of the archaeologist to fully and accurately detail activity areas found at the site, variation and technological advances lost to history, the age, function, and

cultural affiliation of the vessel, and its overall contribution to understanding and documenting the maritime heritage and culture of the region.

BOEM's regulation at 30 C.F.R. § 550.194 requires that an archaeological survey be conducted prior to development of leases within the high-probability zones for historic and prehistoric archaeological resources. Currently, Ewing Bank Block 877 is designated as a high-probability block. At present, some form of survey is required for new bottom disturbing activities. No targets that may represent significant archaeological resources were identified in the high-resolution geophysical survey near/within the area of LLOG's proposed activity.

Accidental Events

Although unlikely, accidental blowouts and spills from the proposed action could lead to oil contact with submerged archaeological resources. While there is no information on the actual impacts of the *Deepwater Horizon* spill on submerged archaeological resources, should an accidental blowout and spill occur during the operator's proposed action, oil may settle on the seafloor due to dispersant use at the wellhead and could come into contact with archaeological resources. Although there is uncertainty and limited data on the effects of an oil spill at depth on submerged archaeological resources, an experimental study has suggested that while the degradation of wood in terrestrial environments is initially retarded by contamination with crude oil; at later stages, the biodeterioration of wood is accelerated (Ejechi, 2003). While there are different environmental constraints that affect the degradation of wood in terrestrial and waterlogged environments, soft-rot fungal activity, one of the primary wood degrading organisms in submerged environments, was shown to be increased in the presence of crude oil. No impacts are expected from marine remediation efforts because bottom-disturbing activities are not anticipated due to the water depth.

Another IPF that could result from an accidental event is from the loss of debris from the MODU during drilling operations. Debris such as structural components (i.e., grating, wire, tubing, etc.), boxes, pallets, and other loose items can become dislodged during heavy seas or storm events and fall to the seabed. Similarly, thousands of joints of drill pipe are used during drilling operations; requiring regular transport out to the MODU via workboats. There is the potential to lose pieces of drill pipe during transfer operations or when "tripping pipe" in and out of the wellbore. Similar to the impacts noted under Routine Activities, if lost drill pipe or debris were to fall onto an unknown archaeological resource near the well site, damage could destroy fragile materials, such as the hull remains and artifacts, and could disturb the site's context and associated artifact assemblage. Additionally, lost material could result in the masking of actual archaeological resources or the introduction of false targets that could be mistaken in the remote sensing record as historic resources.

In the event of a catastrophic spill similar to the *Deepwater Horizon* spill, any substantive impact to archaeological resources is very unlikely because the potential impacts from a catastrophic spill would be similar to aforementioned routine and accidental issues. However, despite the recent *Deepwater Horizon* spill, historical trends in the GOM (see **Chapter 1.4**) indicate that catastrophic spill events are not likely to occur as a result of the proposed action.

Cumulative Analysis

Cumulative impacts on unknown archaeological resources that may be present in the area of the proposed action could result from other GOM activities. Since the water depth at the proposed well sites is 1,570 ft (479) deep and the area of the proposed action is over 67 mi (108 km) from shore, those activities would be limited to commercial fishing, marine transportation, and adjacent oil and gas exploration, development, and production operations.

During adjacent oil and gas operations, commercial fishing, and maritime transportation activities, there is associated the loss or discard of debris that could result in the masking of archaeological resources or the introduction of false targets that could be mistaken in the remote sensing record as historic resources. Future exploration, development, and production operations and/or any related infrastructure support could lead to bottom disturbances in the area of the proposed action; however, no additional activities have been proposed or are under review at this time. Similarly, geological and geophysical (G&G) surveys have been permitted near the area of the proposed action. These surveys may involve the seabed deployment of receivers attached to degradable concrete anchors that are deployed from the sea surface. These anchors

have the potential to damage unknown archaeological resources that may exist in the area of the proposed action as they descend through the water column; however, their small size and relatively light weight (~65 lbs [34 kg]) is not expected to cause significant impacts.

Any known or unknown archaeological resources that may be present in Ewing Bank Block 877 could be impacted by contact with oil from a blowout or spill from adjacent oil and gas operations. Similarly, cumulative impacts from accidental oil spills and remediation efforts for adjacent oil and gas operations are not expected because of the water depth at the proposed well sites and the historically low probability of a loss of well control/blowout.

Considering the potential cumulative impacts from all other GOM activities, the operator's proposed activities would constitute the primary effect, if any, on any known or unknown archaeological resource that may exist in the area of the proposed action. However, based on the archaeological assessment conclusions, there is no reason to believe that the proposed action would result in the disturbance of archaeological resources. Therefore, no significant cumulative impacts are expected as a result of the proposed action when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area as well as other proximal activities.

Conclusion

Based on the previous information and the survey conclusions, there is no reason to believe that archaeological resources could be present in the area of the proposed action. If an unknown archaeological resource were to exist where bottom-disturbing operations are proposed to occur, and the operator were unaware of its existence prior to disturbing the bottom, the operator's activities might have a significant impact on that resource. Such impact would be damage and/or disturbance to the resource from drilling the well and from the associated equipment. Impacts from accidental events related to the proposed action such as accidental oil spills and their remediation efforts are not expected because of the water depth at the well sites and the historically low probability of a loss of well control/blowout. However, debris resulting from accidental events could lead to impacts similar to those expected from routine impacts such as contact with the well and/or well equipment**.**

4. CONSULTATION AND COORDINATION

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, the U.S. Fish and Wildlife Service (FWS) issued its 10-year programmatic BO for BOEM and BSEE's oil and gas activities in the GOM. The FWS BO does not include any terms and conditions for the protection of endangered species that the Bureaus, lessees, or operators must implement but did provide recommendations for Oil Spill Contingency Plan information, aircraft, marine debris and trash, information needs, and future coordination. The FWS 2018 BO also noted that any future consultations may be informal, dependent upon the likelihood of take.

On March 13, 2020, the National Marine Fisheries Service (NMFS) issued a BO and related terms and conditions for oil and gas activities in the GOM for the protection of these species, including holding lease sales. The NMFS programmatic BO addresses any future lease sales and any 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 the NMFS 2020 BO will be applied at the lease sale stage; other specific conditions of approval will also be applied to post-lease approvals. The NMFS 2020 BO 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. BOEM petitioned NMFS for rulemaking under the Marine Mammal Protection Act, to assist industry in obtaining incidental take coverage for marine mammals due to oil and gas & geological and geophysical (G&G) surveys in the Gulf of Mexico. If NMFS issues a final rule as a

result of the petition, the NMFS programmatic BO may be amended and additional mitigation measures beyond what is currently within Appendix A and C may be imposed through Letters of Authorizations under the rulemaking for MMPA.

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 § 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 an EIS/ROD or an EA/FONSI to comply with Section 106 of the National Historic Preservation Act in lieu of 36 CFR §§ 800.3-800.6

5. PUBLIC COMMENT

Once the operator's plan was deemed submitted (as per 30 CFR § 550.231) on August 18, 2020, and it was placed on http://www.regulations.gov for a 10-day public review. At the end of the comment period on August 30, 2020, one comment was received that did not pertain to this project nor the Gulf of Mexico.

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8. APPENDIX

Appendix A—Accidental Oil-Spill Discussion
Available: http://www.boem.gov/Appendix-A-Deepwater-SEA-Oil-Spill-Discusssion/